
2A CAN Communication Protocol

1. Summary

This agreement specifies the electrical interface, data format and communication rate of 2A equalizer board.

2. Communication parameters

The communication parameters are as follows

Communication interface	CAN
Baud rate	250Kpbs

3. Can bus data format

In the process of communication, only the standard frame of CAN bus is used, and the extended frame is not used. The content of the whole communication frame is constrained by the arbitration field ID of CAN bus.

The arbitration field ID of CAN bus extended frame is 11bit in total. According to the protocol, all the high 7 bits are 0, and the low 4 bits are used to indicate the device address.

Court of arbitration(ARBITRATION FIELD)	
BIT10:4	BIT3:0
0	Equalizer Address

4. Communication process

The whole communication adopts the master-slave mode, the host is the main equipment, and the equalizer is the slave equipment. All communication can only be initiated by the master device and responded by the slave device. In the process

of communication, the first byte of each frame data is defined as the data type indication, and all data frames are high byte first and low byte last.

Next, take the device address as 0x01 as an example to explain the communication.

4.1 Request equalizer data

(1) Host sends data

Addr	Data field	
	1	2-8
0x01	0xFF	-

(2) Equalizer response

Addr	Data field							
	1	2	3	4	5	6	7	8
0x01	0x01	Temperature (UINT16)(°C)		Total voltage (UINT16)(10mV)		Average voltage (UINT16)(mV)		Identify quantity
0x01	0x02	Highest monomer	Lowest monomer	Equalization and alarm	Maximum pressure difference		Equalizing current (UINT16)(mA)	
0x01	0x03	Balanced departure pressure difference		Maximum Equalizing current (UINT16)(mA)		Equalizing switch	Monomer quantity	-
0x01	0x04	Monomer number N	Monomer Voltage N (UINT16)(mV)		Monomer Voltage N+1 (UINT16)(mV)		Monomer Voltage N+2 (UINT16)(mV)	

Note 1. Equalization and alarm byte bit0 indicates equalization battery charging

Bit1 indicates the balanced battery discharge; Bit4 indicates that the monomer quantity is not set correctly; Bit5 indicates that the wire resistance is too high.

Note 2. The number of units identified is the actual number of strings identified by the equalizer, and the number of units is the number of working strings set by the equalizer.

Note 3. Unit number n is the number of the first unit voltage in the frame. 4.2 setting the number of single strings

4.2 Set the number of single string

(1) Host sends data

Addr	Data field		
	1	2	3-8
0x01	0xF0	Monomer quantity	-

(2) Equalizer response

Addr	Data field		
	1	2	3-8
0x01	0xF1	Monomer quantity	-

Note: The number of monomers ranges from 2 to 24. If it is beyond the range, the equalizer will not recognize it and return the internal parameters of the current equalizer

4.3 Set the equalizing trigger differential pressure

(1) Host sends data

Addr	Data field			
	1	2	3	4-8
0x01	0xF2	Equilibrium departure pressure difference (UINT16)(mV)		-

(2) Equalizer response

Addr	Data field			
	1	2	3	4-8
0x01	0xF3	Equilibrium departure pressure difference (UINT16)(mV)		-

Note: The range of equalizing trigger differential pressure is 2-1000mv. If it is out of the range, the equalizer will not recognize it and return to when Parameters inside the front equalizer.

4.4 Set the maximum equalizing current

(1) Host sends data

Addr	Data field			
	1	2	3	4-8
0x01	0xF4	Maximum equalizing current (UINT16)(mV)		-

(2) Equalizer response

Addr	Data field			
	1	2	3	4-8
0x01	0xF5	Maximum equalizing current (UINT16)(mV)		-

Note: The maximum equalization current range is 30-1000ma. If it is beyond the range, the equalizer will not recognize it and return the internal parameters of the current equalizer.

4.5 Set the equalizer switch

(1) Host sends data

Addr	Data field		
	1	2	3-8
0x01	0xF6	Equalizing switch	-

(2) Equalizer response

Addr	Data field		
	1	2	3-8
0x01	0xF7	Equalizing switch	-

Note: The setting range of equalization switch is 0-1, 0 means to turn off equalization; 1 means turn on equalization; If the equalizer is out of range, it will not recognize it and return the internal parameters of the current equalizer.

5. Example

5.1 Request equalizer data

Num	Frame interval time	Name	Frame ID	Frame type	Frame format	Dlc	Data	Num of frames
00000001	623.093.308	Sent successfully	001	DATA	STANDARD	1	FF	1
00000002	623.078.363	Reception	001	DATA	STANDARD	8	01 00 15 1E D3 0F 69 14	1
00000003	000.000.262	Reception	001	DATA	STANDARD	8	02 13 02 00 00 05 00 00	1
00000004	000.000.229	Reception	001	DATA	STANDARD	8	03 03 E8 01 FF 00 14	1
00000005	000.009.116	Reception	001	DATA	STANDARD	8	04 00 0F 69 0F 69 0F 67	1
00000006	000.000.236	Reception	001	DATA	STANDARD	8	04 03 0F 69 0F 68 0F 67	1
00000007	000.000.258	Reception	001	DATA	STANDARD	8	04 06 0F 68 0F 68 0F 6C	1
00000008	000.009.609	Reception	001	DATA	STANDARD	8	04 09 0F 6A 0F 67 0F 68	1
00000009	000.000.235	Reception	001	DATA	STANDARD	8	04 0C 0F 6B 0F 69 0F 69	1
00000010	000.000.234	Reception	001	DATA	STANDARD	8	04 0F 0F 69 0F 6A 0F 6B	1
00000011	000.009.632	Reception	001	DATA	STANDARD	8	04 12 0F 6A 0F 6D 00 00	1
00000012	000.000.260	Reception	001	DATA	STANDARD	8	04 15 00 00 00 00 00 00	1

Host send: Frame ID 01;Data 0xFF;

Equalizer response ID: 01

Response data: 01 00 15 1E D3 0F 69 14;

//Temperature 0x0015 * 1 °C = 21 °C

//Total voltage 0x1ED3 * 10mV = 7891 * 10mV = 78.910V

//Average voltage 0x0f69 * 1mV = 3995mV = 3.995V

//Number of identification units: 0x14 * 1 string = 20 strings

Response data: 02 13 02 00 00 05 00 00 ;

//Highest voltage unit 0x13 = the 19th string

//lowest voltage unit 0x02 = the 2nd string

//Equalization and alarm (0x00 & bit0) = 0 unbalanced charging

//Equalization and alarm (0x00 & bit1) =0 unbalanced discharge

//Balance and alarm (0x00 & bit4) = 0, unit number set correctly
//Equalization and alarm (0x00 & bit5) = 0 line resistance normal
//Maximum differential pressure $0x0005 * 1\text{mV} = 5\text{mV} = 0.005\text{V}$
//Equalization current $0x0000 * 1\text{mA} = 0\text{mA} = 0\text{A}$

Response data: 03 03 E8 01 FF 00 14;

//Equalizing trigger differential pressure $0x03E8 * 1\text{mV} = 1000\text{mV} = 1\text{V}$
//Maximum equalizing current $0x01FF * 1\text{mA} = 511\text{mA} = 0.511\text{A}$
//Equalizing switch 0x00 equalizing off
//Set the number of monomer to be $0x14 * 1 \text{ string} = 20 \text{ strings}$

Response data: 04 00 0F 69 0F 69 0F 67;

//Starting voltage No 0x00 = 0
//Monomer 0 Voltage $0x0F69 * 1\text{mV} = 3945\text{mV} = 3.945\text{V}$
// Monomer 1 voltage $0x0F69 * 1\text{mV} = 3945\text{mV} = 3.945\text{V}$
// Monomer 2 voltage $0x0F67 * 1\text{mV} = 3943\text{mV} = 3.943\text{V}$

Response data: 04 03 0F 69 0F 68 0F 67;

//Starting voltage No 0x03 = 0
//Monomer 3 Voltage $0x0F69 * 1\text{mV} = 3945\text{mV} = 3.945\text{V}$
// Monomer 4 voltage $0x0F68 * 1\text{mV} = 3944\text{mV} = 3.944\text{V}$
// Monomer 5 voltage $0x0F67 * 1\text{mV} = 3943\text{mV} = 3.943\text{V}$

Response data: 04 06 0F 68 0F 68 0F 6C;

//Starting voltage No 0x06 = 0
//Monomer 6 Voltage $0x0F68 * 1\text{mV} = 3944\text{mV} = 3.944\text{V}$

// Monomer 7 voltage 0x0F68 * 1mV = 3944mV = 3.944V

// Monomer 8 voltage 0x0F6C * 1mV = 3948mV = 3.948V

5.2 Set the number of units

Num	Frame interval time	Name	Frame ID	Frame type	Frame format	Dlc	Number	Number of frames
00000001	2231.219.316	Sent successfully	001	DATA	STANDARD	2	F0 10	1
00000002	2231.207.202	Reception	001	DATA	STANDARD	2	F1 10	1
00000003	306.305.099	Sent successfully	001	DATA	STANDARD	2	F0 20	1
00000004	000.000.000	Reception	001	DATA	STANDARD	2	F1 10	1

Host sends: frame ID 01;

Data 0xF0 0x10; // set the number of monomers to 16 strings.

Equalizer response ID: 01;

Response data: F110// The number of monomer is 0x10 = 16 strings, the sending data is consistent with the receiving data, and the setting is successful.

Host sends: frame ID 01;

Data 0xF0 0x20; // set the number of monomers to 32 strings.(Data out of range)

Equalizer response ID: 01;

Response data: F110// The number of monomer is 0x10 = 16 strings, the sending data is inconsistent with the receiving data, setting failed.

5.3 Set the equilibrium starting pressure difference

Num	Frame interval time	Name	Frame ID	Frame type	Frame format	Dlc	Number	Number of frames
00000001	004.576.999	Sent successfully	001	DATA	STANDARD	3	F2 00 FF	1
00000002	000.000.000	Reception	001	DATA	STANDARD	3	F3 00 FF	1
00000003	019.923.794	Sent successfully	001	DATA	STANDARD	3	F2 FF FF	1
00000004	000.000.000	Reception	001	DATA	STANDARD	3	F3 00 FF	1

Host sends: frame ID 01;

Data F2 00 FF;

// Set the equilibrium starting pressure difference $0x00FF \times 1Mv = 255mV$

Equalizer response ID: 01;

Response data: F3 00 FF;

// Trigger equalizer differential pressure $0x00FF \times 1Mv = 255mV$, the sending data is consistent with the receiving data, and the setting is successful.

Host sends: frame ID 01;

Data F2 FF FF;

// Set the equilibrium starting pressure difference $0xFFFF \times 1Mv = 65535mV$. (Data out of range)

Equalizer response ID: 01;

Response data: F2 00 FF;

// Trigger equalizer differential pressure $0x00FF \times 1Mv = 255mV$, the sending data is inconsistent with the receiving data, setting failed.

5.4 Set the maximum equalizing current

Num	Frame interval time	Name	Frame ID	Frame type	Frame format	Dlc	Number	Number of frames
00000001	011.586.612	Sent successfully	001	DATA	STANDARD	3	F4 01 FF	1
00000002	011.594.656	Reception	001	DATA	STANDARD	3	F5 01 FF	1
00000003	004.790.044	Sent successfully	001	DATA	STANDARD	3	F4 01 00	1
00000004	004.771.754	Reception	001	DATA	STANDARD	3	F5 01 FF	1

Host sends: frame ID 01;

Data F4 01 FF;

// Set the trigger maximum equalizing current $0x01FF \times 1mA = 511mA = 0.511A$

Equalizer response ID: 01;

Response data: F5 01 FF;

// Set the trigger maximum equalizing current 0x01FF*1mA=511mA=0.511A,

the sending

data is consistent with the receiving data,and the setting is successful.

Host sends: frame ID 01;

Data F4 01 00;

// Set the trigger maximum equalizing current 0x0100*1mA=256mA.(Data
out of range)

Equalizer response ID: 01;

Response data: F5 01 FF;

// Set the trigger maximum equalizing current 0x01FF*1mA==511mA=0.511A,
the sending data is inconsistent with the receiving data, setting failed.

5.5 Set the equalizer switch

Num	Frame interval time	Name	Frame ID	Frame type	Frame format	Dlc	Number	Number of frames
00000001	005.752.495	Sent successfully	001	DATA	STANDARD	2	F6 00	1
00000002	005.743.479	Reception	001	DATA	STANDARD	2	F7 00	1
00000003	016.869.377	Sent successfully	001	DATA	STANDARD	2	F6 01	1
00000004	016.870.476	Reception	001	DATA	STANDARD	2	F7 01	1
00000005	002.407.549	Sent successfully	001	DATA	STANDARD	2	F6 02	1
00000006	002.395.940	Reception	001	DATA	STANDARD	2	F7 01	1

Host sends: frame ID 01;

Data F6 00;// Turn off equalization

Equalizer response ID: 01;

Response data: F7 00;// Equalization is off, data is consistent with the receiving
data,and the setting is successful.

Host sends: frame ID 01;

Data F6 01;// Turn on equalization

Equalizer response ID: 01;

Response data: F7 01;// Equalization is on, data is consistent with the receiving data,and the setting is successful.

Host sends: frame ID 01;

Data F4 02; // Data out of range

Equalizer response ID: 01;

Response data: F7 01;// Equalization is on,the sending data is inconsistent with the receiving data, setting failed.

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