MGate 5217 Series User Manual

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www.moxa.com/products

MGate 5217 Series User Manual

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1. Introduction

Welcome to the MGate 5217 line of Modbus-to-BACnet/IP gateways. All models feature easy protocol conversion between Modbus RTU/ASCII, Modbus TCP, and BACnet/IP protocols. This chapter is an introduction to the MGate 5217.

Overview

The MGate 5217 is an industrial Ethernet gateway for Modbus RTU/ASCII/TCP and BACnet/IP protocol conversions. All models are DIN-rail mountable and come with built-in serial isolation. The rugged design is suitable for industrial applications, such as critical power and HVAC systems.

Package Checklist

All models of the MGate 5217 Series are shipped with the following items:

Standard Accessories:

- 1 MGate 5217 gateway
- Quick installation guide (printed)
- Warranty card

NOTE

Please notify your sales representative if any of the above items are missing or damaged.

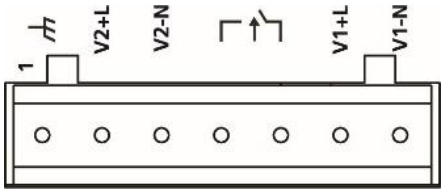
Optional Accessories (can be purchased separately)

- **DK-35A:** DIN-rail mounting kit (35 mm)
- **Mini DB9F-to-TB Adaptor:** DB9 female to terminal block adapter
- **DR-4524:** 45W/2A DIN-rail 24 VDC power supply with universal 85 to 264 VAC input
- **DR-75-24:** 75W/3.2A DIN-rail 24 VDC power supply with universal 85 to 264 VAC input
- **DR-120-24:** 120W/5A DIN-rail 24 VDC power supply with 88 to 132 VAC/176 to 264 VAC input by switch

Product Features

- Supports Modbus RTU/ASCII/TCP master/client or slave/server
- Supports BACnet/IP server or client
- Connects up to 62 Modbus RTU/ASCII servers/slaves
- Connects up to 32 Modbus TCP servers
- Connects up to 32 BACnet/IP servers when MGate act as BACnet/IP client
- 600 points and 1200 points models are available
- Embedded traffic monitoring and diagnostic information for easy troubleshooting
- Supports COV to provide fast data communication
- Virtual nodes designed to make each Modbus device to be seen as a separate BACnet/IP device
- Configures Modbus commands quickly by editing an Excel spreadsheet
- Built-in Ethernet cascading for easy wiring
- -40 to 75°C wide operating temperature
- Serial port with 2 kV isolation protection
- Supports redundant dual AC or DC power inputs
- Supports 5-year warranty
- Supports security features based on IEC 62443-4-2

Power Input and Relay Output Pinouts



	V2+L	V2-N			V1+L	V1-N
Shielded Ground	AC/DC Power Input 2	AC/DC Power Input 2	Relay Output	Relay Output	AC/DC Power Input 1	AC/DC Power Input 1

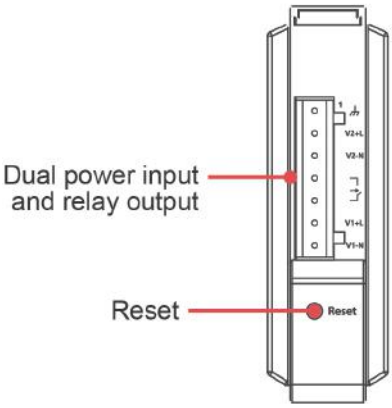
LED Indicators

Name	Color	Function
PWR1	Red	Power is being supplied to the power input
PWR2	Red	Power is being supplied to the power input
RDY	Red	Steady: Power is on, and the unit is booting up
		Blinking: IP conflict, DHCP or BOOTP server did not respond properly, or a relay output occurred
	Green	Steady: Power is on, and the unit is functioning normally
		Blinking: Unit is responding to locate function
	Off	Power is off or power error condition exists
Ethernet	Amber	10 Mbps Ethernet connection
	Green	100 Mbps Ethernet connection
	Off	Ethernet cable is disconnected or has a short
P1, P2	Amber	Serial port is receiving data
	Green	Serial port is transmitting data
	Off	Serial port is not transmitting or receiving data

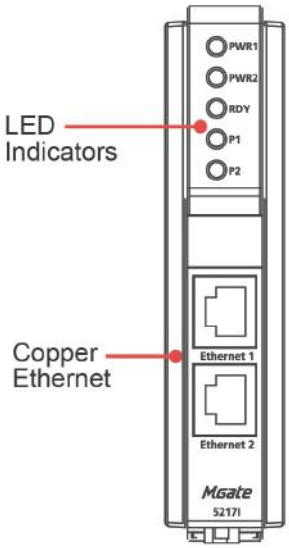
Panel Layouts

The MGate 5217 has two RJ45 Ethernet ports and two DB9 serial ports for connecting to devices.

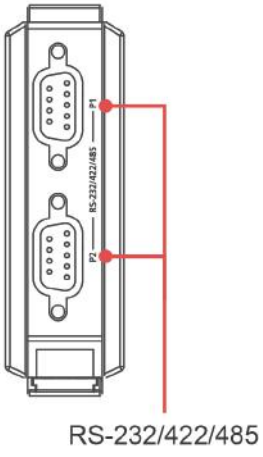
Top View



Front View

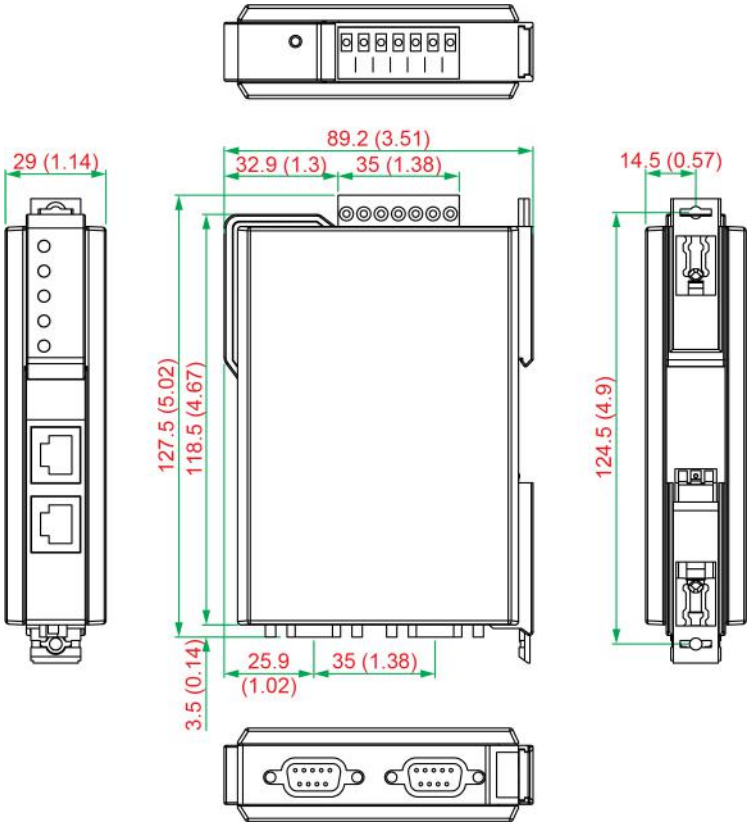


Bottom View



Dimensions

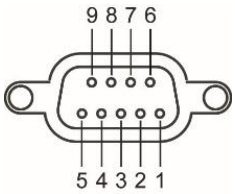
Unit: mm (inch)



Pin Assignments

Serial Port (DB9 Male)

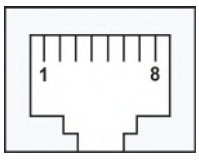
Pin	RS-232	RS-422/RS-485 (4W)	RS-485 (2W)
1	DCD	TxD-	–
2	RXD	TxD+	–
3	TXD	RxD+	Data+
4	DTR	RxD-	Data-
5*	GND	GND	GND
6	DSR	–	–
7	RTS	–	–
8	CTS	–	–
9	–	–	–



*Signal ground

Ethernet Port (RJ45)

Pin	Signal
1	Tx+
2	Tx-
3	Rx+
6	Rx-



Mounting the Unit

Step 1: After removing the MGate 5217 from the box, connect the MGate 5217 to a network. Use a standard straight-through Ethernet cable to connect the unit to a hub or switch. When setting up or testing the MGate 5217, you might find it convenient to connect directly to your computer's Ethernet port. Here, use a crossover Ethernet cable.

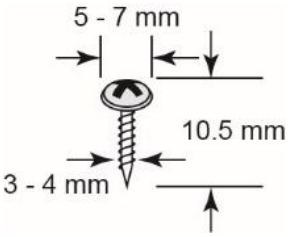
Step 2: Connect the serial port(s) of the MGate 5217 to a serial device.

Step 3: The MGate 5217 is designed to be attached to a DIN rail or mounted on a wall. The two sliders on the MGate 5217 rear panel serve a dual purpose. For wall mounting, both sliders should be extended. For DIN-rail mounting, start with one slider pushed in, and the other slider extended. After attaching the MGate 5217 on the DIN rail, push the extended slider in to lock the device server to the rail. The two placement options are illustrated in the accompanying figures.

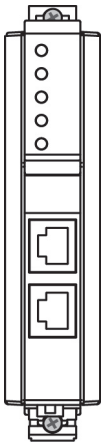
Step 4: Connect the 12 to 48 VDC or 24 VAC power source to terminal block power input.

Wall or Cabinet Mounting

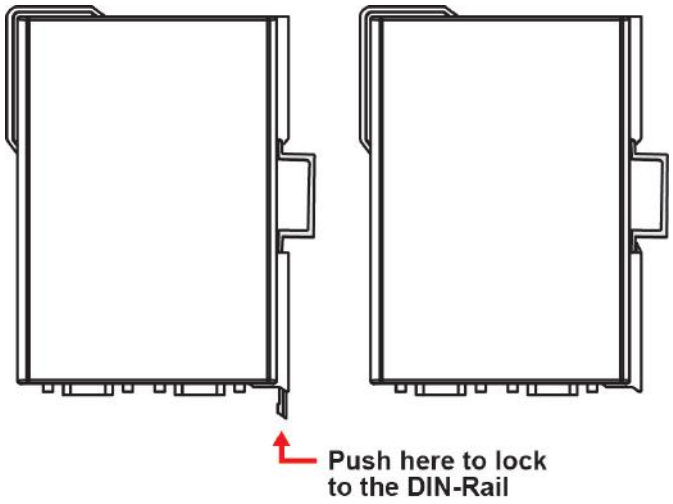
Mounting the MGate 5217 Series on to a wall requires two screws. The heads of the screws should be 5 to 7 mm in diameter, the shafts should be 3 to 4 mm in diameter, and the length of the screws should be more than 10.5 mm.



Wallmount



DIN Rail



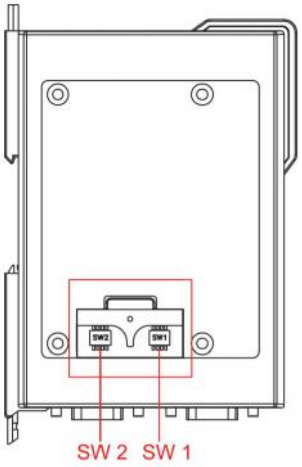
Reset Button

Press the Reset button continuously for 5 sec. to load factory defaults:

The reset button is used to load factory defaults. Use a pointed object such as a straightened paper clip to hold the reset button down for five seconds. Release the reset button when the Ready LED stops blinking.

Pull-high, Pull-low, and Terminator for RS-485

Remove the MGate 5217's top cover where you will find the DIP switches to adjust each serial port's pull-high resistor, pull-low resistor, and terminator. Serial port1/port2 can be adjusted by SW1/SW2, respectively.



SW	1	2	3	4
	Pull-high resistor	Pull-low resistor	Terminator	Reserved
ON	1 kΩ	1 kΩ	120 Ω	Reserved
OFF	150 kΩ*	150 kΩ*	–*	Reserved

*Default

3. Getting Started

Connecting the Power

The unit can be powered by connecting a power source to the terminal block:

1. Loosen or remove the screws on the terminal block.
2. Turn off the power source and then connect a 12–48 VDC or 24 VAC power line to the terminal block.
3. Tighten the connections, using the screws on the terminal block.
4. Turn on the power source.

Note that the unit does not have an on/off switch. It automatically turns on when it receives power. The PWR LED on the top panel will glow to show that the unit is receiving power. For power terminal block pin assignments, refer to the Power Input and Relay Output Pinouts section in *chapter 2*.

Connecting Serial Devices

The MGate 5217 supports connecting to Modbus serial devices. Before connecting or removing the serial connection, first make sure the power is turned off. For the serial port pin assignments, see the Pin Assignments section in *chapter 2*.

Connecting to a Network

Connect one end of the Ethernet cable to the MGate's 10/100M Ethernet port and the other end of the cable to the Ethernet network. The MGate will show a valid connection to the Ethernet in the following ways:

- The Ethernet LED maintains a solid green color when connected to a 100 Mbps Ethernet network.
- The Ethernet LED maintains a solid orange color when connected to a 10 Mbps Ethernet network.
- The Ethernet LED will flash when Ethernet packets are being transmitted or received.

Installing DSU Software

If you do not know the MGate gateway's IP address when setting it up for the first time (default IP is *192.168.127.254*); use an Ethernet cable to connect the host PC and MGate gateway directly. If you connect the gateway and host PC through the same Ethernet switch, make sure there is no router between them. You can then use Device Search Utility to detect the MGate gateways on your network.

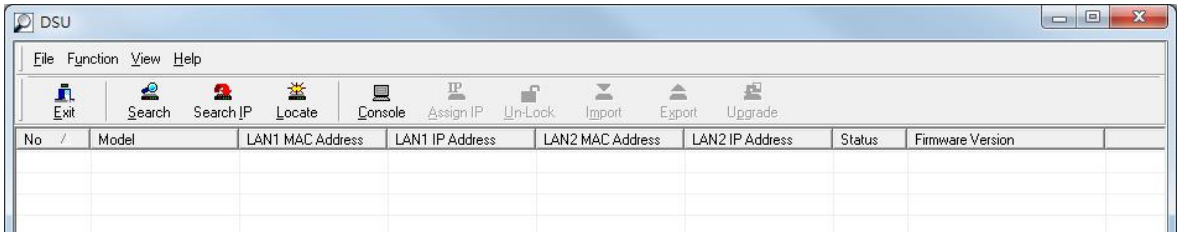
The following instructions explain how to install the Device Search Utility (**DSU**), a utility to search for MGate 5217 units on a network.

1. Download **DSU** from Moxa's website. Locate and run the following setup program to begin the installation process:

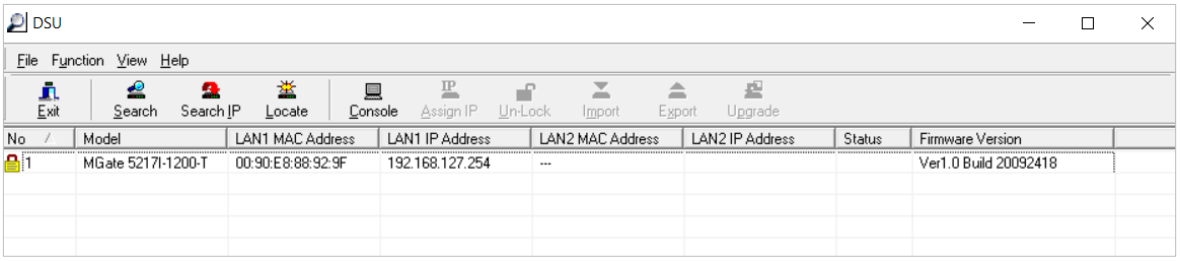
   dsu_setup_[*Version*]**_Build_**[*DateTime*]**.exe**
2. The latest version might be named **dsu_setup_Ver2.0_Build_xxxxxxxx.exe**, for example:
3. The Welcome window will greet you. Click **Next** to continue.
4. When the **Select Destination Location** window appears, click **Next** to continue. You may change the destination directory by first clicking on **Browse...**.
5. When the **Select Additional Tasks** window appears, click **Next** to continue. You may select **Create a desktop icon** if you would like a shortcut to the DSU on your desktop.
6. Click **Install** to copy the software files.
7. A progress bar will appear. The procedure should take only a few seconds to complete.

8. A message will show that the DSU is successfully installed. You may choose to run it immediately by selecting **Launch DSU**.
9. You may also open the DSU through **Start > Programs > MOXA > DSU**.

The DSU window should appear as shown below.



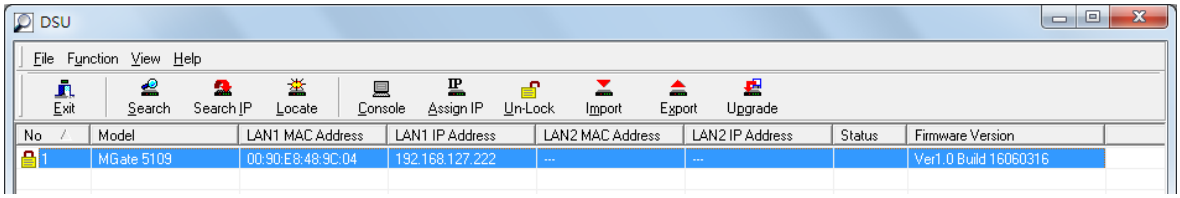
Click **Search** and a new Search window will pop up.



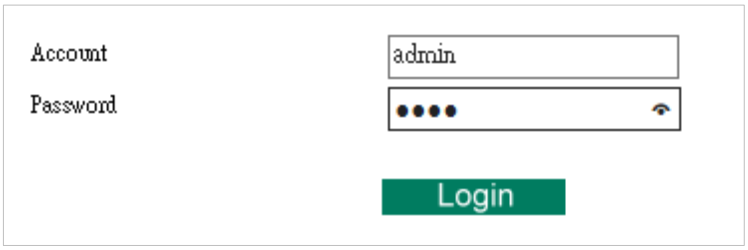
Logging in to the Web Console

Use the Web console to configure the MGate through Ethernet or verify the MGate's status. Use a web browser, such as Microsoft Internet Explorer or Google Chrome to connect to the MGate, using the HTTP/HTTPS protocol.

When the MGate gateway appears on the DSU device list, select the gateway and right-click to open a web console to configure the gateway.



On the first page of the web console, enter the **admin** for the default account name and **moxa** for the default password.

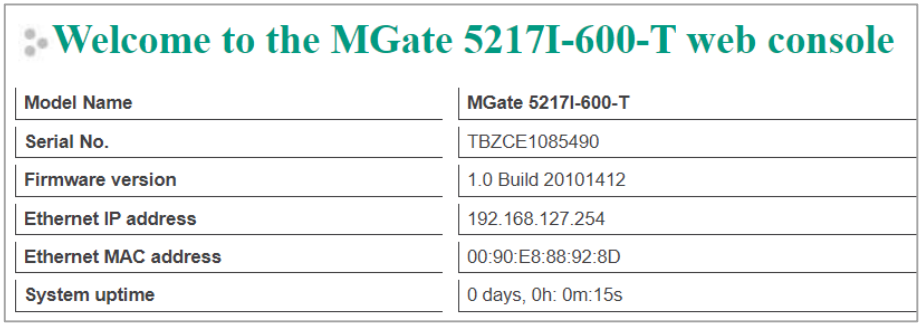


4. Web Console Configuration and Troubleshooting

This chapter provides a quick overview of how to configure the MGate 5217 by web console.

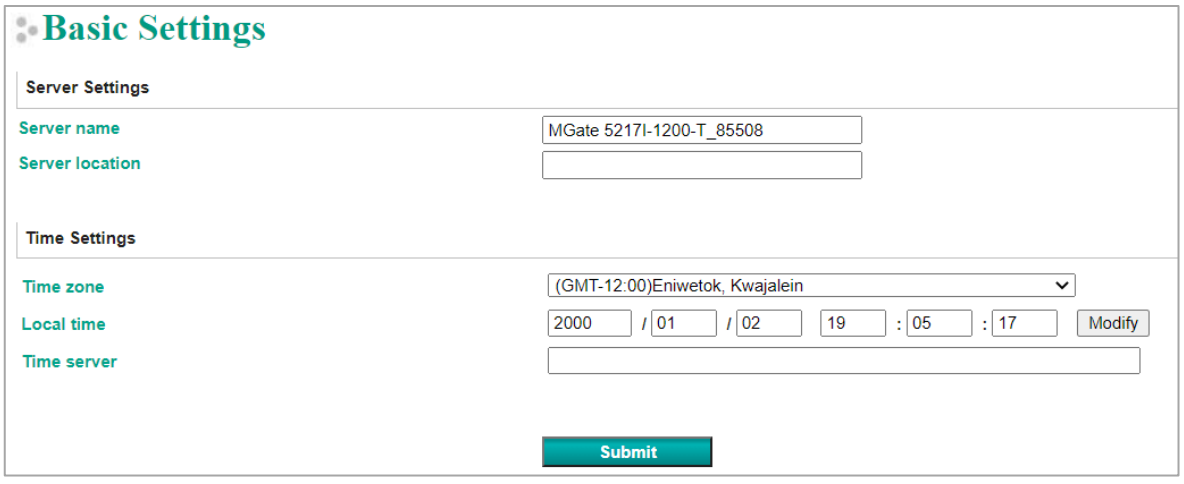
Overview

This section gives an overview of the MGate 5217 information.



Basic Settings

On this webpage, you can change the name of the device and time zone settings.



Server Setting

Parameter	Value	Description
Server Name	(an alphanumeric string)	You can enter a name to help you identify the unit, such as the function, etc.
Server Location	(an alphanumeric string)	You can enter a name to help you identify the unit location. Such as "Cabinet A001."

Time Settings

The MGate 5217 has a built-in Real-Time Clock for time calibration functions. Functions, such as the log function, can add real-time information to the message.

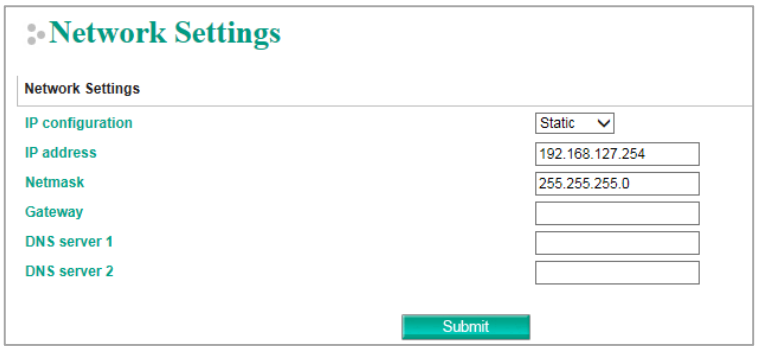
ATTENTION

First-time users should select the time zone first. The console will display the "real time" according to the time zone relative to GMT. If you would like to change the real-time clock, select Local time. MGate's firmware will change the GMT time according to the Time Zone.

Parameter	Value	Description
Time Zone	User's selectable time zone	This field shows the currently selected time zone and allows you to select a different time zone.
Local Time	User's adjustable time.	(1900/1/1-2037/12/31)
Time Server	IP or Domain address (e.g., 192.168.1.1 or time.stdtime.gov.tw)	This optional field specifies your time server's IP address or domain name if a time server is used on your network. The module supports SNTP (RFC-1769) for automatic time calibration. The MGate will request time information from the specified time server every 10 minutes.

Network Settings

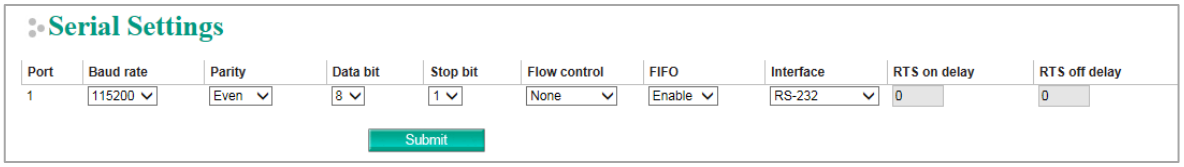
The Network Settings is where the unit's network settings are configured. You can change the IP Configuration, IP Address, Netmask, Default Gateway, and DNS.



Parameter	Value	Description
IP Configuration	Static IP, DHCP, DHCP/BOOTP, BOOTP	Select **Static IP** if you are using a fixed IP address. Select one of the other options if the IP address is set dynamically.
IP Address	192.168.127.254 (or other 32-bit number)	The IP (Internet Protocol) address identifies the server on the TCP/IP network.
Netmask	255.255.255.0 (or other 32-bit number)	This identifies the server as belonging to a Class A, B, or C network.
Gateway	0.0.0.0 (or other 32-bit number)	This is the IP address of the router that provides network access outside the server's LAN.
DNS Server 1	0.0.0.0 (or other 32-bit number)	This is the IP address of the primary domain name server.
DNS Server 2	0.0.0.0 (or other 32-bit number)	This is the IP address of the secondary domain name server.

Serial Settings

The MGate 5217 serial interface supports RS-232, 2-wire RS-485, 4-wire RS-485, and RS-422 interfaces. You must configure the baudrate, parity, data bits, and stop bits before using the serial interface with Modbus RTU/ASCII protocol. Incorrect settings will cause communication failures.



Parameter	Value	Description
Baudrate	Supports standard baudrates (bps): 50/ 75/ 110/ 134/ 150/ 300/ 600/ 1200/ 1800/ 2400/ 4800/ 7200/ 9600/ 19200/ 38400/ 57600/ 115200/ 230400/ 460800/ 921600	
Parity	None, Odd, Even, Mark, Space	
Data bits	8	
Stop bits	1, 2	
Flow control	None, RTS/CTS, RTS Toggle DTR/DSR	The RTS Toggle will turn off RTS signal when there is no data to be sent. If there is data to be sent, the RTS toggle will turn on the RTS signal before a data transmission and off after the transmission is completed.
FIFO	Enable, Disable	The internal buffer of UART. Disabling FIFO can reduce the latency time when receiving data from serial communications, but this will also slow down the throughput.
Interface	RS-232, RS-422, RS-485 2 wire, RS-485 4 wire	
RTS on delay	0-100 ms	Only available for RTS Toggle
RTS off delay	0-100 ms	Only available for RTS Toggle

RTS Toggle

The RTS Toggle function is used for **RS-232** mode only. This flow-control mechanism is achieved by toggling the RTS pin in the transmission direction. When activated, data will be sent after the RTS pin is toggled ON for the specified time interval. After the data transmission is finished, the RTS pin will toggle OFF for the specified time interval.

Protocol Settings

A typical MGate 5217 application facilitates communication between SCADA/DDC systems and meters/controllers, where one side uses BACnet/IP and the other operates on Modbus TCP/RTU/ASCII protocols. Both these components use different protocols and hence need a protocol gateway between them to exchange data. When the system uses a BACnet/IP client SCADA to connect with the Modbus server/slave devices, the MGate functions as a BACnet/IP server and a Modbus client/master. Conversely, when the system uses a Modbus client/master SCADA to connect with BACnet/IP server devices, the MGate operates as a Modbus server and a BACnet/IP client/master. Configure the protocol roles on the MGate by following these steps:

Step 1: Select the correct protocols in the **Protocol Conversion** setting, where the details of both *sides* of the MGate's role is shown below the selection.

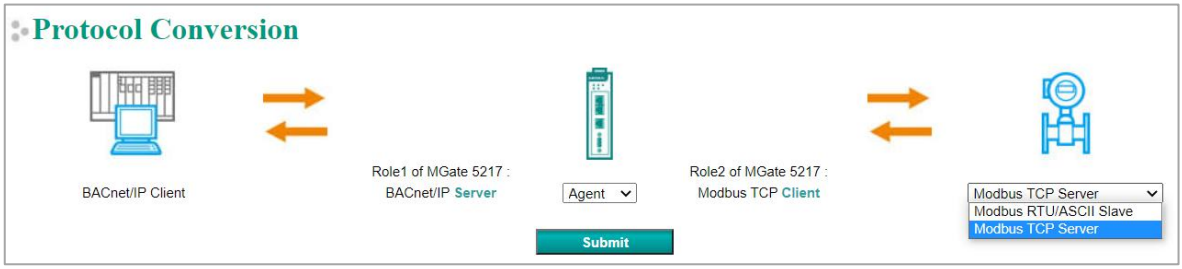
Step 2: Configure the MGate's roles for both sides. Configure the **client/master** side first, followed by the **server/slave** side.

Step 3: After the MGate configuration is completed, click **I/O data mapping** to view the details of the exchanging data between SCADA/DDC and the end devices.

The following sections contain detailed MGate configuration instructions organized as per the above outline.

Protocol Settings—Protocol Conversion

The MGate performs distinct roles on each side, based on your device settings. Be sure to configure the roles for each device correctly , choosing from BACnet/IP server, BACnet/IP client, Modbus TCP/RTU/ASCII server, or Modbus TCP/RTU/ASCII client. Refer to the selection table for the MGate 5217 below.



Device1 \ Device2	Modbus TCP server	Modbus RTU/ASCII slave	BACnet/IP server
BACnet/IP Client	✓	✓	–
Modus TCP Client	–	–	✓
Modbus RTU/ASCII Client	–	–	✓

Protocol Settings—Configure MGate's Role 1 and Role 2

The following shows the way to configure each role:

A1. Modbus TCP Client (Master) Settings

A2. Modbus RTU/ASCII Master Settings

A3. BACnet/IP Server Settings

A4. BACnet/IP Client Settings

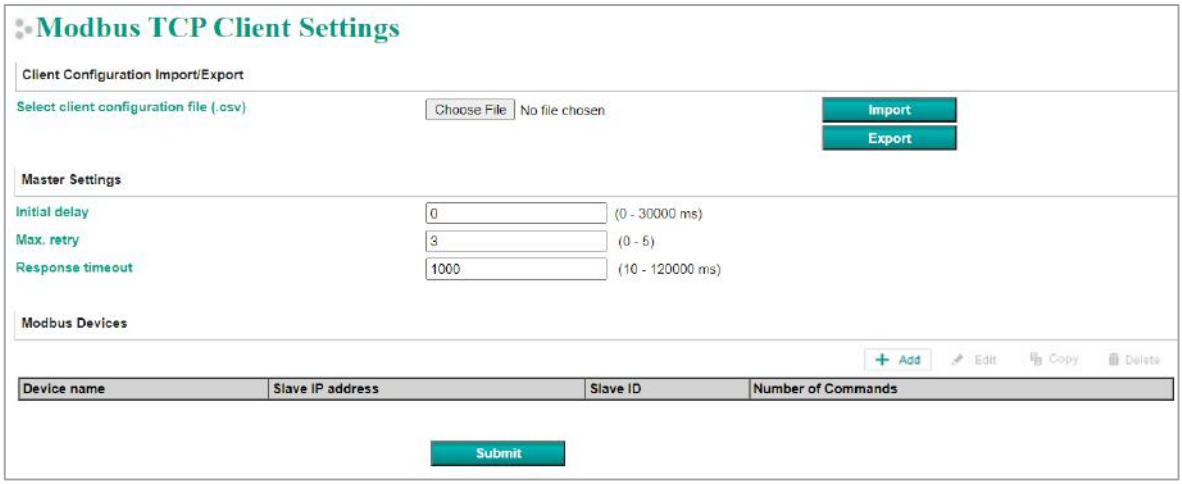
A5. Modbus TCP Server (Slave) Settings

A6. Modbus RTU/ASCII Server (Slave) Settings

A1. Modbus TCP Client (Master) Settings

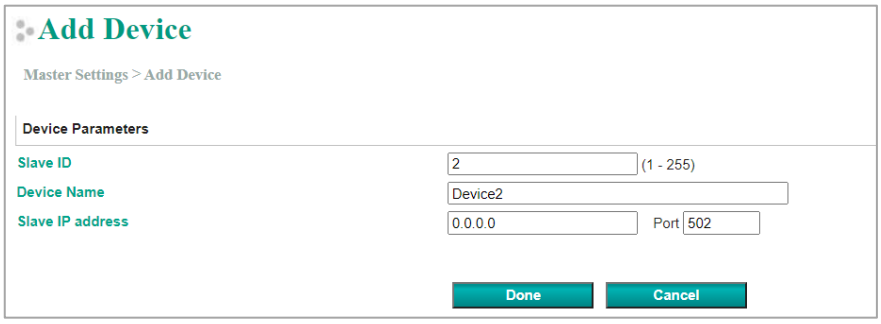
In Modbus TCP client/master mode, the MGate works as a Modbus client/master and will send the Modbus request to the Modbus server/slave actively. The gateway supports Excel sheet import/export, which can easily configure Modbus commands via Excel format. Details can be referenced in *Chapter 7*. Besides, the MGate provides several advanced settings for specific application requirements. It is suggested to use the default settings, which can fit most scenarios.

Client Settings



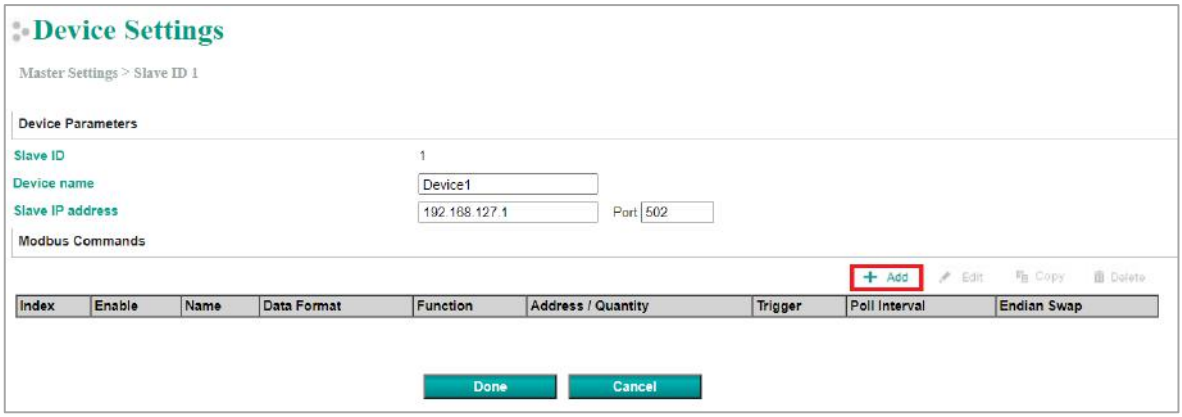
Parameter	Value	Default	Description
Initial delay	0 to 30000 ms	0	Some Modbus servers/slaves may take more time to boot up than other devices. In some environments, this may cause the entire system to suffer from repeated exceptions during the initial boot-up. After booting up, you can force the MGate to wait before sending the first request with the **Initial Delay** setting.
Max. retry	0 to 5	3	This is used to configure how many times the MGate will try to communicate with the Modbus server/slave when Modbus command timeout occurs.
Response timeout	10 to 120000 ms	1000	The device manufacturer based on the Modbus standard defines the time taken by a server/slave device to respond to a request. A Modbus client/master can be configured to wait a certain amount of time for a server/slave's response. If no response is received within the specified time, the client/master will disregard the request and continue the operation. This allows the Modbus system to continue the operation even if a server/slave device is disconnected or faulty. On the MGate 5217, the **Response timeout** field is used to configure how long the gateway will wait for a response from a Modbus server/slave. Refer to your device' manufacturer's documentation to manually set the response timeout

Create the communication settings for your Modbus TCP server/slave device by clicking the **Add** button to configure **Slave ID**, **Device Name** and **Slave IP address.** Then, the created Modbus device will be shown under **Modbus Devices** session.

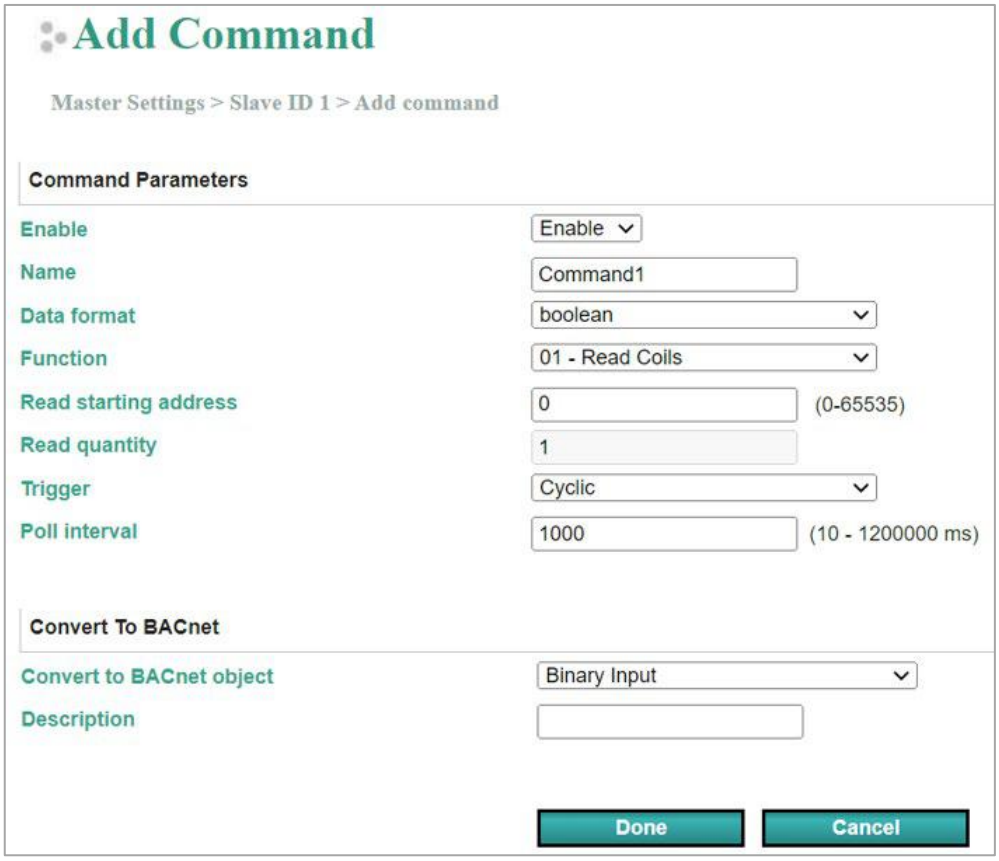


After creating Modbus device, we should configure the Modbus command by double-clicking the device list or pressing the **Edit** icon.

Then, click the **Add** icon to configure the Modbus commands.

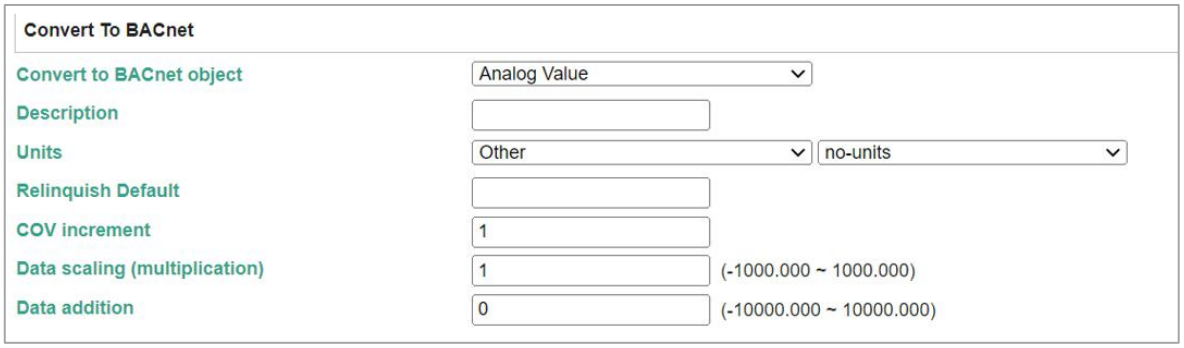


Add Modbus Commands

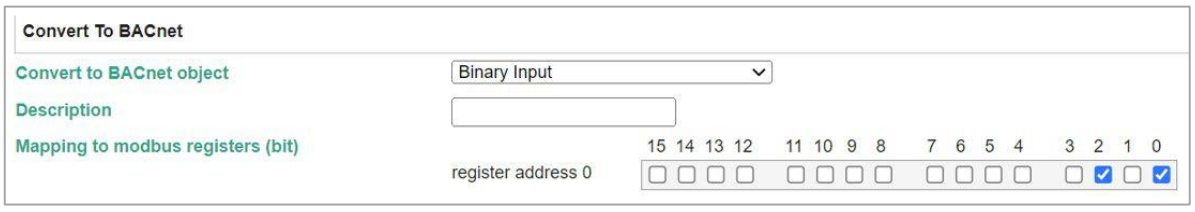


Parameter	Value	Default	Description
Enable	Enable	Enable	Enable: The command is active.
Name	(an alphanumeric string)	Command1	Max. 32 characters
Data Format	boolean uint16 int16 uint32 int32 float32	boolean	Boolean: 0 or 1. Uint16: Unsigned integer with 16 bits. Int16: Signed integer with 16 bits. Uint32: Unsigned integer with 32 bits. Int32: Signed integer with 32 bits. Float32: Float type with 32 bits.
Function	1 – Read coils 2 – Read discrete inputs 3 – Read holding registers 4 – Read input registers 5 – Write single coil 6 – Write single register 15 – Write multiple coils 16 – Write multiple registers		When a message is sent from a client to a server device, the function code field tells the server what kind of action to perform.
Read starting address	0 to 65535	0	Modbus register address.
Read quantity	1 2	1 2	Specifying how many quantities to read.
Write starting address	0 to 65535	0	Modbus register address.
Write quantity	1 2	1 2	Specifying how many quantities to write into.
Trigger	Cyclic Data Change		Cyclic: The command is sent cyclically at the interval specified in the Poll interval parameter. Data change: A command is issued when a change in data is detected.
Poll interval	100 to 1200000 ms	1000	Polling intervals are in milliseconds. Since the module sends all requests in turns, the actual polling interval also depends on the number of requests in the queue and their parameters. The range is from 100 to 1,200,000 ms.
Endian swap	None Byte Word Byte and Word	None	None: Don't need to swap Byte: 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0B, 0x0A, 0x0D, 0x0C. Word: 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0C, 0x0D, 0x0A, 0x0B. ByteWord: 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0D, 0x0C, 0x0B, 0x0A. There are two phases in changing ByteWord: 1) 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0B, 0x0A, 0x0D, 0x0C 2) 0x0B, 0x0A, 0x0D, 0x0C becomes 0x0D, 0x0C, 0x0B, 0x0A
Fault protection	Keep latest data Clear all data bits to 0	Keep latest data	If the MGate's connection to BACnet/IP client fails, the gateway cannot receive data, but the gateway will continuously send output data to the Modbus TCP server device. To avoid problems in this case, the MGate 5217 can be configured to react in one of the following two ways: Keep the latest data or clear data to zero.
Fault timeout	0 to 65535 ms	6000	Defines the communication timeout on the opposite side.

After completing the above settings, each Modbus command should be converted to a BACnet object, which needs to be configured.

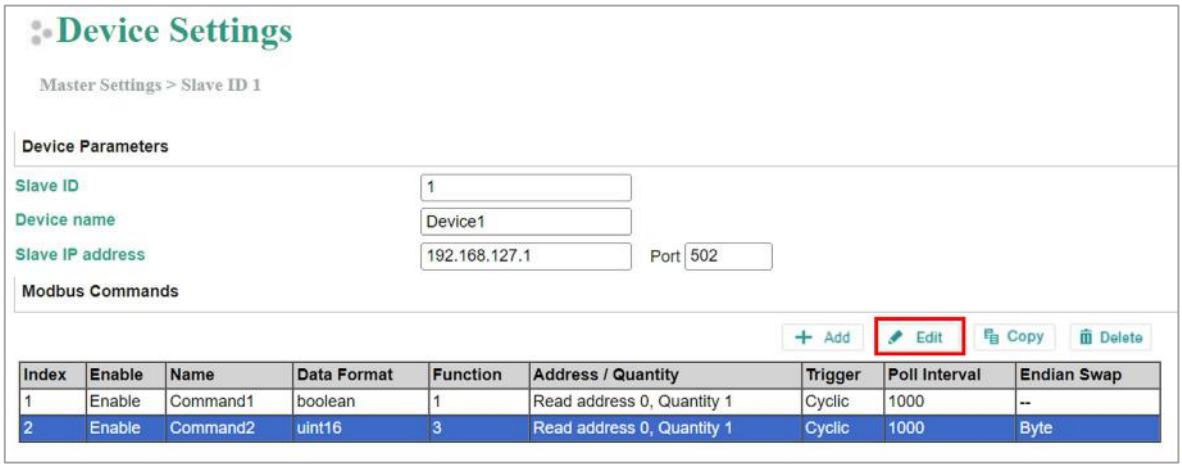


Parameters	Value	Description
Convert to BACnet object	Analog input Analog output Analog value Binary input Binary output Binary value Multi-state input Multi-state output Integer value Positive integer value	Select the BACnet object type for this configured Modbus command
Description	0 to 40 characters, default is none.	Used to describe the BACnet object. For example, "BuildingA_SensorB" can be entered to describe the monitored device. Please note that to be read from BACnet/IP client (usually SCADA), the BACnet/IP client itself should also support the "Description" property.
Units		While selecting a nonbinary value, the BACnet/IP client sometimes needs to have the value with units to identify the meaning of the value. Various units are supported to be selected.
Relinquish default	-1000000000 to 10000000000	If there are no commanded values in the priority array, the present value will be changed to relinquish the default.
COV increment	1 to 10000000000	COV will be triggered when |Current Reported Value - Last Reported Value| > COV Increment
Data scaling (multiplication)	-1000.000 to 1000.000	Data can be calculated by multiplication. For example, if Modbus receives data that equals x, then the configured data scaling value equals a The output equals y equals ax
Data addition	-10000.000 to 10000.000	Data can be calculated by addition. For example, if Modbus receives data that equals x, then the configured data addition equals b The output equals y equals x + b



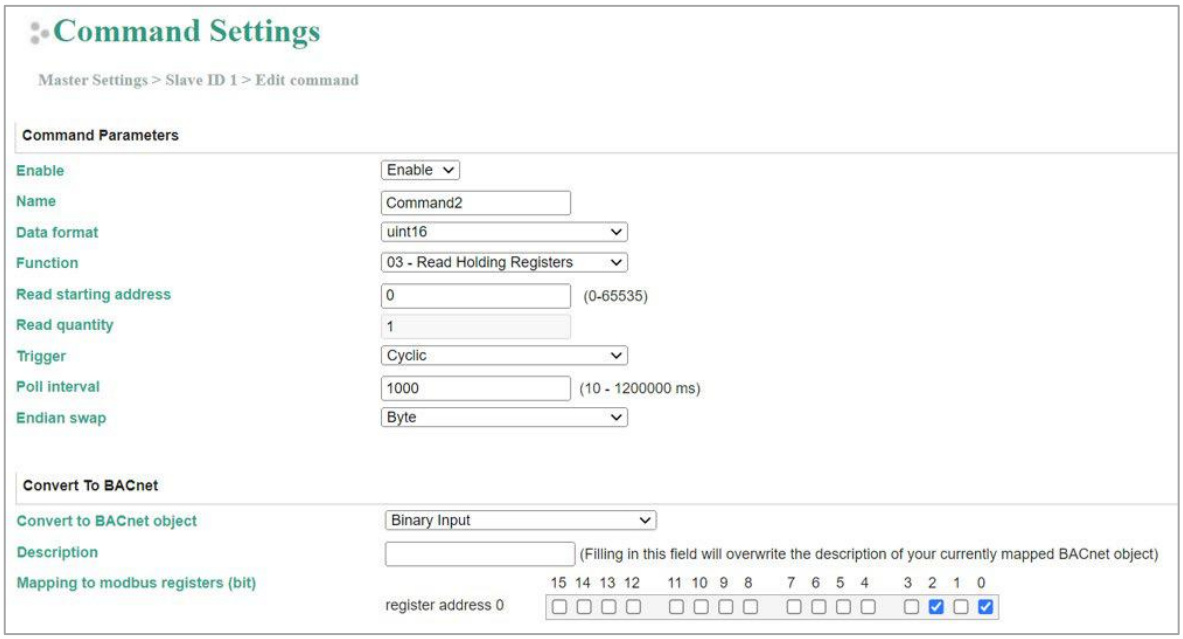
The MGate 5217 also provides an advanced feature that is used to convert one Modbus register to multiple BACnet BI/BO/BV objects. For example, the MGate uses Modbus function code 03 to read the data from the Modbus RTU device. The register shows the status of several I/Os, and the MGate divides one byte into multiple bits. Select the wanted bit address to map to the BI objects.

After adding a Modbus command, you can edit the command by double-clicking the command list or clicking the Edit icon.



Index	Enable	Name	Data Format	Function	Address / Quantity	Trigger	Poll Interval	Endian Swap
1	Enable	Command1	boolean	1	Read address 0, Quantity 1	Cyclic	1000	--
2	Enable	Command2	uint16	3	Read address 0, Quantity 1	Cyclic	1000	Byte

Note that if you "edit" the description field, it will overwrite the description of your current mapped BACnet object.



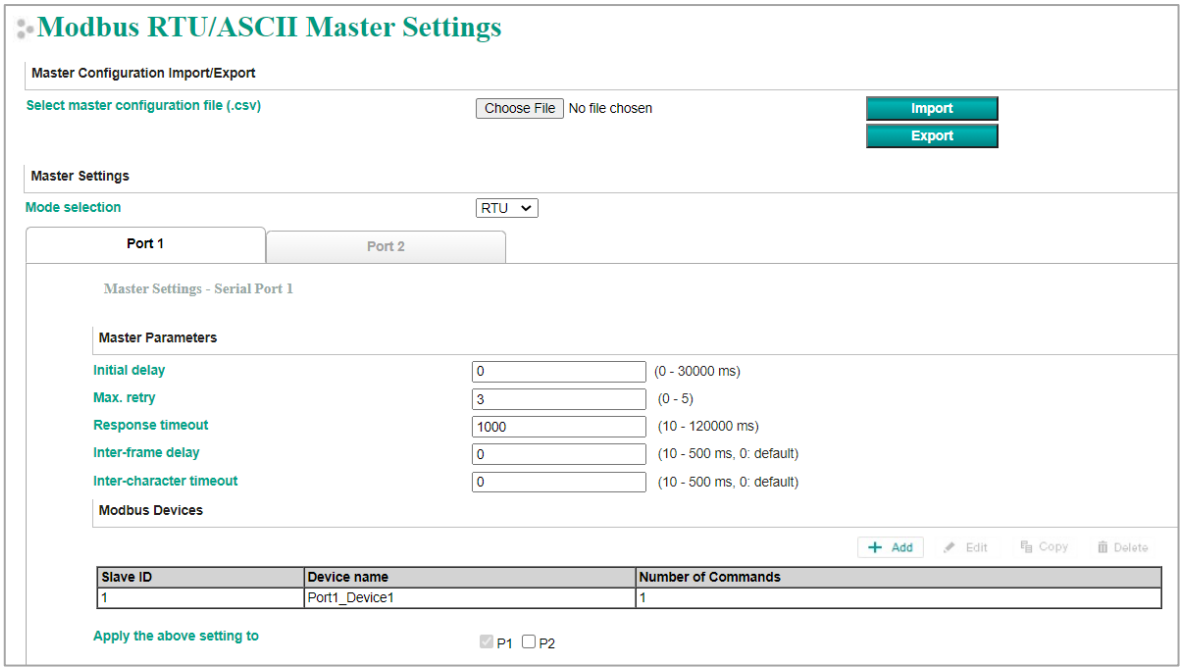
NOTE

To get a better performance, we suggest the number of COV subscriptions should be under 300.

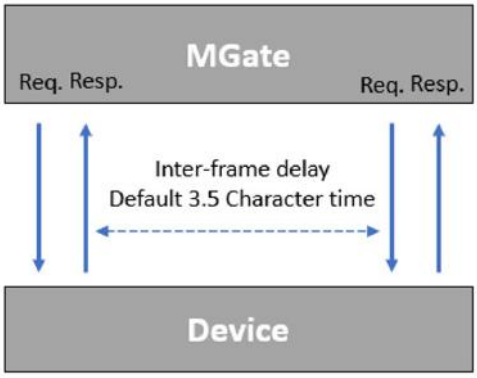
A2. Modbus RTU/ASCII Master Settings

In Modbus RTU/ASCII master mode, the MGate works as a Modbus RTU/ASCII client/master and will send the Modbus request to the Modbus RTU/ASCII server/slave actively. The gateway supports Excel sheet import/export, which can easily configure Modbus commands via Excel format. You can reference details in *Chapter 7*. Besides, the MGate provides several advanced settings for specific application requirements. We suggest using the default settings, which can fit in most scenarios.

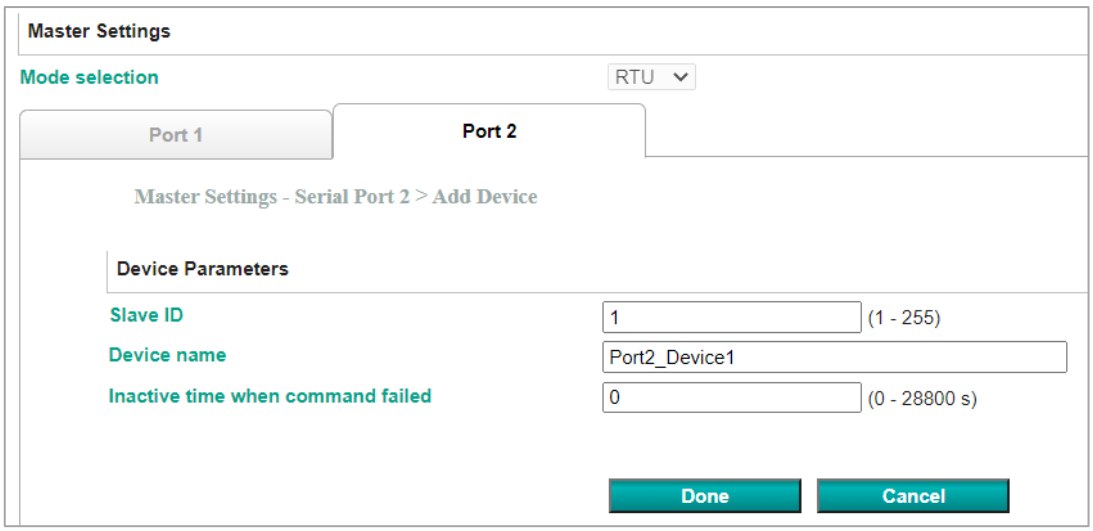
Master Settings



Parameter	Value	Default	Description
Modbus selection	RTU ASCII	RTU	Select the Modbus RTU or Modbus ASCII to communicate with the Modbus server/slave device.
Initial delay	0 to 30000 ms	0	Some Modbus servers/slaves may take more time to boot up than other devices. In some environments, this may cause the entire system to suffer from repeated exceptions during the initial boot-up. After booting up, you can force the MGate to wait before sending the first request with the **Initial Delay** setting.
Max. retry	0 to 5	3	This is used to configure how many times the MGate will try to communicate with the Modbus server/slave.
Response timeout	10 to 120000 ms	1000	The time taken by a server/slave device to respond to a request is defined by the device manufacturer, based on the Modbus standard. A Modbus client/master can be configured to wait a certain amount of time for a server/slave's response. If no response is received within the specified time, the client/master will disregard the request and continue operation. This allows the Modbus system to continue the operation even if a server/slave device is disconnected or faulty. On the MGate 5217, the **Response timeout** field is used to configure how long the gateway will wait for a response from a Modbus server/slave. Refer to your device manufacturer's documentation to manually set the response timeout

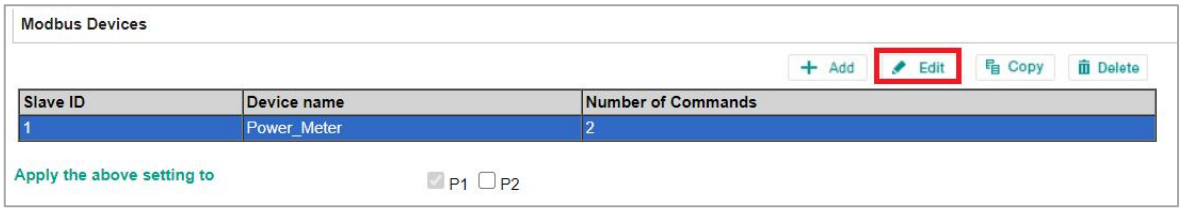
Parameter	Value	Default	Description
Inter-frame delay (only for Modbus RTU)	10 to 500 ms	0	Defines the time interval between an RTU response and the next RTU request. When the baudrate is lower than 19200 bps, the default value is 0, which is 3.5 character time. When the baudrate is larger than 19200 bps, the MGate uses a predefined fixed value that is not user configurable. This function solves the issue when some devices can't handle the RTU requests that quickly, so the MGate opens to user-defined values. How to calculate Modbus character time? E.g., if the baudrate is 9600 bps, 1 character time is about 1 ms. In a serial frame (11 bits, including start bit, data, parity bit, and stop bit), 9600 bps approximately equals to 960 characters/s, so transmitting 1 character needs about 1/960 = 1 ms. 
Inter-character timeout (only for Modbus RTU)	10 to 500 ms	0	The time interval between characters in one frame. When the baudrate is lower than 19200 bps, the default value is 0, which is 1.5 character time. When the baudrate is larger than 19200 bps, MGate uses a predefined fixed value that is not user configurable. When the serial side of the MGate receives one character, and the next one comes after the "inter-character timeout" defined, the frame will be discarded because of timeout.

Create your Modbus RTU/ASCII server/slave device by clicking the **Add** button to configure **Slave ID**, **Device Name,** and **Inactive time when command failed.** Then, the created Modbus device list will be shown under the **Modbus Devices** session.

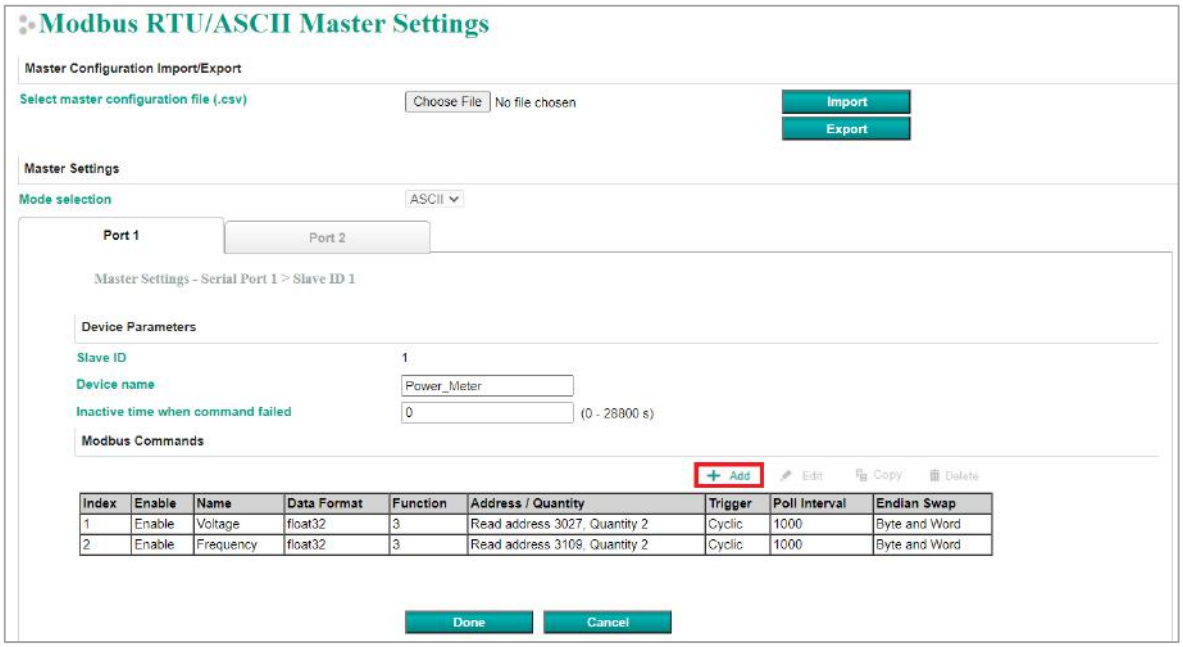


Parameter	Value	Description
Inactive time when a command fails	0 to 28800 s	When the Modbus server/slave device occurs time-out, the MGate's request commands for the Modbus server/slave device will be skipped during the configuration time.

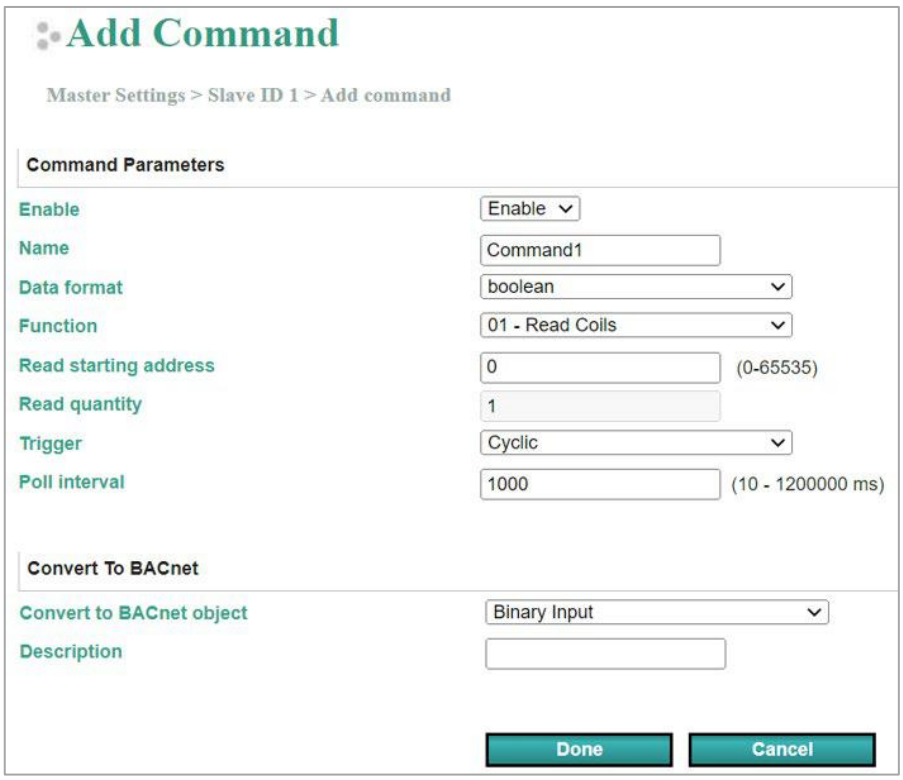
After creating a Modbus device, we should configure the Modbus commands by double-clicking the device list or pressing the **Edit** icon.



Then, click the **Add** icon to configure the Modbus commands.



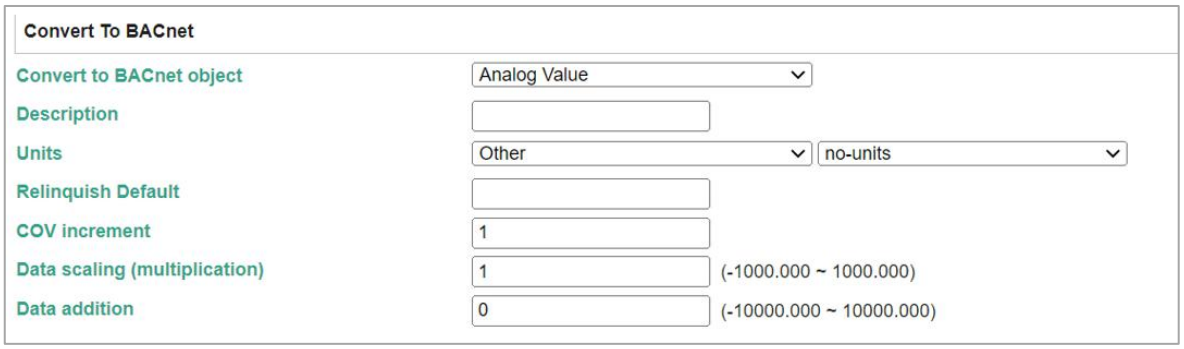
Add Modbus Commands



Parameter	Value	Default	Description
Enable	Enable	Enable	Enable: The command is active.
Name	(an alphanumeric string)	Command1	Max. 32 characters
Data Format	boolean uint16 int16 uint32 int32 float32	boolean	Boolean: 0 or 1. Uint16: Unsigned integer with 16 bits. Int16: Signed integer with 16 bits. Uint32: Unsigned integer with 32 bits. Int32: Signed integer with 32 bits. Float32: Float type with 32 bits.
Function	1 – Read coils 2 – Read discrete inputs 3 – Read holding registers 4 – Read input registers 5 – Write single coil 6 – Write single register 15 – Write multiple coils 16 – Write multiple registers		When a message is sent from a client to a server device, the function code field tells the server what kind of action to perform.
Read starting address	0 to 65535	0	Modbus register address.
Read quantity	1 2	1 2	Specifying how many quantities to read.
Write starting address	0 to 65535	0	Modbus register address.
Write quantity	1 2	1 2	Specifying how many quantities to write into.
Trigger	Cyclic Data Change		Cyclic: The command is sent cyclically at the interval specified in the poll interval parameter. Data change: A command is issued when a change in data is detected.

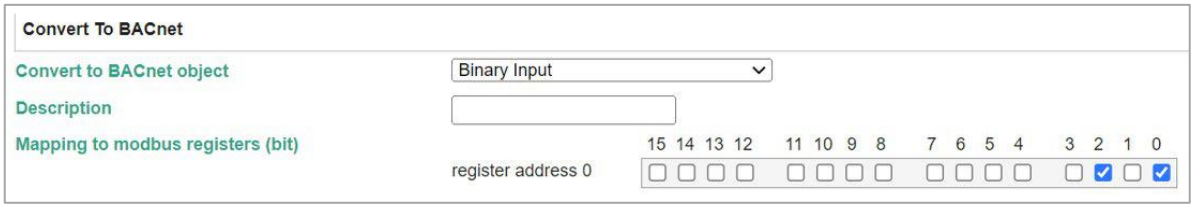
Parameter	Value	Default	Description
Poll interval	1 to 1200000 ms	1000	Polling intervals are in milliseconds. Since the module sends all requests in turns, the actual polling interval also depends on the number of requests in the queue and their parameters. The range is from 100 to 1,200,000 ms.
Endian swap	None Byte Word Byte and Word	None	None: Don't need to swap Byte: 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0B, 0x0A, 0x0D, 0x0C. Word: 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0C, 0x0D, 0x0A, 0x0B. ByteWord: 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0D, 0x0C, 0x0B, 0x0A. There are two phases in changing ByteWord: 1) 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0B, 0x0A, 0x0D, 0x0C 2) 0x0B, 0x0A, 0x0D, 0x0C becomes 0x0D, 0x0C, 0x0B, 0x0A
Fault protection	Keep latest data Clear all data bits to 0	Keep latest data	If the MGate's connection to BACnet/IP client fails, the gateway cannot receive data, but the gateway will continuously send output data to the Modbus TCP server device. To avoid problems in this case, the MGate 5217 can be configured to react in one of the following two ways: Keep the latest data or clear data to zero.
Fault timeout	0 to 65535 ms	6000	Defines the communication timeout on the opposite side.

After completing the above settings, the Modbus command should be converted to BACnet object, which needs to be configured.



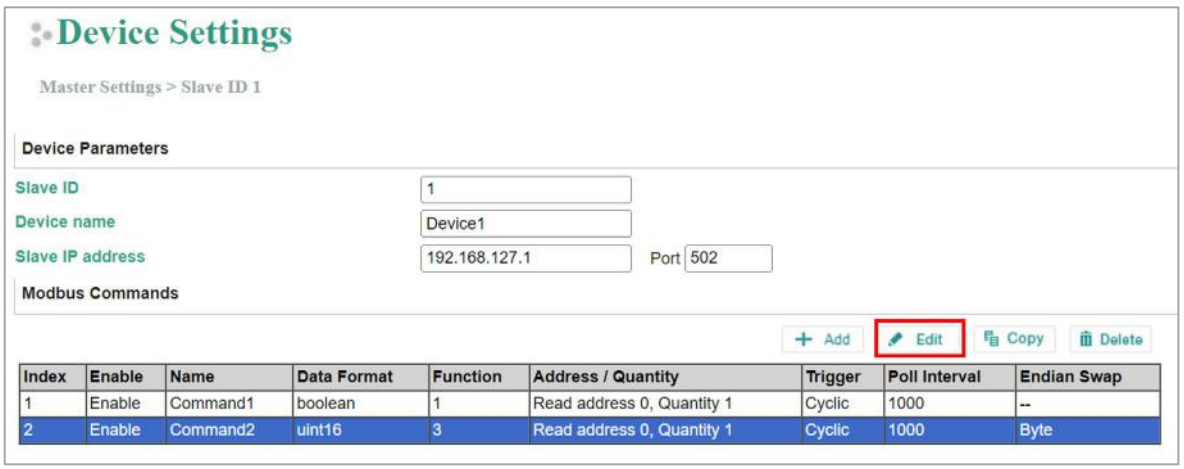
Parameters	Value	Description
Convert to BACnet object	Analog input Analog output Analog value Binary input Binary output Binary value Multi-state Iinput Multi-state output Integer value Positive integer value	Select the BACnet object type for this configured Modbus command
Description	0 to 40 characters, default is none.	Used to describe the BACnet object. For example, "BuildingA_SensorB" can be entered to describe the monitored device. Please note that to be read from BACnet/IP client (usually SCADA), the BACnet/IP client itself should also support the "Description" property.

Parameters	Value	Description
Units		While selecting a nonbinary value, the BACnet/IP client sometimes needs to have the value with units to identify the meaning of the value. Various units are supported to be selected.
Relinquish default	-1000000000 to 10000000000	If there are no commanded values in the priority array, the present value will be changed to relinquish the default.
COV increment	1 to 10000000000	COV will be triggered when |Current Reported Value - Last Reported Value| > COV Increment
Data scaling (multiplication)	-1000.000 to 1000.000	Data can be calculated by multiplication. For example, if Modbus receives data that equals x, then the configured data scaling value equals a The output equals y equals ax
Data addition	-10000.000 to 10000.000	Data can be calculated by addition. For example, if Modbus receives data that equals x, then the configured data addition equals b The output equals y equals x + b

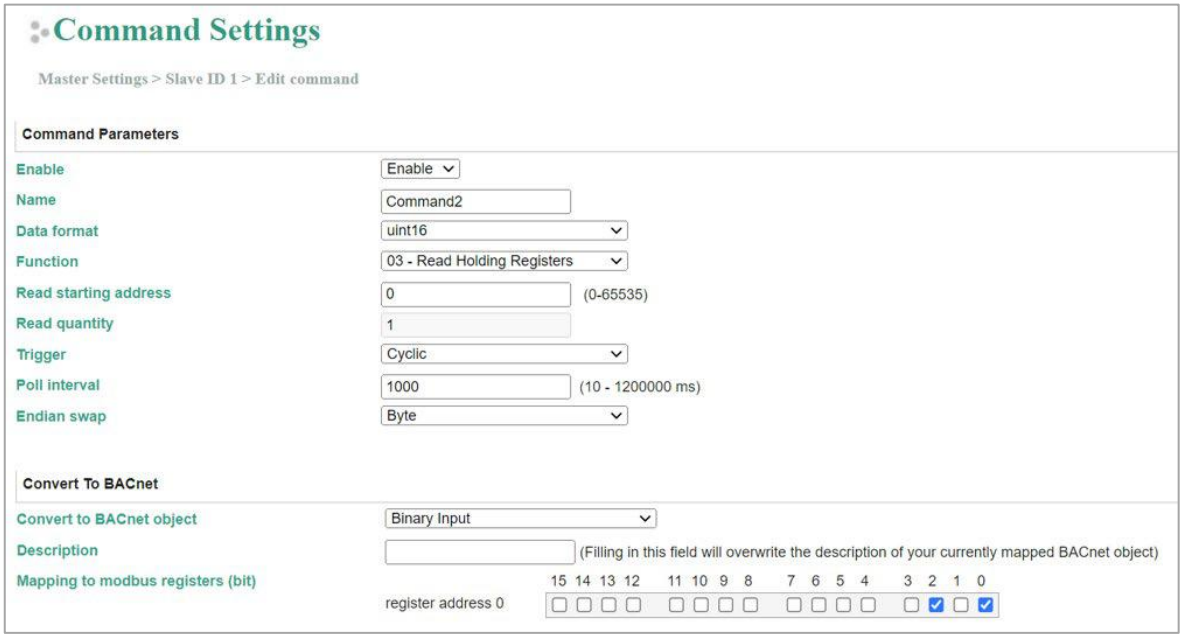


The MGate 5217 also provides an advanced feature that is used to convert one Modbus register to multiple BACnet BI/BO/BV objects. For example, the MGate uses the Modbus function code 03 to read the data from the Modbus RTU device. The register shows the status of several I/Os, and the MGate divides one byte into multiple bits. Select the wanted bit address to map to the BI objects.

After adding a Modbus command, you can edit the command by double-clicking the command list or clicking the Edit icon.



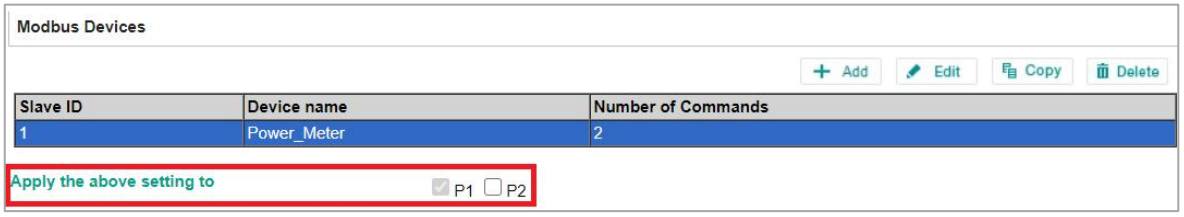
Note that if you "edit" the description field, it will overwrite the description of your current mapped BACnet object.



NOTE

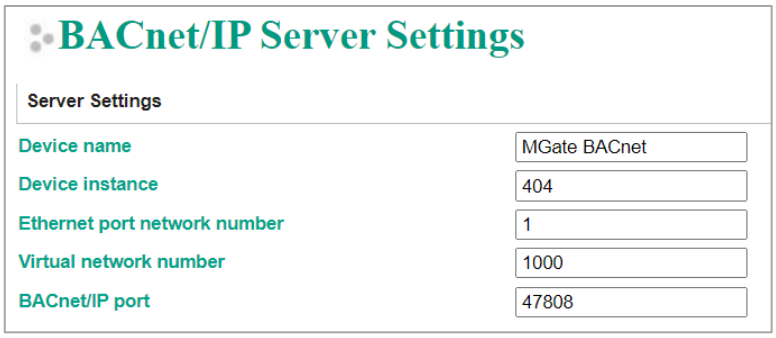
To get a better performance, we suggest the number of COV subscriptions should be under 300.

When the serial port is configured, and you find out all the serial connected Modbus devices are all the same, you can use **Apply the above setting to** other serial ports to save configuration time.



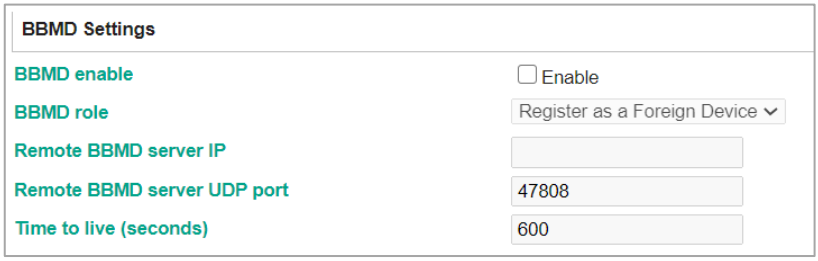
A3. BACnet/IP Server Settings

When MGate act as a BACnet/IP server, assign the **Device name**, **Device instance**, **Network number**, and **BACnet/IP port.**



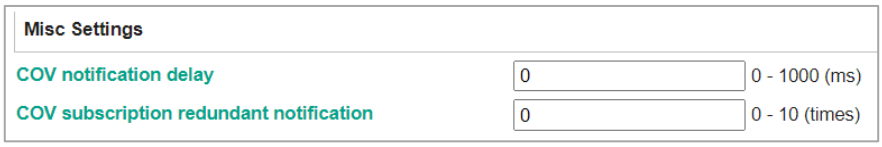
Parameter	Value	Description
Device name	An alphanumeric string. Range: 0 to 40 characters. Default value is "MGate BACnet".	A name to help identify this unit (MGate).
Device instance	Range: 0 to 4194302. Default value is 404.	A number that identifies a device uniquely on the entire interconnected BACnet network. It defines the MGate.
Ethernet port network number	Range: 1 to 65534. Default value is 1.	Each BACnet network segment (subnet is a similar term) within a larger network must have a unique number, which is also called a BACnet network number. This allows for multiple BACnet/IP networks.
Virtual network number	Range: 1 to 65534. Default value is 1000.	This is used to define the non-BACnet network. Here, it shows the Modbus network connected to MGate.
BACnet/IP port	Range: 1024 to 65535. Default value is 47808.	The local port: BACnet communicates on UDP protocol the server (MGate) listens to UDP port 47808 by default.

If the MGate and monitor system are not in the same subnet, the MGate provides a technology called **BBMD** –BACnet/IP Broadcast Management Device—that can forward broadcast messages to different subnet network.



Parameters	Value	Description
BBMD role	Register as a foreign device	
Remote BBMD server IP	0.0.0.0 to 255.255.255.255	The IP addresses of a remote BBMD server.
Remote BBMD UDP port	0 to 65535	The UDP port number of a remote BBMD server.
Time to live (seconds)	0 to 65535	Shows the time to register the MGate as a foreign device. If the MGate fails to re-register before the time expires, the BBMD may delete the foreign device from its Foreign-Device-Table.

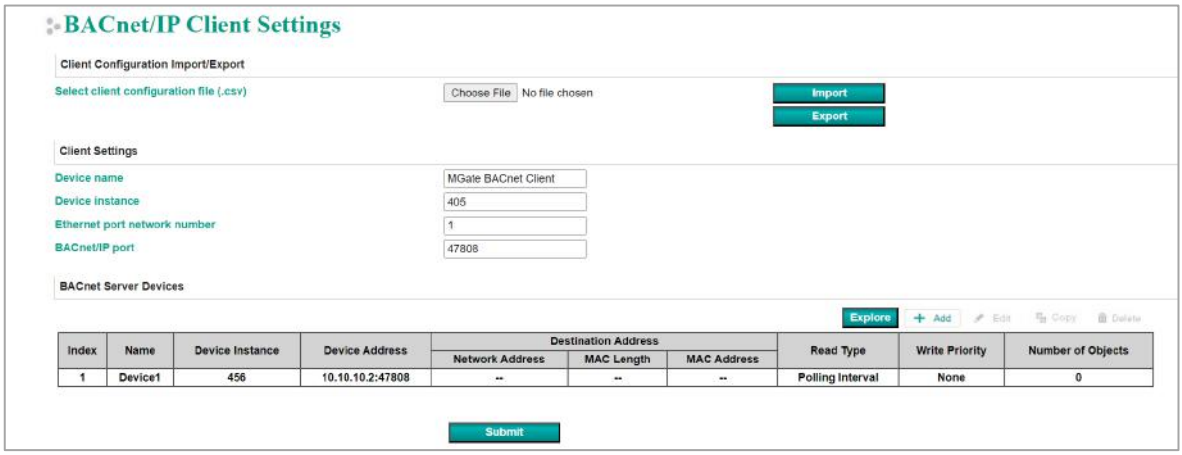
Besides, the MGate provides advanced COV settings for special scenarios.



Parameters	Value	Description
COV notification delay	0 to 1000 ms	It shows the time intervals between COV redundant notifications.
COV subscription redundant notification	0 to 10 times	COV notification uses UDP transmission, which is loss-tolerating connections. To ensure the COV will be received by BACnet/IP client, the MGate as a BACnet/IP server will reply COV value with 1+ configured times.

A4. BACnet/IP Client Settings

When the MGate acts as a BACnet/IP client, assign the **Device name**, **Device instance**, **Ethernet port network number**, and **BACnet/IP port**.



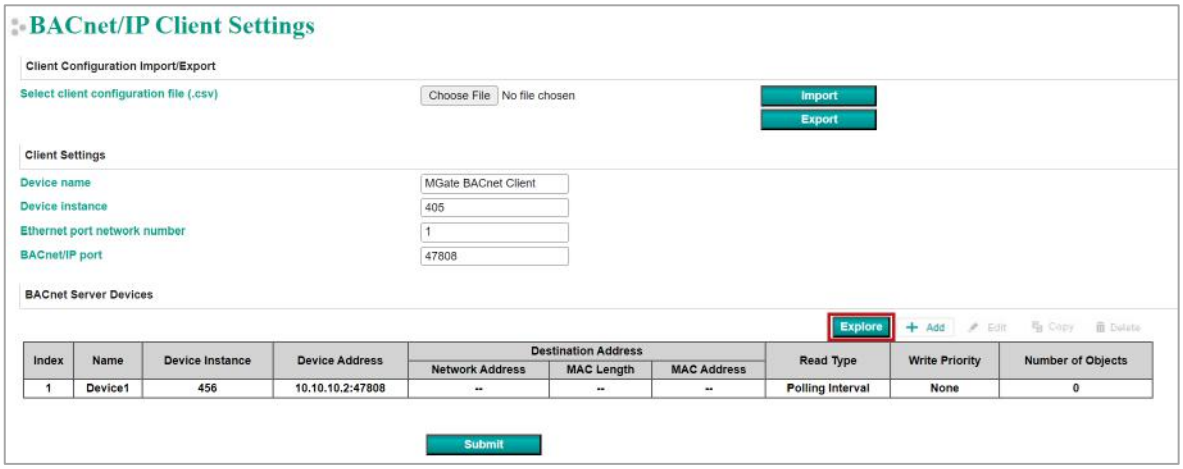
Parameter	Value	Default	Description
Device name	An alphanumeric string. Range: 0 to 40 characters.	MGate BACnet Client	A name to help identify this unit (MGate).
Device instance	Range: 0 to 4194302.	405	A number that identifies a device uniquely on the entire interconnected BACnet network. It defines the MGate.
Ethernet port network number	Range: 1 to 65534.	1	Each BACnet network segment (subnet is a similar term) within a larger network must have a unique number, which is also called a BACnet network number. This allows for multiple BACnet/IP networks.
BACnet/IP port	Range: 1024 to 65535.	47808	The local UDP port. BACnet communicates on UDP protocol, and the MGate BACnet/IP client uses UDP port 47808 to communicate by default.

To configure the protocol conversion from BACnet/IP server devices to Modbus clients through MGate, follow these steps:

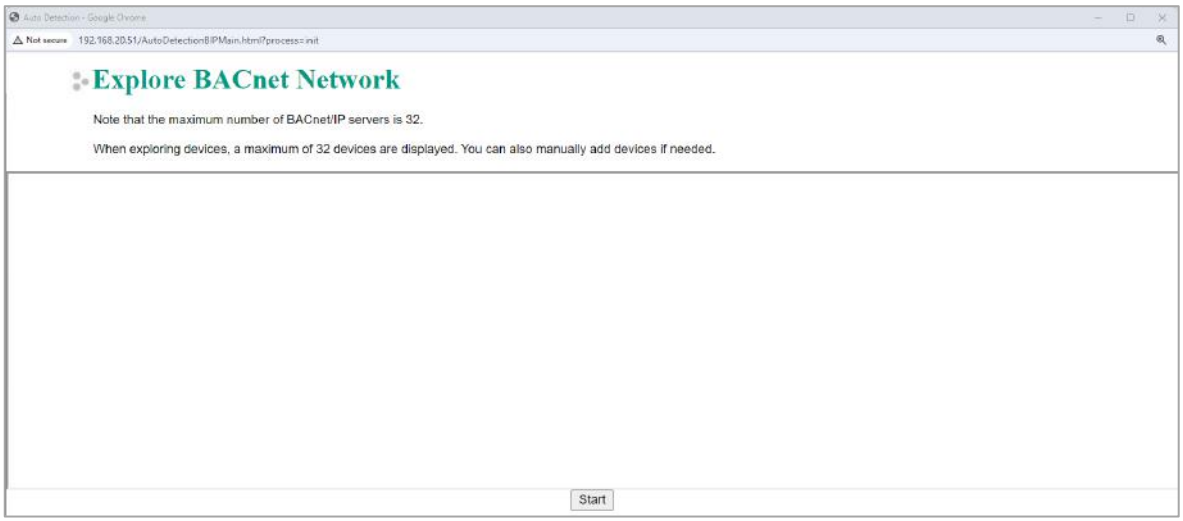
1. Add the BACnet server devices to connect
2. Add the BACnet data objects to read/write or configure COV (Change of Value) settings
3. Set up Modbus TCP or RTU/ASCII server/slave settings
4. The system automatically maps the data between BACnet and Modbus.

BACnet Server Devices

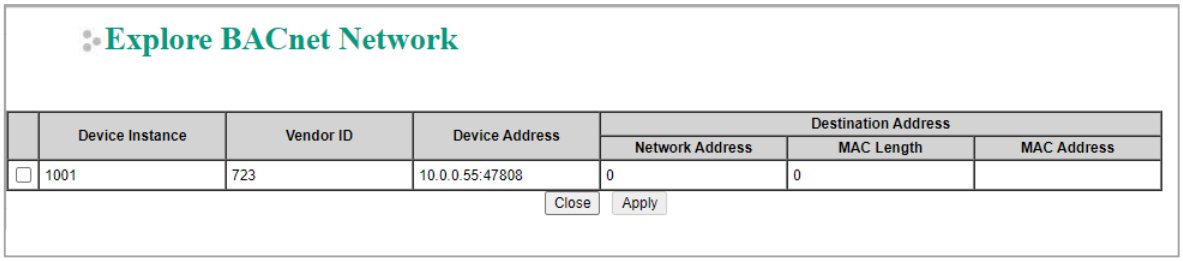
There are two methods to add BACnet/IP server devices connected to MGate: to **Explore** automatically or **Add** manually.



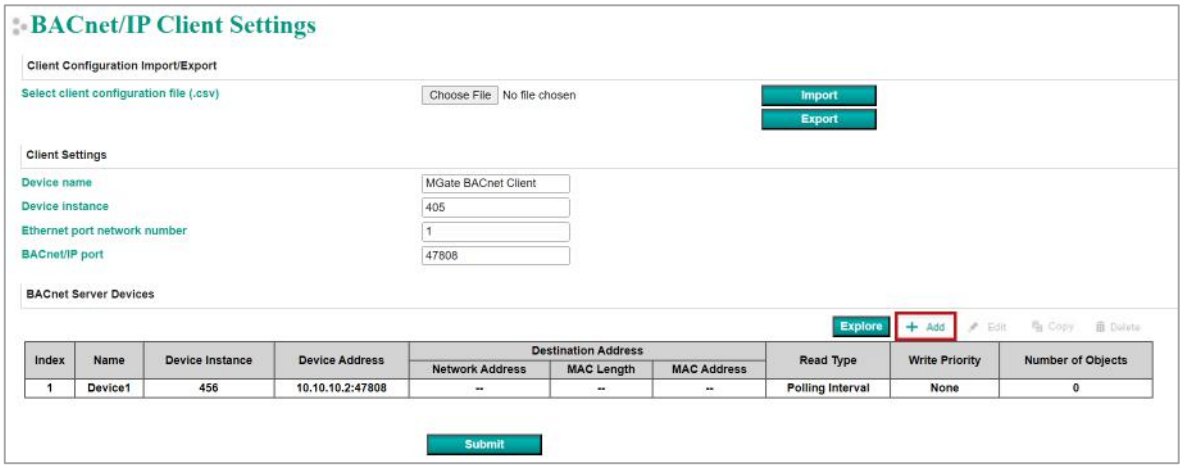
To explore BACnet/IP server devices, click **Explore**, then click **Start**, and the MGate will begin scanning the connected BACnet/IP servers. Please note the maximum number of BACnet/IP devices that can be explored is 32.



After scanning the BACnet/IP devices, select the devices that you'd like to convert by MGate, then click **Apply**.



To manually add BACnet/IP server devices, click **Add** and configure the **Device Instance** and **IP** address of the BACnet/IP server. Note that the **Read Type** settings are specific to each BACnet/IP server device. For instance, if you enable polling for a particular BACnet/IP server, MGate as a BACnet/IP client will use polling as the communication method with that device.

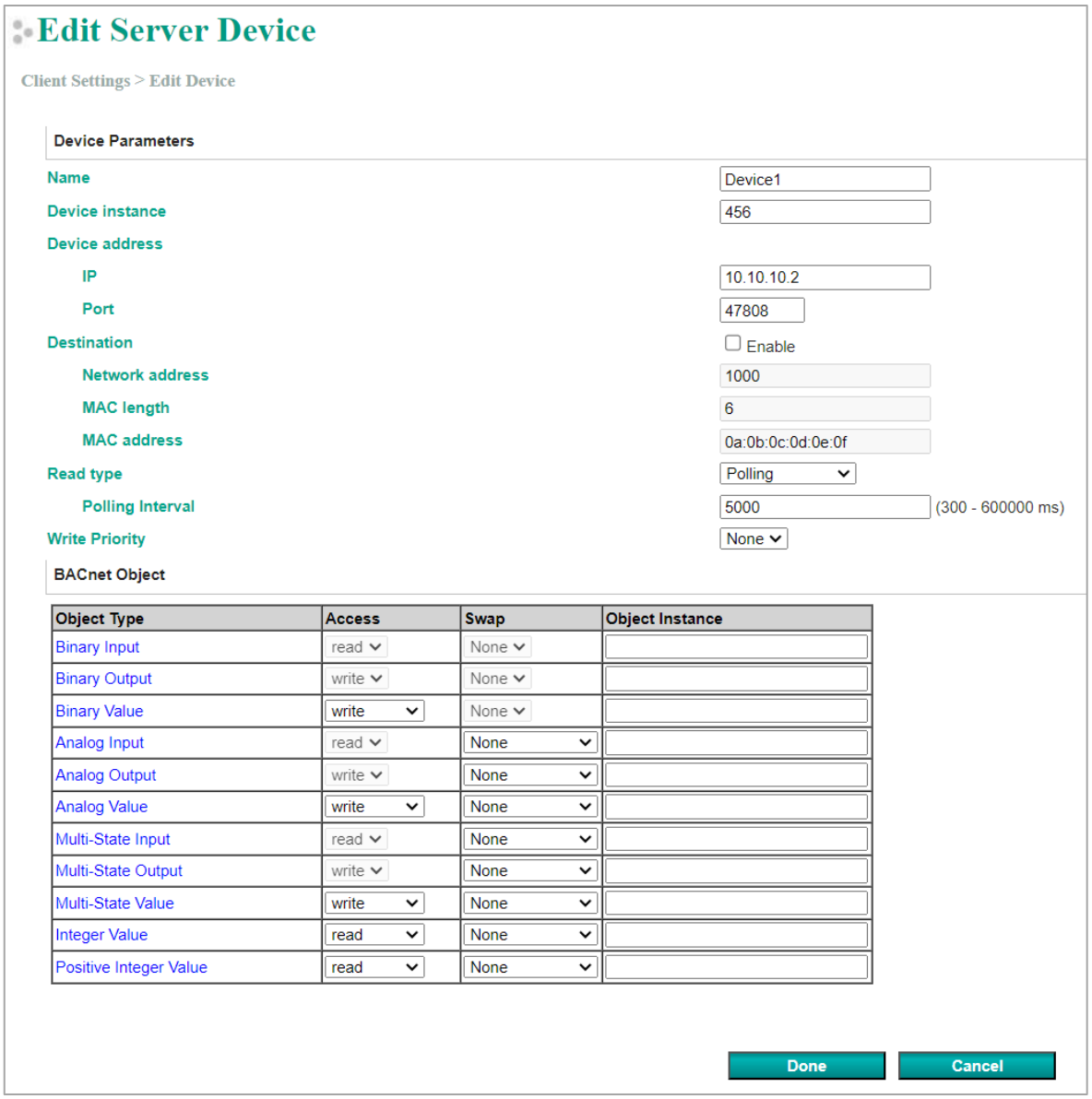


Parameter	Value	Default	Description
Name	An alphanumeric string. Range: 0 to 40 characters.	"device" plus a serial number behind it.	A name to help identify the remote BACnet/IP server device connected to the MGate.
Device instance	Range: 0 to 4194302.	None	A number that identifies a device uniquely on the entire interconnected BACnet network. It defines the remote BACnet/IP server device connected to the MGate.
Device address - IP	Example: 192.168.127.254	None	The IP address of the connected BACnet/IP server device
Device address - Port	Range: 1024 to 65535.	47808	The remote UDP port. BACnet communicates on UDP protocol, and this parameter is the UDP port of the BACnet/IP device used for communication.
Destination – Network address	Range: 1 to 65534.	If enabled, the default value is 1000.	This is used to define the BACnet network address of the BACnet/IP server.
Destination – MAC address	If enabled, please configure the MAC address in the format XX:XX:XX:XX:XX:XX.	None	The MAC address of the BACnet/IP server.
Read type – polling interval	Polling, polling multiple, COV.	polling	Specify the communication type between the MGate and BACnet/IP server devices. **Polling** indicates that the MGate, acting as a BACnet/IP client, uses a polling-response method to retrieve data from BACnet/IP objects. **Polling Multiple** allows for the polling of multiple objects simultaneously. **COV** (Change of Value) means that when there is a change in the value of a BACnet/IP object, the server automatically sends a notification to the BACnet/IP client.
Write Priority	None, or 1~16.	None	Use this parameter to set up the values for the priority array.

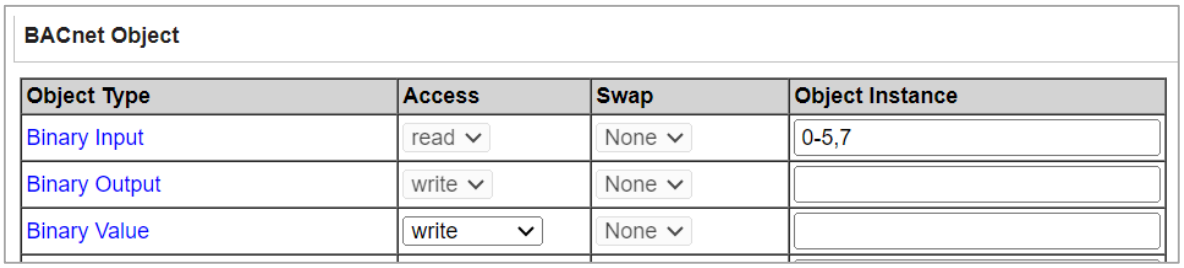
After manually adding BACnet/IP server devices, click **Submit** and **Restart** to take effect.

The next step is to configure the BACnet/IP data objects you wish to read or write.

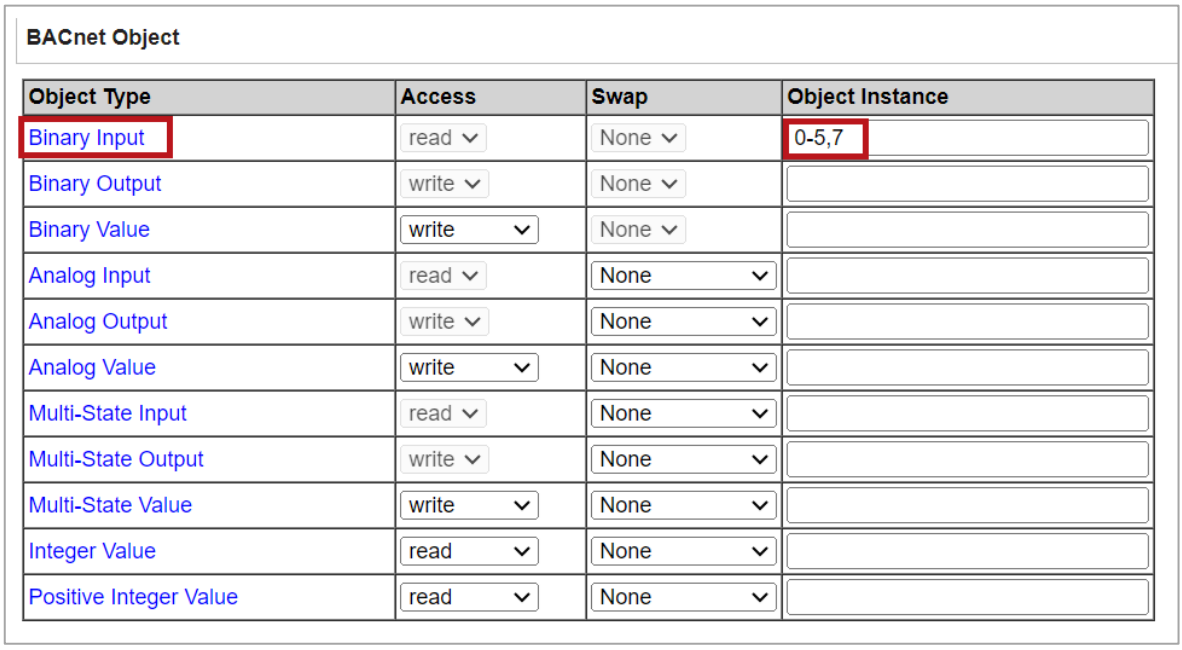
Double-click the device in the BACnet/IP server device list, or select the devices and click **Edit**. In the Edit Server Device page, change the settings if needed, and configure the object settings.

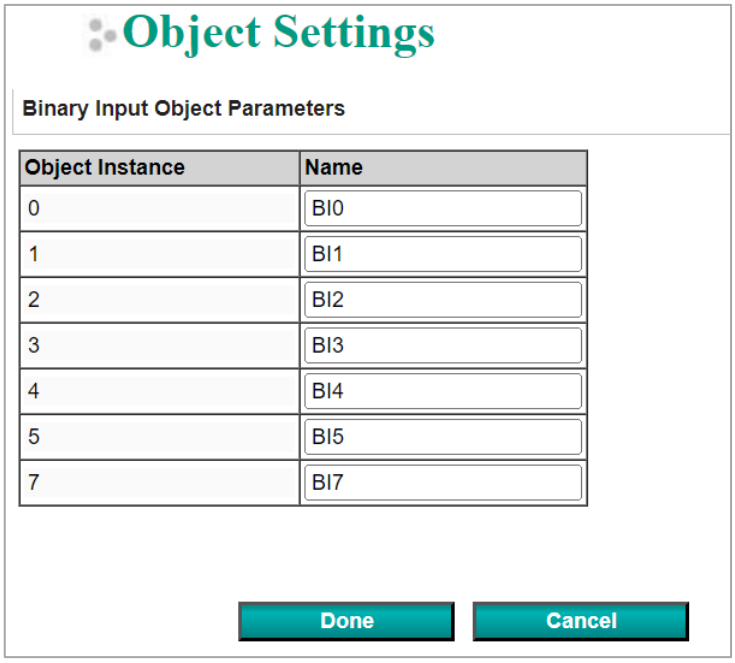


To configure the object instances you want to read, enter a range of numbers (e.g., 0-5) or specify individual numbers separated by commas (e.g., 0-5, 7). If needed, the Access Type(read/write) and Byte/Word Swap settings can also be changed here.

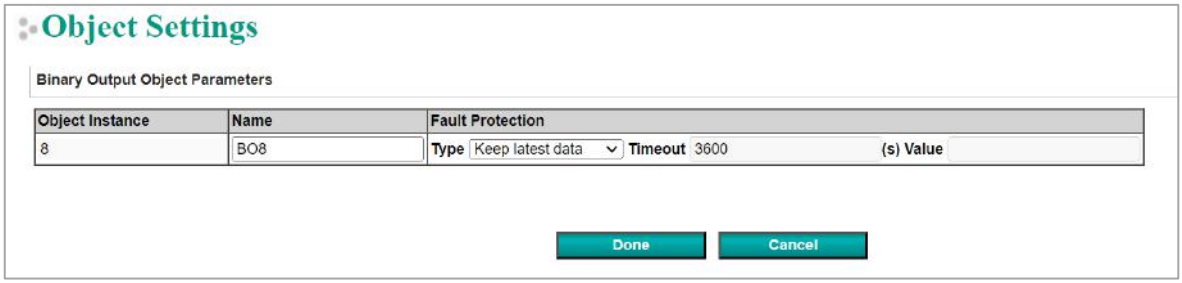


To edit the name of the BACnet/IP object instance, input the Object Instance number first, then click on the Object Type, for example, click on Binary Input to edit the name of each **Binary Input** object.





When configuring objects with 'write' access, such as **Binary Output**, you can set up the Fault Protection function here.



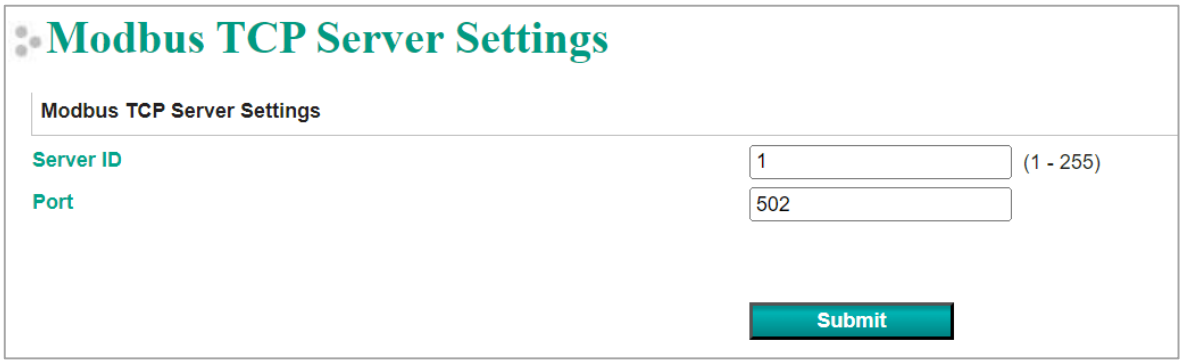
Edit BACnet/IP Objects

Parameter	Value	Default	Description
Object Instance	Range: 0 and 4194302. To edit the object settings, ensure you configure the object instance first.	None	Object instance is a number used to distinguish each object. For example, if a BACnet/IP device has multiple Analog Input objects, each one will have a different instance number, like AI1 and AI2.
Name	An alphanumeric string.	Default is the object type plus the object instance. For example, BO7, meaning Binary Object with Object Instance 7.	This parameter is used to distinguish each BACnet/IP object.
Fault Protection (only available on objects with 'write' access)	Keep latest data Clear all data bits to 0 User defined value	Keep latest data	If the MGate's connection to the Modbus client fails, the gateway cannot receive data, but the gateway will continuously send output data to the BACnet/IP server device. To avoid problems in this case, the MGate 5217 can be configured to react in one of the following three ways: Keep the latest data (ideal for scenarios where you want the system to continue operating as it was), clear data to zero (ideal for scenarios where you want to stop the system), or user defined value (ideal for scenarios where you want to configure the system to a certain status).

Once the BACnet/IP object settings are complete, they are automatically mapped into Modbus commands. Change the Modbus server's (slave's) basic settings if needed.

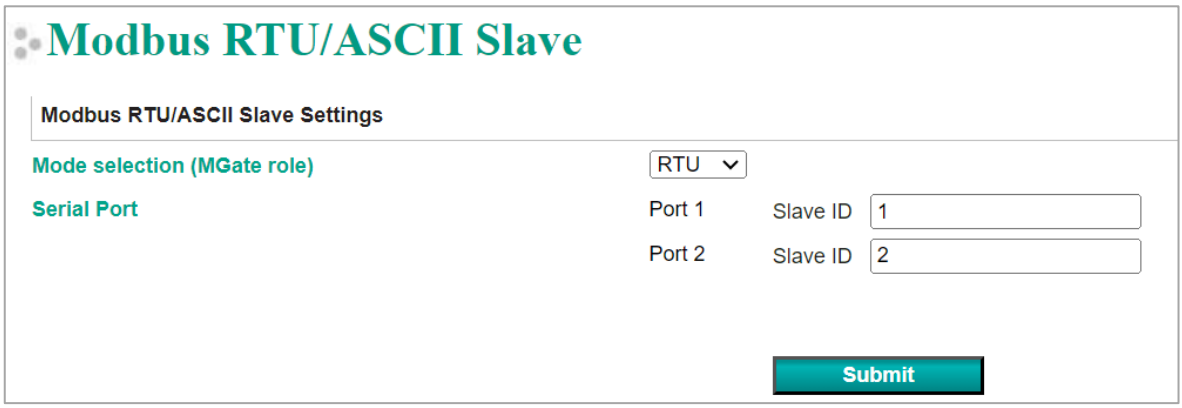
A5. Modbus TCP Server (Slave) Settings

When the MGate acts as a Modbus TCP server, assign the Modbus TCP server ID (slave ID) and the Modbus TCP listen port.



A6. Modbus RTU/ASCII Server (Slave) Settings

When the MGate is configured as a Modbus RTU/ASCII server, assign the Modbus protocol (RTU or ASCII) and specify the Modbus server ID (slave ID) for the desired serial ports.



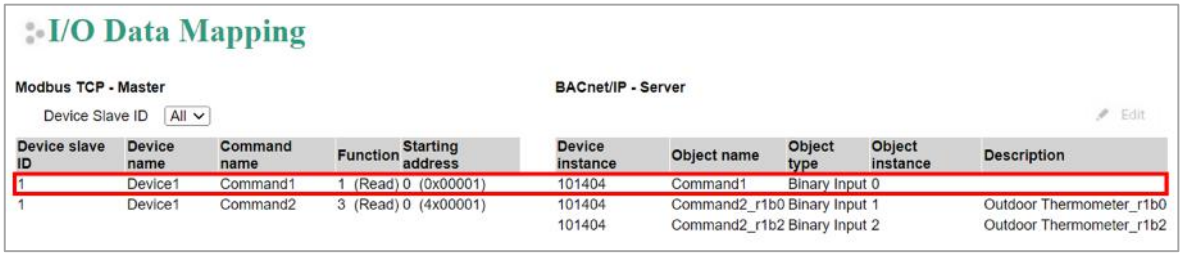
Protocol Settings—I/O Data Mapping

The MGate uses its internal memory to facilitate data exchanges. The **I/O Data Mapping** page shows the complete mapping status.

Converting Modbus Server (Slave) Device to BACnet/IP Client Device

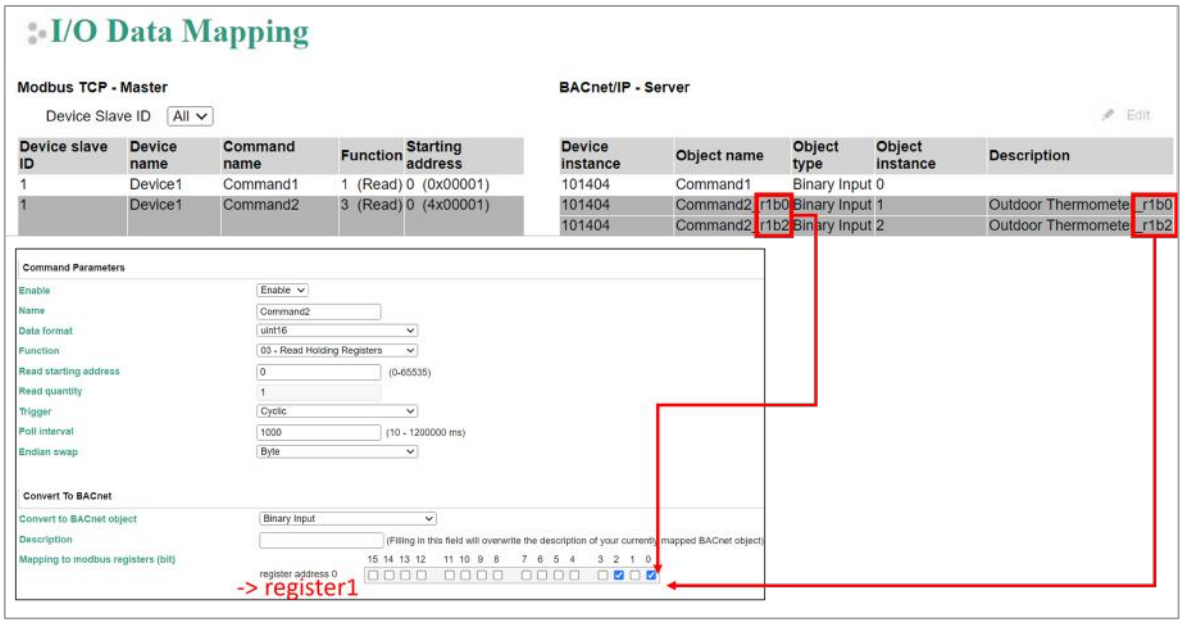
After you have configured Role 1 and Role 2 (client/master and server/slave) of the MGate settings, the SCADA/DDC as the BACnet/IP client role will start monitoring and controlling the remote Modbus server/slave device.

For example, Modbus **Slave ID 1** is connected to the MGate's **Serial Port 1**. The Modbus server/slave device's **Function code 1 (coil data)** with **Address (register) 0** can be read by BACnet/IP Object **Binary Input**, **Instance 0** from the BACnet/IP client side.

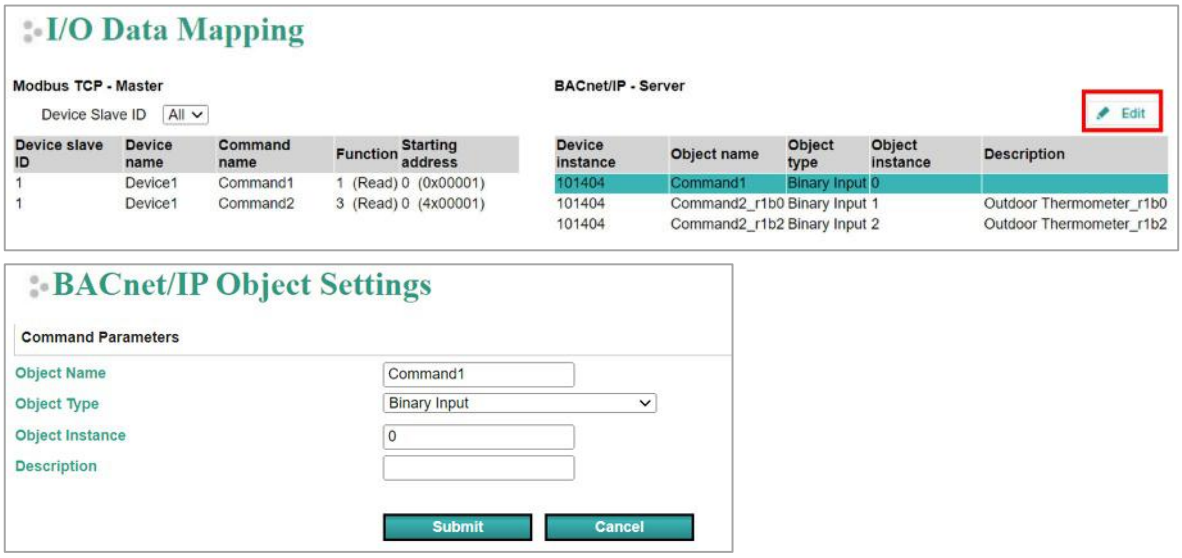


When setting the data mapping of one command to multi-object, for example, when mapping Modbus registers (int16, uint16, int32, uint32) to BACnet binary objects to identify which bit of the register it belongs to, a suffix string read as "rxbx" will be attached to the end of each mapped bit's Object name and Description, where "r" stands for "register" and "b" stands for "bit". For example, when you map uint16 data and use function code 03 as read holding registers to bit 0 and bit 2 of BACnet Binary Input objects, "r1b0" and "r1b2" will be added after the Object name and Description, where"r1b0" stands for register 1 and bit 0; and "r1b2" stands for register 1 and bit 2.

Up to 2 Modbus registers can be mapped to BACbet objects, which means the suffix range will be within r1b0, r1b1...to r1b15, and r2b0...to r2b15.

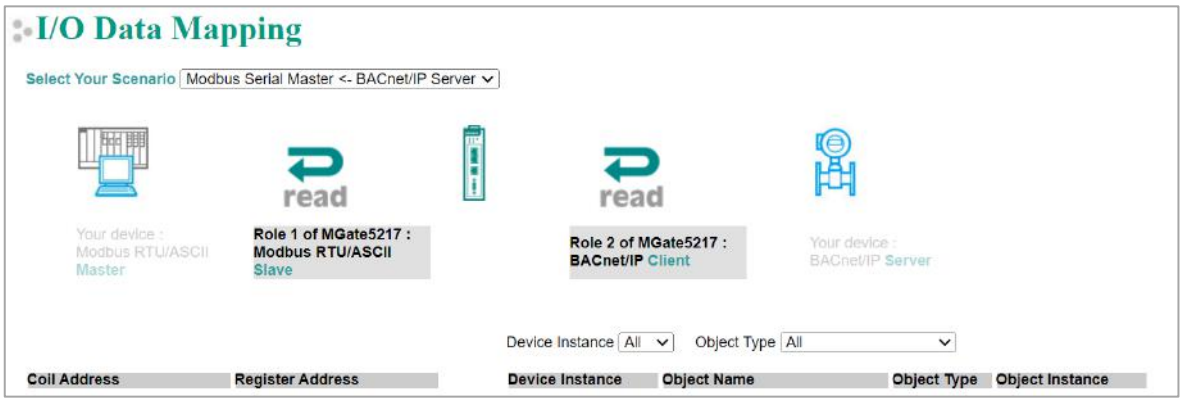


If object settings are wrong and need to be changed, you can press the **Edit** icon to change Object name, Object type, Object Instance ID, and description.

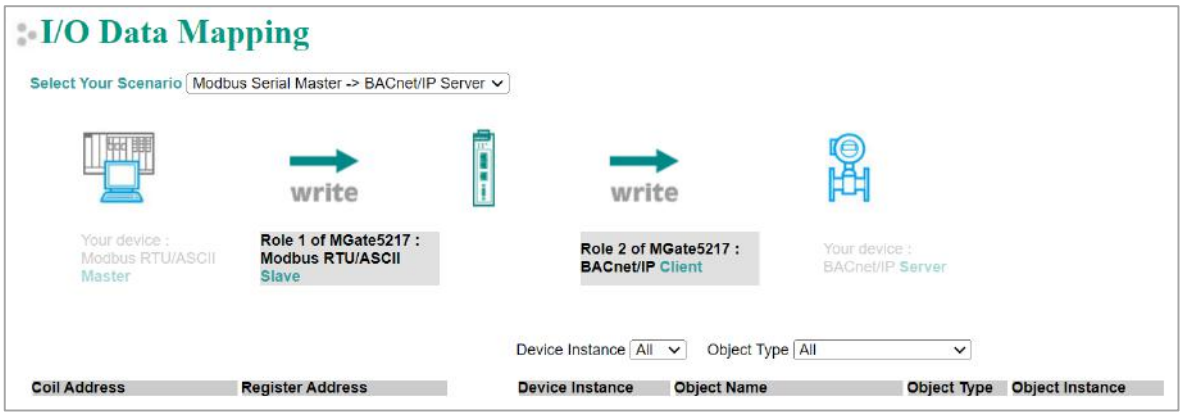


Converting BACnet/IP Server Device to Modbus Client (Master) Device

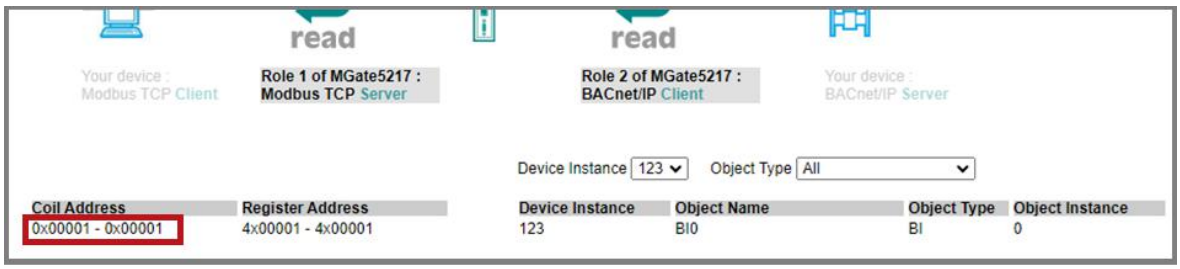
After you have configured Role 1 and Role 2 (client/master and server/slave) of the MGate settings, the SCADA/DDC as the Modbus client role will start monitoring and controlling the remote BACnet/IP server device. Note that the mapping is automatically done by the MGate. For mapping to Modbus read commands, select the following scenario:

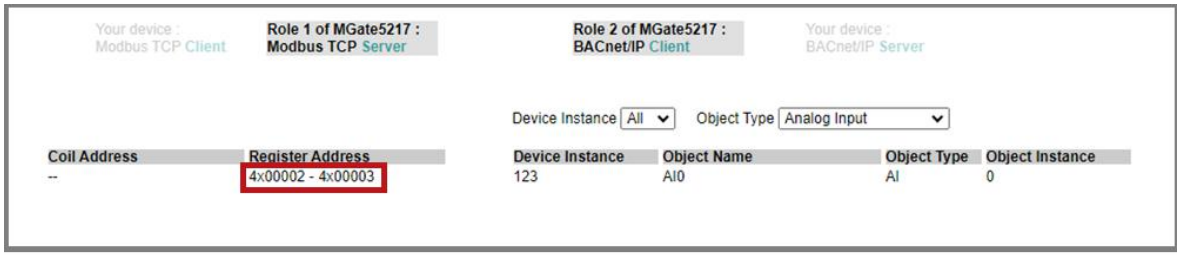


For mapping to Modbus write commands, select the following scenario:



Check the mapped Modbus address information on the I/O mapping page, then configure the Modbus SCADA command to read or write to this address to enable communication.

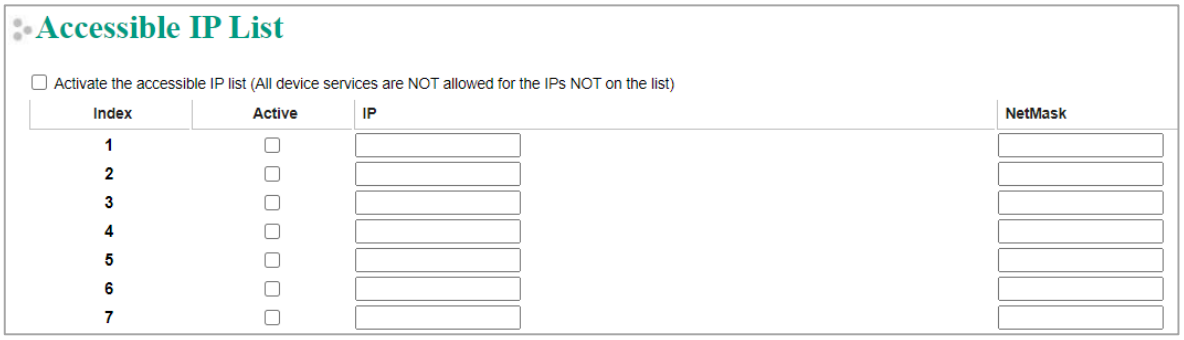




System Management

System Management—Accessible IP List

The Accessible IP List function allows you to add or block remote host IP addresses to prevent unauthorized access. Access to the MGate 5217 is controlled by IP address. If a host's IP address is in the accessible IP table, then the host will be allowed to access the MGate 5217.



These settings are used to restrict access to the module by IP address. Only IP addresses on the list will be allowed access to the device. You may add a specific address or range of addresses by using a combination of IP address and netmask, as follows:

To allow access to a specific IP address: Enter the IP address in the corresponding field; enter 255.255.255.255 for the netmask.

To allow access to hosts on a specific subnet: For both the IP address and netmask, use 0 for the last digit (e.g., "192.168.1.0" and "255.255.255.0").

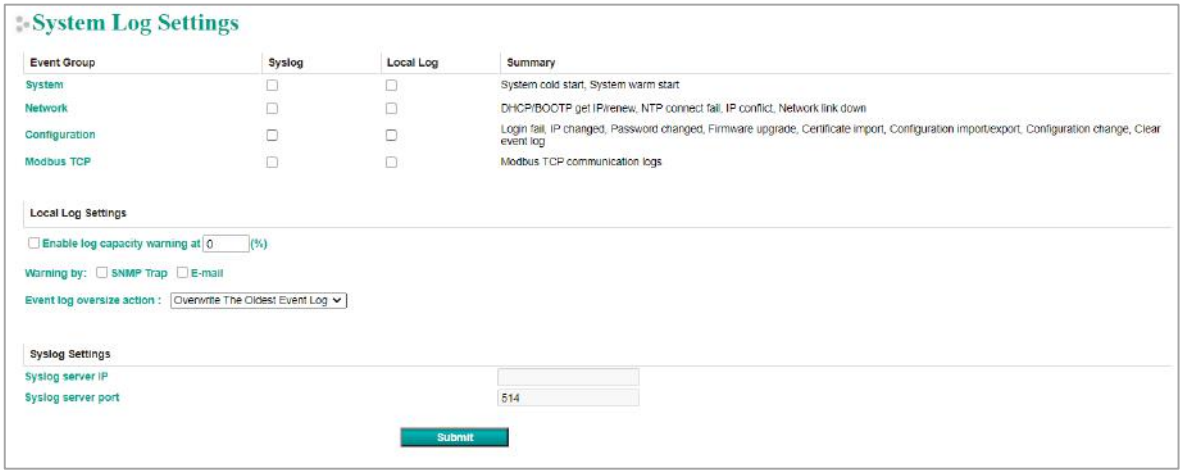
To allow access to all IP addresses: Make sure that **Enable** the accessible IP list is not checked.

Additional configuration examples are shown in the following table:

Desired IP Range	IP Address Field	Netmask Field
192.168.1.120	192.168.1.120	255.255.255.255
192.168.1.1 to 192.168.1.254	192.168.1.0	255.255.255.0
192.168.0.1 to 192.168.255.254	192.168.0.0	255.255.0.0
192.168.1.1 to 192.168.1.126	192.168.1.0	255.255.255.128
192.168.1.129 to 192.168.1.254	192.168.1.128	255.255.255.128

System Management—System Log Settings

These settings enable the MGate firmware to record important events for future verification. The recorded information can only be shown on the **System Log** page.



The information that can be recorded includes the following events:

Event Group	Description
System	System Cold Start, System Warm Start
Network	DHCP/BOOTP Get IP/Renew, NTP Connect Fail, IP Conflict, Network Link Down
Configuration	Login Fail, IP Changed, Password Changed, Firmware Upgrade, SSL Certificate Import, Configuration Import/Export
Modbus TCP	The Modbus TCP connection is connected or disconnected

Local Log Settings	Description
Enable log capacity warning (%)	When the log amount exceeds the warning percentage, it will trigger an event to SNMP Trap or Email.
Warning by	SNMP Trap Email
Event log oversize action	Overwrites the oldest event log Stops recording event log

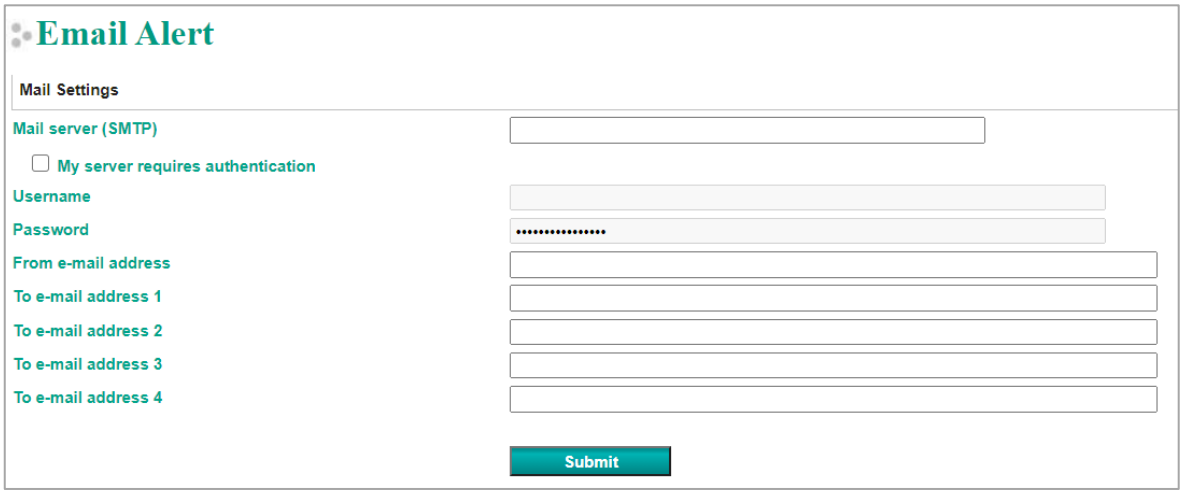
Syslog Settings	Description
Syslog server IP	IP address of a server which will record the log data.
Syslog server port	514

System Management—Auto Warning Settings

Auto Warning is triggered by different events. When a checked trigger event occurs, the MGate can send email alerts, SNMP Trap messages, or open/close the circuit of the relay output and trigger the Fault LED to blink. To enable an email alert, configure the email address on the **E-mail Alert** page. Likewise, to enable SNMP Trap alerts, configure the SNMP trap server on the **SNMP Trap** page.

System Management—Email Alert

Along with activating the Mail function from events on the **Auto Warning Settings** page, the Email Alert should be set up.



Parameters	Description
Mail server (SMTP)	The mail server's domain name or IP address.
Username	This field is for your mail server's username, if required.
Password	This field is for your mail server's password, if required.
From email address	This is the email address from which automatic email warnings will be sent.
To email address 1 to 4	Email addresses to which automatic email warnings will be sent.

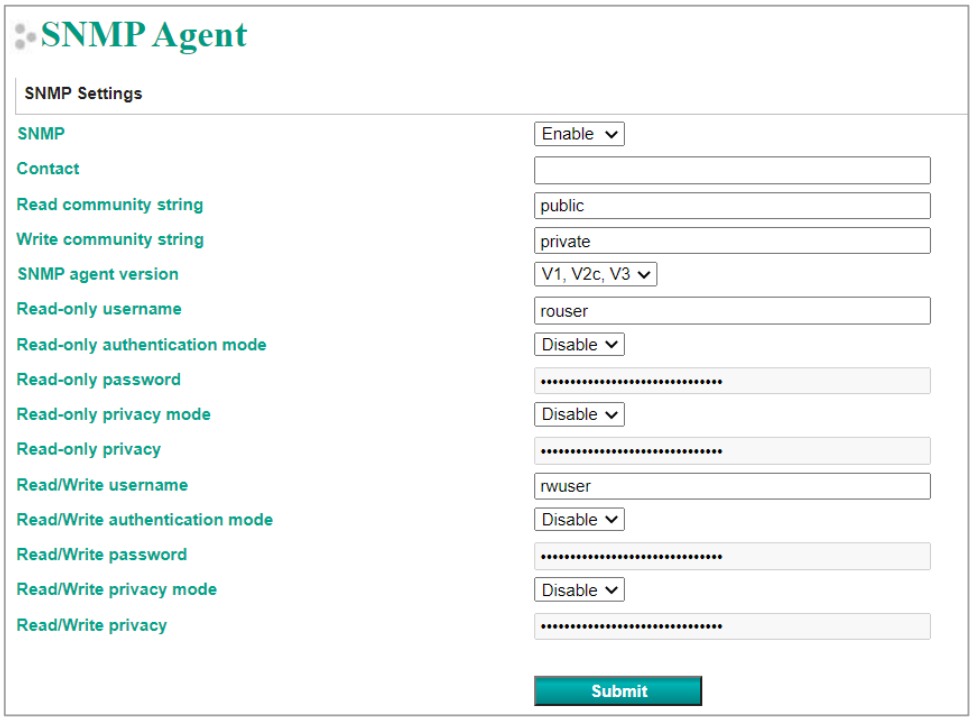
System Management—SNMP Trap

Along with activating the **Trap** function from events on the **Auto Warning Settings** page, the SNMP Trap will be set up.

Parameters	Description
SNMP trap server IP	Use this field to show the IP address to use for receiving SNMP traps.
Trap version	Use this field to select the SNMP trap version.
Trap community	Use this field to designate the SNMP trap community.

System Management—SNMP Agent

The SNMP Agent is a network-management tool for collecting and organizing information about managed devices on an IP network and for modifying the information on the device.



Parameters	Description
SNMP	To enable the SNMP Agent function, select the Enable option, and enter a community name (e.g., public).
Contact name	The optional SNMP contact information usually includes an emergency contact name and telephone number.
Read community string	This is a text password mechanism that is used to weakly authenticate queries to agents of managed network devices.
Write community string	This is a text password mechanism that is used to weakly authenticate changes to agents of managed network devices.
SNMP agent version	The MGate 5217 supports SNMP V1, V2c, and V3.

Read-only and Read/Write Access Control

While selecting SNMP agent V3, the read-only and read/ write access control parameters need to be configured. The following fields allow you to define usernames, passwords, and authentication parameters for two levels of access: read-only and read/write. The name of the field will show which level of access it refers to. For example, **Read-only** authentication mode allows you to configure the authentication mode for read-only access, whereas **Read/write** authentication mode allows you to configure the authentication mode for read/write access. For each level of access, you may configure the following:

Parameters	Description
Username	Use this optional field to identify the username for the specified level of access.
Authentication mode	Use this field to select MD5 or SHA as the method of password encryption for the specified level of access, or to disable authentication.
Privacy mode	Use this field to enable or disable DES_CBC data encryption for the specified level of access.
Password	Use this field to set the password for the specified level of access.
Privacy	Use this field to define the encryption key for the specified level of access.

System Management—LLDP Settings

The Link Layer Discovery Protocol (LLDP) standardizes the method that devices on a network use to periodically send information on their configuration and status. This self-identification method keeps all LLDP devices on a network informed of each other's status and configuration. You can use SNMP protocol to send the LLDP information on the network devices to Moxa's MXview to create auto network topology and for network visualization.

The MGate web interface lets you enable or disable LLDP and set the LLDP transmit interval. In addition, you can go to **System Monitoring–System Status–LLDP Table** to view the MGate's neighbor-list, which is created based on the information reported by neighboring devices on the network.

Parameters	Values	Description
Message transmit interval	5–16383 secs (Default:30 secs)	The MGate will send information on the configuration and status of devices in a network at regular intervals based on the value configured here.

System Management—Certificate

For the MGate self-signed certificate:

When we encounter the valid date of the certificate expired, we can regenerate the "MGate self-signed" certificate through the following steps.

Step 1: Users should delete the SSL certificate file originated from the MGate device.

Step 2: Then, enable the NTP server by setting up the time zone and local time.

Step 3: After restarting the device, the "MGate self-signed" certificate will be regenerated with the updated valid time.

For importing the third-party trusted SSL certificate:

By importing the third-party trusted SSL certificate, the security level can be enhanced. A snapshot of the GUI for the web console is shown below. To generate the SSL certificate through the third party, here are the steps:

Step 1: Create a certification authority (Root CA), such as Microsoft AD Certificate Service (https://mizitechinfo.wordpress.com/2014/07/19/step-by-step-installing-certificate-authority-on-windows-server-2012-r2/)

Step 2: Find a tool to issue a "Certificate Signing Requests" file, where you can find it from third-party CA companies, such as DigiCert (https://www.digicert.com/easy-csr/openssl.htm).

Step 3: Submit it to a public certification authority for signing the certificate.

Step 4: Import the certificate to the MGate Series. Please note that the MGate Series only accepts "xxxx.pem" format.

NOTE

The maximum key length of the MGate devices supports 2,048 bits.

Some well-known third-party CA (Certificate Authority) companies are listed below for your reference: (https://en.wikipedia.org/wiki/Certificate_authority):

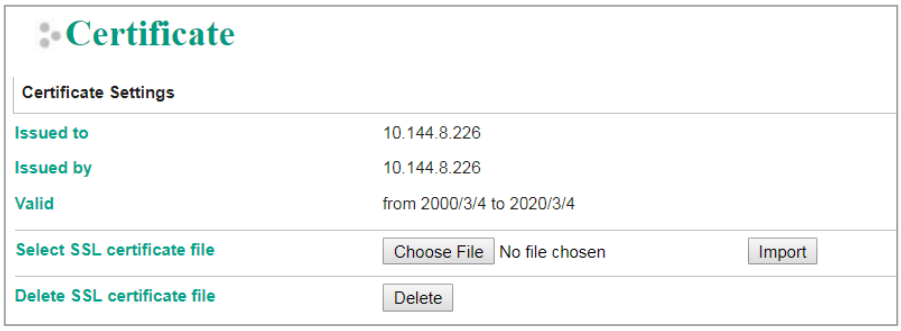
IdenTrust (https://www.identrust.com/)

DigiCert (https://www.digicert.com/)

Comodo Cybersecurity (https://www.comodo.com/)

GoDaddy (https://www.godaddy.com/)

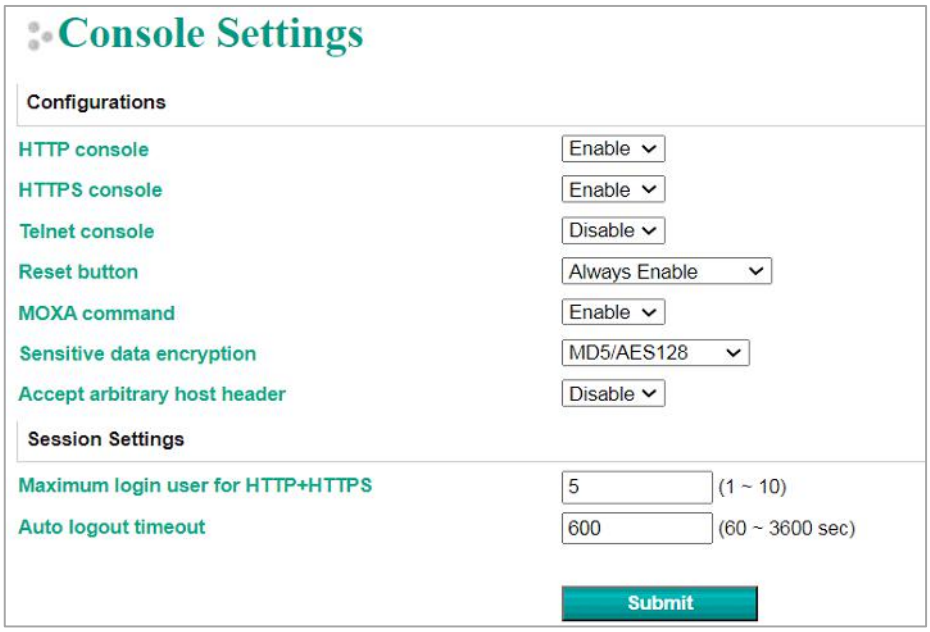
Verisign (https://www.verisign.com/)



System Management—Misc. Settings

This page includes console settings, password, and relay output.

System Management—Misc. Settings—Console Settings

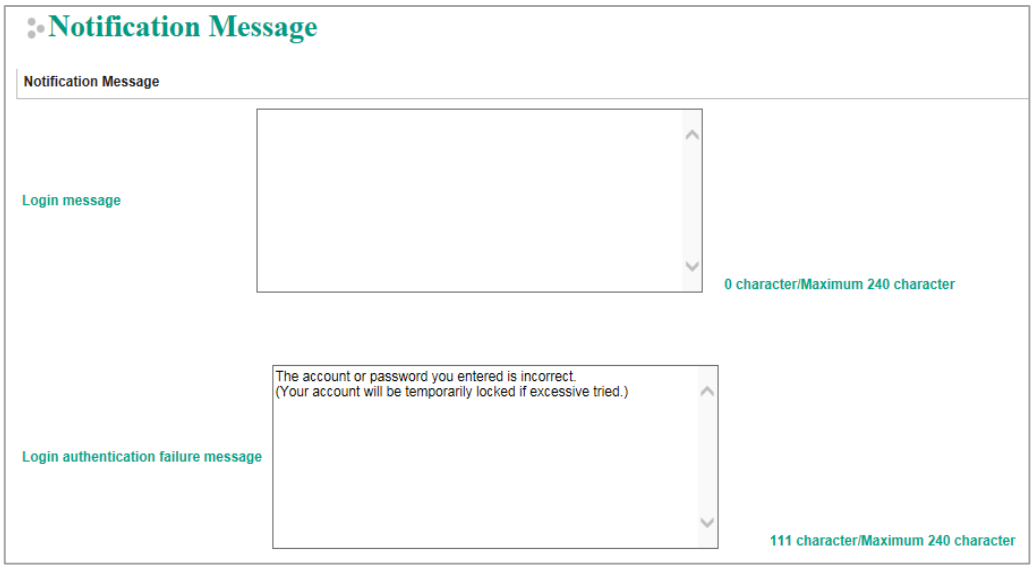


Configuration	Value	Description
HTTP/HTTPS	Enable/Disable	This setting is to enable/disable the web console. For security reasons, users can only enable HTTPS or just disable all settings.
Telnet console	Enable/Disable	Enable or disable telnet console service.
Reset button	Disable after 60 sec., Always enable	The MGate provides the reset button to clear the password or load factory default settings. But for security reasons, users can disable this function. In disabled mode, the MGate will still enable this function within 60 seconds after boot-up, just in case users really need to reset this function.

Configuration	Value	Description
MOXA command	Enable/Disable	Enable or disable the DSU/MXStudio/MCC tool service.
Sensitive data encryption	MD5/AES128 SHA256/AES256	When you enable the Moxa command, use the selected algorithm to encrypt sensitive data.
Accept arbitrary host header	Enable/Disable	If a web service accepts a connection using arbitrary HTTP Host headers, attackers may use DNS rebinding to bypass any IP or firewall-based access restrictions that may be in place, by proxying through their target's browser. The website may be vulnerable to HTTP Host header attacks by enabling this function. Therefore, the default setting is disabled.

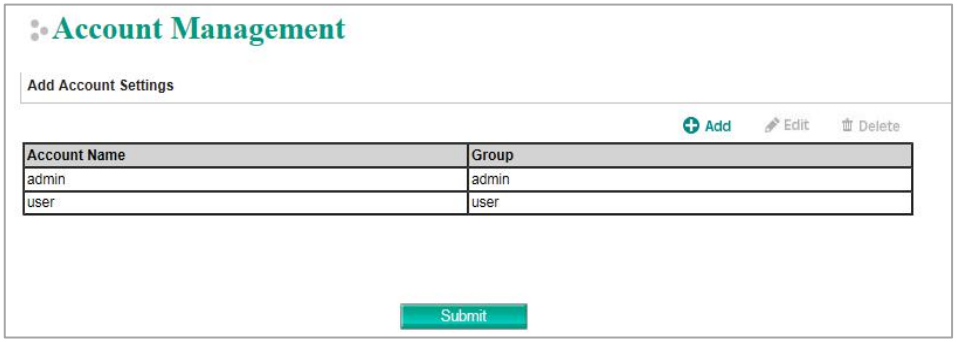
Session Settings	Value	Description
Maximum Login User for HTTP+HTTPS	1 to 10	
Auto Logout Setting	60 to 3600 sec.	Sets the auto logout time.

System Management—Misc. Settings—Notification Message



Users can input a message for Login or for Login authentication failure message.

System Management—Misc. Settings—Account Management



Parameters	Value	Description
Account	admin, user	Users can change the password for different accounts. The MGate provides two different level accounts: admin and user. Admin account can access and change all the settings through the web console. User account can only view the setting and cannot change anything.

System Management—Misc. Settings—Login Password Policy

Account Password Policy	Value	Description
Minimum length	4-16	The minimum password length of the password
Enable password complexity strength check		Select how the MGate checks the password's strength
Password lifetime	90-180 days	Set the password's lifetime period

Account Login Failure Lockout	Value	Description
Retry failure threshold	1-10 time	Shows the number of login failures before the MGate locks out
Lockout time	1-60 min	When the number of login failures exceeds the threshold, the MGate will lock out for a period

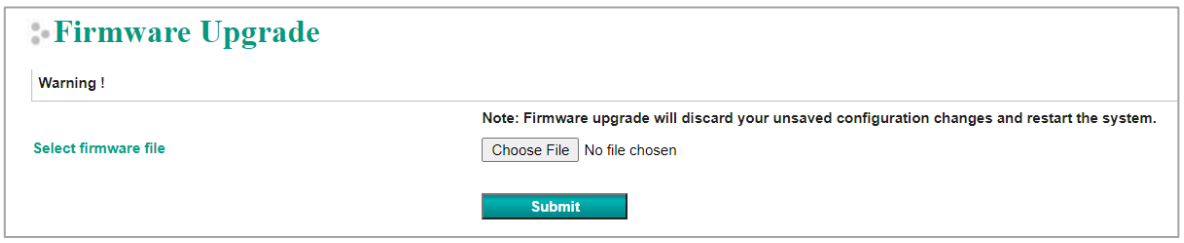
System Management—Maintenance

System Management—Maintenance—Ping

This network testing function is available only on the web console. The MGate gateway will send an ICMP packet through the network to a specified host, and the result can be viewed on the web console immediately.

System Management—Maintenance—Firmware Upgrade

Firmware updates for the MGate 5217 are at www.moxa.com. After you have downloaded the new firmware onto your PC, you can use the web console to write it onto your MGate 5217. Select the desired unit from the list in the web console and click **Submit** to begin the process.



ATTENTION

DO NOT turn off the MGate power before the firmware upgrade process is completed. The MGate will erase the old firmware to make room for the new firmware to flash memory. If you power off the MGate and terminate the progress, the flash memory will contain corrupted firmware and the MGate will fail to boot. If this happens, call Moxa RMA services.

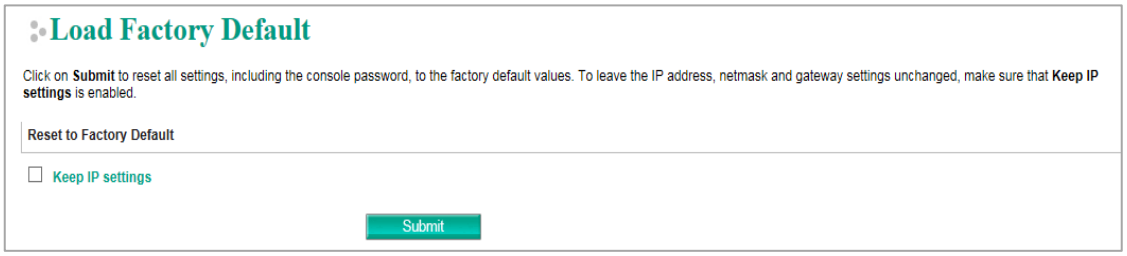
System Management—Maintenance—Configuration Import/Export

There are three main reasons for using the Import and Export functions:

- **Applying the same configuration to multiple units.** The Import/Export configuration function is a convenient way to apply the same settings to units at different sites. You can export the configuration as a file and then import the configuration file onto other units at any time.
- **Backing up configurations for system recovery.** The export function allows you to export configuration files that can be imported onto other gateways to restore malfunctioning systems within minutes.
- **Troubleshooting.** Exported configuration files can help administrators to identify system problems that provide useful information for Moxa's Technical Service Team when maintenance visits are requested.

System Management—Maintenance—Load Factory Default

To clear all the settings on the unit, use the Load Factory Default to reset the unit to its initial factory default values.



ATTENTION

Load Default will completely reset the configuration of the unit, and all the parameters you have saved will be discarded. Do not use this function unless you are sure you want to completely reset your unit.

System Monitoring (Troubleshooting)

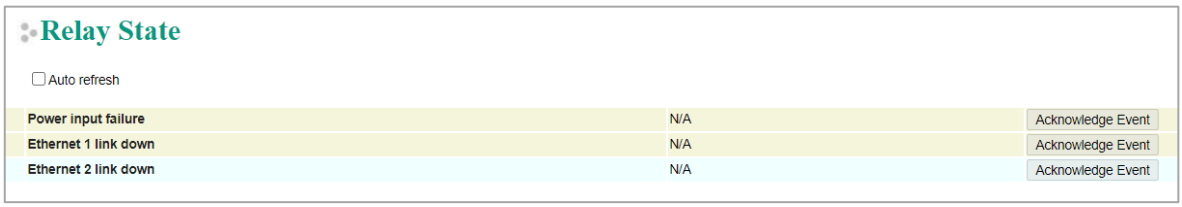
MGate 5217 provides easy-to-use and useful troubleshooting tools. If a communication issue occurs, we suggest that you first check the **Protocol Status > Diagnostics** page for the status of the protocol. To analyze the Modbus or BACnet/IP traffic, view the network logs available at **Protocol Status > Traffic**.

System Monitoring—System Log

Go to **System Log** to view log information. The desired log categories can be configured in the System Log settings.

System Monitoring—Relay State

The MGate gateway includes a built-in relay circuit that is triggered in the event of a power failure or if the Ethernet link is down. You can view the relay status on this page.

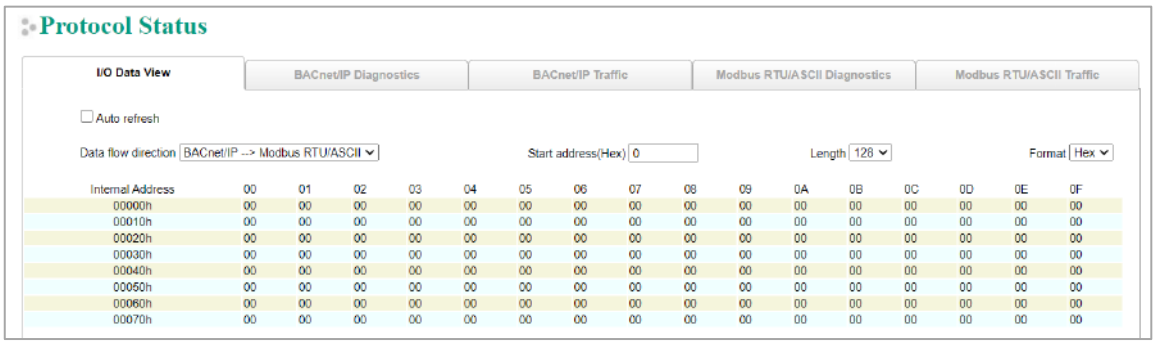


System Monitoring—LLDP Table

You can see LLDP related information, including Port, Neighbor ID, Neighbor Port, Neighbor Port Description, and Neighbor System.

System Monitoring—Protocol Status—I/O Data View

This page displays the internal memory information for input and output data transfers. View updated values for communication verification here. This function is only available on the web console.

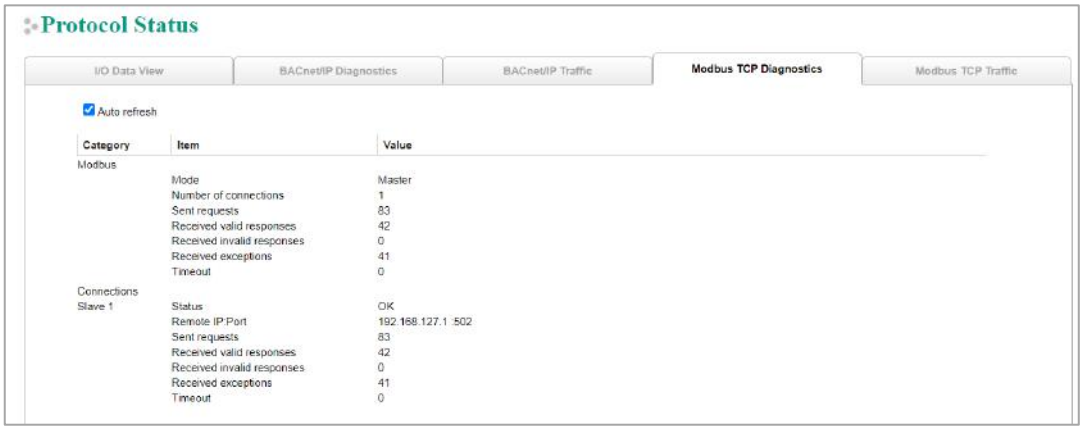


System Monitoring—Protocol Status—Diagnostics

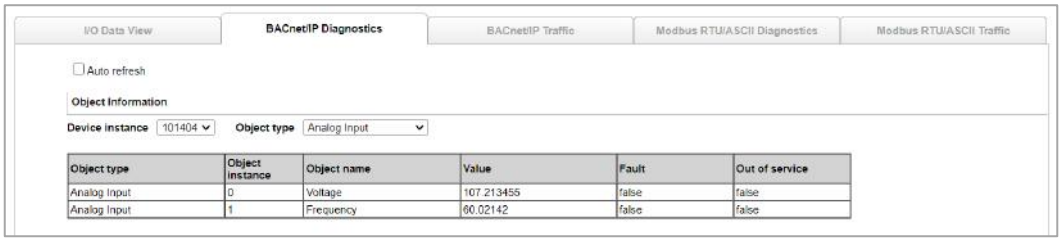
The MGate provides status information for BACnet/IP, Modbus RTU/ASCII, and Modbus TCP troubleshooting. Verify data or packet counters to make sure the communications are running smoothly.

Modbus RTU/ASCII Diagnostics

Modbus TCP Diagnostics



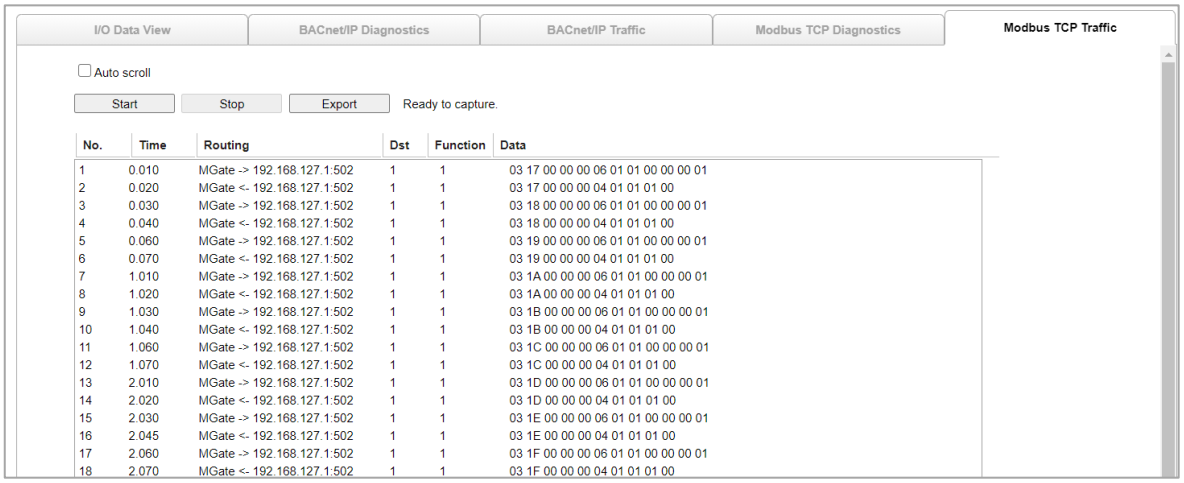
BACnet/IP Diagnostics



System Monitoring—Protocol Status—Traffic

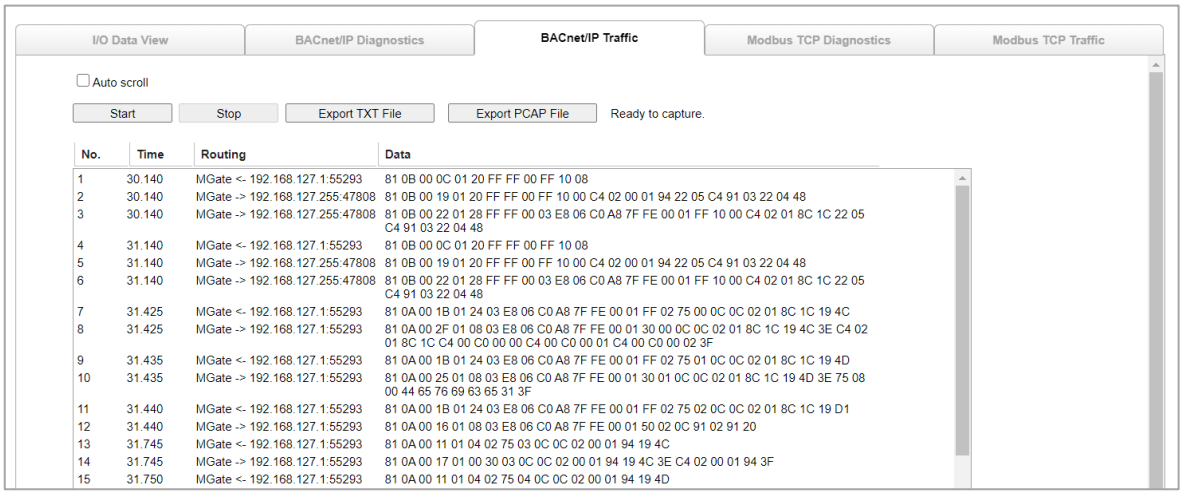
Modbus RTU/ASCII/TCP Traffic

For troubleshooting or management purposes, you can monitor the Modbus RTU/ASCII/TCP data passing through the MGate 5217 on the network. Rather than simply echoing the data, Traffic features the data in an intelligent, easy-to-understand format with clearly designated fields, including type, destination, contents, and more. Moreover, the complete log can be exported to a file for later analysis.



BACnet/IP Traffic

You can monitor the BACnet/IP data passing through the MGate 5217 on the network. The completed logs can be saved to TXT file or PCAP file for later analysis.



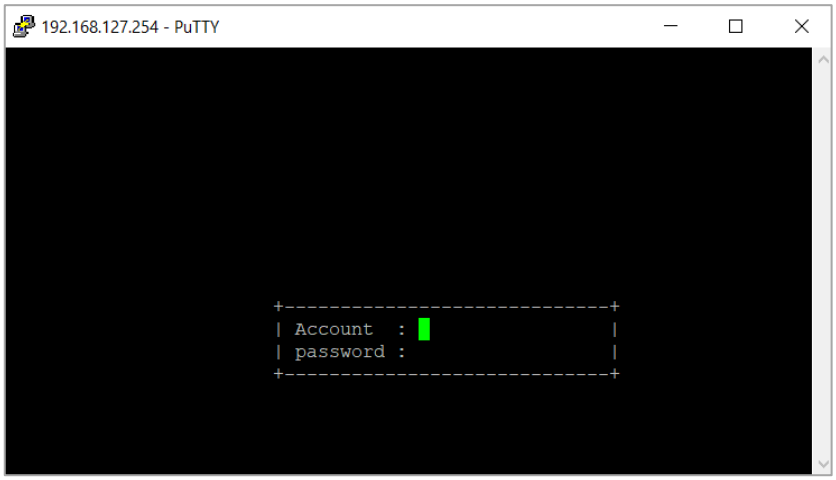
5. Configuration (Text Mode Console)

The MGate 5217 supports a text-mode console with the Telnet protocol. The user interface is the same in all text mode consoles. Note that the text mode console does not support all configuration items. You must configure some parameters through the web console.

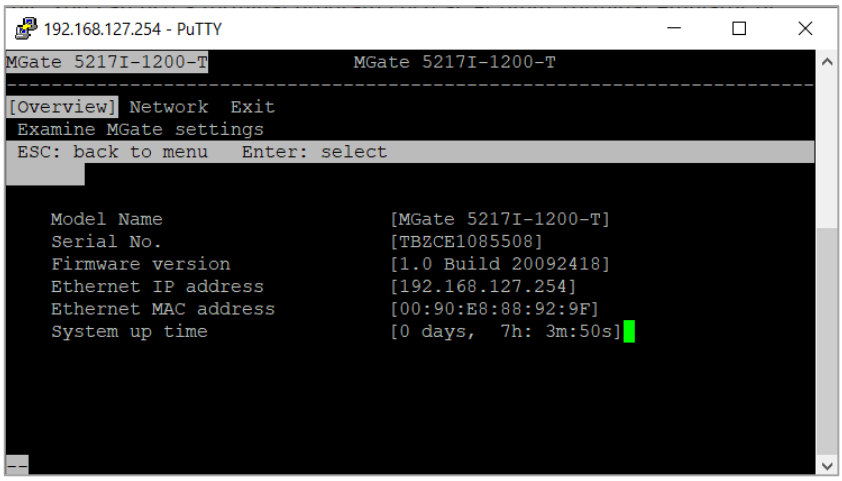
For Telnet, use HyperTerminal or PuTTY to connect to the MGate. Note that the Telnet protocol will transfer the account and password information over the Internet using plain text. If you are concerned about security risks, we suggest you disable the Telnet function by **Console Settings >Telnet Console > Disable.**

To connect to the MGate Telnet console, load the Telnet program and connect to the MGate IP address.

On the first page, input the account and password. The account supports two types of users: **admin** and **user**. An "admin" account can change all the settings, but a "user" account can only review the settings. A "user" account cannot change the configuration. The default password for **admin** is **moxa**.



The text mode console will display the menu-driven interface. Users can use the arrow key to move the menu bar. To select the option, press the "Enter" key to go next level menu. To go previous level menu, press "Esc" key to quit. If necessary, the MGate will need to restart to activate the setting.



6. Network Management Tool (MXstudio)

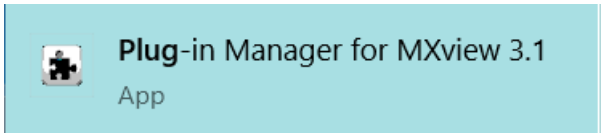
This chapter gives an overview of Moxa's MXstudio industrial network management suite.

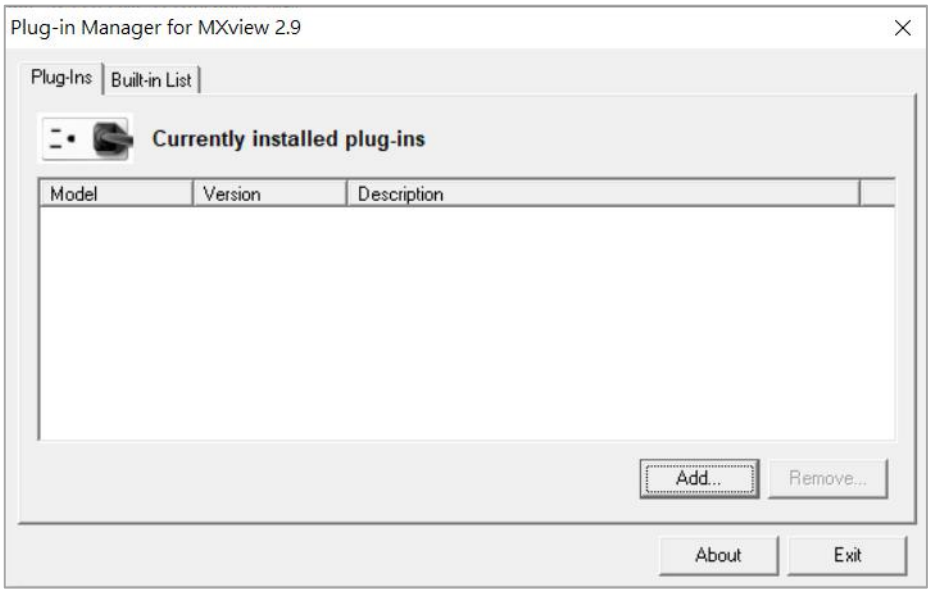
MXview

The Moxa MXview network management software gives you a convenient graphical representation of your Ethernet network and allows you to configure, monitor, and diagnose Moxa networking devices. MXview provides an integrated management platform that can manage the Moxa MGate series of products, Ethernet switches and wireless APs, and SNMP-enabled and ICMP-enabled devices installed on subnets. MXview includes an integrated MIB complier that supports any third-party MIB. It also allows you to monitor third-party OIDs and Traps. Network and Trap components that have been located by MXview can be managed via web browsers from both local and remote sites—anytime, anywhere.

Also, the Moxa MXview supports the Security View function to follow Moxa's security guidelines, which are based on current IEC 62443 component-level recommendations. Security View checks the security level of Moxa's network devices, including the MGate 5217 Series.

Before adding the MGate 5217 devices to the MXview utility, you must add the plug-in package to MXview via Plug-in Manager. The Plug-in Manager is automatically installed when setting up MXview. You can download the plug-in package on the product page. Please execute **Plug-in Manager** and **add** the plug-in package.



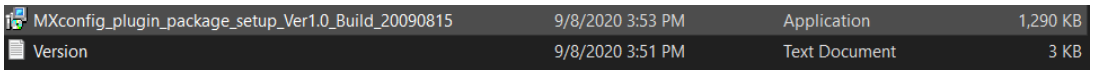


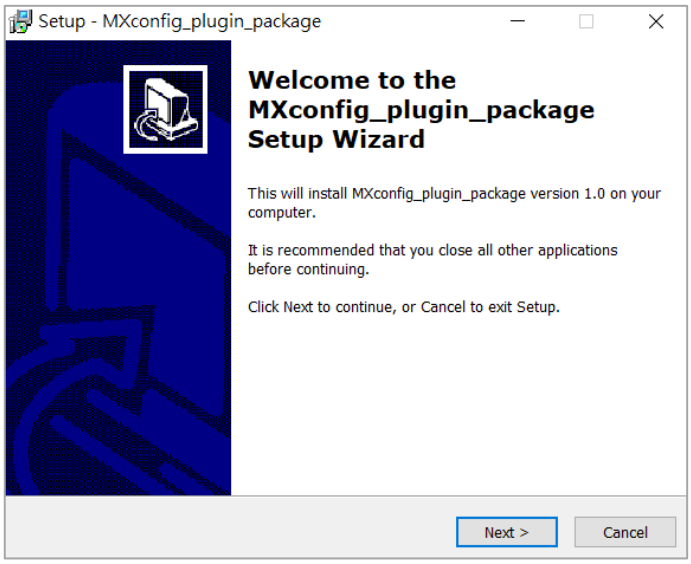
MXconfig

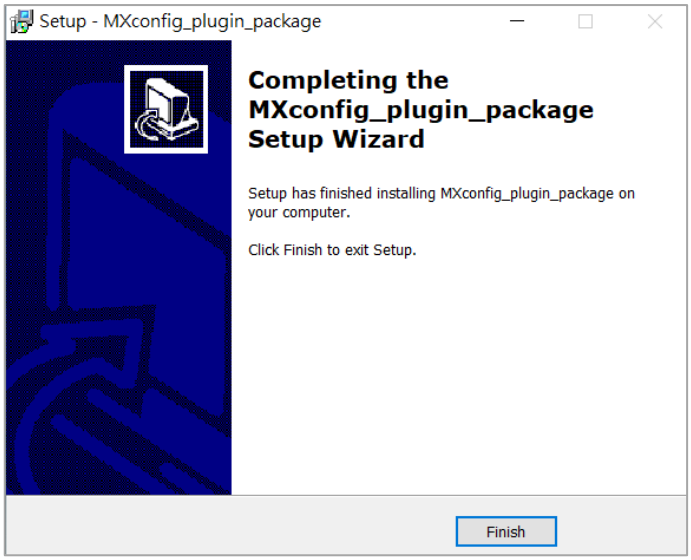
Moxa's MXconfig is a comprehensive Windows-based utility that is used to install, configure, and maintain multiple Moxa devices in industrial networks. This suite of useful tools helps users set the IP addresses of multiple devices with one click, configure the redundant protocols and VLAN settings, change multiple network configurations of multiple Moxa devices, upload firmware to multiple devices, export/import configuration files, copy configuration settings across devices, easily link to web and Telnet consoles, and test device connectivity. MXconfig gives device installers and control engineers a powerful and easy way to mass configure devices, and effectively reduces the setup and maintenance cost.

Through MXconfig, users can access the MGate 5217 devices and take advantage of additional functions, such as searching for the MGate 5217 devices, setting network configurations, upgrading firmware, and importing/exporting configurations.

Before configuring the MGate 5217 devices via MXconfig utility, you must add the plug-in package to MXconfig. You can download the plug-in package in the product page and execute the plug-in package with just a few clicks.







For more detailed information regarding MXview/MXconfig, download the user's manual from Moxa's website at http://www.moxa.com.

7. Modbus Configuration Import/Export

The MGate 5217 provides **the Modbus Configuration Import/Export** feature. On a large scale, you may connect lots of Modbus devices, which must configure lots of Modbus commands to get data. The MGate provides the **Master Configuration Import/Export** feature, which helps you easily edit massive Modbus commands through Excel to save configuration time. To get the template, just click **Export** to download the comma-separated values (**CSV**) file on your computer.

NOTE

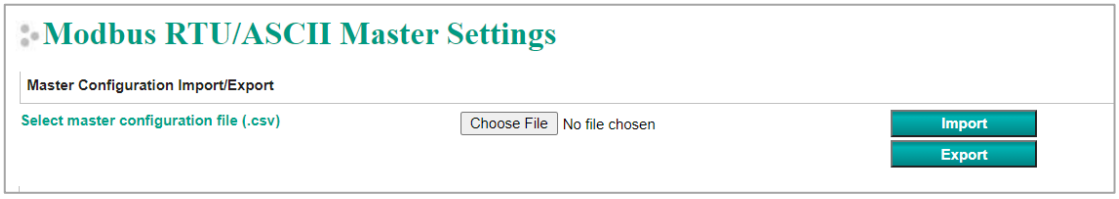
In order to have an overview of the template, we strongly suggest that you create some Modbus commands in the web console before downloading it.

When you are done editing the CSV file, the well-configured file can **import** to the MGate. Then, all the Modbus settings will be effective if you fill in the correct format. If the importing of the CSV file fails, please check the error message and examine the corresponding field.

Note that from firmware version v1.3, the new description field is added also to the CSV file (CSV file version v1.2.0), so it is not backward compatible with firmware versions lower than v1.3. Older csv version (v1.1.0) is compatible with newer firmware versions and can be imported successfully.

The version number of CSV can be checked on the upper left corner of the CSV file.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	[version=1.2.0]															
2	#initDelay	maxRetry	respTout													
3	[master_parameters]															
4	0	3	1000													
5	#devIndex	devSlaveI	devName	devIpAdd	devPort	devSequence										
6	[device_parameters]															
7	1	1	Device1	192.168.1	502	1										
8	#cmdInde	cmdEnabl	cmdName	cmdDevIr	cmdDataF	cmdFunc	cmdTrigg	cmdPollin	cmdEndia	cmdRead	cmdRead	cmdWrite	cmdWrite	cmdFaultI	cmdFaultI	bacnetOb	ba
9	[command_parameters]															
10	1	Enable	Command	1	boolean	1	Cyclic	1000	*	0	1	*	*	*	*	Binary Inp	*
11	2	Enable	Command	1	uint16	3	Cyclic	1000	Byte	0	1	*	*	*	*	Binary Inp	*
12	3	Enable	Command	1	uint16	3	Cyclic	1000	Byte	0	1	*	*	*	*	Binary Inp	*



Below shows the way to configure the CSV file, which includes four parts:

1. **[mode_selection]:** configures the Modbus type (only for Modbus RTU/ASCII)
2. **[master_parameters]:** configures Modbus master/client parameters
3. **[device_parameters]:** configures connected Modbus device parameters
4. **[command_parameters]:** configures Modbus device's commands with BACnet object parameters

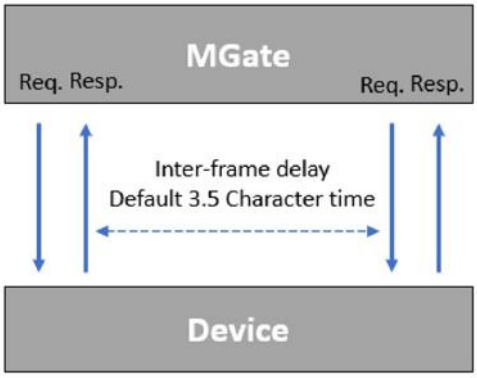
#modeType						
[mode_selection]						
RTU						
#portIndex	initDelay	maxRetry	respTout	interFrameDelay	interCharDelay	
[master_parameters]						
1	0	3	1000	0	0	
2	0	3	1000	0	0	
#devIndex	portIndex	devSlaveId	devName	devInactiveTime		
[device_parameters]						
1	1	1	Port1_Device1	0		
#cmdIndex	cmdEnable	cmdName	cmdDevIndex	cmdDataFormat	cmdFunc	cmdTrigger
[command_parameters]						
1	Enable	Command1	1	boolean	1	Cyclic

[mode_selection]

Parameters	Value	Description	Remark
modeType	RTU ASCII	Selects the Modbus RTU or Modbus ASCII to communicate with Modbus server/slave device	

[master_parameters]

Parameters	Value	Description	Remark
portIndex	1 2	Shows serial port 1 and serial port 2 respectively	
initDelay	0 to 30000	Some Modbus servers/slaves may take more time to boot up than other devices. In some environments, this may cause the entire system to suffer from repeated exceptions during the initial boot-up. After booting up, you can force the MGate to wait before sending the first request with the Initial Delay setting.	Suggested value: 0
maxRetry	0 to-5	This is used to configure how many times the MGate will try to communicate with the Modbus server/slave when timeout occurs	Suggested value: 3
respTout	10 to 120000	The device manufacturer defines the time taken by a server/slave device to respond to a request, based on the Modbus standard. A Modbus master can be configured to wait a certain amount of time for a server/slave's response. If no response is received within the specified time, the client/master will disregard the request and continue operation. This allows the Modbus system to continue the operation even if a server/slave device is disconnected or faulty. On the MGate 5217, the Response timeout field is used to configure how long the gateway will wait for a response from a Modbus server/slave. Refer to your device manufacturer's documentation to manually set the response timeout.	Suggested value: 1000

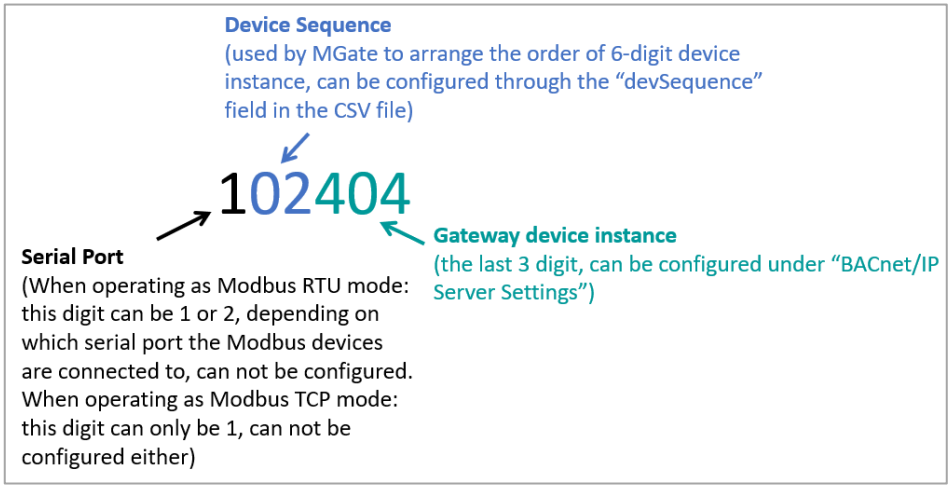
Parameters	Value	Description	Remark
interFrameDelay	10 to 500	Defines the time interval between an RTU response and the next RTU request. When the baudrate is lower than 19200 bps, the default value is 0, which is 3.5 character time. When the baudrate is larger than 19200 bps, the MGate uses a predefined fixed value that is not user configurable. This function solves the issue when some devices can't handle the RTU requests that quickly, so the MGate opens to user-defined values. How to calculate Modbus character time? E.g., if the baudrate is 9600 bps, 1 character time is about 1 ms. In a serial frame (11 bits, including start bit, data, parity bit, and stop bit), 9600 bps approximately equals to 960 characters/s, so transmitting 1 character needs about 1/960 = 1 ms. 	Only for RTU mode Suggested value: 0
interCharDelay	10 to 500	The time interval between characters in one frame. When the baudrate is lower than 19200 bps, the default value is 0, which is 1.5 character time. When the baudrate is larger than 19200 bps, MGate uses a predefined fixed value that is not user configurable. When the serial side of the MGate receives one character, and the next one comes after the "inter-character timeout" defined, the frame will be discarded because of timeout.	Only for RTU mode Suggested value: 0

[device_parameters]

Parameters	Value	Description	Remark
devIndex	1 to 31 1 to 32	**Shows the Modbus device index that is used to bind to Modbus commands. The parameter will be used in [command_parameters].**	Up to 31 devices per serial port Up to 32 devices for Modbus TCP
portIndex	1 2	Indicates the device is under serial port 1 or serial port 2	
devSlaveId	1 to 255	Shows Modbus slave ID	Ensures that the Modbus slave ID is unique under the same serial port.
devName	(an alphanumeric string)	Enter a name to help you identify the Modbus device	Up to 39 characters
devIpAddr	(other 32-bit number)	Modbus TCP server device's IP address	
devPort	1 to 65535	Modbus TCP server's port number	

Parameters	Value	Description	Remark
devInactiveTime	0 to 28800	Device sequence:This parameter is used by the MGate when timeout occurs in the Modbus server/slave device, the MGate's request commands for the Modbus slave device will be ignored during the configuration time.	0: Disable
devSequence	1 to 31 for Modbus RTU, 1 to 32 for Modbus TCP	This parameter is used by the MGate to arrange or change device instance. If you want to change the second and third digit of the 6-digit device instance ID, you can use this field. See the example* below this table on how the MGate generates the 6-digit device instance and how to configure it.	

Example*: How does the MGate generate a device instance ID and how to configure it.



[command_parameters]

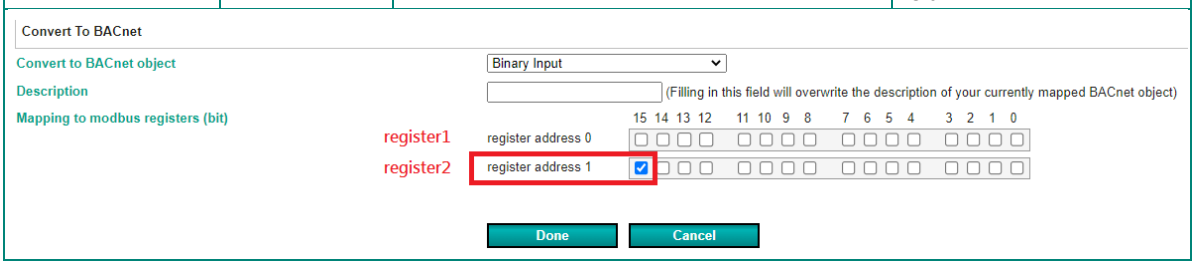
Parameters	Value	Description	Remark
cmdIndex	1 to 1200	Shows the index of this Modbus command	**The index must increase in order**
cmdEnable	Enable	Enable: the command is active	
cmdName	(an alphanumeric string)	You can enter a name to help you identify the Modbus command	Up to 39 characters
cmdDevIndex	1 to 32	**This command belongs to the devIndex that is configured in [device_parameters]**	**The selected devIndex in [device_parameters] must exist**
cmdDataFormat	boolean uint16 int16 uint32 int32 float32	boolean: 0 or 1. uint16: Unsigned integer with 16 bits. int16: Signed integer with 16 bits. uint32: Unsigned integer with 32 bits. int32: Signed integer with 32 bits. float32: Float type with 32 bits.	
cmdFunc	1 2 3 4 5 6 15 16	1: Read coils 2: Read discrete inputs 3: Read holding registers 4: Read input registers 5: Write single coil 6: Write single register 15: Write multiple coils 16: Write multiple registers	- If cmdDataFormat=boolean, cmdFunc=1,2,5 - If cmdDataFormat=uint16, int16, cmdFunc=3,4,6 - If cmdDataFormat=uint32, int32, float32, cmdFunc=3,4,16

Parameters	Value	Description	Remark
cmdTrigger	Cyclic	A command is sent cyclically at the interval specified in the poll interval parameter.	- If cmdFunc=1,2,3,4, cmdTrigger=Cyclic - If cmdFunc=5,6,15,16, cmdTrigger=Cyclic, Data Change
	Data Change	A command is issued when a change in data is detected.	
cmdPollinterval	*	Polling intervals are in milliseconds. Since the module sends all requests in turns, the actual polling interval also depends on the number of requests in the queue and their parameters. The range is from 100 to 1,200,000 ms.	- If cmdTrigger=Data Change, cmdPollinterval = *
	1 to 1200000		- If cmdTrigger=Cyclic, cmdPollinterval=10 - 1200000
cmdEndianSwap	*		- If cmdDataFormat=boolean, cmdEndianSwap=* - If cmdDataFormat=uint16, int16, cmdEndianSwap=None, Byte - If cmdDataFormat=uint32, int32, float32, cmdEndianSwap=None, Byte, Word, Byte and Word
	None	**None:** Don't need to swap	
	Byte	**Byte:** 0x0A, 0x0B, 0x0C, 0x0D become 0x0B, 0x0A, 0x0D, 0x0C.	
	Word	**Word:** 0x0A, 0x0B, 0x0C, 0x0D become 0x0C, 0x0D, 0x0A, 0x0B.	
	Byte and Word	**ByteWord:** 0x0A, 0x0B, 0x0C, 0x0D become 0x0D, 0x0C, 0x0B, 0x0A. There are two phases in changing ByteWord: 1) 0x0A, 0x0B, 0x0C, 0x0D become 0x0B, 0x0A, 0x0D, 0x0C 2) 0x0B, 0x0A, 0x0D, 0x0C become 0x0D, 0x0C, 0x0B, 0x0A	
cmdReadStartAddr	*	Modbus register address	-If cmdFunc=5,6,15,16, cmdReadStartAddr=*
	0 to 65535		-If cmdFunc=1,2,3,4, cmdReadStartAddr= 0 - 65535
cmdReadQuan	1	Specifying how many quantities to be read	- If cmdDataFormat=boolean, cmdReadQuan=1 - If cmdDataFormat=uint16, int16, cmdReadQuan=1
	2		- If cmdDataFormat=uint32, int32, float32, cmdReadQuan=2
cmdWriteStartAddr	*	Modbus register address.	-If cmdFunc=1,2,3,4 cmdReadStartAddr=*
	0 to 65535		-If cmdFunc=5,6,15,16, cmdReadStartAddr=0 - 65535
cmdWriteQuan	1	Specifying how many quantities to write.	- If cmdDataFormat=boolean, cmdReadQuan=1 - If cmdDataFormat=uint16, int16, cmdReadQuan=1
	2		- If cmdDataFormat=uint32, int32, float32, cmdReadQuan=2
cmdFaultProtType	*	If the MGate's connection to the BACnet/IP client fails, the gateway cannot receive data,	-If cmdFunc=1,2,3,4, cmdFaultProtType=*

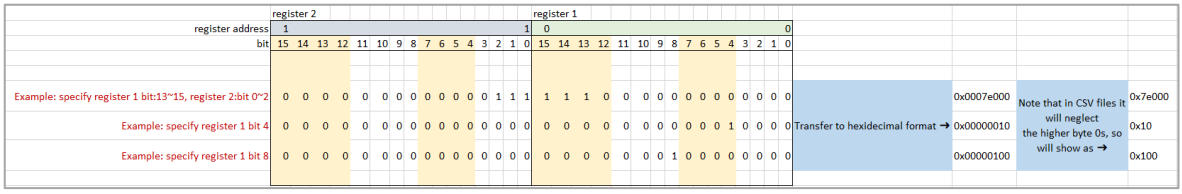
Parameters	Value	Description	Remark
	Keep latest data Clear all data bits to 0	but the gateway will continuously send output data to the Modbus TCP server device. To avoid problems in this case, the MGate 5217 can be configured to react in one of the following two ways: Keep the latest data or clear data to zero.	-If cmdFunc=5,6,15,16, cmdFaultProtType= Keep latest data, clear all data bit to 0
cmdFaultProtTout	*	Defines the communication timeout for the opposite side.	- If cmdFaultProtType=Keep latest data, cmdFaultProtTout=*
	0 to 65535		- If cmdFaultProtType= Clear all data bits to 0, cmdFaultProtTout=0 - 65535
bacnetObjectType	Binary Input	Select the BACnet object type for the configured Modbus command	Binary Input (cmdFunc= 1,2,3,4)
	Binary Output		Binary Output (cmdFunc=5,6,15,16)
	Binary Value		Binary Value (cmdFunc=5,6,15,16)
	Analog Input		Analog Input (only when cmdDataFormat≠boolean, cmdFunc=1,2,3,4)
	Analog Output		Analog Output (only when cmdDataFormat≠boolean, cmdFunc=5,6,15,16)
	Analog Value		Analog Value (only when cmdDataFormat≠boolean, cmdFunc=5,6,15,16)
	Multi-state Input		Multi-state Input (only when cmdDataFormat≠ boolean, cmdFunc=1,2,3,4)
	Multi-state Output		Multi-state Output (only when cmdDataFormat≠ boolean, cmdFunc=5,6,15,16)
	Multi-state Value		Multi-state Value (only when cmdDataFormat≠ boolean, cmdFunc=5,6,15,16)
	Integer Value		Integer Value (only when cmdDataFormat≠boolean, cmdFunc=1,2,3,4)
	Positive Integer Value		Positive Integer Value (only when cmdDataFormat≠boolean, cmdFunc=1,2,3,4)
bacnetUnit	*		If bacnetObjectType =Binary Input, Binary Value, Binary Output, Multi-state Input, Multi-state Output, bacnetUnit=*= no-units (95)

Parameters	Value	Description	Remark
	0 to 254 47808 to 47815	While selecting a nonbinary value, the BACnet/IP client sometimes needs to have the value with units to identify the meaning of the value.	**The codes of units can be found in the bottom table** bacnetUnit=*= no-units (95)
bacnetCovIncrement	*	COV will be triggered when |Current Reported Value - Last Reported Value| > COV Increment	- if bacnetObjectType=Binary Input, Binary Output bacnetCovIncrement=*
	1 to 10000000000		- If bacnetObjectType= Analog Input, Analog Output, Analog Value, bacnetCovIncrement=1 to 10000000000 (float)
	1 to 2147483647		- If bacnetObjectType=Integer Value, Positive Integer Value, bacnetCovIncrement=1 to 2147483647 (integer)
bacnetRelinquishDefault	*	If there are no commanded values in the priority array, the present value will be changed to relinquish the default	- If bacnetObjectType=Analog Input, Binary Input, bacnetRelinquishDefault=*
	-999999999 to 10000000000		- If bacnetObjectType=Analog Output, Analog Value, bacnetRelinquishDefault= -999999999 to 10000000000 (float)
	0 to1		- If bacnetObjectType=Binary Output, Binary Value, bacnetRelinquishDefault= 0 to 1 (integer)
	1 to 4294967295		- If bacnetObjectType=Multi-state Output,Multi-state Value, bacnetRelinquishDefault= 1 to 4294967295 (integer)
bacnetInstance	0 to 4194302	Enter the instance for this mapped BACnet object	Ensure instance is unique under the same object type
bacnetRegisterAddress	in hexadecimal	Use this parameter to configure the specified bits of BACnet objects mapped from the Modbus registers. Remark: This field is shown in hexidecimal format. To specify the bits, you want to map from the Modbus register, list the bits to "1" in binary format. Then convert binary format to hexadecimal. See example 1 below on how to specify BACnet binary objects mapped from Modbus registers.	

Parameters	Value	Description	Remark
bacnetDescription	0 to 40 characters, default is none.	Write a description for the BACnet object. We use this field when mapping one command to one object. For example, when mapping boolean (read coil/read discrete input) to binary object (binary input) or uint16 (read holding registers) to Analog input/Multistate Input/Interger Value/Positive Integer Value. If you are mapping registers to binary objects, which means mapping with data of different sizes, please do not use this field.	If you don't need to write bacnetDescription, please fill in"*". Note that special characters - **" ' # *, [ ]** are not allowed in this field.
r2b15_bacnetDescriptio to r1b0_bacnetDescription	0 to 40 characters, default is none.	Write a description for the BACnet object. These fields are used when setting data mapping for one command to multi-object. For example, when mapping Modbus registers to multiple BACnet binary objects, which means mapping it with data of different sizes. A description can be added to every binary object. In the CSV field,"r" stands for register, and "b" stands for bit. For example, "r2b15_bacnetDescription" stands for the description of the 15th bit in the second register. To correspond to the web, the 15th bit in the second register is as follows.	For example, if you map uint16 data using function code 03 as read holding registers, to BACnet Binary Input objects, and select bit 0 and bit 2 for register 1. You can write the description in the "r1b2_bacnetDescription" and "r1b0_bacnetDescription" fields. If you don't need to write bacnetDescription, please fill in"*". Note that special characters - **" ' # *, [ ]** are not allowed in this field.



*Example 1: How to specify BACnet binary objects mapped from Modbus registers in the CSV, or how to read this field from CSV.



Codes for bacnetUnit

millimeters (30),
meters (31),
inches (32),
feet (33),
watts-per-square-foot (34),
watts-per-square-meter (35),
lumens (36),
luxes (37),
foot-candles (38),
kilograms (39),
pounds-mass (40),
tons (41),
kilograms-per-second (42),
kilograms-per-minute (43),
kilograms-per-hour (44),
pounds-mass-per-minute (45),
pounds-mass-per-hour (46),
watts (47),
kilowatts (48),
megawatts (49),
btus-per-hour (50),
horsepower (51),
tons-refrigeration (52),
pascals (53),
kilopascals (54),
bars (55),
pounds-force-per-square-inch (56),
centimeters-of-water (57),
inches-of-water (58),
millimeters-of-mercury (59),
centimeters-of-mercury (60),
inches-of-mercury (61),
degrees-celsius (62),
degrees-kelvin (63),
degrees-fahrenheit (64),
degree-days-celsius (65),
degree-days-fahrenheit (66),
years (67),
months (68),
weeks (69),
days (70),
hours (71),
minutes (72),
seconds (73),
meters-per-second (74),
kilometers-per-hour (75),
feet-per-second (76),
feet-per-minute (77),
miles-per-hour (78),
cubic-feet (79),
cubic-meters (80),
imperial-gallons (81),
liters (82),
us-gallons (83),
cubic-feet-per-minute (84),
cubic-meters-per-second (85),
imperial-gallons-per-minute (86),
liters-per-second (87),
liters-per-minute (88),
us-gallons-per-minute (89),
degrees-angular (90),
degrees-celsius-per-hour (91),
degrees-celsius-per-minute (92),
degrees-fahrenheit-per-hour (93),
degrees-fahrenheit-per-minute (94),
no-units (95),
parts-per-million (96),
parts-per-billion (97),
percent (98),
percent-per-second (99),
per-minute (100),
per-second (101),
psi-per-degree-fahrenheit (102),
radians (103),
revolutions-per-minute (104),
currency1 (105),
currency2 (106),
currency3 (107),
currency4 (108),
currency5 (109),
currency6 (110),
currency7 (111),
currency8 (112),
currency9 (113),
currency10 (114),
square-inches (115),
square-centimeters (116),
btus-per-pound (117),
centimeters (118),
pounds-mass-per-second (119),
delta-degrees-fahrenheit (120),
delta-degrees-kelvin (121),
kilohms (122),
megohms (123),
millivolts (124),
kilojoules-per-kilogram (125),
megajoules (126),
joules-per-degree-kelvin (127),
joules-per-kilogram-degree-kelvin (128),
kilohertz (129),
megahertz (130),
per-hour (131),
milliwatts (132),
hectopascals (133),
millibars (134),
liters-per-hour (136),
cubic-meters-per-hour (135),
kilowatt-hours-per-square-meter (137),
kilowatt-hours-per-square-foot (138),
megajoules-per-square-meter (139),
megajoules-per-square-foot (140),
watts-per-square-meter-degree-kelvin (141),
cubic-feet-per-second (142),
percent-obscuration-per-foot (143),
percent-obscuration-per-meter (144),
milliohms (145),
megawatt-hours (146),
kilo-btus (147),
mega-btus (148),
kilojoules-per-kilogram-dry-air (149),

megajoules-per-kilogram-dry-air (150),
kilojoules-per-degree-kelvin (151),
megajoules-per-degree-kelvin (152),
newton (153),
grams-per-second (154),
grams-per-minute (155),
tons-per-hour (156),
kilo-btus-per-hour (157),
hundredths-seconds (158),
milliseconds (159),
newton-meters (160),
millimeters-per-second (161),
millimeters-per-minute (162),
meters-per-minute (163),
meters-per-hour (164),
cubic-meters-per-minute (165),
meters-per-second-per-second (166),
amperes-per-meter (167),
amperes-per-square-meter (168),
ampere-square-meters (169),
farads (170),
henrys (171),
ohm-meters (172),
siemens (173),
siemens-per-meter (174),
teslas (175),
volts-per-degree-kelvin (176),
volts-per-meter (177),
webers (178),
candelas (179),
candelas-per-square-meter (180),
degrees-kelvin-per-hour (181),
degrees-kelvin-per-minute (182),
joule-seconds (183),
radians-per-second (184),
square-meters-per-newton (185),
kilograms-per-cubic-meter (186),
newton-seconds (187),
newtons-per-meter (188),
watts-per-meter-per-degree-kelvin (189),
micro-siemens (190),
cubic-feet-per-hour (191),
us-gallons-per-hour (192),
kilometers (193),
micrometers (194),
grams (195),
milligrams (196),
milliliters (197),
milliliters-per-second (198),
decibels (199),
decibels-millivolt (200),
decibels-volt (201),
millisiemens (202),
watt-hours-reactive (203),
kilowatt-hours-reactive (204),
megawatt-hours-reactive (205),
millimeters-of-water (206),
per-mille (207),
grams-per-gram (208),
kilograms-per-kilogram (209),
grams-per-kilogram (210),
milligrams-per-gram (211),
milligrams-per-kilogram (212),
grams-per-milliliter (213),
grams-per-liter (214),
milligrams-per-liter (215),
micrograms-per-liter (216),
grams-per-cubic-meter (217),
milligrams-per-cubic-meter (218),
micrograms-per-cubic-meter (219),
nanograms-per-cubic-meter (220),
grams-per-cubic-centimeter (221),
becquerels (222),
kilobecquerels (223),
megabecquerels (224),
gray (225),
milligray (226),
microgray (227),
sieverts (228),
millisieverts (229),
microsieverts (230),
microsieverts-per-hour (231),
decibels-a (232),
nephelometric-turbidity-unit (233),
pH (234),
grams-per-square-meter (235),
minutes-per-degree-kelvin (236),
ohm-meter-squared-per-meter (237),
ampere-seconds (238),
volt-ampere-hours (239),
kilovolt-ampere-hours (240),
megavolt-ampere-hours (241),
volt-ampere-hours-reactive (242),
kilovolt-ampere-hours-reactive (243),
megavolt-ampere-hours-reactive (244),
volt-square-hours (245),
ampere-square-hours (246),
joule-per-hours (247),
cubic-feet-per-day (248),
cubic-meters-per-day (249),
watt-hours-per-cubic-meter (250),
joules-per-cubic-meter (251),
mole-percent (252),
pascal-seconds (253),
million-standard-cubic-feet-per-minute (254),
standard-cubic-feet-per-day (47808),
million-standard-cubic-feet-per-day (47809),
thousand-cubic-feet-per-day (47810),
thousand-standard-cubic-feet-per-day (47811),
pounds-mass-per-day (47812),
millirems (47814),
millirems-per-hour (47815)

A. SNMP Agents with MIB II and RS-232-Like Groups

The MGate 5217has built-in Simple Network Management Protocol (SNMP) agent software that supports SNMP Trap, RFC1317 and RS-232-like groups, and RFC 1213 MIB-II. The following topics are covered in this appendix:

RFC1213 MIB-II Supported SNMP Variable

System MIB	Interfaces MIB	IP MIB	ICMP MIB
sysDescr	ifNumber	ipForwarding	icmpInMsgs
sysObjectID	ifIndex	ipDefaultTTL	icmpInErrors
sysUpTime	ifDescr	ipInReceives	icmpInDestUnreachs
sysContact	ifType	ipInHdrErrors	icmpInTimeExcds
sysName	ifMtu	ipInAddrErrors	icmpInParmProbs
sysLocation	ifSpeed	ipForwDatagrams	icmpInSrcQuenchs
sysServices	ifPhysAddress	ipInUnknownProtos	icmpInRedirects
	ifAdminStatus	ipInDiscards	icmpInEchos
	ifOperStatus	ipInDelivers	icmpInEchoReps
	ifLastChange	ipOutRequests	icmpInTimestamps
	ifInOctets	ipOutDiscards	icmpTimestampReps
	ifInUcastPkts	ipOutNoRoutes	icmpInAddrMasks
	ifInNUcastPkts	ipReasmTimeout	icmpInAddrMaskReps
	ifInDiscards	ipReasmReqds	icmpOutMsgs
	ifInErrors	ipReasmOKs	icmpOutErrors
	ifInUnknownProtos	ipReasmFails	icmpOutDestUnreachs
	ifOutOctets	ipFragOKs	icmpOutTimeExcds
	ifOutUcastPkts	ipFragFails	icmpOutParmProbs
	ifOutNUcastPkts	ipFragCreates	icmpOutSrcQuenchs
	ifOutDiscards	ipAdEntAddr	icmpOutRedirects
	ifOutErrors	ipAdEntIfIndex	icmpOutEchos
	ifOutQLen	ipAdEntNetMask	icmpOutEchoReps
	ifSpecific	ipAdEntBcastAddr	icmpOutTimestamps
		ipAdEntReasmMaxSize	icmpOutTimestampReps
		ipRouteDest	icmpOutAddrMasks
		ipRouteIfIndex	icmpOutAddrMaskReps
		ipRouteMetric1	
		ipRouteMetric2	
		ipRouteMetric3	
		ipRouteMetric4	
		ipRouteNextHop	
		ipRouteType	
		ipRouteProto	
		ipRouteAge	
		ipRouteMask	
		ipRouteMetric5	
		ipRouteInfo	
		ipNetToMediaIfIndex	
		ipNetToMediaPhysAddress	
		ipNetToMediaNetAddress	
		ipNetToMediaType	
		ipRoutingDiscards	

Address Translation MIB	TCP MIB	UDP MIB	SNMP MIB
atIfIndex	tcpRtoAlgorithm	udpInDatagrams	snmpInPkts
atPhysAddress	tcpRtoMin	udpNoPorts	snmpOutPkts
atNetAddress	tcpRtoMax	udpInErrors	snmpInBadVersions
	tcpMaxConn	udpOutDatagrams	snmpInBadCommunityNames
	tcpActiveOpens	udpLocalAddress	snmpInBadCommunityUses
	tcpPassiveOpens	udpLocalPort	snmpInASNParseErrs
	tcpAttemptFails		snmpInTooBigs
	tcpEstabResets		snmpInNoSuchNames
	tcpCurrEstab		snmpInBadValues
	tcpInSegs		snmpInReadOnlys
	tcpOutSegs		snmpInGenErrs
	tcpRetransSegs		snmpInTotalReqVars
	tcpConnState		snmpInTotalSetVars
	tcpConnLocalAddress		snmpInGetRequests
	tcpConnLocalPort		snmpInGetNexts
	tcpConnRemAddress		snmpInSetRequests
	tcpConnRemPort		snmpInGetResponses
	tcpInErrs		snmpInTraps
	tcpOutRsts		snmpOutTooBigs
			snmpOutNoSuchNames
			snmpOutBadValues
			snmpOutGenErrs
			snmpOutGetRequests
			snmpOutGetNexts
			snmpOutSetRequests
			snmpOutGetResponses
			snmpOutTraps
			snmpEnableAuthenTraps
			snmpSilentDrops
			snmpProxyDrops

RFC1317 RS-232-Like Groups

RS-232 MIB	Async Port MIB
rs232Number	rs232AsyncPortIndex
rs232PortIndex	rs232AsyncPortBits
rs232PortType	rs232AsyncPortStopBits
rs232PortInSigNumber	rs232AsyncPortParity
rs232PortOutSigNumber	
rs232PortInSpeed	
rs232PortOutSpeed	

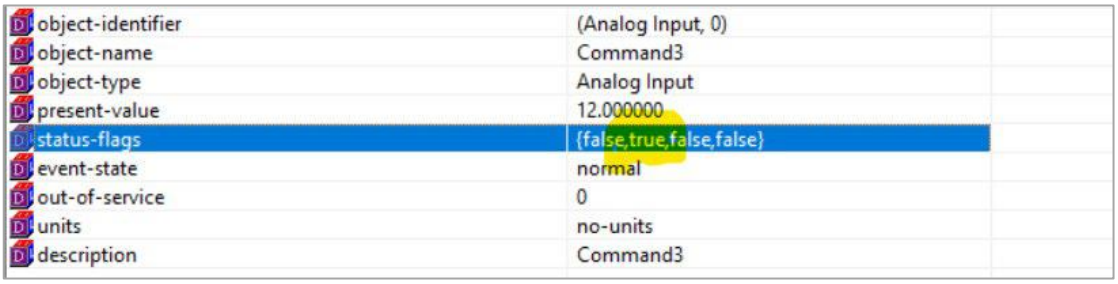
Input Signal MIB	Output Signal MIB
rs232InSigPortIndex	rs232OutSigPortIndex
rs232InSigName	rs232OutSigName
rs232InSigState	rs232OutSigState

B. Status Monitoring

If a Modbus server/slave device fails or a cable comes loose, then gateways that are in agent mode cannot receive up-to-date data from the Modbus server/slave device. The out-of-date data will be stored in the gateway's memory and then retrieved by the BACnet/IP client system, which will not be aware that the Modbus server/slave device is not providing up-to-date data. The MGate 5217 supports the Status Monitoring function, which provides a warning mechanism to report the list of server/slave devices that are still active.

In the MGate 5217's design, each Modbus command will be mapped to a BACnet object. Once the MGate 5217 detects a Modbus command timeout, the status-flags in the BACnet object will turn from "**false**" to "**true**", which shows a fault status. You can see how it works in the figures below.

BACnet status-flags show "true" when there is a Modbus command timeout



BACnet status-flags show "false" when Modbus command is exchanging data