Orion Research, Inc.
Frequently Asked Questions

Listed below are the most frequently asked questions of our Technical Support Group by Orion Customers. The questions are arranged as follows:

pH Electrodes

1. **What pH electrode do I use for a specific application?**
   Follow the general rules below for selecting the right pH electrode:
   - Glass bodied pH electrodes may be used in most sample types.
   - Epoxy bodied pH electrodes are designed for rugged environments, multiple-user situations, and field or plant applications. Epoxy bodied pH electrodes should not be used in organic solvents.
   - For solutions containing proteins, sulfide and TRIS, use ROSS, PerpHecT ROSS, or Tris (calomel) pH electrodes.
   - For viscous or dirty samples, use Orion Sure-Flow pH electrodes for best results and easy cleaning.
   - Refer to the Orion Lab Products Catalog pH Electrode Section for a complete overview of Orion's pH electrode lines.

2. **How do I store my pH electrode?**
   Proper electrode storage maximizes electrode performance and extends electrode life. There are two ways to store a pH electrode:
   - Use Orion's dedicated pH storage solution, Cat. No. 910001
   - As a temporary substitute use 200 mL of pH 7 buffer to which 1 gram of potassium chloride (KCl) has been added.

   For long-term storage information refer to the appropriate Orion pH electrode instruction manual.

3. **What filling solution do I use?**
   The recommended filling solution depends on the type of electrode. Some Orion pH electrodes have sealed references and do not require filling solution. For refillable pH electrodes, use the guide below to choose the correct filling solution:
   - ROSS and PerpHecT ROSS pH Electrodes: Cat. No. 810007 (3 M KCl)
   - Standard Ag/AgCl and PerpHecT Ag/AgCl pH Electrodes: Cat. No. 900011 (4 M KCl saturated with AgCl)
   - Calomel pH Electrodes: Cat. No. 900014 (4 M KCl)
   - Micro pH Electrodes: Cat. No. 900011 (4 M KCl saturated with AgCl)
   - pHuture Sure-Flow pH Probe: Cat. No. 600011

4. **How do I clean my pH electrode?**
   The solution used to clean a pH electrode depends on the possible contaminants. Use the guide

below to choose the appropriate solution.

- For general cleaning soak the pH electrode in 0.1 M HCl or 0.1 M HNO3 for 30 minutes.
- For removing stubborn deposits and bacteria soak the pH electrode in a 1:10 dilution of household laundry bleach for 15 minutes.
- For removal of protein deposits soak the pH electrode in 1% pepsin in 0.1 M HCl for 15 minutes.
- For removal of inorganic deposits soak the pH electrode in 0.1 M tetrasodium EDTA for 15 minutes.
- For removal of oil and grease rinse the pH electrode with mild detergent or methanol.

After any of the cleaning procedures, thoroughly rinse the pH electrode with deionized water, drain and refill the reference chamber, and soak the pH electrode in storage solution for at least 1 hour.

5. **Do pH buffers and filling solutions have a shelf-life?**
The typical shelf-life for pH buffers and filling solutions is 2 years unopened and 6 months open. For best results, the pH buffer bottles should be sealed promptly to avoid carbon dioxide absorption.

6. **What is a good pH electrode slope range?**
The acceptable slope range is 92% to 102%. Slopes below 92% indicate that the electrode may require cleaning or if cleaning does not help, the electrode should be replaced. Slopes above 102% indicate that the pH buffers are contaminated.

General Note: Most Orion pH meters display the slope as a percentage of the theoretical slope (59.12 mV/pH unit). For example, a 98.5% slope is equivalent to a slope of 58.27 mV/pH unit.

7. **Do I need an Automatic Temperature Compensation (ATC) probe?**
The most common cause of error in pH measurements is temperature. The slope of a pH electrode is highly dependent on temperature, and pH buffer values and sample values change with temperature. For the most accurate results an ATC probe is always recommended.

Orion's PerpHecT line of pH meters and electrodes allows for temperature compensation direcly from the pH electrode. A separate ATC probe is not required. Find out "What's so Perfect about PerpHecT® pH?"

There are three advantages for using an ATC probe. The meter recognizes a particular pH buffer and autocalibrates with the correct pH value at the current temperature. The meter calculates and stores the correct slope value. The meter automatically adjusts the stored slope in memory to display the temperature adjusted pH value of the sample.

Note: The meter does not compensate the pH measurement to 25 degrees Celsius, but adjusts the pH value to the measured temperature. Therefore pH values should always be reported along with temperature.

8. **How do I calibrate my pH electrode?**
All Orion pH meter instruction manuals give detailed instructions on how to autocalibrate or manually calibrate your pH system. If you do not have the appropriate instruction manual, please contact Orion to receive the correct manual.

9. **Why will my pH system no longer autocalibrate?**
When the pH system will not autocalibrate, the meter, pH electrode and pH buffers should be checked systematically.

Perform the meter checkout procedures described in Orion instruction manuals to verify correct meter function.

If your meter has a millivolt mode, measure the electrode millivolts in pH buffers. In order for Orion

meters to recognize pH buffers for autocalibration, millivolt (mV) units have been placed on each buffer:

- The electrode millivolts in a pH 7 buffer should be 0 +/- 30 mV.
- The electrode millivolts in a pH 4 buffer should be 140 to 210 mV.
- The electrode millivolts in a pH 10 buffer should be -140 to -210 mV.

If the millivolt values are outside of the above ranges, clean the pH electrode. If cleaning does not return the mV to an acceptable range, either manually calibrate or replace the electrode. Note: As long as the pH electrode has a slope between 92% and 102%, the electrode should be working properly.

The pH buffers should be replaced if the measured millivolts are outside of the acceptable ranges. Contaminated buffers may slightly contribute to shifted millivolt values.

10. **My pH electrode is drifting. What should I do?**
There are three possible causes for electrode drift:
    - If the pH electrode is "out-of-box" and drifting, the electrode may not be properly conditioned Refer to the appropriate electrode instruction manual for details.
    - If the pH electrode is stable in buffers but not in the sample, the electrode may be incompatible with the sample or application. For application assistance contact Orion.
    - If the pH electrode is drifting in buffers and samples the electrode may require cleaning. Refer to Question 2.

Orion Meters

Portable, Benchtop pH, ISE/pH Meters

1. **Which electrode connector does my meter accept?**
The following Orion Meter Models have BNC (British Naval Connector) connections: 210A, 230A, 250A, 290A, 301, 310, 320, 330, 350, 370, 410A, 420A, 520A, 525A, 545, 550, 611, 710A, 720A, 920A. The BNC connector locks onto the electrode input with a half-twist and appears similar to a VCR cable connector.

    Orion Meter Models 260 and 265 have a fully waterproof DIN connection that slides into the electrode input.

    Orion Meter Models 610 and 620 have an 8 pin DIN connector that is pushed into the electrode input.

2. **What is a BNC shorting cap?**
The BNC shorting cap is black and covers the BNC input. The shorting cap is required for the meter self-test procedure. Most Orion meters with BNC connections are shipped with a shorting cap.

3. **Why do I get an "E-3" during the meter self-test?**
The "E-3" error code indicates an open electrode input.

    For most Orion meters with BNC connections, only the BNC shorting cap should be attached to the meter during the meter self-test. If the problem persists after attaching only the BNC shorting cap, either the shorting cap is faulty or the meter is out of calibration. To verify meter calibration, check the millivolt value with the shorting cap on the input. The millivolt value should be within the specifications stated in the instruction manual.

    For Orion Meter Models 260, 265, 545 and 550, the shorting plug is not required for the self-test.

For Orion Meter Models 610 and 620, the pHuture probe must be attached to the meter and in solution during the self-test procedure.

4. **Why do I get "E-7" during the meter self-test?**
The "E-7" error code indicates a keypad failure. During the meter self-test a "0" will appear after Test 7 (7E57 7). Each key on the keypad must be pressed within 5 seconds to pass the keypad test. A number will appear on the display after each key has been pressed.

   Note: For portable meters, the power key must be pressed. Pressing the power key will not shut the meter off or interrupt the self-test.

5. **What is the battery life for portable meters?**
For Orion Meter Models 210A, 230A, 250A, 290A and 610, the average battery life is 40 hours when using a 9 V alkaline battery and 80 hours when using a 9 V lithium battery.

   For Orion Meter Model 260, the average battery life is 2000 hours when using four AA alkaline or lithium batteries.

   For Orion Meter Model 265, the average battery life is 600 hours when using rechargeable batteries.

6. **How do I set the resolution?**
For Orion portable meters, the resolution can be changed in the Setup menu. For Orion benchtop meters, the resolution is changed through the keypad. Refer to the appropriate meter instruction manual for details.

7. **What does "E-20" mean?**
The "E-20" error code indicates an out of range error. The error typically occurs when the electrode not properly connected to the meter or is not in solution. The error should disappear once the electrode is properly connected and the electrode is placed in solution. For additional information refer to the appropriate instruction manual.

8. **Why does my meter shut-off?**
Orion Meter Models 210A, 230A, 250A, 290A, 410A, 420A, 610, 620 and 710A have an auto shut-off feature to protect the meter display. If no key has been pressed for twenty or thirty minutes (depending on the meter), the meter will automatically shut-off. Refer to the appropriate instruction manual for information on turning off the shut-off feature.

9. **Will the meter lose calibration after the meter shut-off?**
As long as the meter has power, either battery or line cord power, all calibration and setup data is stored in memory even when the meter is automatically shut-off.

10. **Will the meter lose calibration if I shut if off?**
Orion meters with auto shut-off features will retain calibration as long as there is power to the meter. When the battery or line cord is removed, all information is lost. Orion meters with stand-by features have battery backup when the line cord is removed.

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