

# **CANBUS Communication Protocol of Sigineer Solar Inverter BMS**

Formulation: \_\_\_\_\_

Reviewed by: \_\_\_\_\_

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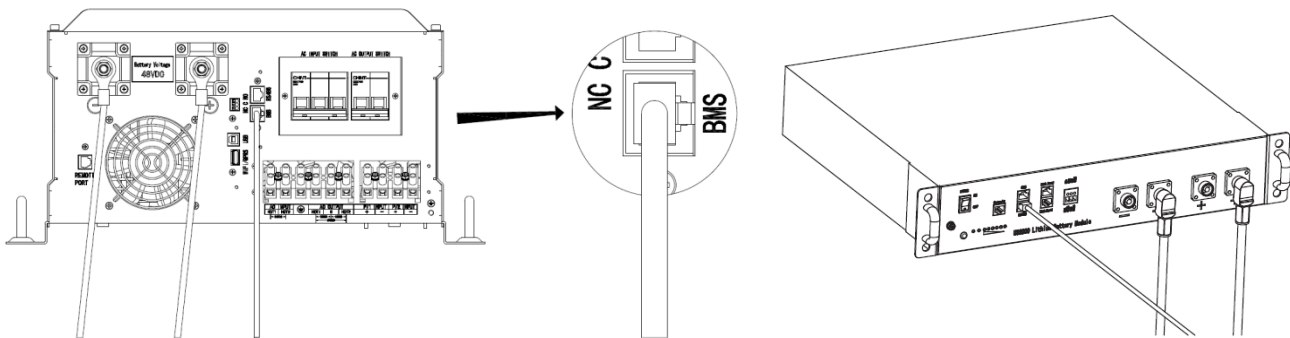
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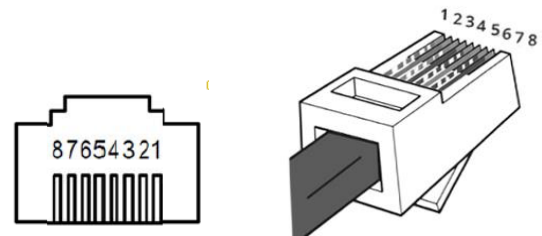
# The latest version of Sigineer Power M3000H-48LV, M5000H-48BP, M6000L-48SP & M12000L-48SP models are built with BMS port with CANBUS Communication.

Connect one end of RJ45 of battery to BMS communication port of inverter. Connect the other end of RJ45 cable to battery communication port.



The inverter BMS port pin and RS485 port pin assignment is shown as below.

Pin number	BMS port	RS485 port (for expansion)
1	RS485B	RS485B
2	RS485A	RS485A
3	--	--
4	CANH	--
5	CANL	--
6	--	--
7	--	--
8	--	--



To connect battery BMS, need to set the battery type as “LI” in Program 05. After set “LI” in Program 05, it will switch to Program 51 to choose battery type.

05	Battery type	AGM 05 ⊗ AGM (Default)
		FLD 05 ⊗ Flood
		USE 05 ⊗ User-Defined If “User-Defined” is selected, battery charge voltage and low DC cut-off voltage can be set up in program 19, 20 and 21.

		<p>US2 05  ⊗ User-Defined 2</p> <p>(Suitable for lithium battery when no communicating with BMS)  If 'US2' is selected, battery charge voltage and low DC cut-off voltage can be set up in program 19,20 and 21.</p>
		<p>Lithium (Only suitable when communicate with BMS)</p> <p>LI 05  ⊗</p>

51	RS485 Communication protocol	Protocol 1	PtC S1 L01 ⊗
		Protocol 2	PtC S1 L02 ⊗
		.	.
		Protocol 50	PtC S1 L50 ⊗
	CAN Communication protocol	Protocol 51	PtC S1 L51 ⊗
		Protocol 52	PtC S1 L52 ⊗
		.	.
		Protocol 99	PtC S1 L99 ⊗

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# 1、 CANCommunication mode

Can bus specification can bus

29 bit identifier is used in the standard frame format, and the bus transmission rate is 500kbps

Data mode

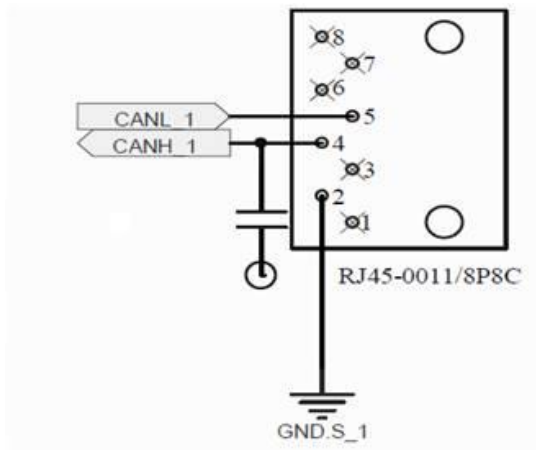
The following data types are used in the protocol, which are defined as follows:

Serial number	data type	type definition	Data length (bytes)
1	Byte	unsigned char	1
2	Uint16	unsigned short int	2
3	Uint32	unsigned int	4
4	Sint8	signed char	1
5	Sint16	signed short int	2
6	Sint32	signed int	4
7	FP32	float	4

Communication mode

The energy storage machine and battery send inquiry or control command frame, battery status and electrical parameters, and response data of energy storage and battery pack through can communication;

The definition of CAN communication hardware interface RJ45 is shown in the figure below



Explanation of terms

PCs: energy storage converter

Cell: battery cell (monomer)

Module: a battery module with 16 strings of cells

Pack: it encapsulates the battery pack of BMS system, which is composed of multiple modules in series and parallel, and can work independently

FCC: full load capacity of battery

RM: remaining capacity

Can: controller area network

BMS: battery management system

## **2 CAN message**

### **2.1:Battery of energy storage machine**

#### **2.1.1 Heartbeat command**

<b>CAN ID</b>	<b>DLC length</b>	<b>Send cycle (ms)</b>	<b>Message type</b>
<b>0x301</b>	<b>8</b>	<b>1000</b>	<b>Cycle cycle</b>

**Data:**

Byte index	numerical value	describe
Byte0	Send times	Cumulative number, plus 1 for each transmission
Byte1		
Byte2	Safety code number of energy storage machine	According to the list of safety regulations for energy storage machine, the battery identification area or national mark can be ignored if the area is not distinguished.
Byte3	0	reserve
Byte4	0	reserve
Byte5	0	reserve
Byte6	0	reserve
Byte7	0	reserve

### 2.1.2 Time instruction

CAN ID	DLC length	Send cycle (ms)	Message type
0x211	8	1000	Cycle cycle

data

Byte index	definition	numerical value	describe
Byte0	FM enable	1: Enable 0: Disable Default: 0	ATL
Byte1	year	20~250	2020=2000+20
Byte2	month	1~12	
Byte3	day	1~31	
Byte4	Time	0~23	
Byte5	branch	0~59	
Byte6	second	0~59	
Byte7	Fault clearing	0~1	1: Enable 0: Disable Default: 0

### 2.1.3 Control instruction

CAN ID	DLC length	Send cycle (ms)	Message type
0x212	8	0	Event event

data

Byte index	definition	numerical value	describe
Byte0	Query enable	Comand Table	Battery parameter query enable
Byte1			
Byte2	Battery ID	1~254	Battery ID to be queried
Byte3	reserve		
Byte4	reserve		
Byte5	reserve		
Byte6	reserve		
Byte7	reserve		

The function of the data frame is to read the battery specified information when necessary, and it is not necessary to send it periodically. After receiving the information, the battery sends the demand data once to complete the response;

Comand table: battery special parameter query instruction

Comand	Define	Value	Description
0x01	Battery serial number		
0x02	Battery history data		
0x03	Battery history failure		

## 2.2 Battery energy storage machine

### 2.2.1 Battery working parameters and status information

CAN ID	DLC length	Send cycle (ms)	Message type
0x311	8	1000	Cycle cycle

Data:

Byte index	definition	numerical value	describe
Byte 0	Constant voltage charging voltage	Unit: 0.1V Range [0.0 ~ 1000.0V] Offset: 0	The highest charging voltage of pack P + and p-ports during charging
Byte 1			
Byte 2	Charging current limiting	Unit: 0.1A Range [0.0 ~ 300.0A] Offset: 0	Current maximum allowable battery charging current
Byte 3			
Byte4	Discharge current limiting	Unit: 0.1A Range [0.0 ~ 300.0A] Offset: 0	Current maximum allowable discharge current value of battery
Byte 5			
Byte 6	Battery operation status	<b>Table1</b>	



Byte 7			
--------	--	--	--

**Table 1: battery status bit**

Bit index	definition	numerical value	describe
Byte7Bit0	Current state of battery	00: soft start	
Byte7Bit1		01: standby 10: state of charge 11: discharge state	
Byte7Bit2	Fault signs	1: fault 0: normal	The pack has entered the fault state, charging and discharging are not allowed and reserved
Byte7Bit3	Cell voltage balance state	0: equilibrium state 1: unbalanced state	Does the pack have internal balance and reservation
Byte7Bit4	Sleep state	0: normal state 1: sleep state	Battery shutdown pre bit sleep flag
Byte7Bit5	Discharge enable	0: not enabled 1: Enable	Allow the battery to discharge
Byte7Bit6	Charging enable	0: not enabled 1: Enable	Allow battery charging
Byte7Bit7	Power line connection status	0: the connection is normal 1: disconnect	
Byte6Bit0	Machine connection status	00: single machine	
Byte6Bit1		01: parallel connection 10: Parallel preparation 11: Reserved	
Byte6Bit2	Battery strong charge state	0: normal state 1: request forced charging status	Is the pack currently requesting forced charging
Byte6Bit 3~ Byte6Bit 7	reserve	reserve	

There is no special control in the current program of energy storage machine. All the control is completed by battery BMS. The energy storage machine is only used to identify the state

### 2.2.2 Battery protection and alarm information

CAN ID	DLC length	Send cycle (ms)	Message type
0x312	8	1000	Cycle cycle

Data:

Byte index	definition	numerical value	describe
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Byte 0	Battery protection 1	<b>Table 2</b>	
Byte 1	Battery protection 2	<b>Table 3</b>	
Byte 2	Battery alarm 1	<b>Table 4</b>	
Byte 3	Battery alarm 2	<b>Table 5</b>	
Byte4	Number of batteries in parallel	Range [1 ~ 32]	
Byte5	Battery power reduction reason 1	<b>Table 6</b>	
Byte6	Battery power reduction reason 2		
Byte 7	reserve		

**Table 2**

Bit index	definition	numerical value	describe
Byte0Bit 0	Software initialization failed	0: normal 1: Protection	Pack soft start failure
Byte0Bit 1	Pack total voltage under voltage protection	0: normal 1: Protection	Pack internal total voltage low protection external stop output voltage
Byte0Bit 2	Pack total pressure over-voltage protection	0: normal 1: Protection	If the total voltage inside the pack is too high, charging is prohibited
Byte0Bit 3	Single under voltage protection	0: normal 1: Protection	Single unit voltage low protection pack external stop output voltage
Byte0Bit 4	Monomer overvoltage protection	0: normal 1: Protection	It is forbidden to charge when the voltage of single unit is too high
Byte0Bit 5	Pack discharge short circuit protection	0: normal 1: Protection	Pack positive and negative short circuit
Byte0Bit 6	Pack charging over current protection	0: normal 1: Protection	
Byte0Bit 7	Pack discharge over current protection	0: normal 1: Protection	

**Table 3**

Bit index	definition	numerical value	describe
Byte1Bit 0	Inconsistent parallel versions	0: normal 1: Protection	Pack parallel version inconsistency protection
Byte1Bit 1	Parallel failure	0: normal 1: Protection	Pack parallel failure protection
Byte1Bit 2	Unit differential pressure protection	0: normal 1: Protection	Protection against large voltage difference of the highest and lowest unit in pack

Byte1Bit 3	system failure	0: normal 1: Protection	retain
Byte1Bit 4	UTC charging under temperature protection	0: normal 1: Protection	If the charging temperature is too low, pack will not charge
Byte1Bit 5	Utd discharge under temperature protection	0: normal 1: Protection	If the discharge temperature is too low, pack will not discharge
Byte1Bit 6	Over temperature protection of OTC charging	0: normal 1: Protection	If the charging temperature is too high, pack will not charge
Byte1Bit 7	OTD discharge over temperature protection	0: normal 1: Protection	If the discharge temperature is too high, pack will not discharge

**Table 4**

Bit index	definition	numerical value	describe
Byte2Bit 0	reserve	reserve	reserve
Byte2Bit 1	Pack under voltage alarm	0: normal 1: Alarm	The total pressure inside the pack is too low
Byte2Bit 2	Pack over voltage alarm	0: normal 1: Alarm	
Byte2Bit 3	Unit under voltage alarm	0: normal 1: Alarm	
Byte2Bit 4	Unit over voltage alarm	0: normal 1: Alarm	
Byte2Bit 5	reserve	Reserve	
Byte2Bit 6	Charging over current alarm	0: normal 1: Alarm	
Byte2Bit 7	Discharge over current alarm	0: normal 1: Alarm	

**Table 5**

Bit index	definition	numerical value	describe
Byte3Bit 0	Communication loss alarm	0: normal 1: Alarm	Battery and PCs timeout at the same time
Byte3Bit 1	Alarm before battery shutdown	0: normal 1: Alarm	Battery shutdown front position
Byte3Bit 2	Unit differential pressure alarm	0: normal 1: Alarm	
Byte3Bit 3	reserve	Reserve	
Byte3Bit 4	Low temperature alarm of charging	0: normal 1: Alarm	
Byte3Bit 5	Discharge low temperature alarm	0: normal 1: Alarm	
Byte3Bit 6	Over temperature alarm of charging	0: normal 1: Alarm	
Byte3Bit 7	Discharge over temperature	0: normal	

	alarm	1: Alarm	
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**Table 6**

Bit index	definition	numerical value	describe
Byte5Bit 0	Hardware fault current limiting	0: normal 1: Current limiting	reserve
Byte5Bit 1	Full charge current limiting	0: normal 1: Current limiting	reserve
Byte5Bit 2	MOS over temperature current limiting	0: normal 1: Current limiting	reserve
Byte5Bit 3	Current limiting due to excessive ambient temperature	0: normal 1: Current limiting	reserve
Byte5Bit 4	Precharge fault current limiting	0: normal 1: Current limiting	reserve
Byte5Bit 5	Communication fault current limiting	0: normal 1: Current limiting	reserve
Byte5Bit 6	Bus fault current limiting	0: normal 1: Current limiting	reserve
Byte5Bit 7	reserve	reserve	
Byte6Bit 0	High current limiting of single unit	0: normal 1: Current limiting	reserve
Byte6Bit 1	Low current limiting of monomer	0: normal 1: Current limiting	reserve
Byte6Bit 2	Over temperature current limiting	0: normal 1: Current limiting	reserve
Byte6Bit 3	Low temperature current limiting	0: normal 1: Current limiting	reserve
Byte6Bit 4	Over high total pressure current limiting	0: normal 1: Current limiting	reserve
Byte6Bit 5	Low total pressure current limiting	Normal: 0 1: Current limiting	reserve
Byte6Bit 6	Individual pressure difference current limiting	0: normal 1: Current limiting	reserve
Byte6Bit 7	Temperature difference current limiting	0: normal 1: Current limiting	reserve

### 2.2.3 Battery operation information

CAN ID	DLC length	Send cycle (ms)	Message type
0x313	8	1000	Cycle cycle

Data:

Byte index	definition	numerical value	describe
Byte 0	Pack total voltage	Unit: 0.01V Range [0 ~ 1000V] Offset: 0	Pack internal total voltage
Byte 1			
Byte 2	Pack total current	Unit: 0.1A Range [- 300.0 ~ 300.0A] Offset: 0	Total current of single unit or system
Byte 3			
Byte4	Battery temperature	Unit: 0.1 °C Range [- 40.0 ~ 120.0 °C] Offset: 0	Pack average temperature
Byte 5			
Byte 6	SOC	Unit: 1% Range [100] Offset: 0	Average SOC
Byte 7	SOH	Bit0~ Bit6: SOH Unit: 1% Range [100] Offset: 0	Bit7: SOH flag Indicates that the battery is not in the Safe use status

### 2.2.4 Battery capacity information

CAN ID	DLC length	Send cycle (ms)	Message type
0x314	8	1000	Cycle cycle

Data:

Byte index	definition	numerical value	describe
Byte 0	Real time capacity	Unit: 10mAh Range [0.0 ~ 500000.0mAh] Offset: 0	Current remaining capacity of battery
Byte 1			
Byte 2	Fully charged capacity	Unit: 10mAh Range [0.0 ~ 500000.0mAh] Offset: 0	Battery capacity after full charge
Byte 3			
Byte4	Maximum pressure difference of monomer	Unit: 1mV Range [0.0 ~ 1000.0mV] Offset: 0	The difference between the maximum voltage and the minimum voltage of a single unit
Byte 5			
Byte 6	Number of cycles	Unit: H Range [0.0 ~ 65535] Offset: 0	Increase by 1 for one time in total full charge
Byte 7			

## 2.2.5 Cell status and voltage

CAN ID	DLC length	Send cycle (ms)	Message type
0x319	8	1000	Cycle cycle

Data:

Byte index	definition	numerical value	describe
Byte 0	Pack request information	Table 7	
Byte 1	Maximum cell voltage	Unit: 1mV Range [0.0 ~ 6000.0mv] Offset: 0	
Byte 2			
Byte 3	Minimum cell voltage	Unit: 1mV Range [0.0 ~ 6000.0mV] Offset: 0	
Byte4			
Byte 5	Maximum voltage cell number	Range [254]	
Byte6	Minimum voltage unit number	Range [254]	
Byte7	Faulty battery address	Range [0,32]	The pack number used to mark the failure when multiple packs are connected

Table 7 battery status

Bit index	definition	numerical value
Byte0 Bit0	Cell type	00: lithium iron phosphate battery 01: ternary battery 10: Lithium titanate battery 11: Reservation
Byte0 Bit1		
Byte0 Bit2	reserve	Res
Byte0 Bit3	reserve	Res
Byte0 Bit4	Forced charge Mark 2	0:disable 1:enable
Byte0 Bit5	Forced charge mark 1	0:disable 1:enable
Byte0 Bit6	Discharge enable	0:disable 1:enable
Byte0 Bit7	Charging enable	0:disable 1:enable

## 2.2.6 Manufacturer name and version information

CAN ID	DLC length	Send cycle (ms)	Message type
0x320	8	1000	Cycle cycle

The data frame is used to identify the battery manufacturer, and the battery compatible with the protocol must contain the data frame. If the battery has no special function that requires the energy storage machine to do compatible processing, the abbreviation of the manufacturer name of the data frame can be 0; the time parameter is not used at present, and the energy storage machine has a clock system;

**Data:**

Byte index	definition	numerical value	describe
Byte 0	Battery manufacturer	Sigineer	Example:Byte 0 =”G”,Byte 1=”T”
Byte 1		ASCII	
Byte 2	Hardware version	Hardware version	
Byte 3	Low software version	Low software version	
Byte 4	Software version high	Software version high	
Byte 5	The highest parallel software version is low	The highest parallel software version is low	
Byte 6	The highest software version of parallel operation is high	The highest software version of parallel operation is high	
Byte 7	reserve		

\*For the high byte of software version extension, if the battery version has only one byte, only the low byte is reported, and the high byte is reported as 0

**2.2.7 Upgrade information (reserved)**

CAN ID	DLC length	Send cycle (ms)	Message type
0x321	8	1000	Event event

**Data:**

Byte index	definition	numerical value	describe
Byte0	Upgrade status	0: normal operation 1: Upgrading 2: Upgrade successful	reserve
Byte1	reserve	0	
Byte2	reserve	0	
Byte3	reserve	0	
Byte4	reserve	0	
Byte5	reserve	0	
Byte6	reserve	0	
Byte7	reserve	0	

**2.2.8 High and low value of parallel operation parameters**

CAN ID	DLC length	Send cycle (ms)	Message type
0x322	8	1000	Cycle cycle

**Data:**

Byte index	definition	numerical value	describe
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Byte 0	Maximum temperature of monomer	Unit [0.1 °C]	
Byte 1		Range [- 40.0 ~ 120.0 °C] Offset: 0	
Byte 2	Minimum temperature of monomer	Unit [0.1 °C]	
Byte 3		Range [- 40.0 ~ 120.0 °C] Offset: 0	
Byte 4	Maximum temperature monomer number	Range [254]	
Byte5	Minimum temperature monomer number	Range [254]	
Byte 6	Maximum SOC of parallel operation	Unit: 1% Range [100] Offset: 0	The highest SOC value when multiple packs are paralleled
Byte 7	Minimum SOC of parallel operation	Unit: 1% Range [100] Offset: 0	The lowest SOC value when multiple packs are paralleled

## 2.2.9 Battery protect add parameters

CAN ID	DLC length	Send cycle (ms)	Message type
0x323	8	1000	Cycle cycle

Data:

Byte index	definition	numerical value	describe
Byte 0	Total number of cells low byte	Range [255]	Number of monomers in the whole system
Byte 1	Unit overvoltage alarm threshold	Unit: 1mV Range [0.0 ~ 6000.0mV] Default: 3.600V	When the energy storage machine reaches the threshold value, low power discharge can prevent battery over-voltage protection
Byte 2			
Byte 3	Total number of cells high byte	Range [256 ~ 5000] Default: 0	When the total number of battery cells is greater than 255, high byte will be enabled, and the rest will be uploaded to 0; new parameters will be added to cluster batteries
Byte 4	Battery protection 3	<b>Table 8</b>	Battery protection 3
Byte 5	Battery protection 4	<b>Table 8</b>	Battery protection 4
Byte 6	Battery protection 5	<b>Table 8</b>	Battery protection 5
Byte 7	Battery alarm 3	<b>Table 9</b>	Battery alarm 3

**Table8**

Bit index	definition	numerical value	describe
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Byte4Bit 0	Charging over power fault	0: normal 1: fault	reserve
Byte4Bit 1	Discharge over power fault	0: normal 1: fault	reserve
Byte4Bit 2	External communication failure	0: normal 1: failure	Communication with PCs timeout
Byte4Bit 3	Precharge failure fault	0: normal 1: fault	Pack precharge failure
Byte4Bit 4	BMS hardware failure	0: normal 1: failure	BMS hardware failure
Byte4Bit 5	Internal communication failure	0: normal 1: failure	Communication failure between master and slave when multiple packs are paralleled
Byte4Bit 6	Unit abnormal fault	0: normal 1: fault	Unit abnormal fault (unit failure)
Byte4Bit 7	Total flow sampling failure	0: normal 1: failure	BMS current sampling abnormal
Byte5Bit 0	Total pressure sampling failure	0: normal 1: failure	Abnormal total pressure sampling in BMS
Byte5Bit 1	Total pressure sampling fault on load side	0: normal 1: fault	Abnormal total pressure sampling at pack output
Byte5Bit 2	Load calibration parameter fault	0: normal 1: fault	BMS protection parameter abnormal
Byte5Bit 3	Bus reverse connection	0: normal 1: reverse	Reverse connection of positive and negative bus at pack output end
Byte5Bit 4	Hardware over voltage	0: normal 1: over volt	Hardware overvoltage (hardware protection feedback)
Byte5Bit 5	Hardware over current	0: normal 1: over curr	Hardware over current (hardware protection feedback)
Byte5Bit 6	Parallel fault	0: normal 1: fault	Multiple packs failed to merge
Byte5Bit 7	The battery pressure difference of the slave is large	0: normal 1: fault	When multiple packs are paralleled, the difference between the pack port voltage and the internal total pressure is large
Byte6Bit 0	Hardware discharge over current fault	0: normal 1: fault	Hardware discharge over-current fault (hardware protection feedback)
Byte6Bit 1	Charging current limiting failure	0: normal 1: failure	Zero limit failure of low temperature charging
Byte6Bit 2	Discharge current limiting failure	0: normal 1: failure	reserve
Byte6Bit 3	Open circuit fault of main circuit	0: normal 1: fault	Internal open circuit fault of main circuit

Byte6Bit 4~6	reserve	reserve	reserve
Byte6Bit 7			

**Table9**

Bit index	definition	numerical value	describe
Byte7Bit 0	Charging over power alarm	0: normal 1: Alarm	reserve
Byte7Bit 1	Discharge over power alarm	0: normal 1: Alarm	reserve
Byte7Bit 2	System internal charging circulating current over-current alarm	0: normal 1: Alarm	Alarm of high internal charging circulating current when multiple packs are paralleled
Byte7Bit 3	System internal discharge circulating current over current alarm	0: normal 1: Alarm	High internal discharge circulating current alarm when multiple packs are paralleled
Byte7Bit 4~ Byte7Bit 7	reserve	reserve	reserve

## 2.2.10 Cumulative charge discharge energy

CAN ID	DLC length	Send cycle (ms)	Message type
0x329	8	1000	Cycle cycle

**Data:**

Byte index	definition	numerical value	describe
Byte0	battery SN	Range [1,16]	Multiple modules are connected in series to form the serial number of battery pack
Byte1	Accumulated discharge capacity 8 bits higher	Unit: 0.1kwh Range [0.0 ~ 1600000.0kwh]	
Byte2	16 bit word lower	Offset: 0	
Byte3	cumulative discharge capacity		
Byte4	battery SN	Range [1,16]	Multiple modules are connected in series to form the serial number of battery pack
Byte5	8 bits higher of accumulated charging capacity	Unit: 0.1kwh Range [0.0 ~ 1600000.0kwh]	
Byte6	16 bit word lower	Offset: 0	
Byte7	accumulated charge		

## 2.2.11 Cluster parameter information

CAN ID	DLC length	Send cycle (ms)	Message type
0x330	8	1000	Cycle cycle

Data:

Byte index	definition	numerical value	describe
Byte 0	Maximum voltage cell cluster number	Range [100]	The cluster number of the cell with the highest voltage is uploaded when the batteries are clustered together
Byte 1	Maximum voltage cell number	Range [254]	The cell number of the highest voltage cell in the cluster is uploaded when the batteries are clustered
Byte 2	Minimum cluster voltage	Range [100]	The cluster number of the lowest voltage cell uploaded when the batteries are clustered together
Byte 3	Minimum voltage unit number	Range [254]	The cell number of the lowest voltage cell in the cluster is uploaded when the battery is in a cluster
Byte 4	Maximum cell voltage	Unit: 1mV	The highest cell voltage among all the cells is uploaded when the batteries are clustered together
Byte 5		Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 6	Minimum cell voltage	Unit: 1mV	When the batteries are clustered together, the lowest cell voltage among all the cells is uploaded
Byte 7		Range [0.0 ~ 6000.0mV] Offset: 0	

## 2.2.12 Serial number

CAN ID	DLC length	Send cycle (ms)	Message type
0x324	8	1000	Cycle cycle

Data:

Return battery serial number

Frame 1:

Byte0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
FrameNo (0)	Battery ID	SN0	SN1	SN2	SN3	SN4	SN5

Second frame

Byte0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
FrameNo (1)	SN6	SN7	SN8	SN9	SN10	SN11	SN12

Frame 3

Byte0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
FrameNo (2)	SN13	SN14	SN15	reserve	reserve	reserve	reserve

**Notice: if the SN of battery exceeds 16 bits, it can be expanded according to the message format, up to 32 bytes**

CAN ID	length	Sending period (ms)	Message type
0x325	8	500	Event type

**Data:**

**Return battery history fault (to be determined)**

Byte0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
FrameNo (0)	Battery ID	reserve	reserve	reserve	reserve	reserve	reserve

### 3. Data retention

The detailed information of unit voltage will not be the key data. In order to be compatible with the old version of the program, can ID number is reserved, and the highest and lowest unit voltage is concerned in the program;

CAN ID	DLC length	Send cycle (ms)	Message type
0x315	8	1000	Cycle cycle

**Data:**

Byte index	definition	numerical value	describe
Byte 0	Cell 1 voltage	Unit: 1mV Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 1			
Byte 2	Cell 2 voltage	Unit: 1mV Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 3			
Byte 4	Cell 3 voltage	Unit: 1mV Range [0.0 ~ 6000.0mV] Offset: 0	
Byte5			
Byte 6	Cell 4 voltage	Unit: 1mV Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 7			

CAN ID	DLC length	Send cycle (ms)	Message type
0x316	8	1000	Cycle cycle

**Data:**

Byte index	definition	numerical value	describe
Byte 0	Cell 5 voltage	Unit: 1mV Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 1			
Byte 2	Cell 6 voltage	Unit: 1mV	

Byte 3		Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 4	Cell 7 voltage	Unit: 1mV	
Byte5		Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 6	Cell 8 voltage	Unit: 1mV	
Byte 7		Range [0.0 ~ 6000.0mV] Offset: 0	

CAN ID	DLC length	Send cycle (ms)	Message type
0x317	8	1000	Cycle cycle

Data:

Byte index	definition	numerical value	describe
Byte 0	Cell 9 voltage	Unit: 1mV	
Byte 1		Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 2	Cell 10 voltage	Unit: 1mV	
Byte 3		Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 4	Cell 11 voltage	Unit: 1mV	
Byte5		Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 6	Cell 12 voltage	Unit: 1mV	
Byte 7		Range [0.0 ~ 6000.0mV] Offset: 0	

CAN ID	DLC length	Send cycle (ms)	Message type
0x318	8	1000	Cycle cycle

Data:

Byte index	definition	numerical value	describe
Byte 0	Cell 13 voltage	Unit: 1mV	
Byte 1		Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 2	Cell 14 voltage	Unit: 1mV	
Byte 3		Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 4	Cell 15 voltage	Unit: 1mV	
Byte5		Range [0.0 ~ 6000.0mV] Offset: 0	
Byte 6	Cell 16 voltage	Unit: 1mV	
Byte 7		Range [0.0 ~ 6000.0mV] Offset: 0	