低压电池协议整理

1、协议设置/Setting of port

Transmission rate:

RS485: 115.2kb/s (recommend), 9.6kb/s

通信传输格式为：起始位 1 位，数据位 8 位，停止位 1 位，无校验。

Format: Start bit 1 bit

Data bit 8 bit

Stop bit 1 bit

Without parity

2、基本格式/Basic format

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

3、帧说明

No	Mark	Meaning	
1	SOI	起始位标志/Start bit mark	
2	VER	协议版本号/Version of protocol	
3	ADR	地址（0、255 保留）/Address	Single pile: start from 2
4	CID1	控制标识码/Control identify code	
5	CID2	命令信息：控制标识码（数据或动作类型的描述） Command information: control mark code (show the data or control command type) 应答信息：返回码 Response information: return code	
6	LENGTH	INFO 字节长度，包括 LENID 和 LCHKSUM INFO length, including LENID and LCHKSUM	
7	INFO	命令信息：控制数据信息	
		Command information: command INFO 应答信息：应答数据信息 Response information: data INFO	
8	CHKSUM	校验和码/CHECKSUM	
9	EOI	结束码/End code	CR(0DH)

■ Command INFO

Command group	1 byte	同一类型设备的不同组号 Group number of same type of device
Command type	1 byte	不同的遥控命令；历史数据传输中的不同控制命令 Different remote control command or different control command in history data transmission
Command id	1 byte	同一类型设备相同组内的不同监控点 Different monitoring point of same type device group
Command time	7 bytes	时间字段 Time field，see table data time format

■ Data INFO flag format

	Bit 7	Bit 6	Bit 5	Bit 4		Bit 3	Bit 2	Bit 1	Bit 0	
Value	0	0	0	0	1	0	0	0	0	1
statement				无未读取的开关量变化 No unread	有未读取的开关量变化 Exist unread				无未读取的告警量变化 No unread	有未读取的告警量变化 Exist unread

数据格式/Data format

Basic data format

除 SOI 和 EOI 是以 16 进制解释 16 进制传输外，其余各项都是以 16 进制解释，以 16 进制－ASCII
码方式传输，每个字节用两个 ASCII 码表示，如当 CID2＝4BH 时，传 输时传送 34H（‘4’的 ASCII
码）和 42H（‘B’的 ASCII 码）两个字节。
SOI and EOI are explained and transferred in HEX. Other items are explained in HEX, transferred in HEX-ASCII, each byte contains 2 ASCII.
g. CID2 = 4BH, transfer in 2 byte, 34H (“4” in ASCII), and 42H (“B” in ASCII).
LENGTH data format

高字节 HIGH				低字节 LOW											
校验码 CLHKSUM				LENID											
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

LENID 表示 INFO 项的 ASCII 码字节数，当 LENID＝0 时，INFO 为空，即无该项。
LENID means the number of byte of ASCII in INFO, when LENID = 0, means INFO is empty.
由于 LENID 只有 12Bit，所以，要求数据包最大不能超过 4095 个字节。
LENID has 12 bits, data package should smaller than 4095 bytes.
LENGTH 传输中先传高字节，再传低字节，分四个 ASCII 码传送。

While transmission, HIGH byte first, then LOW byte and divided into 4 ASCII to transmit.
校验码 LCHKSUM 的计算：D11D10D9D8+D7D6D5D4+D3D2D1D0，求和后模 16 余数 取反加 1
To calculate LCHKSUM: D11D10D9D8+D7D6D5D4+D3D2D1D0, add the sum, modulus 16 take remainder, then do a bit wise invert and then plus 1.
e.g.:
INFO 中 ASCII 码字节数为 18，即 LENID＝000000010010B。
In INFO the number of ASCII is 18, then LENID = 000000010010B
D11D10D9D8+D7D6D5D4+D3D2D1D0＝0000B＋0001B＋0010B＝0011B，
模 16 余数为/ modulus 16 the remainder = 0011B，
取反加 1 为/do a bitwise invert and plus 1 = 1101B，
LCHKSUM = 1101B。
LENGTH = 1101000000010010B，trans: D012
CHKSUM data format
CHKSUM 的计算是除 SOI、EOI 和 CHKSUM 外，其他字符按 ASCII 码值累加求和，所得结果模 65536
余数取反加 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.:
收到或发送的字符序列是：“~1203400456ABCEFEFC72\R”（“~”为 SOI，“CR”为 EOI），
If we have a character: “~1203400456ABCEFEFC72\R ” (“~” is SOI, “CR” is EOI)
则最后 5 个字符“FC72\R”中的 FC72 是 CHKSUM，
The last 5 character ”FC72\R”, the FC72 is the CHKSUM
Calculate:
‘1’＋ ‘2’＋ ‘0’＋…＋‘F’＋ ‘E’＝31H＋32H＋30H＋…＋46H＋45H＝038EH
038EH 模 65536 余码是 038EH，038EH 取反加 1 就是 FC72H。
038EH modulus 65536 remainder = 038EH, do a bitwise invert and plus 1 = FC72H.
DATA INFO data format
模拟量数据的传送采用定点数和浮点数两种形式，可任选一种。
Analog quantity is transmitted in form of fixed-point or floating-point.
Fixed-point (integer, 2 bytes),
本协议采用定点数/this protocol uses fixed-point
有符号整形数/ signed integer: -32768 ~ +32767
无符号整形数/ unsigned integer: 0 ~ +65535
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

编码表/Encoding table

CID1

No	Content	CID1	Note
1	电池数据/battery data	46H	

CID2

NO	Content	CID2	Note
1	获取模拟量量化后数据，定点数	42	
2	获取告警	44	
4	获取充放电管理信息	92	
5	获取序列号 （SN）	93	
6	关机	95	
7	获取软件版本	96	
8	读运行信息	99	

■ 响应信息/response information

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
8	ADR error	90H	
9	Communication error	91H	Internal communication error

■ 定点数数据类型/ fixed point type

No	Telemetering content	Data type
1	Cell voltage	Signed integer
2	Temperature	Signed integer
3	Module voltage	Unsinged integer
4	Module current	Signed integer, charge is +
5	System parameter	Signed integer
6	capacity	Unsigned integer

获取模拟量量化数据，定点型

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	42H	LENGTH	INFO	CHKSUM	EOI

LENID = 02H

INFO is 1 byte command:

Command = 0x01 get data of battery 1

. . .

Command = 0x08 get data of battery 8

Command 内容和 ADR 内容应保持一致

Command should be matched with ADR

■ 响应/response

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	RTN	LENGTH	INFO	CHKSUM	EOI

INFO = INFOFLAG + DATAI

■ 响应/response

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	RTN	LENGTH	INFO	CHKSUM	EOI

INFO = INFOFLAG + DATAI

■ DATAI

No	Content	Data
1	Command value	1 byte
2	Data of battery	

➢ Data of battery

No	Content	Data byte	单位及计算说明 Note	精度 Accuracy
1	电芯节数/number of cell: M	1		
2	Cell 1 voltage	2	V	3
3	Cell 2 voltage	2	V	3
///				
M+1	Cell M voltage	2	V	3
M+2	温度点数量/number of temperature: N	1		
M+3	1: Temperature of BMS board	2	Kelvin temperature: **K** Temperature blow 0 the value is	1
M+4	2: Avg. temperature of cell 1~4	2		

M+5	3: Avg. temperature of cell 5~8	2	negative e.g.: 25.5℃ = 25.5*10+2731=2986 -12.4℃ = -12.4*10+2731=2607	
M+6	4: Avg. temperature of cell 9~12	2		
M+7	5: Avg. temperature of cell 13~15/16	2		
///				
M+N+2	Temperature N**	2		
M+N+3	Current	2	A Actual value = transmission value * 100 Positive is charge Negative is discharge e.g.: -4000mA = 0xFFD8	3
M+N+4	Module voltage	2	V	3
M+N+5	Remain capacity 1	2	Ah	3
M+N+6	用户自定义个数/ User defined items = 2(battery capacity≤65Ah) User defined items = 4(battery capacity ＞65Ah)	1		
M+N+7	Module total capacity 1	2	Ah	3
M+N+8	Cycle number			
M+N+9	**Remain capacity 2 (For battery capacity ＞65Ah)	3	Ah	3
M+N+10	**Module total capacity 2 (For battery capacity ＞65Ah)	3	Ah	3

**To be compatible with old version, we add more items, used to show the capacity of battery bigger than 65Ah.

For US2000B/US2000B-Plus, still send user defined items = 2. And use remain capacity 1 and module total capacity 1.

For US3000 or big capacity (＞65Ah), the user defined items = 4, the value: remain capacity 1= FFFF, the module total capacity = FFFF. And please use remain capacity 2, and module total capacity

获取告警信息/get alarm info

Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	44H	LENGTH	INFO	CHKSUM	EOI

LENID = 02H

INFO is 1 byte command:

Command = 0x01 get data of battery 1

. . .

Command = 0x08 get data of battery 8

Command 内容和 ADR 内容应保持一致

Command should be matched with ADR

■ 响应/response

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	RTN	LENGTH	INFO	CHKSUM	EOI

INFO = DATAFLAG + WARNSTATE

■ WARNSTATE

No	Content	Data
1	Command value	1 byte
2	Module alarm info	

➢ Module alarm info

No	Content	Note
1	电芯节数/number of cell: M	1
2	Cell 1 voltage	1
3	Cell 2 voltage	1
///		
M+1	Cell M voltage	1
M+2	*温度点数量/number of temperature: N	1
M+3	BMS Temperature	1
M+4	Cell temperature 1~4	
M+5	Cell temperature 5~8	
M+6	Cell temperature 9~12	
M+7	Cell temperature 13~15/16	
M+8	MOSFET temperature (US3000B only)	
///		
M+N+2	Temperature N	1
M+N+3	Charge current	1
M+N+4	Module voltage	1
M+N+5	Discharge current	1
M+N+6	Status 1	1
M+N+7	Status 2	1
M+N+8	Status 3	1
M+N+9	Status 4	1
M+N+10	Status 5	1

Note. for No. 1 ~ M+N+5

00H: normal

01H: below lower limit (act as protection)

02H: above higher limit (act as protection)

F0H: other error

- Status 1

Bit	Content	Note
7	总压欠压/module under voltage: UV	0: normal；1: trigger
6	充电过温/charge over temperature	0: normal；1: trigger
5	放电过温/discharge over temperature	0: normal；1: trigger
4	放电过流/discharge over current: DOC	0: normal；1: trigger
3		
2	充电过流/charge over current: COC	0: normal；1: trigger
1	单芯欠压/cell under voltage	0: normal；1: trigger
0	总压过压/module over voltage: OV	0: normal；1: trigger

- Status 2

Bit	Content	Note
3	使用模块供电/using battery module power	1: using；0: not
2	Discharge MOSFET	1: on；0: off
1	Charge MOSFEET	1: on；0: off
0	Pre MOSFET（reserve, function not using）	1: on；0: off

- Status 3

Bit	Content	Note
7	有效充电电流/effective charge current (实际检测到的电流＞0.1A; current detected by BMS＞0.1A)	1: effective；0: normal
6	有效放电电流/effective discharge current (实际检测到的电流＜-0.1A; current detected by BMS＜-0.1A)	1: effective；0: normal
5	加热膜启动/heater (reserve, function not suing)	1: on；0: off
4		
3	充满状态指示/fully charged (SOC=100%)	1: full；0: normal
2		
1		
0	蜂鸣器功能/buzzer	1: on；0: off

Statuse4,5 ： Cellalarm 0xffff ,nomal 0x00;

获取电池充放电管理信息

■ 命令/command

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	92H	LENGTH	INFO	CHKSUM	EOI

LENID = 02H

INFO is 1 byte command:

Command = 0x01 get data of battery 1

. . .

Command = 0x08 get data of battery 8

Command 内容和 ADR 内容应保持一致

Command should be matched with ADR

■ 响应/response

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	RTN	LENGTH	INFO	CHKSUM	EOI

INFO = DATAI

■ DATAI

No	Content	Data
1	Command value	1 byte
2	Charge and discharge management value	

➢ Charge and discharge management value

No	Content	Byte	Note	Accuracy
1	充电电压建议上限/charge voltage limit	2	V	3
2	放电电压建议下限/discharge voltage limit	2	V	3
3	最大充电电流/charge current limit	2	A	1
4	最大放电电流/discharge current limit	2	A	1
5	充放电状态/charge, discharge status	1	-	-

➢ 充放电状态/charge, discharge status

Bit	Content	Note
7	Charge enable	1: yes；0: request stop charge
6	Discharge enable	1: yes；0: request stop discharge
5	强充 1，立即充电/charge immediately	1: yes；0: normal
4	强充 2，立即充电/charge immediately	1: yes；0: normal
3	满充请求/full charge request	1: yes；0: normal
2		
1		
0		

获取设备序列号

■ 命令/command

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	93H	LENGTH	INFO	CHKSUM	EOI

LENID = 02H

INFO is 1 byte command:

Command = 0x01 get data of battery 1

. . .

Command = 0x08 get data of battery 8

Command 内容和 ADR 内容应保持一致

Command should be matched with ADR

■ 响应/response

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	RTN	LENGTH	INFO	CHKSUM	EOI

INFO = DATAI

■ DATAI

No	Content	Data
1	Command value	1 byte
2	Module SN number	16 bytes, integer, ASCII

关机

■ 命令/command

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	95H	LENGTH	INFO	CHKSUM	EOI

LENID = 02H

INFO is 1 byte command

Command = 0x01 turnoff battery 1

. . .

Command = 0x08 turnoff battery 8

Command 内容和 ADR 内容应保持一致

Command should be matched with ADR

■ 响应/response

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	RTN	LENGTH	INFO	CHKSUM	EOI

LENID = 0

获取软件版本

■ 命令/command

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	96H	LENGTH	INFO	CHKSUM	EOI

LENID = 02H

INFO is 1 byte command

Command = 0x01 battery 1

. . .

Command = 0x08 battery 8

■ 响应/response

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	RTN	LENGTH	INFO	CHKSUM	EOI

INFO = DATAI

■ DATAI

No	Content	Data	
1	Command value	1 byte	
2	Module software version	5 bytes	
		2 bytes	3 bytes
		厂商软件版本 Manufacture version	软件主线版本 Main line version

读运行数据

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	99H	LENGTH	INFO	CHKSUM	EOI

LENID = 02H

INFO is 1 byte command

Command = 0x01 battery 1

. . .

Command = 0x08 battery 8

■ 响应/response

No	1	2	3	4	5	6	7	8	9
Byte number	1	1	1	1	1	2	LENID/2	2	1
format	SOI	VER	ADR	46H	RTN	LENGTH	INFO	CHKSUM	EOI

INFO = INFOFLAG + DATAI

■ DATAI

No	Content	Data
1	Command value	1 byte
2	Running Data	

Running Data

NO	Content	byte	单位及说明	精度
1	电芯数量 16	1		
2	Cell 1 voltage	2	V	3
3	Cell 2 voltage	2	V	3
///				
	Cell 16 voltage	2	V	3
	Temperature：7	1		
	Cell Temp1	2	Kelvin temperature: K Temperature blow 0 the value is negative E.g.: 25.5= 25.5*10+2731=2986 -12.4=-12.4*10+2731=2607	1
	Cell Temp2	2		1
	Cell Temp3			
	Cell Temp4	2		1
	DSG_MOSFET TEMP	2		1
	CHG_MOSFET TEMP	2		1
	EVN TEMP	2		1
	Current	2	A： Positive is charge Negative is discharge	1
	Stack Volt	2	V	3
	电池剩余容量	2	Ah	1
	自定义数量 4	1		
	Rev	2		
	Rev	2		
	Rev	3		
	Pack Volt	2	V	3
	SOC	2	%	
	Max Cell Volt	2	V	3
	Min Cell Volt	2	V	3
	Max Cell Volt Num	1		
	Min Cell Volt Num	1		
	Max Cell Temp	2	Kelvin	1

	Min Cell Temp	2	Kelvin	1
	Max Cell Temp Num	1		
	Min Cell Temp Num	1		
	Cell Delta Volt	2	V	3
	I/O STATUS1	1		
	I/O STATUS2	1		
	Afe Balance status	2		
	Warning Status	2		
	Alarm Status	3		

I/O STATUS1

Bit	描述（1：高电平 0：低电平）
7	Hct Power On Status
6	5V Power On Status
5	3.3V Power On Status
4	Freq Derat Status
3	Comm wake up Status
2	Charge wake up Status
1	Power Key Status
0	MCU Lock Status

I/O STATUS2

Bit	描述（1：高电平 0：低电平）
7	REV
6	REV
5	REV
4	EM STOP Status
3	12V Power On Status
2	Pre discharge Mos Status
1	Discharge Mos Status
0	Charge Mos Status

Afe Balance status

Bit	描述（balance charge 1：ON 0：OFF）
15	Cell 16 balance charge status
14	Cell 15 balance charge status
13	Cell 14 balance charge status
12	Cell 13 balance charge status
11	Cell 12 balance charge status
10	Cell 11 balance charge status
9	Cell 10 balance charge status
8	Cell 9 balance charge status
7	Cell 8 balance charge status

6	Cell 7 balance charge status
5	Cell 6 balance charge status
4	Cell 5 balance charge status
3	Cell 4 balance charge status
2	Cell 3 balance charge status
1	Cell 2 balance charge status
0	Cell 1 balance charge status

Warning status

Bit	描述（Warning 1：En 0：Dis EN）
15	Dsg Under Temp
14	DsgOT
13	ChgUT
12	ChgOT
11	Stack Volt Under Limit
10	StackOV
9	Cell Volt Under Limit
8	CellOV
7	rev
6	CellDeltaTemp 温度采样不平衡
5	CellDeltaV 电芯电压不平衡
4	Dsg Over current
3	ChgOC
2	PowerOT
1	EnvUT
0	EnvOT

Warning Alarm

Bit	描述（Alarm 1：En 0：Dis EN）
23	DsgUT
22	DsgOT
21	ChgUT
20	ChgOT
19	StackUV
18	StackOV
17	CellUV
16	CellOV
15	PreChg
14	CellDeltaTemp
13	CellDeltaV
12	DsgOC
11	ChgOC

10	PowerOT
9	EnvUT
8	EnvOT
7	逆变器通讯故障
6	预充失败
5	AFE 检测故障
4	电流采样零偏错误
3	HwCellOV　电芯硬件过压
2	HwDsgOC　放电硬件过流
1	HwChgOC　充电硬件过流
0	ForbidChgUV_Alarm　损坏