

LifePower4 Battery Communication Protocol

Date Version Chapter Note Author				
			First version	

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For battery following this protocol:

When battery communicate with inverter or upper computer, the Address of first battery starts from 1 BMS Module ID:



N O.	Module Address	BMS Module ID	ID Arrangement			
			1#	2#	3#	4#
1	0x01	1	ON	OFF	OFF	OFF
2	0x02	2	OFF	ON	OFF	OFF
3	0x03	3	ON	ON	OFF	OFF
4	0x04	4	OFF	OFF	ON	OFF
5	0x05	5	ON	OFF	ON	OFF
6	0x06	6	OFF	ON	ON	OFF
7	0x07	7	ON	ON	ON	OFF
8	0x08	8	OFF	OFF	OFF	ON
9	0x09	9	ON	OFF	OFF	ON
10	0x0A	10	OFF	ON	OFF	ON
11	0x0B	11	ON	ON	OFF	ON
12	0x0C	12	OFF	OFF	ON	ON
13	0x0D	13	ON	OFF	ON	ON
14	0x0E	14	OFF	ON	ON	ON
15	0x0F	15	ON	ON	ON	ON

0	0x00 (Master)	0	OFF	OFF	OFF	OFF
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1. Protocol

1.1 Protocol settings

Transmission rate: 9.6kb/s

Format: Start bit 1 bit

Data bit 8 bit

Stop bit 1 bit

Without parity

1.2 Basic format

1.2.1 Basic format of frame

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

1.2.2 Introduction of frame

No	Mark	Meaning	Note
1	SOI	Start bit mark	7EH
2	VER	Version of protocol	20H
3	ADR	(0、255)/Address	1~15
4	CID1	Device identification code	4AH
5	CID2	Command information: control mark code (show the data or control command type) RTN Response information: return code RTN	
6	LENGTH	INFO , LENID LCHKSUM INFO length, including LENID and LCHKSUM	

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7	INFO	Command information: COMMAND_INFO Response information: DATA_INFO	
8	CHKSUM	CHECKSUM	
9	EOI	End code	0DH

■ COMMAND_INFO

COMMAND_GROUP	1 byte	Group number of same type of device
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state me nt									No unread alarm value	Exist unread alarm value
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1.3Data format

1.3.1 Basic data format

SOI EOI 16 16, 16 , 16—ASCII , ASCII , CID2=4BH , 34H(‘4’ ASCII) 42H (‘B’ ASCII) 。

SOI and EOI are explained and transferred in HEX. Other items are explained in HEX, transferred in HEX-ASCII, each byte contains 2 ASCII.

E.g. CID2 = 4BH, transfer in 2 byte, 34H (“4” in ASCII), and 42H (“B” in

ASCII). 1.3.2 LENGTH data format

HIGH								LOW							
LCHKSUM				LENID											
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

LENID INFO ASCII , LENID = 0 , INFO 。 LENID means the number of byte of ASCII in INFO, when LENID = 0, means INFO is empty.

LENID 12Bit4095。

LENID has 12 bits, data package should smaller than 4095 bytes.

LENGTH ASCII 。

While transmission, HIGH byte first, then LOW byte and divided into 4 ASCII to transmit.

LCHKSUM : D11D10D9D8+D7D6D5D4+D3D2D1D0 , 16 1

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To calculate LCHKSUM: D11D10D9D8+D7D6D5D4+D3D2D1D0, add the sum, modulus 16 take remainder, then do a bitwise invert and then plus 1.

e.g.:

INFO ASCII 18 , LENID = 000000010010B。

In INFO the number of ASCII is 18, then LENID = 000000010010B

D11D10D9D8+D7D6D5D4+D3D2D1D0=0000B+0001B+0010B=0011B,

Modulus 16 the remainder = 0011B Do a bitwise invert and plus 1 = 1101B, LCHKSUM = 1101B。

LENGTH = 1101000000010010B, trans: D012

1.3.3 CHKSUM data format

CHKSUM SOI, EOI CHKSUM, ASCII ,65536 1。

Except for SOI, EOI and CHKSUM, add sum number of other characters in ASCII, the result modulus 65536 take remainder, then do a bitwise invert and then plus 1.

E.g.:

“1203400456ABCEFEFC71\R”(“~” SOI, “CR” EOI), If we have a character:

“~1203400456ABCEFEFC71\R”(“~” is SOI, “CR” is EOI)

“FC71\R” FC71 CHKSUM,

The last 5 character “FC71\R”, the FC71 is the CHKSUM

Calculate:

$$'1' + '2' + '0' + \dots + 'F' + 'E' = 31H + 32H + 30H + \dots + 46H + 45H = 038FH$$

038FH 65535 038FH, 038FH 1 FC71H。

038FH modulus 65535 remainder = 038FH, do a bitwise invert and plus 1 = FC71H.

1.3.4 DATA_INFO data format

Analog quantity is transmitted in form of fixed-point or floating-point.

Fixed-point (integer, 2 bytes),
This protocol uses fixed-point
Signed integer: -32768 ~ +32767
Unsigned integer: 0 ~ +65535

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1.3.5 DATA_TIME and COMMAND_TIME format

Year	1-9999	Integer	2 bytes, HEX
Month	1-12	Char	1 byte, HEX
Day	1-31	Char	1 byte, HEX
Hour	0-23	Char	1 byte, HEX
Minute	0-59	Char	1 byte, HEX
Second	0-59	Char	1 byte, HEX
Note	Year is transferred as integer, actual value = transfer value		

1.4 mEncoding table

1.4.1 CID1

No	Content	CID1	Note
1	BMS/ LiFePO4 battery BMS	4AH	

1.4.2 CID2

■ Command information

No	Content	CID2	Note
1	Get analog value, fixed point	42H	
2	Get alarm info	44H	
3	Get system parameter, fixed point	47H	

4	Set system parameter, fixed point	49H	
5	Get manufacturer info	51H	
6	Get date time	4DH	
7	set date time	4EH	

■ Response information

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No	Content	CID2	Note
1	Normal	00H	
2	VER error	01H	
3	CHKSUM error	02H	
4	LCHKSUM error	03H	
5	CID2 invalid	04H	
6	Command format error	05H	
7	Invalid data	06H	INFO data invalid

■ Fixed point type

No	Content	Data type	Unit
1	Cell voltage	Signed integer	mv
2	Temperature	Signed integer	0.1K
3	Module voltage	Unsigned integer	10mv
4	Module current	Signed integer	10mA ,charge is positive
5	The remaining capacity	Signed integer	10mAH
6	Total capacity	Signed integer	10mAH

2. Communication command

2.1 Get analog value(fixed-point type)

■ Command

No	1	2	3	4	5	6	7	8	9
Byte	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	CID1	CID2	LENGTH	INFO	CHKSUM	EOI
	7EH	20H		4AH	42H				0DH

Note:LENID = 00H

■ Response

No	1	2	3	4	5	6	7	8	9
Byte	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	CID1	RTN	LENGTH	INFO	CHKSUM	EOI

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INFO Content:

No	Content	byte	Unit	Note
1	DATA_FLAG	1		
2	PACK Group	1		1
3	M(Number of cells)	1	Variable	16 or 8
4	Cell 1 voltage	2	1mv	
5	Cell 2 voltage	2	1mv	
6	Cell 3 voltage	2	1mv	
7	Cell 4 voltage	2	1mv	
8	Cell 5 voltage	2	1mv	
9	Cell 6 voltage	2	1mv	
10	Cell 7 voltage	2	1mv	

11	Cell 8 voltage	2	1mv	
12	Cell 9 voltage	2	1mv	
13	Cell I0 voltage	2	1mv	
14	Cell I1 voltage	2	1mv	
15	Cell 12 voltage	2	1mv	
16	Cell 13 voltage	2	1mv	
17	Cell 14 voltage	2	1mv	
18	Cell 15 voltage	2	1mv	
19	Cell 16 voltage	2	1mv	
20	N (number of cell temperature)	1		4
21	Cell temperature 1	2	Kelvin temperature: K Temperature blow 0 the value is negative e.g.: 25.5°C $=25.5 \times 10 + 2731 = 2986$ -12.4°C = $-12.4 \times 10 + 2731 = 2607$	
22	Cell temperature 2	2	Kelvin temperature: K	
23	Cell temperature 3	2	Kelvin temperature: K	
24	Cell temperature 4	2	Kelvin temperature: K	
25	Environment temperature	2	Kelvin temperature: K	
26	MOSFET temperature	2	Kelvin temperature: K	

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27	Pack current	2	10mA Positive: charging Negative: discharging	
28	Pack voltage	2	10mV	

29	Remain capacity	2	10mAH	
30	Full capacity	2	10mAH	
31	Battery cycle counts	2	Cyc.	
32	User-defined	1		15
33	SOC	2	1%	0~100%
34	SOH	2	1%	0~100%
35	Max cell voltage	2	1mv	
36	Min cell voltage	2	1mv	
37	Cell voltage difference	2	1mv	
38	Max cell temperature	2	Kelvin temperature: K	
39	Min cell temperature	2	Kelvin temperature: K	
40	Cumulative charging capacity	4	0.01AH	
41	Cumulative discharge capacity	4	0.01AH	
42	Cumulative charging energy	4	0.001KWH	
43	Cumulative discharge energy	4	0.001KWH	
44	Cumulative charging time	4	Hour	
45	Cumulative discharge time	4	Hour	

46	Cumulative charging times	2		
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8	PACK GROUP	30 31	01H
9	M(Number of cells)	31 30	10H, 16 Cells
10	Cell 1 voltage	30 43 35 34	0C54H, 3156mv
11	Cell 2 voltage	30 43 38 31	0C81H, 3201mv
12	Cell 3 voltage	30 43 38 31	0C81H, 3201mv

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13	Cell 4 voltage	30 43 38 32	0C82H, 3202mv
14	Cell 5 voltage	30 43 38 31	0C81H, 3201mv
15	Cell 6 voltage	30 43 38 31	0C81H, 3201mv
16	Cell 7 voltage	30 43 38 31	0C81H, 3201mv
17	Cell 8 voltage	30 43 38 31	0C81H, 3201mv
18	Cell 9 voltage	30 43 38 32	0C82H, 3202mv
19	Cell 10 voltage	30 43 38 32	0C82H, 3202mv
20	Cell 11 voltage	30 43 38 32	0C82H, 3202mv
21	Cell 12 voltage	30 43 38 32	0C82H, 3202mv
22	Cell 13 voltage	30 43 38 32	0C82H, 3202mv
23	Cell 14 voltage	30 43 38 32	0C82H, 3202mv
24	Cell 15 voltage	30 43 38 32	0C82H, 3202mv
25	Cell 16 voltage	30 43 37 45	0C7EH, 3198mv
26	N (number of cell temperature)	30 34	04H, 4 cell temperature
27	Cell temperature 1	30 42 43 44	0BCDH, 29.0°C
28	Cell temperature 2	30 42 43 44	0BCDH, 29.0°C
29	Cell temperature 3	30 42 43 44	0BCDH, 29.0°C
30	Cell temperature 4	30 42 43 44	0BCDH, 29.0°C
31	Environment temperature	30 42 44 37	0BD7H, 30.0°C
32	MOSFET temperature	30 42 44 37	0BD7H, 30.0°C

33	Pack current	30 30 30 30	0000H, 0A
34	Pack voltage	31 33 46 44	13FDH, 51.17V
35	Remain capacity	30 30 30 30	0000H, 0AH
36	Full capacity	32 37 31 30	2710H, 100.00AH
37	Battery cycle counts	30 30 30 30	0000H, 0
38	User-defined	30 46	0FH, 15
39	SOC	30 30 30 30	0000H, 0%
40	SOH	30 30 36 34	0064H, 100%
41	Max cell voltage	30 43 38 32	0C82H, 3202mv
42	Min cell voltage	30 43 35 34	0C54H, 3156mv
43	Cell voltage difference	30 30 32 45	002EH, 46mv
44	Max cell temperature	30 42 43 44	0BCDH, 29.0°C
45	Min cell temperature	30 42 43 44	0BCDH, 29.0°C

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46	Cumulative charging capacity	30 30 30 30 30 30 31 35	00000015H, 0.21AH
47	Cumulative discharge capacity	30 30 30 30 30 30 33 43	0000003CH, 0.6AH
48	Cumulative charging energy	30 30 30 30 30 30 30 41	0000000AH, 0.01Kwh
49	Cumulative discharge energy	30 30 30 30 30 30 31 44	0000001DH, 0.029Kwh
50	Cumulative charging time	30 30 30 30 30 30 30 30	00000000H, 0hour

51	Cumulative discharge time	30 30 30 30 30 30 30 30	00000000H, 0hour
52	Cumulative charging times	30 30 30 32	0002H, 2
53	Cumulative discharge times	30 30 31 44	001DH, 29
54	CHKSUM	44 33 30 30	D300H
55	EOI	0D	0DH

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2.2 Get alarm information

■ Command

No	1	2	3	4	5	6	7	8	9
Byte	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	CID1	CID2	LENGTH	INFO	CHKSUM	EOI
	7EH	20H		4AH	44H				0DH

Note:LENID = 00H

■ Response

No	1	2	3	4	5	6	7	8	9
Byte	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	CID1	RTN	LENGTH	INFO	CHKSUM	EOI

INFO Content:

No	Content	byte	Note
1	DATA_FLAG	1	
2	PACK Group	1	1

3	M(Number of cells)	1	Variable 16 or 8
4	Cell 1 voltage alarm status	1	0x00: no alarm 0x01: Lower limit alarm 0x02: Upper limit alarm
5	Cell 2 voltage alarm status	1	
6	Cell 3 voltage alarm status	1	
7	Cell 4 voltage alarm status	1	
8	Cell 5 voltage alarm status	1	
9	Cell 6 voltage alarm status	1	
10	Cell 7 voltage alarm status	1	
11	Cell 8 voltage alarm status	1	
12	Cell 9 voltage alarm status	1	
13	Cell 10 voltage alarm status	1	
14	Cell 11 voltage alarm status	1	
15	Cell 12 voltage alarm status	1	
16	Cell 13 voltage alarm status	1	
17	Cell 14 voltage alarm status	1	

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18	Cell 15 voltage alarm status	1	
19	Cell 16 voltage alarm status	1	
20	N (number of cell temperature)	1	4
21	Cell temperature 1 alarm status	1	0x00: no alarm 0x01: Lower limit alarm 0x02: Upper limit alarm
22	Cell temperature 2 alarm status	1	
23	Cell temperature 3 alarm status	1	

24	Cell temperature 4 alarm status	1	
25	Environment temperature alarm status	1	
26	MOSFET temperature alarm status	1	
27	Pack current alarm status	1	0x00: no alarm 0x01: Lower limit alarm 0x02: Upper limit alarm
28	Pack voltage alarm status	1	0x00: no alarm 0x01: Lower limit alarm 0x02: Upper limit alarm
29	User-defined	1	9
30	Balance event code	1	Bit0: Balance module (1 : On, 0 : Off) Bit1: reserved Bit2: reserved Bit3: reserved Bit4: Cell voltage difference alarm Bit5: Charge MOS fault alarm Bit6: Discharge MOS fault alarm Bit7: reserved
31	Voltage Event Code	1	Bit0: Cell overvoltage alarm Bit1: Cell overvoltage protection Bit2: Cell undervoltage alarm Bit3: Cell undervoltage protection Bit4: Pack overvoltage alarm Bit5: Pack overvoltage protection Bit6: Pack undervoltage alarm Bit7: Pack undervoltage protection

32	Temperature event code	2	Bit0 : Charge high temperature alarm Bit1 : Charge high temperature protection Bit2 : Charge low temperature alarm Bit3 : Charge low temperature protection Bit4 : Discharge high temperature alarm Bit5 : Discharge high temperature protection Bit6 : Discharge low temperature alarm Bit7 : Discharge low temperature protection Bit8 : Environment high temperature alarm Bit9 : Environment high temperature protection Bit10 : Environment low temperature alarm Bit11 : Environment low temperature protection Bit12 : MOSFET high temperature protection Bit13 : fire alarm event Bit14 : reserved Bit15 : reserved
33	Current event code	1	Bit0 : Charge overcurrent alarm Bit1 : Charge overcurrent protection Bit2 : Discharge overcurrent alarm Bit3 : Discharge overcurrent protection Bit4 : Discharge level 2 overcurrent protection Bit5 : Output short circuit protection Bit6 : Discharge level 2 overcurrent lockout Bit7 : Output short-circuit lockout
34	Remaining capacity alarm	1	Bit0 : SOC low alarm Bit1 : reserved Bit2 : reserved Bit3 : reserved Bit4 : reserved Bit5 : reserved Bit6 : reserved Bit7 : reserved

35	FET status code	1	Bit0 : Discharge MOS (1 : On, 0 : Off) Bit1 : Charge MOS (1 : On, 0 : Off) Bit2 : Charge current limiter(1 : On, 0 : Off) Bit3 : Heater (1 : On, 0 : Off) Bit4 : reserved Bit5 : reserved Bit6 : reserved Bit7 : reserved
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36	System status code	1	Bit0 : Discharging Bit1 : Charging Bit2 : reserved Bit3 : Standby Bit4 : reserved Bit5 : reserved Bit6 : reserved Bit7 : reserved
37	Balance Status Code	4	Bit0 : cell 1 equalization on Bit1 : cell 2 equalization on Bit2 : cell 3 equalization on Bit3 : cell 4 equalization on Bit4 : cell 5 equalization on Bit5 : cell 6 equalization on Bit6 : cell 7 equalization on Bit7 : cell 8 equalization on Bit8 : cell 9 equalization on Bit9 : cell 10 equalization on Bit10 : cell 11 equalization on Bit11 : cell 12 equalization on Bit12 : cell 13 equalization on Bit13 : cell 14 equalization on Bit14 : cell 15 equalization on Bit15 : cell 16 equalization on Bit16~Bit31: reserved
38	Reserved for future expansion	1	reserved

e.g.:

```
7E 32 30 30 31 34 41 34 34 30 30 30 30 46 44 41 30 0D
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7E 32 30 30 31 34 41 34 34 30 30 30 30 46 44 41 30 0D
```

Receive data:

7E 32 30 30 31 34 41 30 30 37 30 35 34 30 31 30 31 31 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30
30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 34 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30
39 30 30 30 30 30 30 30 30 30 30 30 30 31 30 33 30 30 30 30 30 30 30 30 30 30 45 44 43 34 0D

Response data parse :

No	Content	Data	Hex
1	SOI	7E	7EH
2	VER	32 30	20H
3	ADR	30 31	01H
4	CID1	34 41	4AH
5	RTN	30 30	00H
6	LENGTH	37 30 35 34	7054H
7	DATA_FLAG	30 31	01H
8	PACK Group	30 31	01H
9	M(Number of cells)	31 30	10H
10	Cell 1 voltage alarm status	30 30	00H
11	Cell 2 voltage alarm status	30 30	00H
12	Cell 3 voltage alarm status	30 30	00H

13	Cell 4 voltage alarm status	30 30	00H
14	Cell 5 voltage alarm status	30 30	00H
15	Cell 6 voltage alarm status	30 30	00H
16	Cell 7 voltage alarm status	30 30	00H
17	Cell 8 voltage alarm status	30 30	00H
18	Cell 9 voltage alarm status	30 30	00H
19	Cell I0 voltage alarm status	30 30	00H
20	Cell I1 voltage alarm status	30 30	00H
21	Cell 12 voltage alarm status	30 30	00H
22	Cell 13 voltage alarm status	30 30	00H
23	Cell 14 voltage alarm status	30 30	00H
24	Cell 15 voltage alarm status	30 30	00H
25	Cell 16 voltage alarm status	30 30	00H
26	N(number of cell temperature)	30 34	04H
27	Cell temperature 1 alarm status	30 30	00H
28	Cell temperature 2 alarm status	30 30	00H

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29	Cell temperature 3 alarm status	30 30	00H
30	Cell temperature 4 alarm status	30 30	00H
31	Environment temperature alarm status	30 30	00H
32	MOSFET temperature alarm status	30 30	00H
33	Pack current alarm status	30 30	00H
34	Pack voltage alarm status	30 30	00H
35	User-defined	30 39	09H
36	Balance event code	30 30	00H
37	Voltage Event Code	30 30	00H

38	Temperature event code	30 30 30 30	0000H
39	Current event code	30 30	00H
40	Remaining capacity alarm	30 31	01H
41	FET status code	30 33	03H
42	System status code	30 30 30 30 30 30 30 30	0000H
43	Balance Status Code	30 30	00H
44	Reserved for future expansion	30 30	00H
45	CHKSUM	45 44 43 34	EDC4H
46	EOI	0D	0DH