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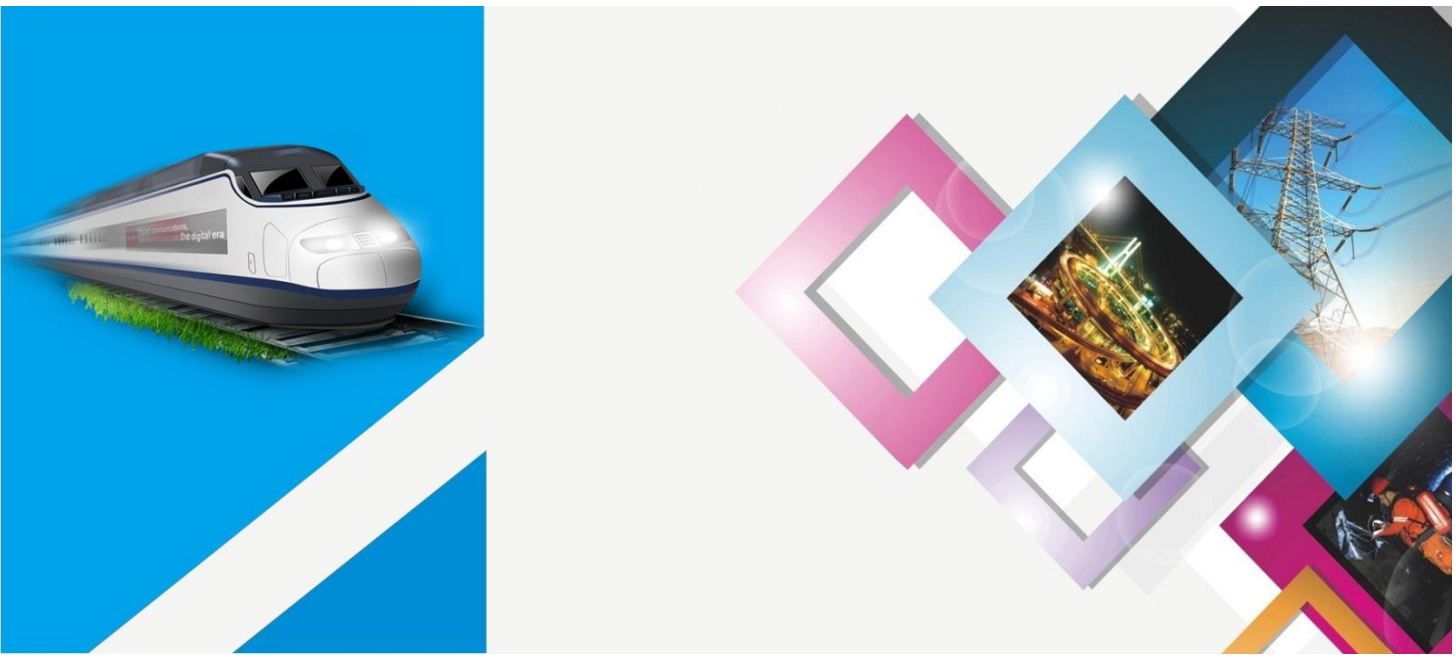

(I)GW11XX Series

Modbus Gateway

User Manual

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3onedata Co., Ltd.

Address:	3/B, Zone 1, Baiwangxin High Technology Industrial park, Nanshan District, Shenzhen, 518108 China
Tel:	+86-755-26702668
E-mail:	sales@3onedata.com
Fax:	+86-755-26703485
Website:	http://www.3onedata.com

Preface

The user manual describes the Modbus Gateway:

- Product features
- Product network management configuration
- Overview of network management principles

Note

The screenshot reference model for this manual is GW1118-8D (3IN1) Modbus. Other types of products in addition to supporting the serial type (RS-232, RS-422, RS-485), and the number of network ports and the number of serial ports are different, the interface functions and interface operations are the same.

Audience

This manual applies to the following engineers:

- Network administrators
- Technical support engineers
- Hardware engineers

Conventions

Format	Description
“ ”	Words with the symbol “” mean that those are interface words. Fox example “Port number”.
>	Multiple paths are separated by the symbol ‘>’.
Light blue Font	Click light blue font to hyperlink The font color is as follows: ‘Light Blue’.
About This Chapter	The section ‘about this chapter’ provides links to various sections of this chapter, as well as links to the Principles Operations Section of this chapter.

Symbols

Format	Description

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Format	Description
Notice	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
Warning	Ndicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
Note	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.
Key	The tips of configuration and operation.

Revision History

Version No.	Date	Revision note
01	August 14, 2017	Layout Adjustment
02	August 16, 2017	Manual Maintenance
03	October 24,2017	Add dual network ports function
04	December 26,2017	Add IP mapping function

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Part One: Operation

1 Login the WEB Interface

About This Chapter

Content	Hyperlink
This chapter	1.1 System Requirements 1.2 Set the IP address of the Computer 1.3 Login the WEB Configuration Interface 1.4 WEB Timeout Processing

1.1 System Requirements

Using the Modbus Gataway device, the system should meet the following conditions.

Hardware and software	System requirements
CPU	Pentium 586
Memory	128M above
Resolution	1024x768 or above
Color	256 color or above
Browser	Internet Explorer 6.0 or above
Operating system	• Windows XP • Windows 7

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1.2 Set the IP address of the Computer

The default management of the Modbus Gataway device is as follows:

IP Settings	Default Values
IP address	192.168.1.254
Subnet mask	255.255.255.0

When configuring a Gataway through the Web:

- Before making remote configuration, make sure that the route between the computer and the Gataway is reachable.
- Before making a local configuration, make sure that the IP address of the computer and the Gataway are on the same subnet.

  Note:
  When the switch is first configured, if it is configured locally, make sure the current computer network segment is 1.

IP configuration example

For example, suppose that the IP address of the computer is 192.168.5.60, need to change the IP address of the network segment "5" to "1"

Operation steps

The steps are as follows:

Step 1 Open “Control panel > Network connection > Local area connection > Properties > Internet protocol version (TCP/IPv4) Properties”.

Step 2 Change the "5" selected by the red frame in the figure to "1".

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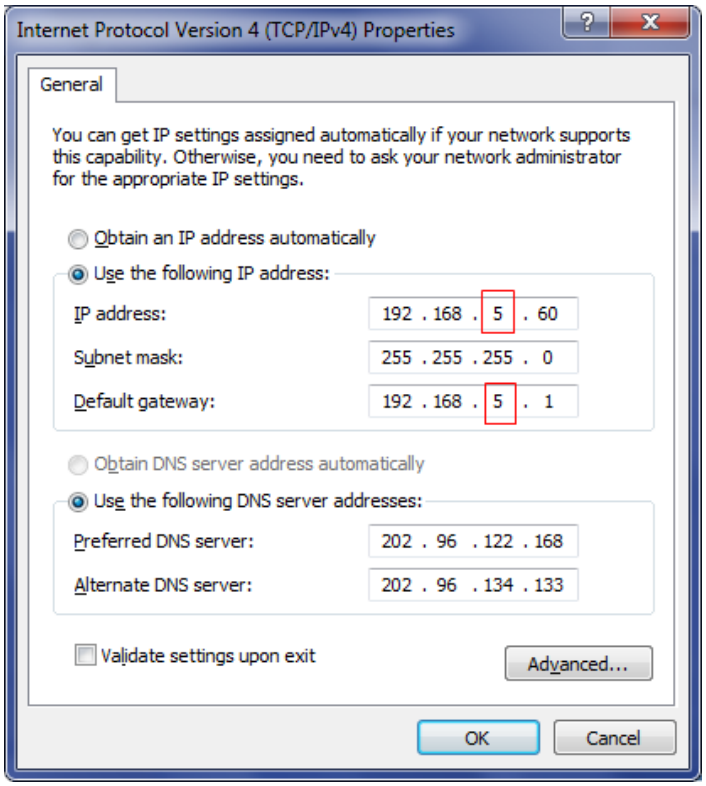

Step 3 Click "OK".

Step 4 End.

1.3 Login the WEB Configuration Interface

Operation steps

Log in to the WEB configuration interface as follows:

Step 1 Run the computer browser.

Step 2 Enter the address of the switch "http://192.168.1.254" in the address bar of the browser.

Step 3 Click the Enter key.

Step 4 Pop-up dialog box as shown below, enter the user name and password in the login window.

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Note:

- The default username and password for the Modbus gateway are "admin", which is strictly case-sensitive when typing.
- The default user password is with administrator privileges.
- WebServer will provide three opportunities to enter the user name and password. If you enter the error 3 times in succession, the browser will display "Access denied" to deny access to the information. Please refresh the page and try again.

Step 5 Click “OK”.

Step 6 End.

After successful login, you can configure the relevant parameters and information of the WEB interface as needed.

Note:

After logging in to the device, you can modify the IP address of the switch for ease of use.

1.4 WEB Timeout Processing

When the user does not operate for more than 300 seconds in the Web interface, the system will do the timeout processing:

- Keep the configuration of this login;
- Logout this login.

  Note:
  After the system times out, if you need to continue operate in the WEB interface, please re-login.

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2 Overview

Function Description

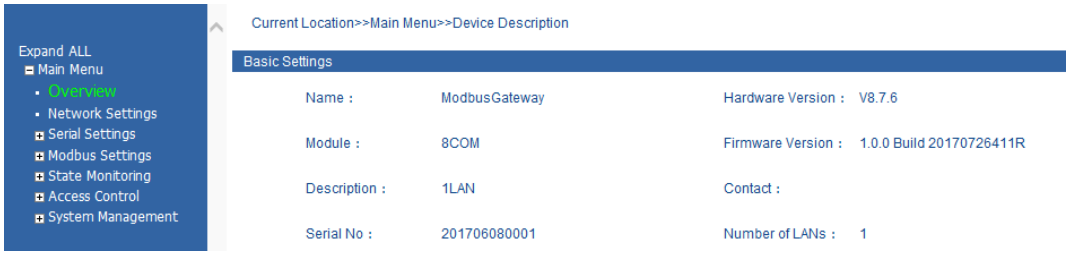
On the “Overview” page, you can view “Basic Settings” and “Network Information”.

Operation Path

Main Menu > Overview

Interface Description

Basic Settings interface screenshot



The main element configuration instructions in the Basic Settings interface.

Interface Elements	Description
Name	Network mark of the device. It is convenient for management tools to judge.
Module	Network identification.
Description	The description of device’s features, like as used key place.
Serial NO.	Serial number of the device. It is convenient for device management.
Hardware version	The current hardware version information, please note the limit of software version to hardware version
Firmware version	The current software’s version information, upgrade software version will have more function

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Interface Elements	Description
Contact	The contact information of person when maintenance the device, it can be configured in system information.
Number of LANs	Display LAN port number of the Gateway device.

Network information interface screenshot

Note

The dual-port device displays the "Lan1" and "Lan2" columns. The single-port device displays only the "Lan1" column.

Interface Elements	Description
IP mode	Display how to get an IP Address of the Gateway device.
Subnet mask	Display the Subnet mask of the Gateway device.
DNS mode	Display how to get a DNS of the Gateway device.
MAC address	Hardware address, 48bits(6 bytes,), 16 hexadecimal, it is unique
IP Address	Display the IP Address of the Gateway device.
Gateway	Display the Gateway address of the Gateway device.
DNS server	Display the DNS server address of the gateway device.

3 Network setting

Function Description

On the “Network settings” page, you can configure how to obtain IPv4 addresses.

Operation Path

Main Menu > Network settings

Interface Description

Network settings interface screenshot

Note

The dual-port device displays the "Lan1" and "Lan2" columns. The single-port device displays only the "Lan1" column.

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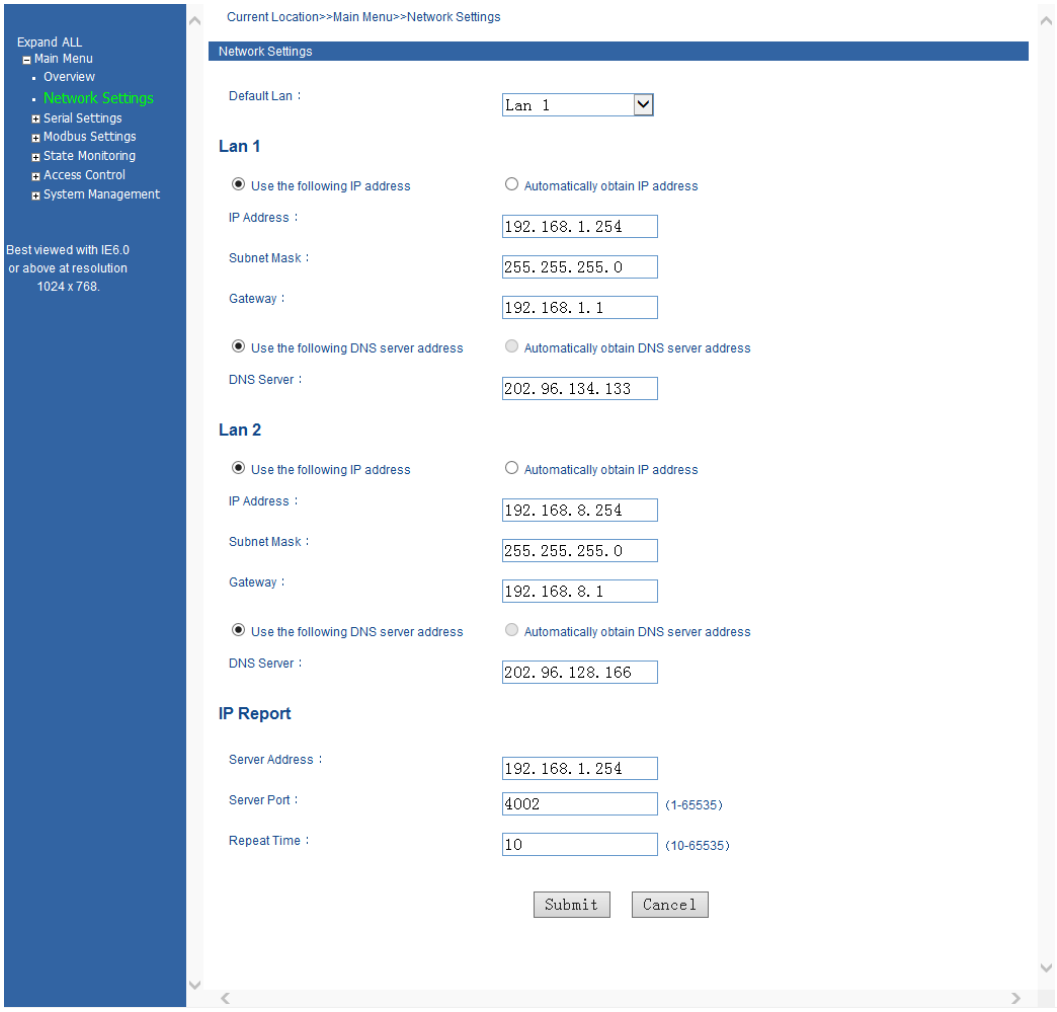

The main element configuration instructions in the Network settings interface.

Interface Elements	Description
Default LAN	Enable the data from the different network segment of the device to transmit from the default network port. Note: Single-port devices do not support this function。
Lan1	Network port 1 network configuration column. Note: The default IP for Lan1 is 192.168.1.254.
The way to get the IP address	• Use the following IP addresses: Manually configure the IP address, subnet mask, and default gateway address. • Obtain an IP address automatically: Obtain an IP address, subnet mask, and default gateway address automatically.

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Interface Elements	Description
IP address	Configure the IP address manually in the “IP Address” text box.
Subnet mask	Configure the subnet mask manually in the “Subnet mask” text box.
Gateway	Configure the gateway address manually in the “Gateway Address” text box.
The way to get the DNS server address	• Use the following DNS server address: Manually configure the DNS server address information. • Automatically obtain DNS server address: Automatically obtain DNS server address information.
Lan2	Network port 2 network configuration column. Note： • The default IP for Lan1 is 192.168.8.254. • Refer to the corresponding section of Lan1 in this table for the description of interface elements.
IP Report	**IP Report** configuration column. Note： When the Modbus gateway adopts the "automatic IP address", it reports the IP address of the user by intermittently, so that the user knows the new IP address of the Modbus gateway in time.
Sever Address	The server that receives the IP address report.
Sever Port	The port that sends the IP address report.
Repeat Time	The sending frequency of IP report.

Note

When the DHCP server assigns a new IP address to the Modbus gateway, the host needs to detect the new IP address of the Modbus gateway when the Modbus gateway is in a network environment that dynamically assigns an IP address. When the dynamic IP address changes, the Modbus gateway reports its own IP address to the user by intermittently, so that the user knows the new IP address of the Modbus gateway in time.

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4 Serial Settings

About This Chapter

Content	Hyperlink
This chapter	4.1 COM Settings 4.2 COM Information

4.1 COM Settings

Function Description

On the “COM settings” page, you can configure basic parameters such as baud rate, data bit, stop bit and parity bit corresponding to the serial port number. You can also configure whether the corresponding serial number is enabled for FIFO function, RTS control, DTR control and Packing length and other advanced parameter information.

Operation Path

Open “Main Menu > Serial Settings > COM Settings” in sequence

Interface Description

COM settings interface screenshot

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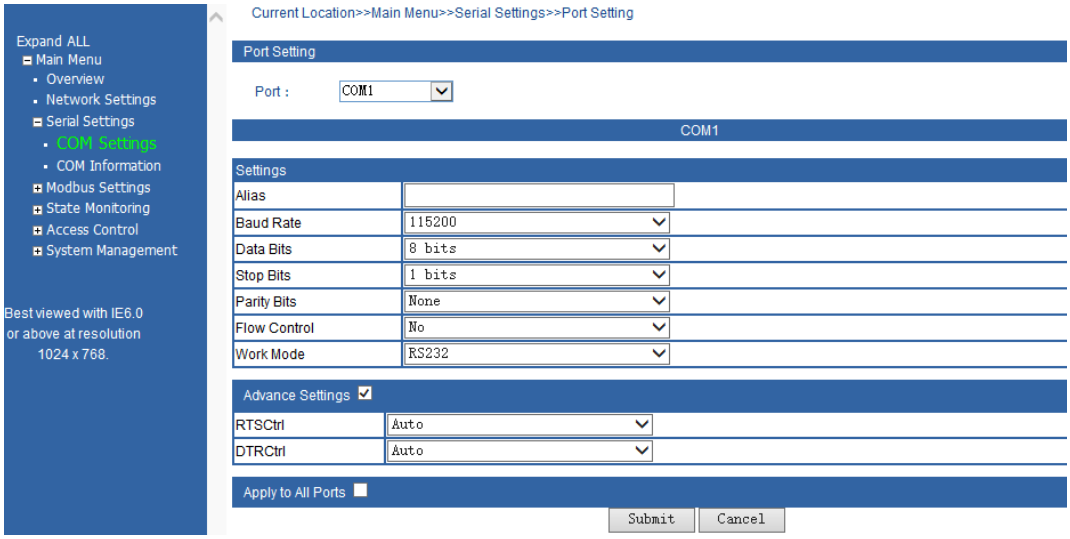

The main elements configuration instructions in COM settings

Interface Elements	Description
Port	Select the serial number of the device.
Alias	Enter the alias for the corresponding serial number in the “Alias” text box.
Baud Rate	Select the baud rate for the corresponding serial number. The options are: 300/600/1200/2400/4800/9600/19200/38400/57600/115200 Note： Some DIN-rail devices support baud rates 230400, 460800 and 921600.
Data Bits	Select the data bit for the corresponding serial number. The options are: • 7 bits • 8 bits
Stop Bits	Select the stop bit for the corresponding serial number. The options are: • 1 bits • 2 bits
Parity Bits	Select the parity bit for the corresponding serial number. The options are: • None • Odd • Even • Mark • Space

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Interface Elements	Description
Flow Control	Flow control is used in two data transmission speed of different devices in the control of data flow technology to ensure that two devices communicate with each other to avoid data loss. Click the "flow control" drop-down list box, select the flow control parameters, the options are: • No • RTS/CTS • XON/XOFF • DTR/DSR
Work mode	By hardware and software jointly decided, there are three modes: • RS232 • RS485/RS422 Note: Different types of products support different types of serial ports.
RTSCtrl	RTS pin can be controlled, the options are: • AUTO • Force ON • Force OFF
DTRCtrl	DTR pin can be controlled, the options are: • AUTO • Force ON • Force OFF
Apply to all Port	Check the “Apply to all port” check box to apply the current settings to all serial ports.

4.2 COM Information

Function Description

On the "COM Information" page, you can view parameter information such as serial number, alias, baud rate, data bit, stop bit, parity bit and flow control.

Operation Path

Open "Main Menu > Serial Settings> COM Information" in sequence

Interface Description

COM information interface screenshot

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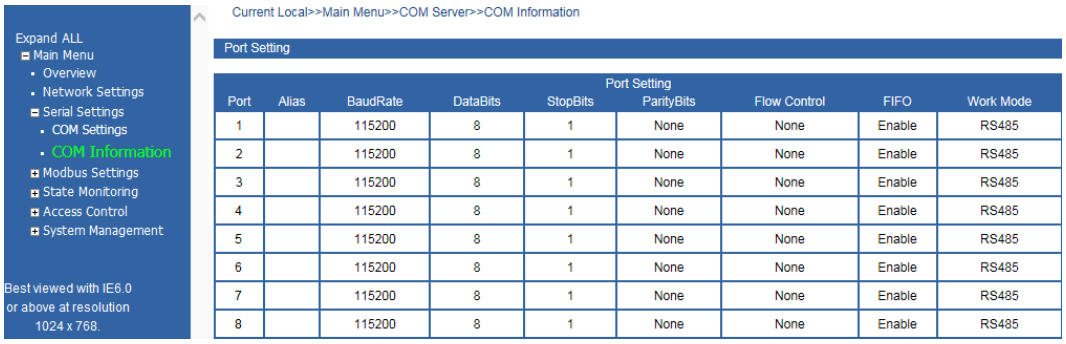

Port Setting

Port	Alias	BaudRate	DataBits	StopBits	ParityBits	Flow Control	FIFO	Work Mode
1		115200	8	1	None	None	Enable	RS485
2		115200	8	1	None	None	Enable	RS485
3		115200	8	1	None	None	Enable	RS485
4		115200	8	1	None	None	Enable	RS485
5		115200	8	1	None	None	Enable	RS485
6		115200	8	1	None	None	Enable	RS485
7		115200	8	1	None	None	Enable	RS485
8		115200	8	1	None	None	Enable	RS485

Note

The screenshot reference model for this manual is GW1108-8D (3IN1) Modbus. Other types of products in addition to supporting the serial type (RS-232, RS-422, RS-485), and the number of network ports and the number of serial ports are different, the interftions are the same.

COM information interface, the main elements of the configuration instructions

Interface Elements	Description
Port	Display device serial port number.
Alias	Display serial port alias.
BaudRate	Display serial port baud rate.
DataBits	Display serial port data bit.
StopBits	Display serial port stop bit.
ParityBits	Display serial port parity bit.
Flow Control	Display whether the serial port flow control function is enabled.
FIFO	Display whether the serial port FIFO function is enabled.
Work Mode	Display serial port work mode.

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5 Modbus Settings

About This Chapter

Content	Hyperlink
This chapter	5.1 Modbus Parameters 5.2 Slave ID

5.1 Modbus Parameters

Function Description

On the “Modbus Parameters” page, you can configure Initial delay, Response timeout and Interval Timeout to Modbus device.

Operation Path

Open “Main Menu > Modbus Settings > Modbus Parameters” in sequence

Interface Description

Modbus Parameters interface screenshot

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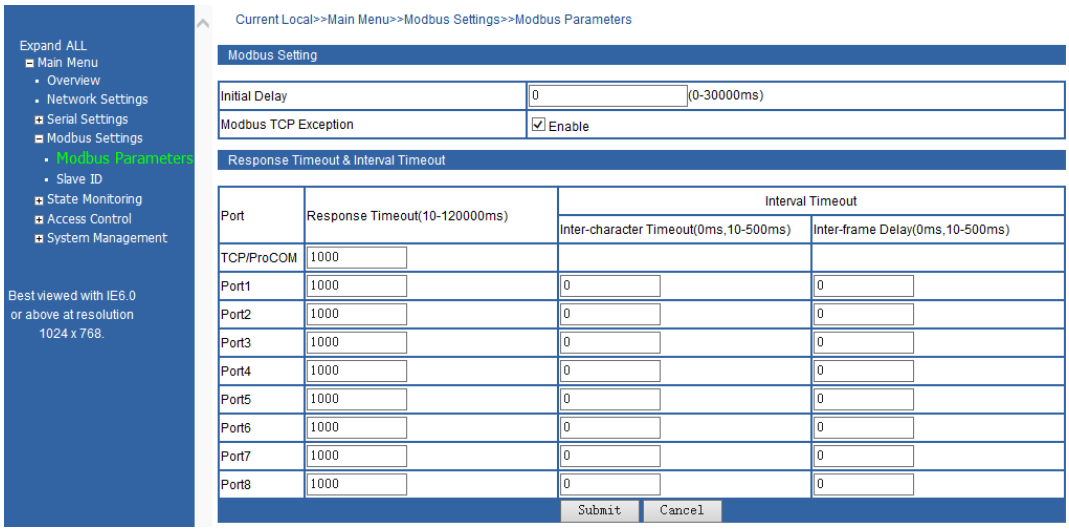


Main element configuration instructions in Modbus Parameters interface

Interface Elements	Description
Initial Delay	Manually configure the Modbus initial delay time.
Modbus TCP Exception	Enable or disable the Modbus TCP exception function.
Port	Select the serial number of the device.
Response Timeout	Manually configure the time between the request and the response.
Inter-character Timeout	Manually configure the character interval.
Inter-frame Delay	Manually configure the interframe delay time.

5.2 Slave ID

Function Description

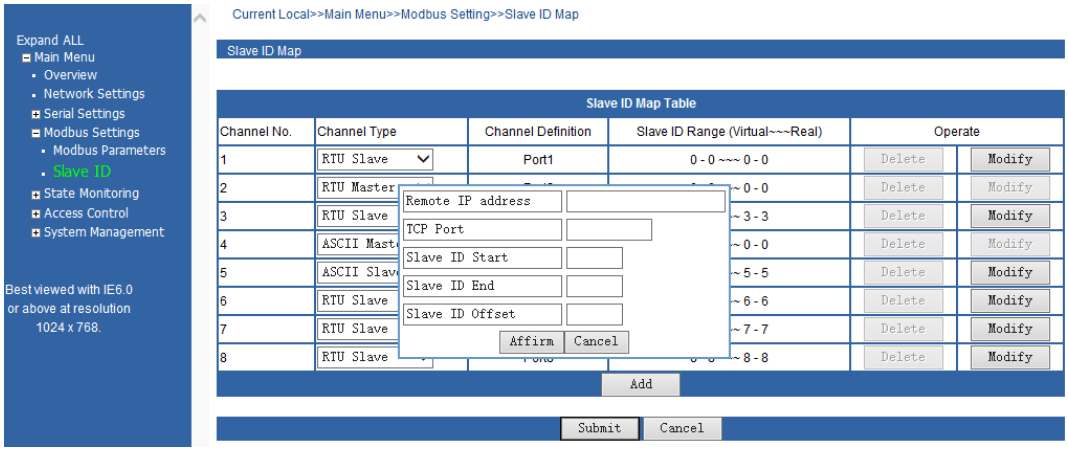
On the “Slave ID” page, you can configure master and slave ID mapping information. Such as the operating mode of the Modbus gateway, the slave start ID, the slave end ID, and the slave offset ID.

Operation Path

Open “Main Menu > Modbus Settings > Slave ID” in sequence

Interface Description

Slave ID interface screenshot



Note

The screenshot reference model for this manual is GW1108-8D (3IN1) Modbus. Other types of products in addition to supporting the serial type (RS-232, RS-422, RS-485), and the number of network ports and the number of serial ports are different, the interftions are the same.

Main element configuration instructions in Slave ID interface

Interface Elements	Description
Channel No.	Display channel number.
Channel Type	Modbus gateway mode of operation, the options are: • RTU Master mode • RTU Slave mode • ASCII Master mode • ASCII Slave mode
Channel Definition	Displays the port number corresponding to the device.
Slave ID Range (Virtual --- Real)	Displays the slave virtual ID and the corresponding real ID range
Operate	Modify or delete the master and slave mapping information that you configured.
Add	Click “Add” to configure the “Remote IP Address”, “TCP Port”, “Slave Start ID”, “Slave End ID”, and “Slave Offset ID” respectively.

6 State Monitoring

About This Chapter

Content	Hyperlink
This chapter	6.1 COM State

6.1 COM State

Function Description

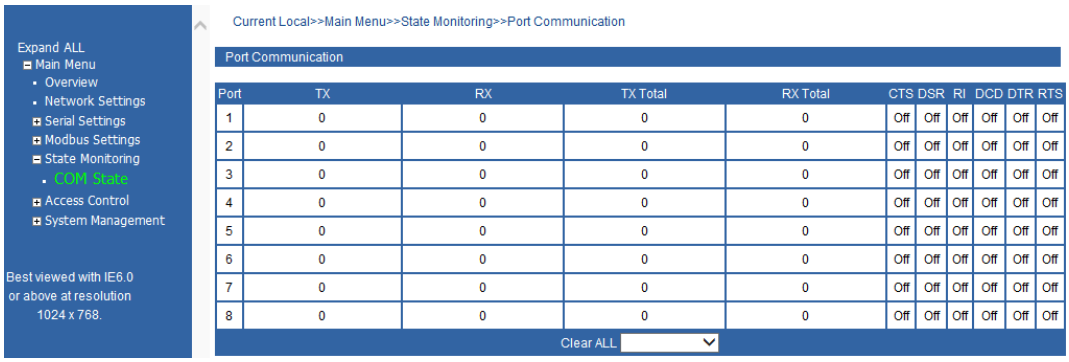
On the “COM State” page, you can view the data transceiver status and pin status of the corresponding serial port of the Modbus gateway.

Operation Path

Open “Main Menu >State Monitoring > COM State” in sequence

Interface Description

COM State interface screenshot



Note

The screenshot reference model for this manual is GW1108-8D (3IN1) Modbus. Other types of products in addition to supporting the serial type (RS-232, RS-422, RS-485), and the number of network ports and the number of serial ports are different, the interftions are the same.

Main element configuration instructions in COM State interface

Interface Elements	Description
Port	Select the serial number of the device.
TX, RX, TX Total, RX Total	Displays the data reception and transmission status of the serial port corresponding to the Modbus gateway.
CTS, DSR, RI, DCD, DTR, RTS	Displays the pin status of the serial port to the modbus gateway corresponding.

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7 Access Control

About This Chapter

Content	Hyperlink
This chapter	7.1 Device Security 7.2 IP Filtering 7.3 MAC Filtering 7.4 User Management

7.1 Device Security

Function Description

On the “Device Security” page, you can enable or disable Web interface configuration, Telnet remote control, BlueEyes/VSP software search device, and firmware upgrade to the device through the Web interface or command line.

Operation Path

Open “Main Menu >Access Control > Device Security” in sequence

Interface Description

Device Security interface screenshot

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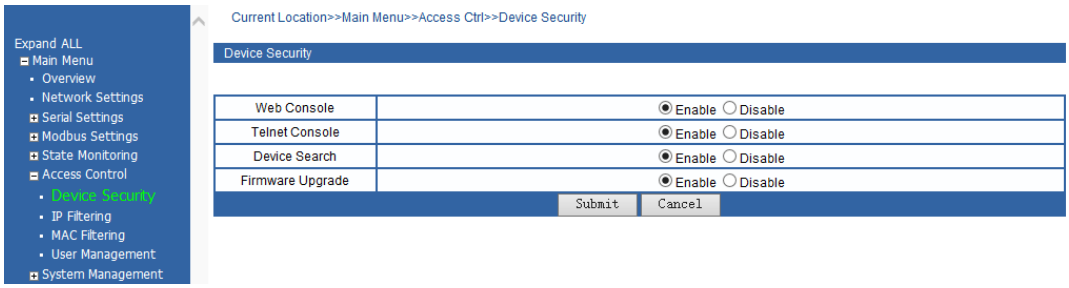

Main element configuration instructions in Device Security interface

Interface Elements	Description
Web Console	Enables or disables the Web console feature. The options are: • Enabled: Users can log in to the Web interface via BlueEyes/VSP software or a browser to configure the device. • Disable: Disable Web console functionality.
Telnet Console	Enable or disable the Telnet console feature. The options are: • Enabled: The user can remotely access the system configuration interface through the Telnet terminal. • Disable: Disable the Telnet console feature.
Device Search	Enable or disable the BlueEyes/VSP software search device feature. The options are: • Enabled: The user can search through the BlueEyes/VSP software to the Modbus gateway device. • Disable: Disable BlueEyes/VSP software to search for device features.
Firmware Upgrade	Enables or disables the firmware upgrade feature. The options are: • Enabled: The user can upgrade the device through the Web interface or the command line. • Disable: Disable the firmware upgrade feature.

7.2 IP Filtering

Function Description

On the “IP Filtering” page, you can restrict access to host IP addresses and subnet masks to be accessed or connected by setting access rules.

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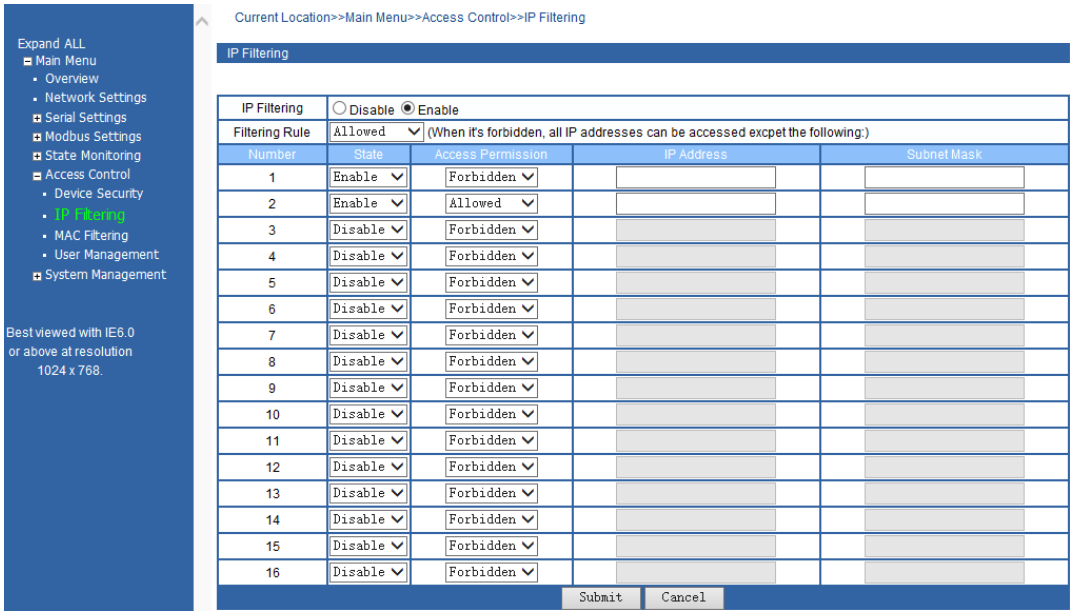
Operation Path

Open “Main Menu >Access Control > IP Filtering” in sequence

Interface Description

IP Filtering interface screenshot



Main element configuration instructions in IP Filtering interface

Interface Elements	Description
IP Filtering	Enables or disables IP address filtering rules.
Filtering rule	• Allowed IP filtering rules 1 to 16 other than the IP address to allow access to the system. • Forbidden IP filtering rules 1 to 16 other than the IP address to forbidden access to the system.
Number	Displays the IP address filtering rule number.
State	Enable or disable filtering rules.
Access Permission	Set the access permission, the options are: • Allowed Allows the setted IP address access device. • Forbidden: Forbids the setted IP address to access device.
IP Address	Set the IP address in dotted decimal format in the filter rule, such as "192.168.1.61".
Subnet Mask	Set the subnet mask in dotted decimal format in the filter

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Interface Elements	Description
	rule, such as "255.255.255.0".

7.3 MAC Filtering

Function Description

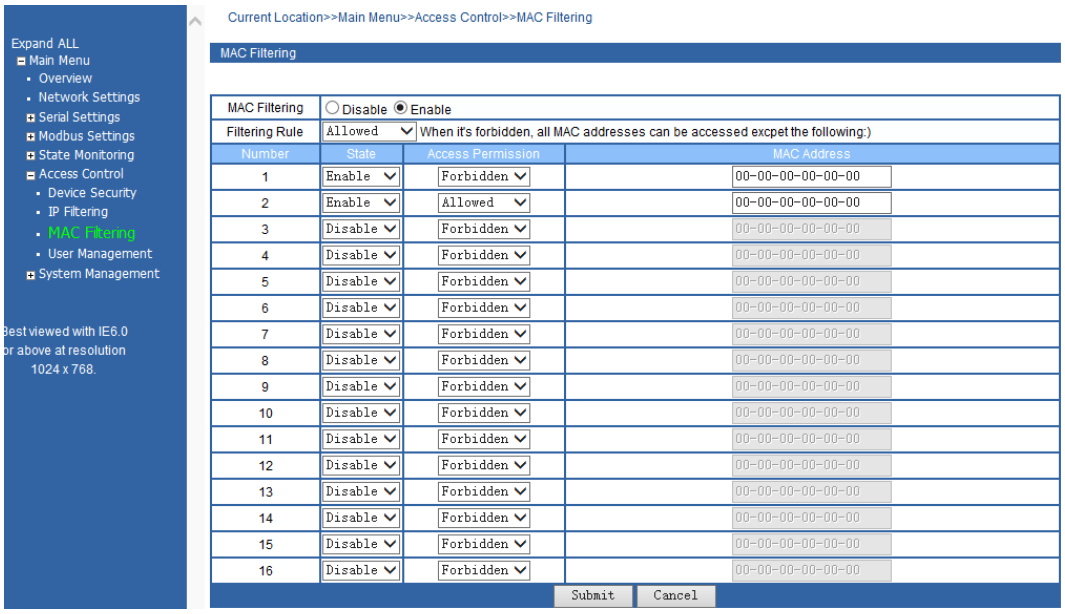
On the “MAC Filtering” page, you can restrict the host MAC address to be accessed or connected by setting access rules.

Operation Path

Open “Main Menu > Access Control > MAC Filtering” in sequence

Interface Description

MAC Filtering interface screenshot



Main element configuration instructions in MAC Filtering interface

Interface Elements	Description
MAC Filtering	Enables or disables MAC address filtering rules.
Filtering rule	Allowed: MAC filtering rules 1 to 16 other than the MAC address to allow access to the system. Forbidden: MAC filtering rules 1 to 16 other than the MAC address to forbidden access to the system.
Number	Displays the MAC address filtering rule number.
State	Enable or disable filtering rules.
Access Permission	Set the access permission, the options are: • Allowed: the MAC address allowed to access device.

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Interface Elements	Description
	• Forbidden: the MAC address forbidden to access device.
MAC Address	Set the six-byte hexadecimal format MAC address in the filter rule, such as "00-22-6F-03-BD-52".

7.4 User Management

Function Description

On the “User Management” page, you can configure the login information such as the user name and password of the login WEB configuration interface.

The Modbus gateway provides hierarchical management:

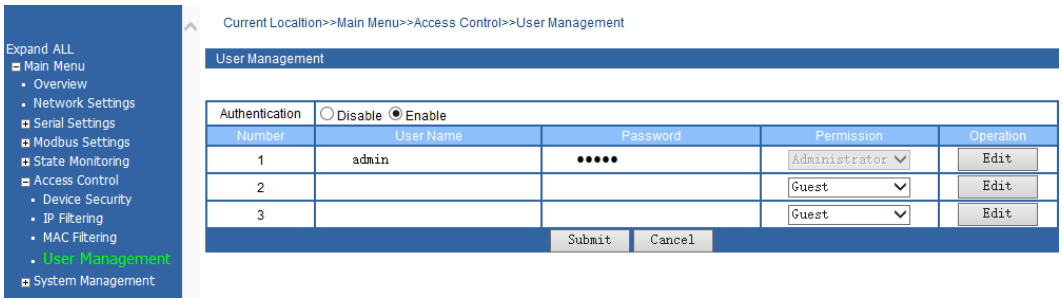
“Guest” and “Administrator” privileges. Guest only has the rights to view the status of the Modbus gateway, and the system administrator can configure the parameters of the Modbus gateway.

Operation Path

Open “Main Menu >Access Control > User Management” in sequence

Interface Description

User Management interface screenshot



Main element configuration instructions in User Management interface

Interface Elements	Description
Authentication	Enable or disable authentication function
Number	Displays the user number.
User Name	Displays the user name of the login WEB configuration interface.
Password	The hidden text displays the user password for logging in to the WEB configuration interface.
Permission	Click the "permission" drop-down list box to select the login

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Interface Elements	Description
	WEB configuration interface user permissions.
Operation	Click "Edit" to modify the user name and password of the login WEB configuration interface.

Notice

Please remember the revised user name and password, if accidentally forgotten, please restore the factory settings in the WEB interface, the default login WEB configuration interface user name and password are "admin".

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8 System Management

About This Chapter

Content	Hyperlink
This chapter	8.1 IP Map 8.2 System Information 8.3 System File 8.4 Logout & Reboot

8.1 IP Map

Note

Dual network port device supports IP mapping function, single network port device does not support this function.

Function Description

On the “IP MAP” page, you can control the data in different network segments to transfer from the specified network port.

The data transmission rules of the device: First confirm whether the data destination address and IP address of the network port are in the same network segment:

- If they are in the same network segment, then directly transmit from the network port.
- Otherwise, check the IP mapping table, if the IP mapping table does not specify the network port, the data will transfer from the default network port.

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Note

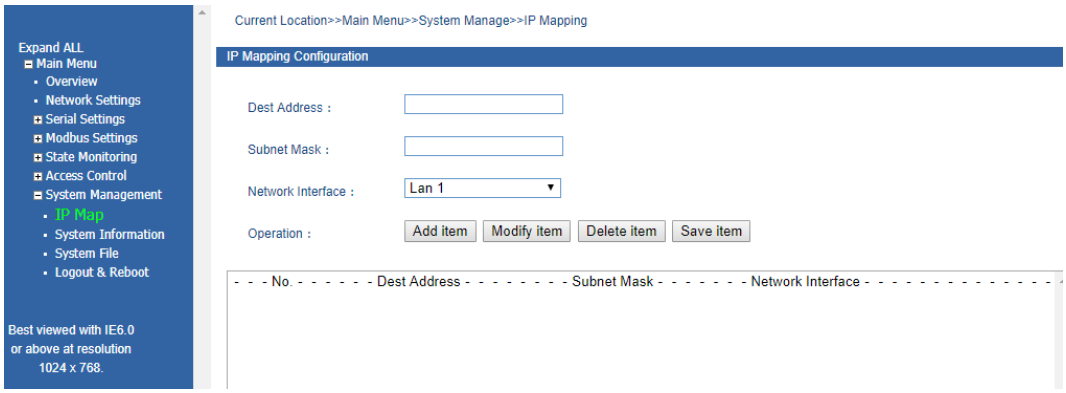
- The IP address of the network port does not need to be added to the mapping table.
- IP mapping table does not limit incoming data; the forwarding data port is sent from corresponding LAN port in the mapping table from the network segment to which the destination address belongs

Operation Path

Open in sequence: "Main Menu > System Management > IP Map".

Interface Description

IP Map interface screenshot



IP Map interface main element configuration instructions

Interface elements	Description
Dest Address	Configure the destination IP address of the mapping table rule.
Subnet Mask	Configure the subnet mask for the mapping table rules.
Network Interface	Click the “Network Interface” drop-down list box to select the destination IP address on which network interface is connected.
Operation	Add, modify, delete, or save IP mapping rules.

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8.2 System Information

Function Description

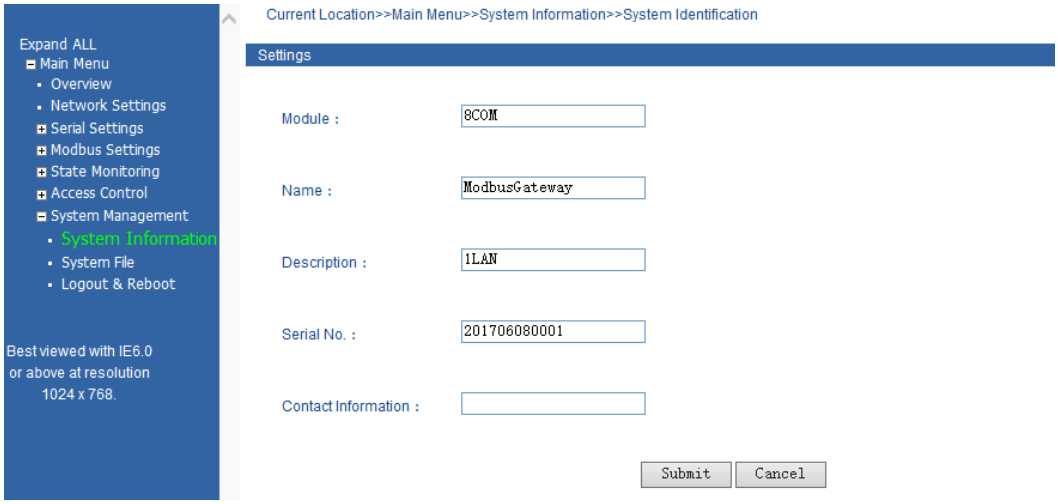
On the “System Information” page, you can configure the device module, name, description, serial number, and contact information.

Operation Path

Open in sequence: "Main Menu > System Management > System Information ".

Interface Description

System information interface screenshot



Main element configuration instructions in System Information interface.

Interface Elements	Description
Module	Enter the device module in the "Module" text box.
Name	Enter the device name in the “Name” text box. To mark each device in the network, give the device a different name, no more than 32 bytes.
Description	Enter the device description in the “Description” text box. A summary of the device, no more than 32 bytes.
Serial NO.	Enter the device number in the “Serial NO.” text box. Describe the location of the device installation, no more than 32 bytes.
Contact information	Enter the contact information of the equipment maintenance personnel in the "Contact information" text box.

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8.3 System File

Function Description

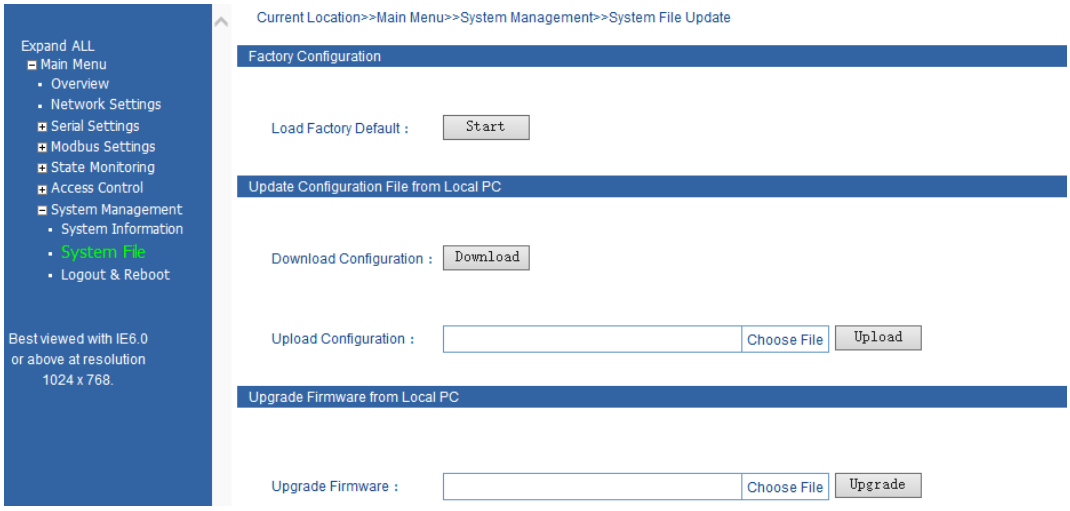
On the “System File” page, you can restore the factory settings, upload and download the configuration file, and make a firmware upgrade.

Operation Path

Open in sequence: "Main Menu > System Management> System File".

Interface Description

System file interface screenshot



Main element configuration instructions in System File interface.

Interface Elements	Description
Load Factory Default	Click "Start" to restore the Modbus gateway to the factory configuration.
Download Configration	Click "Download" to download the current configuration file for the Modbus gateway.
Upload Configuration	Click "Choose File", select the profile you are ready, click "Upload", you can upload the existing configuration to the Modbus gateway.
Upgrade Firmware	Click "Choose File", select your prepared software upgrade file, click "Upgrade", you can achieve Modbus gateway software online upgrade.

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Warning

- When uploading the configuration file or upgrading software, please do not click or configure the other WEB pages of the Modbus gateway, not to restart the Modbus gateway; otherwise the configuration file upload or software upgrade will fail, causing the Modbus gateway system crash and so on.
- Restoring the factory settings will cause all states of the device to be in the factory state. The default IP address is "192.168.1.254".

8.4 Logout & Reboot

Function Description

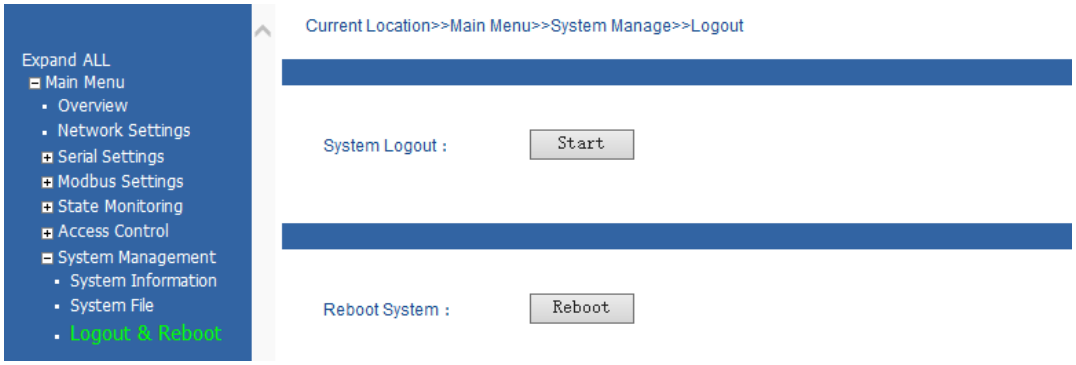
On the “Logout & Reboot” page, you can log off and reboot the Modbus gateway system.

Operation Path

Open in sequence: "Main Menu > System Managment > Logout & Reboot".

Interface Description

Logout & Reboot interface screenshot



Main element configuration instructions in Logout & Reboot interface.

Interface Elements	Description
System Logout	Click "Start" and the system will log out and jump to the initial login screen.
Reboot System	Click "reboot" in the pop-up dialog box, click "OK" to complete the system reboot.

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9 Working Mode Configuration

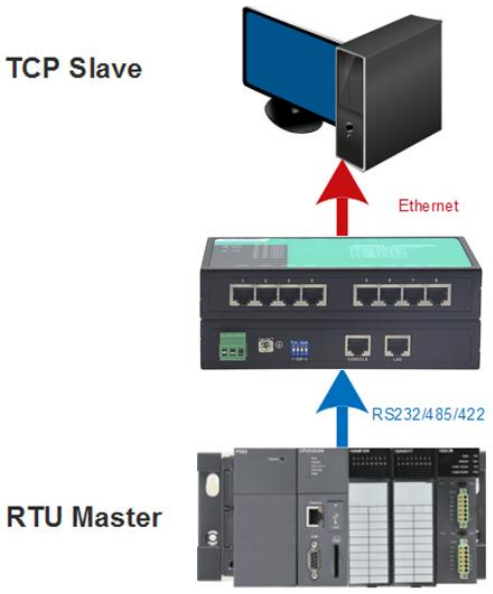
About This Chapter

Connect	Hyperlink
This Chapter	9.1 RTU Master Mode 9.2 RTU Slave Mode 9.3 ASCII Master Mode 9.4 ASCII Slave Mode

9.1 RTU Master Mode

Background brief

When the user needs to implement the Modbus RTU master device to communicate with the Modbus TCP slave device, use the Modbus gateway device and set the device's operating mode to RTU Master.



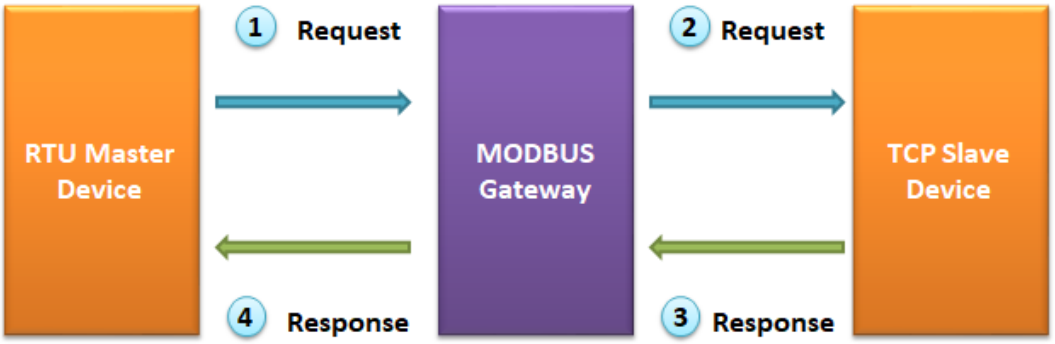
In RTU Master Mode, the RTU master device accesses the TCP slave device through the gateway.

① RTU master device sends request to gateway;

② Gateway forwarding request to TCP slave device;

③ TCP slave device returns a response;

④ The gateway sends back the response.



The parameters of the RTU master are as follows:

- Communication port: COM1
- Baud rate: 115200
- Parity bit: None
- Data bit: 8
- Stop bit: 1

The parameters of the TCP slave are as follows:

- IP address: 192.168.1.80
- Slave ID: 1
- TCP port number: 501

Operation steps

Note

The screenshot reference model for this manual is GW1108-8D (3IN1) Modbus. Other types of products in addition to supporting the serial type (RS-232, RS-422, RS-485), and the number of network ports and the number of serial ports are different, the interftions are the same.

Step 1 Connect the COM serial port of the computer and the COM1 serial port of the Modbus gateway using a cable or a converter.

Step 2 Configure the IP address of the Modbus gateway.

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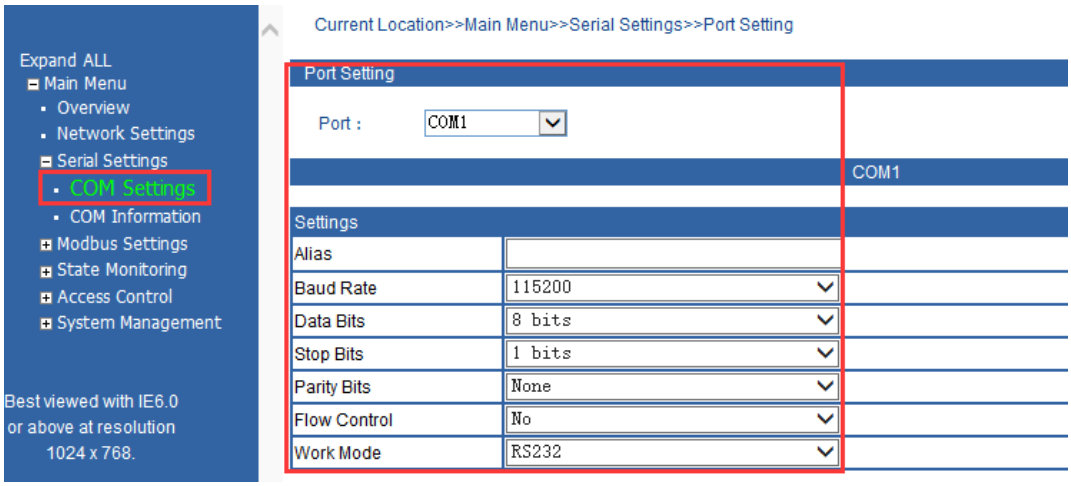
1. Log in to the Web configuration interface and select "Network Setting".
2. In the "Use the following IP address" option box, enter the "IP address", "Subnet Mask" and "Gateway address" corresponding to the Modbus gateway.
3. Other parameters remain the default, click "submit".

Step 3 Configure the serial port parameter information.

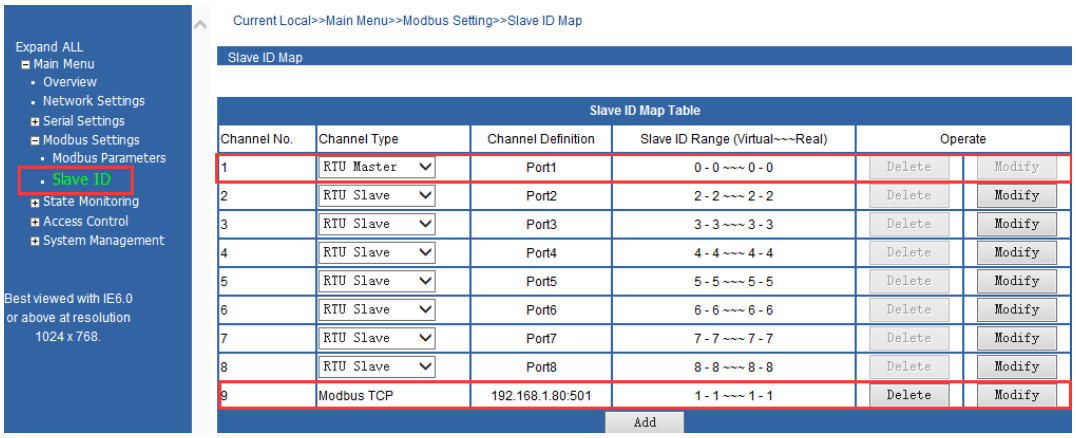
1. Log in to the Web configuration interface and select "Serial Settings> COM Settings".



2. Select "COM1" in the "Port" drop-down list.
3. Set the "BaudRate", "DataBits", "StopBits" and "ParityBits" in the "Settings" option box.
4. Other parameters remain the default, click "Submit".

Step 4 Configure the working mode of the Modbus gateway.

1. Log in to the Web configuration interface and select " Main Menu > Modbus Settings > SlaveID ".



2. In the “Channel NO.” is 1, click the "channel Type" drop-down list box and select "RTU Master".

3. Click "Add" and enter "192.168.1.80" in the "Remote IP Address" text box.

4. Enter "501" in the "TCP port" text box.

5. Enter "1" in the "Slave ID Start" and "Slave ID End" text boxes.

6. Enter "0" in the "Slave ID Offset" text box.

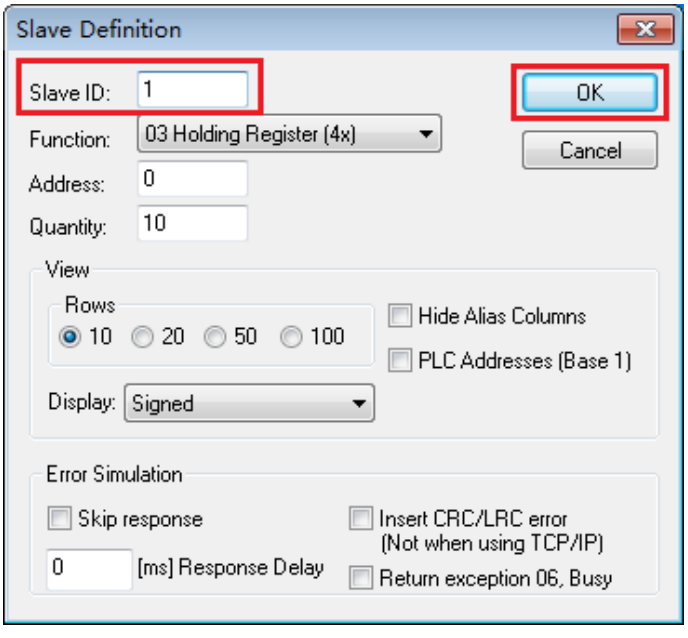
7. Click "OK".

8. Save the configuration, click "Submit".

Step 5 Run "mbpoll" and “mbslave” software to simulate master and slave configuration.

1. Run the “mbslave.exe” software, click "Setup> Slave Definition".

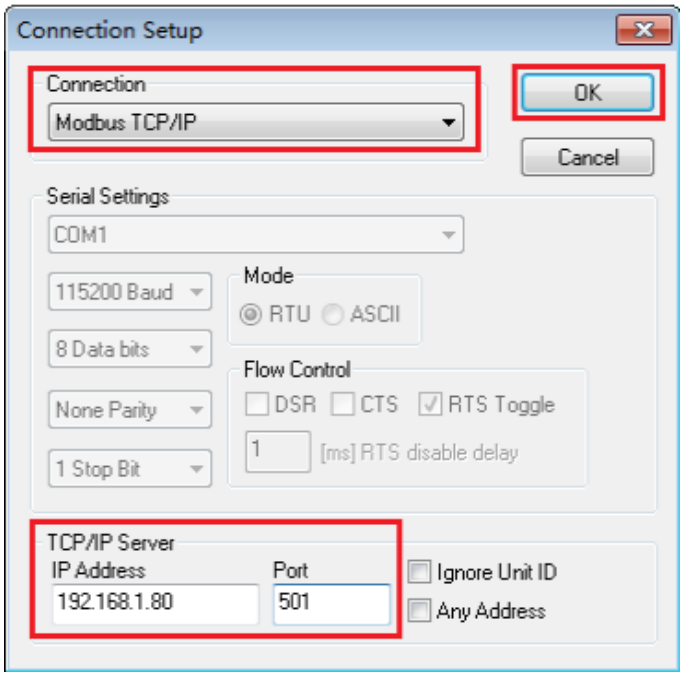
2. Enter "1" in the "Slave ID" text box.



3. Other parameters remain the default, click “OK”.

4. Click " Connection > Connection Setup ".

5. Click the "Connection" drop-down list box and select "Modbus TCP / IP".



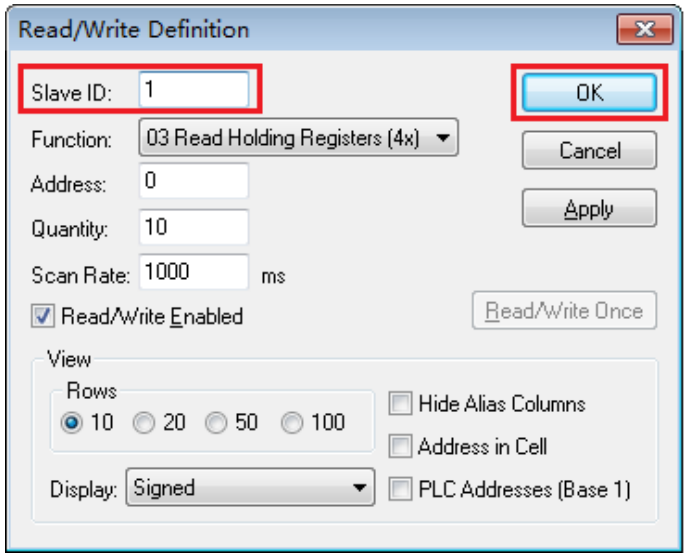
6. Enter the TCP slave IP address "192.168.1.80" in the "IP Address" text box of the "TCP / IP Server" area.

7. Enter the TCP slave port number "501" in the "Port" text box of the "TCP / IP Server" area.

8. Other parameters remain the default, click "OK".

9. Run the “mbpoll.exe” software, click "Setup> Read / Write Definition".

10. Enter "1" in the "Slave ID" text box.



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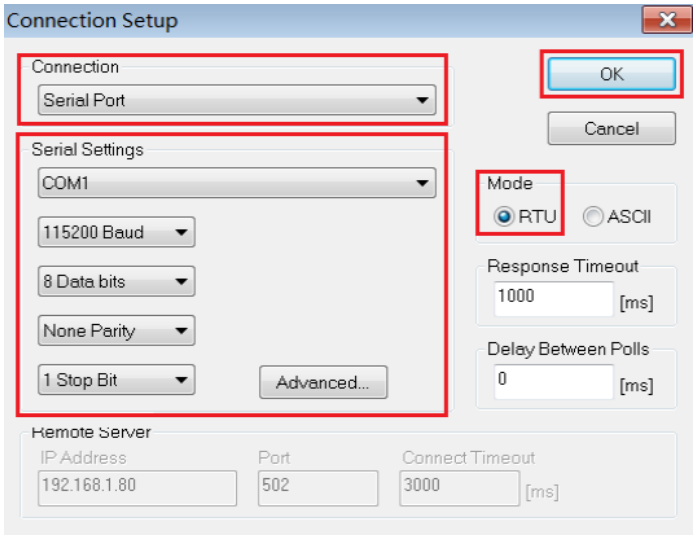
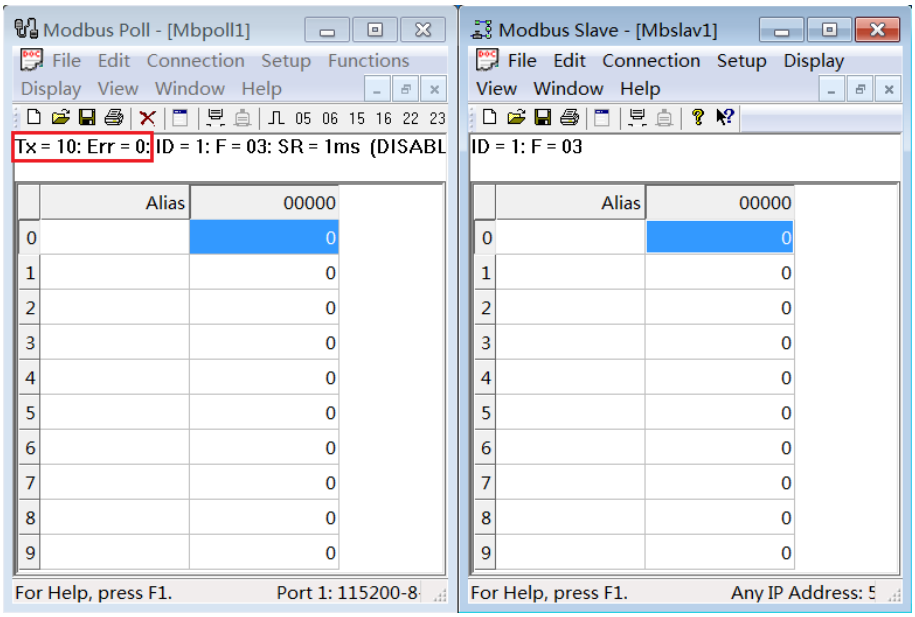
11. Other parameters remain the default, click “OK”.
12. Click " Connection > Connection Setup ".
13. Click the "Connection" drop-down list box and select "serial port".
14. In the "Serial Settings" option box, configure serial port information such as serial number, baud rate, data bit, parity bit and stop bit.



15. Select the "RTU" mode in the "Mode" option.
16. Other parameters remain the default, click “OK”.

Step 6 Check the normal communication between the RTU master and the TCP slave.



Port Communication

Port	TX	RX	TX Total	RX Total	CTS	DSR	RI	DCD	DTR	RTS
1	10	10	250	80	Off	Off	Off	Off	Off	Off
2	0	0	0	0	Off	Off	Off	Off	Off	Off
3	0	0	0	0	Off	Off	Off	Off	Off	Off
4	0	0	0	0	Off	Off	Off	Off	Off	Off
5	0	0	0	0	Off	Off	Off	Off	Off	Off
6	0	0	0	0	Off	Off	Off	Off	Off	Off
7	0	0	0	0	Off	Off	Off	Off	Off	Off
8	0	0	0	0	Off	Off	Off	Off	Off	Off

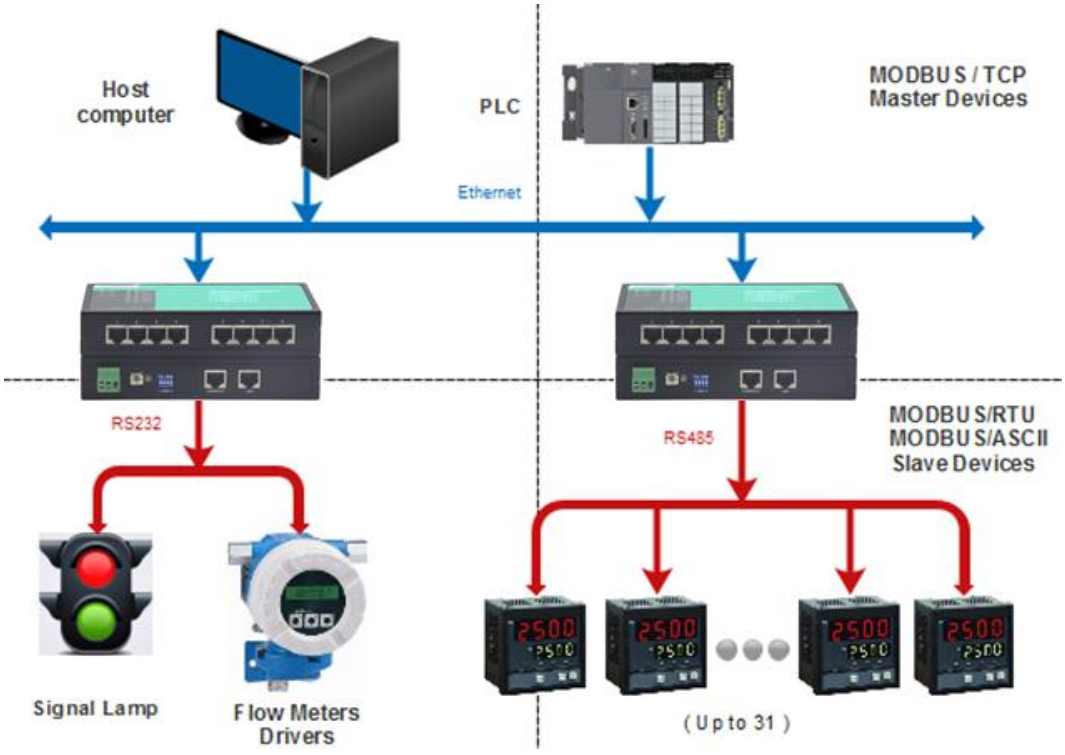
Clear ALL

Step 7 End.

9.2 RTU Slave Mode

Background brief

When the user needs to implement the Modbus TCP master device to communicate with the Modbus RTU slave device, use the Modbus gateway device and set the device's operating mode to RTU Slave.



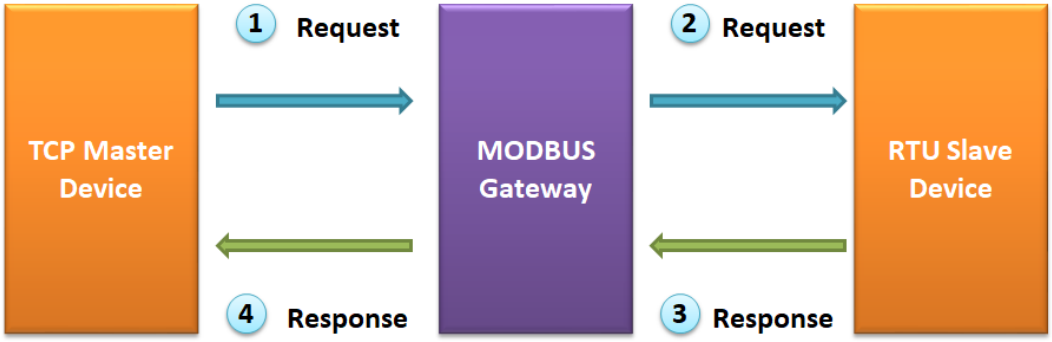
In RTU Slave Mode, the TCP master device accesses the RTU slave device through the gateway.

① TCP master device sends request to gateway;

② Gateway forwarding request to RTU slave device;

③ RTU slave device returns a response;

④ The gateway sends back the response.



The parameters of the TCP master are as follows:

- Slave ID: 2
- TCP port number: 502

The parameters of the RTU slave are as follows:

- Communication port: COM 2
- Baud rate: 115200
- Parity bit: None
- Data bit: 8
- Stop bit: 1

Operation steps

Note

The screenshot reference model for this manual is GW1108-8D (3IN1) Modbus. Other types of products in addition to supporting the serial type (RS-232, RS-422, RS-485), and the number of network ports and the number of serial ports are different, the interftions are the same.

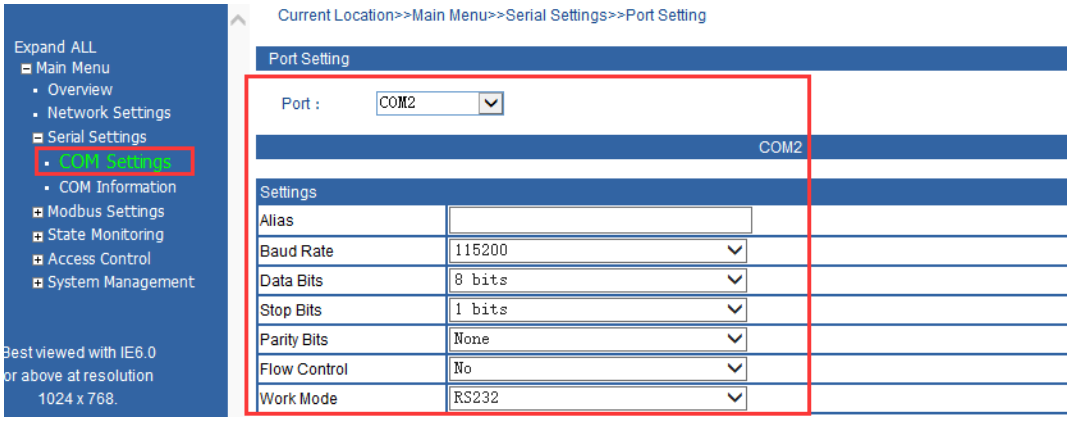
Step 1 Connect the COM serial port of the computer and the COM2 serial port of the Modbus gateway using a cable or a converter.

Step 2 Configure the IP address of the Modbus gateway.

1. Log in to the Web configuration interface and select "Network Setting".
2. In the "Use the following IP address" option box, enter the "IP address", "Subnet Mask" and "Gateway address" corresponding to the Modbus gateway.
3. Other parameters remain the default, click "submit".

Step 3 Configure the serial port parameter information.

1. Log in to the Web configuration interface and select "Serial Settings> COM Settings".



2. Select "COM2" in the "Port" drop-down list.
3. Set the "BaudRate", "DataBits", "StopBits" and "ParityBits" in the "Settings" option box.
4. Other parameters remain the default, click "Submit".

Step 4 Configure the working mode of the Modbus gateway.

1. Log in to the Web configuration interface and select " Main Menu > Modbus Settings > SlaveID ".
2. In the “Channel NO.” is 2, click the "channel Type" drop-down list box and select "RTU Slave".

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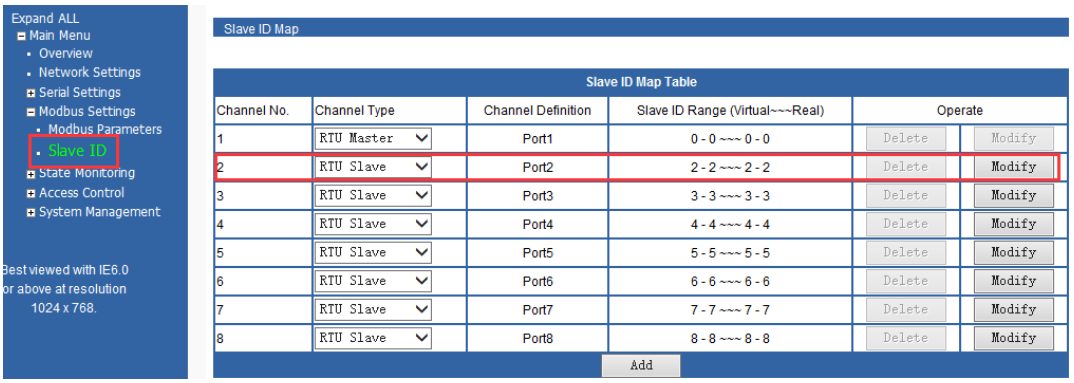


3. In the “Channel NO.” is 2, click the "Modify".

4. Enter "2" in the "Slave ID Start" and "Slave ID End" text boxes.

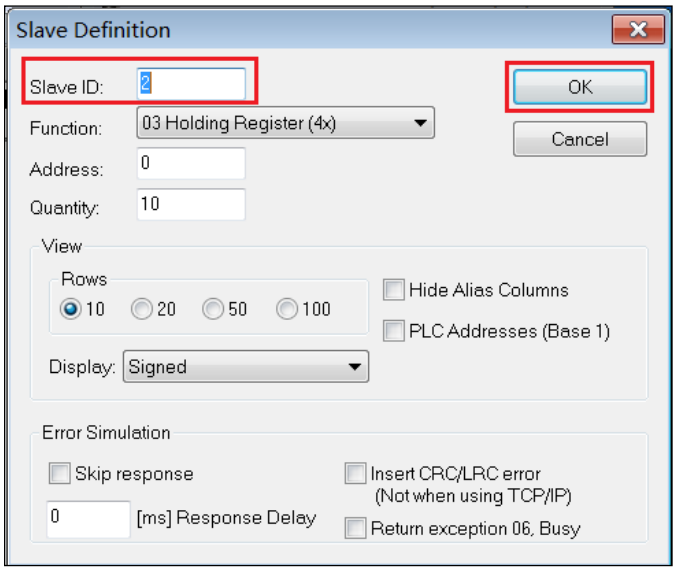
5. Enter "0" in the "Slave ID Offset" text box.

6. Click "OK".

Step 5 Run "mbpoll" and “mbslave” software to simulate master and slave configuration.

1. Run the “mbslave.exe” software, click "Setup> Slave Definition".

2. Enter "2" in the "Slave ID" text box.

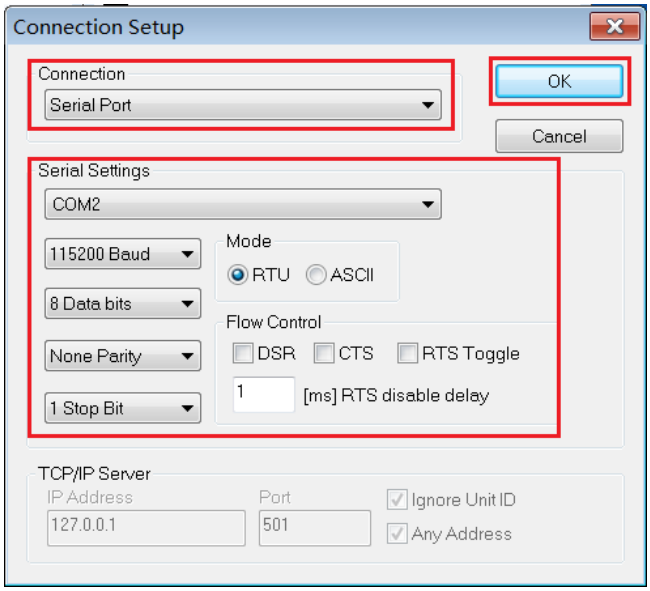


3. Other parameters remain the default, click “OK”.

4. Click " Connection > Connection Setup ".

5. Click the "Connection" drop-down list box and select "serial port".

6. In the "Serial Settings" option box, configure serial port information such as serial number, baud rate, data bit, parity bit and stop bit.

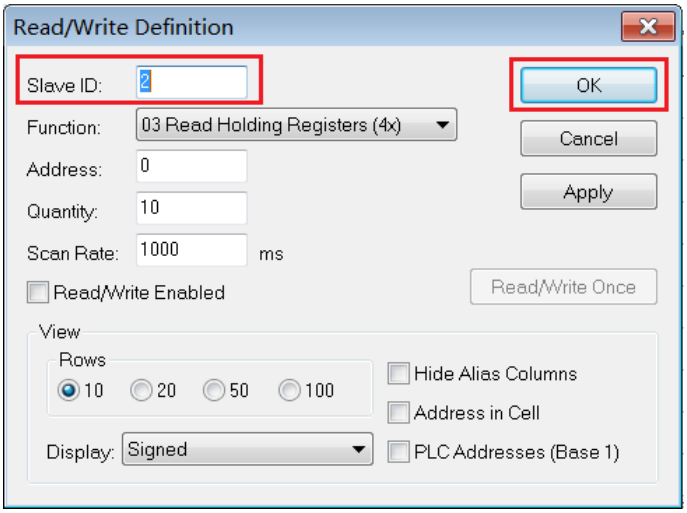


7. Select the "RTU" mode in the "Mode" option.

8. Other parameters remain the default, click “OK”.

9. Run the “mbpoll.exe” software, click "Setup> Read / Write Definition".

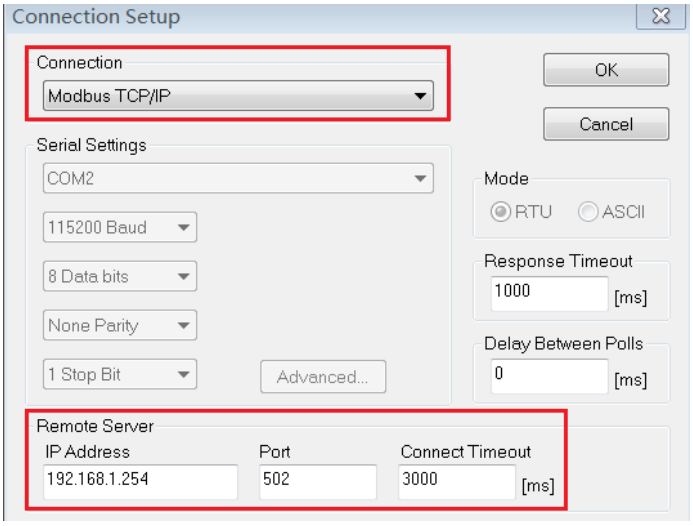
10. Enter "2" in the "Slave ID" text box.



11. Other parameters remain the default, click “OK”.

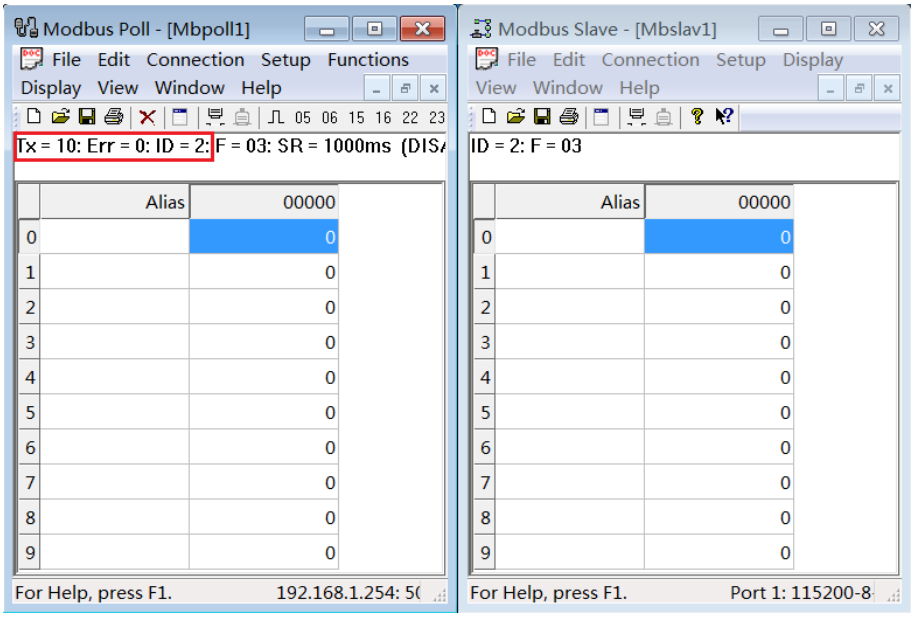
12. Click " Connection > Connection Setup ".

13. Click the "Connection" drop-down list box and select "Modbus TCP / IP".



14. In the “Remote Server” check box, configure the Modbus gateway IP address, port number, and connection timeout.
15. Other parameters remain the default, click "OK".

Step 6 Check the normal communication between the TCP master and the RTU slave.



Port Communication

Port	TX	RX	TX Total	RX Total	CTS	DSR	RI	DCD	DTR	RTS
1	0	0	0	0	Off	Off	Off	Off	Off	Off
2	121	121	968	105	Off	Off	Off	Off	Off	Off
3	0	0	0	0	Off	Off	Off	Off	Off	Off
4	0	0	0	0	Off	Off	Off	Off	Off	Off

Step 7 End.

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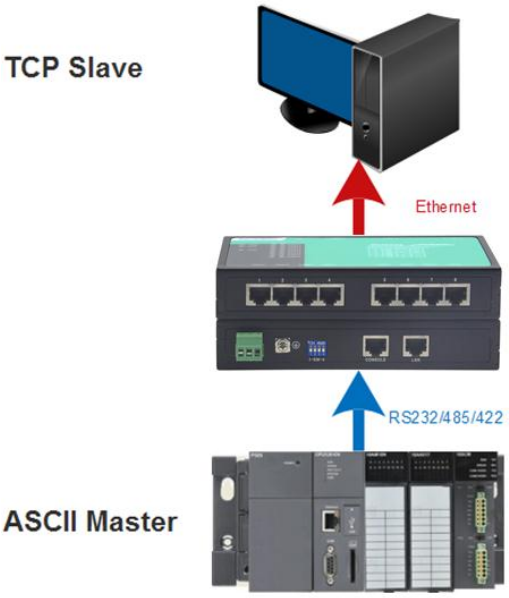
9.3 ASCII Master Mode

Background brief

When the user needs to implement the Modbus ASCII master device to communicate with the Modbus TCP slave device, use the Modbus gateway device and set the device's operating mode to ASCII Master.



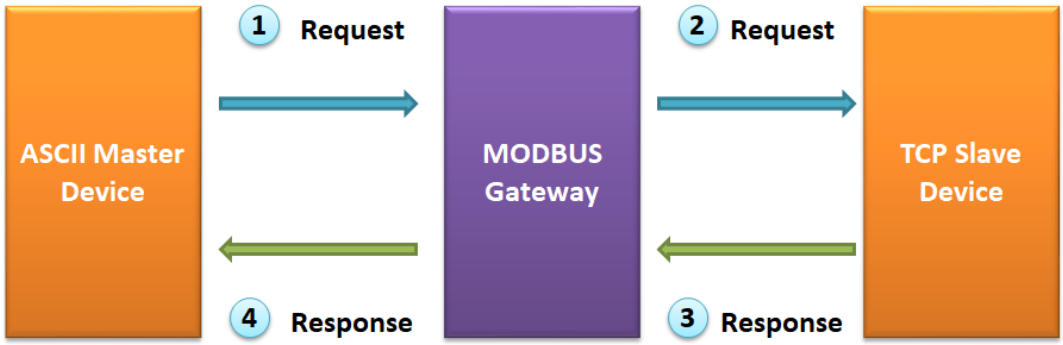
In ASCII Master Mode, the ASCII master device accesses the TCP slave device through the gateway.

① ASCII master device sends request to gateway;

② Gateway forwarding request to TCP slave device;

③ TCP slave device returns a response;

④ The gateway sends back the response.



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The parameters of the ASCII master are as follows:

- Communication port: COM3
- Baud rate: 115200
- Parity bit: None
- Data bit: 7
- Stop bit: 2

The parameters of the TCP slave are as follows:

- IP address: 192.168.1.80
- Slave ID: 3
- TCP port number: 503

Operation steps

Note

The screenshot reference model for this manual is GW1108-8D (3IN1) Modbus. Other types of products in addition to supporting the serial type (RS-232, RS-422, RS-485), and the number of network ports and the number of serial ports are different, the interftions are the same.

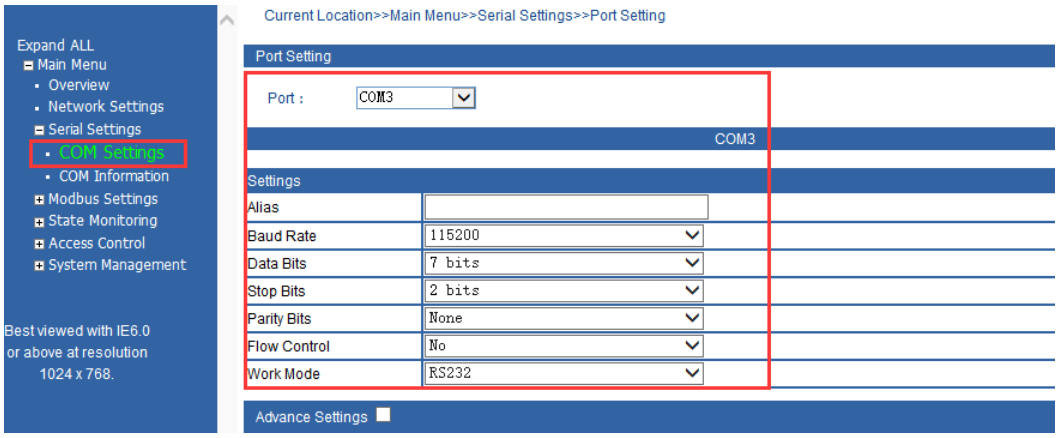
Step 1 Connect the COM serial port of the computer and the COM3 serial port of the Modbus gateway using a cable or a converter.

Step 2 Configure the IP address of the Modbus gateway.

1. Log in to the Web configuration interface and select "Network Setting".
2. In the "Use the following IP address" option box, enter the "IP address", "Subnet Mask" and "Gateway address" corresponding to the Modbus gateway.
3. Other parameters remain the default, click "submit".

Step 3 Configure the serial port parameter information.

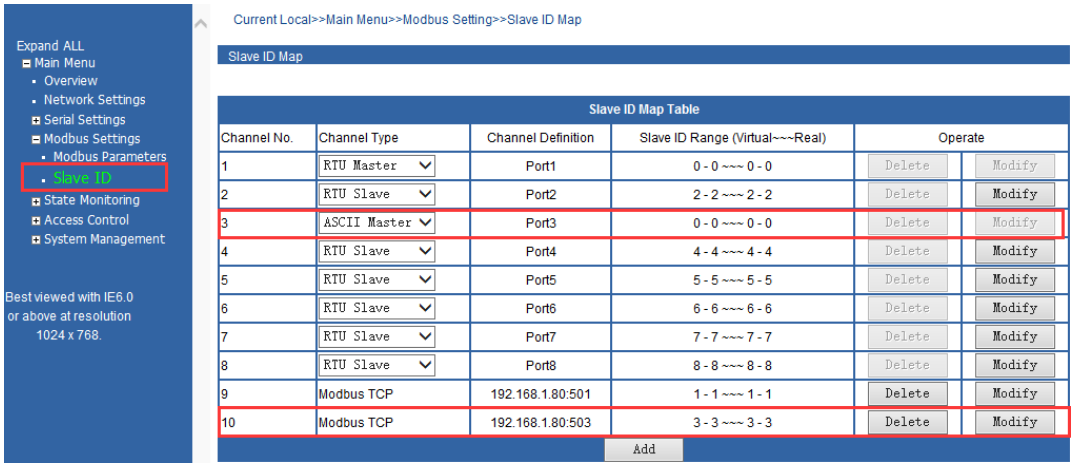
1. Log in to the Web configuration interface and select "Main Menu > Serial Settings> COM Settings ".



2. Select "COM3" in the "Port" drop-down list.
3. Set the "BaudRate", "DataBits", "StopBits" and "ParityBits" in the "Settings" option box.
4. Other parameters remain the default, click "Submit".

Step 4 Configure the working mode of the Modbus gateway.

1. Log in to the Web configuration interface and select " Main Menu > Modbus Settings > SlaveID ".
2. In the “Channel NO.” is 3, click the "channel Type" drop-down list box and select "ASCII Master".



3. Click "Add" and enter "192.168.1.80" in the "Remote IP Address" text box.
4. Enter "503" in the "TCP port" text box.
5. Enter "3" in the "Slave ID Start" and "Slave ID End" text boxes.
6. Enter "0" in the "Slave ID Offset" text box.
7. Click "OK".
8. Save the configuration, click "Submit".

Step 5 Run "mbpoll" and “mbslave” software to simulate master and slave configuration.

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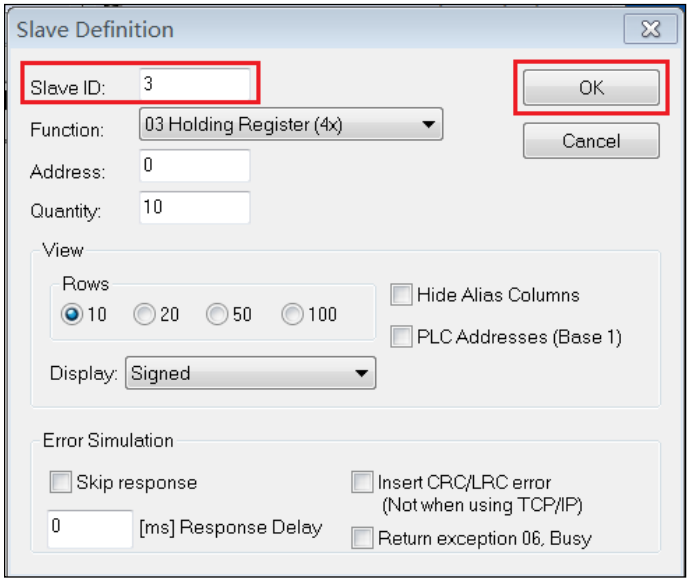
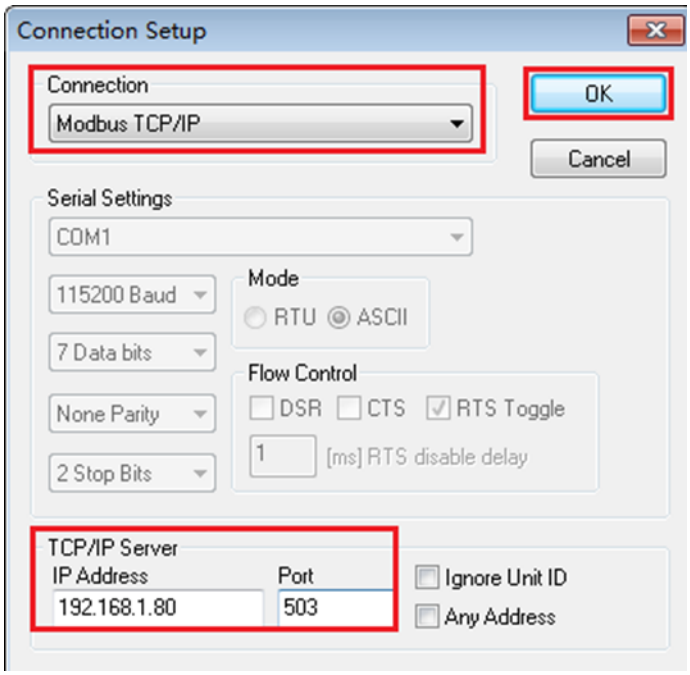
1. Run the “mbslave.exe” software, click "Setup> Slave Definition".
2. Enter "3" in the "Slave ID" text box.



3. Other parameters remain the default, click “OK”.
4. Click " Connection > Connection Setup ".
5. Click the "Connection" drop-down list box and select "Modbus TCP / IP".



6. Enter the TCP slave IP address "192.168.1.80" in the "IP Address" text box of the "TCP / IP Server" area.
7. Enter the TCP slave port number "503" in the "Port" text box of the "TCP / IP

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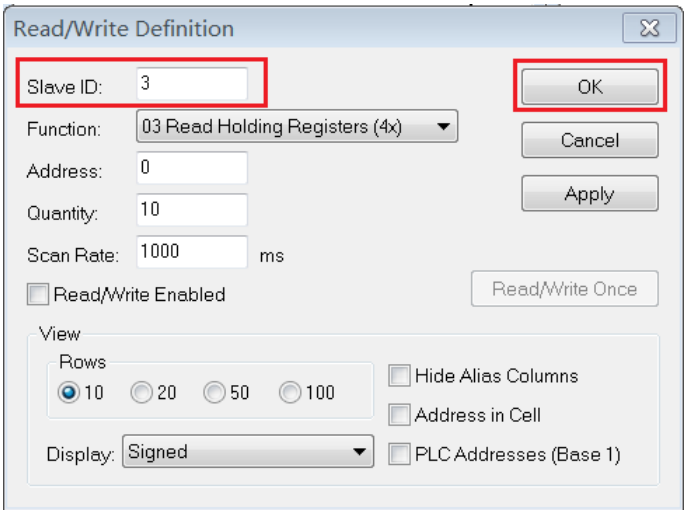
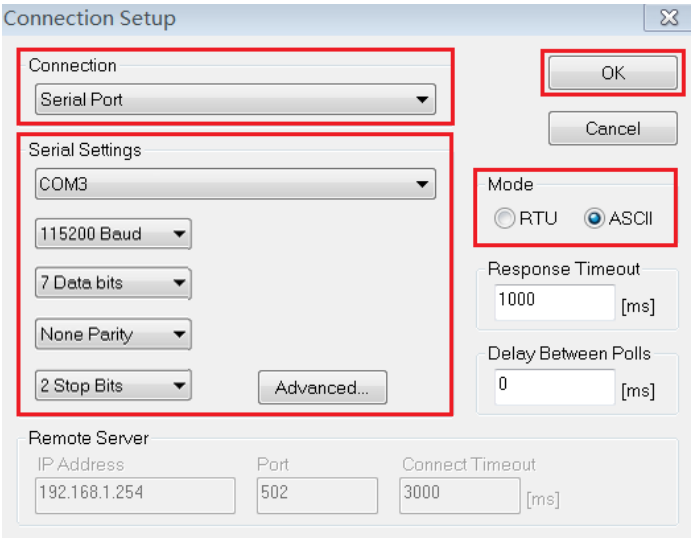
Server" area.

8. Other parameters remain the default, click "OK".
9. Run the “mbpoll.exe” software, click "Setup> Read / Write Definition".
10. Enter "3" in the "Slave ID" text box.



11. Other parameters remain the default, click “OK”.
12. Click " Connection > Connection Setup ".
13. Click the "Connection" drop-down list box and select "serial port".
14. In the "Serial Settings" option box, configure serial port information such as serial number, baud rate, data bit, parity bit and stop bit.



15. Select the "ASCII" mode in the "Mode" option.
16. Other parameters remain the default, click “OK”.

Step 6 Check the normal communication between the ASCII master and the TCP slave.

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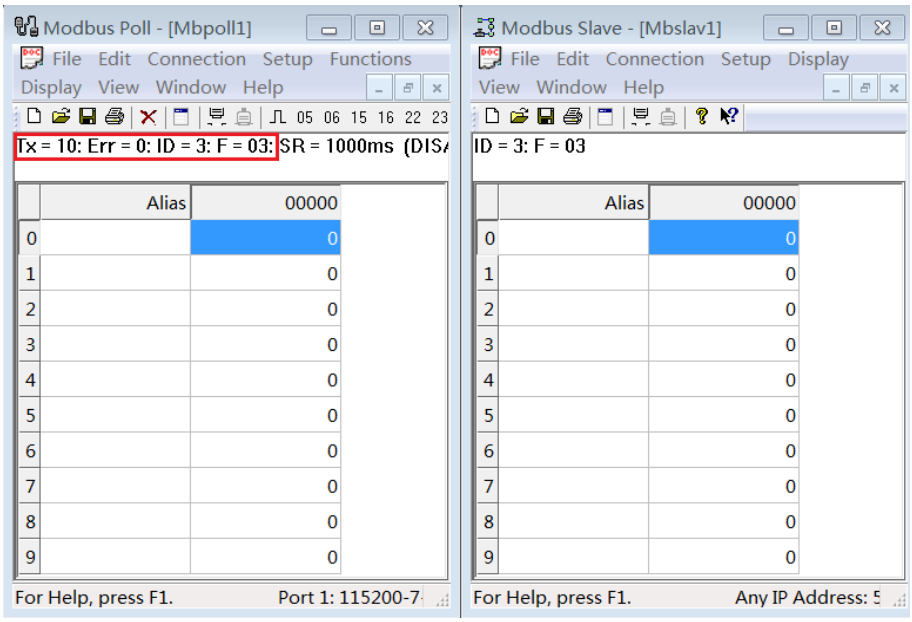

Port Communication

Port	TX	RX	TX Total	RX Total	CTS	DSR	RI	DCD	DTR	RTS
1	0	0	0	0	Off	Off	Off	Off	Off	Off
2	0	0	0	0	Off	Off	Off	Off	Off	Off
3	10	10	250	80	Off	Off	Off	Off	Off	Off
4	0	0	0	0	Off	Off	Off	Off	Off	Off

Step 7 End.

9.4 ASCII Slave Mode

Background brief

When the user needs to implement the Modbus TCP master device to communicate with the Modbus ASCII slave device, use the Modbus gateway device and set the device's operating mode to ASCII Slave.

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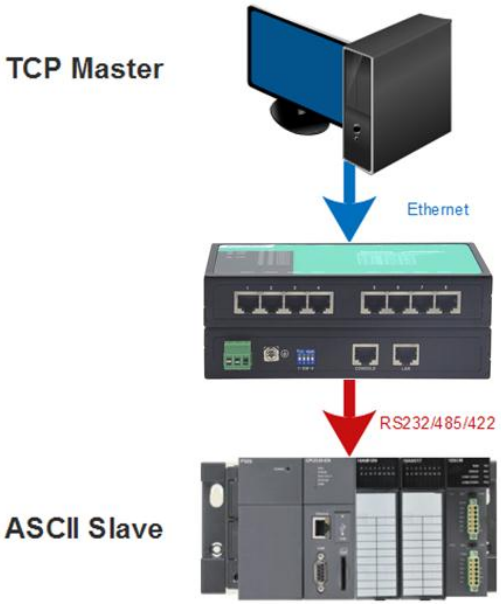


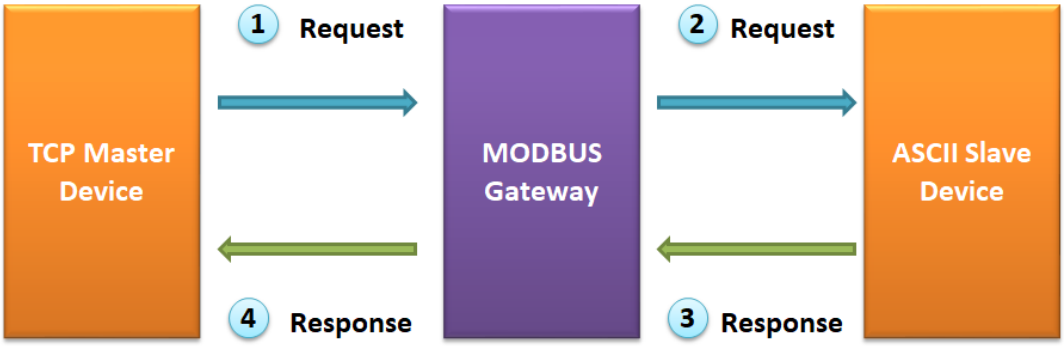
In ASCII Slave Mode, the TCP master device accesses the ASCII slave device through the gateway.

① TCP master device sends request to gateway;

② Gateway forwarding request to ASCII slave device;

③ ASCII slave device returns a response;

④ The gateway sends back the response.



The parameters of the TCP master are as follows:

- Slave ID: 4
- TCP Port: 503

The parameters of the ASCII slave are as follows:

- Communication port: COM 4
- Baud rate: 115200
- Parity bit: None
- Data bit: 7
- Stop bit: 2

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Operation steps

Note

The screenshot reference model for this manual is GW1108-8D (3IN1) Modbus. Other types of products in addition to supporting the serial type (RS-232, RS-422, RS-485), and the number of network ports and the number of serial ports are different, the interftions are the same.

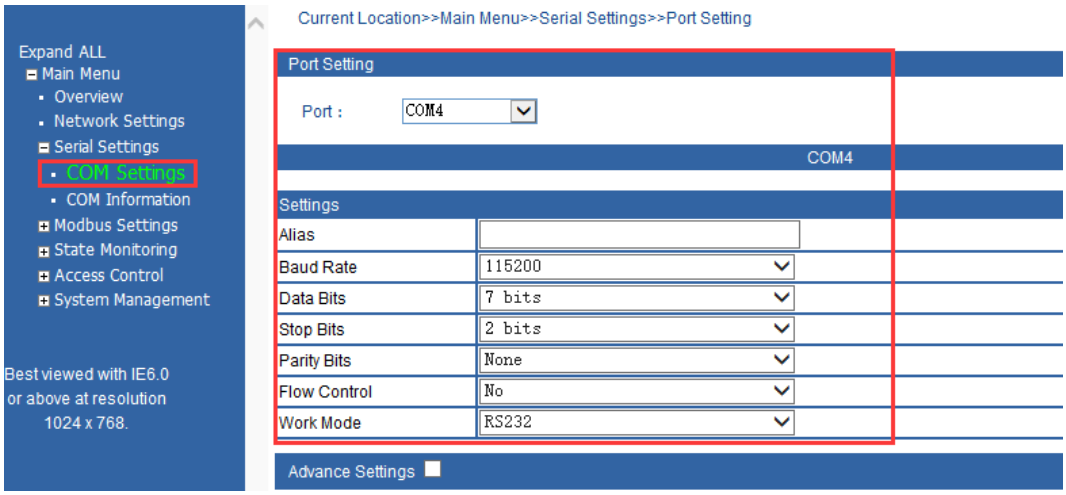
Step 1 Connect the COM serial port of the computer and the COM4 serial port of the Modbus gateway using a cable or a converter.

Step 2 Configure the IP address of the Modbus gateway.

1. Log in to the Web configuration interface and select "Main Menu > Network Setting".
2. In the "Use the following IP address" option box, enter the "IP address", "Subnet Mask" and "Gateway address" corresponding to the Modbus gateway.
3. Other parameters remain the default, click "submit".

Step 3 Configure the serial port parameter information.

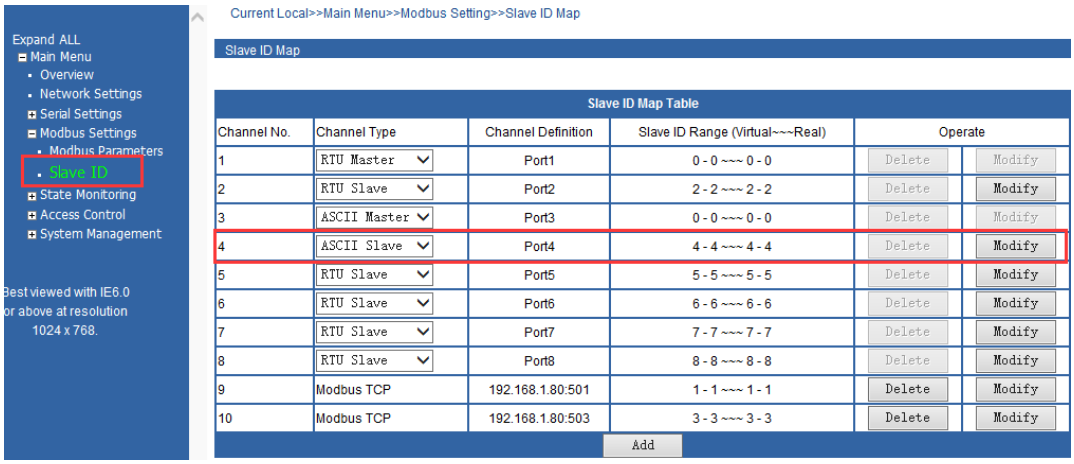
1. Log in to the Web configuration interface and select "Main Menu > Serial Settings> COM Settings".



2. Select "COM4" in the "Port" drop-down list.
3. Set the "BaudRate", "DataBits", "StopBits" and "ParityBits" in the "Settings" option box.
4. Other parameters remain the default, click "Submit".

Step 4 Configure the working mode of the Modbus gateway.

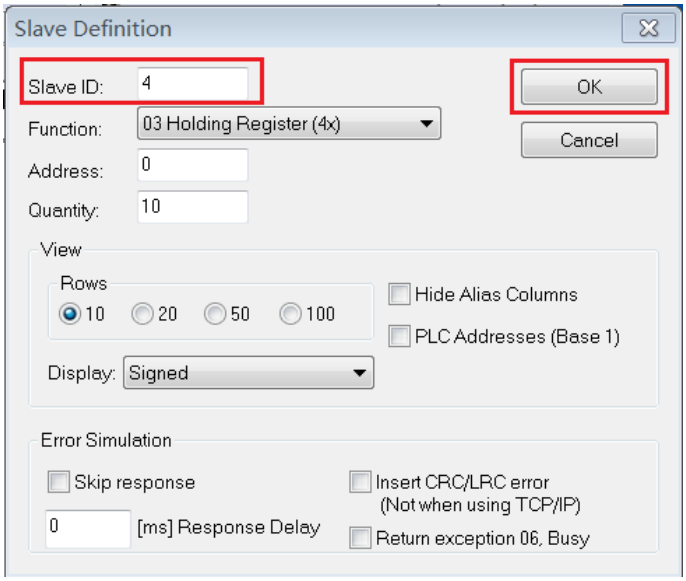
1. Log in to the Web configuration interface and select "Main Menu > Modbus Settings > SlaveID".
2. In the “Channel NO.” is 4, click the "channel Type" drop-down list box and select "ASCII Slave".



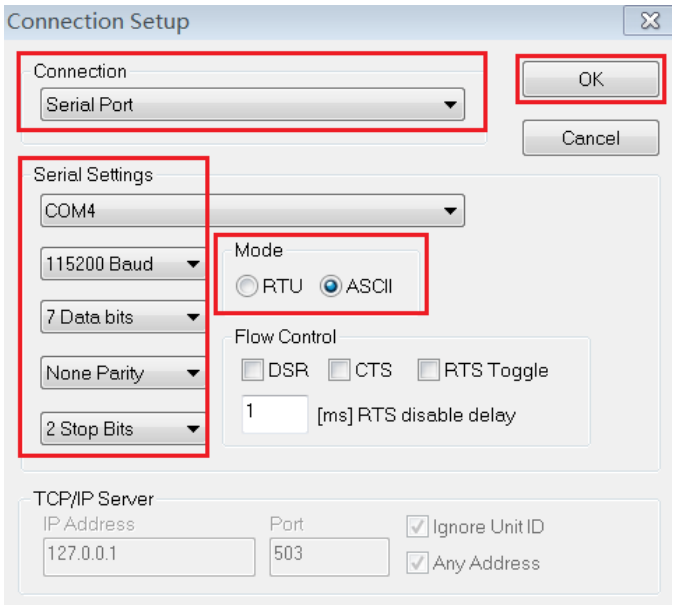
3. In the “Channel NO.” is 4, click the "Modify".
4. Enter "4" in the "Slave ID Start" and "Slave ID End" text boxes.
5. Enter "0" in the "Slave ID Offset" text box.
6. Click "OK".
7. Save the configuration, click "Submit".

Step 5 Run "mbpoll" and “mbslave” software to simulate master and slave configuration.

1. Run the “mbslave.exe” software, click "Setup> Slave Definition".
2. Enter "4" in the "Slave ID" text box.

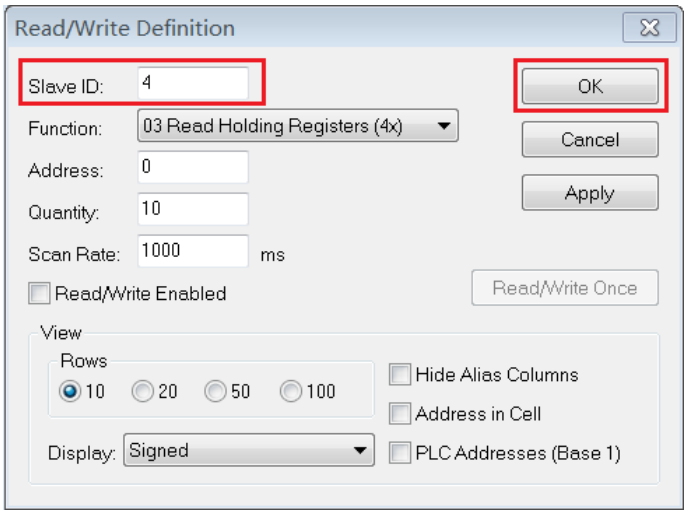


3. Other parameters remain the default, click “OK”.
4. Click " Connection > Connection Setup ".
5. Click the "Connection" drop-down list box and select "serial port".
6. In the "Serial Settings" option box, configure serial port information such as serial number, baud rate, data bit, parity bit and stop bit.

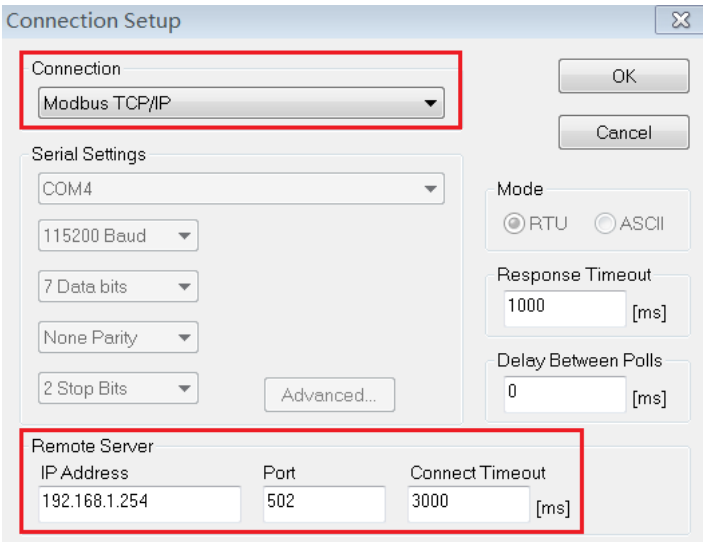


7. Select the "ASCII" mode in the "Mode" option.

8. Other parameters remain the default, click “OK”.
9. Run the “mbpoll.exe” software, click "Setup> Read / Write Definition".
10. Enter "4" in the "Slave ID" text box.

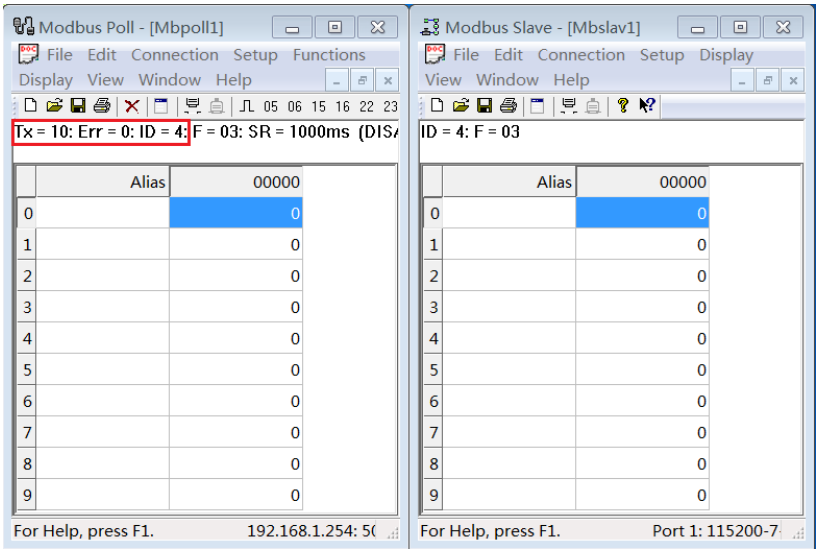


11. Other parameters remain the default, click “OK”.
12. Click " Connection > Connection Setup ".
13. Click the "Connection" drop-down list box and select "Modbus TCP / IP".



14. In the “Remote Server” check box, configure the Modbus gateway IP address, port number, and connection timeout.
15. Other parameters remain the default, click "OK".

Step 6 Check the normal communication between the TCP master and the ASCII slave.



Port Communication

Port	TX	RX	TX Total	RX Total	CTS	DSR	RI	DCD	DTR	RTS
1	0	0	0	0	Off	Off	Off	Off	Off	Off
2	0	0	0	0	Off	Off	Off	Off	Off	Off
3	0	0	0	0	Off	Off	Off	Off	Off	Off
4	10	10	170	510	Off	Off	Off	Off	Off	Off

Step 7 End.

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10 Customer case

Modbus gateway has been successfully used in many industries, to solve many problems of industrial communications, to meet customer demand for high cost. We have a number of successful customer case, if you do not find the same case, does not represent our MODBUS gateway product is not suitable for you, please contact customer service. We do our best for your service!

In the case, the old control system of the client contains a plurality of subsystems built on the serial port, and in each subsystem, a serial master directly controls the serial port slave device, as shown below:

Use TCP Master instead of serial port Master, in this case, the customer's old control system contains multiple subsystems that are based on the serial port. Each subsystem, a serial Master station directly controls the serial Slave device, such as below:

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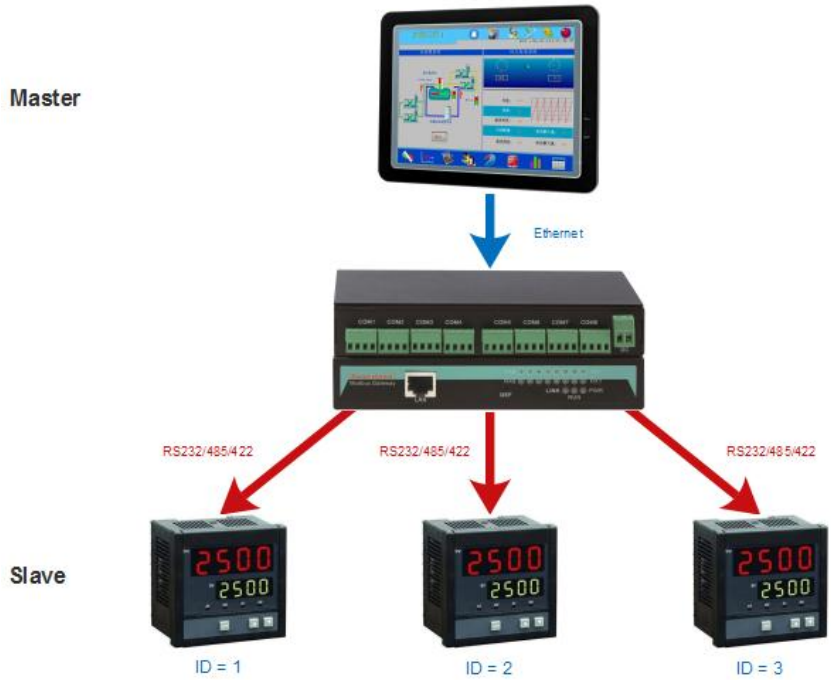
The new system using the Modbus gateway is connected to each of the serial Slave devices, so the Ethernet SCADA can control them. But Slave ID in the network cannot be duplicated, so some devices need to change the ID so that the network can identify them.



Use TCP Master instead of serial port master, do not change the original device Slave ID

In the previous case, some devices use a fixed ID that can not be changed. The access network requires a multi-port Modbus gateway and uses the Virtual Slave ID. The new system is easy to use.

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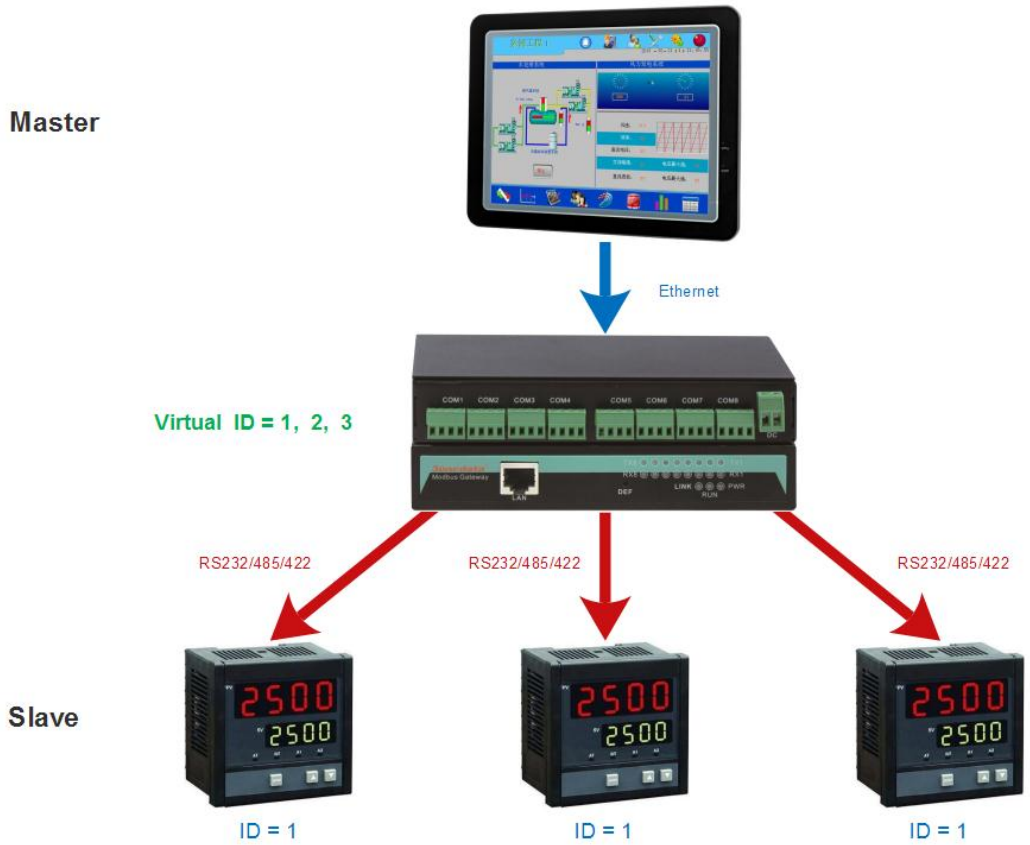

Reserved serial port Master, at the same time to join TCP Master

In this case, the serial port Master requires the direct control device, and the waiting time is short, it is unable to be replaced.

Simultaneous integration Modbus RTU, Modbus ACSII, Modbus TCP

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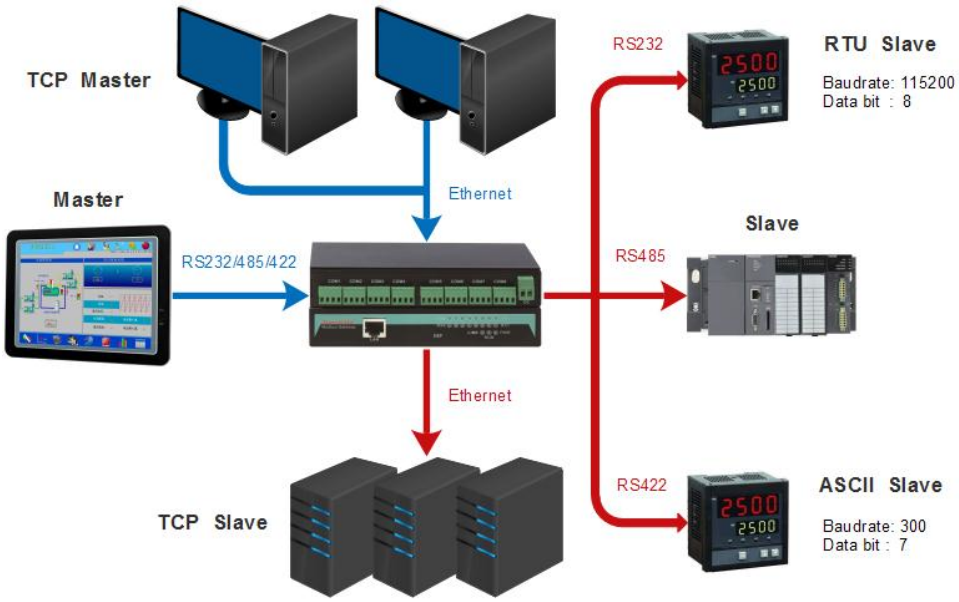
There are numerous and mixed type equipment in the factory, which has the type of mixed type equipment, the instrument, the manufacturing machine and the PLC controller. To integrate these devices into the network, it takes into account a variety of factors, including different communication parameters, different protocols. Modbus gateway equipment has a powerful function, allowing the integration of a variety of different Modbus systems, supporting a variety of communication methods and protocols.



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Part Two: Principle

11 Modbus Overview

About This Chapter

Connect	Hyperlink
This Chapter	11.1 Protocol implementation 11.2 Master and slave working state diagram 11.3 Modbus communication principle 11.4 Transmission mode 11.5 Modbus basic architecture diagram

11.1 Protocol implementation

The MODBUS Serial Line protocol is a Master-Slaves protocol. At the same time, only one master node is connected to the bus, and one or more child nodes (the maximum number is 247) are connected to the same serial bus.A MODBUS communication is always initiated by the master. The slave nodes will never transmit data without receiving a request from the master node. The slave nodes will never communicate with each other. The master node initiates only one MODBUS transaction at the same time.

The master node issues a MODBUS request to the slave nodes in two modes:

- Unicast modeBroadcast mode

The serial link diagram of master and slave is as follows:

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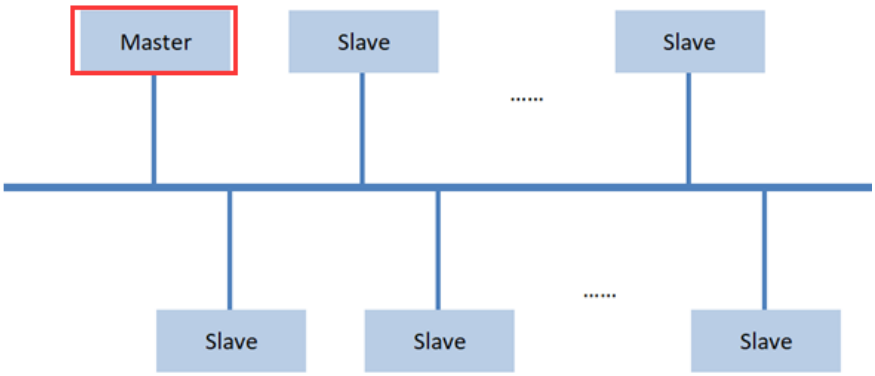
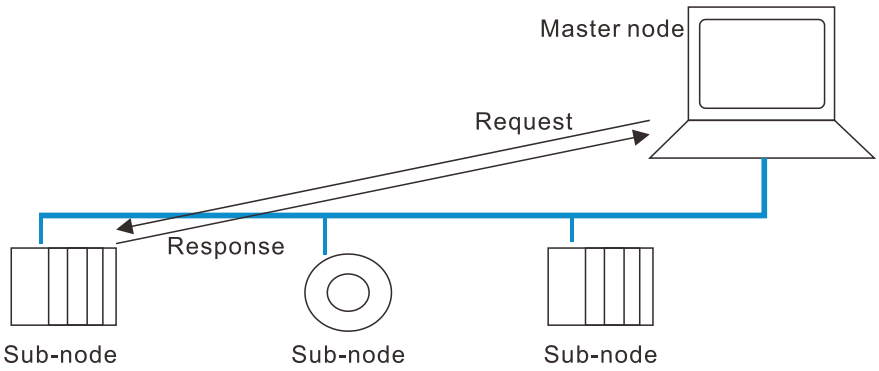
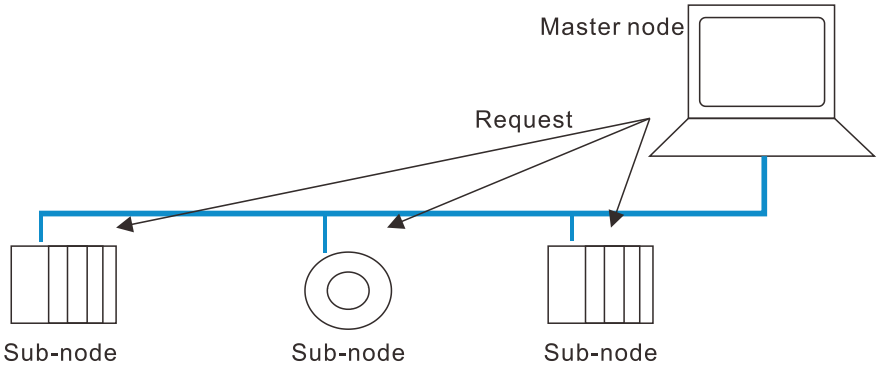


Multipoint structure diagrams in unicast mode are as follow:



Multipoint structure diagrams in broadcast mode are as follow:



11.2 Master and slave working state diagram

Master working state diagram is as follow:

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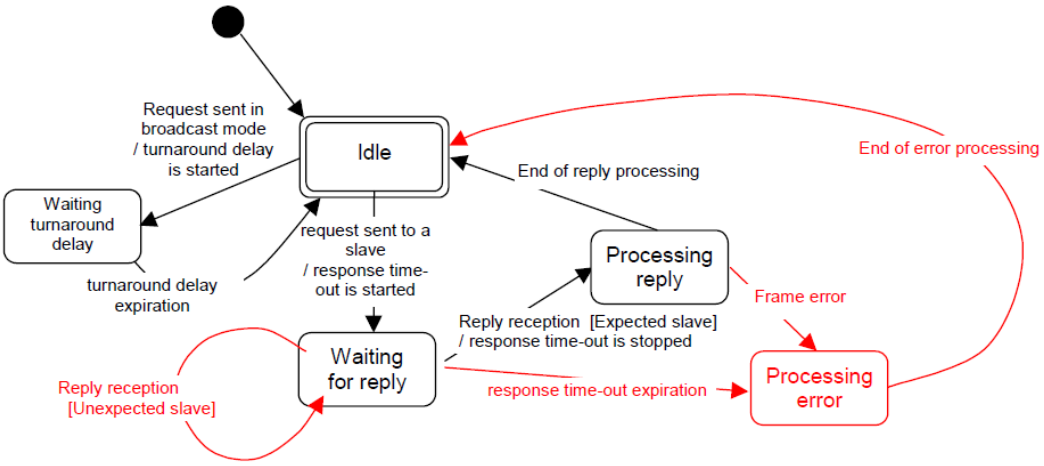
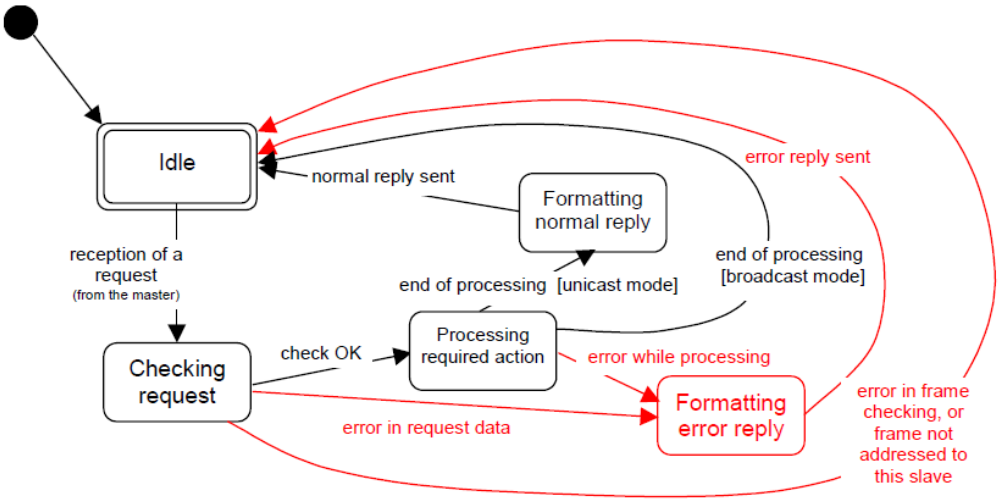


Slave state diagram is as follows:



11.3 Modbus communication principle

Modbus protocol is a client / server application layer protocol, the communication process follows the following process:

- The client sends a request to the server。
- The server analyzes and processes the client requests，and sends the results to the client.
- If an error occurs, the server will return an exception code to the client

The client sends additional information to the message data field sent by the server to the server device, and the server uses this information to perform the operation of the function code definied. If there is no error associated with requesting the Modbus function in a correctly received Modbus ADU, the response data sent by the server to

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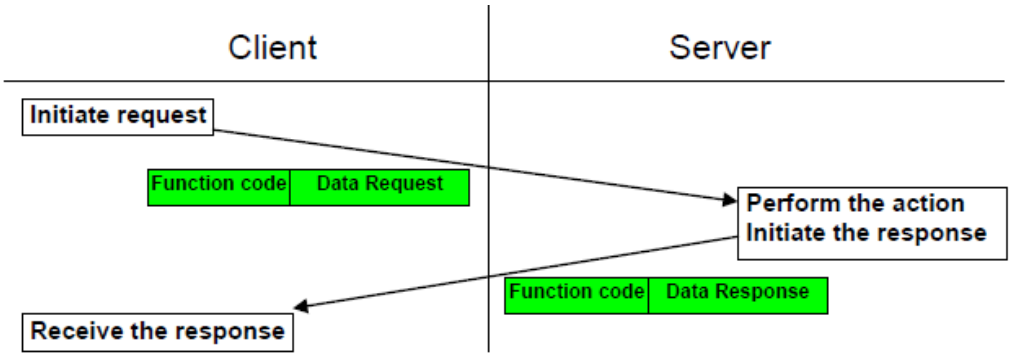
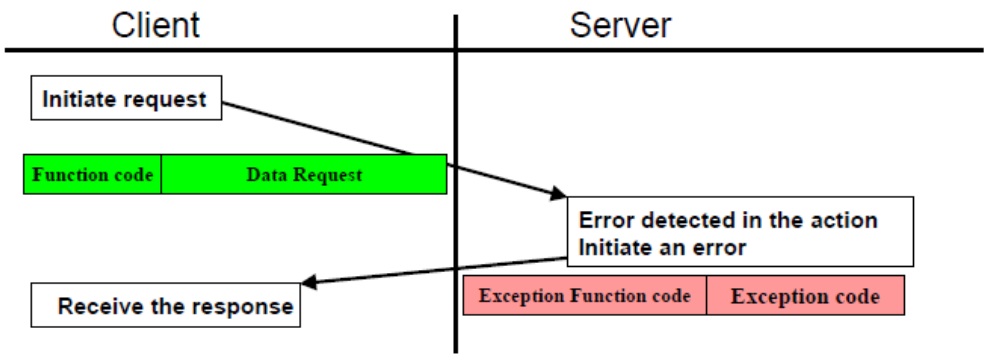
the client will include request data; If there is an error related to requesting a Modbus function, the message data field will include an exception code that the server application can use the code to determine the next operation.

- Operation when there is no error associated with requesting the Modbus function: After the host sends a data request, the slave receives the request and checks the check code successfully, indicating that the processing is error free. Slave operation excute the operation of the function code.



- Operation when there is any error associated with requesting the Modbus function:

  After the host sends the data request, the slave receives the request and verifies that the check code fails, indicating that the sending has an error. The slave returns the exception function code and the exception code.



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11.4 Transmission mode

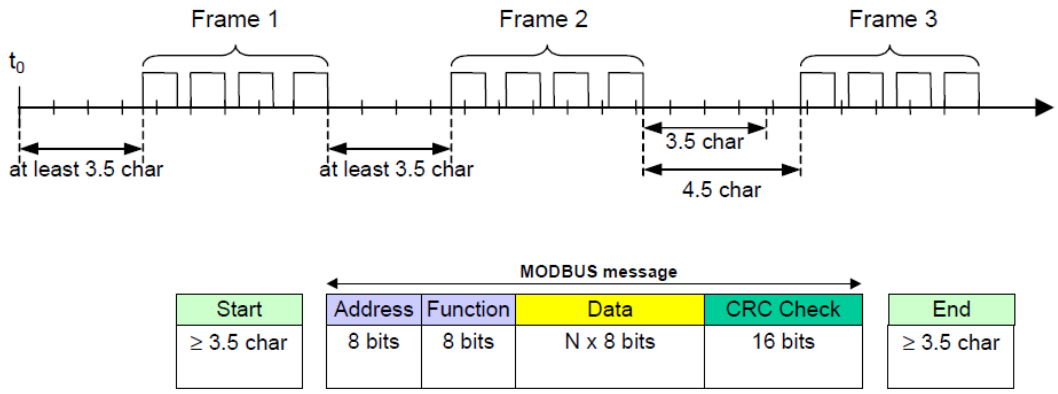
Modbus RTU

When devices communicate on a MODBUS serial line using the RTU (Remote Terminal Unit) mode, each 8–bit byte in a message contains two 4–bit hexadecimal characters.

Key Benefits: Higher data density, higher throughput rates at the same baud rate than ASCII mode, and more data.

Interoperability between Modbus devices only each device has the same mode RTU or ASCII, the default setting must be RTU mode.

The RTU message frame is as follows:



Modbus ASCII

When devices are setup to communicate on a MODBUS serial line using ASCII (American Standard Code for Information Interchange) mode, each 8–bit byte in a message is sent as two ASCII characters.

This mode is used when the physical communication link or the capabilities of the device does not allow the conformance with RTU mode requirements regarding timers management.

- Advantages: The time interval for sending characters can be up to 1 second without error.
- Disadvantages: Since one byte requires two characters, this mode is less efficient than RTU.

ASCII message frame is shown below.

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Start	Address	Function	Data	LRC	End
1 char :	2 chars	2 chars	0 up to 2x252 char(s)	2 chars	2 chars CR,LF

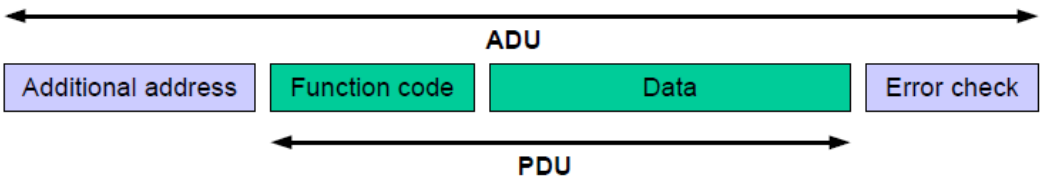
When using ASCII mode, each 8-bit byte in the message is converted to 2 ASCII characters for transmission. The main advantage of the ASCII mode is that the characters can allow up to 1 second intervals without error.

RTU and ASCII mode comparison

RTU and ASCII mode comparison		
Type	RTU	ASCII
Coding System	8-bit binary	Hexadecimal
	Two hexadecimal character contains 8-bits of data within each ASCII character of the message	One hexadecimal character contains 4-bits of data within each ASCII character of the message
Bits per Byte	1 start bit	1 start bit
	8 data bits	7/8 data bits
	Odd / even parity 1 bit	
	No odd / even parity check	
	If there is a odd / even parity check for 1 stop bits	
	If there is no odd / even parity check for 2 stop bits	
Error check	CRC	LRC

Modbus TCP

The Modbus protocol defines a simple protocol data unit (PDU) independent of the underlying communication layers. The mapping of Modbus protocol on specific buses or network can introduce some additional fields on the application data unit (ADU). General Modbus frame:



The Modbus application data unit is built by the client that initiates a Modbus transaction. The function indicates to the server what kind of action to perform.

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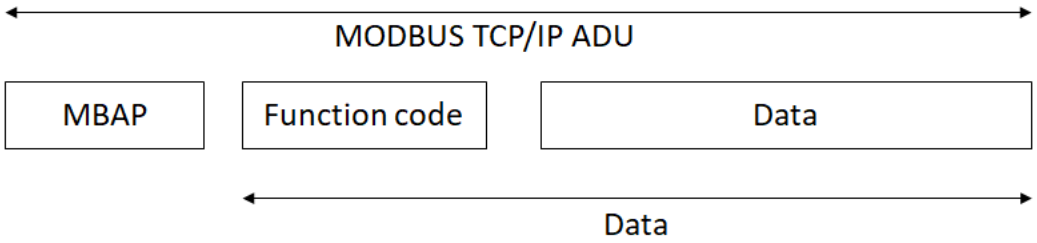
Modbus application data unit on TCP / IP

Modbus requests or responses in a Modbus TCP / IP network

Modbus request / response on TCP / IP



Use a special message header on TCP / IP to identify the Modbus application data unit. This header is called the MBAP header (Modbus protocol header).

This header provides some differences from the Modbus RTU application data units used on the serial link:

- Replace the Modbus slave address field commonly used on the Modbus serial link with a single byte unit identifier in the MBAP header. This unit identifier is used for communication of devices that use a single IP address to support multiple independent Modbus terminal units, such as bridges, routers, and gateways.
- Use the receiver to verify all the Modbus requests and responses by verifying the completion of the message. For a function code with a fixed length of the Modbus PDU, only the function code is sufficient. For a function code that carries a variable data in a request or response, the data field needs to include the number of bytes.
- When Modbus is carried over TCP, even if packets are divided into multiple packets, the additional length information is carried on the MBAP packet header so that the receiver can identify the message boundary. The presence of explicit and implicit length rules and the use of the CRC-32 error check code (on the Ethernet) will produce minimal undetected interference to the request or response message.

MBAP header description

The MBAP header includes the following fields:

Field	Length	Description	Client	Server
Transaction identifier	2 bytes	The identifier of the MODBUS request / response transaction	start up	The server is replicated from the received request
Protocol identifier	2 bytes	0 = MODBUS protocol	start up	The server is replicated from the

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				received request
Length	2 bytes	The number of bytes below	start up (request)	Server (response) start up
Unit identifier	1 byte	The serial number of the remote slave connected to the serial link or other bus	start up	The server is replicated from the received request

The message header is 7 bytes long:

- Transaction Identifier: Used for transactional pairing. In response, the Modbus server replicates the transaction identifier of the request.
- Protocol identifier: multiplexing within the system. The Modbus protocol is recognized by a value of 0.
- Length: The length field is the number of bytes in the next field, including the cell identifier and the data field.
- Unit identifier: Use this field for intra-system routing. Dedicated to communication over Modbus or Modbus + serial link slaves via a gateway between an Ethernet TCP-IP network and a Modbus serial link. The Modbus client sets this field in the request, and the server must return the domain with the same value in the response.

11.5 Modbus basic architecture diagram

Modbus Basic Architecture Figure is shown below:

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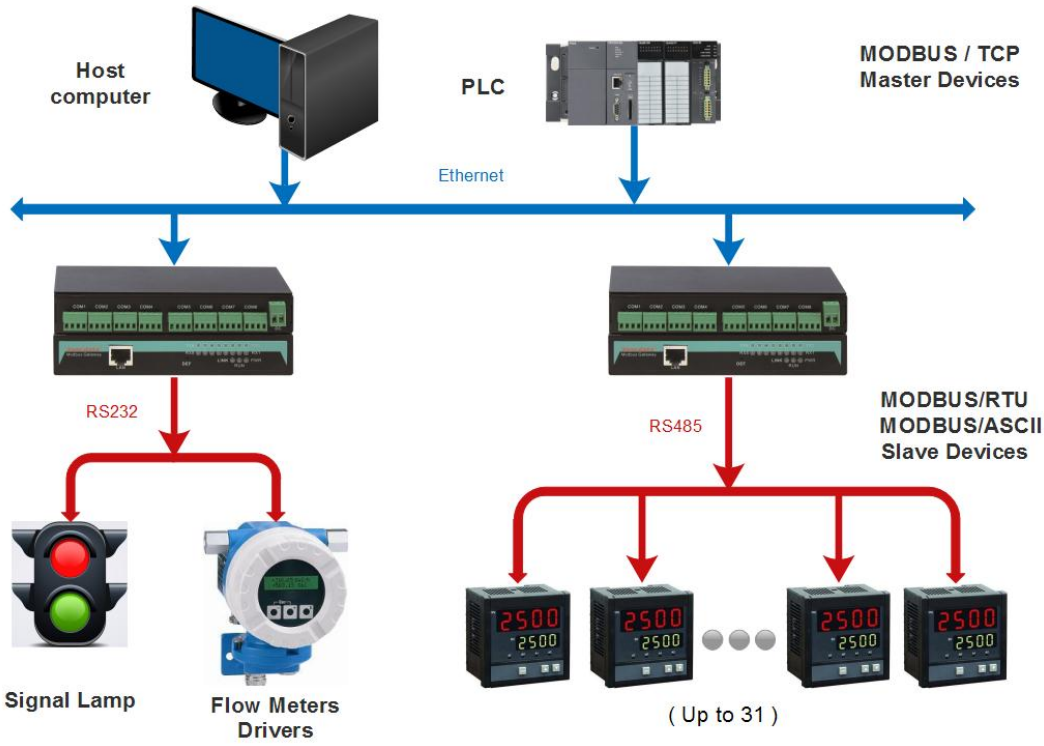
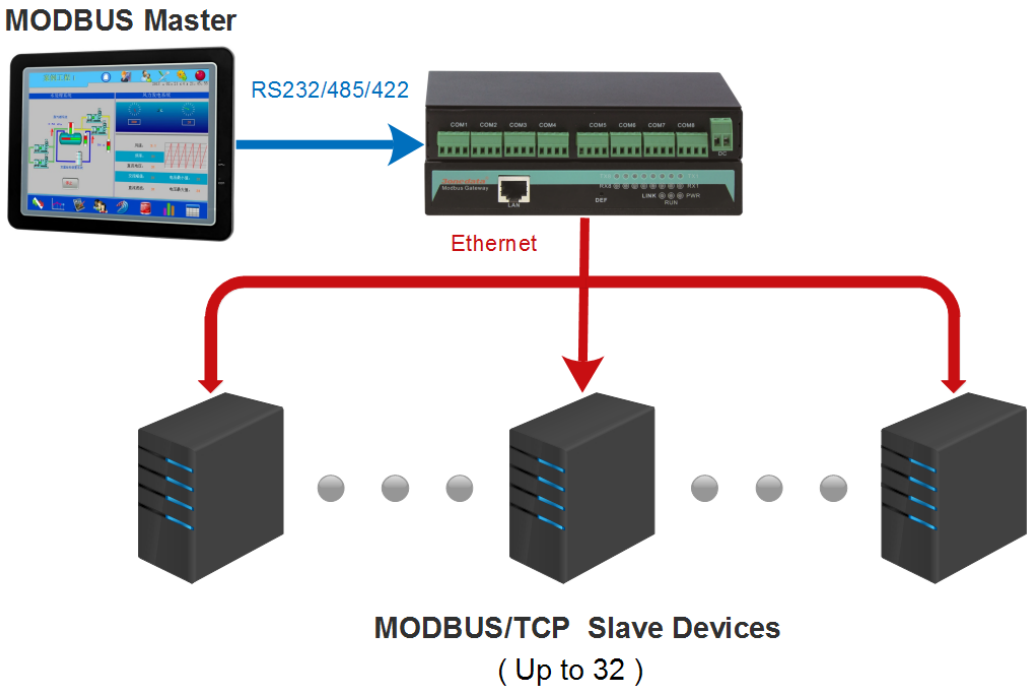


Modbus Basic Architecture Figure is shown below:



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12 Modbus Settings

About This Chapter

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12.1 Modbus parameter settings

Initial delay

When the Modbus gateway device is powered on, it will take a delay time to actually start Modbus. This parameter is because the Modbus slave device initialization time is relatively long, in order to avoid their initialization has not been completed before the request frame access, so the gateway set the initialization delay time to decide to initialize the time to issue the first request frame Delay.

TCP Modbus exception

This parameter is used to display Modbus TCP exception in Modbus monitoring software. The default gateway sends Modbus TCP exception to Modbus monitoring software.

Response timeout

Modbus is a master-slave protocol, the master access to the slave needs a response timeout, and this time is the gateway "response timeout." The parameters exist in the next figure in the ②, ③ between the steps. After the gateway forwards the request to the slave device, if the response of the slave device is not received within the

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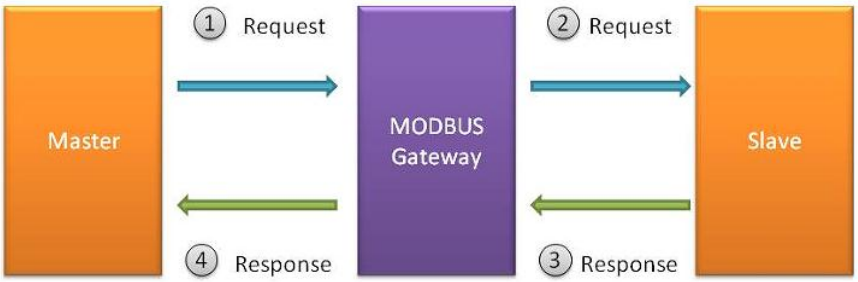
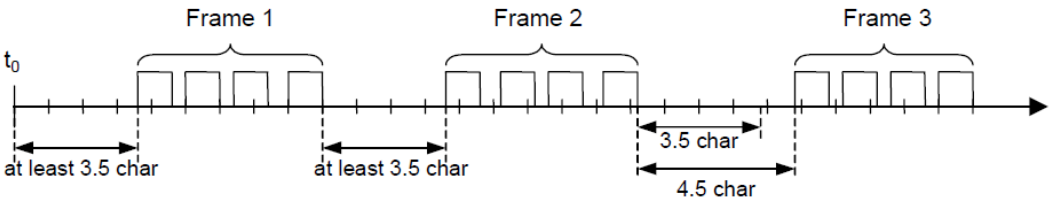
parameter time, it is a timeout response, and the abnormal response is sent back to the master device.



Inter-Character timeout

The character interval timeout is the time interval between a single character and the next character in a frame RTU message. When the value is 0, the default is 3.5T time, equal to 3.5 characters time. In some customer site, the serial device does not have FIFO cache, one by one to send and receive, take a long time, did not meet the Modbus protocol on the standard time. But the character interval allows customers to customize the time, compatible with poor time requirements for older devices.



Inter-Frame delay

That is, the current RTU response and the next RTU request between the time intervals, the default is 0ms. This function is to prevent the slave device from not being able to quickly process the RTU request and set the time interval for the RTU slave device to have sufficient time to process the request.

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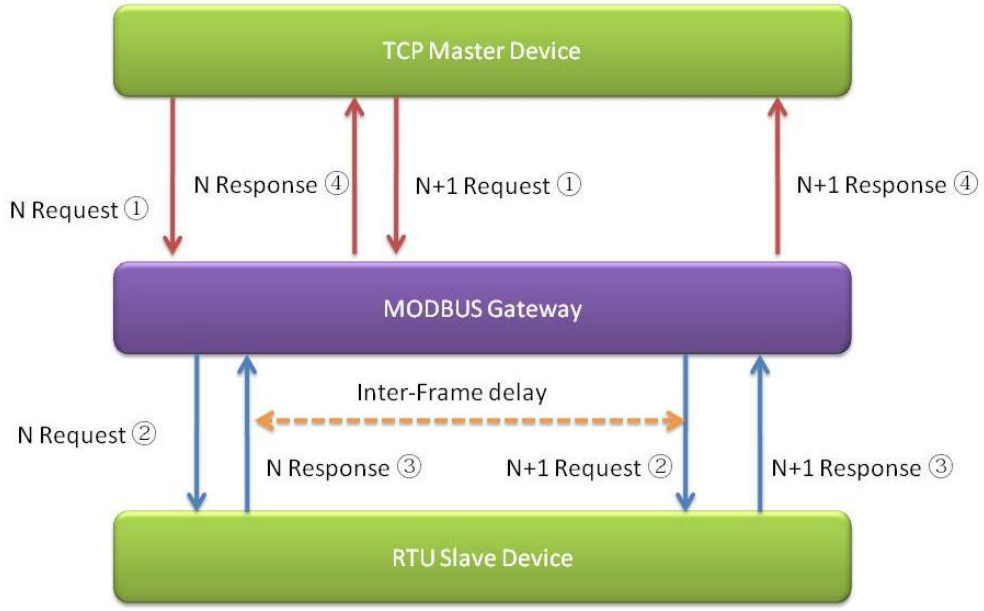
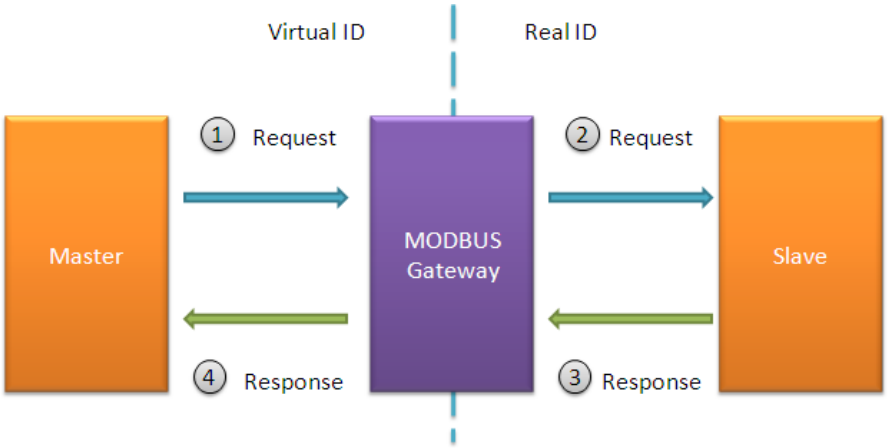


12.2 Slave ID Mapping

The Modbus protocol specifies that all slave devices must have a unique ID number (1 ~ 247). This ID number is used to identify the slave address in response to a request from the master device. Modbus device ID number is set by the manufacturer. In the Slave ID mapping, each slave device has two ID addresses that the virtual ID address and the real ID address. The real ID exists in the slave device, and the other device directly accesses the slave device via the real ID. The virtual ID exists in the gateway, the only access address of the slave device at the gateway, and the other devices indirectly access the slave device using the virtual ID through the gateway.

ID message processing flow:

- The master device uses the virtual ID to access the gateway;
- The gateway converts the virtual ID into a real ID to access the slave device;
- The slave device uses the real ID to send back the response;
- Gateway will be real ID converted into a virtual ID and then sent back to the response.



The gateway implements the function of ID mapping by setting the ID range and the ID offset. The ID range starts from the slave start ID to the slave end ID. Only channels with channel type slaves can be mapped, including serial port (RTU Slave or ASCII Slave) and TCP Slave.

Slave ID mapping formula is as follows:

"Virtual ID + ID Offset = Real ID"

The ranges of the Virtual ID and Real ID in the formula are 1 to 247.

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3onedata Co., Ltd.

Address: 3/B, Zone 1, Baiwangxin High Technology Industrial park, Nanshan District, Shenzhen, 518108 China

Tel: +86-755-26702668

E-mail: sales@3onedata.com

Fax: +86-755-26703485

Website: http://www.3onedata.com

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