

# Instructions

## Calomel Reference Electrodes

Catalog No.	Temperature Range (°C)
13-620-51	-5 to 80
13-620-52	-5 to 80
13-620-57	-5 to 80
13-620-61	-5 to 80
13-620-62	-5 to 80
13-620-63	-5 to 80
13-620-64	-5 to 80
13-620-79	-5 to 80
13-620-258	-5 to 80
13-620-259	-5 to 80

The Calomel Reference Electrodes are ruggedly constructed in a wide choice of configurations to meet a variety of application needs. They provide a stable reference potential when used with an appropriate glass pH electrode, ISE (Ion Selective Electrode), or metallic electrode.

Basically, the design consists of a mercury/mercury (I) chloride reference element surrounded by an electrolyte (saturated KCl solution, or gelled saturated KCl solution) contained in an outer tube. When immersed in a solution, electrical contact is made between the sample and the electrolyte at an opening located at the end of the electrode. The opening or junction forms a conductive bridge between the reference electrode, sample, and indicating electrode.

Two body types (glass and polymer) and four junction types cover most application needs. Glass body liquid-filled types include porous ceramic junctions for routine applications; cracked bead junctions for samples requiring a slow electrolyte flow; and sleeve junctions for samples requiring fast electrolyte flow and/or a renewable junction. Polymer bodied types include liquid-filled with a ceramic junction; and gel-filled with a porous polymer junction.

The permanently gel-filled type requires minimal maintenance and is usable for most routine applications. The Dri-Pak™ versions are packed with the electrolyte cavity unfilled. This avoids formation of crystals on the surface of the electrode and/or allows for the use of non-routine electrolyte fill solutions.

**WARNING** - This electrode contains mercury (I) chloride. Contents may be harmful if swallowed. If breakage occurs, clean up thoroughly and promptly. Leave no residual mercury, as the vapor is harmful. Avoid ingestion of contents; wash hands thoroughly. Dispose of appropriately, according to applicable RCRA regulations, or other governing rules or standards.

## INSTALLATION

**CAUTION:** Polymer bodied electrodes should not be used in non-aqueous solvents, concentrated acetic acid, or concentrated oxidizing agents.

### I. Installing Gel Filled Electrodes

1. Remove the cot from the probe tip and rinse the electrode with water to remove any crystals that may have formed on the outer surface during storage. Crystal formation is caused by the natural leakage and gradual evaporation of the filling solution. Save the cot for future storage.
2. Mount the electrode on a suitable holder and connect the jack to the meter.

### II. Installing Liquid-Filled Electrodes with Ceramic or Cracked Bead Junctions

1. Remove the cot from the probe tip and rinse the electrode with water to remove any crystals that may have formed on the outer surface during storage. Crystal formation is caused by the natural leakage and gradual evaporation of the filling solution. Save the cot for future storage.
2. If the fill hole is located in the cap, rotate the hole in the cap ring from the closed to open position. If the fill hole is located on the electrode body, lower the rubber sleeve on the electrode, and remove the white vinyl tape to expose the fill hole.
3. Check the level of the electrolyte. If the fill hole is in the cap, the meniscus should be at a level approximately 1/4-inch below the cap. If the fill hole is on the body, the meniscus should be at a level approximately 1/4-inch below the fill hole. If the electrolyte level is lower than this, add electrolyte SP138, (saturated KCl) to the electrode with the supplied fill bottle.
4. Proper electrode performance requires electrolyte flow through the junction located near the tip of the electrode. Flow should be checked by performing the following procedure.
  - a. Hold the electrode upright at a 45° angle between the thumb and the forefinger of the left hand, so that the filling hole faces out and is directly opposite the base of the thumb.
  - b. Insert the spout of the dispensing bottle into the fill hole.
  - c. Making sure that the electrode is supported by the base of the thumb, firmly press the spout into the fill hole to make an airtight seal.

*NOTE: Normally, the spout tip will not touch the internal element. While applying pressure, care should be exercised to prevent contact with this element. If contact occurs, it will be necessary to cut off a small portion of the tip.*
  - d. While maintaining the seal, squeeze the filling bottle so that the electrode becomes pressurized. A bead of liquid should form at the liquid junction in about 30 seconds; in some cases it may be necessary to maintain pressure for several minutes.

*NOTE: If using Dri-Pak™ electrode, repeat steps c and d several times. This will in addition to assuring proper junction flow cause the calomel reference element to become wetted with electrolyte. Air bubbles will be observed coming out of the reference element into the electrolyte. Once this has been observed the reference element will be sufficiently wetted for operation.*
  - e. Mount the electrode on a suitable holder and connect the jack to the meter.

### III. Installing Liquid-Filled Electrodes with Sleeve Junctions

1. Remove the paper insert located between the glass sleeve and the electrode body.
2. Seat the glass sleeve on the electrode body with a pushing/twisting motion.
3. Rotate the hole in the cap ring from the closed to the open position.
4. Add electrolyte SP138 (saturated KCl) to the electrode with the supplied fill bottle until the electrolyte level is approximately 1/4-inch below the cap.

5. Proper electrode performance requires both electrolyte flow through the junction located near the end of the electrode and wetting the calomel reference element. Both can be checked by performing the following:
  - a. Hold the electrode upright at a 45° angle between the thumb and the forefinger of the left hand, so that the filling hole faces out and is directly opposite the base of the thumb.
  - b. Insert the spout of the dispensing bottle into the fill hole.
  - c. Making sure that the electrode is supported by the base of the thumb, firmly press the spout into the fill hole to make an airtight seal.  
*NOTE: Normally, the spout tip will not touch the internal element. While applying pressure, care should be exercised to prevent contact with this element. If contact occurs, it will be necessary to cut off a small portion of the tip.*
  - d. While maintaining the seal, squeeze the filling bottle so that the electrode becomes pressurized. Liquid flow should be observed at the junction area in about 15 seconds. Release the pressure. Repeat this step several times. Air bubbles will be observed coming out of the reference element into the electrolyte. Once this has been observed the reference element will be sufficiently wetted for operation.
6. Mount the electrode on a suitable holder and connect the jack to the meter.

## OPERATION

1. Electrodes with liquid electrolyte fills must have their fill holes open when taking measurements. This permits proper electrolyte flow during analysis.
2. The electrolyte must cover the tip of the internal element at all times. When needed, refill the cavity per instructions given under INSTALLATION for the appropriate electrode type.
3. The electrolyte level must always be maintained above the surface of the sample solution. This assures that sample will not backflow into the electrolyte.
4. Always rinse the outer surface of the electrode with distilled water when transferring from one sample to another.
5. If using a sleeve type junction, occasionally remove the sleeve and rinse the sleeve and electrode tip with distilled water to prevent the sleeve from freezing to the body.

## STORAGE

### I. Gel-Filled Electrode

1. Rinse and dry the surface of the electrode body.
2. Place the cot over the probe tip to stop the gel from drying. Store the electrode in an upright position.

### II. Liquid-Filled Electrodes with Ceramic or Cracked Bead Junctions

1. Rinse and dry the surface of the electrode body.
2. Rotate the hole in the cap ring to the closed position or slide the rubber sleeve over the fill hole.
3. Place the cot over the probe tip to stop electrolyte leakage and store the electrode in an upright position.
4. Maintain the electrolyte level above the reference element during storage.

### III. Liquid-Filled Electrodes with Sleeve Junctions

1. Drain electrolyte from electrode.
2. Rinse and dry the surface of the electrode body including ground glass sleeve surfaces.
3. Rotate the hole in the cap ring to the closed position and store electrode and sleeve.

## REJUVENATION

Should meter readings become unstable, perform the following:

### I. Gel-Filled Electrode

1. Remove the electrode from solution, rinse and then dry the outer body.
2. Immerse in warm (approximately 60°C) saturated KCl solution and allow to cool to room temperature.

### II. Liquid-Filled Electrodes with Ceramic or Cracked Bead Junctions

1. Remove the electrode from solution, rinse and then dry the outer body.
2. Check the level of the electrolyte. It must be above the internal reference element. If necessary, add electrolyte as instructed under installation and recheck electrode performance.
3. Inspect the reference cavity for crystallization. If no excessive amount of crystals are present, go to step 4. If an excessive amount of crystals are present, proceed as follows:
  - a. Remove the filling solution by shaking the solution out of the fill hole.
  - b. Repeatedly rinse the electrode with distilled water until all the crystals have been removed.
  - c. Refill the electrode with fresh electrolyte as instructed under installation and recheck electrode performance.
4. Check the electrode for electrolyte flow as instructed under the appropriate installation procedure. If flow cannot be established, go to step 5.
5. If flow cannot be established, the junction is clogged. Perform the following procedures in sequence until flow is established.
  - a. Soak the electrode tip in warm water for five minutes, then check the electrode for electrolyte flow.
  - b. Soak the electrode tip in concentrated hydrochloric acid for 5 to 10 minutes (use adequate ventilation and precautionary measures). Rinse the electrode off then check for electrolyte flow.
  - c. If the junction remains clogged, carefully sand or file the junction area (ceramic only). Then check for electrolyte flow.

### II. Liquid-Filled Electrodes with Sleeve Junctions

1. Remove the electrode from solution, rinse, and then dry the outer body.
2. Check the level of the electrolyte. It must be above the internal reference element. If necessary, add electrolyte as instructed, under installation and recheck electrode performance.
3. Inspect the reference cavity for crystallization. If no excessive amount of crystals are present, go to step 4. If an excessive amount of crystals are present, proceed as follows:
  - a. Remove the filling solution by shaking the solution out of the fill hole or side arm.
  - b. Repeatedly rinse the electrode with distilled water until all the crystals have been removed.
  - c. Refill the electrode with fresh electrolyte as instructed under installation and recheck electrode performance.
4. Check the electrode for electrolyte flow as instructed under the appropriate installation procedure. If flow cannot be established, go to step 5.
5. If flow cannot be established, the junction is clogged. Perform the following procedure in sequence until flow is established.
  - a. Soak the electrode tip in warm water for 5 minutes, then check the electrode for electrolyte flow.
  - b. Rotate the sleeve several times, then check the electrode for electrolyte flow.

# Starting Up and Storing Your Electrode Product

## Calomel Reference Electrodes with Porous Ceramic Junction

**Quick instructions for out-of-box use and storage of your electrode.**

### Applicable Electrodes

#### Catalog #:

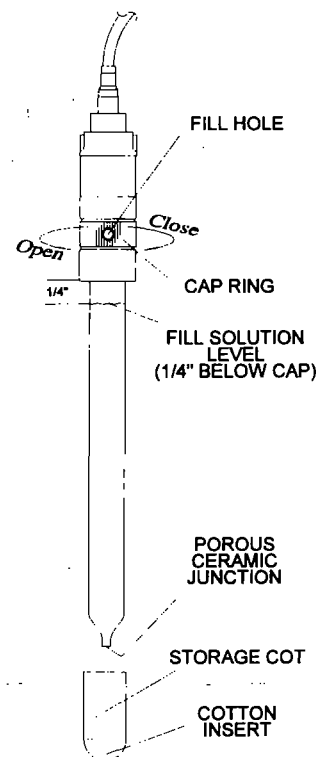
13-620-51 Standard Dri-Pak, Porous Ceramic Junction  
13-620-52, -64 Standard Pre-Filled, Porous Ceramic Junction

### ✓ Starting Up

- Remove Storage Cot:**  
For electrodes 13-620-52 and 13-620-64 only, crystallization around storage cot is normal and is removed by rinsing in water. Then carefully slide storage cot from end and save.
- Clean Junction:**  
Rinse junction with distilled water.
- Rotate Cap Ring:**  
Rotate to open fill hole.
- Add Fill Solution:**  
Add to fill hole from provided fill bottle until  $1/4$ " below cap.
- Prepare Junction:**  
Hold electrode upright and press spout of fill bottle tightly into fill hole. Squeeze bottle until liquid bead forms at junction (approx. 30 sec). Repeat as necessary to form a bead.
- Condition Electrode:**  
Condition electrode in one of the following for 10 min.: saturated KCl (SP138-500) solution, 4 buffer, or 7 buffer.
- Connect Electrode:**  
Attach electrode connector to instrument. Follow instrument instructions for operation.

### ✓ Short Term Storage (Between Shifts/Over Night)

- Clean Junction:**  
Rinse junction with distilled water.
- Store Wet:**  
Store electrode in beaker of 4 or 7 buffer or KCl solution. Leave fill hole in open position.



13-620-51

13-620-52

13-620-64

### ✓ Long Term Storage (Over 24 Hours)

- Clean Junction:**  
Rinse junction with distilled water.
- Store Wet:**  
Add fill solution as above and close fill hole. Saturate cotton insert with KCl solution and reinstall storage cot.

**Notes:** Reference Electrode Sheet, Part No. 69483.  
Fill Sol.: Saturated KCl (Cat. #SP138-500)