Specification for On-Line UPS Battery Monitoring and Data Management System

1   Scope

This specification defines the minimum requirements for a predictive on-line Battery Monitoring and Data Management System BMDMS with test, analysis, and remote monitoring control capabilities. Unless noted otherwise, the BMDMS vendor shall provide all required hardware and software.

2   Warranty

The system shall be warranted against defects in design, materials, workmanship, and overall performance for 12 months from the date of the initial shipment of the system and up to 18 months from date of approved commissioning.

3   System Specifications

String Capacity	System is of modular design, with no limit to the number of strings monitored. The limit to the number of 12V jars per string is 40 or 16V jars per string of 30.
Input Power	115VAC ±10%, 1 Phase 60Hz 230VAC ±10%, 1 Phase 50Hz
Operating Temperature Range	5°C to 40°C 41°F to 104°F
Altitude	0 to 2000 meters above sea level
Humidity	0% to 80% RH (non condensing) at 5°C to 31°C 0% to 50% RH (non condensing) at 32°C to 40°C
Jar voltage:	0 to 20V, ±0.15% of reading ±20mV
Jar resistance:	0 to 32,000μΩ, ±5% of reading ±1μΩ
String voltage:	0 to 600.0V, ±0.2% of reading ±0.5V
Intertier resistance:	0 to 5mΩ, ±5% of reading ±5μΩ.
*Temperature:	0°C to 80°C (32°F to 176°F), ±1°C.
*Discharge current:	0 to 4000A ±5% full scale
*Float current:	0 to 5000mA ±50mA.
*	Current Sensors - One per battery string.Optional current transducer required. Transducer accuracy affects overall current reading accuracy. Temperature Sensors (optional) - Up to two ambient sensors per string can be defined.

4   Monitoring System Description

The on-line Battery Monitoring and Data Management System BMDMS shall monitor the battery systems specified in the attached drawings. The system shall be capable of automatically monitoring, displaying, and recording all battery parameters described in this specification. The BMDMS shall transmit all battery data to a Remote Central Computer RCC via telephone dial-up modem, USB or RS-232, or be capable of being polled over a LAN/WAN connection using TCP/IP.

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5 Measurement Capability

5.1 Individual jar voltage.

5.2 Individual jar DC resistance accomplished by applying a momentary load at user defined intervals.

5.3 Individual intertier resistance measurements performed at user defined intervals.

5.4 Total overall battery voltage per string.

5.5 Ambient or pilot cell temperature, with ability to add up to two temperatures per string for temperature trending.

5.6 System discharge logging of the overall voltage, individual jar voltage, discharge current, and temperatures.

5.7 Float current per string.

6 System Hardware and Software Requirements

6.1 LEDs indicating alarms, communications, and processor status.

6.2 Four communication ports: A USB port configurable for either a local PC connected at all times or for temporary viewing with a notebook computer. A LAN port configurable for use on a network using TCP/IP. A modem port for telephone dial-up. A DB-9 port for RS-232 communication. Setup and viewing of data is to be performed from any one of these ports.

6.3 Nonvolatile SRAM memory for storage of data. Enough memory storage for one complete year of data.

6.4 Wiring harnesses with supplied connectors to be terminated in the field during installation.

6.5 Individual resistor terminated leads for voltage sense.

6.6 Two voltage-free, form C, alarm contacts for annunciating a common alarm to the alarm reporting system. Each contact can be programmed for either a critical or maintenance event.

6.7 Windows® 2000 and XP compatible software for data analysis, display, archiving, and trending.

7 System Performance

7.1 The BMDMS shall monitor, display, and record the battery bank voltage, battery discharge current, individual jar voltages, configured temperature, individual jar resistance, and intertier resistances. All these parameters shall be continuously monitored in real time during normal operation and during all battery discharges, except for resistance test, which is a user programmable event.

7.2 The BMDMS shall transfer all battery parameters specified in paragraph 8.1 at the Remote Central Computer RCC, at user defined intervals.

7.3   The system shall automatically display, record, and provide a print-out of all alarm conditions, as and when they occur, at the RCC. This reporting shall include the following parameters.

    7.3.1   Individual jar voltage high and low alarm.

    7.3.2   Individual internal resistance high alarm.

    7.3.3   Individual internal resistance warning as a percentage of alarm threshold.

    7.3.4   Intertier resistance high alarm.

    7.3.5   Overall voltage high and low alarm.

    7.3.6   Temperature high and low.

    7.3.7   Individual jar voltage low alarm during discharge.

    7.3.8   Discharge string current.

    7.3.9   Discharge time alarm set in hours/minutes.

    7.3.10   Float current high alarm.

7.4   Each alarm record shall include defined limits, alarming parameter, show the time and date of the event, and the peak value reached during the violation.

7.5   Each parameter alarm shall be configurable for a latching or nonlatching alarm contact function.

7.6   As user defined, the system shall automatically page, fax or e-mail a report to responsible personnel when any alarm thresholds are violated.

7.7   The system shall provide and maintain a complete, real-time discharge event log and a dynamic on-line display of battery voltage, individual cell voltages, battery string current, and ambient temperature whenever the battery is in a discharge mode. In addition to the numerical display, the system shall provide a graphical display of the battery voltage and cell voltages versus time that allows playback of the discharge event.

    7.7.1   Store historical record of the internal resistance of each jar.

    7.7.2   Display the actual real time numbers (or stored snapshots) of all battery parameters at the remote central computer. Additionally, the display shall provide individual graphical representation of all battery parameters in relation to alarm thresholds.

    7.7.3   Provide automatic voltage logging of overall voltage, individual jar voltages, and temperature at user defined intervals for trending analysis.

8   Password Protection

The BMDMS shall require a password to allow any programming or calibration changes either via remote connection or local connection.

9   Software

The software shall operate on the Windows 2000 and XP operating systems and maintain a database of all information gathered from the monitors for future analysis and reporting. The software shall be configurable for either a central, local or service computer application. The central configuration shall be responsible for permanently removing any data that may reside in the monitor SRAM memory. The local configuration will not permanently remove data from SRAM memory and will allow it to remain for the central computer. The service configuration will allow service technicians to call for real time analysis from any accessible phone line. The software shall be able to autopoll multiple monitoring systems on a programmed schedule.

10 Reports

10.1 Alarm condition reporting – tabular, fax or pager.

10.2 Jar out-of-limits summary report – tabular.

10.3 Individual jar voltages over time – graph or tabular.

10.4 Individual jar resistance values over time – graph or tabular.

10.5 Total battery voltage over time – graph or tabular.

10.6 Battery temperature / room temperature over time – graph or tabular.

10.7 Discharge report: total battery voltage decay vs. time – graph or tabular.

10.8 Discharge report: jar voltage decay vs. time – graph or tabular.

10.9 Discharge hit summary report – tabular.

10.10 Discharge hit interval summary report – tabular.

10.11 General summary report of battery and monitor status of all systems to the battery or string level based on user set thresholds.

10.12 Detail summary reports of battery and monitor status of all systems with a line graph trend of any parameter that violated a threshold.

11 User's Guide

Each system shall have one set of owner's manuals, which include the following information as a minimum: Installation, ommissioning and operating instructions.

12 Testing

12.1 **Factory Acceptance Tests**: The BMDMS shall be factory tested to demonstrate the functionality and performance required by this specification.

12.2 **Site Acceptance Tests**: Vendor shall prepare site acceptance tests procedures, which shall be used to validate the functionality and performance required by this specification.

13 System Installation, Start-up, Commissioning and Training

The BMDMS vendor shall provide a field start-up engineer to supervise the system installation. After installation, the vendor field engineer shall start up the system and perform all required site acceptance tests to demonstrate that the system meets the functionality and performance requirements of this specification.

14 Communication I/O

14.1 Modbus and SNMP protocols for third party interface.

14.2 Local port, USB connector.

14.3 Local port, RS-232 DB-9 connector.

14.4 LAN port, RJ-45 (optional).

14.5 Telephone via modem, RJ-11 port.

14.6 Fiber optic for system communication.

15 Agency Approvals

15.1 UL listed.

15.2 CE approved.