MPG2

RESEARCH GRADE BATTERY CYCLER

BioLogic
Science Instruments

A dedicated instrument for battery and supercapacitor testing

- LITHIUM - ION BATTERY
- LITHIUM - POLYMER BATTERY
- LITHIUM - AIR BATTERY
- NICKEL - METAL HYDRIDE BATTERY
- SUPERCAPACITOR

OVERVIEW

The **MPG2** is a multi-channel, research grade battery cycler designed for research on intercalation compounds, batteries and supercapacitors. The **MPG2** is the next generation of the **Bio-Logic**'s popular MacPile testing unit. Battery testing typically requires a large number of simultaneous tests being performed. As a result, the configuration of **MPG2** is fixed at 16 channels. Each channel is an independent potentiostat/galvanostat.

The **MPG2** is controlled by a PC using a USB or an Ethernet connection. When using an Ethernet connection, the **MPG2** can be installed on a Local Area Network to allow multiple users to access the instrument.

Each channel has two analog inputs and an analog output to allow interfacing with external instruments. For many battery experiments, it is sometimes necessary to control and record the cell's temperature or the temperature of a thermostatically controlled chamber.

The **MPG2** is supplied with **EC-Lab**® software, especially adapted for battery and supercapacitor applications. Ten of the **MPG2**'s techniques are designed specifically for batteries. There are also general electrochemistry techniques which are important in battery research, such as cyclic voltammetry. Specific analysis tools are also available.

GENERAL SPECIFICATIONS

- Current ranging from 10 µA up to 100 mA with a resolution 0.004% of the range
- ±10 V reference voltage
- Resolution of 300 µV programmable down to 5 µV by adjusting the dynamic range (200 µV resolution on 10 V range)
- Acquisition time: 200 µs
- No limit in time and data recording

OPTIONS

- 2 & 5 A external boosters
- Battery Holder

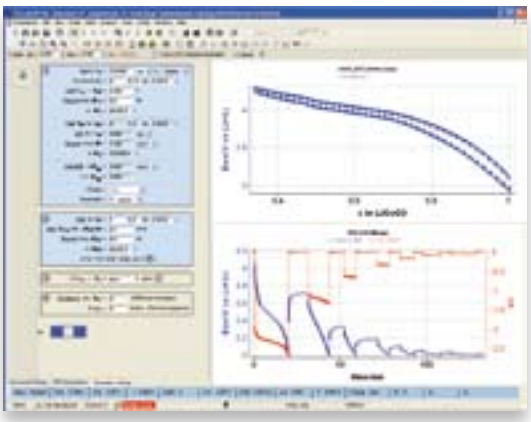
EC-LAB® A COMPLETE SOFTWARE PACKAGE FOR FULL CONTROL OF YOUR BATTERY TESTING

A modular and powerful software with more than 20 techniques dedicated to battery, intercalation compound and supercapacitor studies. Protocols can be easily created by linking various techniques and using the "technique builder".

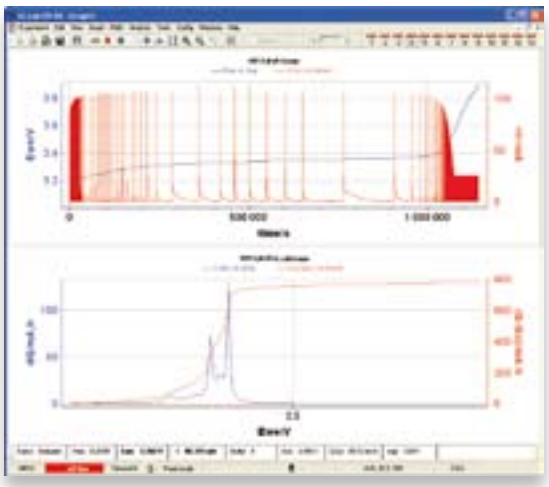
In **EC-Lab®**, the user can define all the parameters related to the battery material in a special "Battery Cell Characteristics" menu.

For each technique that is designed to test batteries, many parameters can be defined as experiment limits (x value, charge/discharge capacity value, potential...).

Some of these limits can be used as security parameters to stop the experiment and to avoid damage to the cell. They can also be used as conditional limits to switch to the next step.



Each technique may be composed of a number of sequences (up to 100) and it is possible to link up to 20 different techniques. With this capability the user can create unique and flexible experiments. These uniquely created experiments can be saved as a settings file (*.mps), and it is possible to place it on the Technique Menu as a Custom Application.



The graphic package provided with the **EC-Lab®** software includes advanced analysis and advanced fitting tools. Some process functions, such as "Process data", "Capacity & Energy per cycle" or "Constant Power Protocol Summary" help the user to calculate additional variables during successive cycles, such as:

- energy,
- charge/discharge capacity,
- efficiency,
- internal resistance.

The processed file is automatically stored in the hard disk.

EC-Lab® software also offers classical analysis tools such as Integral calculations or the Min/Max determination on a curve.

Batteries Testing
GITT, PITT, CLD, CPW, APCG

Voltammetric Techniques
OCV, SOCV, CV

Technique Builder
Modular Potentio/Galvano (MP/MG), SMP, SMG, Loop, Trigger In/Out, Wait

IR Determination
by Current interrupt

TOOLS

Calculation/analysis
Process Data
Capacity & Energy per cycle
Summary per protocol & Cycle
Constant Power Protocol Summary

Graphic tools
Integral
Min/Max determination
Peak Analysis
Linear fit...

SPECIFICATIONS

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Cell Control

Connection	2, 3, 4 or 5 terminal leads (+ ground)
Compliance	±10 V
Maximum Current	±100 mA continuous
Maximum Potential resolution	200 µV on 5 V dynamic range programmable down to 5 µV on 200 mV dynamic range
Maximum Current resolution	0.004% of the dynamic range, programmable down to 760 pA on the 10 µA range
Accuracy (DC)	< 0.1% FSR*
Rise Time	(10% - 90%) < 2 µs (no load)
Acquisition time	200 µs

Current Measurement

Ranges	±10 µA to ±100 mA (5 ranges)
Maximum resolution	0.004% FSR*
Sampling rate	200,000 samples/s
Accuracy (DC)	< 0.1% FSR*

Potential Measurement

Ranges	±10 V
Maximum resolution	0.0015% of the range, down to 75 µV
Sampling rate	200,000 samples/s
Accuracy (DC)	< 0.1% FSR*

Electrometer

Inputs	3 potential measurements
Impedance	> 10^{12} ohms in parallel with < 20 pF
Bias Current	< 5 pA
Common mode rejection	> 60 dB at 50 kHz

Auxiliary Inputs / Outputs

2 general purpose analog inputs	16 bit resolution with automatic ±2.5 V, ±5 V, ±10 V ranges
1 analog output	±10 V
1 input trigger, 1 output trigger, 1 security input to Open Circuit TTL level	

General

Dimensions, weight	470 x 182 x 504.5 (mm, W x H x D), 19 kg
Power	85-264 V, 47-440 Hz

* FSR : Full Scale Range

Specifications are subject to change

BOOSTER 2 & 5 A

Cell Control	2 A	5 A
Connection	2, 3, 4 or 5 terminal leads (+ ground)	
Compliance	±10 V	±10 V
Maximum Current	±2 A continuous	±5 A continuous
Maximum Potential	±10 V	±10 V
Rise Time potentio	15 µs	15 µs
galvano	40 µs	40 µs

Current Measurement

Potential accuracy	< 0.1% FSR*	< 0.1% FSR*
Current accuracy	< 0.1% FSR*	< 0.1% FSR*
Potential noise (peak-to-peak 0 - 100 kHz)	0.6 mV	0.6 mV
Current noise (peak-to-peak 0 - 100 kHz)	1 mA at 2 A	1 mA at 5 A

Electrometer

Inputs	3 potential measurements
Impedance	10^{10} Ohms
Bandwidth	1 MHz

Auxiliary Inputs / Outputs

1 External input	Security to open circuit (TTL level)

BH-1 BATTERY HOLDER

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