Coslight Lithium Battery Communication Protocol

Version NO.:GYFP4875T-V1.6

I. Physical Interface

1.1 The serial communication port adopts RS485。

1.2 Information transmission mode is asynchronous transmission. The start bit is 1 bit, the data bit is 8 bit， the stop bit is 1 bit, and no validation

1.3 The data transfer rate is 19200B/S.

1.4 Address 1 is the master BMS, and other addresses is sub BMS.

1.5Communication time interval is 60s~300s, and the default is 120s.

II. Communication Mode

PC is the upper order computer system， while BMS is the lower order computer system. PC will call BMS to send out order, and the BMS will give response message after it received the order. If PC (give three command continuously with 500ms interval) can not receive response message or response message error from BMS in 500MS, the communication process can be regarded as failure.

III. Information Type and Basic Format of Protocol

3.1 Information Type

It can be divided into two types：

（1）The command information which PC sends out to BMS.(“Command Information” for short)；

（2）The response information which returns to PC from BMS. (“response information” for short)

3.2 Basic Format of Protocol

No.	1	2	3	4	5	6	7	8	9
Byte count	1	1	1	1	1	2	LENID/2	2	1
Format	SOI	VER	ADR	CID1	CID2	LENGTH	INFO	CHKSUM	EOI

Comments of the basic format

No.	Symbol	Significance	Remark
1	SOI	start bit symbol（START OF INFORMATION）	(7EH)
2	VER	communication protocol version	(11H)
3	ADR	device address description（1~254 valid）	
4	CID1	Control identification code（device type description）	(0DH)
5	CID2	command information：Control identification code（data or action type description） response information：return code-RTN（return code in another table）	
6	LENGTH	INFO bits length（include LENID and LCHKSUM）and data format in another table	
7	INFO	command information: control command information-COMMAND INFO response information： response DATA INFO	
8	CHKSUM	checksum code：data format in another table	
9	EOI	End of information	CR(0DH)

Introductions：

COMMAND INFO consists of the following control command code：

COMMAND GROUP（1 byte）:it shows the different compositions of the same type equipment；

COMMAND ID（1 byte）:it shows the different monitory points of the same type equipment within the same group；

COMMND TYPE（1 byte）:it shows different guidance commands or different control commands in historical data transmission；

COMMAND TIME（1 byte）:it shows time fields.

DATA INFO consists of the following answer-back code：

DATAI：response information with integer；

DATAF：response information with floating-point number；

RUNSTATE：running state of equipment；

WARNSTATE：warning state of equipment；

DATAFLAG：mark bytes；

Return Code (RTN)：

No.	RTN value（HEX）	significance	remark
1	00H	normal	√
2	01H	VER error	√
3	02H	CHKSUM error	
4	03H	LCHKSUM error	√
5	04H	CID2 invalid	√
6	05H	command format error	
7	06H	invalid data	√
8	E0H~EFH	other error	user defined（no）

3.3 Data Format

3.3.1 Basic data format

In basic format, all are explained by hexadecimal and transferred by hexadecimal-ASCII (every bytes is indicated by two ASCII codes: one ASCII code indicates high four bytes, the other indicates low four bytes) except SOI and EOI, which are explained by hexadecimal （SOI=7EH，EOI=ODH ） and transferred by hexadecimal. Eg.: CID2=4BH, in transmission, sequence send two bytes of 34H and 42H

3.3.2 LENGTH data format

LENGTH data format is as below.

High Byte				Low byte											
check code: LCHKSUM				Length marking code: LENID（it shows the bytes number of ASCII codes in INFO transmission ）											
D15	D14	D13	D12	D11	D10	D09	D08	D07	D06	D05	D04	D03	D02	D01	D00

LENGTH totally has two bytes, and it consists of LENID and LCHKSUM. LENID signifies ASCII code word number of INFO item, when LENID=0，INFO is empty (the item doesn’t exist). In LENGTH transmission, firstly transfer High Byte, then transfer Low Byte, it is divided into four ASCII

code to transfer.

Check code calculation：D11D10D9D8+D7D6D5D4D+D3D2D1DD0，after summation, take back of module 16 remainder to plus 1.

Eg: ASCII code byte count of INFO item is 18, that is LENID=0000 0001 0010B.

D11D10D9D8+D7D6D5D4+D3D2D1D0=0000B+0001B+0010B=0011B，module 16 remainder is 0011B ，taking 0011B back to plus 1 is 1101B, so LCHKSUM is 1101B.

Conclusion：LENGTH is 1101 0000 0001 0010B，that is D012H.

3.3.3 GHKSUM data format

The calculation of CHKSUM is the accumulative sum of all other chars as ASCII code value except SOI、EOI and CHKSUM. And take back of the result module 65536 remainder to plus 1.

Eg: The chars sequence received or send is:

~1203400456ABCDFEFC72CR（“~”is SOI，“CR”is EOI），and in the last 5 chars, FC72 of FC72CR is CHKSUM, the calculation method is:

‘1’+‘2’+‘0’+***** +‘A’+‘B’+ ****** +‘F’+‘E’

=31H+32H+30H+****** +41H+42H+******+46H+45H

=038EH

Among that‘1’ signifies ASCII code value of 1，‘E’ signifies ASCII code value of E. 038EH module 65536 remainder is 038EH，taking 038EH back to add 1 is FC72H.

3.3.4 INFO data format

3.3.4.1 Floating-point number format

Floating-point number format has relation with IEEE-754 standard（32），length is 32 bits，and floating point data transmission sequence of four bytes is from low byte to high byte. So the transmission sequence is: firstly low byte D7-D0，then D15-D8, next D23-D15, at last high byte D31-D24, in the end it is divided into 8 ASCII code to transmit. The floating point data is：floating-point number value =（-1） piece of（sign bit）1，mantissa 2 pieces of（Expoent-127）

3.3.4.2 Integer（INTEGER，2EYTE）

Signed integer —32768— +32767

Unsigned integer 0 — +65535

Integer data transfer sequence of two chars is from high byte to low byte.

3.3.4.3 Unsigned char（CHAR，1BYTE，0—255）

3.3.4.4 CID2 command information Introductions

No.	Contents	CID2	Remark
1	Obtain data quantized by analog quantity（floating-point number）	41H	
2	Obtain data quantized by analog quantity（fixed-point	42H	√

	number）		
3	Obtain switching value input state	43H	
4	Obtain warning state	44H	√
5	remote control	45H	√
6	Obtain system parameters（floating-point number）	46H	
7	Obtain system parameters（fixed-point number）	47H	√
8	Set system parameters（floating-point number）	48H	
9	Set system parameters （fixed-point number）	49H	√
10	Obtain system historical data（floating-point number）	4AH	include switching value
11	Obtain system historical data（fixed-point number）	4BH	include switching value
12	Obtain historical warning*	4CH	
13	Obtain monitor module time*	4DH	
14	Set monitor module time	4EH	
15	Obtain communication protocol version number	4FH	√
16	Obtain device address	50H	√
17	Obtain information of devices（monitor module）and manufacturers information	51H	√
18	User defined	80H~EFH	√
19	Obtain analog data	82H	√
20	Obtain information state	83H	√

3.3.4.5 The conversion between Integer transfer value and actual value

When it adopts integer to transfer remote measuring data, It should follows these principles：

1. Cell voltage actual value = transfer value /1000 (V)
   e.g. 3600 means 3.600V
2. Battery total voltage
   actual value = transfer value /100 (V)
   e.g. 5200 means 52.00V
3. Cell temp actual value = transfer value (℃)
   e.g. 25 means 25℃
4. Charge/discharge current value
   actual value=transfer value /100 (A)
   e.g. 5000 means 50.00A
5. SOC value actual value=transfer value (%)
   e.g. 50 means 50%
6. Rated capacity actual value=transfer value /100 (Ah)
   e.g. 1234 means 12.34 AH
7. Residual backup time actual value=transfer value/10 (hours) e.g. 56 means 5.6 hours
8. Charging current limiting value
   actual value=transfer value/100 (A)
   e.g. 5000 means 50.00A
9. Battery SOH

actual value=transfer value (%)

e.g. 100 means 100%

10. Battery pack No. actual value = transfer value (Pack)

e.g. 2 means the second battery pack

IV. Communication message：

4.1 Obtain analog data

Command information：

No.	1	2	3	4	5	6	7	8	9
byte count	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	CID1	CID2	LENGTH	COMMAND INFO	CHKSUM	EOI
data	7E	11H	01H	D0H	82H	E002H	01		0DH

Note：LENID=02H，COMMAND INFO consists of COMMAND GROUP. COMMAND GROUP=01H

Response information：

No.	1	2	3	4	5	6	7	8	9
byte count	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	CID1	RTN	LENGTH	DATAINFO	CHKSUM	EOI
data	7E	11H	01H	D0H	00H		（Another note）		0D

DATAINFO consists of DATAFLAG and DATAI. DATAI is remote measuring content of battery monitor. The details are as below:

No.	Content	DATAI bytes
1	LFP battery pack Max. cell voltage	2
2	LFP battery pack Min. cell voltage	2
3	LFP battery pack Max. cell temperature	1
4	LFP battery pack Min. cell temperature	1
5	Battery pack total voltage	2
6	Charging current	2
7	Discharging current	2
8	SOC	1
9	Rated capacity	2
10	Residual backup time	1
11	Charging current limiting value	2
12	Battery SOH	1
13	Battery pack serial number	1

*The above date is single battery pack analog data, and the BMS can transmit 7 packs of data with same format. (Data of 7 battery-packs in parallel)

Special instructions:

If the master BMS communication is fault, Suggest the SMPS current-limiting charging is only for 1 module.

4.2 Obtain information state

Command information：

No.	1	2	3	4	5	6	7	8	9
byte count	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	CID1	CID2	LENGTH	COMMAND INFO	CHKSUM	EOI
data	7E	11H	01H	D0H	83H	E002H	01H		0DH

Note：LENID=02H，COMMAND INFO consists of COMMAND GROUP. COMMAND GROUP=01H

Response information：

No.	1	2	3	4	5	6	7	8	9
byte count	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	CID1	RTN	LENGTH	DATAINFO	CHKSUM	EOI
data	7E	11H	01H	D0H	00H		(Another note）		0D

Public data contents are as below：

- Online service information explain: module online Bit(n) = 1; module offline Bit(n) = 0
- Module data loss explain: module communication data loss alarm Bit(n) = 1; module communication normal Bit(n) = 0

For example：

bit	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Module online	0	0	0	1	1	1	1
Module No.	7	6	5	4	3	2	1

Byte 1 = 0x0F send ACSII 30H and 46H ,module 1~4 online, module 5~7 offline ;

bit	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Data loss alarm	1	1	1	0	0	0	0
Module No.	7	6	5	4	3	2	1

Byte 2 = 0x70 send ACSII 37H and 30H , module 1~4 normal ,module 5~7data loss alarm ;

S.No	Case	Module Power Status	Module Comm. Status
	Coslight	OLS	data loss
1	Batt Available & Comm. OK	1	0
2	Batt Available & Comm. Loss	0	1
3	Batt Not Available (Fault) & Comm. OK	0	0
4	Batt Not Available & Comm. Loss	0	1

1. On-line service information

Data content	Occupying space
（Byte）	（Byte 1）
Battery #1 OLS	Bit0
。。。	。。。
Battery #8 OLS	Bit7
（Byte）	（Byte 2）
Battery #9 OLS	Bit0
。。。	。。。
Battery #16 OLS	Bit7

2. Battery pack data loss warning

Data content	Occupying space
（Byte）	（Byte 3）

Battery #1 data loss warning	Bit0
。。。	。。。
Battery #8 data loss warning	Bit7
（Byte）	（Byte 4）
Battery #9 data loss warning	Bit0
。。。	。。。
Battery #16 data loss warning	Bit7

Single battery pack warning data is as below, and the BMS can transmit 7 packs of data with same format. (Data of 7 battery packs in parallel- byte 5~ 21)

Data content	Occupying space
(Byte)	Byte 5
Cell #1 overvoltage warning	Bit0
。。。	。。。
Cell #8 overvoltage warning	Bit7
(Byte)	Byte 6
Cell #9 overvoltage warning	Bit0
。。。	。。。
Cell #16 overvoltage warning	Bit7
(Byte)	Byte 7
Cell #1 undervoltage warning	Bit0
。。。	。。。
Cell #8 undervoltage warning	Bit7
(Byte)	Byte 8
Cell #9 undervoltage warning	Bit0
。。。	。。。
Cell #16 undervoltage warning	Bit7
(Byte)	Byte 9
Temperature 1 charging over-temperature warning	Bit0
。。。	。。。
Temperature 8 charging over-temperature warning	Bit7
(Byte)	Byte 10
Temperature 1 discharging over-temperature warning	Bit0
。。。	。。。
Temperature 8 discharging over-temperature warning	Bit7
(Byte)	Byte 11
Temperature 1 charging under-temperature warning	Bit0
。。。	。。。
Temperature 8 charging under -temperature warning	Bit7
(Byte)	Byte 12
Cell #1 overvoltage protection	Bit0
。。。	。。。
Cell #8 overvoltage protection	Bit7
(Byte)	Byte 13
Cell #9 overvoltage protection	Bit0
。。。	。。。
Cell #16 overvoltage protection	Bit7
(Byte)	Byte 14
Cell #1 undervoltage protection	Bit0
。。。	。。。

Cell #8 undervoltage protection	Bit7
(Byte)	Byte 15
Cell #9 undervoltage protection	Bit0
◦ ◦ ◦	◦ ◦ ◦
Cell #16 undervoltage protection	Bit7
(Byte)	Byte 16
Temperature 1 charging over-temperature protection	Bit0
◦ ◦ ◦	◦ ◦ ◦
Temperature 8 charging over-temperature protection	Bit7
(Byte)	Byte 17
Temperature 1 discharging over-temperature protection	Bit0
◦ ◦ ◦	◦ ◦ ◦
Temperature 8 discharging over-temperature protection	Bit7
(Byte)	Byte 18
Temperature 1 charging under-temperature protection	Bit0
◦ ◦ ◦	◦ ◦ ◦
Temperature 8 charging under-temperature protection	Bit7
Integrated warning	Byte 19
Battery pack charging overcurrent warning	Bit0
Battery pack discharging overcurrent warning	Bit1
Battery pack overvoltage warning	Bit2
Battery pack undervoltage warning	Bit3
Battery pack charging overcurrent protection	Bit4
Battery pack discharging overcurrent protection	Bit5
Battery pack overvoltage protection	Bit6
Battery pack undervoltage protection	Bit7
(Byte)	Byte 20
Battery pack low SOC warning warning below 20%	Bit0
Contactor/ fuse open circuit warning	Bit1
BMS hardware failure warning	Bit2
Charging contactor status 1：CONNECT　0：DISCONNECT	Bit3
Discharging contactor status 1：CONNECT　0：DISCONNECT	Bit4
Reserved	Bit5
Reserved	Bit6
Reserved	Bit7
Battery pack serial number	Byte 21

** (Remark：in practical application, the master BMS uploads the warning data of battery #1~#16 and temperature 1~8)

** The Bit2 and Bit3 in 20th byte of information state can just explain contactor status but not warning information.

** Remark：Communication bit transformat is as below. (E.g. 12H)

Name	Data content
H4 bit	ASCII code 31H
L4 bit	ASCII code 32H