

MGate 5217 Series User Manual

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MOXA[®]

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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)

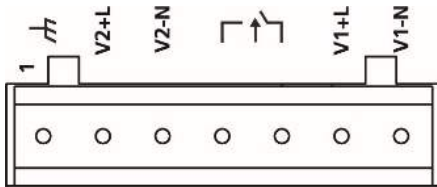
- **DK-35A:** DIN-rail mounting kit (35 mm)
- **Mini DB9F-to-TB Adaptor:** DB9 female to terminal block adapter
- **DR-4524:** 45W/2A DIN-rail 24 VDC power supply with universal 85 to 264 VAC input
- **DR-75-24:** 75W/3.2A DIN-rail 24 VDC power supply with universal 85 to 264 VAC input
- **DR-120-24:** 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
- Supports BACnet/IP server
- Connects up to 62 Modbus RTU/ASCII servers/slaves
- Connects up to 32 Modbus TCP servers
- 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

2. Hardware

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 |

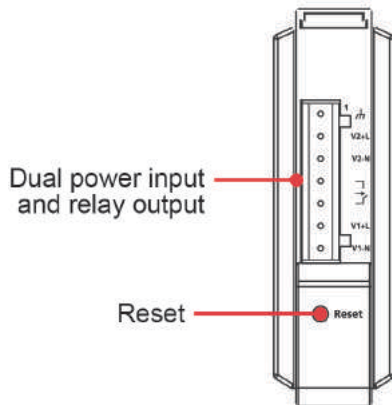
LED Indicators

| 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 |

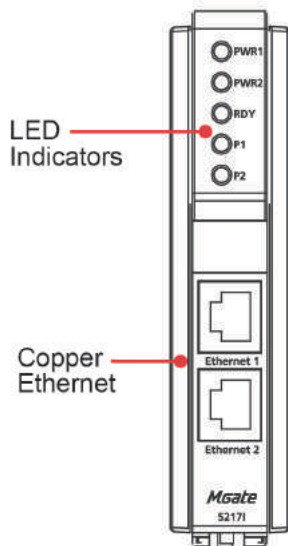
Panel Layouts

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

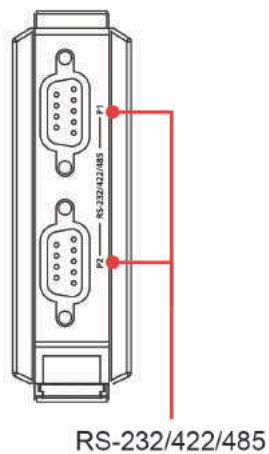
Top View



Front View

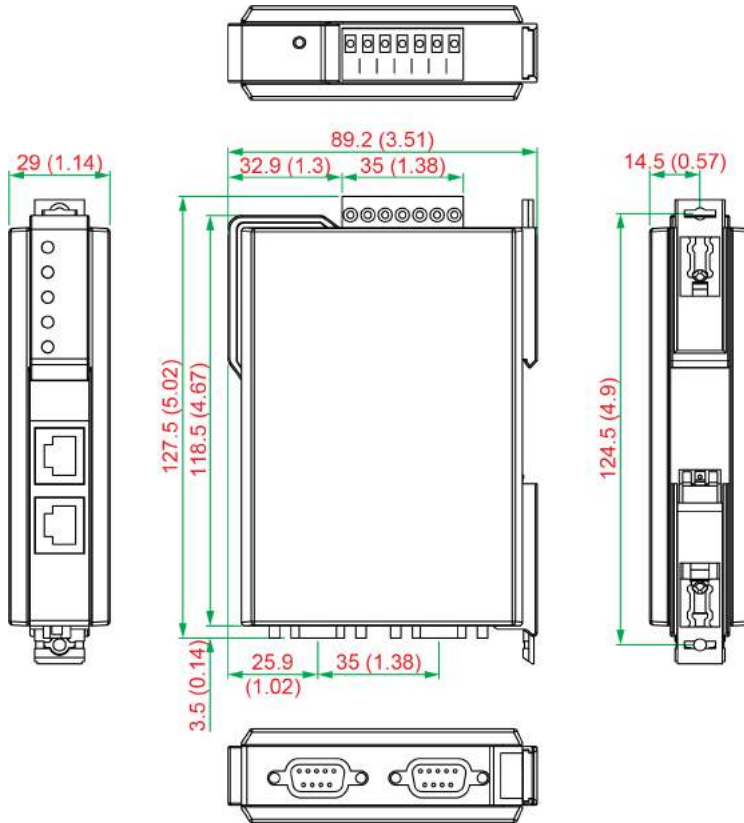


Bottom View



Dimensions

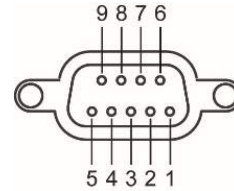
Unit: mm (inch)



Pin Assignments

Serial Port (DB9 Male)

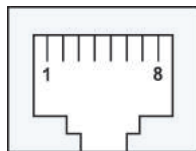
| Pin | RS-232 | RS-422/RS-485 (4W) | RS-485 (2W) |
|-----|--------|--------------------|-------------|
| 1 | DCD | TxD- | - |
| 2 | RXD | TxD+ | - |
| 3 | TXD | RxD+ | Data+ |
| 4 | DTR | RxD- | Data- |
| 5* | GND | GND | GND |
| 6 | DSR | - | - |
| 7 | RTS | - | - |
| 8 | CTS | - | - |
| 9 | - | -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



*Signal ground

Ethernet Port (RJ45)

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

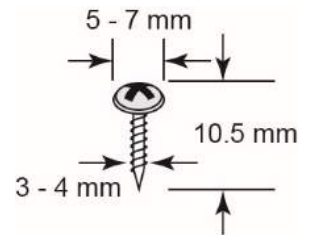


Mounting the Unit

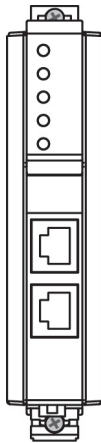
- Step 1:** After removing the MGate 5217 from the box, connect the MGate 5217 to a network. Use a standard straight-through Ethernet cable to connect the unit to a hub or switch. When setting up or testing the MGate 5217, you might find it convenient to connect directly to your computer's Ethernet port.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

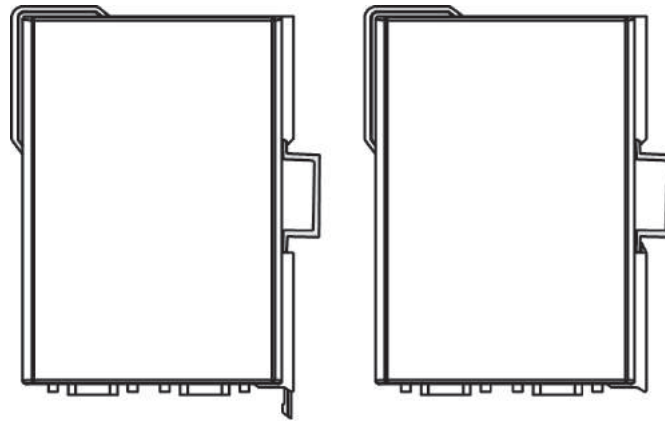
Mounting the MGate 5217 Series on to a wall requires two screws. The heads of the screws should be 5 to 7 mm in diameter, the shafts should be 3 to 4 mm in diameter, and the length of the screws should be more than 10.5 mm.



Wallmount



DIN Rail



Push here to lock to the DIN-Rail

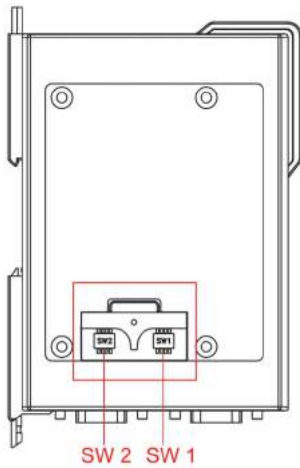
Reset Button

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 k Ω | 1 k Ω | 120 Ω | Reserved |
| OFF | 150 k Ω * | 150 k Ω * | -* | 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

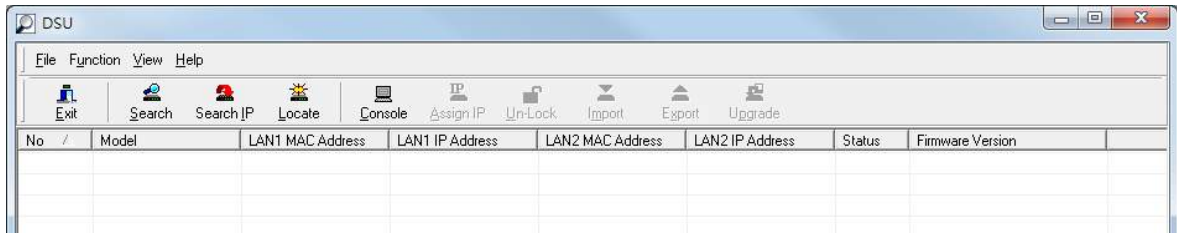
If you do not know the MGate gateway's IP address when setting it up for the first time (default IP is *192.168.127.254*); use an Ethernet cable to connect the host PC and MGate gateway directly. If you connect the gateway and host PC through the same Ethernet switch, make sure there is no router between 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.

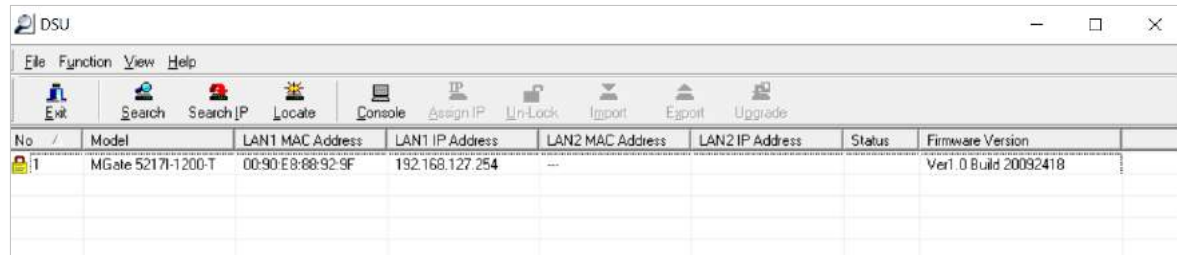
1. Download **DSU** from Moxa's website. Locate and run the following setup program to begin the installation process:
dsu_setup_[Version]_Build_[DateTime].exe
2. The latest version might be named **dsu_setup_Ver2.0_Build_xxxxxxx.exe**, for example:
3. The Welcome window will greet you. Click **Next** 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.



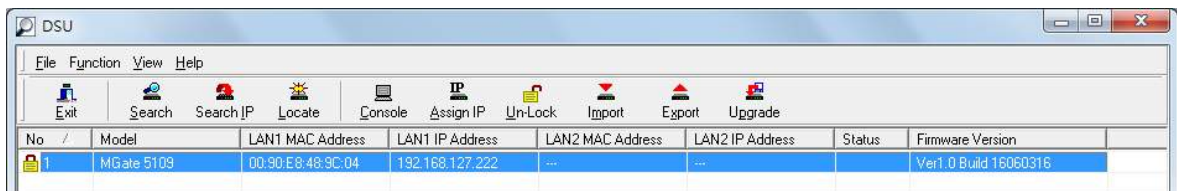
Click **Search** and a new Search window will pop up.



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.

Account

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.

| Welcome to the MGate 5217I-600-T web console | |
|--|--------------------|
| Model Name | MGate 5217I-600-T |
| Serial No. | TBZCE1085490 |
| Firmware version | 1.0 Build 20101412 |
| Ethernet IP address | 192.168.127.254 |
| Ethernet MAC address | 00:90:E8:88:92:8D |
| System uptime | 0 days, 0h: 0m:15s |

Basic Settings

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

| Basic Settings | |
|---------------------------------------|---|
| Server Settings | |
| Server name | <input type="text" value="MGate 5217I-1200-T_85508"/> |
| Server location | <input type="text"/> |
| Time Settings | |
| Time zone | <input type="text" value="(GMT-12:00)Eniwetok, Kwajalein"/> |
| Local time | <input type="text" value="2000"/> / <input type="text" value="01"/> / <input type="text" value="02"/> <input type="text" value="19"/> : <input type="text" value="05"/> : <input type="text" value="17"/> <input type="button" value="Modify"/> |
| Time server | <input type="text"/> |
| <input type="button" value="Submit"/> | |

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.

Network Settings

Network Settings

IP configuration: Static

IP address: 192.168.127.254

Netmask: 255.255.255.0

Gateway:

DNS server 1:

DNS server 2:

Submit

| 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.

Serial Settings

| Port | Baud rate | Parity | Data bit | Stop bit | Flow control | FIFO | Interface | RTS on delay | RTS off delay |
|------|-----------|--------|----------|----------|--------------|--------|-----------|--------------|---------------|
| 1 | 115200 | Even | 8 | 1 | None | Enable | RS-232 | 0 | 0 |

| 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 comprises SCADA/DDC as a BACnet/IP client/master and meters/controllers as a Modbus RTU/ASCII/TCP slave/server. Both these components use different protocols and hence need a gateway between them to exchange data. The MGate acts as the BACnet/IP server/slave when it is connected to the BACnet/IP master/client and as the Modbus RTU/ASCII/TCP client/master when it is connected to the Modbus RTU/ASCII/TCP slave/server. Therefore, to configure the MGate, you must:

- 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 **Modbus client/master** side first, followed by the **BACnet/IP server** 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 Modbus devices.

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

Protocol Settings—Protocol Conversion

The MGate 5217 supports Modbus RTU/ASCII, Modbus TCP, and BACnet/IP protocols. The MGate is dedicated to bring the Modbus device to the BACnet/IP network. Therefore, the MGate is fixed at the BACnet/IP server at one side, but the other side can be selected by your device's settings.



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 Master Settings
- A3. BACnet/IP Server 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

Modbus TCP Client Settings

Client Configuration Import/Export

Select client configuration file (.csv) Choose File No file chosen Import
Export

Master Settings

Initial delay (0 - 30000 ms)

Max. retry (0 - 5)

Response timeout (10 - 120000 ms)

Modbus Devices + Add Edit Copy Delete

| Device name | Slave IP address | Slave ID | Number of Commands |
|-------------|------------------|----------|--------------------|
| Submit | | | |

| 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's 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.

Add Device

Master Settings > Add Device

Device Parameters

Slave ID (1 - 255)

Device Name

Slave IP address Port

Done
Cancel

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

Modbus Devices

| Device name | Slave IP address | Slave ID | Number of Commands |
|-------------|------------------|----------|--------------------|
| Device1 | 192.168.127.1 | 1 | 0 |

Buttons: + Add, Edit (highlighted), Copy, Delete

Submit

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

Device Settings

Master Settings > Slave ID 1

Device Parameters

Slave ID: 1

Device name: Device1

Slave IP address: 192.168.127.1 Port: 502

Modbus Commands

| Index | Enable | Name | Data Format | Function | Address / Quantity | Trigger | Poll Interval | Endian Swap |
|-------|--------|------|-------------|----------|--------------------|---------|---------------|-------------|
|-------|--------|------|-------------|----------|--------------------|---------|---------------|-------------|

Buttons: + Add (highlighted), Edit, Copy, Delete

Done Cancel

Add Modbus Commands

Add Command

Master Settings > Slave ID 1 > Add command

Command Parameters

Enable: Enable

Name: Command1

Data format: boolean

Function: 01 - Read Coils

Read starting address: 0 (0-65535)

Read quantity: 1

Trigger: Cyclic

Poll interval: 1000 (10 - 1200000 ms)

Convert To BACnet

Convert to BACnet object: Binary Input

Description:

Done Cancel

| 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 BACnet object, which needs to be configured.

| Convert To BACnet | |
|-------------------------------|----------------------------|
| Convert to BACnet object | Analog Value |
| Description | <input type="text"/> |
| Units | Other no-units |
| Relinquish Default | <input type="text"/> |
| COV increment | 1 |
| Data scaling (multiplication) | 1 (-1000.000 ~ 1000.000) |
| Data addition | 0 (-10000.000 ~ 10000.000) |

| 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 1000000000 | If there are no commanded values in the priority array, the present value will be changed to relinquish the default. |
| COV increment | 1 to 1000000000 | COV will be triggered when $ \text{Current Reported Value} - \text{Last Reported Value} > \text{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 |

| Convert To BACnet | |
|-----------------------------------|--|
| Convert to BACnet object | Binary Input |
| Description | <input type="text"/> |
| Mapping to modbus registers (bit) | 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 register address 0 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> |

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.

Device Settings

Master Settings > Slave ID 1

Device Parameters

Slave ID:

Device name:

Slave IP address: Port:

Modbus Commands

| 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.

Command Settings

Master Settings > Slave ID 1 > Edit command

Command Parameters

Enable:

Name:

Data format:

Function:

Read starting address: (0-65535)

Read quantity:

Trigger:

Poll interval: (10 - 1200000 ms)

Endian swap:

Convert To BACnet

Convert to BACnet object:

Description: (Filling in this field will overwrite the description of your currently mapped BACnet object)

Mapping to modbus registers (bit)

| | | | | | | | | | | | | | | | | |
|--------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------------------|--------------------------|-------------------------------------|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| register address 0 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |



NOTE

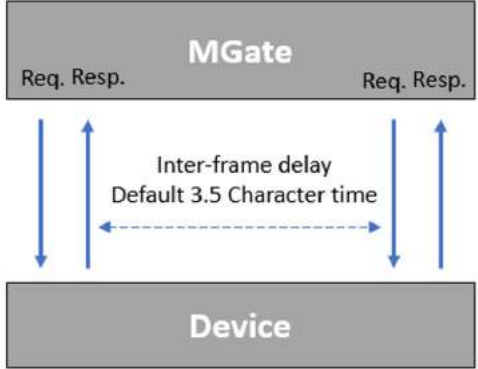
In order to get a better performance, we suggest the number of COV subscription should be under 300.

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 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 | <p>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.</p> <p>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.</p>  |
| Inter-character timeout (only for Modbus RTU) | 10 to 500 ms | 0 | <p>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.</p> |

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.

Master Settings

Mode selection RTU ▾

Port 1
Port 2

Master Settings - Serial Port 2 > Add Device

Device Parameters

Slave ID (1 - 255)

Device name

Inactive time when command failed (0 - 28800 s)

Done
Cancel

| 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.

Modbus Devices

+ Add **Edit** Copy Delete

| Slave ID | Device name | Number of Commands |
|----------|-------------|--------------------|
| 1 | Power_Meter | 2 |

Apply the above setting to P1 P2

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

Modbus RTU/ASCII Master Settings

Master Configuration Import/Export

Select master configuration file (.csv) Choose File No file chosen Import Export

Master Settings

Mode selection ASCII

Port 1 Port 2

Master Settings - Serial Port 1 > Slave ID 1

Device Parameters

Slave ID

Device name

Inactive time when command failed (0 - 28800 s)

Modbus Commands

+ Add Edit Copy Delete

| Index | Enable | Name | Data Format | Function | Address / Quantity | Trigger | Poll Interval | Endian Swap |
|-------|--------|-----------|-------------|----------|-------------------------------|---------|---------------|---------------|
| 1 | Enable | Voltage | float32 | 3 | Read address 3027, Quantity 2 | Cyclic | 1000 | Byte and Word |
| 2 | Enable | Frequency | float32 | 3 | Read address 3109, Quantity 2 | Cyclic | 1000 | Byte and Word |

Done Cancel

Add Modbus Commands

Add Command

Master Settings > Slave ID 1 > Add command

Command Parameters

Enable Enable ▾

Name

Data format boolean ▾

Function 01 - Read Coils ▾

Read starting address (0-65535)

Read quantity

Trigger Cyclic ▾

Poll interval (10 - 1200000 ms)

Convert To BACnet

Convert to BACnet object Binary Input ▾

Description

| 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.

Convert To BACnet

Convert to BACnet object:

Description:

Units:

Relinquish Default:

COV increment:

Data scaling (multiplication): (-1000.000 ~ 1000.000)

Data addition: (-10000.000 ~ 10000.000)

| 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 $ \text{Current Reported Value} - \text{Last Reported Value} > \text{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 |

Convert To BACnet

Convert to BACnet object: Binary Input

Description:

Mapping to modbus registers (bit)

register address 0

| | | | | | | | | | | | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------------------|-------------------------------------|--------------------------|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

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.

Device Settings

Master Settings > Slave ID 1

Device Parameters

Slave ID:

Device name:

Slave IP address: Port:

Modbus Commands

+ Add **Edit** Copy Delete

| 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.

Command Settings

Master Settings > Slave ID 1 > Edit command

Command Parameters

Enable: Enable ▾

Name: Command2

Data format: uint16 ▾

Function: 03 - Read Holding Registers ▾

Read starting address: 0 (0-65535)

Read quantity: 1

Trigger: Cyclic ▾

Poll interval: 1000 (10 - 1200000 ms)

Endian swap: Byte ▾

Convert To BACnet

Convert to BACnet object: Binary Input ▾

Description: (Filling in this field will overwrite the description of your currently mapped BACnet object)

Mapping to modbus registers (bit)

register address 0: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0



NOTE

In order to get a better performance, we suggest the number of COV subscription 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.

Modbus Devices

+ Add Edit Copy Delete

| Slave ID | Device name | Number of Commands |
|----------|-------------|--------------------|
| 1 | Power_Meter | 2 |

Apply the above setting to P1 P2

A3. BACnet/IP Server Settings

The MGate gateway supports BACnet/IP server only. In BACnet/IP server mode, assign the **Device name**, **Device instance**, **Network number**, and **BACnet/IP port**.

BACnet/IP Server Settings

Server Settings

Device name

Device instance

Ethernet port network number

Virtual network number

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 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.

BBMD Settings

BBMD enable Enable

BBMD role

Remote BBMD server IP

Remote BBMD server UDP port

Time to live (seconds)

| 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.

| Misc Settings | | |
|---|--------------------------------|----------------|
| COV notification delay | <input type="text" value="0"/> | 0 - 1000 (ms) |
| COV subscription redundant notification | <input type="text" value="0"/> | 0 - 10 (times) |

| 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. |

Protocol Settings—I/O Data Mapping

After you have configured Role 1 and Role 2 (client/master and server/slave) of the MGate settings, the SCADA/DDC in the BACnet/IP client role will start monitoring and controlling the remote Modbus server/slave device. The MGate uses its internal memory to facilitate data exchanges. The **I/O Data Mapping** page shows the complete mapping status.

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.

| Modbus TCP - Master | | | | | BACnet/IP - Server | | | | |
|---------------------|-------------|--------------|------------|------------------|--------------------|---------------|----------------|-----------------|--------------------------|
| Device slave ID | Device name | Command name | Function | Starting address | Device instance | Object name | Object type | Object instance | Description |
| 1 | Device1 | Command1 | 1 (Read) 0 | (0x00001) | 101404 | Command1 | Binary Input 0 | 0 | Outdoor Thermometer_r1b0 |
| 1 | Device1 | Command2 | 3 (Read) 0 | (4x00001) | 101404 | Command2_r1b0 | Binary Input 1 | | Outdoor Thermometer_r1b0 |
| | | | | | 101404 | Command2_r1b2 | Binary Input 2 | | Outdoor Thermometer_r1b2 |

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.

I/O Data Mapping

Modbus TCP - Master

Device Slave ID: All

| Device slave ID | Device name | Command name | Function | Starting address |
|-----------------|-------------|--------------|------------|------------------|
| 1 | Device1 | Command1 | 1 (Read) 0 | (0x00001) |
| 1 | Device1 | Command2 | 3 (Read) 0 | (4x00001) |

BACnet/IP - Server

| Device instance | Object name | Object type | Object instance | Description |
|-----------------|---------------|----------------|-----------------|--------------------------|
| 101404 | Command1 | Binary Input 0 | | |
| 101404 | Command2_r1b0 | Binary Input 1 | | Outdoor Thermometer_r1b0 |
| 101404 | Command2_r1b2 | Binary Input 2 | | Outdoor Thermometer_r1b2 |

Command Parameters

Enable: Enable

Name:

Data format: uint16

Function: 03 - Read Holding Registers

Read starting address: (0-65535)

Read quantity:

Trigger: Cyclic

Poll interval: (10 - 120000 ms)

Endian swap: Byte

Convert To BACnet

Convert to BACnet object: Binary Input

Description:

Mapping to modbus registers (bit)

register address 0: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

-> register1

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.

I/O Data Mapping

Modbus TCP - Master

Device Slave ID: All

| Device slave ID | Device name | Command name | Function | Starting address |
|-----------------|-------------|--------------|------------|------------------|
| 1 | Device1 | Command1 | 1 (Read) 0 | (0x00001) |
| 1 | Device1 | Command2 | 3 (Read) 0 | (4x00001) |

BACnet/IP - Server

| Device instance | Object name | Object type | Object instance | Description |
|-----------------|---------------|----------------|-----------------|--------------------------|
| 101404 | Command1 | Binary Input 0 | | |
| 101404 | Command2_r1b0 | Binary Input 1 | | Outdoor Thermometer_r1b0 |
| 101404 | Command2_r1b2 | Binary Input 2 | | Outdoor Thermometer_r1b2 |

Edit

BACnet/IP Object Settings

Command Parameters

Object Name:

Object Type: Binary Input

Object Instance:

Description:

Submit

Cancel

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.

Accessible IP List

Activate the accessible IP list (All device services are NOT allowed for the IPs NOT on the list)

| Index | Active | IP | NetMask |
|-------|--------------------------|----------------------|----------------------|
| 1 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 2 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 3 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 4 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 5 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 6 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 7 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |

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 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.

✪ Email Alert

Mail Settings

Mail server (SMTP)

My server requires authentication

Username

Password

From e-mail address

To e-mail address 1

To e-mail address 2

To e-mail address 3

To e-mail address 4

| 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 should be set up.

✪ SNMP Trap

SNMP Trap

SNMP trap server IP or domain name

Trap version v1 v2c

Trap community

| 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/>)

Certificate

Certificate Settings

| | |
|------------------|---------------------------|
| Issued to | 10.144.8.226 |
| Issued by | 10.144.8.226 |
| Valid | from 2000/3/4 to 2020/3/4 |

Select SSL certificate file
 No file chosen

Delete SSL certificate file

System Management—Misc. Settings

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

System Management—Misc. Settings—Console Settings

Console Settings

Configurations

| | |
|-------------------------------------|--|
| HTTP console | <input type="button" value="Enable"/> ▾ |
| HTTPS console | <input type="button" value="Enable"/> ▾ |
| Telnet console | <input type="button" value="Disable"/> ▾ |
| Reset button | <input type="button" value="Always Enable"/> ▾ |
| MOXA command | <input type="button" value="Enable"/> ▾ |
| Sensitive data encryption | <input type="button" value="MD5/AES128"/> ▾ |
| Accept arbitrary host header | <input type="button" value="Disable"/> ▾ |

Session Settings

| | |
|--|--|
| Maximum login user for HTTP+HTTPS | <input type="text" value="5"/> (1 ~ 10) |
| Auto logout timeout | <input type="text" value="600"/> (60 ~ 3600 sec) |

| Configuration | Value | Description |
|----------------|---|--|
| HTTP/HTTPS | Enable/Disable | This setting is to enable/disable the web console. For security reasons, users can only enable the 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 period. |

System Management—Misc. Settings—Notification Message

Notification Message

Notification Message

Login message

0 character/Maximum 240 character

Login authentication failure message

The account or password you entered is incorrect
(Your account will be temporarily locked if excessive tried.)

111 character/Maximum 240 character

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

System Management—Misc. Settings—Account Management

Account Management

Add Account Settings

+ Add
✎ Edit
🗑 Delete

| Account Name | Group |
|--------------|-------|
| admin | admin |
| user | user |

Submit

| 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

Login Password Policy

Account Password Policy

Minimum length (4 ~ 16)

Enable password complexity strength check

At least one digit(0-9)

Mixed upper and lower case letters(A-Z, a-z)

At least one special character: ~!@#%&*~_!;:;<>[]{}()

Password lifetime (90 ~ 180 days)

Account Login Failure Lockout

Enable

Retry failure threshold (1 ~ 10 time)

Lockout time (1 ~ 60 min)

| 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.

Ping Test

Ping Destination

Destination

Result

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.

Firmware Upgrade

Warning !

Note: Firmware upgrade will discard your unsaved configuration changes and restart the system.

Select firmware file No file chosen



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.

The screenshot shows a web interface titled "Configuration Import/Export". It is divided into two main sections: "Configuration Import" and "Configuration Export".

Configuration Import: This section includes a "Select configuration file" label followed by a file selection input field with a "浏览..." (Browse...) button. Below this is a checkbox labeled "Keep IP settings". At the bottom of this section is a green "Import" button.

Configuration Export: This section is currently empty, with a green "Export" button at the bottom.

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.

The screenshot shows a web interface titled "Load Factory Default".

At the top, there is a note: "Click on **Submit** to reset all settings, including the console password, to the factory default values. To leave the IP address, netmask and gateway settings unchanged, make sure that **Keep IP settings** is enabled."

Below the note is a section labeled "Reset to Factory Default" containing a checkbox labeled "Keep IP settings". At the bottom of this section is a green "Submit" button.



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**.

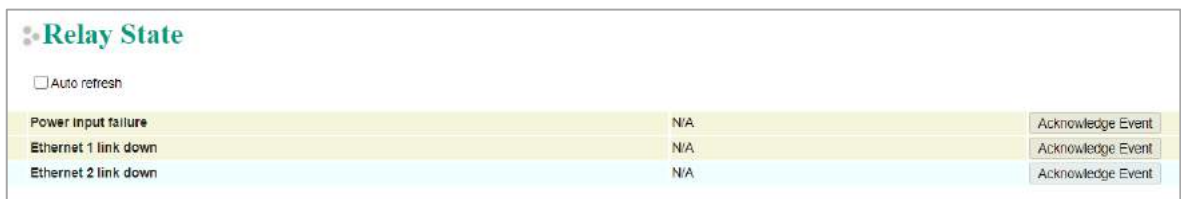
System Monitoring—System Log

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



System Monitoring—Relay State

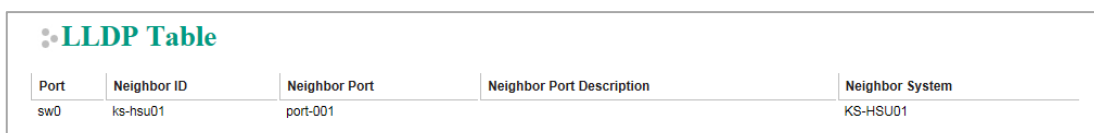
The MGate gateway includes a built-in relay circuit that is triggered in the event of a power failure or if the Ethernet link is down. You can view the relay status on this page.



| Relay State | | |
|---------------------------------------|-----|-------------------|
| <input type="checkbox"/> Auto refresh | | |
| Power input failure | N/A | Acknowledge Event |
| Ethernet 1 link down | N/A | Acknowledge Event |
| Ethernet 2 link down | N/A | Acknowledge Event |

System Monitoring—LLDP Table

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



| Port | Neighbor ID | Neighbor Port | Neighbor Port Description | Neighbor System |
|------|-------------|---------------|---------------------------|-----------------|
| sw0 | ks-hsu01 | port-001 | | KS-HSU01 |

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.

Protocol Status

I/O Data View | BACnet/IP Diagnostics | BACnet/IP Traffic | Modbus RTU/ASCII Diagnostics | Modbus RTU/ASCII Traffic

Auto refresh

Data flow direction: BACnet/IP --> Modbus RTU/ASCII | Start address(Hex): 0 | Length: 128 | Format: Hex

| Internal Address | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F |
|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 00000h | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 00010h | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 00020h | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 00030h | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 00040h | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 00050h | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 00060h | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 00070h | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |

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

Protocol Status

I/O Data View | BACnet/IP Diagnostics | BACnet/IP Traffic | **Modbus RTU/ASCII Diagnostics** | Modbus RTU/ASCII Traffic

Auto refresh | Select port: 1

| Category | Item | Value |
|----------|----------------------------|------------|
| Modbus | Master Mode | RTU Master |
| | Sent requests | 16 |
| | Received valid responses | 0 |
| | Received invalid responses | 0 |
| | Received CRC/LRC Error | 0 |
| | Received exceptions | 0 |
| | Timeout | 15 |

Modbus TCP Diagnostics

Protocol Status

I/O Data View | BACnet/IP Diagnostics | BACnet/IP Traffic | **Modbus TCP Diagnostics** | Modbus TCP Traffic

Auto refresh

| Category | Item | Value |
|------------------------|----------------------------|-------------------|
| Modbus | Mode | Master |
| | Number of connections | 1 |
| | Sent requests | 63 |
| | Received valid responses | 42 |
| | Received invalid responses | 0 |
| | Received exceptions | 41 |
| | Timeout | 0 |
| Connections Slave 1 | Status | OK |
| | Remote IP:Port | 192.168.127.1:502 |
| | Sent requests | 63 |
| | Received valid responses | 42 |
| | Received invalid responses | 0 |
| | Received exceptions | 41 |
| | Timeout | 0 |

BACnet/IP Diagnostics

Protocol Status

I/O Data View | **BACnet/IP Diagnostics** | BACnet/IP Traffic | Modbus RTU/ASCII Diagnostics | Modbus RTU/ASCII Traffic

Auto refresh

Object information

Device instance: 101404 | Object type: Analog Input

| Object type | Object instance | Object name | Value | Fault | Out of service |
|--------------|-----------------|-------------|------------|-------|----------------|
| Analog Input | 0 | Voltage | 107.213456 | false | false |
| Analog Input | 1 | Frequency | 60.02142 | false | false |

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.

| No. | Time | Routing | Dst | Function | Data |
|-----|-------|----------------------------|-----|----------|-------------------------------------|
| 1 | 0.010 | MGate -> 192.168.127.1:502 | 1 | 1 | 03 17 00 00 00 06 01 01 00 00 00 01 |
| 2 | 0.020 | MGate <- 192.168.127.1:502 | 1 | 1 | 03 17 00 00 00 04 01 01 01 00 |
| 3 | 0.030 | MGate -> 192.168.127.1:502 | 1 | 1 | 03 18 00 00 00 06 01 01 00 00 00 01 |
| 4 | 0.040 | MGate <- 192.168.127.1:502 | 1 | 1 | 03 18 00 00 00 04 01 01 01 00 |
| 5 | 0.060 | MGate -> 192.168.127.1:502 | 1 | 1 | 03 19 00 00 00 06 01 01 00 00 00 01 |
| 6 | 0.070 | MGate <- 192.168.127.1:502 | 1 | 1 | 03 19 00 00 00 04 01 01 01 00 |
| 7 | 1.010 | MGate -> 192.168.127.1:502 | 1 | 1 | 03 1A 00 00 00 06 01 01 00 00 00 01 |
| 8 | 1.020 | MGate <- 192.168.127.1:502 | 1 | 1 | 03 1A 00 00 00 04 01 01 01 00 |
| 9 | 1.030 | MGate -> 192.168.127.1:502 | 1 | 1 | 03 1B 00 00 00 06 01 01 00 00 00 01 |
| 10 | 1.040 | MGate <- 192.168.127.1:502 | 1 | 1 | 03 1B 00 00 00 04 01 01 01 00 |
| 11 | 1.060 | MGate -> 192.168.127.1:502 | 1 | 1 | 03 1C 00 00 00 06 01 01 00 00 00 01 |
| 12 | 1.070 | MGate <- 192.168.127.1:502 | 1 | 1 | 03 1C 00 00 00 04 01 01 01 00 |
| 13 | 2.010 | MGate -> 192.168.127.1:502 | 1 | 1 | 03 1D 00 00 00 06 01 01 00 00 00 01 |
| 14 | 2.020 | MGate <- 192.168.127.1:502 | 1 | 1 | 03 1D 00 00 00 04 01 01 01 00 |
| 15 | 2.030 | MGate -> 192.168.127.1:502 | 1 | 1 | 03 1E 00 00 00 06 01 01 00 00 00 01 |
| 16 | 2.045 | MGate <- 192.168.127.1:502 | 1 | 1 | 03 1E 00 00 00 04 01 01 01 00 |
| 17 | 2.060 | MGate -> 192.168.127.1:502 | 1 | 1 | 03 1F 00 00 00 06 01 01 00 00 00 01 |
| 18 | 2.070 | MGate <- 192.168.127.1:502 | 1 | 1 | 03 1F 00 00 00 04 01 01 01 00 |

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.

| No. | Time | Routing | Data |
|-----|--------|--------------------------------|--|
| 1 | 30.140 | MGate <- 192.168.127.1:55293 | 81 0B 00 0C 01 20 FF FF 00 FF 10 08 |
| 2 | 30.140 | MGate -> 192.168.127.255:47808 | 81 0B 00 19 01 20 FF FF 00 FF 10 00 C4 02 00 01 94 22 05 C4 91 03 22 04 48 |
| 3 | 30.140 | MGate -> 192.168.127.255:47808 | 81 0B 00 22 01 28 FF FF 00 03 E8 06 C0 A8 7F FE 00 01 FF 10 00 C4 02 01 8C 1C 22 05 C4 91 03 22 04 48 |
| 4 | 31.140 | MGate <- 192.168.127.1:55293 | 81 0B 00 0C 01 20 FF FF 00 FF 10 08 |
| 5 | 31.140 | MGate -> 192.168.127.255:47808 | 81 0B 00 19 01 20 FF FF 00 FF 10 00 C4 02 00 01 94 22 05 C4 91 03 22 04 48 |
| 6 | 31.140 | MGate -> 192.168.127.255:47808 | 81 0B 00 22 01 28 FF FF 00 03 E8 06 C0 A8 7F FE 00 01 FF 10 00 C4 02 01 8C 1C 22 05 C4 91 03 22 04 48 |
| 7 | 31.425 | MGate <- 192.168.127.1:55293 | 81 0A 00 1B 01 24 03 E8 06 C0 A8 7F FE 00 01 FF 02 75 00 0C 02 01 8C 1C 19 4C |
| 8 | 31.425 | MGate -> 192.168.127.1:55293 | 81 0A 00 2F 01 08 03 E8 06 C0 A8 7F FE 00 01 30 00 0C 0C 02 01 8C 1C 19 4C 3E C4 02 01 8C 1C C4 00 C0 00 00 C4 00 C0 00 01 C4 00 C0 00 02 3F |
| 9 | 31.435 | MGate <- 192.168.127.1:55293 | 81 0A 00 1B 01 24 03 E8 06 C0 A8 7F FE 00 01 FF 02 75 01 0C 0C 02 01 8C 1C 19 4D |
| 10 | 31.435 | MGate -> 192.168.127.1:55293 | 81 0A 00 25 01 08 03 E8 06 C0 A8 7F FE 00 01 30 01 0C 0C 02 01 8C 1C 19 4D 3E 75 08 00 44 65 76 69 63 65 31 3F |
| 11 | 31.440 | MGate <- 192.168.127.1:55293 | 81 0A 00 1B 01 24 03 E8 06 C0 A8 7F FE 00 01 FF 02 75 02 0C 0C 02 01 8C 1C 19 D1 |
| 12 | 31.440 | MGate -> 192.168.127.1:55293 | 81 0A 00 16 01 08 03 E8 06 C0 A8 7F FE 00 01 50 02 0C 91 02 91 20 |
| 13 | 31.745 | MGate <- 192.168.127.1:55293 | 81 0A 00 11 01 04 02 75 03 0C 0C 02 00 01 94 19 4C |
| 14 | 31.745 | MGate -> 192.168.127.1:55293 | 81 0A 00 17 01 00 30 03 0C 0C 02 00 01 94 19 4C 3E C4 02 00 01 94 3F |
| 15 | 31.750 | MGate <- 192.168.127.1:55293 | 81 0A 00 11 01 04 02 75 04 0C 0C 02 00 01 94 19 4D |

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.

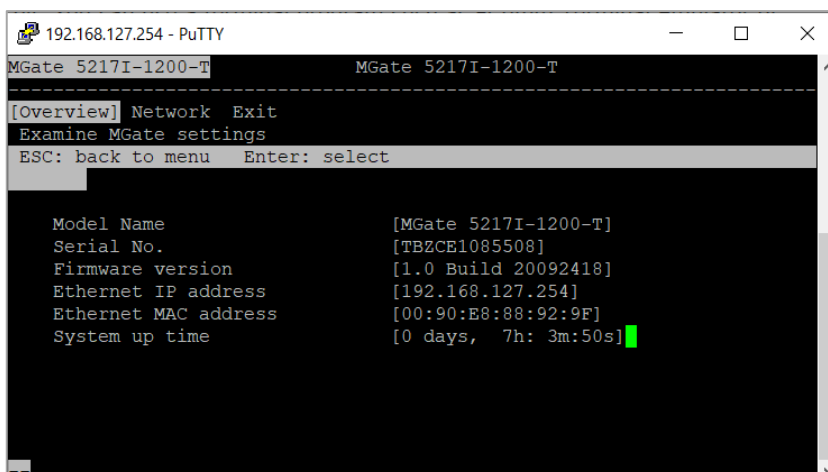
For Telnet, use HyperTerminal or PuTTY to connect to the MGate. Note that the Telnet protocol will transfer the account and password information over the Internet using plain text. If you are concerned about security risks, we suggest you disable the Telnet function by **Console Settings > Telnet Console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

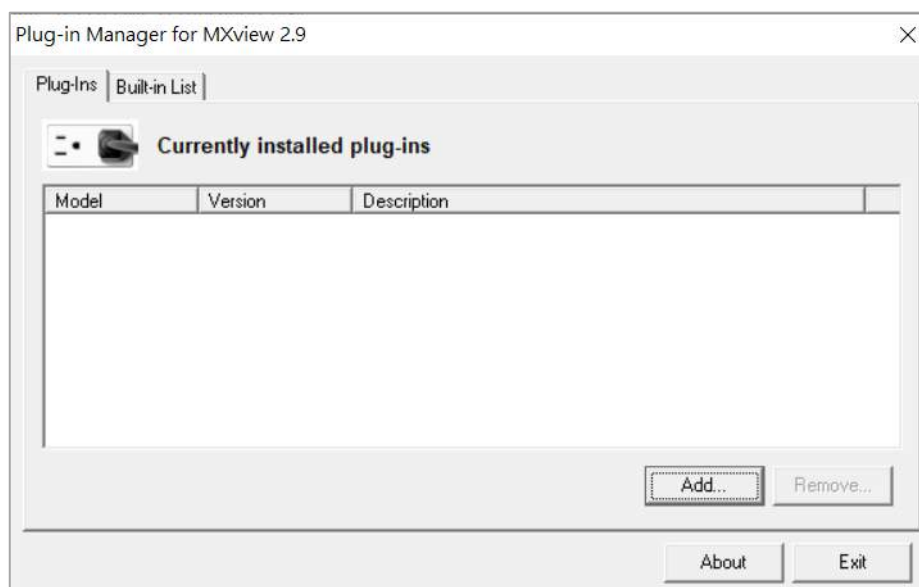
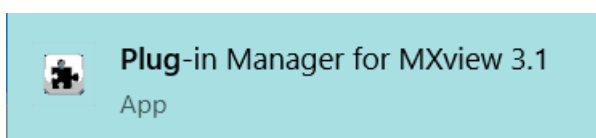
This chapter gives an overview of Moxa’s MXstudio industrial network management suite.

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 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 in the product page. Please execute **Plug-in Manager** and **add** the plug-in package.



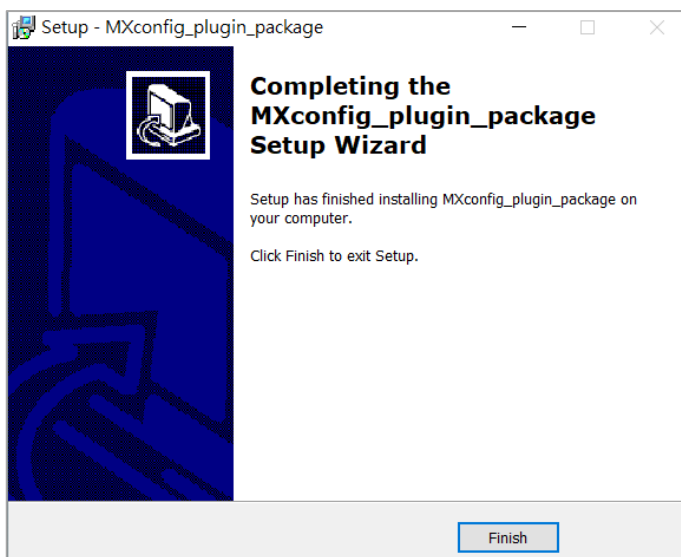
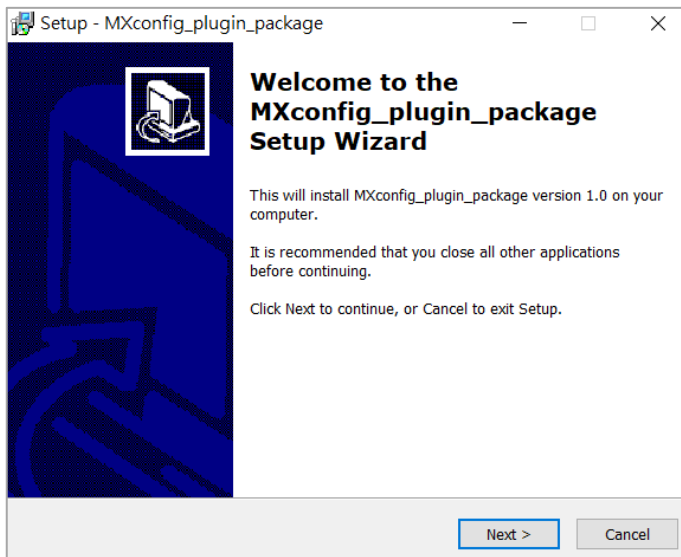
MXconfig

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.

| | | | |
|---|------------------|---------------|----------|
| MXconfig_plugin_package_setup_Ver1.0_Build_20090815 | 9/8/2020 3:53 PM | Application | 1,290 KB |
| Version | 9/8/2020 3:51 PM | Text Document | 3 KB |



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 **Modbus Configuration Import/Export** feature. On a large scale, you may connect lots of Modbus devices, which have to 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 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 | devSlaveId | devName | devIpAdd | devPort | devSequence | | | | | | | | | | |
| 6 | [device_parameters] | | | | | | | | | | | | | | | |
| 7 | 1 | 1 Device1 | 192.168.1. | 502 | 1 | | | | | | | | | | | |
| 8 | #cmdIndex | cmdEnable | cmdName | cmdDevIndex | cmdDataFormat | cmdFunc | cmdTrigger | cmdPollin | cmdEndia | cmdRead | cmdWrite | cmdWrite | cmdFault | cmdFault | 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 * |

Modbus RTU/ASCII Master Settings

Master Configuration Import/Export

Select master configuration file (.csv) Choose File No file chosen

Import
Export

Below shows the way to configure 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

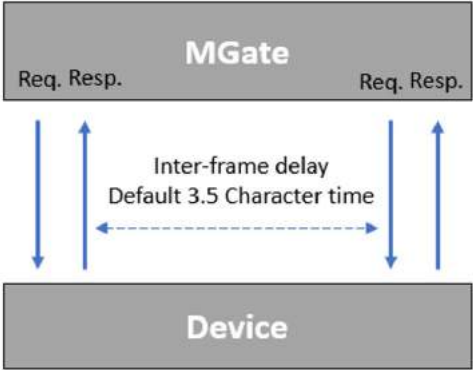
| | | | | | | | | | | | | | | | | |
|----------------------|-----------|------------|---------------|-----------------|----------------|------------|--|--|--|--|--|--|--|--|--|--|
| #modeType | | | | | | | | | | | | | | | | |
| [mode_selection] | | | | | | | | | | | | | | | | |
| RTU | | | | | | | | | | | | | | | | |
| #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 | <p>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.</p> <p>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.</p>  | Only for RTU mode Suggested value: 0 |
| interCharDelay | 10 to 500 | <p>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.</p> | 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?

Device Sequence
(used by MGate to arrange the order of 6-digit device instance, can be configured through the "devSequence" field in the CSV file)

102404

Serial Port
(When operating as Modbus RTU mode: this digit can be 1 or 2, depending on which serial port the Modbus devices are connected to, can not be configured. When operating as Modbus TCP mode: this digit can only be 1, can not be configured either)

Gateway device instance
(the last 3 digit, can be configured under "BACnet/IP Server Settings")

[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 |
| | Data Change | A command is issued when a change in data is detected. | - If cmdFunc=5,6,15,16, cmdTrigger=Cyclic, Data Change |
| 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 |
| | None | None: Don't need to swap | cmdDataFormat=boolean, cmdEndianSwap=* |
| | Byte | Byte: 0x0A, 0x0B, 0x0C, 0x0D become 0x0B, 0x0A, 0x0D, 0x0C. | - If |
| | Word | Word: 0x0A, 0x0B, 0x0C, 0x0D become 0x0C, 0x0D, 0x0A, 0x0B. | cmdDataFormat=uint16, int16, cmdEndianSwap=None, Byte |
| | 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 | - If cmdDataFormat=uint32, int32, float32, cmdEndianSwap=None, Byte, Word, Byte and Word |
| 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 |
| | 2 | | - If cmdDataFormat=uint16, int16, cmdReadQuan=1 - 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 |
| | 2 | | - If cmdDataFormat=uint16, int16, cmdReadQuan=1 - 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 to 1 | | - 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 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 hexadecimal 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. | |

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 5217 has 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 | | snmpInTooBig |
| | tcpEstabResets | | snmpInNoSuchNames |
| | tcpCurrEstab | | snmpInBadValues |
| | tcpInSegs | | snmpInReadOnly |
| | tcpOutSegs | | snmpInGenErrs |
| | tcpRetransSegs | | snmpInTotalReqVars |
| | tcpConnState | | snmpInTotalSetVars |
| | tcpConnLocalAddress | | snmpInGetRequests |
| | tcpConnLocalPort | | snmpInGetNexts |
| | tcpConnRemAddress | | snmpInSetRequests |
| | tcpConnRemPort | | snmpInGetResponses |
| | tcpInErrs | | snmpInTraps |
| | tcpOutRsts | | snmpOutTooBig |
| | | | 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

| | | |
|-------------------|--------------------------|--|
| object-identifier | (Analog Input, 0) | |
| object-name | Command3 | |
| object-type | Analog Input | |
| present-value | 12.000000 | |
| status-flags | {false,true,false,false} | |
| event-state | normal | |
| out-of-service | 0 | |
| units | no-units | |
| description | Command3 | |

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

| Property | Value |
|-------------------|---------------------------|
| object-identifier | (Analog Input, 0) |
| object-name | Command3 |
| object-type | Analog Input |
| present-value | 18.000000 |
| status-flags | {false,false,false,false} |
| event-state | normal |
| out-of-service | 0 |
| units | no-units |
| description | Command3 |