Software board general agreement

I. Overview

This protocol is a universal protocol for the RS485/RS232/UART interface of the Polar Air Active Balance Protection Board, and the baud rate is 9600bps.

II. The frame structure

In the communication process, the protection board is always the slave and the remote device is the master. All communication can only be initiated by the master and responded by the slave. To facilitate the distinction, it is agreed that the frame sent by the host is the configuration frame, and the frame sent by the protection board is the response frame.

The configuration frame includes start bit, status bit, command code, data length, data content, checksum, and stop bit. The frame structure is as follows:

Start bit	Status bit	Command code	Data length	Data content	check	Stop bit

among them:

1） Start bit: 1 byte, indicating the start of a frame of data, fixed to 0xDD;

2） Status bit: 1 byte, status 0xA5 means read, status 0x5A means write.

3） Command code: 1 byte. In the communication process, the command code is used to distinguish the data content carried in the configuration frame. The corresponding relationship between each command code and the data carried is as follows:

Status bit	Command code	Data content
0xA5	0x03	Read basic information and status
	0x04	Read battery cell voltage
	0x05	Read the hardware version number of the protection board
	0x06	Read the private data of the protection board user
0x5A	0xE1	MOS control instructions

4） Data length: 1 byte, indicating the effective length of the data carried in the frame.

5） Data content: N bytes, the content carried by the frame data, when the data length is 0, there is no such part.

6） Verification: 2 bytes, the verification field is "command code + length byte + data segment content", the verification method is the

sum of the above fields and then the inverse plus 1, the high bit is in the front and the low bit is in the back.

7） Stop bit: 1 byte, indicating the end of a frame of data, fixed as 0x77;

The response frame contains the start bit, status bit, command code, data length, data content, checksum, and stop bit. The frame structure is as follows:

Start bit	Command code	Status bit	Data length	Data content	check	Stop bit

among them:

1） Start bit: 1 byte, indicating the start of a frame of data, fixed to 0xDD;

2） Command code: 1 byte, which is the command code of the configuration frame that this frame responds to.

3） Status bit: 1 byte, 0x00 means correct, 0x80 means error.

4） Data length: 1 byte, indicating the effective length of the data carried in the frame.

5） Data content: N bytes, the content carried by the frame data, when the data length is 0, there is no such part.

6） Verification: 2 bytes, the verification field is "command code + length byte + data segment content", the verification method is the sum of the above fields and then the inverse plus 1, the high bit is in the front and the low bit is in the back.

7） Stop bit: 1 byte, indicating the end of a frame of data, fixed as 0x77;

III. Communication example

1） **Read basic information and status**

Host computer send: DD A5 03 00 FF FD 77

BMS response: DD 03 00 1B 17 00 00 00 02 D0 03 E8 00 00 20 78 00 00 00 00 00 00 10 48 03 0F 02 0B 76 0B 82 FB FF 77

Red is the checked byte, which is the sum of all bytes; the latter 2 are the check results, which are the sum of all the check data in the front and then take the inverse +1.

The data content structure of the response frame is as follows:

Data content	length	Description
Total voltage	2 Byte	Unit: 10mV; high byte first, low byte last.

Total current	2 Byte	Unit: 10mA; judge the battery charge and discharge status by current, charge is positive, discharge is negative
The remaining capacity	2 Byte	Unit: 10mAh;
Nominal capacity	2 Byte	Unit: 10mAh;
Cycles	2 Byte	Unit: times;
Production Date	2 Byte	Use 2 bytes to transmit such as 0x2068, where the date is the lowest 5: 0x2028&0x1F = 8 means the date; month (0x2068>>5)&0x0f = 0x03 means March; the year is 2000+ (0x2068>>9) = 2000 + 0x10 =2016;
Equilibrium	2 Byte	Each bit represents the balance of each string, 0 means off, 1 means on, which means 1~16 strings
Equilibrium_High	2 Byte	Each bit means each string is balanced, 0 means off, 1 means on, which means 17~32 strings, and supports up to 32 strings
Protection status	2 Byte	Each bit represents a protection status, 0 is unprotected, 1 is protected. See note 1:
Keep	1 Byte	
remaining battery	1 Byte	Indicates the percentage of remaining capacity
FET control status	1 Byte	MOS indicates status, bit0 means charging, bit1 means discharging, 0 means MOS is off, 1 means on
Number of battery strings	1 Byte	Number of battery strings
Number of NTC	1 Byte	Number of NTC
N NTC content	2*N Byte	The unit 0.1K adopts absolute temperature transmission, 2731+(actual temperature*10), 0 degrees = 2731 25 degrees = 2731+25*10 = 2981;

Note 1: Description of protection status:

BIT 0 monomer overvoltage protection

BIT 1 monomer undervoltage protection

BIT 2 whole set of overvoltage protection

BIT 3 whole group undervoltage protection

BIT 4 charging over temperature protection

BIT 5 charging low temperature protection

BIT 6 discharge over temperature protection

BIT 7 discharge low temperature protection

BIT 8 charging overcurrent protection

BIT 9 discharge overcurrent protection

BIT 10 short circuit protection

BIT 11 front-end detection IC error

BIT 12 software locks MOS

BIT 13~ BIT 15 reserved

2） **Read battery cell voltage**

Host sends: DD A5 04 00 FF FC 77

BMS response: DD 04 00 1E 0F 66 0F 63 0F 63 0F 64 0F 3E 0F 63 0F 37 0F 5B 0F 65 0F 3B 0F 63 0F 63 0F 3C 0F 66 0F 3D F9 F9 77

The data content structure of the response frame is as follows:

Data content	length	the data shows
First string cell voltage	2Byte	Unit mV, high order first
Second string cell voltage	2Byte	Unit mV, high order first
The third string cell voltage	2Byte	Unit mV, high order first
Nth string cell voltage	2Byte	Unit mV, high order first

3） **Read the hardware and software version number of the protection board**

Host sends: DD A5 05 00 FF FB 77

BMS response: DD 05 00 0A 30 31 32 33 34 35 36 37 38 39 FD E9 77

The data content structure of the response frame is as follows:

Data length N	the data shows
BYTE N	The reply content is ASCII code (for example, the hardware version is H-XXXX)

4） **Read the private data of the protection board user**

Machine send: DD A5 06 00 FF FA 77

BMS response: DD 06 00 0A 30 31 32 33 34 35 36 37 38 39 FD E9 77

The data content structure of the response frame is as follows:

Data length N	the data shows
BYTE N	The reply content is ASCII code (than "23562455")

5） **Control MOS instruction**

The host sends a control MOS command:

Host sends: DD 5A E1 02 00 XX CH CL 77

BMS response: DD E1 00 00 CH CL 77

The comparison table of XX and MOS actions is as follows:

XX value	MOS action
0x00	Release the software to close the MOS tube action
0x01	Software closes charging MOS, and releases software closes discharging MOS
0x02	The software closes the discharge MOS, and the software closes the charging MOS.
0x03	Software turns off charge and discharge MOS at the same time

Example: The host sends DD 5A E1 02 00 02 FF 1B 77 to indicate that the software closes the discharge MOS;