

EtherCAT MainDevice to EtherNet/IP Gateway

GT300-EC-EN

User Manual

V 1.1



SST Automation

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Important Information

Warning

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The product has many applications. The users must make sure that all operations and results are in accordance with the safety of relevant fields, and the safety includes laws, rules, codes and standards.

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Table of Contents

1 Product Overview	2
1.1 Product Function	2
1.2 Feature	2
1.3 Technical specification	2
1.4 Revision History	3
2 Hardware Description	4
2.1 Appearance	4
2.2 LED Indicators	5
2.3 Configuration Button	6
2.4 Interface	7
2.4.1 Power Interface	7
2.4.2 Ethernet Interface	7
3 Hardware Installation	8
3.1 Mechanical Dimensions	8
3.2 Installation Method	9
4 How to Start	10
4.1 Quick start guide	10
4.2 ECATStart Software Configuration	14
4.2.1 Pre-configuration Considerations	14
4.2.2 Software Main Interface	15
4.2.3 Toolbar	15
4.2.5 EtherCAT Side Configuration	18
4.2.6 Upload/Download Configuration	24
4.2.7 Save Configuration	27
4.2.8 Load Configuration	27
4.3 Operational	27
5 EtherNet/IP Connection Parameter Settings	29
6 How to Read and Write I/O Data	30
6.1 I/O Method for Reading and Writing Data	30
Appendix 1: CiA 402 State Diagram	33
Appendix 2: Servo Control Mode	35



1 Product Overview

1.1 Product Function

The GT300-EC-EN gateway supports the connection of devices with an EtherCAT interface to an EtherNet/IP network. This module operates as an adapter on the EtherNet/IP side and as a MainDevice on the EtherCAT side. It can connect up to 32 EtherCAT devices to the EtherNet/IP network.

1.2 Feature

- **Wide application:** Supports connecting multiple EtherCAT devices to an EtherNet/IP network, such as frequency converters with EtherCAT interfaces, servo motors, remote I/O modules, field measurement devices, and PLCs. The EtherNet/IP side connects to PLCs such as AB and OMRON.
- **Strong real-time performance:** Minimum 3 ms protocol conversion time.
- **Easy to use:** Supports hot swapping of slave devices, enabling plug-and-play functionality and easy maintenance.
- **Isolated power design:** Enhanced anti-interference performance to ensure stable operation.
- **Professional configuration software SST-ECAT-COM:** The software supports parsing SST-ECAT-COM Slave Information (ESI) files and offline configuration.

1.3 Technical specification

[1] The EtherCAT MainDevice supports CoE and complies with CiA402 standards.

[2] The EtherCAT MainDevice supports up to 32 devices connections.

[3] The EtherCAT MainDevice supports SM and DC synchronization modes, with a configurable Distributed Clock (DC) cycle from 2 ms to 20 ms.

[4] Supports hot swapping of EtherCAT devices (online replacement), allowing the replacement of a Device without affecting the normal communication of already connected Devices.



- [5] Supports a minimum protocol conversion interval time of 4ms.
- [6] Ethernet auto-negotiation with built-in Ethernet switching capabilities, supports cascading..
- [7] EtherNet/IP IP setting options: static configuration or DHCP, with DHCP as the default. (In DHCP mode, if the IP is not assigned within 30 seconds, the gateway assigns a fixed IP: 192.168.0.10).
- [8] Supports the ODVA standard EtherNet/IP communication protocol as an EtherNet/IP Adapter (Slave).
- [9] Maximum EtherNet/IP input and output bytes:
 - Maximum input bytes: 492 bytes
 - Maximum output bytes: 492 bytes
- [10] Power supply: 24VDC (9V ~ 30V), 80mA (24VDC).
- [11] Working temperature:-40°F to 158°F (-40°C to 70°C), relative humidity: 5% - 95% (non-condensing)..
- [12] External dimensions (W*H*D): 1.3in * 4.6in * 4.1in (34mm * 116mm * 105mm).
- [13] Installation: 35 mm DIN rail.

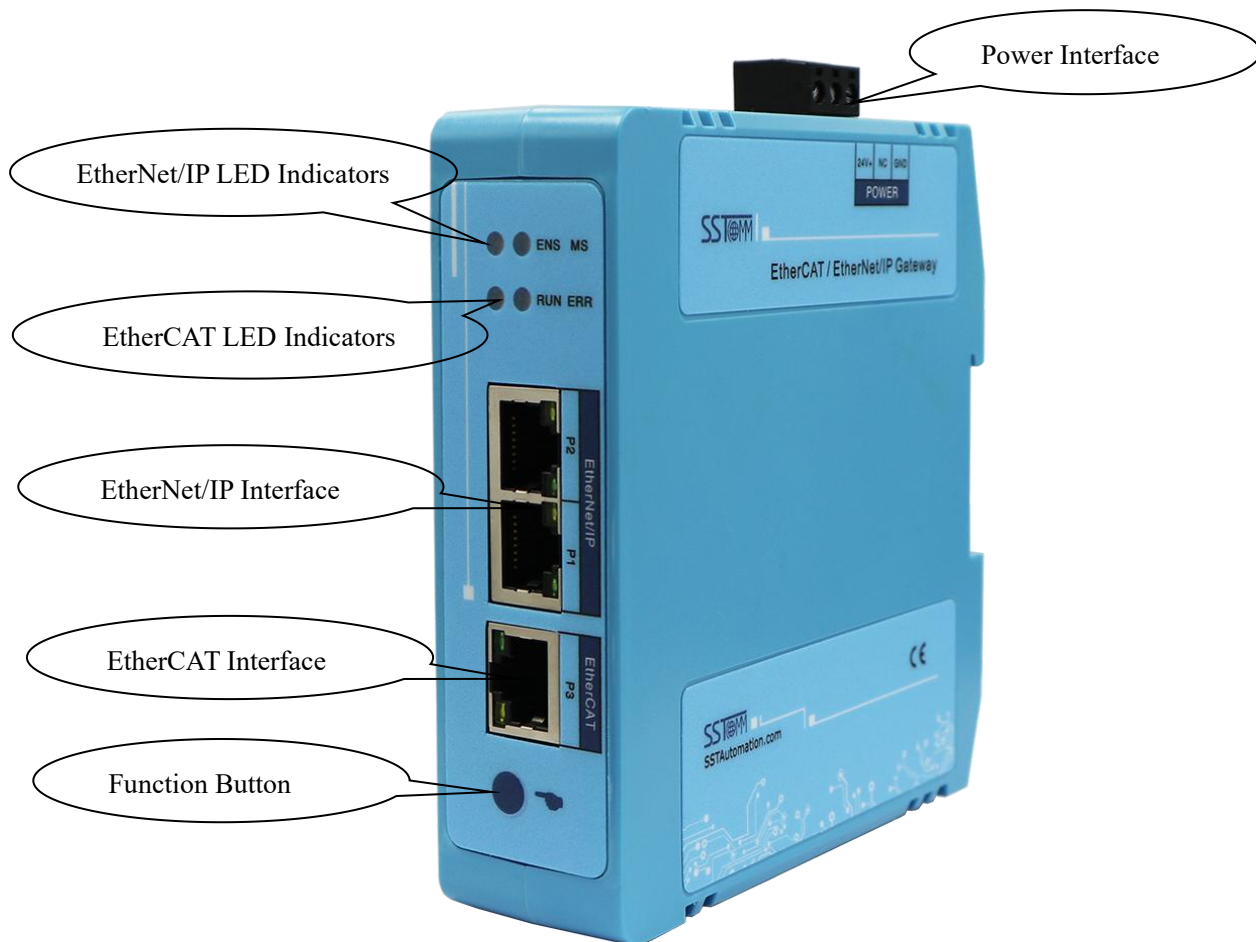
1.4 Revision History

Revision	Date	Chapter	Description
V1.0	11/15/2024	ALL	New release
V1.1	12/10/2024	PART	Change the name'EtherCAT MainDevice to EtherNet/IP Gateway'



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

EtherNet/IP LED Indicators

Indicator Light	Indicator Light	Description
ENS (EIP Status Light)	Off	IP address started normally
	Red flashing	DHCP
	Green On	EtherNet/IP connection has been established, and communication is normal.
	Green flashing	EtherNet/IP connection has not been established.
MS (System Status Light)	Red On	Initializing
	Green On	The system is running normally.
ENS,MS	MS orange on, ENS off	Firmware update mode
	MS red on for 500 ms, then off	Lock configuration
	MS red turns on for 300ms, then turns off for 400ms, and turns on again for 300ms before turning off	Unlock configuration

EtherCAT LED Indicators

Indicator Light	State	Description
RUN	Orange On	Start-up state, waiting to initialize
	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 flashing(1HZ)	A slave device has disconnected(slave devices incorrect physical connection)
	Red flashing(2HZ)	EtherCAT communication error with slave.
	Red On	ECAT interface has no physical connection.



2.3 Configuration Button

After the device starts and enters running mode, the EtherCAT RUN and ERR indicators will blink orange once each time a key press is successfully detected. The specific functions are as follows:

- **Firmware Upgrade**

Press and hold the button while powering on the device to enter Bootloader mode. The MS orange light remains on (both red and green lights on simultaneously), and the MS light remains off.

- **Restore Default Configuration**

Within 10 seconds after the device has powered on and completed startup (when the MS green light is solid), press and hold the button for 5 seconds. The MS green light will flash (2 Hz). Within the next 5 seconds, press the button once to turn off the MS indicator light, restore the default configuration, and automatically restart the device. After restoring to default configuration, the IP settings revert to the default DHCP. If the button is not pressed within 5 seconds, the MS green light will return to solid and normal operation will resume.

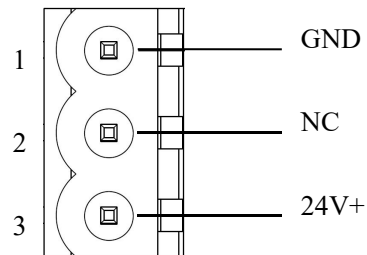
- **Lock/Unlock Configuration**

While the device is running, double-click the button. The MS red light will turn on for 500 ms and then turn off, indicating that the configuration is locked. Double-click the button again, and the MS red light will turn on for 300 ms, off for 400 ms, then on for another 300 ms before turning off, indicating that the configuration is unlocked. When the MS red light is on, the MS green light is off. When the MS red light is off, the MS green light turns back on. After the configuration is locked, the configuration software will not be able to upload or download the device configuration. Once the configuration is unlocked, the software can upload and download the device configuration normally.



2.4 Interface

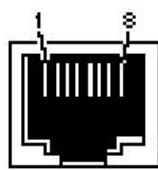
2.4.1 Power Interface



Pin	Function
1	Power GND
2	NC, no connection
3	24V+ , DC

2.4.2 Ethernet Interface

Ethernet interface apply RJ-45 connector, 10/100M adaptive.



RJ-45 port

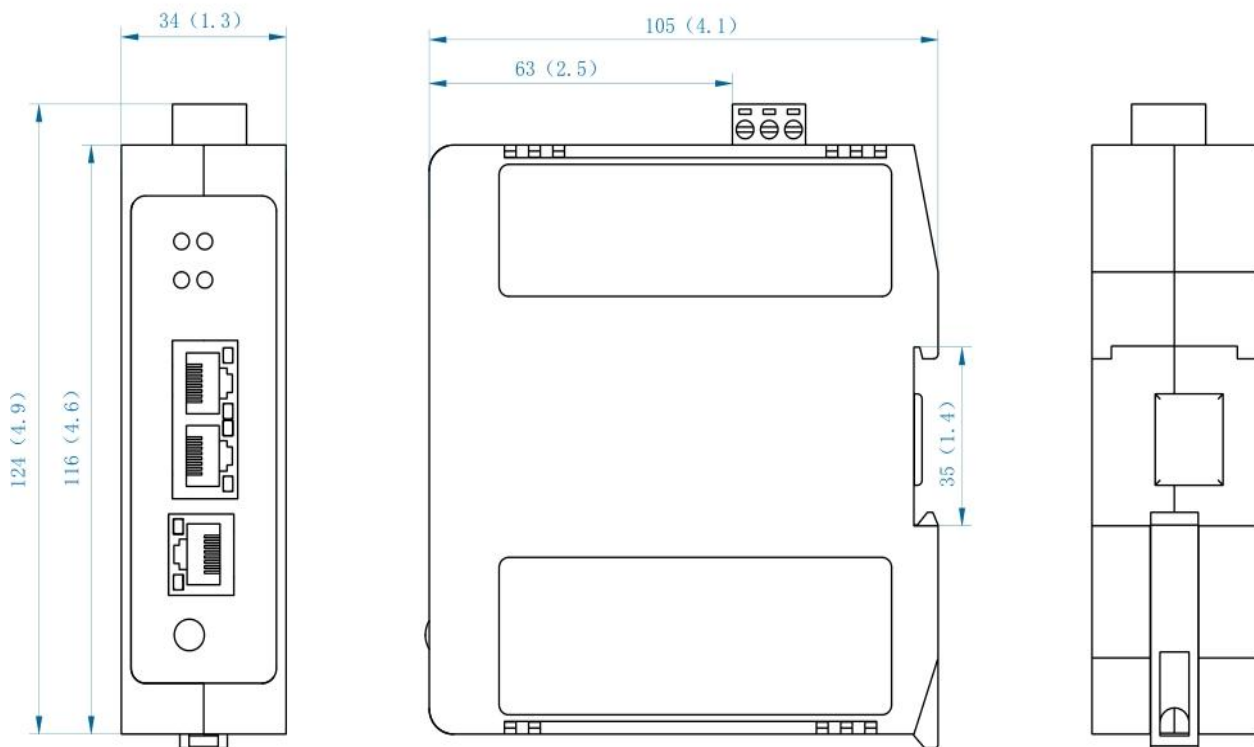
Pin	Signal Description
S1	TXD+, Tranceive Data+, Output
S2	TXD-, Tranceive Data-, Output
S3	RXD+, Receive Data+, Input
S6	RXD-, Receive Data-, Input
S4,5,7,8	Reserved



3 Hardware Installation

3.1 Mechanical Dimensions

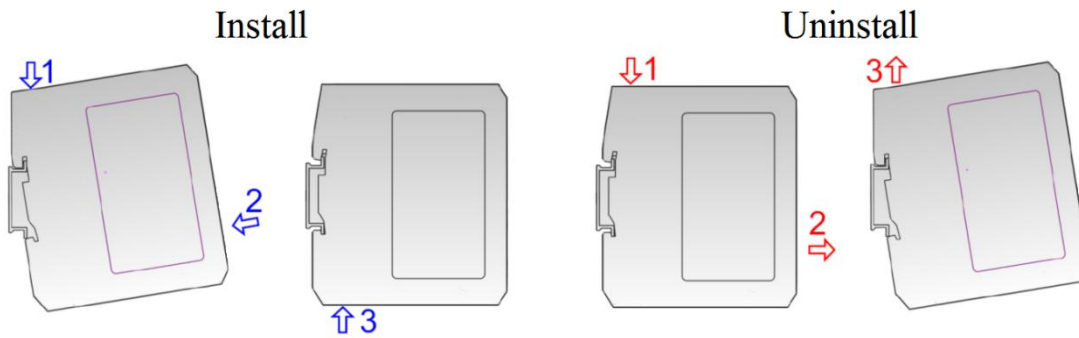
1.3in * 4.6in * 4.1in (34mm * 116mm * 105mm)





3.2 Installation Method

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



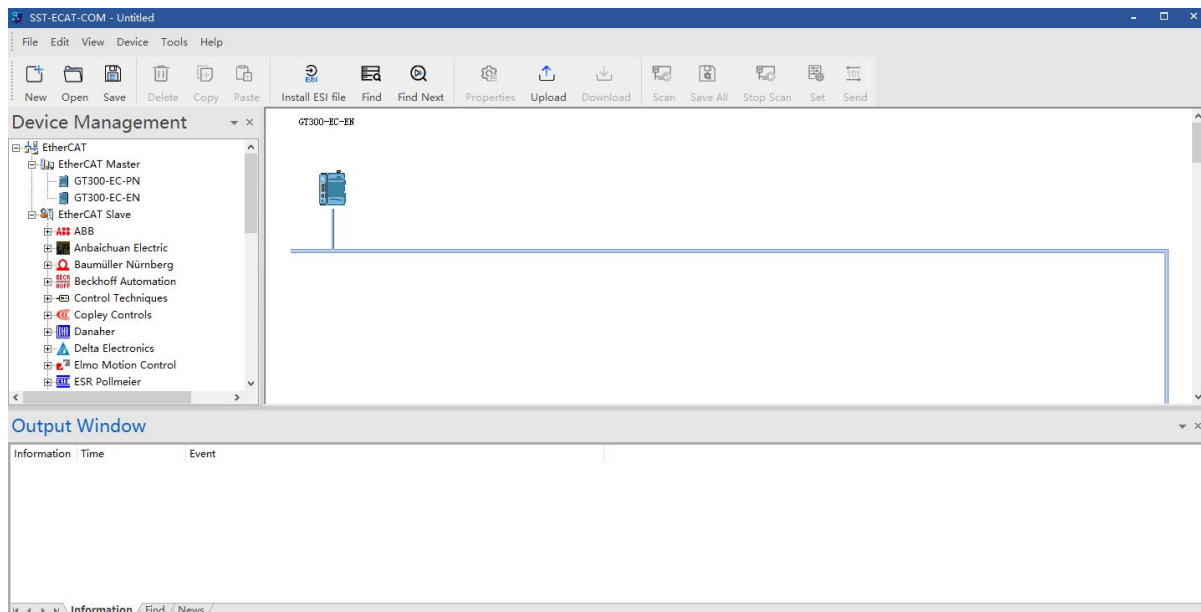


4 How to Start

4.1 Quick start guide

1) The EtherNet/IP port of the GT300-EC-EN (either of the two Ethernet ports) is connected to a PC or the PC's switch. The EtherCAT Port of the GT300-EC-EN is connected to the input port (IN port) of the EtherCAT slave device. If there are multiple slave devices, connect the output port (OUT port) of the current slave to the input port (IN port) of the next device in a daisy-chain manner.

2) Double-click the installed ECATStart software on the PC, as shown in the image below:



3) Click 'Install ESI file' and follow the prompts to import the ESI (*.xml) files of the connected EtherCAT slave devices.

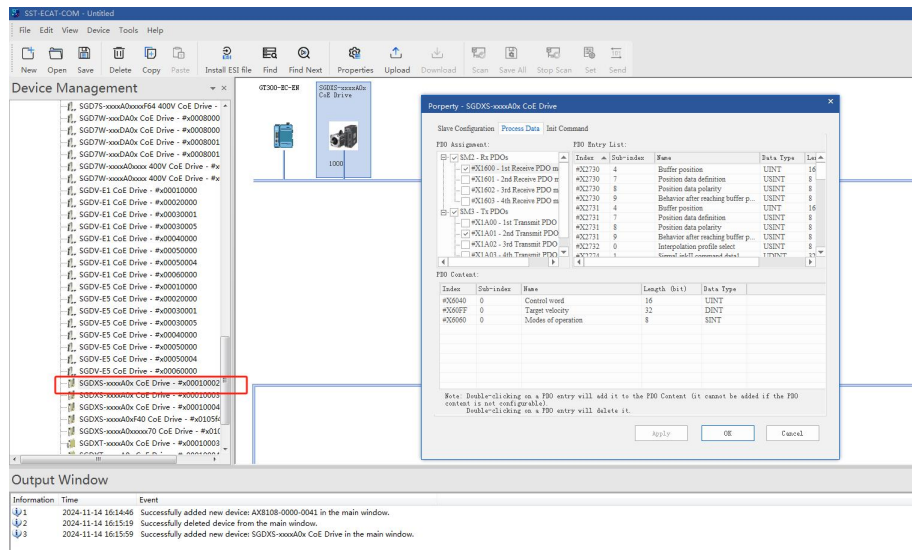
4) Drag the gateway device GT300-EC-EN and the slave devices to be used from the device management column to the bus network on the right.



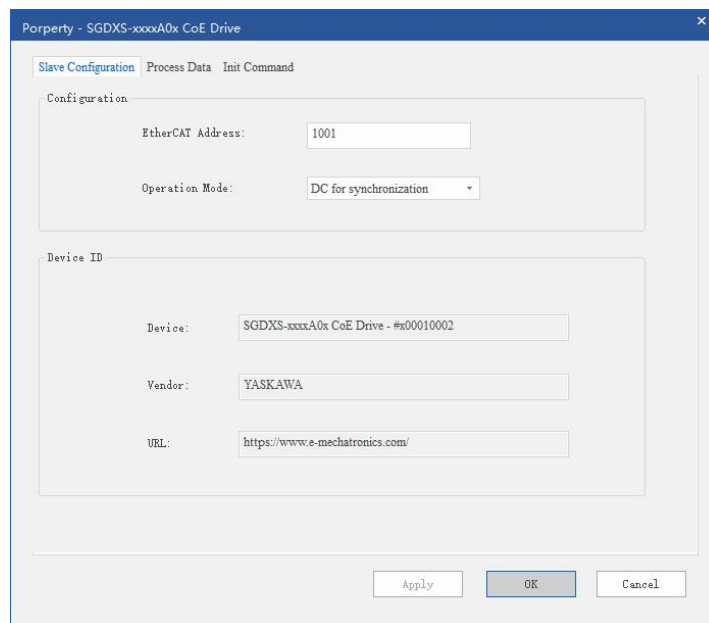
GT300-EC-EN

EtherCAT MainDevice to EtherNet/IP Gateway

User Manual



5) Double-click the slave icon to open the 'Slave Configuration' interface, where you can view the basic information of the slave and select the synchronization mode based on the actual requirements.



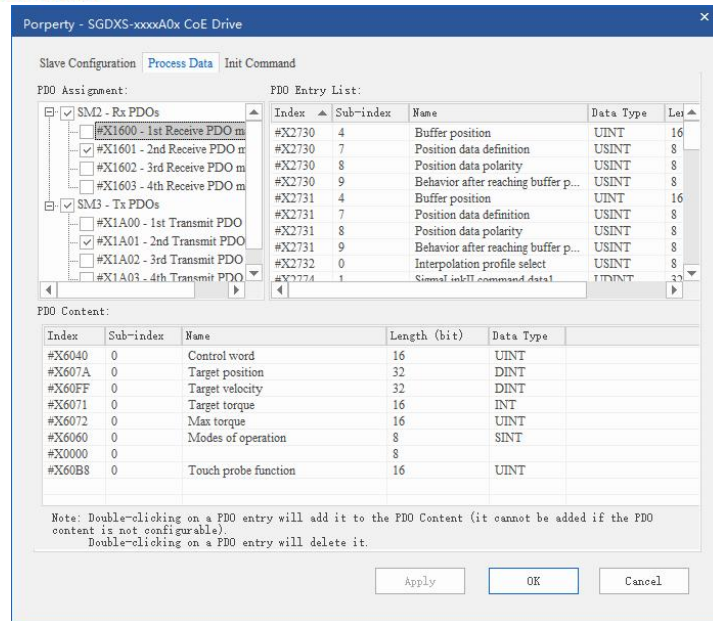
6) Click on the 'Process Data' interface, where you can select the default PDO configuration from the ESI file. If the slave supports PDO Mapping, you can add or remove mapping objects by double-clicking in the PDO Entry List and PDO Content in the upper-right corner. Once the configuration is complete, click the 'OK' button in the lower-right corner.



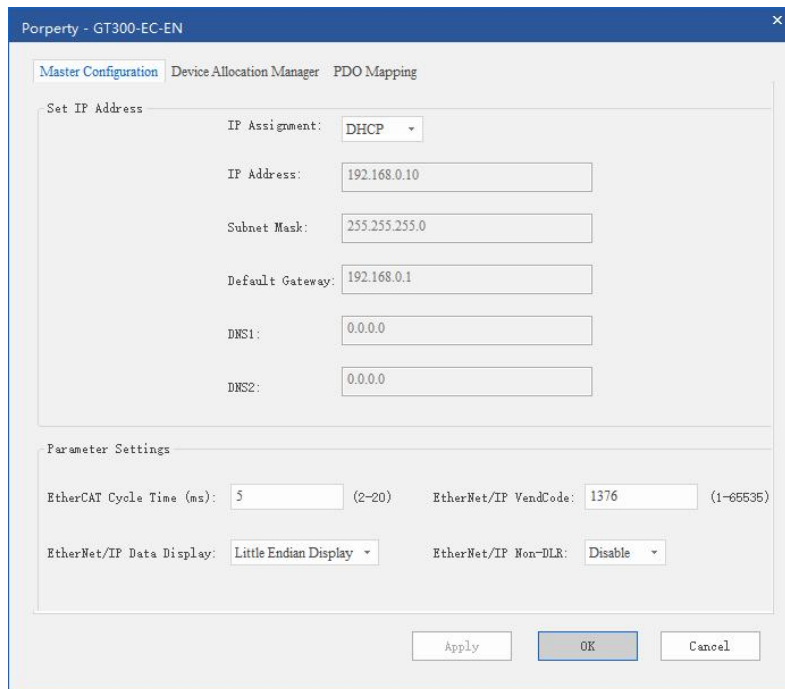
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User Manual



7) Double-click the master icon to open the 'Master Configuration' interface, where you can configure the gateway. Set the gateway's static IP address. And under the Parameter Settings, configure the EtherCAT master's data transmission cycle, EtherNet/IP VendCode (default is 1376), the display format of EtherNet/IP endpoint data (big-endian or little-endian), and whether EtherNet/IP Non-DLR is enabled.



8) In the 'Device Allocation Manager', select a slave device from the Available Devices list and add it to the Allocated Devices list. You can change the connection order between the master and slaves by dragging the



GT300-EC-EN

EtherCAT MainDevice to EtherNet/IP Gateway

User Manual

devices in the Allocated Devices list. Be sure to ensure that the connection order in the configuration matches the actual physical connection order of the devices.

Property - GT300-EC-EN

Master Configuration | **Device Allocation Manager** | PDO Mapping

Available Devices

ID	Device Name
1	SGDXS-xxxxA0x CoE Drive(1001)

Allocated Devices

Connection Order	Device Name
------------------	-------------

> < >> <<

Note: Please make sure the device connection order matches the order in which the devices are physically connected.

Apply OK Cancel

Property - GT300-EC-EN

Master Configuration | **Device Allocation Manager** | PDO Mapping

Available Devices

ID	Device Name
----	-------------

Allocated Devices

Connection Order	Device Name
1	SGDXS-xxxxA0x CoE Drive...

> < >> <<

Note: Please make sure the device connection order matches the order in which the devices are physically connected.

Apply OK Cancel

9) You can click on 'PDO Mapping' to view the offset and data length information of each object on the EtherNet/IP side.



GT300-EC-EN

EtherCAT MainDevice to EtherNet/IP Gateway

User Manual

EtherCAT Address	PDO	Index	Sub-index	Name	Length (bit)	Offset (t)
1001	2nd Rece...	#x6040	0	Control word	16	0
1001	2nd Rece...	#x607A	0	Target position	32	16

EtherCAT Address	PDO	Index	Sub-index	Name	Length (bit)	Offset (t)
1001	2nd Tran...	#x6041	0	Status word	16	0
1001	2nd Tran...	#x6064	0	Position actual value	32	16

10) After completing the configuration, click 'OK' and download the configuration to the gateway device. After the download is complete, restart the device to apply the configuration.

11) Use AB PLC configuration software Studio 5000 for IO configuration. (For detailed configuration, refer to Chapter 6)

Type: ETHERNET-MODULE Generic Ethernet Module
Vendor: Rockwell Automation/Allen-Bradley
Parent: TEST
Name: SSTGateway
Description:
Comm Format: Data - INT
Address / Host Name
☒ IP Address: 192 . 168 . 0 . 10
☐ Host Name:
Connection Parameters
Input: 102, Size: 65 (16-bit)
Output: 101, Size: 64 (16-bit)
Configuration: 103, Size: 10 (8-bit)
Status Input:
Status Output:
☒ Open Module Properties
OK Cancel Help

4.2 ECATStart Software Configuration

4.2.1 Pre-configuration Considerations

After powering on the GT300-EC-EN, wait until the gateway's MS indicator light is solid green and the NS



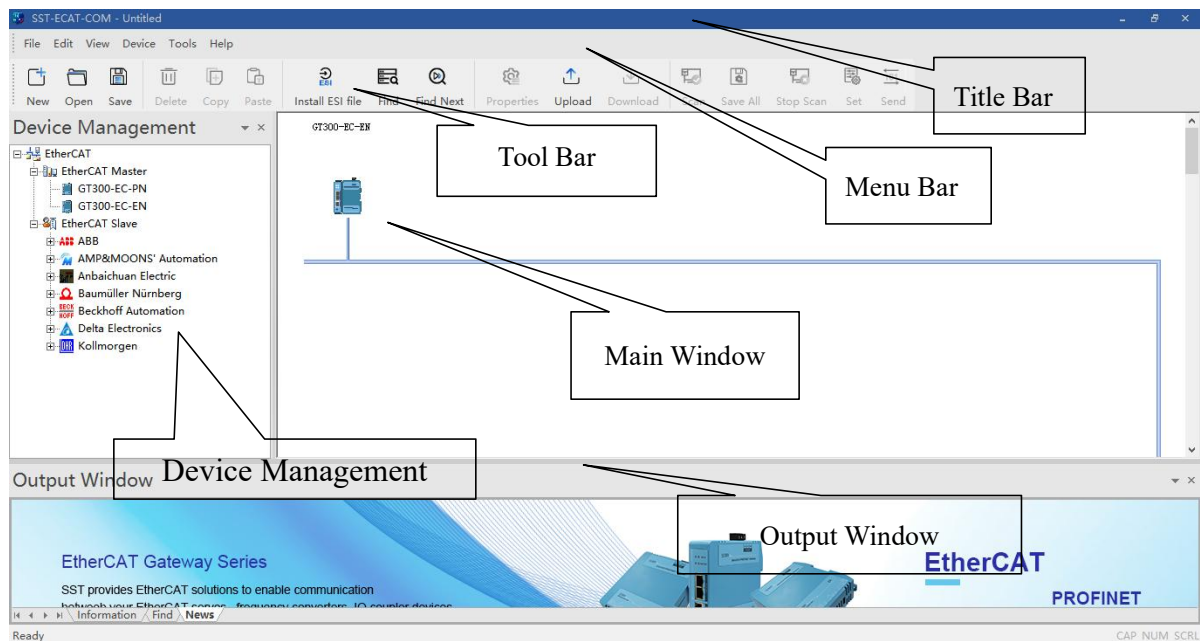
GT300-EC-EN

EtherCAT MainDevice to EtherNet/IP Gateway

User Manual

indicator light is either flashing red or solid green. At this point, the gateway device can be searched for and configured using EtherCAT configuration software. The EtherCAT network configuration software ECATStart, developed by SSTCOMM, is required and should be used with SSTCOMM's GT300-EC-EN or other EtherCAT gateways.

4.2.2 Software Main Interface



Main window: In the configuration interface, in offline mode, you can view the device properties by dragging the device icon into this window.

Device Management window: Displays registered EtherCAT devices. Slave devices are further categorized by manufacturer type.

Output window: Shows information on devices that have been added or removed, along with the results of 'Find Device' and 'Find Next'.

4.2.3 Toolbar



The functions from left to right are: New, Open, Save, Delete, Copy, Paste, Install ESI file, Find, Find



Next,,Properties, Upload, Download.

4.2.4 Install ESI file

Users can configure different EtherCAT devices by registering a new ESI file. To register a new ESI (*.xml) file, you can select 'Tools' -> 'Install ESI file', click the 'Install ESI file' button on the toolbar, or right-click in the device management window and select 'Install ESI file'. The Install ESI file interface will then appear.

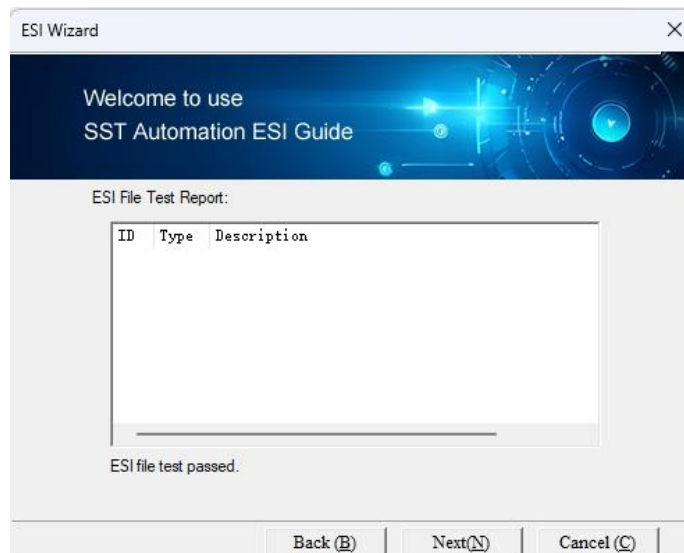


Select 'Start', and the following interface will appear:

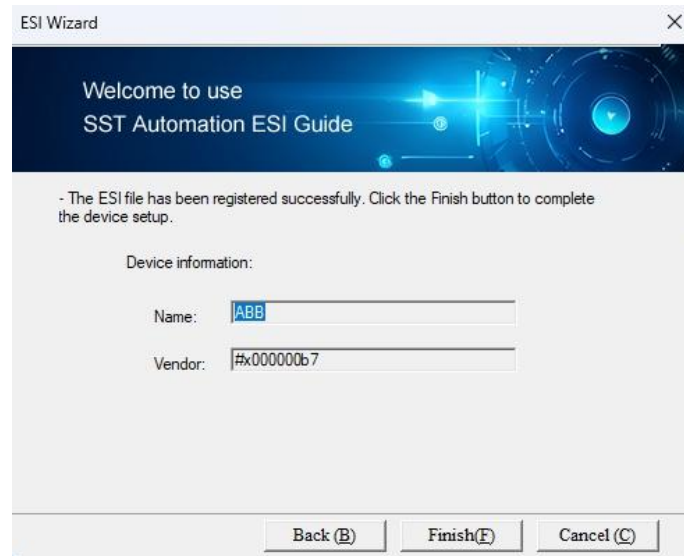




In the pop-up window, select the path to the ESI file, as shown in the figure below:



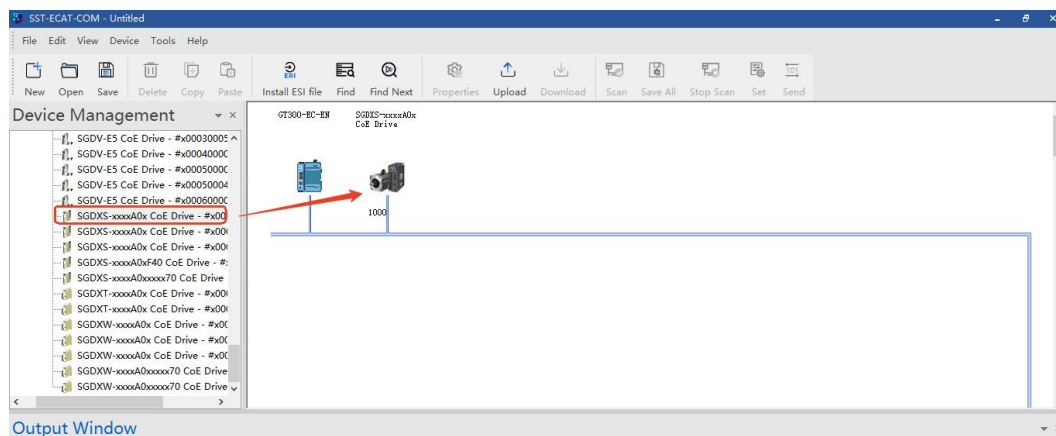
Click 'Next' to display the ESI file test report interface. If the ESI file contains errors, you will not be able to proceed. If no errors are found, click 'Next' to complete the ESI registration.



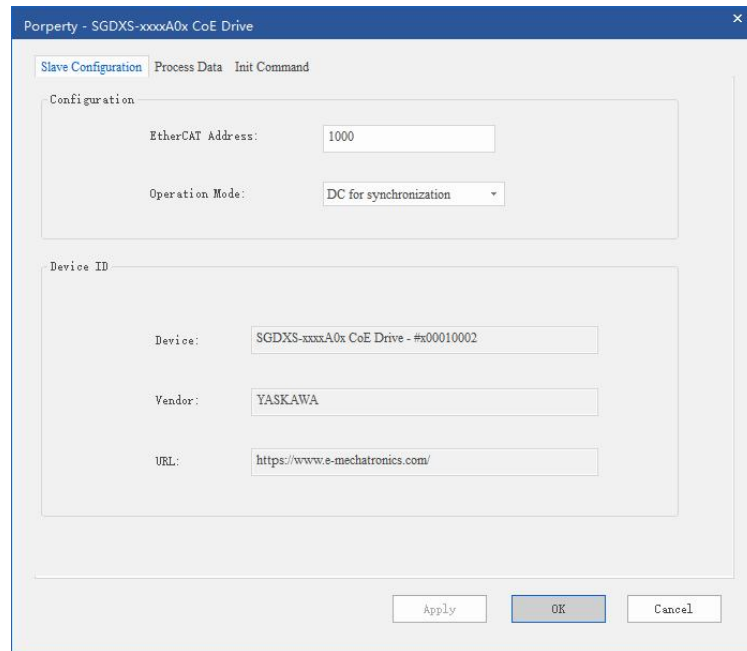
Once the registration is complete, the registered device will be visible in the device management window.

4.2.5 EtherCAT Side Configuration

1. Drag the gateway device GT300-EC-EN and the required slave devices from the Device Management panel into the bus network on the right side.



2. Double-click the slave icon to open the 'Slave Configuration' interface, where you can view the basic information of the slave and select the synchronization mode based on the actual requirements.



EtherCAT Address: EtherCAT sets the address of the slave device during addressing.

Operation Mode: Available synchronization modes for EtherCAT slave operation:

DC-Synchronous: Triggered by distributed clock cycles.

SM-Synchronous: Triggered by read/write events.

FreeRun: Triggered by the slave's internal operating cycle.

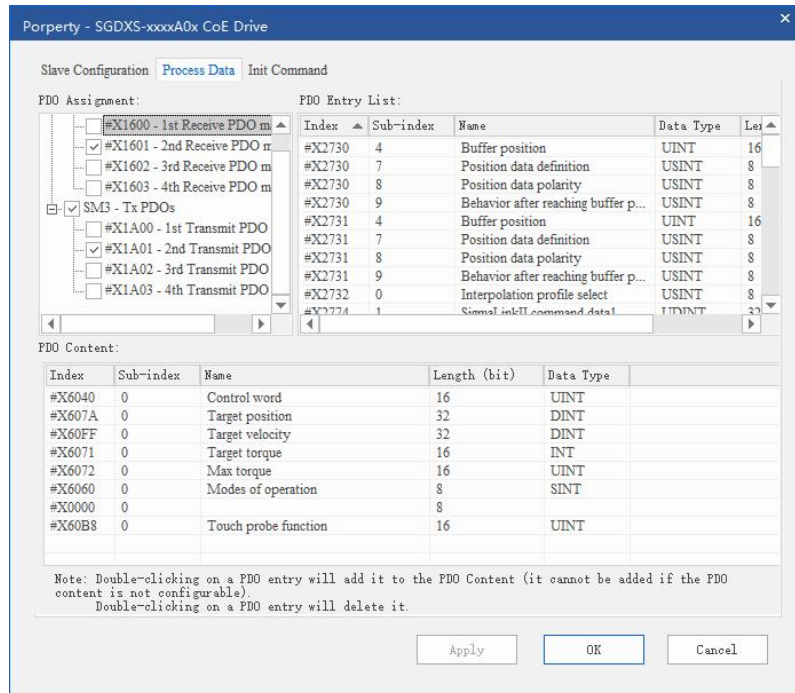
3. Click on the 'Process Data' interface, where you can select the default PDO configuration from the ESI file. If the slave supports PDO Mapping, you can add or remove mapping objects by double-clicking in the PDO Entry List and PDO Content in the upper-right corner. Once the configuration is complete, click the 'OK' button in the lower-right corner.



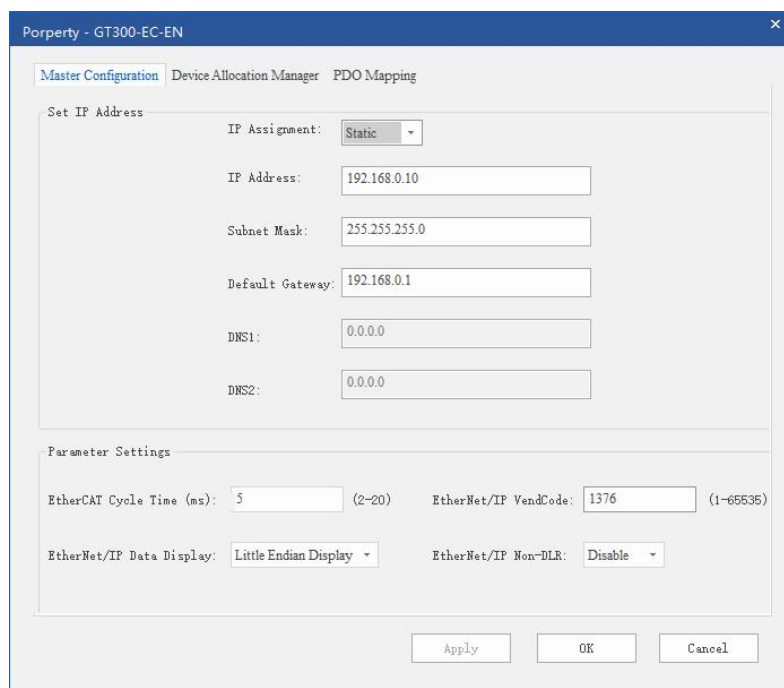
GT300-EC-EN

EtherCAT MainDevice to EtherNet/IP Gateway

User Manual



4. Double-click the master icon to open the 'Master Configuration' interface, where you can configure the gateway. Set the gateway's static IP address. And under the Parameter Settings, configure the EtherCAT master's data transmission cycle, EtherNet/IP VendCode (default is 1376), the display format of EtherNet/IP endpoint data (big-endian or little-endian), and whether EtherNet/IP Non-DLR is enabled.





GT300-EC-EN

EtherCAT MainDevice to EtherNet/IP Gateway

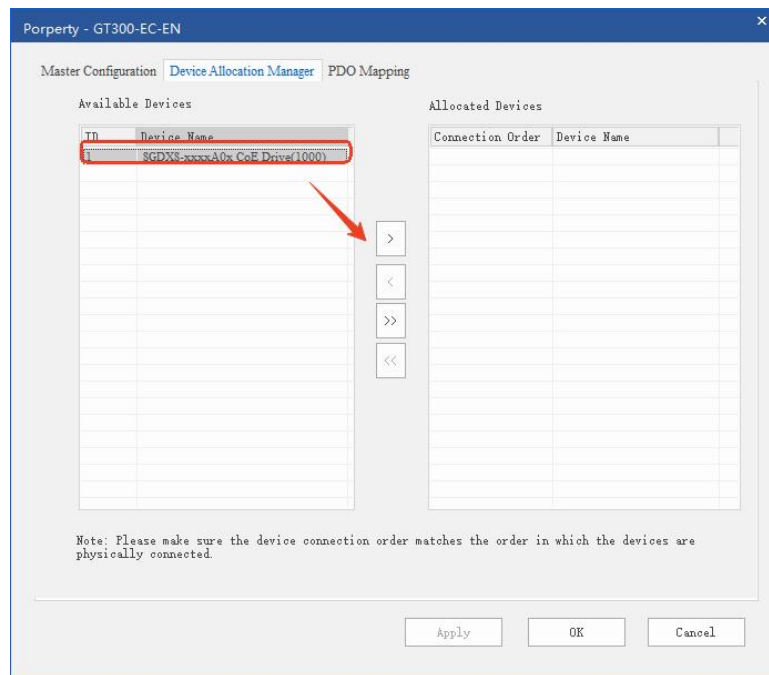
User Manual

EtherCAT Cycle Time (ms): Distributed Clock cycle/EtherCAT data transmission cycle.Range:2ms-20ms.

Default value is 5 ms.

EtherNet/IP Data Display: The data format of EtherCAT devices displayed on the EtherNet/IP side changes when Big Endian Display is enabled. The high and low bytes of 2-byte data are swapped, and 4-byte data changes from abcd to dcba.

5. In the 'Device Allocation Manager', select a slave device from the Available Devices list and add it to the Allocated Devices list. You can change the connection order between the master and slaves by dragging the devices in the Allocated Devices list. Be sure to ensure that the connection order in the configuration matches the actual physical connection order of the devices.

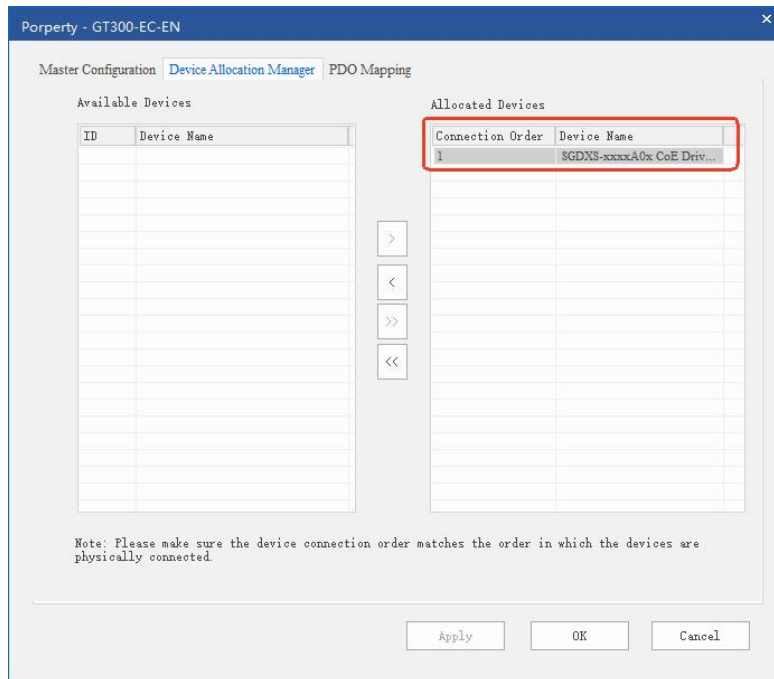




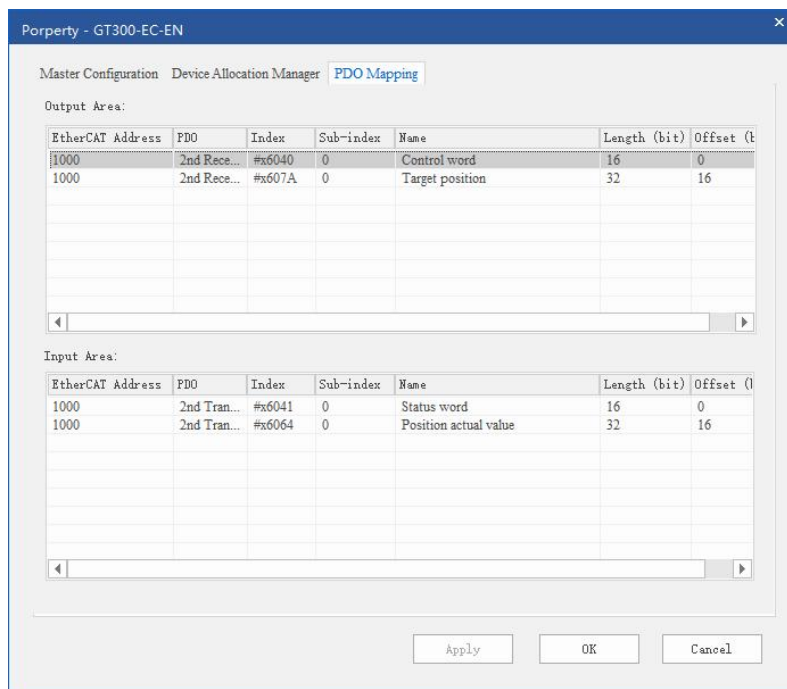
GT300-EC-EN

EtherCAT MainDevice to EtherNet/IP Gateway

User Manual



6. Click on 'PDO Mapping' to view the offset and data length information of each object on the EtherNet/IP side.



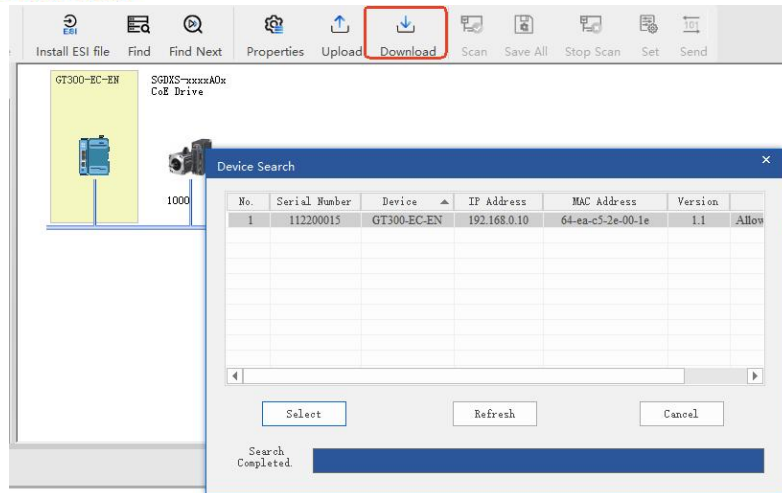
7. After completing the configuration, click 'OK' and download the configuration to the gateway device. Once the download is complete, restart the device to apply the configuration.



GT300-EC-EN

EtherCAT MainDevice to EtherNet/IP Gateway

User Manual

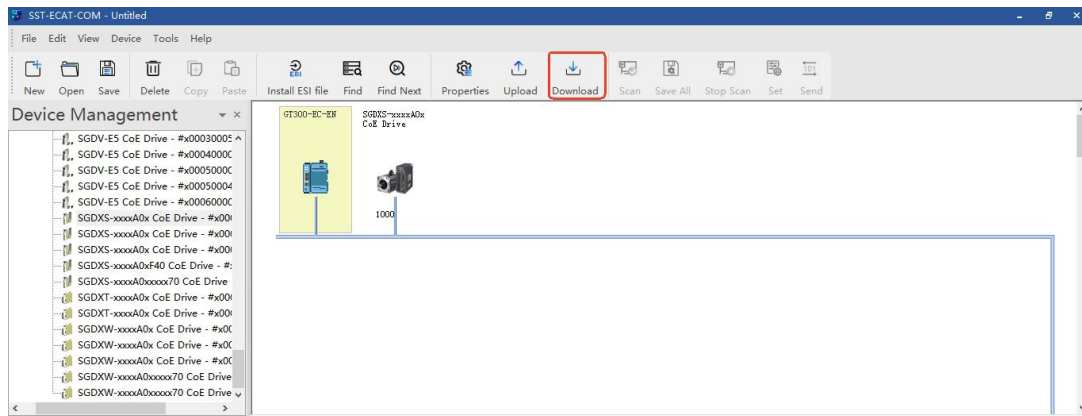




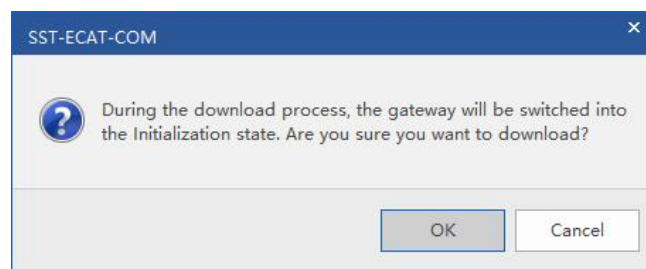
4.2.6 Upload/Download Configuration

Download Configuration:

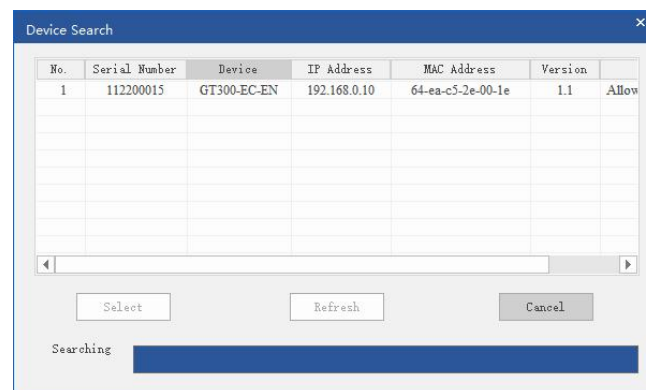
After completing the configuration, left-click the GT300-EC-EN icon and click 'Download', as shown in the image below:



Pop up a dialog box and select 'OK'.



Select the scanned gateway and click 'Select'.



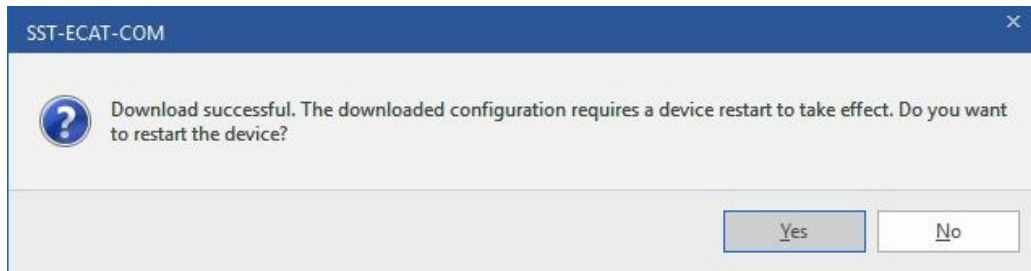
After the download is successful, a success dialog box will pop up.



GT300-EC-EN

EtherCAT MainDevice to EtherNet/IP Gateway

User Manual

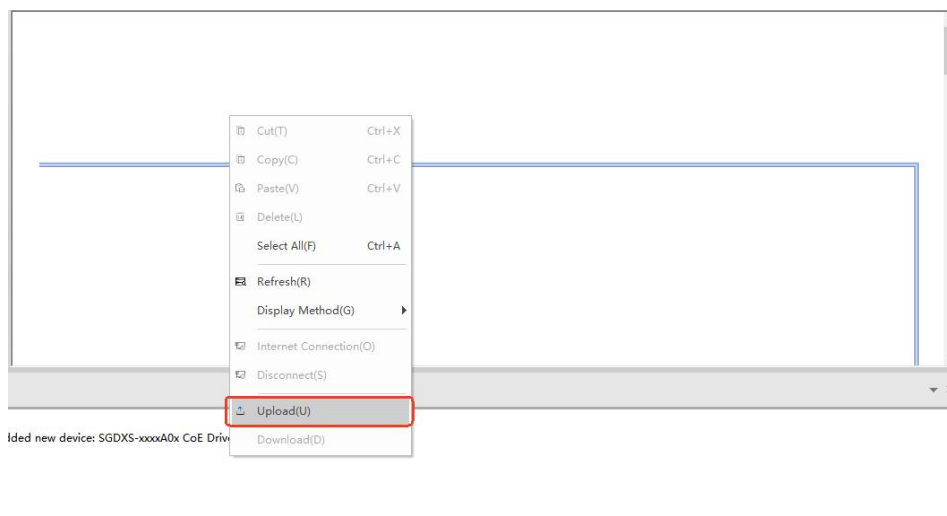
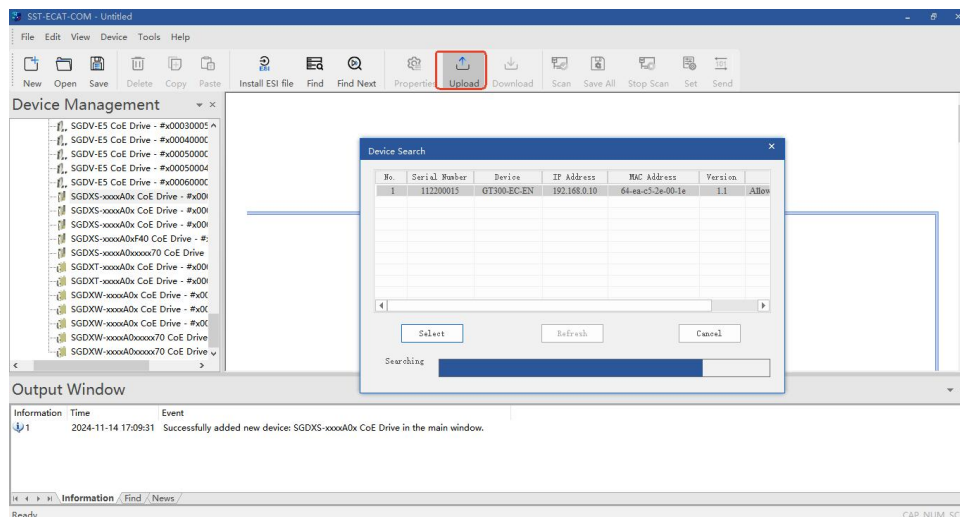


Yes: Restart the gateway remotely to apply the configuration. This restart method is recommended.

No: Do not restart the gateway, it will continue to operate with the existing configuration until the next restart, at which point the new downloaded configuration will be applied.

Upload Configuration:

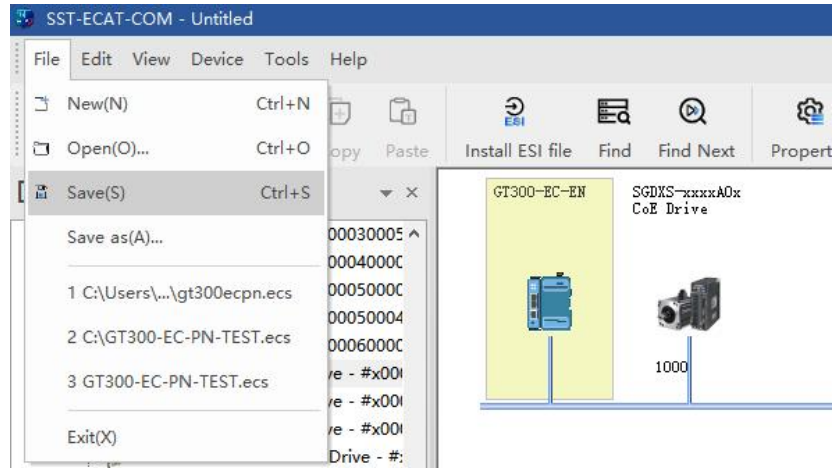
Click the 'Upload' button or right-click on the blank area of the 'Main Window' to pop up the dialog box, then select 'Upload'.



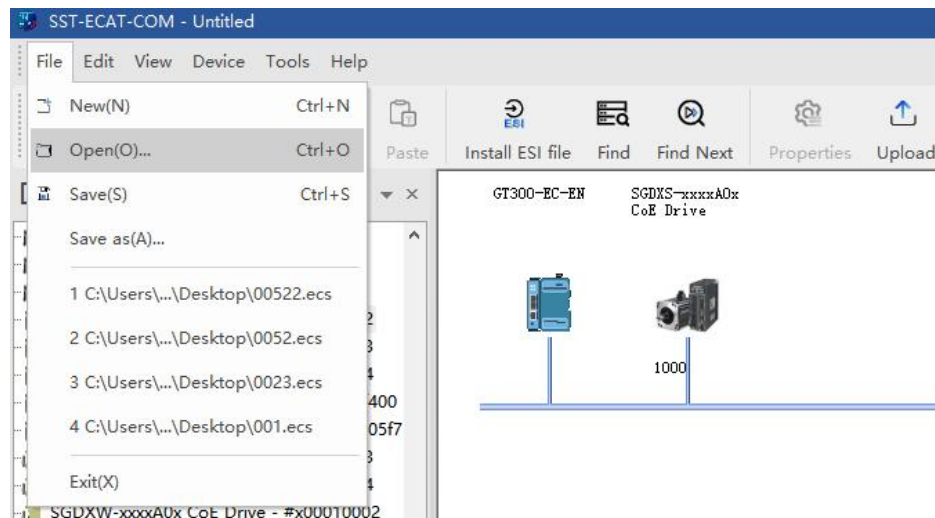
[illegible]



4.2.7 Save Configuration



4.2.8 Load Configuration



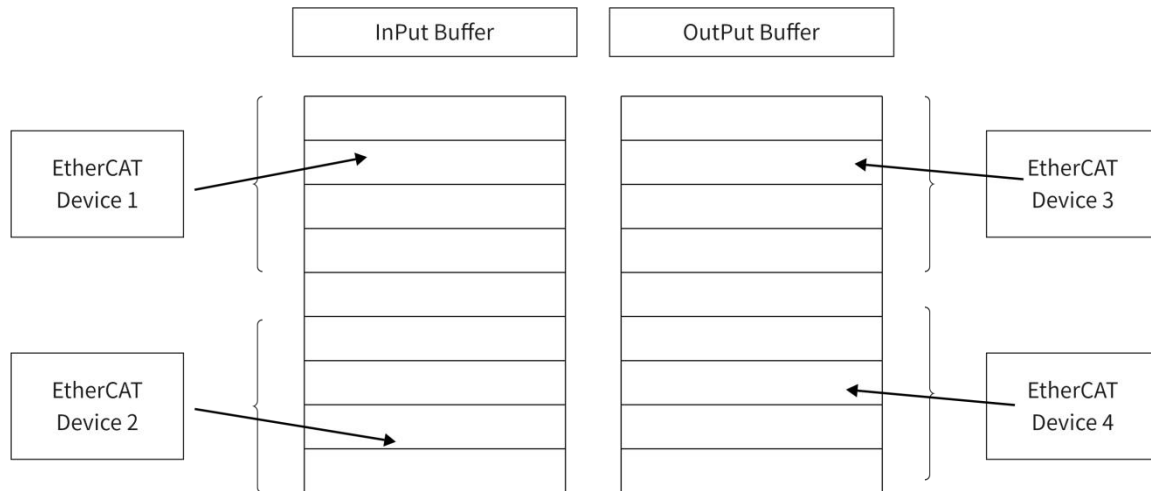
4.3 Operational

Gateway Working Principle:

The data conversion between EtherCAT and EtherNet/IP in GT300-EC-EN is established through a 'mapping' relationship. The GT300-EC-EN has two data buffers: one is the network data input buffer, and the other is the network data output buffer. EtherCAT read commands write the data to the network data input buffer, where it can



be accessed by the EtherNet/IP master. The EtherNet/IP master writes data to the network data output buffer, which is then transmitted by the EtherCAT master to the corresponding EtherCAT device through the write process.





5 EtherNet/IP Connection Parameter Settings

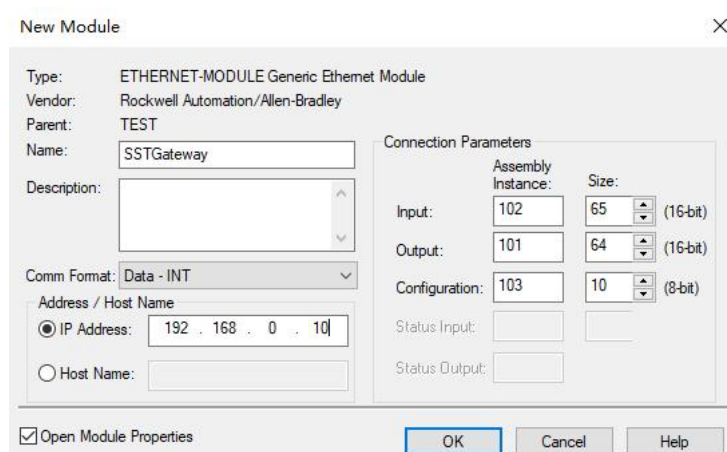
The connection parameters provided by the gateway are as follows:

Input Instance: 102 (128Bytes), 112 (256Bytes), 122 (492Bytes), 132 (64Bytes), 142 (32Bytes), 152 (16Bytes), 162 (8Bytes);

Output Instance: 101 (128Bytes), 111 (256Bytes), 121 (492Bytes), 131 (64Bytes), 141 (32Bytes), 151 (16Bytes), 161 (8Bytes);

Configuration Instance: 103 (10Bytes), 113 (10Bytes), 123 (10Bytes), 133 (0Bytes), 143 (0Bytes), 153 (0Bytes), 163 (0Bytes).

In Studio 5000, an example of parameter configuration is shown in the following image:



Note: When configuring in Studio 5000 of AB PLC, the input byte count is 4 bytes more than the actual value (due to the real-time frame header information of the EtherNet/IP adapter).

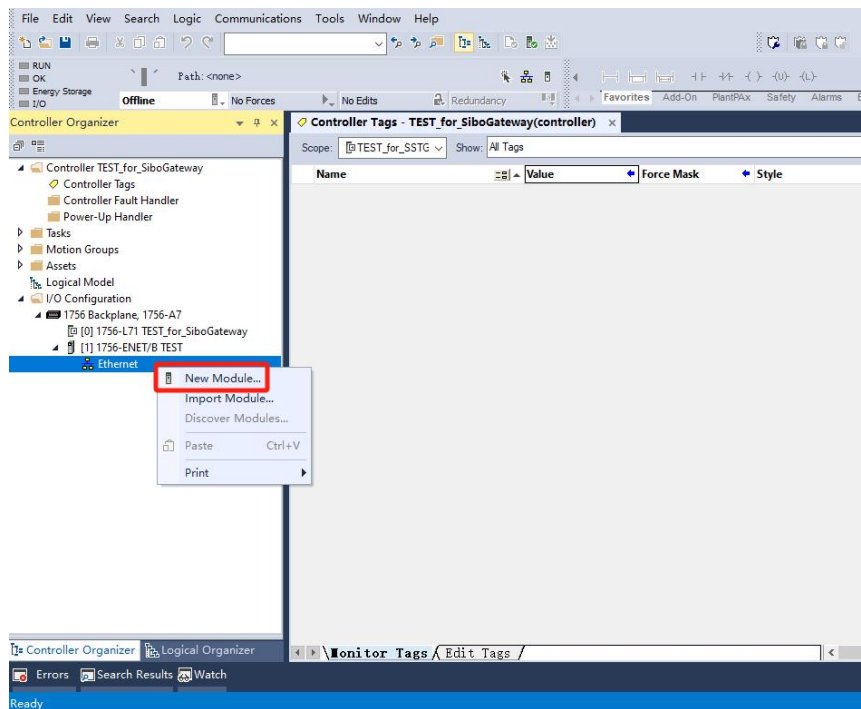


6 How to Read and Write I/O Data

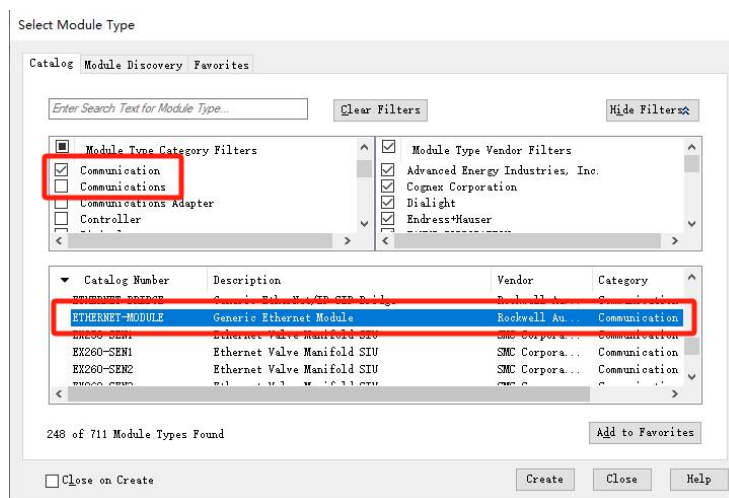
6.1 I/O Method for Reading and Writing Data

The following explains how to use the I/O method for reading and writing data, using Studio 5000 as an example.

Right-click on the EtherNet/IP master module and click 'New Module...' as shown in the image below:



In the pop-up module selection window, check 'Communication' to filter, select 'ETHERNET-MODULE', and then click 'Creat', as shown in the image below:



In the pop-up window, set the relevant information for the GT300-EC-EN, as shown in the image below:



The module information to be set in the above image includes:

Name: Name the added EtherNet/IP slave module (GT300-EC-EN module).

Communication Format: Set the data type. The user can choose to set the data type to DINT, INT, SINT, REAL, etc. This setting cannot be changed once confirmed. If a change is required, a new module must be created.

IP Address: Set the IP address of the EtherNet/IP slave module to be connected, which is the IP address of the GT300-EC-EN. The IP address of the GT300-EC-EN is downloaded to the module via the ECATStart software.

Connection Parameters: Set the connection parameters used for communication. The supported connection parameters for GT300-EC-EN are listed in the previous chapter.

Note: The 'Size' (i.e., the number of bytes set) in the above configuration should be consistent with the corresponding input and output byte count supported by the gateway. Click 'OK', and in the pop-up interface, set the polling interval for the master, which defaults to 10ms, as shown in the image below:

After setting the master polling interval, click 'OK' to save. On the left side, double-click 'Controller Tags'. In the

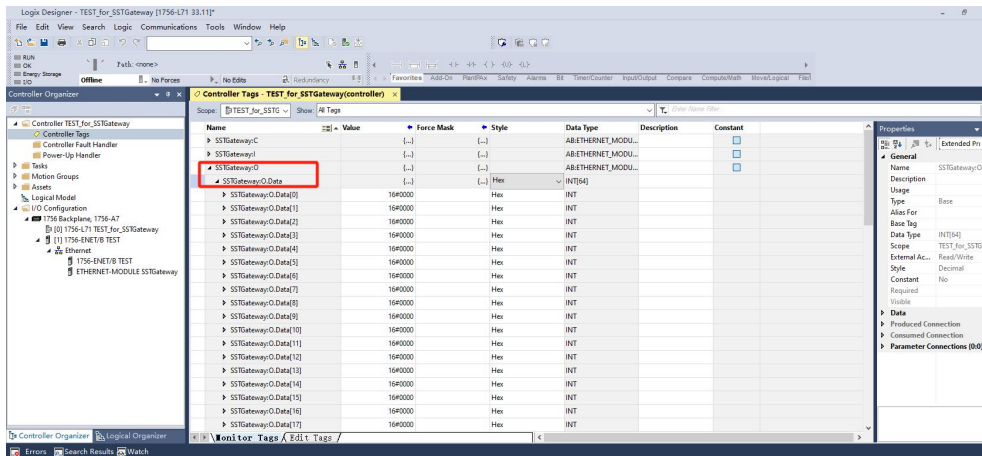


GT300-EC-EN

EtherCAT MainDevice to EtherNet/IP Gateway

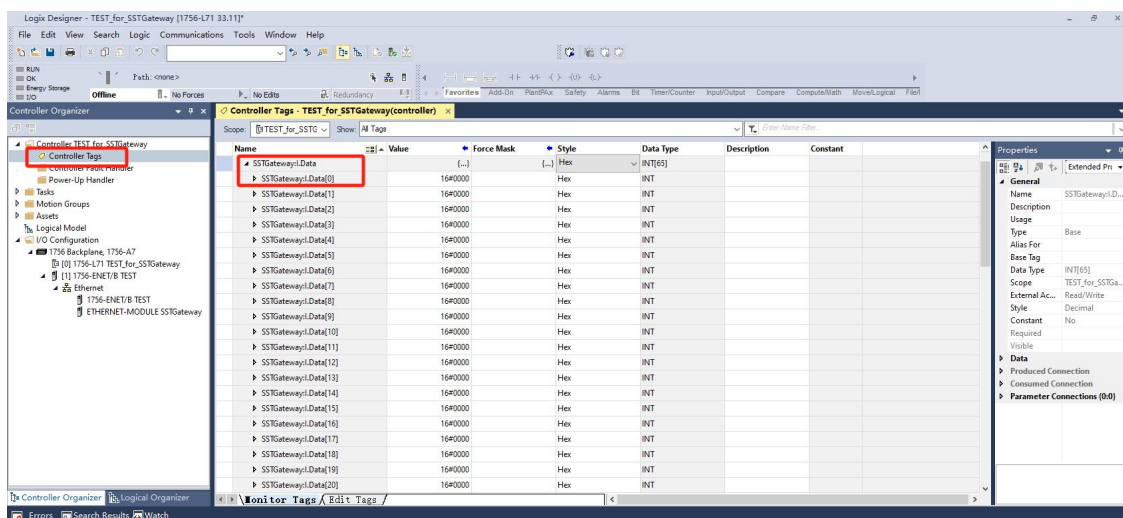
User Manual

pop-up window, open "SSTGateway:O," as shown in the image below:



In the above image, 'SSTGateway:O.Data[0] ~ SSTGateway:O.Data[31]' are the output data addresses corresponding to the added SSTGateway module in the master station.

Next, click on SSTGateway:I, as shown in the image below:

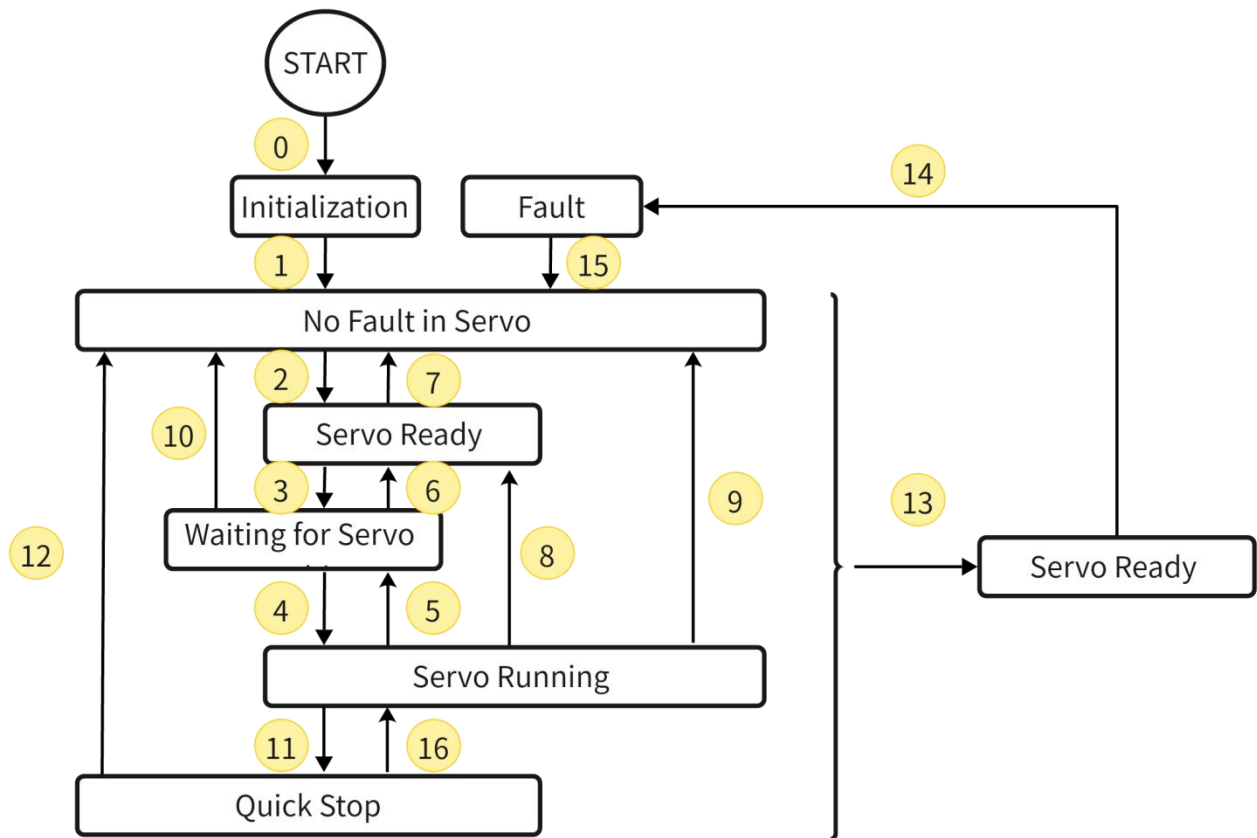


In the above image, 'SSTGateway:I.Data[0]' corresponds to the 4 bytes of the EtherNet/IP slave's real-time frame header.

'SSTGateway:I.Data[1] ~ SSTGateway:I.Data[32]' are the actual input valid data addresses corresponding to the added SSTGateway module in the master station.



Appendix 1: CiA 402 State Diagram



NO.	CiA402 State Transition	Control Word 6040H	Status Word 6041H bit0~bit9
0	Power on → Initialization	Natural transition, no control commands are required.	0x0000
1	Initialization → No servo fault	Natural transition, no control commands are required.	0x0250
		If an error occurs during the initialization process, process directly to step 13.	
2	No servo fault → Servo ready	0x06	0x0231
3	Servo ready → Waiting to enable servo	0x07	0x0233
4	Waiting to enable servo → Servo running	0x0F	0x0237
5	Servo running → Waiting to	0x07	0x0233



	enable servo		
6	Waiting to turn on servo enable → Servo ready	0x06	0x0231
7	Servo ready → No servo fault	0x00	0x0250
8	Servo running → Servo ready	0x06	0x0231
9	Servo running → No servo fault	0x00	0x0250
10	Waiting to turn on servo enable → No servo fault	0x00	0x0250
11	Servo running → Rapid stop	0x02	0x0217
12	Rapid stop → No servo fault	For quick stop mode 605AH, select 0-3. After the stop is completed, natural transition, no control commands are required.	0x0250
13	In any state other than 'Fault' → Fault stop	In any state other than 'Fault', once the servo driver encounters a fault, it will automatically switch to the fault stop state, no control command needed	0x021F
14	Fault stop → Fault	After the fault stop is completed, natural transition, no control commands are required.	0x0218
15	Fault → No servo fault	0x80, bit7 rise is valid; bit7 remains 1, other control commands are invalid.	0x0250
16	Rapid stop → Servo running	For quick stop mode 605AH, select 5~7, after the stop is completed, send 0x0F.	0x0237



Appendix 2: Servo Control Mode

Mode	Control Mode 6060H
Profile Position Mode	1
Profile Velocity Mode	3
Profile Torque Mode	4
Homing Mode	6
Cyclic Synchronous Position Mode	8
Cyclic Synchronous Velocity Mode	9
Cyclic Synchronous Torque Mode	10

Note: Please refer to the actual manual of the slave for the modes supported by the slave, and perform PDO mapping based on actual needs.