How To Guide

Subject: Performing an Internal Dummy Cell Checkout Test

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. Once the proper Cell Cable connections are verified and it is confirmed that the VersaStudio version and Firmware versions match, an internal dummy cell test should be performed. All VersaStudio-compatible Princeton Applied Research potentiostats have a built-in 1 kΩ resistor referred to as the internal dummy cell, which was included in the hardware to aid in troubleshooting. The VersaStudio Software manual describes several Checkout Procedures that use this dummy cell to test the proper functioning of the instrument. This How To Guide will use the Voltammetry Checkout experiment in which a Linear Scan Voltammetry Action is used to apply a voltage sweep across this resistor. Based on Ohm's Law ($V = I R$), plotting Current (A) versus Potential (V) will give a slope that is equal to R (Ω). This simple principle is often used as a starting point for evaluating hardware issues.

Procedure

Open VersaStudio and select Experiment → Load Setup. Upon initial installation of the software, three files should be listed here and include: Voltammetry Checkout, Corrosion Checkout, and Impedance Checkout. If you do not see the Voltammetry Checkout file, then you can add it by clicking on "Add…" and navigating to this file, which is stored in C:\ My Data.

Select the Voltammetry Checkout file, enter a new filename for the checkout to be performed, and select OK. An empty graph, Experiment Properties, and empty Data View window will appear. This setup is complete as-is with the desired parameters already entered and set to the Internal Dummy Cell. Therefore, you can simply press the Run button on the main menu to begin running the checkout experiment on the Internal Dummy Cell. No cell cable connections are needed for these internal experiments.

Once the experiment is complete, select all the data by left-clicking and dragging the mouse or by selecting Data → Select All. Once all of the data is selected (it will be highlighted in red) click on the Line Fit icon at the top of the graph window as shown in Figure 1.

The results should be Slope = 1000 ohms (+/- 10 ohms), Y-Intercept = +/- 4 mV, and the Vertices of the plot should be near +/-1 V and +/-1 mA as shown below. The Vertices may be found either by "hovering" the mouse pointer over the first and last points in the Graph View or more simply by viewing the first and last points in the Data View window.

Note: If data do not appear correct, ensure that the "Cell" in the Advanced Properties area of the Experiment Properties is set to "Internal", and run again.
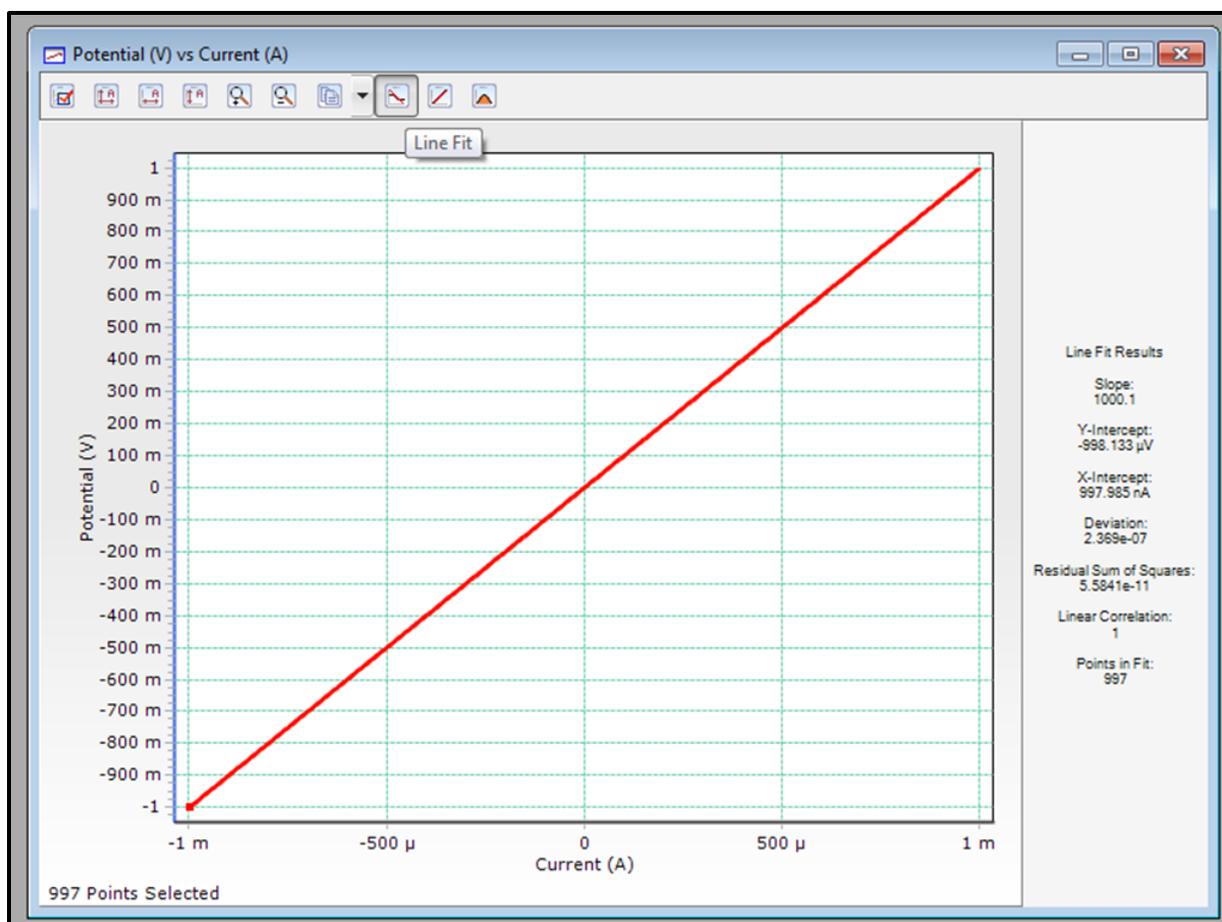
Figure 1: Typical data and Line Fit Results of a Voltammetry Checkout performed on the internal dummy cell of a VersaStudio compatible instrument.

If the results are not within the ranges specified above, this may simply mean that the unit requires a new DC Calibration, which is typically required after the instrument has been commissioned for some time or used with a booster or low current interface. To run the DC Calibration, go to Tools → Options, select the Instrument tab and click on the Calibrate Now button. Be sure that the correct instrument is selected. The Calibration process takes approximately 2 minutes, but can take up to 10 minutes. That lack of a failure notice confirms a successful calibration. There is no message to confirm a successful calibration.

Note: After calibration, the potentiostat will automatically restart, disappearing from the VersaStudio Select Instrument window. It will take ~30 seconds for the instrument to reappear in this window.

Conclusion

If the results are still not within the ranges specified above after a successful DC Calibration or if the calibration fails 3 times in a row, it could mean that your system is in need of repair. Further troubleshooting and/or arranging to have the instrument repaired, will require assistance from technical support. Please contact Technical Support at http://www.princetonappliedresearch.com/support-center/contact-us/index.aspx or PARSOLSR.support@ametek.com. If the instrument passed this internal dummy cell checkout procedure, please refer back to the Guide to Practical Solutions for Common Technical Questions for guidance on how best to proceed with troubleshooting.