xylem
Environmental Solutions

USER MANUAL
ITEM# 610224-01
REVISION B

ProSwap Logger User Manual

1-PORT TEMPERATURE/DEPTH SONDE

YSI
a xylem brand

ProSwap Logger

The information contained in this manual is subject to change without notice.

Effort has been made to make the information in this manual complete, accurate, and current.

The manufacturer shall not be held responsible for errors or omissions in this manual.

Consult **YSI.com** *for the most up-to-date version of this manual.*

Thank you for purchasing a YSI ProSwap Logger. This manual covers setup, operation, and functionality of the sonde, handheld, and sensors.

Product Components

Carefully unpack the instrument and accessories and inspect for damage. If any parts or materials are damaged, contact YSI Customer Service at 800-897-4151 (+1 937 767-7241) or the authorized YSI distributor from whom the instrument was purchased.

Technical Support

Telephone: 800 897 4151 (USA)

+1 937 767 7241 (Globally) Monday through Friday, 8:00 AM to 5:00 ET

Fax: +1 937 767 9353 (orders)

Email: info@ysi.com

YSI.com

Safety Information

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all precautionary statements. Failure to do so could result in serious injury to the operator or damage to the equipment. Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Precautionary Symbols

NOTE: *Information that requires special emphasis*

NOTICE: Indicates a situation which, if not avoided, may cause damage to the instrument

⚠ **CAUTION:** Indicates a potentially hazardous situation that may result in minor or moderate injury

⚠ **WARNING:** Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury

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THIS IS AN INTERACTIVE DOCUMENT

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Section 1
Introduction

This section will cover the ProSwap Logger specifications, sonde contents, power supply, and introduce some relevant accessories.

1.1 ProSwap Logger Overview

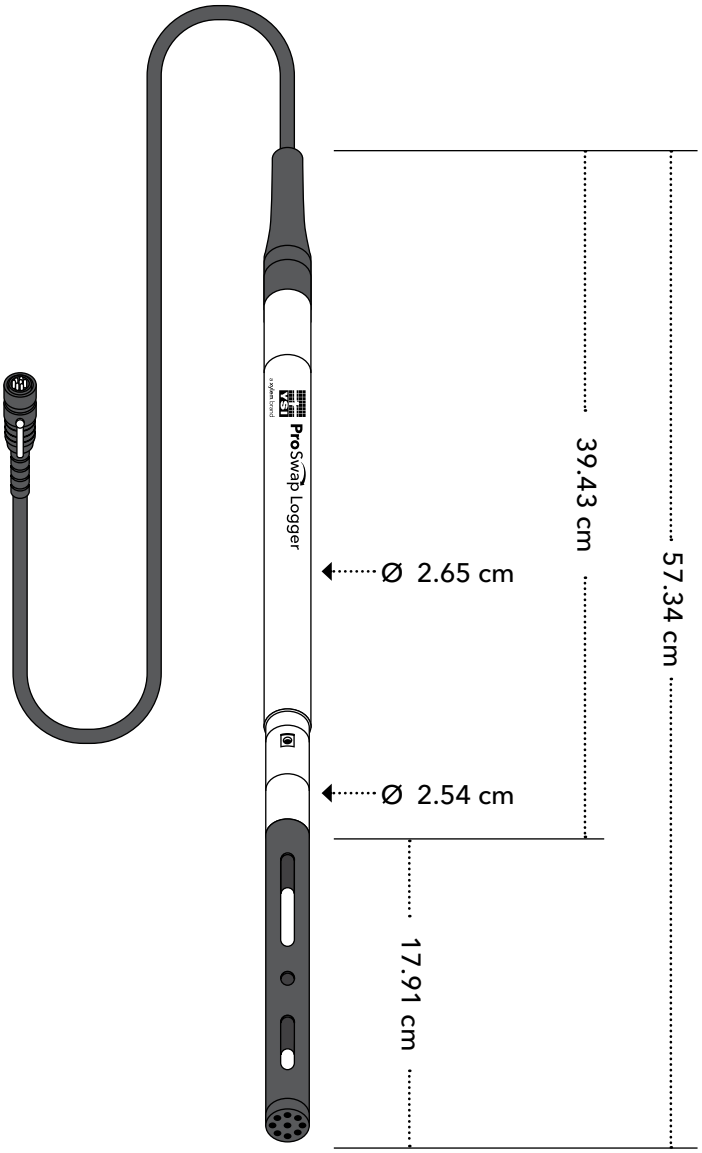
The ProSwap Logger is a multiparameter instrument that collects water quality data. The sonde collects the data with a single user-replaceable sensor, plus an integral temperature sensor and pressure transducer. Each sensor measures its parameter via a variety of electrochemical, optical, or physical detection methods. The 1-port bulkhead accepts any ProDSS sensor and automatically recognizes its type. Depending upon user-defined settings, the ProSwap Logger will collect data and store it onboard the sonde, transfer the data to a data collection platform (DCP), or relay data to the ProSwap/ProDSS Handheld or a PC using Kor Software.

See Section 6 for information specific to vented level sondes.

Users communicate with the ProSwap Logger via the ProSwap or ProDSS Handhelds or via Kor Software with a USB communications adapter to a PC.

Specifications

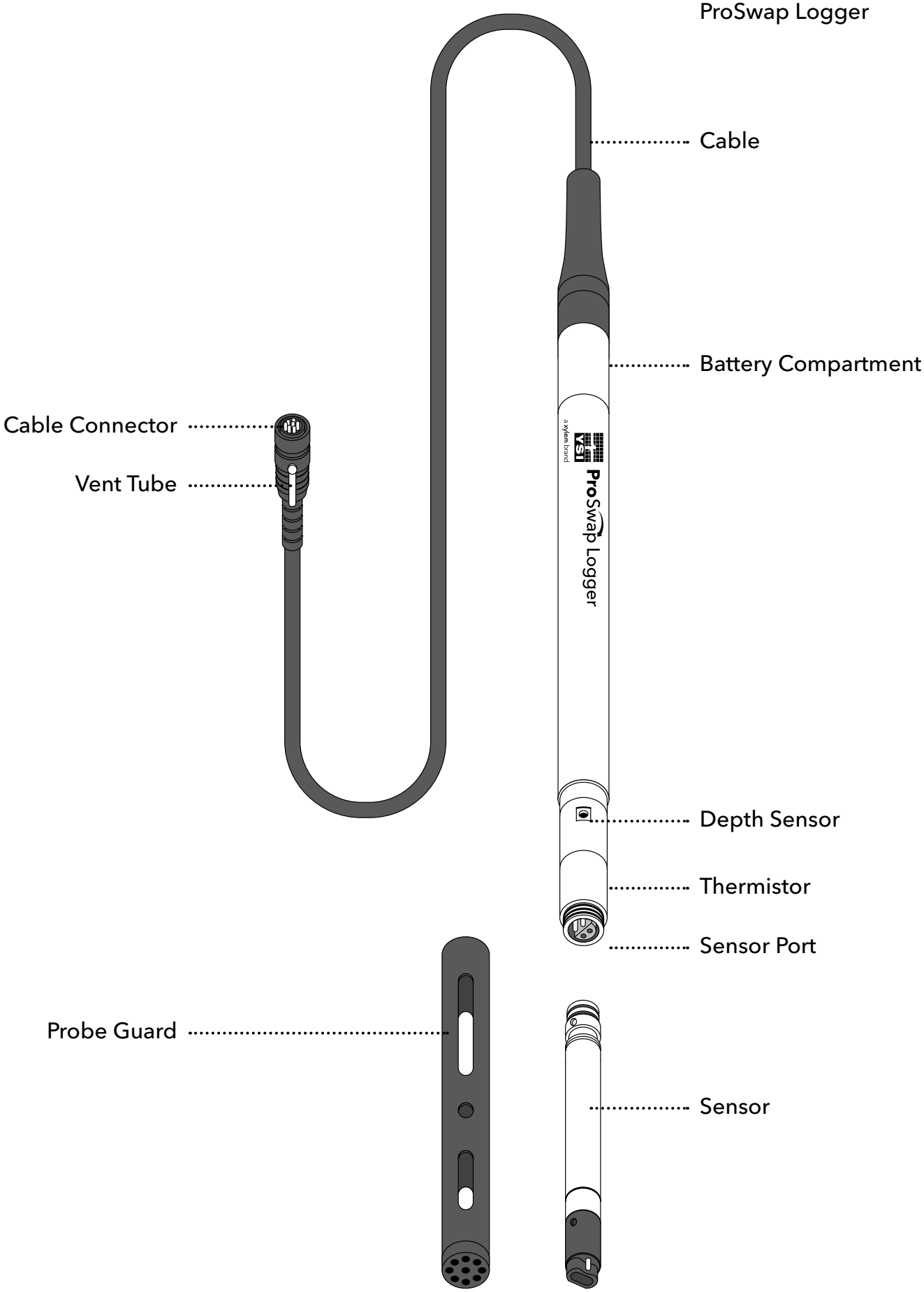
Material	Titanium
Internal Logging Memory Capacity	512 MB, > 100,000 data sets
Sample Rate	Up to 1 Hz
Software	Kor Software
Communications	
Sonde	YSIP, SDI-12
Adapters	USB, Flying Lead
Power	
External	
Powering	5.4-16 V
Charging	9-16 V
Internal[1]	Rechargeable Li-Ion battery
Temperature	
Operating	-5 to 50°C
Storage	-20 to +80°C
Depth Rating	Up to 100 m
Battery Life[1]	≥ 90 days[2]
Dimensions[3]	
Diameter	
Length	
w/ Battery	2.65 cm,1.045 in
w/o Battery	57.35 cm, 22.57 in
Weight	49.70 cm, 19.57 in
w/ Battery	0.57 kg, 1.26 lb
w/o Battery	0.45 kg, 0.99 lb
Warranty	2 years



[1] Internal battery only available on select models.

[2] Battery life based on CT sensor at 15 min logging; this will vary depending on the type of sensor and logging frequency.

[3] Sonde only; does not account for integral cable. Total weight will depend on cable length.


ProSwap Logger
Cable
Battery Compartment
Cable Connector
Vent Tube
a xylem brand
VSI
ProSwap Logger
Depth Sensor
Thermistor
Sensor Port
Probe Guard
Sensor

1.2 ProSwap Logger Contents

Inspect the outside of the shipping container(s) for damage. If you see any damage, contact the shipping carrier immediately.

Carefully remove the equipment from the shipping box and verify that all contents are present.

Contents:

- ProSwap Logger with Integrated Cable
- Probe Guard
- Weight (for Probe Guard)
- Storage Sleeve
- Sponge
- Graduated Cylinder
- USB Drive (contains Kor Software)
- Cable Connector Cap
- Cable Grip Kit
- Cable Management Kit (4m, 10m, 20m) or Cable Spool (30m+)
- Maintenance Kit
- Desiccant Kit (Vented units ONLY)

If any parts or materials are damaged, contact YSI Customer Service at 800-897-4151 (+1 937 767-7241) or the authorized YSI distributor from whom the instrument was purchased.

1.3 ProSwap Logger Power Supply

There are two different versions of the ProSwap Logger – one with an internal, rechargeable lithium ion battery and one without.

Internal Battery Version

Models:

- 610150-XX
- 610151-XX
- 610152-XX

This version includes a built-in, rechargeable lithium ion battery. This battery, fully charged, will last at least 90 days at a 15 minute log interval no matter which ProDSS Sensor is installed and may last longer depending on the sensor type.

Full recharge time may take up to 14 hours depending on the power source.

This battery can be recharged by connecting the cable to a handheld meter (ProSwap or ProDSS). The ProSwap Logger will drain the battery of the handheld to charge its own battery. Plug the handheld's USB connector into the AC power adapter or a computer USB connector to maintain charging.

Alternatively, the battery can be charged using the USB adapter accessory (sold separately). Plug the USB cable into the AC power adapter or a computer USB connector to enable charging.

Non-Battery Version

Models:

- 610153-XX
- 610154-XX
- 610155-XX

This version features no onboard power and therefore requires an external power supply. Options for external power include the following:

- ProSwap or ProDSS Handheld – The handheld will power the logger as long as it is connected and powered on.
- ProSwap Logger AA Power Pack – The power pack utilizes six AA batteries to provide power to the logger for at least 90 days at a 15 minute logging interval.
- USB Adapter – The USB Adapter will power the logger when connected to a PC USB port or AC adapter.
- Flying Lead Adapter – The flying lead adapter may be used to supply external power (9-16 V) and provide communication with a data logger.

Section 2
Setup

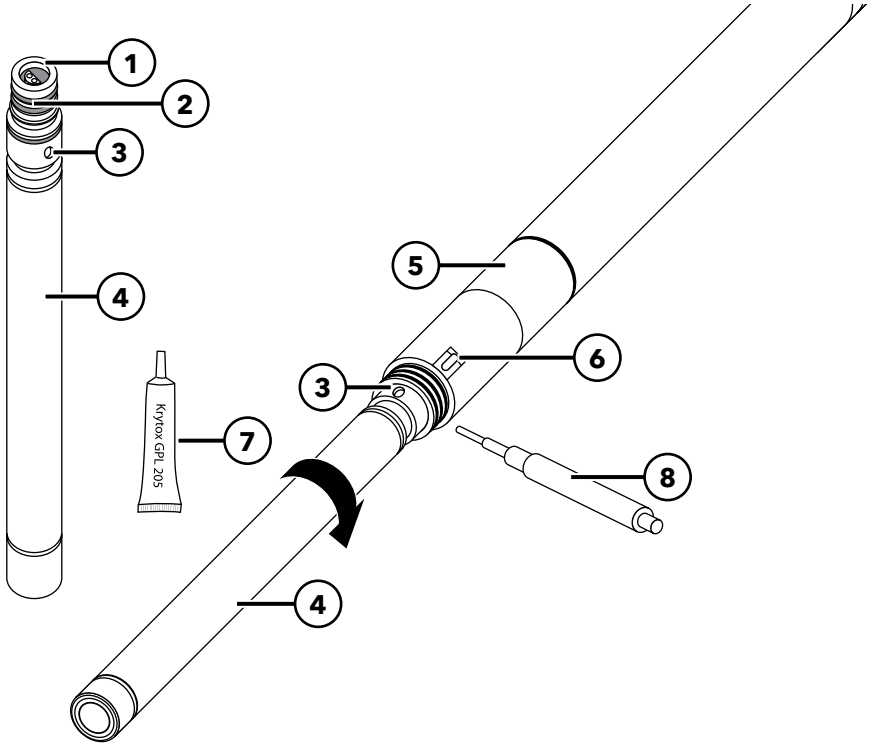
This section will cover the setup and operation of the ProSwap Logger using a ProDIGITAL Handheld (ProSwap and ProDSS). To prepare the sonde for operation, you will need to:

- Install sensor on the bulkhead or plug the port
- Connect ProSwap Logger to a handheld or PC via USB Adapter (not included)

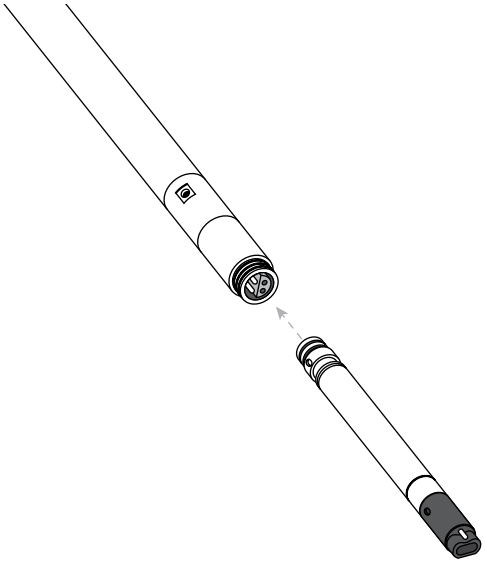
2.1 ProDSS Sensor Installation and Removal

The ProSwap Logger includes built-in temperature and depth sensors in addition to a single port. The port will allow any ProDSS smart sensor to be connected.

NOTICE: The sensor connector and bulkhead port are not wet-mateable. Make sure that the sensor connector and bulkhead port are clean and dry before sensor installation.



1 Sensor port	**5** 1-port cable assembly
2 O-ring	**6** Thermistor
3 Sensor retaining nut	**7** O-ring lubricant
4 Sensor	**8** Port plug

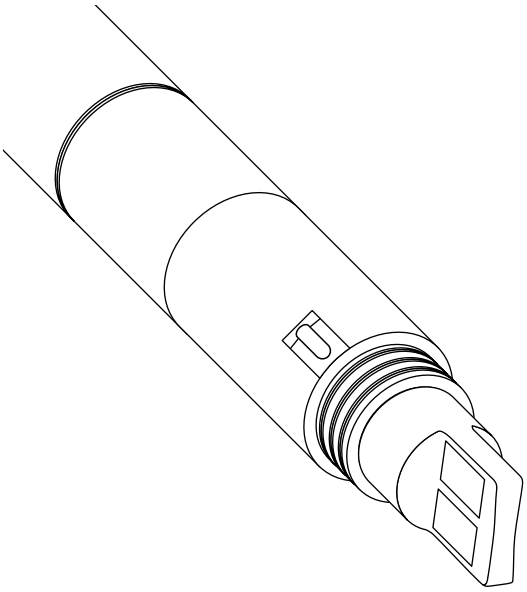


Sensor Installation

To use the ProSwap Logger with a ProDSS Sensor, proceed with the following instructions:

1. Remove the port cover shipped with the cable.
2. Apply a thin coat of lubricant to the sensor o-rings.
3. Carefully align the sensor and bulkhead connectors by inserting the sensor into the port then gently rotating the sensor until the connectors align. Once aligned, push the sensor toward the bulkhead until the sensor seats in the port.
4. Finger-tighten the retaining nut clockwise. If any resistance is felt, loosen the retaining nut completely to prevent cross-threading.
5. Use the sensor installation tool to tighten the retaining nut clockwise until snug. Be careful not to over-tighten the retaining nut.
6. Install the probe guard.

NOTICE: Incorrect installation or over-tightening can cause damage to the sensor or bulkhead that is not covered by the warranty.



Sensor Removal

Make sure the probe guard is removed first.

1. To remove a sensor, insert the sensor installation/removal tool into the retaining nut, then rotate the retaining nut counterclockwise to loosen.
2. After the retaining nut has been completely unscrewed from the bulkhead, pull the sensor straight out of the port and place it on a clean surface.
3. Use a lint-free cloth or compressed air to ensure that the port is clean and dry. Be careful not to damage the connector pins.
4. Install a port plug if not reinstalling a sensor in the exposed port.
   a. Apply a thin coat of o-ring lubricant to the o-rings on the plug port.
   b. Remove any excess lubricant from the o-rings and port plug with a lint-free cloth.
   c. Insert the port plug into the empty port and press until firmly seated.
   d. Finger-tighten the port plug clockwise to install. If necessary, use the sensor installation tool to make sure that the plug is fully seated into the port. The o-rings will not be visible if a port plug is correctly installed. Do not over-tighten the port plug.

NOTICE: Exposure to water can cause damage or corrosion to the bulkhead connector not covered by the warranty.

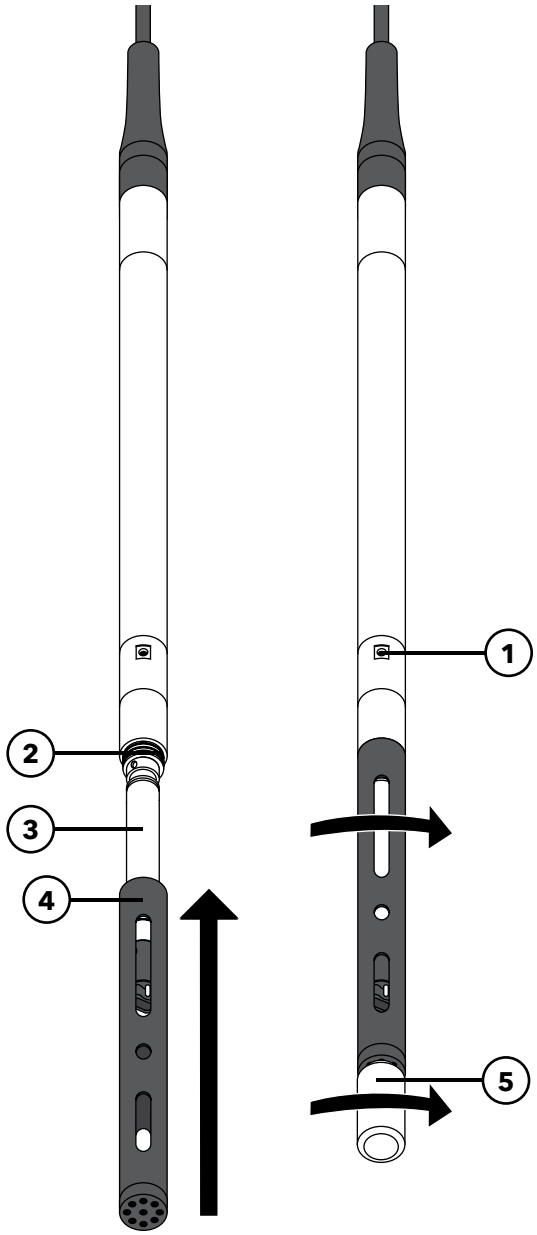
A port plug and a tube of o-ring lubricant are included in the maintenance kit that ships with all ProSwap Loggers.

2.2 Sensor Guard Installation

A sensor guard must be installed in order to protect the ProDSS sensor being used with the ProSwap Logger. Damage resulting from use without a sensor guard is not covered under warranty.

Carefully slide the sensor guard over the bulkhead and attached sensors/port plugs. Push the sensor guard toward the bulkhead until the sensor guard threads align with the bulkhead threads. Then hand-tighten the sensor guard clockwise. If any resistance is felt, loosen the sensor guard completely to prevent cross-threading. Incorrect installation may cause damage to the sensor guard or bulkhead that is not covered by the warranty.

To help stabilize the sensors when profiling at deeper depths, a sensor guard weight is supplied with cable assemblies 4 meters and longer. To attach the weight, carefully hand-tighten it clockwise on to the bottom of the sensor guard. If any resistance is felt, loosen the sensor guard weight completely to prevent cross-threading. The bottom of the weight is threaded so that additional weights can be added if needed. YSI recommends installing no more than 5 lbs of weight on the sensor guard.



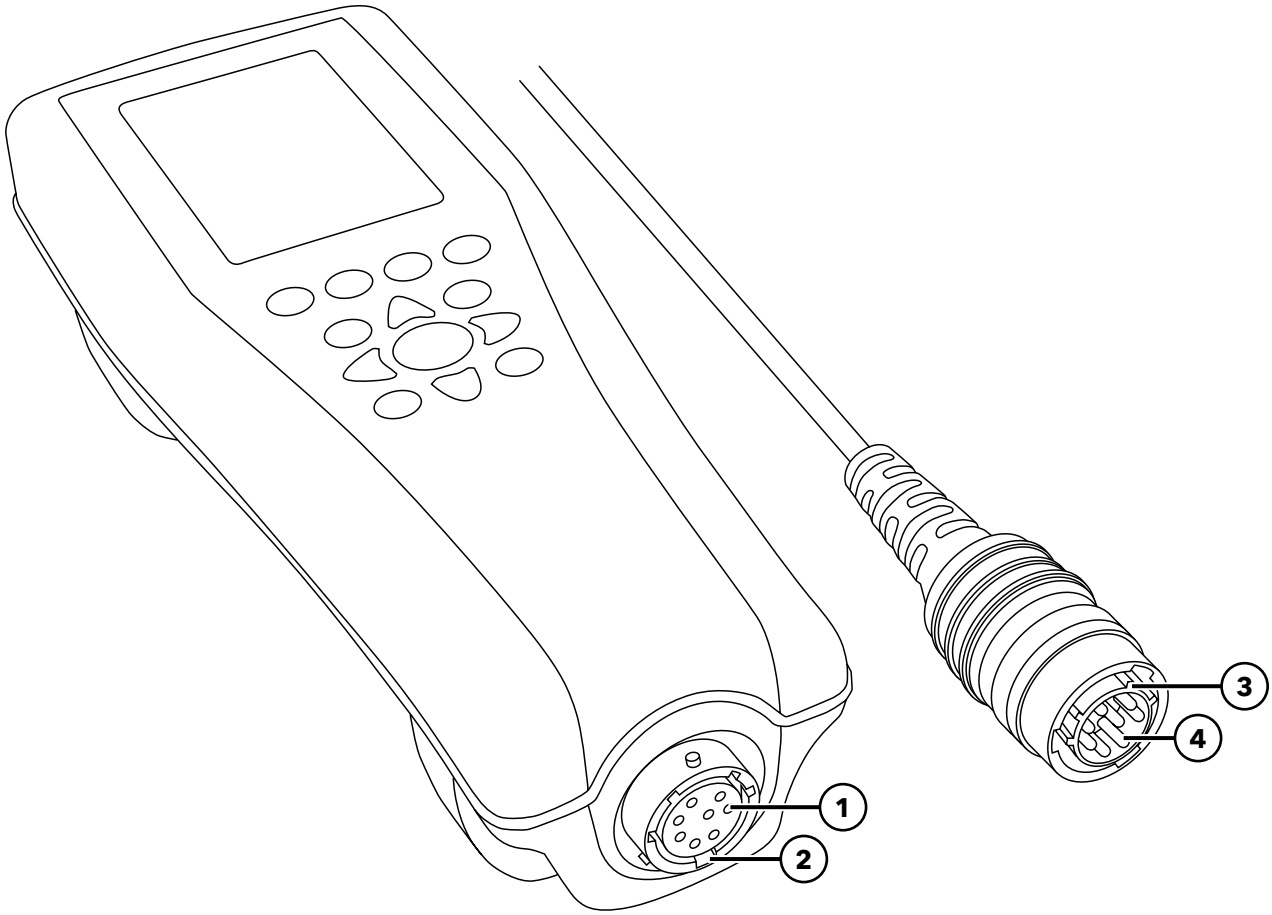
1	Depth sensor
2	Bulkhead threads
3	Sensor
4	Sensor guard
5	Weight

2.3 Connection to ProDIGITAL Handheld

The ProSwap Logger is designed to interface with the ProSwap Handheld and ProDSS Handheld meters via the MS-8 connector.

NOTICE: Be sure that the handheld is updated to the latest firmware (version 1.3.8 or newer).

1. Align the keys on the cable connector with the slots on the handheld connector.
2. Push together firmly, and then twist the outer ring clockwise until it locks into place.
3. Power on the handheld to calibrate and set up for logging.
4. The handheld connection provides power to the ProSwap Logger. Loggers with internal battery may be charged via this connection.



1 Handheld female connector	**3** Keyed area of connector
2 Slotted area of connector	**4** Cable male connector

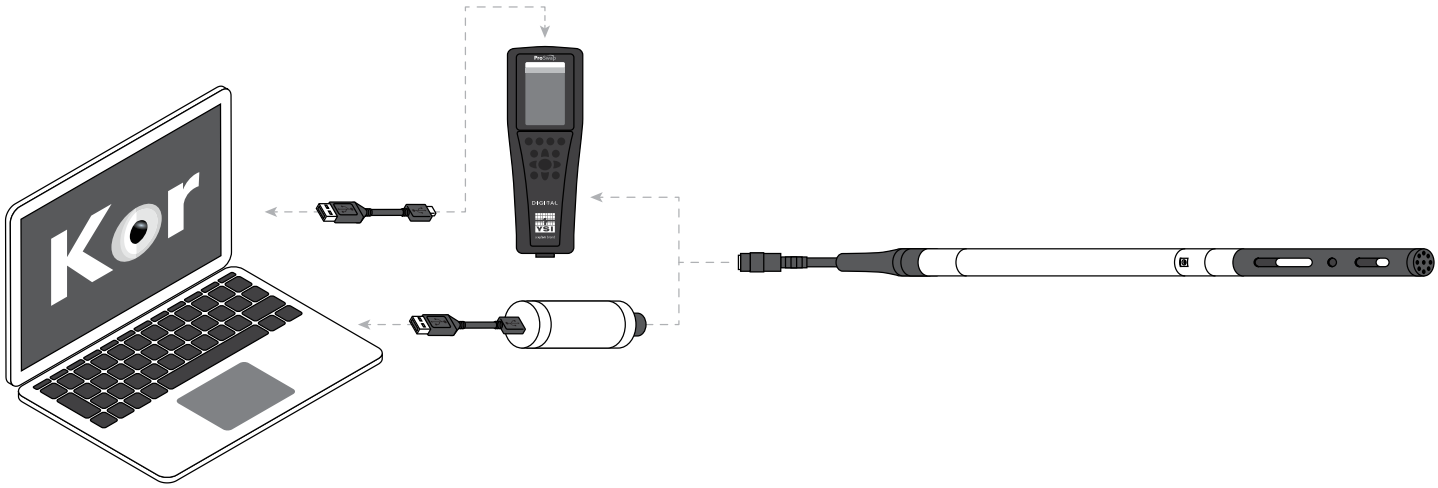
2.4 Connection to Kor Software

The ProSwap Logger can be connected to a PC running Kor Software via a USB adapter. A ProDIGITAL USB adapter is sold separately. Alternatively, the software communication may be established through the handheld's USB port.

1. Download the Kor installer from YSI.com and extract the .zip file, or connect the included USB drive to your PC.
2. Right click on Start.exe and select "Run as administrator".
3. In the installation splash screen, select "Install Application" and follow the prompts to install.
4. After installing Kor, go back to the main installer window and select "Install USB Drivers".
5. Select "Install All" and follow the prompts to install.
6. Connect the PSL to a USB Adapter or handheld.
7. Connect the USB cable to the PC. In Kor, the instrument will show up in the Instrument Connection Panel. Click "Connect".
8. Go to Instrument Connection Panel, and click "Update Device Firmware" to update the device to the latest version. If the device is up to date, a message will appear telling you so.

The USB connection provides communication and power to the ProSwap Logger. Loggers with internal battery may be charged via this connection.

NOTICE: Be sure that the software is updated to the latest version (1.0.27.3 or newer).



Section 3
Handheld Operation

This section will cover operation of the ProSwap Logger using a handheld meter. Interfacing with the ProSwap Logger can be accomplished using a ProSwap Handheld or ProDSS Handheld. These handhelds allow for users to view/record live data, view/transfer recorded data, set up the logger for unattended deployment, perform sensor calibrations, and more!

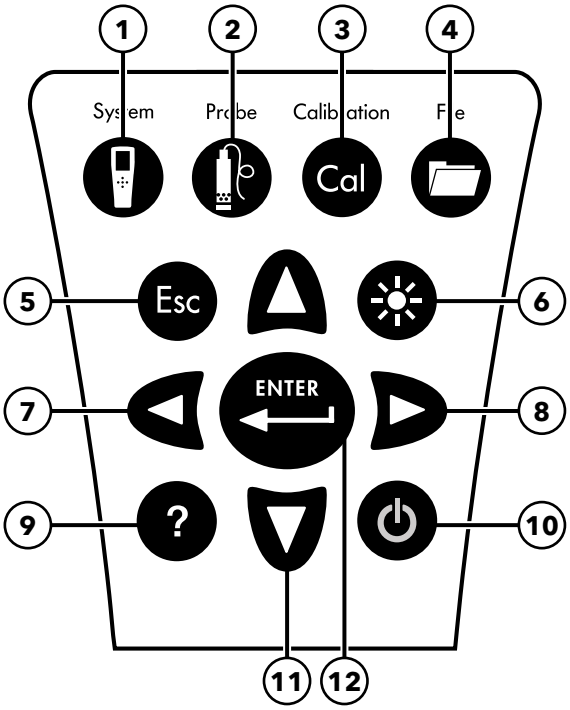
Users may consult the ProDIGITAL User Manual for additional information about the handheld meter and ProDSS Sensors. The follow text will be relevant for handheld operation when used with the ProSwap Logger.

By connecting a ProSwap Logger to the ProSwap or ProDSS Handheld, new menu options and functions are enabled that would otherwise not be available with these handhelds.

NOTICE: Be sure that the handheld is updated to the latest firmware (version 1.3.8 or newer).

3.1 Handheld Keypad

The ProSwap Handheld and ProDSS Handheld both utilize the same keypad and feature identical menu structure. The keypad allows users to interface with the instrument and navigate the menus.



1	**System:** Opens the system menu in order to adjust handheld-specific settings including date/time, language, logging (to handheld) mode, and screen brightness.	**7**	**Left Arrow:** Navigate left in an alpha/numeric entry screen. Push to return to previous menu in all screens except alpha/numeric entry. On the Run screen, push to show graphical representations of the displayed measurements.
2	**Probe:** Opens the probe menu in order to setup the sensor settings, parameter and unit preferences, sonde settings, and deployment configuration.	**8**	**Right Arrow:** Navigate right in an alpha/numeric entry screen. On the Run screen, push to show graphical representations of the displayed measurements. In the View Data screen, push to view additional parameters in the data set.
3	**Calibrate:** Opens the calibration menu in order to calibrate sensors or restore the factory default calibration.	**9**	**Help:** Shows context sensitive help.
4	**File:** Opens the file menu in order to view, delete, and backup (export) recorded data, as well as transfer (import) sonde data.	**10**	**Power On/Off:** Push to turn the handheld on and hold to turn off.
5	**Escape:** Exits to the Run screen. When in an alpha/numeric entry screen, returns to previous menu.	**11**	**Up/Down Arrow keys:** Navigates up or down in an alpha/numeric entry screen and scrolls through menus.
6	**Backlight:** Turns the keypad backlight on or off for use in low light conditions.	**12**	**Enter:** Push to confirm selections. On the Run screen, push to log a single data point or start continuous data logging.

3.2 Handheld Startup and Navigation

Startup

Push the Power On/Off (⏻) key to turn on the handheld. If the handheld does not turn on, make sure that the battery is charged. Push and hold the key for 1.5 seconds to turn the handheld off.

Navigation

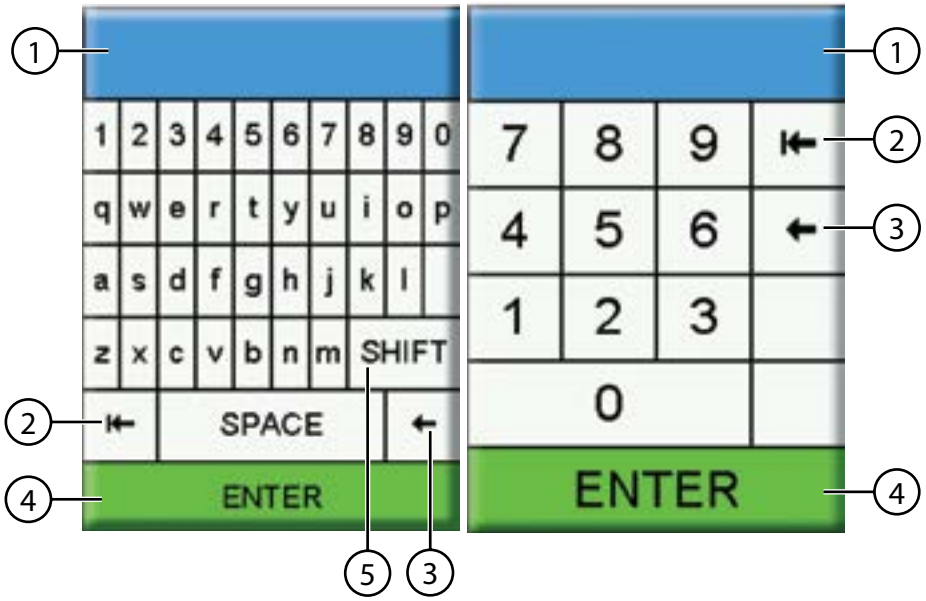
The handheld contains menus to change user-defined options, functions, and parameters. Use the Up/Down Arrow (▲ and ▼) keys to highlight different options within menus and sub-menus, then push the Enter (ENTER) key to select the option. Push the Left Arrow (◀) key to return to the previous menu.

Push the Escape (Esc) key to return to the Run screen. To enable or disable an option, highlight the option, then push the ENTER key. Enabled functions appear as a circle with a dot (◉) or a box with a check mark (☑). Disabled functions appear as a circle only (○) or an empty box (☐).

Alpha/Numeric Entry

When required, an alpha/numeric entry screen will be shown. Use the arrow keys to highlight a specific character and push the ENTER key to select it for entry. When finished entering information, highlight **ENTER**, then push the ENTER key to save the entry.

NOTE: *When in an alpha/numeric screen, the ◀ key is for alpha/numeric navigation only. Push the Esc key to cancel and return to the previous menu.*

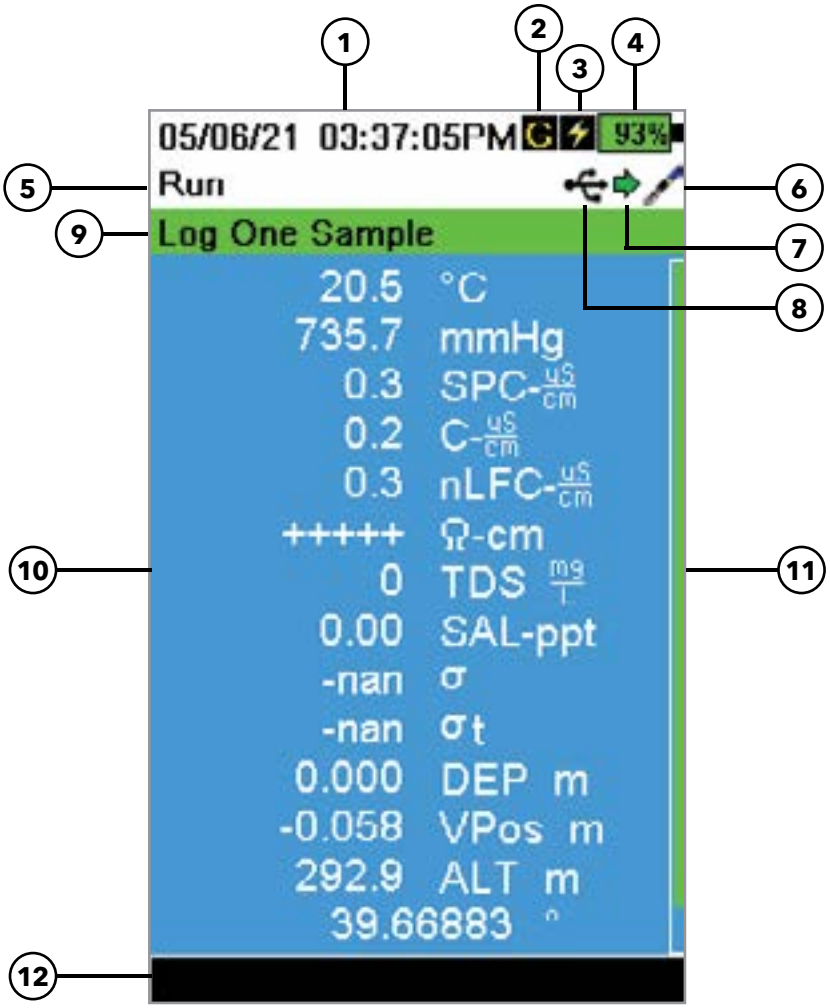


1	User entry field
2	Delete entire entry
3	Backspace
4	Enter (highlighted selection)
5	Upper/lowercase

3.3 Run Screen: Viewing Data and Taking Measurements

The main display (Run screen) shows the current measurements and units as defined in the Sensor Display menu. If more measurements are selected than can be displayed on the Run screen, a scroll bar will be shown. Use the ▲ and ▼ keys to view the additional measurements.

The message area shows status messages, error messages, and information about selected functions.



1	Date/Time	**7**	Sonde Deployed Indicator
2	GPS Signal Indicator	**8**	USB/PC Connection Indicator
3	Handheld Battery Charging Indicator	**9**	Handheld Logging Prompt (Single or Continuous)
4	Handheld Battery Charge %	**10**	Displayed Measurements
5	Current Screen/Menu	**11**	Scroll Bar
6	Sonde Connection Indicator	**12**	Message Area

Logging Measurements to the Handheld

Data logged from the Run Screen is saved to the handheld's memory and not to the sonde's memory. To log data to the sonde, you need to initiate a deployment from the Probe menu. The following instructions pertain to logging data to the handheld.

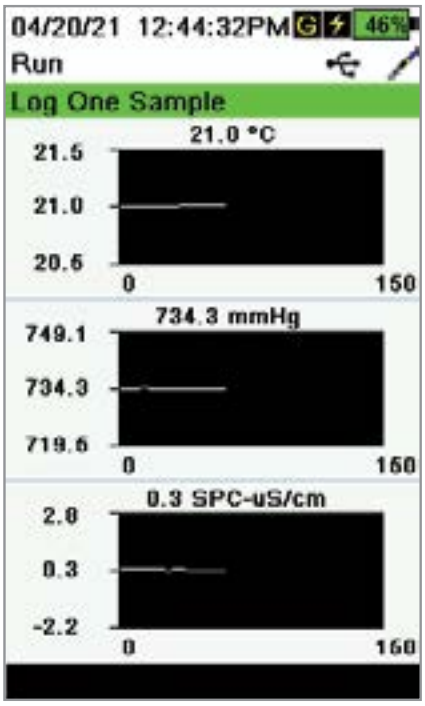
NOTE: *For the highest accuracy, calibrate the instrument before taking measurements (Calibration).*

1. Select a Site for logged data if applicable (System ⟶ Logging).
2. Set the logging method: Single or Continuous (System ⟶ Logging).
3. Set the Auto Stable parameters if applicable (Probe ⟶ Auto Stable).
4. Verify that the sensor and sensor guard are correctly installed.
5. Insert the probe into the sample.

   NOTE: *NOTE: Make sure to submerge the sensors completely.*

6. Move the bulkhead of the sonde in the sample to release any air bubbles.
7. Wait for the sensors to stabilize in the sample.
8. On the Run Screen, press the ENTER key to begin logging (single or continuous).

   NOTE: *If the Use Site List and/or Use Data ID List (System ⟶ Logging) are enabled, an option to change the Site and/or Data ID appears once the ENTER key is pressed on the Run Screen to begin logging.*



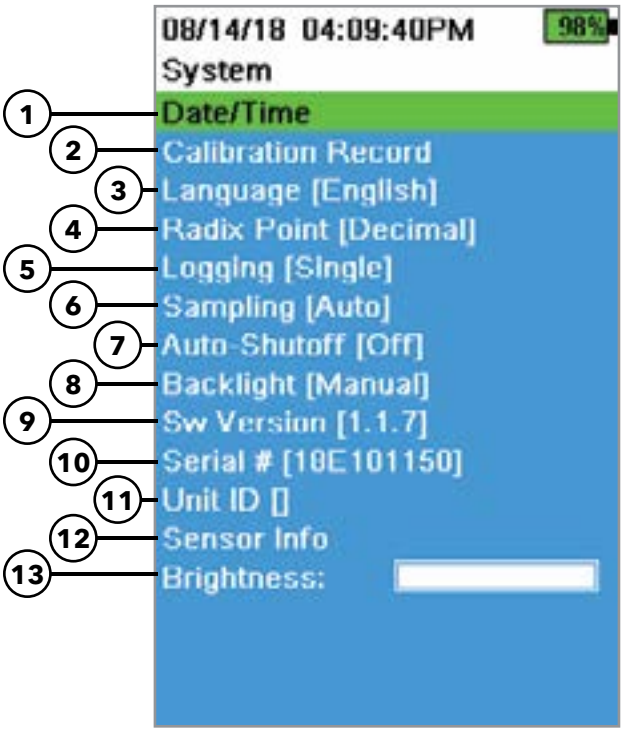
Graph View

Use the ▶ or ◀ keys to switch between the standard Run Screen and the Graph View. Graph View will display all enabled parameters in a graph format so users can view the stability of the readings.

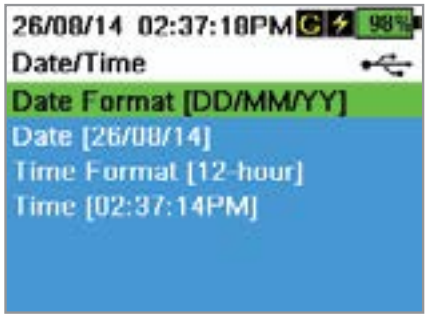
3.4 System Menu

Push the System ( ) key to view and adjust instrument settings. Highlight a sub-menu then push the ENTER key to view the sub-menu options.

Pre-defined or user-selected options are noted within brackets (**[ ]**).



1	Set the Date and Time
2	Change the user-defined Calibration Options
3	Change the instrument Language settings
4	Change the Radix Point
5	Change the Logging options
6	Change the Sampling options
7	Set the handheld Auto-Shutoff time
8	Set the Backlight mode
9	View the Software Version
10	View the handheld Serial Number
11	View and adjust the Unit ID
12	View the Sensor specific information
13	Adjust the display Brightness



Date/Time

→ **Date/Time**

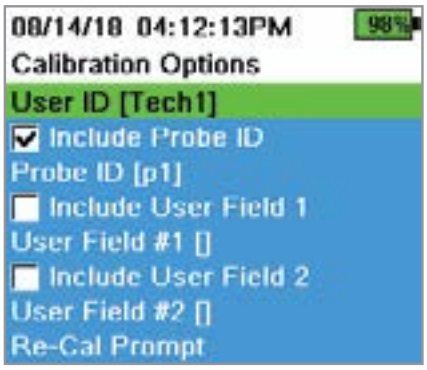
For accurate logging and calibration data, correctly set the date and time options. Select any of the following options to set the Date/Time.

Date/Time options:

- Set YY/MM/DD, MM/DD/YY, DD/MM/YY or YY/DD/MM date format
- Set the correct date
- Select 12 or 24 hour time format
- Set the correct time

Calibration Record

Detailed sensor calibration information is stored for later review. The instrument's internal memory can save up to 400 individual calibration records. After 400 records, the instrument will overwrite previously stored calibration records, starting with the oldest. To prevent the permanent loss of calibration records, periodically download the calibration files to a computer using the Kor Software.



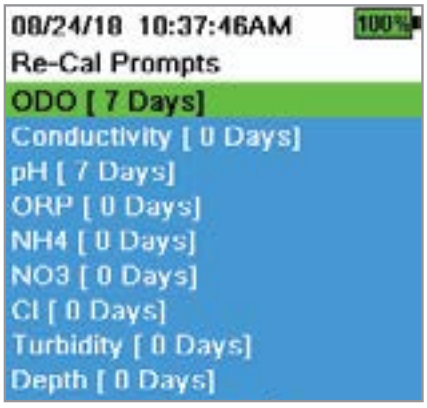
Calibration Options

→ **Calibration Record** → **Options**

User ID, Probe ID, or User Field #1 or 2 can be user-defined for positive calibration file identification of:

- The person calibrating the instrument
- The sensor/cable serial number used during calibration (or other, user-defined Probe ID)
- Other user-specific identification (User Field #1 and #2)

NOTE: *User Field can be used to describe the condition of the probe. For example, new sensor or new ODO cap.*

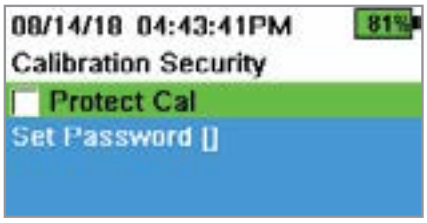


Re-Cal Prompts

→ **Calibration Record** → **Options** → **Re-Cal Prompts**

Re-Cal Prompts provide a reminder to recalibrate a probe in the user-defined number of days. Select the desired sensor Re-Cal prompt, then enter the desired number of days before the Re-Cal prompt occurs. This reminder will be provided when the instrument is powered on and will reoccur every day until the sensor is re-calibrated.

Set the sensor value to zero (0) days (default) to turn off Re-Cal prompts.



Calibration Security

→ **Calibration Record** → **Security**

The Calibration menu can be password protected to prevent accidental or unauthorized sensor calibration.

1. From the Calibration Record menu, select **Security**, then enter the default password "ysi123".
2. Select **Set Password** [ ] and change the default password.
3. Select the **Protect Cal** check box to password protect the Calibration menu.

NOTE: *Write down and keep the password in a safe place. Contact YSI Technical Support if you lose the password (Technical support).*

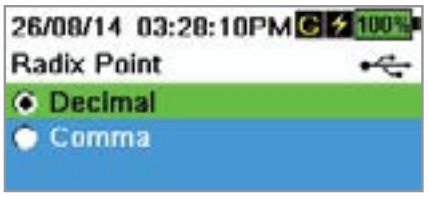
Language

→ **Language**

The instrument is shipped with English enabled. If a different language is desired and selected, the handheld will take approximately 10 to 20 seconds to enable the new language (during the first installation only).

Optional languages:

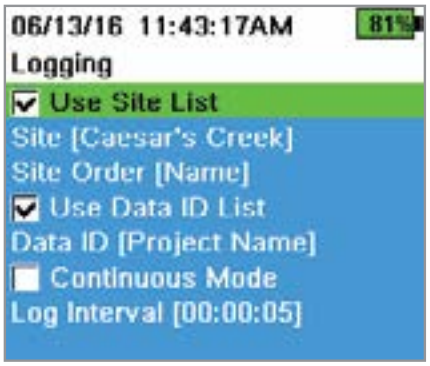
- Spanish
- French
- German
- Italian
- Portuguese
- Norwegian
- Japanese
- Simplified Chinese
- Traditional Chinese
- Korean
- Thai

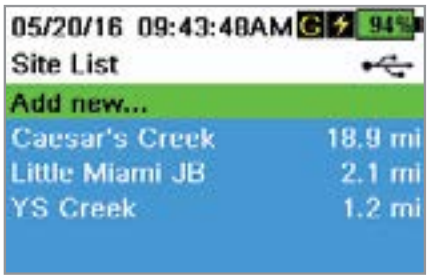


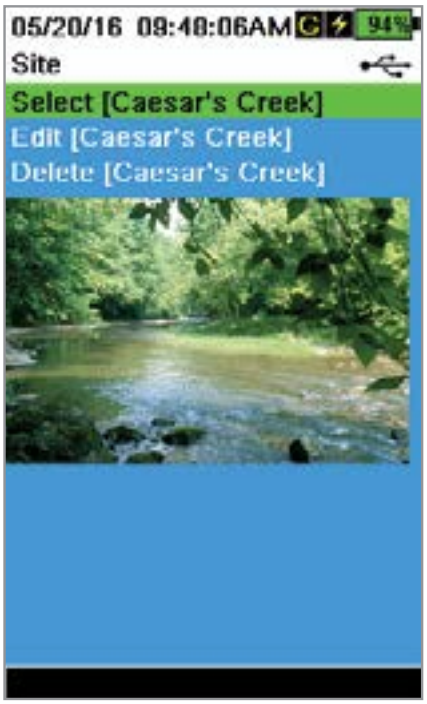
Radix Point

→ **Radix Point**

The radix point can be changed to display a comma or a decimal in numeric displays (*e.g.* 1.00 becomes 1,00 when Comma is selected).







Handheld Logging

→ **Logging**

The handheld can add a user-defined Site and/or Data ID to a data record if these functions are enabled under the Logging menu. A check mark in the box next to these features indicates they are enabled.

After selecting **Site** [ ] or **Data ID** [ ], the Site List or Data ID List will be shown. New entries can be created by choosing **Add new...** The maximum number of sites that can be stored on the handheld is 99.

If the handheld has a GPS signal, the current GPS coordinates will be auto-populated when creating a new site. If the handheld does not have a built-in GPS, the coordinates and altitude can be entered manually.

Sites can be listed in order of Name (*i.e.* alphanumeric order) or Distance from the current position.

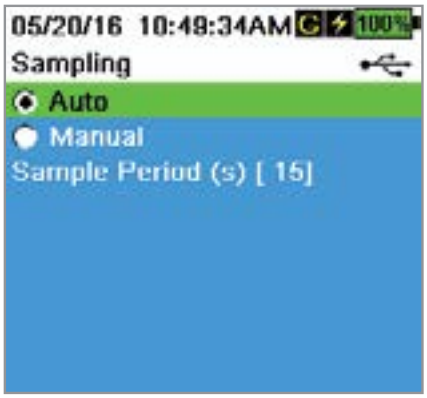
Choose an entry from the Site List or Data ID List to **Select**, **Edit**, or **Delete**. When selected, data recorded will be tagged with the specific site and/or data ID.

NOTE: *The Manage Sites menu in Kor Software can be used to send a picture of the Site to the instrument.*

Continuous Mode (Interval logging): Select the Continuous Mode check box and enter the user-defined Log Interval (in hours:minutes:seconds) to log samples continuously at the specified time interval. The Run screen will display **Start Logging...** when in Continuous Mode. Press ENTER to begin logging.

One sample logging: Clear the Continuous Mode check box. The Run screen will display **Log One Sample**. A sample will be logged each time the ENTER key is pushed when in the Run screen.

NOTE: *An option to change Site and/or Data ID (if enabled) appears once ENTER is pressed to begin logging.*



Sampling

→ **Sampling**

Auto sampling mode continuously updates measurements on the display.

When in Manual mode, the instrument will take measurements for the duration of the user-defined Sample Period (in seconds) then "lock" or hold the readings on the display. The default sample period is 50 seconds, and can be adjusted from 15 to 60 seconds. Manual mode helps conserve battery power.

Once the measurements are locked, push the ENTER key to log the held data, or the Esc key and then the ENTER key to take a new measurement.

NOTE: *When both Continuous Logging Mode and Manual Sampling mode are enabled, the handheld will power the sensors on and take measurements for 15 seconds before logging a data set.*

Auto-Shutoff

→ **Auto-Shutoff**

To conserve battery power, auto-shutoff powers off the instrument after a user-defined time period (in minutes). The auto-shutoff time can be adjusted from 1 to 255 minutes. Set to 0 (zero) to disable Auto-Shutoff.

Backlight

→ **Backlight**

In Automatic mode, the instrument display will dim 60 seconds after the last key was pushed. Once any key is pushed, the instrument display will return to the user-defined brightness setting and the keypad backlight will turn on. The screen will dim and the keypad backlight will turn off after another 60 seconds of inactivity.

In manual mode, the instrument display remains at the user-defined brightness and the keypad backlight is turned on and off by the Backlight key. Setting the backlight to manual mode is recommended for bright conditions.

Software (Sw) Version

→ **Sw Version**

Sw Version shows the instrument's software version number. The latest instrument software and update instructions are available at YSI.com. Instrument software can be updated through the Kor Software under the **Instrument and Sensors** tab.

Serial

→ **Serial #**

Serial # shows the serial number of the handheld instrument. Note the serial number when contacting YSI support.

Unit ID

→ **Unit ID**

Users can set a custom Unit ID. The Unit ID identifies the instrument in Kor Software.

Sensor Info

→ **Sensor Info**

Sensor info shows measurement data, and hardware/software information for each component of the system: instrument, sensor, and bulkhead. Use the ▲ and ▼ arrow keys to scroll through the components.

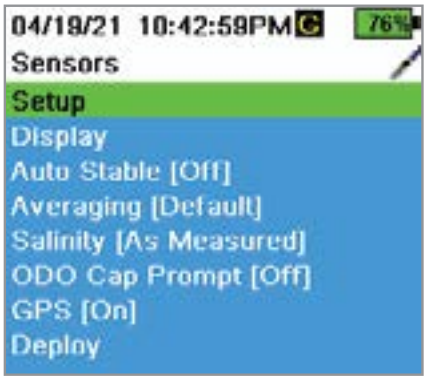
Brightness

→ **Brightness**

The screen brightness can be adjusted to accommodate lighting conditions and to conserve battery power. Use the ◀ and ▶ arrow keys to adjust the screen brightness.

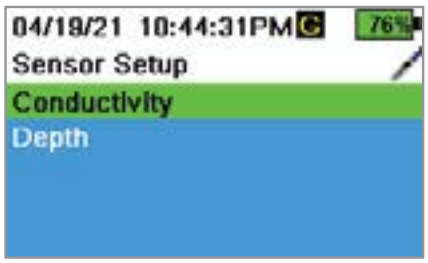
3.5 Probe Menu

Use the Probe ( ) key to access the sensor setup menu, set display parameters and unit preferences, set Auto Stable parameters, change the sensor averaging mode, turn on/off GPS (if available), and manage deployment settings.



Push the key to access the sensor menu. Highlight a sub-menu then push the ENTER key to view sub-menu options.

Pre-defined or user-selected sensor settings are noted within brackets (**[]**).



Sensor Setup

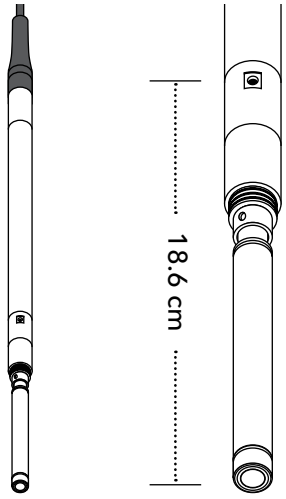
→ **Setup**

The Sensor Setup menu will show all sensors connected to the instrument. If a sensor is connected but is not listed on the Sensor Setup menu (**<None>** displayed), check the sensor and cable connections.

Setup Depth

→ **Setup** → **Depth**

Probes with a depth sensor in the bulkhead can measure virtual vented depth. The virtual vented depth measurement allows for real time compensation for atmospheric pressure using the handheld's barometer.



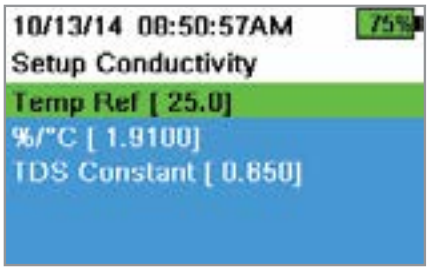
Depth offset: Depth offset can be used if referencing water elevation against a known value. If a depth offset is entered (in meters), the output value will shift by the value of the offset.

A common offset entered by the user is the depth sensor location relative to the rest of the WQ sensors. This value is 18.6 cm on the 1-port cable.

Altitude/Latitude: To compensate for atmospheric pressure based on elevation and gravitational pull, enter the local altitude in meters relative to sea level and latitude in degrees where the instrument is sampling.

Latitude effect: Varying latitudes can cause up to a 200 mm change in depth from equator to pole.

Altitude effect: A 100 m change in altitude causes a 1.08 mm of change to the depth readings.



Setup Conductivity

→ **Setup** → **Conductivity**

Temp Ref: Reference temperature is used to calculate temperature compensated specific conductance. All specific conductance values are compensated to the Temp Ref temperature. The default value is 25°C. Enter a new value between 15.00°C and 25.00°C.

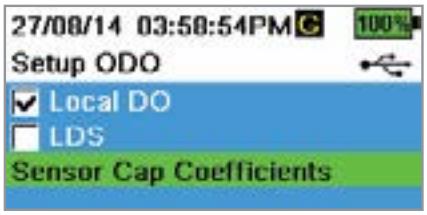
%/°C (Percent per degree Celsius): The temperature coefficient is used to calculate temperature compensated specific conductance. The default is 1.91% based on KCl standards. Enter a new value between 0 and 4%.

TDS Constant: This is a multiplier used to calculate an estimated Total Dissolved Solids (TDS) value from conductivity. The multiplier is used to convert specific conductance in mS/cm to TDS in g/L. The default value is 0.65. Enter a new value between 0 and 0.99.

The TDS multiplier is highly dependent on the nature of the ionic species present in the water sample. To be assured of moderate accuracy for the conversion, you must determine a multiplier for the water at your sampling site. Use the following procedure to determine the multiplier for a specific sample:

1. Determine the specific conductance of a water sample from the site.
2. Filter a portion of water from the site.
3. Carefully measure a volume of the filtered water. Completely evaporate to yield a dry solid.
4. Accurately weigh the remaining solid.
5. Divide the weight of the solid (in grams) by the volume of water used (in liters) to yield the TDS value in g/L for the site.
6. Divide the TDS value in g/L by the specific conductance of the water in mS/cm to yield the conversion multiplier.

NOTE: *If the nature of the ionic species at the site changes between sampling studies, the TDS values will be in error. TDS cannot be calculated accurately from specific conductance unless the make-up of the chemical species in the water remains constant.*



Setup ODO

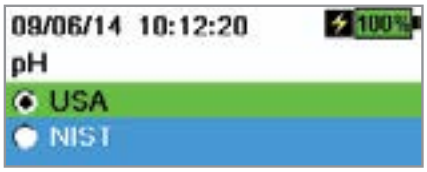
→ **Setup** → **ODO**

Local DO: Enable or disable localized DO% measurements. When enabled, the calibration value is set to 100% regardless of altitude or barometric pressure. When enabled, an L will be shown next to DO% on the run screen. DO mg/L measurements are unaffected when Local DO is enabled.

LDS: Last Digit Suppression (LDS) rounds the DO value to the nearest tenth, *e.g.* 8.27 mg/L becomes 8.3 mg/L.

Sensor Cap Coefficients: The sensor cap coefficients must be updated after sensor cap replacement. Update the sensor cap coefficients using the coefficient sheet provided with the new sensor cap. Once updated, the coefficients are saved to the ODO sensor and do not need to be re-entered.

NOTE: *The coefficients stay with the sensor even when used with different handheld meters.*



Setup pH

→ **Setup** → **pH**

Select USA auto-buffer recognition (4.00, 7.00, and 10.00) or NIST auto-buffer recognition (4.01, 6.86, and 9.18). Calibration values are automatically compensated for temperature for both buffer sets.

Setup Turbidity

→ **Setup** → **Turbidity**

TSS Coefficients: Total Suspended Solids (TSS) can be measured if correlation coefficients are calculated in Kor.

To obtain these coefficients, collect turbidity data at the sampling site with corresponding grab samples. Analyze the samples in a lab to determine a true TSS measurement (mg/L). At least 2 and up to 6 value pairs of turbidity and TSS measurements can be used.

Correlation data must be collected for each unique sampling site, as this correlation is site-specific.

In Kor Software, enter the field-obtained turbidity measurements and the corresponding lab-obtained TSS measurements in the Instrument and Sensors menu. Coefficients can then calculated with Kor Software and sent to the sensor.

NOTE: *Although correlation coefficients can be entered directly into the handheld, only Kor Software can calculate the coefficients.*

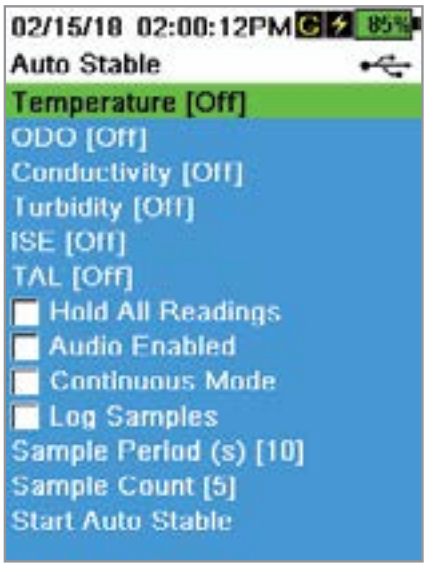
Sensor Display

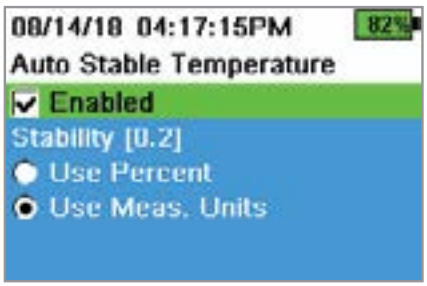
→ **Display**

The Sensor Display menu determines the parameters and units that are shown on the Run screen. The Run screen will only show measurements for sensors that are attached to the cable bulkhead.

If more measurements are selected than can be displayed on one screen, a scroll bar will be shown. Use the ▲ and ▼ keys to scroll through the measurements.

NOTE: *For depth profiling, enable Vertical Position under Depth Display to view the real-time position of the depth sensor in the water column. This is helpful in profiling applications to ensure the depth sensor is lowered to the desired depth without waiting for the depth data to stabilize.*





Auto Stable

→ **Auto Stable**

Auto Stable indicates when a measurement is stable. Sensors with Auto Stable enabled will have A S flash beside the measurement on the Run screen. A S will flash green when the measurement is stable.

Select a sensor to enable or disable Auto Stable. Then set the stability threshold parameters.

The Auto Stable stability threshold can be set by percent of measurement or in the units of measurement selected in the Sensor Display menu. Enter the stability value, then select **Use Percent** or **Use Meas. Units**.

This threshold is used to compare the last reading with the previous. The smaller the number entered in % or units, the longer it will take for the instrument to reach the auto stable criteria.

Example: For temperature in °C, if Measurement Units threshold is set to 0.2 and the temperature reading changes by more than 0.2 degrees, A S will continue to be red until the reading does not change by more than 0.2°C over the defined sample period and sample count.

Hold All Readings: After all sensors have reached their stability criteria, the measurements will be held or 'locked' on the display. If disabled, the sensor measurements will continue to change in real time.

Audio Enabled: An audio alert will sound when stability is reached.

Auto Stable *(continued)*

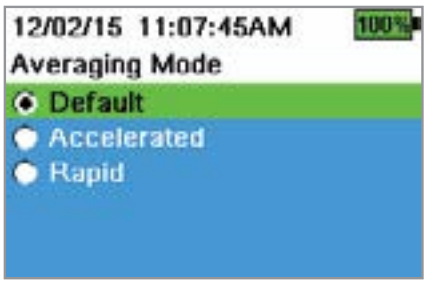
Continuous Mode: The handheld will continuously check sensor values against the stability criteria even after the sample period and sample count have been met.

Log Samples: Logs the sample/s defined by the Sample Period to memory.

Sample Period: Time interval between samples that are used to determine stability. Set the interval in seconds (1 to 900).

Sample Count: Number of consecutive samples required for stability (1 to 10).

Select Start Auto Stable to enable.



Averaging

→ **Averaging**

The averaging mode determines how the handheld will filter data. A smaller time frame for the rolling average window allows changes in the sensor's measurements to be more quickly observed, while a larger rolling window provides more stable measurement readings and a smooth result. Each averaging mode will decrease the time span of the rolling window if a large change in the sensor measurement is detected, allowing the handheld to adapt when an event occurs.

The **Default** mode provides optimum averaging for all sensors. This mode has up to 40 seconds of averaging on some sensors to curb spikes and outliers, resulting in more stable data.

In **Accelerated** mode, changes in sensor measurements are more quickly observed than default (approximately 10 seconds of averaging on some sensors). This mode is recommended when the sensors are moving through the water, such as during profiling studies and most spot sampling applications.

> ***NOTE:*** *For profiling applications, enable Vertical Position under Depth Display to view unfiltered depth measurements. This helps to ensure the depth sensor is lowered to the desired depth without waiting for the averaged measurement.*

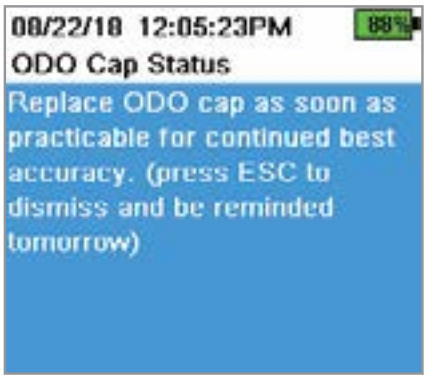
In **Rapid** mode, sensor response is very fast (approximately 2 seconds of averaging on some sensors), but the instrument will never settle on a single steady number. This mode is recommended when the sensors are moving quickly through the water, such as rapid profiling and towed applications.

Salinity

→ **Salinity**

Salinity is determined by calculations derived from the conductivity and temperature sensors.

When a conductivity sensor is installed, the instrument will automatically use the salinity measurement for DO and "As Measured" will be displayed. If no conductivity sensor is installed (*e.g.* ODO/T cable assembly used), the salinity value will be user-selectable.



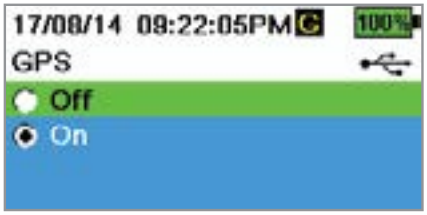
ODO Cap Prompt

→ **ODO Cap Prompt**

The handheld can remind users when it is time to replace the ODO Cap based on a user-defined interval. To set the reminder, select ODO Cap Prompt and **input a number in months**. YSI recommends enabling this setting to match the warranty period of the ODO Cap:

- ProDSS ODO Sensor Cap [SKU: 626890] = **12** months

The handheld will automatically recognize the last time the ODO Sensor Cap coefficients were updated and alert the user when the Cap is due for replacement. To disable the prompt, simply enter **0** for the number of months.



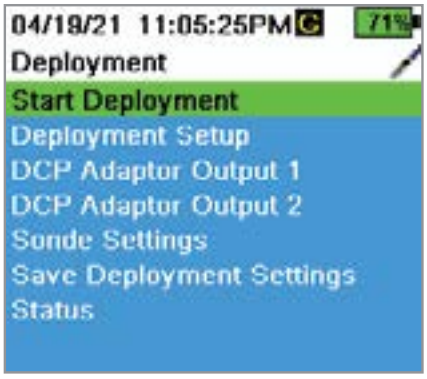
GPS (Optional)

→ **GPS**

Some handhelds feature a built-in GPS. GPS turns the handheld Global Positioning System On or Off. The G symbol is shown when a GPS signal is received.

When enabled, the GPS coordinates will be saved with the Calibration Record and logged data. Note that the battery will drain more rapidly when GPS is enabled than when it is not enabled.

NOTE: *GPS data will be most accurate when there is a clear line of sight to satellites. It may be difficult for the handheld to receive a good GPS signal when under canopy or indoors.*

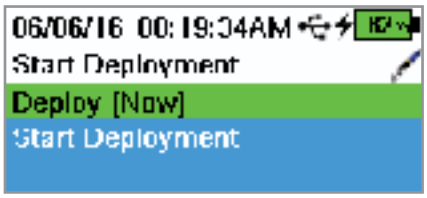


Deployment

→ **Deployment**

Use the Deployment menu to:

- Start or stop a sonde deployment
- Setup deployment options
- Setup DCP adapter outputs (for external data loggers)
- View or change sonde specific settings
- Save updated settings to sonde without starting deployment
- View current sonde configuration



Start Deployment

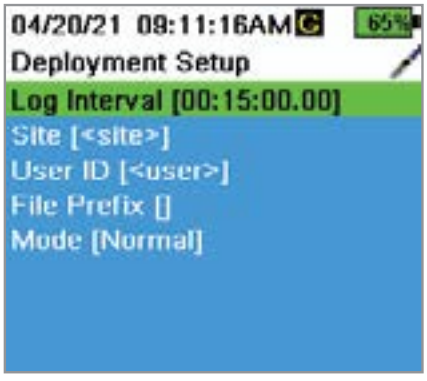
→ **Start Deployment**

Select when the sonde begins logging measurements autonomously in the Start Deployment menu.

NOTE: Prior to starting deployment, navigate to Deployment → Sonde Settings to make sure the sonde time is synced with the handheld time.

Deploy: Setup when the sonde will begin collecting data. Select **Now** to immediately begin autonomously data collection or select **Next Interval** to begin collecting data on the next logging interval. Select **Custom Time** to have the sonde begin data collection at a specified time.

Start Deployment: Select to begin collecting data with the current deployment settings. To stop deployment, return to the Deployment menu and select **Stop Deployment**.



Deployment Setup

→ **Deployment Setup**

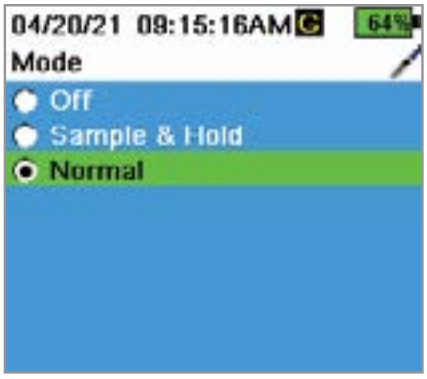
Select how the sonde collects and tags data autonomously during deployment.

Log Interval: Set the duration of time the sonde waits between logging data measurements.

Site: Set a Site name to record where the sonde was deployed while collecting data.

User ID: Enter a User ID to identify who setup the deployment.

File Prefix: Enter a custom prefix for the file name to easily identify logged data files.

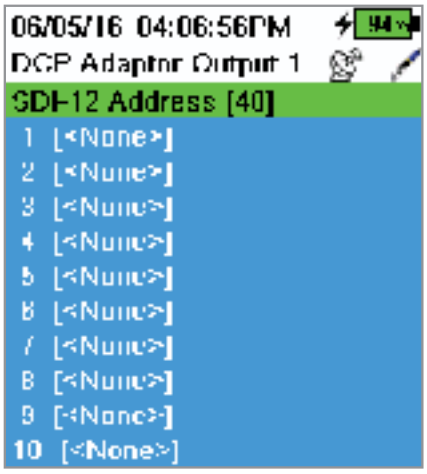


→ Deploy → Mode

This advanced menu allows users to customize how the ProSwap Logger sonde logs data.

Sample & Hold: This mode is useful for when users would like to log data to the sonde's memory and also output data via SDI-12. This mode allows the sonde to log internally at its log interval and when a data logger sends a measure command to the sonde, it will respond back with the last internally logged value instead of taking a new measurement.

Normal: The sonde will collect and average data (based on the averaging mode) into a single data point at the user-specified interval.



→ Deploy → DCP Adapter Output 1&2

The DCP (Data Collection Platform) Adapter Output menu is used to configure SDI-12 output settings for users that are connecting their ProSwap Logger to an external data logger.

> ***NOTE:*** *A Flying Lead Adapter is needed to connect the ProSwap Logger to a data logger.*

Set the address to a number (0-9) or a single letter (A-Z or a-z) so that the data logger can identify from which source the data should be pulled.

Set which parameters the data logger will record and the order in which that data is collected.

> ***NOTE:*** *The sonde and the data logger must be set with the same parameters, in the same order.*

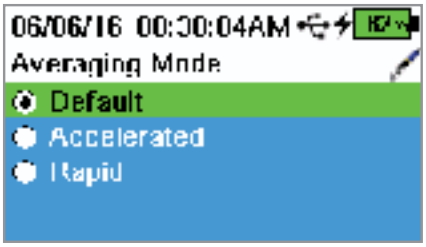
→ Deploy → Sonde Settings

View or change sonde-specific settings in the Sonde Settings menu, including the sonde date and time, and averaging mode.

Use the Sonde Settings menu to:

- View or change the Sonde ID
- Set the sonde date and time

> ***NOTE:*** *YSI recommends that users* ***Sync Time with handheld*** *prior to starting a deployment.*



→ Deploy → Sonde Settings → Averaging

Default mode provides optimum data filtering for all sensors and the highest accuracy during unattended monitoring at a fixed location. This mode has up to 40 seconds of filtering on some sensors.

NOTE: *All sensors ship in default mode.*

In **Accelerated** mode, sensors record data with a smaller rolling average window (5-10 seconds), so changes in sensor response are more quickly observed. Accelerated mode is recommended when the sensors are moving through the water (e.g. profiling studies and most spot sampling applications).

NOTE: *For depth profiling, enable Vertical Position under Depth Display to view the real-time position of the depth sensor in the water column. This is helpful in profiling applications to ensure the depth sensor is lowered to the desired depth without waiting for the depth data to stabilize.*

Rapid mode should be used when the sonde is moving quickly through the water, such as with rapid profiling and unique applications (e.g. towed applications). The data will be noisy and will never settle on a single steady number. This mode has 2-3 second filtering on sensors.

NOTE: *The averaging mode chosen within this menu will be saved to the sonde, not to the sensors or handheld.*

→ Deploy → Sonde Settings → Sync Time with Handheld

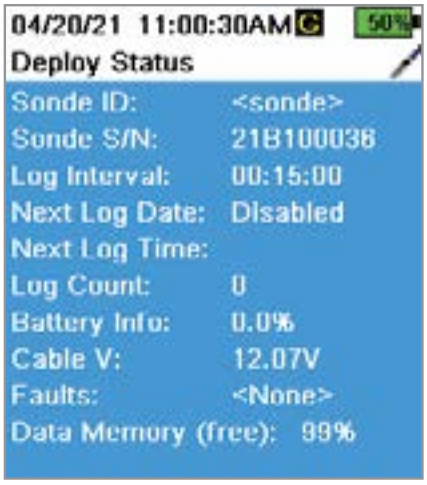
Select to sync the ProSwap Logger sonde date and time with the handheld's date and time.

NOTE: *YSI recommends keeping your handheld and sonde synchronized in order to avoid missing data.*

→ Deploy → Save Deployment Settings

Once the deployment (Setup, Output, and Sonde) settings have been configured, highlight Save Deployment Settings and press the ENTER key. This will push the deployment settings to the sonde.

NOTE: *Saving deployment settings does not start the deployment. Be sure to select Start Deployment to initiate continuous logging.*



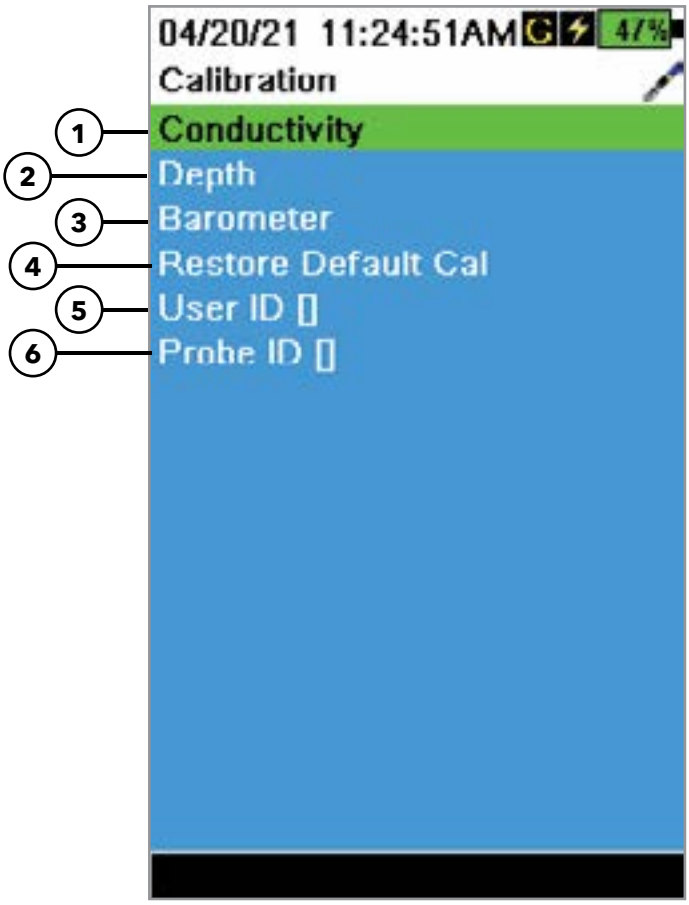
→ Deploy → Status

Select Status to view the sonde information and check if logging is enabled or disabled.

3.6 Calibration Menu

Use the Cal (Cal) key to access the Calibration menu. Highlight a sub-menu then push the ENTER key to view sub-menu options. Refer to the Calibration section for sensor specific calibration procedures.

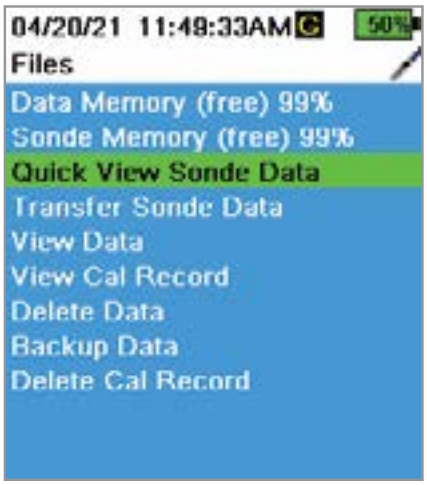
NOTE: *User ID, Probe ID, and User Field #1 and #2 can be enabled in the* ***Calibration Settings*** *under the System menu.*



1 Sensors connected	**4** Restore Default Calibration - restores specified sensor to factory default
2 Depth sensor calibration	**5** User ID
3 Barometer calibration	**6** Probe ID

3.7 File Menu

Push the File ( ) key to access the File menu. Highlight a sub-menu then push the ENTER key to view sub-menu options. Use the Files menu to:



- View available handheld memory
- View available sonde memory
- View handheld and sonde data
- Transfer data files from sonde to Handheld
- Delete data
- Backup data to USB
- View calibration records
- Delete calibration records

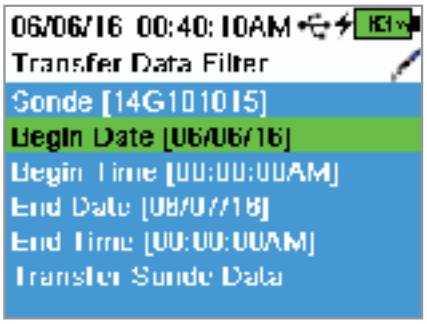
Quick View Sonde Data

→ **Quick View Sonde Data**

View logged data that has been selected in the data filter settings.

Use the ▲ and ▼ arrow keys to scroll through rows of individual data sets.
Use the ◀ and ▶ arrow keys to view additional data for each data set.

NOTE: *The maximum number of rows displayed in Quick View is 1,000.*

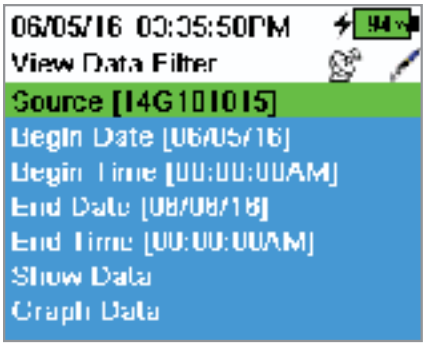


Transfer Sonde Data

→ **Transfer Sonde Data**

Data recorded via a sonde deployment is saved on the sonde's internal memory. Use the Transfer Sonde Data menu to transfer sonde data to the Handheld. Enter the desired filter criteria, then select **Transfer Sonde Data** to transfer data from the sonde.

NOTE: *Make sure the date range covers the entire deployment file. The sonde cannot transfer a partial data file to the handheld.*



View Data

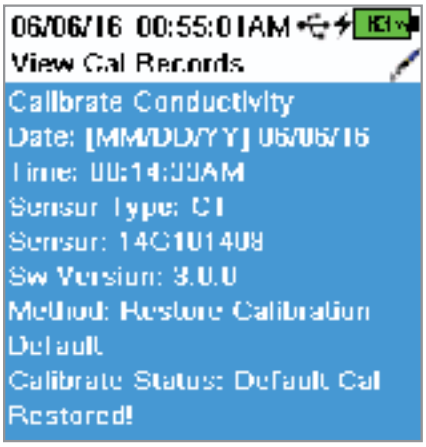
→ **View Data**

Use the View Data Filter menu to view and graph logged data over a specified time period. Enter the desired filter criteria, then select **Show Data** or **Graph Data** to view the tabular or graphical data. If necessary, use the ▲ and ▼ arrow keys to scroll through the data.

Source: View data recorded on the Handheld or sonde. Data logged using the handheld's logging function will show up under the Handheld source. Data logged by a deployed sonde and transferred to the handheld will show up under the sonde's serial number.

Site: View data from one site or all sites.

Begin/End: View data within specified date and time ranges.



View Cal Records

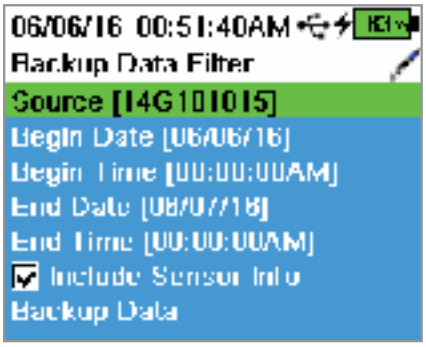
→ **View Cal Records**

Use this menu to view all calibration records stored in memory. Use the ▲ and ▼ arrow keys to scroll through different calibration records.

Calibration information includes the sensor type, the calibration date and time, and the calibration status. Records may also contain optional information, such as User ID and Sonde ID.

⚠ **WARNING:** The calibration record memory is finite and will overwrite the oldest record once the memory is full.

NOTE: *Periodically upload calibration records to a PC to retain a permanent copy.*

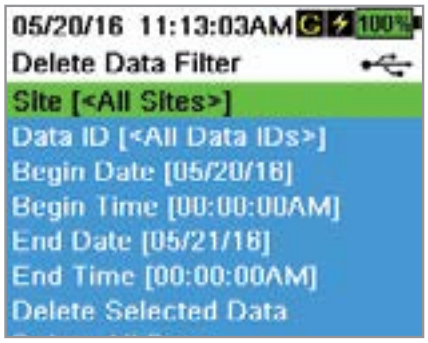


Delete Data

→ **Delete Data**

Use the Delete Data Filter menu to select specific data to be deleted from memory. Enter the desired filter criteria, then select **Delete Selected Data** to *permanently* delete the data.

Select **Delete All Data** to *permanently* delete *all* logged data from the Handheld.

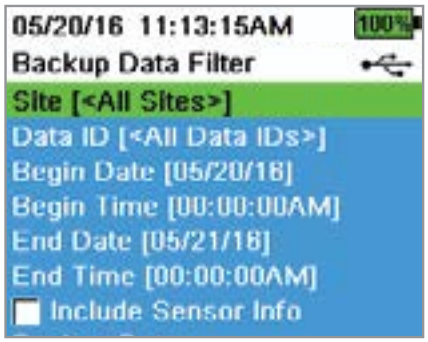


Delete Data

→ **Delete Data**

Use the Delete Data filter menu to select specific data to be deleted from memory. Enter the desired filter criteria, then select **Delete Selected Data** to *permanently* delete the data.

Select **Delete All Data** to permanently delete all logged data from the handheld.

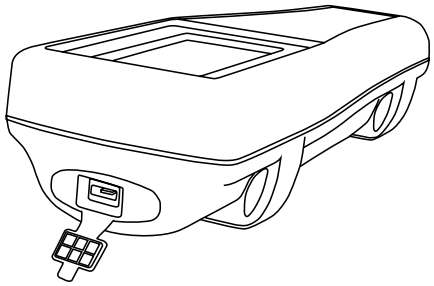


Backup Data

→ **Backup Data**

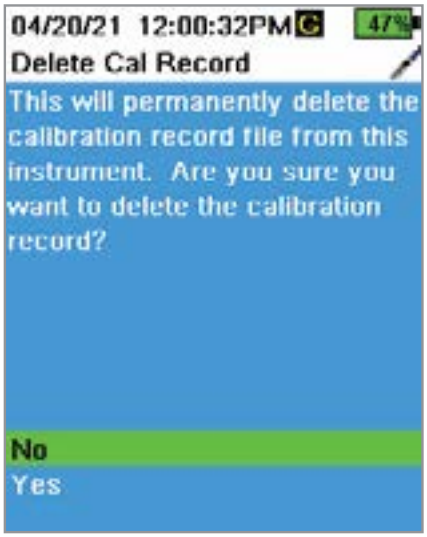
A USB female to micro USB male adapter is included with the Handheld to directly backup files from the handheld to a standard USB storage device. The data is exported as a CSV file.

Enter the desired filter criteria then connect the handheld to the USB storage device using the supplied adapter. Select **Backup Data** to export the data to an USB storage device.



NOTE: The USB storage device must be formatted as FAT32, not NTFS or exFAT. The handheld will only support FAT32.

Include Sensor Info: If this option is selected, it will include all of the sonde and sensor serial number metadata; however, data may be split into separate CSV files. If left unchecked, all the data selected will be dumped into a single CSV file.



Delete Calibration Record

→ **Delete Calibration Record**

Use this menu to delete only the Calibration Record file. Sensor calibrations and logged data will not be affected. Highlight 'Yes' or 'No' and push the ENTER key to confirm the selection.

Section 4
Sensors, Calibration, and Maintenance

This section will cover calibration of ProSwap Logger Depth and all available ProDIGITAL Sensors using a ProDIGITAL Handheld.

All ProSwap Logger and ProDIGITAL Sensors (except temperature) require periodic calibration. Calibration procedures follow the same basic steps with variations for specific parameters.

Before performing a calibration, adjust Calibration Record settings if applicable to user requirements (System → Calibration Record). Also be sure to set up sensor options, settings, and coefficients as applicable (Probe → Setup).

4.1 Calibration Setup

A 250 mL graduated cylinder is included with the ProSwap Logger for the purpose of calibrating sensors that use standard solutions.

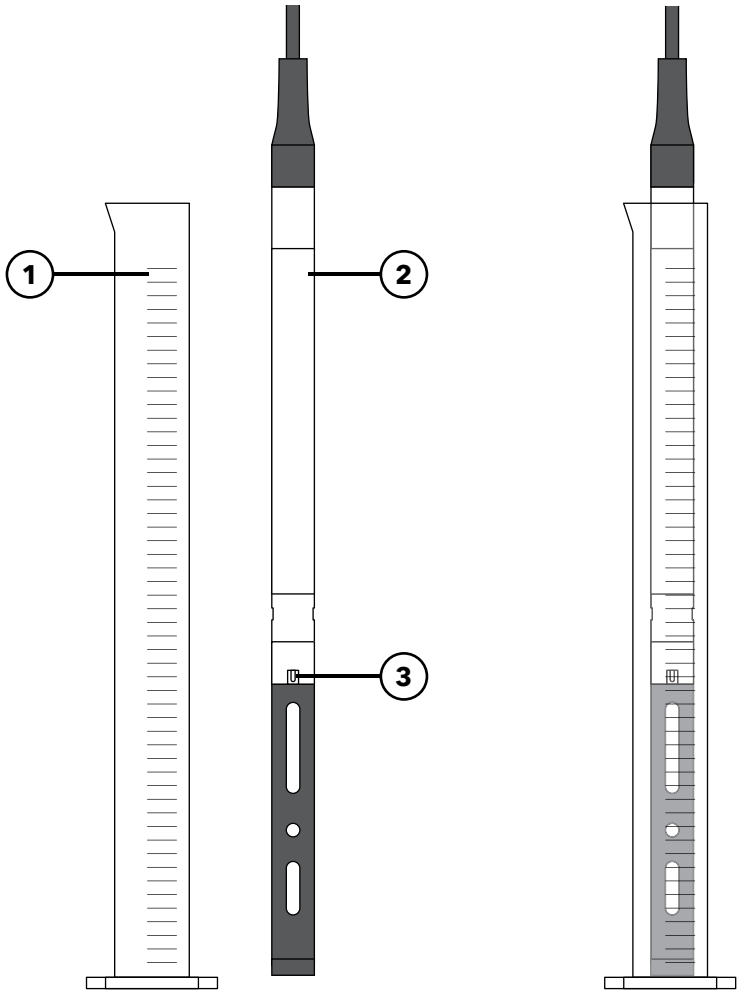
Make sure the graduated cylinder, sensor guard, and all sensors are clean. YSI strongly recommends installing the sensor guard before placing the sensors into the calibration cup.

There are two sensor guards available. The standard (shorter) guard [Item# 610173] is included with the ProSwap Logger. An extended guard [Item# 626740] is sold separately and required for use with Turbidity and Total Algae sensors.

For highest data accuracy, thoroughly rinse the graduated cylinder, guard, and sensors with a small amount of the calibration standard for the sensor to be calibrated. Discard the rinse standard, and proceed with a fresh standard.

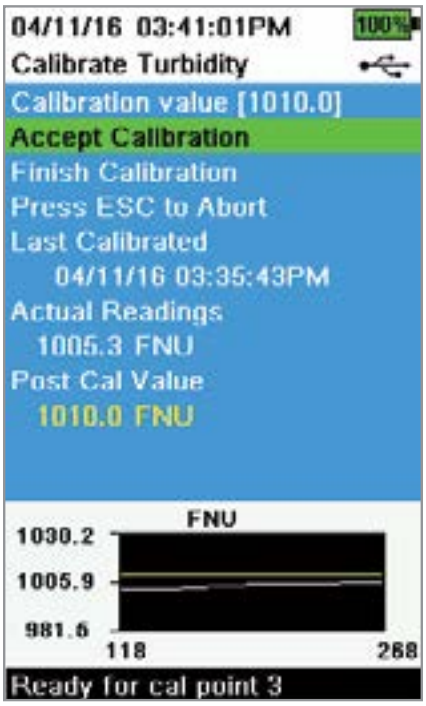
Be careful to avoid cross-contamination with other standards between calibrations by thoroughly rinsing with DI water and drying the graduated cylinder and sensors.

Please ensure the built-in thermistor is fully submerged in the calibration solution.



1	Graduated cylinder
2	ProSwap Logger
3	Thermistor

4.2 Calibration Screen



Calibration Screen Layout

The calibration screen has the same basic layout for each parameter.

Calibration value: This is the value the sensor will be calibrated to. The Yellow Line on the graph corresponds to this value.

Accept Calibration: Select this to calibrate the sensor to the calibration value.

Finish Calibration: This option is only available with multi-point calibrations (*i.e.* pH, ISE, turbidity, PC, PE, and chlorophyll). Finishes the calibration by applying previously accepted points.

Press ESC to Abort: Press the ESC key to leave the calibration. The sensor will not be calibrated to any points. The last successful calibration will be used.

Last Calibrated: View the date and time of the last successful sensor calibration.

Actual Readings: This shows the current measurement value on the Run screen. The White Line on the graph corresponds to this value. Observe the White Line to ensure the measurement is stable before choosing Accept Calibration.

Post Cal Value: This is the same as the calibration value. This will be the measurement value in the current solution after the calibration is finished.

4.3 Temperature Sensor

All ProSwap Loggers have a built-in temperature sensor on the bulkhead. Temperature compensation is critical for just about every parameter. While the temperature sensor cannot be calibrated, it is important to periodically check the sensor performance against an NIST certified thermometer.

To ensure optimal performance, it is important to keep the temperature sensor free of any deposits. Rinse the thermistor after each use. If deposits have formed, use mild soapy water and a soft bristle cleaning brush. The sensor can be stored dry.

As you perform the following sensor calibrations, if they use a liquid calibration standard, make sure the thermistor is submerge. The exception to this is the conductivity sensor, which has its own thermistor and does not rely on the ProSwap Logger temperature sensor.

4.4 Depth Sensor

All ProSwap Loggers have a built-in depth sensor. There are three depth options:

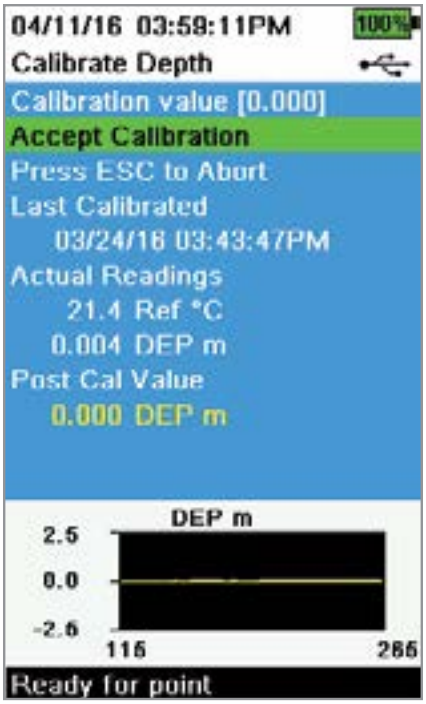
- Shallow vented (0-10 meters)
- Shallow non-vented (0-10 meters)
- Medium non-vented (0-100 meters)

Depth is calculated from the pressure exerted by the water column minus atmospheric pressure. Factors influencing depth measurement include barometric pressure, water density, and temperature. Readings from vented depth sensors are compensated for changes in barometric pressure via a vent tube that runs to the surface.

NOTE: *Water density is not factored into the depth measurement if no conductivity sensor is present.*

If applicable, enter the depth offset to set the depth measurement to something other than zero. Enter the altitude and latitude of your sampling location to increase the accuracy of your depth measurement.

NOTE: *The depth sensor is located 18.6 cm from the tip of the water quality sensor installed on the ProSwap Logger bulkhead.*

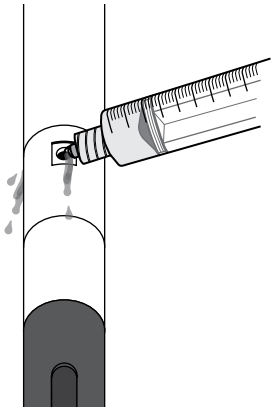


Depth Calibration

Calibration in air "zeros" the sensor with respect to the local barometric pressure. YSI recommends calibrating depth at the location of measurement. A change in barometric pressure will result in a zero shift for non-vented sensors unless the transducer is recalibrated to the new pressure.

1. Make sure that the depth sensor is clean and dry in air, not immersed in any solution. For best results, keep the bulkhead still and in one position while calibrating.
2. Push the Cal key, then select **Depth**. The **Calibration Value** is set to 0.000 and should not be changed for air calibrations, even if using an offset.
3. Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds), then select **Accept Calibration**.

If the depth offset is used, the depth measurement will be adjusted after calibration.



Depth Maintenance

The depth sensor should be flushed after each use. Fill the syringe (included with the maintenance kit) with clean water and gently push water through the ports located on the bulkhead. Flush until clean water flows from the opposite depth port.

The sensor can be stored wet or dry. For long-term storage, YSI recommends storing the sensor dry.

NOTICE: Do not insert objects into the depth ports. Damage to the depth transducer from incorrect cleaning is not covered by the warranty.

4.5 Conductivity

The conductivity/temperature sensor can measure and calculate conductivity, specific conductance (temperature compensated conductivity), salinity, non-linear function (nLF) conductivity, TDS, resistivity, and density. Calibration is only available for specific conductance, conductivity, and salinity. Calibrating one of these options automatically calibrates the other conductivity/temperature parameters listed above. For both ease of use and accuracy, YSI recommends calibrating specific conductance.

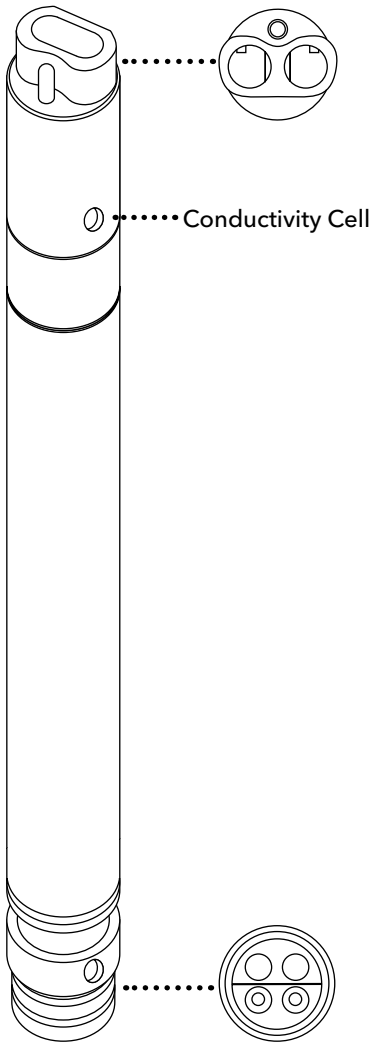
Specifications

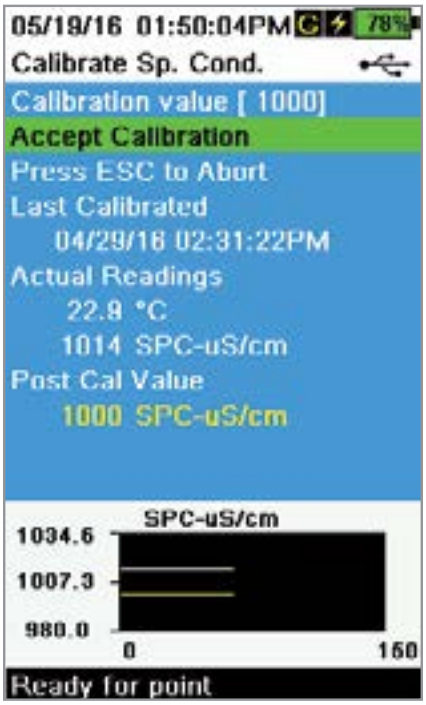
Conductivity

Default Units	microSiemens/centimeter
Temperature	
Operating	-5 to +50°C
Storage	-20 to +80°C
Range	0 to 200 mS/cm
Accuracy	0-100 mS/cm: ±0.5% of reading or 0.001 mS/cm, whichever is greater; 100-200 mS/cm: ±1% of reading
Response	T63<2 sec
Resolution	0.0001 to 0.01 mS/cm range-dependent
Sensor Type	4-electrode nickel cell

Temperature

Default Units	°Celsius
Temperature	
Operating	-5 to +50°C
Storage	-20 to +80°C
Accuracy	-5 to 50°C: ±0.25°C
Response	T63<1 sec
Resolution	0.1°C
Sensor Type	Thermistor





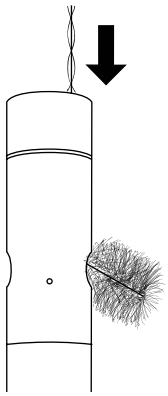
Conductivity Calibration

Select the appropriate calibration standard for the conductivity of the sampling environment. Standards at least 1 mS/cm (1000 µs/cm) are recommended for the greatest stability. For fresh water applications, calibrate to 1,000. For saltwater applications, calibrate to 50,000 µS.'

1. Make sure the conductivity sensor is clean prior to calibration. If necessary, clean the conductivity cell with the supplied soft brush.
2. Place the correct amount of conductivity standard into a clean and dry or pre-rinsed calibration cup.
3. Carefully immerse the sensor into the solution. Make sure the solution is above the vent holes on the side of the conductivity sensor.
4. Gently rotate and/or move the sensor up and down to remove any bubbles from the conductivity cell. Allow at least 40 seconds for temperature equilibration before proceeding.
5. Push the (Cal) key, select **Conductivity**, then select **Specific Conductance**.
6. Select **Calibration value** then enter the calibration value of the standard used. Note the measurement units the instrument is reporting and calibrating and be sure to enter in the correct calibration value for the units being used. For example, 10,000 µS = 10 mS. Make sure that the units are correct and match the units displayed on the handheld.
7. Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds), then select **Accept Calibration**. "Calibration successful!" will be displayed in the message area.
8. Rinse the sensor in clean water then dry.

NOTE: *If the data is not stabilized after 40 seconds, gently rotate the sensor or remove/reinstall the calibration cup to make sure that no air bubbles are in the conductivity cell.*

If you get calibration error messages, check for proper sensor immersion, verify the calibration solutions is fresh, the correct value has been entered into the handheld, and/or try cleaning the sensor.



Conductivity Sensor Maintenance

The conductivity channels should be cleaned after each use. Dip the sensor's cleaning brush (included with the maintenance kit) in clean water, insert the brush at the top of the channels, and sweep the channels 15 to 20 times.

If deposits have formed on the electrodes, use a mild solution of dish soap and water to brush the channels. For heavy deposits, soak the sensor in white vinegar, then scrub with the cleaning brush. Rinse the channels with clean water following the sweepings or soak.

The ProDSS sensor can be stored wet or dry. For long-term storage, YSI recommends storing the sensor dry.

4.6 Dissolved Oxygen

The principle of operation of the ProDSS optical dissolved oxygen sensor is based on the well-documented concept that dissolved oxygen quenches both the intensity and the lifetime of the luminescence associated with a carefully chosen chemical dye. The DO sensor operates by shining a blue light of the proper wavelength on this luminescent dye which is immobilized in a matrix and formed into a disk. The blue light causes the immobilized dye to luminesce and the lifetime of this dye luminescence is measured via a photodiode in the probe. To increase the accuracy and stability of the technique, the dye is also irradiated with red light during part of the measurement cycle to act as a reference in the determination of the luminescence lifetime.

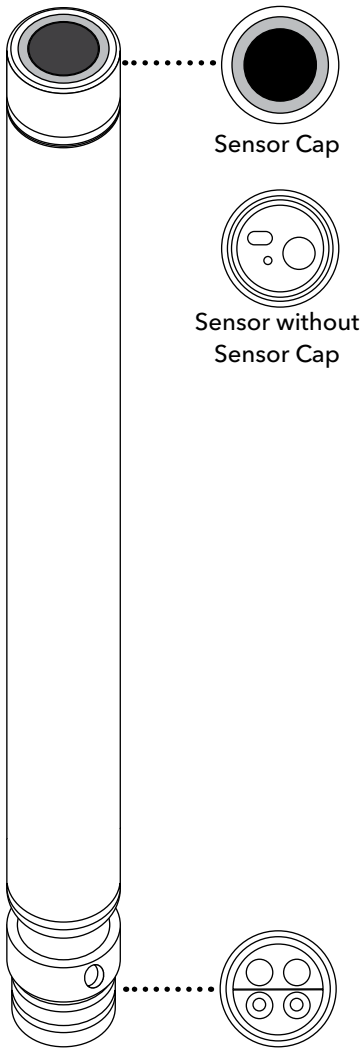
When there is no oxygen present, the lifetime of the signal is maximal; as oxygen is introduced to the membrane surface of the sensor, the lifetime becomes shorter. Thus, the lifetime of the luminescence is inversely proportional to the amount of oxygen present and the relationship between the oxygen pressure outside the sensor and the lifetime can be quantified by the Stern-Volmer equation:

((Tzero/T) – 1) versus O2 pressure

For most lifetime-based optical DO sensors, this Stern-Volmer relationship is not strictly linear (particularly at higher oxygen pressures) and the data must be processed using analysis by polynomial non-linear regression. Fortunately, the non-linearity does not change significantly with time so that, as long as each sensor is characterized with regard to its response to changing oxygen pressure, the curvature in the relationship does not affect the ability of the sensor to accurately measure oxygen for an extended period of time.

Specifications

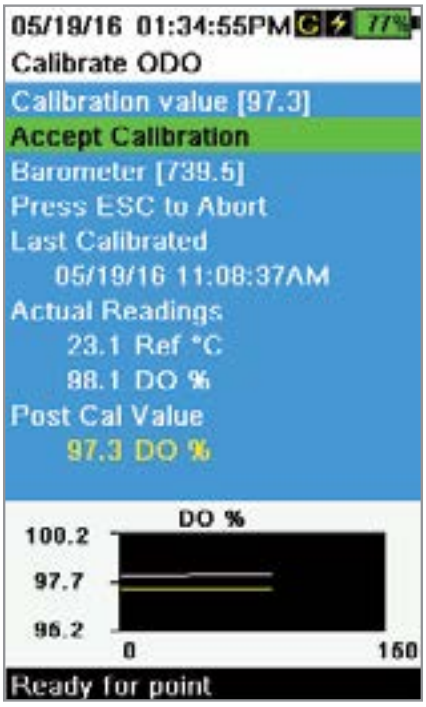
Units	% Saturation, mg/L
Temperature *Operating* *Storage*	 -5 to +50°C -20 to +80°C
Range	0 to 500% air sat. 0 to 50 mg/L
Accuracy	0-200%: ±1% reading or 1% air sat., whichever is greater; 200-500%: ±5% reading 0-20 mg/L: ±1% of reading or 0.1 mg/L; 20-50 mg/L: ±5% reading
Response	T63<5 sec
Resolution	0.1% air sat. 0.01 mg/L
Sensor Type	Optical, luminescence lifetime



Dissolved Oxygen Calibration

Optical Dissolved Oxygen (ODO) calibration requires the current "true" barometric pressure. Make sure that the barometer is reading accurately prior to ODO calibration (See 3.X Barometer).

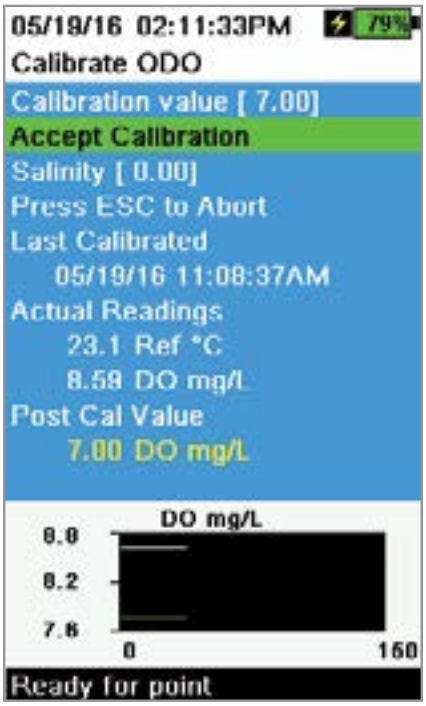
Calibrating DO% automatically calibrates the mg/L and vice versa; there is no reason to calibrate both parameters. For both ease of use and accuracy, YSI typically recommends calibrating DO%.



ODO% - Water Saturated Air Calibration

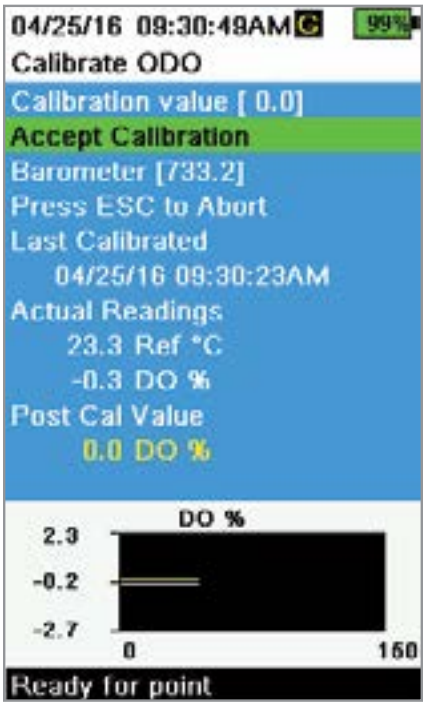
1. Place a wet sponge into the calibration sleeve.
2. Make sure there are no water droplets on the ODO sensor cap or temperature sensor.
3. Attach the probe guard and carefully slide into the calibration sleeve. Make sure a seal is not created around the probe. Atmospheric venting is required for accurate calibration.
4. Turn the instrument on and wait approximately 5 to 15 minutes for the air in the storage container to be completely saturated with water.
5. Push the Cal key, then select **ODO.** Select **DO%**.
6. Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds), then select **Accept Calibration**. "Calibration successful!" will be displayed in the message area.

NOTE: *If you see a calibration error message, verify the barometer reading and inspect the sensor cap. Clean and/or replace the sensor cap as needed.*



ODO mg/L Calibration

1. Place the ODO and conductivity/temperature sensor into a water sample that has been titrated by the Winkler method to determine the dissolved oxygen concentration in mg/L.
2. Push the Cal key, then select **ODO**. Select **DO mg/L**.
3. Select **Calibration value.**
4. Enter the dissolved oxygen concentration of the sample in mg/L.
5. Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds), then select **Accept Calibration**. "Calibration successful!" will be displayed in the message area.
6. Rinse the bulkhead and sensors in clean water then dry.

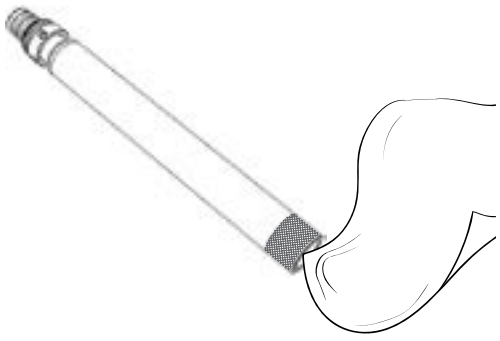


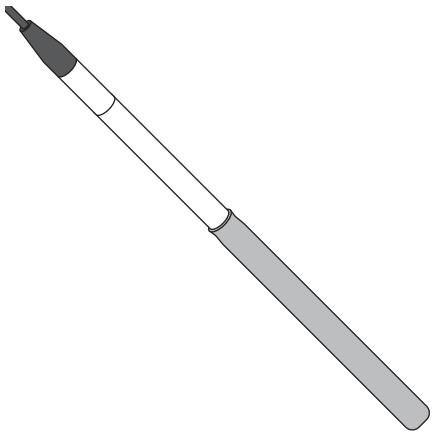
ODO Zero Point Calibration

1. Place the ODO and Temperature sensors in a solution of zero DO.

   NOTE: *A zero DO solution can be made by dissolving approximately 8-10 grams of sodium sulfite into 500 mL of tap water. Mix the solution thoroughly. It may take the solution 60 minutes to be oxygen-free.*

2. Push the (Cal) key, then select **ODO**. Select **Zero**.
3. Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds), then select **Accept Calibration**. "Calibration successful!" will be displayed in the message area.
4. Thoroughly rinse the bulkhead and sensors in clean water then dry.
5. Perform a ODO % water-saturated air calibration after performing a zero point calibration.





Dissolved Oxygen Sensor Maintenance

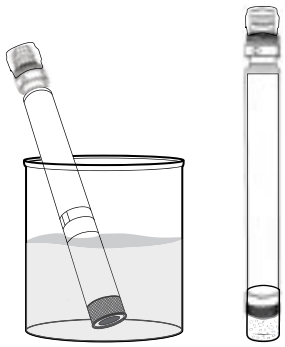
The ODO sensor should be kept clean since some types of fouling may consume oxygen which could affect the dissolved oxygen measurements.

To clean the sensor cap, gently wipe away any fouling with a lens cleaning tissue that has been moistened with water to prevent scratches. Do not clean the ODO sensor with organic solvents as they may damage the cap.

To minimize sensor drift, always store the ODO sensor in a wet or water-saturated air environment.

Short-term Storage:

Store the ODO sensor in a moist air environment. A storage sleeve with a wet sponge is recommended.

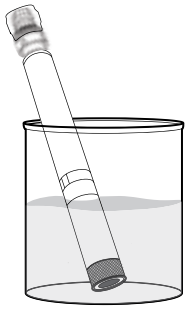


Long-term Storage:

- **Method 1:** Submerge the sensing end of the sensor in a container of distilled or deionized water. Periodically check the level of the water to make sure that it does not evaporate.

- **Method 2:** Wet the sponge located in the cap originally included with the ODO sensor, then install on sensing end of the ODO sensor. Replace the sponge if it becomes dirty.

A grey storage sleeve is shipped with the ProSwap Logger for an easy storage option. Simply moisten the sponge with a small amount of clean water and slide the sleeve over the probe guard to create a moist atmosphere for the sensor.



ODO Sensor Rehydration

If the ODO sensor has accidentally been left dry for longer than 8 hours, it must be rehydrated. To rehydrate, soak the ODO sensor in room temperature tap water for approximately 24 hours. After the soak, calibrate the sensor.

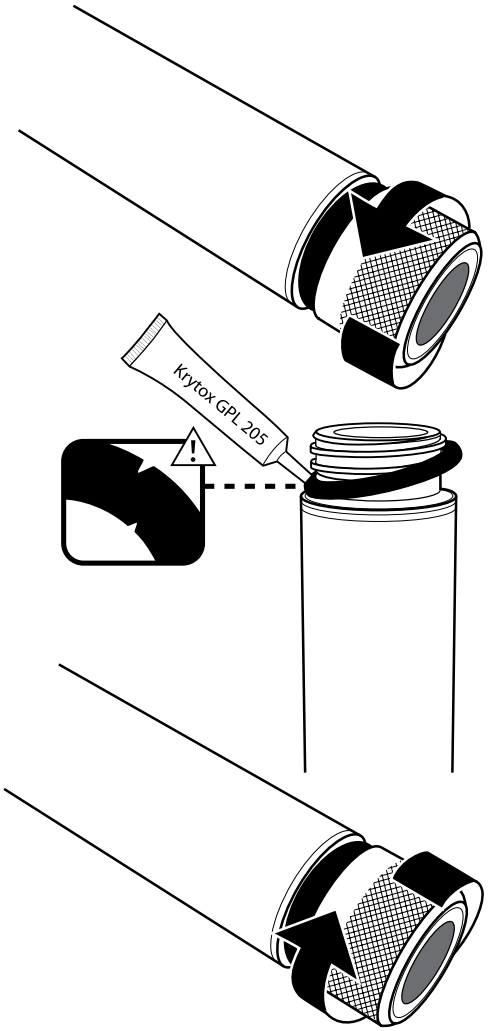
ODO Sensor Cap

Optical DO sensor caps are warrantied for 12 months:

- ProDSS ODO Sensor Cap [SKU: 626890] = **12** months

Depending on usage and storage practices, the cap may last longer than its warranty period.

As the ODO sensor caps ages, deterioration of the dye layer can reduce measurement stability and response time. Periodically inspect the sensor cap for damage and large scratches in the dye layer. Replace the cap when readings become unstable and cleaning the cap and DO recalibration do not remedy the symptoms.



ODO Sensor Cap Replacement

The instruction sheet shipped with the replacement ODO sensor cap includes the calibration coefficients specific to that sensor cap. Make sure to save the ODO sensor cap instruction sheet in case you need to reload the calibration coefficients.

1. Remove the old sensor cap assembly from the probe by grasping the probe body with one hand and rotating the sensor cap counterclockwise until it is completely free. Do not use any tools for this procedure.
2. Carefully remove the o-ring by pinching it with your fingers and rolling it up. Do not use any tools to remove the o-ring. Clean the area of any debris with a lens cleaning tissue.
3. Install the new o-ring that is included with the replacement sensor cap.
4. Apply a thin coat of o-ring lubricant (included with the new cap) to the installed o-ring. Remove any excess o-ring lubricant with a lens cleaning tissue. Be careful to avoid contact with the sensor lens.
5. Inspect the sensor lens for any moisture or debris. If necessary, wipe the lens carefully with a non-abrasive, lint-free cloth to prevent scratches. Do not use organic solvents to clean the ODO sensor lens.
6. Remove the new sensor cap from its hydrated container and dry the inside cavity of the sensor cap with lens cleaning tissue. Make sure the cavity is completely dry before proceeding with the installation.
7. Using clockwise motion, thread the new sensor cap onto the probe assembly until it is finger-tight. The o-ring should be compressed between the sensor cap and probe. Do not over-tighten the sensor cap and do not use any tools for the installation process.
8. After installing the new sensor cap, store the sensor in either water or in the water-saturated air storage chamber.

NOTE: *Be sure to update the ODO Sensor Cap Coefficients after replacement.*

Updating the ODO Sensor Cap Coefficients

After installing a new sensor cap, connect the probe to the handheld and turn the instrument on. Locate the Calibration Code Label on the ODO Sensor Cap Instruction Sheet. This contains the calibration codes for this particular sensor cap. Follow the procedures below to enter the new calibration coefficients into the instrument.

1. Push the  key to access the Sensor menu, then select **Setup**, then **ODO**.
2. Select **Sensor Cap Coefficients**.
3. Highlight each coefficient in turn (K1 through KC) and use the numeric entry screen to enter the corresponding new coefficient from the Calibration Code Label. Push the 

key after each entry and then proceed to the next K selection.
4. After all the new coefficients have been entered, select **Update Sensor Cap Coefficients**.
5. A message will appear warning that you will be overwriting the current sensor cap coefficients and you should confirm that you wish to carry out this action. Select **Yes** to confirm the new coefficients.

After updating the Coefficients, the Serial # in the Sensor Cap menu will be updated automatically based on your entries.

If errors are made in entering the Sensor Cap Coefficients, the instrument will block the update and an error message will appear on the display. If you see this error message, re-enter the coefficients and check them carefully.

NOTE: *After entering the sensor cap coefficients, the ODO sensor must be calibrated.*

4.7 pH/ORP

Users can choose between a pH sensor or a combination pH/ORP sensor to measure these parameters. pH describes the acid and base characteristics of water. A pH of 7.0 is neutral; values below 7 are acidic; values above 7 are alkaline.

The ProSwap Logger measures pH with two electrodes combined in the same probe: one for hydrogen ions and one as a reference. The sensor is a glass bulb filled with a solution of stable pH (usually 7) and the inside of the glass surface experiences constant binding of H+ ions. The outside of the bulb is exposed to the sample, where the concentration of hydrogen ions varies. The resulting differential creates a potential read by the meter versus the stable potential of the reference.

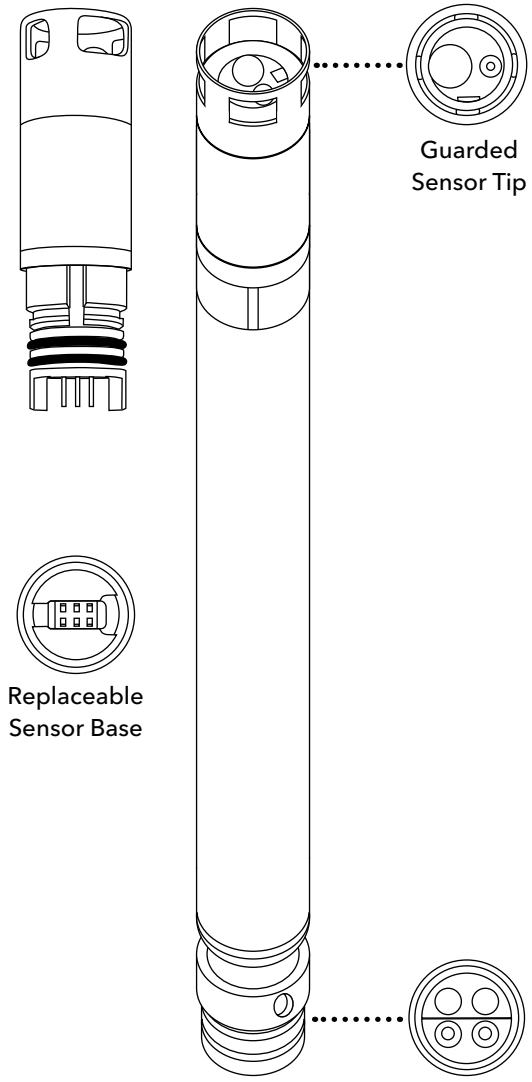
Specifications

pH

Units	pH units
Temperature *Operating* *Storage*	 -5 to +50°C 0 to 60°C
Range	0 to 14 units
Accuracy	±0.1 pH units within ±10°C of calibration temperature; ±0.2 pH units for entire temp range
Response	T63<3 sec
Resolution	0.01 units
Sensor Type	Glass combination electrode

ORP

Units	millivolts
Temperature *Operating* *Storage*	 -5 to +50°C 0 to 60°C
Range	-999 to +999 mV
Accuracy	±20 mV in Redox standard solution
Response	T63<5 sec
Resolution	0.1 mV
Sensor Type	Platinum button



ORP designates the oxidizing-reducing potential of a water sample and is useful for water which contains a high concentration of redox-active species, such as the salts of many metals and strong oxidizing (chlorine) and reducing (sulfite ion) agents. However, ORP is a non-specific measurement—the measured potential is reflective of a combination of the effects of all the dissolved species in the medium. Users should be careful not to over-interpret ORP data unless specific information about the site is known.

The ORP of the media is measured by the difference in potential between an electrode which is relatively chemically inert and a reference electrode. The ORP sensor consists of a platinum button found on the tip of the probe. The potential associated with this metal is read versus the 3.5M Ag/AgCl reference electrode of the combination sensor that utilizes gelled electrolyte. ORP values are presented in millivolts and are not compensated for temperature.

pH Calibration

Observe the pH mV readings during calibration to understand the condition and response of the pH sensor. In buffer 7, pH mVs should be between -50 and +50. In pH4 buffer, the mV reading should be 165 to 180 mV higher than the reading in pH 7 buffer. In pH 10 buffer, the mV reading should be 165 to 180 mV lower than the reading in pH 7 buffer. The theoretically ideal slope is -59 mV/pH unit.

1-Point

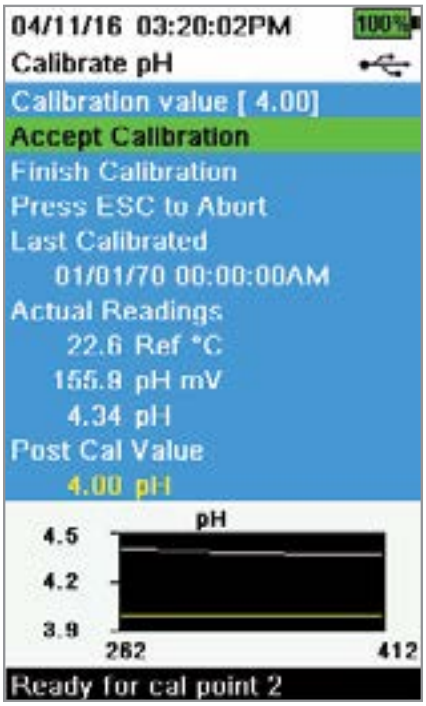
While a 1-point pH calibration is possible, this calibration procedure adjusts only the pH offset and leaves the previously determined slope unaltered. This should only be performed if you are adjusting a previous 2-point or 3-point calibration.

2-point

Perform a 2-point pH calibration if the pH of the media to be monitored is known to be either basic or acidic. In this procedure, the pH sensor is calibrated with a pH 7 buffer and a pH 10 or pH 4 buffer depending upon the pH range you anticipate for your water to be sampled.

3-point

Perform a 3-point pH calibration to assure maximum accuracy when the pH of the environmental water cannot be anticipated or fluctuates above and below pH 7. In this procedure, the pH sensor is calibrated with pH 7, pH 10, and pH 4 buffer solutions.

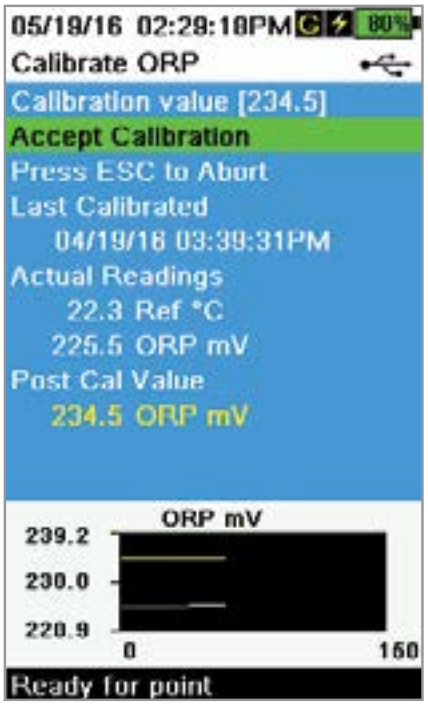


pH Calibration 3-Point

1. Always start the calibration with pH 7 buffer. Fill the graduated cylinder to the appropriate level with pH 7 buffer solution.
2. With the probe guard installed, carefully immerse the probe into the buffer solution. Make sure both the pH sensor and temperature sensor are submerged.
3. Push the (Cal) key; then select **pH** or **pH/ORP**.
4. The **Calibration value** will automatically be adjusted based on the selected buffer and temperature. Alternatively, the Calibration value can be manually entered..
5. Wait for the pH mV and temperature readings to stabilize; the white line on the graph should be flat for about 40 seconds.
6. Select **Accept Calibration** and press the (ENTER) key. "Ready for cal point 2" will be displayed in the message area.
7. Rinse the probe and calibration cup. Fill to the appropriate level with either pH 10 or pH 4 buffer solution; it doesn't matter which one comes next.
8. Immerse the probe into the buffer solution. The **Calibration value** will automatically be adjusted based on the selected buffer and temperature.
9. Wait for the pH mV and temperature readings to stabilize; the white line on the graph should be flat for about 40 seconds.
10. Select **Accept Calibration** and press the (ENTER) key. "Ready for cal point 3" will be displayed in the message area.

    NOTE: *For 2-Point calibrations, select Accept Calibration before selecting Finish Calibration.*

11. Rinse the probe and calibration cup. Fill to the appropriate level with the final buffer solution.
12. Immerse the probe into the buffer solution. The **Calibration value** will automatically be adjusted based on the selected buffer and temperature.
13. Wait for the pH mV and temperature readings to stabilize; the white line on the graph should be flat for about 40 seconds.
14. Select **Accept Calibration** and press the (ENTER) key. The procedure will automatically finish after calibrating the third point.



ORP Calibration

1. Obtain a premixed standard solution that is approved for use with Ag/AgCl ORP sensors or prepare a standard with a known oxidation reduction potential (ORP) value. Zobell solution is recommended.
2. With the probe guard installed, carefully immerse the probe into the standard solution. Make sure both the ORP sensor and temperature sensor are submerged.
3. Push the (Cal) key, then select **pH/ORP**, then **ORP**.
4. If using YSI Zobell solution, the **Calibration value** will automatically be adjusted based on the temperature. Otherwise, refer to the table included with the standard solution and enter the mV value that corresponds to the temperature of the solution.
5. Wait for the ORP mV and temperature readings to stabilize; the white line on the graph should be flat for about 40 seconds.
6. Select **Accept Calibration** and press the (ENTER) key. "Calibration successful!" will be displayed in the message area.

pH/ORP Sensor Maintenance

The pH and pH/ORP sensors are shipped with their tips in a storage bottle containing potassium chloride (KCl) solution. Keep this bottle for long-term storage.

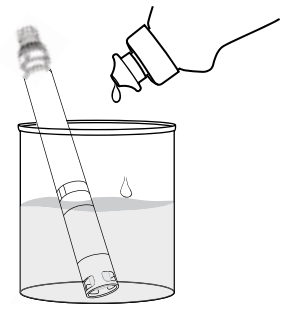
Periodic maintenance is necessary to clear contamination from the sensing elements. Contaminants on the bulb and/or junction can slow sensor response time. Clean the sensors when deposits, bio-fouling or other contamination appears on the glass or when the sensor response time is noticeably slow. There are several methods to clean and restore the sensor depending on the severity of fouling or contamination.

Cleaning Methods

Standard Rinse

Rinse the sensor with tap water each time it is brought in from the field. This is generally recommended for most sensors and use cases to clear mild contamination.

If contaminants remain or the sensor exhibits a slow response time, continue with advanced cleaning.



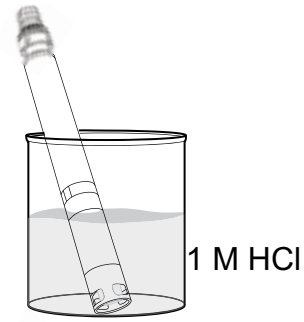
Advanced Cleaning

For moderate contamination or slow response after advanced rinsing, remove the sensor from the bulkhead and perform the following steps:

1. Remove any foreign matter from the sensor tip. If necessary, use a moistened cotton swab to carefully remove foreign material from the glass bulb and junction. Be careful to avoid direct contact with the glass bulb. The bulbs are fragile and will break if pressed with sufficient force.
2. Soak for 10 minutes in a mild solution of clean water and dish soap. Rinse the sensor with tap water and inspect.

If contaminants are removed, attach the sensor to the bulkhead and test the response time.

If contaminants remain or response time does not improve, continue to the hydrochloric acid (HCl) soak.

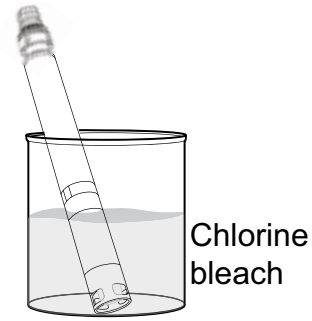


Acid Soak

For heavy contamination or slow response after advanced cleaning, remove the sensor from the bulkhead and perform the following steps:

1. Soak the sensor for 30 to 60 minutes in one molar (1 M) HCl. HCl reagent can be purchased from most chemical or laboratory distributors. To prevent injury, carefully follow the HCl manufacturer's instructions. If HCl is not available, soak in white vinegar.
2. After soaking, thoroughly rinse the sensor with tap water. Then soak the sensor in clean tap water for 60 minutes, stirring occasionally. Finally, rinse the sensor once again with tap water.

Attach the sensor to the bulkhead and test the response time. If response time does not improve or biological contamination of the reference junction is suspected, continue to the chlorine bleach soak.

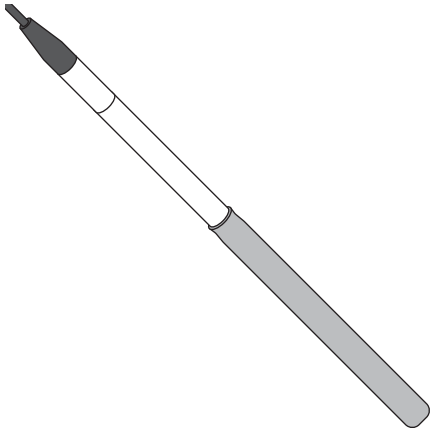


Bleach Cleanse

If biological contamination of the reference junction is suspected or if good response is not restored by the previous methods, remove the sensor from the bulkhead and perform the following steps:

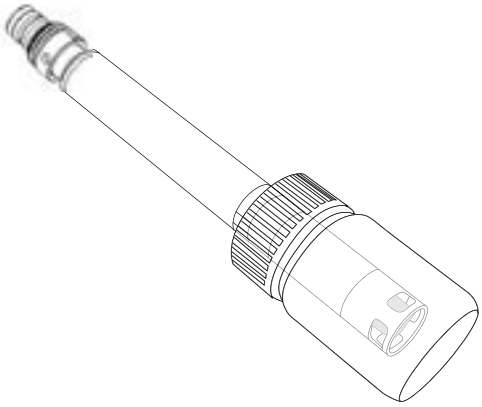
1. Soak the sensor for 60 minutes in a 1:1 dilution of chlorine bleach and tap water.
2. After soaking, thoroughly rinse the sensor with tap water. Then soak the sensor in clean tap water for 60 minutes. Finally, rinse the sensor once again with tap water.

Attach the sensor to the bulkhead and test the response time. If response time does not improve the sensor may be nearing the end of its useful life.



Short-term Storage:

When in regular field use, the pH-pH/ORP sensors should remain on the bulkhead with the calibration/storage sleeve installed. Place a small amount of tap or surface water in the cup prior to storage or transport. The probes should be kept in this water-saturated air chamber between uses; not submerged.



Long-term Storage:

Remove the sensor from the bulkhead and plug the bulkhead port. Insert the sensor tip into the storage bottle and solution that were originally supplied with the sensor. The storage bottle features an open cap and o-ring to form a tight seal around the sensor tip; the solution contains KCl with potassium phthalate and a preservative. If this original solution is not available, one can prepare a 2 M KCl solution or use pH 4 buffer as an alternative, though these solutions should be monitored for microbial growth and replaced if growth is apparent. Other sensors and system components should not be stored in or exposed to these pH buffers for long periods of time.

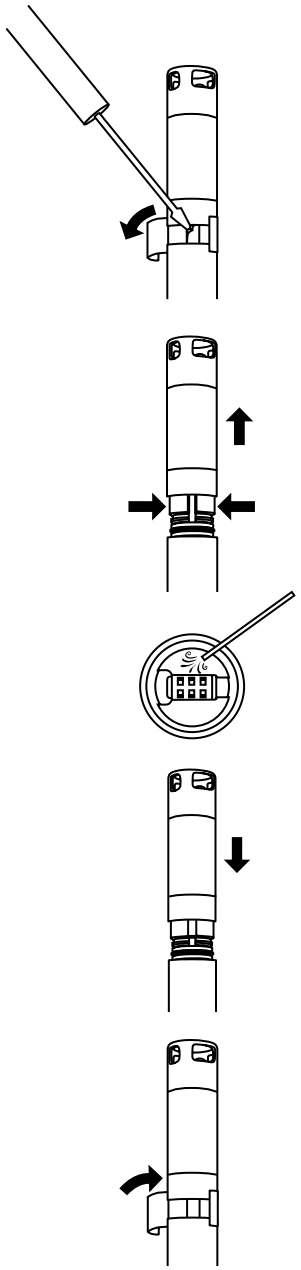
NOTICE: Do NOT let the sensor dry out. Do NOT store the sensor in distilled or deionized water. Either of these will radically shorten the lifespan of the sensor module and void its warranty.

Sensor Module

The pH and pH/ORP sensors feature user-replaceable sensor modules. These modules contain a reference solution that depletes over time. The warranty period for both of these modules is 12 months:

- Replacement pH Module [SKU: 626963] = **12** months
- Replacement pH/ORP Module [SKU: 626964] = **12** months

Depending on usage and storage practices, the module may last longer than its warranty period. Replace the module if the sensor exhibits a slow response time after trying all the cleaning methods listed above.



Module Replacement

1. Peel off and discard the sticker that covers the junction of the sensor body and the module.
2. With a small, flat-blade screwdriver, carefully remove the square rubber plug from the gap in the hard plastic ring at the base of the sensor module.
3. Using two fingers, squeeze the sensor module's hard plastic ring so that it compresses the gap left by the rubber plug.
4. While squeezing, steadily pull the sensor module straight from the sensor body, rocking slightly if necessary. Do not keep the used o-rings as they are unusable after removal from the sensor body. Discard the old sensor module.
5. Inspect the sensor connector port for debris or moisture. If detected, remove it with lint-free cloth or a light blast of compressed air.
6. The new sensor module comes with two o-rings installed and pre-lubricated. Visually inspect the o-rings for nicks, tears, contaminants or particles. Replace any damaged o-rings.

   NOTICE: If a sensor module is removed for any reason, the o-rings must be replaced.

7. Align the prongs on the base of the sensor module with the slots in the sensor body. The sensor module is keyed to insert in only one orientation. Push the sensor module firmly into position until it clicks. Wipe any excess o-ring lubricant from the assembled components.
8. Wrap the junction of the sensor module and sensor body with the new sticker included in the sensor module kit. The sticker helps keep the sensor module junction clean and retain the rubber plug throughout deployment.
9. Write the replacement date on the sticker.

NOTE: *Be sure to calibrate the sensor after module replacement.*

4.8 ISEs

Ammonium, Nitrate, & Chloride

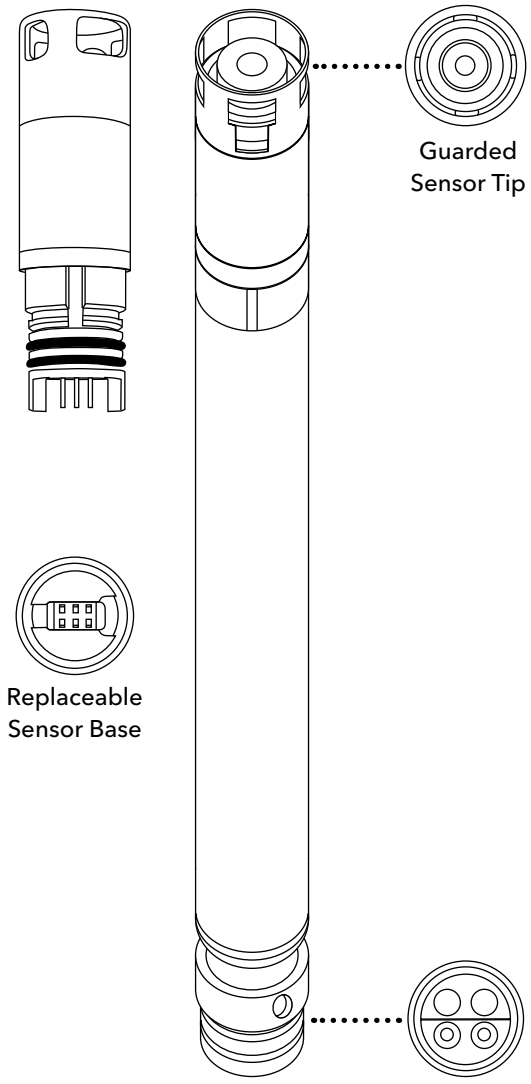
There are three ion selective electrodes (ISEs) options available for use with the ProSwap Logger:

- Ammonium
- Nitrate
- Chloride

The ammonium and nitrate sensors use a silver/silver chloride wire electrode in a custom filling solution. The internal solution is separated from the sample medium by a polymer membrane, which selectively interacts with ammonium or nitrate ions. When the sensor is immersed in water, a potential is established across the membrane that depends on the relative amounts of ions in the sample and the internal solution. This potential is read relative to the Ag/AgCl reference electrode.

The chloride sensor uses a solid-state membrane attached to a conductive wire. This sensor operates in a similar fashion to the ammonium and nitrate sensors.

For all ISEs, the linear relationship between the logarithm of the ammonium, nitrate or chloride activity and the observed voltage, as predicted by the Nernst equation, is the basis for the determination.



Specifications

Ammonium - NH_4

Units	mg/L-N, millivolts
Temperature *Operating* *Storage*	 0 to 30˚C 0 to 30°C
Depth	0 to <55 ft (0 to <17 m)
Range	0 to 200 mg/L-N
Accuracy	±10% of reading or ±2 mg/L-N, whichever is greater
Response	T63<30 sec
Resolution	0.01 mg/L
Sensor Type	Ion-selective electrode
Conductivity	<1500 µS/cm

Nitrate - NO_3

Units	mg/L-N, millivolts
Temperature *Operating* *Storage*	 0 to 30˚C 0 to 30°C
Depth	0 to <55 ft (0 to <17 m)
Range	0 to 200 mg/L-N
Accuracy	±10% of reading or ±2 mg/L-N, whichever is greater
Response	T63<30 sec
Resolution	0.01 mg/L
Sensor Type	Ion-selective electrode
Conductivity	<1500 µS/cm

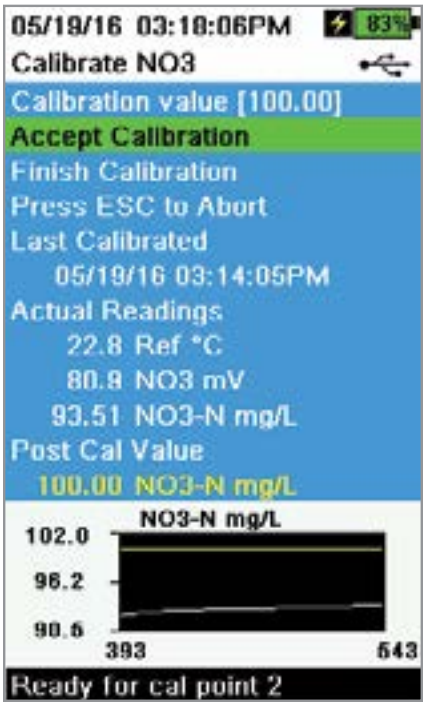
Chloride - Cl

Units	mg/L-Cl, millivolts
Temperature *Operating* *Storage*	 0 to 30˚C 0 to 30°C
Depth	0 to <55 ft (0 to <17 m)
Range	0 to 18000 mg/L-Cl
Accuracy	±15% of reading or ±5 mg/L-Cl, whichever is greater
Response	T63<30 sec
Resolution	0.01 mg/L
Sensor Type	Ion-selective electrode
Salinity	30 psu

NOTE: *Qualification testing for chloride was performed in a stirred calibration solution. Due to the solid state nature of the chloride ISE, the sensor exhibits moderate flow dependence. Mitigation can be achieved by stirring during calibration.*

ISE Precautions

- ISEs should only be used in freshwater environments only at depths of less than 17 meters and less than 25 psi.
- ISEs are intended for sampling purposes and must be calibrated frequently due to sensor drift.
- ISEs can be used in long-term deployments for qualitative trends; however, the user should be aware that drift is almost certain to occur. The extent of the drift will vary depending on the age of the probe, the flow rate at the site, and the quality of the water. Sensor data should be compared to that of grab samples throughout the monitoring period to note drift.
- The typical accuracy specification for an ISE refers to sampling applications where only minimal time has elapsed between calibration and field use.
- Users may find it useful to swap their ISE after 30 days of deployment with a freshly calibrated sensor. The calibration is retained inside the ProDSS digital smart sensor, so it can be calibrated in the lab and installed in the field.



ISE Calibration

YSI recommends a 2-point calibration for ISEs. For best results, use standards that differ by 2 orders of magnitude:

- 1 mg/L and 100 mg/L for Ammonium and Nitrate
- 10 mg/L and 1,000 mg/L for Chloride

1. Fill the graduated cylinder to the appropriate level standard for calibration point #1. Immerse the probe in the standard.
2. Push the (Cal) key, then select the applicable ISE sensor.
3. Select **Calibration value** and enter the value that corresponds to the first calibration standard.
4. Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds), then select **Accept Calibration**. "Ready for cal point 2" will be displayed in the message area.
5. Discard the used standard and rinse the probe and graduated cylinder with a small amount of the next calibration point standard. Discard the rinse standard.
6. Fill the graduated cylinder to the appropriate level with fresh standard for the second calibration point. Immerse the probe in the standard.
7. Select **Calibration value** and enter the value of the second calibration standard.
8. Observe the actual measurement readings for stability, and then select **Accept Calibration**. "Ready for cal point 3" will be displayed in the message area.
9. Select **Finish Calibration** to complete a 2-point calibration.

Optimal mV for ISE calibration

Ammonium mV values

- NH4 1 mg/L = 0 mV +/- 20 mV (new sensor only)
- NH4 100 mg/L = 90 to 130 mV greater than the mV reading in the 1 mg/L standard
- The mV span between 1 mg/L and 100 mg/L values should be approximately 90 to 130 mV. The slope should be 45 to 65 mV per decade of ammonium concentration in mg/L

Nitrate mV values

- NO3 1 mg/L = 200 mV +/- 20 mV (new sensor only)
- NO3 100 mg/L = 90 to 130 mV less than the mV reading in the 1 mg/L mV standard
- The mV span between 1 mg/L and 100 mg/L values should be approximately 90 to 130 mV. The slope should be -45 to -65 mV per decade of nitrate concentration in mg/L

Chloride mV values

- Cl 10 mg/L = 225 mV +/- 20 mV (new sensor only)
- Cl 1,000 mg/L = 80 to 130 mV < 10 mg/L mV value
- The mV span between 10 mg/L and 1000 mg/L values should be approximately 80 to 130 mV. The slope should be -40 to -65 mV per decade of chloride concentration in mg/L

Chilled Third Calibration Point

The chilled 3-point calibration is recommended if there is a large temperature variation during sampling or when the temperature of the media cannot be anticipated. The highest concentration solution and one of the lower concentration solutions should be at ambient temperature. The other lower concentration solution should be chilled to less than 10°C to prior calibration point.

1. Discard the used standard and rinse the probe and calibration cup with a small amount of the next calibration point standard. Discard the rinse standard.
2. Fill the calibration cup to the appropriate level with fresh standard for the third calibration point. Immerse the probe in the standard.
3. Select **Calibration value** and enter the value of the third calibration standard.
4. Observe the actual measurement readings for stability, and then select **Accept Calibration**. "Calibration successful!" will be displayed in the message area.

Preparing Standards

We recommend using YSI calibration solutions whenever possible. However, qualified users can follow these recipes to prepare their own standards.

⚠ **CAUTION:** Some of the chemicals required for these solutions could be hazardous under some conditions; therefore, the standards should only be prepared by qualified chemists in laboratories where proper safety precautions are possible. It is the responsibility of the user to obtain and study the MSDS for each chemical and to follow the required instructions with regard to handling and disposal of these chemicals.

Ammonium Standards

You will need:

- Solid ammonium chloride or a certified 100 mg/L NH_4^+-N from a supplier
- Lithium acetate dihydrate
- Concentrated hydrochloric acid
- High purity water
- A good quality analytical balance
- A 1000 mL volumetric flask
- Accurate volumetric measuring devices for 100 mL and 10 mL of solution
- And a 1000 mL glass or plastic storage vessels

⚠ **CAUTION:** Hydrochloric acid is highly corrosive and toxic and should therefore be handled with extreme care in a well-ventilated fume hood. The equivalent amount of a less-hazardous, more dilute sample of the acid may be used if preferred.

100 mg/L Standard

1. Accurately weigh 0.3817 g of ammonium chloride and transfer quantitatively into a 1000 mL volumetric flask. Add 2.6 g of lithium acetate dihydrate to the flask.
2. Add approximately 500 mL of distilled or deionized water to the flask. Swirl to dissolve all of the reagents and then dilute to the volumetric mark with distilled or deionized water.
3. Mix well by repeated inversion and then transfer the 100 mg/L standard to a storage bottle.
4. Add 3 drops of concentrated hydrochloric acid to the bottle, then seal and agitate to assure homogeneity. Alternatively, 100 mL of certified 100 mg/L NH_4^+-N standard can be used in place of the solid ammonium chloride.

Ammonium Standards *(continued)*

1 mg/L Standard

1. Accurately measure 10.0 mL of the above 100 mg/L standard solution into a 1000 mL volumetric flask. Add 2.6 g of lithium acetate dihydrate to the flask.
2. Add approximately 500 mL of distilled or deionized water. Swirl to dissolve the solid reagents and then dilute to the volumetric mark with water.
3. Mix well by repeated inversion and then transfer the 1 mg/L standard to a storage bottle.
4. Add 3 drops of concentrated hydrochloric acid to the bottle, then seal and agitate to assure homogeneity.

Other concentrations can be made by altering the amount of ammonium chloride. All other ingredient concentrations should remain unchanged.

Nitrate Standards

You will need:

- Solid potassium nitrate or a certified 1000 mg/l NO_3-N from a supplier
- Magnesium sulfate, high purity water
- A good quality analytical balance
- 1000 mL volumetric flask
- Accurate volumetric measuring devices for 100 mL, 10 mL and 1 mL of solution
- And 1000 mL glass or plastic storage vessels

100 mg/L standard

1. Accurately weigh 0.7222 g of anhydrous potassium nitrate and transfer quantitatively into a 1000 mL volumetric flask. Add 1.0 g of anhydrous magnesium sulfate to the flask.
2. Add approximately 500 mL of water to the flask. Swirl to dissolve all of the reagents, and then dilute to the volumetric mark with distilled or deionized water.
3. Mix well by repeated inversion and then transfer the 100 mg/L standard to a storage bottle.
4. Rinse the flask extensively with water prior to its use in the preparation of the 1 mg/l standard. Alternatively, 100 mL of certified 1000 mg/L NO_3-N standard can be used in place of the solid potassium nitrate.

1 mg/L standard

1. Accurately measure 10.0 mL of the above 100 mg/L standard solution into a 1000 mL volumetric flask. Add 1.0 g of anhydrous magnesium sulfate to the flask.
2. Add approximately 500 mL of distilled or deionized water. Swirl to dissolve the solid reagents, and then dilute to the volumetric mark with water.
3. Mix well by repeated inversion and then transfer the 1 mg/L standard to a storage bottle.

Other concentrations can be made by altering the amount of potassium nitrate. All other ingredient concentrations should remain unchanged.

Chloride Standards

You will need:

- Solid sodium chloride or a certified 1000 mg/L chloride solution from a supplier
- Magnesium sulfate
- High-purity water
- A good quality analytical balance
- 1000 mL volumetric flask
- An accurate 10 mL measuring devices
- And 1000 mL glass or plastic storage vessels

1000 mg/L Standard

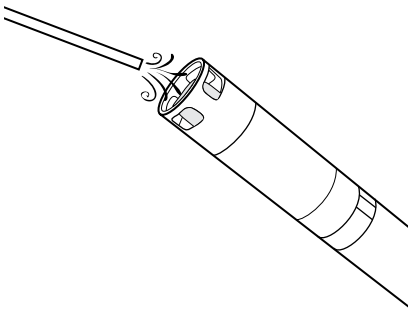
1. Accurately weigh 1.655 grams of anhydrous sodium chloride and transfer into a 1000 mL volumetric flask.
2. Add 0.5 grams of anhydrous magnesium sulfate to the flask.
3. Add 500 mL of water to the flask, swirl to dissolve all of the reagents, then dilute to the volumetric mark with water.
4. Mix well by repeated inversion, then transfer the 1000 mg/L standard to a storage bottle.
5. Rinse the flask extensively with water prior to its use in the preparation of the 10 mg/L standard. Alternatively, simply add 0.5 grams of magnesium sulfate to a liter of a 1000 mg/L chloride standard from a certified supplier.

10 mg/L Standard

1. Accurately measure 10 mL of the above 1000 mg/L standard solution into a 1000 mL volumetric flask.
2. Add 0.5 grams of anhydrous magnesium sulfate to the flask.
3. Add 500 mL of water, swirl to dissolve the solid reagents, then dilute to the volumetric mark with water.
4. Mix well by repeated inversion, then transfer the 10 mg/L standard to a storage bottle.

ISE Maintenance

ISE sensors are shipped with their tips in a dry storage bottle. Keep this bottle for long-term storage. A soak for several hours in a high concentration standard solution is necessary to rehydrate the sensor before calibration and use.

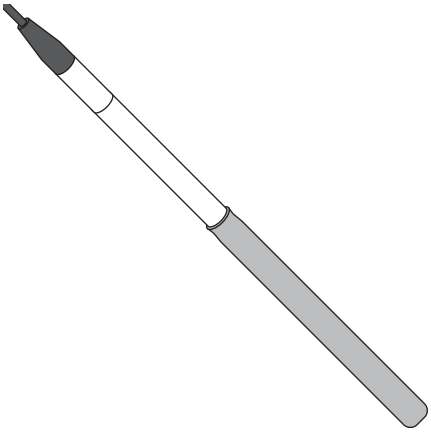


Sensor Maintenance

Ammonium or Nitrate sensor: When deposits, biofouling, or other contamination appear on the membrane, users should *gently* remove them with a fine jet of deionized water or rinsing in alcohol followed by soaking in the high standard calibration solution. Gently dab dry with a lint-free tissue.

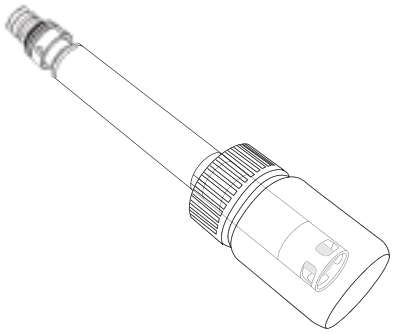
Chloride sensor: When deposits, biofouling, or other contamination appear on the membrane, users should *gently* remove them by washing with alcohol and/or gently polishing with fine emery paper in a circular motion to remove deposits or discoloration, then thoroughly washing with deionized water to remove any debris.

NOTICE: The ion-selective membranes are very fragile. Do not use coarse materials (e.g. paper towels) to clean the membranes, as these could permanently damage the sensor. The exception is fine emery paper for the chloride sensor, noted above.



Short-term Storage:

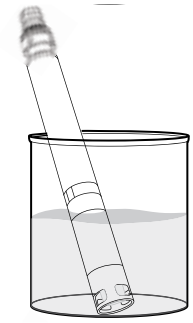
When in regular field use, the sensor should remain installed on the sonde in an environment of water-saturated air such as a storage sleeve with a wet sponge.



Long-term Storage:

Users should remove the sensors from the sonde and place them in their dry storage bottle (installed on the sensor during shipping) to protect the sensor tip.

NOTICE: Do not store the ISE sensors in any water or standard solution.



Rehydrate the Reference Junction

After an ISE sensor has been allowed to dry, soak the sensor for several hours (preferably overnight) in the sensor's high-calibration solution.

Sensor Module

Ammonium, chloride and nitrate sensors feature user-replaceable sensor modules. These modules contain a reference solution that depletes over time. The warranty period for ISE modules is 6 months:

- Replacement Nitrate Module [SKU: 626965] = **6** months
- Replacement Ammonium Module [SKU: 626966] = **6** months
- Replacement Chloride Module [SKU: 626967] = **6** months

Depending on usage and storage practices, the module may last longer than its warranty period. When it is time, perform a sensor module replacement in a clean, dry laboratory environment.

Refer to the pH Section for instructions on Sensor Module Replacement.

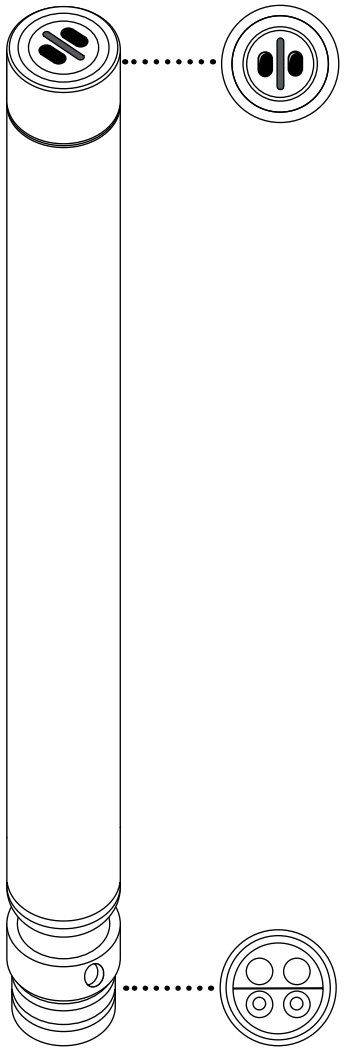
4.9 Turbidity Sensor

Turbidity is the indirect measurement of the suspended solid concentration in water and is typically determined by shining a light beam into the sample solution and then measuring the light that is scattered off of the suspended particles. Turbidity is an important water quality parameter and is a fundamental tool for monitoring environmental changes due to events like weather-induced runoff or illicit discharges. The source of the suspended solids varies (examples include silt, clay, sand, algae, and organic matter) but all particles will impact light transmittance and result in a turbidity signal.

NOTE: *The ProDSS Turbidity Sensor must be used with the Extended Sensor Guard [Item# 626740] which is sold separately.*

Specifications

Default Units	FNU
Temperature *Operating* *Storage*	 -5 to +50°C -20 to +80°C
Range	0 to 4000 FNU
Accuracy	0-999 FNU: 0.3 FNU or ±2% of reading, whichever is greater; 1000-4000 FNU: ±5% of reading[2]
Response	T63<2 sec
Resolution	0-999 FNU: 0.01 FNU 1000-4000 FNU: 0.1 FNU
Sensor Type	Optical, 90° scatter
Optics: Excitation	 860±15 nm



1 *ASTM D7315-07a "Test Method for Determination of Turbidity Above 1 Turbidity Unit (TU) in Static Mode."*

2 *Performance based on 3-point calibration done with YSI AMCO-AEPA standards of 0, 124, and 1010 FNU. The same type of standard must be used for all calibration points.*

Fouling Precaution

Turbidity measurements are vulnerable to both biofouling and non-biological fouling. This is because of the high sensitivity and resolution of measurements, which can be affected by any changes to the sensor face that light must pass through. Any obstruction of that light path will affect measurements, and even bubbles on the sensor's face can affect measurements. Low-range measurements (e.g. <100 FNU) are especially susceptible to these effects.

Without any active anti-fouling, users may find limited applications where turbidity monitoring with the ProSwap Logger can be effective. YSI recommends short-term deployments in low-fouling conditions. Even then, interference will always be a risk.

Calibration Standards

For best results, YSI recommends the following standards for turbidity calibration:

Calibration Point	Standard Value
1	0 FNU [SKU: 608000]
2	124 FNU [SKU: 607300]
3	1010 FNU [SKU: 607400]

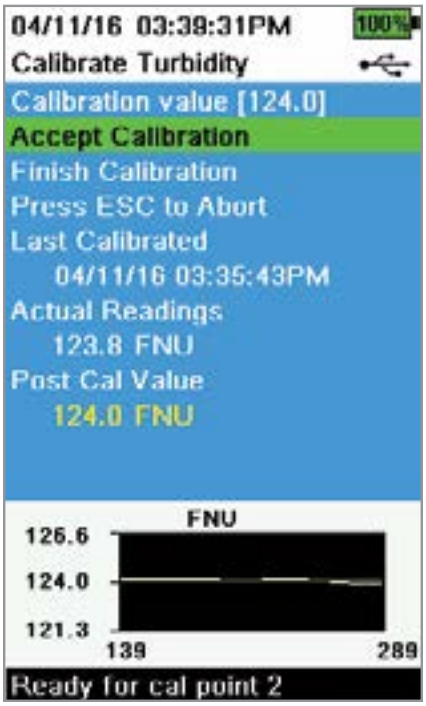
Other standards may be acceptable as long as they have been prepared according to details in Standard Methods for the Treatment of Water and Wastewater (Section 2130 B). These standards include:

- YSI Certified AMCO-AEPA polymer-based standards (see above)
- Hach StablCal™ standards in various NTU denominations
- Dilutions of 4000 NTU formazin concentrate purchased from Hach
- Other formazin standards prepared according to the Standard Methods

The use of standards other than those mentioned above will result in calibration errors and inaccurate field readings. It is important to use the same type of standard for all calibration points; do not mix formazin and polymer-based standards for different points in a multi-point calibration.

When using an alternative standard (non-YSI), calibration can be completed using the following limits; however, a green (optimal) QC Score may not be achievable.

	Min	Max	Unit
1st Calibration Point	0.0	1.0	FNU or NTU
2nd Calibration Point	5.0	200	FNU or NTU
3rd Calibration Point	400	4000	FNU or NTU



Turbidity Calibration 2-Point

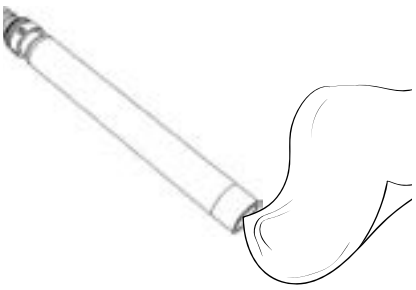
NOTE: *The ProDSS Turbidity Sensor must be used with the Extended Sensor Guard [Item# 626740] which is sold separately.*

Turbidity calibrations, more than most other parameters, are susceptible to interference from contamination. It is critical for calibrations to be performed with very clean sensors, guards, and cups.

NOTE: *Calibration standards should not be re-used.*

1. Fill the graduated cylinder to the appropriate level with 0 FNU standard (deionized water may be used as a substitute). The sensor guard must be installed to ensure an accurate calibration. Make sure the guard is installed and immerse the probe in the zero standard.
2. Push the Cal key, then select **Turbidity**.
3. Select **Calibration Value** and enter 0.00.
4. Make sure there are no air bubbles on the turbidity sensor lens. If present, lightly tap the guard against the cup to dislodge any bubbles. Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds), and then select **Accept Calibration**. "Ready for cal point 2" will be displayed in the message area.
5. Discard the used standard, and rinse the probe, guard, and graduated cylinder with a small amount of the next calibration point standard. Discard the rinse standard.
6. Fill the graduated cylinder to the appropriate level with fresh standard for the second calibration point. Immerse the probe in the standard.
7. Select **Calibration Value** and enter the value of the second calibration standard.
8. Make sure there are no air bubbles on the turbidity sensor lens. Observe the actual measurement readings for stability, and then select **Accept Calibration**. "Ready for cal point 3" will be displayed in the message area.
9. Select **Finish Calibration** to complete a 2-point calibration or continue for the 3-point calibration.

Repeat steps 5 through 8 for a 3-point calibration. "Calibration successful!" will be displayed in the message area. After calibration, rinse with water and dry the probe.



Turbidity Sensor Maintenance

Clean the sensing window with a non-abrasive, lint-free cloth. If necessary, use mild soapy water.

The sensor can be stored wet or dry. For long-term storage, YSI recommends storing the sensor dry. Install the shipping cap or sensor guard to prevent scratches or damage to the optical sensing window.

4.10 Total Algae Sensors

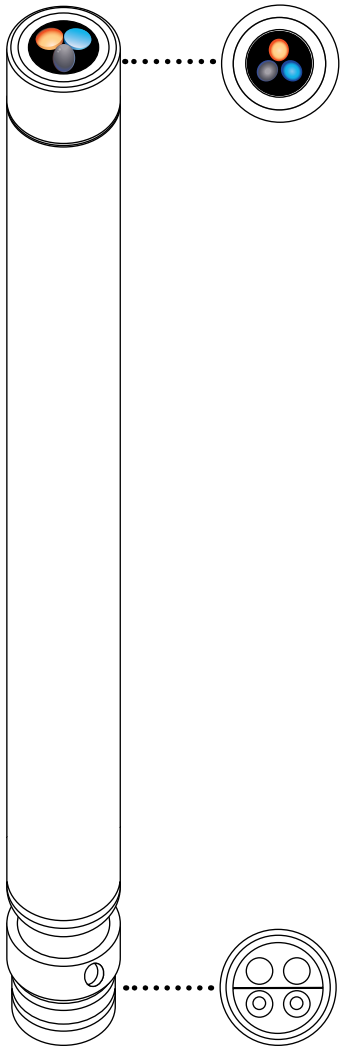
YSI offers two Total Algae (TAL) sensor options. Both are dual-channel fluorescence sensors. The channels on the TAL-PC sensor refer to two independent data sets: one results from a blue excitation beam that excites the chlorophyll a (Chl) molecule and the second results from an orange excitation beam that excites the phycocyanin (PC) accessory pigment. TAL-PC sensors are typically selected for monitoring freshwater cyanobacteria.

The TAL-PE sensor is similar in having a chlorophyll channel, but utilizes a slightly blueshifted beam that excites the pigment phycoerythrin (PE). TAL-PE sensors are typically selected for monitoring marine cyanobacteria.

NOTE: The ProDSS Total Algae Sensors (both PC & PE) must be used with the Extended Sensor Guard [Item# 626740] which is sold separately.

Specifications

Units	
Chlorophyll	RFU, µg/L Chl
PC	RFU, µg/L PC
PE	RFU, µg/L PE
Temperature	
Operating	-5 to +50°C
Storage	-20 to +80°C
Range	*Chl:* 0-100 RFU, 0-400 µg/L Chl*; *PC:* 0-100 RFU, 0-100 µg/L*; *PE:* 0-100 RFU, 0-280 µg/L*
Response	T63<2 sec
Resolution	*Chl:* 0.01 RFU, 0.01 µg/L Chl; *PC:* 0.01 RFU, 0.01 µg/L; *PE:* 0.01 RFU, 0.01 µg/L
Sensor Type	Optical, fluorescence
Linearity	*Chl:* R^2>0.999 for serial dilution of Rhodamine WT solution from 0-400 µg/L Chl equivalents *PC:* R^2>0.999 for serial dilution of Rhodamine WT solution from 0-100 µg/L PC equivalents; *PE:* R^2>0.999 for serial dilution of Rhodamine WT solution from 0-280 µg/L PE equivalents
Optics: **Chl Excitation**	470±15 nm
PC Excitation	590±15 nm
PE Excitation	525±15 nm
Emission	685±20 nm



*Pigment concentration ranges of algae sensors were determined in monocultures of specific algae species. This range will vary depending on algae assemblage and environmental conditions. The best accuracy of pigment measurements can be obtained by user-built correlations between RFU and pigment concentrations measured by an independent method, and using samples from the site or sites of interest with representative algal populations.

Fouling Precaution

Fluorescence-based measurements are vulnerable to both biofouling and non-biological fouling. This is because of the high sensitivity and resolution of measurements, which can be affected by any changes to the sensor face that light must pass through. Any obstruction of that light path will affect measurements, and even bubbles on the sensor's face can affect measurements.

Without any active anti-fouling, users may find limited applications where Total Algae monitoring with the ProSwap Logger can be effective. YSI recommends short-term deployments in low-fouling conditions. Even then, interference will always be a risk.

TAL Units

The TAL sensors report data in RFU and µg/L of pigment (Chl, PC or PE) units. YSI recommends reporting in Relative Fluorescence Units (RFU).

RFU is used to set sensor output relative to a stable secondary standard, Rhodamine WT dye. This allows users to calibrate sensors identically so that results from sensor to sensor can be compared. Calibration with Rhodamine WT also enables users to monitor for sensor drift and external factors such as biofouling or declining sensor optical performance over time as the LEDs age.

The excellent linearity of RFU, once the channels are calibrated with Rhodamine WT, translates to the best accuracy of measurements. For example, a chlorophyll reading of 100 units will represent twice the pigment detected by the sensor than with a chlorophyll reading of 50 units. This high linearity (R2>0.9999) doesn't always hold for µg/L of pigment since that unit was derived from laboratory monocultures, and an environmental algal population can behave quite differently. This is also why the TAL sensors and in situ monitoring should not be regarded as a perfect replacement for other methods such as pigment extractions and cell counting.

The µg/L output generates an estimate of pigment concentration that is based upon correlations built with sensor outputs and extractions of pigments from laboratory-grown blue-green algae. Synonymous with parts per billion (ppb), µg/L is still commonly used by regulatory agencies, but has the drawback that it is very dependent upon the composition of the algal population, the time of day, the physiological health of the algae, and a number of other environmental factors. Thus, users are advised to do their own check of our correlation with a population of algae relevant to their own sites, as described below.

A 2-point RFU calibration is advised to be performed first. Next, with samples collected from the site of interest, measure both RFU and µg/L with the sensor(s). Observing careful handling and preservation of the samples, as soon as possible extract the pigments from the samples, using standardized methods to determine the µg/L in each sample. The extraction data may be used to assess how RFU and µg/L delivered by the sensor compare with the µg/L of pigment that would be predicted by RFU from the sensor. The user's requirements can guide the decision as to whether RFU or µg/L is the best unit to read from the sensor for any specific application.

TAL Raw values can only be seen under Sensor info in the System menu and are unaffected by user calibrations. These values range from 0-100, representing the percent of full scale that the sensor detects in a sample, and are used for diagnostic purposes.

Calibration Standards

Rhodamine WT dye solution must be used when completing a 2-point calibration. Purchase Rhodamine WT as a 2.5% solution to follow the procedure below. Kingscote Chemicals (Miamisburg, OH, 1-800-394-0678) has historically had a 2.5% solution (item #106023) that works well with this procedure. Note that there are many types of Rhodamine—make sure Rhodamine **WT** is selected. If a 2.5% solution cannot be obtained commercially, prepare it from a solid or from another concentration of a liquid solution to a 2.5% final concentration, or adjust the dilutions below accordingly. It should be stored in the refrigerator when not in use.

For PC and chlorophyll channel calibrations, a 0.625 mg/L solution of Rhodamine WT should be prepared. For PE channel calibration, a 0.025 mg/L solution of Rhodamine WT should be prepared. The steps below describe one procedure to prepare these solutions.

1. *For any TAL sensor calibration, prepare a 125 mg/L solution of Rhodamine WT.* Transfer 5.0 mL of the 2.5% Rhodamine WT solution into a 1000 mL volumetric flask. Fill the flask to the volumetric mark with deionized or distilled water and mix well to produce a solution that is approximately 125 mg/L of Rhodamine WT. Transfer to a storage bottle and retain it for future use.

   *This solution can be stored in the refrigerator (4°C). Its degradation will depend upon light exposure and repeated warming cycles, but solutions used 1-2 times a year can be stored for up to two years. Users should implement their own procedures to safeguard against degradation.

2. *For PC and chlorophyll channel calibrations, prepare a 0.625 mg/L solution of Rhodamine WT.* Transfer 5.0 mL of the 125 mg/L solution prepared in step one into a 1000 mL volumetric flask. Fill the flask to the volumetric mark with deionized or distilled water. Mix well to obtain a solution that is 0.625 mg/L of Rhodamine WT. Use this solution within 24 hours of preparation and discard it after use.
3. *For PE channel calibration, prepare a 0.025 mg/L solution of Rhodamine WT.* Transfer 0.2 mL of the 125 mg/L solution prepared in step one into a 1000 mL volumetric flask. Fill the flask to the volumetric mark with deionized or distilled water. Mix well to obtain a solution that is 0.025 mg/L of Rhodamine WT. Use this solution within 24 hours of preparation and discard it after use.

In addition to preparing the Rhodamine solution(s), it is also necessary to determine temperature-compensated calibration values for solutions. In general, fluorescence is inversely related with temperature. Measure the temperature of the Rhodamine solution(s) and use the temperature of the solution at the time of calibration to select the compensated solution concentrations, in either RFU (recommended) or µg/L pigment equivalents, from the table below.

As an example, assume that you will calibrate the chlorophyll channel in RFU, and that the temperature measured in the 0.625 mg/L Rhodamine WT solution is 22°C. The first standard value entered will be 0, and the second standard value will be 16.4 (see table on following page). Likewise, if you intend to use the default µg/L unit when calibrating chlorophyll, the second standard value would be 66 in this example. Using the same 0.625 mg/L Rhodamine WT solution to calibrate the PC channel will yield a second standard value of 16.0 RFU or 16 µg/L. These values will be entered when performing a 2-point calibration.

Rhodamine WT Dye Solution Preparation *(continued)*

	Chlorophyll		Phycocyanin		Phycoerythrin	
Temp (°C)	RFU	µg/L	RFU	µg/L	RFU	µg/L
30	14.0	56.5	11.4	11.4	37.3	104.0
28	14.6	58.7	13.1	13.1	39.1	109.0
26	15.2	61.3	14.1	14.1	41.0	115.0
24	15.8	63.5	15.0	15.0	43.0	120.0
22	16.4	66	16.0	16.0	45.0	126.0
20	17.0	68.4	17.1	17.1	47.0	132.0
18	17.6	70.8	17.5	17.5	49.2	138.0
16	18.3	73.5	19.1	19.1	51.4	144.0
14	18.9	76	20.1	20.1	53.6	150.0
12	19.5	78.6	21.2	21.2	55.9	157.0
10	20.2	81.2	22.2	22.2	58.2	163.0
8	20.8	83.8	22.6	22.6	60.6	170.0

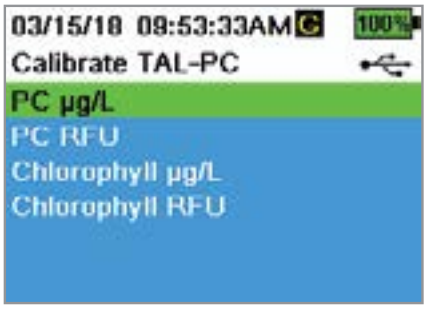
TAL Sensor Calibration

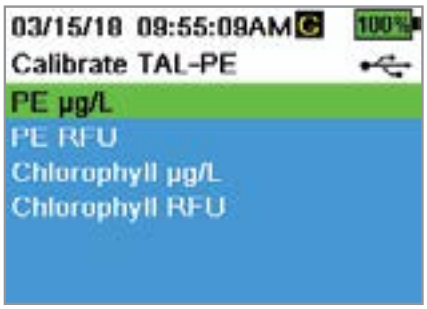
A 1- or 2-point calibration can be completed for all channels on the TAL-PC and TAL-PE sensors.

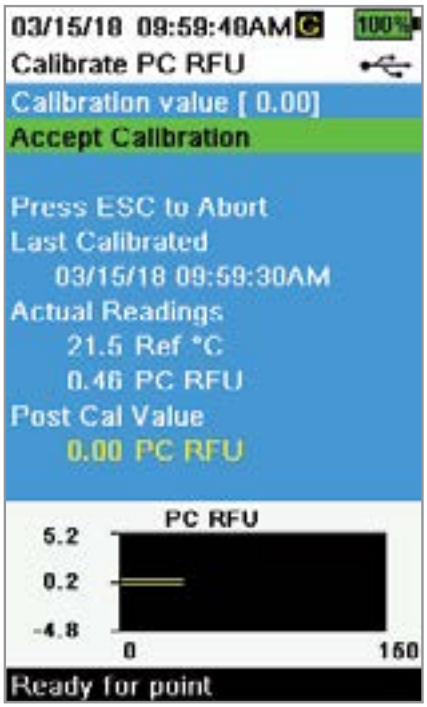
A 1-point calibration, typically completed in clear deionized or distilled water, is simply a re-zeroing of the sensor.
This calibration does not reset the second point entered during the previous 2-point calibration. The consequence is that error will be alleviated at and near zero, but more error can accumulate in the measurement the farther away from zero the measured value is. The amount of error is dependent upon how much the second point drifts, which is not always equivalent to how much the zero point drifts.

For many users, especially those with sites where pigment is rarely detected and values are at or near zero most of the time, the far-from-zero accumulation of error is a non-issue. For others, it is best to perform a 2-point calibration using a Rhodamine WT solution.

NOTE: The ProDSS Total Algae Sensors (both PC & PE) must be used with the Extended Sensor Guard [Item# 626740] which is sold separately.







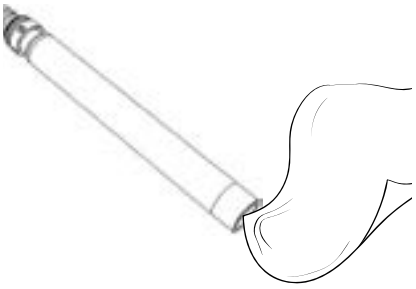
PE, PC and Chlorophyll Calibration 2-Point

Each channel of the sensor must be calibrated independently. Calibration of the chlorophyll channel does not set the calibration for the PC channel or the PE channel. In addition, calibrating in RFU for a channel does not automatically calibrate the µg/L measurement for the same channel. The following calibration procedure must be performed for each channel and each unit the user would like to display.

1. Fill the graduated cylinder to the appropriate level with deionized water (0 standard). Immerse the probe in the standard. Make sure the sensor guard is installed.
2. Push the (Cal) key, then select either **TAL-PC** or **TAL-PE**, depending on the sensor to be calibrated.
3. Select the channel and units to be calibrated. Options for the TAL-PC and the TAL-PE sensors are shown in the figures on the left.
4. Select **Calibration Value** and enter 0.00.
5. Make sure there are no air bubbles on the sensor lens. If present, lightly tap the guard against the cup to dislodge any bubbles. Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds), and then select **Accept Calibration**. "Ready for cal point 2" will be displayed in the message area.
6. Discard the used water, and rinse the probe, guard, and graduated cylinder with a small amount of the standard for calibration point #2. Discard the rinse standard.

   NOTE: *For standard #2, use the 0.625 mg/L Rhodamine WT solution when calibrating chlorophyll (RFU or µg/L) on either TAL sensor, or when completing a PC (RFU or µg/L) calibration on a TAL-PC sensor. Use the 0.025 mg/L Rhodamine WT solution when completing a PE (RFU or µg/L) calibration on a TAL-PE sensor.*

7. Fill the graduated cylinder to the appropriate level with fresh standard #2. Immerse the sensors in the second calibration standard.
8. Observe the temperature reading on the calibration display. Use the table in the Rhodamine WT dye solution preparation section to identify the appropriate value for the calibration standard.
9. Select **Calibration Value** and enter the value of the second calibration standard.
10. Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds), then select **Accept Calibration**. The procedure will automatically finish after calibrating using the second standard.



TAL Sensor Maintenance

Clean the sensing window with a non-abrasive, lint-free cloth. If necessary, use mild soapy water.

The sensor can be stored wet or dry. For long-term storage, YSI recommends storing the sensor dry. Install the shipping cap or sensor guard to prevent scratches or damage to the optical sensing window.

4.11 Barometer

The ProSwap and ProDSS handhelds have a built-in barometer. The barometer is factory calibrated and should rarely need to be recalibrated. The barometer is used for DO calibration and for virtual vented depth measurements. Verify that the barometer is accurately reading "true" barometric pressure and recalibrate as necessary.

Laboratory barometer readings are usually "true" (uncorrected) values of air pressure and can be used "as is" for barometer calibration. Weather service readings are usually not "true", *i.e.* they are corrected to sea level and cannot be used until they are "uncorrected". Use this approximate formula:

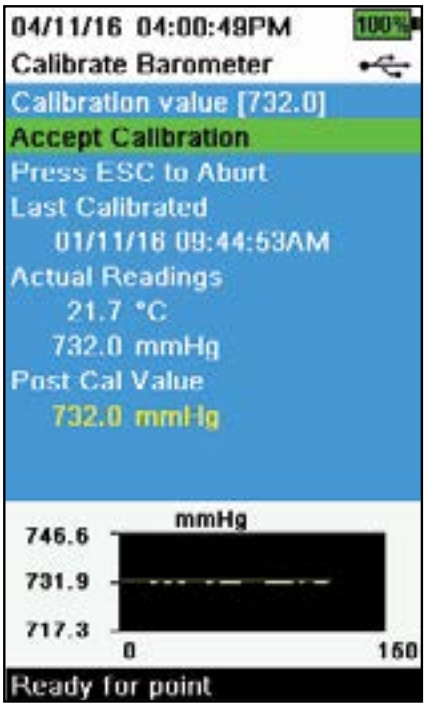
True BP in mmHg=[Corrected BP in mmHg] - [2.5* (Local altitude in ft. above sea level/100)]

Example:

Corrected BP = 759 mmHg

Local altitude above sea level = 978 ft

True BP = 759 mmHg - [2.5*(978ft/100)] = 734.55 mmHg



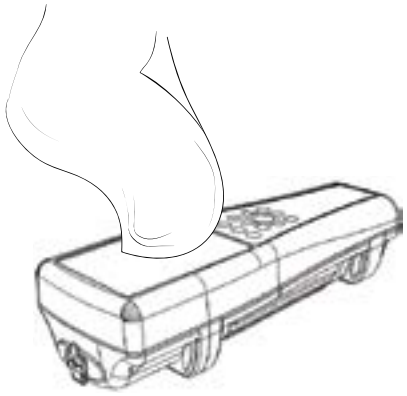
Barometer Calibration

1. Push the Cal key, then select **Barometer**.
2. Select **Calibration value** then enter the correct "true" barometric pressure.

   NOTE: *The measurement units during calibration are dictated by what is enabled in the sensor setup menu. Be sure to enter in the correct units.*

- BP in mmHg=25.4 x BP inHg
- BP in mmHg=0.750062 x BP mb
- BP in mmHg=51.7149 x BP psi
- BP in mmHg=7.50062 x BP kPa
- BP in mmHg=760 x BP atm

3. Select **Accept Calibration**. "Calibration successful!" will be displayed in the message area.



Handheld Maintenance

Wipe the keypad, screen, and case with a cloth dampened with a mild solution of clean water and dish soap. Optimal storage temperature of the handheld instrument is 0-45°C. The battery pack permanently loses capacity at a faster rate when above 45°C.

Short-term Storage:

Assure that the handheld instrument is powered off, and store it in a temperature-controlled, secure location. Ideally all ports should be covered to prevent dust, water, or other contamination.

Long-term Storage:

In addition to the short-term storage guidelines above, remove the battery pack to prevent any damage from possible battery leaks. Reinstall the battery cover. Store the battery pack in a dry place ideally around 25°C.

Section 5
Kor Software

Kor Software allows users to interface with the ProSwap Logger directly with their PC. Kor enables users to view/record live data, view/transfer recorded data, calibrate sensors, set up the logger for deployment and more!

Kor Software and drivers require permissions for successful installation. Administrative privileges may be necessary for a business or networked PC. Contact your organization's IT department for admin privileges.

5.1 System Requirements

System Requirements

Supported 32 bit (x86) and 64 bit (x64) Microsoft Operating Systems:

- Microsoft Windows 7 Home Basic SP1
- Microsoft Windows 7 Home Premium SP1
- Microsoft Windows 7 Professional SP1
- Microsoft Windows 7 Enterprise SP1
- Microsoft Windows 7 Ultimate SP1
- Microsoft Windows 8 Home Basic
- Microsoft Windows 8 Home Premium
- Microsoft Windows 8 Professional
- Microsoft Windows 8 Enterprise
- Microsoft Windows 8.1 Basic
- Microsoft Windows 8.1 Professional
- Microsoft Windows 8.1 Enterprise
- Microsoft Windows 10 Home
- Microsoft Windows 10 Professional
- Microsoft Windows 10 Enterprise
- Microsoft Windows 10 Education

Ram Memory Requirement:

- Minimum of 2 GB of RAM installed

Hard Disk Free Space:

- Minimum of 500 MB of free hard drive space

Internet Access Required to Support:

- Software and device updates, software licensing

5.2 Installing the Driver and Software

Follow these steps to complete the installation process and establish connection:

NOTE: *Be sure to install the driver **before** connecting to your PC for the first time.*

1. Insert the supplied USB flash drive into a USB port on your computer.
2. Depending on the PC operating system and system settings, the Kor Installer may appear. If it does not appear, open the flash drive in Windows Explorer, right click on **Start.exe** and select "Run as administrator" to start the installer.
3. On the Kor Installer, click **Install Driver**. Then choose to Install the driver on the screens that follow.
4. After the driver has installed, choose to go **Back** to the Kor Installer.
5. On the Kor Installer, click **Install Kor Application**. A license agreement will appear.
6. You may be asked if you want to allow a program from an unknown publisher to make changes on the computer. If so, select **Yes**.
7. After successful installation of Kor, click **Launch** to start the program.

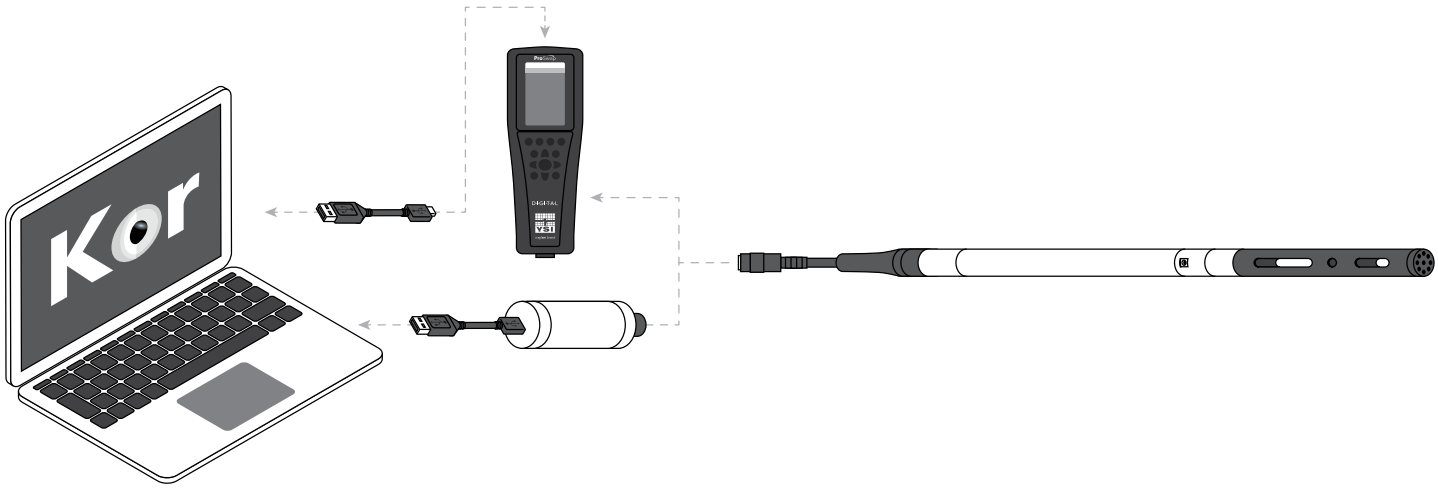
5.3 Connection to Kor Software

The ProSwap Logger can be connected to a PC running Kor Software via the ProDIGITAL USB adapter [Item# 610185] which is sold separately. Additionally, the software communication may be established through the handheld's USB port.

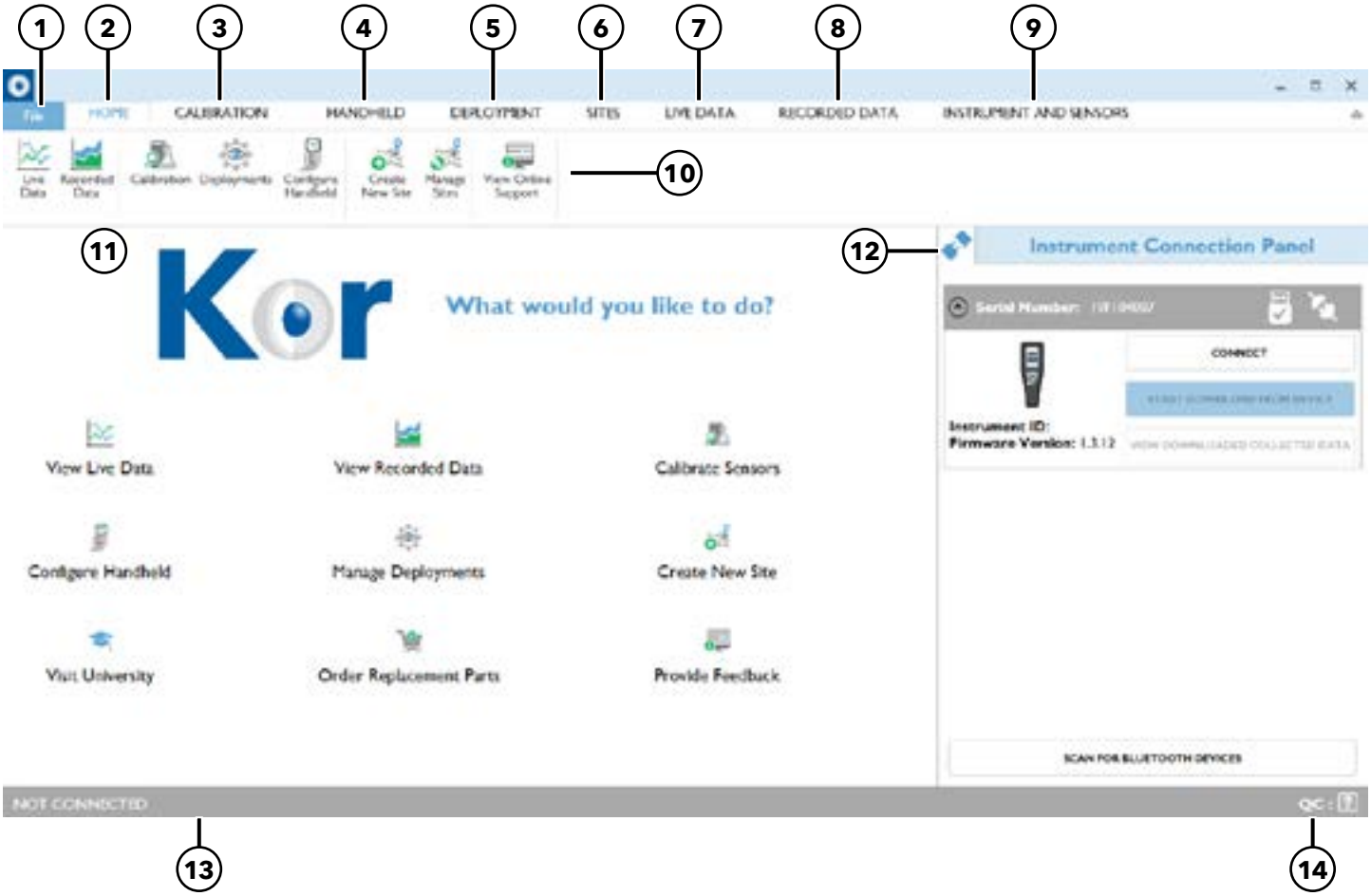
> ***NOTE:*** *Refer to Section 5.2 for Driver and Software installation instructions.*

1. Launch Kor Software.
2. Connect the ProSwap Logger to a USB adapter or handheld.
3. Connect the USB cable to the PC. Click "Connect" in the Instrument Connection Panel to establish communication.
4. Check for firmware updates. If automatic updates are enabled, then the software will automatically prompt you to update firmware. If automatic updates are turned off, navigate to Instrument and Sensors menu, and click "Update Device Firmware".

The USB connection provides communication and power to the ProSwap Logger. Loggers with internal battery may be charged via this connection.



5.4 Kor Software Home Screen



1	**File:** Opens the File menu to view software information and adjust software-specific settings.	8	**Recorded Data:** Allows users to view data files that have been logged in the software and/or downloaded from the ProSwap Logger's internal memory.
2	**Home:** Navigates users to the Home Screen (default view).	6	**Instrument and Sensors:** Allows users to view the status and edit settings for any connected ProSwap Logger and sensors.
3	**Calibration:** Allows users to calibrate sensors, view calibration records, and set calibration reminders.	10	**Ribbon Menu:** A ribbon menu resides below the main menu bar which contains options unique to the menu that is selected.
4	**ProDIGITAL Handheld:** Allows users to configure handheld-specific settings.	11	**Home Screen:** Provides quick access to the most common functions of the software and links to helpful pages on YSI.com.
5	**Deployment:** Allows users to setup the ProSwap Logger for unattended logging.	12	**Instrument Connection Panel:** Displays any available instruments and allows users to connect to instruments.
6	**Sites:** Allows users to create new sites and manage their site list.	13	**Status Bar:** Displays important information about the connected instrument including serial number, averaging mode, battery percentage, and free memory.
7	**Live Data:** Allows users to view live readings from a connected ProSwap Logger and record data.	14	**System QC Score:** Displays the SmartQC score of the connected instrument and sensors. Clicking this will take you to the Instrument and Sensors menu.

5.5 File Menu

The File Menu allows users to view software information and adjust software-specific settings.

- Import
- Settings
- About
- Exit

Import

Users can import various files transferred from previous versions of KorEXO and KorDSS Software or from other instances of Kor Software installed on different computers. These files may be transferred remotely through email or manually using a USB flash drive. Take note of which folder the file is transferred to on the computer.

IMPORT CALIBRATION – Allows users to import calibration files from another instance of Kor Software.
Compatible files will have the ".cal or .xml" extension.

IMPORT DEPLOYMENT – Allows users to import deployment templates from another instance of Kor Software.
Compatible files will have the ".dep or .xml" extension.

IMPORT EXO BINARY FILE – Allows users to import data files from another instance of Kor Software.
Compatible files will have the ".bin" extension.

IMPORT SITE – Allows users to import sites created from an older version of Kor Software.
Compatible files will have the ".sit" extension.

Settings

Users can adjust general settings related to the software as well as parameter specific settings. It is important to note that these settings are saved locally and only pertain to the software itself. These settings are not pushed to any instruments nor are they carried over to instances of Kor Software installed on other computers.

General Settings

AUTOMATION SETTINGS

- Automatically Update Software and Firmware – Toggle On/Off
  The software will indicate if there is an update available. An internet connection is required to check for software and firmware updates.
- Automatically Connect to Instrument – Toggle On/Off
  The instrument will automatically connect as soon as it is discovered by the Instrument Connection Panel.
- Automatically Download Data from Instrument to PC – Toggle On/Off
  Upon connection to the instrument, it will automatically download any new data that has been collected since it was last connected to the software.
- Automatically Update Instrument Time to PC Time – Toggle On/Off
  The software will update the instrument clock to sync with the PC time.

FILE EXPORT

- CSV Delimiting Character – Select from drop-down list
  The delimiting character represents a boundary and acts to separate data in a CSV file. The default option is a comma ',' but some users may prefer a period '.' or Tab as the delimiter.
- CSV Export Type – Select from drop-down list
  There are two options for the CSV export of a measurement file:
  - With Header – Includes a section for mean values and standard deviation for every column of measurement data. Additionally, detailed parameter names are included as well as a dedicated row for sensor serial numbers.
  - Without Header – A simplified view where the top row of the spreadsheet features column labels with the respective data in the rows that follow. Parameter names are shortened and occupy the same cell as their respective sensor serial number.

STARTUP OPTIONS

- Require User Login – Toggle On/Off
  This requires the user to select a User Name when the software is launched. The selected User Name will be the default ID tagged to any data captured in the Live Date screen and any calibration that is performed. The User Name can be switched at any time without having to exit or restart the software.

LANGUAGE SETTINGS

- Select Language – Select from drop-down list
  Available languages include:
  - Chinese (Simplified)
  - Chinese (Traditional)
  - English (United States)
  - English (United Kingdom)
  - French
  - German
  - Italian
  - Japanese
  - Korean
  - Norse
  - Portuguese
  - Spanish (Spain)
  - Spanish (Americas)
  - Vietnamese
- Override Regional Settings – Select radio button
  There are two options for regional settings:
  Use Selected Language Regional Settings – Sets the regional settings based on the language selected in Kor Software.
  Use Local OS Regional Settings – Matches the regional settings to the computer's local operating system.

Parameter Settings

Parameter-specific display preferences are found in the Settings menu. This is where users can enable or disable parameters and select the units of measure for display in Live Data view and Recorded Data view. Note that these settings are saved locally to Kor Software and do not change sensor hardware settings.

> ***NOTE:*** *If a parameter is disabled, then it will not show up in the calibration menu.*

About

Users can view software version information as well as phone, email, and online support information. A status notification will be displayed that indicates whether or not there is an update available.

Exit

This will close the software.

5.6 Calibration Menu

The calibration screen is where users calibrate sensors, view calibration records, and set calibration reminders. This section will explain the calibration options and settings. Information related to calibration methods for a specific parameter calibration can be found in Section 4.

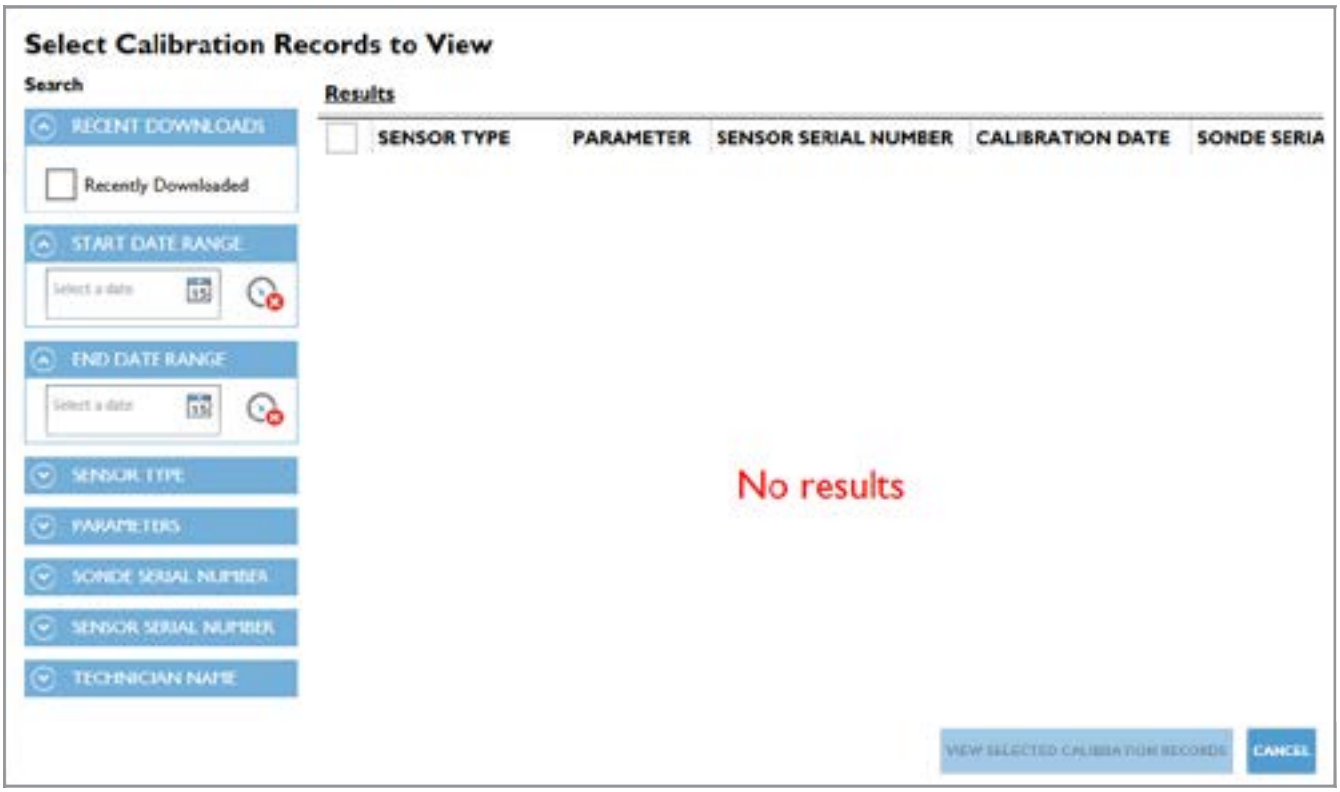
Calibrate

This displays a list of parameters that available to calibrate. The parameters are organized under each respective sensor. Every parameter has two options:

1. CALIBRATE – Select this to perform a user calibration.

2. FACTORY RESET CALIBRATION – Select this to restore the factory default calibration. Note this deletes the user calibrations from the sensor and reverts to the original factory settings. A user calibration must be performed after the factory reset.

Find Calibration Records



This opens the calibration records database where users can filter and find previous calibration records. A calibration record is generated and stored every time a parameter is calibrated. Multiple calibration records may be selected to view simultaneously.

Selected records are listed under the Calibration Records Panel. These records are sorted by calibration date and organized by sensor on the left side of the screen. Select a specific record to view its calibration details displayed on the right side of the screen.

Export to CSV

Select this to save in a file format which can be opened in a spreadsheet (such as Excel).

Export to XML

Select this to save in file format which can be imported by another instance of Kor Software.

Print Records

Select this to print a calibration report for any record shown in the Calibration Records Panel.

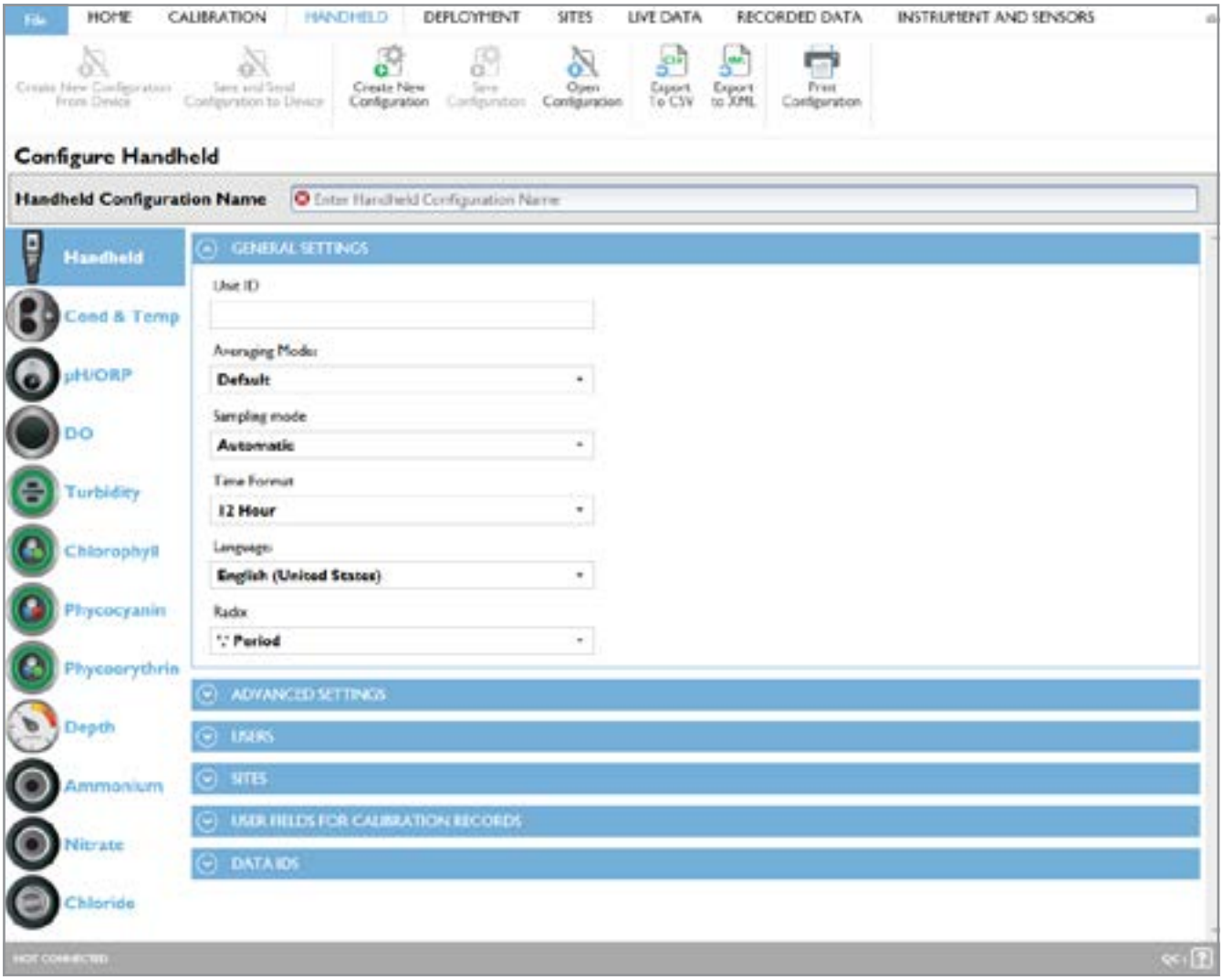
Manage Sensor Reminders

Reminders may be enabled or disabled for select parameters based on a predefined calibration interval. This interval may be adjusted by the user. Additionally, reminders may be set for the replacement of sensor modules and ODO caps.

These settings may affect the QC Score displayed by the software. For example, if the number of days since the last calibration is greater than the interval set, the software QC Score (SoftQC) will be red.

5.7 ProDIGITAL Handheld Menu

The ProDIGITAL Handheld menu allows users to set handheld preferences to push to any connected ProDIGITAL (ProDSS, ProSwap, and ProSolo) Handheld meter. These settings will only be applied to a connected handheld and are handheld-specific.



Configuration files may be read from a connected handheld and saved in the software. Saving a configuration file is an easy way to ensure all handhelds are set up consistently.

5.8 Deployment Menu

The deployment menu is where users can set up a sonde for unattended logging. The sonde log status and deployment information is displayed in the main window. Additionally, a ribbon menu includes options to create, edit, start, and stop a deployment. An instrument must be connected to view its settings and start a deployment.

Start & Stop Deployment

Click Start Deployment to begin logging at the present or a future time. Three options will be presented for Start Time:

1. NEXT INTERVAL – Logging will begin at the next time interval as specified by the deployment template.

2. NOW – Logging will begin immediately.

3. CUSTOM – Logging will begin at a user-specified date and time.

Deployment Template

A deployment template includes all the settings necessary for the sonde to accomplish unattended logging. There are three options for creating or editing a template:

Create Template

Creates a new template from scratch.

Create Template from Sonde

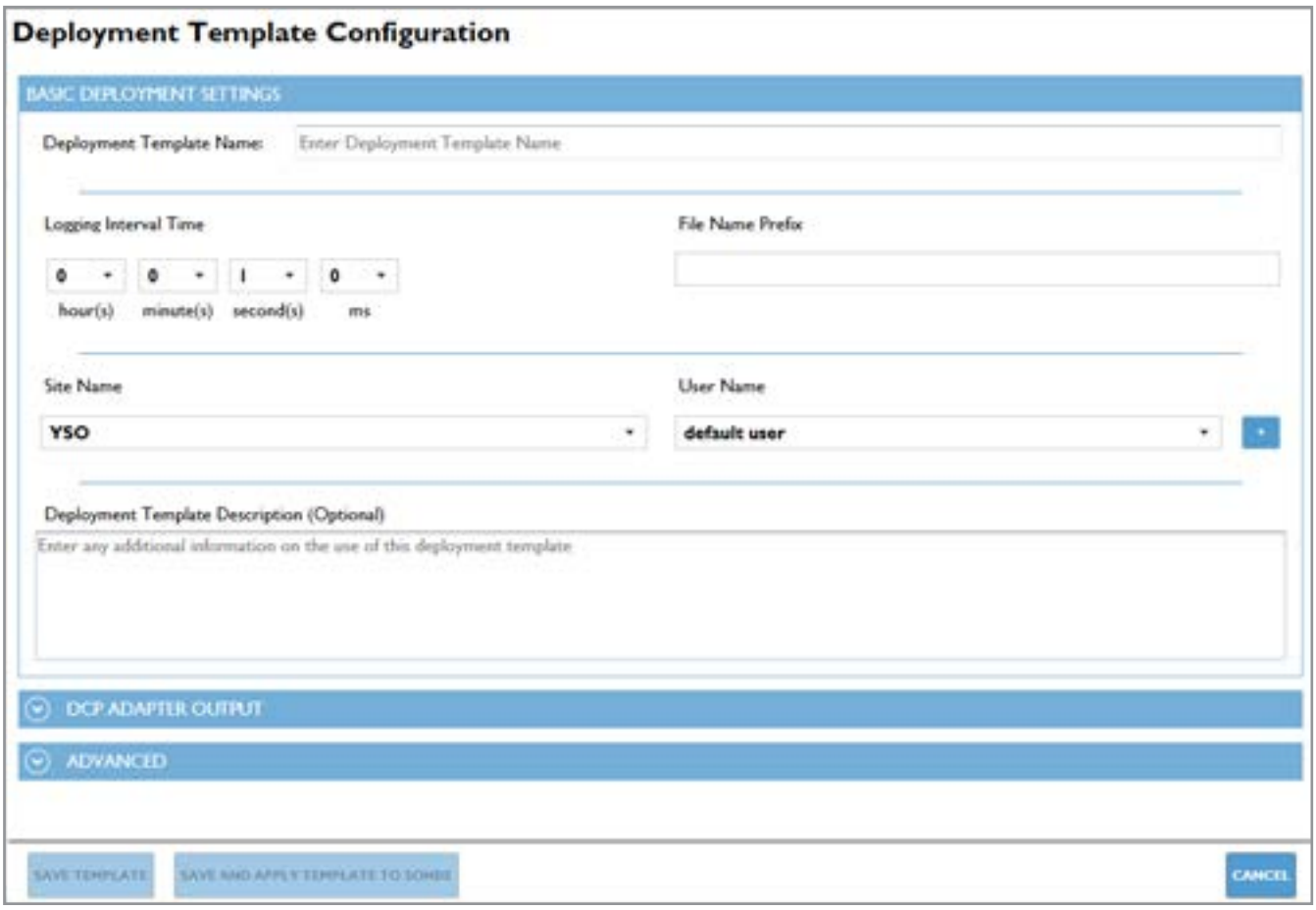
Pulls the deployment settings from a connected sonde which can then be edited, saved, and reapplied to the sonde.

Open Template

Opens an existing template which can be edited, saved, and applied to a connected sonde.

Each template includes the BASIC, DCP ADAPTER OUTPUT, and ADVANCED settings.

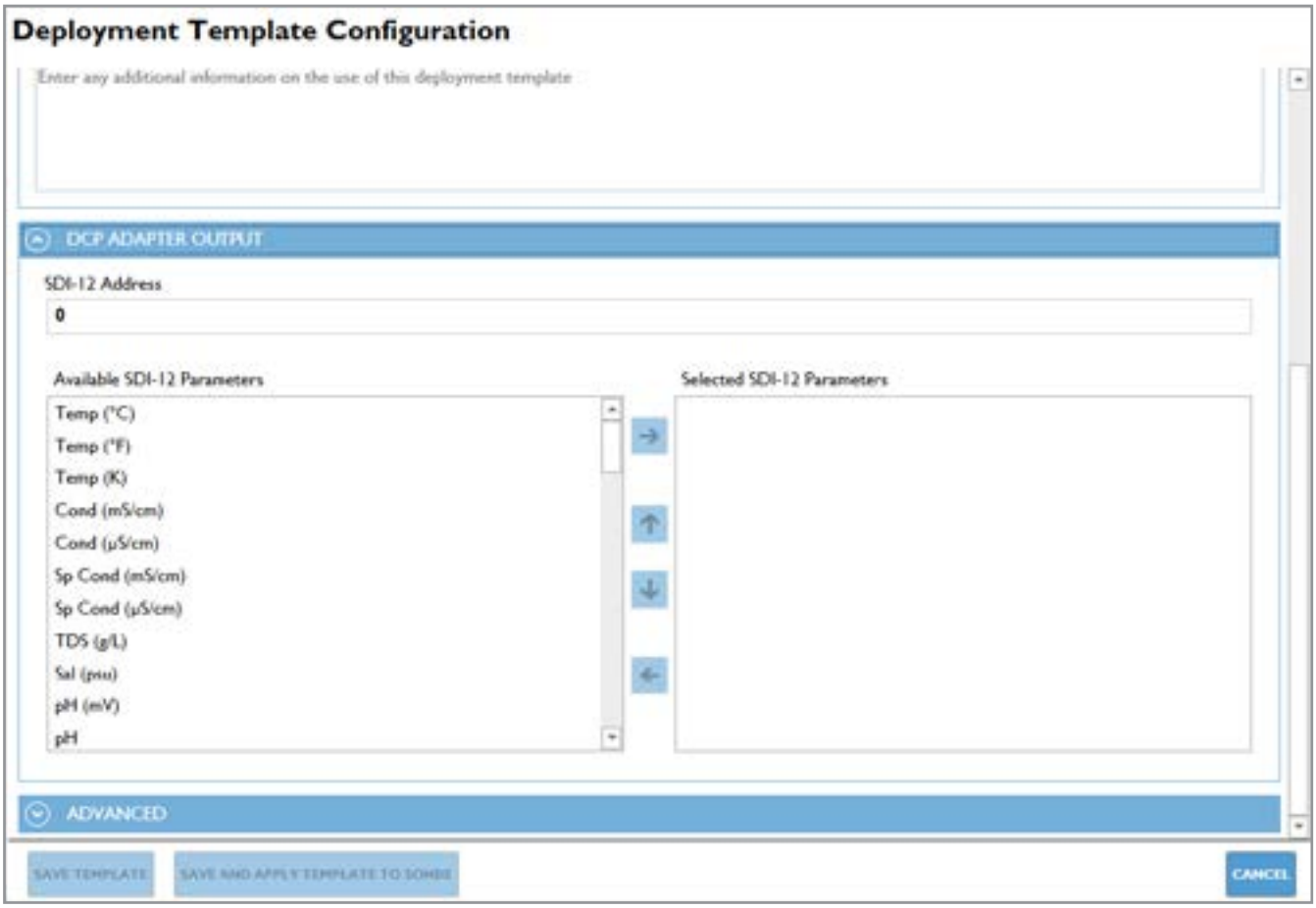
BASIC DEPLOYMENT SETTINGS:



Deployment Template Name – this is the name the template will be saved as
Logging Interval Time – this is how frequently the sonde will log data
File Name Prefix – this is the file name under which the logged data will be saved
Site Name – name of the location to be tagged with the logged data
User Name – name of the user to be tagged with the logged data
Deployment Template Description – any additional information users would like to reference for this template

DCP ADAPTER OUTPUT:

NOTE: *This section is only applicable if the sonde will be communicating to an external device via SDI-12I.*



SDI-12 Address – address of the sonde
Available SDI-12 Parameters – all parameters available to select and organize
Selected SDI-12 Parameters – this dictates which parameters the sonde will send to the SDI-12 data logger and in what order. Move parameters from the "Available" box to the "Selected" box and organize the order in which they will output.

See Section 7 for more information about SDI-12 communication.

ADVANCED:
The Advanced deployment options is where you can specify the Logging Mode:

Normal: The sonde will collect and average data into a single data point (based on the averaging mode) at the user specified log interval.

Sample and Hold: This mode is useful for when users would like to log data to the sonde's memory and also output data via SDI-12. This mode allows the sonde to log internally at its log interval and when a data logger sends a measure command to the sonde, it will respond back with the last internally logged value instead of taking a new measurement.

Burst: Not applicable for the ProSwap Logger.

The Advanced options also enables the user to set the System-Wide Averaging Mode:

Default mode provides optimum data filtering for all sensors and the highest accuracy during unattended monitoring at a fixed location. This mode has up to 40 seconds of filtering on some sensors.

NOTE: *All sensors ship in default mode.*

In Accelerated mode, sensors record data with a smaller rolling average window (5-10 seconds), so changes in sensor response are more quickly observed. Accelerated mode is recommended when the sensors are moving through the water (e.g. profiling studies and most spot sampling applications).

NOTE: *For depth profiling, enable Vertical Position under Depth Display to view the real-time position of the depth sensor in the water column. This is helpful in profiling applications to ensure the depth sensor is lowered to the desired depth without waiting for the depth data to stabilize.*

Rapid mode should be used when the sonde is moving quickly through the water, such as with rapid profiling and unique applications (e.g. towed applications). The data will be noisy and will never settle on a single steady number. This mode has 2-3 second filtering on some sensors.

NOTE: *The averaging mode chosen within this menu will be saved to the sonde, not to any individual sensor.*

NOTICE: There are some Advanced options that are only relevant for EXO Sondes. Samples per Wipe and Adaptive Logging are not applicable to the ProSwap Logger.

5.9 Site Menu

Sites can be created to allow users to organize their data by custom Site Names. The site name will be tagged to any data logged while that site is active. A site can be active in a deployment (specified in the deployment template) and in the Live Data screen for sampling.

Create a New Site

Users can input a custom site name (required) and a site description (optional). The site creation date is auto-populated. Additional options include adding a site photo and adding up to ten custom fields. The site photo must be a 24-bit BMP file no larger than 240 pixels wide by 260 pixels tall.

Manage Sites

Access a local site database to view, modify, or delete existing sites. This also allows users to import existing sites from a handheld.

5.10 Live Data Menu

The Live Data screen displays readings from a connected ProSwap Logger. Data logged from the Live Data menu is saved locally on the computer that is running Kor and not to the sonde's memory.

Save Single Point
Logs one data set at the time the button is pressed.

Start Saving Data
Logs continuously at the specified time interval.

Stop Saving Data
Stops the continuous logging.

Current Site
The active site that is tagged to the logged data.

Interval
The time interval in which data is refreshed and logged.

Clear All Graphs
Clears data from any open graphs.

Start Wiping
Activates the wiper on an EXO Sonde (NOT applicable for the ProSwap Logger).

Graph Configuration
Allows users to customize the parameters and colors that appear in Graph view

Data View

DASHBOARD – The default, grid view of enabled parameter values which are refreshed at the specified time interval.

GRAPH – A time-based or depth-based graph view; each graph can display up to two parameters specified by the user.

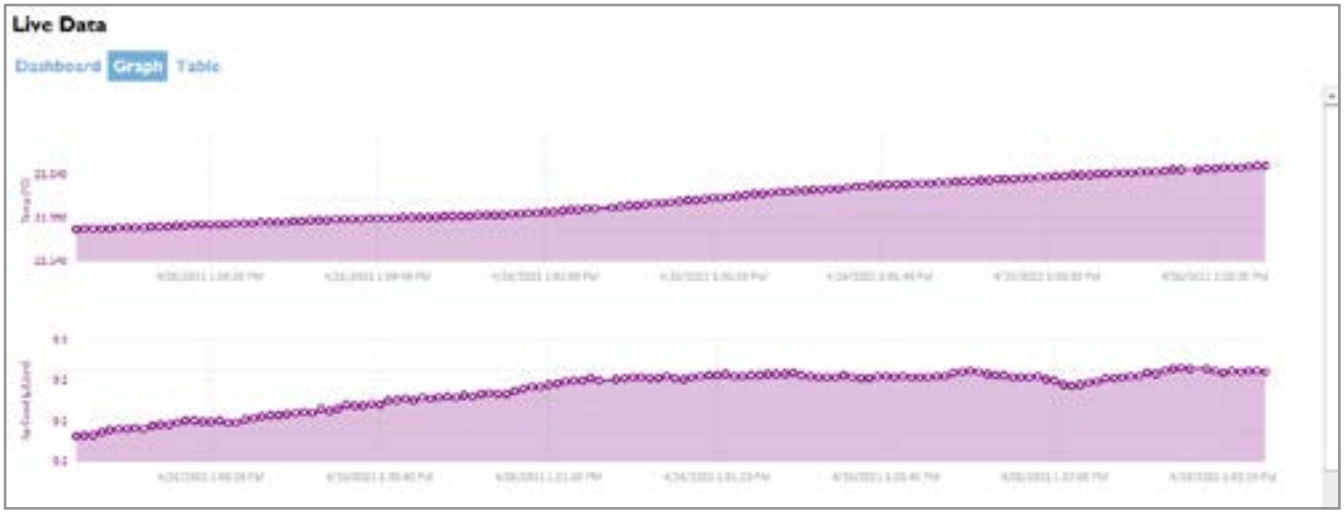
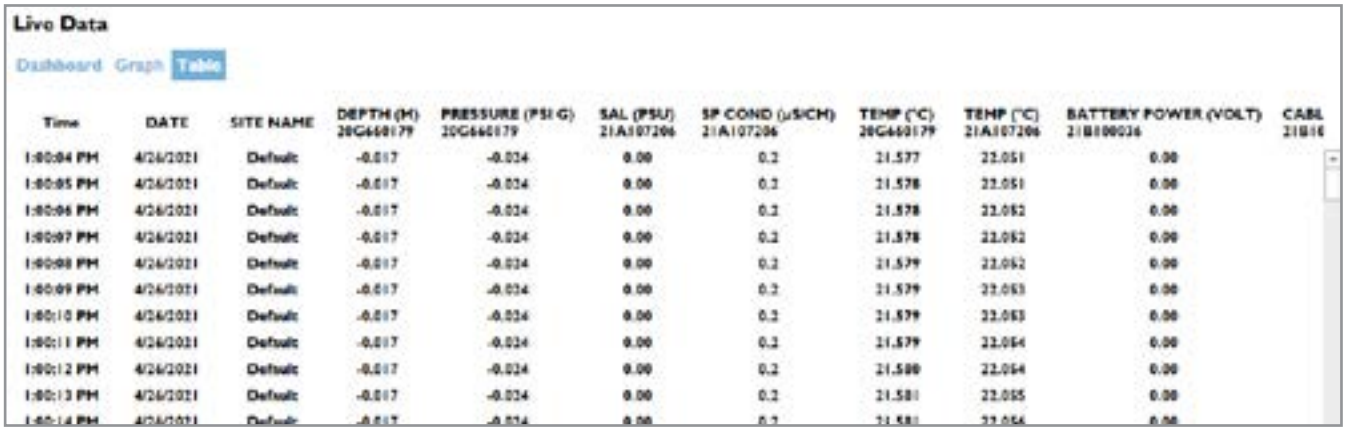


TABLE – A column-based view where new rows of data are added to a list at the specified time interval.



5.11 Recorded Data Menu

The Recorded Data menu displays data files that have been logged in the software and/or downloaded from the sonde's internal memory or from the handheld's memory. Users must first select the file(s) in the Search menu before data are displayed. Data can be viewed in Table or Graph view. Additionally, data can be exported or printed.

Search
Access and filter the software database to find logged data files; multiple files can be viewed simultaneously.

Export to CSV
Saves in a file format which can be opened in a spreadsheet (such as Excel).

Print Graphs
Prints a graph of the selected data.

Print Data
Prints a table of the selected data.

Graph Configuration
Allows users to customize the parameters and colors that appear in Graph view.

5.12 Instruments and Sensors Menu

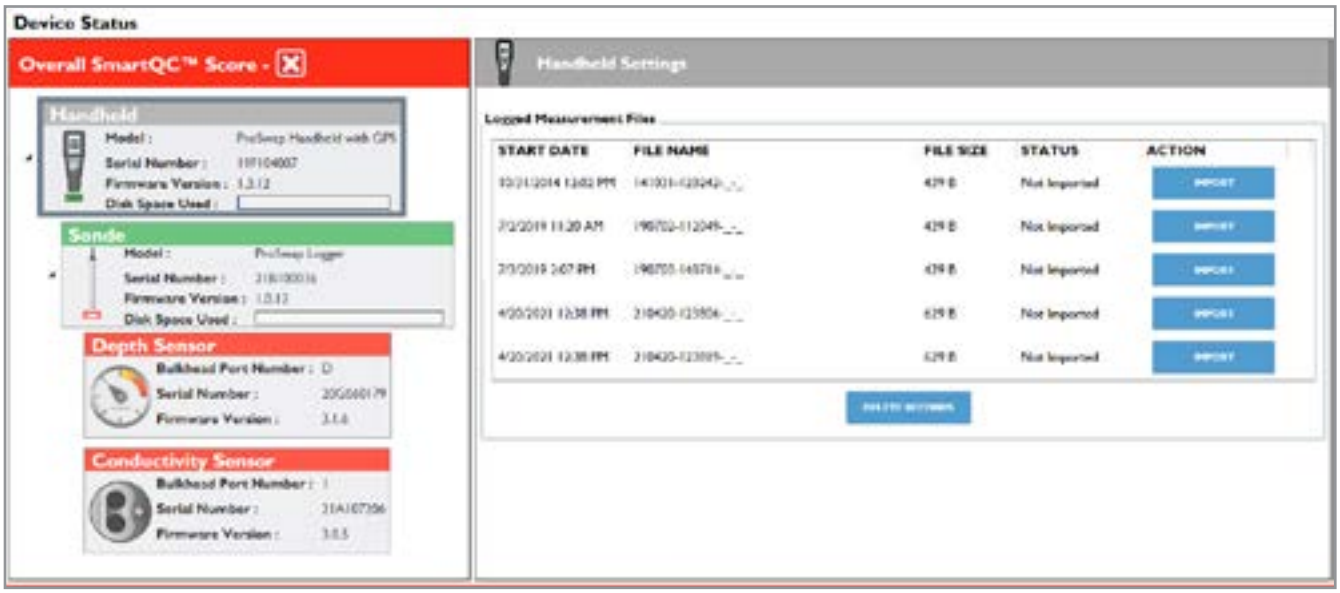
The INSTRUMENTS AND SENSORS screen allows users to view the status and edit settings for any connected instruments. Instruments are listed with the host device at the top and the sensors below. The QC Score of each sensor is available to view. Simply click on the specific instrument to view details related to its QC Score.

Logged data files can be manually imported from the sonde or handheld. Users can also delete data files that are saved on connected instruments. To delete data, click the Delete Records button under the Logged Measurement Files box. Select the records to delete, and then click Delete. This will permanently delete records from the instrument.

Update Instrument Firmware

Instrument firmware can be manually updated by clicking the Update icon in the ribbon.

> **NOTE**: *The latest firmware must be downloaded first. Check the File menu to see if there is an update available. An internet connection is required to check for updates.*



Section 6
Accessories

This section will cover the common accessories designed for use with the ProSwap Logger.

6.1 ProDIGITAL Handheld

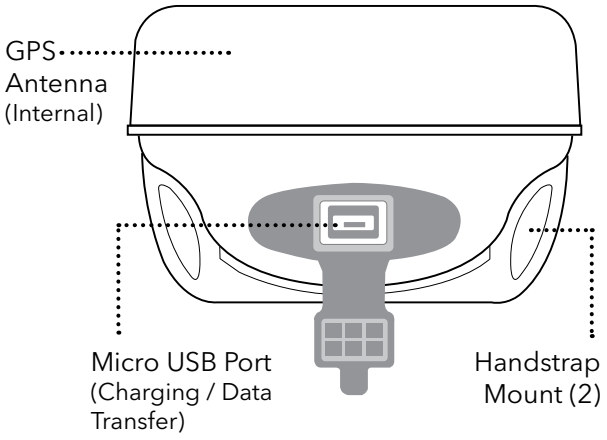
The ProSwap and ProDSS Handhelds are rugged, microcomputer-based instruments that allows the user to display sonde readings, configure sondes, store and retrieve data, and transfer data from sondes to a computer. Equipped with an integrated barometer and optional GPS, the Handheld connects directly to the ProSwap Logger cable. It can also connect to a PC running Kor Software via the USB connector.

Specifications

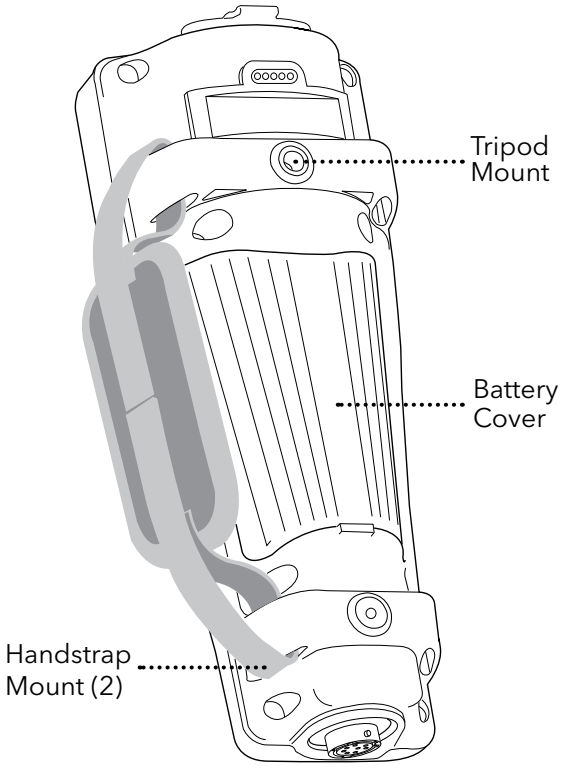
GPS *Accuracy*	Optional 2.5 m CEP (dependent on site conditions)
Display	IP-67 rated, Color-LCD graphic display
Memory	>100,000 data sets
Software	Kor Software
Communications	Field Cable, USB
Power *Internal* *Operating Time* *Charging Time*	 Rechargeable Lithium-Ion Pack > 15 hours 9 hours (from 0 to 100%)
Temperature *Operating* *Storage*	 0°C to 50°C 0°C to 60°C (no battery) 0°C to 45°C (battery installed)
Barometer *Range* *Accuracy* *Resolution*	 *Built-in with User Calibration* 375 to 825 mmHg ±1.5 mmHg from 0 to 50°C 0.1 mmHg
Dimensions *Width* *Length* *Depth* *Weight w/ battery*	 8.3 cm, 3.27 in 21.6 cm, 8.5 in 5.6 cm, 2.21 in 0.57 kg, 1.25 lb

NOTE: *Barometer vent located under battery cover.*

Top View



Back View

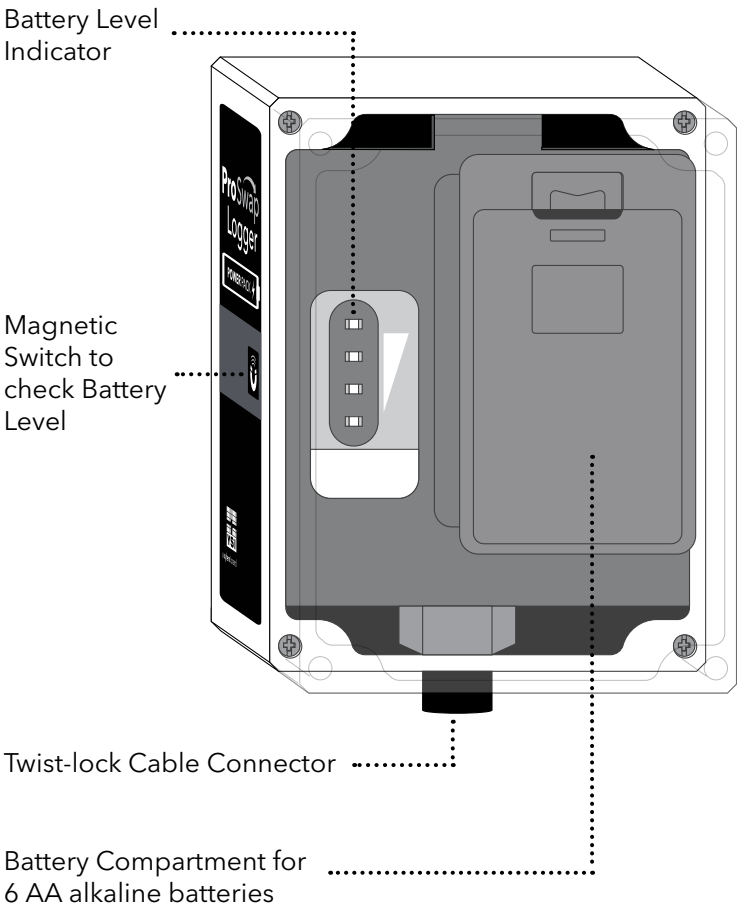


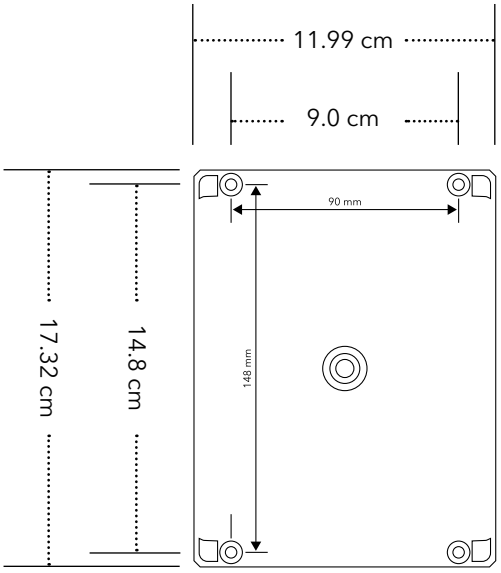
6.2 ProSwap Logger Power Pack

The ProSwap Logger Power Pack is designed to supply top-side power to ProSwap Loggers that do not have a built-in battery. The Power Pack provides power to the ProSwap Logger using six AA alkaline batteries.

Specifications

Batteries	6 AA Alkaline
Battery Life	At least 90 days at 15 minute log interval
Dimensions	
Width	11.99 cm, 4.72 in
Length	17.32 cm, 6.82 in
Depth	8.99 cm, 3.54 in
Weight w/ battery	0.82 kg, 1.8 lb

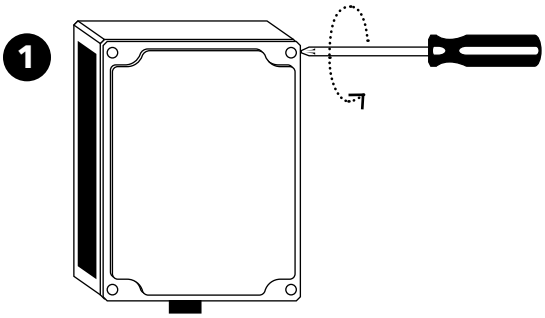


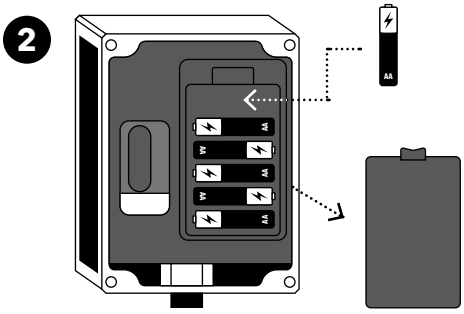


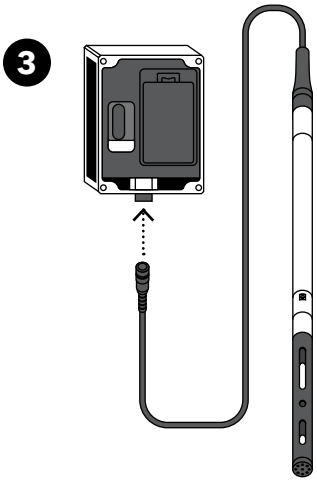
Mounting

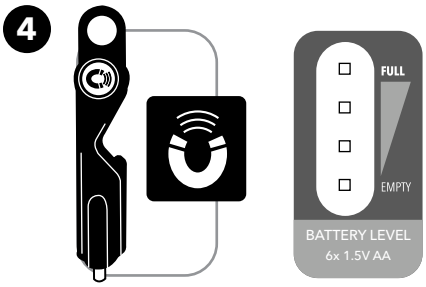
Users may desire to mount the Power Pack. Please refer to the dimensional diagram for reference.

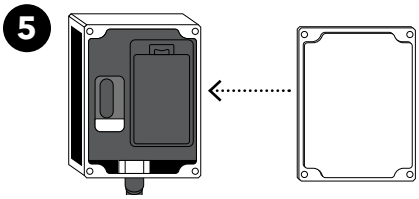
Setting Up







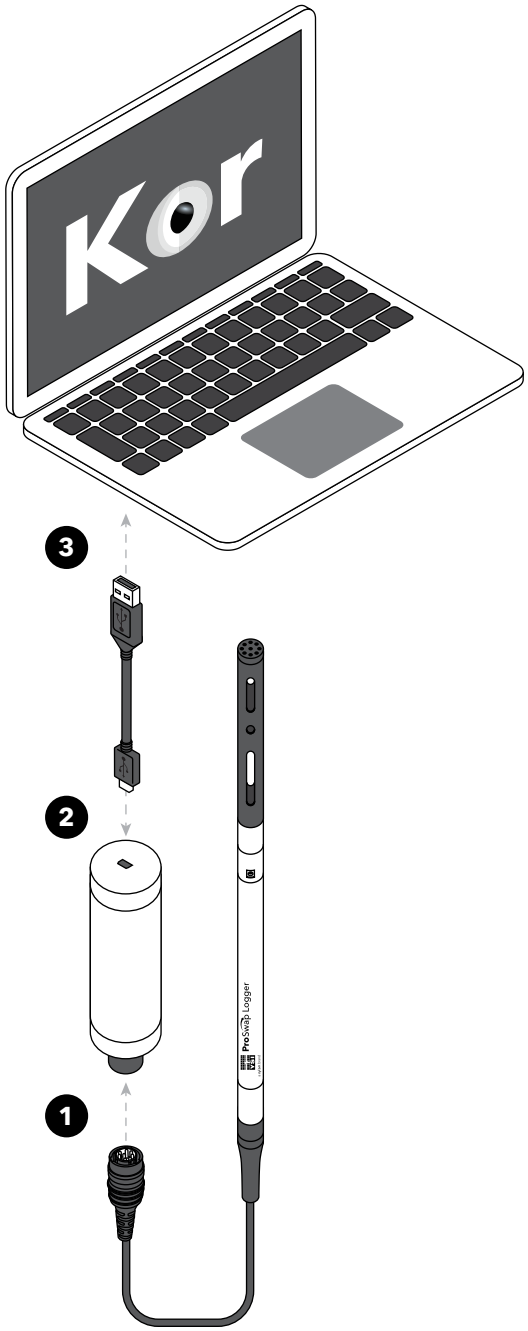




1. The Power Pack cover utilizes captive screws. Use a Phillips head screwdriver to loosen the 4 screws and remove the cover to access the battery compartment.
2. Install 6 AA alkaline batteries in the battery compartment.
3. Connect the ProSwap Logger cable to the MS-8 connector.
4. Use the magnet tool to activate the Battery Level Indicator and check the battery level.
   - 100% charge – 4 Solid LED's
   - 75% charge – 3 Solid LED's
   - 50% charge – 2 Solid LED's
   - 25% charge – 1 Solid LED
   - 0% charge – No Solid LED's (4 Flash)
5. Reinstall the Power Pack cover.

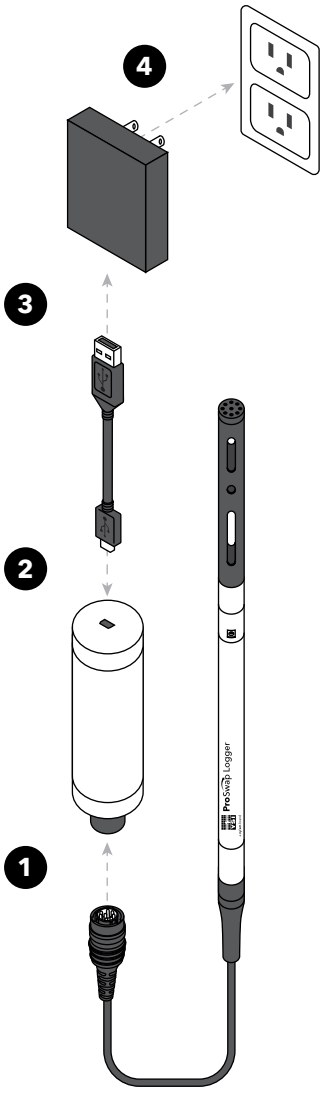
6.3 ProDIGITAL USB Adapter

The ProDIGITAL USB Adapter is designed to enable direct communication between the ProSwap Logger and Kor Software. It also includes a power adapter for AC charging.



Software Interface

1. Connect the ProSwap Logger cable to the USB Adapter.
2. Connect the USB micro B plug of the cable to the USB Adapter.
3. Connect the USB Type A plug of the cable to the laptop or PC.



ProSwap Logger Charging

The included power adapter allows for AC charging of the ProSwap Logger.

1. Connect the ProSwap Logger cable to the USB Adapter.
2. Connect the USB micro B plug of the cable to the USB Adapter.
3. Connect the USB Type A plug of the cable to the Power Adapter
4. Plug the Power Adapter into an AC power source.

6.4 Desiccant Cartridge

NOTE: *The desiccant cartridge is only relevant for ProSwap Logger models with vented depth sensors.*

The ProSwap Logger desiccant cartridge accessory contains equipment which prevents condensation in the vent tube of sondes and cables which measure changes in water level in field applications. It is imperative that a dry atmosphere be maintained in the vent tube for field studies since environmental temperature changes will almost certainly cause water to condense in the tube if it is not protected. This condensed water is likely to block the vent tube, resulting in inaccurate and erratic readings, and may cause permanent damage to the sensor.

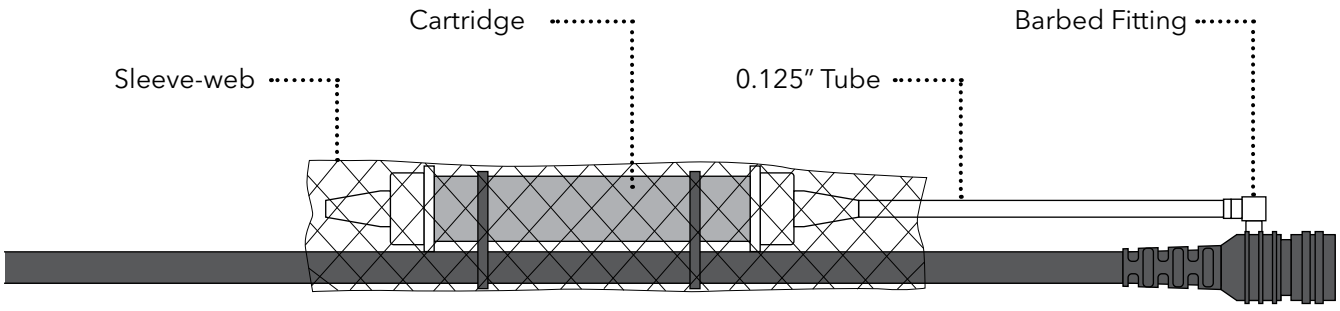
Preparation

1. Familiarize yourself with the items provided in the kit before proceeding with the assembly and deployment of the unit.
2. Enclosed items include prefilled desiccant cartridges, tubing and a barb fitting adapter which facilitates attachment of the cartridge to the barb fitting of the cable, and a cap which protects the MS-8 connector of the cable during deployment.

Installing the Cartridge

Refer to the following drawing for installation of the desiccant cartridge to the cable.

1. Remove one of the plugs from the end of the desiccant cartridge and place the open end of the 0.125" tubing onto the cable fitting. Seat firmly.
2. Place the open end of the 0.125" tubing onto the cable fitting. Seat firmly.
3. Slide the sleeve-web over the end of the cable and the bail. Work the sleeve-web down the cable and over the cartridge taking care not to unplug the hose that connects the cartridge to the cable.



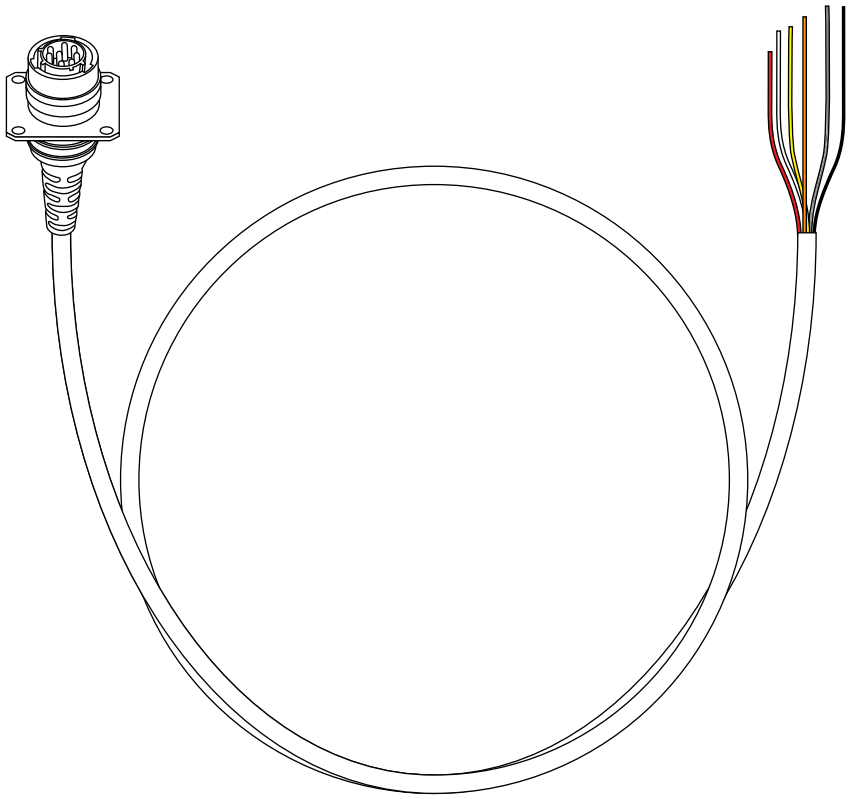
Optional: Using one of the tie-wraps, secure the hose to the cable taking care not to close off the hose.

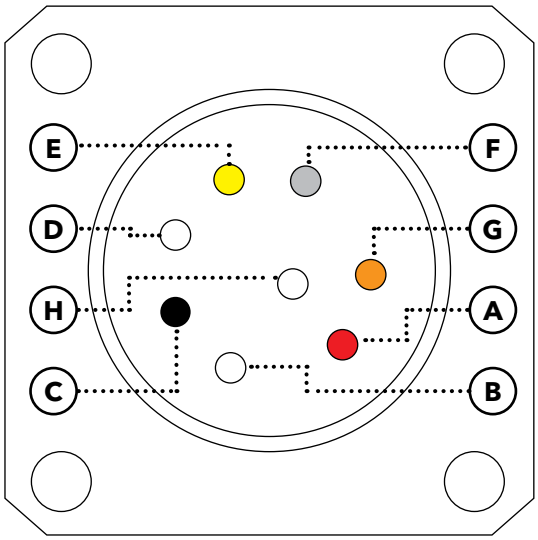
The vent end of the cartridge should remain plugged until the sonde is ready for use. When putting the sonde into service, remove the plug to ensure that the sensor in the sonde is vented to the atmosphere.

Install the protective cap over the MS-8 end of the vented cable when not in use.

6.5 Flying Lead Adapter

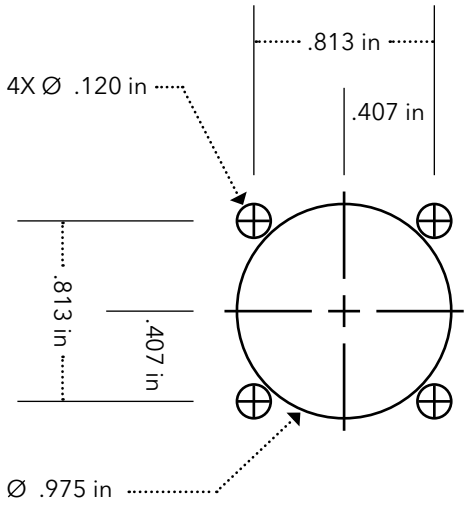
The Flying Lead Adapter allows users to easily make a quick connection between their ProSwap Logger and a DCP for SDI-12 communication. Users may also supply external power (5.4-16 V) via the Flying Lead Adapter.





Receptacle Rear View (Wire Side)

Cable Conductor	Connector Pin Number	Description
Red	A	Sensor Power (12V)
-	B	-
Black	C	Ground
White	D	Com (B)
Yellow	E	Com (A)
Bare	F	Shield/Drain
Orange	G	SDI-12
-	H	-



Mounting

Users may desire to mount the Flying Lead Adapter in an enclosure. Please refer to the dimensional diagram for reference.

Section 7
Signal Output

The ProSwap Logger can output to a DCP via the Flying Lead Adapter. This section covers the setup and configuration to output via SDI-12 communication protocol.

7.1 Signal Output Overview

The ProSwap Logger supports serial communications via both RS-485 and SDI-12 ports. The SDI-12 port provides for a v1.3 compatible SDI-12 interface. The RS485 port provides for either a proprietary YSIP or a Modbus interface

7.2 SDI-12 Output Configuration

In order to appropriately set up a sonde to communicate measurements to a datalogger, it is critical to align the settings from the sonde and the logger.

In Kor software, go to the Deployment menu and either open a template or create a template from the sonde. Go to the DCP Adapter Output tab, and select the parameters and order of output.

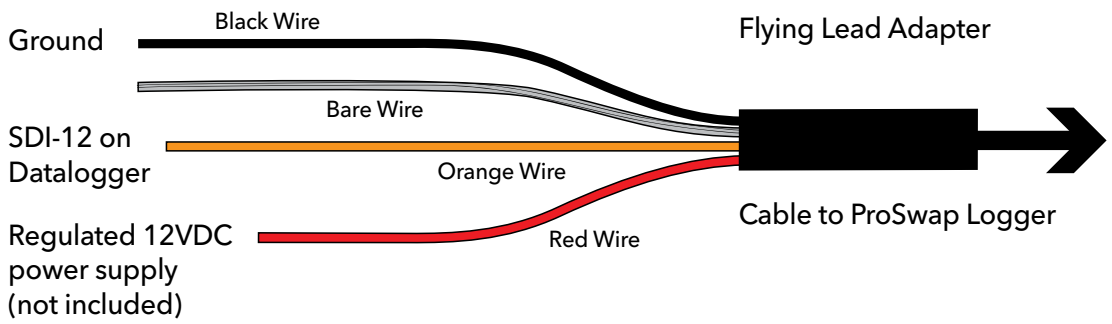
The complete list of parameters is listed in the "Available" box. Move the desired parameters to the "Selected" parameters box and organize them using the arrow buttons. See Section 5.8 DCP Adapter Output for more information.

Once the parameter output is set, save and apply the template to the sonde. This template can be saved locally on the PC, but it must also be pushed to the sonde for the settings to take effect. Be sure to apply the template to the sonde.

NOTE: *There are two options when applying the template to the sonde, apply without logging or with logging. Either option may be used. When deploying with logging the sonde will create a redundant log file inside the sonde. To ensure internally logged data matches output data, be sure to select "Sample and Hold" for sonde's logging mode in the Advanced tab of the deployment template. Without logging, the data will only be available through the SDI-12 output.*

7.3 SDI-12 Interface

The ProSwap Logger includes native SDI-12 output for use with flying lead cables for a direct interface into a 3rd party data collection platform (DCP). Refer to the wiring diagram below for connecting the cable to a terminal:



- **General**
  - Compatible with v1.3 of SDI-12 specification
  - Supports following standard commands:
    - '!' Address Query
    - 'A' Change Address
    - 'C' Concurrent Measurement
    - 'D' Data
    - 'I' Identification
    - 'M' Start Measurement
    - 'V' Start Verification

- **Extended Commands**
  - SDI-12 'Z' command:
  - Supports the following RS232 commands
    - sn Serial Number
    - para Parameter List
    - ver S/W Version
    - ssn Sensor Serial Numbers

7.4 SDI-12 Parameter List

The SDI-12 data parameter list is set by the user in the Deploy menu.
Go to Deploy ⟶ Open Template ⟶ Edit Template menu and click on the SDI-12 tab

• Maximum of 23 codes in sonde parameter list.

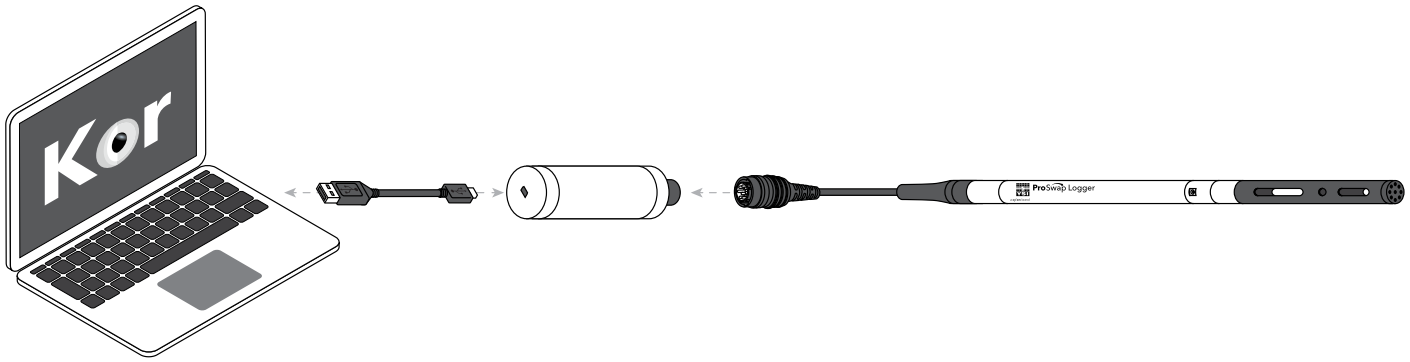
Parameter	Code
Temperature, °C	1
Temperature, °F	2
Temperature, °K	3
Conductivity, mS/cm	4
Conductivity, µS/cm	5
Specific Conductance, mS/cm	6
Specific Conductance, µS/cm	7
TDS, g/L	10
Salinity, PPT	12
pH, mV	17
pH	18
ORP, mV	19
Pressure, psia	20
Pressure, psig	21
Depth, m	22
Depth, ft	23
Battery, V	28
Turbidity, NTU	37

Parameter	Code
NH4 (Ammonium), mg/L	48
Date, DDMMYY	51
Date, MMDDYY	52
Date, YYMMDD,	53
Time, HHMMSS	54
TDS, kg/L	95
NO3 (Nitrate), mV	101
NH4 (Ammonium), mV	108
TDS, mg/L	110
Chloride, mg/L	112
Chloride, mV	145
TSS, mg/L	190
TSS, g/L	191
Chlorophyll, µg/L	193
Chlorophyll, RFU	194
ODO, %Sat	211
ODO, mg/L	212
ODO, %Sat Local	214

Parameter	Code
TAL-PC, cells/mL	215
TAL-PC, RFU	216
TAL-PE, cells/mL	217
TAL-PE, RFU	218
Turbidity, FNU	223
TAL-PC, µg/L	225
TAL-PE, µg/L	226
External Power, V	230
nLF Conductivity, mS/cm	237
nLF Conductivity, µS/cm	238
Vertical Position, m	240
Vertical Position, ft	241
Chlorophyll, cells/mL	242

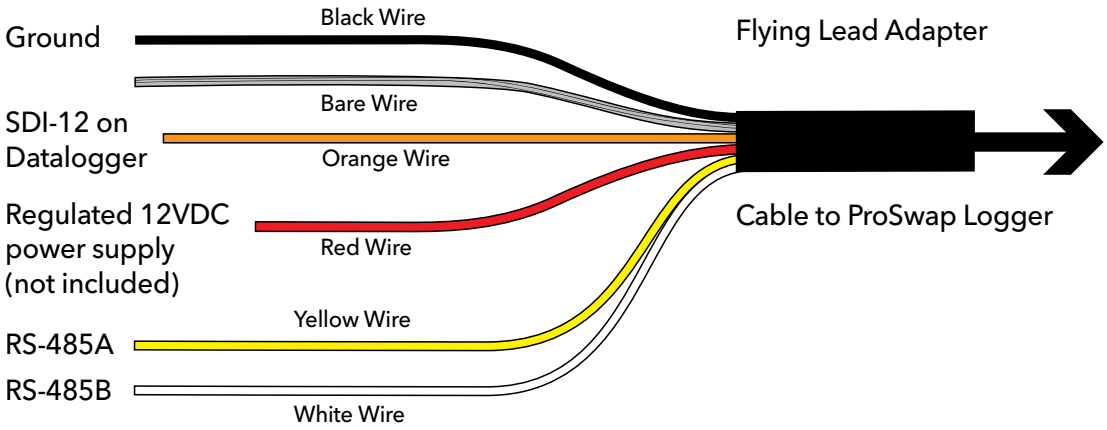
7.5 Modbus Interface

In order for the ProSwap Logger to output Modbus via RS485, it must first be configured using the latest version Kor Software. The connection from the ProSwap Logger to a PC running Kor must be made using the ProDIGITAL USB Adapter [item# 610185]:



When the ProSwap Logger is connected to Kor, navigate to the Instrument and Sensors tab to enable Modbus output and configure Modbus settings. After settings are applied, the ProSwap Logger can be disconnected from Kor and connected to a SCADA system using the Flying Lead Adapter [item# 610195].

Refer to the wiring diagram below for connecting the Flying Lead Adapter cable to a terminal:



7.6 Modbus Setup

The following setup parameters are configurable via YSIP commands:

Address	Selectable from 0 to 255
Format	Select from ASCII or RTU
Baud rate	Select from 1200, 2400, 4800, 9600, 19200, 34800, 57600, 115200
Data bits	Select from 7 or 8. Note that in RTU mode you must select 8
Stop bits	Select from 1 or 2
Parity	Select from None, Odd, or Even

7.7 Modbus Commands

The ProSwap Logger makes use of the Modbus register system to transfer data. It will respond to the Modbus commands "Read Holding Registers" and "Preset Multiple Registers". In general, when attempting to read from a reserved or unused area, the ProSwap Logger will return a value of "0".

The ProSwap Logger maintains a current set of data in the holding registers. Use the "Read Holding Registers" command to obtain the most recent set of data from the instrument. Each parameter is stored in a different register (or register pair). Also in different registers is status information from the ProSwap Logger and the same command is used to read status. Values in other registers control which parameters are enabled in the ProSwap Logger. The DCP Signal Output Adapter does not control the Modbus output parameters. Values must be written to the 129-143 registers as dictated in the table below. Parameters can be enabled and disabled by writing to these registers using the "Preset Multiple Register" command.

There are 4 main register areas to deal with the parameters:

- Parameter type
- Parameter status
- IEEE floating point parameter data
- Scaled integer parameter data

Each of these areas is 15 registers long, except for the floating point data area which is 15 register pairs long. The first register (or register pair for the floating point data) in each area corresponds to the first parameter, the second corresponds to the second parameter, etc. The following table shows the register areas defined in the ProSwap Logger:

Address	Read/Write	Description
1-128		Unused – reserved for future special functions
129-143	Read/Write	Parameter type: The master must write to this area to tell the ProSwap Logger what parameters it wants. Up to 15 parameters can be written here. After the last parameter, the master must write a "0"
144-256		Reserved for future parameter type
257-271	Read only	Parameter Status: The master can read back the values in these registers to check the status of the parameters. The value in register 25 corresponds to the parameter type in register 129 and so on. The meaning of the returned value is: 0 – The parameter is available. 1 – The parameter type has not been set, i.e. type = 0. 2 – The parameter requested is not currently available.
272-384		Reserved for future parameter status
385-414	Read only	IEEE floating point parameter data This is the actual parameter data in floating point form. Two registers are used for each value to make up the 32 bits required for a 4 byte IEEE floating point number. The value in register pair 385:386 corresponds to the parameter type in register 129 and so on. It is highly recommended that this be used rather than the scaled integer format.
415-640		Reserved for future IEEE floating point parameter data

Address	Read/Write	Description
641-655	Read only	Scaled integer parameter data The master should only read data from the ProSwap Logger using this method if it cannot handle floating point data. Most PLCs can manipulate floating point values, so try to avoid reading scaled integer values. The value in register 641 corresponds to the parameter type in register 129 and so on. The values are scaled according to a fixed table in the ProSwap Logger. The scaled data is in an unsigned integer format. Each parameter type has a specific range and resolution. Refer to the scaled integer range table for values for each parameter. For example, temperature C has the range of -50 to 605.35, with a resolution of 0.01. Here are some integer values that could be returned along with their engineering equivalents: 0: -50 C or less. 1: -49.99 C 2: -49.98 C 5000: 0 C 7234: 22.34 C 7500: 25 C 65534: 605.34 C 65535: 605.35 C or higher
656-768		Reserved for future scaled integer parameter data
769-and up		Unused

This table shows the parameters defined in the PSL:

Parameter	Description	Code	Scale Low	Scale High
Temp C	Temperature, C	1	-50	605.35
Temp F	Temperature, F	2	-50	605.35
Temp K	Temperature, K	3	0	655.35
Cond mS/cm	Conductivity, mS/cm	4	0	655.35
Cond uS/cm	Conductivity, µS/cm	5	0	65535
SpCond mS	Specific Conductance, mS/cm	6	0	655.35
SpCond uS	Specific Conductance, µS/cm	7	0	65535
TDS g/L	Total Dissolved Solids, g/L	10	0	65.535
Sal ppt	Salinity, parts per thousand	12	0	65.535
pH mv	pH voltage, millivolts	17	-1638.4	1638.5
pH	pH	18	-27.768	39.767
ORP mV	Oxidation reduction potential, millivolts	19	-1638.4	1638.5
Press psia	Pressure Absolute, pounds/square inch	20	-50	605.35
Press psig	Pressure Gauge, pounds/square inch	21	-50	605.35
Depth M	Depth, Meters	22	-50	605.35
Depth Ft	Depth, Feet	23	-50	605.35
Battery V	PSL Battery Voltage, Volts	28	0	65.535
Turbidity NTU	Turbidity, Nephelometric Turbidity Units	37	0	6553.5
NH4-N mg/L	Ammonium, mg/L	48	0	655.35
TDS kg/L	Total Dissolved Solids, kg/L	95	0	65.535
NO3 mV	Nitrate, mV	101	-1638.4	1638.5
NO3 mg/L	Nitrate, mg/L	106	0	655.35
NH4N mV	Ammonium, mV	108	-1638.4	1638.5
TDS mg/L	Total Dissolved Solids, mg/L	110	0	65535
CL mg/L	Chloride, mg/L	112	0	655.35
CL mV	Chloride, mV	145	-1638.4	1638.5
TSS mg/L	Total Suspended Solids, mg/L	190	0	6553.5

Parameter	Description	Code	Scale Low	Scale High
TSS g/L	Total Suspended Solids, g/L	191	0	6.5535
Chl ug/L	Chlorophyll, micrograms/Liter	193	0	655.35
Chl RFU	Chlorophyll, Relative Florescence Units	194	0	655.35
ODO %sat	Optical Dissolved Oxygen, % Saturation	211	0	655.35
ODO mg/L	Optical Dissolved Oxygen, milligram/Liter	212	0	65.535
ODO %sat L	Optical Dissolved Oxygen, % Saturation Local	214	0	655.35
TAL-PC RFU	TAL PC, Relative Florescence Units	216	0	655.35
TAL-PE RFU	TAL PE, Relative Florescence Units	218	0	655.35
Turbidity FNU	Turbidity, FNU	223	0	6553.5
TAL-PC ug/L	TAL PC, micrograms/Liter	225	0	655.35
TAL-PE ug/L	TAL PE, micrograms/Liter	226	0	655.35
Ext Pwr V	External Power, Volts	230	0	65.535
nLF Cond mS/cm	nLF Conductivity, mS/cm	237	0	655.35
nLF Cond µS/cm	nLF Conductivity, µS/cm	238	0	65535
Vertical Position M	Vertical Position, Meters	240	-50	605.35
Vertical Position Ft	Vertical Position, Feet	241	-50	605.35

Section 8
Safety and Support

This section will cover information related to safety and precautions while using the ProSwap Logger and accessories as well as contact information for service and technical support.

8.1 Rechargeable Lithium-Ion Battery Pack Safety Warnings and Precautions

⚠ **CAUTION:** Failure to follow the safety warnings and precautions can result in fire, personal injury and/or equipment damage not covered under warranty.

⚠ **CAUTION:** If the internal battery fluid comes into contact with skin, wash the affected area(s) with soap and water immediately. If it comes into contact with your eye(s), flush them with generous amounts of water for 15 minutes and seek immediate medical attention.

⚠ **CAUTION:** Always keep batteries away from children.

⚠ **WARNING:** In the unlikely event a lithium-ion battery catches fire, **DO NOT** attempt to put the fire out with water, use a Class A, B or C fire extinguisher.

Do:

- Store the battery pack in a cool, dry, ventilated area.
- Store the battery pack in a non-conductive and fireproof container.
- Store the battery pack at approximately 50% of the capacity.
- Follow applicable laws and regulations for transporting and shipping of batteries.
- *Immediately discontinue* use of the battery pack if, while using, charging or storing the battery pack:
  - Emits an unusual smell
  - Feel hot
  - Changes color
  - Changes shape
  - Appears abnormal in any other way.

Battery Pack General Precautions:

- **DO NOT** put the battery in fire or heat the battery.
- **DO NOT** connect the positive and the negative terminal of the battery to each other with any metal object (*e.g.* wire).
- **DO NOT** carry or store the battery pack with necklaces, hairpins or other metal objects.
- **DO NOT** carry or store the battery pack with hazardous or combustible materials.
- **DO NOT** pierce the battery pack with nails, strike with a hammer, step on or otherwise subject the battery pack to strong impacts or shocks.
- **DO NOT** solder directly onto the battery pack.
- **DO NOT** expose the battery pack to water or salt water or allow it to get wet.
- **DO NOT** disassemble or modify the battery pack. The battery contains safety and protection devices that, if damaged, can cause the battery to generate heat, rupture or ignite.
- **DO NOT** place the battery pack on or near fires, stoves or other high-temperature locations.
- **DO NOT** place the battery pack in direct sunlight or extreme temperatures for extended periods of time or store the battery pack inside cars in hot weather. Doing so may cause the battery pack to generate heat, rupture or ignite. Using the battery pack in this manner may also result in a loss of performance and a shortened life expectancy.
- **DO NOT** place the battery pack in microwave ovens, high-pressure containers or on induction cookware.
- **DO NOT** ship damaged or potentially defective batteries to YSI or any of our authorized service centers unless instructed otherwise. All federal and international shipping laws should be consulted prior to shipping lithium-ion batteries.

Charging/Discharging/Handling the Battery Pack

⚠ **WARNING:** Failure to follow the battery pack charging/discharging instructions can cause the battery to become hot, rupture or ignite and cause serious injury and/or equipment damage.

⚠ **WARNING:** Only charge the battery using charging devices designed specifically for the ProDIGITAL handheld by YSI. Use of unapproved chargers can result in battery failure and potentially serious injury to the user.

If at any time the battery pack becomes damaged, hot or begins to balloon or swell, discontinue charging (or discharging) immediately. Quickly and safely disconnect the charger. Then place the battery pack and/or charger in a safe, open area way from flammable materials. After one hour of observation, remove the battery pack from service. **DO NOT** continue to handle, attempt to use or ship the battery.

Damaged or swollen batteries can be unstable and very hot. **DO NOT** touch batteries until they have cooled. In the event of a fire use a Class A, B, or C fire extinguisher. **DO NOT** use water.

- **DO NOT** attach the battery pack to a power supply plug or directly to a car's cigarette lighter.
- **DO NOT** place the battery pack in or near fire or into direct extended exposure to sunlight. When the battery pack becomes hot, the built-in safety equipment is activated, preventing the battery pack from charging further. Heating the battery pack can destroy the safety equipment and cause additional heating, breaking or ignition.
- **DO NOT** leave the battery pack unattended while charging.

  NOTICE: The ambient temperature range over which the battery pack can be discharged is -20°C to 60°C (-4°F to 140°F). Use of the battery pack outside of this temperature range may damage the performance of the battery pack or may reduce its life expectancy.

- **DO NOT** discharge the battery pack using any device except for a ProDIGITAL handheld. When the battery pack is used in other devices it may damage the performance of the battery or reduce its life expectancy. Use of a non-approved device to discharge the battery pack can cause an abnormal current to flow, resulting in the battery pack to become hot, rupture or ignite and cause serious injury.
- **DO NOT** leave the battery pack unattended while discharging.

Battery Disposal

When the battery pack is worn out, insulate the terminals with adhesive tape or similar materials before disposal.
Dispose of the battery pack in the manner required by your city, county, state or country. For details on recycling lithium-ion batteries, please contact a government recycling agency, your waste-disposal service or visit reputable online recycling sources such as www.batteryrecycling.com.

This product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of their waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment.

For more information about where you can drop off your waste equipment for recycling, please contact your local city office, or your local waste disposal service. **DO NOT ship batteries to YSI or a YSI authorized service center unless instructed to do otherwise.**

Contact YSI Technical Support at (937) 767-7241 if you have additional questions.

8.2 Service Information

YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit YSI.com, highlight Customer Support and then click Product Service or contact YSI Technical Support directly at 800-897-4151 (+1 937-767-7241).

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for a YSI Service Center to accept the instrument for service. The form may be downloaded from YSI.com.
YSI.com/customer-support/product-service

8.3 Technical Support

Telephone: 800 897 4151 (USA)

+1 937 767 7241 (Globally) Monday through Friday, 8:00 AM to 5:00 ET

Fax: +1 937 767 9353 (orders)

Email: info@ysi.com

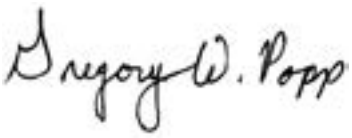
Mail: YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA

Internet: YSI.com

8.4 Declaration of Conformity

The undersigned hereby declares that the products listed below conform to all applicable Essential Requirements of the listed Directives and Standards and carry the CE mark accordingly.

Manufacturer:	YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA
Equipment Name:	ProSwap Logger
Model Numbers:	610150-x, 610151-x, 610152-x, 610153-x, 610154-x, 610155-x
Accessories:	610175, 610185, 006108, 627195, 626740, 696162
Conforms to the following:	
Directives:	EMC 2014/30/EC LVD 2014/35/EU WEEE 2012/19/EU RoHS 2011/65/EU
Harmonized Standards:	EN61326-1:2013 EN61326-2-3:2013 EN61000-3-2:2014 EN61000-3-3:2013 EN55011:2009
Authorized EU Representative	Xylem Analytics UK Ltd Unit 2 Focal Point, Lacerta Court, Works Road Letchworth, Hertfordshire, SG6 1FJ UK



Signed: Gregory Popp
Title: Quality Manager

Date: May 25, 2021

8.5 Warranty

The YSI ProSwap Logger is warrantied for two (2) years from date of purchase by the end user against defects in material and workmanship. ProDIGITAL handheld meters are warranted for three (3) years from date of purchase by the end user against defects in materials and workmanship. ProDSS sensors are warranted for two (2) years from date of purchase by the end user against defects in material and workmanship. ProDSS pH and pH/ORP sensor modules, optical ODO sensor caps, and handheld Li-Ion battery packs are warranted for one (1) year from date of purchase by the end user against defects in material and workmanship. ProDSS ISE sensor modules (ammonium, nitrate, and chloride) are warranted for 6 months. ProDIGITAL systems (instrument, cables & sensors) are warranted for 1 year (excluding sensor modules) from date of purchase by the end user against defects in material and workmanship when purchased by rental agencies for rental purposes. Within the warranty period, YSI will repair or replace, at its sole discretion, free of charge, any product that YSI determines to be covered by this warranty.

To exercise this warranty, call your local YSI representative, or contact YSI Customer Service in Yellow Springs, Ohio at +1 937 767-7241, 800-897-4151 or visit www.YSI.com (Support tab) for a Product Return Form. Send the product and proof of purchase, transportation prepaid, to the Authorized Service Center selected by YSI. Repair or replacement will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days from date of repair or replacement.

LIMITATION OF WARRANTY

This Warranty does not apply to any YSI product damage or failure caused by:

1. Failure to install, operate or use the product in accordance with YSI's written instructions;
2. Abuse or misuse of the product;
3. Failure to maintain the product in accordance with YSI's written instructions or standard industry procedure;
4. Any improper repairs to the product;
5. Use by you of defective or improper components or parts in servicing or repairing the product;
6. Modification of the product in any way not expressly authorized by YSI.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. YSI's LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AND THIS SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY. IN NO EVENT SHALL YSI BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY.

Xylem |'zīləm|

1) The tissue in plants that brings water upward from the roots;

2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com

Who's Minding *the* Planet?®

xylem
Environmental Solutions

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YSI.com

YSI.com/ProSwap-Logger