Universal Dummy Cell 4

Operator's Manual

Revision 1.0
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Introduction

The Universal Dummy Cell 4 is a printed circuit board used for calibration and troubleshooting of a Gamry potentiostat. It has 2 "test cells" equipped with terminals, arranged on the edges of the printed circuit board.

The terminals are marked with labels corresponding to the leads on a Gamry Cell Cable. Some earlier model instruments have fewer cell leads than current ones, so some terminals will have no connection in older models.

This document applies to the UDC 4, engineered to work with Gamry's PCI4/Series G/Reference families of products. The UDC4 is clearly labeled with the text "Universal Dummy Cell 4" written in the center of its printed circuit card.

Calibration

The calibration circuit is a 2 kΩ precision resistor (with some protection components). It is accurate to better than 1 Ω. Because potentiostats are not perfectly accurate, its value measured with a Gamry potentiostat is typically between 1.994 kΩ and 2.006 kΩ.

Very early revision UDCs had a 100 Ω resistor in the calibration circuit. PCI4/Series G/Reference families of products require a 2 kΩ resistor. 100 Ω Universal Dummy Cells (shipped before May 2003) will not calibrate a PCI4/Series G/Reference family potentiostat to its full accuracy.

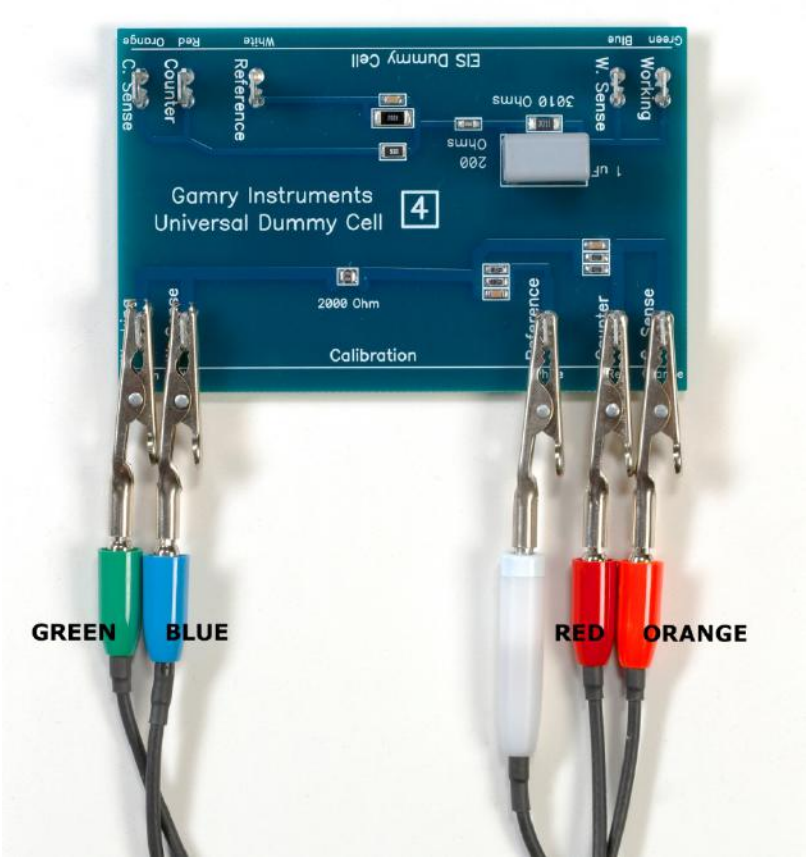
AC calibration of a Reference family potentiostat should always be done using a UDC4. Stray capacitance on an older UDC2 or UDC3 will cause significant phase errors at 1 MHz.

You can also use the calibration circuit to test for proper operation of your potentiostat. Use any technique. The current at any potential should be given by Ohm's law, I = E/R. At 1 Volt, the current should be 500 μA.

More specifically, we recommend you use one of these techniques if you have concerns about your potentiostat's health:

- DC105 Polarization Resistance
- EIS300 Potentiostatic EIS
- PHE200 Cyclic Voltammetry

Figure 1-1
Universal Dummy Cell 4 with Lead Connections for Calibration



EIS

The EIS Dummy Cell is a Randle's cell (as described in Gamry's Help system). If you have a license for Gamry's EIS300 Electrochemical Impedance Spectroscopy software, you can record this cell's EIS spectrum to check your system's EIS operation.

Figure 1-2, a circuit diagram of the EIS cell is shown below. Figure 1-3 is a typical spectrum of the cell in Bode format.

A visual examination of the spectrum is usually sufficient to determine if your EIS system is working. Most system malfunctions totally prevent recording of the spectrum or cause gross errors that dramatically change the shape of the curve.

Figure 1-2
EIS Dummy Cell Schematic Diagram

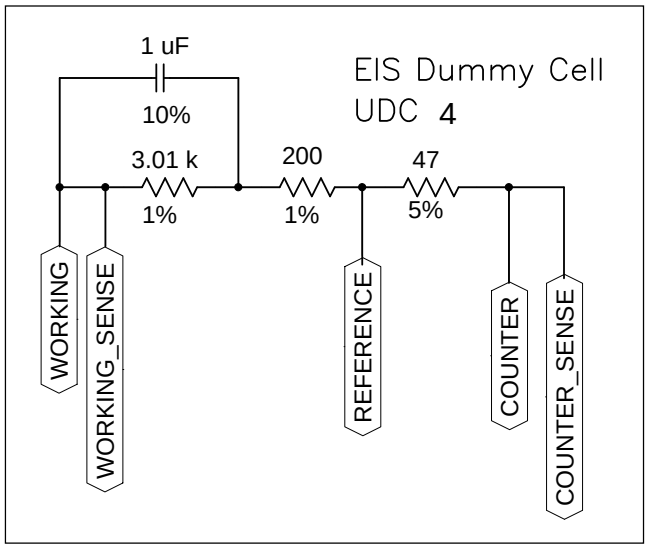
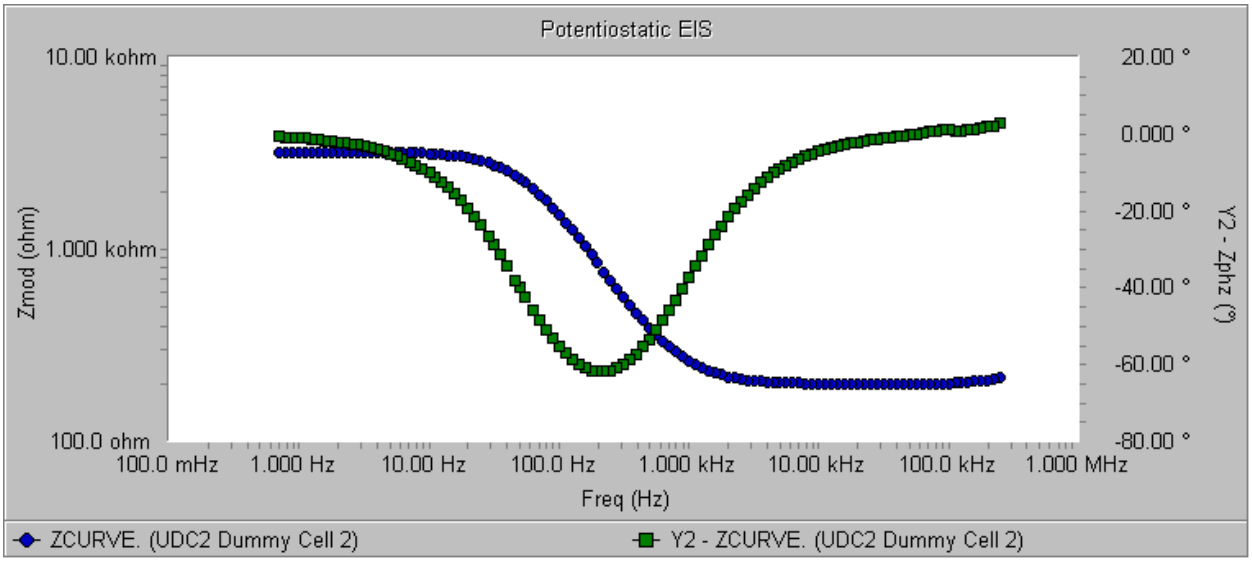


Figure 1-3
Bode Plot of EIS Dummy Cell Spectrum



If you want a numerical confirmation of the system's performance, fit the dummy cell's spectrum to the Randle's model in the EChem Analyst. The calculated values should be between:

R_p 2.95 kΩ -- and -- 3.07 kΩ

R_u 196 Ω -- and -- 204 Ω

C_f 0.90 μF – and – 1.10 μF