

Operator's Manual

Rugged TROLL® 100 and 200 Operator's Manual

The Rugged TROLL 100 and 200 instruments are designed to 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 bodies 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 RuggedReader® Handheld PC or laptop PC. 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.

COMMUNICATION ACCESSORIES

- USB or RS232 docking station for the Rugged TROLL 100 and 200 Instruments
- USB or RS232 Rugged TROLL® Com for the Rugged TROLL 200 and Rugged BaroTROLL® Instruments
- Win-Situ® 5 Software for programming and downloading
- Optional software: Win-Situ® Baro Merge™ for barometric compensation; Win-Situ® Mobile for the RuggedReader Handheld PC; Win-Situ® Sync to transfer downloaded data logs from a RuggedReader to a laptop/desktop PC

OTHER ACCESSORIES

- Rugged TROLL 100 — suspension cable; RuggedReader Handheld PC; Rugged BaroTROLL for logging barometric pressure data
- Rugged TROLL 200 — suspension cable; RuggedReader device; 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; or Modbus/RS485 top-of-well cable
- Rugged TROLL 200 cable suspension kit: Use this to create a weight-bearing loop capable of suspending up to 100 lbs (45.4 kg) of cable and instrument

GETTING STARTED

You will need:

- Rugged TROLL 100 or 200 Instrument
- USB or RS232 docking station or Rugged TROLL Com (for Rugged TROLL 200 and Rugged BaroTROLL). RS232 model needed for connection to a RuggedReader device.
- In-Situ Software/Resource CD or Internet connection
- Desktop / laptop PC or RuggedReader Handheld PC

A. Install software from the In-Situ Software CD or www.in-situ.com.

1. Win-Situ 5 Software (version 5.6.16.0 or higher)

- Click the Win-Situ 5 link and follow the instructions.
- For a USB docking station, be sure to select the "Install USB Drivers" option.

2. Win-Situ Mobile Software (for the RuggedReader)

- Click the Win-Situ Mobile link and follow the instructions to install Win-Situ® Software Manager (desktop component of Win-Situ Mobile).
- If running Windows® XP or earlier, also install Microsoft® ActiveSync® 4.5 or higher. For Windows® Vista or Windows® 7, download and install the Windows® Mobile Device Center software to communicate with the RuggedReader unit.
- To install Win-Situ Mobile on the RuggedReader: connect the RuggedReader to the PC via USB cable; establish a connection via ActiveSync; launch the Win-Situ Software Manager; click Win-Situ Mobile; click Install. Be sure to have your In-Situ Software License Certificate available.

3. Win-Situ Baro Merge Software

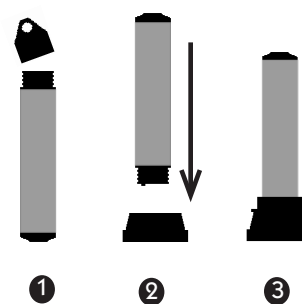
- Install Baro Merge Software if you plan to post-correct level data to compensate for barometric pressure.

4. Win-Situ Sync Software

- Install Win-Situ Sync if you want to automatically transfer downloaded log files from a RuggedReader to a PC.

B. Connect to the Rugged TROLL Docking Station (Rugged TROLL 100 or 200)

- Unscrew and remove the hanger from the Rugged TROLL instrument.
- Invert the instrument. Align the notch on the Rugged TROLL body with the tab on the rim of the docking station to ensure the pins are in contact for communication.



- Place the Rugged TROLL into the docking station.
- Connect the docking station cable to the computer.



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

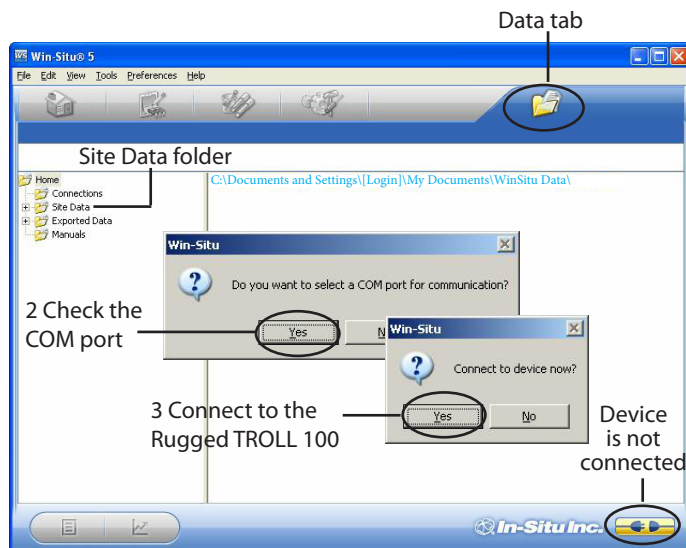


Fig. 1. Win-Situ Data tab on first connection

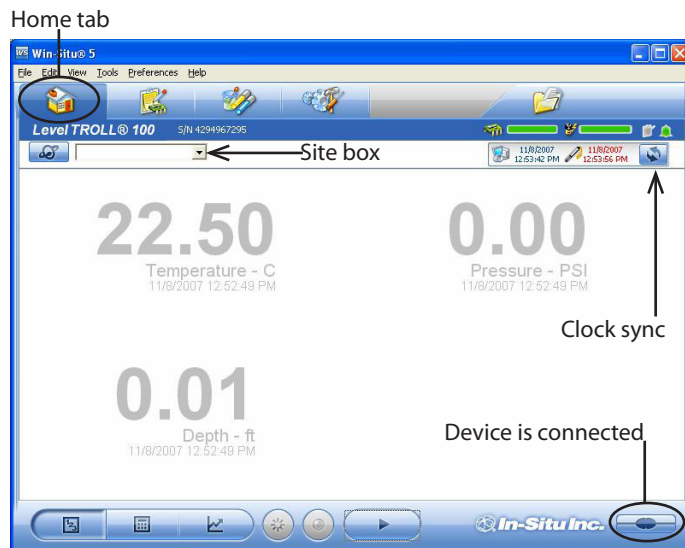


Fig. 2. Home tab with device readings

C. Connect to the Rugged TROLL Com (Rugged TROLL 200 and Rugged BaroTROLL)

- Refer to the Rugged TROLL Com communication device instruction sheet.



TIP: The Rugged TROLL Com requires a minimum of 8 VDC. If you lose connection to your instrument, particularly over long cable distances, replace the Rugged TROLL Com battery.

D. SDI-12 Wire Connections (stripped-and-tinned only)

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

Remaining wires should be terminated (grounded) at the data recorder. For more information, refer to the Rugged TROLL 200 cable instruction sheet.

E. RS485 Wire Connections (stripped-and-tinned only)

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

Remaining wires should be terminated (grounded) at the data recorder.

Which USB Port Am I Using?

When a USB Docking Station is connected, the drivers that were downloaded with Win-Situ 5 are installed. After installation, check which COM port the connected USB Docking Station is using:

- Windows® 2000, Windows XP:** Control Panel > System > Hardware tab > Device Manager > Ports. Click the plus sign to display the ports.
- Windows Vista:** Control Panel > System > Device Manager (User permission required) > Ports. Click the plus sign to display the ports.
- Windows 7:** Control Panel > System > Device Manager > Ports. Click the arrow to display the ports.




Remember the USB Serial Port COM number. You will need it to connect to the instrument with Win-Situ Software.

PROGRAMMING THE RUGGED TROLL 100 OR 200

A. Open the Software

- Start Win-Situ by double-clicking the desktop shortcut . Win-Situ opens at the Data tab, shown in Fig. 1.

- When you use the software for the first time, the software may ask if you want to select a COM port. Do one of the following:

- Answer Yes to the prompt, then check or change the port in the Preferences > Comm Settings dialog, and click OK  to close it.
- Answer No to bypass this step.



The Win-Situ default is COM 1. For USB communication, be sure to select the correct COM port. See the sidebar.


- Win-Situ asks if you want to connect to the device. If the Rugged TROLL is connected to your computer as shown above, answer Yes.
- The software will connect and display a reading of all supported parameters in the Home tab (Fig. 2).

B. Set the Clock



Data collection schedules depend on the device clock, shown with the system (PC) clock near the top of the screen when connected (Fig. 2). If the device clock is red, synchronize it to the system clock by clicking the Clock Sync button (Fig. 2).

C. Create a Site


Logged Rugged TROLL data are organized by the site where the data were logged. You will need a site when setting up a data log. Follow the steps below to create a new site:



- On the Data tab, click the Site Data folder (Fig. 1).
- Select File menu > New > Site.
- Enter a short, descriptive name—for example, a project, well, river, gaging station, town, nearby landmark, etc. (max: 32 characters).
- Enter any additional options you want, and then click Save .
- To set the new site in the Rugged TROLL: Return to the Home tab, click the down arrow beside the site box (Fig. 2), and select the new site.

D. Set up a Data Log

- Click the Logging tab .
- Click the "New" button  at the bottom of the Logging screen.


The Logging Setup Wizard will prompt you through the configuration of a data log. For details, refer to the Win-Situ Help menu.


 **TIP:** When logging Level (DTW or Surface), select the option "Set First Logged Reading to ____" for the Level Reference. Be sure to select a Scheduled start, so the log will start automatically.

 **TIP:** When logging, choose a Scheduled start, or start the log before disconnecting by selecting it in the Logging tab and clicking "Start" .







E. Disconnect and Deploy the Instrument


- Click the Disconnect button.
- Exit the software (File menu > Exit).
- Remove the Rugged TROLL from the docking station or Rugged TROLL Com.
- Connect to the backshell hanger and wire to the cable. Be sure to replace the cover for the top-of-well connector.
- Install the device in the field location.

 **TIP:** A Scheduled log will start at its programmed start time only if the device clock is correctly set (see page 2).

 **WARNING:** Tighten the backshell hanger only until it is hand tight. DO NOT use tools to secure the backshell hanger to the instrument. Over tightening will damage the instrument.

DOWNLOADING THE LOGGED DATA

- Retrieve the Rugged TROLL 100 by pulling up the suspension cable. Dry the instrument and remove the hanger. Place the Rugged TROLL 100 in the docking station (see page 1) and establish a software connection.
- For the Rugged TROLL 200, remove the cap from the cable and attach the Rugged TROLL Com. Connect the Rugged TROLL Com to a PC or RuggedReader device and establish a software connection.
- Click the Logging tab  and then the log. The symbol  shows the log is running. If the log stopped on schedule, the symbol is .
-  **TIP:** It is not necessary to stop the log before downloading, but if you want the device to stop logging, press "Stop" .
- To download, press the "Download" button  and select a download option. The log will be copied to the PC or RuggedReader device.

 **TIP:** Use Win-Situ Sync to transfer downloaded logs from a RuggedReader to a desktop or laptop PC running Win-Situ. This will ensure that the logs are placed in the Win-Situ working directory.

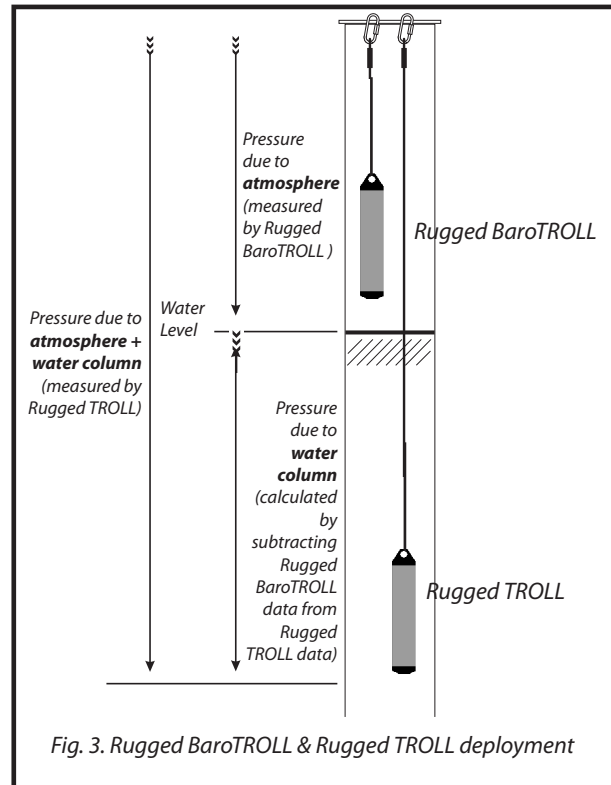



Fig. 3. Rugged BaroTROLL & Rugged TROLL deployment

RUGGED BARO TROLL INSTRUMENT

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

Programming the Rugged BaroTROLL

- Connect as you would for the Rugged TROLL instrument.
 - Program as you would for the Rugged TROLL. **Be sure to sync the clock.** The Baro TROLL measurements can be taken quite far apart as long as they cover the same general time period as the Rugged TROLL log.
 - If the Rugged TROLL log used a reference ("Set first logged reading to"), the Rugged BaroTROLL log should start before the Rugged TROLL log to ensure barometric pressure at the time of the first reading is captured.
 - Disconnect, attach the hanger, and deploy the instrument suspended or lying in a protected location above water level, near the submerged Rugged TROLL 100 or 200. One possibility is shown in Fig. 3.
-  **DO NOT submerge a Rugged BaroTROLL instrument.**
- Download data as you would for the Rugged TROLL 100 and 200.

CORRECTING FOR BAROMETRIC PRESSURE

As shown in Fig. 3, the Rugged TROLL 100 and 200 instruments measure all pressure forces detected by their absolute pressure sensors. These forces include barometric (also called atmospheric) pressure and the pressure of the water above the sensor. As a result, logged data will show the effects of changes in barometric pressure. These effects can be removed manually (see the technical note "Manual Barometric Correction" in the Technical Resources section of the In-Situ website). To automatically remove barometric pressure effects, use Win-Situ Baro Merge software to post correct non-vented water level data.

Using Baro Merge Software

You will need:

- Win-Situ Baro Merge and Win-Situ 5 installed on a desktop/laptop PC
- One or more Rugged TROLL logs in your Win-Situ working directory
- A Rugged BaroTROLL log in your Win-Situ working directory covering the time period of the Rugged TROLL log(s) to be corrected

1. **Launch Baro Merge from the desktop shortcut or the Win-Situ 5 Tools menu.**
2. **In the main window, select "Use a BaroTROLL file" for the compensation method (Fig. 4).**



TIP: Information on the other two compensation methods may be found in Baro Merge Help (press F1 in Baro Merge).

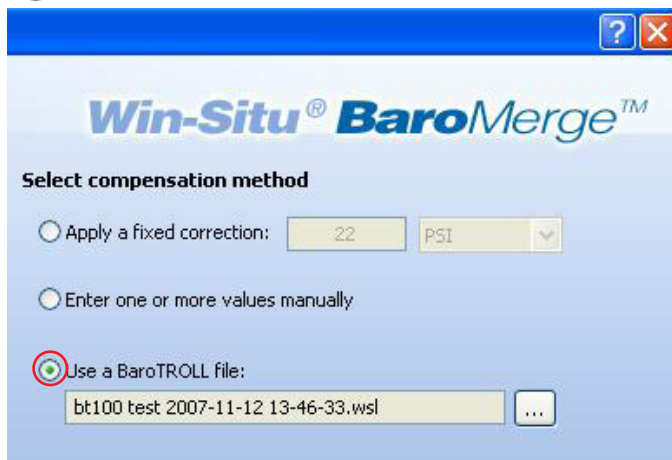








Fig 4. Baro Merge options with BaroTROLL file method selected

3. **Click  to select a Rugged BaroTROLL log file. (Baro Merge displays these automatically by site when they are in the proper location.)**
 - Click the plus sign to expand the site and display the logs.
 - Check ☒ the Rugged BaroTROLL file you want to use, then click OK .
4. **The main window returns to the screen with the Rugged BaroTROLL log file displayed (Fig. 4). Click Next  to continue.**
5. **Baro Merge reads and displays the values in the Rugged BaroTROLL log. Edit the values if necessary, or click Next  to continue.**



TIP: For details on adding or editing values and time stamps in the table, see Baro Merge Help (search for "Manual Entry").

6. **Now choose the Rugged TROLL log file(s) you intend to correct (shown automatically when in the proper location).**

- You may check ☒ as many files as you like. For best results the time stamps in the Rugged BaroTROLL log and the Rugged TROLL log(s) should overlap. (Baro Merge will use the first and last barometric values for Rugged TROLL data points beyond the barometric data time stamps.)
7. **Click OK . The barometric compensation is applied. When processing is complete, click OK again.**
 8. **Click  to close Baro Merge.**
 - The compensated log files may be viewed or exported from the Data tab in Win-Situ. The original Rugged TROLL log file is not changed. A corrected log file with the same name and path is created with the file extension "-BaroMerge.wsl."
 - For more information, refer to the Win-Situ Baro Merge technical note at www.in-situ.com.

Warranty Provisions

In-Situ Inc. warrants the Rugged TROLL 100 and 200 and Rugged BaroTROLL for one (1) year, from the factory ship date, against defects in materials and workmanship under normal operating conditions. Complete warranty provisions are posted on our web site (www.in-situ.com).

How to Contact Us

Technical Support:	800 446 7488, option 3
(Toll-free 24 hours a day in the U.S. and Canada)	
Mailing/Shipping Address:	In-Situ Inc. 221 East Lincoln Ave. Fort Collins, CO 80524 U.S.A.
Phone:	970 498 1500
Fax:	970 498 1598
Internet:	www.in-situ.com
Email:	support@in-situ.com

To Obtain Repair Service (U.S.A.)

If you suspect that your Rugged TROLL 100/200 or Rugged BaroTROLL is malfunctioning and repair is required, you can help assure efficient servicing by following these guidelines:

- Call or email In-Situ Technical Support (support@in-situ.com). Have the equipment with you when you call.
- Be prepared to describe the problem, including how the instrument was being used and the conditions noted at the time of the malfunction.
- If Technical Support determines that service is needed, they will ask that you download and complete a Return Materials Authorization form available on the In-Situ website under Contact>Returns for Service.
- Clean the instrument and/or cable. Decontaminate thoroughly if it has been used in a toxic or hazardous environment.
- Carefully pack the instrument and/or cable in a suitable shipping box.
- Mark the RMA number clearly on the outside of the box with a marker or label.
- Send the package, shipping prepaid, to ATTN: RMA #XXXXX, at the address above.

The warranty does not cover damage during transit. We recommend the customer insure all shipments. Warranty repairs will be shipped back prepaid.

Outside the U.S.A.

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

RUGGED TROLL 100 AND 200 SPECIFICATIONS

Operational Temp. Range ¹	0 to 50° C (32 to 122° F)
Storage Temp. Range	-40 to 80° C (-40 to 176° F)
Calibrated Temp. Range	0 to 50°C (32 to 122° F)
Diameter	2.62 cm (1.03 in) OD
Length	14.43 cm (5.68 in)
Weight	170 g (0.37 lb)
Materials	Titanium body; Delrin® nose cone, hanger, backend
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
Battery Type	3.6 V lithium internal battery
Battery Life	Typical 10 years or 2M readings ¹
External Power	Rugged TROLL 100: NA Rugged TROLL 200: 8-36 VDC
Measurement Current	14 mA typical
Idle Current (network activity only)	200 µA typical
Sleep Current (no network activity)	20 µA typical
Memory	1.0 MB
Data Records	Date/time + 1 parameter 94,500 ² Date/time + 2 parameters 65,000 ² Date/time + 3 parameters 49,500 ²
Number of logs supported	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, Event
Suspension Cable (use with backshell hanger & Rugged TROLL 100/200 or Rugged BaroTROLL)	Poly-coated 304 stainless steel 50 ft, 150 ft, 300 ft (15.24 m, 45.72 m, 91.44 m)
Rugged TROLL 200 Cable (use with Rugged TROLL 200 & Rugged BaroTROLL)	24/4 AWG RS485 with connector, RS485 stripped and tinned Customizable up to 300 m (1000 ft) SDI-12 stripped and tinned Standard lengths up to 60 m (200 ft)
Rugged BaroTROLL	Range: 7.0 to 30.0 psi (0.5 to 2 bar, 0.5 to 2 atm, 14.25 to 61 in Hg)
Docking Station (Rugged TROLL 100/200 & Rugged BaroTROLL)	USB or RS232
Rugged TROLL Com (use with Rugged TROLL 200 & Rugged BaroTROLL)	USB or RS232 for RS485 communications via RS485 cable with connector

Pressure Sensor Type/Material (Non-Vented)	Piezoresistive; Ceramic
Range	9.0 m (30 ft) (Burst: 60 ft) 30 m (100 ft) (Burst: 134 ft) 76 m (250 ft) (Burst: 368 ft)
Accuracy at 15° C ³	Typical ± 0.1% full scale (FS)
Accuracy (FS) ⁴	± 0.3% FS max.
Resolution	± 0.01% FS or better
Units of Measure Pressure Level	psi, kPa, bar, mbar, mmHg, in, ft, mm, cm, m
Temperature Sensor	Silicon
Range	Calibrated: 32 to 122° F (0 to 50° C)
Accuracy	± 0.3° C
Resolution	0.01° C or better
Units of measure	Celsius or Fahrenheit

¹ When used within the factory-calibrated temperature range

² Data logged (no wrapping) from device within the factory-calibrated temperature range

³ Across factory-calibrated pressure range

⁴ Across factory-calibrated pressure and temperature ranges

Specifications are subject to change without notice. Delrin is a registered trademark of E.I. du Pont de Nemours & Co.

Minimum System Requirements

Win-Situ 5 (v5.6.16.0 or higher): 400 MHz Intel® Pentium® II processor; 128 MB RAM, 100 MB free disk space; Microsoft® Internet Explorer® 6.01 or higher; Windows 2000 Professional SP4 or higher; Windows XP Professional SP2 or higher; Windows Vista or Windows 7; CD-ROM drive; RS232 serial port or USB port

Win-Situ Mobile: RuggedReader with Microsoft Windows Mobile® operating system; at least 16 MB data storage memory (SD/CF card or built-in non-volatile memory); Microsoft ActiveSync v. 4.5 or higher for Windows 2000/Windows XP. For Windows 7, download and installation of the Windows Mobile Device Center software is required for communication with the RuggedReader Handheld PC.

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
Model: Rugged TROLL 200
Product Description: The Rugged TROLL measures and logs level and temperature in natural groundwater and surface water.

is in compliance with the following Directives:

89/336/EEC for Electromagnetic Compatibility (EMC) Directive
73/23/EEC for Safety Directive


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

- **Immunity**
EN 61326:1997, Including Amendments A1:1998, A2:2001, A3:2003,
Electric Equipment for Measurement, Control and Laboratory Use
- **Emissions**
Class A requirements of EN 61326:1997, Electric Equipment for Measurement, Control
and Laboratory Use

Supplementary Information:

The device complies with the requirements of the EU Directives 89/336/EEC and 73/23/EEC, and the CE mark is affixed accordingly.

Date of Issue: April 26, 2010

Signature: 
Name: Bruce Barker
Title: Director of New Product Development



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
Model: Rugged TROLL 100
Product Description: The Rugged TROLL measures and logs level and temperature in natural groundwater and surface water.

is in compliance with the following Directives:

89/336/EEC for Electromagnetic Compatibility (EMC) Directive
73/23/EEC for Safety Directive


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

- **Immunity**
EN 61326:1997, Including Amendments A1:1998, A2:2001, A3:2003,
Electric Equipment for Measurement, Control and Laboratory Use
- **Emissions**
Class A requirements of EN 61326:1997, Electric Equipment for Measurement, Control
and Laboratory Use

Supplementary Information:

The device complies with the requirements of the EU Directives 89/336/EEC and 73/23/EEC, and the CE mark is affixed accordingly.

Date of Issue: April 26, 2010

Signature: 
Name: Bruce Barker
Title: Director of New Product Development



Delrin and Teflon are registered trademarks of E.I. DuPont de Nemours and Company. Pentium is a registered trademark of Intel Corp. ActiveSync, Explorer, Windows, and Windows Mobile are registered trademarks of Microsoft Corp.



In-Situ Inc.

For more information, contact In-Situ Inc.

221 East Lincoln Avenue, Fort Collins, CO 80524

1-800-446-7488 (toll-free in U.S.A. & Canada)

1-970-498-1500 (international & domestic)

www.in-situ.com

0091332 rev.004 02/2012