

FuelCell Addendum – Voltage & Current Setpoint Definitions

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Introduction

FuelCell uses 4 different modifiers when setting the voltage and current setpoints.

Absolute

Vs. Open Circuit

Vs. Previous

Vs. Initial

Absolute When an absolute potential or current is specified, the exact value is applied to the whole cell.

Vs. Open Circuit Each time FuelCell takes a data point, it checks to see if the current is zero. If the current is zero, it records the cell voltage value for future use.

If a later experiment has a setpoint ‘vs. Open Circuit’ it uses the previously recorded value. Note that if a long series of experiments (with current>0) has been performed, the ‘open circuit’ value may be very old and may not reflect the true condition of the cell.

As an example, if the following experiment sequence is performed:

Open Circuit vs Time

Constant Current at 1 A

Constant Current at 2 A

Constant Potential at -0.1 vs Open Circuit

The **Constant Potential** experiment would apply a voltage 100mV below the potential that was measured at the end of the **Open Circuit vs Time** experiment.

This example would use a different open circuit voltage when calculating the voltage for the Constant Potential experiment:

Open Circuit vs Time

Constant Current at 1 A

Constant Current at 2 A

Open Circuit vs Time

Constant Potential at -0.1 vs Open Circuit

The second **Open Circuit vs. Time** experiment would establish a new open circuit value which would be used for the **Constant Potential** experiment.

If this sequence were used:

Open Circuit vs Time
Constant Potential at -0.1 vs Open Circuit
Constant Potential at -0.2 vs Open Circuit
Constant Potential at -0.3 vs Open Circuit
Constant Potential at -0.4 vs Open Circuit

The Open Circuit is 925mV at the end of the **Open Circuit** experiment, the other experiments would apply 825, 725, 625, 525 mV.

Vs. Previous To apply a voltage relative to the most recent cell potential, use **vs. Previous**.

For example

Constant Current at 2 A
Constant Potential at 0 vs Previous
Constant Potential at -0.1 vs Previous
Constant Potential at -0.1 vs Previous

If the voltage at the end of the **Constant Current** experiment is 830 mV, the **Constant Potential at 0 vs Previous** would also apply 830 mV.

The last two experiments would apply 730 mV and 630 mV. Note that each potential is vs. the potential used in the previous.

Vs. Initial This mode is only used in **Scan Voltage** experiments. It applies a voltage relative to the Initial setpoint of the sweep.

For example

Constant Current at 2 A
Scan Voltage
 Initial = 0 vs Previous
 Vertex = 0.4 V Absolute
 Final = 0 vs Initial

If the voltage at the end of the **Constant Current** experiment is 830 mV, the Scan would start at 830 mV. It would then scan to 400 mV and then scan back to 830 mV. Note that this is different than **vs. Previous**.

This experiment would not work. The Final Potential would be 0 vs. Previous, but the ‘previous’ voltage is the Vertex, so it would use Final = 0 vs. Vertex. The final segment of the sweep would be skipped.

Constant Current at 2 A

Scan Voltage

Initial = 0 vs Previous

Vertex = 0.4 V Absolute

Final = 0 vs Previous

Using **vs. Initial** is the only way to end the scan at the same voltage as the start of the scan.