

How To Guide



Subject: Changing a Reference Electrode or Bridge Tube Tip

Introduction

Our Global Support Team has decades of experience providing our users practical solutions to common issues in electrochemical measurements. This document is part of a series to formalize these suggestions and make them directly available to our users. All Princeton Applied Research reference electrodes and bridge tube tips consist of KT Glass frits designed specifically to provide ultra-low leakage rates with minimum IR drop through the tip. Using a reference electrode or counter electrode inserted into a bridge tube eliminates complications arising from poisoning of test solutions by the reference electrode fill solution or by unwanted species produced at the counter electrode, and allows high sensitivity operation of potentiostats. The KT Glass frit is deliberately seated to the bridge tube in a dry state. ONCE THE TIP IS WETTED, IT MUST BE MAINTAINED IN A WET STATE. What this means practically is that, when the tube or reference electrode is not in use, it must be stored in a solution - ideally a solution that closely approximates the solutions employed in the electrochemical experiment. If the tip is allowed to remain dry for more than a few minutes once it has been wetted, it will crack. A cracked tip must be replaced before the tube can be used again. Another scenario in which the tip may crack is if it is exposed to drastically different environments, e.g.:

1. The bridge tube is immersed in an aqueous environment but filled with an organic solvent (or vice versa).
2. The bridge tube is removed from an aqueous environment and placed directly in an organic solvent (or vice versa).

If a bridge tube must be used in different environments, i.e., organic solvents and aqueous solutions, it may be possible to prevent the tip from cracking by equilibrating the tip (inside and out) with a mixture (or mixtures) of the two environments. Alternatively, two bridge tubes should be used, one for each environment. However, once a frit is cracked it will need to be replaced.

Reference electrode and bridge tube tips can become discolored or clogged from exposure to certain chemicals. If a probe gives unstable readings the tip should be replaced.

Procedure

This procedure uses the K0077 Saturated Calomel reference electrode to demonstrate how to replace the KT Glass frit as part of standard electrode maintenance. These steps can be generally applied to any Princeton Applied Research reference electrode or bridge tube.

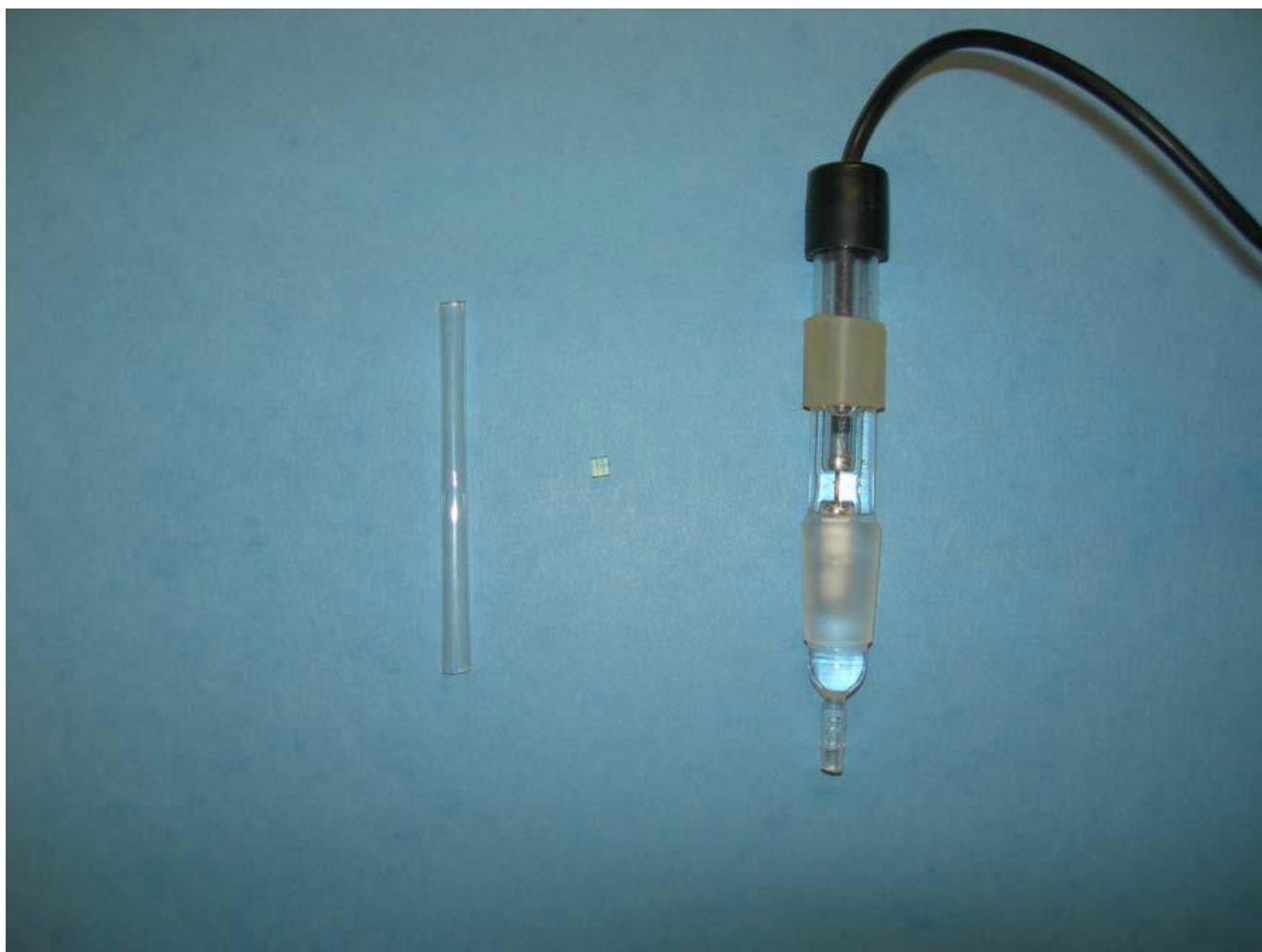


Figure 1: The SCE K0077 with replacement frit and heat-shrink tubing

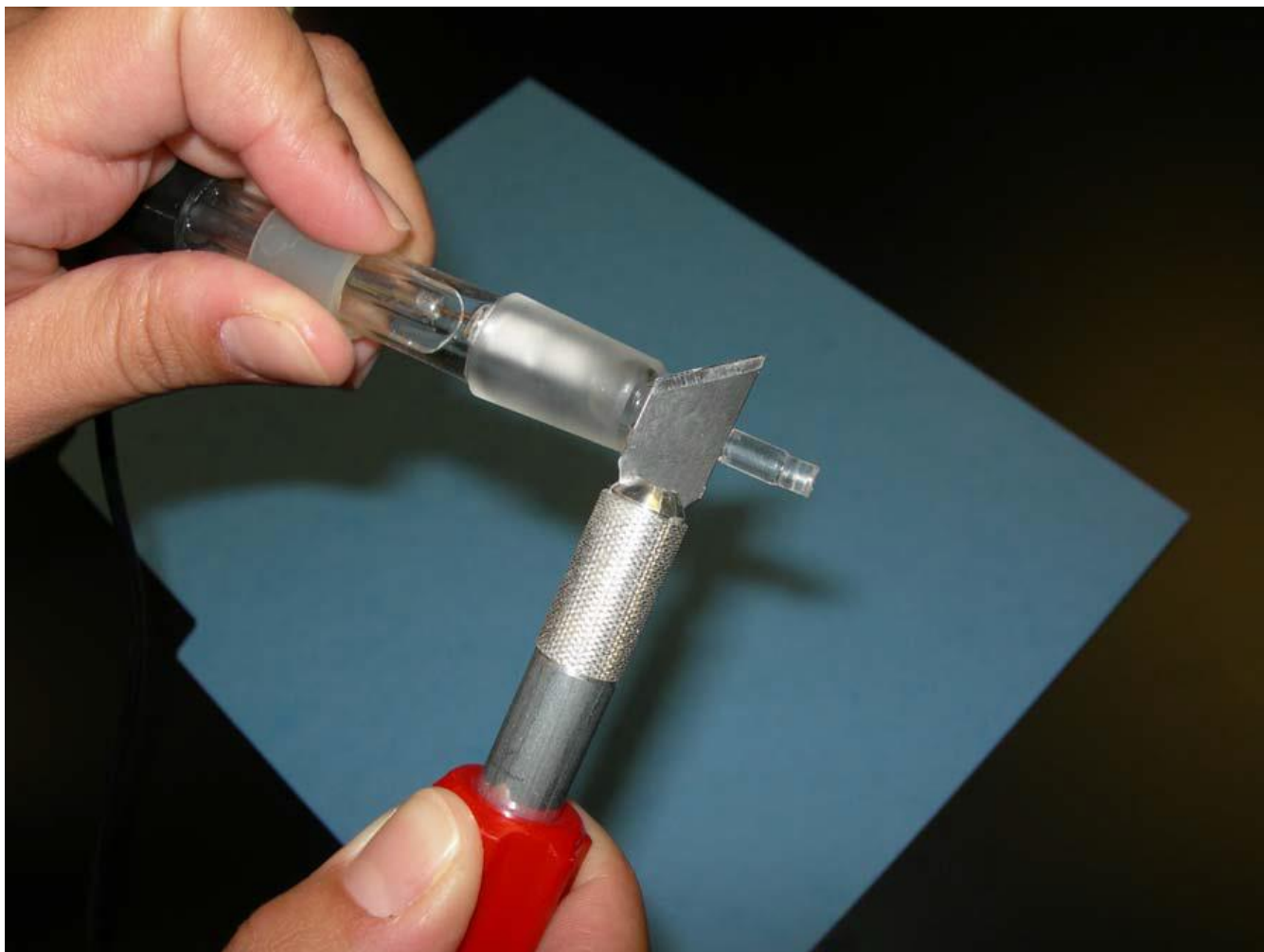


Figure 2: To begin replacing the existing frit, first slice off the old heat shrink sleeve with a razor blade, and discard the old frit and sleeve. Clean and dry the glass tubing where the new frit will be placed. **Note:** If the filling solution is not going to be replaced, take care not to spill too much. If it is to be replaced, then empty the entire SCE of its filling solution (saturated KCl) and rinse thoroughly with water.

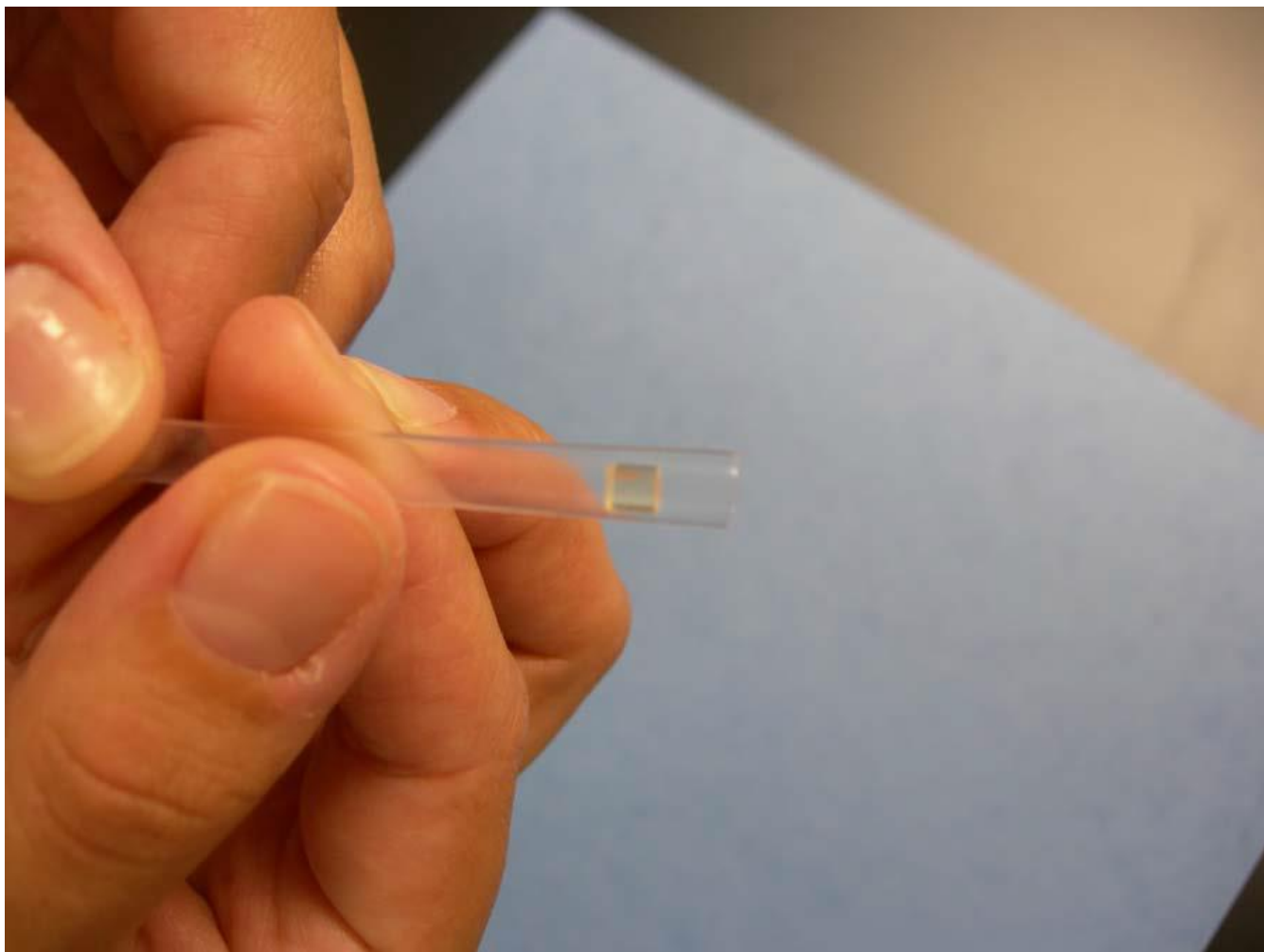


Figure 3: Place the new frit inside a new piece of heat shrink sleeve as shown above. Try not to make finger contact with the frit, as oils from the skin can clog the pores on the frit.

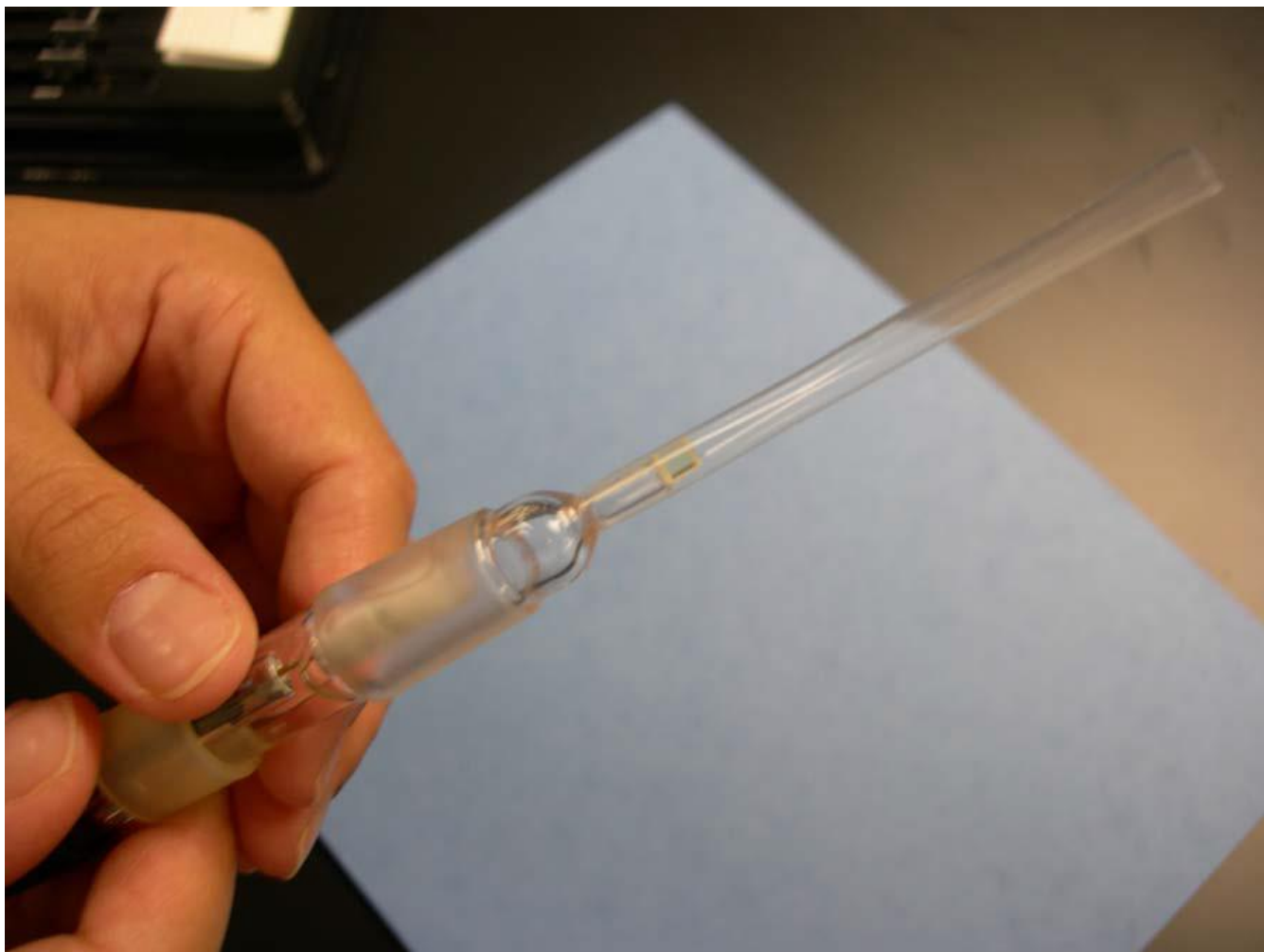


Figure 4: Slide the tubing over the glass tube of the SCE, and tap the tubing so that the frit rests against the glass tube.

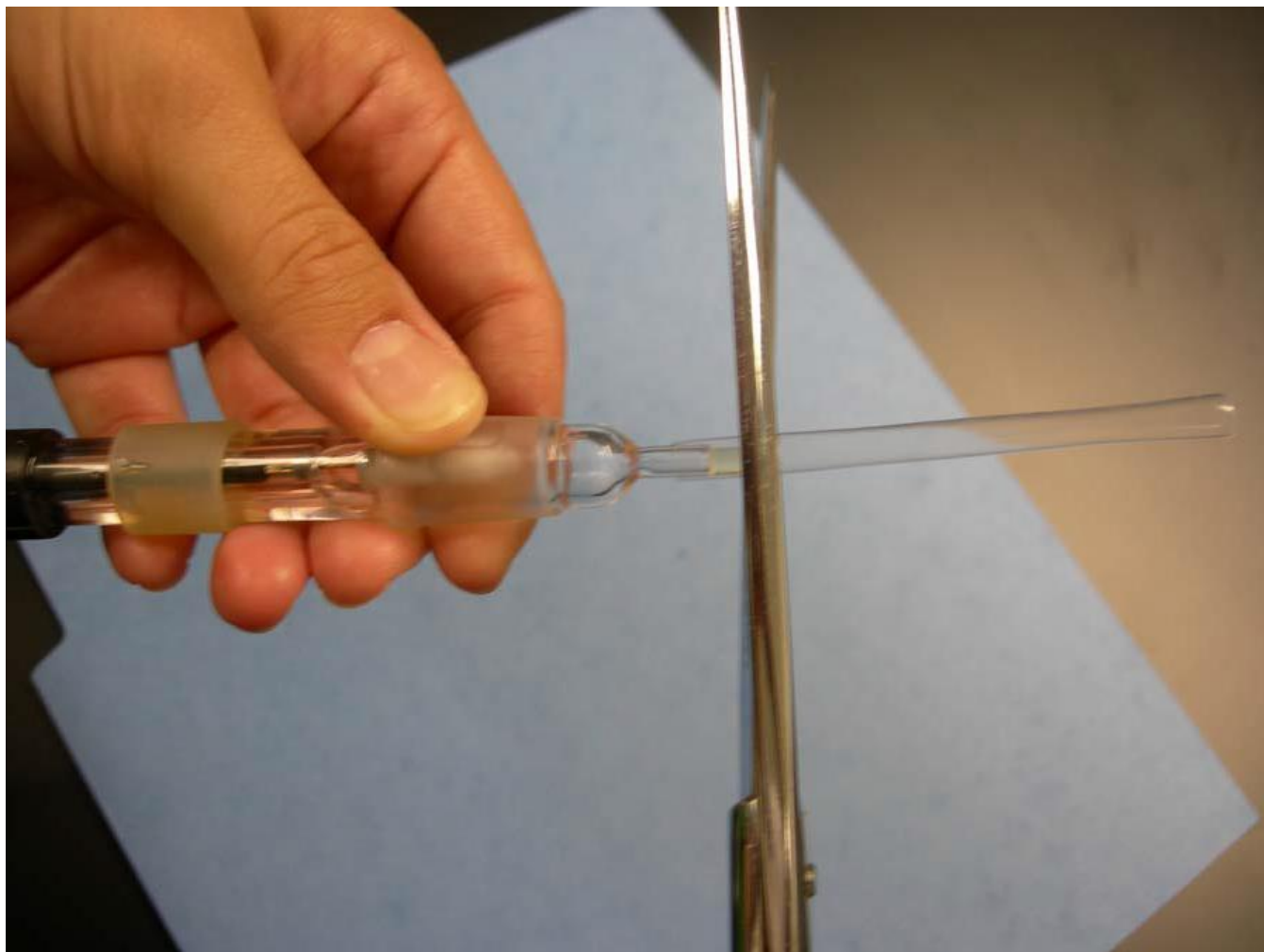


Figure 5: Slide the tubing forward just a bit and cut off the excess tubing with scissors.



Figure 6: Slide the tubing back down over the frit, exposing the one end. If the tubing was cut to the correct length, it should be just below the top 25% of the frit's length.



Figure 7: Heat the heat shrink tubing evenly on all sides with a hot air stream from a heat gun. The tubing will go from translucent to transparent as it shrinks around the frit, holding it firmly against the glass tubing to form a leak-tight seal. Note: If filling solution was still inside the electrode, do not invert the electrode until the glass has cooled to the touch.

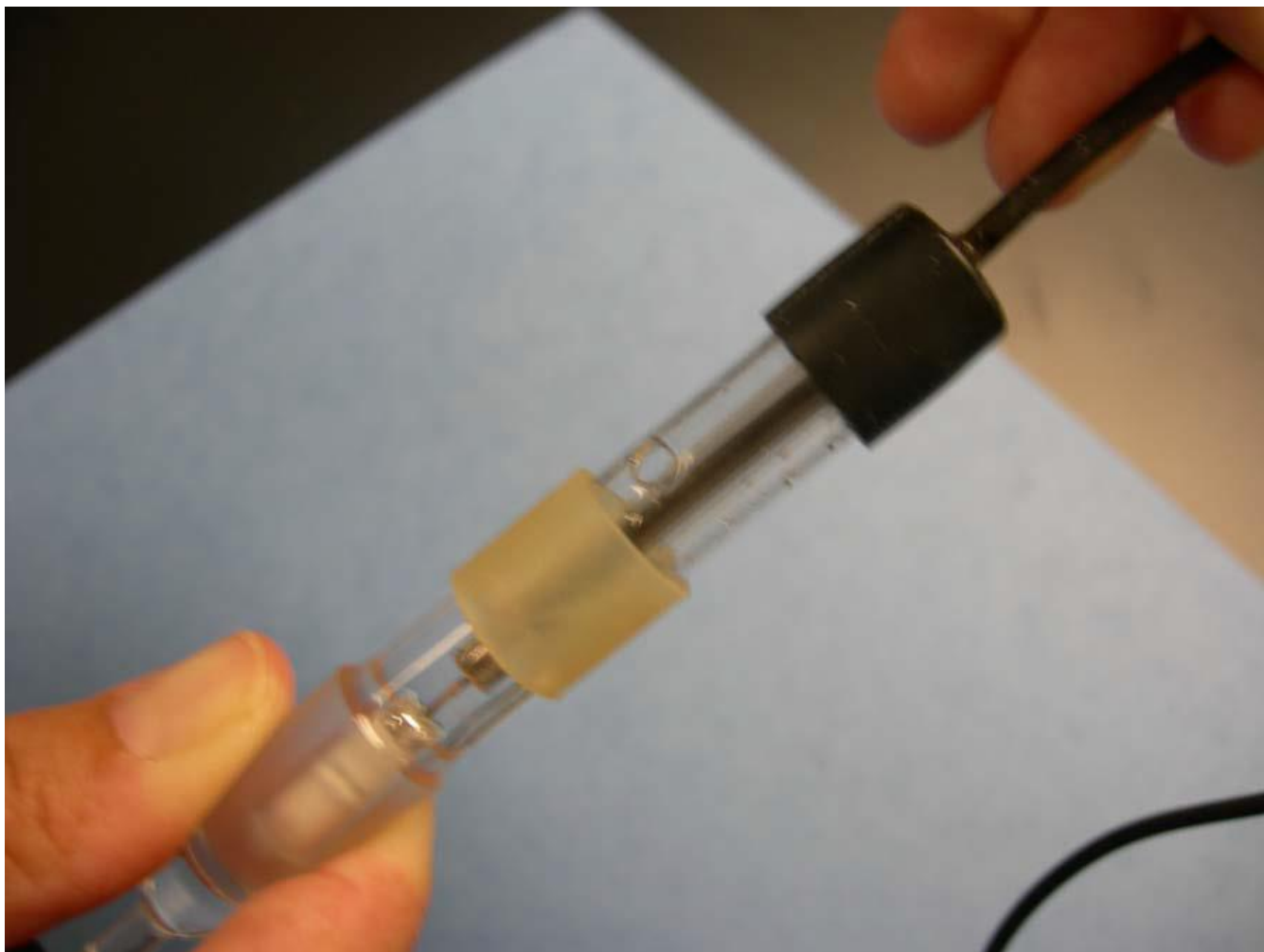


Figure 8: If the fill solution was removed, use the opening near the top of the electrode (slide the rubber tubing cover down if covered) to add new fill solution.

Note: When not in use, this hole should be covered with the tubing to prevent evaporation of the fill solution. When being used, always uncover the opening slightly to allow the filling solution to equilibrate with the atmospheric pressure. When storing the electrode, it's best to store it so that the frit is kept wet by placing it in a solution the same as or very similar to its own fill solution (saturated KCl)

Conclusion

If changing the frit does not stabilize the measurement and/or resolve the current technical support issue, please refer to the [Guide to Practical Solutions for Common Technical Questions](#) for guidance on how best to proceed with troubleshooting.