Elgar BSS - Battery Simulation System

60 W–30 kW

Battery String Simulator

- Flexible Database Operation
- Fully Programmable
- Completely Configurable
- Attention To Spacecraft Safety
- Eliminates the need for test flight batteries and their associated issues

≋	208	400

ETHERNET GPIB

Product Overview

The Elgar Battery String Simulator (BSS) provides safe, reliable battery power for spacecraft testing. The broad range of features available ensures simulation capabilities for more than just two terminal power. It's the ideal solution for complete integrated system testing, not just battery elimination.

The BSS behavior is determined by a charge table, in spreadsheet format, specific for a battery topology and various battery conditions. Many charge tables can be stored on the computer hard drive for easy retrieval.

The BSS operates in two modes, static and dynamic. In the static mode, when a state-of-charge value is entered, the BSS will instantly produce the terminal voltage corresponding to that state-of-charge. Because of this programmable flexibility, time consuming discharge cycles of flight test batteries are eliminated. In the dynamic mode, once a state-of-charge start point is entered, the BSS will monitor the charge and discharge energies being impressed on the "battery" and modify the state-of-charge and terminal voltage accordingly.

Single or dual battery pack simulator versions are available with discharge currents of up to 250A and charge power of up to 10kW per battery. In addition, optional sensor simulators (including thermistor, pressure transducer, and heater load outputs) allow closed loop input to the Spacecraft Power Regulator for true battery emulation.

As with the SAS systems, each Battery Simulator System is a fully integrated, turn-key system using a Windows Graphical User Interface and hardware control software. This control is accomplished via a standard ethernet or optional GPIB interface using standard SCPI format commands.

Features And Benefits

Flexible Database Operation

A unique database engine allows the Battery Simulator to simulate various battery chemistries. The state of charge of the "battery" and the instantaneous current flow in or out of the "battery" is used to calculate the current terminal voltage of the battery. This database engine has the capability of controlling pressure transducer simulator to allow a charging system to operate in a closed loop fashion. The database feature allows the simulator to simulate common battery ailments: shorted cells, degraded charge transfer, and aging, to name a few.

Integrated Battery Sensor Simulator Packages

Integrated thermistor and pressure transducer and cell simulators allow the user to test an entire battery conditioning system closed loop. This integration of simulators allows for faster system debug and greater test flexibility.

Fully Programmable

All aspects of the battery simulation are programmable. A file management system allows different "battery" databases to be loaded and executed transparently while the system is simulating, thus allowing the user the ability to change battery conditions quickly and efficiently. A simulation can be suspended and re-started later, allowing the user to stop the charge/discharge cycle and examine battery maintenance systems in a static environment. All system setpoints and operational points are available to the user either locally or remotely, eliminating the need for external monitoring equipment.

BSS - Battery Simulation System

Attention To Spacecraft Safety
Several safety systems are employed in the battery simulator to ensure proper system operation. Overcurrent trip or foldback points are user settable locally or remotely. Programmable overvoltage protection is also provided.

Wide Range Of Power
Charge/discharge power levels ranging from less than a kilowatt to several kilowatts, are available.

Test System Safety
The BSS is used in place of test flight batteries. There is no need to charge and discharge test batteries, and chance a shorting of the battery.

Test Process Speed
Changing from one state - of - charge to another using flight batteries and be a time consuming process. The Elgar BSS is simple, fast and accurate and can increase test throughput tremendously.

SYSTEM SPECIFICATIONS

Specification	Value	Test Conditions	Notes / Definitions
Operating Modes	Static Battery Battery Simulation Power Supply		
Battery Simulation Model	Any battery can be simulated using an Excel database. Terminal voltage is a function of State of Charge (SOC) vs. Current (charge or discharge)		
Remote Control	Ethernet Standard GPIB Optional		
OVP chassis input impedance	20Megohms		Optional Chassis
OVP chassis response time	20µs		Optional Chassis
OVP Chassis filter	3dB roll off at 85KHz		Optional Chassis
Ambient Operating Temperature	0 – 38 °C		
Operating Humidity	20% to 80% non-condensing		
Operating Altitude	Up to 6,000 feet above sea level		
Non-operating Environment	Temp: -25 – 65 °C Altitude: 50000 ft Humidity: 95% non-condensing		
AC Input	208VAC L-L ±10%, 3PH 5 wire Wye, 0/60Hz or 380–400VAC L-L ±10%, 3PH 5 wire Wye, 50/60Hz		

BSS - Specifications

60 W–30 kW

BATTERY SPECIFICATIONS			
Specification	**Value**	**Test Conditions**	**Notes / Definitions**
Terminal Voltage (TV) Range	Up to 200 V		
Discharge Current Limit	Up to 250 A		
Charge Current Limit	Up to 10kW		
Output Voltage Accuracy	± 0.1% of max Terminal Voltage	Tamb = 25 ± 5 °C	
Terminal Voltage Resolution	± 0.01% of max Terminal Voltage	Tamb = 25 ± 5 °C	
Voltage Readback Accuracy	± 0.2% of max Terminal Voltage	Tamb = 25 ± 5 °C	
Voltage Readback Resolution	± 0.004% of max Terminal Voltage	Tamb = 25 ± 5 °C	
Current Readback Accuracy	± 0.5% of max Discharge current	Tamb = 25 ± 5 °C	
Current Readback Resolution	± 0.004% of max Discharge Current	Tamb = 25 ± 5 °C	
Output Voltage Ripple	TV < 100V, 20.0 mV rms TV >100V, 25.0 mV rms	20 Hz – 300 kHz	
Output Voltage Noise	TV < 60V, 75.0 mV p-p 60V < TV < 100V, 100.0 mV p-p TV > 100V, 150.0 mV p-p	20 Hz – 20 MHz	
Over Voltage Accuracy	± 0.2% of max Terminal Voltage	Tamb = 25 ± 5 °C	
Over Voltage Resolution	± 0.007% of max Terminal Voltage	Tamb = 25 ± 5 °C	
Over Voltage Range	15V – 110% TVmax		
Foldback Current Accuracy	± 0.2% of max Discharge current	Tamb = 25 ± 5 °C	
Shutdown Over Current Accuracy	± 1.0% of max Discharge Current	Tamb = 25 ± 5 °C	
Over Current Resolution	± 0.007% of max Discharge Current	Tamb = 25 ± 5 °C	
Over Current Range	2A – Max Discharge I 2A – Max Charge I		
Over Voltage Protection Circuitry Timing	≤ 100 µs		
Over Current Protection Circuitry Timing	≤ 100 ms		
Transient Response	≤ 20 ms, Recovery within ±1% of TVmax or ±1V whichever is greater. Measured at the output connector.	50% load step charge and discharge current step across 8500µF capacitor.	
Transient Over/Undershoot	10% of TVmax or 10V, whichever is greater.	50% load step charge and discharge current step across 8500µF capacitor.	
Accumulator Accuracy	±2.5% SOC	Constant Current charge or discharge \ resulting in a 50% change in state of charge over 30 minutes.	
Output Capacitance	Consult Factory. Dependent on terminal voltage and maximum discharge current		
Minimum Terminal Voltage	5.0V when using 2KW electronic loads 15.0V when using 5kW electronic loads		
Output Isolation	≥ 1Megohm between channels, and from output to chassis ground.		
Recommended Calibration Interval	1 Year		

SENSOR SIMULATOR OPTIONS
See "Telemetry Options for Solar Array and Battery Simulators" document.

Notes