

Q/SZQY Growatt New Energy Co., Ltd. Corporate Standard

Q/SZQY—20001—2017

RS485 communication protocol between energy storage device and battery PACK

Growatt xxSxxP ESS Protocol

Rev.	Change	Author
Temp Initial	release.	Wei Wei
1.01	2014/7/18: Update Voltage Record address by David Chou 2014/8/19: Add	Wei Wei
1.03	interpretation of error code	Wei Wei
1.04	2014/10/6: Add new definition for status bits and error code	Wei Wei
1.06	2014/12/8: Change definition of Addr. 0x0019 2015/1/27:	Wei Wei
1.07	Add content to event log 2015/2/4: Add content	Wei Wei
1.08	to event log 2015/4/10: Change the definition	Wei Wei
1.09	of event log to maximum the external EEPROM usage (By Jeff Ho)	Wei Wei
1.10	2016/3/18:Added SOH Address 0x0020 and Modified Addr 0x001C 0x001D (By Enoch Chang)	Wei Wei
1.11	2016/3/24: Added error code bit10 for unbalance ,status bit8 for Master box parallel control (By Enoch Chang)	Wei Wei
1.12	2016/6/2: Modify the spec query & status query command to meet the F/W code setting (By Jeff Ho)	Wei Wei
1.13	2016/7/20:Modify addr 0x000F to Using Cap, Modify Status bits 8:11 for master box using(By Enoch Chang)	Wei Wei
1.14	2016/12/14: Added charging overcurrent protection flag, MOS, high and low temperature protection flag, Wei Wei	
1.15	2016/12/23 Added alarm flag function and CV voltage, Wei Wei	
1.16	2017/01/16 Added SOH parsing instructions, PACK software/hardware version number instructions (YW /SN/FW), Wei Wei	
1.17	2017/02/08 Definition of BMS/PACK manufacturers and versions for register addresses 0x000D and 0x000E, Wei Wei	
1.18	2017/08/21 Added BMS and PACK number of xx. Wei Wei	
1.19	Redefine the protocol for reporting 2 groups of battery information after Box is connected in parallel, add 0x0023, 0x0024, 0x0070 three groups of xx Content,	Wei Wei
1.20	Added the definition of whether the Box of 0x001F is online, 1.21 Modified the	Wei Wei
	meaning of 0x0031~0x0052, 1.22 Added 0x001F as xx battery ID	Wei Wei
	identification, and the red annotation is xx modified definition, xx reports multiple groups of batteries in parallel The battery information method reuses the same set of registers by distinguishing the battery ID;	Wei Wei
1.23	2018/08/25 Add a discharge lower limit flag (forced charge flag) 2018/11/30 Preset Multiple	Wei Wei
1.24	Registers (0x10) Handshake instruction format description: 01 10 00 13 00 01 02 00 00 CRCLo CRCHi.	Wang Min
2.01	2019/02/13 Based on the V2.43 battery software version, the highest and lowest voltage reports of single cells are added. 0x0025~0x0028 Add battery ID description 2019/03/25 Based on the V2.43 battery software version, add the number of module monomers 0x0029	Demon
2.02	2019/7/24 Added registers 0x0100-0x0161 and defined the register contents	Mao Zhimin

0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA, 0xEE, 0x2E, 0x2F, 0xEF,
0x2D, 0xED, 0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,
0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60, 0x61, 0xA1,
0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4,
0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F, 0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB,
0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA,
0xBE, 0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,
0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0,
0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97,
0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C, 0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E,
0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88, 0x48, 0x49, 0x89,
0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,
0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83,
0x41, 0x81, 0x80, 0x40

};

3 Communication Parameters

Baud Rate:9600(Default)

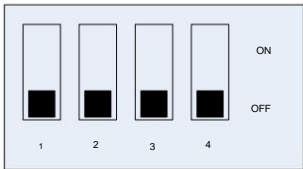
Parity Bit: No

Data Bits: 8

Stop Bit :1

Timeout: 200ms

BMS Module ID:



NO.	Module Address	BMS Module ID	ID Arrangement			
			1#	2#	3#	4#
1	0x00	0	OFF	OFF	OFF	OFF
2	0x01	1	ON	OFF	OFF	OFF
3	0x02	2	OFF	ON	OFF	OFF
4	0x03	3	ON	ON	OFF	OFF
5	0x04	4	OFF	OFF	ON	OFF
6	0x05	5	ON	OFF	ON	OFF
7	0x06	6	OFF	ON	ON	OFF
8	0x07	7	ON	ON	ON	OFF
9	0x08	8	OFF	OFF	OFF	ON
10	0x09	9	ON	OFF	OFF	ON
11	0x0A	10	OFF	ON	OFF	ON
12	0x0B	11	ON	ON	OFF	ON
13	0x0C	12	OFF	OFF	ON	ON
14	0x0D	13	ON	OFF	ON	ON

15	0x0E	14	OFF	ON	ON	ON
16	0x0F	15	ON	ON	ON	ON

4 Modbus Function Format

4.1 Packet Format (Function Code:0x10)

Preset

Slave Address	Function Code (0x10)	Starting Address (Hi)	Starting Address (Lt)	No. of Data (Hi)	No. of Data (Lt)	Byte Count	Data1 (Hi)
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Data1 (Lt)	Data2 (Hi)	Data2 (Lt)	...	Data N (Hi)	Data N (Lt)	CRC16 (Lt)	CRC16 (Hi)
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Response by slave (Write success)

Slave Address	Function Code (0x10)	Starting Address (Hi)	Starting Address (Lt)	No. of register (Hi)	No. of register (Lt)	CRC16 (Lt)	CRC16 (Hi)
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4.2 Description

	Description
Slave Address	8-bit value representing the slave being addressed (1 to 247), 0, is reserved for the broadcast address. The SPR and Integra products do not support the broadcast address. 01 is Box Report stand-alone and parallel battery address.
Function Code	8-bit value telling the addressed slave what action is to be performed. Preset Multiple Registers (0x10).*
Starting Address (Hi)	The top (most significant) eight bits of a 16-bit number specifying the start address of the data being requested.
Starting Address (Lo)	The bottom (least significant) eight bits of a 16-bit number specifying the start address of the data being requested.
No. of Data (Hi)	The top (most significant) eight bits of a 16-bit number specifying the number of registers being requested.
No. of Data (Lo)	The bottom (least significant) eight bits of a 16-bit number specifying the number of registers being requested.
Byte Count	The bytes count of registers being requested.
Date (Hi)	The top (most significant) eight bits of a 16-bit number representing the register(s) requested in the query.

Date (The)	The bottom (least significant) eight bits of a 16-bit number representing the register(s) requested in the query.
CRC16 (Lo)	The bottom (least significant) eight bits of a 16-bit number representing the error check value.
CRC16 (Hi)	The top (most significant) eight bits of a 16-bit number representing the error check value.

*Preset Multiple Registers (0x10) : 01 10 00 13 00 01 02 0C 00 CRCL CRCH.(example)

5 Function Codes

5.1 AP queries Battery Info. (Function Code:0x03)

Query

Slave Address	Function Code	Starting Address (Hi)	Starting Address (It)	No. of Data (Hi)	No. of Data (It)	CRC16 (It)	CRC16 (Hi)
0xXX	0x03	0x0X	0xXX	0x00	N		

Response

Slave Address	Function Code	Byte Count	Data1 (Hi)	Data1 (It)	Data2 (Hi)	Data2 (It)	...
0xXX	0x03	2N	...	...	...	...	...

Data N (Hi)	Data N (It)	CRC16 (It)	CRC16 (Hi)
...	...		

5.2 Read Holding Register 0x03

Spec Query

Address	Content	Comment
0x0001	MCU Software version	First byte (MCU FW Version) Second byte (MCU FW sub Version)
0x0002	Gauge Version	First byte (Gauge Version) Second byte (Gauge sub Version)
0x0003	Gauge FR Version	Gauge FR Version (It)
0x0004		Gauge FR Version (Hi)
0x0005	Date & Time	See 'Date & Time bits' Table below
0x0006		All first byte set to '0'
0x0007		Second byte is the Date & Time data

0x0008		
0x0009	Bar Code	Bar Code 1~4 bytes
0x000A		
0x000B	Bar Code	Bar Code 5~6 bytes
0x000C	Bar Code	Bar Code 7~8 bytes
0x000D	<ul style="list-style-type: none"> different BMS Company • Company Code • (Lo) See "Company bits" Table below 	
0x000E	<ul style="list-style-type: none"> different Batter PACK Company • (Hi) See "Company bits" Table below 	
0x000F	Using Cap	5KW 3700WH /2.7KW 2000WH

'Date & Time bits' Table

Bit Index	Content	Comment
0 ~ 5	Second	0~59
6 ~ 11	Minute	0~59
12 ~ 16	Hour	0~23
17 ~ 21	Day	1~31
22 ~ 25	Month	1~12
26 ~ 31	Year	2000~2063

'Company bits' Table

	Bit Index	Content	Comment
0x000D	0	BMS company	00000000 : xx
	1		00000001 : xx
	2		00000010 : xx
	3		00000011 xx
	4		00000100 xx
	5		
	6		
	7		
	8	BMS Ver.	00000001: first generation
	9		00000002: second generation
	10		.....
	11		
	12		
	13		
	14		
	15		
	Bit Index	Content	Comment

0x000E	0	PACK company	000000000 : xx
	1		000000001 : EVE
	2		000000010 : xx
	3		000000011 xx
	4		000000100
	5		
	6		
	7		
	8	PACK Ver	000000001: first generation
	9		000000002: second generation
	10		
	11		
	12		
	13		
	14		
	15		

Selectively identify the contents of 0x0014 based on the BMS manufacturer information in register 0x000D.

Status Query

Address	Content	Comment	Unit
0x0010	Gauge IC current		10mA
0x0011	Date & Time	It (See Table below)	
0x0012		Hi (See Table below)	
0x0013	Status	First byte set to '0' See Box information	
0x0014	Error	Error code See Box information	
0x0015	SOC	First byte set to '0' 0~100 See Box information	%
0x0016	Voltage	Total pressure See Box information	10 mV
0x0017	Current	Current See Current explain	10 mA
0x0018	Temperature	-127~127	°C
0x0019	Max. charge/(discharge) current	Charger/(Discharger), must use this value to limit charge/(discharge) current.	

0x001A	Gauge RM	Remaining	10mAh
0x001B	Gauge FCC	capacity Rated capacity	10mAh
0x001C	IS/FW	"YW / FW" Table below	
0x001D	Delta	Cell voltage	V
0x001E	Cycle Count		
0x001F	RSVD For Master Box	See Box Number information	
0x0020	SOH	Bit 0~ Bit6 SOH Counters Bit7:SOH Flag	
0x0021	CV Voltage	(CV Voltage List)	10mV
0x0022	Warning	Bit 0~ Bit13 Warning code, Bit 14~Bit15 Battery type,	
0x0023	Max. discharge current	Discharger, must use this value to limit discharge current. (positive value)	10 mA
0x0024	Extended Error	See xx Extended Error code	
0x0025	Maximum cell voltage		1 mV
0x0026	Minimum cell voltage		1 mV
0x0027	Maximum cell voltage number		1
0x0028	Minimum cell voltage number		1
0x0029	Cell Series	Cell series of single module	/
0x002A	.....	.....	.....
0x002B	.....	.....	.....
0x002C	.....	.....	.....
0x002D	.....	.....	.....
0x002E	.....	.....	.....
0x002F	.....	.....	.....
0x0030			

Date & Time bits

Bit Index	Content	Comment
0~5	Second	0~59
6~11	Minute	0~59
12~16	Hour	0~23
17~21	Day	1~31
22~25	Month	1~12
26~31	Year	2000~2063

Status bits

Bit Index	Content	Comment
0	status	00 : soft_starting
1		01 : stand by 10 : charging 11 : discharging
2	Error bit flag	1 : "Error" byte valid 0 : "Error" byte Invalid
3	Cell balance PF status	0 : unbalance PF 1 : balance
4	Sleep status	0 : disable 1 : enable
5	Output Discharge status	0 : disable 1 : enable
6	Output Charge status	0 : disable 1 : enable
7	Battery terminal status	0 : terminal connected 1 : terminal open
8	Master box Operation Mode 00: Single machine	01: Parallel
9		10: Parallel preparation
10	SP Status	00:none
11		01 : stand by 10 : charging 11 : discharging
12	Request force charge	0 : disable 1 : enable

Note : Sleep status bit enable 5s later, Battery power off

Bit 12 is designed for inverter doesn't want battery to shut down, able to charge battery before shut down to avoid low energy. In this case, inverter itself should set a threshold of SOC: after force charge, only when battery SOC is higher than this threshold then inverter will allow discharge, to avoid force charge and discharge status change frequently.

Error code

Address	Content (binary)	Description	Recovery Mechanism
	Bit 0	OCD(Over Current Discharge) protection	(Unloading(1)) && (charging || DG_ON command)
	Bit 1	SCD(Short Circuit Discharge) protection	(Unloading(1))&& (charging || DG_ON command)
	Bit 2	OV (Over Voltage)protection	(Stop charging) && (discharging)
	Bit 3	UV (Under	(Unloading(1)) && (charging)

0x0014		Voltage)protection	
	Bit 4	OTD(Over Temperature Discharge) protection	(Unloading(1)) && (temperature turn down to 60ÿ)
	Bit 5	OTC (Over Temperature Charge)protection	(Stop charging) || (temperature turn down to 50ÿ)
	Bit 6	UTD (Under Temperature Discharge)protection	(Unloading(1)) && (temperature raise to -10ÿ)
	Bit 7	UTC (Under Temperature Charge)protection	(Stop charging) || (temperature raise to 0ÿ)
	Bit 8	Soft start fail	0 : disable 1 : enable
	Bit 9	Permanent Fault	0 : disable 1 : enable
	Bit 10	Delta V Fail	0 : disable 1 : enable
	Bit 11	OCC(Over Current Charge) protection	(Unloading(1)) && (Discharging || DG_ON command)
	Bit 12	OT(MOS Over Temperature) protection	MOS temperature turn down to xÿ (x is the highest MOS temperature)
	Bit 13	OT(Environment Over Temperature) protection	Environment temperature turn down to xÿ (x is the highest environment temperature)
	Bit 14	UT(Environment Under Temperature) protection	Environment temperature raise to xÿ (x is the lowest environment temperature)

Note 1 : Before turning on discharging MOSFET, ESS must process "soft start" first to prevent ESS from inrush

current. If the load is still active when processing "soft start", the "soft start" action will fail, and cannot turn on

discharging MOSFET .

Note: Only Darfon still recognizes the contents between Bit0-Bit10 in the 0x0014 register, while other batteries recognize the contents between Bit0-Bit14.

See Current explain

Address	Content	Description	Comment
0x0017	Current	0x0000~0x7FFF	Indicates that the current is positive
		0x8000~0xFFFF	Indicates that the current is negative

IS/SN/FW

Address	Content (binary)	Description	Numeric
0x001C	BYTE1	Hardware version number	Range: 1~9
	BYTE2	Software version number	Range: 1~9

See Box Number information

Address	Content (binary)	Description	Comment
	Bit 0	0	The default is no box connected.
		1	Indicates that the Box is connected.
	Bit 1~Bit 7	x	Reserve

0x001F	Bit 8	x	Battery ID
	Bit 9	x	000000: default;
	Bit 10	x	000001:1#ÿ
	Bit 11	x	000010:2#ÿ
	Bit 12	x	000011:3#ÿ
	Bit 13	x	000100:4#ÿ 000101:5#ÿ 000110:6#ÿ
	Bit 14	x	Reserve
	Bit 15	x	Reserve

CV Voltage List

Address	Battery Type	CV Voltage/Vÿ
0x0021	Lithium iron phosphate battery	57.6V
	Ternary lithium battery	
	Lithium titanate battery	xx

Depending on the battery type, the PACK manufacturer gives the actual CV voltage value.

Warning Code

Address	Content (binary)	State	Description Normal	Recovery Mechanism
0x0022	Bit 0	0	Single	Discharge or voltage is lower than the single cell overvoltage alarm value
		1	Cell Overvoltage Alarm	Recovery (lithium iron phosphate/ternary battery)
	Bit 1	0	Normal	Charging or voltage is higher than the single cell undervoltage alarm value
		1	Single undervoltage alarm is	Recovery (lithium iron phosphate/ternary battery)
	Bit 2	0	normal	Discharge or voltage is lower than the total voltage overvoltage alarm value
		1	Total voltage overvoltage	Recovery (lithium iron phosphate/ternary battery)
	Bit 3	0	alarm is	Charging or voltage is higher than the total voltage undervoltage alarm value
		1	normal Total voltage	Recovery (lithium iron phosphate/ternary battery)
	Bit 4	0	undervoltage alarm is normal	The current is lower than the discharge overcurrent alarm value
		1	Discharge overcurrent alarm	
	Bit 5	0	normal	The current is lower than the charging overcurrent warning value
		1	Charging overcurrent alarm	
	Bit 6	0	Normal	Temperature is lower than the discharge high temperature warning value (ÿ)
		1	discharge high temperature alarm	
	Bit 7	0	normal	The temperature is higher than the discharge low temperature warning value
		1	Low temperature alarm for	ÿÿÿ
	Bit 8	0	discharge	The temperature is lower than the charging high temperature warning value
		1	Normal charging High temperature alarm	ÿÿÿ
	Bit 9	0	Normal	The temperature is higher than the charging low temperature warning value
		1	charging Low temperature	ÿÿÿ
	Bit 10	0	alarm Normal	The temperature is lower than the MOS high temperature alarm value
		1	MOS High temperature alarm	ÿÿÿ
	Bit 11	0	Normal	The temperature is lower than the ambient high temperature warning value
		1	environment high temperature alarm	ÿÿÿ
	Bit 12	0	normal	The temperature is higher than the ambient low temperature alarm value

		1	Low ambient temperature	yyy
	Bit 13	0	alarm Normal total pressure higher than system shutdown/lock voltage alarm	value (V)
		1	System low voltage shutdown warning	
	Bit 14- Bit 15	Battery Type		00: Lithium iron phosphate battery 01: Ternary battery 10: Lithium titanate battery 11: Reserved

Depending on the battery type, the PACK manufacturer provides specific warning values.

xx Extended Error code

Address	Content (binary)	Description	Recovery Mechanism
0x0024	Bit 0	The DIP switch modes of the parallel modules are inconsistent	
	Bit 1	Module software versions are inconsistent	
	Bit 2	No SN number	
	Bit 3	LMU communication lost (host lost)	
	Bit 4	LMU communication lost (slave lost)	

Report the **Spec and Status Query** information of the **second** battery group when **the Box** is connected in parallel

Address	Content	Comment	Unit
0x0031	MCU Software version	First byte (MCU FW Version) Second byte (MCU FW sub Version)	
0x0032	Gauge Version	First byte (Gauge Version) Second byte (Gauge sub Version)	
0x0033	Gauge FR Version	Gauge FR Version (It)	
0x0034		Gauge FR Version (Hi)	
0x0035	Date & Time	See 'Date & Time bits' Table below	
0x0036		All first byte set to '0'	
0x0037		Second byte is the Date & Time data	
0x0038			
0x0039	Bar Code	Bar Code 1~4 bytes	
0x003A			
0x003B	Bar Code	Bar Code 5~6 bytes	
0x003C	Bar Code	Bar Code 7~8 bytes	
0x003D	<ul style="list-style-type: none"> different BMS Company Company Code 	<ul style="list-style-type: none"> (Lo) See "Company bits" Table below 	
0x003E		<ul style="list-style-type: none"> different Batter PACK Company (Hi) See "Company bits" Table below 	
0x003F	Using Cap	5KW 3700WH /2.7KW 2000WH	
0x0040	Gauge IC current		10mA

0x0041	Date & Time	It (See Table below)	
0x0042		Hi (See Table below)	
0x0043	Status	First byte set to '0' See Box information	
0x0044	Error	Error code See Box information	
0x0045	SOC	First byte set to '0' 0~100 See Box information	%
0x0046	Voltage	Total pressure See Box information	10 mV
0x0047	Current	Current	10 mA
0x0048	Temperature	-127~127	°C
0x0049	Max. charge/discharge current	Charger/Discharger, must use this value to limit charge/discharge current.	10 mA
0x004A	Gauge RM	Remaining	10mAh
0x004B	Gauge FCC	capacity Rated capacity	10mAh
0x004C	IS/FW	"YW / FW" Table below	
0x004D	Delta	Cell voltage	V
0x004E	Cycle Count		
0x004F	RSVD For Master Box	See Box Number information	
0x0050	SOH	Bit 0~ Bit6 SOH Counters Bit7:SOH Flag	
0x0051	CV Voltage	(CV Voltage List)	10mV
0x0052	Warning	Bit 0~ Bit13 Warning code, Bit 14~Bit15 Battery type,	
.....
0x0070	xx / Battery pack ID	Used to identify different battery packs under the same BMS information	

Cell Voltage Status

Address	Content	Comment	Unit
0x0071	Cell 1 Voltage		1 mV
0x0072	Cell 2 Voltage		1 mV
0x0073	Cell 3 Voltage		1 mV
0x0074	Cell 4 Voltage		1 mV
0x0075	Cell 5 Voltage		1 mV
0x0076	Cell 6 Voltage		1 mV
0x0077	Cell 7 Voltage		1 mV
0x0078	Cell 8 Voltage		1 mV
0x0079	Cell 9 Voltage		1 mV

0x007A	Cell 10 Voltage		1 mV
0x007B	Cell 11 Voltage		1 mV
0x007C	Cell 12 Voltage		1 mV
0x007D	Cell 13 Voltage		1 mV
0x007E	Cell 14 Voltage		1 mV
0x007F	Cell 15 Voltage		1 mV
0x0080	Cell 16 Voltage		1 mV

When the **Box** is connected in parallel, it reports the voltage information of the **second** battery cell:

0x0081	Cell 1 Voltage		1 mV
0x0082	Cell 2 Voltage		1 mV
0x0083	Cell 3 Voltage		1 mV
0x0084	Cell 4 Voltage		1 mV
0x0085	Cell 5 Voltage		1 mV
0x0086	Cell 6 Voltage		1 mV
0x0087	Cell 7 Voltage		1 mV
0x0088	Cell 8 Voltage		1 mV
0x0089	Cell 9 Voltage		1 mV
0x008A	Cell 10 Voltage		1 mV
0x008B	Cell 11 Voltage		1 mV
0x008C	Cell 12 Voltage		1 mV
0x008D	Cell 13 Voltage		1 mV
0x008E	Cell 14 Voltage		1 mV
0x008F	Cell 15 Voltage		1 mV
0x0090	Cell 16 Voltage		1 mV

BMS extended message

The message is in Intel format

Register Address	Variable Name	Description	Read and write permission	units
0x0100	ChTime	Description Continuous	R	1 S
0x0101	CurCyclChCap	charging time Current cycle Cumulative	R	0.1AH
0x0102	Cell Average Voltage	charging capacity	R	1 mV
0x0103	Res	Average	TBD	NC
0x0104	FloatUmain	voltage of monomer Reserved floating	R	0.1V
0x0105	AccumulateChCap	voltage (load end	R	0.1AH
0x0106	AccumulateDischCap	voltage) Cumulative	R	0.1AH
0x0107	FaultCodeTab1	charging capacity Cumulative discharge	R	NC
0x0108	FaultCodeTab2	capacity Fault code list 1 (type 1 fault)	R	NC
0x0109	Bal1StTab1	Fault code list 2	R	NC
0x010A	Bal1StTab2	(type 2 fault) Balance state 1 Balance state 2	R	NC
0x010B	BmsStTab	BMS Current Status	R	NC
0x010C	BMS_CtITab	BMS control total	W NC	
0x010D	UmainAdcSpVal	pressure ADC sampling value	R	NC

0x010E	I _{main} AdcSpVal	Total current ADC sampling value	R	NC
0x010F	MainAdcOffset	Total pressure calculation Zero drift	WR NC	
0x0110	U _{main} AdcGain	Total pressure calculation	WR NC	
0x0111	I _{main} AdcOffset	gain Total current calculation Zero	WR NC	
0x0112	U _{main} AdcChGain	drift Charging current calculation	WR NC	
0x0113	U _{main} AdcDisGain	gain Discharging current calculation	WR NC	
0x0114-0x0124	Reserve	gain Reserved	TBD	NC
0x0125	PackU _{rated} rated voltage, offset 0;		WR 0.1V	
0x0126	PackCap _{rated} Rated capacity, offset 0;		WR 0.1AH	
0x0127	Temperature and string number	BYTE0: string number; BYTE1: temperature number;		
0x0128	CellU_H1	Monomer overvoltage protection threshold	WR 1mV	
0x0129	CellU_H2	Monomer overvoltage warning threshold	WR 1mV	
0x012A	CellU_L1	Monomer undervoltage protection	WR 1mV	
0x012B	CellU_L2	threshold Monomer undervoltage warning	WR 1mV	
0x012C	CellU_H1_Tcnf	threshold Monomer overcharge protection	WR 0.01\$	
0x012D	CellU_H1_Trmv	confirmation time Monomer overcharge protection	WR 0.01\$	
0x012E	CellU_H2_Tcnf	elimination time Monomer overcharge warning	WR 0.01\$	
0x012F	CellU_H2_Trmv	confirmation time Monomer overcharge warning	WR 0.01\$	
0x0130	CellU_L1_Tcnf	elimination time Monomer overdischarge protection	WR 0.01\$	
0x0131	CellU_L1_Trmv	confirmation time Monomer overdischarge protection	WR 0.01\$	
0x0132	CellU_L2_Tcnf	elimination time Monomer overdischarge warning	WR 0.01\$	
0x0133	CellU_L2_Trmv	confirmation time Monomer overdischarge warning	WR 0.01\$	
0x0134	Eat_H1	elimination time Total voltage overvoltage	WR 0.1V	
0x0135	U _{main} _H2	protection threshold Total voltage	WR 0.1V	
0x0136	Eat_L1	overvoltage warning threshold Total	WR 0.1V	
0x0137	U _{main} _L2	voltage undervoltage protection threshold	WR 0.1V	
0x0138	U _{main} _H1_Tcnf	Total voltage undervoltage warning threshold Total	WR 0.01\$	
0x0139	U _{main} _H1_Trmv	voltage overvoltage protection confirmation time	WR 0.01\$	
0x013A	U _{main} _H2_Tcnf	Total voltage overvoltage protection elimination	WR 0.01\$	
0x013B	U _{main} _H2_Trmv	time Total voltage overvoltage warning confirmation	WR 0.01\$	
0x013C	U _{main} _L1_Tcnf	time Total voltage overvoltage warning elimination	WR 0.01\$	
0x013D	U _{main} _L1_Trmv	time Total voltage undervoltage protection	WR 0.01\$	
0x013E	U _{man} _L2_Tcnf	confirmation time Total voltage undervoltage	WR 0.01\$	
0x013F	U _{main} _L2_Trmv	protection elimination time Total voltage undervoltage	WR 0.01\$	
0x0140	ChI _{main} _H1	warning confirmation time Total voltage	WR 0.1A	
0x0141	ChI _{main} _H2	undervoltage warning elimination time Charging	WR 0.1A	
0x0142	DiskI _{main} _H1	overcurrent 1 protection threshold Charging	WR 0.1A	
0x0143	DischI _{main} _H2	overcurrent 2 protection threshold Discharging	WR 0.1A	
0x0144	ChI _{main} _H1_Tcnf	overcurrent 1 protection threshold Discharging	WR 0.01\$	
0x0145	ChI _{main} _H1_Trmv	overcurrent 2 protection threshold Charging	WR 0.01\$	
0x0146	ChI _{main} _H2_Tcnf	overcurrent 1 confirmation time Charging	WR 0.01\$	
0x0147	ChI _{main} _H2_Trmv	overcurrent 1 elimination time Charging overcurrent 2 confirmation time Charging overcurrent 2 elimination time	WR 0.01\$	

0x0148	DischImain_H1_Tcnf Discharge	Discharge overcurrent 1 confirmation time	WR 0.01S	
0x0149	DischImain_H1_Trmv Discharge	overcurrent 1 elimination time	WR 0.01S	
0x014A	DischImain_H2_Tcnf Discharge	overcurrent 2 confirmation time	WR 0.01S	
0x014B	DischImain_H2_Trmv Short-	overcurrent 2 elimination time	WR 0.01S	
0x014C	Imain_Short Short	circuit current threshold	WR 0.1A	
0x014D	Imain_Short_Tcnf Short	circuit confirmation time	WR 1us	
0x014E	Imain_Short_Trmv Short	circuit elimination time	WR 0.01S	
	Charging protection temperature threshold BYTE0:	Charging over-temperature protection threshold; BYTE1: Charging over-temperature warning threshold; Offset: -40	WR 1ÿ	
0x0150	Charging protection temperature threshold BYTE0:	Charging low temperature protection threshold; BYTE1: Charging low temperature warning threshold; Offset: -40	WR 1ÿ	
0x0151	Discharge protection temperature threshold BYTE0:	discharge over-temperature protection threshold; BYTE1: discharge over-temperature warning threshold; Offset: -40	WR 1ÿ	
0x0152	Discharge protection temperature threshold BYTE0:	discharge low temperature protection threshold; BYTE1: discharge low temperature warning threshold; Offset: -40	WR 1ÿ	
0x0153	Charging high temperature protection time BYTE0:	Over temperature protection confirmation time; BYTE1: Over temperature protection elimination time;	WR 0.1S	
0x0154	Charging high temperature warning time BYTE0:	Over temperature warning confirmation time; BYTE1: Over temperature warning elimination time;	WR 0.1S	
0x0155	Discharge high temperature protection time BYTE0:	Over temperature protection confirmation time; BYTE1: Over temperature protection elimination time;	WR 0.1S	
0x0156	Discharge high temperature warning time BYTE0:	Over temperature warning confirmation time; BYTE1: Over temperature warning elimination time;	WR 0.1S	
0x0157	Charging low temperature protection time BYTE0:	low temperature protection confirmation time; BYTE1: Low temperature protection elimination time;	WR 0.1S	
0x0158	Charging low temperature warning time BYTE0:	low temperature warning confirmation time; BYTE1: Low temperature warning elimination time;	WR 0.1S	
0x0159	Discharge low temperature protection time BYTE0:	Temperature low temperature protection confirmation time; BYTE1: Low temperature protection elimination time;	WR 0.1S	
0x015A	Discharge low temperature warning time BYTE0:	Temperature low temperature warning confirmation time; BYTE1: Low temperature warning elimination time;	WR 0.1S	
0x015B	ChFullUmain Full total	pressure threshold	WR 0.1V	
0x015C	ChFullUcell	Fully charged single cell	WR 1mV	
0x015D	ChFullImain	threshold charging cut-off	WR 0.1A	
0x015E	ChFullITcnf	current charging end confirmation time	WR	s
0x015F	MOS tube temperature control threshold BYTE0:	MOS temperature protection threshold; BYTE1: MOS temperature warning threshold; Offset: -40	WR 1ÿ	
0x0160	MOS over-temperature protection time BYTE0:	MOS over-temperature protection confirmation time; BYTE1: MOS over-temperature protection elimination time;	WR	1S

0x0161	MOS over-temperature warning time BYTE0: MOS over-temperature warning confirmation time; BYTE1: MOS over-temperature warning elimination time;	WR	1S

FaultCodeTab1

Address	Content (binary)	State	Description Communication	Recovery Mechanism
0x0107	Bit 0	0	is normal	External CAN communication diagnosis, message reception
		1	Communication is	Receive exception or send exception
	Bit 1	0	abnormal Communication is normal	Internal CAN communication diagnosis, message reception
		1	Communication	Receive exception or send exception
	Bit 2	0	abnormality normal	SOC is too low, SOC is less than 5%
		1	Fault	
	Bit 3	0	Normal	SOC is too low Level 2, SOC is less than 10%
		1	failure	
	Bit 4	0	normal	A short circuit occurs
		1	abnormal	
	Bit 5	0	normal	Precharge failure
		1	Fault	
	Bit 6	0	Communication is normal	External RS485 communication is abnormal, message reception exceeds or sending timeout
		1	Communication failure	
	Bit 7	0	Communication is normal	Internal RS48 communication abnormality, message reception exceeds or sending timeout
		1	Communication	
	Bit 8	0	failure	A leakage fault occurs
		1	Normal failure	
	Bit 9	0	Normal	Front-end chip failure
		1	failure	
	Bit 10	0	normal	Main power failure bit
		1	Fault	
	Bit 11	0	Normal	Sensor power supply fault bit
		1	failure	
	Bit 12	0	normal	EEPROM Fault Bits
		1	Fault	
	Bit 13	0	normal	RTC clock fault bit
		1	Fault	
	Bit 14	0	Normal	Monomer loss
		1	failure	
	Bit15	0	Normal	Temperature sampling lost
		1	failure	

FaultCodeTab2

Address	Content (binary)	State	Description Normal	Recovery Mechanism
0x0108	Bit 0	0	fault	Total pressure sampling failure
		1		
	Bit 1	0	normal	Total flow sampling failure
		1	Fault	
	Bit 2	0	Normal	Load voltage sampling failure
		1	failure	
	Bit 3	0	normal	External FLASH failure
		1	Fault	
	Bit 4	0	normal	Error in loading calibration parameters
		1	Fault	
	Bit 5	0	normal	Charging MOS closed fault
		1	Fault	
	Bit 6	0	Normal	Charging MOS disconnection fault
		1	failure	
	Bit 7	0	normal	Discharge MOS closed fault
		1	Fault	
	Bit 8	0	Normal	Discharge MOS disconnection failure
		1	failure	
	Bit 9	0	Normal	MOS tube over temperature protection
		1	failure	
	Bit 10	0	normal	MOS tube temperature is too high warning
		1	Fault	
	Bit 11-15	Reserve		Reserve

Bal1StTab1

Address	Content (binary)	State	Description	Recovery Mechanism
0x0109	Bit 0	0		Section 1 Monomer
		1	open	
	Bit 1	0	close	Section 2 Monomer
		1	open	
	Bit 2	0	close	Section 3 Monomer
		1	open	
	Bit 3	0		Section 4 Monomer
		1	Close	
	Bit 4	0	close	Section 5 Monomer
		1	open	
	Bit 5	0	close	Section 6 Monomer



		1	open	
	Bit 6	0		Section 7 Monomer
		1	Close	
	Bit 7	0	close	Section 8 Monomer
		1	open	
	Bit 8	0		Section 9 Monomer
		1	Close	
	Bit 9	0		Section 10 Monomer
		1	Close	
	Bit 10	0	close	Section 11 Monomer
		1	open	
	Bit 11	0	close	Section 12 Monomer
		1	open	
	Bit 12	0		Section 13 Monomer
		1	Close	
	Bit 13	0	close	Section 14 Monomer
		1	open	
	Bit 14	0		Section 15 Monomer
		1	Close	
	Bit15	0	close	Section 16 Monomer
		1	open	

BmsStTab

Address	Content (binary)	State	Description Initialization	Recovery Mechanism
0x010B	Bit 0-3	0	standby	Current status of BMS
		1		
		2	Discharge	
		3	Charge	
	Bit 4	0	close	Total positive switch state
		1	open	
	Bit 5	0	close	Negative discharge switch status
		1	open	
	Bit 6	0		Negative charging switch status
		1	Close	
	Bit 7	0	close	Precharge switch status
		1	open	
	Bit 8-15	Reserve		



BMS_CtlTab

Address	Content (binary)	State	Description	Recovery Mechanism
0x010B	Bit 0	0		Total positive switch control
		1	open	
	Bit 1	0	close	Negative discharge switch control
		1	open	
	Bit 2	0	close	Negative charging switch control
		1	open	
	Bit 3	0	close	Precharge switch control
		1	open	
	Bit 4-7	0	close	Reserved switch control
		1	open	
	Bit 8-15	0	close	Single cell 1~8 section balance control
		1	open	
	Bit 16-24	0	close	Single 9~16 sections balanced control
		1	open	
	Bit 25-31	Reserve		Reserve