HART / Modbus TCP Gateway GT200-HT-MT

User Manual

V 1.2

Rev G







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Important Information

Warning

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GT200-HT-MT

HART/Modbus TCP Gateway

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1 Product Overview

1.1 Product Function

GT200-HT-MT is a gateway that can provide a seamless connection between HART instruments and a Modbus TCP network. It can connect HART slave devices to a Modbus TCP network and realize bi-directional data exchange easily. The HART interface can be configured as a primary master or a secondary master. It acts as a server at the Modbus TCP side.

1.2 Product Features

- Easy to use: The GT200-HT-MT can achieve seamless data communication following simple steps. Users only need to refer to the product manual and application instances and can realize data communication of a gateway in a short time according to the requirements of the configuration.
- Powerful functionality: Support fast acquisition of the HART slave address and modification, single-point mode of coexistence of HART communication and 4~20mA data acquisition, HART side supports the primary master and the secondary master.
- Easy-to-use configuration software: The GT200-HT-MT can be configured by SST-HE-CFG software easily.
- Multi debugging functions: The configuration software SST-HE-CFG can provide a visual display of data exchange as well as HART command diagnostics and communication debugging functions that greatly facilitate user communication tests.

1.3 Technical Specifications

- [1] The HART interface can be configured as a primary master or the secondary master.
- [2] The HART interface supports point-to-point mode and multi-drop mode.
- [3] Supports one HART channel.
 - In point-to-point mode, the GT200-HT-MT supports burst communication.



- **User Manual**
- ◆ In multi-drop mode, up to 13 HART instruments can be connected with an internal series resistor (2700hm/2W), and up to 15 HART instruments with an external series resistor (2500hm/3W).
- [4] Supports all commands of the HART 6 protocol.
- [5] Each HART command can be configured to different outputting mode: change-of-state output, polling output, initialization output or disable output.
- [6] Supports up to 100 HART commands. Max output data: 2000 bytes, max input data: 3000 bytes.
- [7] Ethernet 10/100M adaptive routing. Supports IP address conflict detection and automatic routing functions.
- [8] Supports connection with up to 36 Modbus TCP clients and 512 requests simultaneously.
- [9] The Ethernet interface can be configured as a Modbus TCP server, supporting function codes:03H, 04H, 06H, 10H.
- [10] Power supply: 24VDC (11V~30V), <100mA (24VDC).
- [11] Working temperature: -4°F~140°F(-20°C~60°C). Rel Humidity: 5%~ 95% (non-condensing).
- [12] Dimensions(W*H*D): 1.6 in*5.0 in*4.4 in (40mm*125mm*110mm).
- [13] Installation: 1.38 in (35mm) DIN RAIL.
- [14] Protection Level: IP20.

1.4 Related Products

Related products include:

- ➢ GT200-HT-RS
- ➢ GT200-3HT-RS
- ➢ GT200-3HT-MT
- ► GT200-HT-EI
- ➢ GT200-HT-DP
- ► GT200-MT-2RS
- ➢ GT200-MT-2RS485

If you want to get more information about related products, please visit SSTCOMM website: www.sstautomation.com.



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1.5 Revision History

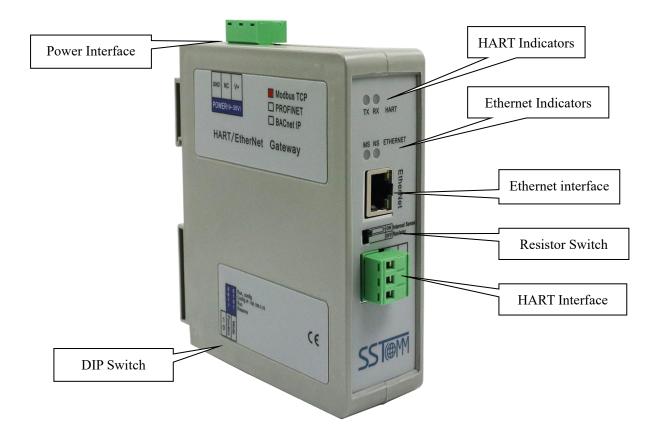
Revision	Date	Chapter	Description
V1.2, Rev A	02/11/2017	ALL	Add description for chapter 4.2.7,
			4.2.8.
V1.2, Rev B	11/16/2020	ALL	
V1.2, Rev C	12/25/2020	Chapter 5	
V1.2, Rev D	7/23/2021	Chapter 4, 6	New chapter 4.2. Address table
			revised.
V1.2, Rev E	07/01/2022	Chapter 5.2.2.3	Add HART Common Commands (ID
			1 and ID 3) to this section
V1.2, Rev F	08/12/2022	Chapter 1.1, 1.2, 1.3,	Revised some mistakes. Corrected
		1.4, 2.3.1, 2.3.2, 2.5,	figure in chapter 2.3.2. Added two
		2.5.1, 4.1.1, 4.1.2, 4.2,	wire and four wire multi-drop wiring
		5.1, 5.2.1, 5.2.2.1,	in chapter 2.5.1. Updated software
		5.2.2.2, 5.2.2.3,	configuration screenshot.
		5.2.2.4, 5.2.2.5,	
		5.2.2.6, 5.2.2.7, 5.2.3,	
		5.2.4, 5.2.5, 5.2.7,	
		5.2.8, 5.2.9, 6.1	
V1.2, Rev G	09/16/2022	Chapter 2.5.1, 2.5.2,	Added troubleshooting steps for
		4.3, 4.4, 5.2.2.3	multiple HART devices in chapter 4.3.
			Added list of HART commands in
			chapter 4.4 and moved content from
			chapter 5.2.2.3. Moved Multi-Drop
			Wiring to chapter 2.5.2 and added
			Point-to-Point Wiring in chapter 2.5.1.





2 Hardware Descriptions

2.1 Product Appearance



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



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2.2 LED Indicators

LED	State	Description
ТХ	Flashing	HART channel is sending data
1X OFF		No data sending
RX	Flashing	HART channel is receiving data
KA	OFF	No data is received
NS	OFF	Communication error in Modbus TCP network
INS	Flashing	Communication running
	Red	IP address conflicts
	Ded fleshing	Connection is OFF / Configuration Mode / DHCP,
MS Red, flashing		BOOTP, IP address conflict detection
	Red, flashing	Connection is OFF
	(For 3 seconds)	

2.3 Configuration Switch/Button

2.3.1 Configuration Switch

The configuration DIP switches are located at the bottom of the GT200-HT-MT and are used to set the operating mode of the device.

Off		
On	1	2

Mode (Bit 1)	Function (Bit 2)	Description	
Off	Off	Running mode, configuration enable	
Off	On	On Running mode, configuration disable	
On Off		Configuration mode, IP is fixed at	
On	Off	192.168.0.10	
On	On	Reserved	

Note: To apply mode switching, restart the gateway.





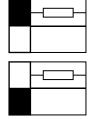
2.3.2 Resistor Switch

The GT200-HT-MT has an internal series (270Ohm/2W) resistor required for the HART channel. This supports 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 (2500hm/3W),

which allows the gateway to support up to 15 HART instruments to be connected.

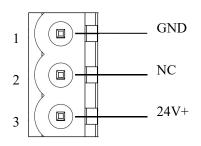


Switch to ON, using the internal series resistor

Switch to OFF, using the external series resistor

2.4 Interface

2.4.1 Power Interface



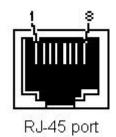
Pin	Description
1	Power ground
2	Not connected
3	+24V DC





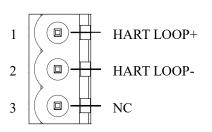
2.4.2 Ethernet Interface

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



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

2.4.3 HART Interface



Signal	Description
HART LOOP+	Connected to HART signal+
HART LOOP-	Connected to HART signal-
NC	Not connected





2.5 Topology of GT200-HT-MT and HART Instruments

Notes:

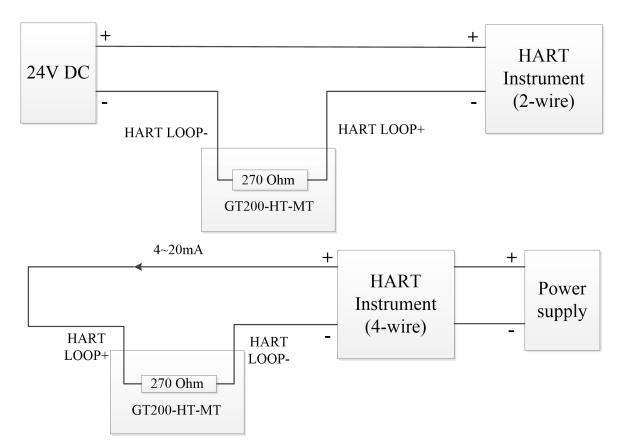
- 1. It is recommended to use a separate power supply for the HART instruments and the GT200-HT-MT to ensure stable communication.
- To improve the communication efficiency of the field bus, it is recommended not to configure empty nodes or unnecessary commands in the SST-HE-CFG software.
- 3. If there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





2.5.1 Point-to-Point Wiring

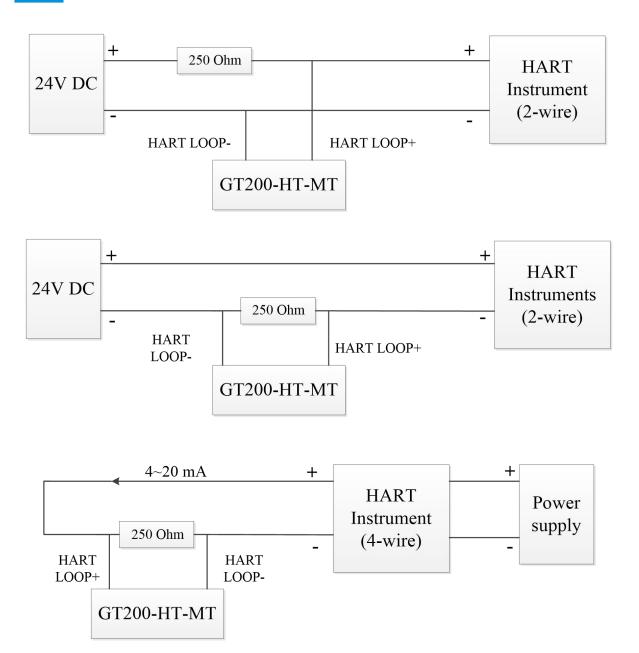
The following are the topologies for two wire and four wire point-to-point wiring.

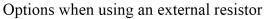


When using the internal resistor



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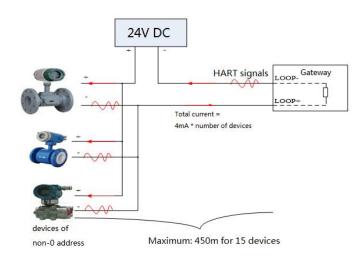




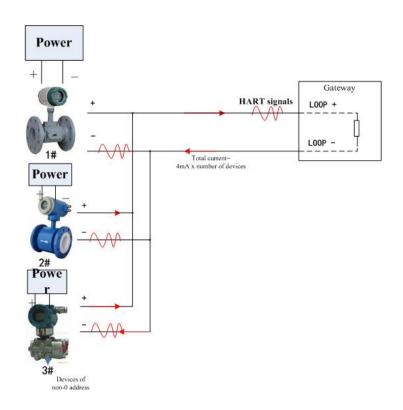
2.5.2 Multi-Drop Wiring

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

Two wire:



Four wire:



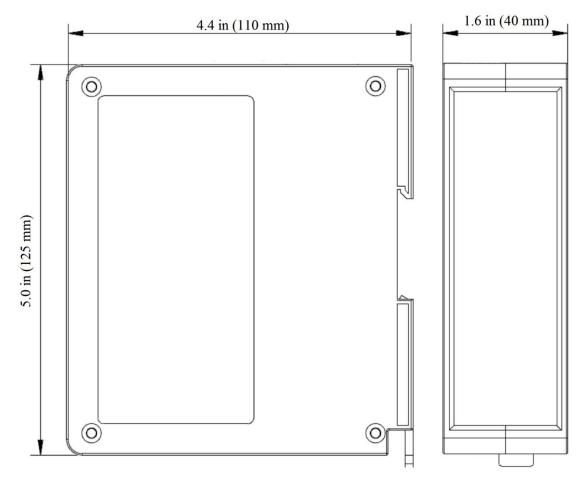




3 Hardware Installation

3.1 Mechanical Dimensions

Size: 1.6 in (width) *5.0 in (height) *4.4 in (depth)



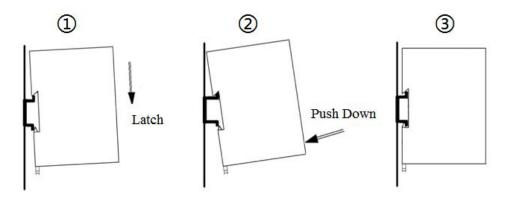




3.2 Mounting Method

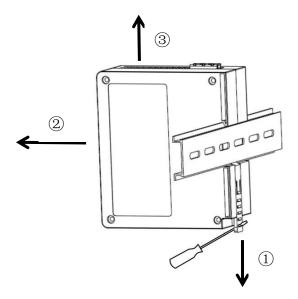
Using 1.38 in (35mm) DIN RAIL.

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

4.1 Start

4.1.1 Connection

- Make sure the GT200-HT-MT is in the appropriate operating mode that allows for configuration. It is recommended to set the gateway to configuration mode (configuration switches Bit 1 ON and Bit 2 OFF) then the IP of the gateway will be fixed at 192.168.0.10.
- 2. Connect the GT200-HT-MT to the computer by Ethernet cable.
- 3. Connect the HART instruments and the power supply. Refer to the topology displayed in <u>chapter 2.5</u>.
- 4. Power on the gateway and run the SST-HE-CFG software to start the configuration process.

4.1.2 Default Configuration

1. Open the SST-HE-CFG software installed on your computer.



<u>1</u>

2. Click "Upload" Upload and "Sign In" to the gateway.

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-HT-MT	192.168.0.10	64-ea-c5-1e-01-1b	1.2	Allows remote configuration
	Sign In		Refresh]	Cancel



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3. You will see the factory default configuration settings are shown below:

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	0.0.00	

Note: There are already two commands and an IP Address preset into the device. You can edit these parameters

for your needs.

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

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)	7	
Length of Receiving Data (WORD)	4	
Command Index	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.)

Configuration Mode	Basic	<u>•</u>
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	7	
Modbus Register Starting Address of Receiving Data	3	
Length of Receiving Data (BYTE)	26	
Length of Receiving Data (WORD)	13	
Command Index	1	

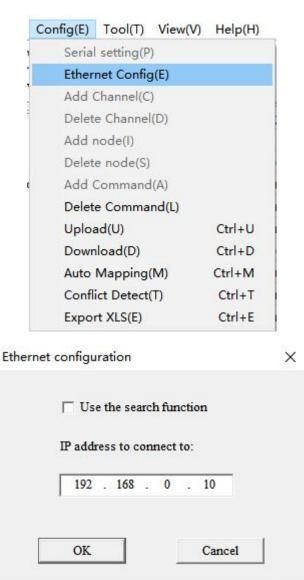


4.1.3 Configuration

1. Open the SST-HE-CFG software installed on your computer.



- 2. Click "Fieldbus" in the "Mode" item on the right and choose "Modbus TCP".
- 3. Select "Ethernet Config" in "Config" menu.





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4. Click "OK". Select the gateway and sign in.

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-HT-MT	192.168.0.10	64-ea-c5-1e-01-1b	1.2	Allows remote configuration
	1			1	
	Sign In		Refresh		Cancel

5. Select the "Fieldbus" on the left and configure the parameters as below:

Mode	Mođbus TCP	4
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	

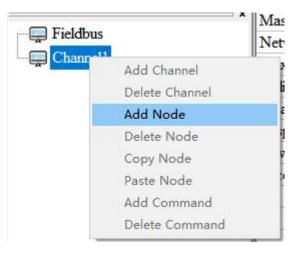
6. Click the HART channel on the left and configure the parameters as below:

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 ID1 box (double click on

"Command ID1" or select "Command ID1" and click "»"). Click OK.

			Selected	command
Command ID0	~			
Command ID1				
Command ID2	and a second second			
Command ID3		1		
Command ID4		>>		
Command ID5	-			
Command ID6				
Command ID7				
Command ID8				
Command ID9		<<		
Command ID10	÷			
Command ID11				
Command ID12	~	3		
Command ID10 Command ID11):	variable	as a float



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9. Click "Command ID1" and configure the parameters as below:

88

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)	7	
Length of Receiving Data (WORD)	4	
Command Index	0	





11.	Click the Download icon	Download

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-HT-MT	192.168.0.10	64-ea-c5-1e-01-1b	1.2	Allows remote configuration
	Sign In		Refresh	1	Cancel



<i>GT200-HT-MT</i> HART/Modbus TCP Gateway
User Manual
Download
Click "Download" to download the configuration. Download Cancel
Remote reset X
Download succeeded, whether to conduct remote reset?

4.2 Communication with Modbus TCP Client

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

- 1. Configure the GT200-HT-MT with some HART nodes and commands. In this example, the GT200-HT-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	<u> </u>
Fieldbus	Mode of Outputting Commands	Polling	
Channel1	Memory Starting Address of Sending Data	3000	
E - R Node(0)	Modbus Register Starting Address of Sending Data	1500	
Command ID1	Length of Sending Data (BYTE)	0	
Command ID3	Length of Sending Data (WORD)	0	
Command ID6	Memory Starting Address of Receiving Data	0	
	Modbus Register Starting Address of Receiving Data	0	
	Length of Receiving Data (BYTE)	7	
	Length of Receiving Data (WORD)	4	
	Command Index	0	
			*



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(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.

- F. 1 #	 Configuration 	on Mode				Advanced	<u> </u>
- Fieldbus	Mode of O	Memory Starting Address of Sending Data				Polling	
🖻 🚃 Channel1	Memory St					3000	
B R Node(0)	Modbus Re	gister Starting A	ddress of Sending I	Data		1500	
Command ID1	Length of S	ending Data (BY	TE)			0	
Command ID3	Length of S	ending Data (W	ORD)			0	
Command ID6	Receive Da	ta Project Config	guration		Configuration		
	Command	Command Index				1	
	Advanced Configur	ation			×		
	Mapping address					Response data	
	Bytes	Memory Address	Starting Address	Byte swap	-	Command Status	
	5-8	0		0 Register swap		Byte0-3	
	10-13	0		0 Register swap		Byte4	
	15-18	0		0 Register swap	_	Byte9	
						Byte14 Byte19	-
			0			-	
Byte offset configuration of the					-	Byte20-23	<u>^</u>
						1	

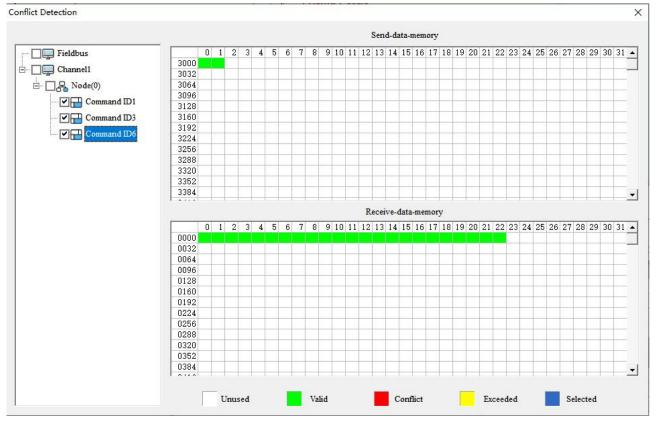
(3) Command 6: 2-byte request and 2-byte response. The response data length includes the command status bytes.

	Configuration Mode	Basic	
Fieldbus	Mode of Outputting Commands	Polling	
E Channel1	Memory Starting Address of Sending Data	3000	
□ S Node(0)	Modbus Register Starting Address of Sending Data	1500	
Command ID1	Length of Sending Data (BYTE)	2	_
Command ID3	Length of Sending Data (WORD)	1	
Command ID6	Memory Starting Address of Receiving Data	20	
	Modbus Register Starting Address of Receiving Data	10	
	Length of Receiving Data (BYTE)	4	
	Length of Receiving Data (WORD)	2	
	Command Index	2	

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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 <u>chapter 6.1</u>, 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.





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

Connection		\times
	lode FRTU CASCII	
	lesponse Timeout 1000 [ms]	Cancel
	lelay Between Polls 10 [ms]	Advanced
Remote Server IP Address 192.168.0.10	Port 502	
Function: 04 Read Input Registers (3x) C Address: 1 Protocol address. E.g. 3)011 -> 1 Quantity: 12	IO Address: 150 Quantity: 1 Apply Scan Rate: 100 Disable Read/Writ	Bead Holding Registers (4x) ▼ OK Cancel 01 Protocol address. E.g. 00 [ms] Apply
View Rows 10 20 50 100 Fit to Quantity Hide Alias Columns Address in Cell Enron/Daniel Mode		



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- 3. You can use the advanced function Memory Data Display (see <u>chapter 5.2.7</u>) or Diagnose (see <u>chapter 5.2.8</u>) to monitor the HART communication.
 - (1) Memory Data Display

		-					_	_													oll - Mbpoll2 Connection		ons Display V	iew Wi	ndow Help
Input Data	Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15						05 06 15 16		
Save		00	00	20	00	00	00	00	00	00	00	00	00	F3	₿7	41	F4 🔺		Ir	Mbpoll	1				2
	Contraction of the	00	00	00	00	05	00	00	00	00	00	00	00	00	00	00	00			$T_x = 23$: E	rr = 0: ID =	1: F = 04: SR	= 1000ms		
		00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00								
1	Same 20035	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00				Alias	3+0000	<u>ام (</u>	00	2,0010
Stop	0064	ЗF															•	3	h.	1	01	0x0000		06	0x0500
																				2		0x2000)	06	0x0000
																		-		3	01	0x0000)		
output Data	Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15			4		0x0000)		
-	300 1	03	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00 🔺	8	11	5	03	0x0000)		
Save	3016		00	00	00	00	00	00	00	00	00	00	00	00	00	00	00			6		0x0000)		
Load	3032	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00			7	03	0xF3A	7		
LUdu	3048	00	00	00	00	00	00	80	00	00	00	00	00	00	00	00	00			8		0x41F4	1		
Send	3064	11															•			9	03	0x0000			
												-								10		0x0000			
Stop														-						10		0,0000			
															-	-				Mbpoll2					
																						: F = 03: SR			
1111		-			-	-	-			-	-	-						-		10. E	0. ID = 1		1000/113		
																					Alias	4+1500			
																				1		0x0300			

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

Nagnose		2		Modbus Pall - Mbpoll1			
Fieldbus Channel	1 Command ID1	Value Response correct Response correct Response correct	0	Edit Connection Se Edit Connection Se Mbpoll1 (= 1184 Err = 3 ID =	9 a]1 05 0	6 15 16 17 22	
ommand 10 data			21	Alias	3x0000	Alias	3x0010
				1 01	0x0000	06	0x0500
	Bem	Value		2	0x2000	06	0x0000
	Primary Variable	0.000000		3 01	0x0000		
(31)	Secondary Variable Tertiary Variable	30.618971		4	0x0000		
	Telopy Island	0.00000		5 03	0		
	17						
				7 03	30.619		
				8			
				9 03	0		
Refresh	1			10	-		



GT200-HT-MT HART/Modbus TCP Gateway User Manual

4.3 Troubleshooting Multiple HART Devices

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

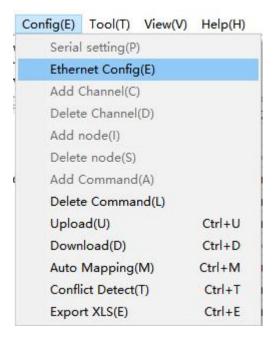
4.3.1 Identifying HART Slave Addresses

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-HT-MT using the wiring diagrams from <u>Chapter 2.5.1</u>.
- 2. Open the SST-HE-CFG software installed on your computer.



- 3. Click "Fieldbus" in the "Mode" item on the right and choose "Modbus TCP".
- 4. Select "Ethernet Config" in "Config" menu.





User Mar	nual	
	Ethernet configuration	×
	☐ Use the search function IP address to connect to: 192 . 168 . 0 . 10	

5. Click "OK". Select the gateway and sign in.

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-HT-MT	192.168.0.10	64-ea-c5-1e-01-1b	1.2	Allows remote configuration
	Sign In		Refresh	1	Cancel

6. Select the "Fieldbus" on the left and configure the parameters as below:

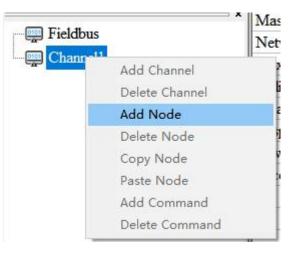
Modbus TCP	-
Manually Assign	
192.168.0.10	
255.255.255.0	
192.168.0.1	
0.0.0.0	
0.0.0.0	
	Manually Assign 192.168.0.10 255.255.255.0 192.168.0.1 0.0.0.0

User Manual

7. 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

8. Right click the channel, select "Add Node".



9. 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.

:
:
:
: 1
Loop Current: p to four predefined 0 Current always matche device. The Secondary, ible is defined for each
ry variable is the sensor



User Manual

10. Click "Command ID3" and configure the parameters as below:

autoMap

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

11. Click the AutoMap icon





No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-HT-MT	192.168.0.10	64-ea-c5-1e-01-1b	1.2	Allows remote configuration
	Sign In		Refresh]	Cancel



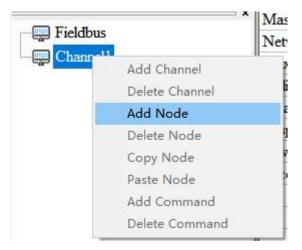
<i>GT200-HT-MT</i> HART/Modbus TCP Gateway User Manual		_
Download		
Click "Download" to download the configuration. Download Cancel		
Remote reset	×	
Download succeeded, whether to conduct remote reset?		

Vac	No	Cancel
ICS	INO INO	Cancer

- 13. 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.
- 14. 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	

15. Right click the channel, select "Add Node".





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16. 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.

150 X 0 (10 X 10 X 10 X 10 X 10 X 10 X 10	Selected command
Command ID0	
Command ID1	
Command ID2	
Command ID3	1
Command ID4	>>
Command ID5	
Command ID6	
Command ID7	
Command ID8	
Command ID9	~~
Command ID10	
Command ID11	
Command ID12	
Command ID10 Command ID11 Command ID12 Read Dynamic Variable Reads the loop current Dynamic Variables. The he AO output current Fertiary and Quatemar	es and Loop Current: and up to four predefined e Loop Current always matche of the device. The Secondary y variable is defined for each
laurian trans a star Ca	condary variable is the sensor
emperature, etc.	

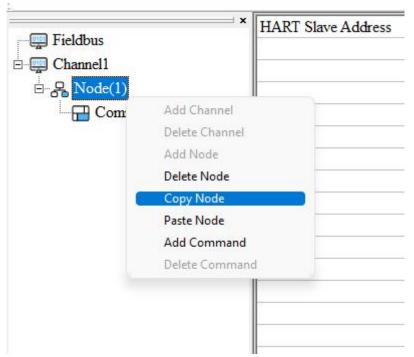
17. Click "Command ID3" and configure the parameters as below:

Configuration Mode	Basic	1
Mode of Outputting Commands	Polling	8
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	

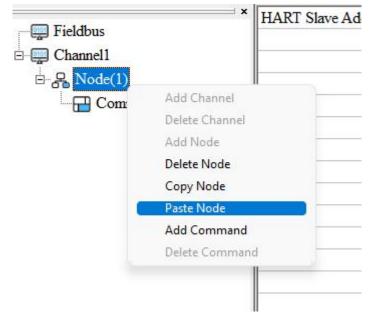




18. Right click on "Node(1)" and select "Copy Node".



19. Right click on "Node (1)" and select "Paste Node". Repeat this step until there are 15 nodes.





User Manual

C T' 1 1	Master Type
- Fieldbus	Network Mode
Channel1	Maximum Repe
E R Node(1)	Polling
	Delay Between
🗄 🔏 Node(3)	Response Timeo
⊞ 🔏 Node(4)	How to Action a
⊞ 🔏 Node(5)	Successive Resp
⊞ 🖧 Node(6)	
⊞ <mark>R</mark> Node(7)	
E Rode(8)	
⊞ 🔏 Node(9)	
⊞ 🔏 Node(10)	
⊞ 🖧 Node(11)	
⊞ <mark>- </mark> Rode(12)	-
⊞ <mark>8</mark> Node(13)	
⊡ - <mark>8</mark> Node(14)	
⊕ 🔏 Node(15)	

AutoMap

20. Click the AutoMap icon





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ᆚ

21. Click the Download icon Download

0.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-HT-MT	192.168.0.10	64-ea-c5-1e-01-1b	1.2	Allows remote configuratio
	Sign In		Refresh]	Cancel
rch		Download			
rch		configu	Download" to downlo tration.	ad the Cancel	
rch		Click "I configu Dow Remote reset	tration.	Cancel	×

22. 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.



4.3.2 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.

Command list	Selected command
Command ID0	
Command ID1	
Command ID2	
Command ID3	>>
Command ID4	
Command ID5	
Command ID6	
Command ID7	
Command ID8	1
Command ID9	~~
Command ID10	
Command ID11	
Command ID12	1
command writes the Pol	management command. This lling address to the device, l the Primary Variable AO output ID.

2. 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	



		<i>GT200-HT</i> HART/Mod User Manu	bus TCP Ga	teway		
3.	Click 1	the AutoMap icon	AutoMap SST-HE-CFG		×	

Whether auto mapping address?

No

Cancel

Yes

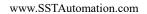
Download

Click the download icon

4.

lo.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-HT-MT	192.168.0.10	64-ea-c5-1e-01-1b	12	Allows remote configuration
_	Cian In		Refresh	1	Grand
	Sign In		Kelfesh		Cancel









Yes	No	Cancel
		

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

June
Manual Contraction
• Debug

6. Click the Diagnose icon Diagnose

No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-HT-MT	192.168.0.10	64-ea-c5-1e-01-1b	1.2	Allows remote configuration
	Sign In		Refresh]	Cancel

User Ma	odbus TCP Gateway
	Upload
	Click "Upload" to upload the configuration.

7. 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.

	Addr	00	01	02 0	3 04	05	06	07 (8 09	10	11 1	12 13	3 14	15				
Save	0000	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
W7271.5	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	
Stop	0064	4B																•
itput Data –	J Addr	00	01	02 0	3 04	05	06	07 (18 09	10	11 1	2 1	3 14	15				
	1														00	00	00	
atput Data Save	3000	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	•
Save	3000 3016	00 00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	-
	3000 3016 3032	00 00 00	00	00 00 00	00 00 00 00	00	00 00 00	00	00	00 00 00	00	00 00 00	00 00 00	00	00	00	00	
Save	3000 3016	00 00 00 00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	

Memory Display

	Addr	00	01	02	03 0	4 05	06	07	08 09	10	11	2 13	14	15				
Save	0000	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
10777 I	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	
Stop	0064	4B					6								6			•
tput Data	Addr	00	01			4 05	06		08 09	10		2 13		15		1		
tput Data	Addr 3000	_	01	02	03 0 00	4 05	06 00	07 00	08 09	10 00	11 1	2 13	14	15	00	00	00	
-	in the second second	02													00	00	00	
-	3000	<mark>02</mark> 00	00	00	00	00	00	00	00	00	00	00	00	00				
Save	3000 3016	02 00 00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
	3000 3016 3032	02 00 00 00	00 00 00	00	00	00	00	00 00 00 00	00 00 00 00	00 00 00	00	00 00 00 00	00 00 00	00	00 00	00	00	



×

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	Addr		01	02 0		05			8 09			2 13		15				
Save	0000	100 mil	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	_
		470	1				1.5							-				-
Stop utput Data —	1	00	01	02 0		05			8 09	10		2 13		15				
		00	01	02 0	3 04 00	05	06	07 (09 09 00	10	11 1 00	2 13	3 14 00	15	00	00	00	
utput Data —	Addr	00 02													00	00	00	-
utput Data –	Addr 3000	00 02 00	00	00	00	00	00	00	00	00	00	00	00	00				
utput Data	Addr 3000 3016	00 02 00 00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
utput Data — Save	Addr 3000 3016 3032	00 02 00 00 00	00	00 00 00	00 00 00	00 00 00	00 00 00	00 00 00	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00	00 00 00 00	00	00	00 00	00	



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 × Input Data Addr 00 02 03 04 05 06 07 08 09 10 11 12 13 14 -Save 003; -4D Go on Output Data Addr 00 02 03 04 05 06 07 08 09 10 11 12 13 14 Save nn nn nn nn Load -0E Send Go on



GT200-HT-MT HART/Modbus TCP Gateway User Manual

4.4 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 Comm	and		Data in Reply	
#	Function	Byte	Data	Туре	Byte	Data	Туре
1	Read primary variable		None		0	PV units code	Enum-8
					1-4	Primary variable	Float
3	Read current and four		None		0-3	Current (mA)	Float
	(predefined) dynamic				4	PV units code	Enum-8
	variables				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	Enum-8	1	Loop current mode	Enum-8
			mode				

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



User Manual

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

le(E) Con	fig(E) Tool(6		-1-	<u>[+</u>	<u>C</u>	1	.↓.			1		<u></u>	(*****)
New	Save	Open	Add Node	Del Node	Add Cmd	Del Cmd	Upload	Download	AutoMap	Conflict	Export	Memory	Diagnose	Debug
			 Config 	uration Mod	le				Basic					
Field			Mode	of Outputtin	g Command	ls			Polling					
Char			Memo	ry Starting A	ddress of S	ending Data			3000					
	lode(1)		Modb	1s Register S	Starting Add	ress of Send	ling Data		1500					
6	Command	ID1	Length	of Sending	Data (BYTH	E)			0					
6	Command	ID3	Length	of Sending	Data (WOR	D)			0					
- F	Command	ID6	Memo	ry Starting A	ddress of R	eceiving Da	ta		0					
			Modb	is Register S	Starting Add	ress of Rece	iving Data		0					
			Length	of Receivin	g Data (BY)	TE)			7					
			Length	of Receivin	g Data (WO	RD)			4					
			Comm	and Index					0					

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



User Manual

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

					<u>C-1</u>	<u>L</u>	1	4			1		<u>~</u>	(*****
New	Save	Open	Add Node	Del Node	Add Cmd	Del Cmd	Upload	Download	AutoMap	Conflict	Export	Memory	Diagnose	Debug
-			× Config	uration Mod	le				Basic					
Field			Mode	of Outputtin	g Command	s			Polling					
🖳 🕎 Char			Memo	ry Starting A	ddress of S	ending Data			3000					
	lode(1)		Modbu	is Register	Starting Add	ress of Send	ling Data		1500					
6	Command	IID1	Length	of Sending	Data (BYTH	E)			0					
6	Command	IID3	Length	of Sending	Data (WOR	D)			0					
6	Command	IID6	Memo	ry Starting A	ddress of R	eceiving Da	ta		0					
			Modbu	is Register	Starting Add	ress of Rece	iving Data		0					
			Length	of Receivin	g Data (BY	TE)			26					
			Length	of Receivin	g Data (WC	RD)			13					
			Comm	and Index					1					

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.

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



	ration				Response data
apping address sytes	Memory Address	Starting Address	Byte swap		Command Status
5-			no swap	_	Byte0-3
10-1	0		no swap		Byte4
					Byte9
					Byte14
					Byte15-18
			7		Byte19 Byte20-23
	-				Byte20-25
			1		
				-	

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

uns enapter.

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.



User Manual

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

					<u>[+</u>]	<u>[]</u>	1	. ↓					
New	Save	Open	Add Node	Del Node	Add Cmd	Del Cmd	Upload	Download	AutoMap	Conflict	Export	Memory	Diagno
-			= × Config	uration Mod	le			Ba	sic				
- Fieldt			Mode	of Outputtin	ng Command	ls		Pol	ling				
Chan			Memo	ry Starting A	Address of S	ending Data		30	00				
	ode(1)		Modb	is Register	Starting Add	ress of Send	ling Data	15	00				
	Command	ID1	Length	of Sending	Data (BYT)	E)		1					
	Command	ID3	Length	of Sending	Data (WOF	D)		1					
	Command	ID6	Memo	ry Starting A	Address of R	eceiving Da	ta	0					
			Modb	s Register	Starting Add	ress of Rece	iving Data	0					
			Length	of Receivin	g Data (BY	TE)		3					
			Length	of Receivin	g Data (WC	ORD)		2					
			Comm	and Index				2					

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 Software Interface Description

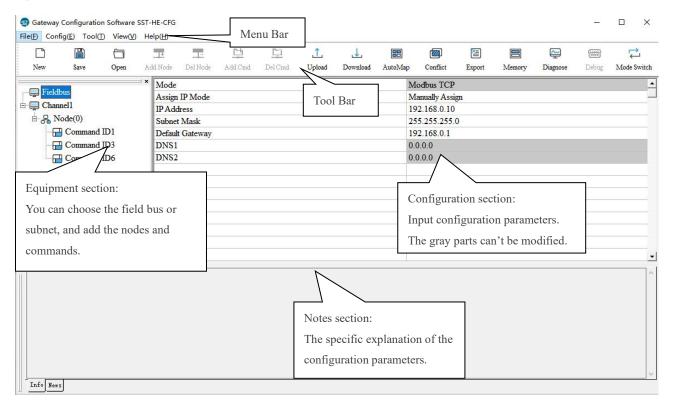
SST-HE-CFG is a configuration software based on Windows platform, and is used to configure HART series

products.

The following describes how to use the software SST-HE-CFG to configure the product GT200-HT-MT. You may

also check the software user manual to get detailed usage.

Open the SST-HE-CFG and enter the main interface of the software:



GT200-HT-MT HART/Modbus TCP Gateway **User Manual Tool Bar:** 0 1 X 14 -브 므 1 ~~ Ç New Add Nod Sav Del Noc Add Cm Del Cm Upload Mode Switch Conflic New New: Create a new configuration file Save Save: Save the configuration file 3 Open **Open:** Open the configuration file + Add Node AddNode: Add a HART node (device) 7-Del Node DelNode: Delete a HART node (device) C+ Add Cmd AddCmd: Add a HART command C, T Del Cmd DelCmd: Delete a HART command .î. Upload Upload: Upload the configuration from the GT200-HT-MT and open it in the software 1 Download Download: Download the configuration to the GT200-HT-MT 88 AutoMap AutoMap: Automatically calculate the mapping address Conflict Conflict: To check whether there are some conflicts in the data buffer × Export Export: Output the configuration and save it as an Excel form



User Manual

Memory Memory: Show the data in the buffer of the GT200-HT-MT.



Diagnose: Analyze operation of fieldbus devices.

Debug: Send any request to Hart devices and show the response information received. (Only for

GT200-3HT-RS model)



Mode Switch Mode Switch: Switch the mode to debugging or configuring.





5.2 Software Functional Specifications

5.2.1 Configure the Modbus TCP Fieldbus

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

below:

			+		<u>C+</u>	<u> </u>	<u>↑</u>	.↓			1		~ <u>~</u>	(*****)
New	Save	Open	Add Node	Del Node	Add Cmd	Del Cmd	Upload	Download	AutoMap	Conflict	Export	Memory	Diagnose	Debuş
💭 Fieldt	ous		* Mode						Modbus					
Chan			Assign IP Add	IP Mode					Manually 192.168					
- R N				ntess Mask					255.255					
	Command	ID1		t Gateway					192.168					
	Command	ID3	DNS1						0.0.0.0					
	Command		DNS2						0.0.0.0					

Assign IP Mode: Manual Assign, BOOTP, DHCP optional.

IP Address: Set the IP address of the GT200-HT-MT.

Subnet Mask: Set the subnet mask of the GT200-HT-MT.

Default Gateway: Set the gateway address of the GT200-HT-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:

1.		n Software S D View(V)											8	
		6		æ	<u>[+</u>]	<u> <u></u></u>	<u>↑</u>	₹			1		<u></u>	()
New	Save	Open	Add Node	Del Node	Add Cmd	Del Cmd	Upload	Download	AutoMap	Conflict	Export	Memory	Diagnose	Debuş
Fieldb			* Maste						Primary 1					
Chanr				ork Mode					Point-to-	Point				
				um Repetiti	ons				3					
B R No		ID 1	Polling		12				Enable					
	Command		-	Between Po					256					
	Command		-	nse Timeout					256					
·	Command	ID6				sive Respon			Hold					
			Succe	ssive Respo	nse Timeout	for N Times			3					
			-											

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.



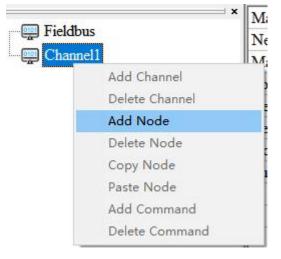


Successive Response Timeout for N times: The max number of timeouts before the data is cleared, ranging from

1 to 14.

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.

e(E) Conf	fig(<u>E)</u> Tool(T) View(V)	Help(<u>H</u>)											
					<u>[~+]</u>	<u>F</u> _	1	.↓			X		<u>~</u>	(1000) 1000
New	Save	Open	Add Node	Del Node	Add Cmd	$\mathrm{Del}\mathrm{Cmd}$	Upload	Download	AutoMap	Conflict	Export	Memory	Diagnose	Debug
🕎 Fieldl 🕎 Chan	nel1			r Type rk Mode um Repetiti	ons				Primary Multi-dro 3					
	ode(1) Command	ID1	Polling						Enable					
	Command			Between Po nse Timeout					256 256					
I	Command	ID6	How to	Action after	er N Succes	sive Respon	se Timeout		Hold					
			Succes	sive Respon	nse Timeout	for N Times	(3					

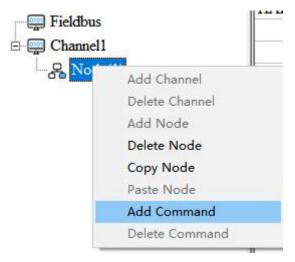
Note: When the number of configured nodes numbers is more than the actual connected devices, the redundant nodes will lead to a longer polling time. It is recommended that the number of configured nodes correspond with the number of actual devices.





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:

Command list		Selected command
Command ID0	^	Command ID1
Command ID2		Command ID3
Command ID4	_	Command ID6
Command ID5		. 1
Command ID7		>>
Command ID8		
Command ID9		
Command ID10		
Command ID11		
Command ID12		~~
Command ID13	-	
Command ID14		
Command ID15	¥	
command writes th	layer ma he Pollin ontrol th	nagement command. This g address to the device, le Primary Variable AO output

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





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:

				Æ	<u>[]+</u>	<u>F</u>	1	_ ↓			1		~~~	(1000)
New	Save	Open	Add Node	Del Node	Add Cmd	Del Cmd	Upload	Download	AutoMap	Conflict	Export	Memory	Diagnose	Debug
🗐 Field	bus			uration Mo					Basic					
Chan					ng Command				Polling 3000					
- R N					Address of S Starting Add	and the second se			1500					
1000	Command	ID1			Data (BYT)		ing Data		0					
-	Command				Data (WOH				0					
	Command				Address of F	1.1.2.1.	ta		0					
			Modb	us Register	Starting Add	ress of Rece	iving Data		0					
			Length	of Receivir	ng Data (BY	TE)			7					
					ng Data (WC	ORD)			4					
			Comm	and Index					0					
			-						- 8					
afo New														

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.



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5.2.2.7 Advanced Options to Configure HART Commands

The GT200-HT-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:

	Configuratio												<u> </u>		×
					<u>C</u>	<u>C</u>	1	J.			1			E	
New	Save	Open	Add Node	Del Node	Add Cmd	Del Cmd	Upload	Download	AutoMap	Conflict	Export	Memory	Diagnose	Det	bug
			* Config	uration Mo	le				Advance	d					
🐺 Fieldt			Mode	of Outputtin	ng Command	ls			Polling						
Chan			Memo	ry Starting A	Address of S	ending Data			3000						
			Modb	us Register	Starting Add	ress of Send	ling Data		1500						
	Command	ID1			Data (BYT)				0						
-6-	Command	ID3	Length	of Sending	Data (WOF	ED)			0						
6	Command	ID6	Receiv	e Data Proj	ect Configur	ation					Config	uration			
			Comm	and Index					1						
															_
									- X						_

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.

User Manual

apping address					Response data
ytes	Memory Address		Byte swap		Command Status
5-8			Register swap		Byte0-3
10-13	0		Register swap		Byte4
15-18	0	0	Register swap	_	Byte9
				_	Byte14
	-				Byte19
				_	Byte20-23
				-	
uatemary Variab	le 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:

Conflict Detection

															Sen	d-d	ata-	men	nory															
Fieldbus		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	3 19	9 21) 2	1 23	2 2	3 24	4 2	25 2	26	27	28	29	30	31 🔺
	3000																				-	T												
Channel1	3032																																	_
- ▼ <mark>₽</mark> Node(1)	3064																																	
Command ID1	3096																																	
	3128																		_		-													
Command ID3	3160																		_		-							_						
Command ID6	3192		_	-	_	-						_					_		_		-		-		-		-		_	_		_		_
	3224		_	-	_	-	_										_	-	_	-	-	-	-	-	-	-	-	_		_		_		
	3256	-	_		_	_	_				_		_			-	-	-	_	-	-	-	-	-	-	-	-	-		_	-	_	-	
	3288		_		_	-	_		_			-	-		_	-	-	-	-	-	-	-	-	-	-	-	-	-	-	_		_	-	_
	3320		_	-	_	-	_						-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	_		_	-	
	3352		_		-	-	_		_				-		_	-	-	-	-	-	-	-		-	-	-	-	-		_		_		-
	3384			-		_			_			1				-		1		1		E.	-	12	-	ł.			-		- 1			-
														R	ecei	ive-	data	1-me	emor	у														
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	3 19	9 21) 2	1 23	2 2	3 2	4 2	25 2	26	27	28	29	30	31 🔺
	0000																									1	-		_	_	-	_	-	
	0032		_	_	_	_	_						_				_		_		_		_		_		_		_	_		_		_
	0064		_		_	-	_			1	_	1	_			1	_	1	_	1	_	1	_		-	1	-		_	_				_
	0096		_	_	_	_	_			-		1	_	-			_	-	_	-	_	-	_	-	_	-	-	-	_	_		_	_	_
	0128		-		_	-	_	_		1	_	11	-	-			-	-	-	-	-	-	_	-	-		-	-	_	_		_		_
																							_		_	_							-	_
	0160			_		-	_				_		-		-		-					1.				1.1		- 10						
	0192																				_	-	-		-	-	-	-	_	_			_	_
	0192								_																									=
	0192 0224 0256																																	
	0192 0224 0256 0288																																	
	0192 0224 0256 0288 0320																																	
	0192 0224 0256 0288																																	

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 sending data.

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-HT-MT.

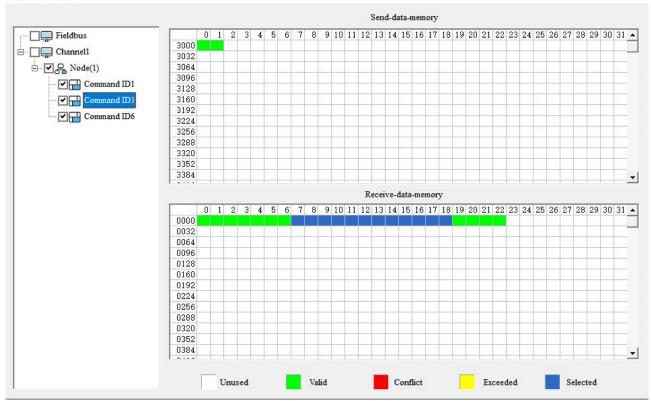


X

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

Conflict Detection



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.

88





×



5.2.5 Upload Configuration

Select "Config" >> " Ethernet Config" in the menu bar:

onfig(E) Tool(T) View((V) Help(H)
Serial setting(P)	
Ethernet Config(E)	
Add Channel(C)	
Delete Channel(D)	
Add node(I)	
Delete node(S)	
Add Command(A)	
Delete Command(L)	
Upload(U)	Ctrl+U
Download(D)	Ctrl+D
Auto Mapping(M)	Ctrl+M
Conflict Detect(T)	Ctrl+T
Export XLS(E)	Ctrl+E
and the second sec	

The "Ethernet Configuration" box is shown as below:

🗖 Us	se the se	arch	fun	ctic	n	
	lress to o					
192	. 168	×	0	<u>ی</u>	10	

When ticking "Use the search function", it will search all identifiable hardware and show them in the device list:

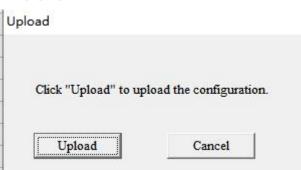


ch Ec	User Man	nual			
No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-HT-MT	192.168.0.10	64-ea-c5-1e-01-1b	1.2	Allows remote configuration
					[]

Select a device and click "Sign in" 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:



Click "Upload" button.







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

5.2.6 Download Configuration

After configuring the conclusion of the conclusi	mmand, click Download button, the pop-up box is as show	vn belo
	Download	
	Click "Download" to download the configuration. Download Cancel	
	Remote reset	×
	Download succeeded, whether to conduct remote reset?	
		11

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

Yes

5.2.7 Memory Data Display

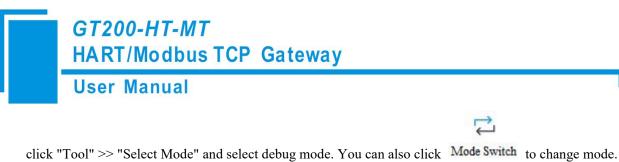
This function shows the data exchange inside of the gateway and is useful in debugging the HART fieldbus in the absence of an EtherNet/IP connection. Users can check the data in buffer of the GT200-HT-MT following these steps:

No

Cancel

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







Memory _____. Choose the required gateway in the device scanning window, as shown Click on the icon 3.

below:

		S	5 yo	() ur)M sy:	M ste	vn/	10										
	- ^{\$}	S <mark>el</mark> eo	et M		Conf	ĩg	2250			• D	ebu	i)						
				Ok	5]					Car	ncel						
y Display																		2
it Data				22					2010			220	12.00		22			
	Addr 0000	00	01 00	02 20	03	04 00	05 00	06	07 00	08 00	09 00	10 00	11 00	12 F3	13 A7	14 41	15 F4	
Save	0016	1	00	20	00	05	00	00	00	00	00	00	00	r5 00	00	41 00	00	-
	0032	1002	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	-
Stop	0064		0.00	1000	1.000	1	l aax		1		2.505	1			1,505 x		10000	•
put Data -	Addr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	i
	3000	03	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	•
1		00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
1	3016			00	00	00	00	00	00	00	00	00	00	00	00	00	00	
Save	3016 3032	10000	00	00	00					00	00	00	00	00	0.0		00	
Save	10000	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
Save Load Send	3032	00 00				00	00	00	00	00	UU	UU	00	UU	00	00	00	•

The upper table shows the memory distribution of HART input data, and the lower table shows the output 4. 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:

- Ensure that the GT200-HT-MT is set to running mode. Set the configuration DIP switch Bit 1 OFF and Bit 2 OFF, then restart the gateway. The GT200-HT-MT now is in running mode.
- 2. Connect the GT200-HT-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 Mode Switch to change mode.

C

SST @M	
Cink your system!	1
- Select Mode	
- Select Mode ∩ Config	• Debug



3. Click

and upload the configuration of the required gateway, as shown below:



User Manual arch Equipment					
No.	Model	IP Address	MAC Address	Firmware Version	State
1	GT200-HT-MT	192.168.0.10	64-ea-c5-1e-01-1b	1.2	Allows remote configuratio
	Sign In		Refresh	1	Cancel

4. 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.



User Manual		
inose		
	Item	Value
🐙 Channel1	System State machine	WAITACK
Node(0)	Request times	25
	Response times Error times	25
peration Refresh	Reset	Periodically refresh

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



User Manual

Fieldbus	Item	Value
🛃 Channell	Command ID1	Response correct
Node(0)	Command ID3	Response correct
	Command ID6	Response correct
eration		
Refresh	Reset	Periodically refresh

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

For example, double click on "Command ID3":

	Item	Value
	Communication Status	sSuccess
Edit	Response Code	Reserved
10000	Primary Variable Current	4.319878
	Primary Variable Units Code	bars
	Primary Variable	-0.000035
	Secondary Variable Units	(null)
	Secondary Variable	0.000000
	Tertiary Variable Units Code	(null)
	Tertiary Variable	0.000000
	4th Variable Units Code	(null)
fresh	4th Variable	0.000000

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 1EEE754 floats or PACKED ASCII codes.

TECH	*		
		50 50 C	8
		Hex	
le precision floa	_	4 bytes hex	data
00071		3A 3A 1F 4E	3
	gle precision floa	i4 floating point conversion gle precision floating point 00071	Hex Hex Hex Hex Hex Hex Hex Hex Hex Hex



6 Working Principle

6.1 Address Table

The GT200-HT-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	Buffer	Modbus Address ¹			
Channel	Address	Function Code	Address	Read/Write ²	Description
	0-2999	04	0-1499	Read	HART input data (response data) ³
Input/Output Data			(3x0001-3x1500)	Keau	
	3000-4999	03, 06,	1500-2499	Read/Write	HART output data (request data) ⁴
		16	(4x1501-4x2500)	Kead/ Wille	
	5000-5019		2500-2509		Device 0_cmd0 response data ⁵
	5020-5039	- 04	2510-2519	Read	Device 1_cmd0 response data
	5300-5319		2650-2659		Device 15_cmd0 response data
	5320		2660 Н		HART channel status ⁶
	5321		2660 L		HART channel request counter
	5322		2661 Н		HART channel response counter
State and	5323		2661 L		HART channel error counter
State and Control	5324		2662 Н		Device 0_cmd0 status ⁷
Bytes	5325		2662 L		Device 1_cmd0 status
Bytes					
	5339		2669 L		Device15 _cmd0 status
	5340-5439		2670-2719		Configured HART command status ⁸
	5744		2872 H		Counters reset trigger ⁹
	5745	03, 06,	2872 L		Polling output control byte ¹⁰
	5746	16	2873 H	Read/Write	Command request trigger ¹¹
	5747	1	2873 L		Triggered command index ¹²
Others			R	eserved	

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-HT-MT, with the specified address. The Modbus address in the above table is based 0 and decimal.



GT200-HT-MT HART/Modbus TCP Gateway User Manual

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

* For more details about the relationship between buffer address and Modbus address, please refer to chapter

<u>4.2</u>.

- Device N_cmd0 response data: The GT200-HT-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 statues: The status of the HART command 0 which is automatically sent. See Note 5 above.

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)

Table 6.2 - Command Status



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- 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 63	Polling	Output	Control Byte
<i>Tuble</i> 0.5 -	roung	Ouipui	Control Dyle

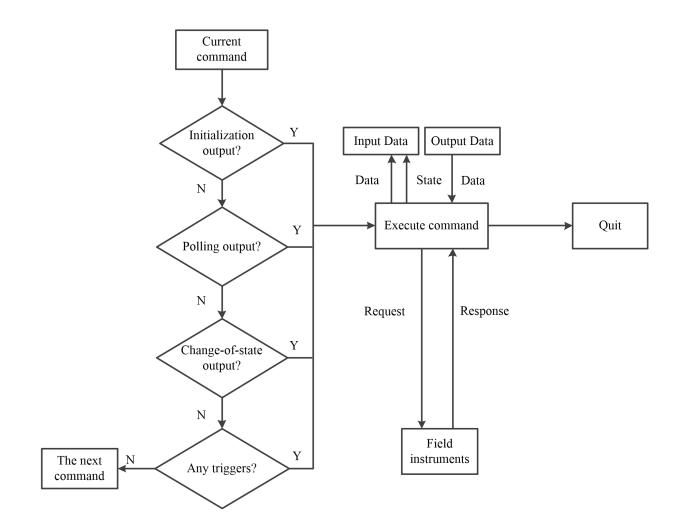
Value	Description
01	Enable polling output. The HART commands will be sent periodically.
00	Disable polling output. The HART commands will be sent with the trigger
	signal, see Note 11 and 12 for details.

- 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".





6.2 Flowchart of Executing One HART Command

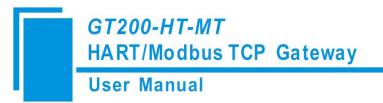


6.3 Trigger Command

Users can trigger any HART command by sending a trigger byte and command index, following the steps below: (The address table refers to <u>chapter 6.1</u>)

- 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.

