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and

U.S. Fish and Wildlife Service
Ludington Biological Station
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and

Fisheries and Oceans Canada
Sea Lamprey Control Centre
1219 Queen Street East
Sault Ste. Marie, Ontario P6A 2E5
Canada

INSTRUMENT OPERATING PROCEDURE

INSTRUMENT:

pH meter

MODEL:

pHI 240

MANUFACTURER:

Beckman

PRECAUTIONS:

POTENTIAL INTERFERENCES

Do not measure pH in metal containers.
Water currents in streams can cause unstable readings.
Do not expose the meter or probe to freezing temperatures.
High humidity and cold temperatures may affect meter operation.
Do not use filling or storage solutions in Ross probes if they contain silver chloride.
Do not over-immerses the probe.
Buffers stored in the light may degrade-change daily.

SAFETY

No special safety precautions

PROCEDURES:

- I. Dispense 30 - 50 mL samples of buffer solutions into glass beakers (laboratory) or plastic bottles (field). Use buffers appropriate for the measurements to be made. If pH is used to determine the endpoint of an alkalinity titration pH 7.0 and 4.0 buffers are used. For most stream measurements of pH buffers of pH 7.0 and 10.0 are used. Buffer solutions are changed daily; note change in proper column in log book or in "remarks and maintenance" column.
- II. Calibration procedures must be followed closely due to the importance of pH measurements in determining treatment concentrations of lampricide. Equipment failures are corrected immediately.
- III. pH meter calibration
 - A. Open the filling hole on the electrode and rinse with deionized water; pat dry with a lab wipe tissue. If required, fill the probe to the proper level with Orion filling solution (number 810007). A comprehensive summary of Orion ROSS electrode use is found in Attachment two.
 - B. Immerse the electrode and temperature probe in one of the selected buffers. Stir to remove deionized water and bubbles which may be adhering to the probes. Continue to stir throughout calibration and measurement procedures.
 - C. Press the **I** (POWER) button to turn on the instrument.
 - D. Wait a minimum of 5 minutes for probe stabilization then press the **CAL** key to enter the calibration mode, and the **CLEAR** button to delete the previous calibration. "Clr" will appear on the numeric display. Again press **CLEAR** to confirm that you want the previous calibration removed. You must remove the previous calibration before recalibration.
 - E. Press the **READ** key. Wait until the "auto eye" stops flashing. This indicates a completed measurement. Note the pH and temperature in the instrument log book. A standard buffer may be re-read by again pressing the **READ** key.
 - D. Rinse the electrode and temperature probe with deionized water and pat dry with a lab wipe tissue. Immerse the probes in the second buffer solution and stir. Wait a minimum of 5 minutes for the probe to stabilize then press the **READ** key. When the "auto eye" stops flashing which indicates a completed measurement note the pH and temperature in the instrument log book. Be sure "probe function" icon is not flashing. This may indicate a need to recalibrate.
 - E. Press the **CAL** key to complete the calibration and exit the calibration mode.
 - F. The electrodes are stored in Orion probe storage solution (number 910001) or stream water (not deionized) between measurements.
 - G. A relationship exists between the pH and temperature of buffers used in calibration. The following table delineates this relationship:

pH buffer	Temperature °C			
	0	10	20	30
4.00	4.00	4.00	4.00	4.01
7.00	7.12	7.06	7.02	6.99
10.00	10.31	10.17	10.05	9.95

IV. Calibration check

- A. A complete calibration check is conducted approximately every two hours, if ambient temperature has changed considerably, at shift change, at the end of the working day, and at any time that results are suspect. The procedure for this check varies from the initial calibration. The meter is not recalibrated; the standards are treated as water samples.
- B. Rinse the electrode and temperature probe in deionized water, pat dry with lab wipe tissue, immerse in one of the buffers, and stir. Wait at least 5 minutes then press the **READ** button. When the "auto eye" appears note the pH on the display and again press the **READ** button. Repeat until at least 3 consecutive measurements agree, then record the pH and temperature in the instrument log book.
- C. Rinse the electrode and temperature probe in deionized water, pat dry with lab wipe tissue, immerse in the second buffer, and stir. Measure the pH according to the procedure followed in step B. Record the pH and temperature in the instrument log book.

V. pH measurement

A. Stream side measurements

1. Measurements of pH are conducted at stream side because pH can change significantly in samples which have been stored or transported.
2. Measurements of pH are made at the stream in samples of stream water collected in plastic bottles. Stream water currents can produce unstable pH meter readings.
3. Measurements of pH must not be made in metal containers.
4. To measure pH immerse the tips of the electrode and temperature probe about two inches in the water sample and gently stir. Do not immerse above the filling hole. Press the **READ** key with the **AUTO** function on. Repeat the measurement until confident that the readings have stabilized.
5. Stabilization of pH meter readings is generally slower in low ionic strength stream water than in buffer solutions.

B. Toxicity test measurements

1. Immerse the tips of the electrode and temperature probe about two inches in the test solution and stir.
2. Press **READ** and note the reading. Repeat the reading until confident that a stable reading is obtained.
3. Do not move the electrode and temperature probe from the test solution unless

the display is locked (the "auto eye" is displayed). Transport between test solutions while the meter is in operation may cause fluctuating readings in subsequent measurements.

VI. Storage

- A. At the end of the work day the pH electrode is stored in Orion storage solution (number 910001).
- B. The pH meter is stored in the plastic carrying case. Use care when placing the meter in the case. Improper placement of the meter in the case can result in a broken temperature probe or crimped electrode leads.

MAINTENANCE:

- A. Only minimal maintenance can be conducted on the pH meter in the field. Replacement of batteries or probes is completed according to instructions found in the instrument manual. A section on electrode troubleshooting and maintenance is included in the instrument operating instructions as IOP: 007A Atch3 Use of Glass Double Junction pH Electrodes.
- B. All maintenance conducted on an instrument is recorded in the instrument log book.

REFERENCES:

Beckman pHI 200 Series instrument instructions
IOP: 007A Atch3 Use of Glass Double Junction pH Electrodes

This procedure has been reviewed and approved by the undersigned representatives of the U.S. Fish and Wildlife Service and Fisheries and Oceans Canada.

REVIEWED/APPROVED _____ DATE _____
Field Supervisor (U.S.)