

# PT2X-BV

## Barometric/Vacuum Smart Sensor and Data Logger Instructions



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**IF USING ALKALINE BATTERIES—PREVENT BATTERY LEAKAGE!**

PT2X-BV sensors are typically shipped with lithium batteries. If, however, you are using alkaline batteries, be aware that under some circumstances alkaline batteries can leak, causing damage to the sensor. To prevent leakage, the following is recommended. **(Does not apply to lithium batteries.)**

- Change the batteries at least every 18 months.
- If the sensor will not be deployed for 3 months or more, remove the batteries.

The **Seametrics PT2X-BV** is a special version of the PT2X designed to measure barometric and vacuum pressure in reference to absolute pressure, along with temperature and time. It will measure pressure/vacuum from 600 to 1100 millibars. This sensor networks with all of the Seametrics Smart Sensor family.

The PT2X-BV is a microprocessor based digital intelligent sensor designed to measure and record pressure, temperature, and time, using low power, battery operated circuitry.

Pressure is measured with an extremely rugged and stable piezo-electric media-isolated pressure element combined with a 16-bit analog-to-digital converter. This provides extremely accurate and stable pressure input into the microprocessor on the circuit board.

This industry standard digital RS485 interface device records up to 520,000 records of barometric pressure, temperature, and time data, operates with low power, and

features easy-to-use Aqua4Plus 2.0 software with powerful features. The PT2X-BV is available in two enclosures – either an ABS weather-proof box or a stainless steel tube. The tube version is available with either a solid end cone or an NPT end cone for connecting to piping.

Two internal 1.5V AA batteries power the PT2X-BV. (Auxiliary power supplies are available for data intensive applications.) The unit is programmed using our easy-to-use Aqua4Plus 2.0 control software. Once programmed the unit will measure and collect data on a variety of time intervals.

A PT2X-BV, along with several PT2Xs, CT2Xs, LevelSCOUTs and other Seametrics Smart Sensors, can be networked together and controlled directly from a single computer.

While most will use the PT2X-BV with our free, easy-to-use Aqua4Plus 2.0 software, it is by no means limited to that software. You can use your own Modbus® RTU or SDI-12 software or logging equipment to read measurements, thus tying into your existing systems and databases.

**Features**



**Box Version**

- Communications Port:**
- At end of cable on cabled version
  - Inside cap on cableless version



**Tube Versions**

**Air Inlets**

**Dimensions**

	English	Metric
<b>Box</b>	4.3" x 3.1" x 2.6"	11 x 8 x 6.5 cm
<b>Box (including connectors)</b>	4.3" x 3.6" x 2.6"	11 x 9 x 6.5 cm
<b>Tube (cabled)</b>	12.18" x 0.75" diameter	30.9 cm x 1.9 cm diameter
<b>Tube (cableless)</b>	11.93" x 0.75" diameter	30.3 cm x 1.9 cm diameter

## Specifications\*

<b>Box Enclosure</b>	<b>Body Material</b>	ABS - IP66/67	
	<b>Dimensions</b>	Box: 4.3" x 3.1" x 2.5" (10.9 x 7.9 x 6.4 cm) Box and connectors: 4.3" x 3.6" x 2.5" (10.9 x 9.1 x 6.4 cm)	
	<b>Wire Seal Material</b>	Fluoropolymer and Buna N	
<b>Tube &amp; Cable</b>	<b>Body Material</b>	Acetal & 316 stainless or titanium	
	<b>Dimensions</b>	Cabled: 12.18" x 0.75" diameter (30.9 cm x 1.9 cm) Cableless: 11.93" x 0.75" diameter (30.3 cm x 1.9 cm)	
	<b>Wire Seal Material</b>	Fluoropolymer and PTFE	
	<b>Weight</b>	0.8 lb. (0.4 kg)	
	<b>Cable</b>	Submersible: polyurethane, polyethylene, or ETFE (4 lb./100 ft., 1.8 kg/30 m)	
	<b>Environmental</b>	IP68, NEMA 6P	
	<b>Field Connector</b>	Standard	
<b>Temperature</b>	<b>Operating Range</b>	Recommended: -15° to 55°C (5° to 131°F)	
	<b>Storage Range</b>	Without batteries: -40° to 80°C (-40° to 176°F)	
<b>Power</b>	<b>Internal Battery</b>	Two lithium 'AA' batteries - Expected battery life: 18 months at 15 min. polling interval (may vary do to environmental factors)	
	<b>Auxiliary</b>	12 Vdc - Nominal, 6-16 Vdc - range	
<b>Communication</b>	<b>Modbus®</b>	RS485 Modbus® RTU, output=32bit IEEE floating point	
	<b>SDI-12</b>	SDI-12 (ver. 1.3) - ASCII	
<b>Logging</b>	<b>Memory</b>	4MB - 520,000 records	
	<b>Logging Types</b>	Variable, user-defined, profiled	
	<b>Logging Rates</b>	8x/sec maximum, no minimum	
	<b>Baud Rates</b>	9600, 19200, 38400	
	<b>Software</b>	Complimentary Aqua4Plus 2.0	
	<b>Networking</b>	32 available addresses per junction (Address range: 1 to 255)	
	<b>File Formats</b>	.a4d and .csv	
<b>Output Channels</b>	<b>Temperature</b>	<b>Temperature</b>	<b>Depth/Level<sup>1</sup></b>
	<b>Element</b>	Digital IC on board	Silicon strain gauge transducer, 316 stainless or Hastelloy
	<b>Accuracy</b>	±0.5°C — 0° to 55°C (32° to 131°F) ±2.0°C — below 0°C (32°F)	±0.05% FSO (typical, static) ±0.1% FSO (maximum, static) (B.F.S.L. 20°C)
	<b>Resolution</b>	0.1°C	0.0034% FS (typical)
	<b>Units</b>	Celsius, Fahrenheit, Kelvin	PSI, FtH <sub>2</sub> O, inH <sub>2</sub> O, mmH <sub>2</sub> O, mH <sub>2</sub> O, inH <sub>2</sub> O, cmHg, mmHg, Bars, Bars, kPa
	<b>Range</b>	-40° to 80°C (-40° to 176°F)	600 to 1100 millibars
	<b>Compensated</b>	---	0° to 40°C (32° to 104°F)
<b>Max operating pressure</b>	1.1 x full scale		
<b>Burst pressure</b>	2.0 x full scale		

\*Specifications subject to change. Please consult our web site for the most current data ([www.seametrics.com](http://www.seametrics.com)). Modbus is a registered trademark of Schneider Electric.

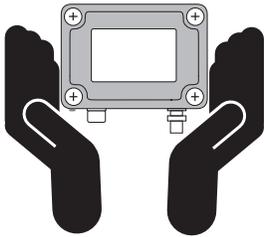
Note: Intended for use in atmosphere—not to be submerged.

**Initial Inspection and Handling**

Upon receipt of your PT2X-BV, inspect the shipping package for damage. If any damage is apparent, note the signs of damage on the appropriate shipping form. After opening the carton, look for concealed damage. If concealed damage is found, immediately file a claim with the carrier.

**Do's and Don'ts**

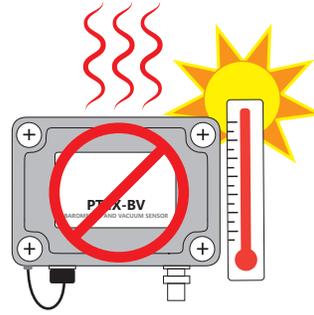
*Box Version*



**Do handle sensor with care**



**Don't install so box or connector is submerged**



**Do protect from excessive sun or heat**

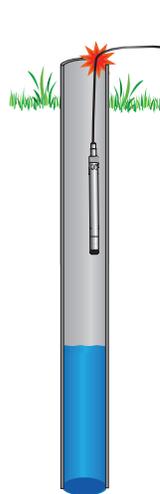


**Don't bang or drop on hard objects**

*Tube version*



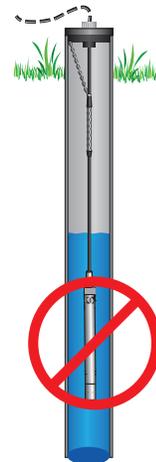
**Do install sensor so the connector end is kept dry**



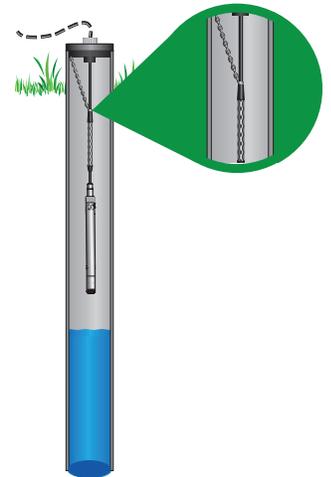
**Don't scrape cable over edge of well**  
May nick or fray the cable



**Don't bend cable sharply**  
May weaken internal wires



**Don't install so sensor may be submerged**



**Don't support sensor with the connector**  
Use a strain relief device

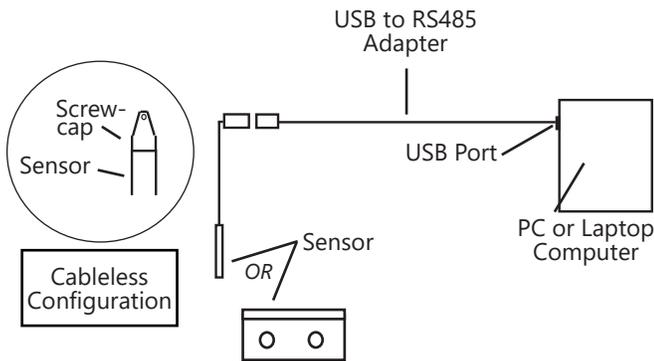
**Connecting External Power**

The PT2X-BV comes with two 1.5V AA internal batteries.

If auxiliary power is desired, you can use a 6–16 VDC supply that can provide 15 mA. Connect to Vaux++ (pin 1 - white) and Ground (pin 5 - blue) or contact Seametrics for auxiliary power supplies.

**Connecting the PT2X-BV to a Computer**

Connect your computer to the PT2X-BV communication port using Seametrics USB to RS485 adapter. If you have the tube version, connect to the weather-resistant connector on the cable or end of the sensor on the cableless version. (For alternate connection options, see below.)



*Connecting sensor to your computer using Seametrics USB to RS485 adapter.*

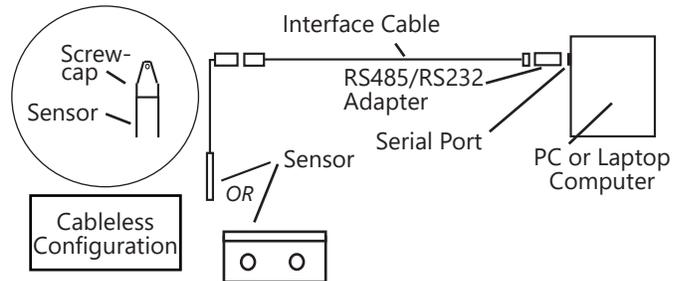
Aqua4Plus 2.0 communicate with the sensor using the USB to RS485 adapter cable. This cable requires drivers to be installed on your computer. If you are connected to the Internet when you first plug in the cable, it will normally obtain and install the correct drivers automatically. If this does not happen, or if you do not have Internet connection, you can use Aqua4Plus 2.0 to install the drivers.

**Alternate Connection Options**

Seametrics recommends connecting the sensor to your computer using the Seametrics USB cable. However, when using Aqua4Plus 2.0, the sensor can also be connected using an RS232 serial port or a USB-to-Serial cable, as described below.

**Connecting via RS232 Serial Port**

Connect the weather-resistant connector to your computer's serial port as shown in next column.

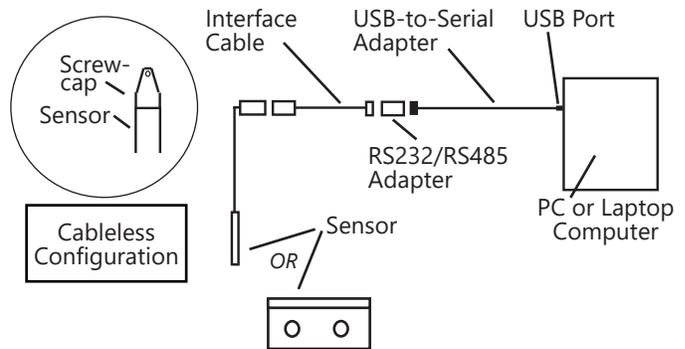


*Connecting sensor to your computer using an RS485/RS232 adapter and an interface cable.*

**Connecting with a USB/Serial Adapter**

USB-to-Serial cables are readily available from many electronics and computer stores, as well as numerous sites on the Internet. Seametrics has tested and recommends the Keyspan USA-19HS. Install as follows:

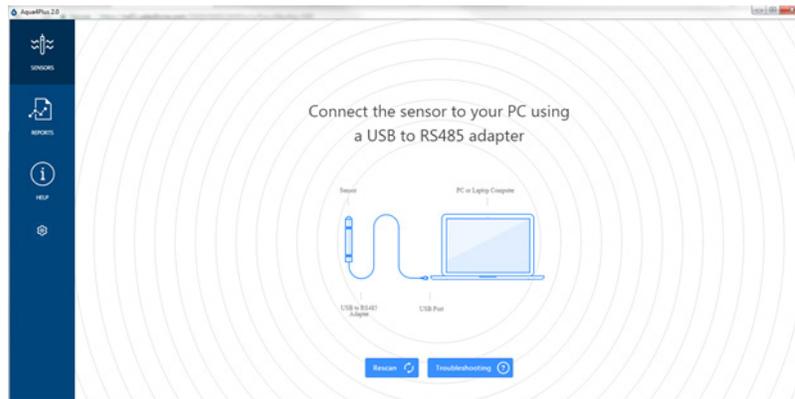
- Plug into USB port.
- Install the drivers provided with the particular unit.
- Once drivers are installed connect to sensor.



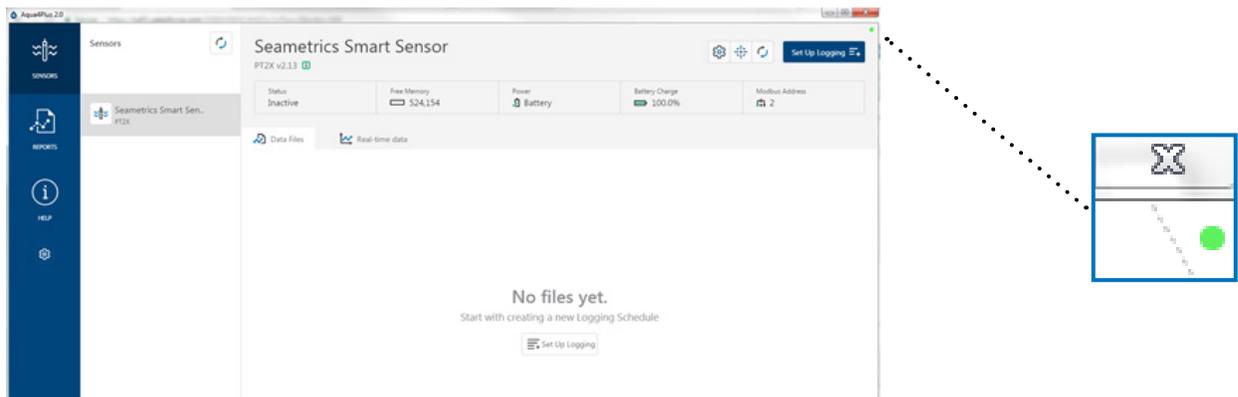
*Connecting sensor to your computer using a USB to Serial adapter and an interface cable.*

**Connecting to Sensors**

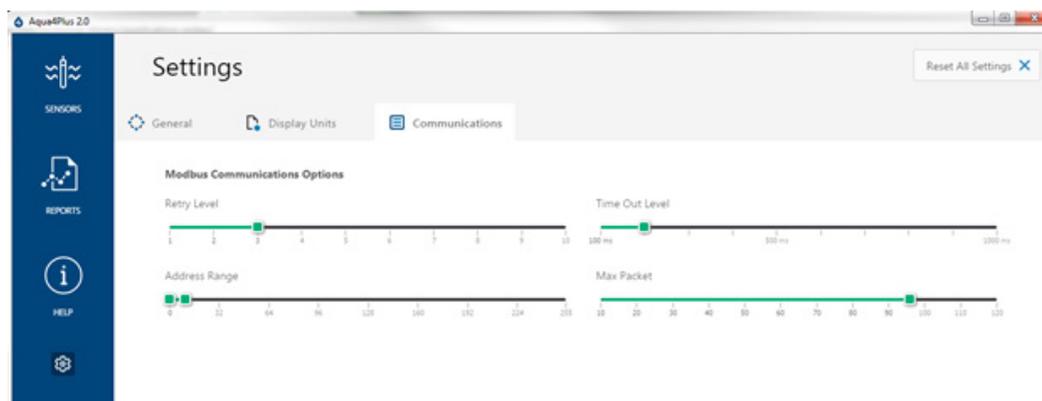
Aqua4Plus 2.0 is designed to automatically detect your communication cable and scan for sensors. It is recommended you connect your USB/RS485 cable to your PC and have the sensor connected before opening Aqua4Plus 2.0.



If your cable and sensor were not connected before opening Aqua4Plus 2.0 simply connect and click Rescan. While scanning is active you'll see a green dot flash in the upper right corner of the program. Scanning is complete when this dot stops flashing.



If your sensor still won't connect you can expand the Modbus address range under program settings here:



Simply drag the Address Range slider higher up to increase the maximum Modbus address scanned. If you've scanned all the way up through address 255 and still have no connection click Troubleshooting for further troubleshooting or contact Seametrics Tech Support for assistance.

Click  at any time to refresh sensor information.

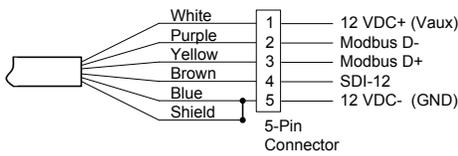
**Wiring and Pin-outs**

**Pin-out for bulkhead connector on box version and connector on cableless tube version**

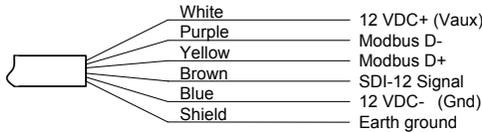
Pin	Description
1	12 Vdc+
2	Modbus D-
3	Modbus D+
4	SDI-12 Signal
5	Ground

**Pin-out for cabled tube version**

With connector:



Without connector:



NOTE: If you have a firmware version prior to 2.0, SDI-12 is not available.

**Installing Aqua4Plus 2.0**

The PT2X-BV comes with the Aqua4Plus 2.0 host software that is installed on your PC or laptop. Use this software to program the datalogger, to retrieve data from the logger, to view collected data, and to export data to external files for use with spreadsheets or databases.

Refer to the software manuals for details on installing and using Aqua4Plus 2.0.

The PT2X-BV can take readings more often than once per second. This is known as a "continuous rate." See logging setup.

**Battery Life Calculator**

IMPORTANT NOTE for PT2X-BV sensors with firmware 2.13 or higher!

PT2X-BVs with firmware version 2.13 and higher have a battery life calculator that is set at the factory when batteries are first put in the sensor. If the battery life calculator is not reset, the remaining life information will be incorrect.

If you need to replace the batteries, see the Maintenance section in this manual for replacement information and for information on resetting the battery life calculator.

**Using Without Aqua4Plus 2.0**

Most users will use the PT2X-BV with Seametrics Aqua4Plus 2.0 software. However, the PT2X-BV is quite versatile, communicating via either Modbus® or SDI-12 interfaces, allowing you to do the following:

- Read a PT2X-BV via Modbus® using your own software.
- Read a PT2X-BV via SDI-12 protocol.
- Display readings from a PT2X-BV on a panel meter.

If you want to use one of these methods, see page 10.

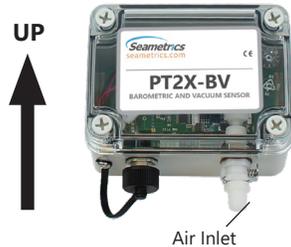
**Installing the Sensor**

**For Barometric Measurement**

*Box version*

The PT2X-BV box version can be installed in any position; however, it is tested at the factory in the vertical position. Therefore, when installing the transmitter outdoors, Seametrics recommends installing it in a vertical position to avoid moisture entering the inlet. Seametrics also recommends installing a sun shield to avoid overheating.

*Vertical installation recommended to avoid moisture entering the air inlet*



*Tube version*

The PT2X-BV tube version can be installed in any position; however, when it leaves the factory it is tested in the vertical position. Strapping the sensor body with tie wraps or tape will not hurt it. Be sure to install so that air inlets will never be submerged. Seametrics also recommends installing a sun shield to avoid overheating.

**For Vacuum Measurement**

If installing a vacuum tube for vacuum measurements, be sure that the tubing is not collapsible. The box unit is provided with a detachable Quick-Connect (QC) with a male 1/8" pipe fitting. Attach the tubing to the QC using an appropriate tube fitting for the tubing chosen. Attach a fitting to the inlet male QC designed to seal the tubing of your choice. Seal the fitting to the QC by using sealant or PTFE tape. Connect the male QC to the inlet QC of the PT2X-BV and the other end of the tube to the vacuum source using appropriate fittings.

**Settings and Calibration**

Settings and calibration values can only be changed when there are no files stored on the sensor. Be sure to retrieve any data and then erase the data before continuing.

The temperature channel rarely needs adjustment. If you think your temperature channel needs adjusting, contact your service representative.

Before leaving the factory your PT2X-BV was inspected using precision instruments. However, you can adjust the settings, if needed, as shown below.

When using a barometric sensor, you may want to change the channel label at the top of the Settings window to read "Barometric Pressure."

**Note: Be sure to use the same units for all measurements on this page. For example, if you have the program set to display in psi then be sure to enter the barometric pressure as psi.**

-- Computing Offset --

- Using a barometric pressure indicator or other measuring device, determine the current barometric pressure.
- Enter this value in the REF box..
- Click the Measure button.
- When readings have stabilized to your satisfaction, click the Accept button in the pop-up box.

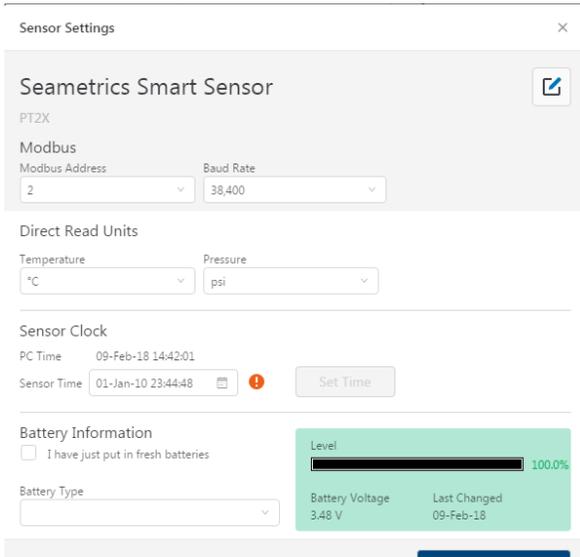
-- Applying offset --

- Click the Apply button to apply calculated offset.
- The calculated offset will be transferred to the offset field near the top of the window.
- Click OK to save the value to the sensor!!!

**Sensor Settings**

Once connected you'll see the Sensor screen appear and display the connected sensor(s) details. Mousing over icons will provide tool-tips, mouse over to view sensor firmware and serial number details.

To change general sensor settings click  in the sensor screen. This allows you to change the following:



Click  to rename the sensor

To change Modbus address and/or Baud Rate simply select the desired address and/or Baud Rate from the drop down menus. Sensor will automatically reconnect at new address and/or Baud Rate

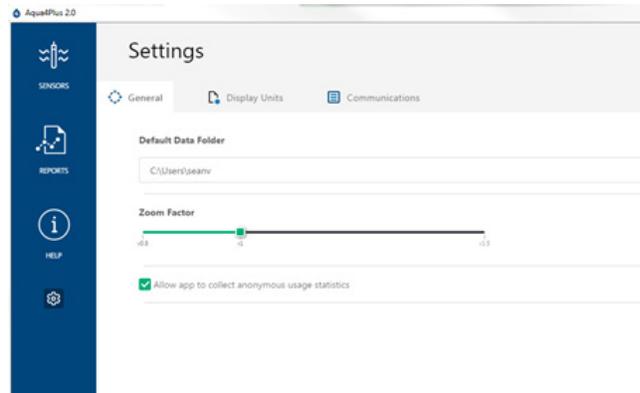
To change the Direct Read output units (for direct Modbus or SDI12 integration) simply select the desired output units from the drop down menus. To change Aqua4Plus 2.0 display units scaling see Program Settings.

Sensor Clock can be synced with your PC time or set manually if desired. To set manually enter your desired date/time and click Set Time.

When batteries are changed out make sure to reset the battery information here, simply check the I have just put in new batteries box and select the battery type that was installed from the drop down menu.

**Program Settings**

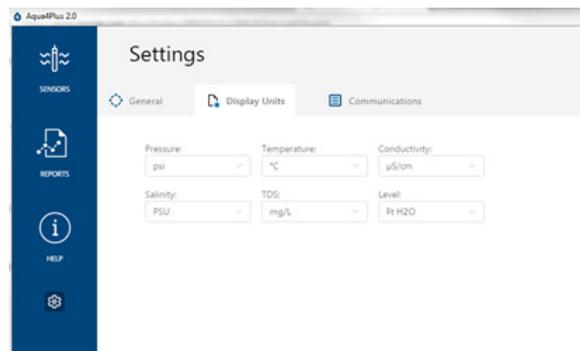
To view/change Aqua4Plus 2.0 settings click  in the blue side-bar menu



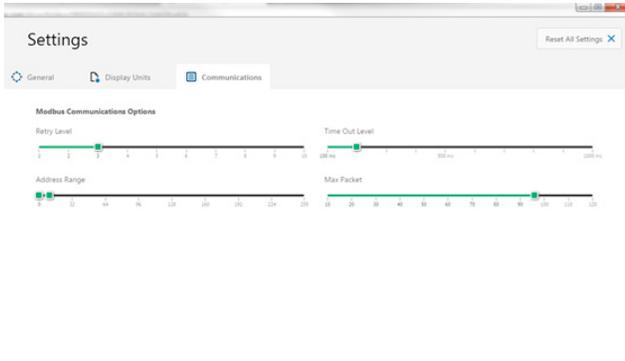
Under the General Settings tab you can change the default data folder location. This is where your Reports are saved to on your PC.

The Zoom Factor slider can be used to adjust the font size within Aqua4Plus 2.0.

Uncheck the Allow app to collect anonymous usage statistics box if you would like to opt out. This information is used to track Aqua4Plus 2.0 reliability across different system configurations.

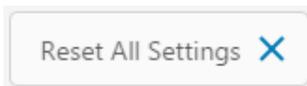


Under the Display Units tab you can select your desired display units for the supported channels. These may be changed at any time and associated Real-Time readings and Reports will rescale to the currently selected display unit. To change Direct Read units scaling see Sensor Settings.



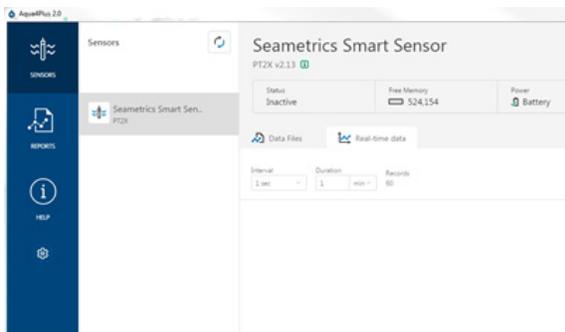
Under the Communications tab you can change your Modbus communication settings. Typically you will only need to change the address range to connect to sensors outside of Modbus address 1-10. In certain cases we may need to change the Retry and Timeout settings to overcome communication issues on very long, or corroded cabling. See Troubleshooting section or contact Seametrics Tech Support for details.

To restore factory default settings click

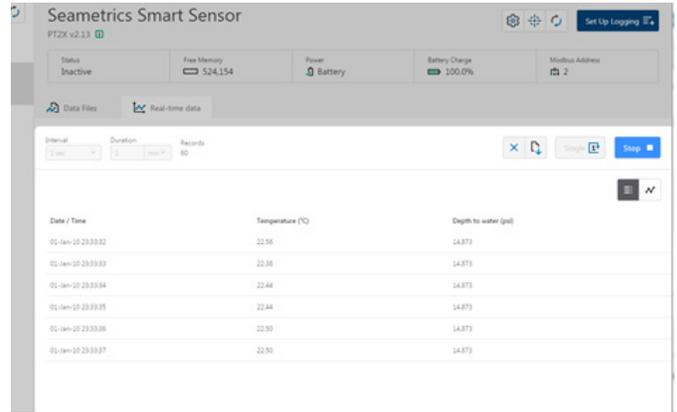


**Real-time Data**

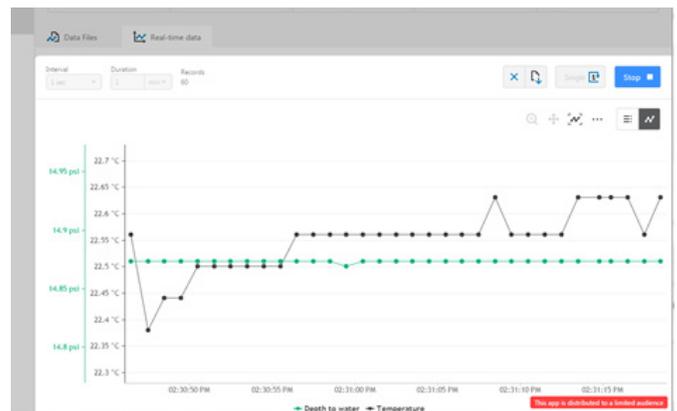
Connect to sensor and select the Real-time data tab



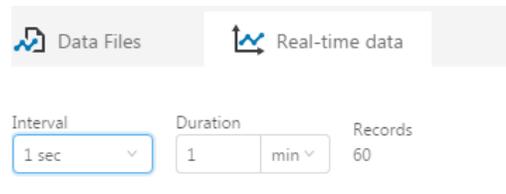
To start real-time readings click Start, readings default to table view



To switch to Real-time graphing view click the  graph icon



Real-time readings default to a 1 second interval for 1 minute, to adjust enter your desired settings here:

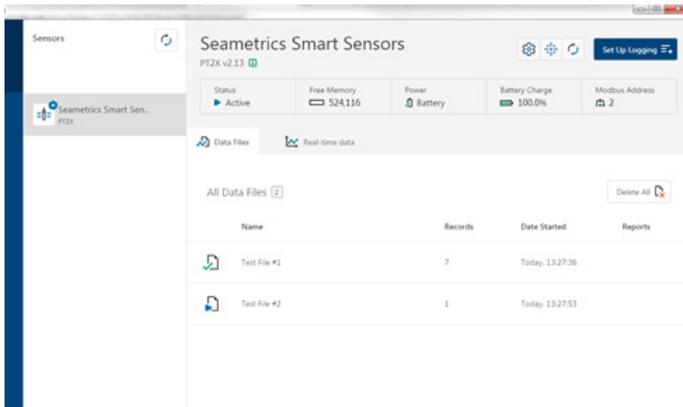


**Note:** Currently this data is not saved and is for viewing current conditions only. To save the data to sensor memory see Data Logging section. You can run Real-time Data while logging is active.

### Data Logging

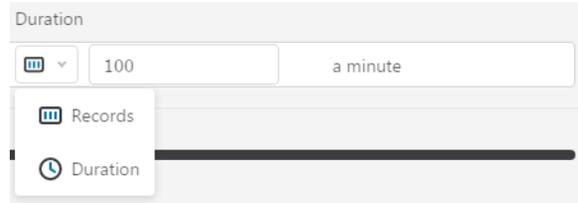
Select Set Up Logging from the sensor screen

If there are no files currently on the sensor you'll see the Set Up Logging button active under the Data Files tab as well as in the upper menu. Once files have been started/ logged on the sensor they will be displayed under the Data Files tab.



Duration can be set by either number of records

Or by setting a duration time



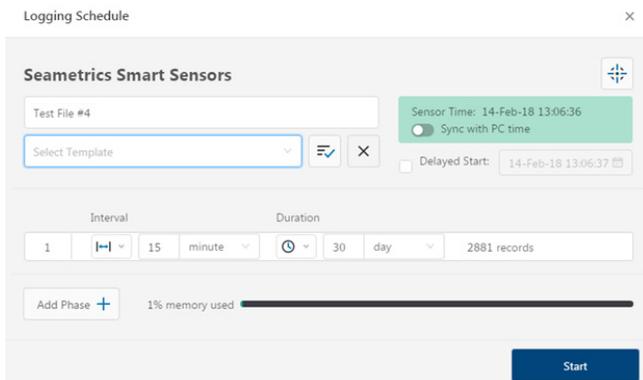
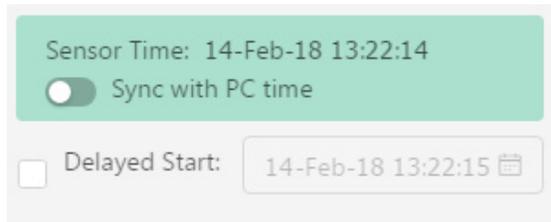
When set by number of records the time of the recording phase will be displayed detailing how long that phase will run. When set by time, the total number of records for that phase will be displayed.

If you need to check settings or perform a calibration click  before proceeding with logging setup to switch to the Settings and Calibration screen.

You may sync the sensor clock with the PC clock when starting logging by clicking the slider here.

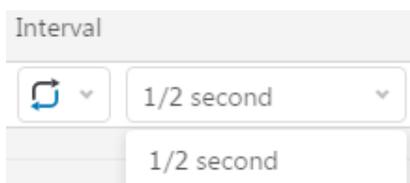
### Setting Up Logging Window

Here you will name your data file and set up the recording interval and duration of each logging phase. Select your desired recording interval and duration for each phase, Aqua4Plus 2.0 will display the available memory at the bottom of the window.

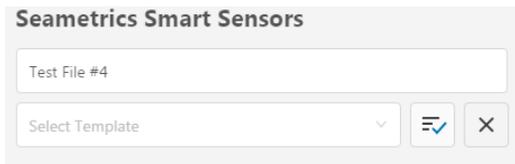


Check the Delayed Start box and enter the desired date/ time you would like logging to start. This is useful for syncing data when setting up multiple sensors on a site. Data will start logging at the set date/time rather than immediately when Start is pressed.

Click  to switch between interval and continuous data recording (PT2X & CT2X only) Select your continuous rate from the drop down box here.



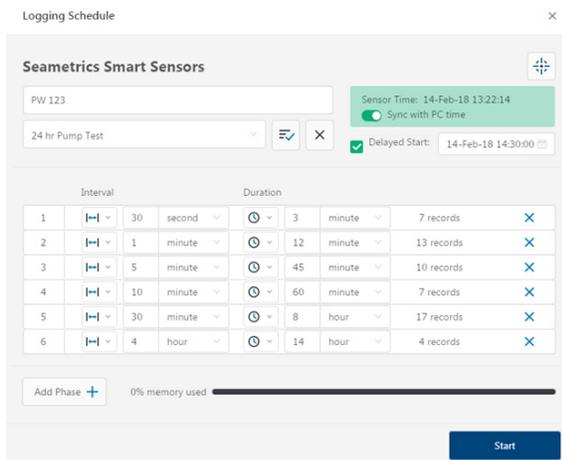
Data file name defaults to Test File # and may be re-named here.



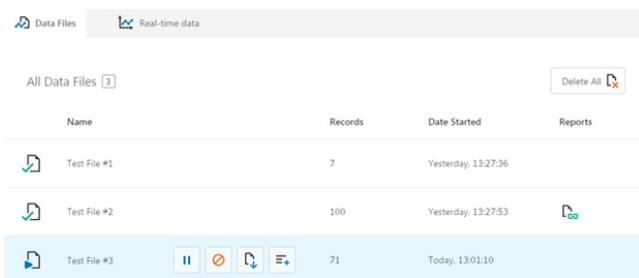
The 3 previous Logging Schedules that were programmed to a sensor will be listed under the Select Template drop down menu. There you will also find pre-programmed logging schedules such as 24 hour pump test, along with any custom logging schedules saved by the user.

To save a logging schedule as a template enter desired settings and click [checkmark icon]. This will add your custom schedule to the Select Template menu.

Once all the desired settings are made simply click Start to begin logging.

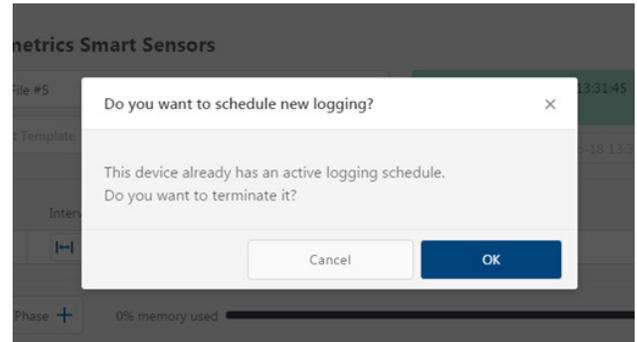


This will return you to the Sensor screen and your status will change to Active with the data file displayed under the Data Files tab. Mouse over an active file to pause, terminate, download, or view logging setup details.

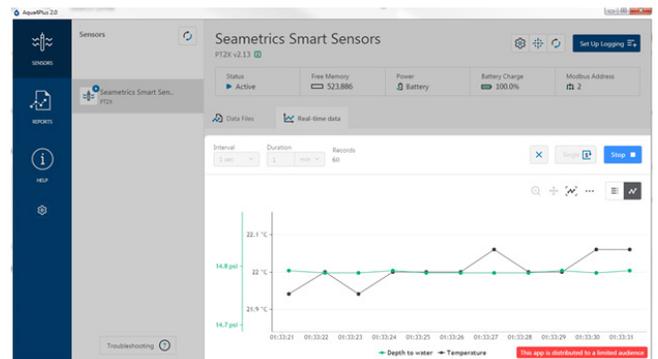


Data files already downloaded will show [download icon] in the Reports column, clicking here will bring you to the reports screen to view the data. See Reports section for details.

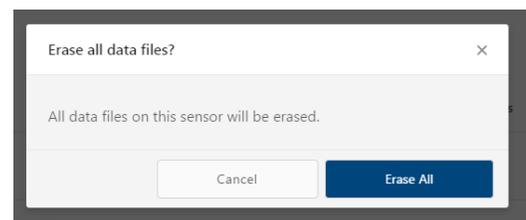
You may only have 1 active data file recording on each sensor, however you can store multiple files in memory if desired.



Starting a new file will automatically terminate the active logging and begin the new logging schedule. Real-time data is available during active logging.



To delete files from memory make sure they have all been downloaded to Reports. Files are removed from memory all at once rather than individually.

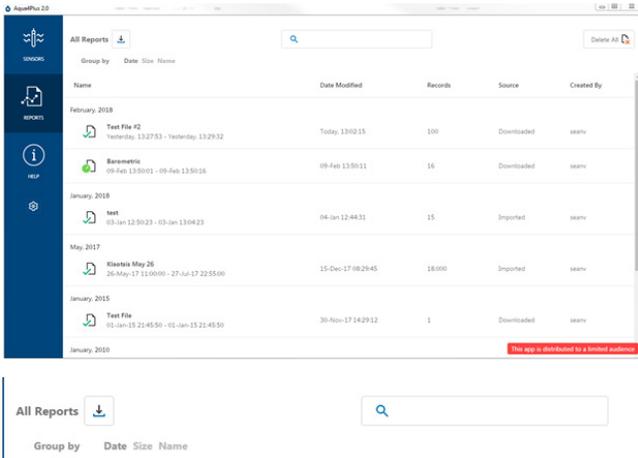


Once confirmed files are permanently deleted from the sensor memory.

### Reports

Data downloaded from your sensor is stored in the Reports section of Aqua4Plus 2.0 for viewing and editing. The files will be saved to default data folder on your PC as well. See Program Settings for default data folder location.

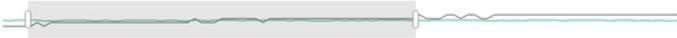
In the main view you'll see a list of reports sorted by date, size, or file name as selected here



You can also search reports by keyword using the search box

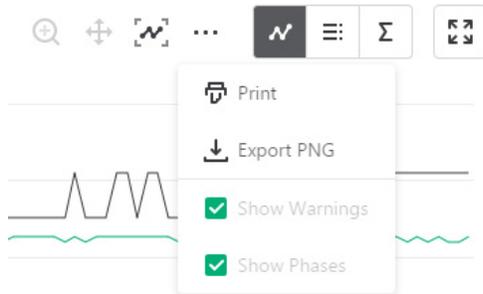
Click on a report to bring up the report details

Reports are displayed in graphing view by default. You can zoom to specific sections by selecting a section with you mouse or by adjusting the slider below the graph.



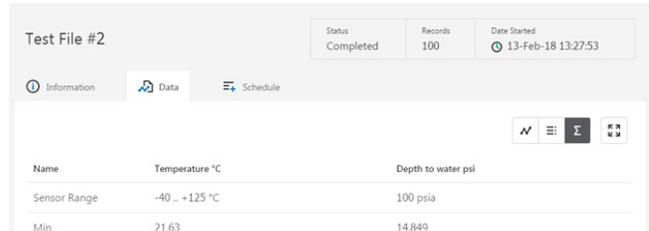
Click to switch to full screen graphing view

Graph saving and export options are available here

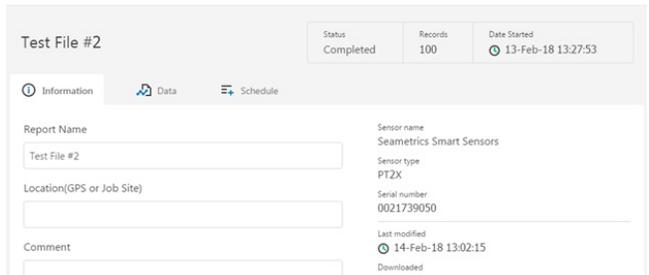


Click to view data as a table

Click to view data statistics



The Information tab is a new feature allowing users to add metadata to their reports such as site location, field notes, or comments.



The Schedule tab will display the logging setup details for the report

Click Export to export the report as a .csv file or .a4d file for distribution or use in 3rd party software.

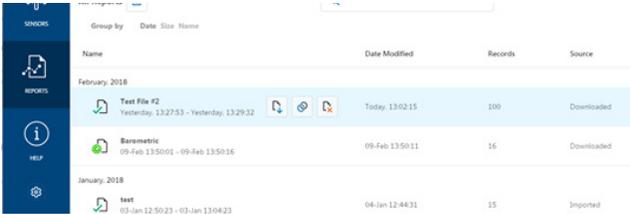
Click Delete to delete the report from Aqua4Plus 2.0

You can also import .a4d files from compatible sensors into Aqua4Plus 2.0 by clicking at the top of the Reports screen.

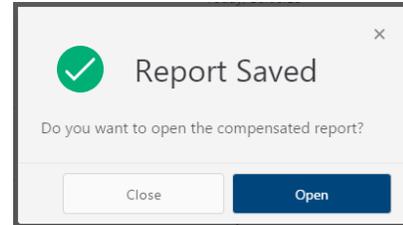
### Barometric Compensation

For PSIA sensors we've built a new barometric compensation utility into the Reports section. Click  on a report to compensate the data for barometric pressure.

Aqua4Plus 2.0 will perform the barometric compensation and create a new compensated report. Original reports are retained as uploaded.

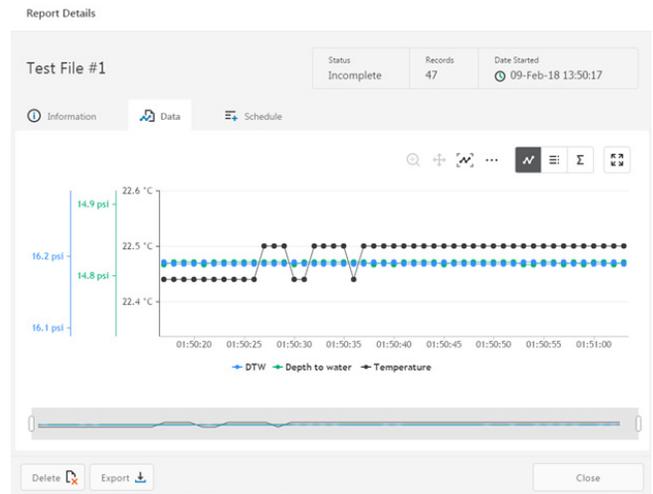
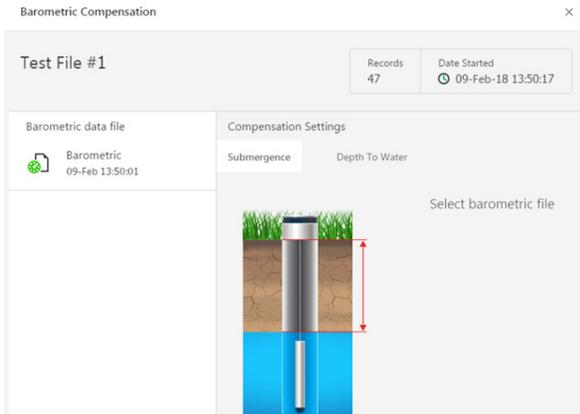


Name	Date Modified	Records	Source
February, 2018			
Test File #2 Yesterday, 13:27:53 - Yesterday, 13:29:32	Today, 13:02:15	100	Downloaded
Barometric 09-Feb 13:50:01 - 09-Feb 13:50:16	09-Feb 13:50:11	16	Downloaded
January, 2018			
test 03-Jan 12:50:23 - 03-Jan 13:04:23	04-Jan 12:44:31	15	Imported

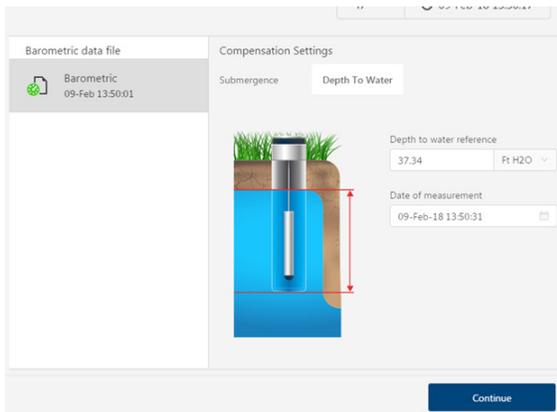


Corresponding barometric files are filtered by date/time and displayed to the left. Select the barometric file you would like to use to compensate the report, select either the Submergence or Depth To Water tab, then click Continue.

Compensated report can then be viewed and exported as needed.



If compensating for Depth to Water enter your depth to water reference measurement and the date/time the measurement was taken (typically taken with a water level indicator before data is uploaded from the sensor) before clicking Continue.



**Power Consideration**

If your sensor does not have internal batteries and is not powered continuously by an auxiliary power supply, then you must turn power on to the sensor at least two seconds before a reading is to be taken to allow the sensor to warm up.

**Reading Via Modbus® RTU**

**Setting Baud Rate**

Your PT2X-BV comes configured to communicate at 38,400 baud, with 8 data bits, one stop bit, and no parity. The sensor can also be set to 19,200 or 9600 baud, if needed for your application. You must use Aqua4Plus 2.0 to make baud rate changes. See sensor settings

**Taking Measurements**

*Reading Registers*

Read measurements using Modbus function 03 – Read Holding Registers. Readings are located in two registers each, starting at address 62592. (PT2X-BV register addressing is zero based, i.e., starts at zero. If your equipment uses one based addressing, you will need to add one to the register addresses.)

**Addresses for PT2X-BVs with firmware lower than 2.0**

	Zero based	One based
Pressure	62592	62593
Temperature	62594	62595

**Addresses for PT2X-BVs with firmware 2.0 or higher**

	Zero based	One based
Temperature	62592	62593
Pressure	62594	62595

*Measurement Timing*

When you request a reading via Modbus, the sensor wakes up, returns the current values in the registers, and then starts taking new readings and updating the registers. After approximately 10 seconds, if no more readings have been requested, the sensor goes back to sleep.

Because of this, the first reading you get will be old. If you are taking readings at intervals of less than 10 seconds, simply ignore the first reading — all remaining readings will be current. On the other hand, if you are taking readings at intervals of greater than 10 seconds, take a reading, ignore it, wait one second, take another reading. Record this second reading.

*Data Format*

The data is returned as 32-bit IEEE floating-point values, highword first, also referred to as big-endian or float inverse.

For further information and detailed Modbus examples, see Seametrics technical bulletin on Direct Read, available from our web site at [www.seametrics.com](http://www.seametrics.com).

**Reading Via SDI-12**

Note: The default units setting for pressure is PSI. The default units setting for temperature is Celsius. To change these, use the Direct Read Units in the Aqua4Plus 2.0 Control Software.

**Addressing**

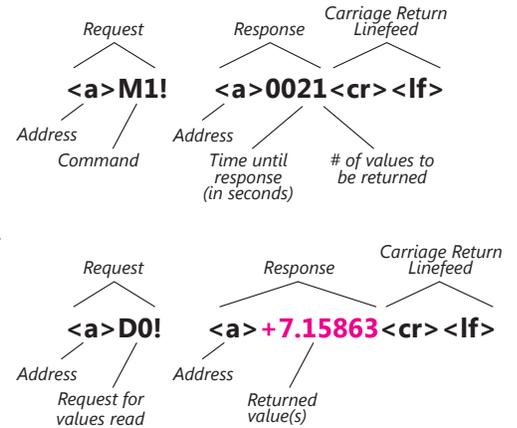
Default SDI-12 Address: 1

**SDI-12 Command Nomenclature**

- <a> = Sensor address
- {crc} = SDI-12 compatible 3-character CRC
- <cr> = ASCII carriage return character
- <lf> = ASCII line feed character

highlighted values indicate variable data

All SDI-12 requests consist of a command followed by a request for values. Some software or equipment may combine these, making the second one unnecessary. Refer to your software or equipment documentation for details.



**SDI-12 Commands**

**Sensor Identification**

<a>! <a>13 INWUSA PT2X-BV  
213sssssssss<cr><lf>

Note: 213 will change to reflect current firmware version.  
sssssssss = device serial number

**Acknowledge Active, Address Query**

<a>! <a><cr><lf>  
?! <a><cr><lf>

**Change Address**

<a>A<b>! <b><cr><lf>

Change address to <b>

**Request Measurement**

<a>M! <a>0022<cr><lf>  
<a>D0! <a>+22.0512+12.0512<cr><lf>

Request all measurements  
Read temperature and pressure

<a>M1! <a>0021<cr><lf>  
<a>D0! <a>+22.0512<cr><lf>

Request temperature measurement only  
Read temperature

<a>M2! <a>0021<cr><lf>  
<a>D0! <a>12.0512<cr><lf>

Request pressure measurement only  
Read pressure

**Request Measurement with CRC**

<a>MC! <a>0022<cr><lf>	Request all measurements with CRC
<a>D0! <a>+22.0512+12.0512{crc}<cr><lf>	Read temperature and pressure
<a>MC1! <a>0021<cr><lf>	Request temperature measurement only with CRC
<a>D0! <a>+22.0512{crc} <cr><lf>	Read temperature
<a>MC2! <a>0021<cr><lf>	Request pressure measurement only with CRC
<a>D0! <a>12.0512{crc} <cr><lf>	Read pressure

**Concurrent Measurement**

<a>C! <a>0022<cr><lf>	Request all measurements
<a>D0! <a>+22.0512+12.0512<cr><lf>	Read temperature and pressure
<a>C1! <a>0021<cr><lf>	Request temperature measurement only
<a>D0! <a>+22.0512<cr><lf>	Read temperature
<a>C2! <a>0021<cr><lf>	Request pressure measurement only
<a>D0! <a>12.0512<cr><lf>	Read pressure

**Concurrent Measurement with CRC**

<a>CC! <a>0022<cr><lf>	Request all measurements with CRC
<a>D0! <a>+22.0512+12.0512{crc}<cr><lf>	Read temperature and pressure
<a>CC1! <a>0021<cr><lf>	Request temperature measurement only with CRC
<a>D0! <a>+22.0512{crc} <cr><lf>	Read temperature
<a>CC2! <a>0021<cr><lf>	Request pressure measurement only with CRC
<a>D0! <a>12.0512{crc} <cr><lf>	Read pressure

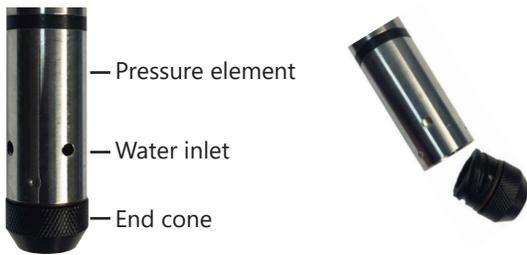
For further information and SDI-12 examples, see Seametrics application note, *"PT2X SDI-12 Interface Specification"* available from our web site at [www.seametrics.com](http://www.seametrics.com).

**Removing Debris from End Cone (Tube version)**

At times mud, silt, or other debris may foul the water inlets to the pressure element. The end cone can be removed to clean out the debris.

*Twist Open Housing*

1. Gently twist off end cone portion only - do not twist off pressure element!
2. Remove debris. **Do not poke anything into the sensor.** This can damage the sensor element and void the warranty.
3. Replace and retighten the end cone.



*Gently twist off the end cone and carefully remove debris*

**Sensor**

There are no user-serviceable parts, other than the batteries. If problems develop with sensor stability or accuracy, contact Seametrics. If the transducers have been exposed to hazardous materials, do not return them without notification and authorization.

**Cable (Cabled tube version)**

Cable can be damaged by abrasion, sharp objects, twisting, crimping, crushing, or pulling. Take care during installation and use to avoid cable damage. If a section of cable is damaged, it is recommended that you send your sensor back to replace the cable harness assembly.

**Changing Batteries**

**Battery Type:** Two 1.5V AA batteries—Lithium or Alkaline (lithium recommended)



**IMPORTANT!**

Because changing the batteries involves opening the water-tight seal, this must be done in a clean, dry environment to avoid contamination or moisture damage to the circuitry.



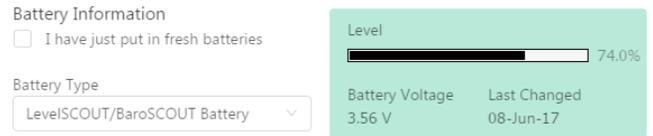
**IF USING ALKALINE BATTERIES —PREVENT BATTERY LEAKAGE!**

PT2X-BV sensors are typically shipped with lithium batteries. If, however, you are using alkaline batteries, be aware that under some circumstances alkaline batteries can leak, causing damage to the sensor. To prevent leakage, the following is recommended. **(Does not apply to lithium batteries.)**

- Change the batteries at least every 18 months.
- If the sensor will not be deployed for 3 months or more, remove the batteries.

**Battery Life Calculator (Firmware 2.13 or higher)**

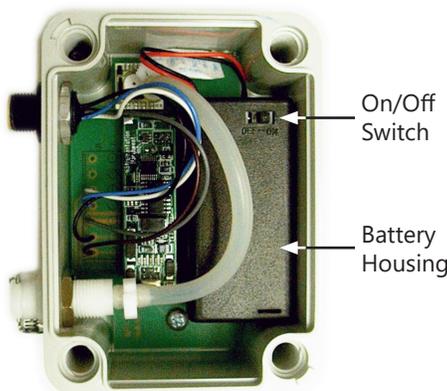
When changing batteries, it is important to reset the Battery Life Calculator. **If the battery life calculator is not reset, the remaining life information will be incorrect.** Access the Battery Life Calculator from the Configure Menu - Battery Information and Reset. If you have put in new batteries, checkmark the box "I have just put in fresh batteries." Click Save and Close.



*Be sure to reset the Battery Life Calculator when changing batteries!*

**Box Version**

- Remove the four screws in the corners of the top cover.
- Remove top cover.
- The battery housing is secured using hook and loop fasteners. Pull gently to release.
- Remove screw on bottom of battery housing and slide housing open.
- Remove the batteries, taking note of polarity.
- Insert new batteries.
- Replace battery cover and screw.
- Secure on hook and loop fastener.
- Be sure battery switch is On.
- Replace top cover and screws. **NOTE: The box is directionally keyed. Failure to replace the lid correctly will prevent a tight seal and will result in water leakage.**

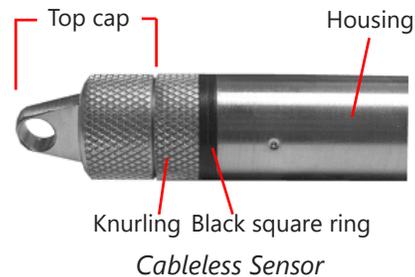
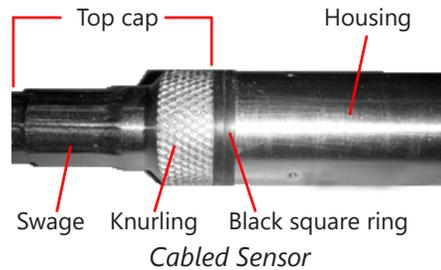


**Tube Version**

**Tips**

- Never place a tool on the sensor body, it is very thin and will deform causing leaks at o-ring seals and potentially crushing the circuit board!
- Always twist the sensor body off the top cap assembly rather than twisting the top cap assembly off of the sensor body.
- For cabled sensors, always clamp the sensor on the swaged area when applicable, the shoulder above it will allow you to press down without the worry of the sensor slipping out of the clamping device.
- If the sensor body is slippery or you are unable to grip it hard enough to twist, try a piece of rubber cabinet liner for additional friction.

There is a black, compressible square ring near the top of the sensor. This ring acts as a spring to lock the cable in. This needs to be compressed in order to allow removal of the top cap. Once this ring is compressed, a gentle counterclockwise twist is all that is needed to remove the cable from the sensor body. Compressing the black square ring does take force, **twisting does not.**



Care must be taken to compress the black square ring before attempting to twist the housing. **Forceful twisting of the housing can permanently damage the sensor.**

**Securing the Sensor**

In order to compress the black square ring, the sensor must be secured so that you can apply downward pressure to compress the ring. This can be done by holding in your hand, using a vise, or using pliers, as follows.

*By Hand—cabled version only*

1. Tightly grasp the top cap in one hand.
2. Brace your hand against something such as a table or the ground. (Do not allow the cable to be pinched against the brace.)

Continue to **Removing the Housing on the next page.**

*With Vise—recommended method*

Cabled Sensor

1. If possible, use a set of soft jaws as shown to prevent marring the surfaces of the top cap assembly.
2. Place the sensor in a vise clamping gently on the swaged area. You do not need to clamp the vise very hard.

Continue to **Removing the Housing on the next page.**



*Cabled Sensor—gripping on swage*

Cableless Sensor

1. If possible, use a set of soft jaws as shown to prevent marring the surfaces of the top cap assembly.
2. Remove the cableless top cap.
3. Place the sensor in a vise clamping gently on the knurled area. You do not need to clamp the vise very hard.

Continue to **Removing the Housing on the next page.**



*Cableless Sensor—gripping on knurled area*

*With Pliers or Vise Grips—good for field use*

Cabled Sensor

1. Grasp the pliers on the swaged area (do not grab the knurled diameter).
2. Find a hard edge and place the tips or side of the jaws of the pliers onto this edge as shown. This will allow you to press down with your weight to compress the square ring.

Continue to **Removing the Housing on the next page.**



*Cabled Sensor*

Cableless Sensor

1. Leave the cableless cap on in order to protect the pins inside.
2. Grasp the pliers on the knurled area tightly being careful to avoid grabbing the knurled cap.
3. Find a hard surface and place the cableless cap down onto it. This will allow you to press down with your weight to compress the square ring.

Continue to **Removing the Housing on the next page.**



*Cableless Sensor*

**Removing the Housing**

1. With your free hand, grasp the sensor body. Press down to compress the square ring. Twist gently. Once the body begins to twist, you can stop the compression action.
2. Finish gently twisting until the sensor body is removed.
3. Carefully disconnect the wiring connector inside from the circuit board in the top cap.

**Replacing Batteries and Resealing Sensor**

1. Gently pull wiring to one side in order to allow batteries to fall out. Shake gently if needed.
2. Replace batteries with button (+) facing open end.
3. Reinstall wiring connector — it only goes in one way, so make sure not to force it.



*Pull wires gently to the side to allow battery removal*



*Connector connected properly*

4. Hold the top cap assembly at 90° to the housing opening as shown. Depress the spring with your fingertip and tuck the wiring into the cutaway on the circuit board with your thumb to protect it while being installed back into the housing.



*Wires tucked into slot and spring tucked into housing*

5. Rotate the top cap assembly into the opening in the housing being very careful not to nick or pinch any wires.



*Push top cap in before twisting and locking*

6. Gently press down until the assembly stops and then twist it into place. It will click in and decompress the gasket when it is fully engaged.



*Properly completed—black ring uncompressed*

Problem	Probable Causes	Things to try...
Software will not communicate with sensor	<p>Loose cable</p> <p>Contacts in connector loose</p> <p>USB driver not installed</p> <p>Incorrect USB or COM port selected</p> <p>SEE ALSO ERRATIC READINGS BELOW</p>	<p>Make sure all cable connections are secure</p> <p>Be sure all wires are securely fastened inside the round connector</p> <p>See Connecting the PT2X-BV to a Computer in the Installation section or see the USB/RS485 Adapter Installation application note on our web site.</p> <p>If using Aqua4Plus, be sure USB is selected in the dropdown box on the tool bar or the correct COM port if using an alternate connection method. (Aqua4Plus Lite automatically uses only the USB connection.)</p>
Erratic readings	<p>Poor connection due to moisture between contacts in connector</p> <p>Loose or broken wires in connector</p> <p>Damaged cable, cracked or fraying</p> <p>Moisture in the unit</p> <p>Damaged transmitter</p>	<p>Dry thoroughly. Be sure desiccant is fresh (see Maintenance section).</p> <p>Repair or return for evaluation and repair</p> <p>Replace cable</p> <p>Return for evaluation and repair</p> <p>Return for evaluation and repair</p>
Oscillating readings over time (usually 0.5 to 1.5 feet of water)	<p>Plugged vent tube (if using a vented unit)</p> <p>Actual water level changes in the aquifer itself in response to barometric pressure changes. This effect can occur in tight formations where the transmitter will immediately pick up barometric changes but the the aquifer will not.</p>	<p>Be sure desiccant tube is installed. Test by gently applying a small amount of pressure to the end of the desiccant tube and seeing if this affect the transmitter reading. If it does not, then the vent tube is plugged. Return for evaluation and repair.</p> <p>You will need to record barometric pressure as well as the water level pressure and compensate the data</p>
Zero readings when pressurized	<p>Poor connection due to moisture between contacts in connector</p> <p>Loose or broken wires in connector</p> <p>Damaged cable, broken, cracked, or fraying</p> <p>No apparent damage upon visual inspection</p>	<p>Dry thoroughly. Be sure desiccant is fresh (see Maintenance section).</p> <p>Repair or return for evaluation and repair</p> <p>Replace cable</p> <p>Return for evaluation and repair</p>

## **LIMITED WARRANTY/DISCLAIMER - Seametrics PT2X-BV BAROMETRIC/VACUUM SMART SENSOR**

A. Seller warrants that products manufactured by Seller when properly installed, shall be free from defects in material and workmanship. Seller's obligation under this warranty shall be limited to replacing or repairing the part or parts or, at Seller's option, the products which prove defective in material or workmanship within TWO (2) years from the date of delivery, provided that Buyer gives Seller prompt notice of any defect or failure and satisfactory proof thereof. Any defective part or parts must be returned to Seller's factory or to an authorized service center for inspection. Buyer will prepay all freight charges to return any products to Seller's factory, or any other repair facility designated by Seller. Seller will deliver replacements for defective products to Buyer (ground freight prepaid) to the destination provided in the original order. Products returned to Seller for which Seller provides replacement under this warranty shall become the property of Seller.

This limited warranty does not apply to lack of performance caused by abrasive materials, corrosion due to aggressive fluids, mishandling or misapplication. Seller's obligations under this warranty shall not apply to any product which (a) is normally consumed in operation, or (b) has a normal life inherently shorter than the warranty period stated herein.

In the event that equipment is altered or repaired by the Buyer without prior written approval by the Seller, all warranties are void. Equipment and accessories not manufactured by the Seller are warranted only to the extent of and by the original manufacturer's warranty.

THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, WHETHER ORAL, WRITTEN, EXPRESSED, IMPLIED OR STATUTORY. IMPLIED WARRANTIES OF FITNESS AND MERCHANTABILITY SHALL NOT APPLY. SELLER'S WARRANTY OBLIGATIONS AND BUYER'S REMEDIES THEREUNDER (EXCEPT AS TO TITLE) ARE SOLELY AND EXCLUSIVELY AS STATED HEREIN. IN NO CASE WILL SELLER BE LIABLE FOR CONSEQUENTIAL DAMAGES, LABOR PERFORMED IN CONNECTION WITH REMOVAL AND REPLACEMENT OF THE SENSOR SYSTEM, LOSS OF PRODUCTION OR ANY OTHER LOSS INCURRED BECAUSE OF INTERRUPTION OF SERVICE. A NEW WARRANTY PERIOD SHALL NOT BE ESTABLISHED FOR REPAIRED OR REPLACED MATERIAL, PRODUCTS OR SUPPLIES. SUCH ITEMS SHALL REMAIN UNDER WARRANTY ONLY FOR THE REMAINDER OF THE WARRANTY PERIOD ON THE ORIGINAL MATERIALS, PRODUCTS OR SUPPLIES.

B. With respect to products purchased by consumers in the United States for personal use, the implied warranties including but not limited to the warranties of merchantability and fitness for a particular purpose, are limited to twentyfour (24) months from the date of delivery.

Some states do not allow limitations on the duration of an implied warranty, so the above limitation may not apply to you. Similarly, some states do not allow the exclusion or limitation of consequential damages, so the above limitation or exclusion may not apply to you. This limited warranty gives you specific legal rights; however, you may also have other rights which may vary from state to state.

