Rugged TROLL

Operator's Manual

2023-10-12 | 0092442

Contents

Introduction

- The Rugged TROLL Instrument measures level and temperature.
- Use it in natural groundwater, surface water, industrial waters, and other installations.

What you'll find in this manual...

- Setup, calibration, and deployment instructions
- Maintenance information
- Modbus and SDI-12 programming overview

Instrument details...

Serial number location

- The serial number is engraved on the instrument housing.
- It is also programmed into the instrument and is displayed when the instrument is connected to the VuSitu mobile app or a computer running Win-Situ Software.

Certification

- See the Declarations of conformity at end of this manual.

Unpacking and inspection

- Your instrument was carefully inspected before shipping.
- Check for any physical damage sustained during shipment.
- Notify In-Situ and file a claim with the carriers involved if there is any shipping damage.
- Accessories may be shipped separately. Inspect them for physical damage and verify that all of the items you ordered are present.

Warranty

See the product specification tables for warranty information.

Contact information

Mailing and shipping address:	In-Situ 221 East Lincoln Avenue Fort Collins, CO 80524-2533 U.S.A.
Phone:	970-498-1500 (international & domestic)
Fax:	970-498-1598
Internet:	www.in-situ.com
Support:	800-446-7488 (U.S.A. & Canada)

Product specifications

Rugged TROLL 100 and 200 specifications

Temperature ranges[1]	Operational: 0 to 50° C (32-122° F) Storage: -40 to 80° C (-40 to 176° F) Calibrated: 0 to 50° C (32 to 122° F)
Diameter	2.62 cm (1.03 in.)
Length	14.43 cm (5.68 in.)
Weight	137 g (0.30 lb)
Materials	Titanium, Acetal, FKM Fluoroelastomer, Ceramic
Output options	Rugged TROLL 100: USB or RS232 via docking station Rugged TROLL 200: USB or RS232 via docking station; Modbus/RS485 or SDI-12 via Rugged TROLL 200 Cable; Wireless TROLL Com
Battery type & life[2]	3.6 V lithium; 10 years or 2M readings
External power	Rugged TROLL 100: NA Rugged TROLL 200: 8-36 VDC
Memory Data records[3] Data logs	2.0 MB 120,000 Rugged TROLL 100: 1 log; Rugged TROLL 200: 2 logs
Fastest logging rate	1 per second
Fastest output rate	Rugged TROLL 200 only: Modbus & SDI-12: 1 per second
Log types	Linear, Fast Linear, and Event
Sensor Type/Material	Piezoresistive; Ceramic
Range	9.0 m (30 ft) (Burst: 18 m; 60 ft) 30 m (100 ft) (Burst: 40 m; 134 ft) 76 m (250 ft) (Burst: 112 m; 368 ft)
Accuracy (FS)[4]	±0.1%
Resolution	±0.01% FS or better
Units of measure	Pressure: psi, kPa, bar, mbar, mmHg, inHg Level: in, ft, mm, cm, m
Temperature Sensor	
Accuracy	±0.3° C

Resolution	0.01° C or better
Units of measure	Celsius or Fahrenheit
Warranty	2 years
Footnotes	[1] Temperature range for non-freezing liquids [2] Typical battery life when used within the factory-calibrated temperature range [3] 1 data record = date/time plus 2 parameters logged (no wrapping) from device within the factory-calibrated temperature range, 360,000 total data points [4] Across factory-calibrated pressure and temperature ranges. Defined as greater than 98% of all readings fall within spec across temperature and pressure range Specifications are subject to change without notice. Delrin is a registered trademark of E.I. du Pont de Nemours and Company.

Rugged Baro TROLL specifications

General	Rugged Baro TROLL
Temperature ranges[1]	Operational: 0-50° C (32-122° F) Storage: -40-80° C (-40-176° F) Calibrated: 0-50° C (32-122° F)
Diameter	2.62 cm (1.03 in.)
Length	14.43 cm (5.68 in.)
Weight	137 g (0.30 lb)
Materials	Titanium body; Delrin nose cone, hanger, backend
Output options	USB or RS232 via docking station; Modbus/RS485 or SDI-12 via Rugged TROLL 200 Cable
Battery type & life[2]	3.6 V lithium; 10 years or 2M readings
External power	8-36 VDC
Memory Data records[3] Data logs	2.0 MB 120,000 2 logs
Fastest logging rate	1 per minute
Fastest output rate	Modbus & SDI-12: 1 per second
Log types	Linear
Sensor Type/Material	Piezoresistive; Ceramic

Range	7.0 to 30.0 psi; 0.5 to 2 bar
Accuracy (FS)[4]	±0.1%
Resolution	±0.01% FS or better
Units of measure	Pressure: psi, kPa, bar, mbar, mmHg, inHg
Temperature Sensor	
Accuracy	±0.3° C
Resolution	0.01° C or better
Units of measure	Celsius or Fahrenheit
Warranty	2 years
Footnotes	[1] Temperature range for non-freezing liquids [2] Typical battery life when used within the factory-calibrated temperature range. [3] 1 data record = date/time plus 2 parameters logged (no wrapping) from device within the factory-calibrated temperature range [4] Across factory-calibrated pressure range and temperature ranges. Defined as greater than 98% of all readings fall within spec across temperature and pressure range Specifications are subject to change without notice. Delrin is a registered trademark of E.I. du Pont de Nemours and Company.

Overview

Rugged TROLL overview

- The Rugged TROLL 100 and 200 instruments measure pressure, level, and temperature in natural groundwater and surface water. They also can be used at industrial sites, landfills, and other installations.
- Both instruments have completely sealed housings that contain an absolute (non-vented) pressure sensor, temperature sensor, real-time clock, microprocessor, lithium battery, and internal memory.
- The Rugged TROLL 100 is designed to hang by a backshell hanger from a suspension wire. The Rugged TROLL 200 can utilize the backshell hanger or can connect to a cable for easy top-of-well RS485 communications via laptop computer or mobile device. Additionally, Rugged TROLL 200 cables with stripped-and-tinned cable ends can communicate with data loggers, TROLL Link Telemetry Systems, or PLC devices via RS485 or SDI-12.

Rugged Baro TROLL overview

- The Rugged BaroTROLL measures and logs barometric pressure and temperature in air. This data is used to correct the Rugged TROLL 100 and 200 data by compensating for barometric pressure effects during the course of a log.

Communication accessories

Rugged TROLL 100:

- USB or RS232 docking station
- Wireless Rugged TROLL COM

Rugged TROLL 100,200 and Rugged BaroTROLL Instruments:

- USB or RS232 docking station
- USB or RS232 Rugged TROLL Com
- Wireless RuggedTROLL Com

Software

- Win-Situ 5 Software or VuSitu mobile app for programming and downloading
- Optional software: Win-Situ Baro Merge for barometric compensation

Other accessories

Rugged TROLL 100

- Suspension cable
- Rugged BaroTROLL for logging barometric pressure data

Rugged TROLL 200

- Suspension cable
- Rugged BaroTROLL for logging barometric pressure data
- SDI-12 compatible cable with stripped-and-tinned uphole termination
- RS485 compatible cable with stripped-and-tinned uphole termination
- RS485 top-of-well cable
- Rugged TROLL 200 cable suspension kit (Use this kit to create a weight-bearing loop capable of suspending up to 45.5 kg (100 lbs.) of cable and instrument.)

Equipment configuration table

Data logger	Deployment options	Communication device
Rugged TROLL 100	Suspension wire —one per Rugged TROLL & Rugged Baro TROLL —one per network of Rugged TROLLs —requires an additional suspension wire	Wireless Rugged TROLL Com Rugged TROLL Docking Station*
Rugged TROLL 200	Option (A) Suspension wire —one per Rugged TROLL & Rugged Baro TROLL —one per network of Rugged TROLLs —requires an additional suspension wire	Wireless Rugged TROLL Com Rugged TROLL Docking Station*
	Option (B) RS485 Direct-read cable —one per Rugged TROLLs & Rugged Baro TROLL —one per network of Rugged TROLLs —requires additional RS485 cable for real-time data	Wireless Rugged TROLL Com Rugged TROLL Com** —one per cable for top-of-well data —one per network—download only
	Option (C) SDI-12 Direct-read cable & Rugged Baro TROLL —one per network of Rugged TROLLs —requires additional SDI-12 cable for real-time data	Wireless Rugged TROLL Com PLC/SCADA & Rugged TROLL Docking Station***

* A Rugged TROLL Docking station can connect to one data logger at a time.
** In this deployment option, make sure to include an additional Rugged TROLL Com for real-time data from the Rugged BaroTROLL.
*** In this deployment option, a Rugged TROLL Docking Station is required for communication with the data loggers when not connected to the SDI-12 Direct-Read Cable.

Getting started

You will need the following items.

- Rugged TROLL 100 or 200 instrument
- Rugged BaroTROLL (optional)
- One of the communication devices below
    - USB or RS232 docking station and Rugged TROLL Com (for Rugged TROLL 200 and Rugged BaroTROLL).
    - Wireless Rugged TROLL Com (if using the VuSitu mobile app)

Install software

You can configure and deploy your In-Situ instrument with the VuSitu mobile app or Win-Situ 5 software for PC. To use Win-Situ, install it from the In-Situ website. Download VuSitu on your mobile device from the Google Play Store at play.google.com.

VuSitu Mobile App

VuSitu is the mobile user interface and control application for In-Situ water quality instruments. You can use VuSitu on mobile devices with Android operating system 4.4, Bluetooth 2.0 and newer. Download the latest version of the app from the Google Play Store at play.google.com.

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

To avoid potential compatibility issues, it is important to use the most recent version of the VuSitu Mobile App. Find version information and app updates from the Google Play Store.

Win-Situ 5 software

1 Click the Win-Situ 5 link and follow the installation instructions.

2 Make sure that you select the option to "Install USB Drivers."

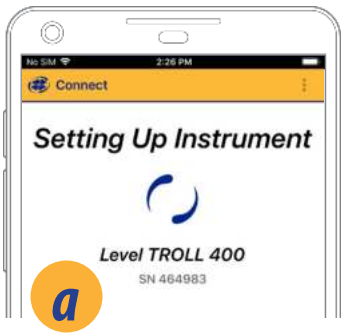
Win-Situ Baro Merge software

Install Baro Merge Software if you plan to post-correct level data to compensate for barometric pressure.

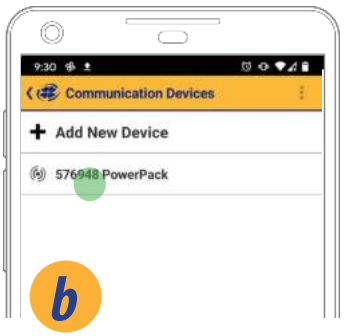
Connecting Your Instrument to VuSitu

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

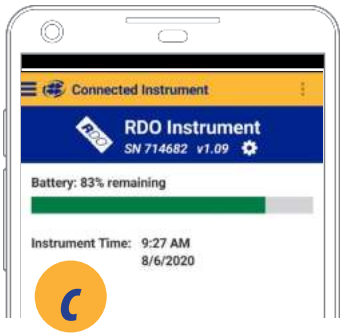
Connecting to VuSitu



Attach an instrument and turn on the Wireless Rugged TROLL Com. Launch VuSitu. The app will automatically connect.



To connect to another instrument, press **Disconnect**. VuSitu displays a list of available connections.



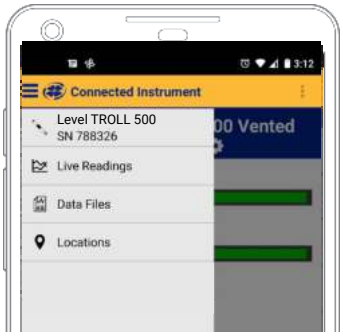
VuSitu displays the Connected Instrument screen when pairing is complete.

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 the features included in VuSitu. Tap the menu icon again to close the menu.

Menu Options when Connected to Instrument

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



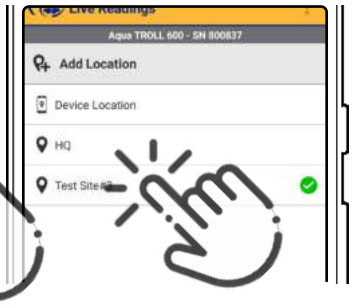
Live Readings Screen

The live readings screen displays 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 if you wish to associate this data with a different location.



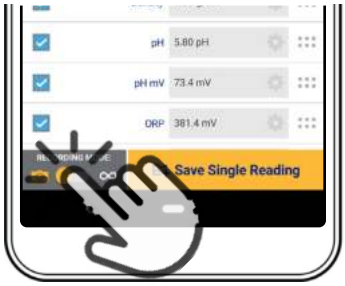
Choose the desired location and press **Save** in the bottom right corner of the screen.

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

VuSitu confirms the new snapshot file.

View the file from the Data Files screen.

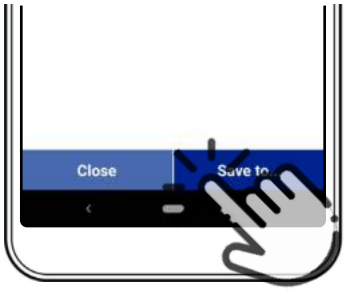
Live Readings Mode



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.

Changing Parameters and Units

From the Live Readings screen, tap the settings wheel next to the field that contains the measurement value.

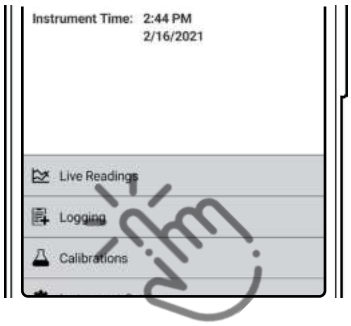
Tap the parameter drop-down arrow and tap the parameter you want to display.

Tap the units drop-down arrow and tap the unit you want to display.

Tap the **OK** button to set the options and return to the Live Readings screen.

Downloading and Sharing Your 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.



Pair VuSitu with the instrument. Select **Logging** from the Connected Instrument screen.

Tap a log and press the **Download** button.

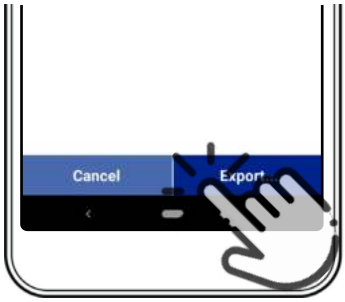
Choose the data you wish to download. To save the entire log to your phone, choose **All data**.

VuSitu displays a progress bar while downloading.

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.

Connect to the Rugged TROLL Docking Station

The docking station is intended for use with the Rugged TROLL 100, 200 and Rugged BaroTROLL Instruments that are not deployed with a communication cable. Once connected, you can program the instrument, view readings, and download the data.

Unscrew and remove the hanger from the instrument.

Invert the instrument. Align the notch on the instrument with the tab on the rim of the docking station. This will ensure that the pins are aligned to enable communication.

Place the instrument into the docking station.

Connect the docking station to a computer.

The hanger is the only removable part of the instrument. Do not attempt to take the instrument apart. There are no user-serviceable parts in the instrument.

Connect to the Wireless Rugged TROLL Com

The docking station is intended for use with the Rugged TROLL 100, 200 and Rugged BaroTROLL Instruments that are deployed with a communication cable. Once connected, you can use the VuSitu mobile app to program the instrument, view readings, and download the data.

Unscrew and remove the hanger from the instrument.

Invert the instrument. Align the notch on the instrument with the tab on the rim Rugged TROLL Cable. This will ensure that the pins are aligned to enable communication.

Connect the other end of the cable to the Wireless Rugged TROLL Com.

Press the button on the Wireless Rugged TROLL Com and open the VuSitu Mobile app to pair.

Connect to the Rugged TROLL Com

The Rugged TROLL Com is used as a communication interface between a Rugged TROLL 200 or a Rugged BaroTROLL instrument, the Rugged TROLL 200 cable and a computer.

An internal 9 volt battery powers the Rugged TROLL Com, but it does not provide power to the instrument. The Rugged TROLL Com connects to the uphole end of the Rugged TROLL 200 cable. Once connected, you can program the instrument, view real-time readings, and download the data.

Do not submerge the Rugged TROLL Com Device.

Rugged TROLL Com battery installation

Open the battery compartment door.

Attach the battery leads to the battery terminals.

Push the battery into the compartment and close the door.

Connections

Attach the Rugged TROLL Com to the Rugged TROLL 200 cable via snap-on connection to the uphole end of the cable.

Connect the communication cable to the PC.

Release the connection to the uphole cable end by pushing in the white tab on the TROLL Com.

The Rugged TROLL Com requires a minimum of 8 VDC. If you lose connection to the instrument, particularly when using a long cable, replace the 9 V battery on the TROLL Com.

Deploying instruments

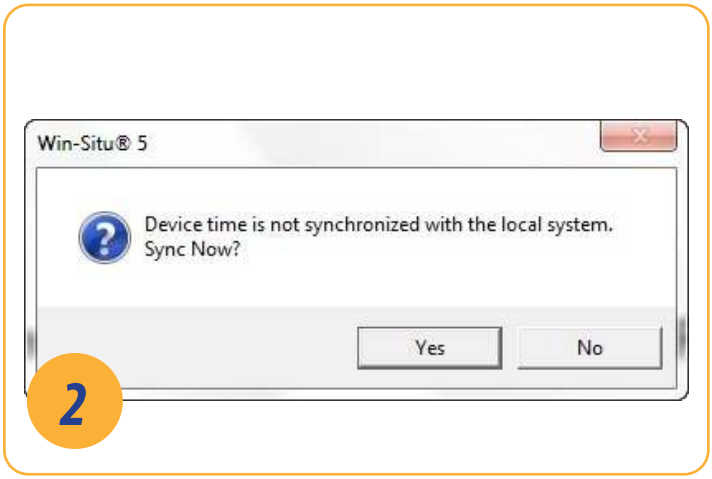
You can deploy a Rugged TROLL Instrument with or without a Rugged BaroTROLL Instrument. Use the Rugged BaroTROLL Instrument when you want to compensate water level measurements for atmospheric pressure.

Use the following steps for each instrument.

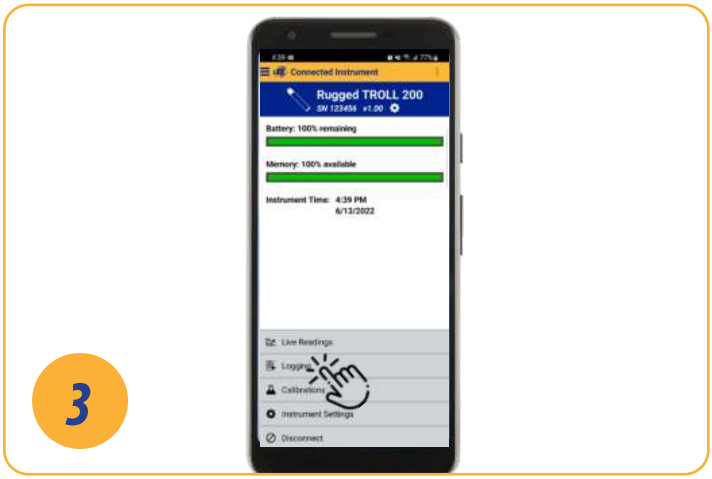
Attach the instrument to a Wireless Rugged TROLL Com and connect to the VuSitu mobile app.

or

Connect the instrument to a computer and Win-Situ 5 software.



If you choose to connect with Win-Situ, be sure to sync the clock.



Program a log. See the Win-Situ 5 or VuSitu section of this document for more details.

The BaroTROLL measurements can be taken far apart as long as they cover the general time period as the Rugged TROLL log.

If the Rugged TROLL log uses the reference "Set first logged reading to," the Rugged BaroTROLL log should start before the Rugged TROLL log to ensure that barometric pressure is measured when the first level reading is captured.

Do not submerge the Rugged BaroTROLL Instrument.

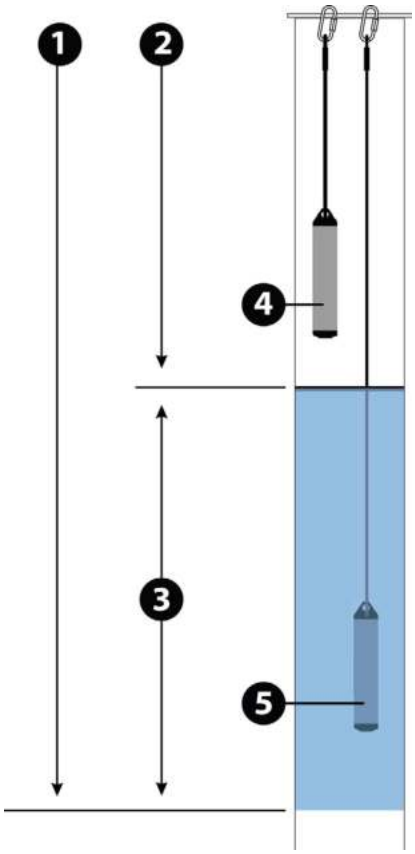


Figure 11.1 Rugged BaroTROLL and Rugged TROLL deployment

1	Pressure due to atmosphere + water column (measured by Rugged TROLL)
2	Pressure due to atmosphere (measured by Rugged BaroTROLL)
3	Pressure due to water column (calculated by subtracting Rugged BaroTROLL data from Rugged TROLL data)
4	Rugged BaroTROLL Instrument
5	Rugged TROLL Instrument

Rugged TROLL 200 Cable Suspension

When a Rugged TROLL 200 Instrument or a Rugged BaroTROLL Instrument needs to be installed with a secure fastener, such as a carabiner, In-Situ Inc. recommends using the Rugged TROLL 200 Cable Suspension Kit (Part Number 0080880).

When installed correctly the connector can support a combined cable and instrument weight of up to 45.4 kg (100 lbs).

Create a loop on the uphole end of the cable and loosely bind it with one zip tie.

Place the metal loop inside the cable loop. Push the zip tie up to form a tight band around the metal loop.

Tighten the zip tie.

Place the second zip tie directly below the first and tighten.

Place the third zip tie about 2.5 cm (1 in.) below the first two ties. Place the fourth zip tie snugly against the third.

Clip the excess tie material from the unit.

Deploy from a well dock or other secure location.

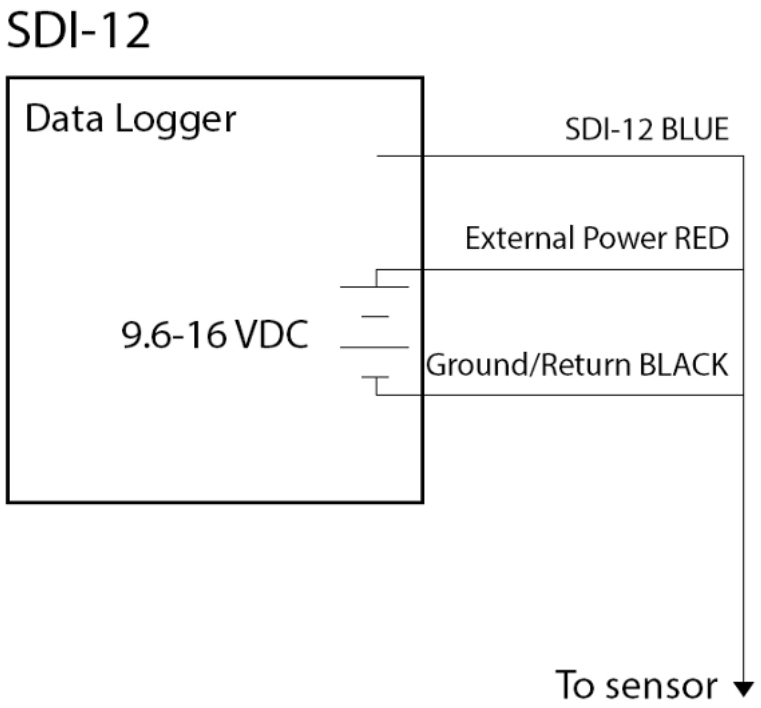
Wiring connections for stripped-and-tinned cable

The Rugged TROLL 200 Cable can be ordered with stripped-and-tinned wires that can be connected to an SDI-12 or RS485 data recorder or controller.

SDI-12 connections

- Blue = serial data
- Red = 12 V power supply
- Black = ground

Terminate remaining wires at the data recorder.

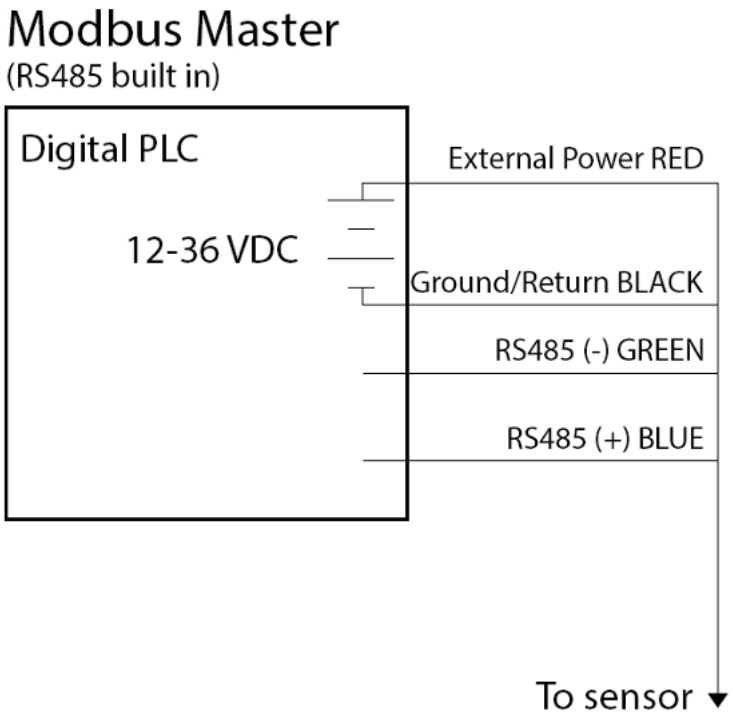


To learn more about using SDI-12 to communicate with a Rugged TROLL, see the SDI-12 Commands Tech Note on In-Situ's website.

RS485 connections

- Red = 12 V power supply
- Black = ground
- Green = RS485 (-)
- Blue = RS485 (+)

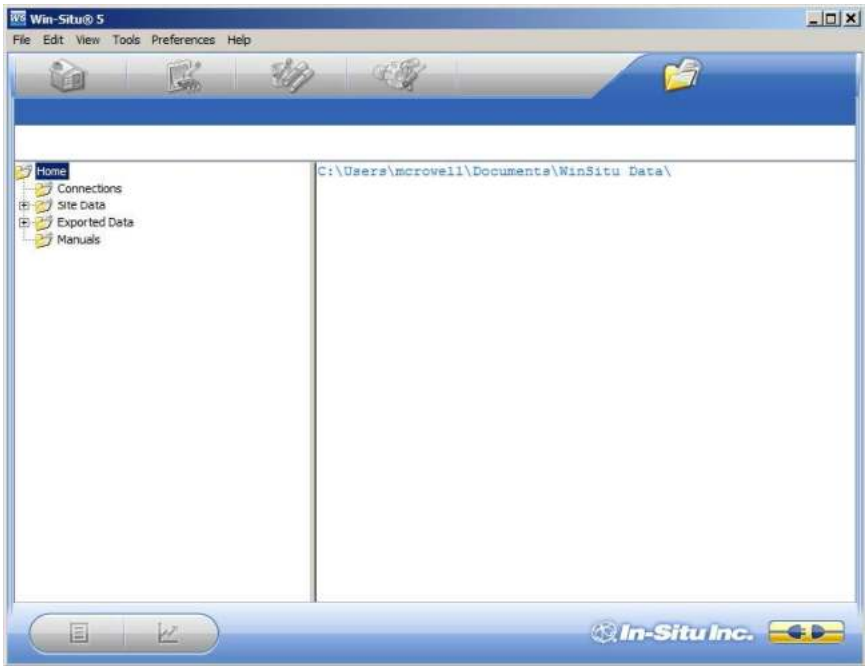
Terminate remaining wires at the data recorder.



To learn more about using RS485 to communicate with a Rugged TROLL, see the In-Situ Modbus Communication Protocol on In-Situ's website.

Data tab

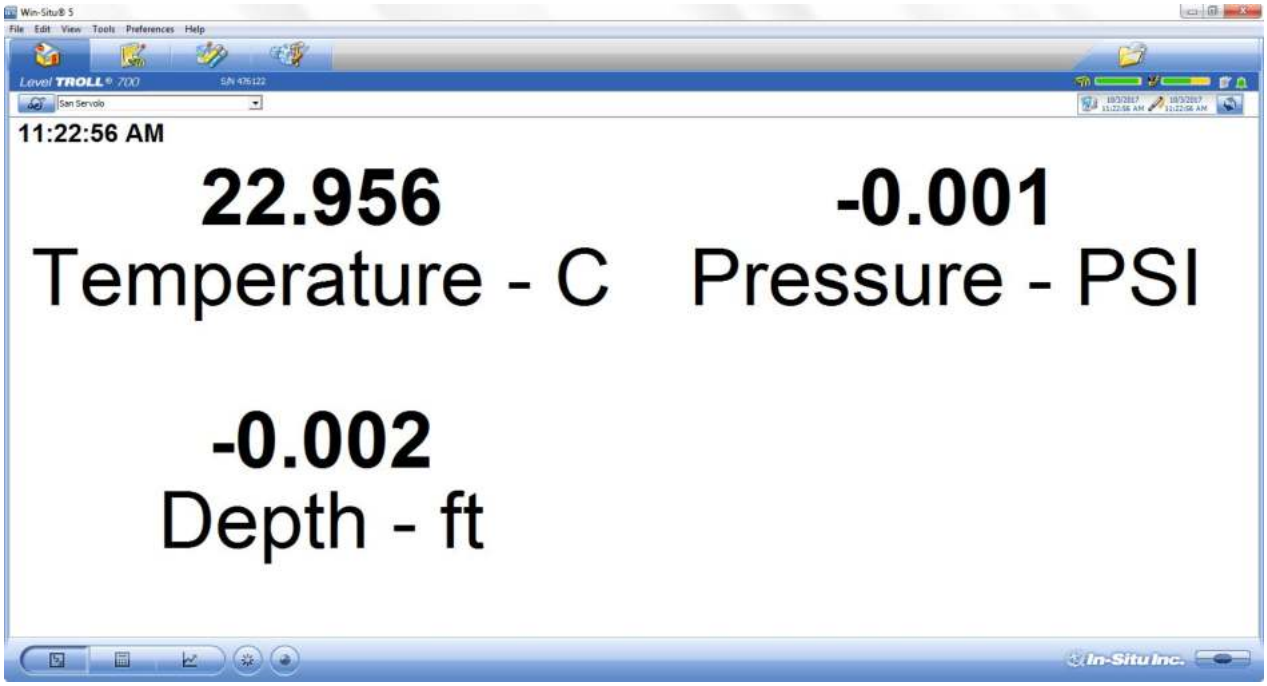
When you open Win-Situ 5 Software, the Data tab appears. The left side of the screen contains a file tree where you can view previously downloaded site data as well as data you have exported to Microsoft Office Excel. The links on the right side of the screen show where downloaded data are stored on your computer. The disconnected plug icon in the lower-right corner of the screen indicates that the software is not yet communicating with an instrument.



Screen element	Definition
	The disconnected plug indicates the instrument is not communicating with the software. Click to establish communication with a connected instrument.
	The connected plug indicates the instrument is communicating with the software. Click to disconnect the software from the instrument.
	The Home tab displays real-time readings from the instrument. When connection to the instrument is first established, the software displays one reading of all available parameters in light gray. You must click the Play button at the bottom of the screen to view real-time readings.
	The Logging tab displays a list of logs stored in the connected instrument. When you click the Logging tab, it can take a moment for the software to retrieve information from the instrument. (Not applicable for the RDO PRO-X and the Aqua TROLL 400.)
	The Sensors tab lists the sensors in the connected instrument, along with their serial numbers and the dates of factory calibration and user calibration. Use the buttons in this tab to calibrate sensors that support user calibration and configure sensors that are supported by the instrument.
	The Device Setup tab allows access to instrument information and settings such as instrument name, serial number, firmware version, communication settings, diagnostics, and factory reset options.

Home tab

The Home tab displays real-time readings from a connected instrument. When you first establish communication, the software displays one reading of all available parameters.

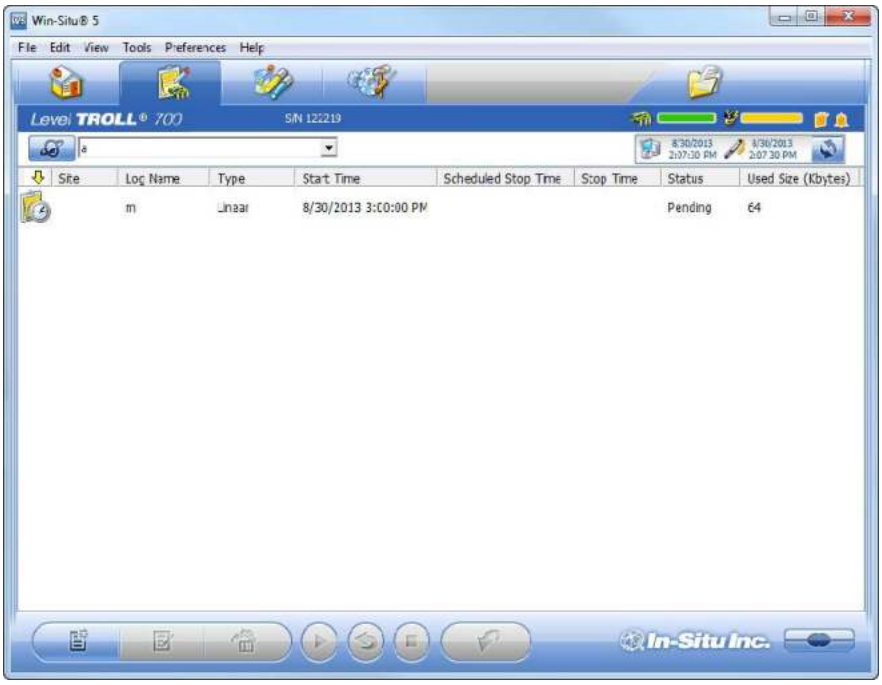


Screen element	Definition
	The Sites button allows you to add, edit, or delete a site. Click the drop-down arrow next to the button to view the list of sites.
	The Device Memory gauge turns yellow when the internal memory is used. Note: Non-logging instruments do not have internal memory, however, the gauge shows 100 percent green when power is applied.
	The Device Battery gauge turns yellow as the battery is depleted. This example shows 80 percent of the battery remaining (green) and 20 percent used (yellow). Note: Non-logging instruments do not have internal batteries, however, the gauge shows 100 percent green when power is applied.
	The Logging Status icon: Green—The instrument is actively logging data. Gray—The instrument has no logs pending or running. Non-logging instruments always show a gray status icon. Yellow—The instrument has log data that was collected according to specific instructions in the "Pending" or "Suspended" state.

	The Alarm icon provides additional instrument status information. Green—No alarms or warnings Yellow—One or more warnings Red—One or more alarms Move the cursor over the alarm icon to view a description. Click the Device Setup tab for detailed information on the alarm or warning. Note: Disregard the Device Reset alarm for non-logging instruments such as the RDO PRO Probe or the Aqua TROLL 400.
	System Time is displayed on the left. Device Time is displayed on the right. Clocks are updated once every two seconds. When the Device Time is displayed in red, it differs from the current System Time, and should be synchronized.
	The Time Sync button is used to write the current PC time to the instrument. If you need to set the instrument clock to a time other than the system (PC) time, use the Set Clock button on the Device Setup tab.
	Meter View shows the last known parameter values, displayed with current units and time stamp. Readings are sized to occupy the entire screen. This is the default display in the Home tab. If the type is black, the readings are updating in real time.
	List View is a running list of the most recent records. New readings are continuously added to the top of the list and old readings scroll off the bottom.
	Graph View shows a real-time trend graph of the selected parameters.
	The Snapshot button records one set of readings.
	The Record button logs data to a CSV file that can be opened in a spreadsheet program. This is not the same as recording data in a log on the instrument.

Logging tab

The Logging tab displays a list of logs in the instrument. When you click the Logging tab, it may take a moment for the software to retrieve information from the instrument.



Log information

Columns across the Logging screen show information about the logs in the instrument.

- Symbol—This is a graphic representation of the information in the Status column.
- Site—The site that was specified when the log was configured.
- Log Name—The name that was entered when the log was configured.
- Type—The logging method that was selected when the log was configured.
- Start Time—For a Pending log, the scheduled start time is shown. For a Ready log that has not yet started, this column displays "Manual." For a Running or Stopped log, the actual start time is shown.
- Scheduled Stop Time—For a log with a scheduled stop, the scheduled stop time is shown. For a log without a scheduled stop time, this column is blank.
- Stop Time—For a Pending or Ready log, this column is blank. For a Running log, the time of the last data point is shown. For a Stopped log, the actual stop time is shown.
- Status—Each log has a specific status. See Log Status for details.
- Used Size—Kilobytes of instrument memory allocated for this log. For a Pending or Ready log, the current size of the log configuration is shown. For a Completed log, the size of the entire log file is shown. For a Running log, the current size of the log up to the last data point is shown.

Log status

The status of each log in the instrument is displayed in the Logging tab by a symbol beside the log name, and in the Status column.


Ready—Manual Start log is ready to start.


Pending—Scheduled start log is ready to start at its programmed time, or when you click the Start button.


Running—The log is actively logging data.


Suspended—The log has been paused (stopped temporarily).


Stopped—The log has been stopped, either manually or on a schedule.


Deleted—The log has been marked for deletion and will be deleted from the instrument when memory is needed. The software manages this automatically.


Invalid—The log as programmed cannot be run.


Ready, Pending, Running, and Suspended logs are considered active. Only one log can be active in the instrument.

Log control buttons

You can control the status of a log by selecting the log and clicking the appropriate button in the Logging tab control panel:

The Start button starts a Ready or Pending log, or resumes a Suspended log.

The Pause button pauses a Running log allowing you the option to resume it.

The Restart button restarts the selected Running log from the beginning. This can be useful during aquifer testing using a logarithmic data collection schedule.

The Stop button permanently stops the selected Running log.

Log operations

Use the buttons in the control panel to perform the following actions:

Create a new log.

The New button is disabled if a Ready, Pending, Running, or Suspended log is on the instrument. When the instrument contains its maximum number of logs, the New button is unavailable.

Edit (or review) the log configuration for a Ready, Pending, or Invalid log.

Delete the log. (Note that you must delete a log twice before it is permanently removed.)

Download the log to a PC.

Sensors tab

The Sensors tab lists the sensors in the instrument, along with their serial numbers and calibration dates. Use the buttons in this tab to calibrate and configure sensors.

Calibrate

Use the Calibration button to calibrate sensors or to adjust a level reference that is currently stored on the instrument. The Calibrate button is not available when the instrument does not support calibration (e.g. BaroTROLL Instrument).

1. With the instrument connected to the software, select the Sensors tab.
2. Select the parameter you intend to calibrate.
3. Click the Calibrate button

Configure

Use the Configure button to select parameter units and to configure parameters that support configuration. Examples include Level/Depth, Specific Conductivity, and Total Dissolved Solids. Parameters cannot be configured while the instrument is showing live data on the Home screen or while the instrument contains an active log.

1. With the instrument connected to the software, select the Sensors tab.
2. Select the parameter you intend to configure.
3. Click the Configure button.

When you configure the Level parameter using the Sensors tab, the settings are stored in the instrument and are available for use in Modbus, SDI-12, or analog communication (if available). If desired, a different configuration can be selected when setting up a log.

Device setup tab

In general, you should not use the Device Setup tab unless you are corresponding with the In-Situ technical support team. However, you can use this screen to set up communication protocols if you are connecting the instrument to a PLC or data logger.

Using Win-Situ 5 software

Connecting an instrument to the software

When you open Win-Situ 5 Software, you are asked if you want to connect to your device. Click Yes. Synchronize the instrument clock to the PC clock.

The software displays an error message if a connection cannot be established.

Selecting the correct COM port

If you are using a USB TROLL Com, select the correct COM port by following the steps below. If you are using a serial TROLL Com, the Win-Situ Software should default to the correct COM port, which is usually COM 1.

Steps for Windows 8.1 and Windows 10 systems.

1. Right-click the Start button.
2. Click Device Manager.
3. Click the arrow next to Ports (COM and LPT), and locate the USB Serial Port listing. The number listed next to this entry is your COM port address.

Steps for Windows 8 systems.

1. Right-click the Start screen.
2. Select All Apps.
3. Click Control Panel.
4. Open the Device Manager.
5. Click the arrow next to Ports (Com and LPT), and locate the USB Serial Port listing. The number listed next to this entry is your COM port address.

Steps for Windows 7 systems.

1. Click the Start button, and open the Control Panel.
2. Click Hardware and Sound, and open the Device Manager.
3. Click the arrow next to Ports (COM and LPT), and locate the USB Serial Port listing. The number listed next to this entry is your COM port address.

Steps for Windows XP systems.

1. Click the Start button, and open the Control Panel.
2. Double-click the System icon. Click the Hardware tab, and open the Device Manager.
3. Click the plus sign next to Ports (COM and LPT), and locate the USB Serial Port listing. The number listed next to this entry is your COM port address.

The following steps apply for all Windows operating systems.

1. Once you have determined the correct COM port address in your operating system, reopen Win-Situ 5 Software.
2. Close any open windows in Win-Situ Software.
3. Click Preferences.
4. Click Comm Settings, and then click the Port Number menu.
5. Scroll down to find the correct COM port address. Click the check mark to accept the changes.
6. Click the yellow Connect button in the lower right corner to establish a connection to the instrument.

Setting the instrument time

The instrument time and the current PC time are shown at the top of the screen when an instrument is connected to the software.

The PC time appears on the left, the instrument time on the right. Both clocks are updated at 0.5 Hz (once every two seconds). The device time is displayed in red if it differs by more than a few seconds from the current PC time. Data logging schedules depend on a correct instrument time.

To synchronize the instrument time to the current PC time, click the Clock Sync button Win-Situ writes the current PC time to the instrument.

Adding a new site

To add a new site to the site database in your working directory do one of the following:
On the **Data** tab, click the **Site Data** folder, select **File> New > Site**.
or
On the **Home** tab, click the Site button to display the site list, then click **New** . Enter a name for the site. This is the only required field.
Click **Save** to save the new site. The new site will appear in the **Site Data** folder, and Win-Situ will add it to the site database in the working directory on your computer. It is now available to select for any instrument log.

Log setup

The Log Setup Wizard presents sequential screens to help you supply all the information necessary to set up a data log in the instrument.

To access the Log Setup Wizard the instrument must be connected to the software.

1. Click the Logging tab. 
2. Click the New button. 

The New button may be disabled or may show a warning if an active log already exists on the instrument, or if the instrument is polling live data (see the Home screen), or if the device already contains its maximum number of logs.

3. Select the Site where the set of data will be logged and supply a name for the log.
4. Click the right arrow to continue after each step.
5. Select the parameters you intend to measure, choose the measurement units, and specify the order in which the selected parameters will be logged.
6. Select the logging method you intend to use. See page 35.
7. Select the log interval. A log interval is how often a measurement will be taken and stored.
8. Select the start condition, stop condition, and specify how to handle full device memory.
9. If you selected Level or Depth as a parameter to measure, specify how you intend to log this parameter.
10. The final screen summarizes the log setup. Click the check mark to write this information to the instrument.

Logging method descriptions

The following is a list of log types and their descriptions. The log types that are available on an instrument vary depending upon the capabilities of the instrument.

Linear

Linear log type measures and records at a user-defined fixed interval of one minute or more. This method is used for long-term studies, landfill monitoring, stream gauging, tidal studies, and background monitoring prior to aquifer testing. Intervals are measured in days, hours, or minutes.

Event

Linear Event log type combines basic fixed-interval logging of specified parameters with the ability to log data at a faster interval when a single-parameter event condition is present.

About the level reference

A Level Reference, also called an offset, is a user-specified starting point for logged Level readings. It is entered in the Logging Setup Wizard when a log is configured, or it can be stored in the device without configuring a log using the Configure button in the Sensors tab.

Depth mode does not require that you enter a Level Reference.

The Level Reference can be any value you choose. Here are some examples:

- **Elevation**—If you calculate the water level above mean sea level (MSL) and enter this as the Level Reference, then elevations above MSL will be logged.
- **Depth to Water**—If you measure the depth to the water surface (DTW) from the top of the well casing and enter this as the Level Reference, then DTW (also called drawdown) values will be logged.
- **Gauge Height or Stage**—Logged readings track water level as related to markings on a nearby staff gauge.
- **Zero**—A Level Reference of 0 effectively sets the probe to zero at the start of the log. Changes, both positive and negative, from the starting water level, will be logged.

Once you have determined the value of your Level Reference, the software gives you three options for entering it. These control when the level reference is applied.

- **New Reference**—This option is designed to be used with an active software connection when the device is installed in the water.

A new level reference must be entered while the device's pressure sensor is submerged in its final position in the water. This is because the current probe reading is set equal to the Level Reference to create the offset that takes effect at the start of the data log. The log header will show the probe reading at the time you entered the Level Reference.

During log setup, the software presents two additional options for entering the Level Reference:

- **Set first logged reading**—Use this option when the instrument will be deployed on wire rather than cable because you will not be able to communicate with the instrument when it is submerged.
- **Remind me to set reference later**—Use this option to defer the entry of the Level Reference during log setup and set a reminder to enter it when the device is submerged in its final position.

Starting a log

Every log is programmed for either a manual or a scheduled start. A log with a manual start time is displayed in the Logging screen with Ready in the Status column. A log with a scheduled start time is displayed with Pending in the Status column.

Starting a pending log

A pending log automatically starts at the scheduled time without any user intervention.

A scheduled log with Pending status can be manually started at any time before its scheduled start.

Starting a manual log

With the instrument connected to the software, select the Logging tab. Select the Ready log you want to start.

Click the Start Log button. The log starts and the symbol changes. The Status column displays Running.

Suspending (pausing) a Log

A running log may be temporarily paused. For example, you might want to reposition an instrument, calibrate a sensor, or clean a sensor and later resume the log. A log can be suspended and resumed three times.

1. With the instrument connected to the software, select the Logging tab
2. Select the log you intend to suspend.
3. Click the Suspend button. Suspended appears in the Status column.

Resuming a suspended log

1. To resume logging after a log has been suspended, select the Logging tab.
2. Select the Suspended log.
3. Click the Start Log button. Logging resumes. Running appears in the Status column. The data file will show the time when the log was suspended and the time when it restarted.

Stopping a log

A log can be manually stopped at any time, even if a stop time has been previously scheduled. If you did not specify a stop condition when you defined the log, the log will run until the instrument is out of memory or battery power, or until you manually stop it.

A log that has been stopped cannot be resumed. If you intend to resume a log later, you should suspend a log rather than stop it.

1. To manually stop a log, the instrument must be connected to the software.
2. Select the Logging tab.
3. Select the running log you intend to stop.
4. Click the Stop Log button.

Downloading data to a PC

This procedure copies the data log from the instrument to a PC. It does not remove the data log from the instrument. After a log is downloaded, it can be exported to a CSV file format that can be used by spreadsheet programs. The time shown in the log name is the time the log was downloaded.

1. With an instrument connected, select the Logging tab
2. Select the log you intend to download.
3. Choose a Running, Suspended, Stopped, or Deleted log.
4. Click the Download button.
5. In the next screen, select one of the three download options.
    - All data
    - New data (data logged since the last download)
    - Time interval to download

New data is downloaded by default to a new log file. To append new data to the last download of this log, be sure the option "Append logs on download" is selected in the General Settings dialog (Preferences > General Settings).

6. The log is copied to the connected PC into your Win-Situ working directory folder. View or change the working directory using File > Settings.
7. At the end of the download, Win-Situ gives you the option of viewing the data.
8. Select Yes and the log is displayed in the Data screen.
9. Select No and the Logging screen appears. You can view the data at any time by selecting it in the Data tab.

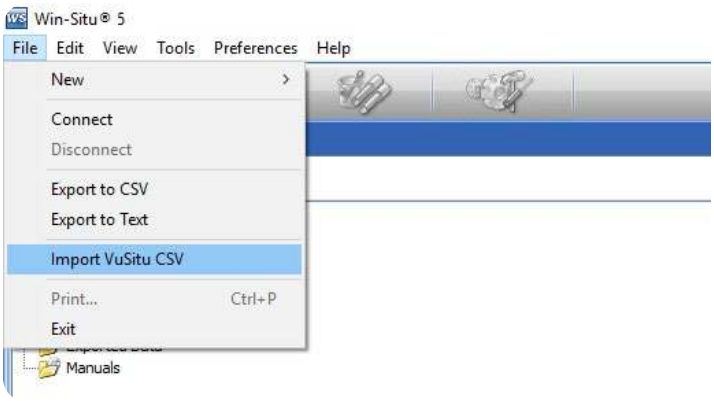
Viewing logged data

To view the data stored in the instrument, you must first download the data. A connection to an instrument is not needed after the data log has been downloaded.
Select the Data tab.
3. On the left side of the screen, select the log you want to view. To expand a folder shown in the navigation tree, double-click the folder. The content of the data log is displayed on the right side of the screen in text or graph format.

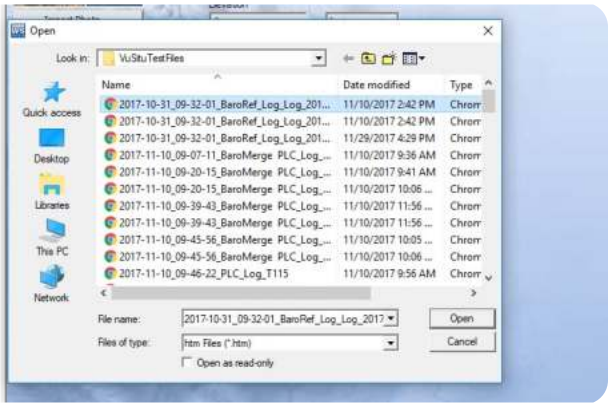
To switch between view formats, click the Text or the Graph button in the control panel. To customize the text or graph view, select Preferences > Graph Settings or Preferences > Data View Settings. These options apply to all downloaded data until you change the options.

Importing VuSitu data to Win-Situ

You can import data files from VuSitu into Win-Situ 5 from the File menu.

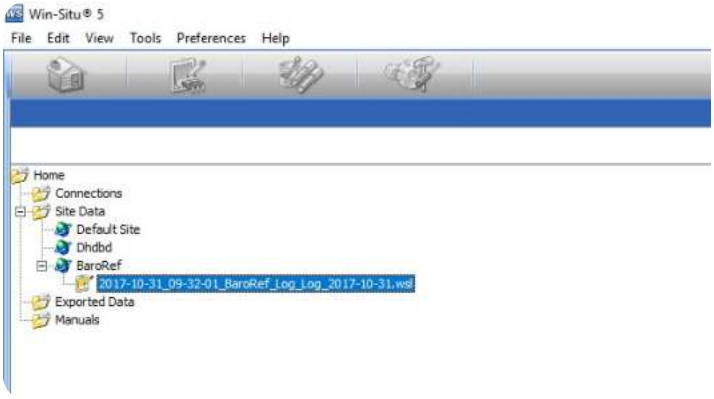


Click File > Import VuSitu CSV in the menu bar at the top of the screen.



Select the file you wish to import and click Open.

Select **OK** at the prompt.



Click on the file name to view it.

Using BaroMerge software

BaroMerge Software is used to post-correct absolute (non-vented) level sensor data to eliminate barometric pressure effects from the measurements. BaroMerge Software can be accessed through the Win-Situ 5 Software Tools menu. BaroMerge provides three options to correct data.

- **Fixed Correction**—A single offset value is applied to all selected log data. Use this option if you know the barometric pressure of the site during the log, and know that it did not change.
- **Manual Entry**—Specify two or more correction values to apply to the log data. Use this option if you wish to manually enter a data set of barometric pressure values.
- **BaroTROLL log file**—Absolute level sensor data points are individually corrected to reflect barometric pressure changes that were logged by a BaroTROLL instrument during the approximate time period.

Baro Merge input—fixed correction

If you select the Apply a fixed correction option, a single correction is applied to all values in the log. To use this correction method you need barometric pressure values from a reliable source. Choose a single value that represents the actual ambient barometric pressure during the time period the log was recorded. You also need to know the file names of the logs you want to correct.

1. From the Tools menu, select Win-Situ Baro Merge.

2. Select the **Apply a fixed correction** option.
3. Enter the barometric correction value and select units from the drop-down menu.
4. Click the **right arrow** button.
5. Select the log files to which the correction will be applied and click the **check mark** button.
6. Compensated data files can be viewed or exported from the **Data** tab.

Baro Merge input—manual entry

When you select the **Fixed Correction** and **Manual Entry** options, it is important to know the barometric pressure for the general time period covered by the log or logs you want to correct.

1. From the **Tools** menu, select **Win-Situ BaroMerge.**

2. Select the **Enter one or more values manually** option.

3. The compensation table appears that allows you to build a table of barometric data that corresponds to the time the log was recorded. The compensation table has three preference options:

- The first option, **Save calculated barometric adjustments in the new data file(s)** is the default option. It adds additional columns depending on which parameters were selected for the absolute/non-vented log in the corrected BaroMerge file that uses the compensation table values. This is intended to show how the adjustments were done in the BaroMerge file. If you do not want to show these adjustments, clear this option.
- When the second option, **Show time in UTC** is selected, the compensation table time stamp displays in Coordinated Universal Time (UTC) time, formally known as Greenwich Mean Time (GMT).

- If the third option, **Ignore daylight saving time (DST**) is selected, the compensation table time stamp format without the daylight savings time adjustment will be shown.

4. Build a table that contains at least two barometric pressure values.
5. Click the right arrow and select the absolute (non-vented) log file or files you intend to correct.
6. Click the check mark and the barometric compensation is applied.
7. Compensated data files can be viewed or exported from the **Data** tab.

BaroMerge output

Your original log file is not changed. A new, corrected log file with the same name and path is created. The original ".wsl" extension is replaced by "-Baro Merge.wsl".

Disconnecting an instrument from the software

Click the plug icon in the lower-right corner of the screen to disconnect the instrument from the software. Disconnect the instrument from the communication device. Attach a desiccant pack if you are using a vented cable.

Connecting the Rugged TROLL to a PLC or Data Logger

The Rugged TROLL 200 and Rugged BaroTROLL may be connected to a controller or logger for communication via:

- SDI-12
- RS485 Modbus
- RS232 to Modbus (with a customer-supplied converter)

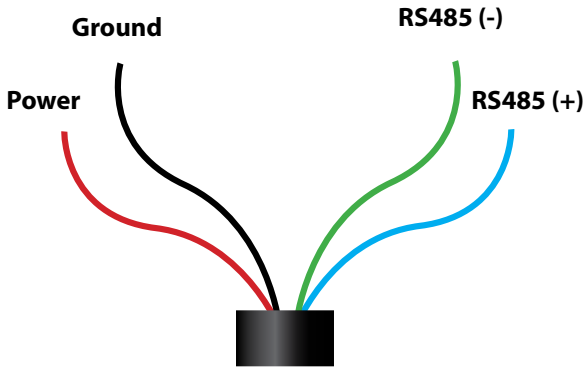
A Rugged TROLL Direct Read cable connects a Rugged TROLL 200 or Rugged BaroTROLL Instrument directly to a controller or logger for communications. The direct read cable is non-vented and is available in the following options:

- Top-of-Well Cable Connector and RS485 Modbus wiring
- Stripped-and-Tinned termination and RS485 Modbus wiring
- Stripped-and-Tinned termination and SDI-12 wiring

Wiring Overview

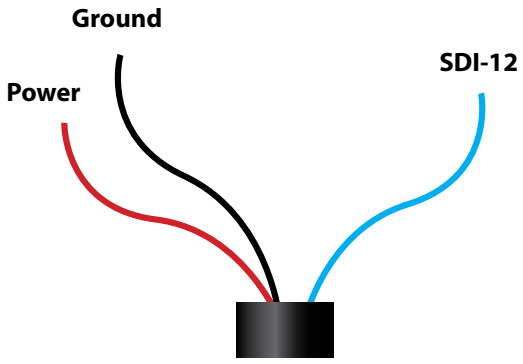
Direct Read Cable - Stripped and Tinned with RS485 Modbus Wiring

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



Direct Read Cable - Stripped and Tinned with SDI-12 Wiring

Signal	Color
Ground/Return	Black
External Power	Red
SDI-12	Blue



Refer to the diagrams on the following page for PLC wiring diagrams. Unused leads should not be touching.

Power connections

The red wire provides power for Modbus and SDI-12 communication modes.

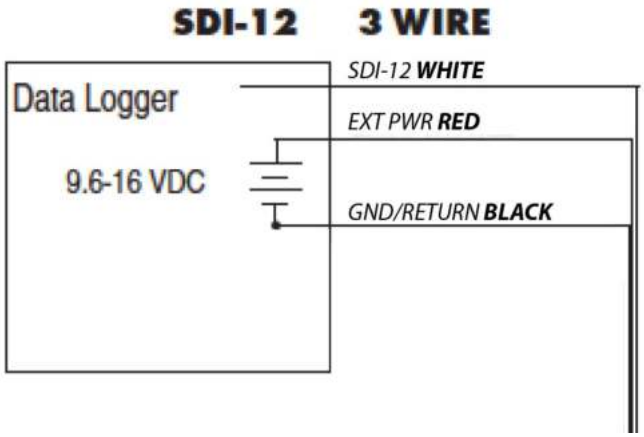
Communication modes

The device automatically switches between Modbus and SDI-12 modes depending on which cable is in use. Modbus and SDI-12 communications are strictly dependent on the cable type that was purchased.

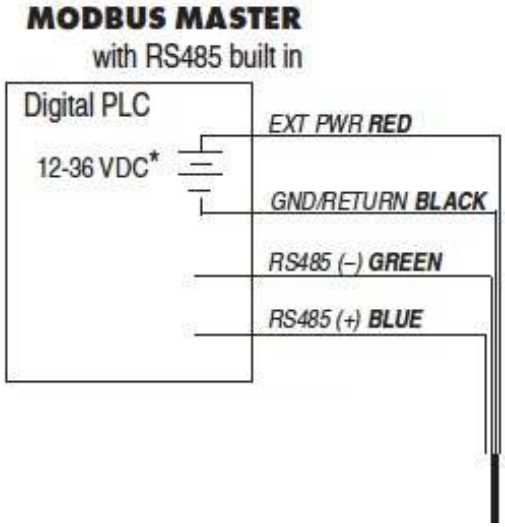
Redundant logging

The Rugged TROLL 200 and Rugged Baro TROLL can continue recording data to a log while connected to a PLC. If the PLC or recorder loses data or stops recording, the instrument will continue to collect data using its own internal batteries and clock. See the VuSitu section of this manual for more information on setting up a data log on the instrument.

SDI-12 wiring diagram



Modbus (RS485) wiring diagram



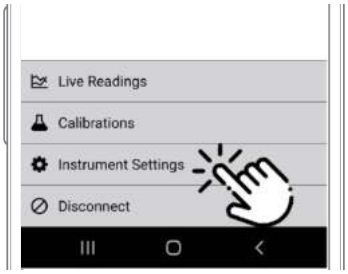
Configuring SDI-12 Settings

About SDI-12

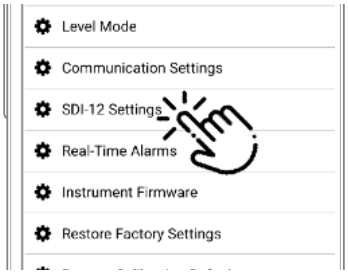
You can configure the list of SDI-12 parameters in VuSitu under **Instrument Settings.**

The Rugged TROLL conforms to the general SDI-12 Standard Version 1.3. For more information about SDI-12 commands, see the SDI-12 Standard Version 1.3 document from the SDI-12 Support Group Technical Committee.

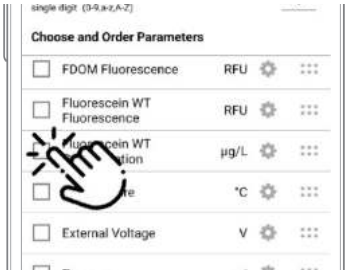
Configure SDI-12 Settings in VuSitu



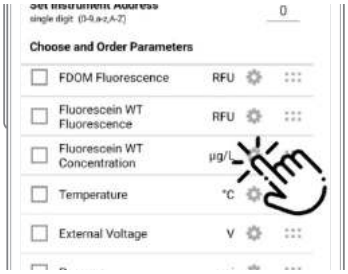
Connect to VuSitu and select **Instrument Settings.**



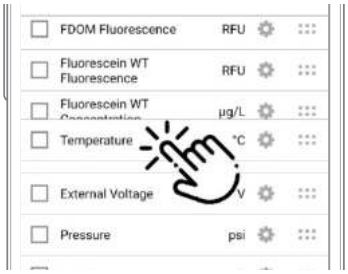
Choose **SDI-12 Settings.**



Use the checkboxes to select parameters to display.



Tap the gear icon to adjust the units for each parameter.



Drag and drop parameters to change the order.

Modbus PLC Interface

Overview

The Modbus PLC Interface is a simplified method of communicating with the Rugged TROLL using the Modbus protocol. For information about the specific Modbus registers and Unit IDs for your Rugged TROLL, see Appendices A and B. The Rugged TROLL conforms to the Modbus standard. For more information about Modbus communication, see www.modbus.org.

Setting Up Instrument

1. Connect power, and wire the instrument.
2. The setup below is using the instrument's factory default settings. Use VuSitu to reset the instrument to factory defaults if they have been changed. Take note of any changes in default units setup.

Programming the PLC

1. Set up the serial communication to match the instrument communication settings. Communication settings can be changed with the VuSitu mobile app. The default communication settings are:

Mode	Start Bit	Baud Rate	Data Bits	Parity	Stop Bit
RTU	1	19200	8	Even	1

2. Set the device address match the instrument address. The default device address is 1.
3. Set the PLC to wake-up the device by sending a carriage return (0x0D) or any Modbus command.
    a. Allow one second before sending a second command. The instrument needs this time to wake up.
    b. After the wake-up command, the next reading must be taken before the end of session timeout. If the reading interval exceeds the end of session timeout, send a new wake-up command before requesting a new reading. The default end of session timeout is 5 seconds, and may be longer if the instrument has been connected to VuSitu.
4. Select the register to read on the PLC using the information in the following sections.
    a. Some PLC devices use the register number directly in programming statements, others use register addresses, which are one less than the register number. Refer to PLC manufacturer instructions to determine which programming style to use.
    b. Each register is a holding register. Some PLCs require you to add 40000 to the register number or address. For example: 5451 would be 45451.
5. Set the type of register to: 32-bit float
    a. If asked by the PLC this is 2 registers
6. Set the byte order to: Big Endian (MSB)
    a. This should be the default and may not be configurable on all PLCs

Reading Device Information

Use the following registers to read general information about the instrument.

Holding Register Number	Holding Register Address	Size (Registers)	Data Type	Description
9001	9000	1	uint16	Device Id: 16 = Rugged TROLL 200 17 = Rugged Baro TROLL
9002	9001	2	uint32	Serial Number
9007	9006	1	uint16	Firmware version (100 = 1.00)

Reading Parameters

Each parameter contains a block of 7 registers as shown in the table below. To read measurements for a specific parameter, look up the starting register for that parameter from the list of Parameter Numbers and Locations in Appendix A. Once you have the starting register, add the number of offset registers for additional information about the reading.

Register Offset	Size (Registers)	Mode (R/W)	Data Type	Description
0	2	R	float	The measured value from sensor
2	1	R	uint16	Data Quality ID: 0 = No errors or warnings 3 = Error reading parameter For additional errors or information, contact technical support.
3	1	R/W	uint16	Units ID for this parameter. See: Appendix B.
4	1	R	uint16	Parameter ID for this parameter. See: Appendix A.
5	2	R/W	float	Off line sentinel value: The value that's returned on error or if the parameter isn't available. The default sentinel is 0.0

For example, you can apply this information to collect a reading for Pressure.

From the list in Appendix A, you can find that the starting register for Pressure is 0038. A reading from register number 0038 (register address 0037) will return the measured value of Pressure

Some PLC devices use the register number directly in programming statements, others use register addresses. Refer to PLC manufacturer instructions to determine which programming style to use.

You can use the register offsets listed in the table above to collect additional information about the reading. Adding the register offset of 2 to the starting register, you can find that register number 0040 (register address 0039) will return the Data Quality ID for the most recent Pressure measurement. Likewise, register number 0041 (register address 0040) will return the Units ID, which can be interpreted from Appendix B. Register number 0042 (register address 0041) will return the Parameter ID, which can be interpreted from Appendix A. Register number 0043 (register address 0042) will return the sentinel value.

The Units ID and Sentinel Value are writable registers. Measurements can be changed to other units using the Units ID as shown in Appendix B. For example, if register number 0041 (Pressure Units ID) returns 17, Pressure is configured to report in psi. Looking at Appendix B, you can find that kPa is also a valid unit which can be set by writing Units ID 19 to register number 0041.

Maintenance, Cleaning, and Storage

O-ring inspection and replacement

Examine O-rings for wear, dryness, discoloration, stretching, cracks, nicks, and brittleness. Replace O-rings if one or more of these conditions are present. Replacing O-rings on an annual basis, regardless of their condition, is the best way to protect against moisture damage.

Perform the following steps to replace an O-ring.

1. Remove and discard the damaged O-ring.
2. Use a clean, dry, soft cloth to clean the O-ring groove to remove dirt or residue.
3. Lubricate the new O-ring using high-vacuum grease.
    - Wash your hands thoroughly.
    - Apply a small amount of grease to the pad of your index finger, and rub your index finger and thumb together to spread the grease evenly.
    - Inspect the new O-ring and remove any debris stuck to it.
4. Rub your fingers around the O-ring until there is a thin layer of grease on the entire O-ring.
5. Install the O-ring in the groove and remove any excess lubricant with a clean cloth.

Do not allow water or lubricant to enter the connector.

Cleaning the instrument

Clean the instrument body with water and a soft brush or plastic scouring pad, or soak overnight in a mild acidic solution, such as household vinegar.

NEVER submerge the connector portion of the instrument when it is not connected to a cable.

If the ports near the pressure sensor are clogged with silt or mud, try the following procedures.

- Agitate the instrument vigorously in a bucket of clean water.
- Apply a gentle rinse of water from a wash bottle.

Do not attempt to remove material from the instrument by tapping the instrument against a surface. You void the instrument's warranty by inserting anything into the sensor opening. If contamination cannot be removed using the recommendations above, please contact In-Situ for cleaning.

Storage

Store the instrument in a clean, dry place. Store the instrument where it will not roll off a bench onto a hard surface or sustain other mechanical shock. Protect the instrument from temperature extremes.
Store the Rugged TROLL within the temperature range -40° C to +80° C (-40° F to +176° F).

Service

Obtaining repair service

If you suspect your system is malfunctioning and repair is needed, you can help assure efficient servicing by following these guidelines:

1. Call or email In-Situ Technical Support. Have the product model and serial number available.
2. Be prepared to describe the problem, including how the product was used and the conditions noted at the time of the malfunction.
3. If Technical Support determines that service is needed, they will ask your company to fill out the RMA form and pre-approve a specified monetary amount for repair charges. When the form and pre-approval is received, Technical Support will assign an RMA (Return Material Authorization) number.
4. Clean the product as described in the manual.
5. If the product contains a removable battery, remove and retain it unless you are returning the system for a refund or Technical Support states otherwise.
6. Carefully pack your product in its original shipping box, if possible.
7. Mark the RMA number clearly on the outside of the box.
8. Send the package, shipping prepaid, to:

In-Situ
ATTN: Repairs
221 East Lincoln Avenue
Fort Collins, CO 80524-2533
The warranty does not cover damage during transit. In-Situ recommends insurance for all shipments. Warranty repairs will be shipped back prepaid.

Outside the U.S.

Contact your international In-Situ distributor for repair and service information.

Guidelines for cleaning returned equipment

Please help us protect the health and safety of our employees by cleaning and decontaminating equipment that has been subjected to any potential biological or health hazards, and labeling such equipment. Unfortunately, we cannot service your equipment without such notification. Please complete and sign the form in your Operator's Manual (or a similar statement certifying that the equipment has been cleaned and decontaminated) and send it with each returned instrument.

- We recommend a cleaning solution, such as Alconox®, which is a glassware cleaning product available from In-Situ (part number 0029810) or laboratory supply houses.
- Clean all cabling. Remove all foreign matter.
- Clean cable connector(s) with a clean, dry cloth. Do not submerge cable connectors.
- Clean the probe body—including the nose cone, cable head, and protective caps. Remove all foreign matter.

Decontamination and cleaning form

If an instrument is returned to our Service Center for repair or recalibration without a statement that it has been cleaned and decontaminated, or if it is the opinion of our Service Representatives that the equipment presents a potential health or biological hazard, we reserve the right to withhold service until proper certification is obtained.

Decontamination & cleaning statement

Company Name		Phone
Address		
City	State	
Instrument Type		Serial Number
Contaminant(s) if known)		
Decontamination procedure(s) used		
Cleaning verified by		Title
Date		

Rugged TROLL 100

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 Rugged TROLL 200 :
Product name: **Rugged TROLL 100**
Model: **Rugged TROLL 100**
Part Number: **0091870**
Product Description: The Rugged TROLL 100 is a water depth sensor that is designed for short- or long-term deployments in wells, lakes, rivers or oceans.
Model Variants: The Rugged TROLL 100 models vary by maximum depth. The models available are: 0-30 ft (0-9m), 0-100 ft (0-30m) and 0-250 ft (0-76m).

These are 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 meet or exceed 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 13, 2022

CE FC

UKCA Declaration of Similarity

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

We declare that the performance of each of the following products is equivalent to the Rugged TROLL 200:
Product name: **Rugged TROLL 100**
Model: **Rugged TROLL 100**
Part Number: **0091870**
Product Description: The Rugged TROLL 100 is a water depth sensor that is designed for short- or long-term deployments in wells, lakes, rivers or oceans.
Model Variants: The Rugged TROLL 100 models vary by maximum depth. The models available are: 0-30 ft (0-9m), 0-100 ft (0-30m) and 0-250 ft (0-76m).

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 13, 2022

Innovations in Water Monitoring

CE Declaration of Conformity

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

Declares that the following product:
Product name: **Rugged TROLL 200**
Model: Rugged TROLL 200
Part Number(s): 0091930, 0091940, 0091950
Product Description: The Rugged TROLL 200 is a water depth sensor that is designed for short- or long-term deployments in wells, lakes, rivers or oceans.
Model Variants: The Rugged TROLL models vary by maximum depth. The models available are: 0-30 ft (0-9m), 0-100 ft (0-30m) and 0-250 ft (0-76m).

is in compliance with the following Directive:

- 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 Standards:
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 13, 2022

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

UKCA Declaration of Conformity

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

We declare that the performance of the following product:
Product name: **Rugged TROLL 200**
Model: Rugged TROLL 200
Part Number(s): 0091930, 0091940, 0091950
Product Description: The Rugged TROLL 200 is a water depth sensor that is designed for short- or long-term deployments in wells, lakes, rivers or oceans.
Model Variants: The Rugged TROLL models vary by maximum depth. The models available are: 0-30 ft (0-9m), 0-100 ft (0-30m) and 0-250 ft (0-76m).

is 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 meets or exceeds the following British requirements and compliance standards:

- **EMC:** BS 61326-1:2021
- **RoHS:** BS 63000:2018

The UKCA mark is affixed accordingly.

David A. Bossie
Regulatory Compliance Manager
In-Situ, Inc.
July 12, 2022

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 Rugged TROLL 200 :
Product name: **Rugged Baro TROLL**
Model: **Rugged Baro TROLL**
Product Description: The Rugged Baro TROLL is used to compensate for barometric pressure when using a water depth sensor that is designed for short- or long-term deployments in wells, lakes, rivers or oceans.
Model Variants: None

These are 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 meet or exceed 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.
November 15, 2022

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

UKCA Declaration of Similarity

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

We declare that the performance of each of the following products is equivalent to the Rugged TROLL 200:
Product name: **Rugged Baro TROLL**
Model: **Rugged Baro TROLL**
Product Description: The Rugged Baro TROLL is a barometric pressure sensor used with a water depth sensor that is designed for short- or long-term deployments in wells, lakes, rivers or oceans.
Model Variants: None

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.

UK CA CE FC

David A. Bossie
Regulatory Compliance Manager
In-Situ, Inc.
November 15, 2022

Appendix

Appendix A: Parameter Numbers and Locations - Rugged TROLL

ID	Parameter Name	Holding Register Number	Holding Register Address	Default Units
1	Temperature	0046	0045	1 = °C
2	Pressure	0038	0037	17 = PSI
3	Depth	0054	0053	38 = feet
4	Level, Depth to Water (Enable with VuSitu)	0054	0053	38 = feet
5	Level, Surface Elevation (Enable with VuSitu)	0054	0053	38 = feet

Parameter Numbers and Locations - Rugged BaroTROLL

ID	Parameter Name	Holding Register Number	Holding Register Address	Default Units
1	Temperature	0046	0045	1 = °C
16	Barometric Pressure	0038	0037	17 = PSI

Appendix B: Unit IDs

ID	Abbreviation	Units
1	C	Celsius
2	F	Fahrenheit
Pressure, Barometric Pressure (17-32)		
17	PSI	Pounds per square inch
19	kPa	Kilopascals
20	Bar	Bars
21	mBar	Millibars
22	mmHg	Millimeters of Mercury (0 to C)
23	inHg	Inches of Mercury (4 to C)
24	cmH_2O	Centimeters of water (4 to C)
25	inH_2O	Inches of water (4 to C)
Distance/Length (33-48)		
33	mm	Millimeters
34	cm	Centimeters
35	m	Meters
37	in	Inches
38	ft	Feet