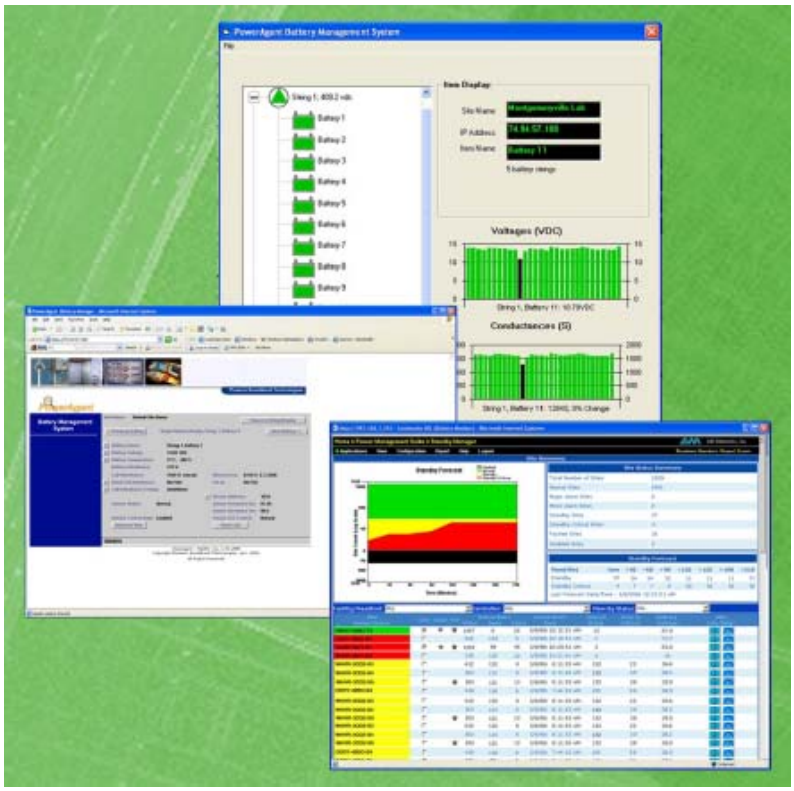
EnergyStorage Technologies

Intelligent Battery Management & Monitoring



APPLICATIONS

- WIRELINE
- WIRELESS
- UTILITY
- DATA CENTERS
- ALTERNATIVE ENERGY

FEATURES

- Enterprise class system designed to manage thousands or tens of thousands of batteries from a single console using open standard interfaces.
- Automated, consistent, continuous measurement data thereby dramatically increasing the reliability of the measurements and making historic trending simple.
- Intelligent equalization which balances float charge across cells in the string reducing or eliminating gassing or sulphation caused by unequal charge on batteries.
- All-inclusive approach to monitoring including voltages, ohmic measurements, individual cell temperature, ripple current, float current, etc.
- Facilities and environmental monitoring (generators, transfer switches ambient temperature and humidity and multiple points and powering for external sensors.
- Data logging of parameter data and of discharge events (number, depth, duration and performance of each cell during the event).

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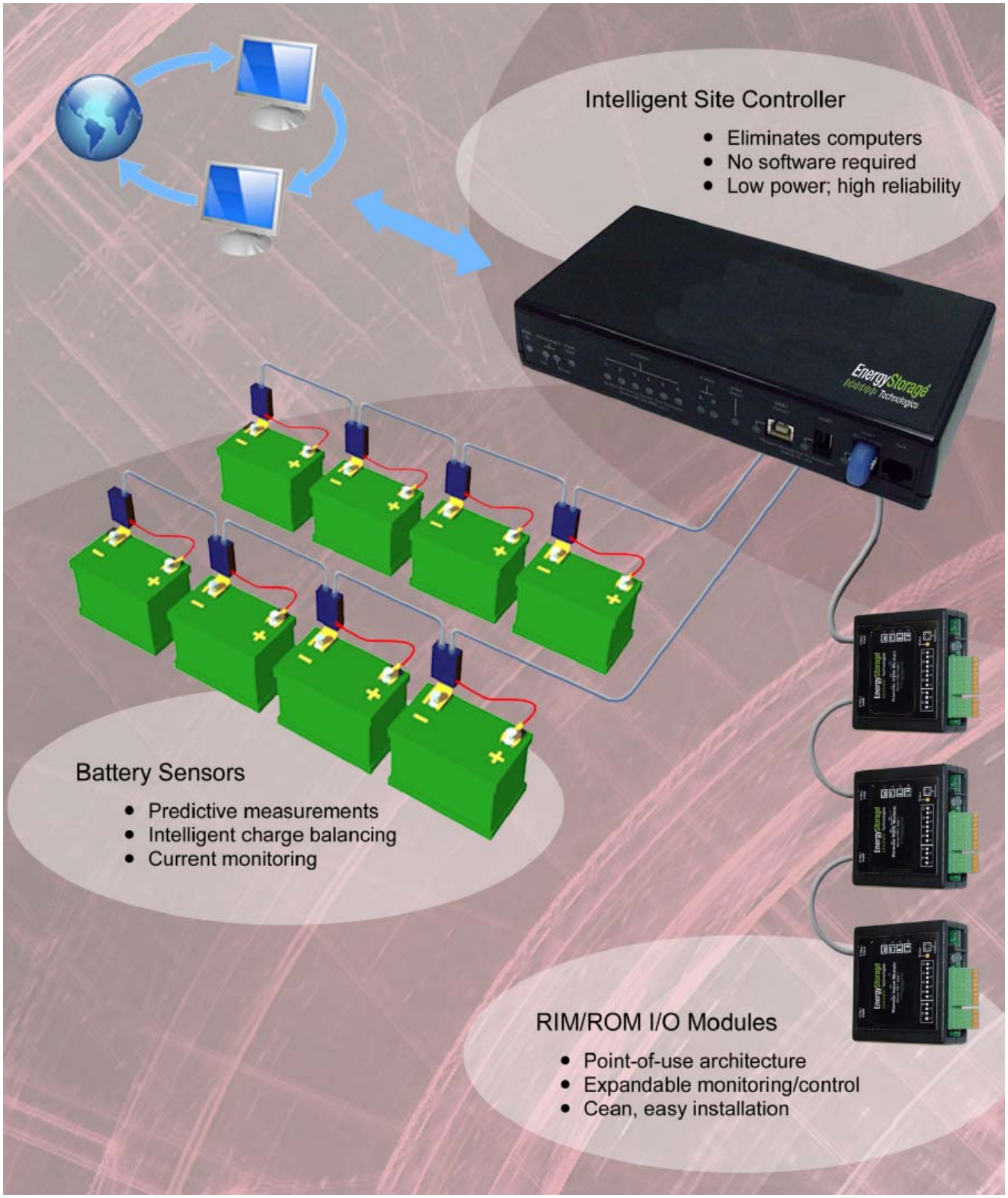

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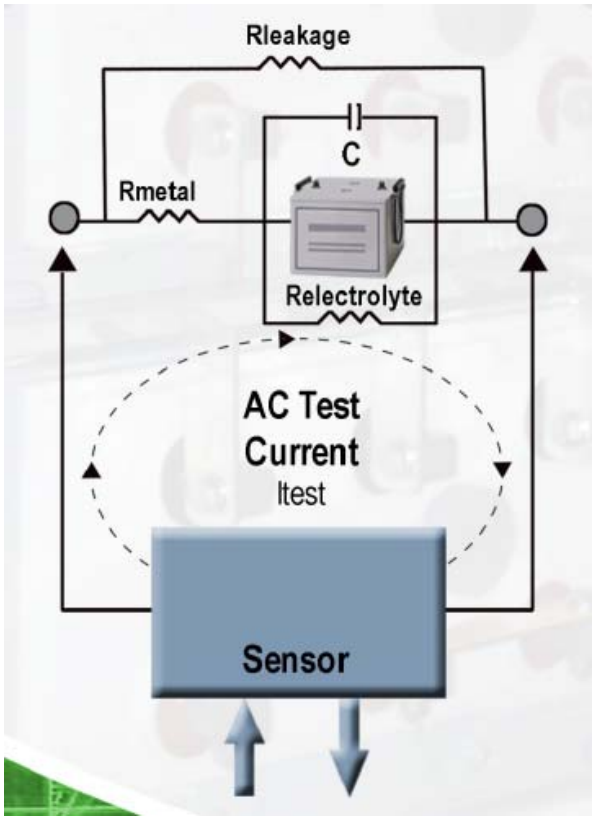
FEATURES

The EST monitoring system was designed to be the most complete enterprise-class monitoring and management system available on the market today. During the design phase, EST gathered input from numerous Telecom, Cable, Power Generation and Wireless operators and we built our system using open industry protocol standards.

EST offers exceptional scalability, providing a cost-effective monitoring solution whether your enterprise has one site or tens of thousands of sites. Our all-inclusive approach provides powerful, predictive information that allows you to proactively manage the health of your batteries, lowering your maintenance costs and actually extending battery life expectancy.

EST provides operators with consistent, continuous and predictive battery information, while eliminating unnecessary manual maintenance visits. Operators also have instant access to information from generators, transfer switches, HVAC and facilities status. The EST system consumes less power and is more reliable than any of our competitors' systems, which typically require a complex, unreliable PC server at each monitored location. These advantages, coupled with our ability to intelligently balance the charge across individual cells/batteries in a string, make the EST system an essential tool for any operator concerned with power reliability.

OPERATING PRINCIPLES



A lead acid battery can be characterized by an equivalent circuit of three resistances that limit its performance:

- A current-limiting resistance (Relectrolyte) attributable to the battery chemistry
- A current-limiting resistance (Rmetal) attributable to the internal connections
- A self-discharge resistance (Rleakage) which causes the battery to lose charge even when no load is connected

These internal parameters are commonly called "ohmic" measurements, and "admittance" is a composite of all of the battery's ohmic parameters. Ohmic measurements, together with individual battery temperature, are widely recognized as leading indicators of a battery's state-of-health.

Each EST sensor generates a digitally synthesized sinusoidal AC test signal (Itest) which is passed through the battery terminals in order to measure the battery's admittance.

A site control unit communicates with each of the sensors to collect these admittance measurements, along with battery voltage and terminal post temperature.

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SPECIFICATIONS

SITE CONTROLLER

Monitored Battery Strings	6 Maximum
Monitored Batteries / Cells, each String	40 Maximum
Monitored Batteries / Cells, all Strings	240 Batteries/Cells
Monitored Parameters (String)	String Voltage, Float current, Ripple Current, Battery Voltage Delta, Discharge Status
Monitored Parameters (Battery/Cell)	Terminal DC Voltage, Terminal Post Temperature, Battery or Cell Admittance (Float and Discharge Current will require optical sensor)
Communications Data	Internal SNMP proxy agent, internet web server, internal Telnet client: internal email client; 2xRJ45 or 2x Mini DIN (P-Bus), USB local programming and configuration serial interface, USB modem/GP serial port, six optically isolates serial sensor communications interfaces.
Communications Protocols	TCP/IP, UDP, SNMP, HTTP, TELNET, SMTP, NTP
Enclosure Material	ABS, UL94V-0
Power	24Vdc or 48Vdc

RIM MODULES

Number of Inputs	6 Digital/Analog (user-defined)	
Analog Measurements	+/- 12VDC; 0-8RMS	
Temperature Sensor	+/- 2°C Accuracy from -40 to +80°C	
Humidity Sensor (Optional)	+/- 3% Accuracy from 20% to 80% RH	+/-5% from 0 to 19% and 81% to 100% RH
Maximum Number of Units	4 RIM Modules per host device	
Interface to Host	RS-485 on RJ-45 connector, Power supplied by daisy chain	
AC Line Measurement	90 to 140VAC, RMS, sine, 50/60 Hz	
Enclosure Material	ABS, UL94V-0	
Size / Weight	2.7" x 3.2" , 4.0 oz.	

SENSORS

Operating Range	-40 to +80°C	
Communications Interface	Optically Isolated RH-45 (1,200 Volts)	
Battery Interface	(POS) Ring Terminal, 12" Wire (NEG) Bracket or Ring Terminal, 12" Wire	
Power Requirements	2V (1.65- 3.0Vdc) / 12V (8.0 - 16Vdc)	
Power Consumption	2V (<15 mA nominal, 2/5A During Testing)	12V (<15 mA nominal, .5/7A During Testing)

