

USER'S MANUAL

MODBUS Gateway

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1 Introduction

1.1 About the program

MODBUS Gateway is a utility that works as a software converter of MODBUS TCP protocol into MODBUS RTU or vice versa. It enables you to connect MODBUS TCP devices to systems or PLCs that can only work with MODBUS RTU. Protocol conversion is executed in real-time.

Our program allows you to save money and do without purchasing hardware converters. Using MODBUS Gateway on an intermediate server or embedded computer gives you a more flexible and scalable solution with multiple settings. At the same time, the program can process up to 256 connections via COM port.

Features:

- You can create many connections with different connection settings.
- When converting exchange protocols, the program can replace a MODBUS network address of the device according to the specified rules.
- When converting MODBUS TCP into MODBUS RTU, you can arrange simultaneous access of two MODBUS master devices to one MODBUS slave device.
- When converting RTU into TCP, the program allows you to specify which IP address to connect to for each MODBUS device.
- All network connections are optimized to work with MODBUS protocols at maximum speed.
- Data can be transmitted over TCP and UDP protocols both on the local network and over the Internet.
- On the Internet, the program can work with dynamic IP addresses using a domain name.
- You can also create local connections within a single computer.
- The program can automatically start as a service utility and run even before the user logs into the system.

Company website: <https://www.aggsoft.com/>

2 License, Registration and technical support

2.1 License

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Registered customers are entitled to free updates during one year from the date of purchase. It means that during one year you can download and install the latest registered versions of MODBUS Gateway from our site. If you don't want to purchase an updates, you can use the program forever; it will never expire, but you won't be able to use the latest version. If you purchased the software more than one year ago, you are no longer entitled to free upgrade and technical support; however, you can purchase an update to the latest version at a special, greatly discounted price, and this updates will allow you to have free updates and technical support for another year. The type of update license must match the type of your existing license.

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Should any term of these terms and conditions be declared void or unenforceable by any court of competent jurisdiction, such declaration shall have no effect on the remaining terms hereof.

If you do not agree to these conditions you should not install this software.

2.2 How to acquire a license

The unlicensed program works in the trial mode. The license key removes all limitations from the trial version and allows you to use our technical support for one year.

If you want to buy a program through the Internet visit the [order page](#) of our site. On this page you can get the newest information about the registration process, and also find an order link. After you have the form of order registration. Enter your personal information and choose the most convenient payment method for you. Further, you will get a notification and follow the notes in it.

You may find more information about our policies, payment terms and payment methods, frequently asked questions on our [web site](#).

2.3 Support

Technical questions	support@aggsoft.com
Common questions	info@aggsoft.com
Sales questions	sales@aggsoft.com

3 Limitations of the trial version

Limited version: You can use only one connection without any limits. The service mode is not available.

Licensed version: No limitations.

4 Installation

4.1 System requirements

CPU: Any CPU compatible with the modern Intel® x86 or x64 CPUs

Operating system: Windows 2000 Professional SP 4 and higher (all versions) x86 or x64.

CPU speed

Minimal: 1 GHz.

It is recommended: 1.5 GHz or higher.

However, our program can successfully operate even on some of the slower multi-core CPUs.

System memory

Minimal: 512 MB

Recommended: 1024 MB.

Free disk space: The program needs about 5 MB, but its system log will also occupy some disk space.

Special access requirements: You must have the administrator privileges to configure our software. These privileges are necessary to install and manage a kernel-mode driver for virtual serial ports.

4.2 Installation

If you are already using MODBUS Gateway, close it. If MODBUS Gateway is running as a service, temporarily stop the service via the Windows Control Panel.

If a beta version of MODBUS Gateway is installed on your computer, uninstall it.

Launch the installation file.

During the installation, follow the installation wizard's instructions.

By default, MODBUS Gateway will be installed to the "C:\Programs Files\MODBUS Gateway" folder on your system disk, but you can select a different path.

After installing MODBUS Gateway, configure it step by step as described [below](#).

5 MODBUS Gateway

5.1 Introduction

As soon as the program is launched, the program's main window will open (Fig. 1). The main window has the following elements:

1. **Main Menu** - these are menu commands which are described in the Menu section of this help file;
2. **Connections** - contains a list of created connections and their respective statuses.
3. **Start-up mode** - allows you to enable and configure an automatic start of MODBUS Gateway at Windows startup. When the program starts, the necessary virtual ports will be automatically created.

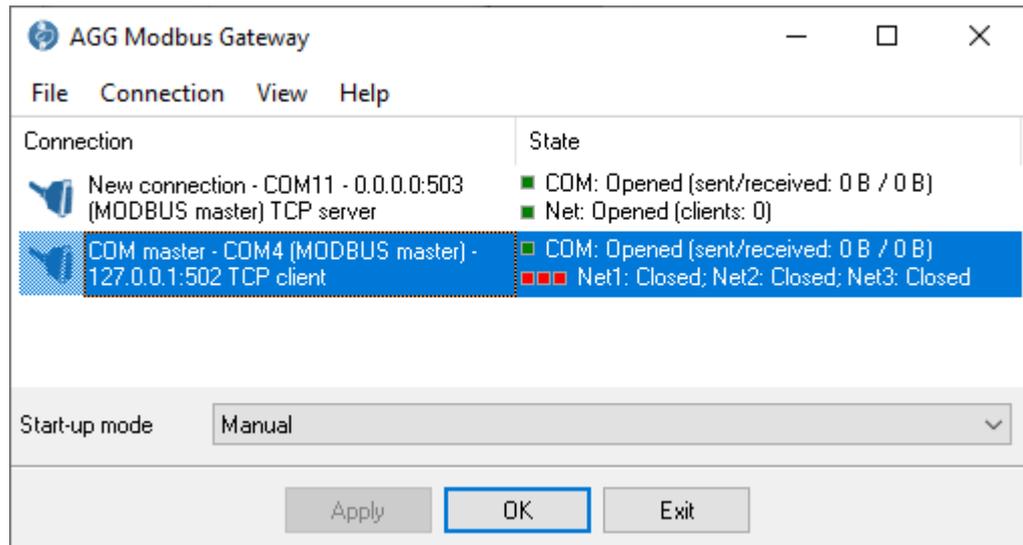


Fig. 1. The main window of the program.

Main menu

The main menu has the following items - File, Connection, View, and Help. Each item in these menus will be described below. Some menu functions can also be enabled using shortcuts (Hotkeys, see [this](#) Help section). See the corresponding keys and toolbar buttons mentioned in each menu item.

Connections

There are two columns in the list of connections. The left column displays the name and type of a connection, and the right column indicates the connection status and the number of bytes transmitted. The connection status is displayed as a color indicator:

- Green - connection is OK.
- Yellow - interim status (initialization, reconnection, etc.).
- Red - a problem occurred during the connection. Short information about the connection status is displayed in the program's main window, and detailed information is recorded in a log file with program messages.

Suppose the program is configured to convert MODBUS addresses to IP addresses. In that case, the program will create separate connections for these addresses and display a status icon for each additionally created connection.

Applying settings

All changes will be automatically applied after adding a new connection and clicking OK in the connection settings window.

Program shutdown

When you click OK or close the window by clicking on the cross in the upper right corner, the program will automatically hide into the taskbar and continue running in the background mode. To stop the program, you need to click Exit.

5.2 Connection menu

New

This menu item launches a simple wizard that helps to add a new connection.

Add

Keyboard: Ctrl+N

This menu item is used to create a new [connection](#).

Configuration

Keyboard: Ctrl+C

This command opens a window where you can change the parameters of a previously created connection. This menu item is only available when a connection from the list is selected.

Delete

Keyboard: Ctrl+X

This command will remove the selected connection from the list. The network connection will be closed, and the COM port will be vacated. This menu item is only available when a connection from the list is selected.

Delete All

The function completely clears the list of connections.

Reset Statistics

The command enables you to reset statistics about transmitted and received data on the selected connection.

5.3 View menu

Icons

In MODBUS Gateway, there are four options: Large Icons, Small Icons, List, and Table. In the table view, the status of the COM port and network connection are also displayed.

Auto arrange icons

The option helps to arrange icons to navigate easily.

5.4 File menu

New

This menu item launches a simple wizard that helps to add a new connection.

Open log file

This command opens a detailed log file with program messages that enables you to monitor the program's status when it is running in service mode or diagnose errors at the initial configuration stage.

A log file is created automatically and has the name "c:\ProgramData\Agg Modbus Gateway\modbusgateway.log". A log file size is limited to 10 MB.

5.5 Connection settings

The settings window (Fig. 2) appears when creating a new connection or editing parameters of an existing one. Please note that all configured connections run simultaneously.

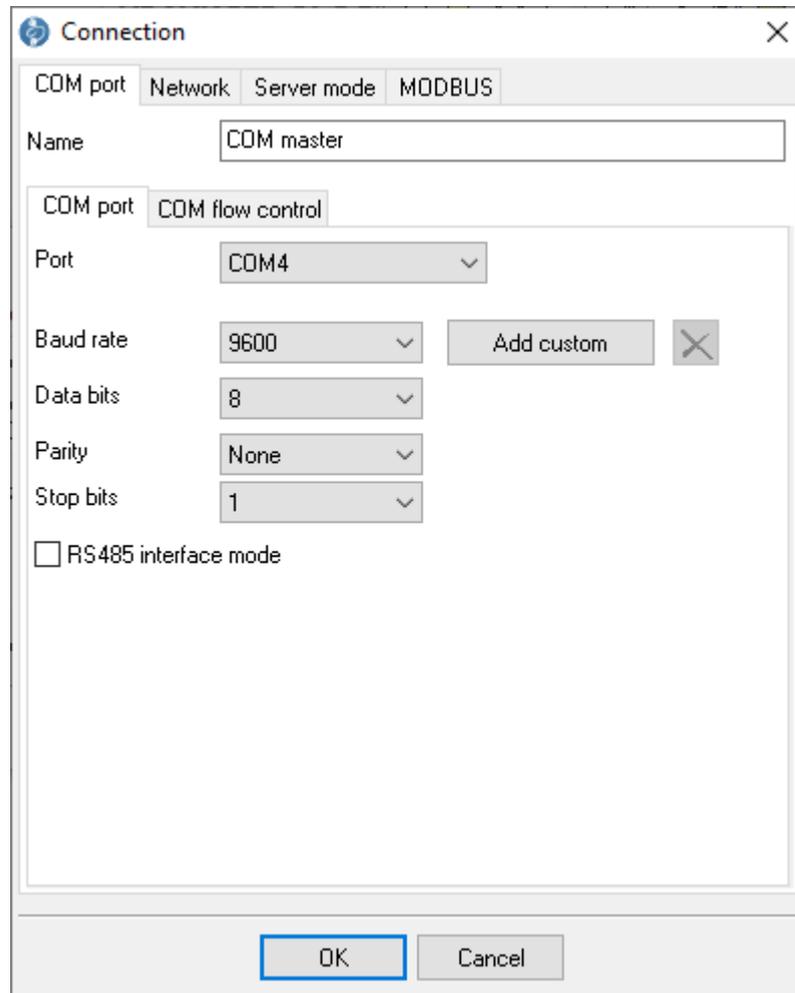


Fig. 2. Connection parameters.

COM port

Port - COM port number. You may select any port from the list. Note, however, that not all ports may exist in your operating system.

Parameters **baud rate**, **data bits**, **parity**, **stop bits** - these parameters are used to set data transfer rate, the number of data bits, bit parity mode, and the number of stop bits.

The Add button allows you to set your own customized data transfer rate. In the pop-up window, enter the rate value in bauds and click OK. That's how you add a new rate value to the list.

RS 485 interface mode - the option enables automatic control of the program by RTS signal. When transmitting data, the program will always keep this parameter enabled. This mode may be required when using external RS232-RS485 hardware converters.

Transmission control

The screenshot shows the 'Connection' dialog box with the following settings:

- COM port: Network, Server mode, MODBUS
- Name: COM master
- COM port: COM flow control
- Hardware data flow control:
 - Use DTR
 - Require DSR
 - Use RTS
 - Require CTS
- Initial state:
 - DTR high
 - DTR low to high
 - RTS high
- Software data flow control:
 - Type: None
 - Character that is sent to disable remote sending (Xoff): #13
 - Character that is sent to enable remote sending (Xon): #11
- Characters Xoff and Xon are entered in format #XX (where XX is character code Hex value)
- In/out buffers size (b): 5000, 5000

Fig. 3: Hardware flow control settings

Hardware flow control over data transmission

The group of parameters "Hardware control of data transmission" and "Initial state" (Fig. 3) define the operating mode with the corresponding RS232 interface lines. If all options in the "Hardware data flow control" group are disabled, then data transfer control will not be performed. You can combine settings to configure different modes of data transmission control.

When **Use RTS** or **Use DTR** options are enabled, the program will set these signals when an internal reception buffer is almost filled to the maximum.

When **Require CTS** or **Require DSR** options are enabled, the program will suspend data transmission once the corresponding signal is received from an external device.

Please note that control over data transmission using RTS and CTS is more common than using DTR and DSR and works only for the interface RS232.

Software flow control

Control over data transmission is performed by transmitting specially allocated bytes with codes specified in the settings.

Control over data transmission is enabled by selecting either "Transmit," "Receive," or "Both" in the field "**Type.**"

Xon - the command is issued when you need to start or resume data transmission.

Xoff - this command is used when you need to suspend data transmission temporarily.

During receipt of data, the program will issue Xon or Xoff commands when the internal buffer is filled up to 10% and 90%, respectively.

The program can receive these commands from an external device during transmission and start or pause data transmission.

In/out buffer size - allows you to set the size of the internal buffer of the program. Some COM port drivers may not support the default buffer size, and in this case, you need to set a smaller buffer size.

Network Settings

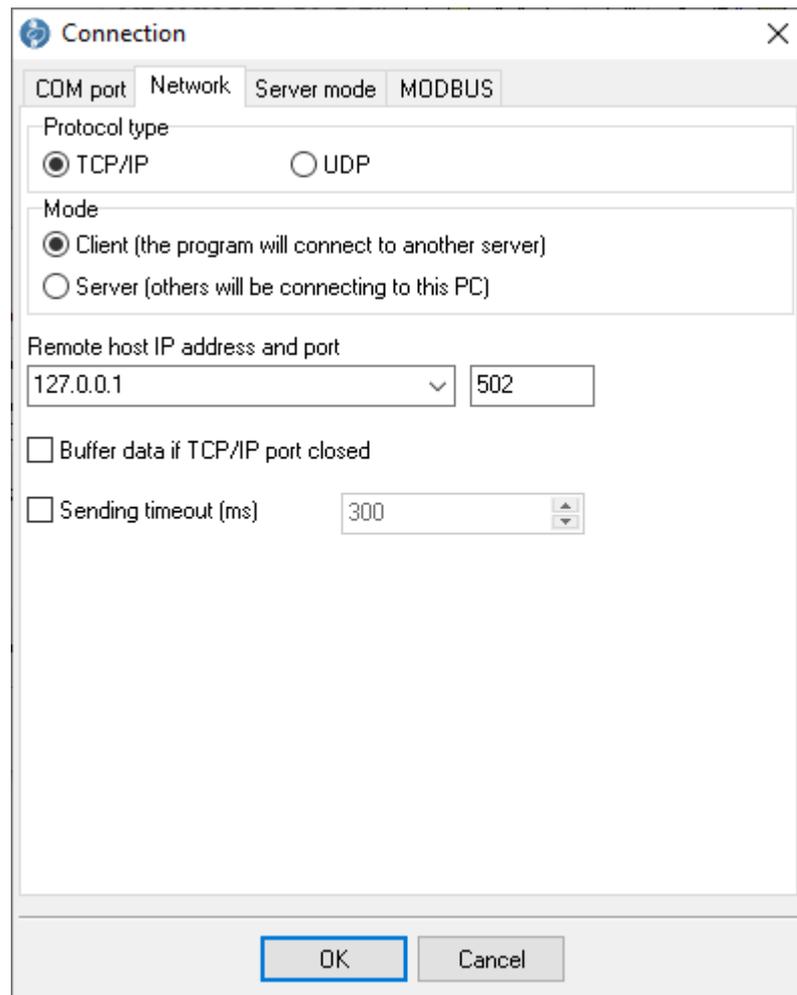


Fig. 4. IP Connection Setup.

Types of protocols

TCP is a proven and reliable protocol, probably the most widely used protocol in IP networks today. The advantage of the protocol is that it allows you to maintain and control connections between computers, and TCP also has internal means to control the integrity of transmitted data. However, the redundancy of transmitted data and the additional time required to establish a connection may be considered as a disadvantage of TCP. Most MODBUS TCP devices use TCP/IP protocol.

UDP is a connectionless protocol that does not require establishing a connection to transmit data. Similar to TCP, UDP works as the top layer of IP networks. However, unlike TCP, UDP does not facilitate data delivery and has no means of error control. But the protocol offers the possibility of direct sending and receiving data packets, allowing applications to monitor data integrity themselves and re-send data if necessary. For example, this feature is used in sending small-size broadcast packets. When using this protocol, the program works on the principle of "fire and forget".

Connection

Each MODBUS Gateway connection can work as:

1. **Client.** You need to specify the IP address and port of the remote computer on which the TCP/IP server is running and which you want to connect. The IP address you specify in MODBUS Gateway during configuration can also be a domain name (e.g., www.yourserver.com) or the computer's name on the local network. For example, if you want to connect to a computer with the "Plant1" name on a local network, you can type in "Plant1" in the IP address field instead of the IP address itself. This addressing type is useful when you configure MODBUS Gateway as a client, and IP addresses in your network are issued dynamically. In this case, it is more convenient to use a name instead of an IP address. The client mode is usually used when COM (MODBUS master) mode is selected in the "MODBUS" tab.
2. **Server.** In this mode, you must specify the IP address of the host computer with MODBUS Gateway. Suppose your computer has multiple network adapters or network interface cards. In that case, MODBUS Gateway will display a list of IP addresses for each network interface card (NIC) installed on your computer. Therefore, you should choose the IP address of the interface that you want to use. For MODBUS Gateway to work as a server, it is necessary to have at least one network card with an IP address assigned to it. In Microsoft Windows, TCP/IP protocol can be configured to obtain an IP address for a computer automatically. In this case, you need to contact the administrator and ask them to assign a static IP address to your computer and set this IP address to the selected network interface. Also, as an IP address, you can specify a special value of 0.0.0.0, which will mean that the program will listen to all IP addresses assigned to this computer. This mode is usually used when Network (MODBUS master) mode is selected in the "MODBUS" tab.

IP address and port - specify the address and port of the remote server (in client mode) or local IP address and port (in server mode).

Send timeout - allows you to set the time interval during which data will be "grouped" and sent as a single IP packet. It enables you to speed up data transfer if small portions of data are frequently received through the COM port.

Buffer data if TCP port is closed - when the option is enabled, the program puts all data received from the COM port into a temporary internal buffer, the size of which is set in the COM port tab. When the program restores a connection, it sends data from the buffer on a first-priority basis.

Server mode

This group of parameters (Fig. 5) is only applicable when a connection runs in server mode.



Fig. 5. Additional server parameters.

Max. clients - enables you to limit the number of clients simultaneously connected to the server. This option allows you to optimize the load on the server when multiple clients are connected, and zero value means that the number of connections is not limited.

Allowed IP addresses - This option is enabled in server mode and will enable you to define one or more addresses for which it is allowed to connect to the server. Connections from an IP address that is not listed will be rejected. This option is handy if you transmit data over an Internet connection or when the server is connected to a large corporate network. It is possible to specify multiple allowed addresses - one address in each line. If you leave the field empty, MODBUS Gateway will accept connections from all IP addresses.

Enable UPnP - this function enables UPnP mode, in which the program tries to detect a router on the network and send a command to redirect data for the configured server port to the local network address at which the program is running.

MODBUS Settings

This group of parameters (Fig. 6) allows you to select the mode of operation of a given connection and enable conversion of the addresses of MODBUS devices during protocol conversion.

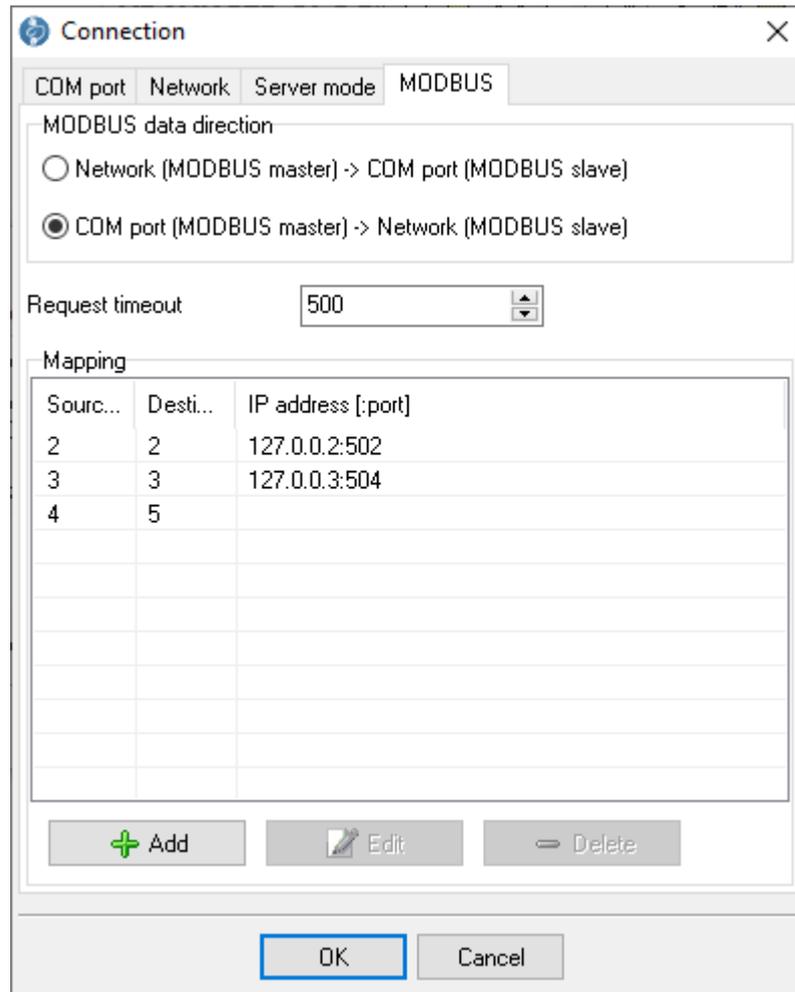


Fig. 6. Additional MODBUS parameters.

Network (MODBUS Master) - in this case, the master device running under the MODBUS TCP protocol will access one or more MODBUS RTU slave devices connected via the COM port.

In this mode, several master devices can connect to one slave device. In this case, the program will arrange requests to the slave in one queue and execute them sequentially, sending responses to the appropriate requester. Please note that the response time may increase significantly due to such a queue, and the master may not receive a response in the expected time.

Request Timeout value allows you to skip requests that have not been answered in a reasonable time and move on to the next request. The value of this parameter has to be selected in accordance with the running speed of your slave device.

COM port (MODBUS master) - the master device operating under the MODBUS RTU protocol will access one or more MODBUS TCP slave devices connected over the network via a COM port.

In this mode, it is possible to configure conversion of the source address in the MODBUS RTU request to the IP address and the address of the target device, but in the MODBUS TCP format (Fig. 7). If the target IP address is not specified, then the IP address from the Network tab will be used.

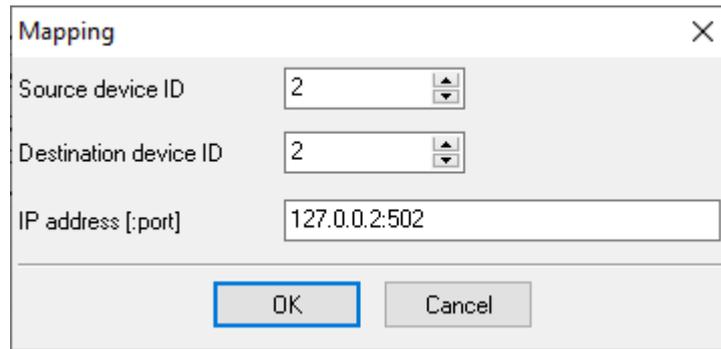


Fig. 7. Address Conversion.

For each new IP address, the program creates a new connection within the configuration. The program's main window also contains the status of every additional connection.

Possibly that conversion will not be required in your system. Then the program will simply convert MODBUS RTU exchange protocol into MODBUS TCP.

Example

A MODBUS TCP slave device is connected over the network has address 5, and the program is configured to convert address 4 into 5.

1. The master device will send a request to the slave device with address 4.
2. MODBUS Gateway will change the protocol type to MODBUS TCP and the address to 5.
3. The program thus redirects the request to the network connection.
4. The program will wait for a response from the device with address 5.
5. If the correct response is received within the time specified as Request Timeout, the program will perform reverse conversion of MODBUS TCP to MODBUS RTU.
6. The program will change the address from 5 to 4 and calculate a new checksum of the response.
7. It will return a response to the master device.