

# Modbus (Two Channel Isolation)/EtherCAT Gateway

**GT200-EC-RS**

## User Manual

**V 1.2**

**Rev A**



***SST Automation***

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# Important Information

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# 1 Product Overview

## 1.1 Product Function

GT200-EC-RS is a device that enables data communication between serial port networks and EtherCAT networks. Two serial ports can be respectively connected to devices with RS485 interfaces to the EtherCAT network. That is, it converts serial port devices (Modbus/general serial ports) into EtherCAT devices, enabling easy and secure connection and efficient communication between Modbus devices and the EtherCAT master station system.

## 1.2 Features

- Supports EtherCAT slave, compliant with IEC 61158 Type 12 (ETG.1000).
- Supports a maximum input of 512 bytes and a maximum output of 512 bytes.
- Support the EtherCAT master to establish communication with the slave through the ESI file.
- Supports PDO mapping, with selectable data types including Byte, Word, and Double Word.
- Support CoE mailbox service, compliant with CiA301.
- Add a termination resistor to the RS-485 interface, which can be set via a toggle switch.
- Configure the software SST-SEC-CFG, which supports two-way data monitoring, command status word and control word functions, etc.
- Support one - click restore to factory configuration.

## 1.3 Technical Specification

- [1] The EtherCAT network is independent of the two Modbus networks.
- [2] The EtherCAT network supports a maximum of 512 bytes of input and 512 bytes of output.
- [3] The EtherCAT network can cascade EtherCAT slave stations.
- [4] The synchronization type of the EtherCAT network is FreeRun.
- [5] EtherCAT supports CoE mailbox service and complies with CiA301.
- [6] Serial port parameters.

- Working mode: half-duplex.
- Baud rate: 300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2Kbps selectable.
- Data bits: 7 bits, 8 bits.
- Parity bit: None, Odd, Even are optional.
- Stop bits: 1 or 2 bits are selectable.

[7] GT200-EC-RS Gateway as Modbus Master:

- Function codes: Function No. 01H, 02H, 03H, 04H, 05H, 06H, 0FH, 10H.
- Format: RTU format and ASCII format.
- Functions: Selectable functions of continuous output, prohibited output, output on change, and single

output for write commands.

- Each master station can be configured with up to 100 Modbus commands.
- Support for automatic degradation function.
- Support for IO status word.
- Support the setting of clearing/holding input data when timeout.
- Supports the control word function, with options of shutdown, all commands, and write-only

commands.

- Modbus function codes 03H, 04H, 06H, and 10H support the "byte swapping" function, which helps users solve the big - endian and little - endian format issues of data between two networks.

[8] GT200-EC-RS Gateway as Modbus Slave:

- Function codes: functions with codes 01H, 02H, 03H, 04H, 05H, 06H, 0FH, 10H.
- Format: RTU format and ASCII format.
- Byte swapping: no swapping, two-byte swapping, four-byte register swapping, four-byte endian swapping.

[9] Power Supply: Isolated power supply, 24VDC (9V - 30V), 80mA (24VDC).

[10] Operating environment temperature: -40°C ~ 60°C, operating relative humidity 5% ~ 95% (non-condensing).

[11] Dimensions: 25mm (width) × 100mm (height) × 90mm (depth).

[12] Installation: 35mm guide rail.

[13] Protection Level: IP20.



[14] Test standard: Complies with EMC test standards.

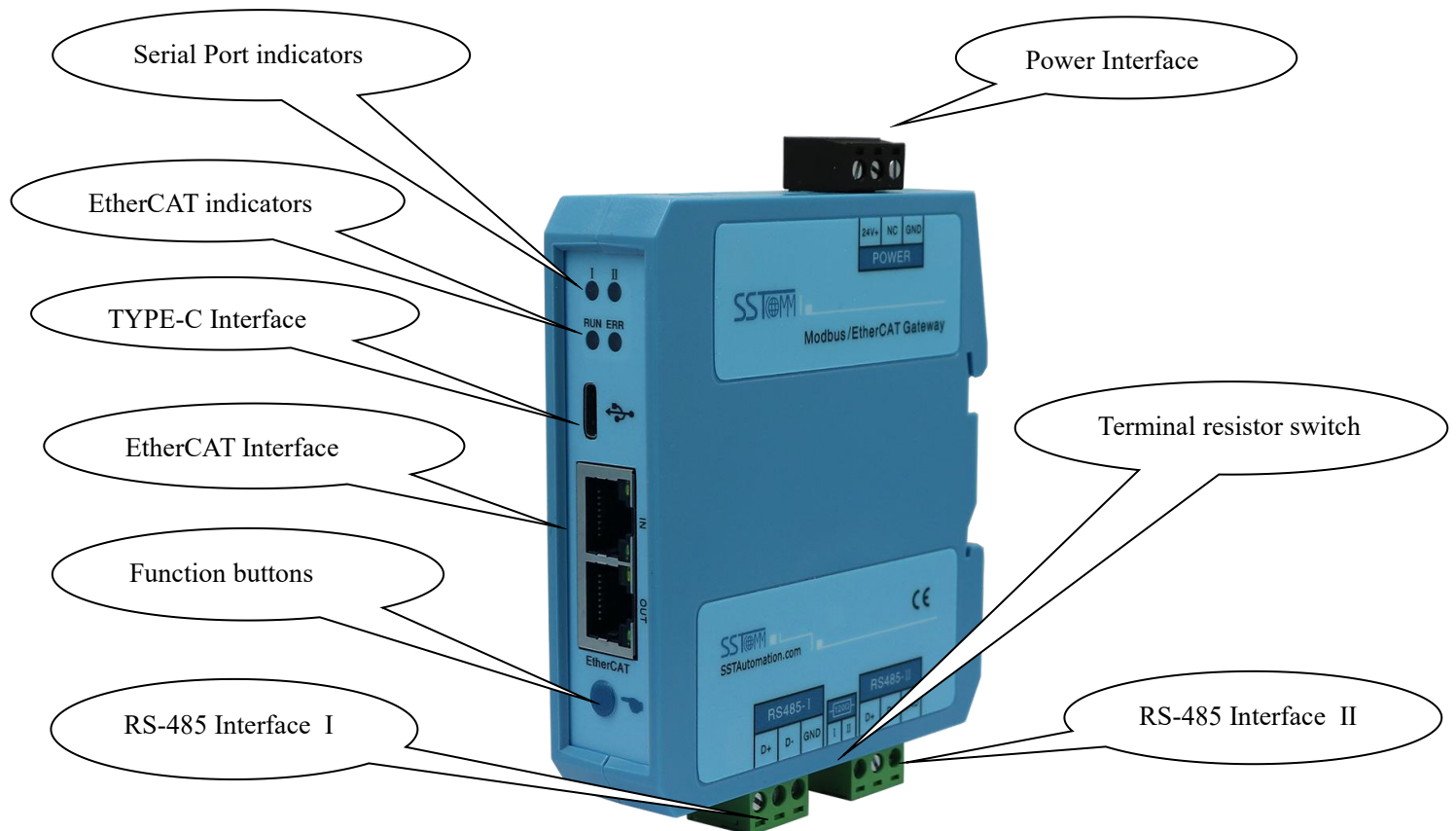
## 1.4 Revision History

| Revision      | Date       | Chapter | Description      |
|---------------|------------|---------|------------------|
| V1.2 Rev<br>A | 1/28/2026  | ALL     | Fix known errors |
| V1.2          | 12/19/2024 | ALL     | Initial version  |



## 2 Hardware Description

### 2.1 Appearance



Notes: This picture is for reference only. The product appearance is subject to the actual product.





## 2.2 LED Indicators

**Serial Port Indicators**

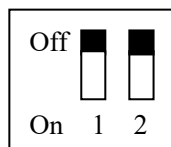
| Indicator Light     | State          | Description                          |
|---------------------|----------------|--------------------------------------|
| Serial Port 1 TX/RX | Red flashing   | Serial port is transmitting data     |
|                     | Red off        | Serial port has no data transmission |
|                     | Green flashing | Serial port is receiving data        |
|                     | Green off      | Serial port has no data reception    |
| Serial Port 2 TX/RX | Red flashing   | Serial port is transmitting data     |
|                     | Red off        | Serial port has no data transmission |
|                     | Green flashing | Serial port is receiving data        |
|                     | Green off      | Serial port has no data reception    |

**EtherCAT LED Indicators**

| Indicator Light | State                | Description                                             |
|-----------------|----------------------|---------------------------------------------------------|
| RUN             | Orange flashing(1HZ) | ECAT initialization state (Init)                        |
|                 | Green flashing(2HZ)  | ECAT pre-operational state (Pre-Operational)            |
|                 | Green flashing(1HZ)  | ECAT safe-operational state (Safe-Operational)          |
|                 | Green On             | ECAT operational state (Operational)                    |
| ERR             | Red Off              | No errors                                               |
|                 | Red On               | Disconnected from master after connection establishment |
| RUN             | Orange On            | Bootloader mode                                         |

## 2.3 DIP Switches

A 2-position DIP switch is used to set whether the RS485 serial port uses a terminal resistor.



| SW (bit1,bit2) | Terminal Resistor |
|----------------|-------------------|
| OFF,OFF        | -                 |
| ON,ON          | 120 $\Omega$      |



## 2.4 Configuration Button

- **Firmware Upgrade**

Press and hold the button while powering on to enter Bootloader; the RUN orange light stays on (both red and green lights on), and ERR is off.

- **Restore Default Configuration**

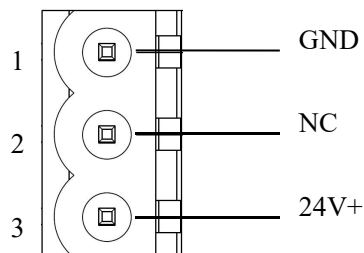
Within 10s after the device finishes power-on startup (i.e., RUN orange light is on), long-press the button for 5s, the RUN green light flashes (2Hz). Click the button within 5s, the RUN indicator turns off, and the device restores default configuration and restarts automatically.

- **Lock/Unlock Configuration**

In the device running state, double-click the button; The RUN red light turns on for 500ms and then turns off, indicating the configuration lock function is activated. Double-click the button again, the RUN red light turns on for 300ms, turns off for 400ms, then turns on for 300ms and turns off, indicating the configuration unlock function is activated. When the RUN red light is on, the RUN green light is off; when the RUN red light is off, the RUN green light turns on again. After locking the configuration, the configuration software cannot upload or download device configurations after searching for the device. After unlocking the configuration, the configuration software can normally upload and download device configurations after searching for the device.

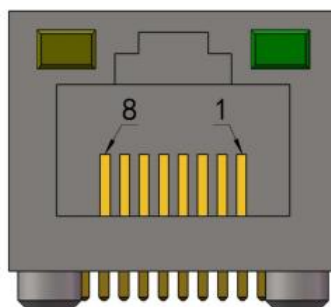
## 2.5 Interface

### 2.5.1 Power Interface



| Pin | Function                                  |
|-----|-------------------------------------------|
| 1   | GND, DC 24V power negative                |
| 2   | NC, no connection                         |
| 3   | 24V+ , DC 24V power positive, range 9~30V |

## 2.5.2 Ethernet Interface



The Ethernet interface adopts a standard RJ45 interface, complying with IEEE802.3u 100BASE-T standard.

| Pin      | Signal Description            |
|----------|-------------------------------|
| S1       | TXD+, Tranceive Data+, Output |
| S2       | TXD-, Tranceive Data-, Output |
| S3       | RXD+, Receive Data+, Input    |
| S6       | RXD-, Receive Data-, Input    |
| S4,5,7,8 | Reserved                      |

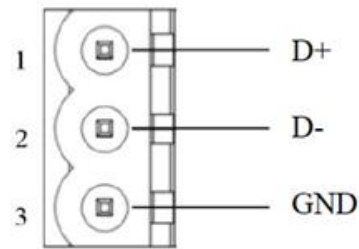


### 2.5.3 RS485 Port

The 485 interface of GT200-EC-RS is a standard RS485 interface.

1.RS485 interface pin definition:

| Pin | Function                                                                  |
|-----|---------------------------------------------------------------------------|
| 1   | D+, RS485 data positive, connected to the data positive of user equipment |
| 2   | D-, RS485 data negative, connected to the data negative of user equipment |
| 3   | GND                                                                       |



2.Basic characteristics of RS485 transmission technology:

- ① Network topology: Linear bus, with active bus terminal resistors at both ends.
- ② Transmission rate: 1200 bit/s ~ 115.2K bit/s.
- ③ Medium: Shielded twisted-pair cable. Shielding can be omitted depending on environmental conditions (EMC).
- ④ Number of stations: 32 stations per segment (without repeater), up to 127 stations (with repeater).
- ⑤ Plug connection: 3-pin detachable terminal. Each terminal is equipped with a 120Ω terminal resistor DIP switch: the terminal resistor is connected when the switch is on and disconnected when the switch is off.

**Note:** For RS485 point-to-multipoint communication, to prevent signal reflection and interference, it is recommended to turn on the RS485 serial port terminal resistor switch of the gateway.

### 2.5.4 TYPE-C Port

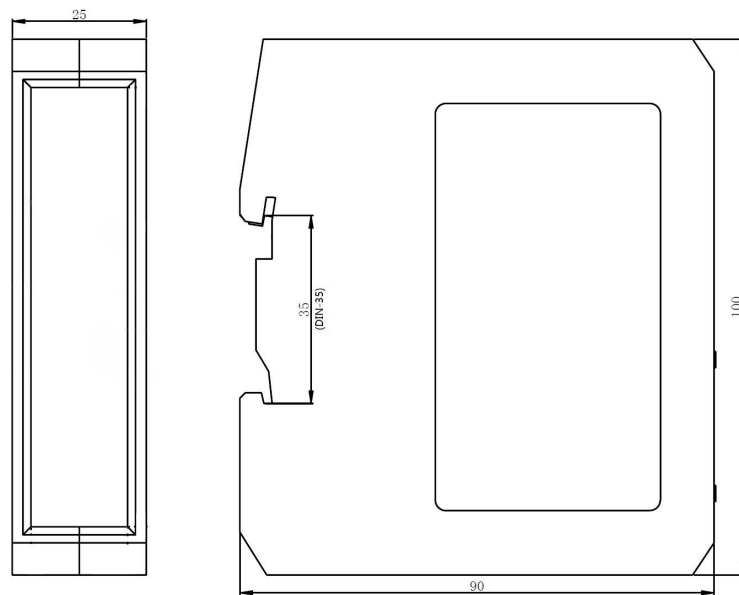
GT200-EC-RS uses a TYPE-C interface as the configuration and debugging interface, which can be used for uploading and downloading serial port parameters.



## 3 Hardware Installation

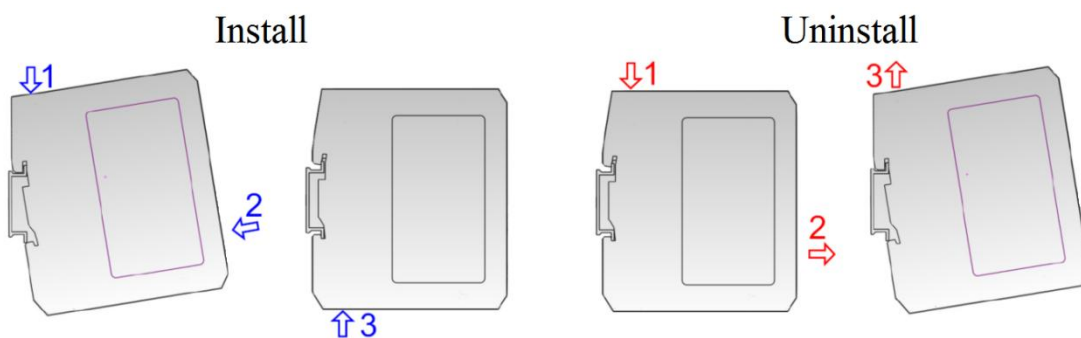
### 3.1 Mechanical Dimensions

1 in \* 4 in \* 3.5 in (25mm \* 100mm \* 90mm)



### 3.2 Installation Method

Install using a 35mm (1.4in) DIN rail.





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## 4 Quick Start Guide

### 4.1 Wiring

1. Complete hardware wiring according to "2.5 Interfaces" in the manual, and connect the ECAT master device to the Ethernet IN port of GT200-EC-RS with a network cable.
2. Connect serial devices.
3. Configure Modbus parameters through the configuration software SST-SEC-CFG.
4. Power on the gateway and download the configuration to the gateway.

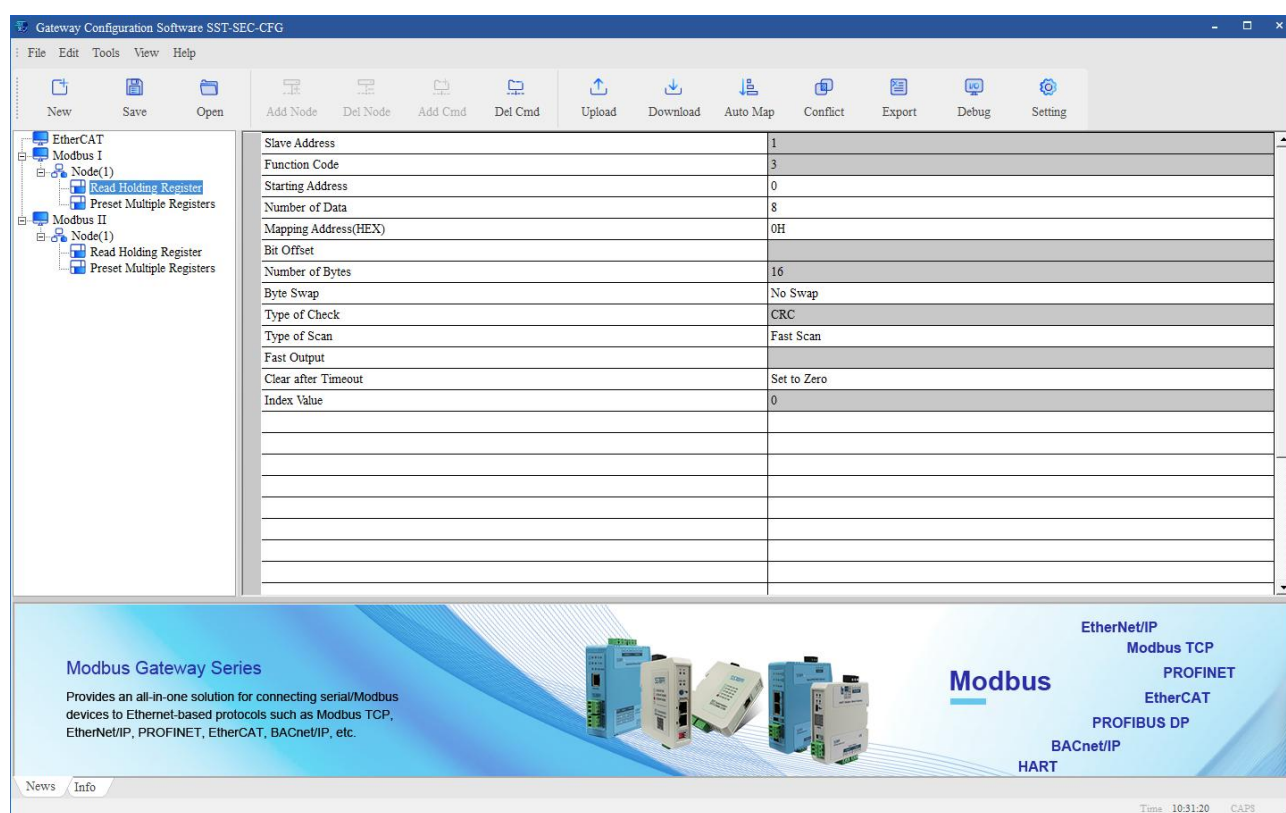
### 4.2 Basic Software Operations

1. Download software:
  - Log in to [www.sstautomation.com](http://www.sstautomation.com) to download the configuration software "SST-SEC-CFG" corresponding to the gateway. A "User Login" interface will pop up during download; if you have not registered before, please register first.
2. After installing the configuration software SST-SEC-CFG, double-click the desktop shortcut to open the configuration interface, which has default configurations for reference. However, users need to modify the configuration according to their own needs and download it to the product after completion. Please refer to Chapter 5 for the software usage method.
  - For device status and button operations, see 2.2 Indicators and 2.4 Buttons.
  - If the download fails: Is the download configuration correct? Is it set to the unlocked configuration state? Or please contact us for technical support.
3. After downloading the configuration, the device can be restarted automatically or manually. The downloaded configuration will take effect only after the restart is completed, and normal communication can be performed.

## 5 Configuration Software User Guide

### 5.1 Precautions Before Configuration

SST-SEC-CFG is a Windows-based software used to configure fieldbus gateway devices, which can set relevant parameters and commands of Modbus. Double-click the icon to enter the main interface of the software:



### 5.2 User Interface

The interface of GT200-EC-RS includes: title bar, menu bar, toolbar, status bar, device section, configuration section, and comment section.

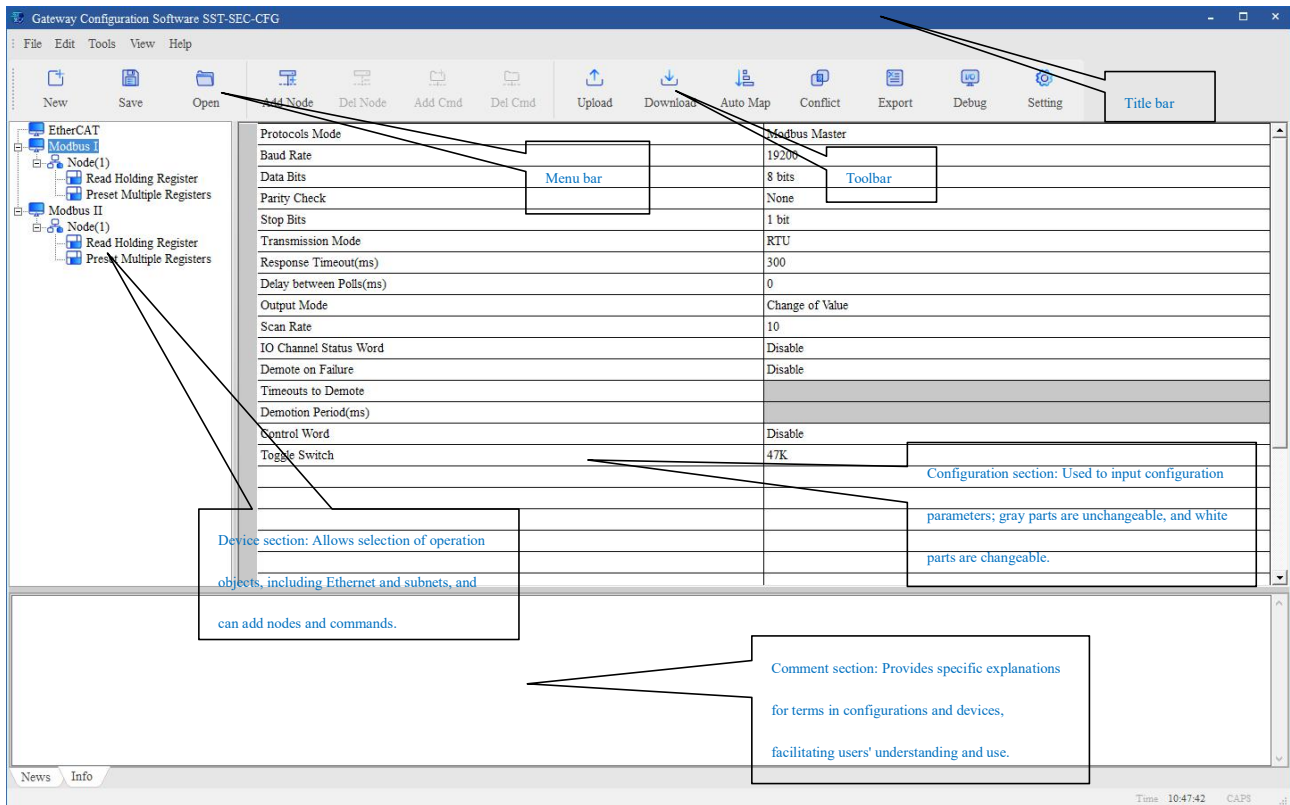
Note: In this software, all gray parts are unchangeable.



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Toolbar:

The toolbar is as shown in the figure below:



Functions from left to right: New, Save, Open, Add Node, Delete Node, Add Command, Delete Command, Upload, Download, Auto-mapping, Conflict Detection, Export Document, Debug, and Settings.



New: Create a new configuration project.



Save: Save the current configuration.



Open: Open a configuration project.



Add Node: Add a Modbus slave node.



Delete Node: Delete a Modbus slave node.



Add Command: Add a Modbus command.



Del Cmd Delete Command: Delete a Modbus command.



Upload Upload: Read configuration information from the module and display it in the software.



Download Download: Download configuration information from the software to the module.



Auto Map Auto-mapping: The software automatically calculates conflict-free memory mapping addresses for configured commands.



Conflict Conflict Detection: Detect address conflicts of "memory mapping start address" in the gateway.



Export Export Document: Export the current configuration to the local hard disk in .xls file format.



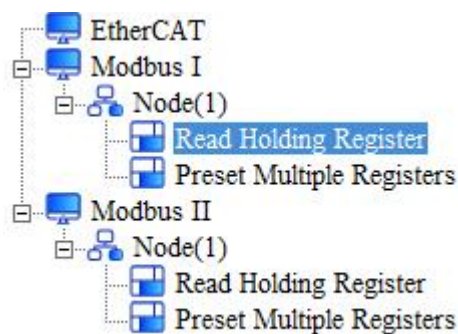
Debug Debug: Online debug data of serial ports or gateway input/output buffers.



Setting Settings: Chinese/English selection and font settings.

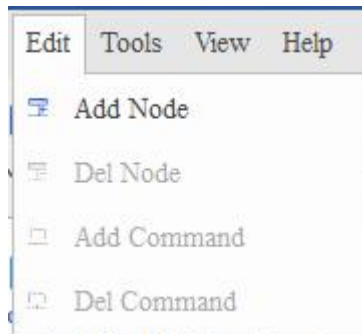
## 5.3 Device View Operations

### 5.3.1 Device View Interface

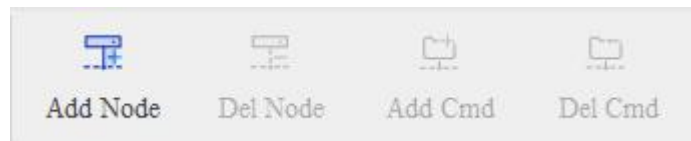


### 5.3.2 Device View Operation Methods

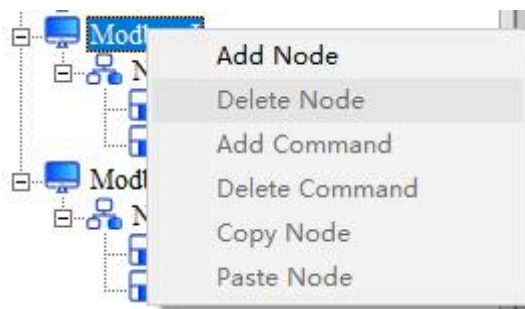
Select "Subnet", which supports three operation methods: edit menu, edit toolbar, and right-click edit menu.



Edit menu



Edit toolbar



Right-click edit menu

### 5.3.3 Types of Device View Operations

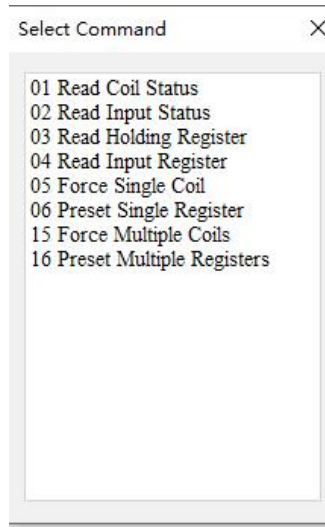
(1) Add Node Operation: Click the left mouse button on a subnet or an existing node to select the node, then perform the add node operation. A node named "Node (X)" will be added under the subnet.

(2) Delete Node Operation: Click the left mouse button to select the node to be deleted, then perform the delete node operation. The node and all its commands will be deleted.

(3) Add Command Operation: Click the left mouse button on a node, then perform the add command operation to add a command to the node. A command selection dialog box will pop up for users to choose.

Currently supported command numbers: 01, 02, 03, 04, 05, 06, 15, 16.

Select command: Double-click the command entry.



(4) Delete Command Operation: Click the left mouse button to select the command to be deleted, then perform the delete command operation. The command will be deleted.

(5) Copy Node Operation: Click the left mouse button on an existing node to select it, then perform the copy node operation (including all commands under the node).

(6) Paste Node Operation: Click the left mouse button to select any node in the serial port where you want to paste, then perform the paste node operation (including all commands under the copied node), and a new node. (including all commands under the copied node) will be added at the end of the serial port; the node address of the new node is default, and users need to add a node address for the new node.

## **5.4 Configuration View Operations**

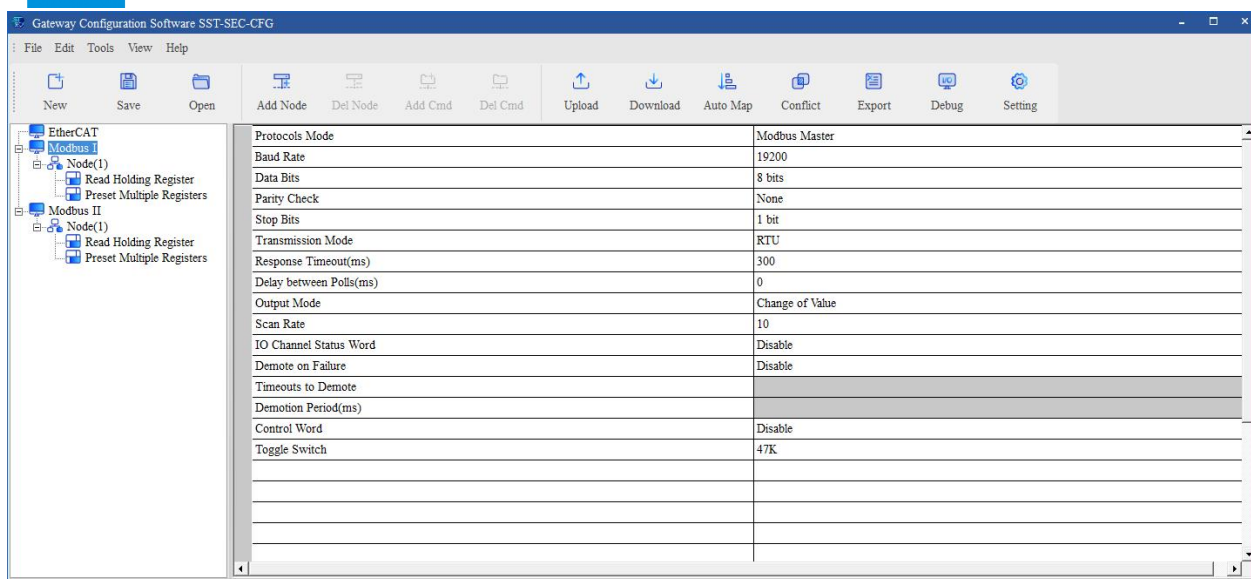
### **5.4.1 Serial Port Configuration View Interface**

#### **5.4.1.1 Modbus Master**

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**Serial Baud Rate:** Serial port baud rate setting, supporting baud rate range: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200bps. Default value: 19200bps.

**Data Bits:** Supports 7 bits or 8 bits. Default 8 bits.

**Modbus Master Mode:** When data bits are set to 7 bits, the communication transmission mode only supports "ASCII", and "None" parity + "1 bit" stop bits cannot exist simultaneously.

**Universal Mode:** When data bits are set to 7 bits, "None" parity + "1 bit" stop bits cannot exist simultaneously.

**Parity Mode:** Supports None, Odd, Even. Default "None".

**Stop Bits:** Supports 1 bit or 2 bits. Default 1 bit.

**Communication Transmission Mode:** Protocol type of Modbus communication transmission, supporting RTU and ASCII modes.

**Response Waiting Time (ms):** Time for Modbus master to wait for slave response after sending a command; range: 50~60000ms. Default value: 300ms.

**Polling Delay Time (ms):** Delay time before sending the next Modbus command after a Modbus command is sent and a correct response is received or a response timeout occurs. Range: 0~2500ms. Default value: 0ms.

**Output Command Polling Mode:** Output modes of Modbus write commands, with the following four modes:

(1) Continuous Output: Same as Modbus read command output mode, sending write commands cyclically.



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When the Modbus command scanning mode is set to slow scanning, it will be sent cyclically according to the scan ratio.

(2) Prohibit Output: Prohibit output of Modbus write commands.

(3) Output on Change: Output write commands when output data changes, and stop output after receiving a correct response.

(4) Output Once: Control word closed + output once. When the output data corresponding to the write command changes, output only once, and no longer output afterward (until power-on or restart).

Control word open + output once: Set the write command control bit to 1 to send the corresponding write command once, set to 0 and then to 1 to resend the corresponding write command once (without detecting whether the output data corresponding to the write command changes).

**Scan Ratio:** Ratio of slow scan cycle to fast scan cycle. Each Modbus command can be set to fast scan or slow scan. If this value is set to 10, fast scan commands will be sent 10 times, and slow scan commands will be sent once. Range: 1~255. Default value: 10.

**Modbus Status Word:** Supports "Close" and "Open". Default "Open".

When Modbus status word is set to "Open": Each command uses a bit to indicate the execution status. If executed successfully, the corresponding bit is set to 1, otherwise 0.

**Auto-degradation:** Supports "Close" and "Open". Default "Open".

When auto-degradation is "Open", if a command fails to respond (error) n times, and the command is in fast scan, it will be degraded to slow scan.

This parameter is only valid for Modbus read commands and continuously output write commands.

**Enter Auto-degradation After n Command Failures:** Enter auto-degradation state after n command response failures (errors). n is configurable. Range: 1~255. Default 3 times.

**Auto-degradation Time:** Determines the time that the degraded command remains in the degraded state. If the degradation time is reached, it will automatically return to the normal state. If a correct response is received in the degraded state, it will immediately return to the normal state. Range: 100 ~ 3600000ms. Default value 10000ms.

**Control Word:** Generate a control word for the read and write commands configured in the subnet at the front of the output data buffer. One command corresponds to one bit, and the command is enabled by setting the



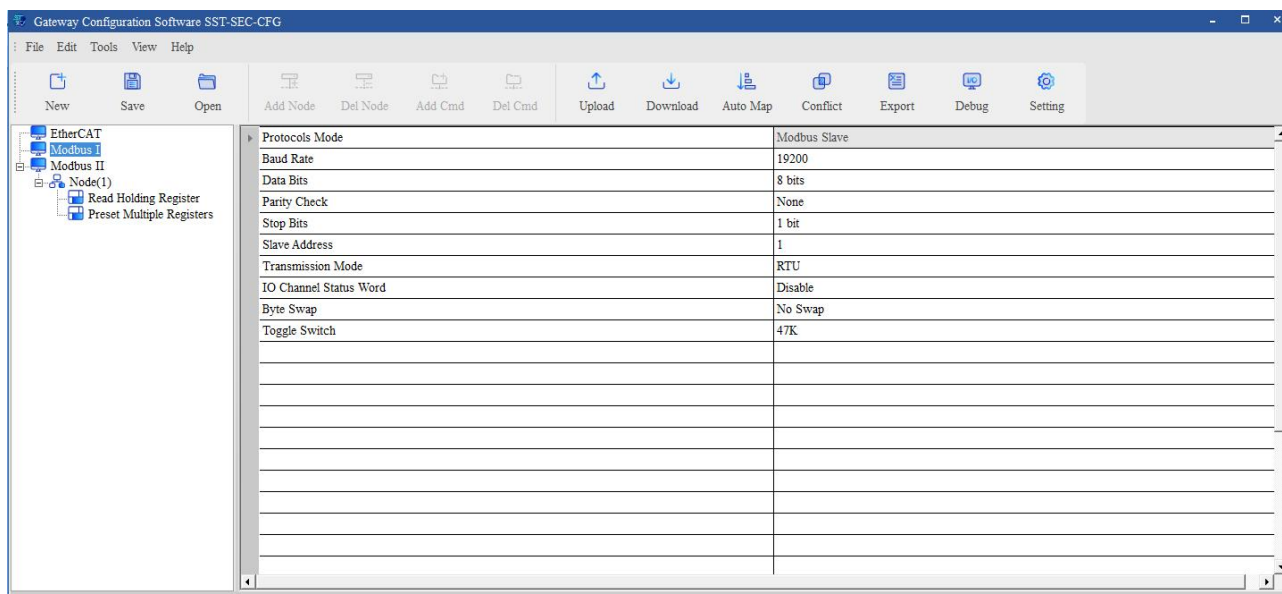
corresponding bit to 1. Options: Close, All Commands, Write-only Commands.

**Output Mode + Control Word:**

- Output on Change + All Commands = Each command corresponds to one bit. Control the sending of the corresponding command by setting the control bit to 1 or 0. The status word function is equivalent to a switch. Setting the address to 1 means the corresponding command is allowed to communicate, 0 means prohibited.
- Output on Change + Write-only Commands = Same as above. Read commands communicate normally. Only when the control bit corresponding to write commands is set to 1, write commands can output on change. When the control bit is set to 0, write commands cannot output;
- Continuous Output + All Commands = Each command corresponds to one bit. Control the sending of the corresponding command by setting the control bit to 1 or 0. The status word function is equivalent to a switch. Setting the address to 1 means the corresponding command is allowed to communicate, 0 means prohibited.
- Continuous Output + Write-only Commands = Same as above. Read commands communicate normally. Only when the control bit corresponding to write commands is set to 1, write commands can output continuously.
- Prohibit Output + All Commands = Status word function is useless. Write commands are prohibited from being sent; read commands communicate normally.
- Prohibit Output + Write-only Commands = Same as above.
- Output Once + All Commands = When enabled, the control word value must be set to 0 first, then to 1 to send a read or write command. After the command communication ends, it is necessary to set to 0 first and then to 1 again for the next command communication.
- Output Once + Write-only Commands = Same as above. Read commands communicate normally. Only for write commands.
- Output Once + Close = Write commands output only once as long as the output data is not 0 since the gateway is powered on, and no longer output afterward unless the gateway is reset or powered off and restarted.

**Pull-up/Pull-down Resistor Switch:** Select the resistance value of RS485 pull-up and pull-down resistors; option 47K: both pull-up and pull-down resistors are 47K; option 1K: both pull-up and pull-down resistors are 1K.

#### 5.4.1.2 Modbus Slave



- **Modbus Communication Baud Rate:** 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200bps (optional).
- **Data Bits:** 7 bits, 8 bits.
- **Parity Mode:** None, Odd, Even, Mark, Space (optional).
- **Stop Bits:** 1, 2 (optional).
- **Slave Address:** Range 1 ~ 247.
- **Communication Transmission Mode:** RTU, ASCII (optional).
- **IO Status Word:** When enabled, a 2-byte integer is used to indicate the number of correctly received frames.
- **Byte Swap:** No swap, 2-byte swap, 4-byte register swap, 4-byte endian swap (optional).
- **Pull-up/Pull-down Resistor:** Select the resistance value of RS485 pull-up and pull-down resistors. Option 47K: both pull-up and pull-down resistors are 47K. Option 1K: both pull-up and pull-down resistors are 1K.

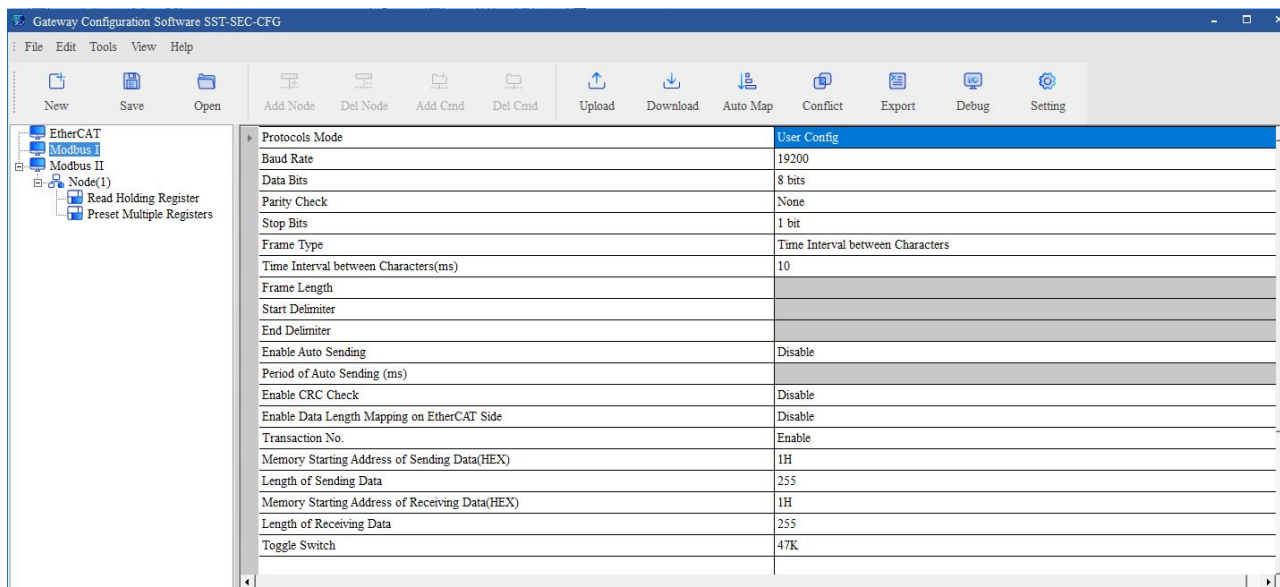


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### 5.4.1.3 Universal Mode



- **Modbus Communication Baud Rate:** 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200bps (optional).
- **Data Bits:** 7 bits, 8 bits.
- **Parity Mode:** None, Odd, Even, Mark, Space (optional).
- **Stop Bits:** 1, 2 (optional).
- **Control Mode:** There are three control modes for serial port data reception: Character Timeout, Character Count, Delimiter.
  - (1) Character Timeout: Determine the end of a frame of serial data by judging the time interval between characters.
  - (2) Character Count: Determine the end of a frame of serial data by judging the number of characters.
  - (3) Delimiter: Determine the start and end of a frame of data by judging the start and end characters of the data frame.
- **Character Timeout Time (ms):** Maximum allowed time interval between characters; range: 10 ~ 60000ms; default: 10ms.
- **Character Count:** Number of characters in the serial port received data frame; only valid when the control mode is "Character Count"; range: 1~254; default value: 111.

- **Start Character:** Start character of the received data frame; only valid when the control mode is "Delimiter"; when data bits are set to 8 bits, range: 0~255; when data bits are set to 7 bits, range: 0-127; default value: 0.
- **End Character:** End character of the received data frame; only valid when the control mode is "Delimiter"; when data bits are set to 8 bits, range: 0~255; when data bits are set to 7 bits, range: 0-127; default value: 0.
- **Auto-send:** Supports "Close" and "Open"; default "Close".  
  
Open: Send serial data according to the auto-send period regardless of whether the serial data changes.  
  
Close: Send serial data only when the data to be sent changes.
- **Auto-send Period (ms):** Period for serial port auto-sending data; only valid when auto-send is open; range: 10~60000ms; default value: 1000ms.
- **Use CRC Check:** Supports "Close" and "Open"; default "Close".  
  
Close: Do not use CRC check.  
  
Open: Serial port transmitted data can automatically add a 2-byte CRC check code; serial port received data can automatically judge whether the CRC check code is correct, and automatically remove the 2-byte CRC check code from the EtherCAT input data.  
  
Only valid when the control mode is "Character Timeout" or "Character Count".
- **Input Valid Data Length:** Supports "Close" and "Open"; default "Close".  
  
When set to "Open", each time data is input from the EtherCAT side, a byte is added at the frame header to indicate the input valid data length, identifying the actual valid data length.
- **Transaction Sequence Number:** Supports "Close" and "Open"; default "Open".  
  
When set to "Open", a byte is added at the frame header to indicate the transaction sequence number, identifying the data frame, cycling from 0~255; when inputting data from the EtherCAT side, input a frame of data, and the transaction sequence number increases by 1; when outputting data from the EtherCAT side, the transaction sequence number increases by 1, and output a frame of data.
- **Memory Mapping Start Address of Transmitted Data (hexadecimal):** Address offset in the output buffer; data direction: EtherCAT->serial port; range: 0x0-0x1FE.
- **Mapping Data Length of Transmitted Data:** Number of bytes mapped to the output buffer; range:

2-256.

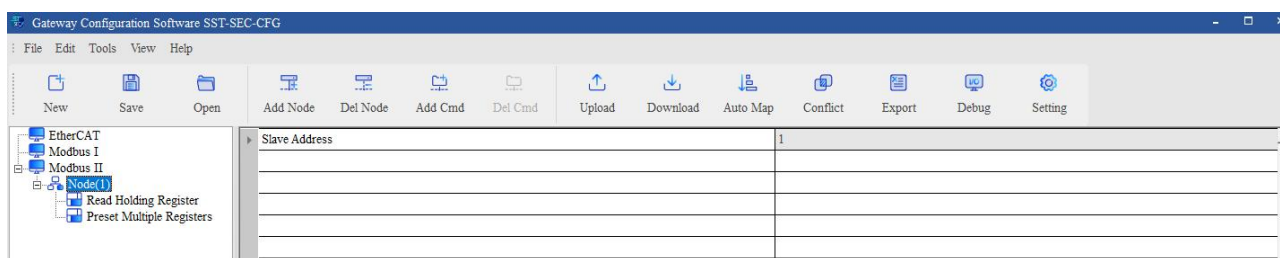
Memory Mapping Start Address of Received Data (hexadecimal): Address offset in the input buffer;  
data direction: serial port->EtherCAT; range: 0x0-0x1FE.

Mapping Data Length of Received Data: Number of bytes mapped to the input buffer; range: 2-256.

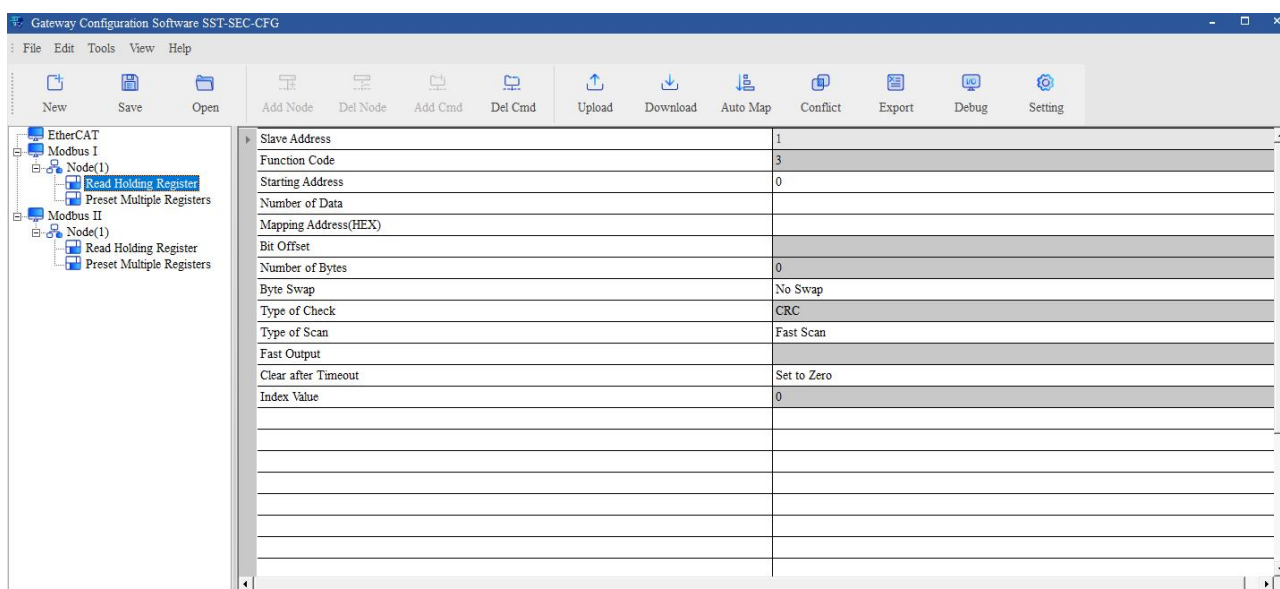
- **Pull-up/Pull-down Resistor:** Select the resistance value of RS485 pull-up and pull-down resistors;  
option 47K: both pull-up and pull-down resistors are 47K; option 1K: both pull-up and pull-down  
resistors are 1K.

## 5.4.2 Node Configuration View Interface

In the device view interface, click the new node, and the configuration view interface is displayed as follows:



## 5.4.3 Command Configuration View Interface

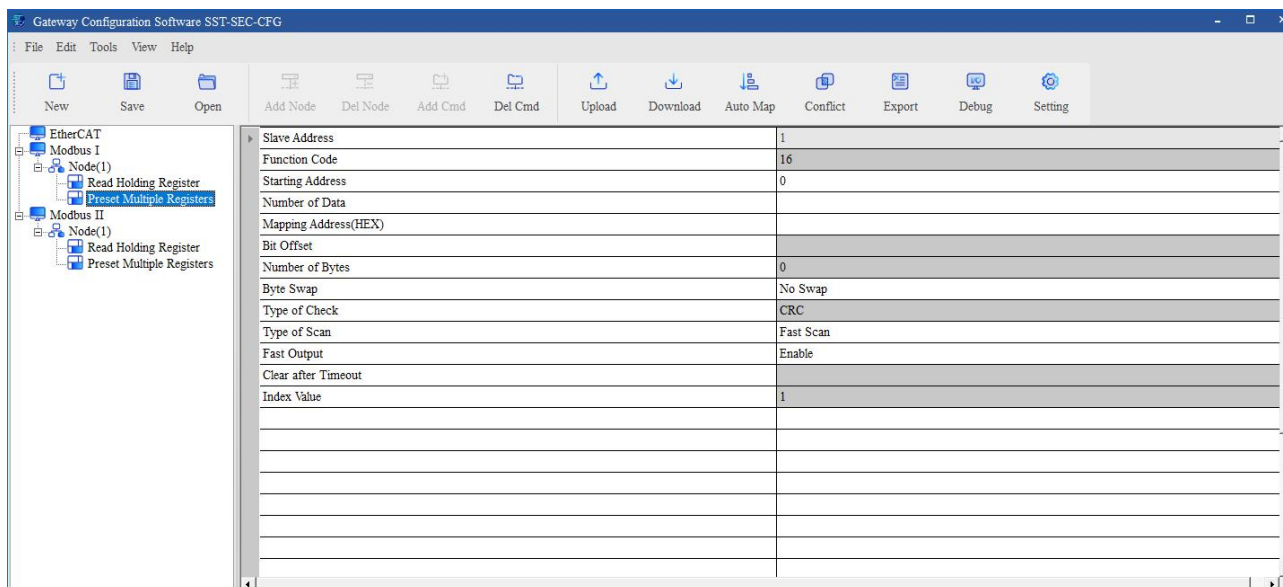


# GT200-EC-RS

## Modbus (2 Channel Isolation) / EtherCAT Gateway

### User Manual

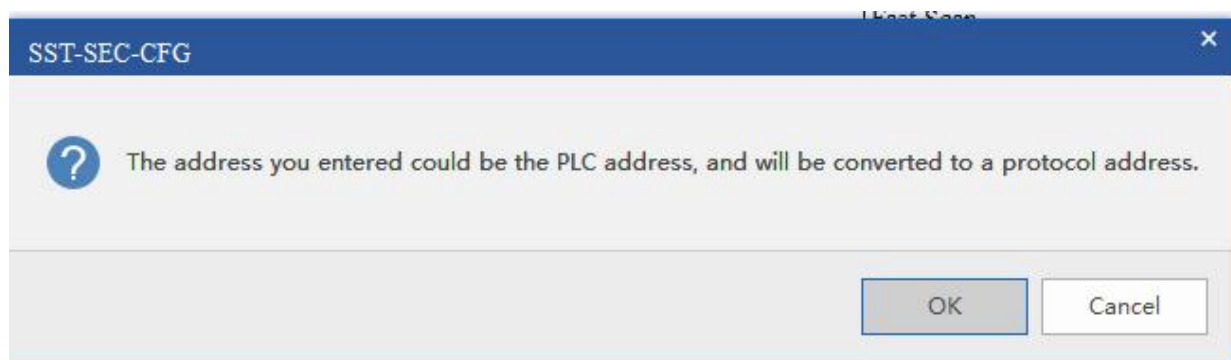
#### Interface of Command 03



#### Interface of Command 16

Modbus Register Start Address: Start address for reading/writing commands in the Modbus slave device; range: 0 - 65535.

**Note:** This entry in the configuration software SST-SEC-CFG refers to the protocol address. When the user inputs a PLC address, a dialog box as shown in the figure below will automatically pop up after confirmation. After clicking OK, the PLC address input by the user will be converted to the protocol address.



Examples of PLC addresses and corresponding protocol addresses are as follows:

| Command | PLC Address Example | Corresponding Protocol Address |
|---------|---------------------|--------------------------------|
|---------|---------------------|--------------------------------|

|                   |             |             |
|-------------------|-------------|-------------|
| Coil Status       | 00001~00010 | 00000~00009 |
| Input Status      | 10001~10010 | 00000~00009 |
| Holding Registers | 40001~40010 | 00000~00009 |
| Input Registers   | 30001~30010 | 00000~00009 |

For example: When the configured Modbus command is 03H (Read Holding Registers), and the user inputs 40001 in this entry (Modbus Register Start Address), the dialog box shown above will pop up after confirmation. After clicking OK, the input PLC address 40001 will be converted to the protocol address 0.

**Data Count:**

For function codes (3, 4, 16, 23): range 1 - 100.

For function codes (1, 2, 15): range 1 - 400.

**Memory Mapping Start Address (hexadecimal):** Address range of data mapped in the module memory.

Hexadecimal display:

Read commands: 0x0000~0x01FF.

Write commands: 0x4000~0x41FF.

Decimal display:

Read commands: 0~511.

Write commands: 0~511.

**Memory Mapping Bit Offset:** For Modbus function codes 01, 02, 05, 15, this parameter can set the position of the bit address in the byte; range: 0 - 7.

**Byte Count:** Number of data bytes.

**Byte Swap:** Four types: No swap, 2-byte swap, 4-byte register swap, 4-byte endian swap.

No swap: Do not swap byte order.

2-byte swap: Swap the high byte and low byte in 2 bytes; e.g., 0x1234 is converted to 0x3412.

4-byte register swap: Swap the first 2 bytes and the last 2 bytes in 4 bytes; e.g., 0x12345678 is converted to 0x56781234.

4-byte endian swap: Swap the high byte and low byte in 4 bytes, and swap the second high byte and second low byte; e.g., 0x12345678 is converted to 0x78563412.

**Scan Mode:** Scanning mode of Modbus commands: Fast scan and Slow scan (optional); default Fast scan.



When the command is set to Slow scan, it is sent according to the scan ratio. For example, if the scan ratio is 10, fast scan commands are sent 10 times, and slow scan commands are sent once.

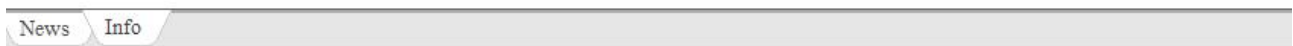
**Fast Output:** In Output on Change mode, for write commands, when Fast Output is "Open", the write command is output immediately when the buffer data corresponding to the write command changes; when "Close", the write command is output according to the configured read/write command polling when the buffer data corresponding to the write command changes.

**Identifier:** Only used to identify each command after the Modbus status word is enabled.

## 5.4.4 Comment View

The comment view displays explanations of corresponding configuration items. For example, when configuring Fast Output, the comment view displays as follows:

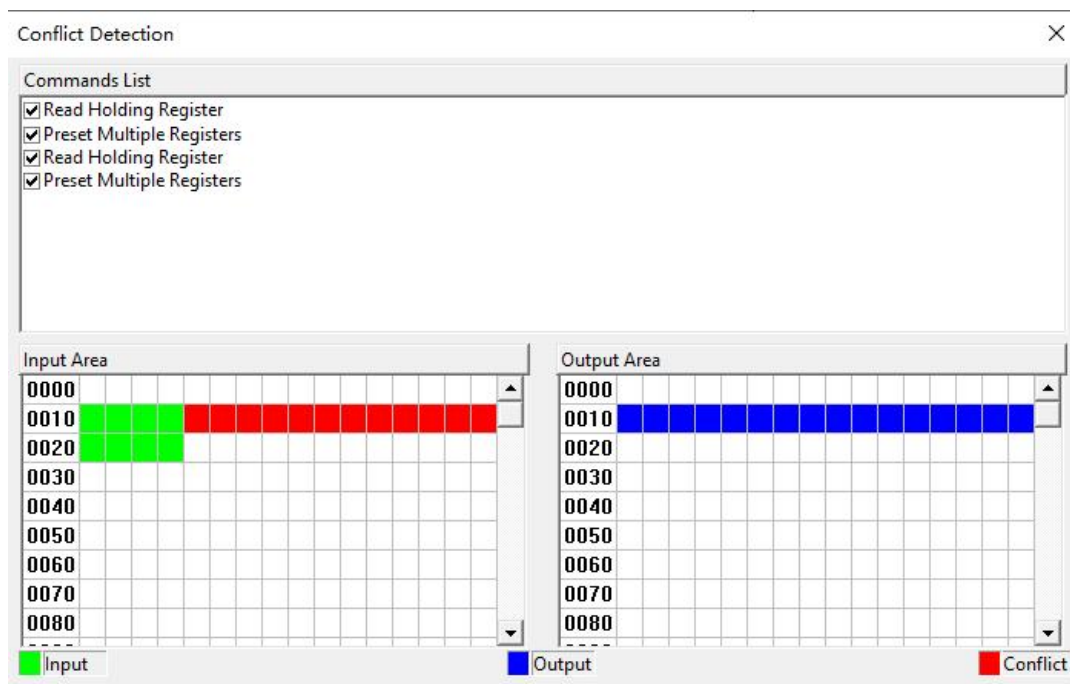
Type of Scan:  
Scanning method of Modbus command: Fast Scan and Slow Scan optional. Default value is Fast Scan.  
Issued at Scan Rate when the command is set to slow scan.  
For example: If Scan Rate is set to 10 then every fast scan command will be sent 10 times and those slow commands will be sent once.



## 5.5 Tools

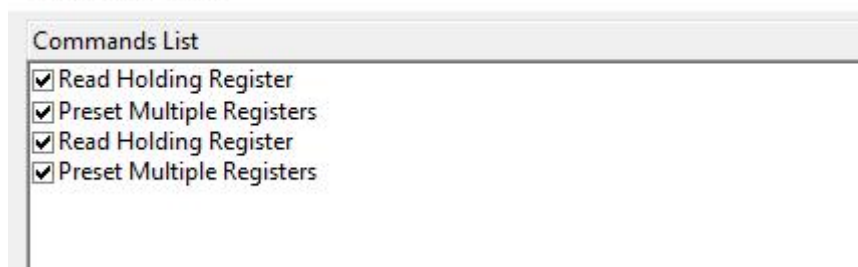
### 5.5.1 Conflict Detection

Used to detect whether there is a conflict in the "Memory Mapping Start Address"; if a conflict is found, adjustments can be made in time. The view is displayed as follows:



All configured commands are displayed in the command list view; the check box in front of each command is used to check the memory mapping position occupied by the command in the memory mapping area. Click a command to check the check box, and the corresponding space position occupied by the command will be displayed in the memory mapping area; click the command again to uncheck the check box, and the command will not display the occupied space in the mapping area. This function can be used to detect conflicts in the memory mapping area between commands.

Conflict Detection



The memory mapping area is divided into input area and output area; each square represents a byte address.

Green: Read commands are displayed in the input mapping area, showing green when there is no conflict.

Blue: When the address mapping area is in the output area, showing blue when there is no conflict.

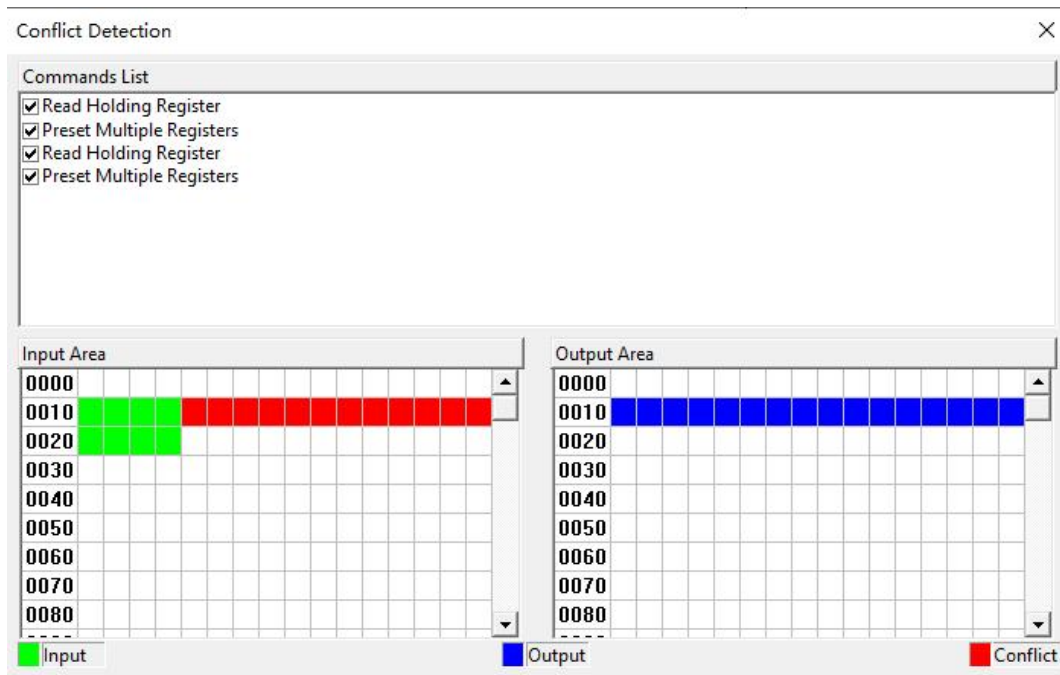
Red: In the input area or output area, if different commands occupy the same byte address, the byte area shows red.



# GT200-EC-RS

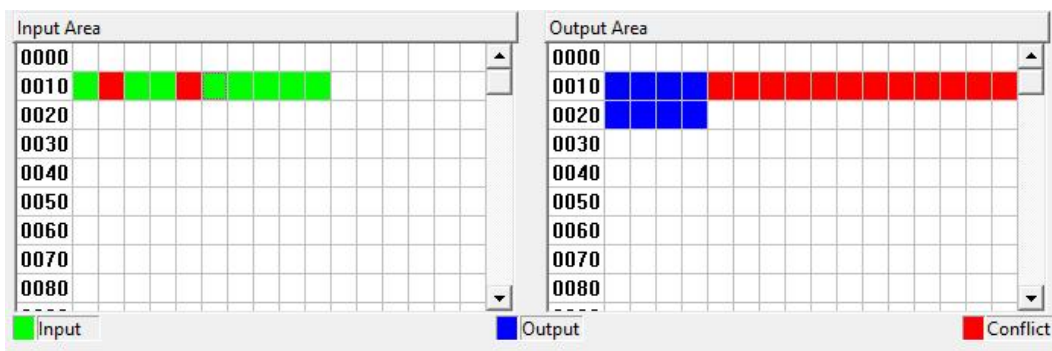
## Modbus (2 Channel Isolation) / EtherCAT Gateway

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The above color coding also applies to bit operation instructions.

Click a square in the input/output area, and whether each bit of the byte corresponding to the square is occupied will be displayed, as shown in the figure below:

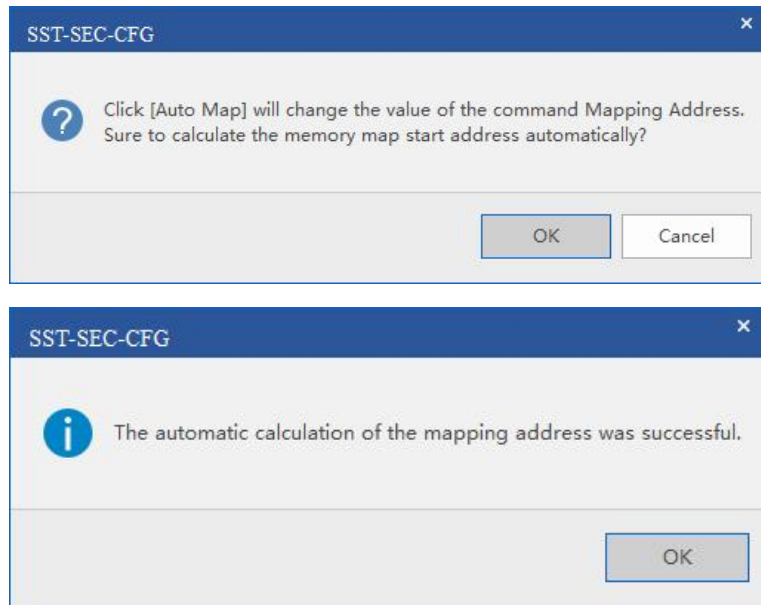


## 5.5.2 Auto-mapping

The auto-mapping function automatically calculates and fills in the mapping address; after this function takes effect, the set data will be re-filled. After auto-mapping, there are no address conflicts in the mapping buffer. It is related to the parameter "Data Count", which cannot be empty.

Select "Auto-mapping" in the "Tools" menu or click the "Auto-mapping" icon, and the following prompt will pop up:

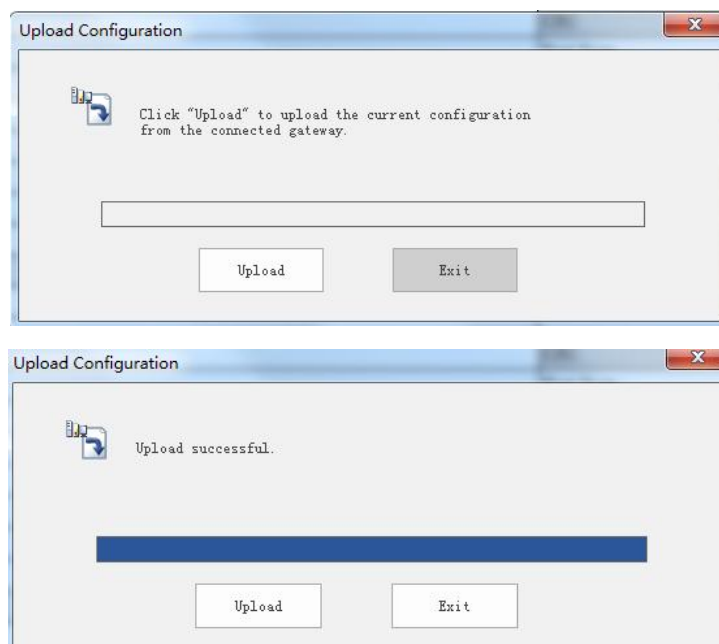




### 5.5.3 Upload Configuration

Select "Upload Configuration" in the toolbar or menu bar to upload the gateway configuration information from the device to the software, and view the specific configuration information of the gateway.

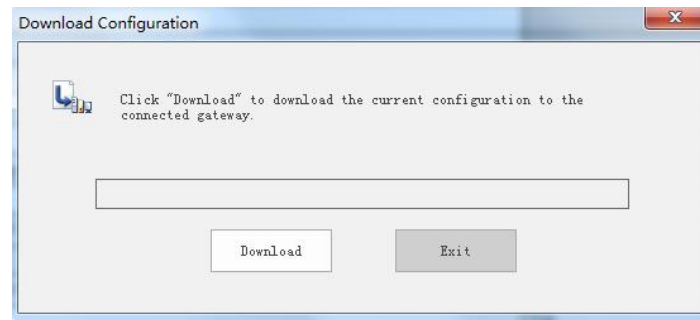
Click "Upload", the window displays the uploaded content, and the configuration upload is completed after a period of time.



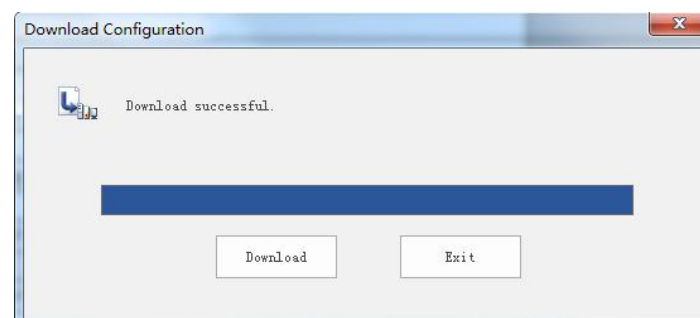
**Note:** The debug serial port needs to be selected for the first use.

## 5.5.4 Download Configuration

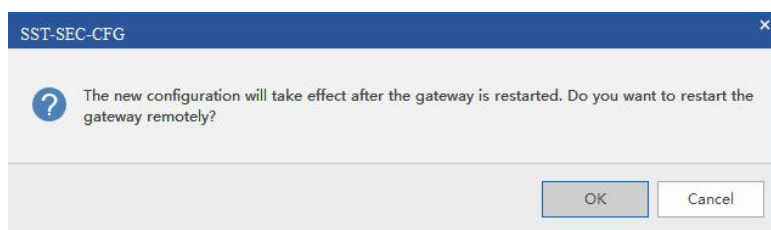
Select "Download Configuration" in the toolbar or menu bar to download the configuration information in the configuration software to the gateway; the display interface is as follows:



Click "Download", the window displays the downloaded content, and the configuration download is completed after a period of time.



Click "Cancel", and a device restart prompt pops up.



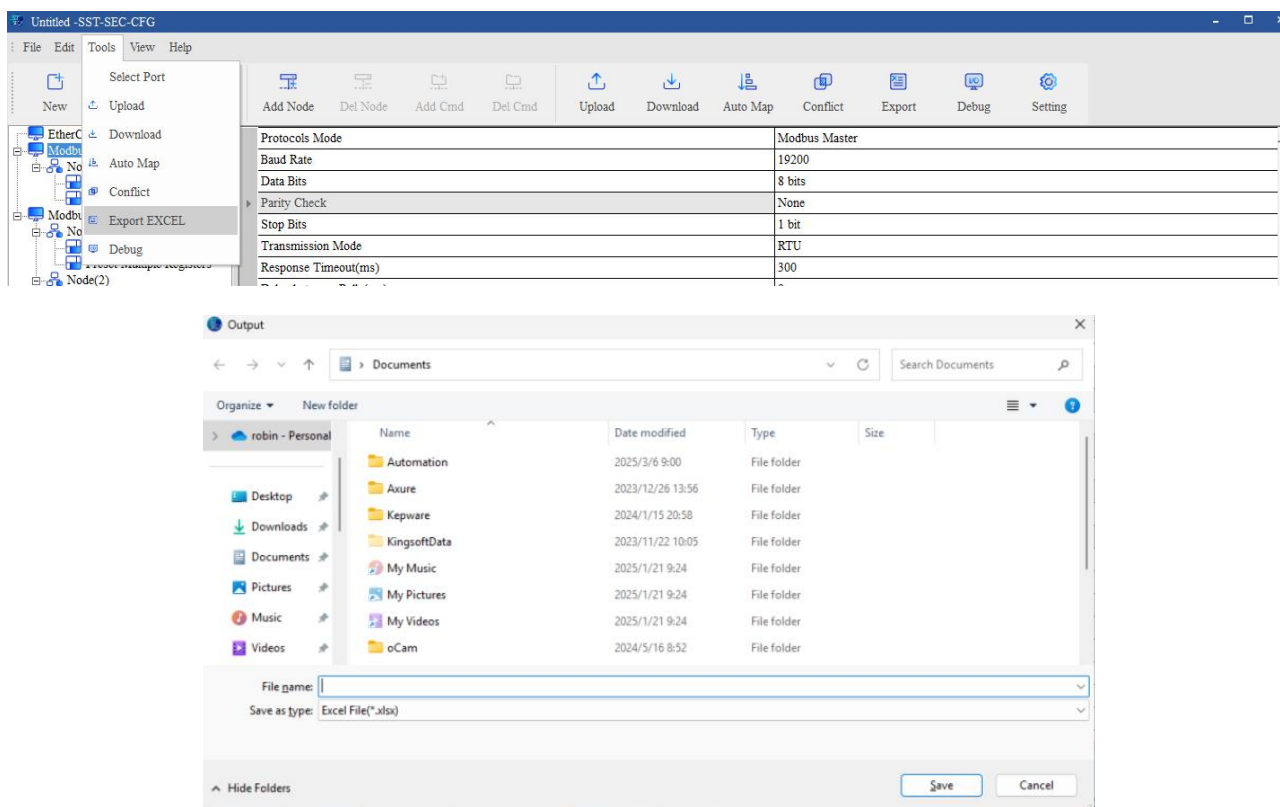
**Note:**

1. Before downloading, please confirm that all configurations are completed and correct.
2. The downloaded configuration requires the gateway to restart to take effect.
3. The debug serial port needs to be selected for the first use.

## 5.5.5 Export Document

Click the "Export Document" button in the toolbar or menu bar.

Exporting the configuration document helps users view relevant configurations; export the configuration information to an Excel document and save it, and select an appropriate path.



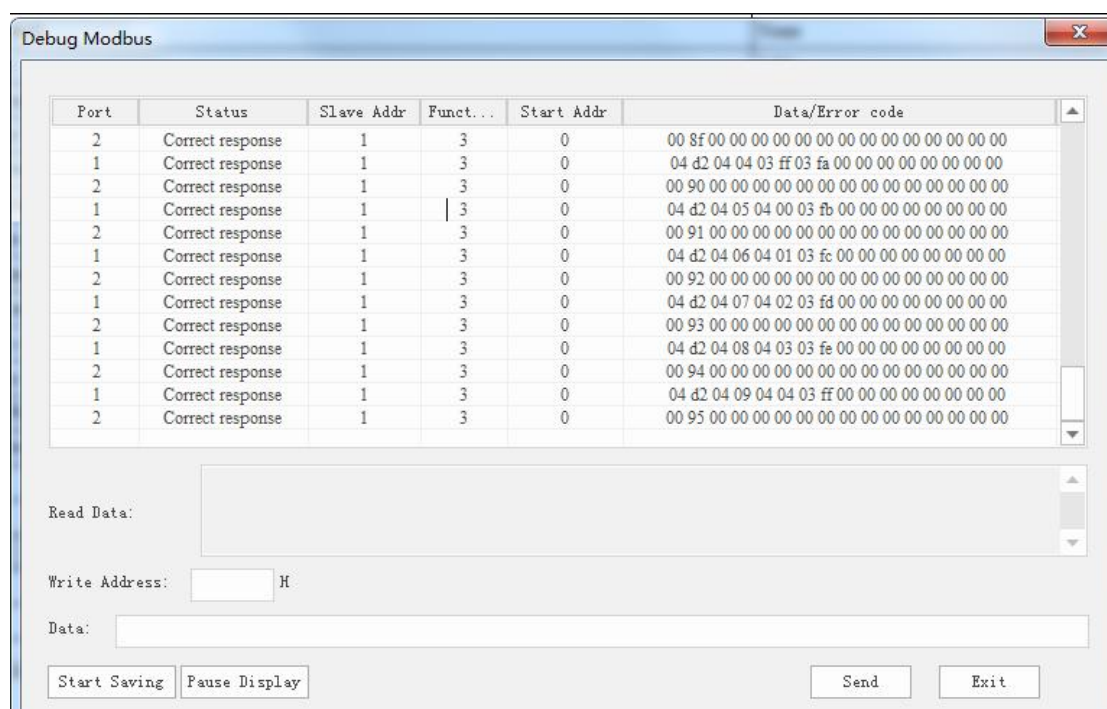
## 5.6 Debugging

The debugging function is divided into two debugging types: "Debug Modbus" mode is only available when the serial port is in Modbus master mode; "Debug Buffer" is available in both Modbus master mode and universal mode.



## 5.6.1 Debugging Modbus

The interface of the Modbus debugging function is as follows:



Memory Mapping Address: Start address where data is written to the gateway memory

Data: Data to be written to the gateway memory

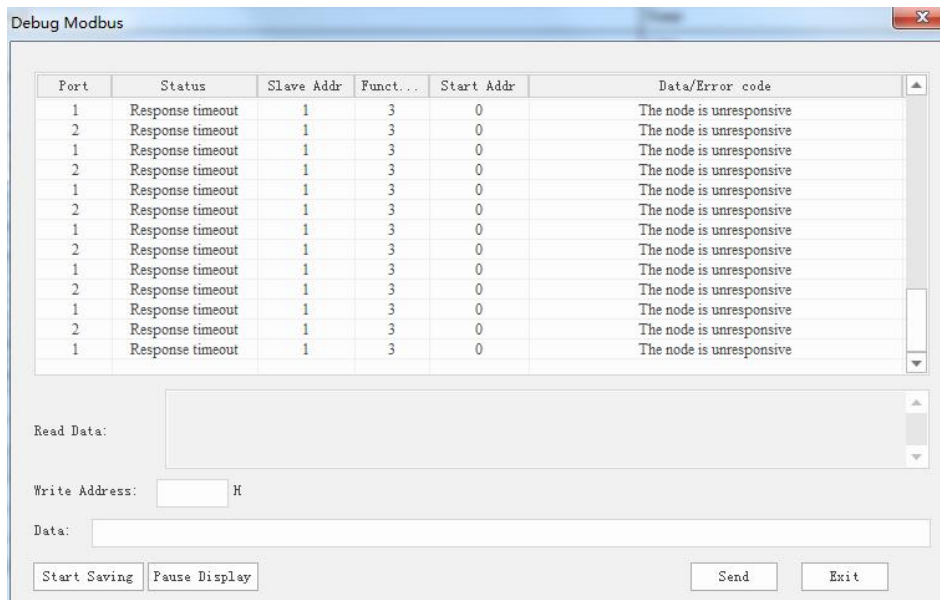
When the data in the gateway memory input buffer times out or has no response:

# GT200-EC-RS

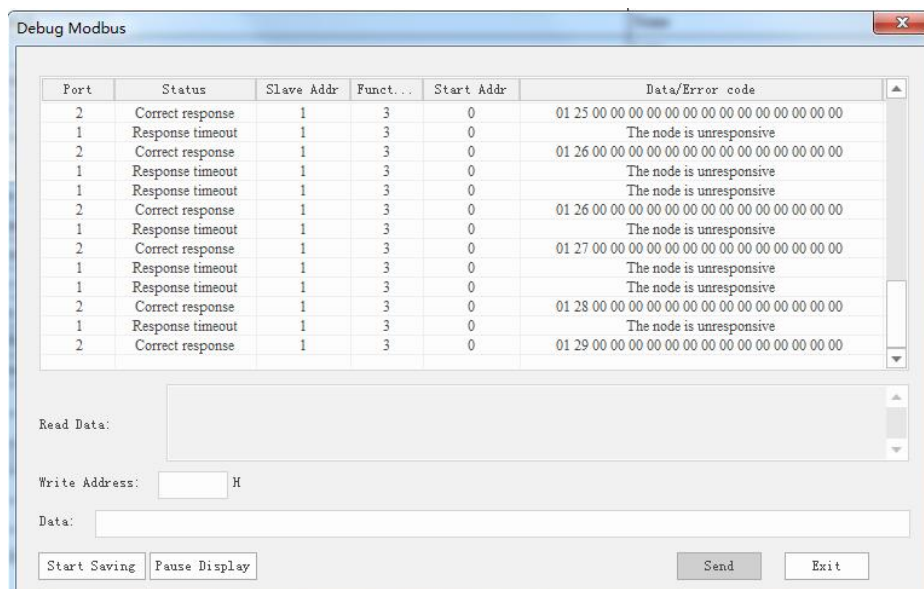
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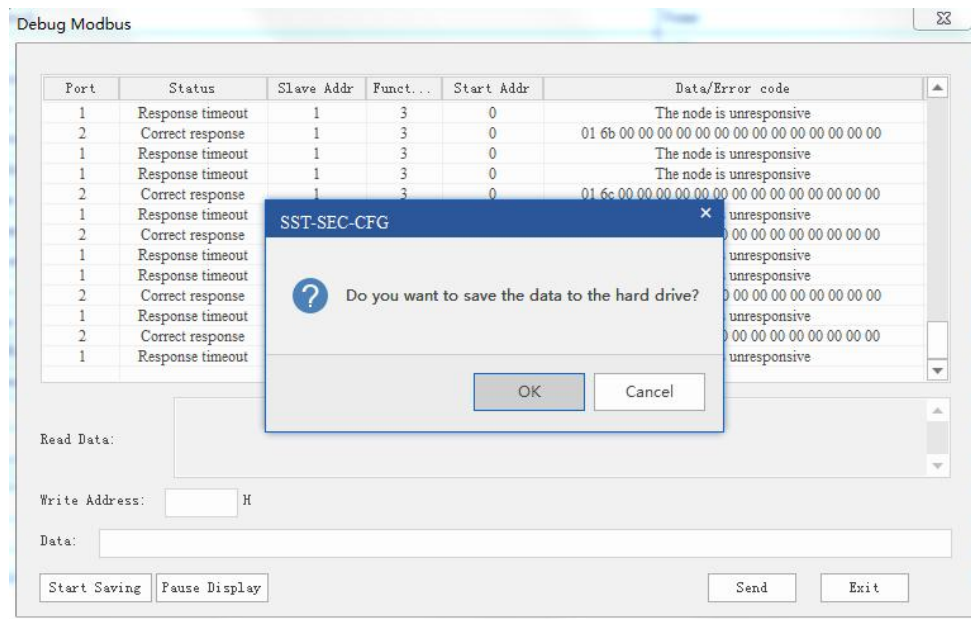
When the data in the gateway memory input buffer is correct:



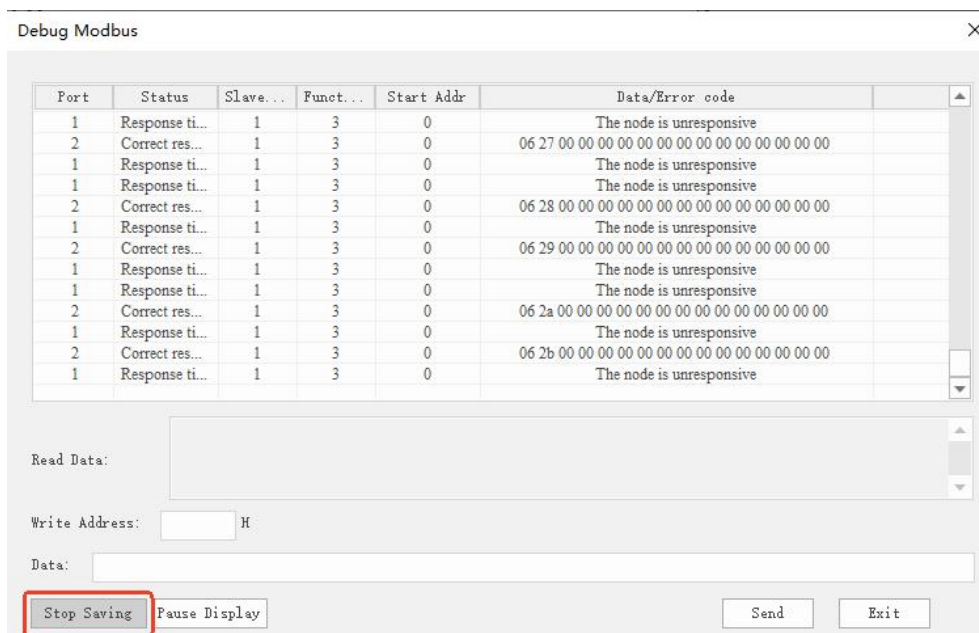
After the user fills in the correct "Memory Mapping Address" and "Data", click the "Send" button to send the data packet.



Users can click the "Save" button to save the received data to the computer hard disk:



After saving, users can click the "Stop Saving" button to stop saving the received data to the computer hard disk:



Click to open the .txt document saved to the hard disk:



```

Port      2
Status    Correct response
Slave Addr 1
Function Code      3
Start Addr0
Data/Error code  06 8f 00 00 00 00 00 00 00 00 00 00 00 00 00
  
```

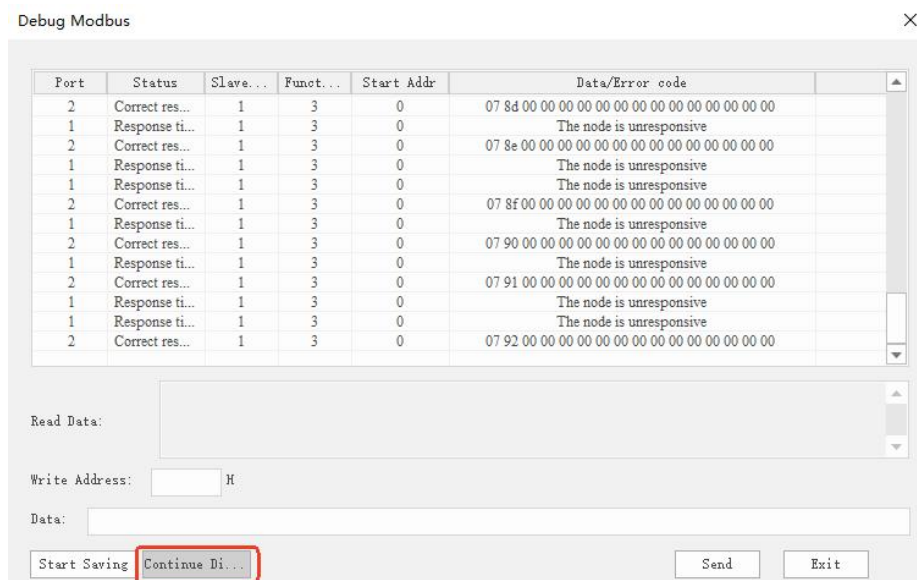
```

Port      1
Status    Response timeout
Slave Addr 1
Function Code      3
Start Addr0
Data/Error code
  
```

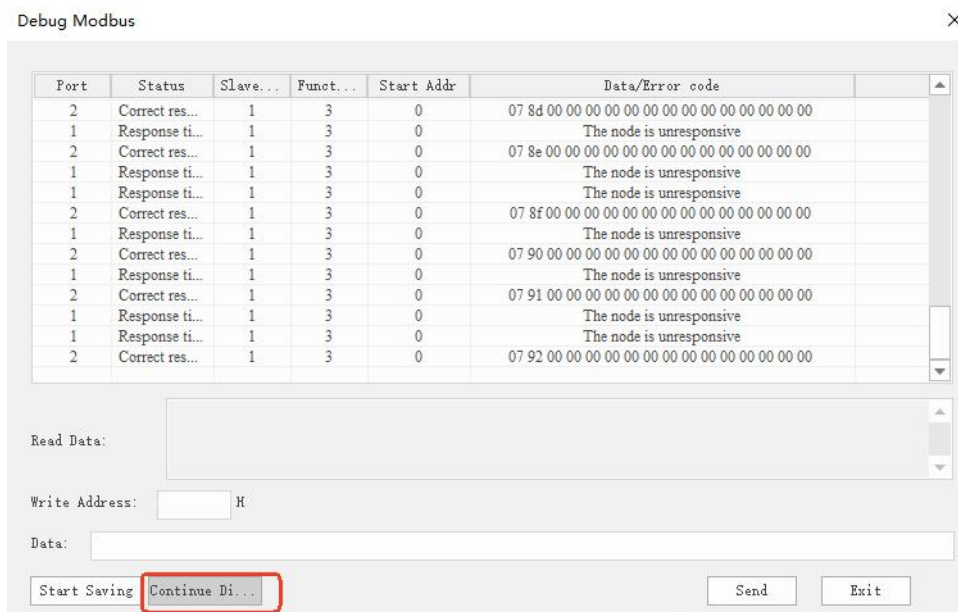
```

Port      1
Status    Response timeout
Slave Addr 1
Function Code      3
Start Addr0
Data/Error code
  
```

Users can click the "Pause Display" button to pause displaying the received data:

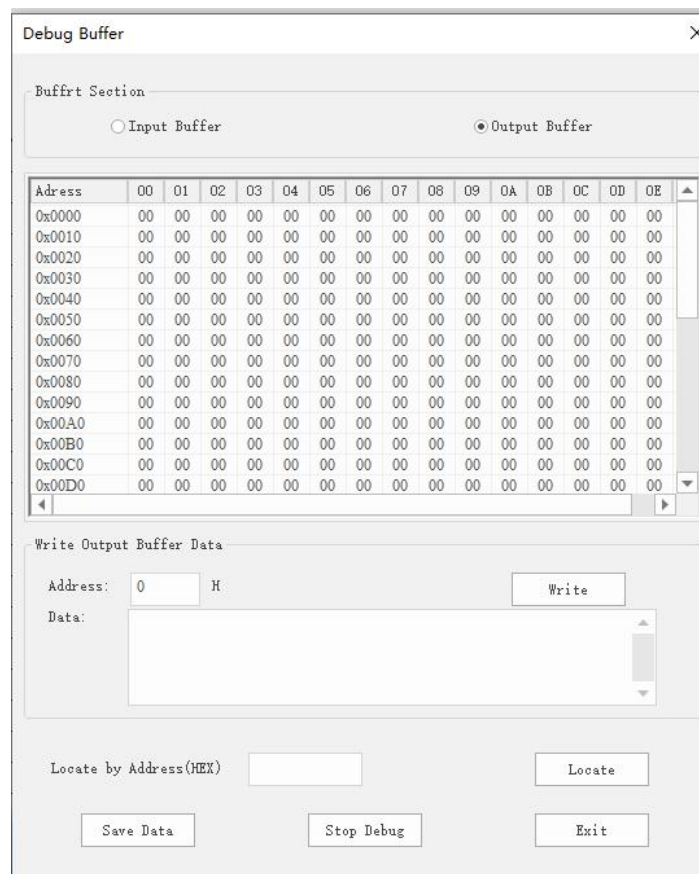


After pausing, users can click the "Continue Display" button to resume displaying the received data content:



## 5.6.2 Debugging Buffer

The interface of the buffer debugging function is as follows:





Users can switch the buffer to be debugged through "Buffer Selection":

Debug Buffer

Buffer Section

☐ Input Buffer
 ☒ Output Buffer

The data of the buffer selected for debugging will be displayed in the table interface below.

| Address | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0x0000  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0010  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0020  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0030  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0040  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0050  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0060  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0070  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0080  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0090  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x00A0  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x00B0  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x00C0  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x00D0  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |

Users can quickly jump to the corresponding address for debugging by filling in the address in "Locate by Address (HEX)" and clicking the "Locate" button:

| Address | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0x0060  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0070  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0080  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0090  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x00A0  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x00B0  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x00C0  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x00D0  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x00E0  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x00F0  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0100  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0110  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0120  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 0x0130  | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |

Write Output Buffer Data

Address: 00F0 H

Write

Data:

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Users can write data to the corresponding buffer through the "Write" button in "Write Input Buffer Data":

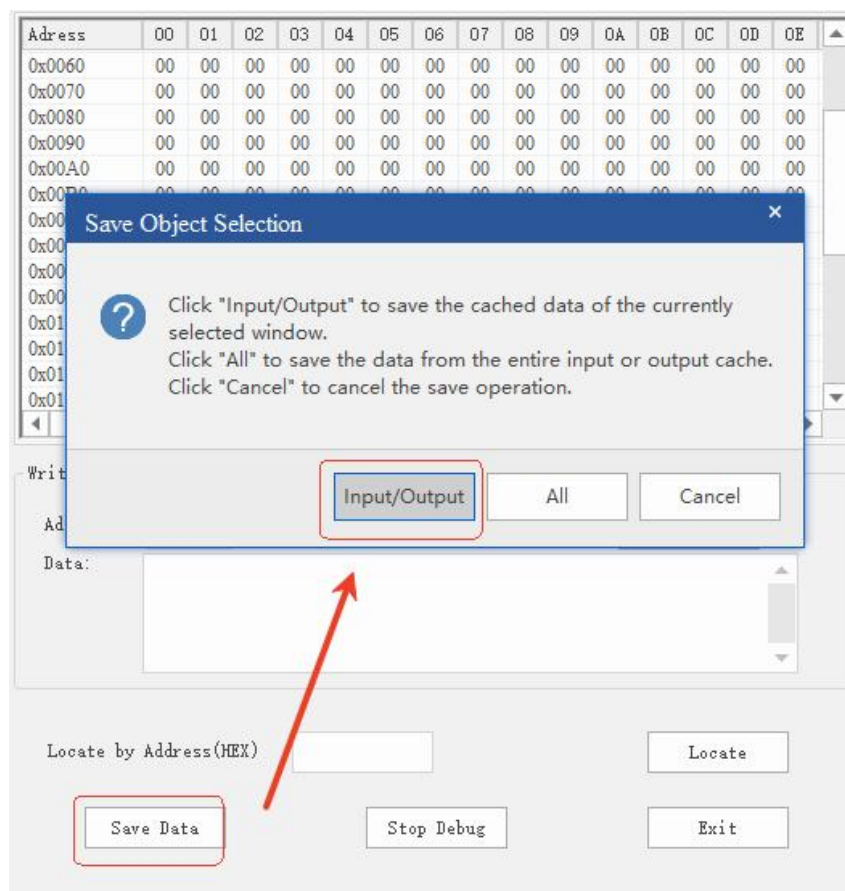
Address: The start address where data is written to the gateway memory

Data: The data to be written to the gateway memory



Users can click the "Save Data" button to save the received data to the computer's hard disk:

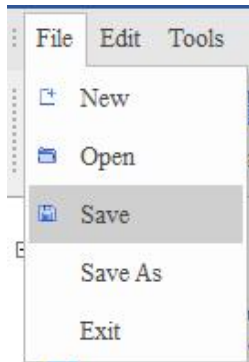
Selecting "Input/Output" will only save the buffer data content displayed in the currently selected window of the chosen buffer, while selecting "All" will save all buffer data content of the chosen buffer.



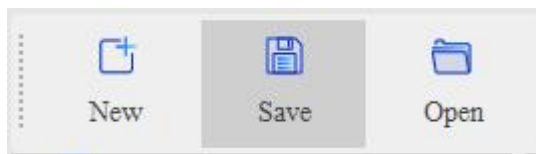
## 5.7 Loading and Saving Configurations

### 5.7.1 Saving Configuration Projects

Click the "Save" button in the menu bar or toolbar to save the configured project as a .chg file.



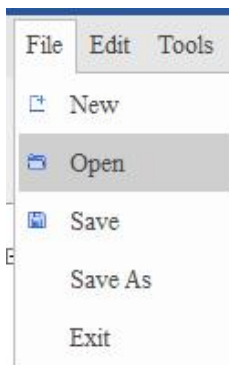
Menu Bar



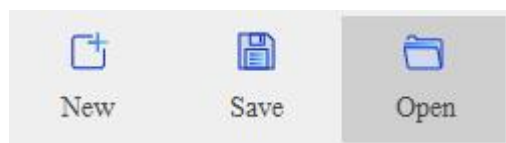
Toolbar

### 5.7.2 Loading Configuration Projects

Click the "Open" button in the menu bar or toolbar to open a saved .chg file.



Menu Bar

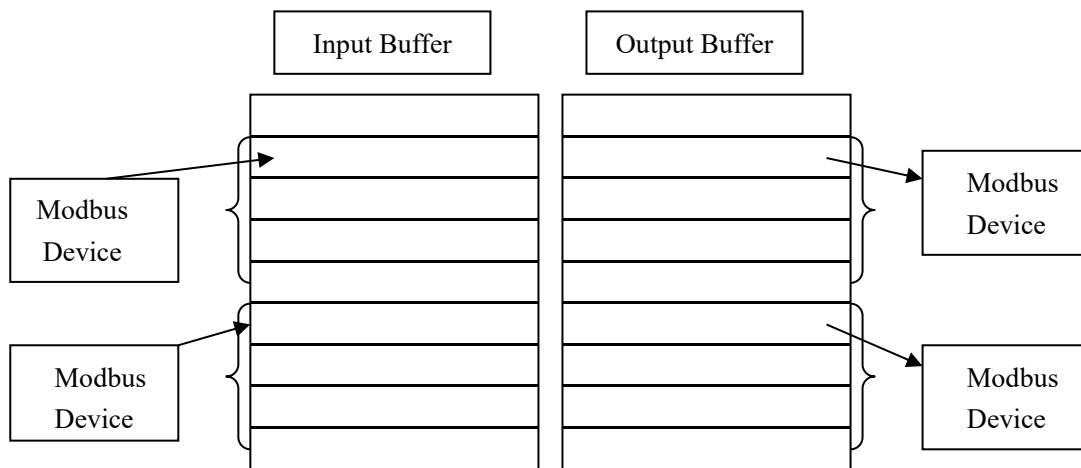


Toolbar



## 6. Working Principle of Modbus Master

Data conversion between the Modbus and EtherCAT protocols in GT200-EC-RS is established through a "mapping" relationship. There are two data buffers in GT200-EC-RS: one is the EtherCAT network input buffer, and the other is the EtherCAT network output buffer. Modbus read commands write the read data into the network input buffer for the EtherCAT network to read. Modbus register write commands retrieve data from the network output buffer and output it to the corresponding Modbus device through the write command.



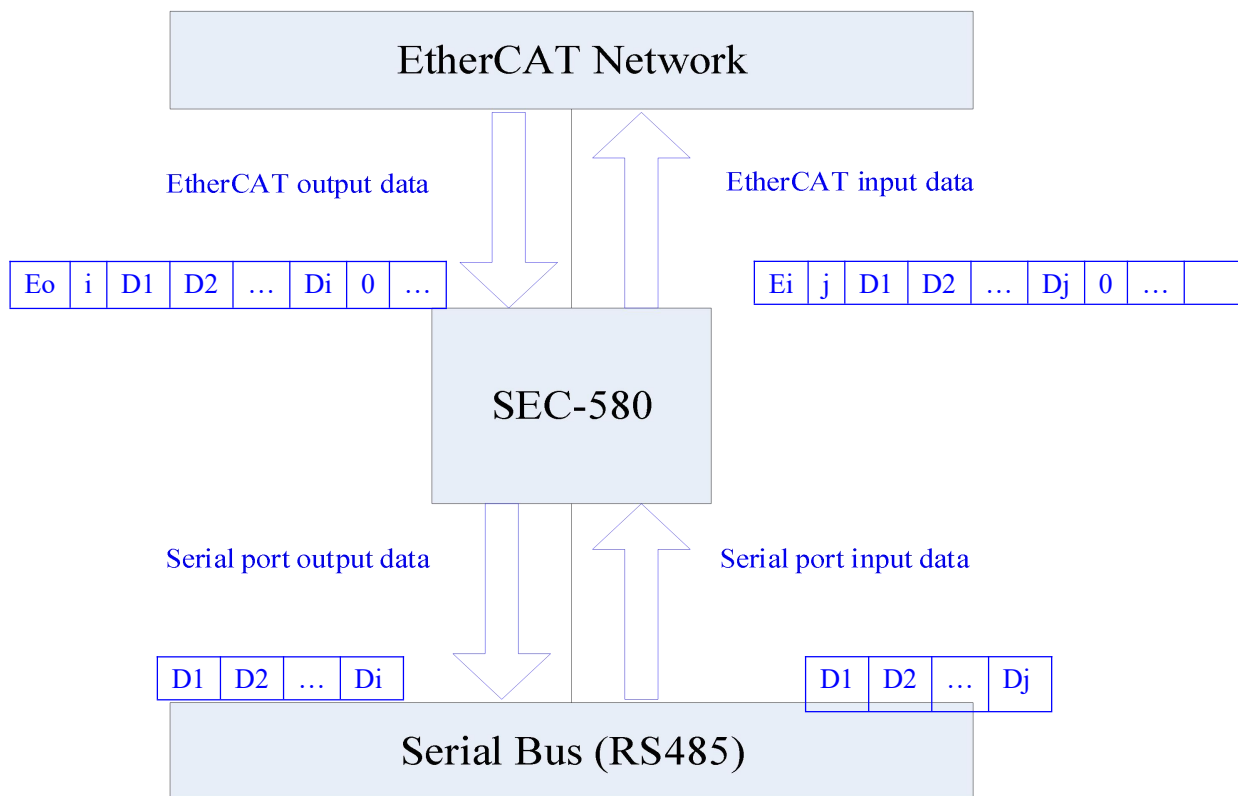
Users can configure 100 commands, and each Modbus command can read a set of continuous Modbus registers.



## 7. Universal Mode

### 7.1 Data Exchange

This gateway realizes data exchange between the EtherCAT industrial Ethernet protocol and the serial port. There is bidirectional conversion and transmission between EtherCAT data and serial port data. EtherCAT output data is sent to the serial bus through the serial port, and data received by the serial port is placed into the EtherCAT input data. The data exchange is shown in the following figure:



In the above figure,  $E_o$  is the transaction number of the EtherCAT output data;  $i$  is the number of serial port data to be sent contained in the output data;  $D1 \sim D_i$  are the serial port sending data;  $E_i$  is the transaction number of the EtherCAT input data;  $j$  is the number of received serial port data contained in the input data;  $D1 \sim D_j$  are the serial port received data.



## 7.2 Universal Protocol

### EtherCAT output data format:

[Transaction Number] [Serial Port Output Data Length n] [Serial Port Output Data 1] ..... [Serial Port Output Data n] [0x00] ..... [0x00]

————— n —————

———| |——— m ———|

Note:

The number of EtherCAT output bytes should be selected to be greater than or equal to  $n + 2$ ;

m 0x00s are padding data (can also be any value), and  $n + m + 2$  should be equal to the number of EtherCAT output bytes.

Transaction Number: When sending output data, the transaction number must be incremented by 1 to indicate a new frame of data.

Example:

If the user selects 8 bytes for both EtherCAT input and output, the serial port output data length is 3, the data is 01 02 03, and the current transaction number is 01.

The output data format is:

[01][03][01][02][03][00][00][00]

### EtherCAT input data format:

[Transaction Number] [Serial Port Input Data Length n] [Serial Port Input Data 1] ..... [Serial Port Output Data n] [0x00] ..... [0x00]

————— n —————

|———m———|

Note:

The number of EtherCAT input bytes should be selected to be greater than or equal to  $n + 2$ ;

m 0x00s are padding data, and  $n + m + 2$  should be equal to the number of EtherCAT input bytes.

Transaction Number: The transaction number is incremented by 1 to indicate a new frame of input data.

Example:

If the user selects 8 bytes for both EtherCAT input and output, the serial port output data length is 3, the data is 04 05 06, and the current transaction number is 01.



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The input data format is:

[01][03][04][05][06][00][00][00]

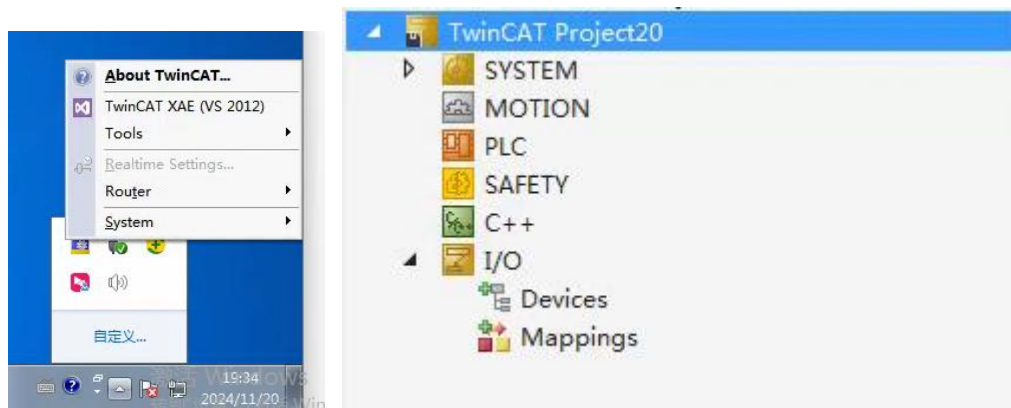
## 8. Communication Example (TwinCAT)

### 8.1 Importing the GT200-EC-RS ESI File into the Specified Folder

Import the GT200-EC-RS V1.1 file into the C:\TwinCAT\3.1\Config\Io\EtherCAT folder.

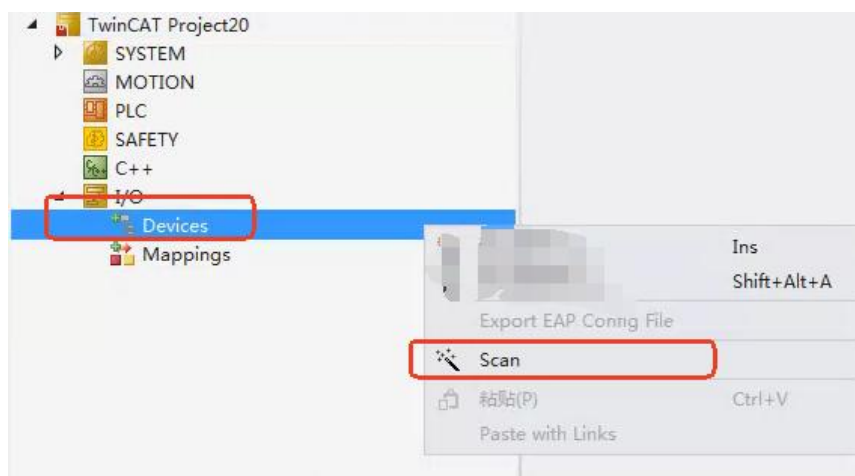
### 8.2 Creating a Project File

1. Right-click the TwinCAT icon, select TwinCAT XAE (VS 2012), then select New -> Project -> OK.

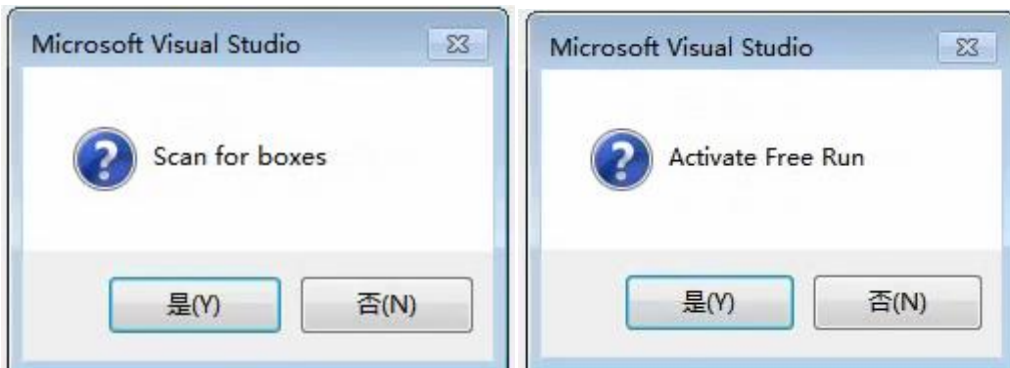
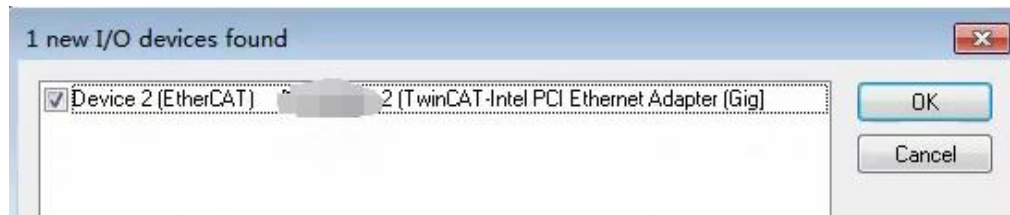


### 8.3 Data Communication

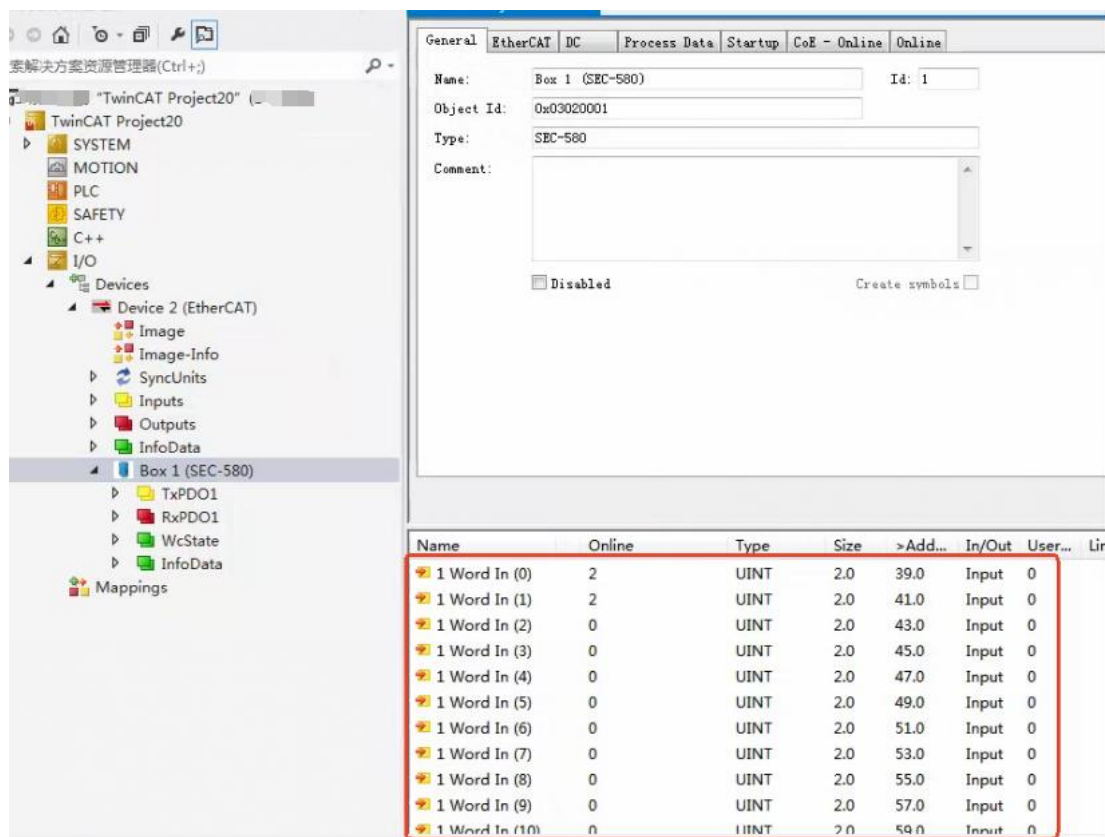
2. Use the mouse to select Devices, right-click and click Scan -> OK.







3. Connection successful.



4. Input and output data can be viewed in TxPDO1 and RxPDO1.

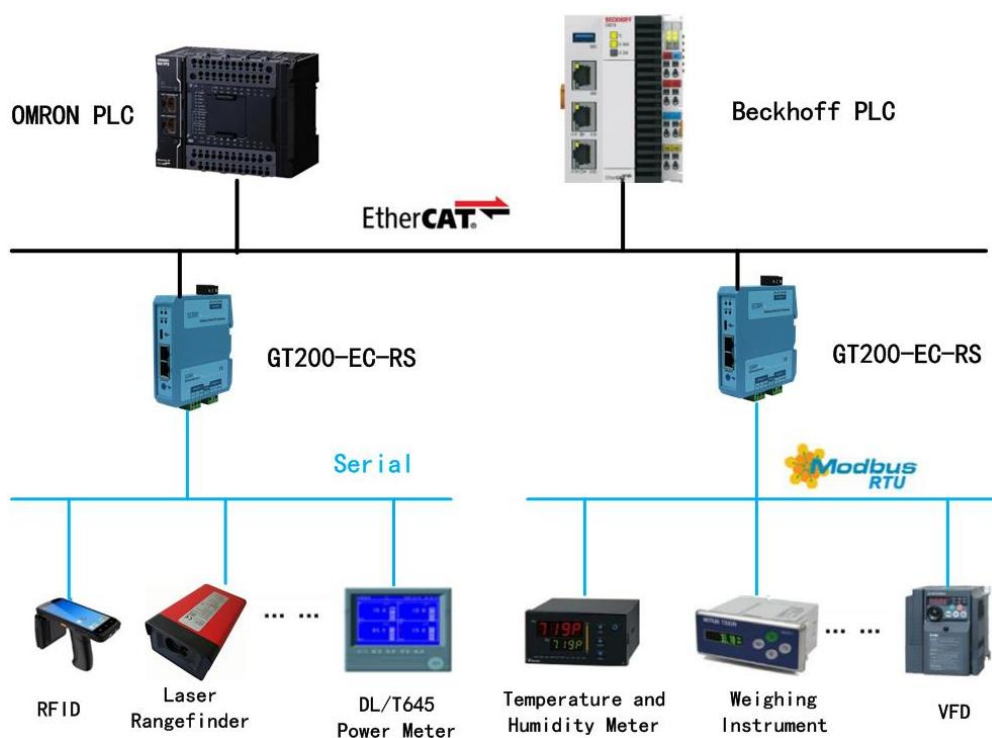
| Name           | Online | Type | Size | >Add... | In/Out | User... | Link |
|----------------|--------|------|------|---------|--------|---------|------|
| 1 Word In (0)  | 2      | UINT | 2.0  | 39.0    | Input  | 0       |      |
| 1 Word In (1)  | 2      | UINT | 2.0  | 41.0    | Input  | 0       |      |
| 1 Word In (2)  | 0      | UINT | 2.0  | 43.0    | Input  | 0       |      |
| 1 Word In (3)  | 0      | UINT | 2.0  | 45.0    | Input  | 0       |      |
| 1 Word In (4)  | 0      | UINT | 2.0  | 47.0    | Input  | 0       |      |
| 1 Word In (5)  | 0      | UINT | 2.0  | 49.0    | Input  | 0       |      |
| 1 Word In (6)  | 0      | UINT | 2.0  | 51.0    | Input  | 0       |      |
| 1 Word In (7)  | 0      | UINT | 2.0  | 53.0    | Input  | 0       |      |
| 1 Word In (8)  | 0      | UINT | 2.0  | 55.0    | Input  | 0       |      |
| 1 Word In (9)  | 0      | UINT | 2.0  | 57.0    | Input  | 0       |      |
| 1 Word In (10) | 0      | UINT | 2.0  | 59.0    | Input  | 0       |      |
| 1 Word In (11) | 0      | UINT | 2.0  | 61.0    | Input  | 0       |      |
| 1 Word In (12) | 0      | UINT | 2.0  | 63.0    | Input  | 0       |      |
| 1 Word In (13) | 0      | UINT | 2.0  | 65.0    | Input  | 0       |      |
| 1 Word In (14) | 0      | UINT | 2.0  | 67.0    | Input  | 0       |      |
| 1 Word In (15) | 0      | UINT | 2.0  | 69.0    | Input  | 0       |      |

| Name            | Online | Type | Size | >Add... | In/Out  | User... | Link |
|-----------------|--------|------|------|---------|---------|---------|------|
| 1 Word Out (0)  | 0      | UINT | 2.0  | 39.0    | Outp... | 0       |      |
| 1 Word Out (1)  | 0      | UINT | 2.0  | 41.0    | Outp... | 0       |      |
| 1 Word Out (2)  | 0      | UINT | 2.0  | 43.0    | Outp... | 0       |      |
| 1 Word Out (3)  | 0      | UINT | 2.0  | 45.0    | Outp... | 0       |      |
| 1 Word Out (4)  | 0      | UINT | 2.0  | 47.0    | Outp... | 0       |      |
| 1 Word Out (5)  | 0      | UINT | 2.0  | 49.0    | Outp... | 0       |      |
| 1 Word Out (6)  | 0      | UINT | 2.0  | 51.0    | Outp... | 0       |      |
| 1 Word Out (7)  | 0      | UINT | 2.0  | 53.0    | Outp... | 0       |      |
| 1 Word Out (8)  | 0      | UINT | 2.0  | 55.0    | Outp... | 0       |      |
| 1 Word Out (9)  | 0      | UINT | 2.0  | 57.0    | Outp... | 0       |      |
| 1 Word Out (10) | 0      | UINT | 2.0  | 59.0    | Outp... | 0       |      |
| 1 Word Out (11) | 0      | UINT | 2.0  | 61.0    | Outp... | 0       |      |
| 1 Word Out (12) | 0      | UINT | 2.0  | 63.0    | Outp... | 0       |      |
| 1 Word Out (13) | 0      | UINT | 2.0  | 65.0    | Outp... | 0       |      |
| 1 Word Out (14) | 0      | UINT | 2.0  | 67.0    | Outp... | 0       |      |
| 1 Word Out (15) | 0      | UINT | 2.0  | 69.0    | Outp... | 0       |      |

## 9. Typical Applications

GT200-EC-RS can connect multiple on-site serial devices to the EtherCAT network through two serial ports to realize data exchange.

The following is a typical application of GT200-EC-RS.





## **10 Operation, Maintenance and Precautions**

- ◆ The module should be protected from heavy pressure to prevent damage to the panel;
- ◆ The module should be protected from impact, as it may damage internal components;
- ◆ The power supply voltage should be controlled within the range specified in the manual to prevent the module from being burned;
- ◆ The module should be protected from water, as water ingress will affect normal operation;
- ◆ Please check the wiring for wrong connections or short circuits before powering on.