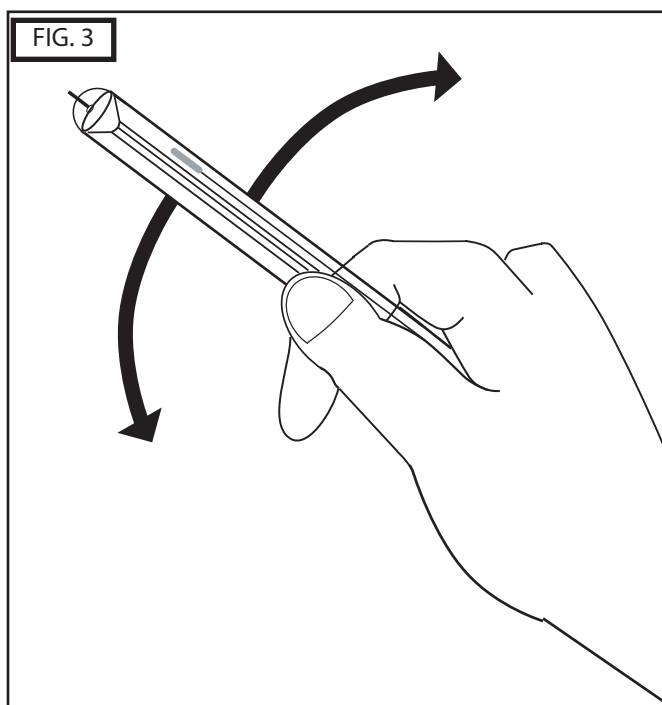
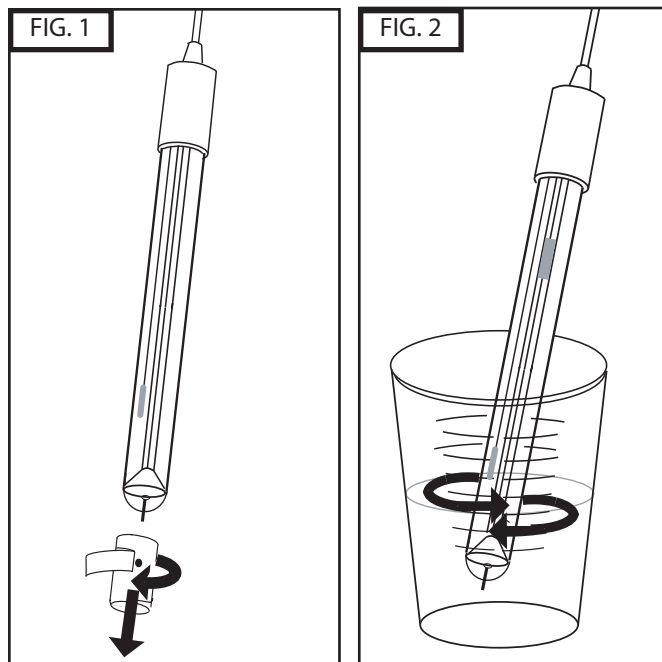


GLASS BODY, SEALED COMBINATION ORP/REFERENCE ELECTRODES

While these instructions are specifically intended for users of Combination REDOX Electrodes, they also can be applied to the use of separate REDOX and Reference Electrodes. Although REDOX Electrodes do not have the fragile glass bulb that is found in pH Electrodes, care should still be taken to prevent their ends from striking hard surfaces and to prevent their platinum sensing surfaces from becoming scratched. The glass body can also be broken and must be handled with care. The suggestions and procedures in these instructions are intended to help users avoid these problems.

SECTION 1.0 HELPFUL OPERATING TIPS

1. As shipped, a protective cap that serves both to keep the reference from drying and to prevent breakage, covers the electrode tip. This cap is a snug fit and it contains a pressure relief hole to facilitate removal and installation. As supplied, this hole is covered by a piece of vinyl tape to retain moisture inside the cap. Before removing or reinstalling this cap the tape must be removed to expose the pressure relief hole (FIG 1).
2. Although vigorous stirring in the laboratory or high velocities in flowing systems more rapidly brings a sample, calibration standard or rinse solution to the platinum measuring surface and so improves speed of response, care must be taken to keep this surface from striking another surface, being hit by a stirring rod, etc. In the laboratory, the electrode should be mounted on the holder that comes with the meter and, if possible, the holder's rod marked with tape to prevent the electrode from being lowered so far that it strikes the bottom of the container or a stirring rod. (FIG 2.)
3. After exposure to a sample, calibrating standard or rinse solution, minimize carryover by a snap action as shown in FIG. 3, shaking of the electrode to remove residual drops of solution. Alternately, the electrode can be wiped dry with an absorbent paper or cloth towel.
4. As a solution, use a part of the next solution to which the electrode will be exposed. This action will also minimize contamination from carryover.
5. When calibrating, keep the temperature of the calibrating standard within a few degrees Celsius of some value that is conveniently maintained at your location. Doing this will minimize changes in readings due to temperature changes.
6. The type of Reference Electrode used will affect the millivolt readings of both samples and calibration standards. The two commonly used Reference Electrode types differ by having internals made of silver/silver chloride (Ag/AgCl) or internals made of calomel. Both Combination and separate Reference



SECTION 1.0 HELPFUL OPERATING TIPS (CONT)

Electrodes that are accompanied by these instructions have Ag/AgCl internals and have 3.5 M KCl gels. This type of electrode will give a reading of about +40 mV as compared to Reference Electrodes with calomel internals and saturated KCl solutions.

7. Depending on the composition of the REDOX Calibration Solution, with time the solution may be oxidized or reduced and this will change its reading. In general, then, REDOX Calibration Solutions cannot be relied on for long term—many months or years—stability (the user should refer to the solution's manufacturer for recommendations regarding solution stability).

8. When REDOX potentials are used to continuously monitor the concentration of the single chemical is easily determined by other means (in the above example, a colorimetric test kit could be used), a REDOX Calibration Standard usually is not needed. The grab sample calibration method described below can be used in such instances.

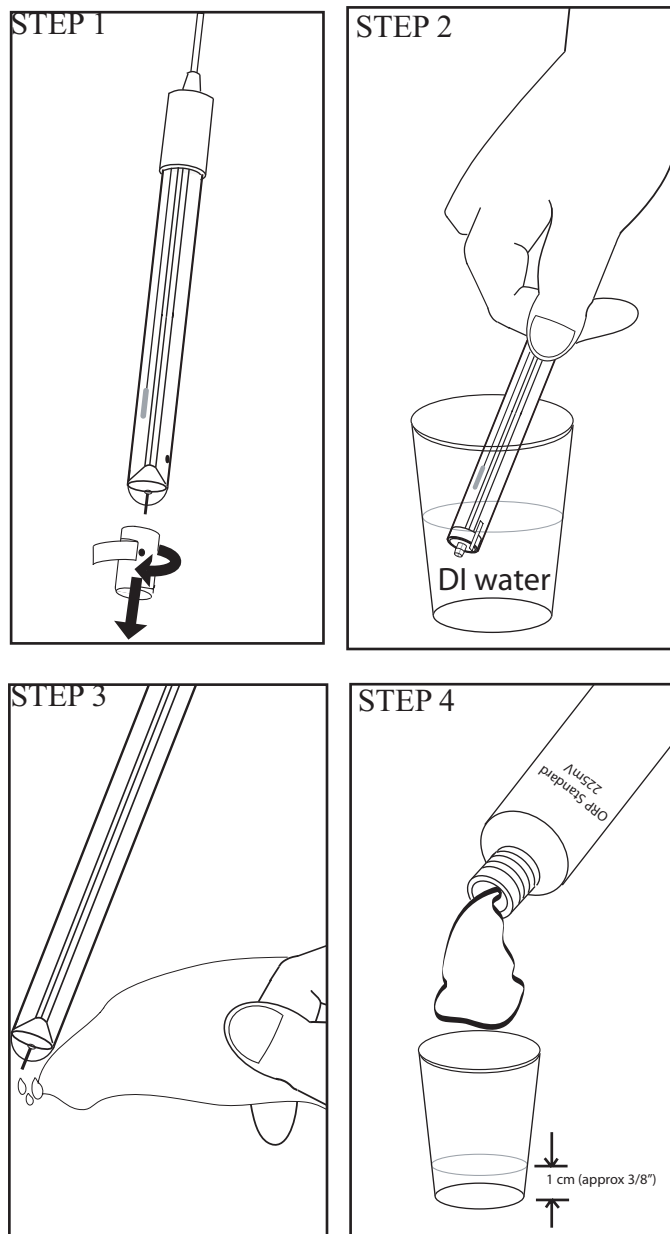
SECTION 2.0 CALIBRATION PROCEDURE

As a general rule, follow the procedures recommended by the REDOX Meter manufacturer keeping in mind the Helpful Operating Techniques given above. The frequency of calibration is a function of both the electrode and the meter. They should be calibrated together with the calibration frequency determined by experience. The following step-wise procedure has been found useful:

LABORATORY PROCEDURE

1. Remove the vinyl tape from the electrode's protective cap to expose the pressure relief hole. Remove and save the cap.
2. Rinse the electrode with de-ionized or tap water by carefully stirring it in a beaker containing this rinse solution.
3. Remove the electrode and wipe dry with a soft paper or cloth towel.
4. Pour REDOX Calibration Standard solution into a small beaker to about a 3/8" (1cm) depth.
5. Insert the electrode into the solution and gently stir taking care not to allow the end of the electrode to hit the beaker.
6. Allow the reading to stabilize and compare it to the standard solution's value. Typically, the readings should agree within \pm mV.
7. If the electrode is to be checked in a different standard solution, repeat steps 2 through 6.

FIG. 4





SECTION 2.0 CALIBRATION PROCEDURE (cont.)

GRAB SAMPLE CALIBRATION

1. Collect a sample of solution the electrode is monitoring (take it from a place as close to the electrode as possible).
2. Just when the sample is collected, observe the meter reading and make a note of that value.
3. As quickly as possible, analyze the collected sample by an appropriate means.
4. Now, if necessary, adjust the meter reading to reflect the difference between the analyzed sample and the meter reading when the sample was collected. For example, if the meter read 0.5ppm when the sample was collected and the analyzed sample value was 0.7 ppm, the meter would be adjusted + 0.2 ppm from whatever its present reading is.

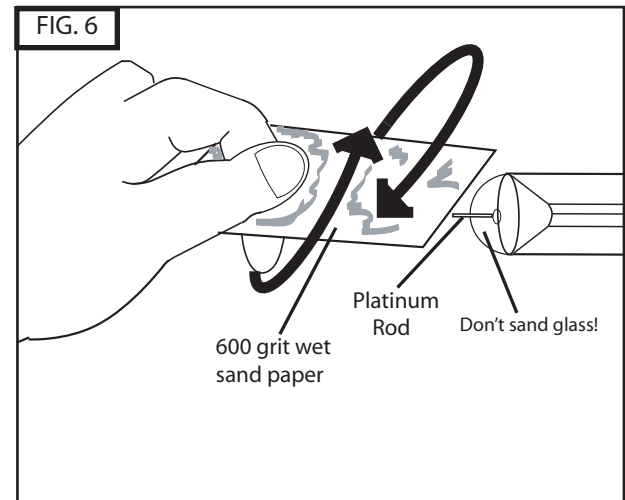
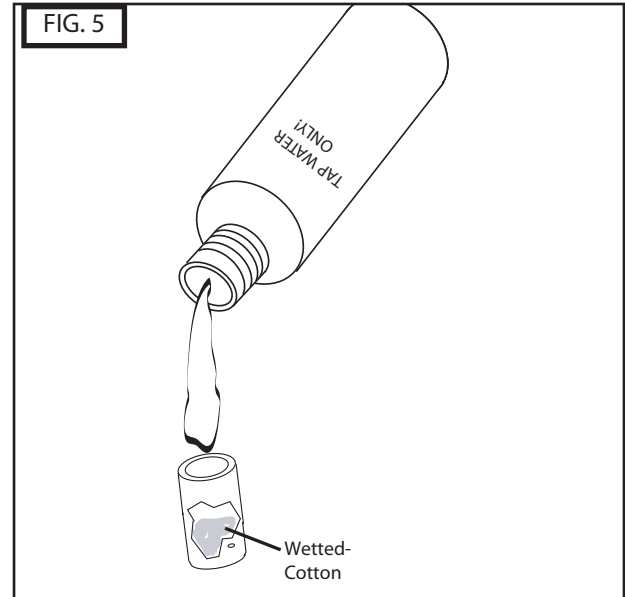
SECTION 4.0 ELECTRODE STORAGE

When readings are made infrequently, for example, several days or weeks apart, the electrode can be stored simply by replacing its protective cap. Make certain that the cotton inside the cap is wet -FIG 5. (do not use distilled water), that the cap pressure relief hole is open and slowly push the cap into position. Then, cover the hole in the cap's side with a piece of tape. For very long-term storage, taping the top of the cap to the electrode's body will provide additional protection against water loss.

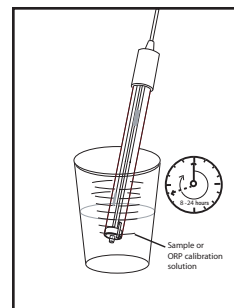
SECTION 4.0 ELECTRODE CLEANING

Coating of the platinum sensing surface can prevent samples from reaching that surface and is a primary cause of erroneous readings. Materials that coat the reference junction can also cause reading errors and coatings must be removed if accurate results are to be obtained.

Soft coatings should be removed by use of a squirt bottle or by wiping with a soft cloth. Hard coatings or organic chemicals should be removed by use of appropriate chemical such as 5% HCl. If a solvent is used, select one that does not damage the electrode materials that include epoxy, nylon, silicone rubber, platinum and glass. The platinum sensing surface is located in the end of the glass tube that extends from the electrode's body. It can be cleaned by gently polishing it with 600 grade wet silicon carbide paper but should only be done when chemical cleaning is not effective. Wet a piece of the paper with water and polish the electrode with a twisting and rocking action as shown in FIG. 6 .



IMPORTANT NOTE: After the platinum sensing surface has been cleaned, some period of time is required before it once again provides stable readings. In general, soak the electrode for 8 – 24 hours in the solution that the electrode usually monitors.



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