Modbus Protocol for Universal Xplorer Industrial and Telecom Monitors (UXIM) and (UXTM) Battery Monitor

Reference Guide

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Document Revision	3
Part Number	4200-102

Revision History

Revision	Date of change	Description of change	By
1.00	7/20/2010	Initial Document Creation	CC
1.10	8/24/2010	Added 25DEH and 25DFH for R-test alarm disable timer. Restructure System Status section and redefined. Added String status registers 0181H.	ED
1.20	10/4/2010	Updated Unit Information Section by adding additional registers to accommodate the amount of data.	CC
1.30	10/6/2010	Added 15 more string names to section 2.5	CC
1.40	10/7/2010	Edited section 2.3 Status Register to use bits for status	CC
1.50	7/19/2011	Added document number, TOC and formatted entire guide	CC
1.60	9/12/2011	New title and marketing updates	CC
1.70	3/08/2012	Added section 4 Alarm Type and PCB Revision/Version Format Appendix	CC
1.80	10/02/2012	Added UXIM throughout guide. Updated; ground fault current, ambient temperature, thresholds, and intertier configuration.	MS
1.90	11/05/2012	Added UXIM charger cable resistance information.	MS
2.00	06/26/2013	Added discharge duration and note.	MS
2.10	08/23/2013	Added ground fault resistance information, for configuration and alarm types.	MS
2.20	03/14/2014	Added a new category called Enables, for the configuration section.	MS
2.21	07/17/2014	Add registers (34543 – 34545) for resistance test starting time Add registers (39711 – 39966) for resistance baseline values Add registers (35122 – 35375) for intercell baseline values Add bit 9 in register 30385 for minor alarm status Add register (39027 – 39030) for major/minor alarm status Add registers (39043 – 39097) for minor alarm events Add registers (49027 – 49053) for minor alarm threshold Add register 49062 for resistance alarm type. Add registers (49063 – 49070) for major/minor alarm setup.	CC, MS

		Add registers (49082 – 49116) for digital input setups and names. Add registers (49134 – 49161) for sequential major alarm thresholds.	
2.22	8/5/2014	Add bit 12 for the intertier alarm status, enable and latch registers. Add bit 13 for the cell to ambient alarm status, enable and latch registers. Add bit 14 for the thermal runaway cell to ambient alarm status, enable and latch registers. Add bit 15 for the thermal runaway float currentt alarm status, enable and latch registers.	XB
2.23	11/17/2014	Add alarm ID 15 for digital input alarms in section 4.1	XB
2.24	04/2/2015	Updated information in the Modbus Protocol (ASCII Frame) (Address and Baud Rate) in section 1. Updated data address for R-test remaining time of alarm disable.	MS
2.25	10/13/2015	Updated Alarm Page Register data address information in the Status Registers section.	MS
3	02/15/16	Updated revision number from 1.08 to 2. This was done so documentation can be added to the Agile/LES system. Also updated the copyright year from 2015 to 2016	MS

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Table of Contents

1   Modbus™ Protocol (ASCII Frame)

This section describes the details of the frame, ASCII character, address, error control, bits per byte, and baud rate settings.

Frame: Colon, Address (H), Address (L), Function (H),
                        Function (L), Data, LRC (H), LRC (L), CR, LF

ASCII Character: Every field in the frame is sent in ASCII character.

Address: Device address is defined as:

                        UXTM: 1-254

                        UXIM: 1-254

Error Control: LRC

                        If correct, send requested data back; if error is found, do nothing.
                        The following binary bytes in the frame are checked:
                        - Address
                        - Function
                        - Data

Bits per Byte: 1 start bit, 7 data bits, 2 stop bits, no parity

Baud Rate: 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps

2 UXIM/UXTM Register List for Function 3, 4 and 16 Data Address: 0000H – 270EH

This section describes the details of the cell parameters, string parameters, status registers, event details, configuration, and unit information.

2.1 Cell Parameters

This section describes the details of the cell voltage, cell temperature, cell resistance, and intercell resistance settings. For information on string parameters, refer to section 2.2. For additional information on Alarm type formats refer to section 4.1.

Category	Name/Description	Reference	Data Address
Cell Voltage	Cell Voltage 1	33586	0E01H
	Cell Voltage 2		
	…	…	…
	Cell Voltage 256	33841	0F00H
Cell Temperature	Cell Temperature 1	33906	0F41H
	Cell Temperature 2		
	…	…	…
	Cell Temperature 256	34161	1040H
Resistance Test Start Time (For both Cell resistance and Intercell**)**	Year/Month	34543	11BEH
	Day/Hour	34544	11BFH
	Minute/Second	34545	11C0H
Cell Resistance	Cell Resistance 1	34546	11C1H
	Cell Resistance 2		
	…	…	…
	Cell Resistance 256	34801	12C0H
Intercell Resistance	Intercell 1	34866	1301H
	Intercell 2		
	…	…	…
	Intercell 256	35121	1400H
Charger Cable Resistance*	Positive Charger Cable Resistance	39242	2419H
	Negative Charger Cable Resistance	39243	241AH
Ground Fault Current	GF Current Cell 1	39244	241BH
	GF Current Cell 2		
	…	…	…
	GF Current Cell 256	39499	251AH
Baseline Internal Resistance	Cell Resistance 1	39711	25EEH
	Cell Resistance 2		
	…	…	…
	Cell Resistance 256	39966	26EDH
Baseline Intercell Resistance	Intercell 1	35122	1401H
	Intercell 2	35123	1402H
	…	…	…
	Intercell 255	35375	14FEH

*UXIM only

2.2 String Parameters

This section describes the details of the overall voltage, string current, ripple, ambient temperature and digital input settings. For information on status registers, refer to section 2.3. For additional information on Alarm type formats refer to section 4.1.

Category	Name/Description	Reference	Data Address
Overall Voltage	OV String 1	32050	0801H
	OV String 2		
	OV String 3		
	OV String 4		
	…	…	…
	OV String 16	32065	0810H
String Current (MSB = sign bit; 0 = Positive, 1 = Negative)	String 1 Current	32082	0821H
	String 2 Current		
	String 3 Current		
	String 4 Current		
	…	…	…
	String 16 Current	32097	0830H
Float Current	String 1 Float Current	32114	0841H
	…		
	String 16 Float Current	32129	0850H
Ripple	String 1 Ripple	32146	0861H
	String 2 Ripple		
	String 3 Ripple		
	String 4 Ripple		
	…	…	…
	String 16 Ripple	32161	0870H
Ambient Temperature	Ambient Temperature 1	31922	0781H
	*Ambient Temperature 2	31923	0782H
Ground Fault Resistance*	Ground Fault Resistance at Battery System Positive	39707 39708	25EAH 25EBH
	Ground Fault Resistance at Battery System Negative	39709 39710	25ECH 25EDH
Digital Inputs	Digital Inputs (*Bitfield*)	39500	251BH
	DI-1	BIT 0	
	DI-2	BIT 1	
	DI-3	BIT 2	
	(Reserved)	BITS 3 - 15	

*UXIM only

2.3 Status Registers

This section describes the details of the status; page register and alarm disable timer settings. For information on event details, refer to section 2.4. For additional information on Alarm type formats refer to section 4.1.

Category	Name/Description		Reference	Data Address
Status	**System Status**		30385	0180H
	Mode	**Bit State**	**Bit**	
	Monitor Mode	1 = Monitor Mode	BIT 0	
	R-Test in progress	1 = R-Test in progress	BIT 1	
	Discharge in progress	1 = Discharge in progress	BIT 2	
	Calibration in progress	1 = Calibration in progress	BIT 3	
	Diagnostic in progress	1 = Diagnostic in progress	BIT 4	
	Maintenance mode	1 = Maintenance mode	BIT 5	
	Major Alarm in progress	1 = Alarm in progress	BIT 6	
	Hardware Failure	1 = Hardware Failure	BIT 7	
	Alarm Acknowledged	1 = Alarm Acknowledged	BIT 8	
	Minor Alarm In Progress	1 = Alarm in progress	BIT 9	
	Reserved	Reserved	BIT 10-15	
	String Status		30386	0181H
	Parameter	**Bit State**	**Bit**	
	String 1 Discharge State	1 = Discharge in progress	BIT 0	
	String 2 Discharge State	1 = Discharge in progress	BIT 1	
	String 3 Discharge State	1 = Discharge in progress	BIT 2	
	String 4 Discharge State	1 = Discharge in progress	BIT 3	
			30387	0182H
	String 1 Alarm Status	1 = String in alarm	BIT 0	
	String 2 Alarm Status	1 = String in alarm	BIT 1	
	String 3 Alarm Status	1 = String in alarm	BIT 2	
	String 4 Alarm Status	1 = String in alarm	BIT 3	
	Major High Alarm Status		39027	2342H
	Parameter	**Bit State**	**Bit**	
	Cell Voltage	1 = Alarm in progress	BIT 0	
	String Voltage	1 = Alarm in progress	BIT 1	
	Float Current	1 = Alarm in progress	BIT 2	
	Ripple Current	1 = Alarm in progress	BIT 3	
	Cell Temperature	1 = Alarm in progress	BIT 4	
	Cell Resistance	1 = Alarm in progress	BIT 5	
	Intercell	1 = Alarm in progress	BIT 6	
	Discharge Current	1 = Alarm in progress	BIT 7	

Status Registers (Continued)

Category	Name/Description		Reference	Data Address
	Charger Cable	1 = Alarm in progress	BIT 8	
	Digital Input	1 = Alarm in progress	BIT 9	
	Reserved	1 = Alarm in progress	BIT 10	
	Ambient Temperature	1 = Alarm in progress	BIT 11	
	Intertier	1 = Alarm in progress	BIT 12	
	Cell to Ambient	1 = Alarm in progress	BIT 13	
	Thermal runaway cell to ambient	1 = Alarm in progress	BIT 14	
	Thermal runaway float current	1 = Alarm in progress	BIT 15	
	Major Low Alarm Status		39028	2343H
	Parameter	**Bit State**	**Bit**	
	Cell Voltage	1 = Alarm in progress	BIT 0	
	String Voltage	1 = Alarm in progress	BIT1	
	Float Current	1 = Alarm in progress	BIT 2	
	Ripple Current	1 = Alarm in progress	BIT 3	
	Cell Temperature	1 = Alarm in progress	BIT 4	
	Cell Resistance	1 = Alarm in progress	BIT 5	
	Reserved	1 = Alarm in progress	BIT 6	
	Reserved	1 = Alarm in progress	BIT 7	
	Reserved	1 = Alarm in progress	BIT 8	
	Digital Input	1 = Alarm in progress	BIT 9	
	Ground Fault	1 = Alarm in progress	BIT 10	
	Ambient Temperature	1 = Alarm in progress	BIT 11	
	Intertier	1 = Alarm in progress	BIT 12	
	Reserved	1 = Alarm in progress	BIT 13 – BIT 15	
	Minor High Alarm Status		39029	2344H
	Parameter	**Bit State**	**Bit**	
	Cell Voltage	1 = Alarm in progress	BIT 0	
	String Voltage	1 = Alarm in progress	BIT1	
	Float Current	1 = Alarm in progress	BIT 2	
	Ripple Current	1 = Alarm in progress	BIT 3	
	Cell Temperature	1 = Alarm in progress	BIT 4	
	Cell Resistance	1 = Alarm in progress	BIT 5	
	Intercell	1 = Alarm in progress	BIT 6	
	Discharge Current	1 = Alarm in progress	BIT 7	
	Charger Cable	1 = Alarm in progress	BIT 8	
	Digital Input	1 = Alarm in progress	BIT 9	

Category	Name/Description		Reference	Data Address
	Reserved	1 = Alarm in progress	BIT 10	
	Ambient Temperature	1 = Alarm in progress	BIT 11	
	Intertier	1 = Alarm in progress	BIT 12	
	Cell to Ambient	1 = Alarm in progress	BIT 13	
	Thermal runaway cell to ambient	1 = Alarm in progress	BIT 14	
	Thermal runaway float current	1 = Alarm in progress	BIT 15	
	Minor Low Alarm Status		39030	2345H
	Parameter	**Bit State**	**Bit**	
	Minor Low Alarm	1 = Alarm in progress	BIT 0	
	String Voltage	1 = Alarm in progress	BIT1	
	Float Current	1 = Alarm in progress	BIT 2	
	Ripple Current	1 = Alarm in progress	BIT 3	
	Cell Temperature	1 = Alarm in progress	BIT 4	
	Cell Resistance	1 = Alarm in progress	BIT 5	
	Reserved	1 = Alarm in progress	BIT 6	
	Reserved	1 = Alarm in progress	BIT 7	
	Reserved	1 = Alarm in progress	BIT 8	
	Digital Input	1 = Alarm in progress	BIT 9	
	Ground Fault	1 = Alarm in progress	BIT 10	
	Ambient Temperature	1 = Alarm in progress	BIT 11	
	Intertier	1 = Alarm in progress	BIT 12	
	Reserved	1 = Alarm in progress	BIT 13 – BIT 15	
Page Registers	Discharge Page Register	Current page of discharge data. Data is accessed one page at a time, 10 records per page starting with page 0.	49501	251CH
	Alarm Page Register	Current page of alarm data. Data is accessed one page at a time, 10 records per page starting with page 0.	49502	251DH

Status Registers (Continued)

Category	Name/Description		Reference	Data Address
Alarm Disable Timer	Discharge Remaining Time of Alarm Disable/Discharge Duration **Note**: While a discharge is in progress this register keeps track of its duration in seconds. At the end of a discharge the register holds the alarm disable time (discharge normalization time) remaining in seconds.	Byte 1/Byte 2	39503	251EH
		Byte 3/Byte 4	39504	251FH
	R-Test Remaining Time of Alarm Disable	Byte 1/Byte 2	39673	25C8H
		Byte 3/Byte 4	39674	25C9H

2.4 Event Details

This section describes the details of alarms, discharge data and resistance test date/time events. For information on the configuration, refer to section 2.5. For additional information on Alarm type formats refer to section 4.1.

Category	Name/Description	Reference	Data Address
Major Alarms *(One page of 1 to 10 records each time. 0FFH is stuffed in all remaining memory spaces After the last record)*	**Actual Alarm number = 10 x Page number + Record number**		
	Alarm Type of record 1 (See section 4.1 for Alarm type formats.)	39505	2520H
	Current Level of record 1		
	Starting Year/Month of record 1		
	Starting Day/Hour of record 1		
	Starting Minute/Second of record 1		
	…		
	Alarm Type of record 10 (See section 4.1 for Alarm type formats.)		
	Current Level of record 10		
	Starting Year/Month of record 10		
	Starting Day/Hour of record 10		
	Starting Minute/Second of record 10		
	…		
		39559	2556H
Category	**Name/Description**	**Reference**	**Data Address**
Minor Alarms *(One page of 1 to 10 records each time. 0FFH is stuffed in all remaining memory spaces After the last record)*	**Actual Alarm number = 10 x Page number + Record number**		
	Alarm Type of record 1 (See section 4.1 for Alarm type formats.)	39043	9882H
	Current Level of record 1		
	Starting Year/Month of record 1		
	Starting Day/Hour of record 1		
	Starting Minute/Second of record 1		
	…		
	Alarm Type of record 10 (See section 4.1 for Alarm type formats.)		
	Current Level of record 10		
	Starting Year/Month of record 10		
	Starting Day/Hour of record 10		
	Starting Minute/Second of record 10		
	…		
		39097	2388H

Event Details (Continued)

Category	Name/Description	Reference	Data Address
Discharge Data	**Actual Discharge number = 10 x Page number + Record number**		
	String Number of Record 1	39560	2557H
(One page of 1 to 10 records each time. 0FFH is stuffed in all remaining memory spaces After the last record)	Lowest OV of Record 1		
	Highest String Current of Record 1		
	Ambient Temperature at End of Record 1		
	Starting Year/Month of Record 1		
	Starting Day/Hour of Record 1		
	Starting Minute/Second of Record 1		
	Ending Year/Month of Record 1	…	…
	Ending Day/Hour of Record 1		
	Ending Minute/Second of Record 1		
	…		
	String Number of Record 10		
	Lowest OV of Record 10		
	Highest String Current of Record 10		
	Ambient Temperature at End of Record 10		
	Starting Year/Month of Record 10		
	Starting Day/Hour of Record 10	…	…
	Starting Minute/Second of Record 10		
	Ending Year/Month of Record 10		
	Ending Day/Hour of Record 10		
	Ending Minute/Second of Record 10		
	…		
		39669	25C4H
Resistance Test Date/Time	Resistance Test Year/Month	39670	25C5H
	Resistance Test Day/Hour	39671	25C6H
	Resistance Test Minute/Second	39672	25C7H

2.5 Configuration

This section describes the details of the thresholds, resistance test interval, firmware commands, site information, and remote password settings. For information on unit information details, refer to section 2.4. For additional information on Alarm type formats refer to section 4.1.

Category	Name/Description	Reference	Data Address
Major Alarm Thresholds (Segmented array) Not recommend for new integration	High Cell Voltage Alarm Threshold	42754	0AC1H
	Low Cell Voltage Alarm Threshold	42722	0AA1H
	High Cell Resistance Alarm Threshold	42946	0B81H
	Low Cell Resistance Alarm Threshold	42914	0B61H
	High intercell Resistance Alarm Threshold	42978	0BA1H
	High Cell Temperature Alarm Threshold	42850	0B21H
	Low Cell Temperature Alarm Threshold	42786	0AE1H
	High Ambient Temperature Alarm Threshold	42466	09A1H
	Low Ambient Temperature Alarm Threshold	42402	0961H
	High Overall Voltage Alarm Threshold	42562	0A01H
	Low Overall Voltage Alarm Threshold	42530	09E1H
	High String Current Alarm Threshold	42594	0A21H
	High Ripple Current Alarm Threshold	42690	0A81H
	High Float Current Alarm Threshold	42658	0A61H
	Low Float Current Alarm Threshold	42626	0A41H
	Cell to Ambient Temperature Deviation Threshold	43106	0C21H
	Cell to Ambient Thermal Runaway Threshold	49711	25EEH
	High Float Current Thermal Runaway Threshold	49712	25EFH
	Discharge Trigger Current Threshold (Not for Alarm, used for discharge detection)	49713	25F0H
	Ground Fault Resistance Positive Threshold (KΩ)*	49705	25E8H
	Ground Fault Resistance Negative Threshold (KΩ)*	49706	25E9H
	Ground Fault Current Threshold (future)	49714	25F1H
	High Positive Charger Cable Resistance Alarm Threshold*	49720	25F7H
	High Negative Charger Cable Resistance Alarm Threshold*	49721	25F8H
	High Intertier Resistance Threshold 1	43010	0BC1H
	High Intertier Resistance Threshold 2	43011	0BC2H
	High Intertier Resistance Threshold 3	43012	0BC3H
	High Intertier Resistance Threshold 4	43013	0BC4H
Major Alarm Thresholds (Sequential array) Only available in UXIM - 1.4.0 UXTM – 1.22.0 and after	High Cell Voltage Alarm Threshold	49134	23ADH
	Low Cell Voltage Alarm Threshold	49135	23AEH
	High Cell Resistance Alarm Threshold	49136	23AFH
	Low Cell Resistance Alarm Threshold	49137	23B0H
	High intercell Resistance Alarm Threshold	49138	23B1H
	High Cell Temperature Alarm Threshold	49139	23B2H
	Low Cell Temperature Alarm Threshold	49140	23B3H
	High Ambient Temperature Alarm Threshold	49141	23B4H
	Low Ambient Temperature Alarm Threshold	49142	23B5H

Configuration (Continued)

Category	Name/Description	Reference	Data Address
	High Overall Voltage Alarm Threshold	49143	23B6H
	Low Overall Voltage Alarm Threshold	49144	23B7H
	High String Current Alarm Threshold	49145	23B8H
	High Ripple Current Alarm Threshold	49146	23B9H
	High Float Current Alarm Threshold	49147	23BAH
	Low Float Current Alarm Threshold	49148	23BBH
	Cell to Ambient Temperature Deviation Threshold	49149	23BCH
	Cell to Ambient Thermal Runaway Threshold	49150	23BDH
	High Float Current Thermal Runaway Threshold	49151	23BEH
	Discharge Trigger Current Threshold (Not for Alarm, used for discharge detection)	49152	23BFH
	Ground Fault Resistance Positive Threshold (KΩ)*	49153	23C0H
	Ground Fault Resistance Negative Threshold (KΩ)*	49154	23C1H
	Ground Fault Current Threshold (future)	49155	23C2H
	High Positive Charger Cable Resistance Alarm Threshold*	49156	23C3H
	High Negative Charger Cable Resistance Alarm Threshold*	49157	23C4H
	High Intertier Resistance Threshold 1	49158	23C5H
	High Intertier Resistance Threshold 2	49159	23C6H
	High Intertier Resistance Threshold 3	49160	23C7H
	High Intertier Resistance Threshold 4	49161	23C8H
Minor Alarm Thresholds	High Cell Voltage Alarm Threshold	49027	2342H
	Low Cell Voltage Alarm Threshold	49028	2343H
	High Cell Resistance Alarm Threshold	49029	2344H
	Low Cell Resistance Alarm Threshold	49030	2345H
	High intercell Resistance Alarm Threshold	49031	2346H
	High Cell Temperature Alarm Threshold	49032	2347H
	Low Cell Temperature Alarm Threshold	49033	2348H
	High Ambient Temperature Alarm Threshold	49034	2349H
	Low Ambient Temperature Alarm Threshold	49035	234AH
	High Overall Voltage Alarm Threshold	49036	234BH
	Low Overall Voltage Alarm Threshold	49037	234CH
	High String Current Alarm Threshold	49038	234DH
	High Ripple Current Alarm Threshold	49039	234EH
	High Float Current Alarm Threshold	49040	234FH
	Low Float Current Alarm Threshold	49041	2350H
	Cell to Ambient Temperature Deviation Threshold	49042	2351H
	Cell to Ambient Thermal Runaway Threshold	49043	2352H
	High Float Current Thermal Runaway Threshold	49044	2353H
	Ground Fault Resistance Positive Threshold (KΩ)*	49045	2354H

Configuration (Continued)

Category	Name/Description		Reference	Data Address
	Ground Fault Resistance Negative Threshold (KΩ)*		49046	2355H
	Ground Fault Current Threshold (future)		49047	2356H
	High Positive Charger Cable Resistance Alarm Threshold*		49048	2357H
	High Negative Charger Cable Resistance Alarm Threshold*		49049	2358H
	High Intertier Resistance Threshold 1		49050	2359H
	High Intertier Resistance Threshold 2		49051	235AH
	High Intertier Resistance Threshold 3		49052	235BH
	High Intertier Resistance Threshold 4		49053	235CH
Intertier Configuration	Intertier 1 Configuration	String # (Byte 1)	49715	25F2H
		Cell # (Byte 2)		
	Intertier 2 Configuration	String # (Byte 1)	49716	25F3H
		Cell # (Byte 2)		
	Intertier 3 Configuration	String # (Byte 1)	49717	25F4H
		Cell # (Byte 2)		
	Intertier 4 Configuration	String # (Byte 1)	49718	25F5H
		Cell # (Byte 2)		
Enables	Ambient Temperature Enable (A value of 0 means all ambient temperature sensors disabled. A value of N means Ambient Temperatures 1 to N are enabled.)		49719	25F6H
Resistance Test Interval	Resistance Test Period (Days)		49694	25DDH
Resistance Alarm Type	BIT0 = 1 Check resistance and intercell alarm using percentage change. = 0 Check resistance and intercell alarm using absolute value.		49062	2365H
Major High Alarm Enable	BIT0 = 1 Enable Cell Voltage BIT1 = 1 Enable String Voltage BIT2 = 1 Enable Float Current BIT3 = 1 Enable Ripple Current BIT4 = 1 Enable Cell Temperature BIT5 = 1 Enable Cell Resistance BIT6 = 1 Enable Intercell BIT7 = 1 Enable Discharge Current BIT8 = 1 Enable Charger Cable Resistance BIT9 = 1 Enable Digital Input BIT10: Reserved BIT11=1 Enable Ambient Temperature BIT12=1 Enable Intertier BIT13=1 Enable Cell to Ambient BIT14=1 Enable Thermal Runaway Cell to Ambient BIT15=1 Enable Thermal Runaway Float current		49063	2366H

Configuration (Continued)

Category	Name/Description	Reference	Data Address
Major Low Alarm Enable	BIT0 = 1 Enable Cell Voltage BIT1 = 1 Enable String Voltage BIT2 = 1 Enable Float Current BIT3 = 1 Enable Ripple Current BIT4 = 1 Enable Cell Temperature BIT5 = 1 Enable Cell Resistance BIT6: Reserved BIT7: Reserved BIT8: Reserved BIT9: Enable Digital Input BIT10 = 1 Enable Ground Fault BIT11=1 Enable Ambient Temperature BIT12=1 Enable Intertier BIT13–BIT15: Reserved	49064	2367H
Minor High Alarm Enable	BIT0 = 1 Enable Cell Voltage BIT1 = 1 Enable String Voltage BIT2 = 1 Enable Float Current BIT3 = 1 Enable Ripple Current BIT4 = 1 Enable Cell Temperature BIT5 = 1 Enable Cell Resistance BIT6 = 1 Enable Intercell BIT7 = 1 Enable Discharge Current BIT8 = 1 Enable Charger Cable Resistance BIT9 = 1 Enable Digital Input BIT10: Reserved BIT11=1 Enable Ambient Temperature BIT12=1 Enable Intertier BIT13=1 Enable Cell to Ambient BIT14=1 Enable Thermal Runaway Cell to Ambient BIT15=1 Enable Thermal Runaway Float current	49065	2368H

Configuration (Continued)

Category	Name/Description	Reference	Data Address
Minor Low Alarm Enable	BIT0 = 1 Enable Cell Voltage BIT1 = 1 Enable String Voltage BIT2 = 1 Enable Float Current BIT3 = 1 Enable Ripple Current BIT4 = 1 Enable Cell Temperature BIT5 = 1 Enable Cell Resistance BIT6: Reserved BIT7: Reserved BIT8: Reserved BIT9 = 1 Enable Digital Input BIT10 = 1 Enable Ground Fault BIT11=1 Enable Ambient Temperature BIT12=1 Enable Intertier BIT13–BIT15: Reserved	49066	2369H
Major High Alarm Latch	BIT0 = 1 Latch Cell Voltage BIT1 = 1 Latch String Voltage BIT2 = 1 Latch Float Current BIT3 = 1 Latch Ripple Current BIT4 = 1 Latch Cell Temperature BIT5 = 1 Latch Cell Resistance BIT6 = 1 Latch Intercell BIT7 = 1 Latch Discharge Current BIT8 = 1 Latch Charger Cable Resistance BIT9 = 1 Latch Digital Input BIT10: Reserved BIT11=1 Latch Ambient Temperature BIT12=1 Latch Intertier BIT13=1 Enable Cell to Ambient BIT14=1 Enable Thermal Runaway Cell to Ambient BIT15=1 Enable Thermal Runaway Float current	49067	236AH

Configuration (Continued)

Category	Name/Description	Reference	Data Address
Major Low Alarm Latch	BIT0 = 1 Latch Cell Voltage BIT1 = 1 Latch String Voltage BIT2 = 1 Latch Float Current BIT3 = 1 Latch Ripple Current BIT4 = 1 Latch Cell Temperature BIT5 = 1 Latch Cell Resistance BIT6: Reserved BIT7: Reserved BIT8: Reserved BIT9: Latch Digital Input BIT10 = 1 Latch Ground Fault BIT11=1 Latch Ambient Temperature BIT12=1 Latch Intertier BIT13–BIT15: Reserved	49068	236BH
Minor High Alarm Latch	BIT0 = 1 Latch Cell Voltage BIT1 = 1 Latch String Voltage BIT2 = 1 Latch Float Current BIT3 = 1 Latch Ripple Current BIT4 = 1 Latch Cell Temperature BIT5 = 1 Latch Cell Resistance BIT6 = 1 Latch Intercell BIT7 = 1 Latch Discharge Current BIT8 = 1 Latch Charger Cable Resistance BIT9 = 1 Latch Digital Input BIT10: Reserved BIT11=1 Latch Ambient Temperature BIT12=1 Latch Intertier BIT13=1 Enable Cell to Ambient BIT14=1 Enable Thermal Runaway Cell to Ambient BIT15=1 Enable Thermal Runaway Float current	49069	236CH

Category	Name/Description	Reference	Data Address
Minor Low Alarm Latch	BIT0 = 1 Latch Cell Voltage BIT1 = 1 Latch String Voltage BIT2 = 1 Latch Float Current BIT3 = 1 Latch Ripple Current BIT4 = 1 Latch Cell Temperature BIT5 = 1 Latch Cell Resistance BIT6: Reserved BIT7: Reserved BIT8: Reserved BIT9 = 1 Latch Digital Input BIT10 = 1 Latch Ground Fault BIT11=1 Latch Ambient Temperature BIT12=1 Latch Intertier BIT13–BIT15: Reserved	49070	236DH

*UXIM only

Configuration (Continued)

Category	Name/Description		Reference	Data Address
	Firmware Control Register		43490	0DA1H
Firmware Commands	**Function**	**Value**		
	Start Resistance Test	0000H		
	Stop Resistance Test	0001H		
	Alarm Reset	0002H		
	Delete Discharge Data	0003H		
	Alarm Acknowledge	0004H		
Site Information *(Null terminated strings or maximum length)*	Location Name	Byte 1/Byte 2	49673	25C8H
	…		…	…
	Location Name	Byte 19/Byte 20	49682	25D1H
	Battery Name	Byte 1/Byte 2	40386	0181H
	…		…	…
	Battery Name	Byte 41/Byte 42	40406	0195H
	String Name1	Byte 1/Byte 2	41250	04E1H
	…		…	…
	String Name1	Byte 41/Byte 42	41270	04F5H
	String Name2	Byte 1/Byte 2	41271	04F6H
	…	…	…	
	String Name2	Byte 41/Byte 42	41291	050AH
	String Name3	Byte 1/Byte 2	41292	050BH
	…	…	…	
	String Name3	Byte 41/Byte 42	41312	051FH
	String Name4	Byte 1/Byte 2	41313	0520H
	…	…	…	
	String Name4	Byte 41/Byte 42	41333	0534H
	String Name5	Byte 1/Byte 2	41334	0535H
	…	…	…	
	String Name5	Byte 41/Byte 42	41354	0549H
	String Name6	Byte 1/Byte 2	41355	054AH
	…	…	…	
	String Name6	Byte 41/Byte 42	41375	055EH
	String Name7	Byte 1/Byte 2	41376	055FH
	…	…	…	
	String Name7	Byte 41/Byte 42	41396	0573H
	String Name8	Byte 1/Byte 2	41397	0574H
	…	…	…	
	String Name8	Byte 41/Byte 42	41417	0588H
	String Name9	Byte 1/Byte 2	41418	0589H
	…	…	…	
	String Name9	Byte 41/Byte 42	41438	059DH
	String Name10	Byte 1/Byte 2	41439	059EH

Category	Name/Description		Reference	Data Address
	…	…	…	
	String Name10	Byte 41/Byte 42	41459	05B2H
	String Name11	Byte 1/Byte 2	41460	05B3H
	…	…	…	
	String Name12	Byte 41/Byte 42	41480	05C7H
Digital Input Alarm Configuration	Digital Input Major Alarm Latch • D0 = 1 Latch Digital Input 1 • D1 = 1 Latch Digital Input 2 • D2 = 1 Latch Digital Input 3 • D3 – D15: Reserved		49082	2379H
	Digital Input Minor Alarm Latch • D0 = 1 Latch Digital Input 1 • D1 = 1 Latch Digital Input 2 • D2 = 1 Latch Digital Input 3 • D3 – D15: Reserved		49083	237AH
	Digital Input Major Alarm Selection • D0 = 1 Enable Digital Input 1 • D1 = 1 Enable Digital Input 2 • D2 = 1 Enable Digital Input 3 • D3 – D15: Reserved		49084	237BH
	Digital Input Minor Alarm Selection • D0 = 1 Enable Digital Input 1 • D1 = 1 Enable Digital Input 2 • D2 = 1 Enable Digital Input 3 • D3 – D15: Reserved		49085	237CH

Category	Name/Description		Reference	Data Address
	Digital Input Open/Close 1: Normal Open 0: Normal Close • D0: Digital Input 1 • D1: Digital Input 2 • D2: Digital Input 3 • D3 – D15: Reserved		49086	237DH
Digital Input Name	Digital Input Name1	Byte 1/Byte 2	49087	237EH
	…			
	Digital Input Name1	Byte 19/Byte 20	49096	2387H
	Digital Input Name2	Byte 1/Byte 2	49097	2388H
	…			
	Digital Input Name2	Byte 19/Byte 20	49106	2391H
	Digital Input Name3	Byte 1/Byte 2	49107	2392H
	…			
	Digital Input Name3	Byte 19/Byte 20	49116	239BH
	String Name13	Byte 1/Byte 2	41481	05C8H
	…	…	…	
	String Name13	Byte 41/Byte 42	41501	05DCH
	String Name14	Byte 1/Byte 2	41502	05DDH
	…	…	…	
	String Name14	Byte 41/Byte 42	41522	05F1H
	String Name15	Byte 1/Byte 2	41523	05F2H
	…	…	…	
	String Name15	Byte 41/Byte 42	41543	0606H
	String Name16	Byte 1/Byte 2	41544	0607H
	…	…	…	
	String Name16	Byte 41/Byte 42	41564	061BH
Remote Password *(Null terminated or maximum length)*	Password 1	Byte 1/Byte 2	49683	25D2H
	Password 1	Byte 3/Byte 4	49684	25D3H
	Password 1	Byte 5/ Byte 6	49685	25D4H

2.6 Unit Information

This section describes the details of the unit settings. For additional information on PCB version/revision format refer to section 4.2.

Category	Name/Description	Reference	Data Address
Unit Settings	Model Number (ASCII)	39686	25D5
		…	…
		39689	25D8
	Serial Number (ASCII)	39690	25D9
		…	…
		39699	25E2
	Firmware Version (ASCII)	39700	25E3
		…	…
		39703	25E6
	PCB Version (See section 4.2 for PCB version/revision format.)	39704	25E7
	Installation Date: Year/Day	43170	0C61H
	Install Date ____/Month	43171	0C62H
	System Configuration (Reference Section 3.2)	49690	25D9H
	System Time: Year/Month	49691	25DAH
	System Time: Day/Hour	49692	25DBH
	System Time: Minute/Second	49693	25DCH

3 Using the Commands

In the communication frames, only integer numbers can be transmitted. Transformation between integer numbers and decimal numbers is necessary when the computer receives and sends data.

3.1 Data Transformation

This section describes the details of the data transformation which is used for the following specific parameters.

Parameters	Transformation	
	Before Send	**After Receive**
Overall voltage (VDC)		/100
Cell voltage (VDC)		/1000
String current (A DC)		/1
Float current (mA DC)		/1
Ground Fault current (mA DC)		/1

Parameters	Transformation	
	Before Send	**After Receive**
Internal resistance (μΩ)		/1
Intercell resistance (μΩ)		/1
Ground Fault resistance (Ω)*		/1
Temperature (deg C)		/1024
Threshold of overall voltage (VDC)	X 100	/100
Threshold of cell voltage (VDC)	X 1000	/1000
Threshold of String current (A DC)	X 1	/1
Threshold of float current (mA DC)	X 1	/1
Threshold of internal resistance (μΩ)	X 1	/1
Threshold of intercell resistance (μΩ)	X 1	/1
Threshold of Ground Fault resistance (KΩ)*	X 1	/1
Threshold of temperature (deg C)	X 1024	/1024
Discharge level in current mode (A DC)	X1	/1

*UXIM only

3.2 System Configurations

This section describes the details of the system configuration types.

Technology	Battery/String configuration (number of strings X number of data points X Nominal voltage of data point)	Configuration Number
1V – NiCad Cells (24V)	1X18X1V	0
2V Cells (24V)	1X12X2V	1
2V Cells (24V)	2X12X2V	2
2V Cells (48V)	1X24X2V	3
4V Mono-Blocks (24V)	1X6X4V	4
	2X6X4V	5
	3X6X4V	6
	4X6X4V	7
4V Mono-Blocks (48V)	1X12X4V	8
	2X12X4V	9
6V Mono-Blocks (24V)	1X4X6V	10
	2X4X6V	11
	3X4X6V	12
	4X4X6V	13
6V Mono-Blocks (48V)	1X8X6V	14
	2X8X6V	15
	3X8X6V	16
8V Mono-Blocks (24V)	1X3X8V	17
	2X3X8V	18
	3X3X8V	19
	4X3X8V	20

System Configurations (Continued)

Technology	Battery/String configuration (number of strings X number of data points X Nominal voltage of data point)	Configuration Number
8V Mono-Blocks (48V)	1X6X8V	21
	2X6X8V	22
	3X6X8V	23
	4X6X8V	24
12V Mono-Blocks (24V)	1X2X12V	25
	2X2X12V	26
	3X2X12V	27
	4X2X12V	28
12V Mono-Blocks (48V)	1X4X12V	29
	2X4X12V	30
	3X4X12V	31
	4X4X12V	32
16V Mono-Blocks (48V)	1X3X16V	33
	2X3X16V	34
	3X3X16V	35
	4X3X16V	36

4 Alarm Type and PCB Revision/Version Format Appendix

This section describes the details of the alarm type, and PCB revision format settings.

4.1 Alarm Type Format

Data BIT Location and Meaning															
D15	D14	D13	D12	D11		D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Parameter				Alarm Status		String number (0 – 15)				Cell number (0 – 127); For Battery System Ground Fault Resistance: 0 = Positive, 1 = Negative						

Parameter Name	Value
Cell voltage	0
Cell temperature	1
Cell resistance	2
Cell intercell	3
Overall voltage	4
String current	5
Float current	6
Ripple current	7
Ambient temperature	8
Cell to ambient	9
Intertier	10
Cell to ambient thermal runaway	11
High float current thermal runaway	12
Ground fault	13
Charger Cable resistance	14
Digital Input	15

Alarm Status	
State	Value
High alarm	1
Low alarm	0

4.2 PCB version/revision format

	Data BIT Location and Meaning							
	Base revision				Sub revision			
	D7	D6	D5	D4	D3	D2	D1	D0
Value	0 – 'A' 1 – 'B' 2 – 'C' 3 – 'D' 4 – 'E' 5 – 'F' 6 – 'G' 7 – 'H'				0 - 15			