

3-Channel HART/Modbus TCP Gateway GT200-3HT-MT

User Manual

V 3.1

Rev A



SST Automation

Email: support@sstautomation.com

www.SSTAutomation.com



Important Information

Disclaimer

No part of this document may be reproduced without the express written permission of SST Automation. SST Automation reserves the right to make changes to the product described within this manual at any time without notice.

The examples and diagrams in this manual are included solely for illustrative purposes and are not intended as a substitute for determining the suitability of the product for specific user applications. It is the responsibility of any such user to ensure that all operations, evaluations, and testing comply with all safety requirements such as laws, rules, codes and standards applicable to the relevant fields. SST Automation shall not be responsible or liable for misuse of the information contained herein.

Copyright

Copyright © 2025 by SST Automation. All rights reserved.

Trademark



is the registered trade mark of SST Automation.

Technical Support Contact Information

www.sstautomation.com

Email: support@sstautomation.com

Catalog

1 Product Overview	5
1.1 Product Introduction	5
1.2 Product Features	5
1.3 Technical Specifications	6
1.4 Related Products	8
1.5 Revision History	8
2 Hardware Description	9
2.1 Product Layout	9
2.2 LED Status Indicators	10
2.3 Configuration DIP Switches	10
2.4 Internal Resistor Switches	11
2.4 Interfaces	11
2.4.1 Power Interface	11
2.4.2 Ethernet Interface	12
2.4.3 HART Interfaces	13
2.5 Wiring Diagrams	14
2.5.1 Point-to-Point HART Wiring	15
2.5.2 Multi-Drop HART Wiring	17
3 Hardware Mounting	21
3.1 Mechanical Dimensions	21
3.2 Installation Method	22
4 Getting Started - Quick Installation Guide	23
4.1 Hardware Connection	23
4.2 Software Setup	24
4.2.1 Configuration of Gateway	24
4.2.2 Communication with Modbus TCP Client	29
5 Software Instructions	6
5.1 Main Interface	6
5.2 Toolbar	7
5.2 Software Functional Specifications	8
5.2.1 Configure the Fieldbus	8
5.2.2 Configure the HART Fieldbus	9
5.2.3 Conflict Detection	15
5.2.4 Auto Mapping	17
5.2.5 Upload Configuration	17
5.2.6 Download Configuration	19
5.2.7 Memory Data Display	20
5.2.8 Diagnose	21
5.2.9 Conversion Tools	24



GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

6 Interface Design Description	25
6.1 Data Exchange	25
6.1.1 Modbus TCP Register Address Mapping	26
6.2 GT200-3HT-MT Address Table	27
6.3 Flowchart of Executing One HART Command	30
6.4 Trigger Command	30
7 How to Connect to a Modbus TCP Client	31



1 Product Overview

1.1 Product Introduction

The GT200-3HT-MT gateway is designed to provide a seamless connection between multiple channel HART instruments and Modbus TCP Clients. It features 3 separate HART interfaces that can connect up to 15 HART devices each, for a total of 45 HART devices to Modbus TCP. On the HART side, the GT200-3HT-MT can be configured as a primary master or secondary master. On the Ethernet side, the GT200-3HT-MT functions as a Modbus TCP Server (slave).

1.2 Product Features

- **Easy to Use:** The product manual includes application examples to quickly configure the gateway to read and write data to HART instruments.
- **Powerful Functionality:** Features 3 independent HART channels with isolating transformers. Supports quick scanning and updating of HART slave addresses, point-to-point mode which allows a coexisting analog 4-20mA signal to be used alongside digital HART, and primary/secondary master functionality on the HART side.
- **Advanced Debugging Tools:** The SST-HE-CFG configuration software offers a real-time visual data traffic display and HART command diagnostic tools to streamline communication testing .



1.3 Technical Specifications

HART Features	
HART Operation Modes	HART primary master, HART secondary master
Number of HART Channels	Three (3) independent HART channels,
Maximum Number of HART Devices per Channel	With the internal resistor: 13 HART devices per channel With an external resistor (250Ω/2W): 15 HART devices per channel
HART Connection Modes	Point-to-Point, Mode, Multi-Drop Mode
Point-to-Point Mode Features	Supports HART Burst-Mode
HART Protocol Versions Supported	Up to HART Version 6
HART Output Modes	Change-of-State Polling Initialization Disable
Maximum Number of HART Commands per Channel	Up to 100 HART commands per channel
Output Buffer Size	Up to 2000 bytes
Input Buffer Size	Up to 3000 bytes
HART Loop Resistor Options	Each channel can choose to use either an internal or external HART sampling resistor

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

Modbus TCP Features	
10/100M Ethernet Communication Port	Supports IP address conflict detection and auto routing
Maximum Number of Modbus TCP Client Connections	Up to 36 simultaneous client connections
Maximum Number of Simultaneous Modbus TCP Command Requests	Up to 512 simultaneous command requests
Modbus TCP Operation Mode	Modbus TCP Server (Slave)
Modbus TCP Function Codes Supported	03H: Read Holding Registers 4x 04H: Read Input Registers 3x 06H: Single Register Write 4x 10H: Multiple Register Write 4x
Electrical / Environmental	
Power Supply	24VDC nominal 11VDC to 30VDC allowed
Current Load	100mA maximum @ 24VDC
Operating Temperature	-4°F to 140°F (-20°C to 60°C)
Relative Humidity	5% to 95% RH with no condensation
Certification	CE Compliant
Physical	
Dimensions (H x W x D)	1.33in x 4.56in x 4.21in 34mm x 116mm x 107mm
Mounting	35mm DIN rail
Enclosure Rating	IP20
Ethernet Port	(1) 10/100 Base-T, RJ45 Connector
HART Interfaces	(3) 3-Pin Terminal Blocks
Power Interface	(1) 3-Pin Terminal Block



1.4 Related Products

Related products include:

- GT200-HT-RS
- GT200-3HT-RS
- GT200-HT-MT
- GT200-HT-DP
- GT200-HT-EI

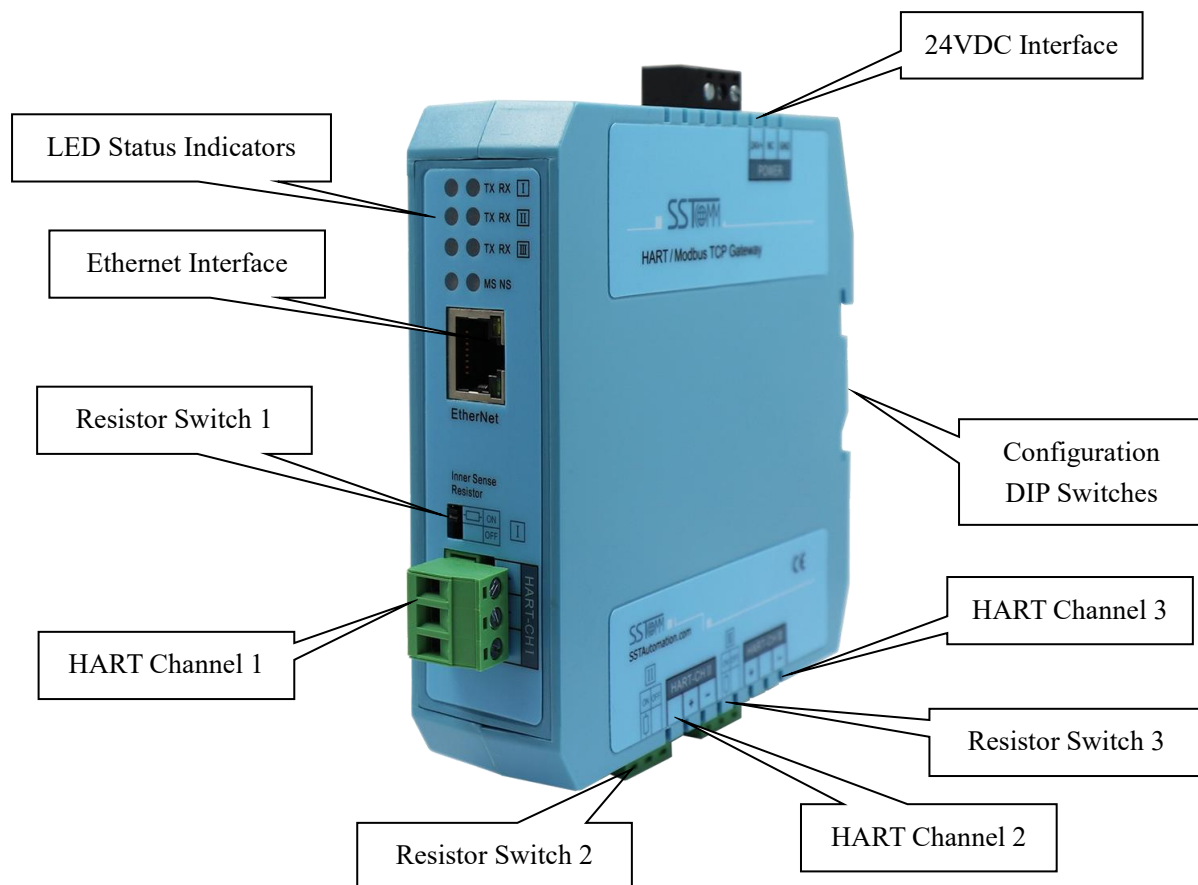
To get more information about these products, please visit SST Automation's website: www.sstautomation.com.

1.5 Revision History

Revision	Date	Chapter	Description
V3.1 Rev A	1/26/2024	Chapters 2.5.1, 2.5.2, 6.1.1	Fixed the node points for the Point-to-Point wiring diagrams in Chapter 2.5.1. Added external HART resistor examples for the Multi-Drop wiring diagrams in Chapter 2.5.2 Added instructions on how to configure the Modbus TCP register addresses in Chapter 6.1.1
V3.1	11/17/2023	Part	Updated the product picture and dimensions
V1.2 Rev A	7/31/2017	Chapter 4	V1.2 REV A new release, enable the memory data display, diagnosis, mode selection and other functions, increase the 4.2.7, 4.2.8 chapters.

2 Hardware Description

2.1 Product Layout



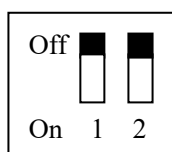
Note: This picture is for reference only. The product appearance is subject to the actual product.

2.2 LED Status Indicators

Indicator	State	Description
TX	Flashing	HART port is actively transmitting data
	OFF	No HART data transmitted
RX	Flashing	HART port is actively receiving data
	OFF	No HART data received
NS	OFF	No Modbus TCP activity
	Flashing Green	Modbus TCP port is actively transmitting or receiving data
MS	Solid Red	IP address conflict
	Flashing Red	- One of the following conditions exists: - No physical network connection detected. No Ethernet communication is possible. Check wiring and cables. - The unit is in configuration mode. - The unit is obtaining an IP address through DHCP. - The unit is obtaining an IP address through BOOTP.
	Flashes red for 3 seconds, then turns off	Modbus TCP connection lost

2.3 Configuration DIP Switches

The configuration DIP switches are located at the rear of the product., bit 1 is the mode selecting bit and bit 2 is the function setting bit.



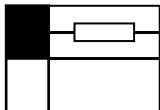
Mode Bit (Bit 1)	Function Bit (Bit 2)	Operating Mode	Description
Off	Off	Run Mode	Protocol communications are enabled. Configuration is allowed.
Off	On	Run Mode with Configuration Lock	Protocol communications are enabled. Configuration cannot be changed.
On	Off	Configuration Mode	Sets the IP address to 192.168.0.10 Configuration is allowed.
On	On	Reserved	Reserved

Note: After re-configuring the DIP switches, power cycle the GT200-3HT-MT for the changes to take effect.

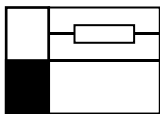


2.4 Internal Resistor Switches

The GT200-3HT-MT has 3 internal resistors (one for each HART channel) that can be toggled by the resistor switches. The specification of each internal resistor is 270Ω , 2W, which allows up to 13 HART devices to be connected to each HART channel. When the power going through the resistor exceeds 2W, an external resistor (250Ω , 3W) must be used instead.



ON Position: Enables the internal resistor.

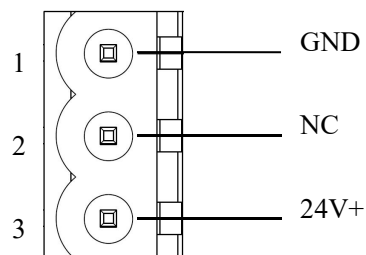


OFF Position: Disables the internal resistor. An external resistor must be used.

2.4 Interfaces

2.4.1 Power Interface

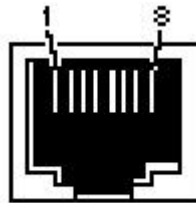
The GT200-3HT-MT gateway operates at 24 VDC and has a detachable 3-pin terminal block connector that is used as the input power interface. The connector is located at the top of the unit and can accept input voltages between 9 to 30 VDC. It is recommended to use a 24V DC power supply.



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



2.4.2 Ethernet Interface

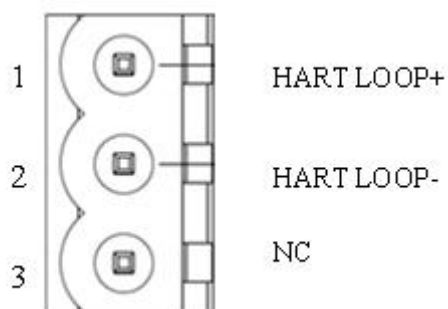


RJ-45 port

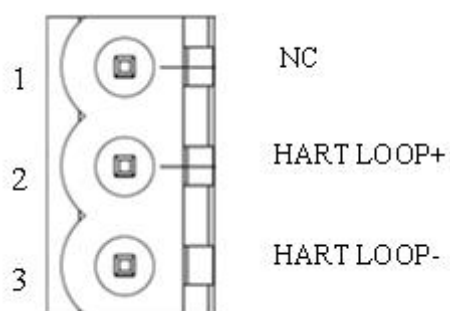
The Ethernet interface is used for both Modbus TCP protocol communications and for configuring the gateway via the SST-HE-CFG configuration software. The interface follows the IEEE802.3u 100BASE-T standard (10/100M), and uses an RJ-45 connector. The pin assignments for the Ethernet interface are shown below:

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

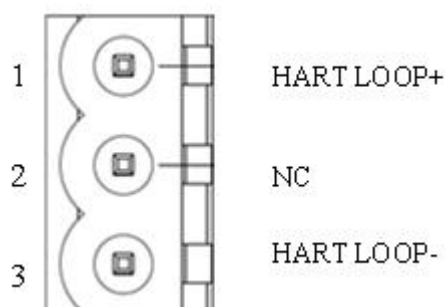
2.4.3 HART Interfaces



HART Channel 1



HART Channel 2



HART Channel 3

Symbol	Function
HARTLOOP+	Connected to HART signal + (positive)
HARTLOOP-	Connected to HART signal - (negative)
NC	NC (Not Connected)



2.5 Wiring Diagrams

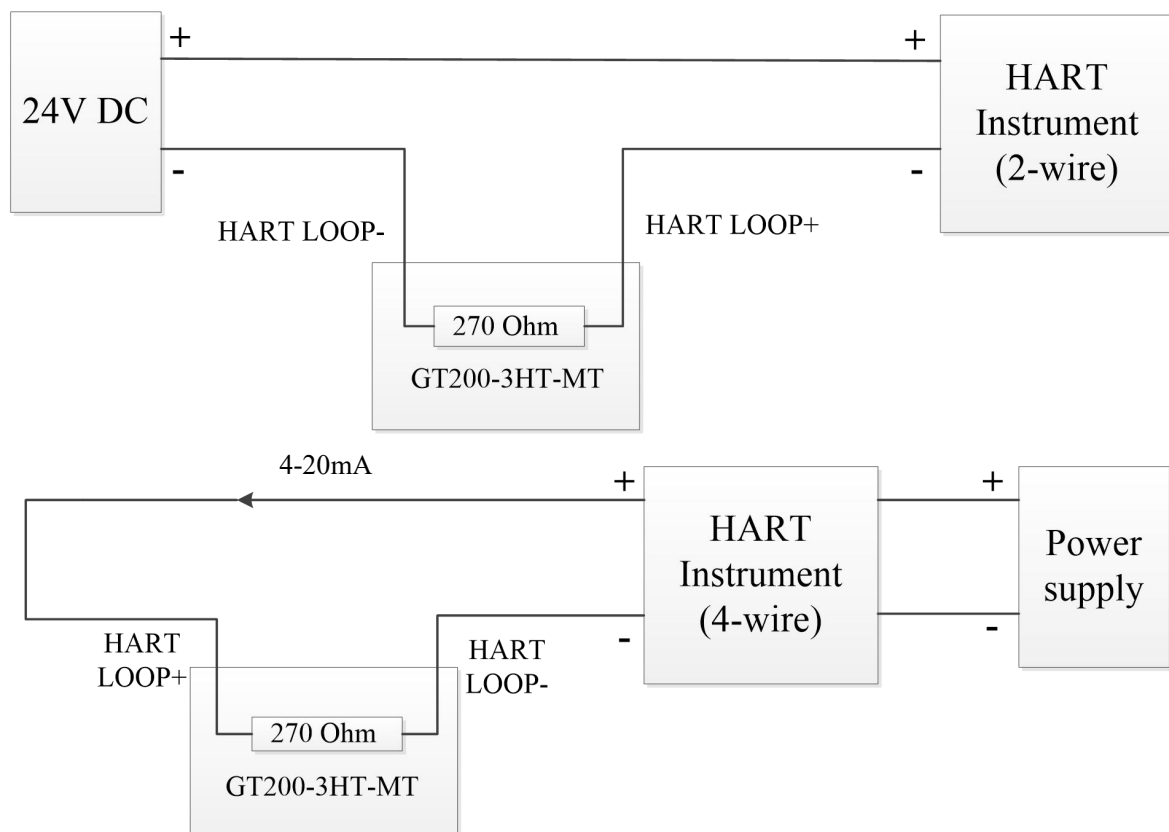
Notes:

1. Some HART instruments may need to perform work such as a self-test when they are first powered on, and may not communicate with HART at this time. It is recommended to use a separate power supply for the HART instruments and the GT200-3HT-MT to ensure a stable communication.
2. To improve the communication efficiency of the field bus, it is recommended not to configure empty nodes or unused commands in the SST-HE-CFG configuration software.
3. HART devices can be categorized as either two-wire systems or four-wire systems. A two-wire system means that HART devices have only two wires for both communication and power supply, while a four-wire system means that the power supply and communication lines of HART devices are separated.
4. If there are two or more HART instruments connected in the same network, their HART LOOP wires should be connected in parallel with each other.
5. When using Multi-Drop mode, the HART instruments should be configured to Fixed Current mode at 4mA.
6. When connecting more than 13 HART instruments to a single HART channel, disable the internal resistor and use an external resistor instead (250 Ohm, 3W) See [Chapter 2.4](#).



2.5.1 Point-to-Point HART Wiring

The following are the wiring diagrams for two wire and four wire point-to-point wiring.

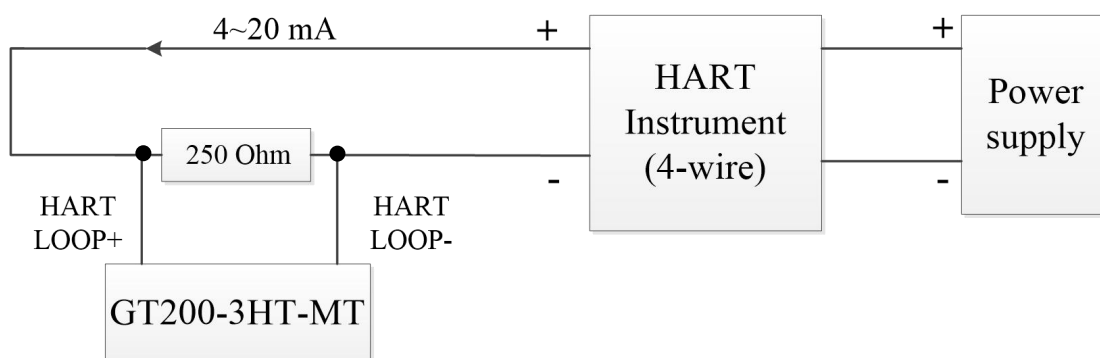
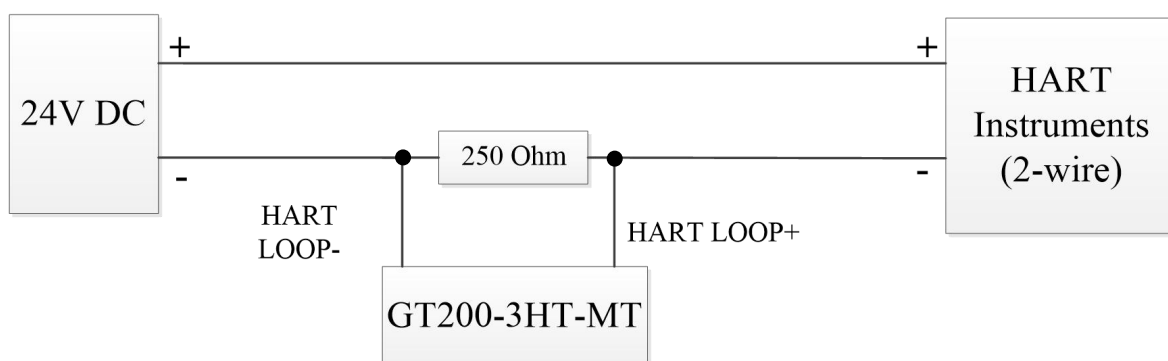
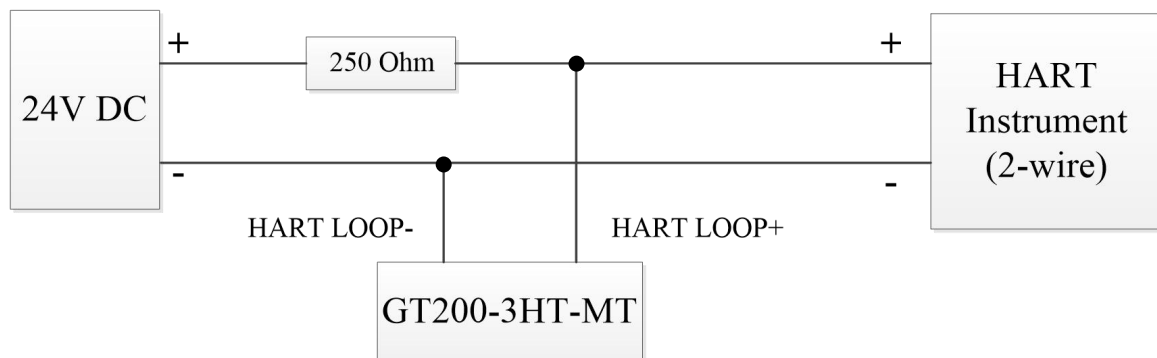


When using the internal resistor

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

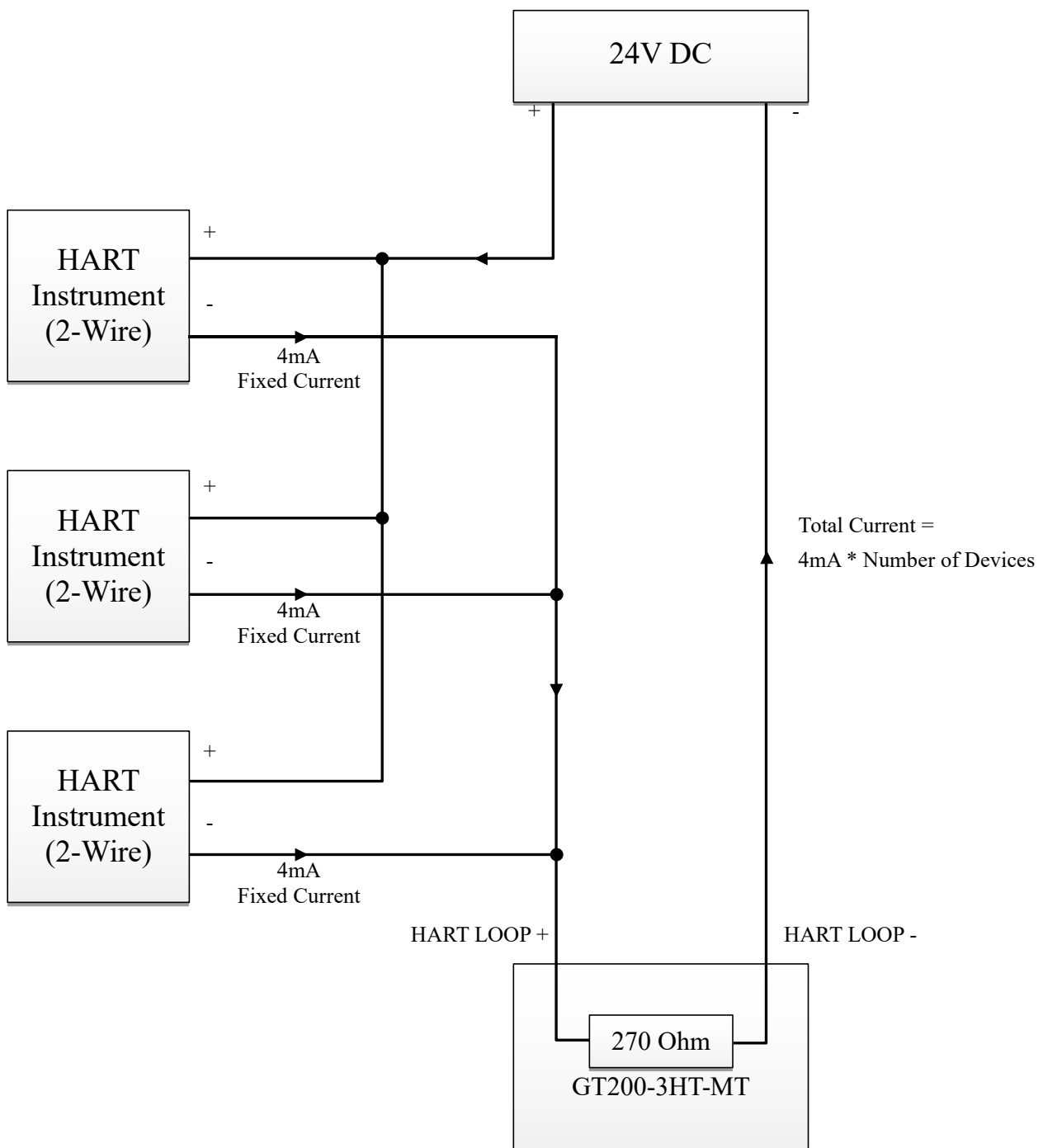


Options when using an external resistor

2.5.2 Multi-Drop HART Wiring

The following are the wiring diagrams for two wire and four wire multi-drop wiring.

Two wire - When using the internal resistor:



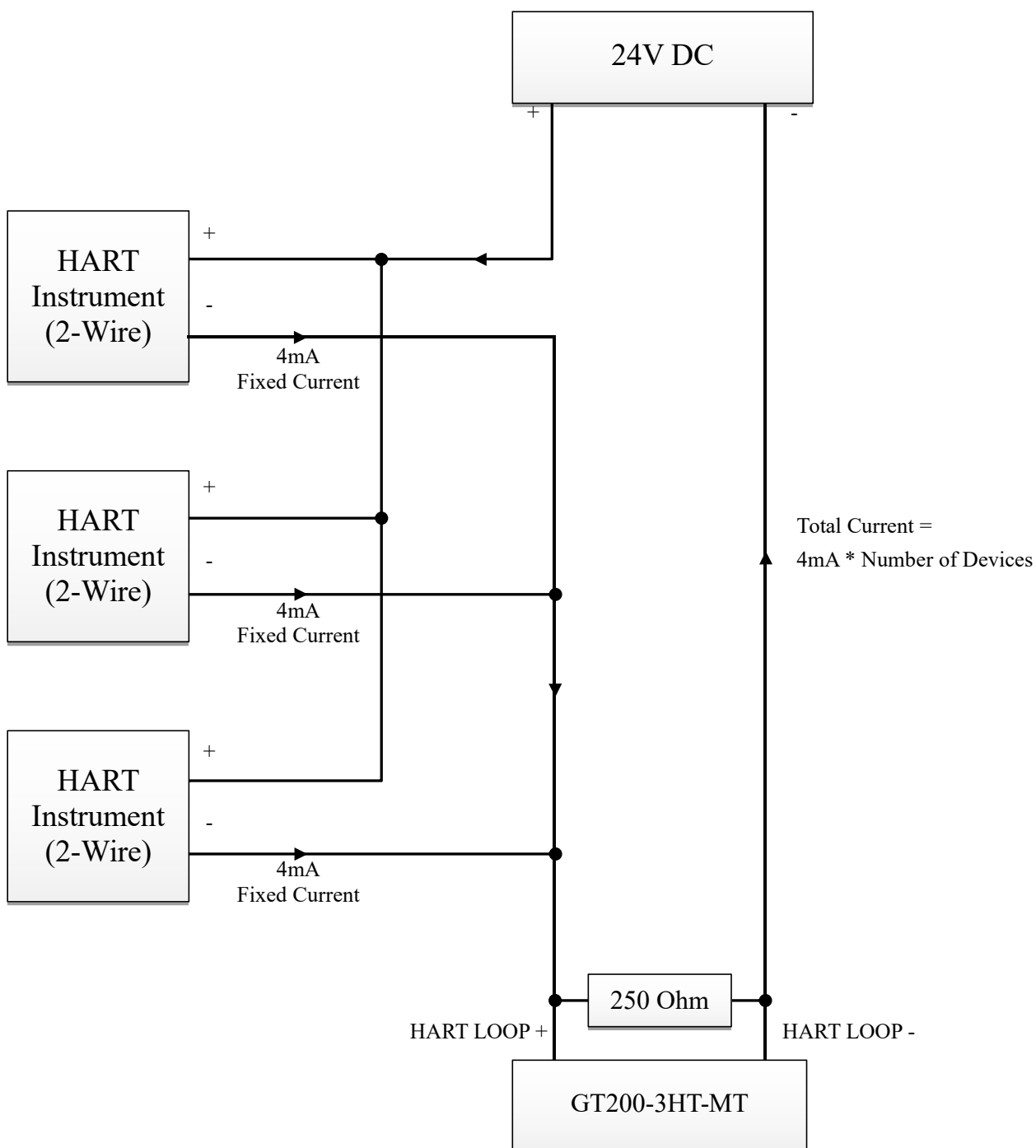
Maximum Cable Length: 450m for 15 Devices

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

Two wire - When using an external resistor:



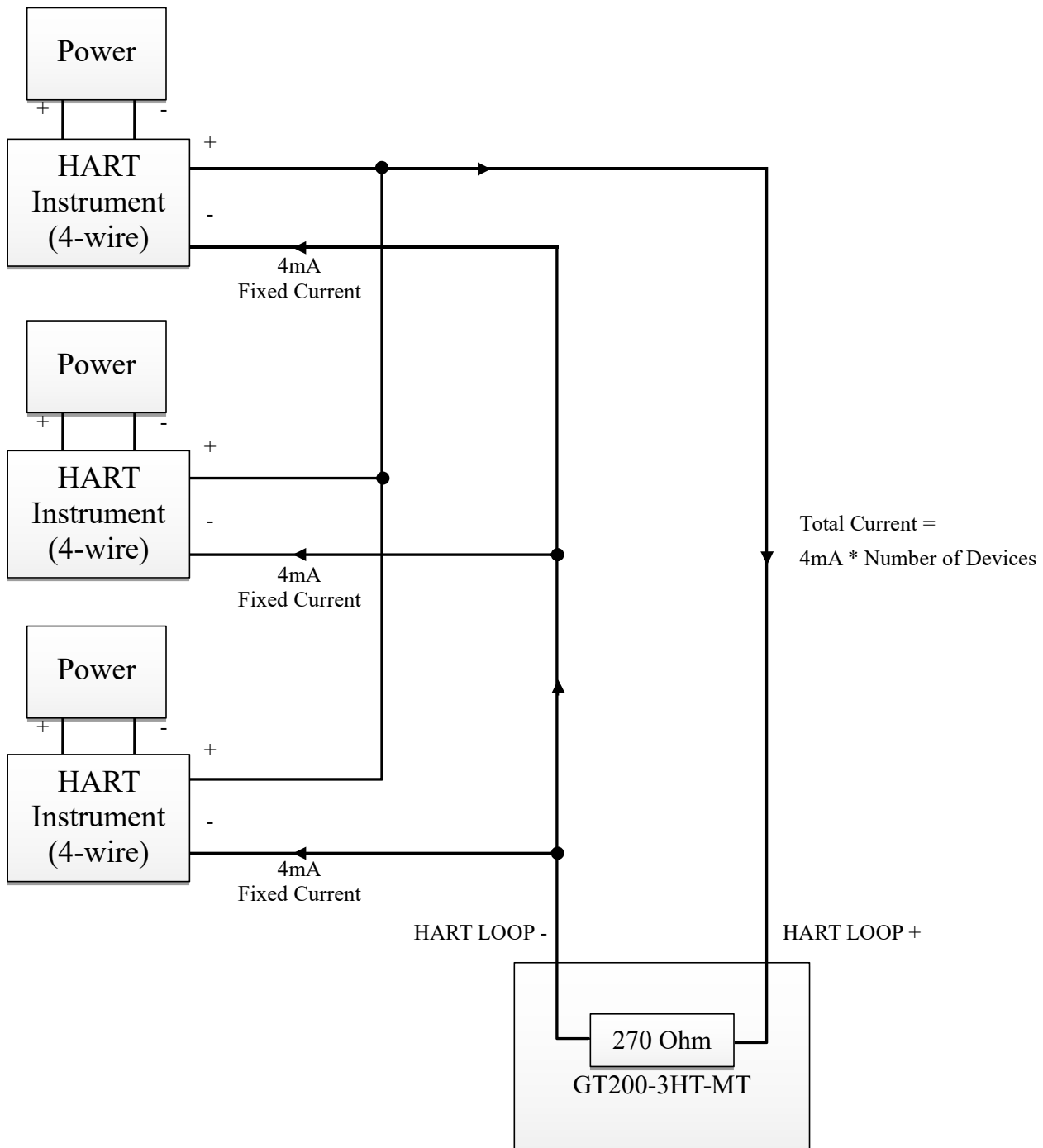
Maximum Cable Length: 450m for 15 Devices

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

Four wire - When using the internal resistor:



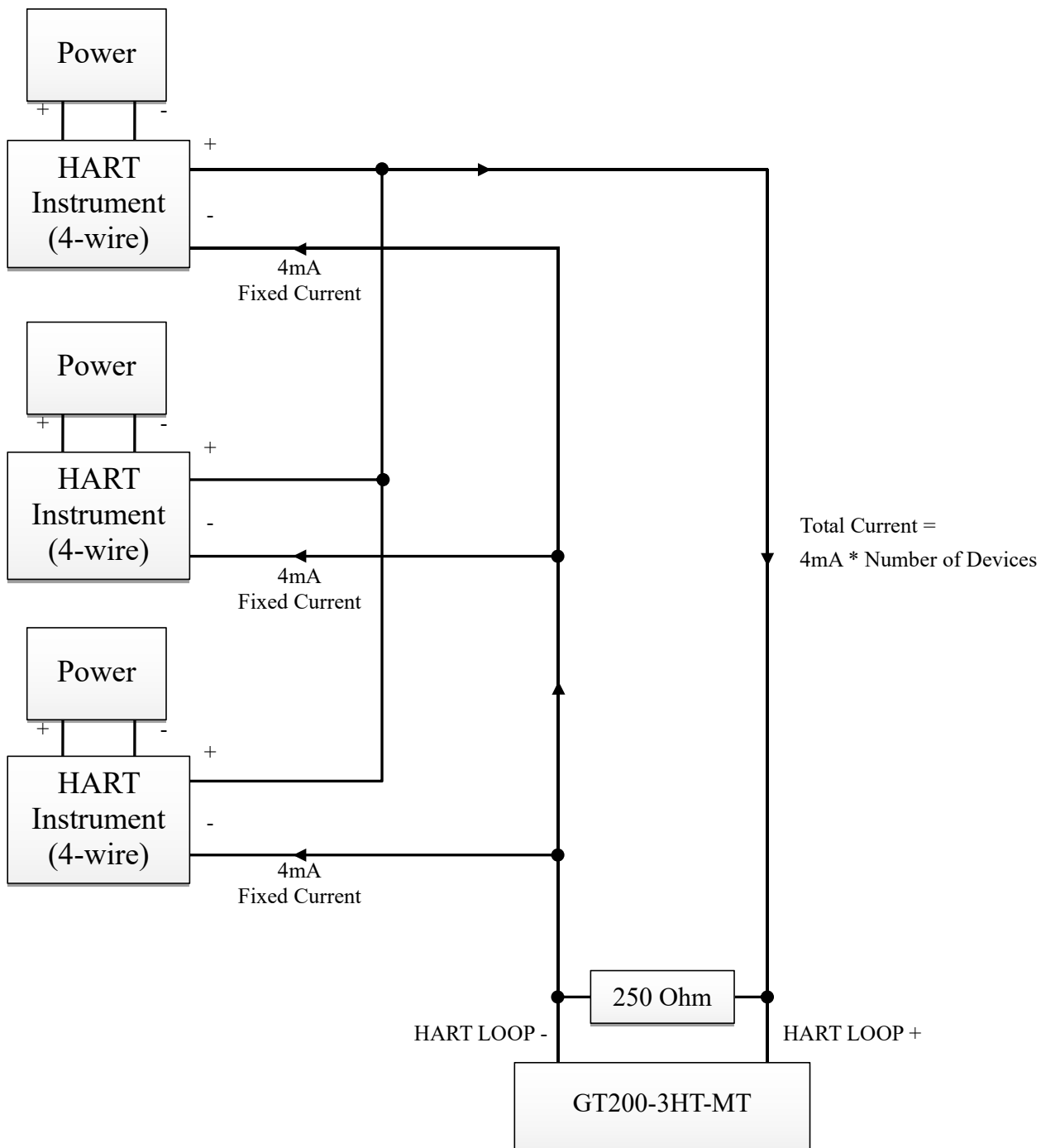
Maximum Cable Length: 450m for 15 Devices

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

Four wire - When using an external resistor:



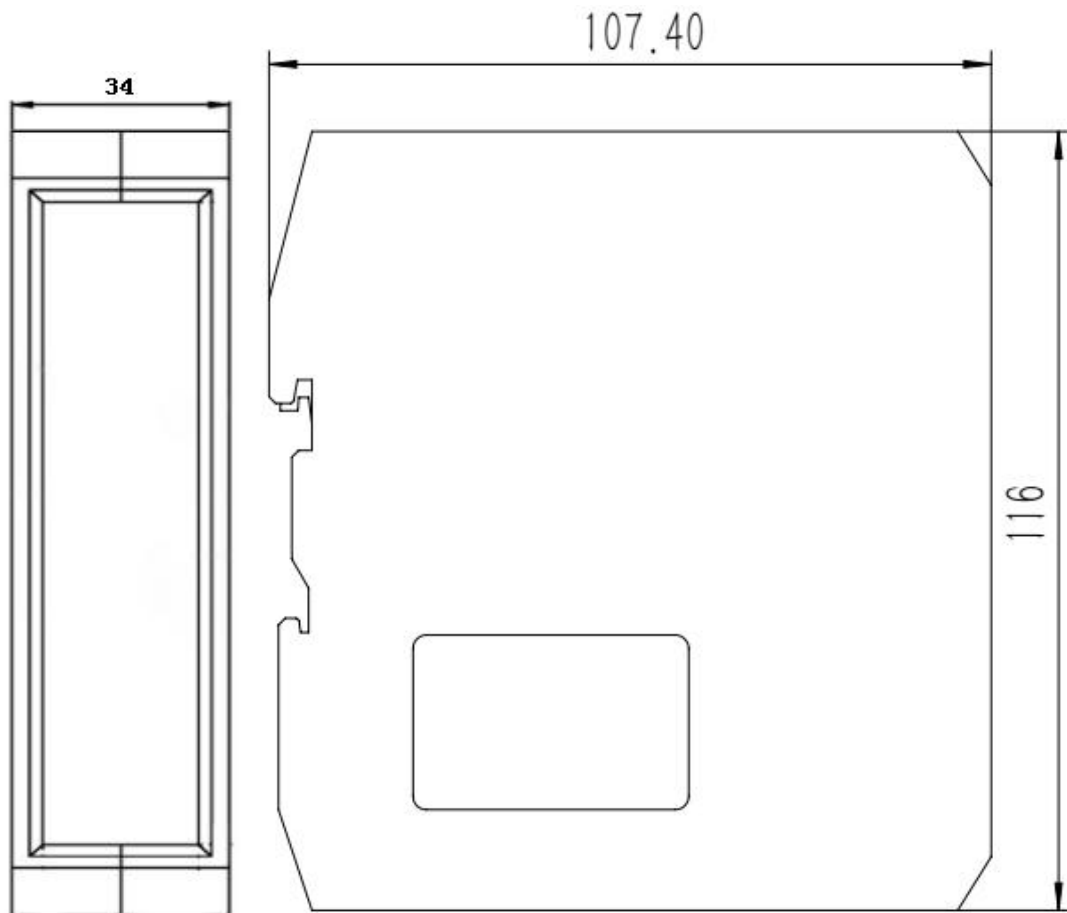
Maximum Cable Length: 450m for 15 Devices



3 Hardware Mounting

3.1 Mechanical Dimensions

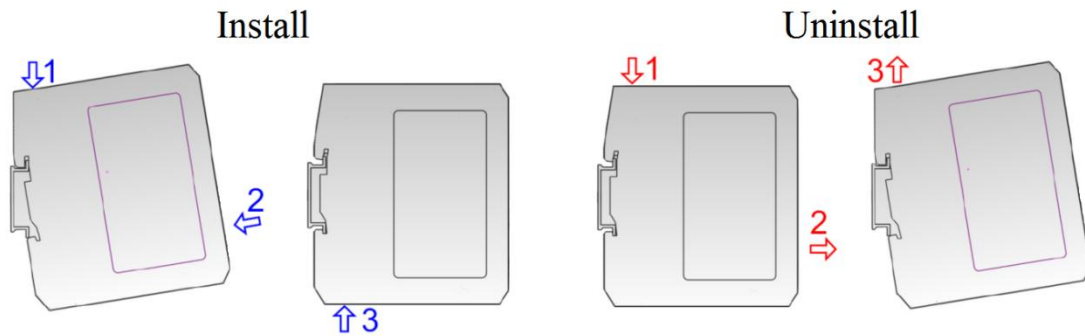
1.33in * 4.56in * 4.21in (34mm * 116mm * 107.4mm)





3.2 Installation Method

Using 1.4 in (35mm) DIN RAIL.

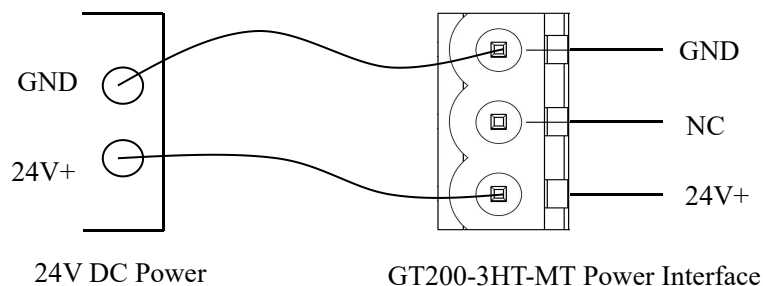




4 Getting Started - Quick Installation Guide

4.1 Hardware Connection

1. Make sure the GT200-3HT-MT is in the appropriate operating mode that allows for configuration. Set the gateway to Configuration Mode by settings the DIP switches to 1-ON, 2-OFF while the gateway is powered off.
2. Connect the Ethernet port of the gateway to the network port of the computer with a network cable. For details about the Ethernet interface, refer to [Chapter 2.4.2](#).
3. Connect the HART instruments to the GT200-3HT-MT. Refer to the wiring diagrams shown in [Chapter 2.5](#).
4. Connect the power supply to the gateway as shown in the figure below.



5. Power on the gateway, the gateway will be in Configuration Mode at this time. The IP of the gateway will be fixed to 192.168.0.11, and the IP of the connected computer should be set to a static IP within the 192.168.0.X subnet. Double-click the installed software icon SST-HI-CFG to start the configuration of the gateway.
6. After the gateway has been configured, power off the gateway and set the gateway to Run Mode by setting the DIP switches to 1-OFF, 2-OFF, then power on the gateway.



4.2 Software Setup

4.2.1 Configuration of Gateway

4.2.1.1 Connection Settings

1. Use network cable to connect the gateway's Ethernet port (RJ45 interface) with that of computer;
2. Power on the gateway, now the IP address of the gateway is fixed: 192.168.0.10 and it is configurable.

4.2.1.2 Software Configuration

1. Open the SST-HE-CFG software installed on your computer.
2. Select GT200-3HT-MT model.



- Upload

- Gateway Configuration Software SST-HE-CFG -- GT200-3HT-MT

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

Command ID1 is pre-configured to read the PV. (For your reference, the default configuration for this command is shown below.)

Fieldbus	Configuration Mode	Advanced
HART Channel 1	Mode of Outputting Commands	Polling
Node(0)	Memory Starting Address of Sending Data	3000
Command ID1	Modbus Register Starting Address of Sending Data	1500
Command ID3	Length of Sending Data (BYTE)	0
	Length of Sending Data (WORD)	0
HART Channel 2	Receive Data Project Configuration	Configuration
Node(0)	Command Index	0
Command ID1		
Command ID3		
HART Channel 3		
Node(0)		

Command ID3 is pre-configured to read the PV, SV, TV, and QV. (For your reference, the default configuration for this command is shown below.)

Fieldbus	Configuration Mode	Advanced
HART Channel 1	Mode of Outputting Commands	Polling
Node(0)	Memory Starting Address of Sending Data	3000
Command ID1	Modbus Register Starting Address of Sending Data	1500
Command ID3	Length of Sending Data (BYTE)	0
	Length of Sending Data (WORD)	0
HART Channel 2	Receive Data Project Configuration	Configuration
Node(0)	Command Index	1
Command ID1		
Command ID3		
HART Channel 3		
Node(0)		

4.2.1.3 Configuration

1. Open the SST-HE-CFG software installed on your computer.
2. Click Upload to upload the configuration.

Gateway Configuration Software SST-HE-CFG -- GT200-3HT-MT		
File Edit Tools View Help		
New Save Open AddNode DelNode AddCmd DelCmd Upload Download AutoMap Conflict Export Debug Memory Diagnose Switch		
Fieldbus	Type of Protocol	Modbus TCP Server
HART Channel 1	Assign IP Mode	Manually Assign
Node(0)	IP Address	192.168.0.10
Command ID1	Subnet Mask	255.255.255.0
Command ID3	Default Gateway	192.168.0.1
Command ID6	DNS1	
HART Channel 2	DNS2	
Node(0)		
Command ID1		

- Search Device
✕

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-3HT-MT	192.168.0.10	64-ea-c5-1d-01-93	2.0	Allows remote configuration

Upload
Refresh
IP Search
Cancel

Searched

- | | |
|-----------------|-----------------|
| Mode | Modbus TCP |
| Assign IP Mode | Manually Assign |
| IP Address | 192.168.0.10 |
| Subnet Mask | 255.255.255.0 |
| Default Gateway | 192.168.0.1 |
| DNS1 | 0.0.0.0 |
| DNS2 | 0.0.0.0 |

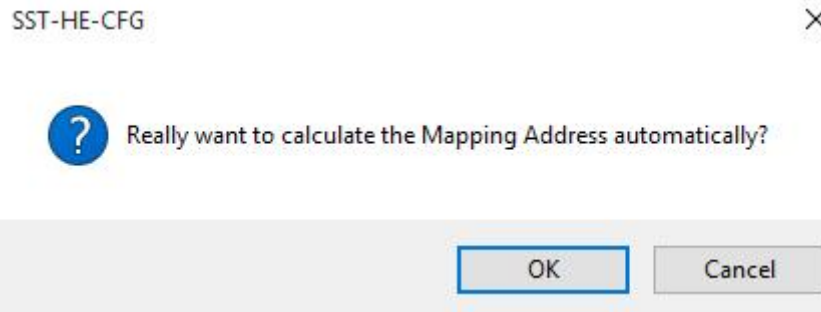
- | | |
|---|----------------|
| Master Type | Primary Master |
| Network Mode | Point-to-Point |
| Maximum Repetitions | 3 |
| Polling | Enable |
| Delay Between Polls | 256 |
| Response Timeout | 256 |
| How to Action after N Successive Response Timeout | Hold |
| Successive Response Timeout for N Times | 3 |

GT200-3HT-MT

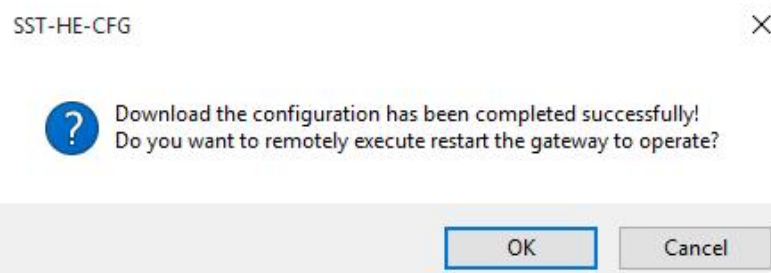
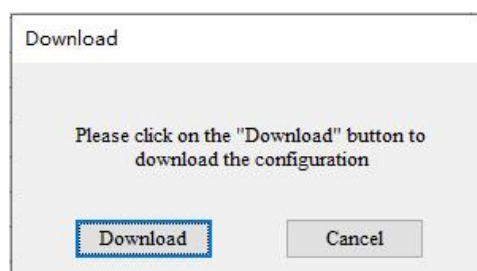
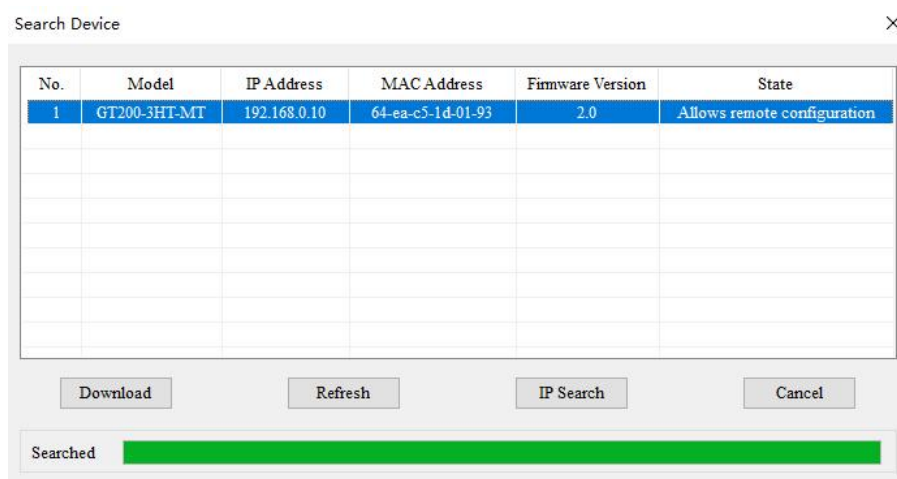
3-channel HART/Modbus TCP Gateway

User Manual

6. Click the AutoMap icon 



7. Click the Download icon 



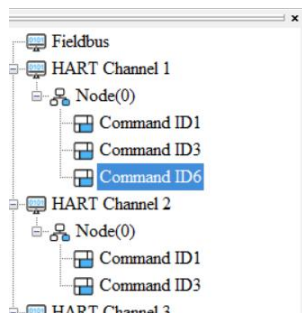


4.2.2 Communication with Modbus TCP Client

The GT200-3HT-MT is able to connect HART instruments to Modbus TCP network as a Modbus TCP server. The following example shows how the GT200-3HT-MT communicates with Modbus Poll (a Modbus simulator software).

1. Configure the GT200-3HT-MT with some HART nodes and commands. In this example, the GT200-3HT-MT is configured with HART commands 1, 3 and 6 for one node.

(1) Command 1: All the response data bytes can be read by the Modbus TCP client.

	Configuration Mode	Basic
	Mode of Outputting Commands	Polling
	Memory Starting Address of Sending Data	3000
	Modbus Register Starting Address of Sending Data	1500
	Length of Sending Data (BYTE)	1
	Length of Sending Data (WORD)	1
	Memory Starting Address of Receiving Data	33
	Modbus Register Starting Address of Receiving Data	16
	Length of Receiving Data (BYTE)	0
	Length of Receiving Data (WORD)	0
	Command Index	2

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

- (2) Command 3: Advanced configuration mode. Double click any values to filter them out. Update the configuration to read only bytes No.5-8, 10-13 and 15-18. The others can be filtered out. The remaining bytes are the secondary, tertiary and quaternary variables.

The screenshot shows the 'Advanced Configuration' dialog box with the following data:

Bytes	Memory Address	Starting Address	Byte swap
5-8	0	0	Register swap
10-13	0	0	Register swap
15-18	0	0	Register swap

The 'Response data' section lists the following command status bytes: Byte0-3, Byte4, Byte9, Byte14, Byte19, and Byte20-23.

- (3) Command 6: 2-byte request and 2-byte response. The response data length includes the command status bytes.

The screenshot shows the 'Configuration Mode' dialog box with the following data:

Configuration Mode	Value
Configuration Mode	Basic
Mode of Outputting Commands	Polling
Memory Starting Address of Sending Data	3000
Modbus Register Starting Address of Sending Data	1500
Length of Sending Data (BYTE)	1
Length of Sending Data (WORD)	1
Memory Starting Address of Receiving Data	33
Modbus Register Starting Address of Receiving Data	16
Length of Receiving Data (BYTE)	4
Length of Receiving Data (WORD)	2
Command Index	2

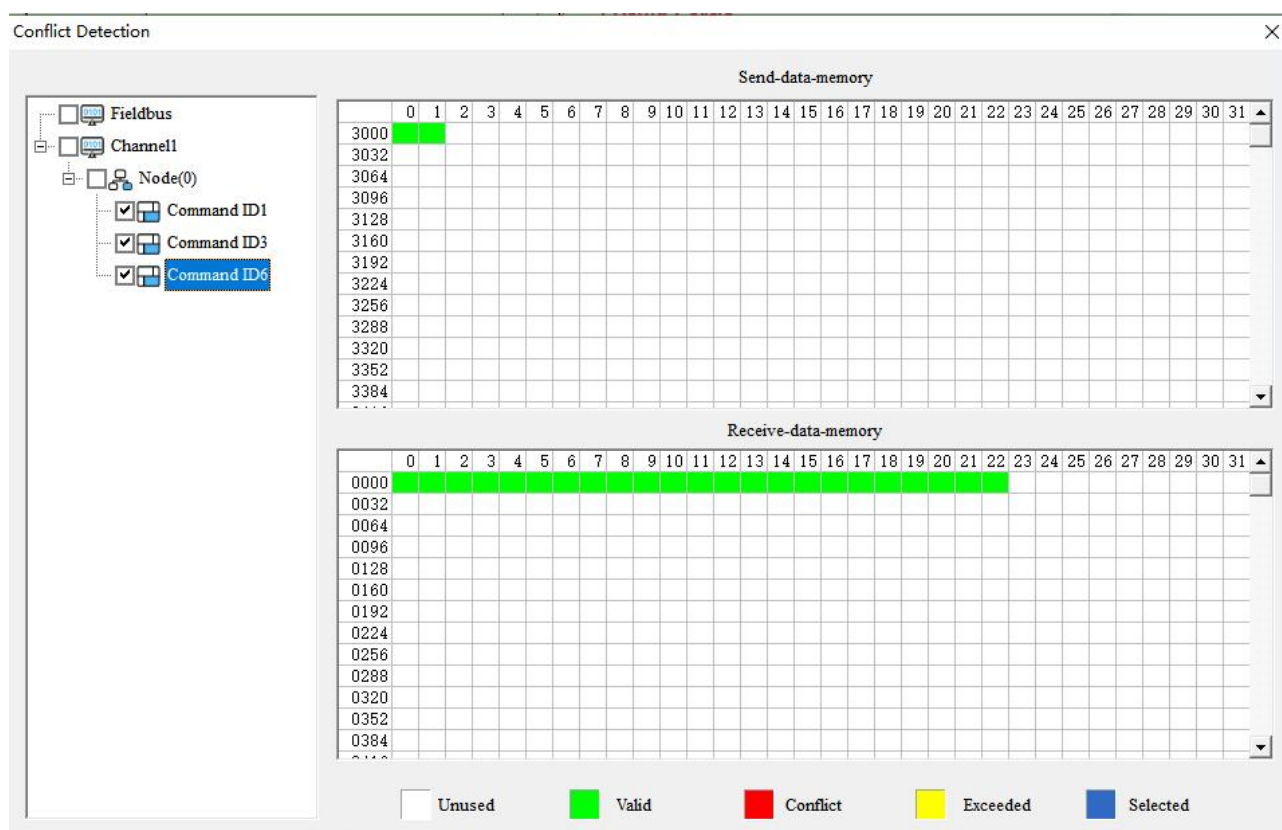
GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

- After mapping the data, check the buffer address in Conflict Detection window. The request data bytes of command 6 are stored in 3000~3001 bytes. The response data bytes of command 1 are stored in 0~6 bytes, command 3 in 7~18bytes and command 6 in 19~22 bytes.

According to the address table in [Chapter 6.2](#), Modbus TCP client should read/write the 4x1501 holding register by function code 03 / 06 or 16, and read the 3x0001 to 3x0004 input registers by function code 04. For Command 3 and 6, it's 3x0005 to 3x0010 and 3x0011 to 3x0012.



GT200-3HT-MT

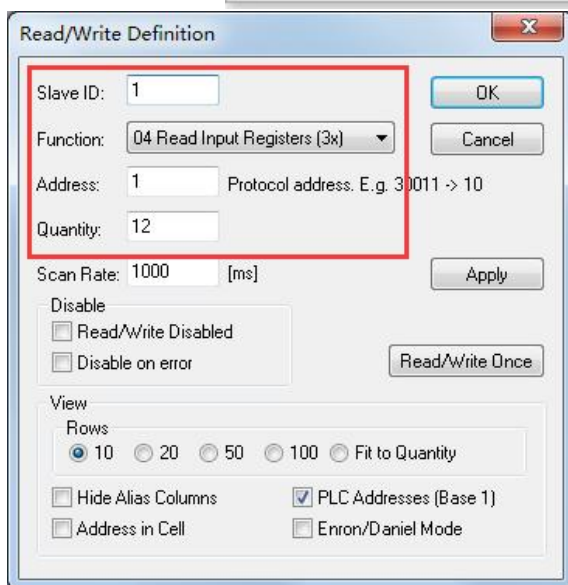
3-channel HART/Modbus TCP Gateway

User Manual

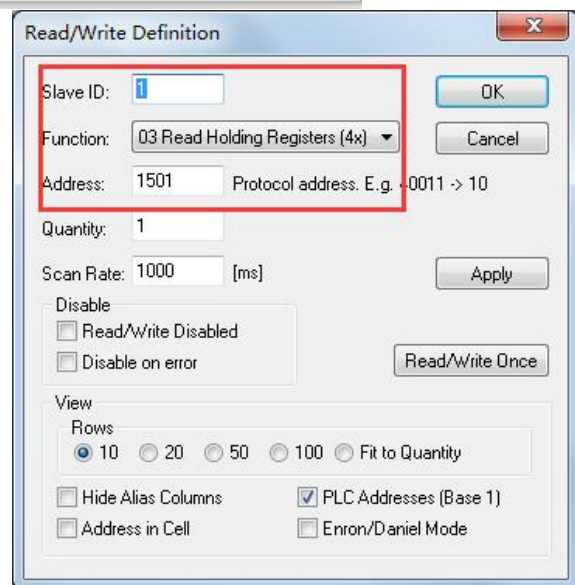
This example uses Modbus Poll on the computer to simulate the Modbus TCP client. Set the correct server IP and read/write parameters.



The 'Connection' dialog box in Modbus Poll is shown. It has a 'Mode' dropdown set to 'TCP/IP'. Below it are settings for '9600 Baud', '8 Data bits', 'Even Parity', and '1 Stop Bit'. To the right, there are radio buttons for 'RTU' (selected) and 'ASCII'. Further right are 'Response Timeout' (1000 [ms]) and 'Delay Between Polls' (10 [ms]). At the bottom, the 'Remote Server' section has 'IP Address' set to '192.168.0.10' (highlighted with a red box) and 'Port' set to '502'. Buttons for 'OK', 'Cancel', and 'Advanced...' are on the right.



The 'Read/Write Definition' dialog box is shown for a read operation. The 'Slave ID' is '1' (highlighted with a red box). The 'Function' is '04 Read Input Registers (3x)'. The 'Address' is '1' and the 'Quantity' is '12'. The 'Scan Rate' is '1000 [ms]'. There are checkboxes for 'Read/Write Disabled' and 'Disable on error'. At the bottom, there are 'View' options for 'Rows' (10, 20, 50, 100, Fit to Quantity) and checkboxes for 'Hide Alias Columns', 'PLC Addresses (Base 1)', 'Address in Cell', and 'Enron/Daniel Mode'. Buttons for 'OK', 'Cancel', 'Apply', and 'Read/Write Once' are present.



The 'Read/Write Definition' dialog box is shown for a read operation. The 'Slave ID' is '1' (highlighted with a red box). The 'Function' is '03 Read Holding Registers (4x)'. The 'Address' is '1501' and the 'Quantity' is '1'. The 'Scan Rate' is '1000 [ms]'. There are checkboxes for 'Read/Write Disabled' and 'Disable on error'. At the bottom, there are 'View' options for 'Rows' (10, 20, 50, 100, Fit to Quantity) and checkboxes for 'Hide Alias Columns', 'PLC Addresses (Base 1)', 'Address in Cell', and 'Enron/Daniel Mode'. Buttons for 'OK', 'Cancel', 'Apply', and 'Read/Write Once' are present.

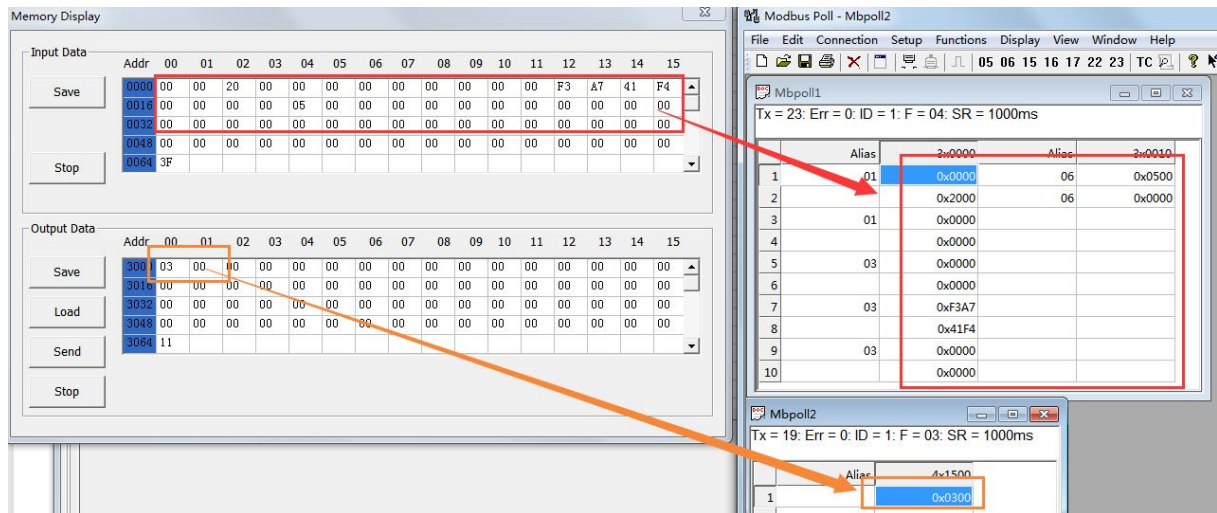
GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

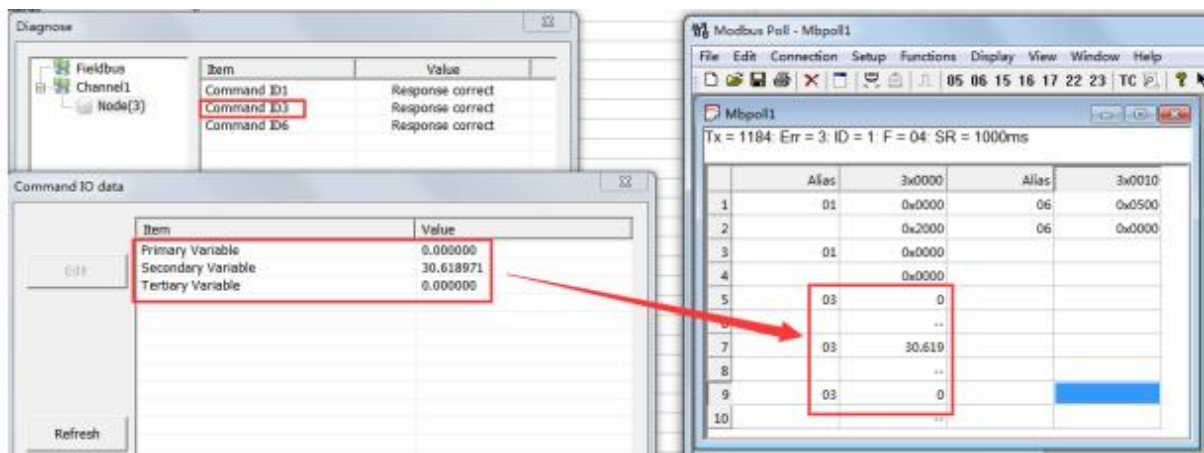
User Manual

3. You can use the advanced function Memory Data Display (see [Chapter 5.2.7](#)) or Diagnose (see [Chapter 5.2.8](#)) to monitor the HART communication.

(1) Memory Data Display



- (2) Diagnose: According to the specifications of HART command, you can convert the hexadecimal data to float number.



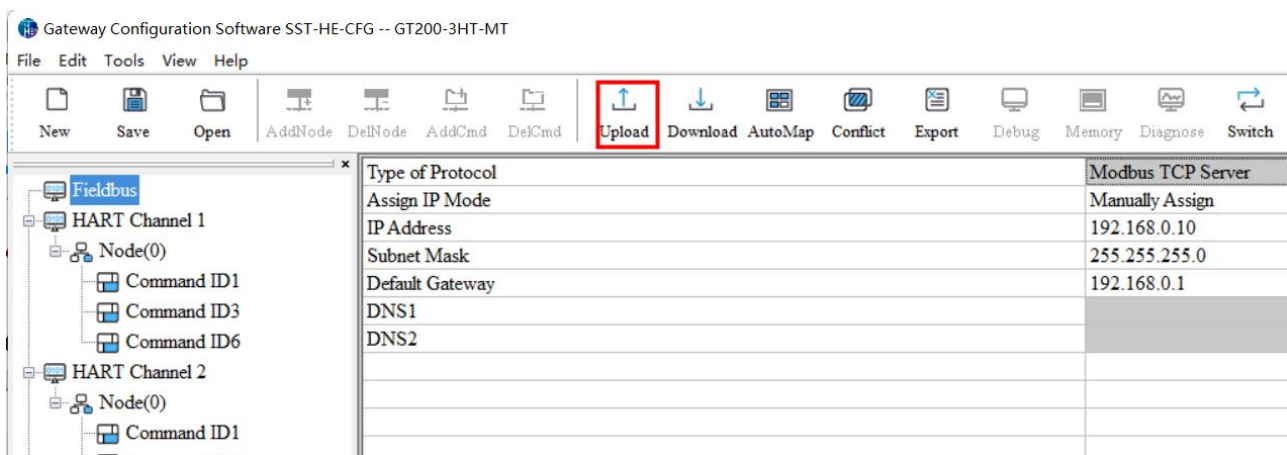
2.3 Troubleshooting Multiple HART Devices

The GT200-3HT-MT can receive data from up to 15 HART devices connected on the same bus. The following example shows how to configure the GT200-3HT-MT in multi-drop mode to receive data from multiple HART nodes.

4.2.3.1 Identifying HART Slave Addresses

Each HART device can have an assigned slave address between 0-15. If the address of a HART device is unknown, the SST-HE-CFG software can be used to identify the address with the following steps:

1. Select a single HART device to find the address for. Addresses will need to be found one at a time. Connect the HART device to the GT200-3HT-MT using the wiring diagrams from [Chapter 2.5](#).
2. Open the SST-HE-CFG software installed on your computer.
3. Click Upload to upload the configuration.



- Search Device

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-3HT-MT	192.168.0.10	64-ea-c5-1d-01-93	2.0	Allows remote configuration

Upload

Refresh

IP Search

Cancel

Searched

-
- Gateway Configuration Software SST-HE-CFG -- GT200-3HT-MT
- File Edit Tools View Help
- New Save Open AddNode DelNode AddCmd DelCmd Upload Download AutoMap Conflict Export Debug Memory Diagnose Switch
- Fieldbus
- HART Channel 1
 - Node(0)
 - Command ID1
 - Command ID3
 - HART Channel 2
 - Node(0)
 - Command ID1
 - Command ID3
 - HART Channel 3
 - Node(0)
 - Command ID1
 - Command ID3
- Type of Protocol
- Assign IP Mode
- IP Address
- Subnet Mask
- Default Gateway
- DNS1
- DNS2
- Modbus TCP Server
- Manually Assign
- 192.168.0.10
- 255.255.255.0
- 192.168.0.1

GT200-3HT-MT

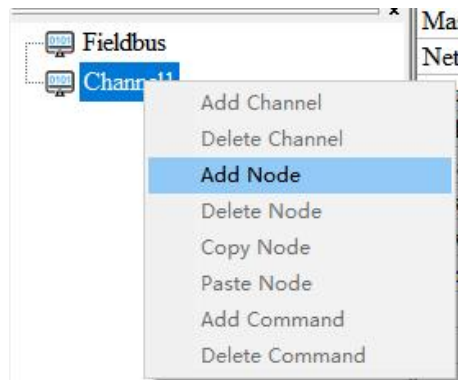
3-channel HART/Modbus TCP Gateway

User Manual

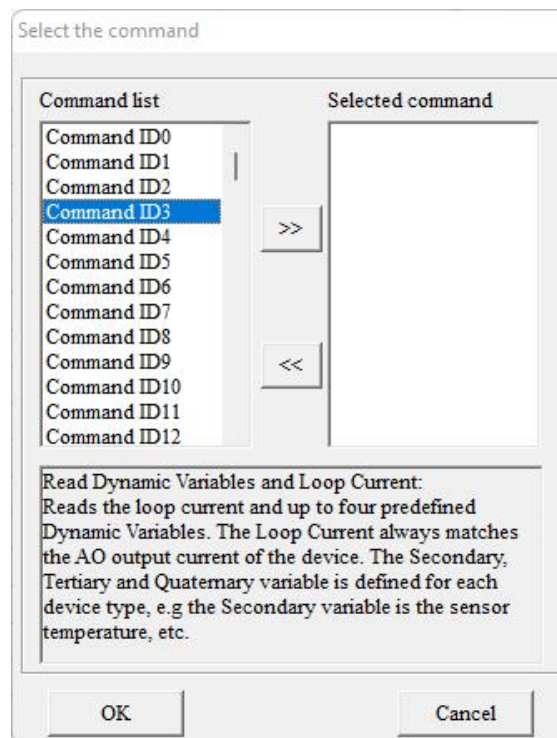
6. Click the HART channel on the left, configure the parameters as below:

Master Type	Primary Master
Network Mode	Point-to-Point
Maximum Repetitions	3
Polling	Enable
Delay Between Polls	256
Response Timeout	256
How to Action after N Successive Response Timeout	Hold
Successive Response Timeout for N Times	3

7. Right click the channel, select “Add Node”.



8. Right click on “Node(0)” and select “Add Command” and add Command ID3 box (double click on “Command ID3” or select “Command ID3” and click “>>”). Click OK.



GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

9. Click “Command ID3” and configure the parameters as shown below:

Configuration Mode	Basic
Mode of Outputting Commands	Polling
Memory Starting Address of Sending Data	3000
Modbus Register Starting Address of Sending Data	1500
Length of Sending Data (BYTE)	0
Length of Sending Data (WORD)	0
Memory Starting Address of Receiving Data	0
Modbus Register Starting Address of Receiving Data	0
Length of Receiving Data (BYTE)	26
Length of Receiving Data (WORD)	13
Command Index	0



AutoMap

10. Click the AutoMap icon

SST-HE-CFG



Really want to calculate the Mapping Address automatically?

OK

Cancel

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual



- Click the Download icon 

Search Device ×

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-3HT-MT	192.168.0.10	64-ea-c5-1d-01-93	2.0	Allows remote configuration

Download Refresh IP Search Cancel

Searched 

Download

Please click on the "Download" button to download the configuration

Download

Cancel

SST-HE-CFG

×



Download the configuration has been completed successfully!
Do you want to remotely execute restart the gateway to operate?

OK

Cancel

- Check the LED indicators to verify the device status. If both TX and RX lights are flashing, then the device is configured to slave address 0. If the RX light is not flashing, then change Network Mode to Multi-drop and proceed to step 14.

GT200-3HT-MT

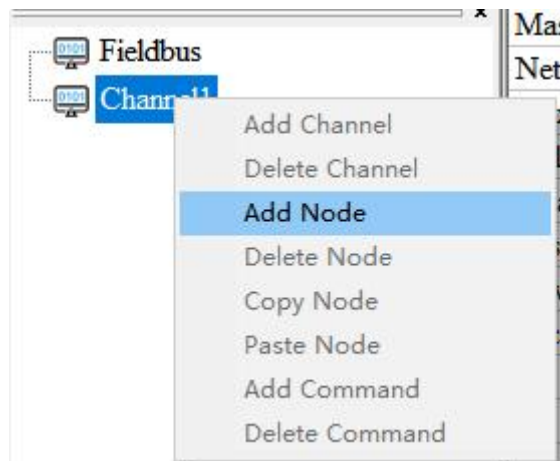
3-channel HART/Modbus TCP Gateway

User Manual

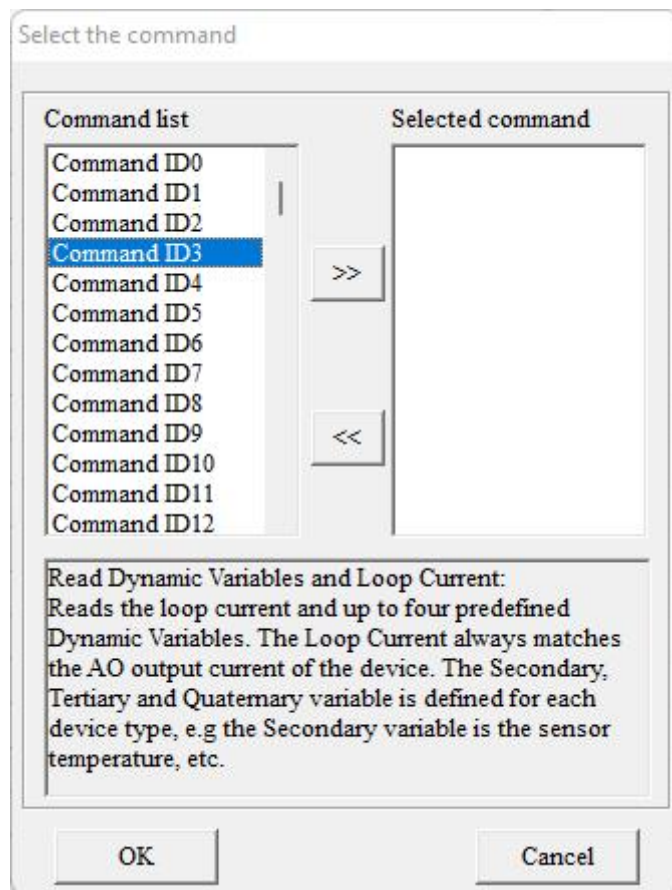
13. Click the HART channel on the left and configure the parameters as below:

Master Type	Primary Master
Network Mode	Multi-drop
Maximum Repetitions	3
Polling	Enable
Delay Between Polls	256
Response Timeout	256
How to Action after N Successive Response Timeout	Hold
Successive Response Timeout for N Times	3

14. Right click the channel, select “Add Node”.



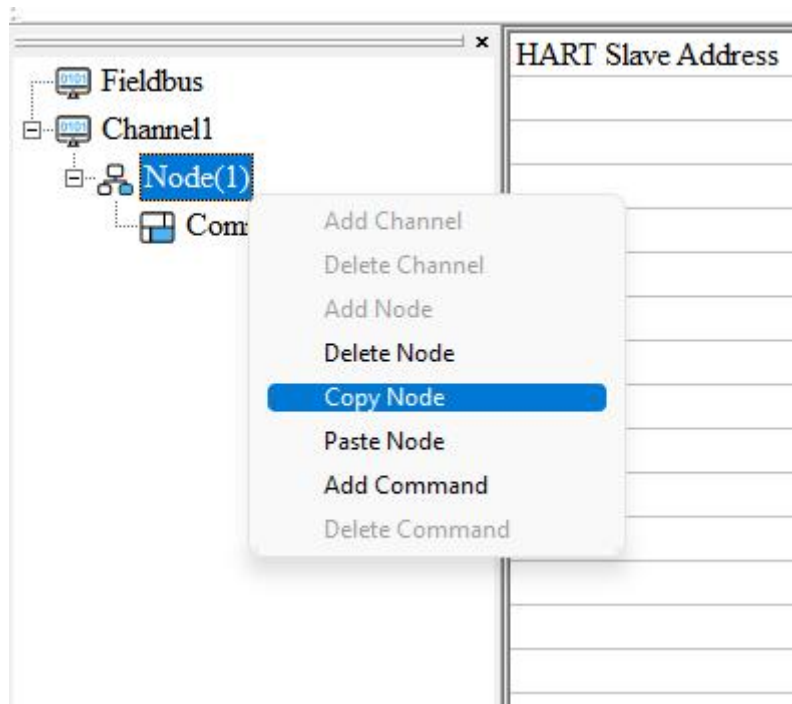
15. Right click on “Node(1)” and select “Add Command” and add Command ID3 box (double click on “Command ID3” or select “Command ID3” and click “»”). Click OK.



16. Click “Command ID3” and configure the parameters as below:

Configuration Mode	Basic
Mode of Outputting Commands	Polling
Memory Starting Address of Sending Data	3000
Modbus Register Starting Address of Sending Data	1500
Length of Sending Data (BYTE)	0
Length of Sending Data (WORD)	0
Memory Starting Address of Receiving Data	0
Modbus Register Starting Address of Receiving Data	0
Length of Receiving Data (BYTE)	26
Length of Receiving Data (WORD)	13
Command Index	0

17. Right click on “Node(1)” and select “Copy Node”.

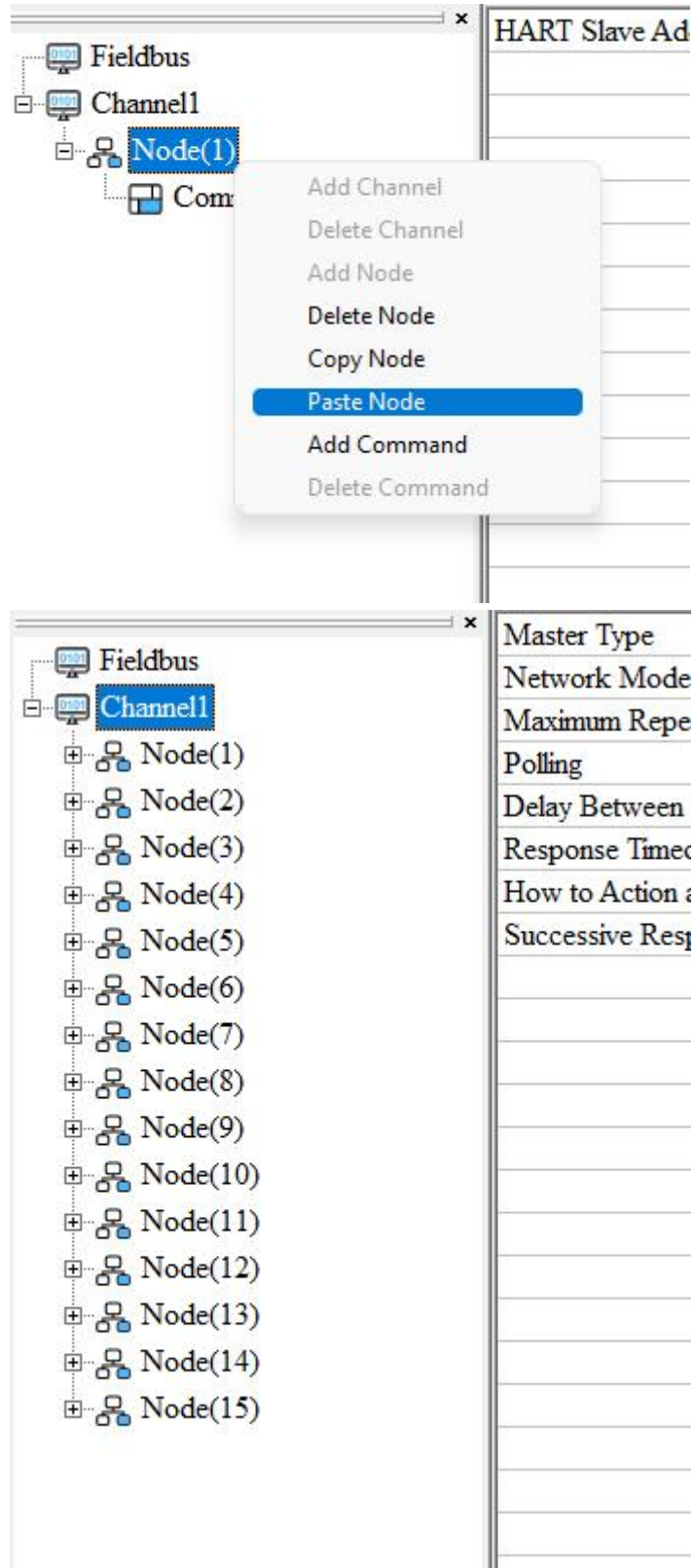


GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

18. Right click on “Node (1)” and select “Paste Node”. Repeat this step until there are 15 nodes.





GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual



AutoMap

19. Click the AutoMap icon

SST-HE-CFG



Really want to calculate the Mapping Address automatically?

OK

Cancel

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual



20. Click the Download icon Download

Search Device
×

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-3HT-MT	192.168.0.10	64-ea-c5-1d-01-93	2.0	Allows remote configuration

Download
Refresh
IP Search
Cancel

Searched

Download

Please click on the "Download" button to download the configuration

Download

Cancel

SST-HE-CFG



Download the configuration has been completed successfully!
Do you want to remotely execute restart the gateway to operate?

OK

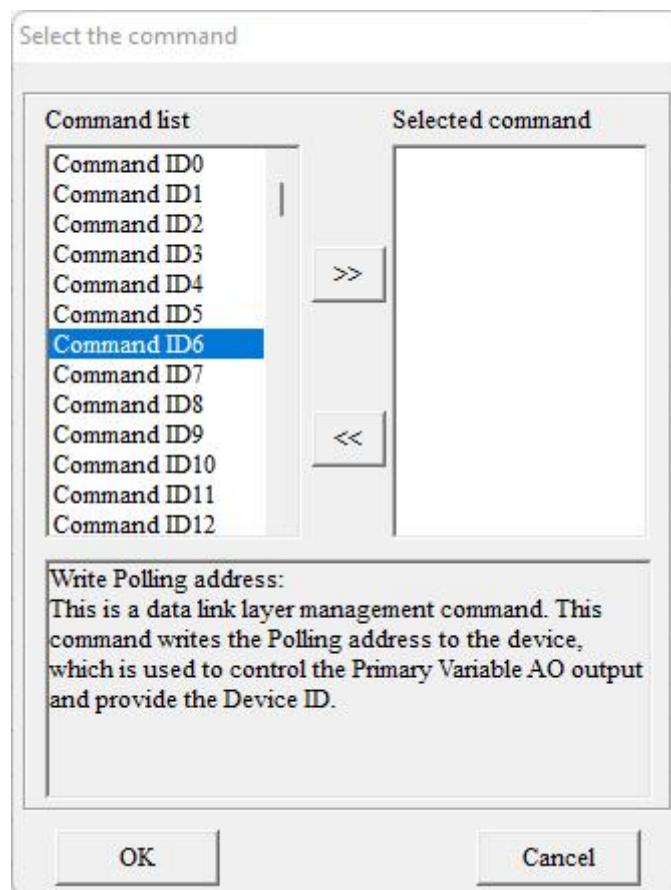
Cancel

21. Check the LED indicators to verify the device status. If both TX and RX lights are flashing, then the device is configured in multi-mode and has a slave address anywhere between 1-15. To find the exact slave address, remove nodes and repeat steps 20-22. If the RX light is not flashing, then change the Master Type to "Secondary Master", remove all nodes, and repeat steps 7-22.

4.2.3.2 Changing HART Slave Addresses

The SST-HE-CFG software has a built-in Debug mode with a Memory Display function that can be used to read and write data to HART devices. This functionality can be used to change the HART slave address of the device with the following steps:

1. Right click on “Node” and select "Add Command" and add Command ID6 box (double click on “Command ID6” or select "Command ID6" and click ">>"). Click OK.



GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

- Click "Command ID6" and configure the parameters as below:

Configuration Mode	Basic
Mode of Outputting Commands	Polling
Memory Starting Address of Sending Data	3000
Modbus Register Starting Address of Sending Data	1500
Length of Sending Data (BYTE)	1
Length of Sending Data (WORD)	1
Memory Starting Address of Receiving Data	0
Modbus Register Starting Address of Receiving Data	0
Length of Receiving Data (BYTE)	4
Length of Receiving Data (WORD)	2
Command Index	0



AutoMap

- Click the AutoMap icon

SST-HE-CFG



Really want to calculate the Mapping Address automatically?

OK

Cancel

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual



4. Click the download icon  Download

Search Device ×

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-3HT-MT	192.168.0.10	64-ea-c5-1d-01-93	2.0	Allows remote configuration

Searched

Download

Please click on the "Download" button to download the configuration

SST-HE-CFG ×

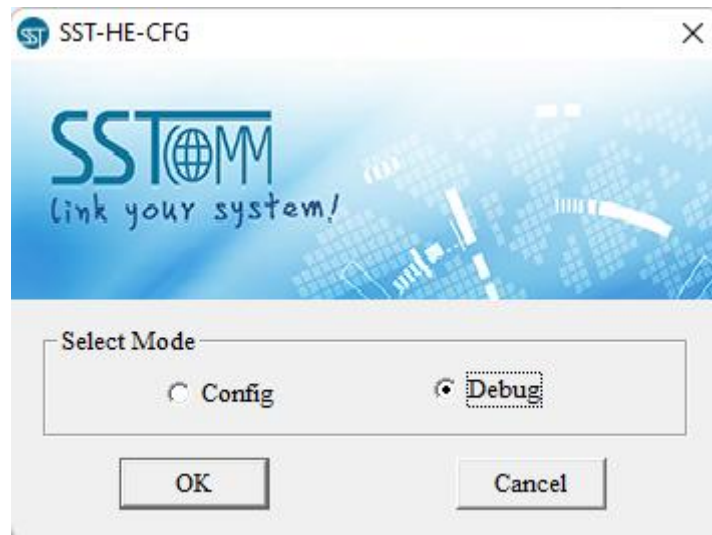


Download the configuration has been completed successfully!
Do you want to remotely execute restart the gateway to operate?



Mode Switch

5. Click the Mode Switch icon to switch into Debug mode



GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual



Diagnose

6. Click the Diagnose icon

Search Device

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-3HT-MT	192.168.0.10	64-ea-c5-1d-01-93	2.0	Allows remote configuration

Upload

Refresh

IP Search

Cancel

Searched

Upload

Click "Upload" to upload the configuration.

Upload

Cancel

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

- Click “Stop” in the Output Data box, update memory address 3000 with the desired HART slave address, and click the “Send” button. The following example shows how to change from slave address 0 to address 2.

Memory Display

Input Data

Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0000	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0016	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0032	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0048	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0064	4B															

Save

Stop

Output Data

Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
3000	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3016	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3032	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3048	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3064	0E															

Save

Load

Send

Stop

Memory Display

Input Data

Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0000	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0016	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0032	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0048	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0064	4B															

Save

Stop

Output Data

Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
3000	02	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3016	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3032	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3048	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3064	0E															

Save

Load

Send

Go on

Memory Display

Input Data

Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0000	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0016	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0032	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0048	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0064	4B															

Save

Stop

Output Data

Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
3000	02	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3016	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3032	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3048	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3064	0E															

Save

Load

Send

Go on

SST-HE-CFG

×



Success to write the memory:3000~3063

OK

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

8. In the Input Data box, memory address 0002 will update to show the HART device's new slave address.

Power cycle the HART device for apply the changes.

Memory Display

Save
Go on

Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0000	00	00	02	00	00	00	00	00	00	00	00	00	00	00	00	00
0016	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0032	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0048	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0064	4D															

Save
Load
Send
Go on

Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
3000	02	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3016	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3032	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3048	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3064	0E															



2.4 Common HART Commands

The following is a short list of useful HART commands that can be used for common applications of most HART devices. More information about supported commands is available from FieldComm Group at the following link: <https://library.fieldcommgroup.org/20127/TS20127/7.2/>

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		Data in Command		Data in Reply			
#	Function	Byte	Data	Type	Byte	Data	Type
1	Read primary variable		None		0	PV units code	Enum-8
					1-4	Primary variable	Float
3	Read current and four (predefined) dynamic variables		None		0-3	Current (mA)	Float
					4	PV units code	Enum-8
					5-8	Primary variable	Float
					9	SV units code	Enum-8
					10-13	Secondary variable	Float
					14	TV units code	Enum-8
					15-18	Tertiary variable	Float
					19	QV units code	Enum-8
					20-23	Quaternary variable	Float
6	Write polling address	0	Polling address	Unsigned-8	0	Polling address	Unsigned-8
		1	Loop current mode	Enum-8	1	Loop current mode	Enum-8

Command 1 (Command ID1): Read Primary Variable

Returns the primary variable value in float data type.

Request: None

Response:

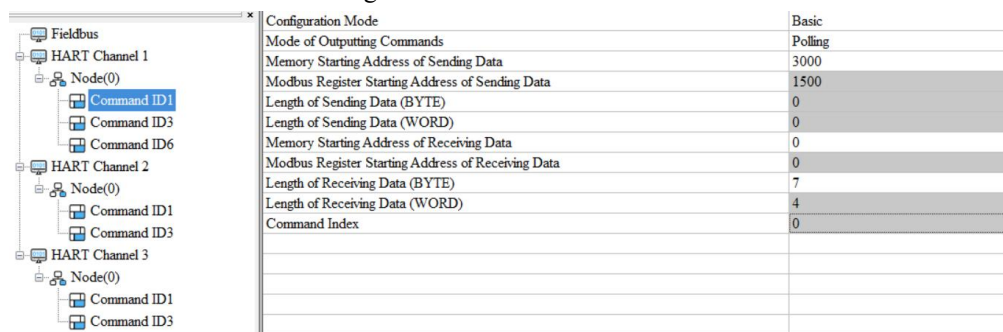
Byte	Description
Byte 0	Primary Variable Units
Byte 1-4	Primary Variable

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

An example of this command in the SST configuration software is shown 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

Reads the 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 can be 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

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

An example of this command in the SST configuration software is shown below:

Fieldbus	Configuration Mode	Basic
HART Channel 1	Mode of Outputting Commands	Polling
Node(0)	Memory Starting Address of Sending Data	3000
Command ID1	Modbus Register Starting Address of Sending Data	1500
Command ID3	Length of Sending Data (BYTE)	0
Command ID6	Length of Sending Data (WORD)	0
HART Channel 2	Memory Starting Address of Receiving Data	7
Node(0)	Modbus Register Starting Address of Receiving Data	3
Command ID1	Length of Receiving Data (BYTE)	26
Command ID3	Length of Receiving Data (WORD)	13
HART Channel 3	Command Index	1
Node(0)		
Command ID1		
Command ID3		

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. Switch to the “Advanced Configuration Mode”, click the “Configuration” button, and only select the variable(s) needed. In this example, only the “Primary Variable” and the “Secondary Variable” are selected. For more details on Advanced Configuration Mode, please refer to [Chapter 5.2.2.7](#).

Fieldbus	Configuration Mode	Basic
Channel1	Mode of Outputting Commands	Basic
Node(1)	Memory Starting Address of Sending Data	Advanced
Command ID1	Modbus Register Starting Address of Sending Data	1500
Command ID3	Length of Sending Data (BYTE)	0
Command ID6	Length of Sending Data (WORD)	0
	Memory Starting Address of Receiving Data	0
	Modbus Register Starting Address of Receiving Data	0
	Length of Receiving Data (BYTE)	26
	Length of Receiving Data (WORD)	13
	Command Index	1

Mapping address				Response data	
Bytes	Memory Address	Starting Address	Byte Swap	Command Status	
5-8	4	2	No Swap	Byte0-3	
10-13	8	4	No Swap	Byte4	
				Byte9	
				Byte14	
				Byte15-18	
				Byte19	
				Byte20-23	
Communication Status And Response Code					



Note: Selected variables are listed in the left table. Variables corresponding to the bytes are listed in the beginning of this chapter.

Command 6 (Command ID6): Write Polling Address

Writes the polling address (HART slave address) to the field device.

Request:

Byte	Description
Byte 0	Polling Address (Between 0-15)
Byte 1 (Only on supported HART devices)	Loop Current Mode (0=Disabled, 1=Enabled)

Response:

Byte	Description
Byte 0	Polling Address (Between 0-15)
Byte 1 (Only on supported HART devices)	Loop Current Mode (0=Disabled, 1=Enabled)

Note: Some HART devices do not support configuring the Loop Current Mode. These devices will only expect to receive Byte 0 of the request.

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

An example of this command in the SST configuration software is shown below:

Fieldbus	Configuration Mode	Basic
HART Channel 1	Mode of Outputting Commands	Polling
Node(0)	Memory Starting Address of Sending Data	3000
Command ID1	Modbus Register Starting Address of Sending Data	1500
Command ID3	Length of Sending Data (BYTE)	1
Command ID6	Length of Sending Data (WORD)	1
HART Channel 2	Memory Starting Address of Receiving Data	20
Node(0)	Modbus Register Starting Address of Receiving Data	10
Command ID1	Length of Receiving Data (BYTE)	0
Command ID3	Length of Receiving Data (WORD)	0
HART Channel 3	Command Index	2
Node(0)		
Command ID1		
Command ID3		

If the HART device does not support configuring the Loop Current Mode, the user should fill “1” for the section “Length of Sending Data (BYTE)”.

The “Length of Receiving Data (BYTE)” will be 3, which is the sum of 2 status bytes and 1 device response bytes.

If the HART device does support configuring the Loop Current Mode, the user should fill “2” for the section “Length of Sending Data (BYTE)”.

The “Length of Receiving Data (BYTE)” will be 4, which is the sum of 2 status bytes and 2 device response bytes.

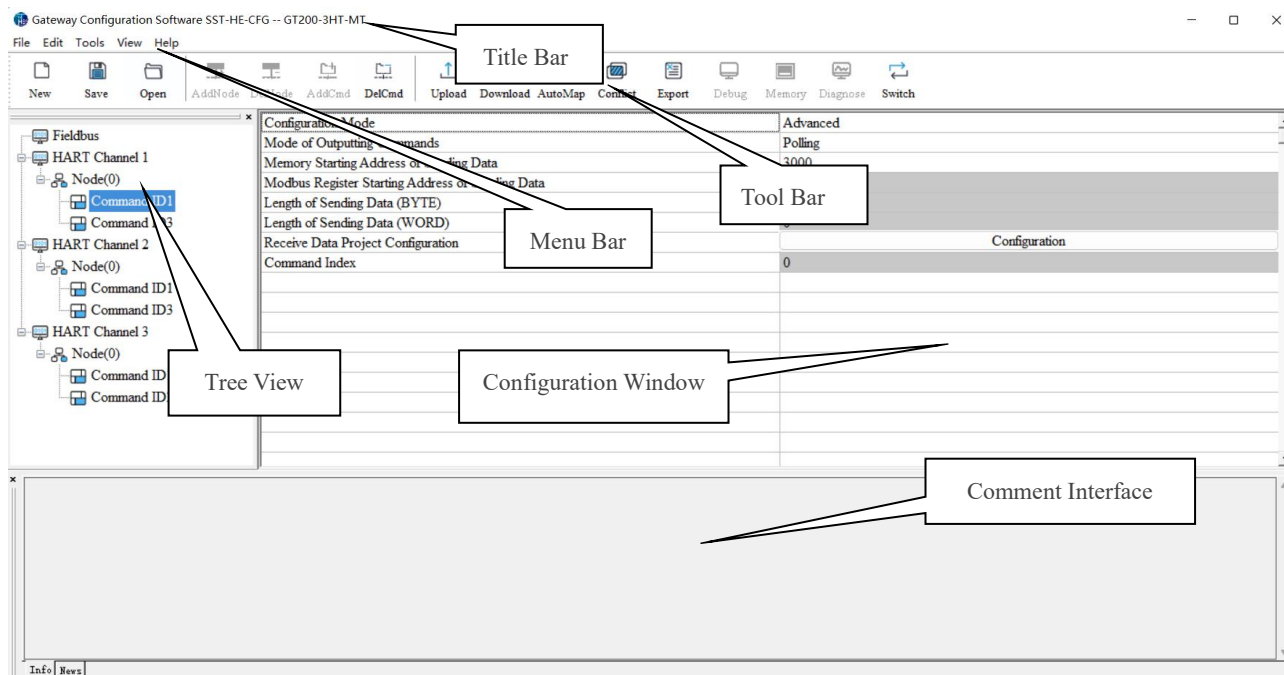
5 Software Instructions

5.1 Main Interface

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

The following describes how to use the software SST-HE-CFG to configure the product GT200-3HT-MT. You may also check the software user manual to get detailed usage.

Double-click on the icon  to enter the main interface of software:



5.2 Toolbar

The toolbar interface is shown as follows:



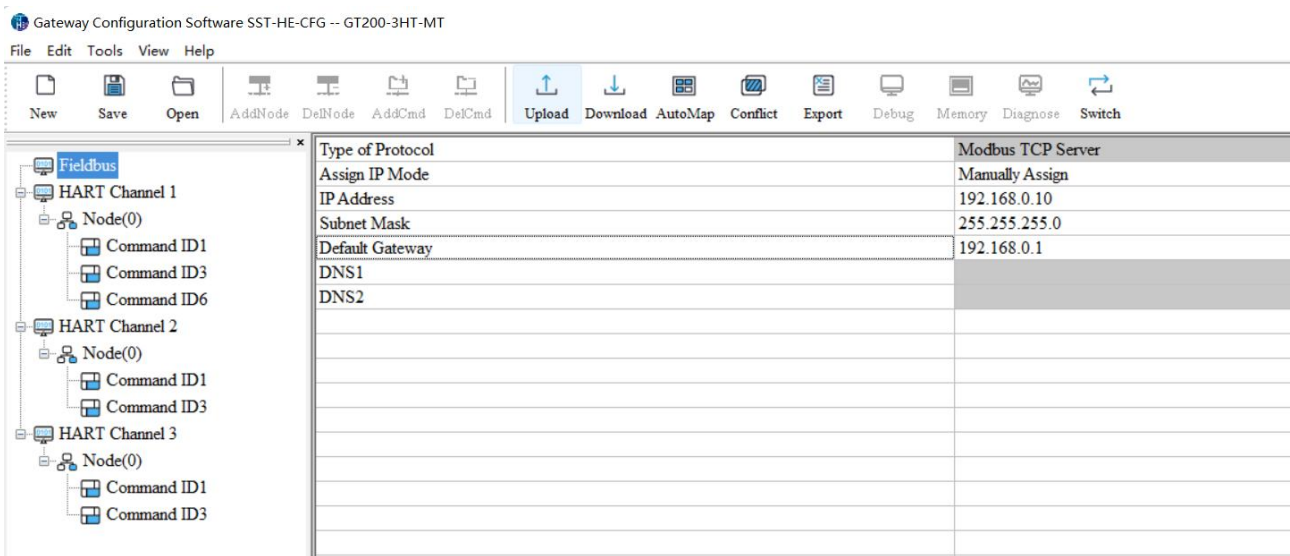
The function from left to right is: New, Save, Open, AddNode, DelNode, DelCmd, Upload, Download, AutoMap, Conflict, Export, Memory, Diagnose, Debug and Mode switch. GT200-3HT-MT doesn't support "Memory", "Diagnose", "Debug" and "Mode switch" function temporarily.

	New: Create a new configuration file.
	Save: Save the configuration file.
	Open: Open the configuration file
	AddNode: Add a HART node (device).
	DelNode: Delete a HART node (device).
	AddCmd: Add a HART command
	DelCmd: Delete a HART command.
	Upload: Upload the configuration from the GT200-3HT-MT and open it in the software.
	Download: Download the configuration to the GT200-3HT-MT.
	AutoMap: Automatically calculate the mapping address.
	Conflict: To check whether there are some conflicts in the data buffer.
	Export: Output the configuration and save it as an Excel form.
	Debug: Send any request to Hart devices and show the response information received (Only for GT200-3HT-RS model).
	Memory: Show the data in the buffer of the GT200-3HT-MT.
	Diagnose: Analyze operation of fieldbus devices
	Switch: Switch the mode to debugging or configuring.

5.2 Software Functional Specifications

5.2.1 Configure the Fieldbus

Click the "Fieldbus" on the left and select "Modbus TCP" in the "Mode" in the configuring plate on the right, as shown below:

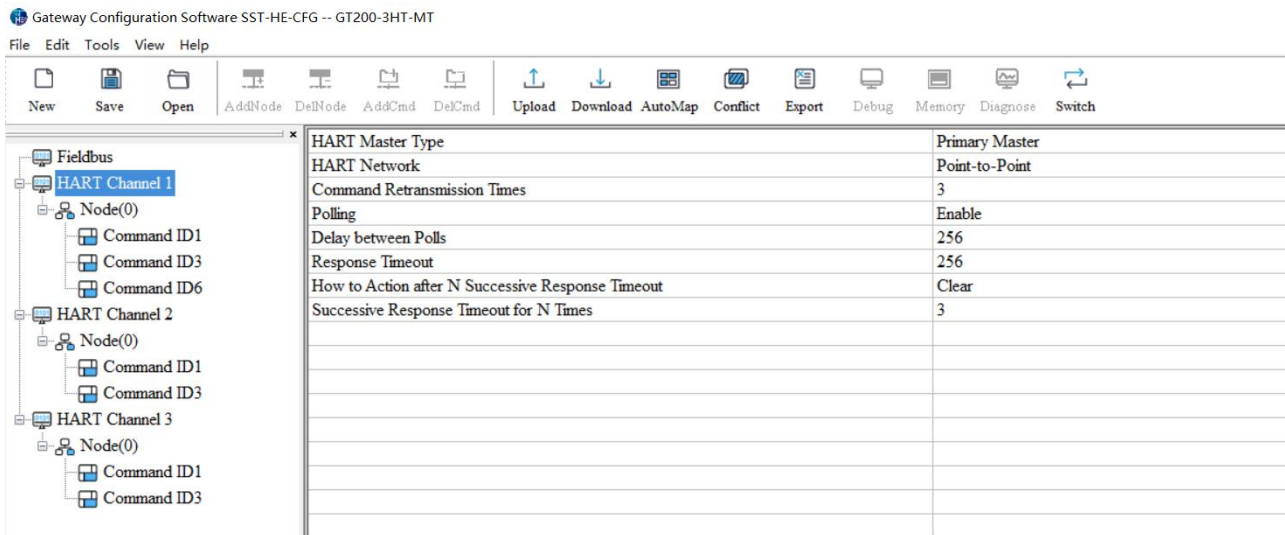


- Assign IP Mode:** Manual Assign, BOOTP, DHCP optional.
- IP Address:** Set the IP address of the GT200-3HT-MT.
- Subnet Mask:** Set the subnet mask of the GT200-3HT-MT.
- Default Gateway:** Set the gateway address of the GT200-3HT-MT.
- DNS1:** Default 0.0.0.0.
- DNS2:** Default 0.0.0.0.

5.2.2 Configure the HART Fieldbus

5.2.2.1 Set the Parameters of HART Channel

Click the "HartChannel0" on the left, then the configuration plate will be shown as below:



Master type: Primary master, Secondary master optional.

Network mode: Select the network mode of HART. In “point-to-point” mode, only one HART instruments of address 0 can be connected.

Maximum repetitions: Select the number of the HART command retries, ranging from 0 to 5.

Polling Enable: Select whether to use polling feature.

Delay between Polls: Set delay time between two commands with the range from 256~65535ms.

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

How to Action after N successive Response Timeout: Select whether to clear input data when the number of response timeouts is more than the set number, or keep the data.

Successive Response Timeout for N times: The max number of timeouts before the data is cleared, ranging from 1 to 14.

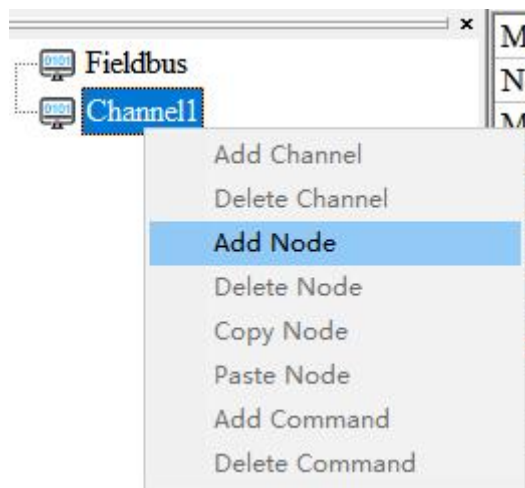
GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

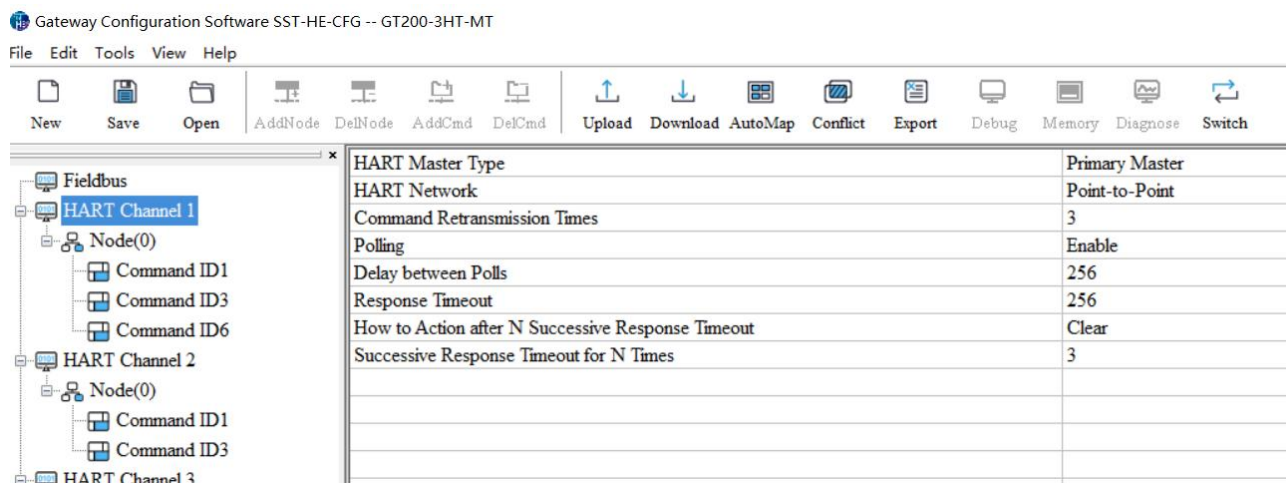
User Manual

5.2.2.2 Add Slave Nodes

Click the selected HART channel, right click on it and select "Add Node" in the pop-up menu.



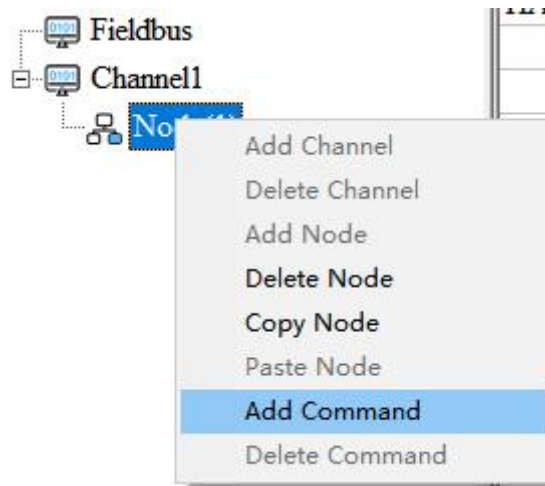
Click the added node, set device address in the right configuration plate.



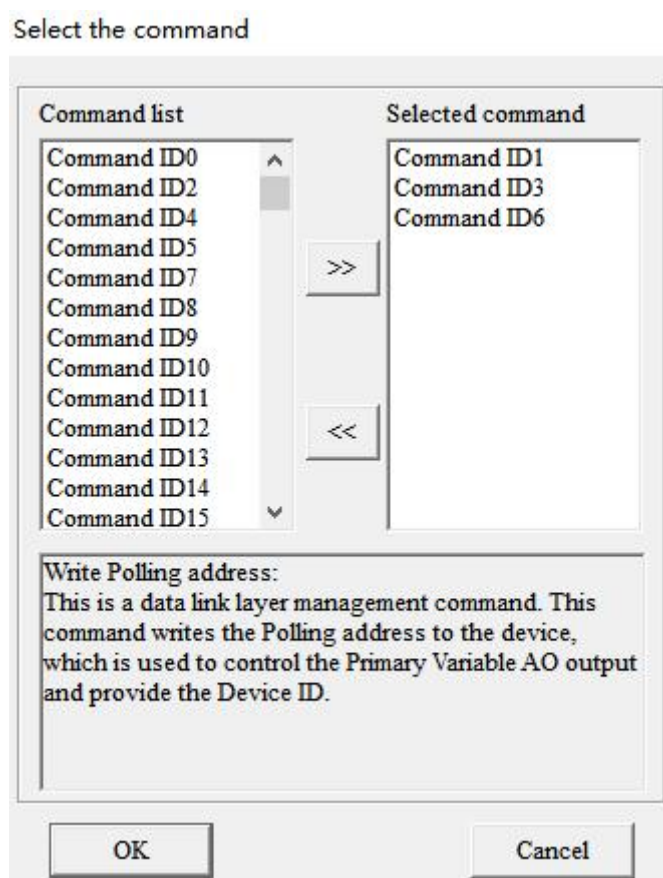
Note: When the number of configured nodes numbers is more than the actual connected devices, the redundant nodes will lead to a longer polling time. It is recommended that the number of configured nodes correspond with the number of actual devices.

5.2.2.3 Add HART Commands

Right click on a Node and select "Add Command" in the pop-up menu



Choose the command you want to add in the pop-up dialog box, and then click "OK" to exit:



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

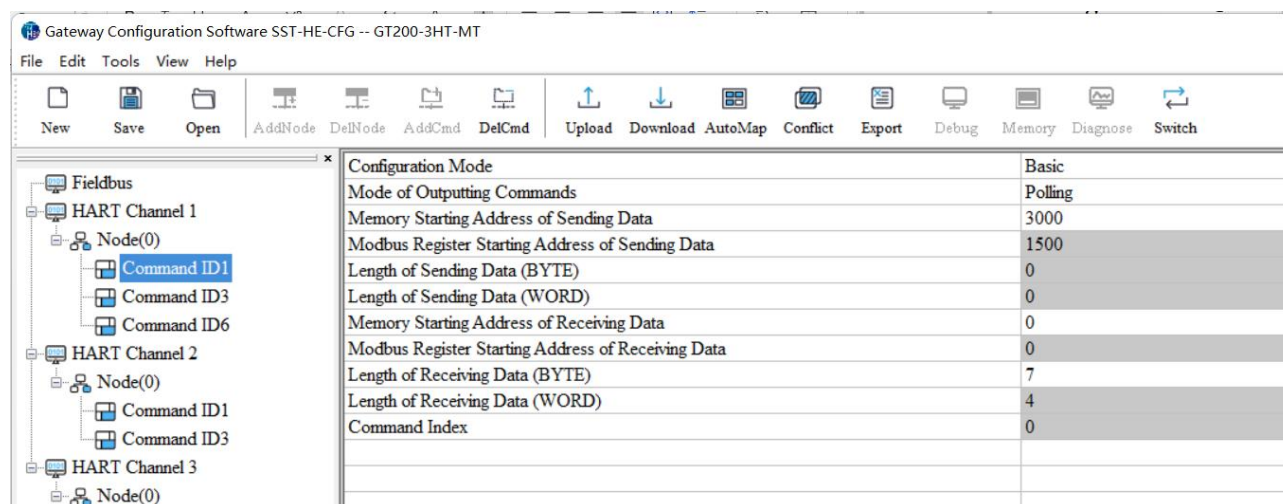
GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

5.2.2.4 Configure HART Commands

Click the command ID on the left, you will see the configuration plate of the command on the right:



Mode of outputting commands: Change-of-state, polling output, Initialization output and disable output optional.

Change-of-state output: Execute this command once the data buffer changes.

Polling output: The command is put in the polling list and executed periodically.

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

Disable output: The command will not be sent.

Memory starting address of sending data: Set the start address in data buffer of output data of this command. The range is 3000~4999.

Modbus register starting address of sending data: This parameter is automatically calculated and used for register addressing.

Sending data length (BYTE): Set the length of output data of this command.

Sending data length (WORD): This parameter is automatically calculated. 1 word=2 bytes.

Memory starting address of receiving data: Set the start address in data buffer of input data of this command. The range is 0~2999.

Modbus register starting address of receiving data: This parameter is automatically calculated and used for register addressing.

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

Receiving data length (WORD): This parameter is automatically calculated. 1 word=2 bytes.

Command index: This parameter is automatically calculated and it indicates the index of this command in the configured command list.

5.2.2.5 Delete Commands

Select the command you want to delete and, right click on it and select "Delete Command". This can also be done through the menu bar or tool bar.

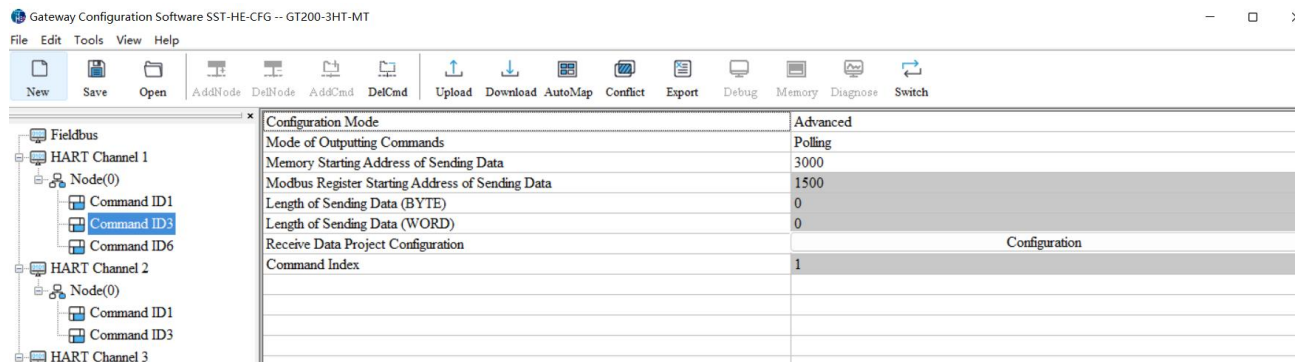
5.2.2.6 Delete Nodes

Select the node you want to delete, right click on it and select "Delete Node". This can also be done through the menu bar or tool bar. When a node is deleted, all commands under this node will also be deleted.

5.2.2.7 Advanced Options to Configure HART Commands

The GT200-3HT-MT can filter the input data in advanced configuration mode which can be useful when users only need one part of the data from one command. For example, if a user only needs the main variable of No.1 HART command, the advanced options can be used to filter out the unneeded units of the main variable. The advanced options is the execution of the “segment mapping function”. The input data of the HART command is divided into segments that can be extracted independently. Users can get any part of the data they want.

Below is the Advanced Options interface:



GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

Below is an example of the "Segment Mapping" function using the No. 3 HART command. Click the "configuration" button in the "Receive Data Project Configuration" option once the configuration mode is set to "Advanced".

Double-click on a variable to add or delete it.

Bytes	Memory Address	Starting Address	Byte swap
5-8	0	0	Register swap
10-13	0	0	Register swap
15-18	0	0	Register swap

Response data

Command Status

Byte0-3

Byte4

Byte9

Byte14

Byte19

Byte20-23

Quaternary Variable Units Code

Bytes: Input bytes of "Response Data". In the above example, clicking on "Byte5-8" will show the information "Primary Variable" in the left bottom area.

Memory Address: Set the start address of these bytes in data buffer.

Starting address: This parameter is automatically calculated and is the relevant Modbus register address of "Memory Address".

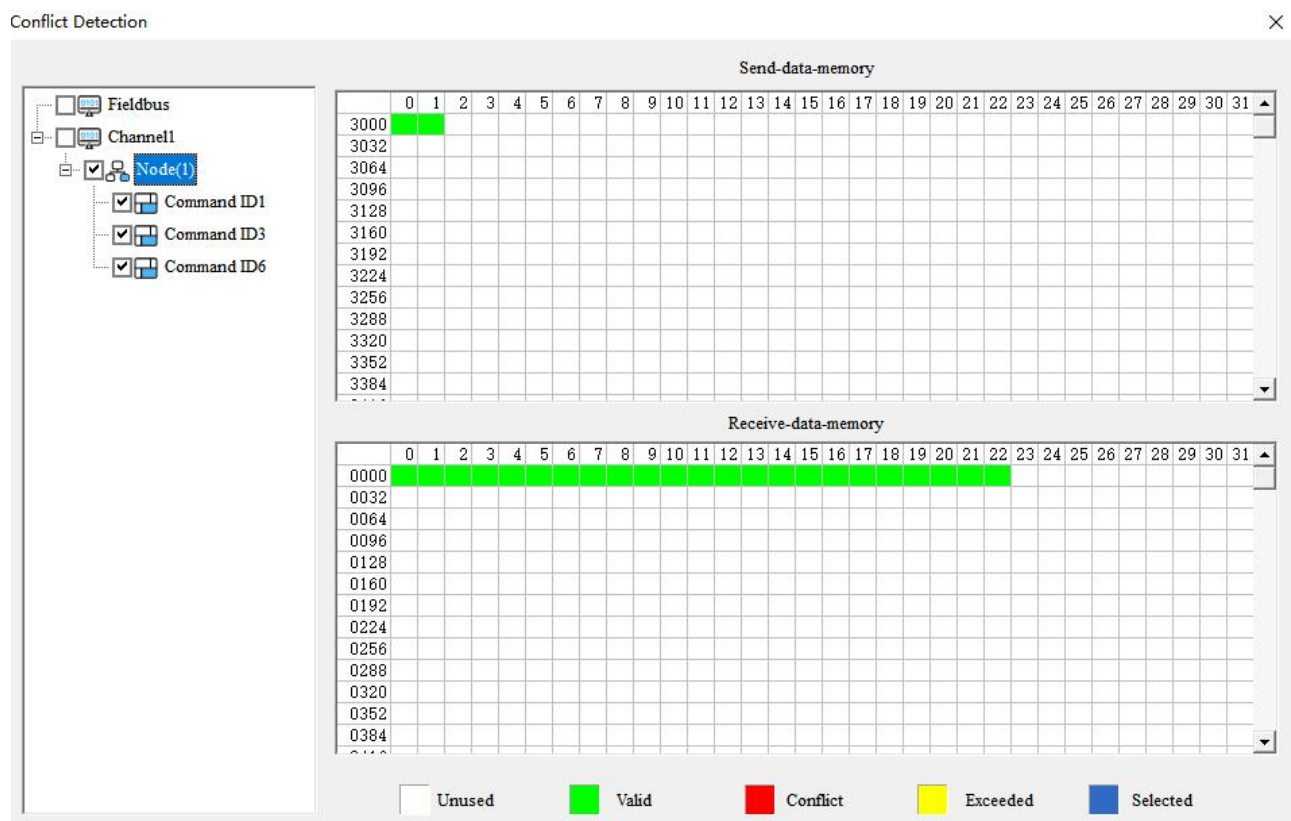
Byte swap: Select between "No swap" and "Register swap". This function is optional and is only valid to float type data. For example, if the original data is 0x12345678, it will be 0x56781234 when using "register swap".

5.2.3 Conflict Detection

"Conflict Detection" is used to check the distribution of the input and output data of all commands stored in the data buffer.



Click **Conflict** icon to open the conflict detection box:



The left side of the tree view shows the configuration commands. The right side of the tree view shows the data memory address which includes the receive data storage address and the send data storage. The top side shows the memory distribution of the HART channel sending data. The bottom side shows the memory distribution of the HART channel receiving data.

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

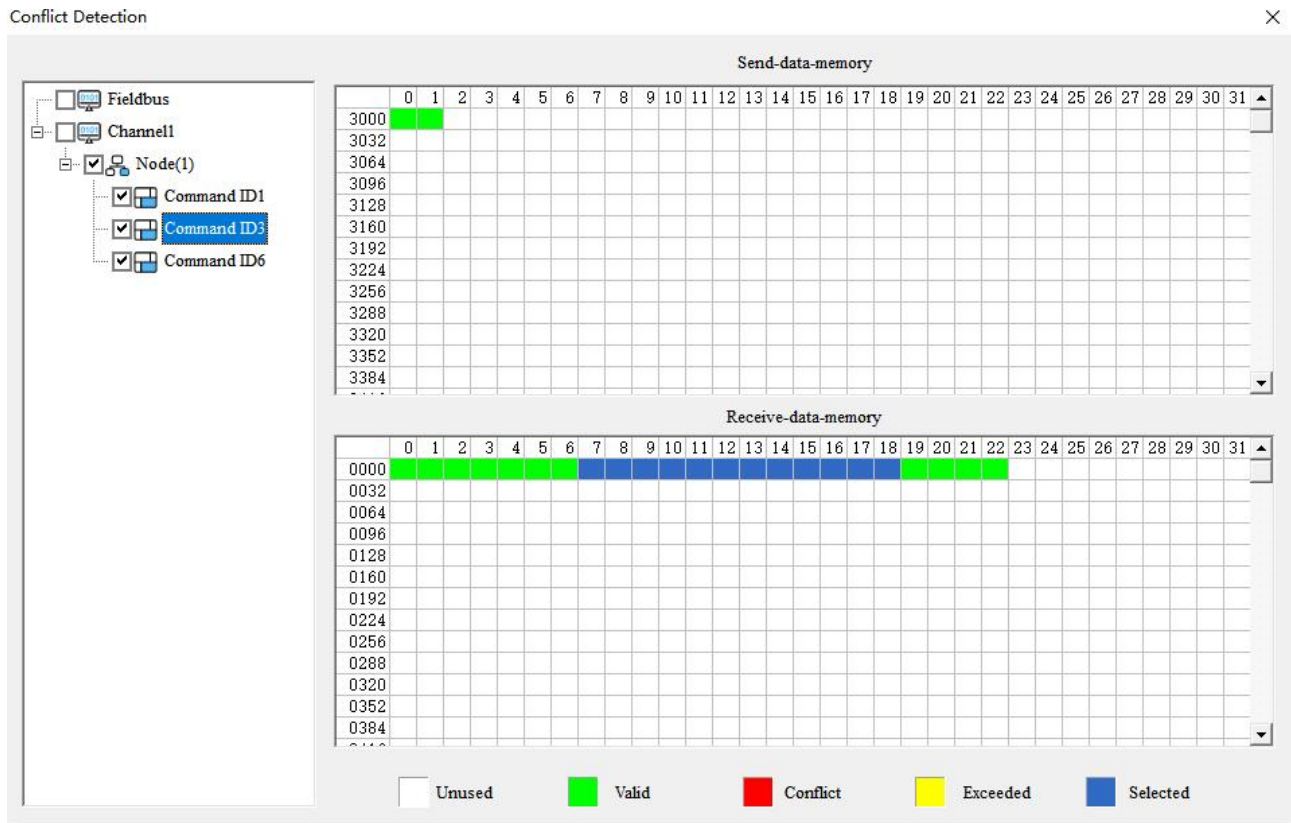
White colored areas are usable addresses.

Green colored areas are occupied addresses.

Red colored areas are memory addresses that are configured with two or more commands.

Yellow colored areas are mapped addresses that exceed the defined range of the GT200-3HT-MT.

Clicking on a command will show the corresponding memory addresses in blue.

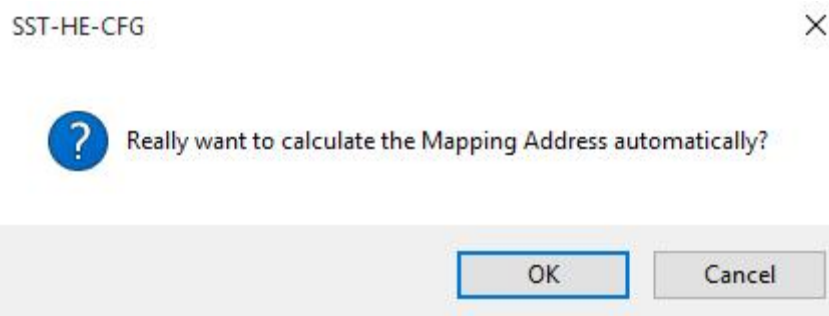


5.2.4 Auto Mapping

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

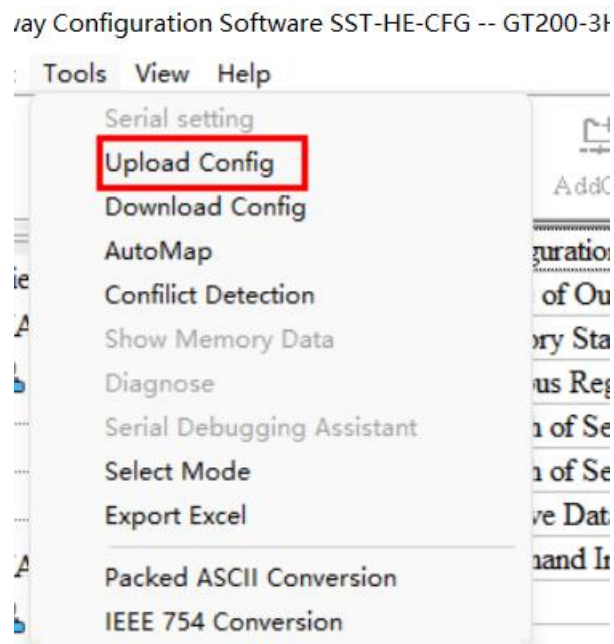


Set the correct input/output bytes for each command, then click **AutoMap** icon and select "yes" in the pop-up menu.



5.2.5 Upload Configuration

Select "Tools" >> "Upload Config" in the menu bar:



GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

It will search all identifiable hardware and show them in the device list:

Search Device ×

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-3HT-MT	192.168.0.10	64-ea-c5-1d-01-93	2.0	Allows remote configuration

Searched

Select a device and click "Upload" to connect the device.

When not ticking "Use the search function", it will only search the appointed hardware and only show this hardware in the device list.

Click the upload icon again, the pop-up box is shown as below:

Upload

Please click on the "Upload" button to upload the configuration

Click "Upload" button.

SST-HE-CFG ×

 Uploading the configuration is successful.

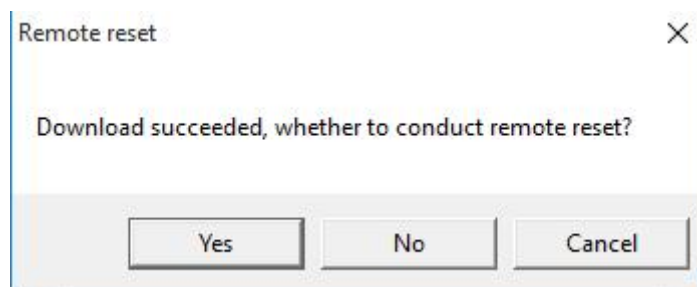
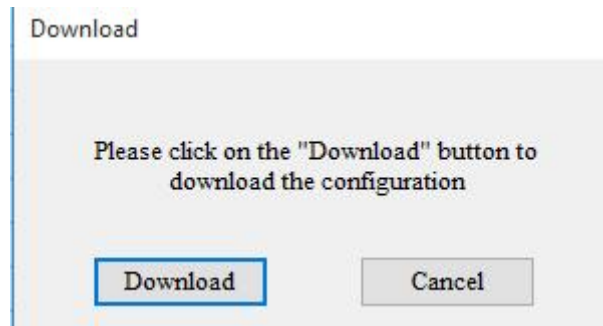
Now, users can upload the configuration of the GT200-3HT-MT into the software and open it there.



5.2.6 Download Configuration



After configuring the command, click **Download** button, the pop-up box is as shown below.
Click "Download data".

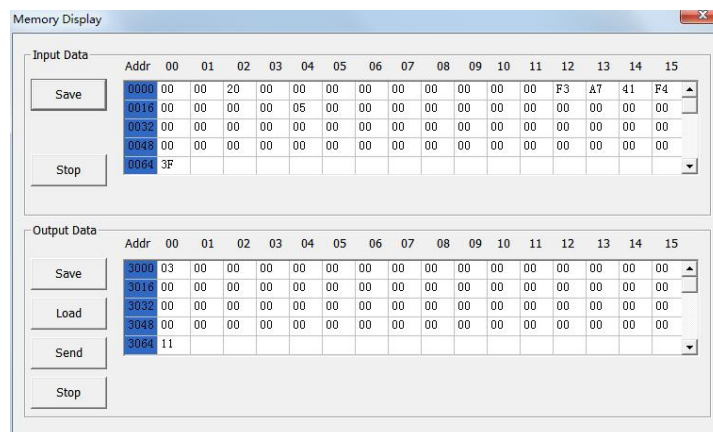


Note: Before downloading, please confirm all configuration is correct.

5.2.7 Memory Data Display

This function shows the data exchange inside of the gateway and is useful in debugging the HART fieldbus in the absence of an EtherNet/IP connection. Users can check the data in buffer of the GT200-3HT-MT following these steps:

1. Connect the GT200-3HT-MT to the computer using the Ethernet interface. Open the software "SST-HE-CFG", click "Tool" >> "Select Mode" and select debug mode. You can also click  to change mode.
2. Click on the icon . Choose the required gateway in the device scanning window, as shown below:



3. The upper table shows the memory distribution of HART input data, and the lower table shows the output data. When you need to modify the output data, first click the "Stop" button. Then modify the required data or load the already saved data table. Finally, click "Send".

5.2.8 Diagnose

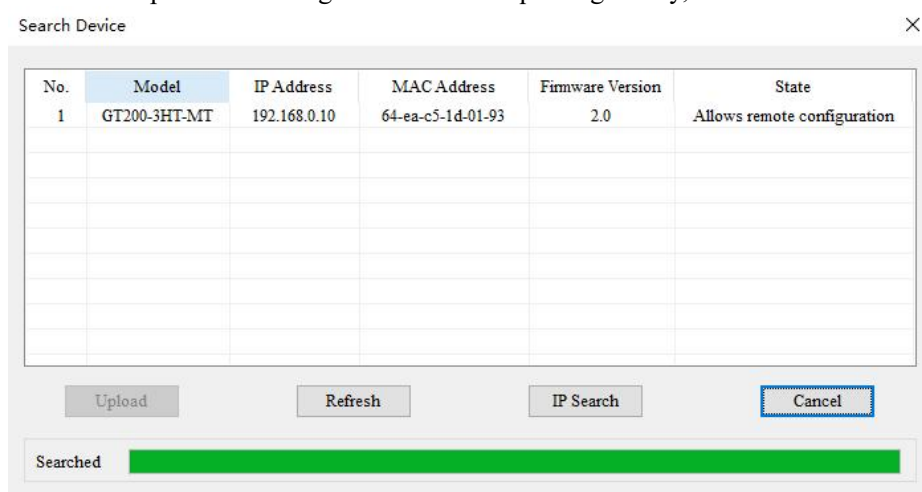
This function helps users to check the communication status of HART instruments, the execution of HART commands, the status of data transmission and reception. It also displays the specific commands and real-time data. The steps are as follows:

1. Ensure that the GT200-3HT-MT is set to running mode. Set the configuration DIP switch Bit 1 OFF and Bit 2 OFF, then restart the gateway. The GT200-3HT-MT now is in running mode.
2. Connect the GT200-3HT-MT to the computer using the Ethernet interface. Open the software

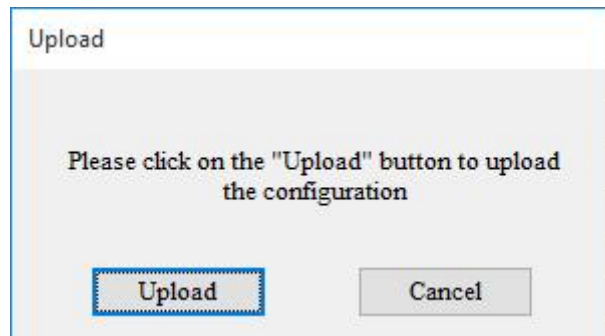
"SST-HE-CFG", click "Tool" >> "Select Mode" and select debug mode. You can also click  to change mode.



3. Click **Diagnose** and upload the configuration of the required gateway, as shown below:

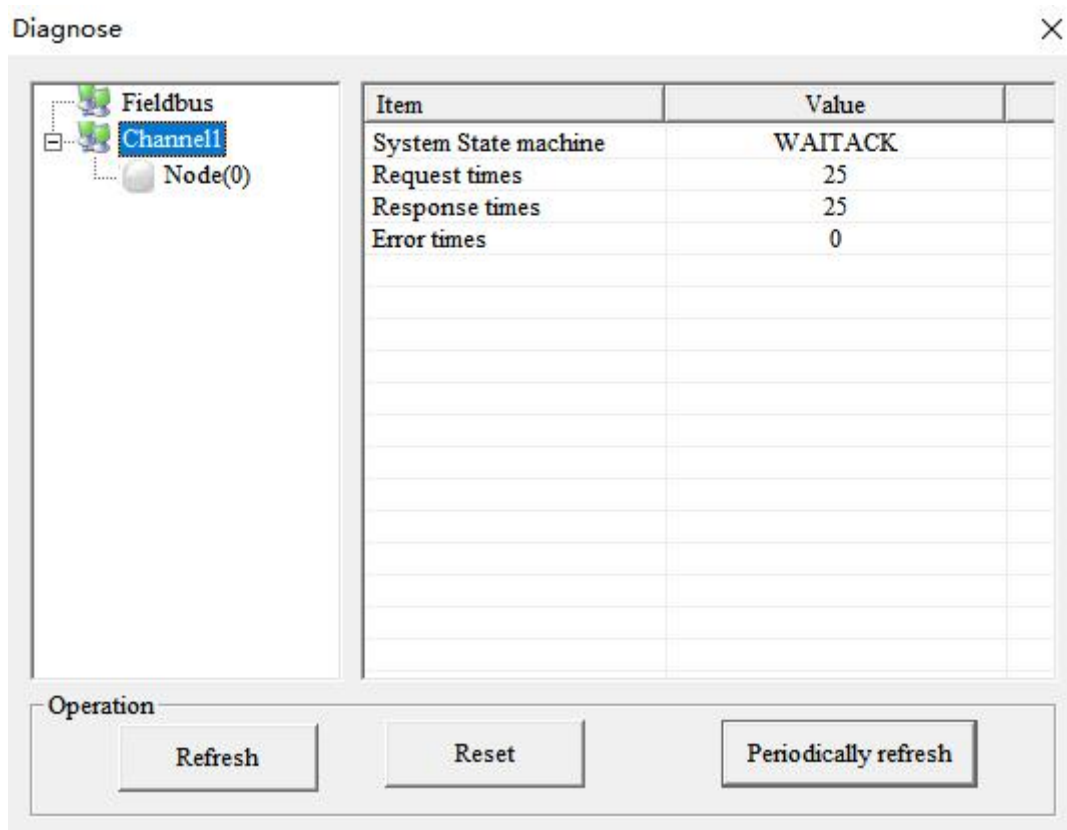


- Click "Upload data":



- Click "OK" to open the diagnostic box. Click "Channel 1" and the right side will display the status of the HART fieldbus.

Click "Refresh" to refresh the data once. Click "Reset" to clear the system status Click " Periodically refresh" to update the data in periodically.

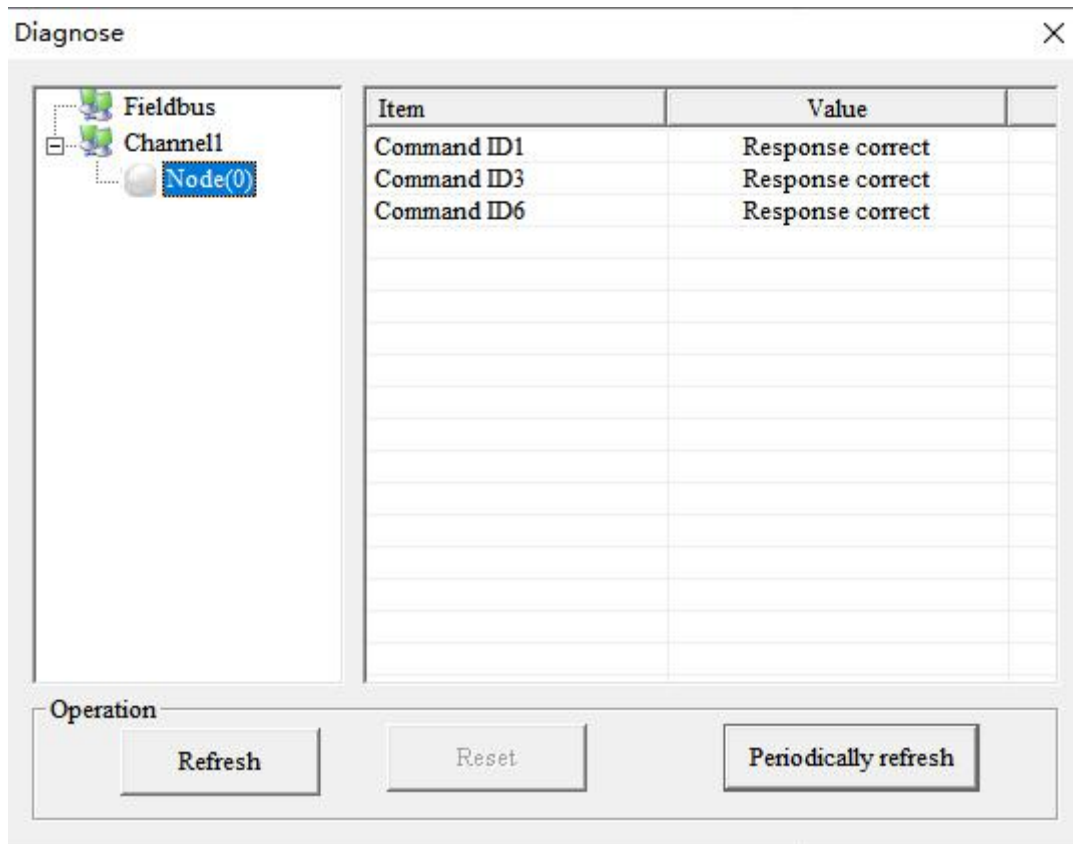


GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

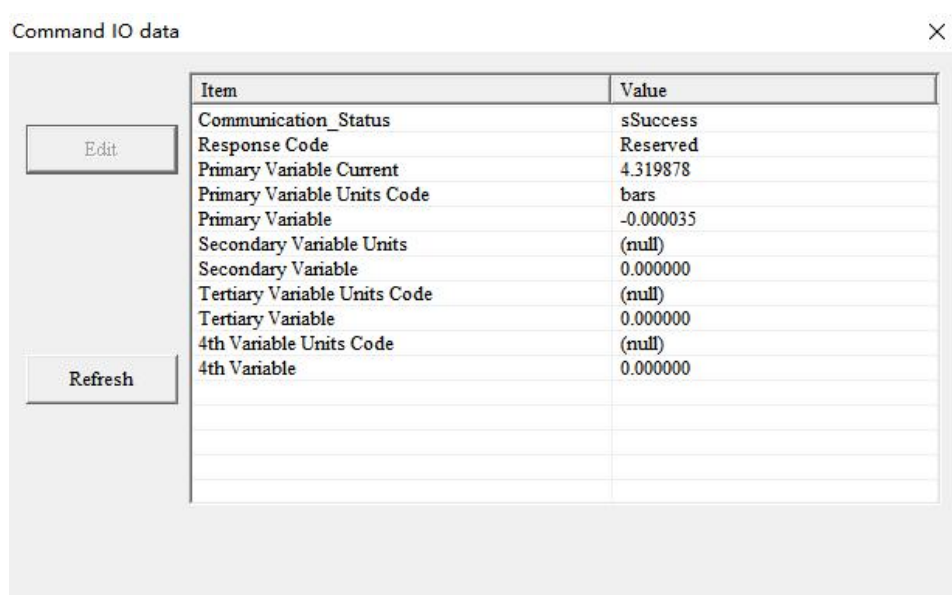
User Manual

- Click Node (x) and the response status of the configured commands will be shown on the right.



- Double click on a command and the detailed information will be show in the pop-up box.

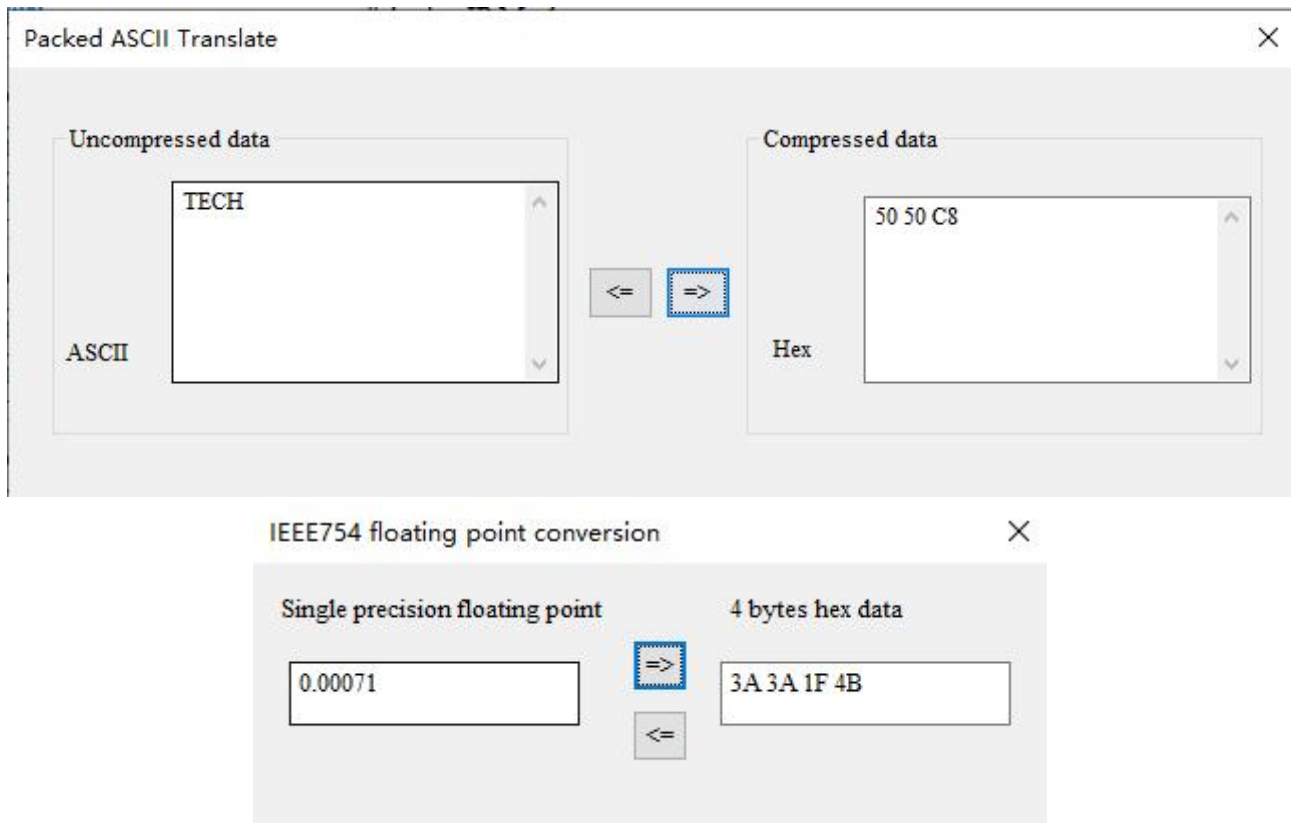
For example, double click on "Command ID3":



Click "Refresh" to update the data. "Edit" in the read-only command does not work.

5.2.9 Conversion Tools

There are two practical tools in the "Tools" menu to convert hexadecimal data to IEEE754 floats or PACKED ASCII codes.



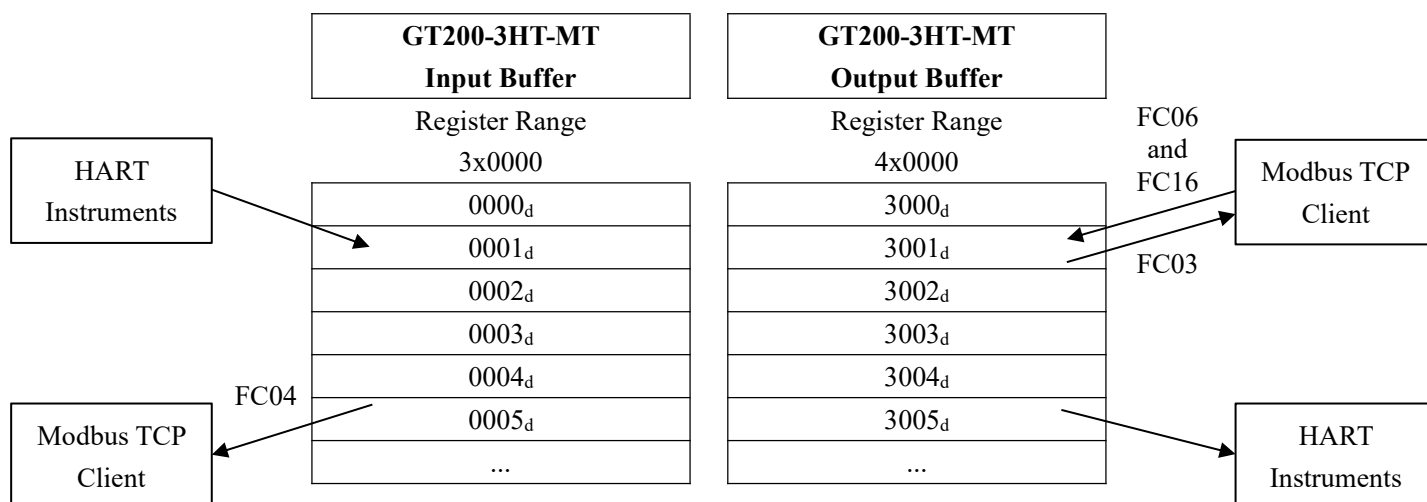


6 Interface Design Description

6.1 Data Exchange

Data exchange between HART and Modbus TCP via the GT200-3HT-MT is defined through “data mapping”. When data is read or written, it is initially stored in the internal memory buffer of the GT200-3HT-MT before being transmitted between HART and Modbus TCP. There are two internal data buffer areas in the GT200-3HT-MT: One is the Modbus TCP network input buffer and the other is the Modbus TCP network output buffer. Incoming data from the HART instruments will be mapped to the input buffer so that it can be read by the Modbus TCP client.. Similarly, output data from the Modbus TCP client will be mapped to the output buffer so that the GT200-HT-MT can write the output data to the HART instruments.

For more details and examples, please refer to Chapters [5.2.3](#), [6.1.1](#), and [7](#).



6.1.1 Modbus TCP Register Address Mapping

The Modbus TCP register addresses that are used to read and write data to HART devices are determined by the location of the GT200-3HT-MT internal memory buffer addresses. Each internal memory buffer address holds 8 bytes of data, and each Modbus register holds 16 bytes of data. This means that every two internal buffer addresses correspond to a single Modbus register address. The GT200-3HT-MT internal memory mapping addresses can be manually configured in the SST-HE-CFG configuration software. The function codes that are used to read data from the internal memory buffer addresses can be configured by setting the function code mode in the SST-HE-CFG configuration software. The Modbus TCP register starting address offset can also be configured in the software. For more details on setting the the function code mode and starting addresses, see [Chapter 5.2.1](#).

Function code 04 is used on the Modbus TCP Client to read the HART response data from the gateway. This means that the data read in the 3x0000 Modbus TCP register range will correspond to the HART response data. Function codes 06 and 16 are used to write request data to the HART devices. Function code 03 is used to read back the HART request data that has been written to the HART devices, which means that this data will be read in the 4x0000 Modbus TCP register range. The data mapping relationship between the GT200-3HT-MT internal memory buffer and Modbus TCP is shown below.

Modbus TCP Register Address	GT200-3HT-MT Input Buffer	Modbus TCP Register Address	GT200-3HT-MT Output Buffer
Function Code 04		Read: Function Code 03	
		Write: FC06/FC16	
3x0000	0000 _d	4x0000	3000 _d
	0001 _d		3001 _d
3x0001	0002 _d	4x0001	3002 _d
	0003 _d		3003 _d
3x0002	0004 _d	4x0002	3004 _d
	0005 _d		3005 _d
X	2*X	Y	2*Y
	(2*X)+1		(2*Y)+1
...	...	...	...

Note: Modbus TCP addresses in SST-HE-CFG are expressed in base-0 notation. If the Modbus TCP Client uses base-1 notation, the addresses will be offset by one.

6.2 GT200-3HT-MT Address Table

The GT200-3HT-MT has a memory buffer of 8156 bytes. 0 to 4999 of the buffer is used for the HART input data and output data. 5000~8155 of the buffer is used for the status of the HART channel and control bytes.

HART Channel	Buffer Address	Modbus Address ¹		Read/Write ²	Description	
		Function Code	Address			
Input/Output Data	0-2999	04	0-1499 (3x0001-3x1500)	Read	HART input data (response data) ³	
	3000-4999	03, 06, 16	1500-2499 (4x1501-4x2500)	Read/Write	HART output data (request data) ⁴	
Status and Control Bytes	5000-5019	04	2500-2509	Read	Device 0_cmd0 response data ⁵	
	5020-5039		2510-2519		Device 1_cmd0 response data	
						
	5300-5319		2650-2659		Device 15_cmd0 response data	
	5320		2660 H		HART channel status ⁶	
	5321		2660 L		HART channel request counter	
	5322		2661 H		HART channel response counter	
	5323		2661 L		HART channel error counter	
	5324		2662 H		Device 0_cmd0 status ⁷	
	5325		2662 L		Device 1_cmd0 status	
						
	5339		2669 L		Device15_cmd0 status	
	5340-5439		2670-2719		Configured HART command status ⁸	
	5744	03, 06, 16	2872 H	Read/Write	Counters reset trigger ⁹	
	5745		2872 L		Polling output control byte ¹⁰	
	5746		2873 H		Command request trigger ¹¹	
	5747		2873 L		Triggered command index ¹²	
	Others	Reserved				

Notes:

1. Modbus Address

The Modbus TCP client should use the corresponding function code(s) to read or write the data from/to the GT200-3HT-MT, with the specified address. The Modbus address in the above table is based 0 and decimal. For example, the Modbus address 0-1499 for the HART input data, is also the 3x0001-3x1500 as PLC address (based 1). For more example, please see [chapter 4.2 Communication with Modbus TCP](#)

[Client.](#)

2. Read/Write

(1) **Read:** The Modbus TCP client can only use function code 04 to read these data from the GT200-3HT-MT.

(2) **Write:** The Modbus TCP client can use function code 03 to read these data from the GT200-3HT-MT, and use function code 06 or 16 to write data to the GT200-3HT-MT.

3. **HART input data (response data):** The response data bytes from HART instruments.

4. **HART output data (request data):** The request data bytes sent by the Modbus TCP client through GT200-3HT-MT.

* For more details about the relationship between buffer address and Modbus address, please refer to [chapter 4.2.](#)

5. **Device N_cmd0 response data:** The GT200-3HT-MT will always send 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 statuses:** 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-HE-CFG software and will generate a unique “Command index”. The status will be

arranged in index order. For example, the high byte of 2670 input register (3x2671) is the status of the command of index 00, and the low byte of 3x2671 register is the status of the command of index 01.

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

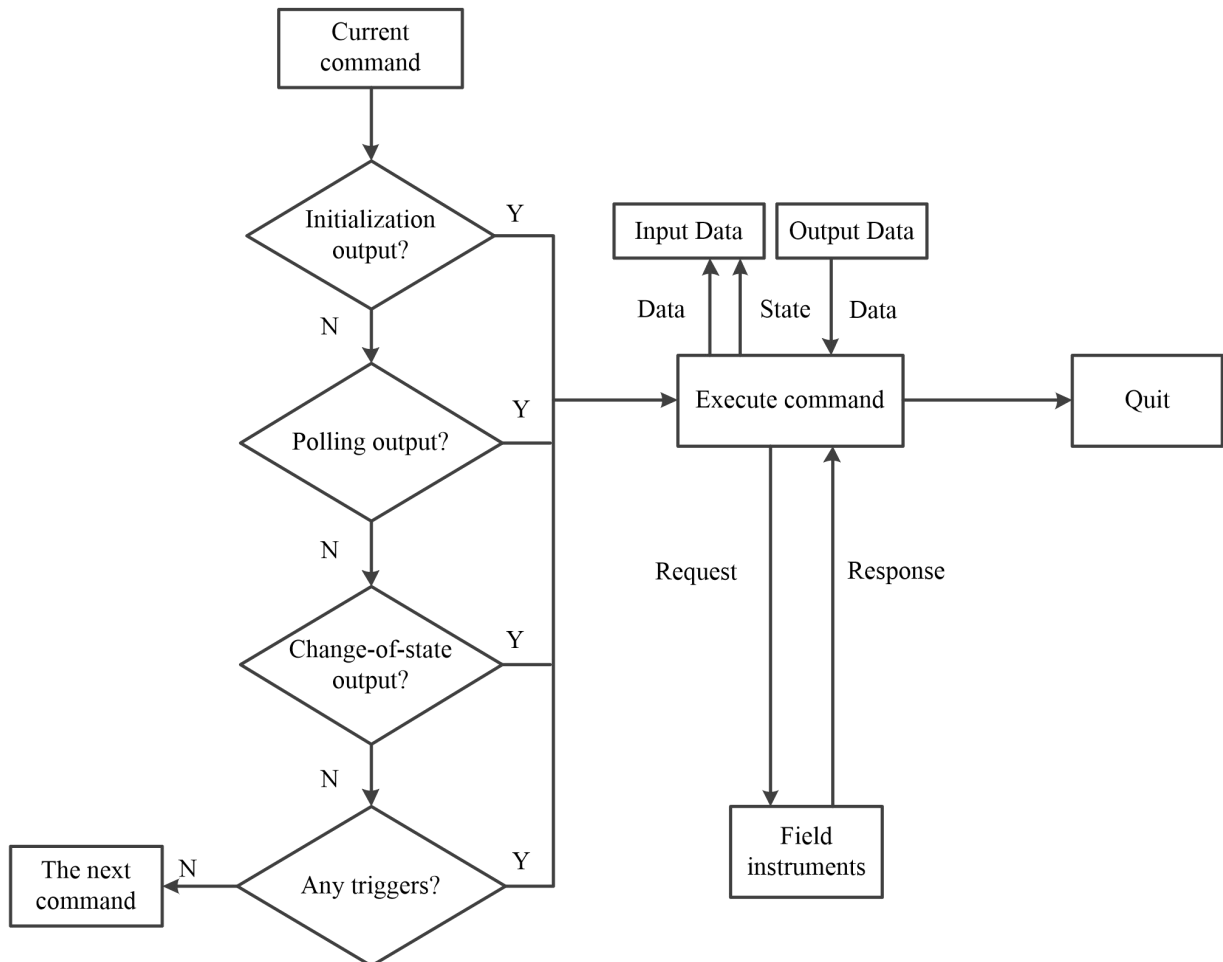
9. **Counters reset trigger:** When this trigger changes the value, all the counters of HART channel (request, response and error) will reset to 0.
10. **Polling output control byte:** This control byte is defined as below.

Table 6.3 - Polling Output Control Byte

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

11. **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.
12. **Triggered command index:** The command index of the triggered HART command. The command is configured in SST-HE-CFG software and will generate a unique “Command index”.

6.3 Flowchart of Executing One HART Command



6.4 Trigger Command

Users can trigger any HART command by sending a trigger byte and command index, following the steps below:

(The address table refers to [Chapter 6.2](#))

1. Disable the polling output. You can disable it in SST-HE-CFG software or by changing the “Polling output control byte” by Modbus TCP client.
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-HE-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.



7 How to Connect to a Modbus TCP Client

The GT200-3HT-MT gateway allows HART instruments to communicate with Modbus TCP Clients in a Modbus TCP network by having the gateway function as a Modbus TCP Server. The following example illustrates how the gateway communicates with a Modbus TCP Client by using Modbus Poll (Modbus TCP Client emulation software).

1. Configure SST-HE-CFG in point-to-point mode (HART address of 0) with HART Commands ID1, ID3 and ID6. The common HART command format can be found in [Chapter 4.3](#), and the configuration is as follows:
 - (1) When configuring HART Command ID1 in basic mode, the size of the data received from the command is 2 bytes greater than the actual response (command response). This is because the received data includes 2 bytes for a Command Status for command-specific diagnostic codes.. In the command response, the primary variable unit (byte 0) and the primary variable (bytes 1-4) along with the Command Status are 7 bytes in total. When mapping these 7 bytes to 4 Modbus register addresses, there will be a 1 byte offset resulting in the last 3 bytes of the primary variable being placed in the last 2 Modbus registers. This will cause the actual primary variable value to not be able to be read.

HART Response	Modbus TCP Register Address	GT200-3HT-MT Input Buffer Address
Function Code 04		
Command Status	3x0000	0000 _d
		0001 _d
Byte 0	3x0001	0002 _d
Bytes 1-4		0003 _d
	3x0002	0004 _d
		0005 _d
	3x0003	0006 _d
0007 _d		

It is recommended to configure HART Command ID1 in advanced mode to align the primary variable with the Modbus TCP register address for direct acquisition.

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

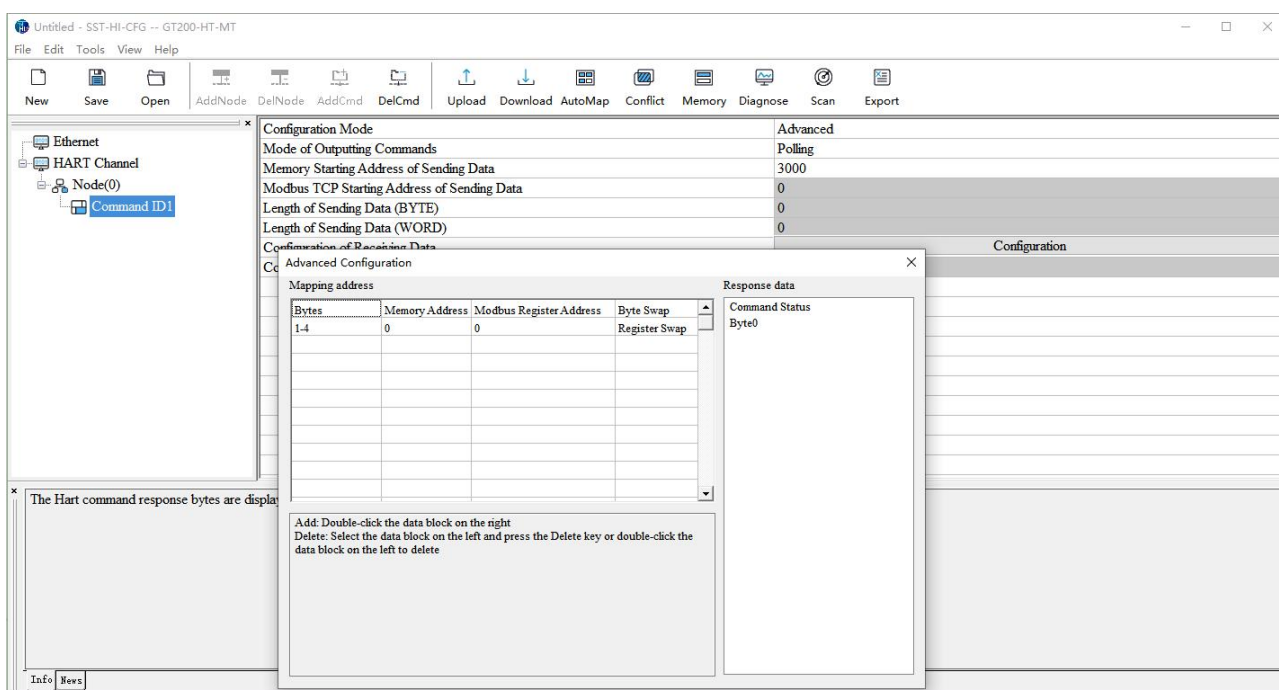
Command ID1: Read primary variable (PV)

Returns the value of the primary variable as a floating-point type

Request: None

Response:

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



GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

- (2) When configuring HART command ID3, use the advanced function to configure the primary variable (PV), the secondary variable (SV), and the tertiary variable (TV).

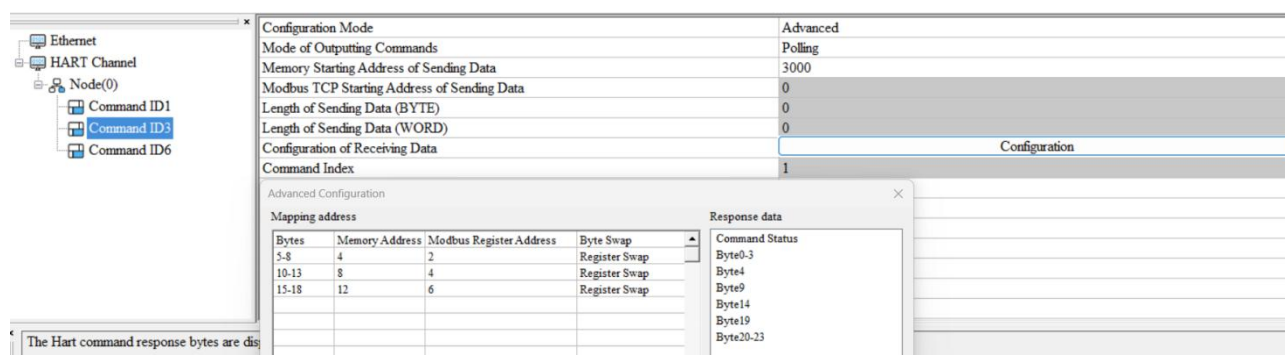
Command ID3: Reads four (predefined) dynamic variables and the primary variable current

Reads the primary variable current and 4 (at most) pre-defined dynamic variables, the primary variable current always matches the device's AO output current. primary, secondary, tertiary and quaternary variables defined for each device type.

Request: None

Response:

Byte	Description
Byte 0-3	Primary Variable Loop Current (mA)
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



GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

(3) The configuration of HART Command ID6 is used to modify the address of the HART device.

Command ID6: Write POLLING address

This is the data link layer management command. This command writes the Polling address and loop current mode to the field device.

Request:

Byte	Description
Byte 0	Polling Address (Between 0-15)
Byte 1 (Only on supported HART devices)	Loop Current Mode (0=Disabled, 1=Enabled)

Length of Sending Data (BYTE)

2

Response:

Bytes	Description
Command Status (2 Bytes)	0=Success 2=Invalid Poll Address Selection 5=Too Few Data Bytes Received 7=In Write Protect Mode 12=Invalid Mode Selection 32=Busy
Byte 0	Polling Address (Between 0-15)
Byte 1 (Only on supported HART devices)	Loop Current Mode (0=Disabled, 1=Enabled)

Length of Receiving Data (BYTE)

4

New	Save	Open	AddNode	DelNode	AddCmd	DelCmd	Upload	Download	AutoMap	Conflict	Memory	Diagnose	Scan	Export
Ethernet HART Channel Node(0) Command ID1 Command ID3 Command ID6 Configuration Mode Mode of Outputting Commands Memory Starting Address of Sending Data EtherNet/IP Starting Address of Sending Data Length of Sending Data (BYTE) Length of Sending Data (WORD) Memory Starting Address of Receiving Data EtherNet/IP Starting Address of Receiving Data Length of Receiving Data (BYTE) Length of Receiving Data (WORD) Command Index Basic Polling 3000 3000 2 1 0 0 0 4 2 2														

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

2. Click  , through  , to view the mapping address of the command in the gateway buffer. The primary variable of HART Command ID1 corresponds to gateway input buffer 0000-0003, Command ID3 corresponds to 0004-0015, Command ID6 request corresponds to output buffer 3000-3001, and response corresponds to 0016-0019. as follows:

The Modbus TCP Client uses function code 04 to read the HART response data from the gateway. Modbus registers 3x0000-3x0001 correspond to the primary variable of HART Command ID1, 3x0002-3x0007 correspond to the primary, secondary, and tertiary variables of HART Command ID3, 3x0008-3x0009 correspond to the command status, polling address, and loop current mode of HART Command ID6. Function codes 06/16 are used to write the HART request data to the gateway. Modbus register 4x0000 corresponds to the Polling address and loop current mode of the requested device of HART Command ID6.

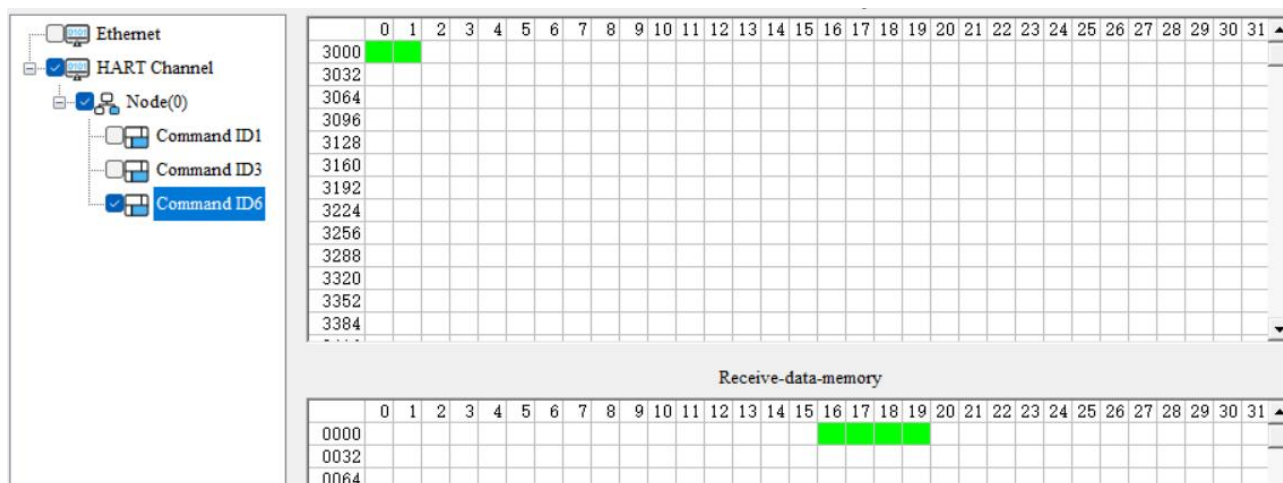
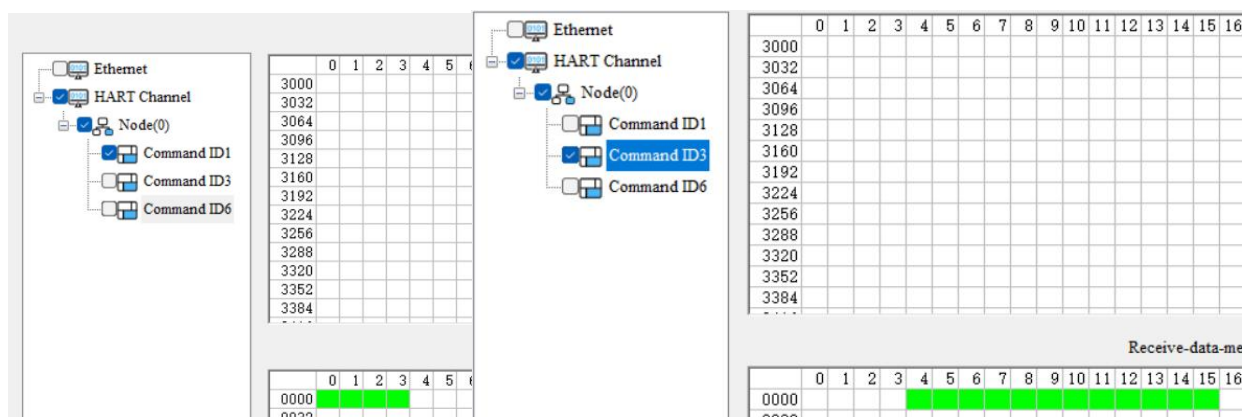
HART Response	Modbus TCP Register Address	GT200-3HT-MT Input Buffer Address
Function Code 04		
Command ID1 Primary Variable (Bytes 1-4)	3x0000	0000 _d
		0001 _d
	3x0001	0002 _d
		0003 _d
Command ID3 Primary Variable (Bytes 5-8)	3x0002	0004 _d
		0005 _d
	3x0003	0006 _d
		0007 _d
Command ID3 Secondary Variable (Bytes 10-13)	3x0004	0008 _d
		0009 _d
	3x0005	0010 _d
		0011 _d
Command ID3 Tertiary Variable (Bytes 15-18)	3x0006	0012 _d
		0013 _d
	3x0007	0014 _d
		0015 _d
Command ID6 Command Status	3x0008	0016 _d
		0017 _d
Command ID6 Polling Address (Byte 0)	3x0009	0018 _d
Command ID6 Loop Current Mode (Byte 1)		0019 _d

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

HART Request	Modbus TCP Register Address	GT200-3HT-MT Output Buffer Address
Read: Function Code 03		
Write: FC06/FC16		
Command ID6 Polling Address (Byte 0)	4x0000	3000 _d
Command ID6 Loop Current Mode (Byte 1)		3001 _d



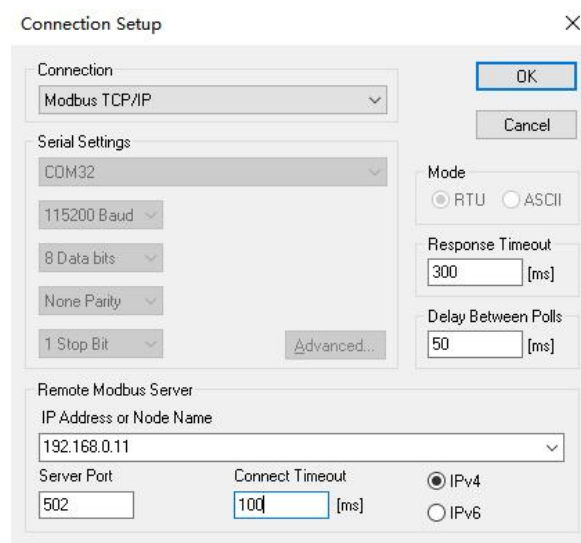
GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

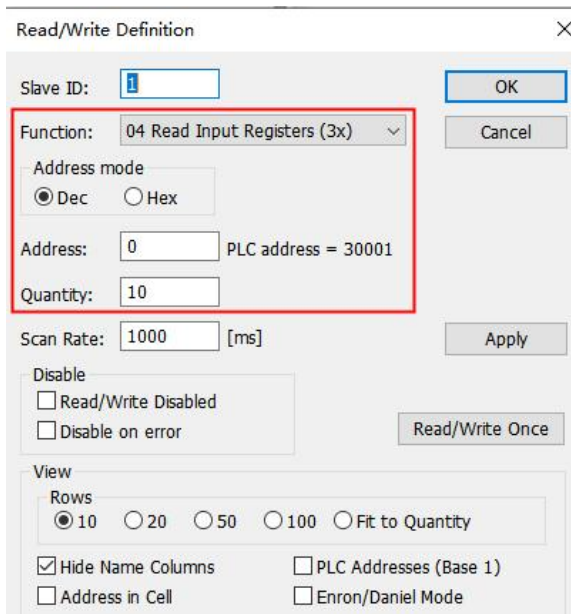
3. Use Modbus Poll to connect to the gateway and read/write data with the following configuration:

Note: The gateway acts as Modbus TCP Server. Use the Modbus Poll software as a Modbus Client to connect to the gateway. The gateway uses either function code 04 to read data from HART devices. The gateway supports using either function codes 06 or 16 (preset single/multiple registers) to write data to HART devices. Function code 03 can read back the data written to HART devices.



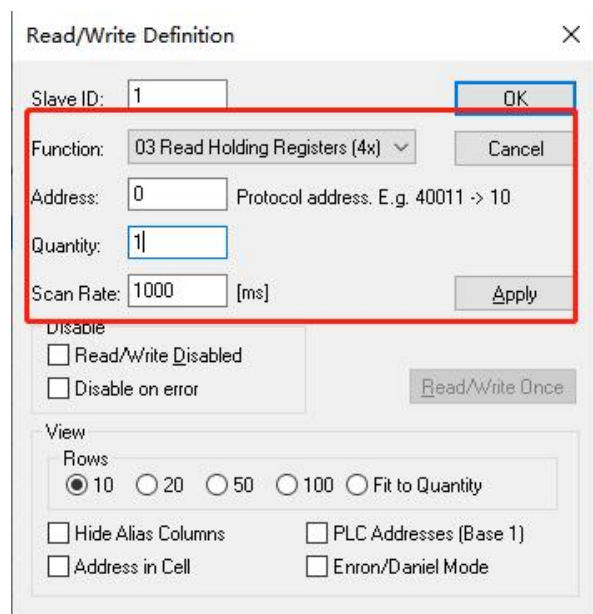
The Connection Setup dialog box is used to configure the Modbus connection. It includes the following fields:

- Connection:** Modbus TCP/IP
- Serial Settings:** COM32, 115200 Baud, 8 Data bits, None Parity, 1 Stop Bit
- Mode:** RTU (selected), ASCII
- Response Timeout:** 300 [ms]
- Delay Between Polls:** 50 [ms]
- Remote Modbus Server:** IP Address or Node Name: 192.168.0.11, Server Port: 502, Connect Timeout: 100 [ms], IPv4 (selected), IPv6



The Read/Write Definition dialog box (Left) is used to define the read/write operation. It includes the following fields:

- Slave ID:** 1
- Function:** 04 Read Input Registers (3x)
- Address mode:** Dec (selected), Hex
- Address:** 0, PLC address = 30001
- Quantity:** 10
- Scan Rate:** 1000 [ms]
- Disable:** Read/Write Disabled, Disable on error
- View:** Rows: 10 (selected), 20, 50, 100, Fit to Quantity; Hide Name Columns, PLC Addresses (Base 1), Address in Cell, Enron/Daniel Mode



The Read/Write Definition dialog box (Right) is used to define the read/write operation. It includes the following fields:

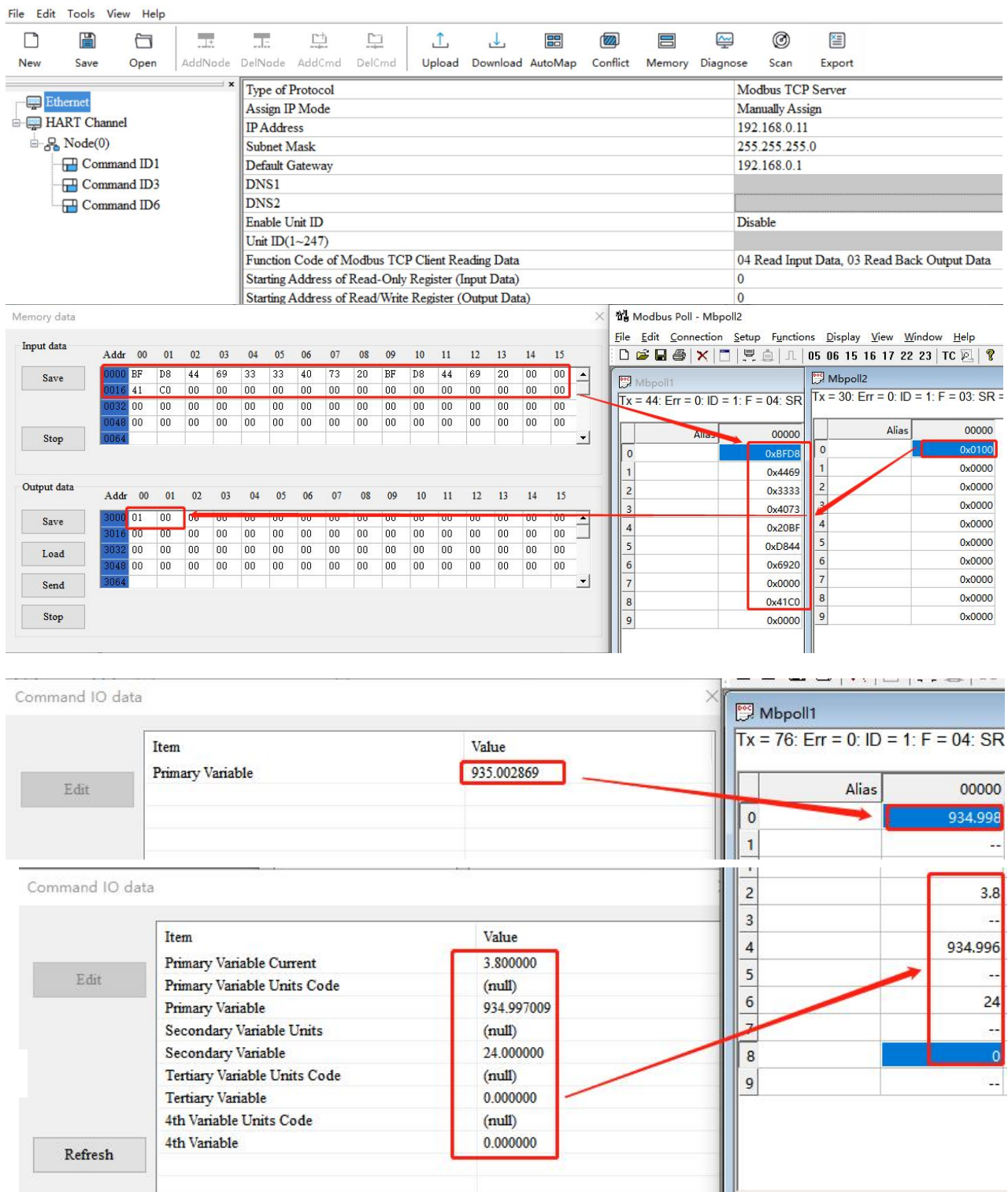
- Slave ID:** 1
- Function:** 03 Read Holding Registers (4x)
- Address:** 0, Protocol address. E.g. 40011 -> 10
- Quantity:** 1
- Scan Rate:** 1000 [ms]
- Disable:** Read/Write Disabled, Disable on error
- View:** Rows: 10 (selected), 20, 50, 100, Fit to Quantity; Hide Alias Columns, PLC Addresses (Base 1), Address in Cell, Enron/Daniel Mode

GT200-3HT-MT

3-channel HART/Modbus TCP Gateway

User Manual

4. Use Modbus POLL to read data (3x0000-3x0009) and write data via 4x0000. The data in the gateway buffer can be viewed in  Memory (refer to [Chapter 5.2.7](#)) and the actual floating-point data of the HART device can be viewed via  Diagnose (refer to [Chapter 5.2.8](#)).



The screenshot displays the software interface for the GT200-3HT-MT gateway, showing the configuration and data monitoring sections.

Modbus Poll - Mbpoll2

File Edit Connection Setup Functions Display View Window Help

05 06 15 16 17 22 23 TC ?

Mbpoll1 Tx = 44: Err = 0: ID = 1: F = 04: SR

Mbpoll2 Tx = 30: Err = 0: ID = 1: F = 03: SR

Alias 00000

Alias	Value
0	0x0100
1	0x0000
2	0x0000
3	0x0000
4	0x0000
5	0x0000
6	0x0000
7	0x0000
8	0x0000
9	0x0000

Memory data

Input data

Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0000	BF	D8	44	69	33	33	40	73	20	BF	D8	44	69	20	00	00
0016	41	C0	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0032	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0048	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0064	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Output data

Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
3000	01	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3016	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3032	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3048	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3064	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Command IO data

Item Value

Primary Variable 935.002869

Command IO data

Item Value

Primary Variable Current 3.800000

Primary Variable Units Code (null)

Primary Variable 934.997009

Secondary Variable Units (null)

Secondary Variable 24.000000

Tertiary Variable Units Code (null)

Tertiary Variable 0.000000

4th Variable Units Code (null)

4th Variable 0.000000

Mbpoll1

Tx = 76: Err = 0: ID = 1: F = 04: SR

Alias 00000

Alias	Value
0	934.998
1	--
2	3.8
3	--
4	934.996
5	--
6	24
7	--
8	0
9	--