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and

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and

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

INSTRUMENT:

pH meter

MODEL:

Star A221

MANUFACTURER:

Thermo Scientific Orion

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. For initial pH setup, see user guide.
- II. 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 4.0 and 7.0 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.
- III. Calibration procedures must be followed closely due to the importance of pH measurements in determining treatment concentrations of lampricide. Equipment failures are corrected immediately.
- IV. pH meter calibration with two buffers
 - A. Remove the cap from the electrode and rinse the electrode with deionized water; pat dry with a lab wipe tissue. The filling hole on the probe must be opened. Check level of filling solution. Fill to proper level with Orion filling solution (number 810007). A comprehensive summary of Orion ROSS electrode use is found in Attachment two.
 1. Press the **I** (POWER) button to turn on the instrument.
 2. Select the two buffers that bracket the expected sample pH that are one to four units apart.
 3. Rinse the electrode with lowest buffer solution and blot dry with a lint-free tissue.
NOTE: Do not wipe or rub the electrode, as a static buildup will occur.
 4. Insert the electrode into the lowest buffer solution.
 5. Wait at least 5 minutes then press the **f1** key to enter calibration mode then press the **f3** key to start and gently stir.
 6. Wait for the **pH** value on the meter to stabilize and stop flashing. The meter should display the temperature corrected pH value. Record pH and temperature in the instrument log book
 7. Press the **f2** key to accept the value.
 8. Rinse the electrode with the second buffer.
 9. Insert the electrode into the second buffer and gently stir for at least 5 minutes the press the **f2** key to select next and the **f3** key to start.
 10. Wait for the **pH** value to stabilize and stop flashing. The meter should display the temperature corrected pH value. Record pH and temperature in the instrument log book.
 11. Press the **f2** key to accept the value.
 12. Press the **f3** key to save and end the calibration.

13. Calibrated buffer values will be displayed below pH value reading on the display screen. If no values are displayed, recheck calibration method for correctness and completeness.

pH Values of Standard Buffers with Temperature

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

V. 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, and then immerse in one of the buffers. Wait at least 5 minutes then press the **measure** button. When the **AR** icons stops flashing note the pH on the display and again press the **measure** 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 and immerse in the second buffer. Measure the pH according to the procedure followed in step B. Record the pH and temperature in the instrument log book.

VI. 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. Rinse the electrode with stream water, blot dry with lint-free tissue, and insert the electrode and temperature probe into the sample.
 5. To measure pH, immerse the tip of the electrode and temperature probe about two inches in the water sample and stir for at least 5 minutes. If the meter is in AUTO-READ mode, press the **measure** key to take measurement. Once the reading stabilizes the **AR** icon will stop flashing and the display will freeze. Press the **measure** key again to take a new measurement. Repeat the measurement until confident that the readings have stabilized.
 6. 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 **measure** 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 **AR** icon is frozen). Transport between test solutions while the meter is in operation may cause fluctuating readings in subsequent measurements.

VII. Storage

- A. At the end of the work day the pH electrode is stored in Orion electrode storage solution (number 910001). The probes may be left in a beaker filled with storage solution, or for prolonged storage or transport, the tip of the pH electrode is placed in the plastic storage bottle filled with electrode storage solution. Replace the filling hole plug before returning to carrying case. Additional information on storage and use is found in Attachment two.
- 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: 007F Atch3 Use of Glass Double Junction pH Electrodes.
- B. All maintenance conducted on an instrument is recorded in the instrument log book.

REFERENCE:

Orion Star A220 Series Portable Meter User Manual.
IOP: 007F Atch3 Use of Glass Double Junction pH Electrodes.

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

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

REVIEWED/APPROVED Julie Stevens DATE 05 MAR 2020
Program Manager (Canada)