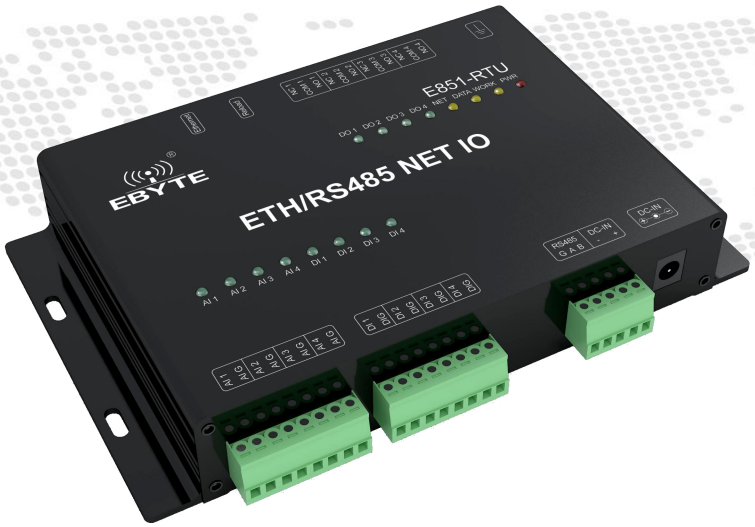
Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual

E851-RTU(4440-ETH)



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Features

- Support 4-channel differential analog input, default current detection;
- Support 4-channel digital input, default dry contact;
- Support 4-way relay output;
- Support socket connection to remote server and TCP Client;
- Adopt Modbus TCP/RTU protocol data processing;
- Support connection to Ebyte Cloud and command control;
- Supports 2 working modes, host mode and slave mode. The slave can cascade multiple devices via RS485;
- Support Reload. Touch the button and press for 5s to restore the Modbus device address, RS485 serial port baud rate and check bit to factory settings.
- Hardware watchdog, with high reliability;
- Multiple indicator lights show working status;
- The power supply has good over-current, over-voltage, and reverse connection protection functions.

Note: Customers can customize functions, such as conditional control (determine how to output based on input status)

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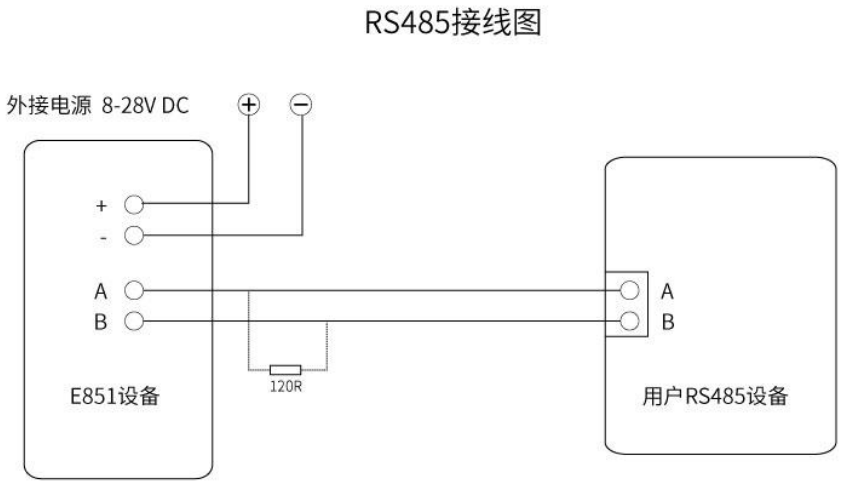
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1 Quick Start

This chapter is a quick introduction to the E851-RTU (4440-ETH) series products. It is recommended that users read this chapter systematically and follow the instructions to have a systematic understanding of the module products. Users can also select the chapters they are interested in to read as needed. For specific details and instructions, please refer to the subsequent chapters.

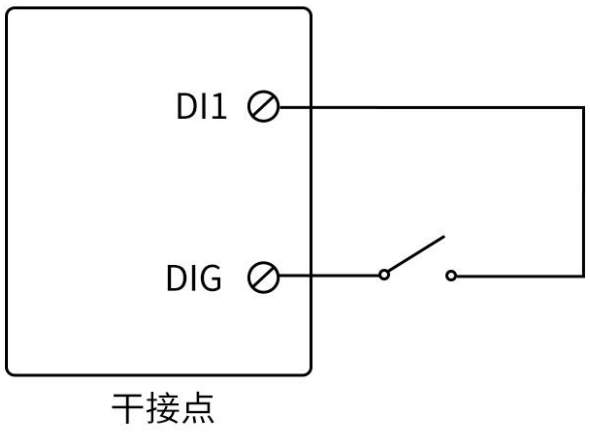
1.1 Port Connection

1.1.1 RS485 connection



Note: When the 485 bus transmits high-frequency signals, the signal wavelength is shorter than the transmission line. The signal will form a reflected wave at the end of the transmission line, interfering with the original signal. Therefore, a terminal resistor needs to be added at the end of the transmission line to prevent the signal from being reflected after reaching the end of the transmission line. The terminal resistor should be the same as the impedance of the communication cable, and the typical value is 120 ohms. Its function is to match the bus impedance and improve the anti-interference and reliability of data communication.

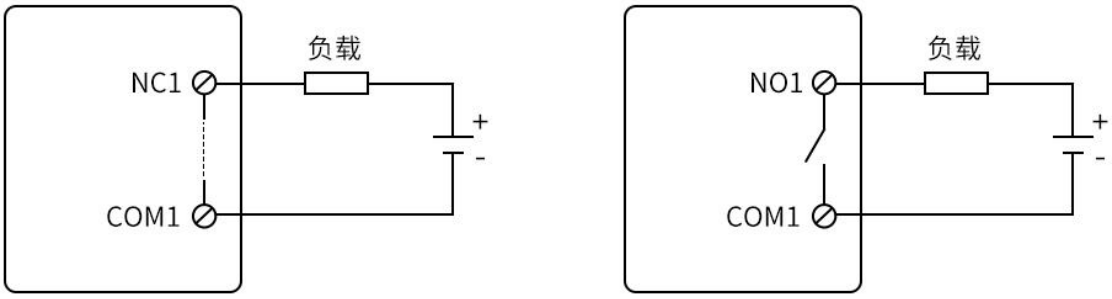
1.1.2 Switch input connection



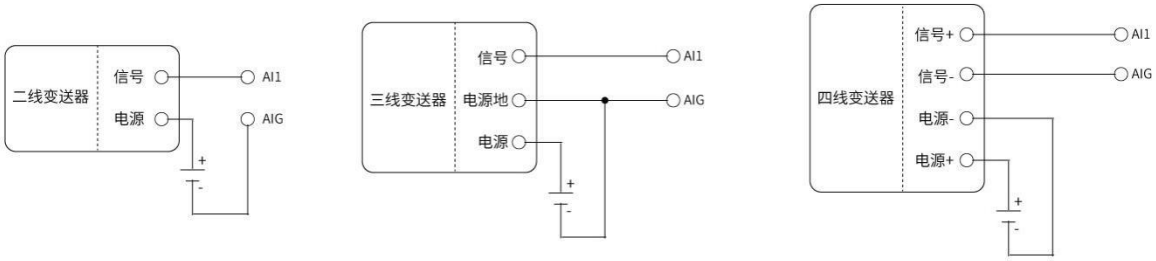
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1.1.3 Relay output connection



1.1.4 Differential analog input connection



模拟量输入连接

1.2 Simple use

Wiring: Computer connected to E851-RTU(4440-ETH) via USB to RS485

Network connection: Plug the network cable into the RJ45 port

Power supply: E851-RTU(4440-ETH) working voltage is DC 8~28V

1.2.1 RS485 bus control

Select the corresponding port and click Search to search for the device.

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After the device is discovered, click Stop .



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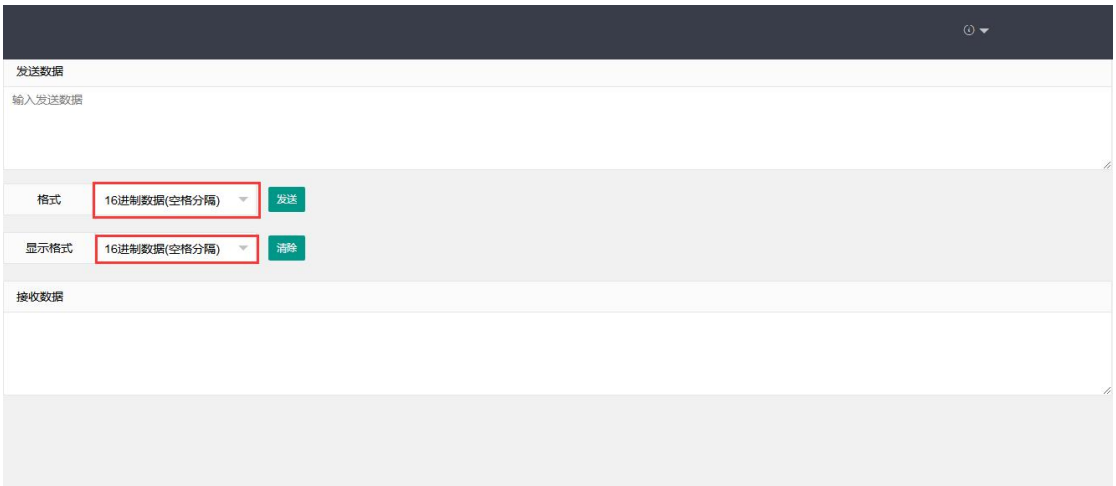
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At this time, you can see the device address of the current device, and process "Auto Refresh"√ to perform switch output control, switch input reading, and differential analog input reading .



1.2.2 Network Control

Enter the URL http://yun.cdebyte.com/www/data_direct and you can control the acquisition through commands. The commands use the Modbus TCP/RTU protocol.



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2 Product Introduction

E851-RTU(4440-ETH) is a network IO product that supports 4 digital inputs (default dry contacts), 4 differential analog inputs, and 4 relay outputs. It supports Modbus TCP/RTU protocol. This product is highly easy to use, and users can easily and quickly integrate it into their own systems to achieve remote control based on Ethernet.

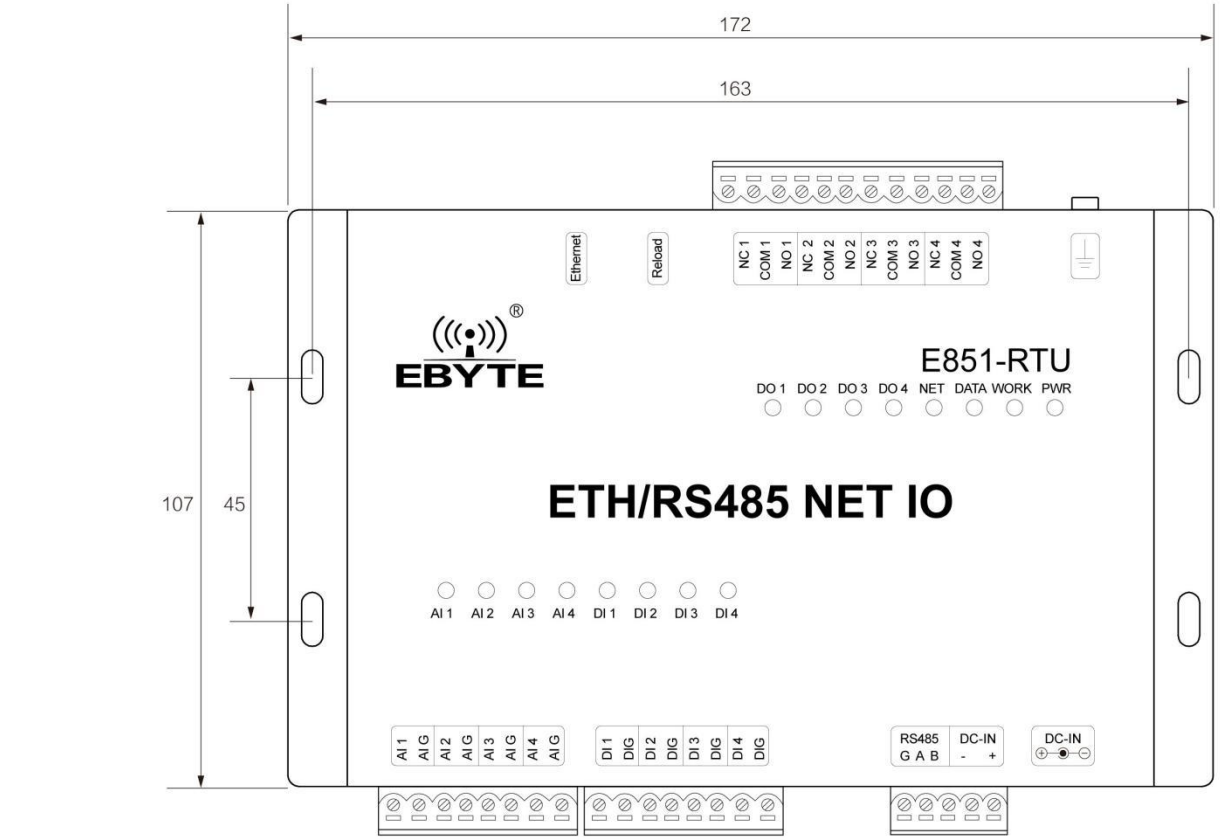
2.1 Basic parameters

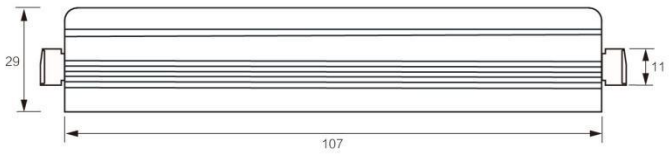
	project	index
Hardware Parameters	Product size (H*W*D)	172*107*29mm
	Product Weight	457.5±5 g
	Operating temperature	-20℃~+70℃
	Storage temperature	-40℃~+85℃
	Operating humidity	5%~95%
	Storage humidity	1%~95%
	Operating voltage	8V~28V
	Current acquisition range	0mA~20mA
	Accuracy	0.2%
	Data Interface	RS485: 1200~115200bps
Software Parameters	Network Type	Ethernet
	Configuration Commands	Modbus TCP/RTU
	Network Protocol	Modbus TCP/RTU
	Working Mode	Master mode, slave mode
	Data transmission method	TCP Client

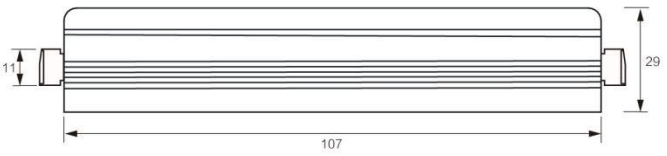
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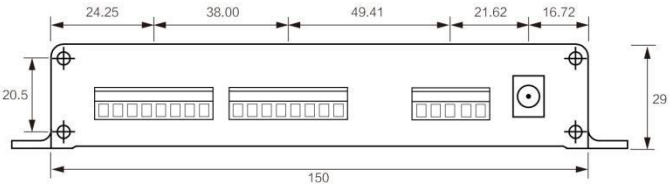
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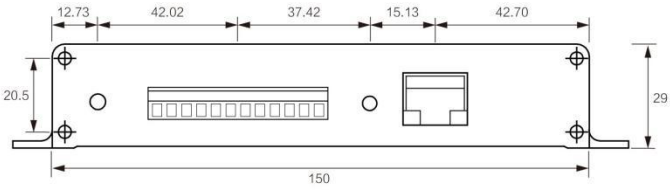
2.2 Dimensions and interface description





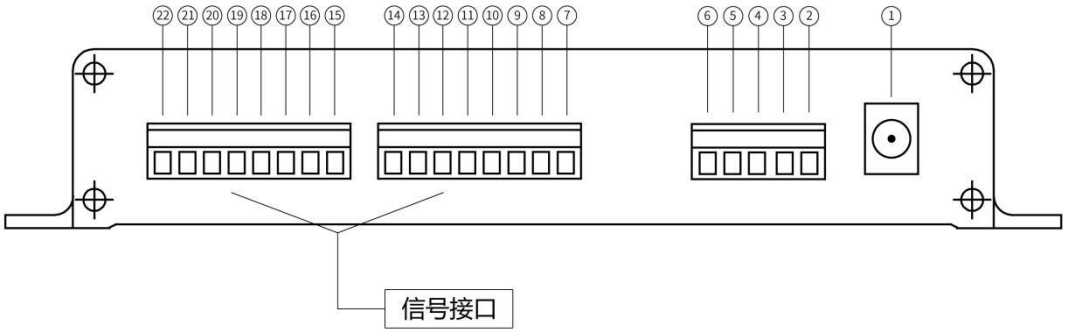


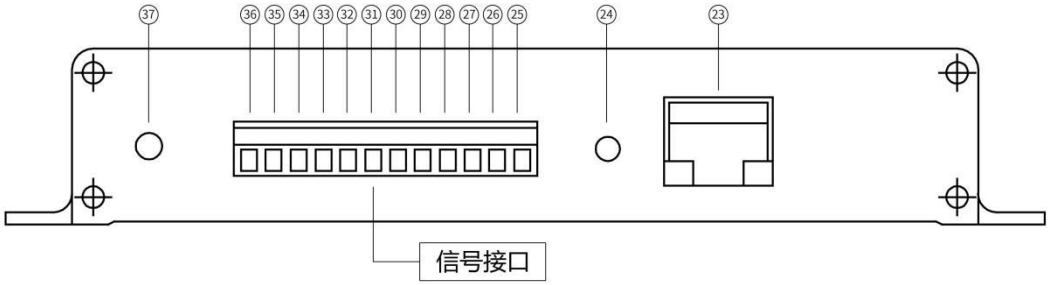




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Serial number	Port and other definitions	Function	illustrate
1	DC-IN socket	DC socket 5.5*2.1mm	Power input terminal, DC 8V~28V, 12V/24V is recommended, and it cannot be powered at the same time as the crimping terminal
2	DC-IN +	Press-wire power input positive terminal	Power input, DC 8V~28V, it is recommended that 12V/24V cannot be powered at the same time as the DC socket
3	DC-IN -	Press-wire power input negative pole	Power reference ground
4	RS485 B	RS485 interface B	RS485 interface B is connected to device B interface
5	RS485 A	RS485 interface A	RS485 interface A is connected to device A interface
6	RS485 G	Signal reference ground	Signal reference ground, not connected
7	DIG	Switch input ground	Can be used in pairs with DI 4
8	DI 4	Switch input channel 4	Form dry contact with DIG
9	DIG	Switch input ground	Used in pair with DI 3
10	DI 3	Switch input channel 3	Form dry contact with DIG
11	DIG	Switch input ground	Can be used in pairs with DI 2
12	DI 2	Switch input channel 2	Form dry contact with DIG
13	DIG	Switch input ground	Can be used in pair with DI 1
14	DI 1	Switch input channel 1	Form dry contact with DIG
15	AIG	Differential analog input ground	Can be used in pair with AI 4
16	AI 4	Differential analog input channel 4	Differential analog input pin, forming input with AIG
17	AIG	Differential analog input	Can be used in pair with AI 3

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		ground	
18	AI 3	Differential analog input channel 3	Differential analog input pin, forming input with AIG
19	AIG	Differential analog input ground	Can be used in pair with AI 2
20	AI 2	Differential analog input channel 2	Differential analog input pin, forming input with AIG
21	AIG	Differential analog input ground	Can be used in pair with AI 1
22	AI 1	Differential analog input channel 1	Differential analog input pin, forming input with AIG
23	Ethernet	Network port	Ethernet port
24	Reload	Reset button	Long press for 5s to work
25	NC 1	Relay 1 Normally Closed Pin	Used with relay 1 common terminal
26	COM 1	Relay 1 common terminal	Used with relay 1 normally open pin/normally closed pin
27	NO 1	Relay 1 Normally Open Pin	Used with relay 1 common terminal
28	NC 2	Relay 2 Normally Closed Pin	Used with relay 2 common terminal
29	COM 2	Relay 2 common terminal	Used with relay 2 normally open pin/normally closed pin
30	NO 2	Relay 2 Normally Open Pin	Used with relay 2 common terminal
31	NC 3	Relay 3 normally closed pin	Used with relay 3 common terminal
32	COM 3	Relay 3 common terminal	Used with relay 3 normally open pin/normally closed pin
33	NO 3	Relay 3 Normally Open Pin	Used with relay 3 common terminal
34	NC 4	Relay 4 Normally Closed Pin	Used with relay 4 common terminal
35	COM 4	Relay 4 common terminal	Used with relay 4 normally open pin/normally closed pin
36	NO 4	Relay 4 Normally Open Pin	Used with relay 4 common terminal
37	Ground screw	Connecting with the Earth	Connecting with the Earth
LED Light			
AI 1	Differential analog input channel 1 indication	Green LED, lights up when input is large enough (≥0.5mA)	
AI 2	Differential analog input channel 2 indication	Green LED, lights up when input is large enough (≥0.5mA)	

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AI 3	Differential analog input channel 3 indication	Green LED, lights up when input is large enough (≥0.5mA)
AI 4	Differential analog input channel 4 indication	Green LED, lights up when input is large enough (≥0.5mA)
DI 1	Switch input channel 1 indication	Green LED, DI 1 and DIG short-circuited, lights up
DI 2	Switch input channel 2 indication	Green LED, DI 2 and DIG short-circuited, lights up
DI 3	Switch input channel 3 indication	Green LED, DI 3, DIG short circuit lights up
DI 4	Switch input channel 4 indication	Green LED, DI 4, DIG short circuit lights up
DO 1	Relay 1 output indication	Green LED, NO 1, COM 1 closed and lit
DO 2	Relay 2 output indication	Green LED, NO 2, COM 2 closed and lit
DO 3	Relay 3 output indication	Green LED, NO 3, COM 3 closed and lit
DO 4	Relay 4 output indication	Green LED, NO 4, COM 4 closed and lit
NET	Network Instructions	Yellow LED, always on after connecting to the network
DATA	Serial port data indication	Yellow LED, lights up when there is data transmission on the RS485 interface (flashes)
WORK	Working/reset indication	Yellow LED, flashes regularly/flashes quickly after successful reset
PWR	Power indicator	Red LED, long on

Notice:

Grounding: It is recommended to connect the shell to the ground

2.3 Reload Touch Button Description

Long press for 5 seconds to be effective. After the reset is successful, the WORK light flashes quickly, and the Modbus device address, RS485 serial port baud rate and parity bit are restored to factory settings.

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3 Modbus

3.1 Modbus address table

Register address table (function code: 0x01H, 0x05H, 0x0FH, 0x03H, 0x06H, 0x10H)					
Register Address	Number of registers	Register attributes	Register Type	Register value range	Support function code
00017 (0x0010)	1	DO1 switch output	Read/Write	0x0000 or 0xFF00 (0x05 function code) 0-1 (0x01, 0x0F function code)	0x01 0x05 0x0F
00018 (0x0011)	1	DO2 switch output	Read/Write		
00019 (0x0012)	1	DO3 switch output	Read/Write		
00020 (0x0013)	1	DO4 switch output	Read/Write		
reserve					
10017 (0x0010)	1	DI1 switch input	Read-only	0-1	0x02
10018 (0x0011)	1	DI2 switch input	Read-only		
10019 (0x0012)	1	DI3 switch input	Read-only		
10020 (0x0013)	1	DI4 switch input	Read-only		
reserve					
30017 (0x0010)	1	AI1 input value, unit (uA)	Read-only	0-20000	0x03 0x04
30018 (0x0011)	1	AI2 input value, unit (uA)	Read-only		
30019 (0x0012)	1	AI3 input value, unit (uA)	Read-only		
30020 (0x0013)	1	AI4 input value, unit (uA)	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 reset	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	Check digit	Read/Write	0 - 2	
40081 (0x0050)	1	Master mode or slave mode	Read/Write	0 - 1	
40082 (0x0051)	1	Automatic reporting of switch quantity	Read/Write	0 - 2	
40083 (0x0052)	1	Switch output time setting (milliseconds)	Read/Write	300-65535	
40084 (0x0053)	1	Analog range setting	Read/Write	0 - 1	
40085 (0x0054)	1	Switch restart output status setting	Read/Write	0x00 - 0x10	

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reserve					
40100 (0x0063)	twenty two	Server IP or domain name (domain name in ASCII)	Read/Write	--	0x03 0x06 0x10
40122 (0x0079)	1	Server Port	Read/Write	1 - 65535	
40123 (0x007A)	1	Protocol type (UDP, TCP)	Read/Write	0 - 1	
40124 (0x007B)	twenty two	Custom Registration Package	Read/Write	--	
40146 (0x0091)	1	Registration package mechanism	Read/Write	0 - 4	
40147 (0x0092)	twenty two	Heartbeat Packet	Read/Write	--	
40169 (0x00A8)	1	Heartbeat packet time	Read/Write	0 - 65535	
40170 (0x00A9)	1	Heart-swap mode	Read/Write	0 - 1	
40171 (0x00AA)	1	Cloud Transmission	Read/Write	0 -1	
40172 (0x00AB)	3	Keep-alive connection	Read/Write	0,2-7200	
40173 (0x00AE)	1	Ethernet timeout restart	Read/Write	0,60-65535	
40174 (0x00AF)	1	Clear the cache	Read/Write	0 - 1	
40175 (0x00B0)	1	Local port number	Read/Write	0-65535	
40176 (0x00B1)	1	How to obtain IP	Read/Write	0 -1	
40177 (0x00B2)	11	Local IP address	Read/Write	--	
40188 (0x00BD)	11	Subnet Mask	Read/Write	--	
40199 (0x00C8)	11	Gateway	Read/Write	--	
40210 (0x00D3)	11	Preferred DNS	Read/Write	--	
40221 (0x00DE)	11	Alternative DNS	Read/Write	--	
40232 (0x00E9)	11	MAC value	Read-only	--	0x03
40243 (0x00F4)	11	SN code value	Read-only	--	
reserve					
40300 (0x012B)	1	Version Number	Read-only	--	0x03

3.2 Modbus address table

Modbus Address Table	
1 (default)	1
2	2
3	3
…	…
245	245
246	246
247	247

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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 check bit value table

Check digit value table	
0 (default)	No verification
1	Even parity
2	Odd Parity

3.5 Configuring parameters through the host computer

Select the "Parameter Setting" column to read parameters, write parameters, and see the product function introduction below for specific functions.

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4 Product Functions

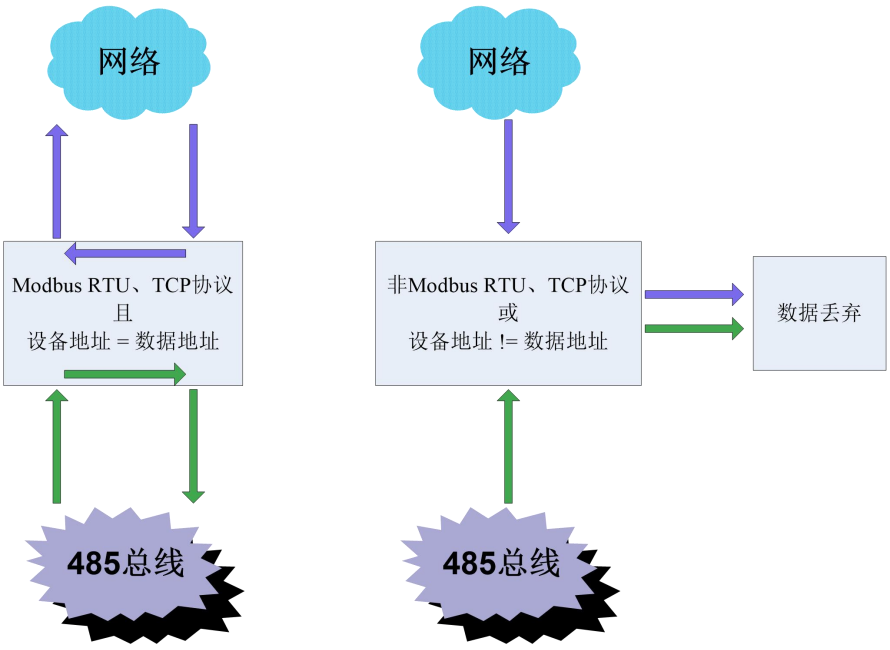
4.1 Working Mode

The working mode is divided into host mode and slave mode, which is configured through Modbus register 40081 (0x0050). When the register value is 0, it is the host mode; when the register value is 1, it is the slave mode, and the default is slave mode.

4.1.1 Slave Mode

In slave mode (register value is 0x01), the data sent by the network or 485 bus (Sender) to the device meets the Modbus RTU and Modbus TCP protocols, and the address in the data is the device address. The device will respond to the Sender with the same protocol; if the data sent by the network or 485 bus to the device does not meet the Modbus RTU and Modbus TCP protocols, or meets the Modbus RTU and Modbus TCP protocols but the data address is not the device address, the data from the Sender will be discarded.

In slave mode, the device can be directly connected to the device in host mode through the 485 bus, so that when the slave is not connected to the Internet, the network end can also access the slave data through the host.



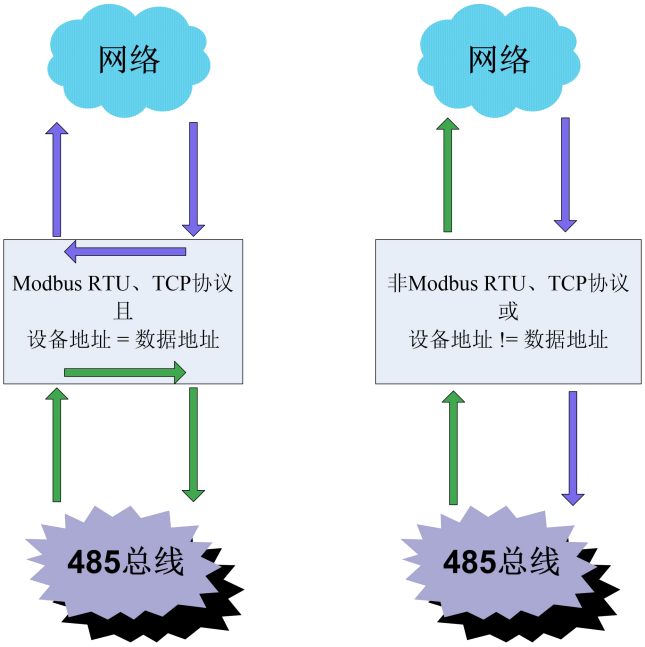
4.1.2 Host Mode

In the host mode (register value is 0x00), the data sent by the network or 485 bus (Sender) to the device meets the Modbus RTU and Modbus TCP protocols, and the address in the data is the device address, and the device will respond to the Sender with the same protocol; if the data sent by the network or 485 bus to the device does not meet the Modbus RTU and Modbus TCP protocols, or meets the Modbus RTU and Modbus TCP protocols but the data address is not the device address, the data from the 485 bus will be transmitted to the network, and the data from the network will be transmitted to the 485 bus.

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This function of host mode can realize device cascading function and data transmission between 485 bus and network.



4.2 Basic IO Functions

4.2.1 Switching DO output

4.2.1.1 Reading switch DO output

Function code: 01, read coil status

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

Note: The relay of the device has passive output. When the coil is not energized, the NC port of the relay is normally closed with the COM port, and the NO port is normally open with the COM port, and the value is 0. When the coil is energized, the phenomenon is the opposite, the NC port of the relay is disconnected with the COM port, and the NO port is closed with the COM port, and the value is 1. Query the relay status through instructions.

example:

Read the status of 4 switch outputs. Assume that the return value is 03, which corresponds to the binary bit 0000 0011. The lower four bits represent the status of the switch output, which are DO4, DO3, DO2, and DO1.

Modbus RTU protocol reads switch output:

Send	01	01	00 10	00 04	3C 0C
	Device ModBus address	Function code	Switch value starting address	Read switch quantity	CRC checksum

Receive	01	01	01	03	11 89
	Device ModBus address	Function code	Returns the number of bytes	Switching output value	CRC checksum

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Modbus TCP protocol reads switch output:

Send	00 01	00 00	00 06	01	01	00 10	00 04
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Switch value starting address	Read switch quantity

Receive	00 01	00 00	00 04	01	01	01	03
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Returns the number of bytes	Switch output value

4.2.1.2 Control switch DO output

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

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

Description: The relay of the device has passive output. When the coil is not energized, the NC port of the relay is closed with the COM port, and the NO port is disconnected with the COM port. When the coil is energized, the NC port of the relay is disconnected with the COM port, and the NO port is closed with the COM port. The relay state is controlled by instructions.

example:

Function code 0x05 writes DO2 switch output, disconnects NC2 and COM2, closes NO2 and COM2, and writes a value of FF 00; closes NC2 and COM2, disconnects NO2 and COM2, and writes a value of 00 00.

Modbus RTU protocol writes switch output:

Send	01	05	00 11	FF 00	DC 3F
	Device ModBus address	Function code	Switch address	Write value	CRC checksum

Receive	01	05	00 11	FF 00	DC 3F
	Device ModBus address	Function code	Switch address	Write value	CRC checksum

Modbus TCP protocol writes switch output:

Send	00 01	00 00	00 06	01	05	00 11	FF 00
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Switch address	Write value

Receive	00 01	00 00	00 06	01	05	00 11	FF 00
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Switch address	Write value

Function code 0x0F writes DO2 and DO3 switch outputs, making NC2 and COM2 open and NO2 and COM2 closed; making NC3 and COM3 open and NO3 and COM3 closed. The written value should be 0x03, corresponding to the binary bit 0000 0011

Modbus RTU protocol writes switch output:

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Send	01	0F	00 11	00 02	01	03	62 95
	Device ModBus address	Function code	Switch address	Write switch quantity	Number of bytes	Write value	CRC checksum

Receive	01	0F	00 11	00 02	84 0F
	Device ModBus address	Function code	Switch address	Write value	CRC checksum

Modbus TCP protocol writes switch output:

Send	00 01	00 00	00 08	01	0F	00 11	00 02	01	03
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Switch address	Write switch quantity	Number of bytes	Write value

Receive	00 01	00 00	00 06	01	0F	00 11	00 02
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Switch address	Write switch quantity

4.2.2 Read switch DI input

Function code: 02, read (switch quantity) input status

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

Note: The device defaults to dry contact input. When DI and COM are short-circuited, the read value should be 1; when DI and COM are not short-circuited, the read value should be 0.

example:

Read the 4-way switch input value, DI input terminal DI1, COM1 short-circuited, DI2, COM2 not short-circuited, DI3, COM3 short-circuited, DI4, COM4 not short-circuited. The read switch input value is 0x05, corresponding to the binary bit 0000 0101, the lower four bits represent the switch input value, which are DI4, DI3, DI2, DI1.

Modbus RTU protocol reads switch input:

Send	01	02	00 10	00 04	78 0C
	Device ModBus address	Function code	Switch value starting address	Read switch quantity	CRC checksum

Receive	01	02	01	05	61 8B
	Device ModBus address	Function code	Returns the number of bytes	Switch input value	CRC checksum

Modbus TCP protocol reads switch input:

Send	00 01	00 00	00 06	01	02	00 10	00 04
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Switch value starting address	Read switch quantity

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Receive	00 01	00 00	00 04	01	02	01	05
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Returns the number of bytes	Switch input value

4.2.3 Read analog AI input

Function code: 03, read holding register; 04, read input register

Address range: 30017 (0x0010) ~ 30020 (0x0013)

Note: The unit of differential analog input value is uA

example:

Function code 0x03, read AI1 input, assuming AI1 input is 9946uA, the corresponding value should be 0x0x26DA

Modbus RTU protocol reads differential analog input:

Send	01	03	00 10	00 01	85 CF
	Device ModBus address	Function code	Analog start address	Read quantity	CRC checksum

Receive	01	03	02	26 DA	23 BF
	Device ModBus address	Function code	Returns the number of bytes	Differential analog input value	CRC checksum

Modbus TCP protocol reads differential analog input:

Send	00 01	00 00	00 06	01	03	00 10	00 01
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Analog start address	Read quantity

Receive	00 01	00 00	00 05	01	03	02	26 DA
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Returns the number of bytes	Differential analog input value

Function code 0x04, read AI1 input, assuming AI1 input is 9946uA, the corresponding value should be 0x0x26DA

Modbus RTU protocol reads differential analog input:

Send	01	04	00 10	00 01	30 0F
	Device ModBus address	Function code	Analog start address	Read quantity	CRC checksum

Receive	01	04	02	26 DA	22 CB
	Device ModBus address	Function code	Returns the number of bytes	Differential analog input value	CRC checksum

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Modbus TCP protocol reads differential analog input:

Send	00 01	00 00	00 06	01	04	00 10	00 01
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Analog quantity starting address	Read quantity

Receive	00 01	00 00	00 05	01	04	02	26 DA
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Returns the number of bytes	Differential analog input value

4.2.4 Analog AI range setting

When the value of register 0x40084 (0x0053) is 0, the differential analog input range is 0 -- 20mA;
When the value of register 0x40084 (0x0053) is 1, the differential analog input range is 4-20mA;

4.3 IO Features

4.3.1 Pulse counting and count clearing

The pulse count will not be saved after power failure, and the pulse level maintenance time must be greater than 10ms to be effective. The switch input changes from the open state to the closed state and maintains the closed state for more than 10ms, and then changes to the open state to complete a pulse count.

4.3.1.1 Reading pulse count value

Function code: 03, read holding register
Address range: 40049 (0x0030) ~ 40052 (0x0033)
Note: The maximum value of pulse count is 65535
example:
DI1 has currently detected 16 pulses, and DI2 has currently detected 3 pulses. Read the DI1 and DI2 switch input count values.
Modbus RTU protocol reads pulse count value:

Send	01	03	00 30	00 02	C4 04
	Device ModBus address	Function code	Starting address	Read quantity	CRC checksum

Receive	01	03	04	00 10	00 03	BB F7
	Device ModBus address	Function code	Returns the number of bytes	DI1 count value	DI2 count value	CRC checksum

Modbus TCP protocol reads pulse count value:

Send	00 01	00 00	00 06	01	03	00 30	00 02
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Starting address	Read quantity

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Receive	00 01	00 00	00 07	01	03	04	00 10	00 03
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	Returns the number of bytes	DI1 count value	DI2 count value

4.3.1.2 Clearing the pulse count value

Function code: 06, write holding register

Address range: 40065 (0x0040)

Note: The lower four bits of the register value represent the counts of DI4, DI3, DI2, and DI1 respectively. Writing "1" means the counts are cleared and the pulse counting starts again.

example:

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

Modbus RTU protocol clears the pulse count value :

Send	01	06	00 40	00 0a	08 19
	Device ModBus address	Function code	address	Write value	CRC checksum

Receive	01	06	00 40	00 0a	08 19
	Device ModBus address	Function code	address	Write value	CRC checksum

Modbus TCP protocol clears the pulse count value :

Send	00 01	00 00	00 06	01	06	00 40	00 0a
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Write value

Receive	00 01	00 00	00 06	01	06	00 40	00 0a
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Write value

4.3.2 Automatic reporting of switch input DI

The automatic reporting function of switch input is to transmit the changed value when the switch value changes. You can choose to transmit via RS485 or GPRS, or turn off the automatic reporting function.

The Modbus register corresponding to the automatic reporting setting of the switch value is 40082 (0x0051), and the value corresponds to the function:

Disable the automatic reporting function of switch quantity

Switching quantity is automatically reported via RS485 transmission

Switching quantity is automatically reported and transmitted via GPRS network

The switch quantity change upload protocol is listed in the following table, where the frame header 0xAA and 0xBB are fixed, and the value range of DI1, DI2, DI3, and DI4 is 0x00, 0x01, and 0xFF.

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0x00 means the switch input is disconnected.

0x01 means the switch input is closed.

0xff means the switch input has not changed.

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

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

4.3.3 Switch output DO time setting

The switch pulse output time setting is to set the switch output time (relay NO, COM closing time). The corresponding Modbus register is 40083 (0x0052), and its value range is 300-65535ms. If the value is lower than 300ms, the default switch output closure is in the hold state, that is, the switch output is always held after closing. If it is set to 300ms or more, such as 500ms, after Sending the switch output closing command, the switch closure will be maintained for 500ms, and then automatically disconnected after 500ms.

4.3.4 Switch DO restart output state setting

Whether the device maintains the state before power failure or restarts to maintain a specific output state after power failure. This function is only valid when the device switch output time setting register value is less than 300ms.

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

4.4 Network related functions

4.4.1 Server IP or domain name, port, TCP or UDP settings (Socket)

The server IP or domain name is stored in 22 modbus registers. The first register is used to store the ASCII code length corresponding to the IP or domain name, and the remaining registers are used to store the ASCII code value corresponding to the IP or domain name. For example, if the IP is 116.62.42.192, the port is 31687, and there are 13 characters in total, that is, the length is 0x000D, and the ASCII code value corresponding to the IP is 31 31 36 2E 36 32 2E 34 32 2E 31 39 32. The corresponding modbus register storage value is as shown in the following table. If it is a domain name, the corresponding domain name is also converted into the hexadecimal corresponding to ASCII for storage. (Note: The maximum length of the domain name does not exceed 40 ASCII codes)

40101 (0x0063)	40101(0x0064) -- 40121(0x0078)
length	IP or domain name value
00 0D	31 31 36 2E 36 32 2E 34 32 2E 31 39 32

Port 31687 corresponds to hexadecimal 7BC7; protocol type (TCP, UDP) is saved using protocol registers, value 0x0001 corresponds to TCP protocol, value 0x0000 corresponds to UDP protocol. That is, when the IP is 116.62.42.192, port is 31687, TCP protocol, unused IP or domain name registers can be filled with "0" or not filled. If you need to use function code "0x10" to write IP, domain name, port, and protocol type at one time, then the unused registers must be filled with values to continuously write modbus registers. The corresponding register values are as follows:

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40100 (0x0063)	40101(0x0064) -- 40121(0x0078)	40122 (0x0079)	40123 (0x007A)
IP or domain name length	IP or domain name value	Server Port	TCP
00 0D	31 31 36 2E 36 32 2E 34 32 2E 31 39 32 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	7B C7	00 01

Since the length of the IP or domain name register is greater than the length of the IP or domain name value, the length of the IP or domain name needs to be considered when writing the IP register, that is, how many registers are needed. For example, write the above IP to the modbus register:

Modbus RTU protocol writes Socket registers:

Send	01	10	00 63	00 18	30	00 0D 31 31 36 2E 36 32 2E 34 32 2E 31 39 32 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

40124 (0x007B)	40125 (0x007C)	40126(0x007D) -- 40145(0x0090)	40146 (0x0091)
type	length	Registration Package Value	Registration package mechanism
00 01	00 0A	41 42 43 44 45 46 47 48 49 4A 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 01

The registration package mechanism has 5 modes:

Registration Packet Mechanism Register Value (0x0091)	Corresponding function description
00 00	Disable the registration package mechanism
00 01	Add MAC/IMEI as registration package data before each packet sent to the server
00 02	Add custom registration package data before each packet sent to the server
00 03	Only Send a MAC/IMEI registration packet when connecting to the server for the first time
00 04	A user-defined registration packet is sent only when connecting to the server for the first time

Modbus RTU protocol write registration packet register:

Send	01	10	00 7B	00 17	2E	00 01 00 0A 41 42 43 44 45 46 47 48 49 4A 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 01	00 F4
	Device ModBus address	Function code	address	Register length	Number of bytes	Write value	CRC Check code

Receive	01	10	00 7B	00 17	F0 1E
	Device ModBus address	Function code	address	Register length	CRC checksum

Modbus TCP protocol write registration packet register:

Send	00 01	00 00	00 33	01	10	00 7B	00 17	2E	00 01 00 0A 41 42 43 44 45 46 47 48 49 4A 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 01
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Register length	Number of bytes	Write value

Receive	00 01	00 00	00 06	01	10	00 7B	00 17
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Register length

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4.4.3 Heartbeat Packet

The heartbeat packet can be ASCII code or hex. The length of hex code cannot be greater than 20 bytes, and the length of ASCII code cannot be greater than 40 bytes. The first register of the heartbeat packet is used to store the heartbeat packet data type. The value 0x0000 indicates that the heartbeat packet is in hex format, and the value 0x0001 indicates that the heartbeat packet is in ASCII format. When the value is 0x0000, the heartbeat packet value is 0x00, 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x08, 0x09. The second register of the heartbeat packet is used to store the length of the heartbeat packet value. The heartbeat packet value length is 10, corresponding to decimal 0x0A. Like the custom registration package register, the unused heartbeat packet value register can be filled with "0" or not filled.

40147 (0x0092)	40148 (0x0093)	40149(0x0094) -- 40168(0x00A7)
type	length	Registration Package Value
00 00	00 0A	00 01 02 03 04 05 06 07 08 09 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

Modbus RTU protocol write registration packet register:

Send	01	10	00 92	00 16	2C	00 00 00 0A 00 01 02 03 04 05 06 07 08 09 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	52 9E
	Device ModBus address	Function code	address	Register length	Number of bytes	Write value	CRC Check code

Receive	01	10	00 92	00 16	E0 2A
	Device ModBus address	Function code	address	Register length	CRC checksum

Modbus TCP protocol write registration packet register:

Send	00 01	00 00	00 33	01	10	00 92	00 16	2C	00 00 00 0A 00 01 02 03 04 05 06 07 08 09 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
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Register length	Number of bytes	Write value

Receive	00 01	00 00	00 06	01	10	00 92	00 16
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Register length

4.4.4 Heartbeat Packet Time

The heartbeat packet time setting range is 0-65535 seconds. When the heartbeat packet time is set to 0, the heartbeat packet is turned off. Set the heartbeat packet time to 5s as follows.

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Modbus RTU protocol write heartbeat packet time register:

Send	01	06	00 A8	00 05	C8 29
	Device ModBus address	Function code	address	Write value	CRC checksum

Receive	01	06	00 A8	00 05	C8 29
	Device ModBus address	Function code	address	Write value	CRC checksum

Modbus TCP protocol Modbus RTU protocol write heartbeat packet time register:

Send	00 01	00 00	00 06	01	06	00 A8	00 05
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Write value

Receive	00 01	00 00	00 06	01	06	00 A8	00 05
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Write value

4.4.5 Heartbeat Packet Mode

The heartbeat packet mode is divided into serial port heartbeat packet and network heartbeat packet (the default is network heartbeat packet). When 0 is written to this register, it is a network heartbeat packet, and when 1 is written, it is a serial port heartbeat packet.

Modbus RTU protocol write heartbeat packet mode register:

Send	01	06	00 A9	00 01	98 2A
	Device ModBus address	Function code	address	Write value	CRC checksum

Receive	01	06	00 A9	00 01	98 2A
	Device ModBus address	Function code	address	Write value	CRC checksum

Modbus TCP protocol write heartbeat packet mode register:

Send	00 01	00 00	00 06	01	06	00 A9	00 00
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Write value

Receive	00 01	00 00	00 06	01	06	00 A9	00 00
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Write value

4.4.6 Local WAN port IP parameter settings

The local IP acquisition method is divided into static IP acquisition and dynamic IP acquisition (DHCP). The related registers are

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34 registers from 0XB1 to 0XD2. When the value in the first register (0XB1) is 1, it is static IP mode, and when it is 0, it is dynamic acquisition mode. From 0XB2 to 0XBC, there are 11 registers that store the local IP address, of which 0XB2 stores the length of the IP address, and 0XB3 to 0XBC stores the ASCII code value of the IP address. From 0XBD to 0XC7, there are 11 registers that store the subnet mask information, of which 0XBD stores the length of the subnet mask address, and 0XBE to 0XC7 stores the ASCII code value of the subnet mask address. From 0XC8 to 0XD2, there are 11 registers that store the gateway address, of which 0XC8 stores the length of the gateway address, and 0XC9 to 0XD2 store the ASCII code value of the gateway address.

You can use the 10 function code to write the above parameter information at one time. Note that the unfilled registers are filled with 0, just like the server IP setting. The following command indicates that the static IP is set, the local IP address is 192.168.4.101, the subnet mask is 255.255.255.0, and the gateway is 192.168.4.1. Note that the corresponding ASCII code value must be written and converted into hexadecimal.

Modbus RTU protocol configuration WAN port parameters :

Send	01	10	00 B1	00 22	44	00 01 00 0D 31 39 32 2E 31 36 38 2E 34 2E 31 30 31 00 00 00 00 00 00 00 00 0D 32 35 35 2E 32 35 35 2E 32 35 35 2E 30 00 00 00 00 00 00 00 00 0B 31 39 32 2E 31 36 38 2E 34 2E 31 00 00 00 00 00 00 00 00 00	31 16
	Device ModBus address	Function code	address	Register length	Number of bytes	Write value	CRC Check code

Receive	01	10	00 B1	00 22	10 37
	Device ModBus address	Function code	address	Register length	CRC checksum

Modbus TCP protocol writes WAN port parameters:

Send	00 01	00 00	00 4B	01	10	00 B1	00 22	44	00 01 00 0D 31 39 32 2E 31 36 38 2E 34 2E 31 30 31 00 00 00 00 00 00 00 00 0D 32 35 35 2E 32 35 35 2E 32 35 35 2E 30 00 00 00 00 00 00 00 00 0B 31 39 32 2E 31 36 38 2E 34 2E 31 00 00 00 00 00 00 00 00 00
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Register length	Number of bytes	Write value

Receive	00 01	00 00	00 06	01	10	00 B1	00 22
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Register length

4.4.7 DNS settings

There are 22 registers from address 0XD3 to 0XDE, which store DNS information. DNS addresses are divided into primary DNS and backup DNS. Register 0xD3 stores the address length of the primary DNS, and 0xD4 to 0xDD store the ASCII code value of the primary DNS address. Register 0XDE stores the length of the backup DNS address, and 0XDE to 0XE8 store the ASCII code value of the backup DNS address.

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You can use the 10 function codes to configure the primary DNS and the backup DNS at one time. The following table shows that the primary and backup DNS are configured as 61.139.2.69 and 192.168.4.1 respectively.

Modbus RTU protocol configuration preferred and alternate DNS :

Send	01	10	00 D3	00 16	2C	00 0B 36 31 2E 31 33 39 2E 32 2E 36 39 00 00 00 00 00 00 00 00 00 00 00 0B 31 39 32 2E 31 36 38 2E 34 2E 31 00 00 00 00 00 00 00 00 00 00	D9 F2
	Device ModBus address	Function code	address	Register length	Number of bytes	Write value	CRC Check code

Receive	01	10	00 D3	00 16	B0 3E
	Device ModBus address	Function code	address	Register length	CRC checksum

Modbus TCP protocol configuration preferred and alternate DNS :

Send	00 01	00 00	00 33	01	10	00 D3	00 16	2C	00 0B 36 31 2E 31 33 39 2E 32 2E 36 39 00 00 00 00 00 00 00 00 00 00 00 0B 31 39 32 2E 31 36 38 2E 34 2E 31 00 00 00 00 00 00 00 00 00 00
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Register length	Number of bytes	Write value

Receive	00 01	00 00	00 06	01	10	00 D3	00 16
	Transmission ID	Protocol Identifier	length	Unit identification	Function code	address	Register length

4.4.8 Ebyte Cloud Transmission

The Ebyte Cloud Transmit function can be turned on or off. The corresponding register for this function is 40169 (0x00AA), supporting function codes 0x0003, 0x0006, and 0x0010:

When the register value is 0x0000, the cloud transparent transmission function is disabled;

When the register value is 0x0001, the cloud transparent transmission function is enabled;

The default factory setting is to disable cloud transparent transmission.

4.4.9 Clear the cache

Register 0xAF can be used to set whether to clear the cache in the network SOKET, supporting function codes 0x0003, 0x0006, and 0x0010:

When the register value is 0x0000, the cache clearing function is enabled;

When the register value is 0x0001, the cache clearing function is disabled.

4.4.10 Keep-alive Connection

Register 40170 (0x00AB) is the keep-alive connection register, which needs to be used in conjunction with registers 40171 (0x00AC) and 40172 (0x00AD).

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Register 40170 (0x00AB) indicates the number of seconds after which a TCP connection starts a detection message when there is no data message transmission. When the register value is 0, it means that this function is turned off. When it is 2~7200, it means that this function is turned on and the parameters of the following two registers take effect.

Register 40171 (0x00AC) indicates the time interval between the previous detection message and the next detection message. Its value is 2~7200, in seconds.

Register 40172 (0x00AD) indicates the maximum number of detection failures. When this number is reached, the TCP connection will be disconnected. Its value is 2~255, unit: times

4.4.11 Timeout Restart

The register 40173 (0x00AE) is used to set the time for the Ethernet physical layer module in the RTU to restart after there is no data on the network. The range is 0, 60-65535 seconds. When it is set to 0, it means that this function is turned off. When it is set to a parameter in the range of 60-65535, this parameter takes effect.

4.4.12 SOCKET local port settings

The register 40175 (0x00B0) is used to set the SOCKET local port number, supporting 0x0003, 0x0006, 0x0010 function codes. When the value is 0, it means using a random port number, and 1-65535 means setting it to the corresponding port number.

4.4.13 MAC Read

The MAC register read start address is 40232 (0x00E9), and the total register length is 11, of which the first register is the MAC length, and the second to eleventh registers store the MAC value. For example, MAC: B2FAEAF2C427, the corresponding register value is as shown in the following table. In the register, the IMEI value exists in hexadecimal ASCII value.

40171 (0x00AA)	40172 (0x00AB) --40181 (0x00B4)
MAC length	MAC value
00 0C	42 32 46 41 45 41 46 32 43 34 32 37 00 00 00 00 00 00 00 00

4.4.14 SN Read

The SN register read start address is 40243 (0x00F4), and the total register length is 11, of which the first register is the SN length, and the second to eleventh registers store the SN value. For example, if SN: 190521135939C140, the corresponding register value is as shown in the following table. In the register, the SN value exists in hexadecimal ASCII value.

40182 (0x00B5)	40183 (0x00B6) --40192 (0x00BF)
SN length	SN value
00 10	31 39 30 35 32 31 31 33 35 39 33 39 43 31 34 30 00 00 00 00

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- Due to the continuous improvement of the product hardware and software, this manual may be changed without prior notice. The latest version of the manual shall prevail.
- Protecting the environment is everyone's responsibility: To reduce paper usage, this manual is only printed in Chinese. The English manual is only available in electronic format. If necessary, please download it from our official website. In addition, unless otherwise requested by the user, when placing a bulk order, we will only provide product manuals in proportion to the order quantity. Not every digital radio will be provided with a manual. Please understand.

Revision History

Version	Revision Date	Revision Notes	Maintainer
1. 2	2025-05-26	Modified Versions	huaa

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