HART / EtherNet/IP Gateway
GT200-HT-EI

User Manual

V 1.3

Rev D

SST Automation

Email: support@sstautomation.com

www.SSTAutomation.com

Important Information

Warning

The data and examples in this manual cannot be copied without authorization. SSTCOMM 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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Catalog

1 Product Overview

1.1 Product Function

GT200-HT-EI is a gateway that can provide a seamless connection between HART and EtherNet/IP. It can connect HART slave devices to an EtherNet/IP network and realize bi-directional data exchange easily. The HART side can be configured as a primary or secondary master, and the EtherNet/IP side works as a slave.

1.2 Product Features

- Easy to use: Users only need to refer to the product manual and application instances and can realize data communication of a gateway in a short time according to the requirements of the configuration.
- Powerful functionality: Support fast acquisition of the HART slave address and modification, single-point mode of coexistence of HART communication and 4~20mA data acquisition, HART side supports the primary master and the secondary master.
- Multi debugging functions: The configuration software SST-HI-CFG can provide a visual display of data exchange as well as HART command diagnostics and communication debugging functions that greatly facilitates user communication tests.

1.3 Technical Specifications

[1] EtherNet/IP network is independent of HART network.

[2] Ethernet 10/100M self-adaptive.

[3] IP address conflict detection.

[4] Supports ODVA standard EtherNet/IP communication protocol in slave mode.

[5] Used as a primary or a secondary HART master.

[6] Supports single-point and multi-point mode at the HART side.

[7] Under single-point mode, supports data burst operation from slave.

[8] Supports one HART-channel, under multi-point mode, supports connecting at most 13 HART slaves with

gateway internal resistor and supports connecting 15 HART slaves with an external resistor (250 Ohm).

[9] Supports all commands of the HART 6 protocol.

[10] Each HART command can be configured for change-of-state output, polling output, initialization output or disable output.

[11] Supports up to 127 HART commands, HART output data buffer is up to 1000 bytes, and the input data buffer is up to 1600 bytes.

[12] Supports an internal or external HART series resistor.

[13] Max input and output bytes of EtherNet/IP:

Max input bytes: 256 bytes.

Max output bytes: 256 bytes.

[14] Power: 24VDC (11V~30V), 70mA (24VDC).

[15] Operating temperature: -40 °F~140 °F(-40 °C~60 °C). Humidity: 5%~ 95% (without condensation).

[16] Dimensions (W*H*D): 1.0 in * 4.0 in * 3.6 in (25 mm * 100 mm * 90 mm).

[17] Installation: 35mm DIN RAIL.

[18] Protection Level: IP20.

1.4 Related Products

Related products include:

- GT200-HT-RS
- GT200-HT-MT
- GT200-3HT-MT
- GT200-3HT-RS
- GT100-EI-RS
- GT200-EI-2RS485

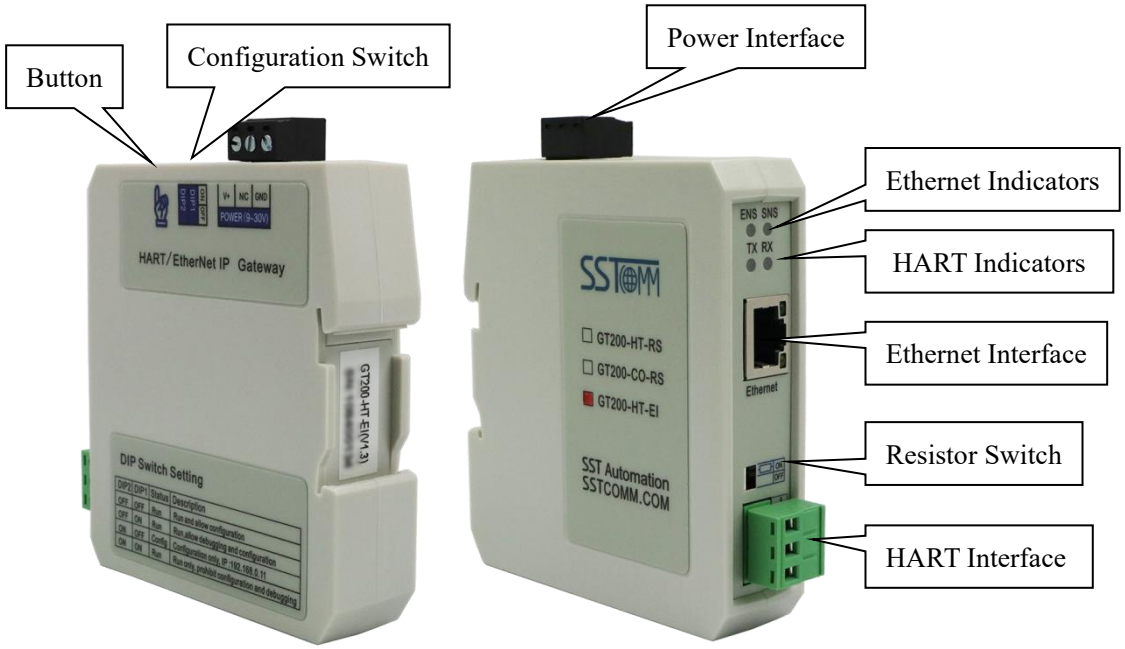
To get more information about related products, please visit SSTCOMM website: www.sstautomation.com.

1.5 Revision History

Revision	Date	Chapter	Description
V1.0, Rev A	9/29/2017	Chapter 2	Add configuration notes into chapter 2. Hardware and software description revised.
V1.0, Rev B	4/20/2020	Chapter 6	Part modifications for chapter 6.
V1.3	8/9/2021	ALL	New release for updated product version.
V1.3 , Rev A	8/24/2021	Chapter 2.7, 4.2	Revised some mistakes.
V1.3, Rev B	07/01/2022	Chapter 5	Add HART Common Commands (ID 1 and ID 3) to this section.
V1.3, Rev C	8/2/2022	PART	Add two wire and four wire multi-drop wiring and replace software screenshot.
V1.3, Rev D	8/9/2022	Chapter 1.1, 1.3, 1.4, 2.5, 2.7, 4.1, 4.3, 5.2.2.3, 5.2.2.4, 5.2.3, 6.1, 8.1	Revised some mistakes. Corrected figure in chapter 2.5.

2 Hardware Descriptions

2.1 Product Appearance



Note: The pictures are for reference only. The product appearance is subject to the actual product.

2.2 LED Indicators

Indicator	State	Description
ENS	Red off	IP address initialization is normal.
	Red blinking	DHCP
SNS	Green on	EtherNet/IP connection is established. Communication is normal.
	Green blinking	EtherNet/IP connection is not established.
TX	Green blinking	HART data sending
	OFF	No data sending
RX	Green blinking	HART data receiving
	OFF	No data receiving

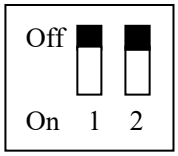
2.3 Button

The button is located at the top of the product and used to update the firmware.

Action	Description
Hold then power on	Bootload state to update firmware.

2.4 Configuration Switch

The configuration switches are located at the top of the product, Bit 1 is the function bit and Bit 2 is the mode bit.

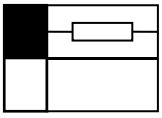


Function (Bit 1)	Mode (Bit 2)	Mode	Description
Off	Off	Run mode	Allows configuration and communication.
On	Off	Debug mode	Allows configuration, communication and debugging.
Off	On	Configuration mode	IP address is fixed at 192.168.0.11. Allows configuration. Prohibits communication.
On	On	Run mode	Allows communication. Prohibits configuration and debugging.

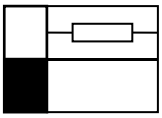
Note: To apply mode switching, please restart the gateway.

2.5 Internal Series Resistor Switch

The GT200-HT-EI has an internal series resistor (270 Ohm /2 W) required for the HART channel. This allows up to 13 HART instruments to be connected. When the power of the series resistor is more than 2W, you must use an external series resistor (250 Ohm /3 W) which allows the gateway to be connected to up to 15 HART instruments.



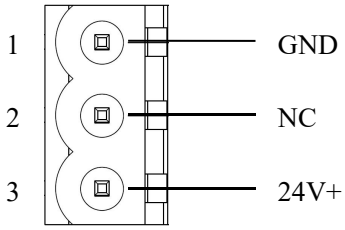
Switch to ON, using the internal series resistor



Switch to OFF, using the external series resistor

2.6 Interface

2.6.1 Power Interface



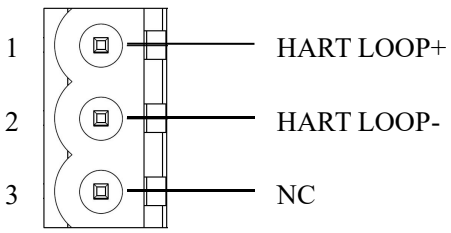
Pin	Description
1	Power GND
2	NC (Not Connected)
3	24V+, DC

2.6.2 Ethernet Interface

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	Description
S1	TXD+, Transmit Data+, Output
S2	TXD-, Transmit Data-, Output
S3	RXD+, Receive Data+, Input
S4	Bi-directional Data+
S5	Bi-directional Data-
S6	RXD-, Receive Data-, Input
S7	Bi-directional Data+
S8	Bi-directional Data-

2.6.3 HART Interface

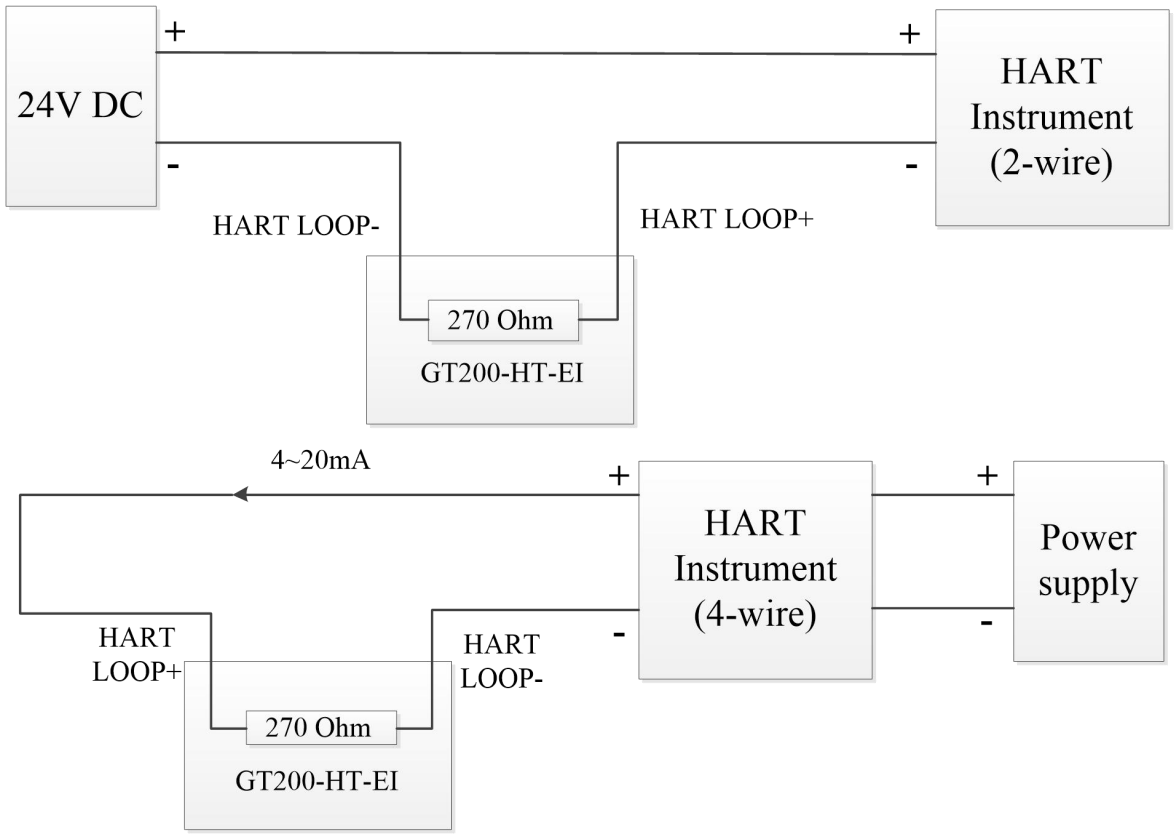


Pin	Description
1	Connected to HART signal +
2	Connected to HART signal -
3	NC (Not connected)

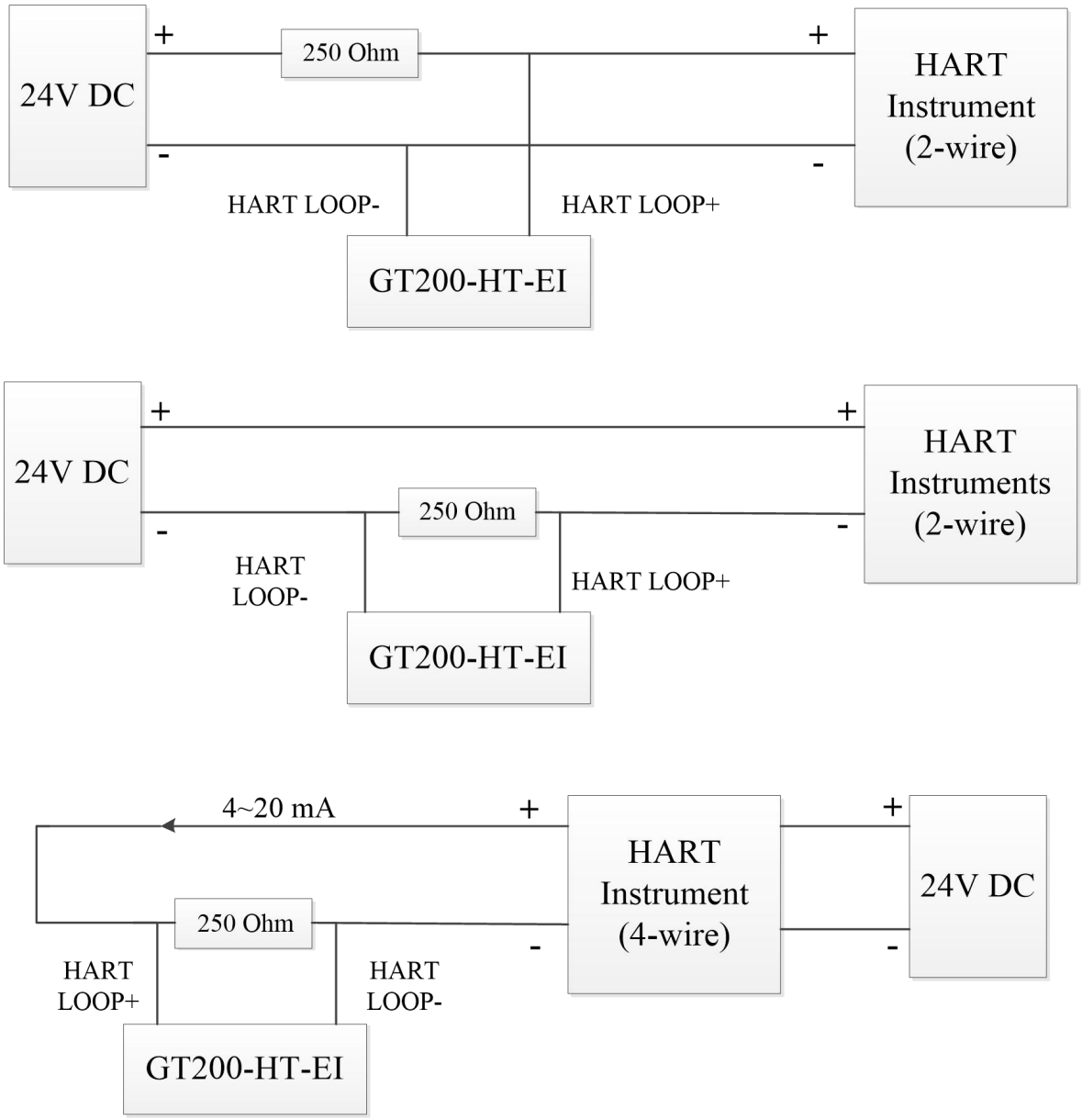
2.7 Topology of GT200-HT-EI and HART Instruments

Notes:

1. It is recommended to use the separate power supply for the HART instruments and the GT200-HT-EI, to ensure stable communication.
2. To improve the communication efficiency of the field bus, it is recommended not to configure empty nodes or useless commands in the SST-HI-CFG.
3. If there are two or more HART instruments connected in the same network, their HART LOOP wires should be connected parallel with each other.



When using the internal resistor

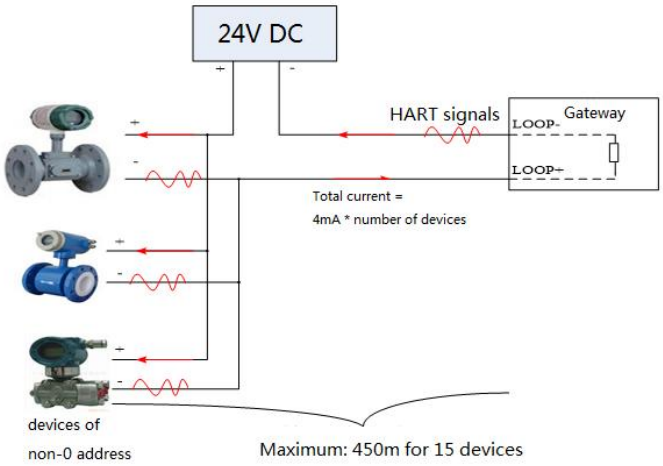


Options when using an external resistor

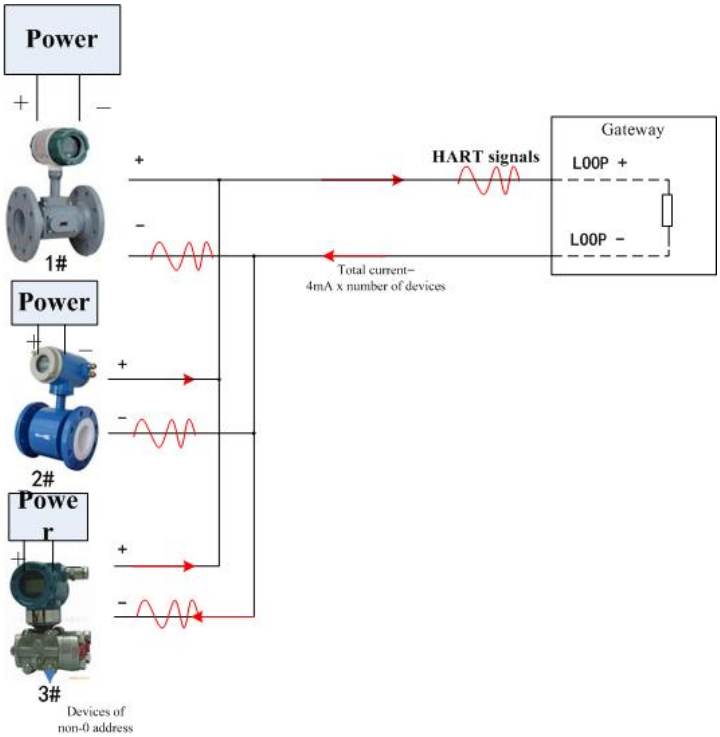
2.7.1 Multi-drop Wiring

The following is the two wire and four wire multi-drop wiring.

Two wire:



Four wire:

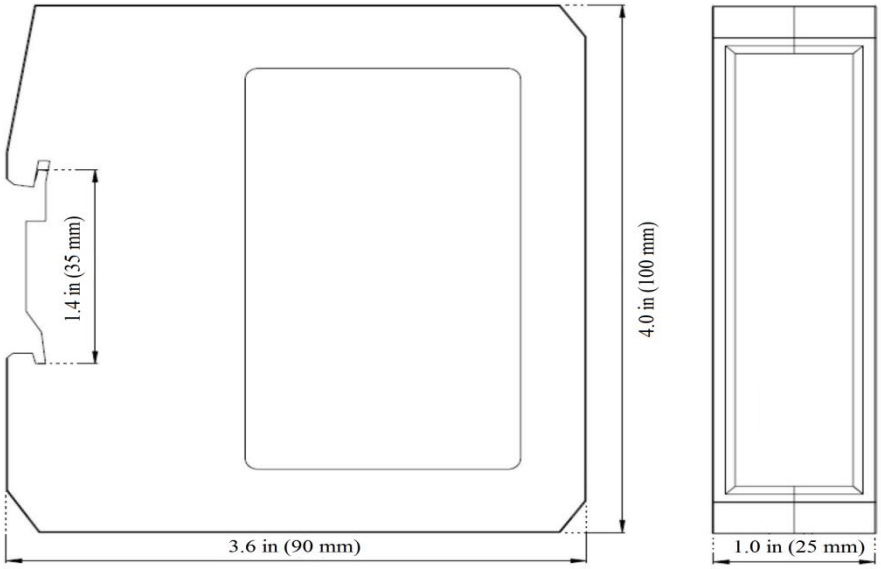


3 Hardware Installation

3.1 Machine Dimension

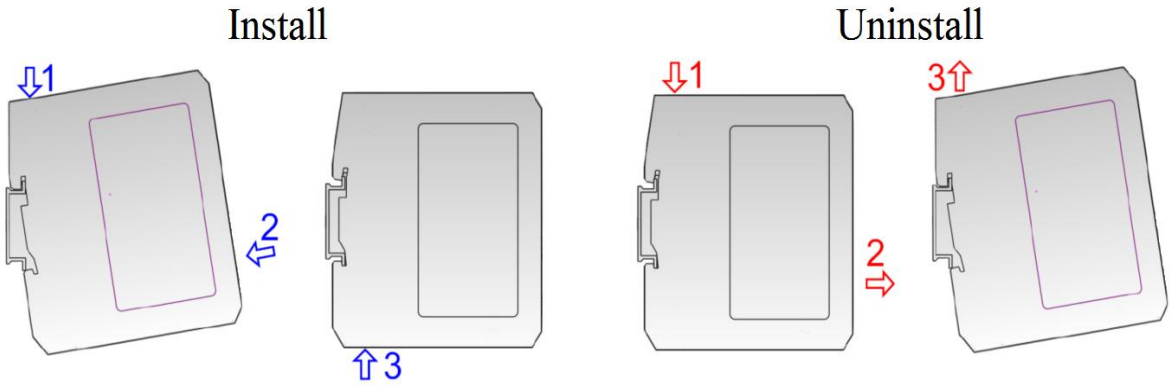
Size (width * height * depth):

1.0 in * 4.0 in * 3.6 in (25 mm * 100 mm * 90 mm)



3.2 Installation Method

Using 1.4 in (35mm) DIN RAIL.



4 Quick Start Guide

4.1 Connection

1. Make sure the GT200-HT-EI is in the appropriate operating mode that allows for configuration. It is recommended to set the gateway to configuration mode (configuration switches Bit 1 OFF and Bit 2 ON) then the IP of the gateway will be fixed at 192.168.0.10.
2. Connect the GT200-HT-EI to the computer by Ethernet cable.
3. Connect the HART instruments and the power supply. Refer to the topology displayed on chapter 2.7.
4. Power on the gateway and run the SST-HI-CFG software to start the configuration process.

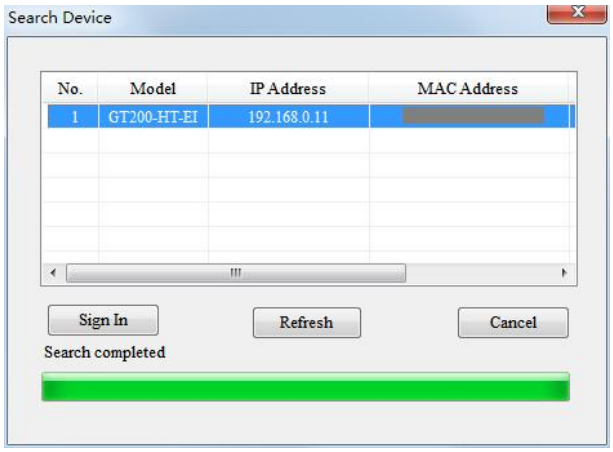
4.2 Configuration

The following steps give an example configuration process, but tailor your configuration to your project needs.

The GT200-HT-EI is connected with a HART instrument which supports HART protocol V5 in Multi-drop mode, configured with the HART commands 01, 03 and 06.

For more details of the software SST-HI-CFG, please refer to chapter 5.

1. Run the SST-HI-CFG software installed on the computer. Click “Upload” on the toolbar and scan available gateways in the network. Select the gateway and click “Sign In” to upload the configuration.

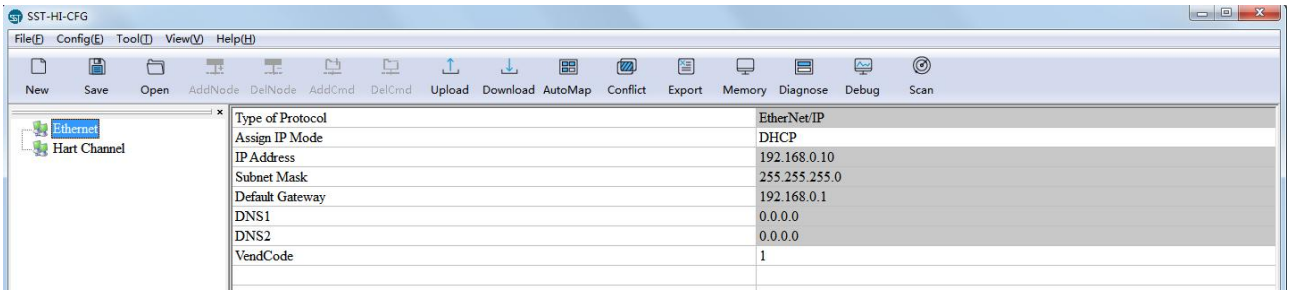


Note: Make sure that the GT200-HT-EI and your computer are in the same network segment.

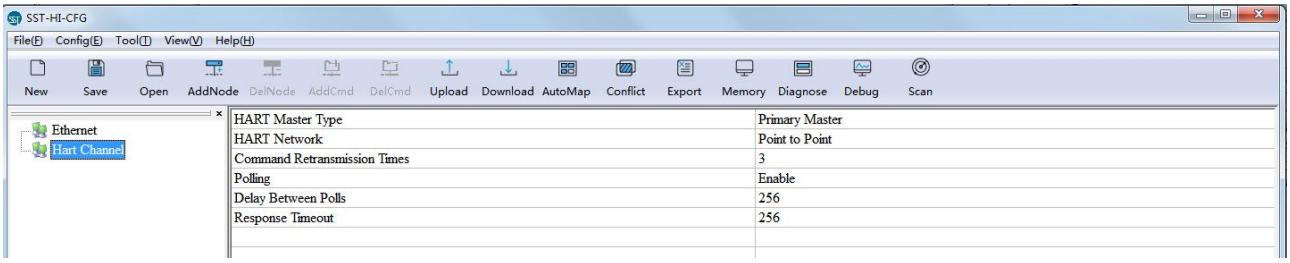
If you can't discover any gateways, please test the network connection first. Please refer to the note "How to Use the Ping Command" located on our Support page on the sstautomation.com website

The first time the GT200-HT-EI is used, the uploaded configuration will be a default configuration created by SST Automation. You can change the parameters based on the default configuration or create a new project. The following steps introduce how to configure for a new project.

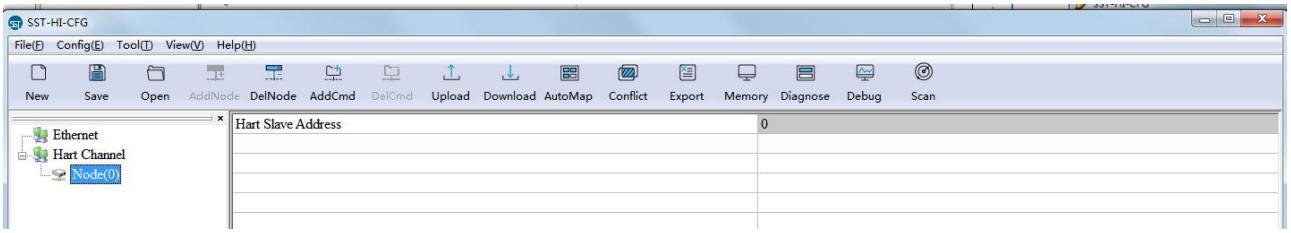
2. Select "Ethernet" on the left, and set the Ethernet parameters.



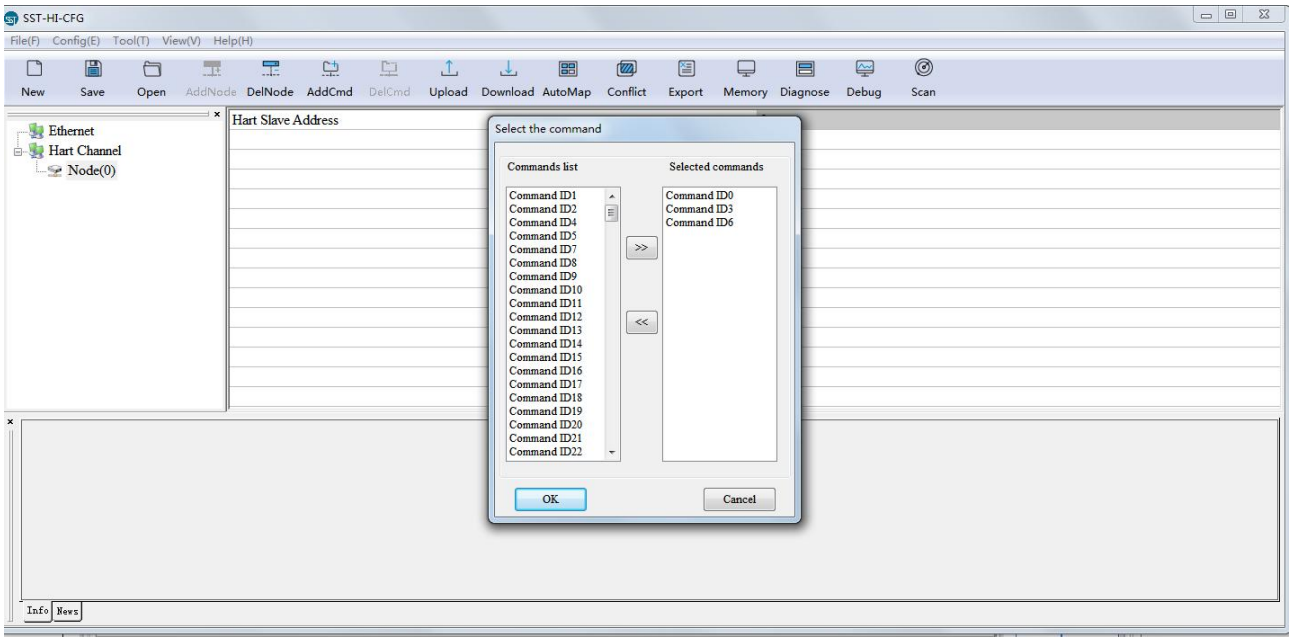
3. Select "HartChannel0" on the left and set the HART channel parameters. As shown below, the GT200-HT-EI is configured as the secondary master and using the point-to-point mode.



4. Add a node (chapter 5.2.2.2). In point-to-point mode, the address of the HART instrument is fixed at 0.



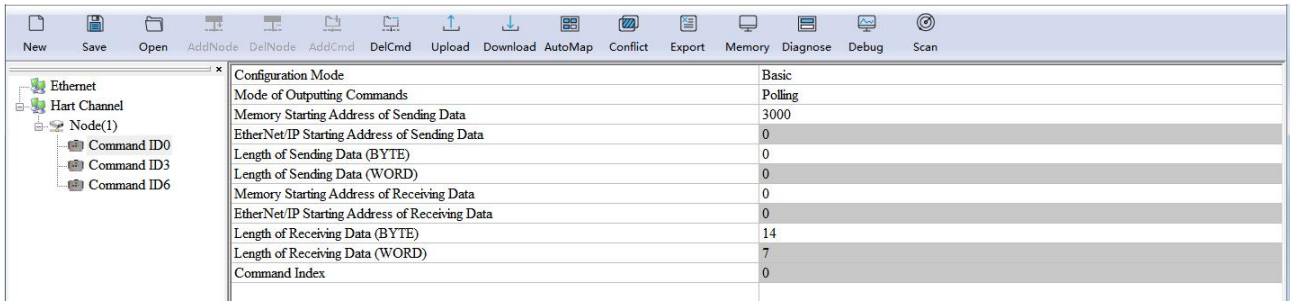
5. Add HART commands (chapter 5.2.2.3).

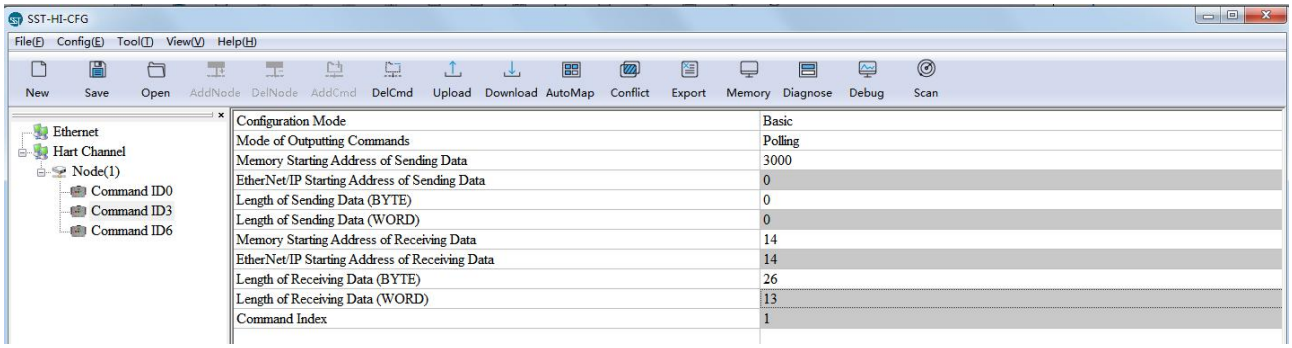


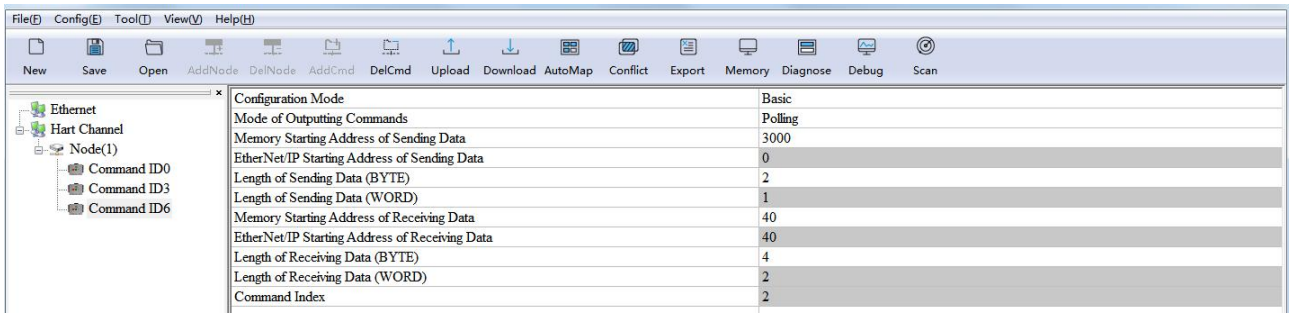
6. Configure the commands (chapter 5.2.2.4, 5.2.2.7). According to HART universal command specifications, the command 00 has no request with 12-byte response, the command 03 has no request with 24-byte response, and the command 06 has 2-byte request with 2-byte response. The request data of the GT200-HT-EI includes an extra 2-byte status, so the receiving data length is 2-bytes more than the actual response.

   After inputting the sending and receiving data length, click “AutoMap” on the toolbar to automatically map the data to the EtherNet/IP side (chapter 5.2.4). You can also map the data manually.

   The configuration of the HART commands are shown below:







7. Check the mapping address in the Conflict Detection window (chapter 5.2.3).

8. Download the configuration. Click “Download” on the toolbar, select the gateway you want to download to and click “Sign In”.

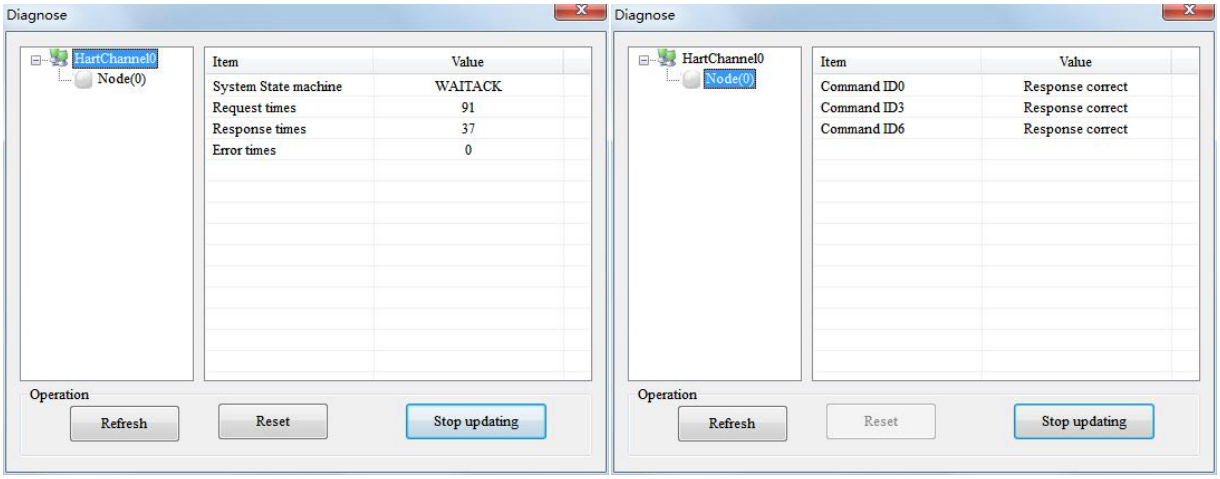
   Note: The GT200-HT-EI will apply the new configuration after gateway restart. After downloading, the software will ask to restart the GT200-HT-EI. You can also power off then power on the GT200-HT-EI to restart the gateway.

9. Test the communication.

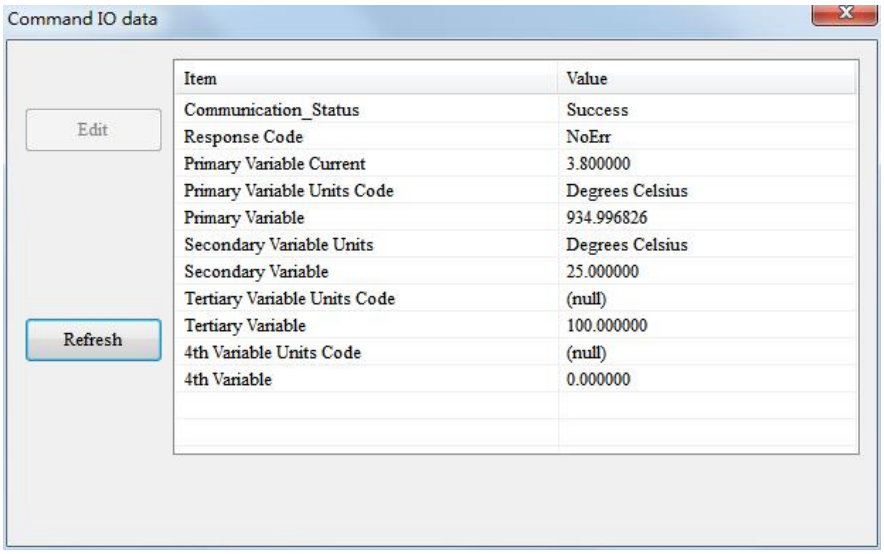
4.3 Test Communication

In this example, the EIPScan Test Tool is used to simulate the EtherNet/IP scanner. The configuration is the same with that in chapter 4.2. The SST-HI-CFG software provides debug and monitor tools (chapter 5.2.7, 5.2.8, 5.2.9). For more EtherNet/IP connection details, refer to chapter 7 and chapter 8.

1. Set the configuration switch to Bit 1 ON and Bit 2 OFF (debug mode). Restart the GT200-HT-EI to apply the mode switching.
2. Click “Diagnose” on the toolbar and upload the configuration. Check the request and response status in the diagnose window.



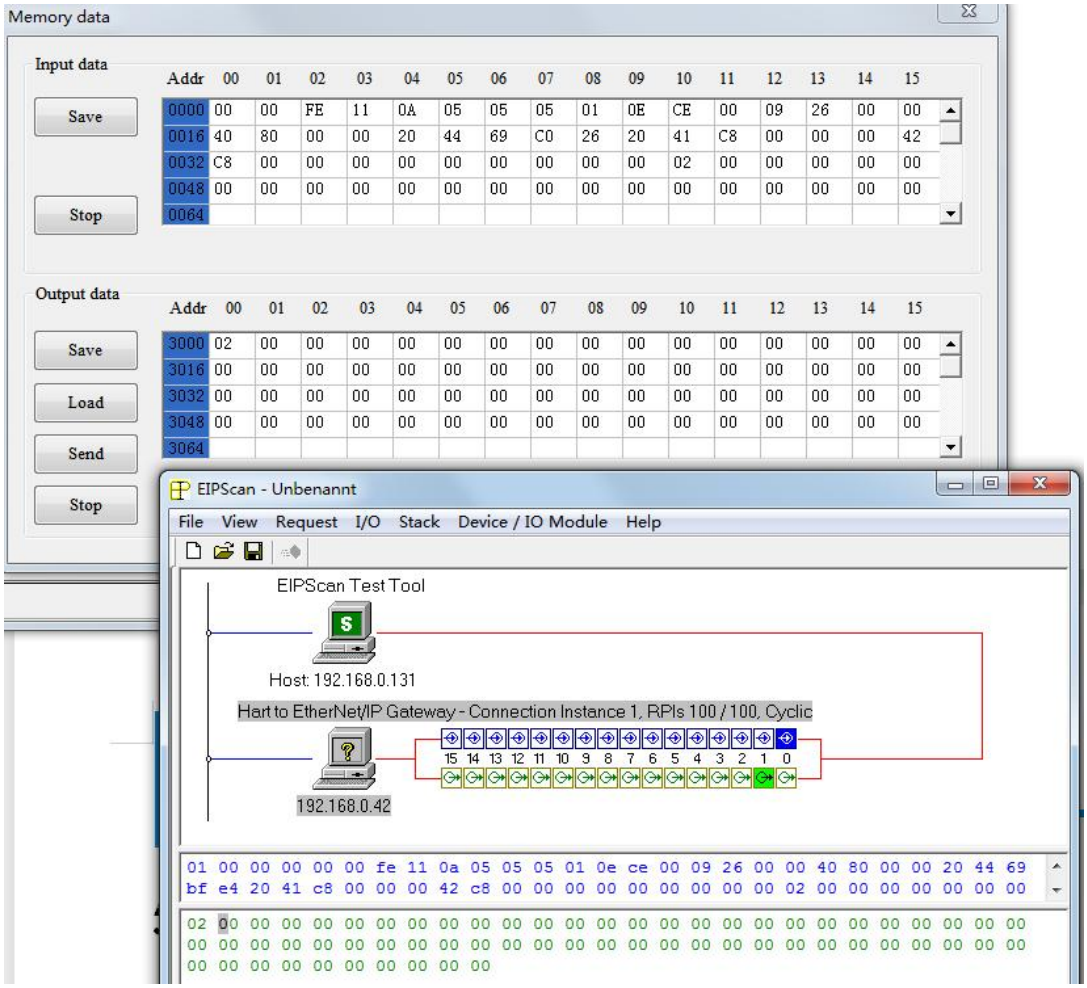
Select a node and double click on a command to check the data. For example, double click on HART command 03:



3. After confirming the data in diagnose window, click “Memory” on the toolbar and sign in the GT200-HT-EI. Check the data bytes and mapping address.

   The input data in the Memory data window corresponds to the input at EtherNet/IP side. The output data corresponds to the output at EtherNet/IP side.

   Note: The first 4 bytes in the EtherNet/IP input area is the gateway status.



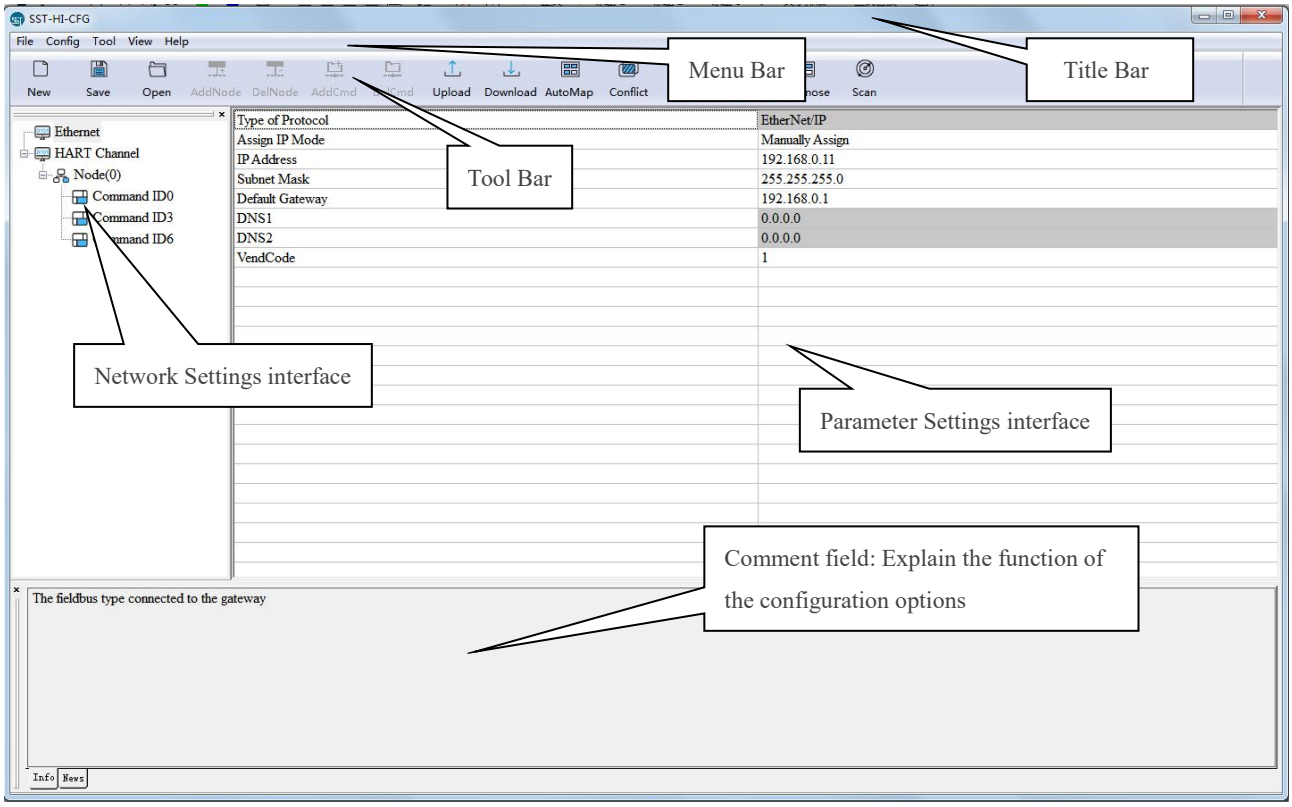
5 Software Instructions

5.1 Software Interface Description

SST-HI-CFG is a configuration software based on the Windows platform, and is used to configure HART series products.

The following describes how to use the software SST-HI-CFG to configure the product GT200-HT-EI. You may also check the software user manual to get detailed usage.

Run the software and enter the main interface of software:



Tool Bar:

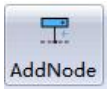
Toolbar interface shown as follow:

The function from left to right is: New, Save, Open, AddNode, DelNode, AddCmd, DelCmd, Upload, Download, AutoMap, Conflict, Export, Memory, Diagnose, Debug and Slave Scan.

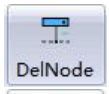
New: Create a new configuration file.

Save**:** Save the configuration file.

Open: Open the configuration file.



AddNode: Add a HART slave node.



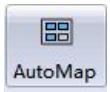
DelNode: Delete a HART slave node.

AddCmd: Add a HART command.

DelCmd: Delete a HART command.

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

Download: Download the configuration file to the gateway.

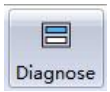


AutoMap: Used to automatically calculate the mapped memory address without conflict by each command.

Conflict: To check whether there are some conflicts with the configured commands in the gateway memory data buffer.

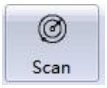
Export: Output current configuration to the local hard disk and save as an Excel spreadsheet form.

Memory: Show the data exchange inside of the gateway.



Diagnose: This function analyzes the operating condition of fieldbus devices.

Debug: This function sends any request frame to the Hart fieldbus and shows the response information received in HART.

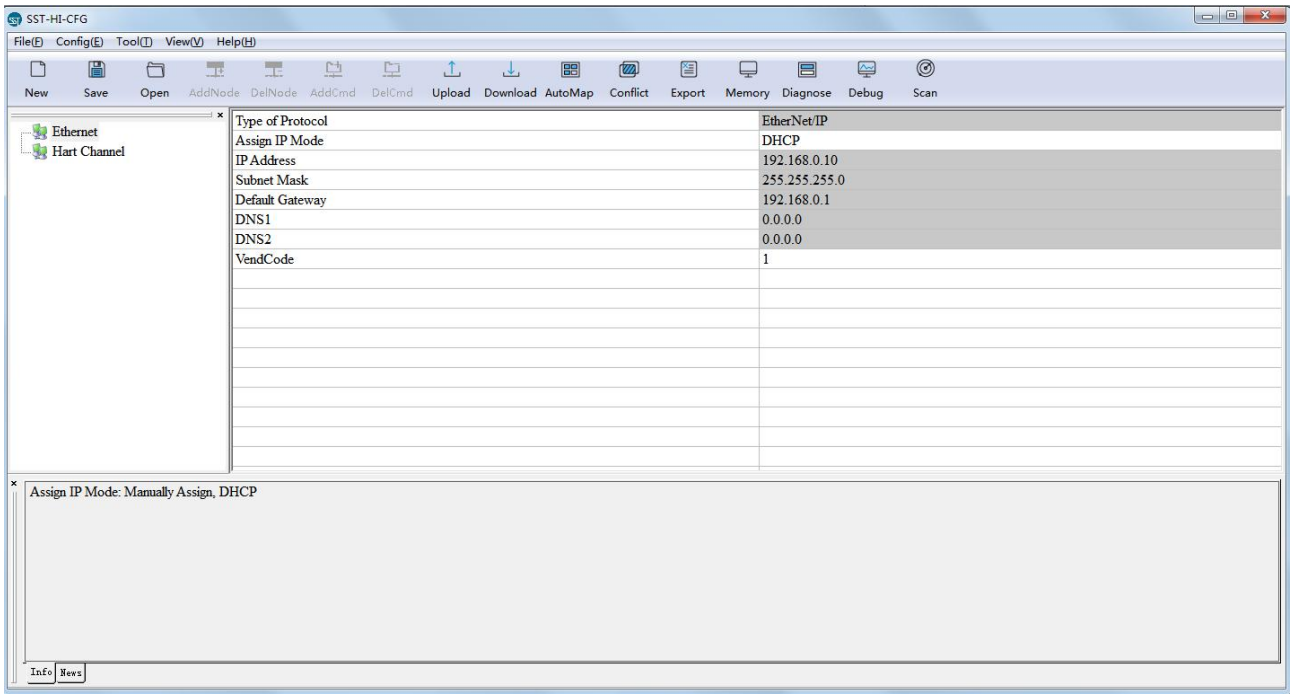


Slave Scan: This function can scan and calculate how many slave devices and relevant slave addresses the HART master is connecting with. This also supports changing slave addresses.

5.2 Software Function Description

5.2.1 Configure the Ethernet

In the device view interface, click Ethernet and the configuration interface will be shown as below:



Configurable items include: Assign IP Mode, IP Address, Subnet Mask, and Gateway Address.

Assign IP Mode: Manual Assign, DHCP

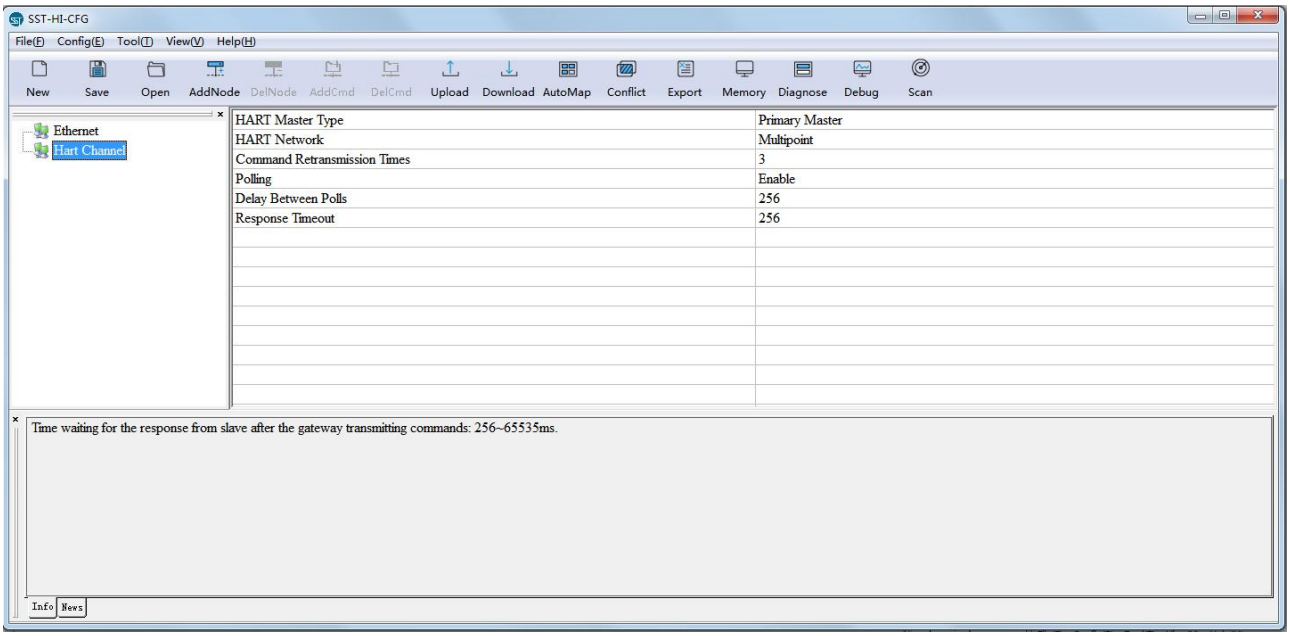
IP Address: Set the IP address of the device

Subnet Mask: Set the subnet mask of GT200-HT-EI.Gateway Address: Set the gateway address of the device

5.2.2 Configure the HART Fieldbus

5.2.2.1 Set the Parameters of HART Channel

Click the HartChannel0 in the tree view and the configuration section will appear on the right:



HART Master: Primary master, Secondary master

HART Networks: Select the networks mode as single or multiple points, under the single point the gateway can only communicate with the slave device whose address is 0

Retries: Select the number of retransmission commands, ranging from 0 to 5

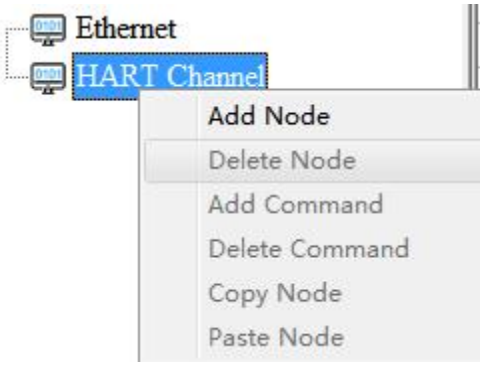
Polling: Determines if the polling function will be used, "Enable" means that the polling function will be enabled.

Delay between polls: Set the time of the polling command (The time interval from a command to send to start the next command) with the range of 256 ~ 65535ms

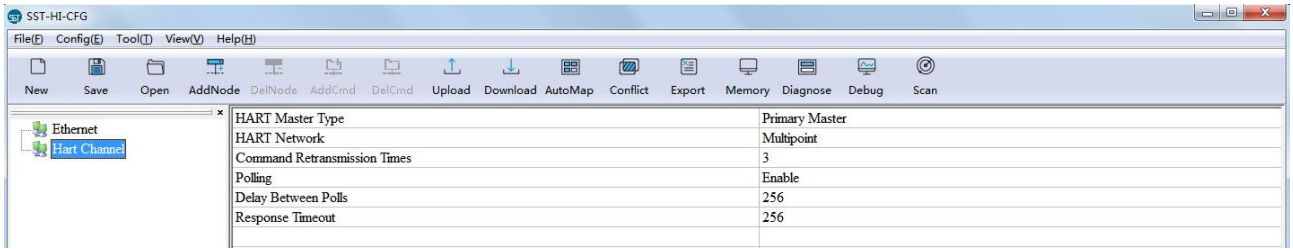
Response timeout: Set the maximum time that the gateway waits for the slave device to respond, ranging from 256 to 65535 ms

5.2.2.2 Add a Node

Select the"HartChannel0", Right click the mouse and select "Add Node" in the pop-up menu.



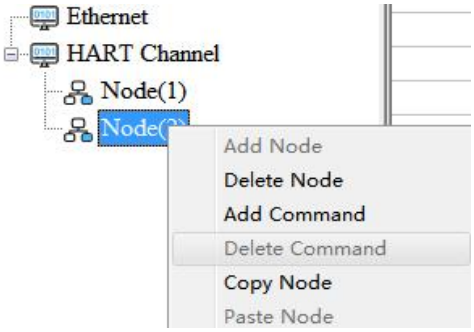
Click the added node, set the slave address in the right configuration plate, and please notice that the HART channel can only be equipped with one slave node which address is 0 when configured in the single point mode.



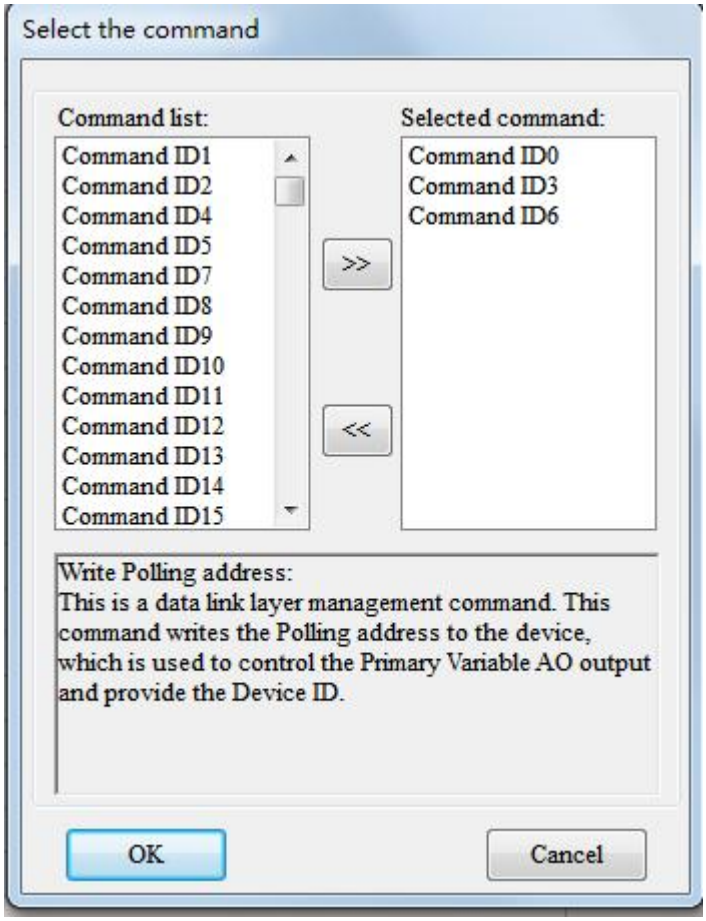
Note: When configured node numbers are more than the actual connected devices, the redundant node will lead to the longer time of polling circle. so, it is recommended that configured node numbers should be the same as actual devices.

5.2.2.3 Add HART Commands

Select the “Node (x)”, Right click the mouse and click “Add Command”.



Choose the command you want in the popup menu, and then click “OK” to exit:



Note: The same command can only be configured once in one node.

※HART Common Commands

Note: The front two bytes of the actual response data is the status info of the device. The data after that two bytes is the device response data.

Command 1 (Command ID1): Read Primary Variable

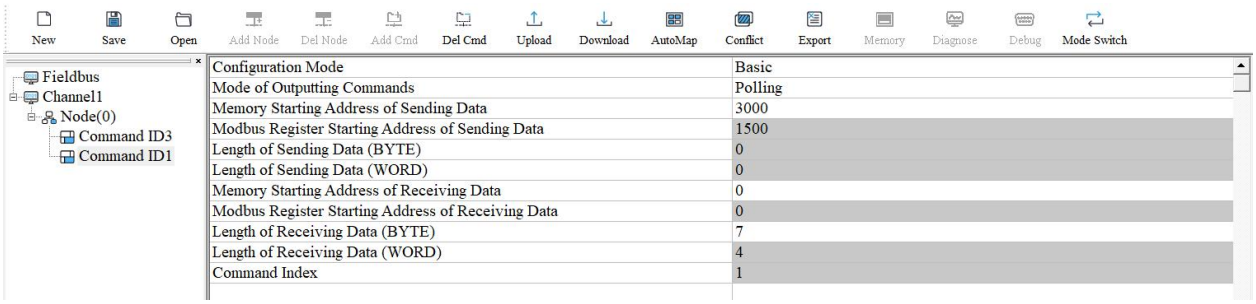
Return primary variable value in float data type.

Request: None

Response:

Byte	**Description**
Byte 0	Primary Variable Units
Byte 1-4	Primary Variable

Please check the picture of the SST configuration software below:



As the request is: “None”, the user should fill “0” for the section “Length of Sending Data (BYTE)”

The “Length of Receiving Data (BYTE)” will be 7, which is the sum of 2 status bytes and 5 device response bytes.

Command 3 (Command ID 3): Read Dynamic Variable and Primary Variable Current

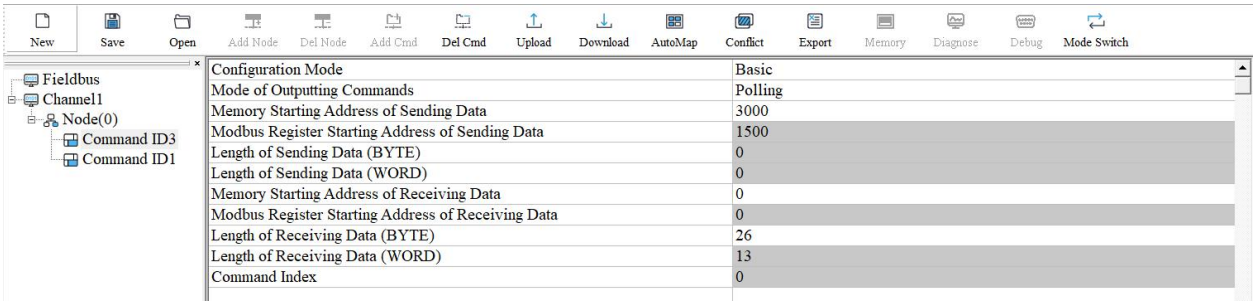
Read primary variable current and four (at most) pre-defined dynamic variables. The primary variable current always matches the AO output current of the device. A second, third and fourth variable is defined for each device type, E.g. The second variable is the sensor temperature, etc.

Request: None

Response:

Byte	**Description**
Byte 0-3	Primary Variable Loop Current（units of milli-amperes）
Byte 4	Primary Variable Units Code
Byte 5-8	Primary Variable
Byte 9	Secondary Variable Units Code
Byte 10-13	Secondary Variable
Byte 14	Tertiary Variable Units Code
Byte 15-18	Tertiary Variable
Byte 19	Quaternary Variable Units Code
Byte 20-23	Quaternary Variable

Please check the picture of the SST configuration software below:

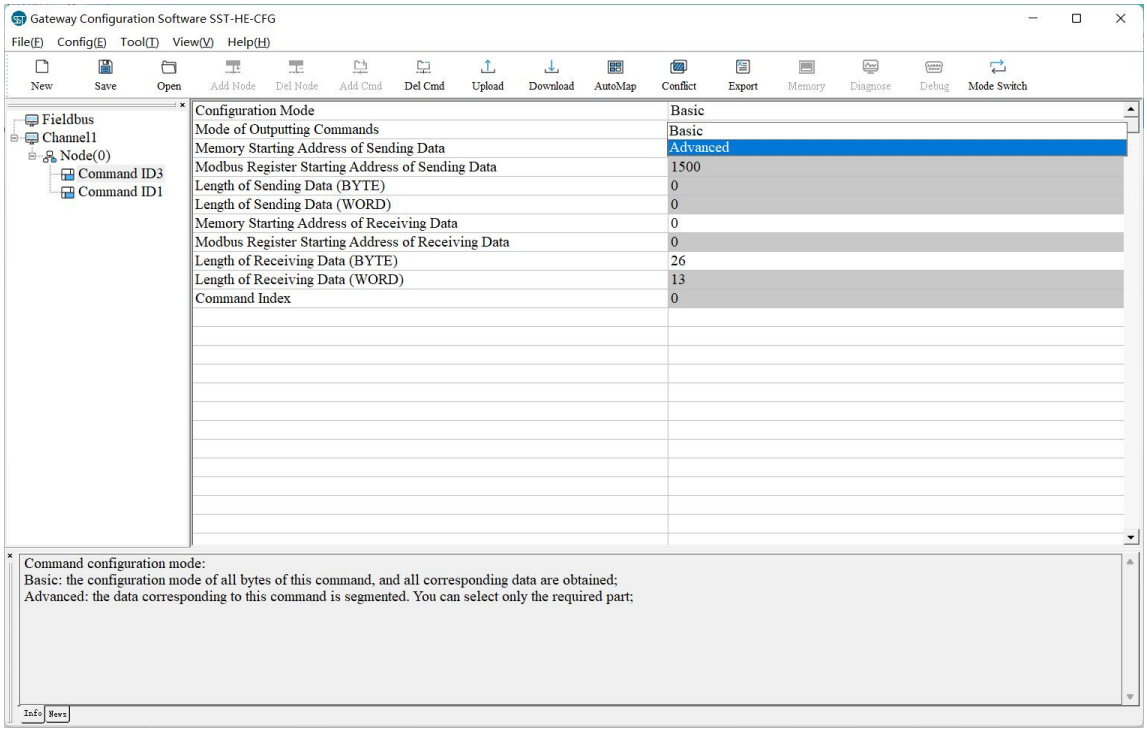


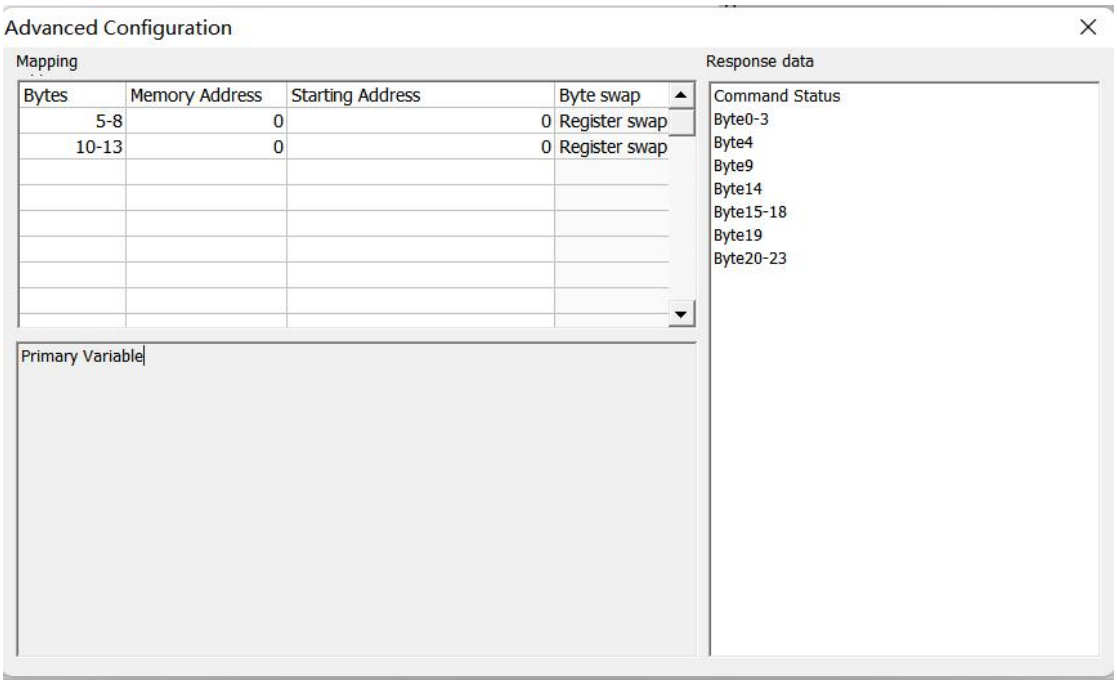
As the request is: “None”, the user should fill “0” for the section “Length of Sending Data (BYTE)”

The “Length of Receiving Data (BYTE)” will be 26, which is the sum of 2 status bytes and 24 device response bytes

If the user does not need to map all the variables to the Modbus TCP registers. Please follow the guide below to switch to the “Advanced Configuration Mode”, then click the “Configuration” button. Only select the variable(s) needed, in this case, only the “Primary Variable” and the “Secondary Variable” are selected.More details for Advanced Configuration Mode, please refer to chapter 5.2.2.7.

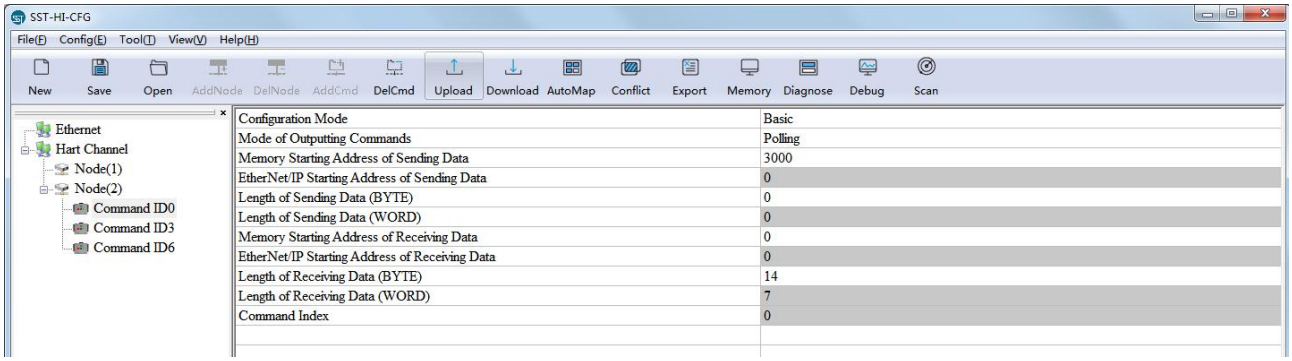
Notes: Selected variables are listed in the left table. Variables corresponding to the bytes are listed in the table above.





5.2.2.4 Configure HART Commands

Click the command number in the tree view. You will see the configuration plate on the right:



Configuration Mode: Basic and Advanced (optional), "Basic" is shown as above. For the "Advanced" configuration please refer to chapter 5.2.2.7.

Mode of outputting command: You choose the execution way of the command, change-of-state, polling output, Initialization output and disable output.

Change-of-state output: Execute this command once as data buffer of HART changes

Polling output: This order is put in the polling list, executed periodically

Initialization output: Execute the command only once when power is on.

Disable output: The command will not be sent.

Memory starting address of sending data: Set the memory starting address of output data by this command, the range is 3000~3999

The register starting address of sending data: The property is automatically calculated by the gateway, used for register addressing.

Sending data length (byte): Used to set the length of output data by this command.

Sending data length (word): The property is automatically calculated by the gateway, used for user checking output data length, 1 word=2 byte

Memory starting address of receiving data: Set the memory address of input data by this command. The response data only includes data area of the HART frame.

The register starting address of receiving data: The property is automatically calculated by the gateway, used for register addressing

Receiving data length (byte): Set the length of input data by this command.

Receiving data length (word): The property is automatically calculated by the gateway, used for user checking output data length conveniently, 1 word=2 byte.

Command index: The property is automatically calculated by the configuration software, it indicates the index in the configured command list this command belongs to.

5.2.2.5 Delete Commands

Select the command that needs to be deleted, Right click the mouse and click “Delete Command”. The menu command in the toolbar can also accomplish the same action.

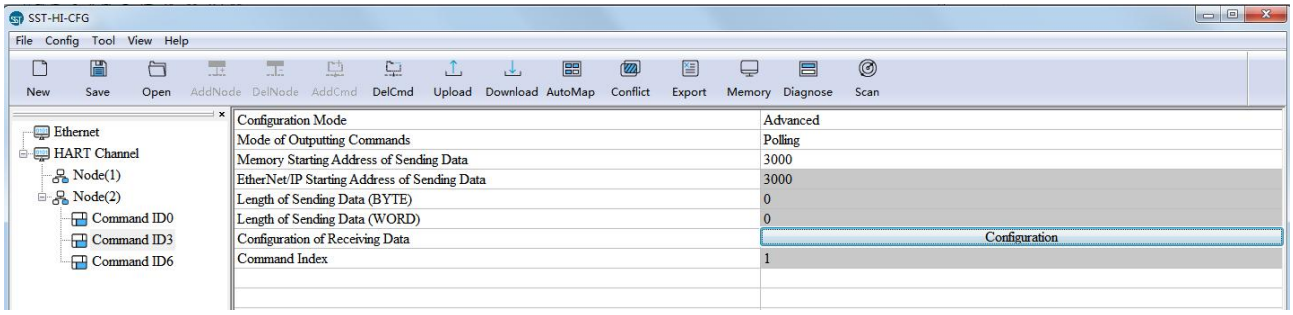
5.2.2.6 Delete Nodes

Select the node needed to be deleted, Right click the mouse and click “Delete Node”. The menu command in the toolbar can also accomplish the same action.

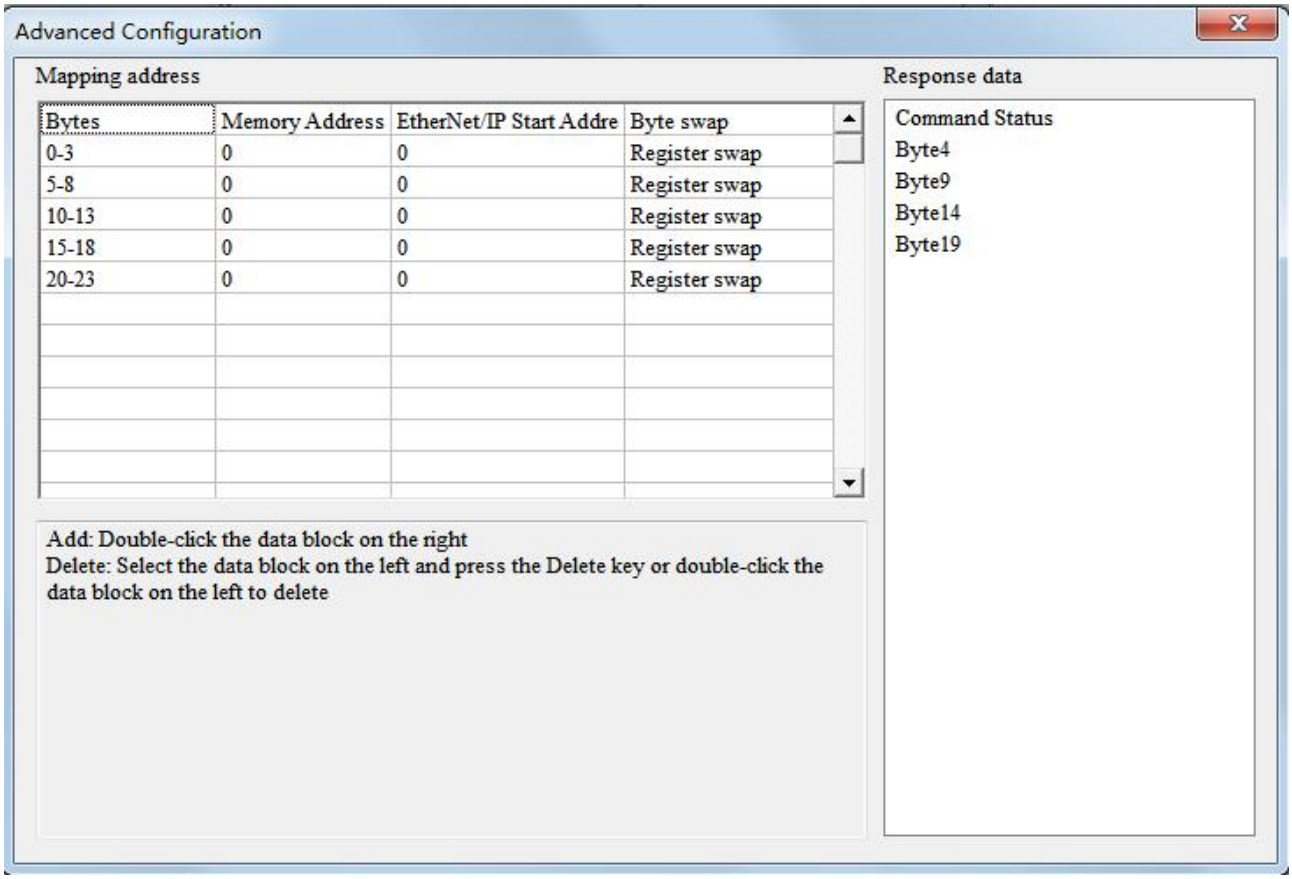
5.2.2.7 Advanced Options to Configure HART Commands

When using the HART command configuration, sometimes users want to get only one part of the data from one command. For example, for No.1 HART command. The float value of the main variable is only needed, so there is no need to get the units of the main variable, therefore the advanced option should be used. The advanced options is the execution of the “segment mapping function”. It cuts the response data of the HART command and isolates a segment of the data. Users can get any part of the data they want.

Below is the interface of the Advanced Options:



The below is the example of the No.3 HART command, this will demonstrate how to use the “Segment Mapping” function. We can see the “configuration” button next to the “receive data project configuration” once the configuration mode is set to “Advanced”, click it:



There are many parts in the “response data”. For example, “Command Status” means the communication status and relevant code of the HART response command, “Byte0-3” means byte 0 to 3 of the data area of the HART response command, and so on. Note: Information of these bytes is based on the Universal Hart Command Specifications.

In the above example, “Byte5-8” represents the Primary Variable and can be seen in a small description in the bottom left area.

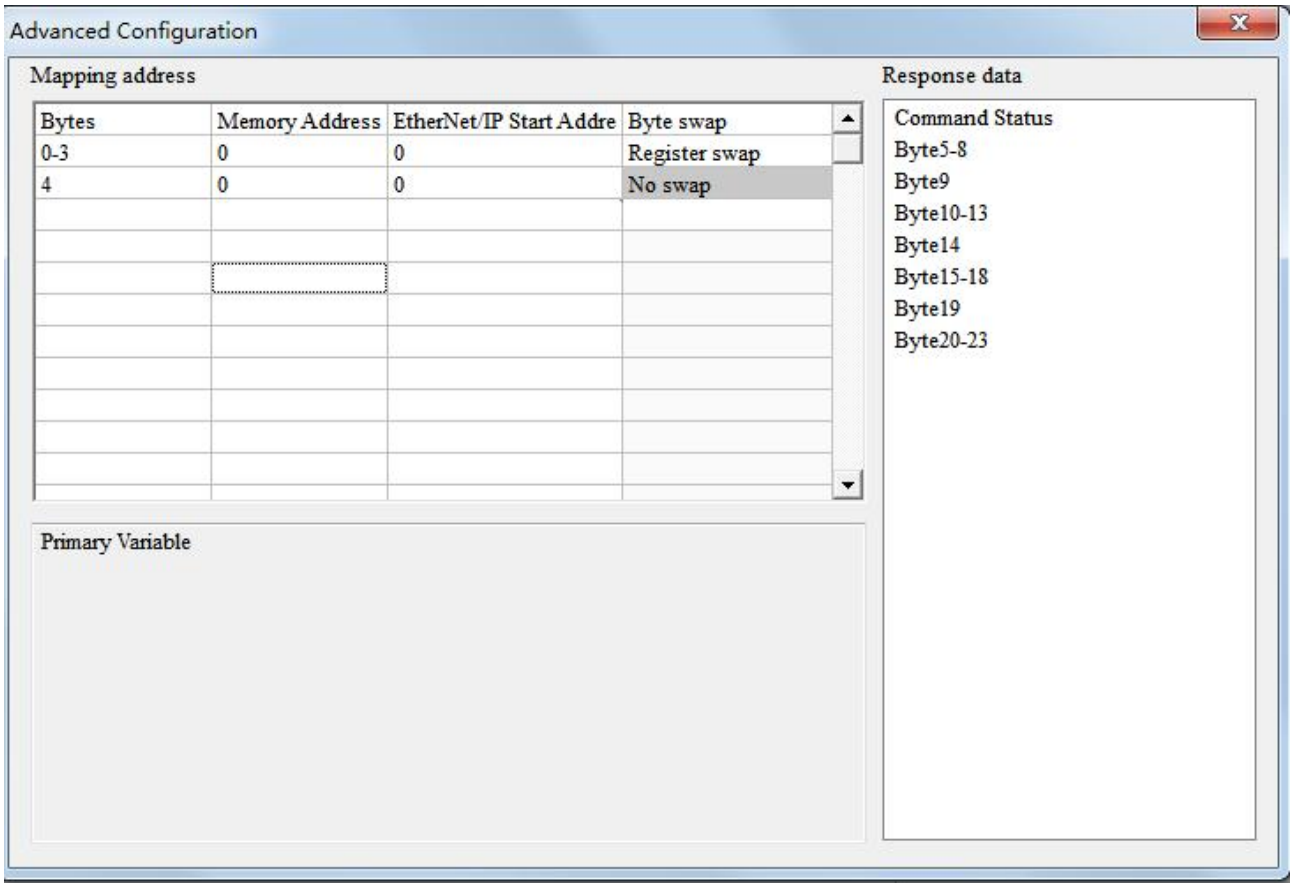
Bytes: Response bytes of “Response Data”

Memory Address: **A**ssigned memory address which this byte is located in the memory buffer area of the GT200-HT-EI

EtherNet/IP register address: **T**he relevant EtherNet/IP register address of the “Memory Address”.

Note: This address is not a single address.

Choose “Byte0-3” and “Byte4”, then click auto mapping, as shown below:



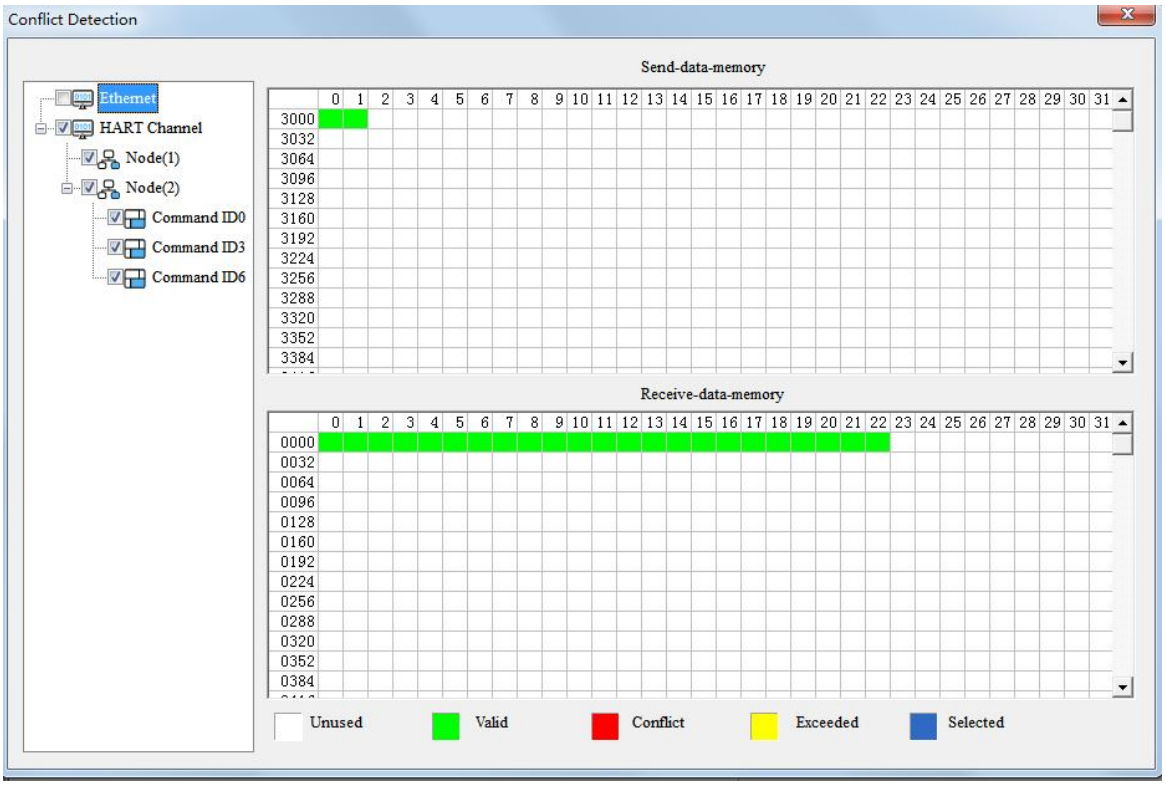
Close the dialog box, download the configuration into the GT200-HT-EI.

5.2.3 Conflict Detection

Conflict detection is used to check the distribution condition of the input and output data of all commands stored in the memory.

Click the 

icon and this will show the conflict detection interface as follow:



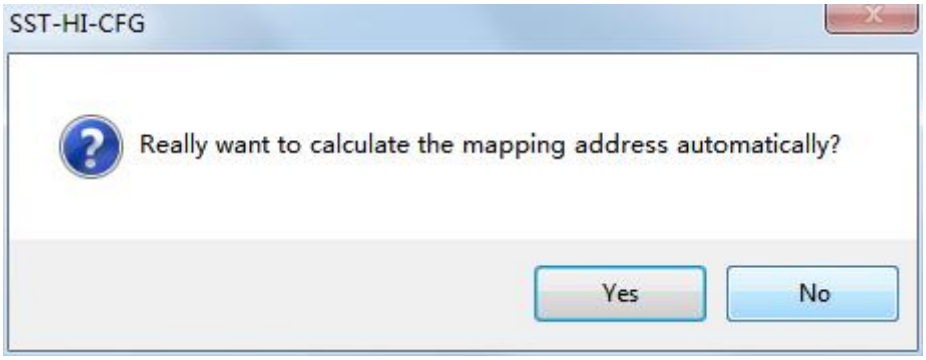
The left side of the tree view is the configuration commands. The right side of the tree view is the data memory address including the receive data storage address and the send data storage. The top side is the memory distribution of the HART channel sending data. The bottom side is the memory distribution of the HART channel receiving data. When one memory unit is configured with two commands or more, the memory unit will display a red color. When the distributed memory exceeds the defined scale of gateway, the exceeding part will display a yellow color. The white color area represents usable memory. The Green color area indicates occupied memory. Clicking on a command, the distribution chart shown in blue, will show the storage location of input/output data.

5.2.4 Auto Mapping

AutoMap will automatically distribute the memory with no conflict according to the input/output bytes number set by the users' commands.

You should set the correct input/output bytes for each commands, then click the 

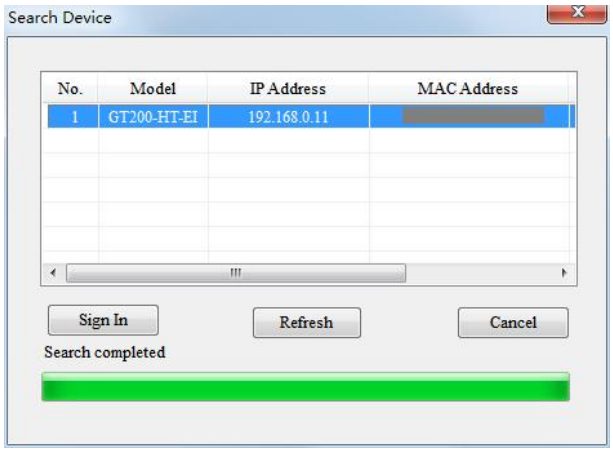
icon and select "yes" in the popup menu.

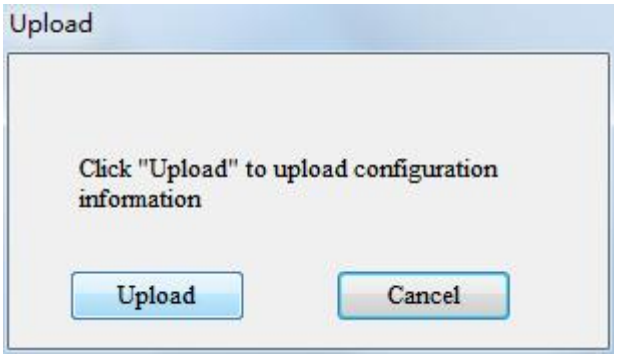


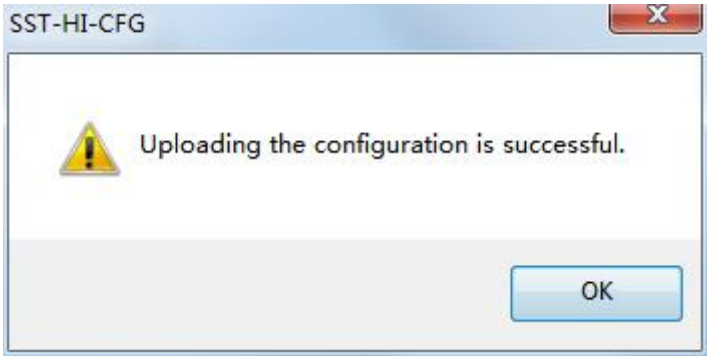
5.2.5 Upload Configuration

Open the software “SST-HI-CFG”, Click on the upload icon 

, Select the gateway you used in the pop-up dialog box, and click “OK”, then “upload data”, if it shows “upload successful”, then the configuration file has been uploaded to the SST-HI-CFG.







5.2.6 Download Configuration

Click the icon 

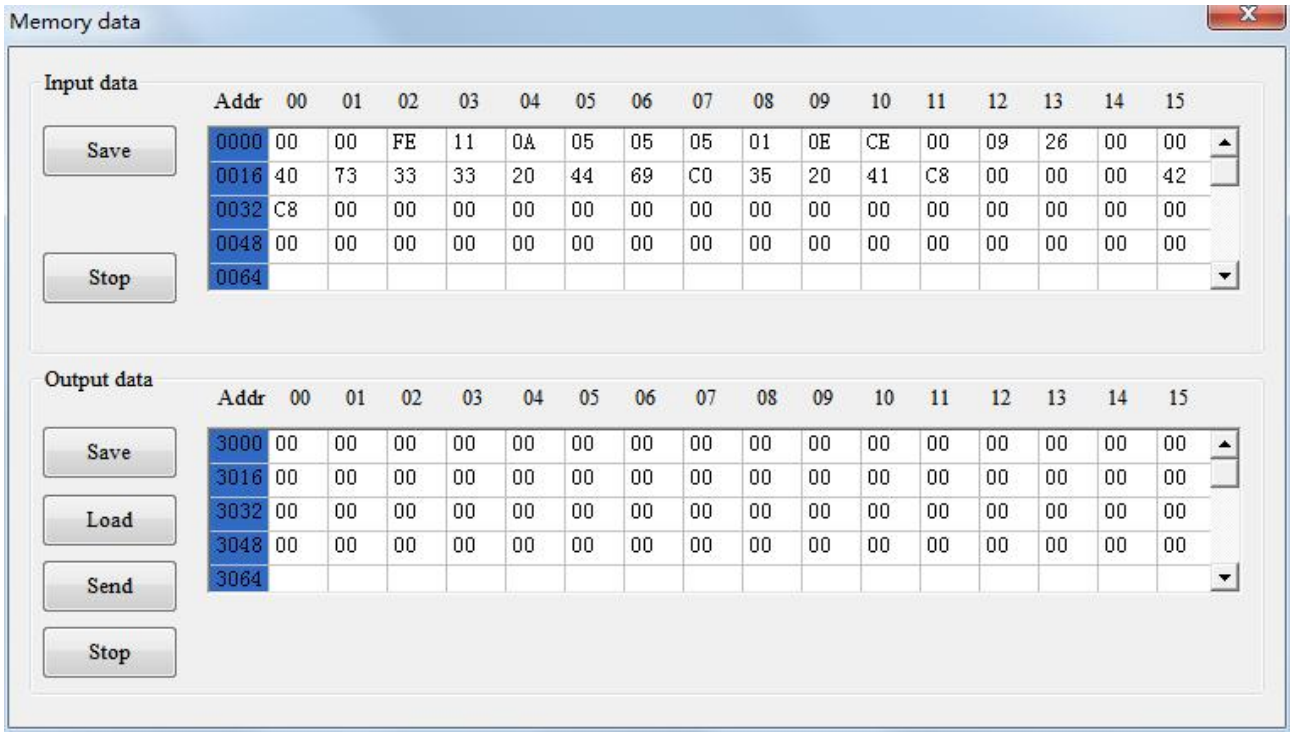
. it will download the configuration into the gateway.

5.2.7 Memory Data Display

Show the data exchange inside of the gateway, users can use this function to debug the HART fieldbus in the absence of the EtherNet/IP side. Steps are as follows:

1) Ensure that the GT200-HT-EI's function bit of configuration switch is in the ON state and the mode bit of configuration switch is in the OFF state, restart the gateway. Then the GT200-HT-EI is in the debug mode.
2) Use a network line to connect the GT200-HT-EI's RJ-45 port and a computer.
3) Open the software "SST-HI-CFG", Click "Tool—Show Memory Data" or click on the icon 

, choose the correct gateway in the device scanning window, interface is as follows:

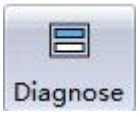


As is shown in the table, upper table shows the memory distribution of the HART input data, the lower table shows the output data. When you need to change the output data, click the “stop” button first, then change the related data or load the already saved data table. Then click the “sending data”.

5.2.8 Diagnose

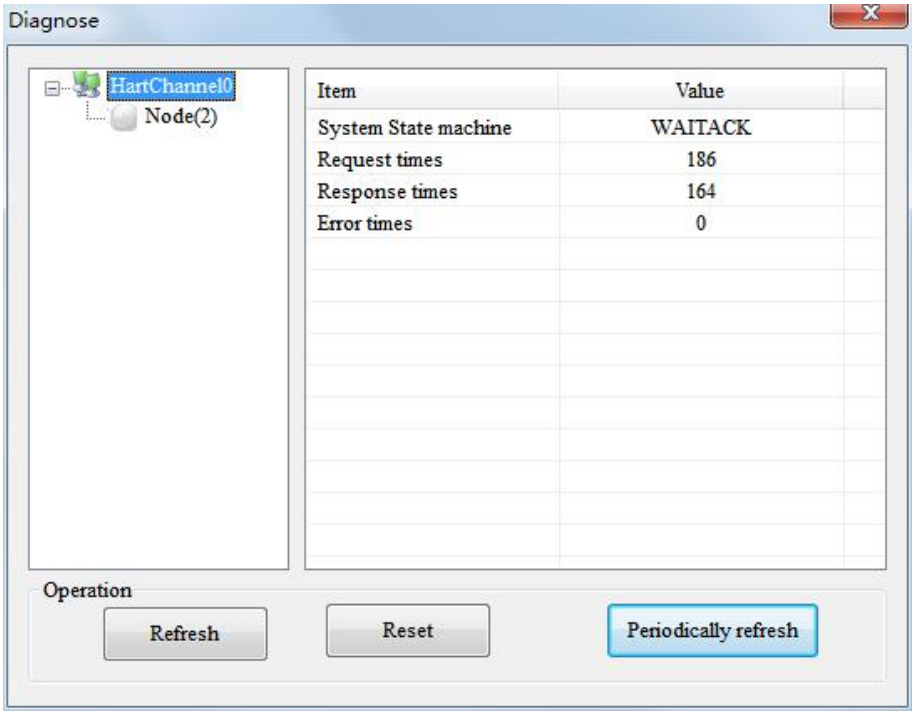
Through this function, users will know which device is not communicating. The execution condition of configured commands, data transmission of the gateway and the displays of certain command’s operating steps are as follows:

1. Ensure that the GT200-HT-EI’s function bit of configuration switch is in the ON state and the mode bit of configuration switch is in the OFF state, restart the gateway. GT200-HT-EI is in the debug mode.

Use a network line to connect the GT200-HT-EI’s RJ-45 port and a computer , Open the software “SST-HI-CFG”, click “Tool—Diagnose” or click on the icon 

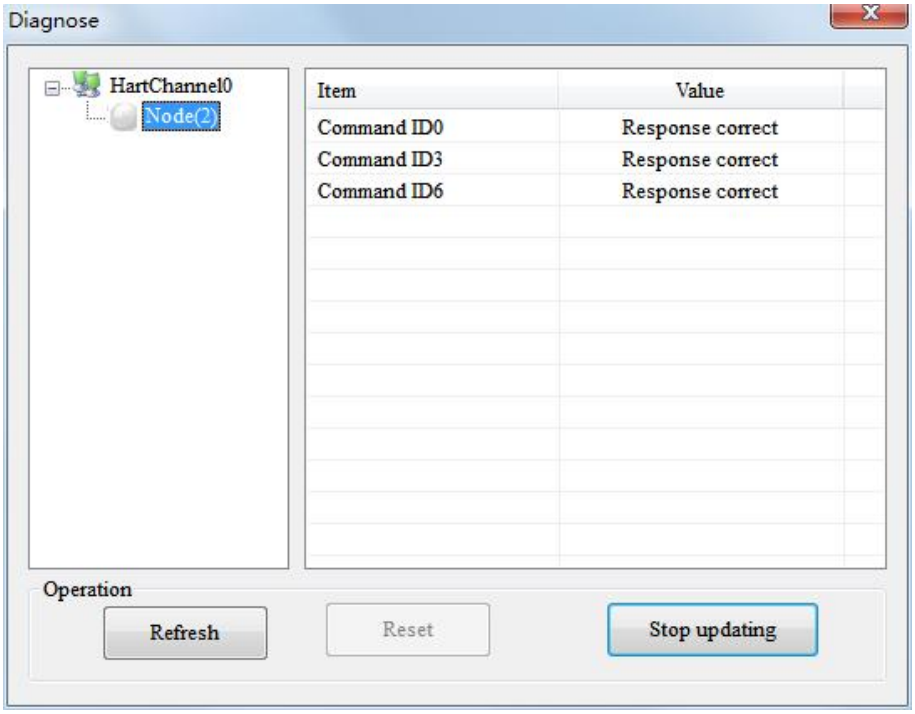
, the software first pop up one dialog box to choose the gateway and click “OK”.

2. Enter the interface of diagnose



Click on the "HartChannel0" in this interface, it will show the status of the HART fieldbus part on the right. Press the "Refresh" button, this will update the data once. Click on "Periodically refresh", to have the software update the data every 500ms.

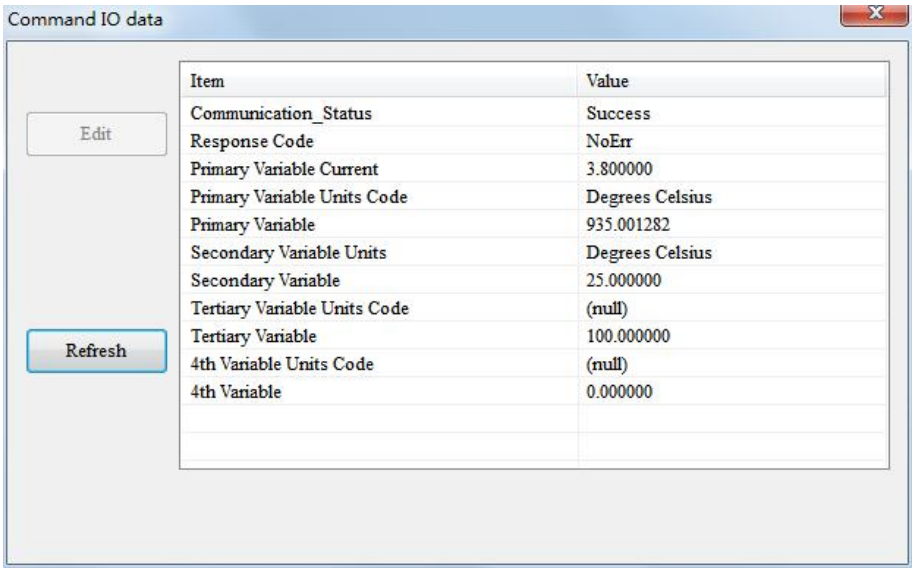
3. Click Node(x), it is shown as below



It shows the response status of the configured commands.

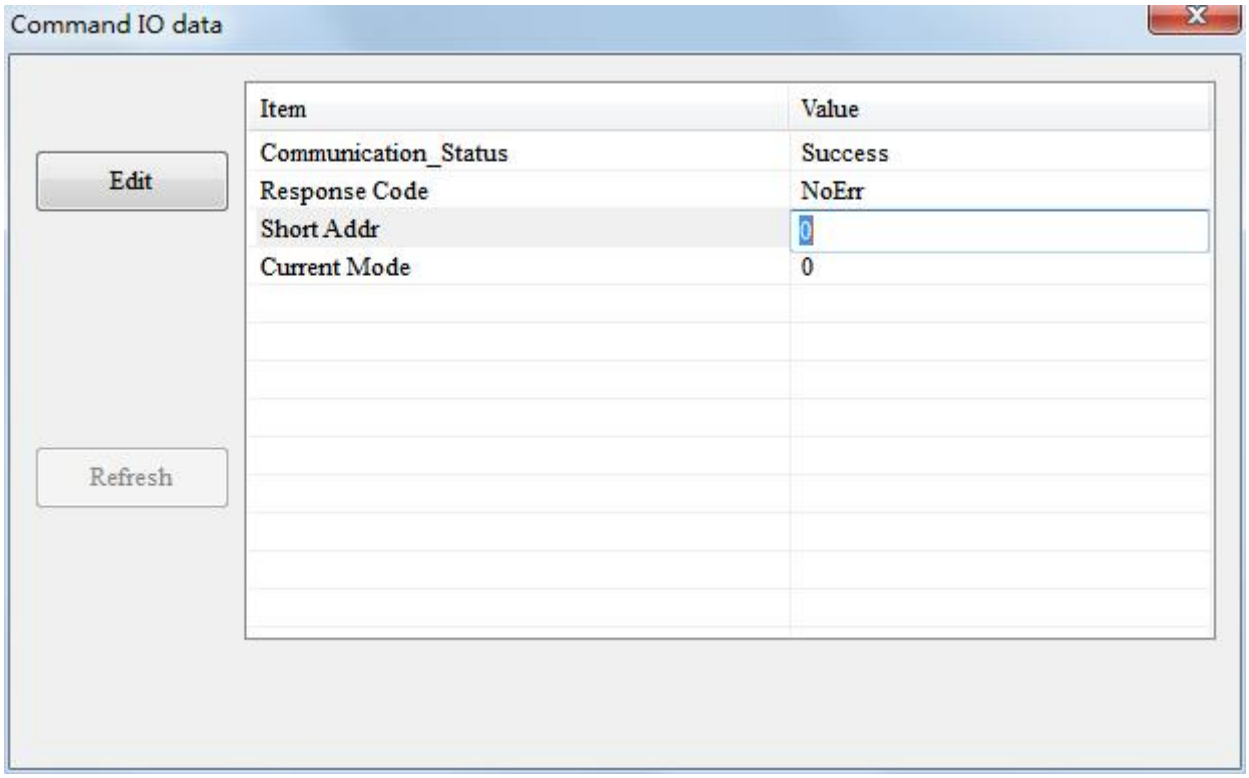
Click “Refresh” this will refresh these command status, “Periodically refresh” will refresh the command status once.

4. Double clicking the commands will show their command information, command 03 can start data input.



Click the“Refresh” button to update the data. Note: The “Edit” button doesn’t work in the Read-only command.

Double click “CMD 06” will show the window as below:



Click the value or attribute you want to change and click “Edit” to execute this operation of write command.

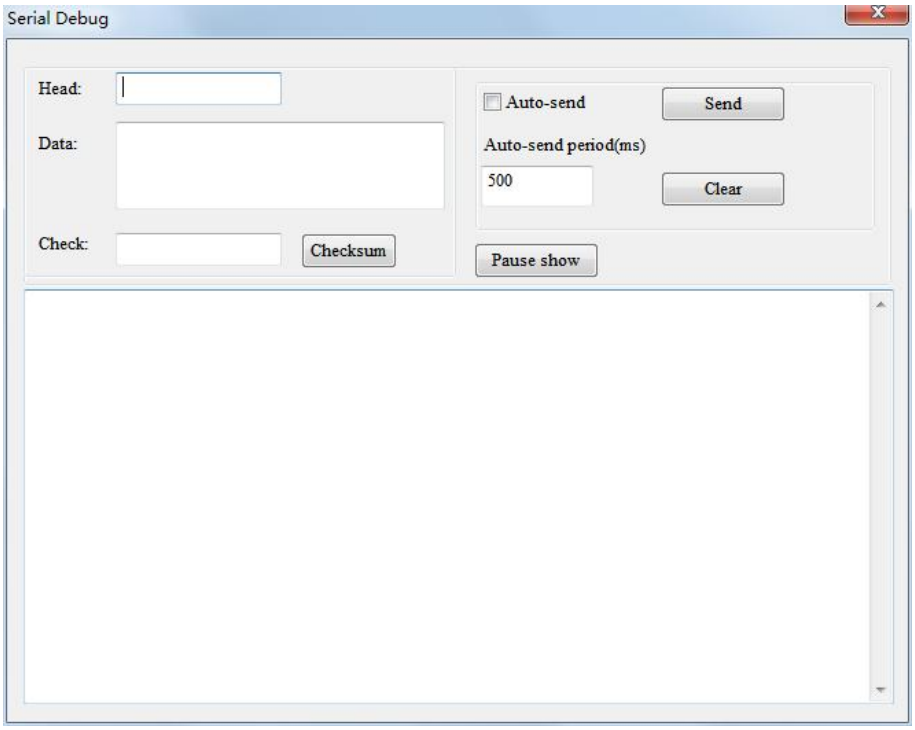
5.2.9 Debug Assistant

The Ethernet generic debugging feature can send any message to the HART and monitor the data received from the gateway on the HART. Steps are as follows:

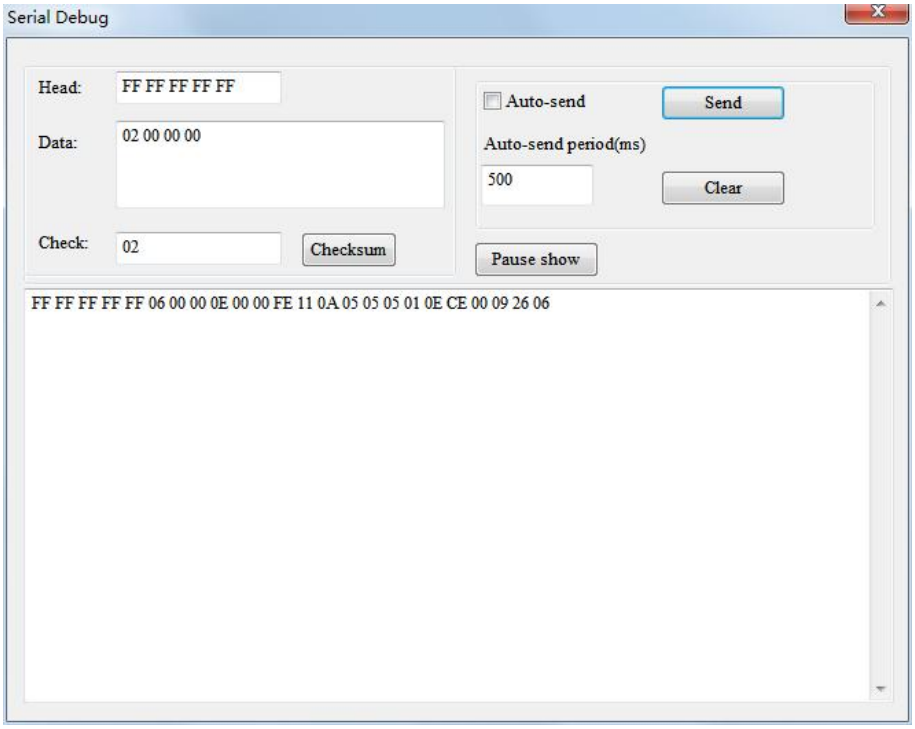
1. Ensure that the GT200-HT-EI’s function bit of configuration switch is in the ON state and the mode bit of configuration switch is in the OFF state, restart the gateway. Now GT200-HT-EI is in the debug mode.

2. Use a network line to connect the GT200-HT-EI’s RJ-45 port and a computer, Open the software “SST-HI-CFG”, Click “Tool—Debug Assistant” or click on the icon 

, Interface is as follows:



In this interface, clicking “Auto-send” or “Send” will combine data head, data, and check code into one frame and send it out. The data that the gateway receives from the HART fieldbus will be shown in the blank place below. The Checksum button only checks part of the data. Here is an example.



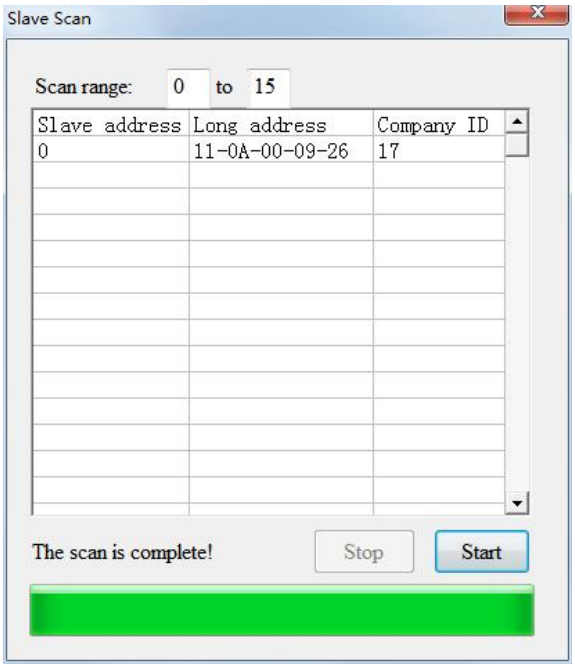
5.2.10 Slave Scan

The slave scan function can help users to check the HART slave address and modify the slave address. The operation steps are:

1) Dial the configuration switch of GT200-HT-EI to 1ON 2OF, which will set the gateway into debug mode.

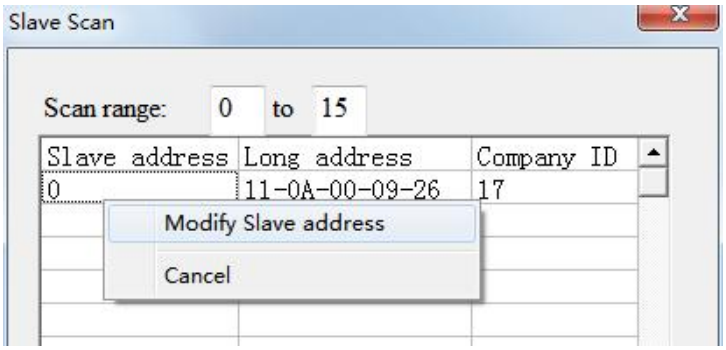
2) Use a network line to connect GT200-HT-EI to a computer, open SST-HI-CFG software, click "Tool->Slave Scan" or click icon 

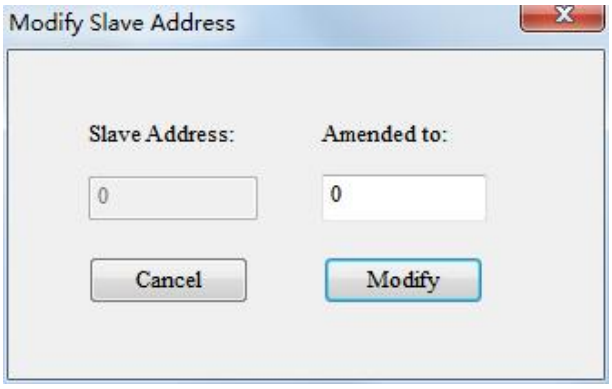
, the software will pop up a dialog box to choose the scanned gateway and click "OK", as shown below:



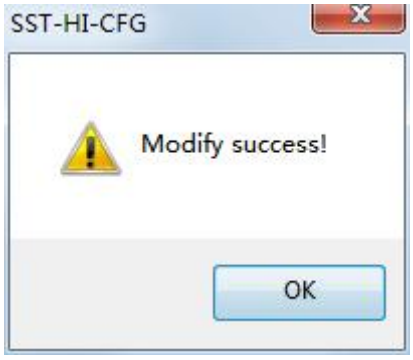
Click “Start” in “Slave Scan” interface, it will show the short address, long address and ID of HART slave devices which are connected to the gateway.

Move to the relevant device and right click it, and click “Modify slave address” will show the “Modify slave address” interface, input the address you want to change in the “Modified to” text.



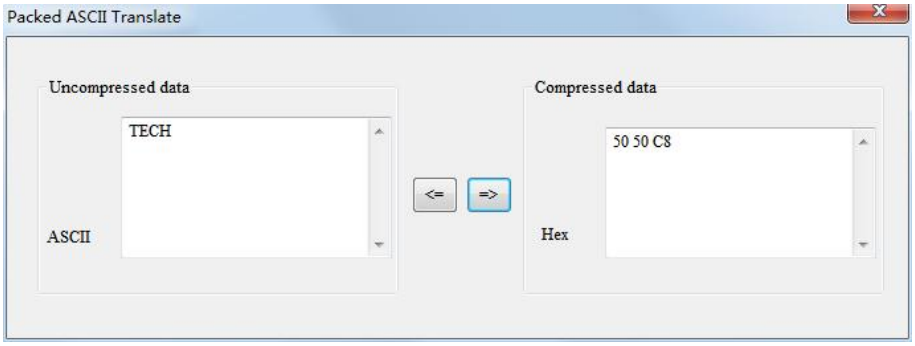


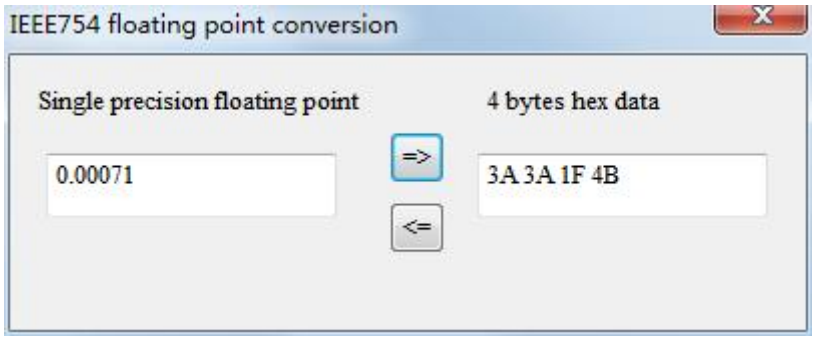
After modification, the HART slave address has been modified, the gateway must be restarted.



5.2.11 Conversion Tools

In the “Tools” menu, there are two practical tools: They are used to switch between IEEE754 and PACKED ASCII conveniently.



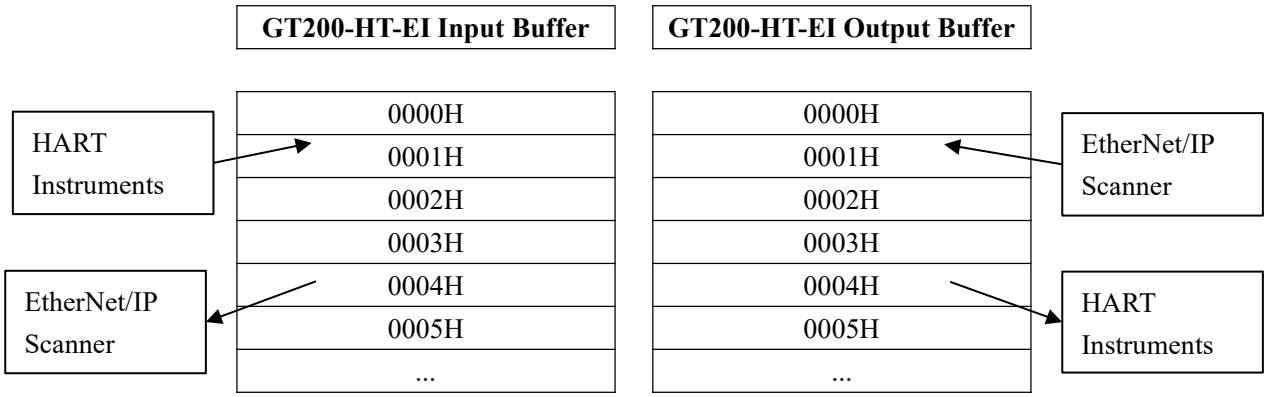


6 Working Principle

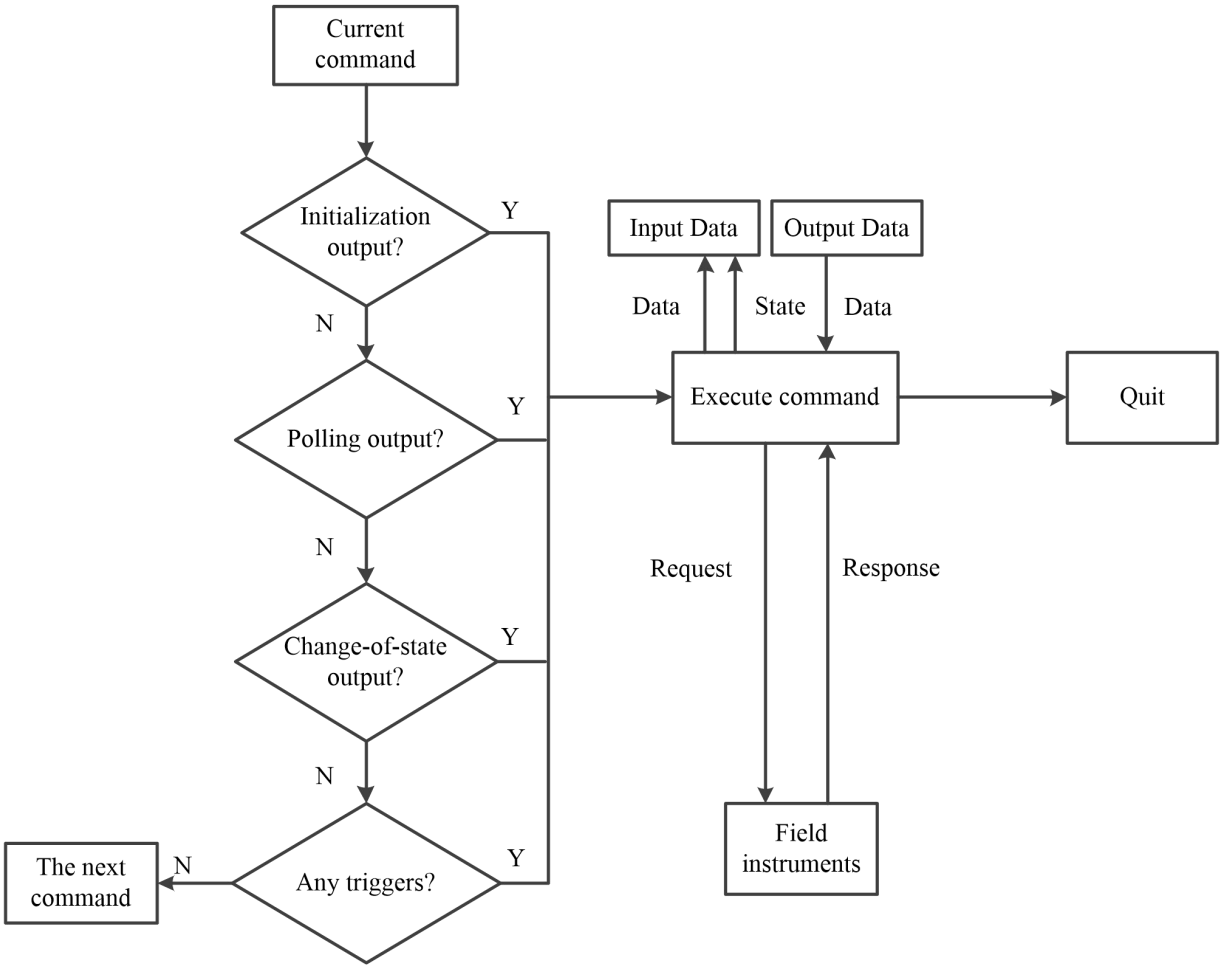
6.1 Data Exchange

Data exchange between HART and EtherNet/IP via GT200-HT-EI is established based on “mapping”. There are two data buffer areas in the GT200-HT-EI: One is the EtherNet/IP network input buffer and the other is the EtherNet/IP network output buffer. The received data from the HART instruments will be mapped to the input buffer for the EtherNet/IP scanner reading. The output data from EtherNet/IP scanner will be mapped to the output buffer, then the GT200-HT-EI will write the output data to the HART instruments.

For more details and examples, please refer to chapter 4.3, 5.2.3 and 5.2.4.



6.2 Flowchart of Executing One HART Command



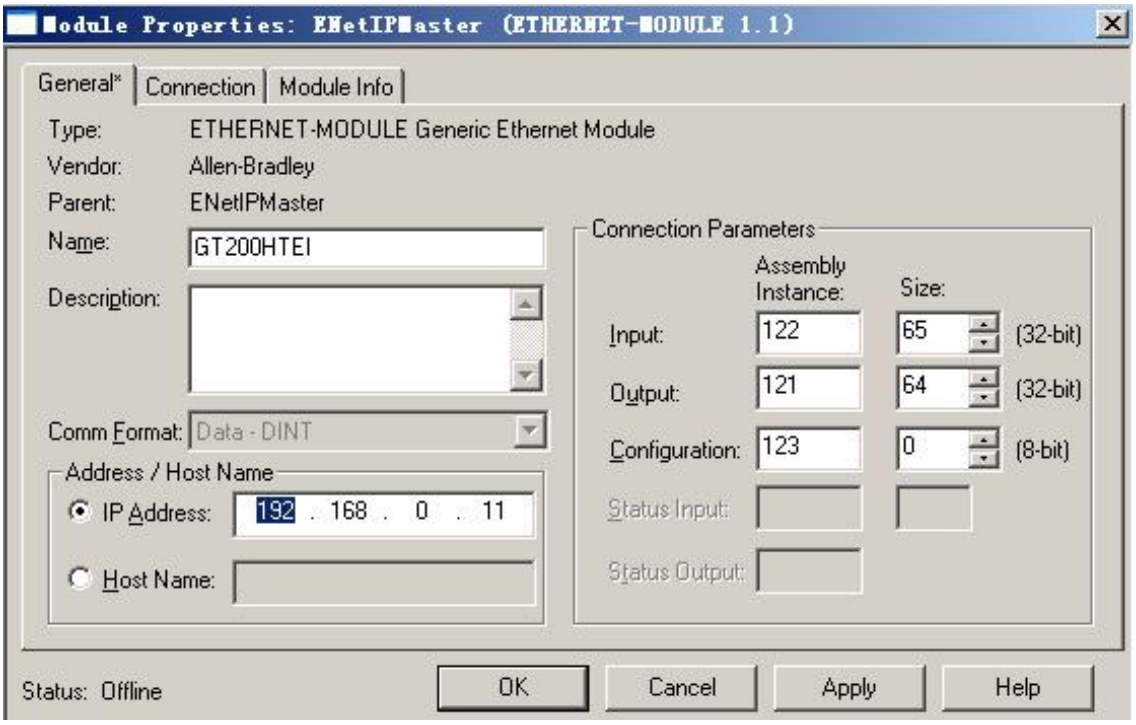
7 EtherNet/IP Connection Parameters

Connection parameters the adapter provides are as below:

Parameters \ Data Size	64 Bytes	128 Bytes	256 Bytes
Input Instance	102	112	122
Output Instance	101	111	121
Configuration Instance	103	113	123

Notes: The Input data size should include a 4-byte status. For example, when using the 256-byte parameters, the input size should be 260 bytes.

Take configuration parameters of RSLogix5000 as an example:

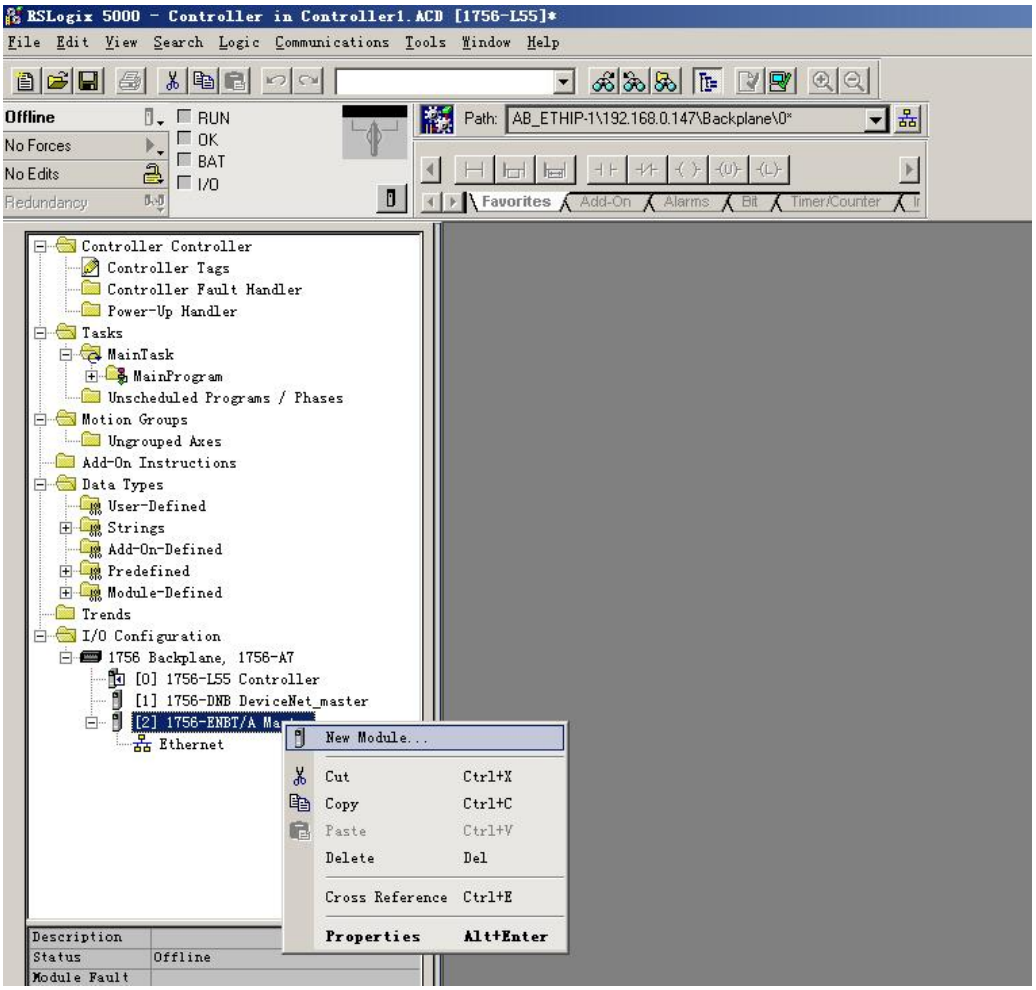


8 How to Read/Write I/O Data

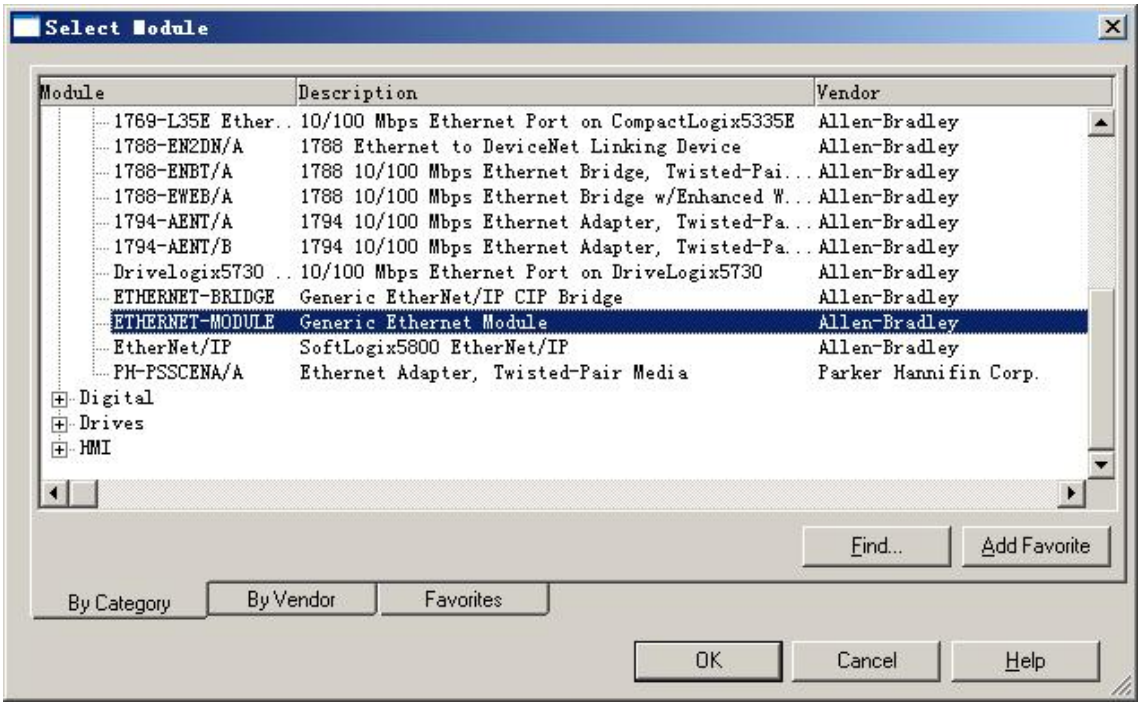
The following RSLogix 5000 example will describe how to read/write I/O data.

8.1 Read/Write Data by IO Messaging (Recommend)

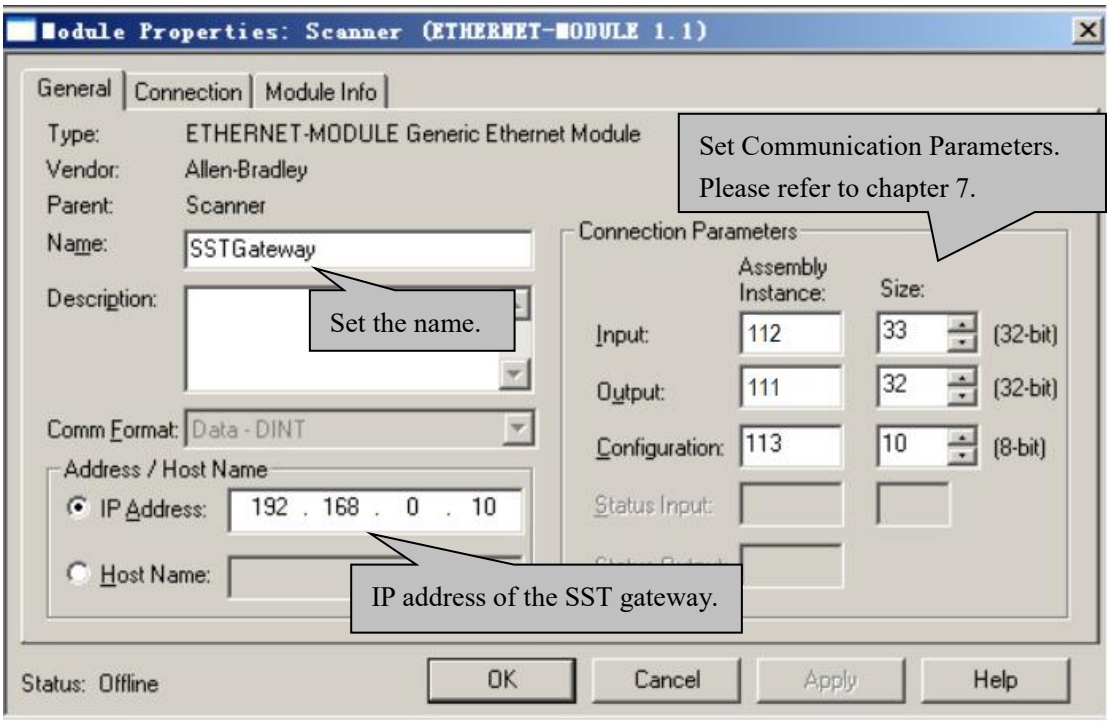
Right click on EtherNet/IP scanner module, click "New Module", as shown below:



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

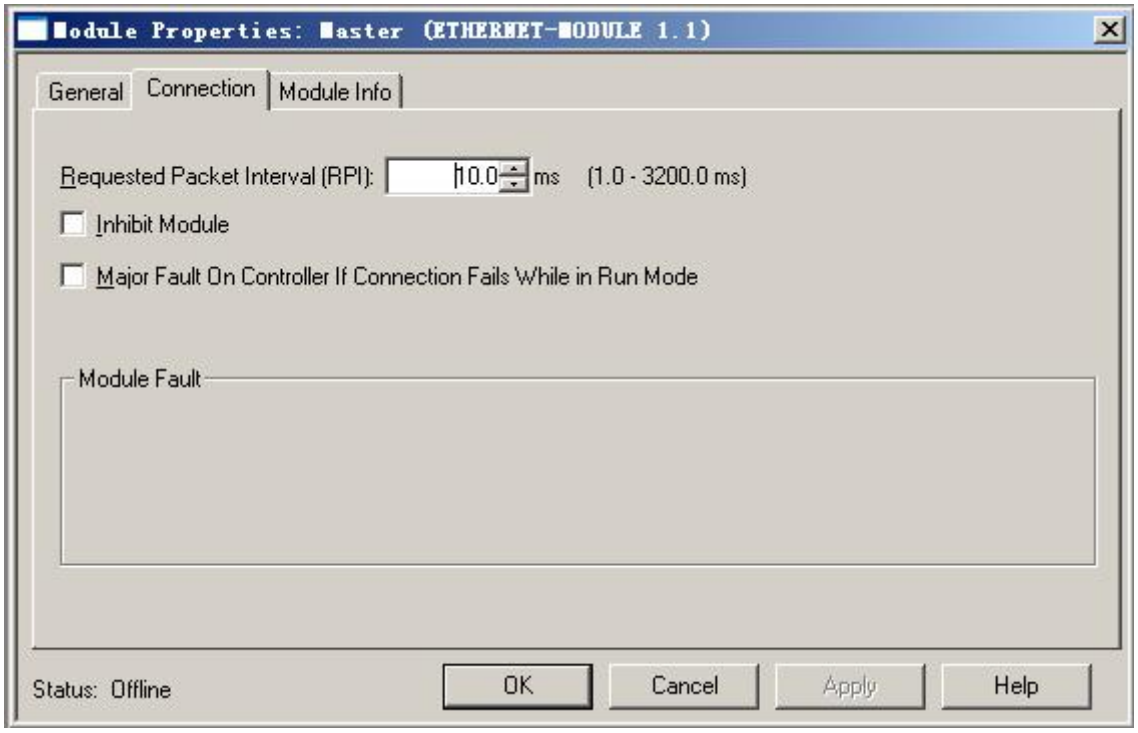
confirmation, this cannot be changed. If you want to change data types, you can create a new module.

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)

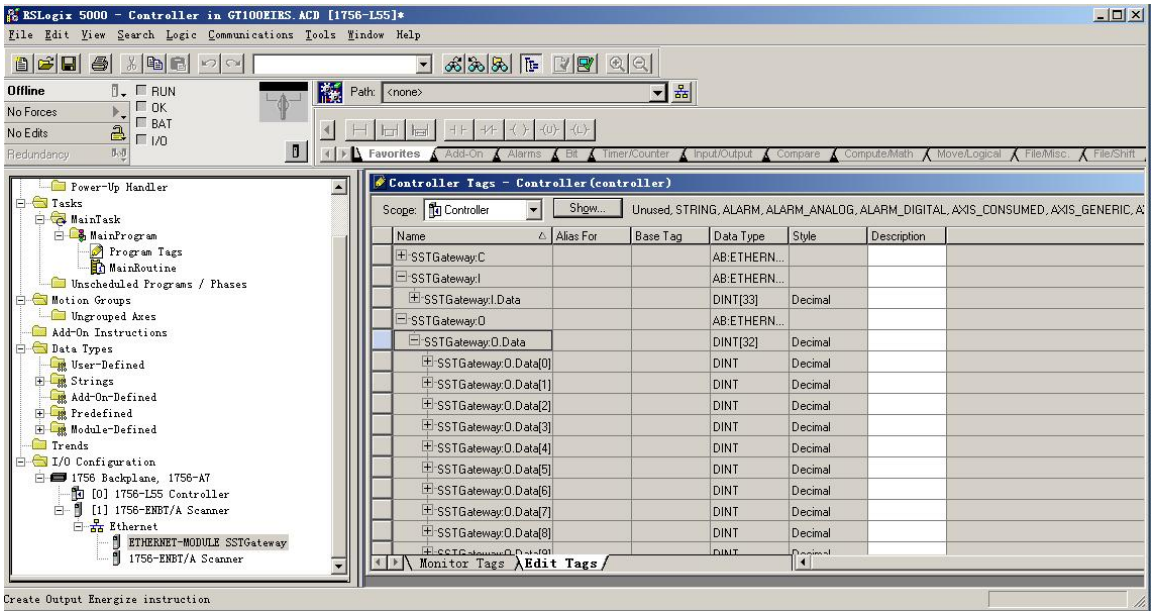
Connection Parameters: Set Connection parameters during communication. Please refer to chapter 7

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:

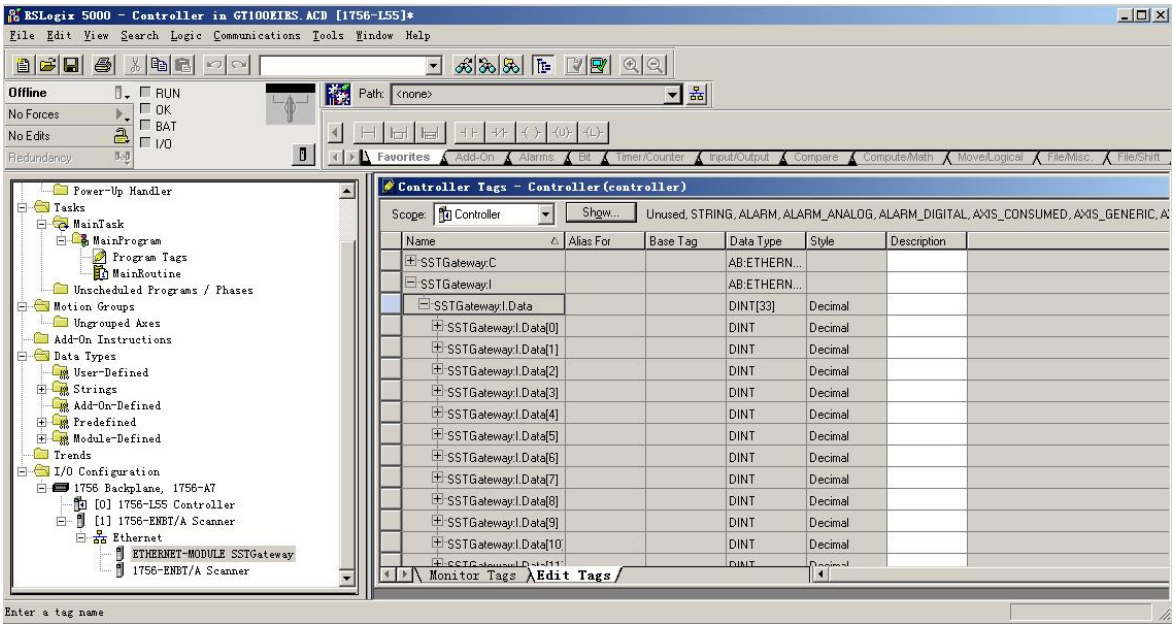


After setting this interval, click "OK" to save. Double click "Controller Tags", unfold "SSTGateway: O", as shown below:



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:

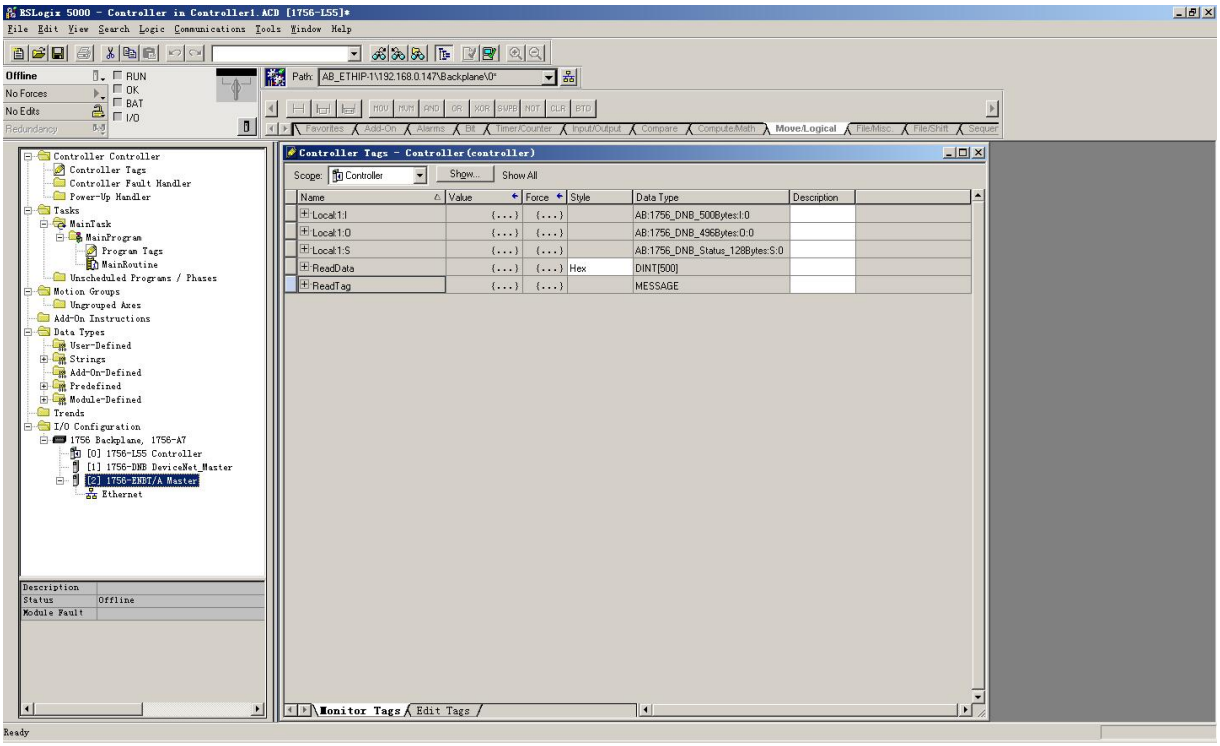


In the above picture, the first 4 bytes of SSTGateway: I. Data [0] are the status bytes. SSTGateway:I.Data [1] ~SSTGateway: I. Data [32] are the input data from the SST Gateway.

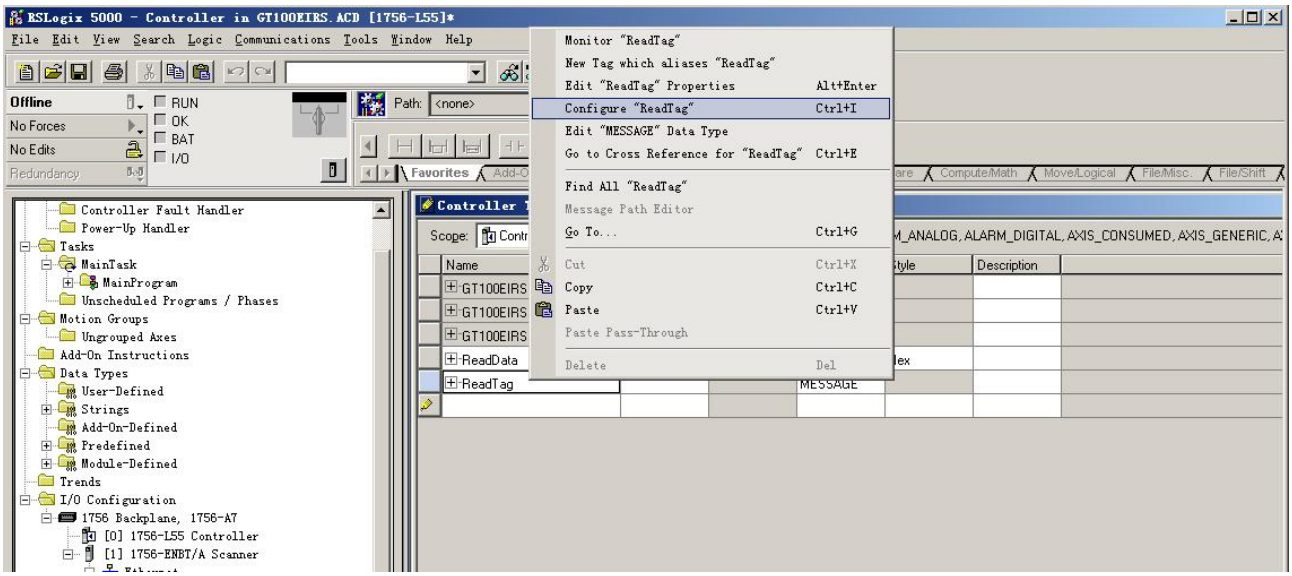
8.2 Read/Write Data by MSG

8.2.1 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]".

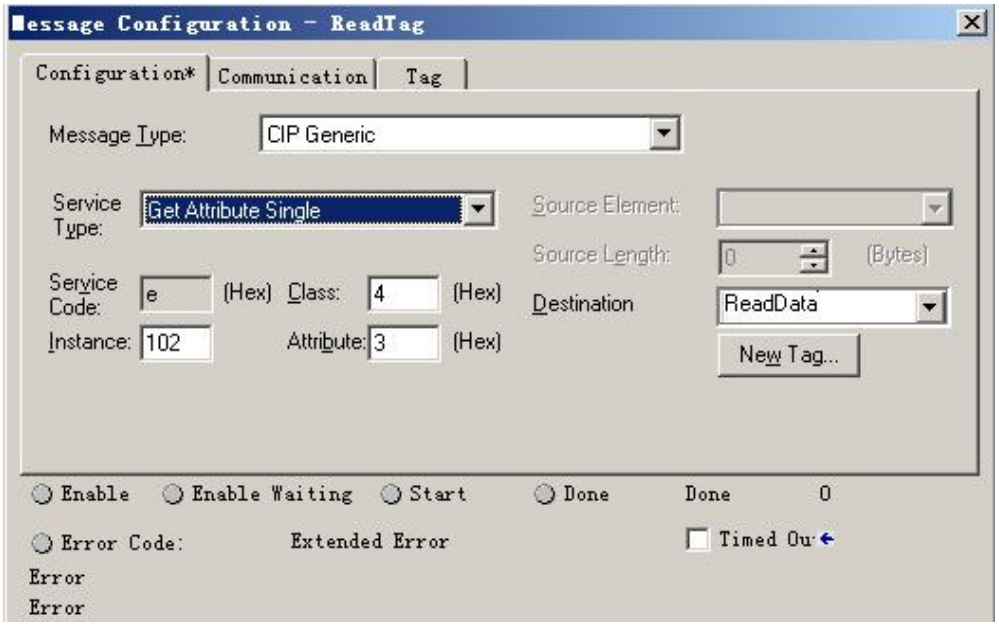


Right click "ReadTag", select "Configure "ReadTag":



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

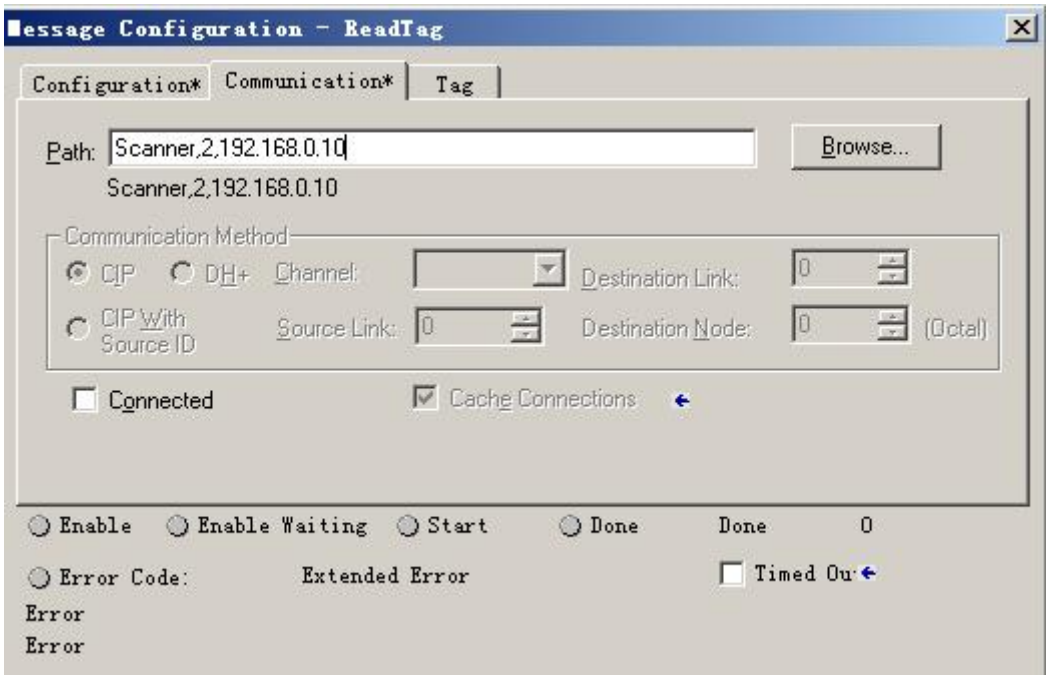
- **Message Type**: CIP Generic
- **Service Type**: Select "Get Attribute Single", now, relevant service code will become "e (Hex)"
- **Class**: 4 (Hex)
- **Instance**: Please refer to chapter 7 EtherNet/IP Connection Parameters Set
- **Attribute**: 3 (Hex)
- **Destination**: Select "ReadData" label, now, the data that has been received will be saved in this tag



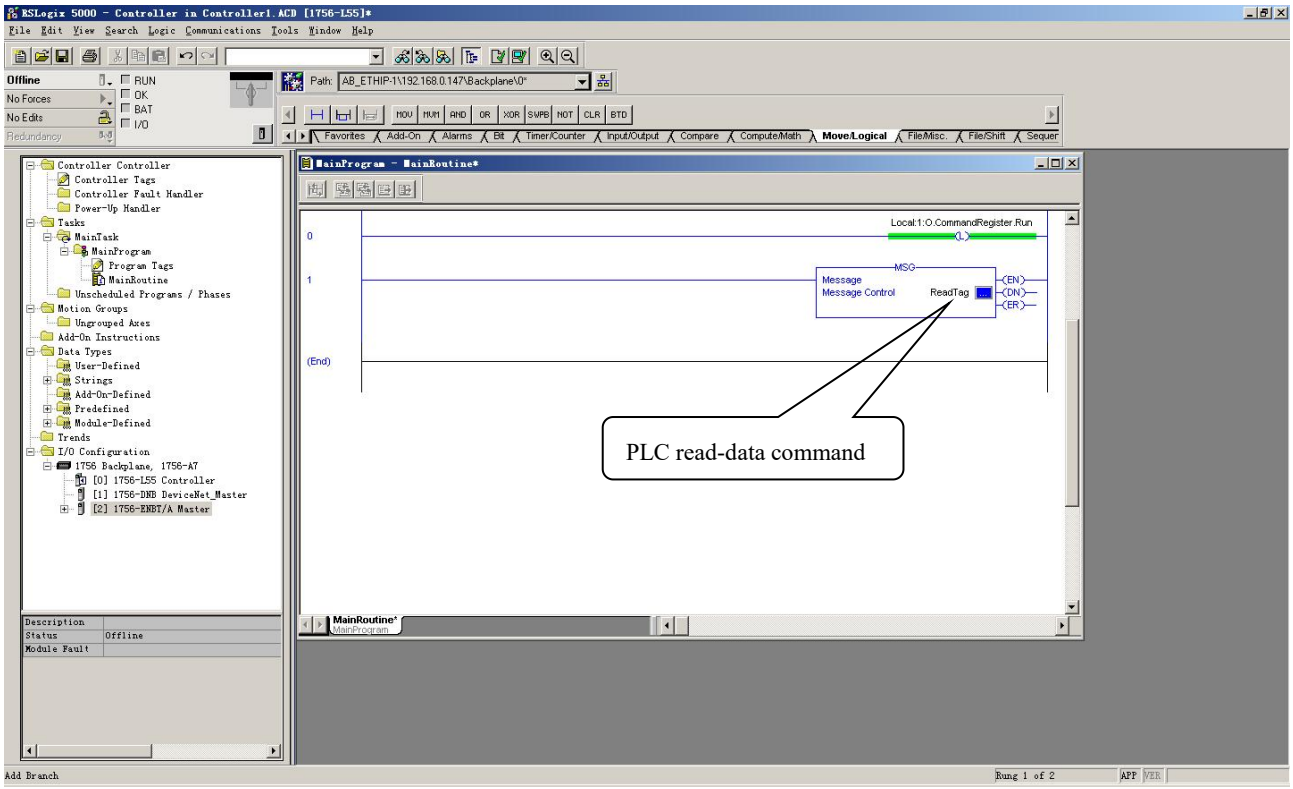
Choose "Communication" label, input the relevant path of connecting EtherNet/IP adapter in the blank space

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.



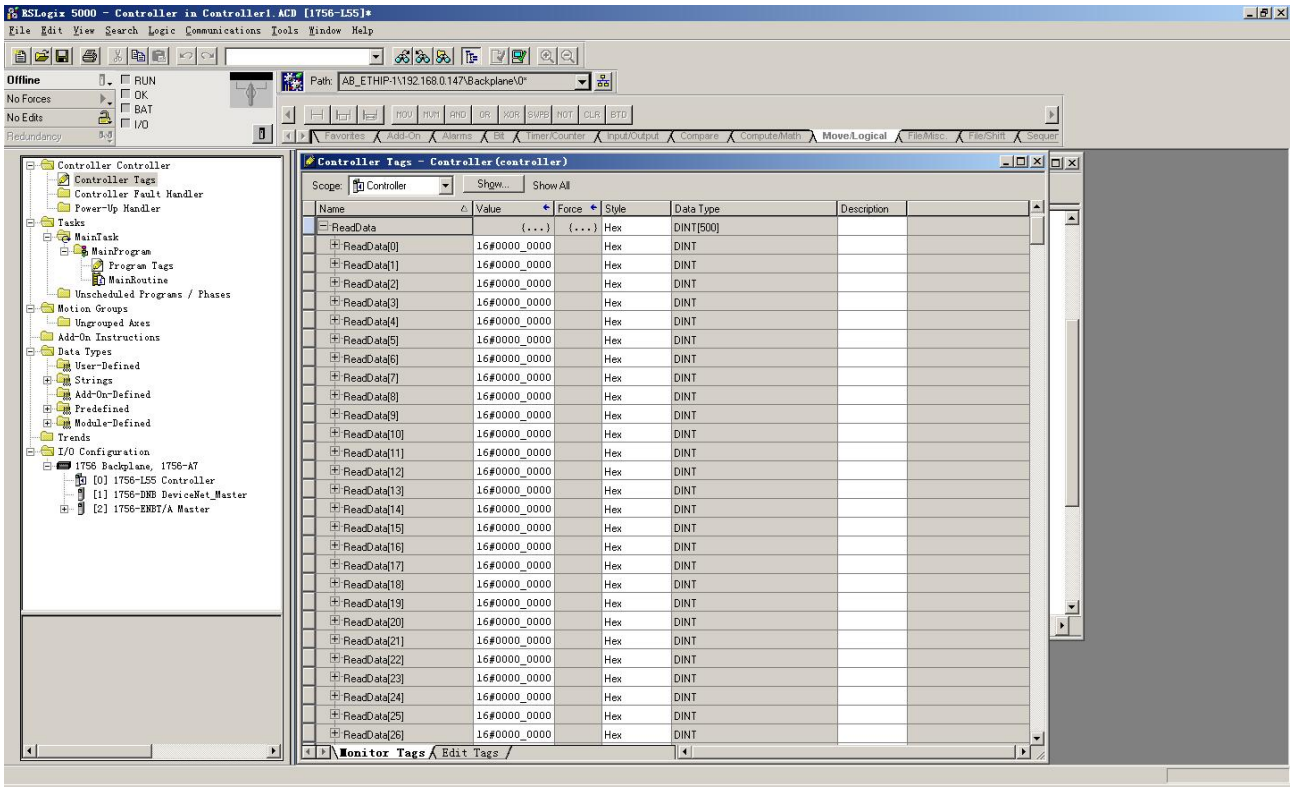
Add a "MSG" command in "MainRoutine" under the "MainProgram" and choose "ReadTag" as "Message Control", as shown below:



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.

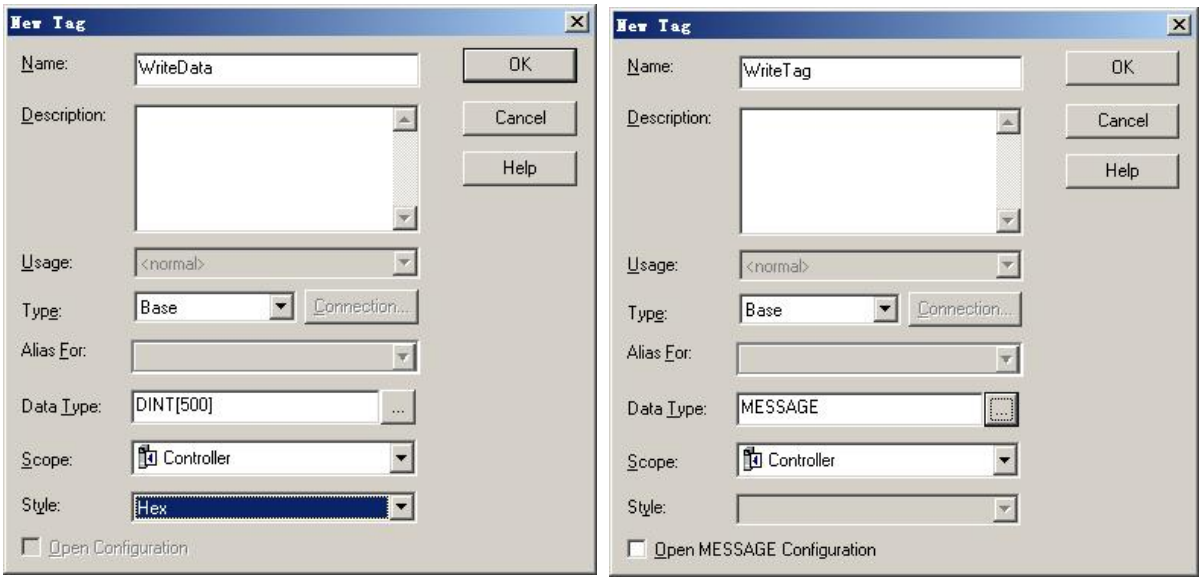
Download the program to the PLC and set PLC into the "Online" state.

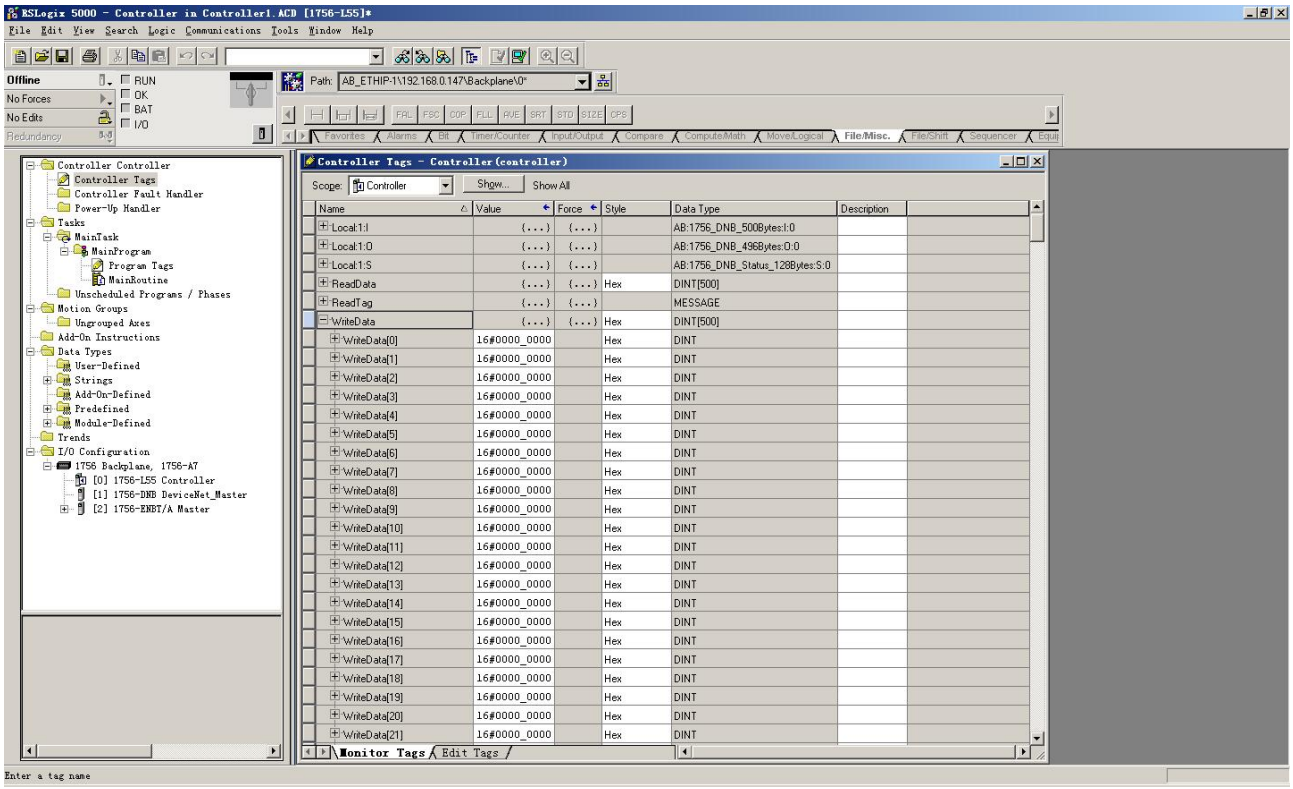
Click "Control Tags" and select "Monitor Tags", unfold "ReadData", you will see that PLC can read the data from EtherNet/IP adapter SST Gateway.



8.2.2 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]":

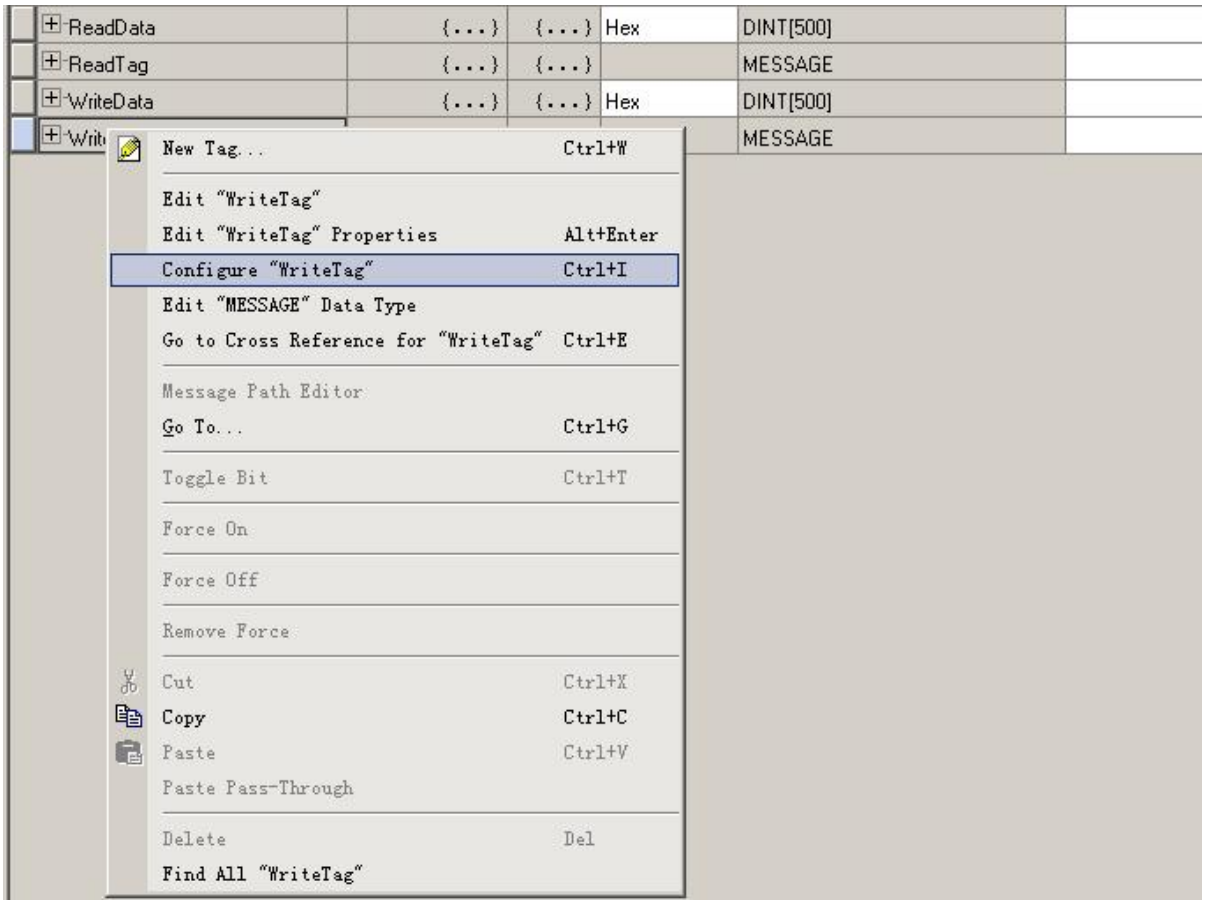




Enter the "Monitor Tags" interface. input some data beginning from address WriteData[0] in the "WriteData" tag.

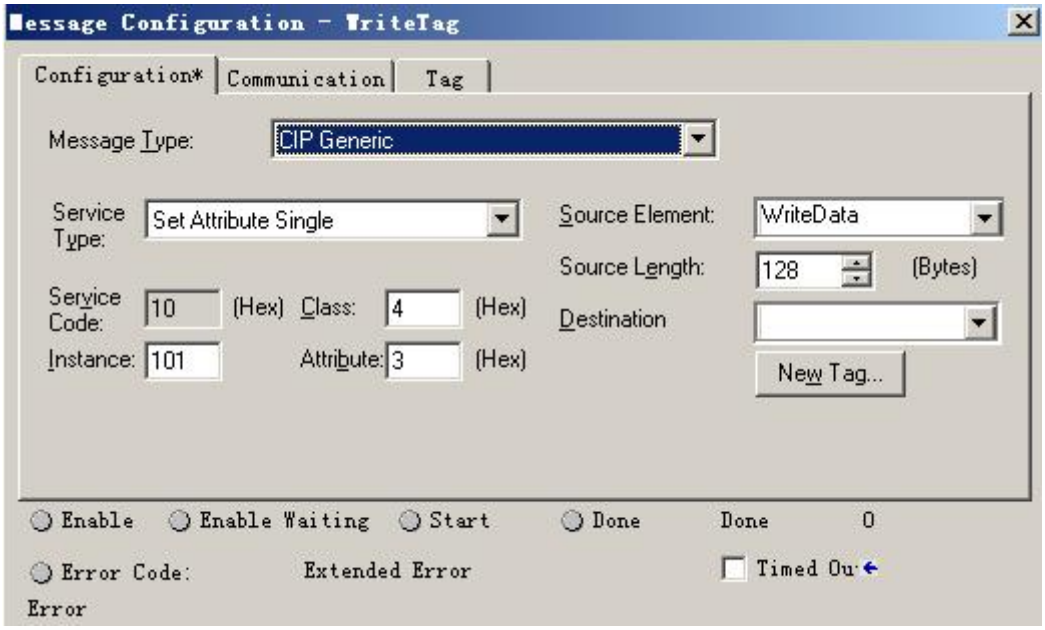
There, data will be outputted to SST Gateway.

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

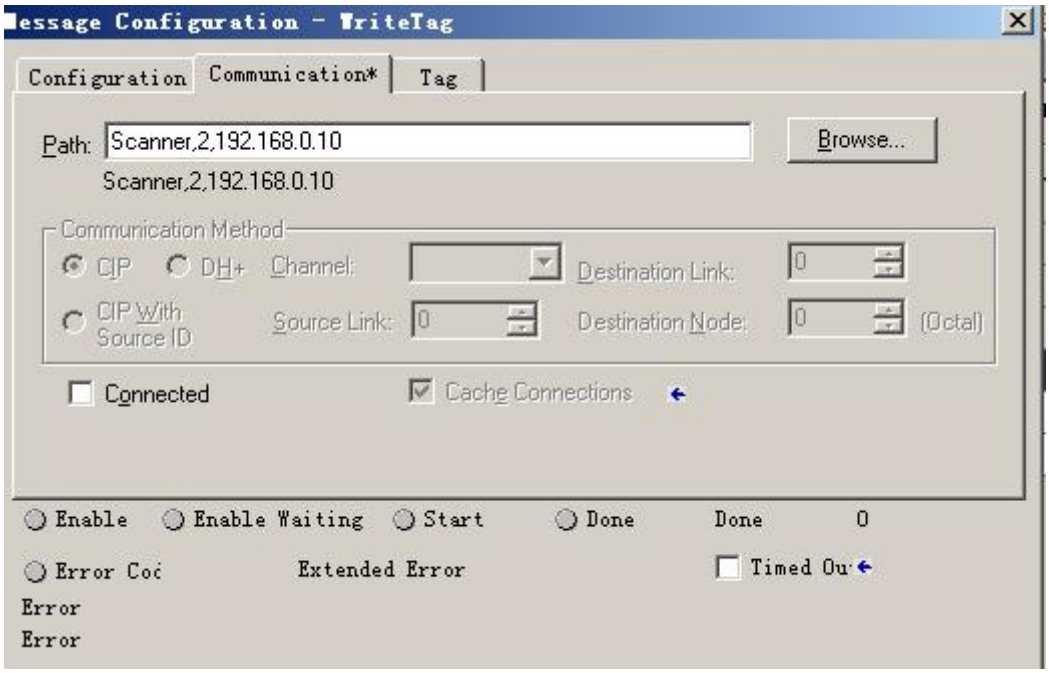


In the new pop-up window, there are variables that need configuration as shown below:

- **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 7 EtherNet/IP Connection Parameters Set
- **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



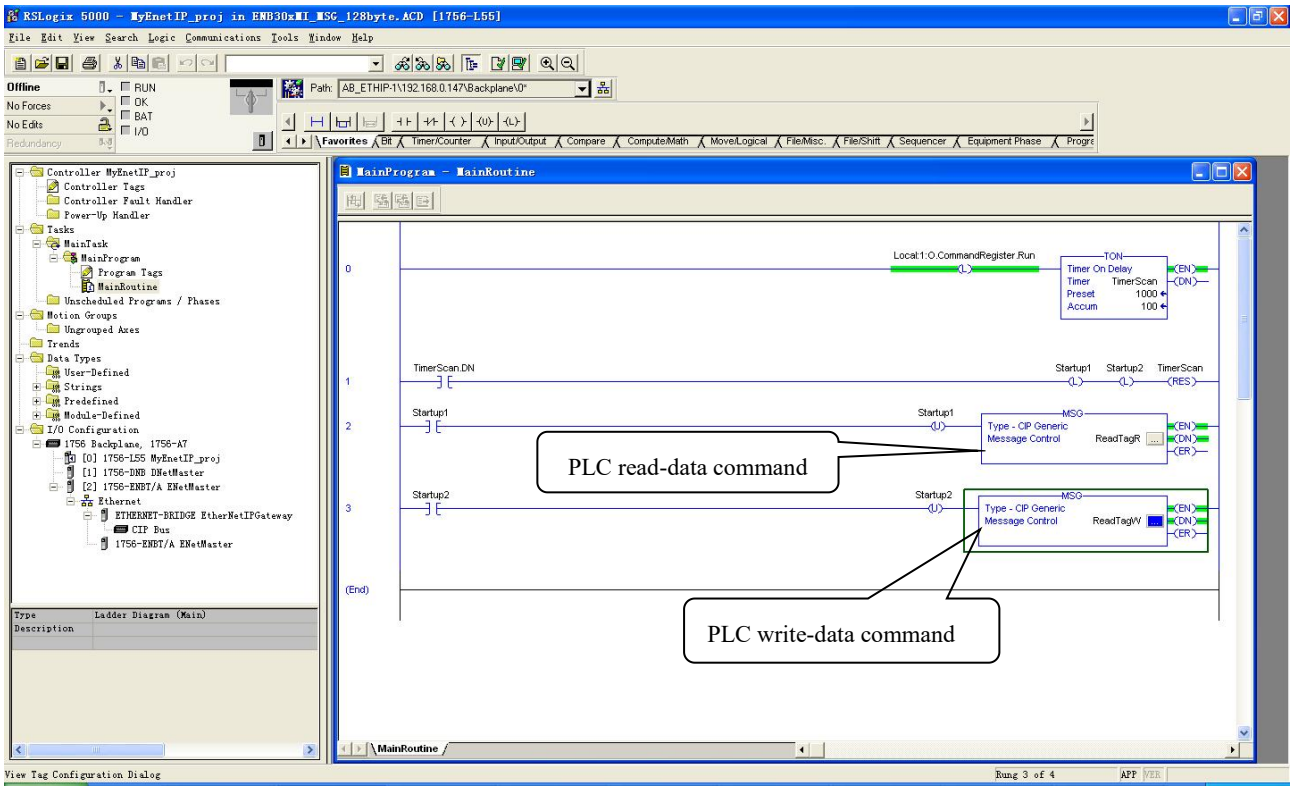
Choose "Communication" label, input the relevant path of connecting EtherNet/IP adapter in the blank space behind the Path, the path format is: EthetNet IP hostname, EtherNet/IP scanner slot No., IP address of EtherNet/IP adapter, after setting the path, click "Apply", "Confirm". As is shown below:



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).