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Application Note

1 Scope

A simple way to assess the Galvanic Isolation (GI) capability is to measure the resistance between the ground (GND) leads of different channel. Check if the ground leads are in open circuit. If you suspect ground interference, you can perform a more realistic test to challenge the GI capability.

This test uses the standard dummy cell and is useful to diagnose a GI issue. You will run a sensitive experiment (Chronopotentiometry resulting in a low voltage) on one channel and a Linear Sweep Voltammetry on another channel. This setup allows even small conductivity between the channel grounds to be detected. The test challenges one pair of channels at a time. Make sure to use MultiTrace in Individual Mode.

2 Test Procedure

2.1 Connections

Connect both channels to WE_B and WE_C, combining their CE+RE leads. Leave the GND leads (green) open and protected with the croc clips. If your device features sense leads, connect them stacked with the WE leads. (i.e. MultiEmStat4 HR version). See Figure 1.

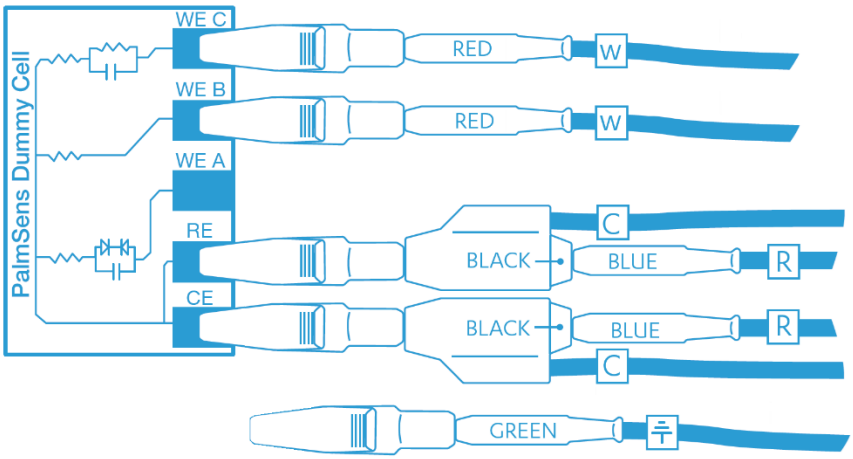

Figure 1 Connection scheme for Galvanic Isolation User Test. If your device features sense leads, connect them stacked with the WE leads

Do not let the dummy cell touch conductive surfaces. Suggestion: connect WE_C to the first channel and WE_B to the last channel.

2.2 Chronopotentiometry settings

On the channel connected to WE_B, set a Chronopotentiometry (CP) with the parameters:

- i applied: 5 µA (0.05 × 100 µA)
- t interval: 0.1
- t run: 200 s

See Figure 2.

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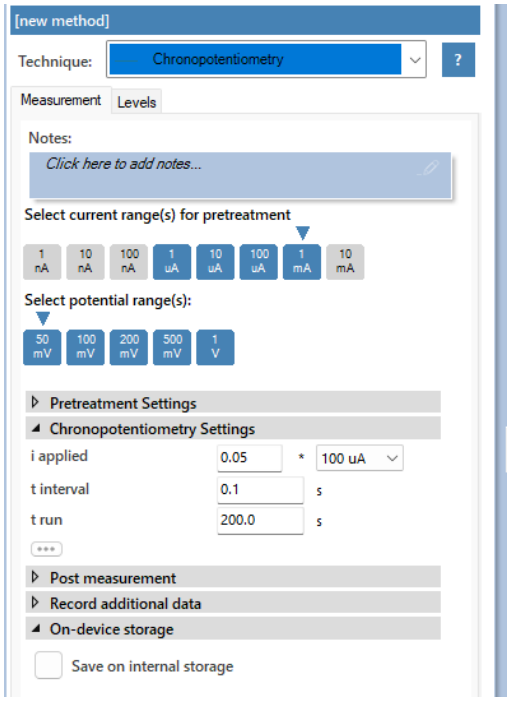

Figure 2 Method Editor showing Chronopotentiometry settings. Displayed options may vary depending on the instrument model and version.

This experiment should produce a constant 50 mV response and is very sensitive to any ground interference.

2.3 Linear Sweep Voltammetry settings

Set a Linear Sweep Voltammetry (LSV) on the channel connected to WE_C. You can keep the default PSTrace parameters, as shown in Figure 3.

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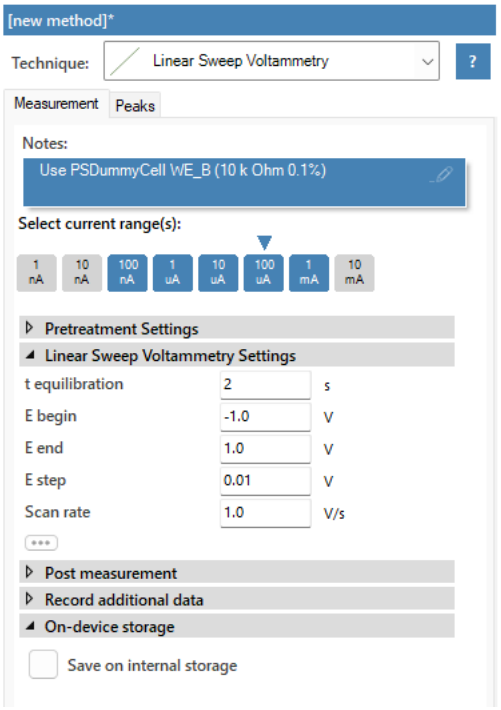

Figure 3 Method Editor showing Linear Sweep Voltammetry settings. Displayed options may vary depending on the instrument model and version

2.4 Run the test

a) Run the experiment on the WE_B channel and autoscale the plot to clearly visualize the ~50 mV response. Autoscale option appears with a right mouse click. See Figure 4.

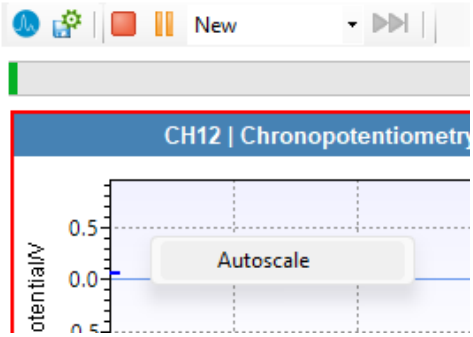

Figure 4 Autoscale on graph. The option appears with a right mouse click.

b) Run the LSV on the WE_C channel.

c) While the WE_B experiment is still running, change the WE_C cable to the next channel of the instrument and repeat the LSV. For example, in a 12-channel system, start with CH12 connected to WE_B / CP and CH1 connected to WE_C / LSV. After the first run is finished, change the WE_C cable from CH1 to CH2, run the LSV, then do it again with CH3, and continue up to CH11. Next, connect WE_B to CH11, start the CP experiment, and run the LSV with WE_C connected to CH1. Then repeat it with CH2, CH3, and continue up to CH10 (you do not need to test CH12 vs CH11 again).

d) If you start the CP experiment in a window that contains an LSV result, the software will display a warning about unsaved data. You can discard the data if the LSV response was normal. If ground

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interference is present, you will observe a deviation in the CP response. See an example (proof of concept) obtained by merging the ground leads in Figure 5.

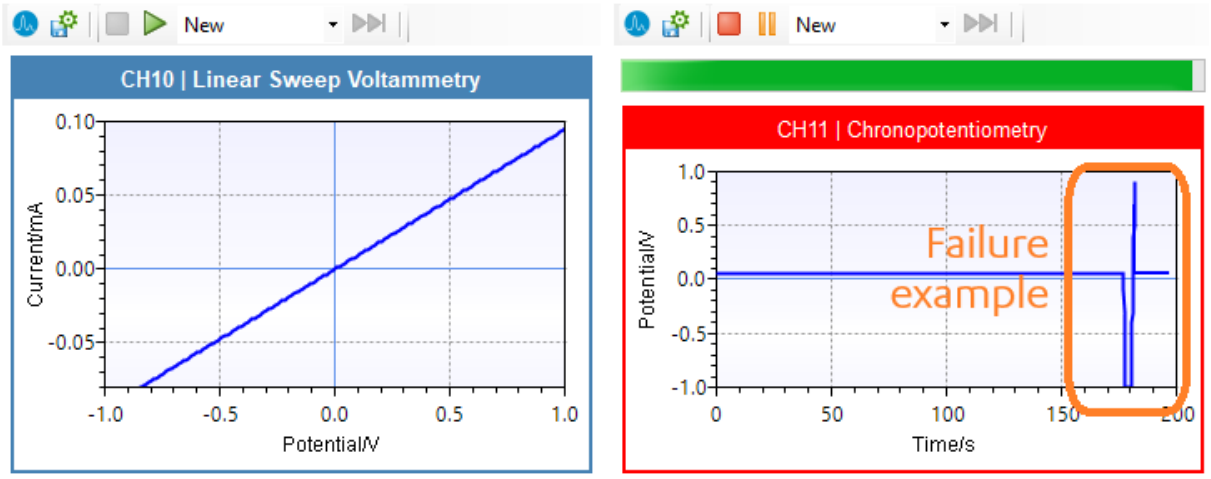

Figure 5 Example of failure in the case of crosstalk between two channels

You do not need to test each pair of channels in both directions. If you observe any issues, check whether the response is reproducible and try swapping the cell cables. Also, verify that the ground leads are open between the channels (e.g., using a multimeter). See an example of a passed test on Figure 6. Note that all CP curves show no disturbances after running LSV in multiple channels. These settings were deliberately chosen to be highly sensitive, so expect some slight noise.

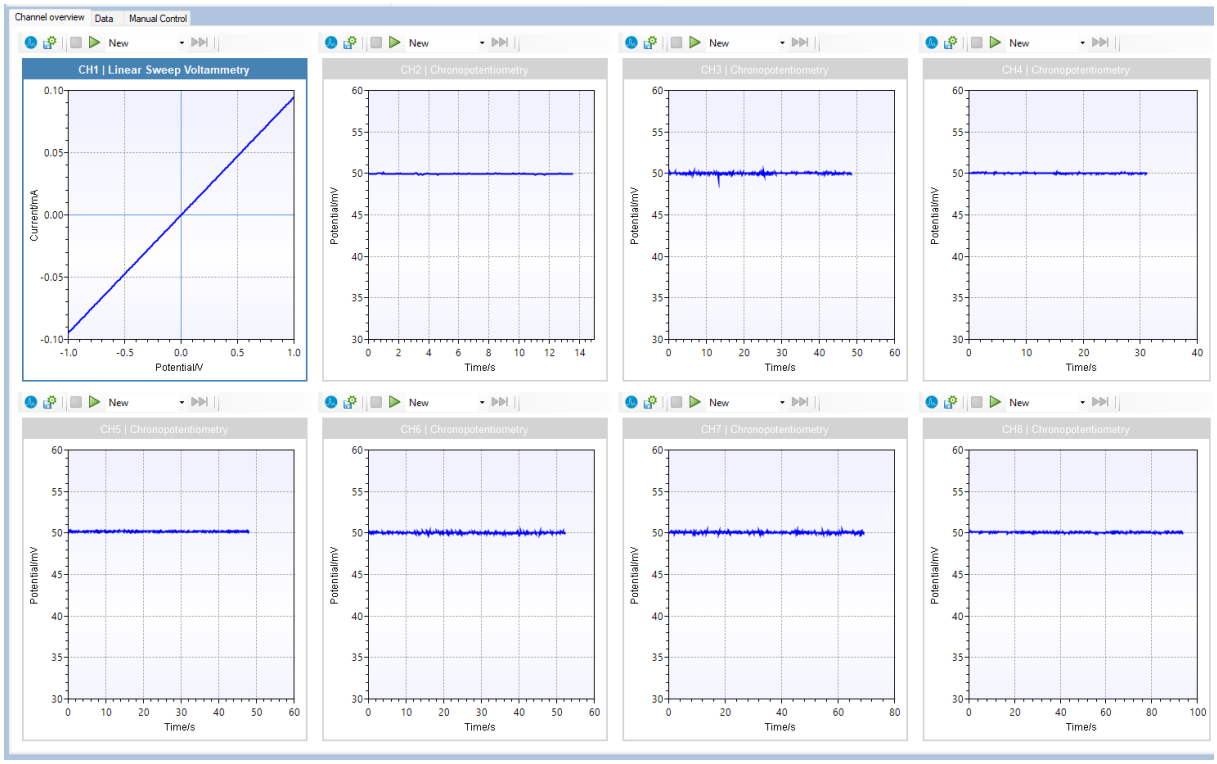

Figure 6 Example of a passed test with 8 channels after testing all channels