ENGLISH

Anybus® Communicator™ - Modbus RTU Server to Modbus TCP Client

USER MANUAL

SCM-1202-252
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Important User Information

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Table of Contents

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1. Preface

1.1. About This Document

This document describes how to install and configure Anybus® Communicator™.

For additional documentation and software downloads, FAQs, troubleshooting guides and technical support, please visit www.hms-networks.com/technical-support.

1.2. Document Conventions

Lists

Numbered lists indicate tasks that should be carried out in sequence:

1. First do this
2. Then do this

Bulleted lists are used for:

- Tasks that can be carried out in any order
- Itemized information

User Interaction Elements

User interaction elements (buttons etc.) are indicated with bold text.

Program Code and Scripts

```
Program code and script examples
```

Cross-References and Links

Cross-reference within this document: Document Conventions (page 1)

External link (URL): www.hms-networks.com

Safety Symbols

DANGER
Instructions that must be followed to avoid an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
Instructions that must be followed to avoid a potential hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION
Instruction that must be followed to avoid a potential hazardous situation that, if not avoided, could result in minor or moderate injury.

IMPORTANT
Instruction that must be followed to avoid a risk of reduced functionality and/or damage to the equipment, or to avoid a network security risk.

Information Symbols

NOTE
Additional information which may facilitate installation and/or operation.

TIP
Helpful advice and suggestions.

1.3. Trademarks

Anybus® is a registered trademark of HMS Networks.

All other trademarks are the property of their respective holders.

2. Safety

2.1. Intended Use

The intended use of this equipment is as a communication interface and gateway.

The equipment receives and transmits data on various physical layers and connection types.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

2.2. General Safety

CAUTION
Ensure that the power supply is turned off before connecting it to the equipment.

CAUTION
This equipment contains parts that can be damaged by electrostatic discharge (ESD). Use ESD prevention measures to avoid damage.

CAUTION
To avoid system damage, the equipment should be connected to ground.

IMPORTANT
Using the wrong type of power supply can damage the equipment. Ensure that the power supply is connected properly and of the recommended type.

3. Cybersecurity

3.1. General Cybersecurity

IMPORTANT
It is important to maintain the cybersecurity of the Communicator.

Before connecting the Communicator to a PLC, ensure the PLC is configured and installed in accordance with the PLC supplier hardening guidelines.

IMPORTANT
To physically secure networks and equipment and to prevent unauthorized access, it is recommended to install the equipment in a locked environment.

IMPORTANT
After completing the configuration of the Communicator, lock the security switch to prevent unauthorized access to the Communicator built-in web interface.

IMPORTANT
To avoid exposure of sensitive data, always perform a factory reset before decommissioning the equipment.

Factory reset will reset any on site made configuration changes and set the Communicator to the same state as leaving HMS production.

See Reset to Factory Settings (page 94).

3.2. Security Advisories

For cybersecurity reasons, stay informed about new vulnerabilities and follow the recommended actions.

HMS Networks Security Advisories includes information about our product vulnerabilities and available solutions.

You find our Safety Advisories at www.hms-networks.com/cybersecurity/security-advisories.

3.3. How to Report a Vulnerability

HMS Networks place the utmost importance on the security of our products and systems, however, despite all the measures we take, it cannot be excluded that vulnerabilities persist.

To report a potential vulnerability in an HMS product or service, please visit www.hms-networks.com/cybersecurity/report-a-vulnerability and follow the instructions.

3.4. Product Cybersecurity Context

3.4.1. Security Defense in Depth Strategy

The defense in depth strategy of the Communicator includes the following security measures:

- Secure Boot: Security standard used to ensure that the Communicator boots using only software that is trusted by HMS Networks.
- Signed firmware: HMS Networks delivers digitally signed firmware. Before the firmware file is imported into the Communicator, the firmware upgrade function performs a validation of the file, to ensure that is authentic.
- Security switch: Used to lock unauthorized access to the Communicator built-in web interface.
- The Communicator is intended to be installed in a Process Control Network (PCN) environment. See Level 1 in the Purdue Model (page 6).
- To physically secure networks and equipment and to prevent unauthorized access, the Communicator is intended to be installed in a locked environment.

3.4.2. Purdue Model

The Communicator is intended to be part of the process control network in Level 1 (E), to enable communication between PLCs or between a PLC and peripheral devices.

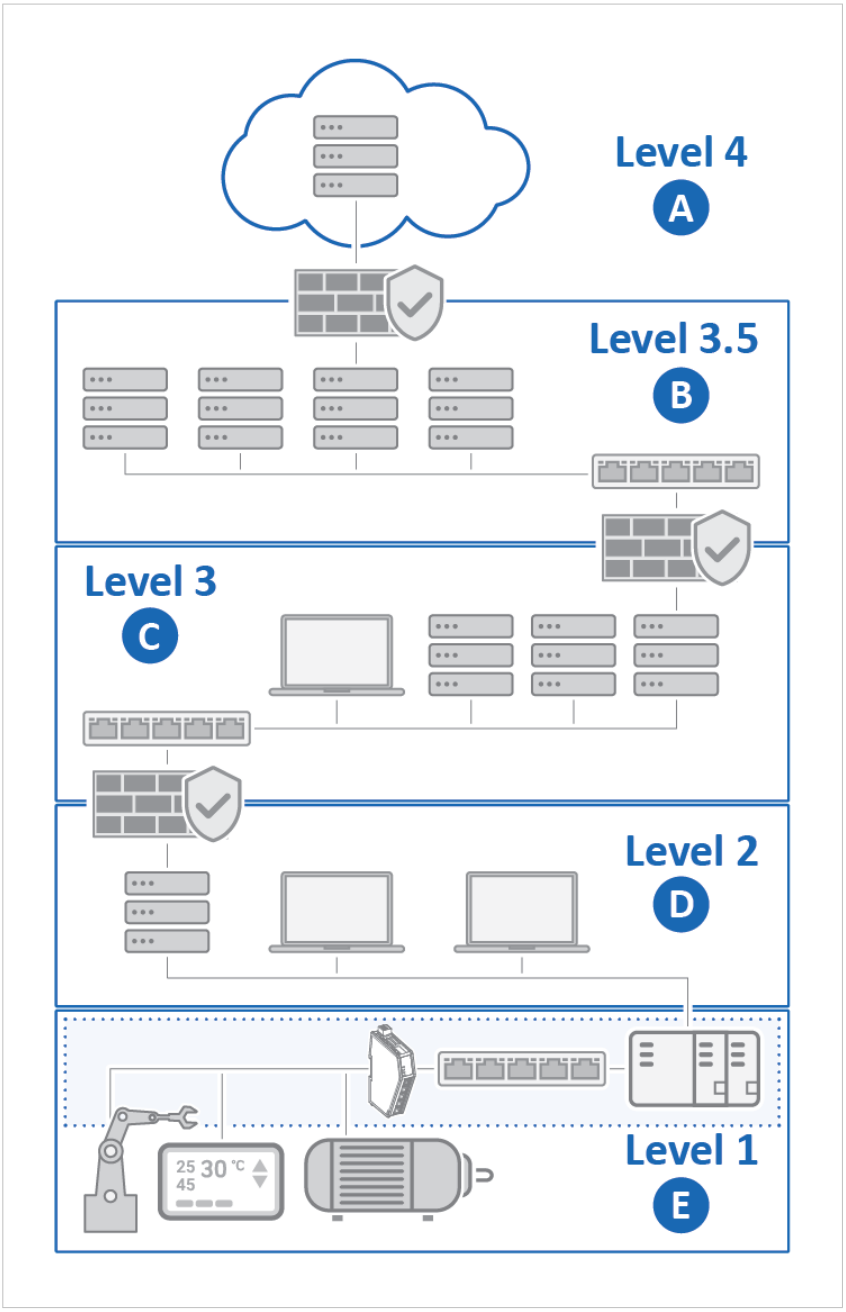


Figure 1. Purdue model, product security context

IT Network

A. **Level 4: Enterprise Network**
Example: Cloud solution, Business LAN (VPN)

B. **Level 3.5: Perimeter Network**
Example: Demilitarized Zone (DMZ)

OT Network

C. **Level 3: Advanced Control Network (ACN)**
Example: SCADA systems, Business control

D. **Level 2: Supervisory Control**
Example: Operator panels, Operator stations, Engineering stations

E. **Level 1: Process Control Network (PCN)**
Environment where the Communicator is installed
Example: Factory floor, Industrial product line

4. Preparation

4.1. Support and Resources

For additional documentation and software downloads, FAQs, troubleshooting guides and technical support, please visit www.hms-networks.com/technical-support.

TIP
Have the product article number available, to search for the product specific support web page. You find the product article number on the product cover.

4.2. Cabling

Have the following cables available:

- Power cable.
- Ethernet cable for configuration.
- 7-pin screw terminal block connector is included with the product.
- Ethernet cable for connecting to network.

4.3. Mechanical Tools and Equipment

Have the following tool(s) available:

Flat-head screwdriver, size 5.5 mm

Needed when removing the Communicator from DIN-rail.

Flat-head screwdriver, size 3 mm

Needed when connecting the cables to the 7-pin connector.

4.4. System Requirements

4.4.1. Supported Web Browsers

The Communicator built-in web interface can be accessed from the following standard web browsers.

- Google Chrome
- Microsoft Edge
- Mozilla Firefox

4.4.2. Supported Operating Systems

Operating System	Description
Windows 7 SP1, 32-bit	Windows 7 32-bit with Service Pack 1
Windows 7 SP1, 64-bit	Windows 7 64-bit with Service Pack 1
Windows 10 64-bit	Windows 10 64-bit
Windows 11 64-bit	Windows 11 64-bit

4.5. HMS Software Applications

Download the software installation files and user documentation from www.hms-networks.com/technical-support.

HMS IPconfig

Use the software application HMS IPconfig and scan your network to discover and change the Communicator IP address and to access the Communicator built-in web interface.

NOTE
As an alternative, you can set a static IP address within the same IP address range as the Communicator IP address on the computer accessing the Communicator built-in web interface.

NOTE
HMS IPconfig is only available for Windows.

4.6. Third-Party Software Applications

Microsoft Excel

Microsoft Excel, or equivalent software application that supports the Office Open XML Workbook (xlsx) file format. Needed to open and read the **Event log** file.

4.7. Software License Information

For license agreements regarding the third-party software used in the Communicator, refer to the *LICENSE.txt* file(s) included in the Communicator firmware update package zip file.

To download the Communicator firmware update package zip file, please visit www.hms-networks.com/technical-support.

TIP
Have the product article number available, to search for the product specific support web page. You find the product article number on the product cover.

5. About Anybus Communicator

5.1. Modbus TCP Client Communication

5.1.1. Modbus TCP Client Building Blocks

The following building blocks are used to describe the subnetwork communication.

Server

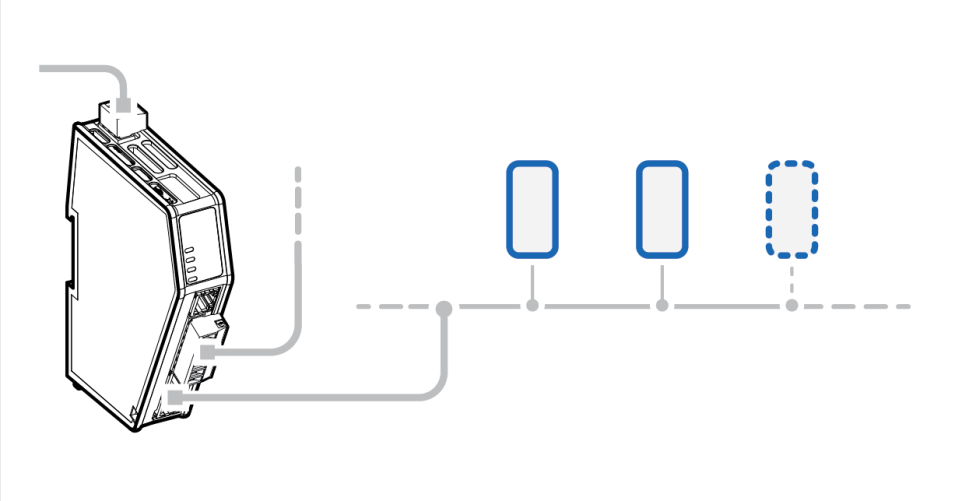


Figure 2. Servers on a Modbus TCP subnetwork

A server represents a single Modbus TCP device on the Modbus TCP subnetwork.

Servers and Transactions

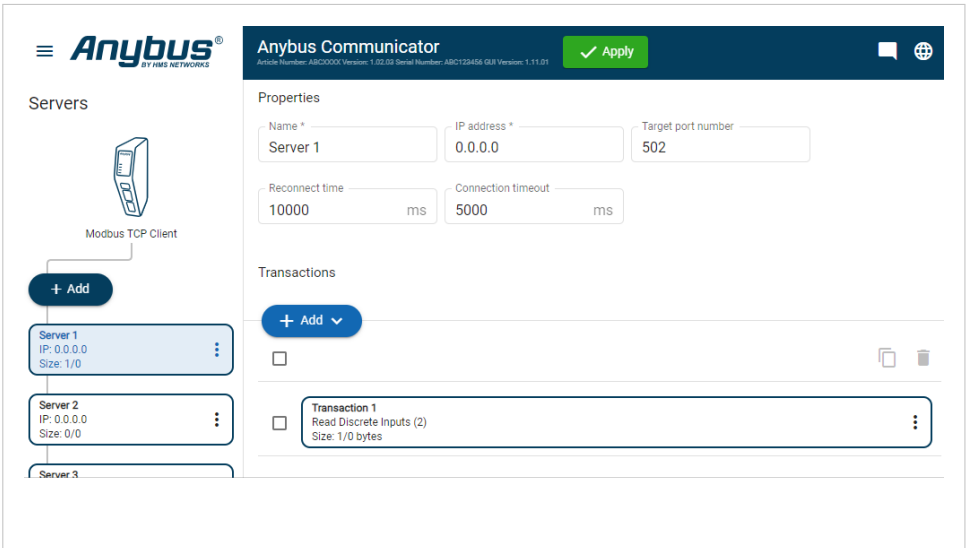


Figure 3. Server with Transactions

Transactions are based on standard Modbus transactions and define the data to be sent or received. See also (page 45).

Each transaction has a number of parameters that need to be configured to define how and when data is to be sent/received.

5.2. How the Communication Works

The Communicator enables communication, data exchange, between one or more server devices connected to a subnetwork and a client device connected to a high level network.

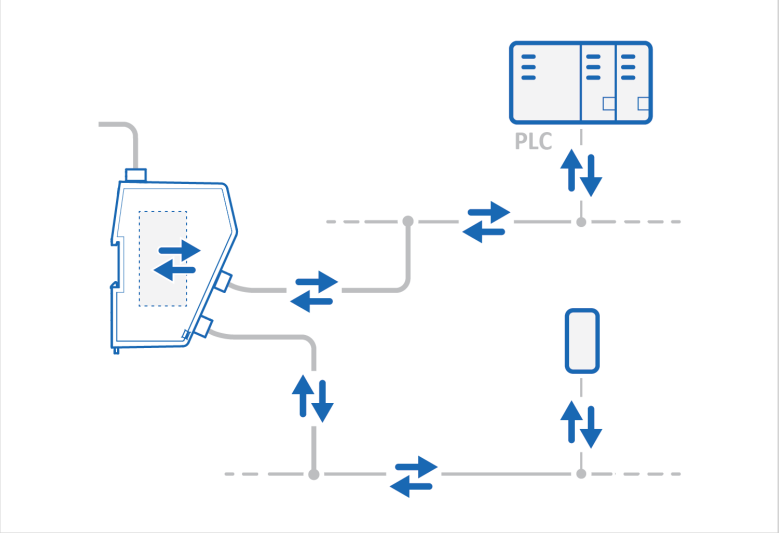


Figure 4. Process data traffic overview

For example:

- The client device can be a PLC controller or a PC.
- A server device can be a sensor, scanner, industrial robot, or sniffer.

The Communicator main task is to send the transactions that the server device(s) are configured to execute, in order to request and transfer process data.

Request Process Data

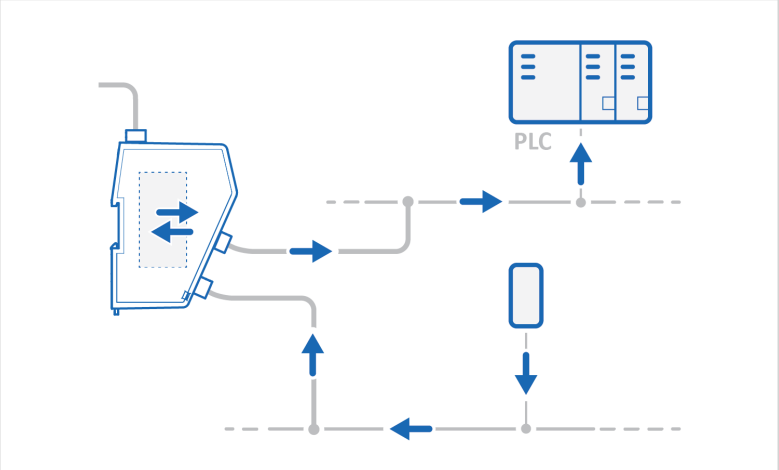


Figure 5. Process data traffic from servers to client

Request process data from the subnetwork nodes, specified in the Communicator configuration, and make the process data available on the server interface and for the high level network client device.

Transfer Process Data

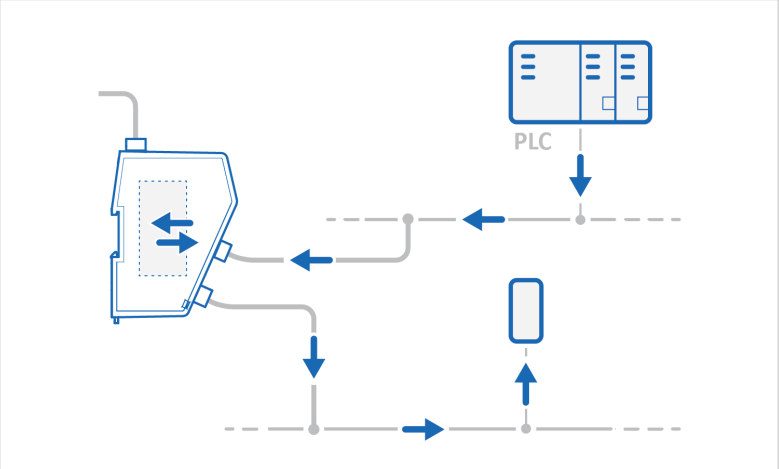


Figure 6. Process data traffic from client to servers

Transfer process data from the high level network client device and make it available on the server interface and for the subnetwork nodes included in the configuration.

5.3. How the Data Exchange Works

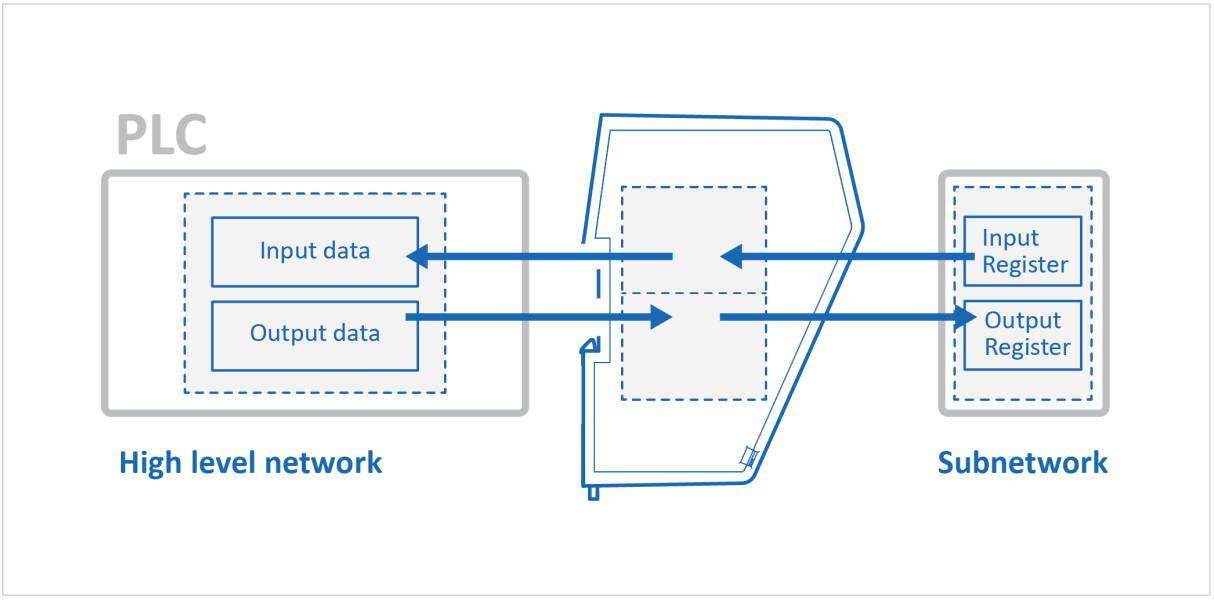


Figure 7. The Communicator internal memory areas

The data exchanged between the Communicator and the Modbus TCP Client subnetwork and the high level network resides in the Communicator internal memory buffer.

To exchange data with the Modbus TCP Client subnetwork, the high level network reads and writes data to the Communicator internal memory buffer.

The same memory locations are exchanged on the Modbus TCP Client subnetwork.

The memory locations are specified when configuring the Communicator using the Communicator built-in web interface.

Input Data

The Input data area is read by the high level network.

Output Data

The Output data area is read/written by the high level network.

6. Installation

6.1. External Parts

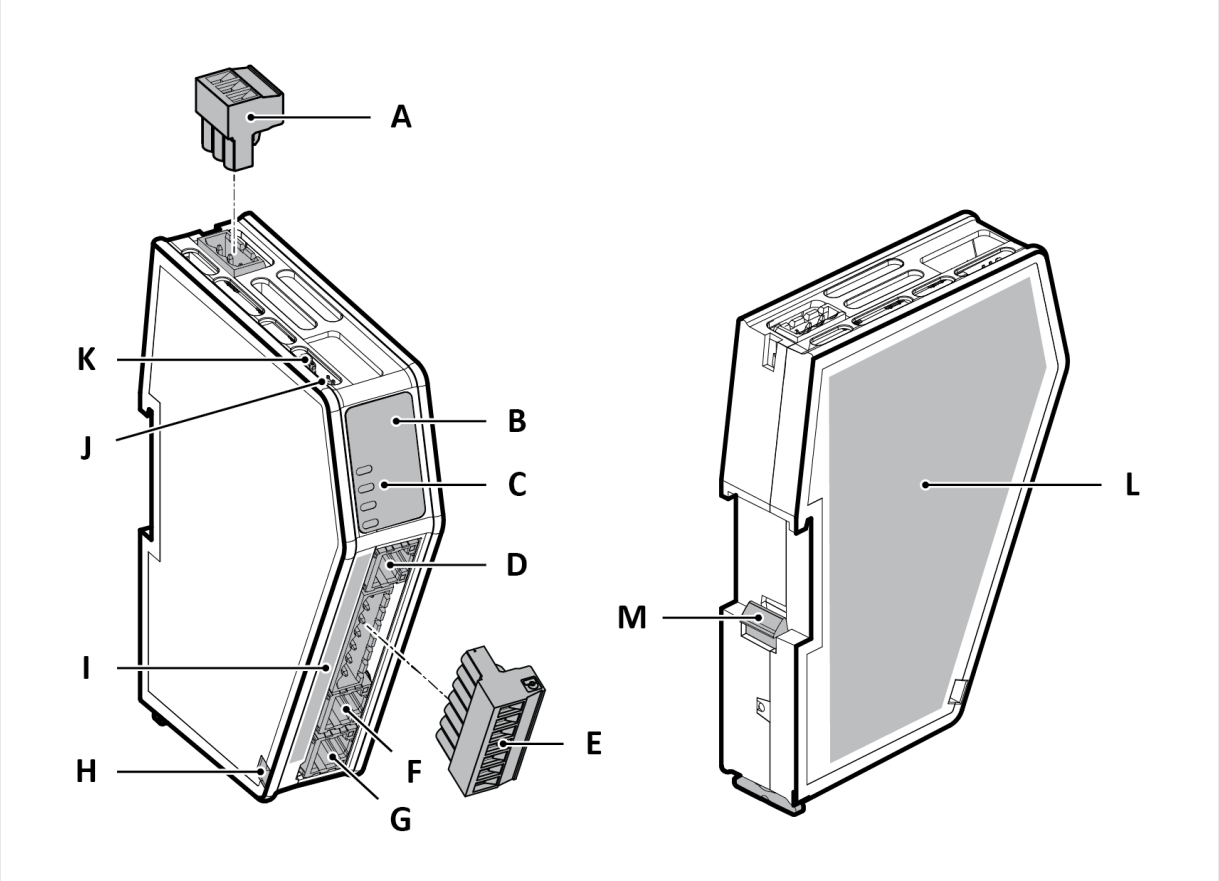


Figure 8. Communicator external parts

A. Power connector
B. Label with LED designation
C. Status LEDs
D. Configuration port
E. Modbus RTU Server (X2) port
F. Modbus TCP Client (X3.1) port
G. Modbus TCP Client (X3.2) port
H. Cable tie mount
I. Laser engraved connectors designation
J. Security switch
K. Factory reset button
L. Laser engraved label with product information
M. DIN rail locking mechanism

6.2. Connector Port Guide

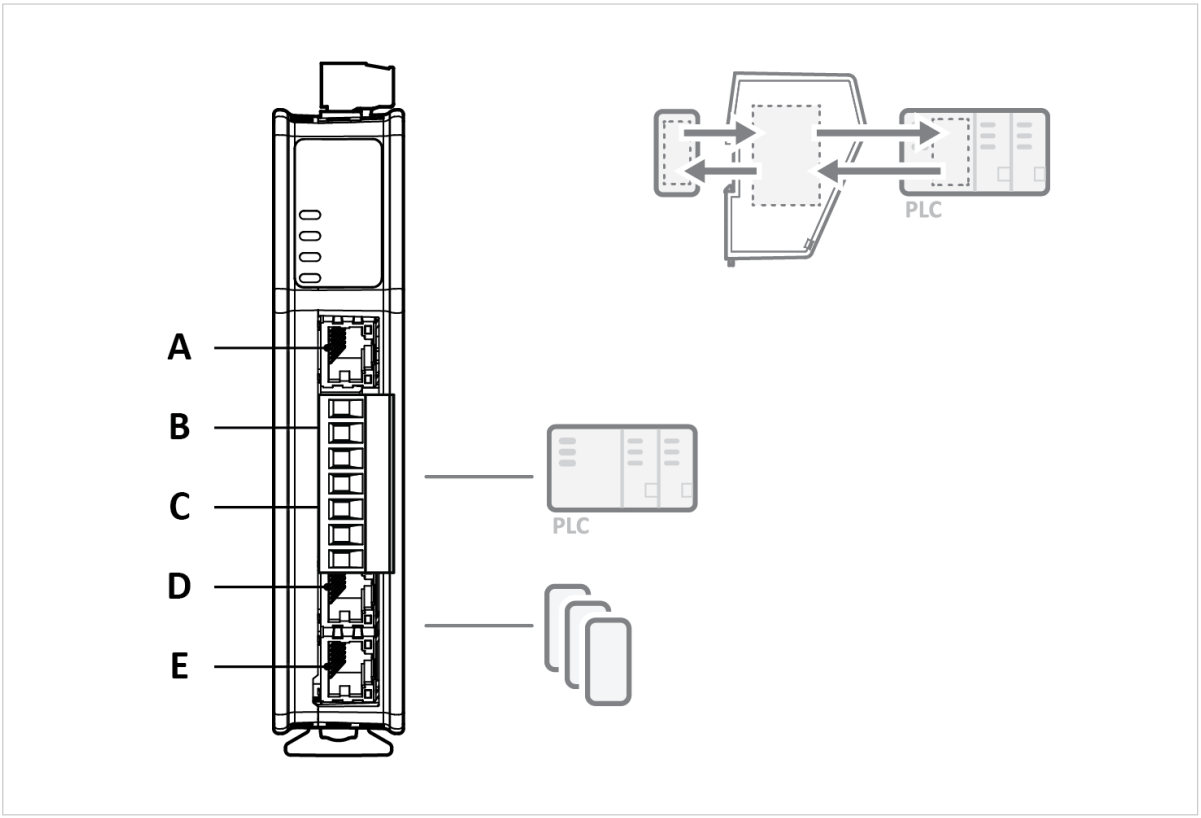


Figure 9. Communicator connector ports

Position	Port Number	Connector	Port Usage
A	X1	Ethernet RJ45	Configuration port
B	X2	7-pin screw terminal block	Modbus RTU Server network
C	X3.1	Ethernet RJ45	Modbus TCP Client network
D	X3.2	Ethernet RJ45	Modbus TCP Client network

See Also

Connect To Modbus RTU Server Network (Page 17)
Connect To Modbus TCP Client Network (Page 19)

6.3. DIN Rail Mounting

IMPORTANT
The equipment must be electrically grounded through the DIN rail for EMC compliance. Make sure that the equipment is correctly mounted on the rail and that the rail is properly grounded.

IMPORTANT
To physically secure networks and equipment and to prevent unauthorized access, it is recommended to install the equipment in a locked environment.

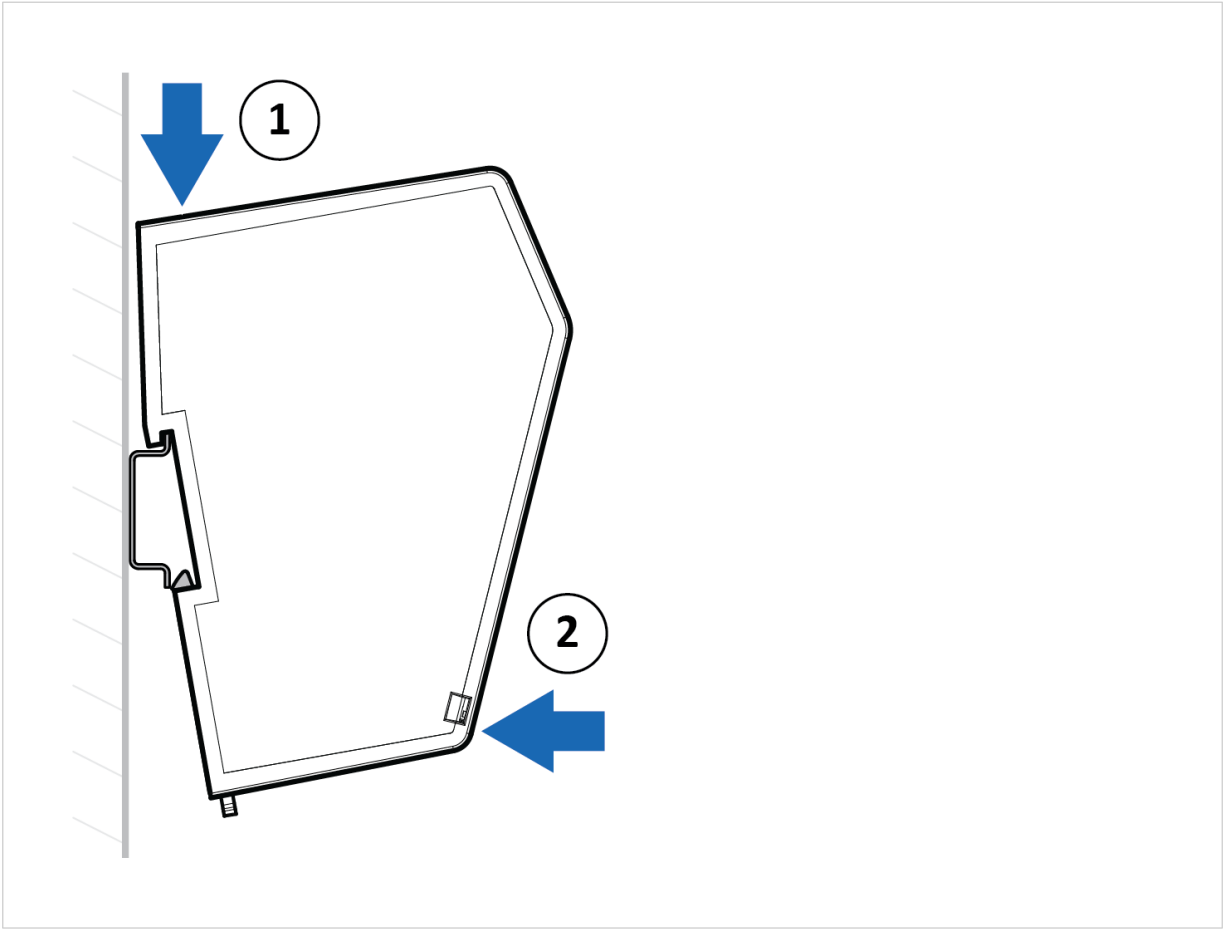


Figure 10. Attach the Communicator on the DIN rail

To attach the Communicator on the DIN rail:

1. Insert the upper end of the DIN rail clip into the DIN rail.
2. Push the bottom of the DIN rail clip into the DIN rail.

6.4. Connect to Modbus RTU Server Network

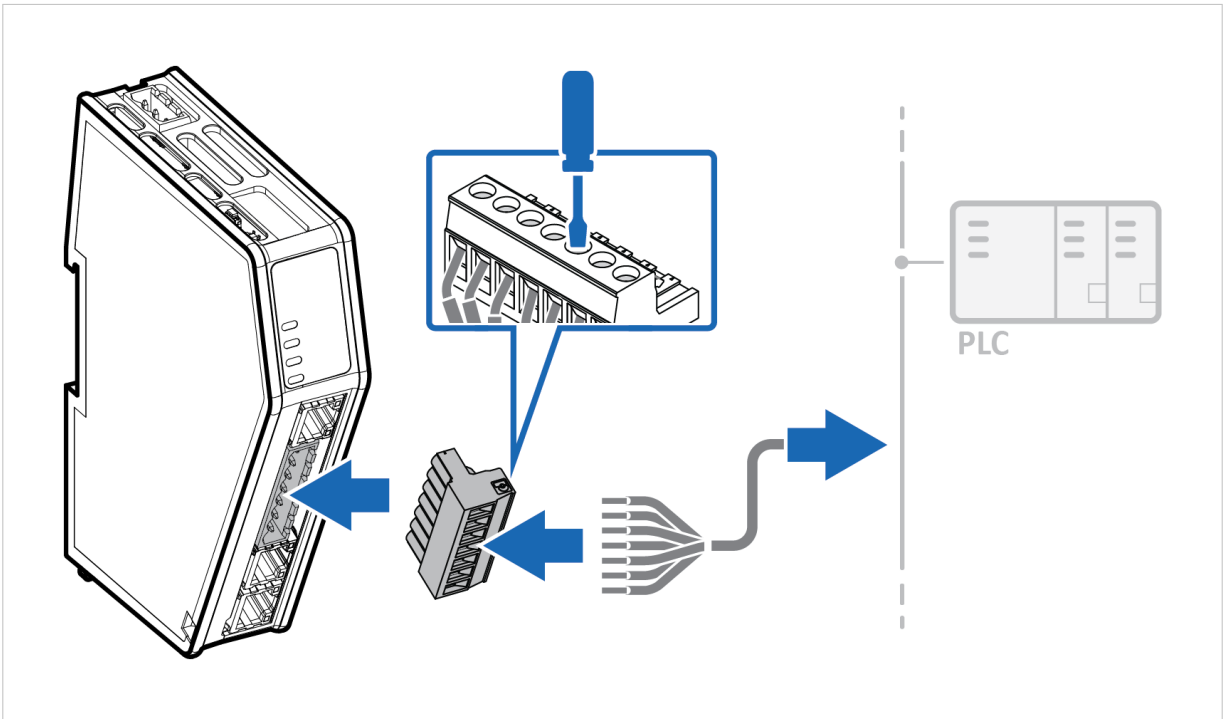
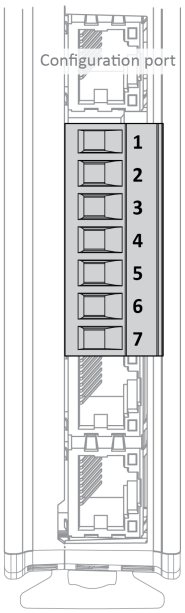


Figure 11. Connect to Modbus RTU server network

Modbus RTU Connector Pinout

NOTE
Use minimum 90 °C copper (Cu) wire only.

7-pin connector	Pin	Signal
	1	+5 V OUT
	2	RS485+ A
	3	RS485- B
	4	Signal GND
	5	Functional Earth (FE)
	6	RS232 Tx Transmit Data
	7	RS232 Rx Receive Data

Procedure

1. Insert the cable wires into the 7-pin connector and tighten the wire clamp screws.
2. Connect the 7-pin connector to the Communicator.
3. Connect the Communicator to your Modbus RTU network.

See Also

Connector Port Guide (Page 15)
Connect To Modbus TCP Client Network (Page 19)
Connect To Power (Page 21)
Communicator Status Monitor (Page 78)
Communicator LED Indicators (Page 80)
LED Status (Page 93)
Firmware Upgrade Error Management (Page 97)

6.5. Connect to Modbus TCP Client Network

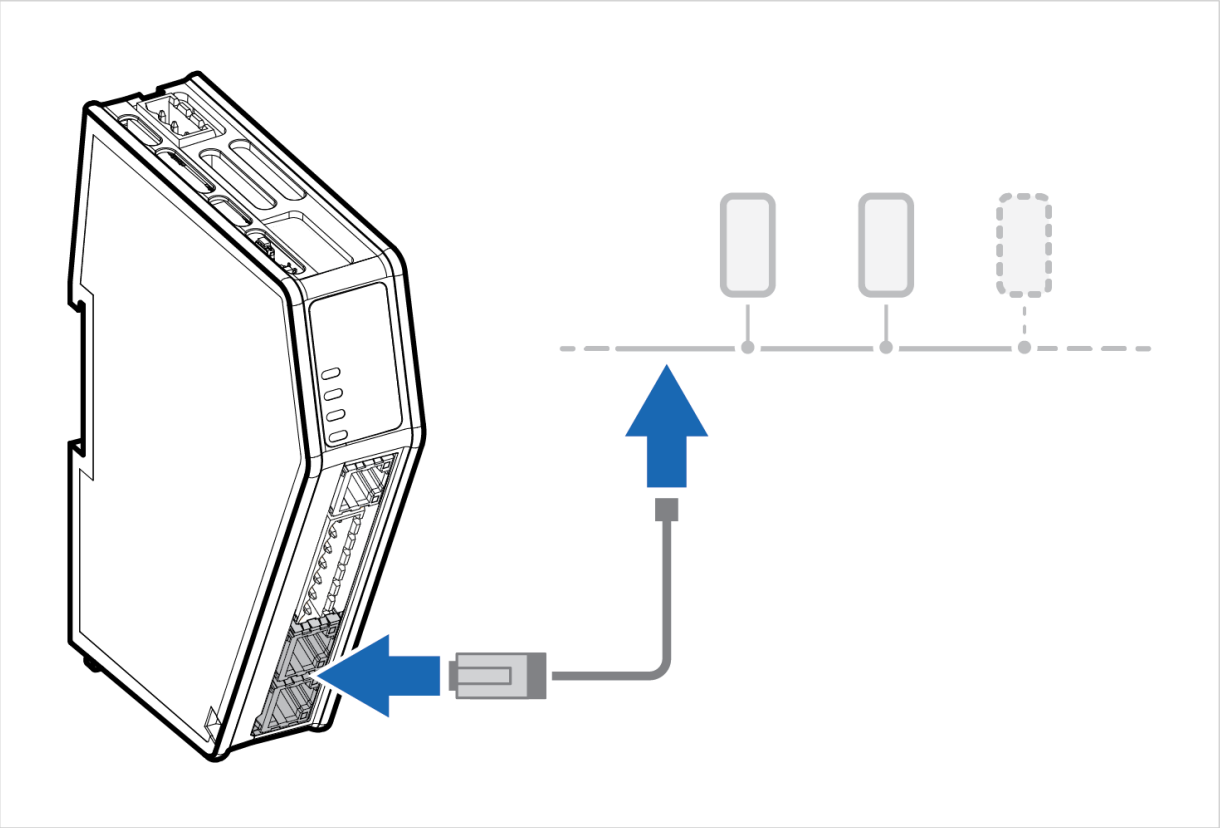
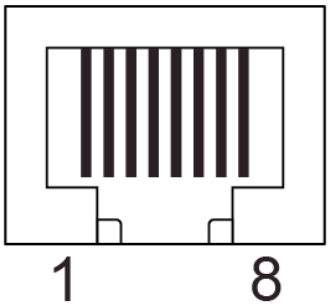


Figure 12. Connect to Modbus TCP Client network

Ethernet RJ45 Connector Pinout

Ethernet RJ45 Connector	Pin	Description
	1	TD+
	2	TD-
	3	RD+
	4	Not used
	5	Not used
	6	RD-
	7	Not used
	8	Not used

Procedure

Connect the Communicator to your Modbus TCP Client network.

See Also

Connector Port Guide (Page 15)
Connect To Modbus RTU Server Network (Page 17)
Connect To Power (Page 21)

6.6. Connect to Power

CAUTION
Ensure that the power supply is turned off before connecting it to the equipment.

IMPORTANT
Using the wrong type of power supply can damage the equipment. Ensure that the power supply is connected properly and of the recommended type.

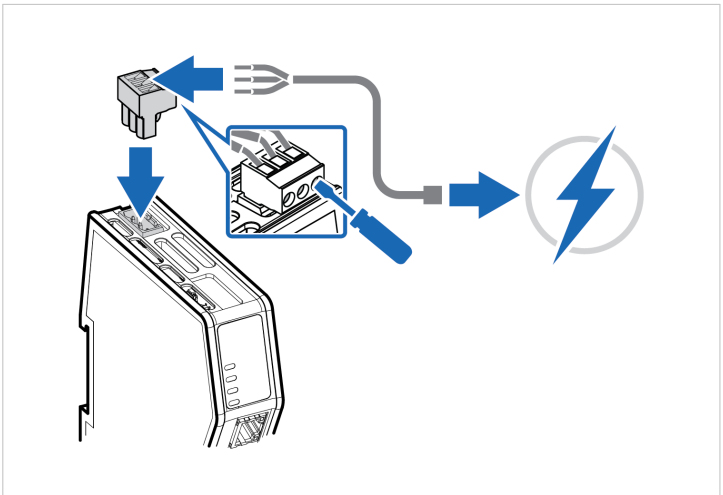
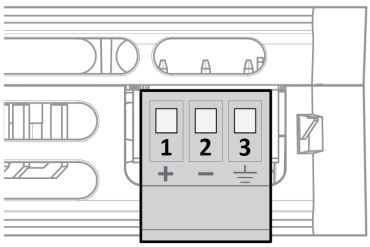


Figure 13. Connect to power

Power Connector Pinout

Power port	Pin	Description
	1	12-30 VDC Power Connector
	2	Ground (GND)
	3	Functional Earth (FE)

Procedure

1. Insert the cable wires to the terminal block and tighten the wire clamp screws.
2. Connect the terminal block to the Communicator.
3. Connect the Communicator to a power supply.
4. Turn on the power supply.

See Also

Connect To Modbus RTU Server Network (Page 17)
Connect To Modbus TCP Client Network (Page 19)
Communicator Status Monitor (Page 78)

Communicator LED Indicators (Page 80)
LED Status (Page 93)
Firmware Upgrade Error Management (Page 97)

6.7. Security Switch

IMPORTANT
After completing the configuration of the Communicator, lock the security switch to prevent unauthorized access to the Communicator built-in web interface.

When the security switch is in its locked position, the Communicator built-in web interface cannot be accessed, and the Communicator cannot be configured using the built-in web interface. Network specific parameters, configured via the PLC is still available.

To Lock and Unlock the Security Switch

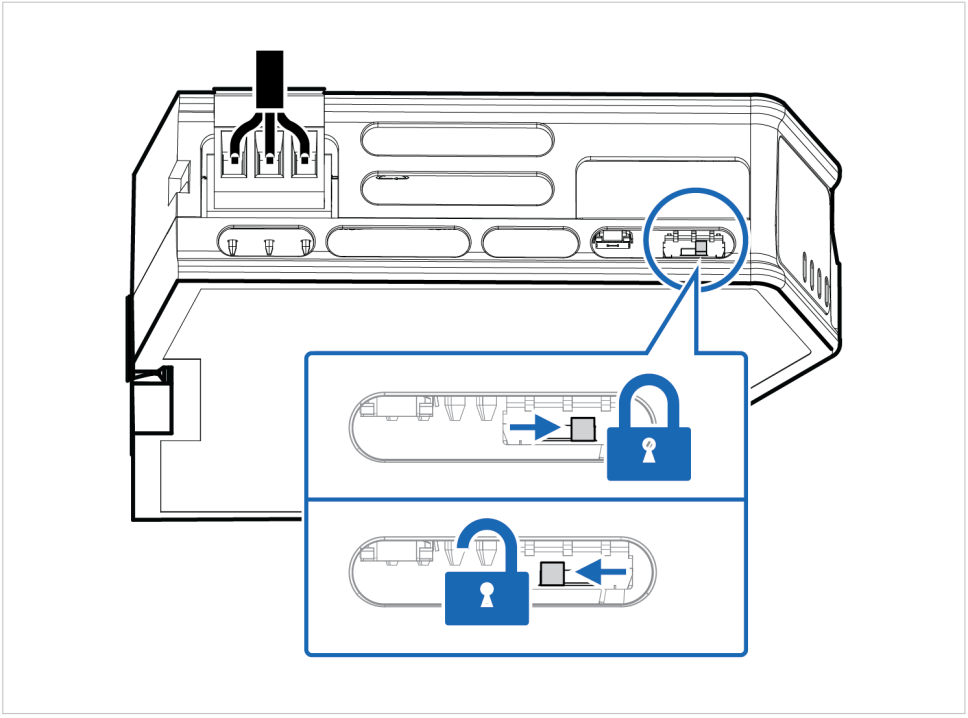


Figure 14. Security switch in locked and unlocked position

Use a pointed object, such as a ballpoint pen.

- To **lock** the security switch, push the toggle towards the **Communicator front**.
- To **unlock** the security switch, push the toggle towards the **Communicator back**.

Security Switch Status LED

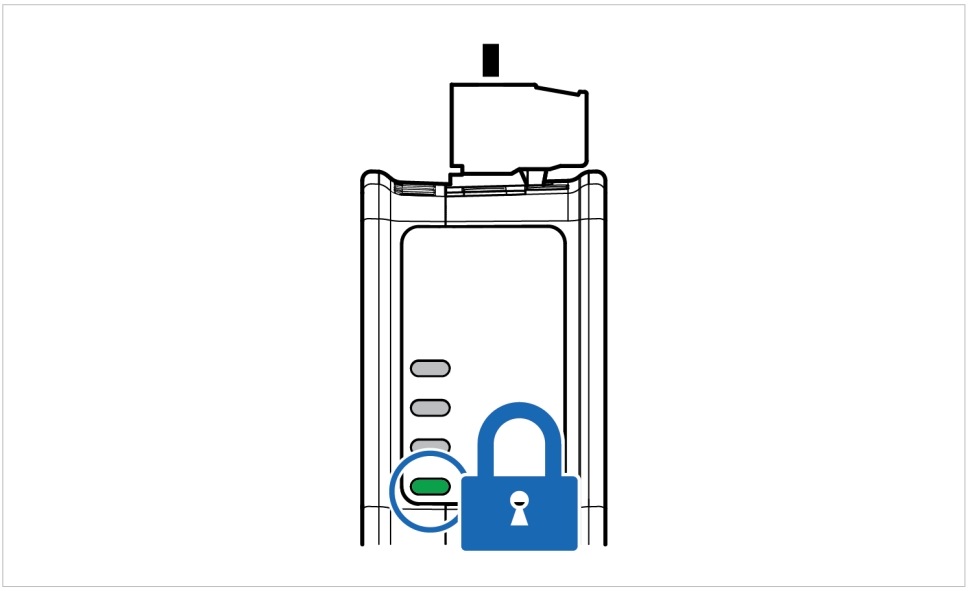


Figure 15. Security switch locked status LED

When the security switch is in its:

- locked position, the security switch status LED turn solid green.
- unlocked position, the security switch status LED is turned off.

6.8. Lock the Cables

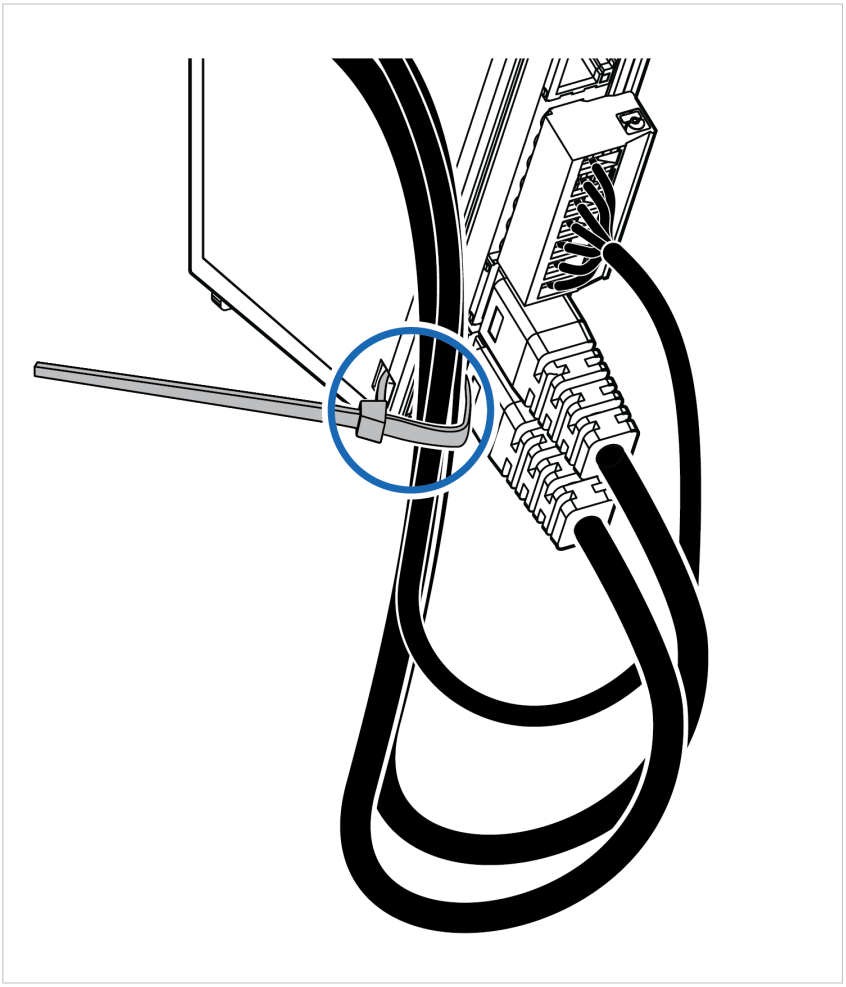


Figure 16. Lock the cables

To strain relieve the cables, place a cable tie in the holder and lock the cables.

6.9. DIN Rail Demount

Before You Begin

IMPORTANT
Be careful when removing the Communicator from the DIN-rail. If not removed properly, the DIN rail locking mechanism and the product cover can break.

Have a flat-blade screwdriver, size 5.5 mm, available.

Procedure

Remove the Communicator from the DIN Rail:

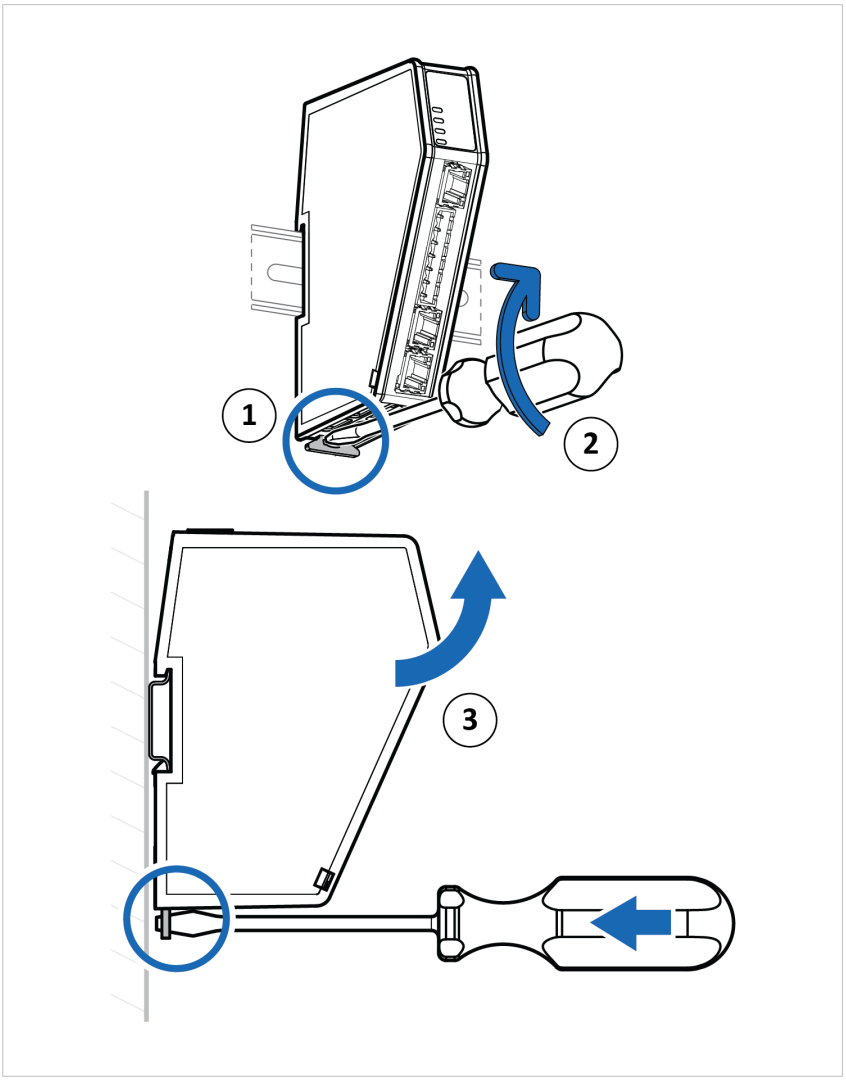


Figure 17. Unlock and unhook the Communicator

1. Insert the screwdriver into the Communicator DIN rail locking mechanism.
2. To unlock the Communicator DIN rail locking mechanism, turn the screwdriver clockwise.
3. Hold the screwdriver in the DIN rail locking mechanism while you unhook the Communicator from the DIN rail.

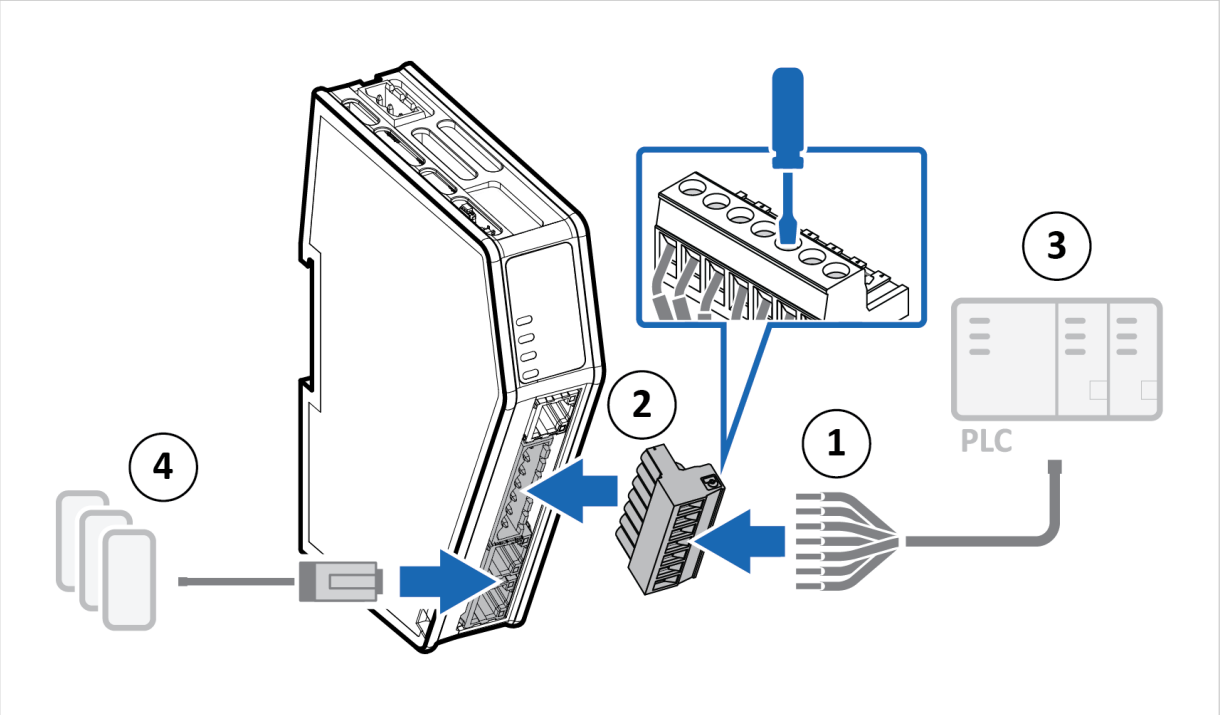
7. Configuration Quick Guide

This section is intended to give you a brief overview of the tasks you need to perform to configure the Communicator.

For detailed information, please refer to Communicator Configuration (page 36) .

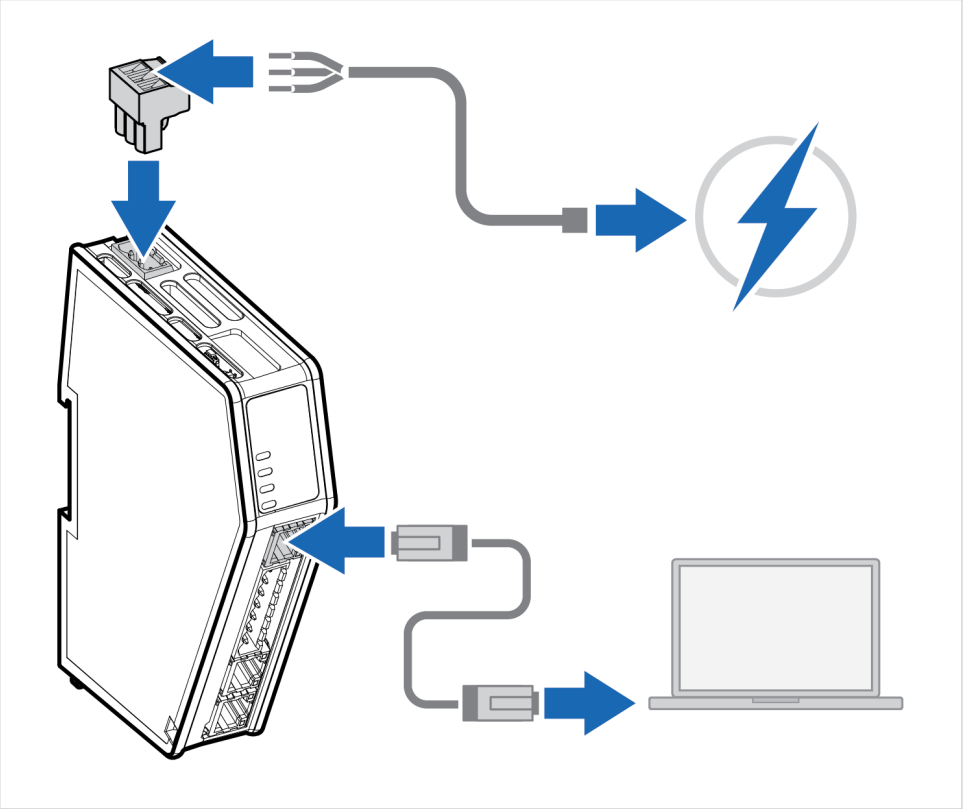
7.1. Prepare Configuration

Connect to Networks



1. Insert the cable wires into the 7-pin connector and tighten the wire clamp screws (1).
   See Modbus RTU Connector Pinout (page 17).
2. Connect the 7-pin connector to the Communicator (2).
3. Connect the Communicator to the Modbus RTU Server network (3).
4. Connect the Communicator to the Modbus TCP Client network (4).

Connect to PC and Power



1. Connect an Ethernet cable between the Communicator configuration port and your PC.
2. Connect the Communicator to a power supply.

Access the Built-In Web Interface

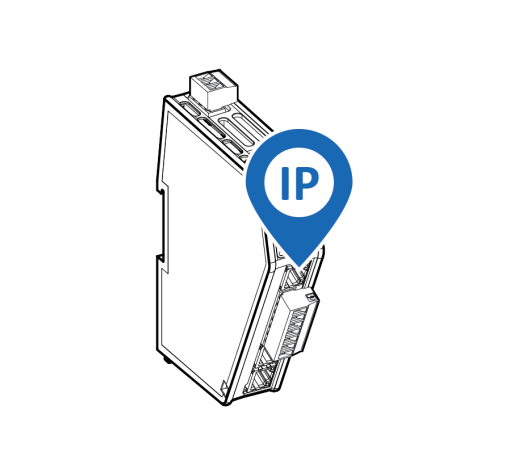
1. Find the Communicator on your PC

> **NOTE**
> The Communicator default IP address is 192.168.0.10.

Option 1 | Static IP Address

On the PC accessing the Communicator built-in web interface, set a static IP address within the same IP address range as the Communicator IP address.

Option 2 | Configuration Port IP Address

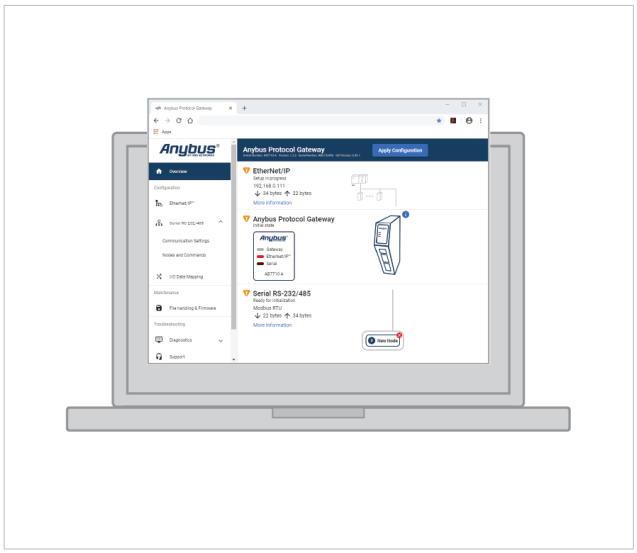


Change the IP address on the Communicator configuration port to one within the same IP address range as your PC.

Use the software application HMS IPconfig to find the Communicator default IP address on your PC.

Download the installation files and user documentation from www.hms-networks.com/technical-support.

2. Access the Communicator built-in web interface



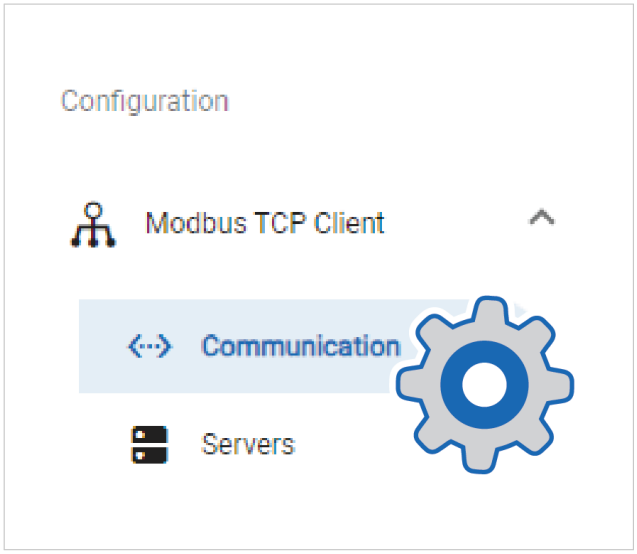
Open the Communicator built-in web interface in HMS IPconfig or enter the Communicator IP address in your web browser.

The Communicator built-in web interface overview page opens in your browser.

7.2. Setup New Configuration

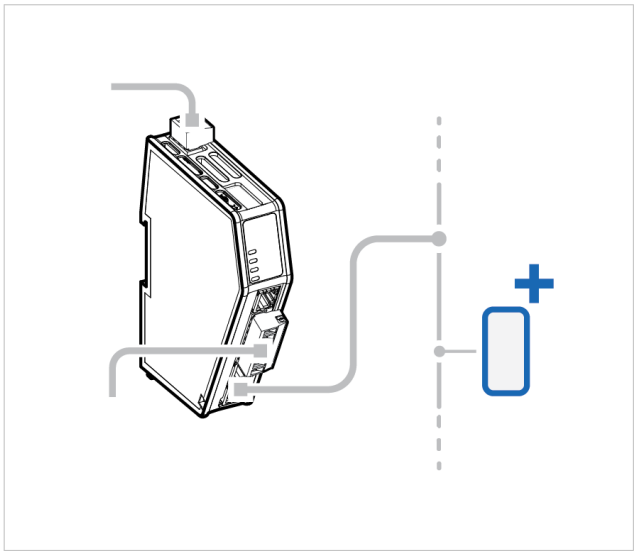
Follow these steps to setup a new Communicator configuration.

1. **Subnetwork configuration**



On the **Communication** page: Enable DHCP or configure the IP settings manually.

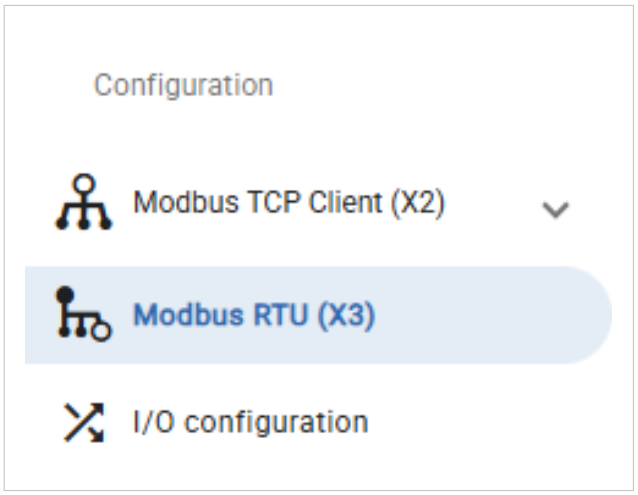
2. **Add Servers**



On the **Servers** page:

a. Add a server and configure the server **Properties**.
b. Add transaction(s) to the server and configure the **Transaction properties**.
c. Repeat until you have added and configured all your servers.

3. **High level network configuration**

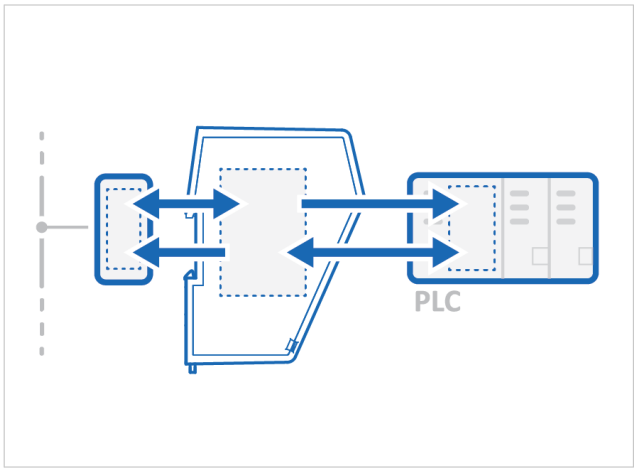


On the **Modbus TCP Client** page:

a. Configure the Communication settings.

b. Configure the Timeout times settings.

4. **I/O Configuration**



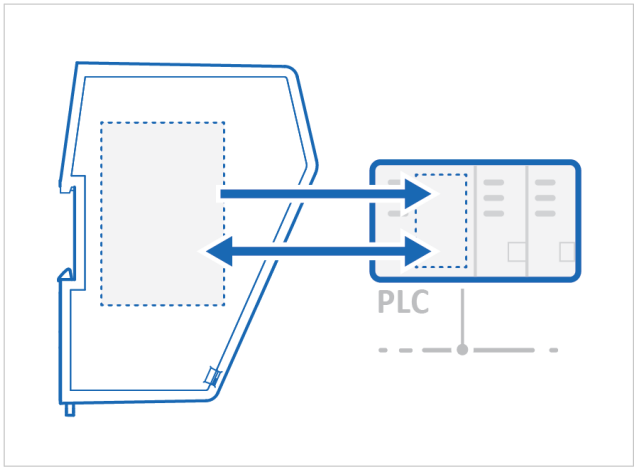
The transaction(s) for each server is automatically mapped to the Communicator internal memory area.

On the **I/O configuration** page, view the mapping relation between the server connections and the layout on the process data area.

7.3. PLC Configuration

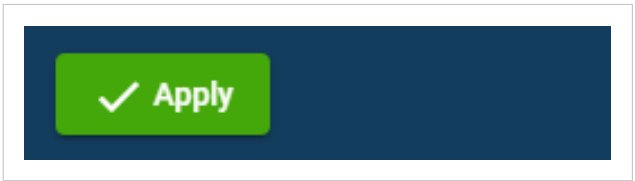
In the PLC Program

- Configure the PLC to communicate with the Communicator according to the I/O data map created in the Communicator.



7.4. Verify Operation

1. **Apply the configuration**



When you have completed and verified the configuration, click **Apply** for the settings to take effect.

2. **Verify status and LED indications**

On the **Home** page:
Monitor the Communicator, network and server status.
You can also view the Communicator LED indications remotely.

3. **Verify and monitor communication**

In **Diagnostics**, use the:

- **I/O data** page to monitor how the data flow between the **Modbus RTU Server** side and the **Modbus TCP Client** side, including any configured endian conversions.
- **Event log** page to detect failures and unexpected behavior over time.

8. Communicator Configuration

This section is intended to give you detailed information about the tasks you need to perform to setup a new Communicator configure.

For a more brief overview of the configuration steps, please refer to the Configuration Quick Guide (page 27).

8.1. Connect to Configure the Communicator

Procedure

1. Connect the Communicator to your:

   - Modbus RTU Server network — (1) (2) and (3)
   - Modbus TCP Client network — (4)

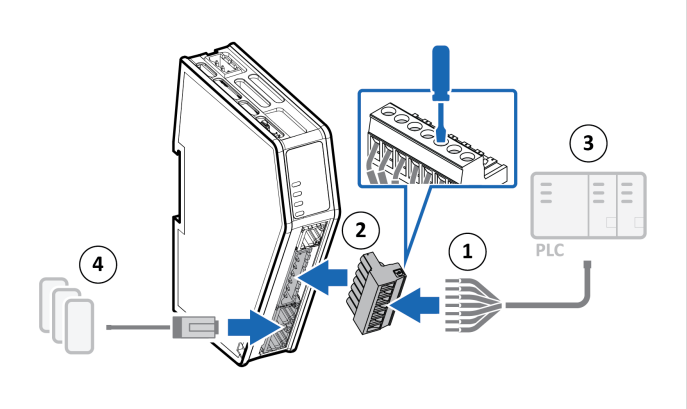


Figure 18. Connect to networks

2. Connect an Ethernet cable between the Communicator and your PC.
3. Connect the Communicator to a power supply.

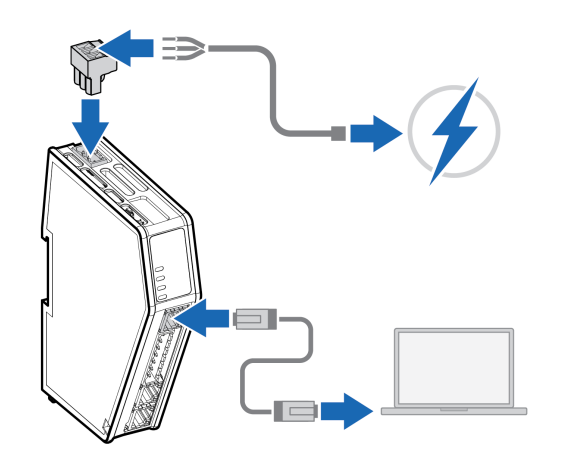


Figure 19. Connect to PC and power

8.2. Access the Built-In Web Interface from HMS IPconfig

Before You Begin

Security Settings

NOTE
Ensure that the security switch is unlocked. HMS IPconfig cannot configure the Communicator if the security switch is locked.

NOTE
To access the Communicator built-in web interface, ensure that Port 80 TCP is open in your Firewall. This applies to any Firewall between the web browser and the gateway.

NOTE
To access the Communicator built-in web interface from HMS IPconfig, ensure that Port 3250 UDP is open in your PC Windows Firewall.

IP Address

NOTE
The Communicator default IP address is 192.168.0.10.

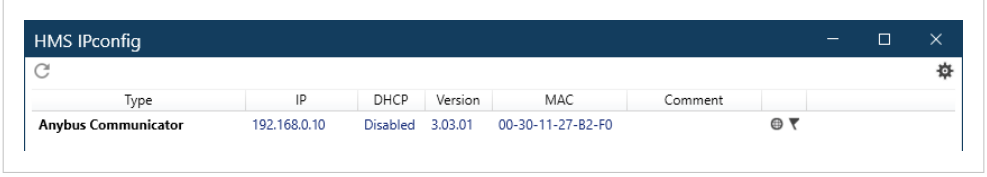
TIP
When you have accessed the Communicator built-in web interface, you can change the IP settings for the Communicator configuration port on the **System** > **Configuration port** page.

Download HMS IPconfig Installation Files

Download the software application HMS IPconfig installation files and user documentation from www.hms-networks.com/technical-support.

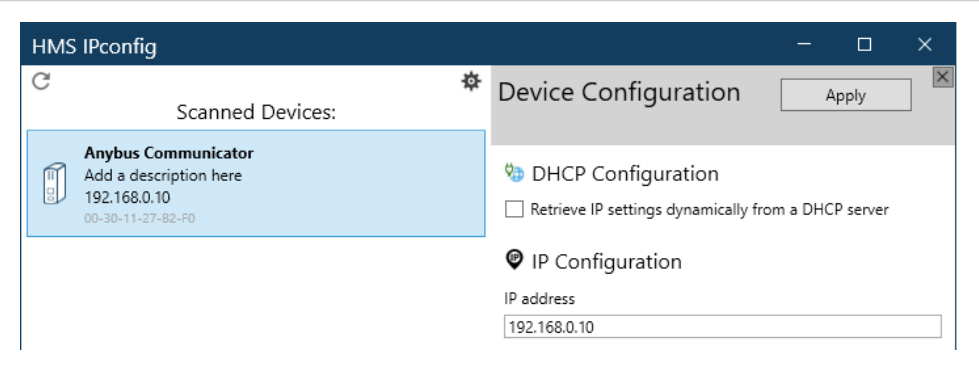
Procedure

1. Install HMS IPconfig on your PC.
2. Open HMS IPconfig.

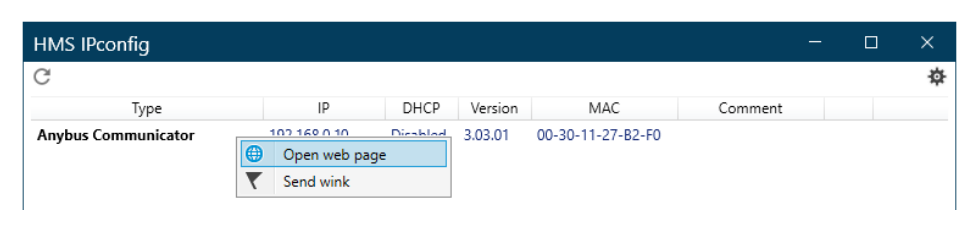


   - HMS IPconfig automatically starts scanning for compatible and active HMS devices.
   - Found HMS devices are added to the device list.
3. To open the settings pane, click on the Communicator in the device list.

4. Change the Communicator configuration port IP address to one within the same IP address range as your PC.

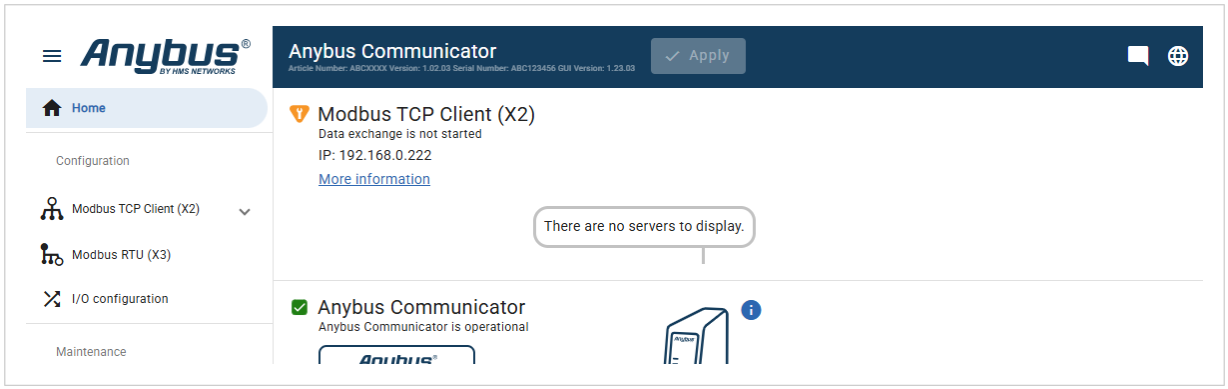


5. To open the **Open web page** built-in web interface, click Communicator.



Result

You are redirected to the Communicator built-in web interface **Home** page.



8.3. Access the Built-In Web Interface from a Web Browser

Before You Begin

Security Settings

NOTE
Ensure that the security switch is unlocked. HMS IPconfig cannot configure the Communicator if the security switch is locked.

NOTE
To access the Communicator built-in web interface, ensure that Port 80 TCP is open in your Firewall. This applies to any Firewall between the web browser and the gateway.

IP Address

NOTE
The Communicator configuration port default IP address is 192.168.0.10.

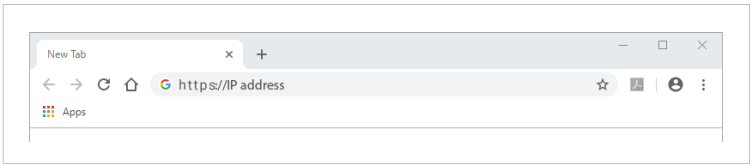
NOTE
When you change to a static IP address on your computer, internet access may be lost.

TIP
When you have accessed the Communicator built-in web interface, you can change the IP settings for the Communicator configuration port on the **System** > **Configuration port** page.

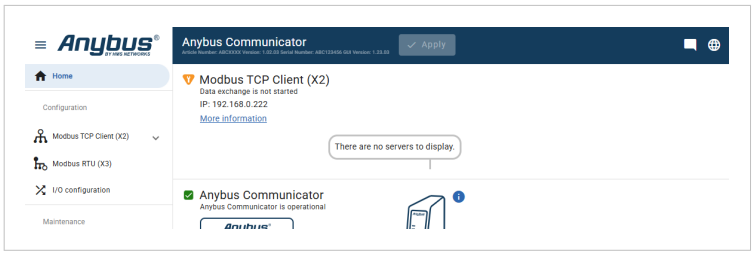
Procedure

1. On the PC accessing the Communicator built-in web interface, set a static IP address within the same IP address range as the Communicator IP address.

2. Open a web browser.
3. Click to select the **Address bar** and enter the Communicator IP address.



4. To open the built-in web interface **Home** page, press **Enter**.



8.4. Communicator Built-In Web Interface Overview

Use the Communicator built-in web interface to configure, maintain and troubleshoot the Communicator.

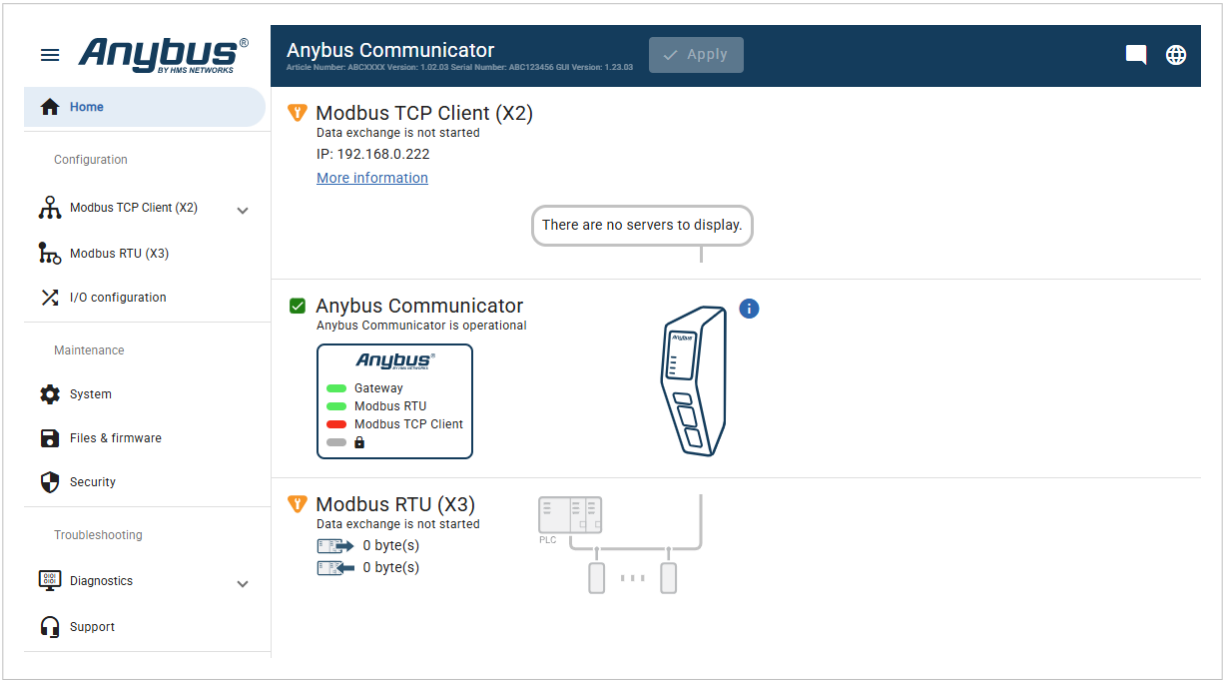


Figure 20. The Communicator built-in web interface Home page

Menu item	Description
Home	View the Communicator, network and adapter(s) status.
Apply	After configuration changes are made and verified, press Apply to make the settings take effect.
Modbus TCP Client	Modbus TCP Client subnetwork with server(s). Configure communication and add servers and transactions.
Modbus RTU Server	Configure the network settings for the Modbus TCP Client network.
I/O configuration	View the connections mapped to the Communicator internal memory area.
System	Define how the device should behave if a serious error occurs. Configure the Communicator configuration port IP settings.
Files & firmware	Save settings in a configuration files, upload configuration files and upgrade firmware.
Diagnostics	Monitor and troubleshoot the Communicator.
Support	Contains Communicator product information, Anybus contact information, link to Anybus support website, and product file for download. Here you can generate a support package with product information, to send to your Anybus support technician.

8.5. Modbus TCP Client Communication Settings

Configure the Modbus TCP Client communication settings.

8.5.1. IP Settings

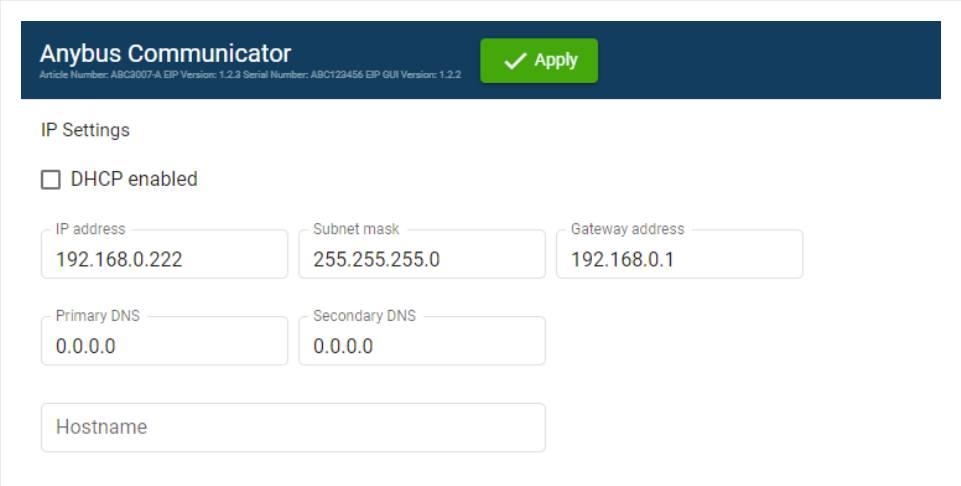


Figure 21. IP Settings

By default, DHCP is Enabled.

Default IP Settings

The Communicator comes with the following factory default IP settings:

Setting	Default value	Description
DHCP	Enabled	DHCP (Dynamic Host Configuration Protocol) automatically gives devices on a network the IP settings they need to connect and communicate.
IP address	There is no default IP address.	The EtherNet/IP network IP address in IPv4 dot-decimal notation.
Subnet mask	There is no default Subnet mask.	The EtherNet/IP network Subnet mask in IPv4 dot-decimal notation.
Gateway address	There is no default Gateway address.	The EtherNet/IP network Gateway address in IPv4 dot-decimal notation. If there is no gateway available, set the Gateway address to: 0.0.0.0
Primary DNS server	There is no default Primary DNS server.	The EtherNet/IP network Primary DNS in IPv4 dot-decimal notation.
Secondary DNS server	There is no default Secondary DNS server.	The EtherNet/IP network Secondary DNS in IPv4 dot-decimal notation.

Using DHCP Server for IP Configuration

Procedure

With DHCP enabled, the IP settings are provided by the high level network DHCP server.

Ensure the **DHCP enabled** checkbox is selected.

To Configure IP Settings Manually

Procedure

1. To disable DHCP, deselect the **DHCP enabled** checkbox.
2. Then, enter the desired IP settings values.

Hostname

You can label the Communicator.

- The maximum allowed length of the Hostname is 64 characters.
- No symbol characters, punctuation characters, or whitespace are permitted.
- Write the Hostname as one single word.

8.6. Modbus TCP Client Servers

8.6.1. Add Server

Before You Begin

NOTE
The maximum number of servers that can be added is 64.

Procedure

1. In the web-interface left sidebar menu, click **Servers**.
2. Click **Add**.
   A new server is added to the **Modbus TCP Client** server list.

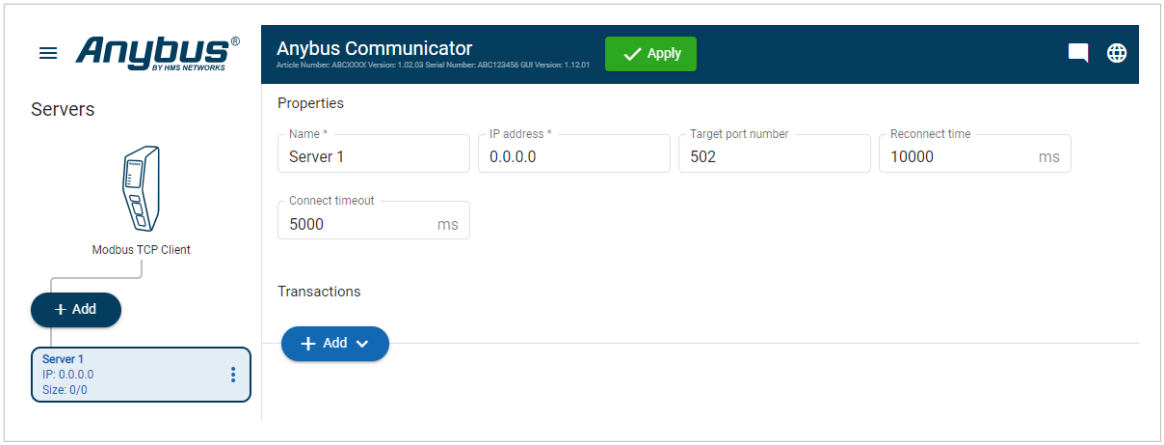


Figure 22. Modbus TCP Client, Server page

3. Repeat until you have added all your servers.

To Do Next

Configure the server Properties, see Server Properties (page 43).

8.6.2. Server Properties

Procedure

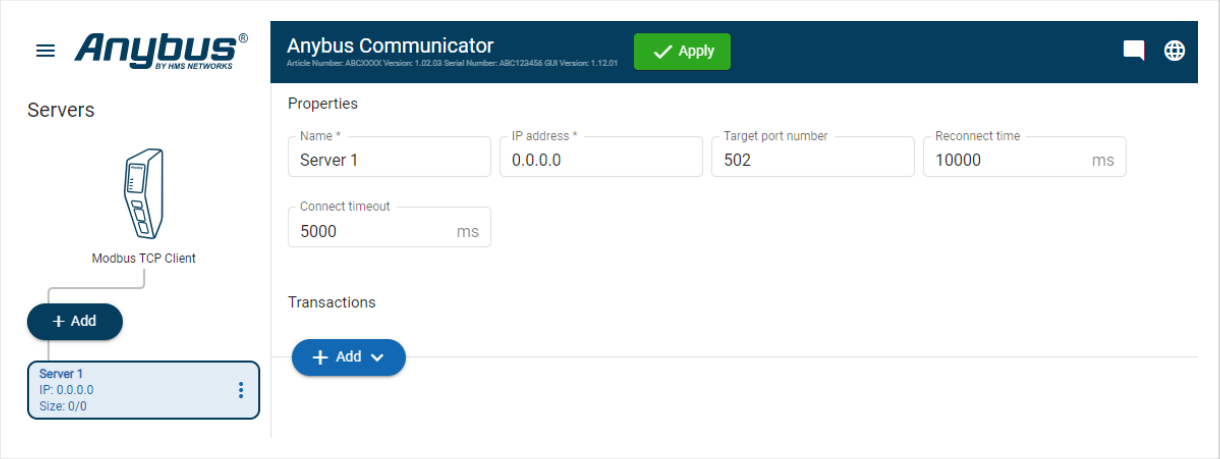


Figure 23. Servers page, Properties

1. In the server list, select a server to configure.
2. Configure the **Properties**.

Setting	Value	Description
Name	Server [n]	The default name is Server, followed by an incremental number suffix.
IP address	Default 0.0.0.0	The server IP address in IPv4 dot-decimal notation
Reconnect time	0 ms to 4294967295 ms Default 1000 ms	Specify for how long the Communicator should wait before attempting to reconnect, if the server is disconnected.
Connect timeout	0 ms to 4294967295 ms Default 5000 ms	Specify the period in which the Communicator should establish a connection with the server.
Target port number	0 to 65535 Default Modbus TCP port 502	Modbus TCP port of the target device. If the server requires it, it is possible to change.

3. To apply the settings, click **Apply** in the web-interface header, and follow the instructions.

To Do Next

Add Transactions, Add Transactions (page 44).

8.6.3. Add Transactions

Before You Begin

NOTE
The transactions are executed in the order they appear in the **Server Transaction** list.

NOTE
One transaction is performed at a time per connection.

NOTE
You can add a maximum of 152 transaction units distributed among the servers.

For Modbus TCP, it is possible to map up to 1500 bytes of data in either direction, including data exchange control and live list.

Procedure

1. In the **Modbus TCP Client** server list, select a server to configure.
2. Click **Add** and select a transaction from the list of standard Modbus transactions.

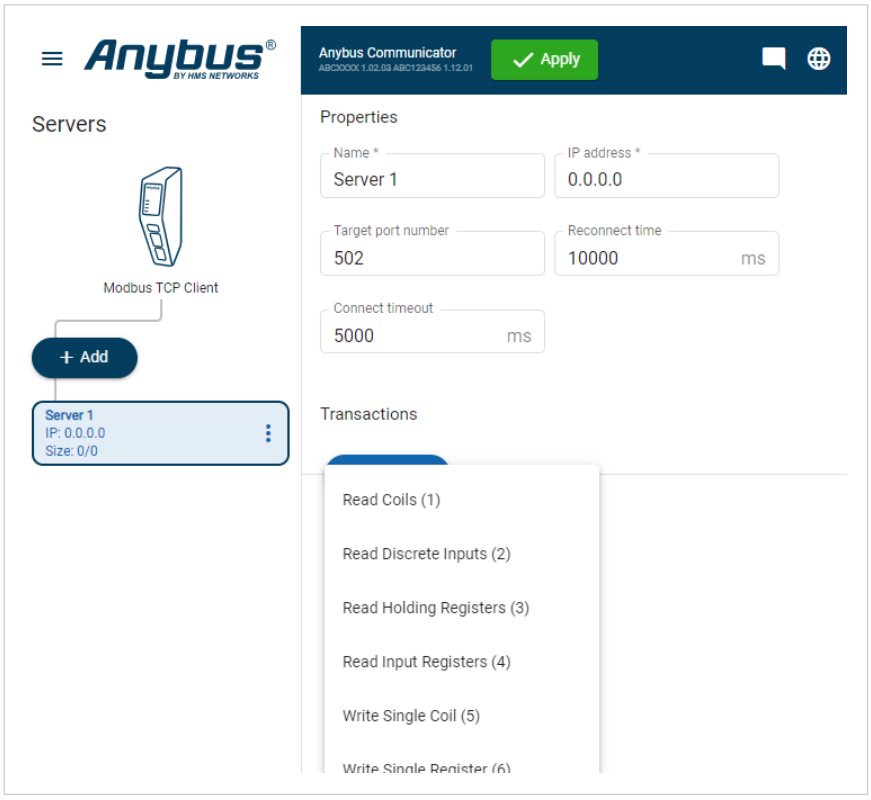


Figure 24. Add Modbus transactions

3. Repeat until you have added all your transactions.

To Do Next

Configure the transaction Properties settings, Transaction Properties (page 46).

8.6.4. Modbus Function Codes

Reference: MODBUS Application Protocol Specification V1.1b3, April 26 2012

For more information refer to the Modbus organization website.

Nr	Function	Area	Function Code	Description
1	Read Coils	Coils	0x01	Read from 1 to 2000 contiguous status of coils in a remote device.
2	Read Discrete Inputs	Discrete inputs	0x02	Read from 1 to 2000 contiguous status of discrete inputs in a remote device.
3	Read Holding Registers	Holding registers	0x03	Read the contents of a contiguous block of holding registers in a remote device.
4	Read Input Registers	Input registers	0x04	Read from 1 to 125 contiguous input registers in a remote device.
5	Write Single Coil	Coils	0x05	Write a single output to ON or OFF in a remote device.
6	Write Single Register	Holding registers	0x06	Write a single holding register in a remote device.
15	Write Multiple Coils	Coils	0x0F	In a sequence of coils, force each coil to either ON or OFF in a remote device.
16	Write Multiple Registers	Holding registers	0x10	Write a block of contiguous registers in a remote device.
23	Read/Write Multiple Registers	Holding registers	0x17	Performs a combination of one read operation and one write operation. The write operation is performed before the read.

8.6.5. Transaction Properties

Before You Begin

For Modbus transaction reference guide, refer to Modbus Function Codes (page 45).

Procedure

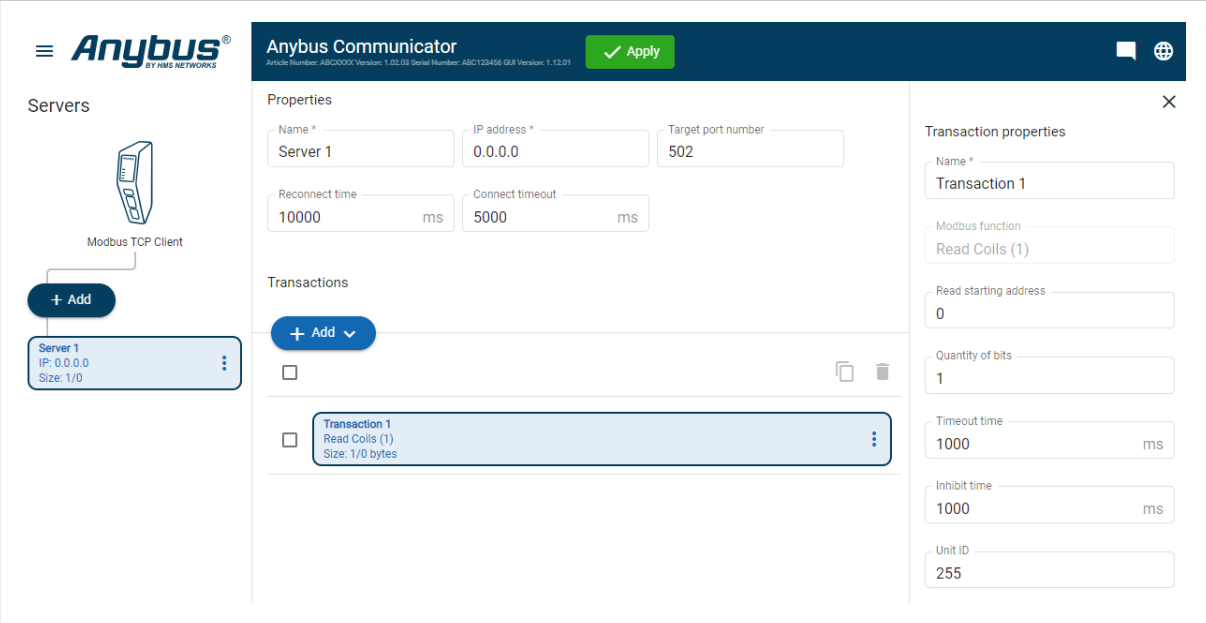


Figure 25. Transaction properties

1. In the **Modbus TCP Client** server list, select a server to configure.
2. In the **Transactions** list, select a transaction to configure.
   The **Transaction properties** sidebar opens, on the right side of the screen.
3. Enter a transaction **Name**.
   By default, the transaction is assigned the name Transaction, followed by an incremental number suffix.
4. Configure the **Transaction properties**.

Setting	Value	Setting for Modbus Transaction	Description
Name	Transaction [n]	Applicable for all.	You can name the transaction to make it easier to identify. The default name is Transaction, followed by an incremental number suffix.
Read starting address	0 to 65 535	Read Coils (1) Read Discrete Inputs (2) Read Holding Registers (3) Read Input Registers (4) Read Write Multiple Registers (23)	Specify the start address for the read/write transaction. The address acts as an address to the data position, where the data is read from or written to. Modbus holding register addresses starts at 0. Modbus address 0 = Register 1
Write starting address	0 to 65 535	Write Single Coil (5) Write Single Register (6) Write Multiple Coil (15) Write Multiple Registers (16) Read Write Multiple Registers (23)	
Quantity to read	1 to 125	Read Holding Registers (3) Read Input Registers (4) Read Write Multiple Registers (23)	Specifies the number of registers to read to follow in the read data field.

Setting	Value	Setting for Modbus Transaction	Description
Quantity to write	Write Multiple Registers (16), 1 to 123 Read Write Multiple Registers (23), 1 to 121		Specifies the quantity of registers to follow in the write data field.
Quantity of bits	Read Coils (1), 1 to 2000 Read Discrete Inputs (2), 1 to 2000 Write Multiple Coils (15), 1 to 1968 Default: 1		Specify the number of coils to follow in the read/write data field.
Unit ID	0 to 255 Default: 255	Applicable for all.	Specifies the unit identifier of the server device.
Timeout time	0 to 65 535 ms	Applicable for all.	Specify the period within which the server must return a response to the transaction. If no response is received within the timeout period, the connection to the server is closed. If the connection to the server is closed, all transactions to that server are affected.
Update time	10 to 10 000 ms	Applicable for all.	Specify the minimum time that may elapse between the transfer of two of the same transaction.
Update mode	Cyclically On data change	Write Single Coil (5) Write Single Register (6) Write Multiple Coil (15) Write Multiple Registers (16) Read Write Multiple Registers (23)	Specify when a transaction shall be sent to the server. Cyclically: The transaction is sent cyclically, at the interval specified in the Update time parameter. On data change: The transaction is sent when the data is changed. The minimum time between two transactions is specified by the Update time parameter.
Startup operation mode	Directly Wait for data	Write Single Coil (5) Write Single Register (6) Write Multiple Coil (15) Write Multiple Registers (16) Read Write Multiple Registers (23)	Directly: Data is sent as soon as possible after start-up. Wait for data: All data for the transaction must have been sent from the High Level network and received by the Communicator before the transaction is sent.
Offline option	Default: Freeze Pause Safe value; Length and Value	Write Single Coil (5) Write Single Register (6) Write Multiple Coil (15) Write Multiple Registers (16) Read Write Multiple Registers (23)	Define the action to be taken when the high level network connection is lost. Freeze: The Communicator holds the value until the network connection is restored. Pause: The transaction is suspended until the network connection is restored. Safe value: To ensure stability and reliability in the absence of a network connection, specify the Length 1 or 2 and the Value 0 to 65 535 to use during offline periods.

5. To apply the settings, click **Apply** in the web-interface header, and follow the instructions.

8.6.6. Duplicate Transaction

When you duplicate a transaction, all settings are preserved.

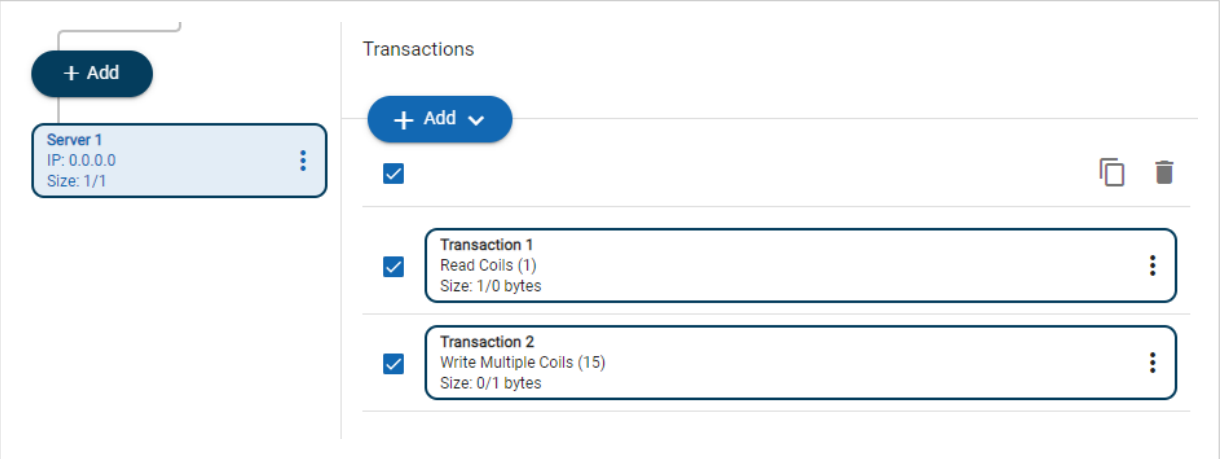


Figure 26. Duplicate transaction

To duplicate, select the checkbox in front of each transaction you want to duplicate and click the **Duplicate** icon.

The duplicated transaction(s) is added at the bottom of the transactions list.

8.6.7. Delete Transaction

When you delete a transaction, all its settings are permanently lost.

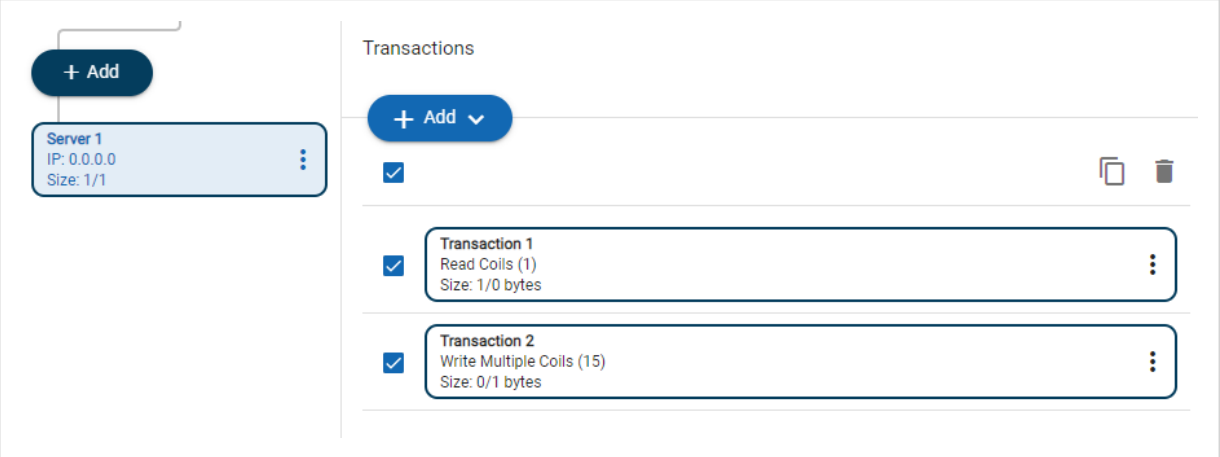


Figure 27. Delete transaction

To delete:

1. Select the checkbox in front of each transaction you want to delete and click the **recycle bin icon**.
2. To confirm, **Delete**.

8.7. Modbus RTU Server Settings

Configure the Modbus RTU Server network settings.

8.7.1. Communication Settings

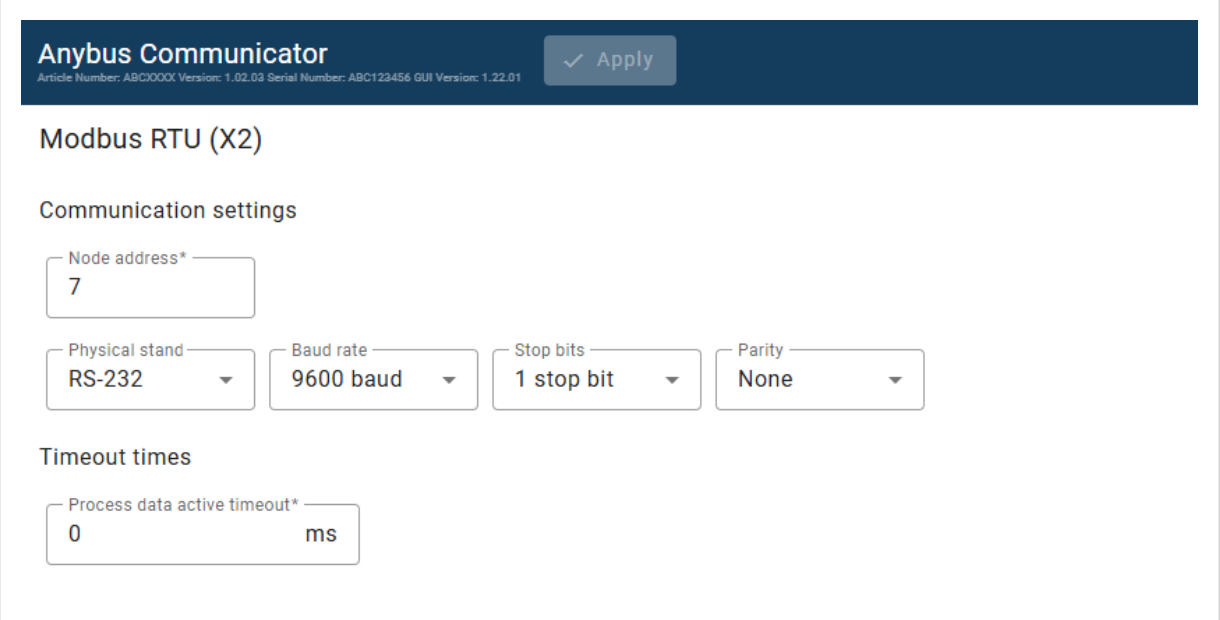


Figure 28. Communication, Basic settings

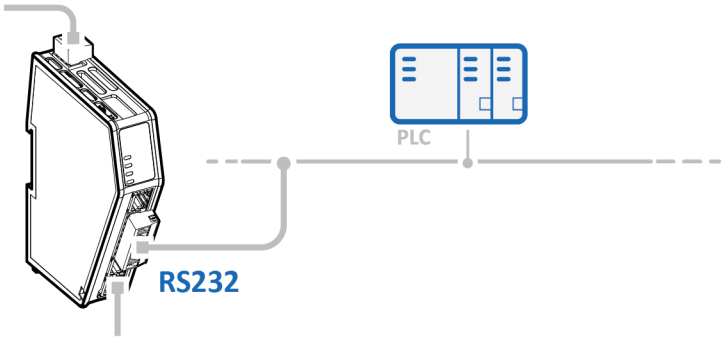
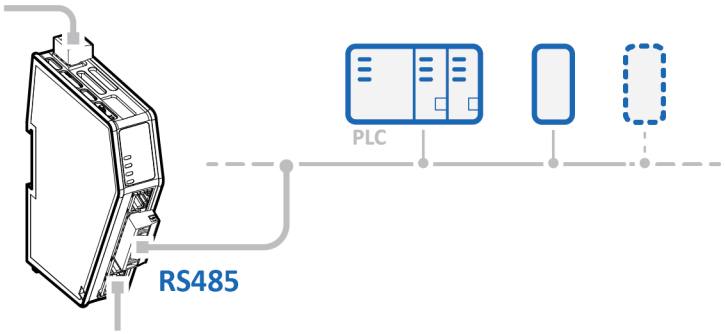
Node Address

Enter the **Node address** for the Modbus RTU server connected to the Communicator.

Physical Standard

Specify the physical interface type for the Modbus RTU network.

Select a physical standard from the **Physical standard** drop-down menu.

Setting	Value	Description
Physical standard	RS-232, Default standard	Use RS-232 when one single device is connected to the network. 
	RS-485	Use RS-485 when multiple devices are connected to the network. 

Baud Rate

Specify the baud rate; the serial transfer speed, maximum bits per second.

Select a baud rate value from the **Baud rate** drop-down menu.

Setting	Value
Baud rate	1200 baud
	1800 baud
	2400 baud
	4800 baud
	9600 baud, Default value
	19200 baud
	35700 baud
	38400 baud
	57600 baud
	115200 baud
	128000 baud

Stop Bits

Specify the number of stop bits used to indicate the end of data transmission.

Select a stop bits value from the **Stop bits** drop-down menu.

Setting	Value
Stop bits	1 stop bit, Default value
	2 stop bit

Parity

Specify if parity should be used to detect errors in the data.

Select parity value from the **Parity** drop-down menu.

Setting	Value	Description
Parity	None, Default value	No parity checking Parity bit is not transmitted
	Odd	Odd parity checking
	Even	Even parity checking

8.8. Modbus RTU Server Advanced Settings

NOTE
The Advanced settings is used to makes the Communicator compatible with the Anybus X-gateway.

8.8.1. Legacy Mode for Anybus Address Mode | Modbus TCP

Advanced settings option for Modbus TCP.

About Legacy Mode
Use Legacy Mode when you want to make a new Communicator compatible with the X-gateway Anybus Address Mode.

See also Legacy Address Mode I/O Data Mapping (page 77).

To Use Legacy Mode

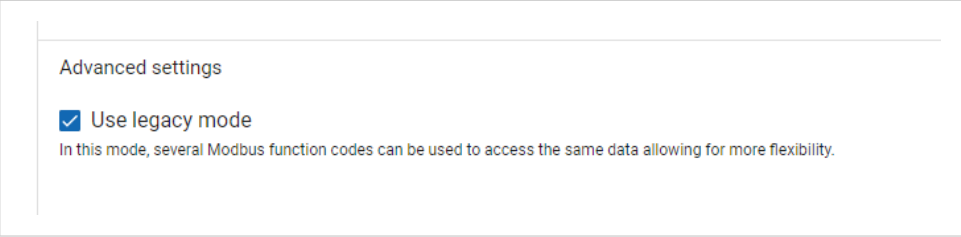


Figure 29. Advanced settings > Use legacy mode

To enable Legacy mode, select the **Use legacy mode** checkbox.

See Also

Legacy Address Mode I/O Data Mapping (Page 77)

8.8.2. Legacy Mode for Anybus Address Mode | Modbus RTU

Advanced settings option for Modbus RTU Server.

About Legacy Mode
Use Legacy Mode when you want to make a new Communicator compatible with the X-gateway Anybus Address Mode.

See also Legacy Address Mode I/O Data Mapping (page 77).

To Use Legacy Mode

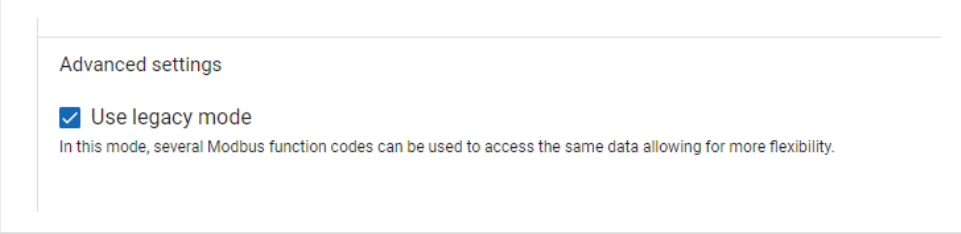


Figure 30. Advanced settings > Use legacy mode

To enable Legacy mode, select the **Use legacy mode** checkbox.

8.9. I/O Configuration

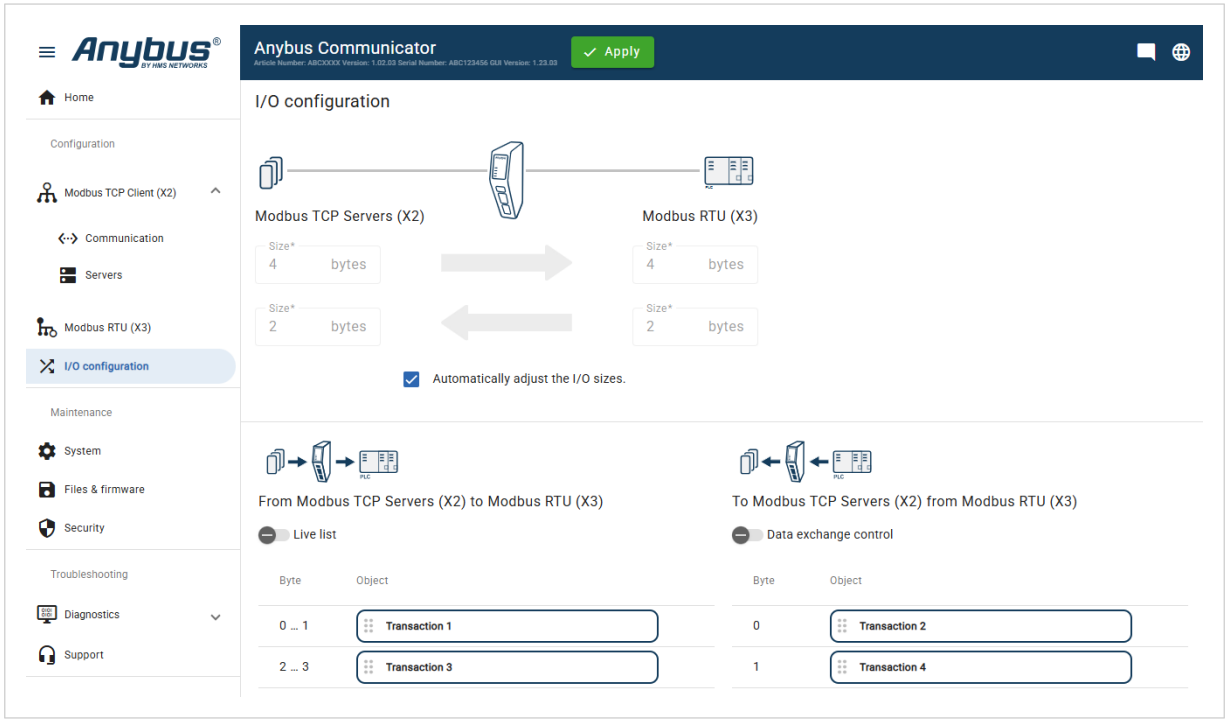


Figure 31. **I/O configuration** page

On the **I/O configuration** page the data communication between the Modbus TCP Server devices and the Modbus TCP Client network is mapped.

The allocated I/O area is auto generated based on the **Modbus TCP Server devices** network server(s) configuration and how the settings on the **Modbus TCP Client** page are configured.

There are two areas: **From Modbus TCP Server devices to Modbus TCP Client** and **To Modbus TCP Server devices from Modbus TCP Client**.

I/O Size Settings

By default, the Communicator is set to use the same I/O sizes for both the Modbus TCP Client network and the Modbus TCP Server devices.

To configure different sizes for the networks, deselect the **Automatically adjust the I/O sizes** checkbox and enter the desired sizes.

8.9.1. Map Area Object Order

To change the order of the objects in a map area, drag and drop the desired transaction to a new location.

Objects can not share the same I/O area.

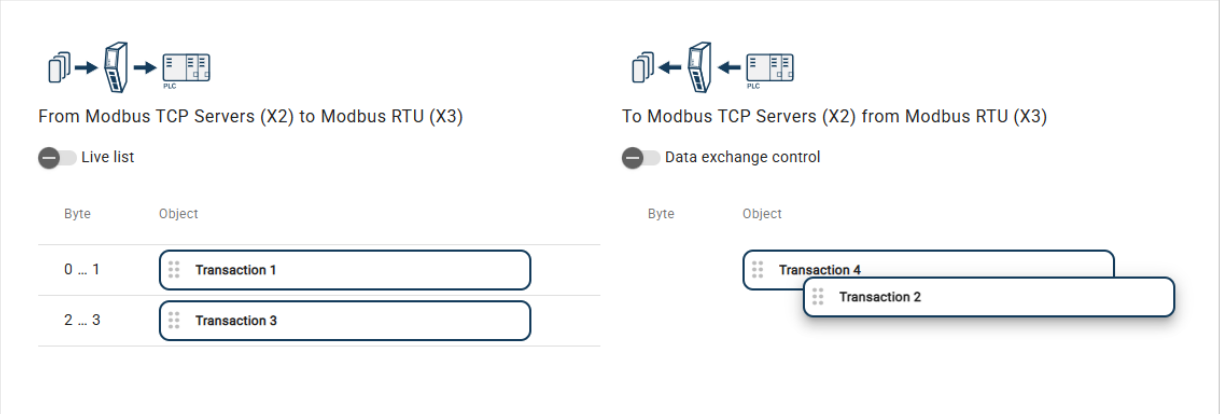


Figure 32. I/O configuration, change the order of objects

8.9.2. Endian Swap

By default, Communicator uses **No swapping**.

About Endianness

Big-endian (BE)

The big-endian format places the most significant byte of the data at the byte with the lowest memory address.

Little-endian (LE)

The little-endian format places the least significant byte of the data at the byte with the lowest memory address.

8.9.3. Map Area

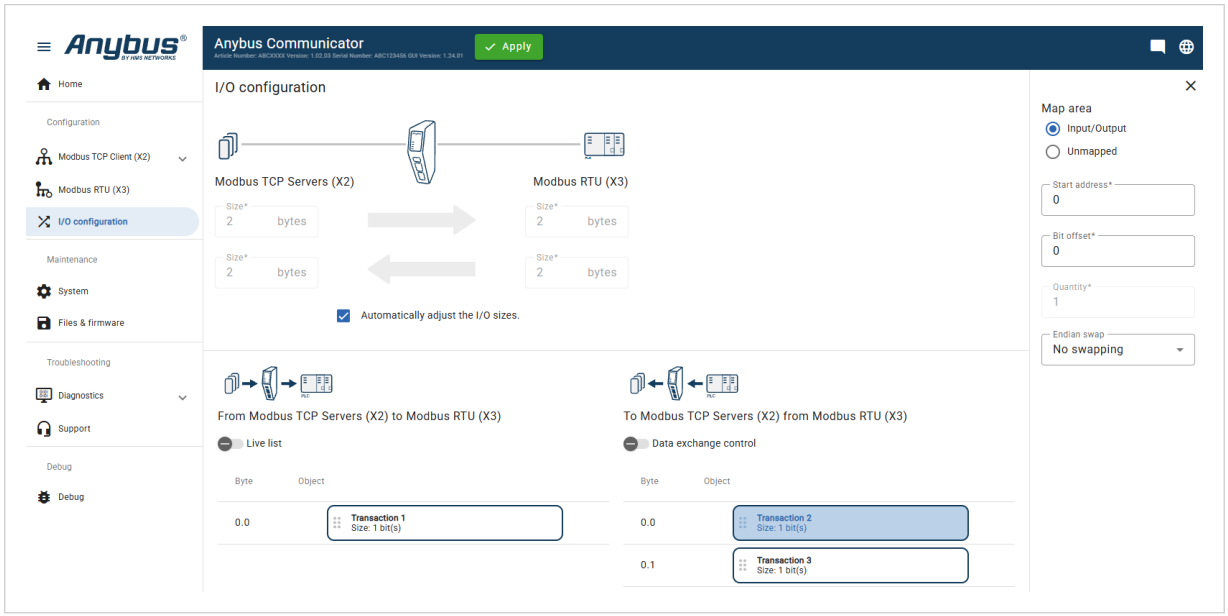


Figure 33. I/O configuration page, Map area options

Map Area Options
You must specify the map area to use for each transaction in the I/O configuration.

Select one of the following **Map area** options:

- **Input/Output**: The transaction data is sent/recieved to/from the high level network.
- **Unmapped**: The transaction data is not used.

Start Address
For Input/Output and General, you can enter a start address for the transaction data.

8.9.4. Bit Offset

Understanding Bit Offset
For certain Modbus transactions, bit offset is used to optimize IO data area usage.

With bit offset, multiple transactions can share the same byte(s) without overlapping.

This method is both memory-efficient and flexible for IO data management.

Supported Transactions
Bit offset is supported in the following Modbus function types:

- Read Coils (1)
- Read Discrete Inputs (2)
- Write Single Coil (5)
- Write Multiple Coils (15)

Read Coils and Read Discrete Inputs
The bit offset shifts the bits before they are written to the IO data area.

Only the bits associated with the specific transaction are affected.

Multiple read transactions can target the same byte(s) in the IO data area, as long as their bit ranges do not overlap.

To maintain byte alignment, set the bit offset to 0 for all transactions. Bits not written by any transaction are padded with zeroes.

Write Single Coil and Write Multiple Coils
In write operations, the bit offset shifts the bits in the IO data area before they are read and sent.

Multiple write transactions can use the same byte(s) in the IO data area without reading to the same bits.

Unsupported Transactions
Bit offset is not supported for register-based transactions, such as:

- Read Holding Registers (3)
- Read Input Registers (4)
- Write Single Register (6)
- Write Multiple Registers (16)
- Read Write Multiple Registers (23)

These transactions are byte-aligned in the IO data area.

Coil Data Packing Examples

Example 1. Byte-Aligned Coil Storage

In this example the transactions are byte-aligned in the IO data area.

8 coils would consume 8 bytes, even though each coil only needs 1.

Coil	Byte	Bit
Coil 1	Byte 1	Bit 0
Coil 2	Byte 1	Bit 1
...	...	...

Coil	Byte	Bit
Coil 8	Byte 1	Bit 7

Example 2. Bit Offset Coil Storage

In this example bit offset is used.

8 coils can be stored in 1 byte, using each bit (0–7) to represent a different coil.

Bit	Coil
Bit 0	Coil 1
Bit 1	Coil 2
...	...
Bit 7	Coil 8

Example 3. Pack Multiple Transactions Using Bit Offset

This example shows how multiple transactions with varying bit lengths can be packed into a shared process data (PD) buffer using bit offsets.

Table 1. Transaction Mapping

Transaction	Bit Length	PD Offset	PD Bit Offset
Transaction 0	1 bit	0	0
Transaction 1	3 bits	0	1
Transaction 2	7 bits	0	4
Transaction 3	8 bits	1	3

Table 2. PD Buffer Bit Layout

PD Offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	T2	T2	T2	T2	T1	T1	T1	T0
Byte 1	T3	T3	T3	T3	T3	T2	T2	T2
Byte 2	-	-	-	-	-	T3	T3	T3
T0–T3 represent the individual transactions. Bits from each transaction are packed into the PD buffer across byte boundaries.								

Procedure

The bit offset is set separately for each transaction and specifies the position of the coil in the transaction data. It represents the number of bits from the start of the transaction data to the coil at that bit offset.

By setting the bit offset, you make sure your **Server** reads or writes the correct coil in each transaction.

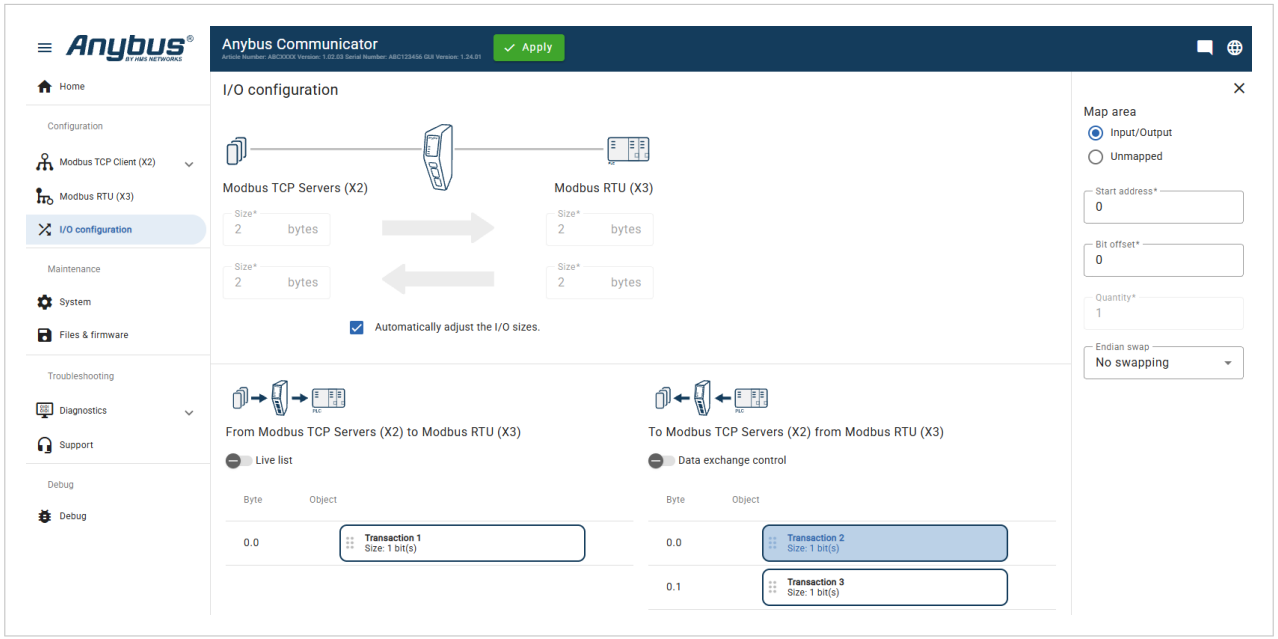


Figure 34. I/O configuration page, Bit offset

1. To set a bit offset, select the relevant **Transaction**.
2. In the **Bit offset** field, enter a value between 0 to 7.

8.9.5. Convert Between Big-Endian and Little-Endian

To convert between big-endian and little-endian you must reverse the byte order.

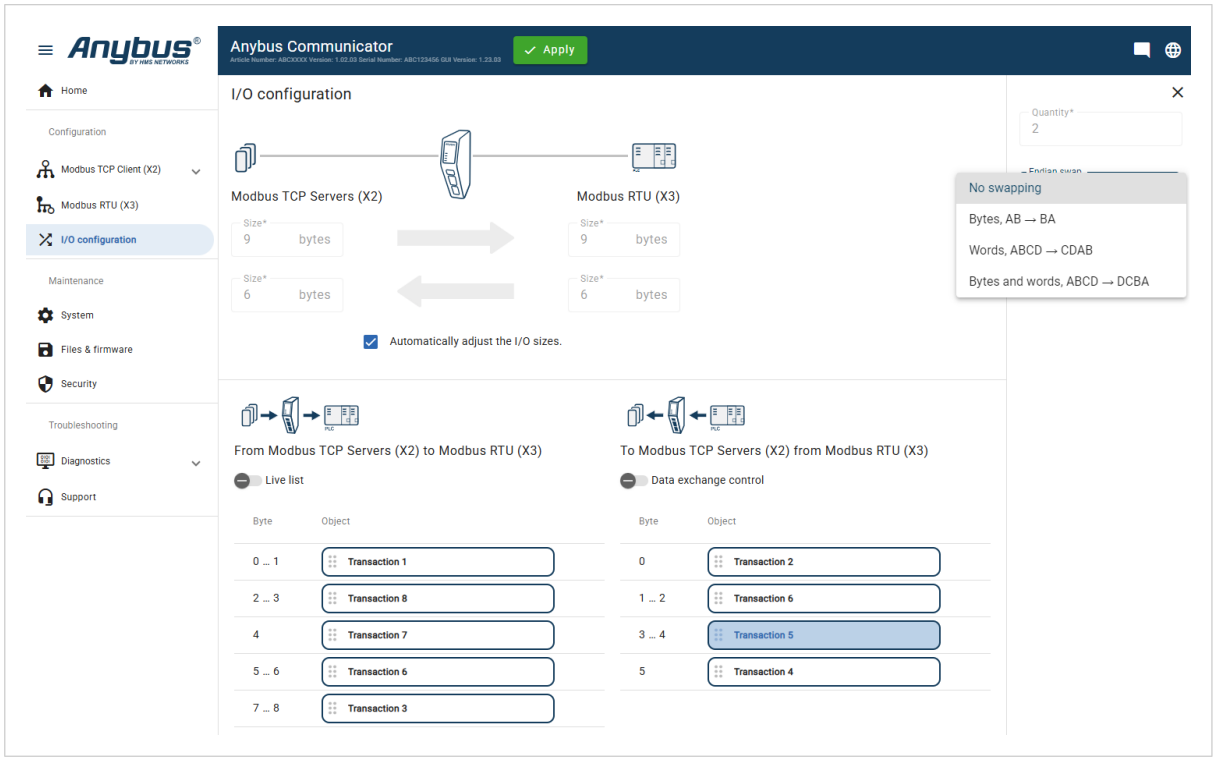


Figure 35. **I/O configuration** page, Endian swap

To reverse the byte order:

1. In the web-interface left sidebar menu, click **I/O configuration**.
2. In the data map, select the transaction for which you want to do swap the byte order.
3. Select the endian swap type from the **Endian swap** drop-down menu.

Setting	Description
No swapping	Default setting No swapping is performed on the data.
Bytes	Swap 2 bytes A B C D becomes B A D C
Words	Swap 4 bytes A B C D becomes C D A B
Bytes and words	A B C D becomes D C B A

4. To apply the settings, click **Apply** in the web-interface header, and follow the instructions.

8.9.6. Live List

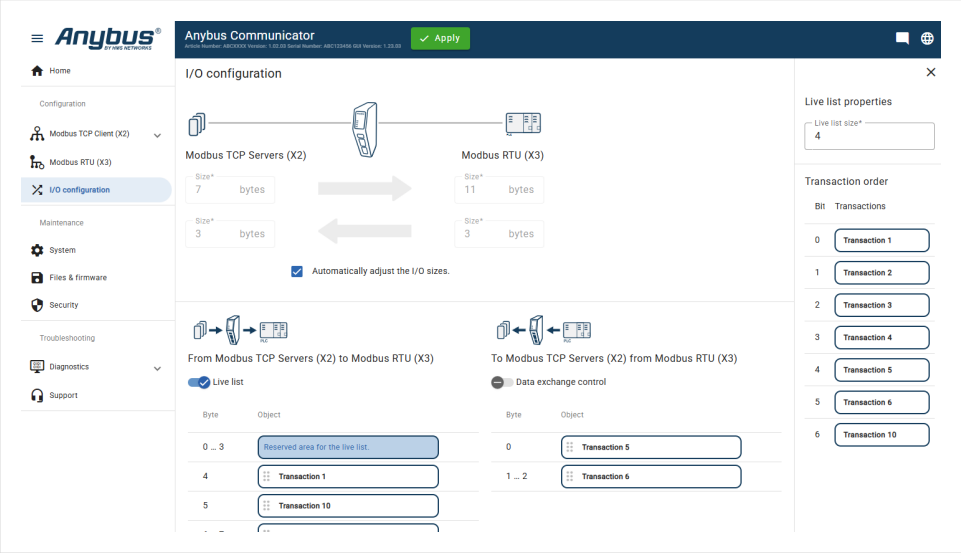


Figure 36. I/O configuration page, Live list enabled

By default, **Live list** is disabled.

About the Live List

- When **Live list** is enabled, the first four bytes of process data on the Modbus TCP Client network contain the live list.
- Each bit in the **Live list** can hold the status for one transaction.

- The **Live list** holds 32 bits, a total of 32 servers connected to the Communicator.
- The bit is 0 when the bit does not correspond to a configured server.
  For example, this occurs when the number of configured servers is less than 32.
- Each bit is 1 when the corresponding servers is online.

Live List Size and Transaction Order

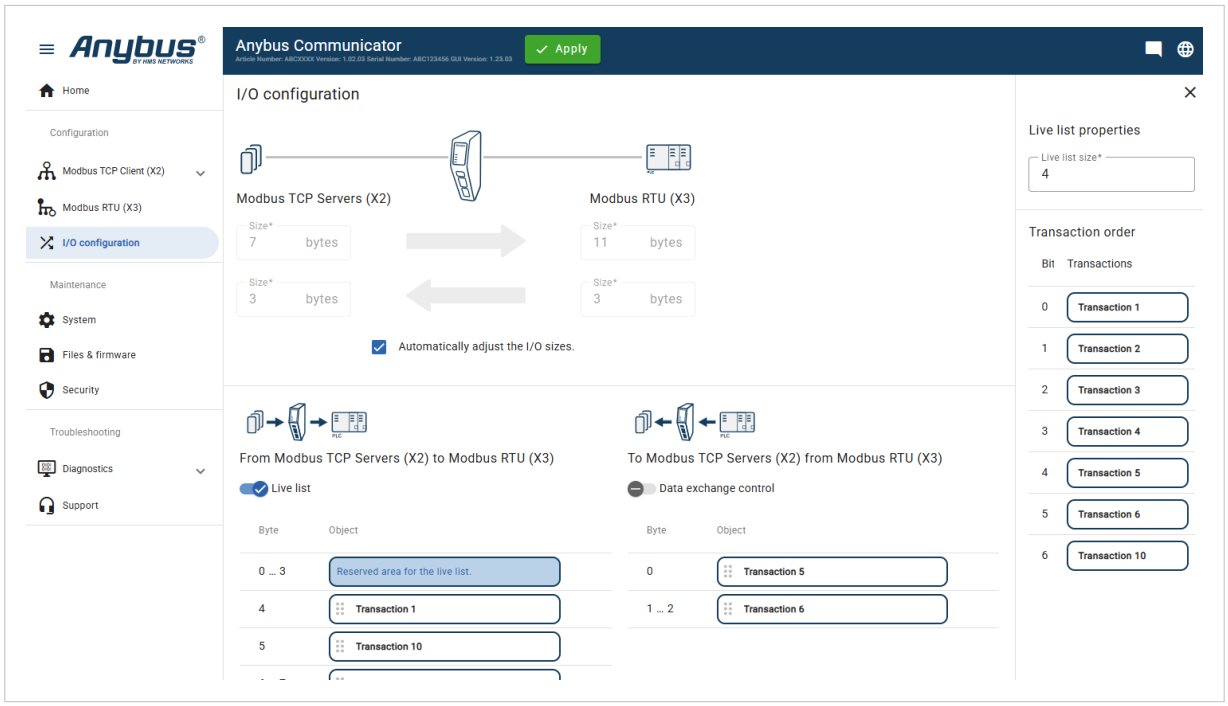


Figure 37. Live list properties and Transaction order

The default **Live list size** is 4 bytes.

The size of the live list can be configured within the range of 1 to 19 bytes.

In the **Transaction order** list, you can view the order in which the transactions are executed.

8.9.7. Data Exchange Control

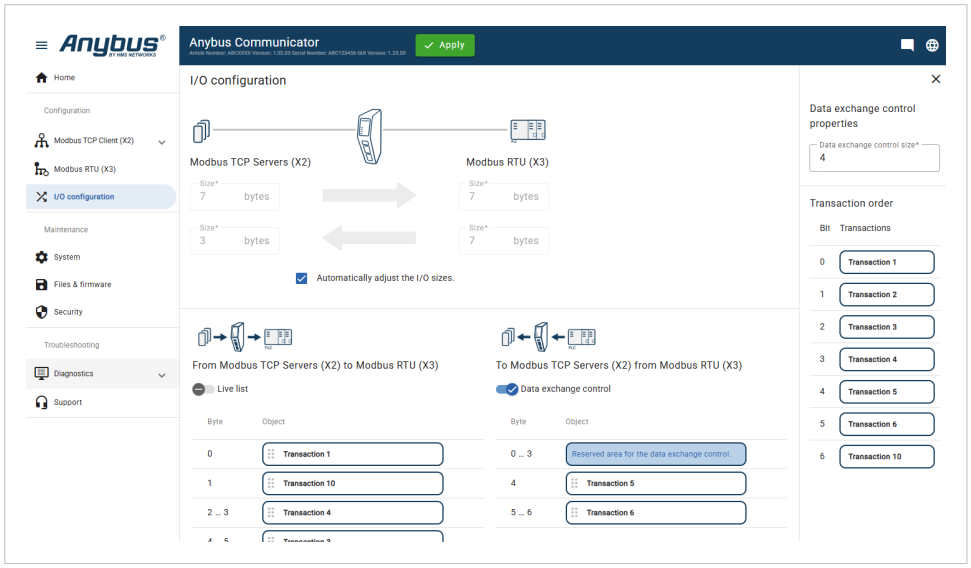


Figure 38. I/O configuration, **Data exchange control** enabled

By default **Data exchange control** is disabled.

When **Data exchange control** is enabled, the first four bytes of process data on the Modbus TCP Client network contain the data exchange control.

The **Data exchange control** holds 32 bits.

Each bit in the **Data exchange control** can be used to enable/disable data exchange for individual transaction on the subnetwork.

The server order in the **Data exchange control** 32 bit array always matches the Live List.

When data exchange is enabled, the transaction is sent only if the corresponding bit is 1.

Data Exchange Control Size and Transaction Order

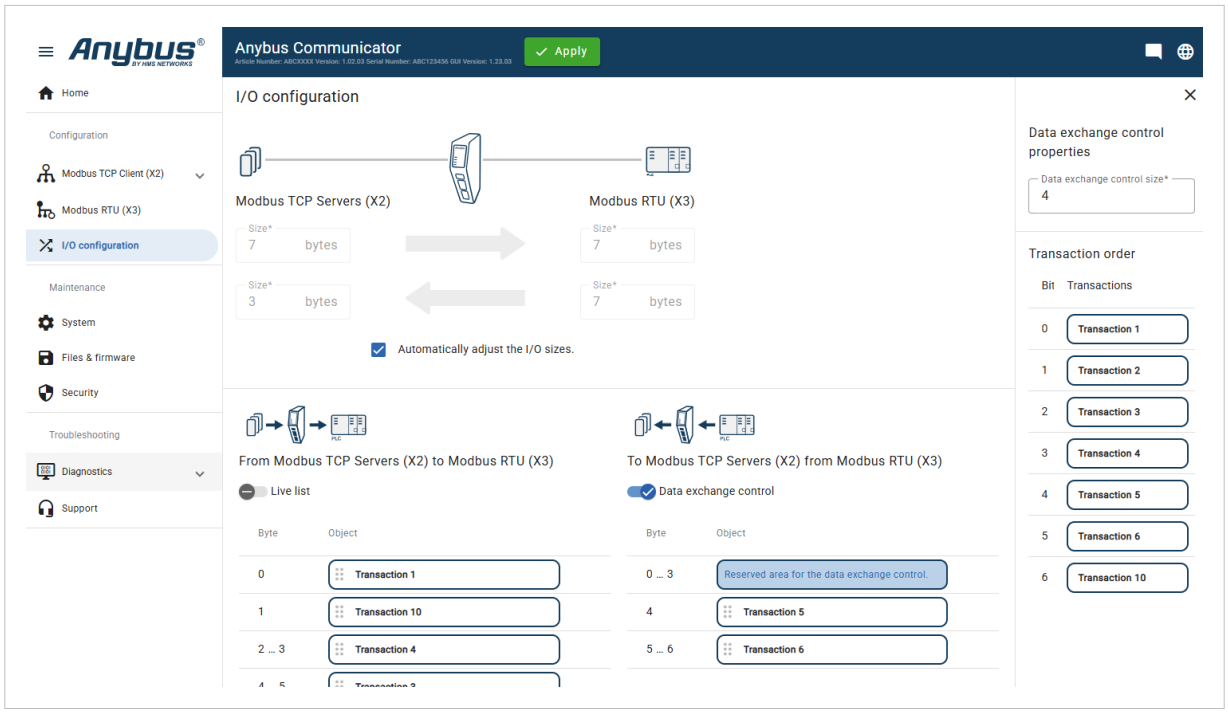


Figure 39. Data exchange control properties and Transaction order

The default **Data exchange control size** is 4 bytes.

The size of the data exchange control can be configured within the range of 1 to 19 bytes.

In the **Transaction order** list, you can view the order in which the transactions are executed.

8.10. Configuration Notes

You can add notes to describe the Communicator configuration.

8.10.1. Add Configuration Note

Procedure

1. To open the **Configuration Notes** window, click on the **comments** icon .

Figure 40. Configuration note, comment icon

2. To add a new configuration note, click **Add**.

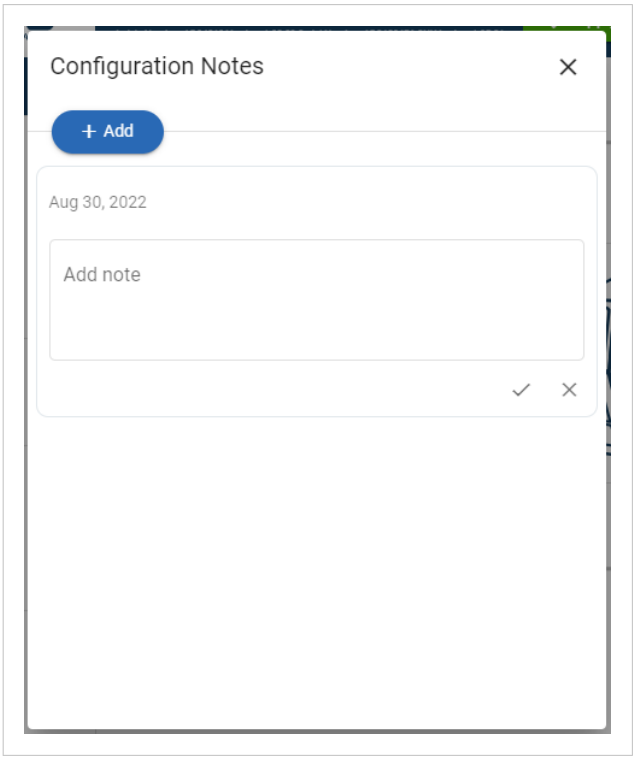


Figure 41. Add new configuration note

3. Write your configuration note and click **accept** ✓.

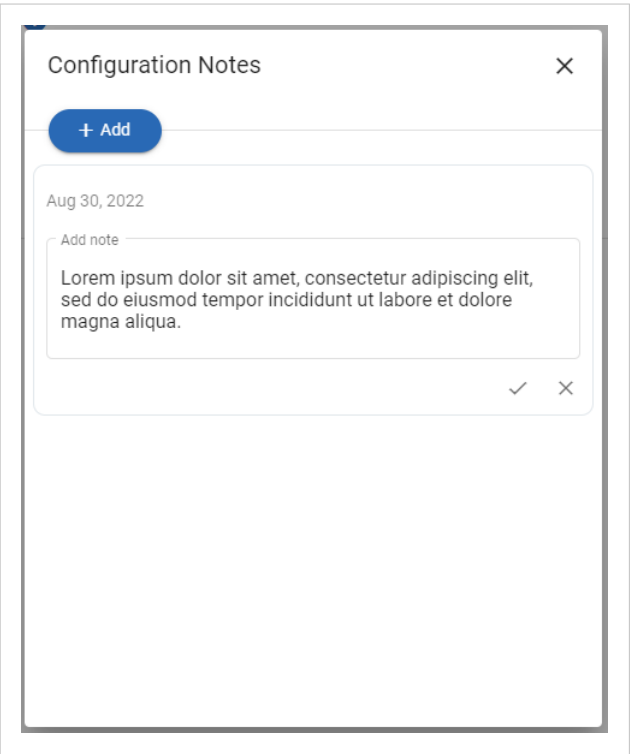


Figure 42. Write a configuration note

The configuration note is added to the list.

4. To close the window, click **close** ×.
5. To save the configuration note, click **Apply** in the web-interface header, and follow the instructions.

8.10.2. View and Edit Configuration Notes

To view and/or edit a note, click on the **comments** icon .

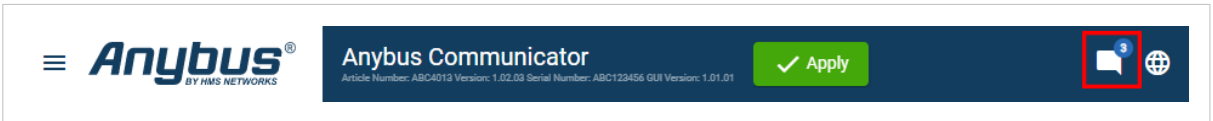


Figure 43. Example: The comment icon indicates that there are three added notes

The configuration notes are listed in the **Configuration Note** window.

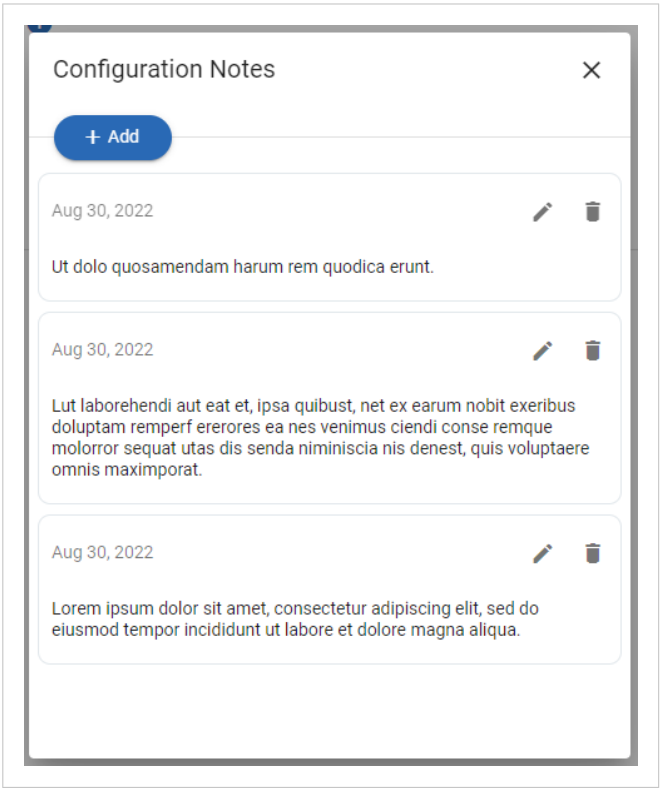


Figure 44. Example: The Configuration Notes window with added notes

8.11. Apply Configuration

Before You Begin

NOTE
When you apply the configuration, any existing configuration is overwritten.

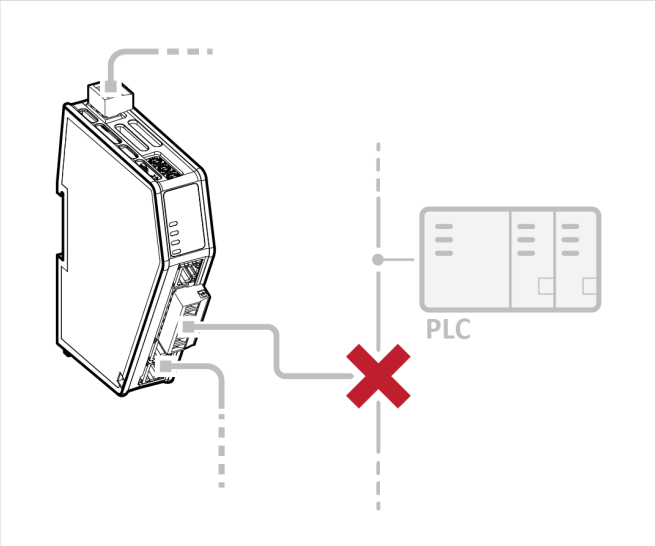


Figure 45. Disconnect the Communicator from the Modbus RTU Server network

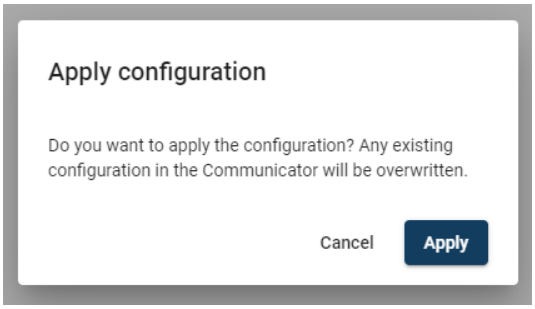
Before you can apply the configuration, ensure that there is no active communication on the Modbus RTU Server network where the Communicator is connected.

Procedure

To make the settings take effect, download the configuration to the Communicator:

1. In the web-interface header, click **Apply**

2. To confirm download, click **Apply**.
   The configured settings are downloaded and applied to the system.



8.12. To Use an Existing Configuration

When you have configured a Communicator and want to use the same settings to configure additional Communicator, do the following.

Procedure

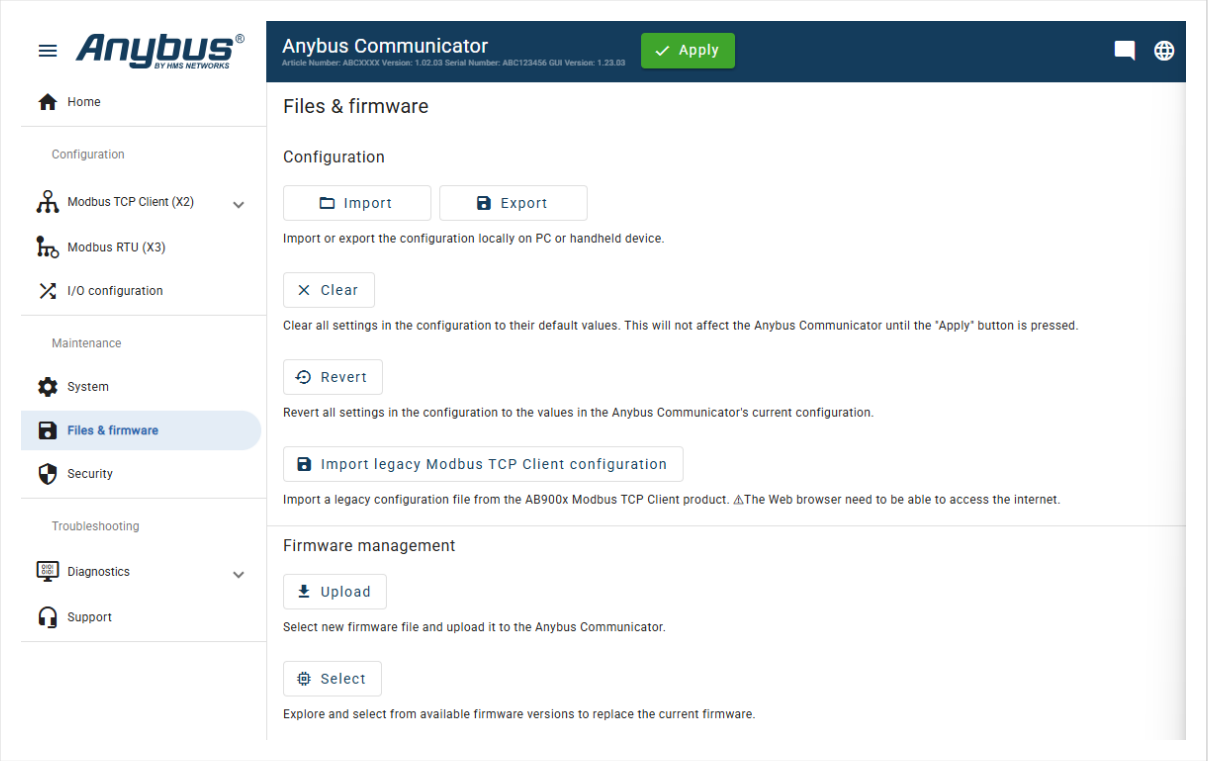


Figure 46. **Files & firmware** page

In the built-in web-interface of the Communicator with the configuration you want to use:

1. On the **Files & firmware** page, click **Export**
   The configuration is saved in a configuration file and downloaded to your PC.

In the built-in web-interface of the new Communicator to be configured:

2. On the **Files & firmware** page, click **Import**
3. In the Import configuration window, click **Select file (.conf)**.
4. In the Open dialog box, browse to and select the configuration file and click **Open**.
5. To import the configuration file, click **Import**.

Result

All the configuration settings are imported.

To apply the settings, click **Apply** in the web-interface header, and follow the instructions.

8.13. To Use a Legacy Modbus TCP Client Configuration

Before You Begin

The intended use of the X-gateway configuration import is to get a new Communicator unit up and running quickly and then complete the configuration in the Communicator built-in web interface.

NOTE

Only the X-gateway Modbus TCP Client configuration settings can be imported.

The I/O data map and high-level network settings are not supported and must be set manually in the Communicator built-in web interface.

Procedure

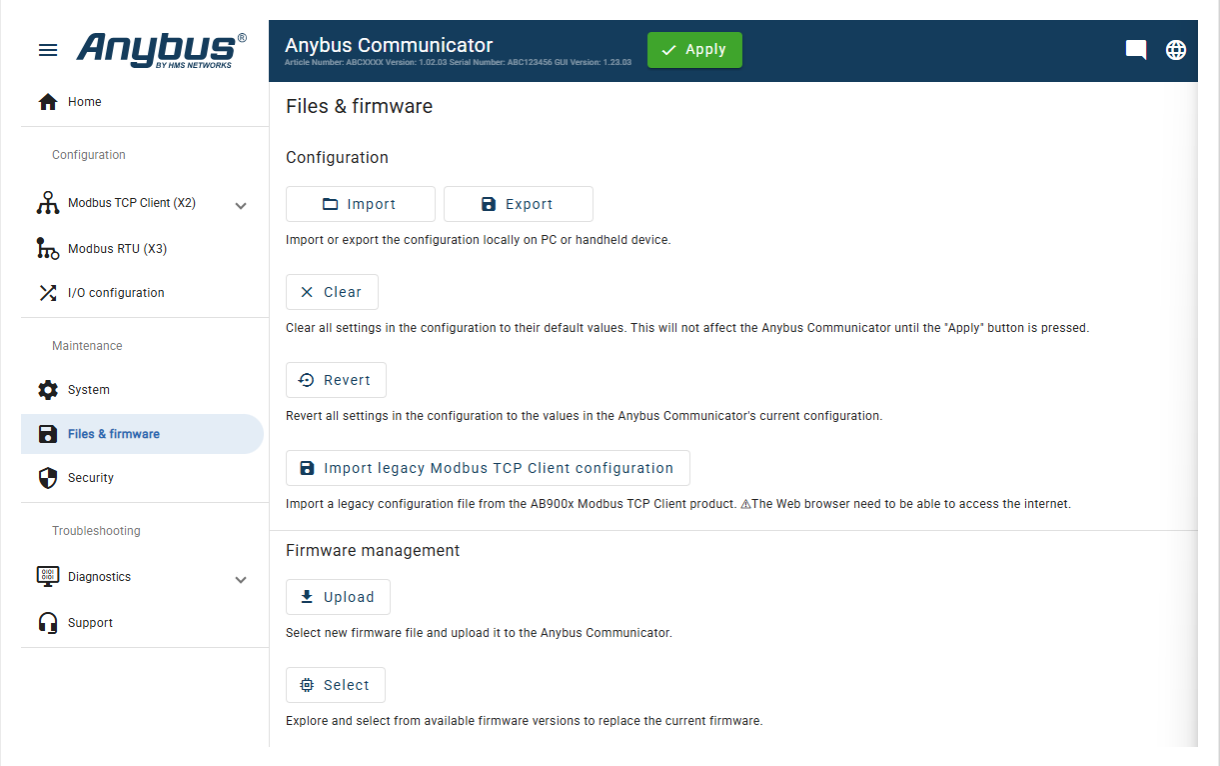


Figure 47. **Files & firmware** page

1. Ensure that the PC you are using to configure the Communicator is connected to the internet.
2. On the **Files & firmware** page, click **Import Modbus TCP Client legacy configuration**.
3. In the **Import Modbus TCP Client legacy configuration** window, click **Select file (.cfg)**.
4. In the Open dialog box, browse to and select the configuration .cfg file and click **Open**.

5. To import the configuration, click **Import**.

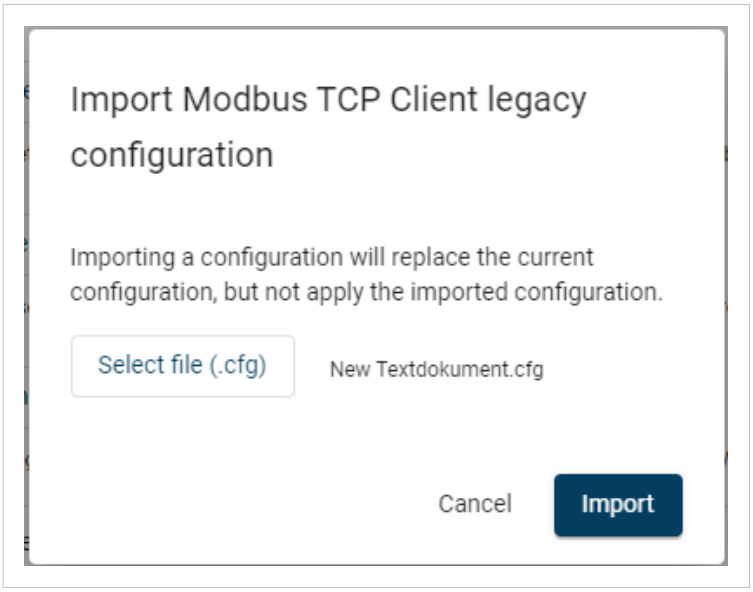


Figure 48. Example, selected .cfg file

6. Option when the X-gateway configuration file is protected with a username and password.
Select the **Authentication details** checkbox and enter the username and password.

> **NOTE**
> For information about X-gateway Authentication to protect the configuration, see the user documentation for your specific X-gateway.

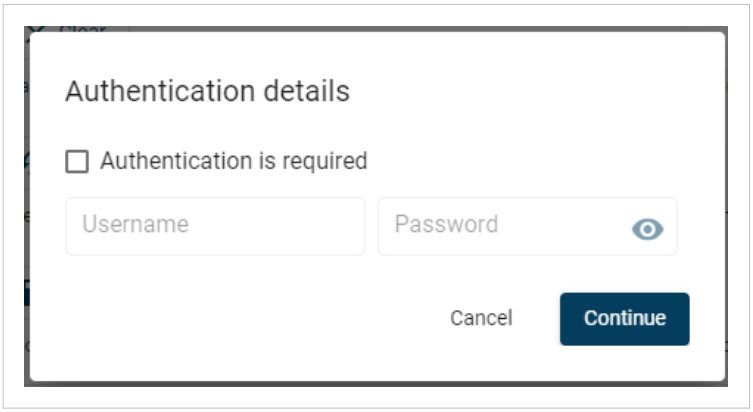
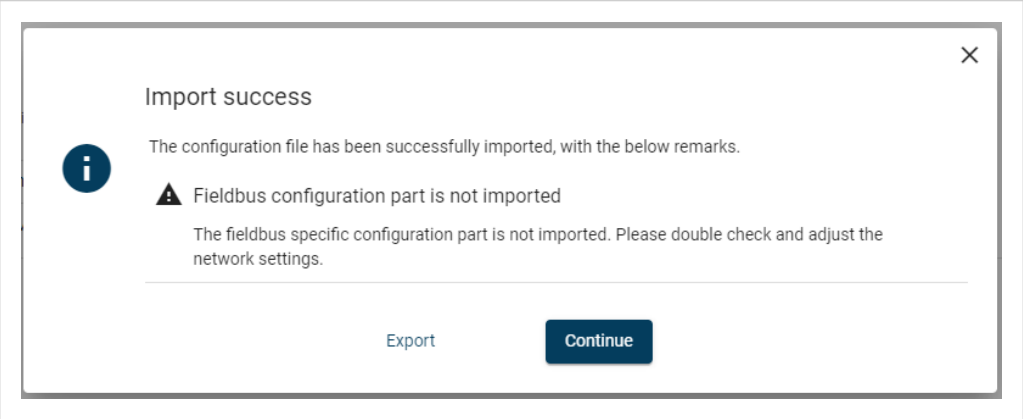


Figure 49. Authentication details

7. Click **Continue**.

Result

The X-gateway Modbus TCP Client configuration settings are imported.



A window with messages about the imported configuration appears.

In the list you can view the settings that are supported or adjusted to work with Communicator and which settings that are not supported and must be set manually in the Communicator built-in interface.

To export the messages in an Excel XLS file, click **Export Messages**.

Figure 50. Example, list with messages about the import

To apply the settings, click **Apply** in the web-interface header, and follow the instructions.

9. PLC Configuration

9.1. PLC Device Security

IMPORTANT
It is important to maintain the cybersecurity of the Communicator.

Before connecting the Communicator to a PLC, ensure the PLC is configured and installed in accordance with the PLC supplier hardening guidelines.

9.2. Modbus Addressing and Register Mapping

For information about the Modbus Transactions, see Modbus Data Model and Modbus Function Codes (page 45).

For information about the Modbus Transactions, refer to the Modbus Organization.

9.2.1. The Difference Between Address and Register Start

To read or write data from a Modbus device you can use either Address or Register.

TIP
If Register is used, add +1 to the Address value.

Example 4. Modbus Function Code 0x04 Read Input Registers

Table 3. Modbus client values

Address	Register	Modicon Register
0	1	30001
1	2	30002
2	3	30003

Example 5. Modbus Function Code 0x03 Read Holding Registers

Table 4. Modbus client values

Address	Register	Modicon Register
0	1	40001
1	2	40002
2	3	40003

9.2.2. To Read and Write Data

To Read Data
To read data, you can use different Modbus Functions.

Discrete Inputs

- Modbus Function 0x02 Read Discrete Input Status

Discrete Input start at address 0.

Input Registers

- Modbus Function 0x04 Read Input Register
- Modbus Function 0x03 Read Holding Registers

The Input Registers starts at address 0 which corresponds to Register 1.

To use Read Holding Registers the address is offset to address 2048 which corresponds to Register 2049.

The first Input Register (30001)
The first Input Register (30001) can be read using Modbus Function code 0x04 Read Input Registers at Address 0 or Register 1.

You can also use Read Holding Registers (Modbus Function code 0x03) to read the same data (at Address 42048 = Register 42049) or use Read Discrete Inputs 0x02 at address 0..15.

To Write Data
To write data, you can use different Modbus Functions.

Coils

- Modbus Function 0x05 Force Single Coil
- Modbus Function 0x0F Force Multiple Coils

Coils starts at address 0.

Holding Registers

- Modbus Function 0x06 Write Single Register
- Modbus Function 0x10 Write Multiple Registers

The Holding Registers starts at address 0 which corresponds to Register 1.

Holding Register (40001)
The first Holding Register (40001) can be written to using Modbus Function code 0x06 Write Single Register at Address 0 or Register 1.

To read back what has been written, you can use Read Holding Registers 0x03 at address 0..749 = Register 1..750 (40001..40750) or Read Coils 0x01 at address 0..11999.

Data Encoding

Modbus uses the big-endian format for addresses and data items.

When a numerical value larger than one byte is transmitted, the most significant byte is sent first.

Example 6. Big-Endian Data Encoding

For a 16-bit register value of 0x1234:

- The first byte sent is 0x12.
- The second byte sent is 0x34.

See also Convert Between Big-Endian and Little-Endian (page 60).

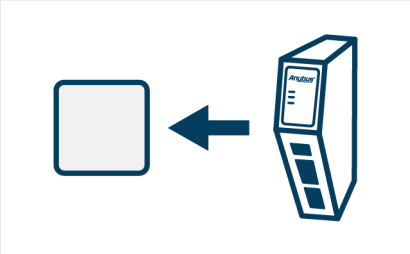
Idle Mode

Transaction	Holding Register	Description
Enter/Exit Idle Mode	0x1004	Used by the Modbus TCP client to indicate an idle/offline mode on the network.

9.2.3. Default Address Mode I/O Data Mapping

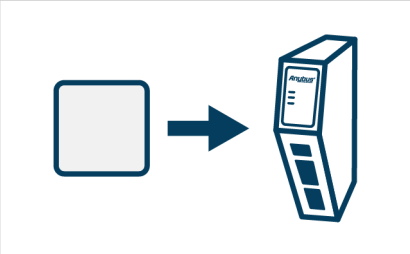
The following Modbus function codes are compatible with the default addressing mode.

Input Data to Client/Server - Data to Modbus



Process I/O data offset		Discrete input address		Input register address		Holding register address	
HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC
0x0000 - 0x0001	0 - 1	0x0000 - 0x000F	0 - 15	0x0000	0	0x0800	2048
0x0002 - 0x0003	2 - 3	0x0010 - 0x001F	16 - 31	0x0001	1	0x0801	2049
...	...	...	...	...	...	...	...
0x05D8 - 0x05D9	1496 - 1497	0x2EC0 - 0x2ECF	11968 - 11983	0x02EC	748	0x0AEC	2796
0x05DA - 0x05DB	1498 - 1499	0x2ED0 - 0x2EDF	11983 - 11999	0x02ED	749	0x0AED	2797

Output Data From Client/Server - Data From Modbus TCP

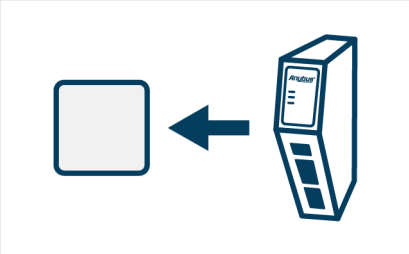


Process I/O data offset		Coil address		Holding register address	
HEX	DEC	HEX	DEC	HEX	DEC
0x0000 - 0x0001	0 - 1	0x0000 - 0x000F	0 - 15	0x0000	0
0x0002 - 0x0003	2 - 3	0x0010 - 0x001F	16 - 31	0x0001	1
...	...	...	...	...	...
0x05D8 - 0x05D9	1496 - 1497	0x2EC0 - 0x2ECF	11968 - 11983	0x02EC	748
0x05DA - 0x05DB	1498 - 1499	0x2ED0 - 0x2EDF	11983 - 11999	0x02ED	749

9.2.4. Legacy Address Mode I/O Data Mapping

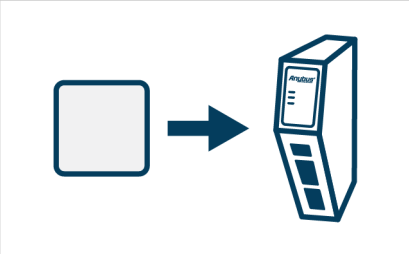
The following Modbus function codes are compatible with the Modbus **Use legacy mode** setting.

Input Data to Client/Server - Data to Modbus



Process I/O data offset		Discrete input address		Coil address		Input register address		Holding register address	
HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC
0x0000 - 0x0001	0 - 1	0x0000 - 0x000F	0 - 15	0x0000 - 0x000F	0 - 15	0x0000	0	0x0000	0
0x0002 - 0x0003	2 - 3	0x0010 - 0x001F	16 - 31	0x0010 - 0x001F	16 - 31	0x0001	1	0x0001	1
...	...	...	...	...	...	...	...	...	...
0x01FC - 0x01FD	508 - 509	0x0FE0 - 0x0FEF	4064 - 4079	0x0FE0 - 0x0FEF	4064 - 4079	0x00FE	254	0x00FE	254
0x01FE - 0x01FF	510 - 511	0x0FF0 - 0x0FFF	4080 - 4095	0x0FF0 - 0x0FFF	4080 - 4095	0x00FF	255	0x00FF	255

Output Data From Client/Server - Data From Modbus



Process data offset		Discrete input address		Coil address		Input register address		Holding register address	
HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC
0x0000 - 0x0001	0 - 1	0x4000 - 0x400F	16384 - 16399	0x4000 - 0x400F	16384 - 16399	0x0400	1024	0x0400	1024
0x0002 - 0x0003	2 - 3	0x4010 - 0x401F	16400 - 16415	0x4010 - 0x401F	16400 - 16415	0x0401	1025	0x0401	1025
...	...	...	...	...	...	...	...	...	...
0x01FC - 0x01FD	508 - 509	0x4FE0 - 0x4FEF	20448 - 20463	0x4FE0 - 0x4FEF	20448 - 20463	0x04FE	1278	0x04FE	1278
0x01FE - 0x01FF	510 - 511	0x4FF0 - 0x4FFF	20464 - 20479	0x4FF0 - 0x4FFF	20464 - 20479	0x04FF	1279	0x04FF	1279

See Also

Legacy Mode For Anybus Address Mode | Modbus TCP (Page 52)

10. Verify Operation

10.1. Communicator Status Monitor

On the Home page, you can get a quick overview of the network and the Communicator operating status.

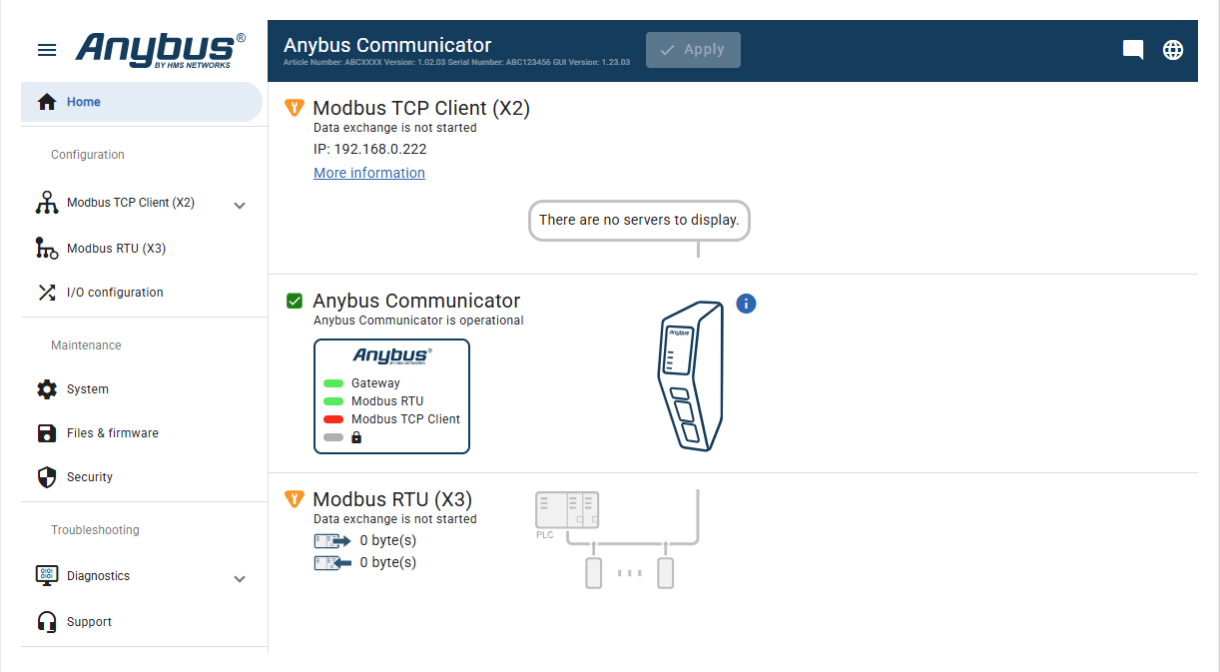


Figure 51. Home page

Gateway Status

Overview the Communicator LED indications remotely.

Server Status

Overview the status for each server added to the subnetwork.

Network Status and Settings

Overview communication status and the current networks settings.

Status Symbols

Symbol	Description
	Internal error has occurred, and operation cannot be guaranteed.
	Out of Specification.
	Check Function: • Initial state where non network components are started and configured. • Network startup in progress. • Invalid configuration detected.
	Normal operation.

See Also

Connect To Modbus RTU Server Network (Page 17)
Connect To Modbus TCP Client Network (Page 19)
Connect To Power (Page 21)
Communicator LED Indicators (Page 80)
LED Status (Page 93)
Firmware Upgrade Error Management (Page 97)

10.2. Communicator LED Indicators

NOTE
Before you can verify operation, you must configure the Communicator.

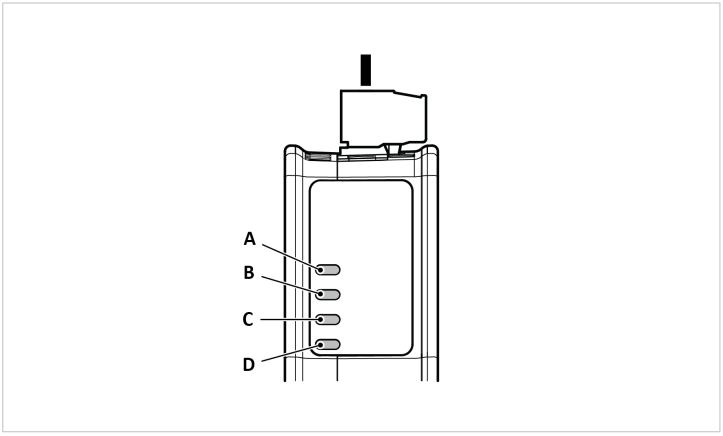


Figure 52. Gateway status (A), Network connection (B)/(C) and Security switch (D)

LED A - Gateway status	
Operation Status	**Description**
Off	No power
Green, flashing	Startup phase
Green, solid	Operational
Red, flashing	Invalid configuration
Green/Red, flashing	Power up self-test/Firmware update/Firmware recovery

Connection to high level network IO controller device

- **LED B for PROFINET netwok**
- **LED C for EtherNet/IP, EtherCAT, PROFIBUS, Modbus TCP, or Modbus RTU networks**

Operation status	EtherNet/IP	EtherCAT	PROFIBUS	PROFINET	Modbus TCP	Modbus RTU
Off	No power/No IP address.	No power	No power/No data exchange.	No power/No connection with IO controller.	No power/No Modbus TCP IP address.	No power, no active nodes, or all nodes are stopped.
Green, solid	Connection with IO controller established.	EtherCAT on.	Operate, data exchange.	Connection with IO controller established. IO controller in Run state.	Modbus TCP online, at least one message received.	At least one Modbus message received.
Green, one flash	N/A	N/A	N/A	Connection with IO controller established. IO controller in STOP state or IO data is inaccurate.	N/A	N/A
Green, flashing	EtherNet/IP online, no connections established.	EtherCAT online, no connections established.	Clear, data exchange.	Used by engineering tools to identify the node on the network.	Modbus TCP online, no messages received.	Waiting for first Modbus message.
Red, solid	IP address conflict detected.	Fatal event			IP address conflict detected.	Fatal event

Connection to high level network IO controller device • LED B for PROFINET netwok • LED C for EtherNet/IP, EtherCAT, PROFIBUS, Modbus TCP, or Modbus RTU networks						
Operation status	**EtherNet/IP**	**EtherCAT**	**PROFIBUS**	**PROFINET**	**Modbus TCP**	**Modbus RTU**
Red, one flash	N/A	Unsolicited state change SubDevice application has changed the EtherCAT state autonomously.	Parameterization error.	Station name not set.	N/A	
Red, two flash	N/A	Sync Manager watchdog timeout.	Configuration error.	IP address not set.	N/A	
Red, three flash	N/A	N/A	N/A	Expected Identification differs from Real Identification.	N/A	
Red, flashing	Connection timeout	Invalid configuration.	N/A	N/A	Connection timeout	Connection timeout. No Modbus messages has been received within the configured process active timeout time.

Connection to subnetwork Modbus TCP client device • LED C for PROFINET network • LED B or EtherNet/IP, EtherCAT, PROFIBUS, Modbus TCP, or Modbus RTU networks	
Operation status	**Description**
Off	No IP address.
Red, flashing	At least one connection error or timeout.
Red, solid	IP address conflict detected, or FATAL event.
Green, solid	No connections errors or timeouts.

Security switch - LED D	
Operation status	**Description**
Off	No power/Security switch is unlocked/Exception/Fatal error
Green	Security switch is locked

Fatal Error and Exception Error

Fatal error: A fatal error causes the Communicator firmware application to crash in an uncontrolled manner.

Exception error: An exception error causes the Communicator to enter a controlled error state. The Communicator firmware application is still running.

LED	Fatal error	Exception error
A	Red, solid	Red, solid
B	Red, solid	Off
C	Red, solid	Off
D	Off	Off

See Also

Connect To Modbus RTU Server Network (Page 17)
Connect To Modbus TCP Client Network (Page 19)

Connect To Power (Page 21)
Communicator Status Monitor (Page 78)
LED Status (Page 93)
Firmware Upgrade Error Management (Page 97)

10.3. Ethernet RJ45 LED Indicators

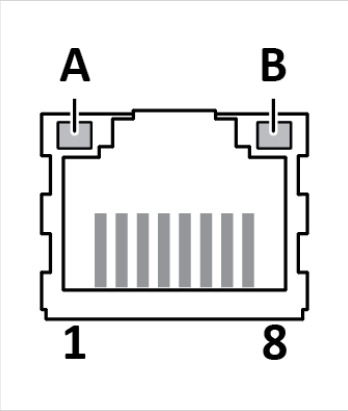


Figure 53. LED A. Activity LED B. Not used

LED A	Function
Off	No link (or no power)
Green	Link (100 Mbit/s) established
Green, flashing	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow, flashing	Activity (10 Mbit/s)

LED B	Function
Off	Not used

11. Maintenance

11.1. Action on Fatal Error

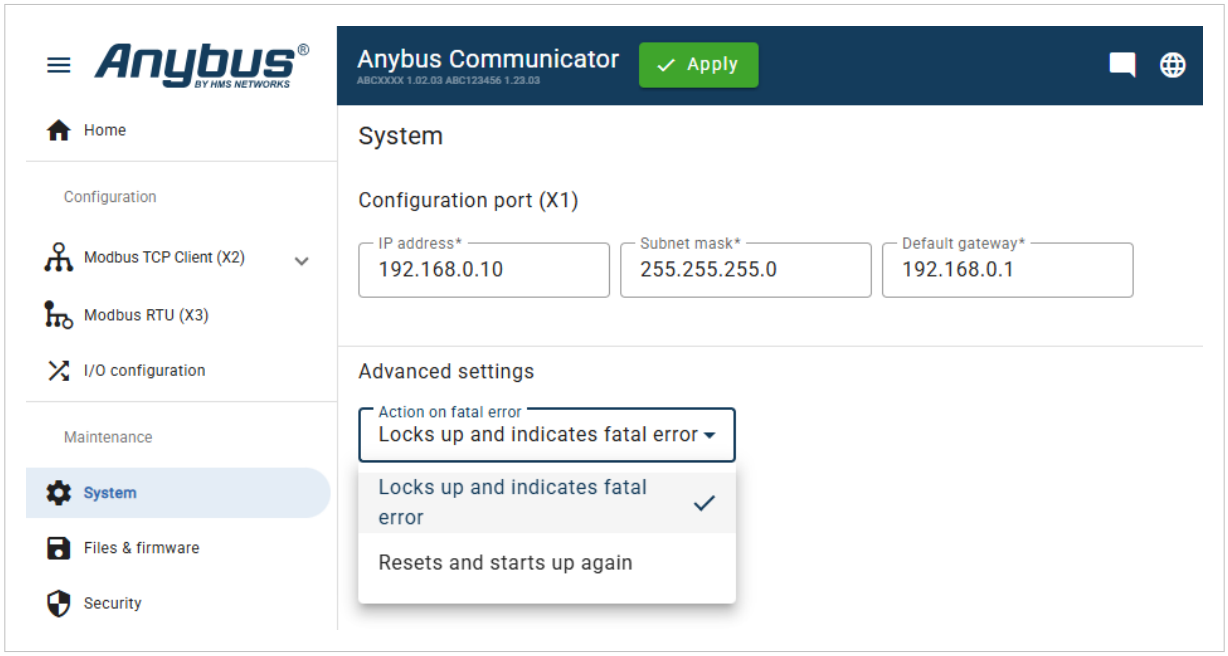


Figure 54. System page, Action on fatal error menu

A fatal error causes the Communicator firmware application to crash in an uncontrolled manner.

You can configure how the Communicator should behave if a fatal error occurs.

In the **Action on fatal error** menu, select one of the following settings:

- **Locks up and indicates fatal error**: Default setting, the Communicator locks up and the LED indicators indicates a fatal error.
- **Resets and starts up again**: The Communicator is rebooted to reset the system and return to normal operation.

11.2. Configuration Port IP Settings

On the **System** page you can change the IP address of the Communicator configuration port.

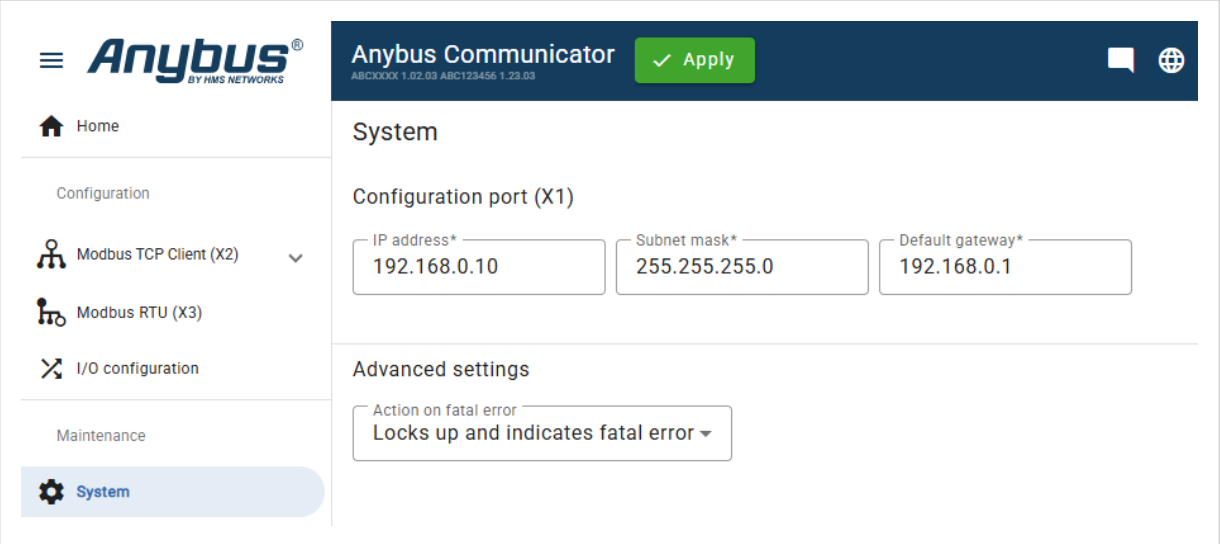


Figure 55. System page, Configuration port settings

Default Configuration Port IP settings

Setting	Default value
IP address	192.168.0.10
Subnet mask	There is no default Subnet mask.
Gateway	There is no default Gateway address.

11.3. Configuration File Handling

11.3.1. Export Configuration

You can export the current configuration, to import and use the same settings to configure additional Communicator.

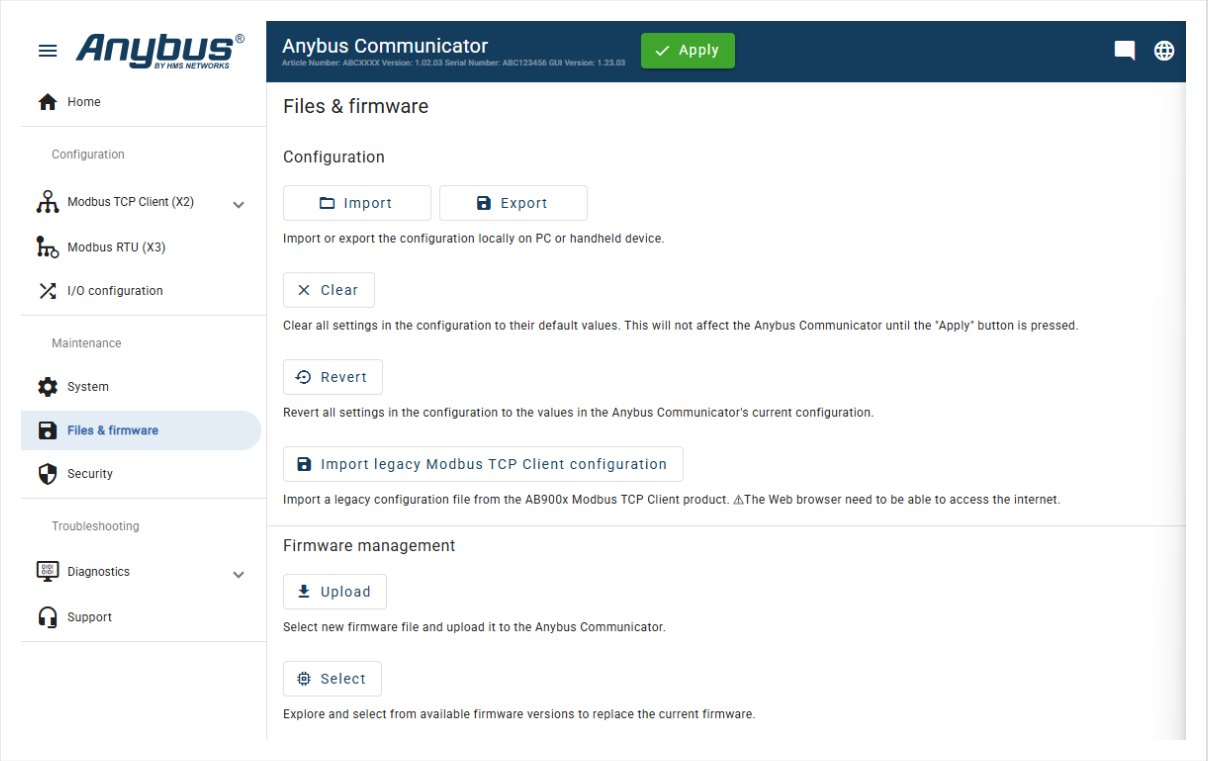


Figure 56. Files & firmware page

To export a configuration file:

In **Files & firmware**, click **Export**.

The configuration settings are stored in a .conf file and downloaded to your PC.

11.3.2. Import Configuration

To easily configure multiple Communicator with the same settings, you can import a configuration file.

Before You Begin

The supported file format is .conf.

Procedure

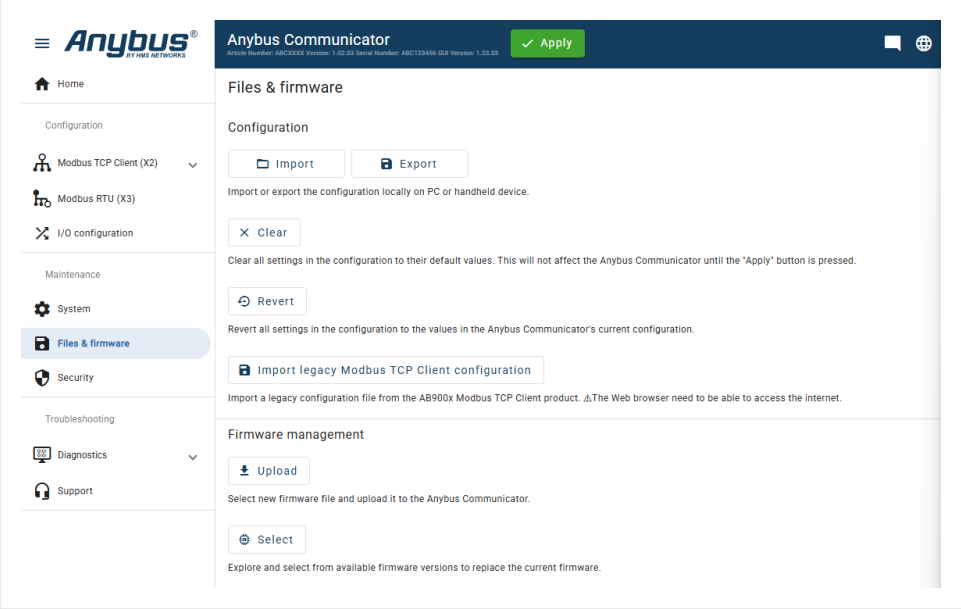


Figure 57. Files & firmware page

Import configuration file:

1. On the **Files & firmware** page, click **Import**.
2. In the Import configuration window, click **Select file (.conf)**.
3. In the Open dialog box, browse to and select the configuration file and click **Open**.
4. In the Import configuration window, click **Import**.
5. In the Communicator address settings window:
   - To import IP settings from the selected configuration file, click **Imported settings**.
     All configuration settings are imported.
   - To continue using the current IP settings, click **Configured settings**.
     All configuration settings except the IP settings are imported.
6. The configuration file is parsed.
   - If the configuration is compatible, the settings are imported.
   - If any compatibility mismatches occur, a message about the mismatch appears.
7. To apply the settings, click **Apply** in the web-interface header, and follow the instructions.

11.4. Clear and Revert Configuration

You can restore all settings in a configuration to the default settings.

Procedure

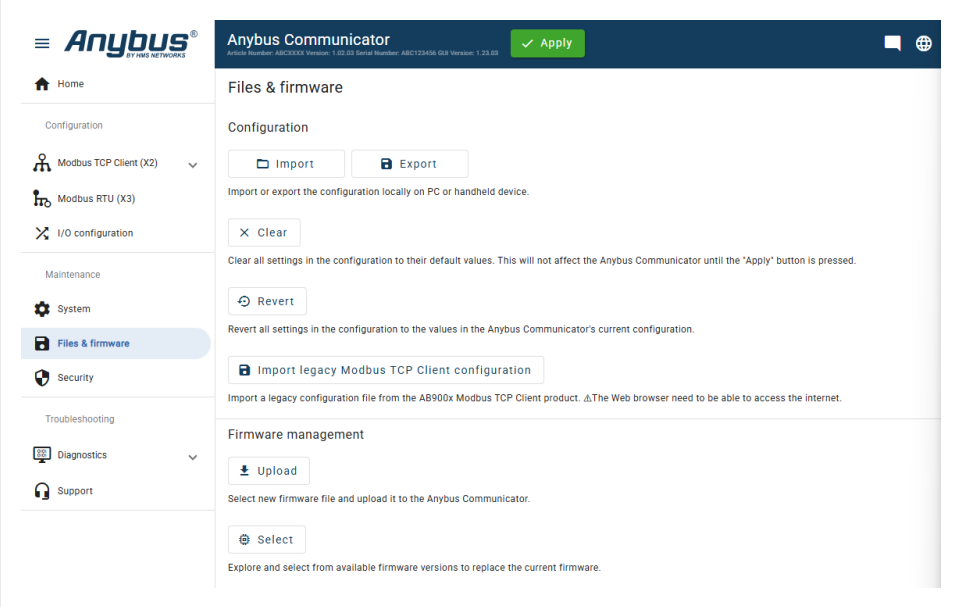


Figure 58. Files & firmware page

To Clear the Configuration

When you want to clear a configuration and return to the default settings.

1. On the **Files & firmware** page, click **Clear**.
2. In the Confirm clear window, click **Clear**.
3. To apply the change, click **Apply** in the web-interface header, and follow the instructions.

To Revert the Configuration

When you want to remove any configuration made in a current session and re-load the configuration from the gateway.

1. On the Files & firmware page, click **Revert**.
2. In the Confirm revert window, click **Revert**.
3. To apply the change, click **Apply** in the web-interface header, and follow the instructions.

11.5. Firmware Management

11.5.1. View the Firmware Version

On the **Support** page, you can view the current applied firmware version.

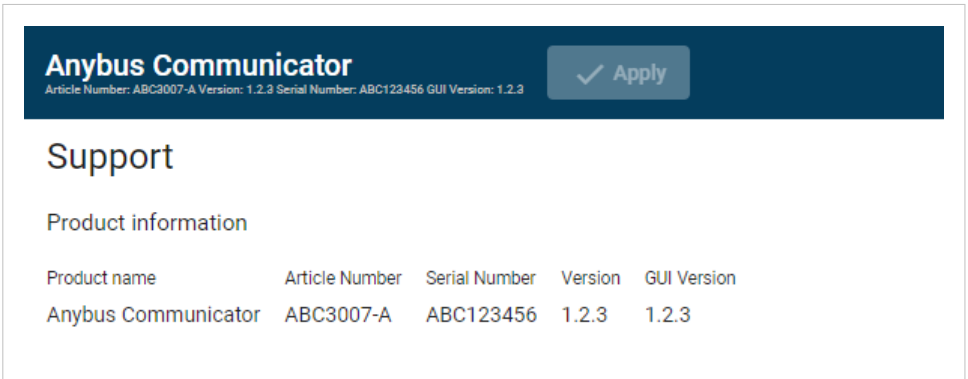


Figure 59. Support page, Product information example

11.5.2. Firmware and Configuration Compatibility

Compatibility after firmware upgrade

Current configuration is still compatible after upgrading the firmware.

Compatibility after firmware downgrade

IMPORTANT

Compatibility after a firmware downgrade cannot be guaranteed.

The current configuration may use features not available in the older firmware version.

11.5.3. Firmware File Validation

Before the firmware file is imported into the system, the firmware upgrade function performs a validation of the file, to ensure that:

- the firmware is compatible with the Communicator hardware
- the firmware is suited for the product
- the officially HMS software signatures are valid
- that the firmware file is not corrupt or damaged

If the firmware file does not pass the validation, the firmware file is rejected and an error message appear.

11.5.4. Update Firmware

Before You Begin

IMPORTANT
To eliminate the risk of interference with plant operation, firmware update is only available when the Communicator is disconnected from the OT networks.

Ensure to disconnect the Communicator from the OT networks.

Procedure

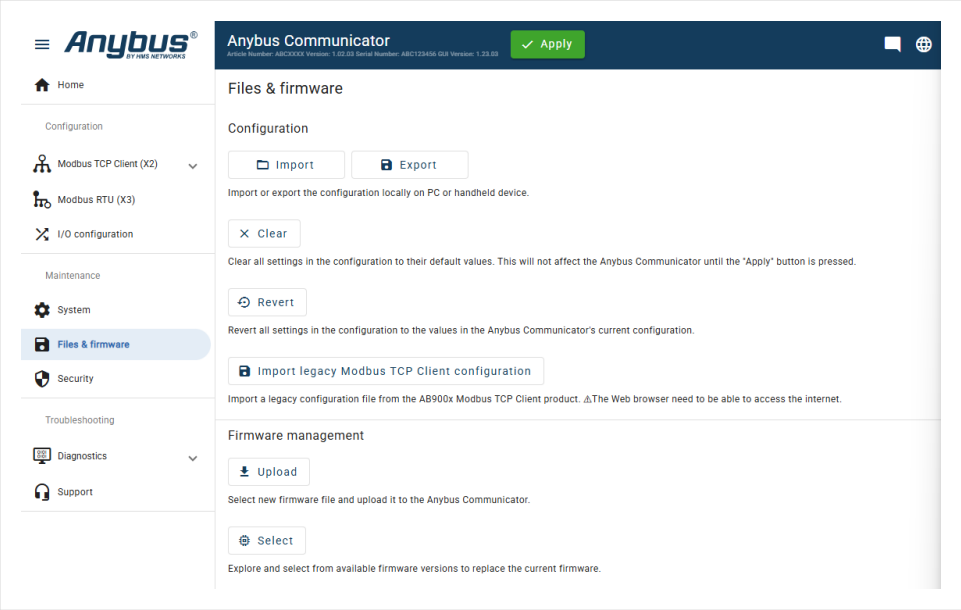


Figure 60. Files & firmware page

To update the firmware:

1. On the **Files & firmware** page, click **Upload**.
2. In the Upload Firmware window, click **Select firmware (.hiff)**.
3. In the Open dialog box, browse to and select the firmware file and click **Open**.
4. To start the firmware upgrade, click **Update firmware**.
   The firmware file is validated and transferred.

Result

- If the firmware file passes the validation: The firmware is upgraded and then the Communicator automatically reboots, for the upgrade to take effect.
- If the firmware file is rejected: An error message appears.

11.6. Change Language

Default language is **English**.

To change the language of the Communicator built-in web interface:

1. In the Communicator built-in web-interface header, click the **Language** icon .

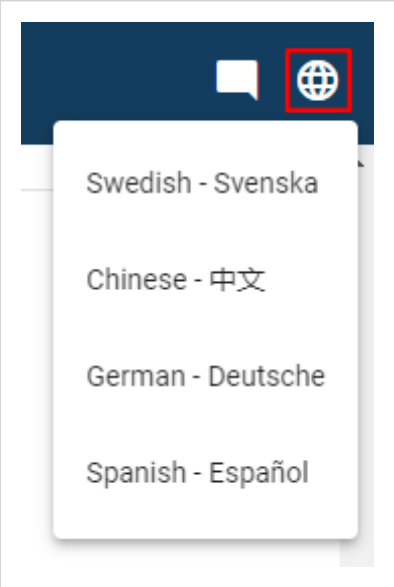


Figure 61. Language menu

2. Select a new language from the list.

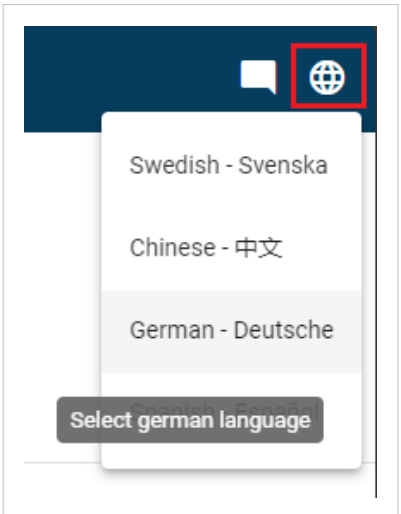


Figure 62. Example: Change language to German

The language change takes effect immediately.

12. Troubleshooting

12.1. Diagnostics

12.1.1. I/O Data

On the **Diagnostics**, **I/O data** page you can monitor how the data flow between the **Modbus RTU Server** side and the **Modbus TCP Client** side, including any configured endian conversions.

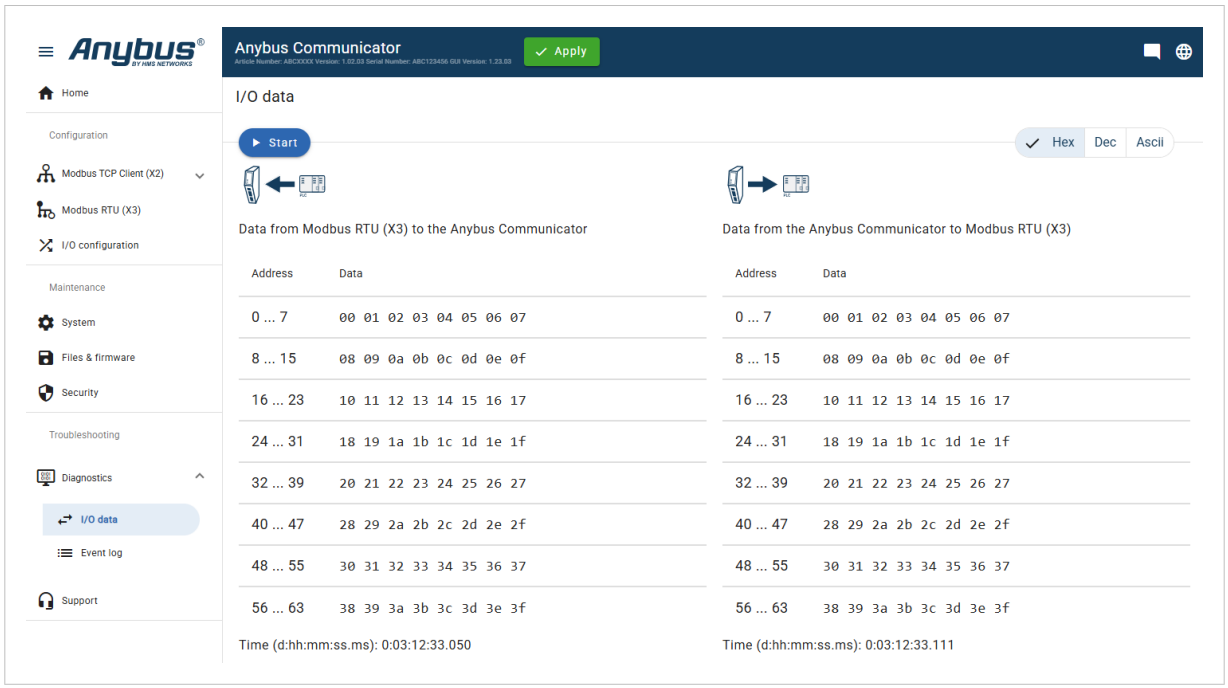


Figure 63. I/O data

I/O data is updated twice every second.

Select how data is displayed

To choose if the data should be displayed in Hexadecimal, Decimal or ASCII, click **Hex**, **Dec** or **Ascii**.

Start and Stop Data flow

- To start the data flow, click **Start**.
- To end the data flow, click **Stop**.

12.1.2. Event Log

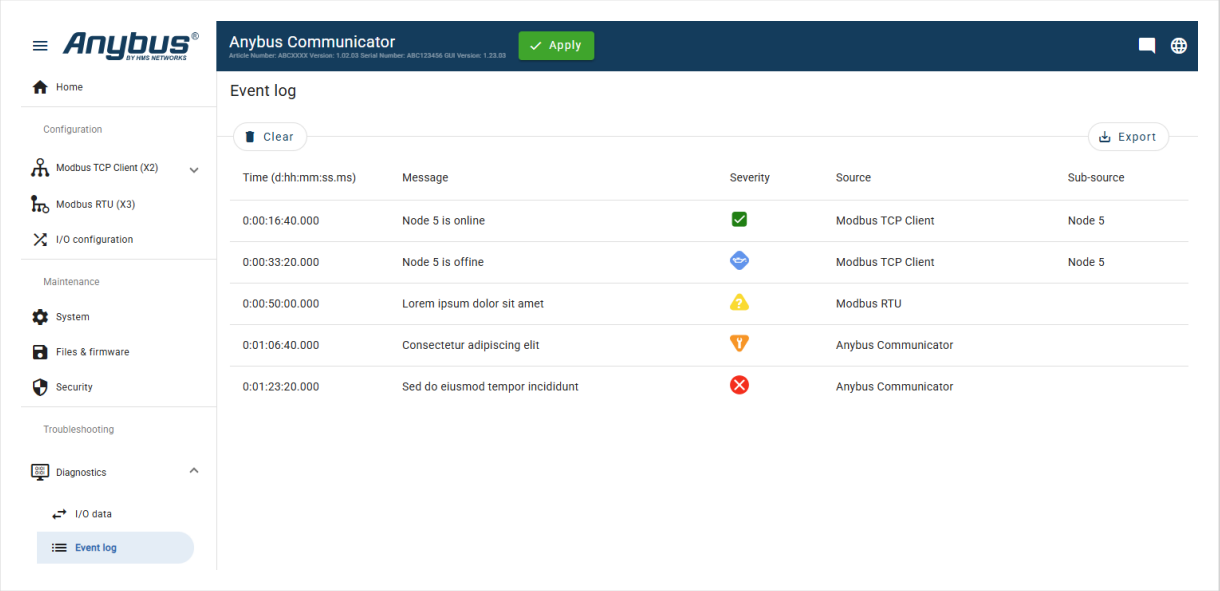


Figure 64. Event log page example

How To Analyze the Information

The log follows the FIFO principle, first in and first out. The oldest (first) value is processed first.

Time (d:hh:mm:ss.ms)	The duration from when the X-gateway was powered on until the event occurred.
Message	A brief description of the event.
Severity	The severity of the event occurred.
Source	Communicator
	Modbus TCP Client
	Modbus RTU Server
Sub-source	The nodes connected to the subnetwork and the PLC connected to the high level network. If there is a problem with a node the node name is displayed in the Sub-source column. Example 7. Sub-source number If the node name is 5, number 5 is displayed in the Sub-source column.

To clear the current log, click **Clear**.

12.1.3. LED Status

On the Home page, you can remotely monitor the Communicator LED status.

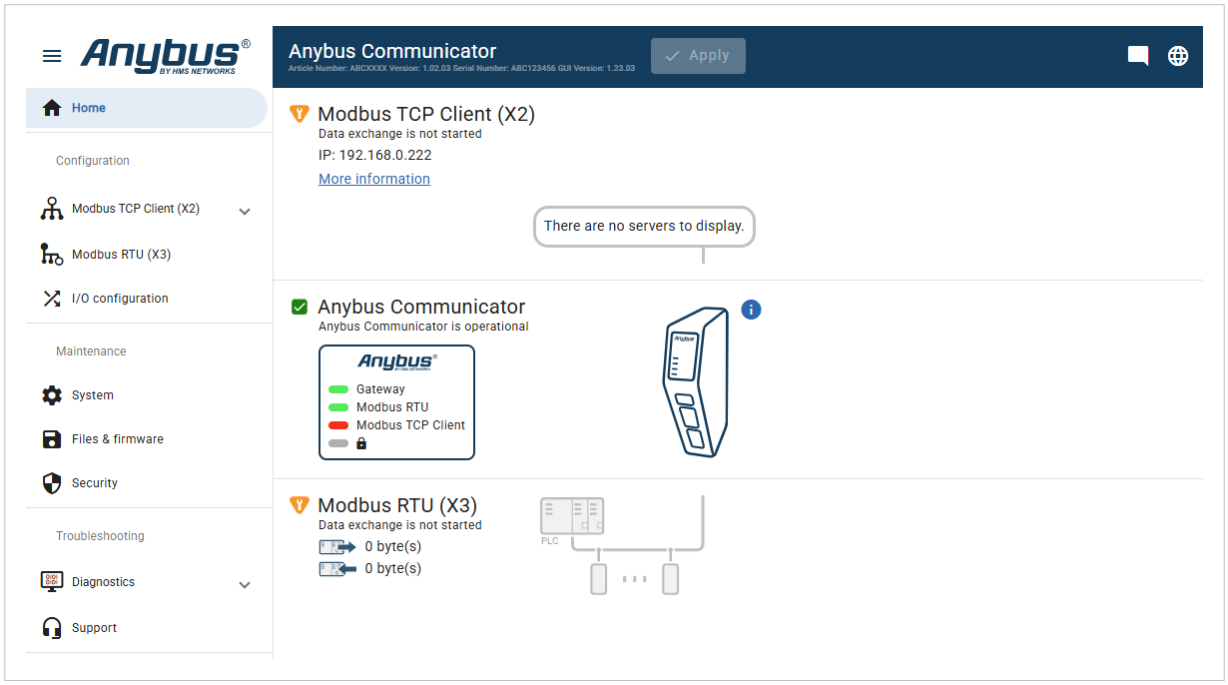


Figure 65. Home page

See Also

Connect To Modbus RTU Server Network (Page 17)
Connect To Modbus TCP Client Network (Page 19)
Connect To Power (Page 21)
Communicator Status Monitor (Page 78)
Communicator LED Indicators (Page 80)
Firmware Upgrade Error Management (Page 97)

12.2. Reset to Factory Settings

Before You Begin

Procedure

To reset the Communicator:

1. Disconnect the Communicator from power.

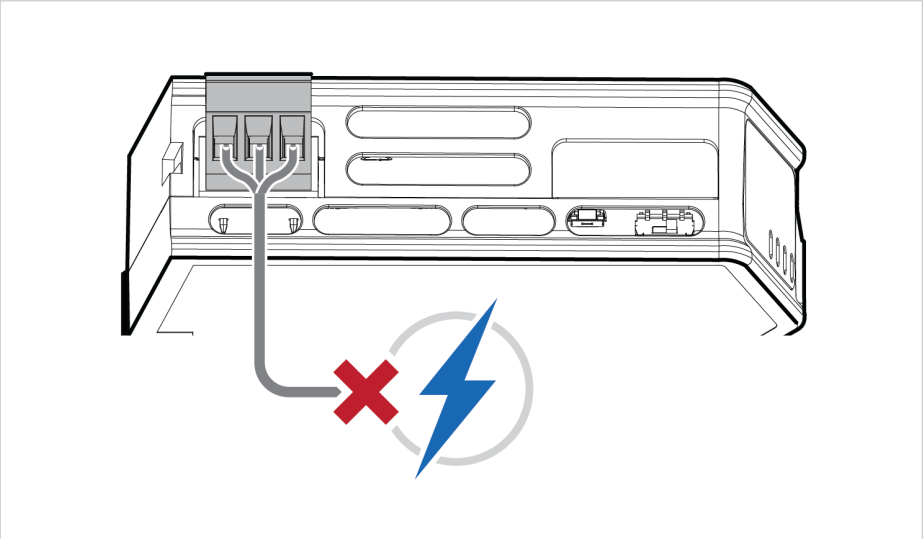


Figure 66. Disconnect power

2. Use a pointed object, such as a ballpoint pen to press and hold the **Reset** button.

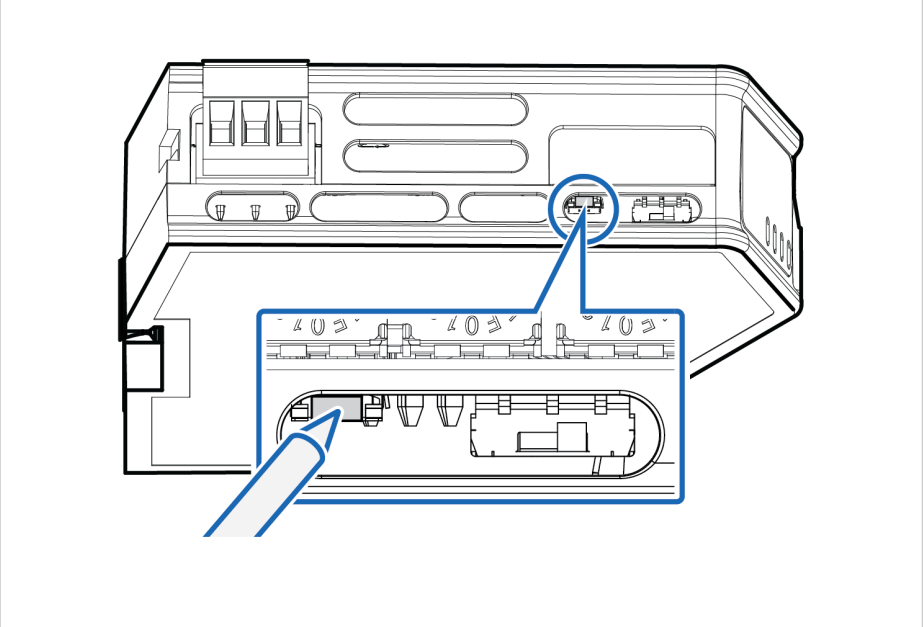


Figure 67. Press and hold **Reset** button

3. While holding the **reset** button, reconnect the Communicator to power.

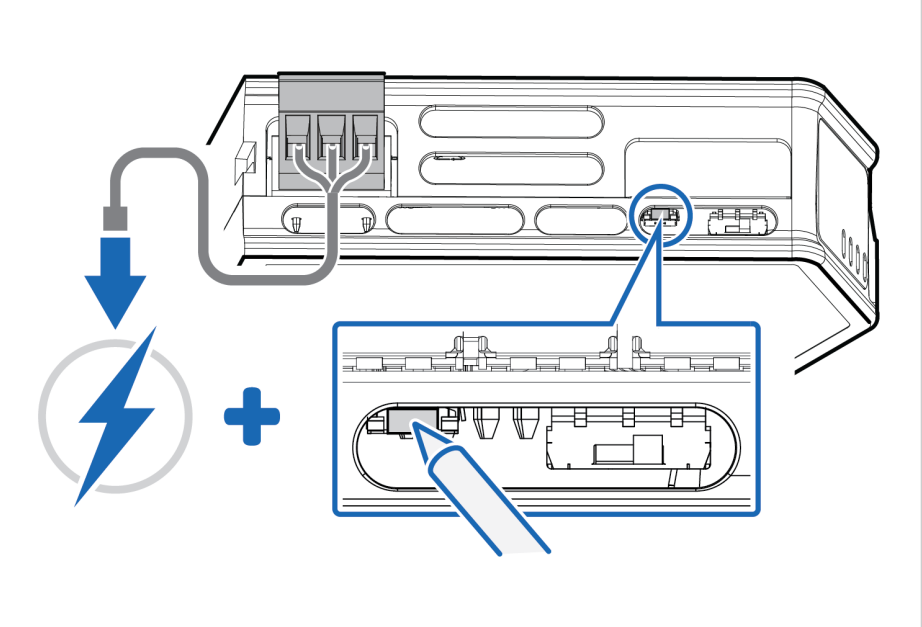


Figure 68. Hold **Reset** button and reconnect power

4. Release the **reset** button.
   The Communicator enters exception state.

5. Reboot the Communicator.

Result

When the Communicator has successfully rebooted, the Communicator configuration is reset to the factory default configuration or the current configuration after firmware upgrade.

To Do Next

To ensure that the Communicator built-in web-interface is synchronized.

1. Open the Communicator built-in web interface.

2. Navigate to the **Files & firmware** page and click **Revert**.

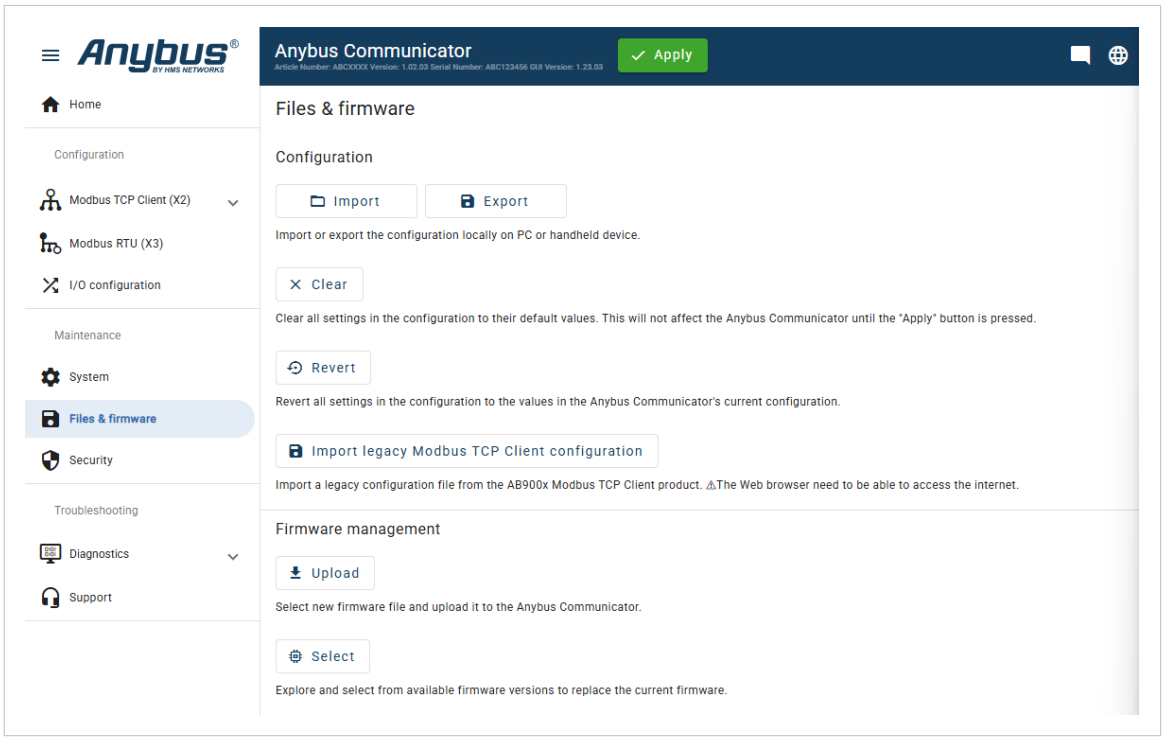


Figure 69. Files & firmware, Revert

12.3. Firmware Upgrade Error Management

Before You Begin

If the firmware update process is interrupted or if the power is lost during the update process, the Communicator goes into fallback mode.

The firmware file from the latest update attempt remains in the flash memory, but it is not active.

Procedure

To complete the interrupted firmware update:

1. Disconnect the Communicator from power.

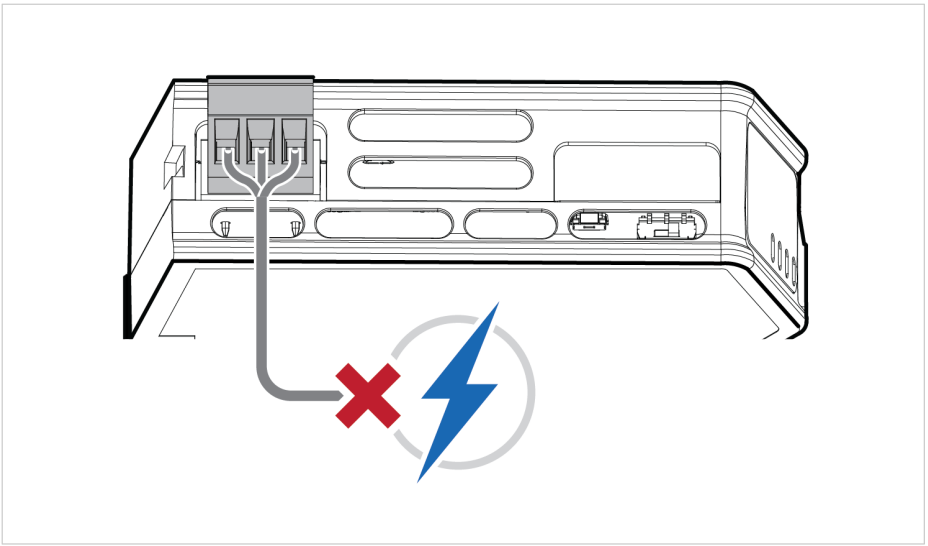


Figure 70. Disconnect power

2. Reconnect the Communicator to power.

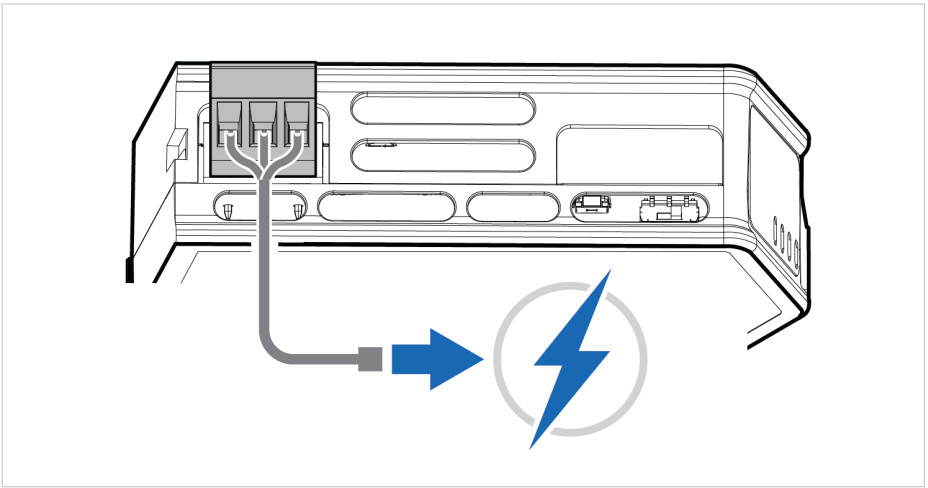


Figure 71. Reconnect power

3. Leave the Communicator for 10 minutes.
   The Gateway status led indicator flashes red and green until the firmware upgrade is completed.

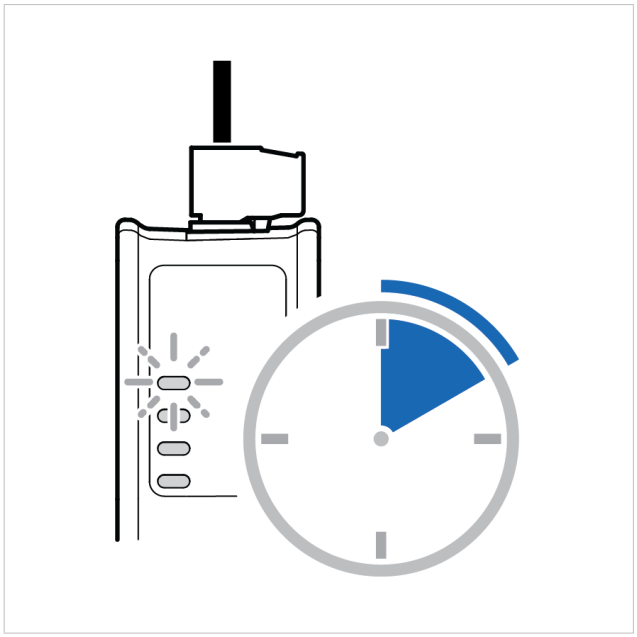


Figure 72. Firmware upgrade LED indication

Result

The Communicator recover and return to normal operation.

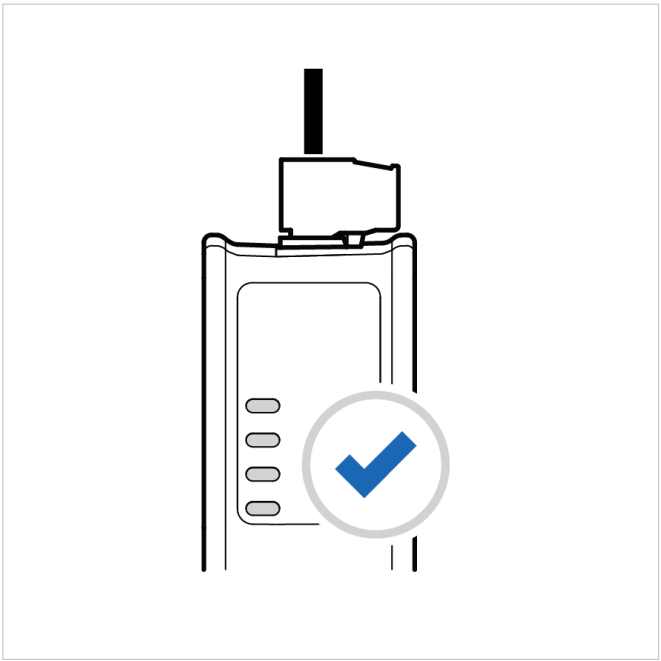


Figure 73. Recover and return to normal operation

See Also

Connect To Modbus RTU Server Network (Page 17)
Connect To Modbus TCP Client Network (Page 19)

Connect To Power (Page 21)
Communicator Status Monitor (Page 78)
Communicator LED Indicators (Page 80)
LED Status (Page 93)

12.4. Support

12.4.1. Support Package

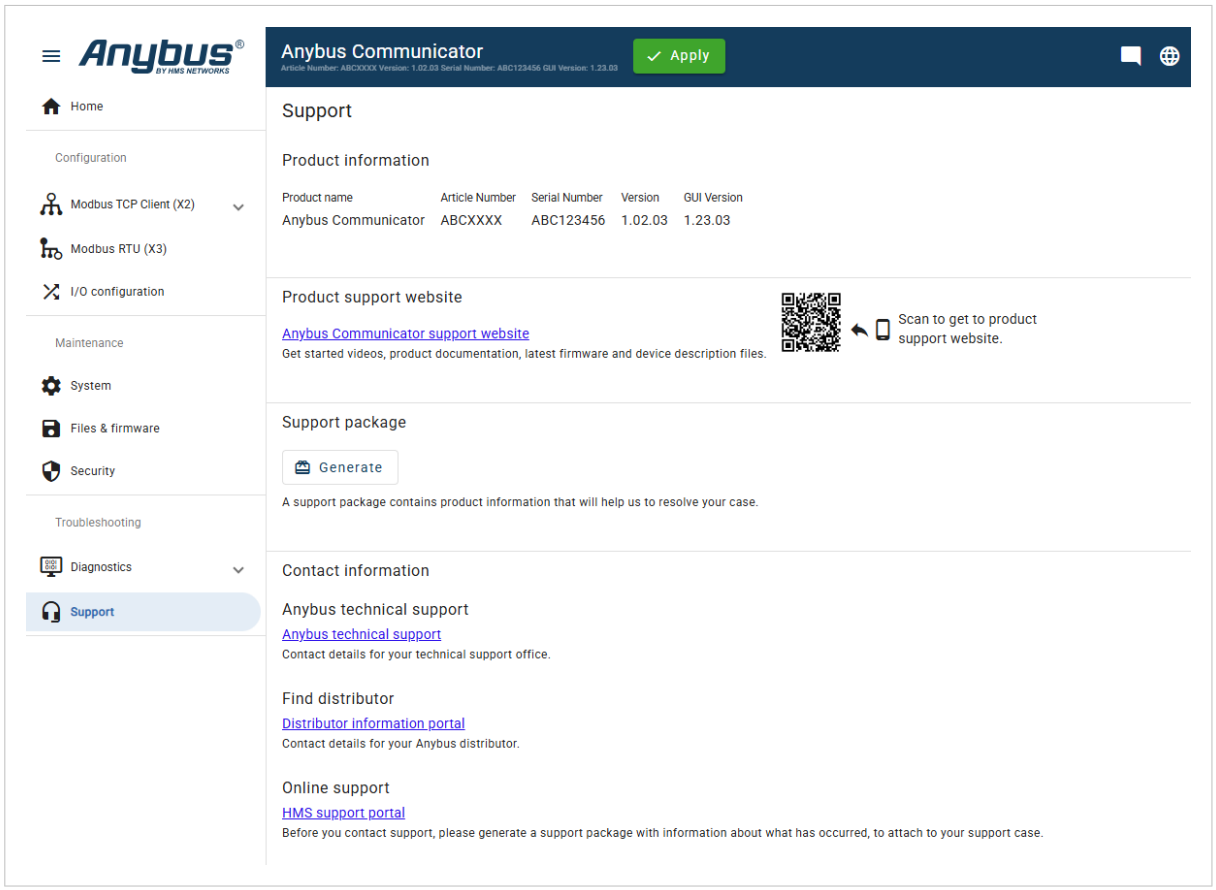


Figure 74. Support page example

Before you create a ticket for technical support, generate a support package.

The support package contains information about what has occurred and will help the Anybus technical support team resolve the support case as quickly and efficiently as possible.

Support Package Content
The information in the support package is available to open and read, the files are not locked or encrypted.

Generate Support Package
On the **Support** page, click **Generate**.

A zip file with the support files is downloaded to your PC.

Create a Support Ticket
1. On the **HMS Networks** home page, navigate to the **Support** main menu and click **Support portal**.
2. In the **Support portal**, create a support ticket and upload the support package.

13. End Product Life Cycle

13.1. Secure Data Disposal

IMPORTANT
To avoid exposure of sensitive data, always perform a factory reset before decommissioning the equipment.

Factory reset will reset any on site made configuration changes and set the Communicator to the same state as leaving HMS production.

See Reset to Factory Settings (page 94).

14. Technical Data

For complete technical specifications and regulatory compliance information, please visit www.hms-networks.com.

14.1. Technical Specification

Article identification	ABC3210
Configuration connector	RJ45
Communication connector	7-pin screw connector
Modbus TCP Client connector	RJ45 x 2
Power connector	3-pin screw connector
Power supply	12-30 VDC, Reverse voltage protection and short circuit protection
Power consumption	Typical: 90 mA @ 24 V (2.2 W) Max: 3 W
Storage temperature	-40 to +85 °C
Operating temperature	-25 to +70 °C
Humidity	EN 600068-2-78: Damp heat, +40°C, 93% humidity for 4 days EN 60068-2-30: Damp heat, +25°C – +55°C, 95% RH, 2 cycles
Vibration	See datasheet
Housing material	Plastic, See datasheet for details
Protection class	IP20
Product weight	150 g
Dimensions	27 x 144 x 98 mm (W x H x D) with connectors included
Mounting	DIN-rail