



## Orion Battery Management System

### Product Specifications:

- Designed for Lithium Ion battery cells (NiMH version also available.)
- Maximum individual cell voltage rating: 0.5v to 5v per cell tap.
- Supports from 5 to 180 cells (can support even more cells if 2 or more BMS units are in series.)
- Total pack voltages from 13v up to 900v (higher if 2 or more BMS units are in series.)
- Full automotive operating temperature range (-40C to 80C).
- Ability to use multiple BMS units together in series (master/slave relationship) to measure more than 180 cells in series.
- Cell voltage measurement total error <0.2% across full temperature range.
- Integrated low loss passive cell balancing to within 10mV (final) during charging.
- Cell voltage resolution of about 1.5mV
- 2 Digital signal outputs for controlling charge and discharge limiting mechanisms.
- 1 Digital safety signal output for providing emergency power off for a battery charger.
- 2 Digital CANBUS 2.0B interfaces (both standard and extended IDs supported).
- 1 PWM controlled fan output and fan speed feedback monitor (external switch and relay required.)

- 4 Analog 0-5v outputs that represent the following signals: Charge Current Limit (CCL), Discharge Current Limit (DCL), State of Charge (SOC), Pack Amperage.
- 4 thermistor inputs for sensing battery pack temperature with optional air intake temperature sensing (can support up to 800 thermistors through external thermistor expansion modules [up to 80 per module], expansion modules sold separately).
- Support for multiple automotive grade, dual-range, bi-directional external hall effect current sensors (see bottom of document for list).
- Redundant 12VDC power supplies for reliability.
- High voltage battery taps fully isolated from 12v supply, chassis and I/O.
- 2500v isolation between each bank of cells (36 cells) used for safety disconnects and safety fuses.
- High voltage isolation fault detection circuit to monitor the breakdown of wire insulation.
- Integrated error detection and fault handling sets diagnostic trouble codes.
- Supports OBD2 automotive protocol for storage of diagnostic trouble codes and polling of live data.
- PC software can be used with a CAN to USB device to monitor battery performance, read and reset trouble codes and program battery profile information and update settings.
- Compatible with '04-'09 Toyota Prius BMS wiring harness (connectors are provided for use in other applications.)

#### **Features:**

- Centralized design allows for faster polling of data resulting in increased accuracy, and resistance to EMI.
- Professional automotive grade locking connectors.
- Current sensor support allows for accurate amp-hour and pack state of charge tracking.
- Dual current sensor channels increase accuracy and reliability.
- Redundant pack voltage measurement increases reliability and accuracy of open cell and internal resistance data.
- Low power sleep mode (see table below) that wakes on "ignition" or "charge" signals.
- BMS retains data while in sleep.
- Charger integration to allow for tapering of current during charge.
- Controller Area Network (CANBUS) interfaces with customizable data formatting allowing the BMS to be directly integrated into a variety of applications (automotive or otherwise).
- Battery profile information and settings are field reprogrammable via CAN interface.
- External thermistor taps allow for pack temperature calculation.
- Programmable voltage compensation tables for various temperatures provide a more accurate method of calculating actual state of charge in various temperatures.
- Pack State of Charge (SOC) is calculated from amp-hour counter with voltage based SOC correction.
- Internal resistance is calculated for all individual cells as well as the total pack.
- Total pack state of health is calculated to help determine when a pack is dead or needs replacing.
- Open cell voltage is calculated for all attached cells and for the total pack.
- Discharge and charge current limits are calculated based on pack health, balance, temperature, state of charge and instant internal resistance.
- Discharge and charge limits designed to actively prevent any cell from being pulled above or below the specified minimum and maximum cell voltages.

- High voltage isolation fault detection circuit can detect breakdowns in wire insulation before it becomes a problem unlike other systems on the market which detect a breakdown only after current flows.



## An Ewert Energy Systems, Inc Product

The Orion BMS is designed and manufactured by Ewert Energy Systems, Inc which is a research & development company focusing on developing solutions for plug-in hybrid and electric vehicles. Ewert Energy provides custom solutions as well as off the shelf components.

Specification Item	Min	Typ	Max	Units
Supply Voltage	10		16	Vdc
Supply Current - Active		250		mA
Supply Current - Sleep (Rev A,B)		8		mA
Supply Current - Sleep (Rev C)		650		uA
Operating Temperature	-40		80	C
Sampling Rate for current sensor		8		mS
Sampling Rate for cell voltages		30	50	mS
Isolation between cell taps and chassis / 12v supply	2.5			kVrms
Isolation between cells 36 - 37, 72 - 73, 108-109 and 144-145	2.5			kVrms
Digital Output Voltage (open drain)			30	V
Digital Output Sink Current			100	mA
Analog Outputs Voltage	0		5	V
Cell Voltage Measurement Range	0.5		5	V
Cell Voltage Measurement Error (over 1 - 5v range)			0.25	%
Cell Balancing Current			200	mA
Cell current (operating)				
Cell current (sleep)				
Thermistor Accuracy		1		C
Cell Voltage Reporting Resolution		1.5		mV
Weight (108 cell version)		5.35		lbs

### Additional Specifications

Item	Values
Supported CANBUS speeds	125, 250, 500 or 1000 Kbps
Current Sensor Values	+/- 200A, 500A, 600A, 750A, 1000A Available