Electrode Cleaning, Calibrating and Maintenance

Step 1: Cleaning

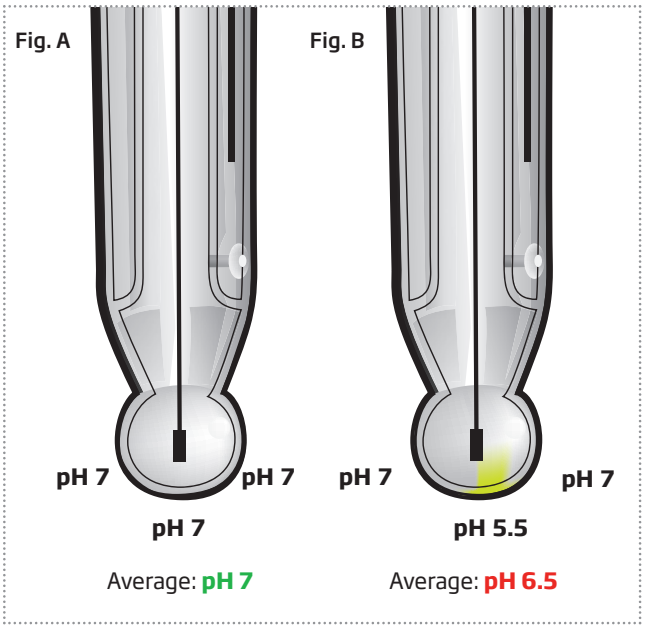
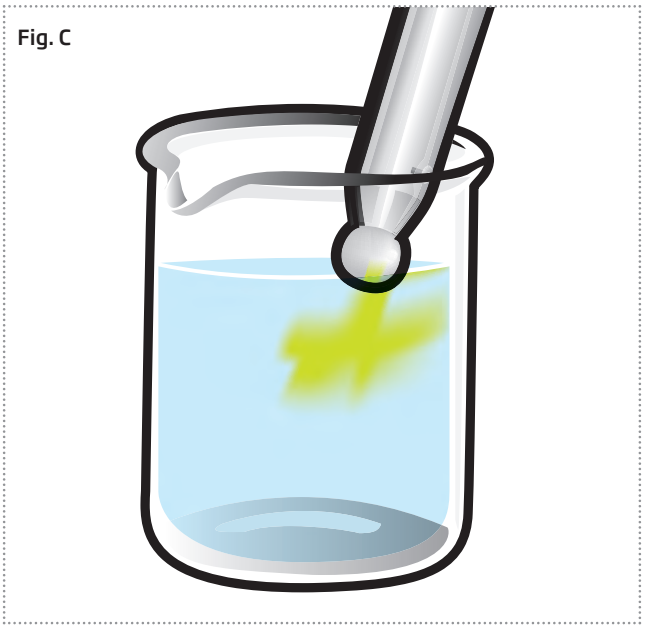


Fig A. pH reading from a properly cleaned electrode in pH 7 solution.

Fig B. pH reading from a dirty electrode in pH 7 solution.



A contaminated electrode could adversely effect not only the buffer solution, but the calibration of clean electrodes as well.

Just because you can't see contamination doesn't mean it isn't there.

An electrode generates a voltage of the average hydrogen ion concentration from the surface area outside the pH bulb tip. **Fig. A** above shows that the clean electrode is submersed in pH 7 from all areas of the bulb surface. When an electrode becomes dirty from use or neglect, the contaminated surface contributes to a voltage offset based on the surface area exposed to buffer as seen in **Fig. B**. Now the pH meter is mistakenly reading pH 6.5 instead of the actual pH 7.

Always clean your electrode before calibration. If a dirty electrode is used for calibration, all subsequent measurements will be in error.

A Dirty Electrode Can Contaminate Solutions

Always use fresh solutions with each calibration. Buffer solutions can be contaminated by dirty electrodes **Fig. C**, which can contaminate clean electrodes and so forth. Always clean your electrode before each use, each calibration, and always use fresh solutions.

Contamination can take time to work its way around the beaker. If your noticing fluctuations in your readings, it may be time to calibrate with fresh solutions.

Fresh Every Time

HANNA single-use sachets are a great way to ensure a fresh solution is used every time you calibrate. **Fig. D** shows just how easy it is to tear open the packet and insert the electrode. These light-tight sachets are also ideal for testers–they fit right in!

pH Cleaning Procedure

HANNA manufactures a full complement of cleaning solutions formulated to address general and specific cleaning needs.

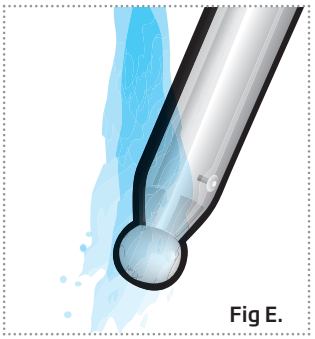


Fig E.

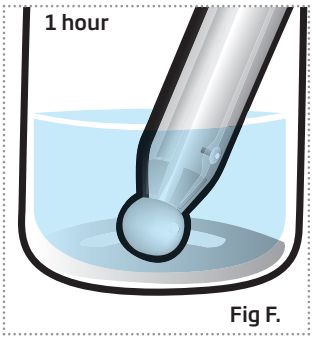


Fig F.

IMPORTANT: After performing any of the cleaning procedures, rinse the electrode thoroughly with distilled water, **Fig. E**, and soak the electrode in HI 70300 or HI 80300 Storage Solution for at least 1 hour before taking measurements, **Fig. F**.

General Cleaning

Soak in HANNA HI 7061 or HI 8061 General Cleaning Solution for approximately 30 minutes to dissolve mineral deposits and other general coatings.

Protein Coating

Soak in HANNA HI 7073 or HI 8073 Protein Cleaning Solution for 15 minutes to enzymatically dissolve deposits from protein sources.

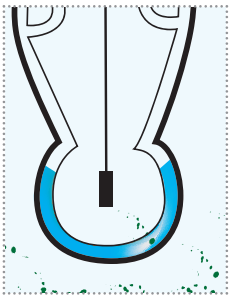
Inorganic Soak

Soak in HANNA HI 7074 Inorganic Cleaning Solution for 15 minutes. This cleaner is especially effective at removal of precipitates caused by reaction with the silver in the filling solution that may form in a ceramic junction.

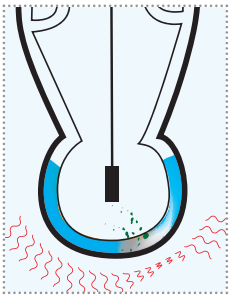
Oil/grease Rinse

Oil and grease removal require the correct chemicals to solubilize the coating but mild enough to leave the electrode unaffected. Use HANNA HI 7077 or HI 8077 Oil and Fat Cleaning Solution.

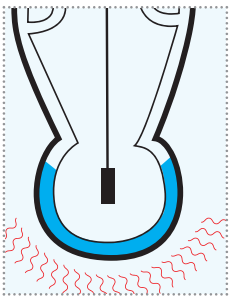
Step 2: Calibration



In time, particles during routine measurement can contaminate the sensor tip. Mishandled and aged solutions can also be affected.



If the electrodes sensor tip is not properly cleaned before calibration, your meter can be calibrated to an incorrect pH.



A proper cleaning and fresh solution ensures the whole surface of the sensor tip is reading correctly, ensuring an accurate calibration.

A pH electrode that is properly manufactured and kept clean will retain its measuring integrity for a long time. As a result of many factors such as age, use, poor maintenance or improper handling, any electrode will lose its integrity in time.

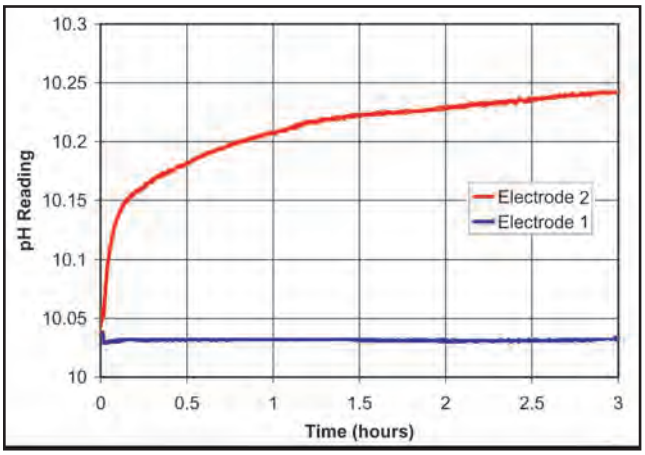
A proper calibration restores an electrodes ability to take professionally accurate measurements.

The most common cause for pH measurement inaccuracies is an unclean or improperly cleaned electrode. This is very important to note, because during calibration, the instrument assumes that the electrode is clean and that the standardization curve created during the calibration process will remain a valid reference until the next calibration. pH meters on the market today will allow an offset of approximately ±60 mV. The deviation from 0 mV is not unusual, in fact it represents the true characteristics of a normal pH electrode.

An offset can be compensated for by calibrating a pH meter with a properly cleaned electrode. Calibrating a meter with a dirty electrode will only compound the problem. An mV offset that continues to deviate on a properly cleaned electrode is a good indication that the electrode may need to be replaced.

Electrode Readings with Different Cleanings

Fig G.



Electrode 1 has been properly cleaned before calibration. Electrode 2 has not been properly cleaned.

Fig. G (above) shows that the pH measured by a dirty electrode changes over a short period of time. This results from the residue on the pH electrode bulb dissolving into the solution and the electrode gradually returning close to its true characteristics. The resulting pH measurements, based upon the calibration of a coated electrode, will then be incorrect.

Conventional pH meters do not warn the user when a pH electrode is dirty or when a solution may be contaminated. A common example of this occurs just *after* calibrating the instrument–the pH electrode is immersed into the pH 7 buffer and the reading is lower than expected (pH 6.8 or 6.9 instead of pH 7). HANNA meters that feature our exclusive Calibration Check™ electrode diagnostics automatically alerts the user of any potential electrode or solution problems *during* calibration.

Precision Solutions

HANNA's wide range of solutions will help guarantee correct cleaning and calibration of electrodes and probes for maximum performance. Our solutions have been manufactured with your application in mind.

Step 3: Maintenance

Measurement

Always calibrate the electrode and pH meter together before making measurements.

Rinse the pH electrode sensor tip with deionized or distilled water. For a faster response and to avoid cross-contamination of the samples, rinse the electrode tip with a few drops of the solution to be tested, before taking measurements submerse the pH sensor tip and reference junction (~3 cm /1¼") in the stirred sample.

Storage

To ensure an optimum response time, the glass sensor tip and the reference junction of the pH electrode should be kept moist and not be allowed to dry out.

Replace the solution in the protective cap with a few drops of HI 70300 or HI 80300 Storage Solution or, in its absence, with pH 4 or pH 7 buffer, **Fig H**.

NOTE: *Never store the electrode in distilled or deionized water.*

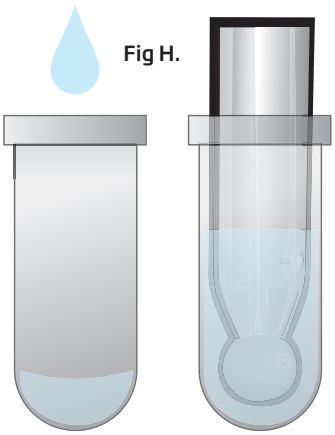
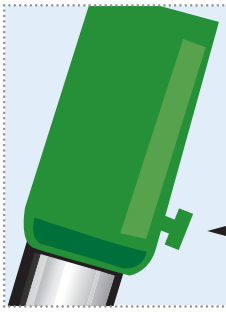


Fig H.

Inspect

Inspect and clean the electrode regularly to ensure the electrode will be ready when you need it. Coatings and reactions from samples result in decreased efficiency and longer response times.

Routine maintenance will ensure accurate readings while extending the life of your electrode.



The reference fill hole is used to replace the reference electrolyte solution (not in gel or solid-filled references).