

Data-Driven Battery Maintenance

Summary

Alarm thresholds are set at different layers. Each layer is independent.

Layer	Device and Interface	Alarm indication and output	Notes
1	Monitoring Unit	LEDs on the unit Modbus-RTU HMI	<p>A normal operating battery should not have any alarm.</p> <p>The alarm threshold shall be set to the correct range so it can catch abnormal condition such voltage, temperature, internal resistance, and connection resistance.</p> <p>Internal resistance range is absolute value, not percentage. This threshold can be wider than the settings on DTU and Analyzer to catch extreme situations such as battery failure.</p> <p>For example, the average IR is 450 micro-ohm, the threshold can be set to HIGH 600, LOW 300.</p> <p>With HMI, to check if any alarm, what the alarm is, make a record of the threshold settings.</p>
2	DTU	Web page, Modbus-TCP	<p>On DTU settings page, monitor code, the last digital is for the battery alarm type.</p> <p>If set to 0, there is no alarm process for DTU. Modbus-TCP digital I/O alarm signal is from monitoring unit.</p> <p>If set to a certain type, it will generate an alarm, and the alarm can be fetched by Modbus-TCP. Refer to register table for details.</p>
3	Master-800	Web page, email alert	<p>Alarm settings are classified up to 8 types of batteries.</p> <p>The alarm type shall match the column "AlarmType" on Banks.csv.</p> <p>Web page //AlarmSettings.htm</p> <p>Adjust threshold for each type and make sure they are in a reasonable range.</p>
4	Analyzer Software	PC software, email alert	<p>Analyzer software gets data from DTU. The alarm settings shall be adjusted on PC software, not the monitoring unit.</p>

Alarm Settings for Sentry Unit(s)

The purpose of alarm settings for BMS units is to catch abnormal conditions. It can be adjusted with the HMI touch screen.

Parameters	Default Low Value	Default High Value	Note
Cell Voltage Abnormal	2150 [2.150V]	2450 [2.450V]	
Cell IR Threshold (Absolute setting with HMI to Sentry)	50	1990	Must change to match actual IR value. Examples: 1) VRLA, average IR 500 uohm, set the range to 50% as 250 to 750. 2) Vented/Flooded cells, average 500 uohm, set the range to 30% as 350 to 650.
Cell IR Abnormal (Percentage setting to PC software)	N/A	30	Recommendations: 50% for VRLA 30% for Vented/Flooded cells
Connection Resistance High		50	Must change to match the actual battery connections. Example: if the inter-tier has 150 uohm connection resistance, set the up limit to 200.
Bus Voltage Abnormal	1290	1470	
Discharge Current	N/A		
Charge Current	N/A		
Temperature Alarm	N/A	500	50.0 C

Check Alarm Settings

Alarm settings on Sentry unit can be read out remotely via DTU-800.

[To secure safe operation, alarm settings are remotely **Read Only**. Cannot be changed remotely. Can only be adjusted with HMI tool in-person.]



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#	Description	Unit#1	Unit#2	Unit#3	Unit#4	Unit#5	Unit#6	Unit#7	Unit#8
1	String Voltage High (x0.1V)	1	1	1	1	1	1	1	1
2	String Voltage Low (x0.1V)	1	1	1	1	1	1	1	1
3	String Discharge Low (x0.1V)	1	1	1	1	1	1	1	1
4	Cell Voltage High (mV)	1	1	1	1	1	1	1	1
5	Cell Voltage Low (mV)	1	1	1	1	1	1	1	1
6	Cell Discharge Low (mV)	1	1	1	1	1	1	1	1
7	Cell IR High	1	1	1	1	1	1	1	1
8	Cell IR Low	1	1	1	1	1	1	1	1
9	Cell CR High	1	1	1	1	1	1	1	1
10	Temperature High (x0.1°C)	1	1	1	1	1	1	1	1
11	Inter-cell Voltage Drop	1	1	1	1	1	1	1	1
12	Battery Capacity	1	1	1	1	1	1	1	1
13	Mode Setting	1	1	1	1	1	1	1	1
21	Voltage Gain	1	1	1	1	1	1	1	1
22	IR Gain	1	1	1	1	1	1	1	1
23	CT1 Gain	1	1	1	1	1	1	1	1
24	CT1 Offset	1	1	1	1	1	1	1	1
25	Ripple Gain	1	1	1	1	1	1	1	1
26	Ripple Offset	1	1	1	1	1	1	1	1
27	TS0 Offset	1	1	1	1	1	1	1	1
28	TS1 Offset	1	1	1	1	1	1	1	1
29	TS2 Offset	1	1	1	1	1	1	1	1

Alarm threshold(s) and calibration value(s) in Sentry units can only be changed locally with HMI

#	Description	Unit#1	Unit#2	Unit#3
1	String Voltage High (x0.1V)	1470	1	1
2	String Voltage Low (x0.1V)	1290	1	1
3	String Discharge Low (x0.1V)	1080	1	1
4	Cell Voltage High (mV)	2450	1	1
5	Cell Voltage Low (mV)	2150	1	1
6	Cell Discharge Low (mV)	1800	1	1
7	Cell IR High	1990	1	1
8	Cell IR Low	50	1	1
9	Cell CR High	50	1	1
10	Temperature High (x0.1°C)	500	1	1
11	Inter-cell Voltage Drop	30	1	1
12	Battery Capacity	-1	1	1
13	Mode Setting	1520	1	1
21	Voltage Gain	2155	1	1
22	IR Gain	260	1	1
23	CT1 Gain	10000	1	1
24	CT1 Offset	-1	1	1
25	Ripple Gain	10000	1	1
26	Ripple Offset	-1	1	1
27	TS0 Offset	-1	1	1
28	TS1 Offset	-1	1	1
29	TS2 Offset	-1	1	1

Alarm Settings for DTU

DTU has its data analysis function which takes thresholds set on “DTU Alarm Settings” page, not from the monitoring unit.

Each DTU unit can work with 3 different types of batteries. Set the last number to type.

	Type-1	Type-2	Type-3
Battery Type	125VDC with NiCad cells	125VDC with lead acid cells	48VDC with lead acid cells

11	Monitor 1 Code	1,2,60,20,11,0,0,1	1,2,60,20,11,0,0,2
-	Battery Bank 1	Bank-1-1	Bank-1-1

Monitor Code Example: (1,2,60,20,10,0,0,2) [Help](#)

1	2	3	4	5	6	7	8
1	2	60	20	11	0	0	0
Address	Wire-Mode 2	60 cells	Nominal 2.0V	10: Independent Monitor 11: 12 (2 units for one string)	Standby	No cell T	Alarm Type-2

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#	Description	Type-1	New Value	Type-2	New Value	Type-3	New Value
1	String Voltage High (x0.1V)	1410	<input type="text" value="1410"/>	1365	<input type="text" value="1365"/>	540	<input type="text" value="540"/>
2	String Voltage Low	1260	<input type="text" value="1260"/>	1218	<input type="text" value="1218"/>	483	<input type="text" value="483"/>
3	String Discharge Low	1110	<input type="text" value="1110"/>	1073	<input type="text" value="1073"/>	425	<input type="text" value="425"/>
4	Cell Voltage High (mV)	1500	<input type="text" value="1500"/>	2350	<input type="text" value="2350"/>	2350	<input type="text" value="2350"/>
5	Cell Voltage Low	1350	<input type="text" value="1350"/>	2100	<input type="text" value="2100"/>	2100	<input type="text" value="2100"/>
6	Cell Discharge Low	1100	<input type="text" value="1100"/>	1850	<input type="text" value="1850"/>	1850	<input type="text" value="1850"/>
7	Cell IR Percentage(%)	30	<input type="text" value="30"/>	30	<input type="text" value="30"/>	30	<input type="text" value="30"/>
8	Cell IR Low	50	<input type="text" value="50"/>	50	<input type="text" value="50"/>	50	<input type="text" value="50"/>
9	Cell CR High	100	<input type="text" value="100"/>	100	<input type="text" value="100"/>	100	<input type="text" value="100"/>
10	Inter-tier CR High	200	<input type="text" value="200"/>	200	<input type="text" value="200"/>	200	<input type="text" value="200"/>
11	Inter-tier Number	3	<input type="text" value="3"/>	3	<input type="text" value="3"/>	3	<input type="text" value="3"/>
12	CR change (uohm above Baseline)	0	<input type="text" value="0"/>	0	<input type="text" value="0"/>	0	<input type="text" value="0"/>
13	Temperature High (°C)	50	<input type="text" value="50"/>	50	<input type="text" value="50"/>	50	<input type="text" value="50"/>
14	Temperature Low	5	<input type="text" value="5"/>	5	<input type="text" value="5"/>	5	<input type="text" value="5"/>
15	Thermal Risk High	50	<input type="text" value="50"/>	50	<input type="text" value="50"/>	50	<input type="text" value="50"/>
16	SOH Low (%)	60	<input type="text" value="60"/>	60	<input type="text" value="60"/>	60	<input type="text" value="60"/>
17	SOC Low (%)	20	<input type="text" value="20"/>	20	<input type="text" value="20"/>	20	<input type="text" value="20"/>

Recommended Settings for 60x2V flooded cells

#	Name	Setting	Value	Description
1	String Voltage High	1410	141.0V	2.35V average per cell
2	String Voltage Low	1290	129.0V	2.15V average per cell
3	String Discharge Low	1080	108.0V	1.80V average per cell
4	Cell Voltage High	2350	2.350V	Float charge high voltage
5	Cell Voltage Low	2100	2.100V	Float charge low voltage
6	Cell Discharge Low	1650	1.650V	Generate low voltage alert during discharge
7	Cell IR Percentage	30	30%	Percentage above average or baseline depending on DTU settings.
8	Cell IR Low	50	50 uohm	This value is set to detect abnormal IR measurement. Or it can be set to half of the average IR value.
9	Cell CR High	100	100 uohm	Inter-cell connection (not for inter-tier). For high-capacity batteries, this value can go as low as 2x maximum of actual readout for normal/good connection, such as 50 uohm.
10	Inter-tier CR High	500	500 uohm	Connection resistance for the longest inter-tier cable
11	Inter-tier Number	3	3 inter-tiers	Number of long inter-tier cables
12	CR change	50	50 uohm	Change to recorded baseline
13	Temperature High	38	38 Celsius	This is Celsius
14	Temperature Low	15	15 Celsius	
15	Thermal Risk High	50	50	Calculated thermal risk value
16	SOH Low (%)	0	N/A	Only available for Telco models
17	SOC Low (%)	0	N/A	Only available for Telco models

Alarm Settings for Dashboard

Instead of settings alarms for each battery bank, dashboard utilizes a "TYPE" to categorize battery banks. Each type will have its own alarm threshold settings.

IR baseline (reference value) can be set for each individual battery bank in banks.csv.

For example, a utility company may have 2V Vented, 4V vented, 2V VRLA, 12V VRLA, 1.2V NiCad etc.

If you have more than 8 types, we recommend you install an additional dashboard.

Master-800-1 Dashboard

Server Settings | **Alarm Settings** | [SNMP Settings](#)

[Server Settings](#) | [Alarm Settings](#) | [SNMP Settings](#) | [Download Banks.csv](#)

Set alarm threshold for each Battery Type

Type	NominalVol.	Vol.High	Vol.Low	DischargeLow	IR High(%)	Temperature	ThermalRisk	SOH	SOC	Modify Value Here(comma separated)
1	1200	1500	1350	1100	30	45	80	80	20	1200,1500,1350,1100,30,45,80,80,20
2	2000	2350	2150	1850	30	45	80	80	20	2000,2350,2150,1850,30,45,80,80,20
3	2000	2350	2100	1800	50	45	80	70	20	2000,2350,2100,1800,50,45,80,70,20
4	6000	7050	6300	5400	50	45	80	80	20	6000,7050,6300,5400,50,45,80,80,20
5	6000	7050	6300	5400	50	45	80	80	20	6000,7050,6300,5400,50,45,80,80,20
6	12000	14700	12900	10800	50	45	80	80	20	12000,14700,12900,10800,50,45,80,80,20
7	12000	15000	12500	10800	50	45	80	80	20	12000,15000,12500,10800,50,45,80,80,20
8	16000	19300	17200	14400	50	45	80	80	20	16000,19300,17200,14400,50,45,80,80,20

```
:: Alarm Thresholds are set for Battery Type 1 to 8 to match "BatteryType" in "Bank.csv".  
:: Type 1 default 1.2V [1200] NiCad  
:: Type 2 default 2V [2000] Wet Cell  
:: Type 3 default 2V [2000] VRLA Cell  
:: Type 4 default 6V [6000] Battery A  
:: Type 5 default 6V [6000] Battery B  
:: Type 6 default 12V [12000] Battery A  
:: Type 7 default 12V [12000] Battery B  
:: Type 8 default 16V [16000] Battery  
:: Voltage value in mV for each battery. IR is percentage above average.  
:: Temperature in Celcius degree. Thermal Risk default 80.  
:: SOH/SOC 10 to 100 (Telecom Models only).
```

Enter Password:

Only authorized person can make changes.Click "Update" to send a data packet.

Alarm Evaluation and Handling

Alarm(s) will be triggered for a variety of reasons, some are from battery conditions, some may come from wrong settings.

If there is an alarm, there must be a cause.

By visualizing data, it is easy to spot deteriorated battery or connection problems.

Disclaimer: This chapter serves as a reference guide only. Each utility company adheres to its unique maintenance practices. To ensure correct and reliable alarm settings and efficient battery maintenance, please contact BatteryDAQ to review your settings and procedures.

