

## Equalizer-2A 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	RS485
Baud rate	9600

### 3. Communication format

The system uses master-slave response mode for communication transmission.

In the process of communication, the equalizer is the slave and the control equipment is the host. All communication can only be initiated by the host, and the slave executes the corresponding operation after receiving the command, and returns the result to the host within 1s. If the slave does not receive the complete response data frame for more than 1s, it means that the data distribution fails. After the host sends a frame of data, it must wait for the slave to return the data or time out before sending the next command.

The content of communication is identified by sixteen, with "frame" as the transmission unit. It is stipulated that the data transmission from the master to the slave is the distribution, and the data transmission from the slave to the master is the upload.

### 3.1 Frame format issued by host

Among the frames issued by the host, one frame data contains five data areas, including frame header, slave address, command code, frame data, and verification. The frame format is as follows.

Frame header	Slave address	Command code	Frame data	check
2Byte	1Byte	1Byte	2Byte	1Byte

The "frame header" represents the beginning of a frame, with a length of 2 bytes and a fixed value of 0x55 0xaa"

"Slave address" indicates the slave number operated by the instruction, with the length of 1 byte;

"Command code " represents the operation content of the frame;

"Frame data" represents the data carried by the frame;

"Check" uses sum check, which is the accumulation of frame head to frame data;

### 3.2 Upload frame format from slave

Among the data frames uploaded from the slave, one frame contains six data areas, including frame header, slave address, command code, frame data and check

Frame header	Slave address	Command code	Frame data	check
2Byte	1Byte	1Byte	69Byte	1Byte

The "frame header" represents the beginning of a frame, with a length of 2 bytes and a fixed value of 0xeb 0x90;

"Slave address" refers to the slave number operated by the instruction, with the length of 1 byte" Command "indicates the content of the issued frame in

response to the frame;

"Frame data" represents the data carried by the frame;

"check" uses the sum check, which is the accumulation of frame head to frame data;

#### 4. communication process

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

##### 4.1 Request equalizer data

(1) Host sends data

55 Aa 01 FF 00 FF where the data structure is shown below.

Deviation	Content	Data type	Length	Unit	Sample data
0	Frame header	UINT8	2	-	0x55 0xAA
2	Slave address	UINT8	1	-	0x01
3	Command code	UINT8	1	-	0xFF
4	Frame data	UINT16	1	-	0x0000
6	Checksums	UINT8	1	-	0xFF

(2) Equalizer response

EB 90 01 FF 1E D3 0F 69 14 13 02 00 00 00 07 00 00 00 05 03 E8 01 14 0F 69 0F

69 0F 69 0F 69 0F 69 0F 69 0F 69 0F 69 0F 69 0F 69 0F 69 0F 69 0F 69 0F 69

0F 69 0F 69 0F 69 0F 69 0F 69 0F 69 0F 69 0F 69 00 16 6F

The data structure is as follows.

Deviation	Content	Data type	Length	Unit	Sample data
0	Frame header	UINT8	2	-	0xEB 0x90
2	Slave address	UINT8	1	-	0x01
3	Command code	UINT8	1	-	0xFF
4	Total battery voltage	UINT16	1	10mV	0x1ED3*10mV=78.910V
6	Unit average voltage	UINT16	1	mV	0x0F69*1 mV=3.995V
8	Number of identifying monomers	UINT8	1	series	0x14=20 series
9	Highest monomer	UINT8	1	series	0x13=19 series

10	Lowest monomer	UINT8	1	series	0x02=2 series
11	Equilibrium state	UINT8	1	-	BIT0 Represents equalizing current charging
					BIT1 Represents the balanced current discharge
12	Alarm status	UINT8	1	-	BIT0 Unit quantity setting error
					BIT1 Indicates that the line resistance is too high
					BIT2 Indicates battery overpressure
13	Maximum differential pressure	UINT16	1	mV	0x0007=7mV
15	Equalizing current	UINT16	1	mA	0x0000=0mA
17	Equilibrium departure pressure difference	UINT16	1	mV	0x0005*1 mV =5mV
19	Maximum equalizing current	UINT16	1	mA	0x03EB*1Ma=1000mA
21	Equalizing switch	UINT8	1	-	0x01 Equalizing on
22	Set the number of units	UINT8	1	series	0.x14*1series=20series
23	Voltage0	UINT16	1	mV	0x0F69*1Mv=3945mV
25	Voltage1	UINT16	1	mV	0x0F69*1Mv=3945mV
27	Voltage2	UINT16	1	mV	0x0F69*1Mv=3945mV
29	Voltage3	UINT16	1	mV	0x0F69*1Mv=3945mV
31	Voltage4	UINT16	1	mV	0x0F69*1Mv=3945mV
33	Voltage5	UINT16	1	mV	0x0F69*1Mv=3945mV
35	Voltage6	UINT16	1	mV	0x0F69*1Mv=3945mV
37	Voltage7	UINT16	1	mV	0x0F69*1Mv=3945mV
39	Voltage8	UINT16	1	mV	0x0F69*1Mv=3945mV
41	Voltage9	UINT16	1	mV	0x0F69*1Mv=3945mV
43	Voltage10	UINT16	1	mV	0x0F69*1Mv=3945mV
45	Voltage11	UINT16	1	mV	0x0F69*1Mv=3945mV
47	Voltage12	UINT16	1	mV	0x0F69*1Mv=3945mV
49	Voltage13	UINT16	1	mV	0x0F69*1Mv=3945mV
51	Voltage14	UINT16	1	mV	0x0F69*1Mv=3945mV
53	Voltage15	UINT16	1	mV	0x0F69*1Mv=3945mV
55	Voltage16	UINT16	1	mV	0x0F69*1Mv=3945mV
57	Voltage17	UINT16	1	mV	0x0F69*1Mv=3945mV
59	Voltage18	UINT16	1	mV	0x0F69*1Mv=3945mV
61	Voltage19	UINT16	1	mV	0x0F69*1Mv=3945mV
63	Voltage20	UINT16	1	mV	0x0F69*1Mv=3945mV
65	Voltage21	UINT16	1	mV	0x0F69*1Mv=3945mV
67	Voltage22	UINT16	1	mV	0x0F69*1Mv=3945mV
69	Voltage23	UINT16	1	mV	0x0F69*1Mv=3945mV
71	Temperature	UINT16	1	°C	0x0016*1°C =22°C
73	checksums	UINT8	1	-	0x6F

## 4.2 Set the number of single string

(1) Host sends data

55 AA 01 F0 00 10 00 The data and structure are as follows.

Deviation	Content	Data type	Length	Unit	Sample data
0	Frame header	UINT8	2	-	0x55 0xAA
2	Slave address	UINT8	1	-	0x01
3	Command code	UINT8	1	-	0xF0
4	Frame data	UINT16	1	series	0x0010*1 series =16 series
6	Checksums	UINT8	1	-	0x00

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

(2) Equalizer response

```
EB 90 01 F0 00 10 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 7C
```

The data and structure are as follows.

Deviation	Content	Data type	Length	Unit	Sample data
0	Frame header	UINT8	2	-	0xEB 0x90
2	Slave address	UINT8	1	-	0x01
3	Command code	UINT8	1	-	0xF0
4	Set the number of units	UINT16	1	series	0x0010*1 series =16 series
6-72	Retain	UINT8	65	-	-
73	Checksums	UINT8	1	-	0x7C

### 4.3 Set the equilibrium starting pressure difference

(1) Host sends data

55 AA 01 F2 00 0A FC The data and structure are as follows

Deviation	Content	Data type	Length	Unit	Sample data
0	Frame header	UINT8	2	-	0x55 0xAA
2	Slave address	UINT8	1	-	0x01
3	Command code	UINT8	1	-	0XF2
4	Frame data	UINT16	1	mV	0x000A*1 mV=10 mV
6	Checksums	UINT8	1	-	0xFC

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.

(2) Equalizer response.

```
EB 90 01 F2 00 0A 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 78
```

The data and structure are as follows.

Deviation	Content	Data type	Length	Unit	Sample data
0	Frame header	UINT8	2	-	0xEB 0x90
2	Slave address	UINT8	1	-	0x01
3	Command code	UINT8	1	-	0xF2
4	Set the number of units	UINT16	1	mV	0x000A*1 mV=10 mV
6-72	Retain	UINT8	65	-	-
73	Checksums	UINT8	1	-	0x78

#### 4.4 Set the maximum equalizing current

(1) Host sends data

55 AA 01 F4 01 F4 E9 The data and structure are as follows

Deviation	Content	Data type	Length	Unit	Sample data
0	Frame header	UINT8	2	-	0x55 0xAA
2	Slave address	UINT8	1	-	0x01
3	Command code	UINT8	1	-	0XF4
4	Frame data	UINT16	1	mV	0x01F4*1 mA=500 mA
6	Checksums	UINT8	1	-	0xE9

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.

(2) Equalizer response.

```
EB 90 01 F4 01 F4 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 65
```

The data and structure are as follows.

Deviation	Content	Data type	Length	Unit	Sample data
0	Frame header	UINT8	2	-	0xEB 0x90
2	Slave address	UINT8	1	-	0x01
3	Command code	UINT8	1	-	0xF4
4	Set the number of units	UINT16	1	mA	0x01F4*1 mA=500 mA
6-72	Retain	UINT8	65	-	-
73	Checksums	UINT8	1	-	0x65

#### 4.5 Set the equalizer switch

(1) Host sends data

55 AA 01 F6 00 01 E7 The data and structure are as follows

Deviation	Content	Data type	Length	Unit	Sample data
0	Frame header	UINT8	2	-	0x55 0xAA
2	Slave address	UINT8	1	-	0x01
3	Command code	UINT8	1	-	0XF6
4	Frame data	UINT16	1	-	0x0001 Turn on Equalization
6	Checksums	UINT8	1	-	0XF7

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.

(2) Equalizer response.

EB 90 01 F6 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
00  
00 73

The data and structure are as follows.

Deviation	Content	Data type	Length	Unit	Sample data
0	Frame header	UINT8	2	-	0xEB 0x90
2	Slave address	UINT8	1	-	0x01
3	Command code	UINT8	1	-	0xF6
4	Set the number of units	UINT16	1	-	0x0001 Turn on Equalization
6-72	Retain	UINT8	65	-	-
73	Checksums	UINT8	1	-	0x73