BASEN Energy Storage BMS Communication Protocol

Shenzhen Basen Technology Co.,Ltd

1 Protocol Description

This communication protocol is developed according to the YD/T1363.1 specification, using serial asynchronous communication mode, 8 data bits, 1 start bit, 1 stop bit, no parity bit, baud rate 9600 or 19200 bps.

2 Communication Method

The monitoring system is a distributed structure, and the communication between the monitoring unit (SU) and the monitoring module (SM) is the master-slave mode, the monitoring unit is the upper computer, and the monitoring module is the lower computer.

Communication process: The SU calls the SM and issues a command. After receiving the command, the SM returns a response message. If the SU does not receive the SM response message or the response message is incorrect within 500ms, the communication process is considered to have failed.

3 Data Frames

3.1 Data frame structure

Table 1 shows the structure of the transmitted data frame. Table 2 is a description of the contents of the data frame, and Table 3 is a description of the return code (RTN).

Table 1 Data frame structure.

No.	1	2	3	4	5	6	7	8	9
Number of Bytes	1	1	1	1	1	2	LENID/2	2	1
Content	SOI	VER	ADR	CID1	CID2	LENGTH	INFO	CHKSUM	EOI

Table 2 Data frame details

No.	Symbol	Meaning	Remarks
1	SOI	Start of Information	(7EH)
2	VER	Protocol Version Number	22H
3	ADR	Device Address (0~15 is valid), marked with 4-digit address dial switch	00~0FH
4	CID1	device identification code (device type description)	4AH
5	CID2	Control identification code (command type description) Return code RTN (return code is shown in Table 3)	SU is sent to SM SM returns to SU
6	LENGTH	INFO byte length (including LENID and LCHKSUM)	

7	INFO	Control Data Information (COMMAND INFO) Response data message (DATA INFO)	SU is sent to SM SM returns to SU
8	CHKSUM	checksum code	
9	EOI	End Code	CR (0DH)

The **COMMAND INFO** in Table 2 consists of the following control command codes:

—— COMMAND GROUP: 1 byte: indicates different group numbers of devices of the same type;

—— COMMAND ID: 1 byte: indicates different monitoring points in the same group of the same type of device;

—— COMMAND TYPE: 1 byte: indicates different remote control commands or different control commands in historical data transmission;

—— COMMAND TIME: 7 bytes: indicates the time field;

—— COMMAND DATAI: Command information containing integers;

The **DATA INFO** in Table 2 consists of the following response codes:

—— DATAI: response information containing integers;

—— RUNSTATE: the running status of the device;

—— WARNSTATE: alarm status of the device;

—— DATAFLAG: identification byte;

—— DATATIME: time field.

Table 3 Return Code RTN

No.	RTN (Hex)	Meaning	Remarks
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	

4 Data Format

4.1 Data Transmission Format

In the data frame structure of Table 1, SOI and EOI (SOI=7EH, EOI=0DH) are transmitted in one byte, and each of the remaining bytes is split into two bytes, and each byte uses two bytes. The ASCII code indicates that the upper four digits are

represented by an ASCII code, and the lower four digits are represented by an ASCII code. The transmission transmits the upper four digits of the ASCII code and then the lower four digits of the ASCII code. For example, if CID1=4AH, the ASCII code of 4 is 34H, the ASCII code of A is 41H, and the two bytes of 34H and 41H are sequentially transmitted during transmission.

4.2 LENGTH Data Format

Table 4 shows the data format of LENGTH.

Table 4 LENGTH Data Format

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

LENGTH has a total of 2 bytes, LENID represents the number of ASCII bytes of the INFO item. When LENID=0, INFO consists of LENID and LCHKSUM, which is empty, that is, there is no such item. LENGTH is split into four ASCII code transfers, the first high byte and the last low byte.

The calculation of the check code: D11D10D9D8+D7D6D5D4+D3D2D1D0, and the remainder of the summed mode is reversed by one.

Example:

The ASCII byte number of the INFO item is 18, which is LENID=0000 0001 0010B. D11D10D9D8+D7D6D5D4+D3D2D1D0=0000B+0001B+0010B=0011B, the remainder of the modulo 16 is 0011B, and the inverse of 0011B is 1101B, that is, LCHKSUM is 1101B.

It can be concluded that LENGTH is 1101 0000 0001 0010B, which is D012H.

4.3 CHKSUM Data Format

The calculation of CHKSUM is that except for SOI, EOI and CHKSUM, other characters are summed and summed according to the ASCII code value, and the result modulo 65536 is inversely incremented by one. CHKSUM splits four ASCII code transfers, first high byte, then low byte.

Example:

The sequence of characters received or sent is: "~20014043E00200FD3BCR" ("~" is

SOI, "CR" is EOI), then FD3B in the last five characters "FD3BCR" is CHKSUM, and the calculation method is:

'2'+'0'+'0'+...+'E'+'0'+'0'+'2' +'0'+'0'

=32H + 30H + 30H + ... + 45H + 30H + 30H + 32H + 30H + 30H

= 02c5H

The ASCII code value of the character '2' is 32H, and the ASCII code value of the character 'E' is 45H. 02C5H mode 65536 remainder is 02C5H, 02C5H reverse plus 1 is FD3BH.

4.4 INFO Data Format

4.4.1 Integer format

Integer number, INTEGER, 2 bytes long, divided into 2 types:

—— signed integers, expressed data range –32768 to +32767;

—— Unsigned integers, the expressed data range is 0 ~ 65535.

The integer number is split into 4 ASCII code transmissions, first high byte and then low byte.

4.4.2 Unsigned Character Number Format

Unsigned character type, CHAR, 1 byte length, expressed data range 0 to 255. When transmitting, split into 2 ASCII codes, first high four-digit ASCII code, then lower four-digit ASCII code.

4.4.3 Conversion of integer transfer value and actual value

When telemetry data is transmitted using integer numbers, conversion between the transmitted value and the actual value is required. The conversion principle is as follows:

a) Battery cell voltage: unit mV, unsigned integer.

b) Total voltage: unit V, unsigned integer, transmission value = actual value * 100, such as 45.69V, transmission value is 4569.

c) Temperature: Unit: Celsius, signed integer, transmission value = actual value *10, such as 25.6 degrees Celsius, transmission value is 256.

d) Current value: unit: ampere, signed integer, transmission value = actual value *100, charging is positive, discharge is negative, such as discharging 12.35 amps, transmission value is -1235.

e) Ampere: Unsigned integer, transmitted value = actual value *100, such as 40.52AH,

the transmitted value is 4052.

f) System parameters: unsigned integer.

5 Communication Commands

5.1 Get real-time data

Table 5 is the command information sent by the SU to the SM, and Table 6 is the response information returned by the SM after receiving the command information.

Table 5 Get real-time data command information

No.	1	2	3	4	5	6	7	8	9
Bytes	1	1	1	1	1	2	LENID/2	2	1
Content	SOI	VER	ADR	4AH	42H	LENGTH	COMMAND INFO	CHKSUM	EOI

Note: LENID=02H, COMMAND INFO is 1 byte, consisting of COMMAND GROUP. At this time, the specific COMMAND GROUP is fixed to 01H, indicating that the first group of battery telemetry data is acquired.

Table 6 Get response information of real-time data

No.	1	2	3	4	5	6	7	8	9
Bytes	1	1	1	1	1	2	LENID/2	2	1
Content	SOI	VER	ADR	4AH	RTN	LENGTH	DATAINFO	CHKSUM	EOI

Note: DATAINFO consists of DATAFLAG and DATAI, which is the telemetry content of the battery management system.

Description of DATAFLAG:

The DATAFLAG bytes are described below.。

D7	D6	D5	D4	D3	D2	D1	D0

D0: The alarm flag is 1 when there is no reported alarm change, otherwise it is 0.

D4: The switch flag is 1 when there is no reported switch change, otherwise it is 0.

Other bits remain unused.

Table 7 shows the transmission contents of DATAI telemetry:

Table 7 Telemetry of each transmission content

No.	Content	Bytes
1	Battery Pack Capacity（SOC）	2
2	battery pack total voltage	2
3	number of batteries m	1
4	Voltage of cell 1	2
5	Voltage of cell 2	2
...	...	...
m+3	Voltage of cell m	2
m+4	ambient temperature	2
m+5	pack average temperature	2
m+6	MOS temperature	2
m+7	pack temperature quantity n	1
m+8	pack temperature 1	2
m+9	pack temperature 2	2
...	...	...
m+n+7	pack temperature n	2
m+n+8	charging or discharging current	2
m+n+9	pack internal resistance	2
m+n+10	pack health status SOH	2
m+n+11	User-defined number =13	1
m+n+12	full charge capacity	2
m+n+13	remaining capacity	2
m+n+14	number of cycles	2
m+n+15	voltage status	2
m+n+16	current status	2
m+n+17	temperature status	2
m+n+18	alarm status	2
m+n+19	FET status	2
m+n+20	Overvoltage protection status	2
m+n+21	undervoltage protection status	2
m+n+22	Overvoltage alarm status	2
m+n+23	undervoltage alarm status	2
m+n+24	cell balance state	2

Table 8 Specific comments on the status of the content starting from m+n+15

Content	Byte	Remarks
Voltage status	2	B0: cell overvoltage protection (1 set,0 clear, the same below) B1: cell undervoltage protection B2: pack overvoltage protection B3: pack undervoltage protection B4: cell overvoltage alarm B5: cell undervoltage alarm B6: pack overvoltage alarm B7: pack undervoltage alarm B8: cell Voltage difference alarm B9~B14: Reserved B15: The system is going to sleep state
Current status	2	B0:Charging (1 charging,0 not discharging) B1:Discharging (1 discharging,0 not discharging) B2: Charge overcurrent protection

		B3: Short circuit protection B4: Discharge overcurrent 1 protection B5: Discharge overcurrent 2 protection B6: Charge overcurrent alarm B7: Discharge overcurrent alarm B8~B15: Reserved
Temperature status	2	B0: Charge over temperature protection (1 set, 0 clear, the same below) B1: Charge under temperature protection B2: Discharge over temperature protection B3: Discharge under temperature protection B4: Ambient over temperature protection B5: Ambient under temperature protection B6: MOS over temperature protection B7: MOS under temperature protection B8: Charge over temperature alarm B9: Charge under temperature alarm B10: Discharge over temperature alarm B11: Discharge under temperature alarm B12: Ambient over temperature alarm B13: Ambient under temperature alarm B14: MOS over temperature alarm B15: MOS under temperature alarm
Alarm status	2	B0:cell voltage differential alarm (1 set, 0 clear, the same below) B1:Charge MOS damage alarm B2: External SD card failure alarm B3:SPI communication failure alarm B4:EEPROM failure alarm B5:LED alarm enable B6:Buzzer alarm enable B7: Low battery alarm B8:MOS over temperature protection B9:MOS over temperature alarm B10: Current limiting board failure B11: Sampling failure B12: Battery failure B13:NTC failure B14:Charge MOS failure B15: Discharge MOS failure
FET Status	2	B0:Discharge MOS status(1 on,0 off) B1: Charge MOS status(1 on,0 off) B2:Discharge MOS failure (1 damaged,0 normal) B3: Discharge MOS failure (1 damaged,0 normal) B5-B4: Current limiting mode B5B4=00：no limit、B5B4=01 current limit 5A、 B5B4=10：current limit10A、B5B4=11 current limit2 5A B6-B10: Reserved B11:LED alarm enable（1 enable 0 disable） B12:Beep enable（1 enable 0 disable） B13~B15: Reserved
Cell overvoltage protect	2	B0~B15 corresponds to cell 1~16

Cell undervoltage protect	2	B0~B15 corresponds to cell 1~16
Cell overvoltage alarm	2	B0~B15 corresponds to cell 1~16
Cell underVoltage alarm	2	B0~B15 corresponds to cell 1~16
Balance status	2	B0~B15 corresponds to cell 1~16