



Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



E870-E1

Edge Collection Cloud IO Gateway

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Chapter 1 Product Description

1.1 Product introduction

E870-E1 is an Ethernet cloud IO gateway developed based on the communication protocol "Ebyte Cloud Device Communication Protocol" developed by our company. It can send commands to the device through the server to achieve control or acquisition functions, and open 4-way switch value acquisition on the device. ,2-channel analog (0-20/4-20mA) acquisition, 2-channel A-type relay output, support multiple protocols (TCP, UDP, MQTT) access to the server, support heartbeat packet, registration packet settings;

At the same time, the product supports a variety of configuration methods and supports web platform;

Supports acquisition and control of edge RTU nodes, and can also be used as an RTU device to parse Modbus commands to acquire and control device IO;

Adopt industrial-grade design standards to ensure high reliability of the equipment.



1.2 Functional features

- Support "Ebyte Cloud Device Communication Protocol" open protocol
- Support remote management of Ebyte cloud platform
- Support edge acquisition and control 20 Modbus RTU data points
- Support change reporting, periodic reporting and other reporting methods
- Supports adding edge computing formulas to upstream and downstream data
- Support Alibaba Cloud IoT model JSON protocol reporting
- Automatic 10/100M Ethernet interface
- Support 4-way Socket independent connection to user-defined server
- Support TCPC, UDPC, MQTT3.1.1 protocol
- Support registration package and heartbeat package
- Support various configuration methods such as Ebyte cloud platform, host computer, network, etc.
- Support the host computer to upgrade the device through the network and serial port
- 2 analog inputs (0-20/4-20mA)
- 4-way switch input DI (dry contact)
- 2-way switch output DO (A-type relay)
- Support as an RTU device to parse the host Modbus RTU command to collect and control the IO of the control device
- Industrial design supports -40~85°C working environment

Chapter 2 Quick Use

[Note] This experiment needs to be carried out with the default factory parameters.


The following two methods are provided for quick access to the server, one is to access the Ebyte cloud platform by factory settings, and the other is to access the self-built server through the host computer configuration.

2.1 Devices Preparation

The following table shows the materials required for this test:

One computer, one E870-E1 (hereinafter referred to as "device"), one network cable, USB to RS485 converter, and several wires;

The most important thing is to need a routing environment that can access the Internet, otherwise the Ebyte cloud control device cannot be used;

	
PC	E870-E1
	
Ethernet cable	USB to RS485

2.2 Devices Connection

2.2.1. Connect Platform

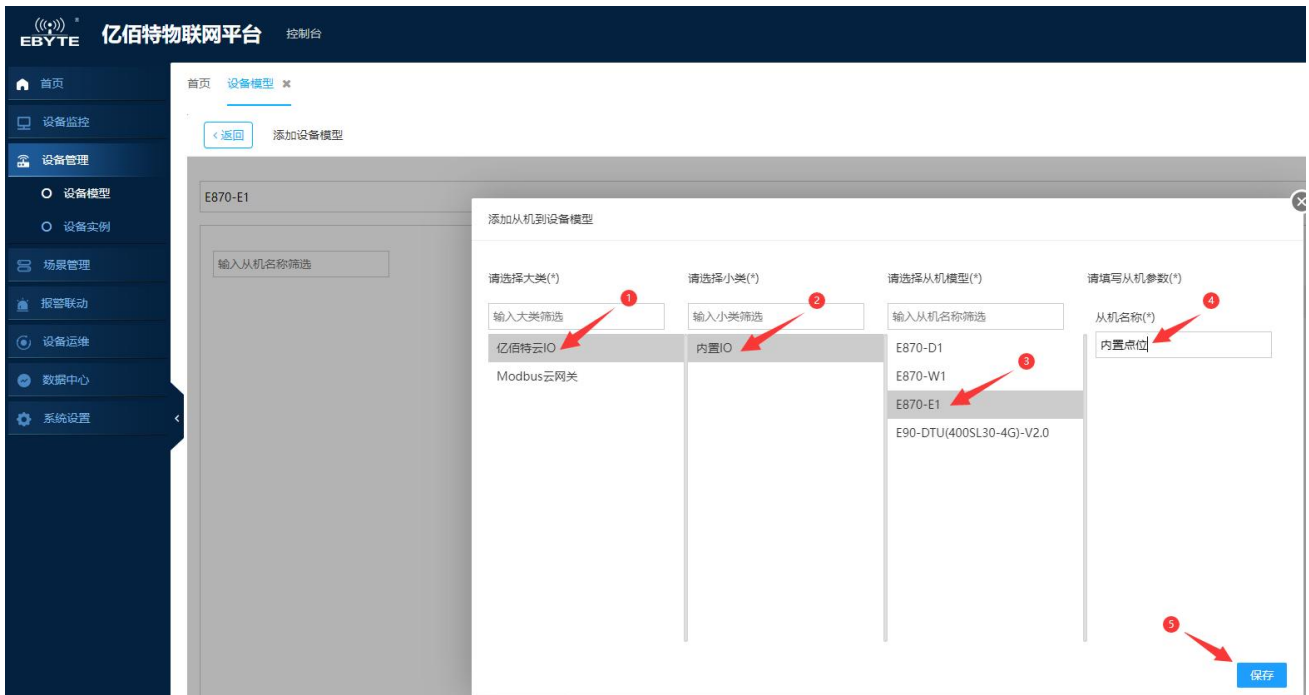
Step 1: Connect the network cable to the device power supply (DC 8-28V) to ensure that the device can access the Internet normally;

Step 2: Use a browser to log in to cloud.ebyte.com, register and log in to the Ebyte cloud platform, and after successfully entering the platform:

- ①Click "Device Management" in the left column box
- ②Click "Device Model", enter the Create Device Model, select "Add Device Model"



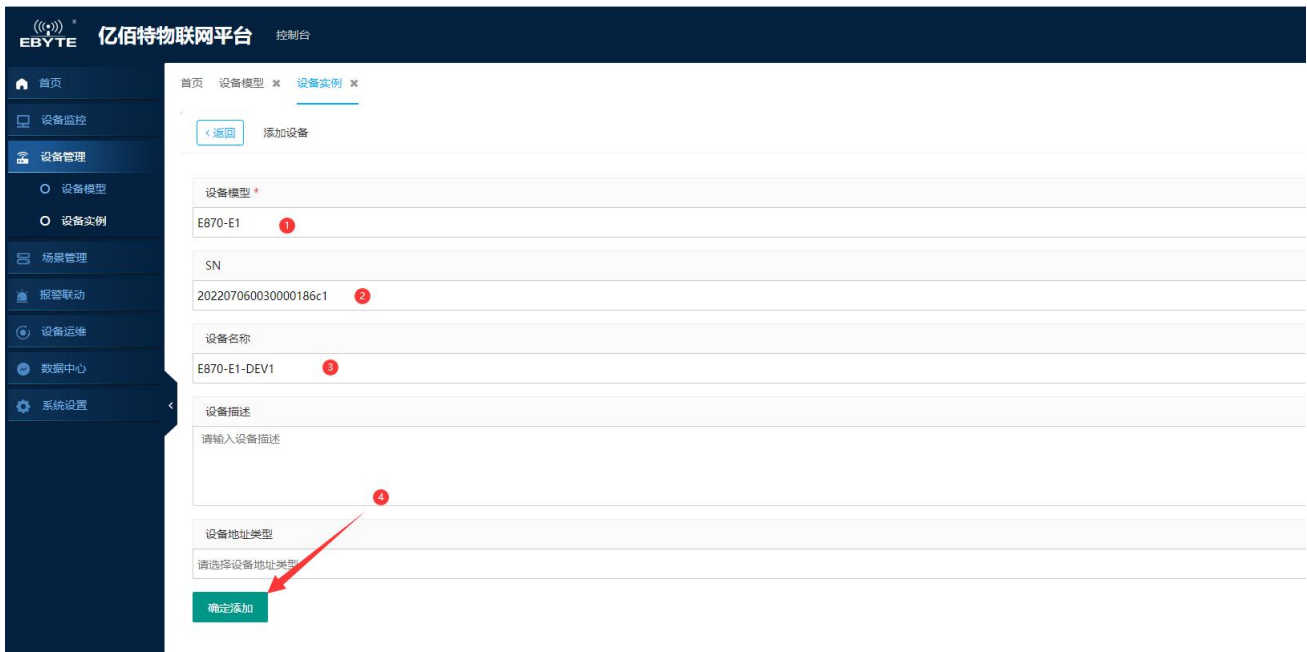
③Enter the relevant parameters, click "Add Slave", select "Ebyte Cloud IO", "Built-in IO", "E870-E1", enter the name of the slave, click "Save", and click "Confirm Add", you can create a device model.



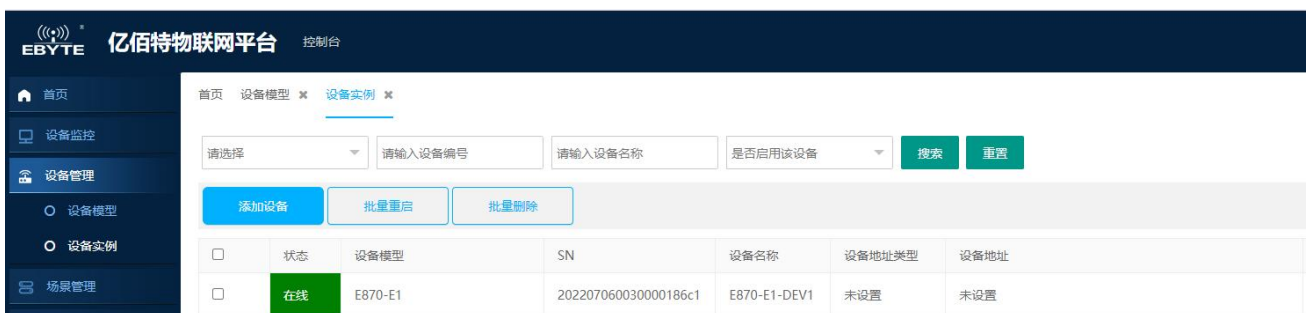
④Click "Device Instance", enter and click "Add Device"



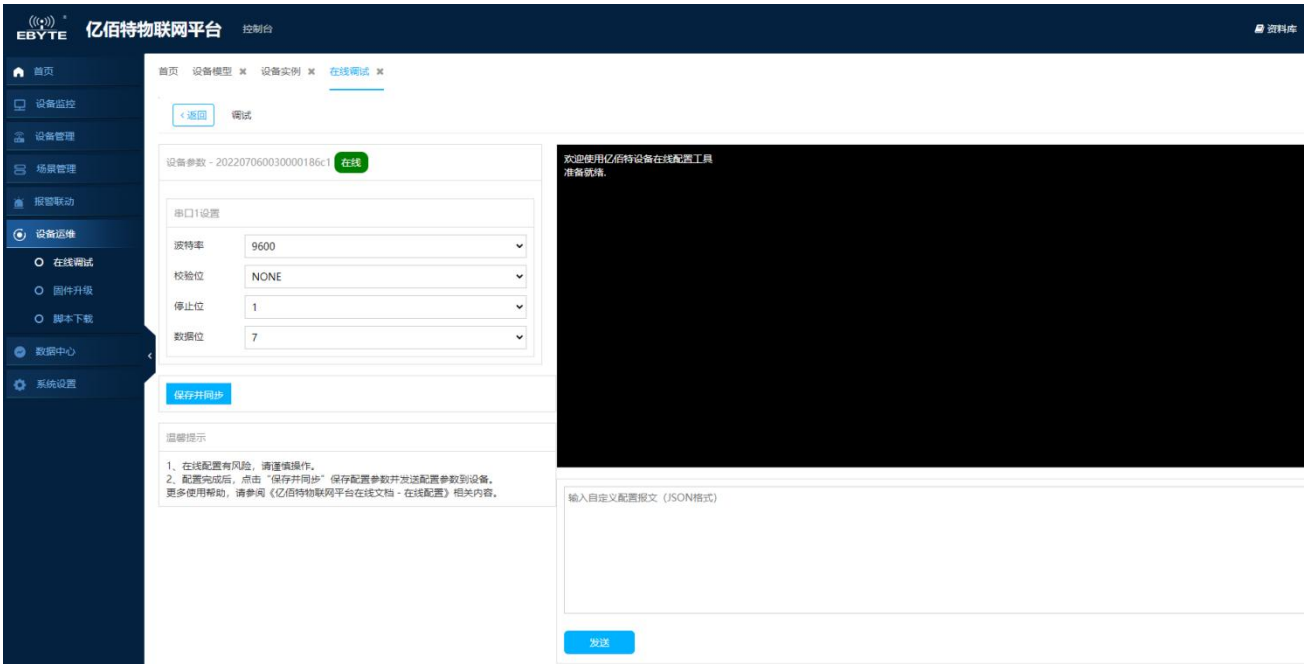
⑤The E870-E1 model created before "Device Model" select, then enter the SN code on the back of the device, fill in other parameters according to your own needs, and click "OK to add" to create the device.



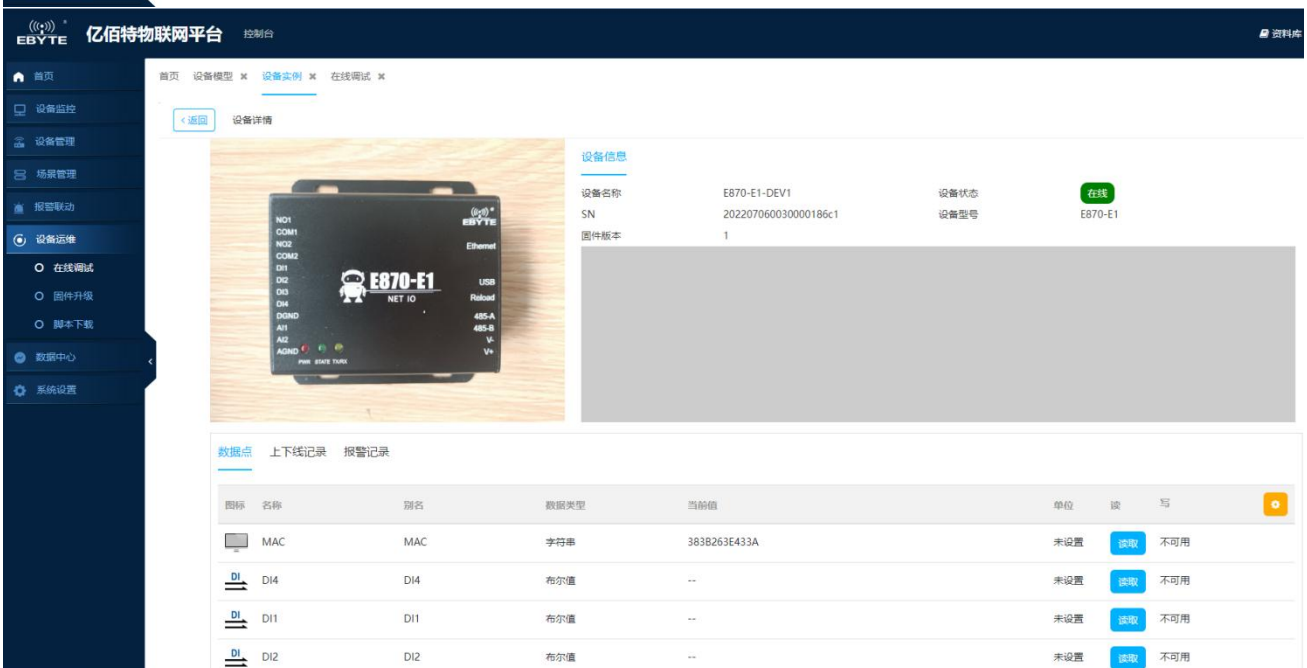
⑥Restart the device, and when the STATE light of the device is always on, you can see that the device is online on the platform.



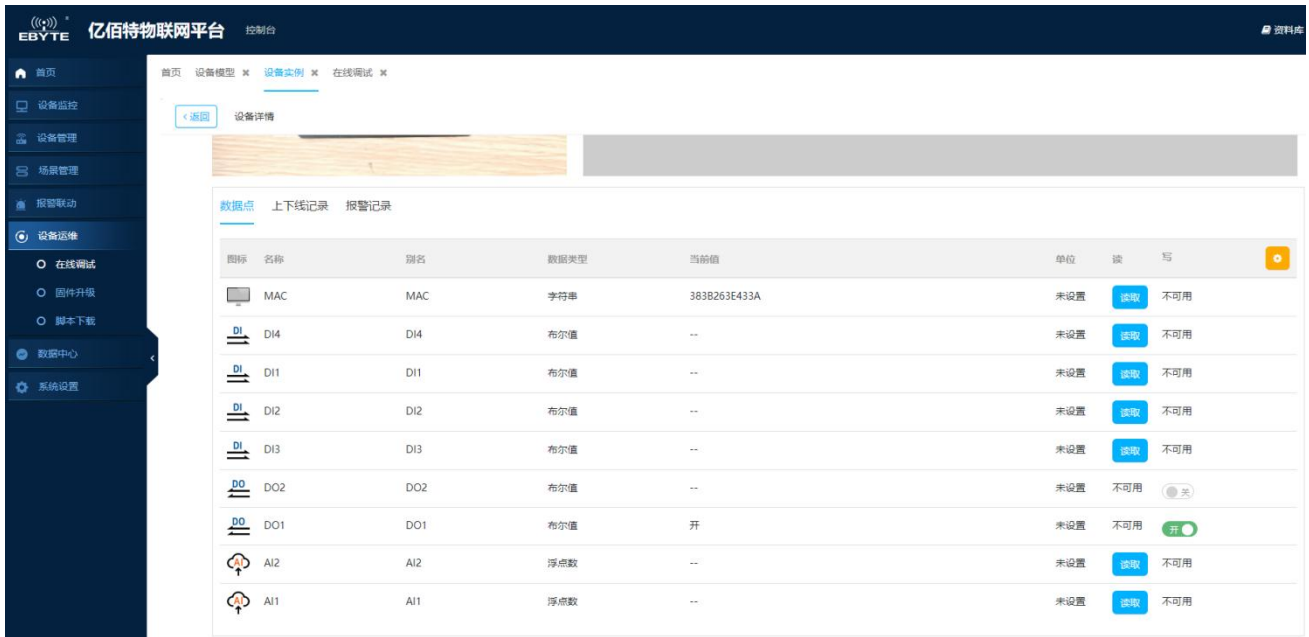
⑦Click "Device Operation and Maintenance", "Online Debugging" on the platform, and click "Debug" behind the device to enter the device debugging interface. Enter the corresponding command to control the device.



⑧Or click "Device Instance" and click "Device Details" of the online device, you can see the information of the device data points in the device details, and you can read the data or operate the device on the interface.



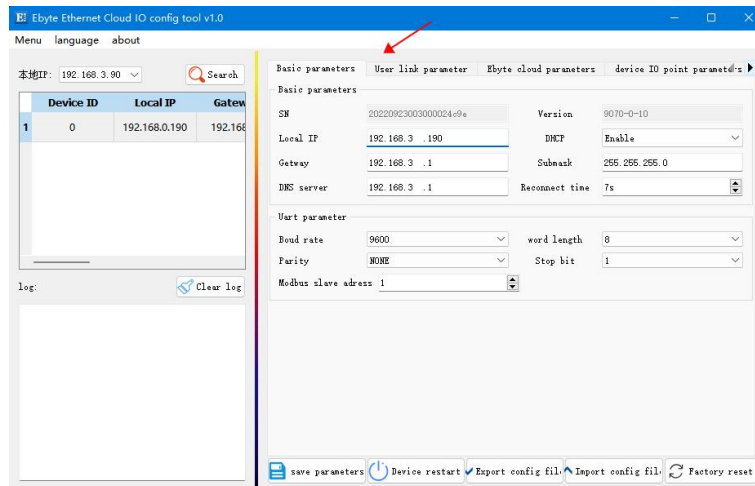
Finally, click the DO control button to execute the DO output to the device;



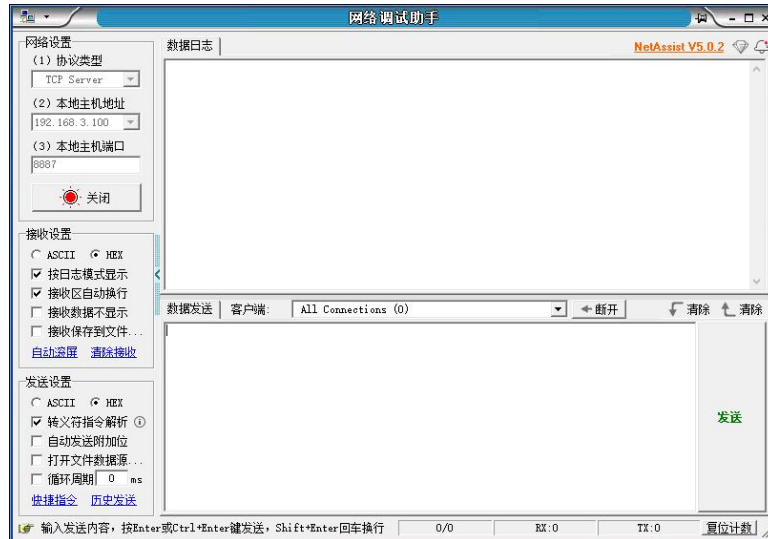
2.2.2. Connect to the self-built serve

Step 1: Connect the network cable and power supply (DC 8-28V) to ensure that the device and the PC are in the same local area network environment;

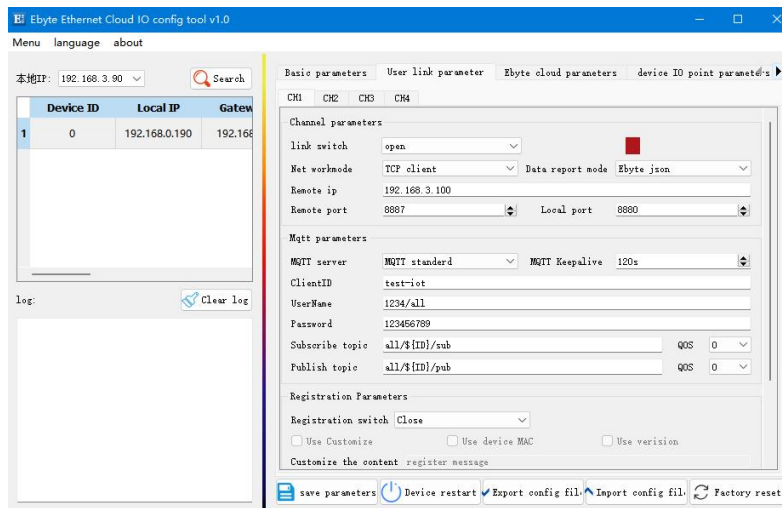
Step 2: Open the host computer, click "Search Device", "Basic Parameters" to configure the network and serial port parameters, the device uses dynamic IP by default, it is recommended to connect directly to the PC under the same router:



Step 3: Use "NetAssist" to build a user server:



Step 4: Fill in the correct server parameters and configure it as TCP client mode, destination address, destination port, etc., as shown in the following figure:



Step 5: After configuring the parameters, save and restart. When the STATE light is always on, the device has been connected to the server platform normally, waiting for the device edge to collect parameters to report.



2.2.3. AI Analog input connection

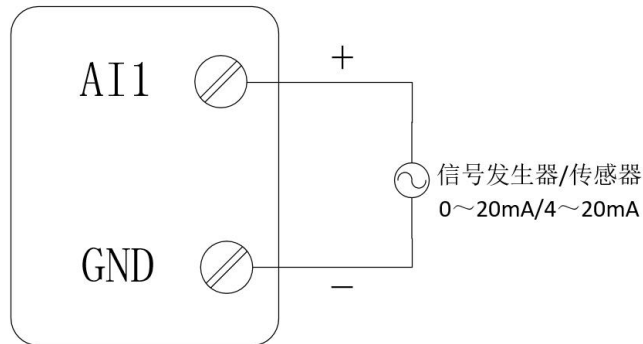
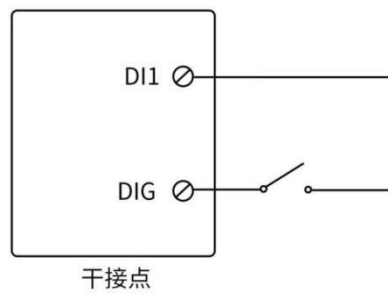


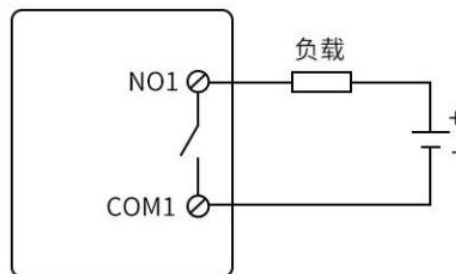
Figure 7 Schematic diagram of AI acquisition connection

2.2.4. DI Switch input connection



DI acquisition connection diagram

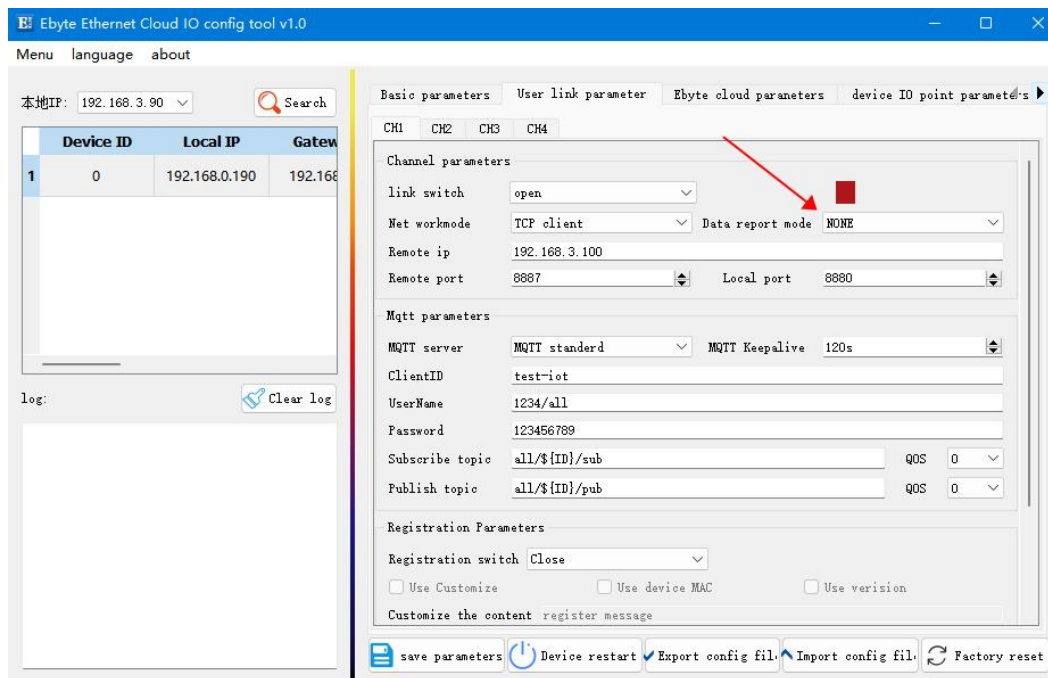
2.2.5. Relay output connection



DO output connection diagram

2.3 Use of transparent transmission

Select channel 1 to configure TCP/UDP transparent transmission, fill in the target server parameters, select TCPC mode, target address 192.168.3.100:8887 (users can configure it as their own IP server), target port 8887 (if using their own IP, fill in the corresponding The port of the server) and other parameters remain default, click Exit Configuration to enter the transparent transmission mode.



Connect the RS485 interface, open the serial port assistant (XCOM) and the network debugging assistant (NetAssist), and directly send the transparent data "E870-E1_TSET", which can be used as a serial port server:

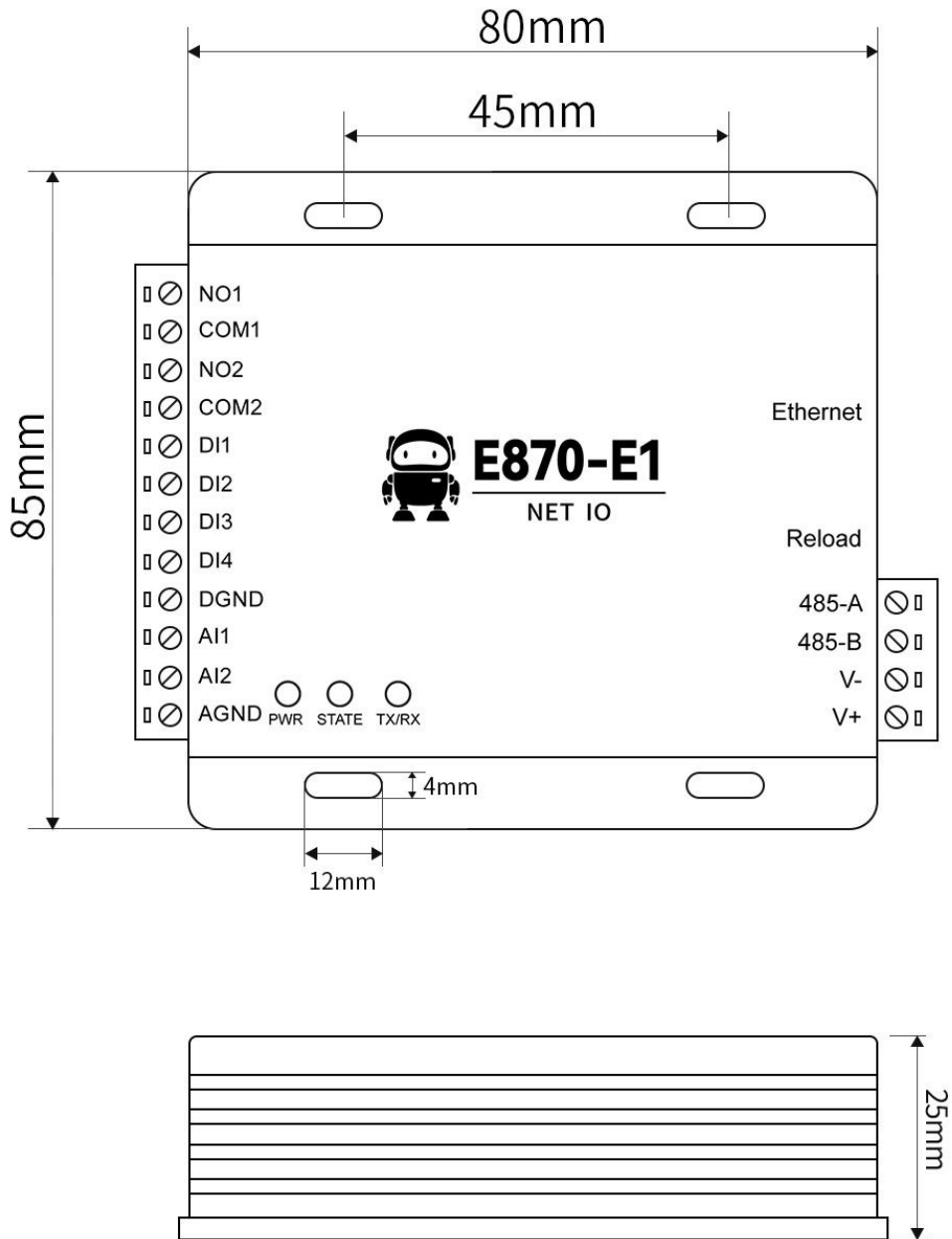


Chaper 3 Technical Indicators

3.1 Specifications

Category	Name	Parameters
power supply	Working voltage	DC 8~28V
	Power indicator	Red LED indication
network port	RJ45	10/100 adaptive RJ45 Ethernet interface
serial port	Communication interface	RS-485
	Baud rate	9600bps(default)
	Protocol	"Ebyte Cloud Device Communication Protocol", transparent transmission
DI Input	Number of DI channels	4 way
	Input type	Default dry contact
	Collection frequency	1 kHz
AI Input	Number of AI channels	2 way
	Acquisition characteristics	single-ended input
	Input type	0-20mA(default)/4-20mA
	AI acquisition accuracy	3‰
	Collection frequency	10Hz
DO Output	Number of DO channels	2 way
	DO output type	A type relay
	DO output mode	Level output, pulse output
	Relay contact capacity	DC: 30V/7A、AC: 250V/7A
Others	Product weight	135±5g
	Operation Temp/Humi	-40 ~ +85°C、5% ~ 95%RH(no condensation)
	Installation method	Positioning hole installation

3.2 Mechanical dimension drawing



3.3 Port Description



No.	Label	Explanation
1	V+	Positive pole of power input terminal, DC 8V~28V
2	V-	Negative pole of power input terminal, DC 8V~28V
3	485-B	RS485 interface B is connected to the external device B interface
4	485-A	The RS485 interface A is connected to the external device A interface
5	Reload	Factory reset button
6	Ethernet	RJ45 Ethernet interface
7	NO1	Relay 1 normally open pin, used with the common terminal of relay 1
8	COM1	Common terminal of relay 1, used in conjunction with the normally open pin of relay 1
9	NO2	Relay 2 normally open pin, used in conjunction with the common terminal of relay 2
10	COM2	Common terminal of relay 2, used in conjunction with the normally open pin of relay 2
11	DI1	Switch input channel 1
12	DI2	Switch input channel 2
13	DI3	Switch input channel 3
14	DI4	Switch input channel 4
15	DGND	Switch input ground
16	AI1	Analog input channel 1
17	AI2	Analog input channel 2
18	AGND	Analog input ground

3.4 LED Indicator Description

Label	Color	Explanation
PWR	Red	Power indicator
STATE	Green	Blinking slowly, connecting to the server
		Fast blinking, waiting for network cable or waiting for dynamic IP acquisition
		Steady on, the server is connected
DATA	Yellow	Blinking: Server interacts with serial port data

【Note】

Indicator status during firmware upgrade:

Waiting for the upgrade (host computer, serial port), STATE and TX/RX flash alternately, if the upgrade package is not sent within 3s, the upgrade wait is exited;

Upgrading, STATE and TX/RX flash alternately slowly;

3.5 Serial port description

The serial port supports the following parameter configurations:

Project	Parameters
Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400
Data bits	8
Check bit	NONE、ODD、EVEN
Stop bit	1、2

Chapter 4 Product function introduction

4.1 DO Output

Two-way A-type relay outputs are used, and 3.81mm phoenix terminals are used to lead out normally open contacts and common points respectively, which can shut off AC 250V/7A and DC 30V/7A at most.

It can be turned on or off to switch input DO to collect signals and report actively. The active report function of DO supports configuration change report, period, change report + period to realize the device's active report function;

Periodic report: report the current status according to the configured time period, the time interval can be 1-65535, unit: minute;

Change reporting: that is, when the DO status changes, the DO status is reported once, and the range needs to be set to a non-zero value.

4.2 DI input

Support 4-way dry contact acquisition, switch input DI acquisition signal can be turned on or off to actively report, DI's active reporting function implementation conditions support configuration change reporting, period, change reporting + period to realize the active reporting function of the device;

Periodic report: report the current status according to the configured time period, the time interval can be 1-65535, unit: minute;

Change reporting: that is, when the DI status changes, the DI status is reported once, and the range needs to be set to a non-zero value.

4.3 AI input mode

It supports 2-channel current signal acquisition, adopts high-resolution ADC, and the acquisition accuracy can reach 3%. The factory default configuration is 0-20mA. It supports configuring the acquisition range (register address is 0x044c) and obtaining the current current signal (floating point) through the Modbus RTU command. : register is 0x00c8, integer: 0x0064), the maximum current cannot exceed 25mA (more than 25mA will cause equipment damage);

Support mode 0x00 (0-20mA): directly output the collected current signal;

Mode 0x01 (4-20mA): The current input device below 3.5mA is used for disconnection detection to output 0mA, and the current greater than 3.5mA is directly output;

Take the Modbus address of the device as 1 as an example (the edge acquisition function needs to be turned off to use this function, and the following commands are in hexadecimal):

Read the collected current signal (integer):

Send: 01 04 00 64 00 02 30 14

Return: 01 04 04 0F A0 13 88 F5 E4 (1st road: 4000uA, 2nd road: 5000uA)

Read the collected current signal (floating point):

Send: 01 04 00 C8 00 04 30 14

Return: 01 04 08 40 80 00 00 40 A0 00 00 B4 17 (The first channel: 4mA, the second channel: 5mA)

Configured as 0-20mA acquisition mode (the first and second channels are configured at the same time):

Send: 01 10 04 4C 00 02 04 00 00 00 00 C5 0A

Configured as 4-20mA acquisition mode (the first and second channels are configured at the same time):

Send: 01 10 04 4C 00 02 04 00 01 00 01 55 0A

[Note] Floating point numbers are stored in IEEE754 single-precision big-endian format (ABCD), for example, 12.5mA uses hexadecimal number 0x41480000;

The switch can be turned on or off to input AI acquisition signals to actively report, and the conditions for the realization of AI's active reporting function support configuration change reporting, periodical, change reporting+periodic realization of the device's active reporting function;

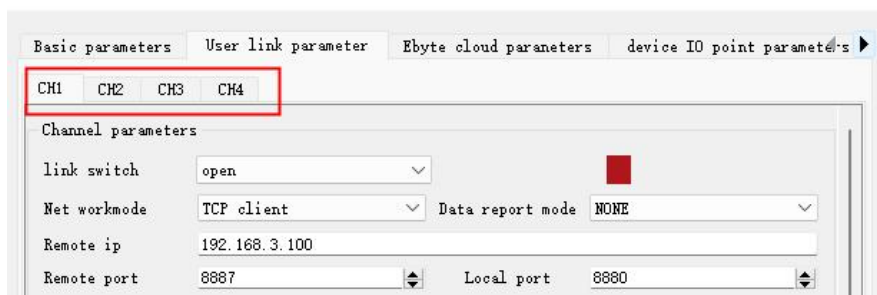
Periodic report: report the current status according to the configured time period, the time interval can be 1-65535, unit: minute;

Change reporting: that is, when the AI status changes, the AI status is reported once. The range condition is a minimum configuration of five decimal places supported.

4.4 Network transparent transmission mode

This product supports TCP client (TCPC) and UDP client (UDPC) transparent communication.

In this mode, the user's serial device can send data to the specified server on the network through this device. The device can also accept data from the server, and forward the information to the serial device, supporting four-way independent configuration.



Users do not need to pay attention to the data conversion process between serial port data and network data packets, and only through simple parameter settings, the data transparent communication between the serial port device and the network server can be realized.

4.5 MQTT Mode

Set the corresponding MQTT parameters, including ClientID, server address, port, username, password, and topics to publish and subscribe to. MQTT connection can be realized.

(1) Product key, device name, device key, device ID, product ID, authentication information, device name, client ID, user name, password, subscription, and publishing can be configured with a maximum of 128Bit, and Alibaba

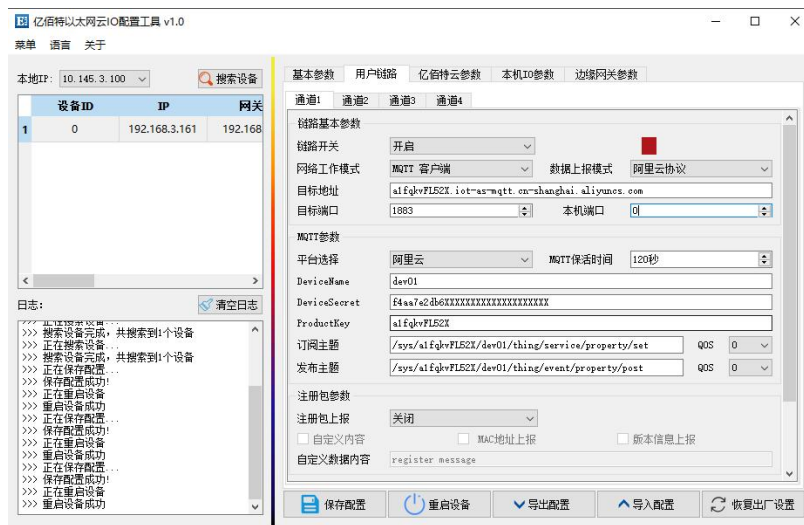
- Cloud product key is 64Bit ;
- (2) The maximum address can be configured with 128Bit domain name;
- (3) Support 0, 1 message release level;

4.5.1 Alibaba Cloud

Supports the use of Alibaba Cloud's "Three Elements" to directly connect to the server to obtain the "Three Elements" required to connect to Alibaba Cloud, as shown in the figure:

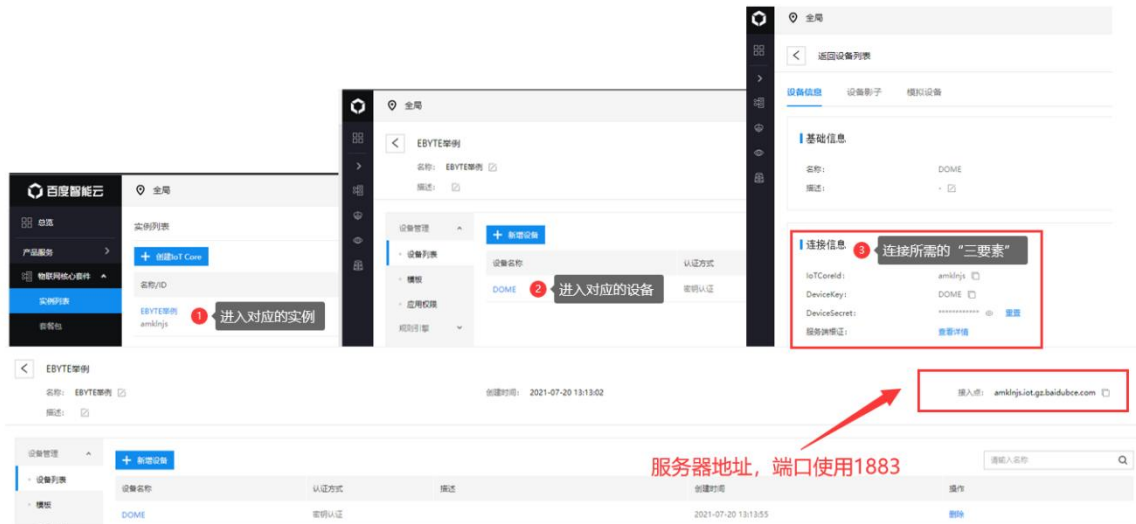


Configure the device connection parameters, as shown in the following figure:

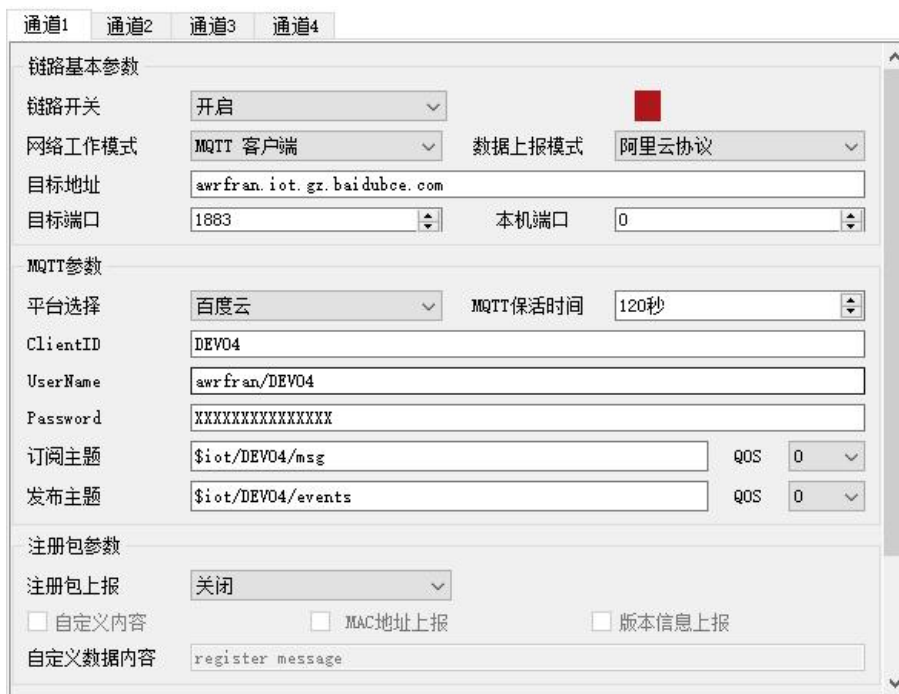


4.5.2 Baidu Cloud

Support the use of Baidu Cloud "Three Elements" to directly connect to the server to obtain the "Three Elements" required to connect to Baidu Cloud, as shown in the figure:



Configure the device connection parameters, as shown in the following figure:



Subscription and publishing need to establish a rule engine to realize the return of data. First, a message template needs to be established, as shown below:



Create a rule engine for data return, as shown in the following figure:

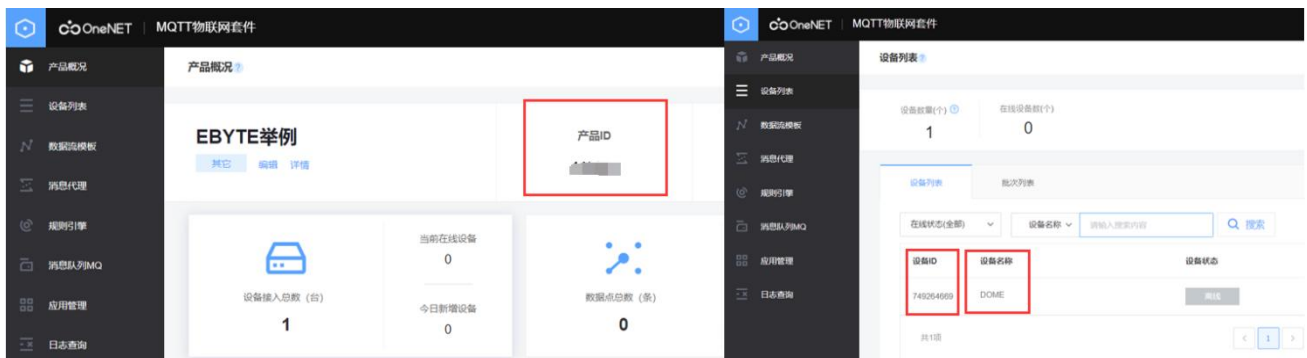


Enable the rule engine, restart the device (re-subscribe, publish), and the communication test is as follows:

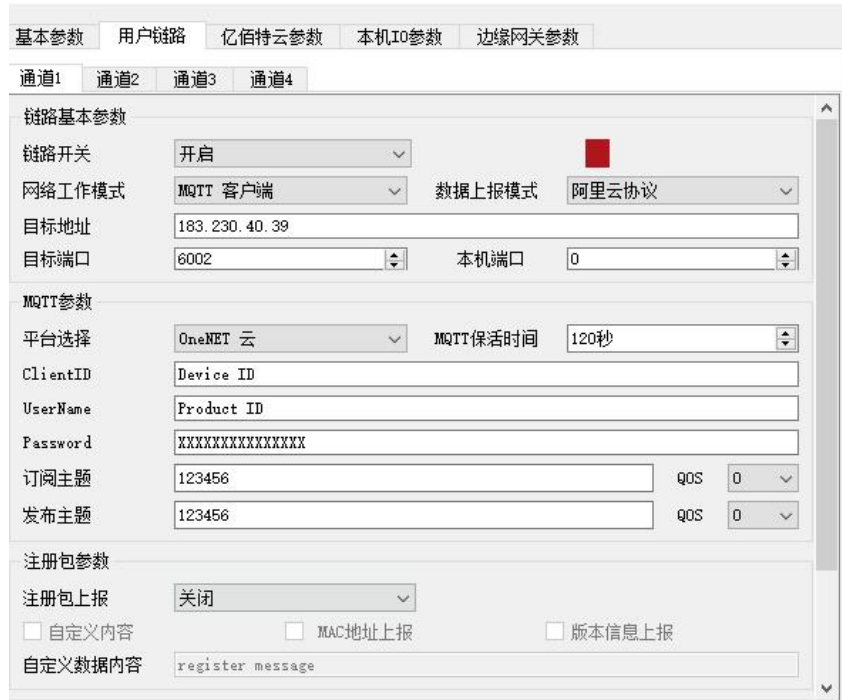


4.5.3 OneNET

Support the use of OneNET's "three elements" to directly connect to the server to obtain the "three elements" required to connect to OneNET, as shown in the figure:



Configure the device connection parameters, as shown in the following figure:



OneNET supports the automatic generation of topics with subscription and publishing attributes. Data can be returned only by subscribing and publishing the same address. Communication test:



4.5.4 Standard MQTT3.1.1

The standard MQTT3.1.1 connection here takes Tencent's standard MQTT3.1.1 server as an example. The "three elements" described in the standard can be obtained from the Tencent server as shown in the following figure:

```
Client ID      ELD0ERCUKDDEV01 复制
MQTT Username ELD0ERCUKDDEV01;12010126;B3GLI;1667511713 复制
MQTT Password 80ff56c...5fca10b;hmacsha256 复制
```

The parameter configuration description is shown in the following figure:

Configure the corresponding subscription publishing address, and use the platform online debugging to send data for communication testing:

Chapter 5 Special Function

5.1 Ebyte Cloud Modbus to JSON

It supports converting the Modbus RTU data of the serial port into the JSON message format of the Ebyte cloud device communication protocol for data transmission and reception.

5.2 Alibaba Cloud Modbus to JSON

It supports converting the serial port Modbus RTU data into the JSON message format of Alibaba Cloud device communication protocol for data sending and receiving.

5.3 Edge acquisition

Support 20 external data points collection, data points can be established through the host computer or Ebyte cloud device communication protocol, the server can read or set data points by sending JSON messages through Ebyte cloud communication protocol or Alibaba cloud protocol, and then The device automatically converts JSON commands to Modbus commands for setting or reading, and then reports the return value in JSON format.

After the data points are set, the device will poll and read all data points (enable) every one second. If the external data points are set to report changes, once the data points are changed, they will actively report the status of the data points or value.

5.4 Registration packet

In the network transparent transmission mode (TCPC/UDPC), the user can choose to let the device send the registration packet to the server. The registration package is used to allow the server to identify the source of the data, or as a password to obtain authorization for server functions. The registration packet can be sent when the device establishes a connection with the server, or the registration packet data can be spliced at the front end of each data packet as the header of a data packet. The data of the registration package can be MAC, FW version information or custom registration data (support ASCII configuration of custom registration package, ASCII can be configured up to 128Bit).

5.5 Heartbeat packet

In the network transparent transmission mode (TCPC/UDPC), the user can select the module to send heartbeat packets. The main purpose of sending to the network is to keep alive with the server, so that devices that are idle

(will not send data to the server for a long time) remain connected to the server. The data of the heartbeat packet can be MAC, FW version information or custom registration data (supports ASCII configuration of custom registration packets, ASCII can be configured with a maximum of 128Bit).

5.6 Firmware upgrade

Firmware upgrade is to write firmware through the host computer, and supports upgrade through the use of serial ports and network;

5.6.1 Network Upgrade:

Step 1: Select the network card connected to the device;



Step 2: Open the host computer and select "Device Upgrade Assistant" under "Menu";



Step 3: Select the product firmware provided under the corresponding product details on the official website;



Step 4: Click to search for devices, and click "Stop Search" after finding the device;



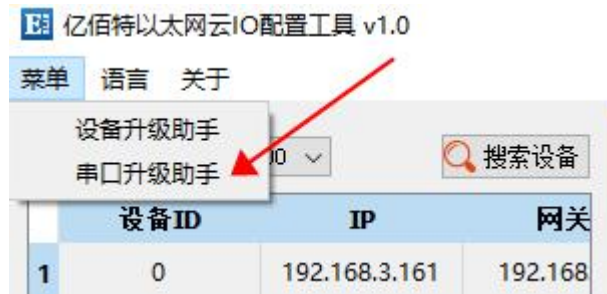
Step 5: Select the device to be upgraded and click Upgrade;



Wait for the upgrade to complete;

5.6.2 Serial port upgrade

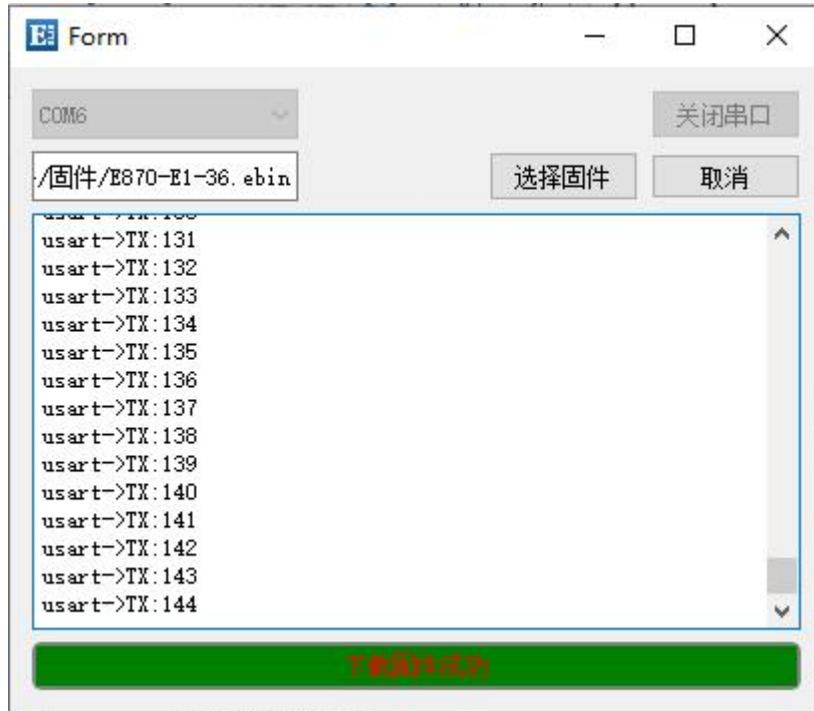
Step 1: Use USB to RS-485 to connect the serial port of the device, open the host computer, and select "Serial port upgrade assistant" under "Menu";



Step 2: Select the serial port number connected to the device, open the serial port, import the upgrade file (the product firmware provided under the product details on the official website), and click to start the upgrade;



Step 3: Disconnect the power of the device, press and hold the "Reload" of the device to turn on the power, and wait for the device to upgrade;



5.7 Hardware is restored to factory default

To restore the factory default parameters, after power on, press the Reload button for 5~10S until all STATE flashes rapidly, and then release, the device parameters can be restored to the factory default parameters, and the device will automatically restart.

5.8 RTU slave

When the edge acquisition function is turned off, the device can be used as an RTU slave device, receive Modbus RTU commands sent by the host device (HMI/SCADA, etc.) and collect the IO status of the control device; The Modbus address of the device in factory mode is: 1.

The function register table is as follows:

DO related						
Register function	Register address	Register type	Number	operate	Data Range/Remarks	Related function codes
DO status	0x0000	coil	2	RW	0: release; 1: suction; Write control value (0/1) to operate device DO output	R: 0x01 W: 0x05、0x0F
DI related						

Register function	Register address	Register type	Number	operate	Data Range/Remarks	Related function codes
DI status	0x0000	Discrete input	4	R	0: No DI input; 1: DI input exists; The storage device DI captures the discrete input state	R: 0x02
AI related						
Register function	Register address	Register type	Number	operate	Data Range/Remarks	Related function codes
AI integer value	0x0064	input register	2	R	0-20000, unit uA	R: 0x04
AI floating point	0x00C8	input register	2	R	0-20, unit mA; 4-byte IEEE754 single-precision floating-point value, big-endian storage ABCD	R: 0x04
AI filter parameters	0x04B0	holding register	1	RW	Analog input filter parameter, the range is 1-16, the smaller the number, the more sensitive, the larger the more stable, the default is 6	R: 0x03 W: 0x06、0x10
AI sampling range	0x044C	holding register	4	RW	AI channel sampling range 0x0000: 0 to 20 mA 0x0001: 4-20mA	R: 0x03 W: 0x06、0x10
Device property related						
Register function	Register address	Register type	Number	operate	Data Range/Remarks	Related function codes
Modbus address	0X07E8	holding register	1	RW	Modbus address, 1~247 configurable addresses	R: 0x03 W: 0x06
Module restart	0x07EA	holding register	1	W	Write 0xFE55 to restart	W: 0x06
baud rate	0x0834	holding register	1	RW	See the baud rate code table, Default is 9600 (0x0003)	R: 0x03 W: 0x06、0x10
Check digit	0x0836	holding register	1	RW	0x0000 no checksum (default) 0x0001 odd parity 0x0002 Even parity	R: 0x03 W: 0x06、0x10
Stop bit	0x0837	holding register	1	RW	0x0000 1bit(default) 0x0001 2bit	R: 0x03 W: 0x06、0x10

Chapter 6 Configuration methods

Support the configuration of the host computer and the "Ebyte Cloud Device Communication Protocol";

Chapter 7 About customization

- ◆Support various public cloud and private cloud platforms to customize IoT gateway access;
- ◆Supports the customization of various transmission protocols such as Json, Modbus, and private protocols;
- ◆Support MQTT, TCP, UDP, HTTP various transmission protocol equipment customization;
- ◆Ethernet, WiFi, 4G, 433M and other gateways;
- ◆Customization of switch value, analog value and various sensors connected to cloud platform;
- ◆LoRa, Zigbee, BLE Mesh, WiFi and other local area network access cloud platforms;
- ◆Support customized explosion-proof, high-temperature, high-power industrial-grade communication equipment;
- ◆The company has its own SMT production line, which supports batch customers to customize product appearance and model identification.

Revise history

Version	Revision Date	Revision Notes	Maintainer
1.0	2022-09-27	Initial version	LC

About US



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