

New York State Department of Environmental Conservation

Division of Water

Standard Operating Procedure:

Use, Calibration, Maintenance and Storage of multiprobe meters used to measure water quality parameters

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Update Log¹

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¹ The detailed 'Update Log' for DOW SOPs was adopted in 2016. The log may not be complete for updates conducted prior to 2016.

² 'No substantive changes' include updating references, correcting typographical errors, and clarifying certain language to make the document more useful and effective.

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1. Scope and Applicability

This standard operating procedure (SOP) covers

- 1.1 Maintenance, calibration and operation of multiparameter water quality meters (hereafter multiprobe) used for instantaneous field measurements by the New York State Department of Environmental Conservation (NYS DEC) Statewide Waters Monitoring program.
- 1.2 This SOP does not cover multiprobe units used for long term deployment or continuous collection of data. (See: Water Quality Monitoring SOP for the HRECOS Hydrologic Stations 2012).
- 1.3 This SOP specifically covers the meters listed below, but can be generally applied to other similar meters
 - 1.3.1 YSI 556 Multi Probe System (MPS) handheld meter
 - 1.3.2 YSI ProPlus handheld meter
 - 1.3.3 YSI ProDSS handheld meter
 - 1.3.4 YSI EXO sondes
 - 1.3.5 Hach Hydromet (formerly Hydrolab) Series 5 Multiparameter Sondes
- 1.4 Maintenance and calibration schedules in this SOP apply unless otherwise noted in sampling project quality assurance project plans (QAPP).
- 1.5 Some procedures necessary to preserve probe longevity and unit accuracy are not covered in the manuals provided by the manufacturers of multiprobes. This document addresses these issues and provides additional guidance to the manufacturer's use and care instructions.
- 1.6 This SOP is to be followed unless project objectives or physical conditions make it impossible or inappropriate. In such a case, the exact procedures followed, or deviations from the SOP must be documented. A log of changes will be maintained for possible incorporation into future updates to this SOP.

2. Summary of Method

- 2.1 Regular calibration, maintenance and use of appropriate buffers and standards are essential to the collection of accurate and consistent data. Proper care and maintenance of multiprobes will extend the serviceable life and help ensure that units are performing as needed for the quality assurance required by the statewide

ambient water quality monitoring program. In some instances, calibration frequency suggested here exceeds recommendations of the manufacturer but will be consistent with historical use of these units by the NYS DEC Stream Monitoring and Assessment and Lake Monitoring and Assessment Sections.

3. Definitions

Chlorophyll-a:

Chlorophyll is used as a measure of phytoplankton concentration. This measurement can be used to help identify and quantify algal blooms.

Conductivity:

A measure of the ability of water to pass an electrical current. Compensation of this measurement to 25 °C constitutes specific conductance. This parameter indicates the amount of dissolved substances (salts). Salts and their concentration dictate osmoregulatory (salt-balancing) functions in plants and animals. The ionic strength of water also regulates the toxicity of many substances (Hach Company 2006).

Dissolved oxygen (DO):

A measure of the amount of oxygen present in water and available for respiration. The amount, or concentration, of DO is controlled by many factors including: consumption by aerobic (requiring DO) organisms (bacteria, fish, amphibians, and invertebrates); consumption by plants (algae, vascular plants, particularly during dark hours); and water temperature, water flow, and depth (Hach Company 2006).

Electrode:

An electric conductor which either measures the potential of a solution (pH, reference, redox, and ammonium electrodes) or forces electric current into or out of a solution (DO and conductivity electrodes) (Hach Company 2006).

Emery cloth:

An abrasive cloth or paper with an adherent layer of emery powder; used to polish and clean metal. (*No. 400 or finer.*) (Hach Company 2006).

Long-term storage:

When a unit will not be used for a period of one month or greater it is considered long-term and proper procedures should be followed. Typically, this type of storage will be from the end of one sampling season to the beginning of the next season.

Luminescent Dissolved Oxygen (LDO):

An in-situ optical measurement of the dissolved oxygen concentration in a given water sample (See DO above)

Multiprobe:

The combination of several sensors, electrodes, or probe assemblies into a complete, stand-alone piece of equipment that simultaneously measures several parameters for profiling, spot-checking, or logging readings and data. A multiprobe is a multiparameter instrument (Hach Company 2006).

Oxidation-reduction potential (ORP) = Redox

A measure of the electrochemical potential between a reference electrode and the solution being monitored. As a measure of the relative ability to oxidize or reduce a substance. Together with pH it provides an indication of possible contamination. An increase in oxidizing potential is recorded as a positive number. An increase in reducing potential is a negative number.

pH:

A measure of the concentration of Hydrogen ions (H⁺) on a logarithmic scale. The higher the pH value the fewer Hydrogen ions are available for chemical activity, affecting solubility and biological availability.

Phycocyanin:

A pigment found in cyanobacteria that is measured alongside chlorophyll-a to help characterize algal activity in surface waters.

Probe:

A small tube containing the sensing elements of electronic equipment. The probe is an essential part of the water quality monitoring system, since it can obtain measurements and data that can be stored, analyzed, and transferred to a computer database. Probes attach to the probe module (Hach Company 2006).

Reading:

The indication shown by an instrument (Hach Company 2006).

Relative Fluorescence Units:

Units used by the YSI Total Algae sensor (chlorophyll-a and phycocyanin) to set the sensor output relative to a stable secondary standard (rhodamine dye).

Response time:

The time required for a system to react, by a prescribed amount, to a step change in some variable (Hach Company 2006).

Short-term storage:

When time intervals between use in the field is less than one month, such as during the field season, it will be considered short-term storage and proper procedures should be followed.

Specific Conductance

See conductivity (above).

Temperature:

A measure of thermal energy. It is important as it has a major influence in both biological and chemical activity.

Turbidity:

Turbidity is an optical measure of clarity of a liquid. It is an expression of the amount of light that is scattered by material in the water when light is shined through the water sample.

4. Health and Safety Warnings

- 4.1 This standard operating procedure does not address all safety concerns associated with the handling of chemical standards and solutions or use of multi-probes in the field. The reader is referred to the Division of Water's [Health and Safety Program](#) and to follow the appropriate health and safety practices covered therein.
- 4.2 Safety is more important than the task. If for any reason conditions are considered unsafe, suspend activity and leave the site.
- 4.3 Be familiar with all pertinent Material Safety Data Sheets (MSDS) before using any cleaning reagents, standards, buffers, or other chemicals.
- 4.4 **COVID19 Modification:** follow additional health and safety procedures during COVID-19 detailed in SOP#603-20 Guidance for Field Work During COVID-19 Pandemic.

5. Cautions

- 5.1 When handling chemical reagents, work in a well-ventilated area.
- 5.2 Do not work near an open flame or sparks.
- 5.3 Wear and maintain assigned/appropriate personal protective equipment.
 - 5.3.1 **COVID19 Modification:** Additional personal protective gear necessary to reduce COVID19 spread according to CDC recommendations including gloves, safety glasses and face masks.
- 5.4 Always wash hands after handling sampling equipment and before eating or drinking.
- 5.5 Maintain adequate multiprobe unit power supply for use in the field. Be familiar with the power supply options available and currently installed on the unit being

used. Units using alkaline batteries, require a spare set of new batteries stored with the unit during fieldwork. Units using a lithium ion or other rechargeable battery pack are to be fully charged before beginning field work and a means to recharge the battery pack needs to accompany the unit.

- 5.6 COVID19 Modification:** as per DOW COVID19 Guidance (SOP# 603-20), staff must stay 6' apart at all times therefore this task will be performed by one person. Multiple sondes may be calibrated at one time as long as proper disinfectant procedures are followed afterwards.

6. Personnel Qualifications

- 6.1** All staff responsible for maintaining and calibrating multiprobes covered by this SOP shall be familiar with the procedures outlined in this standard, the Quality Assurance Plan for the sampling project and the DOW [Health and Safety Program](#) prior to conducting water quality monitoring.

7. Calibration Schedule

- 7.1** Daily, weekly, monthly, and seasonal calibration is required for each unit used during the field season as noted below. Except for unplanned circumstances and dissolved oxygen calibrations, all calibration should take place in a laboratory setting.
- 7.2** All parameters except for dissolved oxygen and ORP will be calibrated at the beginning of each sampling week and, upon successful calibration, a unit may be used for one week before calibration is required again.
- 7.3** Dissolved Oxygen calibration will be performed at the start of each sampling day and may be used for that day without recalibration provided elevation does not change more than 3000 feet or barometric pressure does not undergo any extreme fluctuations caused by passing storms. If either change in elevation or barometric pressure occurs, D.O. should be recalibrated.
- 7.4** Barometric pressure is calibrated seasonally.
- 7.5** ORP should be calibrated monthly
- 7.6** Temperature is factory set, but should be calibrated against a NIST-certified thermometer.

- 7.7** If at any time measurements are considered by field staff to be outside a realistic range, recalibration of the questionable parameter is to be performed regardless of the amount of time since the last calibration.
- 7.8** This calibration schedule is applicable to all YSI meters and the Hydrolab Series 5 Water Quality Multiparameter Sondes described in this SOP.

8. Equipment and Supplies for YSI meters

- 8.1** The equipment needed for proper maintenance and calibration of YSI meters includes but is not limited to:
- 8.1.1** Calibration/maintenance logbook
 - 8.1.2** pH buffers (pH 4, 7, and 10)
 - 8.1.3** Conductivity standards (1,000 $\mu\text{m}/\text{cm}$ only)
 - 8.1.4** ORP standard (YSI Zobell solution)
 - 8.1.5** Rhodamine dye 2.5 WT (for meters with YSI Total Algae sensor)
 - 8.1.6** YSI 124 FNU turbidity standard (for EXO sondes)
 - 8.1.7** Glassware and autopipette (for prepping Total Algae sensor standard)
 - 8.1.8** Deionized (DI) water
 - 8.1.9** Dish Soap
 - 8.1.10** Cleaning brush (supplied by YSI)
 - 8.1.11** Screw driver
 - 8.1.12** DO membrane kit
 - 8.1.13** C batteries (if meter does not use rechargeable batteries)

Items that are to be stored in the YSI carrying case include a screw driver, extra C batteries (if required), cleaning brush, pH 4 buffer for storage, and calibration log book.

For YSI ProPlus/556 units, a DO membrane kit should be kept in the meter case. Date of activation (when DI water is added to powder) should be recorded on the DO electrolyte bottle.

9. YSI Meter Calibration Procedures

Detailed calibration procedures for all YSI meters are described in the Operations Manuals attached to the Appendix of this document. Described in the body of this document is a summary of elements critical to the successful calibration of various optional probes and sensors that may be installed on these meters. Step by step instructions, provided by YSI, Inc. are included in Appendices I of this document.

- 9.1 All field crews are to carry specific conductance calibration standards (≥ 1000 umhos/cm), pH buffers (4, 7, 10) and deionized water in their vehicle in the event a recalibration is necessary
- 9.2 The transport/calibration cup serves as the calibration chamber for all calibrations.
- 9.3 Rinse probes and calibration cup three times with the buffer/standard to which the unit is about to be calibrated.
- 9.4 Submerge all sensors when calibrating as some parameters are dependent on others for proper calibration.
- 9.5 **Specific Conductance:** Always calibrate specific conductance rather than conductivity. Specific conductance corrects for temperature differences that will affect measurements.
 - 9.5.1 Specific conductance is always calibrated before pH to avoid contamination errors. As an example, residual pH buffer not properly rinsed out of the calibration cup will affect calibration of specific conductance.
 - 9.5.2 Conductivity standards below 1000 $\mu\text{m}/\text{cm}$ are unstable and easily contaminated and therefore are not to be used, regardless of the expected specific conductance of the waterbodies to be sampled.
 - 9.5.3 See Appendix I for detailed instructions.
- 9.6 **Dissolved Oxygen (DO):** Calibrate DO using percent saturation. This automatically calibrates mg/L.
 - 9.6.1 When using the calibration cup for DO calibration loosen the seal before calibration to allow pressure equilibration and put about 1/8" water in the cup (1/2" for EXO sonde). Do not cover the DO sensor with water.
 - 9.6.2 Allow the unit to sit with threads loosened for 5-10 minutes (10-15 minutes for the EXO sonde) to properly equilibrate the air in the calibration cup.
 - 9.6.3 Avoid calibrating DO with the calibration cup exposed directly to sunlight, as this will result in continual heating and inaccurate calibration.

- 9.6.4** Periodically check the barometer vent to make sure it is not blocked. This is important because DO calibration is based on barometric pressure and covering the barometer vent will affect accurate calibration.
- 9.6.5** See Appendix I for all YSI Meter Operations Manuals or the YSI Quick Start Guide for detailed instructions.
- 9.7 Barometric Pressure:** The barometer should be calibrated seasonally to a known barometric pressure. See Appendix I for detailed calibration instructions.
- 9.8 pH:** Use either the 2 or 3-point calibration option. This will depend on the expected pH of the waterbodies to be sampled.
- 9.8.1** pH calibration requires pH 7 as the first calibration buffer.
- 9.8.2** Use the 2-point option if the pH is anticipated to be between 4 and 7 or 7 and 10. pH is accurate to +/- 1 pH unit outside the 2 point calibration.
- 9.8.3** When pH cannot be anticipated, use the 3-point option to ensure maximum accuracy.
- 9.8.4** See Appendix I - YSI Operations Manuals or the YSI Quick Start Guide for detailed instructions.
- 9.9 ORP:** See Appendix I - YSI Operations Manuals or the YSI Quick Start Guide for detailed calibration instructions.
- 9.10 Temperature:** Temperature is factory calibrated and does not require further calibration.
- 9.11 Chlorophyll-a and phycocyanin:** Chlorophyll-a and phycocyanin (as measured by the Total Algae sensor of the ProDSS and EXO sondes) are calibrated using twice-diluted rhodamine dye. See Appendix I (YSI operations manual) for detailed instructions on preparation of this standard.
- 9.11.1** Chlorophyll-a and phycocyanin are calibrated separately using the same process detailed in the YSI operations manuals.
- 9.11.2** These parameters are calibrated using a 2-point calibration, with deionized water (0 point) and 0.625 µg/L rhodamine dye (secondary dilution). The calibration value of this solution is temperature-dependent, and therefore must be entered from the table in the Total Algae calibration section of the YSI operations manual.
- 9.11.3** Chlorophyll-a and phycocyanin are each calibrated for two separate output units—RFU and µg/L—requiring a total of 4 calibrations.
- 9.11.4** See Appendix I (YSI operations manual) for details calibration instructions.

9.12 Turbidity: Turbidity is calibrated using a 2-point procedure using deionized water (0 FNU) and YSI 124 FNU turbidity standard. See Appendix I (YSI operations manual) for details calibration instructions.

10. YSI Meter Maintenance:

All O-rings should be greased yearly and replaced as-needed. O-rings are rubber rings that create a water-tight seal at junctions such as those between probes and the probe module. See Appendix I – YSI Operations Manuals for a full description of the locations and maintenance of O-rings.

Firmware for all meters (probes, handhelds, sensors, and sondes) should be updated at least once per year if updates are available. Refer to Appendix I – YSI Operations Manuals for instructions on updating firmware.

10.1 Conductivity/Temperature: A clean conductivity sensor is critical to accurate readings. With proper storage and maintenance average life of a conductivity temperature probe is 5 or more years.

10.1.1 When field conditions warrant, (ex: extremely turbid water), conductivity probes are to be cleaned daily. This can be done using warm, soapy water and the brush included with the unit.

10.1.2 See Appendix I (YSI Operations Manuals) or the YSI Quick Start Guide for details.

10.1.3 Temperature is set in the unit at the factory and requires no maintenance.

10.2 Dissolved Oxygen (556 and ProPlus models): The DO membrane cap and electrolyte solution are to be changed when the probe is not functioning correctly, there is a slow response time, or a rip, wrinkle or damage is noticed on the membrane cap, or every 30 days, even if no issues are noticed.

10.2.1 For routine maintenance YSI recommends changing the KCl solution and the membrane cap every 30 days.

10.2.2 The probe itself may be wet sanded to a shine using the sanding pads provided with the unit (400 grit emery cloth) when needed but normally should be performed at the end of each sampling season before long-term storage.

10.2.3 Barometric pressure is critical to % saturation of DO. It is critical that the vent on the battery compartment not be covered.

10.2.4 Details can be found in Appendix I, the YSI 556, Pro Plus MPS Operations Manual or the YSI Quick Start Guide.

10.3 Dissolved Oxygen (ProDSS and EXO models): The newer generation of YSI dissolved oxygen sensor use a lower-maintenance optical membrane.

10.3.1 Optical membrane caps should be replaced annually. New optical membrane kits come with a list of calibration coefficients that must be manually entered into the unit's settings. Refer to Appendix I for details instructions on optical membrane cap replacement.

10.3.2 Barometric pressure is critical to % saturation of DO. It is critical that the vent on the battery compartment not be covered.

10.3.3 Detailed maintenance procedures can be found in Appendix I.

10.4 pH: YSI recommends cleaning the pH probe every 60 days regardless of its condition to maintain performance. With proper storage and maintenance average life of a pH probe is 18-24 months.

10.4.1 To monitor the condition of the pH probe, millivolts (mV) are to be displayed on the screen (See Appendix IV for details). A properly functioning pH probe will read +/- 50 mV when in a pH 7 buffer and 165-180 mV lower or higher in pH 4 and 10 respectively. Readings outside these mV ranges will give out of range warnings, indicating the probe needs to be cleaned or replaced.

10.4.2 Time for pH stabilization should be 30-60 seconds. Longer stabilization times indicate the need for cleaning or replacing.

10.4.3 A series of cleaning steps are described in detail in Appendix I.

10.5 ORP: Some units are equipped with a combination sensor that houses both pH and ORP sensors. For accurate ORP readings, both sensors must be clean and calibrated, as ORP is dependent of pH. See Appendix I for detailed instructions on calibrating ORP.

10.6 Turbidity: These sensors are fully optical and require little maintenance. See Appendix I for details on maintaining this sensor.

10.7 Total Algae (chlorophyll-a and phycocyanin sensor): These sensors are fully optical and require little maintenance. See Appendix I for details on maintaining this sensor.

11. YSI Meter Storage:

11.1 Do not store multi probes in areas where temperature may drop below freezing.

11.2 Short-term storage (i.e. between sampling trips): These are recommendations by representatives of YSI.

11.2.1 556/ProPlus models only: Minimize the amount of liquid in the calibration cup. A wet piece of sponge (recommended) or a few drops of water (no more than 1/4 inch in calibration cup) is sufficient.

11.2.2 ProDSS and EXO sondes only: Store the meters with a small amount of tap water in the calibration cup to keep the probes moist.

11.2.3 Never store the units with DI water in the calibration cup. The low ionic strength of the deionized water will shorten the life of the pH probe. Tap water or clean environmental water are best for short-term storage. Never keep pH 4 buffer in the calibration cup as it will harm other probes on the unit.

11.2.4 A small amount of tap or clean environmental water will suffice between sampling sites. Excessively turbid water should not be used as it will foul sensors.

11.2.5 See Appendix I, YSI Operations Manuals or the YSI Quick Start Guide for additional short-term storage details.

11.3 Long-term storage: When any unit will not be used for a period of time of one month or greater it is considered long term storage.

11.3.1 Remove the pH or pH/ORP sensor as described in the Operations manual, store sensor in pH 4 standard in its original container. Use clear non-colored pH 4 standard, as the colored standard can damage the probe with long contact periods.

11.3.2 556/ProPlus models only: DO probes should be inspected and sanded as needed prior to long-term storage.

11.3.3 556/ProPlus models only: Remove DO membrane cap, rinse cathode with DI water, dry and cover with a clean dry cap.

11.3.4 ProDSS and EXO models only: Apply the rubber sensor cap and sponge (moistened) that came with the unit.

11.3.5 Remove batteries (if alkaline).

11.3.6 See Appendix I, the YSI 556 MPS Operations Manual or the YSI Quick Start Guide for additional long-term storage details.

12. Cautions for YSI Meter Use, Calibration, Maintenance and Storage:

- 12.1** Submerge all sensors when calibrating as some parameters are dependent on others for proper calibration. Be sure plugs are installed in any ports where sensors are not installed to avoid wetting internal electronics.
- 12.2** Any time a sensor is installed, removed or replaced, it is important that the entire probe module and all sensors are completely dry before beginning the operation.
- 12.3** Do not store multi probes in areas where temperature may drop below freezing.
- 12.4** Conductivity standards below 1000 $\mu\text{m}/\text{cm}$ are unstable and easily contaminated and should not be used, regardless of the expected specific conductance of the waterbodies that will be sampled.
- 12.5** Always use the Probe Sensor Guard when using the multiprobe in the field.
- 12.6** *566/ProPlus units only:* DO probes should be inspected and sanded as needed prior to long-term storage.
- 12.7** Disconnect the cable as infrequently as possible. Modify carrying case to hold a connected cable.
- 12.8** All O-rings should be greased yearly and replaced as needed.
- 12.9** With proper storage and maintenance average life of a conductivity temperature probe is 5-6 years.
- 12.10** With proper storage and maintenance average life of a pH probe is 18-24 months.

13. Equipment and Supplies for Hydrolab Series 5 Multiparameter Sondes

13.1 Maintenance and Calibration

- 13.1.1** Calibration/ Maintenance Logbook
- 13.1.2** Deionized water
- 13.1.3** Methanol (isopropyl alcohol may be substituted)
- 13.1.4** Soap

- 13.1.5 A very mild abrasive such as toothpaste
- 13.1.6 Very clean, soft, nonabrasive lint-free cloths
- 13.1.7 Cotton balls or swabs
- 13.1.8 1 pair of scissors or pocket knife
- 13.1.1 Standard and Phillips screwdrivers
- 13.1.2 Specific conductance or salinity standards (≥ 1000 umhos/cm).
- 13.1.3 pH standards: 7-buffer, and one of the values approximating that of your sample site
- 13.1.4 ORP standards

14. Hydrolab Calibration

Detailed calibration procedures for the Hydrolab multi-probe are described in the *Hydrolab MS5 Water Quality Multiprobe User Manual*. Described in this document is a summary of elements critical to the successful calibration of various optional probes and sensors that may be installed on a Hydrolab MS5.

- 14.1 Calibration is required to calibrate sensors to meet deployment needs. Step by step instructions, provided by Hach Corporation are included in Appendices II and III.
- 14.2 All pre- and post-calibration values are to be recorded in the calibration/maintenance logbook.
- 14.3 All field crews are to carry specific conductance calibration standards of (1,000 umhos/cm), pH buffers (4, 7, 10) and deionized water in their vehicle in the event a recalibration is necessary.
- 14.4 Calibration for specific conductance and salinity, pH, and redox (ORP) is achieved by pouring a calibration standard into the calibration cup. The standard to be calibrated is selected, allowing time for the solution to stabilize then entering the value of the standard.
- 14.5 Specific Conductance: Always calibrate specific conductance rather than conductivity as specific conductance corrects for temperature differences that will affect measurements.
 - 14.5.1 Conductivity standards below 1000 $\mu\text{m}/\text{cm}$ are unstable and easily contaminated and therefore are not to be used, regardless of the expected specific conductance of the waterbodies to be sampled.

- 14.5.2** Always calibrate specific conductance before pH as residual pH buffer not properly rinsed out of calibration cup will affect calibration of specific conductance.
- 14.5.3** See Appendix II for details on Hydrolab conductivity calibration
- 14.6** Luminescent dissolved oxygen (LDO): It is important to maintain temperature stability during calibration. Care should be taken to keep the sonde out of direct sunlight or away from any other energy/heat source which will cause the temperature in the calibration cup to change during calibration. A reflective sunshield is recommended if no natural shade is available. If the temperature in the calibration cup changes more than 0.5 °C during the calibration, it is recommended to recalibrate the sensor.
- 14.6.1** Air Saturated Water Method: With the sensor end of the sonde facing upright, pour air saturated water into the calibration cup, fully submerging the LDO probe and the temperature sensor. Cover the calibration cup with the cap inverted to stop the exchange of air but preventing an increase of barometric pressure. Enter the current barometric pressure into the field provided on the LDO calibration screen.
- 14.6.2** Water Saturated Air Method: Fill the calibration cup with ~1/2 inch of deionized or tap water. Remove any water droplets from the LDO sensor and temperature probe with a tissue or clean cloth. Insert the sonde into the calibration cup such as to prevent air exchange but do not screw the calibration cup onto the sonde. Enter the current barometric pressure into the field provided on the LDO calibration screen.
- 14.6.3** See Appendix III for details on Hydrolab LDO calibration.
- 14.7** pH: Use a two point calibration.
- 14.7.1** Start with the pH 7 buffer. Select the second buffer based on the expected pH to be encountered in the field, either 4 or 10.
- 14.7.2** See Appendix II for details on Hydrolab pH calibration.
- 14.8** Redox: Regular, frequent calibration of the redox system is unnecessary as long as the electrode and platinum tip are kept properly serviced.
- 14.8.1** Keep in mind that accurate redox measurements are dependent on the pH electrode.
- 14.8.2** See Appendix II for details.
- 14.9** Temperature: Is factory set and does not require further calibration.

15. Hydrolab Maintenance

Service of sensors is not necessary if the unit has just been received from Hach. The multiprobe has built-in checks for calibration acceptance and will indicate if they are outside the appropriate calibration range. Follow the below maintenance steps if you receive this message.

15.1 Key points when maintenance of the probes is or may be required.

- When removing the multiprobe from storage
- When fouling of the sensors has occurred as indicated by a visual inspection or “Calibration failed!” message during the calibration process
- When performing calibration of sensors

15.2 Conductivity: The conductivity sensor must be cleaned when fouling is noted and when calibration fails.

15.2.1 Cleaning of this sensor is performed using a small brush provided in the MS basic maintenance kit, mild detergent, and water.

15.2.2 See Appendix II for details on maintaining the conductivity probe.

15.3 Luminescent dissolved oxygen (LDO): The LCO sensor is not affected by fouling or other debris but should periodically be cleaned

15.3.1 Flush the entire instrument with clean water and allow to soak in fresh water for 30 minutes.

15.3.2 Using an optical tissue or cotton swab with soapy water carefully clean the LDO sensor cap then rinse with fresh water.

15.3.3 See Appendix III for details on maintaining the LCO probe.

15.4 pH: The pH glass electrode requires maintenance when fouling is obvious. A slow or obviously erroneous response is indication that the electrode is coated or scratched and should be cleaned or replaced.

15.4.1 Cleaning can be performed with a cotton ball or non-scratching cloth and methanol.

15.4.2 Regular replacement of the electrolyte solution is necessary as response time slows.

15.4.3 Details for both procedures are provided in Appendix II.

15.5 Redox: Maintenance of this sensor is only required when obvious fouling occurs.

15.5.1 Clean the redox electrode using either a cotton ball or swab, or very clean non-abrasive cloth wetted with methanol.

15.5.2 To remove discoloration on the platinum tip use a very mild abrasive such as a polishing strip and rinse with deionized water. Be careful not to scratch the pH electrode.

15.5.3 Hac recommends performing maintenance procedures on the pH reference electrodes when redox (ORP) maintenance is performed, as redox uses the pH reference electrode.

15.5.4 See Appendix II for details

15.6 Temperature: Keeping the temperature sensor clean using a non-abrasive cloth is all the maintenance required.

16. Hydrolab Storage

16.1 For short-term storage, fill the calibration cup with one inch of clean tap water.

16.2 For long term storage (more than one month) remove batteries from the multiprobe, if equipped. However, do not remove the lithium ion battery, as this powers the internal clock.

16.2.1 Lay the cable in coils of at least 6 inches.

16.3 See Appendix II for details.

17. Data and Records Management for All Meters

17.1 A calibration/maintenance log book is to be kept with each multiprobe unit. This log book shall contain columns for standard or buffer being used, initial reading (prior to calibration), calibrated reading, millivolts, date, and operator performing calibration.

17.2 Each time maintenance of any type is performed it is to be recorded with the date in the row below the last calibration along with the name of the person performing the maintenance.

18. Quality Assurance/Quality Control

18.1 The objective of this quality assurance methodology is to establish and maintain standards that will ensure the integrity of water quality parameter measurements made in the field.

18.1.1 Field staff are to follow the outlined calibration schedules and procedures.

18.1.2 Deviations from these methodologies, failure to calibrate, unscheduled multi-probe maintenance, damage or loss of instrumentation should be recorded in the calibration log and reported to the project manager

19. References

- 19.1** NYSDEC, Division of Water, 2013, [Health and Safety Program](#).
- 19.2** NYSDEC, Division of Water, internal website, [Standard Operating Procedures](#).
- 19.3** NYSDEC, Division of Water, 2020. SOP#603-20 Guidance for Field Work During COVID-19 Pandemic.
- 19.4** YSI Environmental, YSI 556 Multi Probe System, Operations Manual
- 19.5** YSI Environmental, YSI ProPlus Multi Probe System, Operation Manual
- 19.6** YSI Environmental, YSI ProDSS Multi Probe System, Operation Manual
- 19.7** YSI Environmental, YSI EXO Operation Manual
- 24.6** Hach Company, Hydrolab DS5X, DS5 and MS5 Water Quality Multiprobes

20. Appendices

Appendix I. YSI 556 MPS Operations Manual



YSI 556 MPS
Operations Manual

Appendix II. YSI Pro Plus Operations Manual



Acrobat Document

Appendix III. Hydrolab DS5X, DS5 and MS5 Water Quality Multiprobes



Hydrolab User
Manual

Appendix IV. Hydrolab Instruction Sheet: Hach LDO Sensor



Hach LDO Instruction
Sheet

Appendix V. YSI ProDSS Operations Manual



Adobe Acrobat
Document

Appendix VI. YSI EXO Operations Manual



Adobe Acrobat
Document