VERTIV™

Albér BDSUi™ and Albér BDSU-50™

Battery Monitoring Systems
For UPS Battery Cabinets

Maximize Your Uptime with an Albér Battery Monitoring System

How Confident Are You That Your Batteries Will Be Available When You Need Them?
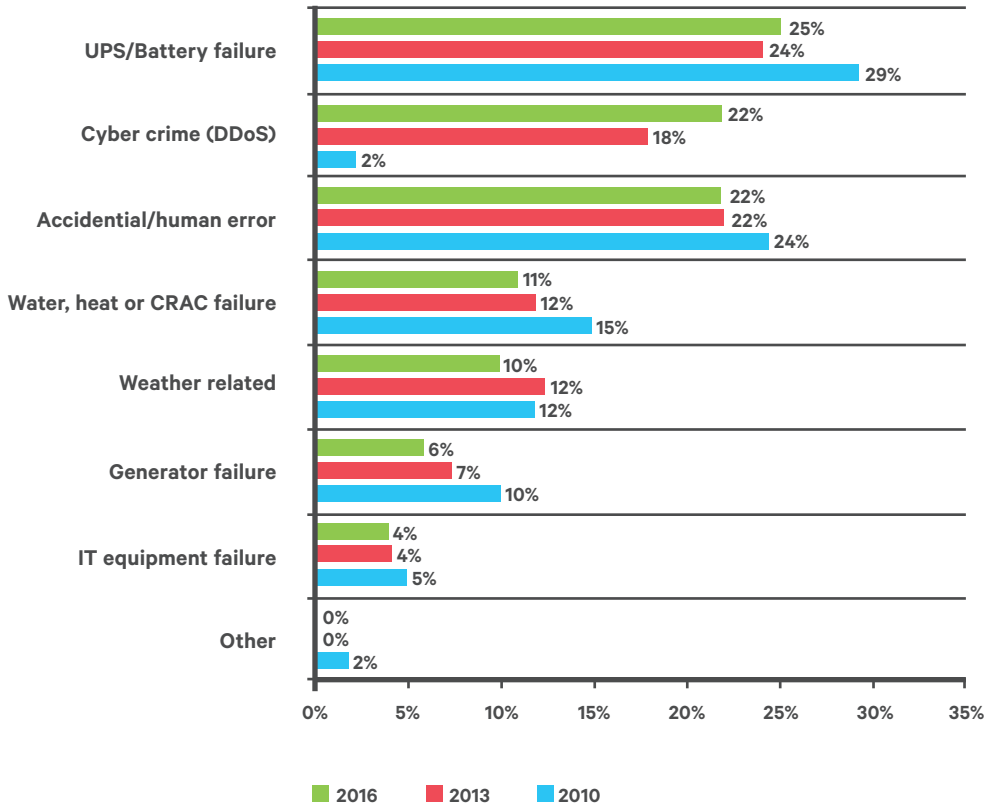
Unplanned data center outages present a difficult and costly challenge for organizations. While eliminating downtime altogether is a challenging undertaking, organizations can start with the most frequent cause of unplanned outages – uninterruptible power supply (UPS) battery failure.

In most cases, the ability to keep critical systems running through power outages is dependent on the UPS. However, a UPS is only as reliable as the batteries that support it. Batteries are one of the most "low-tech" components supporting today's mission-critical data centers but they are the most vulnerable part of an UPS system. While the vast majority of unplanned outages last less than ten seconds, a single bad battery cell can cripple a data center's entire backup system, particularly if adequate UPS redundancy has not been implemented.

Ponemon Institute Study on Data Center Outages. Top root cause of unplanned outages experienced during the last 2 years

Root causes of unplanned outages
Comparison of 2010, 2013 and 2016 results

UPS/Battery failure	25% (2016), 24% (2013), 29% (2010)	
Cyber crime (DDoS)	22% (2016), 18% (2013), 2% (2010)	
Accidental/human error	22% (2016), 22% (2013), 24% (2010)	
Water, heat or CRAC failure	11% (2016), 12% (2013), 15% (2010)	
Weather related	10% (2016), 12% (2013), 12% (2010)	
Generator failure	6% (2016), 7% (2013), 10% (2010)	
IT equipment failure	4% (2016), 4% (2013), 5% (2010)	
Other	0% (2016), 0% (2013), 2% (2010)	

■ 2016 ■ 2013 ■ 2010

While batteries are one of the most "low-tech" components supporting today's mission-critical data centers, they are the most vulnerable part of an UPS system.

Albér Battery Monitoring Systems Have Been Proven To Increase Critical Power Reliability

According to a recent analysis of actual field results of batteries in real-world UPS environments by Vertiv™'s service organization, data centers with Albér battery monitoring systems installed on-site had a reduced rate of outages due to bad batteries.

The use of Albér battery monitoring systems by customers increased the Mean Time Between Failure (MTBF) by more than double when compared to preventive maintenance alone. While outages still occurred at some of these sites, most of these incidents were isolated to human error where customers were not watching the alarm data provided by the battery monitoring system.

The remote use of Albér battery monitoring systems by Vertiv technical experts resulted in no outages due to bad batteries. Not only does remote monitoring lift the burden of monitoring from internal personnel, but in many cases, it also integrates onsite and remote preventative maintenance activities in order to maximize battery availability.

The Effect of Battery Monitoring Systems on Critical Power System Reliability*

The use of Albér battery monitoring by customers increased the MTBF by more than double when compared to preventative maintenance alone

The remote use of Albér battery monitoring by Emerson technical experts resulted in no outages due to bad batteries
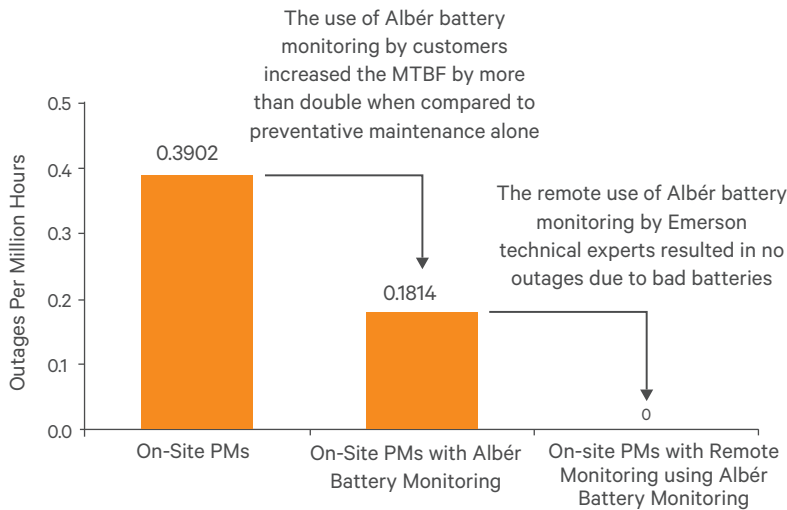
Albér Monitoring Systems Substantially Increase Battery Availability

*Analysis based on more than 450 million operating hours over a 3.5 year period for more than 24,000 strings of batteries under Vertiv contract prior to the end of their expected service life.

Features and Benefits

SEE

Helps you proactively address battery related issues that you could never see before by allowing you to visualize all critical information and know the real state of health of your batteries at all times (in real-time or historical trending)

DECIDE

Helps you make more informed decisions, faster by analyzing data and utilizing built-in decision support functions that determine what matters and what doesn't

ACT

Helps you take the right action with confidence at the right time by recommending the best corrective action

Albér Battery Monitoring Systems provide the ability to make smarter and faster decisions resulting in higher availability, reduced costs, and ultimate confidence in your batteries.

USER BENEFITS	ALBÉR BATTERY MONITORING SYSTEM FEATURES
Increased Availability	• Detects open and shorted batteries • Provides advance warning of an impending battery failure • Eliminate the risk of human error
Reduced Maintenance Costs	• Enables extended maintenance intervals by basing maintenance on the condition of the batteries rather than arbitrarily timed schedules • Automates all of the IEEE recommended practices for battery maintenance and testing except visual inspections
Reduced Replacement Costs	• Enables extended replacement intervals by basing replacement on the condition of the batteries rather than arbitrarily timed schedules • Provides documentation to support warranty claims
Increased Safety	• Detects and mitigates catastrophic conditions including thermal runaway • Minimizes shock, arch-flash, burn and chemical risks by reducing personnel exposure to batteries • Meets the rigorous safety requirements for test and measurement equipment under UL 61010-1
Improved Compliance	• Allows users to comply with International Fire Code (IFC) 608.3 by providing the ability to detect and control thermal runaway • Provides documentation to demonstrate compliance with regulatory standards

See Issues Sooner

By providing real-time system and component level visibility, Albér battery monitoring systems' unique approach provides warning of imminent battery failures underlined months in advance.

	COMPONENTS OF A BATTERY SYSTEM'S OHMIC PATH				
	Internal Cell		Inter-Cell (cell-to-cell)	Inter-Tier	Disconnect Switches (Center Breakers)
	Electro-chemical path	Metallic path			
Albér	✓	✓	✓	✓	✓
Brand B	✓	✓	✓	✓	✓
Brand Ca	✓	✓	X	X	X
Brand Ce	✓	✓	X	X	X
Brand M	✓	✓	X	X	X
Brand P	✓	✓	X	X	X

Electro-chemical path

Albér

Albér systems' patented DC resistance test method (ohmic measurement process) uses a native DC current and a higher test current to provide earlier warning of approaching failures by maximizing accuracy and repeatability.

Competition

By using an AC (non-native) current and a lower test current, AC tests are very susceptible to ripple currents and electrical noise produced by the load and/or aging capacitors resulting in poor accuracy and repeatability.

Metallic path

Albér

Since batteries are DC devices, a DC resistance test method (ohmic measurement process) measures a battery's entire metallic path of an individual battery including the plates/grids which constitute a significant portion of the total resistance of an individual battery.

Competition

Since AC testing is an abnormal battery condition, AC tests are unable to accurately measure the metallic path of plates/grids

Rest of the system

Albér

Since the battery monitor modules in Albér systems' centralized architecture obtain power from a UPS protected AC power source, an Albér battery monitoring system is able to verify the integrity of the entire battery system by measuring the inter-cell, inter-tier/inter-row/inter-shelf, and disconnect switch (central breaker) resistances.

Competition

Most of the competition utilizes a distributed (modular) architecture in which the battery monitoring modules obtain power directly from the batteries being monitored. Not only does this have an adverse impact on the lives of the batteries due to voltage imbalances caused by the modules, but distributed (modular) systems are unable to measure the other components of a battery system beyond the individual cells or jars themselves.

Ohmic Measurements

The measurement of the electronic and ionic conduction path within a battery cell, commonly known as the ohmic value of a cell, is closely related to its capacity and can be used to predict the battery cell's performance during a discharge. Even though there is a close correlation between a battery cell's ohmic value and its capacity, it is not completely linear. Therefore, ohmic measurements are not used as a direct indicator of capacity. Rather, they are used as a warning indicator that signals if a battery cell has deteriorated to a level that will affect the operating integrity of the overall battery system.
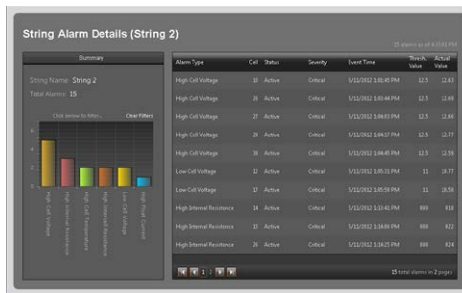
Management Software

Albér systems' user-friendly management software translates data into actionable insights to maximize the availability of critical power systems dependent on stationary back-up batteries. The simple, intuitive software allows users to set thresholds and alarm notifications, view graphs and trends, and generate reports. The reports have built-in decision support that analyzes the data and provides suggestions for the best course of action. Albér Battery Xplorer (standard) is ideally suited for single site users with a few strings of batteries while Albér Battery Xplorer Enterprise (optional) is ideal for multi-site users with many strings of batteries.
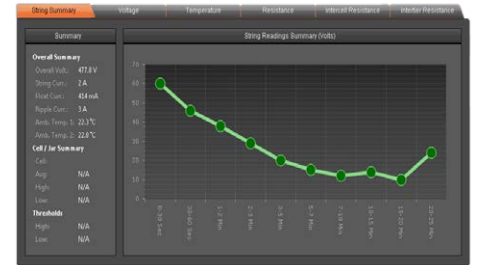
String View

View a trend graph showing the history of all the string level parameters

System View

View data on parallel battery strings simultaneously

Alarm View

View active alarms in a sortable and customizable grid

Discharge View

View data captured during a discharge event

FEATURE	ALBÉR BATTERY XPLORER (STANDARD)	ALBÉR BATTERY XPLORER ENTERPRISE (OPTIONAL)	ALBÉR BATTERY XPLORER ENTERPRISE ADVANTAGE OVER ALBÉR BATTERY XPLORER
Platform	Windows OS	WEB	OS independent
Setup and Configuration	✓		Not Applicable
Diagnostics and Service	✓		Not Applicable
Real-Time Monitoring	✓	✓	Comparable level of functionality
Alarm & Event Management	✓	✓	Automatically centralizes alarms across multiple sites or systems and provides the ability to customize notifications
Report Generation	✓	✓	Comparable level of functionality
Data Management	✓	✓	Aggregates data from multiple sites or systems and stores it in a centralized database
Data Integration		✓	Integrates data from other Albér stationary battery monitoring systems and Albér portable battery testing equipment
Multi-Site Navigation		✓	Easily navigate across multiple sites and systems

Hardware

Designed in accordance with the Institute of Electrical and Electronics Engineers (IEEE) recommendations for battery monitoring, maintenance, and testing, the Albér® BDSUi™ and Albér BDSU-50™ Battery Monitoring Systems are ideally suited for 12 and 16 volt sealed battery applications. The Albér BDSU-50 is designed to be mounted on top of any brand of UPS battery cabinet or open rack while the Albér BDSUi is designed specifically to integrate into Liebert UPS battery cabinets.

An Albér Battery Monitoring System continuously scans and trends all critical battery parameters, providing detailed reports identifying probable root causes and recommended corrective actions. The result: a reliable, effective system that is efficient to deploy and intuitive to use.

The systems consist of two primary components:

- **Albér Universal Xplorer Control Module (UXCM)** — a controller that stores the data, provides alarms, power and communication connections.

Albér Universal Xplorer Battery Module (UXBM/50)

Albér Universal Xplorer Control Module (UXCM)

- **Albér Universal Xplorer Battery Module (UXBM/50)** —a battery module that measures all significant battery parameters and performs a patented DC resistance test (ohmic measurement process) to verify the integrity of the entire battery system.

The first battery cabinet utilizes one Albér UXCM module and one Albér UXBM/50 module. Each additional battery cabinet uses only one Albér UXBM/50 module linked to the single Albér UXCM module on the first battery cabinet. An Albér UXCM can communicate with up to eight Albér UXBM/50 module or battery cabinets.

The Albér BDSUi is factory installed and tested inside Liebert UPS battery cabinets, eliminating the concerns associated with field installation. Since the Albér BDSUi is powered directly from the AC output bus of the UPS, it also eliminates the need to provide an external, protected AC power source. The Albér BDSUi is ideally suited for Liebert® UPS external battery cabinets for 12V and 16V sealed battery applications:

- Liebert NXL™ UPS

- Liebert eXL™ UPS

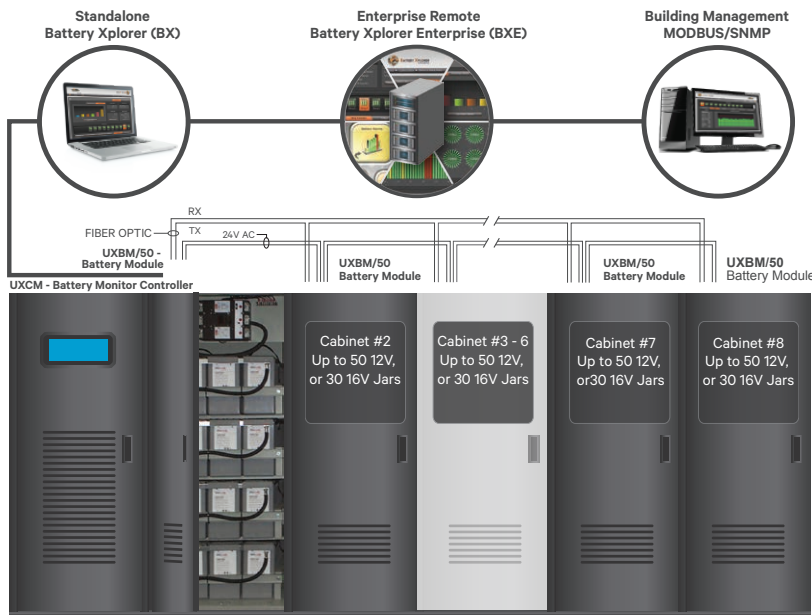- Liebert NX™ 225-600 kVA UPS

- Liebert eXM™ UPS

Communication

Communication network connections are made by the Vertiv IS-UNITY-DP communication card, providing options for industry standard protocols. The card provides the ability to communicate with third-party Building Management Systems (BMS) and Network Management Systems (NMS). The web card protocol enables users to connect to the battery monitoring system via a web interface, premitting quick, real-time viewing of system status and alarms without the PC-based Battery Xplorer software.

Standalone Battery Xplorer (BX)

Enterprise Remote Battery Xplorer Enterprise (BXE)

Building Management MODBUS/SNMP

RX
FIBER OPTIC — TX — 24V AC
UXBM/50 - Battery Module
UXCM - Battery Monitor Controller
UXBM/50 Battery Module
UXBM/50 Battery Module
UXBM/50 Battery Module

Cabinet #2 Up to 50 12V, or 30 16V Jars
Cabinet #3 - 6 Up to 50 12V, or 30 16V Jars
Cabinet #7 Up to 50 12V, or30 16V Jars
Cabinet #8 Up to 50 12V, or 30 16V Jars

* - Each UXBM/50 Features: Ambient Temperature, Discharge and Ripple Current, Float Current, and Thermal Runaway Control

After being founded over 40 years ago, Albér systems continue to set the standard for monitoring and testing stationary batteries used in data center, industrial, telecommunication and utility applications. The company offers a full line of battery monitoring systems, portable and capacity test equipment and educational services.

For more information about Albér products and services, please visit **www.VertivCo.com**

Specifications

Module Level Measurements

- Individual Module Resistance
- Individual Module Voltage

System Level Measurements

- Overall Volts
- String current (Discharge, Float is optional)

- Ripple Current
- Ambient Temperatures
- Intertier/Inter-row/Inter-shelf Cable Resistance
- Mid String Disconnect Switch Resistance

Power

- 3.6 amps at 115 VAC ±10% 60Hz or 1.8 amps at 230 VAC ±10% 60Hz
- Configurations: 12-volt or 16-volt jars

Outputs

- 24 VAC power: For up to eight UXBM/50 units
- Alarm contacts: Two Form C: Assignable as Maintenance or Critical, Programmable for latching or non-latching

Communication

- Ethernet / Modbus TCP / BACnet IP / SNMPv1, v2c, v3 / Vertiv Protocol / HTTP / Email / SMS / Modbus RTU /BACnet MSTP

Software

- Battery Xplorer / Battery Xplorer Enterprise (Optional)

Operating Environment

- Temperature range: 5°C to 40°C (41°F to 104°F)
- Humidity Range:
- 0% to 80% RH (non–condensing) at 5°C to 31°C
- 0% to 50% RH (non–condensing) at 32°C to 40°C
- Altitude: 0 to 2000 meters above sea level
- Indoor use only

Parameters/Features

- Number of cell channels: Up to eight strings of 40, 12 volt jars, six strings of 50, 12 volt jars or eight strings of 30, 16 volt jars

Monobloc Voltage

- 12V range 0 to 18V 0.1% ±12mV
- 16V range 0 to 24V 0.1% ±16mV

Internal Cell Resistance

- 0 to 32,000$\mu\Omega$, 5% of reading ±2$\mu\Omega$

Dimensions and Weights: Albér® Universal Xplorer Control Module (UXCM):

- 2U chassis
- Dimensions: 17.00"W x 3.49"H x 12.00"D
- Weight: 18.25 lbs.

Albér Universal Xplorer Battery Module (UXBM/50):

- 1U chassis
- 17.00"W x 1.74"H x 12.00"D
- Weight: 8.50 lbs.
- Agency Approvals
- UL listed
- CE approved

VERTIV™

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