E831-RTU(4040R-485)

User manual

This manual may be changed with the continuous improvement of the product. Please take the latest version of the manual as the standard. Chengdu Ebyte Electronic Technology Co., Ltd. reserves the right to interpret and modify all contents in this manual.

Contents

Features

- Support 4-channel digital isolation input, default dry contact;
- Support 4-way relay output, support 3A 30VDC and 3A 250VAC;
- Adopt Modbus RTU protocol for data processing;
- Command reset is supported. After sending the AT+RESTORE\r\n command to the 485 serial port within 3S after power on, the Modbus device address, RS485 serial port baud rate and check bit are restored to factory settings;
- Support pulse counting, which can be configured as rising edge counting, falling edge counting and level counting
- Hardware watchdog with high reliability;
- Three indicators display the working status;
- The power supply has good over-current, over-voltage, anti reverse connection and other functions;
- Wide voltage input 8V-28V. 12V or 24V is recommended.

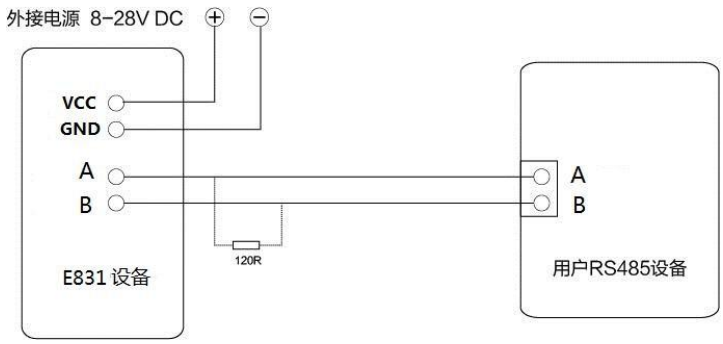
1.Quick start

This chapter is a quick introduction to E831-RTU(4040R-485) series products. It is recommended that users systematically read this chapter and operate it according to the instructions. They will have a systematic understanding of the module products. Users can also choose the chapter you are interested in to read according to their needs. For specific details and instructions, please refer to the following chapters.

1.1. Port connection

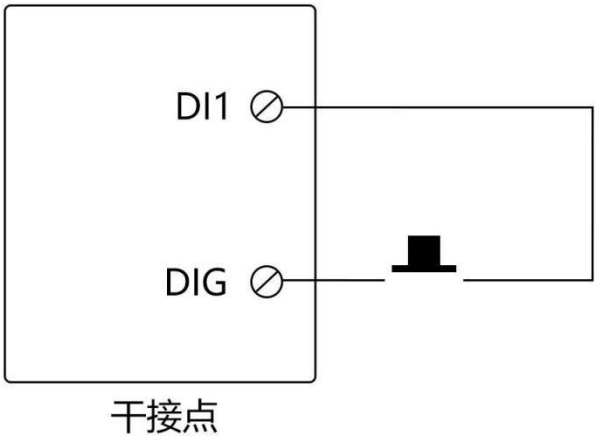
1.1.1 RS485 connection

RS485接线图

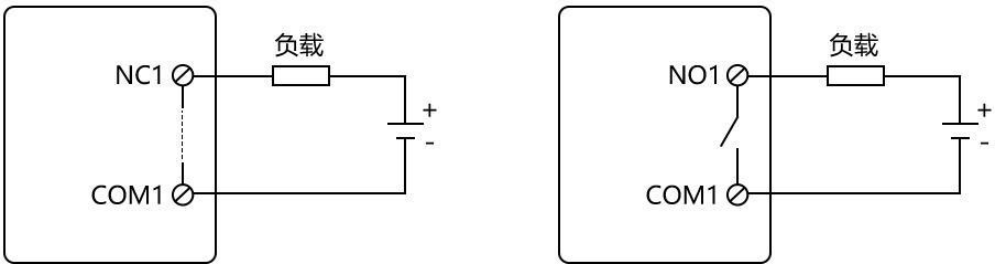


Note: when the 485 bus high-frequency signal is transmitted, the signal wavelength is shorter than the transmission line, and the signal will form a reflected wave at the terminal of the transmission line, interfering with the original signal. Therefore, it is necessary to add a terminal resistor at the end of the transmission line, so that the signal will not be reflected after reaching the end of the transmission line. The terminal resistance should be the same as the impedance of the communication cable, with a typical value of 120 ohms. Its function is to match the bus impedance and improve the anti-interference and reliability of data communication.

1.1.1 Switch input connection



1.1.1 Relay output connection



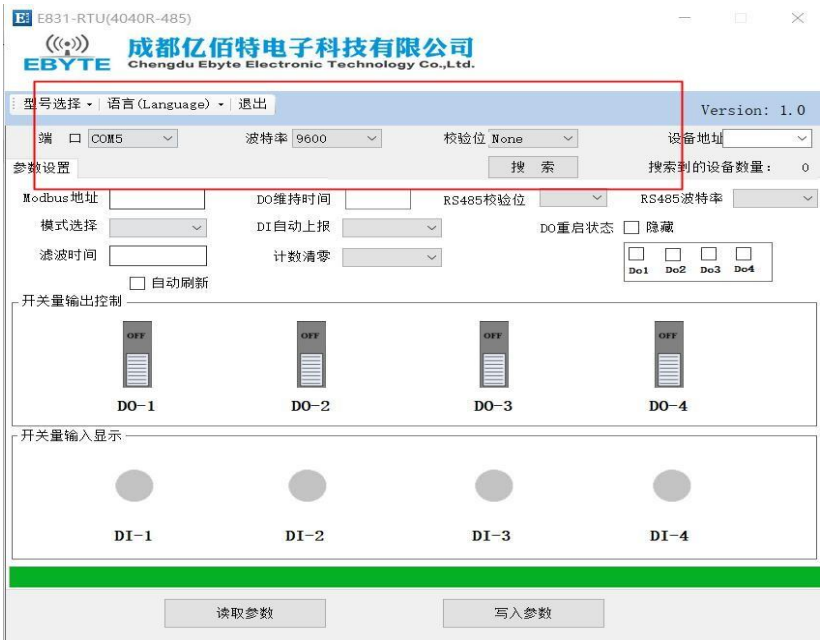
1.2. Simply use

Wiring: the computer is connected to E831-RTU(4040R-485) via USB to RS485.

Power supply: the working voltage of e831-rtu (4040r-485) is DC 8 ~ 28V. 12V or 24V is recommended.

1.2.1. RS485 bus control

Set the corresponding port parameters and click “search” to search for devices.



After searching for the device, click “stop”

At this time, you can see the device address of the current device.
Click read parameter or write parameter to read parameters and configuration parameters.

Check auto refresh to read and configure input / output ports.

Note:Do not choose auto refresh when reading or writing parameters. Choose auto refresh after configuration or reading is completed, otherwise the parameter writing or reading may not be successful

2. Introduction

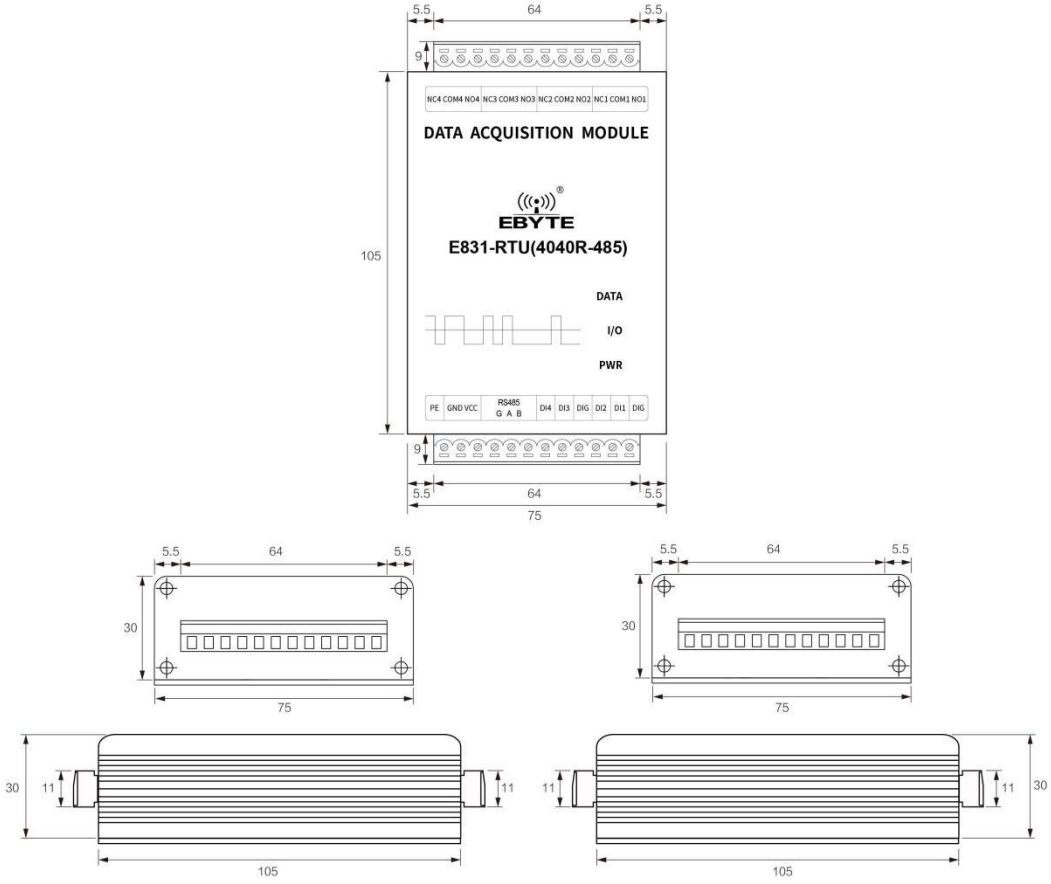
E831-RTU(4040R-485) is an IO product that supports 4-way digital input (default dry contact) and 4-way relay output. Support Modbus RTU protocol. This product is highly easy to use, and users can easily and quickly integrate it into their own systems.

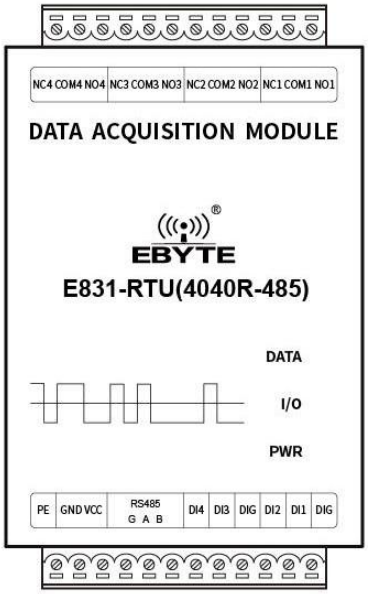
2.1. Parameters

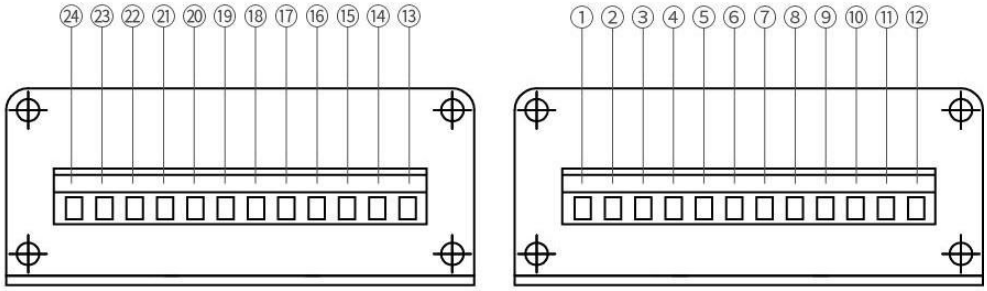
	Items	Index
Hardware parameters	Size (H*W*D)	105*75*30mm
	Weight	279g
	Interface	Crimping，1*12*5.08mm
	Working Voltage	DC8V~28V, 12V or 24V is recommended, over 28V may damage the equipment
	Working current	12V@ 56mA standby current
	Communication interface	RS485：1200~115200bps
	4-channel digital input interface	Dry contact, DI acquisition frequency 1KHz
	4-way relay output	Support 3A 30VDC、3A 250VAC

	Baud rate	Baud rate range 1200~115200bps，production default 9600
	Working temperature	-20℃~+70℃
	Storage temperature	-40℃~+85℃
	Working humidity	5%~95%
	Storage humidity	1%~95%

2.2. Dimension&Interface







Number	Port and other definitions	Function	Illustration
1	PE	Connection with the earth	Connection with the earth
2	GND	Crimp type power supply input negative pole	Power reference ground
3	VCC	Voltage type power supply input positive pole	Power input terminal，DC 8V~28V，12V/24V is recommended
4	RS485-G	RS485 Signal reference ground	RS485 signal reference ground, connection recommended
5	RS485-A	RS485 interface A	RS485 interface A is connected with equipment A
6	RS485-B	RS485 interface B	RS485 interface B is connected with equipment B
7	DI4	Digital input channel 4	Form dry contact with DIG
8	DI3	Digital input channel 3	Form dry contact with DIG
9	DIG	Digital input signal reference ground	Digital input signal reference ground, used with DI terminal
10	DI2	Digital input channel 2	Form dry contact with DIG
11	DI1	Digital input channel 1	Form dry contact with DIG
12	DIG	Digital input signal reference ground	Digital input signal reference ground, used with DI terminal

13	NO1	Relay 1 normally open pin	Used in conjunction with the common end of relay 1
14	COM1	Relay 1 common terminal	Used with relay 1 normally open pin / normally closed pin
15	NC1	Relay 1 normally closed pin	Used in conjunction with the common end of relay 1

16	NO2	Relay 2 normally open pin	Used in conjunction with the common end of relay 2
17	COM2	Relay 2 common terminal	Used with relay 2 normally open pin / normally closed pin
18	NC2	Relay 2 normally closed pin	Used in conjunction with the common end of relay 2
19	NO3	Relay 3 normally open pin	Used in conjunction with the common end of relay 3
20	COM3	Relay 3 common terminal	Used with relay 3 normally open pin / normally closed pin
21	NC3	Relay 3 normally closed pin	Used in conjunction with the common end of relay 3
22	NO4	Relay 4 normally open pin	Used in conjunction with the common end of relay 4
23	COM4	Relay 4 common end	Used with relay 4 N.O. pin / N.C. pin
24	NC4	Relay 4 normally closed pin	Used in conjunction with the common end of relay 4
LED lamp			
DAT A	Serial port data indication	Dual color light, green indicates data reception, blue indicates data transmission	
I/O	I / O status indicator	Dual color light, the green indicator light of any input signal is on, and the blue indicator light of any output signal is on. When there are both outputs and inputs, it is on at the same time, and the indicator light is cyan。	
PWR	Power indication	Red LED, long on	

Note：

Grounding: it is recommended to connect the housing to the earth

2.3. Command reset

Within 3 seconds after power on, send a command to 485 serial port: AT+RESTORE\r\n to reset the MODBU address, serial port baud rate and parity parameters of the machine as default parameters (19600, no check).

3. Modbus

3.1. Modbus address

Register address （function code：0x01H、0x05H、0x0FH、0x03H、0x06H、0x10H）					
Register address	Register quantity	Register attribute	Register type	Register value range	Support function code
00017 (0x0010)	1	DO1 Switching output	Read / Write	0x0000 or 0xFF00 （0x05 function code） 0-1 （0x01、0x0F function code）	0x01 0x05 0x0F
00018 (0x0011)	1	DO2 Switching output	Read / Write		
00019 (0x0012)	1	DO3 Switching output	Read / Write		
00020 (0x0013)	1	DO4 Switching output	Read / Write		
Retain					
10017 (0x0010)	1	DI1 Switching input	Read-only	0-1	0x02
10018 (0x0011)	1	DI2Switching input	Read-only		

10019 (0x0012)	1	DI3 Switching input	Read-only		
10020 (0x0013)	1	DI4 Switching input	Read-only		
Retain					
40049 (0x0030)	1	DI1 Pulse count	Read-only	0-65535	0x03
40050 (0x0031)	1	DI2 Pulse count	Read-only	0-65535	
40051 (0x0032)	1	DI3 Pulse count	Read-only	0-65535	
40052 (0x0033)	1	DI4 Pulse count	Read-only	0-65535	
Retain					
40065 (0x0040)	1	DI1-DI4 Pulse count clearing	Write-only	0x00 - 0x0F	0x06
Retain					
40078 (0x004D)	1	Device address	Read / Write	1 - 247	0x03 0x06
40079 (0x004E)	1	Baud rate	Read / Write	0 - 7	

40080 (0x004F)	1	Check bit	Read / Write	0 - 2	0x10
40081 (0x0050)	1	Automatic reporting of switching value	Read / Write	0 - 1	
40082 (0x0051)	1	Switching output time setting (MS)	Read / Write	100-65535	
40083 (0x0052)	1	Switching restart output state setting	Read / Write	0x00 - 0x10	
40084 (0x0053)	1	Counting mode selection	Read / Write	0-2	
40085 (0x0054)	1	Filter time setting	Read / Write	1-20	
40086 (0x0055)	1	Manual / automatic clearing count	Read / Write	0-1	
Retain					
40300(0x012B)	1	Version	Read-only	--	0x03

3.2. Modbus address

Modbus address	
(default)	1
2	2
3	3
…	…
245	245
246	246
247	247

3.3. RS485 Serial port baud rate code value table

3.4. baud rate code value table	
0	1200
1	2400
2	4800
(default)	9600
4	19200
5	38400
6	57600
7	115200

3.5. RS485 Serial port check bit code value table

check bit code value table	
0 (default)	No verification
1	Even check
2	Odd check

3.6. Configure parameters via the upper computer

Select the "parameter setting" column to read and write parameters. See the product function introduction below for specific functions.

Note: when setting parameters, please clear "auto refresh" on the acquisition control page. So as to avoid unsuccessful parameter writing.

4. Function

4.1. Mode selection

The device supports three pulse counting modes, rising edge counting, falling edge counting and level counting. See the following section on pulse counting and zero clearing

4.2. IO basic function

4.2.1. Switching DO output

4.2.1.1. Read switch DO output

Functional code：01，read coil status

Address range：00017(0x0010)~00020(0x0013)

Example：

Read the output status of 4-channel digital quantity, assuming that the return value is 03, corresponding to the binary bits 0000 and 0011, representing that DO1 and DO2 are open. The four bits represent the digital output status, in order DO4、DO3、DO2、DO1.

Modbus RTU Protocol read digital output：

Send	01	01	00 10	00 04	3C 0C
	equipment ModBus address	Function code	Starting address of switching	Read the number of switching	CRC check code

Receive	01	01	01	03	11 89
	equipment ModBus address	Function code	Return bytes	Digital output value	CRC check code

4.2.1.2. Control switching value DO output

Functional code：05，Write single coil

status；0F，Write multiple coil states.

Address range：
00017(0x0010)~00020(0x0013)
Example：

Function code 0x05 写 DO2 digital output，write value is FF 00；close D02 port，write value 00 00。

（NC2 and COM2 of DO2 are disconnected, and

NO2 and COM2 are closed） Modbus RTU

Protocol write digital output：

Send	01	05	00 11	FF 00	DC 3F
	equipment ModBus address	Function code	Switching value address	Write value	CRC check code

Receive	01	05	00 11	FF 00	DC 3F
	equipment ModBus address	Function code	Switching value address	Write value	CRC check code

The function code 0x0f is used to write the digital output of DO2 and DO3. The written value should be 0x03, corresponding to the binary bit 0000 0011. (note that the starting address here starts from DO2.)

Modbus RTU protocol write digital output：

send	01	0F	00 11	00 02	01	03	62 95
	equipment ModBus address	Function code	Switching value address	Write quantity of switching	Bytes	Write value	CRC check code

receive	01	0F	00 11	00 02	84 0F
	equipment ModBus address	Function code	Switchin g value address	Write value	CRC check code

4.2.2. Read switching value DI input

Function code：02，read (switching value) input status

Address range：10017(0x0010)~10020(0x0013)

Note: the equipment defaults to dry contact input. When DI and DI are short circuited, the read value should be 1; When DI and DIG are not short circuited, the read value should be 0.

Example：

Read four digital input values. DI input terminals DI1 and dig are short circuited, DI2 and DIG are not short circuited, DI3 and DIG are short circuited, and DI4 and dig are not short circuited. The read digital input value is 0x05, corresponding to the binary bits 0000 0101. The four bits represent the digital input value, which are DI4, DI3, DI2 and DI1 in sequence.

Modbus RTU protocol read digital input：

Send	01	02	00 10	00 04	78 0C
	equipment ModBus address	Function code	Starting address of switching value	Read the number of switching values	CRC check code

Receive	01	02	01	05	61 8B
	equipment ModBus address	Function code	Return bytes	Digital input value	CRC check code

4.3. IO unique functions

4.3.1. Pulse counting and count clearing

The device supports three pulse counting modes, rising edge counting, falling edge counting and level counting， This value can be set by writing the corresponding value to the (0x0053) register，Write 0 to represent the rising edge count, write 1 to represent the falling edge count, and write 2 to represent the level count. If counting on rising edges is selected, only when DI detects the rising edge of the level will it count. Other functions are similar.

In addition, the device also supports the input counting and filtering function, and the signal must be kept for several cycles before being confirmed. The default value is 6, 6 sampling cycles before it can be confirmed. The range is 1 ~ 20 values. This value can be set by writing the corresponding value to the (0x0054) register. The sampling cycle is 1ms. Note that this function only supports level counting mode. Pulse count will not be saved after power failure.

Count clearing also supports manual clearing and automatic clearing functions: automatic clearing after reading the input count, or manual clearing, which can be set. If it is auto cleared, the register value will be cleared after each reading. If it is manually cleared, the maximum count value 65536 will be reached or the write register will be cleared. Write 0 to the (0x0055) register for manual zero clearing, and write 1 for automatic zero clearing. Note that when it is set to automatic zero clearing, manual zero clearing will not work.

4.3.1.1. Read pulse count

Function code：03，Read hold register

Address arrange：40049 (0x0030)~40051 (0x0033)

Description：The maximum

value of pulse count is65535

Example：

DI1 has detected 16 pulses and DI2 has detected 3 pulses. Read the digital input count values of DI1 and DI2,

Modbus RTU protocol read pulse count：

Send	01	03	00 30	00 02	C4 04
	Equipment ModBus address	Function code	Starting address	Number of reads	CRC check code

Receive	01	03	04	00 10	00 03	BB F7
	Equipment ModBus address	Function code	Return bytes	DI1 count value	DI2 count value	CRC check code

4.3.1.2. Manually clear the pulse count value

Function code：06，

Write hold

Address range of

holding register：40065

(0x0040)

Note: the lower four bits of the register value represent DI4, DI3, DI2 and DI1 counts respectively. Writing "1" means that the count is cleared and the pulse count is restarted.

Example：

Clear di2 and Di4 pulse count values and keep di1 and di3 pulse count values. The write

value should be 0x0a and the corresponding binary value is 0000 1010,
Modbus RTU protocol clear pulse count

Send	01	06	00 40	00 0a	08 19
	Equipment ModBus address	Function code	Address	Write value	CRC check code

Receive	01	06	00 40	00 0a	08 19
	Equipment ModBus address	Function code	Address	Write value	CRC check code

4.3.2. Digital input DI automatic reporting

The automatic reporting function of digital input is to transmit the change value when the switching value changes. You can choose to transmit through RS485 or GPRS, or turn off the automatic reporting function.

The Modbus register corresponding to the switch value automatic reporting setting is 40081 (0x0050), and the value corresponds to the function:

0, Turn off the automatic reporting function of switching value

1, Automatic reporting of switching value is transmitted through RS485

The switch quantity change upload protocol is shown in the following table, where the frame headers 0XAA and 0xBB are fixed. When the counting mode is set to level counting, the value range of DI1, DI2, DI3, DI4 is 0x00, 0x01 and 0xFF

0x00 Digital quantity input disconnection,

0x01 Digital input closed,

0xff Digital input has not changed，

The values of DI1, DI2, DI3 and DI4 in the table represent that the status of DI1 and DI2 is updated to off, the status of DI3 is updated to close, and the status of DI4 is unchanged. The last two bytes are calculated values of Modbus CRC16.

Note: when set to the rising edge counting mode, it is triggered once, and the value of Di is 00; when set to the falling edge counting mode, it is triggered once, and the value of Di is 01. Similarly 0xff means no change.变化。

Frame header	DI1	DI2	DI3	DI4	Modbus CRC
0xAA 0xBB	0x0 0	0x0 0	0x0 1	0xff	0xBD 0xDA

4.3.3. Digital output DO time setting

The setting of switching value pulse output time is to set the digital output time. The corresponding MODBUS register is 40083 (0x0052), and its value range is 100-65535ms. If the value is lower than 100ms, the digital output is closed to hold state by default, that is, the digital output is held after being closed. If it is set to 100ms or above, such as 500ms, after sending the digital output closing command, the switching value will be closed for 500ms, and then automatically opened after 500ms.

4.3.4. Switching value DO restart output state setting

The setting of whether to keep the state before power-off or to keep a specific output state after power-off and restart of the equipment. This function is only effective when the value of the digital output time setting register of the equipment is less than 100ms.

The Modbus register corresponding to the reset output state setting of switching value is 40085 (0x0054), and its value range is 0x00-0x10. When the value of this register is 0x10, the last digital output state will be maintained after power-off and restart; When the value of this register is 0x00-0x0f, the low four bits determine the output state of the device restart digital quantity. Bit4 corresponds to do4, Bi3 corresponds to do3, bit2 corresponds to DO2, and Bit1 corresponds to do1. For example, when powered on, do4 and DO2 are in the closed state (relay no and com are closed) and do3 and do1 are in the open state (relay no and com are open). The corresponding register value is 0000 1010, that is 0xa0, "1" is in the closed state and "0" is in the open state.

Disclaimer

- Ebyte reserves the right of final interpretation and modification of all contents in this manual.
- Due to the continuous improvement of the hardware and software of the product, this manual may be changed without notice, and the latest version of the manual shall prevail.
- Protecting the environment is everyone's responsibility: to reduce the use of paper, this manual is printed in Chinese only, and the English manual is only provided with electronic documents. If necessary, please download it from our official website; In addition, unless specifically required by the user, when the user orders in batches, we only provide product specifications according to a certain proportion of the order quantity, and not every digital radio station is equipped with them one by one. Please understand.

Revision history

Version	Date	Description	**Maintainer**
1.0	-	Initial version	-
1.1	2019/8/19	Format revision	Linson

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