

EdgeIO



BL206 BL206Pro User Manual

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Shenzhen Beilai Technology Co.,Ltd

Website: <https://www.bliiot.com>

Preface

Thanks for choosing BLIIoT Distributed I/O. These operating instructions contain all the information you need for operation of BL206 and BL206 Pro.

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Disclaimer

This document is designed for assisting user to better understand the device. As the described device is under continuous improvement, this manual may be updated or revised from time to time without prior notice. Please follow the instructions in the manual. Any damages caused by wrong operation will be beyond warranty.

Revision History

Update Date	Version	Description	Owner
2021-10-13	V1.0	First Edition	ZLF
2022-07-01	V1.1	Add Profinet, EtherCAT protocol, add platform, logic control functions	HYQ
2023-07-27	V1.1	Change Model name	HYQ
2023-10-24	V1.2	Add BL203, BL206, BL207 description	HYQ
2023-10-24	V1.2	User manual split by model	HYQ

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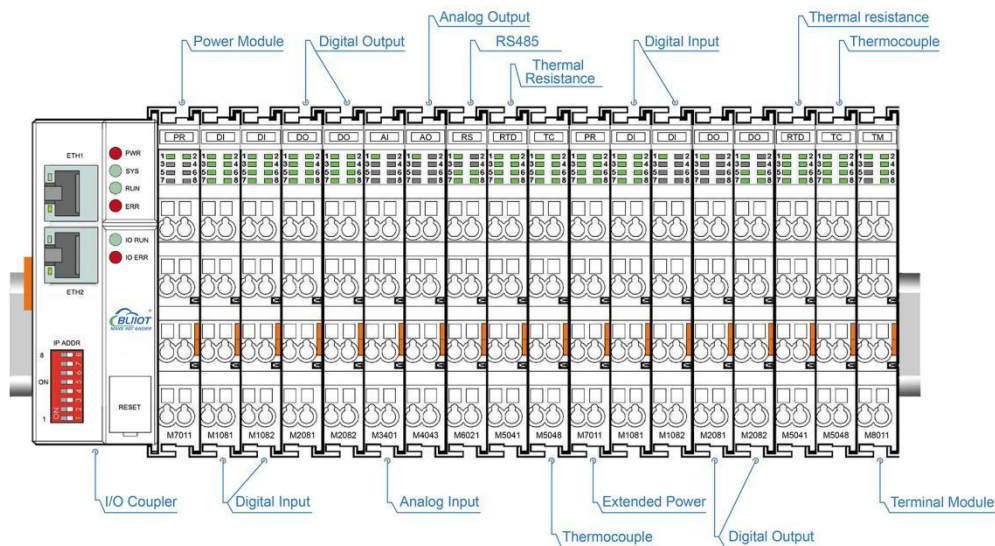
1 Product Introduction

1.1 Overview

The BL206Pro EdgeIO controller is a data acquisition and control system based on a powerful 32-bit microprocessor design with Linux operating system, supports Modbus, MQTT, OPC UA protocols for quick access to on-site PLC, DCS, PAS, MES, Ignition, and SCADA as well as ERP systems, as well as quick connectivity to a number of cloud platforms such as AWS Cloud, Thingsboard, Huawei Cloud, and Ali Cloud.

The I/O system supports programmable logic control, edge computing, and customized applications, it is widely applicable to a variety of IIoT and industrial automation solutions.

The BL206Pro distributed I/O system consists of 3 parts: Controller, I/O modules and terminal module.



The communication between the I/O and the field devices (eg PLC) takes place via the Ethernet port of the controller, and the communication between the controller and the I/O modules takes place via the local bus. The two Ethernet ports are internally integrated with a switch function, which can establish a linear topology without the need for additional switches or hubs.

The system needs to use the power module to provide 24VDC system voltage and 24VDC field voltage. Since two independent power supplies are used, the field

voltage input interface and system voltage input interface of BL206Pro controller are electrically isolated from each other.

When assembling fieldbus node modules, each I/O module can be arranged in any combination, and it is not required to be grouped by module type.

A terminal module must be plugged into the end of a fieldbus node to ensure correct data transmission.

1.2 Typical Application

High reliability, easy expansion, easy setting, and convenient network wiring, these capabilities let users efficiently adapt the BL206Pro I/O system to a variety of complex industrial solutions.

The I/O system is widely applicable to a variety of industrial solutions, such as Internet of Things, smart factories, smart cities, smart medical care, smart homes, smart transportation, data center power environment monitoring, electric power, oil monitoring, automobiles, warehousing and logistics and other industries.

1.3 Features

- Each I/O system can have a maximum of I/O 32 modules.
- Support Modbus, MQTT, OPC UA protocols.
- Support Alibaba Cloud, Huawei Cloud, AWS Cloud, Thingsboard, Ignition, etc.
- Support programmable logic control, edge computing.
- The field side, the system side and the bus side are electrically isolated from each other.
- Support 2 X RJ45 interface, integrated switch function, can establish line topology, without the need for additional switches or hubs.
- Convenient wiring connection technology, screw-free installation.

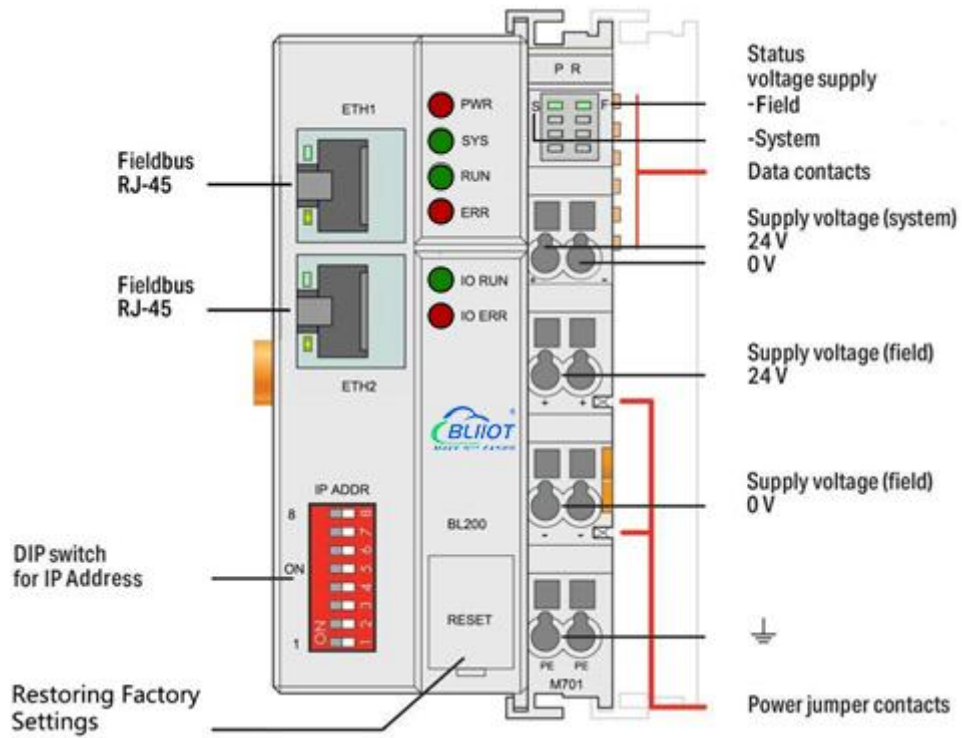
1.4 Model List

Description	Model	Channel	Type
Modbus-TCP I/O Coupler	BL200	/	/
Profinet I/O Coupler	BL201	/	/
EtherCAT I/O Coupler	BL202	/	/
Ethernet/IP I/O Coupler	BL203	/	/

OPC UA EdgeIO Controller	BL205	/	/
MQTT EdgeIO Controller	BL206	/	MQTT
MQTT+OPC UA+Modbus TCP	BL206Pro	/	MQTT, OPC UA, MQTT
BACnet/IP I/O Coupler	BL207	/	/
BACnet/IP+MQTT+OPC UA	BL207Pro	/	/
8CH DI	M1081	8	NPN (low level trigger)
8CH DI	M1082	8	PNP (high level trigger)
16CH DI	M1161	16	NPN (low level trigger)
16CH DI	M1162	16	PNP (high level trigger)
4CH DO	M2044	4	Relay
8CH DO	M2081	8	PNP
8CH DO	M2082	8	NPN
16CH DO	M2161	16	PNP
16CH DO	M2162	16	NPN
4CH AI Single-Ended	M3041	4	0-20mA/4-20mA
4CH AI Single-Ended	M3043	4	0-5V/0-10V
4CH AI Differential	M3044	4	0-5V/0-10V
4CH AI Differential	M3046	4	±5V/±10V
4CH AO	M4041	4	0-20mA/4-20mA
4CH AO	M4043	4	0-5V/0-10V
4CH AO	M4046	4	±5V/±10V
2CH RTD	M5021	2	3Wire PT100
2CH RTD	M5022	2	3Wire PT1000
2CH RTD	M5023	2	4Wire PT100
2CH RTD	M5024	2	4Wire PT1000
4CH TC	M5048	4	TC(B/E/J/K/N/R/S/T)
2CH RS485	M6021	2	RS485
2CH RS232	M6022	2	RS232
1CH RS485, 1CH RS232	M6023	2	RS485+RS232
Power module	M7011	/	/
Terminal module	M8011	/	/

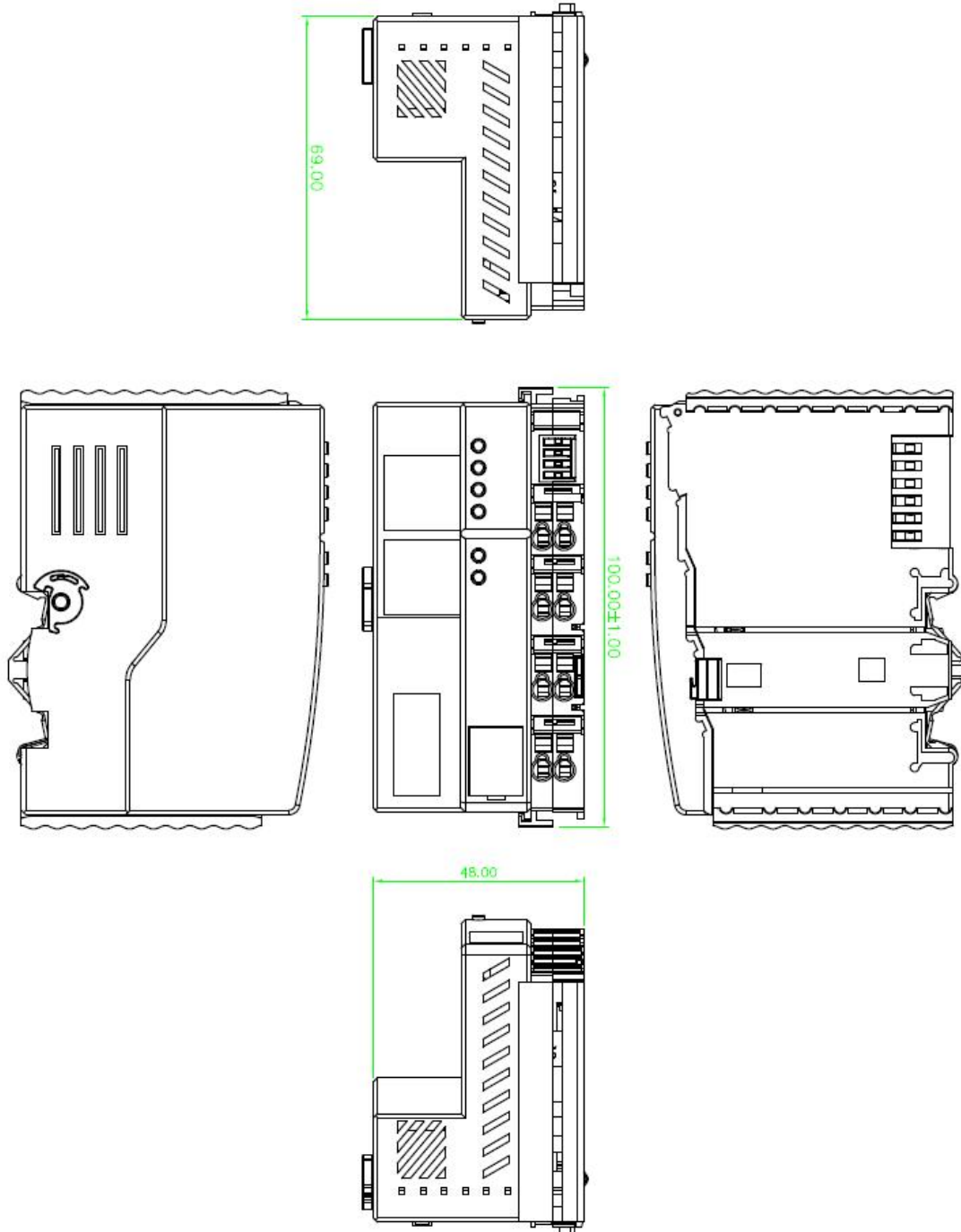
2 Hardware

2.1 I/O Controller



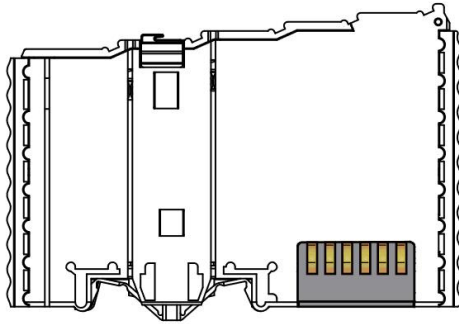
2.2 Dimension

Unit:mm



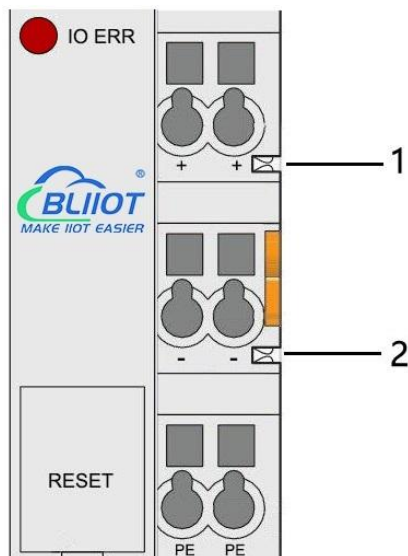
2.3 Data Contacts/Internal Bus

The communication between the I/O controller and the I/O modules, as well as the system power supply of the I/O modules are realized via the internal bus. The internal bus is made up of 6 data contacts, these gold-plated contacts are self-cleaning when connected.



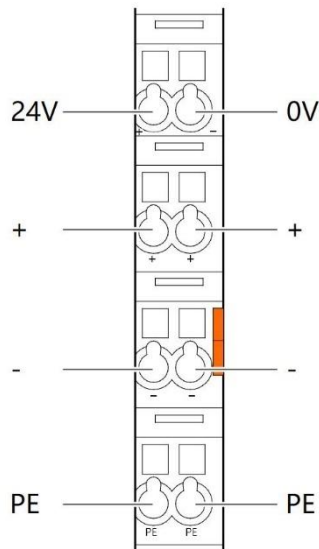
2.4 Power Jumper Contacts

The power module included with the controller has two self-cleaning power jumper contacts for powering the field side. This power supply has a maximum current of 10A across the contacts, current exceeding the maximum will damage the contacts. When configuring the system, it must be ensured that the above-mentioned maximum current is not exceeded. If it exceeds, a power expansion module needs to be inserted.



No.	Type	Description
1	Spring contact	Supply 24V to the field side
2	Spring contact	Supply 0V to the field side

2.5 Terminal Point



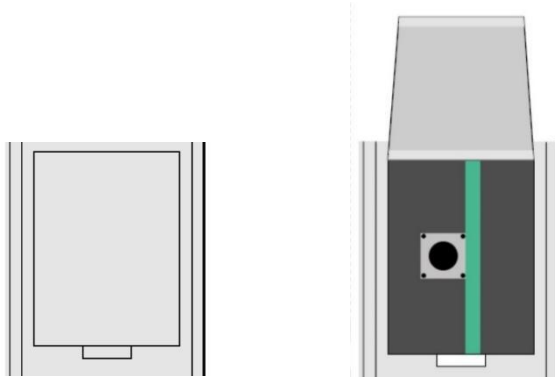
Name	Description
24V	System Power 24VDC
0V	System Power 0VDC
+	Connections Field Supply 24 VDC
+	Connections Field Supply 24 VDC
-	Connections Field Supply 0 VDC
-	Connections Field Supply 0VDC
PE	Grounding
PE	Grounding

2.6 Factory Reset

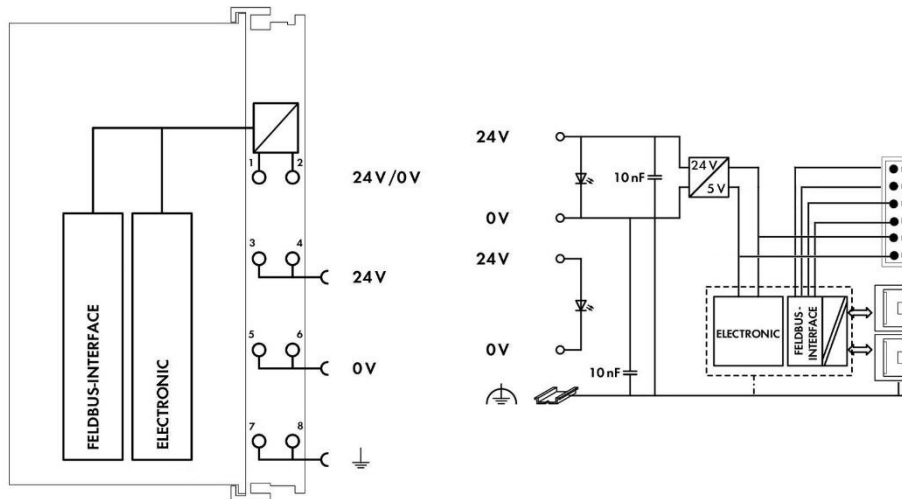
This reset button is used to restore the device configuration parameters to the factory state.

Operation steps:

1. When the device is running, open the flip cover;
2. Press and hold the button for more than 5 seconds, until all the LED lights go off, indicates reset successful, and then the device will automatically restart.



2.7 Electrical Schematic



3 Installation

3.1 Installation Sequence

All distributed controllers and I/O modules from Beilai Technology must be mounted on a standard DIN 35 rail.

Starting from the controller, the I/O modules are assembled from left to right, and the modules are installed next to each other. All I/O modules have grooves and power jumper contacts on the right side, to avoid assembly errors, I/O modules must be inserted from the right and top to avoid damage to the modules.

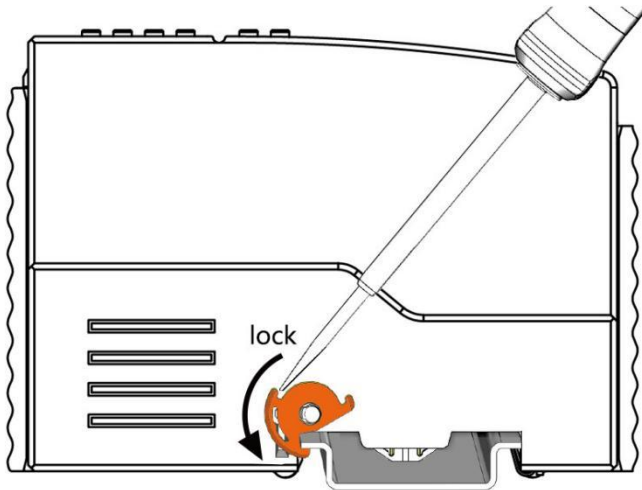
Utilizes a tongue and groove system to form a secure fit and connection. With the automatic locking function, the individual components are securely fixed on the rail

after installation.

Don't forget to install the terminal module! Always plug a terminal module (eg TERM) into the end of the I/O module to ensure correct data transmission.

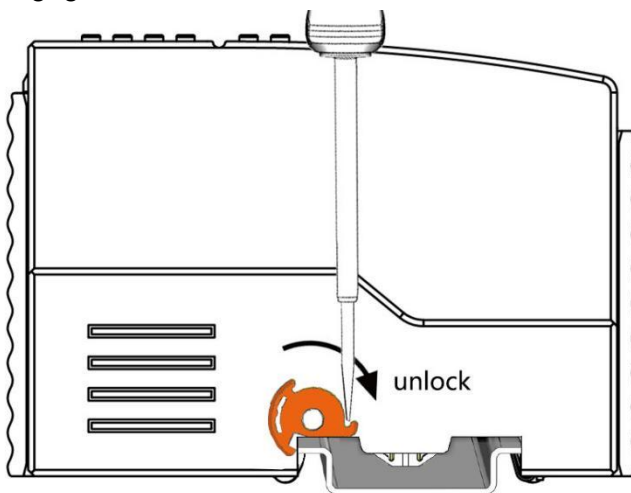
3.2 Install Controller

- 1.Snap the coupler onto the DIN rail first;
- 2.Use a tool such as a screwdriver to turn the locking cam until the locking cam engages the DIN rail.

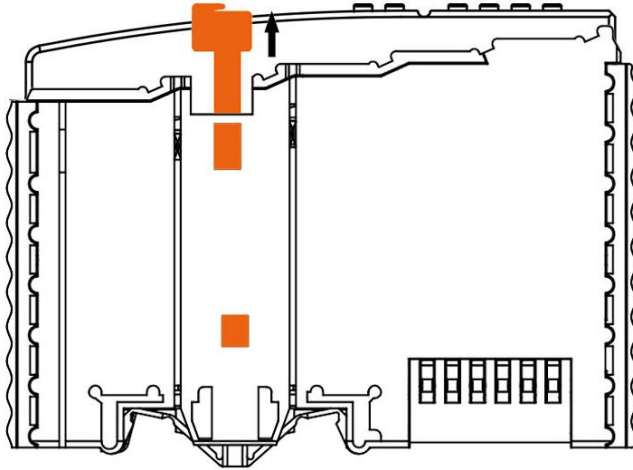


3.3 Remove Controller

- 1.Use a screwdriver to turn the locking disc cam until the locking cam no longer engages the rail.



- 2.Pull the release tab to remove the coupler from the assembly



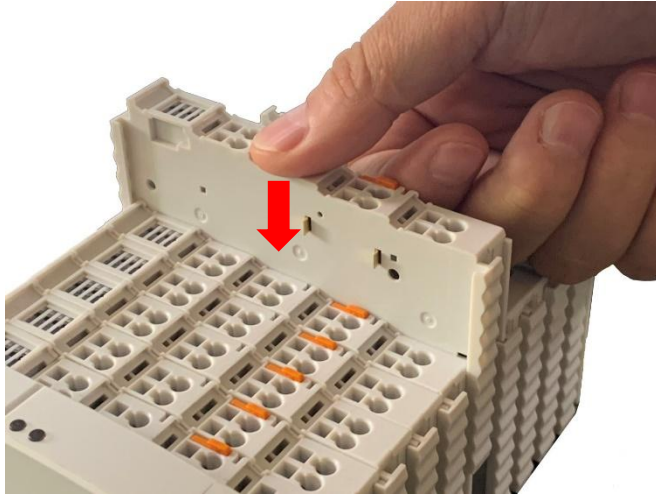
Data or power contacts are electrically disconnected from adjacent I/O modules when the controller is removed.

3.4 Insert I/O Modules

1. When inserting the module, make sure the tabs on the module line up with the grooves of the controller or other I/O module to which it is attached.



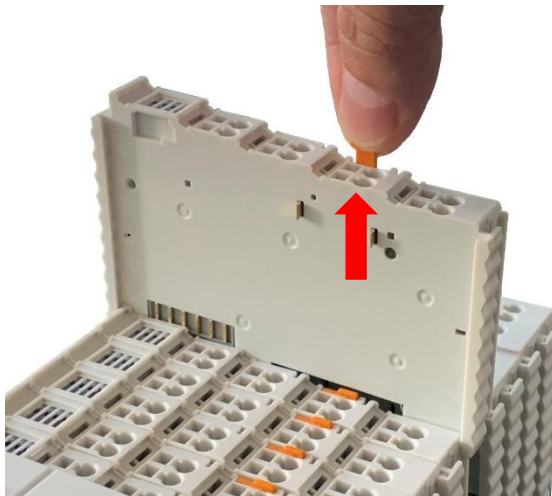
2. Press the I/O module into the assembly position until the I/O module snaps into the rail.



After the I/O module is installed, the electrical connection to the controller (or the previous I/O module) and the following I/O module is established via the data contacts and the power jumper contacts.

3.5 Remove I/O Modules

Pull up on the latch to remove the I/O module from the assembly.



When the I/O module is removed, the electrical connection to the data or power jumper contacts is disconnection.

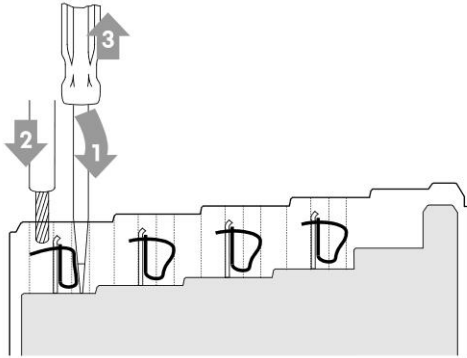
4 Device Connection

4.1 Wiring

CAGE CLAMP connection is suitable for solid, stranded and fine-stranded conductors. Only one wire can be connected to each CAGE CLAMP. If there is more than one wire,

it must be merged into a point before being connected.

1. Open the CAGE CLAMP by inserting the tool into the opening above the junction.
2. Insert the wire into the corresponding open connection terminal.
3. Once the tool is removed, the CAGE CLAMP closes and the wire is clamped firmly by the spring.



4.2 Power Supply

System and field voltages are supplied by power supply modules. The power supply module of the BL206Pro controller supplies power for the internal electronics of the controller and the I/O modules. If necessary (there are many I/O modules and the current is relatively high), it can also be provided through an independent power supply module.

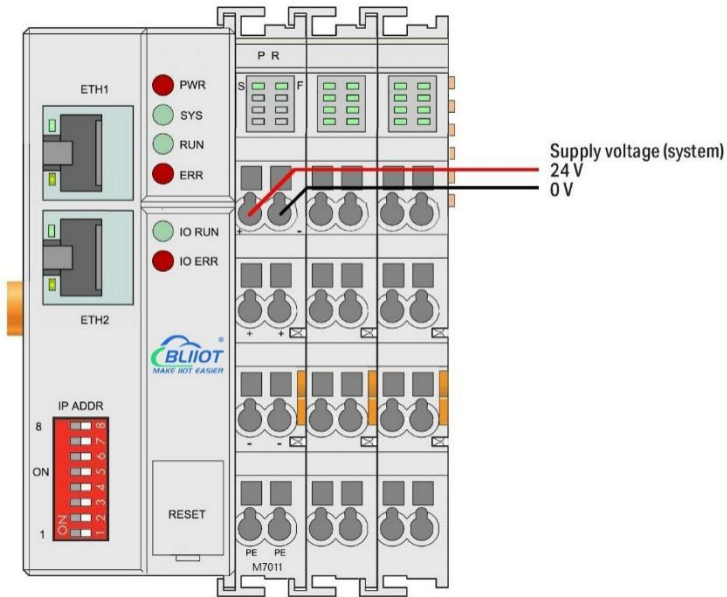
The fieldbus interface (Ethernet interface), system and field are galvanically isolated from each other.

4.2.1 System Power

BL206Pro controller require 24V DC system power, which is connected from the terminal of the power supply module. The 5V bus voltage required inside the system is converted from the 24V system voltage.

The power supply module only has proper fuse protection, please provide proper overcurrent protection externally.

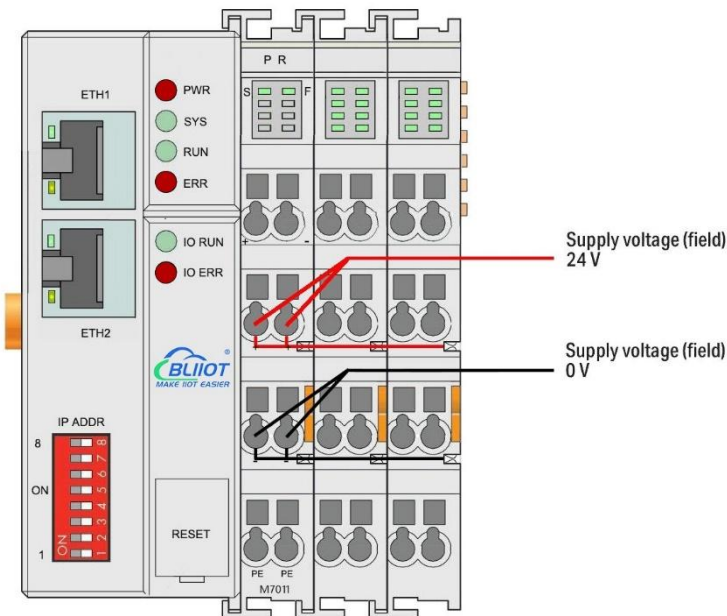
Please pay attention to matching the output power of the power supply module and the load power to avoid excessive load current.



4.2.2 On-site Power Supply

The power supply module supplies 24 VDC on the field side to power the sensors and actuators.

Field power supply only has proper fuse protection. Without overcurrent protection, electronic equipment can be damaged.



Field-side power is automatically output from the power jumper contact when the I/O module is connected. The continuous load current across the contacts of the power supply must not exceed 10 A.

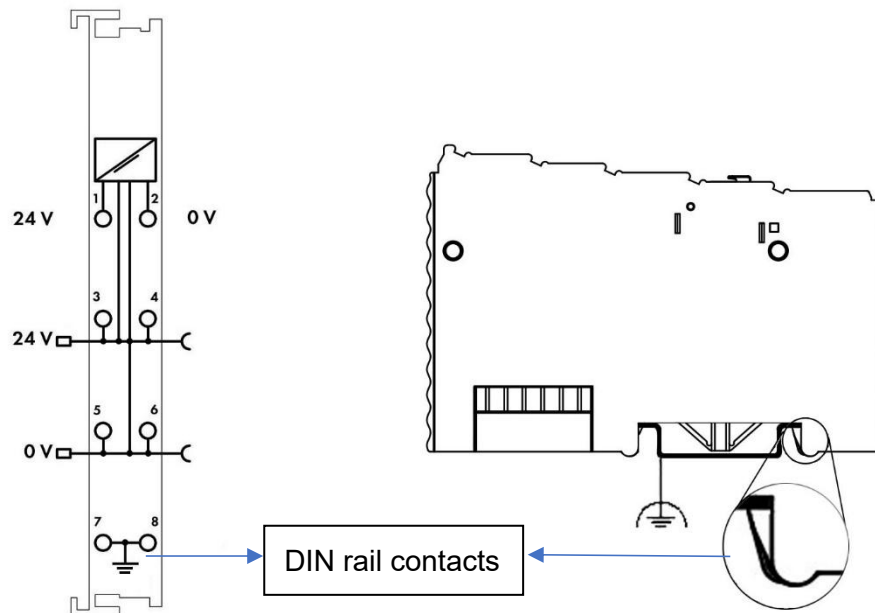
The problem of excessive load power on the system side or on the field side can be

solved by plugging in additional power supply modules. After plugging in an additional power supply module, a new voltage potential may appear on the field side.

In the case where electrical isolation is not required, the field power supply and the system power supply can use the same power supply.

4.2.3 Grounding

When installing the enclosure cabinet, the cabinet must be grounded, and the rail is electrically connected to the cabinet through screws to ensure that the rail is properly grounded. Grounding can increase resistance to electromagnetic interference. Some components in the I/O system have rail contacts that dissipate EMI onto the rail.



5 BL206 Series Controller

5.1 BL206 MQTT EdgeIO Controller

5.1.1 BL206 Overview

The BL206 controller supports MQTT protocol, and data can be uploaded to Alibaba Cloud, Huawei Cloud, AWS Cloud, Thingsboard, BLIIoT cloud, Custom MQTT cloud.

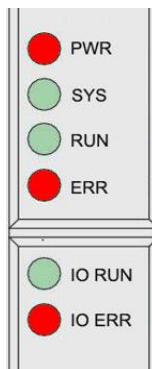
5.1.2 Technical Parameters

Name	Parameters	Description
System power	Input voltage(system)	24 VDC
	Input current(system)	MAX 500 mA@24VDC
	Power Efficiency	84%
	Internal bus voltage	5VDC
	Controller current consumption	MAX 300mA@5VDC
	I/O current consumption	MAX 1700mA@5VDC
	Isolation protection	500 V system/supply
Field power	Input voltage (field)	24 VDC
	Current carrying capacity (power jumper contacts)	MAX 10 ADC
Ethernet	Number	2 X RJ45
	Transmission medium	Twisted Pair STP 100 Ω Cat 5
	MAX cable length	100m
	Baud rate	10/100 Mbit/s
	Isolation protection	ESD contact 8KV, Surge 4KV(10/1000us)
System	Operating system	Linux
	CPU	300MHz
	RAM	64MB
	Flash	128MB
	Number of I/O modules	MAX 32
	Protocols	MQTT, HTTP, DHCP, DNS
Wiring	Method	CAGE CLAMP
	Wire diameter	0.08 mm ² ... 2.5 mm ² , AWG 28 ... 14
	Strip length	8 mm ... 9 mm / 0.33 in
Environment	Working temperature	0 ... 55 ° C
	Storage temperature	-40 ... 70 ° C
	Relative humidity	5 ... 95% no condensation
	Working altitude	0 ... 2000 m
	Protection	IP20
Dimension	Width	48mm
	Length	100mm
	Height	69mm

Material	Color	Light gray
	Housing material	Polycarbonate, Nylon 6.6
	Fire load	1.239 MJ
	Weight	180g
Installation	Method	DIN-35
Certificated	EMC	EN 55022: 2006/A1: 2007 (CE &RE) Class B
		IEC 61000-4-2 (ESD) Level 4
		IEC 61000-4-3 (RS) Level 4
		IEC 61000-4-4 (EFT) Level 4
		IEC 61000-4-5 (Surge)Level 3
		IEC 61000-4-6 (CS)Level 4
		IEC 61000-4-8 (M/S) Level 4

5.1.3 Hardware Interface

5.1.3.1 LED Indicators



LED	Description	Color	Status	Meaning
PWR	Power indicator	Red	ON	Power connection successful
			OFF	No power
SYS	System indicator	Green	ON	System is abnormal
			OFF	System is running normally
RUN	Running indicator	Green	Flashing	System is running normally
			OFF	System is abnormal
ERR	Error indicator	Red	ON	Northbound protocol connection error
			OFF	No errors

I/O RUN	I/O Running indicator	Green	Flashing	I/O module is working normally
			OFF	Module not inserted
I/O ERR	I/O Error indicator	Red	ON	I/O module communication error
			OFF	No errors

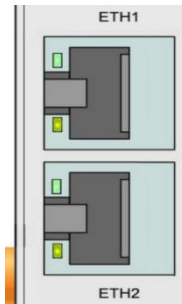


LED	Description	Color	Status	Meaning
S	System 24V power indicator	Green	ON	Power is OK
			OFF	No power
F	Field 24V power indicator	Green	ON	Power is OK
			OFF	No power

5.1.3.2 Ethernet Port

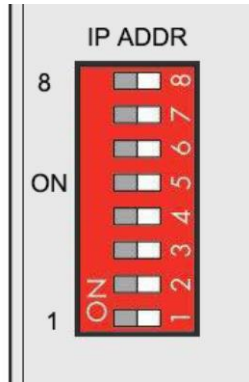
Connect to the Ethernet-based fieldbus through ETH2.

ETH1 is used to connect other nodes that need to be connected to the Ethernet.



5.1.3.3 IP Address Selection Switch

The 8-bit DIP switch is used to set the IP address. The encoding of DIP switches is done bit by bit, starting from DIP switch 1 with the least significant bit (2^0) to DIP switch 8 with the most significant bit (2^7), corresponding to decimal values: 0-255.



When the value of the DIP switch is 1111 1111 (decimal 255), the IP address is set according to the web page. The web page setting can specify the IP or set the automatic acquisition. When the web page is not set, the IP address is: 192.168.1.10

When the value of the DIP switch is 0000 0000 – 1111 1110 (decimal 0-254), determine the 3rd byte of the IP address, and the 1st, 2nd and 4th bytes are fixed bytes, namely 192.168.xxx.253

5.1.4 MQTT Identifiers

The MQTT identifier is REG+Modbus mapping address (such as the first DO module first DO: REG1000).

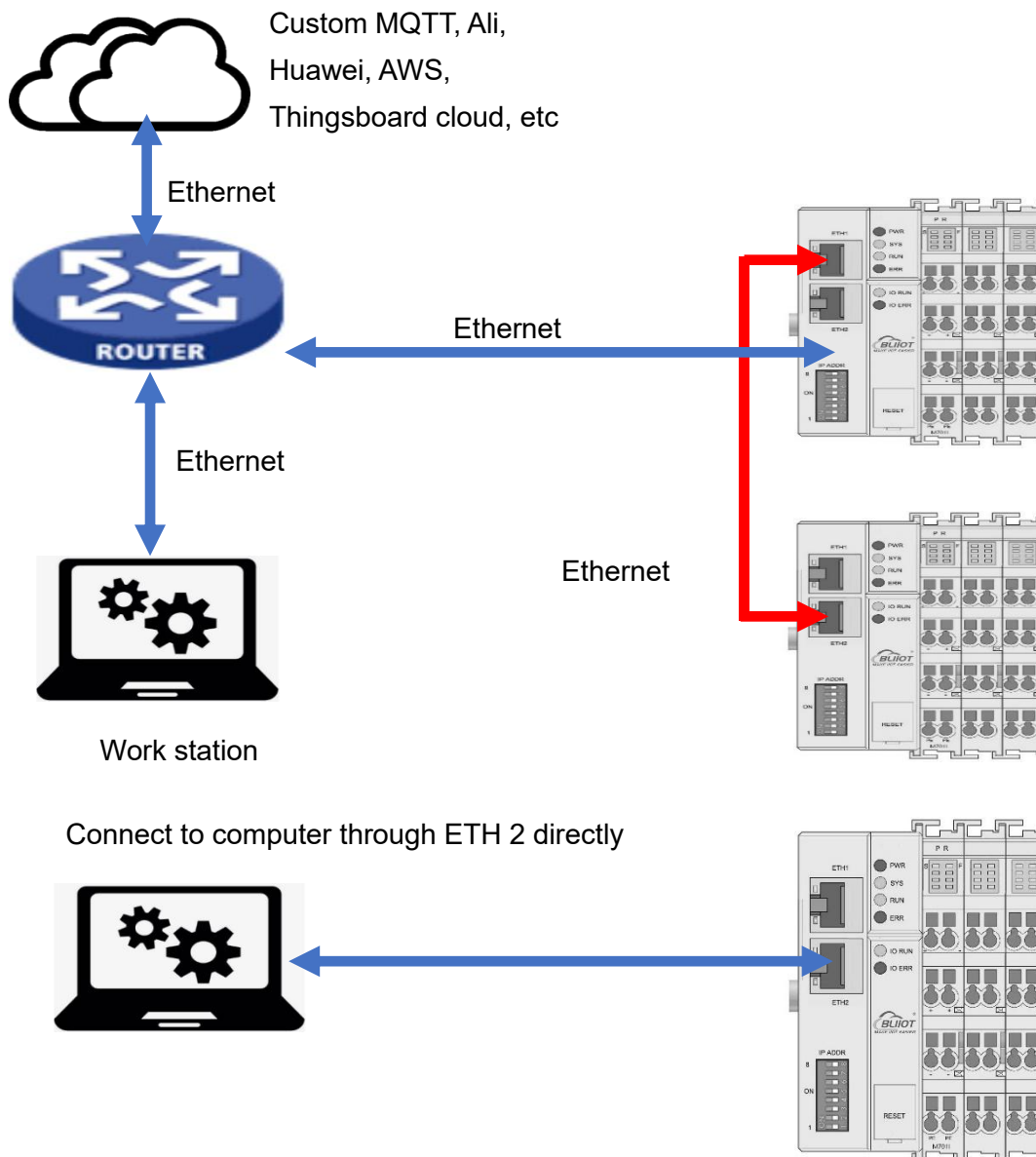
5.1.5 Controller Connection

The BL206 controller comes with 2 x RJ45 Ethernet ports, integrated switch function inside, work in store-and-forward operation mode, each port supports 10/100 Mbit transmission speed and full-duplex and half-duplex transmission mode.

The BL206 controller connect to the router Ethernet network via ETH2 only, while the EHT 1 is for connecting other nodes.

The internal integrated switch supports bypass mode, which can automatically start the bypass mode when the controller system fails, and automatically maintain the link between ETH1 and EHT2.

The wiring of these Ethernet ports conforms to the 100BaseTX specification, which specifies the use of category 5 twisted pair cable as the connecting cable. Cable types S/UTP (Screened unshielded twisted pair) and STP (shielded twisted pair) can be used up to a length of 100m.



5.1.6 Web Page Configuration

BL206 MQTT Controllerr built-in web server is a browser-based configuration utility. When a node is connected to your network, you can access the web console by entering the IP address of the server in your web browser.

5.1.6.1 Preparation Before Configuration

To successfully access the BL206, it must be properly installed and connected to the

computer. In addition, configure them with correct IP addresses to keep them in the same network segment.

5.1.6.1.1 Connect Computer and Controller

1. Mount the fieldbus node on a DIN35 rail. Follow the installation instructions in the "Installation" chapter.
2. Connect the 24 V power supply to the system power terminals.
3. The computer and the bus node can be connected in two ways, one is that the two are connected to the switch device of the local area network through the Ethernet port; the other is that the two are directly connected point-to-point. For detailed steps, follow the instructions in the "Controller Connection" chapter.
4. Turn on the power supply and start supplying power.

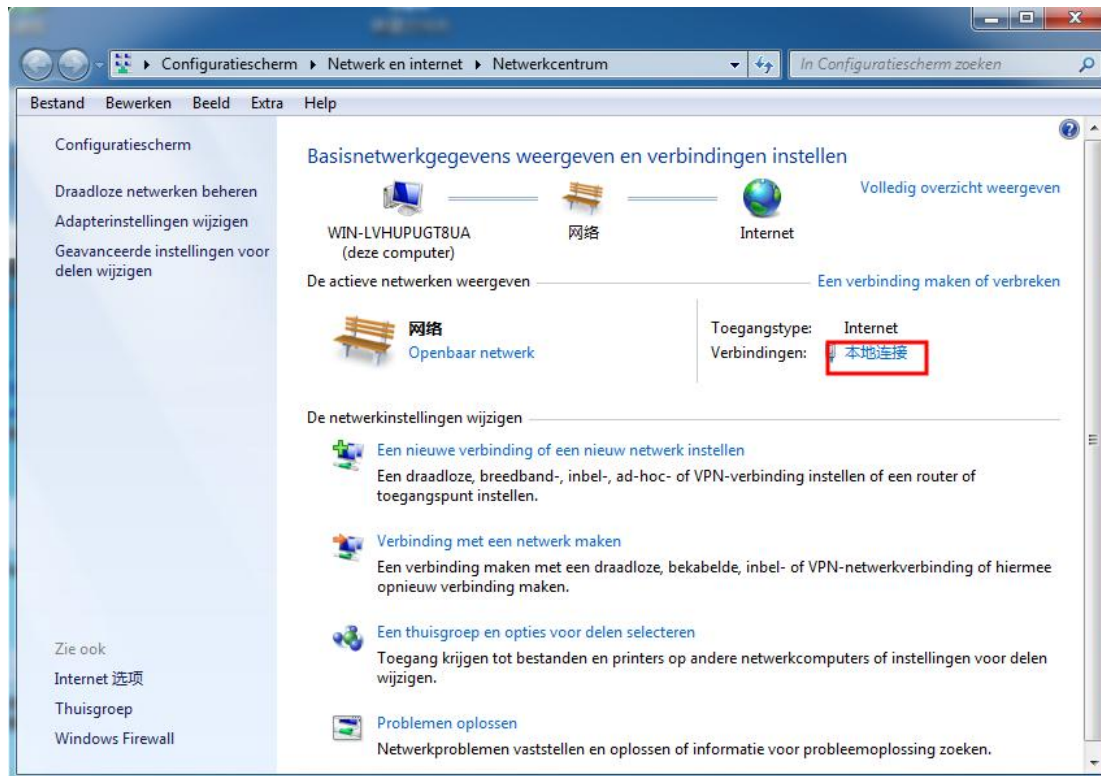
The controller is initialized after power-up, creates process image according to the I/O modules configuration of the node.

5.1.6.1.2 Configure Computer IP Address

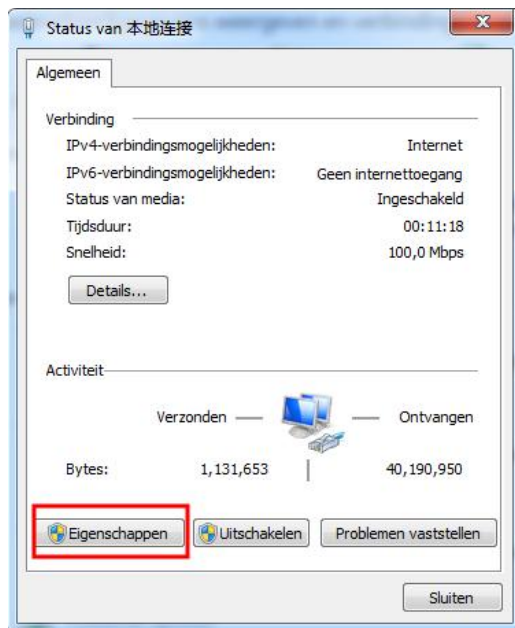
There are two ways to configure PC IP address. One is to turn on the automatic IP address option on the PC's local connection to dynamically assign DHCP in the network. The other is to configure a static IP address with the coupler node on the same network segment on the local connection of the PC.

Takes Windows 7 system as an example for configuration. Windows systems are all configured similarly.

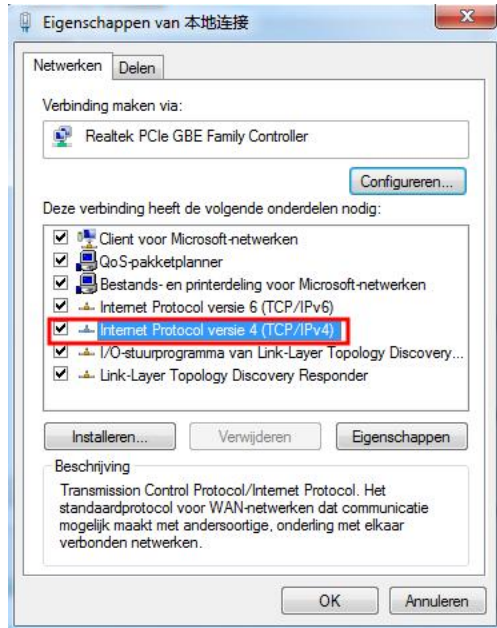
1. Click Start > Control Panel > Network and Sharing Center, and click local connection in the window that opens.



2. In the local connection status window, click Properties.



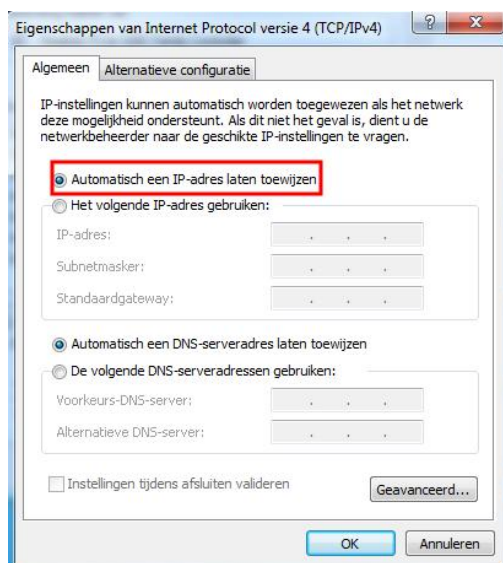
3. Double-click "Internet Protocol Version 4 (TCP/IPv4)" on the local connection properties page.



4. There are two ways to configure the IP address of the PC

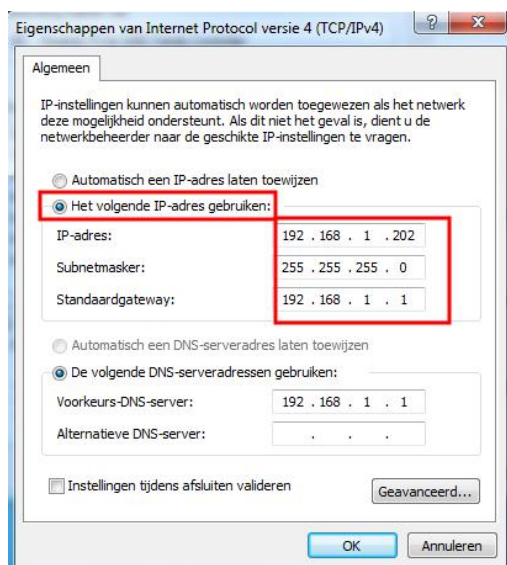
- Obtain IP address automatically (system default mode)

To obtain an IP address automatically from a DHCP server, select "Obtain an IP address automatically";



- Set a static IP address

Select "Use the following IP address" and set the correct values for the IP address, subnet mask and default gateway.



5.1.6.1.3 Configure Controller IP address

There are 2 ways to assign an IP address

- Assignment via built-in web page (static IP or automatic IP assignment)
- Assign via DIP switch (static IP)

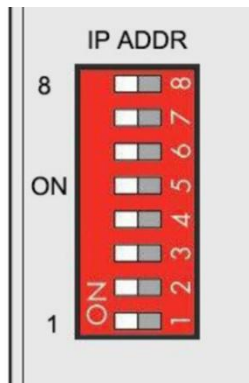
DIP address selector switch definition

Switch position (ON = 1)	Value	Definition
0000 0000 --- 1111 1110	0-254	Enable the DIP selector switch assignment function and determine the value of the 3rd byte. Example: 0010 0110 (22 decimal), the IP address is "192.168.22.253".
1111 1111	255	Enable the function of specifying IP on the web page, or select the function of DHCP automatic allocation. When the IP is not allocated through the web, the IP is 192.168.1.10.

5.1.6.1.3.1 Configuration via Web Page

The controller can be set to an IP address via the "Settings > Local Settings" page after entering the page, or it can be set to be assigned automatically. Select static

address, if not set IP address, the IP is 192.168.1.10



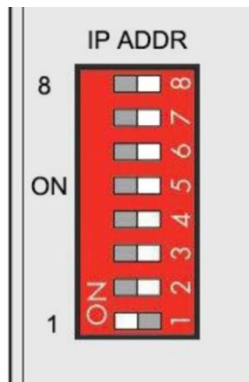
5.1.6.1.3.2 Assign IP via DIP Switch

Set the value of the DIP address selector switch to 0000 0000 - 1111 1110 (decimal 0 - 254), and the IP address will be assigned by the DIP switch.

The IP address consists of fixed bytes and variable bytes. The 1st, 2nd and 4th bytes are fixed bytes, the DIP selector switch determines the 3rd byte, namely:

192.168.xxx.253

The controller assigns an IP address via a DIP switch, and the IP address set in this way is static.



5.1.6.1.4 Factory Default Settings

Before logging into the web configuration page, it is necessary for you to understand the following default parameters,

IP: Determined according to the DIP switch, if the DIP switch is 1111 1111, the default IP is 192.168.1.10

If factory default DIP switch is 0000 0000 status, then the IP is 192.168.0.253

Item	Description
Username	admin
Password	Empty

5.1.6.2 Login Configuration Page

1. Open a browser on your computer, such as IE, Chrome, etc.
2. Enter the IP address of the controller node (192.168.1.10) in the address bar of the browser to enter the user login interface.



3. Enter "Username" and "Password" in the login interface, and then click Login.

BL200UA

Authorization Required

Please enter your username(the default is admin) and password(no password by default).

Username

Password

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4. After successfully logging in to the web interface, the display is as follows

Status

System

Hostname	BL200
Model	BL200-Modbus TCP IO Module
Firmware Version	Shenzhen Beilai Technology Co.,Ltd. V1.1.12
Kernel Version	4.4.194
Local Time	2023-11-07 08:31:30
Uptime	0h 6m 36s
Load Average	1.39, 0.81, 0.38

Memory

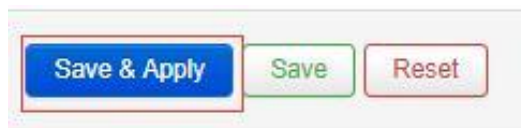
Total Available	26.77 MB / 56.59 MB (47%)
Used	25.66 MB / 56.59 MB (45%)
Buffered	3.34 MB / 56.59 MB (5%)
Cached	9.50 MB / 56.59 MB (16%)

Network

Active Connections	74 / 16384 (0%)
--------------------	-----------------

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5.After configuring the parameters, you need to click the "Save and Apply" button on the page to take effect.



5.1.7 Web Configuration Page Description

5.1.7.1 Status

Users can check overview, system log and kernel log, as well as device parameters and device operating status.

Status > Overview

BL200UA

Status ▾System ▾Settings ▾I/O Module ▾Serial Module ▾OPC UA ▾Operation&Control ▾Logout

REFRESHING

Status

OverviewSystem LogKernel Log

System

Hostname

BL200UA

Model

BL200UA-OPCUA I/O Module

Firmware Version

Shenzhen Beilai Technology Co.,Ltd v1.0.11

Kernel Version

4.4.194

Local Time

2022-03-21 06:44:49

Uptime

3h 31m 35s

Load Average

0.16, 0.11, 0.09

Memory

Total Available

26.05 MB / 56.59 MB (46%)

Used

26.57 MB / 56.59 MB (46%)

Buffered

3.21 MB / 56.59 MB (5%)

Cached

9.98 MB / 56.59 MB (17%)

Network

Active Connections

22 / 16384 (0%)

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Status > System Log

BL200UA

Status ▾System ▾Settings ▾I/O Module ▾Serial Module ▾OPC UA ▾Operation&Control ▾Logout

System Log

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] Booting Linux on physical CPU 0x0

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] Linux version 4.4.194 (peng@peng) (gcc version 5.4.0 (LEDE GCC 5.4.0 unknown)) :#0 PREEMPT Sat May 9 15:23

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] CPU: ARM926EJ-S [41069265] revision 5 (ARMv5TEJ), cr=0005317f

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] CPU: VIVT data cache, VIVT instruction cache

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] Machine model: Nuvoton NUC980 IOT-GateWay Version: 0.1

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] Memory policy: Data cache writeback

Thu Jan 1 00:00:26 1970 kern.debug kernel: [0.000000] On node 0 totalpages: 16384

Thu Jan 1 00:00:26 1970 kern.debug kernel: [0.000000] free_area_init_node: node 0, pgdat c0657704, node_mem_map c3f77000

Thu Jan 1 00:00:26 1970 kern.debug kernel: [0.000000] Normal zone: 128 pages used for memmap

Thu Jan 1 00:00:26 1970 kern.debug kernel: [0.000000] Normal zone: 0 pages reserved

Thu Jan 1 00:00:26 1970 kern.debug kernel: [0.000000] Normal zone: 16384 pages, LIFO batch:3

Thu Jan 1 00:00:26 1970 kern.debug kernel: [0.000000] pcpu-alloc: s0 r0 d32768 u32768 alloc=1*32768

Thu Jan 1 00:00:26 1970 kern.debug kernel: [0.000000] pcpu-alloc: [0] 0

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] Built 1 zonelists in Zone order, mobility grouping on. Total pages: 16256

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] Kernel command line: root=/dev/mtdblock2 console=ttyS0,115200n8 rdinit=/sbin/init mem=64M lpj=744448

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] PID hash table entries: 256 (order: -2, 1024 bytes)

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] Dentry cache hash table entries: 8192 (order: 3, 32768 bytes)

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] Inode-cache hash table entries: 4096 (order: 2, 16384 bytes)

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] Memory: 57756K/65536K available (4538K kernel code, 305K rwdata, 1704K rodata, 188K init, 252K bss, 7780K reserved)

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] Virtual kernel memory layout:

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] vector : 0xffff0000 - 0xffff1000 (4 kB)

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] fixmap : 0xffc00000 - 0xffc00000 (3072 kB)

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] vmalloc : 0xc4800000 - 0xffff0000 (944 MB)

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] lowmem : 0xc0000000 - 0xc4000000 (64 MB)

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] modules : 0xbf000000 - 0xc0000000 (16 MB)

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] .text : 0xc0008000 - 0xc0620f54 (6244 kB)

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] .init : 0xc0621000 - 0xc0650000 (188 kB)

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] .data : 0xc0650000 - 0xc069c784 (306 kB)

Thu Jan 1 00:00:26 1970 kern.notice kernel: [0.000000] .bss : 0xc069c784 - 0xc06db8f8 (253 kB)

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] SLUB: HWalign=32, Order=0-3, MinObjects=0, CPUs=1, Nodes=1

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] Preemptible hierarchical RCU implementation.

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] Build-time adjustment of leaf fanout to 32.

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] NR_IRQS=545

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000000] clocksource: nuc980-timer5: mask: 0xfffff max_cycles: 0xfffff, max_idle_ns: 62215505635 ns

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000033] sched_clock: 24 bits at 120kHz, resolution 8333ns, wraps every 69905062489ns

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.000741] Console: colour dummy device 80x30

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.186616] console [ttyS0] enabled

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.190091] Calibrating delay loop (skipped) preset value.. 148.88 BogoMIPS (lpj=744448)

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.198174] pid_max: default: 32768 minimum: 301

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.203133] Mount-cache hash table entries: 1024 (order: 0, 4096 bytes)

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.209708] Mountpoint-cache hash table entries: 1024 (order: 0, 4096 bytes)

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.218916] CPU: Testing write buffer coherency: ok

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.224863] Setting up static identity map for 0x0400 - 0x843c

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.271558] clocksource: jiffies: mask: 0xfffff max_cycles: 0xfffff, max_idle_ns: 19112604462750000 ns

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.282316] futex: hash table entries: 256 (order: -1, 3072 bytes)

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.288874] pinctrl core: initialized pinctrl subsystem

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.296433] NET: Registered protocol family 16

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.303199] DMA: preallocated 256 KiB pool for atomic coherent allocations

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.316783] <DT> nuc980_dt_device_init +

Thu Jan 1 00:00:26 1970 kern.info kernel: [0.348016] <DT> nuc980_dt_device_init -

Status > Kernel Log

Kernel Log

```
[ 0.000000] Booting Linux on physical CPU 0x0
[ 0.000000] Linux version 4.4.194 (peng@peng) (gcc version 5.4.0 (LEDE GCC 5.4.0 unknown)) #0 PREEMPT Sat May 9 15:23:54 2020
[ 0.000000] CPU: ARM926EJ-S [41069265] revision 5 (ARMv5TEJ), cr=0005317f
[ 0.000000] CPU: VIVT data cache, VIVT instruction cache
[ 0.000000] Machine model: Nuvoton NUC980 IOT-GateWay Version: 0.1
[ 0.000000] Memory policy: Data cache writeback
[ 0.000000] On node 0 totalpages: 16384
[ 0.000000] free_area_init_node: node 0, pgdat c0657704, node_mem_map c3f77000
[ 0.000000] Normal zone: 128 pages used for memmap
[ 0.000000] Normal zone: 0 pages reserved
[ 0.000000] Normal zone: 16384 pages, LIFO batch:3
[ 0.000000] pcpu-alloc: s0 r0 d32768 u32768 alloc=1*32768
[ 0.000000] pcpu-alloc: [0] 0
[ 0.000000] Built 1 zonelists in Zone order, mobility grouping on. Total pages: 16256
[ 0.000000] Kernel command line: root=/dev/mtdblock2 console=ttyS0,115200n8 rdinit=/sbin/init mem=64M lpj=744448
[ 0.000000] PID hash table entries: 256 (order: -2, 1024 bytes)
[ 0.000000] Dentry cache hash table entries: 8192 (order: 3, 32768 bytes)
[ 0.000000] Inode-cache hash table entries: 4096 (order: 2, 16384 bytes)
[ 0.000000] Memory: 57756K/65536K available (4538K kernel code, 305K rwdata, 1704K rodata, 188K init, 252K bss, 7780K reserved, 0K cma-reserved)
[ 0.000000] Virtual kernel memory layout:
[ 0.000000] vector : 0xffff0000 - 0xffff1000 ( 4 kB)
[ 0.000000] fixmap : 0xffc00000 - 0xffd00000 (3072 kB)
[ 0.000000] vmalloc : 0xc4800000 - 0xff800000 ( 944 MB)
[ 0.000000] lowmem : 0xc0000000 - 0xc4000000 ( 64 MB)
[ 0.000000] modules : 0xbf000000 - 0xc0000000 ( 16 MB)
[ 0.000000] .text : 0xc0008000 - 0xc0620f54 (6244 kB)
[ 0.000000] .init : 0xc0621000 - 0xc0650000 ( 188 kB)
[ 0.000000] .data : 0xc0650000 - 0xc069c784 ( 306 kB)
[ 0.000000] .bss : 0xc069c784 - 0xc06db8f8 ( 253 kB)
[ 0.000000] SLUB: HWalign=32, Order=0-3, MinObjects=0, CPUs=1, Nodes=1
[ 0.000000] Preemptible hierarchical RCU implementation.
[ 0.000000] Build-time adjustment of leaf fanout to 32.
[ 0.000000] NR_IRQS:545
[ 0.000000] clocksource: nuc980-timer5: mask: 0xffffffff max_cycles: 0xffffffff, max_idle_ns: 62215505635 ns
[ 0.000033] sched_clock: 24 bits at 120kHz, resolution 833ns, wraps every 69905062489ns
[ 0.000741] Console: colour dummy device 80x30
[ 0.166616] console [ttyS0] enabled
[ 0.190091] Calibrating delay loop (skipped) preset value.. 148.68 BogoMIPS (lpj=744448)
[ 0.198174] pid_max: default: 32768 minimum: 301
[ 0.203133] Mount-cache hash table entries: 1024 (order: 0, 4096 bytes)
[ 0.209702] Mountpoint-cache hash table entries: 1024 (order: 0, 4096 bytes)
[ 0.218916] CPU: Testing write buffer coherency: ok
[ 0.224983] Setting up static identity map for 0x8400 - 0x843c
[ 0.271558] clocksource: jiffies: mask: 0xffffffff max_cycles: 0xffffffff, max_idle_ns: 19112604462750000 ns
[ 0.282316] futex hash table entries: 256 (order: -1, 3072 bytes)
[ 0.288874] pinctrl core: initialized pinctrl subsystem
[ 0.296433] NET: Registered protocol family 16
[ 0.303199] DMA: preallocated 256 KiB pool for atomic coherent allocations
[ 0.316783] <DT> nuc980_dt_device_init +
```

5.1.7.2 System

5.1.7.2.1 System

System Properties > General Settings

BL200UA

Status

System

Settings

I/O Module

Serial Module

OPC UA

Operation&Control

Logout

REFRESHING

System

Here you can configure the basic system properties of the device, such as its hostname or the timezone.

System Properties

General Settings

Logging

Time Synchronization

Language and Style

Local Time

2022/3/21 下午2:58:56

Sync with browser

Sync with NTP-Server

Hostname

BL200UA

Timezone

UTC

Save & Apply

Save

Reset

Item	Description	Default
Local time	Displays the current time of the device. You can click the "Sync browser time" or "Sync with NTP server" button to update the device time.	--
Hostname	The device name can be customized to easily distinguish between multiple devices.	BL200M
Timezone	The time zone can be selected via the drop down menu	UTC

System Properties > Logging

BL200UA
Status
System
Settings
I/O Module
Serial Module
OPC UA
Operation&Control
Logout
REFRESHING

System

Here you can configure the basic aspects of your device like its hostname or the timezone.

System Properties

General Settings
Logging
Time Synchronization
Language and Style

System log buffer size: 64
kiB

External system log server: 0.0.0.0

External system log server port: 514

External system log server protocol: UDP

Write system log to file: /tmp/system.log

Log output level: Debug

Cron Log Level: Debug

Save & Apply
Save
Reset

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Item	Description	Default
System log buffer size		64
External system log server		
External system log server port		
External system log server protocol		
Write system log to file		
Log output level		
Cron log level		

System Properties > Time Synchronization

A NTP server can be set to synchronize time

BL200UA
Status
System
Settings
I/O Module
Serial Module
OPC UA
Operation&Control
Logout
REFRESHING

System

Here you can configure the basic aspects of your device like its hostname or the timezone.

System Properties

General Settings
Logging
Time Synchronization
Language and Style

Enable NTP client ☒

Provide NTP server ☐

Use DHCP advertised servers ☒

NTP server candidates

0.openwrt.pool.ntp.org
1.openwrt.pool.ntp.org
2.openwrt.pool.ntp.org
3.openwrt.pool.ntp.org

Save & Apply
Save
Reset

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System Properties > Language and Style

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Status
System
Settings
I/O Module
Serial Module
OPC UA
Operation&Control
Logout
REFRESHING

System

Here you can configure the basic aspects of your device like its hostname or the timezone.

System Properties

General Settings
Logging
Time Synchronization
Language and Style

Language auto

Design Bootstrap

Save & Apply
Save
Reset

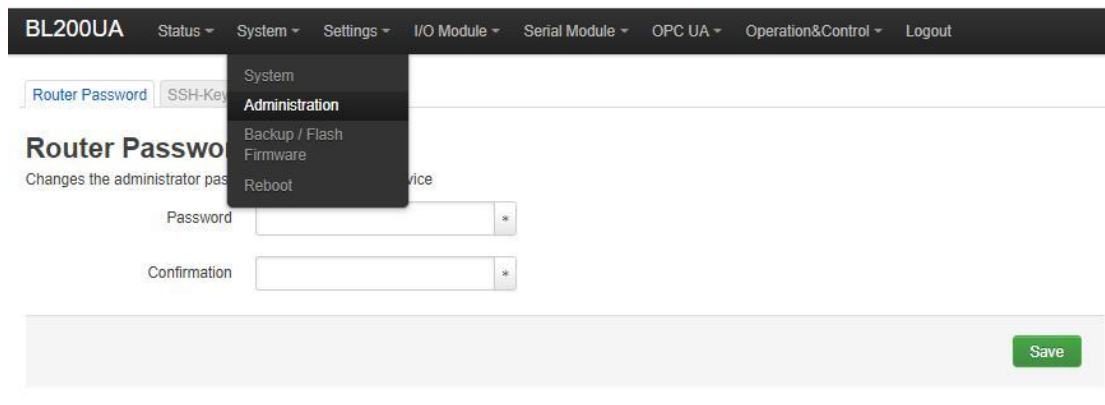
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Item	Description	Default
Language	Available in auto, English, Chinese	auto
Design	Currently only Bootstrap is supported.	Bootstrap

5.1.7.2.2 Administration

Administration > Router Password

Change the administrator password for accessing the device.



BL200UA Status System Settings I/O Module Serial Module OPC UA Operation&Control Logout

Router Password SSH-Key

Router Password

Changes the administrator password of the device.

Password

Confirmation

Save

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Administration > SSH Keys

Public keys allow for the passwordless SSH logins with a higher security compared to the use of regular passwords. In order to upload a new key to the device, paste an OpenSSH compatible public key line or drag a .pub file into the input field.



BL200UA Status System Settings I/O Module Serial Module OPC UA Operation&Control Logout

Router Password SSH-Keys

SSH-Keys

Public keys allow for the passwordless SSH logins with a higher security compared to the use of plain passwords. In order to upload a new key to the device, paste an OpenSSH compatible public key line or drag a .pub file into the input field.

No public keys present yet.

Paste or drag SSH key file... Add key

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5.1.7.2.3 Backup/Flash Firmware

BL200UA

Status

System

Settings

I/O Module

Serial Module

OPC UA

Operation&Control

Logout

Flash operation

Actions

Configuration

System

Administration

Backup / Flash Firmware

Reboot

Backup

Click "Generate archive" to download a tar archive of the current configuration files.

Download backup

Generate archive

Restore

To restore configuration files, you can upload a previously generated backup archive here. To reset the firmware to its initial state, click "Perform reset" (only possible with squashfs images).

Reset to defaults

Perform reset

Restore backup

Upload archive...

Custom files (certificates, scripts) may remain on the system. To prevent this, perform a factory-reset first.

Save mtddblock contents

Click "Save mtddblock" to download specified mtddblock file. (NOTE: THIS FEATURE IS FOR PROFESSIONALS!)

Choose mtddblock

u-boot

Download mtddblock

Save mtddblock

Flash new firmware image

Upload a sysupgrade-compatible image here to replace the running firmware.

Image

Flash image...

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Item	Description	Default
Backup	Click "Generate archive" to download a tar archive of the current configuration files.	--
Restore	To restore configuration files, you can upload a previously generated backup archive here. To reset the firmware to its initial state, click "Perform reset" (only possible with squashfs images).	--
Save mtddblock	Click "Save mtddblock" to download specified mtddblock file. (NOTE: THIS FEATURE IS FOR PROFESSIONALS)	--
Flash image	Upload a sysupgrade-compatible image here to replace the running firmware.	--

5.1.7.2.4 Reboot

Click "Perform reboot" will reboot your device

BL200UA
Status
System
Settings
I/O Module
Serial Module
OPC UA
Operation&Control
Logout

Reboot

Reboots the operating system of your device

Perform reboot

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5.1.7.3 Settings

BL200UA
Status
System
Settings
I/O Module
Serial Module
OPC UA
Operation&Control
Logout

Device settings

Device settings

Modbus Device ID:
If not set or set to 0, the device ID in the Modbus command is ignored

Modbus TCP port:

Dial switch address: 192.168.1.253
The 3rd segment of IP address is determined by dial switch, restart the device and the modification will take effect

IP Address Type:

Set device IP address:

Subnet Mask:

Gateway address:

Save & Apply
Save
Reset

Shenzhen Beilai Technology Co.,Ltd (v1.0.11) / 2022-02-17

Item	Description	Default
Modbus Device ID	Modbus device ID range is 1~247.	1
Modbus TCP port	Modbus TCP protocol port number, which can be customized.	502
DIP switch address	Displays the IP address set by the DIP switch.	
IP address type	Select from "Static Address", "Dynamic Address(DHCP)".	
Set device IP address	The IP address of the device can be set by yourself, and it needs to be restarted to take effect after setting.	--

Subnet mask	Set IP subnet mask	
Gateway address	Set IP gateway address	

5.1.7.4 I/O Modules

After power on, the controller automatically recognizes all I/O modules connected to it and creates an internal local process image based on the module type, data width and the module's position in the node.

If I/O modules are added, changed or removed, a new process image is created and the process data addresses change. When adding an I/O module, the process data of all previous I/O modules must be considered.

The controller can connect up to 32 I/O modules, including digital input and output, analog input and output and special function modules.

BL200UA Status ▾ System ▾ Settings ▾ I/O Module ▾ Serial Module ▾ OPC UA ▾ Operation&Control ▾ Logout								
IO status								
IO Slot	Module Name	Module Type	Channel Number	Modbus Address	24V Address-State	Soft Version	IO Status	Channel Status
1	M1081	DI	8	2000-2007	9001-Power On	5	Normal	Channel Status
2	M2082	DO	8	1000-1007	9002-Power On	5	Normal	Channel Status
3	M3041	AI	4	3000-3006	9003-Power On	5	Normal	Channel Status
4	M4044	AO	4	4000-4006	9004-Power On	5	Normal	Channel Status
5	M6021	COM	2	0-0	9005-Power On	5	Normal	Channel Status

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Item	Description
IO slot	The order of IO modules in the slot, the first module card position close to the controller is 1, and the following ones are 2 3 4...
Module name	I/O module model
Module type	I/O module function type
Channel Number	Data width of I/O module
Modbus Address	Process map address of the I/O module inside the controller
24V Address State	Power supply status on the field side of the I/O module, digital, 1 bit
Software version	I/O module internal firmware version

IO status	I/O module and controller communication status
Channel status	Click to view and set the parameters of different types of I/O modules

5.1.7.4.1 Digital Input Module

The digital input module can provide two types of data, one is the current input state value, Boolean type; the other is the counter value, 32-bit numerical type, which supports the clear function.

IO status

IO Slot:1,Module Type:DI,Module Name:M1081

Channels	Modbus Address	Value
1	2000	Open
2	2001	Open
3	2002	Open
4	2003	Open
5	2004	Open
6	2005	Open
7	2006	Open
8	2007	Open

Fiter Time

Fiter Time(ms)

DI Count

Channels	Modbus Address	Value	Conut Mode	Clear
1	5000	0	Rising Edge	Clear
2	5002	0	Rising Edge	Clear
3	5004	0	Rising Edge	Clear
4	5006	0	Rising Edge	Clear
5	5008	0	Rising Edge	Clear
6	5010	0	Rising Edge	Clear
7	5012	0	Rising Edge	Clear
8	5014	0	Rising Edge	Clear

Back to Overview [Save & Apply](#) [Save](#) [Reset](#)

Item	Description
Channels	Channel number of the digital input module

Modbus Address	Process map address of Boolean status data inside the controller
Value	Display the current input state, open: logic 0, close: logic 1
Filter Time	Selecting the time for DI filtering

Item	Description
Channels	Channel number of the digital input module
Modbus Address	Process map address of the count value inside the controller
Value	Display the current input count value, 32-bit unsigned integer
Count Mode	Selection of "Rising Edge", "Falling Edge", "Rising Edge and Falling Edge" Trigger Counting Methods
Clear	Clear the current channel counter value

5.1.7.4.2 Digital Output Module

BL200UA
Status
System
Settings
I/O Module
Serial Module
OPC UA
Operation&Control
Logout

IO status

IO Slot:2,Module Type:DO,Module Name:M2082

Channels	Modbus Address	Value	PowerOn Status	Open/Close
1	1000	Open	Open	Open/Close
2	1001	Open	Open	Open/Close
3	1002	Open	Open	Open/Close
4	1003	Open	Open	Open/Close
5	1004	Open	Open	Open/Close
6	1005	Open	Open	Open/Close
7	1006	Open	Open	Open/Close
8	1007	Open	Open	Open/Close

Back to Overview
Save & Apply
Save
Reset

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Item	Description
Channels	Channel number of the digital output module
Modbus Address	Process map address of the digital output boolean data inside the controller
Value	Display the current output state, open: 0, close: 1

Power-on status	Set the state of DO after power-on, select from "open", "close", "last"
Open/Close	Can control the current channel output state

5.1.7.4.3 Analog Input Module

The analog input (AI) type module supports setting parameters through the controller web page, so that the data conversion is automatically realized inside the module, and the actual engineering value corresponding to the sensor can be directly output.

BL200
Status
System
Settings
I/O Module
Serial Module
Operation Control
Logout

IO status
IO Slot:4,Module Type:AI,Module Name:M3041

Channels	Modbus Address	Value	Mode	Min Value	Max Value	Offset(mA)
1	3000	4.000000	Current 4-20mA			
2	3002	4.000000	Current 4-20mA			
3	3004	4.000000	Current 4-20mA			
4	3006	4.000000	Current 4-20mA			

Back to Overview
Save & Apply
Save
Reset

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Item	Description
Channels	Channel number of the analog input module
Modbus Address	Process map address of the analog input module inside the controller
Value	Display the actual engineering value input by the current channel, 32-bit single-precision floating-point type
Mode	Different models of analog input modules have different options, please refer to the specific analog input I/O module manual for details.
Min Value	Sensor range minimum
Max Value	Sensor range maximum
Offset(mA)	The offset allows you to adjust the error between acquisition and actual.

There is a linear relationship between the electrical signal value of the analog input module (usually a sensor) and the actual engineering value. Their formulas are as follows (take 4-20mA as an example):

Actual engineering value = (current value - 4) * ((maximum - minimum) / (20 - 4)) + minimum

Take the 4-20mA type water level sensor to measure the depth of the water tower as an example:

The known water level sensor range is 0-100m, the current data is 5.6mA, and the depth of the water tower is calculated:

Into the formula:

$$(5.6 - 4) * ((100 - 0) / (20 - 4)) + 0 = 10$$

The depth of the water tower is 10m

5.1.7.4.4 Analog Output Module

BL200
Status
System
Settings
I/O Module
Serial Module
Operation Control
Logout

IO status
IO Slot:7,Module Type:AO,Module Name:M4041

Channels	Modbus Address	Value	Mode	Min Value	Max Value	Set Value
1	4000	4.000000	Current 4-20mA			
2	4002	4.000000	Current 4-20mA			
3	4004	4.000000	Current 4-20mA			
4	4006	4.000000	Current 4-20mA			

Back to Overview
Save & Apply
Save
Reset

Shenzhen Beilai Technology Co.,Ltd (V1.1.12) / 2023-10-19

Item	Description
Channels	Channel number of the analog output module
Modbus Address	Process map address of the analog output module inside the controller
Value	Display the actual engineering value output by the current channel, 32-bit single-precision floating-point type
Mode	Different models of analog output modules have different options, please refer to the specific analog output I/O module

	manual for details.
Min value	Actual engineering value minimum value
Max value	Actual engineering value maximum value
Set value	You can set the actual project value required for the output

5.1.7.5 Serial Port Module

Various sensors, meters and other devices that support Modbus RTU(Master) protocol can be connected to the edge controller through the serial port module. It allows process mapping between external sensor data and the coupler via the local bus.

5.1.7.5.1 Serial Port Settings

BL200UA
Status
System
Settings
I/O Module
Serial Module
OPC UA
Operation&Control
Logout

Serial Settings

Serial Settings

IO Slot	Module Type	COM Type	COM Name	Baudrate	Data bits	Parity	Stop bits	Modbus Settings
5	M6021	RS485	COM1	9600	8	None	1	Modbus Settings
5	M6021	RS485	COM2	9600	8	None	1	Modbus Settings

Save & Apply
Save
Reset

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5.1.7.5.2 Modbus Settings

Modbus settings are used to add Modbus RTU devices to the serial communication I/O module. A maximum of 25 Modbus commands can be created.

BL200UA
Status
System
Settings
I/O Module
Serial Module
OPC UA
Operation&Control
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Modbus Master

Modbus Master

Name	Alias	Slave Interface	Slave Address	Function Code	Data Type	Register Start Address	Data Number	Mapping Address	Enable	Query
This section contains no values yet										

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Enter the custom data name in the input box and click Add

BL200UA
Status
System
Settings
I/O Module
Serial Module
OPC UA
Operation&Control
Logout

Modbus Master

Modbus Master

Name	Alias	Slave Interface	Slave Address	Function Code	Data Type	Register Start Address	Data Number	Mapping Address	Enable	Query
This section contains no values yet										

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The configuration box pops

Modbus Master - 1

Alias

Slave Interface
COM1

Slave Address

Function Code
01-Digital Output

Register Start Address
0

Data Number

Mapping address alloc
Auto

Polling period(s)

ⓘ If not set, the default is 0.2s

Response timeout(s)

ⓘ If not set, the default is 0.5s

Item	Description
Alias	Device nickname can be used to distinguish data
Slave Interface	Select serial channel
Slave address	Slave device address, range 1-247
Function code	Select according to the slave data type, including: "01", "02", "03", "04"
Register start address	Register start address of slave data
Data number	Number of slave data
Mapping address alloc	Support distribution method: auto According to different data types, the system automatically allocates down the starting address of the mapping, and the addresses are continuous. manual Manual allocation allows mapping addresses to be allocated across segments
Polling period (s)	The interval between two adjacent polling commands
Response timeout (s)	After sending the command to the slave, wait for the maximum time for the slave to return data. If the time exceeds this time, the slave will be considered to have no response.

You can modify, delete, and view data of slave, or you can disable collection.

BL200UA
Status
System
Settings
I/O Module
Serial Module
OPC UA
Operation&Control
Logout

Modbus Master

Modbus Master

Name	Alias	Slave Interface	Slave Address	Function Code	Data Type	Register Start Address	Data Number	Mapping Address	Enable	Query
1	1	COM1	1	1	Bool	0	1	10000-10000	☒	Query Edit Delete

Add

Save & Apply
Save
Reset

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5.1.7.6 Operation and Control

5.1.7.6.1 Arithmetic Operation

BL200
Status
System
Settings
I/O Module
Serial Module
Operation Control
Logout

Arithmetic operation
Logical operation
Condition operation

Arithmetic operation

50000-50014 addresses are used to save intermediate calculation results, which can be published through mqtt or read through MODBUS

Name	Input1	Operation	Input2	Operation	Input3	Output Address	Output Value
This section contains no values yet							

Add

Save & Apply
Save
Reset

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Arithmetic operation - 1

Input1
REG3000

Operation
+

Input2
REG3000

Operation
+

Input3
REG3000

Output Address
REG4000

Publish
☐

Dismiss
Save

It supports "addition, subtraction, multiplication, and division" operations between AI, AO, or RS485 slave numerical data, and can also perform operations with "addition, subtraction, multiplication, and division" constants, and freely match 1 or 2 conditions to combine the output results. If a 16-bit register address is used as the output result, the output with a decimal is an integer.

5.1.7.6.2 Logical Operation

BL200
Status
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I/O Module
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Arithmetic operation
Logical operation
Condition operation

Logical operation

Bool Logic

Name	Input1	Condition	Relationship	Input2	Condition	Output Address	Output Value	Logic Value
This section contains no values yet								

Add

Numerical Logic

Name	Input1	Condition	Threshold	Relationship	Input2	Condition	Threshold	Output Address	Output Value	Logic Value
This section contains no values yet										

Add

Combinational logic

Name	Input1	Condition	Relationship	Input2	Condition	Output Address	Output Value	Logic Value
This section contains no values yet								

Add

Save & Apply
Save
Reset

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Bool logic configuration

Logical operation - 1

Input1 REG1000 ▼

Condition Open ▼

Relationship Logic And ▼

Input2 REG1000 ▼

Condition Open ▼

Output Type Bool Type ▼

Output Address -- Please choose -- ▼

Bool Value Open ▼

Output Delay(ms)

Set Default ☐

Dismiss

Save

Numerical Logic Configuration

Logical operation - 1

Input1 REG3000 ▼

Condition Greater Than(>) ▼

Threshold

Relationship Logic And ▼

Input2 REG3000 ▼

Condition Greater Than(>) ▼

Threshold

Output Type Bool Type ▼

Output Address -- Please choose -- ▼

Bool Value Open ▼

Output Delay(ms)

Set Default ☐

Dismiss

Save

Combinational logic configuration

Logical operation - 3

Input1	1
Condition	Is true
Relationship	Logic And
Input2	2
Condition	Is true
Output Type	Bool Type
Output Address	-- Please choose --
Bool Value	Open
Output Delay(ms)	
Set Default	☐

Dismiss

Save

Users can freely set various combination linkages between I/O (digital input and output, analog input and output) or serial port modules (Modbus slave data) according to needs. Whether the built logic is triggered can be judged according to the logic value item of the web page, "0" means not triggered, and "1" means triggered. Logical value items cannot be updated automatically, and the web page must be manually refreshed.

Example:

Logic 1 (And), input condition A and input condition B meet the trigger condition at the same time, output result Y.

Logic 2 (Or), any one of input condition C or input condition D satisfies the trigger condition, and the output result is Y.

Logic 3: Logic 1 + Logic 2 can be combined to form a logic 3 or more combinations.

5.1.7.6.3 Condition Operation

BL200
Status
System
Settings
I/O Module
Serial Module
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Arithmetic operation
Logical operation
Condition operation

Condition operation

Condition operation

50000-50014 addresses are used to save intermediate calculation results, which can be published through mqtt or read through MODBUS

Name	Condition(True)	Input1	Operation	Input2	Operation	Input3	Output Address	Output Value
This section contains no values yet								

Add

Save & Apply
Save
Reset

Shenzhen Beilai Technology Co.,Ltd (V1.1.12) / 2023-10-19

Condition operation - 1

Condition(True)
REG1000

Input1
REG3000

Operation
+

Input2
REG3000

Operation
+

Input3
REG3000

Output Address
REG4000

Publish
☐

Dismiss Save

Conditional operation is based on arithmetic operation plus condition triggering, that is, when the condition is satisfied, AI, AO or RS485 slave numerical type data or constants, these data can be free to choose 1-3 conditions for each other to "add, subtract, multiply or divide" arithmetic operation.

5.1.7.6.4 Example

✧ Take a simple packing system as an example

Requirements:

(1) After pressing the start button, the conveyor belt B starts to run first, and drags the empty box forward to the designated position. After reaching the designated position,

SQ2 sends a signal to stop the conveyor belt B from running.

(2) After the conveyor belt B stops, the conveyor belt A starts to run, and the products fall into the boxes one by one. The SQ1 sensor detects the products and detects that the products fall into the box. Conveyor belt A stops running, conveyor belt B starts running, and it goes on and on, until the stop button is pressed, and conveyor belts A and B stop at the same time.

To realize such a function in S7-200SMART, the peripheral wiring needs to use DI and DQ as follows:

Input		Output	
I0.0	Automatic control button	Q0.1	Conveyor A output
I0.1	Stop button	Q0.2	Conveyor B output
I0.2	B conveyor belt moving		
I0.3	A conveyor belt moving		
I0.4	SQ2 input		
I0.5	SQ1 input		

Using BL206 calculation and control simulation to achieve such requirements, the DI and DO required for wiring are as follows:

Input		Output	
DI1	A conveyor belt moving	DO1	Conveyor A output
DI2	B conveyor belt moving	DO2	Conveyor B output
DI3	Stop button		
DI4	Automatic control button		
DI5	Detect empty box sensor, SQ2 input		
DI6	Detect product SQ1 input		

5.1.7.6.4.1 Bool Logic Configuration Example

BL200Pro

Status ▾ System ▾ Settings ▾ I/O Module ▾ Serial Module ▾ OPC UA ▾ Operation Control ▾ Cloud platform ▾ Logout

Arithmetic operation Logical operation Condition operation

Logical operation

Bool Logic

Name	Input1	Condition	Relationship	Input2	Condition	Output Address	Output Value	Logic Value	
Achuansongdai	REG2000	close	None	none	none	REG1000	close	0	Edit Delete
Bchuansongdai	REG2001	close	None	none	none	REG1001	close	0	Edit Delete
tingzi	REG2002	close	None	none	none	REG1000,REG1001...	Open	0	Edit Delete
zidongB	REG2003	close	None	none	none	REG1001	close	0	Edit Delete
kongzixiang	REG2004	close	None	none	none	REG1000	close	0	Edit Delete
Btingzi	REG2004	close	None	none	none	REG1001	Open	0	Edit Delete
changping	REG2005	close	None	none	none	REG1001	close	0	Edit Delete
Atingzi	REG2005	close	None	none	none	REG1000	Open	0	Edit Delete

 [Add](#)

Logical operation - Achuansongdai

Input1 ▾
 Condition ▾
 Relationship ▾
 Output Type ▾
 Output Address
 ▾
 Bool Value ▾
 Output Delay(ms)
 Set Default ☐

[Dismiss](#) [Save](#)

Steps:

- (1) Enter Achuansongdai, click Add, and the configuration box will pop up.
- (2) Enter 1: Select DI1 register REG2000.
- (3) Condition: Select Close.

- (4) Relationship: Select "None", because DI1 directly controls the operation of A conveyor belt, so select "None" because there are no other conditions.
- (5) Output type: Select Bool type, because DO1 control is Bool.
- (6) Output address: REG1000, DI1 only controls one DO1, so only select the DO1 register address, if DI controls multiple registers, you can select multiple registers. As in the third logic "tingzi", press the stop button, both conveyor belts A and B stop.
- (7) Bool value: Off, DI1 controls DO1 to close, so choose to close.
- (8) Output delay (milliseconds): Since it is a timely response and no delay is required, leave it blank.
- (9) Set default: When the selection logic is not established, whether DO1 restores the default state, select according to the requirements.
- (10) Click "Save".
- (11) Follow the same steps to build other logic.
- (12) Click "Save and Apply" to write into the BL206 controller.

5.1.7.6.4.2 Numerical Logic Configuration Example

The AI1 register REG3000 is connected to the temperature sensor to monitor the temperature of the motor. When the collected temperature is greater than 50, the fan is turned on, and the fan is controlled by the DO3 register REG1002.

Numerical Logic

Name	Input1	Condition	Threshold	Relationship	Input2	Condition	Threshold	Output Address	Output Value	Logic Value	
wendu	REG3000	Greater Than	50	None	none	none	none	REG1002	close	0	Edit Delete
											Add

Logical operation - wendu

Input1

Condition

Threshold

Relationship

Output Type

Output Address x

Bool Value

Output Delay(ms)

Set Default ☐

Dismiss

Save

Similarly, numerical logic and Bool logic have the same logic principle. Numerical logic only judges that the condition is "greater than", "less than" or "equal to" a certain value as a linkage condition.

5.1.7.6.4.3 Combinational Logic Example

The conveyor belt is not running, the temperature of the motor exceeds 50 degrees, the fan is turned on, and the alarm DO4 register REG1003 is triggered.

Combinational logic

Name	Input1	Condition	Relationship	Input2	Condition	Output Address	Output Value	Logic Value		
bj	zidongB	Is false	Logic And	wendu	Is true	REG1003	close	0	Edit	Delete

[Add](#)

Logical operation - bj

Input1

Condition

Relationship

Input2

Condition

Output Type

Output Address

Bool Value

Output Delay(ms)

Set Default ☐

Dismiss

Save

Steps:

- (1) In the Combinational Logic item, input the name "bj", click Add, and the configuration box will pop up.
- (2) Input 1: Select the logic name "zidongB" built in Bool logic before, you can choose Bool logic or numerical logic according to your demand.
- (3) Condition: Select "Is false", according to your demand, whether the logic selected by input 1 is triggered or not as a condition.
- (4) Relationship: Select "Logic And" to choose, according to your demand, the logical relationship between condition 1 and condition 2, you can also select "no" condition 2.
- (5) Input 2: Select the logic name "wendu", choose Bool logic or numerical logic according to your demand.
- (6) Condition: Select "Is true", according to your demand, whether the logic selected by input 2 is triggered or not as a condition.
- (7) Output Type: Select "Bool Type", select Bool or numeric data according to "Output Address".
- (8) Output address: Select the register address to be operated. DO4 register REG1003.
- (9) Bool value: Close, DO4 closed to control the alarm
- (10) Output delay (milliseconds): It is a timely response, there is no need for a delay, so do not fill in.
- (11) Set default: Choose whether to restore the default state of DO4 when the logic is not valid, according to your demand.

(12) Click "Save".

(13) Click "Save and Apply" to write into BL206 controller.

5.1.7.6.4.4 Arithmetic Operation Configurations

The sensor collects the quantity produced in a day and stores it in register REG40002, and through the arithmetic function it calculates the quantity produced in each hour of an 8-hour day and stores it in register REG40004, and the data in register REG40004 can be sent to your platform or server through MQTT, OPC UA or Modbus.

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Arithmetic operation
Logical operation
Condition operation

Arithmetic operation

Arithmetic operation

50000-50014 addresses are used to save intermediate calculation results, which can be published through mqtt or read through MODBUS

Name	Input1	Operation	Input2	Operation	Input3	Output Address	Output Value	
shengchanxiaolv	REG4002	/	8	+	none	REG4004	0	Edit Delete

Add

Save & Apply
Save
Reset

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Arithmetic operation - shengchanxiaolv

Input1
REG4002

Operation
/

Input2
Constant

Input2
8

Operation
+

Input3
None

Output Address
REG4004

Publish
☐

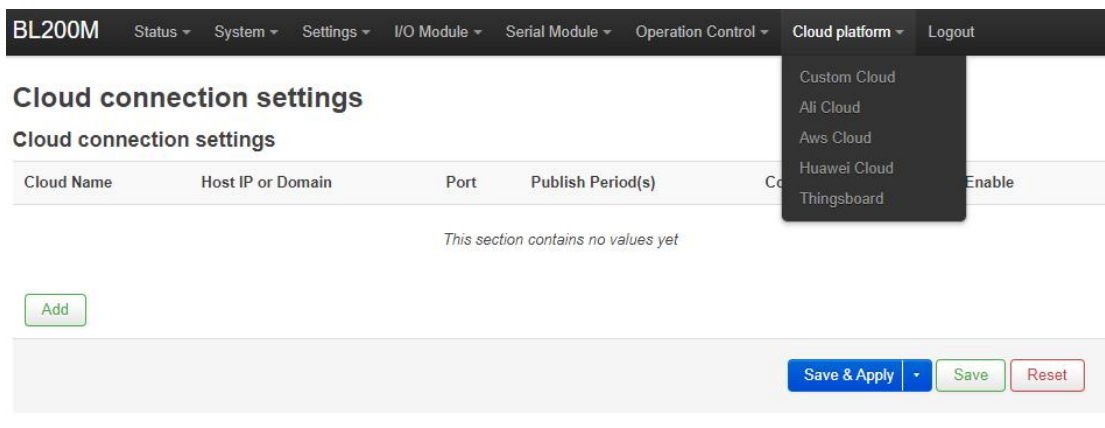
Dismiss
Save

Steps

(1) Enter the name "shengchanxiaolv", click Add, and a configuration box will pop up.

- (2) Input 1: Select the yield register REG40002.
- (3) Operation: Select "/", you can select "add, subtract, multiply and divide" here according to your demand.
- (4) Input 2: Select Constant, you can select other register address according to your demand.
- (5) Input 2: Fill in the constant because constant is selected, when select a register, there is no such item.
- (6) Operation: According to whether there is also a condition 3 selection, if not, then it doesn't matter.
- (7) Input 3: Select "none", because there is no need for this condition option, you can also choose registers, constants, none.
- (8) Output Address: Select the register address to store the result of the operation.
- (9) Click "Save".
- (10) Click "Save and Apply" to write into the BL206 controller.

5.1.7.7 Cloud Connection Settings



BL200M Status System Settings I/O Module Serial Module Operation Control Cloud platform Logout

Cloud connection settings

Cloud connection settings

Cloud Name	Host IP or Domain	Port	Publish Period(s)	Enable
This section contains no values yet				

[Add](#)

[Save & Apply](#) [Save](#) [Reset](#)

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Click "Add", select "Beilai IIoT V2", and the BLIIoT Cloud MQTT configuration will pop up.

Cloud connection settings

Cloud platform Beilai IIoT V2

MQTT Client ID

Publish Period(s)

Data Retransmission Enable ☐

Publish Module Status ☐

Dismiss Save

BLIIoT Cloud Connection	
Item	Description
Cloud platform	Beilai IIoT V2
MQTT Client ID	Contact sales person to get it
Publish Period	MQTT data upload interval period
Data Retransmission Enable	Whether to enable data retransmission
Publish Module Status	Whether to publish I/O module status information
Dismiss	Cancel Beilai Cloud Configuration
Save	Save Beilai Cloud Configuration

Note: 1, Configure BLIIoT cloud, click "Save", and also click "Edit" to open the configuration interface, click "Save" again, as shown below.

2, Publish I/O module status information has a separate topic "io_status", the contents of the I/O slot normal or abnormal status such as: {"slot1": "Normal"}, on behalf of the slot 1 module normal status.

BL200M
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System
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Serial Module
Operation Control
Cloud platform
Logout

Cloud connection settings

Cloud connection settings

Cloud Name	Host IP or Domain	Port	Publish Period(s)	Connect State	Enable	
Beilai IIoT V2	mqtt.dtuip.com	1883	30	Not connected	☒	Edit Delete

Add

Save & Apply
Save
Reset

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Click "Add", select "Custom Cloud", MQTT data format has a default data format and custom data format.

Cloud connection settings

Cloud platform Custom Cloud ▼

Cloud Name

Host IP or Domain

Port

MQTT Client ID

User Name

Password *

Encryption No encryption ▼

Publish data format Default data format ▼

Publish Topic

Subscribe Topic

Publish Period(s)

Publisher QOS 0-At most once ▼

Data Retransmission Enable ☐

Publish Module Status ☐

Data packing ☒ [Send multiple data in one message](#)

Number of data

Publish only changed data ☐

Dismiss

Save

Custom Cloud Connection	
Item	Description
Cloud platform	Custom cloud
Cloud name	Custom cloud platform name
Host IP or Domain	MQTT server IP or domain name
Port	MQTT server port number
MQTT Client ID	The client identifier used by the MQTT connection message, which is used by the server to identify the client.
User name	The username used for MQTT connection messages, which the server can use for authentication and authorization.
Password	The password used for MQTT connection

	messages, which the server can use for authentication and authorization.
Encryption	"No encryption", "Encryption (root certificate)", "Encryption (self-signed)"
Publish data format	"Default Data Format", "Custom Data Format"
Publish topic	The subject name used for MQTT publish messages, the subject name is used to identify the information channel to which the payload data should be published.
Subscribe topic	The subject name used for MQTT subscribe messages. After subscribing, the server can send a publish message to the client.
Publish period	MQTT data publish interval
Publisher QOS	Publish quality of service "0 - at most once", "1 - at least once", "2 - only once"
Data Retransmission Enable	Whether to enable data retransmission
Publish Module Status	Whether to publish I/O module status information
Data packing	Whether to enable data packaging. Disable means one message sent one data point
Number of data	Number of data points published in one message
Publish only changed data	Whether to enable publishing only data that has changed during the cycle
Dismiss	Cancel MQTT platform configuration
Save	Save MQTT platform configuration

"Publish Data Format" item select "Custom Data Format", pop-up custom data format editing interface, click "Data Format Example" to view the editing example, edit the content to comply with the JSON data format, Subscribe topic is Publish topic /, Click on the blank space outside the edit box when you are done editing.

Publish data format Custom data format ▼

Publish Period(s)

Publisher QOS 0-At most once ▼

Data Retransmission Enable ☒

Publish Module Status ☒

Custom data format

Data format example ☒

Custom data format

"(使用'\$'引用本机或MODBUS映射寄存器地址, 服务端使用'主题'+/(例如'主题1/')作为发布主题来设置值"

"Use '\$' to reference local or MODBUS mapping register address, use 'topic'+/(such as 'topic1/') as topic to set value"

```
{
  "topic1": {
    "property1": {
      "data1": "$REG1000",
      "data2": "$REG2000"
    },
    "property2": {
      "data1": "$REG3000",
      "data2": "$REG4000",
      "time": "$TIME"
    }
  }
}
```

5.1.7.7.2 Ali Cloud

Ali cloud settings

Ali cloud settings

Enable ☐

Authentication method Device Serect

Product Key(ProductKey)

Device Name(DeviceName)

Device Serect(DeviceSerect)

Region ID East China 2

Publish Period(s)

Publish only changed data ☐

Data packing ☒ [Send multiple data in one message](#)

Number of data 20

Connect State Not connected

Save & Apply

Save

Reset

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Ali Cloud Connection	
Item	Description
Enable	Check to enable
Authentication Method	"Device Secret" and "X.509"
Product Key	ProductKey on Ali Cloud
Device Name	DeviceName on Ali Cloud
Device Serect	DeviceSecret on Ali Cloud
Region ID	Ali cloud region, If you need to fill in the IP address, you can do so at Customize.
Publish Period(s)	More than 60s
Certification Authority (root certificate)	Select File Upload, displayed when X509 certificate is selected as the authentication method.
Device Certificate	Select File Upload, displayed when X509 certificate is selected as the

	authentication method.
Device Private Key	Select File Upload, displayed when X509 certificate is selected as the authentication method.
Publish only changed data	Whether to enable publishing only data that has changed during the cycle
Data packing	Whether to enable data packaging. Disable means one message sent one data point
Number of data	Number of data points published in one message
Connect state	After clicking "Save and Apply", you can see whether the connection to Ali cloud is successful or not.

5.1.7.7.3 AWS

Aws cloud settings

Aws cloud settings

Enable ☐

Host(EndPoint)

Client ID

Thing Name

Certificate authority

 /etc/mqtt/aws/root.crt

Device certificate

 /etc/mqtt/aws/local.crt

Device private key

 /etc/mqtt/aws/private.key

Publish Topic

Publish Period(s)

Publish only changed data ☐

Shadow Data select None ▾

Data packing ☒

 Send multiple data in one message

Number of data

Connect State Not connected

Save & Apply

Save

Reset

Shenzhen Beilai Technology Co., Ltd. 844 4431 13033 48 48

AWS Connection	
Item	Description
Enable	Check to enable
Host(EndPoint)	Set the endpoint
Client ID	The client identifier used in the MQTT connection message, the server uses the client identifier to identify the client, and each client connected to the server has a unique client identifier.
Thing Name	Set thing name
Certification Authority (root certificate)	Select File Upload

Device Certificate	Select File Upload
Device Private Key	Select File Upload
Publish Topic	The subject name used by MQTT to publish messages. The subject name is used to identify which information channel the payload data should be published to. The subject name in the published message cannot contain wildcards.
Publish Period(s)	More than 60s
Publish only changed data	Whether to enable publishing only data that has changed during the cycle
Shadow data select	Shadow control data point selection from None, All Data, Select Data Points
Data packing	Whether to enable data packaging. Disable means one message sent one data point
Number of data	Number of data points published in one message
Connect state	After clicking "Save and Apply", you can see whether the connection to AWS is successful or not.

5.1.7.7.4 HUAWEI Cloud

Huawei cloud settings

Huawei cloud settings

Enable ☐

Authentication method Device Serect

Device ID

Secret key

Service ID

Region ID CN North-Beijing4

Publish Period(s)

Publish only changed data ☐

Data packing ☒ Send multiple data in one message

Number of data 20

Connect State Not connected

[Save & Apply](#) [Save](#) [Reset](#)

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HUAWEI Cloud Connection	
Item	Description
Enable	Check to enable
Authentication Method	"Device Secret" and "X.509"
Device ID	Huawei Cloud Device ID
Secret key	Password entered when creating the device certificate, you can refer to the HUAWEI CLOUD help document to create a test certificate
Service ID	Products need to create services to report data
Region ID	Device region, select Other to fill in the IP address
Publish Period(s)	More than 60s
Certification authority (root certificate)	Root certificate provided by Huawei cloud, displayed when X509 certificate is selected as the authentication method.
Device certificate	Device certificate deviceCert.pem, upload to /etc/conf directory and select the file, displayed when X509 certificate is selected as the authentication method.

Device key	Device key/deviceCert.key, upload to/etc/conf directory and select the file, displayed when X509 certificate is selected as the authentication method.
Only publish changed data	Whether to enable publishing only data that has changed during the cycle
Data packing	Whether to enable data packaging. Disable means one message sent one data point
Number of data	Number of data points published in one message
Connect state	After clicking "Save and Apply", you can see whether the connection to HUAWEI cloud is successful or not.

5.1.7.7.5 ThingsBoard

BL200M
Status
System
Settings
I/O Module
Serial Module
Operation Control
Cloud platform
Logout

Thingsboard Cloud settings

Cloud connection settings

Enable setting ☐

Thingsboard platform Thingsboard Cloud

MQTT Client ID

User Name

Password

Publish Period(s)

Data Retransmission Enable ☐

Data packing ☒ Send multiple data in one message

Number of data

Publish only changed data ☐

Connect State Not connected

Save & Apply
Save
Reset

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Thingsboard Connection	
Item	Description
Enable Setting	Check to enable
Thingsboard platform	Choose from "ThingsBoard Cloud",

	"Other ThingsBoard Servers".
MQTT Client ID	The client identifier used in the MQTT connection message, the server uses the client identifier to identify the client, and each client connected to the server has a unique client identifier.
User Name	The username used for MQTT connection messages, which the server can use for authentication and authorization.
Password	The password used for MQTT connection messages, which the server can use for authentication and authorization.
Publish Period(s)	More than 60s
Data Retransmission Enable	Check to enable data retransmission
Data Packing	Whether to enable data packaging. Disable means one message sent one data point
Number of data	Number of data points published in one message
Only publish changed data	Whether to enable publishing only data that has changed during the cycle
Connect State	After clicking "Save and Apply", you can see whether the connection to Thingsboard is successful or not.

5.2 BL206Pro EdgeIO Controller

5.2.1 BL206Pro Overview

BL206Pro includes the functions of BL200, BL205, and BL206

5.2.2 Technical Parameters

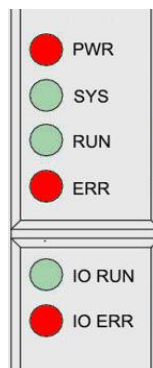
Name	Parameter	Description
------	-----------	-------------

System power	Input voltage(system)	24 VDC
	Input current(system)	MAX 500 mA@24VDC
	Power Efficiency	84%
	Internal bus voltage	5VDC
	Coupler current consumption	MAX 300mA@5VDC
	I/O current consumption	MAX 1700mA@5VDC
	Isolation protection	500 V system/supply
Field power	Input voltage (field)	24 VDC
	Current carrying capacity (power jumper contacts)	MAX 10 ADC
Ethernet	Number	2 X RJ45
	Transmission medium	Twisted Pair STP 100 Ω Cat 5
	MAX cable length	100m
	Baud rate	10/100 Mbit/s
	Isolation protection	ESD contact: 8KV, Surge: 4KV(10/1000us)
System	Operating system	Linux
	CPU	300MHz
	RAM	64MB
	Flash	128MB
	I/O Modules	MAX 32
	Process mapping (Modbus) data points via serial port module	● Bool : 4096 ● 16 Bit : 2048 ● 32 Bit : 1024
	Protocol	Modbus TCP, MQTT, OPC UA, HTTP, DHCP, DNS
	Maximum number of connections	15 Modbus TCP
Wiring method	Method	CAGE CLAMP
	Wire diameter	0.08 mm ² ... 2.5 mm ² , AWG 28 ... 14
	Strip length	8 mm ... 9 mm / 0.33 in
Environment	Working temperature	0 ... 55 ° C
	Storage temperature	-40 ... 70 ° C
	Relative humidity	5 ... 95% no condensation
	Working altitude	0 ... 2000 m
	Protection type	IP20

Dimension	Width	48mm
	Length	100mm
	Height	69mm
Material	Color	Light gray
	Housing material	Polycarbonate, Nylon 6.6
	Fire load	1.239 MJ
	Weight	180g
Installation	Method	DIN-35 rail
Certificates	EMC	EN 55022: 2006/A1: 2007 (CE &RE) Class B
		IEC 61000-4-2 (ESD) Level 4
		IEC 61000-4-3 (RS) Level 4
		IEC 61000-4-4 (EFT) Level 4
		IEC 61000-4-5 (Surge)Level 3
		IEC 61000-4-6 (CS)Level 4
		IEC 61000-4-8 (M/S) Level 4

5.2.3 Hardware Interface

5.2.3.1 LED Indicators



LED	Description	Color	Status	Meaning
PWR	Power indicator	Red	ON	Power connection successful
			OFF	No power
SYS	System indicator	Green	ON	System is abnormal
			OFF	System is running normally
RUN	Running indicator	Green	Flashing	System is running normally
			OFF	System is abnormal

ERR	Error indicator	Red	ON	Northbound protocol connection error
			OFF	No errors
I/O RUN	I/O Running indicator	Green	Flashing	I/O module is working normally
			OFF	Module not inserted
I/O ERR	I/O Error indicator	Red	ON	I/O module communication error
			OFF	No errors

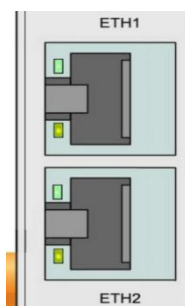


LED	Description	Color	Status	Meaning
S	System 24V power indicator	Green	ON	Power is OK
			OFF	No power
F	Field 24V power indicator	Green	ON	Power is OK
			OFF	No power

5.2.3.2 Ethernet Port

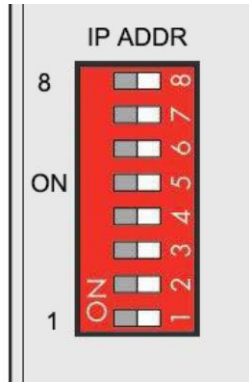
Connect to Ethernet-based fieldbus through ETH2.

ETH1 is used to connect other nodes that need to be connected to the Ethernet.



5.2.3.3 IP Address Selection Switch

The 8-bit DIP switch is used to set the IP address. The encoding of DIP switches is done bit by bit, starting from DIP switch 1 with the least significant bit (2^0) to DIP switch 8 with the most significant bit (2^7), corresponding to decimal values: 0-255.



When the value of the DIP switch is 1111 1111 (decimal 255), the IP address is set according to the web page. The web page setting can specify the IP or set the automatic acquisition. When the web page is not set, the IP address is: 192.168.1.10

When the value of the DIP switch is 0000 0000 – 1111 1110 (decimal 0-254), determine the 3rd byte of the IP address, and the 1st, 2nd and 4th bytes are fixed bytes, namely 192.168.xxx.253

5.2.4 Modbus Register Mapping

The internal register map of BL206Pro controller consists of 2 parts, one part is the data map of digital input and output and analog input and output module, the address range is 1000...9999; the other part is the serial port module, the address range is 10000... 49999

The state of digital and analog I/O modules can be determined or changed through the register map (Address 1000 ... 9999).

Modbus address		Data type	Access type	Function code	Description
decimal	hex				
1000...1999	0x03 E8...0x07 CF	1 Bit	read/write	0x01/05/0F	Digital output
2000...2999	0x07 D0...0x0B B7	1 Bit	read	0x02	Digital input
3000...3999	0x0B B8...0x0F 9F	32 Bit Float	read	0x04	Analog input
4000...4999	0x0F A0...0X13 87	32 Bit Float	read/write	0x03/06/10	Analog output
5000...8999	0x13 88...0x23 27	32 Bit Unint	read/write	0x03/04/10	DI count value
9000...9999	0x23 28...0x27 0F	1 Bit	read	0x02	Module power-on status

Determine or change the state of the data mapped from the serial I/O module through address 10000 ... 49999

Modbus address		Data type	Access type	Function code	Description
decimal	hex				
10000...19999	0x27 10...0x4E 1F	1 Bit	read/write	0x01/05/0F	Digital output
20000...29999	0x4E 20...0x75 2F	1 Bit	read	0x02	Digital input
30000...39999	0x75 30...0x9C 3F	16 Bit	read	0x04	Analog input
40000...49999	0x9C 40...0XC3 4F	16 Bit	read/write	0x03/06/10	Analog output

5.2.5 OPC UA Data Point Node Id

The Node Id for OPC UA defaults to NS=1; S=Modbus mapping address of the I/O data point (for example, the first DO module of the first DO module: NS=1; S=1000), custom OPC UA model Node Id can be customized.

5.2.6 MQTT Identifiers

The MQTT identifier is REG+Modbus mapping address (such as the first DO module first DO: REG1000).

5.2.7 Controller Connection

BL206Pro coupler is to add OPC UA and Modbus TCP protocols to BL206, refer to 5.1.5 Controller Connection.

5.2.8 Web Page Configuration

Refer to 5.1.6 Web Page Configuration.

The BL206Pro controller is based on the BL206 to add the OPC UA and Modbus TCP protocols, so you can refer to the BL206 web configuration page description for the function descriptions of the configuration page.

Modbus TCP is enabled by default, the specific configuration in the web configuration "Settings" item, here only introduce the OPC UA configuration interface. All configurations need to be sent to BL206Pro coupler by clicking "Save and Apply" to take effect.

BL200UA

Status ▾

System ▾

Settings ▾

I/O Module ▾

Serial Module ▾

OPC UA ▾

Operation&Control ▾

Logout

OPC UA settings

OPC UA settings

OPC UA Name

Port

Security Policy

Message Security Mode

Certificate

Private key

Allow Anonymous ☐

Username

Password

Data select

Model File(.xml)

Dependent model files

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Item	Description	Default
OPC UA name	OPC UA server name	
Port	OPC UA server port number	4840
Security policy	None basic128rsa15 basic256 basic256sha256 aes128sha256rsaoaep All security policies	None
Message security mode	Sign Sign and encrypt	
Certificate	OPC UA certificate, click the uploaded certificate to load the configuration page.	
Private key	OPC UA private key, click on the uploaded certificate to load it into the configuration page.	
Allow anonymous	Whether to enable user name and password	

	login	
Username	Fill in the username	
Password	Fill in password	
Data select	All data Select data point Information model	All data
Select data point	You can select the data points you want to read. "Data selection" option to select "select data point" to have this option	
Model file (.xml)	Upload the information model (.xml) file, select "Information Model" in the "Data Selection" item to have this option	
Dependent model files	Select the number of information models to reference, up to 5 can be selected.	
Dependent Models 1-5	Upload the information model (.xml) file to be referenced	

Note: For a customized information model, the data point description item must be in the format of REG + Modbus address during modeling. For example, DO1 point description item fills in REG1000, and other items are customized.

6 Communication Example

6.1 BL206 Communication Example

6.1.1 Connecting BL206 to Custom MQTT

Cloud connection settings

Cloud platform	Custom Cloud ▼
Cloud Name	custom MQTT cloud
Host IP or Domain	
Port	1883
MQTT Client ID	
User Name	
Password	***** *
Encryption	No encryption ▼
Publish data format	Default data format ▼
Publish Topic	/BeiLai/BL206/Data/
Subscribe Topic	/BeiLai/BL206/Down
Publish Period(s)	60
Publisher QOS	0-At most once ▼
Data Retransmission Enable	☒
Publish Module Status	☒
Data packing	☒  Send multiple data in one message
Number of data	100
Publish only changed data	☐

Dismiss

Save

Cloud connection settings

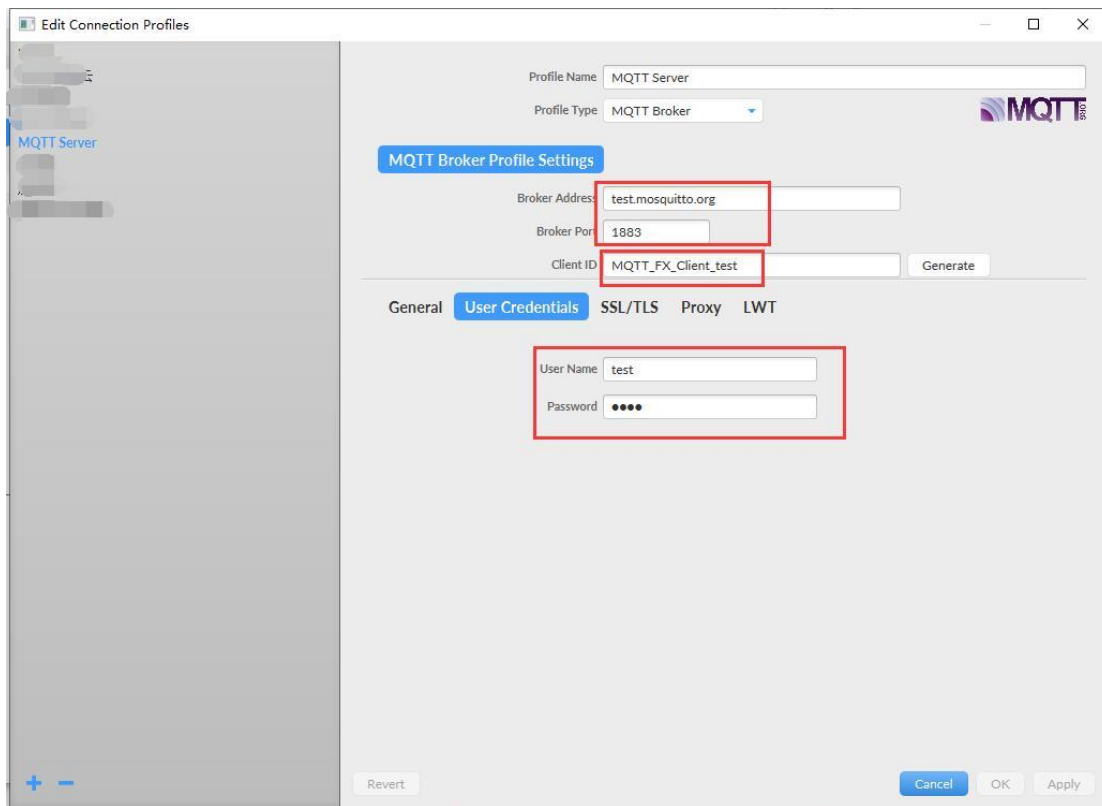
Cloud connection settings

Cloud Name	Host IP or Domain	Port	Publish Period(s)	Connect State	Enable	
custom MQTT cloud		1883	60	Connected	☒	Edit Delete
Add						
Save & Apply Save Reset						

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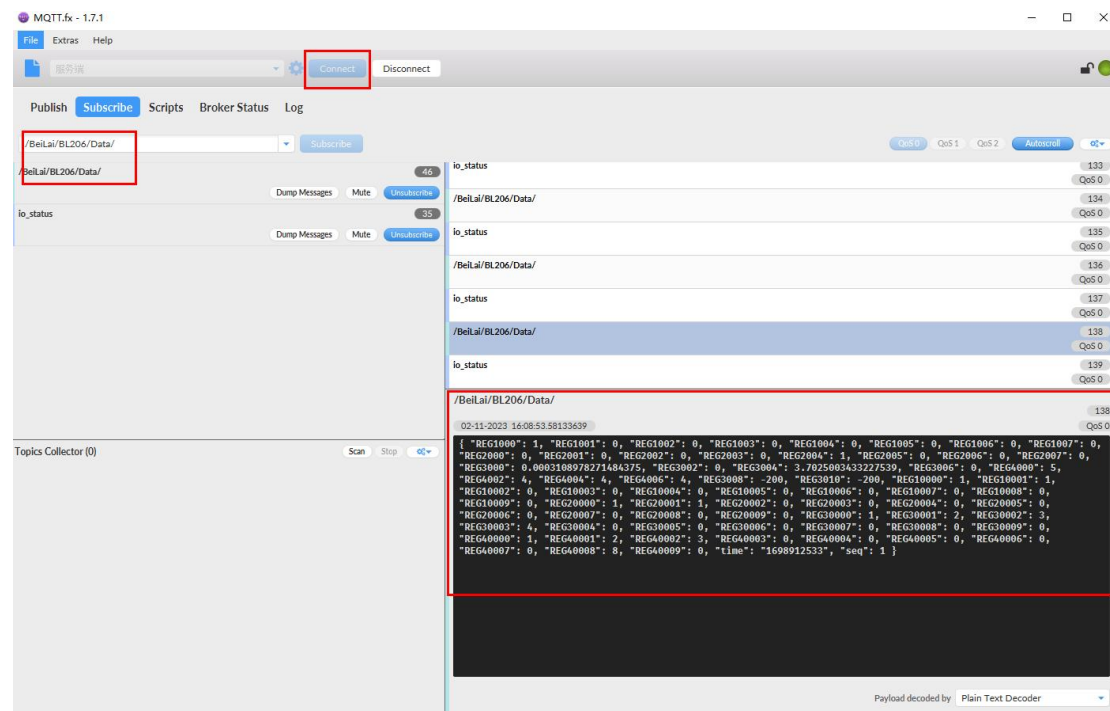
Instructions: 1. Click "Cloud Platform" - "Custom Cloud" 2. Click "Add" button to bring up the cloud platform configuration box. 3. Configure various configurations, refer to 5.1.7.7 Cloud Connection Settings for the description of each item. 4. Click "Save" to save the configuration. 5. Click "Save and Apply" to send the configuration to the BL206Pro and check the connection status. Check the connection status, you can check whether the connection is successful or not.

6.1.2 View and Send Data with MQTT.fx

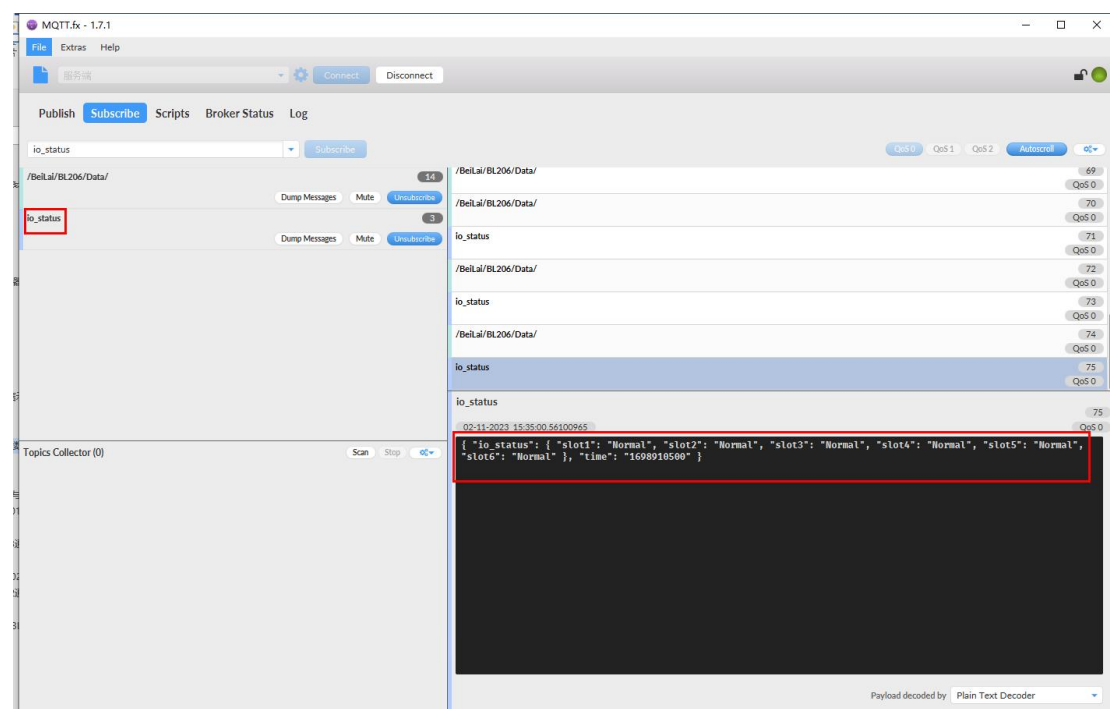


The Client ID cannot be the same as the Client ID filled in on the BL206. Click "connect" to subscribe to the publish topic "/BeiLai/BL206/Data/" of the

customized MQTT cloud configuration on BL206, and all the data is shown in the figure below. For identifier description and data format, refer to Note 7.1 Data Publish Format.



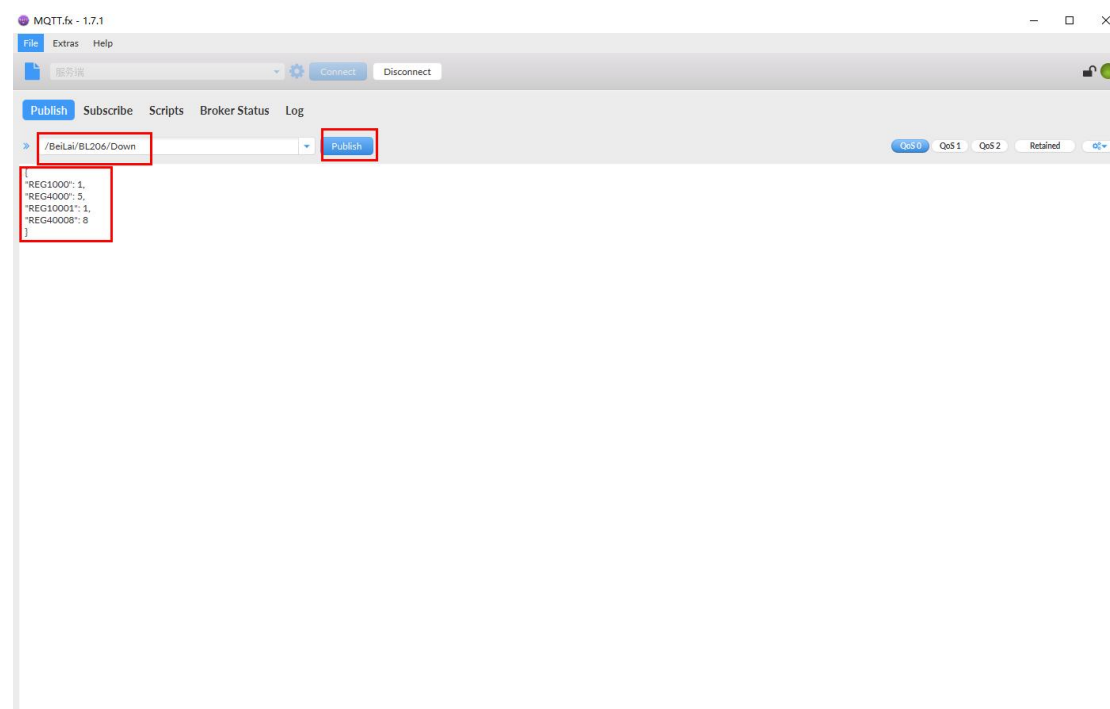
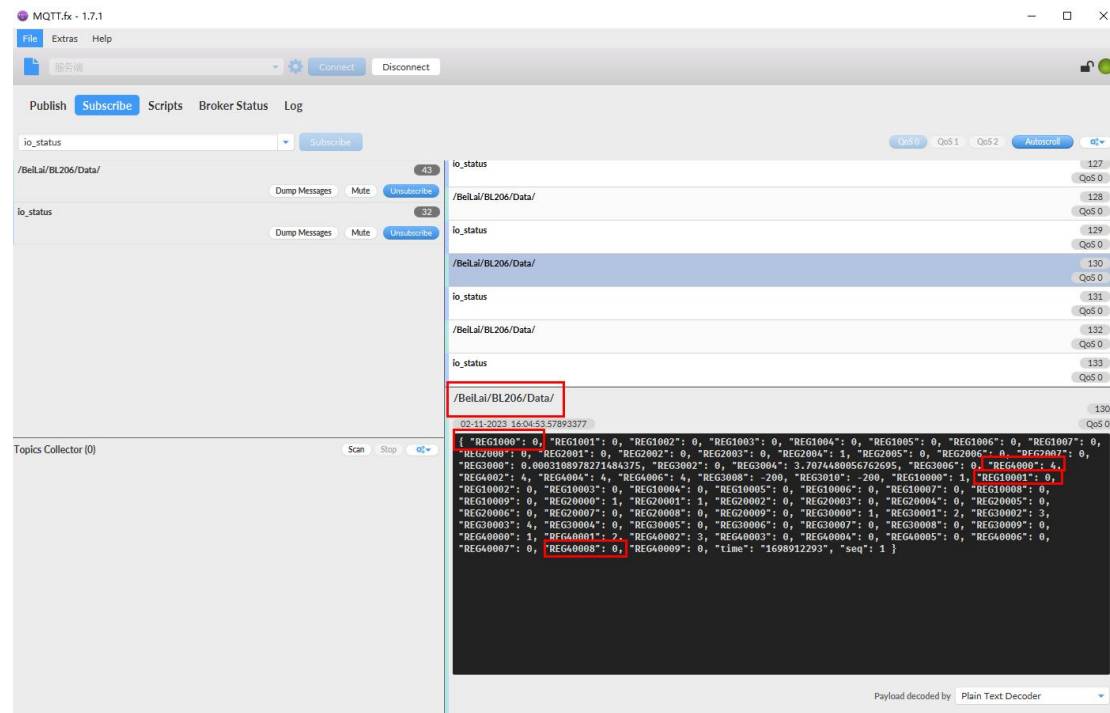
The IO module status message is a separate fixed topic "io_status" that allows you to see if the slot is abnormal.

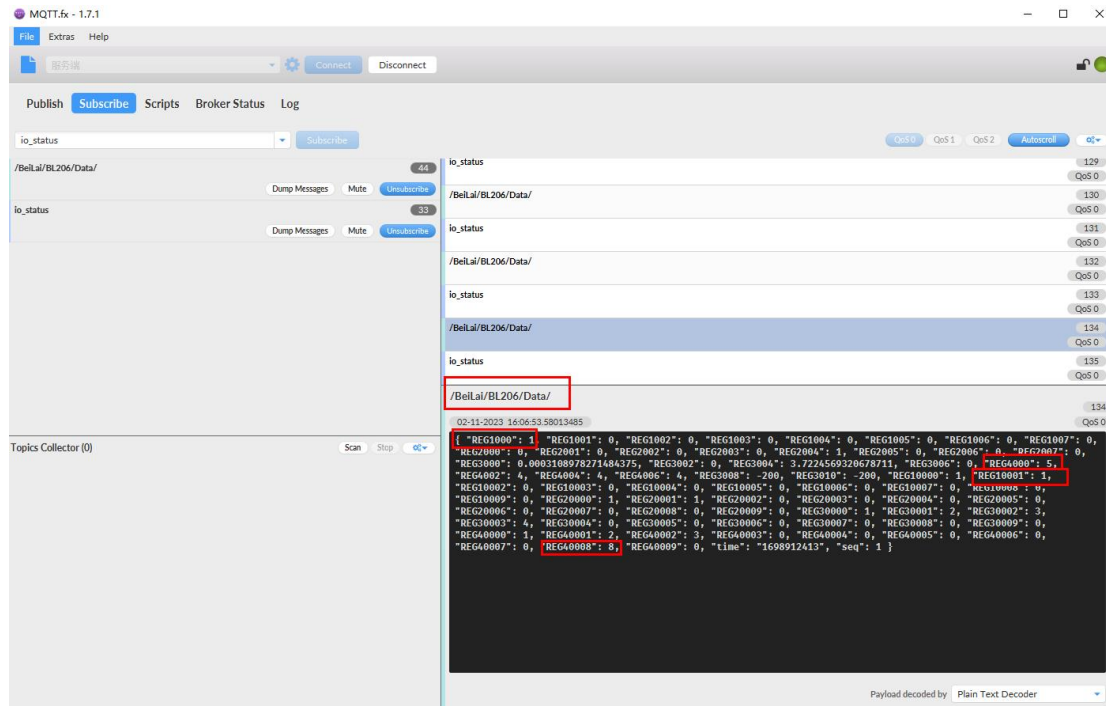


MQTT.fx publish control BL206, the publish topic is BL206 custom MQTT cloud configuration subscribe topic "/BeiLai/BL206/Down" data format reference 7.2

Subscribe Data Format.

Control DO1 closed, REG1000 is "1", AO1 output 5, "REG4000" is "5", the data collected by the serial port, REG10001 is "1", REG40008 is "8".





6.1.3 Connecting BL206 to BLIIoT Cloud

Cloud connection settings

Cloud platform

Beilai IIoT V2

MQTT Client ID

Publish Period(s)

60

Data Retransmission Enable

☒

Publish Module Status

☒

Dismiss

Save

BL200M

Status

System

Settings

I/O Module

Serial Module

Operation Control

Cloud platform

Logout

Cloud connection settings

Cloud connection settings

Cloud Name	Host IP or Domain	Port	Publish Period(s)	Connect State	Enable	
custom MQTT cloud		1883	60	Connected	☒	Edit Delete
Beilai IIoT V2	mqtt.dtuip.com	1883	60	Connected	☒	Edit Delete

Add

Save & Apply

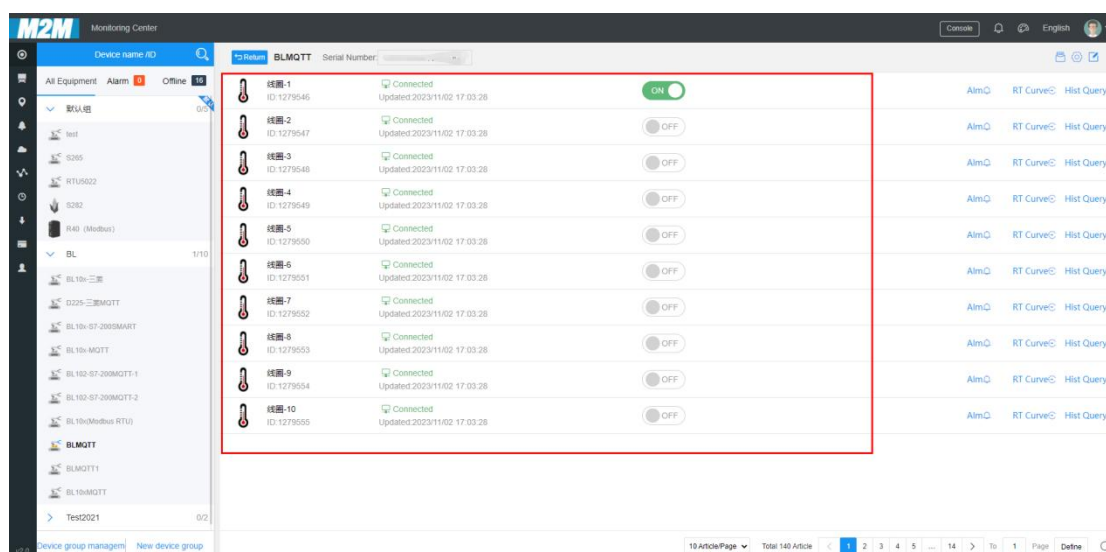
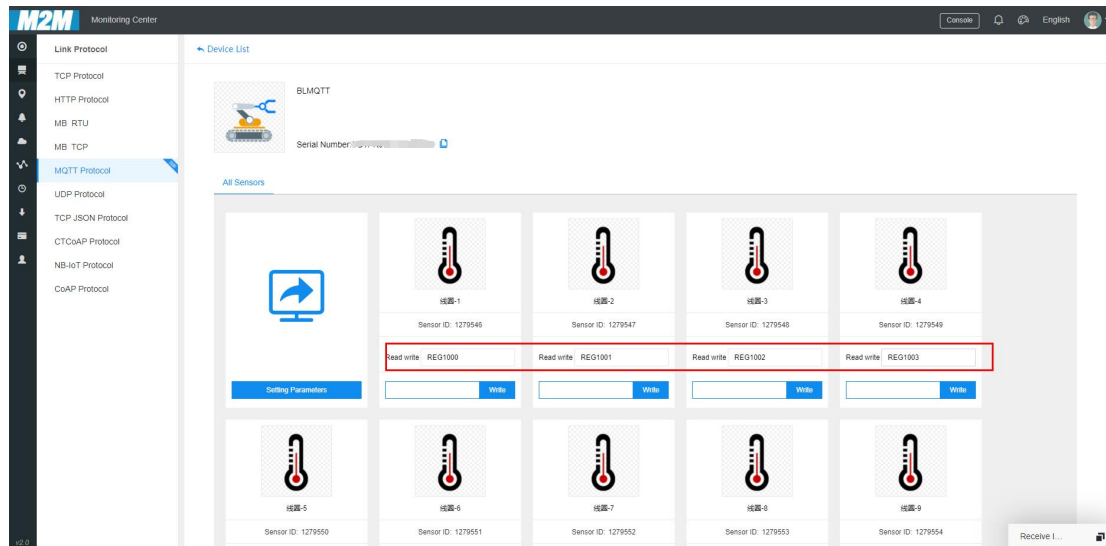
Save

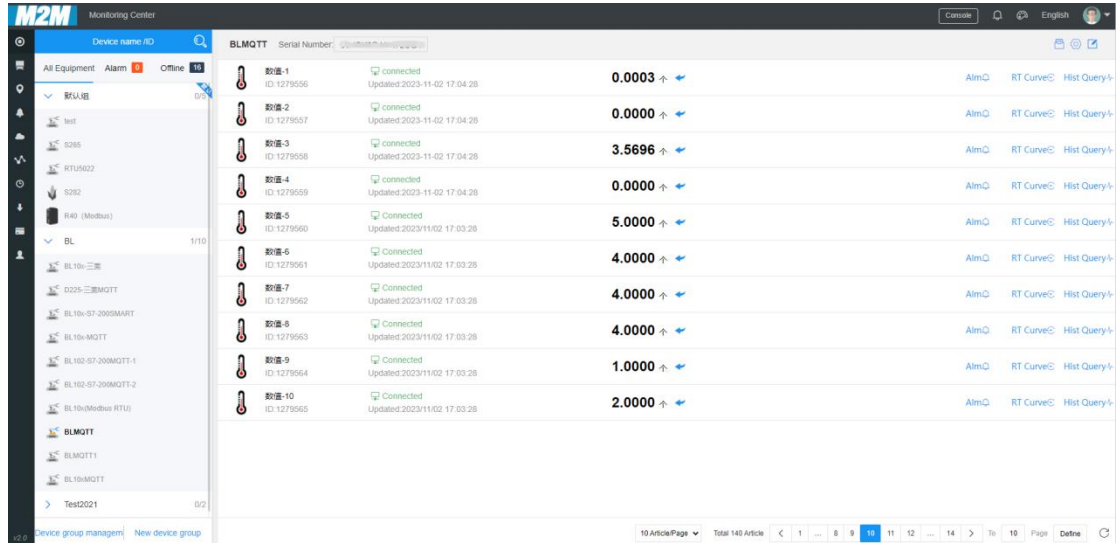
Reset

Instructions: 1, Click "cloud platform" - "custom cloud" 2, click on the "Add" button, the pop-up cloud platform configuration box. 3, Select "Beilai IIoT V2", the client ID is BLIIoT cloud platform serial number, fill in the upload period of 60s. 4, Click "Save" to save the configuration. 5, Click "Edit", click "Save" again. 6, Click "Save and Apply", send the configuration to BL206, check the connection status, you can check whether the connection is successful.

6.1.4 BLIIoT Cloud View and Send Data

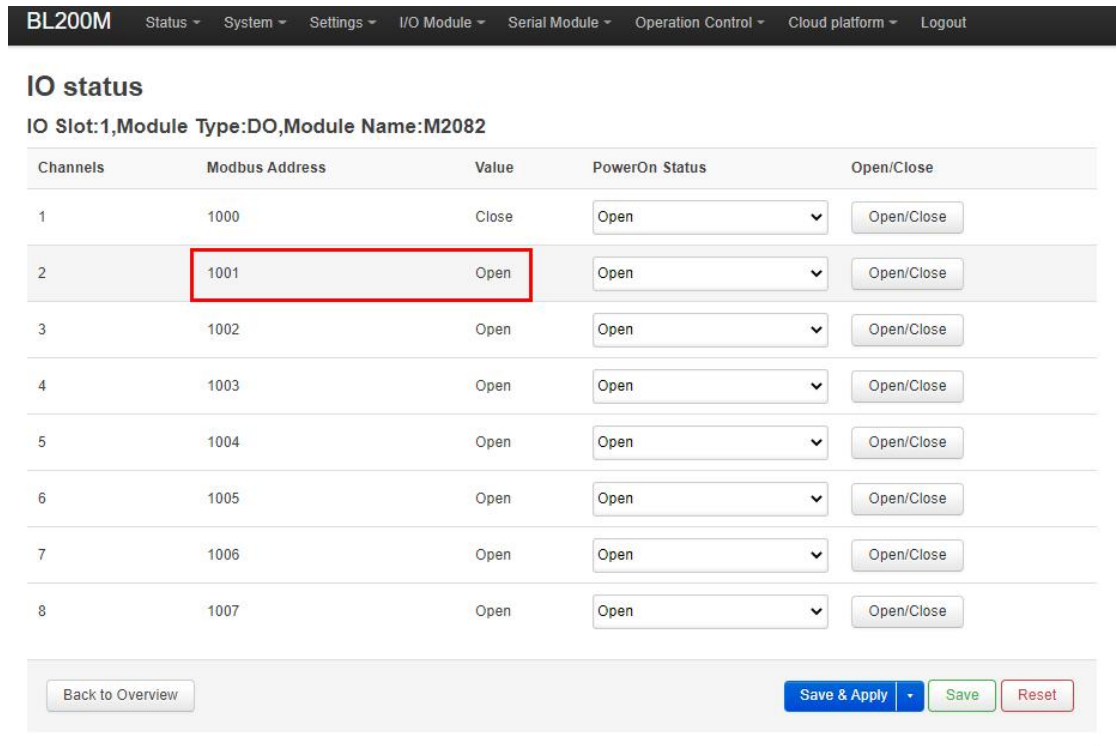
Log in BLIIoT cloud, domain name: www.my-m2m.com. After creating the device, configure the link protocol data point read and write identification can refer to 7.1 Data Publish Format.



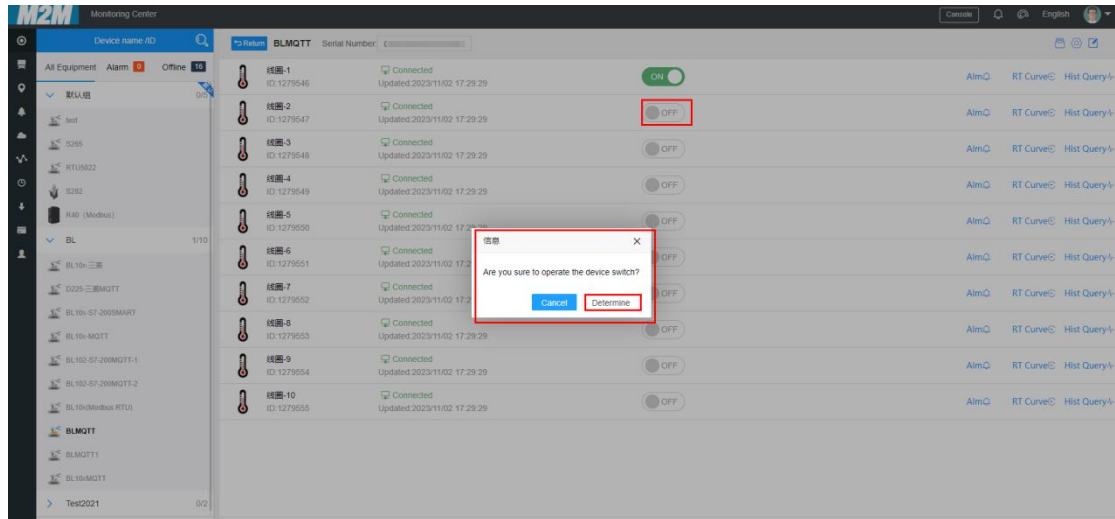


Device name / ID	Serial Number	Status	Value	Unit	RT Curve	Hist Query
数据-1	ID: 1279556	connected	0.0003	↑	AlmQ	RT Curve
数据-2	ID: 1279557	connected	0.0000	↑	AlmQ	RT Curve
数据-3	ID: 1279558	connected	3.5696	↑	AlmQ	RT Curve
数据-4	ID: 1279559	connected	0.0000	↑	AlmQ	RT Curve
数据-5	ID: 1279560	connected	5.0000	↑	AlmQ	RT Curve
数据-6	ID: 1279561	connected	4.0000	↑	AlmQ	RT Curve
数据-7	ID: 1279562	connected	4.0000	↑	AlmQ	RT Curve
数据-8	ID: 1279563	connected	4.0000	↑	AlmQ	RT Curve
数据-9	ID: 1279564	connected	1.0000	↑	AlmQ	RT Curve
数据-10	ID: 1279565	connected	2.0000	↑	AlmQ	RT Curve

Send data: Control DO2 closed, the data collected by the serial port mapping address 40005 corresponding to the data point send "10".



Channels	Modbus Address	Value	PowerOn Status	Open/Close
1	1000	Close	Open	Open/Close
2	1001	Open	Open	Open/Close
3	1002	Open	Open	Open/Close
4	1003	Open	Open	Open/Close
5	1004	Open	Open	Open/Close
6	1005	Open	Open	Open/Close
7	1006	Open	Open	Open/Close
8	1007	Open	Open	Open/Close



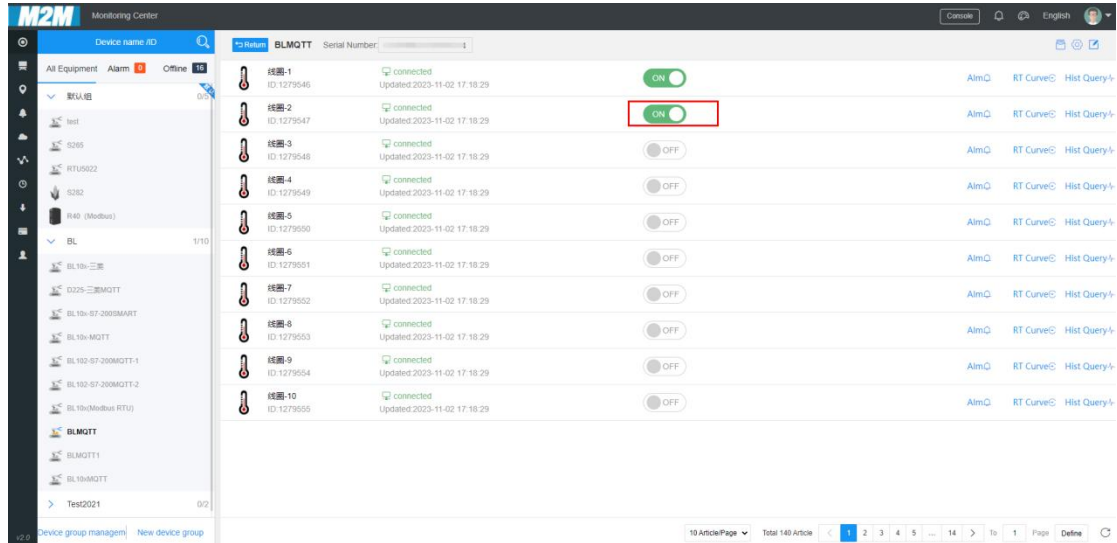
BL200M Status System Settings I/O Module Serial Module Operation Control Cloud platform Logout

IO status

IO Slot:1,Module Type:DO,Module Name:M2082

Channels	Modbus Address	Value	PowerOn Status	Open/Close
1	1000	Close	Open	Open/Close
2	1001	Close	Open	Open/Close
3	1002	Open	Open	Open/Close
4	1003	Open	Open	Open/Close
5	1004	Open	Open	Open/Close
6	1005	Open	Open	Open/Close
7	1006	Open	Open	Open/Close
8	1007	Open	Open	Open/Close

Back to Overview Save & Apply Save Reset



Line	ID	Status	Updated	Control	Alarm	RT Curve	Hist Query
线路-1	ID: 1279546	connected	Updated 2023-11-02 17:18:29	ON	Alarm	RT Curve	Hist Query
线路-2	ID: 1279547	connected	Updated 2023-11-02 17:18:29	ON	Alarm	RT Curve	Hist Query
线路-3	ID: 1279548	connected	Updated 2023-11-02 17:18:29	OFF	Alarm	RT Curve	Hist Query
线路-4	ID: 1279549	connected	Updated 2023-11-02 17:18:29	OFF	Alarm	RT Curve	Hist Query
线路-5	ID: 1279550	connected	Updated 2023-11-02 17:18:29	OFF	Alarm	RT Curve	Hist Query
线路-6	ID: 1279551	connected	Updated 2023-11-02 17:18:29	OFF	Alarm	RT Curve	Hist Query
线路-7	ID: 1279552	connected	Updated 2023-11-02 17:18:29	OFF	Alarm	RT Curve	Hist Query
线路-8	ID: 1279553	connected	Updated 2023-11-02 17:18:29	OFF	Alarm	RT Curve	Hist Query
线路-9	ID: 1279554	connected	Updated 2023-11-02 17:18:29	OFF	Alarm	RT Curve	Hist Query
线路-10	ID: 1279555	connected	Updated 2023-11-02 17:18:29	OFF	Alarm	RT Curve	Hist Query

BL200M

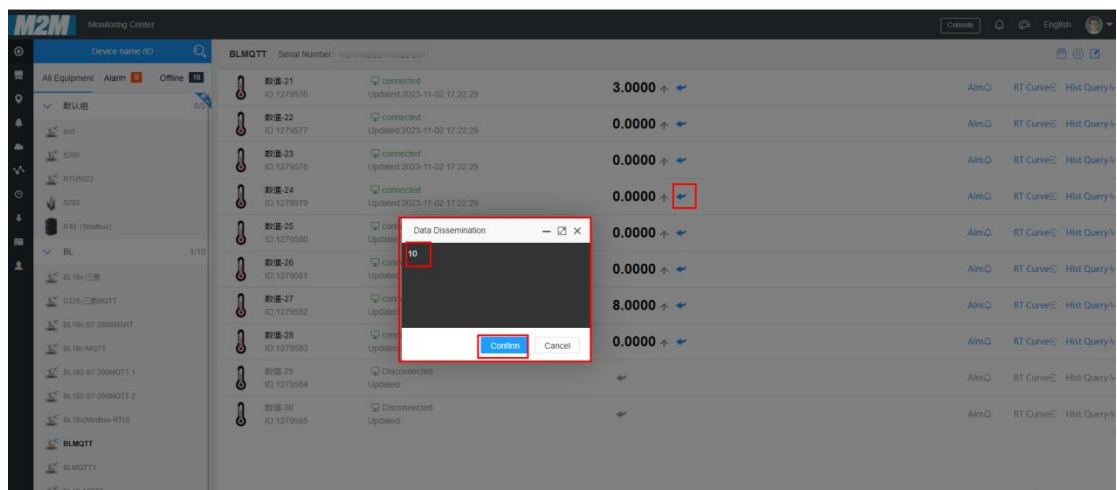
Status System Settings I/O Module Serial Module Operation Control Cloud platform Logout

Modbus Query

Configure Name	Slave Address	Function Code	Mapping Address	Register Address	Data Type	Data Value	COM Port
03	1	3	40000	0	INT16 AB	1	COM1
03	1	3	40001	1	INT16 AB	2	COM1
03	1	3	40002	2	INT16 AB	3	COM1
03	1	3	40003	3	INT16 AB	0	COM1
03	1	3	40004	4	INT16 AB	0	COM1
03	1	3	40005	5	INT16 AB	0	COM1
03	1	3	40006	6	INT16 AB	0	COM1
03	1	3	40007	7	INT16 AB	0	COM1
03	1	3	40008	8	INT16 AB	8	COM1
03	1	3	40009	9	INT16 AB	0	COM1

Back to Overview

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Line	ID	Status	Updated	Value	Control	Alarm	RT Curve	Hist Query
数据-21	ID: 1279576	connected	Updated 2023-11-02 17:22:29	3.0000	ON	Alarm	RT Curve	Hist Query
数据-22	ID: 1279577	connected	Updated 2023-11-02 17:22:29	0.0000	ON	Alarm	RT Curve	Hist Query
数据-23	ID: 1279578	connected	Updated 2023-11-02 17:22:29	0.0000	ON	Alarm	RT Curve	Hist Query
数据-24	ID: 1279579	connected	Updated 2023-11-02 17:22:29	0.0000	ON	Alarm	RT Curve	Hist Query
数据-25	ID: 1279580	connected	Updated 2023-11-02 17:22:29	0.0000	ON	Alarm	RT Curve	Hist Query
数据-26	ID: 1279581	connected	Updated 2023-11-02 17:22:29	0.0000	ON	Alarm	RT Curve	Hist Query
数据-27	ID: 1279582	connected	Updated 2023-11-02 17:22:29	8.0000	ON	Alarm	RT Curve	Hist Query
数据-28	ID: 1279583	connected	Updated 2023-11-02 17:22:29	0.0000	ON	Alarm	RT Curve	Hist Query
数据-29	ID: 1279584	connected	Updated 2023-11-02 17:22:29	0.0000	ON	Alarm	RT Curve	Hist Query
数据-30	ID: 1279585	connected	Updated 2023-11-02 17:22:29	0.0000	ON	Alarm	RT Curve	Hist Query

Modbus Query

Configure Name	Slave Address	Function Code	Mapping Address	Register Address	Data Type	Data Value	COM Port
03	1	3	40000	0	INT16 AB	1	COM1
03	1	3	40001	1	INT16 AB	2	COM1
03	1	3	40002	2	INT16 AB	3	COM1
03	1	3	40003	3	INT16 AB	0	COM1
03	1	3	40004	4	INT16 AB	0	COM1
03	1	3	40005	5	INT16 AB	10	COM1
03	1	3	40006	6	INT16 AB	0	COM1
03	1	3	40007	7	INT16 AB	0	COM1
03	1	3	40008	8	INT16 AB	8	COM1
03	1	3	40009	9	INT16 AB	0	COM1

[Back to Overview](#)

Shenzhen Beilai Technology Co.,Ltd (V1.1.12) / 2023-10-19

The screenshot displays the M2M Monitoring Center interface. The top bar features the 'M2M' logo and 'Monitoring Center' title. The sidebar on the left contains navigation icons. The main content area shows a list of devices under the 'BLMQTT' group. The 'RTU24' device (ID: 1279578) is highlighted with a red box, indicating a value of 10.0000. The interface includes a sidebar with navigation icons, a top bar with 'M2M' logo and 'Monitoring Center' title, and a bottom bar with pagination and search options.

Device name	ID	Status	Value	Unit	Alarm	RT Curve	History
RTU21	ID: 1279576	connected	3.0000	↑	Alarm	RT Curve	History
RTU22	ID: 1279577	connected	0.0000	↑	Alarm	RT Curve	History
RTU23	ID: 1279578	connected	0.0000	↑	Alarm	RT Curve	History
RTU24	ID: 1279579	connected	10.0000	↑	Alarm	RT Curve	History
RTU25	ID: 1279580	connected	0.0000	↑	Alarm	RT Curve	History
RTU26	ID: 1279581	connected	0.0000	↑	Alarm	RT Curve	History
RTU27	ID: 1279582	connected	8.0000	↑	Alarm	RT Curve	History
RTU28	ID: 1279583	connected	0.0000	↑	Alarm	RT Curve	History
RTU29	ID: 1279584	Disconnected			Alarm	RT Curve	History
RTU30	ID: 1279585	Disconnected			Alarm	RT Curve	History

6.1.5 Connecting BL206 to AliCloud

BL200M
Status
System
Settings
I/O Module
Serial Module
Operation Control
Cloud platform
Logout

Ali cloud settings

Ali cloud settings

Enable ☒

Authentication method Device Serect

Product Key(ProductKey)

Device Name(DeviceName) BL200-miyao

Device Serect(DeviceSerect)

Region ID East China 2

Publish Period(s) 60

Publish only changed data ☐

Data packing ☒ Send multiple data in one message

Number of data 100

Connect State Not connected

Save & Apply Save Reset

Shenzhen Beilai Technology Co.,Ltd (V1.1.12) / 2023-10-19

1. Click "Cloud Platform"-"Alicloud". 2. Click "Enable" and select "Device Secret Key" as the authentication method. 3. "Product Secret Key", "Device Name", "Device Secret" and the content of the device certificate of Aliyun platform are the same. 4, Select East China 2 for the region, fill in 60s for the release period, and customize the data packages by packing 100 packages each. 5, Click "Save and Apply", and send the configuration to BL206, and you can check the connection status to see whether the connection is successful.

Device Certificate



Device Certificate [Copy](#)

ProductKey [Copy](#)

DeviceName BL200-miyao [Copy](#)

DeviceSecret [Copy](#)

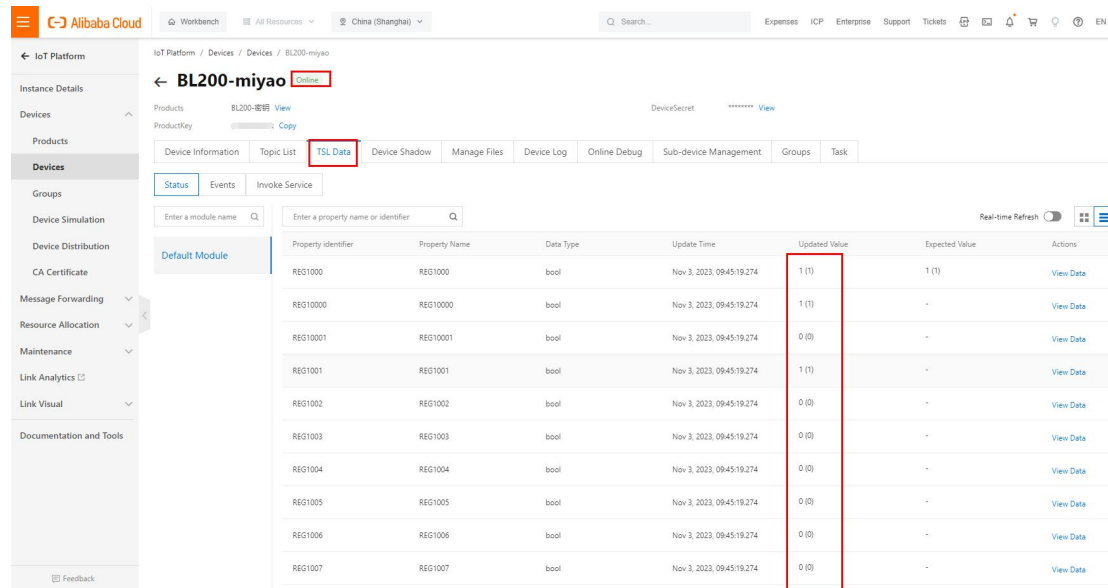
Certificate Installation Modes

✓ [Introduction to the unique-certificate-per-device and unique-certificate-per-product modes](#)

Close

6.1.6 View and Send data on AliCloud

Login to Aliyun, click "TSL Data" to view the data, and refer to 7.1 Data Publish Format for data point read/write identification. The data of local I/O and serial port slave are as follows:



Property identifier	Property Name	Data Type	Update Time	Updated Value	Expected Value	Actions
REG1000	REG1000	bool	Nov 3, 2023, 09:45:19.274	1 (1)	1 (1)	View Data
REG10000	REG10000	bool	Nov 3, 2023, 09:45:19.274	1 (1)	-	View Data
REG10001	REG10001	bool	Nov 3, 2023, 09:45:19.274	0 (0)	-	View Data
REG1001	REG1001	bool	Nov 3, 2023, 09:45:19.274	1 (1)	-	View Data
REG1002	REG1002	bool	Nov 3, 2023, 09:45:19.274	0 (0)	-	View Data
REG1003	REG1003	bool	Nov 3, 2023, 09:45:19.274	0 (0)	-	View Data
REG1004	REG1004	bool	Nov 3, 2023, 09:45:19.274	0 (0)	-	View Data
REG1005	REG1005	bool	Nov 3, 2023, 09:45:19.274	0 (0)	-	View Data
REG1006	REG1006	bool	Nov 3, 2023, 09:45:19.274	0 (0)	-	View Data
REG1007	REG1007	bool	Nov 3, 2023, 09:45:19.274	0 (0)	-	View Data

Alibaba Cloud

Workbench

All Resources

China (Shanghai)

Search...

Expenses

ICP

Enterprise

Support

Tickets

IoT Platform

Instance Details

Devices

Products

Devices

Groups

Device Simulation

Device Distribution

CA Certificate

Message Forwarding

Resource Allocation

Maintenance

Link Analytics

Link Visual

Documentation and Tools

REG3070	REG3070	float	Dec 22, 2022, 10:31:49.179	0	-	View Data
REG4000	REG4000	float	Nov 3, 2023, 09:45:19.274	5.0	-	View Data
REG40000	REG40000	int	Nov 3, 2023, 09:45:19.274	1	-	View Data
REG40001	REG40001	int	Nov 3, 2023, 09:45:19.274	2	-	View Data
REG40002	REG40002	int	Nov 3, 2023, 09:45:19.274	3	-	View Data
REG40003	REG40003	int	Nov 3, 2023, 09:45:19.274	0	-	View Data
REG40004	REG40004	int	Nov 3, 2023, 09:45:19.274	0	-	View Data
REG40005	REG40005	int	Nov 3, 2023, 09:45:19.274	0	-	View Data
REG40006	REG40006	float	Nov 3, 2023, 09:45:19.274	0.0	-	View Data
REG40007	REG40007	int	Nov 3, 2023, 09:45:19.274	0	-	View Data
REG40008	REG40008	float	Nov 3, 2023, 09:45:19.274	0.0	-	View Data
REG40009	REG40009	int	Nov 3, 2023, 09:45:19.274	0	-	View Data
REG40010	REG40010	float	Oct 29, 2022, 15:11:59.542	5.28	-	View Data
REG4002	REG4002	float	Nov 3, 2023, 09:45:19.274	4.0	-	View Data
REG4004	REG4004	float	Nov 3, 2023, 09:45:19.274	4.0	-	View Data
REG4006	REG4006	float	Nov 3, 2023, 09:45:19.274	4.0	-	View Data
REG4008	REG4008	float	Dec 22, 2022, 10:31:49.179	0	-	View Data

Send data: I/O REG1003 closed, serial port slave REG4000 changed from "1" to "20".

[illegible][illegible]

IO status

IO Slot:1,Module Type:DO,Module Name:M2082

Channels	Modbus Address	Value	PowerOn Status	Open/Close
1	1000	Close	Open	Open/Close
2	1001	Close	Open	Open/Close
3	1002	Open	Open	Open/Close
4	1003	Close	Open	Open/Close
5	1004	Open	Open	Open/Close
6	1005	Open	Open	Open/Close
7	1006	Open	Open	Open/Close
8	1007	Open	Open	Open/Close

[Back to Overview](#)

Save & Apply

Save

Reset

Shenzhen Beilai Technology Co.,Ltd (V1.1.12) / 2023-10-19

[illegible]

Alibaba Cloud

Workbench

All Resources

China (Shanghai)

Search

Expenses ICP Enterprise Support Tickets

EN

IoT Platform

Instance Details

Devices

Products

Devices

Groups

Device Simulation

Device Distribution

CA Certificate

Message Forwarding

Resource Allocation

Maintenance

Real-time Monitoring

Dashboard

Device Log

Online Debug

Secure Tunnel

Remote Config

OTA Update

IoT Platform / Maintenance / Online Debug

Online Debug

Select device: BL200-毫研 BL200-miyao

Online debugging only supports debugging real equipment, please use virtual equipment debugging

Device simulator

Property Debugging Service Calls Remote Login

Module: Default Module

Enter a parameter (float)

Debugging

REG4000/REG40000

20

Debugging

REG40001/REG40001

Enter a parameter (int)

Get

REG40002/REG40002

Enter a parameter (int)

Set

REG40003/REG40003

Enter a parameter (int)

Debugging

REG40004/REG40004

Enter a parameter (int)

Debugging

Get Set Set expectations Reset

Real-time Logs Online

Time Content

Nov 3, 2023, 10:05:19.342

```

[{"Status": "false", "RequestId": "1", "InstanceId": "iot-public", "Params": {"Time": "2023-11-03 10:05:19.342", "Operation": "Check", "Code": "E332", "Reason": "Is parse failed"}, "ResultData": {"Time": "2023-11-03 10:05:19.342", "Operation": "Check", "Code": "E332", "Reason": "Is parse failed"}, "DeviceName": "BL200-miyao"}]

```

Nov 3, 2023, 10:05:19.331

```

[{"Status": "true", "RequestId": "1", "InstanceId": "iot-public", "Params": {"Time": "2023-11-03 10:05:19.331", "Operation": "Check", "Code": "E332", "Reason": "Is parse failed"}, "ResultData": {"Time": "2023-11-03 10:05:19.331", "Operation": "Check", "Code": "E332", "Reason": "Is parse failed"}, "DeviceName": "BL200-miyao"}]

```

Nov 3, 2023, 10:04:19.337

```

[{"Status": "false", "RequestId": "1", "InstanceId": "iot-public", "Params": {"Time": "2023-11-03 10:04:19.337", "Operation": "Check", "Code": "E332", "Reason": "Is parse failed"}, "ResultData": {"Time": "2023-11-03 10:04:19.337", "Operation": "Check", "Code": "E332", "Reason": "Is parse failed"}, "DeviceName": "BL200-miyao"}]

```

Modbus Query

Configure Name	Slave Address	Function Code	Mapping Address	Register Address	Data Type	Data Value	COM Port
03	1	3	40000	0	INT16 AB	20	COM1
03	1	3	40001	1	INT16 AB	2	COM1
03	1	3	40002	2	INT16 AB	3	COM1
03	1	3	40003	3	INT16 AB	0	COM1
03	1	3	40004	4	INT16 AB	0	COM1
03	1	3	40005	5	INT16 AB	0	COM1
03	1	3	40006	6	INT16 AB	0	COM1
03	1	3	40007	7	INT16 AB	0	COM1
03	1	3	40008	8	INT16 AB	0	COM1
03	1	3	40009	9	INT16 AB	0	COM1

[Back to Overview](#)

[illegible]

6.1.7 Connecting BL206 to AWS

BL200M
Status
System
Settings
I/O Module
Serial Module
Operation Control
Cloud platform
Logout

Aws cloud settings

Aws cloud settings

Enable ☒

Host(EndPoint)

Client ID

Thing Name

Certificate authority

Device certificate

Device private key

Publish Topic

Publish Period(s)

Publish only changed data ☐

Shadow Data select

Data packing ☒

Number of data

Connect State Connected

Save & Apply
Save
Reset

Shenzhen Beilai Technology Co.,Ltd (V1.1.12) / 2023-10-19

Instructions: **1.** Click "Cloud Platform"->"AWS Cloud" **2.** Click "Enable". **3.** End point: Fill in the same node as the end point in "Settings"->"Device Data End Point" of Amazon Cloud Platform.

AWS IoT
> Settings

Settings

Device data endpoint

Your devices can use your account's device data endpoint to connect to AWS.

Each of your things has a REST API available at this endpoint. MQTT clients and [AWS IoT Device SDKs](#) also use this endpoint.

Endpoint

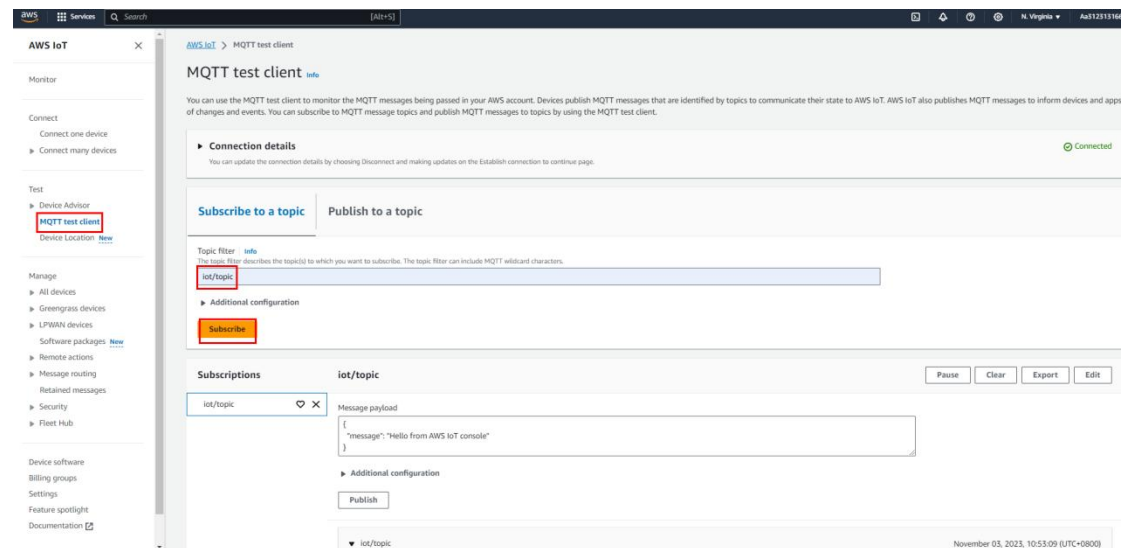
Select security policy

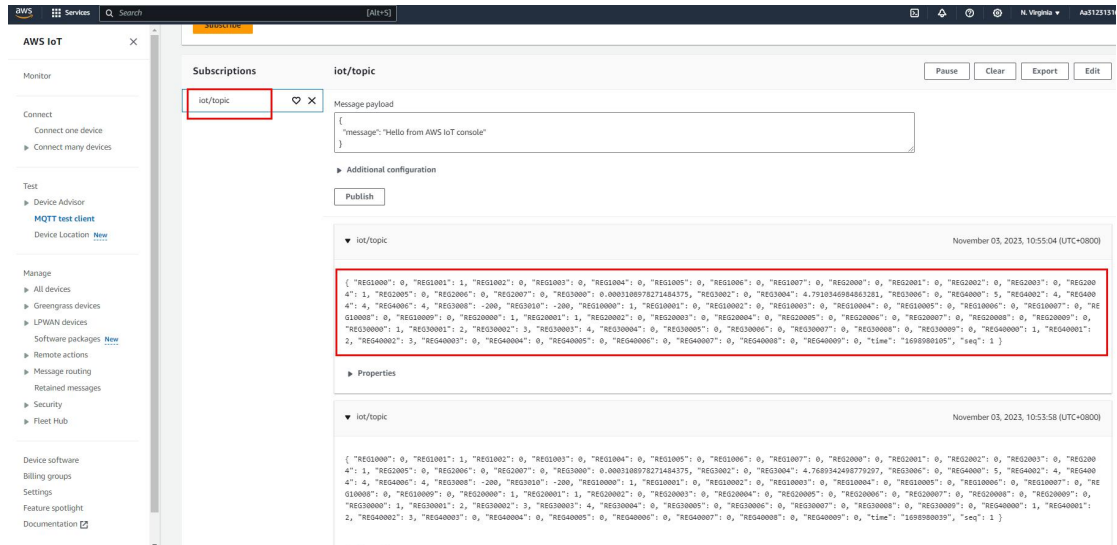
[Compare security policies](#)

4. Client ID: Fill in the user ID, Thing name: Fill in the thing name created by Amazon.com. 5. Certificate authority, device certificate and device private key are the certificates generated when you upload the thing created by Amazon.com. Download them from Amazon.com. How to upload: Click "Select File"->"Upload File", click the certificate, click the open button in the pop-up window, click "Upload File" in the configuration interface, and upload it to the configuration box. Click "Upload File" in the configuration interface to upload it, select the certificate you need in the box and click it. 6. Publishing topic: Fill in the Amazon platform topic, such as `iot/topic`. 7. Publishing cycle: 60s. 8. Shadow data selection: Amazon platform shadow send to control BL206, do not need to send control, select "no", send control data can choose to support all data or individual data can be controlled. 9. Data packing 100 per package, customized. 10. Click "Save and Apply", send the configuration to BL206, the connection status can be queried whether the connection is successful.

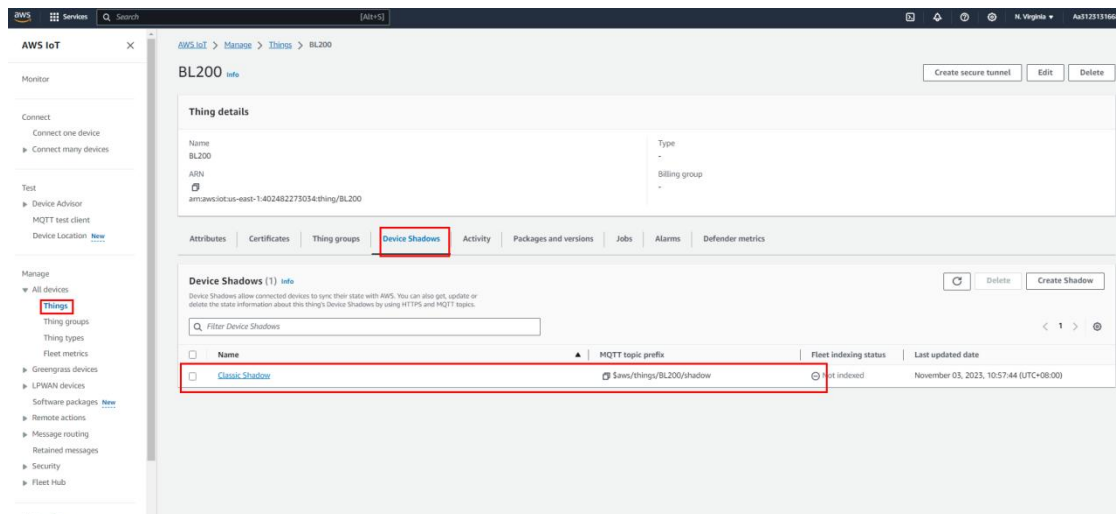
6.1.8 AWS View and Send Data

Click "MQTT Test Client" to subscribe to the BL206 Amazon Cloud Configuration publish topic "`iot/topic`".





Shadow control REG1000 closed and slave REG40000 is changed from "1" to "20".



AWS IoT

Monitor

Connect

Test

Manage

Device software

Billing groups

ARN

MQTT topic prefix

Device Shadow URL

Last updated

Version

Prefix for Fleet indexing query

Fleet indexing status

Classic Shadow

Device Shadow details

Device Shadow document info

Device Shadow state

Edit Device Shadow state

Updating the Device Shadow state sends update messages to your apps and services.

Device Shadow state

```
{
  "state": {
    "desired": {
      "welcome": "aws-iot",
      "REG1000": "1",
      "REG40000": "20"
    },
    "reported": {
      "welcome": "aws-iot",
      "REG1000": 1,
      "REG1001": 0,
      "REG1002": -200,
      "REG1003": 0,
      "REG1004": 0,
      "REG1005": 0,
      "REG1006": 0,
      "REG1007": 0,
      "REG2000": 0,
      "REG2001": 0,
      "REG2002": 0,
      "REG2003": 0,
      "REG2004": 0,
      "REG2005": 0,
      "REG2006": 0,
      "REG2007": 0,
      "REG2008": 0,
      "REG2009": 0,
      "REG30000": 1,
      "REG30001": 2,
      "REG30002": 3,
      "REG30003": 4,
      "REG30004": 0,
      "REG30005": 0,
      "REG30006": 0,
      "REG30007": 0,
      "REG30008": 0,
      "REG30009": 0,
      "REG40000": 20,
      "REG40001": 2,
      "REG40002": 3,
      "REG40003": 0,
      "REG40004": 0,
      "REG40005": 0,
      "REG40006": 0,
      "REG40007": 0,
      "REG40008": 0,
      "REG40009": 0,
      "time": "1698998174",
      "seq": 1
    }
  }
}
```

lot/topic

November 03, 2023, 15:56:14 (UTC+0800)

6.1.9 Connecting BL206 to Huawei Cloud

BL200M
Status
System
Settings
I/O Module
Serial Module
Operation Control
Cloud platform
Logout

Huawei cloud settings

Huawei cloud settings

Enable ☒

Authentication method Device Select

Device ID

Secret key

Service ID BL200

Region ID CN North-Beijing4

Publish Period(s) 60

Publish only changed data ☐

Data packing ☒
Send multiple data in one message

Number of data 100

Connect State Connected

Save & Apply Save Reset

Shenzhen Beilai Technology Co.,Ltd (V1.1.12) / 2023-10-19

Instructions: 1. Click "Cloud Platform"->"Huawei Cloud". 2. Click "Enable" and select "Device Secret" as the authentication method. 3. Device ID is the same as the device ID of Huawei Cloud Platform, and the key is the password entered by Huawei Cloud Platform to create the device. 4. Service ID is the same as the service ID of Huawei Cloud Platform to create the product. 5. Region ID: Select North China-Beijing4, and you can fill in the IP address if you select others. 6. Publish period: 60s 7. Data packing 100 per package, customized. 8. Click "Save and Apply", the Huawei Cloud configuration is sent to BL206, and the connection status can be queried whether the connection is successful or not.

6.1.10 Huawei Cloud View and Send Data

Log in to Huawei Cloud, click Device - Device Info to view the data, and click View All Attributes or Device Shadow to view the data. Click "View All Properties" or "Device Shadow" to view the data, and refer to 7.1 Data Publish Format for data point read/write identifiers. The data of local I/O and serial port slave are as follows:

HUAWEI CLOUD Console Beijing4

IoT Device Access

Basic Default [Change]

Overview

Products

Devices

All Devices

Groups

Software/Firmware Upgrades

Device CA Certificates

Rules

O&M

Resource Spaces

IoTDA Instances

Profiles

Storage Management

IoT Device Provisioning

Documentation

API Explorer

Forum for help

All Devices / Device Details

Device Info Cloud Run Logs Cloud Delivery Device Shadow Message Trace Device Monitoring Child Devices Tags

(No device name) Online Product BL200

Resource Space BLOXX

Node ID BL200

Registered Oct 13, 2022 11:58:58 GMT+08:00

Firmware Version --

Description --

Last Online Nov 03, 2023 16:45:47 GMT+08:00

Device ID --_BL200

Authentication Secret Reset Secret

Type

Node Type Directly connected

Software Version --

Activated Oct 13, 2022 13:53:24 GMT+08:00

MQTT Connection View

Parameter

Product Model Data

Query Historical Data [View All Properties]

Q: Please input the service name

BL200

Latest Reported Time: Nov 03, 2023 16:51:51 GMT+08:00

Q: Please input the property name

REG40000 REG40000	REG40002 REG40002	REG1084 REG1084	REG1085 REG1085
20	3	0	0

HUAWEI CLOUD Console Beijing4

IoT Device Access

Basic Default [Change]

Overview

Products

Devices

All Devices

Groups

Software/Firmware Upgrades

Device CA Certificates

Rules

O&M

Resource Spaces

IoTDA Instances

Profiles

Storage Management

IoT Device Provisioning

Documentation

API Explorer

Forum for help

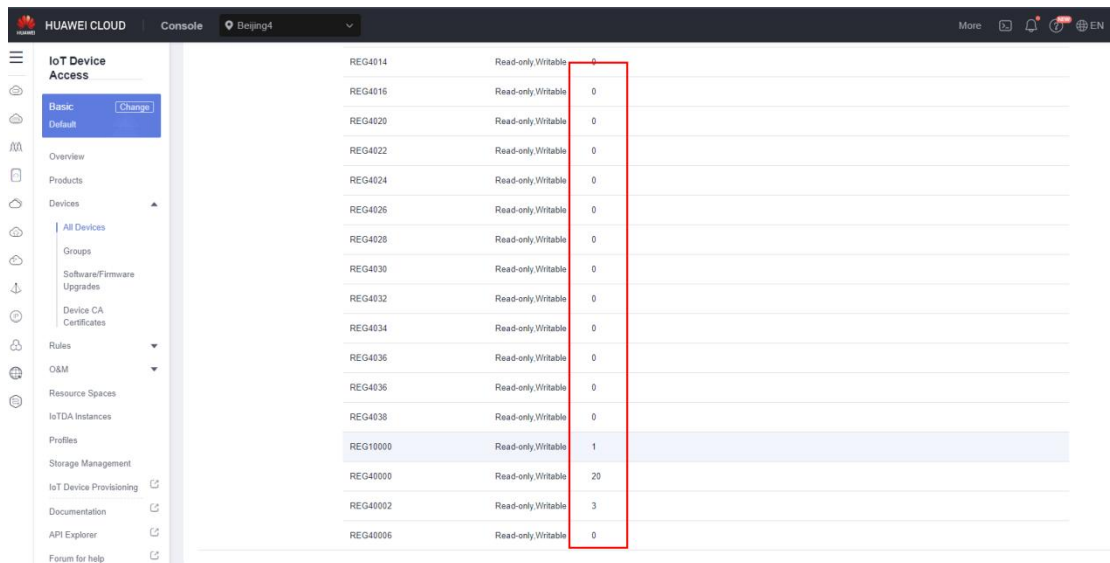
All Devices / Device Details

Device Info Cloud Run Logs Cloud Delivery **Device Shadow** Message Trace Device Monitoring Child Devices Tags

The IoT platform supports the creation of device shadows. A device shadow is a JSON file that stores the device status, latest device properties reported, and device configurations to deliver. Each device has only one shadow. A device can retrieve and set its shadow to synchronize properties, either from the shadow to the device or from the device to the shadow. [Learn more>>](#)

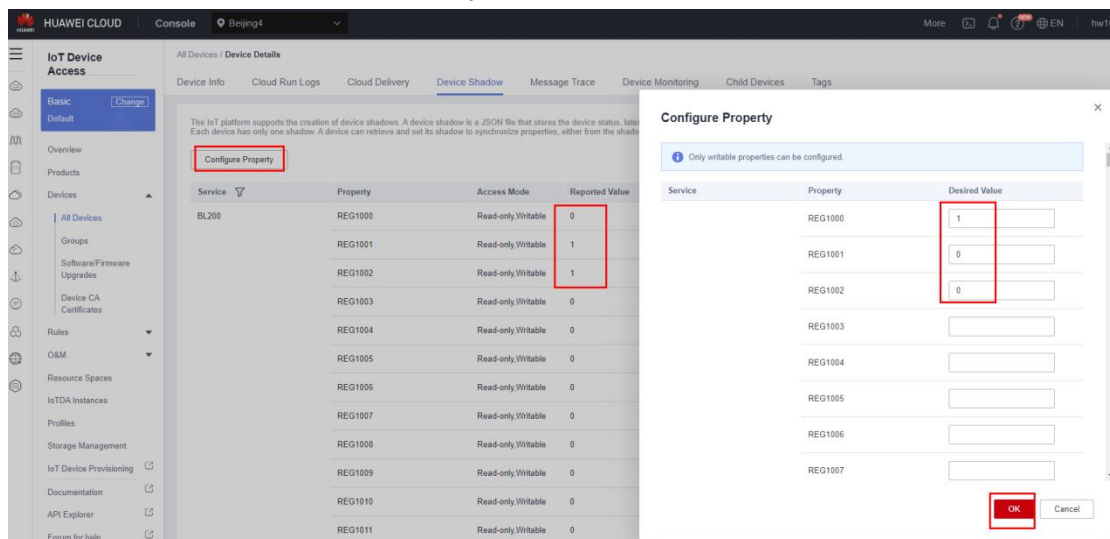
Configure Property

Service	Property	Access Mode	Reported Value	Desired Value
BL200	REG1000	Read-only,Writable	1	
	REG1001	Read-only,Writable	0	
	REG1002	Read-only,Writable	1	
	REG1003	Read-only,Writable	0	
	REG1004	Read-only,Writable	0	
	REG1005	Read-only,Writable	0	
	REG1006	Read-only,Writable	0	
	REG1007	Read-only,Writable	0	
	REG1008	Read-only,Writable	0	
	REG1009	Read-only,Writable	0	
	REG1010	Read-only,Writable	0	
REG1011	Read-only,Writable	0		



Property	Access Mode	Value
REG4014	Read-only,Writable	0
REG4016	Read-only,Writable	0
REG4020	Read-only,Writable	0
REG4022	Read-only,Writable	0
REG4024	Read-only,Writable	0
REG4026	Read-only,Writable	0
REG4028	Read-only,Writable	0
REG4030	Read-only,Writable	0
REG4032	Read-only,Writable	0
REG4034	Read-only,Writable	0
REG4036	Read-only,Writable	0
REG4036	Read-only,Writable	0
REG4038	Read-only,Writable	0
REG10000	Read-only,Writable	1
REG40000	Read-only,Writable	20
REG40002	Read-only,Writable	3
REG40006	Read-only,Writable	0

Shadow send: Control REG1000 to close, REG1001 to disconnect, REG1002 to disconnect. Shadow send control AO and control DO with the same principle, need to output how much value, fill in the value can be, AO send control does not do the demonstration. BL206 Huawei Cloud temporarily does not support the message send down and command send down way control.



Service	Property	Access Mode	Reported Value	Desired Value
BL200	REG1000	Read-only,Writable	0	1
	REG1001	Read-only,Writable	1	0
	REG1002	Read-only,Writable	1	0
	REG1003	Read-only,Writable	0	
	REG1004	Read-only,Writable	0	
	REG1005	Read-only,Writable	0	
	REG1006	Read-only,Writable	0	
	REG1007	Read-only,Writable	0	
	REG1008	Read-only,Writable	0	
	REG1009	Read-only,Writable	0	
	REG1010	Read-only,Writable	0	
	REG1011	Read-only,Writable	0	

HUAWEI CLOUD		Console	Beijing4	More	EN
IoT Device Access		All Devices / Device Details			
Basic		Device Info	Cloud Run Logs	Cloud Delivery	Device Shadow
Default		Message Trace	Device Monitoring	Child Devices	Tags
Overview		The IoT platform supports the creation of device shadows. A device shadow is a JSON file that stores the device status, latest device properties reported, and device configurations to deliver. Each device has only one shadow. A device can retrieve and set its shadow to synchronize properties, either from the shadow to the device or from the device to the shadow. Learn more >			
Products		Configure Property			
Devices		Search by 'property'			
All Devices		Service	Property	Access Mode	Reported Value
Groups		BL200	REG1000	Read-only/Writeable	1
Software/Firmware Upgrades			REG1001	Read-only/Writeable	0
Device CA Certificates			REG1002	Read-only/Writeable	0
Rules			REG1003	Read-only/Writeable	0
O&M			REG1004	Read-only/Writeable	0
Resource Spaces			REG1005	Read-only/Writeable	0
IoTDA Instances			REG1006	Read-only/Writeable	0
Profiles			REG1007	Read-only/Writeable	0
Storage Management			REG1008	Read-only/Writeable	0
IoT Device Provisioning			REG1009	Read-only/Writeable	0
Documentation			REG1010	Read-only/Writeable	0
API Explorer			REG1011	Read-only/Writeable	0
Forum for help					

6.1.11 Connecting Thingsboard

Thingsboard cloud connects to the Pro version of the cloud service with the domain name: thingsboard.cloud. To connect to other thingsboard-formatted cloud platforms, select "Other thingsboard servers". For the time being, only the topic: v1/devices/me/telemetry is supported.

BL200M

Status

System

Settings

I/O Module

Serial Module

Operation Control

Cloud platform

Logout

Thingsboard Cloud settings

Cloud connection settings

Enable setting

Thingsboard platform

MQTT Client ID

User Name

Password

Publish Period(s)

Data Retransmission Enable

Data packing

Number of data

Publish only changed data

Connect State

Save & Apply

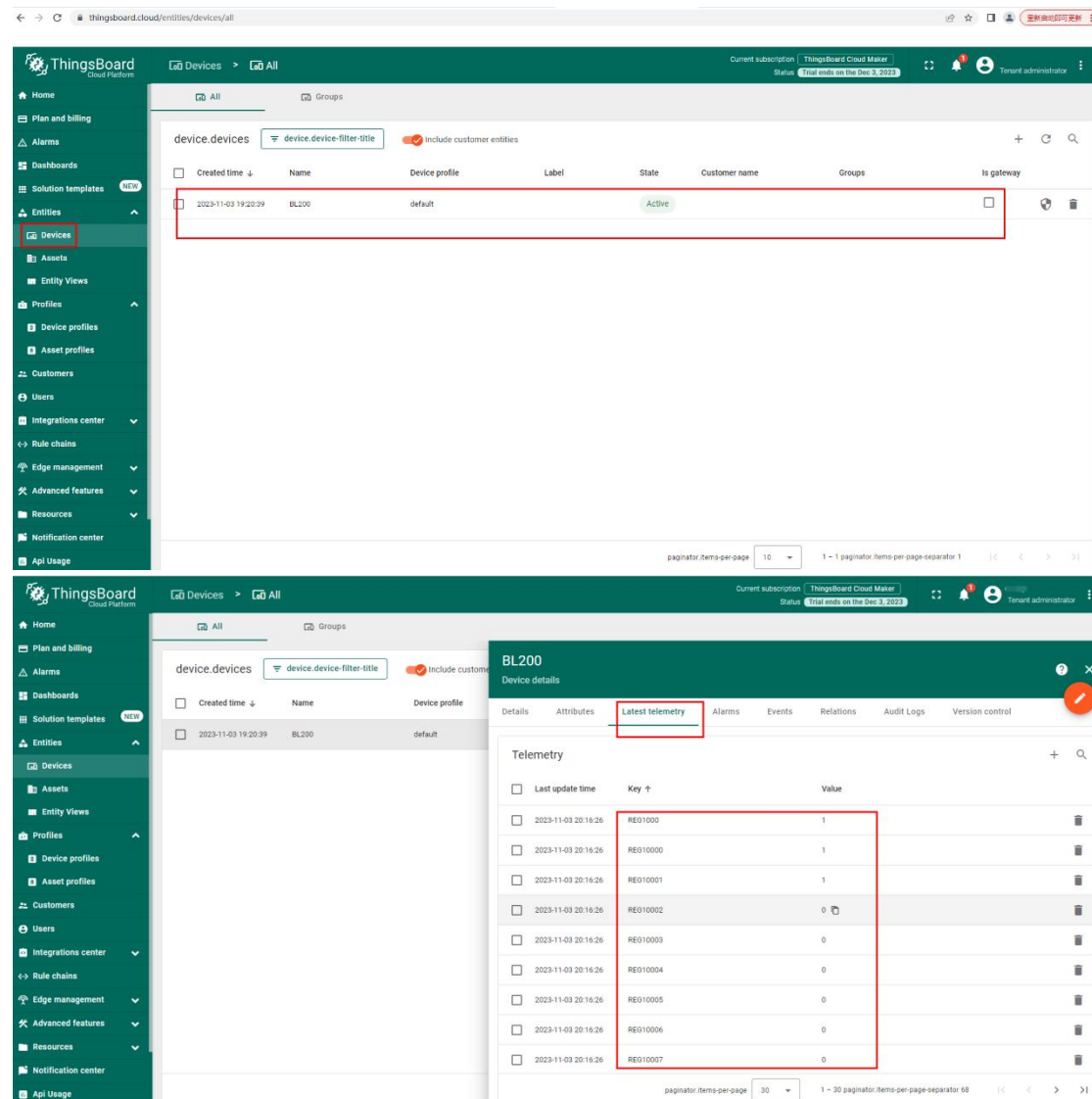
Save

Reset

Instructions: 1. Click "Cloud Platform"->"Thingsboard Cloud". 2. Click "Enable" and select "ThingBoard Cloud". 3. Fill in the MQTT client ID, user name and password in the same way as you fill in MQTT Basic when you create a device for thingsboard platform. 4. Publish period: 60s. 5. Data Packaging 6. Click "Save and Apply" to send the thingsboard cloud configuration to BL206, and you can check whether the connection status is successful or not.

6.1.12 Thingsboard View Data

Thingsboard sends down control data that is not supported at this time.



The screenshot displays the Thingsboard Cloud Platform interface. The top navigation bar shows the current subscription as 'Thingsboard Cloud Master' with a status of 'Trial ends on the Dec 3, 2023'. The left sidebar contains various menu items, with 'Devices' highlighted. The main content area shows a list of devices under the 'device.devices' filter. A red box highlights the device BL200, which is in an 'Active' state. Below this, a modal window titled 'BL200 Device details' is open, showing the 'Latest telemetry' tab. This tab displays a table of telemetry data with columns for 'Last update time', 'Key', and 'Value'. A red box highlights the first seven rows of this table, showing keys ranging from REG10000 to REG10007 and values of 1 or 0.

Last update time	Key	Value
2023-11-03 20:16:26	REG10000	1
2023-11-03 20:16:26	REG100000	1
2023-11-03 20:16:26	REG100001	1
2023-11-03 20:16:26	REG100002	0
2023-11-03 20:16:26	REG100003	0
2023-11-03 20:16:26	REG100004	0
2023-11-03 20:16:26	REG100005	0
2023-11-03 20:16:26	REG100006	0
2023-11-03 20:16:26	REG100007	0

BL200

Device details

Details Attributes Latest telemetry Alarms Events Relations Audit Logs Version control

Telemetry

☐	Last update time	Key ↑	Value	
☐	2023-11-03 20:18:26	REG3010	-200	
☐	2023-11-03 20:18:26	REG4000	5	
☐	2023-11-03 20:18:26	REG40000	20	
☐	2023-11-03 20:18:26	REG40001	2	
☐	2023-11-03 20:18:26	REG40002	3	
☐	2023-11-03 20:18:26	REG40003	0	
☐	2023-11-03 20:18:26	REG40004	0	
☐	2023-11-03 20:18:26	REG40005	0	
☐	2023-11-03 20:18:26	REG40006	0	

paginator.items-per-page 30 31 – 60 paginator.items-per-page-separator 68 |< < > >|

BL200

Device details

Details Attributes Latest telemetry Alarms Events Relations Audit Logs Version control

Telemetry

☐	Last update time	Key ↑	Value	
☐	2023-11-03 20:19:26	REG40007	0	
☐	2023-11-03 20:19:26	REG40008	0	
☐	2023-11-03 20:19:26	REG40009	0	
☐	2023-11-03 20:19:26	REG4002	4	
☐	2023-11-03 20:19:26	REG4004	4	
☐	2023-11-03 20:19:26	REG4006	4	
☐	2023-11-03 20:19:26	seq	1	
☐	2023-11-03 20:19:26	time	1699013966	

paginator.items-per-page 30 61 – 68 paginator.items-per-page-separator 68 |< < > >|

6.2 BL206Pro Communication Example

BL206Pro supports Modbus TCP, OPC UA, and MQTT connection, and the communication example of MQTT connection can be referred to the communication example of BL206.

6.2.1 Modbus TCP Communication

6.2.1.1 Overview

Modbus is an open, manufacturer-independent fieldbus standard protocol for a variety of applications in manufacturing and process automation.

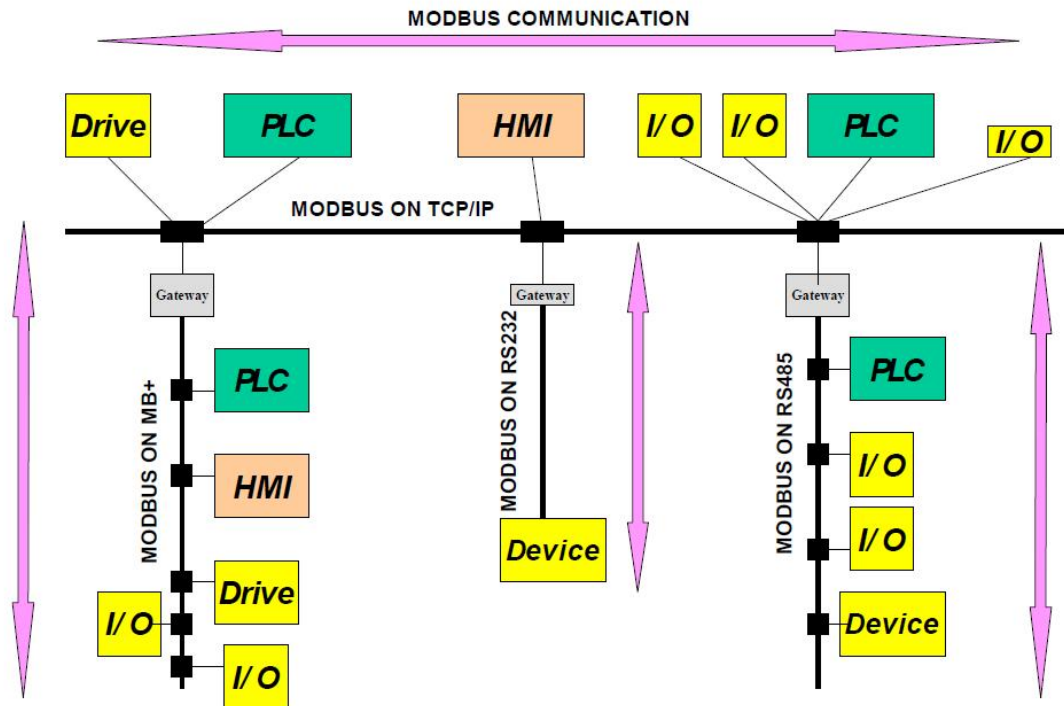
MODBUS is an application layer messaging protocol at layer 7 of the OSI model that enables client/server communication between devices connected on different types of buses or networks.

Several commonly used networks are as follows:

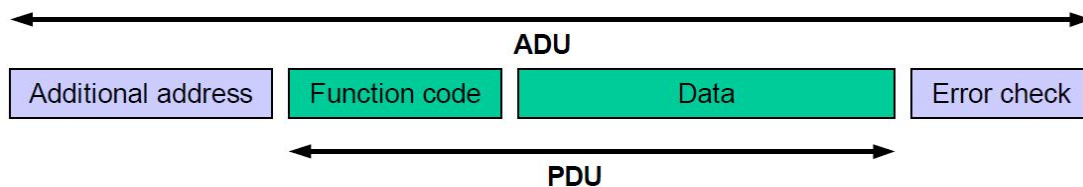
- TCP/IP over Ethernet
- Asynchronous serial transmission of multiple media (wired: EIA/TIA-232-E, EIA-422, EIA/TIA-485-A; optical fiber, radio, etc.).
- MODBUS PLUS, high-speed token.

MODBUS is a request/response protocol that provides services specified by function codes.

The MODBUS protocol allows easy communication within all types of network architectures.



MODBUS protocol defines a simple protocol data unit (PDU) independent of the underlying communication layer. The mapping of the MODBUS protocol on a specific bus or network can introduce some additional fields on the Application Data Unit (ADU).



6.2.1.1.1 Modbus TCP

The Modbus TCP protocol is a variant of the Modbus protocol that is optimized for communication over a TCP/IP connection. The protocol is designed for data exchange at the field level (ie for I/O data exchange in the process image). On the server side, all packets are sent over a TCP connection with port number 502.

The general Modbus TCP message is as follows:

byte	0	1	2	3	4	5	6	7	8 - n
Definition	Transaction identifier		Protocol identifier(Always 00)		Field length		Slave address	Modbus function code	Data

6.2.1.1.2 Modbus Data Encoding

Modbus uses "big endian" representation for address and data items. This means that when transferring numbers larger than a single byte, the most significant byte is sent first.

6.2.1.1.3 Modbus Data Type

The modbus protocol is based on the following basic data types:

Data type	Object type	Access type	Description
Digital input	1 bit	read	Digital input
Coil	1 bit	read/write	Digital output
Input register	16 bit (word)	read	Analog input
Holding register	16 bit (word)	read/write	Analog output

For each basic data type, one or more function codes are defined. These function codes allow digital or analog input and output data, as well as internal variables to be set or read directly from the fieldbus node.

6.2.1.2 Modbus Function Code

The function codes supported by the BL200 fieldbus node are shown in the table below. To perform the required functions, please specify the respective function codes and the address of the selected input or output channel or register.

Modbus function code	Function	Access type	Description
0x02	read digital input	read	Access by 1 bit
0x01	read coil	read/write	
0x05	write a single coil	read/write	
0x0F	write multiple coils	read/write	
0x04	read input register	read	Access by 16 Bit
0x03	read multiple registers	read/write	
0x06	write a single register	read/write	
0x10	write multiple registers	read/write	

The MODBUS function is performed as follows:

1. The MODBUS TCP master (such as PC) sends a request to the BL206Pro fieldbus node using a specific function code;
2. The BL206Pro fieldbus node receives the data message, and then responds to the master with correct data according to the master's request.

If a fieldbus node receives an incorrect request, it sends an error data telegram (exception) to the master.

The meaning of the exception code contained in the exception is as follows:

Exception code	Description
0x01	illegal function
0x02	illegal data address
0x03	illegal data value
0x04	slave device failure

6.2.1.2.1 Function Code 0x02

This function code is used to read the continuous state of single or multiple digital inputs.

1. Request

The request specifies the starting address and the quantity to be read.

Field Name	Number of bytes	Example	Description
Transaction identifier	2 Byte	0x00 01	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 06	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x02	Read digital input, use function code 0x02
Start address	2 Byte	0x07 D0	The address is detailed in the "Modbus Register Mapping" chapter
Enter quantity	2 Byte	0x08	Read 8 digital inputs

2. Response

The data field indicates the value of the input state. A binary 1 corresponds to the on state and a 0 corresponds to the off state. The least significant bit (LSB) of the first data byte contains the first bit of the request, the others are in ascending order. If the response data is not a multiple of 8, the remaining bits of the last data byte will be padded with zeros (towards the upper bits of the byte).

Field Name	Number of bytes	Example	Description
Transaction identifier	2 Byte	0x00 01	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 04	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x02	Read digital input, use function code 0x02
Data bytes	1 Byte	0x01	Number of bytes of data
Data	1 Byte	0x89	Response data

3. Abnormal

Field Name	Number of bytes	Example	Description
...			
Function code	1 Byte	0x82	Modbus function code + 0x80
Abnormal code	1 Byte	0x01	0x01 or 0x02

4. Example

Read the value of 8 digital inputs from address 2000 to 2007.

request

0x00 01 00 00 00 06 01 02 07 D0 00 08

Byte	1	2	3	4	5	6	7	8	9	10	11	12
Data	00 01		00 00		00 06		01	01	07 D0		00 08	
illustrate	Transaction identifier		Protocol identifier		Message length		Device address	Function code	Start address		Number of coils	

response

0x00 01 00 00 00 04 01 02 01 89

Byte	1	2	3	4	5	6	7	8	9	10
Data	00 01		00 00		00 04		01	01	01	89
illustrate	Transaction identifier		Protocol identifier		Message length		Device address	Function code	Data bytes	Data

Status from 2007 to 2000 is displayed as byte value 0x89 or binary 1000 1001.

Address 2007 is the most significant bit MSB of the byte, 2000 is the least significant bit LSB, the distribution from high to low is as follows:

Bit	7	6	5	4	3	2	1	0
Address	2007	2006	2005	2004	2003	2002	2001	2000
Status	1	0	0	0	1	0	0	1
illustrate	close	open	open	open	close	open	open	close

6.2.1.2.2 Function Code 0x01

This function code is used to read the continuous status of single or multiple coils in the remote device.

1. Request

The request specifies the starting address, which specifies the address of the first coil, and the number of coils.

Field Name	Number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 01	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 06	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x01	Read coil, use function code 0x01
Start address	2 Byte	0x03 E8	The address is detailed in the "Modbus Register Mapping" chapter
Number of coils	2 Byte	0x00 08	Read 8 coil states

2. Response

The data field indicates the value of the input state. A binary 1 corresponds to the on state and a 0 corresponds to the off state. The least significant bit (LSB) of the first data byte contains the first bit of the request, the others are in ascending order. If the response data is not a multiple of 8, the remaining bits of the last data byte will be padded with zeros (towards the upper bits of the byte).

Field Name	Number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 01	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 04	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x01	Read coil, use function code 0x01
Data bytes	1 Byte	0x01	Number of bytes of data
Data	1 Byte	0x89	Response data

3. Abnormal

Field Name	Number of bytes	Example	illustrate
...			
Function code	1 Byte	0x81	Modbus function code + 0x80
Abnormal code	1 Byte	0x01	0x01 or 0x02

4. Example

Read the status values of 8 coils from addresses 1000 to 1007.

request

0x00 01 00 00 00 06 01 01 03 E8 00 08

Byte	1	2	3	4	5	6	7	8	9	10	11	12
Data	00 01		00 00		00 06		01	01	03 E8		00 08	
illustr	Transaction		Protocol		Message		Device	Function	Initial		Number of	

ate	identifier	identifier	length	address	code	address	coils
------------	------------	------------	--------	---------	------	---------	-------

response

0x00 01 00 00 00 04 01 01 01 89

Byte	1	2	3	4	5	6	7	8	9	10
Data	00 01		00 00		00 04		01	01	01	89
illustrate	Transaction identifier		Protocol identifier		Message length		Device address	Function code	Data bytes	Data

Status from 1007 to 1000 is displayed as byte value 0x89 or binary 1000 1001.

Address 1007 is the most significant bit MSB of the byte, 1000 is the least significant bit LSB, the distribution from high to low is as follows:

Bit	7	6	5	4	3	2	1	0
Address	1007	1006	1005	1004	1003	1002	1001	1000
Status	1	0	0	0	1	0	0	1
illustrate	close	open	open	open	close	open	open	close

6.2.1.2.3 Function Code 0x05

This function will write a single coil status to the slave device.

1. Request

Field Name	Number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 01	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 06	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x05	To write a single coil, use function code 0x05
Register address	2 Byte	0x03 E8	The address is detailed in the "Modbus Register Mapping" chapter
Data input	2 Byte	0xFF 00	This value is: 0xFF 00 or 0x00 00. 0xFF

			00 means write 1, 0x00 00 means write 0.
--	--	--	--

2. Response

Field Name	Number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 01	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 06	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x05	To write a single coil, use function code 0x05
Data bytes	2 Byte	0x03 E8	Write the register address of the coil
Data input	2 Byte	0xFF 00	This value is: 0xFF 00 or 0x00 00. 0xFF 00 means write 1, 0x00 00 means write 0.

3. Abnormal

Field Name	Number of bytes	Example	illustrate
...			
Function code	1 Byte	0x85	Modbus function code + 0x80
Abnormal code	1 Byte	0x81	0x01 or 0x02

4. Example

Write the state value of the coil at address 1000 as 1, that is, the closed state.

request

0x00 01 00 00 00 06 01 05 03 E8 FF 00

Byte	1	2	3	4	5	6	7	8	9	10	11	12
Data	00 01		00 00		00 06		01	05	03 E8		FF 00	
illustrate	Transaction identifier		Protocol identifier		Message length		Device address	Function code	Coil address		Write "1"	

response

0x00 01 00 00 00 06 01 05 03 E8 FF 00

Byte	1	2	3	4	5	6	7	8	9	10	11	12
Data	00 01		00 00		00 06		01	05	03 E8		FF 00	
illustrate	Transaction identifier		Protocol identifier		Message length		Device address	Function code	Coil address		Write "1"	

6.2.1.2.4 Function Code 0x0F

This function code is used to set multiple consecutive coils to open or close. The on/off state of the request is specified by the content of the request data field. A logical "1" requests the corresponding output to close, and a logical "0" requests it to open. The normal response returns the function code, the starting address and the number of coils executed.

1. Request

Field Name	number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 01	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 08	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x0F	Write multiple coils, use function code 0x0F
Start address	2 Byte	0x03 E8	The address is detailed in the "Modbus Register Mapping" chapter
Number of coils	2 Byte	0x00 08	
Data bytes	1 Byte	0x01	
Data	1 Byte	0xFF	

2. Response

Field Name	number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 00	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 06	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x0F	Write multiple coils, use function code 0x0F
Start address	2 Byte	0x03 E8	
Number of coils	2 Byte	0x00 08	

3. Abnormal

Field Name	number of bytes	Example	illustrate
...			
Function code	1 Byte	0x8F	Modbus function code + 0x80
Abnormal code	1 Byte		0x01 or 0x02

4. Example

Starting from address 1000, close all 8 coils, that is, write the value of 8 coils as 0xFF.
request

0x00 01 00 00 00 08 01 0F 03 E8 00 08 01 FF

Byte	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Data	00 01		00 00		00 08		01	0F	03 E8		00 08		01	FF
illustrate	Transaction identifier		Protocol identifier		Message length		Device address	Function code	Start address		Number of coils		Data bytes	Data

response

0x00 01 00 00 00 06 01 0F 03 E8 00 08

Byte	1	2	3	4	5	6	7	8	9	10	11	12
Data	00 01		00 00		00 06		01	0F	03 E8		00 08	
illustrate	Transaction		Protocol		Message		Device	Function	Start		Number of	

	identifier	identifier	length	address	code	address	coils
--	------------	------------	--------	---------	------	---------	-------

6.2.1.2.5 Function Code 0x04

This function code is used to read consecutive input registers in multiple remote devices. The request PDU specifies the address of the starting register and the number of registers. The register data in the response message is packed into two bytes per register, and the binary content within each byte is right-aligned.

1. Request

Field Name	Number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 01	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 06	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x04	Read input register, use function code 0x04
Start address	2 Byte	0x0B B8	The address is detailed in the "Modbus Register Mapping" chapter
Number of registers	2 Byte	0x00 08	

2. Response

Field Name	Number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 00	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 13	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification

Function code	1 Byte	0x04	Read input register, use function code 0x04
Data bytes	1 Byte	0x10	
Data	16 Byte	0x 3F 8E 38 86 40 0E 38 86 40 55 54 CA 40 8E 35 3F	

3. Abnormal

Field Name	Number of bytes	Example	illustrate
...			
Function code	1 Byte	0x84	Modbus function code + 0x80
Abnormal code	1 Byte	0x01	0x01 or 0x02

4. Example

Starting at address 3000, read the values of the 4 analog inputs. Since the BL200 controller node register map data type is 32Bit Float, that is, 1 analog input data = 2 registers = 4 bytes, 8 input registers need to be read.

request

0x00 01 00 00 00 06 01 04 0B B8 00 08

Byte	1	2	3	4	5	6	7	8	9	10	11	12
Data	00 01		00 00		00 06		01	04	0B B8		00 08	
illustrate	Transaction identifier		Protocol identifier		Message length		Device address	Function code	Start address		Number of registers	

response

0x00 01 00 00 00 13 01 04 10 3F 9D 70 A4 40 15 C2 8F 40 5C CC CD 40 91 EB 85

Byte	1	2	3	4	5	6	7	8	9	10...25
Data	00 01		00 00		00 13		01	04	10	xxx
illustrate	Transaction identifier		Protocol identifier		Message length		Device address	Function code	Data bytes	Data

The data part has a total of 16 bytes, which are converted into decimal as follows

Byte	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Data	3F 9D 70 A4				40 15 C2 8F				40 5C CC CD				40 91 EB 85			
Decimal	1.23				2.34				3.45				4.56			
illustrate	First data				Second data				Third data				Fourth data			

6.2.1.2.6 Function Code 0x03

This function code is used to read continuous holding registers in multiple remote devices. The request PDU specifies the address of the starting register and the number of registers. The register data in the response message is packed into two bytes per register, and the binary content within each byte is right-aligned.

1. Request

Field Name	number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 01	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 06	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x03	Read holding register, use function code 0x03
Start address	2 Byte	0x0F A0	The address is detailed in the "Modbus Register Mapping" chapter
Number of registers	2 Byte	0x00 08	Number of holding registers to read

2. Response

Field Name	Number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 00	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message	2 Byte	0x00 13	The number of bytes of the following

length			data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x03	Read holding register, use function code 0x03
Data bytes	1 Byte	0x10	Data bytes
Data	16 Byte	0x 3F 9D 70 A4 40 15 C2 8F 40 5C CC CD 40 91 EB 85	Response data

3. Abnormal

Field Name	Number of bytes	Example	illustrate
...			
Function code	1 Byte	0x83	Modbus function code + 0x80
Abnormal code	1 Byte	0x01	0x01 or 0x02

4. Example

Starting at address 4000, read the values of the 4 analog outputs (belonging to the holding registers). Since the analog output I/O module register map data type is 32Bit Float, that is, 1 analog output data = 2 registers = 4 bytes, it is necessary to read 8 holding registers.

request

0x00 01 00 00 00 06 01 03 0F A0 00 08

Byte	1	2	3	4	5	6	7	8	9	10	11	12
Data	00	01	00	00	00	06	01	03	0F	A0	00	08
illustrate	Transaction identifier		Protocol identifier		Message length		Device address	Function code	Start address		Number of registers	

response

0x00 01 00 00 00 13 01 03 10 3F 9D 70 A4 40 15 C2 8F 40 5C CC CD 40 91 EB 85

Byte	1	2	3	4	5	6	7	8	9	10...25
Data	00	01	00	00	00	13	01	03	10	xxx

illustrate	Transaction identifier	Protocol identifier	Message length	Device address	Function code	Data bytes	Data
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The data part has a total of 16 bytes, and the conversion to decimal is as follows:

Byte	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Data	3F 9D 70 A4				40 15 C2 8F				40 5C CC CD				40 91 EB 85			
Decimal	1.23				2.34				3.45				4.56			
illustrate	First data				Second data				Third data				Fourth data			

6.2.1.2.7 Function Code 0x06

This function code is used to write to holding registers in a single remote device. The request PDU specifies the address of the starting register and the number of registers. The register data in the response message is packed into two bytes per register, and the binary content within each byte is right-aligned.

This function code is only suitable for reading the serial port I/O module register mapping data, the address range: 40000 ... 49999. The data type of the analog input/output I/O module is 32Bit Float format, the complete data cannot be read, and this function cannot be used.

1. Request

Field Name	Number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 01	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 06	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x06	Write a single holding register, use function code 0x06
Register address	2 Byte	0x9C 40	The address is detailed in the "Modbus Register Mapping" chapter
Data	2 Byte	0x04 D2	

2. Response

Field Name	Number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 00	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 06	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x06	Write a single holding register, use function code 0x06
Register address	2 Byte	0x75 30	
Data	2 Byte	0x04 D2	

3. Abnormal

Field Name	Number of bytes	Example	illustrate
...			
Function code	1 Byte	0x86	Modbus function code + 0x80
Abnormal code	1 Byte	0x01	0x01 or 0x02

4. Example

Write the value of register address 40000 to 1234 (0x04 D2).

request

0x00 01 00 00 00 06 01 06 9C 40 04 D2

Byte	1	2	3	4	5	6	7	8	9	10	11	12
Data	00 01		00 00		00 06		01	06	9C 40		04 D2	
illustrate	Transaction identifier		Protocol identifier		Message length		Device address	Function code	Register address		Data	

response

0x00 01 00 00 00 06 01 06 9C 40 04 D2

Byte	1	2	3	4	5	6	7	8	9	10	11	12
Data	00 01		00 00		00 06		01	0F	9C 40		04 D2	

illustrate	Transaction identifier	Protocol identifier	Message length	Device address	Function code	Register address	Data
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6.2.1.2.8 Function Code 0x10

This function code is used to write to consecutive holding registers in multiple remote devices. The request PDU specifies the address of the starting register and the number of registers. The register data in the response message is packed into two bytes per register, and the binary content within each byte is right-aligned.

1. Request

Field Name	Number of bytes	Example	illustrate
Transaction identifier	2 Byte	0x00 01	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 17	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x10	Write multiple holding registers, use function code 0x10
Start address	2 Byte	0x0F A0	The address is detailed in the "Modbus Register Mapping" chapter
Number of registers	2 Byte	0x00 08	
Data bytes	1 Byte	0x10	
Data	16 Byte	0x 3F 9D 70 A4 40 15 C2 8F 40 5C CC CD 40 91 EB 85	

2. Response

Field Name	Number of bytes	Example	illustrate
------------	-----------------	---------	------------

Transaction identifier	2 Byte	0x00 00	Identification of Modbus request/response transactions
Protocol identifier	2 Byte	0x00 00	0x00 00: Modbus protocol
Message length	2 Byte	0x00 13	The number of bytes of the following data
Device address	1 Byte	0x01	Slave address identification
Function code	1 Byte	0x10	Write multiple holding registers, use function code 0x10
Start address	2 Byte	0x0F A0	
Number of registers	2 Byte	0x00 08	

3. Abnormal

Field Name	number of bytes	Example	illustrate
...			
Function code	1 Byte	0x90	Modbus function code + 0x80
Abnormal code	1 Byte	0x01	0x01 or 0x02

4. Example

Starting at address 4000, write the values of the 4 analog outputs. Since the BL200 controller node register map data type is 32Bit Float, that is, 1 analog output data = 2 holding registers = 4 bytes, 8 holding registers need to be written.

request

0x00 01 00 00 00 17 01 10 0F A0 00 08 10 3F 9D 70 A4 40 15 C2 8F 40 5C CC CD 40 91 EB 85

Byte	1	2	3	4	5	6	7	8	9	10	11	12	13	14...23
Data	00 01	00 00	00 17	01	10	0F A0	00 08	10						xxx
illustrate	Transaction identifier	Protocol identifier	Message length	Device address	Function code	Start address	Number of registers	Data bytes						Data

The data part has a total of 16 bytes, and the conversion to decimal is as follows:

Byte	14														
Data	3F 9D 70 A4	40 15 C2 8F	40 5C CC CD	40 91 EB 85											

Decimal	1.23	2.34	3.45	4.56
illustrate	First data	Second data	Third data	Fourth data

response

0x00 01 00 00 00 06 01 10 0F A0 00 08

Byte	1	2	3	4	5	6	7	8	9	10	11	12
Data	00 01		00 00		00 06		01	10	0F A0		00 08	
illustrate	Transaction identifier		Protocol identifier		Message length		Device address	Function code	Start address		Number of registers	

6.2.2 OPC UA Communication Example

6.2.2.1 UaExpert and BL206Pro Communication

The BL206Pro collects DI, DO, and AI modules, selects basic128rsa15 as a security policy, and selects a signature and encryption method. The data format is based on a custom information model. Take an information model as an example. The data can also be uploaded directly according to the format of our company. For the definition of each configuration, please refer to chapter 5.2.8 web page configuration.

6.2.2.1.1 OPC UA Web Page Configuration

BL200UA
Status
System
Settings
I/O Module
Serial Module
OPC UA
Operation&Control
Logout

OPC UA settings

OPC UA settings

OPC UA Name: BL200 OPC UA Server

Port: 4840

Security Policy: Basic128Rsa15

Message Security Mode: Sign&Encrypt

Certificate: /etc/opcua/server_cert.der (988 B)

Private key: /etc/opcua/server_key.der (1.19 KB)

Allow Anonymous: ☐

Username: BL200

Password: *****

Data select: Information Model

Model File(.xml): /etc/opcua/do.xml (9.95 KB)

Dependent model files: One model file

Dependent model 1st(.xml): /etc/opcua/di.xml (9.77 KB)

Save & Apply Save Reset

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Steps:

- (1) Fill in the OPC UA name, which can be customized to facilitate the OPC UA client to search and distinguish different OPC UA servers. For example: fill in "BL206Pro OPC UA Server".
- (2) The port number of the OPC UA server, default: 4840.
- (3) Security policy selection. For example, choose basic128rsa15.
- (4) Message security mode selection. For example, choose Signing and Encryption.
- (5) Upload the certificate and key, click "Select File" > click "Upload File" > select your certificate or key file, click Open > After it is displayed in the file name box, click Upload file > After uploading the file successfully The file you uploaded will be displayed in the box, click the certificate or key file you uploaded > then your certificate or key file will be displayed in the certificate or key item.
- (6) Whether to allow anonymity, because of the use of signature and encryption methods, allow anonymity is not checked.
- (7) Fill in the username and password. The client needs to fill in the username and password when connecting.

(8) Select the data, because the user-defined information model is used, so choose the "information model".

(9) Upload the information model file. The upload method is the same as uploading the certificate or key file. The uploaded file is an xml file.

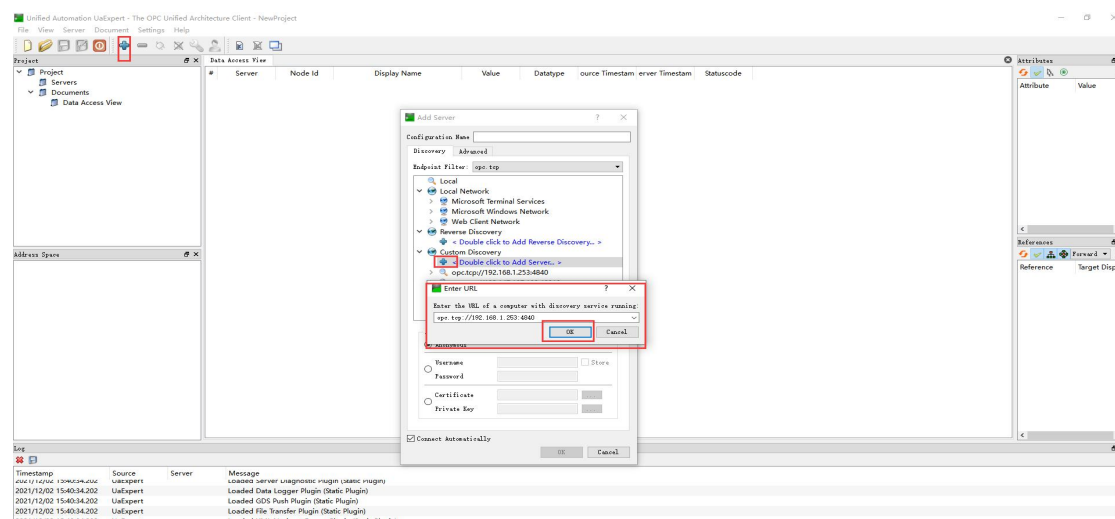
(10) Depends on the model file, whether there is a reference model, and how many references are there.

(11) Dependent model: Upload the model you refer to. The upload method is the same as uploading the certificate or key file. The upload is an xml file.

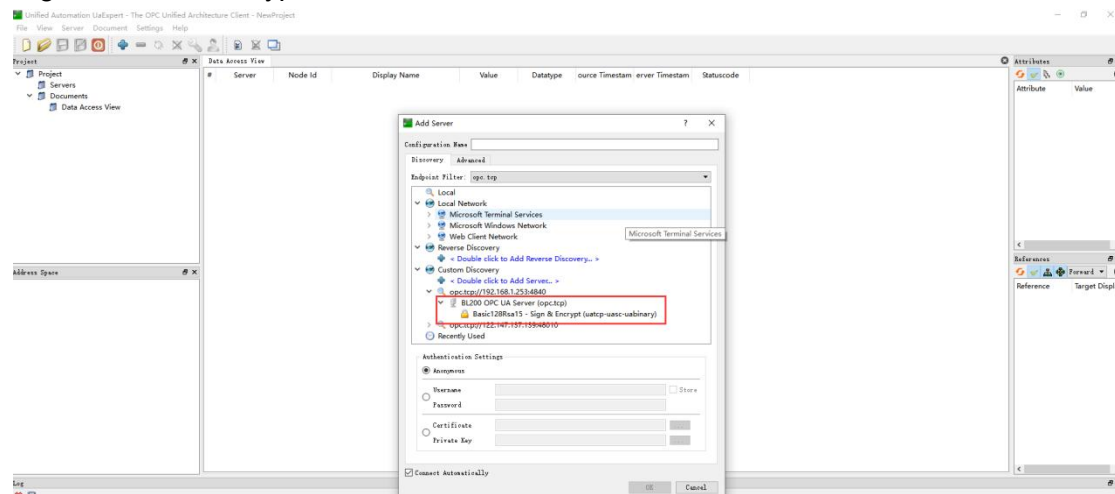
(12) Click "Save and Apply".

6.2.2.1.2 Send and Receive Data Using UaExpert Client

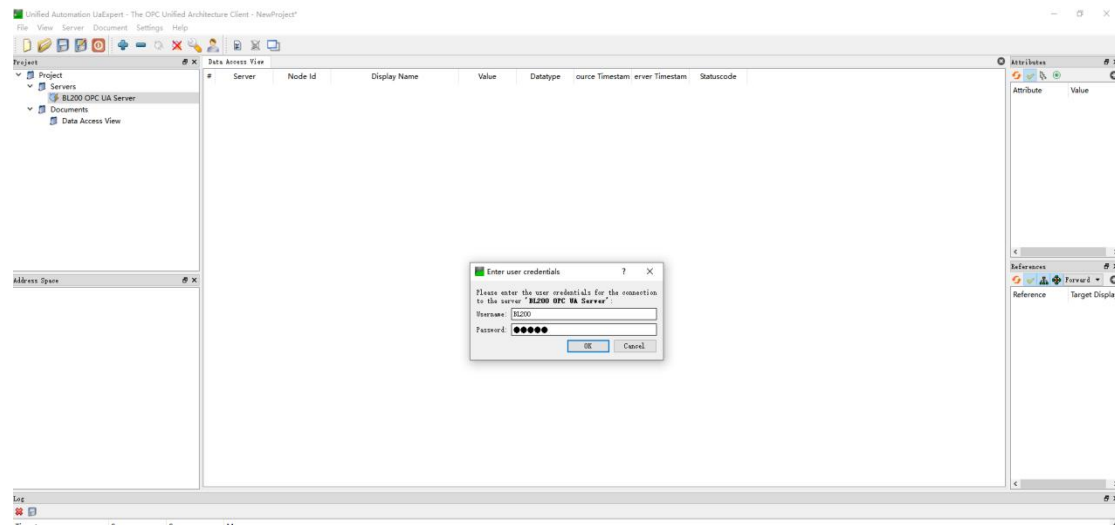
Open UaExpert (OPC UA client) and enter the OPC UA server IP and port.



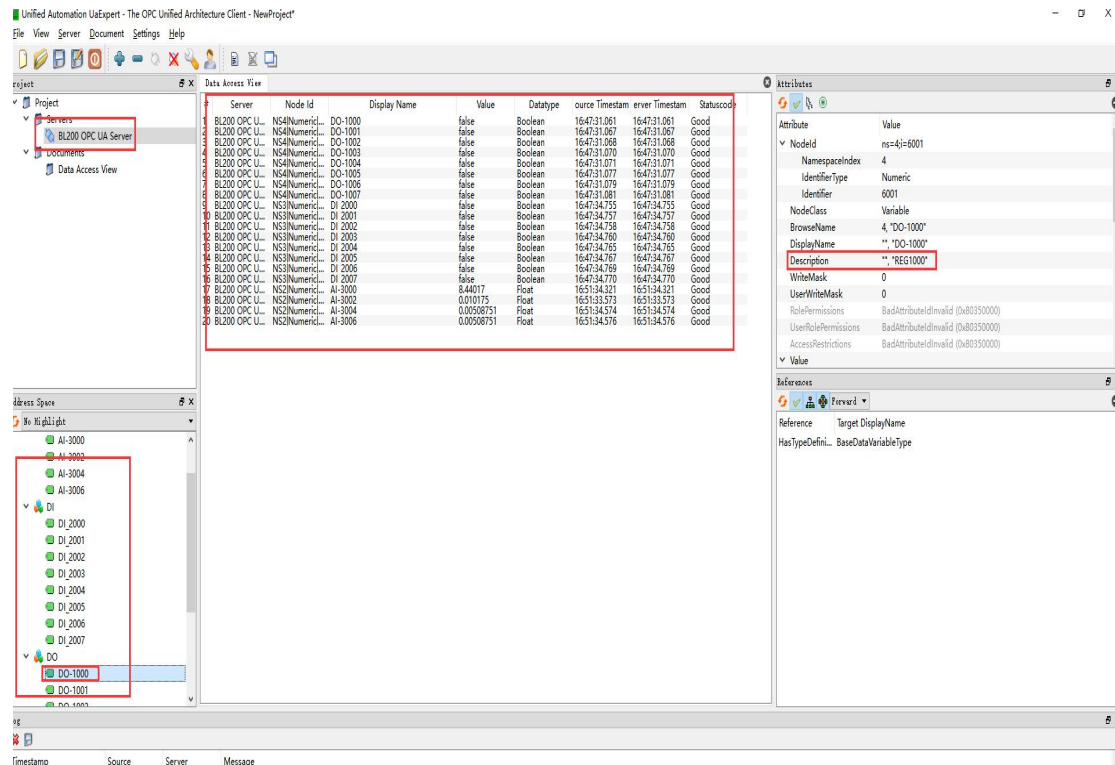
Click Search, click the searched OPC UA server, and click basic128rsa15 for Signature and Encryption.



Enter the set username and password



The collected data is as follows:



The description item of the custom information model data point must be REG+Modbus address, as shown in the description of the DO-1000 point in the figure above.

OPC UA client data delivery

Take the following data point DO-1000 as an example

BL200UA

Status

System

Settings

I/O Module

Serial Module

OPC UA

Operation&Control

Logout

IO status

IO Slot:2,Module Type:DO,Module Name:M2082

Channels	Modbus Address	Value	PowerOn Status	Open/Close
1	1000	Open	Open	Open/Close
2	1001	Open	Open	Open/Close
3	1002	Open	Open	Open/Close
4	1003	Open	Open	Open/Close
5	1004	Open	Open	Open/Close
6	1005	Open	Open	Open/Close
7	1006	Open	Open	Open/Close
8	1007	Open	Open	Open/Close

Back to Overview

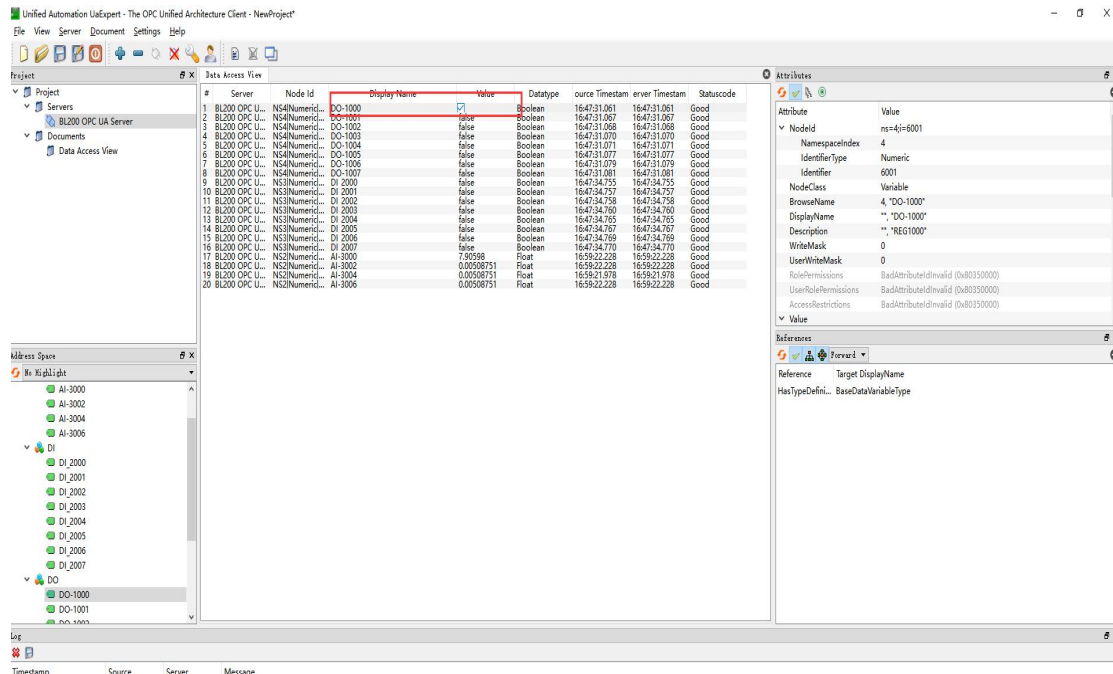
Save & Apply

Save

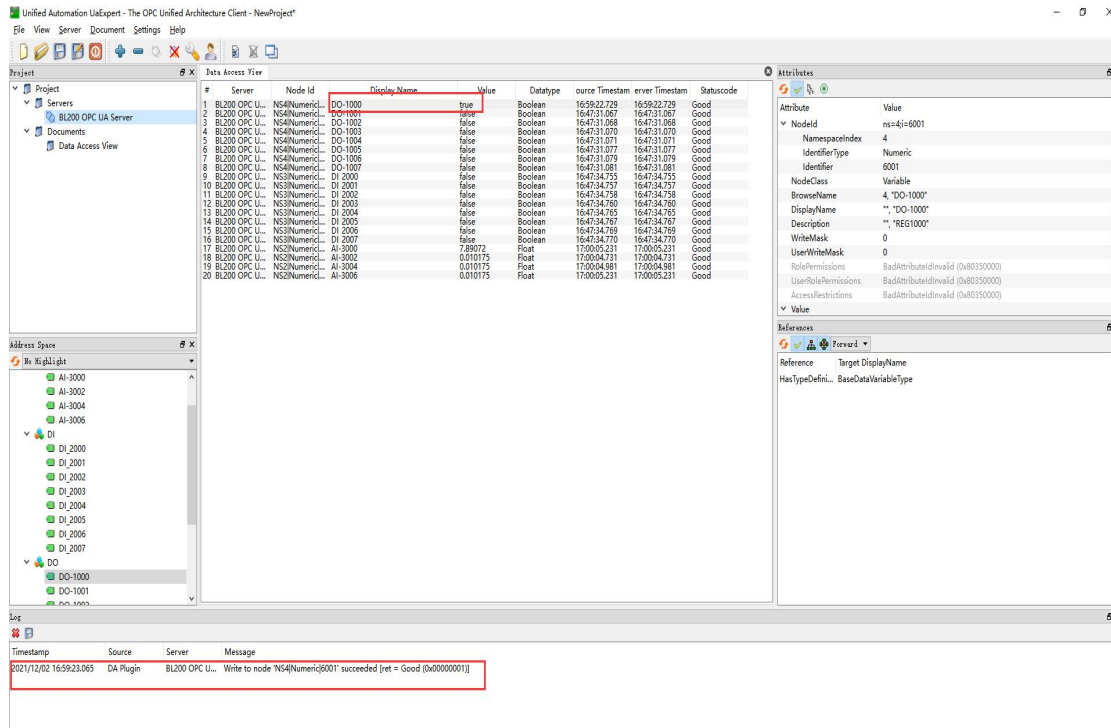
Reset

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Click the value of the DO-1000 data point, it turned out to be false, there is no ✓ in the square, click once to put ✓, click the left mouse button in the blank space or press the [Enter] key on the keyboard.



The OPC UA client will send a message successfully. Because the server responds quickly, you can see that the value has changed to "true".



Check the DO status in the web configuration of BL206Pro. DO1 is also changed from the original open to close.

BL200UA Status System Settings I/O Module Serial Module OPC UA Operation&Control Logout									
IO status									
IO Slot	Module Name	Module Type	Channel Number	Modbus Address	24V Address- State	Soft Version	IO Status	Channel Status	
1	M1081	DI	8	2000-2007	9001-Power Off	5	Normal	Channel Status	
2	M2082	DO	8	1000-1007	9002-Power Off	5	Normal	Channel Status	
3	M3041	AI	4	3000-3006	9003-Power Off	5	Normal	Channel Status	
4	M4044	AO	4	4000-4006	9004-Power Off	5	Normal	Channel Status	
5	M6021	COM	2	0-0	9005-Power Off	5	Normal	Channel Status	

IO status

IO Slot:2,Module Type:DO,Module Name:M2082

Channels	Modbus Address	Value	PowerOn Status	Open/Close
1	1000	Close	Open	Open/Close
2	1001	Open	Open	Open/Close
3	1002	Open	Open	Open/Close
4	1003	Open	Open	Open/Close
5	1004	Open	Open	Open/Close
6	1005	Open	Open	Open/Close
7	1006	Open	Open	Open/Close
8	1007	Open	Open	Open/Close

Back to Overview

Save & Apply

Save

Reset

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7 Custom MQTT Protocol

7.1 Data Publish Format

If data packaging is checked during configuration, multiple I/O data points will be sent in one message (multiple messages will be sent separately when there are many data points, and each message contains multiple data points), if not checked, the message only corresponds to one I/O data point, and there are some differences between the two publishing formats.

1) The payload data format in the device publish message

Publish subject: Corresponding to the configured publish subject setting item

{

"REG1000": 1, //Device DO read/write identifier and value

"REG2000": 1, //Device DI reads and writes identifiers and values

"REG3000": 2, //Device AI read/write identification and value

"REG4000": 3, //Device AO read and write identifiers and values

"REG10000": 1, //Serial Port Collect Slave 01 Function Code Read/Write Identification and Value

```
"REG20000": 1, //Serial Port Collect Slave 02 Function Code Read/Write Identification and Value
"REG30000": 8, //Serial Port Collect Slave 04 Function Code Read/Write Identification and Value
"REG40000": 10, //Serial Port Collect Slave 03 Function Code Read/Write Identification and Value
"time": "1698910380", //Time stamp, data publish timestamp in UTC format
"seq": 1 //Number of packets, packet number
"retransmit": "enable"//Retransmission identifier, indicating historical data (retransmission of historical data has this identifier, real-time data does not have this identifier)
}
```

Note:

1. Device I/O data point read and write identification:

Data name	Read and write identification	Data type	Description
DO	REG1000~1999	Switcher	0 is open, 1 is close
DI	REG2000~2999	Switcher	0 is open, 1 is close
AI	REG3000~3999	Value	true value = original value
AO	REG4000~4999	Value	true value = original value

2. Serial port module slave I/O data point read and write identification:

Data name	Read and write identification	Data type	Description
Coil state	REG10000~19999	Switcher	According to slave data definition
Input coil	REG20000~29999	Switcher	According to slave data definition
Holding register	REG40000~49999	Value	According to slave data definition
input register	REG30000~39999	Value	According to slave data definition

7.2 Subscribe Data Format

Payload data format in device subscribe message

Subscribe topic: serial number/+ (corresponding to the configured subscribe topic setting item)

(The topic used by BLIIoT V2.0 for downlink publishing messages is named "Serial Number/Sensor ID", so the device subscribe topic needs to add a wildcard "+", so that the data sent by the platform can be received for control)

```
{  
"REG1000":1, //Device DO downstream control  
"REG4000":5, //Device AO downstream control  
"REG10001": 1, //Serial Port Slave DO downstream Control  
"REG40008":8 //Serial Port Slave AO downstream Control  
}
```

8 Warranty

- 1) This equipment will be repaired free of charge for any material or quality problems within one year from the date of purchase.
- 2) This one-year warranty does not cover any product failure caused by man-made damage, improper operation, etc.

9 Technical Support

Shenzhen Beilai Technology Co., Ltd

Website: <https://www.bliiot.com>