

Universal Serial/PROFINET Gateway

GT200-PN-RS

User Manual

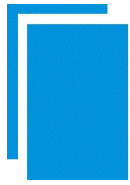
V 5.4



SST Automation

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www.SSTAutomation.com



Important Information

Warning

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The product has many applications. The users must make sure that all operations and results are in accordance with the safety of relevant fields, and the safety includes laws, rules, codes and standards.

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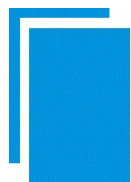


Table of Contents

1 Product Overview	2
1.1 Product Function	2
1.2 Product Features	2
1.3 Technical Specification	2
1.4 Related Products	4
1.5 Revision History	4
2 Hardware Descriptions	5
2.1 Product Appearance	5
2.2 Indicators	5
2.3 Interface	6
2.3.1 Power Interface	6
2.3.2 Serial I RS485	6
2.3.3 Serial II RS232	7
2.3.4 Pull-Up and Pull-Down resistor switch.	7
2.3.5 Ethernet Interface	7
2.3.6 Button Function	8
3 Installation	9
3.1 Machine Dimension	9
3.2 Installation Method	10
4 Quick Start Guide	11
5 Software Instructions	12
5.1 Software Interface Description	12
5.2 Device View	13
5.2.1 Ethernet Configuration View	13
5.2.2 Subnet Configuration View-Modbus Master	15
5.2.3 Subnet Configuration View-Modbus Slave	20
5.2.4 Subnet Configuration View-Custom Protocol	22
5.2.5 Subnet Configuration View-User Config	23
5.3 Tools	24
5.3.1 Upload and Download	24
5.3.2 Conflict Detection	27
5.3.3 Export EXCEL	29
5.3.4 Assign Ethernet Parameters	29
6 Work Principle	36
6.1 Data Exchange	36
6.2 Command execution instructions	37
6.3 Custom Protocol	42
6.4 User Config	43



1 Product Overview

1.1 Product Function

GT200-PN-RS is a gateway which can provide a seamless connection between PROFINET network and Modbus. It can connect devices with RS232 or devices with RS485 interface to PROFINET network.

1.2 Product Features

- **Wide application:** Any devices with RS232/RS485 interface can use this gateway to realize exchanging data. For example, Such as frequency converters with Modbus protocol interface, motor startup protection devices, intelligent high and low voltage electrical appliances, power measuring devices, transmitters, intelligent field measuring equipment and instruments etc.
- **Easy configuration:** Users don't need to know the technical details of Modbus. Users only need to refer to this manual and use the gateway configuration software SST-TS-CFG to easily complete the configuration of gateway according to requirements. No complicated programming is required, and connection and communication can be realized in a short time.

1.3 Technical Specification

- [1] At PROFINET side GT200-PN-RS is PROFINET slave and acts as Modbus master or Modbus slave at serial side.
- [2] Supports standard PROFINET RT and IRT protocol.
- [3] PROFINET: Supports up to 32 slots, input/output data buffer is up to 1440 bytes (the length uses can use is limited to specific PLC and PDU size of communication module), the length of input/output bytes can be set by configuration software of PROFINET Master such as TIA Portal or STEP7.
- [4] The supported module types are as follows:
 - **Input 001 byte**
 - **Input 002 bytes**
 - **Input 004 bytes**
 - **Input 008 bytes**
 - **Input 016 bytes**
 - **Input 032 bytes**
 - **Input 064 bytes**
 - **Input 128 bytes**

- **Input 256 bytes**
- **Input 512 bytes**
- **Output 001 byte**
- **Output 002 bytes**
- **Output 004 bytes**
- **Output 008 bytes**
- **Output 016 bytes**
- **Output 032 bytes**
- **Output 064 bytes**
- **Output 128 bytes**
- **Output 256 bytes**
- **Output 512 bytes**
- **Input / Output 001 byte**
- **Input / Output 002 bytes**
- **Input / Output 004 bytes**
- **Input / Output 008bytes**
- **Input / Output 016 bytes**
- **Input / Output 032 bytes**
- **Input / Output 064 bytes**
- **Input / Output 128 bytes**
- **Input / Output 256 bytes**
- **Input / Output 512 bytes**

- [5] With 2 serial ports: Serial I support RS485,serial II support RS232,Two serial ports can be used as communication ports, and they can communicate at the same time.
- [6] The protocol type serial ports support: Modbus master, Modbus slave, Custom protocol, User Config.
- [7] Serial port parameters:
- ◆ Operation mode: Half-duplex.
 - ◆ Baud rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bps optional.
 - ◆ Data bits: 7, 8 optional.
 - ◆ Parity: None, Odd, Even, Mark and Space optional.
 - ◆ Stop bits: 1,2 optional.
- [8] Modbus master:
- ◆ Function code: 01H, 02H, 03H, 04H, 05H, 06H, 0FH and 10H.

GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual

- ◆ Format: RTU and ASCII.
- ◆ Function: Cycle output, Forbidden output, Change of value output of write command and Output once.
- ◆ Each master can configure up to 100 Modbus commands.
- ◆ When serial port 1 (RS485 serial port) and serial port 2 (RS232 serial port) simultaneously connect the slave equipment as the Modbus master, Serial port 1 supports connection of 3 Modbus slave devices, and serial port 2 can configure up to 1 node.
When configuring serial port 1 as the Modbus master independently, it can configure up to 4 nodes.
- ◆ Support input data timeout clear/hold setting.
- ◆ Support automatic demotion.
- ◆ Supports control word functions, with options to Disable, All Commands, Only Write Commands.

[9] Modbus slave:

- ◆ Function code: 01H, 02H, 03H, 04H, 05H, 06H, 0FH and 10H.
- ◆ Format: RTU and ASCII.

[10] Power: 24VDC (9~30VDC). 250mA (24VDC).

[11] Operating temperature: -4°F~140°F(-20°C~60°C), Humidity: 5%~ 95% (non-condensing).

[12] Built-in electrostatic protection: 15 KV ESD. Communication interface isolation: 3KV.

[13] Dimensions (W*H*D): 1.33 in*4.56 in*4.13 in (34mm*116mm*105mm).

[14] Installation: 1.4 in (35 mm) DIN RAIL.

[15] Protection level: IP20.

1.4 Related Products

The related products include: GT200-DN-RS, GT200-DP-RS.

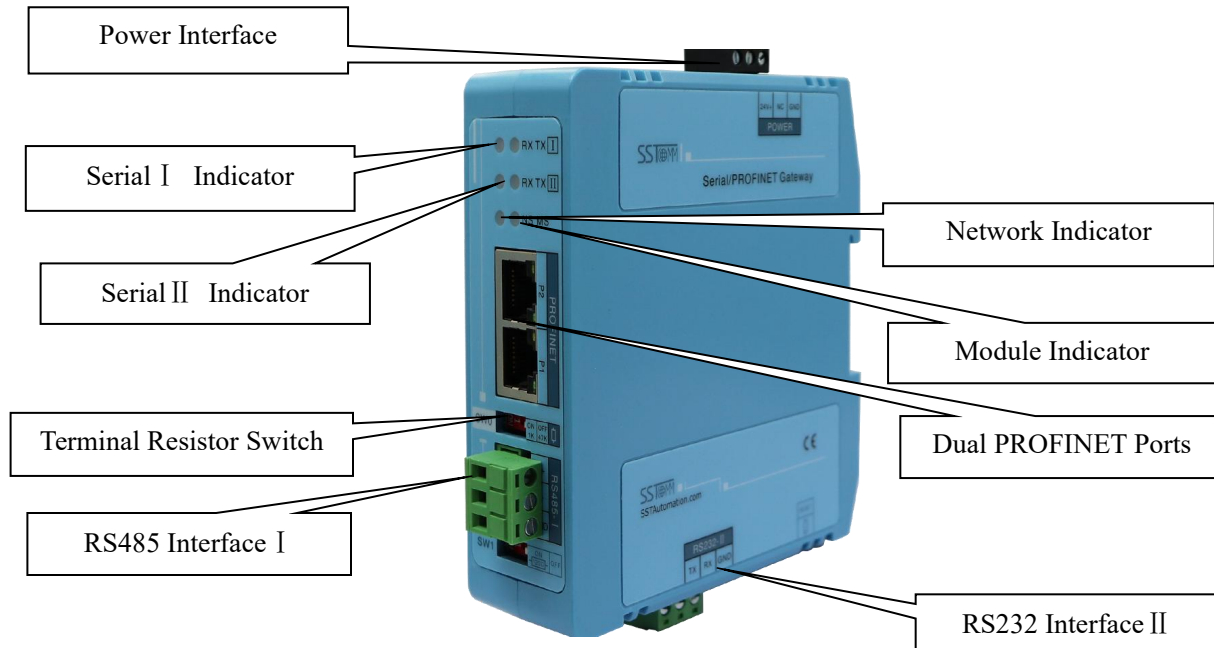
To get more information about related products, please visit SSTCOMM website: www.sstautomation.com.

1.5 Revision History

Revision	Date	Chapter	Description
V5.4	7/19/2024	PART	Add Pull-up and Pull-down resistor; Increase input/output data buffer to 1440 bytes
V4.4	7/21/2023	PART	Add the new control word function, increase Modbus master command to 100
V3.5 Rev A	8/4/2022	PART	Updated the product picture, dimensions and software screenshot
V1.0 Rev B	12/28/2021	All	Updated the format
V1.0 Rev A	2/22/2018	All	New release

2 Hardware Descriptions

2.1 Product Appearance



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

2.2 Indicators

Indicators	State	Description
Serial I/II TX	Green Blinking	Serial port data sending
	OFF	No data is sending
Serial I/II RX	Green Blinking	Serial port data receiving
	OFF	No data is receiving
MS	See below table	
NS	See below table	

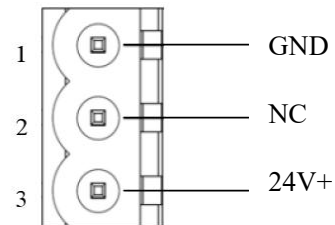
Module indicator and network indicator:

Module indicator state MS	Network indicator state NS	Description
OFF	Red blinking	Start-up state, waiting to initialize
Green on	Red blinking	Initialize complete, no connection with PLC
Green on	Green on	PLC has connected
Other	Other	Undefined state

2.3 Interface

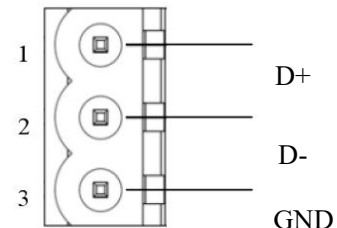
2.3.1 Power Interface

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



2.3.2 Serial I RS485

Pin	Function
1	D+, RS485 Data Positive
2	D-, RS485 Data Negative
3	GND

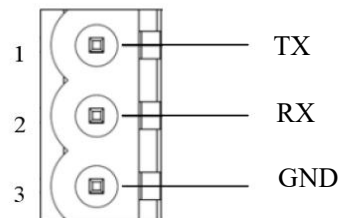


The basic characteristics of RS485 transmission technology:

- Network topology: Linear bus, there are active bus terminal resistors at both sides. If the communication quality is unstable, users can turn on the terminal resistor (120Ω, 1/2W) switch on the gateway.
- Media: Shielded twisted-pair cable and also can cancel the shielding, depending on environmental conditions (EMC).
- Station number:
 - (1) When serial port 1 and serial port 2 simultaneously connect the slave equipment as the Modbus master or User config, serial port 1 can configure up to 3 nodes.
 - (2) When configuring serial port 1 as the Modbus master independently, it can configure up to 4 nodes.

2.3.3 Serial II RS232

Pin	Function
1	TX, connect RS232's RX of user device
2	RX, connect RS232's TX of user device
3	GND, connect RS232's GND of user device



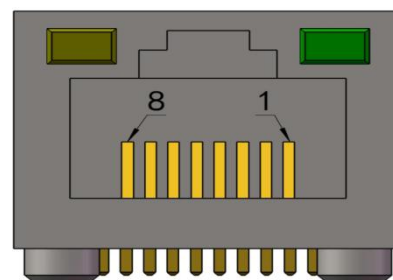
2.3.4 Pull-Up and Pull-Down resistor switch.

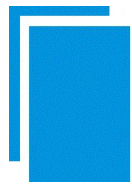
Function	Description
OFF	Switch to 47K Ω resistor
ON	Switch to 1K Ω resistor

2.3.5 Ethernet Interface

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

Pin	Signal Description
1	TXD+, Transmit Data+
2	TXD-, Transmit Data-
3	RXD+, Receive Data+
6	RXD-, Receive Data-
4,5,7,8	reserved





2.3.6 Button Function

This button is used to restore default settings.

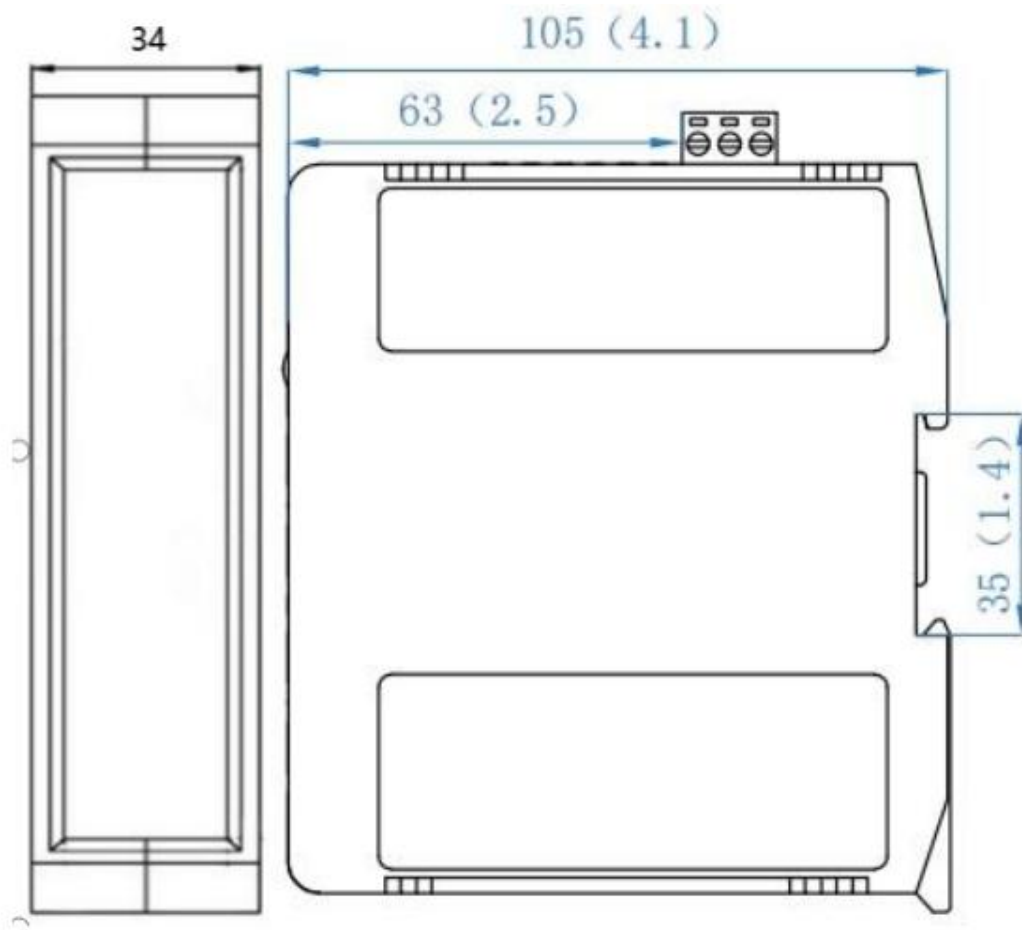
Operating Procedure: Within 10 seconds after the gateway's power-on MS indicator light illuminates, press and hold the button for more than 5 seconds until the MS green light blinks. Click the button again within 5 seconds, and the gateway will restore the default configuration. After the default configuration is restored, the gateway's IP address will be reset to 0.0.0.0, and a new IP address will need to be assigned.

3 Installation

3.1 Machine Dimension

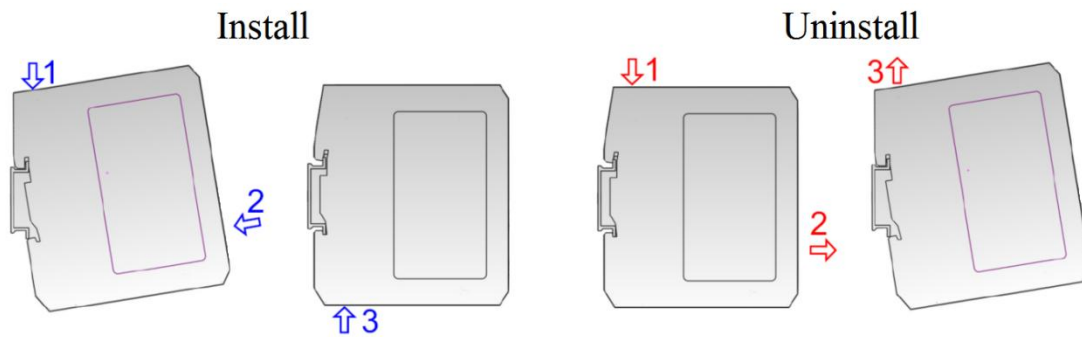
Size (width * height * depth):

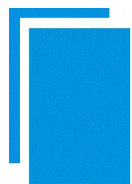
1.33in * 4.56in * 4.13in (34mm * 116mm * 105mm)



3.2 Installation Method

Using 1.4 in (35mm) DIN RAIL.





4 Quick Start Guide

Basic steps when configuring GT200-PN-RS :

1. Wiring: See also [Chapter2.3 Interface](#).
 - (1) Connect the network port of the gateway to the PC with a network cable for downloading the configuration. Another network port can be connected to PROFINET master equipment such as PLC for data communication.
 - (2) Connect the serial port of the gateway to the serial device for communication with the serial port device.
 - (3) Connect the gateway power supply and power on.
2. Download SST-TS-CFG software from www.sstautomation.com/Download1/ and install it.
3. Download the latest device description file for GT200-PN-RS from www.sstautomation.com/Download1/.
4. Build your configuration using SST-TS-CFG and download it to the gateway. For more details, see [Chapter5](#).

When the download is completed, it will give hints “whether to restart the gateway”, click “Yes”.
5. Install the appropriate device description file in the PROFINET configuration tool.
6. Configure the PROFINET network as required. Make sure that the configuration matches the configuration present in the GT200-PN-RS.

When GT200-PN-RS establishes a connection with the PROFINET master, the gateway will display: NS green on, MS green on.

Please note the following two points:

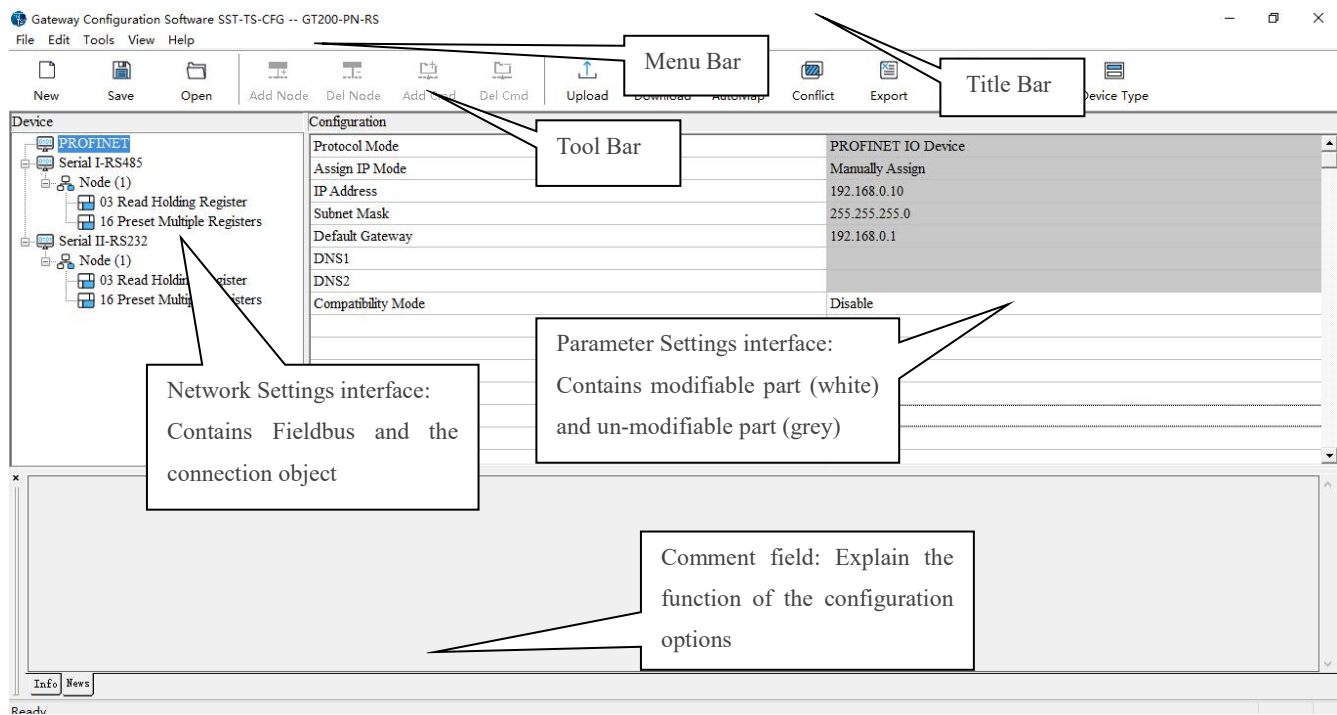
The gateway configuration in SST-TS-CFG must be consistent with the settings of configuration software of PROFINET Master station.

- 1) Device IP Address. Also see [Chapter5.3.4](#).
- 2) Device Name. Also see [Chapter5.3.4](#).

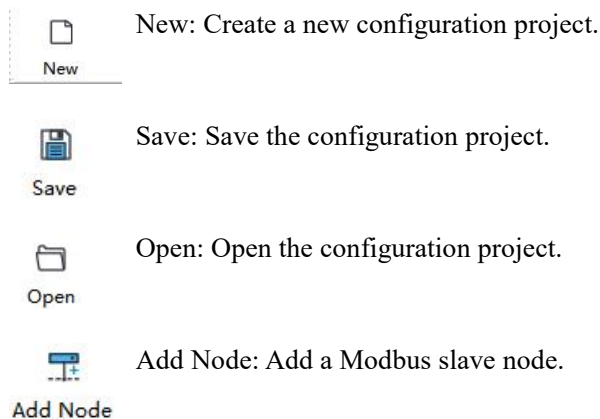
5 Software Instructions

5.1 Software Interface Description

SST-TS-CFG is the configuration software based on Windows, and used to configure GT200-PN-RS through network Interface. Double click software icon ,select GT200-PN-RS, enter the main interface of software:



Tool bar interface is shown as below:



GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual



Delete Node: Delete a Modbus slave node.

Add Cmd



Add Command: Add a Modbus command.

Add Cmd



Delete Command: Delete a Modbus command.

DelCmd



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

Upload



Download: Download the configuration file to the gateway.

Download



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

AutoMap



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

Conflict



Export EXCEL: Export current configuration to the local hard disk, saved as .xls file.

Export



Debug: Monitor or modify the gateway memory buffer data.

Debug



Assign Ethernet Parameters: Used to assign the IP, subnet and gateway information on the LAN.

Set IP



Select another gateway configuration

Device Type

5.2 Device View

Ethernet is used to configure PROFINET network parameters. Subnet is used to configure serial port parameters. The operations of Subnet 1 and Subnet 2 are the same.

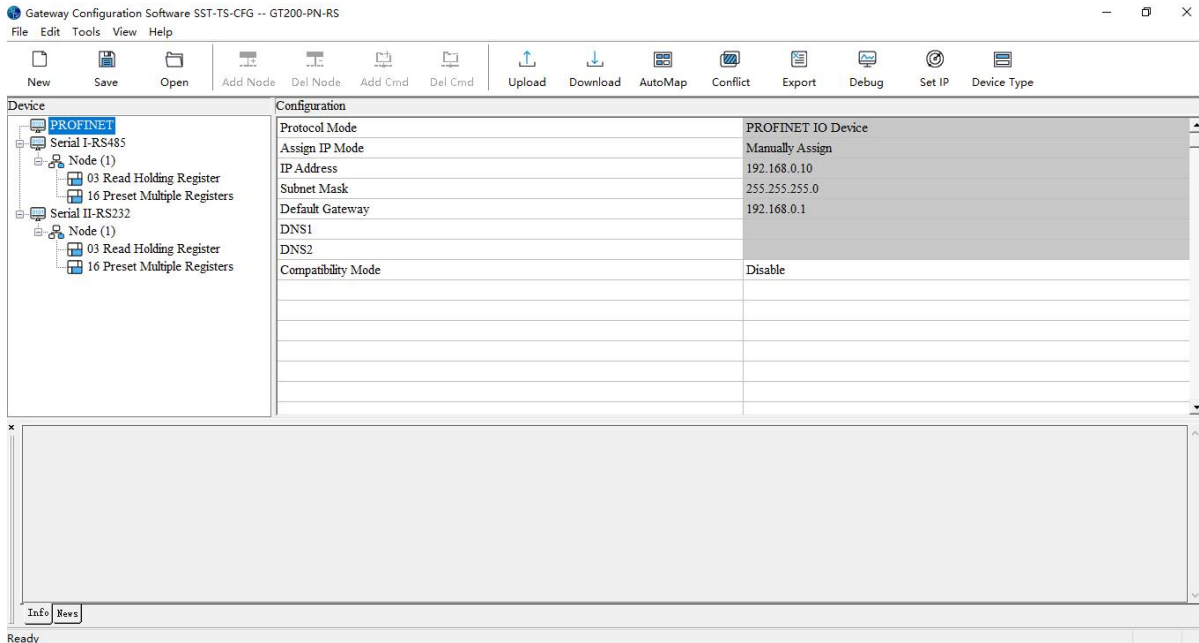
5.2.1 Ethernet Configuration View

The Ethernet configuration interface is shown as below:

GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual



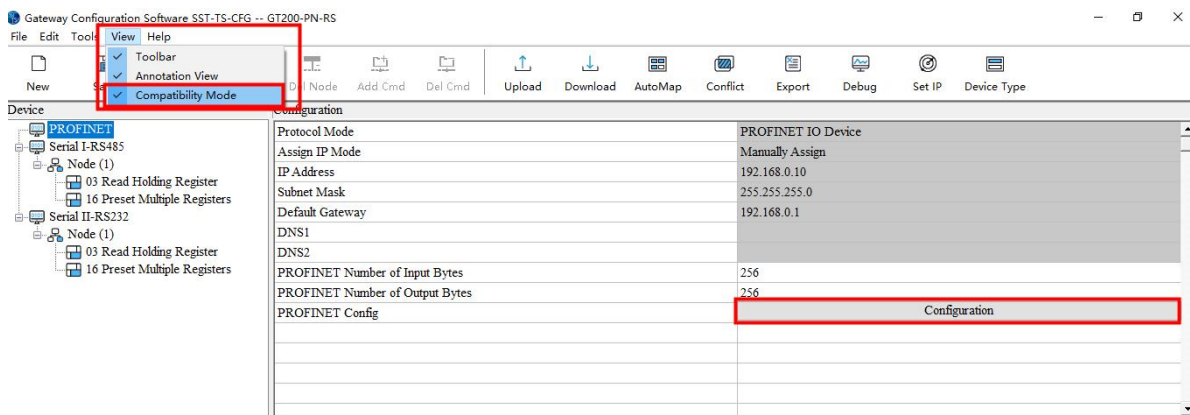
IP Address: IP address of GT200-PN-RS.

Subnet Mask: Subnet mask of GT200-PN-RS.

Default Gateway: Gateway address GT200-PN-RS is located in LAN.

Compatibility Mode: Default:Disable. If Enabled, the new version GT200-PN-RS can use GSDML files from V4.X.

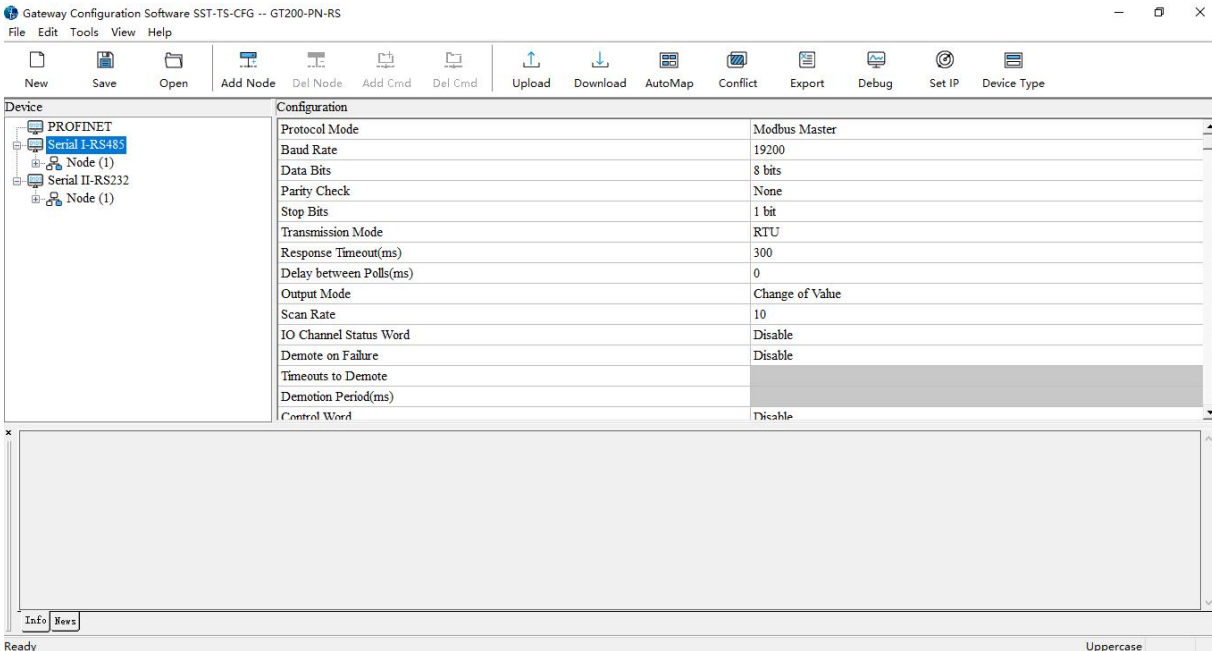
Notes: When Configuration SST-TS-CFG, there is no PROFINET input/output data block configuration on the Ethernet side. For versions lower than V5.X, you need to turn on compatibility mode, as shown below:



5.2.2 Subnet Configuration View-Modbus Master

1. Modbus Master configuration view

The “Modbus Master” configuration interface of “Protocols Select” is shown as below:



Baud Rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200bps optional.

Data Bits: 7, 8.

Parity Check: None, Odd, Even, Mark and Space optional.

Stop Bits: 1, 2.

Transmission Mode: RTU, ASCII.

Response Timeout(ms): After the Modbus Master sends request, it waits the Modbus slave's response time. range: 300 ~ 60000ms.

Delay between Polls(ms): Delay between a response has been received and sending next request, the range is 0~2500ms. **Output Mode:** Modbus write command (Output Mode) supports four output modes: Cycle, Forbidden, Change of Value and Output Once.

- Cycle: The write command will be sent periodically. When the Modbus command scan mode is set to slow scan, it will be sent cyclically according to the scan rate.
- Forbidden: The write command won't be sent.
- Change of Value: When the output data change, the write command will be sent.

➤ **Output Once:**

1. **Control Word Off + Output Once.** When the output data corresponding to the write command changes, it will only be output once, and will not be output afterwards (until the power restarts).
2. **Control Word is On + Output once,** write command control bit 1 to send the corresponding write command, set to 0 and then set to 1 to resend the corresponding write command (do not detect whether the output data corresponding to the write command has changed).

Scan Rate: Scan Rate is the ratio of fast scan cycle to slow scan cycle. If this parameter value is set to 10 then every fast scan command will be sent 10 times and those slow scan commands will be sent once.

IO Channel Status Word: In Modbus Master and User Config - Poll Mode, each command uses a bit to indicate the execution status of the command. If the execution is successful, the corresponding bit is set to 1, otherwise it is set to 0.

Demote on Failure: Supports Disable and Enable. Default value is Disable.

When Demote on Failure is Enable, after N times of command response failures (errors), if the command is a fast scan, it will be demoted to a slow scan. This parameter is valid for Modbus reading command and cycle writing command.

Timeouts to Demote: After N times successive incorrect Response the command will be demoted a slow scan command. The range of the parameter value is 1 to 255. Default value is 3.

Demotion Period(ms): The Demotion Period determines how long a demoted command remains in a demotion state. If the demotion time is up, the commands in the demotion state will automatically revert to the original non - demote state. Range: 100-3600000ms. Default value is 10000ms.

Control Word: Generate a control word at the front of the output data buffer, one command corresponds to one bit, and the command takes effect by setting the corresponding position; there are disable, all commands, and only write commands optional.

Output Mode + Control Word:

- **Change of Value + All Commands** = Each command corresponds to 1 bit, according to the control bit is set to 1 and 0 to control the sending of the corresponding command. The function of the status word is equivalent to a switch. Setting the address to 1 means that the corresponding command allows communication, and 0 means that communication is forbidden.
- **Change of Value + Only Write Command** = Same as above, read command communicates normally, only when the write command control bit is 1, the write command can output data change, the control bit is 0, the write command cannot be output.
- **Cycle+ All Commands** = Each command corresponds to 1 bit, according to setting the control bit to 1 or 0, to control the sending of the corresponding command. The function of the status word is equivalent to a switch. Setting the address to 1 means that the corresponding command allows communication, and 0 means

GT200-PN-RS

Universal Serial/PROFINET Gateway

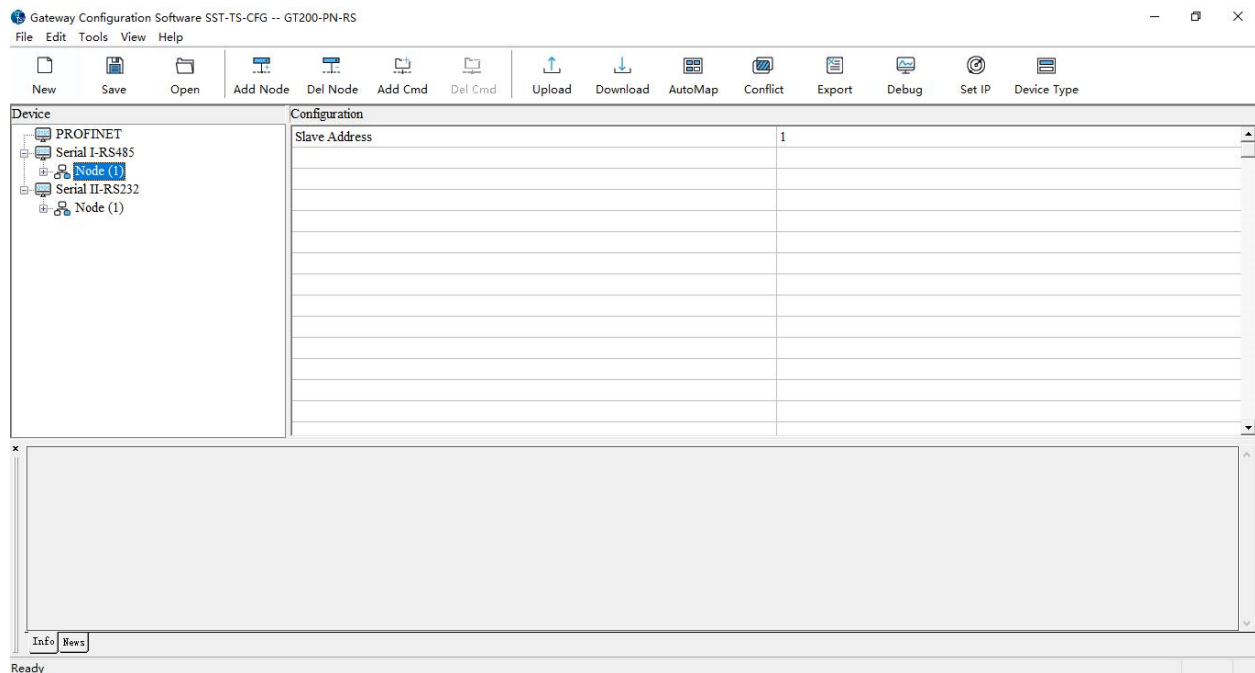
User Manual

communication is forbidden.

- Cycle + Only Write Command = Same as above, read command communicates normally, only for write command, when the corresponding control bit is 1, write command can be output continuously.
- Forbidden+ All Commands = The function of the status word is useless, the writing command is forbidden and the communication of the reading command is normal.
- Forbidden + Only Write Command = same as above.
- Output once + All Commands = When it is enable, the value of the control word must be set to 0 first, and then set to 1, now a read command or write command can be issued. After the communication is finished, it needs to be set to 0 first, and then set to 1 to execute the next command.
- Output once + Only Write Command = Same as above, read command communicates normally, only for write command.
- Output once + Disable = Write command starts from the gateway power on, as long as the output data is not 0, it will only output once, and then no longer output, unless the gateway is reset or restarted.

2. Serial Configuration

Under the “Modbus Master” mode, left click on a node and then the configuration interface is shown as below:

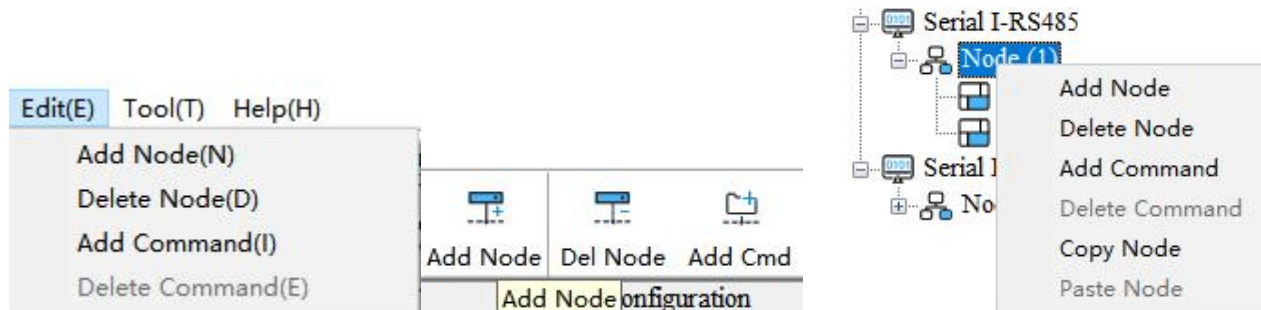


● Parameter Description:

- (1) When the Serial protocols Mode is selected as “Modbus Master”, the node is the Modbus slave station address, ranging from 0 ~ 247.
- (2) When serial port 1 (RS485 serial port) and serial port 2 (RS232 serial port) simultaneously connect the slave

equipment as the Modbus master, Serial port 1 supports connection of 3 Modbus slave devices, and serial port 2 can configure up to 1 node. When configuring serial port 1 as the Modbus master independently, it can configure up to 4 nodes.

- Instructions: For device view, the software supports three kinds of operation modes: edit menu, edit toolbar, and right-click edit menu.



- (1) Add Node: Left click on subnet or existing nodes, and then perform the operation of adding a new node. Then there is a new node named "The new node" under subnet.
- (2) Delete Node: Left click on the node to be deleted, and then perform the operation of deleting node. The node and all commands will be deleted.
- (3) Copy Node: Select an existing node and copy the node. The commands under the node will be copied at the same time.
- (4) Paste Node: Select the Subnet or an existing node and paste the node. The pasted node has the same parameters with the copied node.

3. Command Configuration

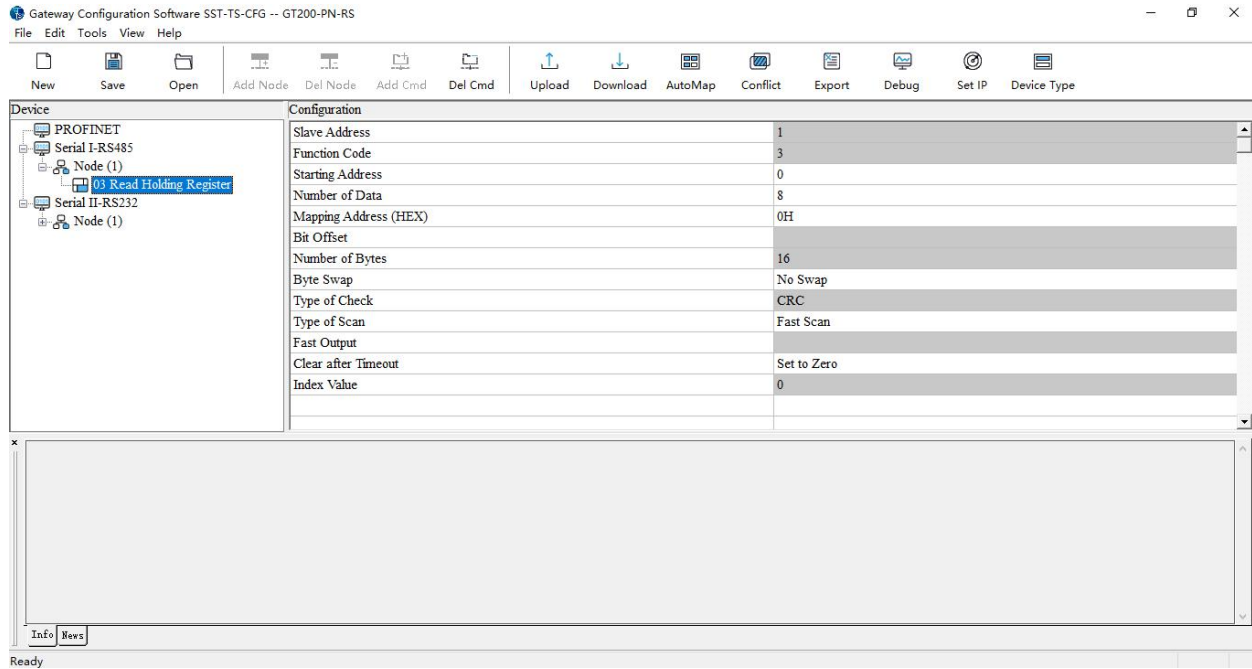
- Parameter Description: Commands No. supported: 01, 02, 03, 04, 05, 06, 15, 16.
- Instructions: The Command Configuration view supports three types of operation: Edit Menu, Edit Toolbar and Right click edit Menu.
 - (1) Add commands: Left click on the node, and then perform the operation of adding command to add a command for the node.
 - (2) Delete commands: Left-click on the command and perform the operation of deleting command.

Under the "Modbus Master" mode, left click on a command and then the configuration interface is shown as below:

GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual



Starting Address: The starting address of the register/switching value/coil in Modbus slave device, the range of the parameter value is 0 to 65535.

Number of Data: Number of the register/switching value/coil of Modbus slave devices.

Mapped Address (HEX): Starting address of data in the module.

The address range of data mapping in the module memory:

Read command (1, 2, 3, 4): 0x0000~0x0593

Write command (5, 6, 15, 16): 0x0000~0x0593.

Bit Offset (0~7): For the bit operation command, the position where the start bit is located in, range: 0~7.

Byte Swap: There are four types: No Swap, Two Bytes Swap, Four Bytes Swap and Four Bytes Big - endian and Little - endian Swap.

No Swap: No byte order exchange.

Two Bytes Swap: The high and low bytes of the 2 bytes are exchanged. For example : 0x1234, convert to 0x3412.

Four Bytes Swap: The first 2 bytes and the last 2 bytes of the 4 bytes are exchanged. For example: 0x12345678, convert to 0x56781234.

Four Bytes Big - endian and Little - endian Swap: The high and low bytes out of the 4 bytes are exchanged, and the second high and second low bytes are exchanged. For example: 0x12345678, convert to 0x78563412.

Type of Scan: There are two ways, fast and slow scan. Every Modbus command can be set to fast scan or slow scan. The gateway will send Modbus command according to the "Scan Rate". Scan Rate is ratio of fast scan to slow scan

GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual

(configured in the subnet configuration interface).

Fast Output: Supports Disable and Enable.

Disable: When there is a change in the buffer data corresponding to the write command, poll and output the write command according to the configured read and write commands.

Enable: When there is a change in the buffer data corresponding to the write command, the write command is immediately output.

Clear after Timeout: It's the processing mode when the gateway doesn't receive the response within response wait time (set in "Response Timeout" of the subnet)

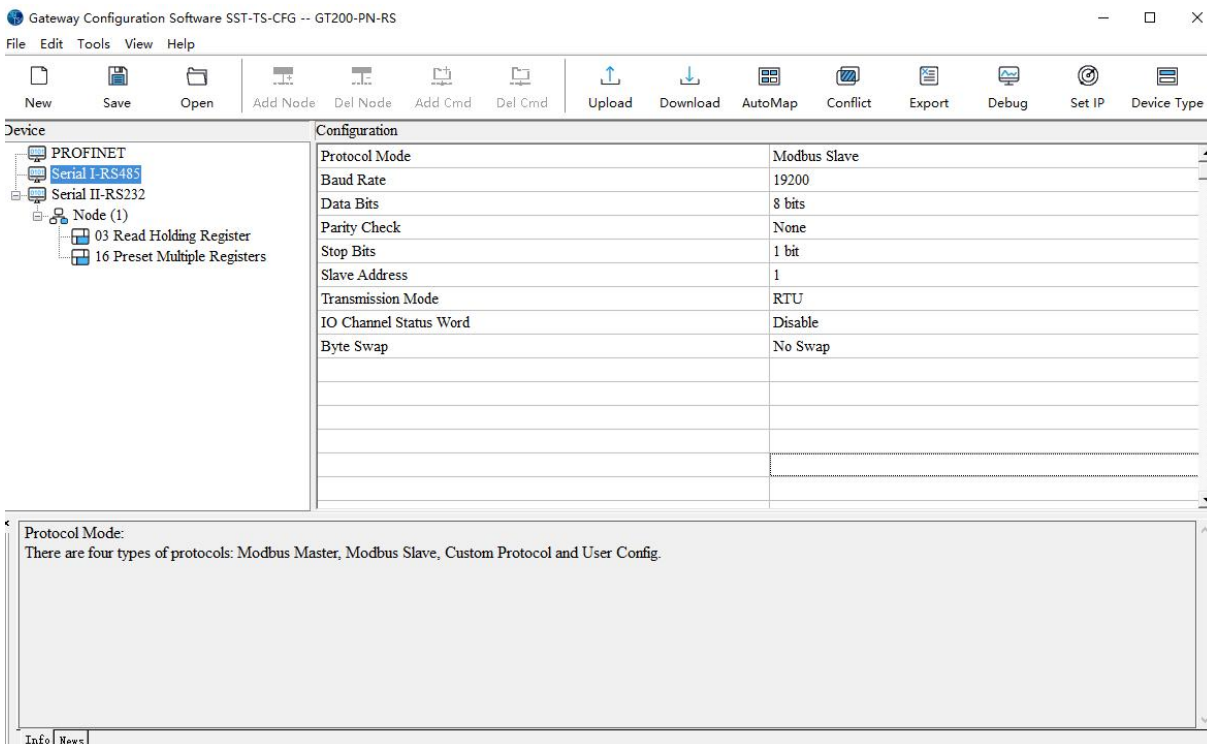
Set to Zero: Sets the response data in the input buffer to zero.

Keep: The data in the input buffer remains the same.

For specific communication instructions, please see Chapter 6.

5.2.3 Subnet Configuration View-Modbus Slave

The "Modbus Slave" configuration interface of "Protocols Select" is shown as below:



Baud Rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200bps optional.

Data Bits: 7, 8.



GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual

Parity Check: None, Odd, Even, Mark and Space optional.

Stop Bits: 1, 2.

Slave Address: 0~247.

Transmission Mode: RTU, ASCII.

IO Channel Status Word: In Modbus Slave and Custom Protocol, a 2 - bytes integer is used to indicate the number of times the correct frame has been received.

Byte Swap: There are four types: No Swap, Two Bytes Swap, Four Bytes Swap and Four Bytes Big - endian and Little - endian Swap.

No Swap: No byte order exchange.

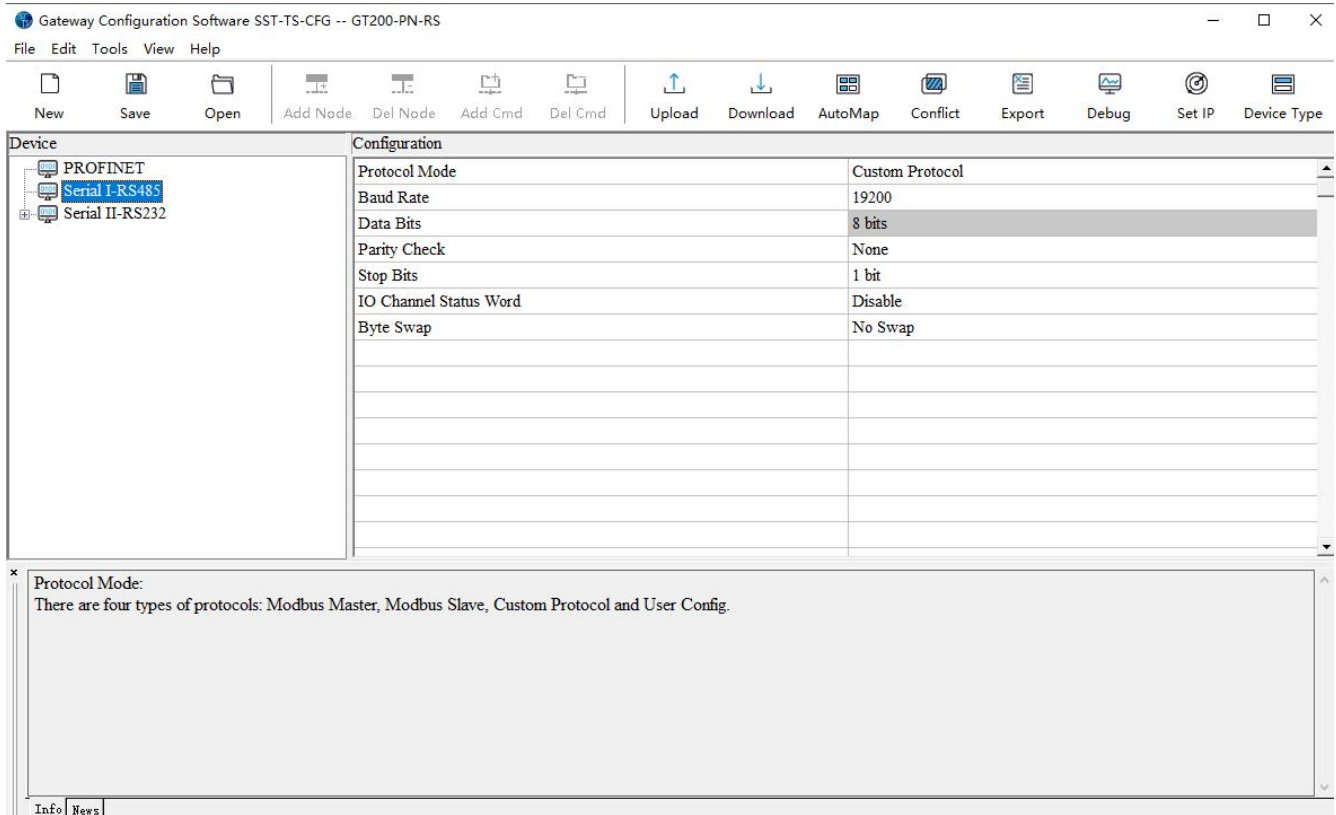
Two Bytes Swap: The high and low bytes of the 2 bytes are exchanged. For example : 0x1234, convert to 0x3412.

Four Bytes Swap: The first 2 bytes and the last 2 bytes of the 4 bytes are exchanged. For example: 0x12345678, convert to 0x56781234.

Four Bytes Big - endian and Little - endian Swap: The high and low bytes out of the 4 bytes are exchanged, and the second high and second low bytes are exchanged. For example: 0x12345678, convert to 0x78563412.

5.2.4 Subnet Configuration View-Custom Protocol

The “Custom Protocol” configuration interface of “Protocols Select” is shown as below:



Baud Rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200bps optional.

Data Bits: 7, 8.

Parity Check: None, Odd, Even, Mark and Space optional.

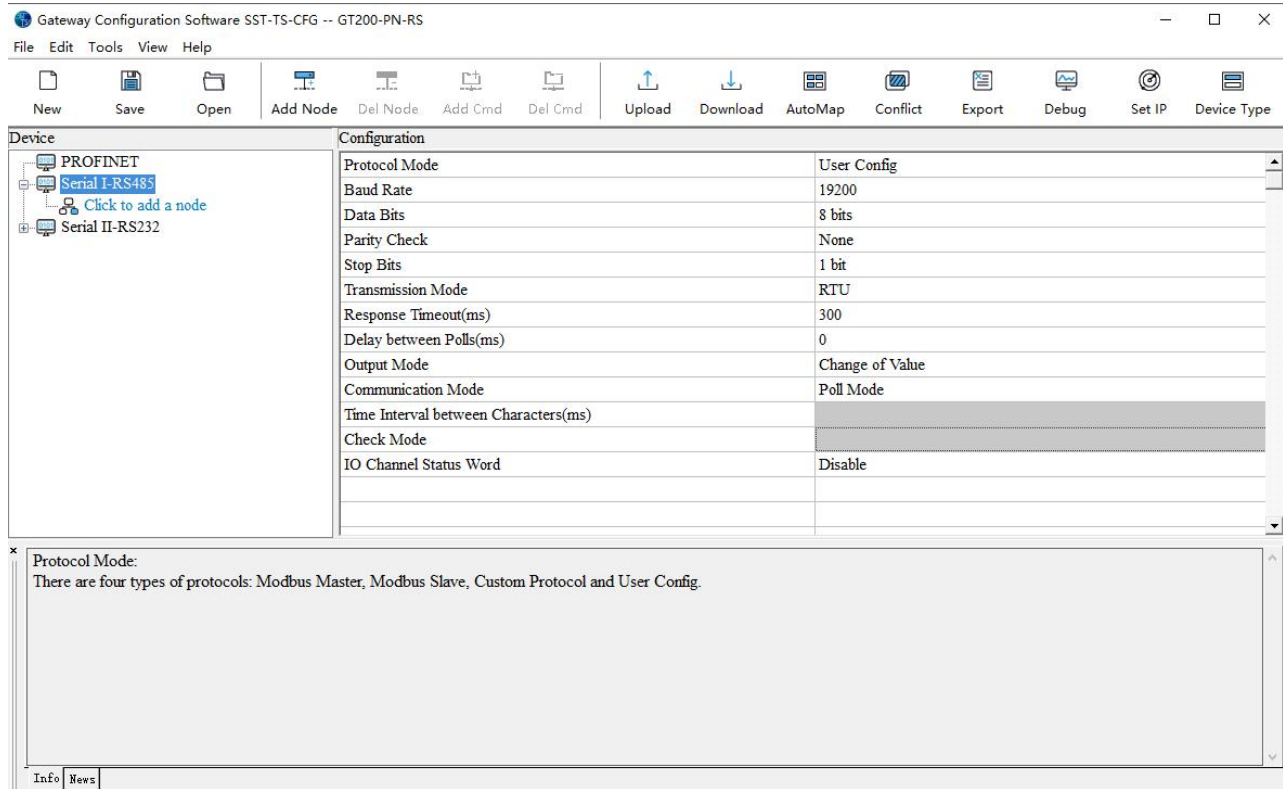
Stop Bits: 1, 2.

IO Channel Status Word: Enabled, In Modbus Slave and Custom Protocol, a 2 - bytes integer is used to indicate the number of times the correct frame has been received.

Byte Swap: No swap, double-byte swap, four-byte swap and Four-Byte Big-endian and Little-endian Swap.

5.2.5 Subnet Configuration View-User Config

The “User config” configuration interface of “Protocols Select” is shown as below:



Baud Rate: 300,600, 1200, 2400,4800, 9600, 19200, 38400, 57600 and 115200bps optional.

Data Bits: 7, 8.

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

Stop Bits: 1, 2.

Transmission Mode: RTU, ASCII, valid when communication mode is poll mode.

Response Timeout: After the Modbus Master sends request, it waits the Modbus slave's response time. range: 300~60000ms.

Delay between Polls: Delay between a response has been received and sending next request, the range is 0~ 2500ms. Valid when communication is poll mode.

Output Mode: (valid when communication is poll mode)

Write command (command with data in request). There are three types of output command: Cycle, Forbidden and Change of value.

Cycle: Same as Modbus read command (command without data in request) output way.

Forbidden: Disable output of Modbus write command.

Change of Value: When the output data change, the write command will be sent and stop to output when receiving the right response.

Communication Mode: Poll Mode and Receiving Only Mode. Poll Mode is similar to the Modbus communication. Receiving only Mode is that the gateway only receives data. For specific communication instructions, please see [Chaper 6.4 User Config](#).

Time Interval between Characters: Start to count after receiving last byte. If exceeding that time, this will be regarded one full frame is received and ready to receive next frame. Range: 1~300ms. Valid when communication mode is read mode.

Check Mode: None, CRC and Sum optional. Valid when communication mode is Read Mode.

IO Channel Status Word:In Modbus Master and User Config - Poll Mode, each command uses a bit to indicate the execution status of the command. If the execution is successful, the corresponding bit is set to 1, otherwise it is set to 0.

5.3 Tools

The “Tools” tab on the menu bar contains the following functions:

- Upload Config
- Download Config
- Conflict Detection
- Export EXCEL
- Assign Ethernet Parameters

5.3.1 Upload and Download

The gateway upload and download via a network cable.

After configuration, click “Upload” or “Download” on the tool bar, it will pop up the following interface:

GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual

Search Device ×

IP Address	MAC Address	Device Name	Default Gateway	Subnet Mask
192.168.0.88		dut88	192.168.0.88	255.255.255.0

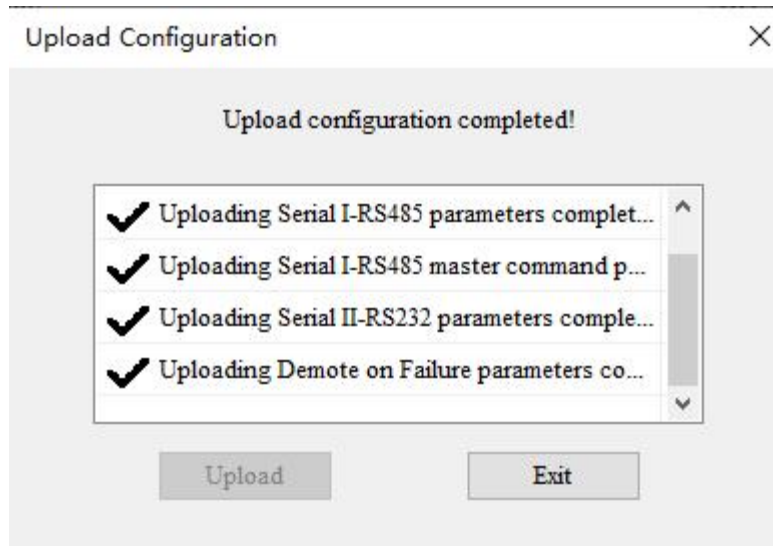
Search completed

If scanning no device, please click “Refresh”. In the above picture, GT200-PN-RS shows, first select the device and click “Log In”.

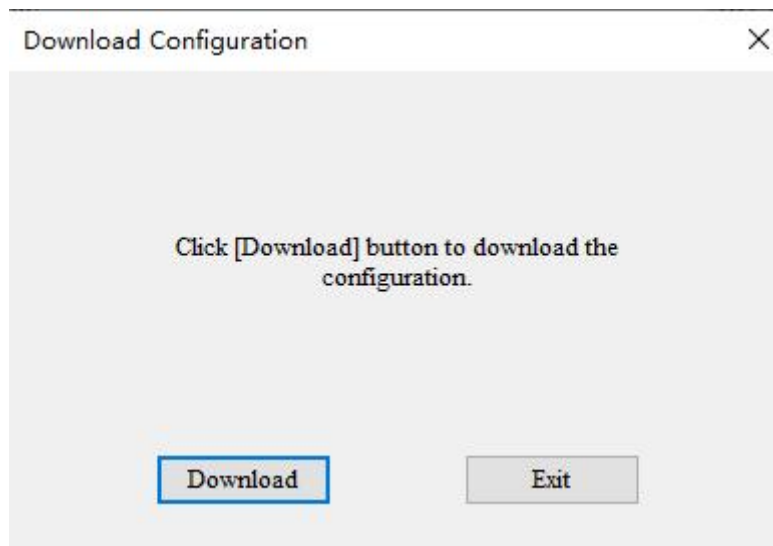
Select “Upload”, it will read configurations from the gateway, and the interface is shown as below:

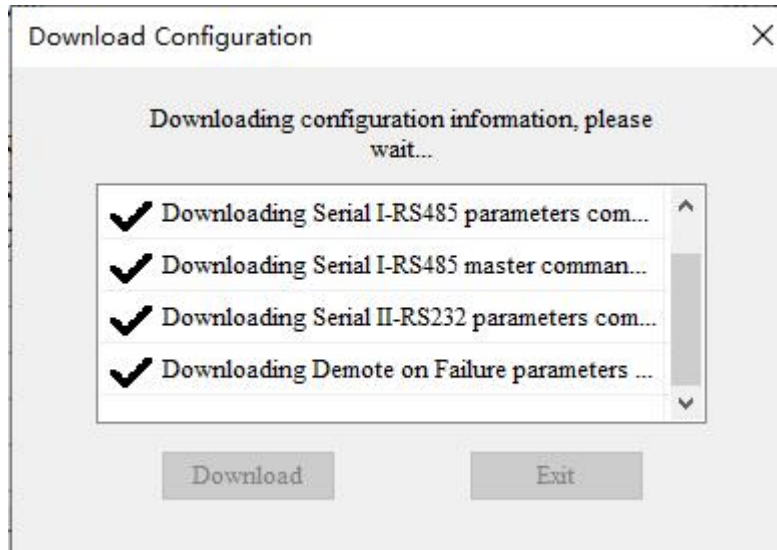
Upload Configuration ×

Click [Upload] button to upload the configuration.



Select "Download", it will download configurations to the gateway, and the interface is shown as below:





Remark: Please confirm the configurations are correct before downloading configurations.

If the gateway cannot be searched:

- Please check whether the computer and gateway are in the same network segment. When using the gateway for the first time, the gateway is in the 192.168.0.X network segment.
- Please test the network connection first. Please refer to the note “[How to Use the Ping Command](#)” located on our Support page on the sstautomation.com website.

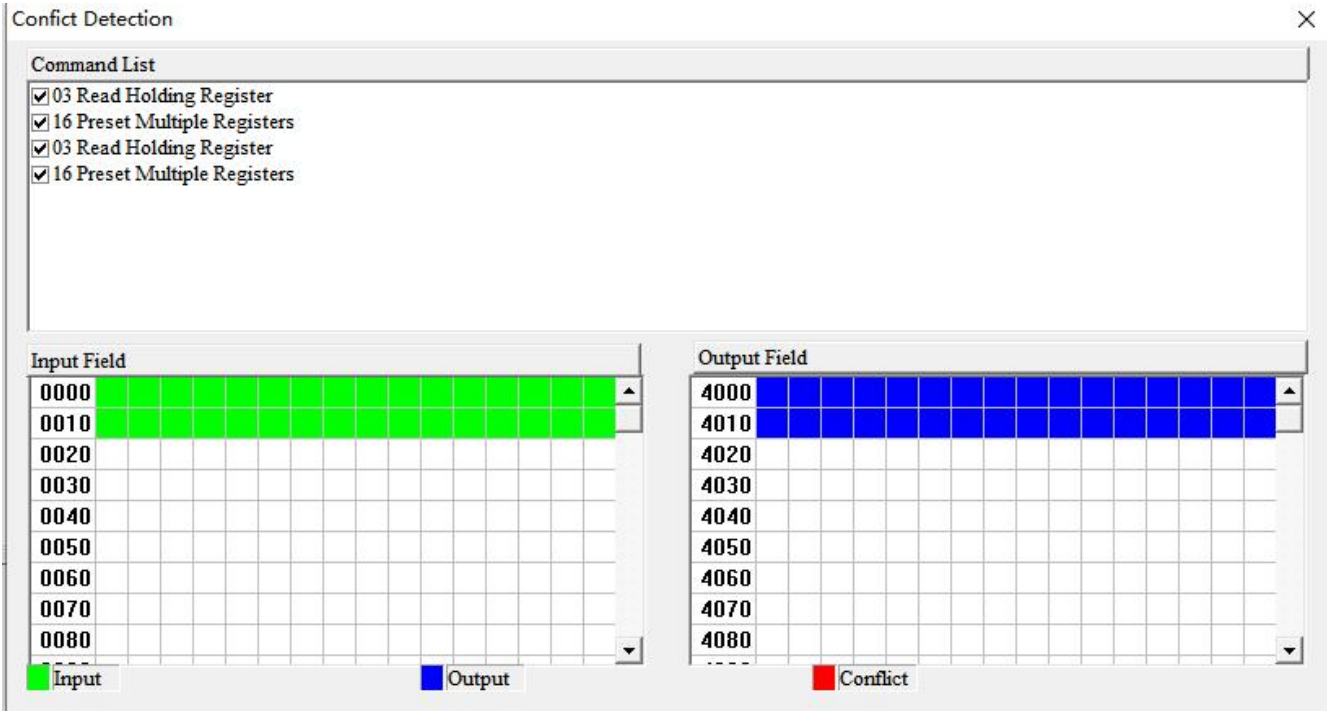
5.3.2 Conflict Detection

It is used to check whether there exists confliction in "memory mapping data". If users find confliction, it can be adjusted in time. The interface is shown below:

GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual



(1) Command List Operation

It shows configured command in the command list interface. Check box before each command is used to check the position of this command in memory mapping area. Click one command and check the box, it will show the position where relevant commands occupy in the memory mapping area. Click the command again and uncheck the box, the command will not be shown in the mapping area. This function will be used for confliction detect among commands in memory mapping area.



(2) Memory Mapping Area Operation

Memory mapping area divides into input area and output area.

Input mapping address range: 0x0000 ~ 0x0593.

Output mapping address range: 0x0000 ~ 0x0593.

Each grid represents one byte address.

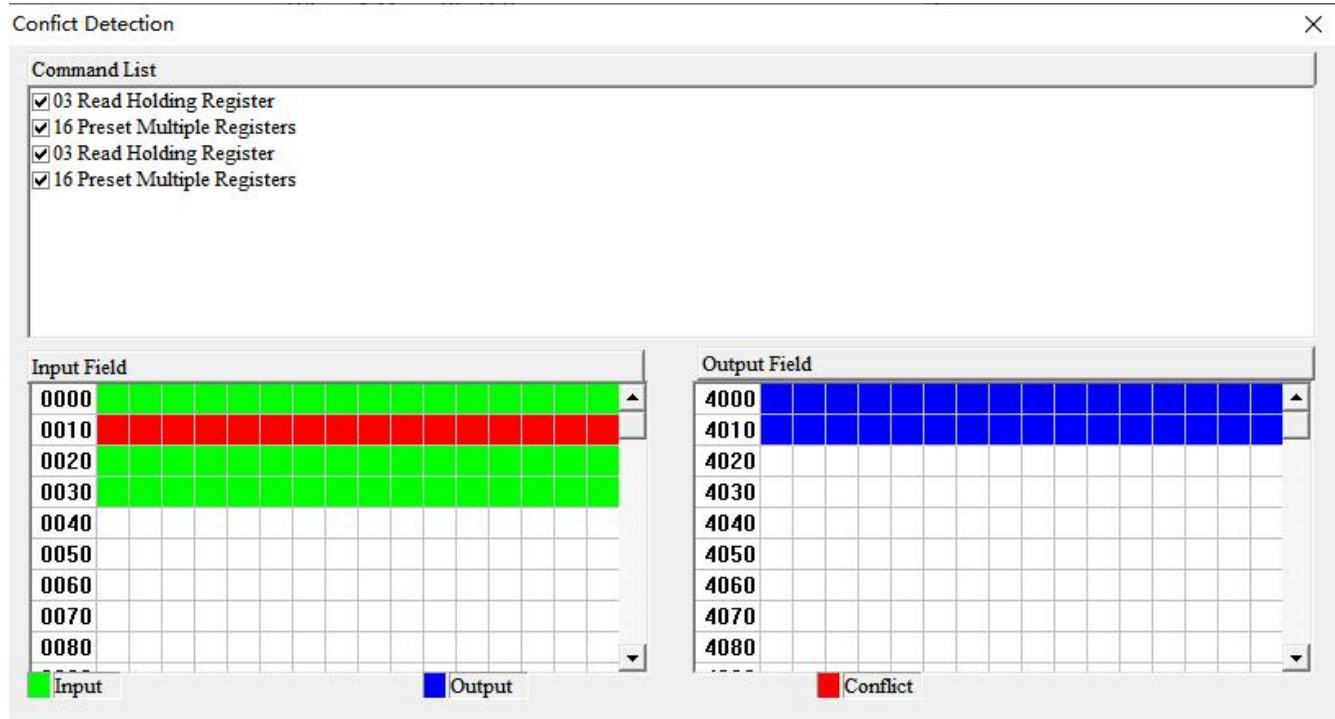
Green: Read command is shown in input mapping area, it will be in green without conflict.

Blue: When address mapping area is located in output area, it will be in blue without conflict.

Red: In input area or output area, different command occupied on the same byte, this byte area will be in red.

For bit operation command, the above grid displaying meaning works the same.

Click input/output area grids, each bit of relevant byte in the grid will show whether each bit is occupied. As is shown below:



5.3.3 Export EXCEL

Users can use the function to check the gateway configurations.



Click icon **Export** on the tool bar you can save the configuration with .xls as its extension.

5.3.4 Assign Ethernet Parameters

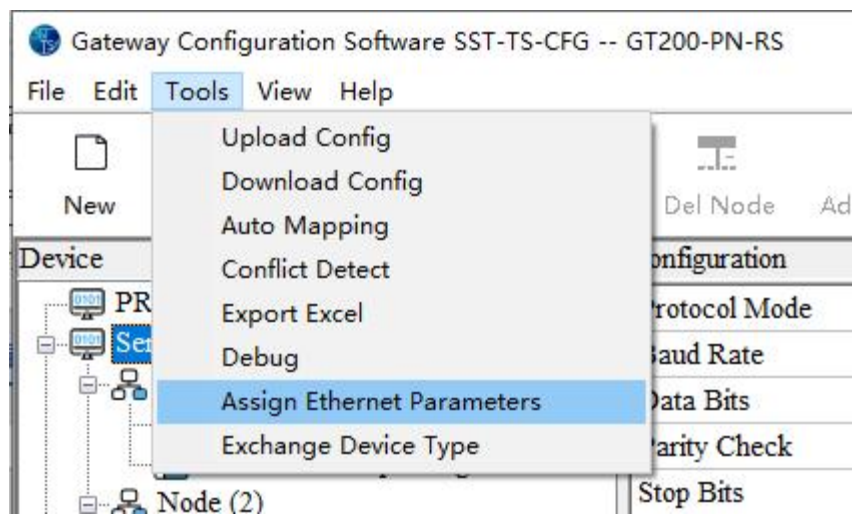
1. Scan Devices on LAN

- 1) Open SST-TS-CFG and click Tools on the menu bar, shown as below:

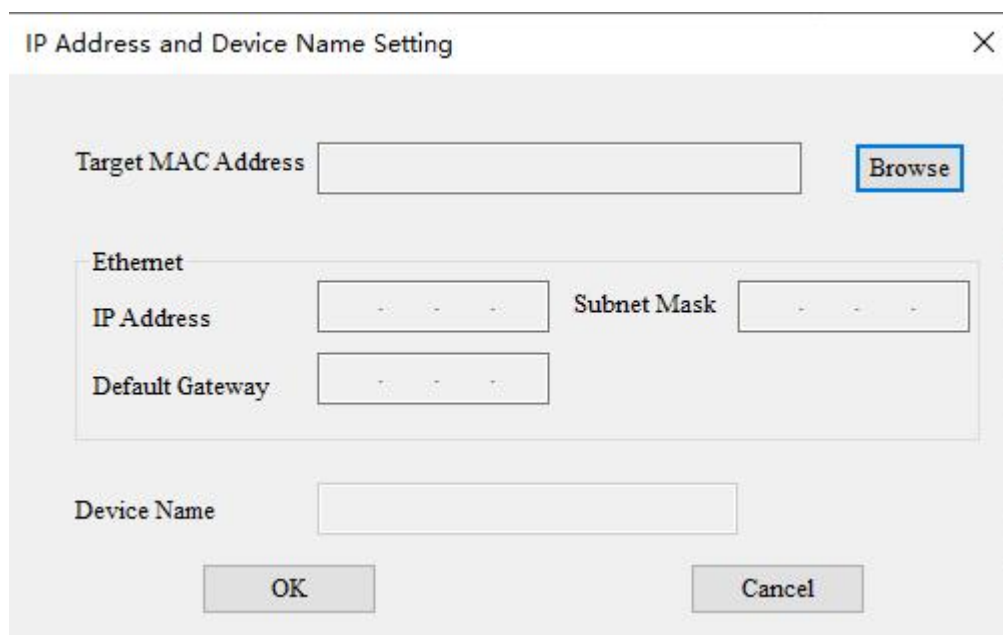
GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual



2) Click “Assign Ethernet Parameters” will pop up below interface:



3) Click “Browse”, the dialog box will be shown as below:

GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual

Search Device ×

IP Address	MAC Address	Device Name	Default Gateway	Subnet Mask
192.168.0.83		dut83	192.168.0.83	255.255.255.0

Search completed

Please select the gateway you want to modify and click “Login”. You will see the Ethernet information of the device, for example:

IP Address and Device Name Setting ×

Target MAC Address

Ethernet

IP Address Subnet Mask

Default Gateway

Device Name

“Target MAC Address” : Shows MAC address of GT200-PN-RS (unmodified).

Notes:

- ① Make sure that the GT200-PN-RS and your computer are in the same network segment. When using the

gateway for the first time, the gateway is in the 192.168.0.X network segment.

② If you can't discover any gateways, please test the network connection first. Please refer to the note "[How to Use the Ping Command](#)" located on our Support page on the sstautomation.com website.

2. Set IP Address and Device Name

1) Example of Ethernet parameter and Device Name setting:

Modify IP address to "192.168.0.188", gateway address to "192.168.0.1" and Subnet Mask to "255.255.255.0", Change Device Name to "gt200pnrs", shown as below:

IP Address and Device Name Setting

Target MAC Address

Ethernet

IP Address Subnet Mask

Default Gateway

Device Name

Click "OK" to complete the setting of Ethernet and Device Name.

Note:

- The IP address and Device Name settings of the gateway here must be consistent with those set in the PROFINET master configuration software.
- The device name of GT200-PN-RS, which supports only a combination of lowercase letters and numbers, and must begin with a lowercase letter.

The following are legal names: dut83, dut83nn32.

The following are illegal names: 83dut, dut83\$, dut83+uu.

2) Click again "Browse" will lead to scanning device again. See below:

Search Device
×

IP Address	MAC Address	Device Name	Default Gateway	Subnet Mask
192.168.0.83		dut83	192.168.0.83	255.255.255.0

Set
Refresh
View
Cancel

Search completed

You can see that IP address has been modified “192.168.0.83”, Device Name is “dut83”.

3. IP Address Conflict Resolution

According to the specification of PROFINET protocol, acting as a PROFINET slave, GT200-PN-RS must obey the rule that there can’t be more than 1 PROFINET device which has the same IP address and name on the same LAN when connecting many GT200-PN-RS devices.

If there are conflictions of IP address and device name, users can change IP address and name of GT200-PN-RS according to chapter “Set IP Address and Device Name” and ensure that others IP address and name are different (Notes: after changing is complete, some relevant change should be taken in PLC modeling and users must ensure the IP address and name of GT200-PN-RS is the same with that of PLC modeling).

For example:

When it happens to IP address confliction, IP address, subnet mask and gateway address of GT200-PN-RS will be reset to “0.0.0.0”. Now, users can't use “Upload” or “Download” to scan GT200-PN-RS and only use chapter “Scan Devices on LAN” to scan the device, the scanning result is shown as below:

GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual

Search Device

×

IP Address	MAC Address	Device Name	Default Gateway	Subnet Mask
0.0.0.0			0.0.0.0	0.0.0.0

Upload

Refresh

View

Cancel

Search completed

You can see the IP address is reset to “0.0.0.0”, choose the device and log in, the dialog box is shown as below:

IP Address and Device Name Setting

×

Target MAC Address

Browse

Ethernet

IP Address

0 . 0 . 0 . 0

Subnet Mask

0 . 0 . 0 . 0

Default Gateway

0 . 0 . 0 . 0

Device Name

dut83

OK

Cancel

Set “IP”, “Subnet” and “Gateway” to “192.168.0.28”, “255.255.255.0” and “192.168.0.1” and you will see the below picture:

GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual

IP Address and Device Name Setting

Target MAC Address Browse

Ethernet

IP Address Subnet Mask

Default Gateway

Device Name

OK Cancel

Click "OK".



6 Work Principle

6.1 Data Exchange

The data conversion between PROFINET network and serial of GT200-PN-RS is established by "mapping". GT200-PN-RS has two data buffers, one is input buffer (1428+12 bytes) with address range 0x0000-0x0593. the other is output buffer (1428+12 bytes) with address range 0x0000-0x0593. Where 12 bytes indicate the status of the input/output data block.

6.1.1 PROFINET Slave

Presuming the input data length users have configured is N1, output data length is N2. GT200-PN-RS will periodically send the data within the address range of [0x0000, N1] to PROFINET network. When receiving data from PROFINET network, GT200-PN-RS will write the data to the address range of [0x0000, 0x0000+N2].

6.1.2 Modbus Master

When one serial runs Modbus master protocol, for all write registers, write coils command GT200-PN-RS supports, GT200-PN-RS can get data from address range 0x0000-0x0593 and send them to the Modbus slave. For all read registers, read coils command, GT200-PN-RS can write the data returned from Modbus slave to address range 0x0000-0x0593.

Notes: Each Modbus master can configure 100 commands, and every command can get one continuous Modbus register.

6.1.3 Modbus Slave

When one serial runs Modbus slave protocol, for No. 02 04 commands master sent, GT200-PN-RS will get data from address range 0x0000-0x0593.. For No. 05 15 06, 16 command, it will write the Modbus master data to the address range of 0x0000-0x0593. Use commands 01 and 03 to read the written data.

6.1.4 Custom Protocol

When one serial runs self-defined protocol, users' serial device can read/write data to any address of two buffers of 0x0000-0x0593.

6.1.5 User Config-Poll Mode

When one serial runs universal mode-ask and answer, request part of command can get data from any address of buffer 0x0000-0x0593 and 0x0000-0x0593 and send data to the serial slave device. When serial slave devices didn't give any response (if they did), if there exists data in response, GT200-PN-RS will write them to the address range of



0x0000-0x0593. The specific data size will depend on users' configuration.

6.1.6 User Config-Receiving Only Mode

When one serial runs universal mode-receive, it will receive data sent from serial master device and don't give any response. In this way, GT200-PN-RS will write the data which it received to some address areas of 0x0000-0x0593.

6.2 Command execution instructions

6.2.1 IO Status Word

This content is applicable to the four modes of the gateway.

In order to easily obtain the state of the execution of each command under each master station, the IO state word is introduced.

➤ MODBUS master protocol and User Config-POLL protocol.

Both of these protocols are the master protocol and are also based on command. We use a bit to indicate whether the execution of each command is successful or not. When the command execution is successful, the corresponding bit is set to 1, otherwise it is set to 0. When a subnet is configured as a master protocol, the number of bytes occupied by the IO status word of the subnet is calculated using the following formula:

The number of bytes in IO status word = ((integer, Discard decimal part) (command bar number under subnet + 15) / 16) * 2.

For example:

MODBUS master station protocol is configured in subnet 1, with a total of 15 commands, according to the calculation formula above:

$(15 + 15) / 16 = 1, 1 * 2 = 2$ (bytes)

So the IO status of these 15 commands takes up 2 bytes. The specific IO status indication information is as follows:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Command 7 indicate bit	Command 6 indicate bit	Command 5 indicate bit	Command 4 indicate bit	Command 3 indicate bit	Command 2 indicate bit	Command 1 indicate bit	Command 0 indicate bit
Byte 1		Command 14 indicate bit	Command 13 indicate bit	Command 12 indicate bit	Command 11 indicate bit	Command 10 indicate bit	Command 9 indicate bit	Command 8 indicate bit

➤ MODBUS slave protocol and Self-defined protocol.

The two protocols are slave protocols. Their IO status word is used to indicate the running state of the protocol by a 16-bit integer change. Every time a correct request frame is received from the slave. The value is automatically added 1.

The 16-bit integer is represented in a Little-endian, where the low address represents the low byte of the 16-bit integer and the high address represents the high byte of the 16-bit integer.

6.2.2 Byte-swap

This content is only applicable to the three modes of the gateway: Modbus Master/Modbus Slave/Custom Protocol.

1. Byte swap introduction

There are four types: No swap, double-byte swap, four-byte register swap and Four-Byte Big-endian and Little-endian Swap.

➤ double-byte swap

When using double-byte swap, the number of bytes exchanged must be 2 times integer.

Double-byte swap is 2 bytes for unit exchange, and the exchange mode is shown in the following table:

Before exchange		After exchange	
Byte index	Byte value	Byte index	Byte value
0	0x12	0	0x34
1	0x34	1	0x12

➤ four-byte register swap

When using four-byte register swap, the number of bytes exchanged must be 4 times integer.

Four-byte register swap is 2 registers for unit exchange, and the exchange mode is shown in the following table:

Before exchange		After exchange	
Byte index	Byte value	Byte index	Byte value
0	0x12	0	0x56
1	0x34	1	0x78
2	0x56	2	0x12
3	0x78	3	0x34

➤ Four-Byte Big-endian and Little-endian Swap

When using Four-Byte Big-endian and Little-endian Swap, the number of bytes exchanged must be 4 times

integer.

Four-Byte Big-endian and Little-endian Swap is 4 bytes for unit exchange, and the exchange mode is shown in the following table:

Before exchange		After exchange	
Byte index	Byte value	Byte index	Byte value
0	0x12	0	0x78
1	0x34	1	0x56
2	0x56	2	0x34
3	0x78	3	0x12

2. Bytes Exchange Way in Various Protocols

The schematic diagram is as follows:



As you can see from the figure, the byte-exchange program is only a process between the buffer and the request or response frame of the command, without changing the length of the total data, only changes the organization way of the data.

Command execution mode:

- (1) Read a certain length of data from the buffer (input or output) and put it in the frame buffer of the command. Then, send the command.
- (2) When the command has a response, the data is separated from the response frame of the command and copied to the buffer.

After adding byte swap processing:

- (1) Read a certain length of data from the buffer (input or output), byte swap processing, then put it in the frame buffer of the command, and finally send the command.
- (2) When the command has a response, the data is separated from the response frame of the command ,byte swap processing, then copied to the buffer.

Note: When the byte swapping process is performed, the data to be processed is divided according to a specific length. For example, when 2 bytes are exchanged, data is processed in units of 2 bytes. When 4 bytes are exchanged, data is processed in units of 4 bytes.



6.2.3 Command Output Mode

The content of this section is only applicable to MODBUS Master protocol and User Config-POLL Mode.

Write command: The request frame contains commands for memory mapping area data of GT200-PN-RS. For example, the 5, 6, 15 and 16 function codes of MODBUS master protocol are written commands. The command with “data” field in the request frame of User Config-POLL is written command.

Read command: The command that is not written is read.

Command execution process:

1. The number of timeout retransmission is set to 0.
2. Request frame for sending commands. After sending, the response timeout timer begins.
3. Wait for the command response frame.
4. If a response frame is received within the response timeout period, a response is considered. Whether the response is correct depends on the specific response frame format. If the response frame is correct, the execution of the command ends, If a response frame is not received within the response timeout period, the response timeout is considered. Response error and response timeout, enter 5.
5. Determine whether the number of retransmission is 3. If 3, the execution of the command ends. Otherwise, the timeout retransmission times add 1, enter 2.

➤ **Cycle output mode**

In the Master protocol, each command has a unique command index in each subnet.

The Master protocol works in Cycle output mode and is executed as follows:

1. Execute the command N.
2. Wait for “command delay time”, N plus 1. If N is greater than the number of command, N is 0. Execute order N.

➤ **Change of Value output mode**

The Master protocol works in Change of Value output mode and is executed as follows:

1. If command N is read, execute command N. Otherwise, check whether the memory mapping data contained in the request frame of command N is changed. If there is a change, execute the command N.
2. Wait for “command delay time”, N plus 1. If N is greater than the number of command, N is 0. Execute order N.

➤ **Quick output mode**

Note: Quick output is valid only if “Output Command Polling Mode” in the subnet is “Change of Value” and only for write commands.

When the system is initialized, if a Quick output command is found under the subnet, all commands under the subnet will be divided into two queues. Queue 1 is a Quick output command queue, and queue 2 is an normal command



queue.

➤ Output Once

When the Modbus master works in output primary mode (output command polling mode), it is executed in the following ways.

1. If command N is a read command, execute command N. Otherwise, check whether the memory mapping data included in the request frame of command N has changed, and if there is a change (the initial data of the memory mapping is 0, if the initial data of the PROFINET side is not 0 after the gateway is powered on, it is also considered that the data has changed), execute command N once, and then do not execute command N until the gateway is restarted.
2. If the command N is a write command, wait for the "command delay time", and add one to N. If N is greater than the number of commands, then N is 0. Execute command N.

The Master protocol works in Quick output mode and is executed as follows:

1. Check the commands in the "Quick Output Command" queue one by one, and execute the command if the data of a command changes. Until the data of all commands in the queue did not change.
2. Execute a command in the normal queue. An execution index in a normal queue plus one. If the number of commands in a normal queue is exceeded, the index value is 0. Enter 1.

As you can see from the above execution, Quick output is preferred to write commands, which is of great benefit to the transmission of control information as soon as possible at some low baud rates (≤ 19200), but this advantage is small for high baud rates.

6.2.4 Response Timeout Handling for Master Protocol

The content of this section is only applicable to MODBUS Master protocol and User Config-POLL Mode.

The specific application scene is like this: After the master sends the request frame, it will wait for the response of the slave device within the limited time. If the slave does not respond within a limited time, the master protocol will trigger the response timeout processing. How to deal with this?

If the command is successfully executed the previous time, it will be reissued three times (a total of four times), In the process of retransmission, if any response is given from the slave, it will stop repeating and transferred to the next command. If the slave still has no response after three retransmission, the processing method given in the response timeout handling option is executed. Namely: Clear or Hold. It should be noted that the clear or hold here is for the data part of the slave response frame. Because GT200-PN-RS transformation between protocols is achieved by mapping, so the data part of each command's response frame will have a mapping area in the input buffer of GT200-PN-RS. Our "clear or hold" is for this mapped data area. Specifically, if "clear" is selected, all data in the map area will be set to 0 after the response timeout. if "hold", the content of the map data area will not be changed after the response timeout.

If the command is unsuccessfully executed the previous time, re-transmission is not executed.

6.3 Custom Protocol

6.3.1 Definition

User device acts as initiator, send output data in the request frame.

GT200-PN-RS acts as responder which sends input data in the response frame.

Communication way is point to point.

Time interval between bytes in request frame should be less than 50ms, or GT200-PN-RS will dispose this frame data.

For every valid request frame, GT200-PN-RS should make response in 200ms.

Supports communication baud rate range 300~115200 bps, 8 data bits, parity (None, Odd, Even, Mark, Space) and 1 or 2 stop bits.

6.3.2 Communication Message Format

1) Request Frame Message

[Output data length] [High byte of output data start address] [Low byte of output data start address] [Input data length]
[High byte of input data start address] [Low byte of input data start address] [Output data 1]..... [Output data n]
[Parity]

Notes: Output means the data that users device writes to GT200-PN-RS, input means the data that users device gets from GT200-PN-RS.

Data number n equals output data length.

Output data address range: 0x0000-0x0593.

Input data address range: 0x4000-0x4593.

2) Response Frame Message

Correct response:

[Input data length] [High byte of input data start address] [Low byte of input data start address] [Input data 1].....
[Input data n] [Parity]

Data number n equals input data length.

Wrong response:

[0x00] [0xFF] [0xFF] [error code] [parity]

6.3.3 Parity

Accumulated sum of 8 bits of all data, ignore the flow bit. That is:

[Message parity code] = [output data length] + [high byte of output data start address] + [low byte of output data start address] + [input data length] + [high byte of input data start address] + [low byte of input data start address] + [output data 1] + + [output data n].

[Response parity code] = [input data length] + [high byte of input data start address] + [low byte of input data start address] + [output data 1] + + [output data n].

6.3.4 Error Code

Error Code	Meaning
0x01	Output data length error.
0x02	Accumulated sum parity error.
0x03	Output data start address error or illegal output data area.
0x04	Input data start address error or illegal input data area.

6.3.5 Message Examples

If input data number is 50 bytes, output data is 32 bytes.

Now, users want to output all zero data and get all input data, examples are as below:

[The following data format is all HEX]

Request frame message:

[20] [00 00] [32] [40 00] [00.....00] [92]

| output data length | output start address | input data length | input start address | 32 output data | parity (accumulated sum) |

Response frame message:

[32] [40 00] [00.....00] [72]

| input data length | input start address | 50 output data | parity (accumulated sum) |

Here the output and input address is memory mapping address of GT200-PN-RS.

6.4 User Config

6.4.1 Definition

Common mode protocol message of GT200-PN-RS can be set freely by users, which solves the communication problem between Modbus standard protocol and Modbus nonstandard protocol devices. There are two operation modes under common mode: POLL and READ. Working principle of POLL is similar with Modbus communication protocol, which uses request and response communication way and every subnet can set 30 commands under common mode. READ only receives stored data and doesn't respond after receiving data, such as bar code scanner and device communication etc.



6.4.2 User Config-POLL Mode

Users need to configure request message and response message of User Config-POLL before using it.

Frame header: HEX input. Maximum byte count: 15 bytes for request, 8 bytes for response.

Data: HEX input, every option occupies two bytes.

Constant: HEX input. Maximum byte count: 15 bytes for request, 8 bytes for response.

Parity: None check, CRC check, LRC check, Sum check.

End of Frame: HEX input. Maximum number of bytes: 3.

Send order in RTU format: Header, data, constant, parity and end.

Receive order in RTU format: Header, data, constant, parity and end.

Send order in ASCII format: Header, constant, data, parity and end.

Receive order in ASCII format: Header, constant, data, parity and end.

For example, configuring Modbus commands, RTU transmission format:

Request:

Slave address: 01

Function code: 03

Register address H: 00

Register address L: 00

Number of data H: 00

Number of data L: 02

CRC check H: C4

CRC check L: 0B

Message: 01 03 00 00 00 02 C4 0B

Response:

Slave address: 01

Function code: 03

Number of data: 04

Data: 00

Data: 00

Data: 00

GT200-PN-RS

Universal Serial/PROFINET Gateway

User Manual

Data: 00

CRC check H: FA

CRC check L: 33

Message: 01 03 04 00 00 00 00 FA 33

Command configuration example is as below:

The screenshot shows a configuration window titled "Node (1)-Command(1)". It contains two main sections: "Request" and "Response". Each section has checkboxes for "Frame Header", "Data", "Constant", "Parity", and "Frame Tail". In the "Request" section, "Data" is checked. The "Data" configuration shows "Starting Address" as 0000 H, "Number of Bytes" selected as 0010 H (with "Number of Bits" at 0016 H), and "Parity" set to "CRC Check". The "Frame Tail" is 0D 0A. The "Response" section has identical settings. At the bottom are "OK" and "Cancel" buttons.

Notes: Under RTU transmission format, supports following parity: None, CRC check and sum check.

For example, configuring Modbus command, ASCII transmission format:

: (3A)

Slave

Function

Number of data

Data 1

.....

Data n

LRC high byte

LRC low byte

CR (0D)

LF (0A)

Command configuration example is as below:

The screenshot shows a configuration window titled "Node-1 Command-1". It is divided into two main sections: "Request" and "Response".

Request Section:

- ☒ **Frame Header:** 3a
- ☐ **Data:**
 - Starting Address: 0000
 - Number of Bytes: 0010
 - Number of Bits: 0016
 - Offset: 0
- ☒ **Constant:** 01 03 00 00 00 02
- ☒ **Parity:** CRC Check
- ☒ **Frame Tail:** 0d 0a

Response Section:

- ☒ **Frame Header:** 3a
- ☒ **Data:**
 - Starting Address: 0000
 - Number of Bytes: 0004
 - Number of Bits: 0016
 - Offset: 0
- ☒ **Constant:** 01 03 04
- ☒ **Parity:** CRC Check
- ☒ **Frame Tail:** 0d 0a

Tips:
Data region for reserving hexadecimal data, There is a space between each byte that the length is limited not more than 8 bytes

Buttons: OK, Cancel

Note: Under ASCII transmission format, supports parity: None, LRC check and sum check.

Note: User Config-POLL in different "communication mode", the frame format is different!!!.

RTU frame: Header+ data+constant+parity +end

ASCII frame: Header+constant(ASCII)+data(ASCII)+parity(ASCII) +end

6.4.3 User Config-Receiving only Mode

User Config-Receiving only mode only receives data and doesn't respond. It can be used in receiving data of bar code scanner devices. Each subnet of User Config-Receiving only has 16 group data receiving buffer and receiving data buffer of each group is 254 bytes.

Configuring interface is as below:

GT200-PN-RS Universal Serial/PROFINET Gateway

User Manual

Configuration	
Protocols Select	User Config
Baud Rate	19200
Data Bits	8
Parity Check	None
Stop Bits	1
Slave Address	
Transmission Mode	
Response Timeout	
Delay between Polls	
Output Mode	
Output Pulse	
Scan Rate	
Communication Mode	Receiving Only Mode
Time Interval Between Characters	3
Check Mode	None
Memory Mapped Starting Address (Hex)	
Mapping Data Length	

Configurable domain introduction:

“Time interval between characters”: In Receiving only Mode, it is maximum time interval between characters and used to decide whether a frame is terminated or not. If the receiving time interval for two consecutive characters is greater than this value, GT200-PN-RS will think it receives two frames.

“Check Mode”: There are three checking method: no parity check, CRC check, and sum check. Note that when the GT200-PN-RS transmits data to the PN side, the field will automatically lose the check value according to the check mode. For example, one byte of the end of the frame is discarded when the sum check is performed, and two bytes of the end of the frame are discarded when the CRC check is performed.

“Memory Mapped Starting Address”: The address offset in the input buffer, range 0-0x0593.

“Mapping Data Length”: The number of bytes mapped to the input buffer, range: 2-254.

User Config-Receiving only mode ,the format for transferring data to PN is:

0	1	2..N
Transaction No.	Data length(N-2)	N-2 Valid data

Whenever GT200-PN-RS receives a correct User Config-Receiving only frame, the transaction number will automatically add one.

The connection diagram is as follows:

