

Modbus TCP / EtherCAT Series Gateway

GT300-MT-EC

User Manual

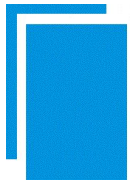
V 1.1



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Important Information

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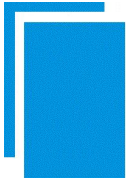
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1 Introduction

1.1 Overview

The GT300-MT-EC is an industrial protocol conversion gateway. It acts as a "translator," enabling devices that only support the Modbus TCP protocol (such as sensors, meters, PLCs) to seamlessly exchange data bi-directionally with an EtherCAT master (such as Beckhoff TwinCAT), significantly improving system integration efficiency and communication reliability.

1.2 Product Selection Guide

Model	GT300-MT-EC	GT200-EC-RS	GT300-EC-PN	GT300-EC-EN
Target Network	Modbus TCP	Modbus RTU/ASCII	PROFINET	EtherNet/IP
EtherCAT Role	Slave	Slave	MainDevice (up to 32 nodes)	MainDevice (up to 32 nodes)
I/O Capacity	512 Bytes In / Out	512 Bytes In / Out	1440 Bytes In / Out	492 Bytes In / Out
Sync Mode	FreeRun	FreeRun	SM / DC (2-20ms)	SM / DC (2-20ms)
Key Features	TCP Client/Server, 128 commands, 1.5kV isolation	Modbus M/S, RTU/ASCII, 100 commands	PROFINET RT/IRT, CoE/CiA 402, Hot-swap	EIP Adapter, CoE/CiA 402, Hot-swap

1.3 Key Features

- Seamless EtherCAT Integration:** Operates as a standard EtherCAT slave with CoE (CANopen over EtherCAT) mailbox support (CiA 301 compliant), enabling easy master configuration via an ESI file.
- Robust Modbus TCP Capabilities:** Supports up to 4 IP connections and 128 commands when functioning as a Master. It features control/status words and flexible byte/register swapping.
- Professional Configuration and Debugging Software:** The SST-ECE-CFG software allows users to quickly define Modbus TCP parameters and visually map the bi-directional data exchange to the EtherCAT network without complex programming.
- High-Speed & Large Capacity:** Delivers protocol conversion times as fast as 2 ms, while accommodating a large



data payload of up to 512 bytes for both input and output.

5. **Isolated Power Supply:** Uses an isolated power supply to enhance anti-interference capability.

1.4 Technical Specification

- [1] **Protocol Support:** Supports bidirectional protocol conversion with flexible role configurations. The EtherCAT Slave complies with the IEC 61158 standard, while the Modbus TCP side offers selectable Master or Slave modes.
- [2] **Data Capacity:** Features large bidirectional data buffers, supporting up to 512 bytes for both input and output.
- [3] **Nodes & Commands:** Provides robust capabilities for multi-device connections and command processing, featuring 4 independent channels and supporting a maximum of 128 commands.
- [4] **Real-time Performance:** Delivers high protocol conversion efficiency with a minimum conversion cycle of 2ms.
- [5] **Network Configuration:** Easily integrates into existing networks, supporting IP assignment via DHCP or Static IP. If a DHCP assignment times out, the gateway automatically falls back to the default address 192.168.0.11.
- [6] **Device Maintenance:** Facilitates routine operation, maintenance, and system upgrades, supporting firmware updates and a one-click factory reset function.
- [7] **EtherCAT:**
 - ◆ Standard: Complies with IEC 61158 Type 12 (ETG.1000) Slave Standard.
 - ◆ Data Area: 512 bytes Input (RxPDO) + 512 bytes Output (TxPDO).
 - ◆ Services: Supports CoE Mailbox Services, compliant with CiA301.
 - ◆ Sync Mode: Supports FreeRUN.
 - ◆ Addressing: Sequential, Configured, and Logical Addressing.
 - ◆ Supported Commands: NOP, APRD, APWR, APRW, FPRD, FPWR, FPRW, BRD, BWR, BRW, LRD, LWR, LRW, ARMW, FRMW.
 - ◆ Config: Supports master-slave communication establishment via ESI file.
- [8] **Modbus TCP Master:**
 - ◆ Function Codes: 01H, 02H, 03H, 04H, 05H, 06H, 0FH, 10H, 17H.
 - ◆ Capacity: Up to 4 nodes, 128 commands.
 - ◆ Command Output Methods: Serial and Parallel Output.
 - ◆ Output Polling Modes: Cycle, Forbidden, Change of Value, Output Once.
 - ◆ Advanced: Control word, status word, byte swap capabilities.
 - ◆ Port: Default 502 (customizable).
- [9] **Modbus TCP Slave:**

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- ◆ Function Codes: 01H, 02H, 03H, 04H, 05H, 06H, 0FH, 10H, 17H.
- ◆ Advanced: Network Status Monitoring, 01H/02H & 03H/04H Function Code Swapping, Byte Swapping.
- ◆ Unit Identifier: Supported.
- ◆ Port: Default 502 (customizable).

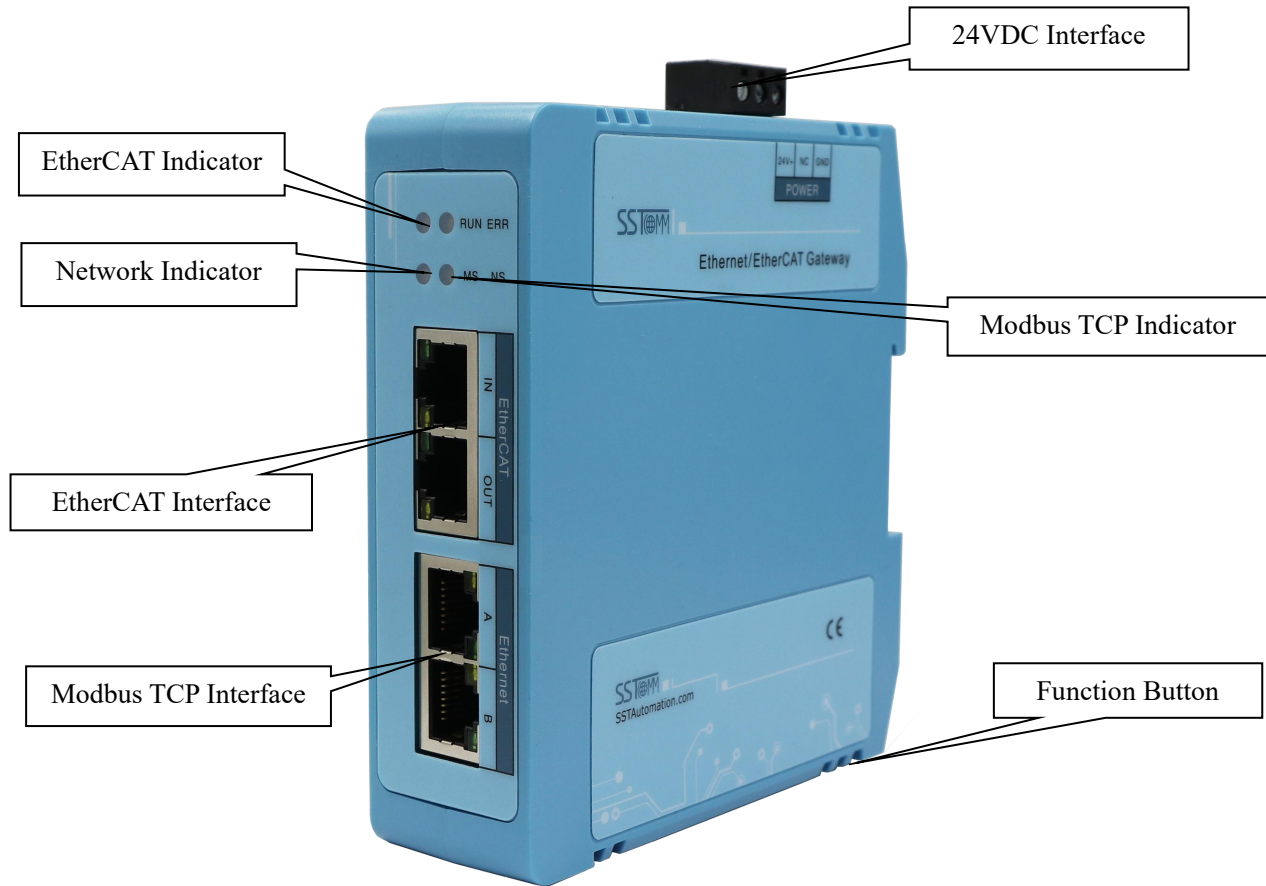
- [10] Power supply: 24VDC (9-30VDC). 130mA(24VDC).
- [11] Operating temperature: -40°C-70°C (-40°F-158°F) . Humidity: 5%-95% (non-condensing).
- [12] Dimensions (W x H x D): 1.3in x 4.6in x 4.1in (34mm x 116mm x 105mm).
- [13] Certification: Complies with EMC Testing Standards.
- [14] Mounting: 35 mm DIN rail.
- [15] Protection level: IP20.

1.5 Revision History

Revision	Date	Chapter	Description
V1.1	05/18/2026	ALL	New release

2 Hardware Installation

2.1 Product Design



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

2.2 Indicators

Indicator	State	Meaning	Solution
MS	Green ON	Gateway has booted and is running normally.	
	Flashing Red (lasts 3s)	Quickly locate the target gateway among multiple devices.	
	Flashing Red	Acquiring IP address automatically via DHCP (configuring).	Wait 30 seconds. ► If it doesn't turn solid green after 30s, check: ① Network connection. ② Active DHCP server presence. ► If no DHCP, it falls back to fixed IP: 192.168.0.11. Set PC to same subnet and reconnect.
	Orange ON	Entered Bootloader mode.	1. Special state for firmware upgrade only. 2. To exit, reboot the gateway or upgrade.
NS (MBTCP Master)	Green ON	All Modbus TCP node connections established successfully.	
	Fast Flashing Green(500ms ON, 500ms OFF)	All slaves failed to connect.	1. Check wiring: Confirm Modbus TCP slaves are connected. 2. Check IP: Confirm gateway and slaves are on the same subnet, no conflicts. 3. Check Slave: Confirm slaves are powered, running, Modbus TCP enabled. 4. Check Config: Confirm IPs and ports in gateway config are correct.
	Slow Flashing Green(1700ms ON, 300ms OFF)	Some slaves connected normally, others are abnormal.	1. Verify via "Device Status" placeholder bit. 2. Follow steps for "Fast Flashing Green" for the specific abnormal slaves.

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	Flashing Red	All nodes disconnected (Severe fault).	1. Potential total network disruption. 2. Reboot gateway and recheck network. 3. Check switches and network links.
	Flashing Red for 3s	A slave device disconnected (Warning).	1. A previously connected slave went offline. 2. Check power/network of that slave. 3. Observe if network recovers from temporary fluctuation.
NS (MBTCP Slave)	Green ON	Connection with Modbus TCP Master established.	
	Flashing Green	Not connected to master or connection lost.	1. Confirm Master (SCADA, host) IP/Port are correct and it is initiating connection. 2. Check if slave config (Unit ID) matches. 3. Check if firewalls/security are blocking.
	Flashing Red for 3s	A master device disconnected (Warning).	1. Master disconnected or network issue. 2. Check if master program/network is stable.
RUN (EtherCAT)	Orange 1Hz	INIT State	
	Orange 2Hz	Bootstrap State	
	Flashing Green 2Hz	PRE-OP State	
	Flashing Green 1Hz	SAFE-OP State	
	Green ON	OPERATIONAL State	
ERR (EtherCAT)	Off	No Error	
	Red ON	Disconnected after establishing connection with EtherCAT master.	1. Physical layer: Confirm cable is secure, master port is normal. 2. Master config: Log into TwinCAT, check scan status and error info. 3. Restart link: Reboot gateway and master controller.

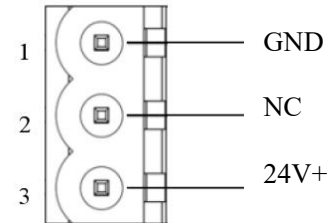


2.3 Connector Pinouts

2.3.1 Power Interface

Supports a single power interface. A 24V DC power supply is recommended:

Pin	Function
1	Power GND
2	NC, Not connected
3	24V+, DC Positive 24V



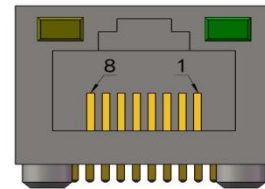
⚠ Warning: Do not reverse the polarity, or it may burn out the device!

2.3.2 Ethernet Interface

The 4 Ethernet interfaces use RJ-45 connectors and follow the IEEE802.3u 100BASE-T standard. There are two ports for Modbus TCP and two for EtherCAT.

(1) Pin Definitions:

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



2.3.3 Indicator Status

Ethernet Port	Indicator	State
Modbus TCP	Link	Green: Solid when a network connection is established.
	ACT	Yellow: Flashing when transmitting/receiving data.
EtherCAT		Green indicates data transmission/reception, yellow LED is off.



2.4 Physical Configuration

2.4.1 Factory Reset

! This operation erases all user configurations (including IP addresses) and restores the device to default settings. Back up important configs before executing!

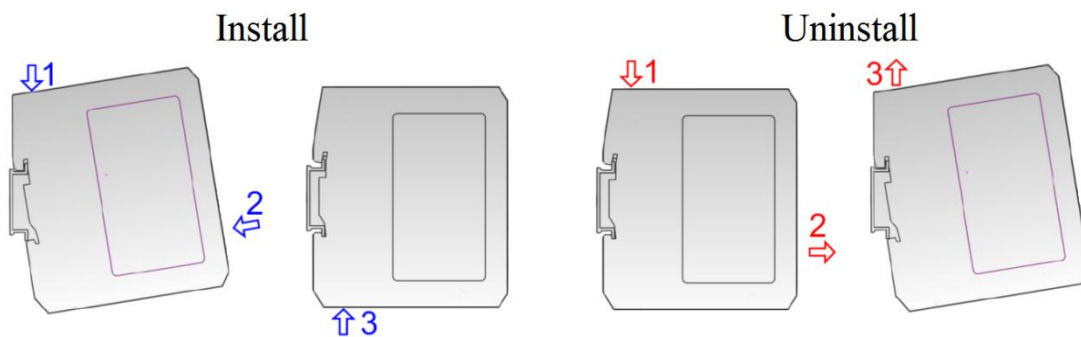
Procedure:

1. Initiate Reset: Within 10s of power-on boot completion (MS solid green), press and hold the button for 5s until MS flashes green (2Hz).
2. Confirm/Cancel:
 - Confirm: Single-click the button within 5s of the MS indicator starting to flash. The MS indicator turns off, the device restores defaults, and automatically reboots.
 - Cancel: Do not press the button within the 5s window. The device exits the mode, MS returns to solid green, and normal operation resumes.
3. Completion: After reboot, all configurations are reset, and the IP assignment mode defaults to DHCP.

2.5 Mounting and Dimensions

2.5.1 Mounting Method

Using 1.4 in (35mm) DIN RAIL.

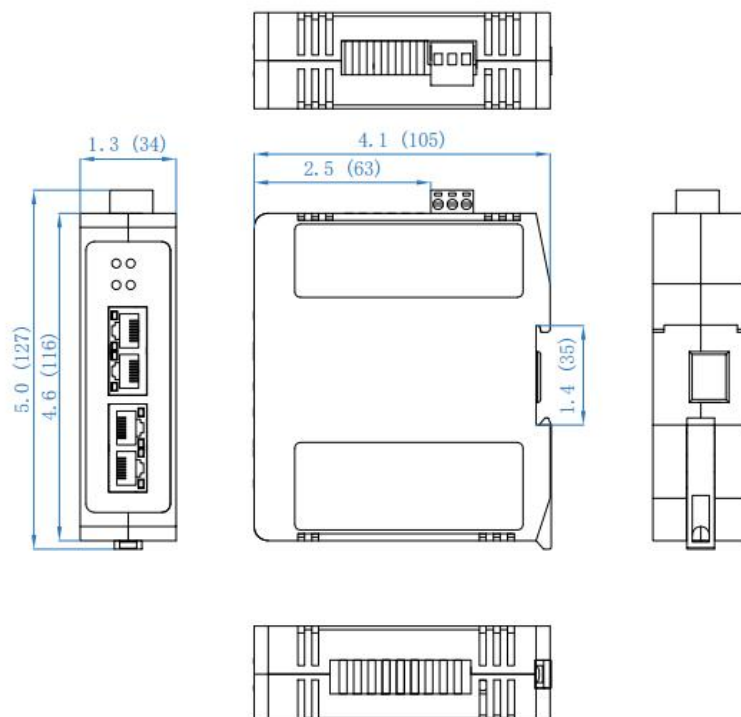


2.5.2 Dimensions

Size (width x height x depth): 1.3in x 4.6in x 4.1in (34mm x 116mm x 105mm)

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3 Getting Started

3.1 Hardware Connection

1. **Configuration Interface:** Modbus TCP Port.
 - Connect the gateway's Modbus TCP port to a PC using a standard Ethernet cable.
2. **IP Configuration:** Ensure your PC's IP address is on the same subnet as the gateway's Modbus TCP port.
 - Factory Defaults: The gateway defaults to DHCP mode.
 - Fallback IP: If a DHCP assignment times out after 30 seconds, the gateway automatically assigns itself the static IP: 192.168.0.11.
3. **Power Supply:** Power the gateway using a 24V DC power source.
 - ▲ **Note:** The gateway features two distinct sets of network ports:
 - (1) EtherCAT Port: Dedicated strictly to EtherCAT network communication.
 - (2) Modbus TCP Port: Used for Modbus TCP communication as well as device discovery, configuration, and debugging. This product includes two internally cascaded Modbus TCP ports, allowing you to connect any Modbus TCP-enabled device to either port.

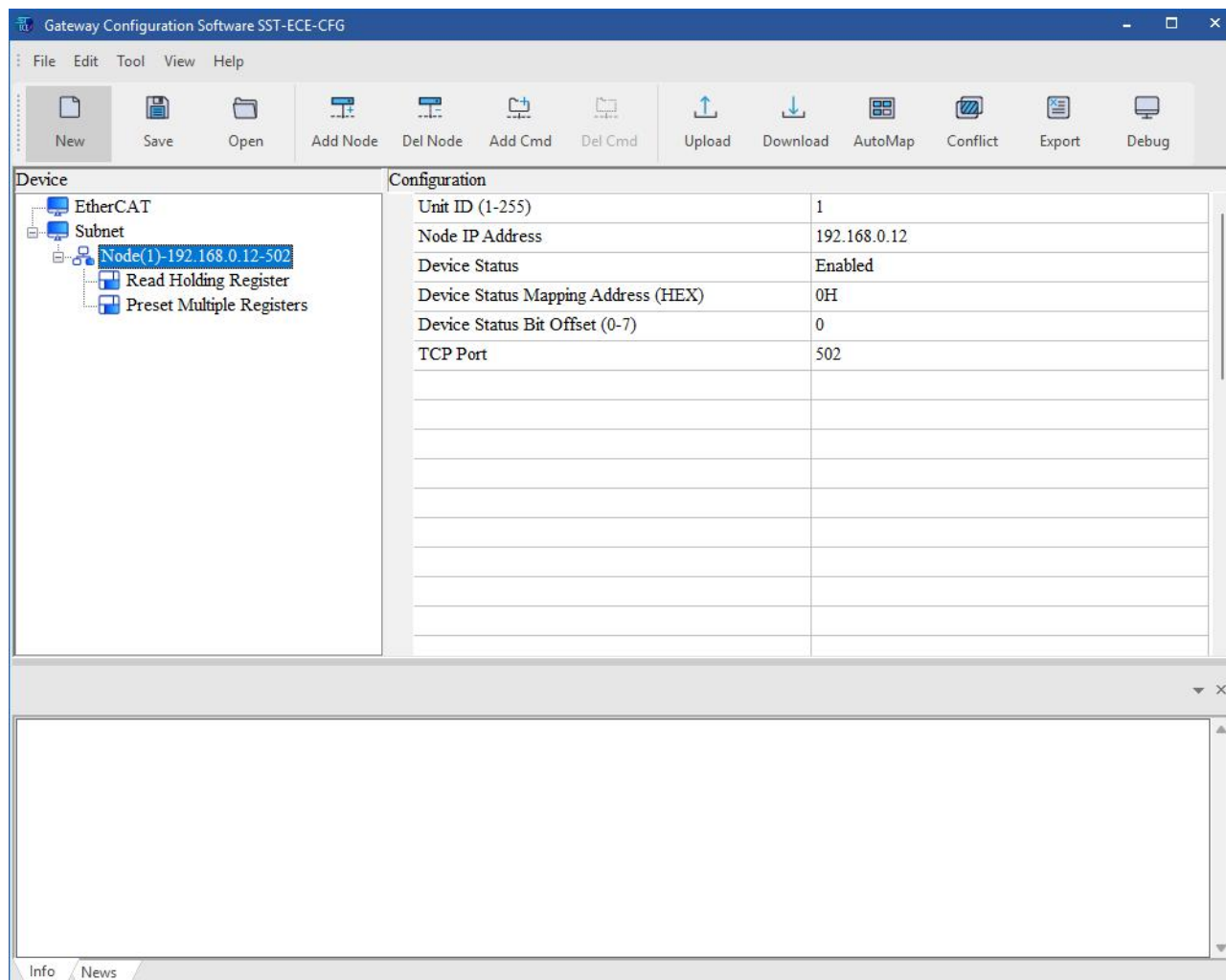
3.2 Configuration

3.2.1 Launching the Software

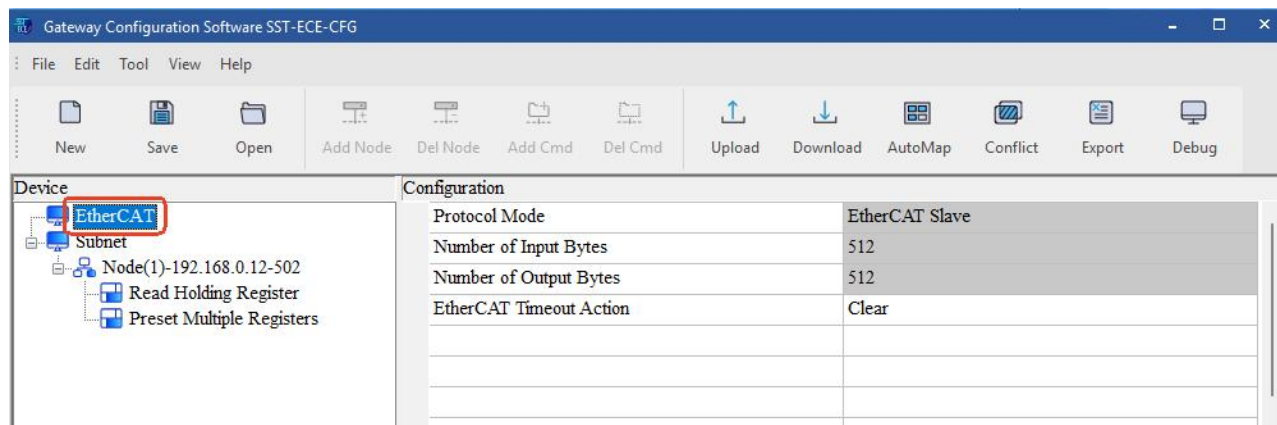
Double-click the desktop shortcut to launch the SST-ECE-CFG configuration software.

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3.2.2 EtherCAT Side Configuration



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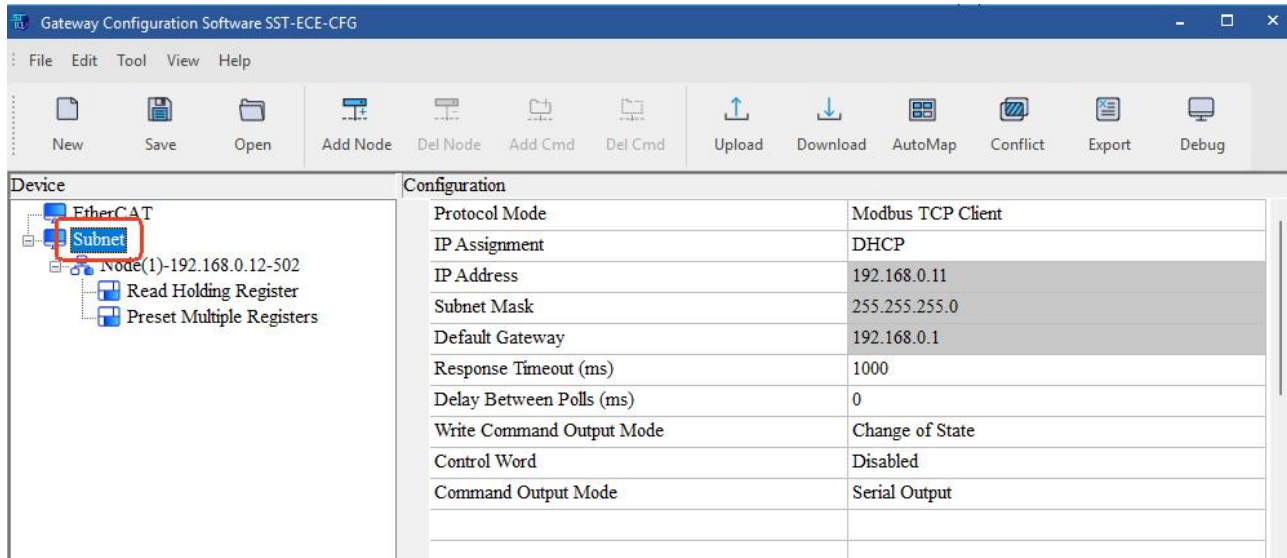
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Select "EtherCAT" in the software interface to configure the following:

Input Data Clear/Hold: This setting is only applicable when the gateway operates in Modbus TCP Master mode. It is not required for Modbus TCP Slave mode.

3.2.3 Subnet Side Configuration



Select "Subnet" in the tree view and choose the Protocol Type based on your requirements. The gateway supports two modes:

- (1) **Modbus TCP Master Mode:** Refer to Section [4.2.2](#) for details.
- (2) **Modbus TCP Slave Mode:** Refer to Section [4.2.3](#) for details.

3.2.4 Downloading the Configuration

After setting all parameters, write this configuration to the gateway. Click the "Download" button on the toolbar to bring up the "Search Device" interface, then select the target gateway to download the configuration. Once the download is complete, follow the prompts to restart the gateway to apply the configuration.

- For detailed instructions on downloading configurations, please refer to Section [4.4.2 Tools: "2. Download"](#)

Downloading a configuration will overwrite the existing settings in the gateway and affect its communication status. Please verify that all configuration information is correct before proceeding with the download. Alternatively, you can upload the gateway's current configuration to save a backup before downloading the new one.

After downloading, you can click the "Upload" button on the toolbar to review and verify the gateway's configuration.

- For detailed instructions on uploading configurations, please refer to Section [4.4.1 Tools: "1. Upload"](#).

operations.

2: Toolbar

Common menu commands can be accessed by clicking the buttons in the toolbar.

3: Tree View

This is a hierarchical tree view of the configuration, primarily divided into two sections:

- EtherCAT: Used for EtherCAT protocol settings.
- Subnet: Used for Modbus TCP protocol settings.

4: Configuration View

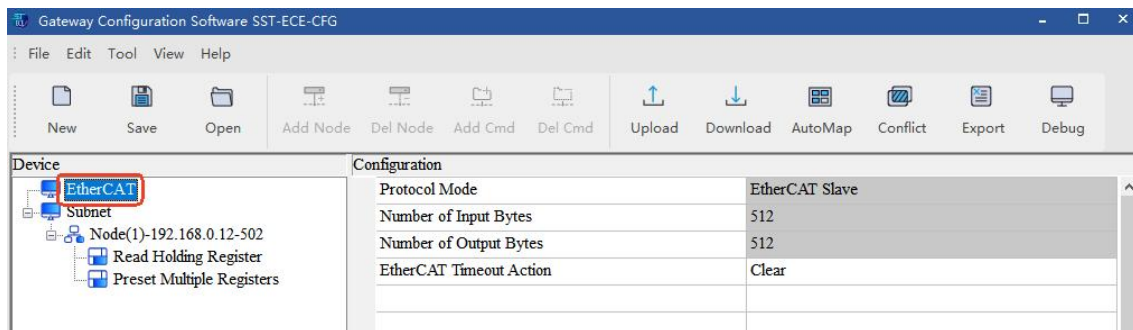
- Select an item in the tree view to configure its corresponding parameters.
- Grayed-out fields are read-only and cannot be modified.
- Depending on the specific parameter, settings can be configured via drop-down menus or manual input.

5: Notes and News

- Selecting a parameter in the Configuration View will display its function and setup instructions.
- Select "News" to view the latest product updates.

4.2 Device View

4.2.1 EtherCAT Configuration View



Clear/Hold EtherCAT Input Data: Configurable when the gateway is selected as Modbus TCP Master; no setting required when set as Modbus TCP Slave.

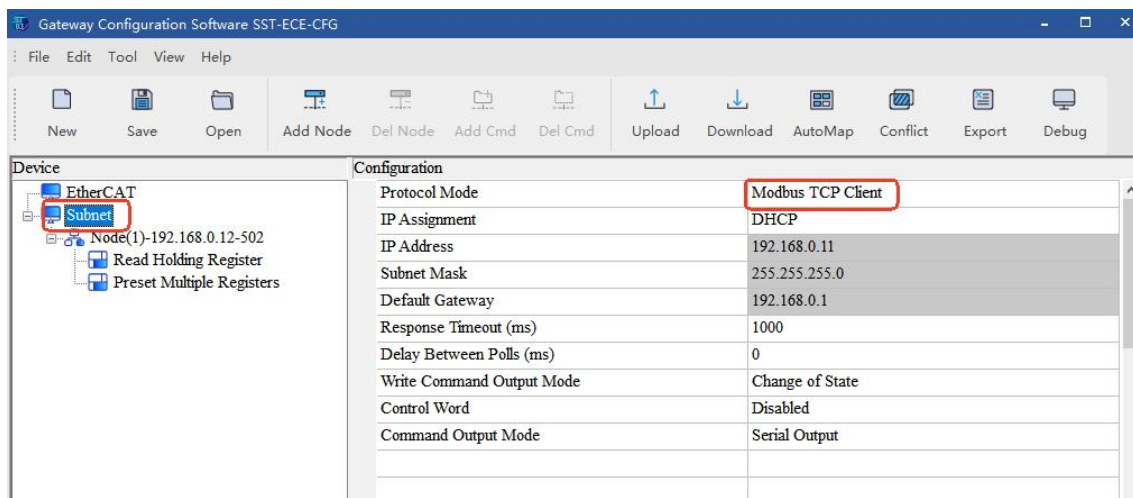
- Clear: When all read commands of a Modbus node fail to receive a correct response, the corresponding EtherCAT input data for this node's read commands will be cleared to zero.
- Hold: Retains the contents of the last successfully received data.

4.2.2 Modbus TCP Master Configuration View

Select "Subnet" in the tree view and choose "Modbus TCP Master" in "Protocol Type". This indicates the gateway communicates as a Modbus TCP Master and can connect to multiple Modbus TCP slave devices.

The setup steps for Modbus TCP Master mode are as follows:

1. **Protocol Type:** Select "Modbus TCP Master". The basic parameters required are:



2. **Set Basic Ethernet Parameters:**

- **IP Assignment Mode:** Supports Static Configuration and DHCP. Default is DHCP mode.
- **Response Timeout (ms):** The time to wait for a slave response after the Modbus TCP master sends a command. Range: 300 - 60000ms, Default: 1000ms.
- **Delay Between Polls (ms):** The delay time before sending the next Modbus command after a command finishes and receives a correct response or times out. Range: 0 - 2500ms, Default: 0ms.
- **Command Output Mode:** The output mode for Modbus write commands. There are four modes:
 - Cycle: Same as the read command output mode, continuously cycling to send write commands.
 - Forbidden: The gateway does not send write commands.
 - Change of Value: Sends the write command when output data changes, and stops sending after receiving a correct response.
 - Output Once: Outputs the Modbus write command only once.

! Note: The IP address set here is the gateway's IP address as a Modbus TCP Master. This address is used for Modbus TCP data communication, searching/uploading/downloading/debugging the gateway.

3. **Set Advanced Functions:**

- **Command Output Method:** Default is set to Serial Output.

- **Serial Output:** All commands for a single slave device are sent one by one; the next command is sent only after receiving a response or timing out.
- **Parallel Output:** All commands for a single slave device are sent together.

Example: Connecting 2 slave devices, configuring 2 nodes, with multiple commands under each node. In Serial Output, commands under Node 1 are sent one by one. In Parallel Output, all commands under Node 1 are sent together, and the same for Node 2.

- **Control Word:** Configures a control word at the start of the output data buffer for the commands set in Modbus TCP. One command corresponds to one bit, and setting the bit to 1 enables the command. Options: Disable, All Commands, Only Write Commands.

Default is "Disable": The gateway executes read/write commands normally; write commands execute based on the "Command Output Mode".

If "All Commands" or "Only Write Commands" is selected, it combines with the "Command Output Mode" as follows:

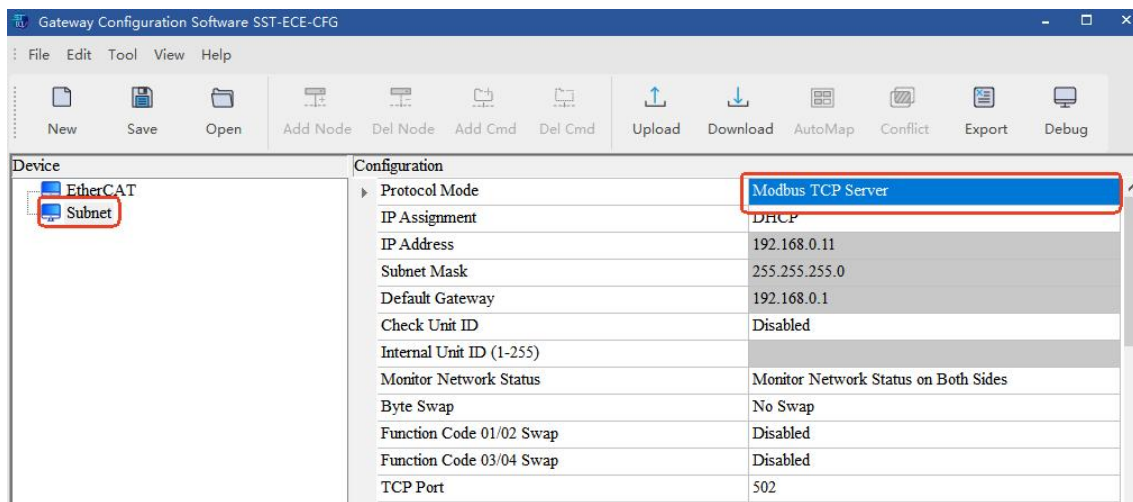
- **Change of Value + All Commands:** Each command corresponds to 1 bit. Setting it to 1 allows communication; 0 forbids communication.
- **Change of Value + Only Write Commands:** Read commands communicate normally. For write commands, only when the control bit is 1 can they output upon a change of value; if 0, write commands cannot output.
- **Cycle + All Commands:** Each command corresponds to 1 bit. Setting it to 1 allows communication; 0 forbids communication.
- **Cycle + Only Write Commands:** Read commands communicate normally. Only when the control bit is 1 can write commands output continuously.
- **Forbidden + All Commands:** Control word function is invalid; write commands are forbidden, read commands communicate normally.
- **Forbidden + Only Write Commands:** Same as above.
- **Output Once + All Commands:** When enabled, the control word value must be set to 0, then to 1, to send a read or write command. After communication finishes, it must be reset to 0, then 1 to communicate the next command.
- **Output Once + Only Write Commands:** Same as above, read commands communicate normally, applies only to write commands.
- **Output Once + Disable:** The write command outputs only once from boot as long as the output data is not 0, and won't output again unless the gateway is reset or rebooted.

4.2.3 Modbus TCP Slave Configuration View

Select "Subnet" in the tree view and choose "Modbus TCP Slave" in "Protocol Type". This indicates the gateway communicates as a Modbus TCP Slave and can connect to a Modbus TCP Master device.

The setup steps for Modbus TCP Slave mode are as follows:

1. **Protocol Type:** Select "Modbus TCP Slave". The basic parameters required are:



2. **Set IP Assignment Mode:** Supports Static Configuration and DHCP. The IP set here is the gateway's IP as a Modbus TCP Slave.

3. **Set "Enable Unit ID":** Disabled by default (gateway slave address adapts to any value from the master). When enabled, a specific Unit ID (Modbus TCP slave address) can be designated.

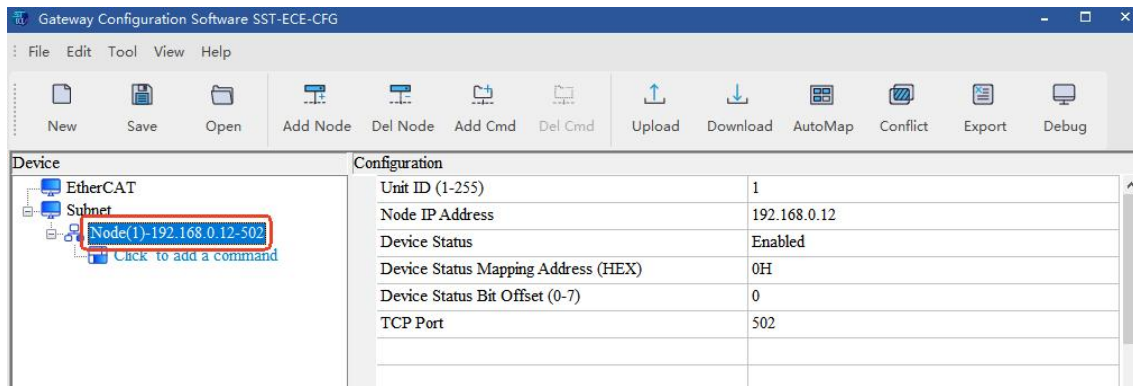
4. **Set Port Number:** The gateway's port number as a Modbus TCP slave. Default is 502, configurable range: 1-65535.

5. **Set Advanced Functions:**

- Network Status Monitoring: The gateway can be set to monitor the online status of devices on the EtherCAT or Modbus TCP ends. Options: Mutual monitoring on both ends, EtherCAT monitors Modbus TCP, Modbus TCP monitors EtherCAT, and Do not monitor network status.
- Byte Swap: Default is "No Swap". Options: No swap, Double-byte swap, Four-byte swap, Two-word swap. Set according to communication requirements.
- Function Code 1 & 2 Swap: Keep default disabled; enable if swapping is required.
- Function Code 3 & 4 Swap: Keep default disabled; enable if swapping is required.

4.3 Node and Command Configuration

4.3.1 Node Configuration



● Node Parameter Settings:

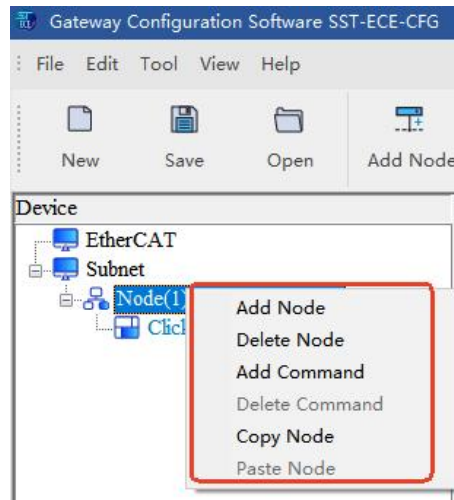
The gateway acting as a Modbus TCP Master can connect to multiple Modbus TCP slave devices. 1 Node represents one slave device. The settings are as follows:

- (1) Slave Address: The station address of the slave device.
- (2) Target Modbus TCP Slave IP Address: The IP address of the slave device. This IP must not be identical to the gateway's Modbus TCP Master IP to avoid conflicts.
- (3) Device Status: Enabled by default. When enabled, monitors the online status of the slave. Each slave occupies 1 bit (1 = offline, 0 = online). The location of this status word in the gateway's input buffer can be set via "Memory Mapping Starting Address" and "Memory Mapping Bit Offset".
- (4) Port Number: The port number of the slave device. Default: 502, Range: 1-65535.

Note: The Slave IP address, Slave Address, and Port Number cannot all be exactly the same.

● Node Setup Instructions:

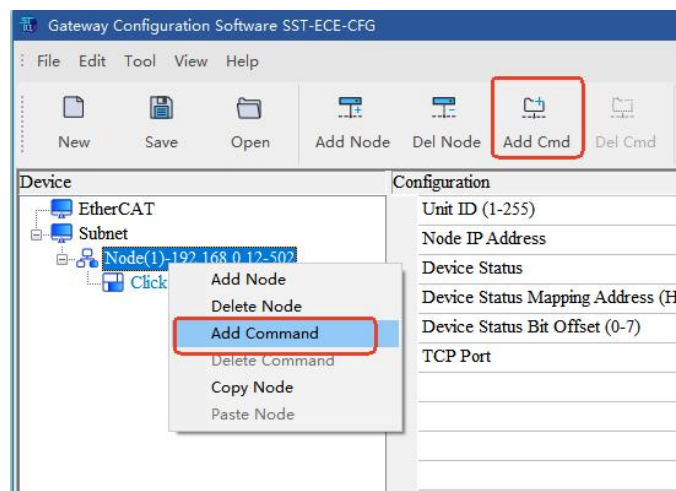
Nodes have four operations: Add Node, Delete Node, Copy Node, Paste Node.



- Add Node: Right-click "Subnet" or a Node, and select "Add Node" from the pop-up menu. Alternatively, use "Edit - Add Node" in the menu bar or the "Add Node" button on the toolbar.
- Delete Node:
 - ① Right-click the node and select "Delete Node".
 - ② Use "Edit - Delete Node" from the menu bar or the "Delete Node" toolbar button.
 - ③ Left-click the node and press the Delete key on the keyboard.
- Copy Node: Right-click the node to copy and select "Copy Node".
- Paste Node: After copying, right-click an existing node and select "Paste Node".

4.3.2 Command Configuration

- **Command Setup Instructions:**



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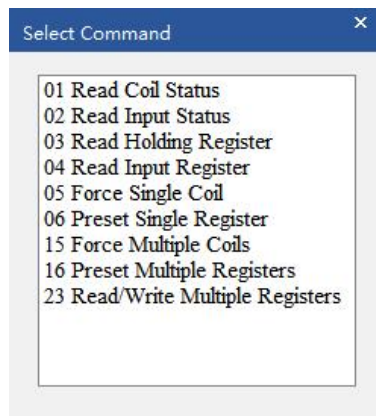
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The gateway requires adding commands based on the Modbus commands supported by the slave device.

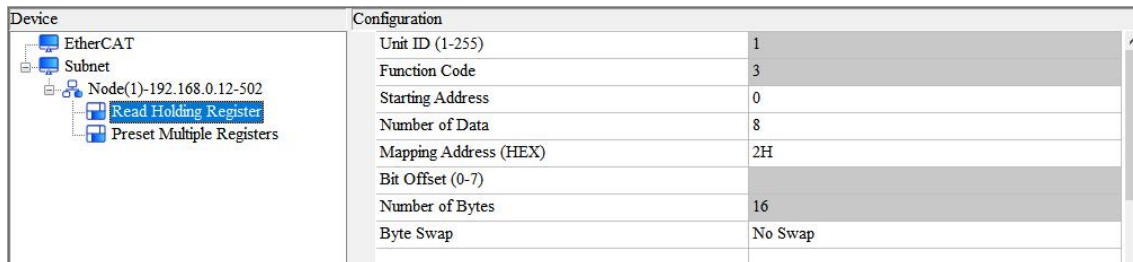
- Add Command: Right-click the node to add a command to, select "Add Command", and a pop-up window will appear. Double-click the desired command to add it. Alternatively, use the Menu Bar or Tool Bar.
- Delete Command: Right-click the command and select "Delete Command", use the menu/toolbar, or press the Delete key.
- Command Parameter Settings:

Modbus TCP Master supports function codes: 01, 02, 03, 04, 05, 06, 15, 16, 23.

When selecting "Add Command", the following options appear:



An example configuration interface for Modbus commands:



- Modbus Register Starting Address: The starting address of the command. The Modbus protocol has two address formats; this uses a base-0 format (decimal). Range: 0 - 65535.
- Data Count: Number of data items for the command (decimal).
- Memory Mapping Starting Address (HEX): The internal gateway buffer start address (hexadecimal) where read/write data is stored. You can input this manually, or click "AutoMap" on the toolbar after filling in the "Data Count" to have the software assign it.
- Memory Mapping Bit Offset (0-7): Valid for commands 01/02/05/15. Sets the starting bit position within a byte (default is 0, no offset).
- Byte Swap: Default "No Swap". Options: No swap, Double-byte swap, Four-byte swap, Two-word swap.

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● Explanation of "Modbus Register Starting Address":

Modbus addresses have two formats: Base-0 and Base-1. Examples:

Function Code	Base-1 Address Display	Base-0 Address Display
Coil Status (01, 05, 15)	00001~00010	00000~00009
Input Status (02)	10001~10010	00000~00009
Holding Register (03, 06, 16, 23)	40001~40010	00000~00009
Input Register (04)	30001~30010	00000~00009

The software configuration interface uses Base-0 addresses in decimal format.

● Modbus Command Setup Example:

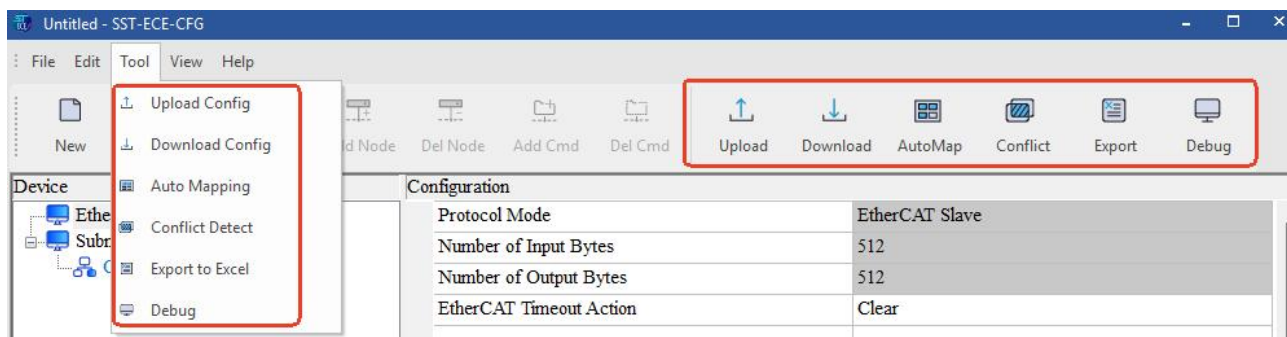
A user needs the gateway to read the following Modbus TCP slave data:

Function Code	Base-1 Address Display	Data Length
01	0X0001~0X0002	2
02	1X0058	1
03	4X0004~4X0013	10
04	3X0025	1

The settings in SST-ECE-CFG should be:

Function Code	Modbus Register Start Addr (Base-0)	Data Count (Decimal)
01	0	2
02	57	1
03	3	10
04	24	1

4.4 Tools

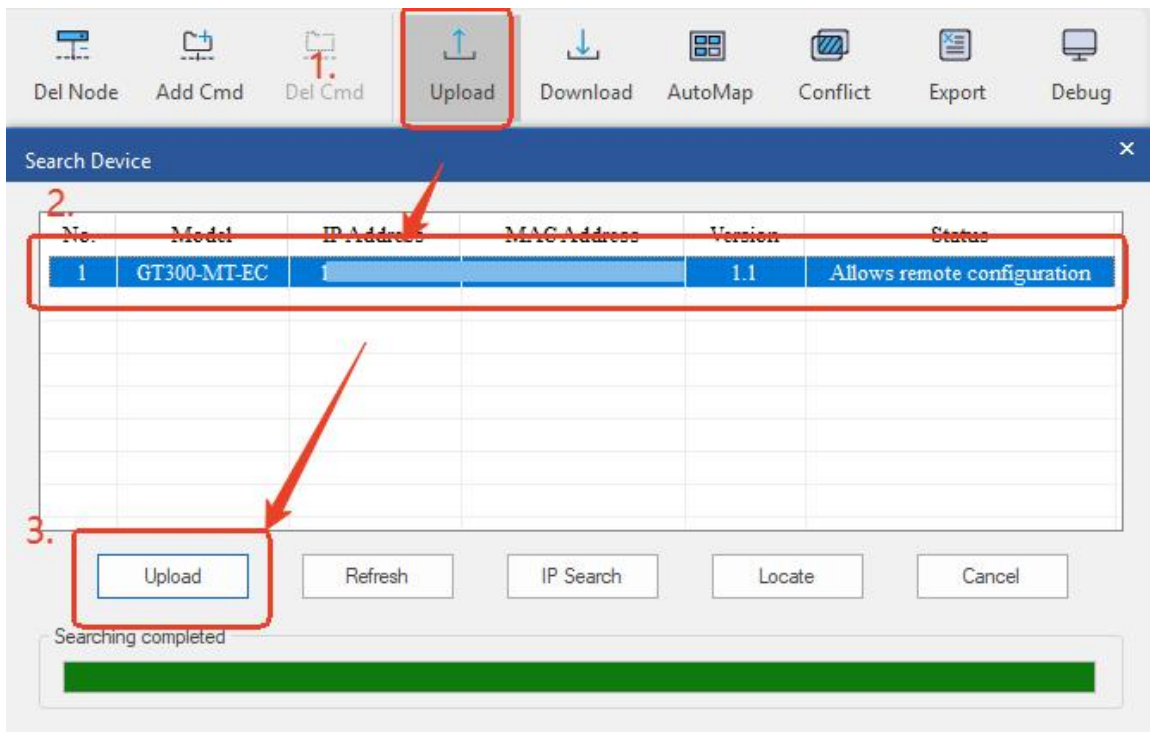


4.4.1 Upload

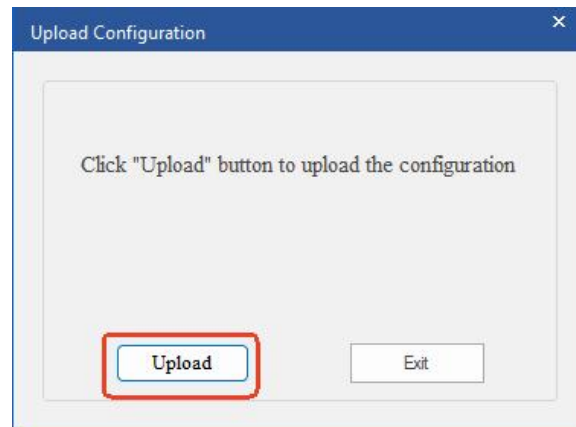
Upload Configuration: Upload the configuration information from the gateway to the configuration software interface for viewing.

The specific steps are as follows:

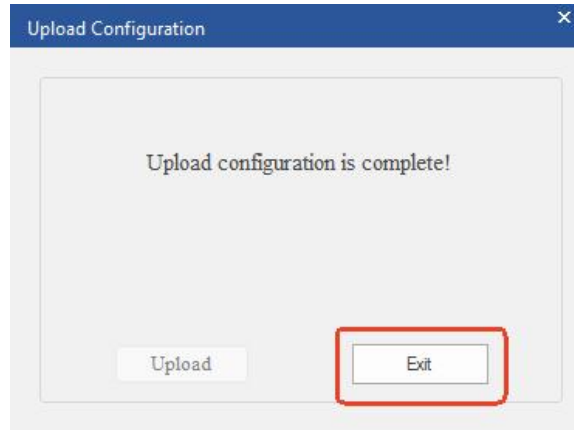
- (1) Click the "Upload" button on the toolbar, and the "Search Devices" interface will pop up.



- (2) Select the gateway that needs to be uploaded, then click "Upload". The "Upload Configuration" window will pop up.



- (3) Click the "Upload" button to start the upload process, and it will continue until the upload is completed.

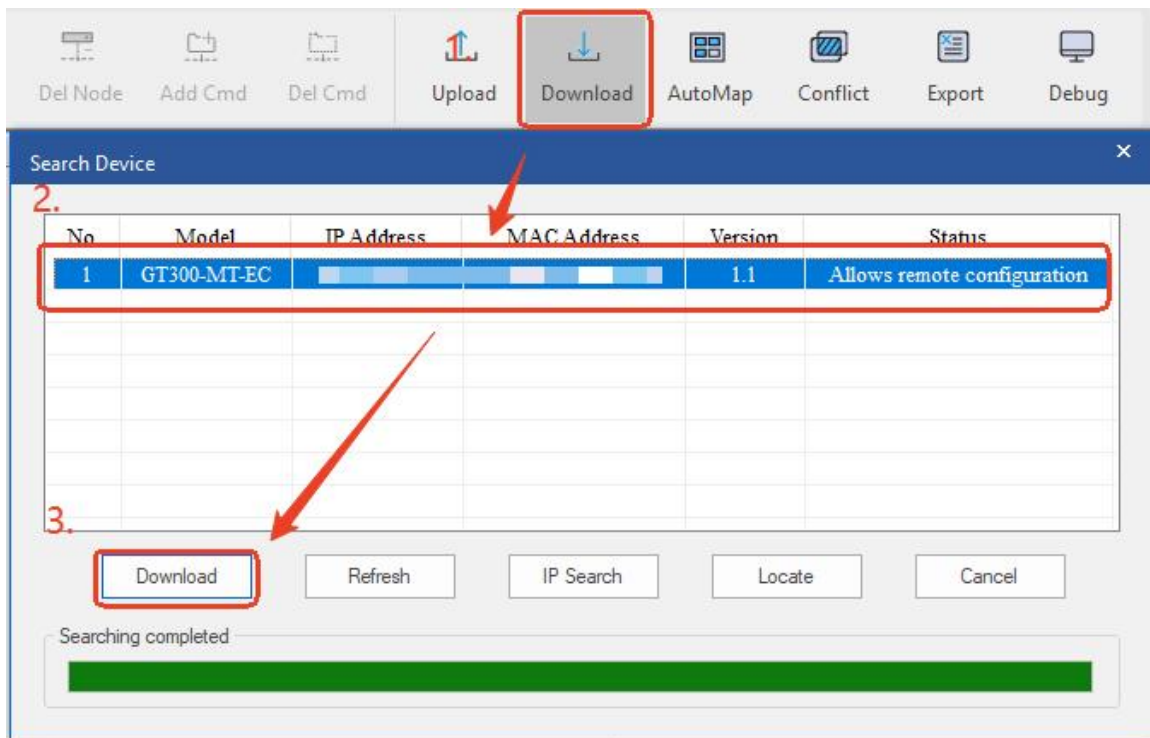


4.4.2 Download

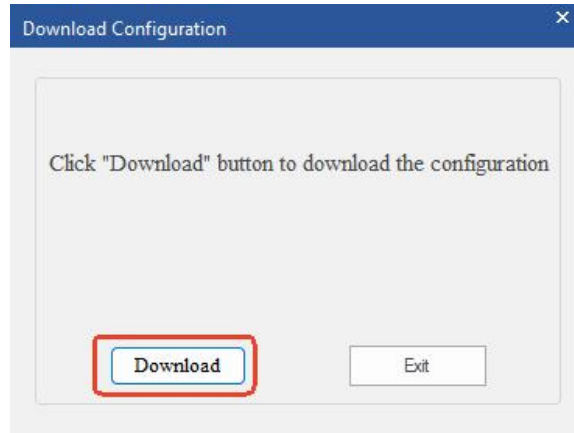
Download Configuration: Download the current configuration settings from the software interface to the gateway.

The specific steps are as follows:

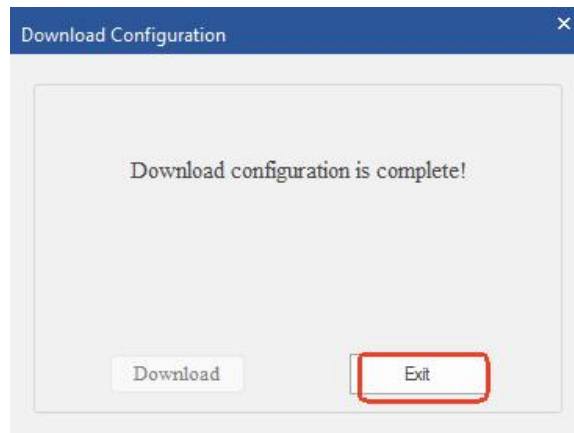
- (1) Click the "Download" button on the toolbar, and the "Search Devices" interface will pop up:



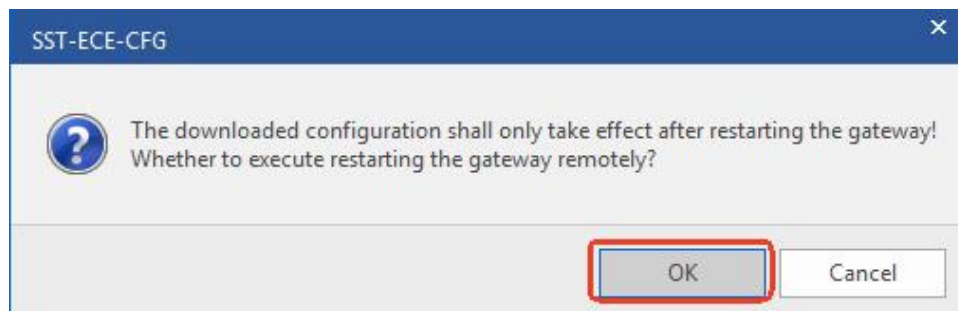
- (2) Select the gateway you wish to download the configuration to, then click "Download" to open the download configuration window.



- (3) Click the "Download" button to begin the download process, and it will continue until the download is successful.



- (4) Click "Exit" to bring up the following prompt box:



After the download is complete, the gateway must be restarted for the configuration to take effect.

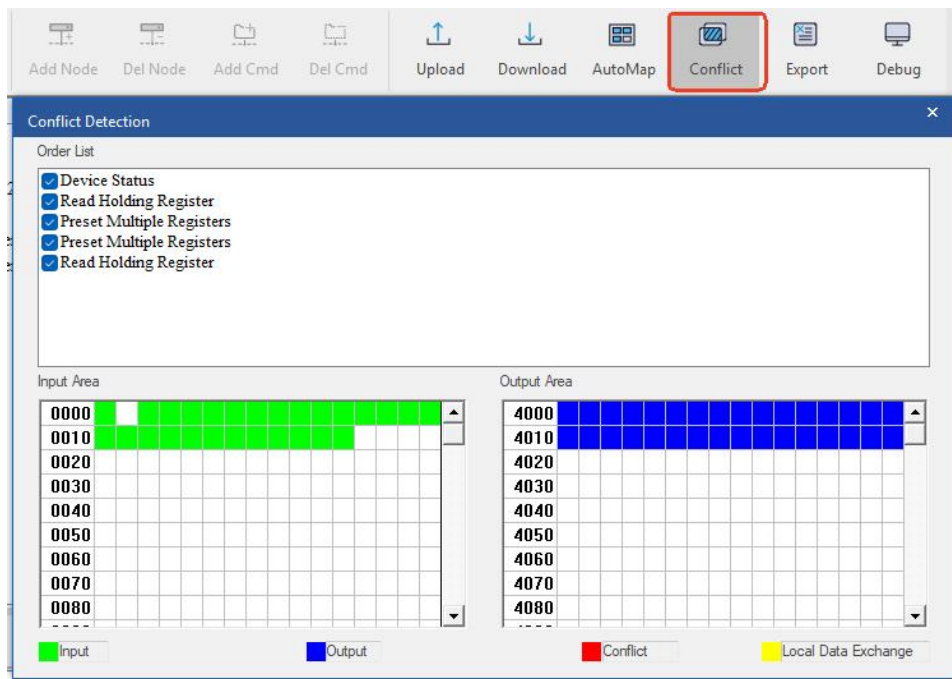
- Click "OK": The gateway will automatically restart, and the downloaded configuration will take effect, enabling communication according to the downloaded settings.

- Click "Cancel": The gateway will not restart. Although the configuration is successfully downloaded, communication will continue based on the previous settings. The gateway needs to be manually restarted for the new configuration to take effect.

4.4.3 Conflict Detection

The Conflict Detection feature allows you to view the gateway's memory mapping address occupancy and check for any conflicts.

Click "Menu Bar > Tools > Conflict Detection" or the "Conflict Detection" button on the toolbar to open the Conflict Detection window, as shown below:



Each square represents one byte. Clicking on a square displays the occupancy status of its 8 bits.

Green: Indicates the occupancy of the input buffer address, typically for read commands; it displays as green when there are no conflicts.

Blue: Indicates the occupancy of the output buffer address, typically for write commands; it displays as blue when there are no conflicts.

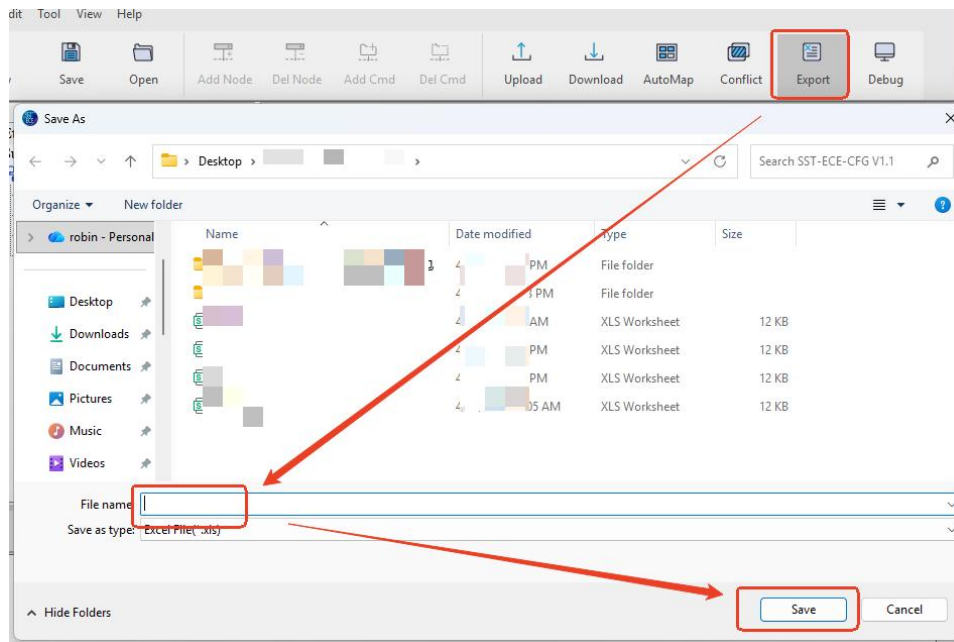
Red: Indicates a memory mapping address occupancy conflict in either the input or output area; the affected area will display as red.

Yellow: Indicates a write command used for local data exchange that utilizes a mapped address in the input buffer; it displays as yellow when there are no conflicts.

4.4.4 Export to Excel

The Export to Excel feature saves configuration data as an Excel file, making it convenient for users to review related settings.

Click "Menu Bar > Tools > Export to Excel" or the "Export to Excel" button on the toolbar to bring up the Save As window, as shown below:



Select the appropriate path, enter a file name, and click Save. A successful configuration export prompt will pop up.



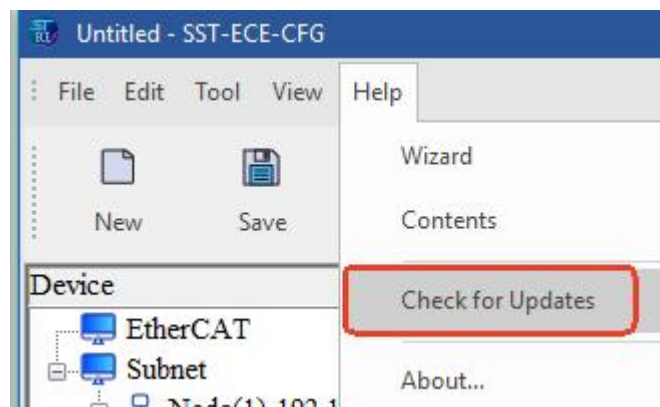
Click OK. The Excel file will automatically open, and you can select different sheets to view the specific configuration details.

4.5 Check for Updates

The Check for Update feature enables the configuration software to perform real-time, online updates to the latest version.

Provided the PC hosting the software is connected to the internet, clicking "Menu Bar > Help > Check for Updates" will indicate whether the current software version is up to date and if a new version is available.

When connected to the internet, clicking "Menu Bar > Help > Check for Updates" will open the following interface:



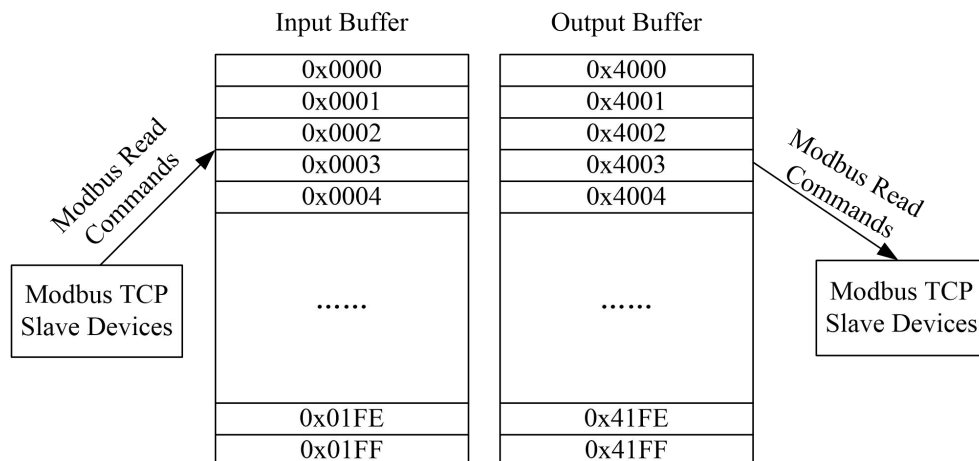
Clicking the "Install Update" button initiates a process that uninstalls the current version before installing the update; simply follow the on-screen prompts to complete the operation.



5 Operating Principles

5.1 Modbus TCP Master Mode

Data conversion between Modbus TCP and EtherCAT in the GT300-MT-EC is established through a "mapping" relationship. The GT300-MT-EC has two data buffers: the EtherCAT Network Input Buffer and the EtherCAT Network Output Buffer. These buffers are relative to the EtherCAT Master. When the gateway acts as a Modbus TCP Master, Modbus read commands write fetched data into the Network Input Buffer for the EtherCAT network to read. Modbus write register commands fetch data from the Network Output Buffer and output it to the corresponding Modbus TCP slave devices.



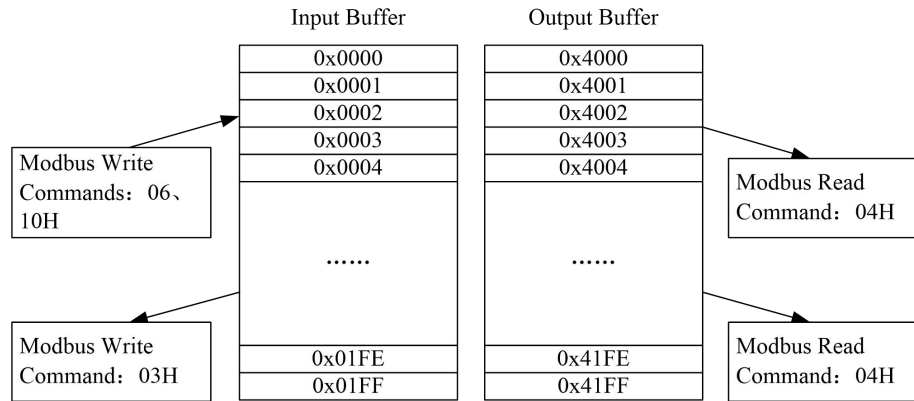
As shown above: The Network Input Buffer range is 0x0000 ~ 0x01FF (supports function codes 01, 02, 03, 04, 23 for data input; supports 05, 06, 15, 16, 23 for local data exchange). The Network Output Buffer range is 0x4000 ~ 0x41FF (supports function codes 05, 06, 15, 16, 23 for data output).

A maximum of 128 commands can be configured respectively, with each command capable of reading a continuous block of Modbus registers.

5.2 Modbus TCP Slave Mode

Similar to the Master mode, data conversion is established through mapping. The buffers are relative to EtherCAT. When the gateway acts as a Modbus TCP Slave, Modbus write register commands place data into the Network Input Buffer for the EtherCAT network to read. Modbus read commands fetch data from the Network Output Buffer and

transmit it back to the Modbus TCP Master device via response messages.



As a Modbus TCP Slave, the gateway supports function codes: 01H, 02H, 03H, 04H, 05H, 06H, 0FH, 10H, 17H.

Network Input Buffer (Modbus TCP side): Represents Master Output. Users can read it back using 03H or 01H commands. Supports 03H, 06H, 10H, 17H (Starting Reg 40001) and 01H, 05H, 0FH (Starting Reg 00001).

Network Output Buffer (Modbus TCP side): Represents Master Input. Users can read it using 04H or 02H. Supports 04H (Starting Reg 30001) and 02H (Starting Reg 10001).

5.3 Network Status Monitoring

When acting as a Modbus TCP Slave, the gateway features Network Status Monitoring. In SST-ECE-CFG, 4 options are available: Mutual monitoring on both ends, EtherCAT monitors Modbus TCP, Modbus TCP monitors EtherCAT, and Do not monitor network status.

1. EtherCAT Monitors Modbus TCP Network Status:

- **Enabled:** The first two bytes of the EtherCAT input area are occupied by the status word, monitoring the number of Modbus TCP slaves with established connections.
- **Disabled:** No input address is occupied; the starting address stores data from the Modbus TCP end.

2. Modbus TCP Monitors EtherCAT Network Status:

- **Enabled:** The first two bytes for the Modbus TCP Client are occupied by the status word, monitoring EtherCAT communication faults (1 = Normal, 0 = Fault).
- **Disabled:** No output address is occupied; the starting address stores data from the EtherCAT end.

The Modbus TCP Client can use the following function codes/addresses to read this gateway output buffer data:

- ① 04H Function Code, Starting Address 30001 (0)
- ② 02H Function Code, Starting Address 10001 (0)

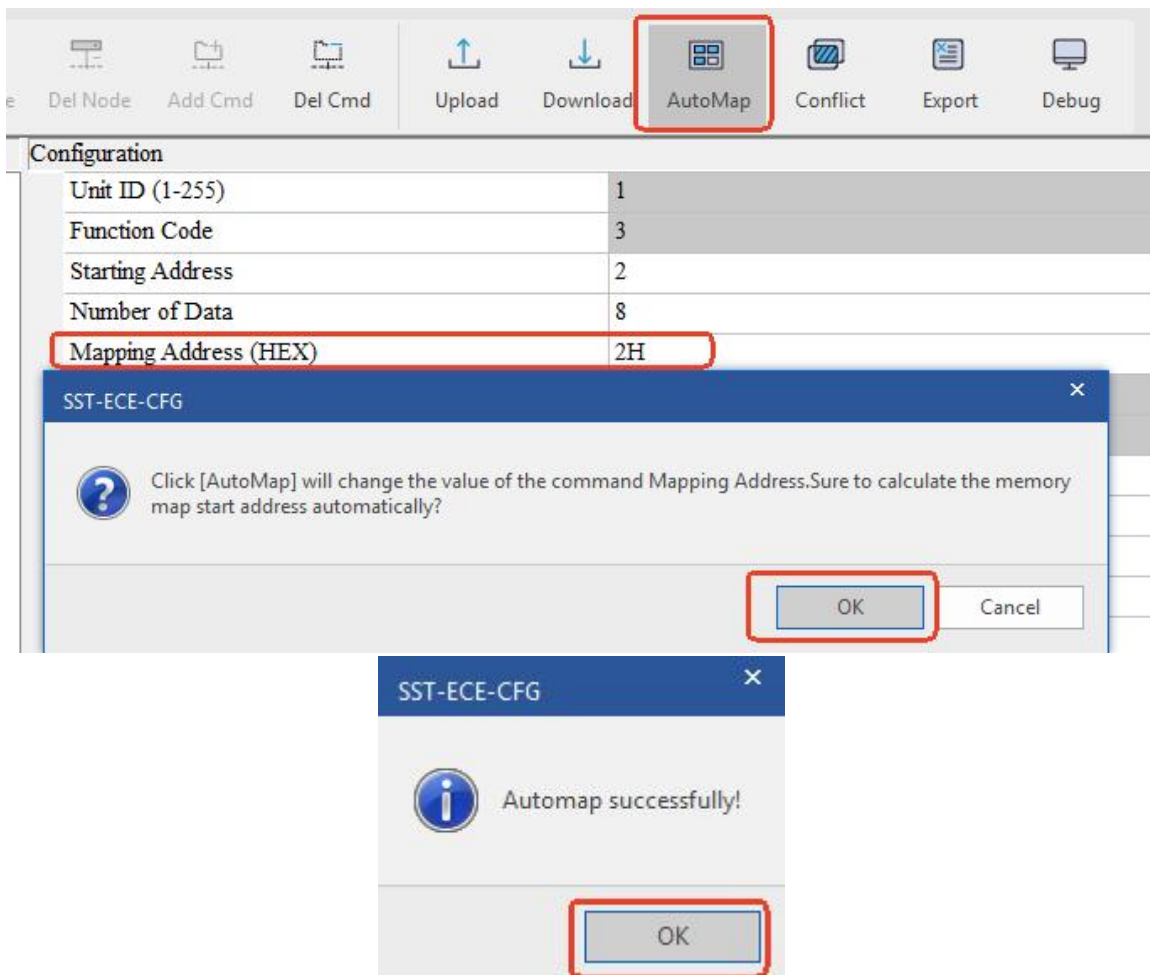
6 Diagnostics and Maintenance

6.1 Automap

The Auto Mapping feature helps users automatically populate the "Memory Mapping Start Address" parameter values in the gateway, effectively avoiding address conflicts.

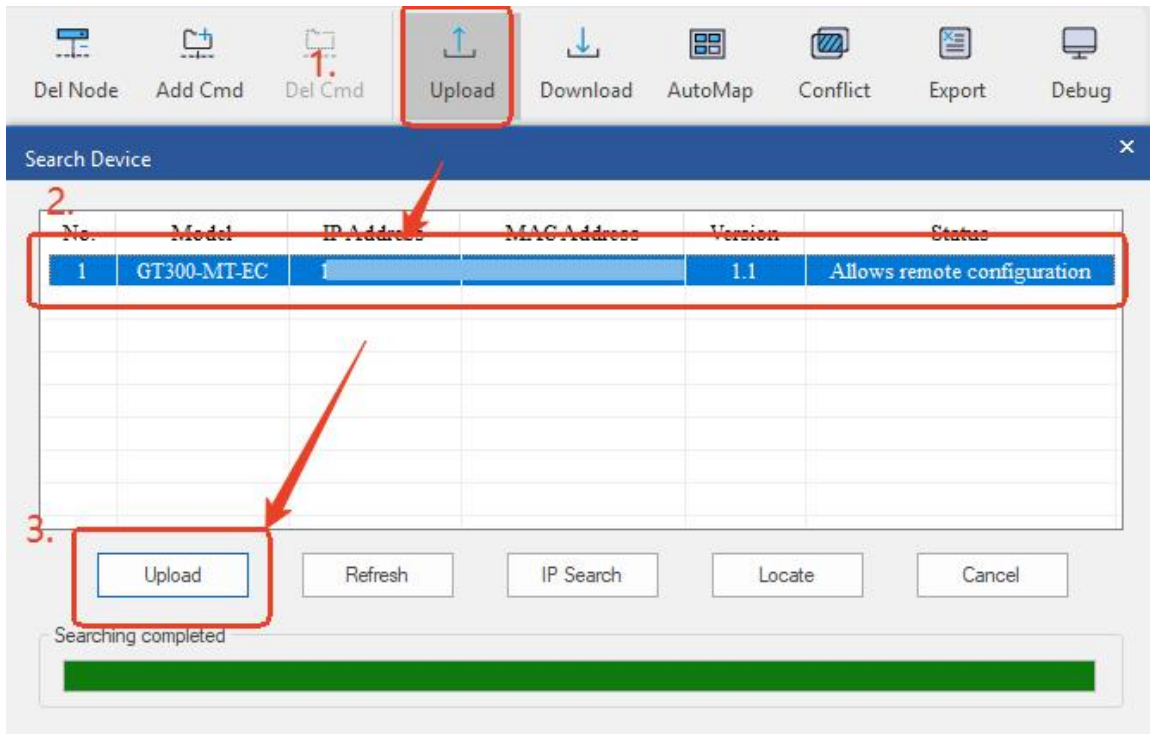
Operation Instructions:

After setting the data count for read/write commands in Modbus TCP Master mode, you can click "Menu Bar > Tools > Auto Mapping" or the "AutoMap" button on the toolbar to automatically populate the memory mapping start address values. You can also enter the memory mapping start address manually, but please ensure there are no address conflicts.



6.2 Search Device Interface

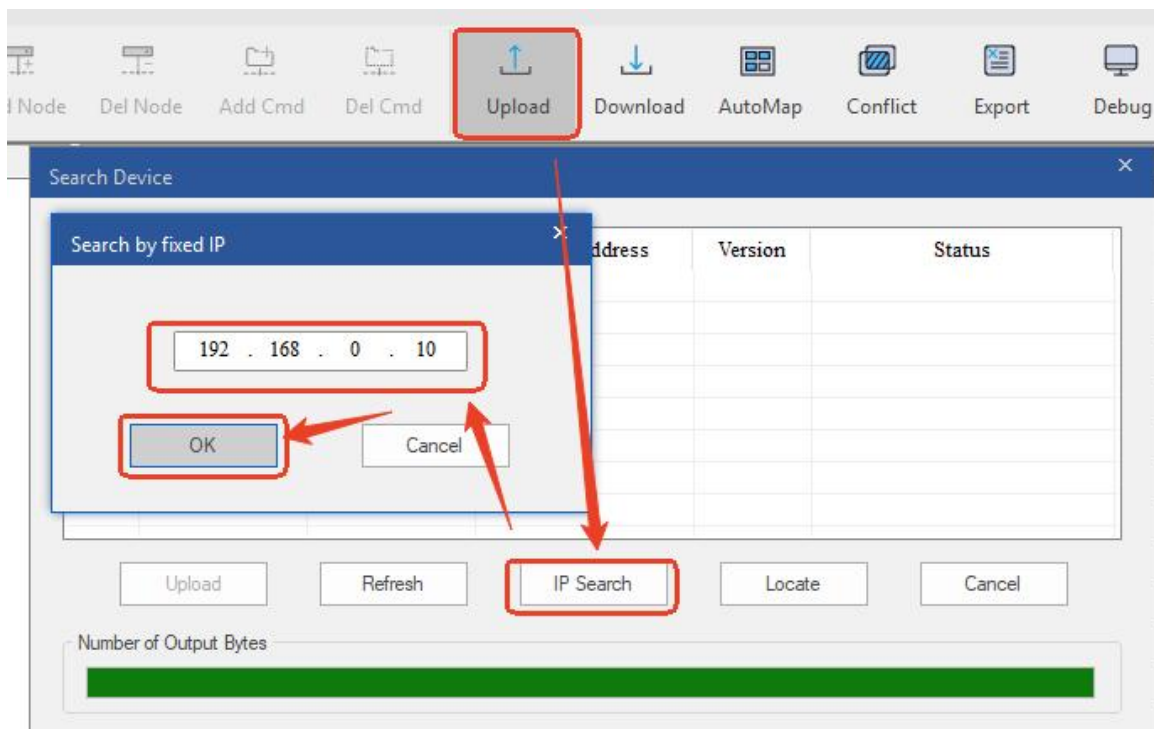
Several software functions can open the "Search Device" interface; for example, the "Search Device" window that appears during an upload is shown below:



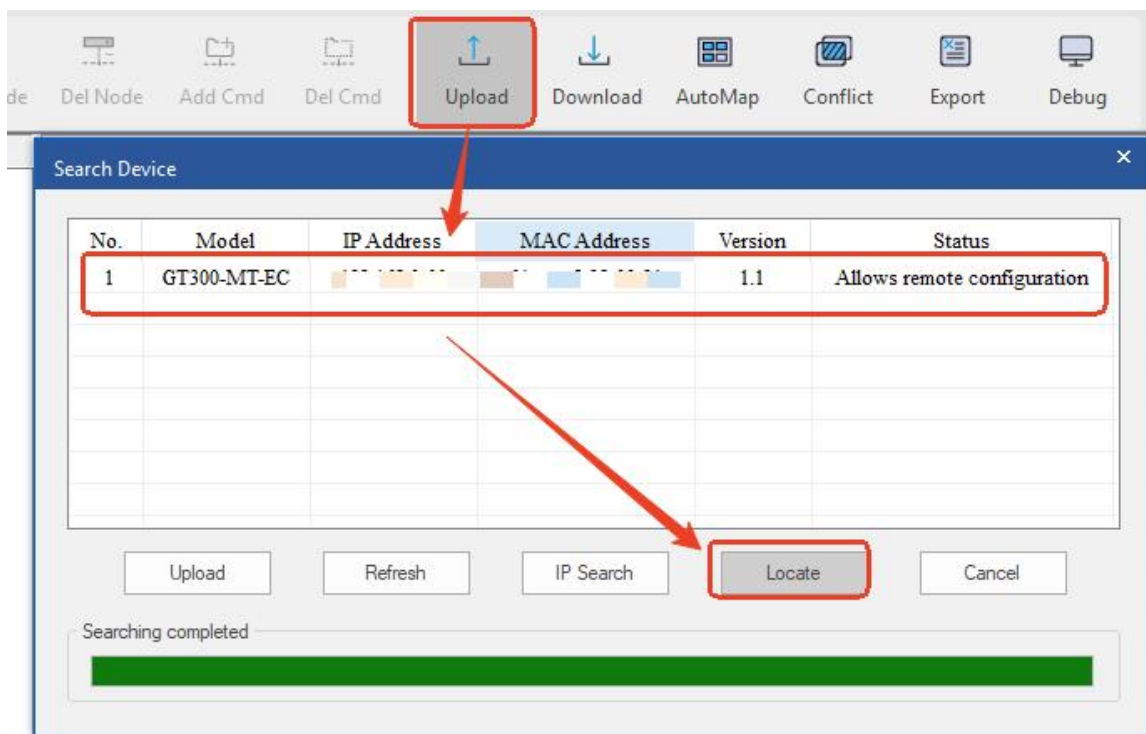
- (1) Specified IP Search: If clicking the "Refresh" button in the "Search Device" interface still fails to locate the gateway, you can attempt to search using a specific static IP address.

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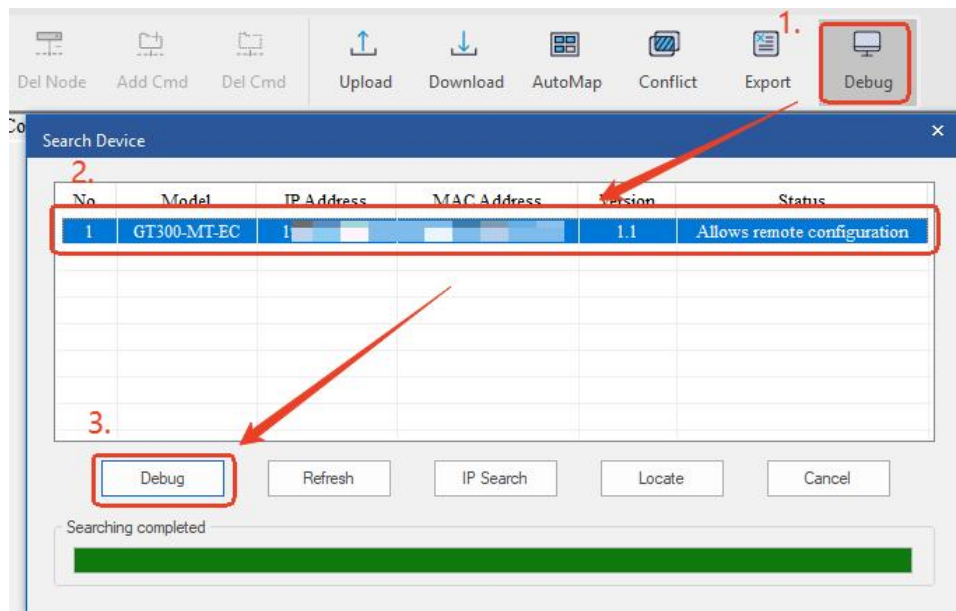
- (2) Locate: After selecting a gateway in the Search Device interface, clicking the "Locate" button will cause the MS indicator light on that gateway to flash red (for 3 seconds).



6.3 Real-time Debugging

The Debug feature allows users to conveniently monitor data communication on both ends of the gateway protocol. When data exchange anomalies occur, this feature can be used to troubleshoot issues.

Click "Menu Bar > Tools > Debug" or the "Debug" button on the toolbar to open the Search Device interface:



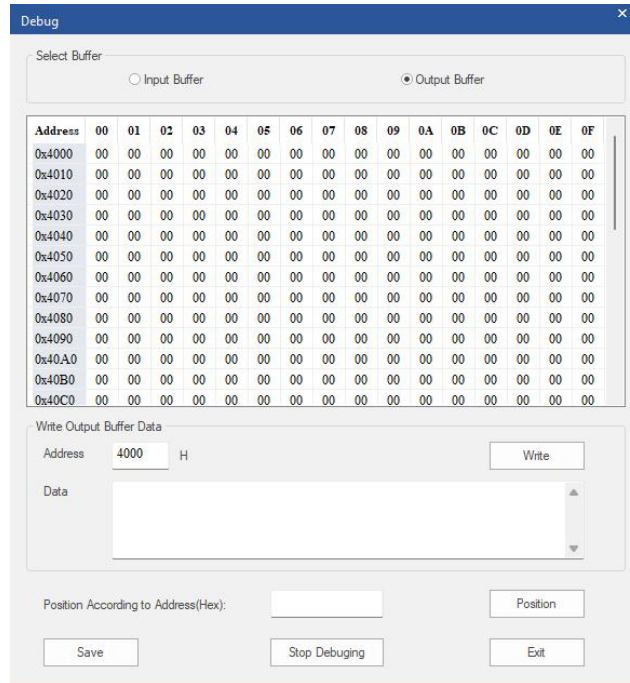
Select the gateway you wish to debug from the Search Device interface, and click the "Debug" button to open the Debug window:

- **Output Buffer:**

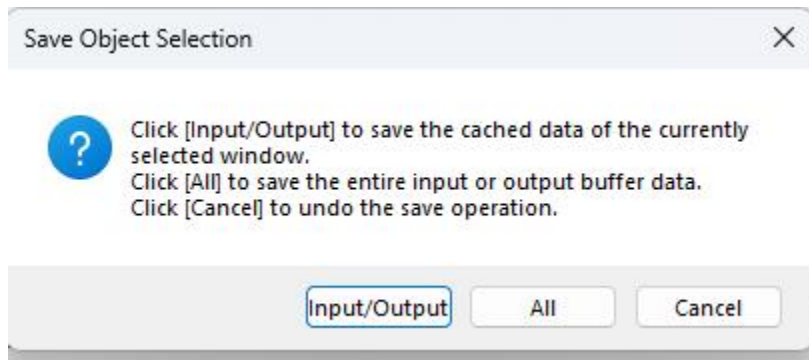
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- (1) Displays the data content of the gateway's output buffer.
- (2) Write Output Buffer Data: When not connected to an EtherCAT master device, you can manually modify the data values in the output buffer from this interface to transmit them.
- (3) Locate: Allows you to jump to and view data at a specific address within the output buffer.
- (4) Save Data: Allows you to save the buffer's data as a .txt file. Clicking "Save Data" opens the prompt below; save according to your needs.

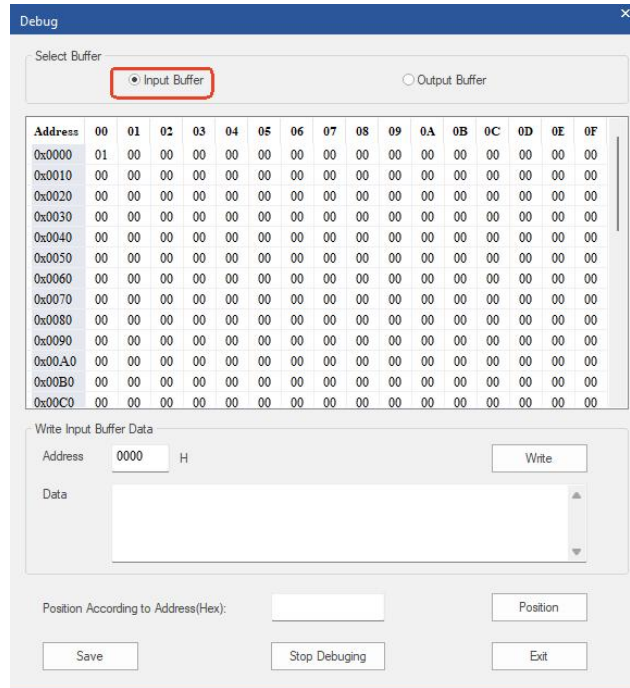


• Input Buffer:

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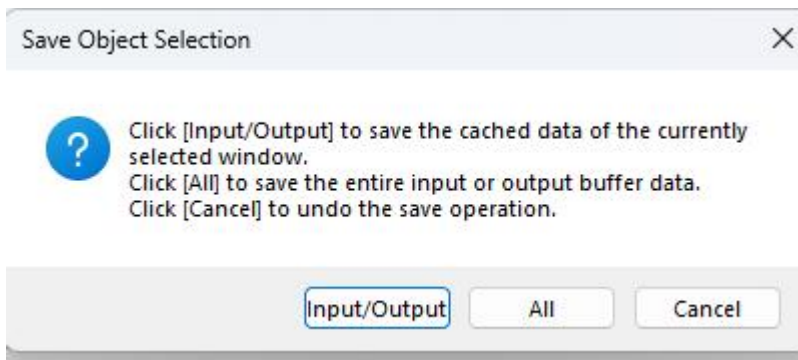


(1) Displays the data content of the gateway's input buffer.

(2) Write Input Buffer Data: When not connected to a Modbus TCP device, you can modify the data values in the input buffer from this interface to transmit them. (Note: In Modbus TCP Master mode, if the "ECAT Input Data Clear/Hold" parameter is set to "Clear", the input buffer data will display as 0 because no slave devices are connected.)

(3) Locate: Allows you to jump to and view data at a specific address within the input buffer.

(4) Save Data: Allows you to save the buffer's data as a .txt file. Clicking "Save Data" opens the prompt below; save according to your needs:





6.4 Firmware Update

! In this mode, the device IP address is fixed, and normal communication tasks cannot be executed. Used only for firmware upgrades.

Procedure:

1. Enter Bootloader Mode:
 - Power off the device, press and hold the button, and power on.
 - Release the button when the MS indicator turns solid orange, indicating successful entry into Bootloader mode.
 2. Connect & Access:
 - Connect the gateway's Modbus TCP port to the PC on the same LAN.
 - Set the computer's IP to the same subnet (e.g., 192.168.0.20).
 - Open a browser and navigate to the fixed address: <https://192.168.0.10>.
 3. Execute Update:
 - Follow the web prompts to select the new firmware file and begin. Wait for the device to automatically reboot upon success.
 - After reboot, MS returns to solid green, indicating normal operation with the new firmware.
- ⚡ Important: Do not remove power or perform other operations until the page indicates the update is complete.

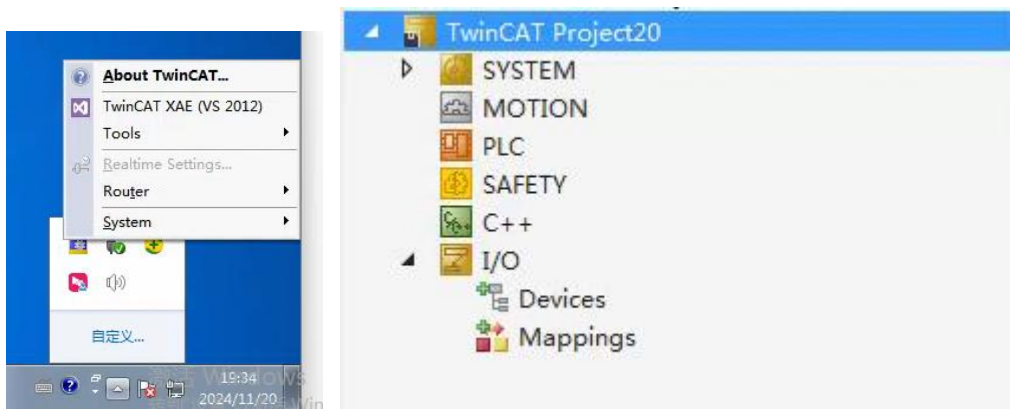
7. Communication Example (TwinCAT)

7.1 Importing the GT300-MT-EC ESI File into the Specified Folder

Import the GT300-MT-EC V1.1 file into the C:\TwinCAT\3.1\Config\Io\EtherCAT folder.

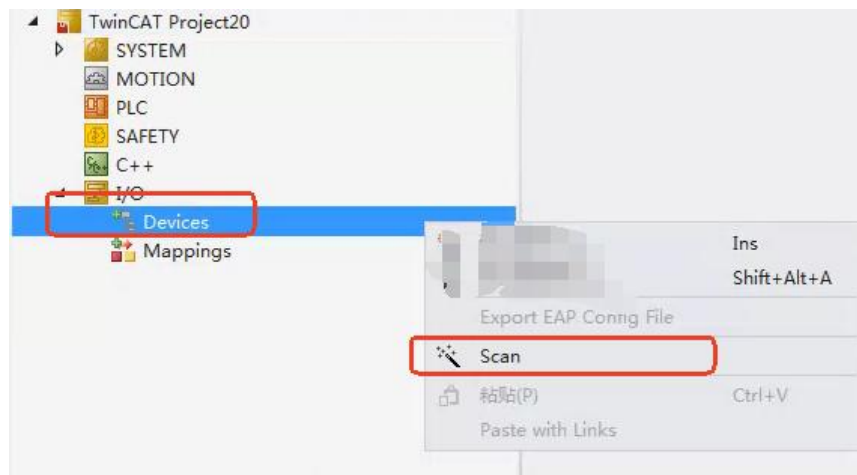
7.2 Creating a Project File

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



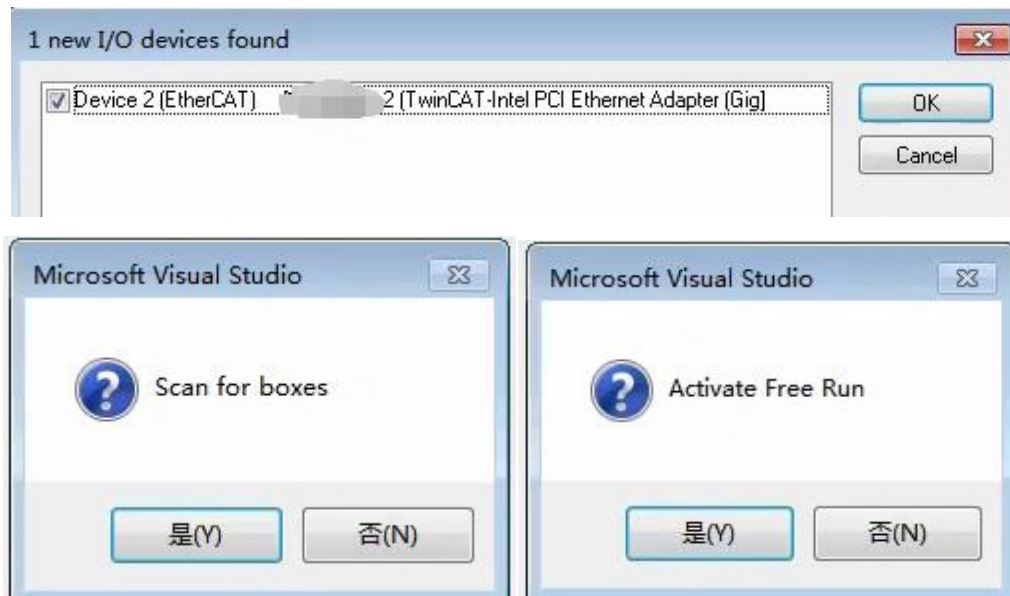
7.3 Data Communication

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



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3. Connection successful.

Name	Online	Type	Size	>Add...	In/Out	User...	Lin
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	

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

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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...
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



8 FAQ

Q1: How can I avoid address conflicts when configuring the gateway?

A: You can use the AutoMap feature in the SST-ECE-CFG software. After setting the data count for your Modbus TCP read/write commands, navigate to Menu Bar > Tools > Auto Mapping or simply click the AutoMap button on the toolbar. The software will automatically populate the "Memory Mapping Start Address" values without any overlaps.

Q2: What should I do if the software cannot find the gateway in the "Search Device" interface?

A: If clicking the "Refresh" button does not locate the gateway, you can try the Specified IP Search feature. Enter the static IP address of the gateway manually to search for it directly. Ensure your PC is on the same subnet as the gateway.

Q3: I have multiple gateways installed on the DIN rail. How can I identify a specific one?

A: Use the Locate function. Select the gateway you suspect in the "Search Device" interface and click the Locate button. The MS (Module Status) indicator light on that specific physical gateway will flash red for 3 seconds, helping you easily identify it.

Q4: How can I monitor the data exchange between the EtherCAT master and Modbus TCP devices?

A: Use the Real-time Debugging feature. Click Menu Bar > Tools > Debug or the Debug button on the toolbar. In the Debug window:

Output Buffer: Displays data coming from the EtherCAT master. If the EtherCAT master is disconnected, you can manually write data here to send to the Modbus network.

Input Buffer: Displays data collected from Modbus TCP devices.

You can also use the Locate function here to jump to a specific address, and use Save Data to export the buffer communication logs as a .txt file for further analysis.

Q5: Why is my Input Buffer showing all "0"s in Modbus TCP Master mode?

A: If no Modbus TCP slave devices are currently connected or responding, and your gateway's "ECAT Input Data Clear/Hold" parameter is set to "Clear", the gateway will automatically clear the buffer and display 0s.

9 Troubleshooting

9.1 LED Indicator Diagnostics

The gateway status indicators provide the first level of fault isolation. Refer to the table below for quick diagnosis based on observed LED behavior.

Observed Behavior	Likely Cause	Recommended Action
MS: Off (no light at all)	No power supply or power failure	1. Verify 24 VDC power source is connected and polarity is correct (Pin 1 = GND, Pin 3 = 24V+). 2. Measure supply voltage at terminal (9-30 VDC range). 3. Check power wiring for breaks or loose connections.
MS: Flashing Red continuously (DHCP acquiring)	DHCP server unavailable or network issue	1. Wait 30 seconds for DHCP timeout. 2. If MS does not turn solid green, verify network cable connection to Modbus TCP port. 3. Confirm an active DHCP server is present on the subnet. 4. If no DHCP server exists, the gateway will fall back to static IP 192.168.0.11. Set PC to 192.168.0.x subnet to connect.
MS: Solid Orange	Device entered Bootloader mode	1. This is the firmware upgrade mode. 2. To exit: reboot the gateway (power cycle) or complete the firmware update. 3. If unintentional, check that the Function button is not stuck or pressed during power-on.
NS (Master): Fast Flashing Green (500ms ON/OFF)	All configured Modbus TCP slaves failed to connect	1. Check physical wiring and switch connections to slaves. 2. Verify slaves are powered on and Modbus TCP is enabled. 3. Confirm gateway and slaves share the same subnet with no IP conflicts. 4. Verify slave IP addresses and port numbers in gateway configuration match actual devices. 5. Check firewall settings on slave devices.
NS (Master): Slow Flashing Green (1700ms ON, 300ms OFF)	Partial connection: some slaves connected, others offline	1. Check the Device Status placeholder bit in the input buffer to identify which specific slave is offline (1 = offline, 0 = online). 2. Apply the Fast Flashing Green troubleshooting steps to the affected slave(s) only.
NS (Master): Flashing	All nodes	1. Possible total network disruption.

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Red	disconnected (severe fault)	2. Reboot the gateway. 3. Check network switches, cables, and link status on all ports. 4. Verify no IP address conflicts on the subnet.
NS (Master): Flashing Red (3s burst)	A previously connected slave device disconnected	1. A slave that was online has gone offline temporarily or permanently. 2. Check the power and network connection of that specific slave. 3. Monitor whether the condition recovers (may be a transient network fluctuation).
NS (Slave): Flashing Green	No Modbus TCP Master connected or connection lost	1. Verify the Master device (SCADA, PLC, host) IP address and port number are correctly configured. 2. Confirm the Master is actively initiating the connection. 3. Check that the slave Unit ID setting in the gateway matches the Master's expected value. 4. Check for any firewall or security software blocking port 502.
NS (Slave): Flashing Red (3s burst)	Modbus TCP Master disconnected	1. Master device disconnected or network interrupted. 2. Verify the Master program/network stability. 3. Check Ethernet link status on the Master side.
RUN (EtherCAT): Off	EtherCAT master not communicating or no power	1. Confirm the EtherCAT master (e.g., TwinCAT) is in OPERATIONAL state. 2. Check EtherCAT cable connections (IN and OUT ports). 3. Verify the ESI file has been imported correctly into the master configuration.
RUN: Solid Orange 1Hz	EtherCAT in INIT state	The gateway has been detected but has not transitioned to PRE-OP. Check the master configuration for the correct device and ensure the ESI file is loaded.
RUN: Flashing Green 2Hz	EtherCAT in PRE-OP state	Normal transitional state. The master should automatically transition to SAFE-OP and then OP. If stuck, check the master state machine settings.
RUN: Flashing Green 1Hz	EtherCAT in SAFE-OP state	Mailbox communication is active but output data is not yet enabled. The master should transition to OP. Verify no configuration errors in the master.
ERR (EtherCAT): Solid Red	Connection to EtherCAT master lost after being established	1. Physical layer: Verify EtherCAT cable is securely connected and the master port is operational. 2. Master config: Log into master software (e.g., TwinCAT) and check scan status and error log. 3. Restart link: reboot both the gateway and the master controller.
EtherCAT Port LED:	No physical link	1. Check the EtherCAT cable is properly seated.

Off	on EtherCAT port	2. Verify the cable is not damaged (try a known-good cable). 3. Confirm the master EtherCAT port is active. 4. Ensure the correct port is used (IN vs. OUT on daisy-chain topology).
Modbus TCP Port Link LED: Off	No physical link on Modbus TCP port	1. Check the Ethernet cable connection. 2. Verify the connected device (PC, switch, slave) is powered and its port is active. 3. Try a different cable or port on the switch/device.

9.2 Before Contacting Technical Support

To expedite resolution, please gather the following information before contacting support@sstautomation.com:

1. Firmware version: Upload the configuration via SST-ECE-CFG to view the current firmware version.
2. Configuration file: Export the gateway configuration to Excel (Menu Bar > Tools > Export to Excel) and attach it to your support request.
3. LED indicator status at time of issue: Note the exact state and color of all four indicators (MS, NS, RUN, ERR).
4. Network topology: Describe or diagram how the gateway is connected (EtherCAT master model, Modbus TCP slave models and quantities, switch models).
5. Steps to reproduce: Provide the exact sequence of actions that triggers the problem.
6. Environment details: Operating temperature, power supply voltage, cable types and lengths.
7. Debug buffer data: If possible, use the Real-time Debugging tool (Section 6.3) to save the input and output buffer contents as .txt files at the moment of failure.