CANopen / EtherNet/IP Gateway
GT200-EI-CO

User Manual
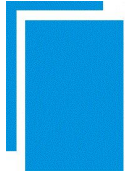
V 2.4

Rev B

SST Automation

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www.SSTAutomation.com

Important Information

Warning

The data and examples in this manual cannot be copied without authorization. SST Automation reserves the right to upgrade the product without notifying users.

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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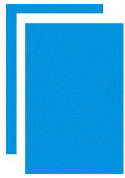Copyright © 2023 by SST Automation. All rights reserved.

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Technical Support Contact Information

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Catalog

1 Product Overview

1.1 Product Function

GT200-EI-CO is a gateway that can provide a seamless connection between CANopen and EtherNet/IP. It can connect CANopen devices to an EtherNet/IP network and realize bi-directional data exchange easily. The gateway converts the devices on the CANopen network to EtherNet/IP network devices.

1.2 Product Features

➢ Easy to use: Users only need to refer to the product manual and application instances to realize a gateway data communication in a short time that meets configuration requirements.

➢ Supports one channel CAN 2.0A.

➢ CAN interface: 3KV photoelectric isolation.

➢ Supports 1 channel, 10M/100M adaptive routing network port.

➢ 32-bit processor with the main frequency up to 55M.

➢ Supports TCP and UDP port communication.

1.3 Technical Specifications

[1] Communication rate:

◆ CAN baud rate: 10kbit/s, 20kbit/s, 50kbit/s, 100kbit/s, 125kbit/s, 250kbit/s, 500kbit/s, 1Mbps.

◆ Ethernet: 10M / 100M adaptive routing.

[2] Ethernet supports OVDA standard EtherNet/IP communication protocol, supports 504/256/128/64/32/16/8 bytes instance number.

[3] CAN interface supports CAN2.0A protocol.

[4] DS-301 V4.01 and CiA Draft Recommendation 303 compliant.

◆ Supports maximum 8 bytes TPDO and RPDO.

◆ Supports maximum 64 PDO commands and maximum 128 SDO commands.

◆ Supports fast Download SDO and fast Upload SDO.

◆ The COB-ID of TPDO and RPDO can be set by the user, or the default COBID can be used.

◆ Supports Clear Data Time for TPDO function.

◆ Supports SDO response timeout function.

◆ Supports NMT management.

◆ Supports SYNC function.

◆ Supports Guard life function (Life-guarding and Heartbeat protocols).

◆ Supports RPDO cycle sending function.

◆ Supports CANopen master delay to start-up function.

◆ Supports Control Status function.

◆ Supports changing VendCode.

[5] Operating environment:

◆ REL Humidity: 5% to 95% (non-condensing).

◆ Work circumstance temperature: -4℉~140℉(-20℃ to 60℃), the average temperature of 24-hour does not exceed 113℉(45℃).

◆ Installation site elevation should not exceed 2000 meters.

◆ Pollution level: class 3.

[6] Power: 24VDC (11V~30V), maximum 150mA (24V).

[7] External dimensions (W*H*D): 1.57 in*4.92 in *4.33 in (40mm*125mm*110mm).

[8] Installation: 1.38 in (35mm) DIN RAIL.

1.4 Related Products

Related products include:

- ➢ GT100-CO-RS

- ➢ GT200-CO-RS

- ➢ GT200-PN-CO

- ➢ GT200-DP-CO

- ➢ GT100-EI-RS

- ➢ GT200-EI-2RS485

To get more information about related products, please visit SSTCOMM website: www.sstautomation.com

1.5 Revision History

Revision	Date	Chapter	Description
V2.4, Rev B	8/29/2022	Chapter 4.2	Fixed all incorrect DHCP references and replaced them with BOOTP.
V2.4, Rev A	8/12/2022	Chapter 1.1, 1.2, 1.3, 2.4.3, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3.8.4, 5.3.8.5, 6, 7	Revised some mistakes. Added Ethernet/IP connection parameters and RSLogix 5000 example in chapters 6 and 7.
V2.4	6/29/2021	ALL	New Release
V2.2	12/09/2020	ALL	New Release

SST☺MM

2 Hardware Descriptions

2.1 Product Appearance
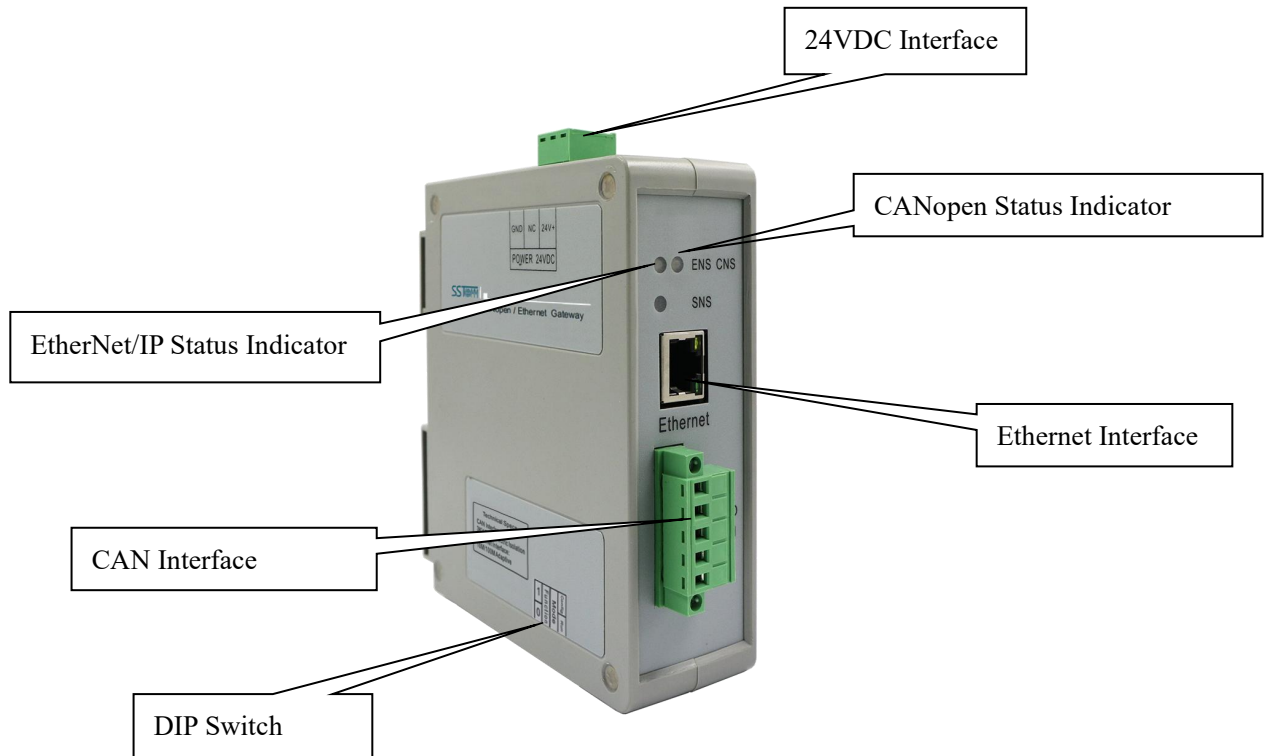
Note: This picture is for reference only. The product appearance is subject to the actual product.
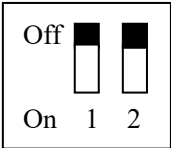
2.3 DIP Switch

The DIP switch is used to set operating mode of the device.

| Mode (Bit 1)	Function (Bit 2)	Description
Off	Off	Running mode, prohibits reading and writing configuration data
On	Off	Configuration mode, with fixed IP address 192.168.0.10, only can read and write configuration data
On	On	BootLoader mode, with fixed IP address 192.168.0.10

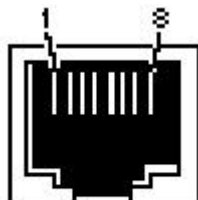**Note:** After changing the switch, please restart the GT200-EI-CO to apply the settings.

2.4 Interface

2.4.1 Power Interface
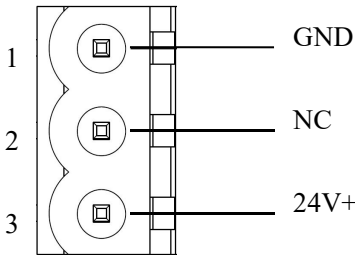
Pin	Function
1	Power ground
2	NC(Not Connected)
3	+24V DC
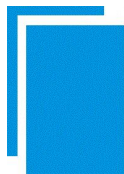
2.4.2 Ethernet Interface

RJ-45 port

The Ethernet interface uses RJ45 interface, follows the IEEE802.3u 100BASE-T standard, 10/100M adaptive,. its pin (standard Ethernet signal) is defined as below:

Pin	Signal description
S1	TXD+, Tranceive Data+, Output
S2	TXD-, Tranceive Data-, Output
S3	RXD+, Receive Data+, Input
S4	Bi-directional Data+
S5	Bi-directional Data-
S6	RXD-, Receive Data-
S7	Bi-directional Data+
S8	Bi-directional Data-

2.4.3 CAN Port

5-pin connector:

GND   CAN-L   CAN-H V+
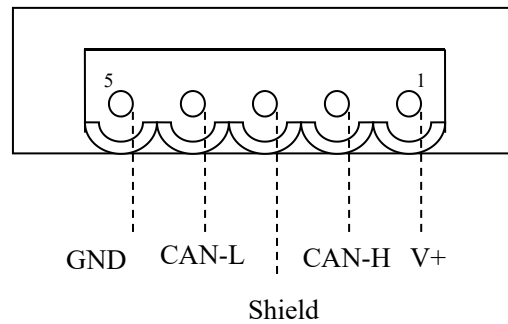
Shield

The gateway uses open five-pin connector at the side of CAN:

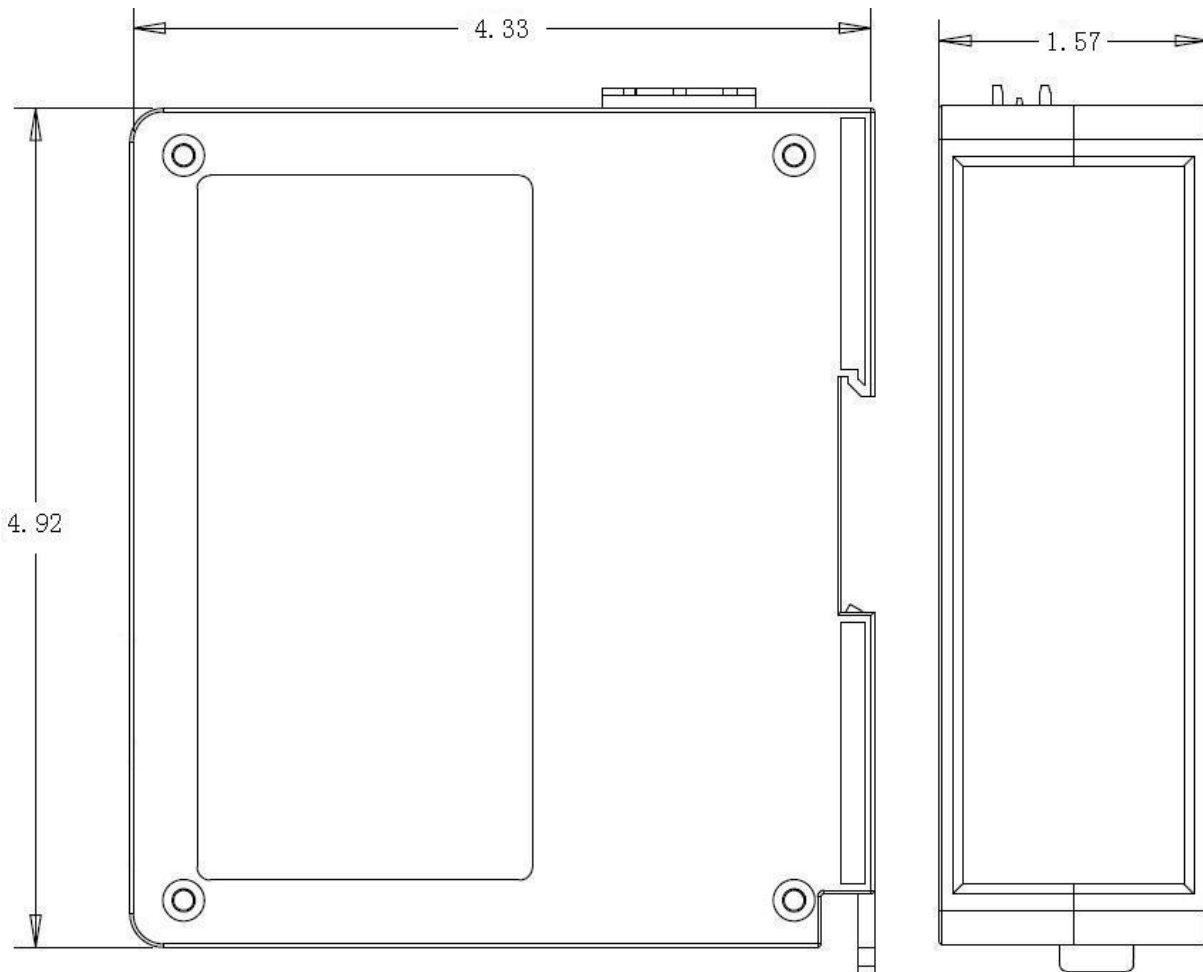| Pin	Connection
1	V+ (Optional)
2	CAN-H
3	Shield (Optional)
4	CAN-L
5	GND

Note: Connections V+ and shield are optional. Only connections CAN-H and CAN-L are required. Connection

GND is recommended to be used to improve communication quality.

3 Hardware Installation

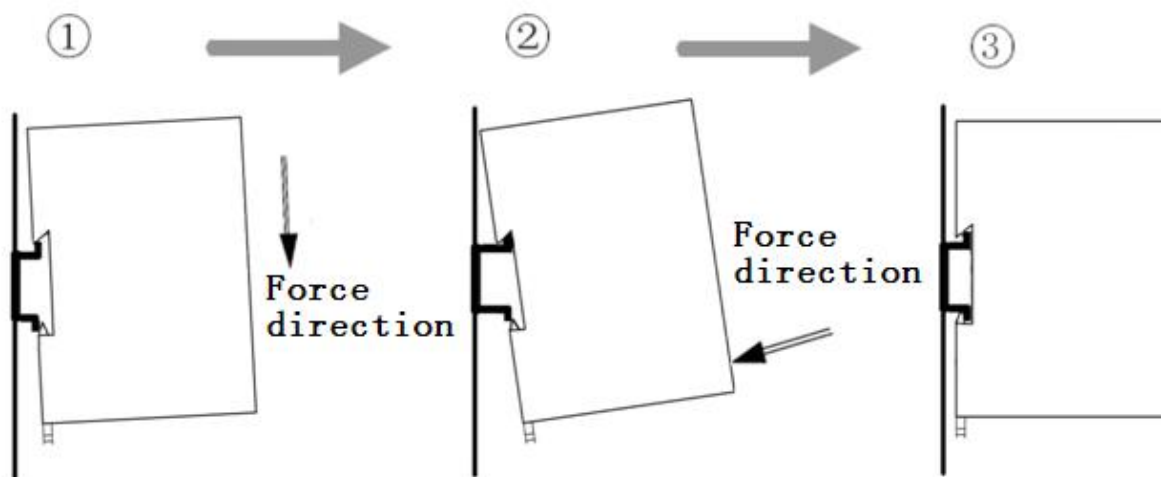## 3.1 Mechanical Dimensions

Size: 1.57 in * 4.92 in * 4.33 in (width * height * depth)

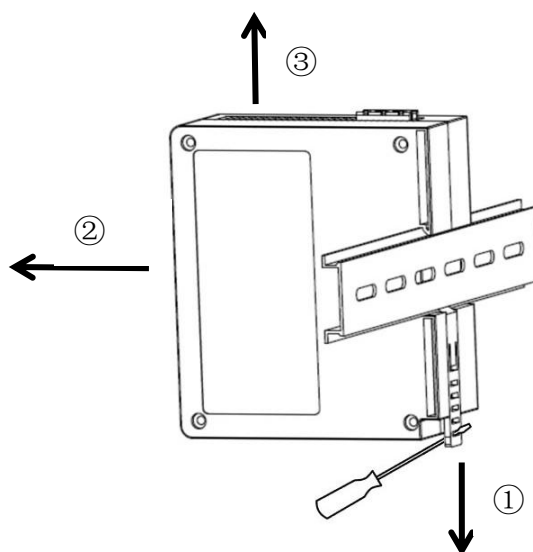## 3.2 Installation Method

Use 1.38 in (35 mm) DIN Rail.

Install the gateway

Uninstall the gateway

1. Use a screwdriver to pass through the DIN RAIL bar, pull down, and hold.

2. Pull out the gateway.

3. Lift up to unload the gateway.

4 Quick Start Guide

4.1 Gateway Configuration

1. Make sure the GT200-EI-CO is in the appropriate operating mode that allows for configuration. It is recommended to set the gateway to configuration mode (configuration switches Bit 1 ON and Bit 2 OFF) then the IP of the gateway will be fixed at 192.168.0.10.

2. Use an Ethernet cable to connect the GT200-EI-CO to the PC.

3. Connect the CAN instruments by connecting pins 2 and 4 at minimum.

4. Connect the power supply, then power on the device.

5. Run the SST-ECO-CFG software to start the configuration process.

6. In the configuration software, set the CAN baud rate, node ID, and IP address. (See chapters 5.3.6 and 5.3.8.4 for details).

7. After the gateway has been configured, set the configuration DIP switch Bit 1 OFF. Power on again and the module will go into run mode.

4.2 Software Configuration

Users can connect the gateway to their PC through the RJ-45 port and use the SST-ECO-CFG software to finish configuring the GT200-EI-CO. Settings such as IP address, baud rate of the CANopen port, and CANopen commands can all be effortlessly configured using the software.

There are two ways to set the IP address:

1. **Manual setting:** The user manually sets the IP in the configuration state.

2. **BOOTP:** The user must use a BOOTP Server to allocate the IP in the running state.
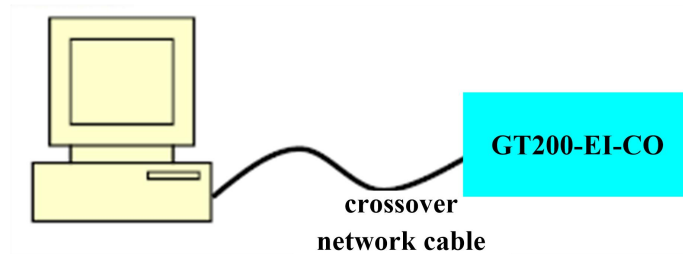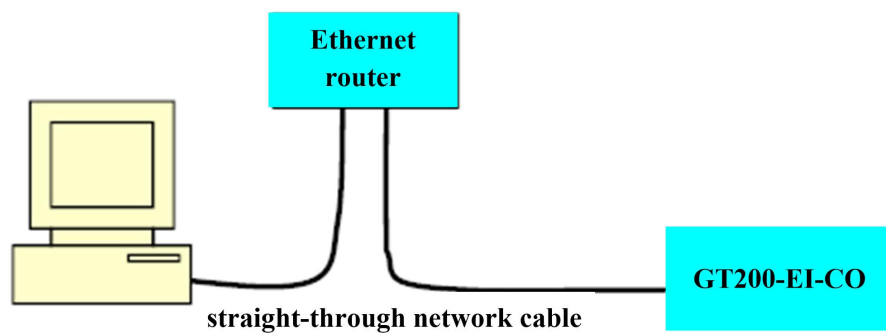
The default IP of GT200-EI-CO in configuration mode is 192.168.0.10, and users can connect GT200-EI-CO and

PC in two ways:

1. Connect the GT200-EI-CO and PC directly with a crossover network cable, as shown below:

2. Connect the GT200-EI-CO, PC and Ethernet router (gateway, hub, switch) with a straight-through
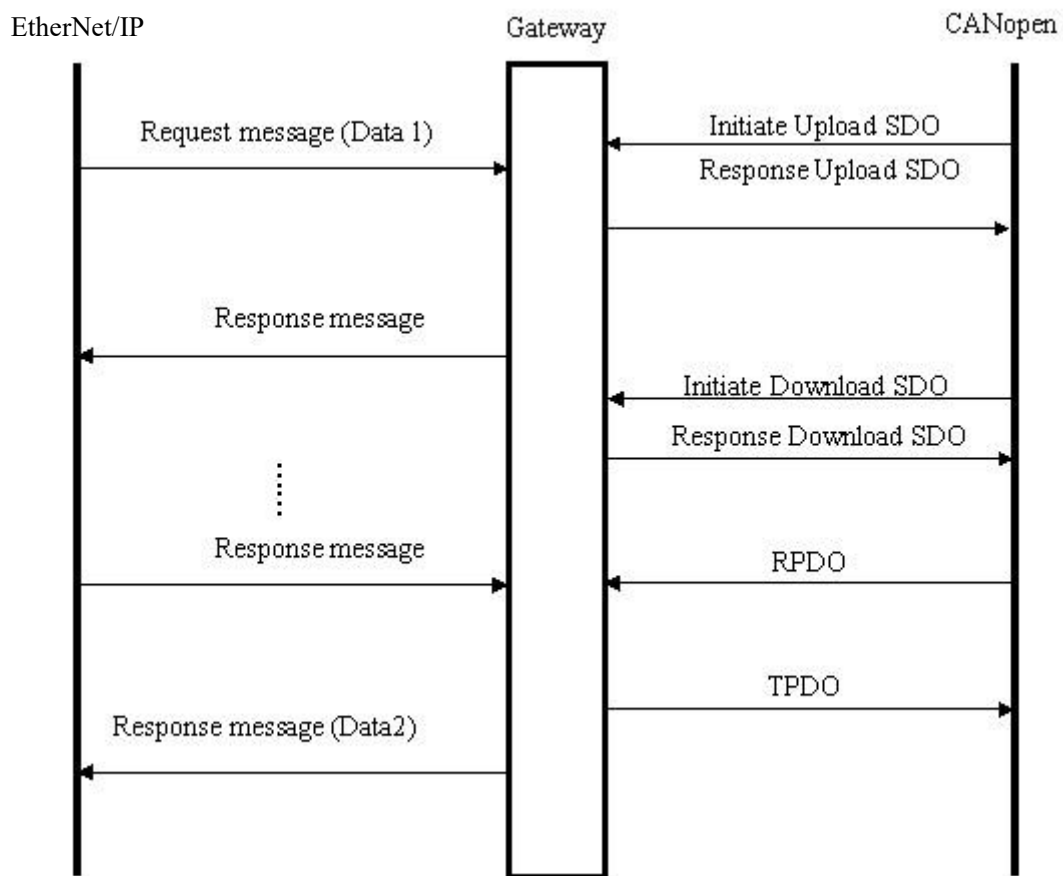
   network cable, as shown below:

Note: In the configuration mode, the IP address of the PC must be changed to 192.168.0.X; The subnet mask must

be changed to 255.255.255.0; The default gateway should be changed to 192.168.0.1.

4.3 Operation

4.3.1 Data Exchange Mode

The communication mode between CANopen and EtherNet/IP is asynchronous, as shown below:

"Data 1" shows the data transfer process from EtherNet/IP to CAN. "Data 2" shows the data transfer process from CAN to EtherNet/IP.

An EtherNet/IP I/O output can carry between 0 to multiple CAN frames of data. The gateway will send the CAN frame when it receives the I/O output, and then packs the received CAN response frame into the I/O input and sends it to the EtherNet/IP master. TPDO and RPDO commands follow a producer/consumer communication model, and are often used in occasions with a high speed requirement. Upload SDO and Download SDO
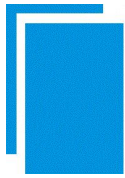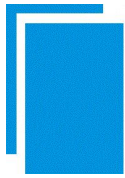
commands follow a client/server communication model that can guarantee safety of data, and are often used in occasions with a low speed requirement.

GT200-EI-CO supports Clear Data Time for TPDO: As long as GT200-EI-CO does not receive the TPDO from the slave within the set time, GT200-EI-CO will clear the data in corresponding position of the EtherNet/IP input buffer.

GT200-EI-CO supports simple NMT function: It supports simple startup of all CANopen slave functions.

GT200-EI-CO supports Guard life function and SYNC function.

5 Software Instructions

5.1 Software Interface Description

SST-ECO-CFG is configuration software based on the Windows platform, and is used to configure parameters and commands of the product GT200-EI-CO.

This manual describes the method of configuring the gateway, GT200-EI-CO. Please read the manual carefully before using it.

5.2 Notes Before Configuration

If it is the first time using the product, please set the configuration DIP switch (Bit 1 ON and Bit 2 OFF), and configure the product parameters under configuration mode.

Note: The configured IP addresses must not conflict with other devices' IP. Otherwise, the product will not start normally due to IP conflicts.

Under configuration mode, the product can upload and download the configuration. The gateway cannot communicate with other devices during this process.

5.3 Software Function

5.3.1 User Interface
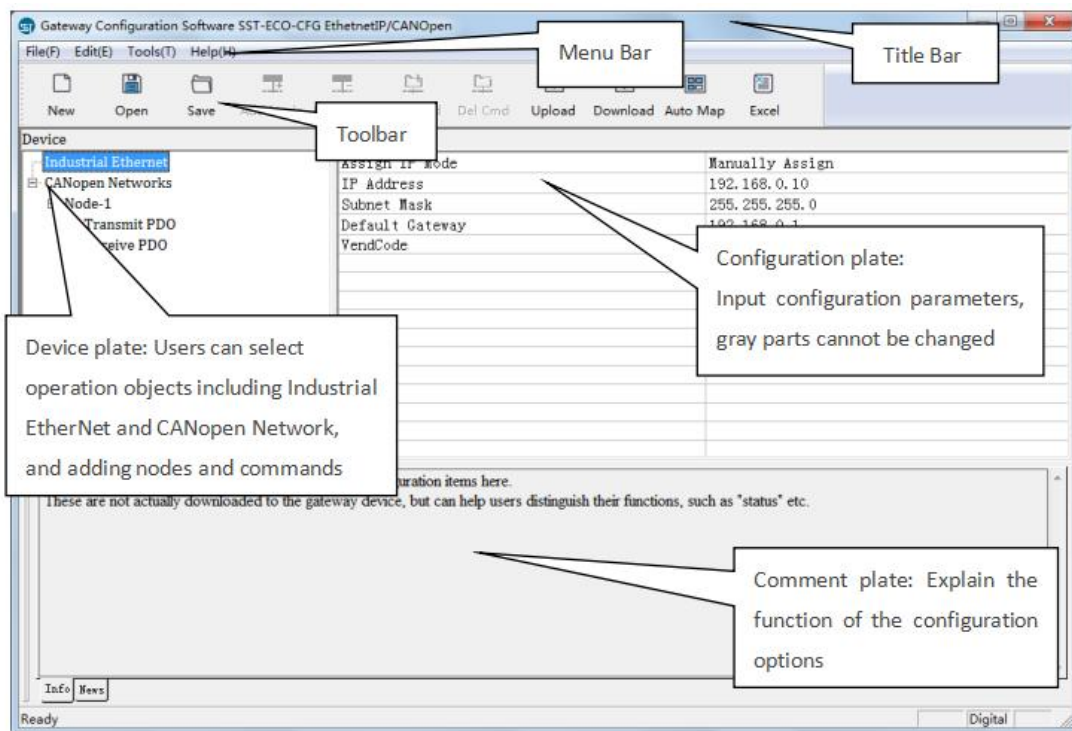
5.3.2 Toolbar

Toolbar is shown as below:

The function of Toolbar: New, Open, Save, Add Node, Delete Node, Add Command, Delete Command, Upload, Download, Calculate Mapping Address and Export EXCEL.

New: Create a new configuration project

Save: Save current configuration

Open: Open a configuration project

Add Node: Add a CANopen node

Delete Node: Delete a CANopen node

Add Command: Add a CANopen command

Delete Command: Delete a CANopen command

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

Download: Download the configuration file to the gateway

Calculate Mapping Address: Used to automatically calculate the mapped memory address without conflict by each command

Export EXCEL: Export current configuration to the local hard disk, saved as .xls file

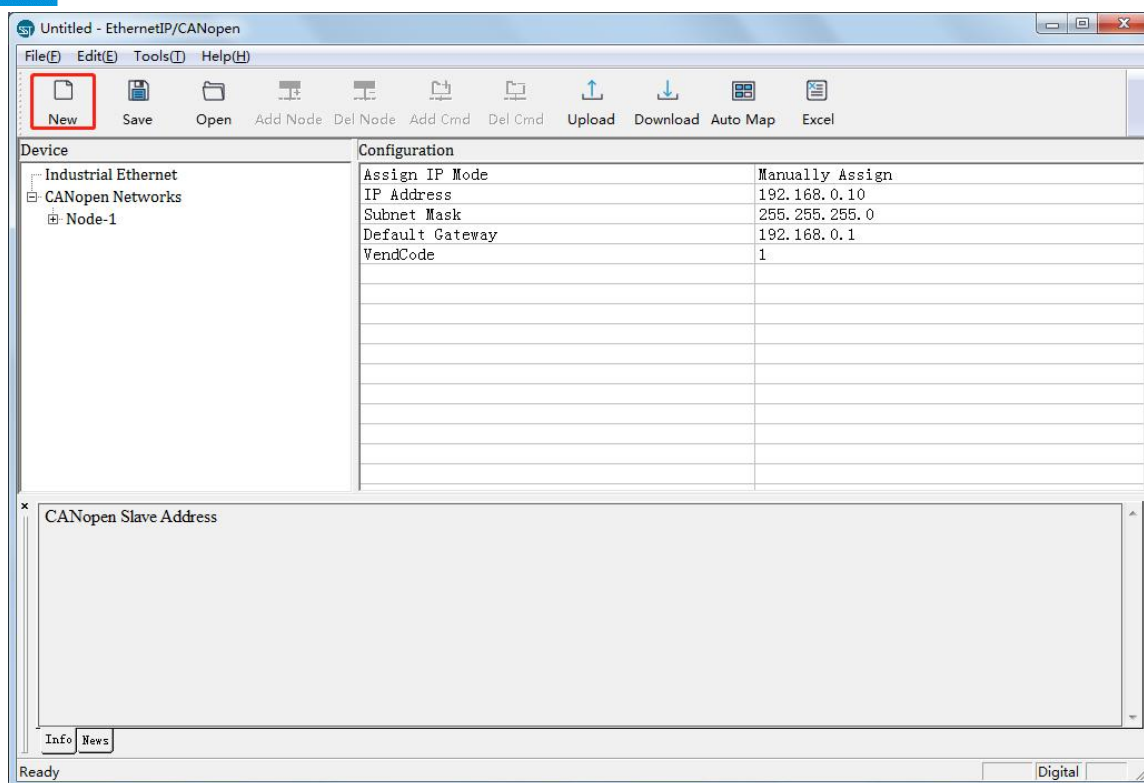## 5.3.3 New Configuration Project

New-initialized parameters to open the configuration interface:

Note: The new function is mainly used for offline configuration, that is, you can use the initialization parameters to open the configuration interface when there is no equipment.
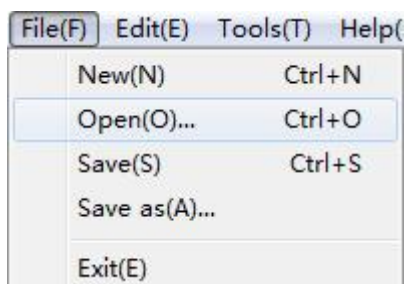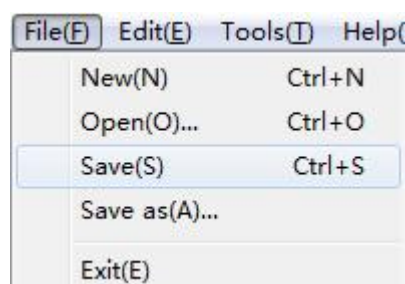
5.3.4 Open and Save Configuration

Select "Open", you can open the configuration project that you have saved.

Select "Save" or "Save as", you can save the configuration project with .chg as its extension.

Click icon ![Excel] on the tool bar to save the configuration with .xls as its extension.


Note: After saving the parameters as a file, the data in the file can be changed by the user, but please ensure the correctness of the changed data, otherwise the incorrect data will be processed according to the default value. Please do not change the keywords of the data, please do not add spaces.

5.3.5 Upload and Download

Select "Upload", it will read the configuration applied from the gateway, and the interface is shown as below:
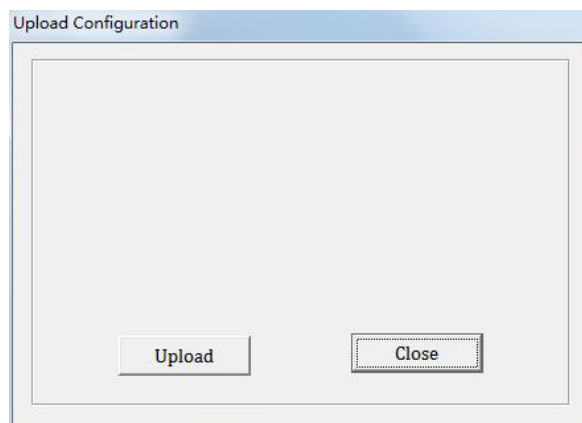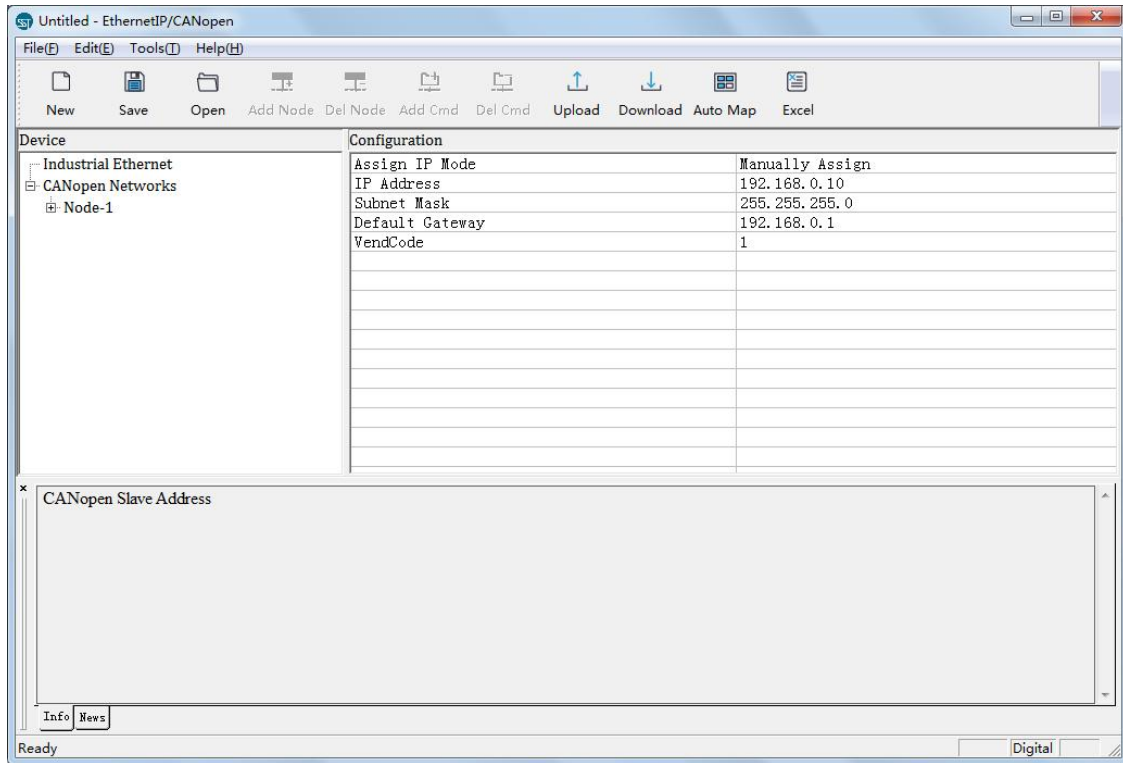

Select "Download", it will download the configurations to the gateway, and the interface is shown as below:
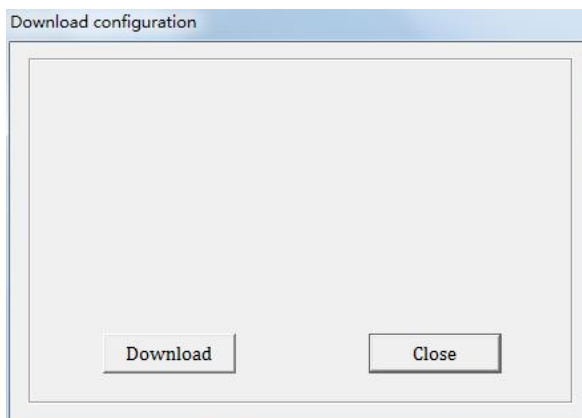
Note: The IP address is fixed at 192.168.0.10 in GT200-EI-CO configuration mode

5.3.6 Industrial Ethernet Configuration Parameters

The Industrial Ethernet configuration interface is shown as below:

In the above parameters, the detailed information is shown as below:

➢ **Assign IP Mode:** Manually Assign and BOOTP optional.

➢ **IP Address:** IP address of GT200-EI-CO.

➢ **Subnet Mask:** Subnet mask of GT200-EI-CO.

➢ **Default Gateway:** Gateway address GT200-EI-CO is located in LAN.

➢ **VendCode:** Users can change VendCode, default is 1.

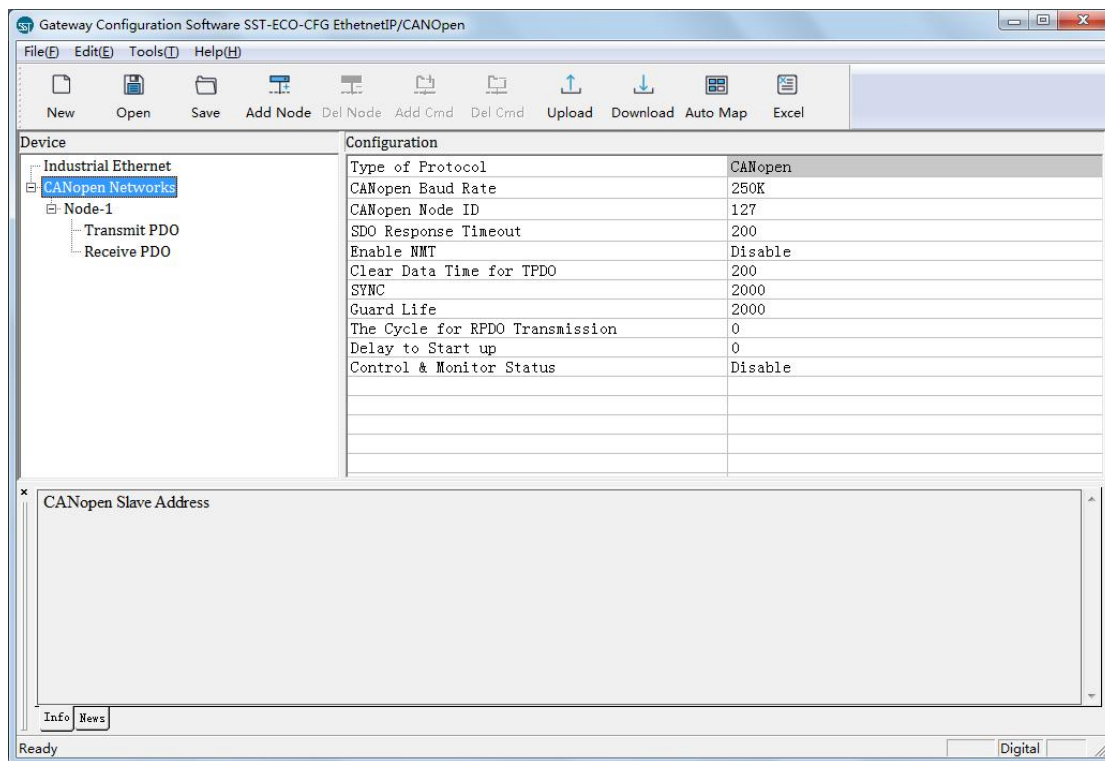## 5.3.7 CANopen Configuration Parameters

Configure CANopen network parameters including CANopen Baud Rate, CANopen Node ID, SDO Response Timeout, Enable NMT, Clear Data Time for TPDO, SYNC, Guard Life, The Cycle for RPDO Transmission, Delay to Start up and Control & Monitor Status.
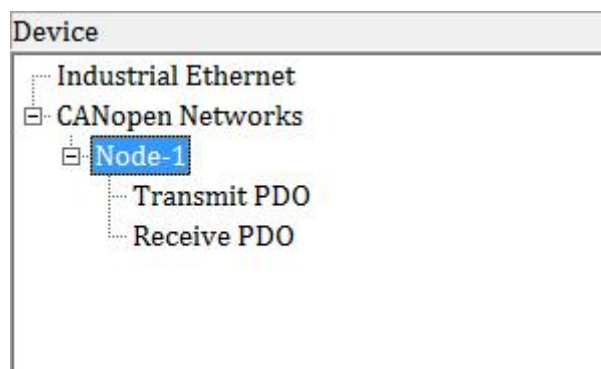
CANopen configuration interface is shown as below:
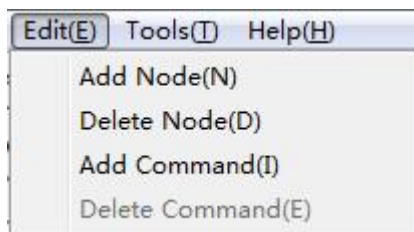

5.3.8 Device View Interface

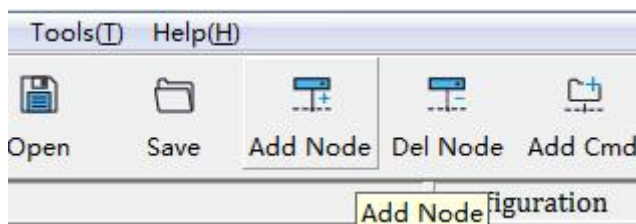### 5.3.8.1 Device View Interface

5.3.8.2 Operation Mode

Supports three kinds of operation modes: edit menu, edit toolbar, and edit menu by right-click.

Edit Menu

Edit Toolbar
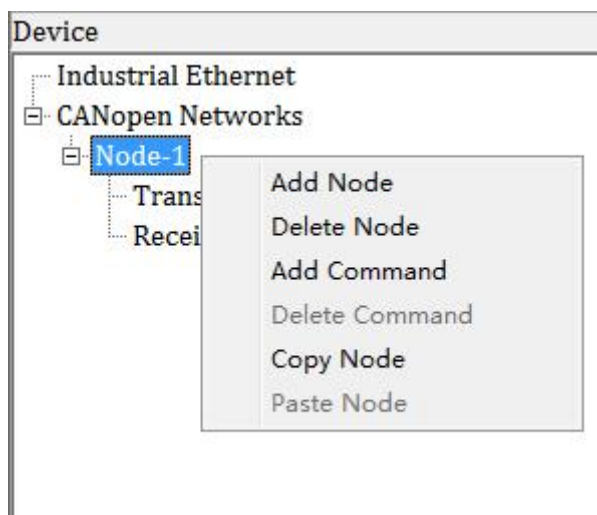
Edit Menu by Right Click

5.3.8.3 Operation Types

➢ **Add node:** Left click on CANopen Networks or existing nodes, and then perform the operation of adding a new node. Then there will be a new node named "New node" under CANopen Network (The newly added node has no address. Nodes without addresses are invalid. Please enter the address of the node. Node address cannot be repeated).

➢ **Delete node:** Left click on the node to be deleted, and then perform the operation of deleting node. The node and all commands will be deleted.

➢ **Add commands:** Left click on the node, and then perform the operation of adding command to add a command for the node. The command selecting dialog box will pop up for users to choose from. Shown as below:

Commands: Upload SDO->ENet In, Download SDO <- ENet Out, Transmit PDO-> ENet In,

Receive PDO<- ENet Out

➢ **Select commands:** Double click a command.
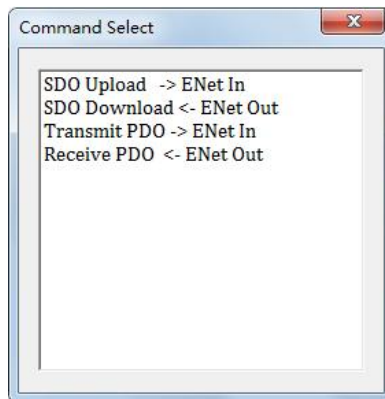
➢ **Delete command:** Left click a command and you can delete it.

➢ **Copy node:** Left click on the existing node, choose the node and execute the operation of copying nodes (include all commands under the node).

➢ **Paste node:** Left click and choose any existing node, execute the operation of pasting a node. Then under the CANopen Network tree you can see the new node (include all commands under the node). The parameters of the new node is default setting, it needs to be reset.

5.3.8.4 CANopen Networks Configuration Interface
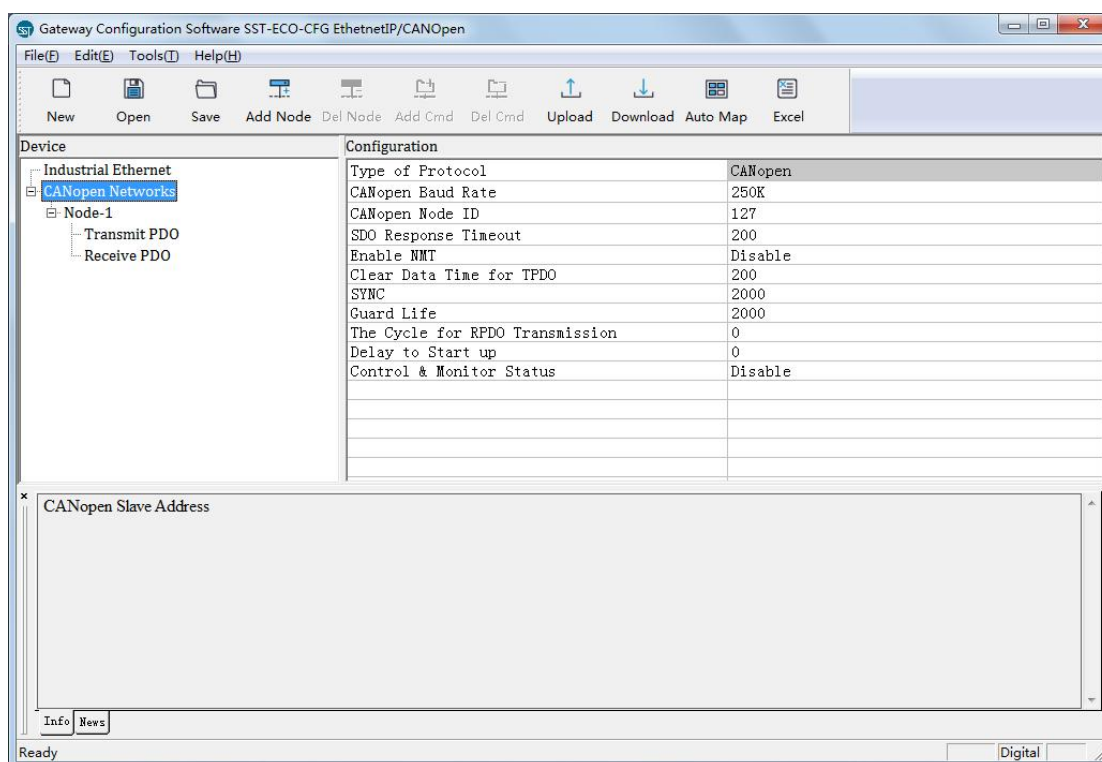
Configurable parameters are shown as below:

CANopen Baud Rate, CANopen Node ID, SDO Response Timeout, Enable NMT, Clear Data Time for TPDO, SYNC, Guard Life, The Cycle for RPDO Transmission, Delay to Start up and Control & Monitor Status.

CANopen configuration interface is shown as below:

- ➢ **CANopen Baud Rate:** 10K, 20K, 50K, 100K, 125K, 250K, 500K, 1000K can be selected; the default value is 250K.

- ➢ **CANopen Node ID:** 1 to 127, the default value is 127.

- ➢ **SDO Response Timeout:** This parameter is based on 10 milliseconds. The range of the parameter value is 1 to 200. Default value is 200.

- ➢ **Enable NMT:** Whether to start all CANopen nodes on the network or not, the default is disable.

- ➢ **Clear Data Time for TPDO:** TPDO timeout value.

  0: Do not use the function.

  Nonzero value: Use the timeout function.

  The timeout value is a nonzero integral multiple of 10 milliseconds. The range is 0 to 200. The default value is 0.

➢ **SYNC:** Synchronizing cycle.

0: Do not use synchronizing cycle function.

Nonzero value: Use the function.

The synchronizing cycle is a nonzero integral multiple of 1 millisecond. The range is 0 to 2000. The default

value is 0.

➢ **Guard Life:** Life-guarding function.

0: Use Heartbeat protocol.

Nonzero value: Use Life-guarding protocol.

Guard life is used when input value is non 0, else uses heartbeat. The range is 0 to 2000. The default value is

0, which adopts the heartbeat protocol.

➢ **The Cycle for RPDO Transmission:** The cycle for RPDO Transmission is based on 1ms.

0: Use the mode of change of value output.

Nonzero value: Send all RPDO according to the cycle.

Sending cycle equals setting value, the default value is 0. The range is 0 to 60000.

Note: This parameter and CAN baud rate are relevant with RPDO command numbers. If the system focuses

on real-time performance, it is recommended to set this value to 0 (Change of value output).

➢ **Delay to start up:** Delay value.

0: Do not use the function.

Nonzero value: Use the function.

Delay value is a nonzero integral multiple of 1 millisecond. The range is 0 to 60000. The default value is 0.

➢ **Control & Monitor Status:** The first two bytes of input/output buffer are used as status byte of CANopen

slave. The first byte of this two byte is the address of the CANopen slave, and the second byte is the

command which controls&monitors the CANopen slave (e.g., enter pre-operation state, enter operation state,

enter stop state, reset node, reset application, reset communication, etc.).

Selecting "Enable" requires the user to deduct two usable bytes from device memory, as these two bytes of

data are saved in front of the data buffer. The default value is Disable.

5.3.8.5 Command Configuration

In the device interface, left click on a command and then the configuration interface is shown as below:
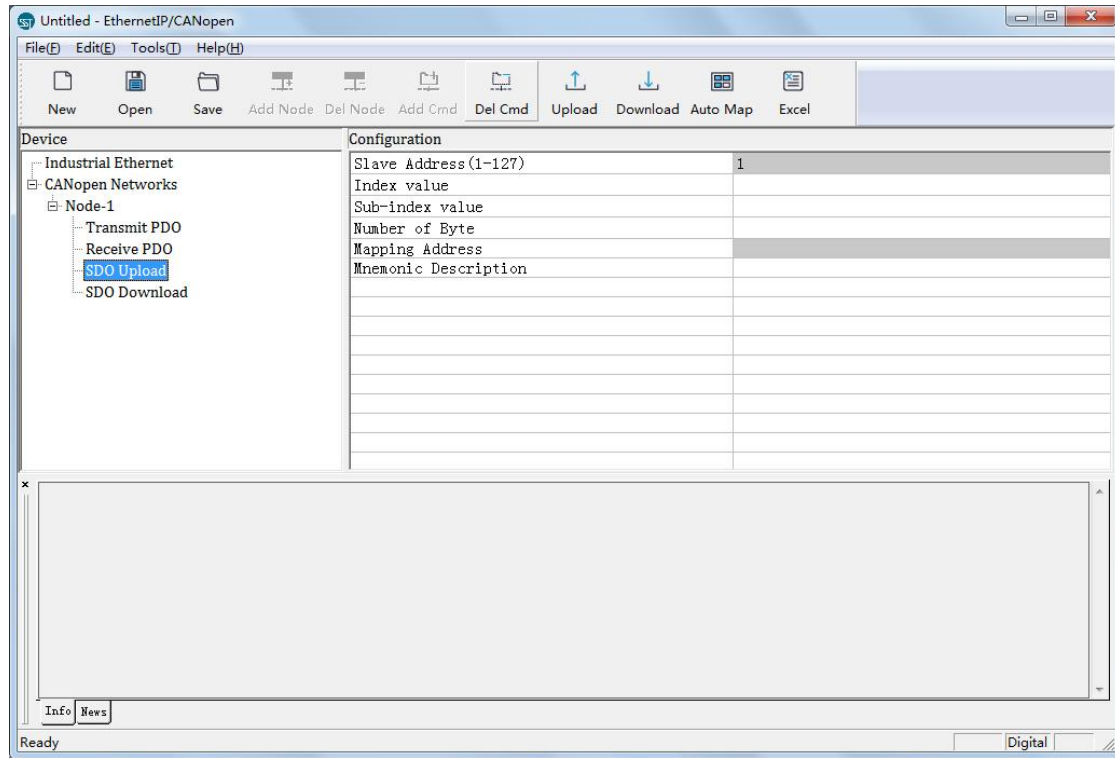
➢ **Slave address:** CANopen slave address, the range is 1 to 127.

➢ **Index value:** Object index value in object dictionary (decimal).

➢ **Sub-index value:** Object sub-index value in object dictionary (decimal).

➢ **Number of bytes:** Number of bytes of mapping item.

➢ **Mapping address:** Memory address mapped in the gateway (Read only).

➢ **COB-ID:** The CAN ID (decimal) of CANopen PDO:

Default value of Transmit PDO command: 384(0x180) + node ID or 640(0x280) + node ID or 896 (0x380) + node ID or 1152(0x480) + node ID.

Default value of Receive PDO: 512(0x200) + node ID or 768(0x300) + node ID or 1024 (0x400) + node ID or 1280 (0x500) + node ID.

If users want to fill in a custom value, please fill in the required value directly when Customized item is selected in the drop-down option box. The range is (1~127) & (257~1408) & (1664~1791) & (1920~2046).

Mnemonic description: Users can input the description of project configuration items here; these are not actually downloaded to gateway and is mainly used as reference when configuring.
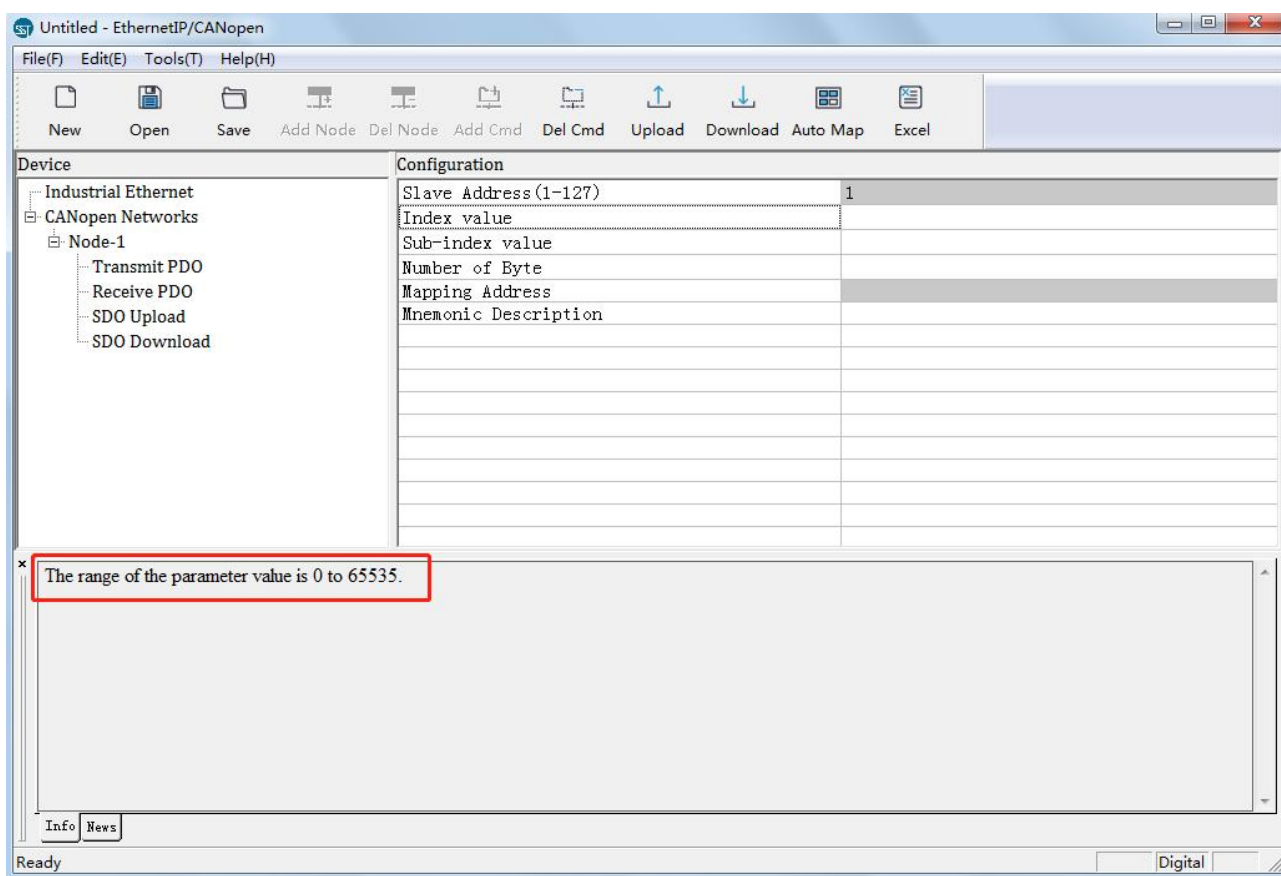
Note: Max TPDO commands ≤ 64

Max RPDO commands ≤ 64

Max Upload SDO commands ≤ 128

Max Download SDO commands ≤ 128

5.3.8.6 Comment Interface

Comment interface displays the explanation of relevant configuration item. When the configuration item is "Index value", the comment interface is shown as below:

5.3.8.7 View Device Information

View the basic information of the currently connected device including device serial number, production date, firmware version number, hardware version number, and IP address.

6 Ethernet/IP Connection Parameters

The connection parameters provided by the gateway are as follows:

Number	Input Instance	Output Instance	Configuration Instance
1	112(132Bytes)	111(128Bytes)	113(10Bytes)
2	122(260Bytes)	121(256Bytes)	123(10Bytes)
3	132(68Bytes)	131(64Bytes)	133(10Bytes)
4	142(36Bytes)	141(32Bytes)	143(10Bytes)
5	152(20Bytes)	151(16Bytes)	153(10Bytes)
6	162(12Bytes)	161(8Bytes)	163(10Bytes)
7	172(508Bytes)	171(504Bytes)	173(10Bytes)

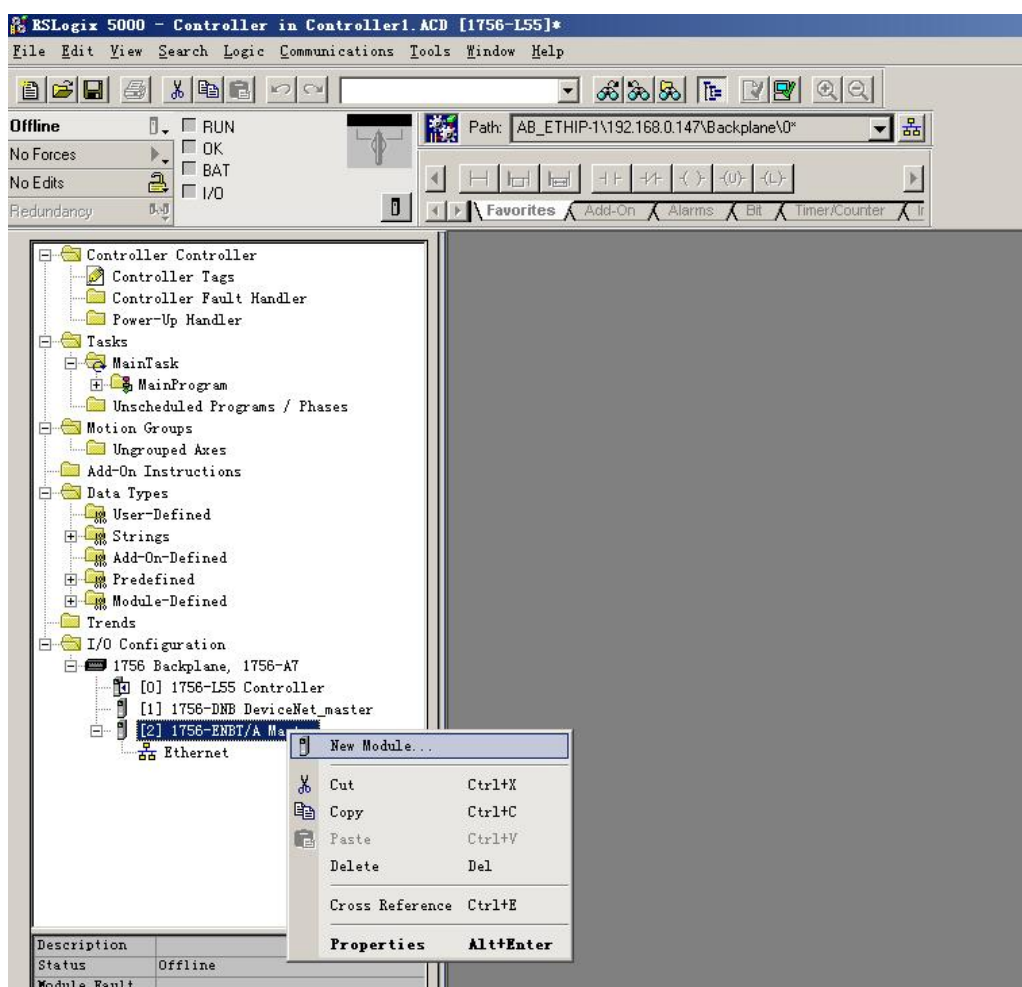An example of parameter configuration in RSLogix5000 is as follows:

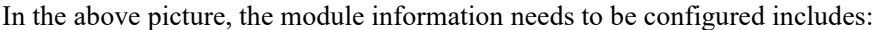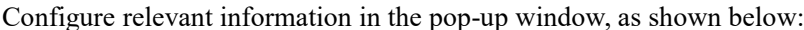# 7 How to Read/Write I/O Data

The following RSLogix 5000 example will describe how to read/write I/O data.

7.1 Read/Write Data by IO Messaging (Recommended)

Right click on EtherNet/IP scanner module, click "New Module", as shown below:

In the pop-up dialog box, unfold "+" before "Communications", choose "ETHERNET-MODULE", click "OK", as shown below:

Configure relevant information in the pop-up window, as shown below:

In the above picture, the module information needs to be configured includes:

Name: Name the added EtherNet/IP adapter module

Comm Format: Configure data types. Users can choose data types as DINT, INT, SINT and REAL, etc. After

confirmation, this cannot be changed. If you want to change data types, you can create a new module.

IP Address: Set the IP address of the EtherNet/IP adapter module (IP address of GT200-HT-EI, configured by the software SST-HI-CFG)

Connection Parameters: Set Connection parameters during communication. Please refer to chapter 6

Note: "Size" (configured bytes) in the above picture should be consistent with the relevant input and output bytes of Instance in the above chapter.

Click "OK", set the scanner polling time interval in the pop-up dialog box, the default is 10ms, as shown below:
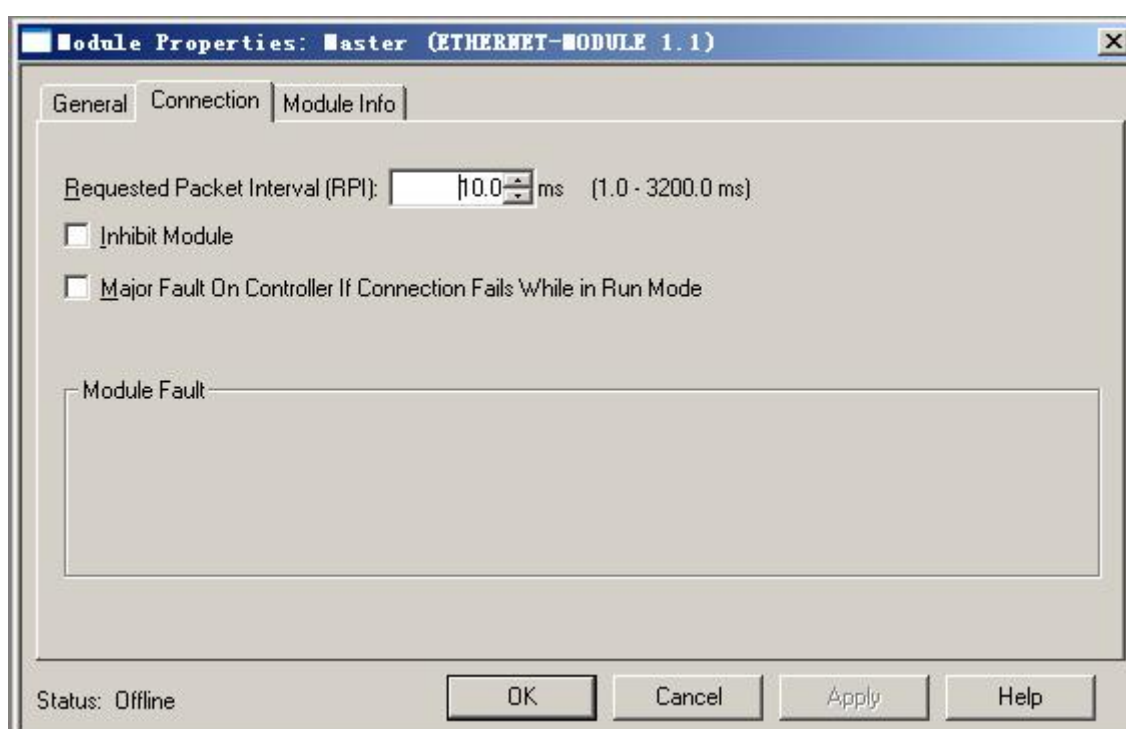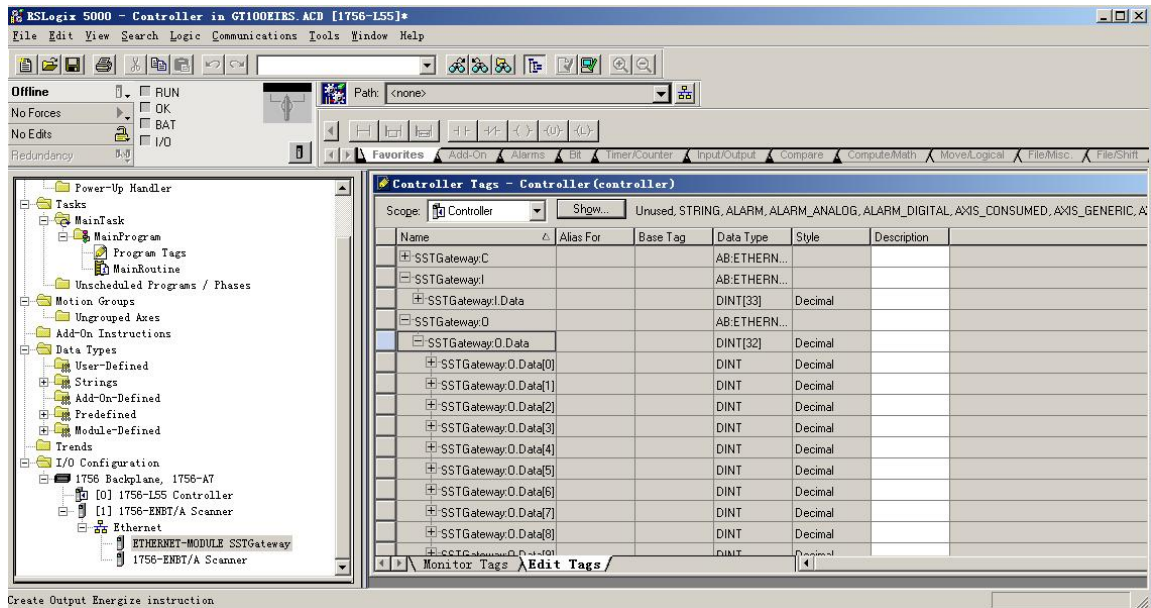

After setting this interval, click "OK" to save. Double click "Controller Tags", unfold "SSTGateway: O", as shown below:

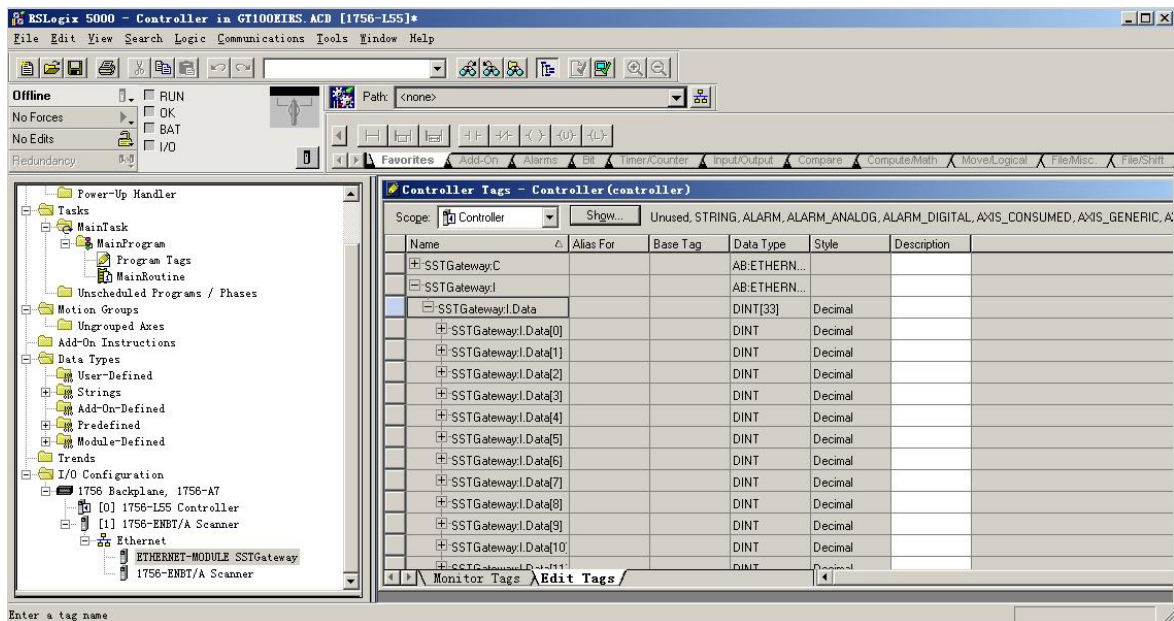In the picture above, SSTGateway:O.Data [0] ~SSTGateway:O.Data [31] is the corresponding output data address of the SST Gateway module in scanner.

Unfold "SSTGateway: I", as shown below:

In the above picture, the first 4 bytes of SSTGateway: I. Data [0] are the status bytes. SSTGateway:I.Data [1] ~SSTGateway: I. Data [32] are the input data from the SST Gateway.
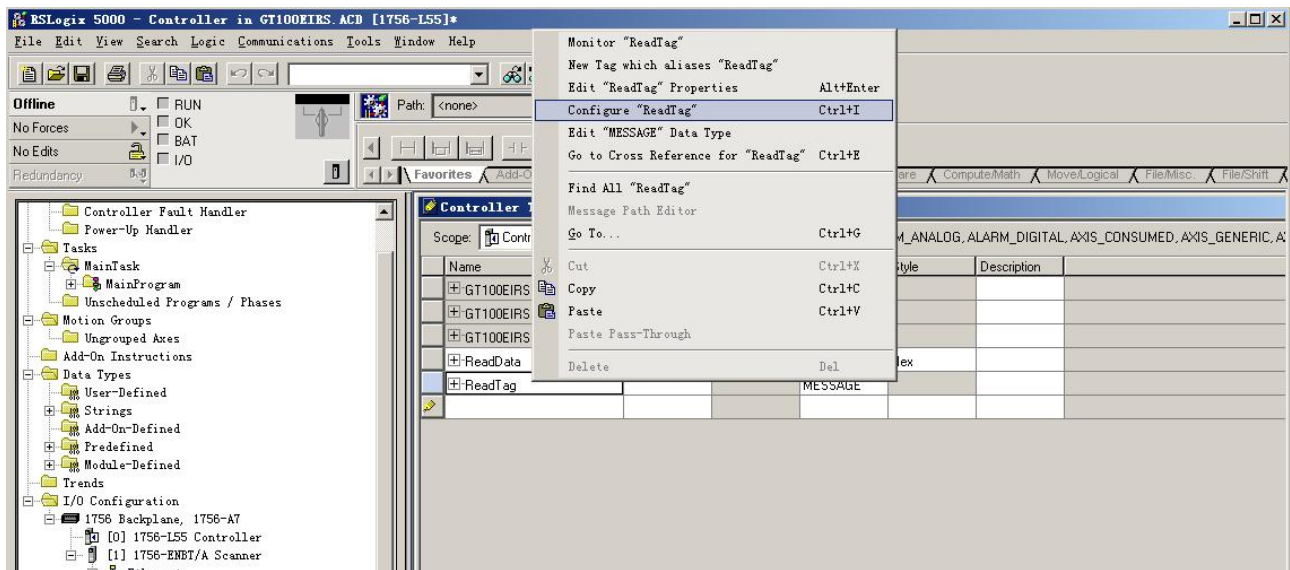
7.2 Read/Write Data by MSG

7.2.1 Read Data

Create a new project. Ensure it is in the "Offline" mode. Add two new tags "ReadTag" and "ReadData" under the

"Controller Tags" and set the type of "ReadTag" as "MESSAGE" and "ReadData" as "DINT [500]".
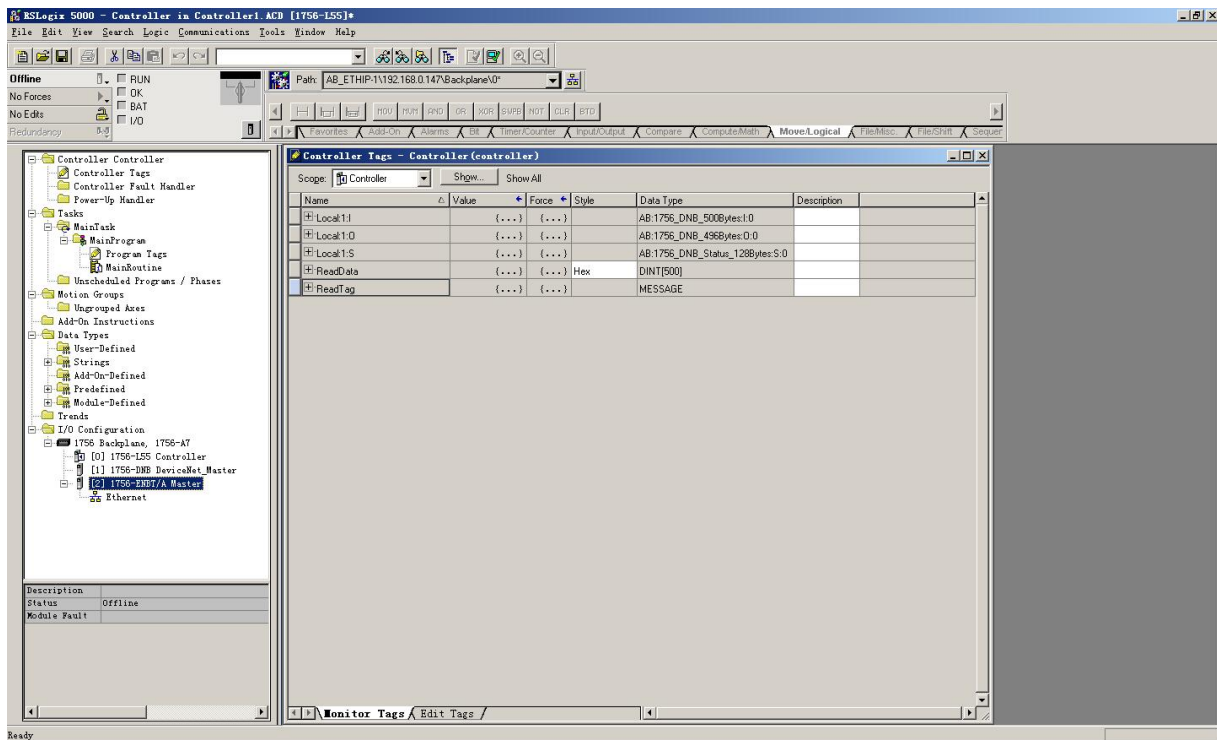
Right click "ReadTag", select "Configure "ReadTag":

In the new pop-up window, some parameters need to be set as below:

➢ **Message Type**: CIP Generic

➢ **Service Type**: Select "Get Attribute Single", now, relevant service code will become "e (Hex)"

➢ **Class**: 4 (Hex)

➢ **Instance**: Please refer to chapter 6 EtherNet/IP Connection Parameters

➢ **Attribute**: 3 (Hex)

➢ **Destination**: Select "ReadData" label, now, the data that has been received will be saved in this tag
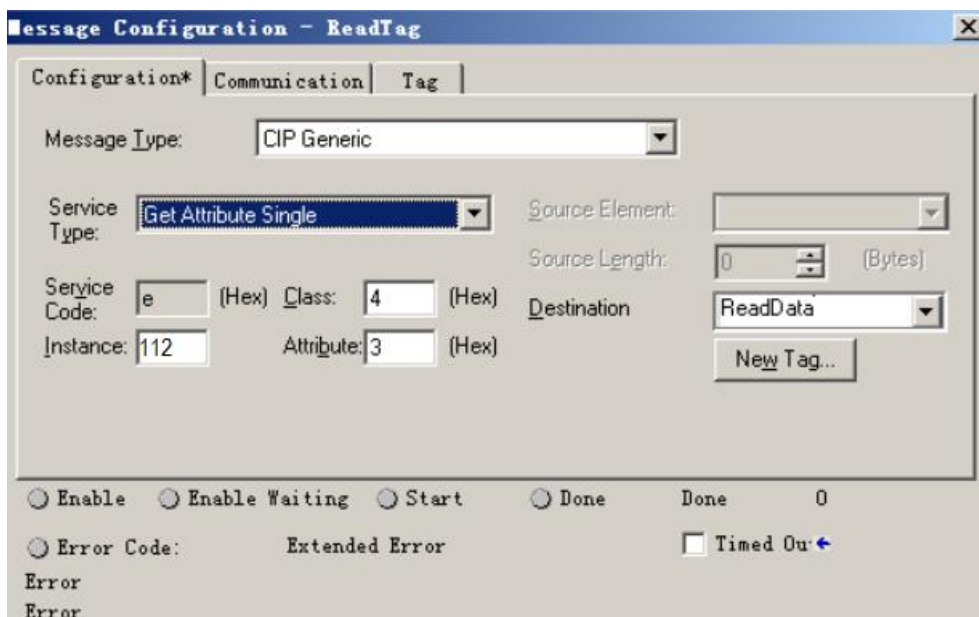
Choose "Communication" label, input the relevant path of connecting EtherNet/IP adapter in the blank space

behind the Path, the path format is: EthetNet IP hostname, EtherNet/IP scanner slot No., IP address of EtherNet/IP adapter, after setting the path, click "Apply", "Confirm". As is shown below:

In this instance, EtherNet/IP hostname is "Scanner", EtherNet/IP scanner slot No. Is "2", EtherNet/IP adapter is "192.168.0.10". IP address of SST Gateway is the address which is configured by the configuration software.
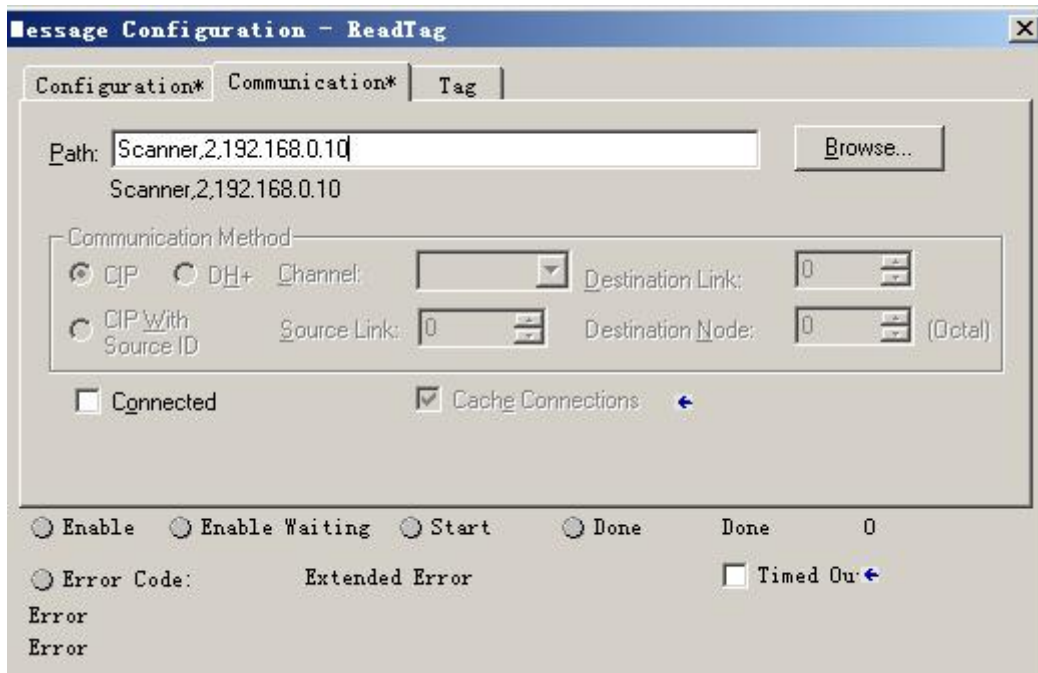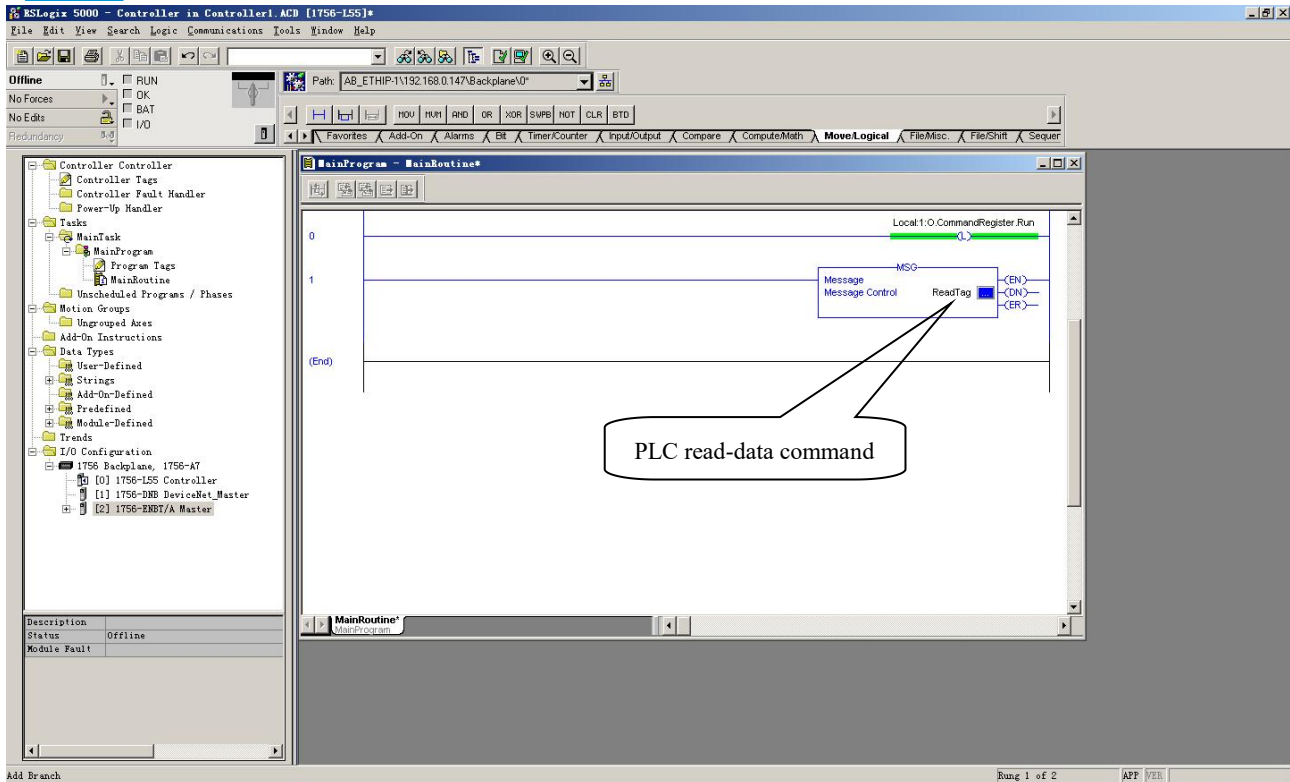

Add a "MSG" command in "MainRoutine" under the "MainProgram" and choose "ReadTag" as "Message Control", as shown below:

This is a simple command which can send a read request, it still needs to add some logic commands to trigger this command in the common program. For more detailed information, please refer to RSLogix5000.
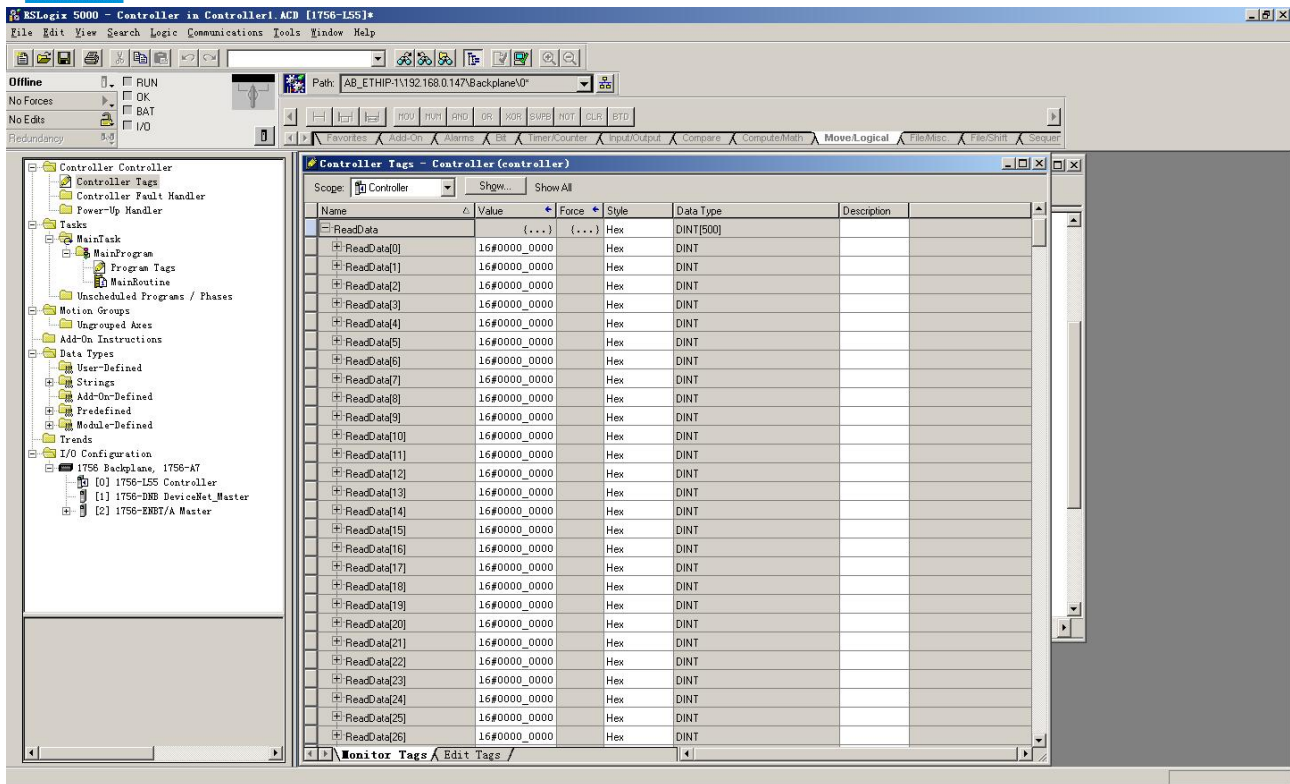
Download the program to the PLC and set PLC into the "Online" state.

Click "Control Tags" and select "Monitor Tags", unfold "ReadData", you will see that PLC can read the data from EtherNet/IP adapter SST Gateway.
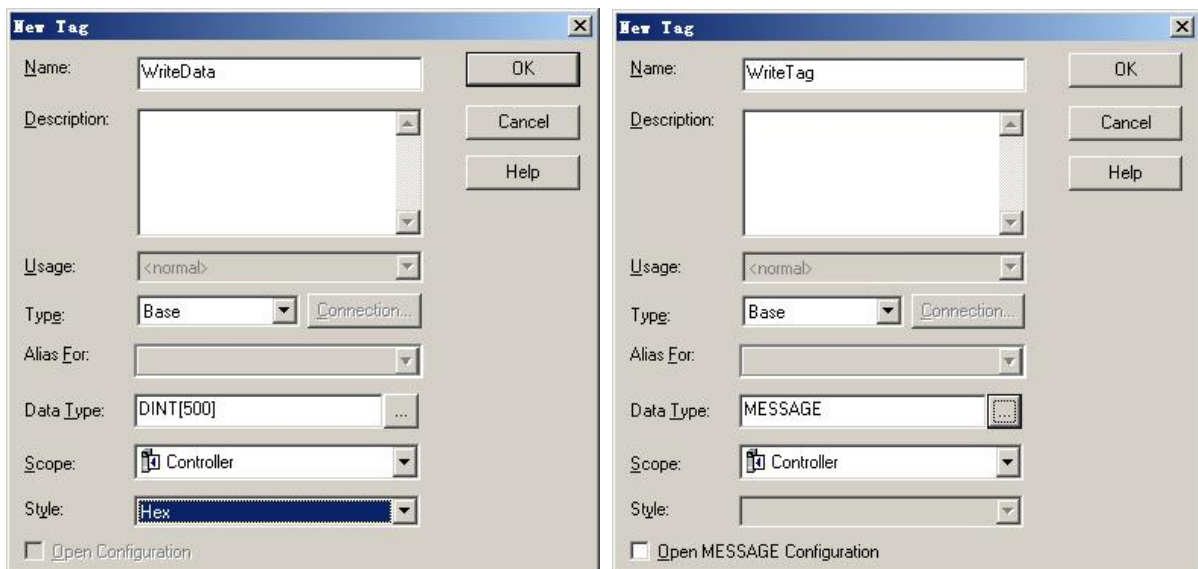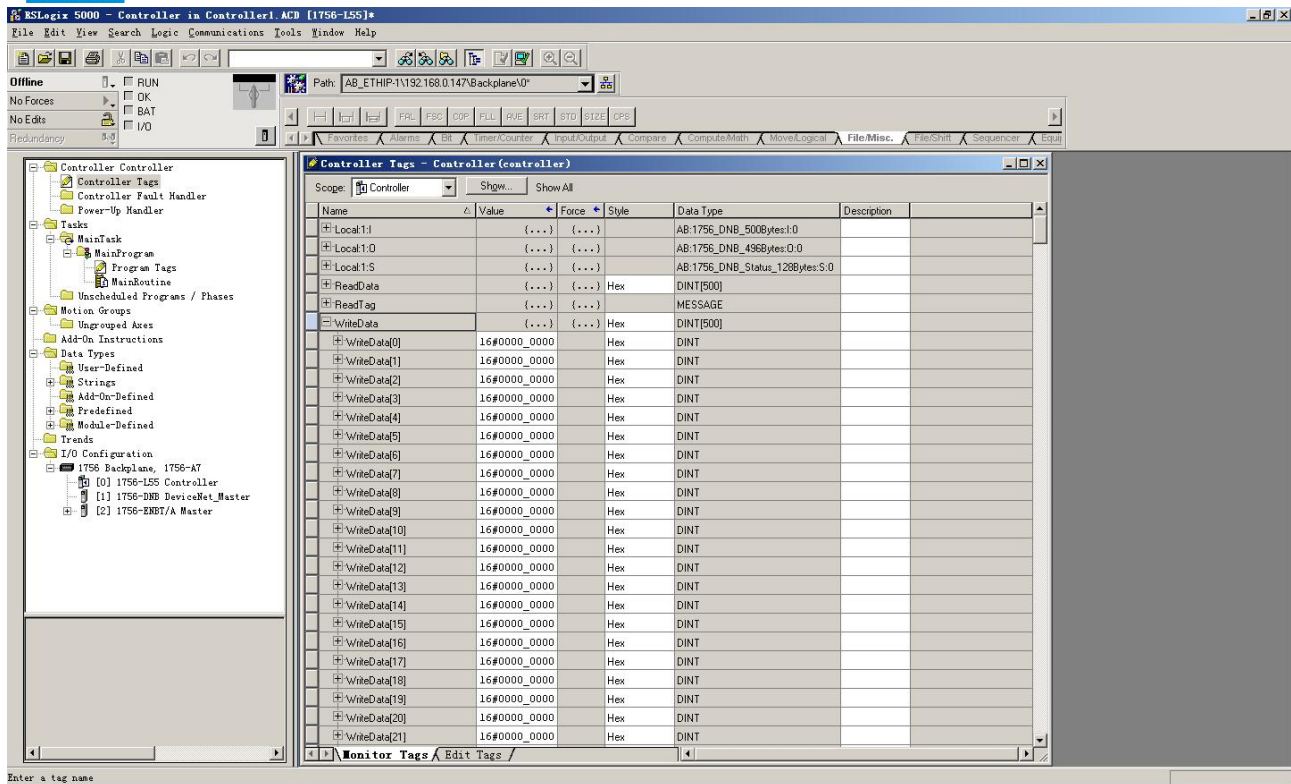
7.2.2 Write Data

Enter the "Offline" mode, add two new tags "WriteTag" and WriteData" under the "Controller Tags". Define the type of "WriteTag" as "MESSAGE" and "WriteData" as "DINT [500]":
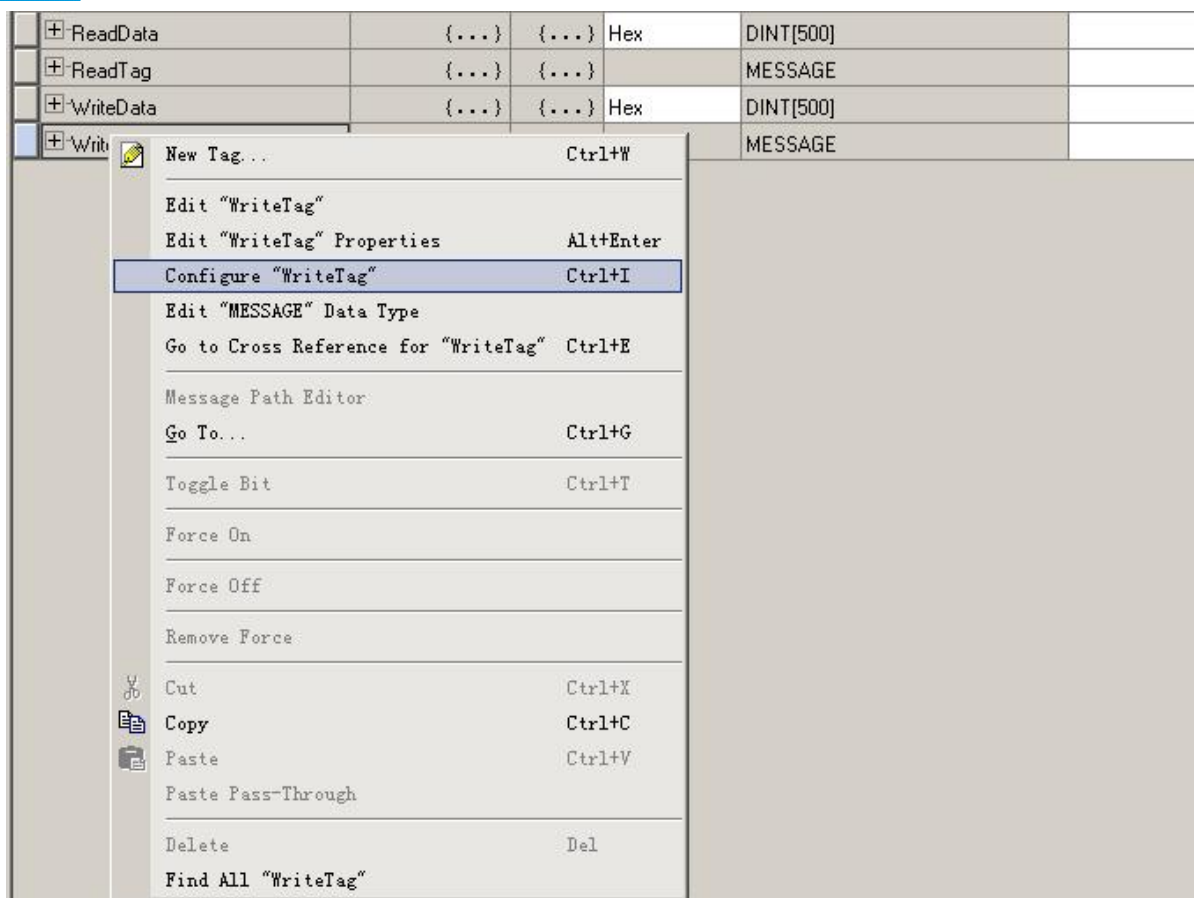
Enter the "Monitor Tags" interface. input some data beginning from address WriteData[0] in the "WriteData" tag.

There, data will be outputted to SST Gateway.

Right click "WriteTag", select "Configure "WriteTag"":

⊞ ReadData	{...}	{...}	Hex	DINT[500]	
⊞ ReadTag	{...}	{...}		MESSAGE	
⊞ WriteData	{...}	{...}	Hex	DINT[500]	
⊞ Writ...				MESSAGE	

	New Tag...	Ctrl+W
	Edit "WriteTag"	
	Edit "WriteTag" Properties	Alt+Enter
	Configure "WriteTag"	Ctrl+I
	Edit "MESSAGE" Data Type	
	Go to Cross Reference for "WriteTag"	Ctrl+E
	Message Path Editor	
	Go To...	Ctrl+G
	Toggle Bit	Ctrl+T
	Force On	
	Force Off	
	Remove Force	
	Cut	Ctrl+X
	Copy	Ctrl+C
	Paste	Ctrl+V
	Paste Pass-Through	
	Delete	Del
	Find All "WriteTag"	

In the new pop-up window, there are variables that need configuration as shown below:

➢ **Message Type**: CIP Generic

➢ **Service Type**: Select "Set Attribute Single", now, relevant Service Code will become "10 (Hex)"

➢ **Class**: 4 (Hex)

➢ **Instance**: Please refer to chapter 6 EtherNet/IP Connection Parameters

➢ **Attribute**: 3 (Hex)

➢ **Source Element**: Select "WriteData" tag, it indicates the data in the "WriteData" tag will become the data PLC outputs

➢ **Source Length**: Use byte as unit, this value should be less than or equal to the current selecting bytes which Instance represents

SSTOMM

Choose "Communication" label, input the relevant path of connecting EtherNet/IP adapter in the blank space behind the Path, the path format is: EthetNet IP hostname, EtherNet/IP scanner slot No., IP address of EtherNet/IP adapter, after setting the path, click "Apply", "Confirm". As is shown below:

In this instance, EtherNet/IP hostname is "Scanner", EtherNet/IP scanner slot No. Is "2", EtherNet/IP adapter (SST Gateway) is "192.168.0.10". IP address of SST Gateway is the address which is configured by the configuration software.
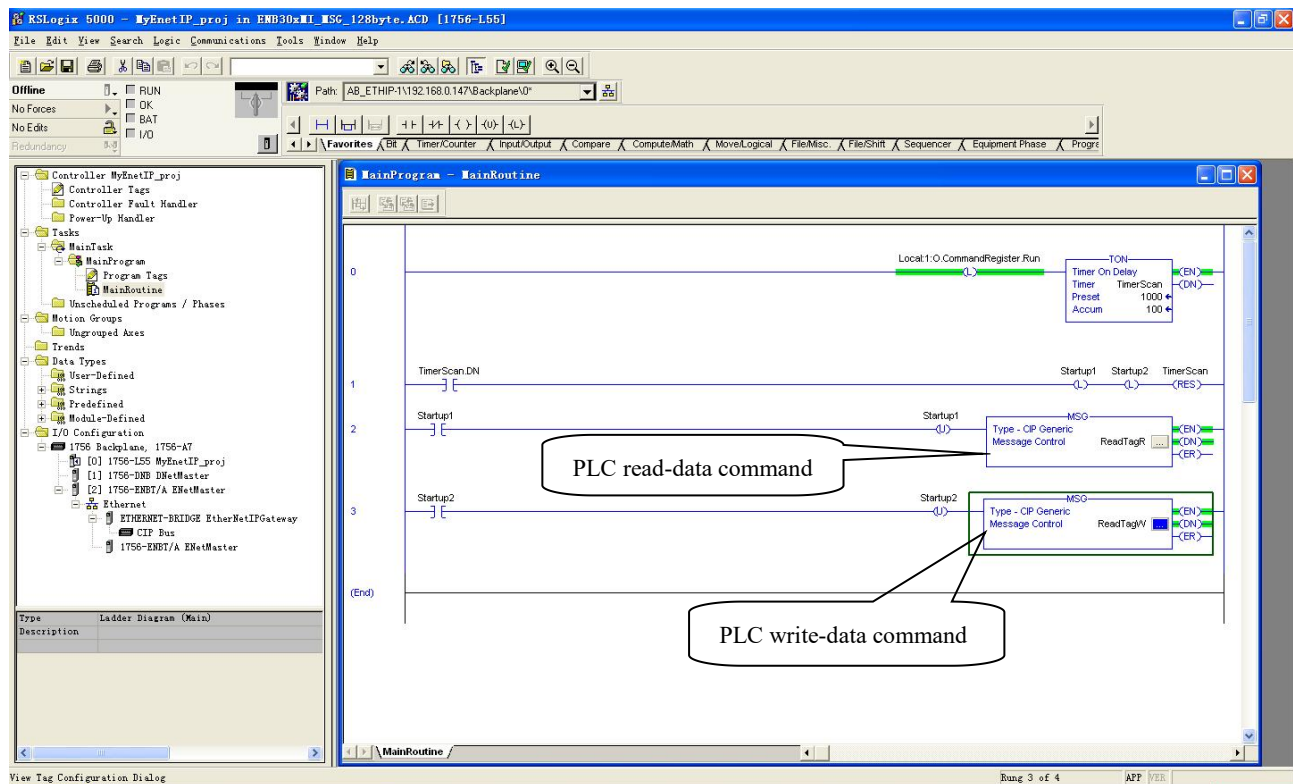
Add a "MSG" command in the "MainRoutine" under the "MainProgram" and choose "WriteTag" as the "Message

Control", as shown below:

Download the PLC program to the PLC and set PLC to the "Online" state, the data in the "WriteData" will be outputted to EtherNet/IP adapter (SST Gateway).