General Manual for Analog Products(RS485)

This manual is applicable to the following products:

All the RS 485 analog data-collection modules

All the RS 485 blended modules for analog collection and output

To whom to be concerned:

Please read carefully the operation instruction and cautions before using the products in order to reduce the accidents. The safety norms must be strictly followed in the process of installation and operation. The safety issues are not confined to what are mentioned in the manual, which is just a complementary to the cautions.

Contents

Chapter 1: Hardware Parameters

1：Analog Collection Module

Technical parameters	Description
Input channels	2-channel, 4-channel, 8-channel, 12-channel, 16-channel
Working voltage	DC 8V~32V(with anti-reversal connection protection)
Working Current	<200mA
Signal input way	Unilateral input
Resolution rate	12 bits(16AI), 18 bits (4AI, 8AI, 12AI)
Precision degree	prior to±0.1%
Input impedance	Voltage collection 10 MΩ; Current collection 120Ω
communication port	RS485 hardware insulation
Communication protocol	Standard MODBUS RTU protocol
Communication Baud rate	1200/2400/4800/9600/19200/38400/57600/115200bps
Communication data format	7/8 data bits 1/2 stop bit odd-even verification No verification optional
Communication distance	≥800 meters
Protection measures	Power supply input polarity protection communication error indication
Installation	Standard U-shape lead rail (35mm)
Environment requirements	Temperature scope: -10~65℃, moisture scope : 0~85% without dew

Chapter 2: Setting of Communication Ways (Dial Code Switch)

Explanation: the gear of the dial code switches for RS 485 module must be pre-set before using.

The gear adjustment take effect when the module is restarted next time.

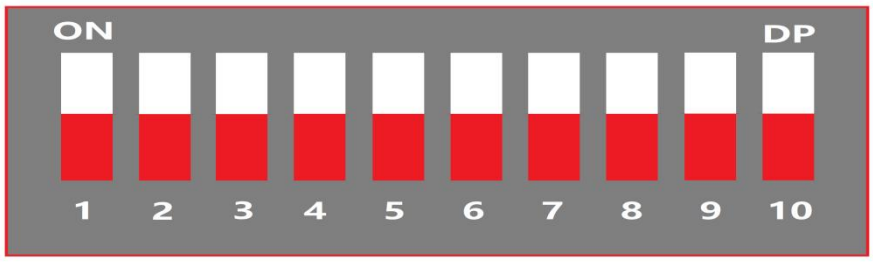
Default：

Address：1

Baud rate：9600bps

Data format：8 data bits, 1 stop bit, no odd-even verification

Overtime time of communication: 10 seconds



Communication port data verification	S1	S2
No verification 1 stop bit	0FF	OFF
No verification, 2 stop bits	0FF	ON
Odd verification, 1 stop bit	ON	0FF
Even verification, 1 stop bit	ON	ON

Baud rate options	S3	S4	S5
1200	OFF	OFF	OFF
2400	OFF	OFF	ON
4800	OFF	ON	OFF
9600	OFF	ON	ON
19200	ON	OFF	OFF
38400	ON	OFF	ON
57600	ON	ON	OFF
115200	ON	ON	ON

Setting of hardware address	S6	S7	S8	S9	S10

0	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	ON	ON
4	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	ON	OFF	ON
6	OFF	OFF	ON	ON	OFF
7	OFF	OFF	ON	ON	ON
8	OFF	ON	OFF	OFF	OFF
9	OFF	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON	OFF
11	OFF	ON	OFF	ON	ON
12	OFF	ON	ON	OFF	OFF
13	OFF	ON	ON	OFF	ON
14	OFF	ON	ON	ON	OFF
15	OFF	ON	ON	ON	ON
16	ON	OFF	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON
18	ON	OFF	OFF	ON	OFF
29	ON	OFF	OFF	ON	ON
20	ON	OFF	ON	OFF	OFF
21	ON	OFF	ON	OFF	ON
22	ON	OFF	ON	ON	OFF
23	ON	OFF	ON	ON	ON
24	ON	ON	OFF	OFF	OFF
25	ON	ON	OFF	OFF	ON
26	ON	ON	OFF	ON	OFF
27	ON	ON	OFF	ON	ON
28	ON	ON	ON	OFF	OFF
29	ON	ON	ON	OFF	ON
30	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON

Chapter 3 About Registers

1：Information about the registers of current-collection module(If the products you bought belong to current-collection module, please see the table below)

Input port	Register address(hexadecimal	Registers(decimal)	Remarks	Properties
Input channel Ai0	0x0020	00032	**data scope 0~20000** **Actual current= collection/1000** e.g. if the collected current is 10000, the current=10.000mA	read only
Input channel Ai1	0x0021	00033		read only
Input channel Ai2	0x0022	00034		read only
Input channel Ai3	0x0023	00035		read only
Input channel Ai4	0x0024	00036		read only
Input channel Ai5	0x0025	00037		read only
Input channel Ai6	0x0026	00038		read only
Input channel Ai7	0x0027	00039		read only
Input channel Ai8	0x0028	00040		read only
Input channel Ai9	0x0029	00041		read only
Input channel Ai10	0x002A	00042		read only
Input channel Ai11	0x002B	00043		read only
Input channel Ai12	0x002C	00044		read only
Input channel Ai13	0x002D	00045		read only
Input channel Ai14	0x002E	00046		read only
Input channel Ai15	0x002F	00047		read only

2: Information about the registers voltage-collection module(if the products you bought belong to voltage-collection module, please see the table below.)

Input port	Register address(hexadecimal)	Registers(decimal)	Remarks	Properties
Input channel Ai0	0x0020	00032	**data scope 0~10000** Actual current value=collected data/1000 e.g. if 10000 is collected, the voltage value is 10.000V	read only
Input channel Ai1	0x0021	00033		read only
Input channel Ai2	0x0022	00034		read only
Input channel Ai3	0x0023	00035		read only
Input channel Ai4	0x0024	00036		read only
Input channel Ai5	0x0025	00037		read only
Input channel Ai6	0x0026	00038		read only
Input channel Ai7	0x0027	00039		read only
Input channel Ai8	0x0028	00040		read only
Input channel Ai9	0x0029	00041		read only
Input channel Ai10	0x002A	00042		read only
Input channel Ai11	0x002B	00043		read only
Input channel Ai12	0x002C	00044		read only
Input channel Ai13	0x002D	00045		read only
Input channel Ai14	0x002E	00046		read only
Input channel Ai15	0x002F	00047		read only

3：Communication Overtime Registers

Overtime registers	Register address(hexadecimal	Registers(decimal)	Remarks	Properties
High	0x7530（breakdown saving）	30000	Communication overtime duration(default 10s)	read/edit
Low	0x7531（breakdown saving）	30001		read/edit

Explanation of overtime registers

It is reckoned as overtime communication if the communication breaks down for some reason and the breakdown time is longer than that specified in the overtime register. The indicator will be ON until the problem is solved.

E.g. If the overtime time is set to be 3 seconds, two registers are to be edited: 7530H=0x0000 and 7531H=0x0bb8 because 3 seconds(decimal) equal to 0x0bb8(hexadecimal)

Analysis: 【0x0000(high 16 bits) *65536】+ 0x0bb8(low 16 bits) = 0x0bb8（i.e.3000mS）

Chapter 4 Realization of MODBUS-RTU Communication

1：A Brief introduction to MODBUS –RTU Working Mechanism

Modbus-RTU protocol works under the mode of response with enquiry. The main station sends an order to the specified address of the sub station and the message includes the main station command on the sub-station and the affiliated inform that is necessary to execute the order. The selected sub-station starts to carry out the order once it receives it from the main station and feedback to the main station according to the execution. If the order is carried out successfully, the feedback is normal and an abnormal feedback will be sent to the main station if the sub-station failed to execute the order. The main station makes a judgment according to the feedback and decides what to do next.

2：Modbus-RTU Function Codes

Function Codes	Functions	Properties	**The related products**
03	Read a single register or several successive registers	Read only	Analog data-collection modules

Function code: No. 03

No. 03 code is used to read the contents in the holding register and it can read 1 register or several registers successively.

Attention: It can not read the register that does not exist. Otherwise, the module will feedback ERROR.

E.g. the input current when the main station asks to read the channels of Ai0,Ai1 and Ai2

The main station command			
The message contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function codes	1 byte	0x03	0x03
Initial address	2 bytes	0x0000～0x000F	0x0020
Register quantity	2 bytes	0x0001～0x0010	0x0003
CRC verification	2 bytes	0x0000～0xFFFF	0x0401

The Normal Response from the Sub-station			
The message contents	Length	Scope	Sample
Sub-station address	1 byte	0x01～0x1F	0x01
Function codes	1 byte	0x03	0x03
Valid byte quantity	1 byte	N	0x06
Collected Data	2 bytes		0x1388
	2 bytes		0x0FA0
	2 bytes		0x4E20
CRC verification	2 bytes	0x0000～0xFFFF	0xF487

Analysis: There are 3 data collected from the channels of Ai0,Ai1 and Ai2.

Ai0=0x1388（decimal 5000）i.e. 5000/1000=5.000mA

Ai1=0x0FA0（decimal 4000）i.e. 4000/1000=4.000mA

Ai2=0x4E20（decimal 20000）i.e. 20000/1000=20.000mA

<table>
<tr><td colspan="4">Abnormal Response from the Sub-station</td></tr>
<tr><td>The message contents</td><td>Length</td><td>Scope</td><td>Sample</td></tr>
<tr><td>Sub-station address</td><td>1 byte</td><td>0x01～0x1F</td><td>0x01</td></tr>
<tr><td rowspan="4">Error code</td><td rowspan="4">1 byte</td><td>0x83</td><td rowspan="4">0x83
0x01</td></tr>
<tr><td>0x01（not a supported function code）</td></tr>
<tr><td>0x02（initial address does not exist）</td></tr>
<tr><td>0x03（the register quantity is out the range of the scope.）</td></tr>
<tr><td>CRC verification</td><td>2 bytes</td><td>0x04（data verification error）</td><td>0x80F0</td></tr>
<tr><td>CRC verification</td><td>2 bytes</td><td>0x0000～0xFFFF</td><td>0x80F0</td></tr>
</table>

If the module feedback as the above table, a comprehensive check has to be done to solve the problems.

Chapter 5: Description of System Indicators

System indicators

There are 3 types of system indicators, i.e. power supply indicator, communication indicator and overtime indicator.

Power supply indicator: the indicator is ON when the module is connected to the power.

Communication indicator: the indicator flickers when the module finds the right data in the 485 BUS. Otherwise, it is OFF. The flickering speed increases with the data transmission speed.

Overtime indicator: the indicator start to work when the module is disconnected or when the break-down time is over the specification of the register(The outputs of the mask off registers are different from each other) . otherwise, the indicator is OFF.

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