



## IT7000 Series HMI Communication Guide



Industrial  
Automation



Intelligent  
Elevator



New Energy  
Vehicle



Industrial  
Robot



Rail  
Transit



Data code PS00018769A01

# Preface

## Introduction

This guide describes the communication protocol, hardware wiring, communication parameter configuration, communication component classification and specification, troubleshooting, and usage precaution of Inovance IT7000 series HMIs, Inovance PLCs, Inovance AC drives, Inovance servo drives, and third-party PLCs. The guide intends for you to quickly understand communication connections and protocols.

The Appendix section describes hardware port pin assignment and wiring, communication cable selection, serial port and Ethernet parameters, communication troubleshooting methods, steps, and tools, relationship between the standard Modbus and Inovance Modbus protocol, and standard Modbus parameters and error codes.

## Revision History

| Date       | Version | Revision                                                                              |
|------------|---------|---------------------------------------------------------------------------------------|
| July 2025  | A01     | Updated <i><a href="#">“3.4.3.1.1 Integrated RS485 Port (Port 0)” on page 76.</a></i> |
| April 2025 | A00     | First release.                                                                        |

## Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version in the following ways

- Do keyword search under Service and Support at [www.inovance.com](http://www.inovance.com).
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install My Inovance app, where you can search for and download user guides.



## Warranty Disclaimer

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. Maintenance will be charged after the warranty period expires.

Within the warranty period, maintenance fee will be charged for the following damage:

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or unusual voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see Product Warranty Card.

# Fundamental Safety Instructions

## Safety Precautions

1. Read and follow the safety instructions when installing, operating, and maintaining the equipment.
2. To ensure your safety and prevent damage to the equipment, follow the marks on the equipment and safety instructions in this guide when installing, operating, and maintaining the equipment.
3. "CAUTION", "WARNING", and "DANGER" items in the guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
4. Use this product according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
5. Inovance shall take no responsibility for any personal injury or property damage caused by improper use.

## Safety Levels and Definitions



Indicates that failure to comply with the notice will result in severe personal injuries or even death.



Indicates that failure to comply with the notice may result in severe personal injuries or even death.



Indicates that failure to comply with the notice may result in minor or moderate personal injury or equipment damage.

Keep this user guide properly for future use and deliver it to the end user.

**Control System Design**

- Interlock circuits and other circuits such as emergency stop, conventional protection, forward and reverse rotation must be set outside the product; devices for preventing equipment damage (up, down and reciprocating movement limit) must be set outside the product.
- Set a fault protection circuit outside the product to prevent unintended mechanical movements, such as those arising from errors in undetectable I/O control areas.
- Design a user program to inform users of faults concerning the display, control, communication, power supply and so on, ensuring safety of the user system.
- Make sure that measures have been taken to avoid malfunction caused by the communication faults between the product and the master controller. This is to prevent personal injury and equipment damage.
- During operation, keep live objects away from the metal housing of the equipment.



- Do not set switches that may result in operator injury or equipment damage on the touch screen. Use independent switches for critical operations. Failure to comply may result in accidents caused by wrong outputs or faults.
- Do not set any switch on the equipment to control safety operation, such as emergency stop. Use independent hardware switches for safety operations. Failure to comply may result in severe personal injury or equipment damage.
- Do not use this product for critical alarms that may result in severe personal injury, equipment damage or system shutdowns. Use independent hardware and/or mechanical interlocks for critical alarms and the related control/triggering devices.

**Installation**

- Install the product properly in indoor environments complying with the related specifications.
- Install the product in environments free from strong magnetic field, direct sunlight, high temperature, inflammable gases, vapors, and dust. Failure to comply may result in explosion.
- Use the product in environments without drastic temperature changes or high humidity. Failure to comply may result in water condensation inside the product, leading to equipment damage.
- Securely connect all cables to the product. Loose connection may cause wrong input or output signals.



- Install the product in environments with recommended storage temperature. Failure to comply may result in display faults of the LCD screen.

### Wiring



- Before wiring, cut off all power supplies. Failure to comply may result in electric shock or damage to the circuit.
- Connect the DC power supply to the dedicated terminals specified in this guide.
- Avoid metal chippings or cable terminals from falling into the HMI during screw hole machining and wiring. This is to prevent faults, component damage, and fire accidents.
- After wiring, perform a meticulous inspection to ensure the operating voltage is correctly connected to the corresponding terminals. Failure to comply may result in fire or accident.



- To avoid electric shock, cut off the power supply before connecting the product to the power supply.
- The input power supply of this product must be 24 VDC. Power supplies outside  $\pm 20\%$  of 24 VDC can cause severe damage to the product. Therefore, check whether the DC power supply provided by the switching-mode power supply is stable at a regular interval.

### Operation and Maintenance



- During use, touch the HMI panel with hands only. Failure to comply may result in panel damage, which is not covered by warranty.
- Retired lithium batteries, LCD screens, capacitors and other objects that may contain ingredients hazardous to health and environment must be disposed of as industrial waste.

#### Safety Recommendations

- In the position where the operator directly touches the machinery part, for example, where a machinery tool is loaded/unloaded, or where a machine runs automatically, the on-site manual operating devices and any other alternative means must be carefully arranged and designed so that they are independent of the PLC and can start or terminate the automatic running of the system.
- If modification on the program is needed during system operation, use the lock function or other protective measures. Ensure that only authorized personnel can make the necessary modifications.

### Battery Use



- The battery model must be correct.
- Do not throw batteries into fire or hot ovens. Do not crush or cut batteries.
- Do not expose batteries to extremely high temperatures.
- Do not swallow batteries. Failure to comply can result in chemical burns.
- This product contains button batteries. If you eat the button battery by accident. It may cause severe burns in the human body and even lead to death within 2 hours.



- Keep new and used batteries away from children.
- If the battery compartment cannot be shut tight, stop using the product and keep it away from children.
- If you suspect that a battery may have been swallowed or entered the body, seek medical help immediately.

**Disposal**



- Treat the scrapped product as industrial waste. Dispose of the battery according to local laws and regulations.

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# 1 Overview

This guide describes the communication protocol, hardware wiring, communication parameter configuration, communication component classification and specification, troubleshooting, and usage precaution of Inovance IT7000 series HMIs, Inovance PLCs, Inovance AC drives, Inovance servo drives, and third-party PLCs. The guide intends for you to quickly understand communication connections and protocols.

The Appendix section describes hardware port pin assignment and wiring, communication cable selection, serial port and Ethernet parameters, communication troubleshooting methods, steps, and tools, relationship between the standard Modbus and Inovance Modbus protocol, and standard Modbus parameters and error codes.

## 2 Protocol List

| Manufacturer              | Protocol                              | Type        | Applicable product                                                                                                                                    |
|---------------------------|---------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inovance                  | H1U monitoring protocol               | Serial port | Inovance H1U                                                                                                                                          |
|                           | H1U Qlink protocol                    | Serial port | Inovance H1U                                                                                                                                          |
|                           | H2U monitoring protocol               | Serial port | Inovance H2U                                                                                                                                          |
|                           | H2U Qlink protocol                    | Serial port | Inovance H2U                                                                                                                                          |
|                           | H3U monitoring protocol               | Serial port | Inovance H3U                                                                                                                                          |
|                           | H3U Qlink protocol                    | Serial port | Inovance H3U                                                                                                                                          |
|                           | H3U Modbus TCP                        | Ethernet    | Inovance H3U                                                                                                                                          |
|                           | H3U Qlink TCP                         | Ethernet    | Inovance H3U                                                                                                                                          |
|                           | H5U Qlink Protocol                    | Serial port | Inovance H5U                                                                                                                                          |
|                           | H5U Qlink TCP                         | Ethernet    | Inovance H5U                                                                                                                                          |
|                           | Easy TCP monitoring protocol          | Ethernet    | Inovance H5U                                                                                                                                          |
|                           | Easy protocol                         | Serial port | Inovance Easy series                                                                                                                                  |
|                           | Easy TCP monitoring protocol          | Ethernet    | Inovance Easy series                                                                                                                                  |
|                           | AM600 Modbus protocol                 | Serial port | Inovance AM series                                                                                                                                    |
|                           | AM600 Modbus TCP                      | Ethernet    | Inovance AM series                                                                                                                                    |
|                           | AM600 Qlink TCP                       | Ethernet    | Inovance AM series                                                                                                                                    |
|                           | AC810 Qlink TCP                       | Ethernet    | Inovance AC series                                                                                                                                    |
|                           | IT7000 series - Modbus slave          | Serial port | Inovance IT7000 series                                                                                                                                |
|                           | IT7000 series- Modbus TCP slave       | Ethernet    | Inovance IT7000 series                                                                                                                                |
|                           | MD series AC drive Modbus protocol    | Serial port | Inovance MD series AC Drive                                                                                                                           |
|                           | IS series servo drive Modbus protocol | Serial port | Inovance IS series servo drive                                                                                                                        |
|                           | AC800 tags series                     | Ethernet    | <ul style="list-style-type: none"> <li>• Inovance AM series</li> <li>• Inovance AC series</li> </ul>                                                  |
| General standard protocol | OPCUA Tags Protocol                   | Ethernet    | <ul style="list-style-type: none"> <li>• Inovance AM series</li> <li>• Inovance AC series</li> <li>• Devices supporting the OPCUA protocol</li> </ul> |
|                           | Modbus RTU                            | Serial port | Devices supporting any protocol                                                                                                                       |
|                           | Modbus RTU (address 1)                | Serial port | Devices supporting any protocol                                                                                                                       |
|                           | Modbus ASCII                          | Serial port | Devices supporting any protocol                                                                                                                       |
|                           | Modbus TCP                            | Ethernet    | Devices supporting any protocol                                                                                                                       |
|                           | Modbus TCP (address 1)                | Ethernet    | Devices supporting any protocol                                                                                                                       |
|                           | Serial port free protocol             | Serial port | Devices supporting any protocol                                                                                                                       |
|                           | TCP free protocol                     | Ethernet    | Devices supporting any protocol                                                                                                                       |

| Manufacturer | Protocol                                  | Type        | Applicable product   |
|--------------|-------------------------------------------|-------------|----------------------|
| Omron        | FINS serial port protocol                 | Serial port | -                    |
|              | Host Link                                 | Serial port | -                    |
|              | NT Link                                   | Serial port | -                    |
|              | FINSTCP                                   | Ethernet    | -                    |
|              | Omron EthernetIP Tags protocol            | Ethernet    | -                    |
|              | Omron EthernetIP Tags monitoring protocol | Ethernet    | -                    |
| Siemens      | S7-200                                    | Serial port | Siemens S7-200       |
|              | S7-200 Smart                              | Serial port | Siemens S7-200 Smart |
|              | S7-200 Smart (Ethernet)                   | Ethernet    | Siemens S7-200 Smart |
|              | S7-1200/1500 (Ethernet)                   | Ethernet    | Siemens S7-1200/1500 |
|              | S7-300 (Ethernet)                         | Ethernet    | Siemens S7-300       |
|              | S7-400 (Ethernet)                         | Ethernet    | Siemens S7-400       |
| Mitsubishi   | FX0SFX0NFX1SFX1NFX2                       | Serial port | -                    |
|              | FX2N                                      | Serial port | -                    |
|              | FX3U/FX3G                                 | Serial port | -                    |
|              | FX5U                                      | Serial port | -                    |
|              | FX5U (ASCII)                              | Ethernet    | -                    |
|              | MelSec-Q/L (Binary)                       | Ethernet    | -                    |
|              | MelSec-Q/L (ASCII)                        | Ethernet    | -                    |
|              | FX5U (Binary)                             | Ethernet    | -                    |
| Delta        | Delta DVP RTU protocol                    | Serial port | -                    |
|              | Delta DVP ASCII protocol                  | Serial port | -                    |
|              | Delta AS300 Modbus RTU protocol           | Serial port | -                    |
|              | Delta AS300 Modbus ASCII protocol         | Serial port | -                    |
|              | Delta AS300 Modbus TCP protocol           | Ethernet    | -                    |
| Panasonic    | Panasonic FP                              | Serial port | -                    |
|              | Panasonic FP (Ethernet)                   | Ethernet    | -                    |
| Koyo         | SN K series                               | Serial port | SN series            |
| Fatek        | FATEK Fbs                                 | Serial port | FB/FBS series        |
| Xinjie       | XC series                                 | Serial port | -                    |
|              | XD\XL series protocol                     | Serial port | -                    |
|              | XD series Modbus TCP                      | Ethernet    | -                    |
| Kingway      | Kingway 984 protocol                      | Serial port | -                    |
| Yudian       | AlBus                                     | Serial port | -                    |
| LG           | LG Master-K Direct                        | Serial port | -                    |
|              | LG XBM XBC XGK CPU DIRECT                 | Serial port | -                    |
| HollySys     | LE/LM PLC                                 | Serial port | -                    |
| Suhao        | Suhao drive protocol                      | Serial port | -                    |
| Keyence      | KV-L120/700/1000/3000/5000/7500/Nano      | Ethernet    | -                    |
| Yaskawa      | Yaskawa MP23XX                            | Ethernet    | -                    |
| Yokogawa     | YOKOGAWA-FA-M3 TCP                        | Ethernet    | -                    |

---

### **Note**

In serial communication, the baud rate is an important indicator of the data transmission rate. When the communication speed of the serial port is slow, the data transmission speed can be increased by increasing the baud rate. However, the baud rate increase is limited by various factors, such as transmission distance, signal interference, and device performance.

If the baud rate is adjusted to the maximum value but it still cannot meet the communication speed requirements, it is recommended to switch to network port communication. Network port communication is based on Ethernet protocol, which features higher data transmission rate and better anti-interference capability. It can accommodate more complex network environments and meet large data transmission requirements. Network port communication enables high-speed data exchange between multiple devices, and supports expansion of the network size through devices such as network switches.

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## 3 Protocol Configuration

### 3.1 Inovance

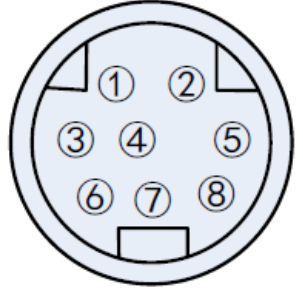
#### 3.1.1 H1U/H2U/H3U Serial Port

##### 3.1.1.1 Hardware Connection

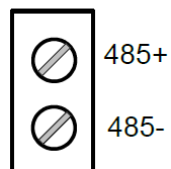
###### 3.1.1.1.1 H1U

COM0 is a standard RS422 interface, and the interface terminal is an 8-hole mouse female connector. COM1 is a standard RS485 interface.

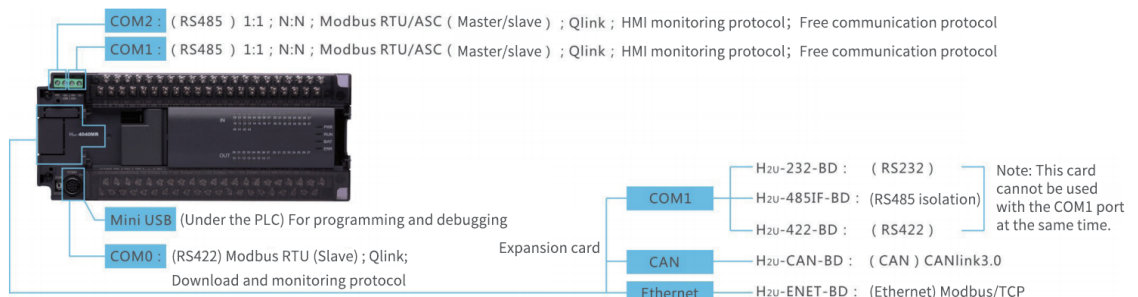
Table 3-1 COM0

| Pin No. | Signal    | Description                                                                        | COM0 Communication Port                                                              |
|---------|-----------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1       | RXD-      | Negative receiving signal                                                          |  |
| 2       | RXD+      | Positive receiving signal                                                          |                                                                                      |
| 3       | GND       | Communication ground                                                               |                                                                                      |
| 4       | TXD-/RXD- | Negative transmitting signal                                                       |                                                                                      |
| 5       | +5V       | External power supply +5 V, which is the same as the logical +5 V used internally. |                                                                                      |
| 6       | CCS       | Communication direction control cable                                              |                                                                                      |
| 7       | TXD+/RXD+ | Positive transmitting signal                                                       |                                                                                      |
| 8       | NC        | Not connected                                                                      |                                                                                      |

##### COM1

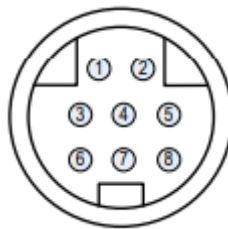


###### 3.1.1.1.2 H2U



### 3.1.1.1.3 H3U

COM0 is a standard RS422 interface, and the interface terminal is an 8-hole mouse female connector. The pin assignment is shown below.



| Pin No. | Signal    | Description                                                                                                                                                                                                                                                                                                                                        |
|---------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | RXD-      | Negative receiving signal                                                                                                                                                                                                                                                                                                                          |
| 2       | RXD+      | Positive receiving signal                                                                                                                                                                                                                                                                                                                          |
| 3       | GND       | Communication ground                                                                                                                                                                                                                                                                                                                               |
| 4       | TXD-/RXD- | Negative transmitting signal, or negative receiving signal for RS485 interface                                                                                                                                                                                                                                                                     |
| 5       | +5V       | External power supply +5 V, which is the same as the logical +5 V used internally.                                                                                                                                                                                                                                                                 |
| 6       | CCS       | Communication direction control cable, with the high level indicating "transmitting" and low level indicating "receiving". When the serial port is an RS485 interface, the PLC determines whether pins 4 and 7 are used to send or receive data. If the interface is an RS422 interface, and the level keeps high, pins 4 and 7 keep sending data. |
| 7       | TXD+/RXD+ | Positive transmitting signal, or positive receiving signal for RS485 interface                                                                                                                                                                                                                                                                     |
| 8       | NC        | Not connected                                                                                                                                                                                                                                                                                                                                      |

COM1 is an RS485 interface, and the interface terminal is a wiring terminal. The following figure shows the interface definition.

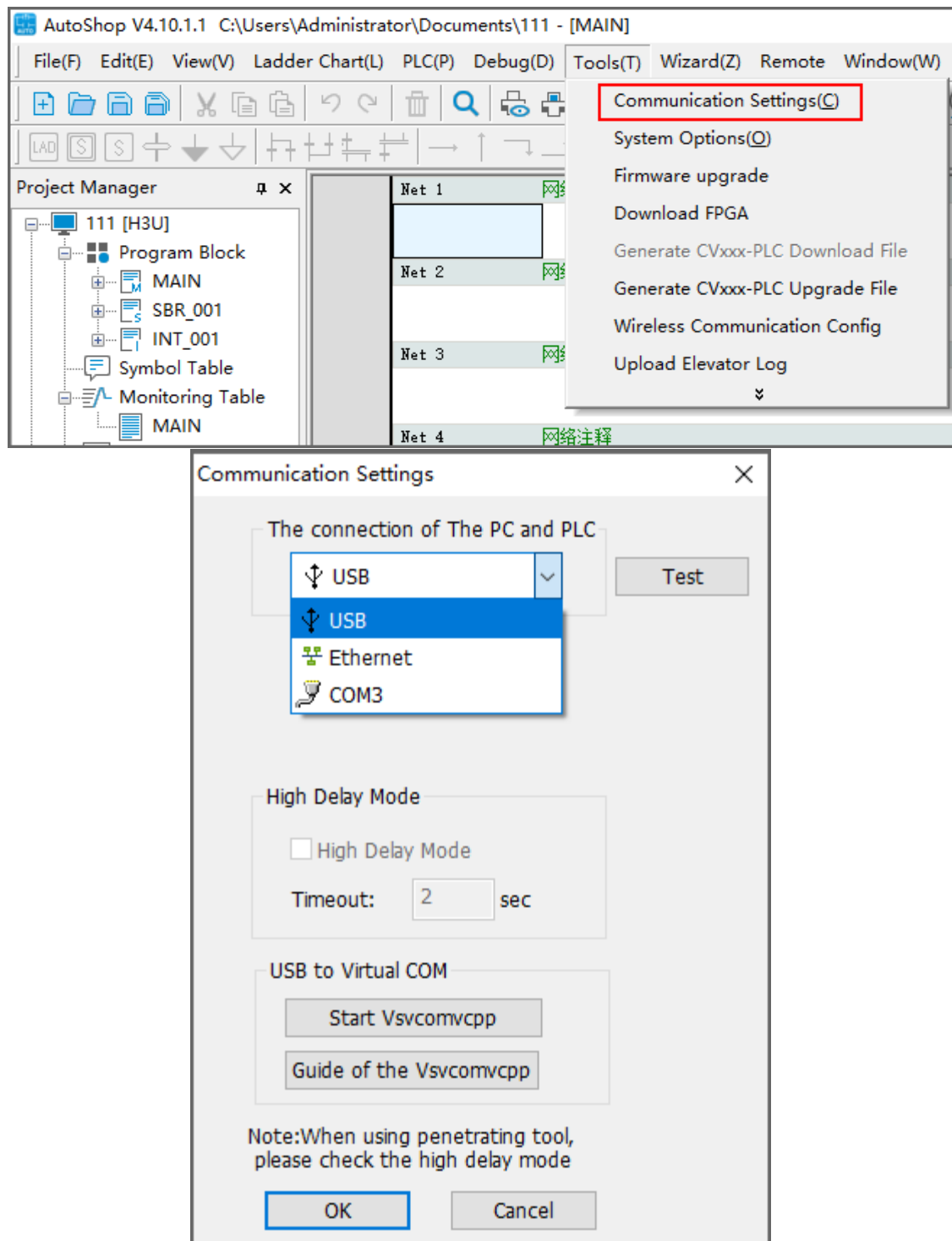


### 3.1.1.2 Monitoring Protocol

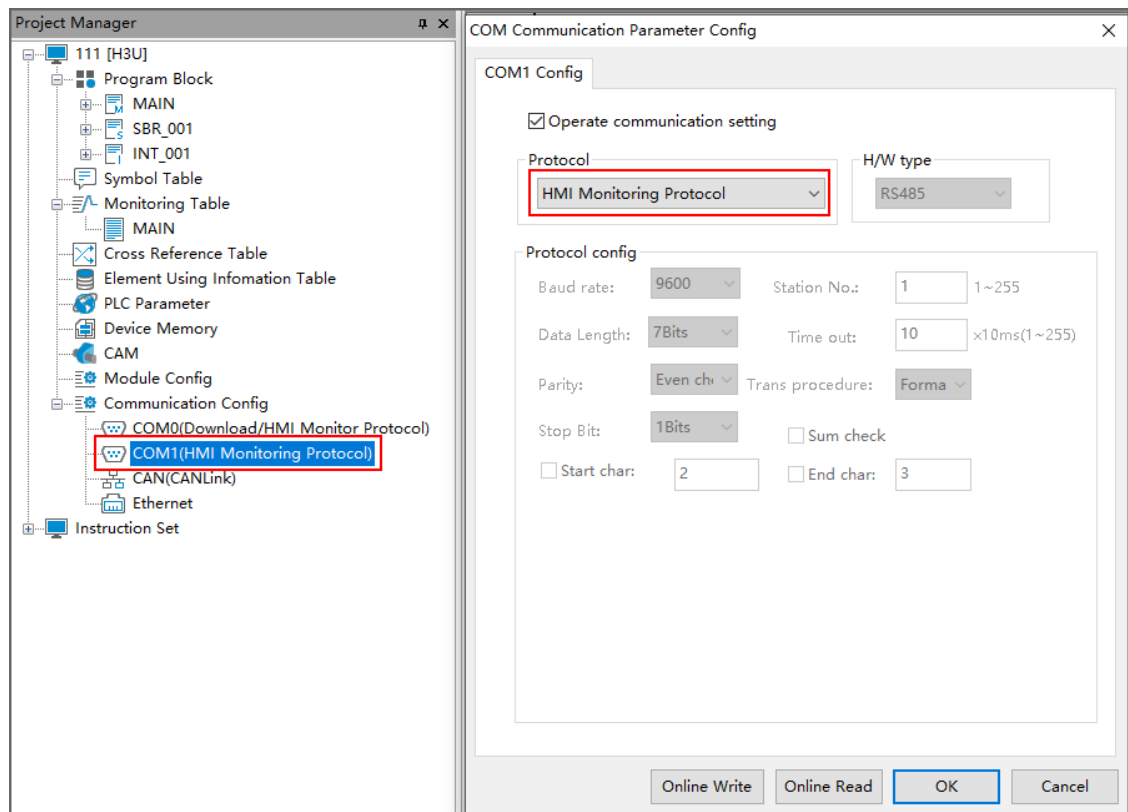
#### 3.1.1.2.1 Configuration on the PLC Side

1. Connect the PLC.

You can connect the PLC through the serial port, USB port, and network port. Connecting the PLC through the USB port is used as an example.



2. Configure communication parameters.



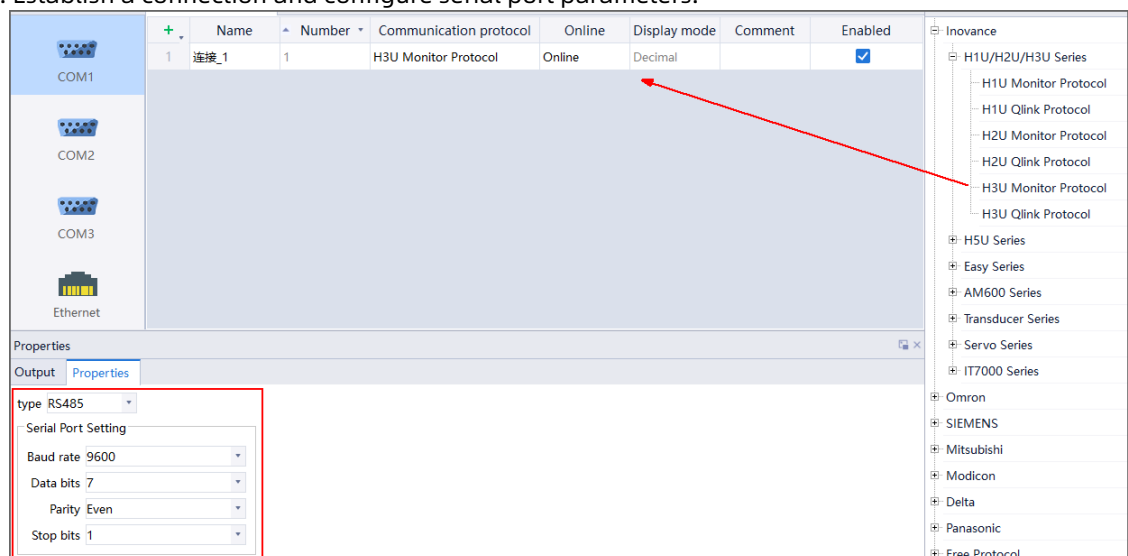
### Caution

Both COM0 and COM1 can be used. Select the COM port based on the hardware wiring. HMI monitoring protocol must be selected on the PLC side.

It is recommended to select COM0. If you select COM1, make sure that the HMI does not use COM1 to collect PLC data. Failure to comply will result in data collection failure.

### 3.1.1.2.2 Configuration on the HMI Side

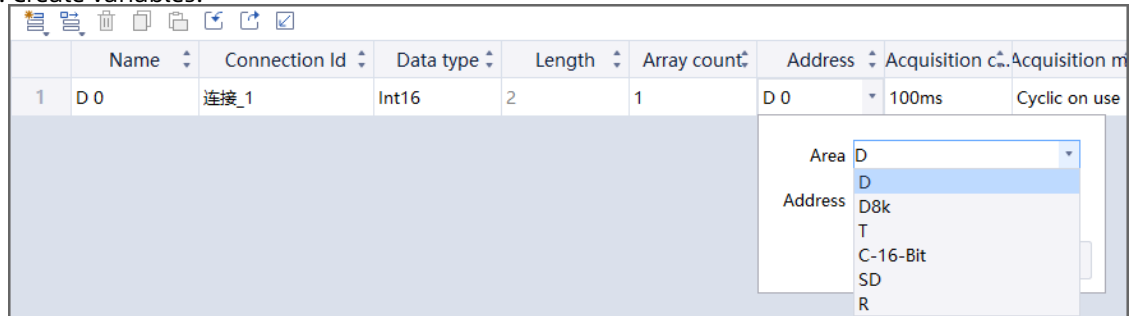
1. Establish a connection and configure serial port parameters.



**Caution**

The serial port parameters must be the same as those configured on the PLC side.

## 2. Create variables.

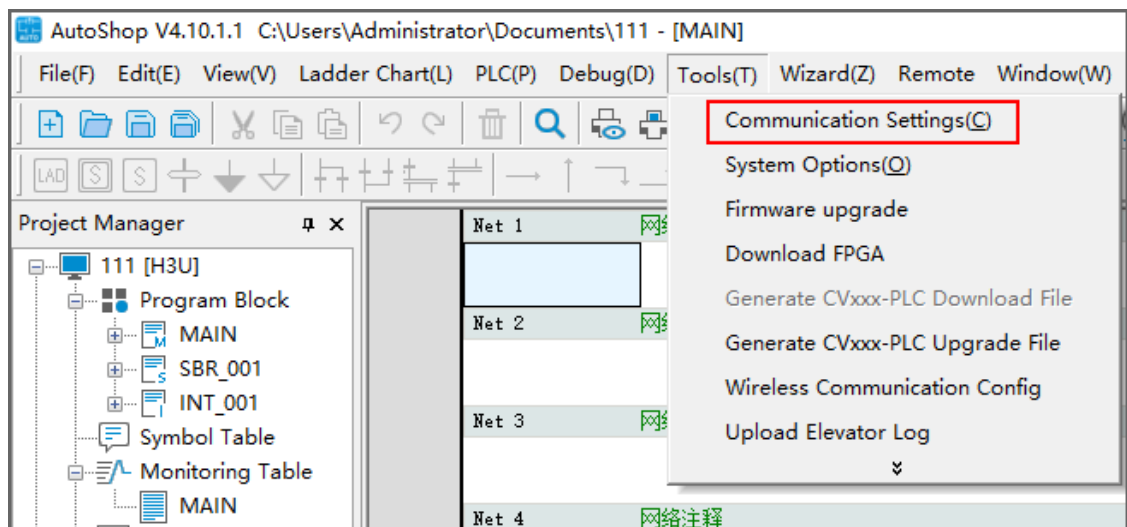


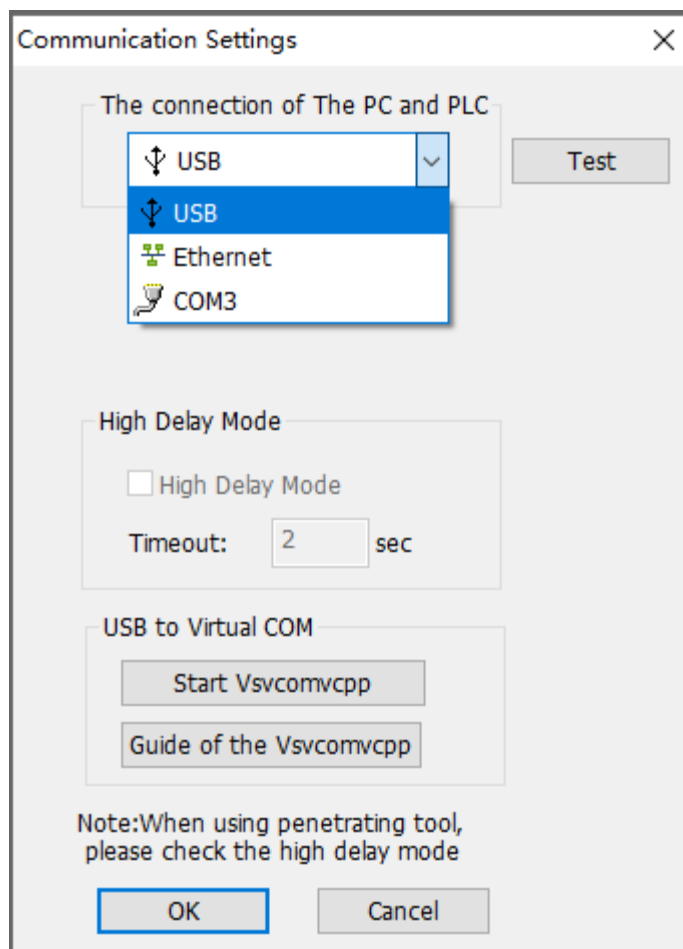
### 3.1.1.3 Qlink

#### 3.1.1.3.1 Configuration on the PLC Side

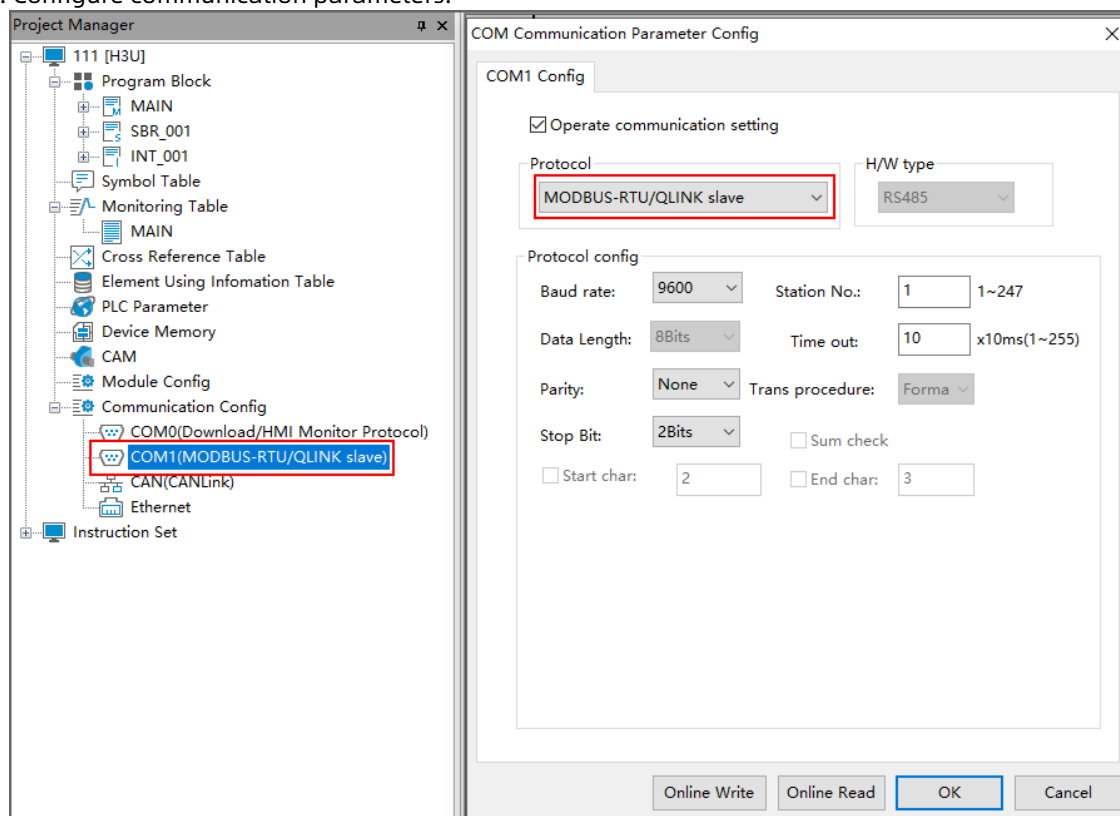
##### 1. Connect the PLC.

You can connect the PLC through the serial port, USB port, and network port. Connecting the PLC through the USB port is used as an example.



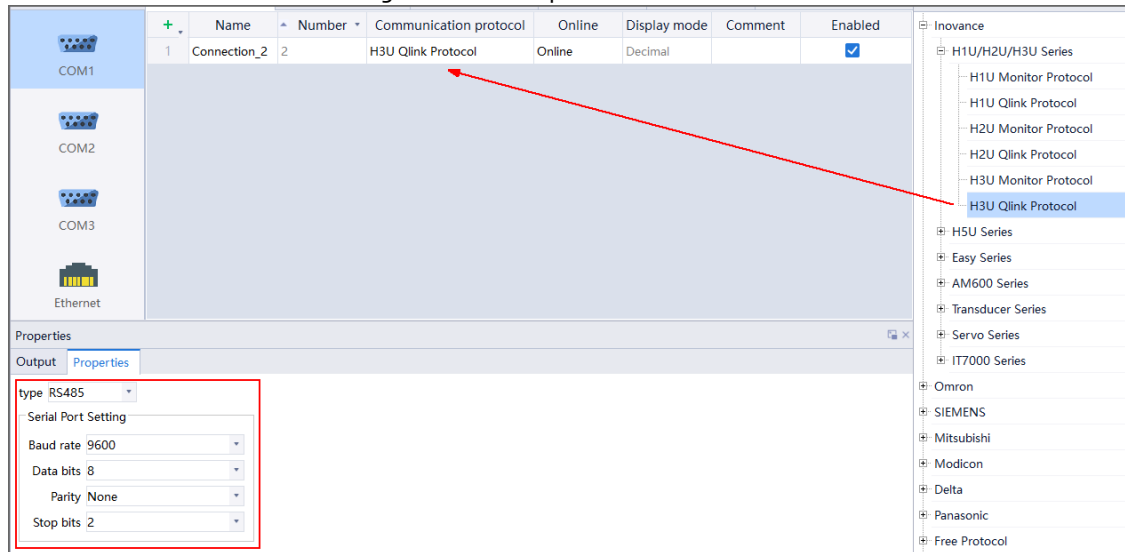


## 2. Configure communication parameters.

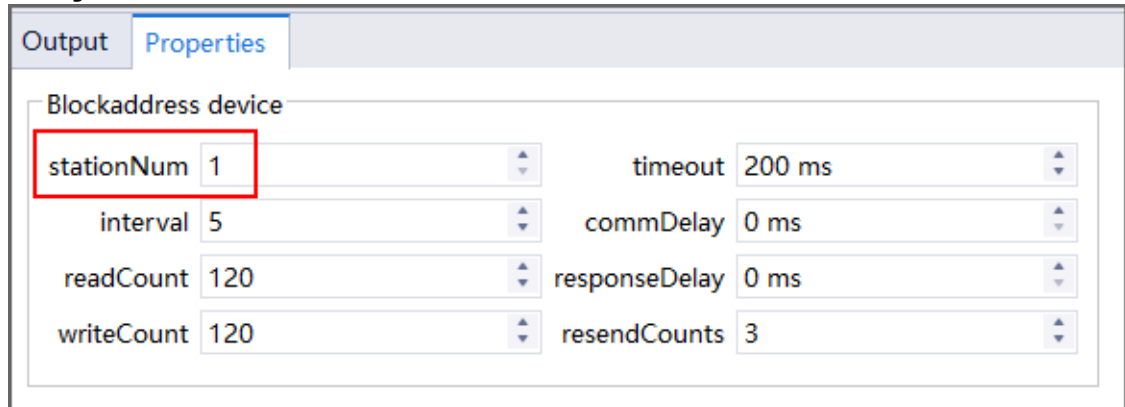


### 3.1.1.3.2 Configuration on the HMI Side

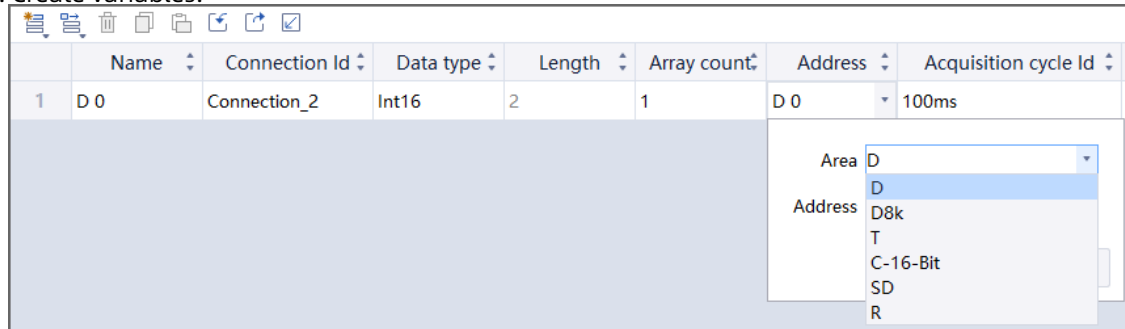
1. Establish a connection and configure the serial port.



2. Configure the station number.



3. Create variables.



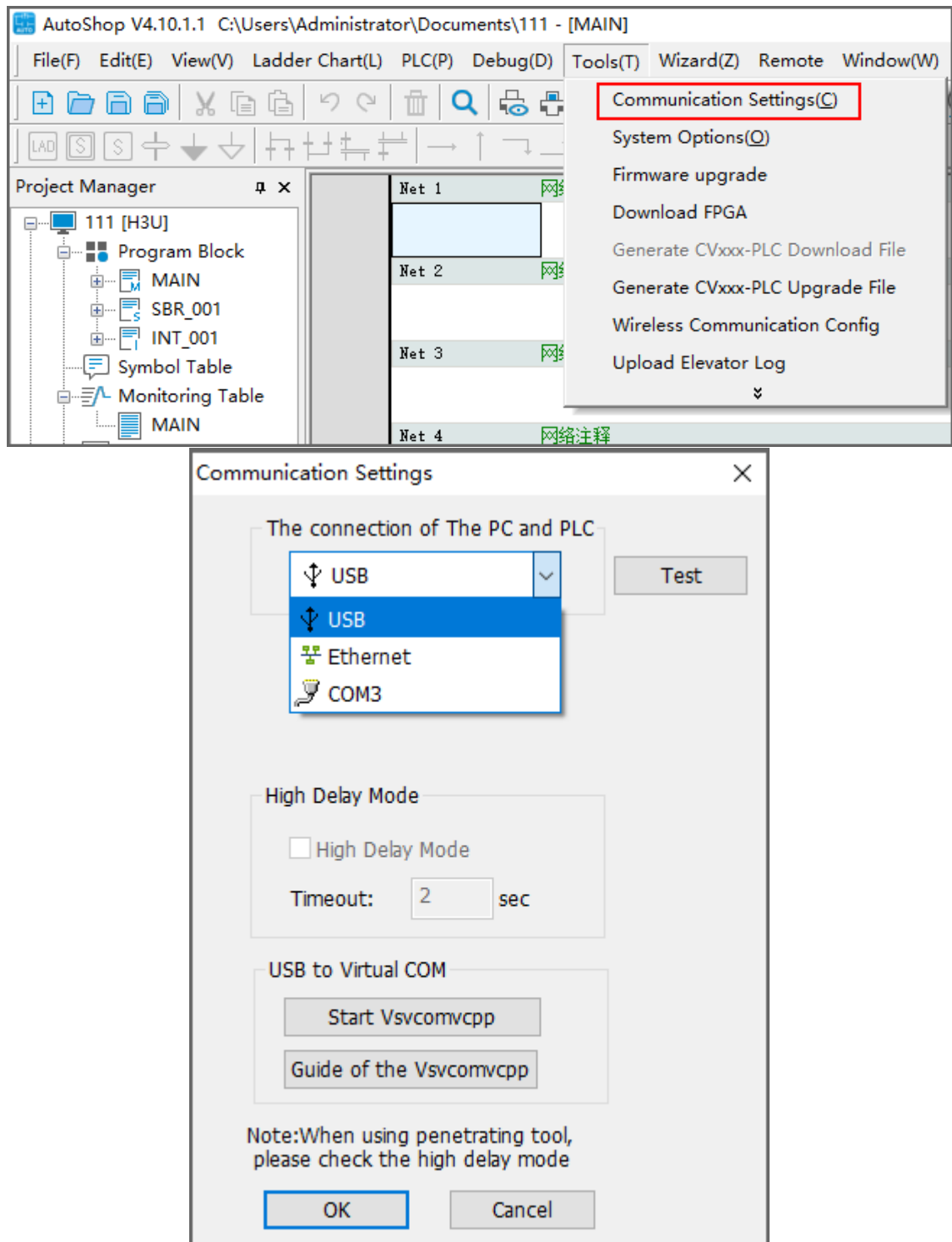
## 3.1.2 H1U/H2U/H3U Ethernet

### 3.1.2.1 H3U Modbus TCP

#### 3.1.2.1.1 Configuration on the PLC Side

1. Connect the PLC.

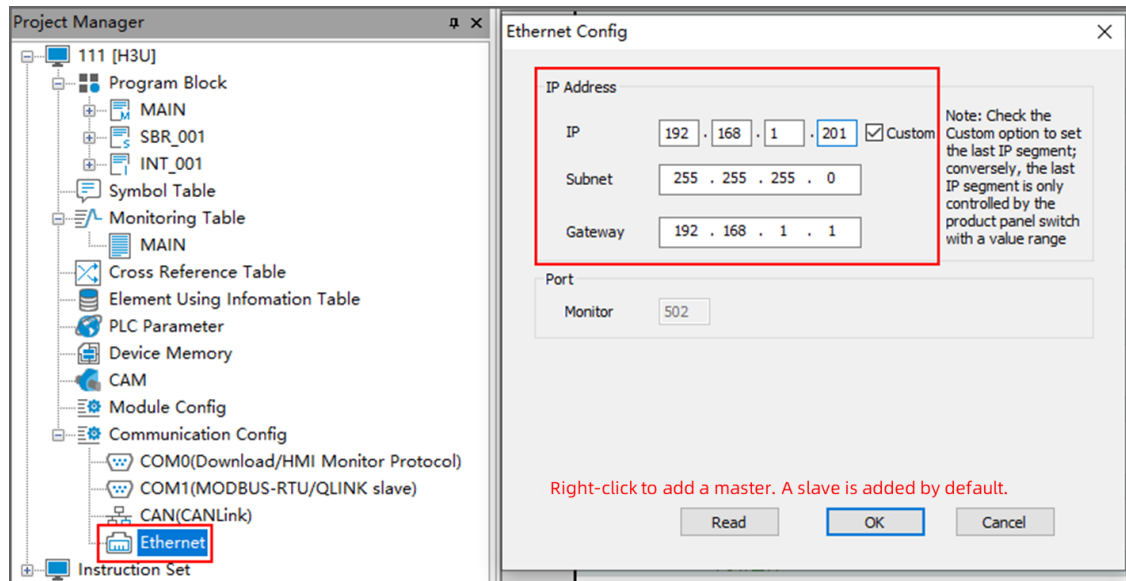
You can connect the PLC through the serial port, USB port, and network port. Connecting the PLC through the USB port is used as an example.



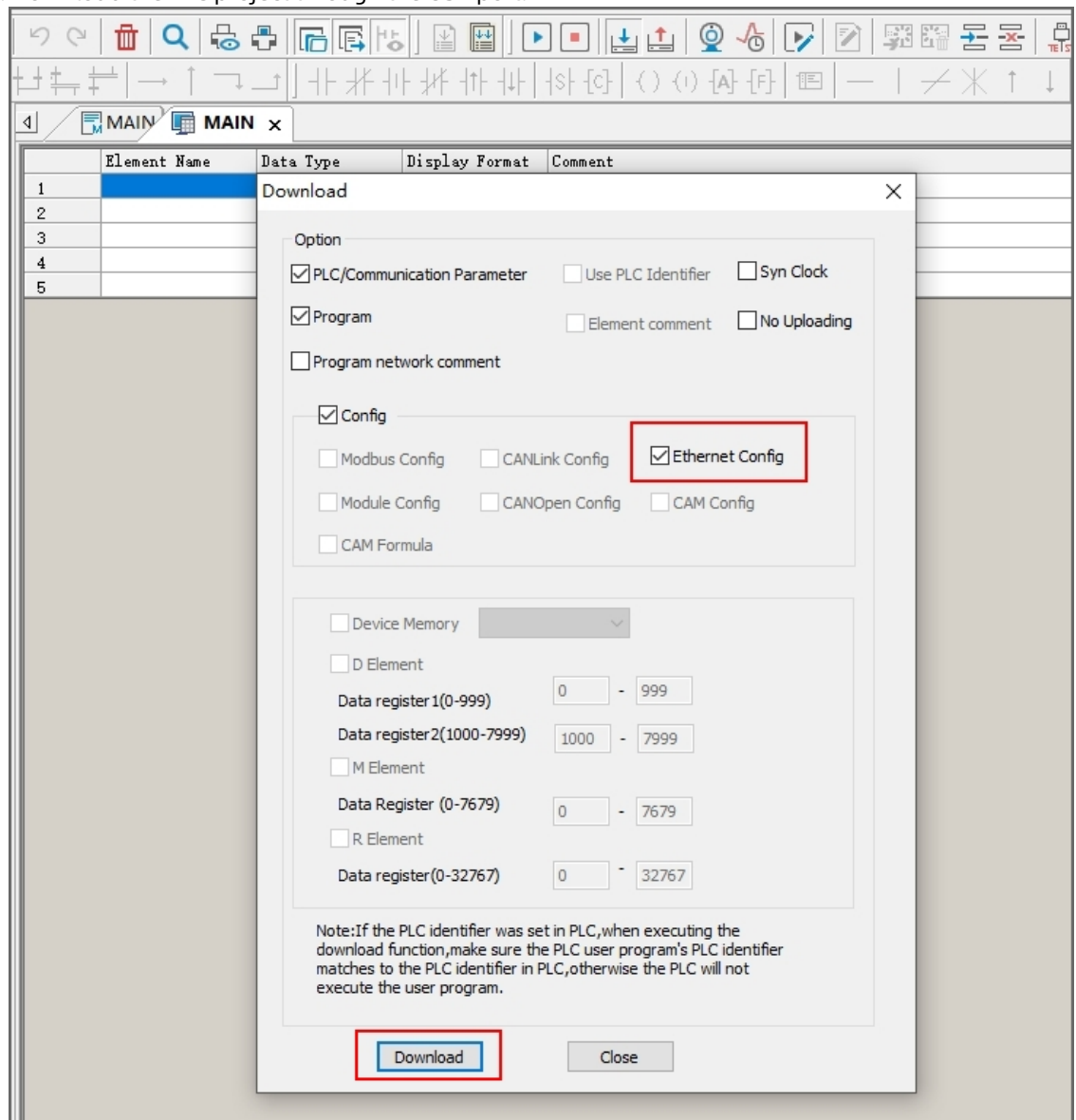
If the IP address of the PLC is determined, skip this step.

### 2. Configure communication parameters.

Connect to the PLC through the USB port and set the IP address of the PLC.



3. Download the PLC project through the USB port.



## 3.1.2.1.2 Configuration on the HMI Side

1. Establish a connection and configure the IP address.

The screenshot shows the 'Connection' configuration window. On the left, 'Ethernet' is selected. The main table lists connections, with 'Connection\_3' selected. The 'Communication protocol' is 'H3U Modbus TCP Protocol'. The 'Properties' panel at the bottom shows the 'Blockaddress device' settings. The 'IP Address' field is highlighted with a red box, showing '192 . 168 . 1 . 201'. The 'Port' is '502'. The right sidebar shows a list of protocols, with 'H3U Modbus TCP Protocol' selected.

| Name         | Number | Communication protocol  | Online | Display mode | Comment | Enabled                             |
|--------------|--------|-------------------------|--------|--------------|---------|-------------------------------------|
| Connection_3 | 3      | H3U Modbus TCP Protocol | Online | Decimal      |         | <input checked="" type="checkbox"/> |

Blockaddress device

|            |                     |               |        |
|------------|---------------------|---------------|--------|
| stationNum | 1                   | timeout       | 100 ms |
| interval   | 5                   | commDelay     | 0 ms   |
| readCount  | 120                 | responseDelay | 0 ms   |
| writeCount | 120                 | resendCounts  | 3      |
| IP Address | 192 . 168 . 1 . 201 |               |        |
| Port       | 502                 |               |        |

2. Create variables.

The screenshot shows the 'Variable' configuration window. The table lists variables, with 'D 0' selected. The 'Connection Id' is 'Connection\_3', 'Data type' is 'Int16', 'Length' is '2', 'Array count' is '1', 'Address' is 'D 0', and 'Acquisition cycle Id' is '100ms'. The 'Area' dropdown is open, showing options: D, D8k, T, C-16-Bit, SD, R. The 'Address' dropdown is also open, showing the same options.

| Name | Connection Id | Data type | Length | Array count | Address | Acquisition cycle Id |
|------|---------------|-----------|--------|-------------|---------|----------------------|
| D 0  | Connection_3  | Int16     | 2      | 1           | D 0     | 100ms                |

Area: D, D8k, T, C-16-Bit, SD, R

Address: D, D8k, T, C-16-Bit, SD, R

## 3.1.2.2 H3U Qlink TCP

### 3.1.2.2.1 Configuration on the HMI Side

1. Establish a connection and configure the IP address.

The screenshot shows the 'Connection' configuration window. On the left, 'Ethernet' is selected. The main table lists connections, with 'Connection\_4' selected. The 'Communication protocol' is 'H3U Qlink TCP Protocol'. The 'Properties' panel at the bottom shows the 'Blockaddress device' settings. The 'IP Address' field is highlighted with a red box, showing '192 . 168 . 1 . 100'. The 'Port' is '502'. The right sidebar shows a list of protocols, with 'H3U Qlink TCP Protocol' selected.

| Name         | Number | Communication protocol | Online | Display mode | Comment | Enabled                             |
|--------------|--------|------------------------|--------|--------------|---------|-------------------------------------|
| Connection_4 | 4      | H3U Qlink TCP Protocol | Online | Decimal      |         | <input checked="" type="checkbox"/> |

Blockaddress device

|            |                     |               |        |
|------------|---------------------|---------------|--------|
| stationNum | 1                   | timeout       | 100 ms |
| interval   | 5                   | commDelay     | 0 ms   |
| readCount  | 120                 | responseDelay | 0 ms   |
| writeCount | 120                 | resendCounts  | 3      |
| IP Address | 192 . 168 . 1 . 100 |               |        |
| Port       | 502                 |               |        |

## 2. Create variables.

|   | Name | Connection Id | Data type | Length | Array count | Address | Acquisition cycle Id |
|---|------|---------------|-----------|--------|-------------|---------|----------------------|
| 1 | D 0  | Connection_4  | Int16     | 2      | 1           | D 0     | 100ms                |

Area

D

Address

D8k

T

C-16-Bit

SD

R

### 3.1.3 H5U

#### 3.1.3.1 Network Port Communication

##### 3.1.3.1.1 H5U TCP Monitoring Protocol Configuration

(Recommended)

##### 3.1.3.1.1.1 Configuration on the PLC Side

1. Export the variable table.

The screenshot shows a software interface with a 'Project Manager' on the left and a 'Variable Table' on the right. The 'Project Manager' tree structure includes:

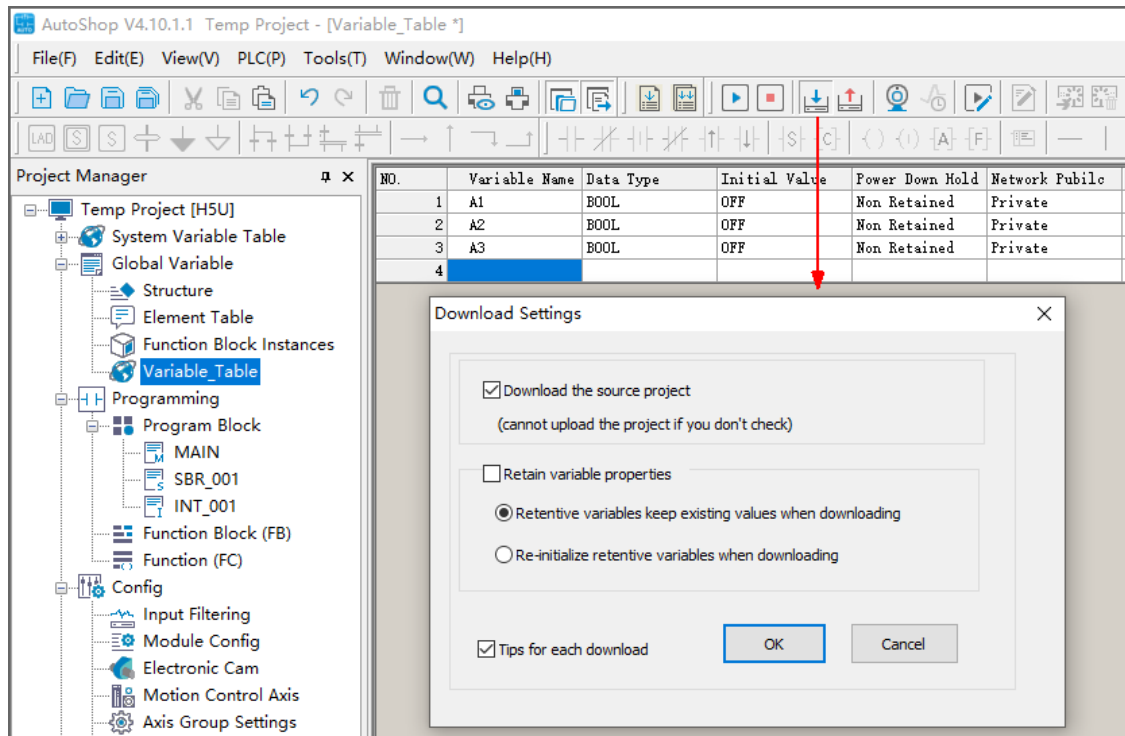
- Temp Project [H5U]
  - System Variable Table
  - Global Variable
    - Structure
    - Element Table
    - Function Block Instances
    - Variable\_Table (selected)
  - Programming
    - Program Block
      - MAIN
      - SBR\_001
      - INT\_001
    - Function Block (FB)
    - Function (FC)
  - Config
    - Input Filtering
    - Module Config
    - Electronic Cam
    - Motion Control Axis
    - Axis Group Settings
    - EtherCAT
    - COM0
    - CAN(CANLink)
    - Ethernet
    - EtherNet/IP
  - Variable Monitor Table
    - MAIN
  - Cross Reference Table
  - Element Using Information Table
  - Trace

The 'Variable Table' on the right has the following data:

| NO. | Variable Name | Data Type | Initial Value |
|-----|---------------|-----------|---------------|
| 1   | A1            | BOOL      | OFF           |
| 2   | A2            | BOOL      | OFF           |

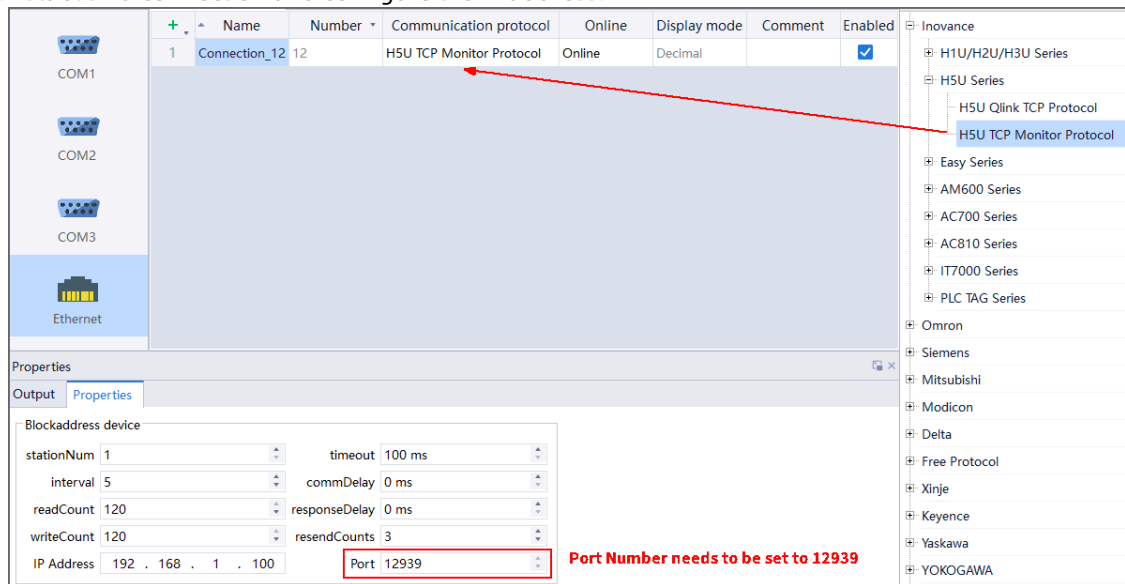
A context menu is open over the table, showing various actions. The option 'Export HMI Monitoring Variable Table(H)' is highlighted with a red rectangular box.

2. Download the PLC project.

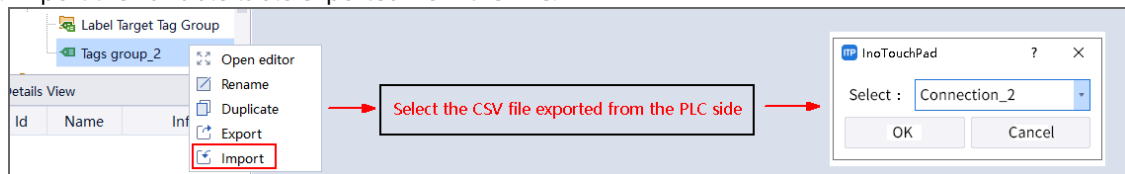


### 3.1.3.1.1.2 Configuration on the HMI Side

1. Establish a connection and configure the IP address.



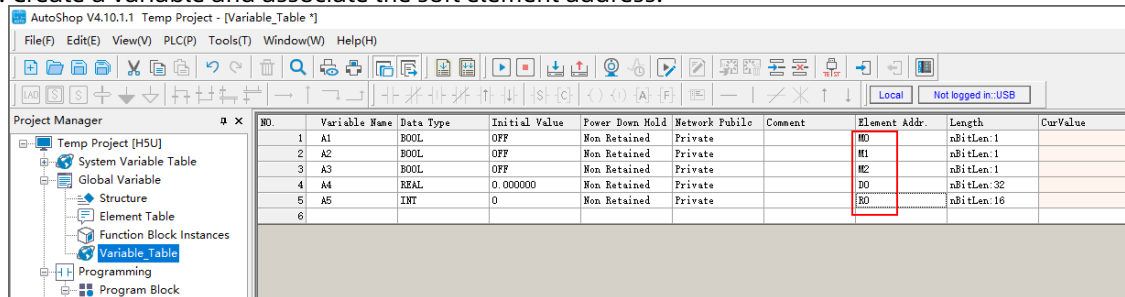
2. Import the variable table exported from the PLC.



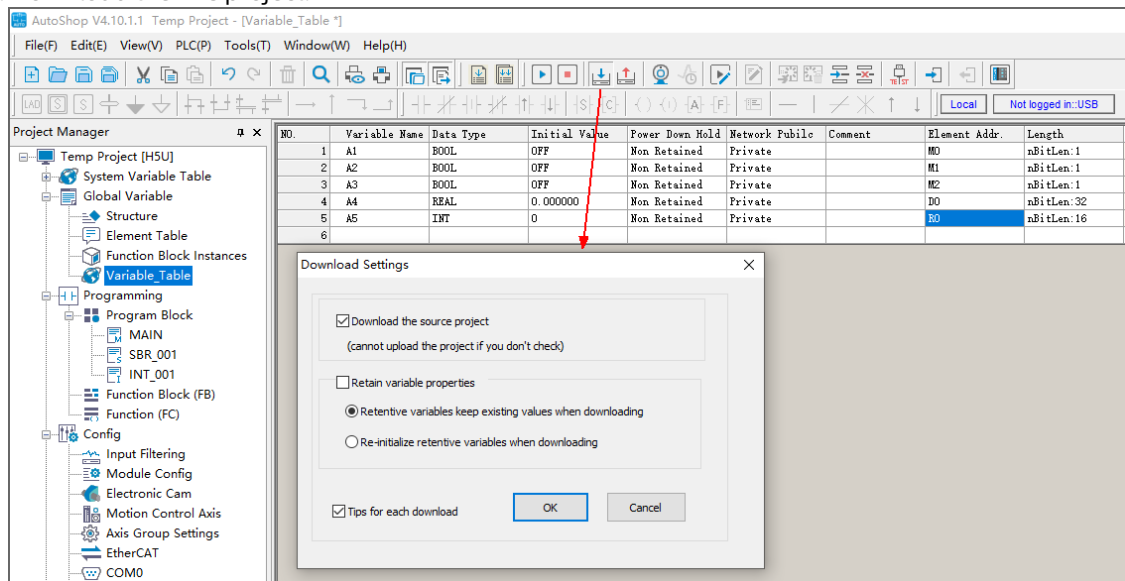
## 3.1.3.1.2 H5U Qlink TCP Configuration

### 3.1.3.1.2.3 Configuration on the PLC Side

1. Create a variable and associate the soft element address.

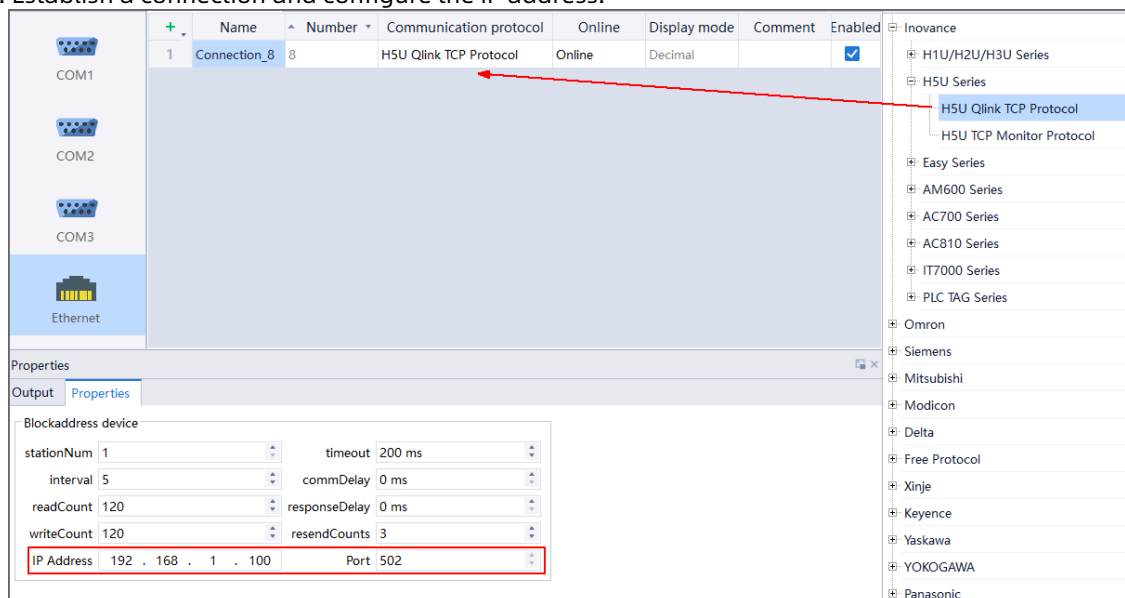


2. Download the PLC project.



### 3.1.3.1.2.4 Configuration on the HMI Side

1. Establish a connection and configure the IP address.



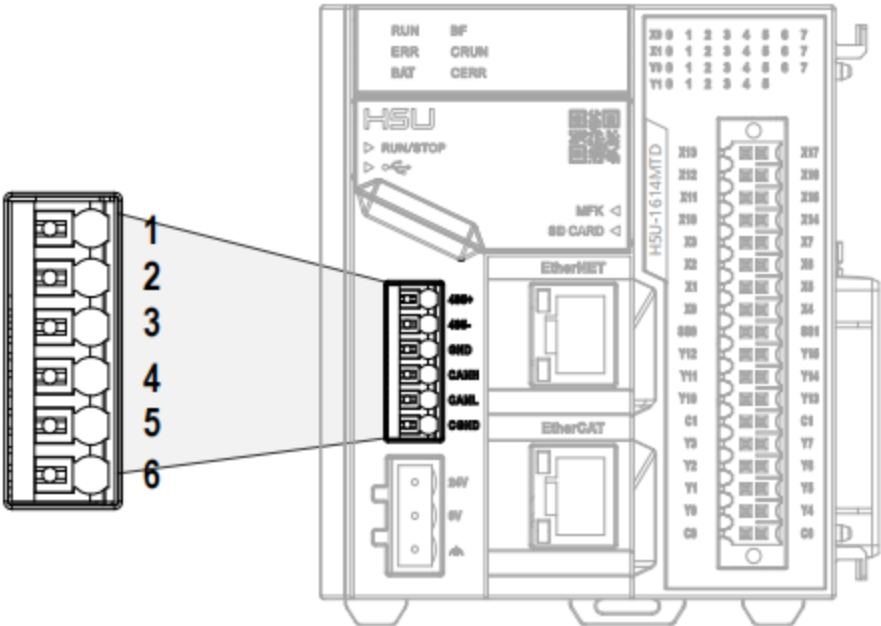
## 2. Configure communication variables.

|   | Name | Connection Id | Data type | Length | Array count | Address | Acquisition cycle Id | Acquisition mode | Data log Id | Logging cycle | Logging acquisition... |
|---|------|---------------|-----------|--------|-------------|---------|----------------------|------------------|-------------|---------------|------------------------|
| 1 | D 0  | Connection_8  | Int16     | 2      | 1           | D 0     | 100ms                | Cyclic on use    | <Undefined> | 1s            | Cyclic contin...       |

### 3.1.3.2 Serial Port Communication

#### 3.1.3.2.1 Hardware Connection

H5U has one serial port, which supports 485 Modbus and free protocols.

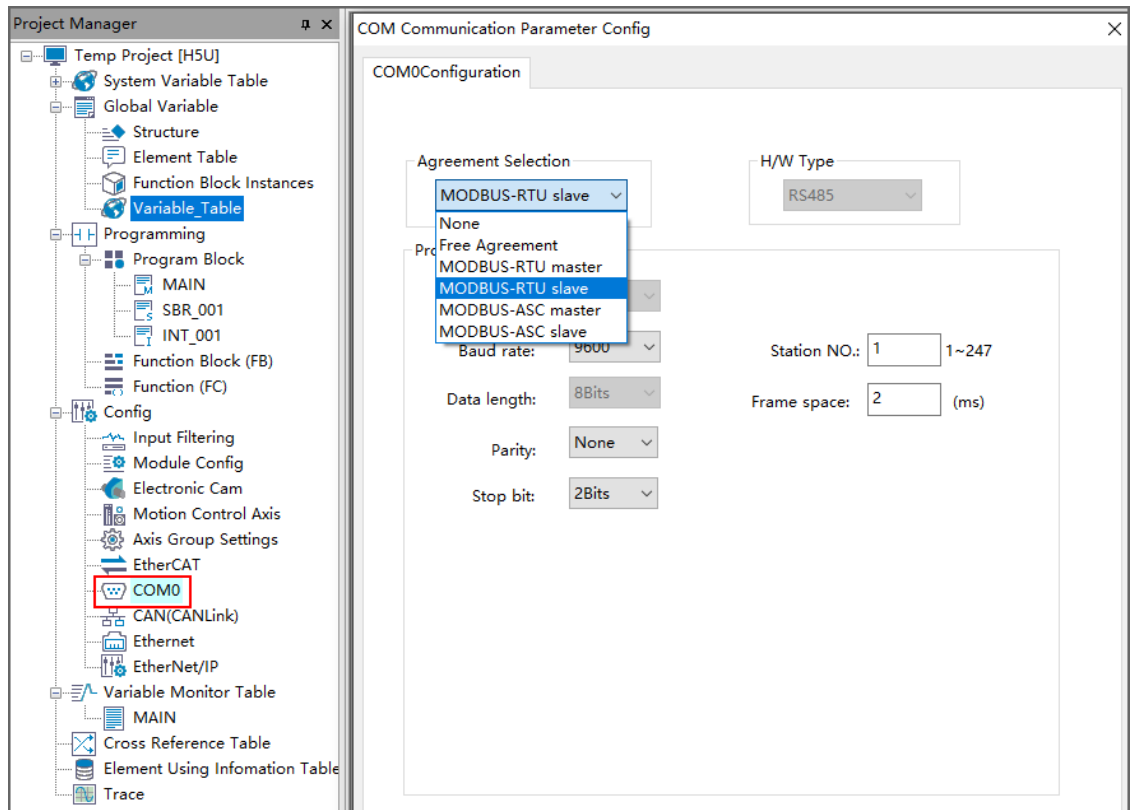


| Pin No. | Signal Assignment | Description                              |
|---------|-------------------|------------------------------------------|
| 1       | 485+              | RS485 differential pair signal + of COM0 |
| 2       | 485-              | RS485 differential pair signal - of COM0 |
| 3       | GND               | Power ground of COM0                     |
| 4       | CANH              | CAN data receiving terminal              |
| 5       | CANL              | CAN data transmitting terminal           |
| 6       | CGND              | CAN ground                               |

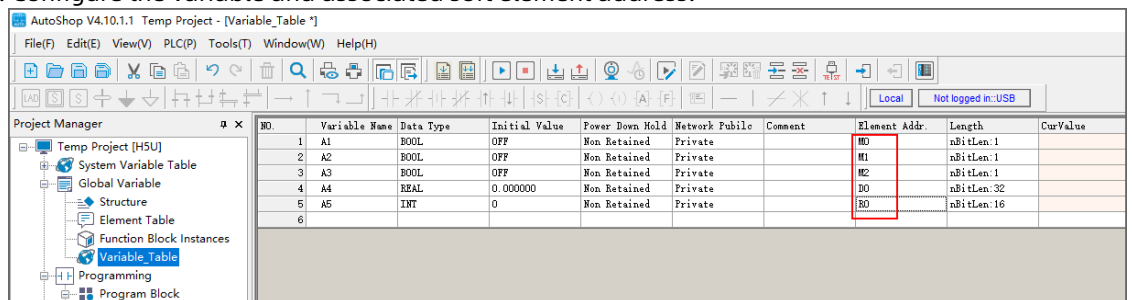
#### 3.1.3.2.2 H5U Qlink Protocol

#### 3.1.3.2.2.5 Configuration on the PLC Side

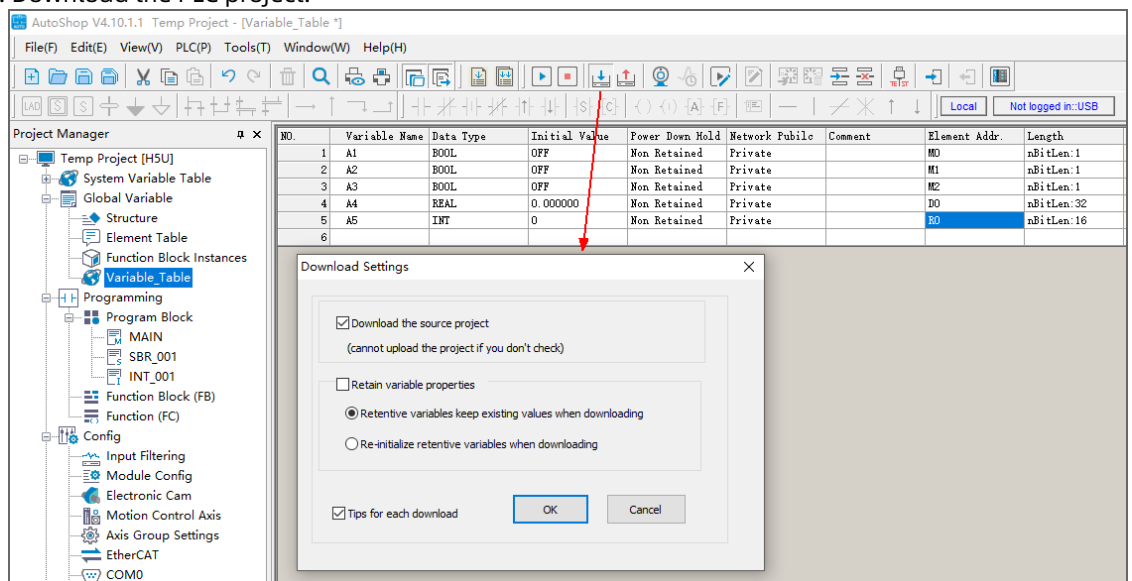
1. Configure COM0 port.



## 2. Configure the variable and associated soft element address.



## 3. Download the PLC project.



### 3.1.3.2.2.6 Configuration on the HMI Side

1. Establish a connection and configure serial port parameters.

The serial port parameters need to be the same as those set on the PLC side.

|   | Name         | Number | Communication protocol | Online | Display mode | Comment | Enabled                             |
|---|--------------|--------|------------------------|--------|--------------|---------|-------------------------------------|
| 1 | Connection_9 | 9      | H5U Qlink Protocol     | Online | Decimal      |         | <input checked="" type="checkbox"/> |

Properties

Output Properties

type RS485

Serial Port Setting

Baud rate 9600

Data bits 8

Parity None

Stop bits 2

Blockaddress device

|            |     |               |        |
|------------|-----|---------------|--------|
| stationNum | 1   | timeout       | 200 ms |
| interval   | 5   | commDelay     | 0 ms   |
| readCount  | 120 | responseDelay | 0 ms   |
| writeCount | 120 | resendCounts  | 3      |

The station number is the same as the station number set by the PLC.

2. Create communication variables.

|   | Name | Connection Id | Data type | Length | Array count | Address | Acquisition cycle Id | Acquisition mode | Data log Id | Logging cycl... | oggin  |
|---|------|---------------|-----------|--------|-------------|---------|----------------------|------------------|-------------|-----------------|--------|
| 1 | D 0  | Connection_9  | Float     | 4      | 1           | D 0     | 100ms                | Cyclic on use    | <Undefined> | 1s              | Cyclic |
| 2 | D 2  | Connection_10 | Int32     | 4      | 1           | D 2     | 100ms                | Cyclic on use    | <Undefined> | 1s              | Cyclic |

## 3.1.4 Easy

### 3.1.4.1 Easy TCP Monitoring Protocol

#### 3.1.4.1.1 Configuration on the PLC Side

1. Export communication variables.

**Project Manager**

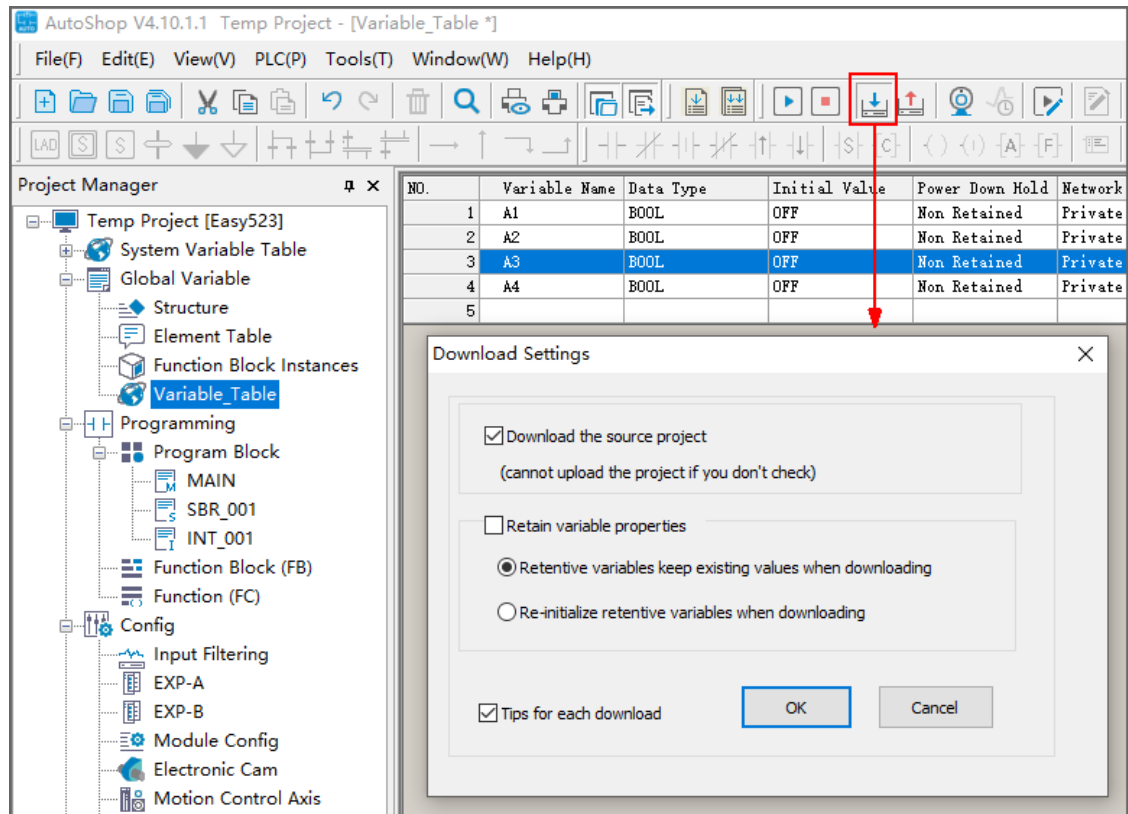
- Temp Project [Easy523]
  - System Variable Table
  - Global Variable
    - Structure
    - Element Table
    - Function Block Instances
    - Variable\_Table**
  - Programming
    - Program Block
      - MAIN
      - SBR\_001
      - INT\_001
    - Function Block (FB)
    - Function (FC)
  - Config
    - Input Filtering
      - EXP-A
      - EXP-B
    - Module Config
    - Electronic Cam
    - Motion Control Axis
    - Axis Group Settings
    - EtherCAT
    - COM0
    - Ethernet
    - EtherNet/IP
    - OPC UA
  - Variable Monitor Table
    - MAIN
  - Cross Reference Table
  - Element Using Information Table
  - Trace

| NO. | Variable Name | Data Type | Initial Value | Power |
|-----|---------------|-----------|---------------|-------|
| 1   | A1            | BOOL      | OFF           | Non   |
| 2   | A2            | BOOL      | OFF           | Non   |
| 3   | A3            | BOOL      | OFF           | Non   |
| 4   | A4            | BOOL      | OFF           | Non   |
| 5   |               |           |               |       |

**Display Format**

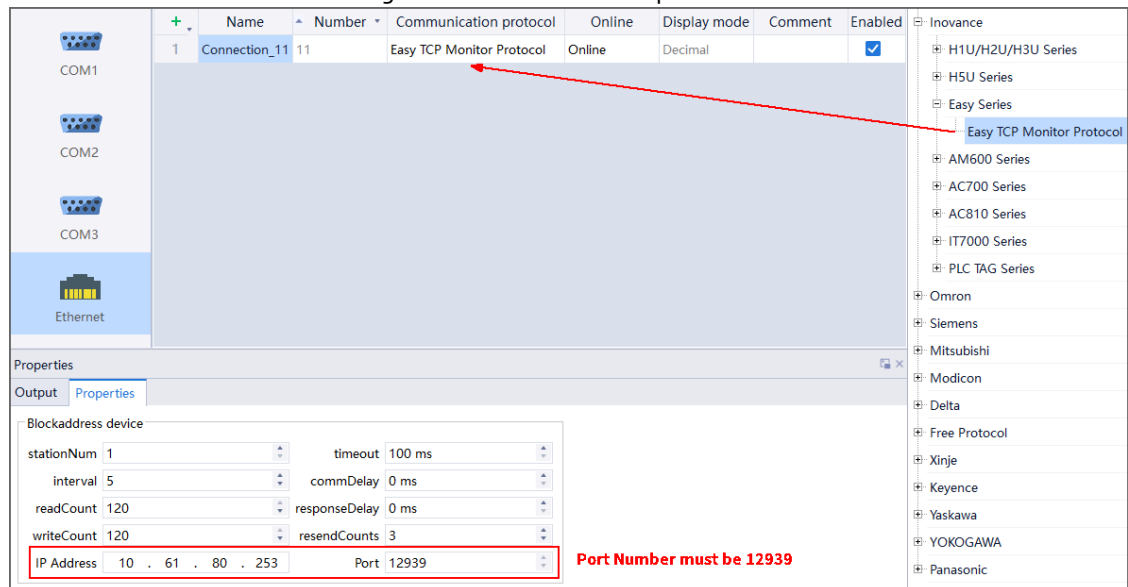
- Cut(T) Ctrl+X
- Copy(C) Ctrl+C
- Paste(P) Ctrl+V
- Select All(A) Ctrl+A
- Delete(D) Delete
- Insert row(I) Shift+Insert
- Delete rows(L) Shift+Delete
- Add Row(N)
- Bulk Add(B)
- Export(X)
- Import(M)
- Export HMI Monitoring Variable Table(H)**
- Update EIP Label
- SynchronizeTo
- Save Values
- Load Values
- Read Memory
- Write Memory
- Clear column data

2. Download the project.

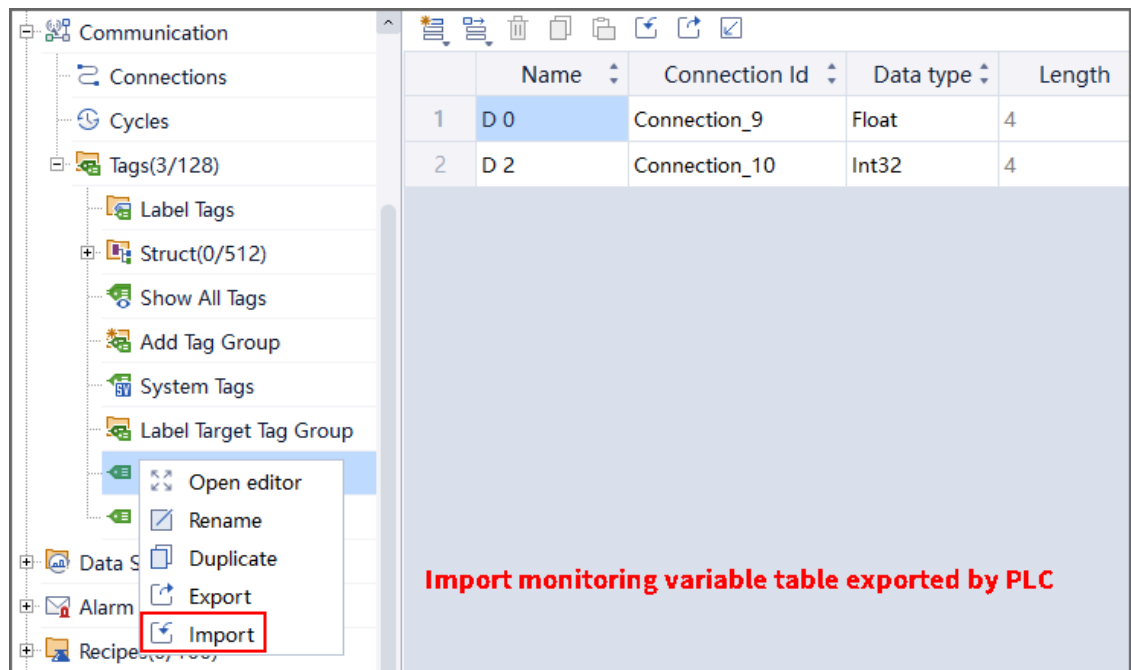


### 3.1.4.1.2 Configuration on the HMI Side

1. Establish a connection and configure the IP address and port.



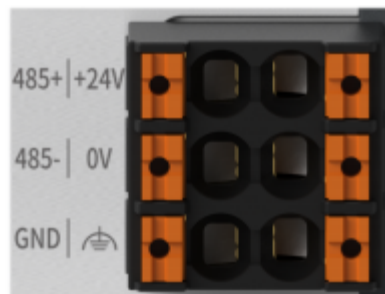
2. Import communication variables.



### 3.1.4.2 Easy Protocol (Serial Port)

#### 3.1.4.2.1 Hardware Connection

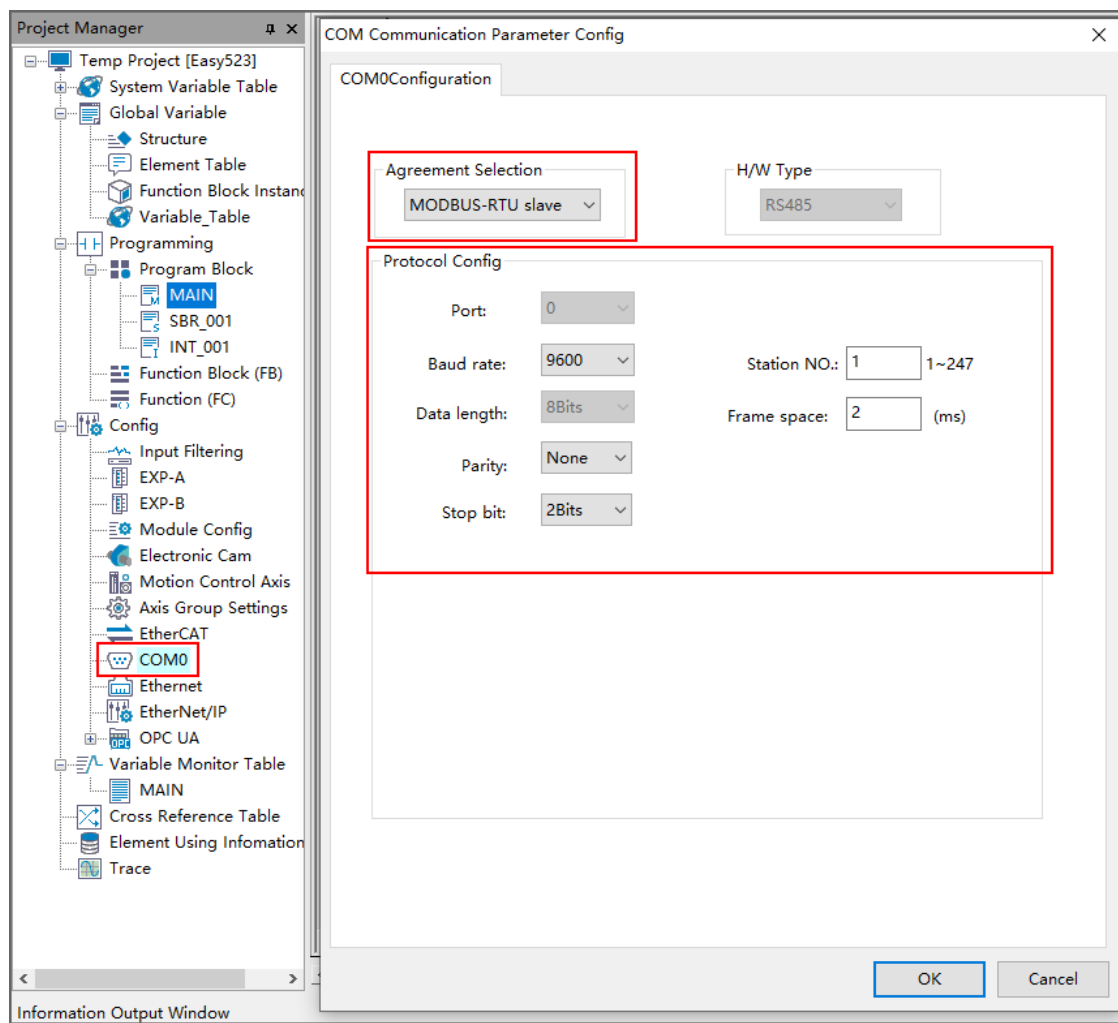
The RS485 communication port and the power supply port share the same terminal block. Terminals on the left are for RS485 communication and terminals on the right are for 24 V power supply.



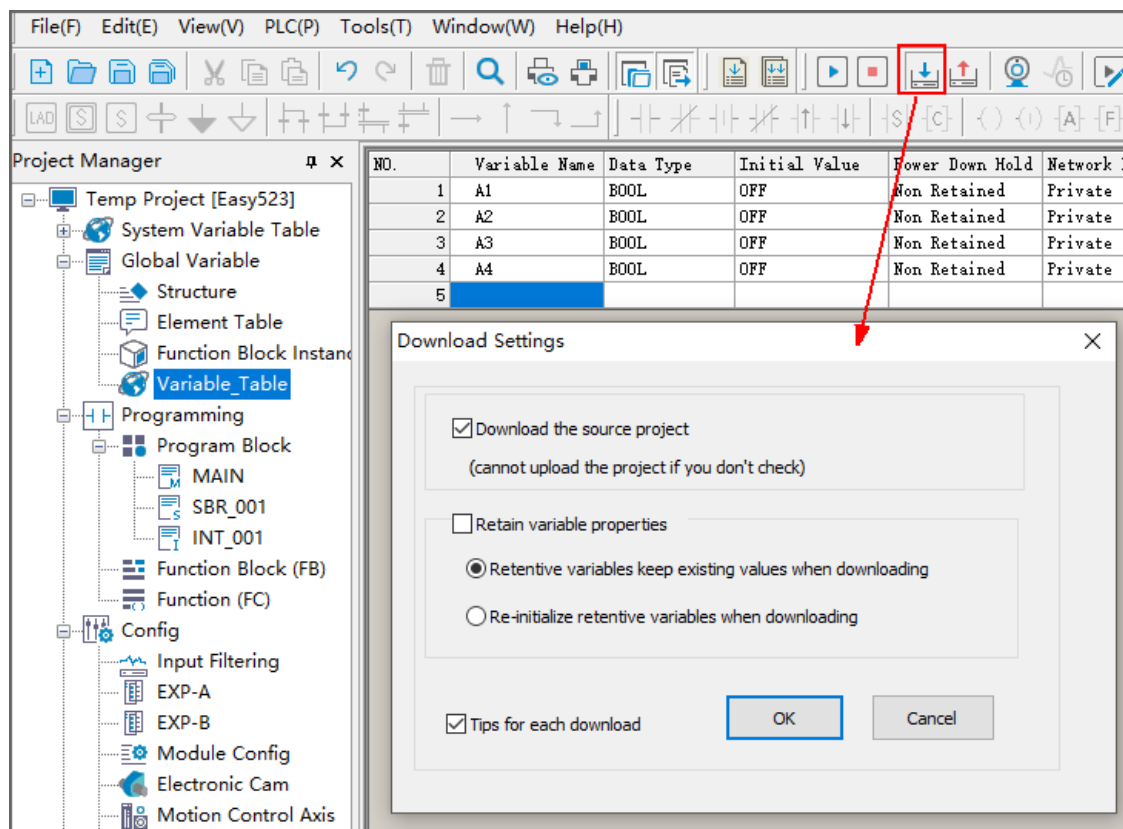
| Signal                        | Terminals on the Left | Terminals on the Right                                                               | Signal     |
|-------------------------------|-----------------------|--------------------------------------------------------------------------------------|------------|
| RS485 differential signal (+) | 485+                  | +24V                                                                                 | 24 VDC (+) |
| RS485 differential signal (-) | 485-                  | 0V                                                                                   | 24 VDC (-) |
| RS485 communication ground    | GND                   |  | PE         |

#### 3.1.4.2.2 Configuration on the PLC Side

1. Configure the serial port.

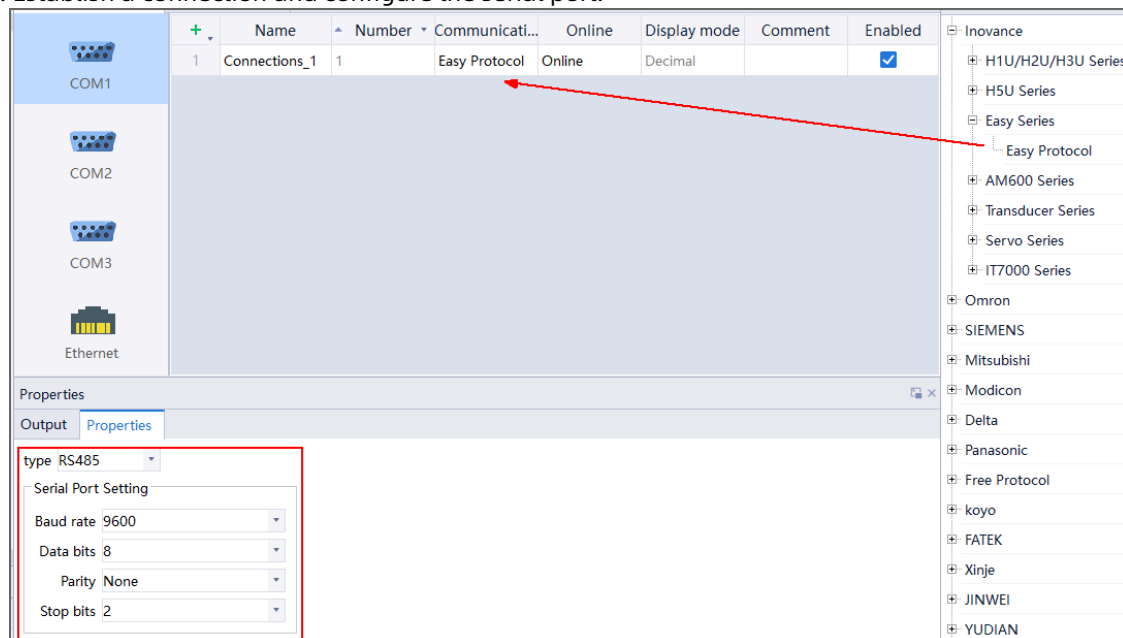


2. Download the project.



### 3.1.4.2.3 Configuration on the HMI Side

1. Establish a connection and configure the serial port.



2. Configure the station number.

Output Properties

Blockaddress device

|            |     |               |        |
|------------|-----|---------------|--------|
| stationNum | 1   | timeout       | 200 ms |
| interval   | 5   | commDelay     | 0 ms   |
| readCount  | 120 | responseDelay | 0 ms   |
| writeCount | 120 | resendCounts  | 3      |

### 3. Create variables.

|   | Name | Connection Id | Data type | Length | Array count | Address | Acquisition cycle Id |
|---|------|---------------|-----------|--------|-------------|---------|----------------------|
| 1 | D 0  | Connections_1 | Int16     | 2      | 1           | D 0     | 100ms                |

Area: D  
Address: D, R, W, UW

## 3.1.5 AM600

### 3.1.5.1 AM600 Modbus TCP

#### 3.1.5.1.1 Configuration on the PLC Side

##### 1. Configure the TCP slave.

Hardware Configuration

LocalBus

COM 0: ☐ Modbus Master ☐ Modbus Slave ☐ Free Protocol

COM 1: ☐ Modbus Master ☐ Modbus Slave ☐ Free Protocol

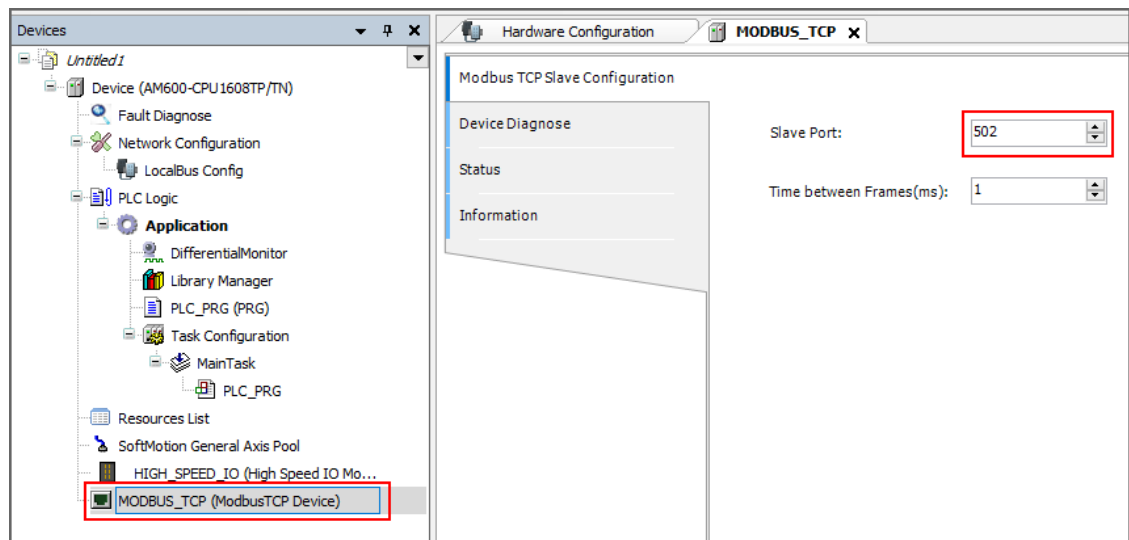
CAN0: ☐ CANopen Master ☐ CANlink Master ☐ CANlink Slave ☐ Free CAN

Ethernet: ☐ ModbusTCP Master ☒ ModbusTCP Slave ☐ Melsec Master

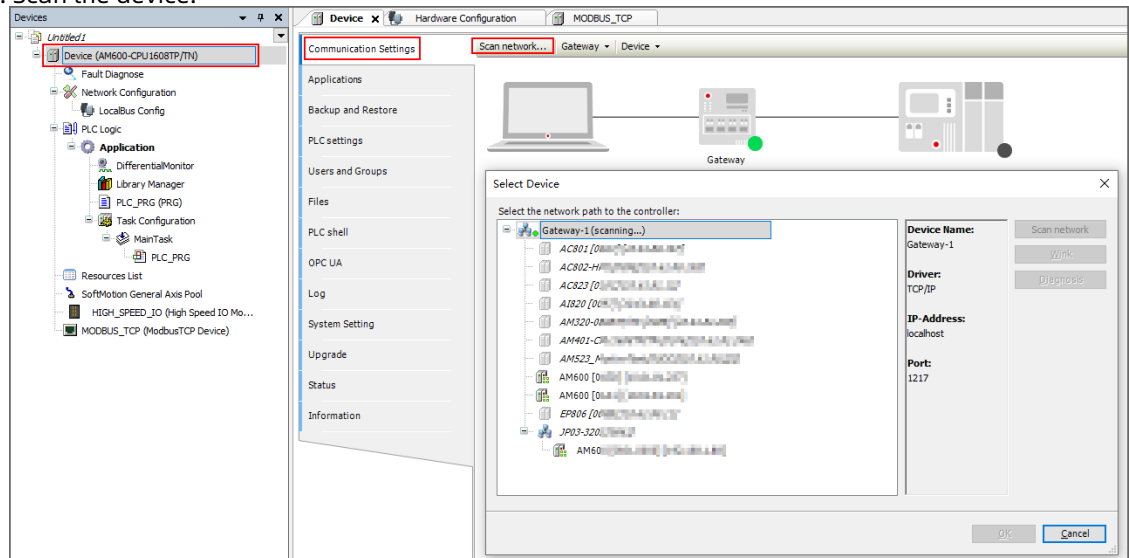
EtherCAT: ☐ EtherCAT Master

EtherNet/IP: ☐ EtherNet/IP Master ☐ EtherNet/IP Slave

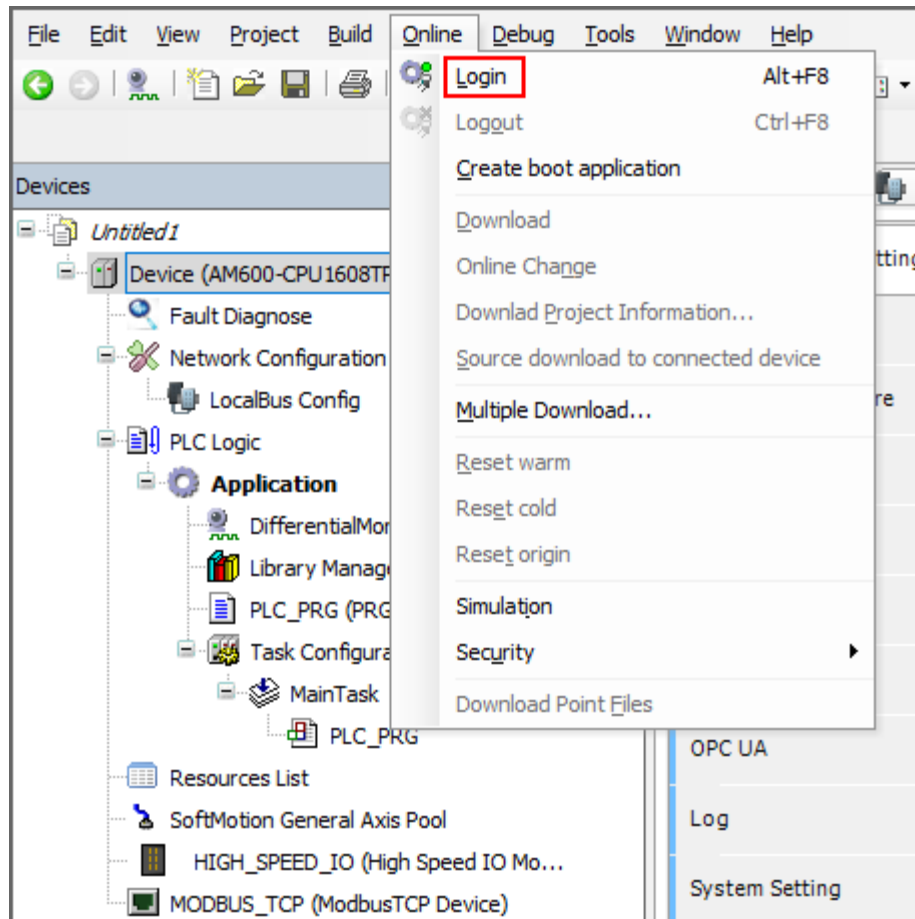
##### 2. Configure the slave port.



### 3. Scan the device.

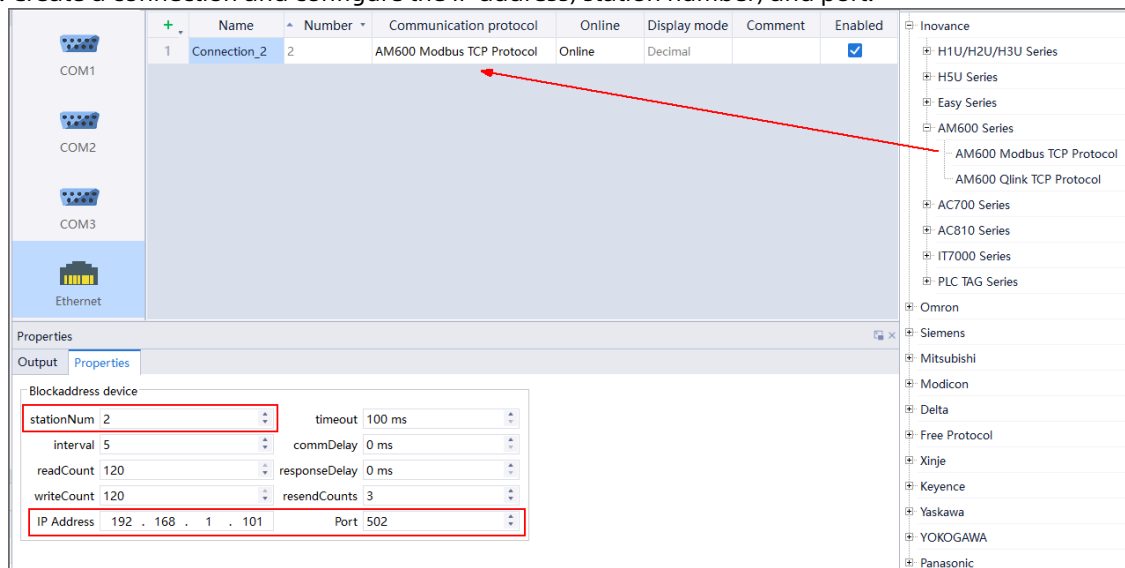


### 4. Download the project.



### 3.1.5.1.2 Configuration on the HMI Side

1. Create a connection and configure the IP address, station number, and port.



2. Create variables.

|   | Name | Connection Id | Data type | Length | Array count | Address | Acquisition cycle Id |
|---|------|---------------|-----------|--------|-------------|---------|----------------------|
| 1 | D 0  | Connection_2  | Int16     | 2      | 1           | D 0     | 100ms                |

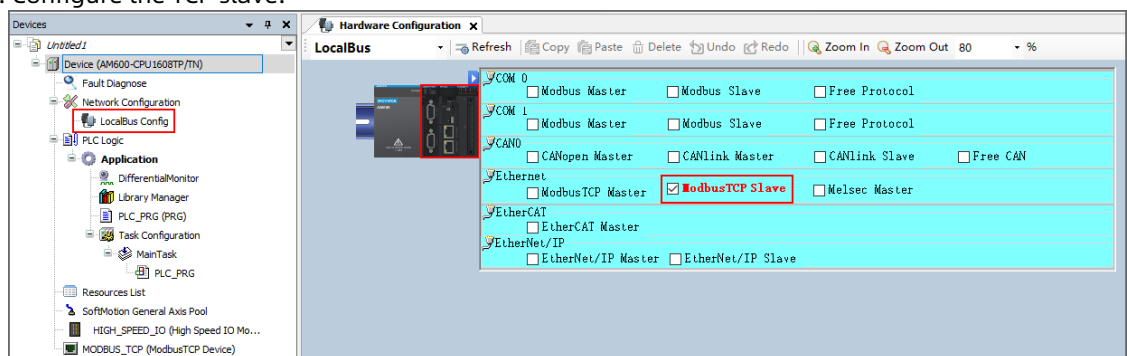
Area Q

Address Q  
QW  
I  
IW  
MW  
SD

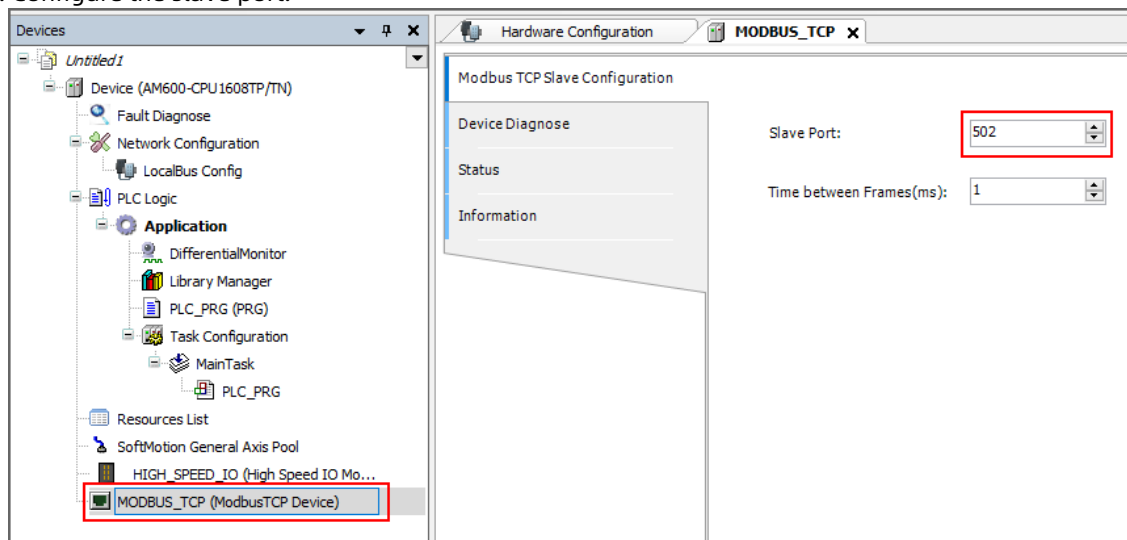
### 3.1.5.2 AM600 Qlink TCP

#### 3.1.5.2.1 Configuration on the PLC Side

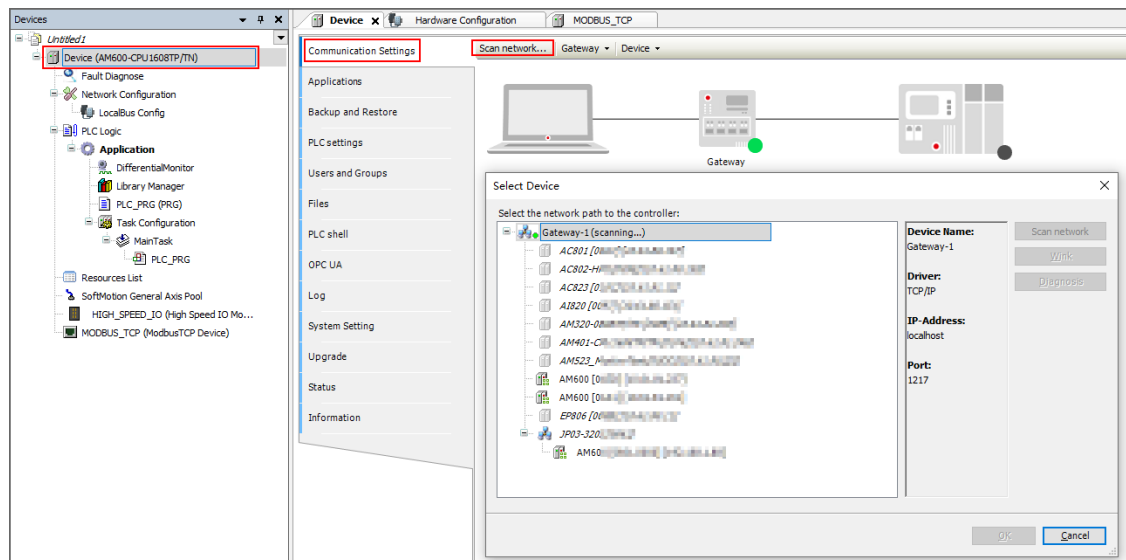
1. Configure the TCP slave.



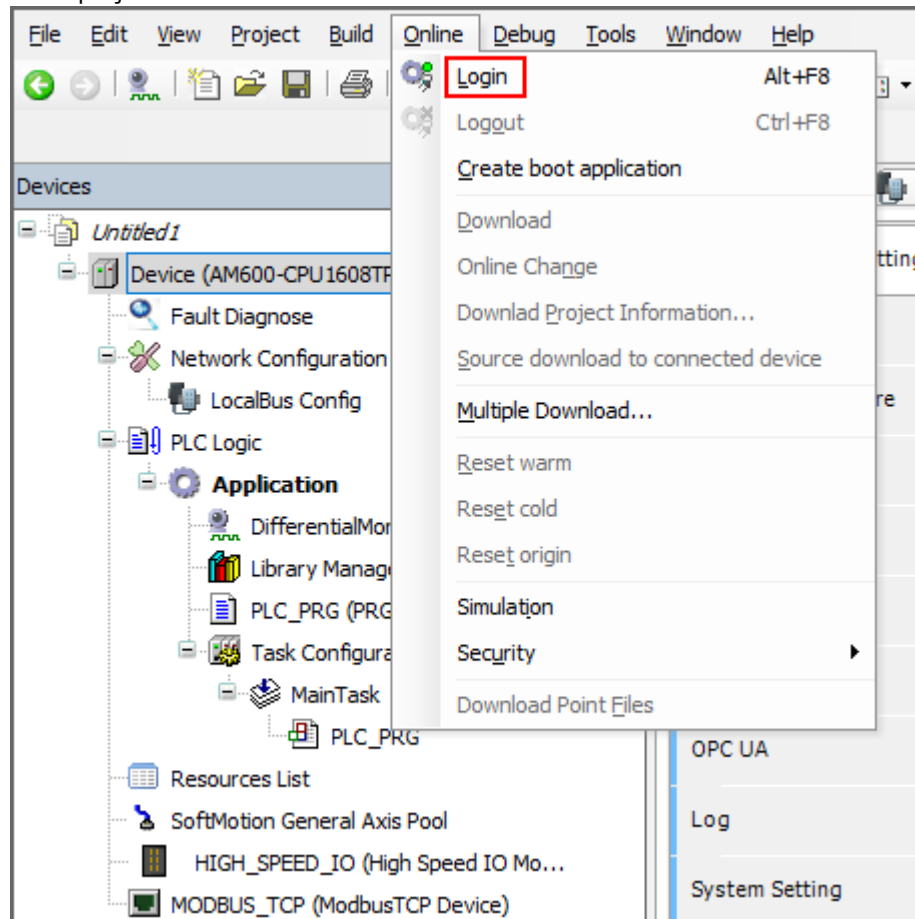
2. Configure the slave port.



3. Scan the device.

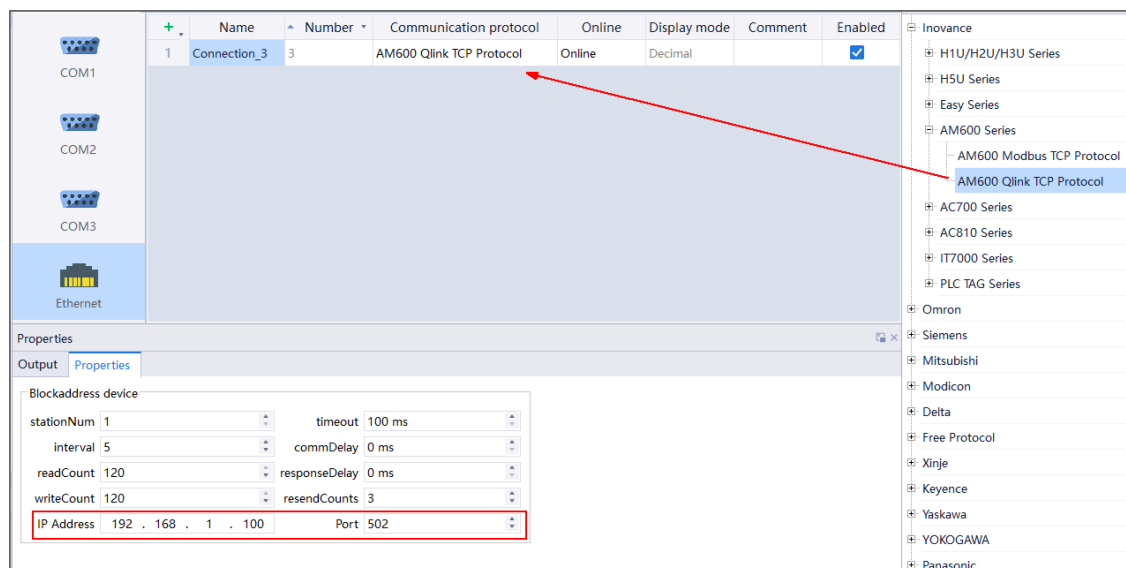


4. Download the project.

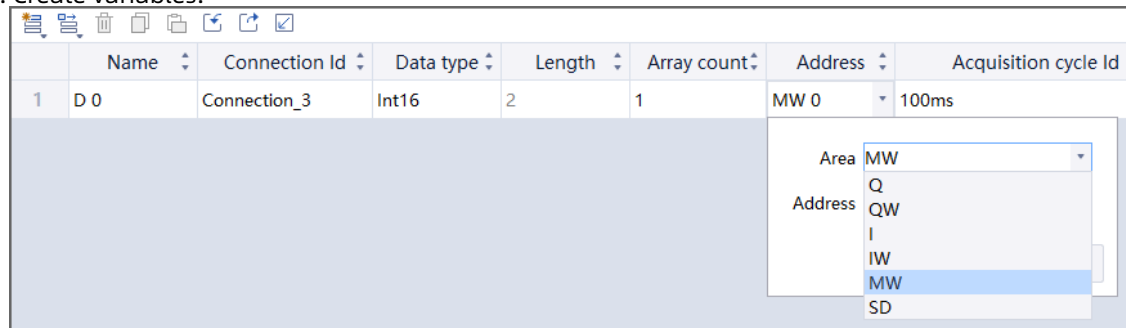


### 3.1.5.2.2 Configuration on the HMI Side

1. Establish a connection and configure the IP address and port.



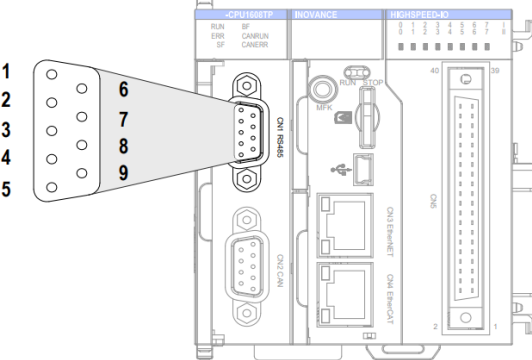
### 2. Create variables.



### 3.1.5.3 AM600 Modbus (Serial Port)

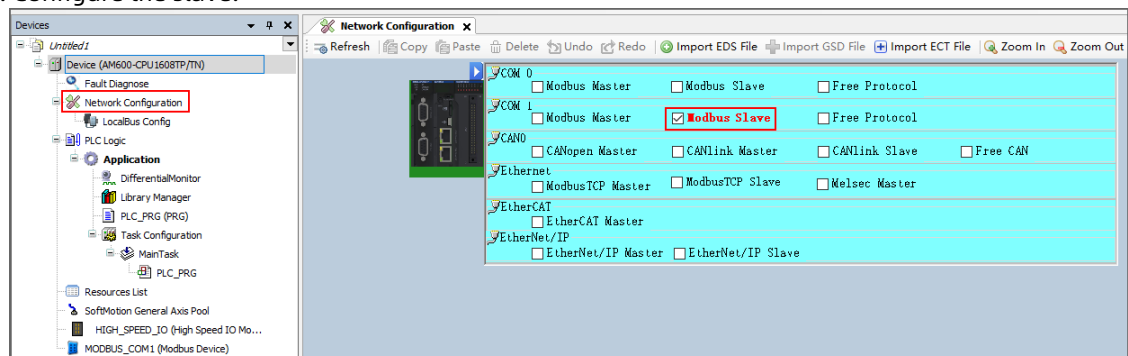
#### 3.1.5.3.1 Hardware Connection

The AM600 supports two RS485 interfaces, which share the same DB9 interface. The pin assignment of the DB9 interface is described as follows.

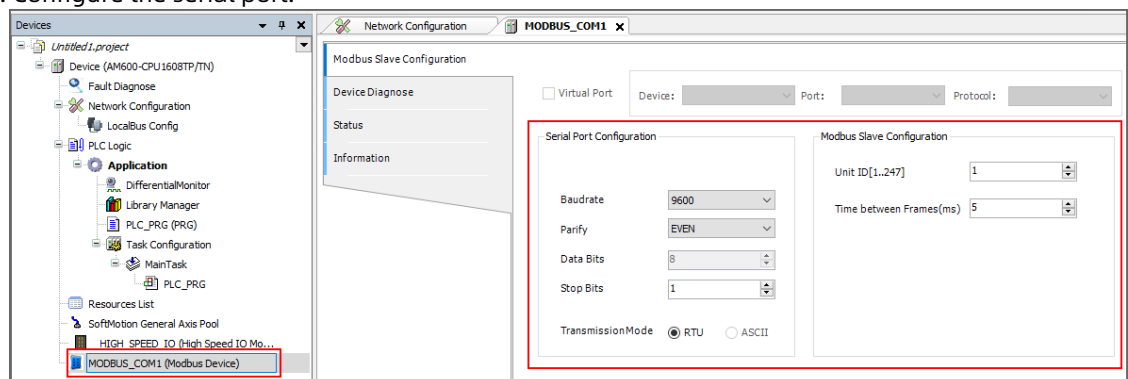
| RS485 Interface on CPU                                                            |   | Pin No. | Channel      | Assignment | Function                                               |
|-----------------------------------------------------------------------------------|---|---------|--------------|------------|--------------------------------------------------------|
|  | 1 |         | COM0 (RS485) | RS485-     | RS485 differential pair signal- of COM0                |
|                                                                                   | 2 |         |              | RS485+     | RS485 differential pair signal+ of COM0                |
|                                                                                   | 5 |         |              | GND0       | Power ground of COM0                                   |
|                                                                                   | 6 |         | COM1 (RS485) | RS485-     | Negative signal of the RS485 differential pair of COM1 |
|                                                                                   | 9 |         |              | RS485+     | Positive signal of the RS485 differential pair of COM1 |
|                                                                                   | 3 |         |              | GND1       | Power ground of COM1                                   |

### 3.1.5.3.2 Configuration on the PLC Side

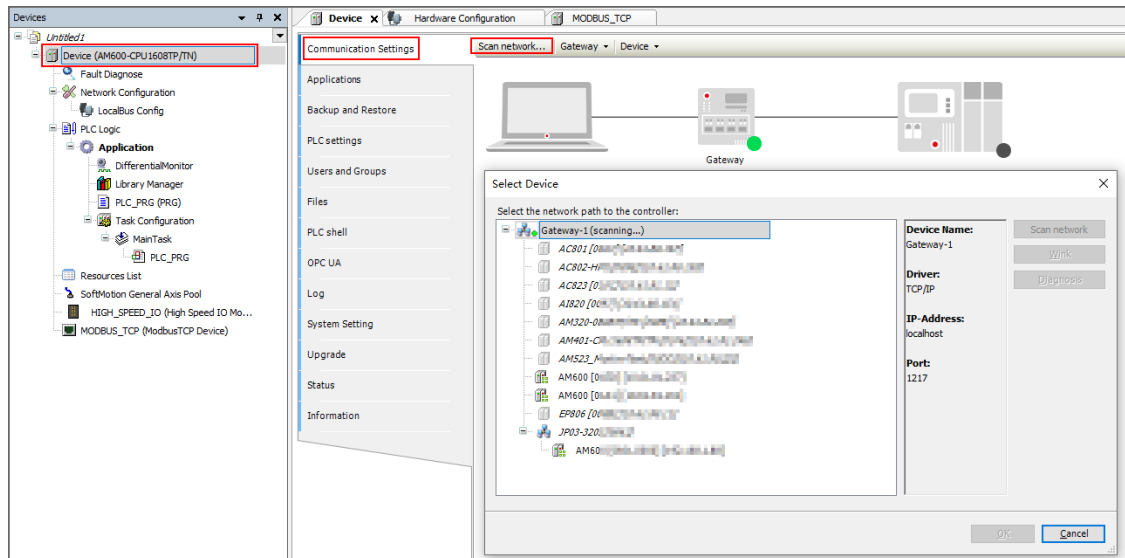
#### 1. Configure the slave.



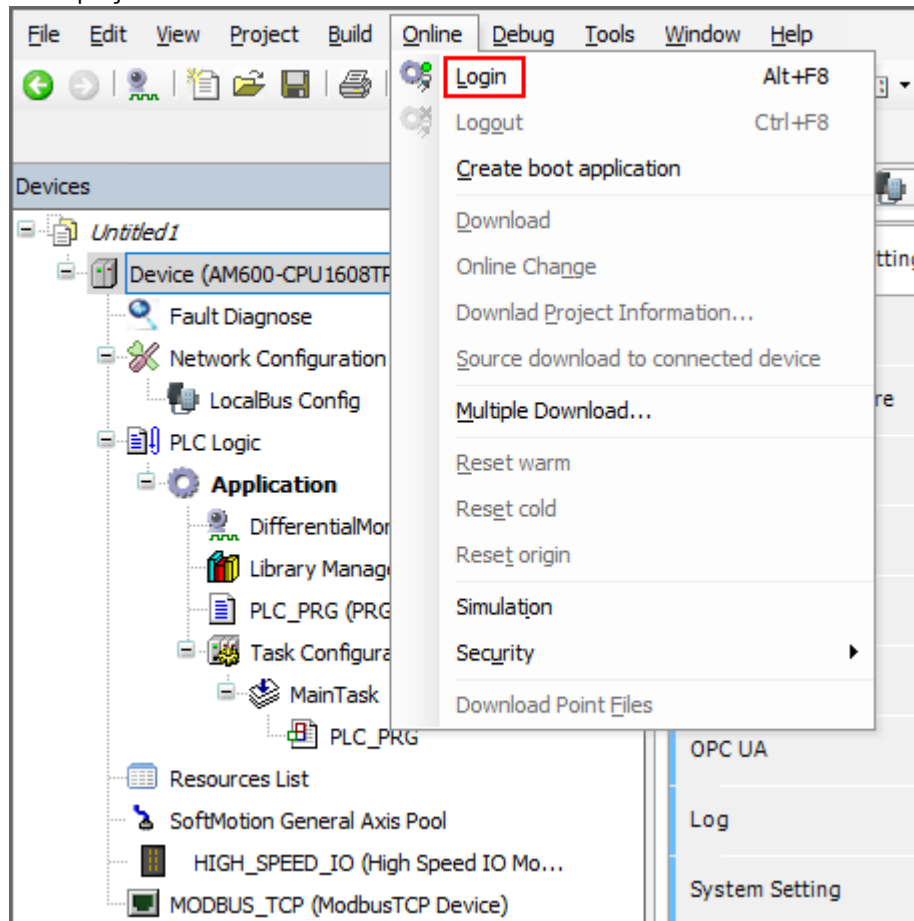
#### 2. Configure the serial port.



#### 3. Scan the device.

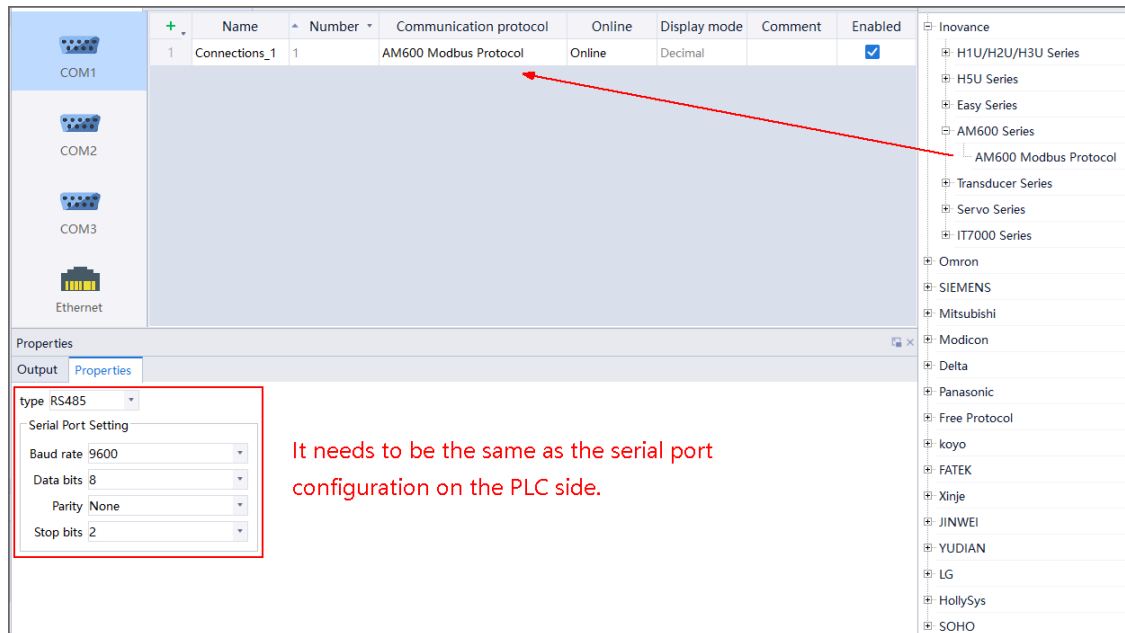


4. Download the project.

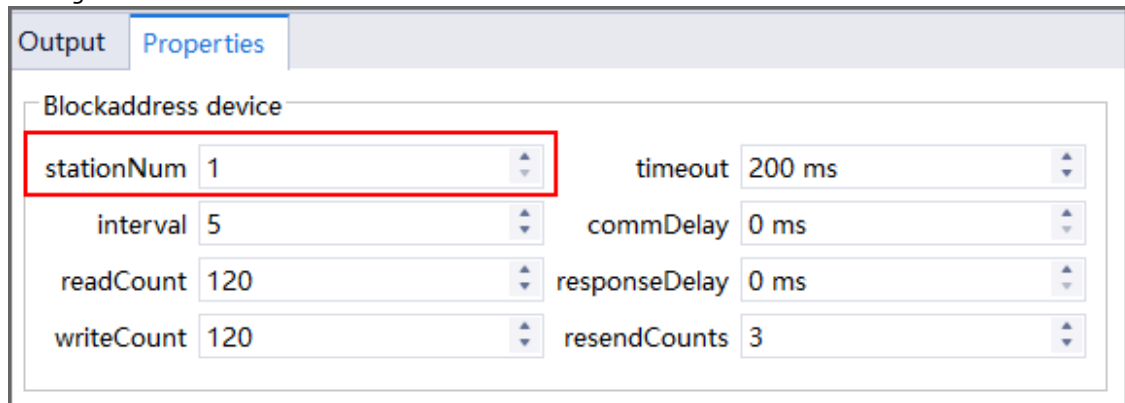


### 3.1.5.3.3 Configuration on the HMI Side

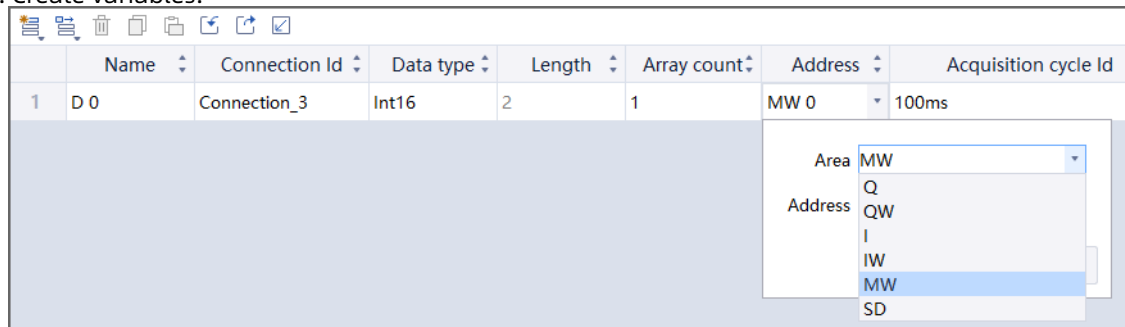
1. Establish a connection and configure serial port parameters.



2. Configure the slave station number.



3. Create variables.

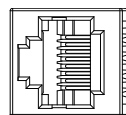


## 3.1.6 AC Drive Series

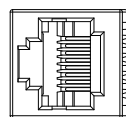
### 3.1.6.1 MD Series AC Drive Modbus (Serial Port)

#### 3.1.6.1.1 Hardware Connection

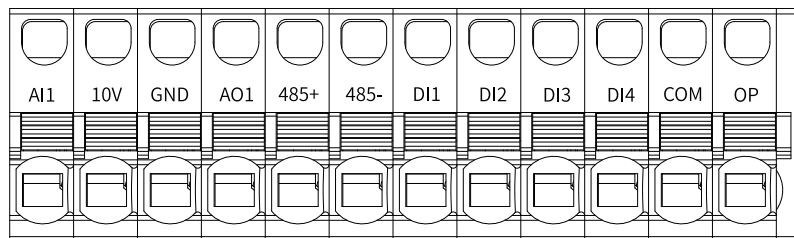
Terminals or RJ45 ports can be used for connection on the AC drive side. When the RJ45 port is used as the communication port, change the value of n1-03 on the AC drive panel.



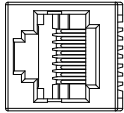
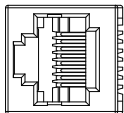
CN1



CN2



CN4

| Terminal Mark |        | Terminal Name                                  | Function Description                                              | Layout                                                                                                                                                                                                                                                                         |
|---------------|--------|------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RJ45<br>CN1   | NC     | -                                              | -                                                                 |  <div style="display: flex; flex-direction: column; align-items: center;"> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> </div>   |
|               | NC     | -                                              | -                                                                 |                                                                                                                                                                                                                                                                                |
|               | CGND   | Power supply GND                               | It is used to connect to the reference ground of all RS485 nodes. |                                                                                                                                                                                                                                                                                |
|               | RS485+ | RS485+ input                                   | RS485 commissioning and communication positive terminal           |                                                                                                                                                                                                                                                                                |
|               | RS485- | RS485- input                                   | RS485 commissioning and communication negative terminal           |                                                                                                                                                                                                                                                                                |
|               | NC     | -                                              | -                                                                 |                                                                                                                                                                                                                                                                                |
|               | NC     | -                                              | -                                                                 |                                                                                                                                                                                                                                                                                |
|               | GND    | Communication ground                           | Communication ground                                              |                                                                                                                                                                                                                                                                                |
| RJ45<br>CN2   | NC     | -                                              | -                                                                 |  <div style="display: flex; flex-direction: column; align-items: center;"> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> </div> |
|               | NC     | -                                              | -                                                                 |                                                                                                                                                                                                                                                                                |
|               | CGND   | Power supply GND                               | It is used to connect to the reference ground of all RS485 nodes. |                                                                                                                                                                                                                                                                                |
|               | RS485+ | RS485+ input                                   | RS485 commissioning and communication positive terminal           |                                                                                                                                                                                                                                                                                |
|               | RS485- | RS485- input                                   | RS485 commissioning and communication negative terminal           |                                                                                                                                                                                                                                                                                |
|               | NC     | -                                              | -                                                                 |                                                                                                                                                                                                                                                                                |
|               | 10 V   | External operating panel SOP-20 power          | It is used to power the external operating panel SOP-20.          |                                                                                                                                                                                                                                                                                |
|               | GND    | Communication ground                           | Communication ground                                              |                                                                                                                                                                                                                                                                                |
| CN4           | 485+   | RS485 communication signal (+)                 | RS485 communication input terminal with the isolation function    | -                                                                                                                                                                                                                                                                              |
|               | 485-   | RS485 communication signal (-)                 | RS485 communication input terminal with the isolation function    | -                                                                                                                                                                                                                                                                              |
|               | GND    | Reference ground of RS485 communication signal | Isolated power supply                                             | -                                                                                                                                                                                                                                                                              |

## 3.1.6.1.2 AC Drive Parameters

| Parameter Code | Parameter Name                                         | Default              | Setpoint Range                                                                                                                                        | Description                                                                                                                                                                                                                           |
|----------------|--------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n1-03          | Commissioning interface function selection             | 0: Commissioning     | 0: Commissioning<br>1: (RJ45 interface) Modbus RTU                                                                                                    | This parameter sets whether the commissioning interface is used for commissioning or Modbus RTU communication.<br>Value description:<br>0: Commissioning<br>1: Modbus RTU                                                             |
| n1-04          | Modbus RTU data format (RJ45 interface)                | 0: No check (8-N-2)  | 0: No check (8-N-2)<br>1: Even parity check (8-E-1)<br>2: Odd parity check (8-O-1)<br>3: No check (8-N-1)                                             | This parameter defines the format of Modbus data transmitted between the host controller and the AC drive. Note that the data format of the host controller must be the same as that of the AC drive. Otherwise, communication fails. |
| n1-05          | Modbus RTU response delay (RJ45 interface)             | 2 ms (default value) | 0 ms to 20ms                                                                                                                                          | This parameter defines the interval from the end of data reception by the AC drive to the start of data transmission to the host controller.                                                                                          |
| n1-06          | Modbus RTU communication timeout time (RJ45 interface) | 0.0s                 | 0.0s to 60.0s                                                                                                                                         | This parameter sets the Modbus communication timeout time.                                                                                                                                                                            |
| n1-07          | Modbus RTU communication baud rate (RJ45 interface)    | 5: 9600 bps          | 0: 300 bps<br>1: 600 bps<br>2: 1200 bps<br>3: 2400 bps<br>4: 4800 bps<br>5: 9600 bps<br>6: 19200 bps<br>7: 38400 bps<br>8: 57600 bps<br>9: 115200 bps | This parameter sets the Modbus RTU communication baud rate. The higher the baud rate, the faster the communication speed.                                                                                                             |
| n1-08          | Modbus RTU communication address (RJ45 interface)      | 1                    | 1 to 247                                                                                                                                              | This parameter sets the address of the AC drive commissioning interface for Modbus RTU communication.                                                                                                                                 |

| Parameter Code | Parameter Name       | Default | Setpoint Range                                                                                                                                        | Description                                                                                                                                                                                                                                                                                                                                                                |
|----------------|----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n2-00          | Modbus baud rate     | 5       | 0: 300 bps<br>1: 600 bps<br>2: 1200 bps<br>3: 2400 bps<br>4: 4800 bps<br>5: 9600 bps<br>6: 19200 bps<br>7: 38400 bps<br>8: 57600 bps<br>9: 115200 bps | This parameter defines the speed of data transmitted between the host controller and the AC drive. The higher the baud rate, the faster the communication speed.<br><br>Note:<br>1 .The higher the baud rate, the faster the communication speed.<br>2 .The baud rate of the host controller must be the same as that of the AC drive. Otherwise, communication will fail. |
| n2-01          | Modbus data format   | 0       | 0: No check (8-N-2)<br>1: Even parity check (8-E-1)<br>2: Odd parity check (8-O-1)<br>3: No check (8-N-1)                                             | This parameter defines the format of Modbus data transmitted between the host controller and the AC drive.<br><br>Note:<br>The data format of the host controller must be the same as that of the AC drive. Otherwise, communication fails.                                                                                                                                |
| n2-02          | Modbus local address | 1       | 1 to 247                                                                                                                                              | This parameter sets the Modbus local address.<br><br>Note:<br>The local address must be unique in the range of 1 to 247, which is the basis for point-point communication between the AC drive and the host controller.                                                                                                                                                    |

| Parameter Code | Parameter Name                    | Default | Setpoint Range                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------|-----------------------------------|---------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n2-03          | Modbus response delay             | 2 ms    | 0 ms to 20 ms<br>(valid for Modbus) | <p>This parameter defines the interval from the end of data reception by the AC drive to the start of data transmission to the host controller.</p> <p>Note:</p> <p>If the response delay is shorter than the system processing time, the system processing time prevails. This means that the system processes data and then sends the data to the host controller. If the response delay is longer than the system processing time, the system processes data and waits for the response delay time. After the time elapses, the system sends the data to the host controller.</p> |
| n2-04          | Modbus communication timeout time | 0.0s    | 0.0 (invalid)<br>0.1s to 600.0s     | <p>This parameter sets the Modbus communication timeout time.</p> <p>Note:</p> <p>1 .When it is set to 0.0s, the Modbus communication timeout time is invalid. Generally, set this parameter to 0.0s. This parameter is used to monitor communication status in a system with continuous communication.</p> <p>2 .If this parameter is set to a valid value and the communication interval between the current communication and the next communication exceeds the value of n2-04 (Modbus communication timeout time), the system reports a communication fault.</p>                |

### 3.1.6.1.3 Common Communication Address

This section describes common communication addresses. For complete communication addresses, see the AC drive guide.

#### 1. Start/Stop the AC drive through communication.

Set F0-03/b1-00 or b3-00 (Main command source of control channel) to 2 (Communication) and configure the communication parameters correctly. After sending a command to any control command address below according to the communication protocol, you can control the start, stop, forward run, reverse run, jog, and fault reset of the drive.

| Communication Address                |       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Communication setting control word 2 | 7311H | <p>The value format of 7311H is decimal.</p> <p>0: Stop (stop according to F2-17 [OFF1 stop mode])</p> <p>1: Forward run</p> <p>2: Reverse run</p> <p>3: Jog 1</p> <p>4: Jog 2</p> <p>5: Coast to stop</p> <p>6: Stop (stop according to F2-17 [OFF1 stop mode])</p> <p>7: Reset upon fault</p> <p>8: Emergency stop</p> <p>For example, write 1 to 7311H to control the forward running of the AC drive.</p>                                                                                                                                                                                                        |
| Communication setting control word 1 | 7321H | <p>The value format of 7321H is hexadecimal. Details of bits are described below:</p> <p>Bit 00: ON_OFF1; 0: Stop, 0 to 1: Run</p> <p>Bit 01: OFF2 (coast to stop); 0: Active, 1: Inactive</p> <p>Bit 02: OFF3 (quick stop); 0: Active, 1: Inactive</p> <p>Bit 03: Running allowed; 0: Disable, 1: Enable</p> <p>Bit 04: Reset command; 0: Inactive, 1: Active</p> <p>Bit 05: Jog 1 (JOG1); 0: Inactive, 1: Active</p> <p>Bit 06: Jog 2 (JOG2); 0: Inactive, 1: Active</p> <p>Bit 07: Opposite to the speed direction; 1: Active</p> <p>For example, write 0x000F to 7321H to control the start of the AC drive.</p> |

## 2. Set the frequency.

Set the main frequency source parameters such as F0-29/b5-00 or b6-00 to 9 (Communication), and configure the communication parameters correctly. After sending a command to a specific communication address according to the communication protocol, you can set the main frequency of the drive. The following table lists the input source special addresses supported by the AC drive.

| Communication Address    |       | Description                                                                                                                              |
|--------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------|
| Communication setpoint 2 | 7310H | The target frequency can be set through the communication address. The address format is defined by n0-14 (speed setting through 7310H). |

The data format of the special address 7310H is set by n0-14 (speed set through 7310H), as shown in the following table.

| Parameter Code | Parameter Name          | Default | Setpoint Range                                                                                                                                                                                                                               |
|----------------|-------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n0-14          | Speed set through 7310H | 1       | <p>0: Frequency (UInt16)</p> <p>1: Frequency (Int16)</p> <p>2: Speed (Int16)</p> <p>3: Percentage (corresponds to rated frequency/Int16/2 decimal places)</p> <p>4: Percentage (corresponds to maximum frequency/Int16/2 decimal places)</p> |

The following table shows the format of different setpoints of n0-14 (Speed set through 7310H).

| n0-14 Value                                                             | Unit | Data Format | Number of Decimal Places                                        | Example of Communication Value               | Actual Value         |
|-------------------------------------------------------------------------|------|-------------|-----------------------------------------------------------------|----------------------------------------------|----------------------|
| 0: Frequency (UInt16)                                                   | Hz   | UInt16      | Set by A0-70 (Number of frequency decimal places), 2 by default | 1000                                         | 10.00 Hz             |
|                                                                         |      |             |                                                                 | 2000                                         | 20.00 Hz             |
| 1: Frequency (Int16) (Default)                                          | Hz   | Int16       | Set by A0-70 (Number of frequency decimal places), 2 by default | 1000                                         | 10.00 Hz             |
|                                                                         |      |             |                                                                 | -1000                                        | -10.00 Hz            |
| 2: Speed (Int16)                                                        | rpm  | Int16       | No decimal place                                                | 1500 (The number of motor pole pairs is 2.)  | 1500 rpm (50.00 Hz)  |
|                                                                         |      |             |                                                                 | -1500 (The number of motor pole pairs is 2.) | 1500 rpm (-50.00 Hz) |
| 3: Percentage (corresponds to rated frequency/Int16/2 decimal places)   | %    | Int16       | Two decimal places                                              | 1000 (Rated frequency: 50.00 Hz)             | 10.00% (5.00 Hz)     |
|                                                                         |      |             |                                                                 | -1000 (Rated frequency: 100.00 Hz)           | -10.00% (-10.00 Hz)  |
| 4: Percentage (corresponds to maximum frequency/Int16/2 decimal places) | %    | Int16       | Two decimal places                                              | 1000 (maximum frequency: 50.00 Hz)           | 10.00% (5.00 Hz)     |
|                                                                         |      |             |                                                                 | -5000 (maximum frequency: 100.00 Hz)         | -50.00% (-50.00 Hz)  |

The following setting process takes frequency source set through communication as an example.

- Check the supported communication protocol according to the AC drive model and select the correct wiring terminal to connect.
  - Set the corresponding communication parameters. Set Modbus communication parameters in group n2 or CAN communication parameters in group n3.
  - Set b0-03 (Set channel selection) to 0 (Set channel 1). To select the frequency source corresponding to the set channel, set F0-29 (Main frequency source) to 9 (Communication).
  - Send the write command to the AC drive through the host controller. Set n0-14 (Speed set through 7310H) to 1 (Frequency (Int16)) and set A0-70 (Number of frequency decimal places) to 2 (Two decimal places). Write 2500 to 7310H to set the main frequency to 25.00 Hz. Write -2500 to 7310H to set the main frequency to -25.00 Hz.
3. Query the AC drive state.

When the AC drive running status is read through communication, the communication addresses are 703DH and 7044H. The host controller enables you to obtain the current running status of the drive by reading the address. The addresses are defined as follows.

| Communication Address |       | Property  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------|-------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AC drive status 1     | 703DH | Read-only | <p>The values read through 703DH are converted to values in decimal. The drive states corresponding to different values are as follows:</p> <ul style="list-style-type: none"> <li>1: Forward run</li> <li>2: Reverse run</li> <li>3: Stop</li> <li>4: Auto-tuning</li> <li>5: Fault</li> </ul>                                                                                                                                                                                                                                                                                                    |
| Drive state 2         | 7044H | Read-only | <p>The value format of 7044H is hexadecimal. The drive states corresponding to bit values are as follows.</p> <ul style="list-style-type: none"> <li>Bit 00: Operation status. 0: Stopped; 1: Operating</li> <li>Bit 01: Operating direction. 0: Forward; 1: Reverse</li> <li>Bit 02: Faulty state. 0: No fault; 1: Faulty</li> <li>Bit 03: Frequency reached. 0: Not reached; 1: Reached</li> <li>Bit 04: Reserved</li> <li>Bit 05: Reserved</li> <li>Bit 06: Reserved</li> <li>Bit 07: Reserved</li> <li>Bits 08-15: Fault master code. For details, see specific fault descriptions.</li> </ul> |

#### 4. DO control

When the RO/DO/VDO function (E1-00/E1-04/E1-05/E1-10 to E1-15) is set to 20 (Communication), the host controller can control the DO of the drive through the special communication address 7312H. The address is defined as follows.

| Communication Address |       | Property   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------|-------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DO control            | 7312H | Read/Write | <p>The output of the RO/DO/VDO terminal is set through the bit state. When the bit is 1, the corresponding terminal output is valid. When the bit is 0, the corresponding terminal output is invalid. The mapping relationship between bits and DOs is described in the following table.</p> <p>Bit 00: RO</p> <p>Bit 01: Reserved</p> <p>Bit 02: Reserved</p> <p>Bit 03: Reserved</p> <p>Bit 04: DO</p> <p>Bit 05: Reserved</p> <p>Bit 06: Reserved</p> <p>Bit 07: Reserved</p> <p>Bit 08: FMR (valid only for MD630S)</p> <p>Bit 09: Reserved</p> <p>Bit 10: VDO1</p> <p>Bit 11: VDO2</p> <p>Bit 12: VDO3</p> <p>Bit 13: VDO4</p> <p>Bit 14: VDO5</p> <p>Bit 15: VDO6</p> |

For example, set E1-00 (RO1 output function selection) to 20 (communication setting), and then set the corresponding communication parameters. Write 0001H to 7312H in the instruction format and set bit 0 to 1 to set the RO1 output to be active.

#### 5. AO control

When E3-00 (AO1 output function selection) is set to 12 (Communication), the host controller can control the AO terminals of the AC drive through the special communication address 7313H, as defined below.

| Communication Address |       | Property   | Description                                                                                                                    |
|-----------------------|-------|------------|--------------------------------------------------------------------------------------------------------------------------------|
| AO output reference   | 7313H | Read/Write | <p>Set the AO output proportion by writing a hexadecimal value:</p> <p>0 to 7FFF represent the AO output value 0% to 100%.</p> |

When E3-00 (AO1 output function selection) is set to 12 (Communication setting), configure the corresponding communication parameters and write 7FFFH to 7313H in the instruction format to set the AO1 output proportion to 100%.

#### 6. Query the fault information of the AC drive.

When the running status of the drive is read through communication, the communication addresses are 702DH to 7030H. The host controller can obtain the current faulty status of the drive by reading the address. The communication address is defined as follows.

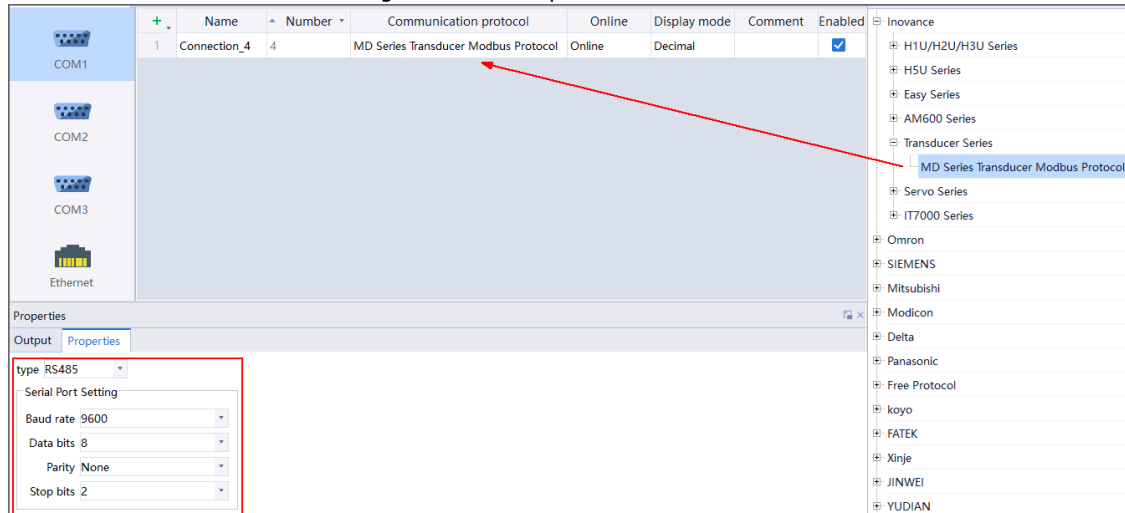
| Communication Address |       | Property  | Description                              |
|-----------------------|-------|-----------|------------------------------------------|
| Code                  | 702DH | Read-only | Current fault code of the AC drive       |
| Minor fault code      | 702EH | Read-only | Current minor fault code of the AC drive |

## Protocol Configuration

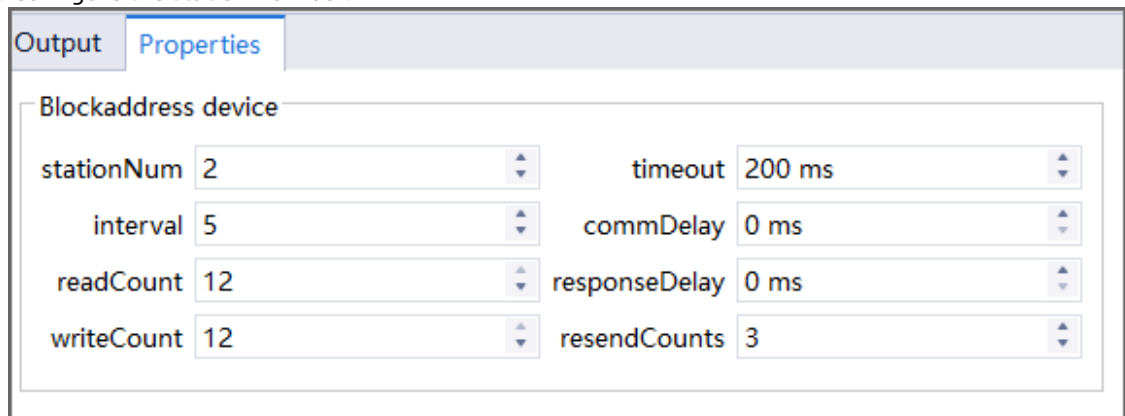
| Communication Address | Property | Description |
|-----------------------|----------|-------------|
| Alarm code            | 702FH    | Read-only   |
| Prompt code           | 7030H    | Read-only   |

### 3.1.6.1.4 Configuration on the HMI Side

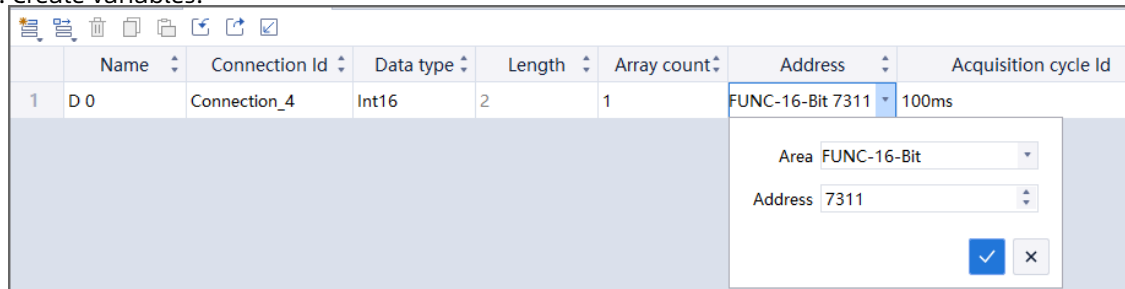
1. Establish a connection and configure the serial port.



2. Configure the station number.



3. Create variables.



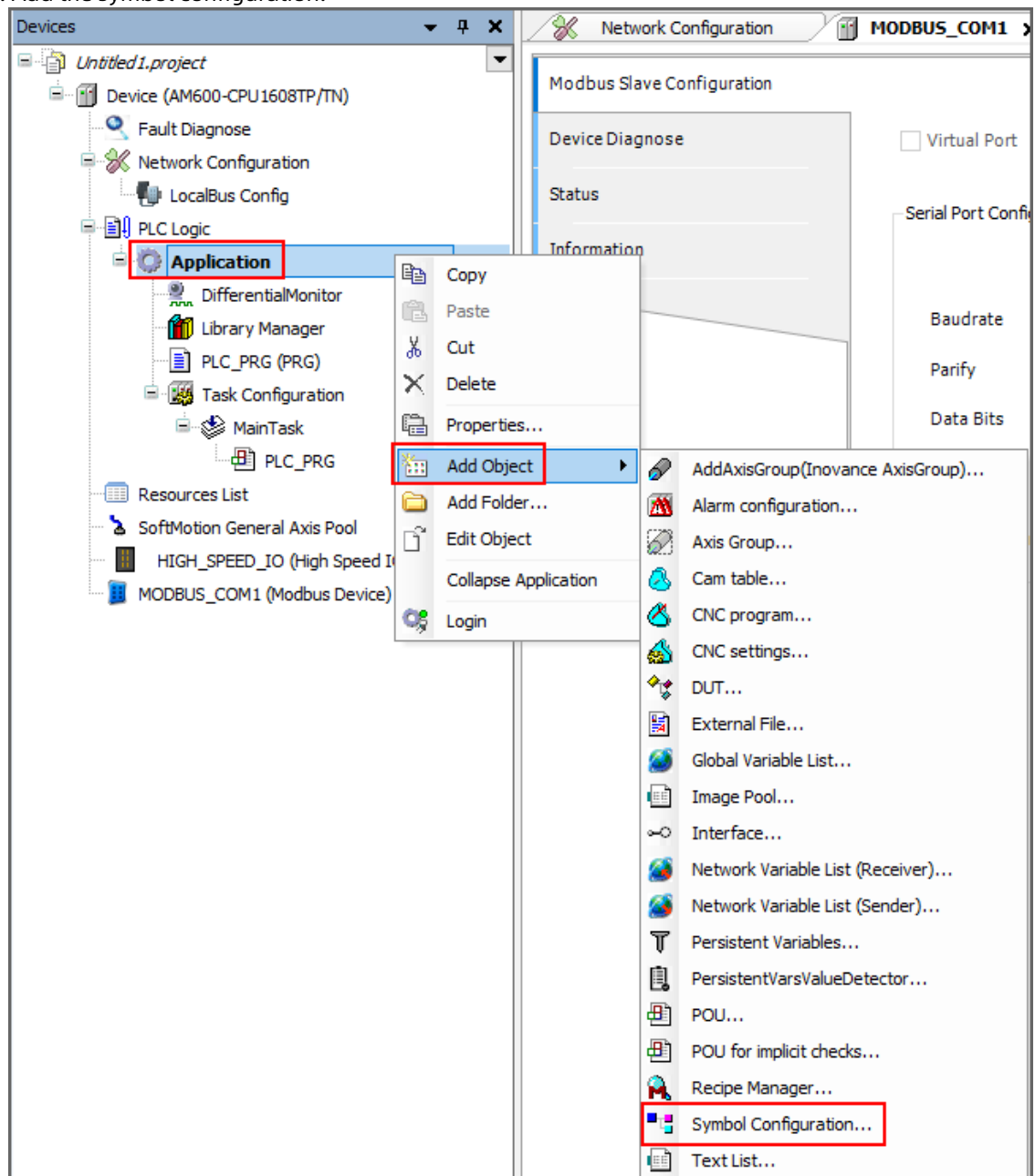
## 3.1.7 AC800 Tags Protocol

### 3.1.7.1 Supported Devices

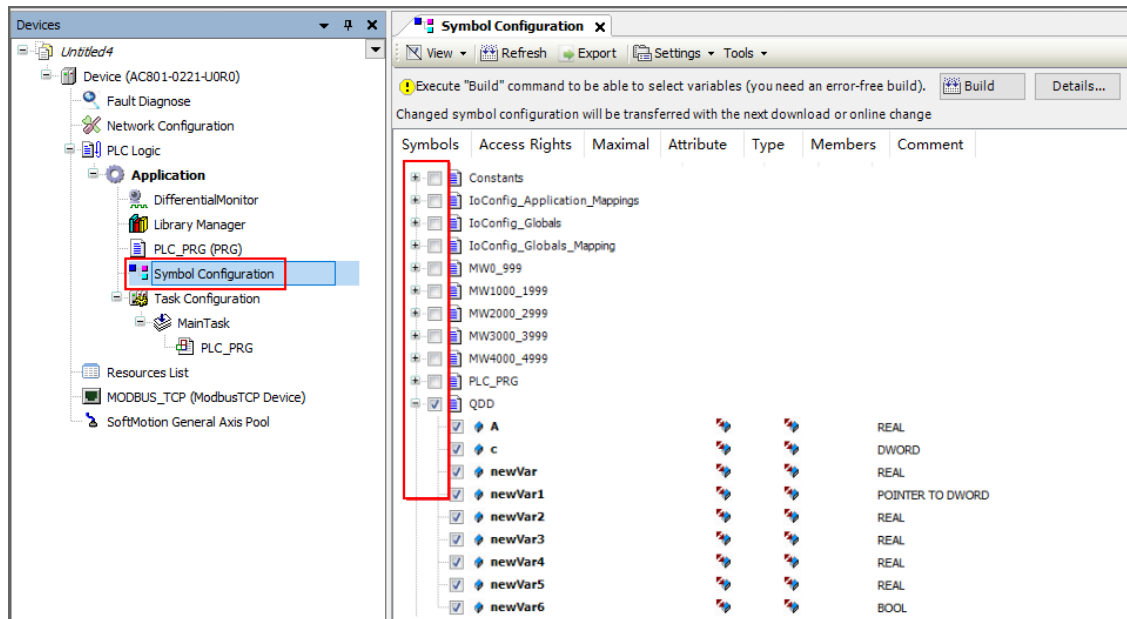
Inovance AM400, AM600, AC800, and HMI (used as the master device) support AC800 Tags.

### 3.1.7.2 Configuration on the PLC Side

1. Add the symbol configuration.



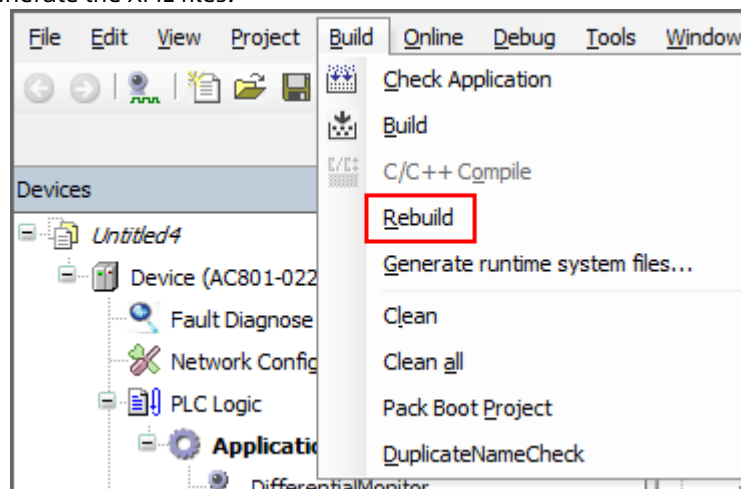
2. Select the communication variables.



### Caution

At least one variable in the variable table is used in POU. Otherwise, the variables in the variable table cannot be displayed.

3. Compile and generate the XML files.



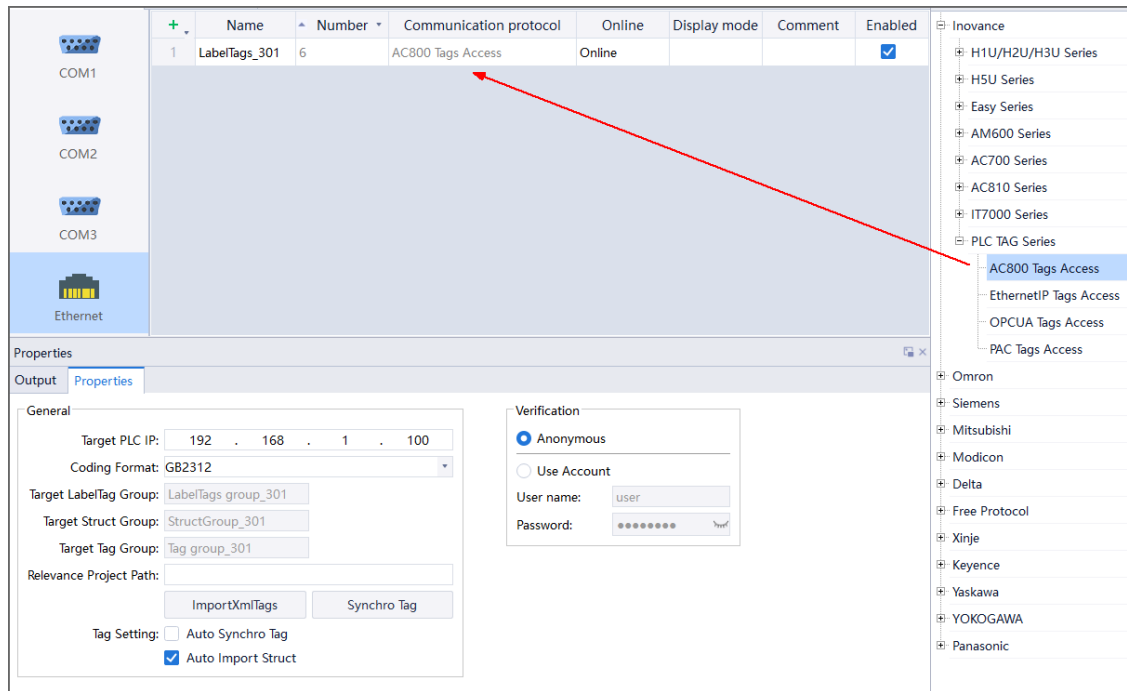
### Caution

Full compilation is required.

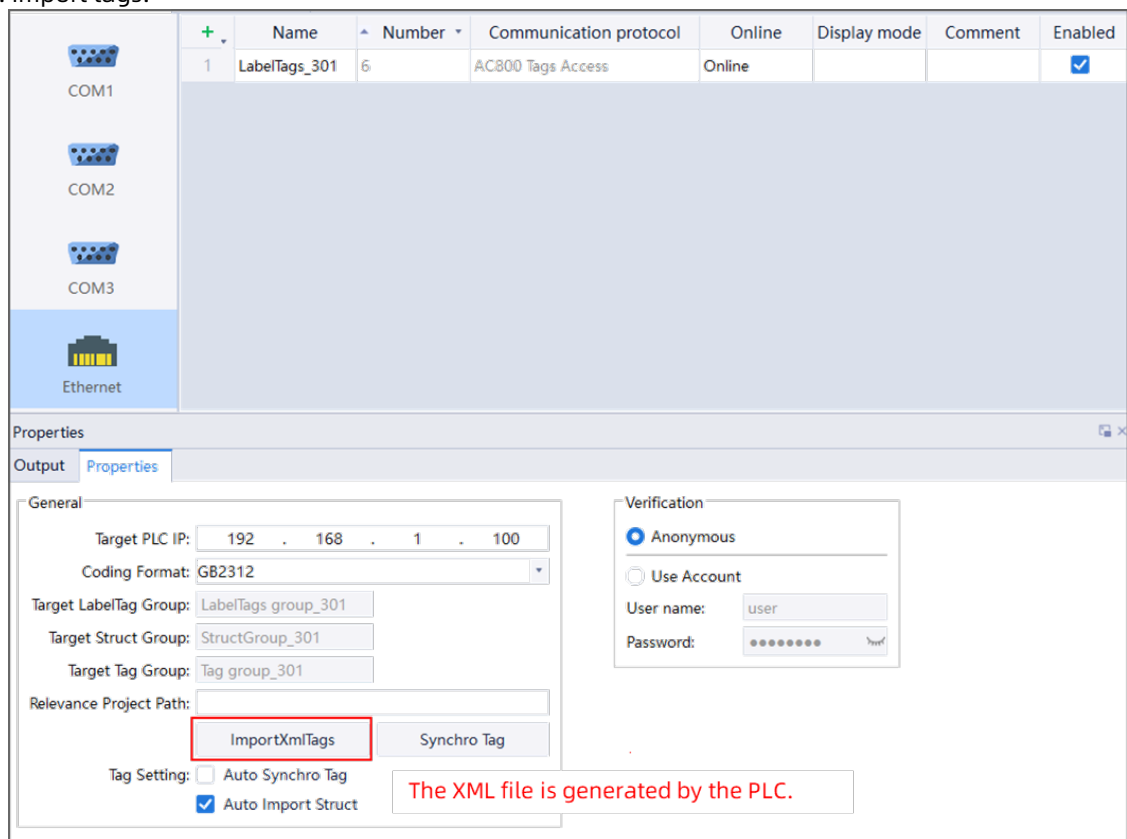
4. Check the XML file directory.  
The XML file is stored in the project root directory.

### 3.1.7.3 Configuration on the HMI Side

1. Establish a connection.



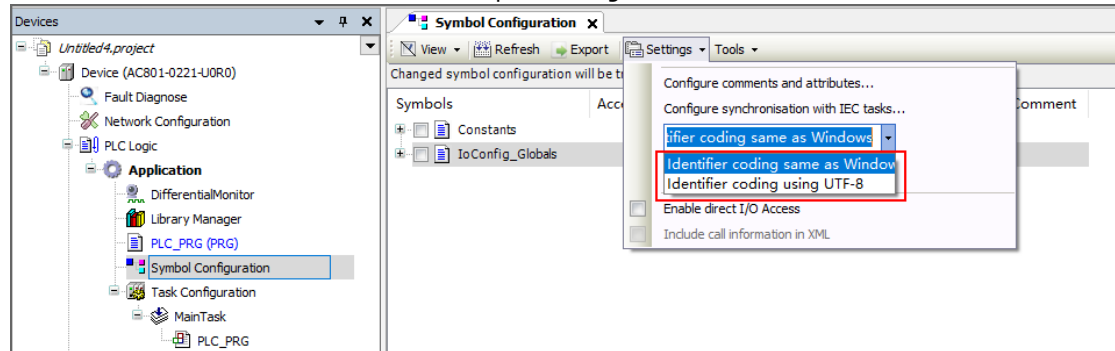
## 2. Import tags.



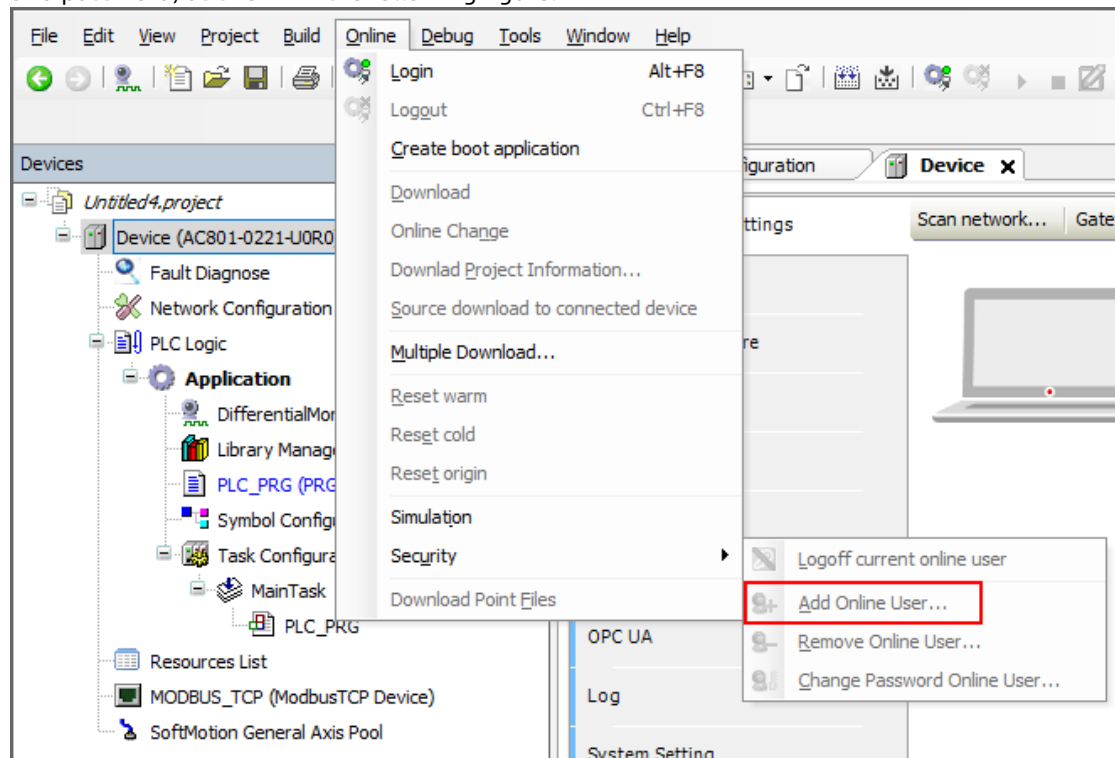
## Precautions

- The encoding format depends on the XML file encoding format exported by the PLC. Ensure that the XML file encoding format on the PLC is the same as that on the HMI. The following encoding

formats can be selected when the PLC compiles and generates the XML file.



- Whether an anonymous user or account is used for authentication depends on the PLC. If an online user is added on the PLC, you need to select the account and fill in the correct user name and password, as shown in the following figure.



### 3.1.8 EthernetIP Tags Protocol

#### 3.1.8.1 Supported Devices

Inovance AM300, AM400, AM500, AM600, AC700, AC800, EVO500 series, H5U series, and Easy series (Easy523, Easy522, Easy521, Easy320) are supported.

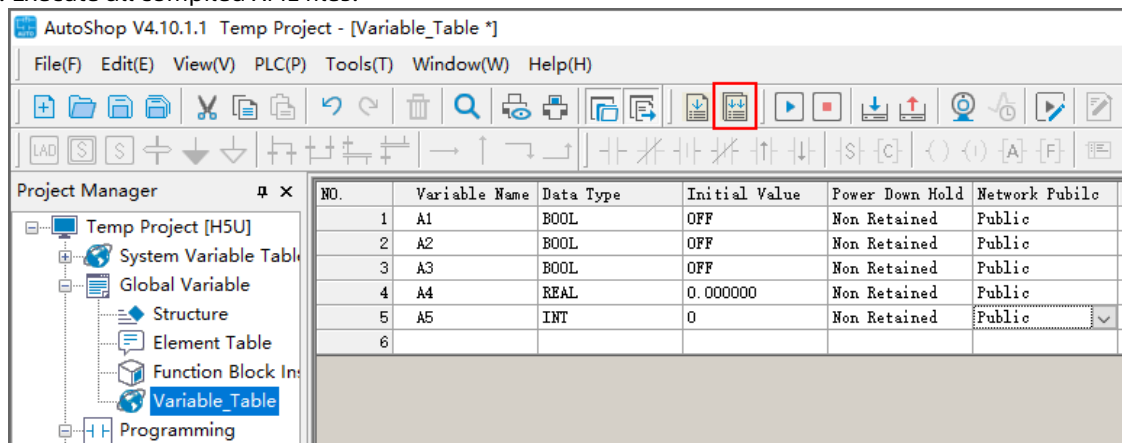
#### 3.1.8.2 Configuration on the PLC Side

##### 3.1.8.2.1 AutoShop

1. Configure network public properties of variables.

| NO. | Variable Name | Data Type | Initial Value | Power Down Hold | Network Public | Comment |
|-----|---------------|-----------|---------------|-----------------|----------------|---------|
| 1   | A1            | BOOL      | OFF           | Non Retained    | Public         |         |
| 2   | A2            | BOOL      | OFF           | Non Retained    | Public         |         |
| 3   | A3            | BOOL      | OFF           | Non Retained    | Public         |         |
| 4   | A4            | REAL      | 0.000000      | Non Retained    | Public         |         |
| 5   | A5            | INT       | 0             | Non Retained    | Public         |         |
| 6   |               |           |               |                 |                |         |

- Execute all compiled XML files.

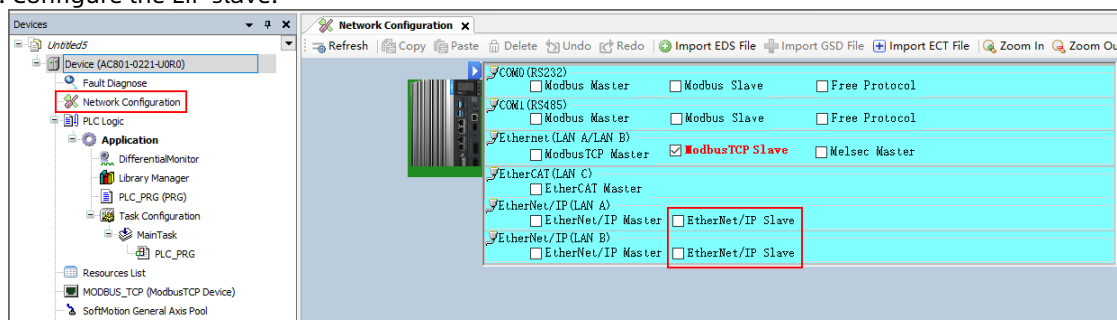


- Check the XML file directory.

The XML file is stored in the Project directory/InteractiveFile folder.

### 3.1.8.2.2 InoProShop

- Configure the EIP slave.

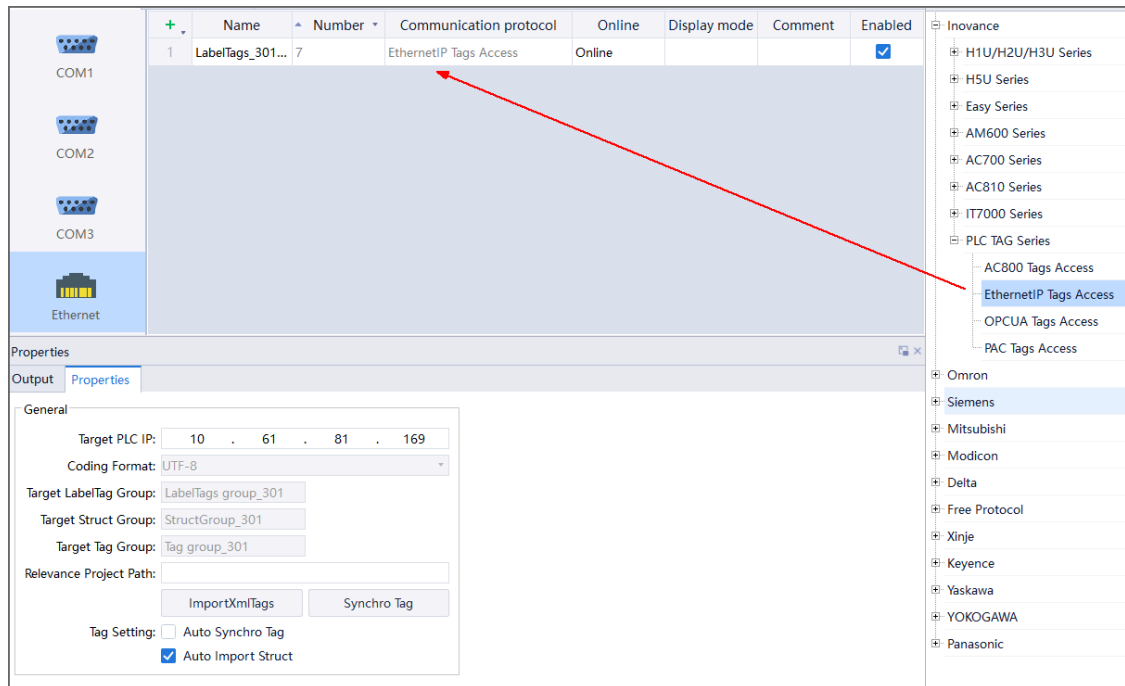


- Export the XML file.

For details, see section [“3.1.7.2 Configuration on the PLC Side”](#) on page 52.

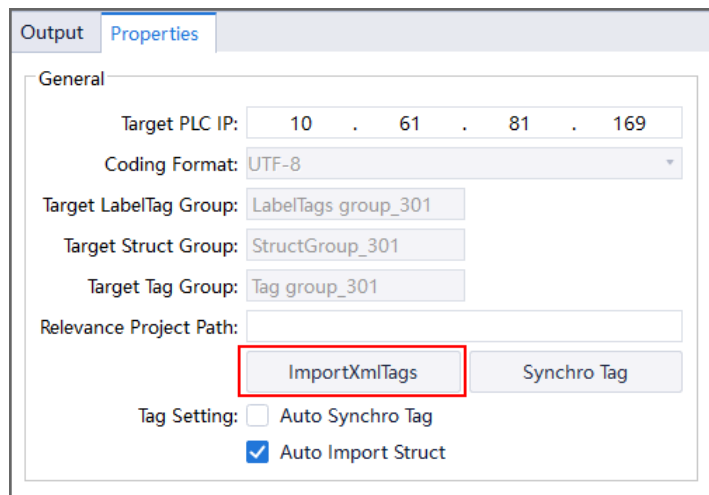
### 3.1.8.3 Configuration on the HMI Side

- Establish a connection.



### 2. Import the XML file

Import the XML file compiled and generated by the PLC.



## 3.2 General Standard Protocol

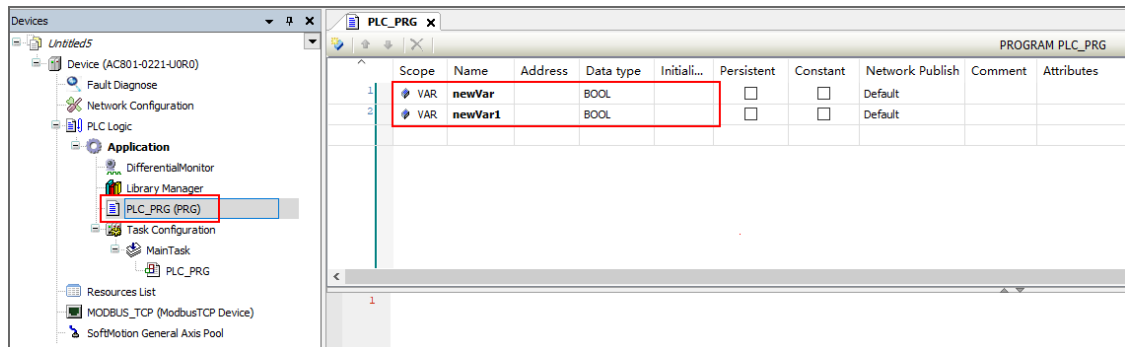
### 3.2.1 OPCUA Tags Protocol

Inovance AM and AC series PLCs do not support variable association by importing XML.

#### 3.2.1.1 Browser Tags (AC801 as an Example)

##### 3.2.1.1.1 Configuration on the PLC Side

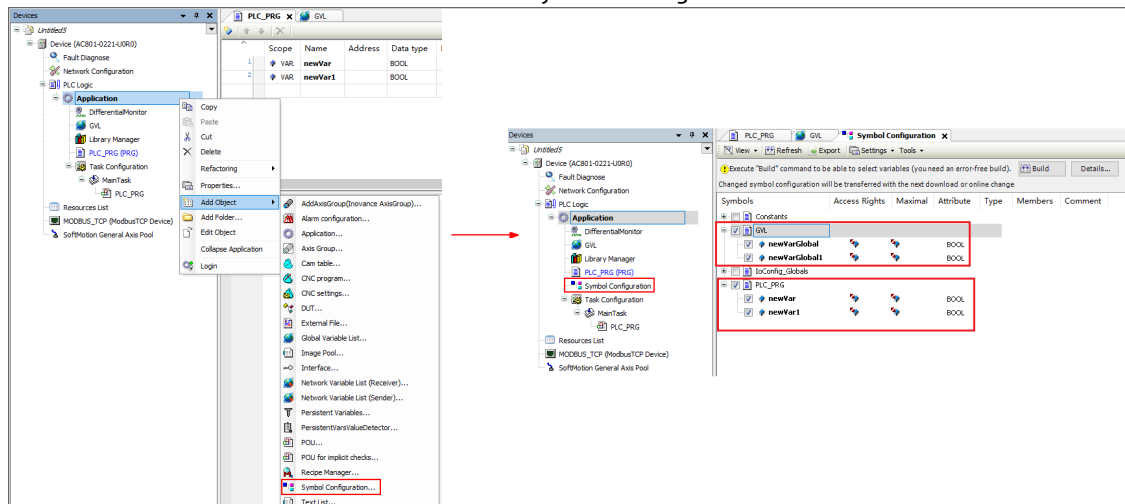
1. Add variables.



### Caution

Adding local variables are used as an example. You can also add global variables.

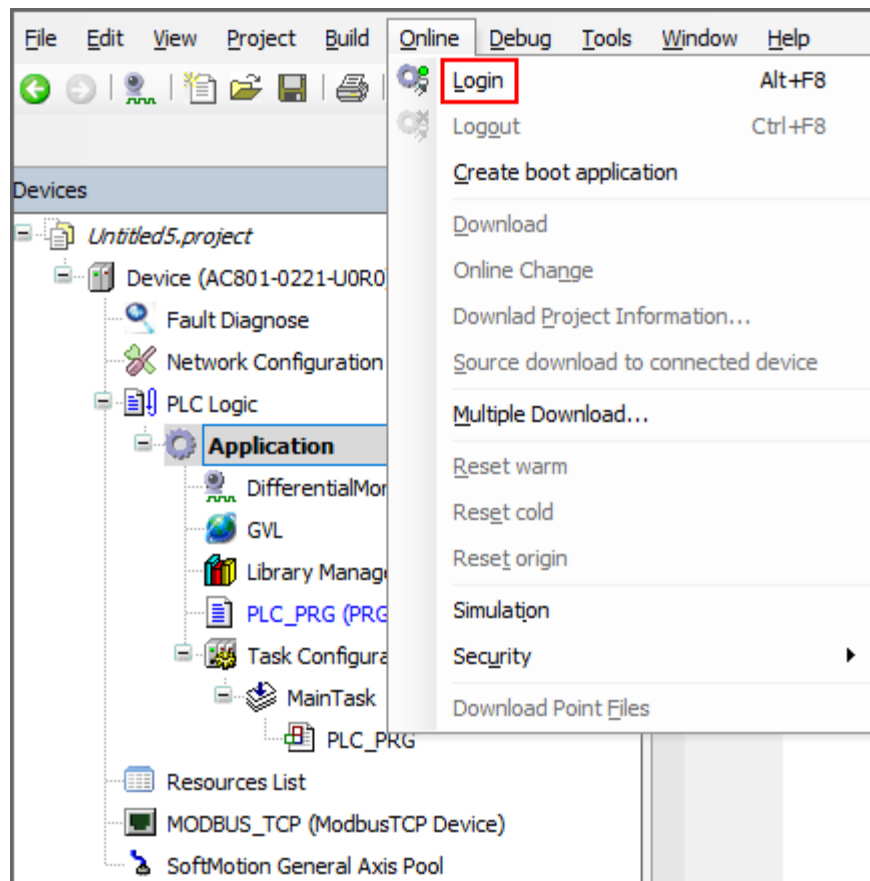
## 2. Check the variables for communication in the symbol configuration.



### Caution

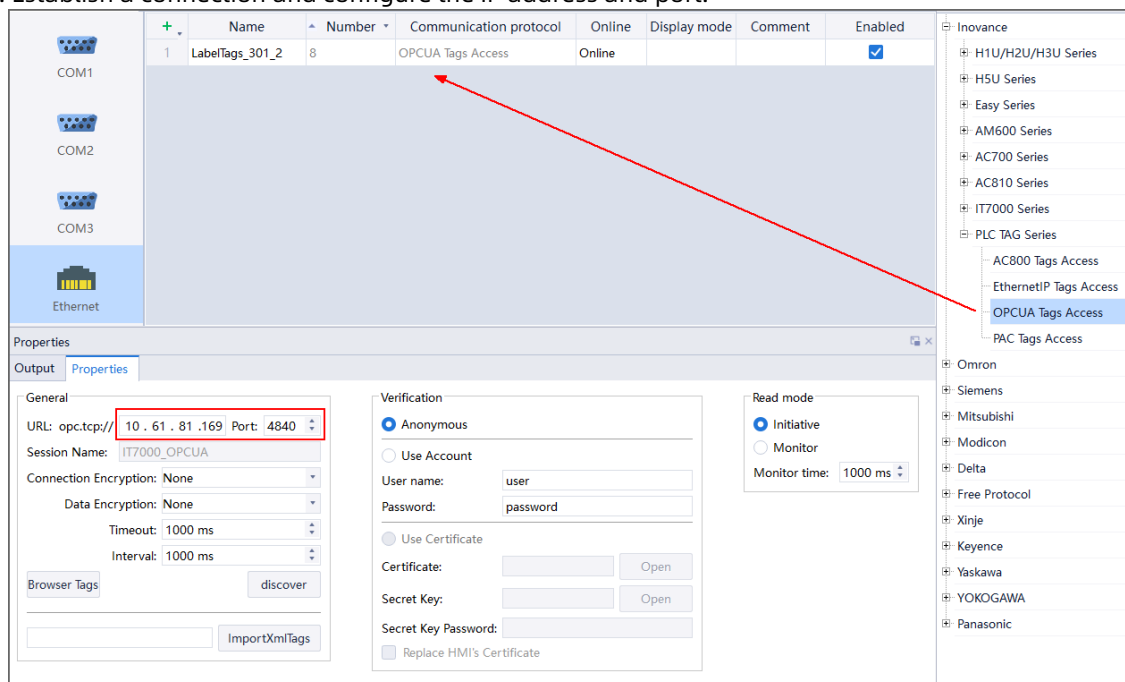
At least one variable in the variable table is used in the POU. Otherwise, there is no variable list in the symbol configuration.

## 3. Download the PLC project.

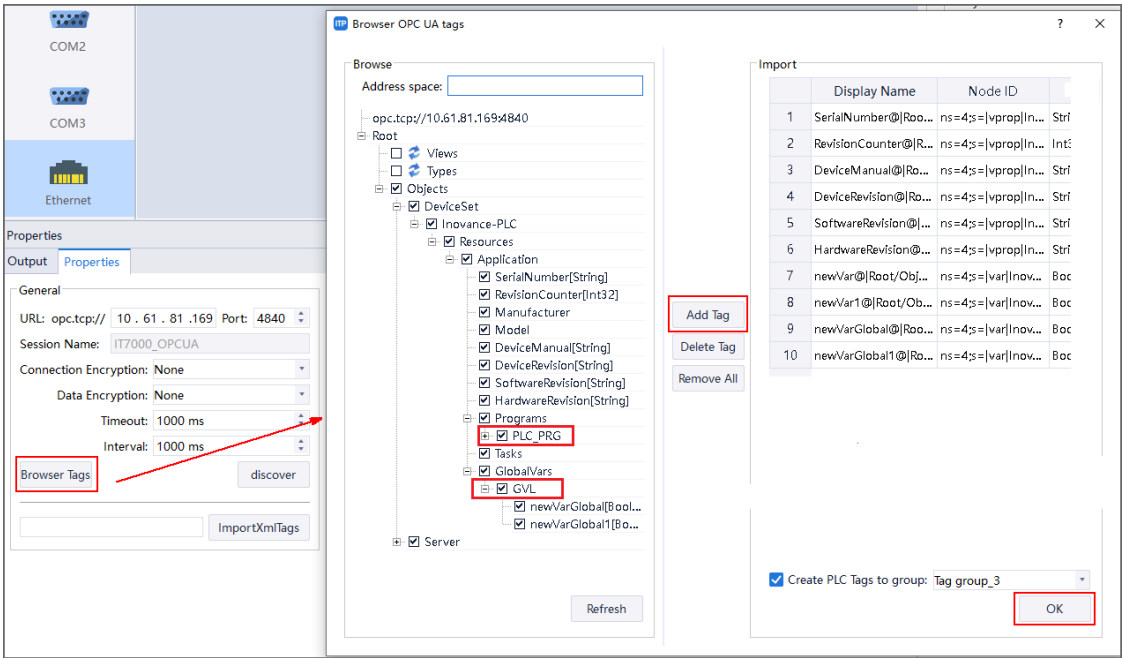


### 3.2.1.1.2 Configuration on the HMI Side

1. Establish a connection and configure the IP address and port.



2. Add tags to Browser Tags.



3.2.2 Modbus

3.2.2.1 Serial Port

3.2.2.1.1 Modbus RTU

The Modbus RTU protocol is an open serial protocol widely used by industrial monitoring devices. This protocol uses RS232 or RS485 serial interfaces for communication.

The Modbus RTU protocol uses the master/slave technology for communicate between devices. Any application that uses the Modbus RTU protocol will have one Modbus master and at least one Modbus slave. The Modbus master is usually an HMI or a PC. It communicates with one or more Modbus slaves with the slave ranging from 0 to 247.

The Modbus RTU protocol adopts binary data transmission, which provides high transmission efficiency and stability. In the Modbus RTU protocol, two hexadecimal characters can be transmitted per byte. For example, 0xAB (binary: 10101011) is sent directly in the hexadecimal format. The message frame format consists of the following parts.

| Slave address | Parameter   | Data                          | CRC          |
|---------------|-------------|-------------------------------|--------------|
| 1 character   | 1 character | 0 character to 255 characters | 2 characters |

3.2.2.1.2 Modbus RTU (Address 1)

The configuration process of Modbus RTU (address 1) is the same as that of Modbus RTU. The difference is that the register address starts from 1 and the Modbus RTU protocol register address starts from 0.

## 3.2.2.1.3 Modbus ASCII

In **Modbus ASCII** (American Standard Code for Information Interchange), texts are transferred in ASCII. The protocol has lower transmission efficiency and better readability than Modbus RTU. Modbus ASCII also uses serial communication and supports RS232 and RS485 interfaces for short-distance communication. In ASCII mode, each 8-bit byte is divided into two ASCII characters to be sent. The message frame starts with a colon ":" and ends with an enter and a line break sign (CRLF). For example, the hexadecimal number 0xAB is divided into ASCII characters "A" and "B" to be sent. The message frame format consists of the following parts.

| Start          | Address        | Parameter | Data               | LRC            | End                     |
|----------------|----------------|-----------|--------------------|----------------|-------------------------|
| One character: | Two characters | 2         | 0-2*252 characters | Two characters | Two characters CR or LF |

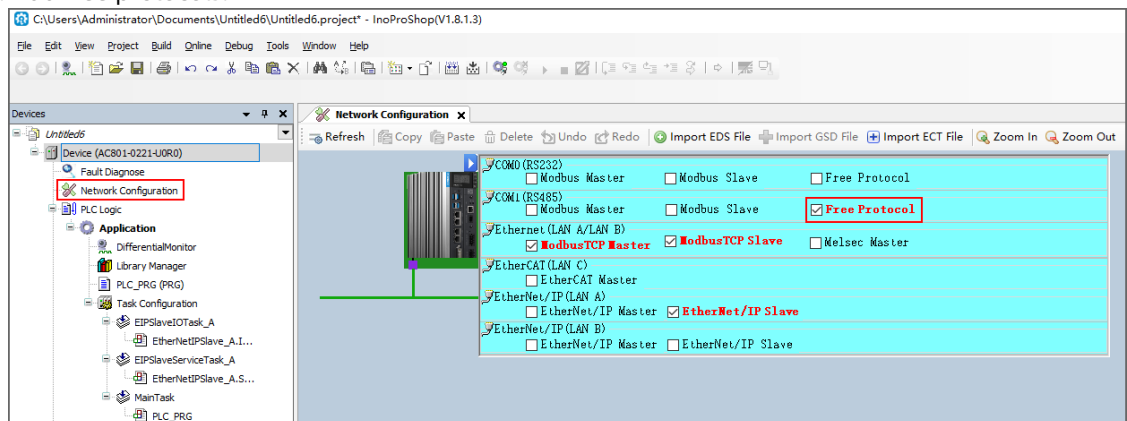
## 3.2.3 Free Protocol

### 3.2.3.1 Serial Port

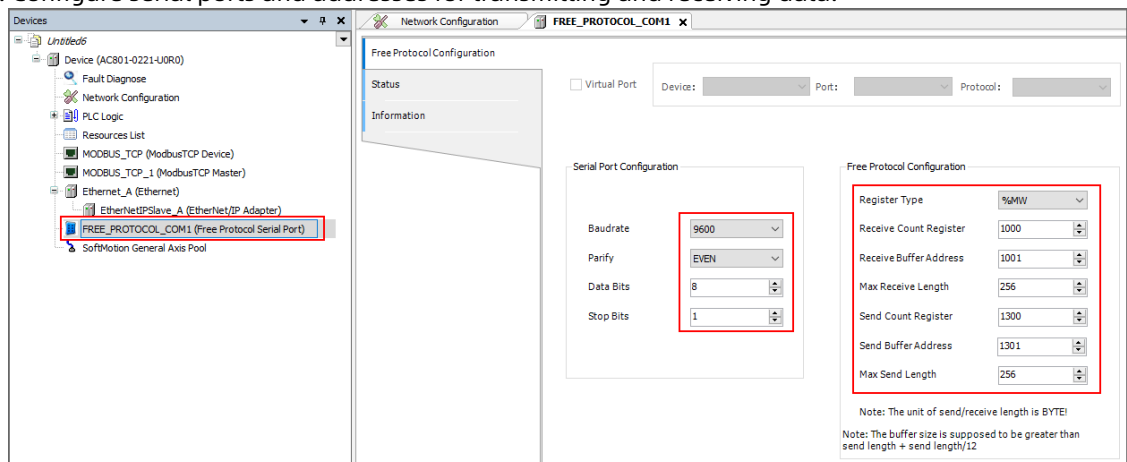
#### 3.2.3.1.1 Configuration on the PLC Side (AC801 as an

Example)

1. Add free protocols.



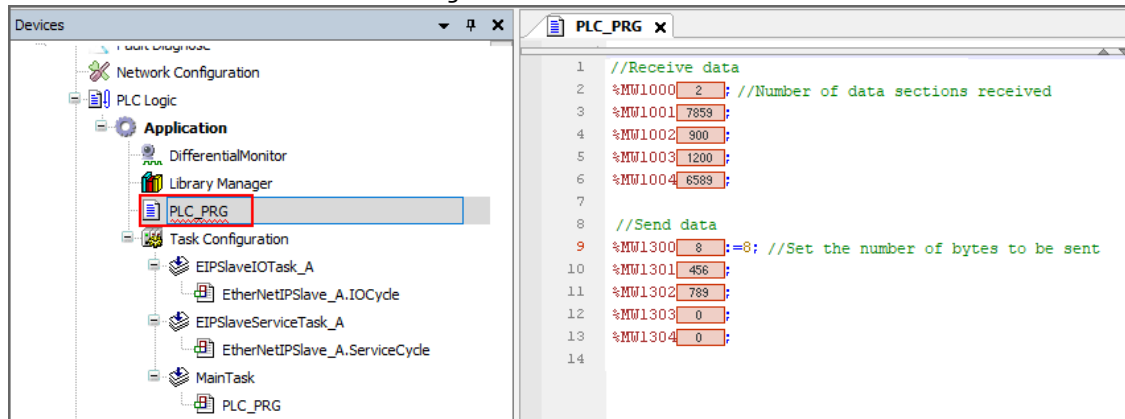
2. Configure serial ports and addresses for transmitting and receiving data.



### Note

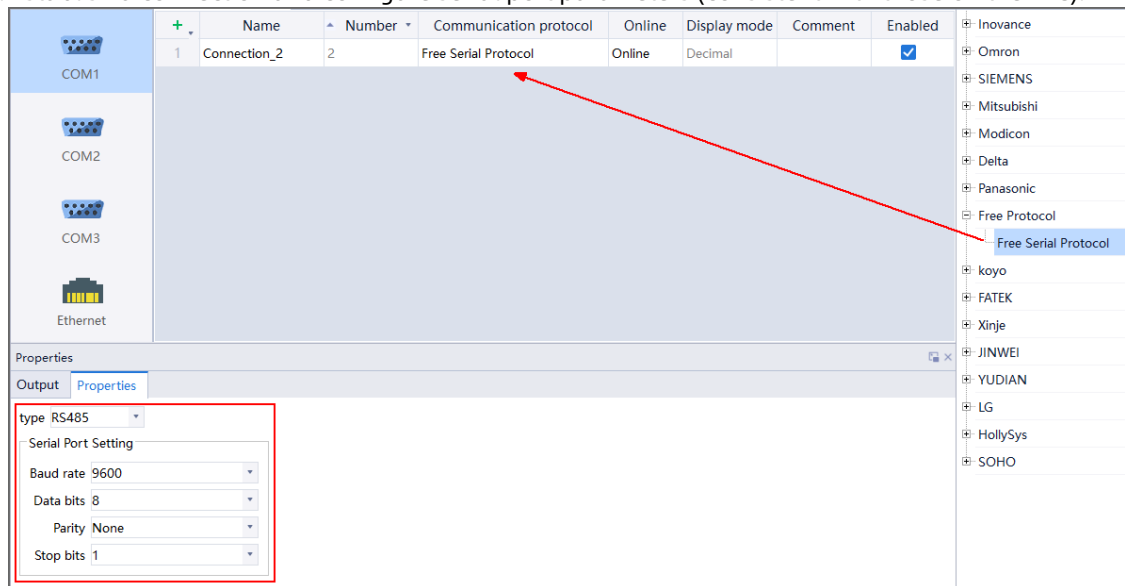
- Each time the data is received, you need to manually clear the data in "%MW1000" so that the data can be cached again with "%MW1001". If %MW1000 is not cleared, the data will be cached in sequence.
- When the received data exceeds the set maximum receiving length of 256 bytes, "%MW1000" will be re-counted and the received data will be re-cached from "%MW1001".

### 3. Add variables in the PRG for monitoring.



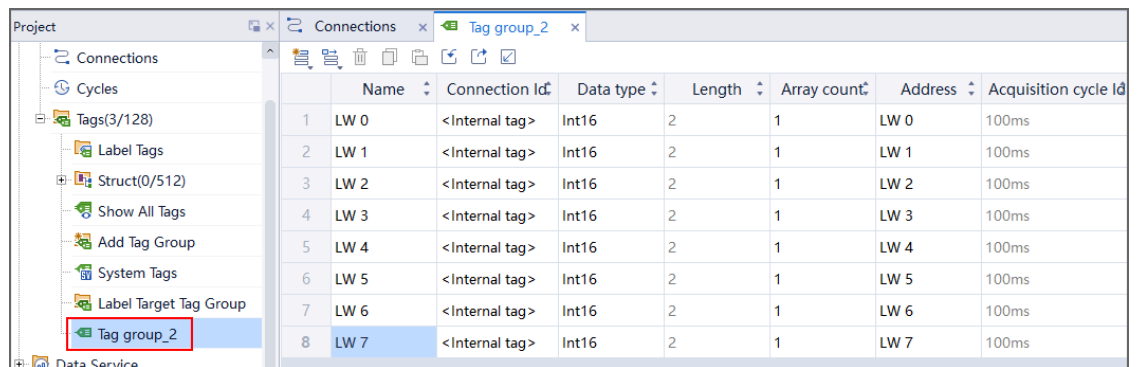
#### 3.2.3.1.2 Configuration on the HMI Side

### 1. Establish a connection and configure serial port parameters (consistent with those on the PLC).



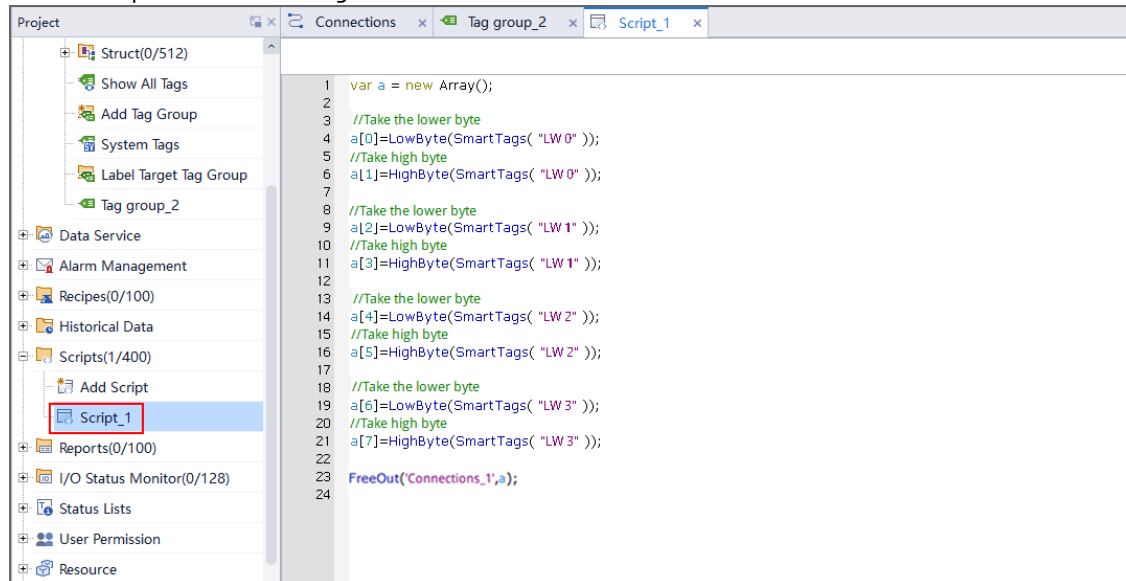
### 2. Create variables.

LW 0 to LW 3 are data sent from the HMI to the PLC, and LW 4 to LW 7 are PLC data received.



|   | Name | Connection Id  | Data type | Length | Array count | Address | Acquisition cycle Id |
|---|------|----------------|-----------|--------|-------------|---------|----------------------|
| 1 | LW 0 | <Internal tag> | Int16     | 2      | 1           | LW 0    | 100ms                |
| 2 | LW 1 | <Internal tag> | Int16     | 2      | 1           | LW 1    | 100ms                |
| 3 | LW 2 | <Internal tag> | Int16     | 2      | 1           | LW 2    | 100ms                |
| 4 | LW 3 | <Internal tag> | Int16     | 2      | 1           | LW 3    | 100ms                |
| 5 | LW 4 | <Internal tag> | Int16     | 2      | 1           | LW 4    | 100ms                |
| 6 | LW 5 | <Internal tag> | Int16     | 2      | 1           | LW 5    | 100ms                |
| 7 | LW 6 | <Internal tag> | Int16     | 2      | 1           | LW 6    | 100ms                |
| 8 | LW 7 | <Internal tag> | Int16     | 2      | 1           | LW 7    | 100ms                |

### 3. Create scripts for transmitting data.



```

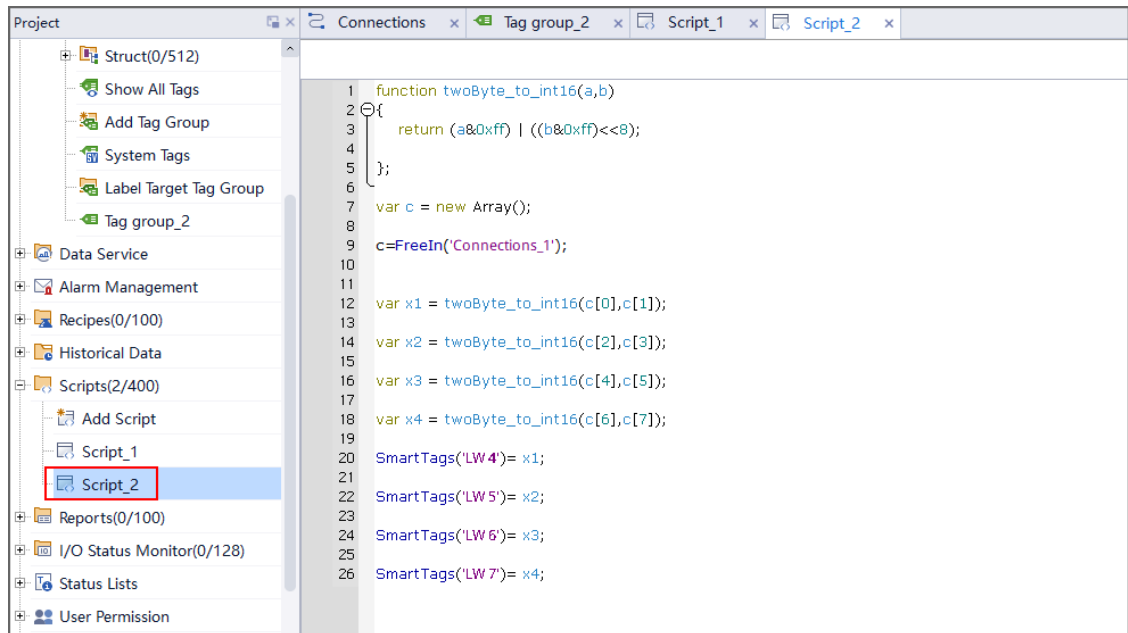
1  var a = new Array();
2
3  //Take the lower byte
4  a[0]=LowByte(SmartTags( "LW 0" ));
5  //Take high byte
6  a[1]=HighByte(SmartTags( "LW 0" ));
7
8  //Take the lower byte
9  a[2]=LowByte(SmartTags( "LW 1" ));
10 //Take high byte
11 a[3]=HighByte(SmartTags( "LW 1" ));
12
13 //Take the lower byte
14 a[4]=LowByte(SmartTags( "LW 2" ));
15 //Take high byte
16 a[5]=HighByte(SmartTags( "LW 2" ));
17
18 //Take the lower byte
19 a[6]=LowByte(SmartTags( "LW 3" ));
20 //Take high byte
21 a[7]=HighByte(SmartTags( "LW 3" ));
22
23 FreeOut('Connections_1',a);
24

```

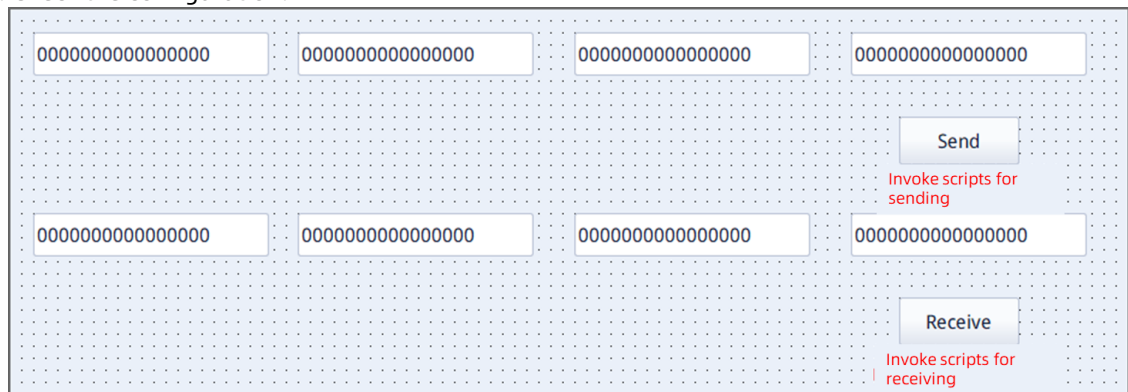
### Note

LW 0 has two bytes and array element a[i] has one byte. LW 0 cannot be assigned with values directly. When sending LW 0, split it into two bytes.

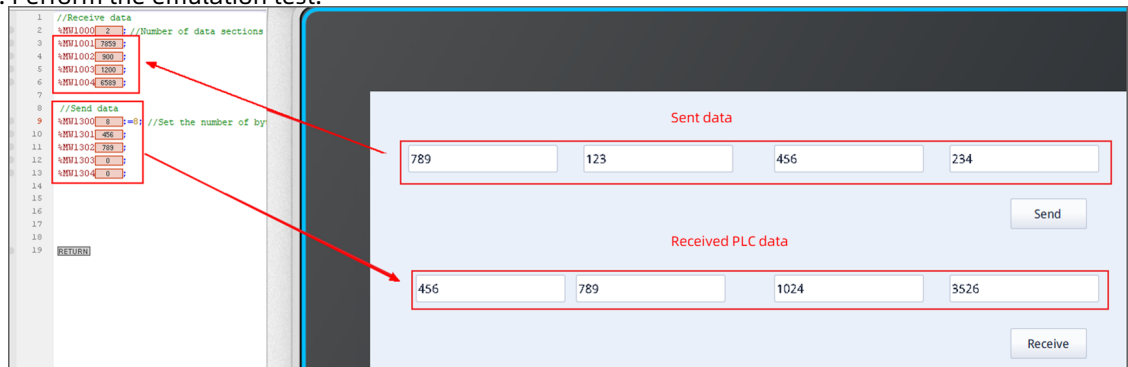
### 4. Create scripts for receiving data.



##### 5. Check the configuration.

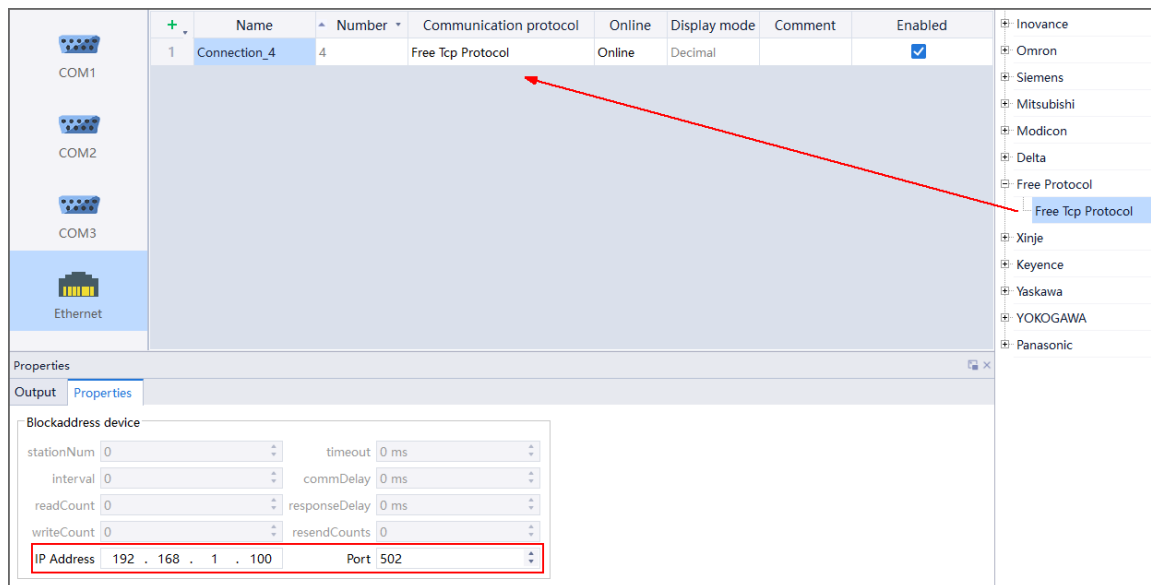


##### 6. Perform the emulation test.



### 3.2.3.2 Ethernet

The network port and serial port are used in a similar way, but differ in connection option, as shown below.

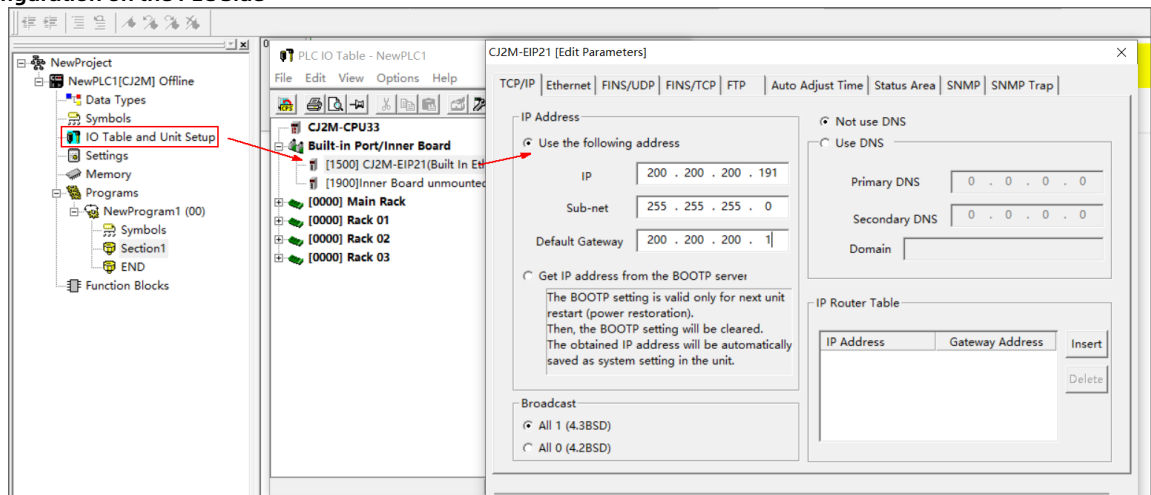


### 3.3 Omron

#### 3.3.1 Network Port

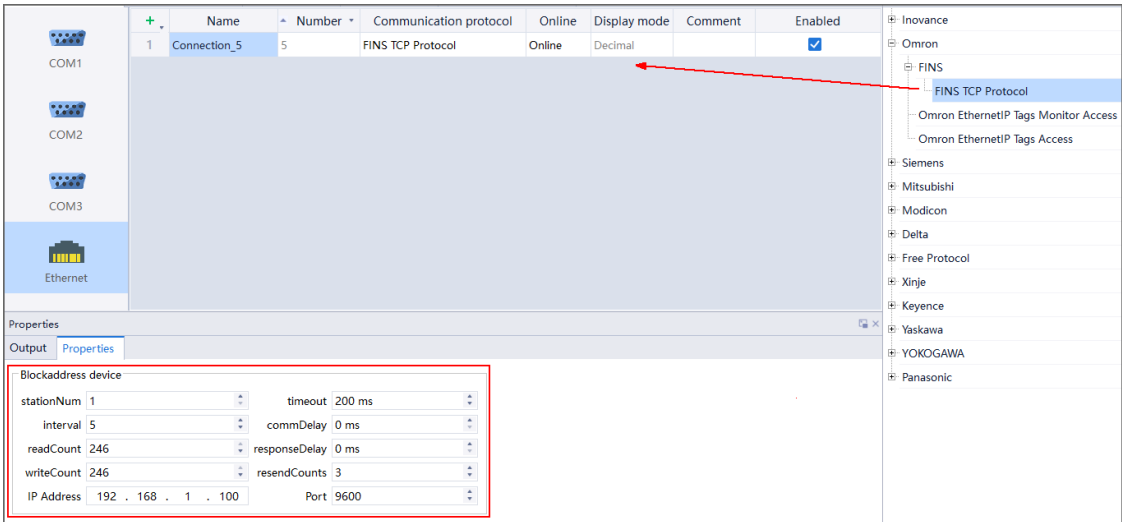
##### 3.3.1.1 FINS TCP

##### 3.3.1.1.1 Configuration on the PLC Side

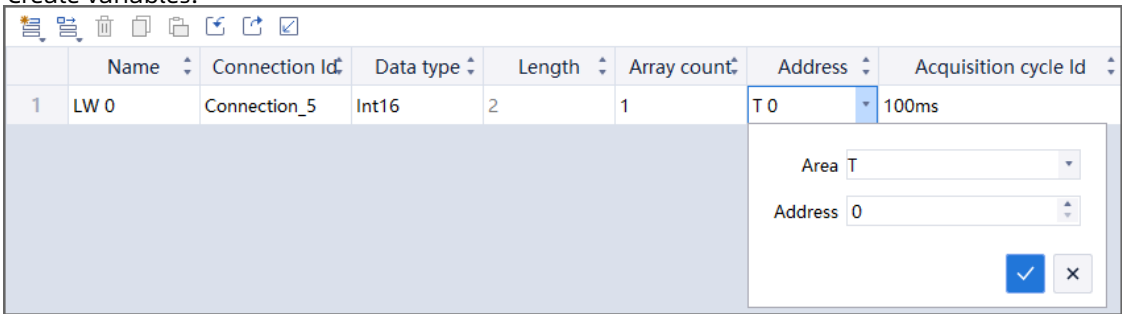


##### 3.3.1.1.2 Configuration on the HMI Side

1. Establish a connection and configure the IP address.



2. Create variables.



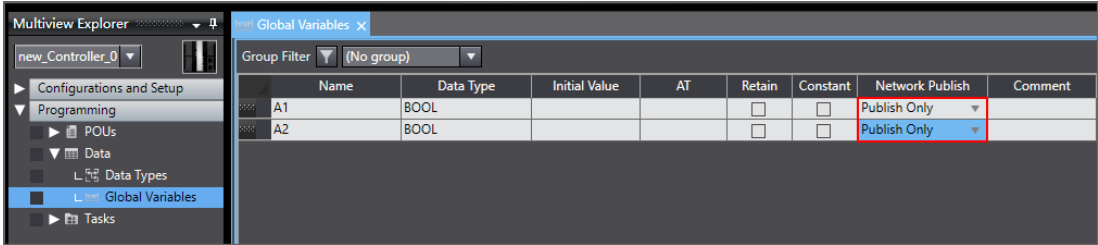
3.3.1.2 Omron EthernetIP Tags Monitor Protocol

3.3.1.2.1 Overview

This protocol is the Omron fast protocol which features high communication efficiency. The Omron EthernetIP Tags Monitor protocol is used in the similar way as the Omron EthernetIP Tags protocol.

3.3.1.2.2 Configuration on the PLC Side

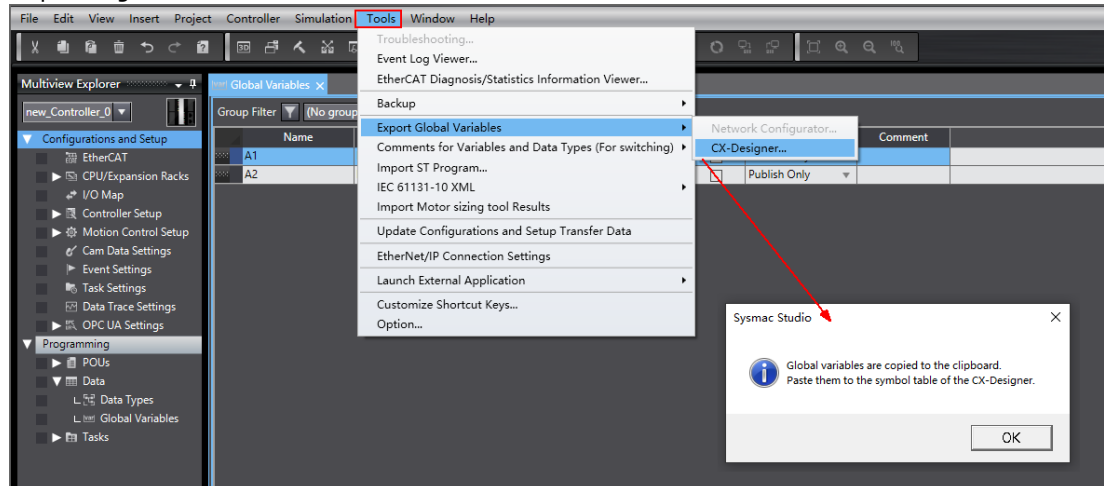
- 1. Export tag files.
  - a. Create a variable that requires communication in the global variable.



Caution

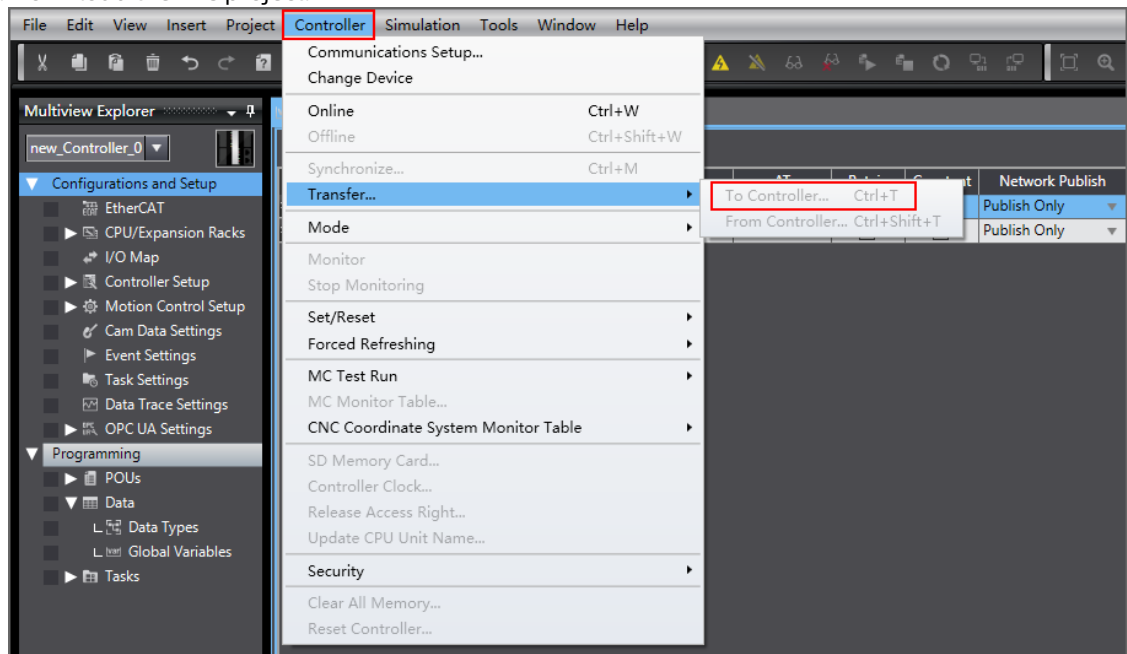
"Network Publish" must be set to "Publish Only".

### b. Export tag variables.



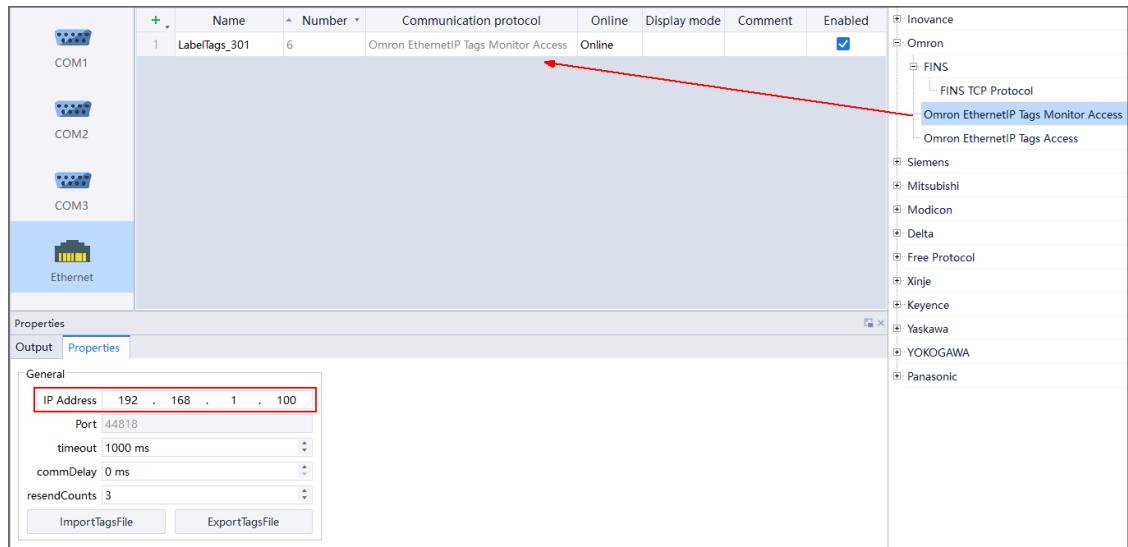
Create a TXT file and copy the content of the clipboard to the TXT file.

### 2. Download the PLC project.



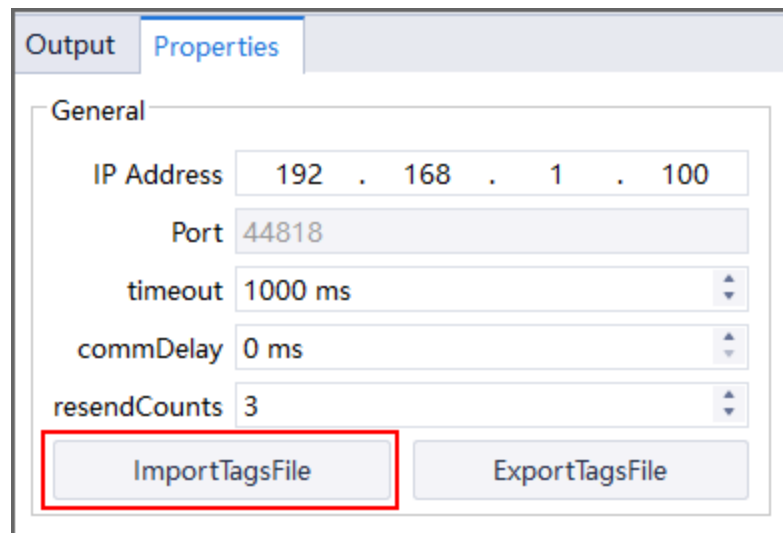
#### 3.3.1.2.3 Configuration on the HMI Side

##### 1. Establish a connection and configure the IP address.



## 2. Import tags.

Import the TXT file exported from the PLC.



## 3.3.2 Supported Register

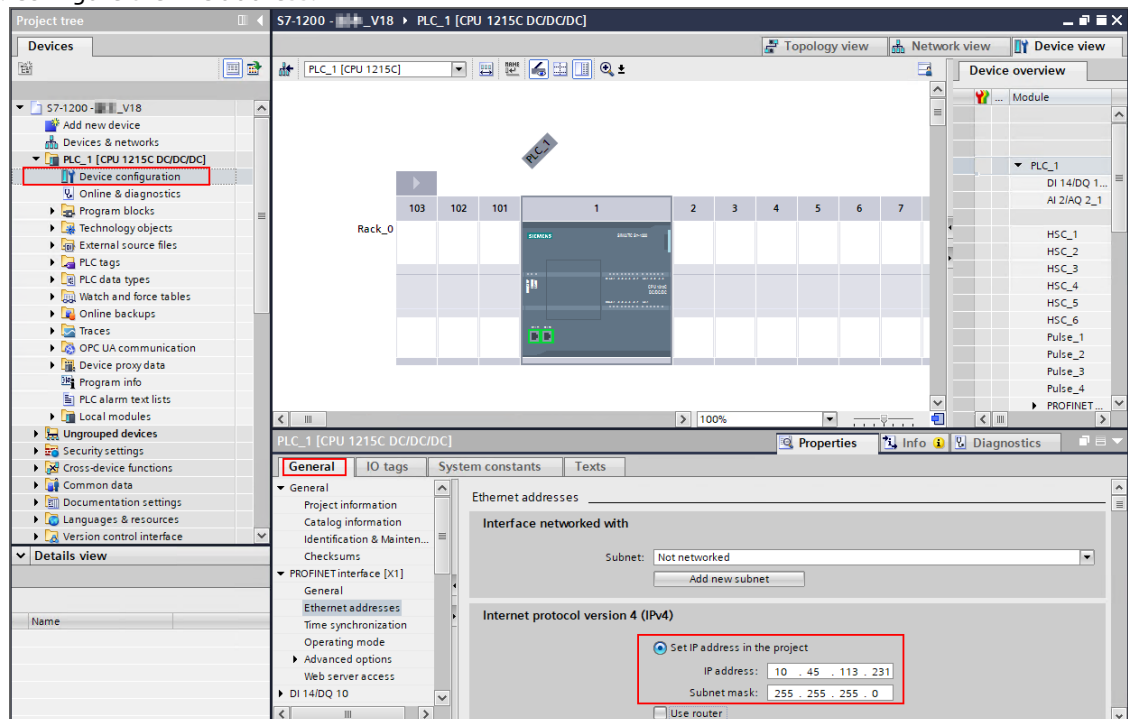
| OMRON CPM Series Host Link |                 |              |         |       |
|----------------------------|-----------------|--------------|---------|-------|
| Device                     | Bit Address     | Word Address | Format  | Notes |
| Hold Relay                 | HR 0.00-4095.15 | -----        | DDDD.DD |       |
| Link Relay                 | LR 0.00-4095.15 | -----        | DDDD.DD |       |
| Auxiliary Relay            | AR 0.00-4095.15 | -----        | DDDD.DD |       |
| Internal Relay             | IR 0.00-4095.15 | -----        | DDDD.DD |       |
| Timer/Counter Register     | -----           | TC 0-255     | DDD     |       |
| Data Register              | -----           | DM 0-9999    | DDDD    |       |

## 3.4 Siemens

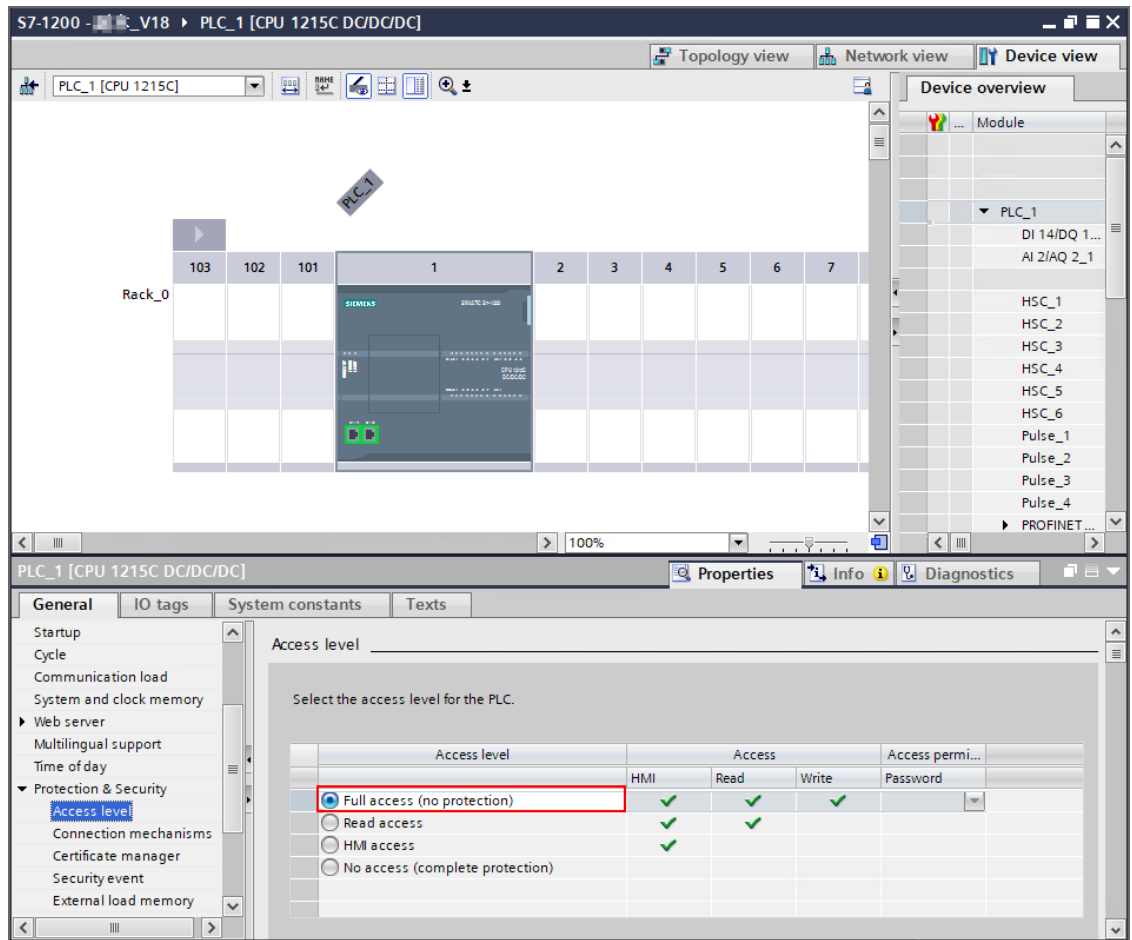
### 3.4.1 S7-1200/1500 (Ethernet)

#### 3.4.1.1 Configuration on the PLC Side

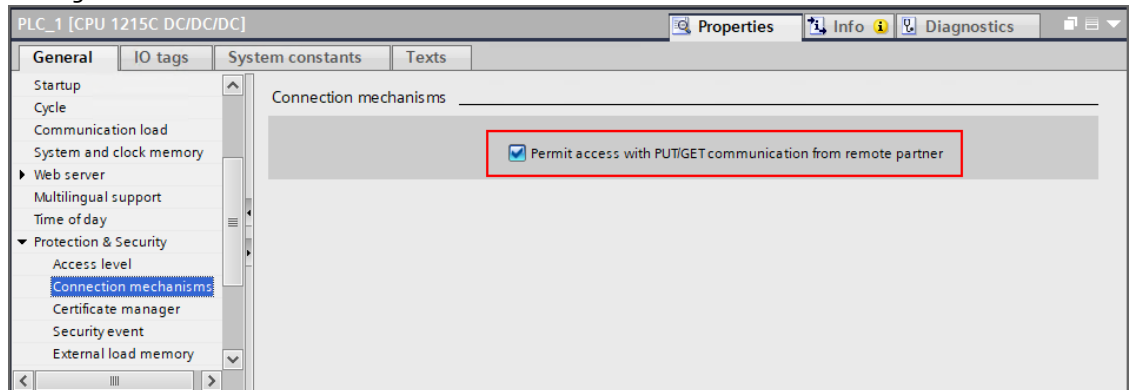
1. Configure the PLC address.



2. Configure the access level.

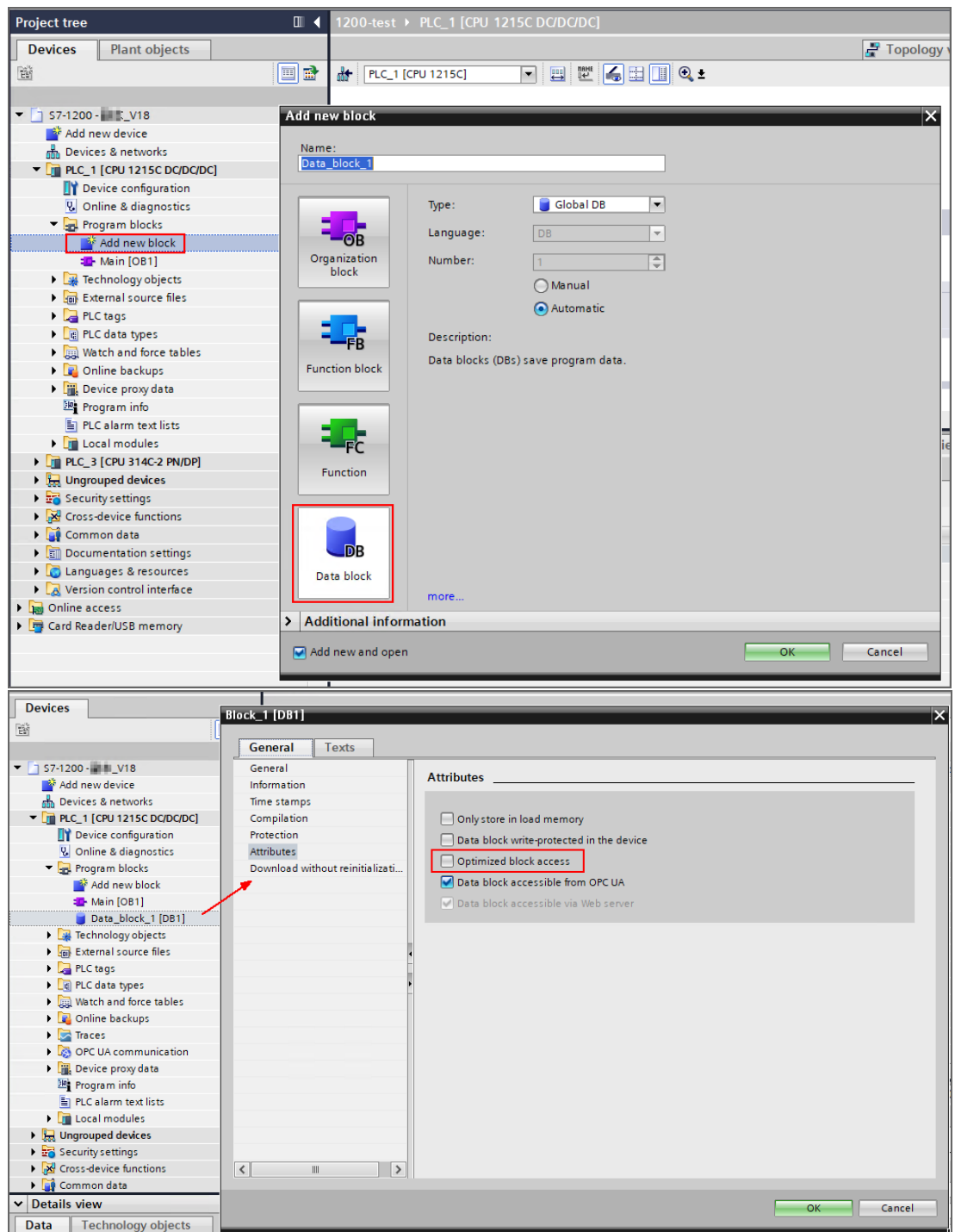


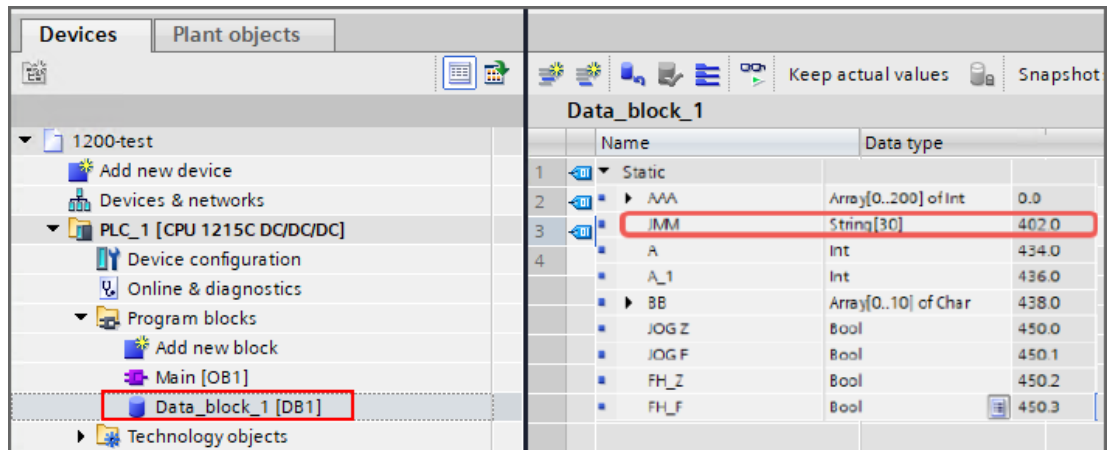
3. Configure the connection mechanism.



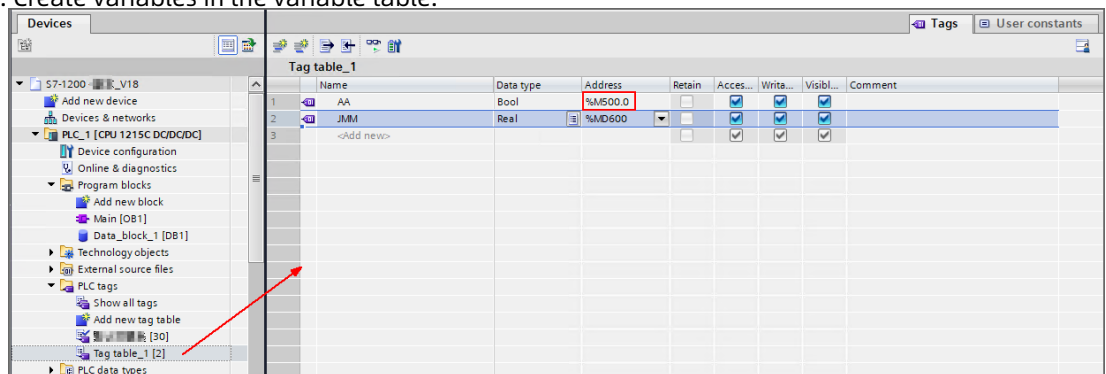
4. Create variables.

- a. Create variables in the DB block.



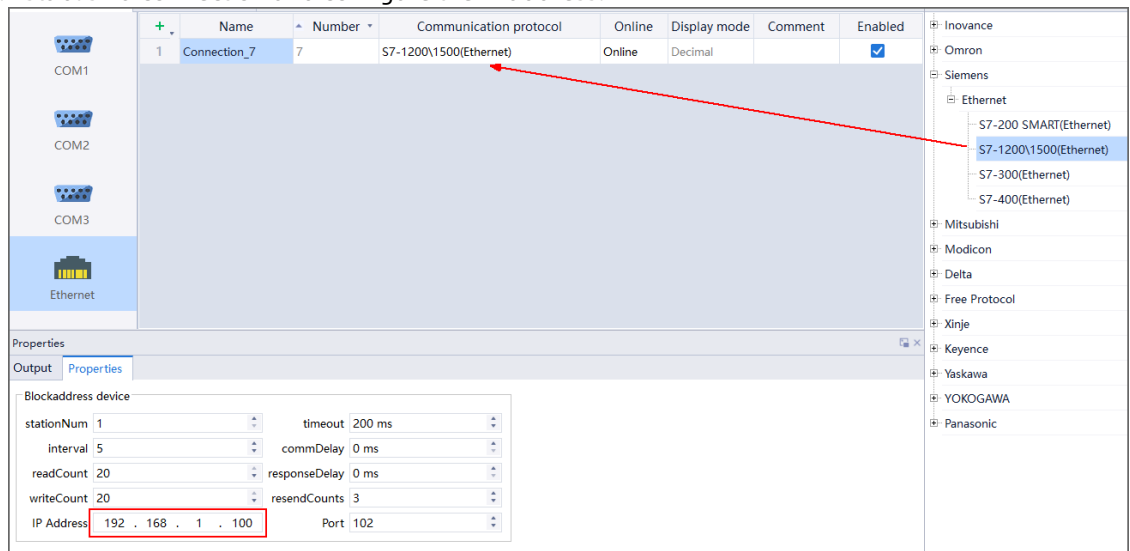


b. Create variables in the variable table.



### 3.4.1.2 Configuration on the HMI Side

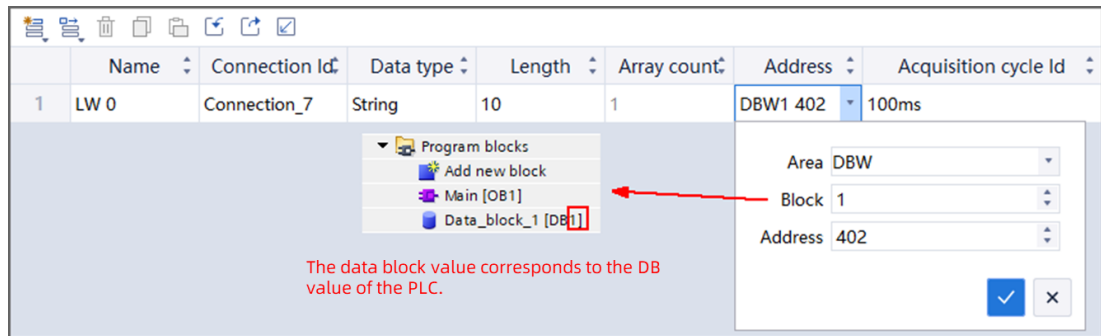
1. Establish a connection and configure the IP address.



2. Create variables.

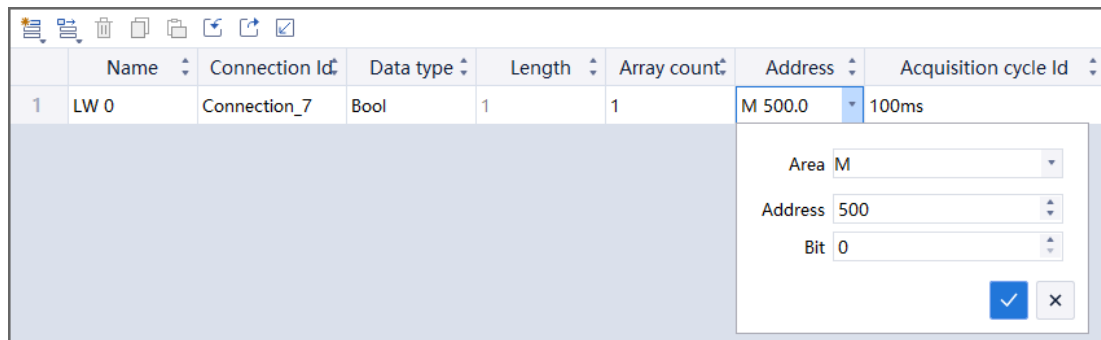
a. Link addresses of the data block.

Select DBW in the HMI for the data in the PLC data block.



### b. Link PLC variable addresses.

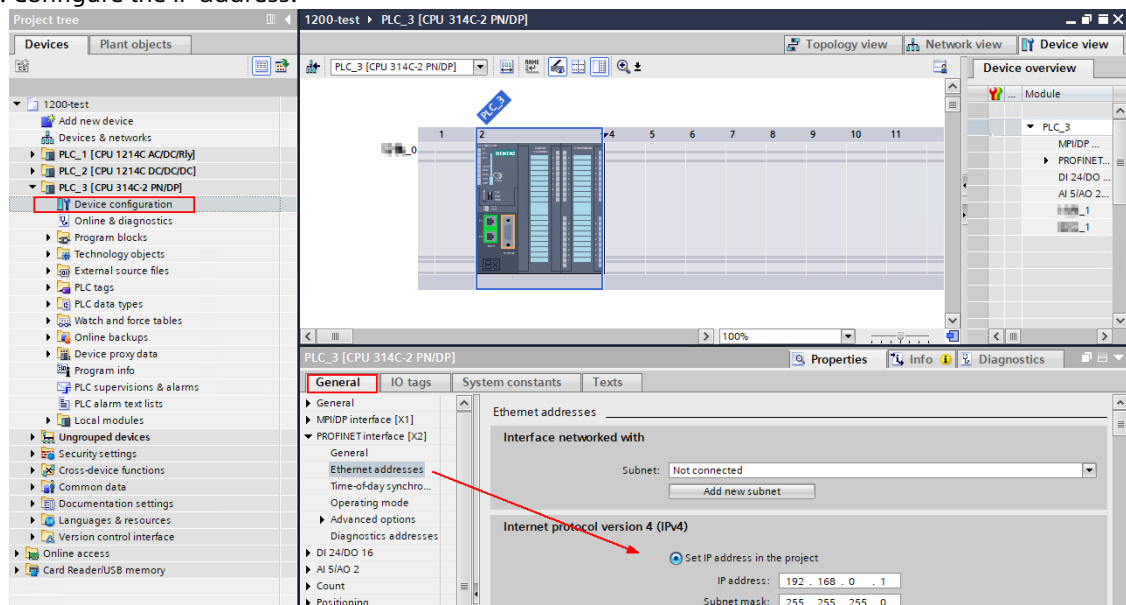
For communication variables in the PLC variable table, write the address corresponding to the PLC directly in the HMI.



## 3.4.2 S7-300 (Ethernet)

### 3.4.2.1 Configuration on the PLC Side

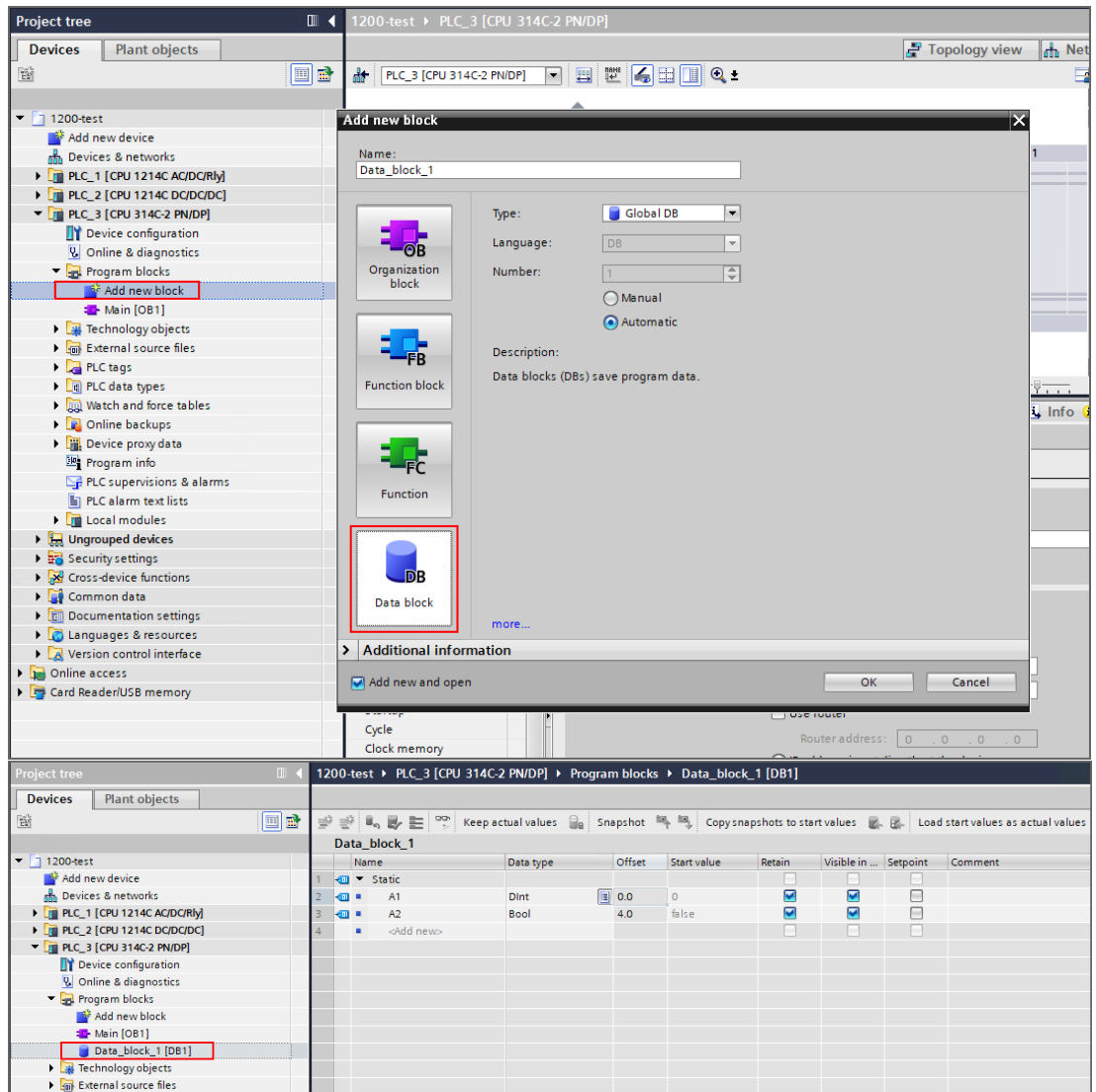
#### 1. Configure the IP address.



#### 2. Add variables.

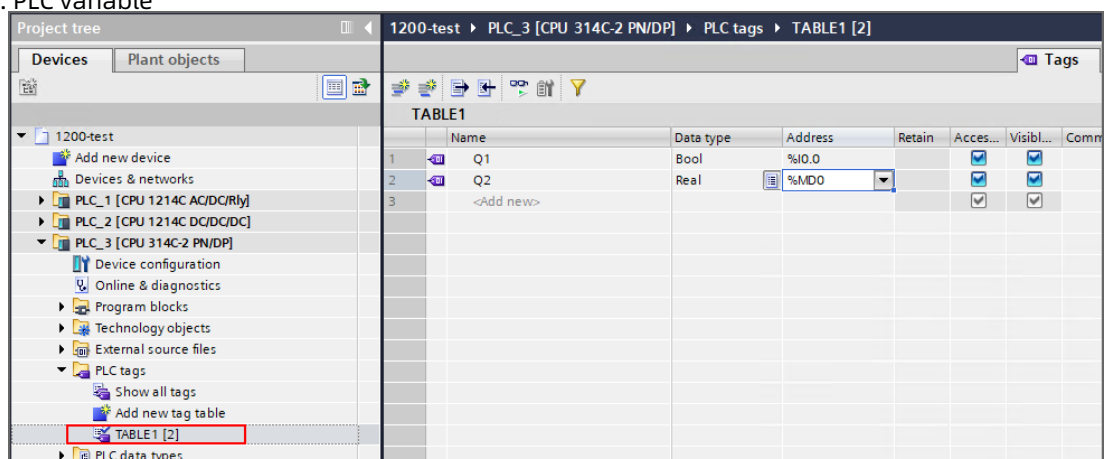
You can add variables in a block or in the PLC variable.

##### a. Data block



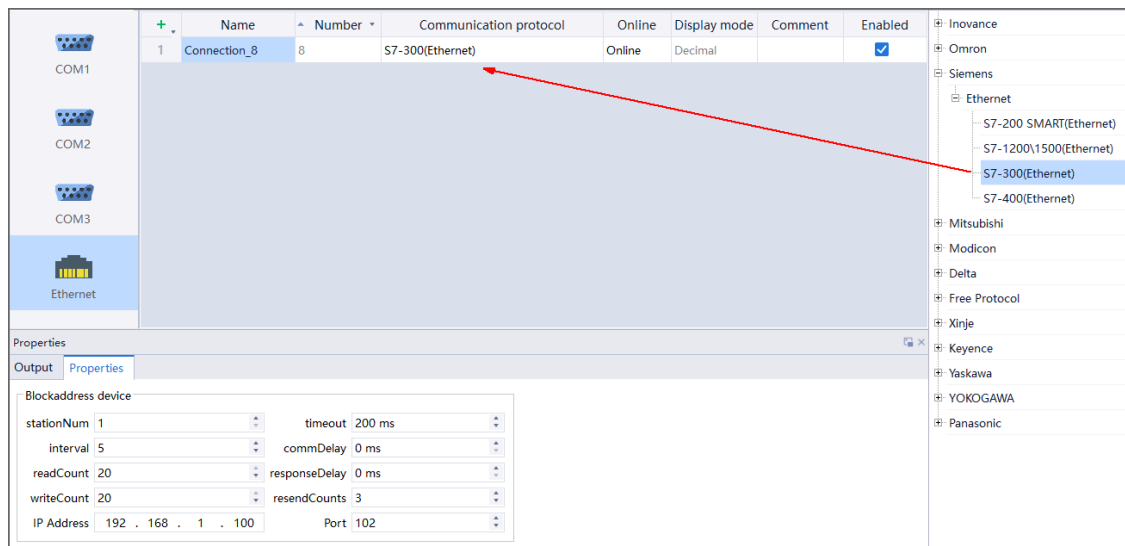
Compile the project and allocate addresses.

#### b. PLC variable



### 3.4.2.2 Configuration on the HMI Side

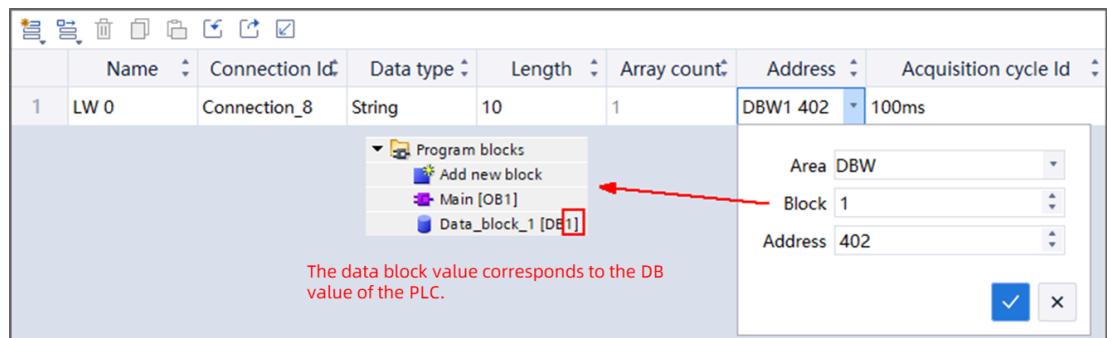
1. Establish a connection and configure the IP address.



### 2. Create variables and link addresses.

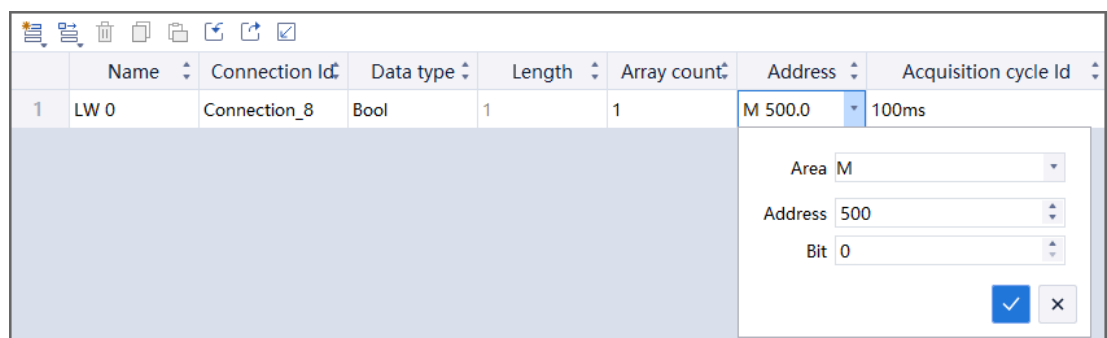
#### a. Link addresses of the data block.

Select DBW in the HMI for the data in the PLC data block.



#### b. Link PLC variables.

For communication variables in the PLC variable table, write the address corresponding to the PLC directly in the HMI.



### 3.4.3 S7-200 Smart (PPI)

#### 3.4.3.1 Hardware Connection

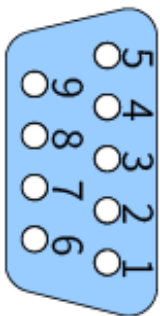
##### 3.4.3.1.1 Integrated RS485 Port (Port 0)

The S7-200 SMART CPU is integrated with the RS485 communication port. The pin assignment is described as follows.

Table 3-2 HMI side

| Pin No. | Signal                  |                                    |                               |              |
|---------|-------------------------|------------------------------------|-------------------------------|--------------|
|         | COM1 (RS485)<br>2 Wires | COM1 (RS422)<br>4 Wires            | COM2 (RS232)                  | COM3 (RS485) |
| 1       | -                       | -                                  | -                             | RS485-       |
| 2       | -                       | -                                  | RS232 RXD (receiving data)    | -            |
| 3       | -                       | -                                  | RS232 TXD (transmitting data) | -            |
| 4       | -                       | TX+ (positive transmitting signal) | -                             | -            |
| 5       | GND (signal ground)     |                                    |                               |              |
| 6       | -                       | -                                  | -                             | RS485+       |
| 7       | RS485-                  | RX- (negative receiving signal)    | -                             | -            |
| 8       | RS485+                  | RX+ (positive receiving signal)    | -                             | -            |
| 9       | -                       | TX- (negative transmitting signal) | -                             | -            |

Table 3-3 PLC side

| Connector                                                                           | Pin No.   | Signal               | Pin Assignment                     |
|-------------------------------------------------------------------------------------|-----------|----------------------|------------------------------------|
|  | 1         | Shield               | Enclosure ground                   |
|                                                                                     | 2         | 24 V return          | Logic common terminal              |
|                                                                                     | 3         | RS-485 signal B      | RS-485 signal B                    |
|                                                                                     | 4         | Request transmission | RTS (TTL)                          |
|                                                                                     | 5         | 5 V return           | Logic common terminal              |
|                                                                                     | 6         | +5V                  | +5 V, 100 Ω series resistor        |
|                                                                                     | 7         | +24V                 | +24 V                              |
|                                                                                     | 8         | RS-485 signal A      | RS-485 signal A                    |
|                                                                                     | 9         | N/A                  | Ten-bit protocol selection (input) |
|                                                                                     | Enclosure | Shield               | Enclosure ground                   |

Pin No. 3 on the PLC side is connected to pin No. 8 on the HMI side. Pin No. 8 on the PLC side is connected to pin No. 7 on the HMI side.

## Note

The pin assignment vary with different HMI models. For details on wiring, see "[HMI Serial Port Wiring Description](#)" on page 86.

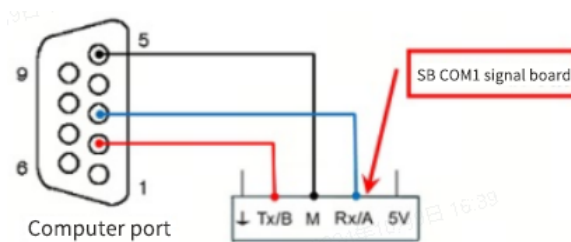
### 3.4.3.1.2 Communication Terminal (Terminal 1) on the Signal Board

The signal board SB COM1 provides RS232 and RS485 interfaces. The pin assignment is described as follows.

| Connector                                                                          | Pin No. | Signal               | Pin Assignment                     |
|------------------------------------------------------------------------------------|---------|----------------------|------------------------------------|
|  | 1       | Grounding            | Enclosure ground                   |
|                                                                                    | 2       | Tx/B                 | RS232-Tx/RS485-B                   |
|                                                                                    | 3       | Request transmission | RTS (TTL)                          |
|                                                                                    | 4       | M grounding          | Logic common terminal              |
|                                                                                    | 5       | Rx/A                 | RS232-Tx/RS485-A                   |
|                                                                                    | 6       | +5V                  | +5 V, 100 $\Omega$ series resistor |

#### RS232 connection

The RS232 network enables point-to-point connection between two devices, with the maximum communication distance of 15 m and maximum communication rate of 115.2 kbit/s. RS232 can be used to connect devices such as a scanner, printer, and modem. The SB COM1 signal board can be configured as an RS232 communication port. The following figure shows the typical RS232 wiring.



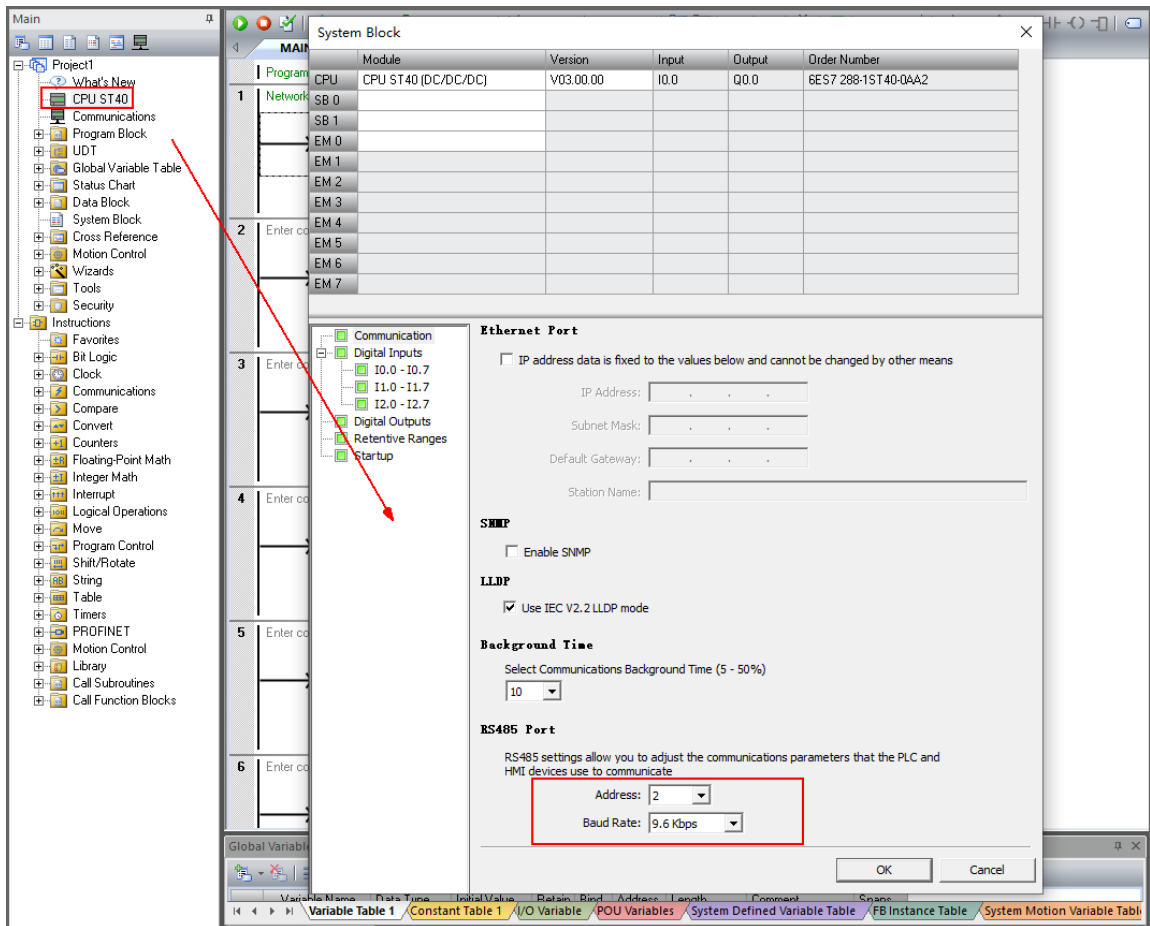
## Note

1. RS232 supports one-to-one connection and does not support one-to-many connection.
2. Connect RX of the RS232 device to TX of the peer end and TX of the RS232 device to RX of the peer end. RX and TX of the RS232 device and those of the peer end are cross connected.

### 3.4.3.2 Configuration on the PLC Side

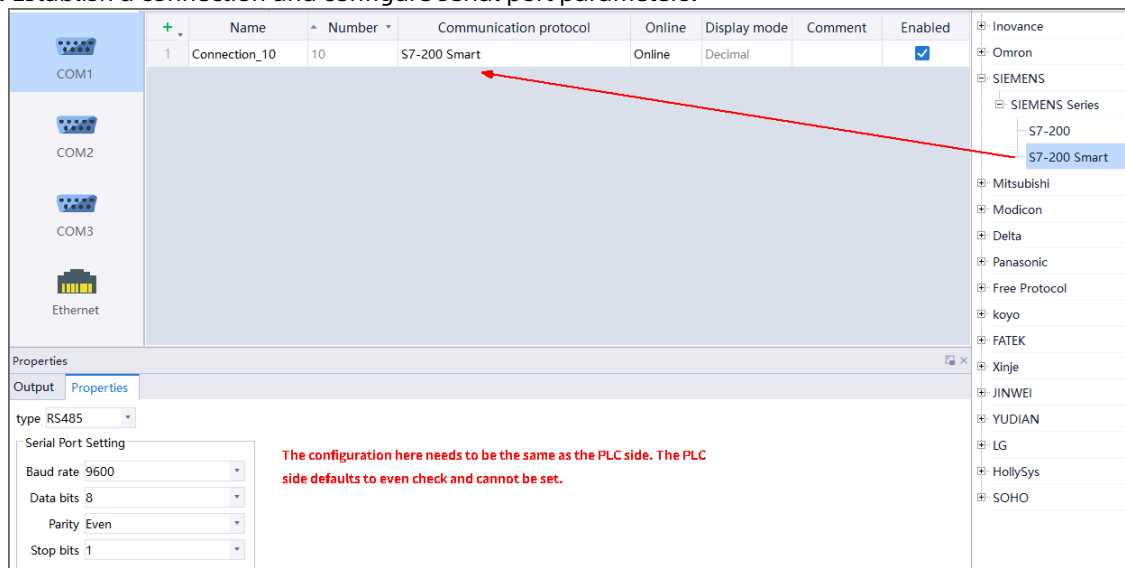
This section exemplifies the communication port integrated with the CPU, which is similar to the communication port on the signal board.

Set the serial port parameters.



### 3.4.3.3 Configuration on the HMI Side

1. Establish a connection and configure serial port parameters.



2. Configure the station number.

Output

Properties

Blockaddress device

stationNum

1

timeout

200 ms

interval

5

commDelay

0 ms

readCount

32

responseDelay

30 ms

writeCount

32

resendCounts

3

### 3. Create communication variables.

|   | Name  | Connection Id | Data type | Length | Array count | Address | Acquisition cycle Id |
|---|-------|---------------|-----------|--------|-------------|---------|----------------------|
| 1 | LW 0  | Connection_10 | Int16     | 2      | 1           | MW 0    | 100ms                |
| 2 | MW 2  | Connection_10 | Int16     | 2      | 1           | MW 2    | 100ms                |
| 3 | MW 4  | Connection_10 | Int16     | 2      | 1           | MW 4    | 100ms                |
| 4 | MW 6  | Connection_10 | Int16     | 2      | 1           | MW 6    | 100ms                |
| 5 | MW 8  | Connection_10 | Int16     | 2      | 1           | MW 8    | 100ms                |
| 6 | MW 10 | Connection_10 | Int16     | 2      | 1           | MW 10   | 100ms                |
| 7 | MW 12 | Connection_10 | Int16     | 2      | 1           | MW 12   | 100ms                |

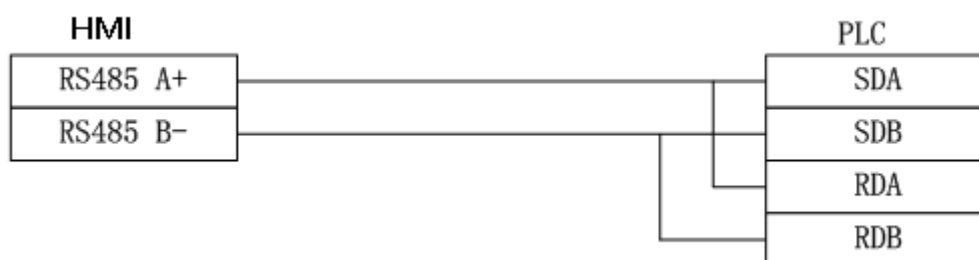
#### 3.4.3.4 PLC Memory Address Range

| Access by | Memory Type | CPU CR20s<br>CPU CR30s<br>CPU CR40s<br>CPU CR60s | CPU SR20/ST<br>20 | CPU SR30/ST<br>30 | CPU SR40/ST<br>40 | CPU SR60/ST<br>60 |
|-----------|-------------|--------------------------------------------------|-------------------|-------------------|-------------------|-------------------|
| Bit       | V           | 0.0 to 8191.7                                    | 0.0 to 8191.7     | 0.0 to 12287.7    | 0.0 to 16383.7    | 0.0 to 20479.7    |
|           | I           | 0.0 to 31.7                                      | 0.0 to 31.7       | 0.0 to 31.7       | 0.0 to 31.7       | 0.0 to 31.7       |
|           | Q           | 0.0 to 31.7                                      | 0.0 to 31.7       | 0.0 to 31.7       | 0.0 to 31.7       | 0.0 to 31.7       |
|           | M           | 0.0 to 31.7                                      | 0.0 to 31.7       | 0.0 to 31.7       | 0.0 to 31.7       | 0.0 to 31.7       |
|           | SM          | 0.0 to 2047.7                                    | 0.0 to 2047.7     | 0.0 to 2047.7     | 0.0 to 2047.7     | 0.0 to 2047.7     |
|           | S           | 0.0 to 31.7                                      | 0.0 to 31.7       | 0.0 to 31.7       | 0.0 to 31.7       | 0.0 to 31.7       |
|           | T           | 0 to 255                                         | 0 to 255          | 0 to 255          | 0 to 255          | 0 to 255          |
|           | C           | 0 to 255                                         | 0 to 255          | 0 to 255          | 0 to 255          | 0 to 255          |
|           | L           | 0.0 to 63.7                                      | 0.0 to 63.7       | 0.0 to 63.7       | 0.0 to 63.7       | 0.0 to 63.7       |
| Byte      | VB          | 0 to 8191                                        | 0 to 8191         | 0 to 12287        | 0 to 16383        | 0 to 20479        |
|           | IB          | 0 to 31                                          | 0 to 31           | 0 to 31           | 0 to 31           | 0 to 31           |
|           | QB          | 0 to 31                                          | 0 to 31           | 0 to 31           | 0 to 31           | 0 to 31           |
|           | MB          | 0 to 31                                          | 0 to 31           | 0 to 31           | 0 to 31           | 0 to 31           |
|           | SMB         | 0 to 2047                                        | 0 to 2047         | 0 to 2047         | 0 to 2047         | 0 to 2047         |
|           | SB          | 0 to 31                                          | 0 to 31           | 0 to 31           | 0 to 31           | 0 to 31           |
|           | LB          | 0 to 63                                          | 0 to 63           | 0 to 63           | 0 to 63           | 0 to 63           |
|           | AC          | 0 to 3                                           | 0 to 3            | 0 to 3            | 0 to 3            | 0 to 3            |

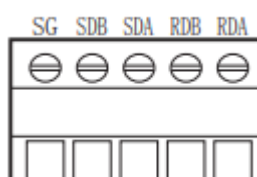
| Access by   | Memory Type | CPU CR20s<br>CPU CR30s<br>CPU CR40s<br>CPU CR60s | CPU SR20/ST<br>20 | CPU SR30/ST<br>30 | CPU SR40/ST<br>40 | CPU SR60/ST<br>60 |
|-------------|-------------|--------------------------------------------------|-------------------|-------------------|-------------------|-------------------|
| Word        | VW          | 0 to 8190                                        | 0 to 8190         | 0 to 12286        | 0 to 16382        | 0 to 20478        |
|             | IW          | 0 to 30                                          | 0 to 30           | 0 to 30           | 0 to 30           | 0 to 30           |
|             | QW          | 0 to 30                                          | 0 to 30           | 0 to 30           | 0 to 30           | 0 to 30           |
|             | MW          | 0 to 30                                          | 0 to 30           | 0 to 30           | 0 to 30           | 0 to 30           |
|             | SMW         | 0 to 2046                                        | 0 to 2046         | 0 to 2046         | 0 to 2046         | 0 to 2046         |
|             | SW          | 0 to 30                                          | 0 to 30           | 0 to 30           | 0 to 30           | 0 to 30           |
|             | T           | 0 to 255                                         | 0 to 255          | 0 to 255          | 0 to 255          | 0 to 255          |
|             | C           | 0 to 255                                         | 0 to 255          | 0 to 255          | 0 to 255          | 0 to 255          |
|             | LW          | 0 to 62                                          | 0 to 62           | 0 to 62           | 0 to 62           | 0 to 62           |
|             | AC          | 0 to 3                                           | 0 to 3            | 0 to 3            | 0 to 3            | 0 to 3            |
|             | AIW         | Not applicable                                   | 0 to 110          | 0 to 110          | 0 to 110          | 0 to 110          |
|             | AQW         | Not applicable                                   | 0 to 110          | 0 to 110          | 0 to 110          | 0 to 110          |
| Double word | VD          | 0 to 8188                                        | 0 to 8188         | 0 to 12284        | 0 to 16380        | 0 to 20476        |
|             | ID          | 0 to 28                                          | 0 to 28           | 0 to 28           | 0 to 28           | 0 to 28           |
|             | QD          | 0 to 28                                          | 0 to 28           | 0 to 28           | 0 to 28           | 0 to 28           |
|             | MD          | 0 to 28                                          | 0 to 28           | 0 to 28           | 0 to 28           | 0 to 28           |
|             | SMD         | 0 to 2044                                        | 0 to 2044         | 0 to 2044         | 0 to 2044         | 0 to 2044         |
|             | SD          | 0 to 28                                          | 0 to 28           | 0 to 28           | 0 to 28           | 0 to 28           |
|             | LD          | 0 to 60                                          | 0 to 60           | 0 to 60           | 0 to 60           | 0 to 60           |
|             | AC          | 0 to 3                                           | 0 to 3            | 0 to 3            | 0 to 3            | 0 to 3            |
|             | HC          | 0 to 3                                           | 0 to 3            | 0 to 3            | 0 to 3            | 0 to 3            |

## 3.5 Mitsubishi

### 3.5.1 Hardware Connection (FX5U)



The built-in terminal block for RS485 communication is shown as follows.



| Signal Name | Function                   |
|-------------|----------------------------|
| RDA         | Receiving data (input)     |
| RDB         |                            |
| SDA         | Transmitting data (output) |
| SDB         |                            |
| SG          | Signal ground              |

### 3.5.2 PLC Register Range

#### FX5

| Modbus Address<br>(Bit Soft element) | FX5 Soft Component |                   |
|--------------------------------------|--------------------|-------------------|
|                                      | Coil (read/write)  | Input (read-only) |
| 0000H to 03FFH                       | Y0 to 1023         | X0 to 1023        |
| 0400H to 1FFFH                       | -                  | -                 |
| 2000H to 3DFFH                       | M0 to 7679         | -                 |
| 3E00H to 4FFFH                       | -                  | -                 |
| 5000H to 57FFH                       | SM0 to 2047        | -                 |
| 5800H to 75FFH                       | L0 to 7679         | -                 |
| 7600H to 77FFH                       | -                  | -                 |
| 7800H to 78FFH                       | B0 to 255          | -                 |
| 7900H to 97FFH                       | -                  | -                 |
| 9800H to 987FH                       | F0 to 127          | -                 |
| 9880H to 9FFFH                       | -                  | -                 |
| A000H to A0FFH                       | SB0 to 255         | -                 |
| A100H to AFFFH                       | -                  | -                 |
| B000H to BFFFH                       | S0 to 4095         | -                 |
| C000H to CFFFH                       | -                  | -                 |
| D000H to D1FFH                       | TC0 to 511         | -                 |
| D200H to D7FFH                       | -                  | -                 |
| D800H to D9FFH                       | TS0 to 511         | -                 |
| DA00H to DFFFH                       | -                  | -                 |
| E000H to E00FH                       | SC0 to 15          | -                 |
| E010H to E7FFH                       | -                  | -                 |
| E800H to E80FH                       | SS0 to 15          | -                 |
| E810H to EFFFH                       | -                  | -                 |
| F000H to F0FFH                       | CC0 to 15          | -                 |
| F100H to F7FFH                       | -                  | -                 |
| F800H to F8FFH                       | CS0 to 255         | -                 |
| F900H to FFFFH                       | -                  | D0 to 7999        |
| 0000H to 1F3FH                       | -                  | D0 to 7999        |
| 1F40H to 4FFFH                       | -                  | -                 |
| 5000H to 770FH                       | -                  | SD0 to 9999       |
| 7710H to 77FFH                       | -                  | -                 |
| 7800H to 79FFH                       | -                  | W0 to 512         |
| 7A00H to 9FFFH                       | -                  | -                 |
| A000H to A0FFH                       | -                  | SW0 to 512        |
| A100H to CFFFH                       | -                  | -                 |
| D000H to D1FFH                       | -                  | TN0 to 511        |
| D200H to DFFFH                       | -                  | -                 |
| E000H to E00FH                       | -                  | SN0 to 15         |
| E010H to EFFFH                       | -                  | -                 |
| F000H to F0FFH                       | -                  | CN0 to 255        |
| F100H to FFFFH                       | -                  | -                 |

### 3.5.3 Serial Port

#### 3.5.3.1 Configuration on the PLC Side

##### Interface

Navigation interface: Parameters->FX5UCPU->Module Parameters->485 Serial.

When the protocol is set Modbus RTU communication, complete configurations in this section.

##### Basic settings

- Protocol format: Modbus RTU communication
- Parity check: N/A
- Stop bit: bit 1
- Baud rate: 115200 bit/s

| Item         | Setting                                                                                                                                   | Station                      |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Protocol     | MELSOFT connection/Non-ordered communication/MC protocol/Modbus RTU communication/AC drive communication/Communication protocol support*1 | Master station/Slave station |
| Parity check | None/Odd/Even                                                                                                                             | Master station/Slave station |
| Stop bit     | Bit 1/bit 2                                                                                                                               | Master station/Slave station |
| Baud rate    | 300 bps/600 bps/1200 bps/2400 bps/4800 bps/9600 bps/19200 bps/38400 bps/57600 bps/115200 bps                                              | Master station/Slave station |

\*1: When using the Modbus serial communication, select Modbus RTU communication.

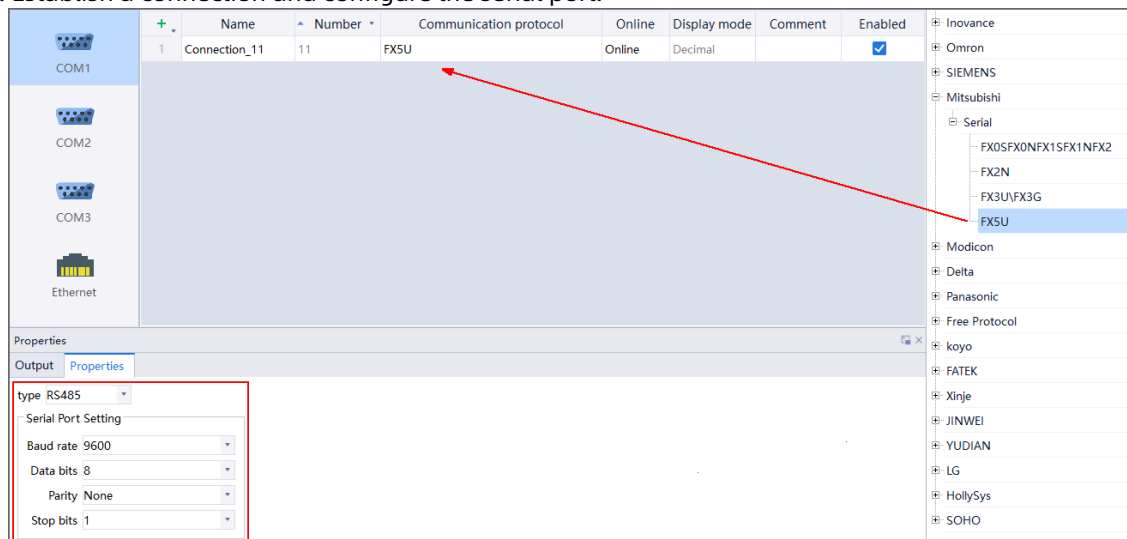
##### Fixed settings

- Local station number: 0
- Slave timeout time: 3000 ms
- Broadcast delay: 400 ms
- Delay between requests: 1 ms
- Number of re-transmissions: 5

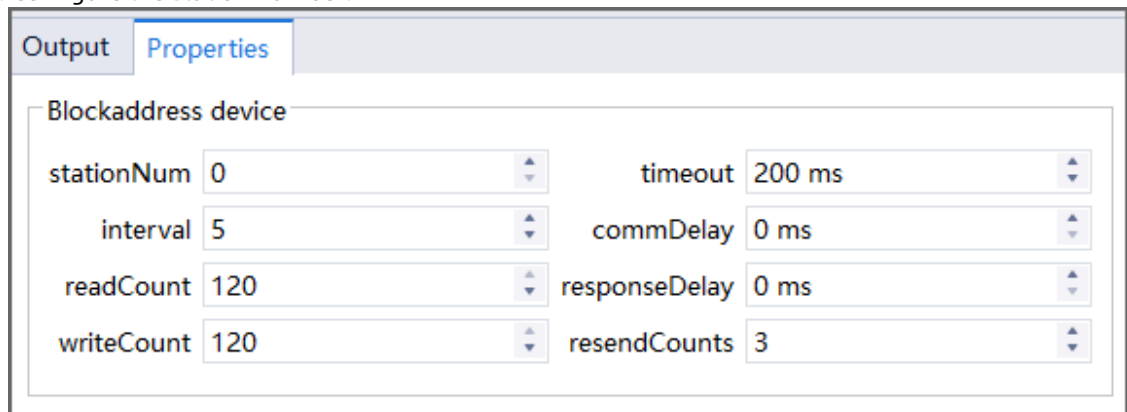
| Item                       | Setting                               | Station                      |
|----------------------------|---------------------------------------|------------------------------|
| Local station number       | 0 to 247 (master: 0; slave: 1 to 247) | Master station/Slave station |
| Slave timeout time         | 1 ms to 32767 ms                      | Master station/Slave station |
| Broadcast delay            | 1 ms to 32767 ms                      | Master station/Slave station |
| Delay between requests     | 1 ms to 16382 ms                      | Master station/Slave station |
| Number of re-transmissions | 0 to 20                               | Master station/Slave station |

## 3.5.3.2 Configuration on the HMI Side

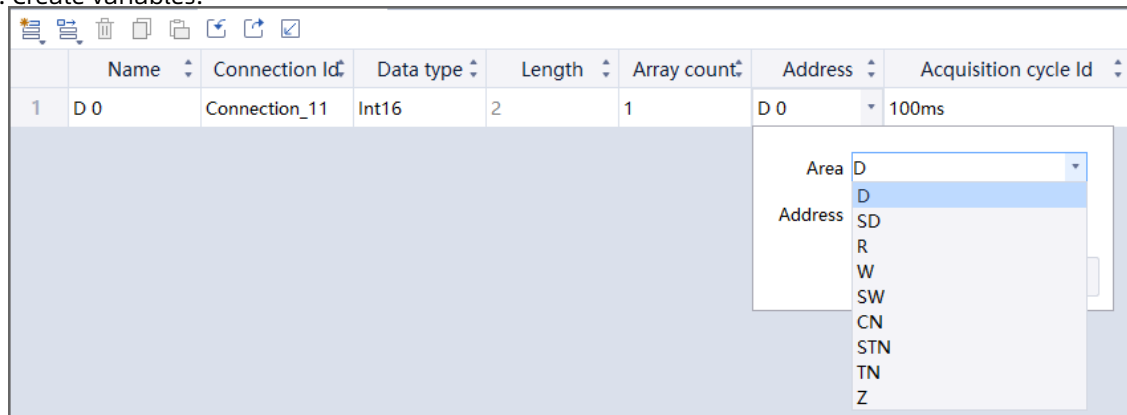
1. Establish a connection and configure the serial port.



2. Configure the station number.



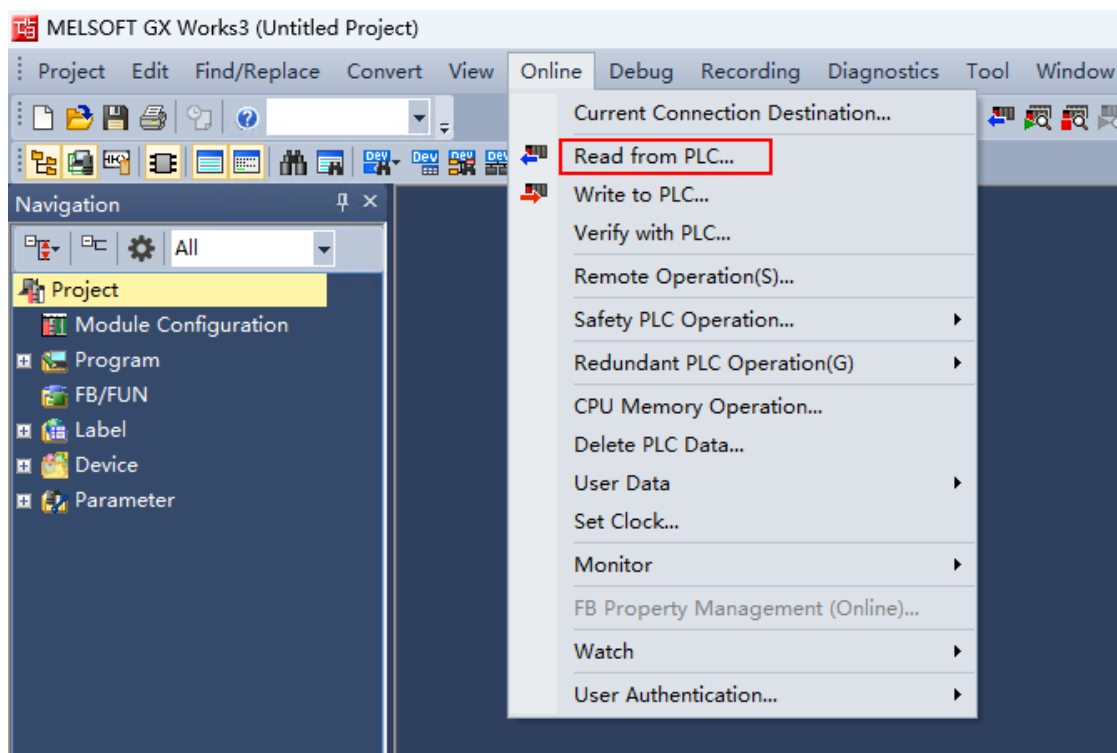
3. Create variables.



## 3.5.4 Network Port

### 3.5.4.1 Configuration on the PLC Side

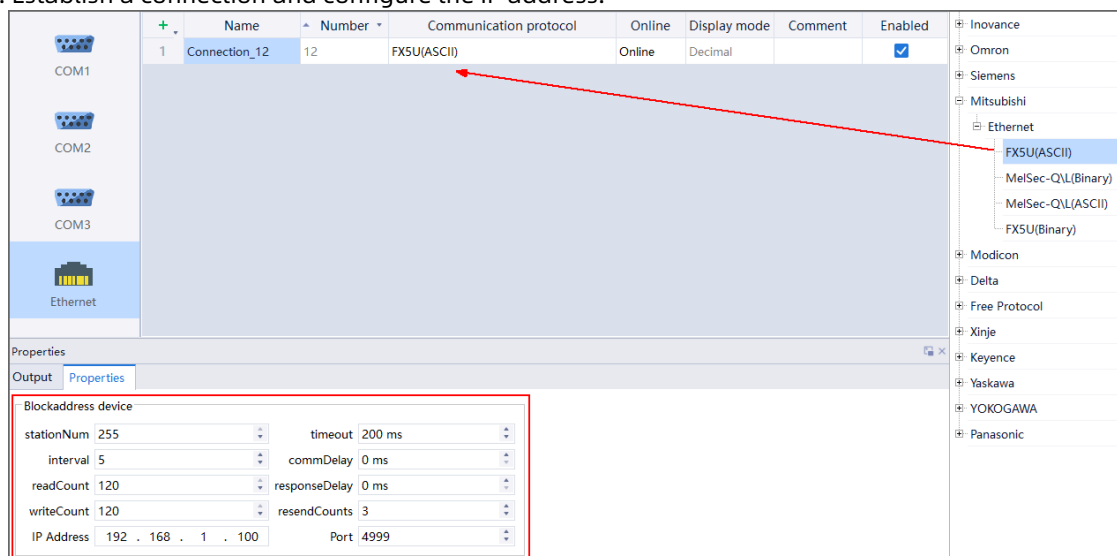
1. Connect the PLC.



2. Select the CPU type.
3. Configure the network connection.
4. Download the project.
  - a. Click "Convert" > "Convert(B)".
  - b. Click "Online" > "Write to PLC".
  - c. In the displayed dialog box, click "Select All" > "Execute".
  - d. After the download is completed, power off the PLC and then restart it to ensure that parameter settings take effect immediately.

### 3.5.4.2 Configuration on the HMI Side

1. Establish a connection and configure the IP address.



2. Create variables.

|   | Name | Connection Id | Data type | Length | Array count | Address | Acquisition cycle Id |
|---|------|---------------|-----------|--------|-------------|---------|----------------------|
| 1 | D 0  | Connection_11 | Int16     | 2      | 1           | D 0     | 100ms                |

Area

D

Address

SD

R

W

SW

CN

STN

TN

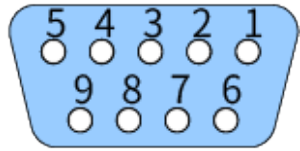
Z

## 4 HMI Serial Port Wiring Description

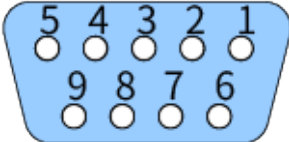
### 4.1 IT7000

| Pin No. | Signal                  |                                    |                               |              |
|---------|-------------------------|------------------------------------|-------------------------------|--------------|
|         | COM1 (RS485)<br>2 Wires | COM1 (RS422)<br>4 Wires            | COM2 (RS232)                  | COM3 (RS485) |
| 1       | -                       | -                                  | -                             | RS485-       |
| 2       | -                       | -                                  | RS232 RXD (receiving data)    | -            |
| 3       | -                       | -                                  | RS232 TXD (transmitting data) | -            |
| 4       | -                       | TX+ (positive transmitting signal) | -                             | -            |
| 5       | GND (signal ground)     |                                    |                               |              |
| 6       | -                       | -                                  | -                             | RS485+       |
| 7       | RS485-                  | RX- (negative receiving signal)    | -                             | -            |
| 8       | RS485+                  | RX+ (positive receiving signal)    | -                             | -            |
| 9       | -                       | TX- (negative transmitting signal) | -                             | -            |

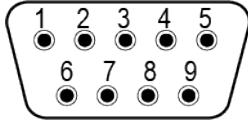
### 4.2 IT7043T-CP

| Pin No. | Signal                  | Pin Layout of DB9 Female Connector                                                                                                                                         |
|---------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | COM1 (RS485)<br>2 Wires |                                                                                                                                                                            |
| 1       | RS485-                  |  <p>COM1 (RS485 2W)<br/>DB9 female connector<br/>(receptacles for pins receiving)</p> |
| 2       | RS485+                  |                                                                                                                                                                            |
| 3       | -                       |                                                                                                                                                                            |
| 4       | -                       |                                                                                                                                                                            |
| 5       | GND                     |                                                                                                                                                                            |
| 6       | -                       |                                                                                                                                                                            |
| 7       | -                       |                                                                                                                                                                            |
| 8       | -                       |                                                                                                                                                                            |
| 9       | -                       |                                                                                                                                                                            |

### 4.3 IT7043T-F01 and IT7043E-F01

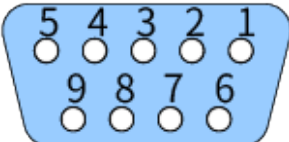
| Pin No. | Signal                  |                                    |                    |              | Pin Layout of DB9 Female Connector                                                                                                                                                                           |
|---------|-------------------------|------------------------------------|--------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | COM1 (RS485)<br>2 Wires | COM1 (RS422)                       | COM2 (RS232)       | COM3 (RS485) |                                                                                                                                                                                                              |
| 1       | RS485-                  | RX- (negative receiving signal)    | -                  | -            |  <p>COM1 (RS485 2W/RS422)<br/>COM2 (RS232)<br/>COM3 (RS485)<br/>DB9 female connector (receptacles for pins receiving)</p> |
| 2       | RS485+                  | RX+ (positive receiving signal)    | -                  | -            |                                                                                                                                                                                                              |
| 3       | -                       | TX- (negative transmitting signal) | -                  | -            |                                                                                                                                                                                                              |
| 4       | -                       | TX+ (positive transmitting signal) | -                  | -            |                                                                                                                                                                                                              |
| 5       | GND                     |                                    |                    |              |                                                                                                                                                                                                              |
| 6       | -                       | -                                  | -                  | RS485-       |                                                                                                                                                                                                              |
| 7       | -                       | -                                  | TXD (transmitting) | -            |                                                                                                                                                                                                              |
| 8       | -                       | -                                  | RXD (receiving)    | -            |                                                                                                                                                                                                              |
| 9       | -                       | -                                  | -                  | RS485+       |                                                                                                                                                                                                              |

### 4.4 IT7150E

| Pin No. | Signal              | Pin Layout of DB9 Male Connector                                                      |
|---------|---------------------|---------------------------------------------------------------------------------------|
|         | COM2[RS232]         |                                                                                       |
| 1       | /                   |  |
| 2       | RXD (receiving)     |                                                                                       |
| 3       | TXD (transmitting)  |                                                                                       |
| 4       | /                   |                                                                                       |
| 5       | GND (signal ground) |                                                                                       |
| 6 to 9  | /                   |                                                                                       |

COM2[RS232]

DB9 male connector  
(protruding pins)

| Pin No. | Signal                  |                                    |              | Pin Layout of DB9 Female Connector                                                                                                                                                             |
|---------|-------------------------|------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | COM1 (RS485)<br>2 Wires | COM1 (RS422)                       | COM3 (RS485) |                                                                                                                                                                                                |
| 1       | RS485-                  | RX- (negative receiving signal)    | -            |  <p>COM1 (RS485 2W/4W)<br/>COM3 (RS485)<br/>DB9 female connector<br/>(receptacles for pins receiving)</p> |
| 2       | RS485+                  | RX+ (positive receiving signal)    | -            |                                                                                                                                                                                                |
| 3       | -                       | TX- (negative transmitting signal) | -            |                                                                                                                                                                                                |
| 4       | -                       | TX+ (positive transmitting signal) | -            |                                                                                                                                                                                                |
| 5       | GND (signal ground)     |                                    |              |                                                                                                                                                                                                |
| 6       | -                       | -                                  | RS485-       |                                                                                                                                                                                                |
| 7/8     | -                       | -                                  | -            |                                                                                                                                                                                                |
| 9       | -                       | -                                  | RS485+       |                                                                                                                                                                                                |

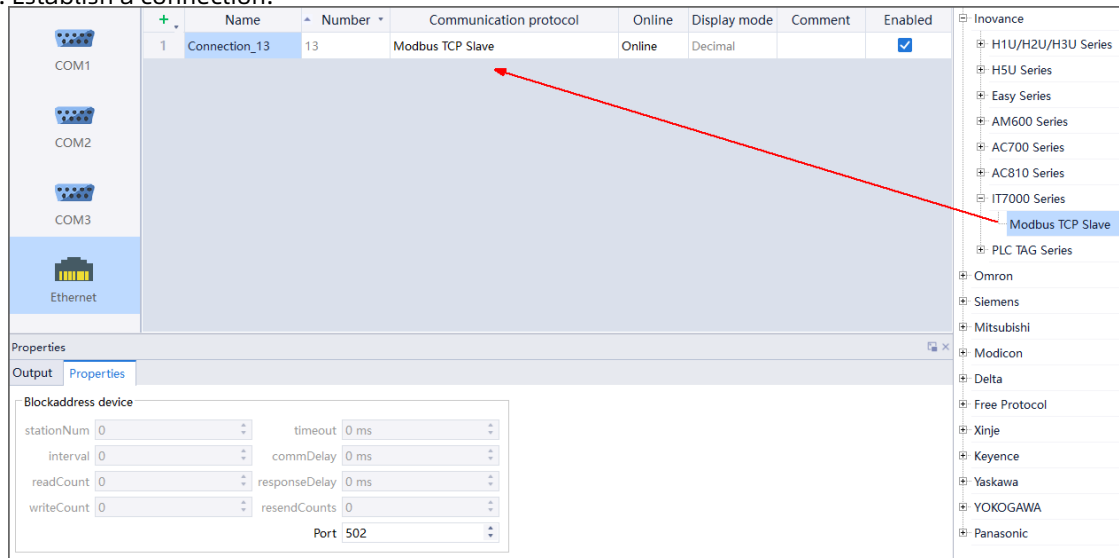
## **5 HMI Simulation Serial Port Communication**

When the PLC is connected through HMI simulation, the communication serial port is fixed to COM1. If a USB-to-RS485 device is inserted into the computer and a port other than COM1 is assigned, change the port to COM1 manually.

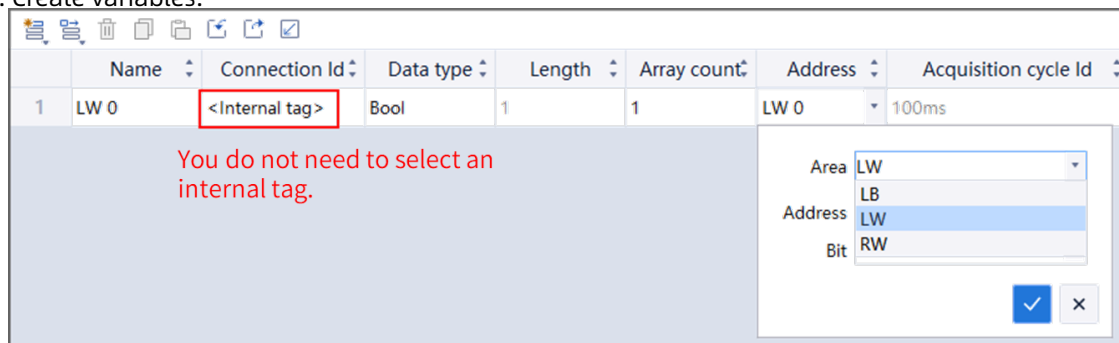
## 6 HMI as a Slave

### 6.1 Network Port

1. Establish a connection.

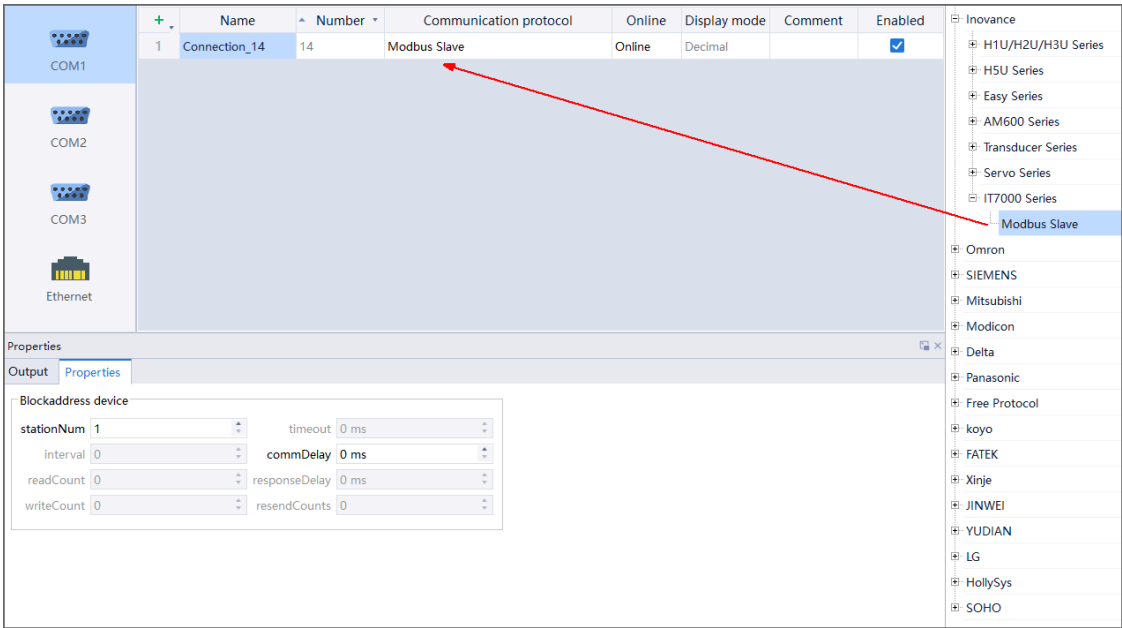


2. Create variables.

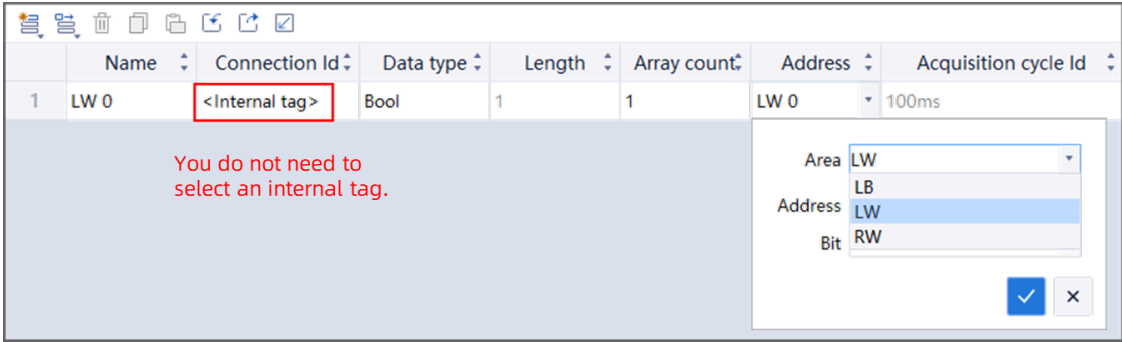


### 6.2 Serial Port

1. Establish a connection.



2. Create variables.



### 6.3 Address Mapping

| Storage Area                          | Correspondence               |
|---------------------------------------|------------------------------|
| Reading/Writing 0x/1x (0-11999)       | Reading/Writing LB (0-11999) |
| Reading/Writing 3x/4x/5x (0-8999)     | Reading/Writing LW (0-8999)  |
| Reading/Writing 3x/4x/5x(10000-65535) | Reading/Writing RW (0-55535) |

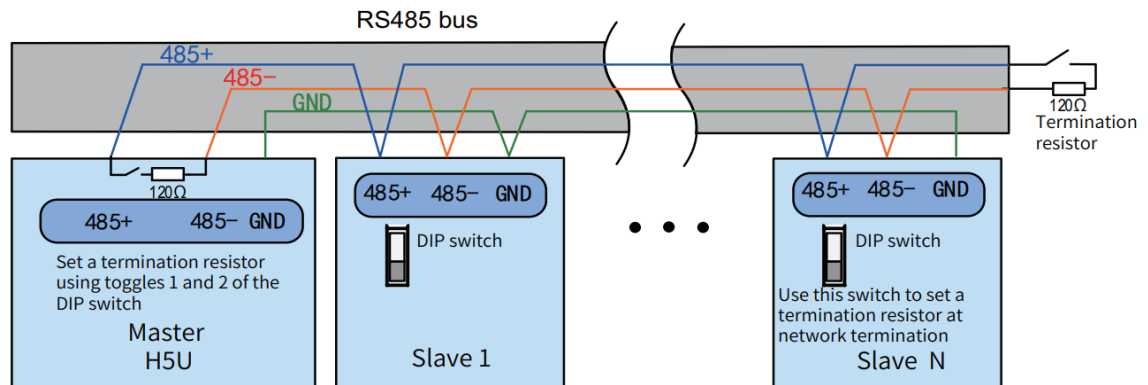
**Note**

The maximum address on the Modbus master side is 65535. Therefore, the addresses 55536 to 131071 in the HMI cannot be read or written.

## 7 Appendix 1: RS485/RS422 Bus Topology

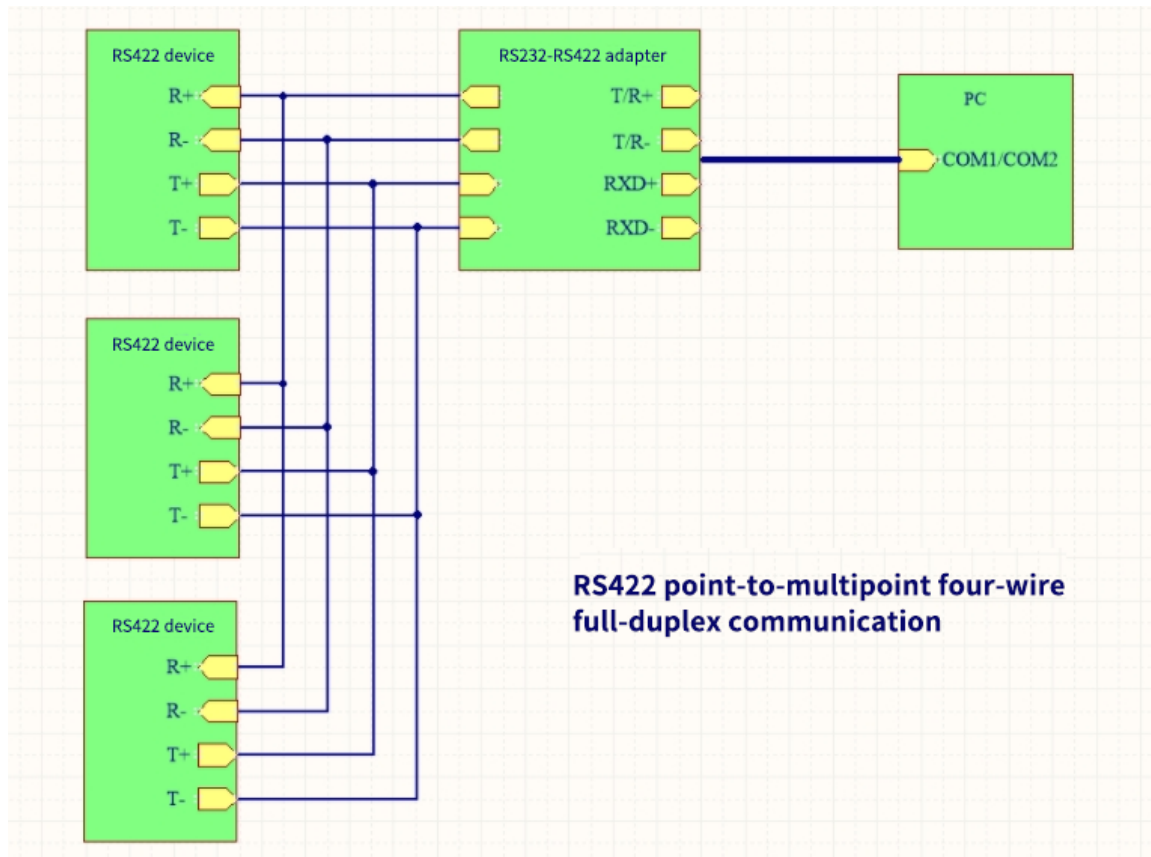
### 7.1 RS485 Bus Topology

It is recommended to use a shielded twisted pair cable for the RS485 bus and use a twisted pair cable to connect the RS485+ and RS485- terminals. Connect a 120  $\Omega$  termination resistor to both ends of the bus to prevent signal reflection. Connect the signal reference grounds of all nodes together. Up to 31 nodes can be connected and the distance between branches must be less than 3 m. A star topology is not allowed.



### 7.2 RS422 Bus Topology

RS422 allows a maximum of 10 receiving nodes to be connected on the same transmission cable. The system usually consists of one master device and multiple slave devices. The slave devices cannot communicate directly among them. Therefore, RS422 supports point-to-multipoint bi-directional communication mode. The input impedance of the receiver is 4 k $\Omega$ , which enables the receiver to drive up to ten 4 k $\Omega$  loads plus one 120  $\Omega$  termination resistor.



## 8 Appendix 2: Modbus Registers and Parameters

### 8.1 Register

| Register Type           | Data Type | Access Type | Parameter Code | PLC Address    | Register Address |
|-------------------------|-----------|-------------|----------------|----------------|------------------|
| Coil register           | Bit       | Read/Write  | 01H 05H 0FH    | 00001 to 09999 | 0000H to FFFFH   |
| Discrete input register | Bit       | Read-only   | 02H            | 10001 to 19999 | 0000H to FFFFH   |
| Input register          | Word      | Read-only   | 04H            | 30001 to 39999 | 0000H to FFFFH   |
| Holding register        | Word      | Read/Write  | 03H 06H 10H    | 40001 to 49999 | 0000H to FFFFH   |

### 8.2 Parameter

| Parameter | Description               | PLC address    | Register address | 位/字操作     | Operand:           |
|-----------|---------------------------|----------------|------------------|-----------|--------------------|
| 01H       | Reads registers           | 00001 to 09999 | 0000H to FFFFH   | Operation | Single or multiple |
| 02H       | Reads input registers     | 10001 to 19999 | 0000H to FFFFH   | Operation | Single or multiple |
| 03H       | Read holding register     | 40001 to 49999 | 0000H to FFFFH   | Operation | Single or multiple |
| 04H       | Reads input registers     | 30001 to 39999 | 0000H to FFFFH   | Operation | Single or multiple |
| 05H       | Writes a single register. | 00001 to 09999 | 0000H to FFFFH   | Operation | 单个                 |
| 06H       | Writes a single register. | 40001 to 49999 | 0000H to FFFFH   | Operation | 单个                 |
| 0FH       | Writes multiple registers | 00001 to 09999 | 0000H to FFFFH   | Operation | 单个                 |
| 10H       | Writes multiple registers | 40001 to 49999 | 0000H to FFFFH   | Operation | 单个                 |



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