



# Wireless Data Transceiver E831-RTU(4040R-485)

## User Manuel



This manual may change as the product continues to improve, please refer to the latest version of the manual

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## Functional features

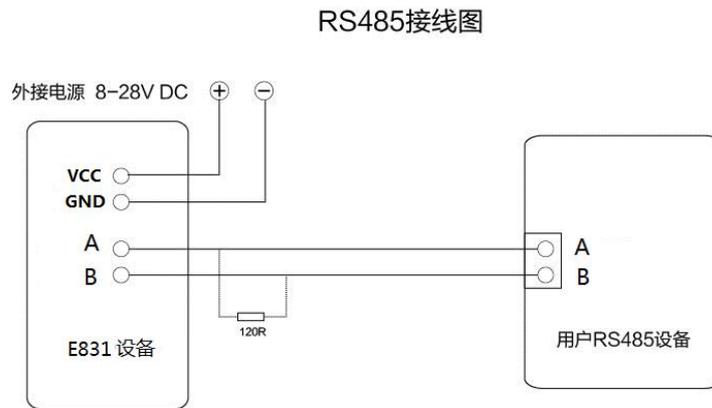
- Support 4 digital isolated inputs, default dry contact;
- Support 4 relay outputs, support 3A 30VDC, 3A 250VAC;
- Modbus RTU protocol data processing;
- Support command reset. After sending AT + RESTORE \r \n command to 485 serial port within 3s after power-on, Modbus device address, RS485 serial port baud rate and parity bit are restored to factory settings;
- Support pulse counting, can be configured as rising edge counting, falling edge counting, level counting method;
- Hardware watchdog with high reliability;
- 3 indicators show operating status;
- Power supply has good functions such as over-current, over-voltage, and anti-reverse connection;
- Wide voltage input 8V-28V, 12V or 24V is recommended.

## 1. Quick start

This chapter is a quick start introduction to E831-RTU (4040R-485) series products. It is recommended that users read this chapter and follow the instructions once and they will have a systematic understanding of the module. Users can also choose chapters they are interested in to read as needed. For specific details and instructions, please refer to the subsequent sections.

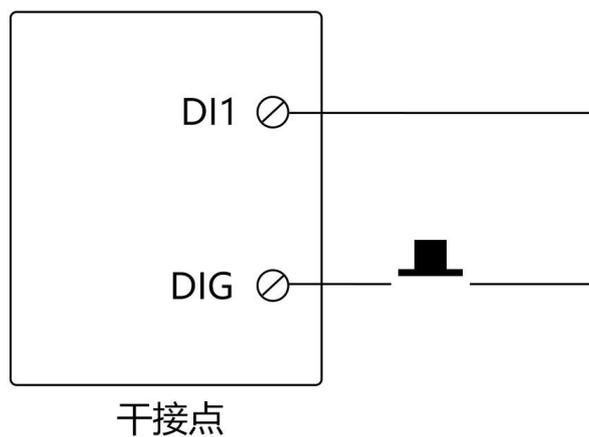
## 1.1. Port connection

### 1.1.1. RS485 Connection

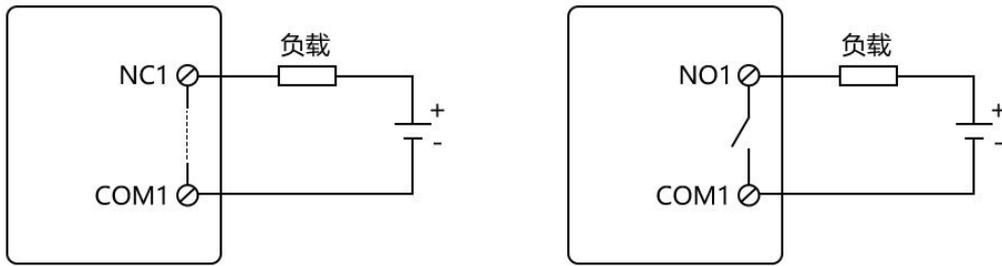


Note: When transmitting high-frequency signals on the 485 bus, the signal wavelength is shorter than the transmission line. The signal will form reflected waves at the end of the transmission line and interfere with the original signal. Therefore, a termination resistor must be added at the end of the transmission line so that the signal does not reflect after reaching the end of the transmission line. The termination resistance should be the same as the impedance of the communication cable, with a typical value of 120 ohms. Its role is to match the impedance of the bus to improve the anti-interference and reliability of data communication.

### 1.1.2. Switch input connection



### 1.1.3. Relay output connection



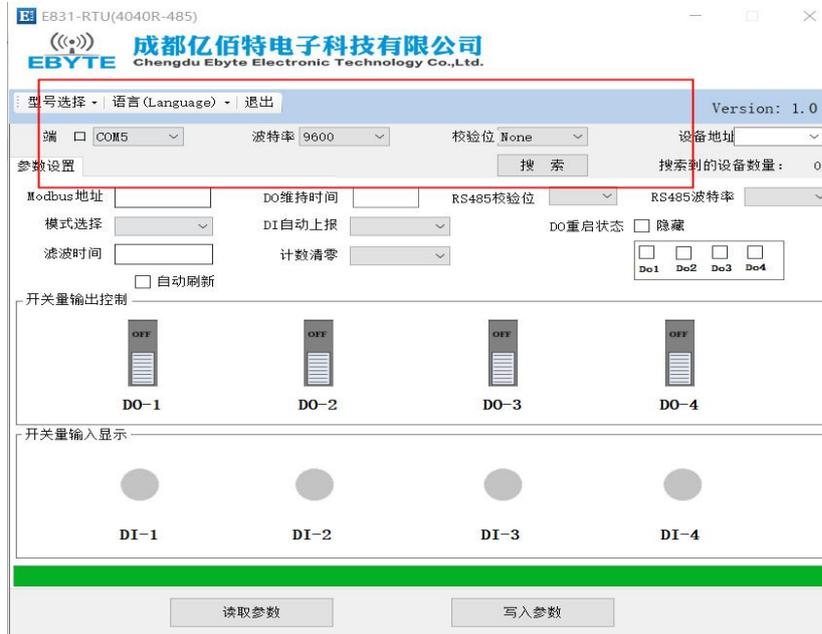
## 1.2. Simple use

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

Power supply: E831-RTU (4040R-485) working voltage 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 the device.



When the device is found, click Stop



At this point, users can see the device address of the current device. Click on read parameters or write parameters to read parameters and configure parameters.



Tick Auto Refresh to read and configure the input and output ports.



Note: Do not tick Auto refresh when reading or writing parameters. Instead, tick it after configuration or reading is completed, otherwise the parameter writing or reading may not be successful.

## 2. Product introduction

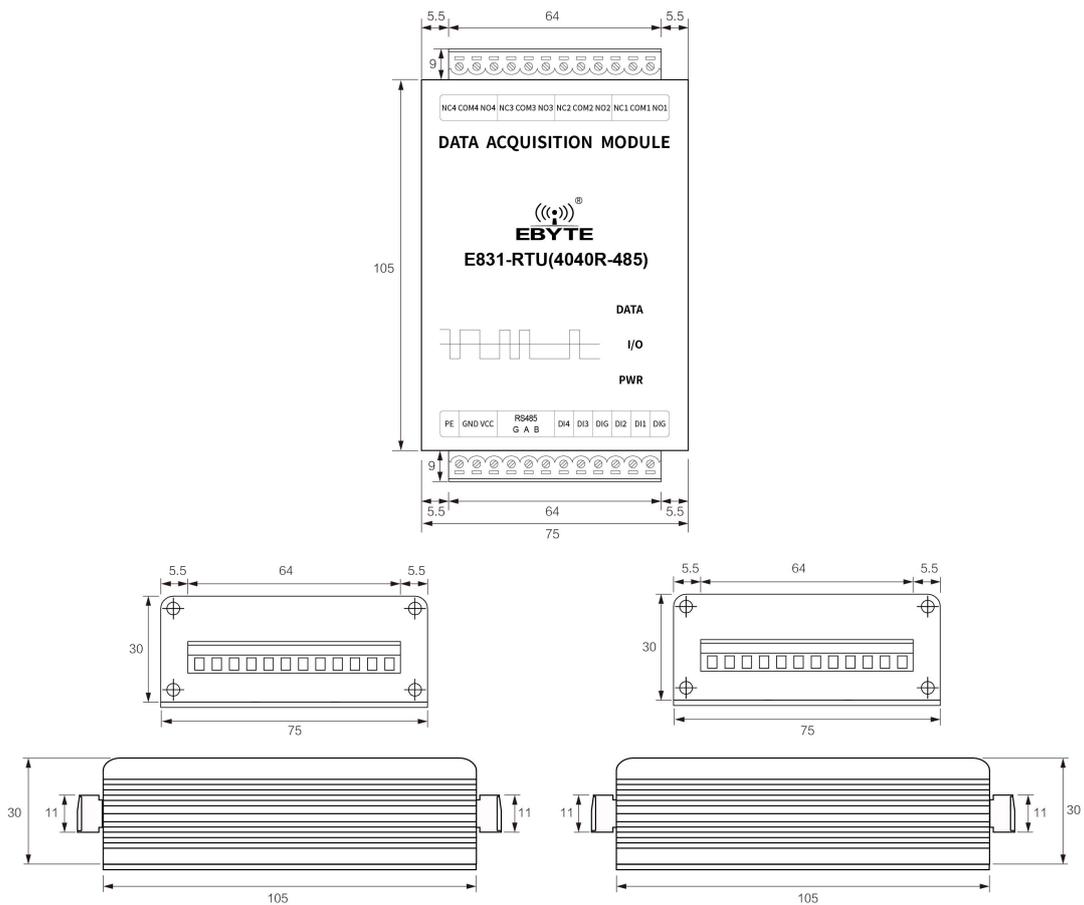
E831-RTU (4040R-485) is an IO product that supports 4 digital inputs (default dry contact) and 4 relay outputs. It supports Modbus RTU protocol. The product is easy to use, allowing users to quickly and easily integrate into their systems.

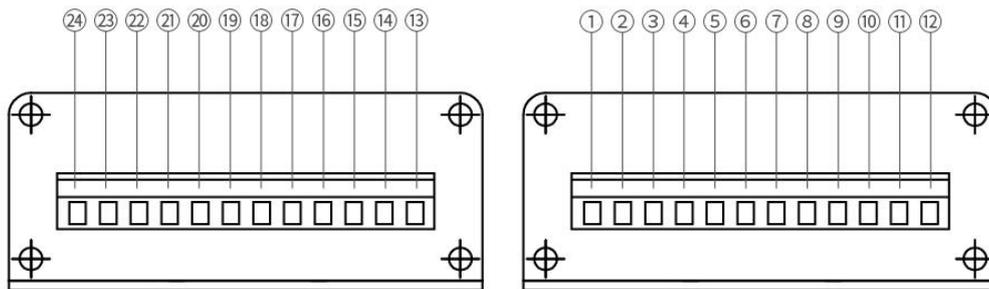
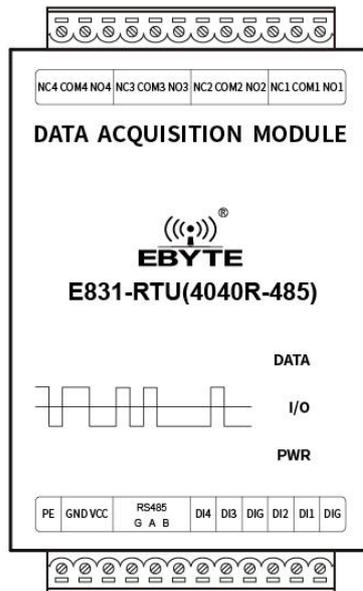
### 2.1. Basic parameters

	Project	Index
Hardware parameter	Size(H*W*D)	105*75*30mm
	Weight	279g
	Interface method	Crimping method, 1*12*5.08mm

	Operating Voltage	DC8V~28V, 12V or 24V is recommended, over 28V may damage the device
	Operating current	12V@ 56mA stand-by current
	Communication Interface	RS485: 1200~115200bps
	4 digital inputs	Dry contact, DI acquisition frequency 1KHz
	4 relay outputs	Support 3A 30VDC、3A 250VAC
	Baud rate	Baud rate range 1200~115200bps, factory default 9600
	Operating temperature	-20°C~+70°C
	storage temperature	-40°C~+85°C
	Operating humidity	5%~95%
	Storage humidity	1%~95%

## 2.2. Size, Interface description





No.	Ports and other definitions	Function	Description
1	PE	Connect with the earth	Connect with the earth
2	GND	Crimped power input negative	Power supply reference ground
3	VCC	Crimped power input positive	Power input, DC 8V ~ 28V, 12V / 24V recommended
4	RS485-G	RS485 signal reference ground	RS485 signal reference ground, it is recommended to connect
5	RS485-A	RS485 interface A	RS485 interface A is connected to device A interface
6	RS485-B	RS485 interface B	RS485 interface B is connected to device B interface
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 with relay 1 common terminal
14	COM1	Relay 1 common terminal	Used with relay 1 normally open pin / normally closed pin
15	NC1	Relay 1 normally closed pin	Used with relay 1 common terminal
16	NO2	Relay 2 normally open pin	Used with relay 2 common terminal
17	COM2	Relay 2 common terminal	Used with relay 2 normally open pin / normally closed pin
18	NC2	Relay 2 normally closed pin	Used with relay 2 common terminal
19	NO3	Relay 3 normally open pin	Used with relay 3 common terminal
20	COM3	Relay 3 common terminal	Used with relay 3 normally open pin / normally closed pin
21	NC3	Relay 3 normally closed pin	Used with relay 3 common terminal
22	NO4	Relay 4 normally open pin	Used with relay 4 common terminal
23	COM4	Relay 4 common terminal	Used with relay 4 normally open pin / normally closed pin
24	NC4	Relay 4 normally closed pin	Used with relay 4 common terminal
LED light			
DATA	Serial data indication	Two-color light, green indicates data reception, blue indicates data transmission	
I/O	I / O status indicator	Two-color light, any one input has a signal, green indicator is on, any one output has a signal, blue indicator is on, when there is both output and input, both lights are on at the same time, the indicator is cyan.	
PWR	Power indicator	Red LED, Always on	

Note:

Grounding: It is recommended to connect the case to the earth

### 2.3. Command reset description

Within 3 seconds after power-on, send a command to 485 serial port: AT + RESTORE \ r \ n can reset the local MODBU address, serial port baud rate, and parity parameters are the default parameters (1,9600, no parity).

### 3. Modbus

#### 3.1. Modbus Address table

Register address table (function code: 0x01H, 0x05H, 0x0FH, 0x03H, 0x06H, 0x10H)					
Address	Number	Attribute	Type	Value range	Support function code
00017 (0x0010)	1	DO1 Switch value output	Read/write	0x0000 or 0xFF00  (0x05function code) 0-1 (0x01、 0x0Ffunction code)	0x01 0x05 0x0F
00018 (0x0011)	1	DO2 Switch value output	Read/write		
00019 (0x0012)	1	DO3 Switch value output	Read/write		
00020 (0x0013)	1	DO4 Switch value output	Read/write		
Reserve					
10017 (0x0010)	1	DI1 Switch value input	Read only	0-1	0x02
10018 (0x0011)	1	DI2 Switch value input	Read only		
10019 (0x0012)	1	DI3 Switch value input	Read only		
10020 (0x0013)	1	DI4 Switch value input	Read only		
Reserve					
40049 (0x0030)	1	DI1 Pulse count value	Read only	0-65535	0x03
40050 (0x0031)	1	DI2 Pulse count value	Read only	0-65535	
40051 (0x0032)	1	DI3 Pulse count value	Read only	0-65535	
40052 (0x0033)	1	DI4 Pulse count value	Read only	0-65535	
Reserve					
40065 (0x0040)	1	DI1-DI4 Pulse count clear	Write only	0x00 - 0x0F	0x06
Reserve					
40078 (0x004D)	1	Device address	Read/write	1 - 247	0x03 0x06 0x10
40079 (0x004E)	1	Baud rate	Read/write	0 - 7	
40080 (0x004F)	1	Parity bit	Read/write	0 - 2	
40081 (0x0050)	1	Automatic report of switch value	Read/write	0 - 1	
40082 (0x0051)	1	Switch value output time setting (ms)	Read/write	100-65535	
40083 (0x0052)	1	Switch value restart output status setting	Read/write	0x00 - 0x10	
40084 (0x0053)	1	Counting mode selection	Read/write	0-2	
40085 (0x0054)	1	Filtering time setting	Read/write	1-20	
40086	1	Manual / automatic clear count	Read/write	0-1	

(0x0055)					
Reserve					
40300 (0x012B)	1	Version No.	Read only	--	0x03

### 3.2. Modbus Address table

Modbus Address table	
1 (Default)	1
2	2
3	3
...	...
245	245
246	246
247	247

### 3.3. RS485 Serial port baud rate code value table

Baud rate code value table	
0	1200
1	2400
2	4800
3 (Default)	9600
4	19200
5	38400
6	57600
7	115200

### 3.4. RS485 Serial port parity digit code value table

Parity digit code value table	
0 (Default)	No parity
1	Even parity
2	Odd parity

### 3.5. Configure parameters through host

Select the “Parameter Setting” column to read and write parameters. For specific functions, refer to product function introduction below.

**Note:** To set the parameters, please clear the “Auto Refresh” in the acquisition control page in order to avoid sometimes the parameter writing is not successful.



## 4. Product features

### 4.1. Mode selection

The device supports 3 types of pulse counting methods, rising edge counting, falling edge counting and level counting methods, see the pulse counting and clearing section below.

## 4.2. IO Basic function

### 4.2.1. Switch value DO output

#### 4.2.1.1. Reading switch value DO output

Function code: 01, Read coil status

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

Example:

Read 4 digital output status. Assuming the return value is 03, the corresponding binary bit is 0000 0011, which means that DO1 and DO2 are on. The 4 bits represent digital output status, which are DO4, DO3, DO2, DO1 in order.

Modbus RTU protocol read digital output:

Transmission	01	01	00 10	00 04	3C 0C
	Device ModBus Address	Function code	Switch value initial address	Read switch value numbers	CRC parity code
Receiving	01	01	01	03	11 89
	Device ModBus Address	Function code	Return bytes numbers	Digital output value	CRC parity code

#### 4.2.1.2. Control switch value DO output

Function code: 05, Write single coil status; 0F, write multiple coil status

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

Example:

Function code 0x05 writes DO2 digital output, the write value is FF 00; close D02 port, write the value 00 00.

(At this time, NC2 and COM2 of DO2 are disconnected, and NO2 and COM2 are closed.)

Modbus RTU protocol write digital output:

Transmission	01	05	00 11	FF 00	DC 3F
	Device ModBus Address	Function code	Switch value address	Write value	CRC parity code

Receiving	01	05	00 11	FF 00	DC 3F
	Device ModBus Address	Function code	Switch value address	Write value	CRC parity code

Function code 0x0F writes DO2 and DO3 digital output. The write value should be 0x03, corresponding to the binary bit 0000 0011. (Note that the initial address here starts from DO2.)

Modbus RTU protocol write digital output:

Transmission	01	0F	00 11	00 02	01	03	62 95
	Device ModBus Address	Function code	Switch value address	Write switch value numbers	Bytes numbers	Write value	CRC parity code

Receiving	01	0F	00 11	00 02	84 0F
	Device ModBus Address	Function code	Switch value address	Write value	CRC parity code

#### 4.2.2. Read switch value DI input

Function code: 02, Read (switch value) input status

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

Description: The device defaults to dry contact input. When DI and DIG 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 4 digital input values. DI input terminal DI1 and DIG are short-circuited, DI2 and DIG are not short-circuited, DI3 and DIG are short-circuited, DI4 and DIG are not short-circuited. The read digital input value is 0x05, corresponding to the binary bit 0000 0101. The 4 bits represent the digital input value, which are DI4, DI3, DI2, and DI1 in order.

Modbus RTU protocol read digital input:

Transmission	01	02	00 10	00 04	78 0C
	Device ModBus Address	Function code	Switch value initial address	Read switch value numbers	CRC parity code

Receiving	01	02	01	05	61 8B
	Device ModBus Address	Function code	Return bytes numbers	Digital input value	CRC parity code

### 4.3. IO Features

#### 4.3.1. Pulse counting and counting clear

The device supports 3 kinds of pulse counting methods, rising edge counting, falling edge counting, and level counting. This value can be set by writing the corresponding value to the (0x0053) register. Writing 0 represents rising edge counting, writing 1 represents falling edge counting, writing 2 represents level counting. If users choose rising edge counting, it will only count when DI detects that level is on the rising edge. Other functions are similar.

In addition, the device also supports the input count filtering function, and the signal must be held for several cycles can be confirmed. The default value is 6, 6 sampling cycles can be confirmed. The range is 1-20. 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 the level counting mode. The pulse count will not be not saved after power off.

Counting clear also supports manual clear and automatic clear functions: input count is automatically cleared or manually cleared after reading, which can be set. If it is automatically cleared, the register value will be cleared after each reading. If it is manually cleared, then either the maximum count of 65536 is cleared or the register is written to clear. Writing 0 to the (0x0055) register means manual clearing, and writing 1 means automatic clearing. Note that when automatic clearing is set, manual clearing has no effect.

##### 4.3.1.1. Reading pulse count value

Function code: 03, Read holding register

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

Description: Maximum pulse count is 65535

Example:

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

Modbus RTU protocol read pulse count value:

Transmission	01	03	00 30	00 02	C4 04
	Device ModBus Address	Function code	Initial address	Read numbers	CRC parity code

Receiving	01	03	04	00 10	00 03	BB F7
	Device ModBus Address	Function code	Return bytes numbers	DI1 count value	DI2 count value	CRC parity code

#### 4.3.1.2. Manual clear pulse count value

Function code: 06, Write holding register

Address range: 40065 (0x0040)

Description: The lower four bits of the register value represent the counts of DI4, DI3, DI2, and DI1 respectively. Writing "1" means clearing the count and restarting the pulse count.

Example:

Clear the pulse count value of DI2 and DI4, and keep the pulse count value of DI1 and DI3. The write value should be 0x0a, and the corresponding binary value is 0000 1010.

Modbus RTU protocol clear pulse count value:

Transmission	01	06	00 40	00 0a	08 19
	Device ModBus Address	Function code	Address	Write value	CRC parity code

Receiving	01	06	00 40	00 0a	08 19
	Device ModBus Address	Function code	Address	Write value	CRC parity code

#### 4.3.2. Automatic report of digital input DI

The digital input automatic report function is to transmit the changed value when the switch value changes. Users can choose to transmit via RS485 or GPRS, or turn off the automatic report function.

The switch value automatically reports and sets the corresponding Modbus register to 40081 (0x0050). The value corresponds to the function:

0, Turn off switch value automatic report function

1, Switch value automatic report function transmit via RS485

The uploading protocol of switch value change is entered 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, 0xFF, of which

0x00 represents digital input is disconnected,

0x01 represents digital input is closed,

0xff represents digital input has not changed.

The values of DI1, DI2, DI3, and DI4 in the table represent that the status of DI1, DI2 is updated to open, the status of DI3 is updated to closed, and the status of DI4 has not changed. The last two bytes are calculation value of modbus CRC16.

Note: When set to rising edge counting mode, trigger once, the value of DI is 00, when set to falling edge counting mode, trigger once, the value of DI is 01. Also 0xff means no change.

Frame header	DI1	DI2	DI3	DI4	Modbus CRC
0xAA 0xBB	0x00	0x00	0x01	0xff	0xBD 0xDA

### 4.3.3. Digital output DO time setting

The setting of digital 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 less than 100ms, the default digital output is closed to hold status, that is, the digital value remains on after the output is closed. If it is set to 100ms and above, such as 500ms, after the digital output close command is sent, the switch value close will be maintained for 500ms, and then automatically open 500ms later.

### 4.3.4. Switch value DO restart output status setting

Whether the device is powered off and restarted to maintain the status before power off or restart to maintain a specific output status setting. This function is only valid when the device digital output time setting register value is less than 100ms.

The corresponding Modbus register of the switch value restart output status setting is 40085 (0x0054), and its value range is 0x00-0x10. When the value of this register is 0x10, the last digital output status is maintained after power-off and restart. When the value of this register is 0x00-0x0F, the lower 4 bits determine the status of the digital output of the device restart, bit4 corresponds to DO4, bit3 corresponds to DO3, bit2 corresponds to DO2, bit1 corresponds to DO1. For example, when power is on, DO4 and DO2 are in the closed status (relay NO and COM are closed), DO3 and DO1 are in the open status (relay NO and COM are open). The corresponding register value is 0000 1010, that is, 0xa0, "1" is the closed state, and "0" is the open status.

## Revision history

Version	Data	Description	Issued by
1.0	-	Initial version	-
1.1	2019/8/19	Format adjustment	Linson

## About us

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