PYLON Li-Fe battery communication protocol

V2.8

Contents

Change record		
20081120	Original version	V2.2
20081223	1. get the amount of Pack，change the corresponsing data location 2. get system parameters;add cell&pack under-voltage threshold 3. the value of command 0x42，0x44 should not be 0xFF 4. add the following content to State2 of the alarm data：use the pack power	
20090326	*1.ADR is host address in command 2. add switch on-off for function of buzzer - - 3.8 3. Buzzer function identification - - State3 的 bit0	V2.4
20091207	1. add state4&state5 to alarm data，which represent single cell fault 2. bit6 of state3 in alarm data represent AC power failure alarm. （effective discharge current）	
20160620	1. Modify state4 about unit of current description, all modify to Actual Value = Transmission Value *100 2. Add state5 Routine (Case Analysis). Add communication terminal 3. Add description of Communication Terminal and Transmission Speed	V2.5

20160819	4. Add command “Get charge/discharge management information” and “get Series Number Information”	V2.6
20161013	Add command “setup charge/discharge management information”	V2.7
20161215	Add command “turn off”	V2.8

note：*1、upper computer communicates with the host only, so the address of the host is what we care about, select the host address, and the slaves in turn. The address of the host starts from 1(usually the default host address is 1)

1. Communication requirement

According to the requirement of communication standard technical report <Communication backup lithium iron battery Pack>，storage battery provide the items of communication equipment or analog device see table 1(include the communication items of storage battery and upper computer)，and live monitor。

Table 1 the communication requirement of storage battery

State	The charge/discharge state of battery; state of charge(SOC); output voltage ,output current and so on。
Environment analogy data	temperature；environment temperature；PCB temperature；unit cell temperature。
Alarm data	Charge over voltage alarm and protect of the pack; Charge current alarm and protect of the pack; Charge under voltage alarm and protect of the pack; Polarity transposition alarm and protect of the pack; Charge over current alarm and protect of the pack; High temperature alarm and protect of the pack; Environment temperature alarm and protect of the pack; Under capacity alarm and protect of the pack; temperature sensor fail alarm of the pack; voltage sensor fail alarm of the pack; current sensor fail alarm of the pack; High temperature alarm and protect of cell; Charge over voltage alarm and protect of cell; Discharge under voltage alarm and protect of cell; Charge over current alarm and protect of cell。

2. Communication protocol

It defines the communication protocol in detail in <Communication protocol of front-end smart devices>, according to the practical application and characteristic, the protocol (B.12) give a specific definition of the SM and SO(Master Smart Pack).

Standard data format is the requirement in the protocol.

Communication protocol and command follow 7,8.9,10 rules

The protocol released under B.12 data protocol

2.1. Communication Interface and Transmission Rate

Communication Interface of Intelligent device should proved asynchronous serial communication mode. Asynchronous Serial Communication Interface and Transmission Rate have:

RS-232C: 1.2kb/s, 2.4kb/s, 4.8kb/s, 9.6kb/s or 19.2kb/s;

Communication Interface Format: Start Bit (1bit), Data Bit (8bit), Stop Bit (1bit), without parity.

2.2. Basic format of the protocol

2.2.1. Basic format of the frame structure see Table A1

Table A1 frame structure

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

2.2.2. the interpretation of the basic format see Table A2

Table A2 basic format

No.	Symbol	Description	Remark
1	SOI	START OF INFORMATION	（7EH）
2	VER	The version of communication protocol	
3	ADR	Different address description for the same type device（1－254，0、255 reserve）	
4	CID1	Control identifier	
5	CID2	Command information：Control identifier（data or action） Response information：return code RTN	
6	LENGTH	INFO length（include LENID & LCHKSUM）	
7	INFO	Command information：control data information COMMAND_INFO Response information：response data information DATA_INFO	
8	CHKSUM	checksum	
9	EOI	END OF INFORMATION	CR（0DH）

Remark：
VER – see the specification of each protocol
ADR – different address for each battery,support a maximum of 254 batteries。
the description of INFO（include COMMAND_INFO& DATA_INFO）
COMMAND_INFO include several forms：
COMMAND_INFO include in command information, the content(see table A3) is a combination of one or several types.

DATA_INFO include the below forms：
DATA_INFO contained in response information，the content(see table A4) is a combination of one or several types。
DATA_FLAG see Table A5：

Table A3 COMMAND_INFO

COMMAND_GROUP	1 byte	Different number for the same type device

COMMAND_TYPE	1 byte	Different remote control order or different control command in history data transmission
COMMAND_ID	1 byte	Different point for the same type device
COMMAND_TIME	7 byte	Time field，see table A9

Table A4 DATA_INFO

DATAI	Fixed-point number response information （it is not support in this protocol）
DATAF	Floating-point number response information
DATA_FLAG	Data flag information
RUN_STATE	The state of device
WARN_STATE	The alarm information
DATA_TIME	Time-to-event，see table A9 （temporarily not use in this protocol）

Table A5 DATA_FLAG

	Bit7	Bit6	Bit5	Bit4		Bit3	Bit2	Bi1t	Bit0	
No.	0	0	0	0	1	0	0	0	0	1
statement				No unread switch change	Unread switch change				No unread alarm change	Unread alarm change

2.3 Data format

The Basic data format SOI and EOI are explained and transferred in hexadecimal, the other items are explained in hexadecimal and transferred by hexadecimal-ASCII, each byte contains two ASCII，e.g. CID2＝4BH，transfer 2byte: 34H（the ASCII of '4') and 42H(the ASCII of 'B').。

2.4 LENGTH DATA FORMAT see table A7

Table A7 LENGTH data format

High								low							
LCHKSUM				LENID(represent the number of ASCII byte of INFO in transmission）											
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

LENID represent the byte amount of ASCII code in INFO, when LENID＝0 ， INFO is empty 。

Since LENID is only 12Bit，it requires the maximum data package must not exceed 4095 byte。

For LENGTH transmission, the sequence is high byte to low byte, divide to four ASCII to

transmit.

Computing formula of

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

E.g.:

The number of ASCII byte in INFO is 18，that is LENID＝0000 0001 0010B。D11D10D9D8+D7D6D5D4+D3D2D1D0＝0000B＋0001B＋0010B＝0011B，take modulus 16 of the sum, the result is 0011B, do a bitwise invert and plus, we get LCHKSUM is 1101B，and LENGTH：1101 0000 0001 0010B，is D012H.

2.5 CHKSUM DATA FORMAT

Calculator the sum of all characters in ASCII value, except for SIO,EOI and CHKSUM, Take modulus 65536,and inverse the remainder ,plus 1.

For example:

Received or Sent character sequence is "~1203400456ABCEFEFC72\R"("~"is SOI, "CR" is EOI),the "FC72" in last 5 characters "FC72\R" is CHKSUM, Calculation method is: '1' + '2' + '0'+ ... + 'F' + 'E' = 31H + 32H + 30H + ... + 46H + 45H = 038EH，take modulus 65536 of 038EH, the remainder is 038EH, do a bitwise invert of the remainder ,and plus 1, the result is FC72H

2.6 DATA_INFO DATA FORMAT

Analog data is transmitted in form of fixed-point or floating-point。

a）floating-point format（FLOAT，4bytes）

floating-point format is relevant to IEEE－754 standard（32），the length is 32 。the transmission sequence of four byte floating-point is low byte to high byte。Floating-point format seeA8

Table A8floating-point format

D31	D30～D23	D22～D0
Floating-point	exponent	mantissa

Floating-point value＝（（－1）sign bit）

×1.mantissa×2（exponent－127）

b）fixing-point format（INTEGER，2 byte）

（the protocol takes fixed-point number）

signed integer －32768～＋32767

unsigned integer 0～＋65535

transfer order: high byte to low byte。

2.7 DATA_TIME & COMMAND_TIME see table A9

table A9 time format

Year	（1－9999）	INTEGER	（integer 2 byte，Hex）
Month	（1－12）	CHAR	（char 1 byte，Hex）
Day	（1－31）	CHAR	（char 1 byte，Hex）
Hour	（0－23）	CHAR	（char 1 byte，Hex）
Minute	（0－59）	CHAR	（char 1 byte，Hex）

Second	（0－59）	CHAR	（char 1 byte，Hex）
Note：year is transferred as INTEGER, actual VALUE=transfer value			

2.8 SmartPack

Each SmartPack manage M series Cells, which can detect the voltage of each Cell and current, manage N temperature sensors, handle the protection of voltage, current, and temperature, all protection parameters are stored in EEPROM。 A group can contain 16 Smart Pack, one is Master and the others are Slave。

Master Pack (SO) communicates with SM via RS232 bus, meanwhile, communicate with other Slave Pack via RS485 bus.

SM can read the data of Master Pack (Pack1) and all Slave Pack(Pack2,3,…)via communication command with SO.

The communication rate is 1200BPS.

2.9 Encoding Table

CID1encoding table

No.	content	CID1	Remark
1	li-battery data	46H	

CID2encoding table

No.	content	CID2	Remark
1	Get analog value（fixed-point number）	42H	
2	Get alarm data	44H	
3	Get system parameter（fixed-point number）	47H	
4	Get communication protocol version	4FH	
5	Get manufacturer information	51H	
6	Get quantity of pack	90H	User-defined command
7	Set communication rate	91H	User-defined command
8	Get charge/discharge management information	92H	User-defined command
9	Get Series Number of Equipment	93H	User-defined command
10	Setup charge/discharge management information	94H	User-defined command
11	Turn Off	95H	User-defined command
12	Control command	99H	User-defined command

CID2response encoding table (RTN)

No.	description	RTN	Remark
1	Normal	00H	

2	VER error	01H	
3	CHKSUM error	02H	
4	LCHKSUM error	03H	
5	CID2 invalidation	04H	
6	Command format error	05H	
7	Invalid data	06H	*1
8	ADR error	90H	User-defined
9	Communication error	91H	User-defined*2

note：*1 INFO data is invalidation.

*2 communication error:： SM can get one Slave Pack data ， the communication between Master Pack amd Slave Pack is wrong.

Fixed-point number type

No.	content	Data type
1	Unit cell voltage	Signed integer
2	Temperature	Signed integer
3	Pack voltage	unsigned integer
4	Current	Signed integer（charge is positive）
5	System parameter	Signed integer
6	capacity	Unsigned integer

3 Communication command

3.1 Get protocol version

Command information

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	46H	4FH	LENGT	INFO	CHKSUM	EOI

note：VER is arbitrary number ， LENID = 00H

response information

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	46H	RTN	LENGTH	INFO	CHKSUM	EOI

note：SO does not check the VER when the command is coming

in response information，VER is version，V2.1 is transferred as 21H

3.2 Get Pack number

Command information

No.	1	2	3	4	5	6	7	8	9
byte	1	1	1	1	1	2	LENID/2	2	1
forma	SOI	VER	ADR	46H	90H	LENGT	INFO	CHKSU	EOI

Note：LENID = 0

Response information

No.	1	2	3	4	5	6	7	8	9
byte	1	1	1	1	1	2	LENID/2	2	1
Forma	SOI	VER	ADR	46H	RTN	LENGTH	INFO	CHKSUM	EOI

Note：LENID = 2，INFO = Pack number， 1 byte

3.3 Get manufacturer information

Command information

No.	1	2	3	4	5	6	7	8	9
byte	1	1	1	1	1	2	LENID/2	2	1
Form	SOI	VER	ADR	46H	51H	LENGT	INFO	CHKSUM	EOI

Note：LENID = 0

Response information

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	46H	RTN	LENGTH	INFO	CHKSUM	EOI

Note：LENID = 40H

DATAINFO

No.	Name	Data type
1	Device Name	10
2	Software version	2
3	Manufacturer name	20

Note：the name of collector and the manufacturer are ASCII，the version is 2byte，every

byte is integer

3.4 Set communication rate

Command information

No.	1	2	3	4	5	6	7	8	9
byte	1	1	1	1	1	2	LENID/2	2	1
Form	SOI	VER	ADR	46H	91H	LENGT	INFO	CHKSU	EOI

Note：LENID = 2，INFO is 1byte，Command

Rate set

Command	rate（BPS）
01H	1200
02H	2400
03H	4800

Response information

No.	1	2	3	4	5	6	7	8	9
byte	1	1	1	1	1	2	LENID/2	2	1
Form	SOI	VER	ADR	46H	RTN	LENGT	INFO	CHKSUM	EOI

Note：LENID = 0

The new rate will be set when SO response the right RTN。

3.5 Get analog value (fixed-point type)

Command information

No.	1	2	3	4	5	6	7	8	9
byte	1	1	1	1	1	2	LENID/2	2	1
Form	SOI	VER	ADR	46H	42H	LENGTH	INFO	CHKSU	EOI

Note：LEDID = 02H INFO is 1byte Command：

Command = 0xFF get the data of all Pack；

Command = 0x01 get the data of Pack1

……

Command = 0x08 get the data of Pack8

Response information

No.	1	2	3	4	5	6	7	8	9
byte	1	1	1	1	1	2	LENID/2	2	1
Form	SOI	VER	ADR	46H	RTN	LENGT	INFO	CHKSUM	EOI

Note INFO contains INFOFLAG and DATAI

Corresponding DATAI data

No.	content	remark
1	* amont of Pack M /	1byte
2	Pack1data	
……		
M+1	PackM data	
M+2		

Each Pack data

No.	content	DATAI byte
1	Cells count M	1
2	Cell1 voltage	
3	Cell2 voltage	2
……	……	……
M+1	CellM voltage	2
M+2	Temperature count N	1
M+3	Temperature 1	2
……	……	……
M+N+2	Temperature N	2
M+N+3	Pack current	2
M+N+4	Pack voltage	2
M+N+5	Pack remains mAH	2
M+N+6	User-defined = 2	1
M+N+7	Pack total mAH	2
M+N+8	Pack cycle	

note： * when Command = 0xFF， it means amount of Pack ， when Command is other value, it means Command value。

3.6 Get system parameter (fixed-point number)

Command data

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	46H	47H	LENGTH	INFO	CHKSUM	EOI

Note：LENID = 0

response data

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	46H	RTN	LENGTH	INFO	CHKSUM	EOI

Note：INFO contains INFOFLAG and DATAI。

DATAI data

No.	Content	DATAI byte
1	Unit cell voltage	2
2	Unit cell low-voltage threshold	2
3	Unit cell under-voltage threshold	2
4	Charge upper-limit temperature	2
5	Charge lower-limit temperature	2
6	Charge lower-limit current	2
7	Upper limit of Total voltage	2
8	Lower limit of total voltage	2
9	Under voltage of total voltage	2
10	Discharge upper-limit temperature	2
11	Discharge lower-limit temperature	2
12	Discharge lower-limit current	2

3.7 Get alarm information

Command data

No	1	2	3	4	5	6	7	8	9
Byte	1	1	1	1	1	2	LENID/2	2	1
for	SO	VE	A	46	44	LENG	INFO	CHKS	EO

note：LEDID = 02H

INFO is one byte，=Command：

Command = 0xFF get all Pack data；

Command = 0x01 get Pack1 data

……

Command = 0x08 get Pack8 data

Response data

No	1	2	3	4	5	6	7	8	9
Byt	1	1	1	1	1	2	LENI	2	1
for	SO	VE	AD	46	RT	LENG	INFO	CHKS	EO

note：INFO contains DATAFLAG and WARNSTATE。

Corresponding WARNSTATE data

No.	Content	Remark
1	* amount of Pack M /	1 byte
2	Pack1alarm data	
……	……	
M+1	PackM alarm data	1

Each Pack data format：

No.	Content	Remark
1	Total Cells M	1
2	Cell1voltage	1
3	Cell2 voltage	1
……	……	……
M+1	CellM voltage	1
M+2	Temperature count N	1
M+3	temperature1	1
……	……	……
M+N+2	Temperature N	1
M+N+3	Charge current	1
M+N+4	Pack voltage	1
M+N+5	Discharge current	1
M+N+6	status1	1
M+N+7	status2	1
M+N+8	status3	1
M+N+9	status4	1
M+N+9	status5	1

note（no. 1 ~ M+N+5）

00H – normal

01H – below lower limit

02H – above upper limit

F0H – other error

status1

Bit	Description	Remark
7	Pack under voltage	1：uv 0：normal
6	Charge temperature protection	1：charge temp-prot
5	Discharge temperature protection	1：disc temp-prot 0：
4	Discharge overcurrent	1：doc 0：normal
3		
2	Charge overcurrent	1：coc 0：normal
1	Cell lower-limit voltage	1：lv 0：normal
0	Over voltage	1：ov 0：normal

status2

Bit	Description	Remark
3	Use the pack power	1：use thepack power 0：
2	DFET	1：ON 0：OFF
1	CFET	1：ON 0：OFF
0	PreFET	1：ON 0：OFF

status3

Bit	Description	Remark
7	Effective charge current	1：ecc 0：normal
6	Effective discharge current	1：edc 0：normal
5	Start-up heater	1：start-up 0：normal
4		
3	Fully Charged	Fully charged
2		
1		
0	Buzzer	1：start-up 0：shut

status4

Bit	Description	Remark
7	Check cell8	1：fault 0：normal
6	Check cell7	1：fault 0：normal

5	Check cell6	1：fault 0：normal
4	Check cell5	1：fault 0：normal
3	Check cell4	1：fault 0：normal
2	Check cell3	1：fault 0：normal
1	Check cell2	1：fault 0：normal
0	Check cell1	1：fault 0：normal

status5

Bit	Description	Remark
7	Check cell16	1：fault 0：normal
6	Check cell15	1：fault 0：normal
5	Check cell14	1：fault 0：normal
4	Check cell13	1：fault 0：normal
3	Check cell12	1：fault 0：normal
2	Check cell11	1：fault 0：normal
1	Check cell10	1：fault 0：normal
0	Check cell9	1：fault 0：normal

note：
when Command = 0xFF，it means amount of Pack，when Command is other value，it means Command data。
* battery testing – actually in application，the voltage of each cell should be same，while sometimes there is one or more cells have large voltage difference compare to other cells in battery module（according to the specific characteristics of battery）we consider that this module is fault。

3.8 control command

Command data

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	46H	99H	LENGTH	INFO	CHKSUM	EOI

note：LEDID = 02H，INFO takes one byte，= Command

INFO data

Command	Description
0x0C	Shut Buzzer
0x0D	Start-up Buzzer

Response data

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	46H	RTN	LENGTH	INFO	CHKSUM	EOI

note：LENID = 0

3.9 Get charge/discharge management information

Command Information

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

Note: LEDID = 02H INFO as one byte, for Command:

Command = 0x01 get Pack1 charge/discharge management information

……

Command = 0x08 get Pack8 charge/discharge management information

Respond Information

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

Note: INFO data is composed of charge/discharge management information

Corresponding DATAI

No	Content	Remark
1	* Pack Quantity M / Command Value 值	1 byte
2	Pack1 charge/discharge management data	
……		
M+1	Pack M charge/discharge management data	
M+2		

Note: When Command = 0xFF, this byte is Pack Quantity. If Command is another value, this byte is Command value.

注：

Corresponding charge/discharge management information

No.	Description	Remark
1	Recommend Charge Voltage Up Limit	2 bytes

2	Recommend discharge Voltage Down Limit	2
3	Maximum Charge Current	2
4	Minimum Discharge Current	2
5	Status	1

Status

Bit	Description	Remark
7	Charge enable	1: enable 0: normal
6	Discharge enable	1: enable 0: normal
5	Charge immediately	1: enable 0: normal
4		
3		
2		
1		
0		

3.10 Get Series Number Inforamtion

Command Infomation

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

Note: LEDID = 02H INFO as one byte, as Command:

Command = 0xff not support

Command = 0x01 get Pack1 SN information

……

Command = 0x08 get Pack8 SN information

带格式的: 缩进: 首行缩进: 0 厘米, 右侧: -0.04 厘米, 段落间距段前: 0.2 磅, 行距: 单倍行距

Response Information

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

Note: INFO data is constituted by DATAI.

Corresponding DATAI data

No	Content	Remark
1	Command Value	1 byte
2	Pack SN	

Corresponding SN Information

No	Content	Remark
1	SN	16 byte

Note: SN are all ASCII code, 16 byte, every byte are all integer type.

3.11 Setup Charge/Discharge Management Information

Command Information

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	46H	94H	LENGTH	INFO	CHKSUM	EOI

Note: LENID=12H, INFO is 9 byte, consisted with “Command” and “DataF”.

Command = 0xff not support

Command = 0x01 setup the charge/discharge management information of Pack1

……

Command = 0x08 setup the charge/discharge management information of Pack8

Response Information

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	46H	RTN	LENGTH	INFO	CHKSUM	EOI

Note: LENID = 0

DataF Infomation

No	Content	Remark
1	Recommend Charge Voltage Up Limit	2 byte
2	Recommend discharge Voltage Down Limit	2
3	Maximum Charge Current	2
4	Minimum Discharge Current	2

Note: When you need to manually set charge/discharge management information, send this command periodically, if the battery does not receive this command again 10 seconds, the battery is automatically set charging and discharging management information according to the current conditions.

Do not use this command until the PYLON's proposed value for current is specified.

3.12 Turn Off

Command Information

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

Note: LENID=02H, INFO is 1 byte, consisted with Command

Command = 0xff not support
Command = 0x01 Pack1 turn off
…
Command = 0x08 Pack8 turn off

Response Information

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	46H	RTN	LENGTH	INFO	CHKSUM	EOI

Note: LENID = 0

4 Description

Type	Parameter	Description
Live data	Cell voltage	mV
	Temperature	negative temperature value is negative，the calculation is： the temperature unit in response data is 0.1K，e.g.25.5° =25.5 * 10 + 2731 = 2986（0.1K） -12.4° = -12.4 * 10 + 2731 = 2607（0.1K）
	Pack current	mA。Signed number，highest identify charge or discharge Signed number, actual value = Transmission Value * 100
	Pack voltage	mV
	Pack remains mAH	mAh
	Pack total mAH	mAh
System parameter	Upperlimit voltage of cell	mV
	Unit cell low-voltage threshold	mV，lower-voltage alarm
	Unit cell under-voltage threshold	mV，under-voltage protection
	Charge upper-limit temperature	0.1K
	Charge lower-limit temperature	0.1K

	Charge lower-limit current	mA, Signed number, actual value = Transmission Value * 100
	Upper limit of Total voltage	mV
	Lower limit of total voltage	mV，lower voltage threshold
	Under voltage of total	mV，under voltage proctection
	Discharge upper-limit	0.1K
	Discharge lower-limit	0.1K
	Discharge lower-limit current	mA，signed number，actual value=passing value * 100，e.g. -4000mA，passing value is 0xFFD8
charge/discharge management information	Recommend Charge Voltage Up Limit	mV
	Recommend discharge Voltage Down Limit	mV
	Maximum Charge Current	mA，signed number，actual value=passing value * 100
	Minimum Discharge Current	mA，signed number，actual value=passing value * 100

5 Routine

Get analog quantization data (fixed point type)

Host Commands: 7E 32 30 30 31 34 36 34 32 45 30 30 32 30 31 46 44 33 35 0D

回复数据:Reply Data: 7E 32 30 30 31 34 36 30 30 43 30 36 45 31 31 30 31 30
46 30 44 34 35 30 44 34 34 30 44 34 35 30 44 34 34 30 44 34 35 30 44 34
34 30 44 33 45 30 44 34 35 30 44 34 41 30 44 34 41 30 44 34 42 30 44 34
41 30 44 34 41 30 44 34 41 30 44 34 41 30 35 30 42 43 33 30 42 43 33 30
42 43 33 30 42 43 44 30 42 43 44 30 30 30 30 43 37 32 35 42 46 36 38 30
32 43 33 35 30 30 30 30 32 45 35 35 33 0D

The corresponding data take out and analysis as follow:

No	Content	Original Data	Hexadecimal and Decimal	Actual Value
1	Cells M	30 46	(0FH)15	15Unit
2	Cell1 Votage	30 44 34 35	(0D45H)3397	3397mV
3	Cell2 Votage	30 44 34 34	(0D44H)3396	3396mV

……	……	30 44 34 35 30 44 34 34 30 44 34 35 30 44 34 34 30 44 33 45 30 44 34 35 30 44 34 41 30 44 34 41 30 44 34 42 30 44 34 41 30 44 34 41 30 44 34 41		
M+1	Cell M Votage	30 44 34 41	(0D4AH)3402	3402mV
M+2	Temperature Qty. N	30 35	(05H)5	5 Unit
M+3	Temperature 1	30 42 43 33	(0BC3H)3011	28 °C
……	……	30 42 43 33 30 42 43 33 30 42 43 44		
M+N+2	TemperatureN	30 42 43 44	(0BCDH)3021	29°C
M+N+3	Pack Current	30 30 30 30	(0000H)0	0
M+N+4	Pack Total Voltage	43 37 32 35	(C725H)50981	50981mV
M+N+5	Pack Residual mAh	42 46 36 38	(BF68H)49000	49000mAH
M+N+6	User Defind Quantity =2	30 32	(02H)2	2
M+N+7	Pack Total mAh	43 33 35 30	(C350H)50000	50000mAH
M+N+8	Cell cycle	30 30 30 32	(0002H)2	2 times