Embedded EtherNet/IP Module
GS11-EI

User Manual

V 1.4

REV A
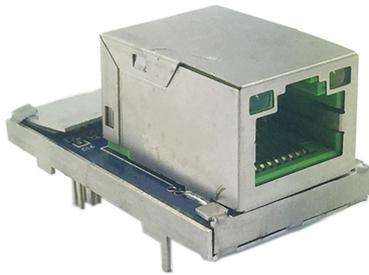
Catalog

1 Product Overview

1.1 Product Function

GS11-EI is an embedded EtherNet/IP module which can provide easy EtherNet/IP connectivity via a UART interface with a simple polling protocol.. Any device that supports the host interface can communicate with GS11-EI through UART.

1.2 Product Features

➢ Upgrade the UART or serial device to EtherNet/IP device easily.

➢ Ethernet is 10/100M self-adaptive.

➢ Supports one EtherNet/IP connections.

➢ Provides user configuration software.

➢ Setting the IP address via the UART (Optional Features).

1.3 Technical Specifications

[1] Supports the EtherNet/IP communication protocol that follow ODVA standard.

[2] GS11-EI provides one Ethernet port and one UART interface (included in the 20-pin connector), it can achieve the data conversion between the EtherNet/IP data and serial data.

[3] Ethernet is 10/100M self-adaptive.

[4] The size of input and output buffers can be set by users:

The input buffer size is 256 bytes at most.

The output buffer size is 256 bytes at most.

[5] As an EtherNet/IP server on the Ethernet side, can support one EtherNet/IP client to communicate only, the minimum data transmit rate is 5ms.

[6] The serial interface: UART, half duplex, 8 data bits, one stop bit, and none parity, support 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 baud rate.

[7] Serial port use user-defined protocol, easy to achieve serial port communication.

[8] Power supply: +3.3VDC (3.14 ~ 3.45V), 190mA.

[9] Working temperature: -40℉~185℉ (-40℃~85℃), humidity: 5% ~ 90%.

[10] Dimensions (L x W x H): 1.46 in x 0.88 in x 0.95 in (37.2mm x 22.6mm x 24.2mm).

1.4 Revision History

Revision	Date	Chapter	Description
V1.3	5/10/2018	ALL	New release
V1.4	3/1/2022	PART	Revision for GS11-EI V1.4
V1.4 REV A	6/24/2022	PART	Revision for GS11-EI V1.4 Rev A

2. Hardware Description

2.1 Product Appearance
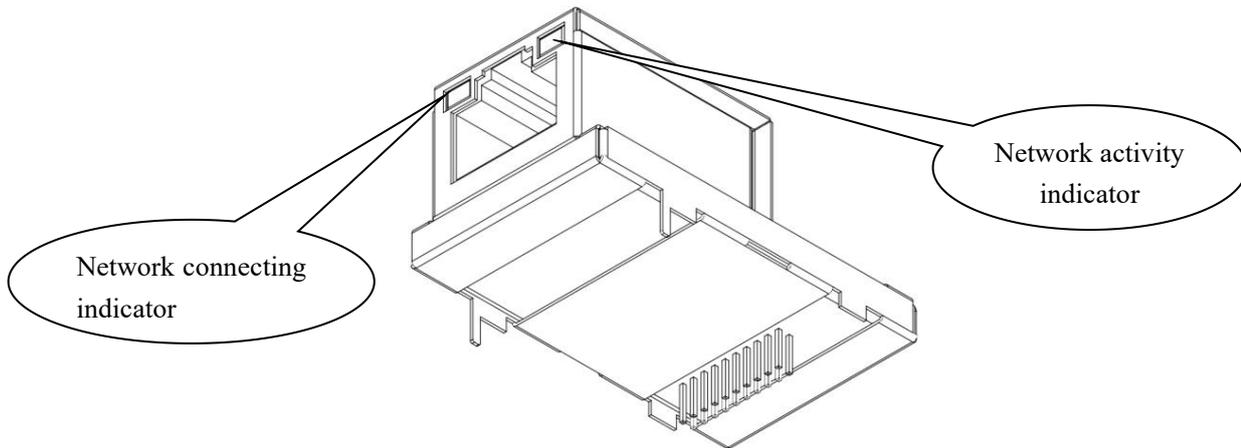
2.2 Indicators

Indicator	Status	Description
Green	Off	No network connection
	Always on	Network connection normal
Yellow	Off	No network data transmitting
	Blinking	Network data transmitting normal

2.3 Interface

2.3.1 Ethernet Interface
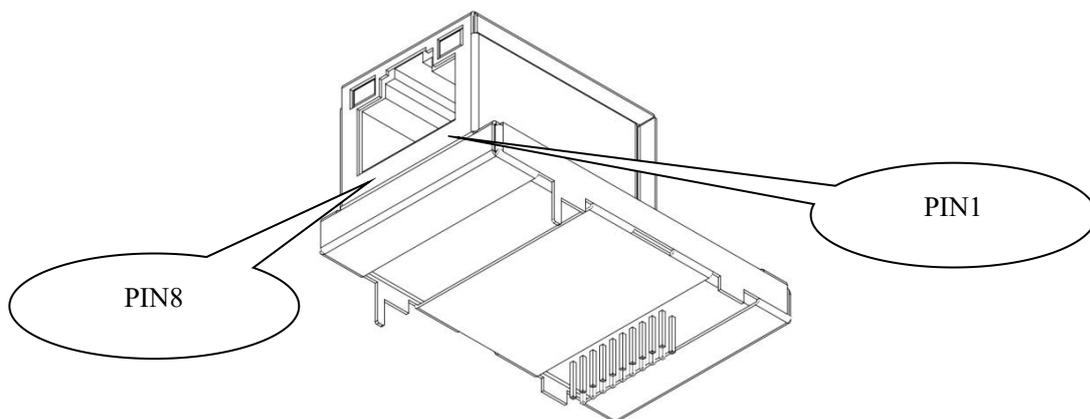

The Ethernet interface uses an 8-line RJ-45 interface, follows IEEE802.3u 100BASE-T standard,10/100M self-adaptive, and the pin definitions are as follows:

Pins	Signals	Descriptions
Pin 1	TXD+	Transmit Data+
Pin 2	TXD-	Transmit Data-
Pin 3	RXD+	Receive Data+
Pin 4	BID+	Bi-directional Data+
Pin 5	BID-	Bi-directional Data-
Pin 6	RXD-	Receive Data-
Pin 7	BID+	Bi-directional Data+
Pin 8	BID-	Bi-directional Data-

2.3.2 Host Interface

GS11-EI has a 20-pin socket connector (needle-type), including power interface, UART interface and GPIO. The pin position and definition are as follows:

Pins	Signals	Description
1 ~ 6	NC	Reserved
7	RXD	UART Receiving (Input), connect with TXD of host processor or MCU
8	TXD	UART Sending (Output), connect with RXD of host processor or MCU
9	GPIO	Reserved
10	/RUN	The status of GS11-EI (Output), which need a 10kΩ pull-up resistor on the user board. Logic 1(light on): The GS11-EI module on the startup. Logic 0(light off): The module's startup has been completed. (Include waiting for initialization state, start the EtherNet/IP protocol stack and data exchange state, etc.) *Default IP address mode: By pulling down Pin 10 to low voltage before starting the module (by using a 1kΩ pull-down resistor), the module will start with default IP address (192.168.0.11), and this mode is only used to update the firmware.
11	BAUD2	
12	BAUD1	Set the UART baud rate (Input), see the following table.
13	BAUD0	
14	/RESET	Reset signal (Input), Active low.
15	+3.3V	+3.3V DC power Supply
16	GND	GND power Supply
17 ~ 19	NC	Reserved
20	/DATAEXCH	Data Exchange (Output), and need a 10kΩ pull-up resistor on the user board. Logic 1(light on): The module is in non-data exchange state (such as start state, waiting for initialization state, start the EtherNet/IP protocol stack, etc.)

		Logic 0(light off): The module is ready for data exchange.

2.4 UART Baud Rate

UART baud rate settings are as follows:

| Index	BAUD2	BAUD1	BAUD0	Baud Rate（bps）
0	0	0	0	2400
1	0	0	1	4800
2	0	1	0	9600
3	0	1	1	19200
4	1	0	0	38400
5	1	0	1	57600
6	1	1	0	115200
7	1	1	1	230400

2.5 Reset Signal

GS11-EI RESET (Pin 14) supports input of hardware reset signal. When the RESET pin is pulled down to GND or connects with voltage lower than 2.88V for more than 1 millisecond, the module will be forced to reset.The host must wait for 250 ms (typical value, after reset the module) after reset, then the user must check the Pin 10 (/RUN) and Pin 20(/ DATAEXCH). If the two pins are both Logic 0 (low voltage), then the host (user board) can exchange data.

3. Dimensions

Unit: [mm]

Front:

Side:

PCB dimension:

contour line
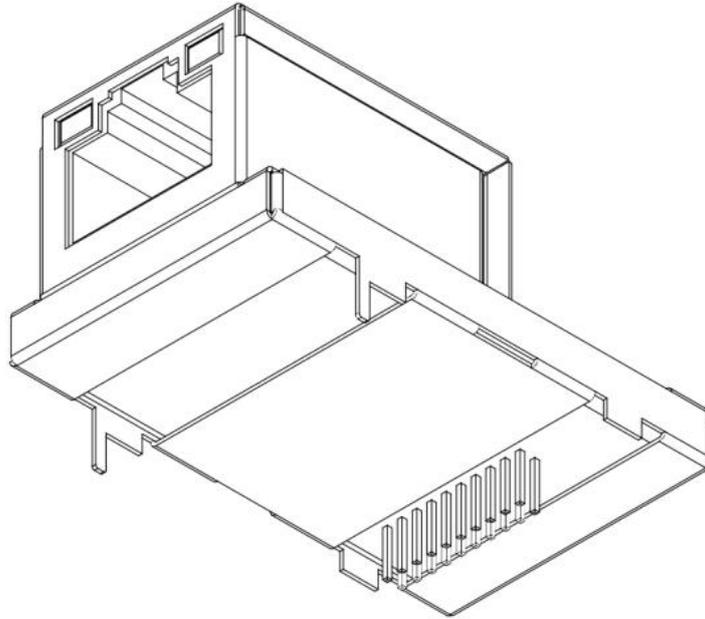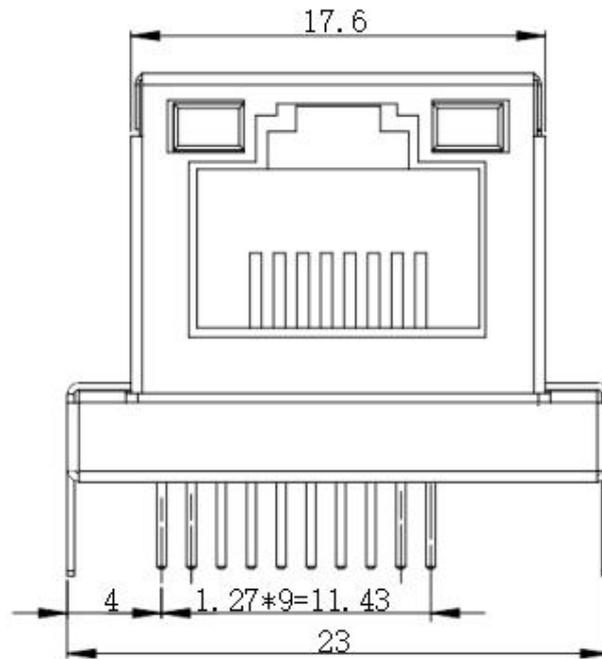
4. Communication Protocol

4.1 Description

GS11-EI acts as an EtherNet/IP server at the Ethernet side, serial port uses user-defined protocol. The EtherNet/IP communication and serial communication are completely independent. The data exchange can be finished through the internal input and output data buffer of GS11-EI. According to the GS11-EI serial communication protocol, the user board can complete the input and output data exchange.

The procedure of message transmission is as follows:
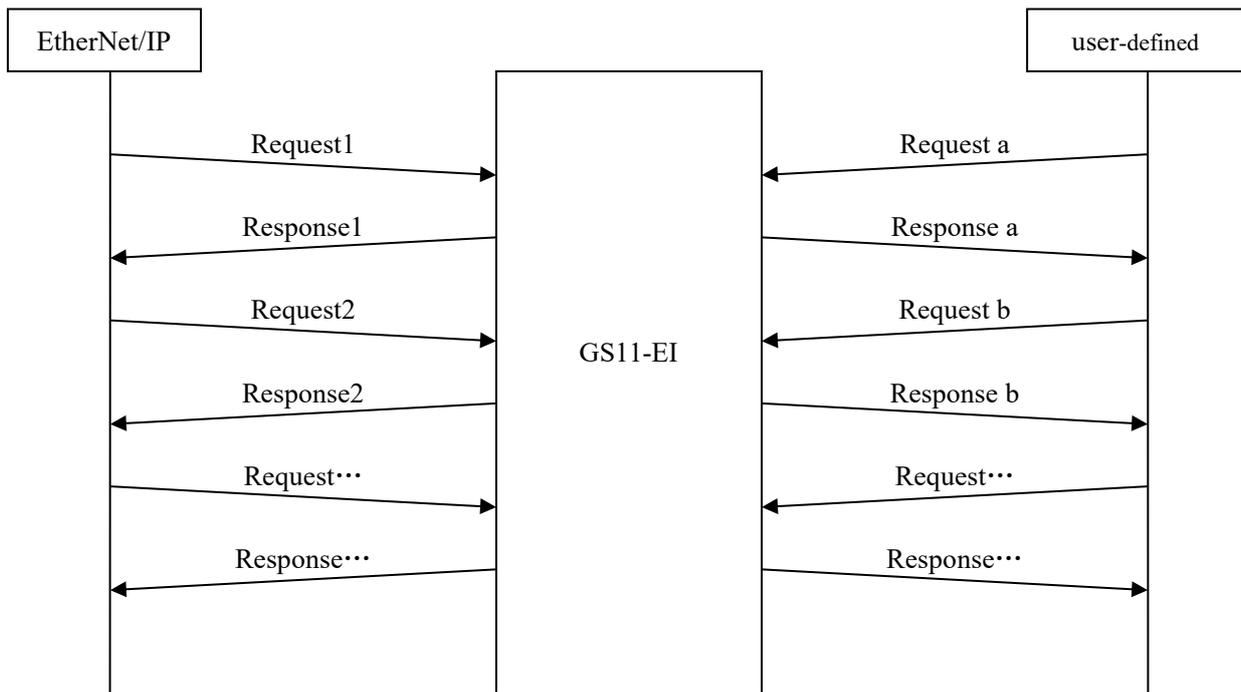
## 4.2 The GS11-EI Communication Flowchart and User Program

Here are the flowcharts of two kinds of IP configuration; users can choose one of them in accordance with specific conditions. For choosing the chart, please refer to the "Advanced Parameters" section in Chapter 6.4.

The communication flow chart of using serial port (UART) setting method:
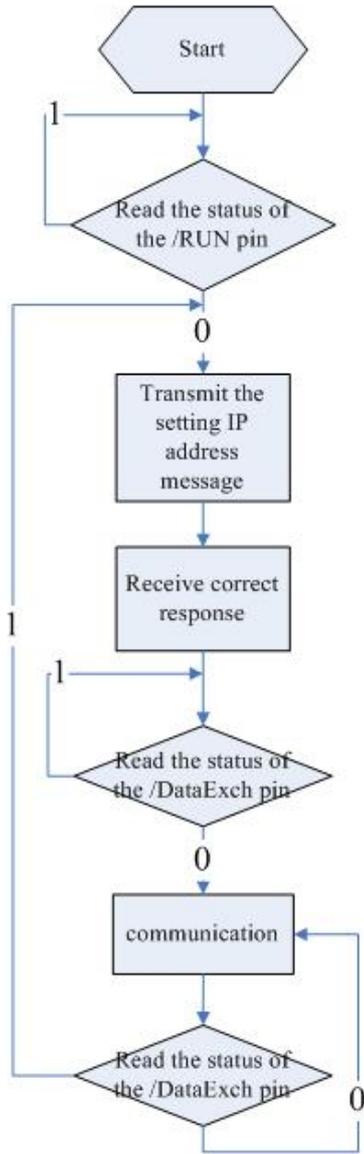
The communication flow chart of using PC configuration software setting method:
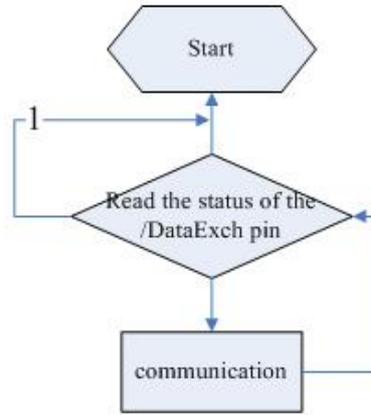
4.3 Real-time monitoring IP function

If the GS11-EI is set to DHCP, then the module will monitor its IP when it is running. If IP changed, it will pull up /DATAEXCH pin to logic 1.Then two cases:

1. Using configuration software to set IP address mode: The module will obtain an IP again. User needs to read //DATAEXCH pin state. If it returns to logic 0, indicating that the module has obtained IP, and the module can

begin to communicate;

2. Using UART to set IP address mode: GS11-EI will wait the user to send the request for setting IP address, and the next step is the same with the first initialization.

4.4 Initialize Communication

Communication mode: user board (host) is the communication initiator, and GS11-EI responses.

Configuration of baud rate: Once the GS11-EI is powered on or reset, it reads the pins BAUD0, BAUD1, BAUD2 and select the UART baud rate accordingly by itself.

1. Initialization request message--- (user board->module), When user chooses to use the serial port (UART) to set the IP address and other information, sent this initialization request message.

Byte	EtherNet/IP to user-defined protocol
0	Define the length of the package in bytes, in normal it is 17 bytes (in hexadecimal) which includes all following bytes from 2 through 18, high-byte is priority.
1	
2	The default value is 0; when the user sets GS11-EI via UART that use DHCP to assign IP address, the value of this byte is 1 *
3	IP Configuration Mode, 0: Static Configuration; 1: DHCP ;
4	IP Address, high-byte first
5	
6	
7	
8	Subnet Mask, high-byte first
9	
10	
11	
12	Default Gateway Address, high-byte first
13	
14	
15	
16	Reserved, always 0
17	Reserved, always 0
18	Reserved, always 0
19	Check sum, byte 0+byte 1+…+byte 18

Notes:

When setting the GS11-EI module via UART that uses DHCP to assign IP address, the user board sends above message (the value of byte 2 should be 1).

And then, when GS11-EI does not receive the IP address that assigned by DHCP Server on the network, it will send 0x2E to user board each second.

If DHCP Server finished IP allocate, then GS11-EI will send a message which contains the IP address, the subnet mask, and the default gateway to user board.

For example: GS11-EI sends message to user board: 0C C0 A8 00 BB FF FF FF 00 C0 A8 00 01 95.

The 0x0C is the header and means there are 12 bytes behind, and it follows by a 4 bytes of IP address (192.168.0.187), 4 bytes of subnet mask (255.255.255.0), 4 bytes The default gateway (192.168.0.1), the last byte represents checksum.

when user set the GS11-EI module IP address via UART and does not use DHCP, user board sends above message （the value of byte 2 should be 0）, and then the module will send the following message to the user board.

1. Initialize response message--- (module->user board)

byte	Correct Response	Incorrect Response
0	Data length is 2	Data length is 2
1	0：Correct	Error code (not 0)
2	0	Extra error code
3	Check sum, byte 0+byte 1+byte 2	Check sum, byte 0+byte 1+byte 2

2. Error code

| Index	Error Code	Explanation
0	1	Check sum error.
1	2	Data length error.
2	3	IP configuration mode does not exist.

3. Extra error code is always 0xFF

4.5 User-defined Protocol

Communication mode: User board is the communication initiator, and GS11-EI responses.

The request messages contain input data, and the response messages contain output data. The communication process is as follows:
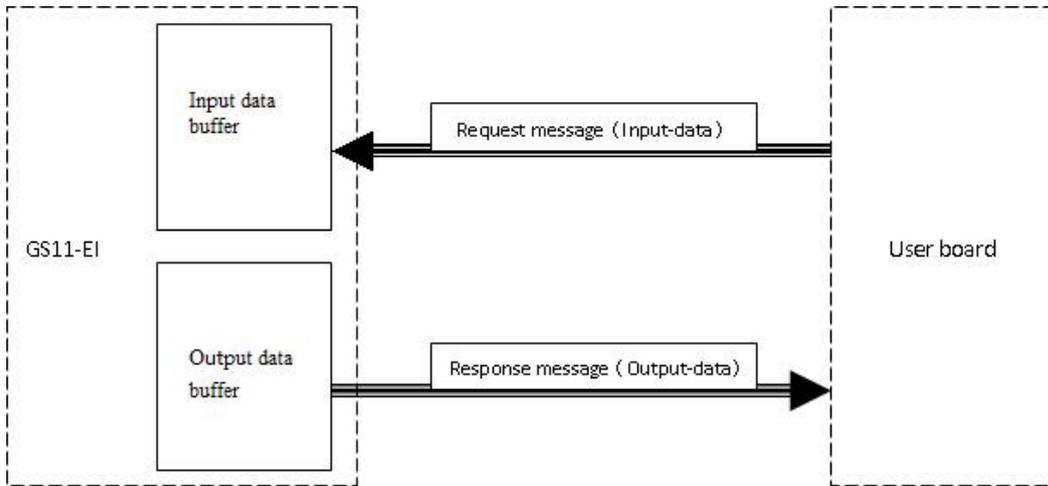
1. Request message (user board -> module)

Byte	Description
0	message length includes all following bytes except the check sum byte , high-byte first
1	
2	Input data, high-byte first
…	
n	
n+1	Check sum, byte 0+byte 1+…+byte n

2. Response message of user-defined protocol (module -> user board)

Byte	Correct response	Byte	Incorrect response
0	message length includes all following bytes except the	0	0x80
1	check sum byte , high-byte first	1	Data length is2
2	Output data, high-byte first	2	Error code
…		3	Extra error code
n		4	Check sum, byte 0+byte 1+byte 2+byte3
n+1	Check sum, byte 0+byte 1+…+byte n		

3. Error code

Index	Error code	Description
0	1	Sum CRC Error
1	2	Data Length Error

4. Extra error code is always 0xFF.

5. Development Board

5.1 Appearance

5.2 Function

5.2.1 RS232 Interface

RS232 interface is DB9 pin-connector, the description show as follow:

Pin	Signal	Description
2	RX	Connect with pin TX of RS232 of PC
3	TX	Connect with pin RX of RS232 of PC
5	GND	Connect with pin GND of RS232 of PC

DB9 hole-connector crossover cable must be used when connect the board with RS232 interface of PC, as shown below:
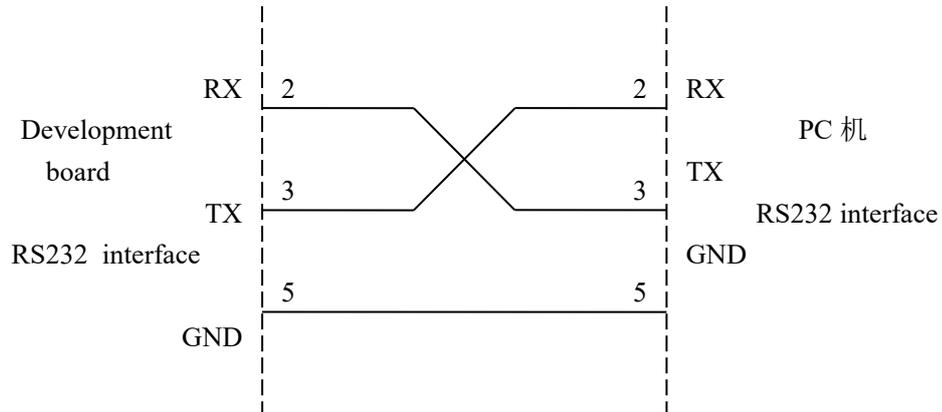
5.2.2 Baud Rate Setting Switch

The 4-bit DIP switch on the development board is used to set the serial (UART) baud rate and default IP address locking（for firmware update）, shown as below:

Low bit　　Middle bit　　High bit　　Default IP address
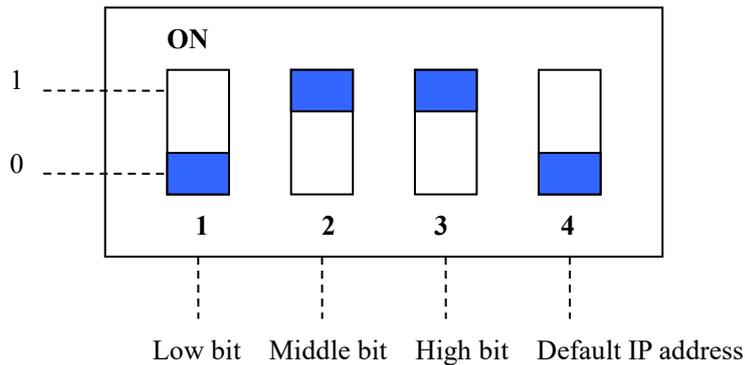
Corresponding relationship of baud rate is as follows:

Index	High bit	Middle bit	Low bit	Corresponding baud rate（bps）
0	0	0	0	2400
1	0	0	1	4800
2	0	1	0	9600
3	0	1	1	19200
4	1	0	0	38400
5	1	0	1	57600
6	1	1	0	115200
7	1	1	1	230400

The baud rate showing in the picture is 115200bps.

The fourth bit of DIP is "Default IP address locking" bit. When this bit is "ON", Module is in firmware update

state (unable to communicate normally), and the module will start up with default IP configuration.

IP address：192.168.0.11

Subnet mask：255.255.255.0

Default gateway：192.168.0.1

5.2.3 Reset Key

The key on the development board is the reset key, which is used to manual reset GS11-EI through clicking once.

5.2.4 LED

There are six indicators on the development board, and the description is as follows:

Index	Name	Description
0	Power	Power indicator,　On: Power on;　　Off: Power off
1	RTS	Reserved
2	TX	GS11-EI'UART transmits indicator; Blinking: GS11-EI'UART is transmitting data; Off: GS11-EI'UART isn't transmitting data.
3	RX	GS11-EI'UART receives indicator. Blinking: GS11-EI'UART is receiving data; Off: GS11-EI'UART isn't receiving data.
4	Run	GS11-EI status indicator, On: In run status; Off: In start-up status.
5	DataExch	GS11-EI data exchange indicator, On: In data exchange status; Off: Not in data exchange status.

6. Configuration Software

Download the configuration software SST-EIP-CFG on www.SSTAutomation.com and install . Follow the

prompts to complete the installation. Then open the configuration software and finish the configuration of

GS11-EI.

6.1 SST-EIP-CFG Introduction

SST-EIP-CFG is a product based on Windows platform, and is used to configure parameters of GS11-EI, Double

click the icon to run the SST-EIP-CFG and its main window will appear as below:
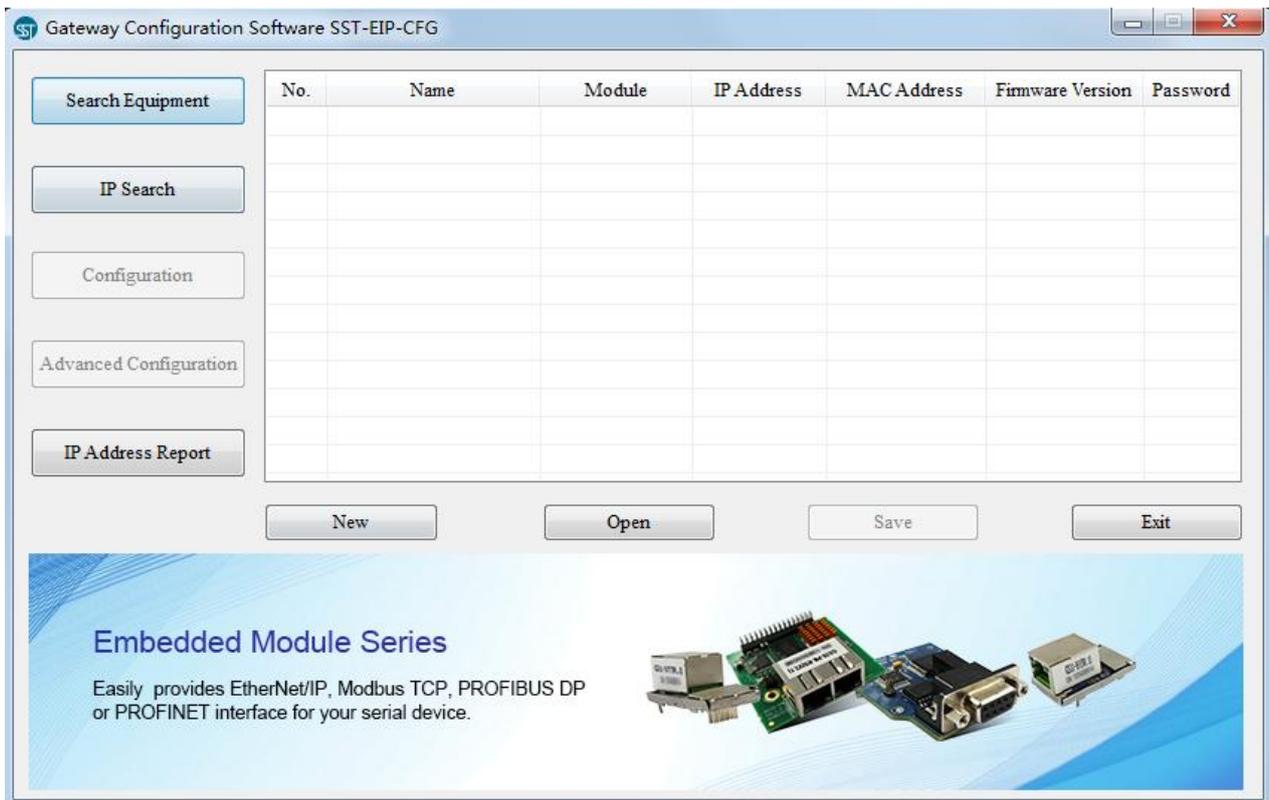
6.2 Search Equipment

Before configurating the parameters of GS11-EI, the user needs to search the equipment. Click the "Search

Equipment" button in the main window, SST-EIP-CFG will automatically list all of the GS11-EI on the network,

as shown below.
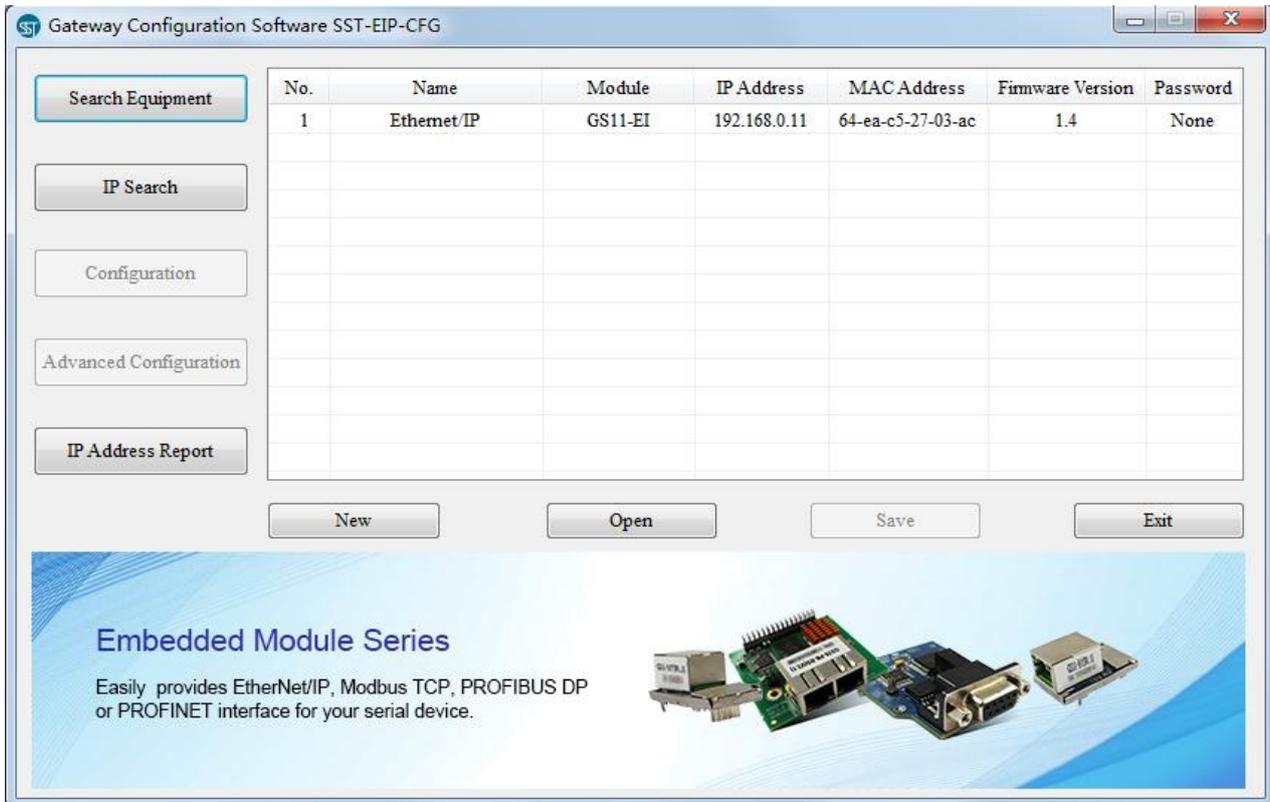
6.3 IP Search

When user just wants to search a known IP address device on the network, click "IP Search" button in the main window, and there will be popping up a dialog box: Fill in the IP address you want to search in the window and click OK.
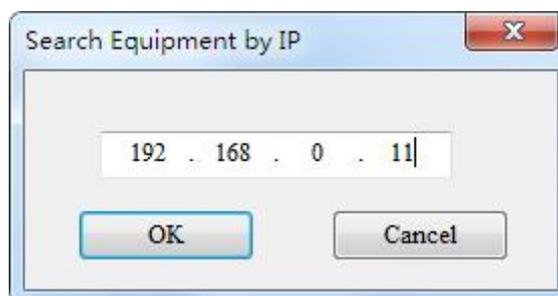
The SST-EIP-CFG will list all searched equipment(s) in the table, as shown below.
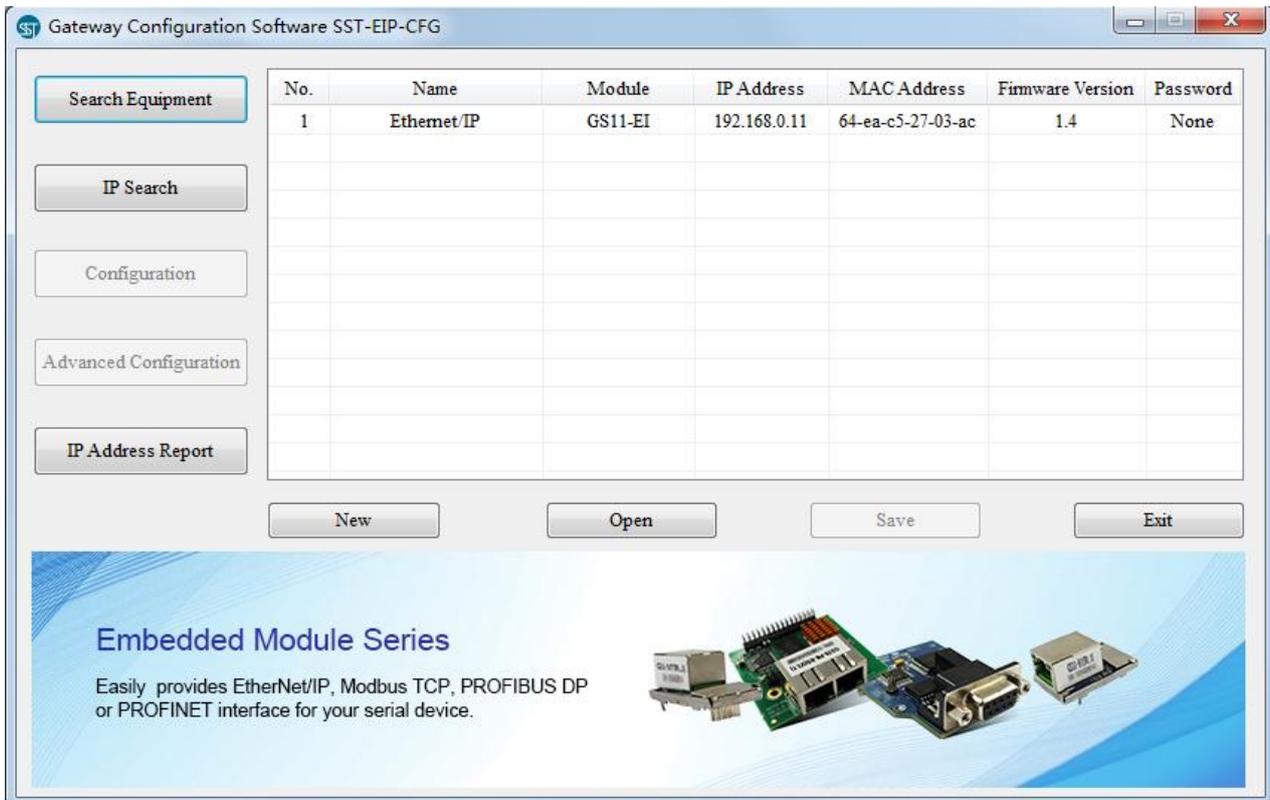
6.4 Advanced Configuration

Note: The Advanced configuration is used to set the product-related parameters, it require the user to set the administrator password to prevent other users from modifying the advanced parameters through the SST-EIP-CFG.

Select one device in the main window, Click "Advanced Configuration" button.
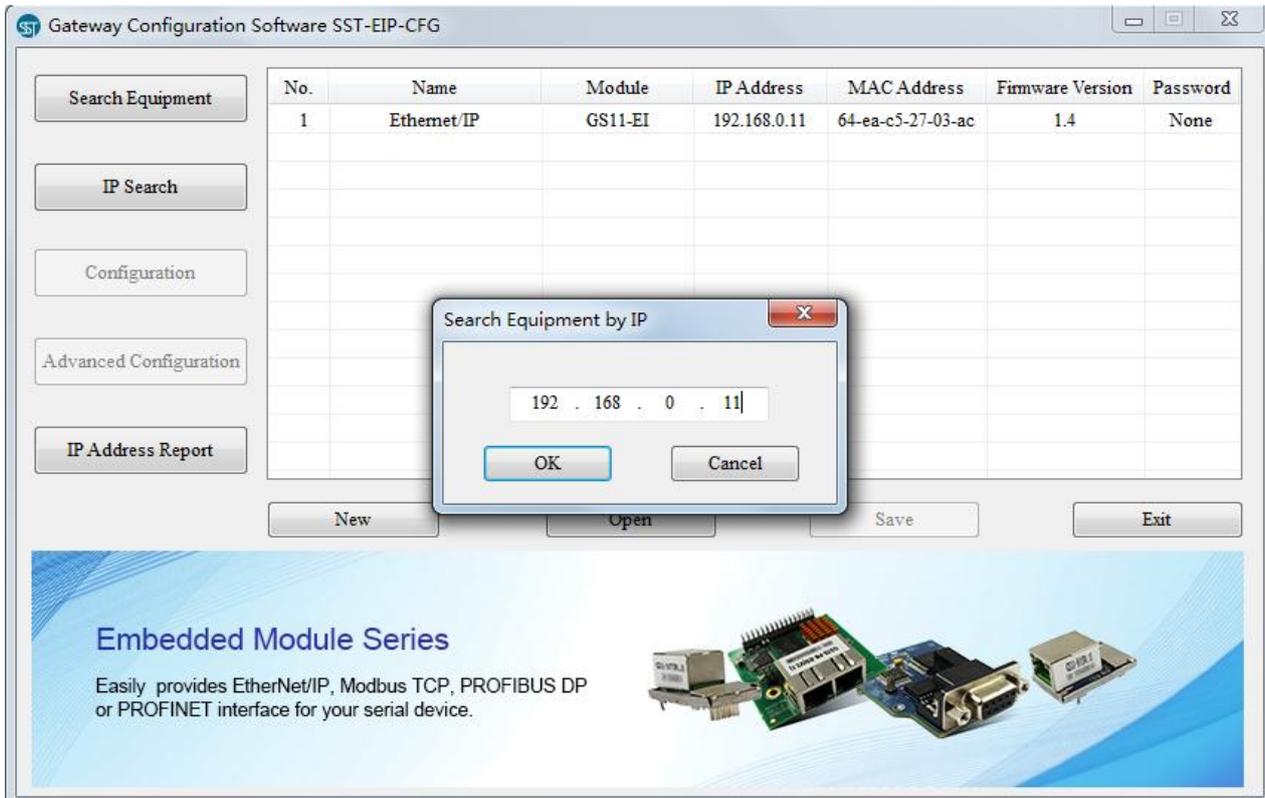
The following interface will pop up:
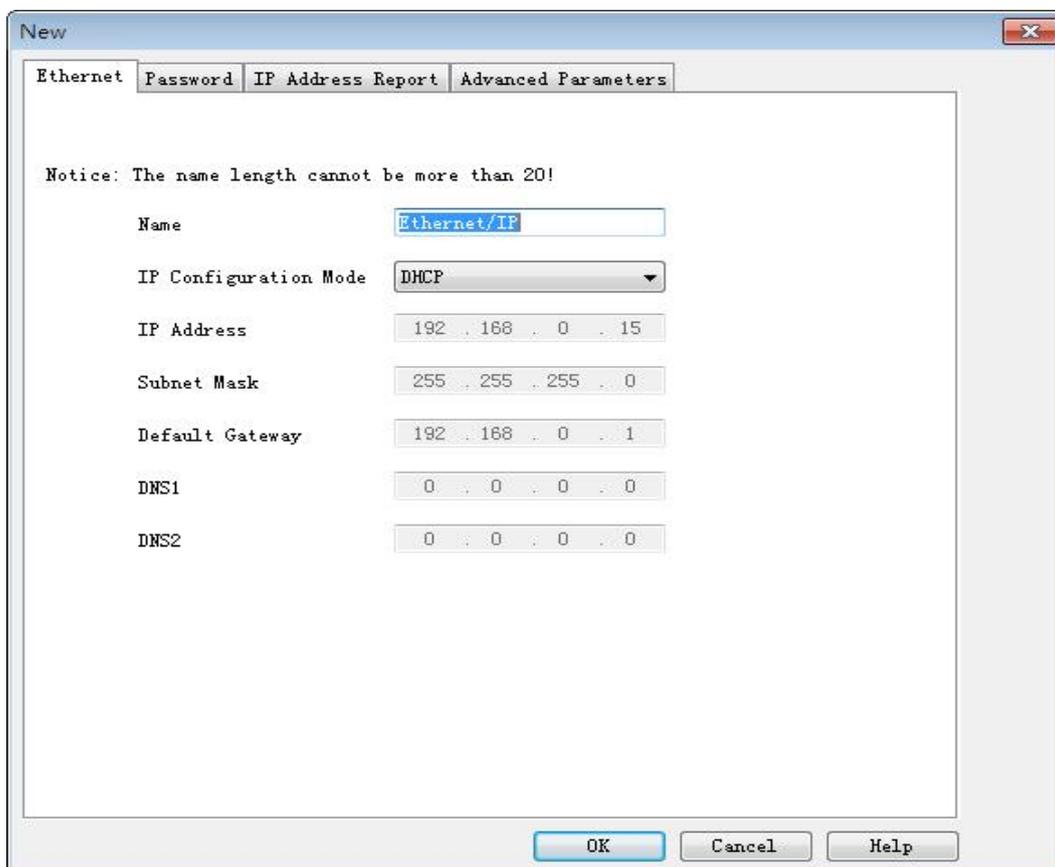
In this interface, users can configure: Ethernet, Password, IP Address Report and Advanced Parameters. The following describes the above interface.

➢ Ethernet Parameters: (as shown above)

- Name——The name is used to identify the GS11-EI module on the network, it can also be the name of the device's model;

- IP Configuration Mode——Set the device's IP address configuration mode, Static or DHCP;

- IP Address——Set the device's IP address;

- Subnet Mask——Set the subnet mask of the device;

- Default Gateway——Set the default gateway address of the device;

- DNS1——currently not supported

- DNS2——currently not supported

➢ Password Setup（as shown below）

- User Password: Refers to the password that the user needs to enter when clicking the "advanced configuration" button on the main screen. Once the user password is set, the user needs to enter this password every time when configuring SST-EIP-CFG for user parameters. It is recommended not to set this password, as this password is for the users.

- Admin Password: Refers to the password that the administrator needs to enter when clicking the "Advanced Configuration" button on the main screen. After the admin password is set, the administrator needs to enter this password when configuring SST-EIP-CFG for advanced parameters. It is recommended that the adaministrator set this password after the product setup is complete, it protect the advanced parameters from being modified by other users..
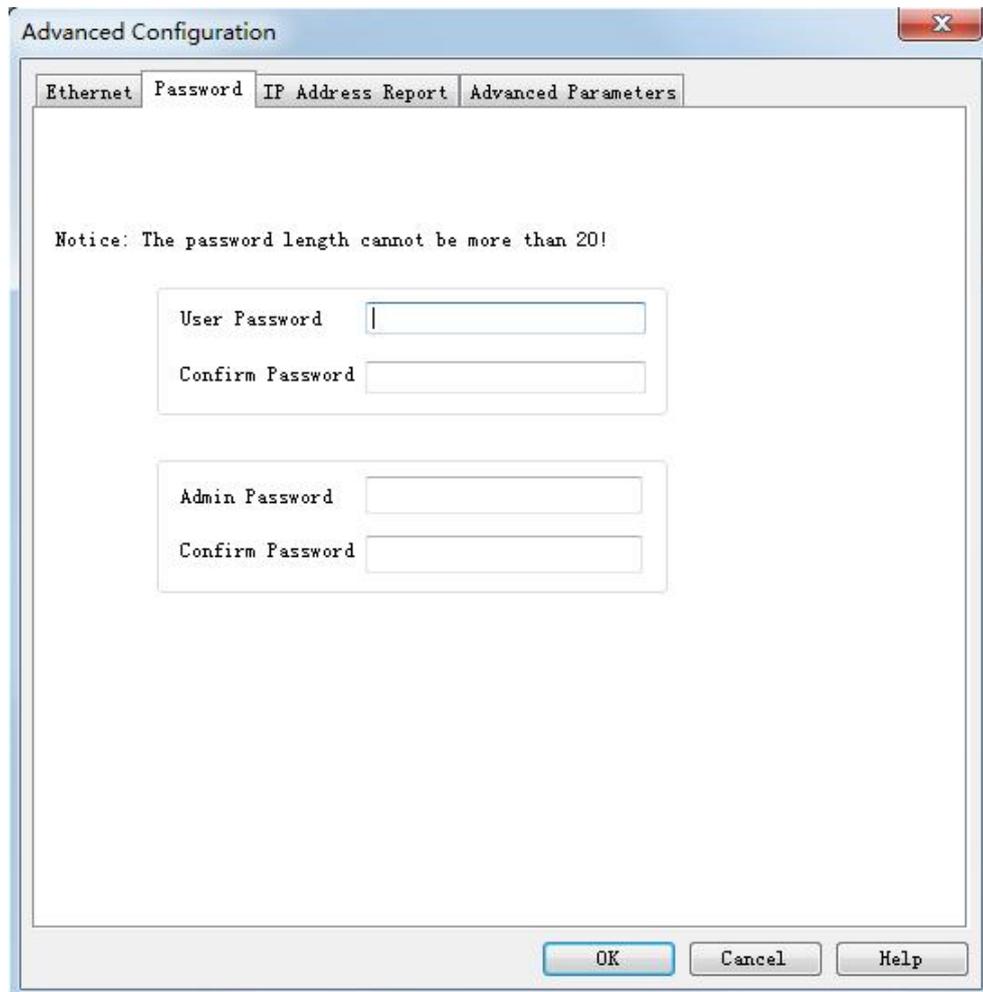
➢ IP Address Report:

It is used to set the GS11-EI by sending a packet that reports its current IP address, subnet mask, and default

gateway to a port of the specified IP address device, which is sent as UDP. Users can enable this function by

clicking on the "IP Address Report" button in the main screen of the configuration software SST-EIP-CFG. Click

"Start" button and the SST-EIP-CFG will list all of the messages sent by the devices on the network.

After this function is enabled, the user needs to set the IP address, Port Number and the Auto Report Period of the

remote device, , as shown below:

➢   Advanced Parameters: (as shown above)

The way to obtain IP address

● Setting the IP address via software SST-EIP-CFG. The users use this software to configure

network parameters (user parameter configuration).

- Setting the IP address via host interface (UART): The user board sets the IP address and other parameters through the UART. The user board sets parameters such as the IP address by sending an initialization request message; see section 4.4.

- Ethernet/IP connection parameters: The GS11-EI supports 3 sets of connection parameters. Each set of parameters has input and output. The number of input and output bytes can be any value from 0 to 256 bytes. (These three parameters are valid according to the largest Assembly Instance)

- Ethernet/IP device parameters: Supports changing VendCode and ProdCode.

6.5 User Parameter Configuration

Note: The user parameter configuration is the parameters set for user, such as the IP address parameters (If the IP address obtain method in Advanced Parameters choose "Setting the IP address via software SST-EIP-CFG", see chapter 6.4)

In the main screen select the device need to be configured and click the "Configuration" button.
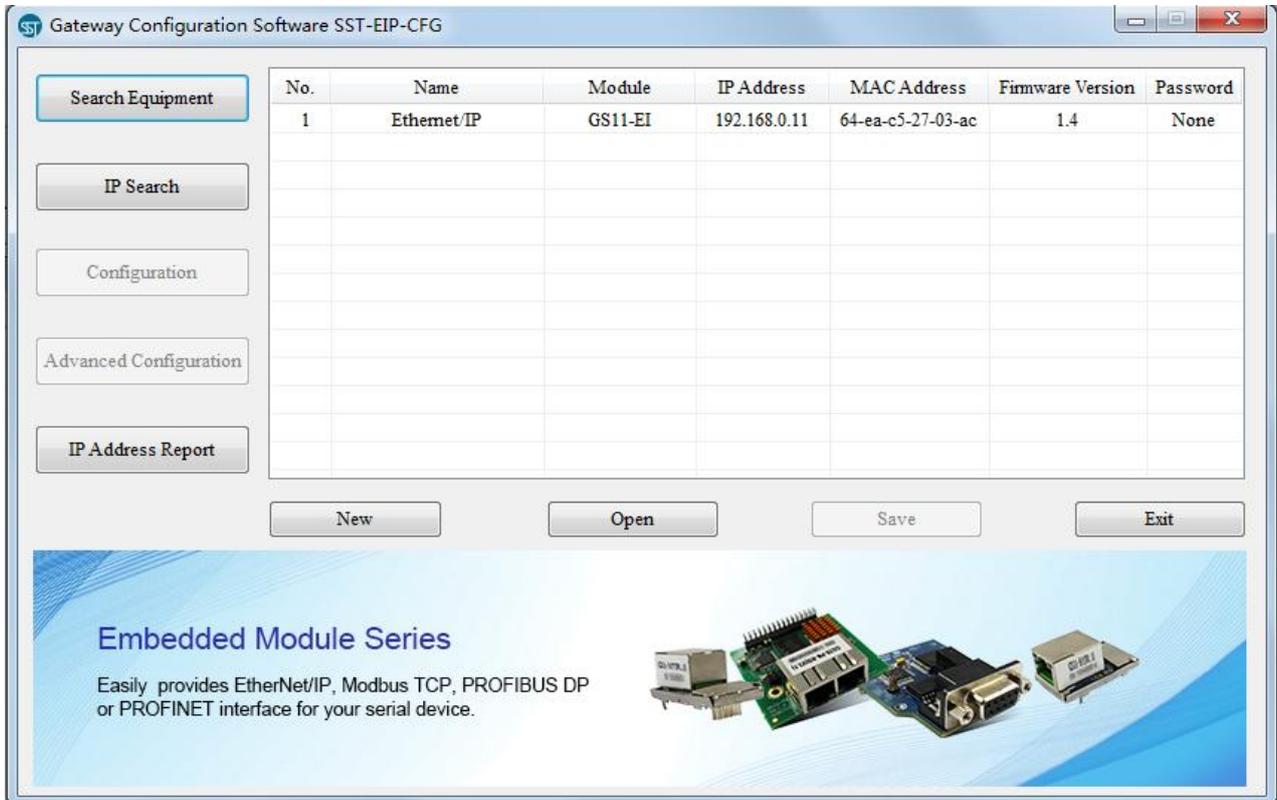
It will pop up the following interface:
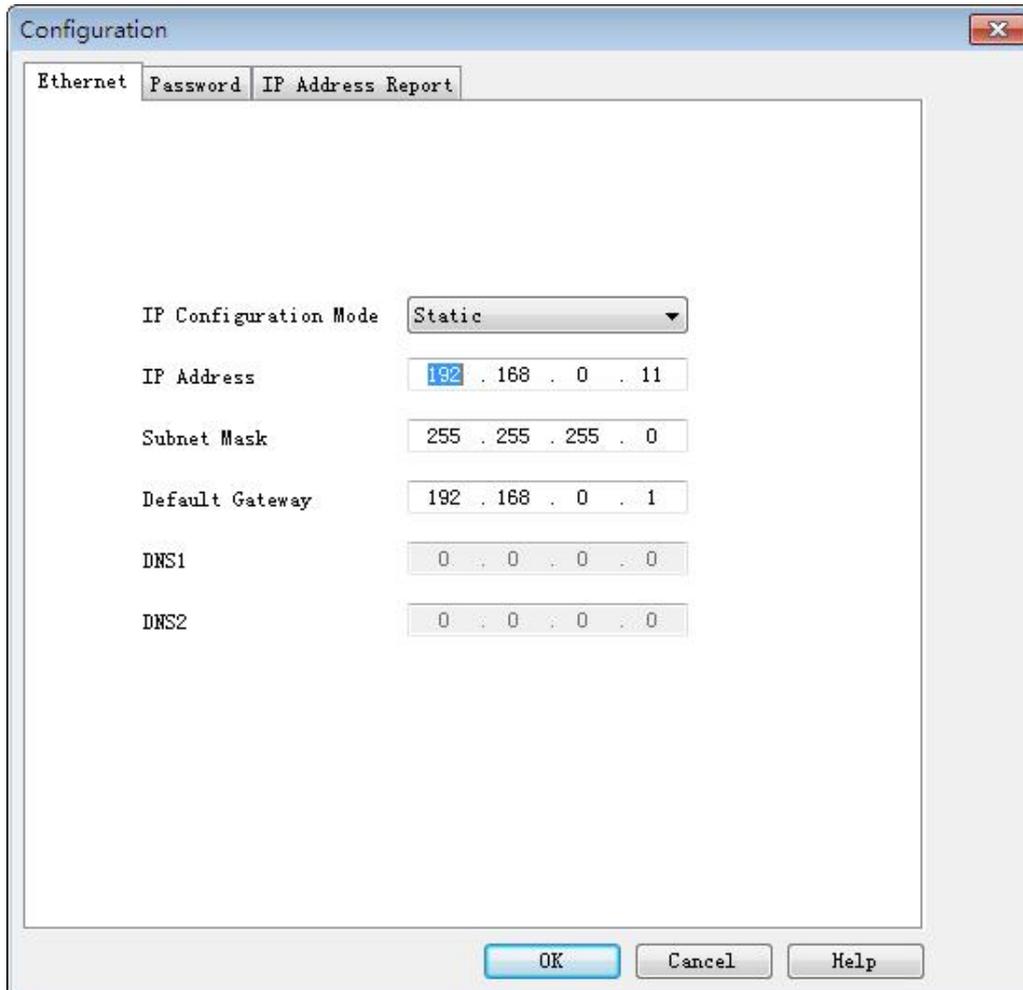
In this interface, users can configure: Ethernet, Password, IP Address Report. The following describes the above interface.

Ethernet Parameters: (as shown above)

- Name——The name is used to identify the GS11-EI module on the network, it can also be the name of the device's model;

- IP Configuration Mode——Set the device's IP address configuration mode, Static or DHCP;

- IP Address——Set the device's IP address;

- Subnet Masks——Set the subnet mask of the device;

- Default Gateway——Set the default gateway address of the device;

- DNS1——currently not support;

- DNS2——currently not support;

Password: (as shown below）

● User Password: Refers to the password that the user needs to enter when clicking the "User parameter configuration" button on the main screen. After the user password is set, the user needs to enter this password when configuring SST-EIP-CFG for user parameters. It is recommended not to set this password., as this password is for users.

➢ IP Address Report:

It is used to set the GS11-EI by sending a packet that reports its current IP address, subnet mask, and default gateway to a port of the specified IP address device, which is sent as UDP. Users can enable this function by clicking on the "IP Address Report" button in the main screen of the configuration software SST-EIP-CFG. Click "Start" button and the SST-EIP-CFG will list all of the messages sent by the devices on the network.

After this function is enabled, user needs to set the IP address,   Port Number and the Auto Report Period of the

remote device, , as shown below:
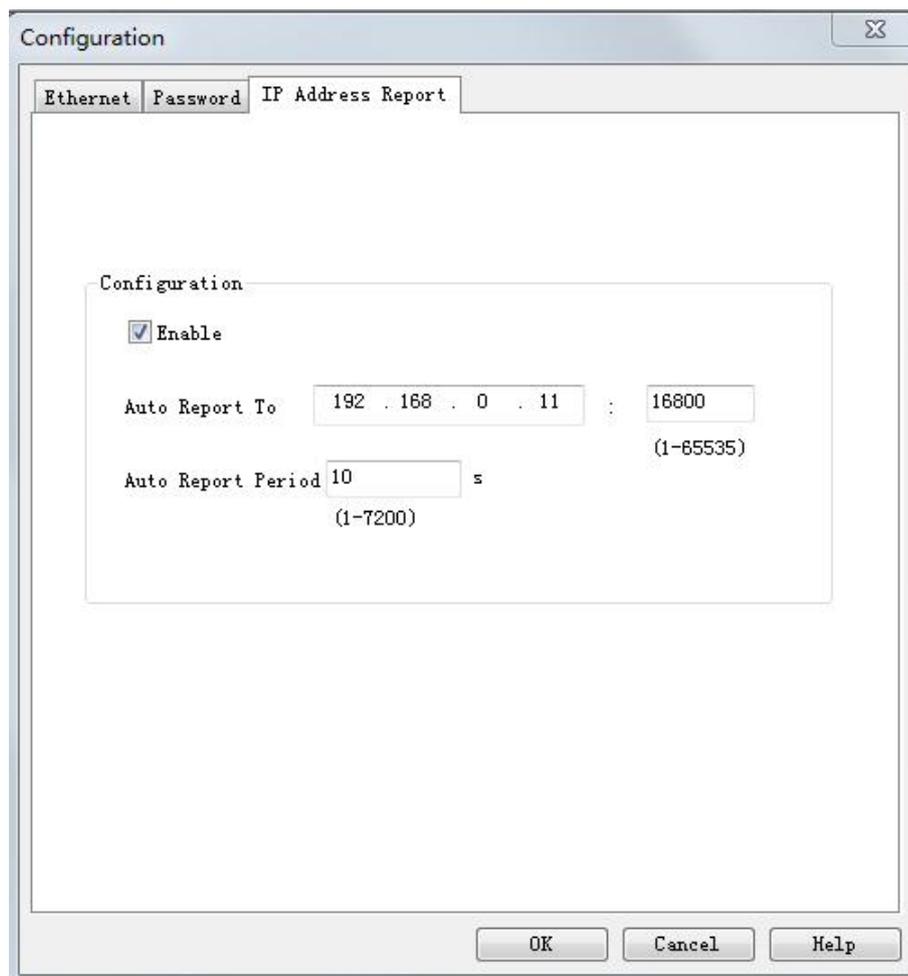
Appendix: How to Read and Write I/O Data

There are 2 ways to read and write I/O data.

## Use I/O Method to Read and Write Data (Recommended)

The following uses RSLogix 5000 as an example to explain how to use I/O method to read and write I/O data.

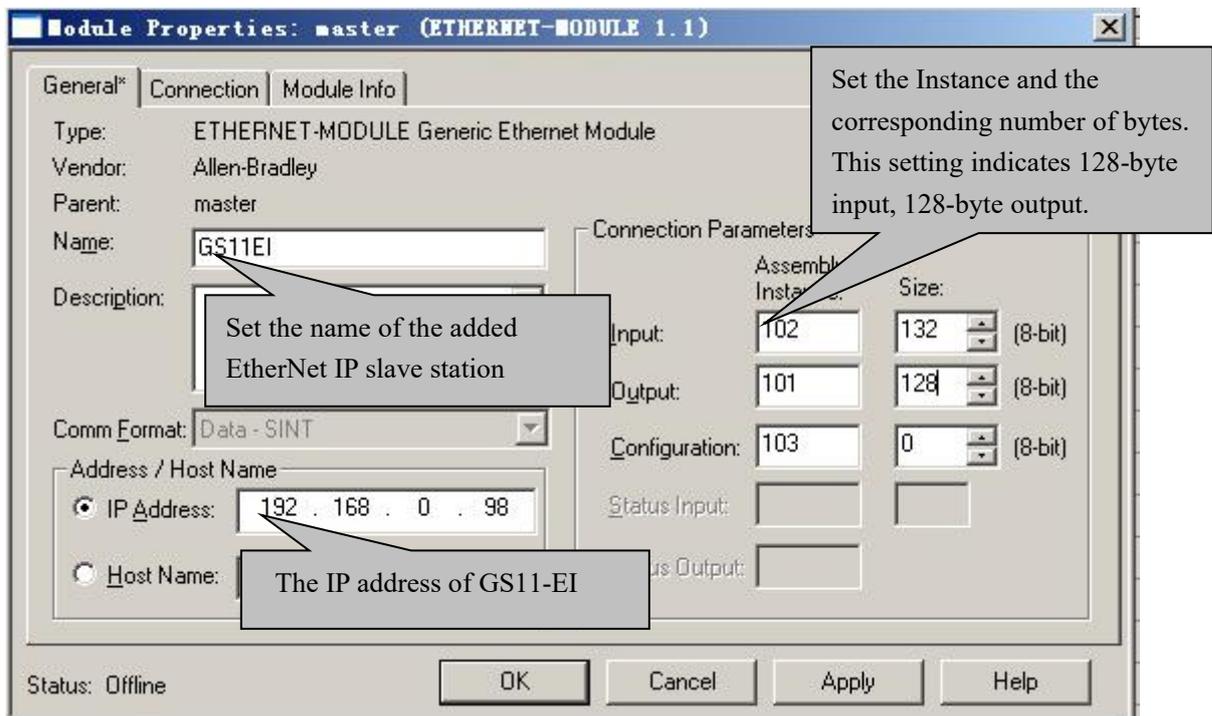Right-click on the EtherNet IP master module and choose "New Module..." as shown below:
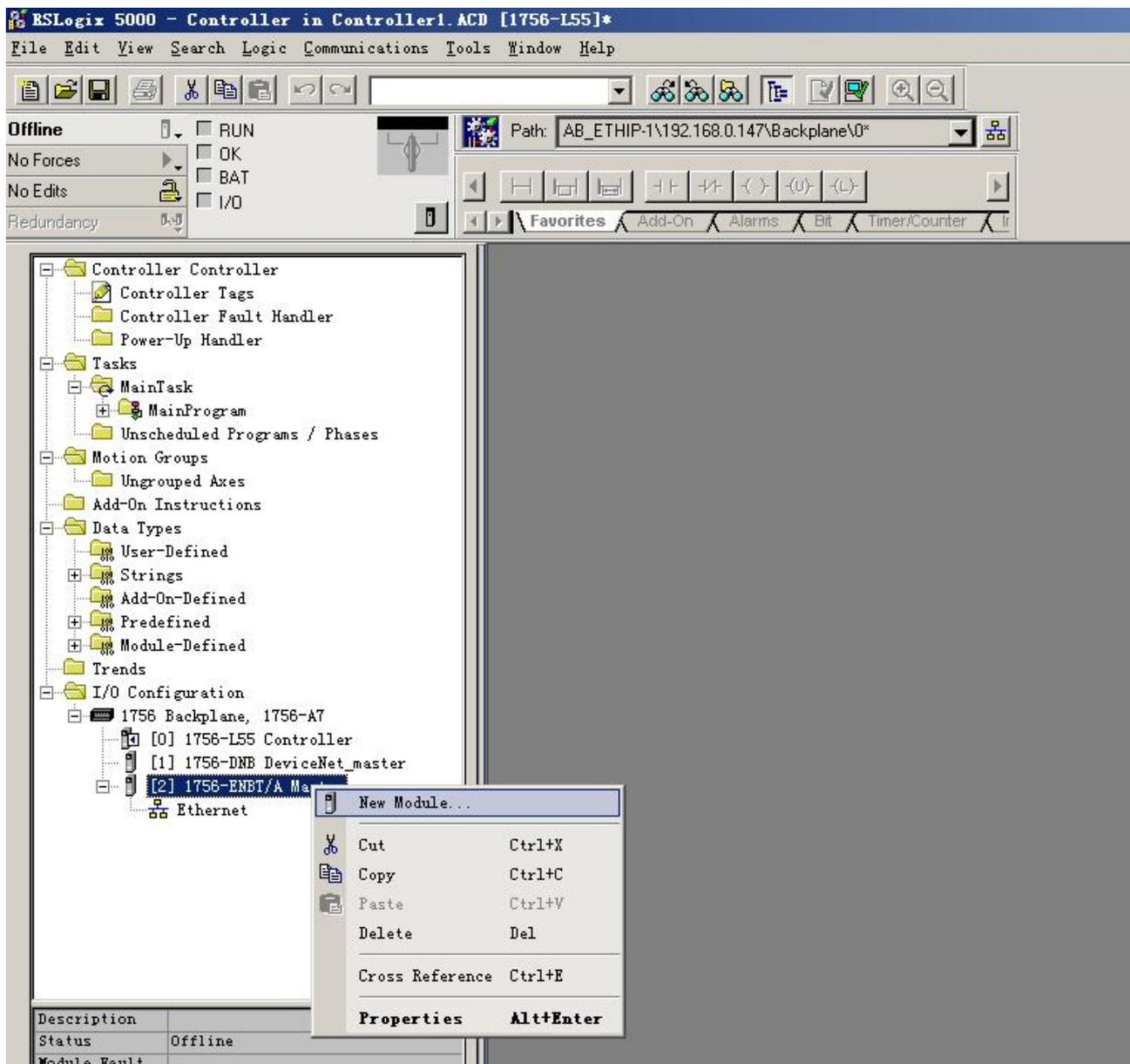
In the pop out module selection window, click on the "+" in front of "Communications" to expand, then select

"ETHERNET-MODULE" and click "OK" as shown below:
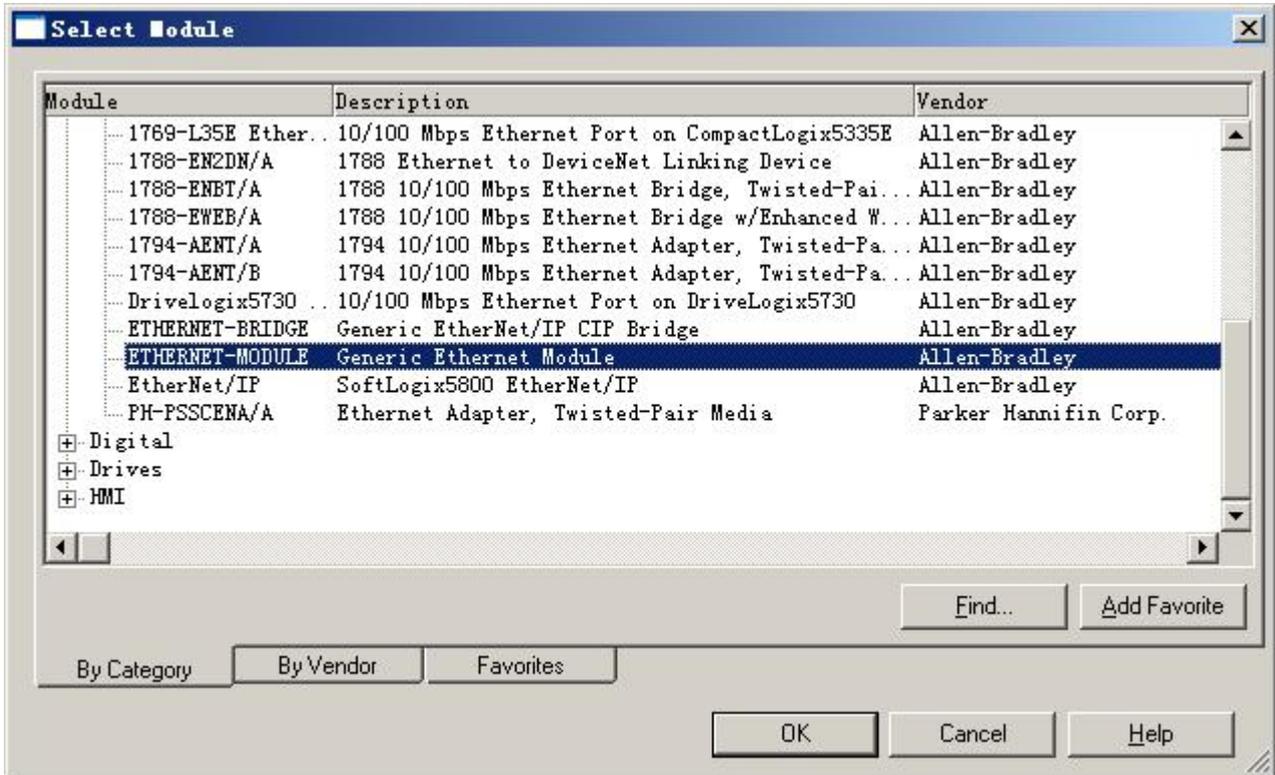
Set the related information of GS11-EI in the pop out window, as shown below.

The module information that needs to be set in the above figure includes:

Name: Name the added EtherNet IP slave module (GS11-EI module)

Comm Format: Set the data type. User can choose to set the data type to DINT, INT, SINT, REAL, and so on. This setting cannot be changed after confirmation. If you need to change the data type, you can create a new module.

IP Address: Set the IP address of the EtherNet IP Slave module need to be connected, it is also the GS11-EI's IP address.

Connection Parameters: Set the connection parameters used in the communication. For the connection parameters supported by the GS11-EI, see the previous chapter.

Note: The size of "Size" set in the above figure (the number of bytes set) should be consistent with the number of input and output bytes corresponding to the instance described in the previous chapter.

Click "OK" to set the polling interval of the master station in the pop out window. The default is 10ms, as shown below:
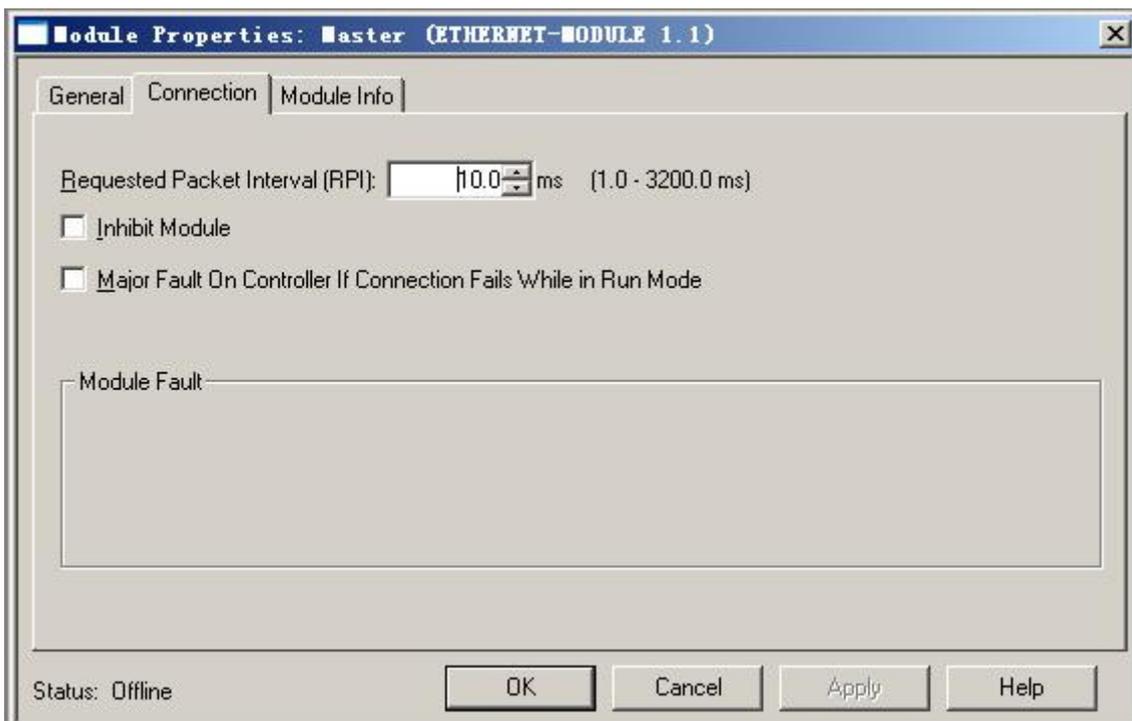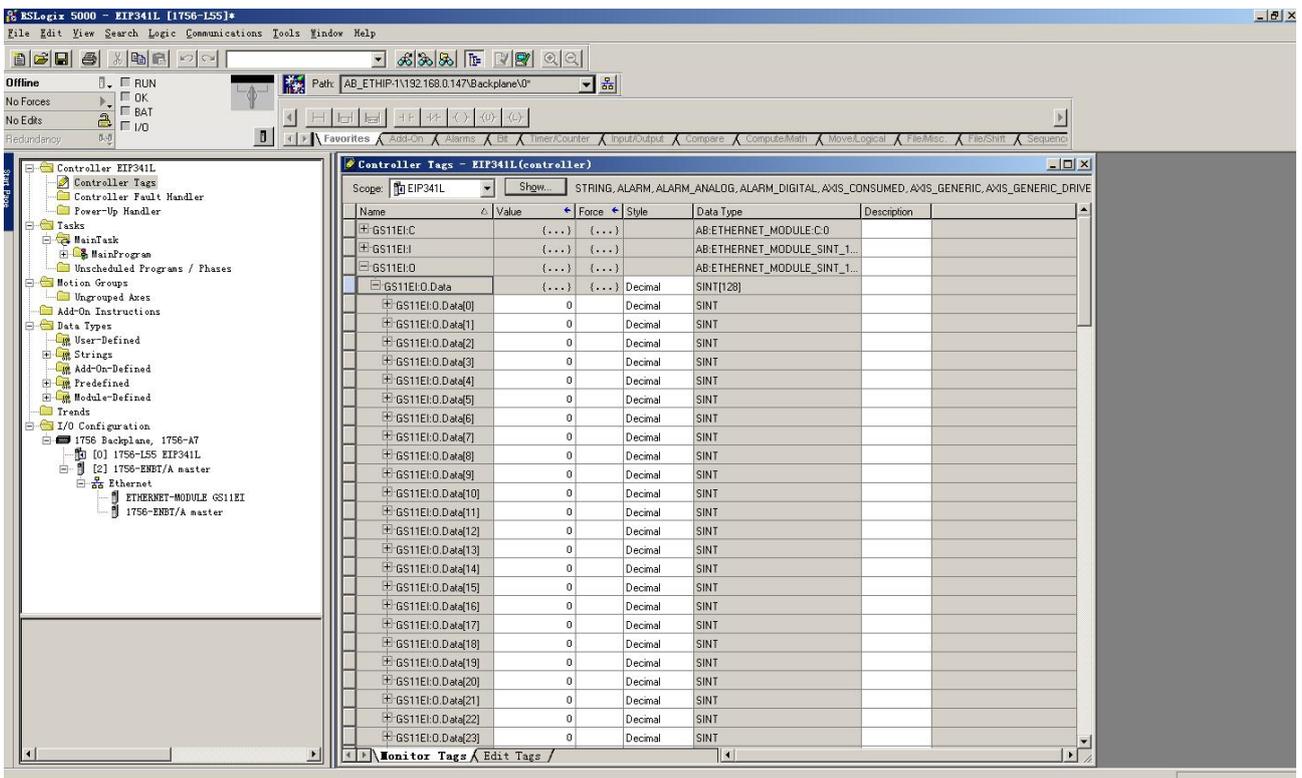

After setting the master polling interval, click "OK" to save. Double-click "Controller Tags". In the pop out window, click "GS11EI: O", as shown below:
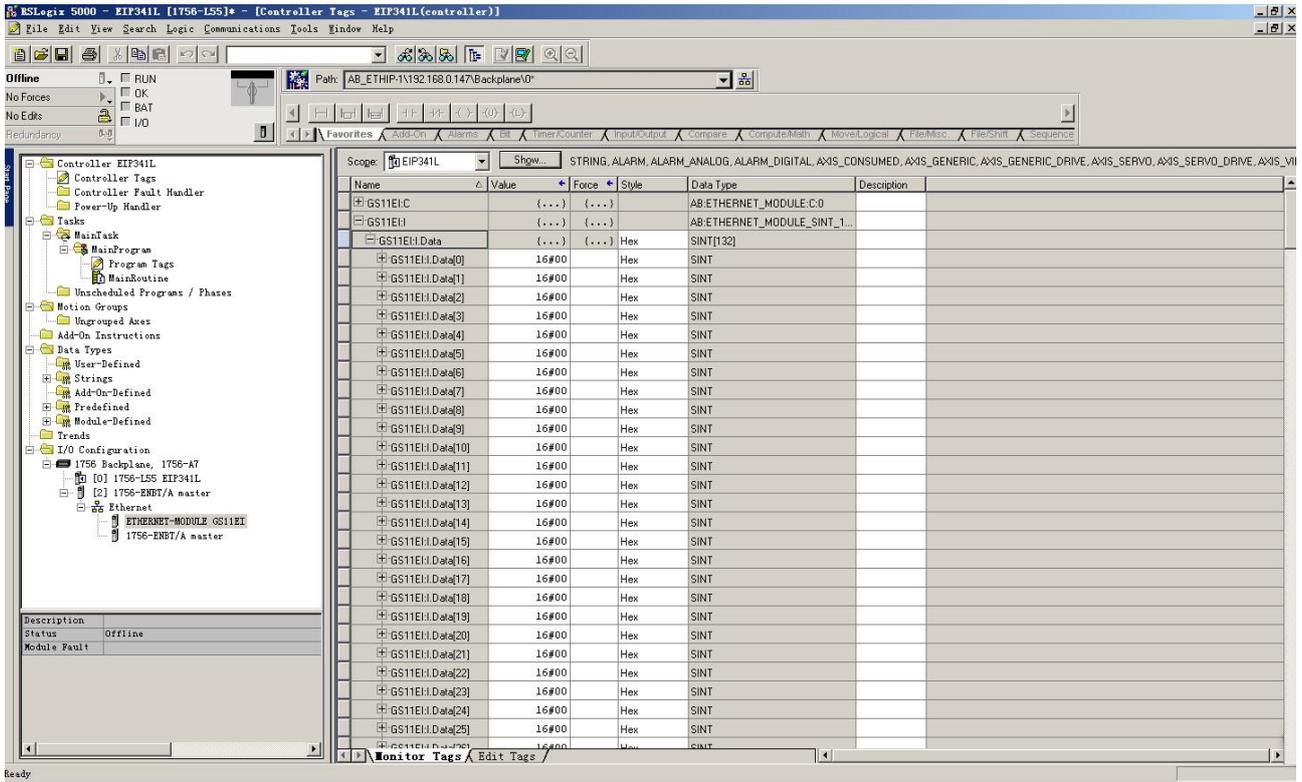
In the figure above, GS11EI:O.Data [0]~GS11EI:O.Data [127] is the corresponding output data address of the added GS11-EI module in the master station.

Click on "GS11EI: I", as shown below:

In the figure above, the 4 bytes corresponding to GS11EI:I.Data [0] is the real time frame header of EtherNet IP slave station.

GS11EI: I.Data[1]~GS11EI: I.Data[127] is the corresponding input data address of the added GS11EI module in the master station.

Use MSG Method to Read and Write Data

The following uses RSLogix 5000 as an example to explain how to use MSG to read and write I/O data.

Read I/O Data

Create a new project and be in "Offline" mode. Add two new tags "ReadTag" and "ReadData" under "Controller Tags", and define the type of "ReadTag" as "MESSAGE" and define the type of "ReadData" as "DINT[500]":
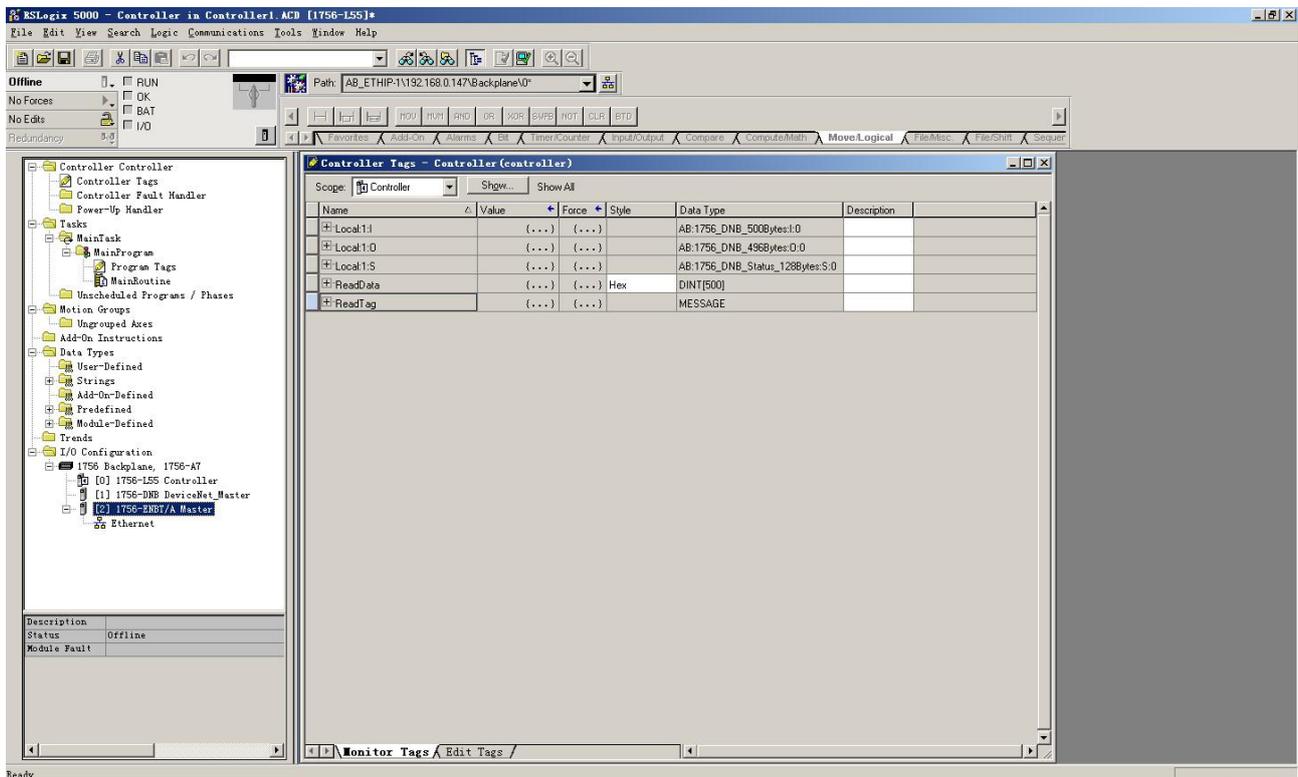
Right-click on "ReadTag" and select "Configure "ReadTag"":
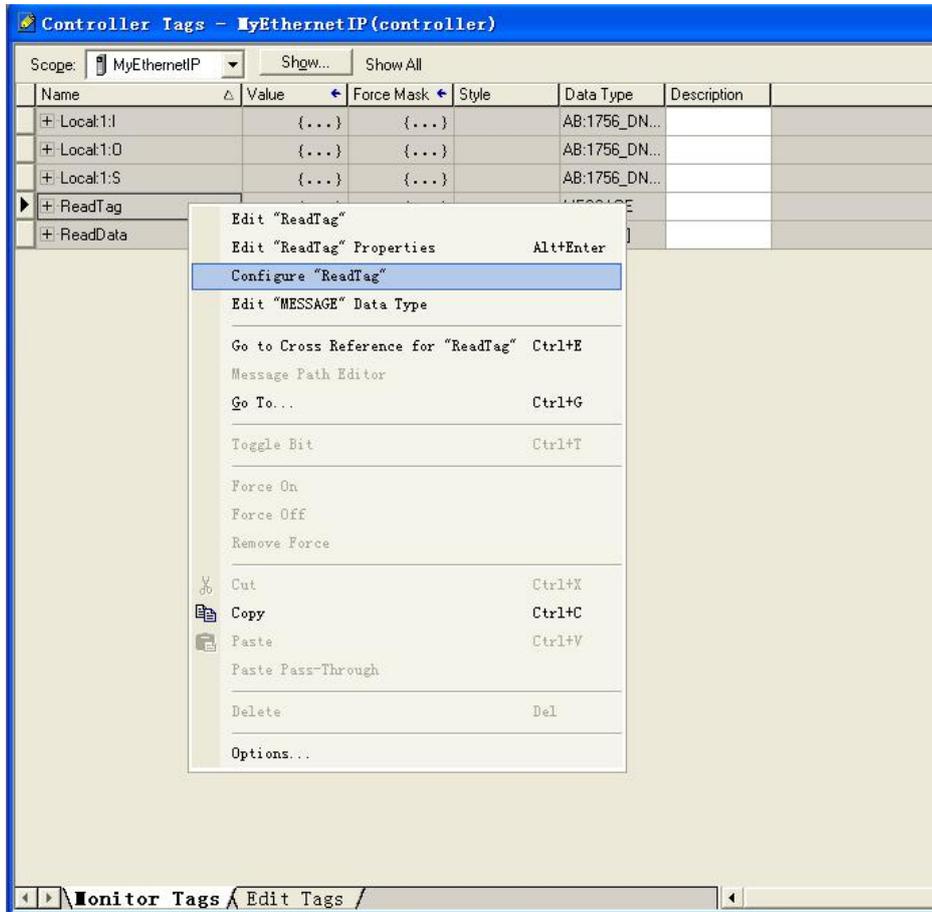
In the new pop-out window, finish the settings as below:
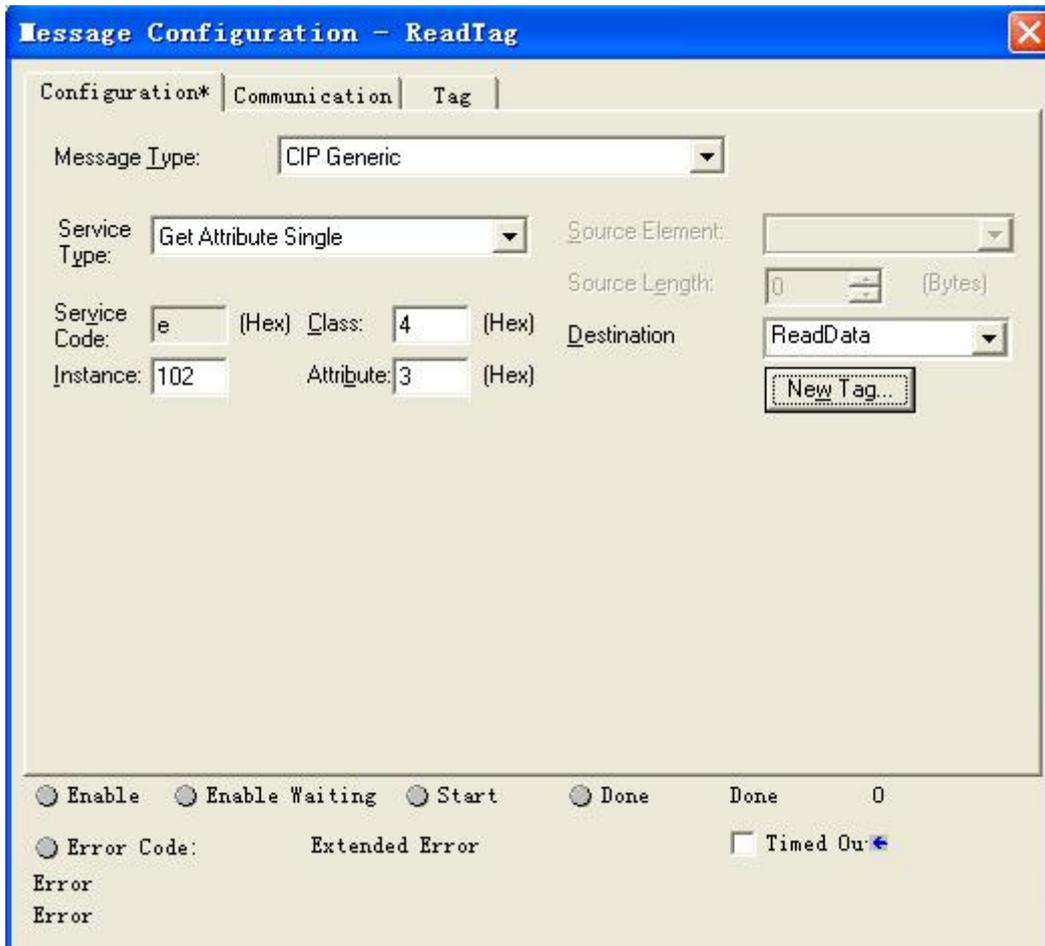
Message Type: CIP Generic

Service Type: select "Get Attribute Single", at this point, the corresponding Service Code becomes to "e (Hex)"

Class:4 (Hex)

Instance:102 (64Bytes), 112 (128Bytes), 122 (256Bytes) can be set.

Attribute:3 (Hex)

Destination: Select the "ReadData" tab. At this point, the read data will be saved in this tab.

Select the "Communication" tab. In the space after Path, enter the path which corresponding to the connected EtherNet IP slave station. The format of the path is: the EtherNet IP master name, the slot number where the EtherNet IP master resides, and the connected EtherNet IP address. After the path is set up, click "Apply" and "Confirm". As shown below.

In this example, the name of EtherNet IP master is "Master", the EtherNet IP master station is in the slot number "2", and the connected EtherNet IP slave (GS11-EI) has the IP address "192.168.0.10".
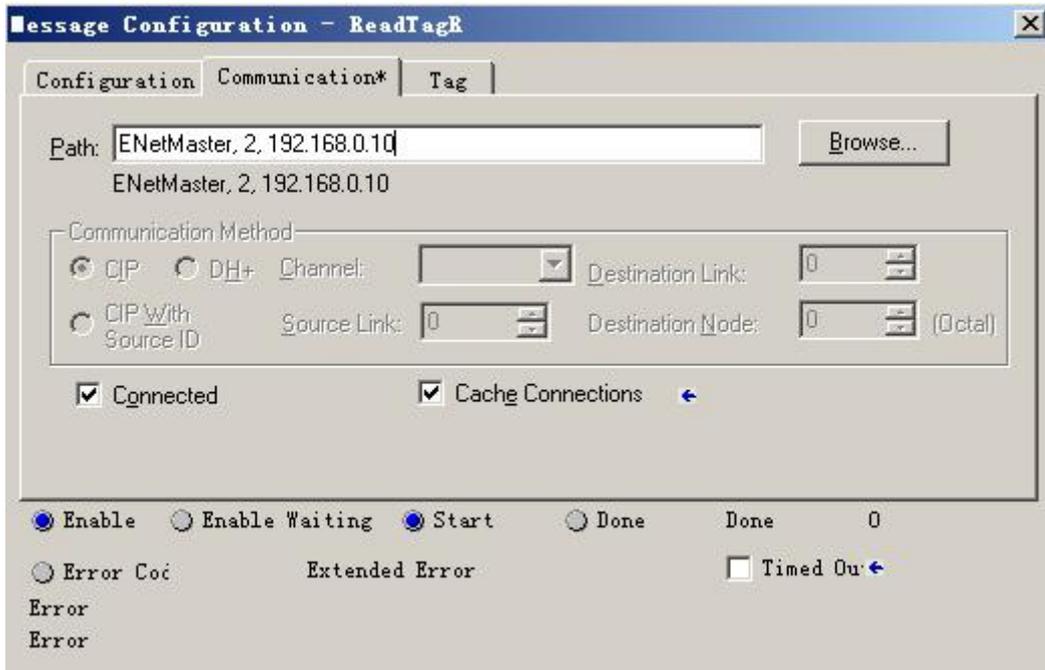
Add a "MSG" instruction to "MainRoutine" under "MainProgram" and select "ReadTag" as "Message Control", as

shown below.

PLC read data instruction
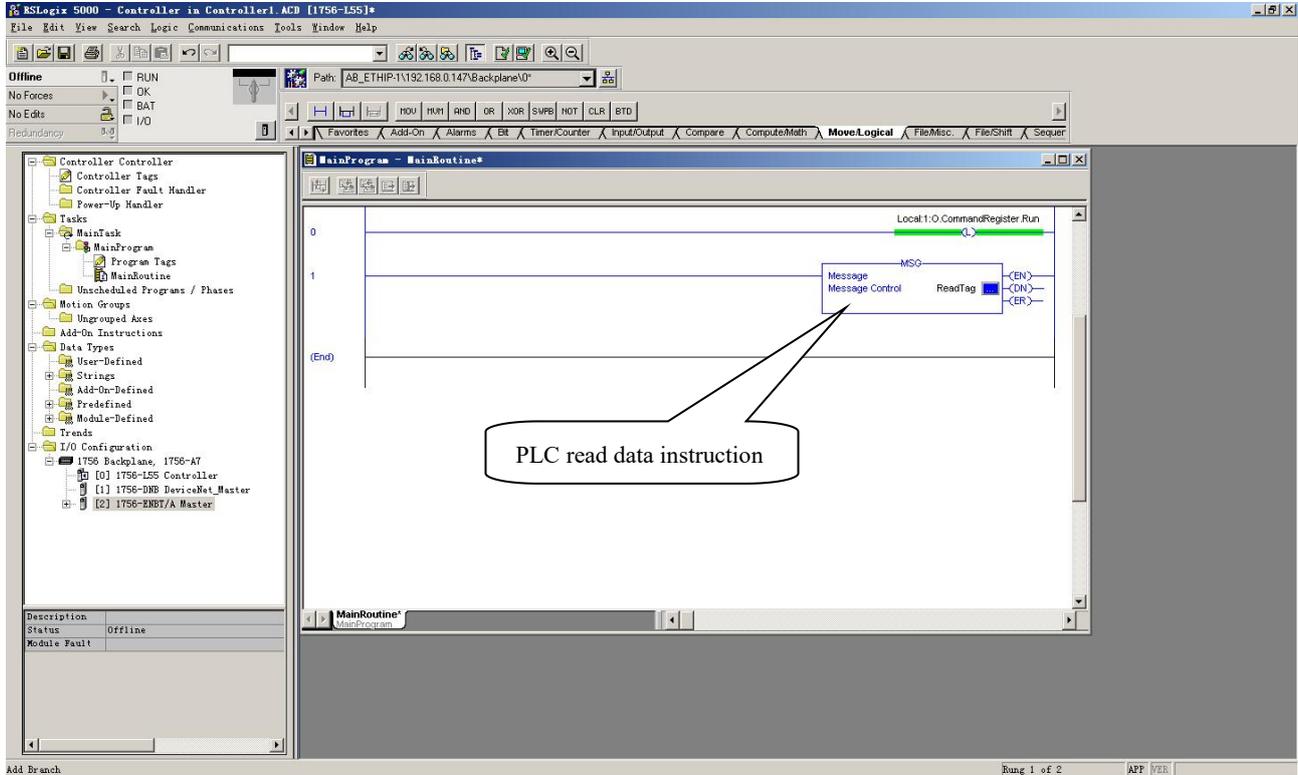
This is a simple instruction that can send a read request. In a normal program, some logical commands need to be

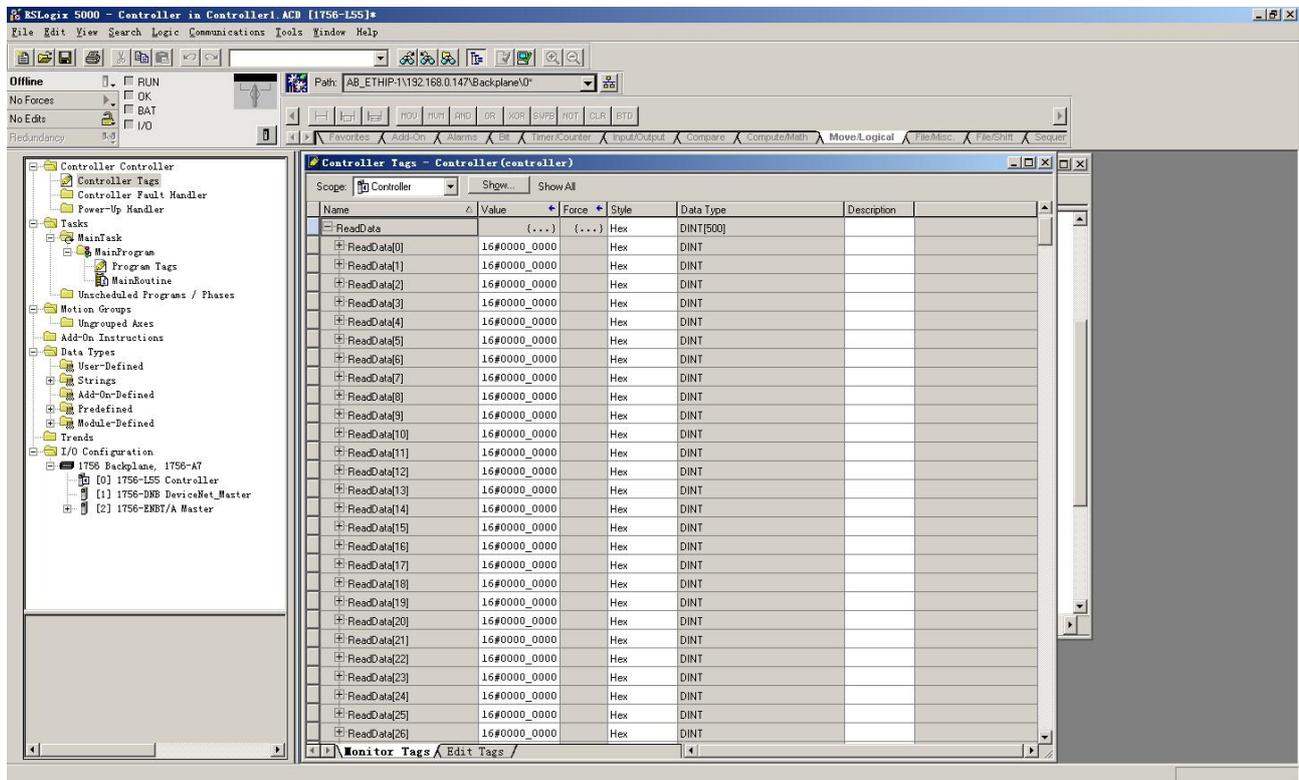added to trigger this instruction. For details on this instruction, refer to RSLogix5000.

Download the program to the PLC and put the PLC into the "Online" state.

Click on "Control Tags" and select "Monitor Tags" to expand "ReadData", as shown below. The data stored at the starting address ReadData[0] is the data of the user device which is read by the PLC via the gateway GS11-EI.


Write I/O Data

Go to the "Offline" mode, add two new tags "WriteTag" and "WriteData" under "Controller Tags", and define the type of "WriteTag" as "MESSAGE", also the type of "WriteData" as "DINT[500]":
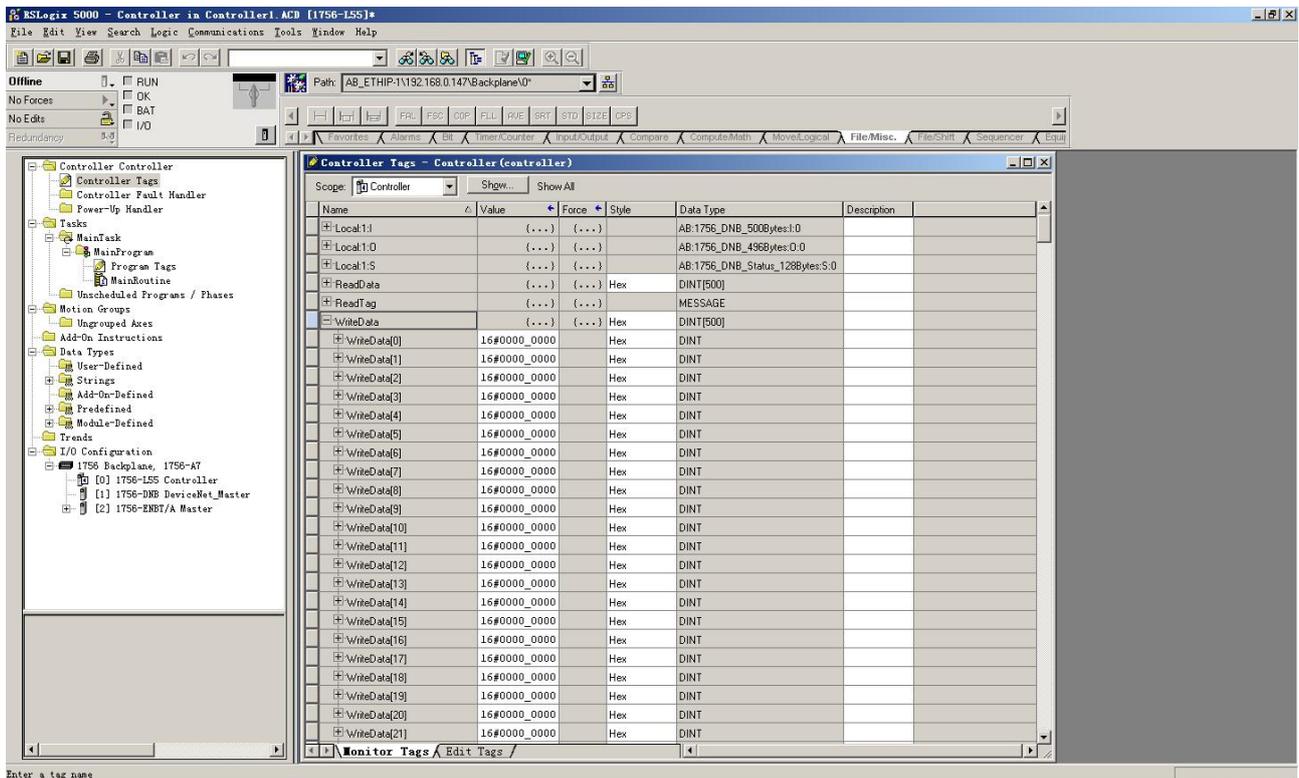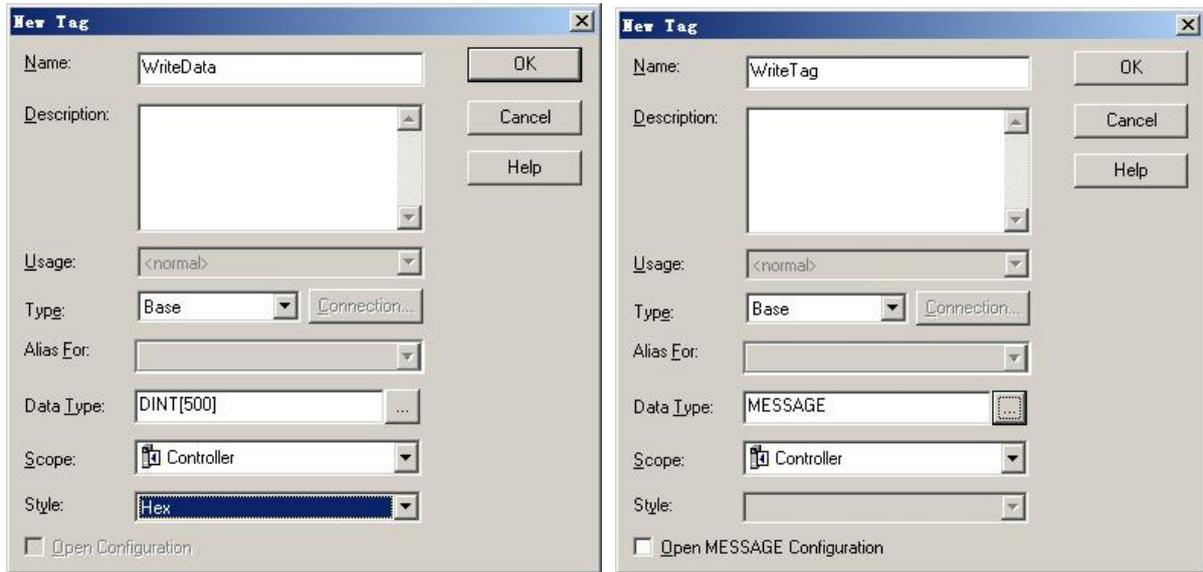
Go to the "Monitor Tags" page,input some data into the address writeData[0] under "WriteData" tab. The data will

be sent out by the PLC to the GS11-EI first, then to the user device by using the configured write command.
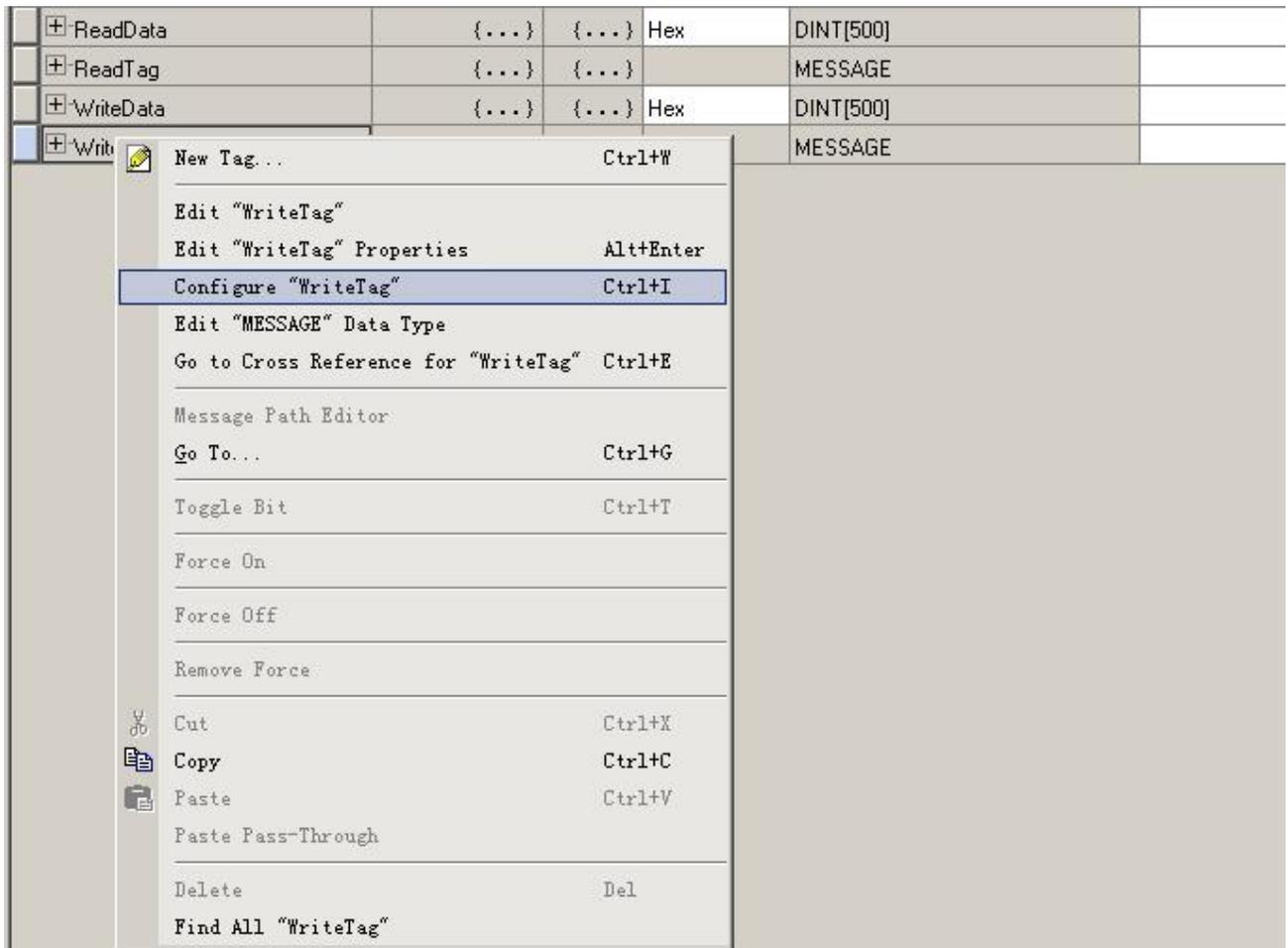
In the new pop-out window, finish the settings as below:

Message Type: CIP Generic

Service Type: select "Get Attribute Single", at this point, the corresponding Service Code becomes to "10(Hex)"

Class:4 (Hex)

Instance:101 (64Bytes), 111 (128Bytes), 121 (256Bytes) can be set
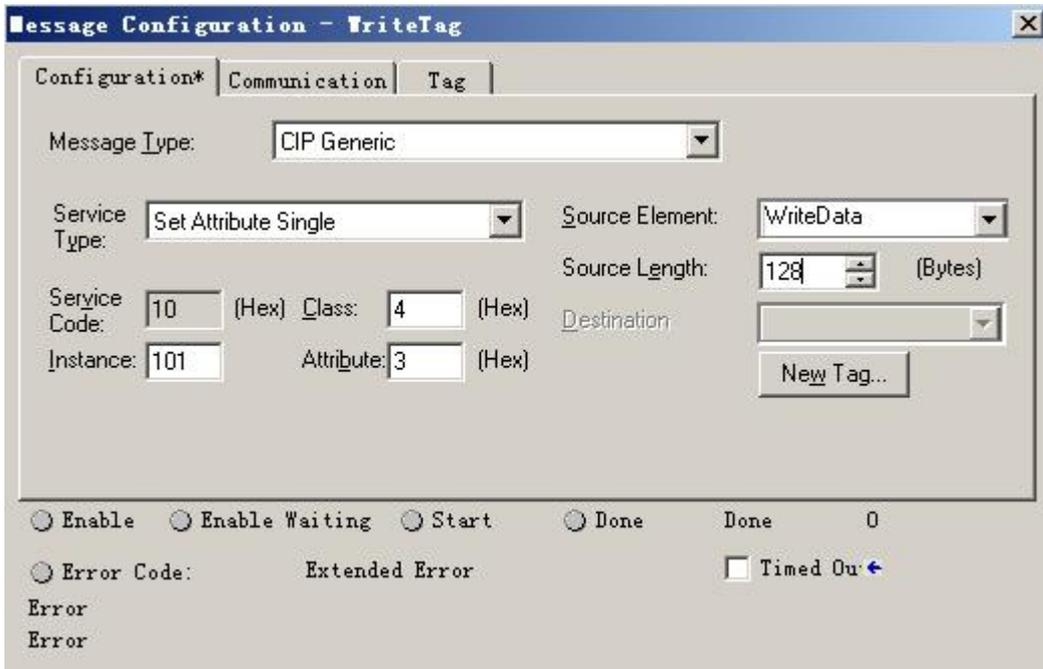
Attribute:3 (Hex)

Source Element: Select the "WriteData" tab. It represents the data used in the "WriteData" tab as PLC output data.

Source Length: With the unit of byte, this value should be less than or equal to the number of bytes represented by

the currently selected instance.

Destination: Select the "ReadData" tab. At this point, the read data will be saved in this tab.

Select the "Communication" tab. In the space after Path, enter the path which corresponding to the connected EtherNet IP slave station. The format of the path is: the EtherNet IP master name, the slot number where the EtherNet IP master resides, and the connected EtherNet IP address. After the path is set up, click "Apply" and "Confirm". As shown below.
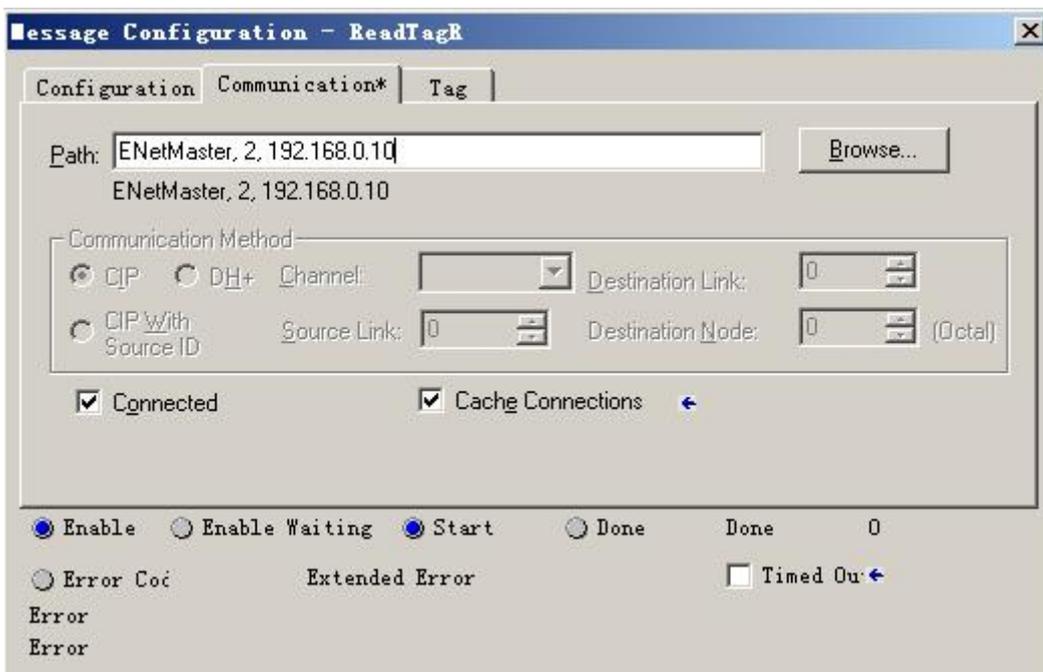

In this example, the EtherNet IP master station name is "Master", the EtherNet IP master station is in the slot number "2", and the connected EtherNet IP slave (GS11-EI) has the IP address "192.168.0.10". The IP address of

the GS11-EI is downloaded to the module via software SST-EIP-CFG.

Add a "MSG" instruction to "MainRoutine" under "MainProgram" and select "WriteTag" as "Message Control",

as shown below.
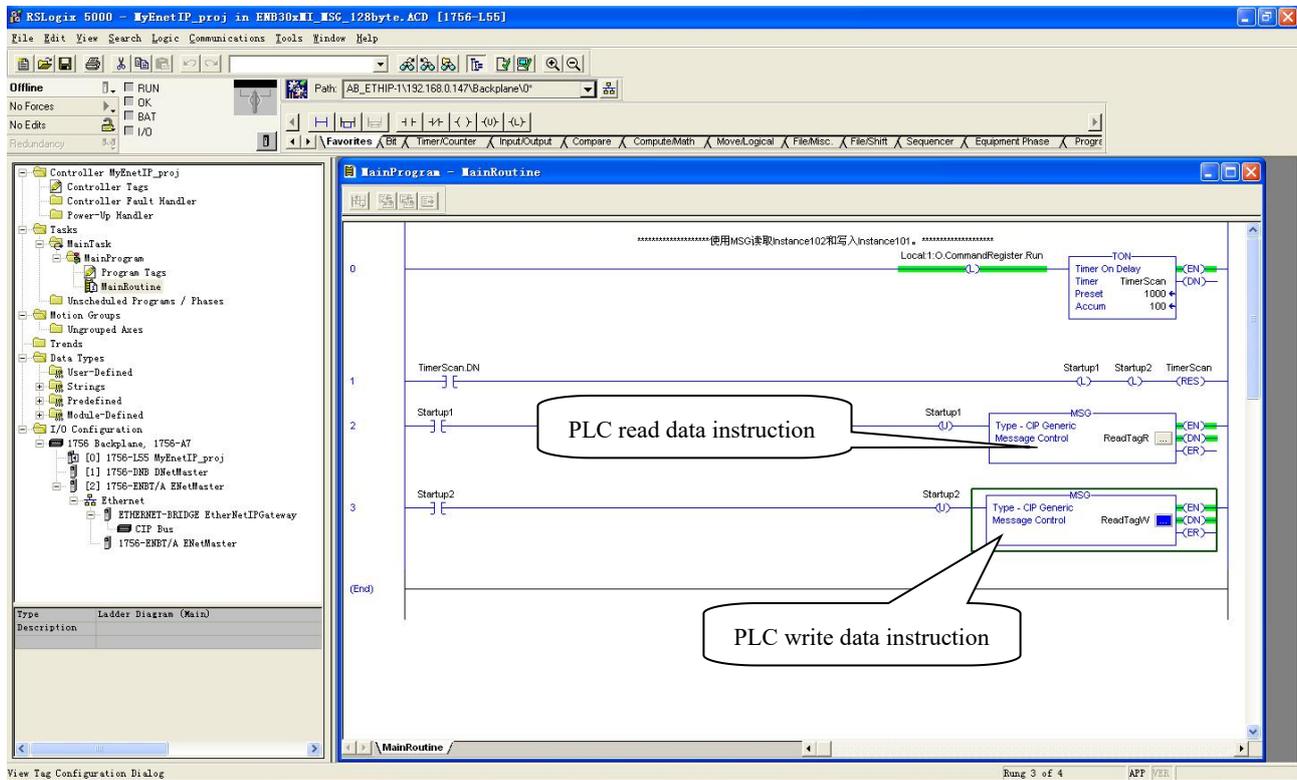
Download the PLC program to the PLC and put the PLC into the "Online" state. The data in "WriteData" will be sent to the user device via the GS11-EI (EtherNet IP Slave station) by the PLC module.