

# Alber Universal Xplorer Industrial Monitor (UXIM) Battery Monitor

## Product Description Guide



# Alber

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## Universal Xplorer Industrial Monitor (UXIM) Product Description Guide

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Revision	Date of Change	Description of Change	By
1.00	9/23/12	Initial Draft	ED, MS
1.01	10/07/12	Final edits before release	MS, ED
1.02	02/13/13	Updated UXIM Specifications section in input power and packaging areas.	MS
1.03	03/20/13	Updated UXIM Specifications section in input power area.	CC, MS
1.04	04/24/13	Updated UXIM Installation Category from 1 to O for other.	CC, MS
1.05	05/28/13	Updated UXIM specifications from Installation Category to Measurement Category.	CC, MS
1.06	08/14/13	Updated the information on the front panel LED functions.	MS
1.07	09/12/13	Updated the information in the Cell Measurements table.	MS
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# 1. Glossary of Terms

The following is a list of terms commonly used with respect to batteries and battery monitoring.

Term	Definition
<b>Battery</b>	Two or more cells connected together electrically in series or parallel.
<b>Cell</b>	The basic electrochemical unit, characterized by an anode and a cathode, used to receive, store and deliver electrical energy.
<b>Current transducer</b>	The component that measures current.
<b>DC resistance measurement</b>	A test method that places a load across a group of cells and measures the instantaneous voltage response to calculate the battery's state of health.
<b>Discharge rate</b>	The rate, in Amperes or Watts, at which current or power is delivered by a battery.
<b>Float current</b>	The current drawn by a cell that is being float charged.
<b>Intercell connector</b>	An electrical conductor used to connect adjacent cells on the same rack.
<b>Intertier connector</b>	An electrical conductor used to connect two cells on different steps of the same rack.
<b>Internal ohmic measurement</b>	A measurement of the electronic and ionic conduction path within a cell or unit using techniques commonly known as impedance, conductance or resistance tests.
<b>Jar</b>	The container that holds a cell or a group of cells. A battery container can be a single cell or multicell unit, also called a <i>monobloc</i> .
<b>Monobloc or multicell unit</b>	A multicell container in which cells are installed. (Multicell Unit <i>US</i> , Monobloc <i>outside the US</i> )
<b>Ohmic value</b>	The unit of measure that indicates resistance of a conductor (intercell or intertier) or a cell / monobloc.
<b>Ripple current</b>	A type of electrical noise characterized by a uniform waveform riding in the DC circuit, normally expressed as peak, peak to peak, or RMS (Root Mean Square) voltage or current.
<b>String</b>	A number of cells connected together in series to form a battery.

**Table 1 - Glossary of Terms**

## 2. Product Overview

### 2.1 Product Description

The Universal Xplorer Industrial Monitor (UXIM) is a stationary battery monitor designed for use in Industrial or Utility applications. With standard configurations specifically designed for Utility Substations, make it ideal for NERC compliancy. Each monitor is considered a stand-alone system, in that no external computer is required for normal operation with standard provisions to integrate to customer owned Building Management or Enterprise Systems.

Complete and comprehensive remote monitoring capabilities include features you expect.

- Remote access via Ethernet or RS-485 using industry standard protocols such as Modbus or SNMP for simple BMS integration.
- Embedded Web servers permit Web browsing from any PC on the network for quick real-time battery viewing to inspect data in easy to interpret graphical views for all cell and string level parameters, active monitor status and state of active or latched alarms.
- Embedded email clients for alarm notifications and data delivery of battery parameters (XML format) with priority handling of message sent to responsible service technicians.
- Local USB connectivity to view and analyze battery systems using laptop computers.

With the UXIM, all your battery parameters are measured and constantly monitored against user defined thresholds. And what sets Albér monitors apart from others is the ability to provide early warning of potential battery problems by performing a proactive, patented resistance test, a proven technology to reliably predict battery performance. To complement the resistance proactive test, other parameters monitored to ensure optimal battery performance and life is the following:

- Cell Level Measurements
  - Individual Cell Resistance
  - Individual Cell Voltage
  - Individual Intercell Resistance
  - Electrolyte Level (Optional)
- System Level Measurements
  - Overall Volts
  - String current (Discharge/Float)
  - Ripple Current
  - Ambient Temperatures
  - Charger Cable Resistance
  - Ground Fault Currents

For details on parts inventory, installing and maintaining the UXIM, refer to the UXIM Installation Guide.

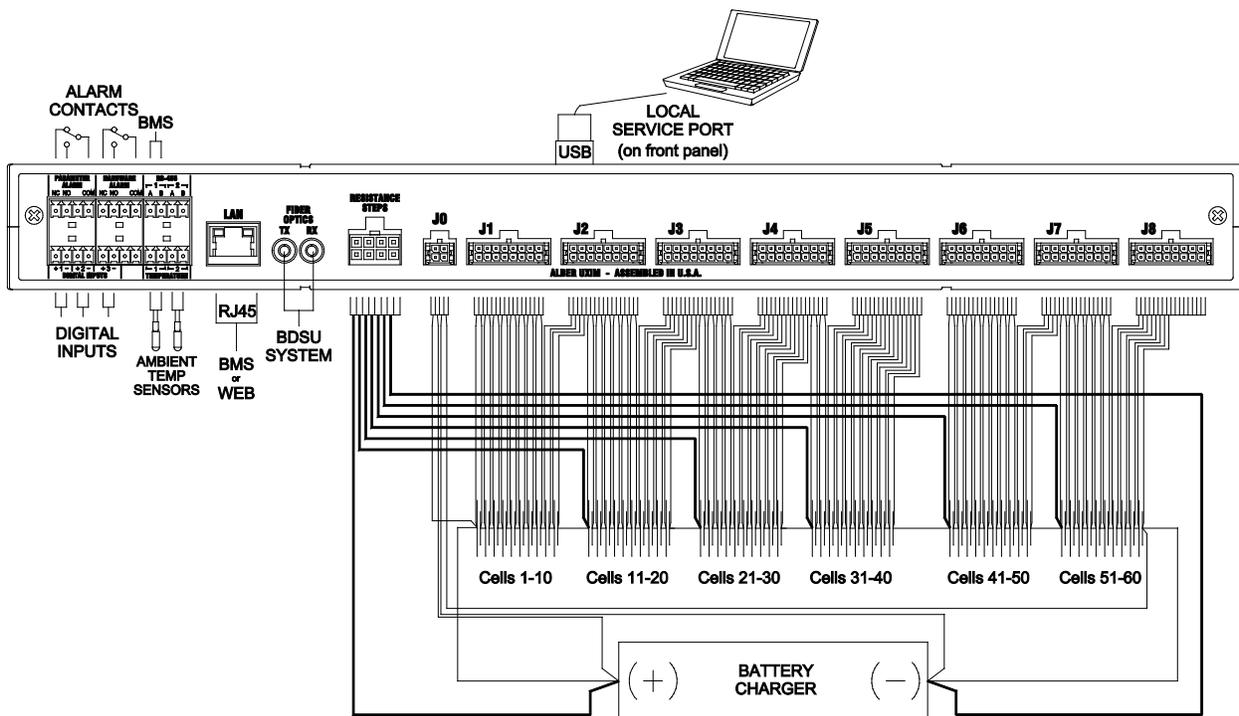
## 2.2 Supported System Configurations

Refer to the following table to identify supported systems. As the table shows, the monitor has the ability to monitor up to 62 cells and can be used in five different common configurations. If the desired configuration is not in the table, contact Albér for further information.

Technology	Nominal Volts	Battery/String Configuration (Number of strings) x (Number of data points) x (Nominal voltage of data point)
2V cells, VLA/VRLA	116V	1X58X2V
	118V	1X59X2V
	120V	1X60X2V
	122V	1X61X2V
	124V	1X62X2V

**Table 2 - Supported System Configurations**

The figure below shows a typical system connection for a single string of 60 cells.



**Figure 1 - System Connections (1X60X2V Configuration)**

### 3. Features

- All system configurations are field configurable
- Continual real time scanning of the following parameters:
  - Individual cell voltage
  - String discharge current
  - String float current
  - String ripple current
  - Ambient temperatures
- Automatic/ scheduled testing of internal resistance, intercell and intertier connection measurements
- Stores discharge events to allow playback of recorded data including cell voltages, currents and temperatures
- Fiber optic connectivity for BDSU system network integration
- Form C contact for battery parameter or hardware alarm
- Embedded Web server for viewing battery data via Web browsers
- Embedded email manager for delivery of alerts and battery data on a defined priority to service technicians.
- Isolated RS-485 interface for third party vendor integration
- Ethernet connectivity for connection to company network
- Compact 1U, 19" rack mount enclosure
- USB connectivity for PC to allow real time data viewing and configuration
- Local status indicators and alarm reset
- Maintenance override - global disable of all alarms
- Self calibrating
- Supports MODBUS (via RS-485 and Ethernet) SNMP and SMTP (via Ethernet) protocols

The system is compatible with the BDSU architecture. For a full description of features used with that system, refer to the BDSU Product Description Guide.

## 4. Measurement Capabilities

The UXIM has the following measurement capabilities.

### Cell or Monobloc Level Measurements (Max)

- 62 voltages, 2 volt
- 62 internal resistances
- 61 intercell resistances

### String Level Measurements

- Overall voltage (cumulative value of cell measurements)
- Discharge current
- Float current
- Ripple current
- $\pm$  Charge cable resistance
- Ground fault currents
- 4 intertier resistances

### System Level Measurements

- 2 ambient temperatures

## 5. Operating Modes

Although the monitoring system excels as a maintenance tool, the real advantage is knowing the current status of the batteries at a glance or being notified via email when there is an issue. By using status lights and extensive graphics when used with the Battery Explorer software, pertinent status and alarm events are easily accessible.

### 5.1 Normal Operating Mode

In normal operating mode, the system continuously scans all parameters within a one-second time frame. As readings are taken, they are compared to user-programmed alarm thresholds. Each parameter is constantly compared to the previously scanned value and, if the value exceeds an alarm threshold, the unit triggers an alarm event, causing the Form C alarm contact to activate. If Email Dispatcher is configured, a message will be sent to the first priority responder. Up to five levels of priorities and the amount of repeat messages sent to each priority responder is configurable.

### 5.2 Discharge Mode

If a discharge is detected, the system goes into a data logging mode and stores discharge start and end times, lowest overall voltage reached, highest string current reached during the event, and all cell voltages during the discharge event. These discharge events can then be played back later for further analysis.

### 5.3 Acceptance/Performance Test

Real time data viewing allows the user to monitor the individual cell voltage, cell temperature, overall voltage and discharge currents during a discharge. Seeing real-time data during acceptance testing is critical in identifying faulty connections or cells.

### 5.4 Resistance Test

A battery resistance test may be performed at user-set intervals or on demand. The test utilizes a patented technology that can identify failing cells or monoblocs, allowing service to be performed on a proactive schedule. Additional measurements taken include intercell, intertier/inter-row, and charger cable resistance measurements for identifying bad connections due to improper torque or corrosion at the connections.

### 5.5 Ground Fault Detection

With Alber's patent pending ground fault detection measures ground currents periodically throughout the entire string. Fault currents are identified and displayed graphically to identify what cell or area of the battery has a fault to highlight potential leaking cells creating shorts to ground.

### 5.6 Alarm Mode

Every monitored parameter can have an assigned alarm threshold. When any parameter goes outside the normal range, the Alarm LED lights and a Form C contact energizes. The event can be programmed to stay latched until the alarm is reset.

## 5.7 Email Dispatcher

The Email Dispatcher is a configurable embedded email service that can be set up in a couple of different modes. One is the email notification of alarms handled by a priority manager. This priority manager can have up to five emails assigned in a priority with the ability to set the amount of message reattempts and how often. The second mode is an automatic data delivery mode that will automatically send an email with the latest set of data available within the UXIM. This data is delivered in an XML format.

## 6. Model Number Descriptions

The model number is in the format of PPPP-COB, where PPPP is 1010 and C, O, and B are described below.

PPPP-	C	O	B	Description	Choices
<b>1010</b>	C			Communications	0 = RS-485 Only 1 = Network 2 = Fiber Optic 3 = Network and Fiber Optic
<b>1010</b>		O		Options	0 = None 1-9 = Reserved
<b>1010</b>			B	Branding	0 = OEM 1-9 = Reserved

**Table 3 - Model Number Description**

## 6.1 Parts List

The following items are included with each order of a UXIM.

Name	Part Number	Description	Requirements
<b>UXIM Battery Monitor Module</b>	1010-### ###=options	UXIM Battery Monitor Module.	One supplied per system
<b>Sense lead harness (standard)</b>	1102-560-XX XX=length Available in 25', 50', 75' or 100'	Harness for monitoring internal cell voltage/internal resistance, and intercell resistance	Eight supplied per system.
<b>Load lead harness (standard)</b>	1102-550-XX XX=length Available in 25', 50', 75' or 100'	Harness for connecting power and load module for internal resistance testing	One supplied per system
<b>Single Ambient temperature sensor harness</b>	1102-553-XX XX=length Available in 25', 50', 75' or 100'  1102-554-XX XX=length Available in 25', 50', 75' or 100'	One Ambient temperature sensor used to monitor room or cabinet temperature.  Optionally, a double ambient temperature sensor can be ordered. Contact your Alber Sales representative for details.	One supplied per system.  Double Ambient Temperature Sensor harness is (optional)
<b>USB Cable</b>	2025-108	3 meter USB communication cable	One supplied per system
<b>Load Fuse Holder</b>	1102-551	Fuse holder for connecting the load fuse	Seven supplied per system
<b>Load fuse</b>	4301-015	Fuse used in fused load lead	Seven supplied per system
<b>4 Position Connector</b>	2140-047	4 position plug connector for connecting digital inputs, RS-485 communication and alarm contacts	Five supplied per system
<b>Charger cable resistance harness (standard)</b>	1102-552-XX XX=length Available in 25', 50', 75' or 100'	Harness for monitoring charger cable resistance measurements.	One supplied per system
<b>10K Resistor Sense Lead Assembly</b>	1102-555	10K Resistor sense leads assembly connectors	136 supplied per system
<b>Single Tab Washer</b>	2120-164	5/16 single tab washer	140 tab washers are supplied per system
<b>Software CD</b>	2027-029	UXIM software installation CD	1 CD is supplied
<b>Flush Mounting Kit</b>	KIT 1400-531	Optional flush mounting kit	The flush mounting kit is sold separately. Contact your Alber Sales representative.

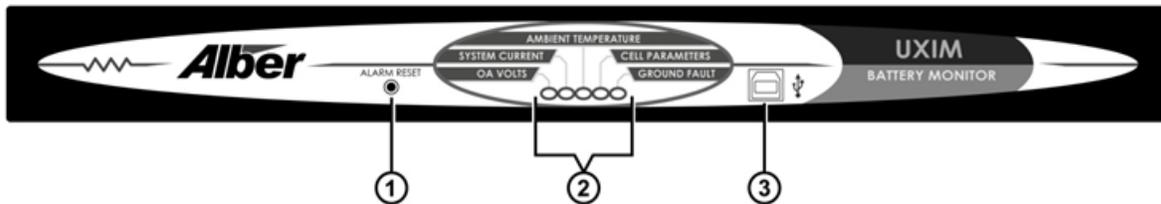
**Table 4 - Standard Parts List**

## 7. Panel Controls and Indicators

This section describes the front and rear panels of the UXIM. Additional descriptions may appear elsewhere in this guide or in related manuals.

### 7.1 Front Panel (All Models)

This section describes the components on the front panel of the UXIM.



**Figure 2 - UXIM Front Panel**

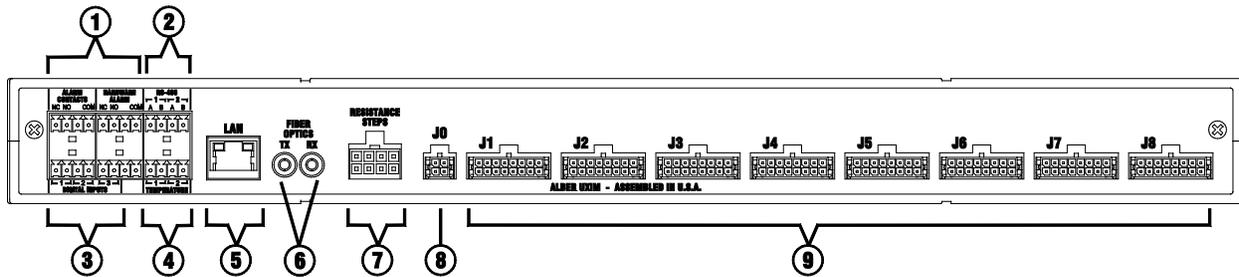
The UXIM front panel has the following components. The numbers in the table refer to the callout numbers in the preceding figure.

Number	Description	Function
1	Alarm Reset Button	Reset button for resetting latched alarms.
2	Front Panel Indicators	<p>Used for showing system alarm status and mode of operation.</p> <ul style="list-style-type: none"> <li>• OA VOLTS LED – stays off or blinks green when no alarms are present. The LED stays red and scans amber when the overall volts are out of range.</li> <li>• SYSTEM CURRENT LED – stays off or blinks green when no alarms are present. The LED stays red and scans amber when the system current is out of range.</li> <li>• AMBIENT TEMPERATURE LED – stays off or blinks green when no alarms are present. The LED stays red and scans amber when the ambient temperature is out of range.</li> <li>• CELL PARAMETERS LED – stays off or blinks green when no alarms are present. The LED stays red and scans amber when the cell parameters are being polled.</li> <li>• GROUND FAULT LED – stays off and scans green when no alarms are present. The LED stays red and scans amber when the system detects a ground fault has occurred.</li> <li>• All LEDs sequentially scans amber while system is in maintenance mode.</li> <li>• All LEDs flash amber while system is performing a battery discharge.</li> <li>• All LEDs flash green while system is running a resistance test.</li> <li>• All LEDs flash red and alternating green while system is performing a firmware upgrade.</li> </ul>
3	USB Connection	Allows connectivity of computers for setup, configuration, and real time data viewing.

**Table 5 - UXIM Front Panel Component Descriptions**

## 7.2 Rear Panel

This section describes the components on the rear panel of the UXIM.



**Figure 3 - UXIM Rear Panel**

The UXIM rear panel has the following components. The numbers in the table refer to the callout numbers in the preceding figure.

Number	Description	Function
1	Alarm Contact	Form C alarm contact for remote parameter or hardware alarm notification.
2	RS-485 Connection	Two ports available; One used for remote communications using a MODBUS protocol and the second is used for communicating to optional accessories.
3	Digital Inputs	Used for monitoring wet or dry contact inputs.
4	Ambient Temperature Inputs	Ambient temperature probe connection.
5	LAN Connection	Ethernet connection for network connectivity. This is optional and is only available on the 1009-1XX or 1009-3XX models.
6	Fiber Optic Connections	Used for communication to the BDSU network. This is optional and only available on the 1009-2XX or 1009-3XX models.
7	Load Inputs	Load connections for performing internal resistance measurements.
8	Charger Cable Resistance Inputs	Sense lead connection for monitoring charge cable resistance.
9	Cell Voltage Inputs	Sense lead connections for making voltage measurements.

**Table 6 - UXIM Rear Panel Component Descriptions**

## 8. UXIM Specifications

### 8.1 UXIM System Specifications

#### Safety Approvals

- UL61010-1
- EN61010-1
- IEC61010-1

#### EMC Approvals

- EN61326-1
- FCC part 15 class A

#### Operating Environment

- Temperature Range: 0°C to 40°C (32°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 31°C to 40°C
- Indoor Use Only
- Measurement Category O (500V Transient Rating)
- Pollution Degree 2
- Altitude: 0 to 2000 meters above sea level

#### Alarms

- 2 - Form C relay contact, 2A at 30Vdc

#### Input Power

- DC Power, 85 to 150VDC, 11.3W max.

#### Communications

- RS485/1 - MODBUS
- RS-485/2 - Proprietary for optional accessories
- Ethernet -TCP/IP MODBUS, SNMP, and SMTP
- USB
- Fiber optic for BDSU integration

#### Packaging

- 1U chassis
- 17.0"W x 1.75"H x 12.00"D
- 4.0 lbs.
- Wall or 19" Rack Mount

## 8.2 Cell Measurements

This section describes cell measurement specifications.

Parameter	Tolerance
Cell Voltage	0 to 3V, 0.1% $\pm$ 2mV
Internal Cell Resistance	0 to 32,000 $\mu\Omega$ , 5% of reading $\pm$ 2 $\mu\Omega$
Intercell Resistance	0 to 5000 $\mu\Omega$ , 5% of reading $\pm$ 5 $\mu\Omega$
Intertier/charge cable Resistance	0 to 5000 $\mu\Omega$ , 5% of reading $\pm$ 5 $\mu\Omega$

**Table 7 - Cell Measurement Specifications**

## 8.3 System Measurements

This section describes system measurement specifications.

Parameter	Tolerance	Number Of Inputs
String Voltage	85Vdc to 150 Vdc $\pm$ .5%	Calculated
String Current	0 to 2000ADC $\pm$ 1% of full scale	Calculated
Ripple Current	0 to 250 Amperes RMS, $\pm$ 5% of full scale	Calculated
Float Current	0 to 5000mADC, $\pm$ 50mA	Calculated
Ambient Temperature	0°C to 80°C $\pm$ 0.1°C (32°F to 176°F)	1

**Table 8 - System Measurement Specifications**

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