

# HART to PROFIBUS DP/MODBUS Gateway GT200-HT-DP

## User Manual

V 1.5

Rev A



*SST Automation*

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## **Important Information**

### **Warning**

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# **GT200-HT-DP** **HART to PROFIBUS DP/MODBUS Gateway**

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# 1 Product Overview

## 1.1 Product Function

The GT200-HT-DP is a gateway that provide a seamless connection between HART and PROFIBUS DP or Modbus. At the HART side the gateway can be configured as a primary master or as the secondary master as well as acts as a slave at the PROFIBUS DP or Modbus side. The GT200-HT-DP's PROFIBUS DP and Modbus cannot work simultaneously.

## 1.2 Product Features

- PROFIBUS function: Supports the interconnection between HART and PROFIBUS DP.
- Powerful Serial function: Support the interconnection between HART and Modbus, also support transparent transmission between HART and serial port.
- Multi debugging functions: It can display the exchanging data, and diagnosis the HART command

## 1.3 Technical Specifications

- [1] Used as a primary or the secondary HART master.
- [2] Supports one HART-channel, under multi-point mode, support connecting at most 13 HART slaves with gateway internal resistor and support connecting 15 HART slaves with an external resistor (250Ω).
- [3] Supports single-point and multi-point mode at the HART side.
- [4] Under single-point mode, support data burst operation.
- [5] Supports all commands of the HART protocol.
- [6] Each HART command can be configured for change-of-state output, polling output, initialization output or disable output.
- [7] Supports up to 128 HART commands, HART output data buffer is up to 1000 bytes, and the input data buffer is up to 1600 bytes.

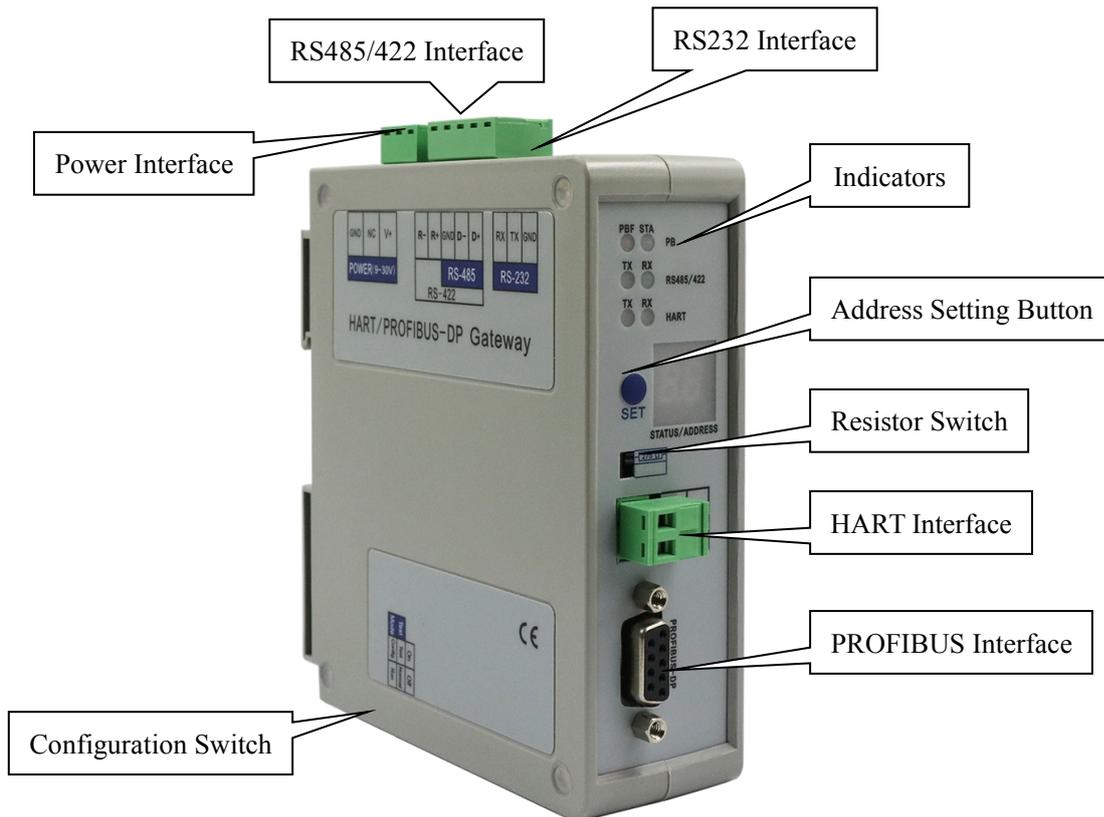
- [8] Supports an internal or external HART sampling resistor.
- [9] Supports PROFIBUS DP V0.
- [10] Adaptive baud rate on PROFIBUS (9600 bit/s ~ 12 Mbit/s).
- [11] PROFIBUS DP data: output bytes ≤ 244 bytes, input bytes ≤ 244bytes.
- [12] The serial port can be configured as Modbus slave, supports function code: 03H, 04H, 06H, 10H.
- [13] Modbus slave supports RTU and ASCII mode.
- [14] The serial port can be configured as universal mode, and achieve transparent data transmission with HART slave devices.
- [15] Power: 24VDC (9V~30V), 80mA(24VDC).
- [16] Operating Temp: -4°F to 140°F (-20°C to 60 °C), Rel. Humidity: 5%-95% ( non-condensing).
- [17] External dimension(W\*H\*D): 1.6in\*4.9in\*4.3in (40mm\* 125mm \* 110mm).
- [18] Installation: 1.38in (35mm) DIN RAIL.
- [19] Protection Level: IP20.

## 1.4 Revision History

Revision	Date	Chapter	Description
V1.5	7/27/2021	ALL	New release
V1.5, Rev A	8/28/2021	ALL	New chapter 4. Revised chapter 5, 6 and 7.

## 2 Hardware Descriptions

### 2.1 Product Appearance



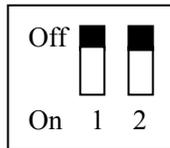
Note: This picture is for reference only. Product appearance should refer to the real object.

### 2.2 Indicators

Indicator LED	State	Description
PBF	Always Red	PROFIBUS DP communication failed
	OFF	Communication is normal
STA	Green Blinking	PROFIBUS DP bus data transmitting
	OFF	No data communication
TX	Blinking	HART data sending
	OFF	No data sending
RX	Blinking	HART data receiving
	OFF	No data receiving

## 2.3 Configuration Switch

The configuration switch is located at the bottom of product, bit 1 is the debugging bit and bit 2 is the configuration bit.



Debugging (Bit 1)	Configuration (Bit 2)	Mode
Off	Off	Run mode
Off	On	Configuration Mode
On	Off	Debug mode
On	On	Configuration Mode

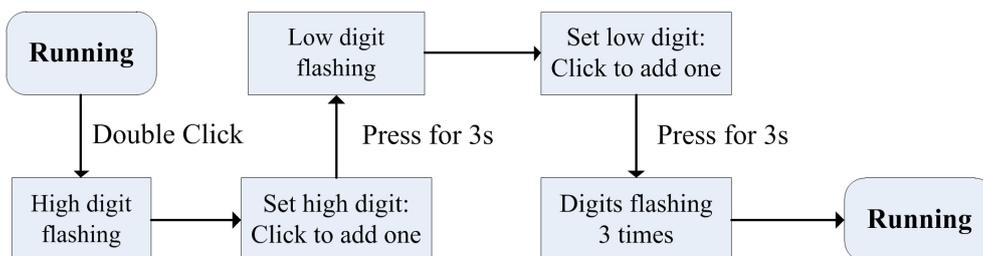
**Note:**

1. To apply the mode, restart the gateway.
2. In debug mode, if the GT200-HT-DP’s serial interface is configured to “Modbus Slave” or “Universal Mode”, it will force the RS-485 interface to be the communication port and the RS-232 interface as debugging interface. If the GT200-HT-DP is configured as PROFIBUS DP slave, it has no effects.

## 2.4 Address Setting Button

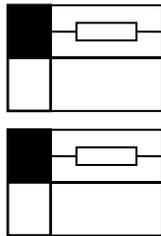
The address setting button is located on the front panel of the GT200-HT-DP. It’s used to set the PROFIBUS DP/Modbus address (range: 0 to 99).

**Note:** If there is no actions taken for more than 10 seconds during the address setting process, the GT200-HT-DP will restore the previous address.



## 2.5 Resistor Switch

The GT200-HT-DP has an internal series resistor (270 Ohm, 2 W) required for the HART channel, that 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), allowing the gateway to be connected to up to 15 HART instruments.

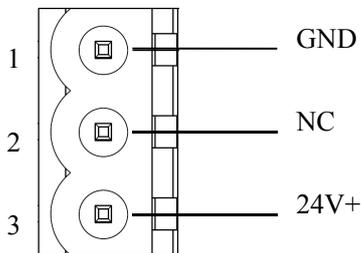


Switch to ON, using the internal series resistor

Switch to OFF, using the external series resistor

## 2.6 Interface

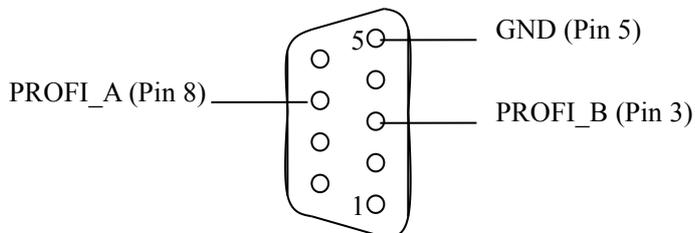
### 2.6.1 Power Interface



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

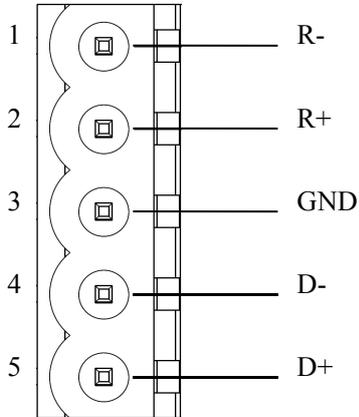
### 2.6.2 PROFIBUS DP interface

The PROFIBUS DP interface is a standard DB9 connector.



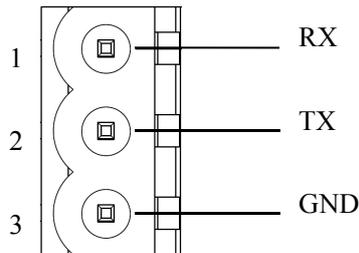
Pin	Description
3	PROFI_B, Data+
5	GND
8	PROFI_A, Data-

### 2.6.3 RS-485/422 Interface



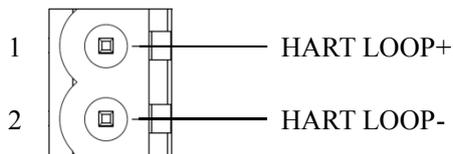
Pin	Description
1	R-, RS-422 Receive-
2	R+, RS-422 Receive+
3	GND
4	D-, RS-485/422 Transmit-
5	D+, RS-485/422 Transmit+

### 2.6.4 RS-232 Interface



Pin	Description
1	RX, connected to user's device RS-232 TX
2	TX, connected to user's device RS-232 RX
3	GND, connected to user's device RS-232 GND

### 2.6.5 HART Interface

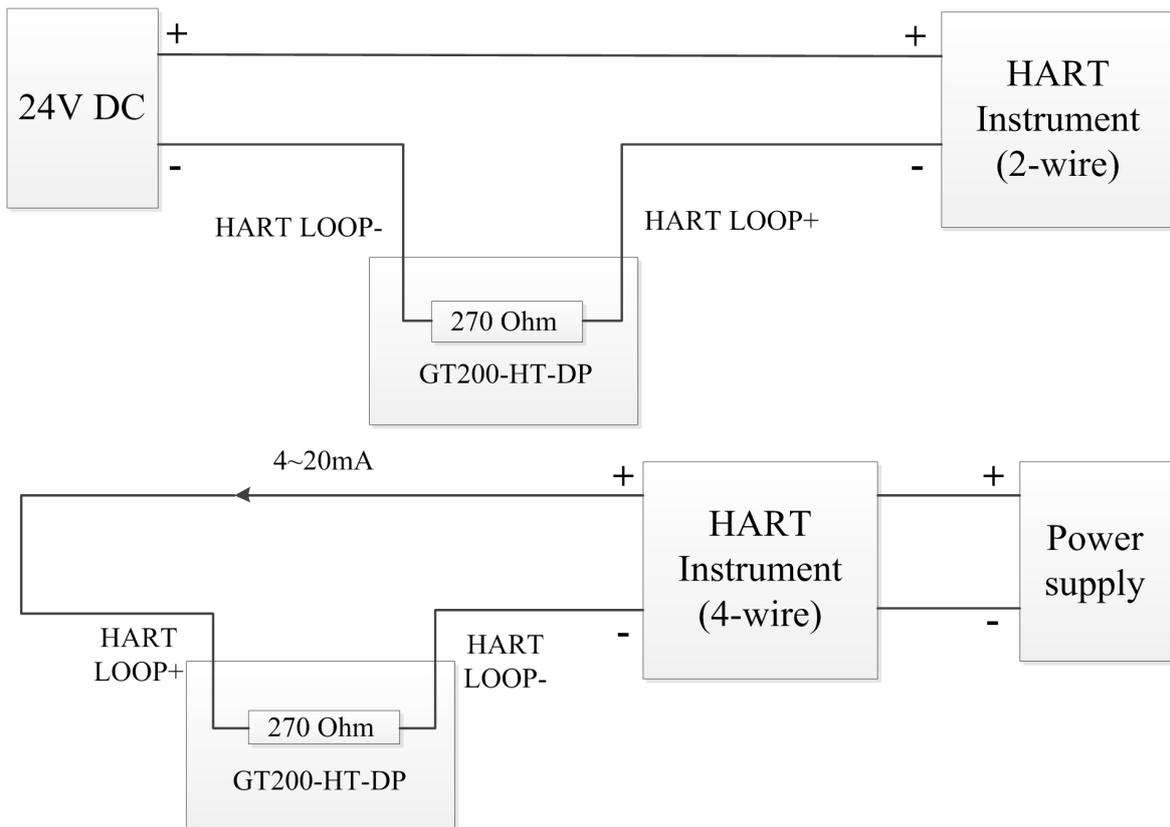


Pin	Description
1	Connected to HART signal +
2	Connected to HART signal -
3	NC (Not connected)

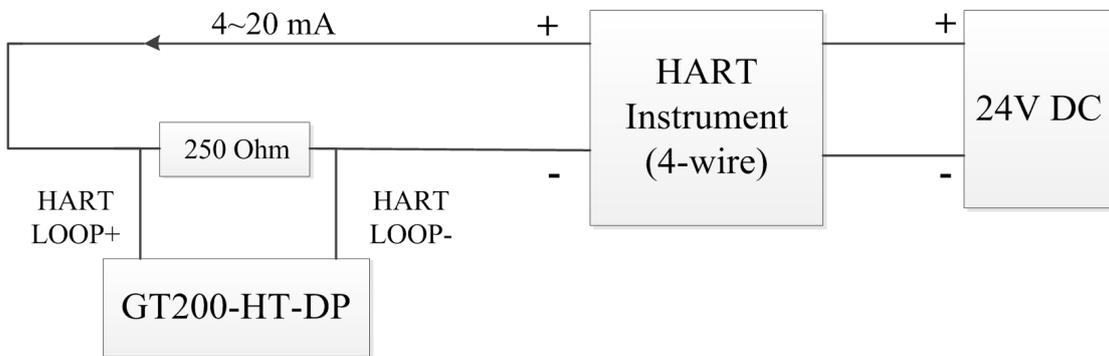
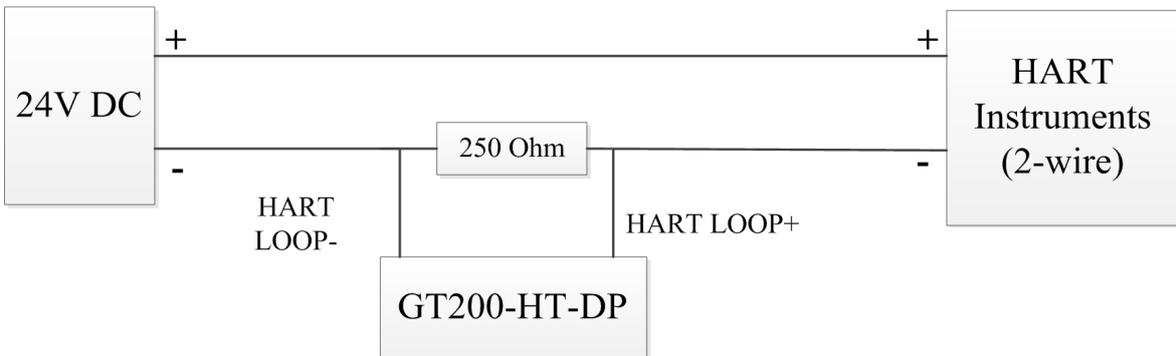
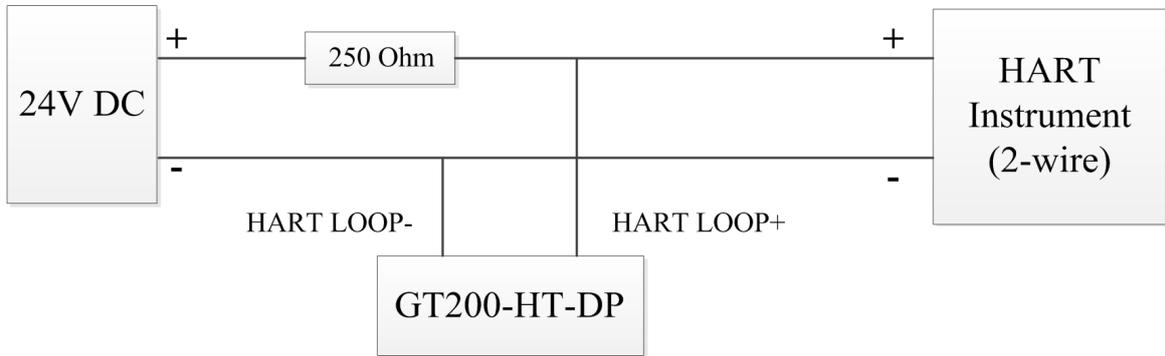
## 2.7 Topology of GT200-HT-DP and HART Instruments

**Notes:**

1. It is recommended to use separate power supplies 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 an empty node or useless commands in the SST-HT-CFG software.
3. If there are two or more HART instruments connected in the same network, their HART LOOP wires should be connected parallel with others.



When using the internal resistor



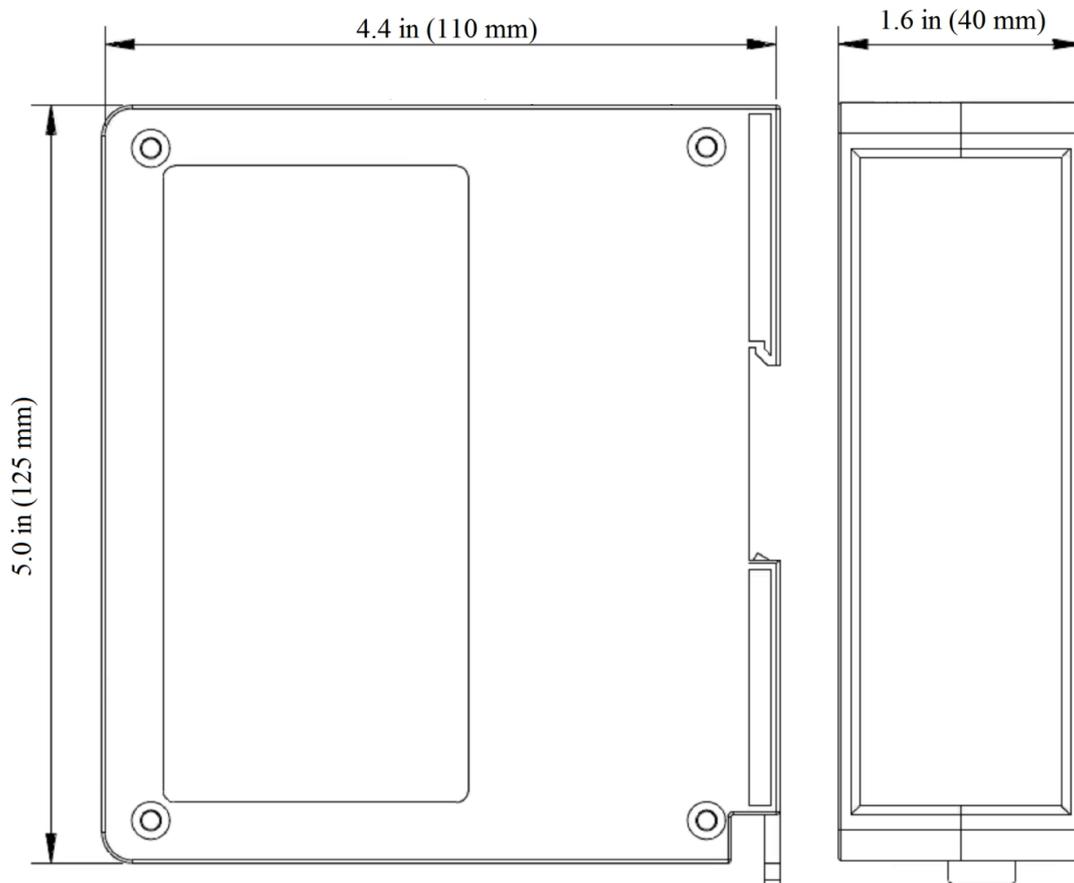
Options when using an external resistor

## 3 Hardware Installation

### 3.1 Machine Dimension

Size (width \* height \* depth):

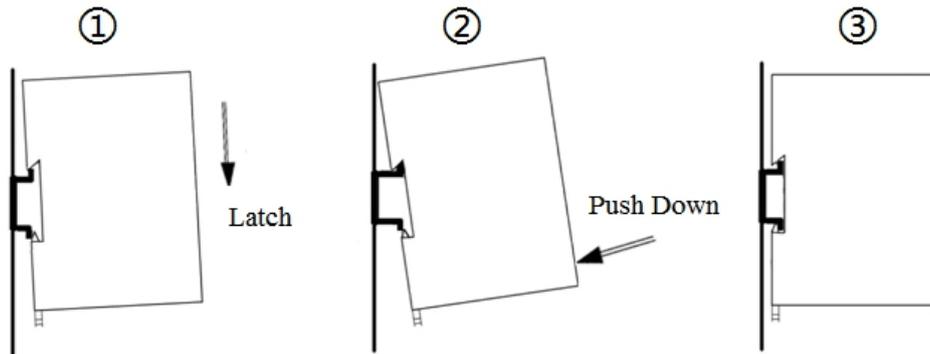
1.6 in \* 5.0 in 4.4 in (40 mm \* 125 mm \* 110 mm)



## 3.2 Installation Method

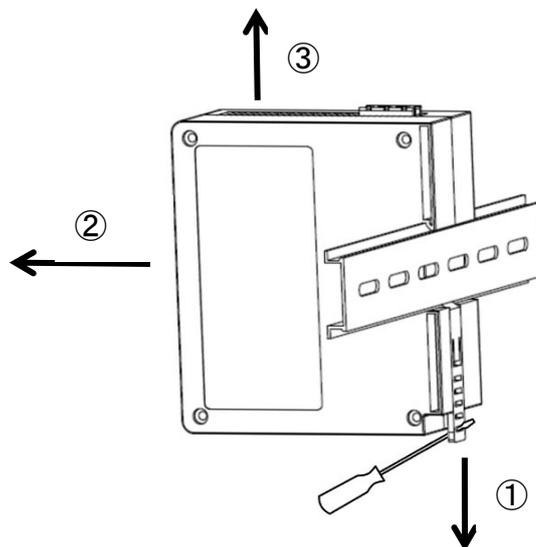
Using 1.38 in (35mm) DIN RAIL.

### 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 the gateway.



## 4 Quick Start Guide

The following steps will help in quickly setting up communication between HART and PROFIBUS or Modbus.

For more details please see [Chapter 5](#).

### 4.1 Connection

1. Connect the RS-232 interface of gateway and the serial port of the computer with the serial cable. For wiring methods refer to [chapter 2.6.4](#).
2. If you want the GT200-HT-DP to act as a PROFIBUS DP slave, connect the PROFIBUS DP PLC or control system to the gateway. It is suggested to use the standard PROFIBUS DP connector shown in [chapter 2.6.2](#).  
If you want the GT200-HT-DP to act as a Modbus slave, connect the Modbus master to the gateway, refer to chapter [2.6.3](#) or [2.6.4](#). The communication interface can be set in the SST-HT-CFG software.
3. Connect the HART device(s) to the HART interface, refer to the topology in [chapter 2.7](#).
4. Connect the GT200-HT-DP with the power supply, refer to [chapter 2.6.1](#). Power on the GT200-HT-DP. Check the LED display and ensure that it shows “CF” indicating that the gateway is in the configuration mode. Refer to [chapter 2.4](#).

### 4.2 Configuration by SST-HT-CFG Software

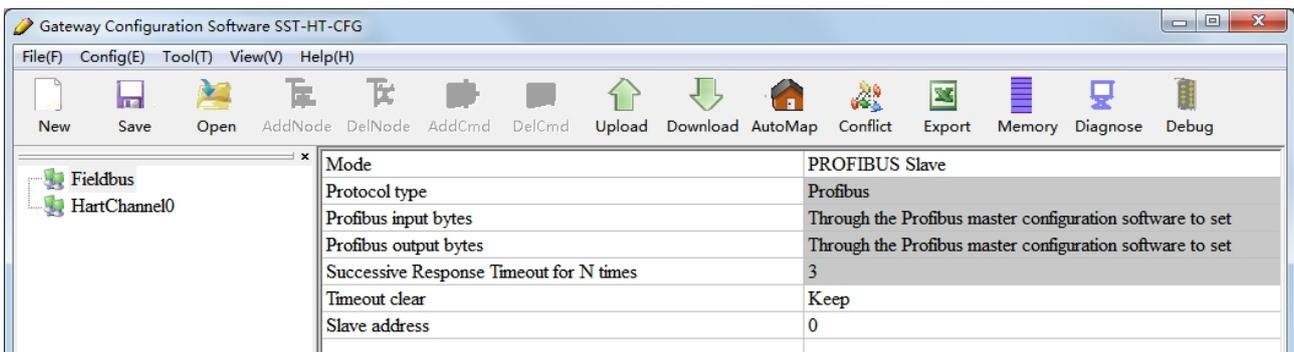
1. Download, install, and run the configuration software, SST-HT-CFG, which can be found on the GT200-HT-DP product page at [sstcomm.com](http://sstcomm.com).
2. Turn the configuration switch to “1-OFF 2-ON”, to set the gateway to configuration mode.
3. Click the upload button on the tool bar. The Upload Configuration will pop up, in this window select the GT200-HT-DP gateway you wish to configure and click “Upload.”

Note: This will upload the default configuration in the software, this is also how you can edit your configuration after downloading your configuration to the gateway. If you cannot find the gateway, check your connections and network settings.

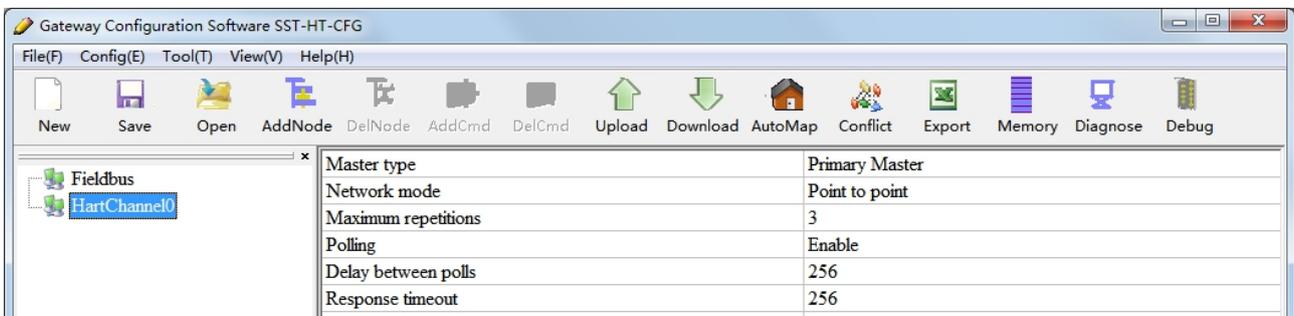
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- Click “Field Bus” at left. Configure the parameters to meet the needs of your project. The mode will determine the behavior of the gateway.



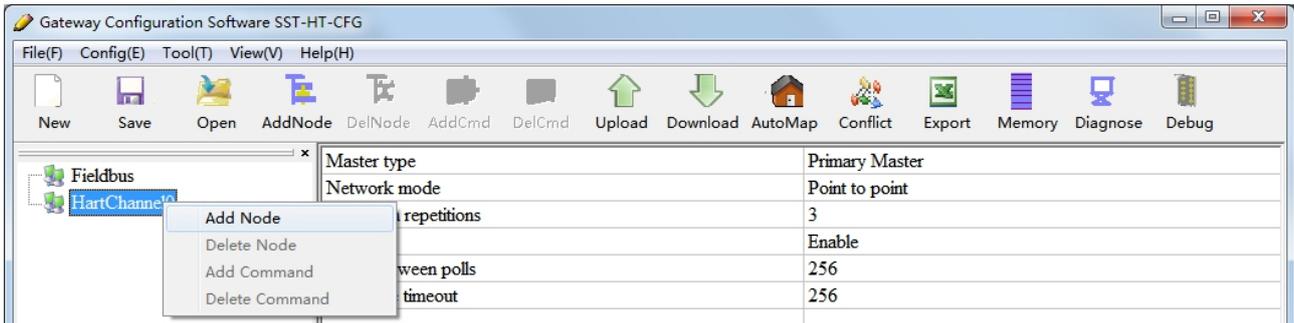
- Click “HartChannel0” at left. Configure the parameters located in the Configuration Section to meet the needs of your project.



- Right Click “HartChannel0” and Select “Add Node”. Click the newly created node and configure the Slave parameters.

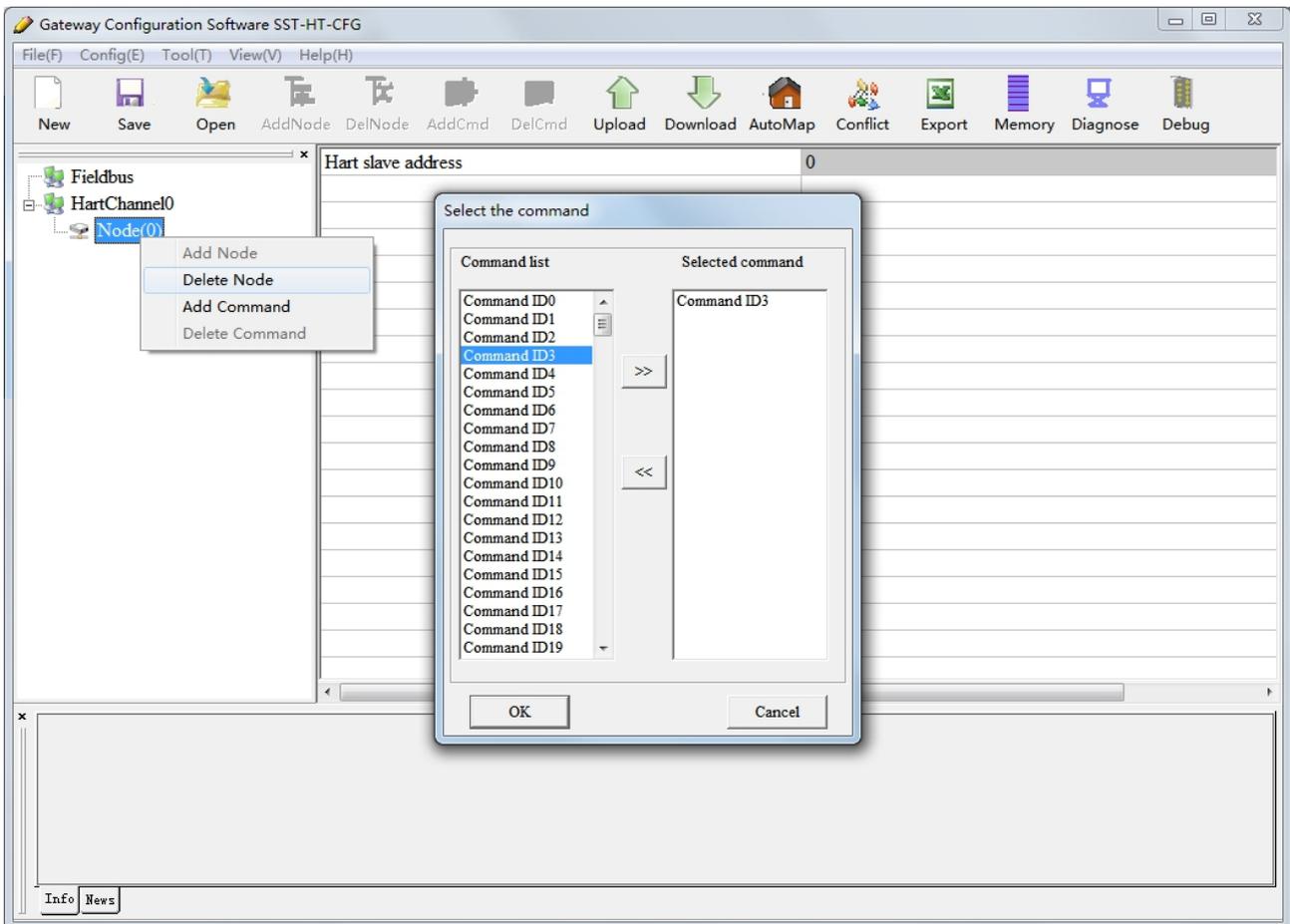
**Note:** Node address is automatically set to 0 in point to point mode. In multi-drop mode, the node address can be 1 to 15.

# GT200-HT-DP HART to PROFIBUS DP/MODBUS Gateway User Manual



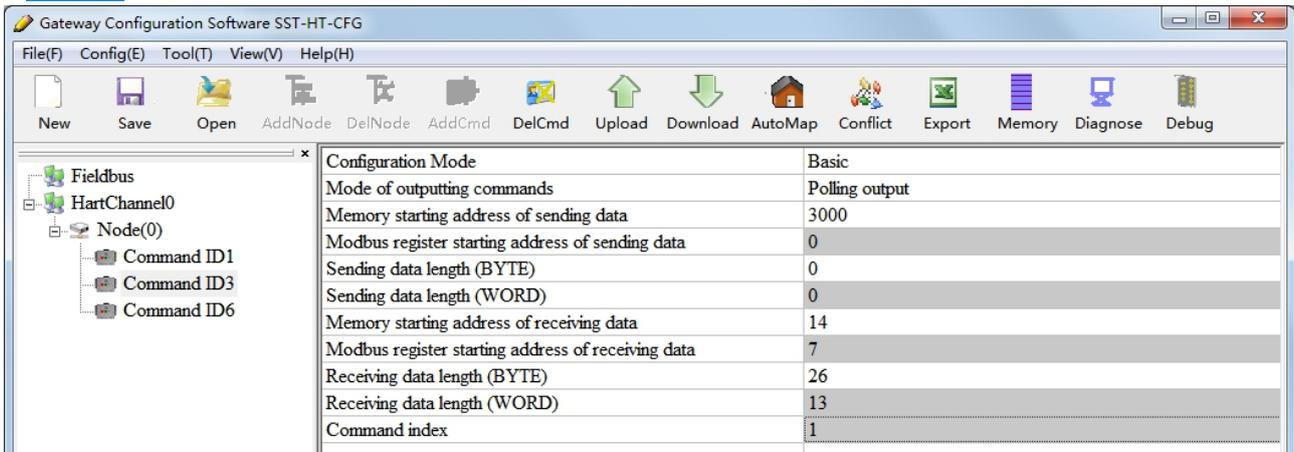
7. Right Click “Node(#)”. Select “Add Command”. In the select Command window, double click the command you wish to add.

**Note:** Command 3 is usually used to read Primary, Secondary, Tertiary, and Quaternary Variables.



8. Click the Command you wish to configure and configure the parameters in the Configuration Section to meet the needs of your project.

# GT200-HT-DP HART to PROFIBUS DP/MODBUS Gateway User Manual

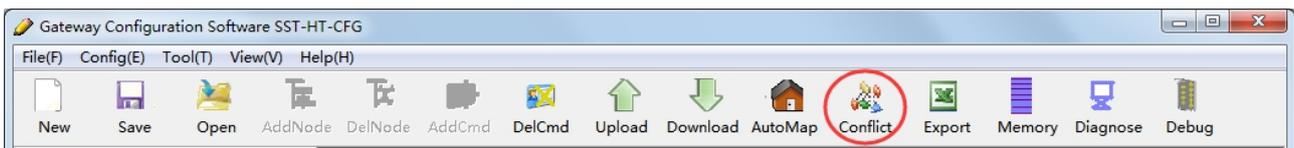


Note: The data can be filtered to display only the main variables using the Advanced Configuration Mode.

- Once the “Fieldbus”, “HartChannel0”, Node(s), and Command(s) are configured, click the “AutoMap” icon on the toolbar to map the HART data to the PROFIBUS DP or Modbus network.



- Check the mapping address in the Conflict Detection window to confirm that there is no conflict.



- Click “Download” to download your configurations into the GT200-HT-DP.

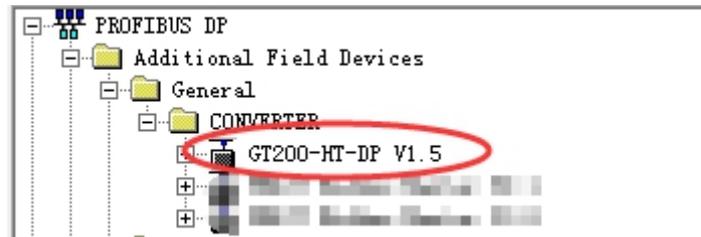


- Turn the configuration switch to “1-OFF 2-OFF” and restart the gateway.

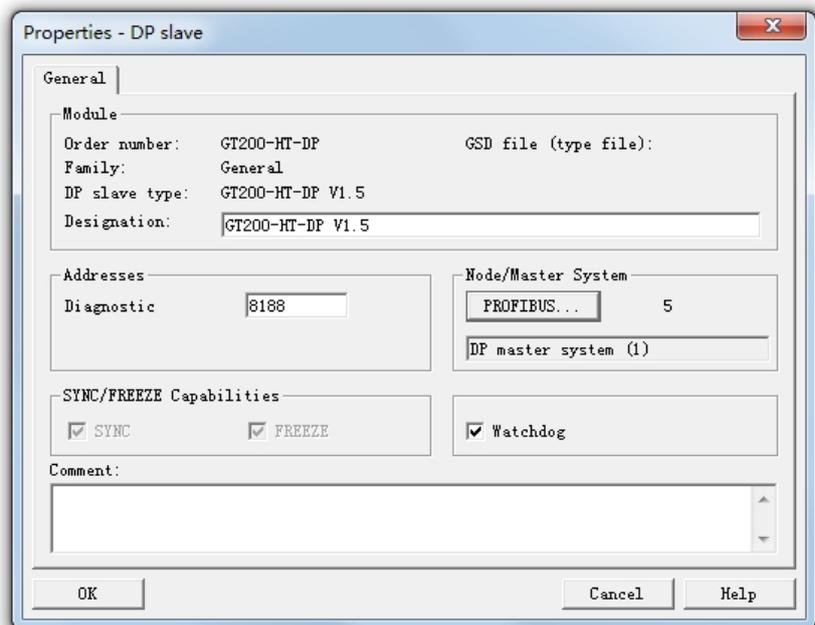
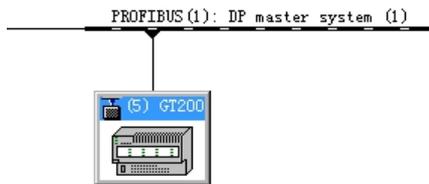
### 4.3 Configure PROFIBUS DP Modules

After finishing configuration in SST-HT-CFG software, the GT200-HT-DP should be configured into the PROFIBUS DP network. Take STEP7 for example.

1. Import the GSD file of GT200-HT-DP. (Download at [www.sstcomm.com](http://www.sstcomm.com)) Find the GT200-HT-DP device in the catalog.

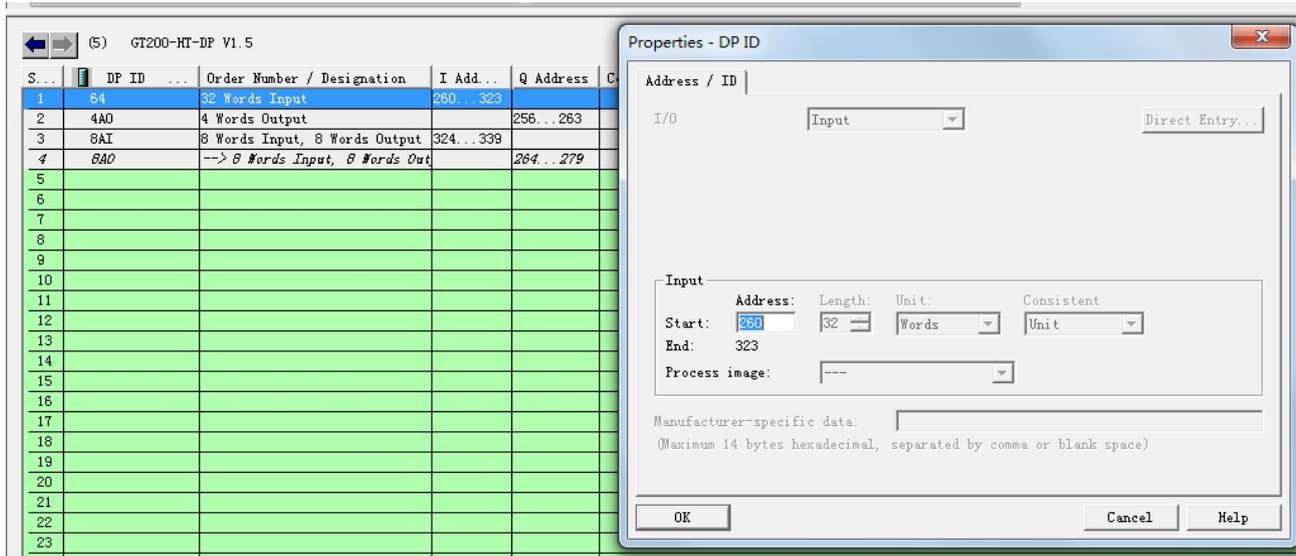


2. Add a GT200-HT-DP to the PROFIBUS DP bus. Set the same DP address that you have configured for GT200-HT-DP.



3. Add some modules for GT200-HT-DP and set the data address. For more details of PROFIBUS DP module, please see chapter 7.

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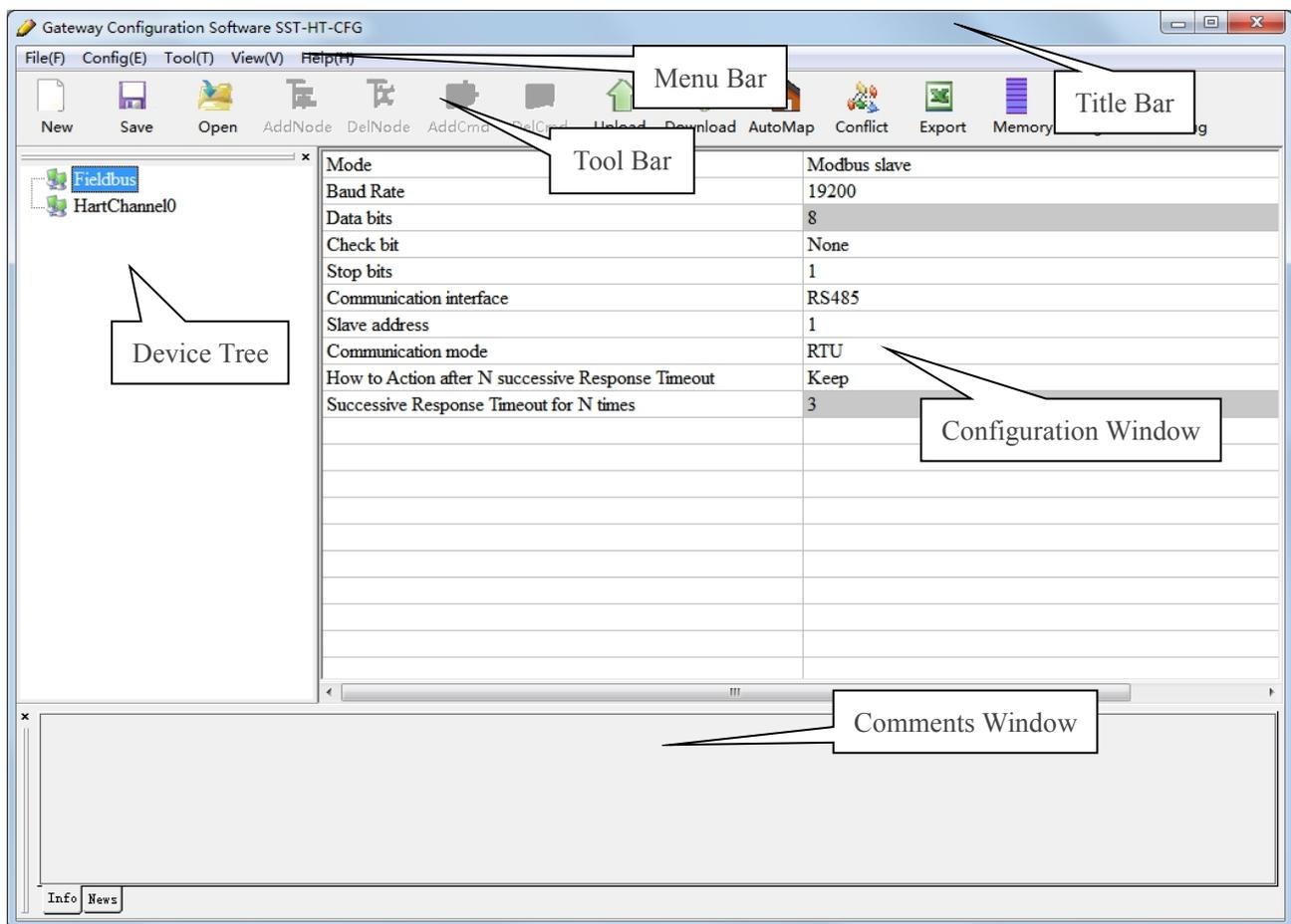
4. Compile and download the configuration.

## 5 SST-HT-DP Software Instructions

### 5.1 Software Interface Description

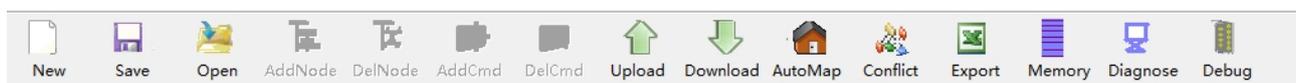
SST-HT-CFG is the configuring software based on the Windows platform, and is used to configure HART series products.

The following describes how to use the software, SST-HT-CFG, and configure the GT200-HT-DP. You may also read the software user manual to get more detailed information.



#### Tool Bar:

Toolbar interface is shown as follow:



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 New	New: Create a new configuration file
 Save	Save: Save the configuration file
 Open	Open: Open the configuration file
 AddNode	AddNode: Add a HART slave node
 DelNode	DelNode: Delete a HART slave node
 AddCmd	AddCmd: Add HART commands
 DelCmd	DelCmd: Delete a HART command
 Upload	Upload: Read the configuration information from the gateway
 Download	Download: Download the configuration file to the gateway
 AutoMap	AutoMap: Used to automatically calculate the mapped memory addresses to prevent conflict by each command
 Conflict	Conflict: To check whether there are conflicts with the configured commands in the gateway memory data buffer
 Export	Export: Output the current configuration to the local hard disk and save as an Excel spreadsheet form
 Memory	Memory: Show the internal data exchange of the gateway

# GT200-HT-DP HART to PROFIBUS DP/MODBUS Gateway

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Diagnose: Data monitor.

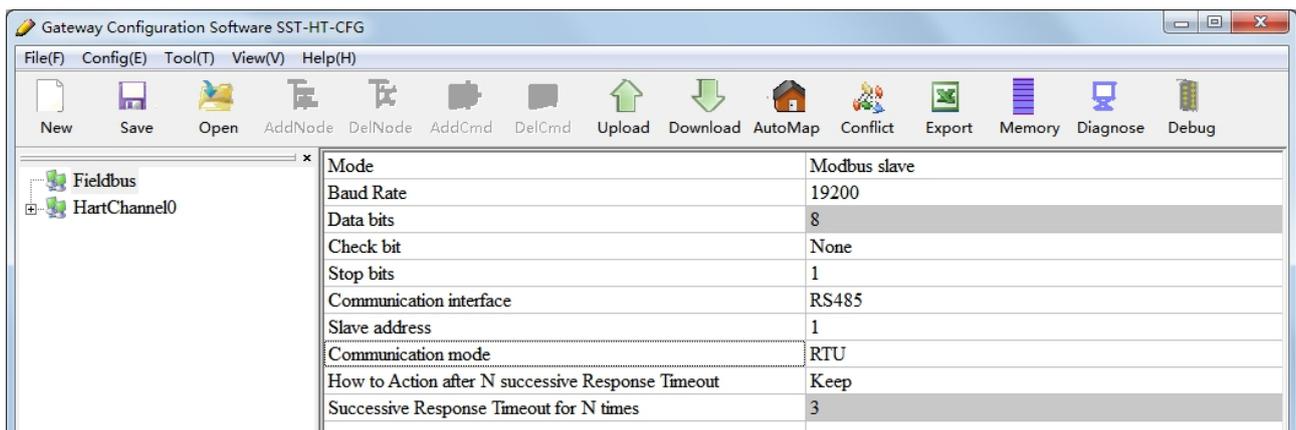


Debug: Send request frames to the HART channel and show the response information from HART channel.

## 5.3 Configure Fieldbus

### 5.3.1 Modbus Slave Mode

If you want to use the functionality of Modbus slave, click the “Fieldbus” in the tree view, select the mode as “Modbus slave” in the right configuration plate, and then press ENTER to confirm, you will see the interface as below:



**Baud rate:** 300, 600, 1200, 2400, 9600, 19200, 38400, 57600, 115200bps.

**Data bits:** 8.

**Parity:** None, Odd, Even, Mark, Space optional.

**Stop bits:** 1, 2.

**Communication mode:** RTU, ACSII.

**Slave address:** 0~247.

**Communication interface:** RS485, RS232 optional. When the serial needs to communicate with RS422, please choose “RS485”.

**Input data timeout clear/Keep:** When the HART commands exceed the no-reply times, this will determine whether or

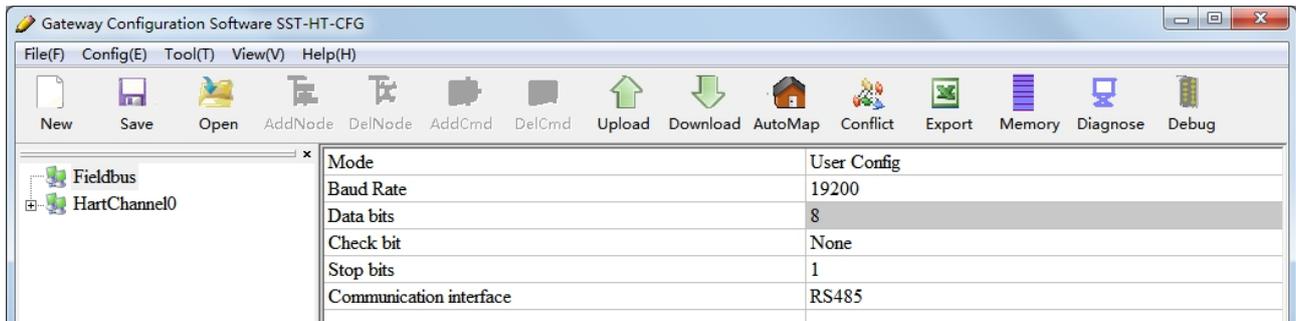
not to clear the HART input data buffer.

Timeout number: set the timeout/clear times.

### 5.3.2 Universal Mode (User Config)

The universal mode (transparent transmission mode) means that we can send a HART frame directly through the serial port (RS232/RS485/RS422) while the gateway will also send out the data received from the HART bus through serial port. During this process, the data does not change.

Click the “Fieldbus” in the tree view, select mode “Universal mode” in the right configuration plate, and then press ENTER to confirm, you will see the interface as below:

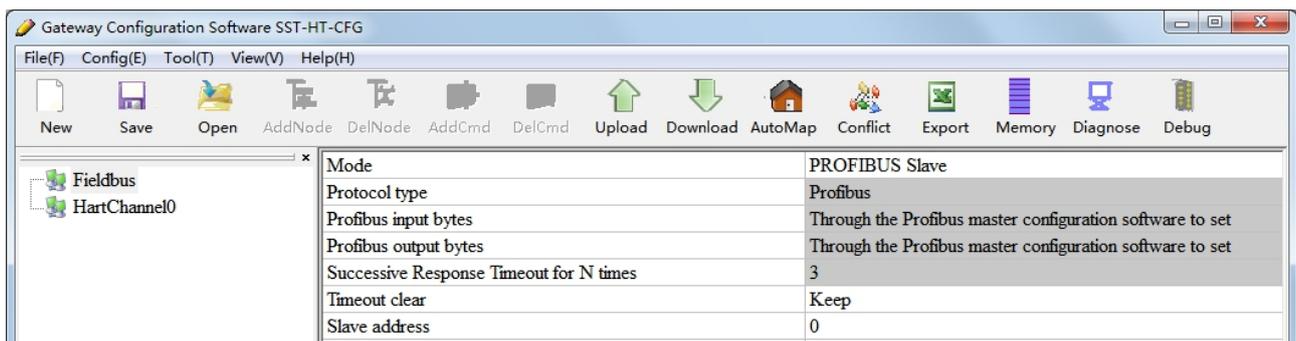


### 5.3.3 PROFIBUS Slave Mode

When the HART commands exceed the no-reply times, this will decide whether or not to clear the HART input data buffer.

Timeout number: set the timeout/clear times.

Click the “Fieldbus” in the tree view, select the mode as “PROFIBUS slave”. In the right configuration plate, and then press ENTER to confirm, you will see the interface as below:



**Numbers of input bytes:** Setting through the modeling software of PROFIBUS master, it can't be changed.

**Numbers of output bytes:** Setting by the configuration software of PROFIBUS master, it can't be changed.

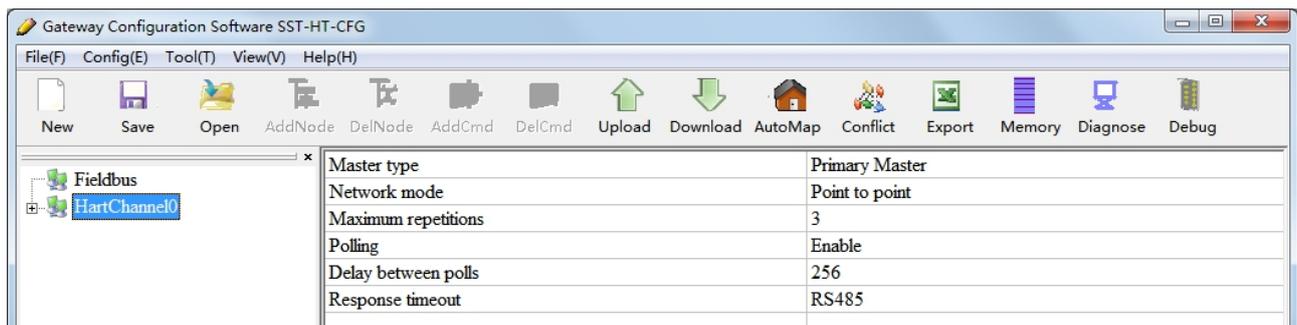
**Timeout clear/keep of input data:** The meaning is the same as “Modbus slave”.

**Slave address:** PROFIBUS DP slave address (When the gateway works properly, the address can be changed by the configuring button) .

## 5.4 Configure HART Channel

### 5.4.1 Channel Parameters

Click the HartChannel0 and examine the configuration panel.



**Master type:** Primary master, Secondary master.

**Network mode:** Select the networks link as single or multiple points, in the single point the gateway can only communicate with the slave device whose address is 0.

**Maximum repetitions:** Select the timeout numbers, range is 0~5.

**Polling:** This will enable the polling function.

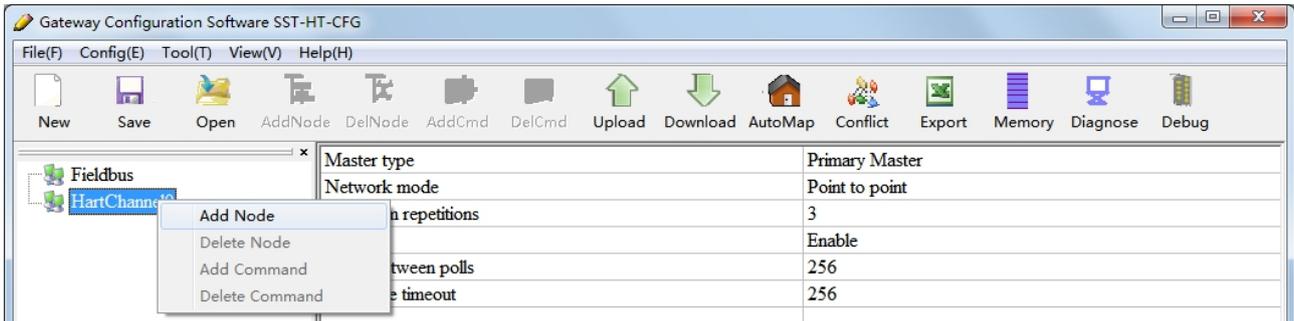
**Delay between Polls:** Set the polling circle time (time interval between starting to send one order and starting to send next order, ranged in 500~65535ms.

**Response timeout:** Set the maximum time that the gateway will wait to response from a slave, which ranges in 256~65535ms.

### 5.4.2 Add Nodes

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

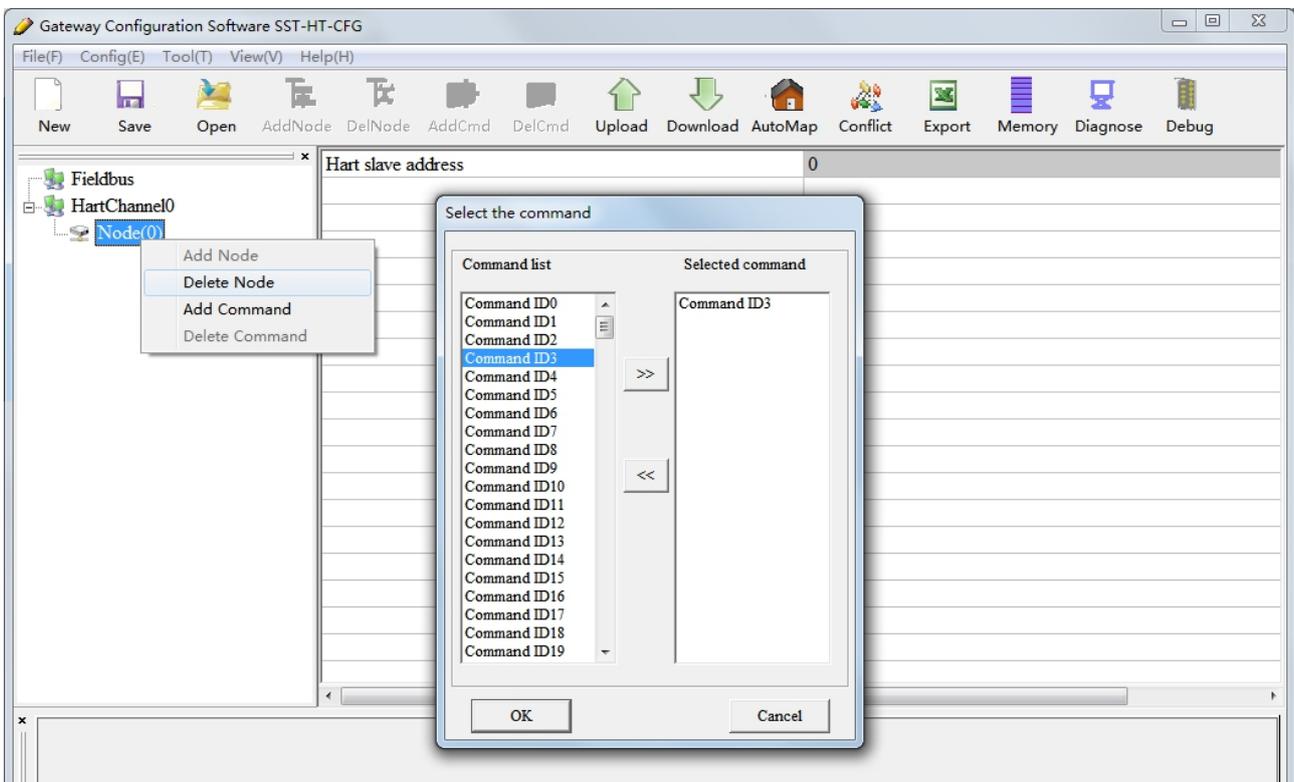
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Note: When the configuration node numbers are more than the actual connected devices, The redundant node will lead to the longer times in the polling circle. It is recommended that the configured node numbers should be the same as the other actual devices.

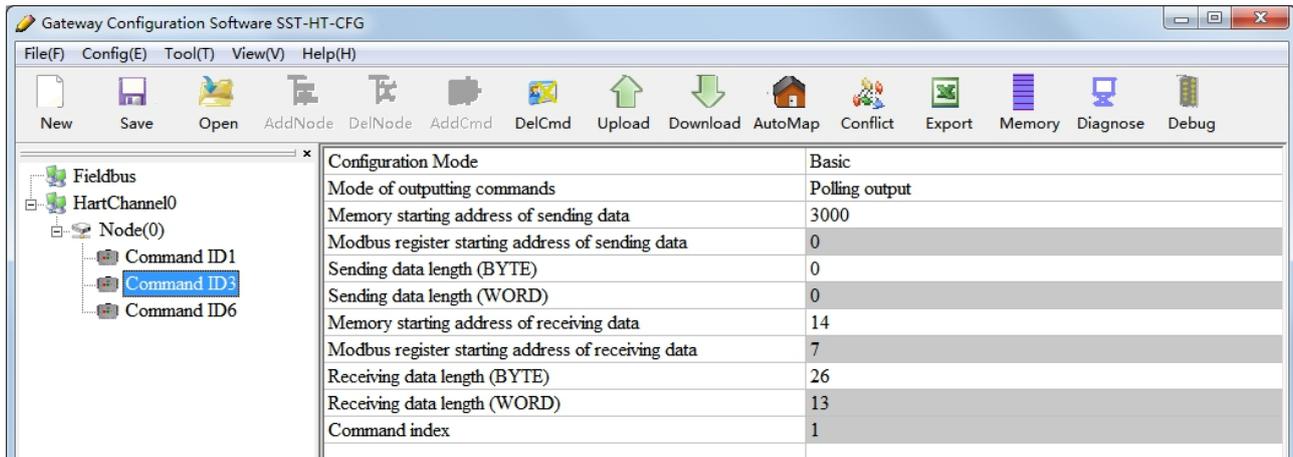
## 5.4.3 Add HART Commands

Right click on the node you want to add commands to and select “Add Command”. In the command window, move the commands you want to add to the right.



Select the command to configure its parameters.

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**Change-of-state output:** Execute this command once s data buffer of HART changes.

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

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

**Disable output:** The command will not generate output data.

**Set starting address of sending data:** 3000~3999.

**Modbus Register starting address of sending data:** 0~499.

**Sending data length (BYTE):** 0~255.

**Sending data length (WORD):** 0~127.

**Memory starting address of receiving data:** 0~1599.

**Modbus register starting address of receiving data:** 0~799.

**Receiving data length (BYTE):** 0~255.

**Receiving data length (WORD):** 0~127.

**Command index:** The index of the command in the configured commands list.

## 5.4.4 Delete Commands

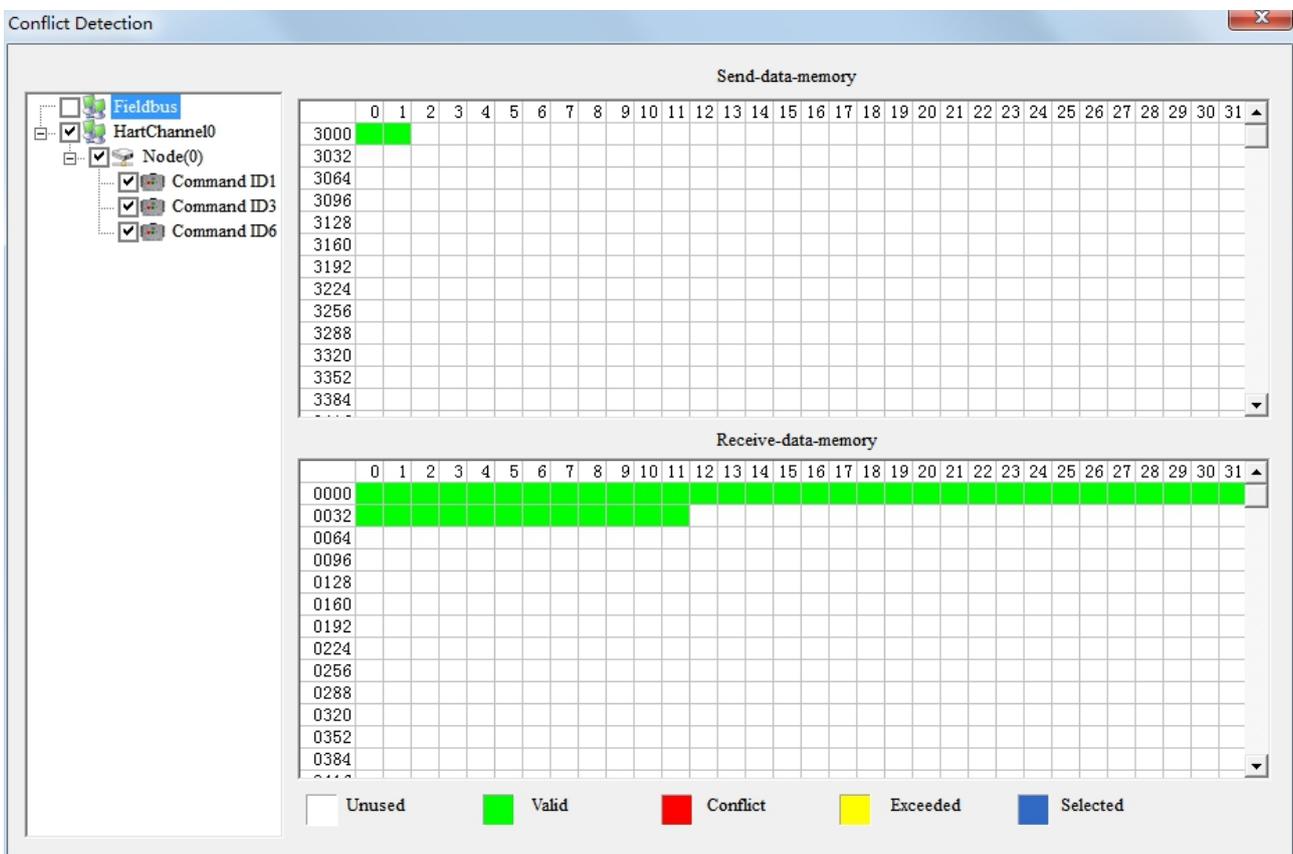
Select the command needed to deleted, right click the mouse and click “Delete Command”. Through the menu command you can execute the same action.

### 5.4.5 Delete Nodes

Select the node needed to be deleted, right click the mouse and click “Delete Node”. Through the menu command you can execute the same action.

## 5.5 Conflict Detection

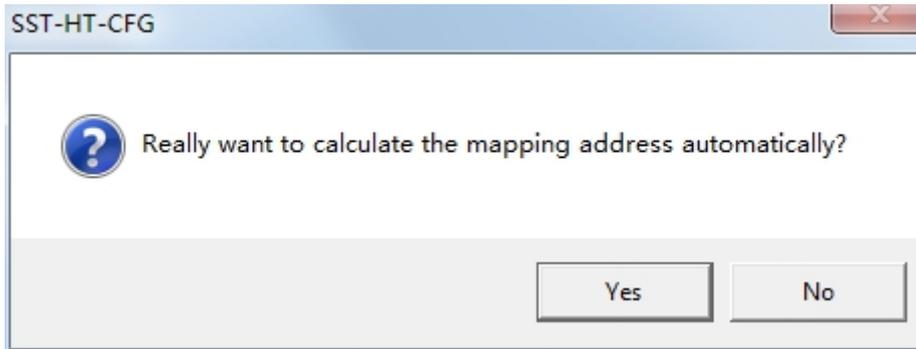
Users can check the mapping address in the Conflict Detection Window. Click “Conflict” icon to open this window.



## 5.6 AutoMap

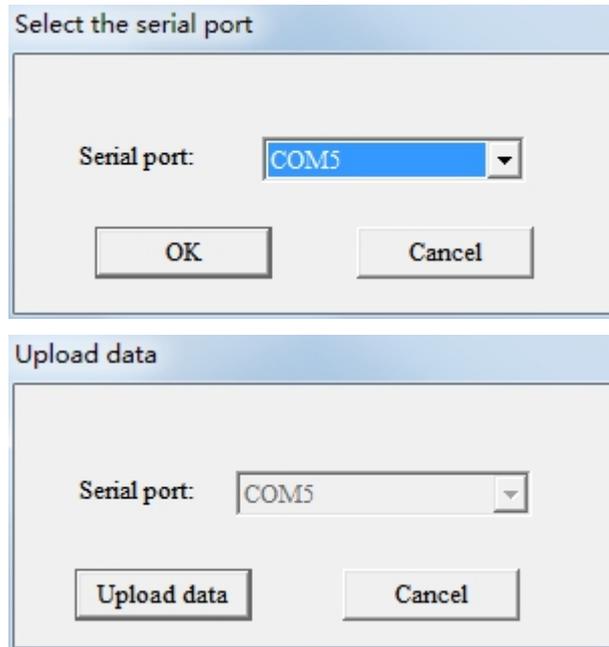
AutoMap will automatically map the data between HART channel and PROFIBUS DP network.

After you finish all the parameters configuration, click on AutoMap icon to automatically map the data addresses.



## 5.7 Upload Configuration

Click the Upload icon, select the computer port connected to the gateway and then click "Upload Data".



## 5.8 Download Configuration

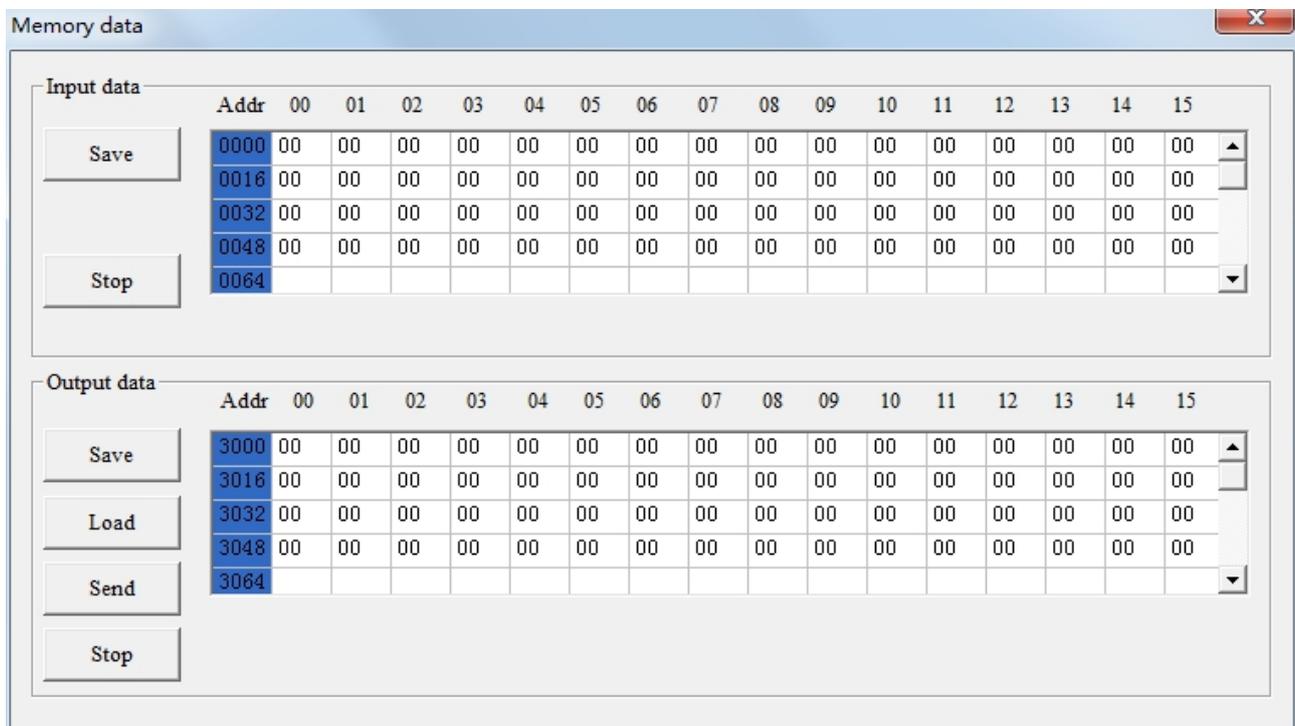
Click the Download icon to download the configuration into the gateway. Before downloading the file, please make sure you finish all the configuration. Restart the gateway to apply the configuration.

## 5.9 Data in Memory Buffer

The image below shows the data exchange inside of the gateway, users can use this function to debug the HART

channel in the absence of a PROFIBUS or Modbus master station. Steps are as follows:

1. First set the debugging DIP switch to “ON”, then restart the gateway. Now, the GT200-HT-DP is in debugging mode.
2. Connect the RS-232 interface of the gateway and the serial port of the computer with the serial cable and open the software“SST-HT-CFG”, click “Config—serial setting”, Select the correct serial port.
3. Click “Tool—Show Memory Data” or click on the Memory icon, Interface is as follows:



As is shown in the table, the upper table shows the memory distribution of the HART input data, the lower table shows the output data. If you need to change the output data, click the “Stop” button first, then change the related data or load the already saved data table, at last, click “Send”.

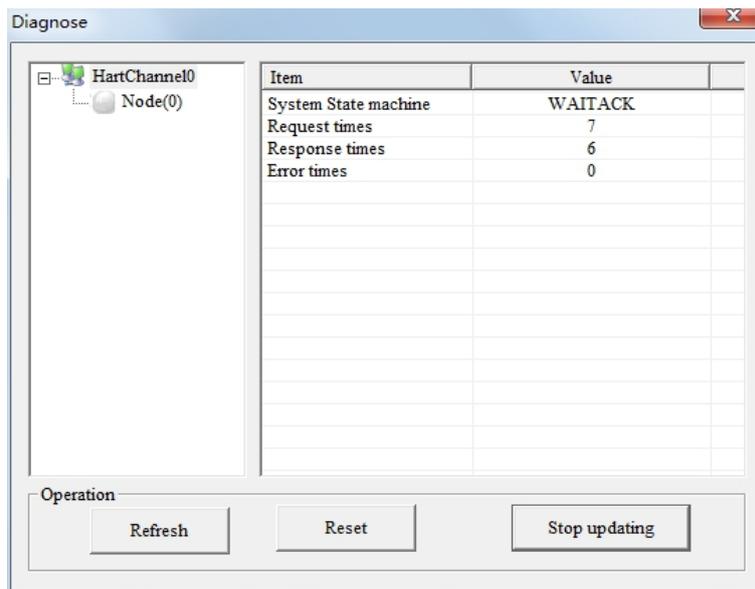
## 5.10 Diagnose

Through this function, users will know which device is not communicating, the execution condition of the configured commands, and the data transmitted by the certain commands of the gateway.

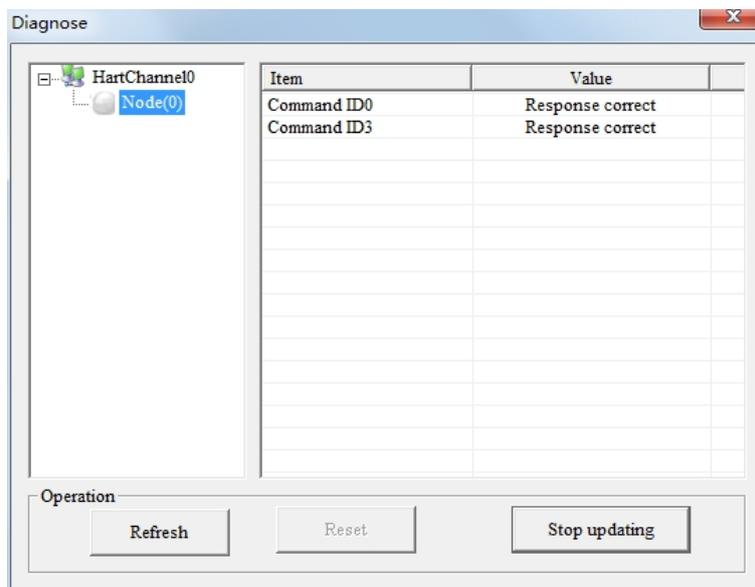
The operating steps are as follows:

# GT200-HT-DP HART to PROFIBUS DP/MODBUS Gateway User Manual

1. Ensure that the gateway's debug switch is in the ON state, and then restart the gateway. The GT200-HT-DP will then be in debugging mode.
2. Connect the RS-232 interface of the gateway and the serial port of the computer with the serial cable., Open the software, "SST-HT-CFG", Click "Config—serial setting", Select the correct serial port.
3. Click "Tool—Diagnose" or click on the Diagnose icon and upload configuration.



4. Click on "HartChannel0" in this interface, it will show the status of HART channel. Press the "Refresh" button to update the data once. Click on "Periodically refresh", to update the data every 500 ms.
5. Next Click Node(x) to show the response status of that Node.



6. Click on “Refresh” to refresh the command status, or “Periodically refresh” to update the data every 500 ms.
7. Double click on a command to open the detailed information.

**Note:** The SST-HT-CFG supports monitoring all HART commands, but detailed information only for command 0, 1, 2, 3, 6, 11, 12, 13, 14, 15, 16, 17, 18 and 19. Supports output data of the command 6, 17, 18 and 19.

For example, double click on command 3:

Item	Value
Communication_Status	Success
Response Code	NoErr
Primary Variable Current	3.800000
Primary Variable Units Code	Degrees Celsius
Primary Variable	935.000793
Secondary Variable Units	Degrees Celsius
Secondary Variable	25.000000
Tertiary Variable Units Code	(null)
Tertiary Variable	100.000000
4th Variable Units Code	(null)
4th Variable	0.000000

Press the “Refresh” button to update the data once.

8. To output data, double click on the command that has request data , such as command 6. Input the value and click “Edit”.

Item	Value
Communication_Status	Success
Response Code	NoErr
Short Addr	0
Current Mode	0

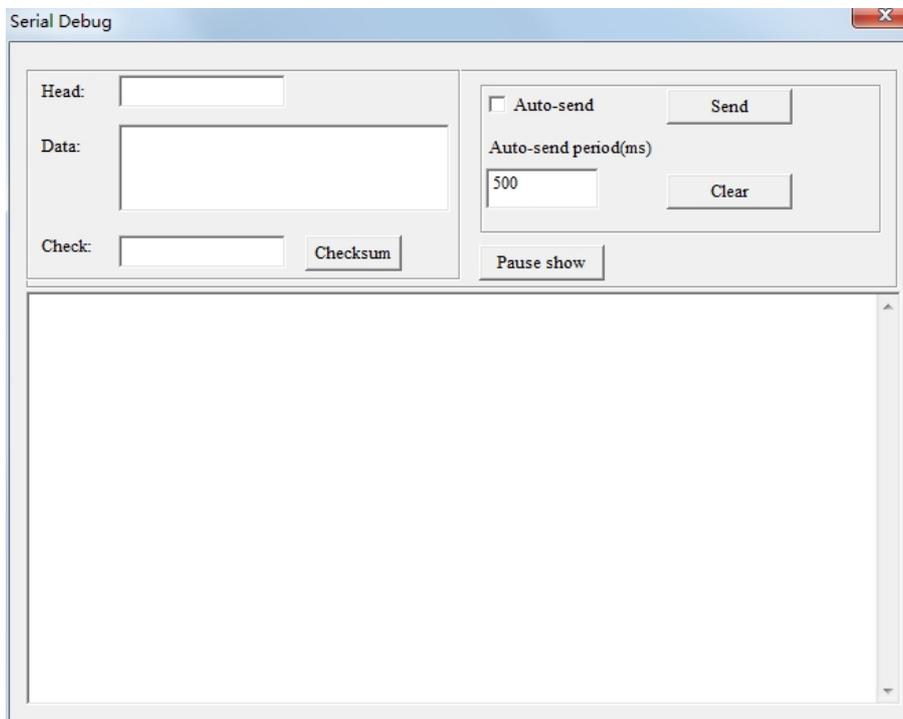
## 5.11 Serial Debug

Through this function you could send any request message to the HART channel and monitor the data that is received in

# GT200-HT-DP HART to PROFIBUS DP/MODBUS Gateway User Manual

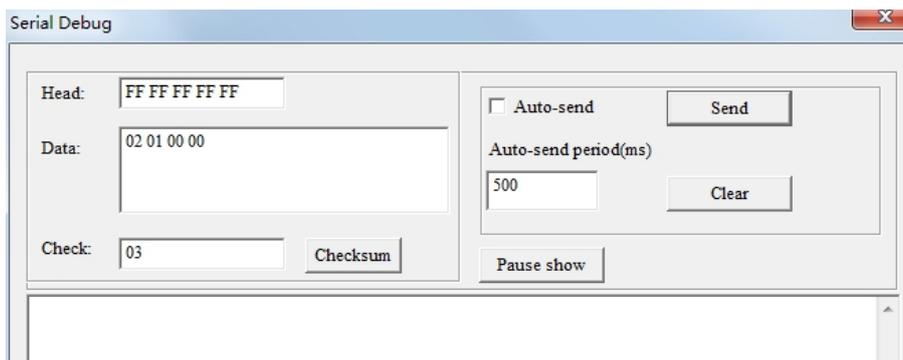
the HART channel, concrete operations are as follows:

1. First put the gateway's debug DIP switch to "ON" state and restart the gateway. Now, GT200-HT-DP is in the debugging mode.
2. Connect the RS232 interface of GT200-HT-DP with the computer and open the software "SST-HT-CFG". click "Config—serial setting" and select the correct serial port.
3. Click "Tool" - "Serial debugging assistant" or click on the Debug icon, it will pop the serial debugging assistant interface::



In this interface, clicking "Auto-send" or "Send" will combine the data head, data, and check code into one frame and send it out. The data that the gateway receives from HART channel will be shown in the blank space below.

The "Checksum" button only checks part of the data. Here is an example:

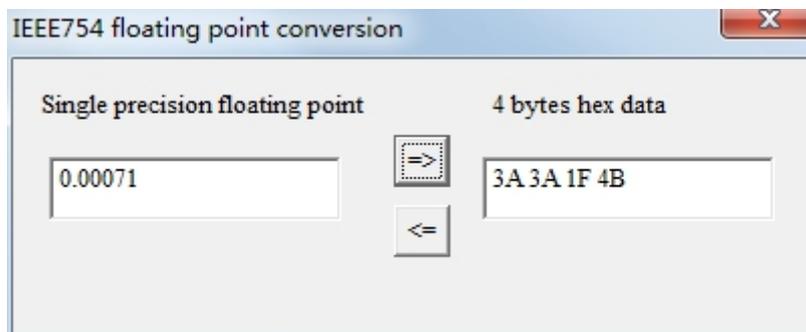
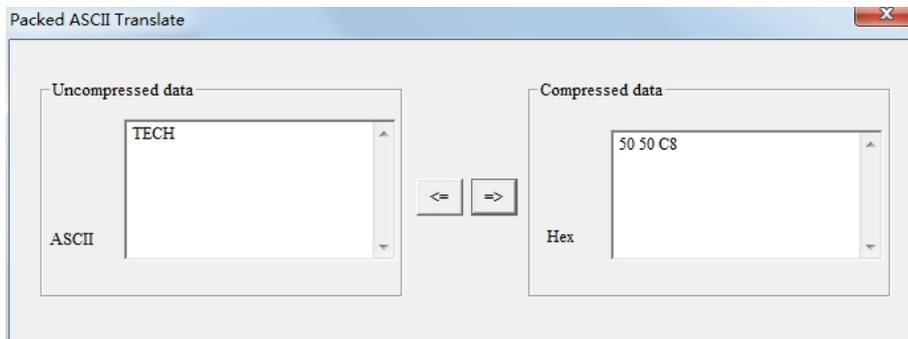


In this example, command 0 is composed of a data head, data and check code. It uses a short address. when you click “Send”, you will get the response data.

Note: Under this function, the gateway will stop executing the configured commands. Switch the function to run or configuration modes to have the gateway execute the configured commands.

## 5.12 Data 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 Address Table

The GT200-HT-DP has a memory buffer of 5000 bytes. From byte 0 to 2999 of the buffer is used for the HART input data and output data.

HART Channel	Buffer Address	PROFIBUS DP Address	Description
Input/Output Data	0-1599	Input address (Max 244 bytes)	HART input data (response data) <sup>1</sup>
	3000-3999	Output address (Max 244 bytes)	HART output data (request data) <sup>2</sup>

The GT200-HT-DP also supports Modbus protocol and universal mode. From byte 3000 to 4999 of the buffer is used for the status of the HART channel and control bytes.

**Note:** The State and Control Bytes are not available in PROFIBUS DP mode.

HART Channel	Buffer Address	Modbus Address <sup>3</sup>		R/W <sup>4</sup>	Description
		Function Code	Address		
Input/Output Data	0-1599	04	0-799 (3x0001-3x0800)	R	HART input data (response data)
	3000-3999	03, 06, 16	0-499 (4x0001-4x0500)	R/W	HART output data (request data)
State and Control Bytes	1600-1619	04	800-809	R	Device 0_cmd0 response data <sup>5</sup>
	1620-1639		810-819		Device 1_cmd0 response data
	...		...		.....
	1900-1919		950-959		Device 15_cmd0 response data
	1920		960H		HART channel status <sup>6</sup>
	1921		960L		HART channel request counter
	1922		961H		HART channel response counter
	1923		961L		HART channel error counter
	1944		972H		Device 0_cmd0 status <sup>7</sup>
	1945		972L		Device 1_cmd0 status
	...		...		.....
	1959		979L		Device15_cmd0 status
	1960-2119		980-1059		Configured HART command status <sup>8</sup>
	2392		1196H		Response transaction no. <sup>9</sup> (Universal Mode)

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	2393		1196L		Response error counter (Universal Mode)		
	2394-2395		1197		Length of response data (Universal Mode)		
	2396-2695		1198-1347		Response data (Universal Mode)		
	4000	03, 06, 16	500H	R/W	Counters reset trigger <sup>10</sup>		
	4001		500L		Polling output control byte <sup>11</sup>		
	4002		501H		Command request trigger <sup>12</sup>		
	4003		501L		Triggered command index <sup>13</sup>		
	4270		635H		Request transaction no. <sup>9</sup> (Universal Mode)		
	4271		635L		Universal Mode enable byte <sup>14</sup>		
	4272-4273		636		Length of request data (Universal Mode)		
	4274-4573		637-786		Request data (Universal Mode)		
Others	Reserved						

### Notes:

- HART input data (response data):** The response data bytes from HART instruments.
- HART output data (request data):** The request data bytes sent by the Modbus master through GT200-HT-DP.
- Modbus Address**  
The Modbus master should use the corresponding function code(s) to read or write the data from/to the GT200-HT-DP, with the specified address. The Modbus address in the above table is based 0 and decimal. For example, the Modbus address 0-799 for the HART input data, is also the 3x0001-3x0800 as PLC address (based 1).
- R/W (Read/Write)**
  - R (Read):** The Modbus master can only use function code 04 to read these data from the GT200-HT-DP.
  - W (Write):** The Modbus master can use function code 03 to read these data from the GT200-HT-DP, and use function code 06 or 16 to write data to the GT200-HT-DP.
- Device N\_cmd0 response data:** The GT200-HT-DP will always sent a request of HART command 0 to get instrument information. The response data bytes will be stored in these addresses. The “N” is the HART instrument address.

6. **HART channel status:** The present status of the HART channel.

*Table 6.1 - HART Channel Status*

Value	Description
00	No data communication
01	Sending request
02	Waiting for response
03	Processing response

7. **Device N\_cmd0 status:** The status of the HART command 0 which is automatically sent. See Note 5 above.

*Table 6.2 - Command Status*

Value	Description
00	No request
01	Correct response
02	CRC error
03	No response
04	Errors defined by HART protocol
05	Disconnection with HART instrument(s)

8. **Configured HART command status:** The status of configured HART command(s). These commands are configured in SST-HT-CFG software and will generate a unique “Command index”. The status will be arranged in index order. For example, the high byte of 980 input register (3x0981) is the status of the command of index 00, and the low byte of 3x0981 register is the status of the command of index 01.

The status details refer to the *Table 6.2 - Command Status*.

9. **Response/Request transaction no.:** In universal mode, the changing of the value of the response/request transaction no. indicates that a HART response is received.
10. **Counters reset trigger:** When this trigger changes the value, all the counters of HART channel (request, response and error) will reset to 0.
11. **Polling output control byte:** This control byte is defined as below.

*Table 6.3 - Polling Output Control Byte*

Value	Description
00	Enable polling output. The HART commands will be sent periodically.
01	Disable polling output. The HART commands will be sent with the trigger signal, see Note 11 and 12 for details.

12. **Command request trigger:** When this trigger changes the value, a request of the HART command will be sent. The triggered HART command is specified by the “Command index”, see Note 12.
13. **Triggered command index:** The command index of the triggered HART command. The command is

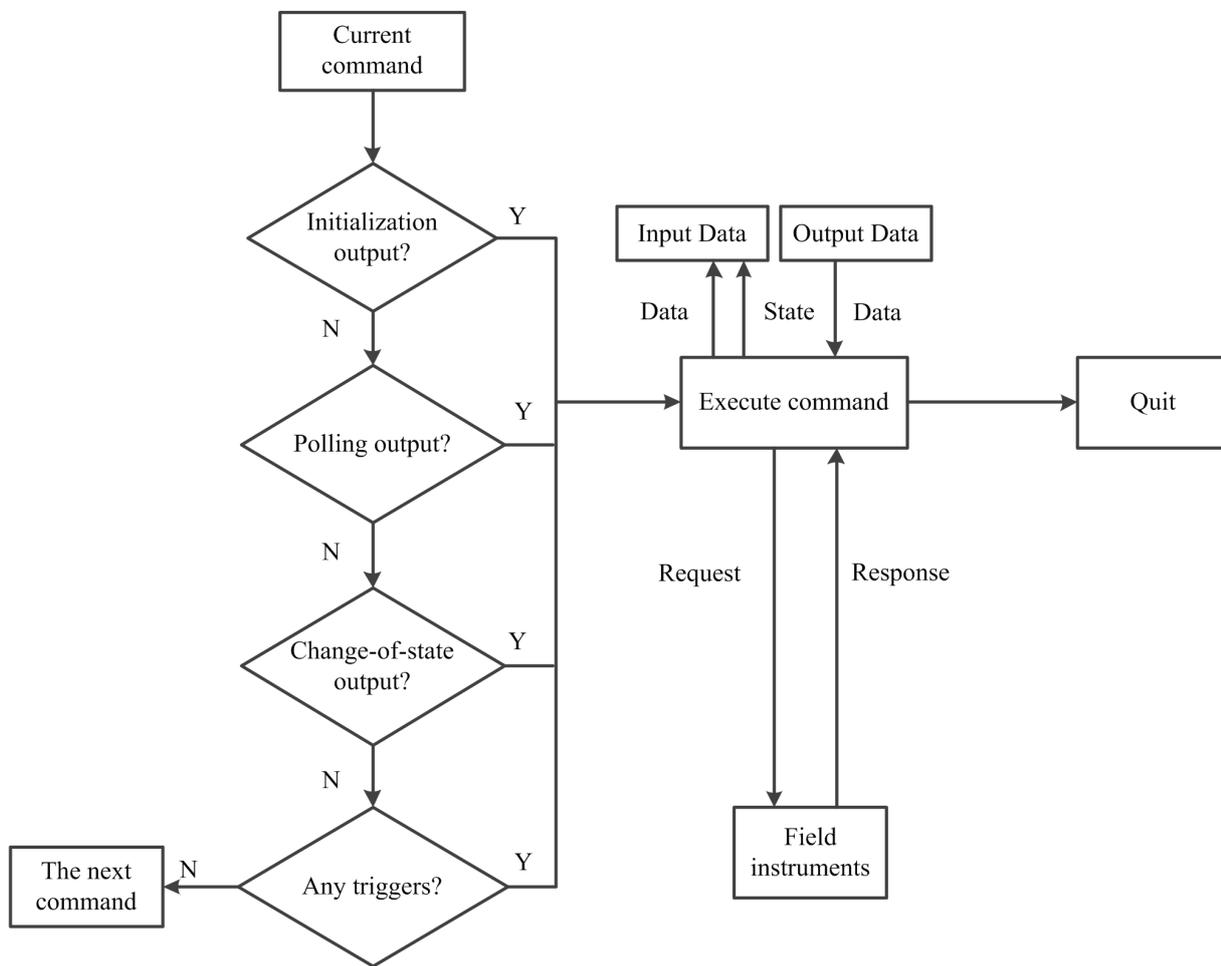
configured in SST-HT-CFG software and will generate a unique “Command index”.

14. **Universal Mode enable byte**

*Table 6.4 - Universal Mode Enable Byte*

Value	Description
01	Enable Universal Mode.
00	Disable Universal Mode.

**6.2 Flowchart of Executing One HART Command**



**6.3 Universal Mode**

The GT200-HT-DP supports two universal mode, which allows users to receive/send original HART data.

1. Set the Mode to “User Config” in the SST-HT-CFG software.

In this mode, the GT200-HT-DP receives the data with 3.5 characters interval and sends serial data directly to the HART instruments.

The characters timeout depends on the baud rate. For example, if the baud rate is 19200 bps, then the characters timeout is  $(1/19200)*10*3.5 \approx 2\text{ms}$ .

2. Set the Mode to “Modbus Slave” and enable Universal Mode by Modbus command. In this mode, the T200-HT-DP acts as a Modbus slave. Follow the steps:
  - (1) Set the low byte of 4x0636 register (Universal Mode enable byte) of the GT200-HT-DP to “01” (Enable).
  - (2) Write the data to be sent to 4x0638-4x0787 registers (Request data (Universal Mode)).
  - (3) Write the data length to 4x0637 register (Length of request data (Universal Mode)).
  - (4) Change the high byte of 4x0636 register (Request transaction no. (Universal Mode)), to trigger the output.
  - (5) Once the GT200-HT-DP receives the response, the high byte of 3x1197 register (Response transaction no. (Universal Mode)) will add one. The response data will be stored in 3x1199-3x1348 registers (Response data (Universal Mode)). If the GT200-HT-DP does not receive any response within the timeout, the low byte of 3x1197 register (Response error counter) will add one.

## 6.4 Trigger Command

When the GT200-HT-DP acts as a Modbus slave, users can trigger any HART command by sending a trigger byte and command index, following the steps below: (The address table refers to chapter 6.1)

1. Disable the polling output. You can disable it in SST-HT-CFG software or by changing the “Polling output control byte” by Modbus master.
2. Write the index of the command that you want to trigger, to the “Triggered command index” address. The command index is generated when you configure the HART command in SST-HT-CFG software.
3. Change the “Command request trigger” value.
4. Now the command of the index in “Triggered command index” address is triggered. The response data bytes will be stored in the corresponding buffer address.

## 6.5 Data Mapping

The data mapping address can be automatically mapped (AutoMap) or manually configured. The data mapping relationship between GT200-HT-DP buffer and PROFIBUS DP is shown below. The address N and M (or X and Y) can be discontinuous number.

PROFIUS DP Input Address		GT200-HT-DP Input Buffer	PROFIUS DP Output Address		GT200-HT-DP Output Buffer
Module 1	N	0000	Module 3	X	3000
	N+1	0001		X+1	3001
Module 2	M	0002		X+2	3002
	M+1	0003	X+3	3003	
	M+2	0004	Module 4	Y	3004
	M+3	0005		Y+1	3005
...	...	...	...	...	

For example, in STEP7, add the following modules on the slot of the GT200-HT-DP. The I address corresponds to input buffer data and the Q address corresponds to output buffer.

The IB260~323 corresponds to bytes 0000~0063 of GT200-HT-DP input buffer. The IB512~527 of next input module corresponds to bytes 0064~0079.

The QB256~263 can corresponds to bytes 3000~3007 of GT200-HT-DP output buffer. The QB326~327 of next output module corresponds to bytes 3008~3023.

S...	DP ID	Order Number / Designation	I Add..	Q Address	Comment
1	64	32 Words Input	260...323		
2	4AO	4 Words Output		256...263	
3	8AI	8 Words Input, 8 Words Output	512...527		
4	8AO	--> 8 Words Input, 8 Words Out		384...399	
5					

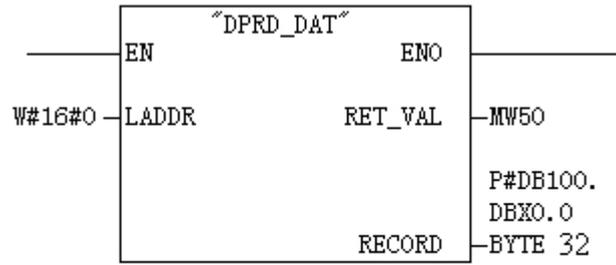
## 7 PROFIBUS DP Modules

The supported PROFIBUS DP modules are shown below.

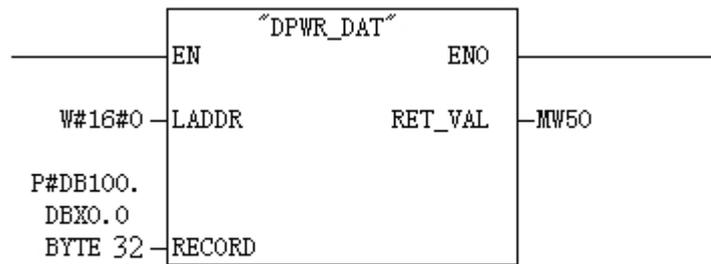
Module	Integrity
4 Words Input, 4 Words Output	Word
8 Words Input, 8 Words Output	Word
24 Words Input, 24 Words Output	Word
56 Words Input, 56 Words Output	Word
1 Byte Input	Byte
1 Word Input	Word
2 Words Input	Word
4 Words Input	Word
8 Words Input	Word
16 Words Input	Word
32 Words Input	Word
64 Words Input	Word
2 Words Input Consistent	Length
4 Words Input Consistent	Length
8 Words Input Consistent	Length
16 Words Input Consistent	Length
1 Byte Output	Byte
1 Word Output	Word
2 Words Output	Word
4 Words Output	Word
8 Words Output	Word
16 Words Output	Word
32 Words Output	Word
64 Words Output	Word
2 Words Output Consistent	Length
4 Words Output Consistent	Length
8 Words Output Consistent	Length
16 Words Output Consistent	Length

For modules which support word and byte as its consistent, users can apply the "MOVE" command to read and write data in Step7 programming.

For modules which support total length as its consistent, users can apply "SFC 14" to read data and "SFC 15" to write data in Step 7 programming.



SFC14



SFC15