FIELD PROCEDURE: pH METER CALIBRATION

The pH meter needs a 2-point calibration, at pH 7 & 10, at the beginning of each day of sampling. The team leader or designee should ideally perform this calibration at home prior to leaving for the field. [NOTE: In the unusual circumstance that you’ll be sampling where you suspect pH will be 6.5 or lower, you will need to do a 3-point calibration at pH 4, 7 & 10. We have included instructions for 3-point calibration in brackets; you’ll need to get pH 4 buffer from the office, because it won’t normally be stocked in the field kit.]

EQUIPMENT NEEDED:
- Field data sheet—“pH Calibration” section
- YSI Model 60 pH Meter
- Purified water
- Lint-free tissues
- pH [4,] 7 and 10 buffering solution in high, narrow bottles
- Extra buffer solution for top-up
- Foam bottle holder

CALIBRATION:
1. Turn the instrument on. The instrument will activate all segments of the display for a few seconds, which will be followed by a self test procedure which will last for several more seconds. If “LO BAT” is displayed, you will need to replace the batteries. Also, if the meter locks up, try replacing the batteries. When the meter is first turned on, it should display pH and °C. If not, press “MODE” until you get to the right display on the screen.

2. If the probe is in the long-term storage bottle, remove it and cap the bottle (see last page for details). If the probe is in the transport chamber in the meter, simply remove it from this chamber.

3. Rinse the entire probe with purified water, then carefully dry it using Lint-free tissues (or rinse it with some of the extra buffer solution).

4. Place the tall pH 7 buffer bottle in the foam holder, uncap it, insert the probe about 1” into the buffer, shake away any bubbles near the glass sensor, then insert the probe all the way down into this bottle, making sure that the temperature sensor is covered by the solution (see diagram below). If topping up is needed, keep the probe in the buffer and pour against the top part of the probe using the pH 7 refill bottle. Let the probe sit in this solution to stabilize. Meanwhile, on the data sheet for the first site you’ll be visiting later that day, record the Meter’s kit # or name, time, and pH 7 & pH 10 expiration dates written on the bottles.

5. Wait for the pH reading to stabilize—not varying by more than 0.01 for 2 min. If the meter still isn’t stable after 10 min., see the “Troubleshooting” section below.

6. Record the “Pre-Cal” temperature (to the nearest tenth) and pH reading (to the nearest hundredth) in the “pH7 pre-cal” section of the data sheet.

7. To enter the calibration menu, simultaneously press both the “UP ARROW” and “DOWN ARROW” keys. The display will show “CAL” at the bottom, “STAND” will be flashing and the main display will show 7.00
pH METER CALIBRATION
(the pH of the buffer you are using).

[Note: The meter automatically accounts for the fact that the true pH of the buffers changes with temperature; therefore, the pH values displayed during calibration won't always display the same values as what's written on the buffer bottles. For a table showing how pH buffer differs with temperature, see the table at the end of this protocol.]

8. Setting the midpoint:
   a. Press the “ENTER” key. The screen will show “CAL” at the bottom, “STAND” will stop flashing and the pH calibration value is shown with the middle decimal point flashing.

   ![Image of pH meter screen showing STAND CAL 24.8°C]

   b. When the meter decides the reading is stable, the decimal point will stop flashing. Press and hold the “ENTER” key until “SAVE” along with “OFS” is displayed and the display returns to the main screen. “SLOPE” will now appear on the display and be flashing. This indicates that the slope is ready to be set using the second pH buffer. Take the probe out of the pH 7 buffer solution and cap the bottle.

9. Setting the upper point:
   a. Rinse the entire probe with purified water, then carefully dry the probe. Place the tall pH 10 buffer bottle in the foam holder, uncap it, insert the probe about 1” into the buffer, shake away any bubbles near the glass sensor, then insert the probe all the way down into this bottle, making sure that the temperature sensor is covered by the solution (see prior diagram). If topping up is needed, keep the probe in the buffer and pour against the top part of the probe using the pH 10 refill bottle. Let the probe sit in this solution to stabilize—not varying by more than 0.01 for 2 min.
   b. Press “ENTER.” The screen will now show “CAL” at the bottom, “SLOPE” will stop flashing, and the pH value for the pH 10 buffer is shown with the right decimal point flashing (see diagram).

   ![Image of pH meter screen showing SLOPE CAL 24.8°C]

   c. When the reading is stable, the decimal point will stop flashing. Press and hold “ENTER” until “SAVE” flashes on the display along with “SLP” to indicate the second slope value has been saved.
10. **Setting the lower point:**

a. Rinse the entire probe with purified water, then carefully dry it. Place the tall pH 4 buffer bottle in the foam holder, uncap it, insert the probe about 1” into the buffer, shake away any bubbles near the glass sensor, then insert the probe all the way down into this bottle, making sure that the temperature sensor is covered by the solution (see prior diagram). If topping up is needed, keep the probe in the buffer and pour against the top part of the probe using the pH 4 refill bottle. Let the probe sit in this solution to stabilize—not varying by more than 0.01 for 2 min.

b. Press “ENTER.” The screen will now show “CAL” at the bottom, “SLOPE” will stop flashing, and the pH 4 buffer value is shown with the left decimal point flashing.

c. When the reading stabilizes, the decimal point will stop flashing. Press and hold “ENTER” to save the first slope until “SAVE” is displayed along with “SLP,” and you return to a normal screen.

11. **Completing & testing calibration:**

a. Press the “MODE” button to return to a normal screen and complete the calibration process. The meter is now calibrated at 2 [or 3] points.

b. Take out the probe and cap the buffer bottle.

c. Rinse the entire probe with purified water and dry carefully.

d. Re-immers the probe into the pH 7 buffer bottle, following instructions above.

e. Wait for the pH reading to stabilize—not varying by more than 0.01 for 2 min.

f. On your data sheet, record the “post-cal” temperature (to the nearest tenth) and pH (to the nearest hundredth). Then record the expected reading from the temperature table at end of this protocol, extrapolating as appropriate. Next, record the difference between the actual and expected readings; if this is ≤ 0.10 pH unit, you can check “OK” and you’re done. If not, you’ll have to try recalibrating; otherwise, all of your pH data from that day may be flagged as “Estimated” or “Rejected”.

g. Rinse the entire probe with purified water and replace it in the meter’s storage chamber (no need to dry).

h. Record your initials on the “pH Calibration” section of your data sheet.

**Calibration troubleshooting:**

If display reads “undr” or “OVEr” while calibrating, try letting it sit for a few minutes to see if the problem goes away. Also make sure that both the pH and temperature sensors are fully immersed, and try jiggling or shaking the probe in the buffer to dislodge any bubbles that might be sticking to it.

If readings do not stabilize after 20-30 minutes, the probe may need cleaning or replacing. Let program managers know about the problem as soon as possible, and if possible, borrow another meter.
Removing the pH probe from its long-term buffer storage bottle: If you find the pH probe stored in its long-term buffer storage bottle, please follow the steps below to remove it:

1. Remove the “closed cap” from the Velcro at the bottom of the bottle.
2. Holding the bottle upright, unscrew it from the cap with the hole ("open cap") and screw the closed cap onto it.
3. Rinse the probe and open cap with distilled water.
4. Slide the open cap toward the cord to expose the O-ring beneath the cap. Roll off the O-ring, then slide the open cap off the end of the probe.
5. Sandwich the O-ring between the Velcro on the bottom and the Velcro on the open cap, so that it doesn’t fall out. Thus, the bottle, both caps, and O-ring are all stored together in a single “package.”
6. Remove the tape that’s covering the probe chamber on the side of the meter, being careful not to lose the little sponge that’s inside.

7. Make sure that the little sponge is inside the chamber, and add a few drops of purified water to moisten it.

**pH Buffer Values at Various Temperatures (YSI 2002)**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>pH 4</th>
<th>pH 7</th>
<th>pH 10</th>
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<tr>
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<td>4.00</td>
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<td>9.90</td>
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