

EV HEV PHEV and Energy Storage Battery Test System

The Series 8500 is a range of high power fully automated test systems designed for testing the performance characteristics of Electric Vehicle and Energy Storage batteries under real world conditions. This high specification system is designed with the capability to allow the electrical energy produced during discharge to be returned to the electrical grid.



Systems are supplied as standard for continuous operation at the specified power level with power limited systems available as an option. Using Maccor's standard fully featured battery test software the Series 8500 can perform virtually any type of battery test including FUDS, SFUDS, DST etc. for electric vehicle batteries and standard cycling tests for energy storage devices. With typical test channel ratings of 500 Volts, currents up to 1000 Amps and with the highest accuracy available for this type of equipment, the Series 8500 is the perfect system for your high power battery testing application.

Applications include testing of:

- EV, HEV, PHEV batteries of all chemistries
- Energy Storage batteries
- High Power PV systems
- High Power Fuel Cells

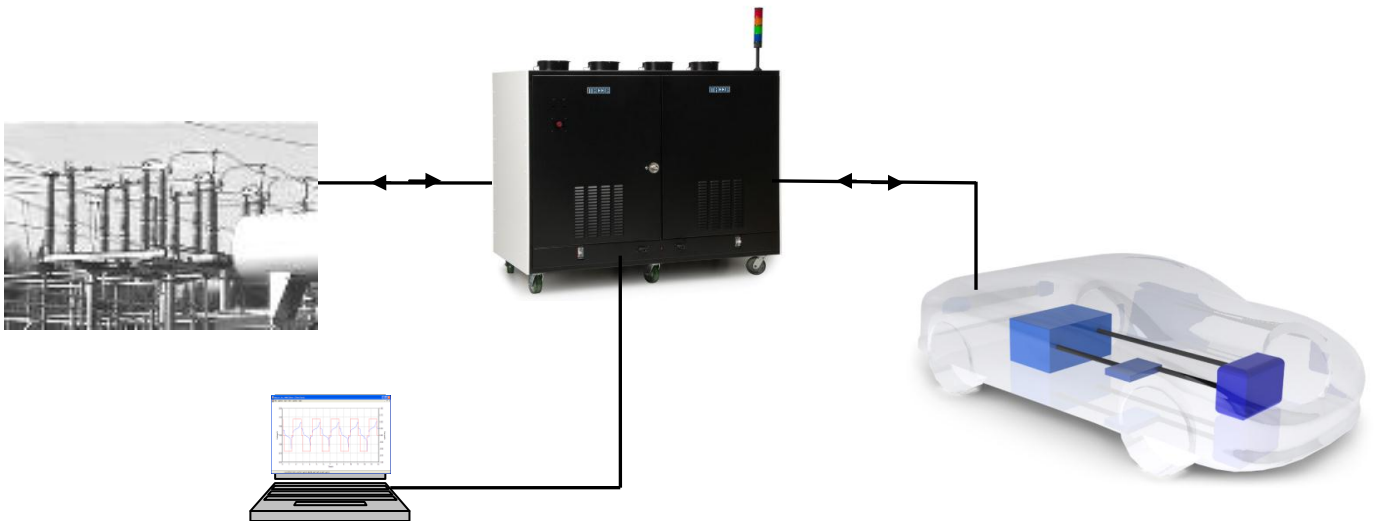
Maccor's proprietary G₂B (AC Grid to Battery) and B²G (Battery to AC Grid) system allows testing at high power levels with minimal net electrical energy use.

Maccor Inc. is a USA based manufacturer of battery test systems. We design and develop all of our own hardware and software. For over 25 years this has been our only business and we are considered the Gold standard in the battery test industry worldwide. With voltage ranges from 5V to 500V, and currents spanning 300nA to 2000A, systems are available for multiple applications ranging from R&D to manufacturing to end-users. The accuracy, capability, and reliability of our test systems are second to none, and our products are backed by experienced technical sales and support personnel.

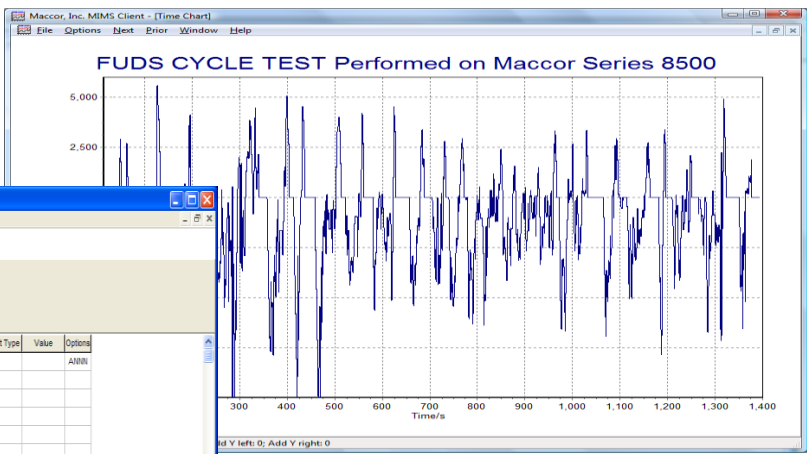
Features and Benefits

- Electrical energy is returned to the AC grid during discharge – Reduces energy costs and no additional cooling system is required.
- Easy to use standard Maccor battery test system software – No programming or scripting experience required, minimal operator training, tried and tested
- 100% duty cycle standard – No system power limit, test channel rated for continuous operation at full power, allows use in testing very high power storage batteries and PV systems.
- Drive Cycle Simulation – Waveforms can be imported into the test procedure to increase test efficiency and reduce potential operator error.
- Flexible CAN-Bus interface available as an option – Has the ability to create CAN profiles for any battery with no 3rd party package required, optional use for control of test flow.
- Individual test steps can be programmed to operate in any combination of operating modes from constant current, voltage, or power – Can be used for multiple applications with any battery chemistry.
- Local emergency cut-off switch, automatic shutdown on loss of AC power, reverse voltage protection, internal circuit breakers – Provides a high level of safety
- Automatic scaling of data in W/kg or C-rate for drive cycle simulation programs and other test procedures – Reduces operator workload
- 20 mS time resolution – Provides a high level of accuracy for both control and measurement
- Real time data and graphics – Allows battery performance to be visually monitored at any time as the test progresses

The Series 8500 is supplied as a complete turnkey system consisting of a test cabinet, PC computer, test software, data acquisition, and analysis software. The test cabinet, with a distributed architecture, is connected to the tester PC via an Ethernet communications network.



Drive cycle simulation



Build Test - [C:\Maccor\procedures\Example.000]

Description
 Super Test Procedure
 Step 12 Note (Enter up to an 80 character description for each step)

| Step | Type | Mode | Value | Limit | Value | End Type | Op | Value | Goto | Report Type | Value | Options |
|------|---------------|---------|---------|---------|------------|-----------|----|----------|------|-------------|----------|---------|
| 1 | Rest | | | | | Step Time | = | 00:00:01 | 002 | | | ANNN |
| 2 | Dot | | | | | | | | | | | |
| 3 | Advance Cycle | | | | | | | | | | | |
| 4 | Discharge | Current | 0.5 | | Voltage | <= | | 1.1 | 005 | Step Time | 00:00:15 | 477H |
| | | | | | Step Time | = | | 06:00:00 | 005 | | | |
| 5 | Charge | Current | 0.50004 | Voltage | 2.086 | Step Time | = | 12:00:00 | 006 | Step Time | 00:00:15 | ANNN |
| 6 | Loop# | | | | Loop Count | = | | 4 | 007 | | | |
| 7 | Rest | | | | Step Time | = | | 00:05:00 | 008 | | | ANNN |

Easy to use menu driven build test program

Easy to use CAN editor

MacCAN Edit

Profile: CANtest01.CAN
 Description: This the first CAN test profile

| ID | Name | ByteNum | Bits | Bit0 | Calculate | Comment |
|-----|----------|---------|------|------|-----------|-----------------|
| 101 | Max_Volt | 0 | 10 | 0 | X*15/1023 | |
| 101 | Min_Volt | 2 | 10 | 0 | X*15/1023 | |
| 101 | Min_Temp | 4 | 8 | 0 | X-30 | |
| 101 | Max_Temp | 5 | 8 | 0 | X-30 | |
| 101 | VoltPack | 6 | 8 | 0 | X*1.25 | |
| 102 | SOC | 2 | 8 | 0 | X | State of charge |
| 102 | I_Pack | 4 | 8 | 0 | X/2 | Current of pack |

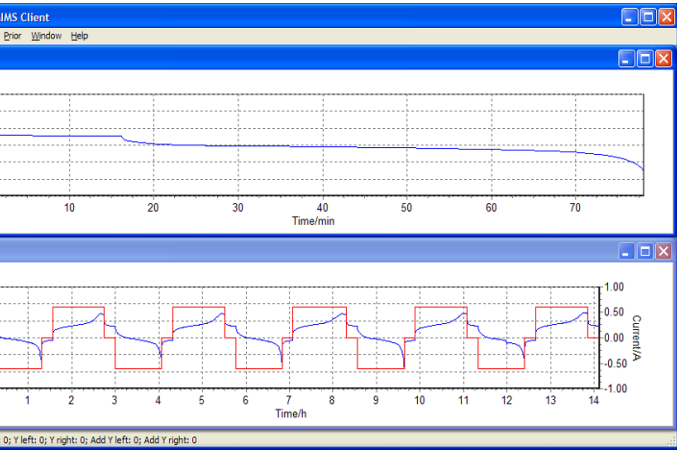
Buttons: Open, Save, Close, Add, Move Up, Insert, Move Down, Delete

View Data

Name: iScreen2Test
 Channel: 45
 Tester: Conference
 Started: 31 January 2006, 11:21:00 AM
 Comment:

Procedure: iScm2
 Description:
 S Cap: 1.0
 C Rate: 0.0

| Rec | Cycle | Step | Test Time (min) | Step Time (min) | Capacity | Energy | Current | Voltage | MD | ES | DPT |
|-----|-------|------|-----------------|-----------------|----------|--------|---------|---------|----|-----|-------|
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1.369 | R | 0 | 01/31 |
| 2 | 0 | 1 | 0:08 | 0:08 | 0 | 0 | 0 | 1.369 | R | 129 | 01/31 |
| 3 | 0 | 2 | 0:08 | 0 | 0 | 0 | 0.999 | 0.924 | D | 0 | 01/31 |
| 4 | 0 | 2 | 2:08 | 2 | 0.033 | 0.023 | 1 | 0.649 | D | 1 | 01/31 |
| 5 | 0 | 2 | 4:08 | 4 | 0.067 | 0.044 | 1 | 0.629 | D | 1 | 01/31 |
| 6 | 0 | 2 | 6:08 | 6 | 0.1 | 0.065 | 1 | 0.605 | D | 1 | 01/31 |
| 7 | 0 | 2 | 8:08 | 8 | 0.133 | 0.095 | 1 | 0.577 | D | 1 | 01/31 |
| 8 | 0 | 2 | 10:08 | 10 | 0.167 | 0.103 | 1 | 0.545 | D | 1 | 01/31 |
| 9 | 0 | 2 | 12:08 | 12 | 0.2 | 0.121 | 1 | 0.513 | D | 1 | 01/31 |
| 10 | 0 | 2 | 14:08 | 14 | 0.233 | 0.137 | 1 | 0.478 | D | 1 | 01/31 |
| 11 | 0 | 2 | 16:08 | 16 | 0.267 | 0.153 | 1 | 0.435 | D | 1 | 01/31 |
| 12 | 0 | 2 | 18:08 | 18 | 0.3 | 0.166 | 1 | 0.38 | D | 1 | 01/31 |
| 13 | 0 | 2 | 20:08 | 20 | 0.333 | 0.178 | 1 | 0.287 | D | 1 | 01/31 |
| 14 | 0 | 2 | 22:08 | 22 | 0.366 | 0.184 | 0.786 | 0.099 | D | 1 | 01/31 |
| 15 | 0 | 2 | 24:08 | 24 | 0.391 | 0.195 | 0.327 | 0.1 | D | 1 | 01/31 |
| 16 | 0 | 2 | 26:08 | 26 | 0.352 | 0.186 | 0.295 | 0.1 | D | 1 | 01/31 |
| 17 | 0 | 2 | 28:08 | 28 | 0.401 | 0.187 | 0.281 | 0.1 | D | 1 | 01/31 |
| 18 | 0 | 2 | 30:08 | 30 | 0.41 | 0.188 | 0.272 | 0.1 | D | 1 | 01/31 |
| 19 | 0 | 2 | 32:08 | 32 | 0.419 | 0.189 | 0.263 | 0.1 | D | 1 | 01/31 |



Real time data acquisition and graphics

Technical Specifications

| | |
|---|---|
| Minimum Voltage | 1% of full scale voltage |
| Minimum Current (constant current & constant power modes) | 1% of full scale current |
| Current Measurement & Control Accuracy | $\pm 0.05\%$ of full scale + 0.1% of reading |
| Voltage Measurement & Control Accuracy | $\pm 0.02\%$ of full scale + 0.02% of reading |
| Resolution | 16 –bit (1 part in 65,536) |
| Maximum No. of Test Cycles | 2^{32} |
| Maximum No. of Waveform Steps | 2^{16} |
| Maximum No. of Test Steps | 128 |
| Minimum Step Time | 100mS |
| Maximum Data Sampling Rate | 20mS |
| Input Power Supply | 380/400/480VAC, 3-phase, 50/60Hz |
| Dimensions and weight will vary with system voltage and power | Contact Maccor for details |

Options

- Auxiliary Voltage, Thermocouple, Thermistor and Pressure Inputs
- CAN Bus, I²C, SMB Interfaces
- Digital I/O
- Interface with Temperature Test Chamber
- Test Channel Power Limit
- Remote Emergency shut off
- Local light pole status indicator



Medium Power 200KW Version

Worldwide sales and technical support is available for the Series 8500. Please contact Maccor for your nearest representative or visit our web site at www.maccor.com

MACCOR

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