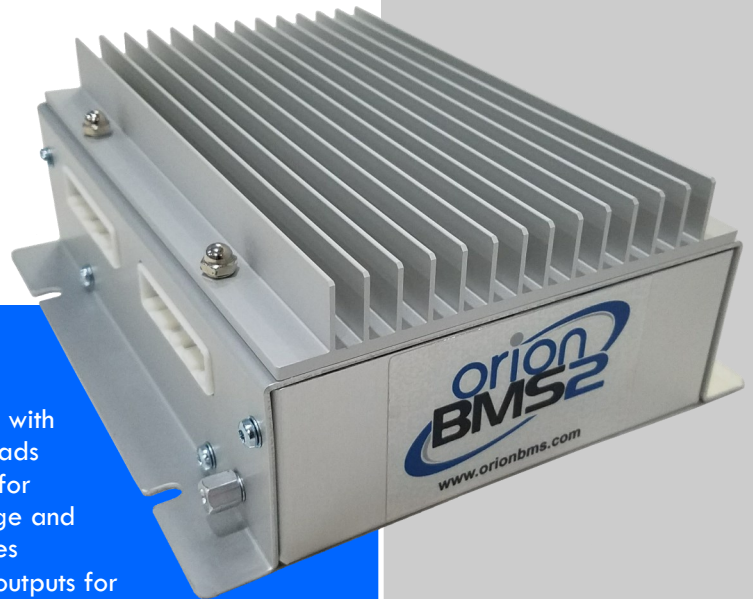# orion BMS2

Lithium Ion Battery Management System

Main Features
- Monitors every cell voltage in series
- Field programmable and upgradeable
- Intelligent cell balancing (efficient passive balancing)
- Enforces min. and max. cell voltages
- Enforces maximum current limits
- Enforces temperature limits
- Professional and robust design
- Monitors state-of-charge
- Retains lifetime data about battery history
- Integration with 3rd party smartphone apps (Torque, EngineLink) and external displays

Battery Compatibility
- Compatible with almost all lithium-ion cells
- One-click setup for common battery types
- Supports 4-180 cells in series per BMS unit (2x additional remote units can be used in series)

Battery Calculations
- State of Charge (SOC) & Pack Health
- Open-Circuit (sitting) cell voltages
- Charge & Discharge current limits
- Internal resistance (for all cells and total pack)

Centralized Design
- No cell tap boards or external circuitry
- Fast cell voltage polling (every 25 mS typical)
- High immunity to EMI and other noise
- High accuracy cell voltage measurement

2x Programmable CANBUS Interfaces
- CAN2.0B (11-bit and 29-bit IDs supported)
- Independently operate at different baud rates
- Fully customizable message formatting
- Field upgradable firmware and settings using either CAN interface
- One-click setup for many common chargers and inverters
- ISO-15765 OBD2 protocol compatible
- Compatible with CAN-Open and J1939

Charger Support
- Integrated support for J1772 charging stations
- Works with J1772 proximity & pilot signals
- Supports CHAdeMO DC fast charging protocol

Input / Output
- Easy interfacing with chargers and loads
- On/off outputs for controlling charge and discharge sources
- 0 – 5V analog outputs for gradual current reduction (improves usable range of battery)
- Thermal management controls for battery cooling / heating

Diagnostic Features
- Diagnostic trouble codes quickly identify and diagnose battery problems
- Freeze frame data records exact conditions and battery data when a fault occurred
- Supports OBD2 automotive protocol for storing diagnostic trouble codes and polling live data

Data Logging
- Unit tracks total number of battery cycles
- Records detailed lifetime battery usage and environment conditions internally.
- All BMS parameters can be logged using PC utility software
- Optional WiFi Connect module can record any parameters to a memory card or Internet
- Internal event logging for easy troubleshooting

Other Features
- Integrated isolation fault detection circuit
- Multiple remote modules may be used in series
- Automotive grade locking connectors
- Temperature compensation for improved monitoring in different temperatures
- Integrated status LED for indicating faults

Common Applications
- Electric Vehicles (cars, trucks, busses, boats, heavy equipment, racing, etc)
- Hybrid & Plug-In Hybrid Vehicles
- Solar and wind energy storage
- UPS and peak shaving applications
- Research & Laboratory Testing

The Orion BMS is a product of Ewert Energy Systems, Inc.

Ewert Energy Systems is a research and development company focused on developing solutions for plug-in hybrid and electric vehicles and other energy storage applications.

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Cell Voltage Monitoring Specs
- Cell voltage measurement resolution of 0.1mV.
- Maximum individual cell voltage rating: 0.5v to 5v per cell tap.
- Cell voltage measurement total error <0.25% across full product temperature range.
- Total pack voltages from 12vDC up to 800vDC (maximum).
- Supports from 4 to 340 cells per battery pack (requires remote modules for more than 180 cells, 800vDC maximum).

Reliability & EMI Immunity
- Operates through the highest class passenger vehicle load dump ISO 7637 Class IV (178V, 400mS, 0.5 ohm source.)
- Operates through ISO 7637 "cold crank" brownouts down to 5v on input supply rail and can operate > 100mS with no power (with initial voltage of at least 12v)
- Meets EN 50498: 2010 EMC Aftermarket Vehicle Directive
- Meets European UNECE Reg 10.05 (Replaced Road Vehicle Directive)

Product Dimensions & Weight (Typical, With Heatsink)
- 24-72 Cells: 7.15" (W) x 6.72" (L) x 2.37" (H) — 2.50 lbs
- 84-108 Cells: 9.50" (W) x 6.72" (L) x 2.37" (H) — 3.25 lbs
- 120-180 Cells: 15.52" (W) x 6.72" (L) x 2.37" (H) — 4.80 lbs

Isolation
- Cell taps isolated from input power supply, chassis and I/O
- 2.5kV isolation between each connector of cell taps
- Isolation allows for use of in-pack safety disconnects and fuses
- High voltage isolation fault detection circuit to monitor the breakdown of wire insulation

I/O Interfaces
- 2 Digital signal outputs for enabling charge and discharge.
- 1 Digital signal output to control a battery charger
- 5 Digital programmable multi-purpose outputs
- 2 Digital programmable CANBUS (CAN2.0B) interfaces.
- 3 Analog 0-5v outputs that represent the following signals: Charge / Discharge Current Limits and State of Charge (SOC)
- 1 PWM fan output and fan speed feedback monitor (external switch and relay required, uses MPO4)
- 8 Thermistor inputs (Can support up to 800 thermistors through external thermistor expansion modules (sold separately)
- 1 Dual range current sensor input (measures pack current)

Power Supply
- 3 redundant 12V—24V DC power supplies for reliability
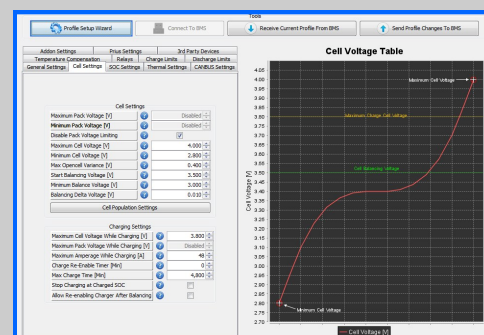- BMS retains data and settings without power
- Low power sleep mode

Specification Item	Min	Typ	Max	Units
Input Supply Voltage	8		30	Vdc
Supply Current—Active (at 25 degrees Celsius)		< 2		Watts
Supply Current—Sleep (at 25 degrees Celsius, 12vDC)		450		µA
Operating Temperature	-40		80	C
Sampling Rate for Current Sensor		8		mS
Sampling Rate for Cell Voltages		25	40	mS
Isolation Between Cell Tap #1 and Chassis / Input Supply	1.5			kVrms
Isolation Between Cell Taps #2+ and Chassis / Input Supply	2.5			kVrms
Isolation Between Cell Tap Connectors	2.5			kVrms
Digital Output Switching Voltage (Open Drain)			30	V
Digital Output Sink Continuous Current (**Some outputs can pulse up to 4A for contactors**—see wiring manual for details)			175	mA
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)		0.5		mA
Cell Current (Low Power Sleep)		50		µA
Thermistor Accuracy		1		C
Cell Voltage Reporting Resolution		0.1		mV

Optional Specifications	
CAN bus speed	125, 250, 500, or 1000 Kbps
Current Sensor Values	+/- 200A, 500A, 800A, 1000A Available

Screenshot of Torque smartphone display

Screenshot of BMS utility