

PYLON low voltage Protocol CAN Bus Version 2.0.6

Version History

Date	Version	Chapter	Remark	Author
2016/11/03	1.0		我司协议 BMS Protocol_CAN_20161103, 视为 1.0 版本	
2017/11/14	1.1	0x359 0x35C	1、修正协议描述错误, 0-bit1 应为过压保护。 Modified wrong description of byte 0 bit 1 2、修改排版, 提高可读性, 增加协议内容解释。 Add assistant note. 3、增加强充标志 2 Add force charge bit4	王万祥 王中鹤
2018/04/08	1.2	0x35C	1、增加满充请求标志 Add full charge bit3	王亚坤 王中鹤
2019/07/02	1.3	0x351 0x1001	1. 增加放电电压 Add discharge voltage. 2. 增加握手指令。 Add heart beat signal.	王亚坤 王中鹤
2019/09/02	1.4 beta	0x370- 0x373	1. 扩展 CAN 协议, 增加容量, 最大最小电压温度值及所在模块, 增加模块输出状态	邹慧兴
2019/12/23	1.5		增补升级协议 After 2.0 released, V1.5 cancelled 冲突的部分以 V2.0 为准。	王亚坤
2020/10/28	1.6 草稿		增补 SOC 不均衡, mosfail, 关机等命令。 增加触发条件和建议动作描述。供参考。 部分安规对保护动作的解除有限制, 以产品手册为准。	王中鹤
2021/1/5	1.7 草稿		增加了问答形式的命令, 共两条, 0x4000000 指示模拟量状态等更新量; 0x5000000 指示 sn 号与版本号等固定量; 0x4000000 中删除重复项电流, 对一致性差做出定义;	叶闻
2021/3/16	2.0	[2.3, 2.4, 2.5]	Latest design.	王中鹤
2021/4/2	2.0.1	[2.4]	Change from sending by BMS to need trigger by upper device/inverter	

			Change definition of address of 0x373	
2021/6/15	2.0.2	[2.6]	增加电池回复升级指令的地址位说明	葛东亚
2021/6/30	2.0.3	[2.6]	优化升级协议/Optimization upgrade agreement	葛东亚
2021/11/22	2.0.4	[2.1.4] [2.4.3] [2.1.1]	去掉温度告警英文翻译中 cell 描述 修正开式温度公式 修正充放电电流为无符号整数	葛东亚
2022/01/04	2.0.5	[2.6]	优化升级协议/Optimization upgrade agreement	叶闻
2022/05/10	2.0.6	[2.4.6]	新增 0x382/Battery family name	葛东亚

1 目录

1. 说明/PROTOCOL INFO.....	3
2 协议/PROTOCOL.....	4
2.1 标准/standard.....	4
2.1.1 0x351/operation limit	4
2.1.2 0x355/SOC and SOH.....	4
2.1.3 0x356/analog quantity	4
2.1.4 0x359/protect and alarm	5
2.1.5 0x35C/BMS request	6
2.1.6 0x35E/brand.....	7
2.2 控制/Control.....	8
2.2.1 0x4800/turn off.....	8
2.2.2 0x1001/heartbeat signal.....	8
2.2.3 0x0020, 0x0060/protocol change	8
2.3 定制/customized flags	8
2.4 增补系统信息 /extend system level	9
2.4.1 0x35A	9
2.4.2 0x372/module status	10
2.4.3 0x373/max-min analog quantity.....	11
2.4.4 0x374~377/address of module in 0x373.....	11
2.4.5 0x379/total capacity	11
2.4.6 0x382/battery family name	12
2.4.7 May use in future.....	12
2.5 增补模块信息/extend module level	12
2.6 升级/upgrade.....	15
2.6.1 command 1: 固件大小 / size of firmware	15
2.6.2 command 2: 传输数据 / transfer data	15
2.6.3 command 3: 校验固件 / CRC of firmware	16
2.6.4 command 4: 重启更新 / restart to upgrade.....	16
2.6.5 command 5: 获取状态 / check upgrade process	16

1. 说明/Protocol info

小端。

Little endian.

采用标准帧，速率 500kbps，*BMS 上传数据间隔：1 或 2s。

Standard Frame, 500kbps, *BMS data transmission cycle: 1or2s

****逆变器每秒发送数据：标准帧 0x305：00-00-00-00-00-00-00-00**

***, **:**

非强制：US2000, US3000, V2.4 之前版本若不持续发送，则 BMS 上传数据间隔会延迟至 1~10s 不等。其间会有非本协议内容上传。如逆变器对旧版本电池间隔有要求，则建议发送此命令。

Optional: For US2000, US3000 version earlier than V2.4, if not sending 0x305, then BMS data transmission cycle will between 1~10 seconds. And will send info do not belongs to this protocol. If inverter needs to be compatible with older version batteries by 1-2s, then this command is suggested to use.

本协议适用于派能：US、US-C、Force L、UP、LV-HUB 等 24、48V 产品和工具。协议及软件版本对应情况详询派能技术支持人员。

This protocol is designed for US, US-C, Force-L, UP, LV-HUB etc., for further information please contact us.

电池的拨码开关或连接器的 pin 序可能对 CAN 通信质量有影响。详见各产品说明书。

The settings of dip switch or pin definition may influence the CAN communication. Please refer to user manual.

非特殊说明，建议外部设备如逆变器的 CAN 端口终端电阻为 120Ω。

Unless otherwise noted, the inverter CAN resistance suggested to be 120Ω.

Cell	1 串电芯, 1 serial of cell(s)
Module	1 个电池模块, 1 battery module. 24 or 48 or 51.2V
Group/pile	1 簇电池, several battery module connect in parallel
Master	1 簇电池的主机, 定义参见产品手册, master battery of 1 group, refer to manual

2 协议/Protocol

2.1 标准/standard

BMS 主动上传标准数据帧。

These standard data frames will be sending by BMS automatically.

2.1.1 0x351/operation limit

		Unit		Suggestion
Byte 0	Charge voltage limit	0.1V	16 bits unsigned int	不超过本数值 Lower than limit
Byte 1				
Byte 2	Charge current limit	0.1A	16 bits unsigned int	当=0时，停止充电。 Stop charge when current=0
Byte 3				
Byte 4	Discharge current limit	0.1A	16 bits unsigned int	当=0时，停止放电。 Stop discharge when current=0
Byte 5				
Byte 6	Discharge voltage limit	0.1V	16 bits unsigned int	不低于本数值 Higher than limit
Byte 7				

2.1.2 0x355/SOC and SOH

		Unit	Design
Byte 0	SOC	1%	Average value of all modules (off-line slave battery is also calculated)
Byte 1			
Byte 2	SOH	1%	Average value of all modules. Minimum value (For Force L only)
Byte 3			
Byte4~7	reserve		

2.1.3 0x356/analog quantity

		Unit	
Byte 0	Average module voltage	0.01V	16 bits unsigned int
Byte 1			
Byte 2	Total current	0.1A	16 bits signed int, 2`s complement
Byte 3			
Byte 4	Average temperature	0.1℃	16 bits signed int, 2`s complement
Byte 5			
Byte6~7	reserve		

2.1.4 0x359/protect and alarm

* :

除特殊说明外，保护和告警 flag 的含义为：电池系统内 ≥ 1 台电池模块发生相关保护或告警。相关模块条件满足后自动解除。

Unless otherwise noted or required, the protection and alarm flag: exist 1 module in battery system has protection or alarm. The module able to recover from protection or alarm by itself.

**:

除特殊说明外，保护和告警 flag 建议逆变器动作为，跟随 BMS 建议电流。

Unless otherwise noted, when protection or alarm flag rise, inverter is supposed to follow the current limit of battery system.

对于告警标志的 byte2 和 byte3 内容，根据其定义和控制逻辑，这些标志位可能在每个循环周期内都会频繁触发，所以仅记录告警和执行对应的建议电流即可，不需要上报呈现到界面上。

For Alarm flag (Byte 2 & 3), due to the definition and control logic behind. These flags could be triggered frequently during every cycles. So only need record and keep following the suggest operation current to operate. No need presenting on portal/HMI.

对于保护标志的 byte0 和 byte1 内容，这些关键性错误不会频繁触发，需要记录并上报呈现在界面上同时响应此时对应的建议电流。

For protection flag (Byte 0 & 1), these are the critical error and will not triggered frequently, please record and present on portal/HMI to draw attention and keep following the suggest operation current to operate.

			Design	Suggestion
Byte 0 Protect 保护	Bit 0			
	Bit 1	过压/Cell or module over voltage	停止继续充电 Stop charging	响应充电使能指令，避免出现这种保护 Follow force charge enable flag to avoid trigger such protection
	Bit 2	欠压 /Cell or module under voltage	依靠充电恢复。 Need charge	响应强充请求，避免出现这种保护 Follow force charge flag to avoid trigger such protection.
	Bit 3	过温/over temperature	*	**
	Bit 4	欠温/under temperature	*	**
	Bit5~6	reserve		
	Bit 7	放电过流/Discharge over current	*	**
Byte 1	Bit 0	充电过流/Charge over current	*	**
	Bit 1	reserve		

Protect 保护	Bit 2	reserve		
	Bit 3	故障/System error	* 需重启、故障排查。 Need restart or trouble shooting.	=1: 停止充放电。 Stop charge/discharge =0: 可恢复运行。 Recover.
	Bit4~7	reserve		
Byte 2 Alarm 告警, 无 保护动作	Bit 0	reserve		
	Bit 1	高压/Cell or module high voltage	*	**
	Bit 2	低压/Cell or module low voltage	*	**
	Bit 3	高温/high temperature	*	**
	Bit 4	低温/low temperature	*	**
	Bit5~6			
Byte 3 Alarm 告警, 无 保护动作	Bit 7	放电大电流 /Discharge high current	*	**
	Bit 0	充电大电流/Charge high current	*	**
	Bit1~2	reserve		
	Bit 3	从机掉线, 从柜掉线 Slave battery or slave group communication off-line	从机/柜因低电量或故障关机。或主从通信不良。 Slave battery/pile communication off-line, because of low capacity or error or lost communicate connection.	尝试充电、重启或故障排查 First try to charge the system, if not working then restart the system or further trouble shooting.
Byte 4	Bit4~7	reserve		
		Module numbers: 8 bits unsigned char	装机电池总数 Total battery numbers in system	After system turns on and running normally, this is a fixed number.
Byte 5		“P”, 0x50		
Byte 6		“N”, 0x4E		
Byte 7		reserve		

2.1.5 0x35C/BMS request

		Design	Suggestion:
Byte 0	Bit 0	reserve	
	Bit 1	reserve	
	Bit 2	reserve	
	Bit 3	Full charge 1=charge; 0=normal SOC 需要校准、电芯需要均衡 SOC needs recalculation, cell needs	将电池充电至 100% Full charge battery system to 100%

		balance	
Bit 4	Force charge:		【高优先级】[High priority] 给电池系统充电直到标记=0。 Immediately charge the battery system until these 2 flags = 0
Bit 5	1=charge; 0=normal 低电量、低压时触发 Triggered when capacity too low		
Bit 6	Discharge enable 1=enable; 0=stop		【高优先级】[High priority] Inverter shall follow these registers to enable charge & discharge.
Bit 7	Charge enable 1=enable; 0=stop		

2.1.6 0x35E/brand

Byte0~4	Brand	“PYLON”	ASCII(50 59 4C 4F 4E)
Byte5-7	reserve		

2.2 控制/Control

如果不需要，请不要发送或响应。

Inverter that don't need please ignore [chapter 2.2] and do NOT send or response.

2.2.1 0x4800/turn off

电池收到后不回复信息。主机收到后会关闭本组电池。注意：远程关机操作的必要条件：无开机信号，无外部电压，无并柜。

BMS have no response message. After master battery received will turn off all batteries in this group. Note: this operation request: no wakeup signal on, no DC voltage, no parallel pile connection.

2.2.2 0x1001/heartbeat signal

电池收到后不回复信息。主机若收到了此 ID，逆变器需要至少五分钟发送两次，否则电池会关机。

BMS have no response message. After master battery turn on, if battery received this CAN ID, the heart-beat function is ON. In 5 minutes, if battery does not receive the ID, the master battery will turn off all batteries.

2.2.3 0x0020, 0x0060/protocol change

收到后，BMS 将自动切换协议。

After received these ID, the protocol send by BMS will change.

2.3 定制/customized flags

特定版本支持本命令。详询派能技术支持人员。

Implemented on latest version, please contact us for further information.

标准帧：0x350

		Design	Suggestion:
Byte 0	Bit0~5		
	Bit 6	Exist 1 module charge MOSFAIL 0=normal; 1=error	Stop charge and discharge. Trouble shooting.
	Bit 7	Exist 1 module discharge MOSFAIL 0=normal; 1=error	
Byte 1	Bit0~5		
	Bit 6	0=normal; 1= trigger Module SOC max-SOC min $\geq$ 25	Customized
	Bit 7	float charge request 0=normal, 1=trigger Trigger: $V_{max} \geq 3.63v$ and SOC <100 Release: $V_{max}-V_{min} < 40mv$ and SOC = 100	保持充电状态 Keep charge the system

2.4 增补系统信息 /extend system level

本段落采用询问制发送，需构造发送包获取电芯详细内容

Under this section request to ask command to get feedback from BMS

特定版本支持本命令。详询派能技术支持人员。

Implemented on latest version, please contact us for further information.

Sending:

标准帧: 0x305 00-00-00-00-00-00-00-00

标准帧: 0x307

Byte0	Reserved	
Byte1	Reserved	
Byte2	Reserved	
Byte3	Reserved	
Byte4	Ascii	可用于配合逆变器品牌进行协议适配 Can be used to identify inverter brand. BMS can change protocol information.
Byte5	Ascii	
Byte6	Ascii	
Byte7	Ascii	

And BMS will reply all CAN ID in [2.4] every 2s.

目前展示的[2.4.1-2.4.5]内容，当期仅在以下命令组合的情况下上传

For now, section 2.4.1-2.4.5 will be triggered by below command ONLY:

标准帧: 0x305 00-00-00-00-00-00-00-00

标准帧: 0x307 00-00-00-00-00-00-00-00

Or

标准帧: 0x305 00-00-00-00-00-00-00-00

标准帧: 0x307 12-34-56-78-56-49-43-00

当前 BMS 仅识别到以上两种报文组合后回复增补系统信息，仅识别标准帧，扩展帧不识别。两帧报文无先后顺序，当单次触发增补信息上传后，BMS 除重启或初始化外，将持续上传增补信息。

The current BMS only recognizes the combination of the above two types of packets and then replies to supplement the system information. Only standard frames are recognized, but extended frames are not recognized. There is no sequence between the two frames of packets. When the supplementary information is uploaded once, the BMS will continue to upload the supplementary information except for the restart or initialization.

2.4.1 0x35A

In this message, each warning and alarm is implemented to consist of two bits.

Bit N	Bit N+1	Design:
0	0	Reserved
1	0	触发 Alarm/warning active
0	1	解除 Alarm/warning inactive (status = OK)
1	1	Reserved

			Definition
Byte 0	Bit0~1	General Alarm:	Function reserved (bit0: 0 bit1: 1)
	Bit2~3	Battery high voltage protect	=0x359 byte 0 bit 1: Over voltage
	Bit4~5	Battery low voltage protect	=0x359 byte 0 bit 2: Under voltage
	Bit6~7	Battery high temperature protect	=0x359 byte 0 bit 3: Over temperature
Byte 1	Bit0~1	Battery low temperature protect	=0x359 byte 0 bit 4: Under temperature
	Bit2~3	Battery high temperature charge protect	Function reserved (bit2: 0 bit3: 1)
	Bit4~5	Battery low temperature charge protect	Function reserved (bit4: 0 bit5: 1)
	Bit6~7	Battery high current protect	=0x359 byte 0 bit 7: discharge over current
Byte 2	Bit0~1	Battery high charge current alarm	=0x359 byte 1 bit 0: charge current
	Bit2~3	Contactor error	有电池发生 MOSFET 或继电器失效 Exist ≥ 1 module with : MOSFAIL, relay error
	Bit4~5	Short circuit protect	有电池发生短路保护 Exist ≥ 1 module with short circuit
	Bit6~7	BMS protect or error	反接、外部输入过压、硬件错误, 传感器错误、板内错误等 Reversed connection, input overvoltage, hardware failure, sensor error, BMS error
Byte 3	Bit0~1	Cell imbalance protect	Function reserved (bit0: 0 bit1: 1)
	Bit2~3	Reserved	
	Bit4~5	Reserved	
	Bit6~7	Reserved	
Byte 4~7		Reserved	

2.4.2 0x372/module status

		Design	
Byte 0	Number.	跟随系统状态变化 Will change based on system status.	16 bits unsigned int
Byte 1	在线的正常运行电池数量 Number of batteries running normally		
	充电 mos on 或放电 mos on 或继电器闭合的电池数量 Number of modules charged MOS ON or discharged MOS ON or relays closed		
Byte 2	Number		
Byte 3	禁止充电的模块数量 Number of modules under charge protection or limit=0		
Byte 4	Number		
Byte 5	禁止放电的模块数量		

	Number of modules under discharge protection or limit=0		
Byte 6	Number		
Byte 7	通信掉线的模块数量 Number of modules that communication offline 通信掉线告警后上传。Only sent after flag on at 0x359, byte 3 bit 3		

2.4.3 0x373/max-min analog quantity

		Unit		Design
Byte 0	最低单芯电压	0.001V	16 bits unsigned int	
Byte 1	Minimum cell voltage			
Byte 2	最高单芯电压	0.001V	16 bits unsigned int	
Byte 3	Maximum cell voltage			
Byte 4	最低单芯温度	1 Kelvin	16 bits unsigned int	Kel = T+ 273 (T=电池实际温度)
Byte 5	Minimum cell temperature			
Byte 6	最高单芯温度	1 Kelvin	16 bits unsigned int	
Byte 7	Maximum cell temperature			

2.4.4 0x374~377/address of module in 0x373

NOTE:

if more than 1 module has same value at same time, the smallest address will be sent.

0x374	Minimum cell voltage address	ASCII
0x375	Maximum cell voltage address	e.g. :30 31 30 35 00 00 00 00
0x376	Minimum cell temperature address	0, 1, 0, 5, 0, 0, 0, 0
0x377	Maximum cell temperature address	第一柜子, 第5台电池, 1 st group, battery 5 th

2.4.5 0x379/total capacity

		Unit		Design
Byte 0	装机总容量 Total capacity	Ah	32 bits unsigned int	This is the total installed capacity

Byte 1				e. g. : 50+50+74+100 = 274Ah
Byte 2				
Byte 3				

2.4.6 0x382/Battery family name

Byte0~6	Brand	“Pelio_L”	ASCII(50 65 6C 69 6F 5F 4C)
Byte7	reserve		

注：0x382 仅 raybow（Pelio）电池上传，在触发增补协议后随增补协议内其他报文帧一起发送。

2.4.7 May use in future

Under develop.

0x35F, battery model, firmware version

0x378, energy in/out

0x380, 381 etc, SN

2.5 增补模块信息/extend module level

特定版本支持本命令。详询派能技术支持人员。

Implemented on latest version, please contact us for further information.

本段落采用询问制发送，需构造发送包获取电芯详细内容

Ask command to get feedback from BMS

For debug, trouble shooting, after sale service.

扩展帧。

Extended frame.

有定义的情况下 FF 占位，表明目前产品不支持此命令。For defined byte。FF: not support.

无定义的情况下 00 占位。For undefined byte: 00: undefined

建议最快 2s 发送一次；

Sending interval shall ≥ 2 seconds.

Inverter send Command: 0x4000000: 00-00-00-00-00-00-00-00

N = the address in one group, master battery = 1

M= group number. First group = 1

e. g. : Single module: n=1, m=1

Response of BMS:

			Unit	
0x4000001 + N * 0x100 + M * 0x10000	Byte 0	最低单芯电压	0.001V	16 bits unsigned int
	Byte 1	Min cell voltage of this module		
	Byte 2	最高单芯电压	0.001V	16 bits unsigned int
	Byte 3	Max cell voltage		
	Byte 4	电流	0.1A	16 bits signed int
	Byte 5	Current		
	Byte 6	总压	0.01V	16 bits unsigned int
	Byte 7	Module voltage		
0x4000002 + N * 0x100 + M * 0x10000	Byte 0	最高单芯温度	0.1℃	16 bits signed int
	Byte 1	Max cell temp		
	Byte 2	最低单芯温度	0.1℃	16 bits signed int
	Byte 3	Min cell temp		
	Byte 4	Mos 温度	0.1℃	16 bits signed int
	Byte 5	MOSFET Temp		
	Byte 6	Bms 温度	0.1℃	16 bits signed int
	Byte 7	BMS temp		
0x4000003 + N * 0x100 + M * 0x10000	Byte 0	SOC	1%	
	Byte 1			
	Byte 2			
	Byte 3			
	Byte 4	SOH	1%	
	Byte 5			
	Byte 6	额定容量	Ah	
	Byte 7	Nominal capacity of this module		
0x4000004 + N * 0x100 + M * 0x10000	Byte 0	本台状态情况		Table: [status]
	Byte 1	Status of this module		
	Byte 2	本台 flag 情况		Table:[flag]
	Byte 3	Flag of this module		
	Byte 4	本台故障代码		32 bits unsigned int
	Byte 5			
	Byte 6			
	Byte 7			

[status]

Bit 15	Reserved	Bit 7	Refer to error code
Bit 14	Lock, forbidden charge or discharge	Bit 6	Reserved
Bit 13	Discharge over current, short circuit	Bit 5	Discharge high current
Bit 12	Charge over current	Bit 4	Charge high current
Bit	Cell under temperature	Bit 3	Cell high temperature

11			
Bit 10	Cell over temperature	Bit 2	Cell low temperature
Bit 9	Cell or module under voltage	Bit 1	Cell or module high voltage
Bit 8	Cell or module over voltage	Bit 0	Cell or module low voltage

[flag]

Bit 15	This module is communication offline.	Bit 7	
Bit 14	Charge MOS status	Bit 6	
Bit 13	Discharge MOS status	Bit 5	
Bit 12		Bit 4	
Bit 11		Bit 3	Reserved-cell voltage difference
Bit 10		Bit 2	Reserved- balance charge
Bit 9		Bit 1	Reserved- full charge
Bit 8		Bit 0	Reserved- force charge

Inverter send Command: 0x5000000: 00-00-00-00-00-00-00-00

Response of BMS:

0x5000001 + N * 0x100 + M * 0x10000		SN1~8	Acsii
0x5000002 + N * 0x100 + M * 0x10000		SN9~16	Acsii
0x5000003 + N * 0x100 + M * 0x10000		SN17~24—reserved	Acsii
0x5000004 + N * 0x100 + M * 0x10000		SN24~32—reserved	Acsii
0x5000005 + N * 0x100 + M * 0x10000	Byte 0	Master battery firmware version	Byte0:0x01 Byte1:0x04 =1.4
	Byte 1		
	Byte 2		
	Byte 3		
	Byte 4	Master battery firmware version 2(internal ID)	Byte4:0x38 Byte5:0x03 =56.3
	Byte 5		
	Byte 6		
	Byte 7		

2.6 升级/upgrade

特定版本支持本命令。详询派能技术支持人员。

Implemented on latest version, please contact us for further information.

升级过程中，需要按照顺序下发命令。

The command shall send by order.

Firmware: .bin file

分包：将固件按照顺序和固定大小拆解。

Block: divide firmware file into many packages in order, each one is one block.

2.6.1 command 1: 固件大小 / size of firmware

Command	Content	Bytes
0x4610	固件大小 / size of firmware	4

Response of BMS: 0x4620+N(N 为电池地址，主机默认为 1)

(N is battery address, Master battery default at 1)

如连接到主机时，响应报文 ID 为 0x4621

	Item	Content	Bytes
Condition 1	1	0xA1: size OK	3(A1 00 80)
	2	支持的最大分包大小 / the max size of block (目前只支持 128bytes, 后续只能是 128 的倍数)	
Condition 2	1	0x01: 固件大小错误 / size error	1

2.6.2 command 2: 传输数据 / transfer data

send these 3 commands one by one and wait for response, until all data block finish.

循环发送此 3 条指令，直到数据正确传输完成。

Command	Content	Bytes
0x4630	分包序号 / block number 从 1 开始 / starts from No.1	2
0x4650	分包数据 / block data	128
0x4670	分包 CRC/ CRC of 0x4650 (CRC 计算包含 0x4630 以及 0x4650: 128 + 2) CRC16 modbus x16+x15+x2+1	2
	分包大小	2

Response of BMS of these 3 commands: 0x4680+N(N 为电池地址，主机默认为 1)

(N is battery address, Master battery default at 1)

如连接到主机时，响应报文 ID 为 0x4681

	Content
--	---------

Condition 1	0xA2: all OK
Condition 2	0x02: 分包 CRC 不匹配 / CRC of block unmatched
Condition 3	0x03: 分包序号错误 / block number error
Condition 4	0x04: 分包数据写入错误 / block data write in error
Condition 5	0x05: 分包数据大小错误 / block data size error
Condition 5	0x13: 该命令不符合流程 (未按照顺序发送)

2.6.3 commend 3: 校验固件 / CRC of firmware

Command	Content	Bytes
0x4690	固件的 CRC / CRC of firmware CRC16 modbus x16+x15+x2+1	2

Response of BMS: 0x46A0+N (N 为电池地址, 主机默认为 1)

(N is battery address, Master battery default at 1)

如连接到主机时, 响应报文 ID 为 0x46A1

	Item	Content	Bytes
Condition 1	1	0xA3: all OK	3 (A3 00 01)
Condition 2	1	0x06: CRC 数据写入错误 / CRC data write in error	1
Condition 3	1	0x07: 固件总大小异常 / firmware size error	
Condition 4	1	0x08: 固件 CRC 不匹配 / CRC of firmware unmatched	
Condition 5	1	0x14: 总体固件 CRC16 存储故障	1
Condition 6	1	0x13: 该命令不符合流程 (未按照顺序发送)	1

2.6.4 commend 4: 重启更新 / restart to upgrade

Command: 0x46B0

Response of BMS: 0x46C0+N (N 为电池地址, 主机默认为 1)

(N is battery address, Master battery default at 1)

如连接到主机时, 响应报文 ID 为 0x46C1

	Content
Condition 1	0x0A: 固件符合本机设备的子设备 (转发中)
Condition 2	0x0B: 固件符合本机设备 (升级)
Condition 3	0x09: 无效固件 / unvalued firmware
Condition 4	0x15: 暂时不符合升级条件 (特殊情况无法升级, 低压暂时无该条件)
Condition 5	0x13: 该命令不符合流程 (未按照顺序发送)

2.6.5 commend 5: 获取状态 / check upgrade process

Command: 0x46D0

Response of BMS: 0x46E0+N (N 为电池地址, 主机默认为 1)

(N is battery address, Master battery default at 1)

如连接到主机时，响应报文 ID 为 0x46E1

	Item	Content	Bytes 3
Condition 1	1	0x0C: 转发中 / transferring	1
Condition 2	1	0x0D: 升级成功	
Condition 3	1	0x0E: 转发错误 / transfer error	
Condition 4	1	0x0F: 升级失败 / upgrade error	
Condition 5	1	0x10: 本机设备升级中	1
Condition 6	1	0x11: 暂时不符合升级条件（特殊情况无法升级，低压暂时无该条件）	1
Condition 7	1	0x12: 设备版本不符合要求	1
Condition 8	1	0x13: 该命令不符合流程（未按照顺序发送）	1