



## Level **TROLL**® 100 and Level **TROLL**® 200 Operator's Guide

The Level TROLL 100 and 200 are rugged, accurate instruments for measuring pressure, level, and temperature in natural groundwater and surface water, as well as industrial, waste, and other installations.

Both instruments have completely sealed bodies that contain an absolute (non-vented) pressure sensor, temperature sensor, real-time clock, microprocessor, sealed lithium battery, and internal memory.

The Level TROLL 100 is designed to hang by a backshell hanger from a suspension wire. The Level 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, Level TROLL 200 cables with stripped and tinned cable ends can communicate with data loggers or PLC devices via RS485 or SDI-12.

### COMMUNICATION COMPONENTS

- USB or RS232 Docking Station for the Level TROLL 100 or 200
- USB or RS232 TROLL® Com for the Level TROLL 200 only
- Win-Situ® 5 control software for programming and downloading
- Optional software: Win-Situ® Baro Merge™ for barometric compensation, Win-Situ® Mobile for the RuggedReader, Win-Situ® Sync to transfer downloaded data logs from a RuggedReader to a PC

### OTHER ACCESSORIES

- Level TROLL 100: suspension cable, RuggedReader handheld PC, BaroTROLL® 100 for logging barometric pressure data
- Level TROLL 200: suspension cable, RuggedReader® handheld PC, BaroTROLL® 100 for logging barometric pressure data, SDI-12 compatible cable with bare wire uphole termination, RS485 compatible cable with bare wire uphole termination, or RS485 compatible cable with watertight cable connectors.
- Level TROLL 200 Cable Suspension Kit: creates a weight-bearing loop capable of suspending up to 100 lbs of cable and instrument.

### GETTING STARTED

You will need—

- Level TROLL 100 or 200 instrument
- USB or RS232 Docking Station or TROLL Com (for Level TROLL 200 only). You will need RS232 models for connection to a RuggedReader.
- In-Situ Software/Resource CD, or Internet connection
- Desktop / laptop PC, or RuggedReader

### A. Install software from the In-Situ Software CD or [www.in-situ.com](http://www.in-situ.com).

#### 1. Win-Situ 5

- 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 (for the RuggedReader)

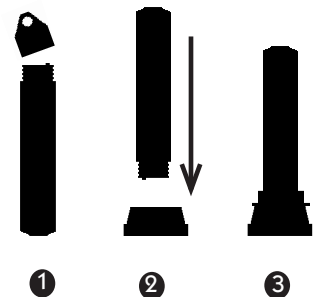
- Click the Win-Situ Mobile link and follow the instructions to install Win-Situ Software Manager (desktop component of Win-Situ Mobile).
- If running Windows® XP or earlier: Also install Microsoft® ActiveSync® 4.5 or higher (not required for Windows Vista™).
- To install Win-Situ Mobile on the RuggedReader: 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. Have your In-Situ Software License Certificate handy.

#### 3. Win-Situ Baro Merge (version 1.3.1.6 or higher)

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

#### 4. Win-Situ Sync

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



### B. Connect to the Docking Station (Level TROLL 100 and 200)

- Unscrew and remove the hanger from the Level TROLL 100.
- Invert the instrument. Align the notch on the Level TROLL 100 body with the tab on the rim of the Docking Station to ensure the pins are mated for communication.
- Place the Level TROLL 100 into the Docking Station.
- Connect the docking station cable to the computer.



*The hanger is the only removable part of the Level TROLL 100. Do not attempt to take the instrument apart. There are no user-serviceable parts in the instrument body.*

### C. Connect to the TROLL Com (Level TROLL 200 only)

- Connect to the TROLL Com as described in the TROLL Com instruction sheet.



*The TROLL Com 200 requires a minimum of 8 VDC. If you lose connection to your instrument, particularly over long distances, replace the TROLL Com 200 battery.*

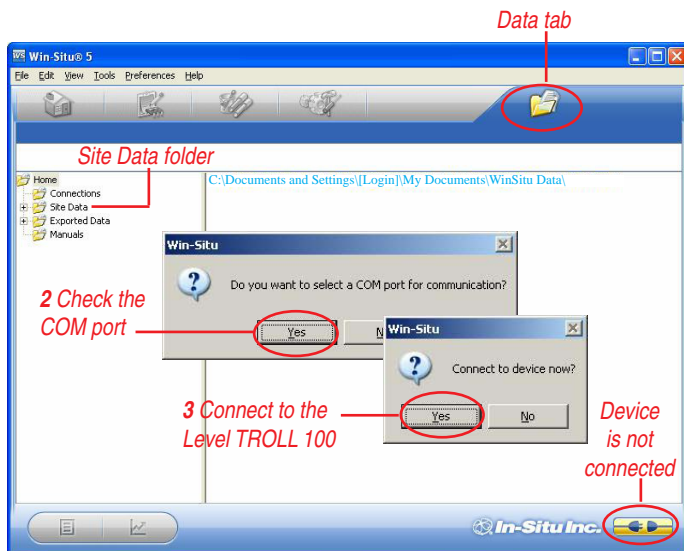


Fig. 1. Win-Situ Data tab on first connection

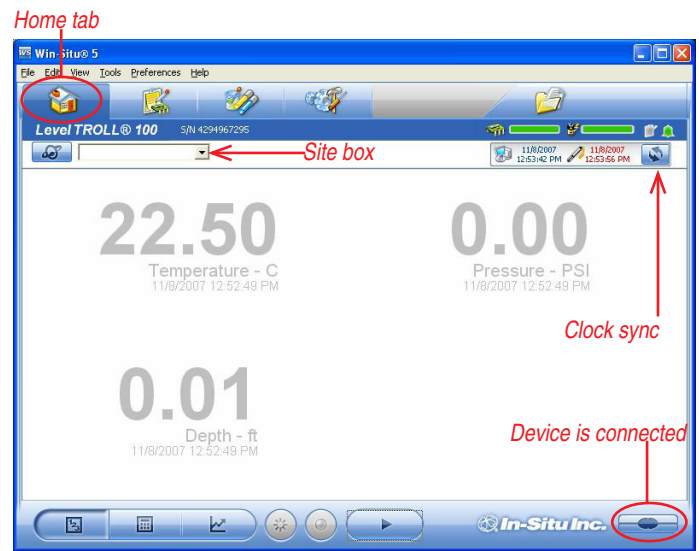


Fig. 2. Home tab with device readings

#### 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 Level 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.

### PROGRAMMING THE LEVEL TROLL 100

#### A. Launch the Software

1. Start Win-Situ by double-clicking the desktop shortcut .
  - Win-Situ launches at the Data tab, shown in Fig. 1.
2. When you launch 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 Comm Settings dialog, and click OK  to close it, or
  - Answer No to bypass this step.

 Win-Situ's default is COM 1. For USB communication, be sure to select the correct COM port. See the sidebar below.
3. Win-Situ asks if you want to connect to the device. If the Level TROLL is connected to your computer as shown on page 1, answer Yes.
4. Software connects and displays 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 Level 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, then click **Save**.
- To set the new site in the Level TROLL: Return to the Home tab, click the down arrow beside the site box (Fig. 2), and select your new site.

#### D. Set up a Data Log

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

The Logging Setup Wizard will prompt you through the configuration of a data log. For details, refer to Win-Situ's 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 Depth, choose a Scheduled start, or start the log before disconnecting by selecting it in the Logging tab and clicking "Start" .

#### 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.






Remember the port number. You will need it to connect to the instrument in Win-Situ software.




## E. Disconnect and Deploy the Instrument


Exit the software (File menu > Exit). Remove the Level TROLL from the docking station or TROLL Com. Connect to the backshell hanger and wire or to the cable. 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 **B** on this page).

## DOWNLOADING THE LOGGED DATA

- Retrieve the Level TROLL 100 by pulling up the cable. Dry the instrument and remove the hanger. Place the Level TROLL 100 in the docking station (see page 1) and establish a software connection.
- For the Level TROLL 200, remove the cap from the cable and attach the TROLL Com 200. Connect the 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” , or suspend it by pressing “Pause” . Remember to resume the log if suspended!

- To download, press the “Download” button  and select a download option. The log will be copied to the PC or RuggedReader.

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

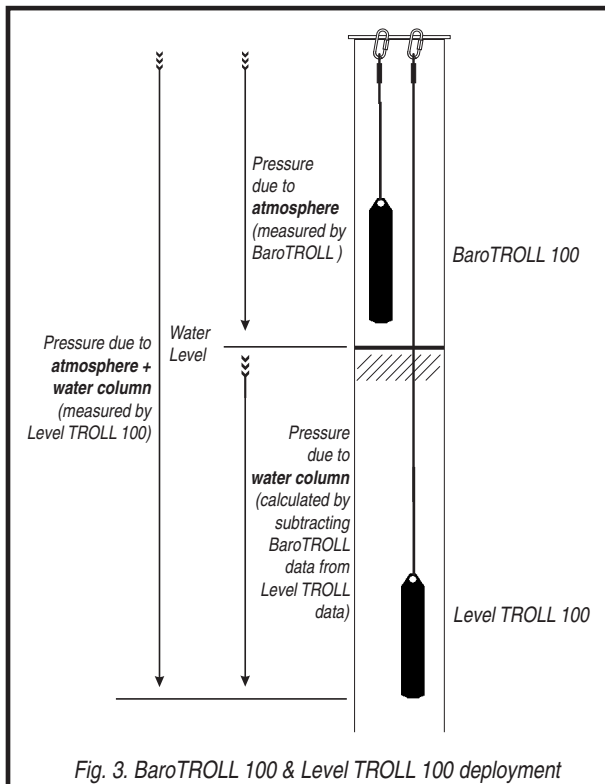



Fig. 3. BaroTROLL 100 & Level TROLL 100 deployment

## BaroTROLL® 100 INSTRUMENT

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

 **Note:** BaroTROLL 100 instruments with serial numbers greater than 144621 can be used with Level TROLL 200 cables and TROLL Com, or the docking station. Earlier models are compatible with the docking station only.

### A. Programming the BaroTROLL 100

- Connect as for the Level TROLL 100.
- Program as for the Level TROLL 100. Be sure to sync the clock! The measurements can be quite far apart as long as they cover the same general time period as the Level TROLL 100 log.
- If the Level TROLL 100 log used a reference (“Set first logged reading to”), the BaroTROLL log should start **before** the Level TROLL log to ensure barometric pressure at the time of the first reading is captured.
- Disconnect, attach the hanger, and deploy suspended or lying in a protected location above water level, near the submerged Level TROLL 100 or 200. One possibility is shown in Fig. 3.

 **DO NOT** submerge a BaroTROLL 100.

- Download data as for the Level TROLL 100 and 200.

## CORRECTING FOR BAROMETRIC PRESSURE EFFECTS


As shown in Fig. 3, the Level 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 Downloads section of the In-Situ website). To automatically remove barometric pressure effects, use Win-Situ Baro Merge software.

### A. Using Baro Merge Software

You will need:

- Win-Situ Baro Merge and Win-Situ 5 installed on a desktop/laptop PC
- One or more Level TROLL 100 logs in your Win-Situ working directory
- A BaroTROLL 100 log in your Win-Situ working directory covering the time period of the Level TROLL 100 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).

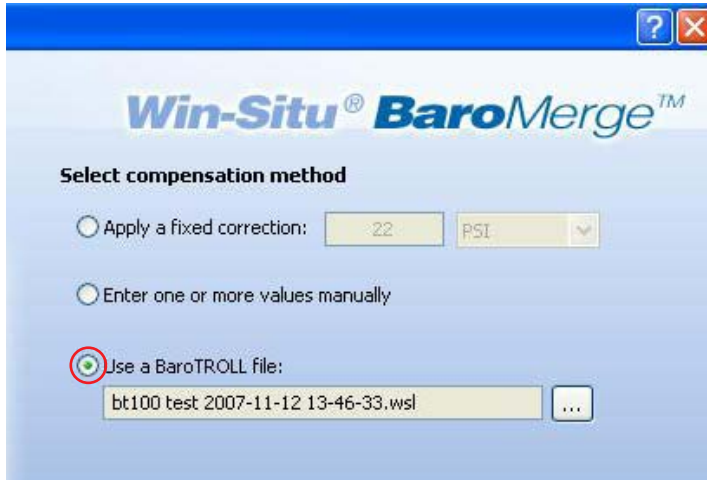




Fig 4. Baro Merge options with BaroTROLL file method selected

3. Click  to select a BaroTROLL 100 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 BaroTROLL 100 file you want to use, then click OK .

4. The main window returns to the screen with the BaroTROLL 100 log file displayed (Fig. 4). Click Next  to continue.


5. Baro Merge reads and displays the values in the BaroTROLL 100 log. Edit the values if you wish, 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 Level TROLL 100 log file(s) you wish 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 BaroTROLL 100 log and the Level TROLL 100 log(s) should overlap. (Baro Merge will use the first and last barometric values for Level 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 Level TROLL 100 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](http://www.in-situ.com).

## A. Warranty Provisions

In-Situ Inc. warrants the Level TROLL 100 and 200 and BaroTROLL 100 for one (1) year from date of purchase against defects in materials and workmanship under normal operating conditions. To exercise this warranty, contact Technical Support at the phone or e-mail address below for a return material authorization (RMA) and instructions. Complete warranty provisions are posted on our web site at [www.In-Situ.com](http://www.In-Situ.com).

## B. How to Contact Us

Technical Support:	800 446 7488
	<i>Toll-free 24 hours a day in the U.S. and Canada</i>
Mailing/Shipping Address:	In-Situ Inc.
	221 East Lincoln Ave.
	Fort Collins, CO 80524
	USA
Phone:	970 498 1500
Fax:	970 498 1598
Internet:	<a href="http://www.in-situ.com">www.in-situ.com</a>
E-mail:	<a href="mailto:support@in-situ.com">support@in-situ.com</a>

## C. To Obtain Repair Service (U.S.)

If you suspect that your Level TROLL 100 is malfunctioning and repair is required, you can help assure efficient servicing by following these guidelines:

- Call or e-mail In-Situ Technical Support ([support@in-situ.com](mailto:support@in-situ.com)). Have the product model and serial number handy.
- 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 your company pre-approve a specified dollar amount for repair charges. When the pre-approval is received, Technical Support will assign an RMA (Return Material Authorization) number.
- Clean the instrument and/or cable. Decontaminate thoroughly if it has been used in a toxic or hazardous environment.
- Carefully pack your 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: Repairs 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.

## D. Outside the U.S.

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

**LEVEL TROLL 100 AND 200 SPECIFICATIONS**

Operational Temp. Range	-20°C to 50° C (-4°F to 122° F)
Storage Temp. Range	-40°C to 80° C (-40°F to 176° F)
Diameter	1.03 in (26.2 mm) OD
Length	5.5 in (14.0 cm)
Weight	0.33 lb (0.15 Kg)
Material	ABS
Output connection	USB or RS232
Power	3.6 V lithium internal battery
Level TROLL Battery Life	5 years or 2 million readings
Memory	0.5 MB—Level TROLL 100 1.0 MB—Level TROLL 200, BaroTROLL 100
Data Records	32,000—Level TROLL 100 50,000—Level TROLL 200
Fastest Logging Rate	1 per sec
Log Types	Linear, Fast Linear, Event
Suspension Cable (for use with a backshell hanger and Level TROLL 100 or 200)	Poly-coated 304 stainless steel 50 ft, 150 ft, 300 ft
Cable (Level TROLL 200 only)	24/4 AWG RS485 with connector, RS485 stripped and tinned, or SDI-12 stripped and tinned
BaroTROLL 100	Range: 7 to 30 psia (0.5 to 2 bar, 0.5 to 2 atm, 14.25 to 61 in Hg)
Docking Station (Level TROLL 100 and 200)	USB or RS232
TROLL Com (Level TROLL 200 only)	USB or RS232 for RS485 communications via RS485 cable with connector

Pressure Sensor (Non-Vented)	Piezoresistive
Material	Ceramic
Calibrated temperature	0° to 50° C
Accuracy @ 15°	Typical $\pm 0.1\%$ FS
Accuracy Full Scale	Maximum $\pm 0.3\%$ FS
Resolution	$\pm 0.01$ or better
Range	0-30 ft, 0-9.0 m 0-100 ft, 0-30 m 0-250 ft, 0-76 m
Burst pressure	0-30 ft: 60 ft, 18 m 0-100 ft: 134 ft, 40.8 m 0-250 ft: 368 ft, 112 m
Units of measure Pressure Level	psi, kPa, bar, mbar, mm Hg, ft, in, m, cm, mm
Temperature Sensor	Silicon
Accuracy	$\pm 0.3^\circ$ C
Resolution	0.01° C or better
Units of measure	Celsius, Fahrenheit

**Minimum System Requirements**

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

**Win-Situ Mobile:** RuggedReader® with Microsoft Windows Mobile® operating system (Yellow RuggedReader, Pocket PC 2003 or later; Blue RuggedReader, Windows Mobile 5 or later), 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

Declaration of Conformity

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

Declares that the following product:

Product name: Level TROLL  
Model: Level TROLL 200  
Product Description: The Level 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.

Bob Blythe  
President and CEO  
In-Situ Inc.  
May 27, 2009



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

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Bob Blythe  
President and CEO  
In-Situ Inc.  
November 12, 2007



1 800 446 7488

(toll-free, US and Canada) or 970 498 1500 [www.in-situ.com](http://www.in-situ.com)

