I. PROJECT MANAGEMENT
1.0 Title and Approval Page

Maine Volunteer River Monitoring Program (VRMP) Quality Assurance Program Plan

SAMPLING and ANALYSIS PLAN (SAP)

Maine Department of Environmental Protection
Bureau of Water Quality
Division of Environmental Assessment

Title of SAP: Northeast Creek

Volunteer Group Name: Town of Bar Harbor

Date of Latest Modification to SAP: June 20, 2025

Date of VRMP QAPP Being Referenced in this SAP: 2025

Review & Approval Signatures:

Bar Harbor Planning Director:	Michele Gagnon	6/23/2025
	Michele Gagnon	Date
Volunteer Group Coordinator:	Hailey Bondy	6/23/2025
	Hailey Bondy	Date
Maine DEP-VRMP Program Coordinator:	Kristin Feindel	6/23/25
	Kristin Feindel	Date
Maine DEP-Volunteer Monitoring Specialist:	Amelie Jensen	6/23/25
	Amelie Jensen	Date

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1.2 List of Tables, Figures, and Appendices

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Acronyms Commonly Used in This Document

DEP	Department of Environmental Protection (also MDEP)
EGAD	Environmental and Geographic Analysis Database
MDIBL	MDI Biological Laboratory
PAL	Pace Analytical Laboratory
Pre-EDD	Pre-Electronic Data Deliverable
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
VRMP	Volunteer River Monitoring Program

1.3 SAP Distribution List

- Names & contact information for Maine DEP recipients.
- Names & contact information for volunteer group representatives.
- Names and contact information of external technical reviewer(s), if any.

Table 1. Distribution List

Name	Title	Organization	Email	Phone Number
Kristin Feindel	VRMP Program Manager	MDEP	kristin.b.feindel@maine.gov	207-215-3461
Amelie Jensen	Volunteer Monitoring Specialist	MDEP	amelie.jensen@maine.gov	207-592-2068
Michele Gagnon	Planning Director	Town of Bar Harbor	mgagnon@barharbormail.org	207-288-3329
Hailey Bondy	Staff Planner; Volunteer Group Coordinator and Data Manager	Town of Bar Harbor	hbondy@barharbormaine.gov	207-288-1783
Lisa Shaffer	Project Manager	Pace Analytical, Brewer Service Center	Lisa.Shaffer@pacelabs.com	508-439-5166
Jane Disney	Director, Community Environmental Health Laboratory	MDI Biological Laboratory	jdisney@mdibl.org	207-288-9880 ext. 423
Tony Griffin	Lab Manager	Bar Harbor Sewer Plant	wwsupt@barharbormaine.gov	207-288-4028

1.4 Project / Task Organization.

- Identify the individuals and organizations participating in your project and outline their specific roles and responsibilities (Table 1) other than those already included in the Maine DEP's Volunteer River Monitoring Program (VRMP) QAPP.
- Include group's coordinator(s), decision-makers, project data manager, principal data users, laboratories and any other persons critical to the implementation of the SAP.
- Each entry should include the following: name, title, organization, and a brief description of that person's or organization's responsibilities related to this specific project.
- Use or include an organizational chart (Figure 1) or table that identifies reporting relationships between and within organizations and between personnel participating in the project.

The Group Coordinator is Hailey Bondy. She will be responsible for coordinating volunteers and interfacing between the Town of Bar Harbor, MDEP, laboratories, and volunteers. The Data Manager is Hailey Bondy and will be responsible for data review and data entry. MDEP VRMP staff will provide equipment, training, and act in an advisory capacity, as needed. MDEP VRMP staff will provide an annual data report and data management through the Maine VRMP Data Dashboard. Volunteers from the town of Bar Harbor will perform the sampling. See Figure 1 and Table 2.

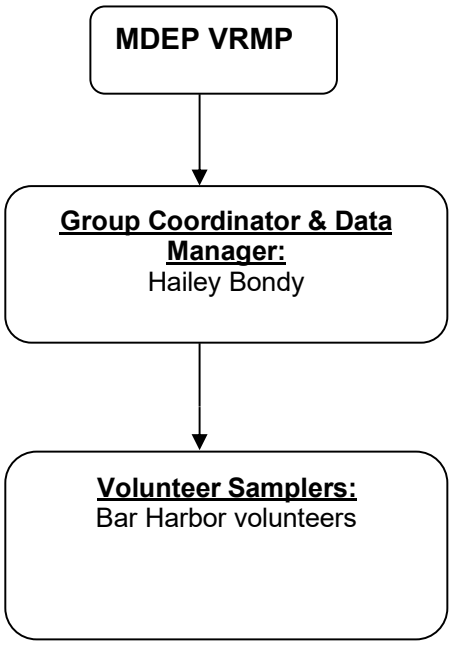

Figure 1 Organizational Flow Chart

Table 2: Position and Responsibilities of Group's Volunteer Monitors

Position	Responsibilities
Volunteer Group Coordinator: Hailey Bondy	• Oversees organization of group's Volunteer monitoring program • Assists MDEP VRMP staff with sampling site location determinations and any changes to sites • Develops and updates Sampling & Analysis Plan (SAP) • Assists with volunteer training sessions • Recruits and manages volunteers • Ensures volunteers receive most up-to-date copy of the SAP • Acts as primary contact with recruited volunteers • Coordinates with lab that provides analyses, and sends lab report to VRMP staff
Data Manager: Hailey Bondy	• Collects and reviews volunteer data sheets for quality assurance • Ensures all water quality data is submitted to VRMP staff in Pre-EDD format or through the Survey123 application to the Maine VRMP Data Dashboard • Looks at suspect data and contacts VRMP program with questions • Sends completed field forms and laboratory analysis reports to VRMP
Volunteer Samplers: Bar Harbor volunteers	• Attends annual training session • Collects water quality data and records data on paper field forms or electronic field forms • Submits data using the Survey123 application to the Maine VRMP Data Dashboard

1.5 Problem Definition / Project Background

- Provide sufficient background information to provide a historical, scientific, and regulatory perspective for the project.

- Describe any known water quality impact issues, studies, local ordinances, or watershed management plans which form the basis for the project. Information on Maine's water classification, assessment reports, and water quality data is available on Maine DEP's Rivers and Streams website: < http://www.maine.gov/dep/water/rivers-streams/index.html >.

Northeast Creek is not listed as impaired in the 2018/2020/2022 or the draft 2024 Integrated Water Quality Monitoring and Assessment Reports. However, it appears on the Maine DEP Impaired Marine Waters Priority List due to a historic shellfish harvesting restriction and nonpoint source threats from development (Maine Department of Environmental Protection, 2023). In the 2014 and 2016 editions of the Integrated Water Quality Report, the estuary and Thomas Bay were classified as Category 5-B-1(a): Estuarine and Marine Waters Impaired for Bacteria Only – TMDL Required. The harvesting restriction was lifted in 2015. The harvesting restrictions were based on high bacteria levels, measured using P90 scores. The Maine Department of Marine Resources (DMR) collects fecal coliform levels in the Mount Desert Narrows, where Northeast Creek enters Thomas Bay. Since 2015, P90 scores have remained below the threshold requiring shellfish harvesting restrictions, as defined by the National Shellfish Sanitation Program (NSSP). Currently there is no approved TMDL for the estuary.

While bacteria contamination in the waterbody has improved, nitrogen pollution remains a concern. In 1998, the National Park Service, U.S. Geological Survey, Town of Bar Harbor, and research scientists began characterizing nitrogen dynamics in the Northeast Creek estuary in response to concerns over rapid land use changes. A 1999–2000 study identified significant variations in nitrogen loading rates among the tributary watersheds, likely driven by differences in land use. Compared to eutrophic estuaries elsewhere on the East Coast, nitrogen loading rates in Northeast Creek were relatively low. Following this initial study, researchers conducted land use assessments and nitrogen loading simulations for various landscape categories. The study established that: 2.2 kg/ha/yr marks the transition from a "healthy" to a "degrading" estuary, and 4.4 kg/ha/yr represents the shift from "degrading" to "degraded" conditions. These findings were used to guide land use planning decisions within the watershed.

In 2010, the Town of Bar Harbor, National Park Service, and USGS conducted follow-up studies to evaluate changes in nitrogen loading over the preceding decade and to assess the accuracy of the land use-based nitrogen loading simulations. Using updated aerial imagery, researchers revised the GIS land use dataset, maintaining the same classification scheme as the original study. Despite a 40% increase in rural housing between 2000 and 2008, land use changes were relatively modest, with only a 2.6% shift, primarily from forest and agriculture to urban/suburban development. This shift was projected to increase total nitrogen loading by 7%, with a predicted load of 2.12 kg/ha/yr. However, nitrogen loads estimated from streamflow and water quality data showed a much larger increase, with total nitrogen loads from five main tributaries rising by 66%, from 1.9 kg/ha/yr to 3.1 kg/ha/yr between 2000 and 2010. These findings suggest that land use change models alone may not fully account for observed nitrogen loading trends in the watershed, as climate factors, including increased rainfall and streamflow, likely contributed to the rise in nitrogen loading during the study period. A lack of recent nitrogen loading data in the watershed impedes the Town's ability to plan for future development in an environmentally sound manner.

Between 2000 and 2001, the USGS, in collaboration with Acadia National Park, collected additional water quality samples at the Route 3 bridge monitoring station (USGS-01022820), analyzing 34 parameters to further assess nutrient conditions. Together with data from five other stations in the creek, these monitoring efforts established baseline seasonal patterns in the estuary's water chemistry.

Phosphorus levels in the watershed's ponds also indicate potential nutrient loading into the Northeast Creek system. According to the Lake Stewards of Maine, Hamilton Pond has a mean bottom-grab total phosphorus (TP) concentration of 36 µg/L, based on only two samples collected in 1985 and 1988. A single

epilimnion grab sample from 1988 measured 12 µg/L. Although the bottom grab value is on the higher end for Maine lakes, the limited data set makes it difficult to draw firm conclusions. Similarly, French Hill Pond has an average surface grab TP concentration of 34 µg/L, based on two samples collected in 2009 and 2016. These elevated phosphorus levels suggest potential nutrient inputs into the Northeast Creek watershed, warranting further investigation into nutrient sources.

The Maine DEP Biomonitoring Program conducts macroinvertebrate surveys at the “Lake Wood Outlet Stream – Station 855” in the eastern portion of the watershed. This site’s attainment of its AA statutory class has been indeterminate in the last two years of monitoring (2017 and 2021), but it attained Class B status in the previous three survey years. Northeast Creek has been assigned Class AA status for its segments within Acadia National Park, Class B for reaches outside of the park boundary, and Class SB for the estuarine reaches.

Looking forward, the development pressure is very high for the Northeast Creek watershed. Bar Harbor is facing a significant housing shortage, particularly affordable and workforce housing. With many zoning and physical constraints already in place limiting development, any existing areas of developable land will be in high demand in the near future. A housing analysis conducted by RKG Associates as part of the Bar Harbor 2035 A Comprehensive Plan for the Future estimated that there will be demand for approximately 616 new housing units by 2033. Given the concern of existing nonpoint source pollution in Northeast Creek, there is large concern from Bar Harbor residents that further development in the watershed could lead to degradation in water quality and habitat. Development of a watershed-based management plan is key to understanding current and future water quality within the watershed and to developing sustainable recommendations that balance watershed protection with development.

All residential and commercial developments within the Northeast Creek watershed rely on septic systems, as Bar Harbor's sewer lines do not extend into the area. Additionally, the Maine Water Well database indicates a high concentration of wells within the watershed. Because all developments in the watershed rely on septic systems and many properties depend on wells for drinking water, protecting groundwater quality is essential to prevent contamination.

1.6 Project / Task Description

- Provide an overview of the project.
- Describe your group's expected goals for participating in the VRMP (e.g. baseline data, determine health of watershed, potential for re-classification). In addition to expected goals state the specific problem to be solved, decision to be made, or outcome to be achieved. In other words, describe the reason the monitoring is being done.
- This section must give an overall picture of how the project will resolve the problem, goal, or question described in the previous section. Provide a brief summary of the "who, what, where, when, why, and how" aspects of the project. Include a general description of the sampling region (detailed site locations are covered later in this SAP [section 2.0]).
- Summarize work to be performed, products to be produced, and the schedule/timeline.

This SAP is being developed to evaluate water quality in the Northeast Creek watershed and establish baseline water quality standards for Northeast Creek and its tributaries. Emphasis will be placed on nutrient, chloride and bacteria monitoring in subbasins of the watershed, with testing focused on the primary tributaries (Aunt Betsey's Brook, French Hill Brook, Old Mill Brook, Stony Brook, and Liscomb Brook) and Northeast Creek including one estuarine site located below the Head of Tide, near the Route 3 bridge, and one site on the mainstem accessed from Stone Barn Farm. The goal is to determine whether nutrient inputs into Northeast Creek have increased since earlier USGS monitoring, and how these inputs are spatially distributed in the watershed. Developing an understanding of current baseline water quality will aid in evaluating impacts of potential pollution sources (e.g., failing septic systems, agriculture) and guide future development planning by the Town of Bar Harbor. The sampling locations have been selected and documented with the help of the MDEP VRMP staff.

This SAP provides the means and methodologies for monitoring water quality within the Northeast Creek watershed and guarantees that usable data is collected to support plan implementation. This plan covers the monitoring period from June to September 2025.

Following training by, and under the guidance of the MDEP VRMP staff, the volunteer sampling team will conduct sampling from June to September 2025. Two YSI ProSolo meters will be provided by the MDEP VRMP. Volunteer monitors will take direct measurements of water temperature, dissolved oxygen, salinity, and specific conductance, twice a month. Standard operating procedures (SOPs) for monitoring these variables are provided in Appendix A. Grab samples for *E. coli* (freshwater sites) or fecal coliform (tidal site), Total Kjeldahl Nitrogen, Nitrate + Nitrite, Ammonia, Total Nitrogen, Total Phosphorus, Orthophosphate, and Chloride will be collected monthly during one of these events from each site. Grab samples will additionally be collected during two wet weather events between June and September 2025. SOPs for collecting grab samples for nutrients, chloride and bacteria are provided in Appendix A. The 250 mL unpreserved bottles for Chloride and Orthophosphate will be triple-rinsed with water from the sample water at each site. The bottles containing preservative for analysis of Total Phosphorus, Nitrogen species, and fecal coliform will not be rinsed at each site. The results of the YSI and grab sampling will be forwarded to the data manager for input into a spreadsheet (the VRMP Survey123 appfield form).

The methodologies outlined in this SAP are consistent with the Generic Quality Assurance Project Plan (QAPP) for the Maine Volunteer River Monitoring Program (2019-2024). These methods will be utilized throughout the process to ensure high quality data collection.

1.7 Data Quality Objectives and Criteria

- Discuss your targeted data quality objectives and measurement performance criteria for all parameters that include the following. Refer to Table 3a and Table 3c of the VRMP QAPP (attached as Appendix D and E in this SAP) and list any deviations or additions.
  - *Precision*: in most cases, using the relative percent difference or "RPD" method
  - *Accuracy*: shows how close a sample result is to the actual value
  - *Measurement range*: the range of reliable measurements of an instrument or measuring device
  - *Quality control samples*: in most cases, 10% of samples should be quality control samples
- Discuss the representativeness of sampling design and monitoring schedule: collecting samples that represent actual stream conditions (example considerations: season, time of day, frequency of sampling).
- Discuss the completeness required (completeness is the measure of the number of samples you must take to be able to use the information as compared to the number of samples you plan to take).
- Discuss comparability (extent that data can be compared to past data from the project or data from another project).
- (*See Appendix 1 of the VRMP QAPP for more information*). Refer to section 4.4 of the VRMP QAPP for minimum VRMP standards. Insert or append a table summarizing plans, if necessary.

The volunteer monitors will measure the following parameters: water temperature, dissolved oxygen, salinity, specific conductance, bacteria, and nutrients. They will follow the data quality objectives for precision, accuracy, and measurement range as outlined in the VRMP QAPP.

Representativeness
Water quality will be measured at 7 freshwater sites within the Northeast Creek watershed and 1 tidal/marine site. Sites were selected based on sub-watershed drainages, accessibility from roads, and key estuarine locations. The samples will be representative of water quality during the relatively warmer, drier months of June through September. At freshwater sites, monitoring will be done before 8:00 AM whenever possible, as this is the time of day when dissolved oxygen is at the lowest level. Sampling of the tidal site will occur either first or last to best correlate with low tide, but does not need to occur within a specific low-tide window. All samples will be collected from sampling sites at locations and depths that are well mixed.

Quality Control
All parameters are tested in the field using calibrated meters. Volunteers will undergo training and show proficiency with obtaining accurate and consistent measurements. See section 2.4 for QA/QC details.

Completeness
The data will be considered complete for the purposes of assessing the general health and conditions of the creek, and for showing trends in seasonal or year to year water quality. The goal is to collect/monitor a minimum of 90% of the expected total number of sampling events for the sampling season.

Comparability
Data collected will be comparable to all other data collected under the VRMP since the volunteer monitors will be following SOPs and standards set forth in the VRMP QAPP. There will be consistency in training, equipment calibration and sampling locations throughout the duration of the program.

1.8 Training Requirements / Certification

- Groups participating in the VRMP must be trained or recertified by VRMP/DEP staff on an annual basis.
- Identify and describe any specialized training or certifications needed by personnel in order to successfully complete the project or task.
- Refer to training and certification details included in the Volunteer River Monitoring Program QAPP (see section 4.5) as needed.
- List laboratories that will be part of the study design. Contact the VRMP Coordinator for a list of approved laboratories and the parameters for which they are approved.

All volunteers will be certified or re-certified through a training session provided by staff from the Maine DEP VRMP in May 2025. The volunteers will receive training on the use of dissolved oxygen/temperature meters, conductivity meters, conducting grab samples and completing data sheets. Volunteers will also be trained in the calibration of meters. VRMP staff will maintain a list of certified volunteers.

Safety will also be covered during the training. Volunteers are strongly encouraged to work in teams allowing for increased reliability, coverage and safety during collection visits. They are cautioned about the dangers of working around streams/rivers and advised on practices to increase safety (e.g. informing family/friends about sampling plan, carrying a cell phone).

1.9 Documentation and Records

- Describe the process and responsibilities for ensuring the appropriate project personnel have the most current approved version of the QAPP and SAP, including necessary updates.
- Detail the types of data and other records that will be kept in this volunteer group's archives (electronic or hardcopy) as well as how that information will be forwarded to the VRMP. If these details are exactly the same as those described in sections 4.6 and 5.10 of the VRMP QAPP, then a reference to that document is sufficient. If this volunteer group plans any deviations from those protocols, then specify below. (Records can include raw data, data from other sources such as databases or literature, field logs, sample preparation and analysis logs, instrument printouts, model input and output files, reports, and results of calibration and QC checks.)
- Briefly identify any other records and documents applicable to the project that will be produced, such as annual reports and audit reports, if applicable. Specify or reference all applicable requirements for the management of records and documents, including location and length of retention period.

The SAP will be reviewed annually to determine if any changes are necessary (e.g. changes in SOPs, additions/deletions/re-location of sampling sites, additions/deletions of parameters that are sampled). Modifications may be made at the discretion of the Group Coordinator with input and final approval from the VRMP Program Manager. The Volunteer Group Coordinator will sign the "Project Oversight Certification" form (Appendix C) which states they understand the requirements of the SAP and the QAPP and will fulfill these requirements.

Field Forms: Each monitor or team of monitors maintains the completed field forms for the sampling station(s) to which they are assigned. Completed field forms are given to the Data Manager, who will review the forms and enter the data into a pre-EDD spreadsheet or the VRMP Survey123 app. Copies of all field forms and the and the Pre-EDD spreadsheets if applicable will be sent either periodically throughout or at the end of the field season to VRMP staff.

Data submitted through the VRMP Survey123 app is immediately available for public viewing on the Maine VRMP Data Dashboard. The intent is for the data to be uploaded as soon as possible, for the educational benefit of the volunteers and community. Data are reviewed by MDEP VRMP staff and uploaded into MDEP's EGAD database following protocols outlined in section 5.10 of the VRMP QAPP. MDEP VRMP staff will provide groups with an annual data report and data will be available for visualization and for download on the Maine VRMP Data Dashboard.

Lab Data: Copies of lab reports for analysis of *E. coli* completed by the MDI Biological Laboratory, fecal coliform by the Bar Harbor Sewer Plant, and nutrient concentrations by Pace Analytical Laboratory will be sent to the Group Coordinator and the VRMP staff. Each Lab will also send QA/QC data to the VRMP Program Manager.

II. DATA GENERATION AND ACQUISITION
2.0 Sampling Process (Experimental Design)

Describe the experimental data generation or data collection design for the project including the following:

- *Design of the sampling network [Table 3] (i.e. sampling locations)*: Provide a list or table, or map that shows the geographic locations of sample stations (see Figure 2). Be sure to include the geographic coordinates. The VRMP will assist with documenting locations of sampling sites (Appendix 6 {Sampling Site Location Form} of the VRMP contains the necessary form for documenting this information.)
- *Specific water quality, hydrology, habitat and biology parameters to be sampled or monitored [Table 2].*
- *Sampling methods (provide brief summaries here) [Tables 2 and 3].* The details regarding sampling methodologies, protocols and SOPs are saved for Section 2.1.
- *Sampling frequencies [Table 2]* including and sampling season(s) including numbers of samples and monitoring period.
- *Rationale for sampling design* (i.e., addressing the group's goals, representativeness, safety, landowner permission, etc.).
- Insert or append tables, as necessary (see examples below). Refer to sections 5.1 and 5.2 of the VRMP QAPP for guidance.

Monitoring will be conducted at eight sites within the watershed from June through September 2025, with two additional wet-weather monitoring events during this period. For this project, wet weather will be defined as a sample collected within 24 hours of at least 0.5" rain.

Temperature, dissolved oxygen, salinity, and specific conductance will be collected at each site using a YSI ProSolo field meter (Appendix A). These field parameters will be collected bi-weekly from each site. Grab samples will be collected monthly during one of these events from each site. *E. coli* samples from freshwater sites will be analyzed at the MDI Biological Laboratory (MDIBL) in Bar Harbor, fecal coliform samples from the marine site will be analyzed by the Bar Harbor Sewer Plant (BHSP), and all other samples will be analyzed by Pace Analytical Laboratory (PAL). Duplicates for all parameters will be taken at one site during five out of six events (at least one during wet weather sampling) for all parameters. All laboratories and analysis methods are listed in Section 2.3 of this SAP.

Table 3: Sampling Parameters, Method and Frequency

Parameter	Method*	Frequency
Water Temperature	YSI ProSolo meter	Twice a month from June - Sept
Dissolved Oxygen	YSI ProSolo meter	Twice a month from June - Sept
Salinity	YSI ProSolo meter	Twice a month from June - Sept
Specific Conductance	YSI ProSolo meter	Twice a month from June - Sept
E. coli	Grab sample	Monthly plus two additional wet-weather samples, June - Sept
Fecal Coliform	Grab sample	Monthly plus two additional wet-weather samples, June - Sept
Total Kjeldahl Nitrogen	Grab sample	Monthly plus two additional wet-weather samples, June - Sept
Nitrate + Nitrite	Grab sample	Monthly plus two additional wet-weather samples, June - Sept
Ammonia	Grab sample	Monthly plus two additional wet-weather samples, June - Sept
Total Phosphorus	Grab sample	Monthly plus two additional wet-weather samples, June - Sept
Chloride	Grab sample	Monthly plus two additional wet-weather samples, June - Sept
Orthophosphate	Grab sample	Monthly plus two additional wet-weather samples, June - Sept
Total Nitrogen	Grab sample	Monthly plus two additional wet-weather samples, June - Sept

* Standard Operating Procedures for the YSI and grab sample procedure are in Appendix A. Laboratory methods are shown but are not covered in this SAP.

Table 4: Sampling Sites, Group's Site ID#, Coordinates, and Sampling Method

VRMP Site ID	Site Description	Geographic Coordinates	Freshwater/ Tidal	Sampling Method/Location
NEC01	Northeast Creek mainstem from Stone Barn Farm	44.418056, -68.306944	Freshwater	Wading/Reach with extension pole or sample from boat
NEC02	Northeast Creek Estuary at Rte. 3 Bridge	44.424712, -68.326889	Tidal	Wading/Reach
ABB01	Aunt Betsey's Brook at Gilbert Farm Rd	44.405833, -68.319444	Freshwater	Wading/Reach
FHB01	French Hill Brook at Betsey's Rd	44.406389, -68.312222	Freshwater	Wading/Reach
OMB01	Old Mill Brook at Norway Dr	44.41460, -68.29570	Freshwater	Culvert/Wading/Reach
OMB02	Old Mill Brook at Mill Brook Rd	44.398889, -68.287778	Freshwater	Wading/Reach
LB01	Liscomb Brook at Norway Dr	44.41917, -68.29167	Freshwater	Wading/Reach
SB01	Stony Brook upstream of Hamilton Pond	44.42611, -68.28361	Freshwater	Wading/Reach

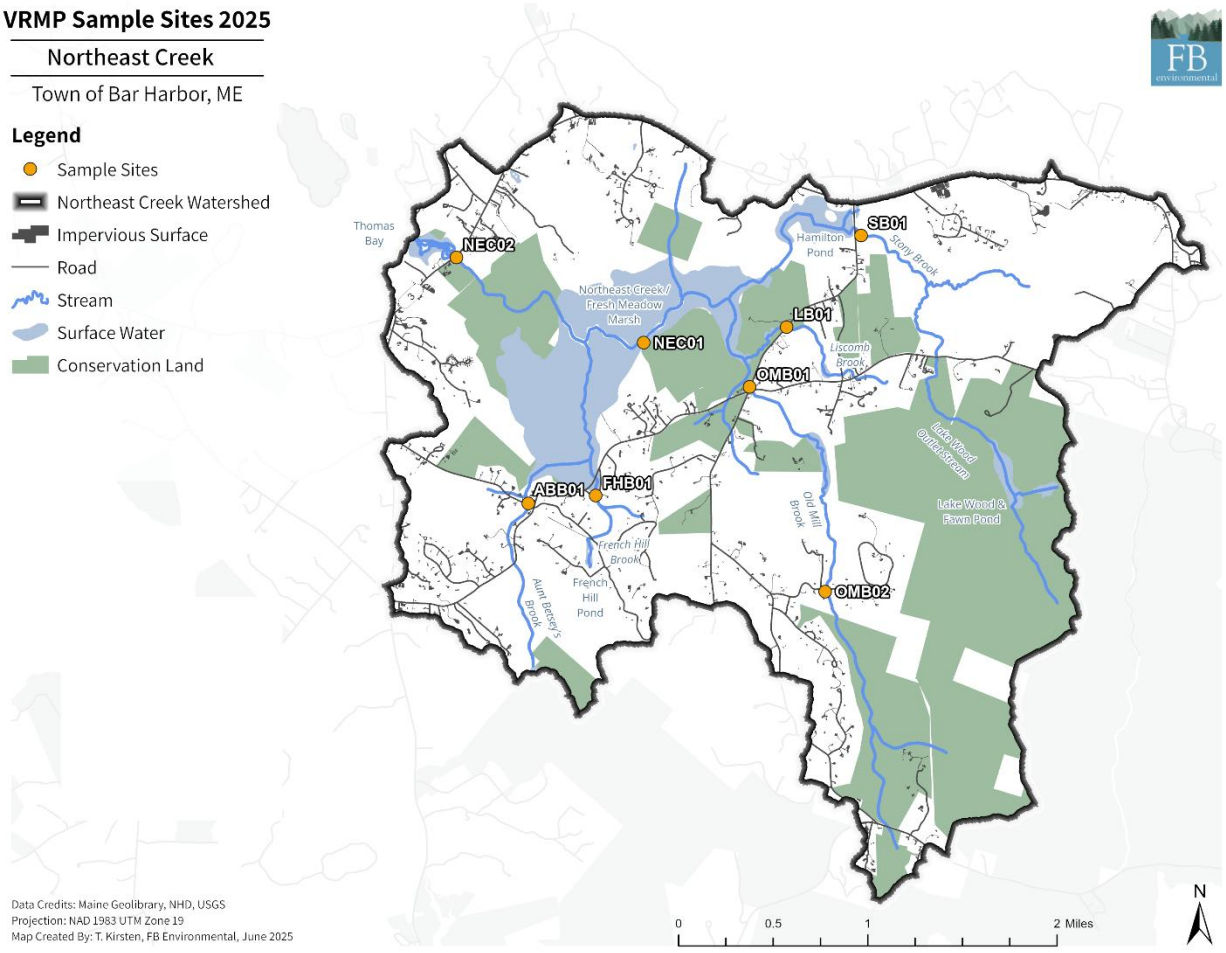

Figure 2: Map of Sampling Site Locations

2.1 Sampling Methods

- Describe the procedures for collecting samples.
- Identify the sampling methods and equipment, including any implementation requirements, sample preservation requirements, decontamination procedures, and materials needed for projects involving physical sampling.
- Insert or append tables and SOPs as necessary. Refer to sections 4.4, 5.1, and 5.2 of the VRMP QAPP for guidance as needed, as well as Appendix 2 (VRMP Standard Operating Procedures {SOPs} Cookbook).
- Refer to Table 3a of the VRMP QAPP for data quality objectives and Table 3c for typical preservation requirements for various parameters (attached as Appendix D and E in this SAP).

On each monitoring day and at each location, volunteer monitors will take direct measurements of water temperature, dissolved oxygen, salinity, and specific conductance using a YSI meter. Grab samples for nutrients and chloride will be collected using bottles, and using whirl-paks for bacteria. The SOPs for each of the parameters are in Appendix A.

Appendix 6 of the VRMP QAPP describes the required river/stream sampling and monitoring locations (i.e. longitudinal, vertical and horizontal position in the channel). The volunteers will have equipment including long water quality meter cables and samplers to allow sampling at required locations and depths as needed. For all sampling, volunteers will either wade/reach (may use extension pole) or use bridge locations to collect a representative measurement. All volunteer monitors will be equipped with a data sheet in which general field observations, quality assurance checks and water quality data are recorded (VRMP QAPP Appendix 5a).

Each volunteer will take a field duplicate sample in a separate container within a minute of the first grab sample once every 10 samples. Field duplicates for dissolved oxygen, temperature, salinity, and specific conductance, are taken with the YSI ProSolo by leaving the probe in the water for 5 minutes after the first reading before recording the duplicate reading. A minimum of one field duplicate per season per volunteer will be taken, even if a volunteer collects fewer than 10 samples, specified in Section 4.4 of the VRMP QAPP.

In total, a minimum of 53 surface grab samples (48 samples plus 5 duplicates) will be collected per parameter (some analyses may share bottles). If modification to the approved SAP is deemed necessary by the Project Manager and the project team, revisions and amendments will be submitted to Maine DEP VRMP staff for review and approval. Field activities to be conducted under this SAP at the locations shown in Figure 2 shall include:

1. Eight sites in the Northeast Creek watershed will be monitored biweekly for temperature, dissolved oxygen, salinity, and specific conductivity as outlined in the VRMP SOP (Appendix A).
    - All field data will be recorded using the VRMP Field Data Sheets (Appendix 5 of the VRMP QAPP).
    - Field parameters will be collected before 8am on each sampling day.
    - Field parameters will be collected on Wednesdays or Thursdays only because of restricted MDIBL capacity to analyze *E. coli* samples on other days of the week.
2. Because the sampling plan involves both tidal and freshwater sites, the tidal site in Thomas Bay will be sampled first or last in each sampling event. The YSI ProSolo should be rinsed with freshwater after use at the tidal site. The meter should also be rinsed well at each sampling location, which can be achieved by allowing the meter to equilibrate properly.
3. Surface grab sample collection to be analyzed for *E. coli* indicator bacteria at seven freshwater sites and fecal coliform at one estuarine site, total nitrogen, total Kjeldahl nitrogen, nitrate + nitrite,

ammonia, total phosphorus, chloride, and orthophosphate at eight sites during four monthly events and two wet weather events as outlined in the VRMP Water Grab SOP (Appendix A).

2.2 Sample Handling and Custody

- Describe the requirements for sample handling and custody in the field, laboratory, and transport; taking into account the nature of the samples, storage temperature requirements, the maximum allowable sample holding times before extraction or analysis, and available shipping options and schedules for projects involving physical sampling.
- Refer to the VRMP QAPP as needed (section 5.3 and Appendix 2 and 8). Please note any deviations from these VRMP recommended procedures so that they may be reviewed.
- Indicate which laboratory will be used to analyze your samples, if applicable. (See section 4.5 of the VRMP QAPP for information about laboratories that can be used by volunteer groups wanting to have their data in the VRMP database.)
- Examples of sample labels and chain-of-custody or sample submission forms/logs should be included when they differ from those in the VRMP QAPP (section 5.3, Appendix 8).

All grab samples will be collected in bottles provided by PAL and stored on ice in the dark at 4°C until delivery to the laboratory.

Samples for *E. coli* will be collected in Whirl-paks and fecal coliform will be collected in bottles. Both sets of samples will be stored on ice in the dark at 4°C until delivery to the lab within 6 hours. Sample analysis will be initiated within 2 hours of lab arrival.

E. coli samples must be delivered to MDI BioLab no later than six hours after the collection of the first sample. Fecal coliform samples must be delivered to the Bar Harbor Sewer Plant no later than six hours after the collection of the first sample. Pace Analytical lab samples must be delivered to the Brewer Service Center (72 Center Street, Suite 3, Brewer, ME 04412) by 5PM on the day of sampling.

Volunteers must fill out the appropriate lab chain-of-custody (COC) forms for each laboratory (Appendix F. Copies of completed COCs and field forms must be sent to the Group Coordinator for record-keeping by the end of each sampling day.

Laboratory results will be sent to the VRMP Project Manager for review.

Sample containers for laboratory analyses will be labeled with the following:

a) Volunteer group name
b) Date and time of sample
c) Station ID#
d) Type of analysis (e.g. E. coli)

2.3 Analytical Methods

- Identify the analytical methods and equipment required, including sub-sampling or extraction methods, and any specific performance requirements for the method.
- Where appropriate, refer to section 5.4 of the VRMP QAPP and its SOPs (in Appendix 2) or to SOPs from other laboratories.
- Specify the laboratory turnaround time needed, if important to the project schedule. Discuss how problems are addressed in section 3.0 below.

Dissolved oxygen, temperature, specific conductance, and salinity will be measured in the field with a YSI meter.

Laboratory analysis of *E. coli* samples will follow the IDEXX Colilert-18 operating procedures and will be incubated for less than 24 hours at 35°C ± 0.5°C. Samples will not be regularly diluted but could be diluted 1:10 or 1:100 when levels are expected to be high (above 2,419 MPN/100 ml). See Appendix A for details. MDI Biological Laboratory has a QAPP on file with Maine DEP that is currently in the process of being updated; all sample analysis will occur in adherence with their QAPP.

Laboratory analysis of fecal coliform samples will follow the Bar Harbor Sewer Plant Quality System Procedure for the IDEXX Colilert-18 method. See Appendix A3 for details.

Total Kjeldahl Nitrogen, Nitrate + Nitrite, Ammonia, Total Nitrogen, Total Phosphorus, Orthophosphate, and Chloride analysis at Pace Analytical Laboratory will follow the methods detailed below:

- Total Kjeldahl Nitrogen: 4500NH3-H: Ammonia by Flow Injection Analysis
- Nitrate + Nitrite: 4500NO3-F: Nitrate by Automated Cadmium Reduction
- Ammonia: 4500NH3-BH: Ammonia: Preliminary Distillation Step
- Total Phosphorus: 4500P-E: Phosphorus by Ascorbic Acid
- Chloride: 4500CL-E: Chloride by Automated Ferricyanide Method
- Orthophosphate: 4500P-E: Phosphorus by Ascorbic Acid
- Total Nitrogen: SM 4500-N Calculation

2.4 Quality Control

- Identify any QC activities needed for each sampling, analysis, or measurement technique that differ from those listed in the VRMP QAPP (sections 4.4 and 5.5) and associated SOPs (Appendix 2). Include if any guidance on when the 10% duplicate should be taken (e.g. on the 10th sample or middle of field season).

- For any additional QC activities, list the associated method or procedure, and acceptance criteria. Be sure to describe how sample bottles or containers, if used, will be appropriately prepared (rinsed, sterilized, etc.) prior to sampling (or if new containers shall be used), by either a laboratory or the volunteer group.

- Explain arrangements made with the analytical laboratory regarding delivery (i.e. format and timeline) of the results of their internal quality control procedures.

Monitors follow VRMP Program SOPs for each parameter monitored (Appendix A). Additional details regarding QA/QC procedures are contained in the VRMP QAPP (section 4.4 and 5.5).

Each volunteer will take a field duplicate grab sample in a separate container within a minute of the first grab sample once every 10 samples. Field duplicates for dissolved oxygen, temperature, salinity, and specific conductance, are taken with the YSI ProSolo by leaving the probe in the water for 5 minutes after the first reading before recording the duplicate reading. A minimum of one field duplicate per season per volunteer will be taken, even if a volunteer collects fewer than 10 samples, specified in Section 4.4 of the VRMP QAPP. Comparisons of duplicates versus “original” sample results will be expected to meet the criteria in the VRMP QAPP (Table 3a).

Five duplicates for nutrient samples (including chloride) will be taken throughout the field season. Ten duplicates will be taken for YSI parameters. One duplicate will be taken for fecal coliform. Duplicates for *E.coli* will be taken every other sampling event which includes an *E.coli* sample. One lab blank for *E.coli* will also be used for each sampling event.
E.coli samples will be collected with whirl-paks. All nutrient and fecal coliform samples will be collected in bottles. All sampling containers will be checked before leaving a site and before delivery to the lab to ensure lids are properly sealed, and that no containers have been damaged.

2.5 Instrument / Equipment Testing, Inspection and Maintenance

- Identify any instrument/equipment testing, inspection and maintenance activities that differ from those listed in the VRMP QAPP (section 5.6) and associated SOPs (Appendix 2). For any different or additional procedures, describe how they will be implemented and documented to assure quality.
- Describe how deficiencies are to be resolved, when re-inspection will be performed, and how the effectiveness of the corrective action shall be determined and documented.
- Describe or reference how periodic preventive and corrective maintenance of measurement or test equipment and their components affecting quality shall be performed to ensure availability and satisfactory performance of the systems (refer to specific equipment manuals if necessary).
- Identify the equipment and/or systems requiring periodic maintenance. When appropriate, assemble such activities into SOP format to be appended to the SAP.

Table 5b from the VRMP QAPP provides equipment inspection and maintenance requirements.

2.6 Instrument / Equipment Calibration and Frequency

- Identify all instruments and other equipment used for data generation/collection activities that must be controlled and, at specified periods, calibrated to maintain performance within specified limits. Instruments must be calibrated and checked as stated in the VRMP QAPP (sections 4.4, 4.5, 5.5, and 5.7).
- Refer to SOPs for use of each instrument/piece of equipment for specific details about additional calibrations (e.g., most dissolved oxygen meters need to be calibrated each day that they are used).
- For any procedures differing from those found in the VRMP QAPP Appendix 2 (SOPs), describe how each will be implemented and documented to assure quality including: the basis for the calibration, certified equipment and/or standards used for calibration and how records of calibration shall be maintained and be traceable to the instrument.

Refer to Table 5b from the VRMP QAPP for maintenance and calibration requirements. Refer to individual SOPs (Appendix A) for details.

2.7 Inspection / Acceptance of Supplies and Consumables

- Describe how and by whom supplies and consumables (standard materials and solutions, sample bottles, reagents, electronic data storage media, etc.) shall be inspected and accepted for use in the project.
- State the acceptance criteria for such supplies and consumables.
- Refer to the VRMP QAPP (section 5.8), associated SOPs, and equipment manuals as needed.

Whirl-pak bags for the collection of E.coli samples will be provided by the Town of Bar Harbor. Whirl-pak bags will be inspected prior to use and discarded if damaged.

Bottles for fecal coliform analysis will be provided by the Bar Harbor Sewer Plant. Bottles will be inspected by field personnel prior to sample collection.

Bottles for nutrient and chloride analysis will be provided by Pace Analytical Laboratory. Bottles will be inspected by field personnel prior to sample collection.

2.8 Non-direct Measurements

- Identify any types of data needed for project implementation or decision-making that is obtained from non-measurement sources such as computer databases, programs, literature files or publications, historical information, maps, data from other monitoring groups, or geographic information systems (GIS). Describe the intended use of the data. Define the acceptance criteria for the use of such data in the project, if applicable, and specify any limitations on the use of the data. Refer to the VRMP QAPP (section 5.9) and associated SOPs as needed.

- If collecting weather data refer to websites such as www.weather.com; www.weather.gov; https://www.maine.gov/mema/weather/general-information.

In some cases, the volunteers may rely on Internet-based weather data from NOAA (www.weather.gov) or Weather Underground (www.wunderground.com).

2.9 Data Management

- Trace the path of the data from their collection/generation to their final use or storage (e.g. the field, the office, the laboratory, town conservation commission, report to watershed council, as well at the VRMP and its EGAD database).
- Describe or reference the standard record-keeping procedures, document control system, and the approach used for data storage and retrieval on electronic media, if different than that detailed in the VRMP QAPP (section 5.10).
- Discuss the control mechanism for detecting and correcting errors and for preventing loss of data during data entry to forms, reports, and databases.
- Provide examples of any forms or checklists to be used.
- Identify and describe all data handling equipment and procedures to process, compile, and analyze the data, including procedures for addressing data generated as part of the project as well as data from other sources, as they apply to your group.
- Describe any data management processes not addressed by the VRMP QAPP (see section 5.10).

Volunteers use standardized VRMP field forms (see VRMP QAPP Appendix 5a) or electronic field data sheets on the Survey123 App (See VRMP QAPP Appendix 5d). Volunteers are advised to carefully review and double check their forms, and ensure the forms are complete and legible. The Data Manager collects the forms and inputs the data into the VRMP Survey123 app. The field forms are checked against the data entry. The Data Manager will also look for suspect data and contact the VRMP about questions or problems. The Survey123 data and field forms are submitted to the VRMP either periodically through the field season or at the end of the sampling season.

VRMP QAPP Section 5.10 outlines the data management, input and review steps taken in managing the VRMP data. Data not meeting the limits for the measured parameters will be discarded at the VRMP level prior to data uploads into the MDEP-EGAD database. Data may also not be uploaded at the discretion of VRMP (e.g. meter calibration value not recorded or value is high/low). Original complete records can still be maintained by the volunteer group and monitors at their discretion. VRMP QAPP Table 6 contains the criteria used to review/validate data.

III. ASSESSMENT AND OVERSIGHT

3.0 Assessment and Response Actions / Problem Resolution

- Describe problem assessments and detection procedures specific to the project not addressed by the VRMP QAPP (section 6.1). Assessments can be done on data versus data quality objectives, sampling and analytical methods, data management, audits of test procedures and methods.
- Discuss the information expected from the problem assessments/detections and the success criteria (i.e., goals, performance objectives, acceptance criteria specifications) for each assessment proposed. Include information as to how any problems identified through these assessments will be corrected, who will carry this out and how the effectiveness of the corrective action(s) will be assessed.
- Describe how and to whom the results of each assessment shall be reported. Include details on how the corrective actions will be verified and documented.

All volunteers must attend a certification/re-certification course offered prior to the start of each sampling season. The Group Coordinator will supervise and coordinate all volunteer activities. The Data Manager will review all field forms and the DEP will provide a second review of the data. If problems are encountered, the Data Manager will communicate directly with the volunteer. Procedures and equipment may need to be examined to determine which steps are critical for resolving the problem. If errors in sampling technique are consistently identified, re-training may be scheduled. All field and laboratory activities and records may be reviewed by VRMP staff upon request.

3.1 Reports to management

- Describe reports to VRMP staff specific to the project not addressed by the VRMP QAPP (section 6.2).
- Identify the frequency and distribution of reports issued to inform VRMP staff of project status including periodic data quality assessments and significant quality assurance problems/recommended solutions or corrective actions.
- Identify the individual responsible for such reports, recipients of the reports, and any specific actions recipients are expected to take as a result of the reports.

The VRMP Program Manager will keep track of volunteers trained at workshops. At the end of the sampling season, MDEP VRMP will provide groups with an annual data report and data will be available for visualization and for download on the VRMP Data Dashboard.

IV. DATA VALIDATION AND USABILITY

4.0 Data Review, Verification and Validation Requirements

- State any criteria used to review and validate (accept, reject, or qualify) data, specific to the project not addressed by the VRMP QAPP (section 7.1), especially as they may apply to your group. Table format is preferred.

VRMP staff are responsible for final review of all field data and laboratory results. Data will be reviewed against Table 6, Criteria used to review/validate data, from the VRMP QAPP. Field and lab duplicates may also be used to assist with decisions.

4.1 Verification and Validation Methods

- Describe any data verification and validation methods not addressed by the VRMP QAPP (section 7.2), especially as they may apply to your group. These may occur at any step from initial data acquisition through the duration of the project.

- Discuss how issues shall be resolved and the system for resolving such issues. Describe how the results are conveyed to the VRMP and other data users. Provide examples of any forms or checklists to be used. Identify any project-specific calculations required.

VRMP Program staff reviews the data submitted by volunteers for outliers and follows up with the volunteer group and monitors if needed. Problematic data (as outlined in the above steps) will be flagged or will not be included in the DEP database (i.e. EGAD). The “problematic data” may, however, be kept by the volunteer group, volunteer monitors and in the VRMP files and archives. The volunteer Data Manager is welcome to send data to VRMP staff periodically during the season for confirmation of procedures and to discuss problem areas as needed.

4.2 Reconciliation with Data Quality Objectives

- Describe how it will be determined if the actual data collected meets the data quality objectives described in Section 1.7. If the data does not meet outlined objectives, describe how it will be utilized.
- Describe how reconciliation with data quality objectives will be documented, issues will be resolved, and how limitations on the use of the data will be reported to decision-makers outside of those identified under the VRMP QAPP (section 7.3).

Data completeness, accuracy and precision will be evaluated by the VRMP Program Manager or staff. Sampling collection methods, equipment and procedures will be reviewed by the VRMP Program Manager or staff to identify the source of problems and correct as necessary. Data will also be periodically evaluated for representativeness and comparability.

IV. REFERENCES

Maine Department of Environmental Protection. "2024 Draft Integrated Water Quality Monitoring and Assessment Report". Available at < https://www.maine.gov/dep/water/monitoring/305b/ >.

Maine Volunteer River Monitoring Program / Maine Department Environmental Protection. March 2025. Maine Volunteer River Monitoring Program (VRMP) Quality Assurance Program Plan (QAPP). Updated by Mary Ellen Dennis and Kristin Feindel, Maine Department of Environmental Protection.

U. S. Environmental Protection Agency (USEPA), 1996. The Volunteer Monitor's Guide to Quality Assurance Project Plans. Office of Wetlands, Oceans and Watersheds; USEPA document # 841-B-96-003; Washington, D.C., 59 pp. < https://www.epa.gov/sites/production/files/2015-06/documents/vol_qapp.pdf > (as of 12/17/2024)

Appendices

APPENDIX A: STANDARD OPERATING PROCEDURES (SOPS) FOR WATER QUALITY MEASUREMENTS USING METERS OR KITS

APPENDIX A1: MAINE VOLUNTEER RIVER MONITORING PROGRAM YSI PROSOLO STANDARD OPERATING PROCEDURE – FIELD DATA COLLECTION METHODS

STANDARD OPERATING PROCEDURE

MAINE VOLUNTEER RIVER MONITORING PROGRAM

METHODS FOR USING THE YSI PROSOLO (ProSolo) OPTICAL DISSOLVED OXYGEN INSTRUMENT IN RIVERS AND STREAMS

Note: The mention of brand names does not constitute recommendation of a specific company.

Volunteer River Monitoring Program (VRMP)

Standard Operating Procedure
Methods for using the YSI ProSolo Optical Dissolved Oxygen Instrument

1. Applicability. This standard operating procedure (SOP) is used by the Volunteer River Monitoring Program (VRMP) of the Maine Department of Environmental Protection's Division of Environmental Assessment. It applies to the collection of dissolved oxygen (DO), temperature and specific conductivity from rivers and streams in Maine using the YSI ProSolo Optical Dissolved Oxygen Instrument.

2. Purpose. This purpose of this SOP is to provide standardized methods for volunteer groups to determine dissolved oxygen, temperature and specific conductivity of rivers and streams as an instantaneous reading using the YSI ProSolo Optical Dissolved Oxygen Instrument. This SOP also provides standardized methods for DEP VRMP staff to conduct quality assurance checks on volunteer groups' equipment.

3. Definitions.

A. YSI. Yellow Springs International, manufacturer of water quality monitoring meters.

B. Optical Dissolved Oxygen Sensor (ODO). Sensor that measures the light emission characteristics of a luminescent reaction.

C. Sensor Cap. Removable sensing cover that protects the sensor and is replaced once per year.

D. Calibration. Set of procedures established by the manufacturer to ensure that the meter is operating properly; a critical quality assurance step in meter preparation prior to use.

E. Sensor Guard. A protective cover for the ODO sensor cap.

F. Calibration/Storage Sleeve. Cover for the probe guard that keeps the probe in a moist atmosphere for storage or calibration.

4. Responsibilities.

A. *Volunteer Monitors & Volunteer Groups*

- **Certification.** It is the responsibility of the individual obtaining this data to maintain current certification for the parameter(s) they collect if they wish their data to be

entered into the VRMP database. Training will be provided to volunteers on an annual basis by VRMP/DEP staff.

- **Data Recording.** It is the responsibility of the individual obtaining this data to record the results and additional qualifying information on current hardcopy or electronic field sheets obtained from their affiliated watershed association or through the VRMP program of the DEP.

- **Data Quality Checks and Data Submission.** The group data manager will collect hardcopy field sheets and perform quality assurance checks on all data. Refer to Section 5.10 of the VRMP Quality Assurance Program Plan (QAPP). Copies of the field sheets will be submitted to VRMP staff for further quality assurance as outlined in the VRMP QAPP. Either the group data manager or the volunteer will enter and submit the data to DEP via the VRMP Survey123 app or in pre-EDD format.

B. ***Volunteer River Monitoring Program (VRMP) Staff***

- **Oversight of Volunteer Groups and Volunteers.** VRMP staff will oversee volunteer groups and volunteers through a variety of ways including maintaining an up-to-date VRMP QAPP; reviewing sampling and analysis plans (SAPs) of the volunteer groups; providing annual training/certification sessions for volunteers; conducting quality assurance checks on volunteer data collection and data submitted by volunteer groups and laboratories; and uploading data into the DEP's EGAD database. These tasks are described in greater detail in the latest VRMP QAPP.

5. Guidelines and procedures.

***A. YSI ProSolo Instrument Preparation*.**

- **First time use (to be done by VRMP staff).** Follow manufacturer's instructions for preparing meter for setup (refer to "1. Introduction", pgs. 4-9; "2. Operation", pgs. 10-29; and "3. Calibration", pgs. 30-38).
    - If you plan to use the data storage features of the meter (in addition to manually writing down data on the VRMP field data sheet), then familiarize yourself with "Logging", pg.16.

- **Beginning of field season (to be done by VRMP staff).** Before each field season, conduct a full inspection of the meter. A newly charged battery pack shall be installed prior to the start of field sampling. A new sensor cap shall be installed if needed (according to the warranty period of the sensor cap). Refer to "Setup ODO", pg. 19; "ODO Cap Prompt", pg. 24; and "4.7 Optical Dissolved Oxygen Sensor", pg. 52-55. Check the accuracy of the DO (mg/l) reading in 100% saturated water such as the aerated aquarium in the DEP water lab. If this method is not available, check the meter against a DEP "benchmark" DO meter for accuracy. Conduct a specific

calibration according to the manufacturer's instructions. Refer to "3.3 Conductivity", pgs. 33-34.

- **Prior to field sampling.** Before each field sample collection, the volunteer shall inspect the meter.
    1. Check screen on handheld for status of battery power. Charge battery with included charging cord if needed.
    2. Check the sensor cap and probe for algae, debris, etc. If anything is present, rinse off with distilled water or tap water.
    3. Check to make sure drops of water are not clinging to the membrane. If drops are present, blow on membrane to gently remove droplets. Don't tap; these probes are very fragile.
    4. Check sponge is present in the grey calibration/storage sleeve and the sponge is moist. It should not have excess water on it that could cause water droplets to cling to the sensor during calibration.
    5. Be familiar with the testing, inspection, maintenance, and calibration considerations described in sections 5.6 through 5.8 of the VRMP QAPP.
    6. Power on the meter and allow sufficient time (15 minutes) to reach equilibrium prior to calibration and initial use for the day. While the readings for optical DO sensors will reach stability almost immediately after turning on, this is only the case when the ambient temperature has not changed. Given the often varied temperatures between indoors, vehicles, and outdoors during the summer season, allowing the meter time to equilibrate will ensure proper calibration and readings.

- **Specific Conductance Calibration.** VRMP staff will conduct a system calibration according to manufacturer's instructions. Specific conductance calibration should not be conducted by volunteers during the monitoring season. If there are any issues with specific conductance or salinity readings, contact your group coordinator or VRMP staff.

- **Dissolved Oxygen Calibration.** YSI recommends that a calibration be performed or verified daily, before sampling starts. While the calibration of newer optical-based dissolved oxygen meters is very stable, the VRMP protocol is to have volunteers calibrate at the beginning of the sampling day, as is done for the other VRMP meters. This is to ensure accurate data and is considered less complicated than verifying the instrument's calibration based on the barometric pressure.

  Calibration with water saturated air is the recommended method. The following calibration instructions are excerpted from Appendix A "3.5 Dissolved Oxygen", pgs. 35-36.
  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. Carefully slide the probe with probe guard 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 sleeve 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. Press **ESC** to return to main screen to begin taking readings.
7. If calibration is unsuccessful, an error message will display on the screen. Press the **Cal** key to exit the error message and return to the run screen. Check there are no droplets of water on the sensor, the sponge is moist, and the calibration sleeve does not create a suction when placed on the probe. Repeat the calibration procedure until calibration is successful. If the calibration still is not successful, contact your group's coordinator.

- **Barometer Calibration.** The barometer is calibrated in the factory. If the barometer requires calibration, contact your group's coordinator or VRMP staff.

B. Temperature/Dissolved Oxygen/Specific Conductance Measurements.

- **Sampling Period and Site Location.** Sampling period and site location information will be documented in the volunteer groups' VRMP-approved SAP which are submitted by the volunteer groups prior to any sampling. (Detailed information regarding how volunteer groups are to obtain and document site location information can be found in VRMP SOP-02 [Documenting Site Location].)

- **Sample Timing.** For the dissolved oxygen data to be most useful, measurements should be taken prior to the start of daily photosynthesis. The VRMP defines this as before 8:00 AM. Monitoring of tidal waters should also consider the tidal cycle in conjunction with the monitoring's goal to ensure the tidal stage is appropriate for the goal. Details on timing should be included in each group's SAP.

- **Familiarize Yourself with the Meter and its User Manual.** Familiarize yourself with the basic operations, keypad and readouts of the meter. Refer to Appendix A "2. Operation", pgs. 10-29.

- **General Sampling Protocol.**
  - Record site location and time on data sheet.
  - Remove probe from calibration/storage sleeve.
  - Submerge probe in the water at the site where you are monitoring, as described in your group's approved SAP. Move the probe in the sample to release any air bubbles.

- Wait for the sensor to stabilize before recording the value on the field sheet. A measurement is considered stable when it stops going in one direction (up or down) and either fluctuates between a couple values (going both above and below by a unit or two) or settles on a value for a period of time.
- Follow the instructions below measuring specific parameters.
- The meter can either be turned off or remain on between stations, depending on time between sites and desire to conserve battery power. If the meter is turned off or turns off automatically, turn it back on, allow it to stabilize, and proceed with measurements. There is no need to recalibrate when the meter is turned back on. The meters are designed to record and save the calibration values.

- **Temperature Measurements.**
  1. Review and follow the instructions for making temperature measurements (Appendix A: Section 2.9 Taking Measurements, pg. 29). Make sure units are °C. If they are not, note this when recording the data.
  2. Be sure the temperature reading has stabilized prior to recording other measurements as many are temperature dependent. Stabilization can take some time when moving between air conditioning/hot car/hot day/cold stream. After you have recorded the other parameter values, check the temperature value has not changed. If it has, use this new value and record any changes to the other parameter values as well.

- **Dissolved Oxygen Measurements.**
  1. Review and follow the instructions for making DO measurements (Appendix A: Taking Measurements). Make sure units are in mg/L (or ppm).
  1. Record dissolved oxygen value displayed on the screen.

- **Specific Conductance and Salinity Measurements.**
  1. There are several options for displaying conductivity. Specific conductance-uS/cm and Salinity-ppt should be enabled. If the meter is reading in other units, be sure to note this when recording the values.
  2. If other options are required see Appendix A for how to change.

- **Quality Control.**
  1. At the beginning of each field season, all VRMP staff and VRMP volunteers who collect temperature, dissolved oxygen and specific conductance data will have a training/refresher/certification session to (re)familiarize themselves with the contents of this SOP.
  2. For every volunteer, a field duplicate shall be obtained for all parameters for at least 10% of their own sampling efforts. A field duplicate will be collected for every 10 samples monitored.
  3. Refer to the VRMP QAPP for more QA/QC details.

6. Equipment Care.

A. Start of field season (to be done by VRMP staff).

1. Follow manufacturer's directions for preparation of a new probe or renewing probe in the spring. Be sure to replace sensor cap at the start of each sampling season or according to the warranty period of the sensor cap. (Refer to Appendix A "ODO Sensor Cap", pg. 53.)
    - *Note of caution:* Avoid handling the face of the sensor cap. DO NOT use alcohol or other organic solvents to clean the face of the sensor cap. These solvents will destroy the sensor cap.
2. Recharge the battery pack at start of each sampling season.
3. If needed, clean the conductivity cell with the supplied soft brush. Refer to "3.3 Conductivity", pg. 33.
4. Check calibration sponge is in good condition. Replace sponge if necessary.

B. Field Season

1. When not in use, keep the meter in a case to protect from damage and to keep clean. Ideally the case will be water-resistant and have padding for additional protection.
2. Keep the calibration/storage sleeve over the probe guard whenever probe is not in use. Be sure to keep the sponge with a small amount of moisture (distilled or tap water) in the sleeve during storage and calibration.
3. The handheld part of the meter should not be submerged.
4. Allow the case and contents to air-dry at end of each day. This may be accomplished by simply propping the lid open. When contents are very wet, remove the contents and spread out to facilitate drying.
5. Do not store the meter in a very hot or cold location. Store the instrument within the optimal storage temperature range of 0-45° C.
6. Refer to Appendix A "4. Maintenance and Storage", pg. 49.
7. When the ODO sensor is not in use, it must be stored in a moist environment. Moisten the sponge in the calibration/storage sleeve with a small amount of clean water and place over the probe. If the cap dries out, it will need to be rehydrated. Refer to Appendix A "4.7 Optical Dissolved Oxygen Sensor", pgs. 52-53.
8. If there are issues or concerns with the meter, contact your group's coordinator or VRMP staff.

C. End of field season (to be done by VRMP staff)

1. Completely dry meter, case, and all items in the case before storing.
2. Remove battery pack and store in a dry place ideally around 25°C.
3. Keep meter dry and at room temperature to prevent corrosion of electronic parts.
4. Follow instructions for ODO Sensor long term storage. Refer to Appendix A "4.7 Optical Dissolved Oxygen Sensor", pgs. 52-53. 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

5. Record winterization date and equipment repairs in Equipment Log.
6. Label the meter and case as 'WINTERIZED' in an obvious manner (so users will know the current status of the unit).

7. Specifications

Measurement	Range	Resolution	Accuracy
Temperature	-5°C - 70°C	0.1°C	±0.2°C
Dissolved Oxygen (mg/L)	0-50 mg/L	0.01 or 0.1 mg/L (auto adjusts based on range)	0-20 mg/L, ± 0.1 mg/L or ± 1% of reading, whichever is greater.
			20-50 mg/L, ± 8% of the reading.
Dissolved Oxygen (%)	0-500%, air saturation	0.1% or 1% (auto adjusts based on range)	0 to 200%, ± 1% of the reading or ± 1% saturation, whichever is greater.
			200-500%, ± 8% of the reading.
Conductivity	0-200 mS/cm	0.001, 0.01, or 0.1 µS (range dependent)	0 to 100 mS/cm ±0.5% of reading or .001 mS/cm, whichever is greater; 100 to 200 mS/cm ±1.0% of reading
Salinity	0 to 70 ppt	0.01 ppt	±1.0% of reading or ±0.1 ppt, whichever is greater

8. Appendices.

A. ProDIGITAL User Manual Professional Series Digital Handheld Meters. User Manual
Item # 626973-01REF Revision F
YSI, a Xylem brand. 2018. Yellow Springs, Ohio.

9. References

A. DEP Standard Operating Procedures:

- Document number #:DEPLW-0890: Dissolved Oxygen and Temperature, Instantaneous Measurement using Electronic Meters
- Document number #: DEPLW-0636: Protocols for using Hanna Dissolved Oxygen and Specific Conductance/Temperature/pH Meters

B. Maine VRMP QAPP:

- Maine Department of Environmental Protection (MDEP). 2025. Maine Volunteer River Monitoring Program (VRMP) Quality Assurance Program Plan (VRMP). Document number#: DEPLW-0984

xylem
Let's Solve Water

USER MANUAL
ITEM# 626973-01REF
REVISION F

ProDIGITAL User Manual

PROFESSIONAL SERIES DIGITAL HANDHELD METERS

YSI
a xylem brand

Pro D·I·G·I·T·A·L

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 Professional Series Digital handheld meter. This manual covers setup, operation, and functionality of the ProDIGITAL handhelds which include the ProDSS and ProSolo.

ProDIGITAL Handheld features include:

- Digital smart probes that are automatically recognized by the instrument when connected
- Waterproof (IP-67) case
- Long-life rechargeable lithium-ion battery pack
- Color display and backlit keypad
- User-selectable cable options
- USB connectivity
- Global Positioning System (GPS) (optional on ProDSS)
- Depth sensor (optional on 4-port cable)
- Large memory with extensive site list capabilities
- Rugged enclosure with rubber over-molded case and miltary-spec (MS) connectors
- KorDSS data management software included with each instrument (Please see Installation Instructions)

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. 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

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.

TABLE OF CONTENTS

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When viewing this document as an Adobe™ PDF, hovering your cursor over certain phrases will bring up the finger-point icon. Clicking elements of the Table of Contents, website URLs, or references to certain sections will take you automatically to those locations.

1. Introduction

1.1 Battery Use and Battery Life

ProSeries Digital handhelds use a rechargeable lithium-ion (Li-Ion) battery pack as a power source. The battery comes pre-installed in the handheld and ships at less than 50% full capacity. Battery life depends on use, enabled parameters, LCD brightness, and GPS use.

A new battery, that has been fully charged, is expected to last for the following durations at 25°C, with Sampling set to Auto, Backlight set to Auto, and GPS enabled:

- ProDIGITAL handheld only - 48 hours
- ProDSS with fully loaded 4-port cable assembly and 25% LCD brightness - 20 hours

To increase battery life, enable manual sampling mode (Sampling). Manual sampling mode powers the sensor(s) on to take a measurement and then powers down to conserve battery life.

As with all lithium-ion batteires, battery life will decline over time and use. This decay should be expected. For the long-term health of the battery, a larger discharge is better than a small dishcarge between recharges.

1.2 Charging the Battery Pack

A USB cable is included with the handheld to charge the instrument battery pack and connect the instrument to a PC. The battery pack can be charged from the AC power adapter, directly from a computer USB connection or from an external, portable USB battery pack (sold separately, see Accessories).

Plug the USB connector into the AC power adapter, computer USB connector or external USB battery pack, then plug the micro USB connector into the handheld (Figure 1).

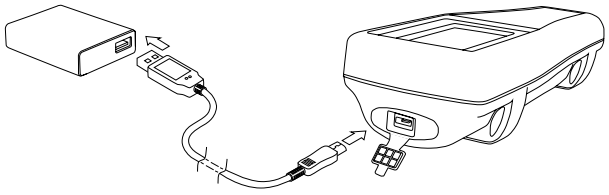


Figure 1 Connecting the handheld to AC power supply

⚠ **WARNING:** Charge the battery pack in an open area away from flammable materials, liquids, and surfaces. Do not charge or handle a battery pack that is hot to the touch. Failure to follow the safety warnings and precautions can result in personal injury and/or instrument damage not covered under warranty. Read Rechargeable Lithium-Ion battery pack safety warnings and precautions.

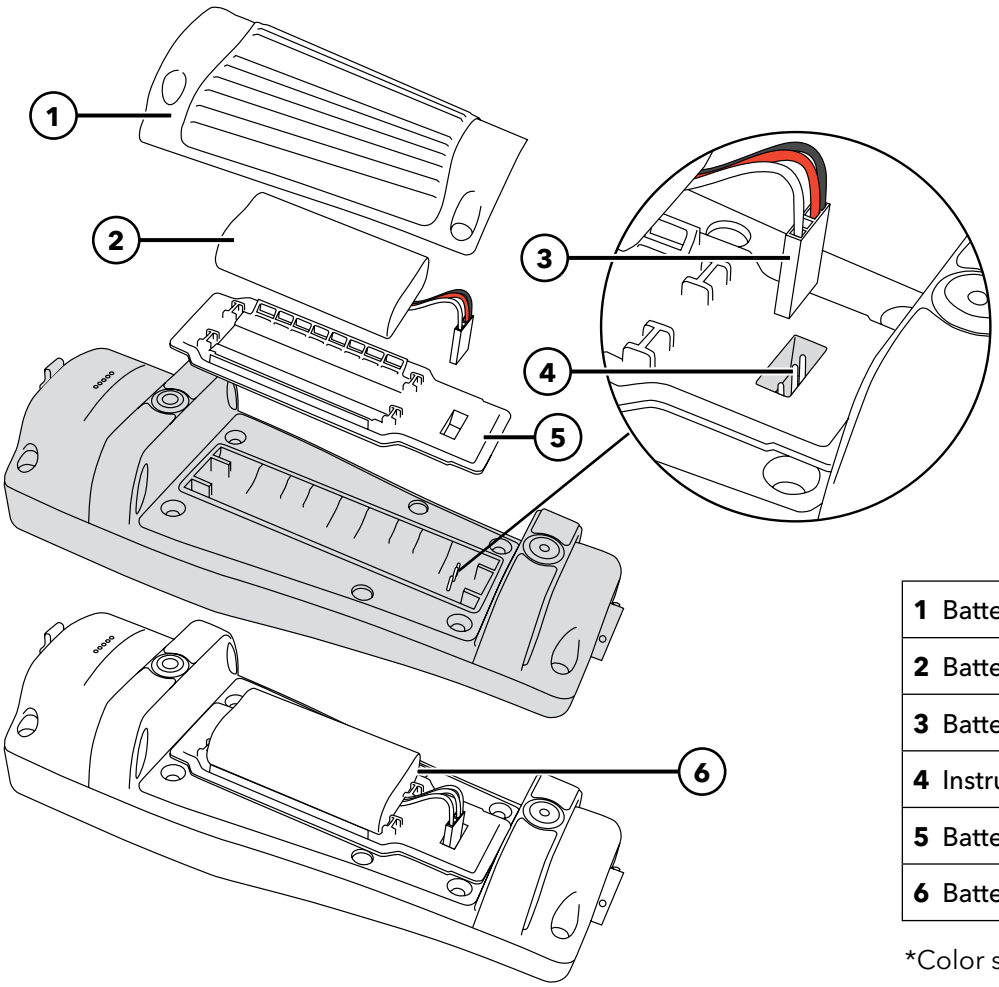
For the handheld to recognize that it is using AC power, you must start charging the handheld while it is turned on. After the instrument recognizes it is being charged, it can be turned off to finish charging.

AC Charging	DC Charging
9 hr	14 hr

1.3 Battery Replacement

1. Remove the battery pack cover by unscrewing (counter-clockwise) the four screws with a flat or Phillips head screwdriver (Figure 2). The retaining screws are captured into the battery pack cover and are not removable.
2. If replacing an existing battery pack, remove the Li-Ion battery pack and rubber battery pack cradle. With two fingers, grasp the battery pack connector and pull the connector straight up to disconnect and remove. Properly dispose of the old battery pack (See Battery Disposal).
3. Inspect the replacement battery pack and battery pack cradle for damage. Contact YSI technical support if there is any damage.
4. Correctly align and seat the battery pack cradle and battery pack into the instrument.
5. Align the battery pack connector wire terminals with the three instrument pins, then connect the battery pack to the instrument. Make sure that the three wire terminal connectors and three instrument pins are correctly aligned before connecting the battery pack connector. Incorrect installation can damage the battery pack connectors or instrument pins.
6. Install the battery pack cover, then hand tighten the cover screws with a screwdriver. DO NOT use any power tools. Make sure that the cover sealing surface is correctly aligned and free of any contamination or damage.

NOTICE: The battery cover does NOT need to make a compressed seal. Overtightening the cover screws can damage the battery cover and the handheld.



1	Battery pack cover
2	Battery pack
3	Battery pack connector*
4	Instrument pin connectors
5	Battery pack cradle
6	Battery pack cradle installed

*Color shown for reference

Figure 2 Battery replacement

1.4 Connect the Handheld to the Cable Assembly

The cable connectors are keyed for positive mating and to prevent connector damage (Figure 3). The handheld retains its IP-67 waterproof rating when the cable is disconnected. However, the connectors are not wet-mateable and should be clean and dry before connecting.

Align the keys on the cable connector with the slots on the handheld connector. Push together firmly, then twist the outer ring clockwise until it locks into place.

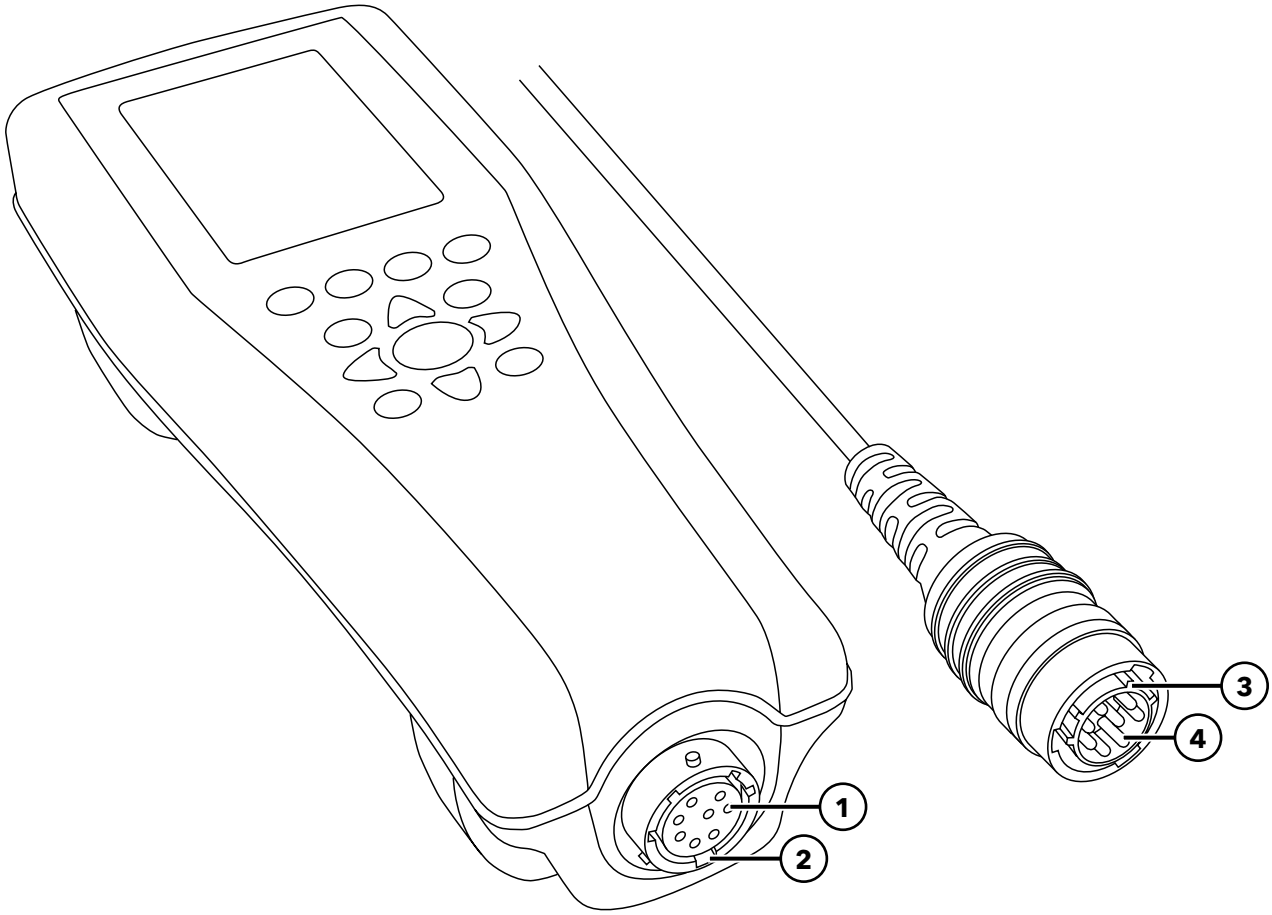


Figure 3 Keyed connectors

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

1.5 Sensor Installation/Removal

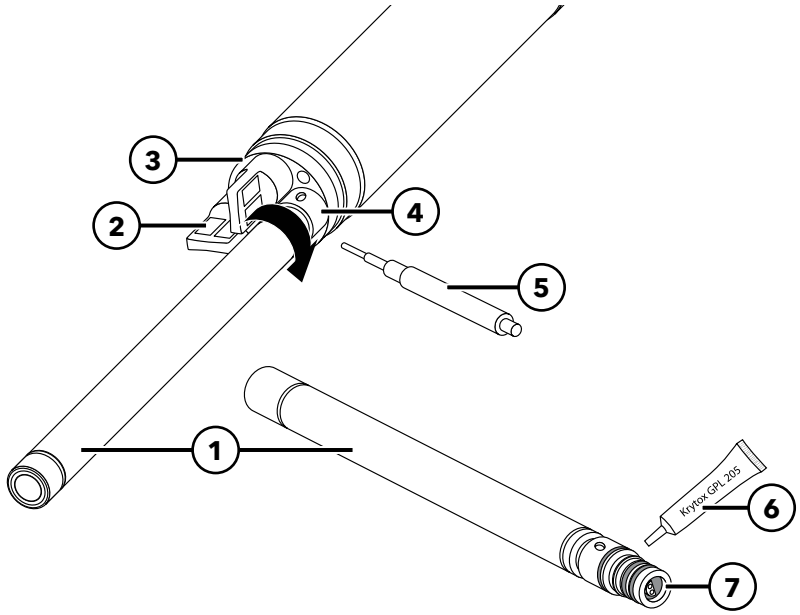
Probe assemblies like the ODO/CT, ODO/T, and ProOBOD feature integral sensors. These sensors cannot be removed from the cable. Therefore, this section pertains only to the ProDSS 4-port cable.

ProDSS 4-port Cable

ProDSS 4-port cables feature user-replaceable sensors. The ports on the bulkhead are universal, meaning that you can install any sensor into any port. A conductivity/temperature sensor must be installed for accurate measurement of all parameters except turbidity and TSS.

Bulkhead ports are numbered (Figure 4), so if multiple sensors of the same type are installed, the port number will be added to the Run screen display to clarify the measurement value of each sensor.

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



1	Sensor
2	Port plug
3	Bulkhead
4	Sensor retaining nut
5	Sensor installation/removal tool
6	O-ring lubricant
7	Sensor port

Figure 4 Sensor installation

Sensor Installation

1. Remove the port cover shipped with the 4-port cable. This cover can be kept to protect the bulkhead ports from contamination during long-term storage.
2. Inspect each bulkhead port for contamination. If the port is dirty or wet, clean it with compressed air.
3. Apply a thin coat of o-ring lubricant to the sensor o-rings. Wipe off excess o-ring grease with a lint-free cloth.
4. 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.

5. Carefully finger-tighten the retaining nut clockwise. If any resistance is felt, loosen the retaining nut completely to prevent cross-threading.
6. Use the sensor installation/removal tool to tighten the retaining nut clockwise until snug, about a ¼ to ½ additional turn of the retaining nut. Be careful not to over-tighten the retaining nut.

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

Sensor Removal

To remove a sensor, insert the sensor installation/removal tool into the retaining nut, then rotate the retaining nut counterclockwise to loosen. 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. Install a port plug if not reinstalling a sensor in the exposed port. Exposure to water can cause damage or corrosion to the bulkhead connectors not covered by the warranty.

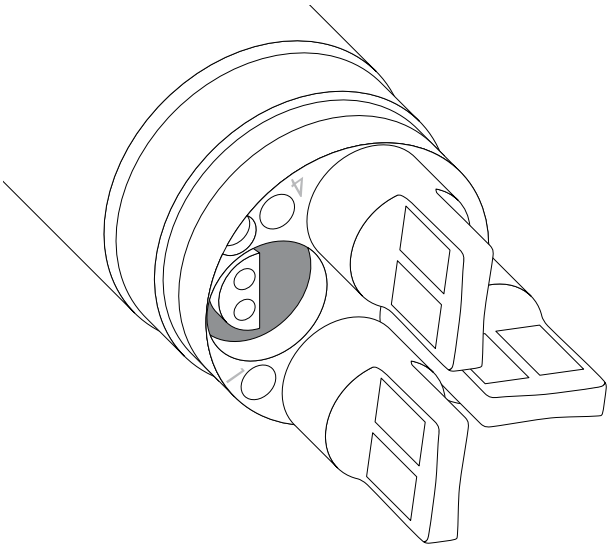


Figure 5 Sensor port plugs and port numbering (4-port cables)

Port plugs

Port plugs and a tube of o-ring lubricant are included in the maintenance kit that ships with all 4-port cables.

Installation

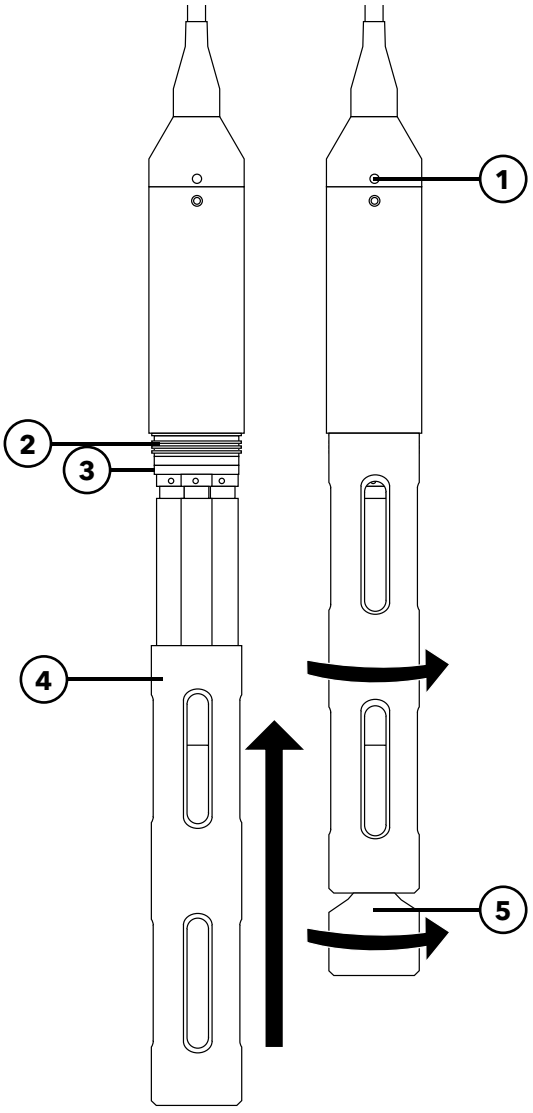
1. Apply a thin coat of o-ring lubricant to the o-rings on the plug port.
2. Remove any excess lubricant from the o-rings and port plug with a lint-free cloth.
3. Insert the port plug into the empty port and press until firmly seated.
4. Finger-tighten the port plug clockwise to install. If necessary, 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: Do not submerge the bulkhead without a sensor or port plug installed in all ports.

Sensor Guard and Weight Installation

1. 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.
2. Carefully 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.

Sensor Guard and Weight Installation *(continued)*



1	Depth sensor (if equipped)
2	Bulkhead threads
3	Bulkhead
4	Sensor guard
5	Weight

Figure 6 Sensor guard and weight installation on a 4-port cable assembly

Sensor Guard Weights

To help stabilize the sensors when profiling at deeper depths, a 1 lb. sensor guard weight is supplied with 4-port assemblies 10 meters and longer. To attach the weight, carefully hand-tighten it clockwise on to the bottom of the sensor guard (Figure 6). 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 ProDIGITAL cables. See Accessories.

NOTE: *Do not have any weights installed on the sensor guard when calibrating using the calibration cup.*

2. Operation

2.1 Keypad and Navigation

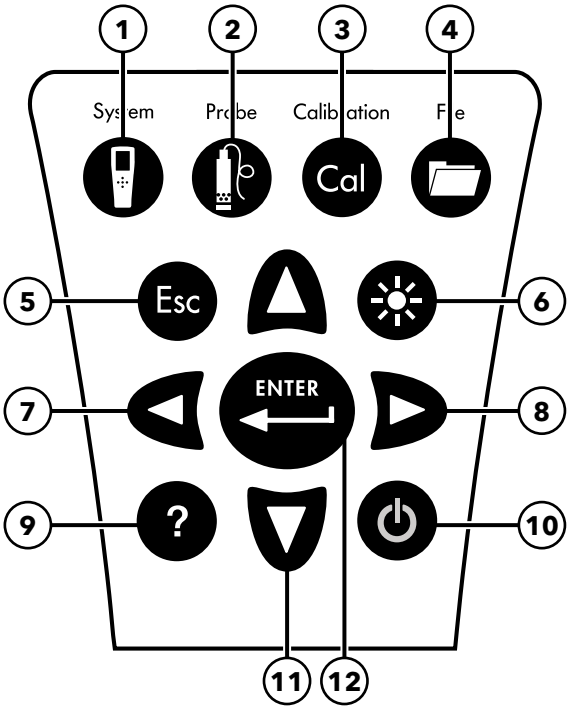


Figure 7 Keypad description

1	**System:** Opens the system menu. Use to adjust system settings.	**7**	**Left arrow key:** 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 sensor menu. Use to setup sensors, change the units shown, select the sensor averaging mode, and turn on/off Auto Stable and GPS.	**8**	**Right arrow key:** 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. Use to calibrate sensors or restore default calibration.	**9**	**Help:** Shows context sensitive help.
4	**File:** Opens the file menu. Use to view logged data and calibration files, backup data to a USB stick, and delete data.	**10**	**ON/OFF:** Turn on or turn off the instrument.
5	**Exit/Escape key:** Exits to the Run screen. When in an alpha/numeric entry screen, returns to previous menu.	**11**	**Up/Down arrow keys:** Scroll through menus or enter numbers and letters.
6	**Backlight:** Turns the keypad backlight on or off for use in low light conditions.	**12**	**Enter key:** Push to confirm selections. On the Run screen, push to log a single data point or start continuous data logging.

2.2 Startup

Push the 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.

2.3 Navigation

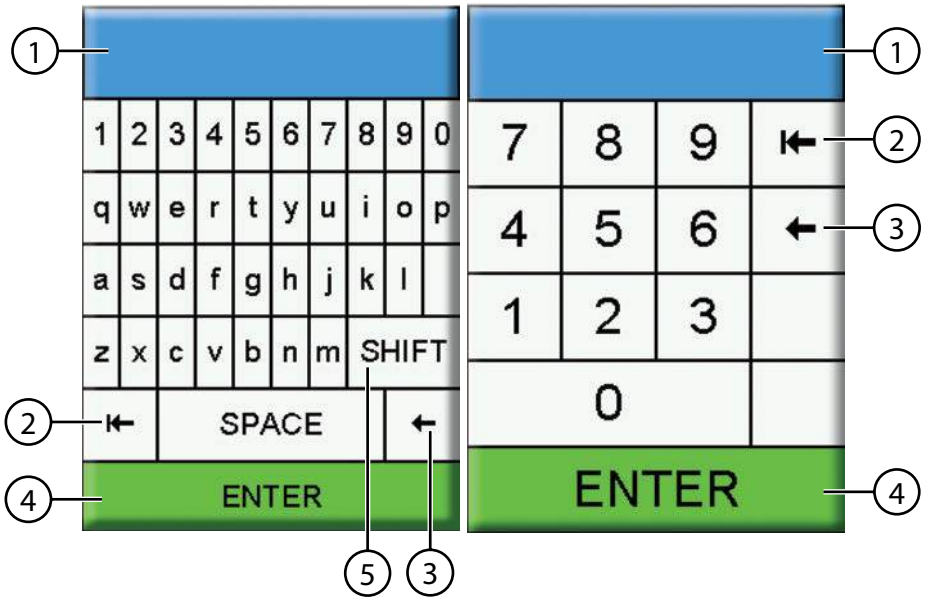
The handheld contains menus to change user-defined options, functions, and parameters. Use the arrow keys (▲ and ▼) to highlight different options within menus and sub-menus, then push the Enter (ENTER) key to select the option. Push the left arrow (◀) key to return to the previous menu.

Push the Exit/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 (Figure 8).

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

Figure 8 Alpha/numeric and numeric entry screens

2.4 Main Display Description

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 ▼ arrow keys to view the additional measurements (Figure 9).

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

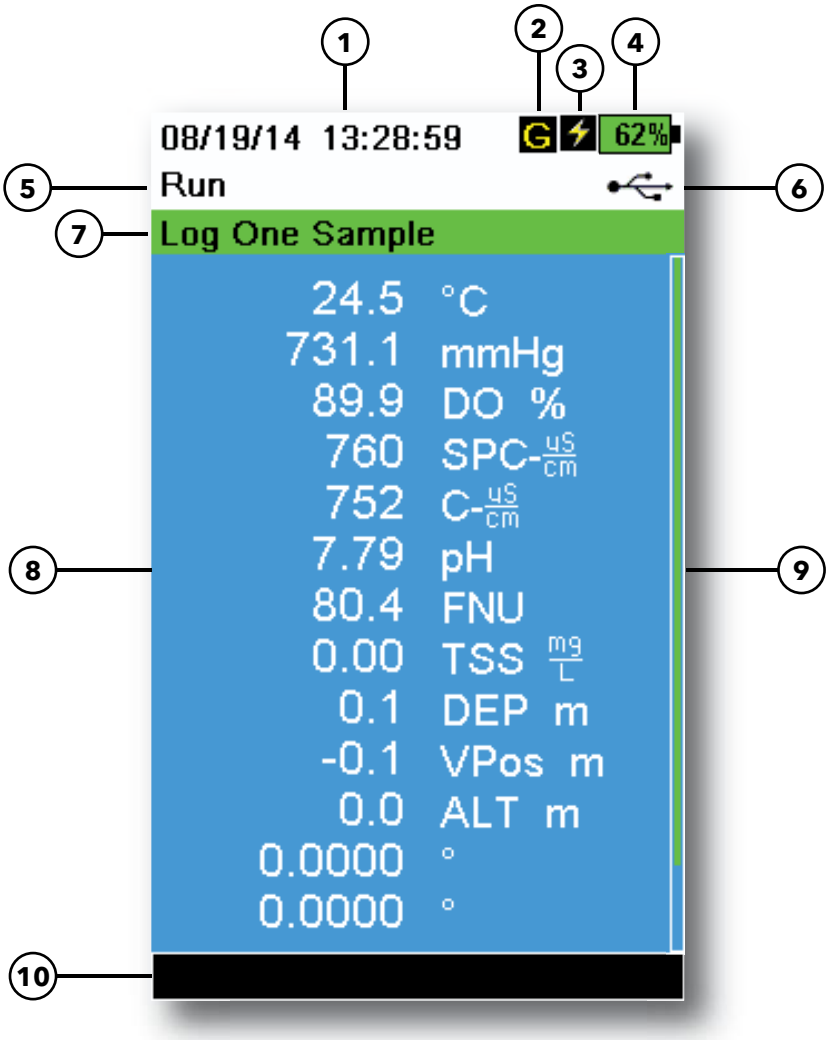


Figure 9 Main display example

1	Date/Time	**6**	USB/PC connection indicator
2	GPS signal indicator	**7**	Log or sampling (update measurements) prompt on Run screen (single or continuous)
3	Battery charging indicator	**8**	Displayed measurements
4	Battery charge %	**9**	Scroll bar
5	Current screen/menu	**10**	Message area

2.5 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 (Figure 10).

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

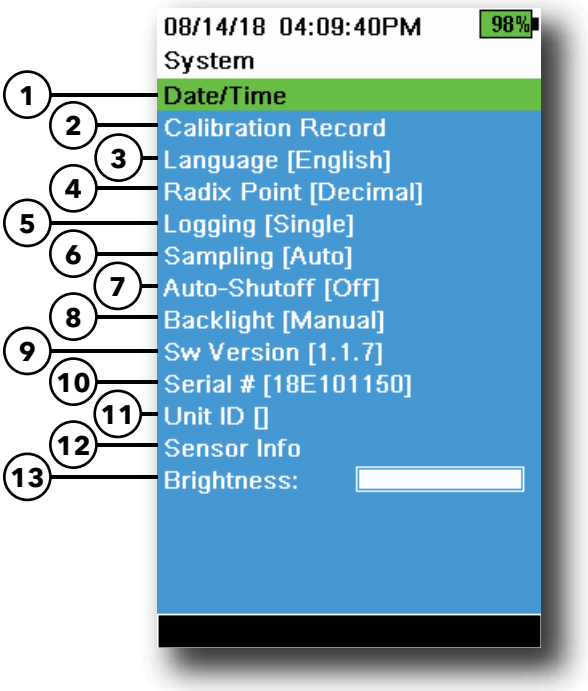


Figure 10 System menu

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

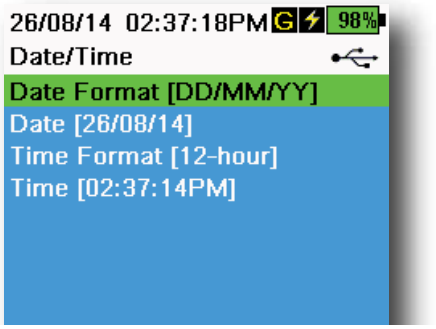


Figure 11 Date/Time

Date/Time

→ **Date/Time**

For accurate logging and calibration data, correctly set the date and time options (Figure 11). 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 KorDSS software.

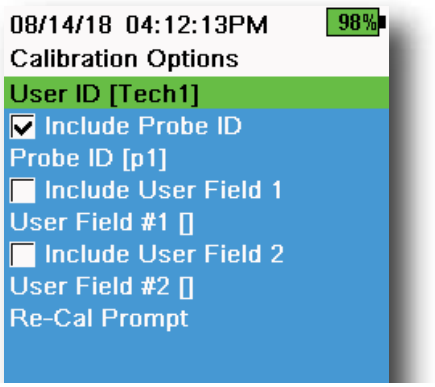


Figure 12 Calibration Options

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) (Figure 12)

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

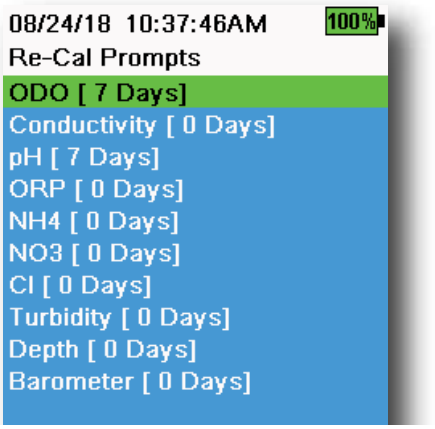


Figure 13 Re-Cal Prompts

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 (Figure 13). 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**

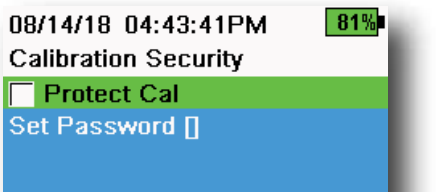


Figure 14 Calibration Security

The Calibration menu can be password protected to prevent accidental or unauthorized sensor calibration (Figure 14).

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**

Figure 15 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**

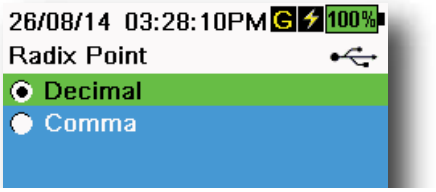


Figure 16 Radix Point

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) (Figure 16).

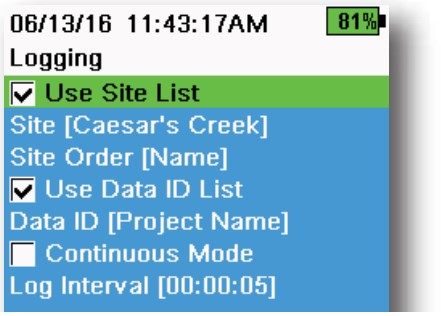


Figure 17 Logging

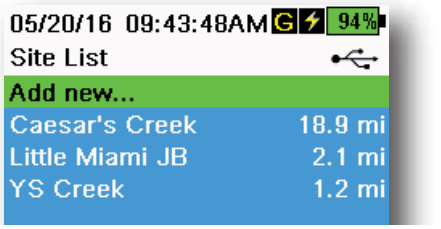


Figure 18 Site List

Figure 19 Site

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 (Figure 17).

After selecting **Site** [ ] or **Data ID** [ ], the Site List or Data ID List will be shown (Figure 18). New entries can be created by choosing **Add new...**

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 (Figure 18).

Choose an entry from the Site List or Data ID List to **Select**, **Edit**, or **Delete** (Figure 19). When selected, data recorded will be tagged with the specific site and/or data ID.

NOTE: *The Manage Sites menu in KorDSS 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.*

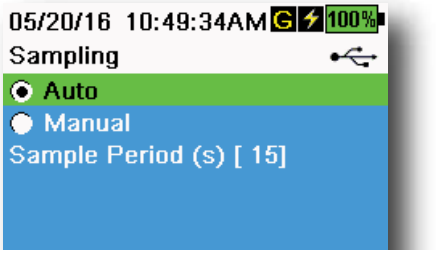


Figure 20 Sampling

Sampling

→ **Sampling**

Auto sampling mode continuously updates measurements on the display (Figure 20).

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 KorDSS 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 KorDSS 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 (Figure 21). Use the ◀ and ▶ arrow keys to adjust the screen brightness.

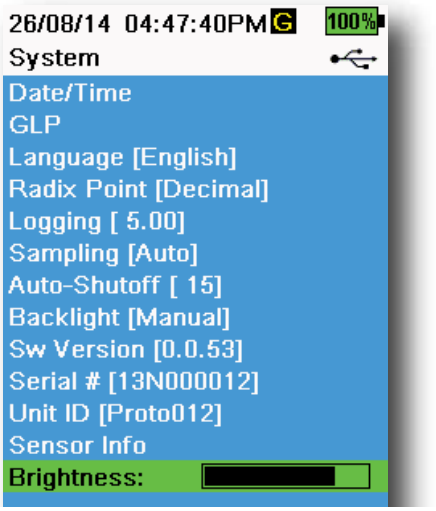


Figure 21 Display Brightness

2.6 Sensor Menu

Use the Probe ( ) key to access the Sensor menu and change sensor settings (if applicable), enable the measurement units displayed on the Run screen, set Auto Stable parameters, change the sensor averaging mode, and if equipped, turn on/off GPS.

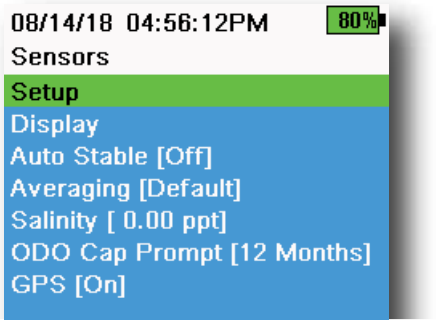


Figure 22 Probe (Sensor) menu

Push the key to access the sensor menu (Figure 22). 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 (**[]**).

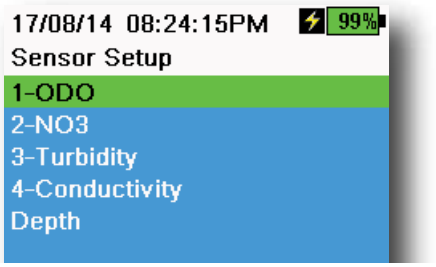


Figure 23 Sensor Setup

Sensor Setup

→ **Setup**

The Sensor Setup menu will show all sensors connected to the instrument (Figure 23). If a sensor is connected but is not listed on the Sensor Setup menu (**<None>** displayed), check the sensor and cable connections.

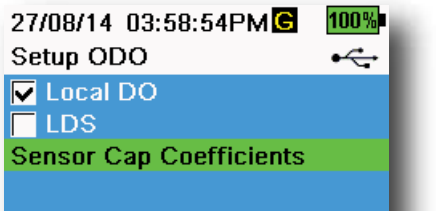


Figure 24 Setup ODO

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 (Figure 24).

LDS: Last Digit Supression (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.*

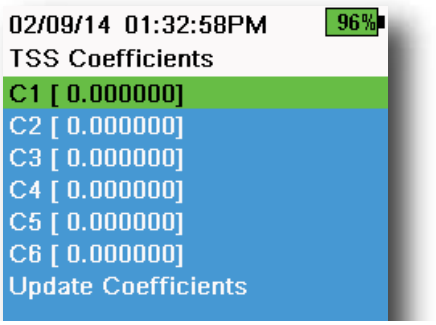


Figure 25 TSS coefficients

Setup Turbidity

→ **Setup** → **Turbidity**

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

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 KorDSS 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 KorDSS and sent to the sensor.

NOTE: *Although correlation coefficients can be entered directly into the handheld (Figure 25), only KorDSS Software can calculate the coefficients.*

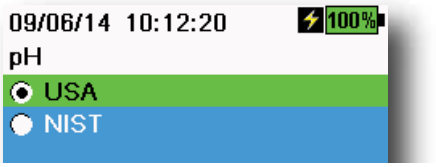


Figure 26 Setup pH

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) (Figure 26). Calibration values are automatically compensated for temperature for both buffer sets.

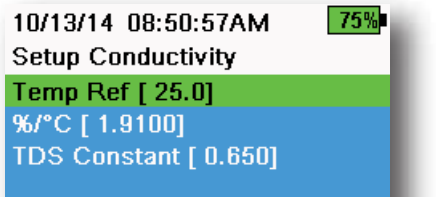


Figure 27 Setup Conductivity

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 (Figure 27). 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.*

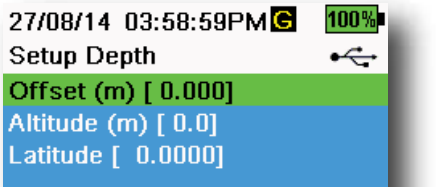


Figure 28 Setup Depth

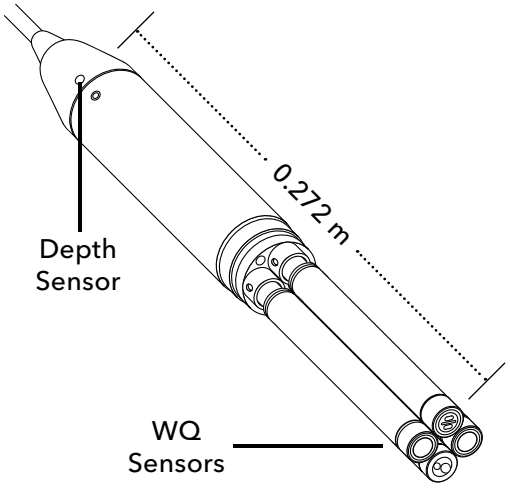


Figure 29 Distance of depth sensor to WQ sensors on 4-port cable

Setup Depth

→ **Setup** → **Depth**

Cable assemblies 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 (Figure 28).

A common offset entered by the user is the depth sensor location relative to the rest of the WQ sensors. This value is 0.272 m on the 4-port cable (Figure 29).

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 altitutde causes a 1.08 mm of change to the depth readings.

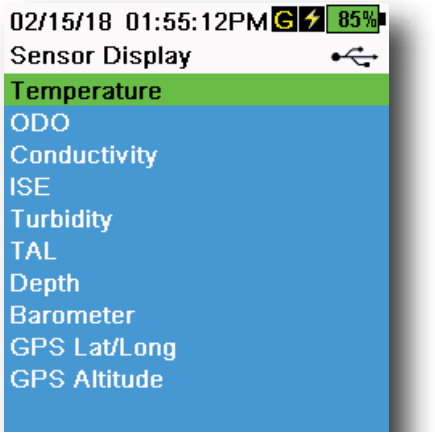


Figure 30 Sensor Display

Sensor Display

→ **Display** (Figure 30)

The Sensor Display menu determines the parameters and units that are shown on the Run screen (Figure 9). 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.*

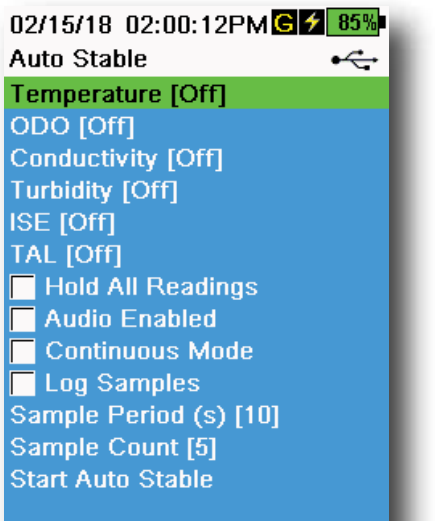


Figure 31 Auto Stable

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 (Figure 31). 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** (Figure 32).

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.

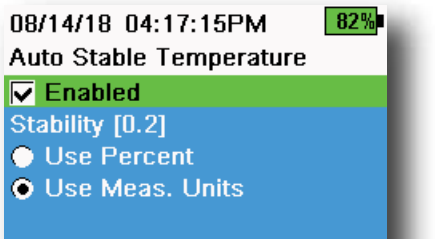


Figure 32 Auto Stable stability threshold

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.

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.

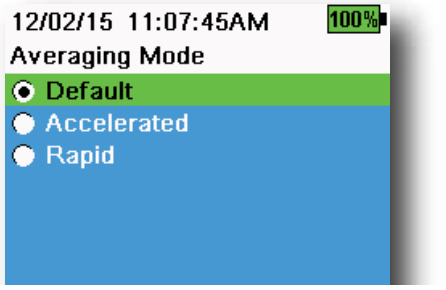


Figure 33 Averaging

Averaging

→ **Averaging** (Figure 33)

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 the 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). 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), 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.

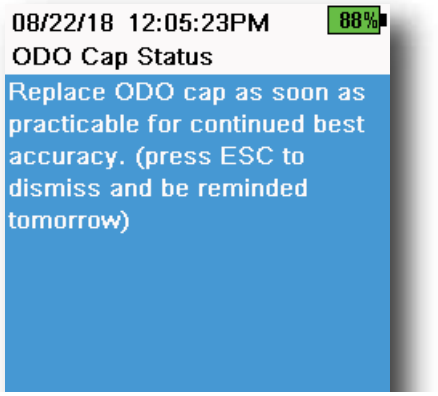


Figure 34 ODO Cap Status

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 (Figure 34). 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
- ODO Extended Warranty Sensor Cap [SKU: 627180] = **24** 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.

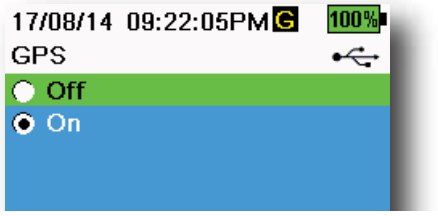


Figure 35 GPS

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 (Figure 35).

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.*

2.7 Calibration Menu

Push the Calibrate (Cal) key to access the Calibration menu (Figure 36). Highlight a sub-menu then push the ENTER key to view sub-menu options. Pre-defined or user-selected parameters are noted within brackets (**[ ]**). 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.*

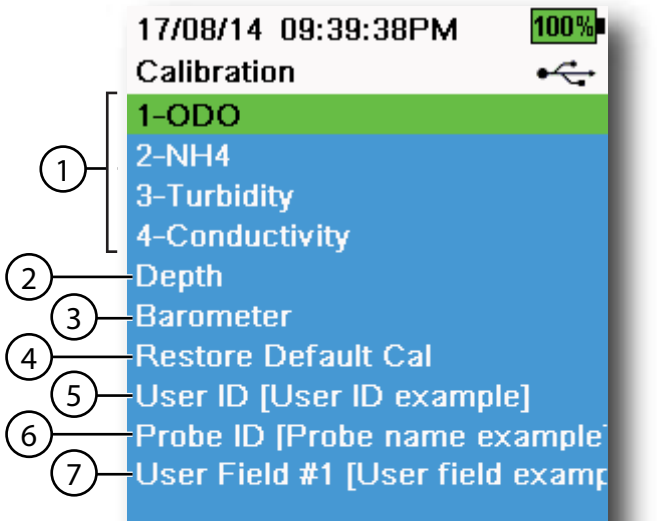


Figure 36 Calibration menu

1 Sensors connected	**5** User ID
2 Optional Depth sensor calibration	**6** Probe ID
3 Barometer calibration	**7** User Field #1
4 Restore Default Calibration - restores specified sensor to factory default	

2.8 Files Menu

Push the File ( ) key to access the Files menu (Figure 37). Highlight a sub-menu then push the ENTER key to view sub-menu options.

Use the Files menu to view, delete or backup logged data or the calibration file. Data can be filtered by a specific date and time range and by user-created Site and Data ID lists.

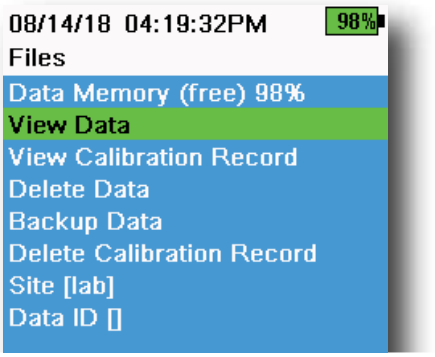


Figure 37 Files menu

Data Memory: (free) % shows the remaining memory available. Download or delete data to free available internal memory.

The Site List and/or Data ID List can be seen by selecting **Site [ ]** or **Data ID [ ]**. To enable the use of Site and/or Data ID when logging data, select **Logging** under the System menu.

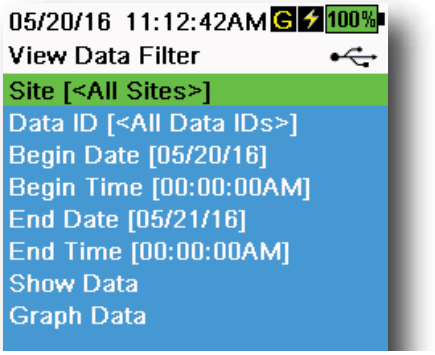


Figure 38 View Data Filter

View Data Filter

→ **View Data**

Enter the desired filter criteria, then select **Show Data** or **Graph Data** to view the tabular or graphical data. If necessary, use the arrow keys to scroll through the data (Figure 38 and Figure 39).

Site: View data from one site or all sites.

Data ID: View data from one ID or all IDs.

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

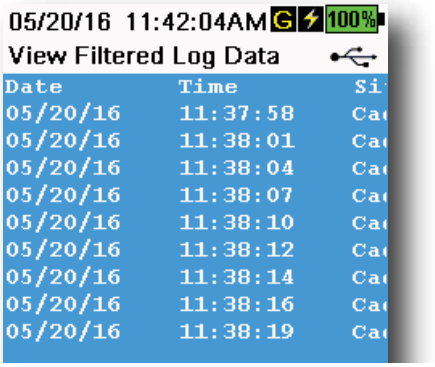


Figure 39 View Filtered Log Data

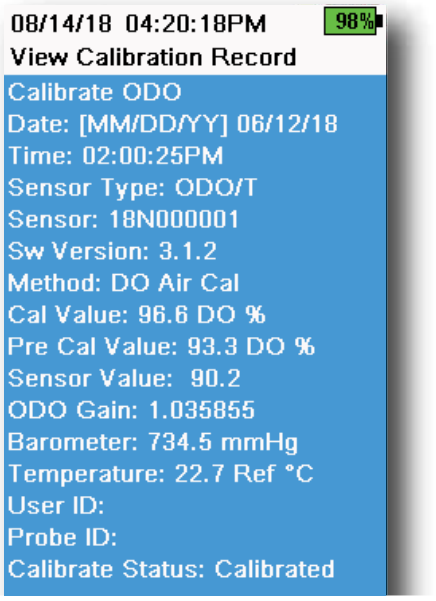


Figure 40 View GLP

View Calibration Record

→ **View Calibration Record**

Select **View Calibration Record** to show the stored sensor calibrations (Figure 40).

Use the arrow keys to scroll through the calibration file data.

Calibration Information

Information in each calibration record:

- Sensor calibrated
- Date/time stamp
- Sensor ID
- Sensor serial #
- Sensor software version
- User ID (optional)
- Probe ID (optional)
- User Fields #1 and #2 (optional)
- Calibration status
- Calibration value
- Temperature

Depending on the parameter, a calibration record may include additional information such as the Conductivity cell constant, ODO gain, ORP offset, and pH slope.

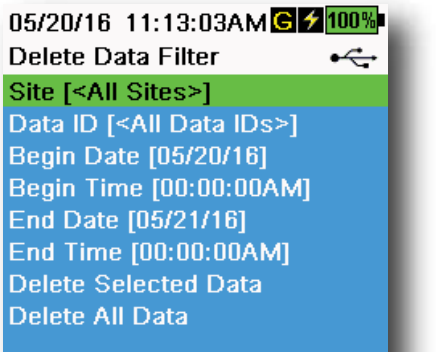


Figure 41 Delete Data Filter

Delete Data

→ **Delete Data**

Enter the desired filter criteria, then select **Delete Selected Data** to *permanently* delete the data (Figure 41).

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

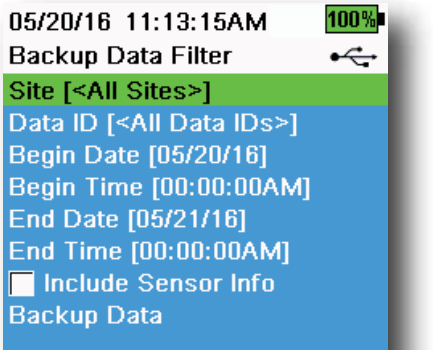


Figure 42 Backup Data

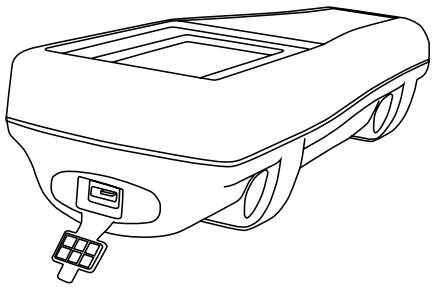


Figure 43 Micro USB female connector

Backup Data

→ **Backup Data**

This function allows you to backup logged data to a flash drive based on Site, Data ID, and log date (Figure 42). A USB female to micro USB male adapter is included with new instruments for this data backup.

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

If the box next to "**Include Sensor Info**" is checked, each data set will be sent to a flash drive as a separate file with sensor serial number and sensor software information included. If the box is not checked (default), all data sets will be sent in a single backup file with no sensor serial number or sensor software information.

NOTE: *It is suggested to send data to the USB flash drive as a single file (i.e. box is not checked) unless this sensor information is needed. This makes importing the data much faster and easier.*

Once the filter settings are configured, select **Backup Data** to send the data to a flash drive. The data is exported in a CSV file.

If the data backup is not successful, ensure the correct filter criteria are selected and the USB connection indicator can be seen at the top of the screen (Figure 9).

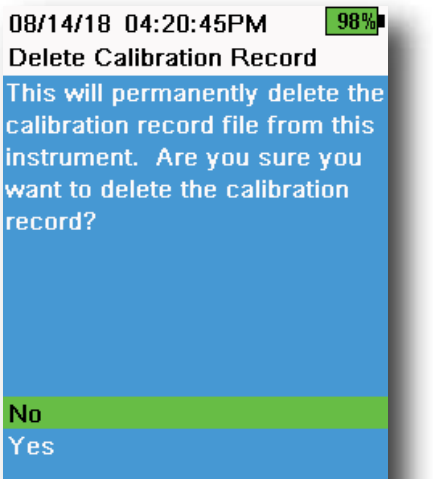


Figure 44 Delete Calibration Record

Delete Calibration Record

→ **Delete Calibration Record**

To permanently delete the Calibration Record file from the instrument, select **Yes**, then push the ENTER key (Figure 44).

2.9 Taking Measurements

For the highest accuracy, calibrate the sensor(s) before taking measurements.

1. Create Site and Data ID lists for logged data (if applicable).
2. Set the logging method (single or interval).
3. Set the Auto Stable parameters (if applicable).
4. Verify that the sensors and/or port plugs are correctly installed in all bulkhead ports.
5. Install the probe guard.
6. Insert the probe into the sample. Make sure the probe is fully submerged.
7. Move the probe in the sample to release any air bubbles and to provide a fresh sample to the sensors.
8. Wait for the sensor/s to stabilize in the sample.
9. On the main run screen, press 

to begin logging (single or interval) (See Logging).

   NOTE: *An option to change Site and/or Data ID (if enabled) appears once* 

is pressed to begin logging.

10. To stop continuous logging, simply press 

key again.

3. Calibration

ProDIGITAL sensors (except temperature) require periodic calibration. Calibration procedures follow the same basic steps with variations for specific parameters. Before calibration, adjust *Calibration Record* settings under the **System** menu if applicable to user requirements. Set up sensor options, settings, and coefficients as applicable.

3.1 Calibration Setup

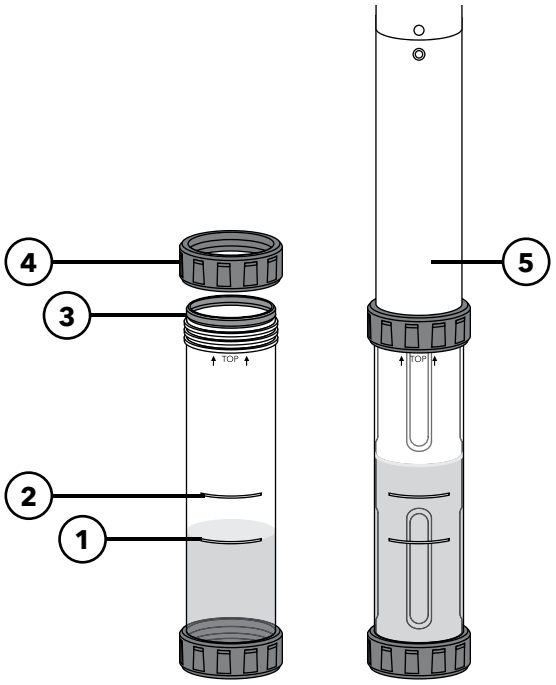
Make sure the calibration cup, sensor guard, and all sensors are clean. YSI recommends installing the sensor guard before placing the sensors into the calibration cup.

For highest data accuracy, thoroughly rinse the calibration cup 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 calibration cup and sensors.

Ensure the calibration cup gasket is correctly seated. Loosely install the retaining nut on the cup. Slide the calibration cup over the sensors and sensor guard and tighten the retaining nut (Figure 45).

Calibration Cup Installation for 4-Port Cable Assemblies



1	Fill line one (for all calibration solutions except for conductivity)
2	Fill line two (for conductivity calibration solution)
3	Gasket
4	Retaining nut
5	Calibration cup installed

It takes 170 mL of solution to fill the calibration cup to line 1, while it takes 225 mL to fill to line 2.

Figure 45 Calibration cup standard volume (4-port cable)

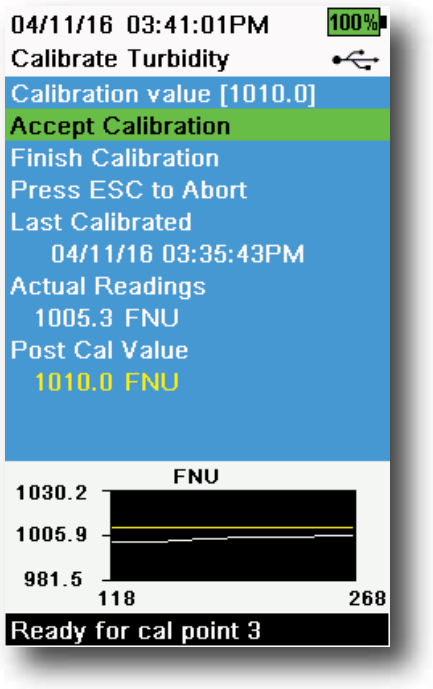


Figure 46 Layout of calibration screen

Calibration Screen Layout

The calibration screen has the same basic layout for each parameter (Figure 46).

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.

3.2 Depth

NOTE: *This calibration option is available only if your bulkhead is equipped with a depth sensor.*

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. Calibration in the atmosphere "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 unless the transducer is recalibrated to the new pressure.

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.

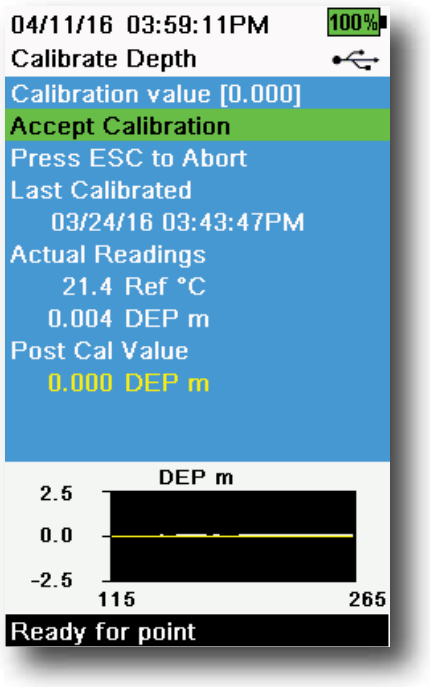


Figure 47 Calibrate Depth

Depth Calibration

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** (Figure 47).

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

3.3 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.

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 salt water applications, calibrate to 50,000 µS.

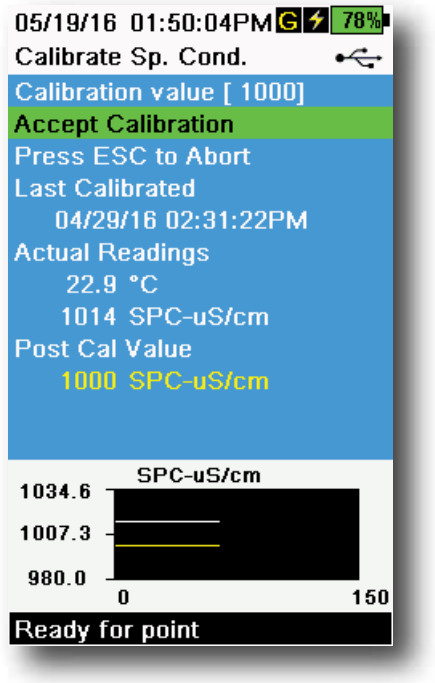


Figure 48 Calibrate specific conductance

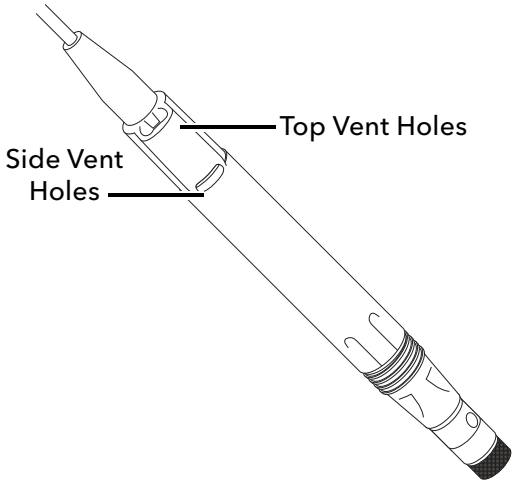


Figure 49 ODO/CT Cable Assembly

Conductivity Calibration

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 sensors into the solution. Make sure the solution is above the vent holes on the side of the conductivity sensor.

   If using the ODO/CT assembly, ensure the vent holes at the top of the sensor are completely immersed and the solution level is at least 1 cm higher than the top vent holes (Figure 49). A graduated cylinder is included with ODO/CT cable assemblies for the purpose of calibrating conductivity.

   For 4-port cable assemblies, fill the calibration cup to the second line with fresh calibration standard. It takes 225 mL of solution to fill to line 2.
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** (Figure 48). "Calibration successful!" will be displayed in the message area.

(continued on next page)

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.

3.4 Barometer

The barometer is factory calibrated and should rarely need to be recalibrated. The barometer is used for DO calibration, %Local measurements, 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

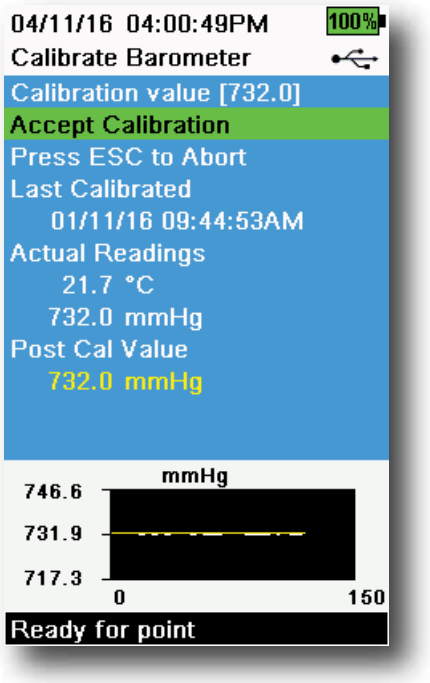


Figure 50 Calibrate Barometer

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** (Figure 50). "Calibration successful!" will be displayed in the message area.

3.5 Dissolved Oxygen

ODO calibration requires the current "true" barometric pressure. Make sure that the barometer is reading accurately prior to ODO calibration.

Calibrating in DO% or DO% local automatically calibrates the mg/L and ppm measurement. There is no reason to calibrate both parameters. For both ease of use and accuracy, we recommend that you calibrate DO% or DO% Local and not mg/L.

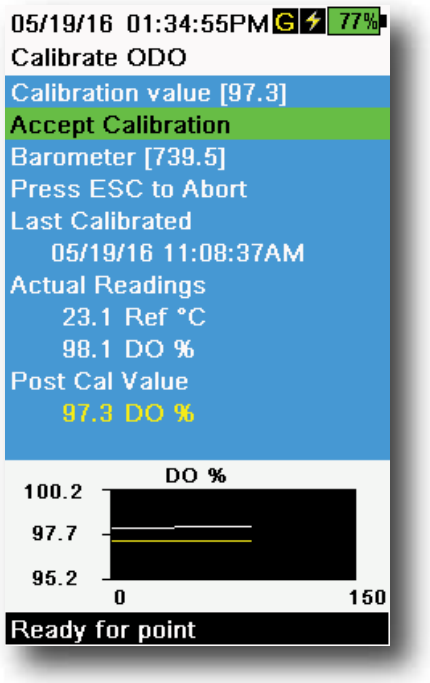


Figure 51 Calibrate ODO %

ODO% and ODO% Local - Water Saturated Air Calibration

1. Place a small amount of clean water (5 mL) in the calibration cup or a wet sponge into the calibration sleeve (for ODO/T and ODO/CT probes).
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 cup. 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** (Figure 51). "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.*

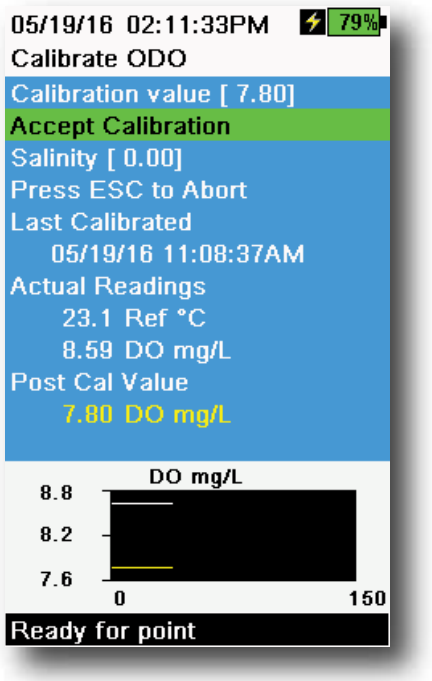


Figure 52 Calibrate ODO mg/L

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** (Figure 52). "Calibration successful!" will be displayed in the message area.
6. Rinse the bulkhead and sensors in clean water then dry.

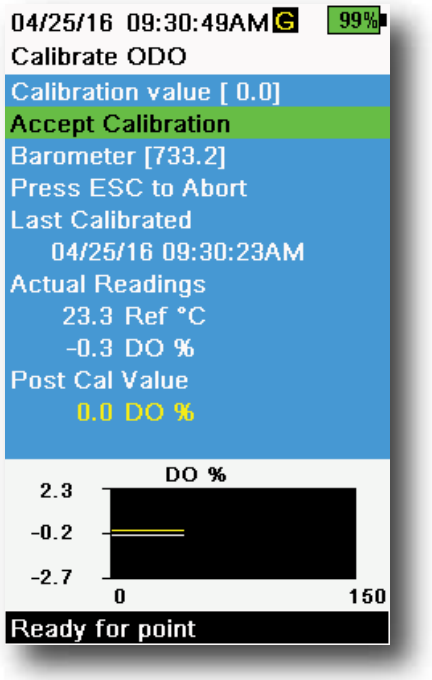


Figure 53 Calibrate ODO zero point

ODO Zero Point Calibration

1. Place the ODO and Conductivity/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** (Figure 53). "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.

3.6 Turbidity

Standards

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

Calibration Point	Standard Value
1	0 FNU [SKU: 608000]
2	12.4 FNU [SKU: 607200] or 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:

	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

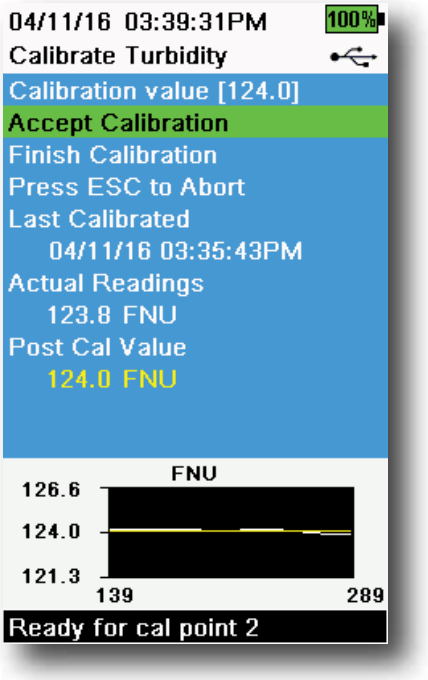


Figure 54 Calibrate Turbidity

Turbidity Calibration 2-Point

Turbidity calibrations, more than most other paramters, 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 calibration cup 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 intalled 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 calibration cup with a small amount of the next calibration point standard. Discard the rinse standard.
6. Fill the calibration cup 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** (Figure 54). "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.

3.7 Total Algae

TAL 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.

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.

Rhodamine WT Dye Solution Preparation

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 page 41). 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 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.

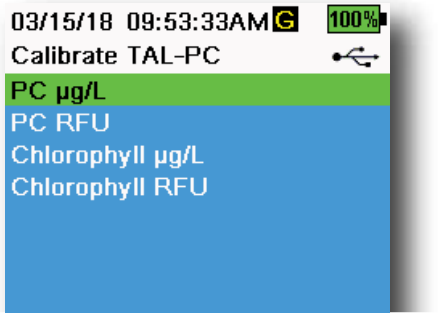


Figure 55 TAL-PC Calibration Options

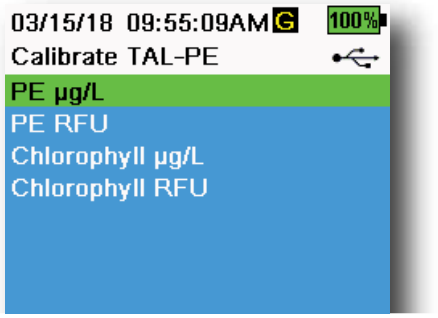


Figure 56 TAL-PE Calibration Options

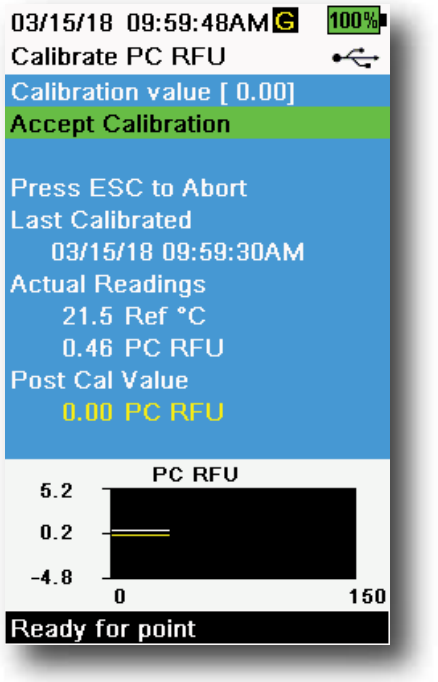


Figure 57 Calibrate PC RFU

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 calibration cup 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 sensor are shown in Figure 55, while options for the TAL-PE sensor are shown in Figure 56.
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 calibration cup 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 calibration cup 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 (Figure 57). 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.

3.8 pH/ORP

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 185 mV higher than the reading in pH 7 buffer. In pH 10 buffer, the mV reading should be 165 to 185 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.

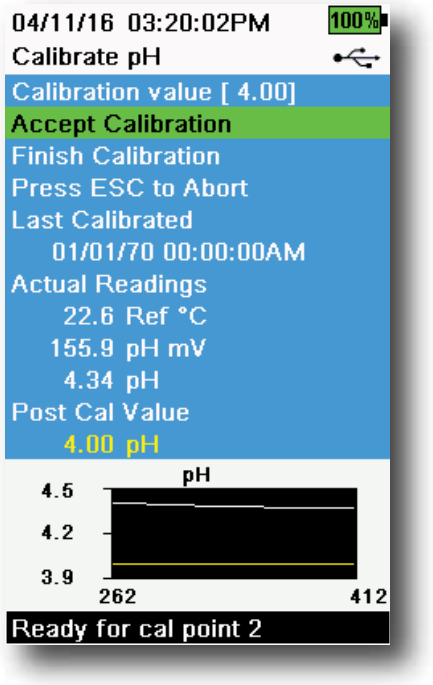


Figure 58 Calibrate pH 2- or 3-point

pH Calibration 3-Point

1. Always start the calibration with pH 7 buffer. Fill the calibration cup 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.

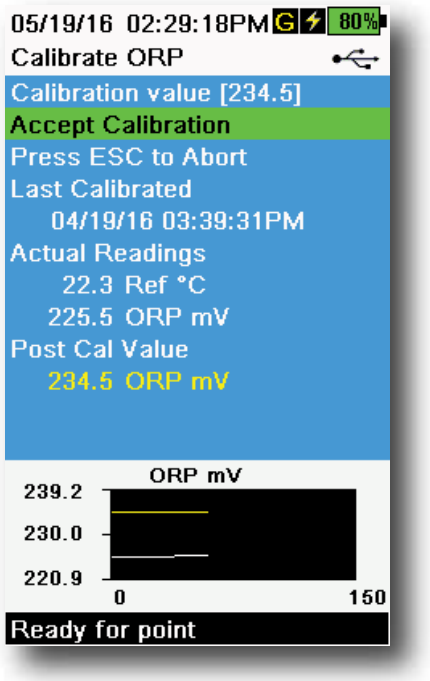


Figure 59 Calibrate ORP

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.

3.9 ISEs

Ammonium, Nitrate, & Chloride

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

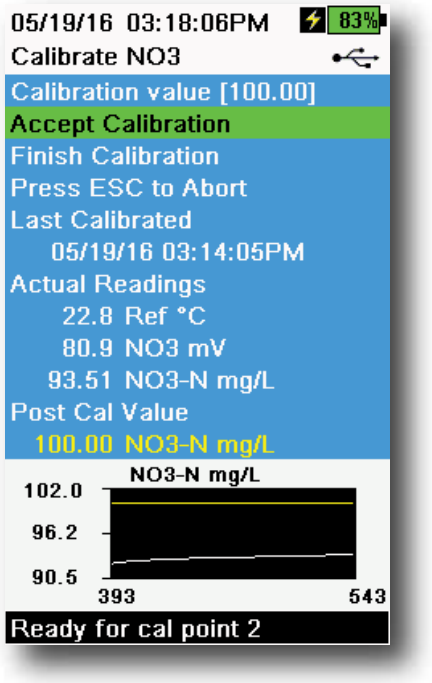


Figure 60 Calibrate ISE

ISE Calibration

1. Fill the calibration cup 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 calibration cup with a small amount of the next calibration point standard. Discard the rinse standard.
6. Fill the calibration cup 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** (Figure 60). "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

- NH_4 1 mg/L = 0 mV +/- 20 mV (new sensor only)
- NH_4 100 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

- NO_3 1 mg/L = 200 mV +/- 20 mV (new sensor only)
- NO_3 100 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.

4. Maintenance and Storage

Follow all maintenance and storage procedures in this section. Incorrect or unapproved maintenance and/or storage can cause handheld, sensor or cable damage not covered by the warranty.

Storage terms are defined as follows:

Short-term Storage = Less than 4 weeks

Short-term storage is appropriate when the handheld, cables, and sensors will be used at regular intervals (daily, weekly, etc.).

Long-term Storage = More than 4 weeks

During long periods of inactivity, such as the "off-season" for environmental monitoring, the instrument, sensors, and cables should be placed in long-term storage.

YSI recommends cleaning and maintenance before long-term storage.

4.1 ProDIGITAL Handheld

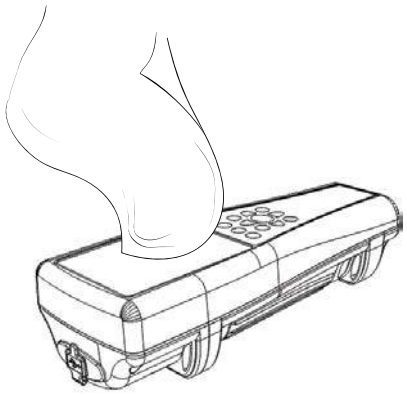


Figure 61 Handheld cleaning

Wipe the keypad, screen, and case with a cloth dampened with a mild solution of clean water and dish soap (Figure 61). 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 ot 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.

4.2 4-Port Bulkhead

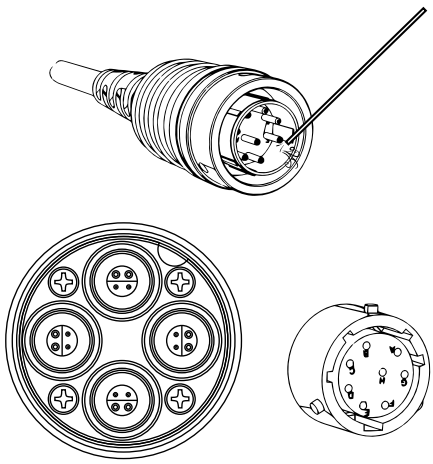


Figure 62 Cable, bulkhead, connector maintenance

Wipe the cable and bulkhead with a cloth dampened with a mild solution of clean water and dish soap. Make sure sensors or port plugs are installed in ProDSS 4-port cable assemblies so the bulkhead ports do not get wet when cleaning. Exposure to water can cause damage or corrosion to the bulkhead connectors not covered by the warranty.

For short-term storage, YSI recommends leaving the sensors installed on the bulkhead. The ODO, pH, and pH/ORP sensors must be kept in a moist air environment; therefore, place a small amount of water (5-10 mL) in the calibration cup and tighten the retaining nut to seal the storage chamber.

For long-term storage, YSI recommends uninstalling the sensors from the bulkhead and following each sensor's respective long-term storage instructions. Inspect the bulkhead ports and cable connectors for contamination. If dirty or wet, clean it with compressed air (Figure 62). Install the cap that protected the bulkhead during initial shipment. Alternatively, install the bulkhead port plugs.

4.3 Sensor Guard

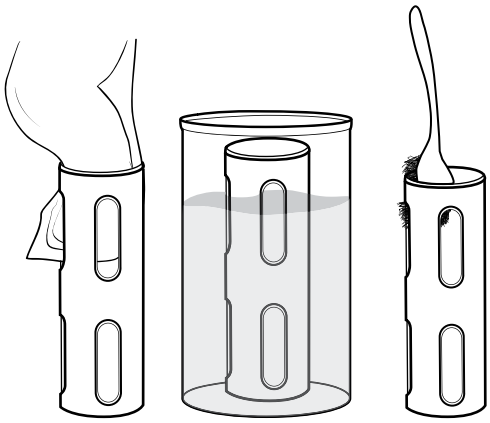


Figure 63 Sensor guard maintenance

Remove light bio-fouling with a cloth soaked in a mild solution of clean water and dish soap. Soak in vinegar to remove hard growth and deposits. Use a plastic scrub brush to remove any remaining bio-fouling. Rinse the sensor guard with clean water (Figure 63).

NOTICE: Do not sand or polish the guard. Removal of the guard coating can affect some sensor readings.

4.4 Depth Sensor

Figure 64 Depth sensor flush

The depth sensor on 4-port ProDSS cables 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 (Figure 64).

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 Temperature Sensor

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 wet or dry.

4.6 Conductivity Sensor

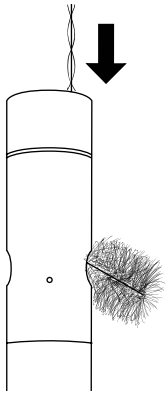


Figure 65 Channel brush

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 (Figure 65).

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

4.7 Optical Dissolved Oxygen Sensor

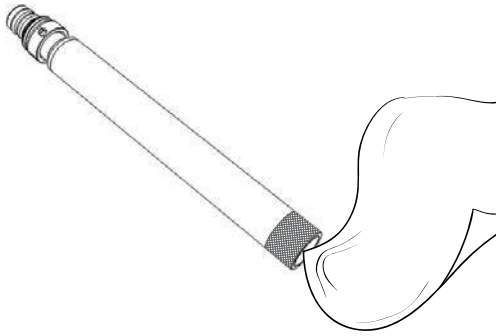


Figure 66 ODO sensor window

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 (Figure 66). 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.

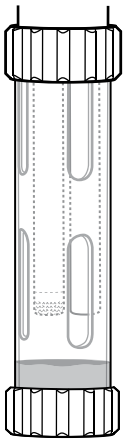


Figure 67 ODO short-term storage

Short-term Storage:

Store the ODO sensor in a moist air environment. A storage sleeve with a wet sponge or the calibration cup with a small amount of water is recommended (Figure 67).

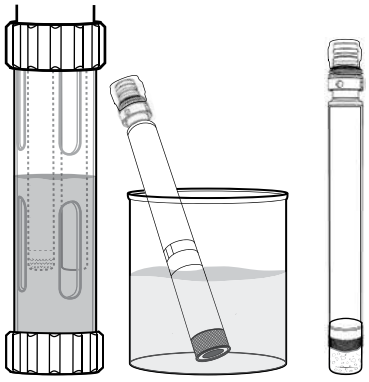


Figure 68 ODO long-term storage

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.

For ProDSS ODO sensors, the sensor can be left on the 4-port bulkhead or removed for long-term storage (Figure 68).

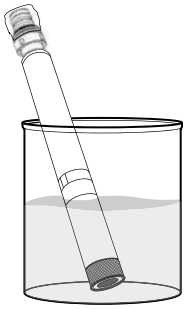


Figure 69 ODO rehydration

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 (Figure 69).

ODO Sensor Cap

Optical DO sensor caps are warrantied for either 12 or 24 months depending on the model:

- ProDSS ODO Sensor Cap [SKU: 626890] = **12** months
- ODO Extended Warranty Sensor Cap [SKU: 627180] = **24** 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.

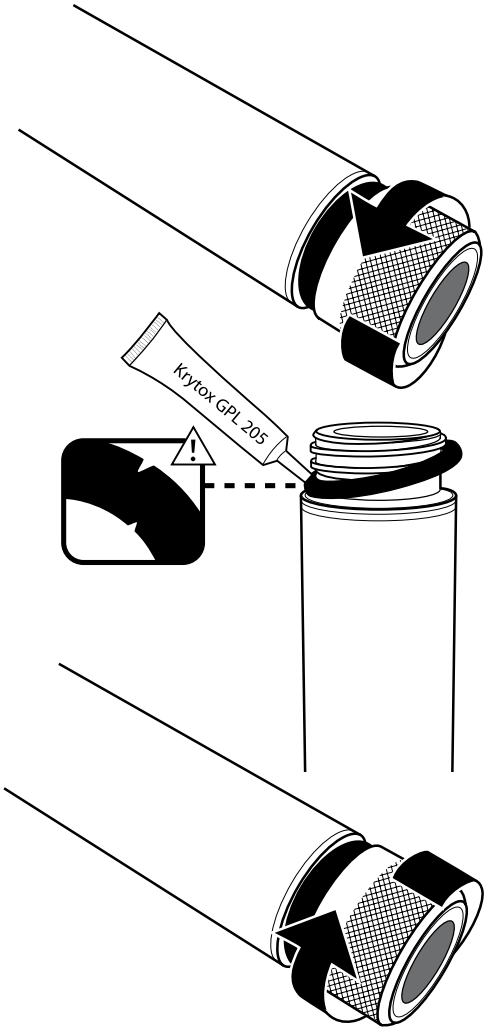


Figure 70 ODO cap replacement

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.*

4.8 Turbidity & Total Algae Sensors

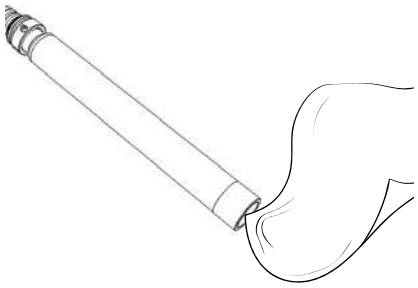


Figure 71 Sensor window

Clean the sensing window with a non-abrasive, lint-free cloth (Figure 71). 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.

4.9 pH/ORP Sensor

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.

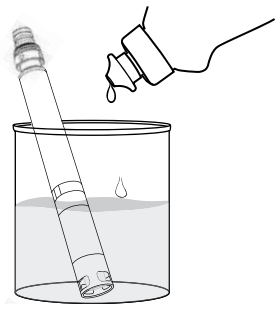


Figure 72 Cleaning the pH and pH/ORP sensor with dish soap

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 (Figure 72). 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.

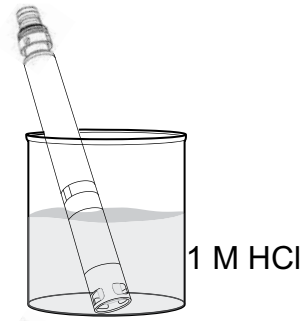


Figure 73 Cleaning the pH and pH/ORP sensor with hydrochloric acid

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 (Figure 73). 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.

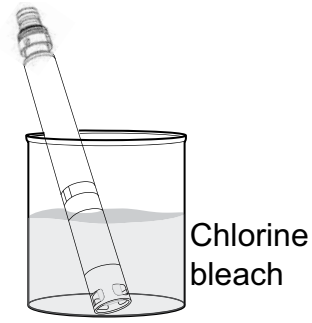


Figure 74 Cleaning the pH and pH/ORP sensor with chlorine bleach

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.

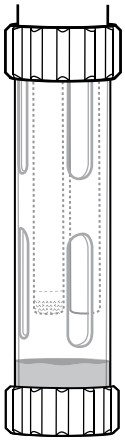


Figure 75 pH and pH/ORP short-term storage

Short-term Storage:

When in regular field use, the pH-pH/ORP sensors should remain on the bulkhead with the calibration/storage cup 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 (Figure 75). Make sure the storage cup makes a tight connection to prevent evaporation.

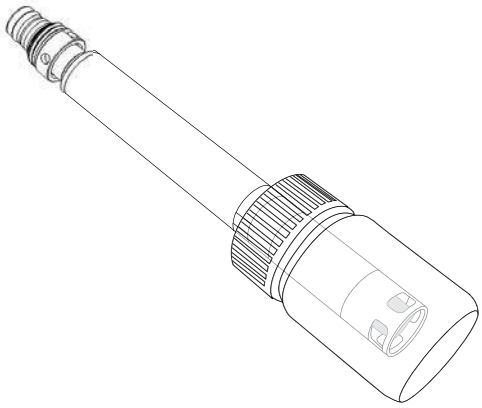


Figure 76 pH and pH/ORP long-term storage

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 (Figure 76). 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.

4.10 ISE Sensor

ISE sensors are shipped with their tips in a storage bottle. Keep this bottle for long-term storage.

Do not let the ISE sensor reference electrode junctions dry out. Clean the sensors when deposits, bio-fouling or other contamination appears on the membrane.

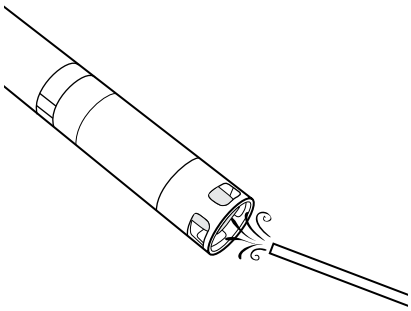


Figure 77 Ammonium and nitrate maintenance

Ammonium and Nitrate Sensor Maintenance

1. Carefully clean the ammonium or nitrate sensor by rinsing with DI water followed by soaking in the high standard calibration solution.
2. Carefully dab the sensor dry with a clean, lint-free cloth.

NOTICE: The ion-selective membranes are very fragile. Do not use coarse material (*e.g.* paper towels) to clean the membranes or permanent damage to the sensor can occur. The only exception is fine emery cloth on the chloride sensor.

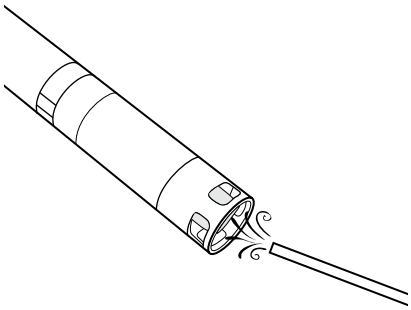


Figure 78 Chloride maintenance

Chloride Sensor Maintenance

1. Carefully clean the chloride sensor by carefully polishing with fine emery paper in a circular motion to remove deposits or discoloration.
2. Carefully rinse with DI water to remove any debris.

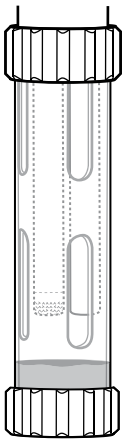


Figure 79 ISE short-term storage

Short-term Storage:

When in regular field use, ISEs should remain on the bulkhead with the calibration/storage cup 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. Make sure the storage cup makes a tight connection to prevent evaporation (Figure 79).

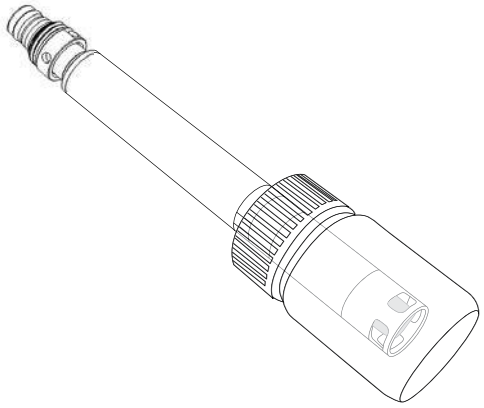


Figure 80 ISE long-term storage

Long-term Storage:

Remove the sensor from the bulkhead and plug the bulkhead port. Insert the sensor tip into the storage bottle with a small amount of high-calibration solution or tap water. The sensor tip should not be submerged. The storage bottle features an open cap and o-ring to form a tight seal around the sensor tip (Figure 80).

NOTICE: Do NOT let the sensor dry out. Do NOT store the ISE sensor in conductivity standard, pH buffer, or salt water. Either of these will radically shorten the lifespan or kill the sensor module and void its warranty.

Rehydrating the Reference Junction

If an ISE module has been allowed to dry, soak the sensor for several hours (preferably overnight) in the sensor's high-calibration solution. If the sensor is irreparably damaged, the sensor module must be replaced.

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.

4.11 ProDSS Sensor Module Replacement

Sensor modules for pH, pH/ORP, nitrate, ammonium, and chloride all require periodic replacement. Perform a sensor module replacement in a clean, dry laboratory environment. Remove the sensor from the bulkhead and perform the following steps:

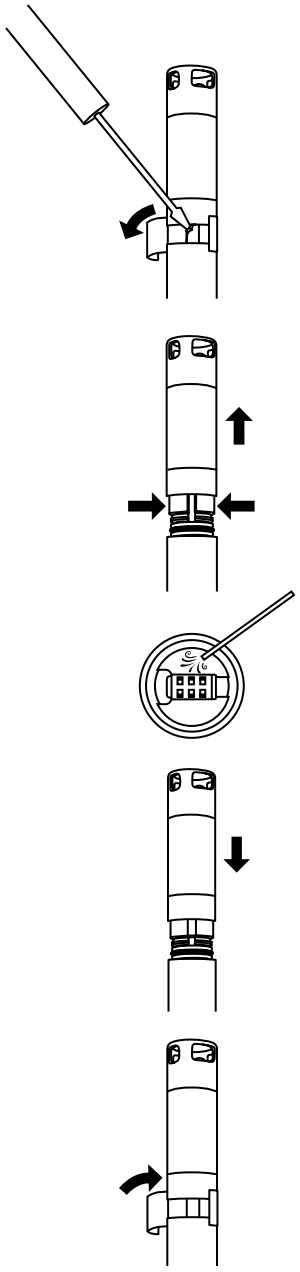


Figure 81 Sensor module replacement

Module Replacement

1. Peel off and discard the sticker that covers the junction of the sensor body and the module (Figure 81).
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.*

5. KorDSS Software

5.1 Introduction

KorDSS 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.

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

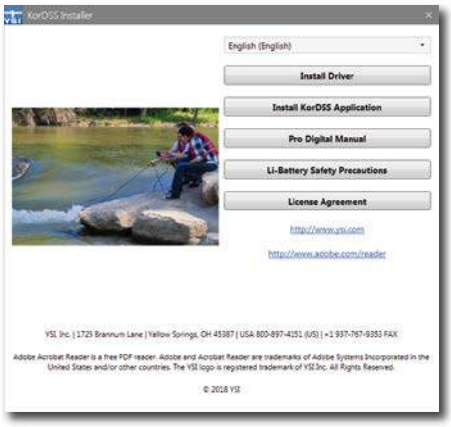


Figure 82 KorDSS Installer

Figure 83 ProDSS Driver Installer

Figure 84 Back button

Figure 85 KorDSS license agreement

Figure 86 Launch KorDSS

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

NOTE: *Be sure to install the driver* ***before*** *connecting the handheld 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 KorDSS Installer may appear. If it does not appear, open the flash drive in Windows Explorer and double-click **Start.exe** to start the installer. Figure 82 shows how the installer will appear once it starts.
3. On the KorDSS Installer, click **Install Driver**. Then choose to Install the driver on the screens that follow (Figure 83).
4. After the driver has installed, choose to go **Back** to the KorDSS Installer (Figure 84) .
5. On the KorDSS Installer, click **Install KorDSS Application**. A license agreement will appear (Figure 85).
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 KorDSS, click **Launch** to start the program (Figure 86).
8. Connect the handheld meter to the PC with the supplied USB cable.
9. Power on the handheld and click **Connect** when it appears under the **Instrument Connection Panel**; there may be a short delay before it appears in the software.

6. Accessories

6.1 Ordering

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
Web: Visit YSI.com to order replacement parts, accessories, and calibration stolutions.

When placing an order please have the following available:

1. YSI account number (if available)
2. Name and phone number
3. Purchase Order or Credit Card number
4. Model Number or brief description
5. Billing and shipping addresses
6. Quantity

ProDIGITAL Handhelds

YSI Item #	Description
626650	ProSolo handheld, no GPS, not compatible with ProDSS 4-port cable assemblies
626870-1	ProDSS handheld, no GPS
626870-2	ProDSS handheld with GPS

ProDIGITAL Probe Assemblies

NOTE: *The ODO and OBOD sensor caps come pre-installed on the following probe assemblies, with calibration coefficients of the sensor cap pre-loaded into the probe at the factory.*

YSI Item #	Description
	Optical Dissolved Oxygen and Temperature Probes
627200-1	ODO/T Probe Assembly, 1m
627200-4	ODO/T Probe Assembly, 4m
627200-10	ODO/T Probe Assembly, 10m
627200-20	ODO/T Probe Assembly, 20m
627200-30	ODO/T Probe Assembly, 30m
627200-50	ODO/T Probe Assembly, 50m
627200-100	ODO/T Probe Assembly, 100m
	Optical Dissolved Oxygen, Conductivity, and Temperature Probes
627150-1	ODO/CT Probe Assembly, 1m
627150-4	ODO/CT Probe Assembly, 4m
627150-10	ODO/CT Probe Assembly, 10m
627150-20	ODO/CT Probe Assembly, 20m
627150-30	ODO/CT Probe Assembly, 30m
627150-50	ODO/CT Probe Assembly, 50m
627150-100	ODO/CT Probe Assembly, 100m
	Self-Stirring Optical Biochemical Oxygen Demand Probes
626400	ProOBOD probe assembly (lab BOD probe); U.S./Japanese version with power supply
626401	ProOBOD probe assembly (lab BOD probe); International version with power supply

ProDSS 4-Port Cable Assemblies (No Sensors Included)

YSI Item #	Description
626909-1	ProDSS-1 meter 4-port cable assembly, no depth
626909-4	ProDSS-4 meter 4-port cable assembly, no depth
626909-10	ProDSS-10 meter 4-port cable assembly, no depth
626909-20	ProDSS-20 meter 4-port cable assembly, no depth
626909-30	ProDSS-30 meter 4-port cable assembly, no depth
626909-40	ProDSS-40 meter 4-port cable assembly, no depth
626909-50	ProDSS-50 meter 4-port cable assembly, no depth
626909-60	ProDSS-60 meter 4-port cable assembly, no depth
626909-70	ProDSS-70 meter 4-port cable assembly, no depth
626909-80	ProDSS-80 meter 4-port cable assembly, no depth
626909-90	ProDSS-90 meter 4-port cable assembly, no depth
626909-100	ProDSS-100 meter 4-port cable assembly, no depth
626910-1	ProDSS-1 meter 4-port cable assembly, with depth
626910-4	ProDSS-4 meter 4-port cable assembly, with depth
626910-10	ProDSS-10 meter 4-port cable assembly, with depth
626911-20	ProDSS-20 meter 4-port cable assembly, with depth
626911-30	ProDSS-30 meter 4-port cable assembly, with depth
626911-40	ProDSS-40 meter 4-port cable assembly, with depth
626911-50	ProDSS-50 meter 4-port cable assembly, with depth
626911-60	ProDSS-60 meter 4-port cable assembly, with depth
626911-70	ProDSS-70 meter 4-port cable assembly, with depth
626911-80	ProDSS-80 meter 4-port cable assembly, with depth
626911-90	ProDSS-90 meter 4-port cable assembly, with depth
626911-100	ProDSS-100 meter 4-port cable assembly, with depth

ProDSS Sensors (for 4-Port Cable Assemblies)

YSI Item #	Description
626900	Optical dissolved oxygen sensor
626902	Conductivity and temperature sensor
626901	Turbidity sensor
626903	pH sensor with module
626904	pH/ORP sensor with module
626906	Ammonium sensor with module
626905	Nitrate sensor with module
626907	Chloride sensor with module
626210	Total algae sensor, PC
626211	Total algae sensor, PE

Replacement Sensor Modules and ODO Sensor Caps

YSI Item #	Description
626890	Replacement ProDSS Optical Dissolved Oxygen sensor cap (for 626900 smart sensor)
626482	Replacement ProOBOD Optical Dissolved Oxygen sensor cap (for 626400 or 626401 lab probes)
627180	Replacement ODO Extended Warranty Sensor Cap (only compatible with ODO/T and ODO/CT probe assemblies)
626963	Replacement ProDSS pH sensor module
626964	Replacement ProDSS pH/ORP sensor module
626966	Replacement ProDSS Ammonium sensor module
626965	Replacement ProDSS Nitrate sensor module
626967	Replacement ProDSS Chloride sensor module

Calibration Standards

YSI Item #	Description
065270	Conductivity standard, 1000 µmhos/cm (quart, glass); ideal for fresh water
065272	Conductivity standard, 10000 µmhos/cm (quart, glass); ideal for brackish water
065274	Conductivity standard, 100000 µmhos/cm (quart, glass); ideal for supersaturated sea water
060907	Conductivity standard, 1000 µmhos/cm (box of 8 individual pints, plastic); ideal for fresh water
060906	Conductivity standard, 1413 µmhos/cm, ±1%, 0.01 M KCl (box of 8 individual pints, plastic)
060911	Conductivity standard, 10000 µmhos/cm (box of 8 individual pints, plastic); ideal for brackish water
060660	Conductivity standard, 50000 µmhos/cm (box of 8 individual pints, plastic); ideal for sea water
061320	ORP (mV) standard, Zobell solution, powder - needs hydrated (125 mL bottle, plastic)
061321	ORP (mV) standard, Zobell solution, powder - needs hydrated (250 mL bottle, plastic)
061322	ORP (mV) standard, Zobell solution, powder - needs hydrated (500 mL bottle, plastic)
003821	pH 4 buffer (box of 6 individual pints, plastic); ideal for storage solution for pH sensor
003822	pH 7 buffer (box of 6 individual pints, plastic)
003823	pH 10 buffer (box of 6 individual pints, plastic)
603824	Assorted case of pH 4, 7, and 10 buffers (2 individual pints of each buffer, plastic)
005580	Confidence solution to verify conductivity, pH and ORP system (box of 6 individual 475 mL bottles, plastic). ***Note:*** *Not for calibration*
003841	Ammonium standard, 1 mg/L (500 mL, plastic)
003842	Ammonium standard, 10 mg/L (500 mL, plastic)
003843	Ammonium standard, 100 mg/L (500 mL, plastic)
003885	Nitrate standard, 1 mg/L (500 mL, plastic)
003886	Nitrate standard, 10 mg/L (500 mL, plastic)
003887	Nitrate standard, 100 mg/L (500 mL, plastic)
608000	Turbidity standard, 0 FNU (1 gallon, plastic)
607200	Turbidity standard, 12.4 FNU (1 gallon, plastic)
607300	Turbidity standard, 124 FNU (1 gallon, plastic)
607400	Turbidity standard, 1010 FNU (1 gallon, plastic)

ProDIGITAL Accessories

YSI Item #	Description
626946	Large, hard-sided carrying case (Fits ProDSS 4-port cables 10, 20, and 30 meters in length, cable management kit, handheld, and accessories)
603075	Large, soft-sided carrying case
626945	Small, hard-sided carrying case (Fits ProDSS 4-port cables 1 and 4 meters in length, handheld, flow cell, and accessories)
599080	Flow cell for ProDSS 4-port cables
603076	Flow cell for ODO/CT cables (requires single port adapter; 603078)
603078	Adapter required for ODO/CT flow cell (603076)
603056	Flow cell mounting spike
063507	Tripod (screws into back of meter)
063517	Ultra clamp (screws into back of meter)
603070	Shoulder strap
603069	Belt clip (screws into back of meter)
626942	USB car charger
626943	Small external Li-Ion rechargeable battery pack (Typical performance: will charge a completely discharged handheld battery to about 50%)
626944	Large external Li-Ion rechargeable battery pack (Typical performance: will charge a completely discharged battery to full charge, plus have power to charge a second battery to 20%)
626940	AC charger (USA). Includes power supply and USB cable (included with handheld)
626941	AC charger (international). Includes power supply, USB cable and outlet adapters (included with handheld)
626846	Replacement Lithium-ion battery pack
626969	USB flash drive (included with handheld)
626991	Cable for charging and PC connection (included as part of 626940 and 626941)
626992	Cable for connection to USB drive (included with handheld)
626990	ProDSS maintenance kit (included with all ProDSS 4-port cables): • 3 port plugs • 1 tube of o-ring lubricant • 1 brush • 1 syringe • 1 sensor installation/removal tool • O-rings (6)
626919	Sensor guard for 4-port ProDSS cable assembly (included with all 4-port cables)
599786	Calibration/storage cup for 4-port ProDSS cable assembly (included with all 4-port ProDSS cables)
627195	Calibration cup for ODO/CT cable assembly (included with all ODO/CT cables)
603062	Cable management kit (included with **ProDSS 4-port cables** 10, 20, and 30-meters long; **ODO/CT cables** 4, 10, 20, and 30-meters long; and **ODO/T cables** 4, 10, 20, and 30-meters long)
626918	1 lb weight (included with ProDSS 4-port cables 10-meters and longer)
605978	4.9 oz weight

7. Safety and Support

7.1 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.
- Disconnect the battery pack when not in use and for long-term storage.
- 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 neckaces, 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.

7.2 Service Information

YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit ysi.com and click 'Support' 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.

7.3 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

7.4 Declaration of Conformity

The undersigned hereby declares on behalf of the named manufacturer under our sole responsibility that the listed product conforms to the requirements for the listed European Council Directive(s) and carries the CE mark accordingly.

Manufacturer:	YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA
Product Name:	ProDSS, ProSolo
Conforms to the following:	
Directives:	EMC 2004/108/EC RoHS 2011/65/EU WEEE 2012/19/EU
Harmonized Standards:	EN61326-1:2013 (IEC 61326-1:2012) IEC 61000-3-2:2005 +A1:2008+A2:2009 IEC 61000-3-3:2008
Supplementary Information:	All performance met the operation criteria as follows: 1. ESD, IEC 61000-4-2:2008 2. Radiated Immunity, IEC 61000-4-3:2006 +A1:2007+A2:2010 3. Electrical Fast Transient (EFT), IEC 61000-4-4:2004 +A1:2010 4. Immunity to Surge, IEC 61000-4-5:2005 5. Radio Frequency, Continuous Conducted Immunity, IEC61000-4-6:2008 6. IEC 61000-4-8:2009 7. IEC 61000-4-11:2004
Authorized EU Representative	Xylem Analytics UK Ltd Unit 2 Focal Point, Lacerta Court, Works Road Letchworth, Hertfordshire, SG6 1FJ UK

Signed: Lisa M. Abel
Title: Director of Quality

Date: March 16, 2018

The undersigned hereby declares on behalf of the named manufacturer under our sole responsibility that the listed product conforms to the requirements for electrical equipment under US FCC Part 15 and ICES-003 for unintentional radiators.

Manufacturer:	YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA
Product Name:	Professional Digital Sampling System Instrument
Model Numbers	
Instrument/Accessory:	ProDSS non-GPS (626870-1) / ProDSS GPS (626870-2), ProSolo (626650)
Probe/Cable Assemblies:	626909-1, 626909-4, 626909-10, 626909-20, 626909-30, 626909-40, 626909-50, 626909-60, 626909-70, 626909-80, 626909-90, 626909-100, 626910-1, 626910-4, 626910-10, 626911-20, 626911-30, 626911-40, 626911-50, 626911-60, 626911-70, 626911-80, 626911-90, 626911-100 627200-1, 62700-4, 627200-10, 627200-20, 627200-30, 627200-50, 627200-100 627150-1, 627150-4, 627150-10, 627150-20, 627150-30, 627150-50, 627150-100 626250-1, 626250-4, 626250-10, 626250-20, 626250-30, 626250-40, 626250-50, 626250-60, 626250-70, 626250-80, 626250-90, 626250-100 626400, 626401
Sensors:	626900, 626902, 626901, 626903, 626904, 626906, 626905, 626907, 626210, 626211
Conforms to the following:	
Standards:	• FCC 47 CFR Part 15-2008, Subpart B, Class B, Radio Frequency Devices • ICES-003:2004, Digital Apparatus
Supplementary Information:	Tested using ANSI C63.4-2003 (excluding sections 4.1, 5.2, 5.7, 9, and 14)

Signed: Lisa M. Abel Date: March 16, 2018
Title: Director of Quality

7.5 Warranty

The YSI Professional Series Digital (ProDIGITAL) handheld meters are warranted for three (3) years from date of purchase by the end user against defects in materials and workmanship. Digital sensors and cables (ProDSS 4-port, ODO/CT, ODO/T, and ProOBOD) are warranted for two (2) years from date of purchase by the end user against defects in material and workmanship. The ODO Extended Warranty Sensor Cap (627180) for the ODO/T and ODO/CT cable assemblies is 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 (all but the 627180 cap previously mentioned), and Li-Ion battery pack 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.

8. Appendices

8.1 Appendix A
DO% Calibration Values

Calibration Value	Pressure			
D.O. %	**in Hg**	**mmHg**	**kPa**	**mbar**
101%	30.22	767.6	102.34	1023.38
100%	29.92	760.0	101.33	1013.25
99%	29.62	752.4	100.31	1003.12
98%	29.32	744.8	99.30	992.99
97%	29.02	737.2	98.29	982.85
96%	28.72	729.6	97.27	972.72
95%	28.43	722.0	96.26	962.59
94%	28.13	714.4	95.25	952.46
93%	27.83	706.8	94.23	942.32
92%	27.53	699.2	93.22	932.19
91%	27.23	691.6	92.21	922.06
90%	26.93	684.0	91.19	911.93
89%	26.63	676.4	90.18	901.79
88%	26.33	668.8	89.17	891.66
87%	26.03	661.2	88.15	881.53
86%	25.73	653.6	87.14	871.40
85%	25.43	646.0	86.13	861.26
84%	25.13	638.4	85.11	851.13
83%	24.83	630.8	84.10	841.00
82%	24.54	623.2	83.09	830.87
81%	24.24	615.6	82.07	820.73
80%	23.94	608.0	81.06	810.60
79%	23.64	600.4	80.05	800.47
78%	23.34	592.8	79.03	790.34
77%	23.04	585.2	78.02	780.20
76%	22.74	577.6	77.01	770.07
75%	22.44	570.0	75.99	759.94
74%	22.14	562.4	74.98	749.81
73%	21.84	554.8	73.97	739.67
72%	21.54	547.2	72.95	729.54

8.2 Appendix B Oxygen Solubility Table

Solubility of oxygen in mg/L in water exposed to water-xaturated air at 760 mm Hg pressure.

Salinity = Measure of quantity of dissolved salts in water.

Chlorinity = Measure of chloride content, by mass, of water.

S(0/00) = 1.80655 x Chlorinity (0/00)

Temp °C	Chlorinity : 0 Salinity: 0	5.0 ppt 9.0 ppt	10.0 ppt 18.1 ppt	15.0 ppt 27.1 ppt	20.0 ppt 36.1 ppt	25.0 ppt 45.2 ppt
0.0	14.62	13.73	12.89	12.10	11.36	10.66
1.0	14.22	13.36	12.55	11.78	11.07	10.39
2.0	13.83	13.00	12.22	11.48	10.79	10.14
3.0	13.46	12.66	11.91	11.20	10.53	9.90
4.0	13.11	12.34	11.61	10.92	10.27	9.66
5.0	12.77	12.02	11.32	10.66	10.03	9.44
6.0	12.45	11.73	11.05	10.40	9.80	9.23
7.0	12.14	11.44	10.78	10.16	9.58	9.02
8.0	11.84	11.17	10.53	9.93	9.36	8.83
9.0	11.56	10.91	10.29	9.71	9.16	8.64
10.0	11.29	10.66	10.06	9.49	8.96	8.45
11.0	11.03	10.42	9.84	9.29	8.77	8.28
12.0	10.78	10.18	9.62	9.09	8.59	8.11
13.0	10.54	9.96	9.42	8.90	8.41	7.95
14.0	10.31	9.75	9.22	8.72	8.24	7.79
15.0	10.08	9.54	9.03	8.54	8.08	7.64
16.0	9.87	9.34	8.84	8.37	7.92	7.50
17.0	9.67	9.15	8.67	8.21	7.77	7.36
18.0	9.47	8.97	8.50	8.05	7.62	7.22
19.0	9.28	8.79	8.33	7.90	7.48	7.09
20.0	9.09	8.62	8.17	7.75	7.35	6.96
21.0	8.92	8.46	8.02	7.61	7.21	6.84
22.0	8.74	8.30	7.87	7.47	7.09	6.72
23.0	8.58	8.14	7.73	7.34	6.96	6.61
24.0	8.42	7.99	7.59	7.21	6.84	6.50
25.0	8.26	7.85	7.46	7.08	6.72	6.39
26.0	8.11	7.71	7.33	6.96	6.62	6.28
27.0	7.97	7.58	7.20	6.85	6.51	6.18
28.0	7.83	7.44	7.08	6.73	6.40	6.09
29.0	7.69	7.32	6.93	6.62	6.30	5.99
30.0	7.56	7.19	6.85	6.51	6.20	5.90
31.0	7.43	7.07	6.73	6.41	6.10	5.81
32.0	7.31	6.96	6.62	6.31	6.01	5.72

Temp °C	Chlorinity : 0 Salinity: 0	5.0 ppt 9.0 ppt	10.0 ppt 18.1 ppt	15.0 ppt 27.1 ppt	20.0 ppt 36.1 ppt	25.0 ppt 45.2 ppt
33.0	7.18	6.84	6.52	6.21	5.91	5.63
34.0	7.07	6.73	6.42	6.11	5.82	5.55
35.0	6.95	6.62	6.31	6.02	5.73	5.46
36.0	6.84	6.52	6.22	5.93	5.65	5.38
37.0	6.73	6.42	6.12	5.84	5.56	5.31
38.0	6.62	6.32	6.03	5.75	5.48	5.23
39.0	6.52	6.22	5.98	5.66	5.40	5.15
40.0	6.41	6.12	5.84	5.58	5.32	5.08
41.0	6.31	6.03	5.75	5.49	5.24	5.01
42.0	6.21	5.93	5.67	5.41	5.17	4.93
43.0	6.12	5.84	5.58	5.33	5.09	4.86
44.0	6.02	5.75	5.50	5.25	5.02	4.79
45.0	5.93	5.67	5.41	5.17	4.94	4.72

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.

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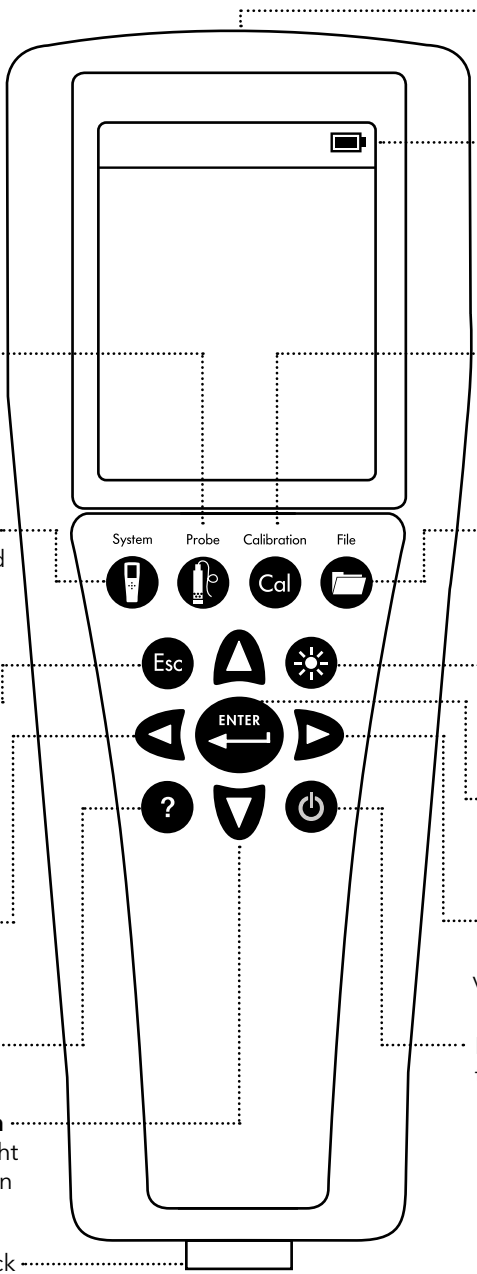
www.xylem.com

Pro D·I·G·I·T·A·L

Quick Start Guide

Item #626972REF

This is a reference guide for operating the ProDIGITAL line of handhelds. Refer to the User Manual for more information.



Micro USB port

Battery indicator

Press the **Probe** key to setup sensors and select displayed units

Press the **Cal** key to calibrate attached sensors

Press the **System** key to setup the handheld and adjust logging settings

Press the **File** key to access logged data

Press the **Esc** key to return to the Run screen or to exit an alpha/numeric entry screen

Toggle **Backlight**

Press the **Enter** key to activate the selection

Use the **left arrow** key to go back one screen

Use the **right arrow** key to toggle graph view on the Run screen

Activate **Help** Menu

Press the **Power** key to turn on the instrument. Press and hold for 1.5 seconds to turn the instrument off

Use the **up** and **down arrow** keys to highlight a desired menu option

Military spec, twist-lock **cable connector**

YSI.com

Setting Up

Charge the battery by connecting the handheld to an AC power supply or USB connector using the micro USB cable. Ensure all components are dry when charging. A full charge takes approximately 9 hours.

Make sure the **date/time** is correct and set the **logging mode** (Single or Continuous).

Setup sensor parameters and select **units displayed** on the Run and Data View screens.

Calibrate sensors prior to taking measurements; sensor-specific calibration instructions can be found in the User Manual.

Taking Measurements

Insert the probe into the sample and briefly move it up and down to release any air bubbles. Allow measurements to stabilize and press the Enter key to **log data**. To stop Continuous logging, simply press the Enter key again.

Data Management

Press the File key to **view**, **delete**, or **backup** logged data. Data can be filtered by date/time and by the user-created Site and/or Data ID.

Transfer data to your PC using **KorDSS Software**. Make sure the instrument driver and software are installed from the included USB flash drive or from **YSI.com**.

1. Open KorDSS Software.
2. Use the micro USB cable to connect the handheld to the PC.
3. Power on the handheld; there may be a short delay before it shows up in the software.
4. Select the handheld under the **Instrument Connection Panel** and click Connect.
5. Click **Start Download from Device**.
6. After data download, click **View Logged Data** to view, print, and export data files from KorDSS.

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Item# 626972REF Dwg# 626972
June 2018 Rev C

APPENDIX A2: MAINE VOLUNTEER RIVER MONITORING PROGRAM METHODS FOR COLLECTING WATER GRAB SAMPLES STANDARD OPERATING PROCEDURE

STANDARD OPERATING PROCEDURE

MAINE VOLUNTEER RIVER MONITORING PROGRAM (VRMP)

METHODS FOR COLLECTING
WATER GRAB SAMPLES IN RIVERS AND STREAMS

Note: The mention of brand names does not constitute recommendation of a specific company.

Volunteer River Monitoring Program (VRMP)

Standard Operating Procedure
Methods for Collecting Water Grab Samples

1. **Applicability.** This standard operating procedure (SOP) is used by the Volunteer River Monitoring Program (VRMP) of the Maine Department of Environmental Protection's (DEP's) Bureau of Water Quality, Division of Environmental Assessment, Watershed Management Unit. It applies to the collection of water grab samples for water chemistry analysis [generally for nutrients, suspended sediments/solids, biochemical oxygen demand; see section 5-C-(1), below] that are collected by volunteers from rivers and streams in Maine.

2. **Purpose.** The purpose of this SOP is to provide standardized methods for collecting water grab samples from rivers and streams in Maine.

3. **Definition.** A water grab sample is a sample of river and stream water collected for the purpose of analyzing its constituent water chemistry.

4. **Responsibilities**

A. ***Volunteer Monitors & Volunteer Groups***

• **Certification.** It is the responsibility of the individual obtaining these water grab samples to maintain a current certification for the parameter(s) they collect if they wish their data to be entered into the VRMP database. Training for water sampling/testing will be provided to volunteers on an annual basis by VRMP/DEP staff, and certification will last for one year from the date of training.

• **Water Sample Collection.** It is the responsibility of the volunteer to collect water samples as specified in their (VRMP) volunteer group's Sampling and Analysis Plan (SAP).

• **Data Recording.** It is the responsibility of the individual obtaining this data to record the results and additional qualifying information on current VRMP field data sheets (see Appendix 5 of the VRMP's Quality Assurance Program Plan or QAPP) obtained from their affiliated watershed association or through the VRMP program of the DEP.

• **Submitting Samples to VRMP-Approved Laboratories.** Volunteers and/or volunteer groups will submit water grab samples to a VRMP-approved laboratory for analyses following protocols outlined in their approved SAP. See QAPP Appendix 11 information on approved laboratories. This includes the completion of laboratory chain of custody forms.

• **Data Quality Checks and Data Submission.** The data manager for the volunteer group will collect and enter volunteer field sheet data onto the appropriate computer file, perform quality assurance checks (Refer to Section 5.10 of the QAPP), and submit data to the VRMP – all following protocols outlined in the volunteer group's latest SAP that has been approved by the VRMP.

B. ***VRMP-Approved Laboratories Used by the Volunteer Groups***

• **Sample Processing.** Laboratories will accept water quality samples and chain of custody forms from volunteer groups and then process/analyze the samples.

• **Sending Data and Quality Assurance Results.** Laboratories will send water quality data and quality assurance results to both the volunteer group's data manager and the VRMP, simultaneously, using an electronic "EDD" (electronic data deliverable) format.

C. ***Volunteer River Monitoring Program (VRMP) Staff***

• **Oversight of Volunteer Groups and Volunteers.** VRMP staff will oversee volunteer groups and volunteers through a variety of ways including maintaining an up-to-date VRMP QAPP; reviewing SAPs of the volunteer groups; providing annual training/(re-) certification sessions for volunteers; conducting quality assurance checks on data submitted by volunteer groups and laboratories; and uploading data into the DEP's EGAD (Environmental and Geographic Analysis Database) database. These tasks are described in greater detail in the VRMP's latest QAPP.

5. Guidelines and Procedures

A. Sampling period and location. Sampling period and site location information will be documented in SAPs (which require approval by the VRMP) that are submitted by the volunteer groups prior to the beginning of a sampling season. Detailed information regarding how volunteer groups are to obtain and document site location information can be found in the VRMP's Appendix 2 (SOP-02 - Methods for Selecting and Documenting Site Location) and Appendix 6 (Sampling Site Location Form)**.**

B. Supplies

(1) For water samples:
  (a) Water quality kits from a VRMP-approved laboratory, which include containers specific to parameter(s) measured [see section C (1) below] and preservatives, as required
  (b) Waterproof labels (BE SURE TO STICK ON CONTAINER PRIOR TO SAMPLING)
  (c) VRMP-approved water sampling device, if using OPTION 3 [i.e., sampling from bridges or boats; see section C below]
  (d) VRMP approved laboratory-chain of custody sheets
  (e) Permanent marker
  (f) Pencil

(2) Miscellaneous supplies (as needed [refer to Tables 3a {QA criteria} and 3c {sample preservation} in the latest VRMP QAPP])
  (a) Cooler with ice
  (b) Waders
  (c) Gloves
    - Currently, gloves are considered OPTIONAL.
    - In the future, if groups begin to monitor phosphorus or metals, this issue may be revisited.
    - If wearing gloves, the VRMP recommends non-latex glove materials (e.g., nitrile) to help avoid possible allergic reactions.
  (d) Personal floatation device (PFD)
  (e) Anchor, if sampling from a boat (e.g., OPTIONS 2 or 3)

C. Collecting Water Grab Samples in Field

(1) Water samples for the VRMP are collected for all or a subset of the following parameters: bacteria (*E. coli*, fecal coliform, or *Enterococcus*); turbidity; suspended sediment concentration (SSC); hardness; alkalinity; total phosphorus (TP); ortho-phosphorus; total Kjeldahl-nitrogen; nitrate/nitrite-nitrogen; total suspended solids; total dissolved solids; chloride; pH; and specific conductance. (Other parameters, such as metals, are not currently part of the VRMP program, but may be in the future.) Parameters such as dissolved oxygen (DO), temperature, specific conductance, and turbidity will usually be analyzed by volunteer groups using a water quality meter or test kit. Separate VRMP SOPs exist for those parameters.

(2) Record the sample kit number (pre-assigned by the laboratory) on the VRMP Data Sheet.

(3) Collect water samples using appropriate sample container before stirring up sediments from the river or stream bottom, or, alternatively, collect samples upstream of any agitated (stirred-up) water where you have walked. Collect samples choosing one of the following OPTIONS:
1 - wading,
2 - collecting from edge of river/stream or boat by reaching one's arm or by using an extension pole, or
3 - VRMP-approved water sampling device, from either a bridge or boat, as appropriate.
Be sure to avoid eddies, pools, and deadwater. See Appendix B of this document for more information on acceptable location of sample collection.

(4) Avoid touching the inside or lip of the sample containers (e.g., bottles, cubitainers, Whirl-Pak® bags) or caps.

(5) **OPTION 1** ("wading method", collecting from within a stream/river)
(a) Caution should be used in all cases, but especially when wading in rivers and streams deeper than two feet. If sampling within a stream or river, wearing waders and a U.S. Coast Guard approved Type-III floatation vest (PFD) are recommended. Additional caution should be used when the streambed or streambanks are composed of loose or slippery material such as rocks, bedrock, clay, or mud. Algae can make these materials even more slippery. *Do not wade into streams/rivers that are deeper than your thighs!!*
(b) Be sure waterproof label is on container and is properly labeled.
(c) Approach the stream from a downstream location, walking upstream to the sampling site. (This prevents the disturbance of bottom sediments that could contaminate the water quality sample.)
(d) Rinse sample containers in stream water three times (only for certain parameters, as specified in Appendix A of this document).
If using a Whirl-Pak ® for bacteria sampling (avoid collecting surface film):
(e) The Whirl-Pak ® should be submerged before opening it to collect the water sample. Submerge it under water, open the bag and remove once it is approximately half-full. Roll up (whirl) the bag to close it and seal it by tying the two yellow tabs together. Using clean tongs with alligator clips that attach to the Whirl-Pak ® bag by its two yellow tabs is acceptable for holding the bag.
For all other containers (in both options, avoid collecting surface film):
(f) (Alternative 1-a; submersing bottle before cap is unscrewed)
With cap still screwed on, submerse bottle underwater. (It is okay to loosen cap before submersion.) Tip container upright, remove cap (keeping hand downstream of bottle), and allow water to fill container. Once container is full, place cap on while the container is still submersed. Remove container from water.
(g) (Alternative 1-b; unscrewing cap first and then submersing bottle)
Remove cap from bottle. With bottle pointed upside-down, quickly submerse

the bottle under water, turn it upright, and allow it to fill with water. Once container is full, quickly remove it from water and cap.

(6) **OPTION 2** (Collecting from edge of river/stream or boat by reaching one's arm or by using an extension pole.)

- Edge of River or Stream: Reaching to collect a sample from edge of river/stream is acceptable if a well-mixed sample may be obtained. Use an extension pole to collect sample if well-mixed sample cannot be obtained by reaching.
- Boat Situations: For boat situations, refer to Appendix B to determine whether samples can be collected by reaching or whether a VRMP-approved sampling device (OPTION 3) is required.

Reaching Method

(a) Caution should be used in all cases. If in a boat, wear a US Coast Guard-approved Type-III flotation vest (PFD) at all times for safety. Anchor the boat when in the correct position to sample. When sampling from a boat, sample from the upstream side of the boat.
(b) Be sure waterproof label is on sampling container and is properly labeled.
(c) Be careful not to contaminate the cap, neck, or inside the container with your fingers or other foreign objects.
(d) Rinse sample containers in stream water three times (only for certain parameters, as specified in Appendix A of this document).
(e) If using a Whirl-Pak ® for bacteria sampling (avoid collecting surface film):
(d) The Whirl-Pak ® should be submerged before opening it to collect the water sample. Submerge it under water, open the bag and remove once it is approximately half-full. Roll up (whirl) the bag to close it and seal it by tying the two yellow tabs together. Using clean tongs with alligator clips that attach to the Whirl-Pak ® bag by its two yellow tabs is acceptable for holding the bag.
For all other containers (in both options, avoid collecting surface film):
(e) (Alternative 1-a; submersing bottle before cap is unscrewed)
With cap still screwed on, submerse bottle underwater. (It is okay to loosen cap before submersion.) Tip container upright, remove cap (keeping hand downstream of bottle), and allow water to fill container. Once container is full, place cap on while the container is still submersed. Remove container from water.
(f) (Alternative 1-b; unscrewing cap first and then submersing bottle)
Remove cap from bottle. With bottle pointed upside-down, quickly submerse the bottle under water, turn it upright, and allow it to fill with water. Once container is full, quickly remove it from water and cap.

Extension Pole Method (not recommended for sampling by boat)

(a) Be sure waterproof label is on container and is properly labeled.

(b) Rinse the clamp end of the extension pole in the stream/river prior to sampling.
(c) Remove lid or stopper from sample container prior to sampling. Be careful not to contaminate the cap, neck, or inside the container with your fingers or other foreign objects.
(d) Securely attach the sample container to the extension pole using the clamps.
(e) Extend the pole to desired length. Ensure that a well-mixed sample will be collected. (Do not, however, extend the pole too far when sampling in high velocity streams to avoid damage to the pole.)
(f) Rinse sample container in stream water three times (only for certain parameters as specified in Appendix A of this document).
(g) Prepare to collect water sample by first rotating the extension pole until the sample container is oriented upside down.
(h) Immerse the sample container to desired depth and then rotate the rod underwater to fill the container. (Avoid collecting surface film.)
(i) Once the sample container is full, remove it from the water, cap it and remove it from the clamp.

(7) **OPTION 3** (“VRMP-approved water sampling device” method; if collecting from a bridge or from a boat;)
(. See Appendix B1 of this document for information on acceptable location of sample collection and Appendix B2 for a list and description of approved sampling devices.)
(a) Caution should be used in all cases. If sampling from a bridge, wear an orange vest for safety. If collecting samples from a boat, wear a US Coast Guard -approved Type-III flotation vest (PFD) at all times for safety.
(b) If on a boat, anchor it when in the correct position to sample.
(c) Be sure waterproof label is on appropriate containers and that they are properly labeled.
(d) Make sure the VRMP-approved water sampling device has been cleaned ahead of time according to directions in Appendix C of this document.
(e) Rinse the sampling device and any associated sample containers in stream water three times (only for certain parameters as specified in Appendix A of this document). (Make sure this is done from a safe location!) When on a bridge, dump the rinse water at least 20 feet away from where you plan to take the water sample. When on a boat, dump the rinse water on the downstream side of the boat.
(f) Lower the sampling device from the upstream side of the bridge or boat (whenever possible) into the river to the appropriate depth. Completely fill the sampling device with water. (See Appendix B for information on appropriate depth for sampling.)
(g) Pull the filled sampling device up and carry to a safe location. (Be sure to watch out for traffic.) Avoid bumping the sampling device against the bridge as you raise it to avoid any potential sample contamination.

(h) Prepare to analyze your water sample. Place the sample container on a clean, stable surface such as the bottom of an upside-down 5-gallon bucket. Carefully open the sample device in order to access the water inside.

(i) *Dissolved oxygen and temperature:* In many cases volunteers will be monitoring dissolved oxygen (DO) and temperature directly off of bridges using meters and probes with long cords that follow other standard operating procedures (SOPs). If, instead, you are analyzing DO and temperature from the water within your sampling device, analyze the sample for DO and temperature first, following the appropriate equipment SOPs, before analyzing other parameters. Do not agitate the water before DO and temperature have been measured.

(j) *Other water quality parameters:* After DO and temperature have been measured, swirl and mix the water sample. Measure other parameters using the appropriate meters/probes (following their specific SOPs) or pour off water samples into their appropriate sample containers.

(k) Follow Appendix C for directions on how to clean and store the water sampling device.

(9) Store and transport samples in cooler with ice, as appropriate (refer to Table 3c of the VRMP QAPP for more information).

(10) Complete VRMP field data sheet (QAPP Appendix 5) and VRMP-approved laboratory chain of custody sheet.

(11) Drop off samples at VRMP-approved laboratory within the holding time frame (see Table 3c of the VRMP QAPP for more details). Include a completed chain of custody sheet specific to your VRMP-approved laboratory.

D. Quality Control

(1) At the beginning of each field season, all VRMP staff and VRMP volunteers who will collect water grab samples will have a training/(re-)certification session to (re)familiarize themselves with the contents of this SOP.

(2) For every volunteer, a field duplicate will be collected for 10% (i.e., 1 for every 10 water grab samples) collected for laboratory analysis. However, if, for example, only 5 samples were collected for a given parameter in a given year by a volunteer, 1 field duplicate must still be collected for that parameter. The field duplicate must be processed by the same laboratory.

(3) Laboratory: quality control samples analyzed in the laboratory are specified in their respective SOPs and generally include duplicate, spiked, and blank samples.

(4) Refer to the VRMP QAPP for more QA/QC details.

6. References.

Maine Department of Environmental Protection (DEP). 2014. Protocols for Collecting Water Grab Samples in Rivers, Streams, and Freshwater Wetlands. Prepared by Tom Danielson, DEP, Augusta, Maine. Document ID: DEPLW0637.

Maine DEP. 2025. Maine Volunteer River Monitoring Program QAPP.

Appendix A. List of Water Quality Parameter Containers that Require or do not Require Rinsing with Stream Water (3 times) Prior to Actual Sampling. Containers for certain parameters should not be rinsed prior to sampling because they are a) easily contaminated, b) already washed/rinsed by the laboratory using a special protocol, or c) already contain a pre-measured preservative in them, which would be washed out if the container were to be rinsed.

Water Quality Parameter Containers REQUIRING Rinsing Prior to Sampling	
Maine State Health and Environmental Testing Laboratory (HETL)	• pH • total dissolved solids • chloride • turbidity • solids/sediments (i.e., total suspended solids; suspended sediment concentration) • ortho-phosphorus (soluble reactive phosphorus) • nitrogen (NO_2, NO_3, TKN) • alkalinity *or* hardness • biochemical oxygen demand (BOD)
Add to this list as more labs get added to the VRMP list of approved labs.	
Water Quality Parameter Containers Which SHOULD NOT or DO NOT NEED TO BE RINSED Prior to Sampling	
Maine State Health and Environmental Testing Laboratory (HETL)	• total phosphorus • bacteria (i.e., *E. coli*, fecal coliform, or *Enterococcus*)
Add to this list as more labs get added to the VRMP list of approved labs.	

Appendix B1. Required river/stream monitoring locations for inclusion in the VRMP.

Lateral Position Across a River/Stream

à Sampling needs to occur so that a flowing, well-mixed, representative sample is collected. If possible, volunteers should try to sample in the "center half of flow". The center half of flow is usually close to the middle of the channel, though it sometimes can move away from the middle of the channel, following the thalweg (Figure 2), towards the outside of a river-bend.

à Samplers need to avoid shore-related features such as:
• eddies • deadwaters • shallows • jetties
• pools (even though parts of the thalweg may pass through them)
• docks (unless they within the center half of flow).

à To obtain a well-mixed representative sample, volunteers can use a variety of techniques including:
• wading out by foot • reaching out • using an extension pole • using a boat
• sampling from a bridge/culvert using a VRMP-approved water sampling device[1]

Vertical Position in a River/Stream

(In all cases, avoid allowing water surface films or "stirred-up bottom sediments" into the sample. Always face upstream when sampling.)

(*For Dissolved Oxygen & Temperature as well as any Other Water Quality Parameters*)
à For rivers/streams that are non-wadeable, sample at mid-depth (if depth is known) or 1 meter below the surface.
à For rivers/streams that are wadeable, sample at mid-depth or 1 ½ feet below the surface.
(Volunteers will specify which depth on their data sheet.)

(For Dissolved Oxygen & Temperature Profiles)
à Sample at 1-m increments to obtain a vertical profile

Longitudinal Position in River/Stream

(when near crossing such as a bridge or culvert)

à To avoid the possible effects of roads, bridges, or scour pools on water quality, the preferred location to sample is at the upstream end of a bridge or culvert crossing (as opposed to the downstream end) *unless*:
(1) it is safer to sample at the downstream end;
(2) the purpose of sampling at the downstream end of the crossing is to include any effects of the crossing on water quality.

à Be sure to document where the sampling takes place with respect to a crossing, especially on the Site Location Description Form (Appendix 6).

Impoundments

à Sample as close as possible* to the deepest "hole" (depth) of the impoundment – generally in the vicinity of the upstream side of the dam. Bathymetry maps or sonar equipment can be used to determine river depths. *(Do not risk your safety! Do not get too close to the dam! Do not go into "roped-off" sections of the impoundment.)

[1] See VRMP's QAPP's section 5.2 and also Appendix 2 SOP Cookbook (specifically, "Standard Operating Procedure - Methods for Collecting Water Grab Samples"; SOP-01, Appendix D) for details regarding VRMP-approved water sampling devices.

Appendix B2. Acceptable Water Sampling Equipment with Associated Parameters for Sampling from Bridges, Culverts, or Boats.

*** = For certain water samplers, a separate 2nd water sample must be collected for solids-related parameters.

Note: The mention of brand names does not constitute recommendation of a specific company. Also, "D. O." = dissolved oxygen and "Temp." = temperature.

Last modified: June 2, 2009

EQUIPMENT	PHOTO	EST. COST	Parameters
MDEP Weighted Bacteria Sampler (and rope) [[Secure a sterilized bottle, or a sterile Whirl-Pak ® bag propped upright a small bottle, within the sampler; immerse upside-down in water and pull rope to turn bottle upright and fill with sample water.]]		$25	
Discrete-Depth Water Sampler (Currently, either the MDEP 250-mL wide-mouth bottle modification of the Aquatic Research Instrument's (A.R.I) D.O. water sampler for use with D.O. meters -or- A.R.I.'s or LaMotte's D.O. samplers, which use 60-mL bottles for use with D.O. kits.) [[For use with a D.O. probe, prop sampler upright on an upside-down bucket and insert & jig D.O. probe.]]		$125 - 175	*** *** ? ***
Van Dorn Sampler ("Beta" Version Sampler) [[For D.O., prop sampler upright on an upside-down bucket and insert & jig D.O. probe.]]		$375	
Kemmerer Sampler [[For D.O., prop sampler upright on an upside-down bucket and insert & jig D.O. probe.]]		$475 - 500	?
Van Dorn Sampler ("Alpha" --or-- "Student" Version) [[For D.O., prop sampler upright on an upside-down bucket and insert & jig D.O. probe.]]		$80 - 250	

Appendix C. Cleaning and storage methods for VRMP-approved water sampling devices.

A. Cleaning of sample devices before and after sampling events.

1. Rinse devices thoroughly with distilled water.
2. Store upside down or covered between site visits.
3. Rinse devices with stream water three times prior to each sampling site (only for certain parameters, as specified in Appendix A of this document) and also after the last sampling site.

B. Storage of sample devices between sampling events.

1. Empty out any water from with the device.
2. Prop open the sampling device a little so it can air dry. A clean plastic spoon or small, clean stick may do the trick.
3. Store the device in a clean area.

C. End of season storage.

1. VRMP staff will collect all loaned water sampling devices, wash them with Liqui-Nox **(**non-phosphate) detergent, rinse with deionized or distilled water, and dry the equipment prior to the next sampling season.
2. Equipment will be stored in a clean location, either by the VRMP or volunteer group, depending upon storage space availability.

APPENDIX A3: MAINE VOLUNTEER RIVER MONITORING PROGRAM METHODS FOR USING IDEXX COLILERT AND ENTEROLERT (BACTERIA)

IDEXX COLILERT®-18 TEST and QUANTI-TRAY® METHOD FOR THE DETECTION OF FECAL COLIFORMS IN WASTEWATER

IDEXX Colilert®-18 and Quanti-Tray® Test Method for The Detection of Fecal Coliforms in Wastewater

1. Scope and Application

1.1. This method is intended for use in the detection and confirmation of fecal coliforms in wastewater. The minimum, non-zero number of bacterial counts detectable with this method is a function of the dilution scheme used when processing the sample.

1.2. The Colilert-18 method can be applied to test for fecal coliforms in wastewaters with the Quanti-Tray® system (21.1, 21.5).

1.3. Since there can be a wide range of fecal coliform levels in wastewaters, dilutions can be used with this method for detecting and enumerating the actual level.

2. Summary of Method

2.1. The method is based on Defined Substrate Technology®. The product utilizes a nutrient indicator (ONPG) that produces a yellow color when metabolized by fecal coliforms at 44.5 ± 0.2 ºC. When the reagent is added to the sample and incubated, it can detect fecal coliforms at 1 CFU/100 mL at 18 and up to 22 hours.

3. Definitions

3.1. In this method, fecal coliform bacteria are those bacteria which produce a yellow color after incubation at 44.5 ±0.2°C at 18 and up to 22 hours.

3.2. Fecal coliform detection is based on the presence of the enzyme ß-D-galactosidase which is known to be present in fecal coliform bacteria.

3.3. For the detection of ß-D-galactosidase, Colilert-18 utilizes the chromogenic nutrient indicator ortho-nitrophenyl-ß-D-galactopyranoside (ONPG) which produces a distinct yellow color when hydrolyzed by ß-D-galactosidase.

4. Interferences

4.1. Some samples containing humic material may have an innate color and a control blank of the same water sample may be required for comparison to the inoculated sample or a dilution may be made.

5. Safety

5.1. The analyst/technician must know and observe the appropriate safety procedures required in a microbiology laboratory preparing, using, and disposing of samples, reagents and materials, and while operating equipment.

5.2. Mouth pipetting is prohibited.

6. Equipment and Supplies

6.1. Sterile pipettes, sterile, T.D. bacteriological or Mohr, glass or plastic of appropriate volume and sterile loops.

6.2. Sterile vessels, glass or plastic containing sodium thiosulfate to neutralize up to 15 mg/L of chlorine.
6.3. Vessels should be at least120 mL or of larger capacity to hold 100 mL of sample to allow for proper mixing of sample.
6.4. 51 Well Quanti-Tray or Quanti-Tray/2000
6.5. Quanti-Tray Sealer
6.6. Incubator maintained at 44.5 ±0.2°C. (Dry incubator or water bath which can maintain the required temperature tolerance).

7. Reagents

7.1. Sterile, non-buffered, oxidant-free water for dilutions. (21.1)
7.2. Colilert-18, stored at 2 -25°C away from light. The expiration date is indicated on the package (15 months from the date of manufacture).
7.3. 51 Well Quanti-Tray or Quanti-Tray/2000 Comparator
7.4. Antifoam reagent (optional see 12.7).
7.5. Sodium thiosulfate reagent *Standard Methods for the Examination of Water and Wastewater*, (21.3) or sterile vessels containing sodium thiosulfate to neutralize up to 15mg/L chlorine

8. Sample Collection, Preservation and Storage

8.1. Sampling procedures as described in detail in the USEPA microbiology methods manual, Section II, A (21.2) and in Standard Methods for the Examination of Water and Wastewater (21.3).
8.1.1. Storage Temperature and Handling Conditions: Ice or refrigerate bacteriological samples at a temperature less than 10°C (2-10°C) during transit to the laboratory. Use insulated containers to assure proper maintenance of storage temperature. Ensure the sample vessels are not totally immersed in water during transit. Do not allow samples to freeze. If frozen, sample cannot be thawed and a new sample is required.
8.1.2. Holding Time Limitations: Examine samples as soon as possible after collection. The required maximum hold time of samples is 8 hours from collection to incubation (21.4).

9. Quality Control

9.1. Quality control should be conducted on each lot of Colilert-18 or more often as regulations requires. One of the following quality control procedures is recommended for each lot of Colilert-18 when used for fecal coliform testing:
9.1.1. IDEXX-QC for Fecal Coliform
1. See the package insert for instructions.
2. Obtain the mean and range from the website; www.idexx.com/water under Quality Certificates.
9.1.2. ATCC: Fill 2 sterile vessels with 100 mL of sterile non-buffered oxidant-free water and inoculate with a sterile loop of, *Escherichia coli* ATCC 11775 (positive control) and *Pseudomonas aeruginosa* ATCC 10145 or 27853 (negative control).

9.2. Follow Section 12. Quanti-Tray Enumeration Procedure, Section 13. Incubation and Section 14. Interpretation and Calculations

9.3. Sample bottle and Quanti-Tray sterility check per lot (21.7; Section V, 5. 4.2)

9.3.1. At least one sample bottle/lot and tray/lot are tested with Tryptic Soy Both (25 mL for the bottle and 100 mL for the tray) and incubated at 35±0.5°C. It is recommended that this be performed in a laminar flow hood. Aseptic technique must be used. If not available, aseptic technique must be maintained. Do not open bottle for long periods of time nor place the cap on the lab surface facing up. Open cap just enough to add the TSA to the bottle and close immediately.

9.3.2. Check samples at 24 and 48 hours for growth.

9.3.3. No growth should be observed.

9.3.4. If growth is observed, retest and if still positive, call IDEXX Water Technical Service (1-800-321-0207).

9.4. Monthly Sealer Check with food color or dye: (21.7; see Section V, 5.3.2.1.2)

9.4.1. Add 2-3 drops of food coloring dye or equivalent to 100 mL of water. Mix well.

9.4.2. Add this to the Quanti-Tray and seal the tray.

9.4.3. Observe the tray. There should be no dye observed outside the wells.

9.4.4. If dye is observed outside the well, retest and if it still occurs call IDEXX Water Technical Service (1-800-321-0207).

9.5. Media sterility check using sterile water per lot (17.7; Section V, 5.3.1.3)

9.5.1. Each new lot shall be checked for sterility. Select at least one blister pack and add 100 mL of sterile DI water to a vessel. Mix well and add this to a Quanti-Tray and seal. Incubate up to18 and no longer than 22 hours at 44.5±0.2°C

9.5.2. No color should be observed.

9.5.3. If color is observed, retest and if still positive, call IDEXX Water Technical Service (1-800-321-0207).

10. Calibration and Standardization

10.1. Check the temperature of the incubator at least twice per day (when in use) separated by at least 4 hours to insure it is within the stated limits. Record the date, temperature, time of reading and initial.

10.2. Check thermometers at least annually against NIST certified thermometer or one that meets the requirements of NIST Monograph SP 250-23 (21.3).

11. Corrective Action

11.1. If an unacceptable result is obtained, then the lab should review the test procedure to determine the cause of the failure to prevent this from reoccurring again by:

11.2. Defining the problem:

A. Identify corrective action and steps required to correct the problem.

B. Implement correction action.

C. Document corrective action.

11.3. Repeat testing to ensure that corrective action was successful.

11.4. Examples are:
- 11.4.1. Procedure followed for preparing the control and or diluent.
- 11.4.2. Incubation temperature within the required tolerance.
- 11.4.3. Verified the thermometer for the incubator or water bath was calibrated against NIST thermometer and corrections made if required.
- 11.4.4. Sample incubation within the required time period.
- 11.4.5. Test kit is within the expiration date.
- 11.4.6. Call and review problem encountered with IDEXX Water Technical Support at 1-800-321-0207.

12. Quantification Procedure

12.1. Colilert-18 and the IDEXX Quanti-Tray System work with either the 51 Well Quanti-Tray or the Quanti-Tray/2000. (21.1, 21.5)

12.2. Carefully separate one blister pack from the strip taking care not to accidently open the adjacent pack.

12.3. Ensure the powder is at the bottom of the blister pack.

12.4. Hold the blister pack face down (paper side up) at the top and towards the back and snap back the scoreline forming a "v" with the opening facing the open vessel.

12.5. Allow the powder to fall into the vessel containing the room temperature sample. Mix the sample well to dissolve the reagent.

12.6. If a dilution is necessary, use sterile deionized or distilled water, not buffered water for making the dilution prior to adding Colilert-18. Always add Colilert-18 to the final 100 mL diluted sample only.

NOTE: If the sample has some background color, it is recommended that the sample be diluted at least 1:4 (25 mL of a well mixed sample to 75 mL of sterile water) or 1:10 (10 mL of a well mixed sample to 90 mL of sterile water) as noted in 12.6. As an alternative, compare the sample with Colilert-18 to a control blank of the same water sample adding it to the Quanti-Tray (no Colilert-18) and incubate along with the sample with Colilert-18.

12.7. The use of IDEXX Antifoam reagent may be necessary to reduce foaming and eliminate excess bubbles in the wells of the Quanti-Tray. Alternatively, let the sample sit for 30-60 seconds to allow the foam to dissipate. Note: All the foam does not need to dissipate.

12.8. Remove the sterile trays from the plastic bag by opening the bag at the black line (follow the package insert). Reseal the bag with tape or a clip. Label the back of the tray with a felt tip marker to identify the sample. Open the tray following the directions as outlined in the insert for Quanti-Tray (21.5). Pour the reagent mixture from the vessel into the tray avoiding contact with the foil tab. Seal the tray with the Quanti-Tray sealer.

13. Incubation:

13.1. Place the sealed tray in a 44.5 ±0.2˚C incubator for 18 hours and up to 22 hours. For incubation in a water bath, submerge the Quanti-Tray (**do not place in a plastic bag**) below the water level using a weighted ring (below

water level) or a bungee cord or metal rack. Note: do not use a rock or a bottle containing water to hold down the trays. A dry incubator can also be used as long as it can meet the ±0.2˚C tolerance throughout the incubator.

14. Results Interpretation:

14.1. Read results at 18 hours. In addition, laboratories may incubate samples for additional time (up to 22 hours total for their convenience.) Compare each result against the comparator dispensed into an identical tray. Count the number of positive wells and refer to the MPN Table provided with the Quanti-Tray to obtain a Most Probable Number. If the sample was diluted, correct the MPN obtained from the MPN table by multiplying that MPN value with the dilution factor to obtain the final corrected MPN/100 mL (if a 1:10 dilution was made, the dilution factor is 10).

14.2. Less yellow than the comparator when incubated at 44.5 ±0.2°C is negative for fecal coliforms. **Note:** However, *if the results are ambiguous to the analyst based on the initial reading, incubate up to an additional four hours (but not to exceed 22 hours total) to allow the color to intensify*.

14.3. Yellow equal to or greater than the comparator when incubated at 44.5 ±0.2°C is positive for fecal coliforms.

14.4. Colilert-18 results are definitive at 18 and up to 22 hours. In addition, positives for fecal coliforms observed before 18 hours and negatives observed after 22 hours are also valid.

14.5. Positive for fecal coliforms observed before18 hours and negatives after 22 hours are also valid.

15. Interpretation and Calculations

15.1. Follow the same interpretation directions from section 14.0; Count the number of positive wells. Refer to the Quanti-Tray MPN table provided by IDEXX to determine the most Probable Number (MPN) for total coliforms (yellow wells) in the sample. Correct the MPN value for any dilution made. The color of positive wells may vary. Use the appropriate Quanti-Tray MPN comparator following the instructions as indicated.

16. Method Performance-40CFR136.3 ATP evaluation (21.6)

16.1. Colilert-18 is equally as sensitive as m-FC

16.2. Variances across the ten sites were similar using the Bartlett's test with Colilert-18 having a p-value (>0.05) of 0.308

16.3. Colilert-18 false positive rate was determined to be - 0%; False negatives -7%

16.4. The EPA determined that Colilert-18 is a suitable method for the detection of fecal coliforms in wastewater when incubated at 44.5 ±0.2°C.

17. Reporting Results

17.1. Report results as MPN/100 mL for fecal coliforms

18. Verification Procedure

18.1. Not applicable

19. Pollution Prevention

19.1. The solutions and reagents used in this method pose no threat to the environment when recycled and managed properly.

19.2. Solutions and reagents should be prepared in volumes consistent with laboratory use to minimize the volume of expired materials to be disposed.

20. Waste Management

20.1. It is the laboratory's responsibility to comply with all federal, state and local regulations governing waste management, particularly the biohazard and hazardous identification rules and land disposal regulations. Compliance with all sewage discharge permits and regulations is also required.

20.2. Samples, reference materials and equipment known or suspected to have viable bacteria attached or contained must be sterilized prior to disposal.

21. References

21.1. Colilert-18 Package Insert from IDEXX.

21.2. Bordner, R., J.A. Winter and P.V. Scarpino (eds.) Microbiological Methods for Monitoring the Environment, Water and Wastes, EPA-600/8-78-017. Office of Research and Development, USEPA. (December 1978)

21.3. Clesceri, L.S., A.E. Greenberg, A.D. Eaton (eds.). 1998 Standard Methods for the Examination of Water and Wastewater, 20th Edition, American Public Health Association, Washington, DC.

21.4. Federal Register/ Vol 77, #97/ Friday, May 18th 2012, page 29806-29807

21.5. Quanti-Tray Package Insert from IDEXX.

21.6. ATP summary report and letter from EPA

21.7. USEPA Manual for Certification of Laboratories Analyzing Drinking Water, Fifth Edition, Section V

APPENDIX B: SITE DESCRIPTIONS AND PHOTOGRAPHS FOR SAMPLING SITES

APPENDIX B: NORTHEAST CREEK SAMPLING SITES LOCATION DATA

6/2/2025

DEP ID#	Station ID	River/Stream Name	Orig Site ID	Site Name	Town	Latitude	Longitude	GPS Model/ Coordinate Source	Accuracy (ft.)	Pollution Issues	Riparian Disturb. Y/N	Canopy Cover	Channel Width	Mid-Channel Depth	Primary Bottom Type	Secondary Bottom Type	Dominant Riparian Vegetation	Horizontal Sampling Position	Vertical Sampling Position	Center of Flow?	Sampling Approach	DO Sampling Method	Site Location Description	Date Site Was Initially Documented	Date Site Description Was Updated (if applicable)	Details About What Kinds of Changes Were Made in Site Descriptions (for archive purposes)	Other Notes
						Must be in NAD83 or WGS84					Y/N	1) 0-20% 2) 20-40% 3) 40-60% 4) 60-80% 5) 80-100%	(Feet or Meters/Estimated or Measured)		1)Fines 2)Sand 3)Boulder 4)Gravel 5)Cobble 6)Bedrock/Ledge	1)Fines 2)Sand 3)Boulder 4)Gravel 5)Cobble 6)Bedrock/Ledge	1)Wetland 2)Grass 3)Shrub 4)Mixed Succ. 5)Mature Trees 6)Ferns	1)Middle 2) Thalweg 3) Outside of Bend, Edge 4) Dock 5) Constricted area 6)Bridge	1) Mid-depth 2) Half Arms Length (1 1/2 ft.) 3) Depth profile (1 m. increments)	Y/N	1) Wading 2) Bridge/Culvert 3) Extension Pole 4) Boat 5) Reach	1)Weighted Sampler 2)Direct Probe 3) Kit					
	OMB01	Old Mill Brook	5	Old Mill Brook at Norway Drive; downstream	Bar Harbor	44.4146	-68.2957	USGS		Road, agriculture	Y - field, road	1	12 ft (estimated)	3 ft (estimated)	5	2	1	5, 6	1	Y	2 or 5	2	Access from Norway Drive on downstream side of bridge. Stand on bridge or from the edge of the bank and reach, will need to be at edge of bank for grab samples	5/30/2025			
	LB01	Liscomb Brook	6	Liscomb Brook at Norway Drive; downstream	Bar Harbor	44.41917	-68.29167	iphone 13	30	Road, agriculture, cows	Y - field	1	5 ft (estimated)	1 ft (estimated)	1	2	3	5, 6	1	Y	2	2	Access from Norway road, downsteam side, same side of the road as Rockafeller Farm. Sample DO from culvert and take grab sample from the bank	5/30/2025			
	SB01	Stony Brook	7	Stony Brook upstream of Hamilton Pond	Bar Harbor	44.42611	-68.28361	iphone 13	30	None	N	5	12 ft (estimated)	6 in (estimated)	5	4	5	1	1	Y	1	2	Access from Norway Road at Hamilton Pond, semi-established path a short distance through the woods to the stream, sample by wading/stepping onto ricks in the stream	5/30/2025			
	NEC02	Northeast Creek	2	Northeast Creek Estuary at Route 3 bridge	Bar Harbor	44.424712	-68.326889	Googlemaps	15	Road, farm	N	1	25 ft (estimated)	unknow, tidal	1		1, 3	3	1	N	5	2	Access at Bar Harbor Rd/Rt 3; upstream side of bridge	5/30/2025			
	ABB01	Aunt Betseys Brook	3	Aunt Betsys Brook at Gilbert Farm Rd	Bar Harbor	44.405833	-68.319444	iphone 13	30	Road, residential	N	5	5 ft (estimated)	1 ft (estimated)	2	1	4	5	1	Y	5	2	Aunt Betsys Brook access at Gilbert Farm Road close to Crooked Rd intersection. Sample from culvert on downstream (north) side of the road. Reach into the center of the flow from the edge of the bank.	5/30/2025			
	FHB01	French Hill Brook	4	French Hill Brook at Betsys Road	Bar Harbor	44.40638889	-68.3122222	iphone 13	30	Road	N	5	(estimated)	(estimated)	1	2	4	1, 3	1	Y	1 or 5	2	Access from Betsys Road on upstream side of the crossing	5/30/2025			
	OMB02	Old Mill Brook	NA	Old Mill Brook at Mill Brook Road	Bar Harbor	44.39888889	-68.2877778	iphone 13	30	Residential	N	5	8 ft (estimated)	10 in (estimated)	5	3	5	1	1	Y	1, 5	2	Access from Mill Brook Road; sample on upstream (south) side of the road; wade/reach into the middle from the rocks.	5/30/2025			
	NEC01	Northeast Cr	NA	Northeast Creek mainstem from Stone Barn Farm	Bar Harbor	44.418056	-68.306944	iphone 13	30	None	N	1	40 ft (estir	unknow, tic	1		1	3	1	N	3	2	Access from Stone Barn Wagon Path Trail. Boat sampling would be ideal or reach with a sampling pole. National Park Property requires research permit.	5/30/2025			

OMB01 upstream

downstream

OMB02 upstream

downstream

LB01 upstream downstream

SB01 upstream downstream

NEC02 upstream downstream

ABB01 upstream downstream

FHB01

NEC01 upstream downstream

APPENDIX C: PROJECT OVERSIGHT CERTIFICATION FORM

VRMP Group Name: Northeast Creek – Town of Bar Harbor Year: 2025

PROJECT OVERSIGHT CERTIFICATION

To be signed by all persons who are responsible for overseeing any and all work, including laboratory analysis, carried out under the terms of this Sampling and Analysis Plan.

"I certify that I have read and understand the requirements of this Sampling and Analysis Plan (SAP), and that I am knowledgeable about the requirements of the Quality Assurance Program/Project Plan (QAPP) to which it refers. I certify that I will fulfill all SAP and QAPP requirements. I will assure that all staff, volunteers, etc., for whom I am responsible are familiar with these requirements and competent to carry out their responsibilities."

Name (print)	Position	Date	Signature
Michele Gagnon	Planning Director	6/23/2025	Michele Gagnon
Hailey Bondy	Staff Planner; Volunteer Group Coordinator and Data Manager	6/23/2025	Hailey Bondy
Lisa Shaffer	Project Manager, Pace Analytical	6/25/25	Lisa Shaffer
Jane Disney	Director, Community Environmental Health Laboratory (MDI Biological Laboratory)	6/26/2025	Jane Disney
Austin Townley	Lab Specialist and Maintenance Worker, Bar Harbor Sewer Plant	6/24/25	Austin Townley

APPENDIX D: TABLE 3A. QUALITY OBJECTIVES FOR COMMONLY MEASURED STREAM ASSESSMENT PARAMETERS UNDER THE UMBRELLA OF THE VRMP- FROM VOLUNTEER RIVER MONITORING PROGRAM QAPP

Table 3a. Quality objectives for commonly measured stream assessment parameters under the umbrella of the VRMP.
See Table 3b for an explanation of frequency of precision measurements. Accuracy assessments will be made at the annual volunteer certification workshops. Laboratories will be responsible for providing accuracy and precision information to volunteer organizations. Refer to Appendix 1 for background information about various quality assurance critieria such as "precision" (including RPD), "accuracy", etc. Also see footnotes at bottom of table.

Parameter	Parameter Subgroup	Sampling & Analysis Method	Analysis Location	Measurement Range (Detection Limits)		Duplicate Precision	Accuracy	Reso-lution	Notes
	[or additional parameter information]			Minimum*	Maximum*	[Relative % Difference (RPD)] [4]	(Assessed at annual trainings and in field (after calibration), or in lab via % recovery [spiked samples].)	**	(In addition to the notes in this table, most water quality meters require calibration at least at the beginning of each sampling day if not more. Refer to appropriate SAP.)
INSTANTANEOUS MEASUREMENTS									
Dissolved Oxygen (D. O.)	Instantaneous	field meter or Winkler-style test (See footnote *** for guidance regarding time-of-day for dissolved oxygen measurements.)	field or field & lab	1 mg/L	15 mg/L (20 mg/L is re-commended)	Field dup.: ± 0.3 mg/L	Annual certification by VRMP ± 0.3 mg/L Measured against VRMP "benchmark" optical D. O. meter	0.2 mg/L	• Simultaneous temperature measurement is mandatory. • D. O. meter membranes should be inspected for problems prior to use. • Most meters require continuous movement of water across their membranes in order to function properly. • VRMP "benchmark" D. O. meter accuracy must be ± 0.2 mg/L against DEP's lab-grade Winkler titration set-up in Augusta. • Volunteers using meters also perform "zero oxygen" standard (accuracy) check at beginning of field season, mid-season and end of season using the same accuracy criteria. • See Table 4a of VRMP QAPP for guidance regarding depth profiles of D. O. and temperature for Tier 1.
Temperature	Instantaneous	field thermometer or meter	field	0° C	35° C	Field dup.: ± 1° C	Annual certification by VRMP ± 1° C	0.5° C	• Thermometers (or meters with ability to record temp.) will have their accuracy checked against an NIST-certified thermometer prior to or at annual VRMP certification workshop. (VRMP will purchase thermometers for groups not using meters, if they do not have thermometers having a resolution of 0.5 °C. Any NIST-certificates which accompany thermometers will be archived at VRMP headquarters.)

Parameter	Parameter Subgroup	Sampling & Analysis Method	Analysis Location	Measurement Range (Detection Limits)		Duplicate Precision	Accuracy	Reso-lution	Notes
	[or additional parameter information]			Minimum*	Maximum*	[Relative % Difference (RPD)] [4]	(Assessed at annual trainings and in field (after calibration), or in lab via % recovery [spiked samples].)	**	(In addition to the notes in this table, most water quality meters require calibration at least at the beginning of each sampling day if not more. Refer to appropriate SAP.)
Specific Conductance	Specific Conductance	field meter	field	1 µS/cm	2000 µS/cm	Field dup.: ± 15% (0 - 499 µS/cm); ± 10% (≥ 500 µS/cm)	Annual certification by VRMP ± 10% (against VRMP "benchmark": either 47 or 84 µS/cm [5] standard set)	1 µS/cm	• Make sure that data are expressed in units of µS/cm and not mS/cm. (1000 µS = 1 mS) • Make sure to measure & report specific conductance (which is conductance that has been corrected / adjusted to a temperature of 25 °C). Most modern meters can do this automatically -- refer to your owner's manual.
Bacteria	*E. coli*	field: grab sample lab: glass millipore filter method	Must use a VRMP approved lab.	0/ 100 mL	TNTC (TNTC = Too Numerous To Count)	Field dup.: ± 30% [for log 10 transformed duplicate data]	Prior to each day of lab analyses "Blank" (see notes)	1/ 100mL	• [Accuracy] A lab blank, using distilled water, must be performed (run) for each batch of samples and result in "0/100 mL" for the sample batch to be valid.
Bacteria	*E. coli*	field: grab sample lab: IDEXX Colilert method	lab	1 / 100 mL	>2419 / 100 mL	Field dup.: ± 30% [for log 10 transformed duplicate data]	Prior to each day of lab analyses Use either method "1" or "2": 1) "Blank" (see notes); 2) Need to be TNTC on positive control.	1/ 100mL	• [Accuracy method # 1] A lab blank, using distilled water, must be performed (run) for each batch of samples and result in "0 MPN" for the sample batch to be valid. • [Accuracy method # 2] >2419 /100 mL on positive control (a spiked sample {e.g., raw sewage sample from wastewater treatment plant}.) --> NOT a recommended method for safety reasons.
Bacteria (in tidal sections of coastal streams)	*Enterococcus*	field: grab sample lab: glass millipore filter method	Must use a VRMP approved lab.	0/ 100 mL	TNTC (TNTC = Too Numerous To Count)	Field dup.: ± 30% [for log 10 transformed duplicate data]	Prior to each day of lab analyses "Blank" (see notes)	1/ 100mL	• A lab blank, using distilled water, must be performed (run) for each batch of samples and result in "0/100 mL" for the sample batch to be valid. [[Accuracy]]

Parameter	Parameter Subgroup	Sampling & Analysis Method	Analysis Location	Measurement Range (Detection Limits)		Duplicate Precision	Accuracy	Reso-lution	Notes
	[or additional parameter information]			Minimum*	Maximum*	[Relative % Difference (RPD)] [4]	(Assessed at annual trainings and in field (after calibration), or in lab via % recovery [spiked samples].)	**	(In addition to the notes in this table, most water quality meters require calibration at least at the beginning of each sampling day if not more. Refer to appropriate SAP.)
Bacteria	*Enterococcus*	field: grab sample lab: IDEXX Enterolert method	lab	1 / 100 mL	>2419 / 100 mL	Field dup.: ± 30% [for log 10 transformed duplicate data]	Prior to each day of lab analyses Use either method "1" or "2": 1) "Blank" (see notes); 2) Need to be TNTC on positive control.	1/ 100mL	• [Accuracy method # 1] A lab blank, using distilled water, must be performed (run) for each batch of samples and result in "0 MPN" for the sample batch to be valid. • [Accuracy method # 2] >2419 on positive control (a spiked sample {e.g., raw sewage sample from wastewater treatment plant}.) --> NOT a recommended method for safety reasons.
pH	pH	field meter	field	1	14	Field dup.: ± 0.4 pH units	Annual Certification by VRMP ± 0.2 pH units against two buffers of (4 and 7) or (7 and 10)	0.1	• Buffer solutions should be brought to stream water temperature before performing calibration or determining accuracy.
Salinity	Salinity	refractometer	field	0	100 ppt	Field dup.: ± 10%	N/A	1 ppt	Calibrated with deionized water
Salinity	Salinity	field meter	field	0	70 ppt	Field dup.: ± 10%	Annual certification by VRMP ± 10% (against VRMP "benchmark")	0.1 ppt	
Turbidity	Turbidity (tier 1)	field: grab sample field or lab: meter	field	0	1000 NTUs	Field dup.: ± 20%	Annual Certification by VRMP ± 2 NTUs (checked against VRMP "benchmark" standards)	1 NTU	Checked against turbidity standards.
Turbidity	Turbidity (tier 1)	field: grab sample lab: 2130 B (APHA, 1995)	VRMP certified lab	0	1000 NTUs	Field dup.: ± 20% Lab split: ± 10%	N/A	1 NTU	Checked against turbidity standards.

Parameter	Parameter Subgroup	Sampling & Analysis Method	Analysis Location	Measurement Range (Detection Limits)		Duplicate Precision	Accuracy	Reso-lution	Notes
	[or additional parameter information]			Minimum*	Maximum*	[Relative % Difference (RPD)] [4]	(Assessed at annual trainings and in field (after calibration), or in lab via % recovery [spiked samples].)	**	(In addition to the notes in this table, most water quality meters require calibration at least at the beginning of each sampling day if not more. Refer to appropriate SAP.)
Suspended Sediment Concentration (SSC)	SSC	field: grab sample lab: ASTM[1] Method D 3977-97	VRMP certified lab	5 mg/L	200 mg/L	Field dup.: ± 30% Lab split: ± 20%	N/A	1 mg/L	Due to the sub-sampling procedures that typically are used with the TSS method, and associated error problems[2], MDEP recommends that SSC be measured instead of total suspended solids (TSS). The reason that TSS is included in this table at all is because some groups may have historical TSS data.
Turbidity	Turbidity (tier 2)	field: turbidity tube	field	0 cm	60 cm	Field dup.: ± 5 cm	Annual Certification by VRMP ± 5 cm between experienced staff and trainees	1 cm	If turbidity is to be monitored primarily under stormflow conditions, then a 60 cm tube may be adequate. If turbidity is to be monitored primarily under low flow conditions, then a 120 cm tube is recommended.
Total Dissolved Solids (TDS)	TDS	field: meter *-or-* field: grab sample with laboratory analysis; Method 2540C (APHA et al., 1995)	field or VRMP certified lab	1 mg/L	2000 mg/L	Field dup.: ± 15% Lab split: ± 10%	Annual certification by VRMP ± 10% (against VRMP "benchmark" 30 ppm [5] standard set)	1 mg/L	• (The TDS concentration in mg/L is approximately 65 % [range 55 - 75%] of the specific conductivity value in µS/cm. {Allan and Castillo 2007}[3]
Chloride	Chloride	field: grab sample: lab: Method 4500 CL^- (B or C) (APHA et al, 1995)	VRMP certified lab	3 mg/L	300 mg/L	Field dup.: ±30% Lab split: ±10%	On each day of lab analyses Lab ±10%	1 mg/L	
Phosphorus	Total Phosphorus	field: grab sample lab: EPA 365.1; Lachat 10-115-01-1-F	Only HETL or SECRL labs	1 ppb	200 ppb (> 200 ppb by dilution)	Field dup.: ±30% Lab split: ±10%	On each day of lab analyses Lab ±30%	1 ppb	HETL = State of Maine Health & Environmental Testing Laboratory (Augusta) SECRL = Sawyer Environmental Chemistry Research Laboratory (University of Maine)
Phosphorus	Ortho Phosphate	field: grab sample lab: EPA 365.1; Lachat 10-115-01-1-B	Only HETL or SECRL labs	1 ppb	200 ppb (> 200 ppb by dilution)	Field dup.: ±30% Lab split: ±10%	On each day of lab analyses Lab ±30%	1 ppb	HETL = State of Maine Health & Environmental Testing Laboratory (Augusta), SWRL = Sawyer Water Research Laboratory (University of Maine), Clearwater Lab (Newport)

Parameter	Parameter Subgroup	Sampling & Analysis Method	Analysis Location	Measurement Range (Detection Limits)		Duplicate Precision	Accuracy	Reso-lution	Notes
	[or additional parameter information]			Minimum*	Maximum*	[Relative % Difference (RPD)] [4]	(Assessed at annual trainings and in field (after calibration), or in lab via % recovery [spiked samples].)	**	(In addition to the notes in this table, most water quality meters require calibration at least at the beginning of each sampling day if not more. Refer to appropriate SAP.)
Nitrogen	Nitrate (NO_3) and Nitrite (NO_2)	field: grab sample lab: EPA 353.2; Lachat 10-107-04-1-C	VRMP certified lab	1 ppb	2000 ppb	Field dup.: ±30% Lab split: ±10%	On each day of lab analyses Lab ±10%	1 ppb	Usually reported as 1 value
Nitrogen	Total Kjeldahl Nitrogen (TKN)	field: grab sample lab: EPA 351.2; Lachat 10-107-06-2-E	VRMP certified lab	40 ppb	5000 ppb	Field dup.: ±30% Lab split: ±10%	On each day of lab analyses Lab ±30%	10 ppb	
Hardness	Hardness	field: grab sample lab: Method 2340 B (APHA et al, 1995)	VRMP certified lab	3 mg/L	400 mg/L	Field dup.: ±30% Lab split: ±10%	On each day of lab analyses ± 10%	1 mg/L	Expressed in terms of $CaCO_3$/L
Alkalinity	Alkalinity	field: grab sample lab: EPA 310.1; Method 2320 B (APHA, 1995)	VRMP certified lab	5 mg/L	400 mg/L	Field dup.: ±30% Lab split: ±10%	On each day of lab analyses ± 10%	1 mg/L	Expressed in terms of $CaCO_3$/L
Total Suspended Solids (TSS)	TSS	field: grab sample lab: EPA Method 160.2; method 2540 D (APHA et al., 1995)	VRMP certified lab	5 mg/L	200 mg/L	Field dup.: ± 30% Lab split: ± 20%	N/A	1 mg/L	Due to the sub-sampling procedures that typically are used with the TSS method, and associated error problems, MDEP generally recommends that suspended sediment concentration (SSC) be measured instead of TSS. The reason that TSS is included in this table at all is because some groups may have historical TSS data or a specific use for TSS data.
Bacteria (in tidal sections of coastal streams))	Fecal Coliform	field: grab sample lab: glass millipore filter method	Must use a VRMP approved lab.	0/ 100 mL	2400/ 100mL	Field dup.: ± 30% [for log 10 transformed duplicate data]	Prior to each day of lab analyses "Blank" (see notes)	1/ 100mL	• A lab blank, using distilled water, must be performed (run) for each batch of samples and result in "0/100 mL" for the sample batch to be valid. [[Accuracy]]
Chlorophyll *a*	Total Chl a; Active Chl a; Pheophytin	field: grab sample lab: EPA 445.0, SM10200H.3	VRMP certified lab	Determined annually by lab	NA	Field dup.: ±30% Lab split: ±10%	On each day of lab analyses ±10% lab blank; ±10% lab control	0.01 µg/L	

Parameter	Parameter Subgroup	Sampling & Analysis Method	Analysis Location	Measurement Range (Detection Limits)		Duplicate Precision	Accuracy	Reso-lution	Notes
	[or additional parameter information]			Minimum*	Maximum*	[Relative % Difference (RPD)] [4]	(Assessed at annual trainings and in field (after calibration), or in lab via % recovery [spiked samples].)	**	(In addition to the notes in this table, most water quality meters require calibration at least at the beginning of each sampling day if not more. Refer to appropriate SAP.)
CONTINUOUS MEASUREMENTS (DATA LOGGERS, SONDES, ETC.)									
Temperature	continuous	datalogger	field	0˚C+F41	35˚C	See notes.	0.2˚C	0.02° C	• Data logger precision checked annually following VRMP-approved SOP. Basically, this consists of placing all of a group's loggers in a fume hood or ice bath for 2 hours and then comparing to determine whether the mean temperature of any of the loggers falls outside ± 0.5 °C of the grand mean temperature (mean of the means) of all the loggers.

Footnotes

*: VRMP and VRMP volunteer group equipment must be able to make measurements, for a given parameter, at least down to the minimum detection limit and at least up to the maximum detection limits shown in the "Measurement Range" column for the equipment and data to be considered valid for the program.

**: Resolution values indicate minimum resolution values [but not necessarily minimum detection limits] that must be attained by field or lab equipment for it to be considered valid by the VRMP. Equipment that has better resolution than required minimum standards is acceptable.

***: Dissolved oxygen (D.O.) data collected between dawn and 8:00 AM are important for assessment of attainment of D.O. criteria within Maine's Water Quality Standards. But, except as naturally occurs, D.O. concentrations below the applicable D.O. criteria at any time of day signal non-attainment. If there are no D.O. concentrations below the criteria after 8:00 AM, then data between dawn and 8:00 AM must be collected to assess attainment of the criteria.

1: American Society for Testing and Materials (ASTM), 2000, Standard test methods for determining sediment concentration in water samples: Method D 3977-97, vol. 11.02, Water (II), 395-400.

2: Gray, J. R, G. D. Glysson, L. M. Turcios, and G. E. Schwarz. 2000. Comparability of Suspended-Sediment Concentration and Total Suspended Solids Data. U. S. Geological Survey. Water-Resources Investigations Report 00-4191. Reston, Virginia. 14 pp.

3: Allan, J. D. and M. M. Castillo. 2007. Stream ecology: structure and function of running waters. Springer, Dordrecht, Netherlands, 436 pp., 2nd edition.

4: "Field duplicates" are extra samples or monitoring replicates that are collected immediately after the initial sample was collected so that precision can be estimated. For water grab samples, this involves collecting a duplicate grab sample after collecting an initial grab sample for a given parameter. For water quality meters, thermometers, or similar field equipment, the field duplicate consists of lowering the meter's probe back into the water immediately after the initial reading was taken. "Lab split" refers to a precision estimation technique used by laboratories in which they take the initial water grab sample, mix well, and split into two samples. Then analyses are made on the two new samples to see how close they were to each other.

5: Some possible standard solutions:

- Myron L Company; Total Dissolved Solids/Conductivity Standard Solution 442™ Standard Solution (30ppm / 46.7µS); (formula 442 is intended for lakes, streams, etc.)
- Oakton; Conductivity Standard Solution, 84 µS

APPENDIX E: TABLE 3C. TYPICAL SAMPLING TECHNIQUES AND SAMPLE PRESERVATION METHODS FOR COMMON WATER QUALITY PARAMETERS OF THE VRMP- FROM VOLUNTEER RIVER MONITORING PROGRAM QAPP

Table 3c. Typical sampling techniques and sample preservation methods for common water quality parameters of the VRMP.

* Reference for sample container type and holding time (except bacteria, salinity, and chlorophyll a): USEPA. 1983. Methods for Chemical Analysis of Water and Wastes. VRMP-approved laboratories (see section 4.5 and Appendix 8a of QAPP) shall be consulted regarding container types/volumes that should be used for specific projects.

Parameter	Sampling Techniques	Typical Sample Volume*	Sample Container Type* / Preparation	Sample Preservation / Maximum Holding Time*	Analysis Location
Dissolved Oxygen	Place field meter in channel; *or* use Winkler-style chemical kit	--	Kit: Glass sample collection bottle	For kits: (*Preservation*): Fix immediately, store in the dark. (*Sample Temperature*): Store (a) at the temperature of the collected water or (b) water-sealed and kept 10°C - 20°C. (*Max. Hold. Time*): 8 hrs.	Field (or lab for kit)
Salinity	*Usually measured in the field with a meter* (however, when salinity, spec. cond. or TDS can't be measured in the field, they can be analyzed in a lab)	--	Plastic or Glass	Cool, 4 °C; 28 days	Field (or lab for conductance and TDS)
Specific Conductance			Plastic or Glass	Cool, 4 °C; 28 days	
Total Dissolved Solids			Plastic or Glass	Cool, 4 °C; 7 days	
Temperature (instantaneous)					
pH					
Temperature (continuous)	Optic Stowaway data logger	--	--	--	Record in field; download onto office computer using appropriate logger software
Total Kjeldahl Nitrogen	Grab sample	250 ml	Plastic or Glass	Cool, 4°C; H_2SO_4 to pH<2; 28 days (speak with lab about the H_2SO_4 & safety; they may add the acid)	VRMP certified lab
Nitrate or Nitrite	Grab sample	250 ml	Plastic or Glass	Cool, 4°C; 48 hr	VRMP certified lab
Total Phosphorus	Grab sample	55 ml	Plastic or Glass	Cool, 4°C; H_2SO_4 to pH<2; 28 days (speak with lab about the H_2SO_4 & safety; they may add the acid)	VRMP certified lab
Ortho-Phosphate	Grab sample	250 ml	Plastic or Glass	Cool, 4°C; 48 hr	VRMP certified lab
Chloride	Grab sample	250 ml	Plastic or Glass	(Cooling not required); 28 days	VRMP certified lab
Total Suspended Solids	Grab sample	500 ml	Plastic or Glass	Cool, 4°C; 7 days	VRMP certified lab
Suspended Sediment Concentration	Grab sample	500 ml	Plastic or Glass	Cool, 4°C; 7 days	VRMP certified lab
Turbidity	Grab sample	500 ml	Plastic or Glass	Cool, 4°C; 48 hr	VRMP certified lab
Hardness	Grab sample	250 ml (x 2)	Plastic or Glass	Cool, 4°C; HNO_3 to pH<2; 6 months (speak with lab about the HNO_3 & safety)	VRMP certified lab
Alkalinity	Grab sample	250 ml (x 2)	Plastic or Glass	Cool, 4°C; 14 days	VRMP certified lab
Bacteria	Grab sample	100 ml	Sterile Plastic or Glass (e.g., Whirl-pak or new cubitainer)	Cool, < 10°C; 6 hr (Samples must processed within 2 hr of arriving at laboratory.)	VRMP certified lab

APPENDIX F: LABORATORY CHAIN-OF-CUSTODY FORMS

Pace® Location Requested (City/State):

CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevant fields

LAB USE ONLY- Affix Workorder/Login Label Here

Scan QR Code for instructions

Company Name:	Contact/Report To:
Street Address:	Phone #:
	E-Mail:
	Cc E-Mail:
Customer Project #:	Invoice to:
Project Name:	Invoice E-mail:
Site Collection Info/Facility ID (as applicable):	Purchase Order # (if applicable):
	Quote #:
Time Zone Collected: [ ] AK [ ] PT [ ] MT [ ] CT [ ] ET	County / State origin of sample(s):
Data Deliverables: [ ] Level II [ ] Level III [ ] Level IV [ ] EQUIS [ ] Other_____	Regulatory Program (DW, RCRA, etc.) as applicable: Reportable [ ] Yes [ ] No
	Rush (Pre-approval required): [ ] Same Day [ ] 1 Day [ ] 2 Day [ ] 3 Day Other _____ **Date Results Requested:**
	DW PWSID # or WW Permit # as applicable: Field Filtered (if applicable): [ ] Yes [ ] No Analysis:

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SS), Oil (OL), Wipe (WP), Tissue (TS), Bioassay (B), Vapor (V), Surface Water (SW),Sediment (SED), Sludge (SL), Caulk (CK), Leachate (LL), Biosolid (BS), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Composite Start Date	Composite Start Time	Collected or Composite End Date	Collected or Composite End Time	# Cont.	Residual Chlorine Result	Residual Chlorine Units	Specify Container Size **	Identify Container Preservative Type***	Analysis Requested	Sample Comment

**Container Size: (1) 1L, (2) 500mL, (3) 250mL, (4) 125mL, (5) 100mL, (6) 40mL vial, (7) EnCore, (8) TerraCore, (9) 90mL, (10) Other

*** Preservative Types: (1) None, (2) HNO3, (3) H2SO4, (4) HCl, (5) NaOH, (6) Zn Acetate, (7) NaHSO4, (8) Sod. Thiosulfate, (9) Ascorbic Acid, (10) MeOH, (11) Other

Lab Use Only: Proj. Mgr: | AcctNum / Client ID: | Table #: | Profile / Template: | Prelog / Bottle Ord. ID:

Preservation non-conformance identified for sample.

Additional Instructions from Pace® :	Collected By: Printed Name Signature	Customer Remarks / Special Conditions / Possible Hazards:

# Coolers:	Thermometer ID:	Correction Factor (°C):	Obs. Temp. (°C):	Corrected Temp. (°C):	[ ] On Ice

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	Tracking Number:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	Delivered by: [ ] In- Person [ ] Courier
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	[ ] FedEX [ ] UPS [ ] Other
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	Page: of

Chain of Custody Instructions

***Pace Location Requested**: City and State of Pace Laboratory testing is to be performed at.
***Company Name**: Client's company name
***Street Address**: Client's mailing address
***City, State, Zip**: Client's city, state and zip code for mailing
***Contact/ Report to**: Person to receive results
Customer Project # and Project Name: Client's reference to the project or work involved with these samples.
Site Collection Info/ Facility ID: Client's location of project
Time Zone: Check time zone of sample to ensure proper hold times are met.
Purchase Order #: Client specific number to be listed on project invoice for client billing purposes.
Invoice To: Client contact the project invoice needs to be emailed to.
Invoice Email: Email address that project invoice will need to be emailed to
***Phone #**: Client's contact phone number
E-mail: Client's e-mail for correspondence and final report
Regulatory Program: List the program that is guiding the work to ensure proper regulations are followed: DW, RCRA, etc.
Data Deliverable: Please select or enter required deliverables.
***County/State Origin of Samples**: Enter the county to ensure proper handling of regulated soils. State required to ensure proper reporting.
Field Filtered: Indicate if samples have been filtered in the field. If samples are required to be field filtered and filtering is not indicated, a qualifier will be added to all associated data.

***Customer Sample ID**: The unique sample ID you want to appear on the analytical report
***Collected Date**: Date sample was collected. For composite samples, please fill in both beginning and end date.
***Collected Time**: Time sample was collected. For composite samples, please fill in both beginning and end time.
***Comp/Grab**: Please denote "GRAB" if the sample was collected at one time from one specific location. Please denote "COMP" if the sample is a composite of samples collected at one or more times or locations and combined to make one sample.
***Matrix**: Select from list provided list. If prepopulated chain is provided for you matrix codes may vary.
***Number and Type of Containers**: Total number of containers per container type submitted for the samples
***Container Size:** Specify container size from list.
***Container Preservation Type**: Specify sample preservation from provided list.
***Analysis Requested**: Write the analysis name (or an abbreviation), the name of a group of tests, or the method number you would like us to perform. Examples are BOD, TCLP Metals, PCBs, Method 624, etc. Place a check mark in the small boxes that correspond to the sample(s) on which you want these tests performed.

Sample Comment: List any notes or important information about the individual sample here. Please identify in the sample comment if a sample should be used for MS/MSD.

Customer Remarks/Special Conditions/Possible Hazards: List special instructions about the sample here. If the sample is known or suspected to be hazardous indicate that here and attach SDS if possible. This space can also be used for listing additional analyses, or to request an extra copy of the report to be sent to an alternate person/address, etc.

Rush request: If faster than standard turnaround time results are needed. Circle one of the rush options and note the day the results are requested by. All rush requests require preapproval by the laboratory. Surcharges will apply for non- standard turnaround times. Results will be due by the end of business on the date due based on standard turnaround time unless other arrangements have been made with your Project Manager.

Summarized Sample Acceptance Policy Requirements:

- Proper, full and completed chain-of-custody documentation
- Readable unique sample container identification written in indelible ink
- Appropriate sample container
- Sufficient sample volume to perform requested tests
- Received within required holding time
- Received within temperature preservation requirements
- Sample containers received in good condition (not leaking or broken)
- Any custody seal intact
- Properly preserved
- No headspace in volatile water samples
- **Note:** When sample specific Quality Control is required (e.g. MS/MSD) please ensure necessary sample containers and sample volume is provided.

A data qualifier and/or case narrative will be added to the final test report when the above sample acceptance requirements are not met.

Location Specific Sample Acceptance Policy available from your Project Manager

***Collected By**: Printed name of sample collector
***Collected By Signature**: Signature of sample collector

***Relinquished By/Received By:** This form **must be signed** each time the sample(s) changes hands. Custody seals are available upon request if needed.

***Required field**: Failure to fill in a required field may result in a sample(s) being put on hold until information can be obtained. This may result in a delay in receiving results.

Northeast Creek Chain of Custody – E. Coli and Fecal Coliform

Management Entity (Town/Park): _____ **Date Collected:** ___/___/___ **Collected By (initials):** _____

Rainfall in 48 Hours: ☐ Heavy ☐ Medium ☐ Light ☐ None ☐ Unknown **Rainfall in 48 Hours (inches):** _____

Current Weather: ☐ Clear ☐ Partly Cloudy ☐ Overcast ☐ Rain

Number of Days with Similar Weather: ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ >3 ☐ Unknown

Site: _____ Field duplicate collected? ☐ Is this a Resample? ☐

Time Collected (24hr):	Air Temp (°C):	Water Temp (°C):	Salinity (ppt):
:	.	.	

Tide Observed:
☐ Low
☐ Mid
☐ High
☐ Unknown

Tide Direction:
☐ Incoming
☐ Outgoing
☐ Unknown

Water Surface:
☐ Calm
☐ Medium
☐ Rough
☐ Unknown

Water Current:
☐ None
☐ Slow
☐ Medium
☐ Rapid
☐ Unknown

Comments:

Pollution Sources (select all that apply):

☐ **B**-Boats
☐ **C**-Children in diapers
☐ **D**-Dogs or dog feces
☐ **F**-Flood
☐ **H**-Habitation
☐ **M**-Marinas
☐ **N**-Nonpoint
☐ **R**-Runoff
☐ **S**-Seaweed
☐ **T**-Turbid or murky water
☐ **W**-Wildlife
☐ **O**-Other: _____

Pollution Sources Definitions

B – Boats: moorings, anchorages
C – Children in diapers present
D – Dogs or dog feces present
F – Flood: official statewide flood
H – Habitation: seasonal occupation of homes
M – Marinas: slips/moorings for 10+ boats
N – Nonpoint: streams, rivers, and storm drains
R – Runoff: drainage directly resulting from rainfall
S – Seaweed: wrack on beach/water
T – Turbid: murky water
W – Wildlife: waterfowl, domestic or wild animals

Chain of Custody Record

Relinquished by:	Received by:	Date:	Time:	Cooler Temp °C
_____	_____	___/___/___	___:___	_____
_____	_____	___/___/___	___:___	_____
_____	_____	___/___/___	___:___	_____

Cooler temperature must be kept below **10°C**

VOLUNTEER RIVER MONITORING PROGRAM FIELD DATA SHEET

Organization: _____ Date: _____

River Name: _____ Monitors: _____

QA/QC CHECK:

DO Meter Type (YSI Pro2030 YSI 55oA YSI ODO YSI ProSOLO) DO Meter Tag ____

Time DO Meter Turned ON _____ Time of Callibration _____ Reading After Calibration _____ %
Must be >= 15 min. later Must be > 96% and < 103%. If not, recalibrate.

SPC Meter Type (DO EC300 Pen) SPC Meter Tag _____ Sensors Inspected: ☐ YES ☐ NO

SAMPLE COLLECTION INFO:

⚠ MEASUREMENTS AND SAMPLES SHOULD BE OBTAINED FROM A WELL-MIXED AREA ⚠

SITE ID#	SITE NAME	TIME SAMPLED	SAMPLING LOCATION 1) WADING 2) BRIDGE 3) BOAT 4) BANK 5) CULVERT 6) DOCK	WATER TEMP. (°C)	VERTICAL DEPTH NON-WADEABLE 1) MID-DEPTH 2) 3 FT BELOW SURFACE WADEABLE 3) MID-DEPTH 4) 1.5 FT BELOW SURFACE	D.O. COLLECTION METHOD 1) EXTENSION POLE & PROBE 2) PROBE ONLY (DIRECT PROBE)	DISSOLVED OXYGEN READINGS MG/l	DISSOLVED OXYGEN READINGS % SAT	SPECIFIC CONDUCTANCE (SPC) READING (µS/cm)	SALINITY (PPT)
FIELD DUPLICATE (1 duplicate per 10 measurements) wait 5 mins before taking duplicate measurement; ± 0.3 mg/L for DO and ± 10% for SPC										

LAB SAMPLES:

SITE ID#	SAMPLE CONTAINER 1)PLASTIC 2)GLASS 3)WHIRLPACK	BACTERIA 1) E. COLI 2) ENTEROCOCCUS OTHER ANALYSES:
FIELD DUPLICATE		

FIELD NOTES:

INCLUDE ANY UNUSUAL OBSERVATIONS OR OTHER ITEMS OF NOTE.

OBSERVATIONS TO MAKE:

WATER COLOR ODOR STORM FLOW WATER LEVEL TIDAL STAGE