



Protocols for Using Dissolved Oxygen and Specific Conductance/pH Meters in Rivers, Streams, and Freshwater Wetlands



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**Bureau of Water Quality
Division of Environmental Assessment
Biomonitoring Program**

**Standard Operating Procedure
Protocols for Using Field Meters**

- 1. Applicability.** This standard operating procedure (SOP) is used by the Biomonitoring Program to collect from rivers, streams and freshwater wetlands in Maine the following data:
 - A. Dissolved oxygen (DO; mg/L and % saturation),
 - B. Temperature (°C; °Celsius),
 - C. Specific conductance (SPC; $\mu\text{S}/\text{cm}$), and
 - D. pH.

- 2. Purpose.** This procedure is used to determine instantaneous levels of DO, °C, SPC and pH, in rivers, streams, and freshwater wetlands.

- 3. Definitions**
 - A. Meter. Handheld field instrument that returns the instantaneous reading of DO/°C and SPC/pH/°C.
 - B. Probe. Sensing device located at the end of a cable that is attached to the meter.
 - C. 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.

- 4. Responsibilities**
 - A. Training. It is the responsibility of the team leader to ensure that the individual(s) collecting the DO/°C and/or SPC/°C/pH data have received training in using the meter(s).
 - B. Data recording. It is the responsibility of the individual collecting the data to record the results and additional qualifying information on standard field sheets obtained from the MDEP Biomonitoring program.
 - C. Data submission. It is the responsibility of the team leader or the staff member collecting the data to place completed field sheets in the appropriate field sheet folder located in the Biomonitoring staff area.



5. Guidelines and Procedures

- A. Sampling Period. In the majority of cases, data will be collected concurrently with the collection of biological samples (macroinvertebrates, algae, macrophytes and/or fish).
- B. Meter preparation. Follow manufacturer's instructions for preparing meters for initial use.
- C. Data collection
 - (1) DO/°C meters
 - (a) A calibration must be carried out once at the beginning of the field season, following the manufacturer's instructions.
 - (b) Whenever the Sensor Cap is replaced, the coefficients need to be updated and a calibration performed (see user's manual).
 - (c) The calibration should be verified daily by placing the probe in a calibration environment and checking the DO% is reading its calibration value based on the barometric pressure (see user's manual and the laminated quick reference in each meter's case).
 - a. A water saturated air environment is created by the moist sponge in the tip of the storage sleeve. Ensure the sponge stays clean as bacterial growth may consume oxygen within the sleeve. Make sure there are no water droplets on the probe when inserted into the sleeve and make sure the probe is not immersed in water.
 - (d) Following calibration verification, immerse the probe in a representative section of the waterbody, making sure that the probe is suspended above the substrate. For rivers and streams macroinvertebrates, chose sampling location near, and slightly upstream of the location of the sampling units.
 - (e) Move the probe in the water once or twice to release any air bubbles. Continuous movement is not required.
 - (f) Allow temperature to stabilize and wait approximately 25-35 seconds for DO readings to stabilize. Record the DO value in mg/L (ppm) and %, and the temperature in °C on the field sheet. Also note on field sheet the meter number as shown on protective case and the back of the meter.
 - (g) Remove probe from waterbody. Check that the probe is clean, rinse with tap water if it is not or if stream has high conductivity, replace cap, dry meter with towel if it got wet while taking measurements, and return to protective case. Turn meter off.
 - (h) Allow the case and contents to air-dry at the 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.
 - (2) SPC/°C/pH meters



- (a) A calibration must be carried out once at the beginning of the field season, following the manufacturer's instructions.
- (b) In the field, immerse the probe completely in a representative section of the waterbody, making sure that the probe is suspended above the substrate. For rivers and streams, choose sampling location near, and slightly upstream of, the location of sampling units.
- (c) Make sure the probe is completely submerged in the water so that the two holes for the SPC sensor near the cable are submerged. Move the probe in the water once or twice to release any air bubbles. Continuous movement is not required.
- (d) Allow the SPC and temperature readings to stabilize and note SPC and pH reading on field sheet. Note: generally, the temperature reading from this meter is not recorded as temperature is obtained from the DO meter.
- (e) The sensors generally provide very quick and accurate readings. Occasionally cleaning will be required to remove coating or fouling, see Maintenance section of user's manual.
- (f) Remove probe from water body and turn off. Check that the probe is clean; if it is not, or if sample location had high conductivity, rinse probe well with tap water. Replace cap, dry meter with towel if it got wet while taking measurements, and return to protective case.
- (k) At the end of the day, put a little pH 7 buffer solution in the cap to help prevent the probe tip from drying out. **DO NOT USE DISTILLED WATER.**
- (l) 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.

D. Quality Control

- (1) All DO/°C and SPC/°C/pH meters used by the MDEP biomonitoring program are inspected and calibrated by program staff once at the start of each sampling season (May or June). Details relating to the work performed must be recorded in the Quality Control Log Book kept in the offices of the MDEP Biomonitoring staff.
- (2) At the beginning of each field season, all MDEP staff and field personnel who will use the meters covered under this SOP will have a training/refresher session to (re)familiarize themselves with the contents of this SOP and the particulars of all meters.

6. Equipment Care

A. Start of field season

- (1) Follow manufacturer's directions for preparation of a new probe. If continuing use of existing meter, arrange for regular maintenance (see section 5.D.1, above).



- (2) Use new batteries at the start of each sampling season. See manufacturer's instructions for correct battery replacement procedures.

B. During field season.

- (1) The following items must be available (in a tackle box or loose) for dealing with minor problems in the field:
 - (a) Extra "O" rings for protective cap on DO meter.
 - (b) Replacement caps, and whirlpack bags as stand-by replacement caps.
 - (c) An extra set of appropriate size batteries.
 - (d) Screw driver for removing back of meter to replace batteries.
- (2) Other supplies that may be brought to the field if deemed necessary by team leader:
 - (a) Towel for drying meters if they got wet.
 - (b) For calibration purposes: conductivity calibration solutions, pH buffers, and tap water in squirt bottle at ambient temperature, lint-free towel.

C. End of field season

- (1) Completely dry meter and case and all items in the case before storing.
- (2) Remove batteries.
- (3) Keep meter dry and at room temperature to prevent corrosion of electronic parts.
- (4) Label the meter and case as 'WINTERIZED, (date)' in an obvious manner so users will know the current status of the unit.

7. References.

Instruction manuals for YSI ProODO and YSI Pro103 (SPC/°C /pH) meters.