

Modify records

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1.3way of communication

1.3.1 Standalone mode

cell phoneAPPConnect to the battery packBMSBluetooth, using a question-and-answer interactive mode, the mobile phone sends commands toBMS,BMS After receiving the command, response information is returned via Bluetooth.

BMSBoard received the mobile phoneAPPAfter the command, response information is returned. If the mobile phone is5sUnable to adductBMSIf the board's response information or received response information is incorrect, it is considered that this communication failed.3After several failures,APPTThe page prompts that the connection is abnormal.

1.3.2 Parallel mode

When running in parallel, the Bluetooth device name of each battery pack is set toBPxx(xxwith battery packBMS The decimal numbers corresponding to the dialing addresses are the same.BP00~BP15) .

cell phoneAPPChoose from different battery packsBMSBluetooth connection to achieve communication with different battery packs.

APPParallel mode can select the hostBP00The summary display can also achieve individual display of each battery pack by

switching the target device name.

2. Information structure

In order to ensure that information can beBMSThe information is transmitted accurately to and from the mobile phone, and the information is organized according to a certain structure to express1The information structure is given.

Information consists of many bytes. One or more bytes form a unit, which has a name and expresses a certain meaning. surface2It's a table1Notes for each unit, table3It's a table2middleCIDFurther notes on, table3,surface4It's a table2 middleCID,RTNFurther comments.

surface1-Data frame structure table

data	SOI	VER	ADR	REQ CID	CID RTN	LENGTH	DATA	CRC	EOI
content	7EH	/	/	/	/	/	/	/	0DH
byte number	1	1	1	1	1	2	LENGTH	2	1

surface2-Data frame structure annotation

data	meaning	Remark
SOI	Start character: indicates the beginning of a data frame	Fixed value:7EH(~)
VER	Protocol version: Bluetooth communication protocol version	Request value: fixed value10H Return value: variable value

ADR	Address code: device address identification code	Variable value:00H~FFH
REQ/CID	REQ:Command request CID:REQReturn value, return the corresponding function code	Fixed value:46H See table for details3
CID/RTN	CID:function code RTN: function return code	See table for details3 See table for details4
LENGTH	Length code: data informationDATANumber of bytes	Variable value:0000H~FFFFH
DATA	Data content:BMSwith mobile phoneAPP Interactive data (i.e.:PAYLOAD)	The length isLENGTHbytes
CRC	CRCCheck code: adoptedcrc16-xmodemcheck	For details on verification methods, see3.3
EOI	Terminator: indicates the end of a data frame	Fixed value:0DH(CR)

surface3-CIDfunction code

serial number	CID(function code)	meaning
1	47H	ObtainBMSPParameter information
2	51H	Get device manufacturer information
3	61H	Get single machine data
4	62H	Get parallel data
5	63H	switchCANprotocol
6	64H	switch485protocol
7	A1H	set upBMSPParameter information (protection switch)
8	65H	Set device group number and name
.....

surface4-RTN(CIDreturn code)

serial number	RTN(CIDreturn code)	meaning
1	00H	normal
2	01H	VERmistake
3	02H	CRCCheck error

4	03H	Data length error
5	04H	CIDinvalid
6	05H	Command format error
7	06H	Invalid data
8	07H	No data (history)
9	E1H	REQinvalid
10	E2H	Command execution failed
11	E3H	Equipment failure
12	E4H	Invalid permissions

surface5-Data conversion table

serial number	data	Conversion method
1	Cell voltage	unsigned integer, unitmV, actual value = transmission value For example:0x0CD9=3289mV
2	temperature	unsigned integer, unit0.1℃, actual value = (transmission-2731)/10 For example:0x0BD8=3032express(3032-2731)/10(℃)=30.1℃
3	total current	signed integer, unitA, actual value = transmission value /100 For example:0x1194=4500express45.00A
4	total voltage	unsigned integer, unitV, actual value = transmission value / 100 For example:0x1518=5400express54.00 V
5	capacity	unsigned integer, unitAh, actual value = transmission value /100 For example:0x12DE=4830express48.30Ah

3. Data format

3.1 Data transfer format

Data information is transmitted in hexadecimal. Please refer to the relevant table for the content represented by the data part.

3.2 CRC Check byte format

CRCThe check byte is calculated usingCRC-16/XMODEMCheck word calculation program, divide the command frameSOI,
EOland CRCExcept for bytes, the rest of the data is calculated16bit unsigned integer data,CRCWhen transmitting check bytes, first

Transmit the high byte and then the low byte.

3.3 CRC-16/XMODEMCheck word calculation program

```
1.  uint16_t  crc_16_xmodem(uint8_t *Data, uint16_t len)
2.  {
3.      uint8_t  i      = 0 ;
4.      uint16_t  crc16  = 0x0000 ;
5.
6.      while(len--)
7.      {
8.          for(i  =0x80 ; i != 0 ; i >>= 1 )
9.          {
10.             if((crc16 & 0x8000) != 0)
11.             {
12.                 crc16 = crc16 << 1 ;
13.                 crc16 = crc16 ^ 0x1021 ;
14.             }
15.             else
16.             {
17.                 crc16 = crc16 << 1 ;
18.             }
19.             if((*Data & i) != 0 )
20.             {
twenty one.                 crc16 = crc16 ^ 0x1021 ;
twenty two.             }
twenty three.         }
twenty four.         Data++;
25.     }
26.     return  crc16;
27. }
```

3.4 CRCCheck byte calculation example

BluetoothAPPrequest information

7E 10 00 46 51 00 003A 7F0D BMS

response message

**7E 10 00 51 00 00 24 43 41 4E 3A 50 4E 47 5F 44 59 45 5F 4C 75 78 70 5F 54 42 42 45 4D 55 31
31 30 31 31 30 45 10 04 01 0 1 46 02 1458 510D**

4. Communication commands

4.1 function code 51H (Get manufacturer information)

4.1.1 Bluetooth APPask

surface6-CID-51H command information

data	SOI	VER	ADR	REQ	CID	LENGTH	DATA	CRC	EOI
content	7EH	10H	/	46H	51H	00H 00H	/	/	0DH

explain:

VER: Fixed value 10H;

ADR: Device address number 00H~FFH;

REQ: fixed value 46H;

CID: Function code 51H, see Table 3 for details; LEN: Data length 00H 00H (0);

DATA: empty;

Command example:

7E 10 00 46 51 00 00 3A 7F 0D

4.1.2 BMSresponse

surface7-CID-51H response message

serial number	data	unit	Number of bytes
Data frame header~LENGTH			
1	SOI	none	1
2	VER	none	1
3	ADR	none	1
4	CID	none	1
5	RTN	none	1
6	LENGTH	none	2
DATA			

7	Manufacturer information	none	20
8	Part model	none	10
9	Software version	none	2
10	CANprotocol[See table for details8]	none	1
11	485protocol[See table for details9]	none	1
12	Battery Type[See table for details10]	none	1
13	Number of slaves	none	1
CRC+end of data frame			
15	CRC	none	2
16	EOI	none	1

explain:

VER: Protocol version number, such as 20H, interpreted as

V3.2; ADR: Device address number 00H~FFH;

CID: Function code 51H, see Table 3 for details; RTN:

Function code return value, see Table 4 for details;

LEN: Data length 00H 24H (36);

DATA: Manufacturer information and component model are interpreted in ASCII, and the rest are interpreted in HEX;

Software version: 10H 04H interpreted as V16.4; Battery

type: see Table 10 for details;

Number of slaves: 00H means 0 slaves, 01H means 1 slave, ..., 0FH means 15 slaves;

Command example:

```
7E 10 00 51 00 00 24 43 41 4E 3A 50 4E 47 5F 44 59 45 5F 4C 75 78 70 5F 54 42 42 45 4D 55 31 31 30 31
31 30 45 10 04 01 0 1 46 02 14 58 51 0D
```

surface8-CANprotocol

serial number	CANprotocol data	CANProtocol name
1	00H	no deal
2	01H	PN_GDLT
3	02H	GRWT
4	03H	VCTR
5	04H	SMA_SF

6	05H	GINL
7	06H	STUD
.....

surface9-485protocol

<small>serial number</small>	485protocol data	485Protocol name
1	00H	no deal
2	01H	Paineng (PN)
3	02H	Gurivat (GRWT)
4	03H	Day and month (VLTC)
5	04H	maiden voyage (SF)
6	05H	Pengcheng (Luxp)
7	06H	STUD
.....

surface10-Battery type code

<small>serial number</small>	Battery Type	meaning
1	46H	Lithium iron phosphate battery(LFP)
2	47H	Ternary lithium battery (NMP)
3	48H	Lithium cobalt oxide battery (LCO)
4	49H	Lithium titanate battery (LTO)
5	4AH	To be added
.....

4.2 function code 61H (Get single machine data)

4.2.1 Bluetooth APPask

surface11-CID-61H command information

data	SOI	VER	ADR	REQ	CID	LENGTH	DATA	CRC	EOI
content	7EH	10H	/	46H	61H	00H 01H	00H~FFH	/	0DH

explain:

VER: Fixed value 10H;

ADR: Device address number 00H~FFH;

REQ: fixed value 46H;

CID: Function code 61H, see Table 3 for details; LEN: Data length 00H 01H (1); DATA:

Group number, value range 00H~FFH;

Command example:

7E 10 00 46 61 00 00 FF DA 0D

4.2.2 BMSresponse

surface12-CID-61H response message

serial number	data	unit	Number of bytes
Data frame header~LENGTH			
1	SOI	none	1
2	VER	none	1
3	ADR	none	1
4	CID	none	1
5	RTN	none	1
6	LENGTH	none	2
DATA			
7	DATA FLAG	none	1

8	Device address number (00H~0FH)	none	1
9	Number of cellsM	none	1
10	Cell voltage1	0.001V	2
	Cell voltage2	0.001V	2
		
	Cell voltageM	0.001V	2
11	Temperature quantityN	none	1
12	Cell temperature1	0.1℃	2
	Cell temperature2	0.1℃	2
		
	Cell temperature (N-2)	0.1℃	2
	ambient temperature	0.1℃	2
	Power temperature	0.1℃	2
13	Charge and discharge current	0.01A	2
14	total battery voltage	0.01V	2
15	The remaining capacity	0.01Ah	2
16	Custom amountK=6	none	1
17	battery capacity	0.01Ah	2
18	SOC	1‰	2
19	Rated Capacity	0.01Ah	2
20	Cycles	none	2
twenty one	SOH	1‰	2
twenty two	Port voltage	0.01V	2
twenty three	Cell voltage1Alarm	none	1

	Cell voltage2Alarm	none	1
		
	Cell voltageMAAlarm	none	1
twenty four	Cell temperature1Alarm	none	1
	Cell temperature2Alarm	none	1
		
	Cell temperatureN-2Alarm	none	1
	Ambient temperature alarm	none	1
	Power temperature alarm	none	1
25	Charge and discharge current alarm	none	1
26	Battery total voltage alarm	none	1
27	system status[See table for details13]	none	1
28	switch status[See table for details14]	none	1
29	Custom alarm volumeP	none	1
30	Alarm event1[See table for details15]	none	1
	Alarm event2[See table for details15]	none	1
	Alarm event3[See table for details15]	none	1
	Alarm event4[See table for details15]	none	1
	Alarm event5[See table for details15]	none	1
	Alarm event6[See table for details15]	none	1
	Alarm event7[See table for details15]	none	1
	Alarm event8[See table for details15]	none	1
		
		Alarm eventP	none

31	equilibrium state1[See table for details16]	none	1
	equilibrium state2[See table for details16]	none	1
		
	equilibrium stateX(X=M/8)[See table for details16]	none	1
32	Disconnected state1[See table for details17]	none	1
	Disconnected state2[See table for details17]	none	1
		
	Disconnected stateX(X=M/8)[See table for details17]	none	1
CRC+end of data frame			
33	CRC	none	2
34	EOI	none	1

explain:

VER: Protocol version number, such as 20H, interpreted as

V3.2; ADR: Device address number 00H~FFH;

CID: Function code 61H, see Table 3 for details; RTN:

Function code return value, see Table 4 for details;

LEN: Data length (variable);

DATA: See Table 12 for details;

Command example:

```
7E 10 00 61 00 00 6A 00 00 10 00 17 00 30 00 4E 00 12 00 12 00 12 00 12 00 12 00 12 00 15 00 1D 00
32 00 70 01 3B 04 0D 0 F D5 06 08 B7 08 B7 08 B7 08 B7 0B B8 0B B5 00 00 02 4B 24 F5 06 27 10 03
B2 27 10 00 00 03 E8 13 93 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 02 01 01 0 1 01 00 00 00 01
20 00 08 12 8A 08 00 00 10 00 00 00 00 00 00 00 44 CF 0D
```

surface13-System status table

system status(bit)	Flag bit information (1:Enter,0:quit)
0	discharge
1	Charge
2	float charge
3	reserved seat

4	standby
5	Shut down
6	reserved seat
7	reserved seat

surface14-Switch status table

switch status(bit)	Flag bit information (1: On,0:closure)
0	Discharge switch status
1	Charging switch status
2	Current limit switch status
3	Heating switch status
4-7	reserved seat

surface15-Alarm event table

Alarm event1(bit)	Flag bit information (1:trigger,0:normal)
0	Voltage sensing failure
1	Temperature sensing failure
2	Current sensing failure
3	Key switch failure
4	Cell voltage difference failure
5	Charging switch failed
6	Discharge switch failure
7	Current limit switch failure
Alarm event2(bit)	Flag bit information (1:trigger,0:normal)
0	Single high voltage alarm

1	Single unit overvoltage protection	
2	Single unit low voltage alarm	
3	Single unit under voltage protection	
4	Total pressure high pressure alarm	
5	Total voltage overvoltage protection	
6	Low total pressure alarm	
7	Total voltage undervoltage protection	
Alarm event3(bit)	Flag bit information (1:trigger,0:normal)	
0	Charging high temperature alarm	Cell temperature
1	Charging over-temperature protection	
2	Charging low temperature alarm	
3	Charging under-temperature protection	
4	Discharge high temperature alarm	
5	Discharge over temperature protection	
6	Discharge low temperature alarm	
7	Discharge under-temperature protection	
Alarm event4(bit)	Flag bit information (1:trigger,0:normal)	
0	Environmental high temperature alarm	ambient temperature
1	Environmental over-temperature protection	
2	Environmental low temperature alarm	
3	Environmental under-temperature protection	Power temperature
4	Power over temperature protection	
5	Power high temperature alarm	Cell temperature
6	Battery core low temperature heating	

7	Secondary trip protection	
Alarm event5(bit)	Flag bit information (1:trigger,0:normal)	
0	Charging overcurrent alarm	
1	Charging overcurrent protection	
2	Discharge overcurrent alarm	
3	Discharge overcurrent protection	
4	Transient overcurrent protection	
5	Output short circuit protection	
6	Transient overcurrent lockout	
7	Output short circuit lockout	
Alarm event6(bit)	Flag bit information (1:trigger,0:normal)	
0	Charging high voltage protection	
1	Waiting for intermittent power replenishment	
2	Remaining capacity alarm	
3	Remaining capacity protection	
4	Battery cell low voltage charging is prohibited	
5	Output reverse polarity protection	
6	Output connection failure	
7	internal bit	
Alarm event7(bit)	Flag bit information (1:trigger,0:normal)	
0	internal bit	
1	internal bit	
2	internal bit	
3	internal bit	

4	Automatic charging waiting
5	Manual charging waiting
6	internal bit
7	internal bit
Alarm event8(bit)	Flag bit information (1:trigger,0:normal)
0	EEPstorage failure
1	RTCClock failure
2	Voltage calibration not done
3	Current calibration not done
4	Zero point calibration not done
5	Perpetual calendar not synchronized
6	internal bit
7	internal bit

equilibrium state1(bit)	Flag bit information (1: On,0:closure)
0	Batteries01balanced
1	Batteries02balanced
2	Batteries03balanced
3	Batteries04balanced
4	Batteries05balanced
5	Batteries06balanced
6	Batteries07balanced
7	Batteries08balanced
equilibrium state2(bit)	Flag bit information (1: On,0:closure)

0	Batteries09balanced
1	Batteries10balanced
2	Batteries11balanced
3	Batteries12balanced
4	Batteries13balanced
5	Batteries14balanced
6	Batteries15balanced
7	Batteries16balanced
.....	
equilibrium stateX(bit)	Flag bit information (1: On,0:closure)
0	Batteries8(X-1)+1balanced
1	Batteries8(X-1)+2balanced
2	Batteries8(X-1)+3balanced
3	Batteries8(X-1)+4balanced
4	Batteries8(X-1)+5balanced
5	Batteries8(X-1)+6balanced
6	Batteries8(X-1)+7balanced
7	Batteries8(X-1)+8balanced

surface17-Disconnection status table

Disconnected state1(bit)	Flag bit information (1:trigger,0:normal)
0	Batteries01Disconnected
1	Batteries02Disconnected
2	Batteries03Disconnected
3	Batteries04Disconnected

4	Batteries05Disconnected
5	Batteries06Disconnected
6	Batteries07Disconnected
7	Batteries08Disconnected
Disconnected state2(bit)	Flag bit information (1:trigger,0:normal)
0	Batteries09Disconnected
1	Batteries10Disconnected
2	Batteries11Disconnected
3	Batteries12Disconnected
4	Batteries13Disconnected
5	Batteries14Disconnected
6	Batteries15Disconnected
7	Batteries16Disconnected
.....	
Disconnected stateX(bit)	Flag bit information (1:trigger,0:normal)
0	Batteries8(X-1)+1Disconnected
1	Batteries8(X-1)+2Disconnected
2	Batteries8(X-1)+3Disconnected
3	Batteries8(X-1)+4Disconnected
4	Batteries8(X-1)+5Disconnected
5	Batteries8(X-1)+6Disconnected
6	Batteries8(X-1)+7Disconnected
7	Batteries8(x-1)+8Disconnected

4.3 function code 62H (Get parallel data)

4.3.1 Bluetooth APPask

surface18-CID-62H command information

data	SOI	VER	ADR	REQ	CID	LENGTH	DATA	CRC	EOI
content	7EH	10H	/	46H	62H	00H 00H	/	/	0DH

explain:

VER: Fixed value 10H;

ADR: Device address number 00H~FFH;

REQ: fixed value 46H;

CID: Function code 62H, see Table 4 for details; LEN: Data length 00H 00H (0);

DATA: empty;

Command example:

7E 10 00 46 62 00 00 A6 8A 0D

4.3.2 BMSresponse

surface19-CID-62H response message

serial number	data	unit	Number of bytes
Data frame header~LENGTH			
1	SOI	none	1
2	VER	none	1
3	ADR	none	1
4	CID	none	1
5	RTN	none	1
6	LENGTH	none	2
DATA			
7	DATA FLAG	none	1

8	Device address number (00H)	none	1
9	Number of cellsM	none	1
10	Maximum cell voltage for parallel operation	0.001V	2
11	Minimum cell voltage for parallel operation	0.001V	2
12	Temperature quantityN	none	1
13	Parallel maximum battery core temperature	0.1°C	2
14	Minimum cell temperature of parallel machine	0.1°C	2
15	Parallel ambient temperature	0.1°C	2
16	Parallel power temperature	0.1°C	2
17	Charge and discharge current	0.1A	2
18	total battery voltage	0.01V	2
19	The remaining capacity	0.1Ah	2
20	Custom amountK=7	none	1
twenty one	battery capacity	0.1Ah	2
twenty two	SOC	1‰	2
twenty three	Rated Capacity	0.1Ah	2
twenty four	Cycles	none	2
25	SOH	1‰	2
26	Port voltage	0.01V	2
27	Parallel connection status	none	2
28	system status	none	1
29	switch status	none	1
30	Custom alarm volumeP	none	1
31	Alarm event1	none	1

	Alarm event2	none	1
	Alarm event3	none	1
	Alarm event4	none	1
	Alarm event5	none	1
	Alarm event6	none	1
	Alarm event7	none	1
	Alarm event8	none	1
		
	Alarm eventP	none	1
		CRC+end of data frame	
32	CRC	none	2
33	EOI	none	1

explain:

VER: Protocol version number, such as 20H, interpreted as

V3.2; ADR: Device address number 00H~FFH;

CID: Function code 62H, see Table 3 for details; RTN:

Function code return value, see Table 4 for details;

LEN: Data length 00H 30H (48);

DATA: See Table 19 for details;

Command example:

**7E 10 00 62 00 00 30 00 00 10 0F D4 00 12 06 08 B7 08 B7 0B B8 0B B4 00 00 02 4B 03 B2 07 03 E8
03 B2 07 D0 00 00 03 E8 13 94 01 00 10 00 08 12 8A 08 00 00 10 00 00 9E B8 0D**

4.4function code47H(ObtainBMSparameter)

4.4.1BluetoothAPPask

surface20-CID-47Hcommand information

data	SOI	VER	ADR	REQ	CID	LENGTH	DATA	CRC	EOI
content	7EH	10H	/	46H	47H	00H 01H	00H	/	0DH

explain:

VER: Fixed value 10H;

ADR: Device address number 00H~FFH;

REQ: fixed value 46H;

CID: Function code 47H, see Table 3 for

details; LEN: Data length 00H 01H (1); DATA:

Group number, value range 00H~FFH;

Command example:

7E 10 00 46 47 00 01 00 E7 16 0D

4.4.2 BMSresponse

surface21-CID-47Hresponse message

serial number	data	unit	Number of bytes
Data frame header~LENGTH			
1	SOI	none	1
2	VER	none	1
3	ADR	none	1
4	CID	none	1
5	RTN	none	1
6	LENGTH	none	2
DATA			
7	GroupNumber	none	1
8	Number of integer parametersM=60	none	1
9	Single high voltage alarm	0.001V	2
10	Single high pressure recovery	0.001V	2
11	Single unit low voltage alarm	0.001V	2
12	Single unit low pressure recovery	0.001V	2
13	Single unit overvoltage protection	0.001V	2

14	Cell overvoltage recovery	0.001V	2
15	Single unit under voltage protection	0.001V	2
16	Single unit undervoltage recovery	0.001V	2
17	Balanced turn-on voltage	0.001V	2
18	Battery cell low voltage charging is prohibited	0.001V	2
19	Total pressure high pressure alarm	0.01 V	2
20	Total pressure high pressure recovery	0.01 V	2
twenty one	Low total pressure alarm	0.01 V	2
twenty two	Total pressure low pressure recovery	0.01 V	2
twenty three	Total voltage overvoltage protection	0.01 V	2
twenty four	Total pressure overvoltage recovery	0.01 V	2
25	Total voltage undervoltage protection	0.01 V	2
26	Total voltage and undervoltage recovery	0.01 V	2
27	Charging overvoltage protection	0.01 V	2
28	Charging overvoltage recovery	0.01 V	2
29	Charging high temperature alarm	0.1°C	2
30	Charging high temperature recovery	0.1°C	2
31	Charging low temperature alarm	0.1°C	2
32	Charging low temperature recovery	0.1°C	2
33	Charging over-temperature protection	0.1°C	2
34	Charging over-temperature recovery	0.1°C	2

35	Charging under-temperature protection	0.1°C	2
36	Charging under-temperature recovery	0.1°C	2
37	Discharge high temperature alarm	0.1°C	2
38	Discharge high temperature recovery	0.1°C	2
39	Discharge low temperature alarm	0.1°C	2
40	Discharge low temperature recovery	0.1°C	2
41	Discharge over temperature protection	0.1°C	2
42	Discharge over-temperature recovery	0.1°C	2
43	Discharge under-temperature protection	0.1°C	2
44	Discharge under-temperature recovery	0.1°C	2
45	Battery core low temperature heating	0.1°C	2
46	Battery cell low temperature recovery	0.1°C	2
47	Environmental high temperature alarm	0.1°C	2
48	Environmental high temperature recovery	0.1°C	2
49	Environmental low temperature alarm	0.1°C	2
50	Ambient low temperature recovery	0.1°C	2
51	Environmental over-temperature protection	0.1°C	2
52	Environment over-temperature recovery	0.1°C	2
53	Environmental under-temperature protection	0.1°C	2
54	Environmental low temperature recovery	0.1°C	2
55	Power high temperature alarm	0.1°C	2

56	Power high temperature recovery	0.1°C	2
57	Power over temperature protection	0.1°C	2
58	Power over temperature recovery	0.1°C	2
59	Charging overcurrent alarm	0.01A	2
60	Charging overcurrent recovery	0.01A	2
61	Discharge overcurrent alarm	0.01A	2
62	Discharge overcurrent recovery	0.01A	2
63	Charging overcurrent protection	0.01A	2
64	Discharge overcurrent protection	0.01A	2
65	Transient overcurrent protection	0.01A	2
66	Output soft start delay	ms	2
67	Battery rated capacity	0.01 Ah	2
68	Battery remaining capacity	0.01 Ah	2
69	Number of bytes parametersN=27	none	1
70	Cell failure voltage difference	0.01 V	1
71	Battery failure recovery	0.01 V	1
72	Equilibrium opening pressure difference	0.001 V	1
73	equalization end pressure difference	0.001 V	1
74	static equilibrium time	hour/h	1
75	Number of battery cells in series	string/s	1

76	Charging overcurrent delay	Second/s	1
77	Discharge overcurrent delay	Second/s	1
78	Transient overcurrent delay	ms	1
79	Overcurrent recovery delay	Second/s	1
80	Overcurrent recovery times	Second-rate/times	1
81	Charging current limit delay	point/min	1
82	Charge activation delay	point/min	1
83	Charging activation interval	hour/h	1
84	Number of charging activations	Second-rate/times	1
85	Work record interval	point/min	1
86	Standby recording interval	point/min	1
87	Standby shutdown delay	hour/h	1
88	Remaining capacity alarm	%	1
89	Remaining capacity protection	%	1
90	Intermittent replenishment capacity	%	1
91	Cycle cumulative capacity	%	1
92	Connection fault impedance	0.1 mΩ	1
93	compensation point1.Location	string/s	1
94	compensation point1Impedance	0.1 mΩ	1
95	compensation point2.Location	string/s	1
96	compensation point2Impedance	0.1 mΩ	1

Function switch-bit(1:Open,0:closure)			
97	Number of function switchesP=8	none	1
98	Voltage sensing failure (function switch1_bit0)		1
	Temperature sensing failure (function switch1_bit1)		
	Current sensing failure (function switch1_bit2)		
	Key switch failure (function switch1_bit3)		
	Cell voltage difference failure (function switch1_bit4)		
	Charging switch fails (function switch1_bit5)		
	Discharge switch failure (function switch1_bit6)		
	Current limit switch failure (function switch1_bit7)		
99	Single high voltage alarm (function switch2_bit0)		1
	Single overvoltage protection (function switch2_bit1)		
	Single unit low voltage alarm (function switch2_bit2)		
	Single unit undervoltage protection (function switch2_bit3)		
	Total pressure high voltage alarm (function switch2_bit4)		
	Total voltage overvoltage protection (function switch2_bit5)		
	Total pressure low pressure alarm (function switch2_bit6)		
	Total voltage undervoltage protection (function switch2_bit7)		
100	Charging high temperature alarm (function switch3_bit0)		1
	Charging over-temperature protection (function switch3_bit1)		
	Charging low temperature alarm (function switch3_bit2)		
	Charging under-temperature protection (function switch3_bit3)		
	Discharge high temperature alarm (function switch3_bit4)		

	Discharge over-temperature protection (function switch3_bit5)		
	Discharge low temperature alarm (function switch3_bit6)		
	Discharge under-temperature protection (function switch3_bit7)		
101	Ambient high temperature alarm (function switch4_bit0)		1
	Environmental over-temperature protection (function switch4_bit1)		
	Ambient low temperature alarm (function switch4_bit2)		
	Environmental under-temperature protection (function switch4_bit3)		
	Power over-temperature protection (function switch4_bit4)		
	Power high temperature alarm (function switch4_bit5)		
	Battery core low-temperature heating (function switch4_bit6)		
	Secondary trip protection (function switch4_bit7)		
102	Charging overcurrent alarm (function switch5_bit0)		1
	Charging overcurrent protection (function switch5_bit1)		
	Discharge overcurrent alarm (function switch5_bit2)		
	Discharge overcurrent protection (function switch5_bit3)		
	Transient overcurrent protection (function switch5_bit4)		
	Output short circuit protection (function switch5_bit5)		
	Transient overcurrent lockout (function switch5_bit6)		
	Output short circuit lockout (function switch5_bit7)		
103	Charging high voltage protection (function switch6_bit0)		
	Intermittent power supply function (function switch6_bit1)		
	Remaining capacity alarm (function switch6_bit2)		

	Remaining capacity protection (function switch6_bit3)		1
	Battery cell low voltage charging is prohibited (function switch6_bit4)		
	Output reverse polarity protection (function switch6_bit5)		
	Output connection failure (function switch6_bit6)		
	Output soft start function (function switch6_bit7)		
104	Charge balancing function (function switch7_bit0)		1
	Static equalization function (function switch7_bit1)		
	Timeout prohibits equalization (function switch7_bit2)		
	Over-temperature prohibition equalization (function switch7_bit3)		
	Automatic activation of charging (function switch7_bit4)		
	Manual activation of charging (function switch7_bit5)		
	Active current limiting charging (function switch7_bit6)		
	Passive current limiting charging (function switch7_bit7)		
105	Switch shutdown function (function switch8_bit0)		1
	Standby power-off function (function switch8_bit1)		
	History function (function switch8_bit2)		
	LCDDisplay function (function switch8_bit3)		
	Bluetooth communication function (function switch8_bit4)		
	Automatic address encoding (function switch8_bit5)		
	Parallel external polling (function switch8_bit6)		
	Standalone1.0CCharging (function switch8_bit7)		
106	Device model	none	10

CRC+end of data frame			
107	CRC	none	2
108	EOI	none	1

explain:

VER: Protocol version number, such as 20H, interpreted as

V3.2; ADR: Device address number 00H~FFH;

CID: Function code 47H, see Table 3 for details;

RTN: 00H/E2H, see Table 4 for details;

LEN: Data length 00H A9H (169); DATA: Except for the device model, which is ASCII

interpretation, the rest are HEX interpretation;

Command example:

```
7E 10 00 47 00 00 A9 00 3C 0D AC 0D 48 0B 54 0C 1C 0E 42 0D 48 0A 8C 0C 1C 0D 48 05 DC 15 E0
15 18 12 20 12 C0 16 80 15 18 10 E0 12 C0 17 70 17 0C 0C 9F 0C 81 0A BF 0A DD 0C D1 0C 9F 0A
47 0A AB 0C B3 0C 81 0A 47 0A C9 0C D1 0C 9F 0A 15 0A AB 0A AB 0B 0F 0C 9F 0C 81 0A AB 0A
C9 0D 03 0 C D1 0A 47 0A AB 0E 2F 0D FD 0E 93 0D FD 2A F8 29 04 D5 08 D6 FC 2E E0 D1 20 B9
B0 07 D0 27 10 13 88 1B 3C 28 1E 14 0A 10 0F 0F 64 3C 05 05 01 01 30 1E F0 30 0F 05 60 50 64 09
00 0D 00 08 FF FF FF 3F BF 1F AF 1E 45 4D 55 31 31 30 31 31 30 45 FB 65 0D
```

4.5function codeA1H(set upBMSparameter)

4.5.1BluetoothAPPask

surface22-CID-A1Hcommand information

data	SOI	VER	ADR	REQ	CID	LENGTH	DATA	CRC	EOI
content	7EH	10H	/	46H	A1H	00H A9H	/	/	0DH

explain:

VER: Fixed value 10H;

ADR: Device address number 00H~FFH;

REQ: fixed value 46H;

CID: Function code A1H, see Table 3 for details; LEN: Data length 00H A9H (169);

DATA: See Table 21 for details;

Command example:

```
7E 10 00 46 A1 00 A9 00 3C 0D AC 0D 48 0B 54 0C 1C 0E 42 0D 48 0A 8C 0C 1C 0D 48 05 DC 15 E0 15 18
12 20 12 C0 16 80 15 18 10 E0 1 2 C0 17 70 17 0C 0C 9F 0C 81 0A BF 0A DD 0C D1 0C 9F 0A 47 0A AB
0C B3 0C 81 0A 47 0A C9 0C D1 0C 9F 0A 15 0A AB 0A AB 0B 0F 0C 9F 0C 81 0A AB 0A C9 0D 03 0 C
D1 0A 47 0A AB 0E 2F 0D FD 0E 93 0D FD 2A F8 29 04 D5 08 D6 FC 2E E0 D1 20 B9 B0 07 D0 27 10 13
88 1B 3C 28 1E 14 0A 10 0F 0F 64 3C 05 05 01 01 30 1E F0 30 0F 05 60 50 64 09 00
```

0D 00 08 FF FF FF 3F BF 1F AF 1E 45 4D 55 31 31 30 31 31 30 45 01 FF 0D

4.5.2 BMSresponse

surface23-CID-47Hresponse message

data	SOI	VER	ADR	CID	RTN	LENGTH	DATA	CRC	EOI
content	7EH	10H	/	A1H	00H/E2H	00H 00H	/	/	0DH

explain:

VER: Protocol version number, such as 20H, interpreted as

V3.2; ADR: Device address number 00H~FFH;

CID: Equipment code A1H, see Table 3 for

details; RTN: 00H/E2H, see Table 4 for details;

LEN: Data length 00H 00H (0);

DATA: empty;

Command example:

7E 10 00 A1 00 00 00 86 46 0D 7E

10 00 A1 E2 00 00 48 17 0D

4.6function code63H(toggleCANprotocol)

4.6.1BluetoothAPPask

surface24-CID-63Hcommand information

data	SOI	VER	ADR	REQ	CID	LENGTH	DATA	CRC	EOI
content	7EH	10H	/	46H	63H	00H 01H	/	/	0DH

explain:

VER: Fixed value 10H;

ADR: Device address number 00H~FFH;

REQ: fixed value 46H;

CID: Function code 63H, see Table 3 for details;

LEN: Data length 00H 01H (1); DATA: CAN

protocol content, see Table 8 for details;

Command example:

7E 10 00 46 63 00 01 02 3A EB 0D

4.6.2 BMSresponse

surface25-CID-63Hresponse message

data	SOI	VER	ADR	CID	RTN	LENGTH	DATA	CRC	EOI
content	7EH	10H	/	63H	00H/E2H	00H 01H	/	/	0DH

explain:

VER: Protocol version number, such as 20H, interpreted as

V3.2; ADR: Device address number 00H~FFH;

CID: Function code 63H, see Table 3 for details;

RTN: 00H/E2H, see Table 4 for details;

LEN: Data length 00H 01H (1); DATA: CAN

protocol content, see Table 8 for details;

Command example:

```
7E 10 00 63 00 00 01 02 D3 06 0D 7E
```

```
10 00 63 E2 00 01 02 BA 84 0D
```

4.7function code64H(toggle485protocol)

4.7.1BluetoothAPPask

surface26-CID-64Hcommand information

data	SOI	VER	ADR	REQ	CID	LENGTH	DATA	CRC	EOI
content	7EH	10H	/	46H	64H	00H 01H	/	/	0DH

explain:

VER: Fixed value 10H;

ADR: Device address number 00H~FFH;

REQ: fixed value 46H;

CID: Function code 64H, see Table 3 for details;

LEN: Data length 00H 01H (1); DATA: 485

protocol content, see Table 9 for details;

Command example:

```
7E 10 00 46 64 00 01 02 6B C6 0D
```

4.7.2 BMSresponse

surface27-CID-64Hresponse message

data	SOI	VER	ADR	CID	RTN	LENGTH	DATA	CRC	EOI
content	7EH	10H	/	64H	00H/E2H	00H 01H	/	/	0DH

explain:

VER: Protocol version number, such as 20H, interpreted as

V3.2; ADR: Device address number 00H~FFH;

CID: Function code 64H, see Table 3 for details;

RTN: 00H/E2H, see Table 4 for details;

LEN: Data length 00H 01H (1); DATA: 485

protocol content, see Table 9 for details;

Command example:

7E 10 00 64 00 00 01 02 B4 D2 0D 7E

10 00 64 E2 00 01 02 DD 50 0D

4.8function code65H(Set device group number)

4.8.1BluetoothAPPask

surface28-CID2-65Hcommand information

data	SOI	VER	ADR	REQ	CID	LENGTH	DATA	CRC	EOI
content	7EH	10H	/	46H	65H	00H 02H	/	/	0DH

explain:

VER: Fixed value 10H;

ADR: Device address number 00H~FFH;

REQ: fixed value 46H;

CID: Function code 65H, see Table 3 for

details; LEN: Data length 00H 02H (2); DATA:

Group number, value range 00H~FFH;

Device number, value range 00H~FFH;

Command example:

7E 10 00 46 65 00 02 01 00 BD 9F 0D

4.8.2 BMSresponse

surface29-CID-65Hresponse message

data	SOI	VER	ADR	CID	RTN	LENGTH	DATA	CRC	EOI
------	-----	-----	-----	-----	-----	--------	------	-----	-----

content	7EH	10H	/	65H	00H/E2H	00H 01H	/	/	0DH
---------	-----	-----	---	-----	---------	---------	---	---	-----

explain:

VER: protocol version number, such as 20H, interpreted as V3.2;

ADR: Device address number 00H~FFH;

CID: Function code 65H, see Table 3 for details;

RTN: 00H/E2H, see Table 4 for details;

LEN: Data length 00H 02H (2); DATA:

Group number, value range 00H~FFH;

Device number, value range 00H~FFH;

Command example:

7E 10 00 65 00 00 02 01 00 7C FC 0D 7E

10 00 65 E2 00 02 01 00 03 73 0D