

IOP:008.3A
IOP:008.3B

Accumet pH Meters

IOP:008.3A

Accumet Model AR 15 pH Meter

IOP:008.3A

January 12, 2012

U.S. Fish and Wildlife Service
Marquette Biological Station
3090 Wright Street
Marquette, Michigan 49855
U.S.A.

and

U.S. Fish and Wildlife Service
Ludington Biological Station
229 South Jebavy Drive
Ludington, Michigan 49431
U.S.A.

and

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

INSTRUMENT OPERATING PROCEDURE

INSTRUMENT:

pH meter

MODEL:

Accumet® model AR 15

MANUFACTURER:

Fisher Scientific

SERIAL, PROPERTY, AND DEPARTMENT NOS:

Model number	Location	Serial number	Property number	Identifying number
Model AR 15	MBS	AR81203080	1257	23
Model AR 15	MBS	AR81203078	1258	22
Model AR 15	LBS	AR81205129	00297	2
Model AR 15	LBS	AR81201732	00260	3
Model AR 15	LBS	AR81211921	00166	4

PRECAUTIONS:

POTENTIAL INTERFERENCES

Substances that can contaminate the probe

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 precautions

PROCEDURES:

- I. Dispense 50 – 70 mL samples of buffer solutions into glass beakers. The three U.S. standard buffers used for calibration of the meter are pH 4.0, 7.0 and 10.0.
- 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. The meter allows for auto-recognition of U.S. standard buffers (pH 4, 7, and 10). This procedure need only be performed during the initial set up of the meter following the procedure as described in the operating instructions.
- IV. The meter allows for multi-point standardization for measurements performed over a very broad pH range (i.e. from naturally occurring stream water pH to lower values encountered during alkalinity titration). With multiple buffer points (4, 7, and 10), the meter uses the electrode slope applicable to the pH range of the current sample.
- V. pH meter calibration

Over time, both an electrode's slope and its zero potential will change. As a general rule of thumb, pH electrodes require a complete re-standardization at least once per working day and single buffer updates roughly once an hour or immediately prior to conducting a series of pH measurements. In order to do a complete re-standardization, the existing buffers must be cleared from memory. If probe has a filling hole it must be opened. Check level of filling solution. Fill to proper level with appropriate solution for brand of probe (attachment). Buffer solutions are changed daily; changes are noted in the instrument log book.

A. Clearing existing buffers

1. Press the **pH** key to select pH measurement. Observe display of the current pH standardization points.
2. Press **STD**. A menu of standardization options appears.
3. Press **CLEAR** to clear existing standards.
4. The meter returns to the main screen, but with all the pH standardization points cleared from memory.

B. Adding a buffer

When the meter is standardized with a new calibration buffer, the value (temperature compensated with U.S. standard) is added to the standardization data set, and shown in the display.

1. Press **pH** to select pH measurement (if not in pH mode).
2. Prepare the electrode by rinsing with deionized water then pat dry with a lab wipe tissue. Alternatively, a portion of the next buffer (to be discarded) can be used to rinse the electrode. Immerse the electrode in the buffer solution and stir slowly.
3. Press **STD**. A menu of standardization options is displayed.
4. Press **STD** again to access standard mode.
5. Press the **STD** key to accept the buffer.
6. The meter will wait until a predetermined electrode stability is reached, and then it will automatically read the signal and calibrate.
7. The meter returns to the main screen with the added buffer point shown. Record the pH and temperature in the instrument log book.
8. Press **STD** to access standardize mode.
9. Press **STD** to standardize new buffer.
10. The probes are stored in electrode storage solution (pH ~ 4) between measurements.

Note: 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

C. Updating the standardization

Over periods of an hour or so, the zero potential of a pH electrode changes much more significantly than does its slope. Consequently, it is more convenient, and usually sufficiently accurate, to simply update the electrode's zero potential for drift by re-standardizing at a single point roughly once per hour.

1. To update the existing standardization for zero drift, select a buffer of value identical to any of the currently stored buffer points.
2. Press the **pH** key to select pH measurement if necessary.
3. Rinse the electrodes with deionized water and pat dry with a lab wipe tissue, or rinse with a portion of the buffer, then immerse in the buffer. Stir slowly.

4. Press the **STD** key. A menu of standardization options is displayed.
5. Press **STD** to update a standard.
6. Press **STD** to accept the buffer.
7. The meter will wait until a predetermined electrode stability is reached, then it will automatically read the signal and calibrate.
8. The meter returns to the main screen with the added buffer point shown. Record the pH and temperature in the instrument log book.

VI. pH measurement

- A. Measurements of pH are made in samples of stream water collected in plastic bottles. Samples are transported from the collection site and measured as quickly as possible to minimize pH changes.
- B. Rinse probes with water sample and immerse tips of probes into sample ensuring that probe junction is completely submerged.
- C. Press **MEAS**. When **MEAS** is selected the meter continuously monitors the pH of the sample. The STABLE display indicates the stability of the measured pH.
- D. When STABLE is displayed and the operator is confident that the readings have stabilized, the measurement is recorded.

VII. Storage

At the end of the work day the pH probe is stored upright, in electrode storage solution, with the filling hole left open.

MAINTENANCE:

- A. Electrode efficiency (expressed as a percent) is monitored by the meter. On this scale, properly functioning pH electrodes typically exhibit efficiencies between 90 and 105%. Probes that fall outside of this range fail to measure pH and may require re-conditioning or replacement.
- B. The unit touch screen occasionally requires calibration.
 1. Go into **System Setup**.
 2. Under System Setup options, select – **Display Meter Information**.
 3. Unit must have Software Revision Number 1.02 or higher to be able to have field calibration performed.
 4. Touch upper right hand corner of the touch screen area 10 times (unit will flash each time you touch it).
 5. **Maintenance Mode** will be displayed.
 6. Touch the number 1 (dark circle with a white 1).

7. To re-calibrate the touch screen, touch yes.
8. In the upper left hand corner of the screen, there will appear the numbers (64, 64) with a tiny black dot next to them. With a fine tipped object (a pen tip, mechanical pencil, the edge of a small flat blade screwdriver) touch the screen where the tiny black dot is located.
9. In the lower right hand corner of the screen, there will appear the numbers (416,576) with a tiny black dot next to them. Touch the tiny black dot with a fine tipped object.
10. Your touch screen will now be re-calibrated.
11. Unplug the meter to exit the program.

REFERENCE:

Fisher Scientific Model AR15 pH Meter Operating Instructions.

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

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

Attachment

Instrument Log Book Pages

PH METER

ACCUMET MODEL AR 15

Serial number _____

Property number _____

Unit number _____

Location _____

Attachment

Use of Orion Ross Glass Electrodes

Use of Orion ROSS glass electrodes

This is an addendum to the Instrument Operating Procedures for Beckman pHI 240 and pHI255 meters, and the Accumet 15, AR 15, and 15 XL meters. Additional procedures and precautions are found in IOP:007.x, IOP:007.xA, IOP:008.x, IOP:008.xA, and IOP:008.xB.

- I. Preparation of new Orion ROSS probe.
 - A. Remove the black shipping cap and rinse the end of the probe with de-ionized water to remove salt deposits.
 - B. Remove the tape covering the filling hole
 - C. Add Filling Solution (Orion 810007 ONLY) to the filling solution chamber. Fill the chamber to a point between the top of the glass coil and the bottom of the filling hole. The filling hole remains open except during storage.
 - D. Suspend the probe in the air for 15 minutes to wet the reference junction.
 - E. Shake down the electrode to remove air bubbles, then soak the electrode in pH Electrode Storage Solution (Orion 910001) for 60 minutes.
 - F. Connect the electrode to the pH meter.
- II. Electrode storage
 - A. Short-term storage
 1. Seal the electrode filling hole. If the electrode will be stored vertically this step may be omitted.
 2. Fill the plastic storage bottle or black plastic cap with Electrode Storage Solution (Orion 910001) and slip the bottle or cap over the end of the electrode. If the electrode will be temporarily stored in an electrode holder, the tip may be immersed in a glass or plastic beaker containing Electrode Storage Solution. If storing the probe/meter in a storage case place the electrode in the storage slot with the filling hole up to inhibit leakage.
 3. For subsequent use open the electrode filling hole, rinse salt from the electrode with de-ionized water, and immerse in pH 7 buffer to begin calibration.
 - B. Long-term storage
 1. The filling solution chamber should be filled with Filling Solution (Orion 810007) and sealed with the plastic collar or tape.
 2. Fill the plastic storage bottle or black plastic cap with Electrode Storage Solution (Orion 910001) and slip the bottle or cap over the end of the electrode. If storing the probe/meter in a storage case place the electrode in the storage slot with the filling hole up to inhibit leakage.
 3. For subsequent use prepare the electrode as a new electrode (page 3 Orion ROSS pH Electrode Instruction Manual).

IOP:008.3B

Accumet Model XL15 pH Meter

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December 31, 2012

U.S. Fish and Wildlife Service
Marquette Biological Station
3090 Wright Street
Marquette, Michigan 49855
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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:

Accumet® model XL15

MANUFACTURER:

Fisher Scientific

SERIAL, PROPERTY, AND DEPARTMENT NOS:

Model number	Location	Serial number	Property number	Identifying number
Model XL15	MBS	XL94004046	2194	--
Model XL15	MBS	XL94004045	2195	--
Model XL15	SLCC	XL94004305	07-51	07-51
Model XL15	SLCC	XL94004304	07-52	07-52
Model XL15	LUD	94004092	LFY08-027	5

PRECAUTIONS:

POTENTIAL INTERFERENCES

Substances that can contaminate the probe

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 precautions

PROCEDURES:

- I. Dispense 50 – 70 mL samples of buffer solutions into glass beakers. The three U.S. standard buffers used for calibration of the meter are pH 4.0, 7.0 and 10.0.
- 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. The meter allows for auto-recognition of U.S. standard buffers (pH 4, 7, and 10). This procedure need only be performed during the initial set up of the meter following the procedure as described in the operating instructions.
- IV. The meter allows for multi-point standardization for measurements performed over a very broad pH range (i.e. from naturally occurring stream water pH to lower values encountered during alkalinity titration). With multiple buffer points (4, 7, and 10), the meter uses the electrode slope applicable to the pH range of the current sample.
- V. General procedures for pH meter calibration

Over time, both an electrode's slope and its zero potential will change. As a general rule of thumb, pH electrodes require a complete re-standardization at least once per working day and single buffer updates roughly once an hour or immediately prior to conducting a series of pH measurements. In order to do a complete re-standardization, the existing buffers must be cleared from memory. If the probe has a filling hole it must be opened. Check the level of the filling solution. Fill to the proper level with appropriate solution for the brand of probe (attachment). Buffer solutions are changed daily; the change is noted in the instrument log book.

- VI. Instrument setup procedures
 - A. Remove the *shorting cap* on the BNC connector.
 - B. Plug the combination electrode into the BNC input connector.
 - C. Install the ATC probe into the ATC jack.
 - D. Open the filling hole on the electrode by turning the collar near the top of the probe.
 - E. If the pH electrode has been in long-term storage, soak it in electrode storage solution.

VII. Instrument startup procedure

- A. Connect the power adaptor to the meter.
- B. Plug the adapter into a power outlet or a terminal strip.
- C. Turn on the power at the terminal strip.
- D. Press the black startup button on the right-rear side of the unit and hold for five seconds.
- E. Release the button and the unit will power on.

VIII. Touch screen operation and use of the stylus.

- A. The meter operates with a touch screen. The buttons on the right side of the screen control all functions of the meter.
- B. A stylus is provided for tapping on the touch screen (stored inside the back - top/right - of the meter).
 1. When you touch the screen with the stylus you will hear a tone; the screen will not change until the stylus is lifted.
 2. The stylus is used like a mouse; you can tap to select or drag to change position of an item.
- C. Screen calibration: see maintenance section.
- D. Buttons used during normal operation.
 1. **Channel 1:** accesses the display screen corresponding to the channel.
 - a. **Standardize:**
 - (1) **Confirm:** accepts the current value of the buffer
 - (2) **Clear:** clears all previous standardization points
 - (3) **Cancel:** cancels current standardization and returns to measurement screen
 - (4) **Temp std:** allows accuracy check of the temperature probe
 - b. **Measure:** Directs the meter to measure the sample when in the Auto Read function
 2. **Mode:** allows switching among the various operations of the meter; used to configure display options and select input parameters.
 - a. **pH mode:** selected from the Mode screen for Channel 1.
 - b. **pH mode:** allows switching to the various pH operations.
 3. **Setup:** accesses the setup screen of the channel in use.
 4. **Help:** accesses helpful information on the screen.

IX. pH calibration and measurement

- A. Standardization
 1. Tap (once) the **standardize** button on the top right of the channel 1 screen (the meter should default to this screen when turned on).

2. Tap the **clear** button to clear the previous standardization; respond to "are you sure?" by tapping **OK**.
3. Place the pH electrode and the temperature probe into a buffer.
4. After allowing five minutes for the reading to stabilize, tap the **confirm** button to standardize on the buffer.
5. Remove the probe from the buffer, rinse in deionized water, pat dry with a tissue, and place into a second buffer.
6. After allowing five minutes for the reading to stabilize, tap the **confirm** button to standardize on the second buffer.

Note: 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

B. Sample measurement

1. Measurements of pH are made in samples of stream water collected in plastic bottles. Samples are transported from the collection site and measured as quickly as possible to minimize pH changes.
2. Remove the pH electrode and temperature probe from the second buffer, rinse, and pat dry.
3. Place the pH electrode and temperature probe in the unknown sample and allow 5 minutes for stabilization (subsequent samples may be read a shorter stabilization period).
4. Tap the **measure** button. The pH of the sample will be displayed.

X. Instrument shut down procedure

- A. Close any open applications and log off.
- B. Bring up the task bar by tapping anywhere on the thin black band along the bottom of the screen.
- C. Tap on the **Start** button.
- D. Tap on the **Shutdown** button.
- E. Tap on the **Yes** button in the *shutdown* window.

XI. Storage

At the end of the work day the pH probe is stored upright in electrode storage solution with the filling hole left open.


MAINTENANCE:

- A. Electrode efficiency (expressed as a percent) is monitored by the meter. On this scale, properly functioning pH electrodes typically exhibit efficiencies between 90 and 105%. Probes with an efficiency that falls outside of this range require re-conditioning or replacement.
- B. The unit touch screen occasionally requires calibration.
 - 1. From the **HOME** screen, tap the thin black strip at the bottom edge of the screen to access the Task bar.
 - 2. Tap **Start > Settings > Control Panel**. This launches the Control Panel screen.
 - 3. Double tap the **Stylus** icon.
 - 4. Tap the **Calibration** tab to access the calibration screen.
 - 5. Tap the **Recalibrate** button.
 - 6. Carefully tap and briefly hold the stylus on the center of the target. Repeat tapping the target as it moves to the 4 corners of the screen. If you miss the target center, keep the stylus on the screen, slide it over the target's center, and then lift the stylus.
 - 7. Once the calibration is complete, the target will disappear. Tap anywhere in the screen to accept the new calibration and go back to the "*Stylus Properties*" window. Tap **OK** to close the "*Stylus Properties*" window.

REFERENCE:

Fisher Scientific Model XL15 pH Meter Operating Instructions.

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 1-17-13
Field Supervisor (U.S.)

REVIEWED/APPROVED  DATE Jan 16/13
Division Manager (Canada)

Attachment

Instrument Log Book Pages

PH METER

ACCUMET MODEL XL15

Serial number _____

Property number _____

Unit number _____

Location _____

Attachment

Use of Orion Ross Glass Electrodes

Use of Orion ROSS glass electrodes

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I. Preparation of new Orion ROSS probe.

- A. Remove the black shipping cap and rinse the end of the probe with de-ionized water to remove salt deposits.
- B. Remove the tape covering the filling hole
- C. Add Filling Solution (Orion 810007 ONLY) to the filling solution chamber. Fill the chamber to a point between the top of the glass coil and the bottom of the filling hole. The filling hole remains open except during storage.
- D. Suspend the probe in the air for 15 minutes to wet the reference junction.
- E. Shake down the electrode to remove air bubbles, and then soak the electrode in pH Electrode Storage Solution (Orion 910001) for 60 minutes.
- F. Connect the electrode to the pH meter.

II. Electrode storage

A. Short-term storage

1. Seal the electrode filling hole. If the electrode will be stored vertically this step may be omitted.
2. Fill the plastic storage bottle or black plastic cap with Electrode Storage Solution (Orion 910001) and slip the bottle or cap over the end of the electrode. If the electrode will be temporarily stored in an electrode holder, the tip may be immersed in a glass or plastic beaker containing Electrode Storage Solution. If storing the probe/meter in a storage case place the electrode in the storage slot with the filling hole up to inhibit leakage.
3. For subsequent use open the electrode filling hole, rinse salt from the electrode with de-ionized water, and immerse in pH 7 buffer to begin calibration.

B. Long-term storage

1. The filling solution chamber should be filled with Filling Solution (Orion 810007) and sealed with the plastic collar or tape.
2. Fill the plastic storage bottle or black plastic cap with Electrode Storage Solution (Orion 910001) and slip the bottle or cap over the end of the electrode. If storing the probe/meter in a storage case place the electrode in the storage slot with the filling hole up to inhibit leakage.
3. For subsequent use prepare the electrode as a new electrode (page 3 Orion ROSS pH Electrode Instruction Manual).