BMS-CAN Communication Protocol

1. Summary

This protocol specifies the communication protocol between BMS and other nodes in automobile can network.

2. Definition of terms

BMS: Battery Management System.
CAN: Controller Area Network.

3. Physical interface.

This protocol adopts can2.0a standard, frame format adopts standard frame, and communication baud rate is 250kbps.

The communication between BMS and instrument is point-to-point unidirectional communication, that is, BMS sends data to the instrument, the instrument receives the data and analyzes the data for display.

4. Data agreement

In the data transmission of this protocol, low byte priority is adopted for multi byte data except for special instructions.

For the total current value of the battery, a positive value indicates discharge and a negative value indicates charging.

The data format of this agreement is defined as follows.

CAN_ID		Data field	
			...	
FUNC	SA	DATA	
3	8	064	

FUNC Indicates the function code. Indicates the frame data type.

SA is the source address, here is the address of BMS, fixed as 0Xf4.

Data represents data field information, and the length of this protocol is fixed to 8 bytes.

5. Parameter group number

Parameter group number assignment is shown in the table below.

Num	Name	Describe	FUNC	ID	Sender	Message period
1	BATT_ST	status information	Ox02	Ox02F4	BMS	20ms
2	CELL_VOLT	Voltage	Ox04	Ox04F4	BMS	100ms
3	CELL_TEM P	Temperature	Ox05	Ox05F4	BMS	lOOms
4	ALM_I N FO	Alarm information	Ox07	Ox07F4	BMS	lOOms

The battery information status, voltage, temperature and message are sent periodically after power on, and the alarm information message is sent by event triggerin.

6. Message definition

6.1 Battery status (BATT_ST) ID:0x02F4

This message defines the status information of the power battery, and the specific format is as follows.

Num	Parameter	Starting position	Bit length	Range	Resolving power	Offset	Unit	Remarks
1	Battery Voltage	0	16	0-1000	0.1	0	V	Total voltage
2	Battery Current	16	16	-400-1000	0.1	-400	A	Total current
3	SOC	32	8	0-100	1	0	%	Remaining capacity
4	Discharge Time	48	16	0-65535	1	0	h	Discharge timing

Example:02F4   13 01 D7 11 33 XX 64 00

Indicate: Voltage:27.5V, Current:56.7A(accuracy : 0.1A) , SOC:51%, Discharge time : 100h.

6.2 Cell Voltage (CELL_VOLT) ID:0x04F4

This message defines the Cell Voltage information, and the specific format is as follows.

Num	Parameter	Starting position	Bit length	Range	Resolving power	Offset	Unit	Remarks
1	MaxCellVolt	0	16	0-5000	1	0	mV	Maximum cell voltage
2	MaxCvNO	16	8	1-250	1	1		Highest monomer position
3	MinCellVolt	32	16	0-5000	1	0	mV	Minimum cell voltage
4	MinCvNO	48	8	1-250	1	1		Lowest monomer position

Example: 04F4   8C 0A 05 92 09 08 XX XX

Indicate: Maximum cell voltage: 2700 mV, The corresponding monomer number is 5;

Minimum cell voltage: 2450 mV, The corresponding monomer number is 8;

6.3 Cell Temperature (CELL_TEMP) ID:0x05F4

This message defines the cell temperature information, and the specific format is as follows.

Num	Parameter	Starting position	Bit length	Range	Resolving power	Offset	Unit	Remarks
1	MaxCellTemp	0	8	-50-200	1	-50	℃	Maximum cell temperature
2	MaxCtNO	8	8	1-250	1	1		Maximum temperature position
3	MinCellTemp	16	8	-50-200	1	-50	℃	Minimum cell temperature
4	MinCtNO	24	8	1-250	1	1		Minimum temperature position
5	AvrgCellTem	32	8	-50-200	1	-50	℃	Average cell temperature

Example:05F4   48 26 2F 01 3F XX XX XX

Indicate: Maximum cell temperature:22℃, The corresponding monomer number is 6;

Minimum cell temperature:-3℃, The corresponding monomer number is 1;

Average cell temperature: 33℃.

Fault information（ALM_INFO）ID:0x07F4

Alarm information message is sent by event triggerin. When there is an alarm, BMS sends the message periodically, No alarm message, no sending.

When multiple alarms occur at the same time, the instrument interface will display the alarm number circularly, up to four alarm signals can be displayed circularly, and the priority of alarm number display is the alarm occurrence sequence. nd the specific format is as follows.

Num	Parameter	Starting position	Bit length	Range	Resolving power	Offset	Unit	Remarks
1	Unit overvoltage	0	2	0-3	1	0		
2	Unit undervoltage	2	2	0-3	1	0		
3	Total voltage overvoltage	4	2	0-3	1	0		
4	Total voltage undervoltage	6	2	0-3	1	0		
5	Large pressure difference of monomer	8	2	0-3	1	0		
6	Discharge overcurrent	10	2	0-3	1	0		
7	Charge overcurrent	12	2	0-3	1	0		
8	Temperature is too high	14	2	0-3	1	0		
9	Temperature is too low	16	2	0-3	1	0		
10	Excessive temperature difference	18	2	0-3	1	0		
11	SOC too low	20	2	0-3	1	0		
12	Insulation is too low	22	2	0-3	1	0		
13	High voltage interlock fault	24	2	0-3	1	0		
14	External communication failure	26	2	0-3	1	0		
15	Internal communication failure	28	2	0-3	1	0		

Alarm level:0 Indicates no alarm information ; 1 Indicates a serious alarm;

2 Indicates an important alarm; 3 Indicates general alarm.

Example:07F4 43 00 20 00 XX XX XX XX

Indicate: Unit overvoltage, Level 3 alarm; Total voltage undervoltage, Level 1 alarm;

SOC too low, Level 2 alarm.

7 Test case

7.1 Normal state

Normal state only displays SOC, voltage value, hour meter and other information.

In normal state, only battery status message, cell voltage message and cell temperature message are sent, and there is no alarm message.

CAN_ID	Data	Data meaning	Instrument display
0x02F4	13 01 d7 11 33 XX 64 40	Voltage:27.5V, Current:56.7A , SOC:51%, Discharge time : 100h.	The display voltage of the main interface is 27.5; SOC display 51%; The number of grid is 2; The current is not displayed.

7.2 **The battery is low**

When the power is too low, the alarm will be given(SOC≥20%),

The main interface does not display the voltage, but displays the current alarm number.

If it is a single alarm, the hour meter will display the corresponding single alarm number.

CAN_ID	Data	Data meaning	Instrument display
0x02F4	E1 00 8A 10 10 XX XX XX	Voltage:22.5V, Current:23.4A , SOC:16%,	The alarm number 11 is displayed on the main interface, and the "AL" symbol flashes; SOC display 16%; The number of grid is 1; The current is not displayed.
0x07F4	00 00 30 00 XX XX XX XX	SOC too low, Level 3 alarm.	

7.3 **Unit voltage too high or too low**

CAN_ID	Data	Data meaning	Instrument display
0x04F4	E1 00 8A 10 10 XX XX XX	Maximum cell voltage: 2700 mV, The corresponding monomer number is 5; Minimum cell voltage: 2450 mV, The corresponding monomer number is 8;	The main interface circularly displays alarm numbers 1 and 2, at the same time, "AL" symbol flashes; And unit numbers 5 and 8 corresponding to the alarm are displayed at the hour meter.
0x07F4	0F 00 00 00 XX XX XX XX	Unit overvoltage, Level 3 alarm; Unit undervoltage, Level 3 alarm.	

7.4 **Cell temperature too high, too low**

CAN_ID	Data	Data meaning	Instrument display
0x05F4	48 06 2F 01 3F XX XX XX	Maximum cell temperature:22℃, The corresponding monomer number is 6; Minimum cell temperature:-3℃, The corresponding monomer number is 1; Average cell temperature: 33℃.	The main interface circularly displays alarm numbers 8 and 9, at the same time, "AL" symbol flashes; And unit numbers 6 and 1 corresponding to the alarm are displayed at the hour meter.
0x07F4	00 C0 03 00 XX XX XX XX	Monomer High temperature, Level 3 alarm; Monomer low temperature, Level 3 alarm.	