MGate 5114 User's Manual

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www.moxa.com/product

MGate 5114 User's Manual

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Introduction

Welcome to the MGate 5114 series of gateways that feature easy protocol conversion between Modbus RTU/ASCII/TCP, IEC 60870-5-101/104 protocols. This chapter is an introduction to the MGate 5114 Series. The following topics are covered in this chapter:

- **Overview**
- **Package Checklist**
- **Product Features**

Overview

The MGate 5114 is an industrial Ethernet gateway for Modbus RTU/ASCII/TCP, IEC 60870-5-101, and IEC 61870-5-104 network communications. To integrate existing Modbus or IEC 60870-5-101 devices into a IEC 60870-5-104 network, use the MGate 5114 as a Modbus master or IEC 60870-5-101 master to collect data and exchange data with IEC 60870-5-104 system.

Package Checklist

All models of the MGate 5114 Series are shipped with the following items:

Standard Accessories:

- 1 MGate 5114 gateway
- 1 Serial cable: DBL-RJ45F9-150
- Quick installation guide (printed)
- Warranty card

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

Optional Accessories (can be purchased separately)

- CBL-F9M9-150: DB9-female-to-DB9-male serial cable, 150 cm
- CBL-F9M9-20: DB9-female-to-DB9-male serial cable, 20 cm
- CBL-RJ45F9-150: RJ45-to-DB9-female serial cable, 150 cm
- CBL-RJ45SF9-150: RJ45-to-DB9-female serial shielded cable, 150 cm
- Mini DB9F-to-TB DB9: Female-to-terminal-block connector
- DK-25-01: 1 DIN-rail kit with 2 screws
- WK-36-02: Wall-mounting kit, 2 plates with 6 screws
- CBL-PJTB-10: Non-locking barrel plug to bare-wire cable

Product Features

- Protocol conversion between Modbus RTU/ASCII/TCP, IEC 60870-5-101, IEC 60870-5-104
- Supports IEC 60870-5-101 master/slave (balanced/unbalanced mode)
- Supports IEC 60870-5-104 client/server
- Step-by-step guide with wizard configuration
- Complete packet analysis and diagnostic information for maintenance
- Embebbed Modbus and IEC 101/104 traffic monitoring
- Redundant dual DC power inputs and one relay output
- microSD card for configuration backup and event logs
- -40 to 75°C wide operating temperature models available
- Serial port with 2 kV built-in isolation protection
- Built-in Ethernet cascading for easy wiring
- Security features based on IEC-62443 standards

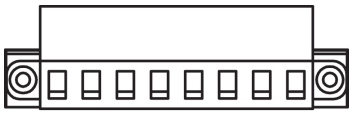
2

Hardware

The following topics are covered in this chapter:

- **Power Input and Relay Output Pinouts**
- **LED Indicators**
- **Dimensions**
- **Pin Assignments**
- **Hardware Installation Procedure**
- **Specifications**
- **Reset Button**
- **Pull-High, Pull-Low, and Terminator for RS-485**
- **MicroSD**

Power Input and Relay Output Pinouts



	V2+	V2-				V1+	V1-
Shielded Ground	DC Power Input 2	DC Power Input 2	N.O.	Common	N.C.	DC Power Input 1	DC Power Input 1

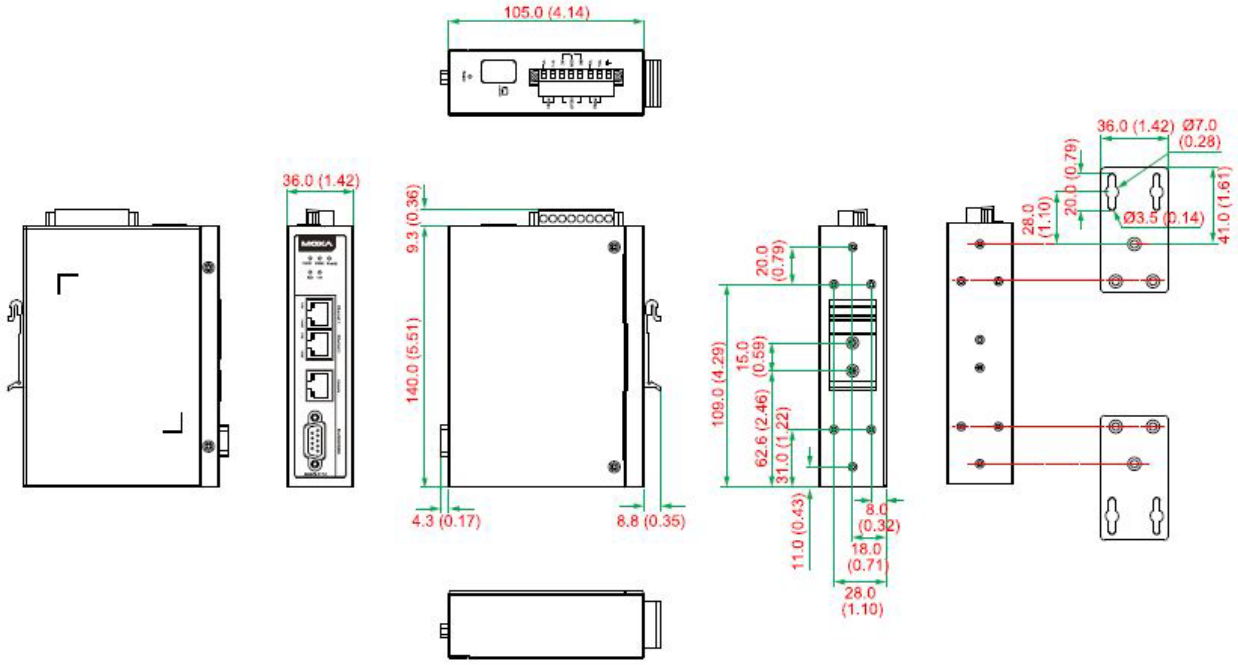
LED Indicators

Agent Mode:

LED	Color	Description
Ready	Off	Power is off or a fault condition exists
	Green	Steady: Power is on, and the MGate is functioning normally
	Red	Steady: Power is on, and the MGate is booting up
		Blinking slowly: Indicates an IP conflict, or the DHCP or BOOTP server is not responding properly
		Flashing quickly: microSD card failed
MB*	Off	No serial communication with Modbus device
	Green	Normal Modbus serial communication in progress
	Red	Communication error When the MGate 5114 acts as a Modbus RTU/ASCII master: 1. Slave device returned an error (exception) 2. Received a frame error (parity error, checksum error) 3. Timeout (the master sends but no response) When the MGate 5114 acts as a Modbus RTU/ASCII slave: 1. Received an invalid function code The master accessed an invalid register address or coil address 2. Received a framing error (parity error, checksum error)
101*	Off	No connection with the IEC 60870-5-101 device
	Green	Normal IEC 60870-5-101 serial communication in progress
	Red	An error in serial communication occurred when the MGate 5114 acts as an IEC 60870-5-101 master: Received a slave exception (format error, checksum error, invalid data, slave responds are not supported) When the MGate 5114 acts as an IEC 60870-5-101 slave: Received a master exception (format error, checksum error, invalid data)

*Only indicates serial communication status; for IEC 60870-5-104 or Modbus TCP status, please refer to the LED indicator on the Ethernet port.

Dimensions

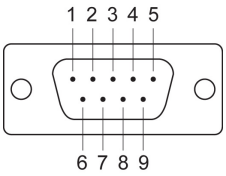


Unit: mm (inch)

Pin Assignments

Serial Port (Male DB9)

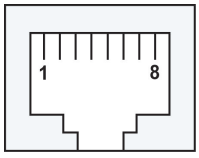
Pin	RS-232	RS-422/RS-485 (4W)	RS-485 (2W)
1	DCD	TxD-(A)	–
2	RXD	TxD+(B)	–
3	TXD	RxD+(B)	Data+(B)
4	DTR	RxD-(A)	Data-(A)
5*	GND	GND	GND
6	DSR	–	–
7	RTS	–	–
8	CTS	–	–
9	–	–	–



*Signal ground

Ethernet Port (RJ45)

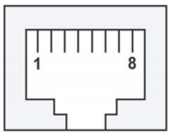
Pin	Signal
1	Tx+
2	Tx-
3	Rx+
6	Rx-



Console Port (RS-232)

The MGate 5114 Series can use a RJ45 serial port to connect to a PC for device configuration.

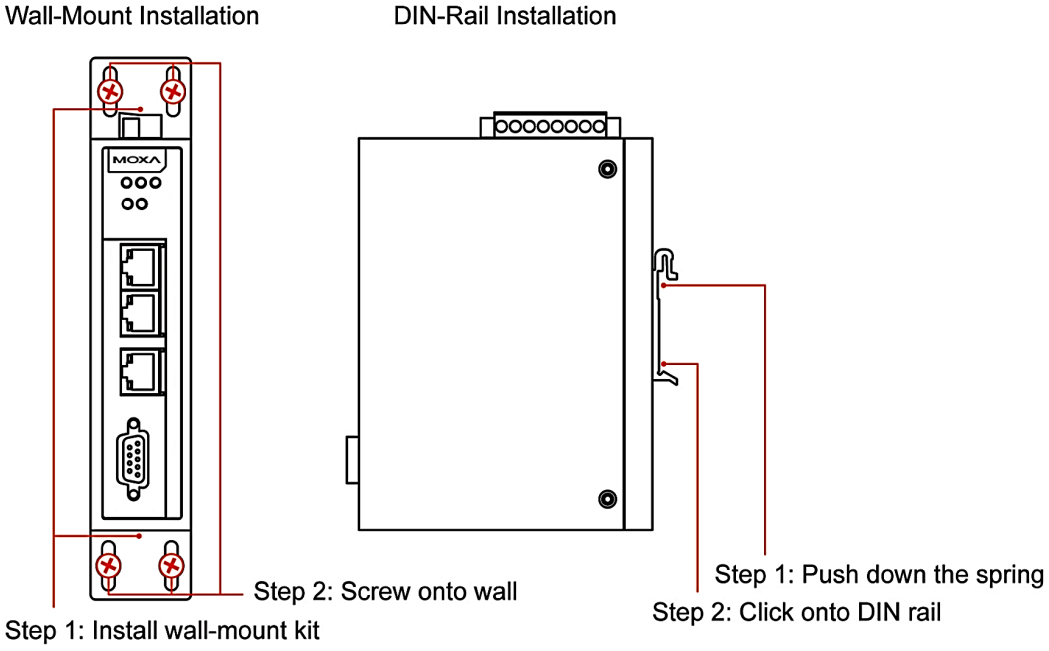
Pin	RS-232
1	DSR
2	RTS
3	GND
4	TXD
5	RXD
6	DCD
7	CTS
8	DTR



Hardware Installation Procedure

1. Connect the power adapter. Connect the 12-48 VDC power line or DIN-rail power supply to the MGate 5114's terminal block.
2. Use a serial cable to connect the MGate to the Modbus RTU/ASCII or IEC 60870-5-101 device.
3. Use an Ethernet cable to connect the MGate to the Modbus TCP or IEC 60870-5-104 device.
4. The MGate 5114 is designed to be attached to a DIN rail or mounted on a wall. For DIN-rail mounting, push down the spring and properly attach it to the DIN rail until it snaps into place. For wall mounting, install the wall-mount kit (optional) first and then screw the device onto the wall.

The following figure illustrates the two mounting options:



Specifications

Ethernet Interface

Protocols: Modbus TCP client/server, IEC60870-5-104 client/server
Number of Ports: 2 (1 IP, used for Ethernet cascading)
Speed: 10/100 Mbps, Auto MDI/MDIX
Connector: 8-pin RJ45
Magnetic Isolation Protection: 1.5 kV (built-in)

IEC 60870-5-104:

- Mode: Client/Server
- Max. number of connections:
  MGate as IEC 104 server: 32 client connections
  MGate as IEC 104 client: 32 server connections
- The maximum number of information objects: 2000 points

Modbus TCP:

- Mode: Client/Server
- Functions supported: 1, 2, 3, 4, 5, 6, 15, 16, 23
- Max. number of commands: 128
- Max. number of connections:
  MGate as Modbus TCP Client: 32 server connections
  MGate as Modbus TCP Server: 32 client connections

Serial Interface

Protocols: Modbus RTU/ASCII master/slave, IEC60870-5-101 master/slave (balanced/unbalanced)
Number of Ports: 1
Serial Standards: RS-232/422/485, software selectable
Connectors: DB9 male
RS-485 Data Direction Control: ADDC® (automatic data direction control)
Pull High/Low Resistor for RS-485: 1 kΩ, 150 kΩ
Terminator for RS-485: 120 Ω
Isolation: 2 kV (built-in)
Modbus RTU/ASCII:

- Mode: master, slave
- Functions supported: 1, 2, 3, 4, 5, 6, 15, 16, 23
- Max. number of commands: 128

IEC 60870-5-101:

- Mode: Master/Slave (balanced/unbalanced)
- MGate as IEC 101 master: 31 slave connections
- MGate as IEC 101 slave: 1 master connection
- The maximum number of information objects: 2000 points

Serial Communication Parameters

Data Bits: 7, 8
Stop Bits: 1, 2
Parity: None, Even, Odd, Space, Mark
Flow Control: RTS/CTS, RTS Toggle (RS-232 only)
Baudrate: 50 bps to 921.6 kbps

Serial Signals

RS-232: TxD, RxD, RTS, CTS, DTR, DSR, DCD, GND
RS-422: Tx+, Tx-, Rx+, Rx-, GND
RS-485-4w: Tx+, Tx-, Rx+, Rx-, GND
RS-485-2w: Data+, Data-, GND

Software

Configuration Options: Web Console, Serial Console
Configuration: MXconfig, MXview, SNMP (v1, v2c, v3), Private MIB
Utility: Device Search Utility(DSU) for Windows 2000, Windows XP, Server 2003, Vista, Server 2008 (x86/x64), Windows Server 2008 R2, Windows 7/8/8.1/10 (x86/x64), Windows Server 2012 (x64), Windows 2012 R2

Time Synchronization

Supports NTP/SNTP

Physical Characteristics

Housing: Metal, IP30
Weight: 507 g (1.12 lb)
Dimensions: 36 x 105 x 140 mm (1.42 x 4.14 x 5.51 in)

Storage Card Slot: 1 microSD (SDHC) card slot supports up to 32 GB
Relay Alarm Circuit: 3-pin circuit with current carrying capacity of 2 A @ 30 VDC

Environmental Limits

Operating Temperature:
Standard Models: 0 to 60°C (32 to 140°F)
Wide Temp. Models: -40 to 75°C (-40 to 167°F)
Storage Temperature: -40 to 85°C (-40 to 185°F)
Ambient Relative Humidity: 5 to 95% (non-condensing)
Vibration: IEC 60068-2-6, IEC 60068-2-64
Shock: IEC 60068-2-27
Drop: IEC 60068-2-32

Power Requirements

Input Voltage: 12 to 48 VDC
Input Current: 455 mA max.
Power Connector: Terminal block

Standards and Certifications

Safety: UL 508, EN 60950-1
Hazardous Location*: Class 1 Division 2, ATEX, IECEx
*Certification is underway. Please contact a Moxa sales representative for details.
EMC: EN 55032/24
EMI: CISPR 32, FCC Part 15B Class B
EMS:
IEC 61000-4-2 ESD: Contact: 8 kV; Air: 15 kV
IEC 61000-4-3 RS: 80 MHz to 1 GHz: 10 V/m
IEC 61000-4-4 EFT: Power: 4 kV; Signal: 2 kV
IEC 61000-4-5 Surge: Power: 2 kV; Signal: 2 kV
IEC 61000-4-6 CS: 150 kHz to 80 MHz: 10 V/m
IEC 61000-4-8 PFMF

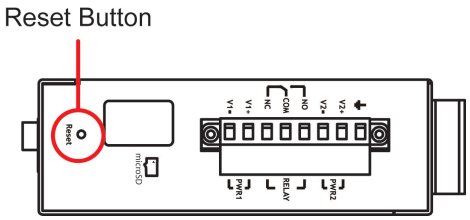
MTBF (mean time between failures)

Time: 1,140,815 hrs
Standard: Telcordia SR332

Warranty

Warranty Period: 5 years
Details: See www.moxa.com/warranty

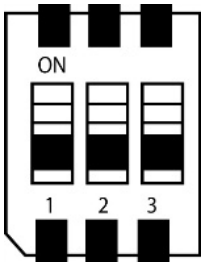
Reset Button



Restore the MGate to factory default settings by using a pointed object (such as a straightened paper clip) to hold the reset button down until the Ready LED stops blinking (approx. five seconds).

Pull-High, Pull-Low, and Terminator for RS-485

Remove the MGate 5114's top cover, and you will find DIP switches to adjust each serial port's pull-high resistor, pull-low resistor, and terminator.



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

*Default

MicroSD

The MGate 5114 provides users with an easy way to backup, copy, replace, or deploy. The MGate is equipped with a microSD card slot. Users can plug in a microSD card to backup data, including the system configuration setting, and system data log.

First time using the MGate gateway with a new microSD card

1. Format the microSD card as FAT file system through a PC.
2. Power off the MGate and insert the microSD card (ensure that the microSD card is empty).
3. Power on the MGate. The default settings will be copied to the microSD card.
4. Manually configure the MGate via web console, and all the stored changes will copy to the microSD card for synchronization.

First time using the MGate with a microSD card containing a configuration file

1. Power off the MGate and insert the microSD card.
2. Power on the MGate.
3. The configuration file stored in the microSD card will automatically copy to the MGate.

Duplicating current configurations to another MGate gateway

1. Power off the MGate and insert a new microSD card.
2. Power on the MGate.
3. The configuration will be copied from the MGate to the microSD card.
4. Power off the MGate and insert the microSD card to the other MGate.
5. Power on the second MGate.
6. The configuration file stored in the microSD card will automatically copy to the MGate.

Malfunctioning MGate replacement

1. Replace the malfunctioning MGate with a new MGate.
2. Insert the microSD card into the new MGate.
3. Power on the MGate.
4. The configuration file stored on the microSD card will automatically copy to the MGate.

MicroSD card writing failure

The following circumstances may cause the microSD card to experience a writing failure:

1. The microSD card has less than 20 Mbytes of free space remaining.
2. The microSD card is write-protected.
3. The file system is corrupted.
4. The microSD card is damaged.

The MGate will stop working in case of the above events, accompanied by a flashing Ready LED and beeping alarm. When you replace the MGate gateway's microSD card, the microSD card will synchronize the configurations stored on the MGate gateway. Note that the replacement microSD card should not contain any configuration files on it; otherwise, the out-of-date configuration will copy to the MGate device.

3

Getting Started

The following topics are covered in this chapter:

- **Connecting the Power**
- **Connecting Serial Devices**
- **Connecting to a Network**
- **Installing DSU Software**
- **Log In to the Web Console**
- **Quick Setup**
  - Quick Setup—System Setting
  - Quick Setup—Select Protocol
  - Quick Setup—Configure Role 1 and Role 2
  - Quick Setup—Finish

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 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 indicate that the unit is receiving power. For power terminal block pin assignments, refer to the **Power Input and Relay Output Pinout** section in *chapter 2*.

Connecting Serial Devices

The MGate 5114 supports 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 indicate 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

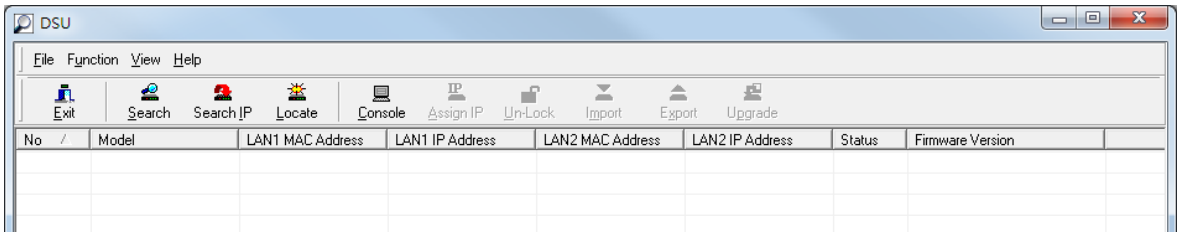
If you do not know the MGate gateway's IP address when setting it up for the first time (default IP is *192.168.127.254*); use an Ethernet cable to connect the host PC and MGate gateway directly. If you connect the gateway and host PC through the same Ethernet switch, make sure there is no router between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

The following instructions explain how to install the DSU, a utility to search for MGate 5114 units on a network.

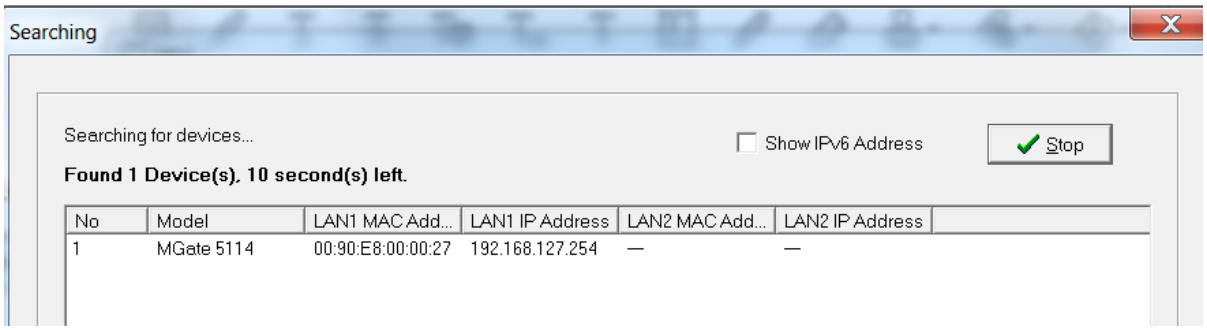
1. Locate and run the following setup program to begin the installation process:
   dsu_setup_[*Version*]**_Build_**[*DateTime*]**.exe**

   This version might be named **dsu_setup_Ver2.x_Build_xxxxxxxx.exe**
2. You will be greeted by the Welcome window. Click **Next** to continue.
3. When the **Select Destination Location** window appears, click **Next** to continue. You may change the destination directory by first clicking on **Browse...**.
4. 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.
5. Click **Install** to start copying the software files.
6. A progress bar will appear. The procedure should take only a few seconds to complete.
7. A message will indicate that the DSU is successfully installed. You may choose to run it immediately by selecting **Launch DSU**.
8. You may also open the DSU through **Start → Programs → MOXA → DSU**.

The DSU window should appear as shown below.



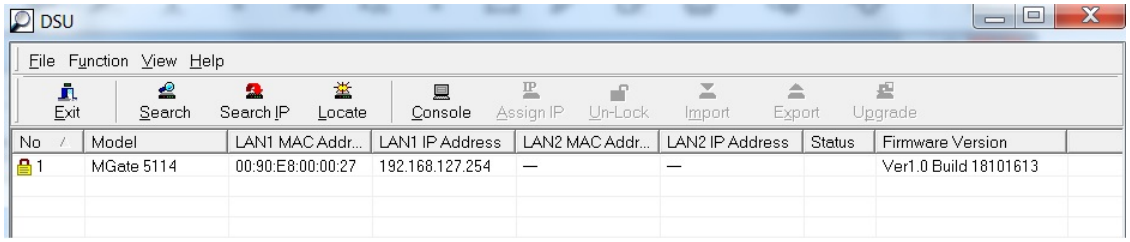
Click **Search** and a new Search window will pop up.



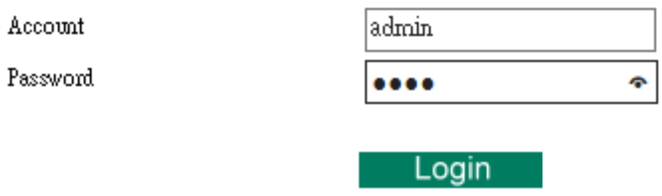
Log In to the Web Console

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.

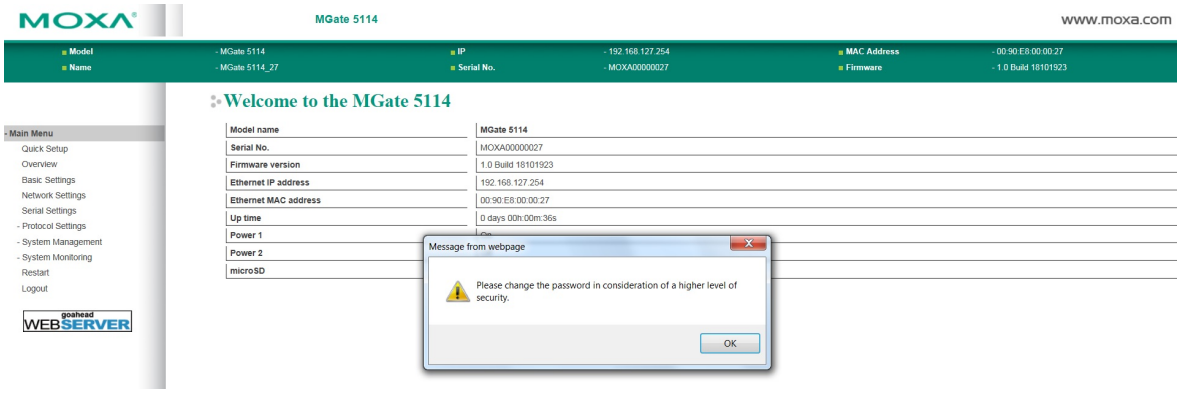
When the MGate gateway appears on the DSU device list, select the gateway and right-click the mouse button to open a web console to configure the gateway.



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



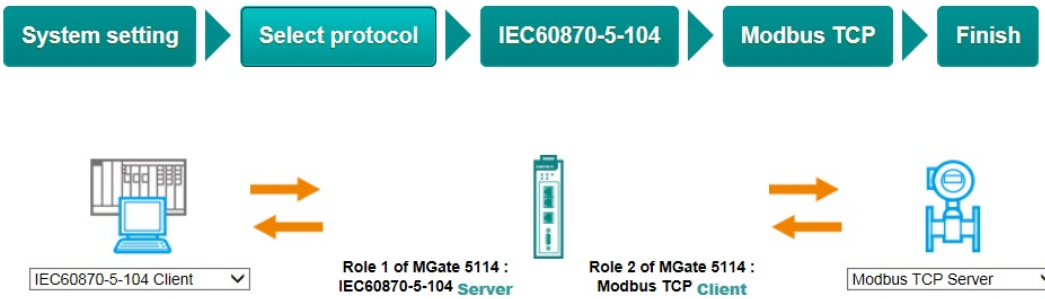
When you log in the web console for the first time, a message will pop up. Emphasizing a higher security level, we suggest you to change the password.



The password can be changed in the following path: **System Management>Misc. Settings>Account Management**

Quick Setup

The MGate Series provides a Quick Setup Wizard, an illustrated guide specifically designed to make the configuration process easy. The Quick Setup wizard takes you through the configuration process from start to finish so that you do not miss any step. The following agent modes are supported in the Quick Setup:

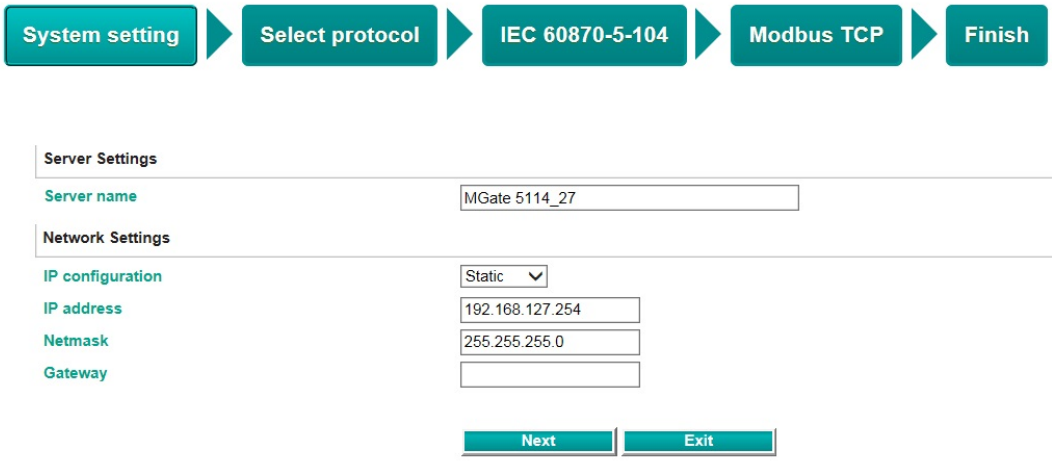


Here are the protocol conversion combinations:

Device 1	Device 2
IEC 60870-5-104 Client	Modbus RTU/ASCII Slave
IEC 60870-5-104 Client	Modbus TCP Server
IEC 60870-5-104 Client	IEC 60870-5-101 Slave
IEC 60870-5-101 Master	Modbus TCP Server
IEC 60870-5-101 Master	IEC 60870-5-104 Server
Modbus TCP Client	IEC 60870-5-101 Slave
Modbus TCP Client	IEC 60870-5-104 Server
Modbus RTU/ASCII Master	IEC 60870-5-104 Server

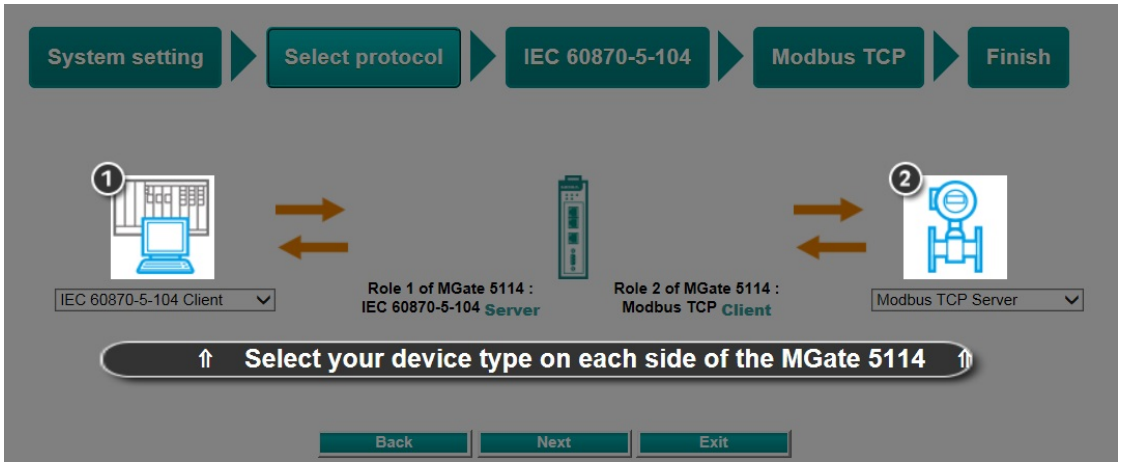
Quick Setup—System Setting

First, configure the **Server Settings** to identify the units and **Network Settings** of the MGate.



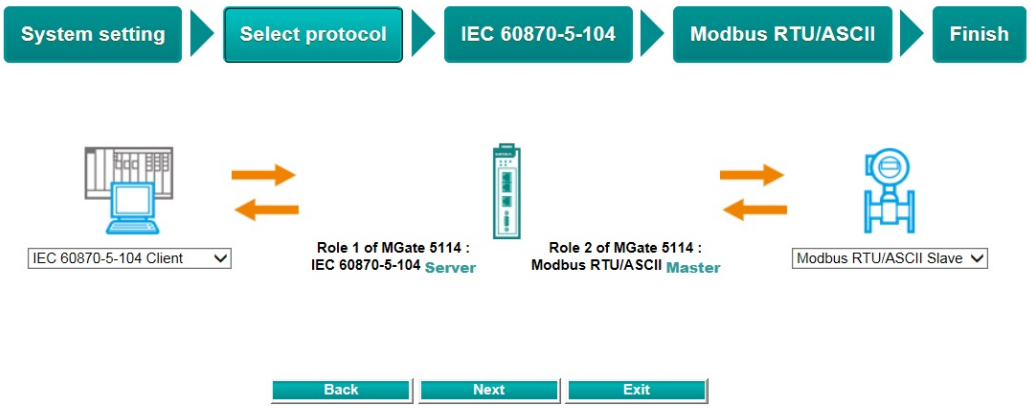
Quick Setup—Select Protocol

Then, you should select your devices' protocols on each side. After selection, the MGate will automatically change to its proper role. For example, if the device is set as a IEC 60870-5-104 client, the MGate will then automatically configure as a IEC 60870-5-104 server by itself. Regarding protocol configuration, refer to *chapter 4*.

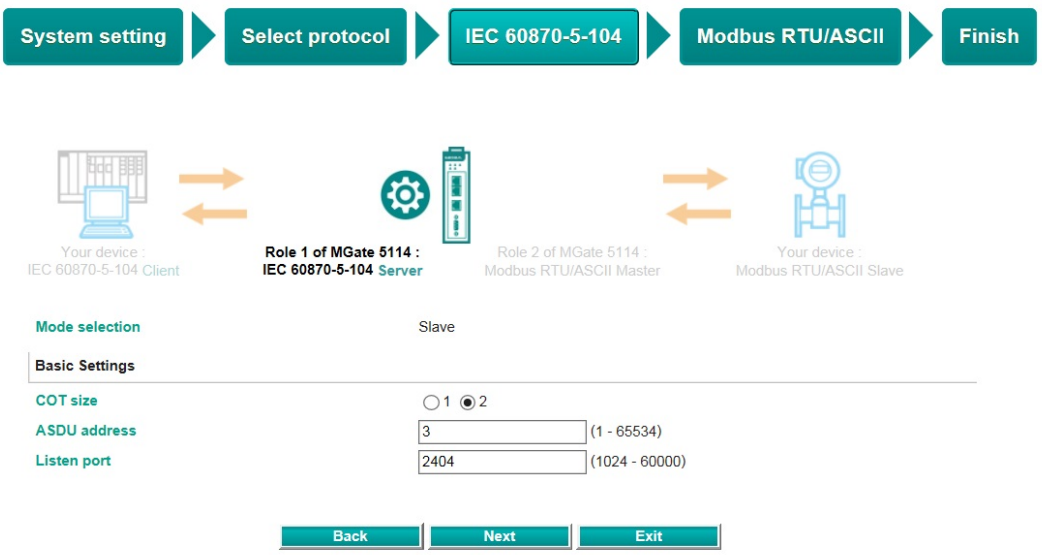


Quick Setup—Configure Role 1 and Role 2

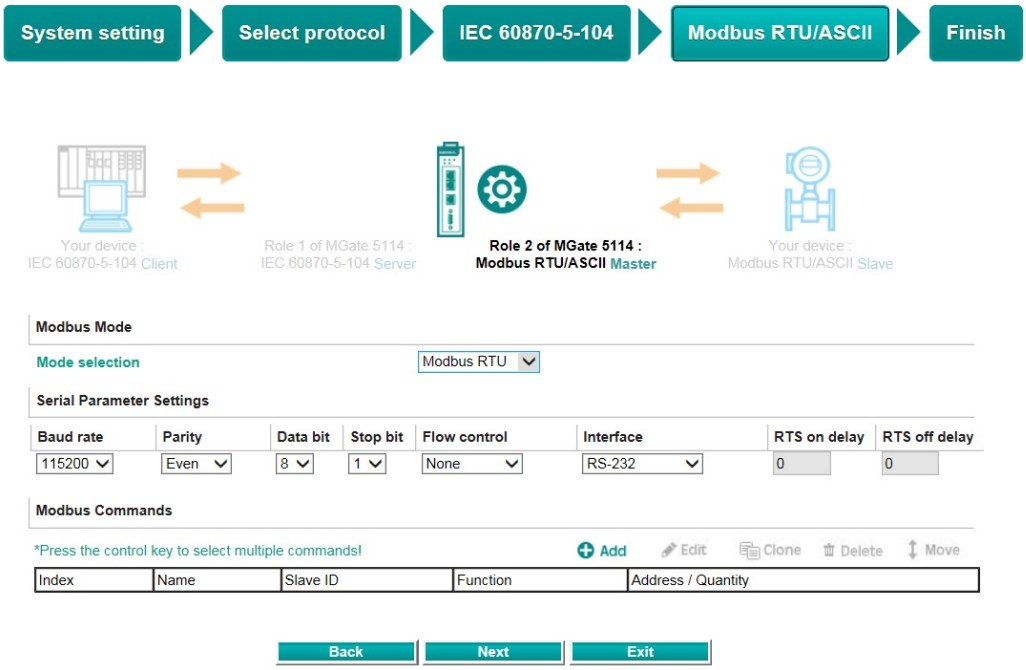
After finishing the device protocol selection, Role 1 and Role 2 of MGate will be confirmed. You will need to configure the roles on each side by the following steps. Here is an example of Role 1 as a IEC 60870-5-104 server, and Role 2 as a Modbus RTU/ASCII master.



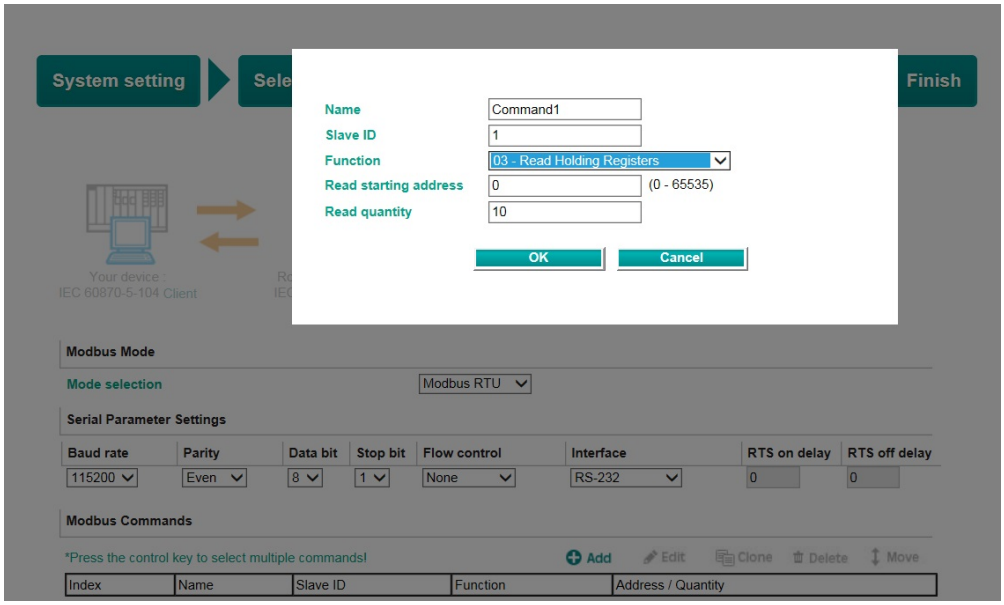
IEC 60870-5-104 Server settings: Configure COT size, ASDU address, and Listen port.



Modbus RTU/ASCII Master settings: Set Mode selection, Serial Parameters Settings and Modbus Commands.

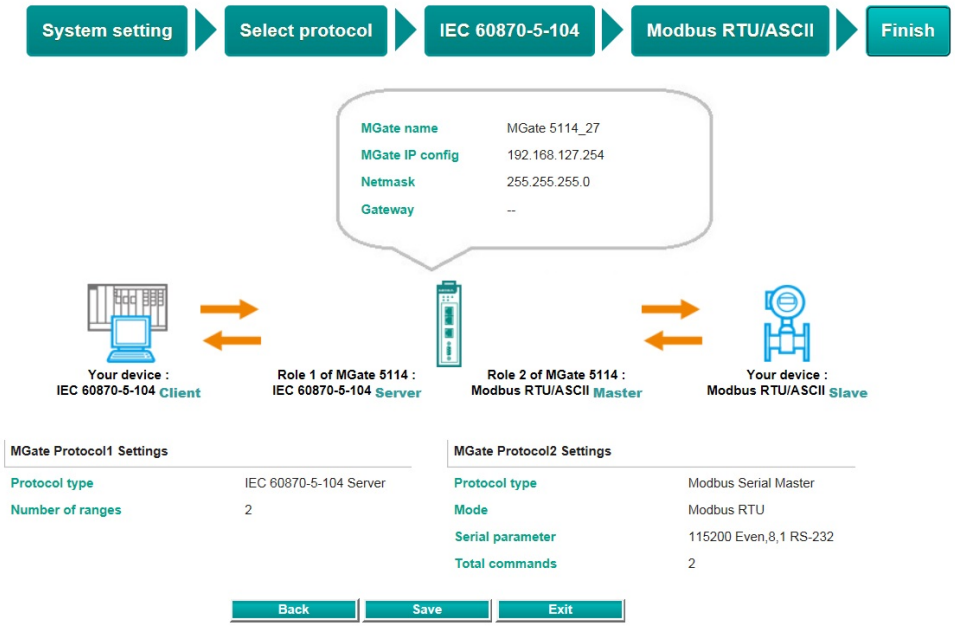


Modbus Command settings: For configuration details, refer to Chapter 4.



Quick Setup—Finish

Once all the configurations are done, you can check if the parameters are correct on this webpage. Click **Save** to make the parameters effective.



To view IEC 60870-5-104 and Modbus mapping status, click I/O data mapping. It will go to the Protocol Settings > I/O Data Mapping page. For additional details, refer to chapter 4, Protocol Settings—I/O Data Mapping.

4

Web Console Configuration and Troubleshooting

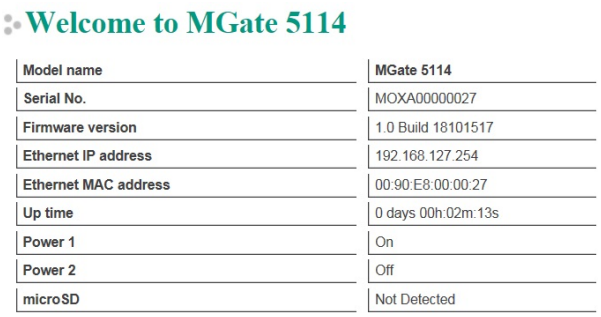
This chapter provides a quick overview of how to configure the MGate 5114 by web console.

The following topics are covered in this chapter:

- **Overview**
- **Basic Settings**
- **Network Settings**
- **Serial Settings**
- **Protocol Settings (Agent Mode)**
  - Protocol Settings—Protocol Conversion
  - Protocol Settings—Modbus TCP Client (Master) Settings
  - Protocol Settings—Modbus RTU/ASCII Master Settings
  - Protocol Settings—Modbus TCP Server (Slave) Settings
  - Protocol Settings—Modbus RTU/ASCII Slave Settings
  - Protocol Settings—IEC 60870-5-104 Client Settings
  - Protocol Settings—IEC 60870-5-104 Server Settings
  - Protocol Settings—IEC 60870-5-101 Master Settings
  - Protocol Settings—IEC 60870-5-101 Slave Settings
  - Protocol Settings—IO Data Mapping
- **System Management**
  - System Management—Accessible IP List
  - System Management—DoS Defense
  - System Management—System Log Settings
  - System Management—Auto Warning Settings
  - System Management—Email Alert
  - System Management—SNMP Trap
  - System Management—SNMP Agent
  - System Management—LLDP Settings
  - System Management—Certificate
  - System Management—Misc. Settings
  - System Management—Maintenance
- **System Monitoring (Troubleshooting)**
  - System Monitoring—System Status
  - System Monitoring—Protocol Status
- **Status Monitoring**

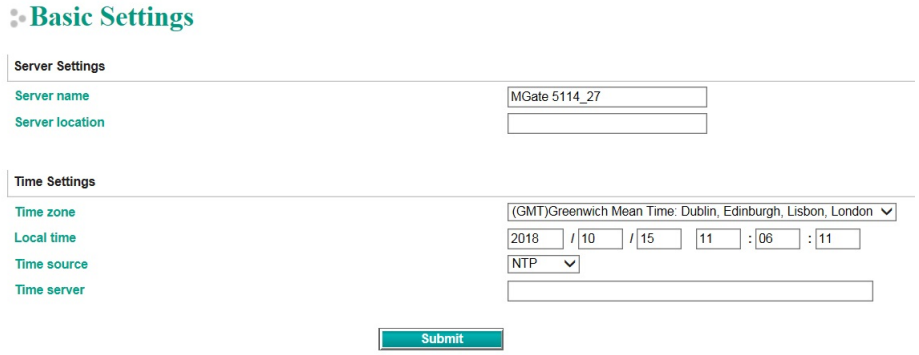
Overview

This section gives an overview of the MGate 5114 status.



Basic Settings

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



Server Setting

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

Time Settings

The MGate 5114 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 modify the real-time clock, select **Local time**. MGate's firmware will modify the GMT time according to the Time Zone.

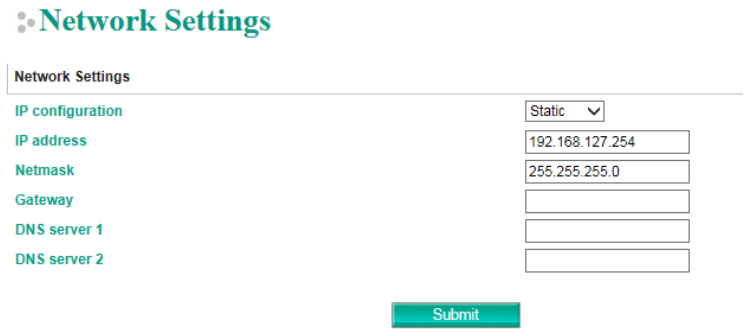
Parameter	Value	Description
Time Zone	User's selectable time zone	This field shows the currently selected time zone and allows you to select a different time zone.
Local Time	User's adjustable time.	(1900/1/1-2037/12/31)
Time Server	IP or Domain address (e.g., 192.168.1.1 or time.stdtime.gov.tw)	This 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.
Time Source	NTP or Protocol	Select the way to do time synchronization

ATTENTION

If the dispersion of the time server is higher than the client (MGate), the client will not accept NTP messages from the time server. MGate's dispersion is 1 second. You must configure your time server with a dispersion value lower than 1 sec for the NTP process to complete.

Network Settings

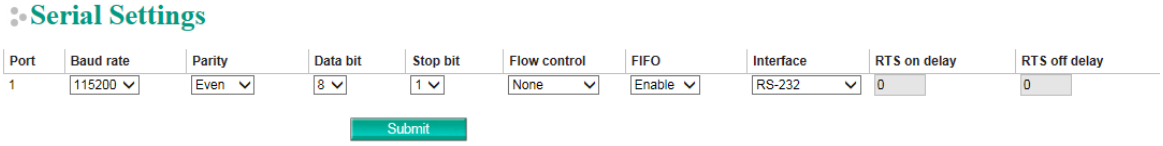
The Network Settings is where the unit's network settings are configured. You can modify the IP Configuration, IP Address, Netmask, Default Gateway, and DNS.



Parameter	Value	Description
IP Configuration	Static IP, DHCP, 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 5114's serial interface supports RS-232, RS-422, and RS-485 interfaces. You must configure the baudrate, parity, data bits, and stop bits before using the serial interface with Modbus RTU/ASCII or IEC 60870-5-101 protocol. Incorrect settings will result in communication failures.



Parameter	Value	Description
Baudrate	50 bps to 921600 bps	
Parity	None, Odd, Even, Mark, Space	
Data bits	7,8	
Stop bits	1, 2	
Flow control	None, RTS/CTS, RTS Toggle	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 (Agent Mode)

A typical MGate 5114 application consists of a PSCADA as a client/master and a field device as a server/slave. Both these components use different protocols and hence need a gateway in between to exchange data. The MGate can do the role of a gateway by acting as the server/slave when it is connected to PSCADA and the client/master when it is connected to a field device. Therefore, to configure an MGate, you must:

1. Select the correct protocols in the **Protocol Conversion** setting.
2. Configure MGate's Role 1 and Role 2. Configure the master side first followed by the slave side.

NOTE We suggest that you configure the master side first and then the slave side.

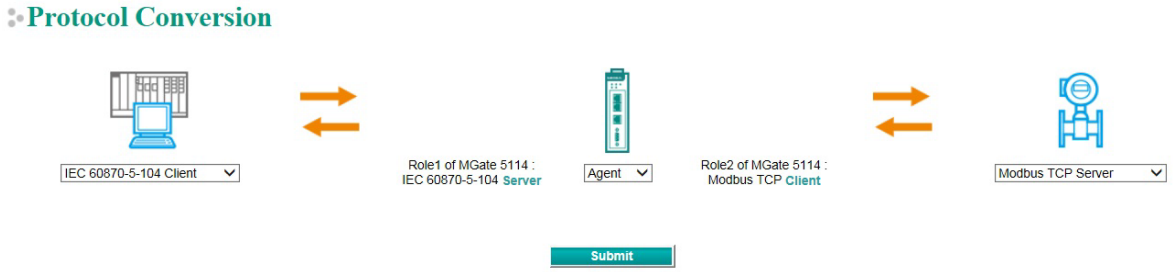
3. After the MGate configuration is completed, click **I/O data mapping** to view details on exchanging data with the PSCADA.

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

Protocol Settings—Protocol Conversion

The MGate 5114 supports Modbus RTU/ASCII, Modbus TCP, IEC 60870-5-101, and IEC 60870-5-104 protocols. The MGate fulfills a different role on each of its sides. Each role is determined by your device's settings. Therefore, set the role of each of your devices correctly.

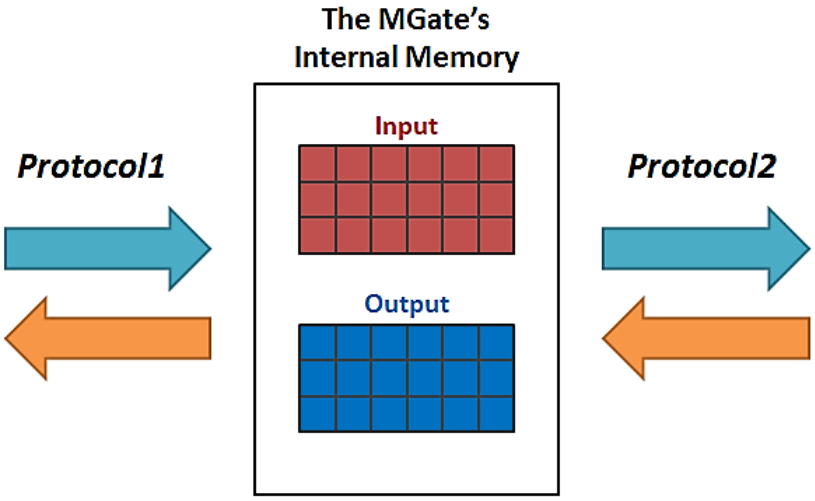
Below is the protocol combinations of the MGate 5114.



Device 1	Device 2
IEC 60870-5-104 Client	Modbus RTU/ASCII Slave
IEC 60870-5-104 Client	Modbus TCP Server
IEC 60870-5-104 Client	IEC 60870-5-101 Slave
IEC 60870-5-101 Master	Modbus TCP Server
IEC 60870-5-101 Master	IEC 60870-5-104 Server
Modbus TCP Client	IEC 60870-5-101 Slave
Modbus TCP Client	IEC 60870-5-104 Server
Modbus RTU/ASCII Master	IEC 60870-5-104 Server

The MGate 5114 runs agent mode when it is used for various different protocol conversions. In agent mode, the MGate 5114 uses an internal memory to exchange data.

The MGate's internal memory is divided into two parts—one for input and the other for output as shown in the illustration below. The internal memory concept is shown in the figure below:



To learn more about MGate's internal memory, refer to **Protocol Settings- I/O Data Mapping**.

After protocol selection, we have to configure each side of MGate's role. In a typical application, one side of MGate will be set as a server/slave and the other side will be set as a client/master. You will find the corresponding lists under **Protocol Settings**. The following configuration settings are possible:

A1. Modbus TCP Client (Master) Settings

A2. Modbus RTU/ASCII Master Settings

A3. Modbus TCP Server (Slave) Settings

A4. Modbus RTU/ASCII Slave Settings

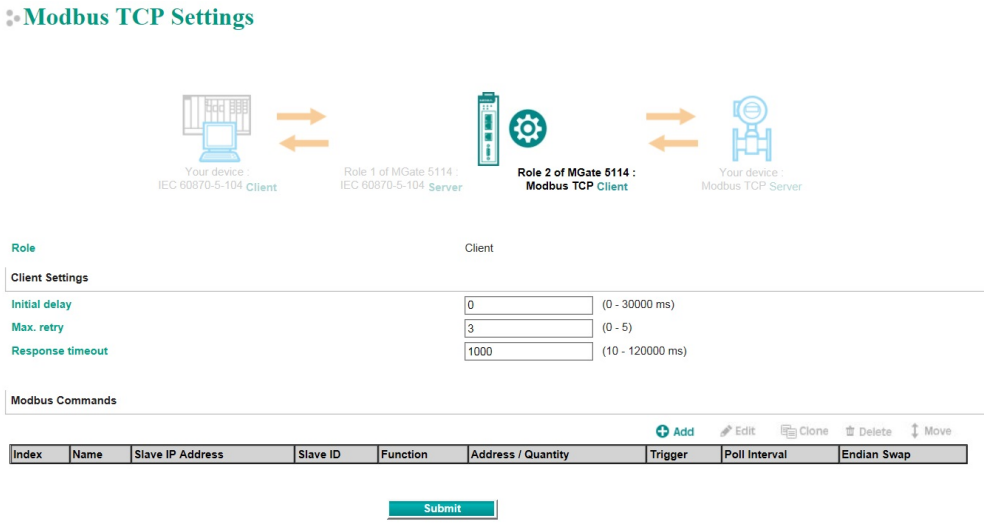
A5. IEC 60870-5-104 Client Settings

A6. IEC 60870-5-101 Master Settings

A7. IEC 60870-5-104 Server Settings

A8. IEC 60870-5-101 Slave Settings

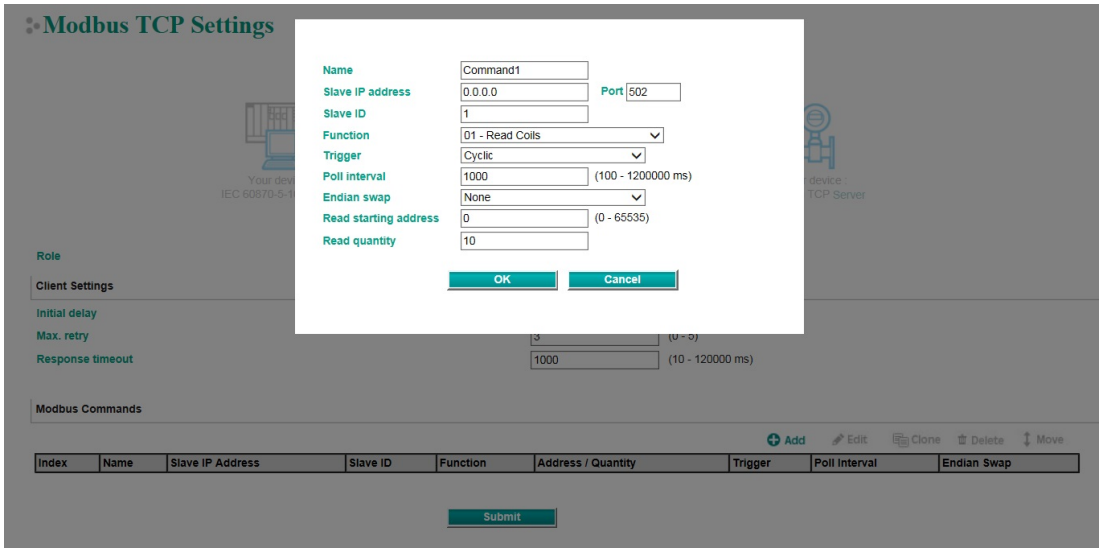
Protocol Settings—Modbus TCP Client (Master) Settings



Client Settings

Parameter	Value	Default	Description
Initial delay	0-30000 ms	0	Some Modbus 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	0-5	3	This is used to configure how many times the MGate will try to communicate with the Modbus slave when the Modbus command times out.
Response timeout	10-120000 ms	1000	The time taken by a slave device to respond to a request is defined by the device manufacturer based on the Modbus standard. A Modbus master can be configured to wait a certain amount of time for a slave's response. If no response is received within the specified time, the master will disregard the request and continue operation. This allows the Modbus system to continue the operation even if a slave device is disconnected or faulty. On the MGate 5114, the **Response timeout** field is used to configure how long the gateway will wait for a response from a Modbus slave. Refer to your device manufacturer's documentation to manually set the response timeout

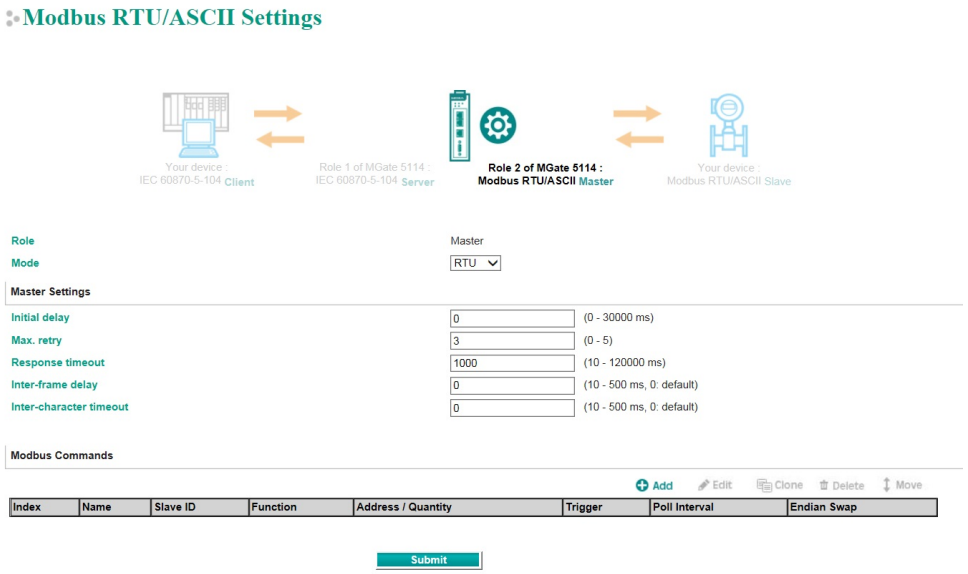
Add Modbus Commands



Parameter	Value	Default	Description
Name	(an alphanumeric string)	Command1	Max. 32 characters
Slave IP address	0.0.0.0 - 255.255.255.255	0.0.0.0	The IP address of a remote slave device.
Port	1-65535	502	The TCP port number of a remote slave device.
Slave ID	1-255	1	The Modbus slave ID
Function	1 – Read Coils 2 – Read Discrete Inputs 3 – Read Holding Registers 4 – Read Inputs Registers 5 – Write Single Coil 6 – Write Single Register 15 – Write Multiple Coils 16 – Write Multiple Registers 23 – Read/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.
Trigger	Cyclic Data Change Disable		Disable: The command is never sent Cyclic: The command is sent cyclically at the interval specified in the Poll Interval parameter. Data change: The data area is polled for changes at the time interval defined by Poll Interval. A command is issued when a change in data is detected.
Poll interval	100-1200000 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.

Parameter	Value	Default	Description
Endian swap	None Byte Word Byte and Word	None	Data Byte Swapping **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. **Byte and Word**: 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0D, 0x0C, 0x0B, 0x0A.
Read starting address	0-65535	0	Modbus register address.
Read quantity	Read Coils: 1 - 2000 Read Discrete Inputs: 1 - 2000 Read Inputs Registers: 1 - 125 Read Holding Registers: 1 - 125 Read/Write Multiple Registers: 1 - 125	10	Specifying how many items to read.
Write starting address	0-65535	0	Modbus register address.
Write quantity	Write Multiple Coils: 1 - 1968 Write Multiple Registers: 1 - 123 Read/Write Multiple Registers: 1 - 123	1	Specifying how many items to write into.
Fault protection	Keep latest data Clear all data bits to 0 Set to user defined value		If MGate's connection to the other side (server/slave) fails, the gateway will not be able to receive data, but the gateway will continuously send output data to the Modbus TCP server device. To avoid problems in this case, the MGate 5114 can be configured to react in one the following three ways: Keep latest data, clear data to zero, set the data bits to user-defined values.
Fault value		00 00	The user-defined values to write into the data bits when the **Set to user defined value** option is selected.
Fault timeout	100-65535 ms	6000	Defines the communication timeout for the opposite side.

Protocol Settings—Modbus RTU/ASCII Master Settings



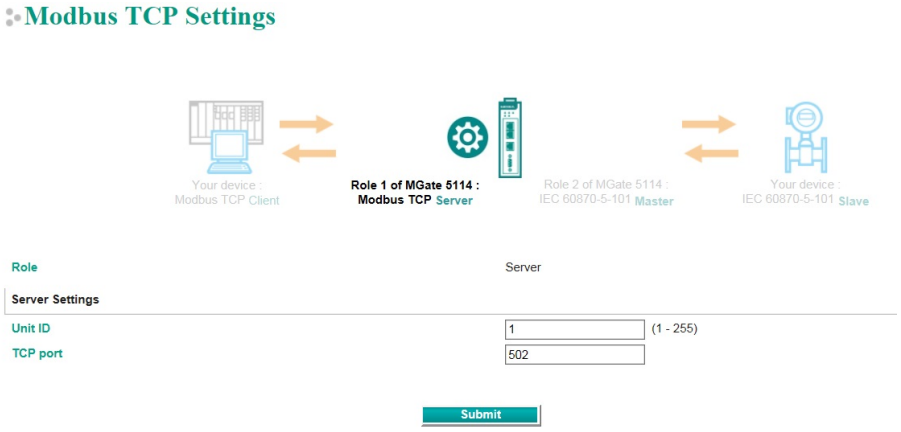
Master Settings

Parameter	Value	Default	Description
Mode	RTU or ASCII	RTU	The Modbus protocol type
Initial delay	0-30000 ms	0	Some Modbus 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	0-5	3	The number of times the master will retry the same request when the response times out.
Response timeout	10-120000 ms	1000	According to the Modbus standard, the time it takes for a slave device to respond to a request is defined by the device manufacturer. Based on this response time, a master can be configured to wait a certain amount of time for a slave's response. If no response is received within the specified time, the master will disregard the request and continue operation. This allows the Modbus system to continue operations even if a slave device is disconnected or faulty. On the MGate 5114, the **Response timeout** field is used to configure how long the gateway will wait for a response from a Modbus ASCII or RTU slave. Refer to your device manufacturer's documentation to manually set the response time.
Inter-frame delay (only for Modbus RTU)	10-500 ms	0	Use this function to determine the timeout interval between characters for Modbus devices that cannot receive Rx signals within an expected time interval. If the response is timed out, all received data will be discarded. The MGate 5114 will automatically determine the timeout interval if the timeout value is set to 0.
Inter-character timeout (only for Modbus RTU)	10-500 ms	0	The users can determine the time delay to transmit the data frame received from the slave device to the upstream. The MGate 5114 will automatically determine the time interval if it is set to 0.

Add Modbus Commands

Refer to *Modbus TCP Client (Master) Settings*.

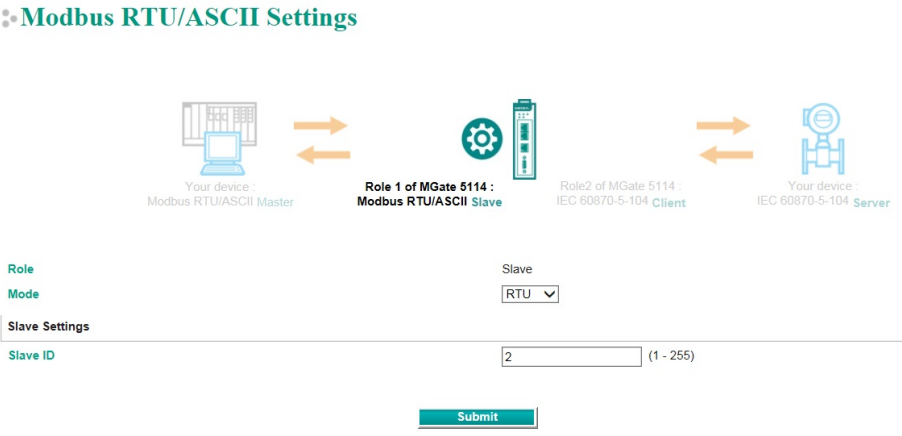
Protocol Settings—Modbus TCP Server (Slave) Settings



Server Settings

Parameter	Value	Default	Description
Unit ID	1-255	1	The Modbus slave ID that this slave module will accept.
TCP port	1-65535	502	The TCP port number.

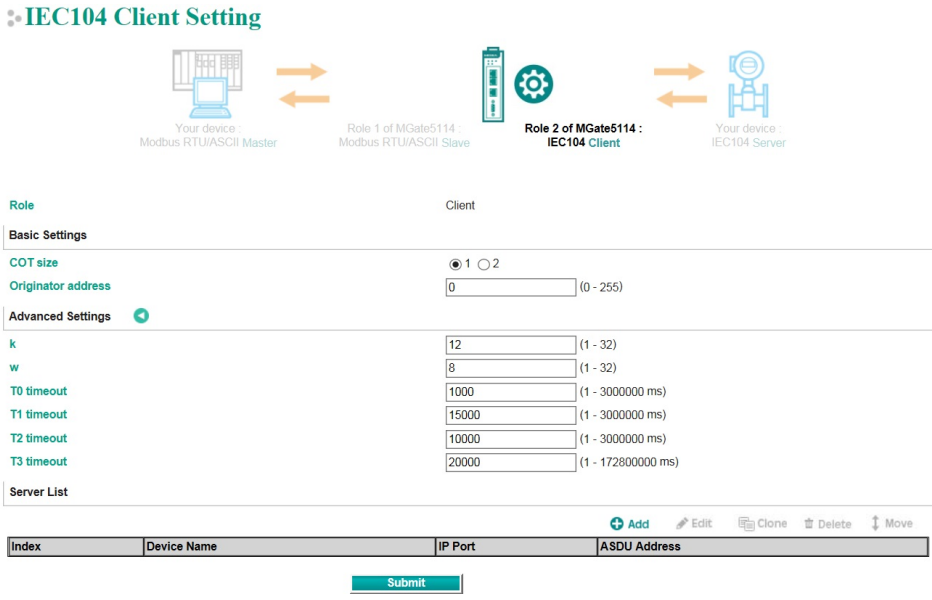
Protocol Settings—Modbus RTU/ASCII Slave Settings



Slave Settings

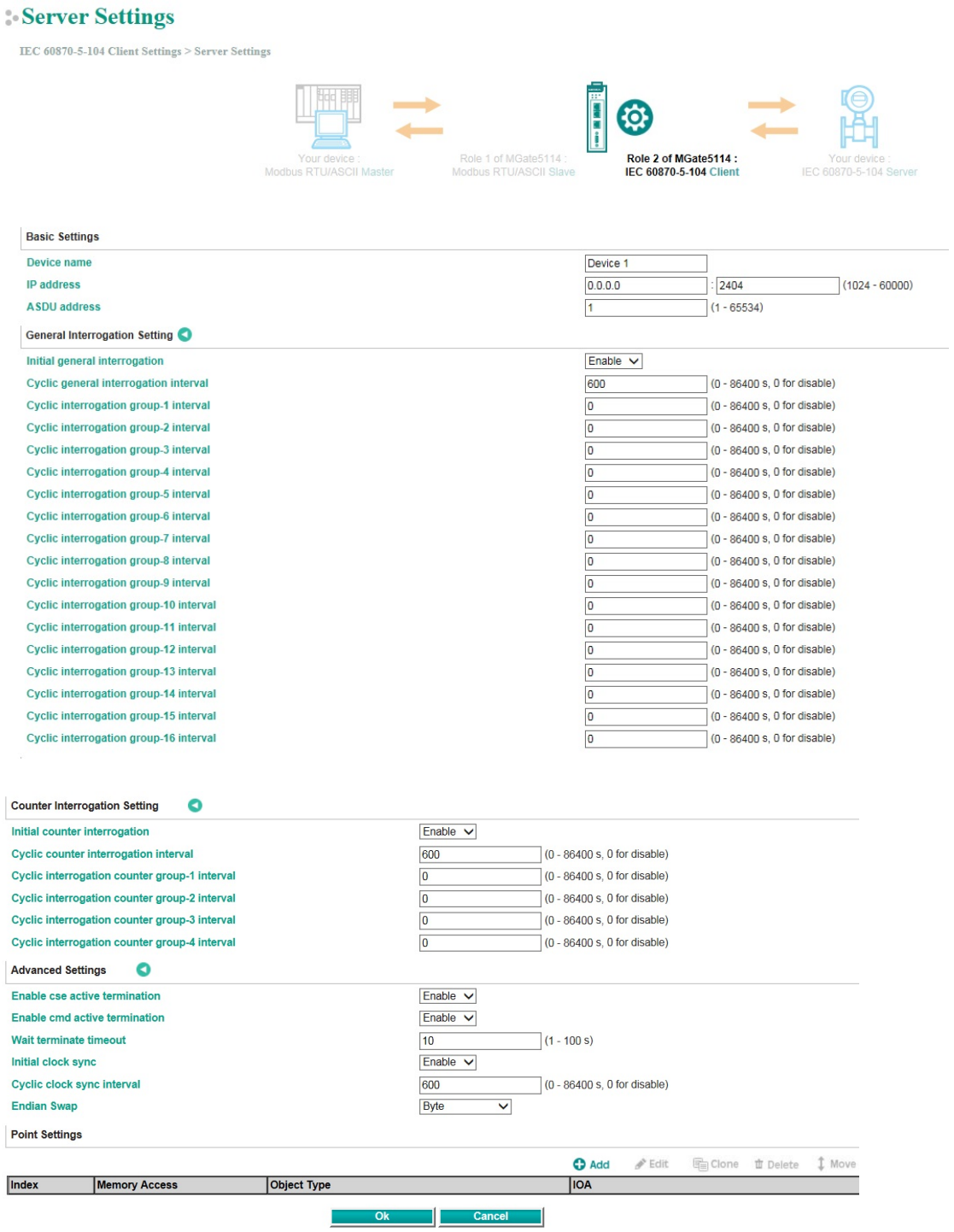
Parameter	Value	Default	Description
Mode	RTU or ASCII	RTU	The Modbus protocol type
Slave ID	1-255	2	The Modbus slave ID that this slave module will accept.

Protocol Settings—IEC 60870-5-104 Client Settings



Parameter	Value	Default	Description
COT size	1-2	2	Set the size of ASDU COT field
Originator address	0-255	0	The address of the IEC 60870-5-104 client
k	1-32	12	Maximum number of unacknowledged I format transmitted APDUs
w	1-32	8	Maximum number of unacknowledged I format received APDUs
T0 timeout	1-3000000 ms	1000	Timeout of determination if a connection has been lost with the remote server
T1 timeout	1-3000000 ms	15000	Timeout of waiting for acknowledgement of a transmitted APDU
T2 timeout	1-3000000 ms	10000	Timeout of when to send S-format to the host to acknowledge outstation messages received
T3 timeout	1-172800000 ms	20000	Timeout of sending test frame to prevent from long idle state

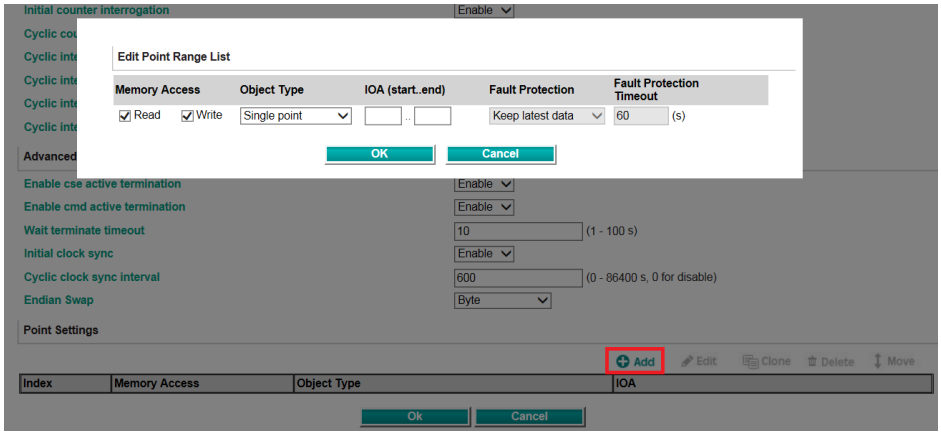
Add IEC 60870-5-104 Server List



Parameter	Value	Default	Description
Device name	An alphanumeric string	Device 1	You can enter a name to help you identify the unit, such as the function, etc.
IP address	IP: 0.0.0.0 – 255.255.255.255 TCP port: 1024 - 60000	0.0.0.0:2404	Indicate IP address of IEC 60870-5-104 server that MGate connects to
ASDU address	0-65534	1	Indicate ASDU address of IEC 60870-5-104 server that MGate connects to

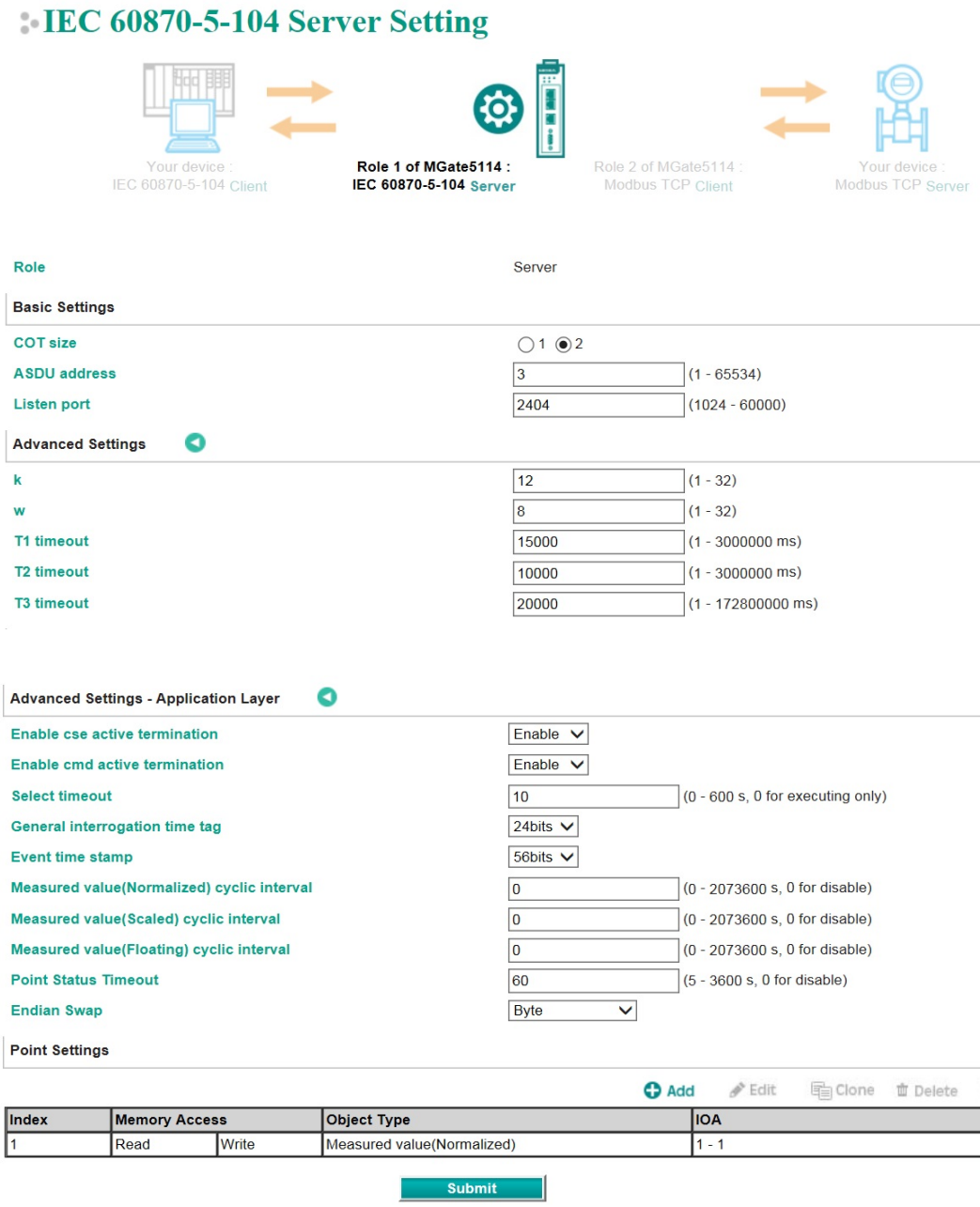
Parameter	Value	Default	Description
Initial general interrogation	Enable/Disable	Enable	IEC 60870-5-104 client does general interrogation with server after connecting
Cyclic general interrogation interval	0-86400 s; 0 for disable	600	General interrogation polling intervals
Cyclic interrogation group interval	0-86400 s; 0 for disable	0	Interrogation group polling intervals
Initial counter interrogation	Enable/Disable	Enable	IEC 60870-5-104 client does counter interrogation with server after connecting
Cyclic counter interrogation interval	0-86400 s; 0 for disable	600	Counter interrogation polling intervals
Cyclic interrogation counter group interval	0-86400 s; 0 for disable	0	Interrogation counter group polling intervals
Enable cse active termination	Enable/Disable	Enable	IEC 60870-5-104 client expects ACT TERM from slave upon completion of commands CSENA, CSENB, CSENC
Enable cmd active termination	Enable/Disable	Enable	IEC 60870-5-104 client expects ACT TERM from slave upon completion of commands CSCNA, CDCNA, CRCNA, CBONA
Wait termination timeout	1-100 s	10	The period of time waiting for ACT TERM from server upon completion of all control commands
Initial clock sync	Enable/Disable	Enable	IEC 60870-5-104 client synchronize clock of IEC 60870-5-104 server after connecting
Cyclic clock sync interval	0-86400 s; 0 for disable	600	Cyclic clock sync command polling intervals
Endian swap	None Byte Word Byte and Word	None	Data Byte Swapping **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 **Byte and Word:** 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0D, 0x0C, 0x0B, 0x0A,

When connecting to an IEC 60870-5-104 server, you have to add the objects you want to collect and configure them.



Parameter	Value	Default	Description
Memory Access—Read/Write	Check or uncheck	Check	To define the read/write capability of the object
Object Type	Single point, Double point, Step position, Bitstring of 32 bit, Measured value (Normalized), Measured value (Scaled), Measured value (Floating), Integrated totals	Single point	The server object that the MGate would like to collect
IOA(start…end)	1 – 16777215	-	Set a range of IOA
Fault Protection	Keep latest data Clear all data bits to 0 Set to user defined value	Keep latest data	If the MGate's connection to the other side (server/slave) fails, the gateway will not be able to receive data, but the gateway will continuously send output data to the Modbus TCP server device. To avoid problems in this case, the MGate 5114 can be configured to react in one the following three ways: Keep latest data, clear data to zero, set the data bits to user-defined values.
Fault Protection Timeout	1-86400 s	60s	Defines the communication timeout for the opposite side.

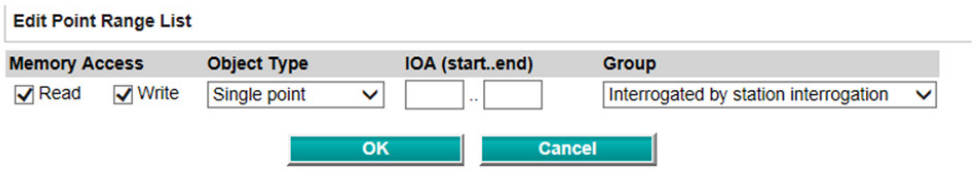
Protocol Settings—IEC 60870-5-104 Server Settings



Parameter	Value	Default	Description
COT size	1-2	2	Set the size of ASDU COT field
ASDU address	1-65534	3	The address of the IEC 60870-5-104 server
Listen port	1024-60000	2404	Set IEC 60870-5-104 server listen port
k	1-32	12	Maximum number of unacknowledged I format transmitted APDUs
w	1-32	8	Maximum number of unacknowledged I format received APDUs
T1 timeout	1-3000000 ms	15000	Timeout of waiting for acknowledgement of a transmitted APDU

Parameter	Value	Default	Description
T2 timeout	1-3000000 ms	10000	Timeout of when to send S-format to the host acknowledge to acknowledge slave messages received
T3 timeout	1-172800000 ms	20000	Timeout of sending test frame to prevent from long idle state
Enable cse active termination	Enable/Disable	Enable	Send ACT TERM to Master upon completion of commands CSENA, CSENB, CSENC.
Enable cmd active termination	Enable/Disable	Enable	Send ACT TERM to Master upon completion of commands CSCNA, CDCNA, CRCNA, CBONA
Select timeout	0-600 s; 0 for executing only	10	0: Do not need to receive a select command before receiving an execute command Others: A valid execute command must be received during timeout after receiving select command
General interrogation time tag	None 24bits 56 bits	None	General interrogation response with/without time stamp
Event timestamp	None 24bits 56 bits	56 bits	Event with/without time stamp
Measured value (Normalized) cyclic interval	0-2073600 s; 0 for disable	0	Cyclic send Measured value (normalized value)
Measured value (Scaled) cyclic interval	0-2073600 s; 0 for disable	0	Cyclic send Measured value (scaled value)
Measured value (Floating) cyclic interval	0-2073600 s; 0 for disable	0	Cyclic send Measured value (short floating point number)
Point Status Timeout	5-3600 s; 0 for disable	60	Check the MGate's internal memory to see if the object point updates periodically. Once timeout happens, the object point's flag will change to "invalid".
Endian Swap	None Byte Word Byte and Word	Byte	Data Byte Swapping **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. **Byte and Word:** 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0D, 0x0C, 0x0B, 0x0A.

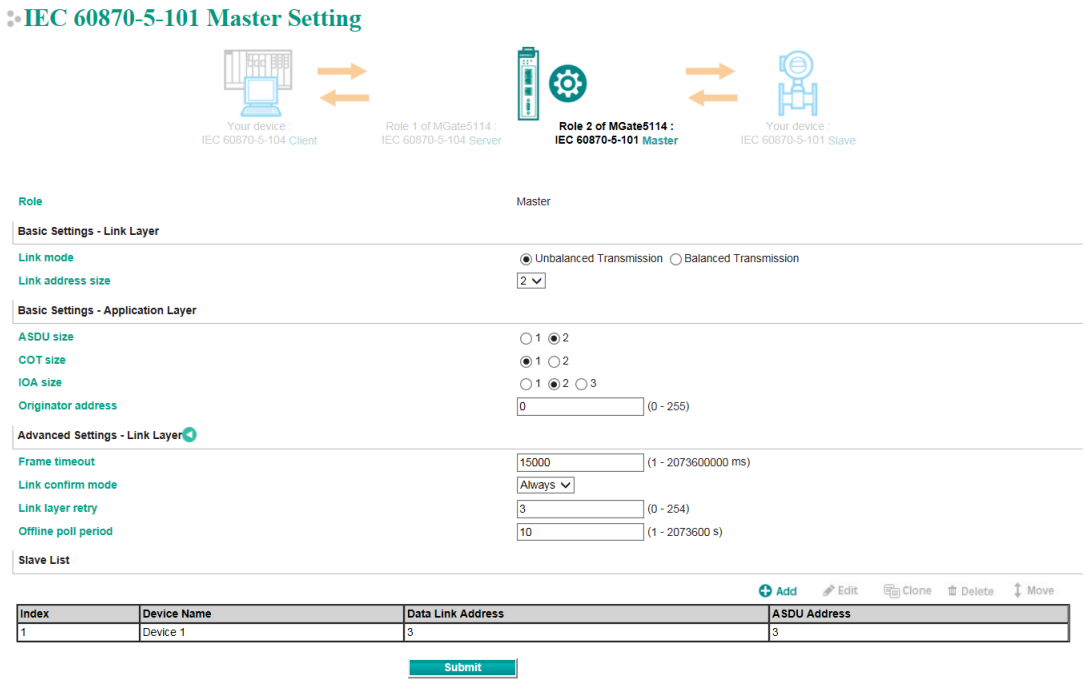
When MGate functions as an IEC 60870-5-104 server, you have to create the object space to put the data coming from Modbus TCP/RTU/ASCII or IEC 60870-5-101 at the other side. The points can be defined in the range, and can be set as station interrogation or group interrogation. Then, the data can be monitored or controlled by your IEC 60870-5-104 client.



Parameter	Value	Default	Description
Memory Access – Read/Write	Check or uncheck	Check	To define the read/write capability of the object
Object Type	Single point, Double point, Step position, Bitstring of 32 bit, Measured value (Normalized), Measured value (Scaled), Measured value (Floating), Integrated totals	Single point	The objects that MGate would like to collect
IOA(start…end)	1 – 16777215	-	Set a range of IOA
Group	Integrated by station interrogation, Integrated by group 1~16 interrogation	Integrated by station interrogation	The definition of the objects

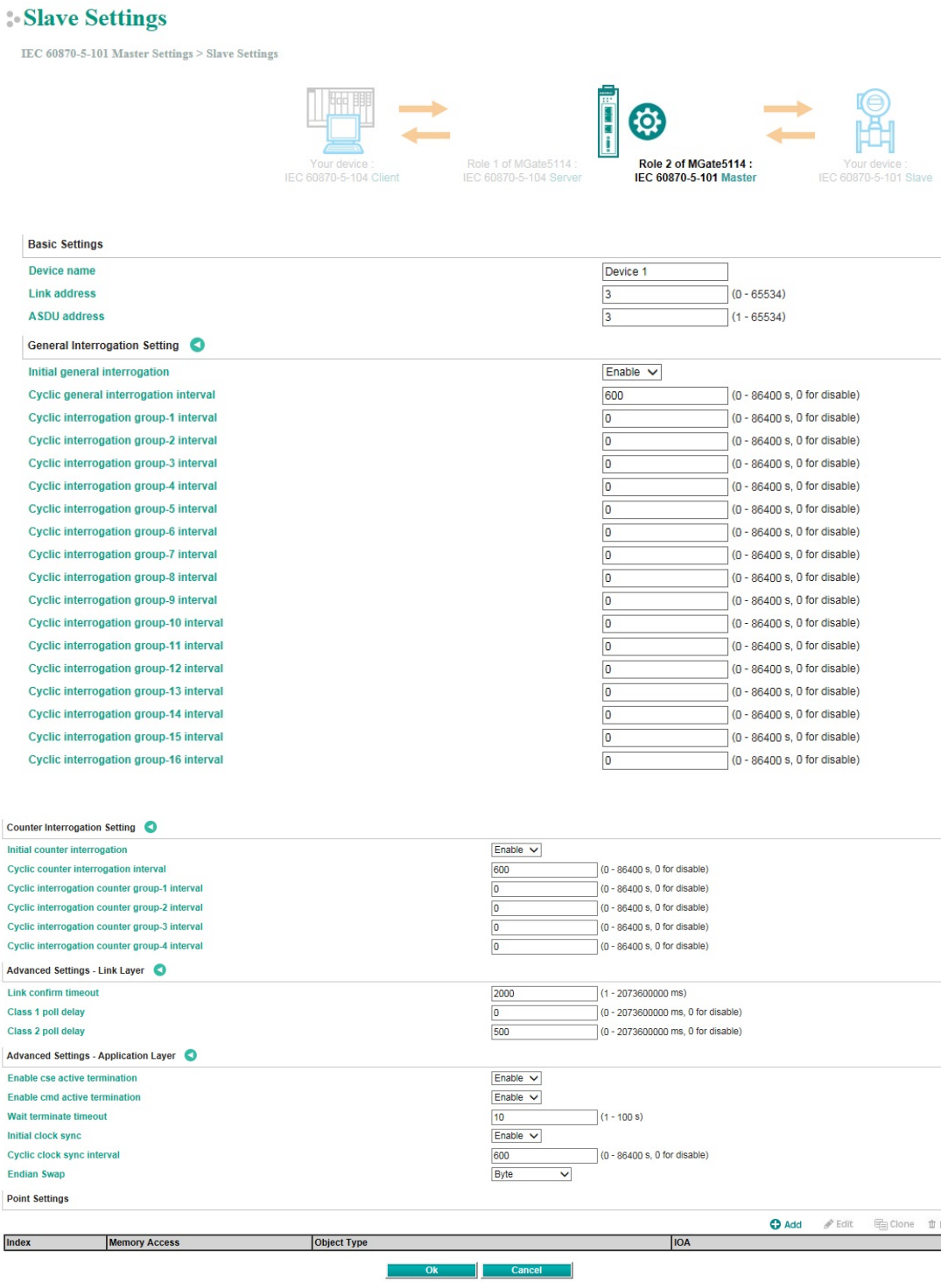
Protocol Settings—IEC 60870-5-101 Master Settings

You can configure parameters related to the IEC 60870-5-101 communication.



Parameter	Value	Default	Description
Link mode	Unbalanced Transmission/ Balanced Transmission	Unbalanced Transmission	The transmission ways of IEC 60870-5-101 protocol
Link address size	1-2	2	Set the size of the Link address field specified in Link transactions for the relevant slave session
ASDU size	1-2	2	Set the size of the ASDU address field for the relevant slave session
COT size	1-2	1	Set the size of ASDU COT field
IOA size	1-3	2	Set the size of the IOA address field for the relevant slave session
Originator address	0-255	0	The address of the IEC 60870-5-101 master
Frame timeout	1-2073600000 ms	15000	Timeout for serial port to decide whether a frame is completely received or not
Link confirm mode	Always/Never	Always	Always: Mode for master to use SEND-CONFIRM frame Never: SEND-NO REPLY frame(Never) to send user data
Link layer retries	0-255	3	The number of retry when link confirm timeout
Offline poll period	1-2073600 s	10	Time for master to wait before resend request status of link to slave after Trp timeout

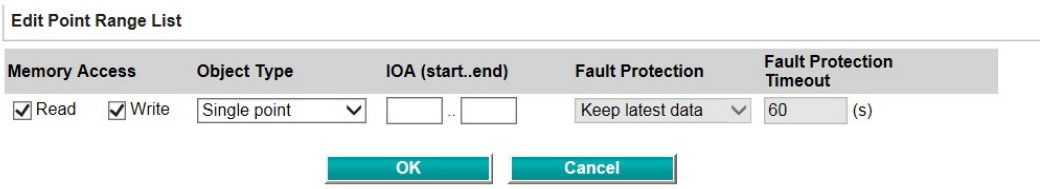
After basic and advanced settings, you have to configure the slave lists of which MGate you would like to connect to.



Parameter	Value	Default	Description
Device Name	An alphanumeric string	Device 1	You can enter a name to help you identify the unit, such as the function, etc.
Link address	0-65534	3	Indicate link address of IEC 60870-5-101 slave that the MGate connects to
ASDU address	0-65534	3	Indicate ASDU address of IEC 60870-5-101 slave that the MGate connects to

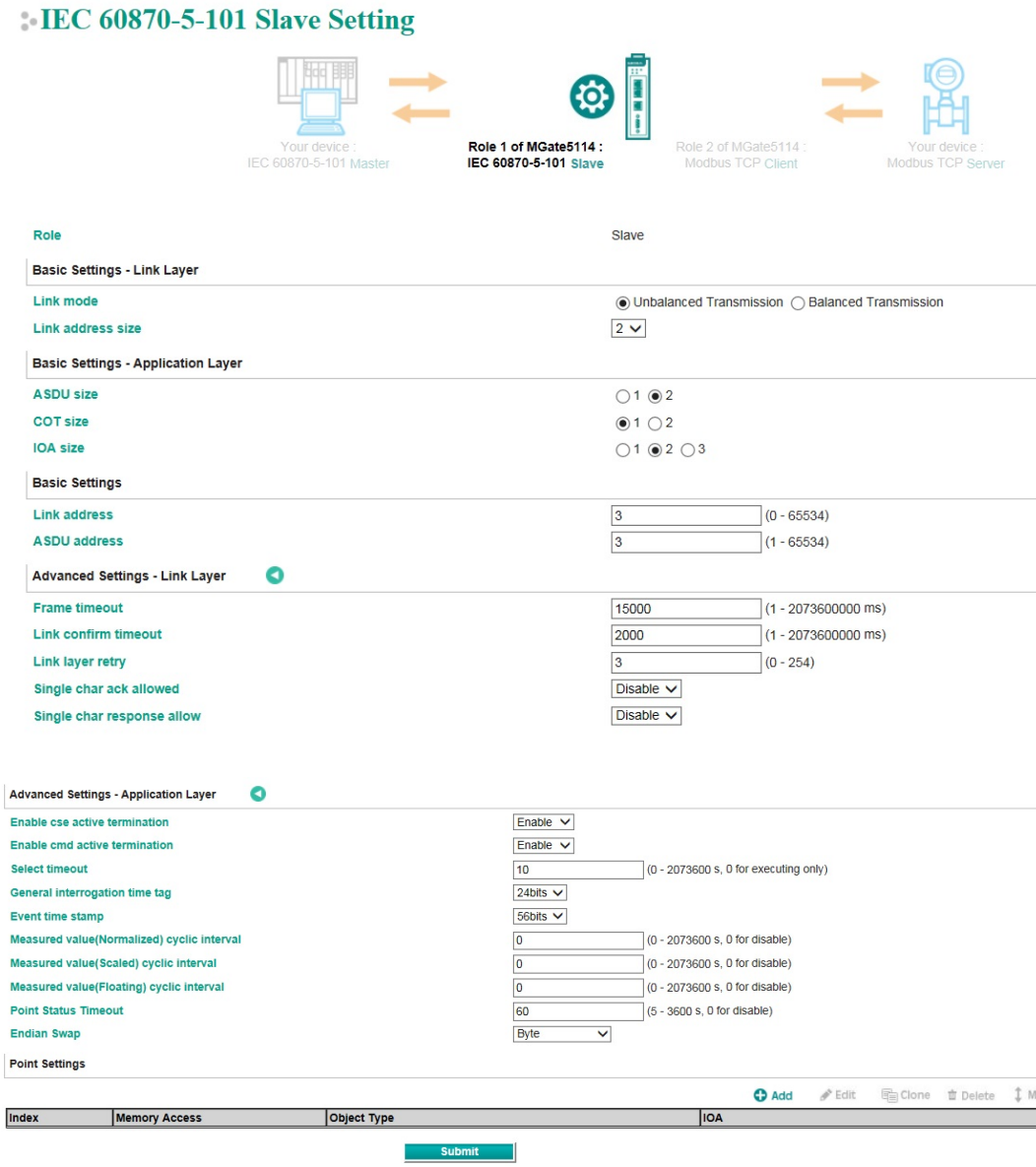
Parameter	Value	Default	Description
Initial general interrogation	Enable/Disable	Enable	IEC 60870-5-101 master does general interrogation with slave or not
Cyclic general interrogation interval	0-86400s, 0 for disable	600	Cyclic general interrogation command polling time to IEC 60870-5-101 slave
Cyclic interrogation group interval	0-86400s, 0 for disable	0	Cyclic interrogation group command polling time to IEC 60870-5-101 slave
Initial counter interrogation	Enable/Disable	Enable	IEC 60870-5-101 master does counter interrogation with slave
Cyclic counter interrogation interval	0-86400s, 0 for disable	600	Cyclic counter interrogation command polling time to IEC 60870-5-101 slave
Cyclic interrogation counter group interval	0-86400s, 0 for disable	0	Cyclic interrogation counter polling time to IEC 60870-5-101 slave
Link confirm timeout	1-2073600000 ms	2000	Timeout for repetition of frames in IECIEC 60870-5-101 data link layer(T0)
Class 1 poll delay	0-2073600000 ms, 0 for disable	0	Set the minimum milliseconds to delay between Class 1 polls for pending data
Class 2 poll delay	0-2073600000 ms, 0 for disable	500	Set the minimum milliseconds to delay between Class 2 polls for pending data
Enable cse active termination	Enable/Disable	Enable	IEC 60870-5-101 master expects ACT TERM from slave upon completion of commands CSENA, CSENB, CSENC
Enable cmd active termination	Enable/Disable	Enable	IEC 60870-5-101 master expects ACT TERM from slave upon completion of commands CSCNA, CDCNA, CRCNA, CBONA
Wait terminate timeout	1-100s	10	The period of time waiting for ACT TERM from slave upon completion of all control commands
Initial clock sync	Enable/Disable	Enable	IEC 60870-5-101 master synchronize clock of IEC 60870-5-101 slave or not
Cyclic clock sync interval	0-86400s, 0 for disable	600	Cyclic clock sync command polling time to IEC 60870-5-101 slave
Endian swap	None Byte Word Byte and Word	Byte	Data Byte Swapping **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. **Byte and Word:** 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0D, 0x0C, 0x0B, 0x0A.

When the MGate functions as an IEC 60870-5-101 master, you have to create space to collect the data from IEC 60870-5-101 slave device. The points can be defined in the range with different object types.



Parameter	Value	Default	Description
Memory Access – Read/Write	Check or uncheck	Check	To define the read/write capability of the object
Object Type	Single point, Double point, Step position, Bitstring of 32 bit, Measured value(Normalized), Measured value(Scaled), Measured value(Floating), Integrated totals	Single point	The server object that MGate would like to collect
IOA(start…end)	1–16777215	-	Set a range of IOA
Fault Protection	Keep latest data Clear all data bits to 0 Set to user defined value	Keep latest data	If MGate's connection to the other side (server/slave) fails, the gateway will not be able to receive data, but the gateway will continuously send output data to the Modbus TCP server device. To avoid problems in this case, the MGate 5114 can be configured to react in one the following three ways: Keep latest data, clear data to zero, set the data bits to user-defined values.
Fault Protection Timeout	1–16777215s	60s	Defines the communication timeout for the opposite side.

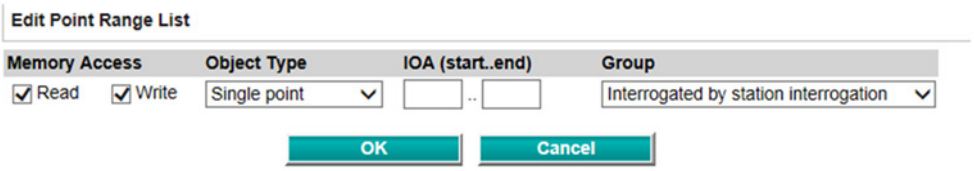
Protocol Settings—IEC 60870-5-101 Slave Settings



Parameter	Value	Default	Description
Link mode	Unbalanced Transmission/ Balanced Transmission	Unbalanced Transmission	The transmission ways of IEC 60870-5-101 protocol
Link address size	1-2	2	Set the size of the Link address field specified in Link transactions for the relevant slave session
ASDU size	1-2	2	Set the size of the ASDU address field for the relevant slave session
COT size	1-2	1	Set the size of ASDU COT field
IOA size	1-3	2	Set the size of the IOA address field for the relevant slave session
Link address	0-65534	3	Indicate the MGate's link address of IEC 60870-5-101 slave
ASDU address	1-65534	3	Indicate the MGate's ASDU address of IEC 60870-5-101 slave

Parameter	Value	Default	Description
Frame timeout	1-2073600000 ms	15000	Timeout for serial port to decide whether a frame is completely received or not
Link confirm timeout	1-2073600000 ms	2000	Timeout for repetition of frames in IEC 60870-5-101 data link layer(T0)
Link layer retries	0-254	3	The number of retry when link confirm timeout
Single char ack allowed	Enable/Disable	Disable	Slave will transmit a single character ACK instead of a confirm for SEND-CONFIRM frame
Single char response allow	Enable/Disable	Disable	Slave will transmit a single character response instead of a response for REQUEST-RESPONSE frame
Select timeout	0-2073600s, 0 for executing only	10	0: Do not need to receive a select command before receiving an execute command Others: A valid execute command must be received during timeout after receiving select command
General interrogation time tag	None 24bits 56 bits	24 bits	General interrogation response with/without timestamp
Event time stamp	None 24bits 56 bits	56 bits	Event with/without timestamp
Measured value(N)cyclic interval	0-2073600s, 0 for disable	0	Cyclic send Measured value, normalized value
Measured value(S)cyclic interval	0-2073600s, 0 for disable	0	Cyclic send Measured value, scaled value
Measured value(F)cyclic interval	0-2073600s, 0 for disable	0	Cyclic send Measured value, short floating point number
Point Status Timeout	0: Disabled 5 – 3600 second	60	If the data objects doesn't update in a period of time, the timeout will be happened with invalid flag for the object.
Endian Swap	None Byte Word Byte and Word	Byte	Data Byte Swapping **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. **Byte and Word:** 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0D, 0x0C, 0x0B, 0x0A.

When the MGate acts as an IEC 60870-5-101 slave, you have to create the object space to put the data coming from Modbus TCP or IEC 60870-5-104 at the other side. The points can be defined in the range with different object types. Then, the data can be monitored or controlled by your IEC 60870-5-101 master.



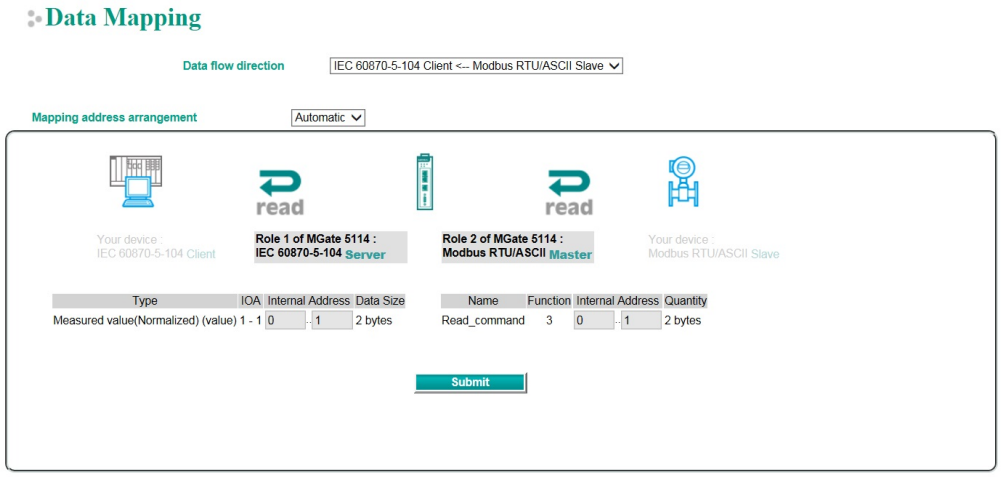
Parameter	Value	Default	Description
Memory Access – Read/Write	Check or uncheck	Check	To define the read/write capability of the object
Object Type	Single point, Double point, Step position, Bitstring of 32 bit, Measured value (Normalized), Measured value (Scaled), Measured value (Floating), Integrated totals	Single point	The objects that MGate would like to collect
IOA(start…end)	1-16777215	-	Set a range of IOA
Group	Integrated by station interrogation, Integrated by group 1~16 interrogation	Integrated by station interrogation	The definition of the objects

Protocol Settings—IO Data Mapping

After you have configured each side (client/master and server/slave) of the MGate settings, the PSCADA/PLC in the master role will start monitoring and controlling the remote slave device. The MGate uses its internal memory to facilitate data exchange. The I/O Data Mapping page shows the complete mapping status. There are two communication directions: read and write directions. You can change the settings of Data flow direction to show read or write mapping status.

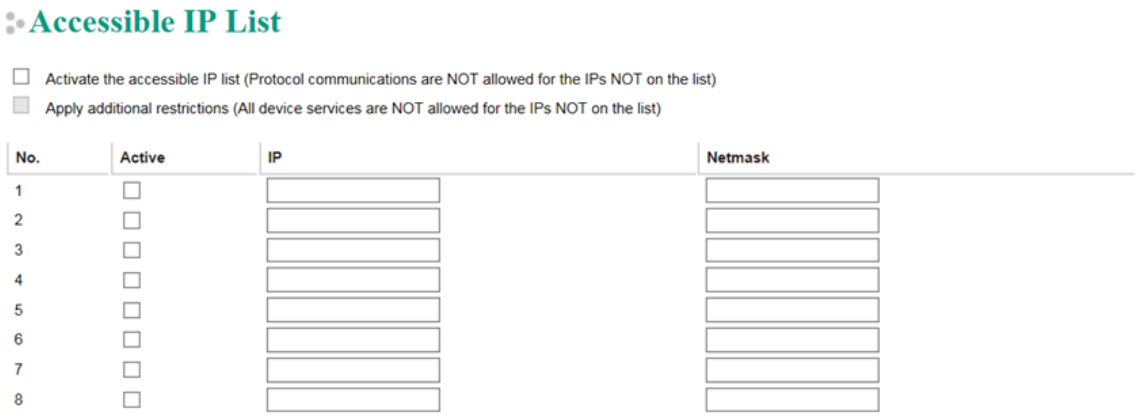
For example, see the read direction example: The MGate 5114 as Modbus RTU/ASCII master and IEC 60870-5-104 server. It shows how IEC 60870-5-104 client reads the data from the Modbus RTU/ASCII slave device.

As you can see, Modbus RTU master sends a "Read_command" to read the value from the Modbus slave device. If IEC 60870-5-104 client wants to read the value from the "read_command", it has to read the data from "Measured value(N)" IOA "1" because of same internal address. If you find that the data mapping is not correct, you can change the setting of Mapping address arrangement from "Automatic" to "Manual". Then, you can adjust internal address by yourself.



System Management

System Management—Accessible IP List



These settings are used to restrict access to the module by the IP address. Only IP addresses on the list will be allowed access to the device. The restriction difference listed as below table: (check box "Apply additional restrictions" only can be activated if "Active the accessible IP list" is activated.

Active the accessible IP list	Apply additional restrictions	IPs on the list (Active checked)	IPs NOT on the list (Active NOT checked)
✓		All protocol communication and services* are allowed.	Protocol communication is not allowed, but services* are still allowed.
✓	✓	All protocol communication and services* are allowed.	All services* are not allowed.

*Services indicates HTTP, HTTPS, TELNET, SSL, SNMP, SMTP, DNS, NTP, DSU (Device Search Utility)

You may add a specific address or range of addresses by using a combination of an IP address and a 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").

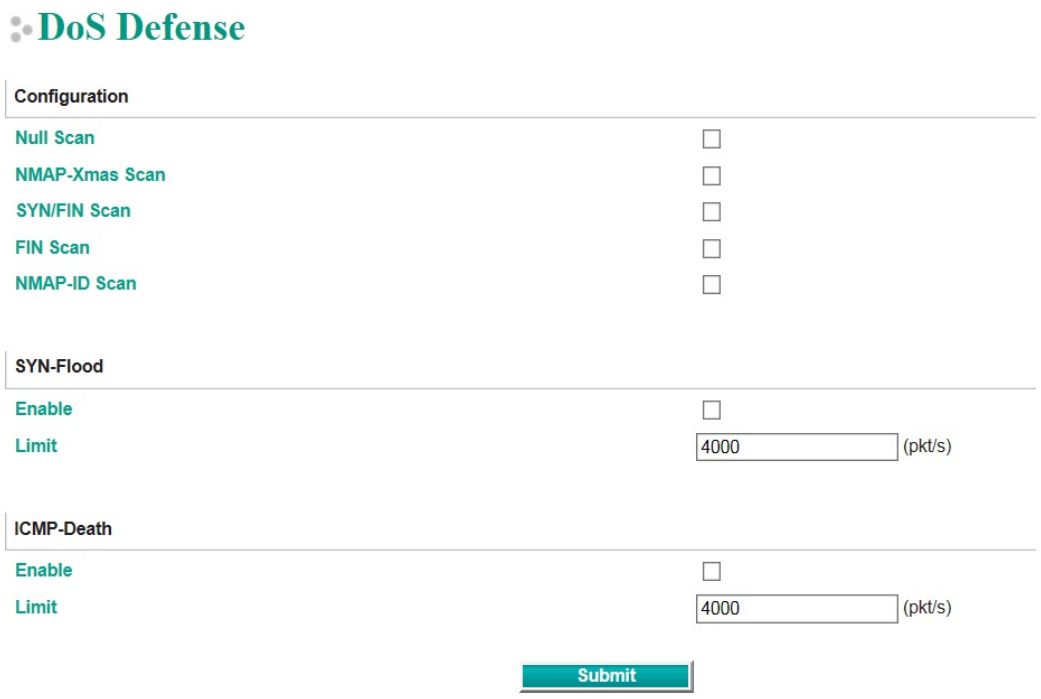
To allow access to all IP addresses: Make sure that Enable the accessible IP list is not checked. These settings are used to restrict access to the module by the IP address. Only IP addresses on the list will be allowed access to the device. You may add a specific address or range of addresses by using a combination of an IP address and a netmask as follows:

Additional configuration examples are shown in the following table:

Allowed hosts	Entered IP address/Netmask
Any host	Disable "Accessible IP List" function
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

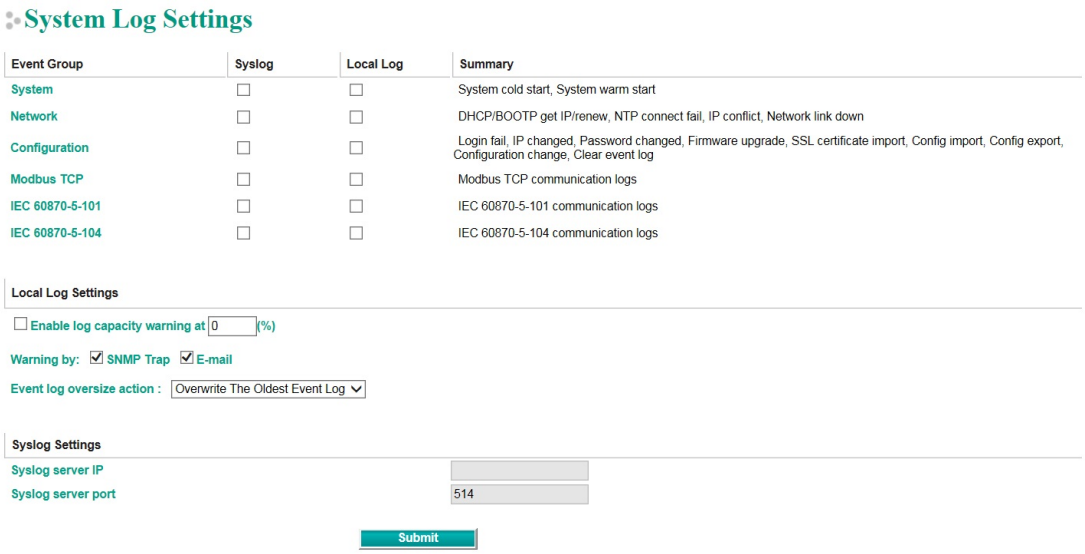
System Management—DoS Defense

Users can select from several options to enable DoS Defense in order to fend off cybersecurity attacks. A denial-of-service (DoS) attack is an attempt to make a machine or a network resource unavailable. Users can select from the following options to counter DoS attacks.



System Management—System Log Settings

The system log settings enable the MGate firmware to record important events, which can be record in two ways: Syslog and Local Log (stored in the MGate).



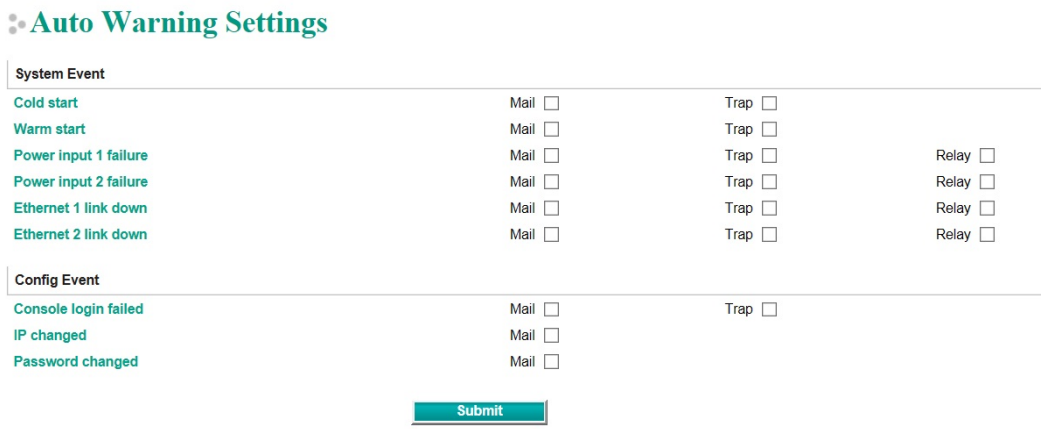
The available information that can be recorded includes the following events:

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, Configuration Change, Clear Event Log
Modbus TCP	Modbus TCP communication logs
IEC 60870-5-101	IEC 60870-5-101 communication logs
IEC 60870-5-104	IEC 60870-5-104 communication logs

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

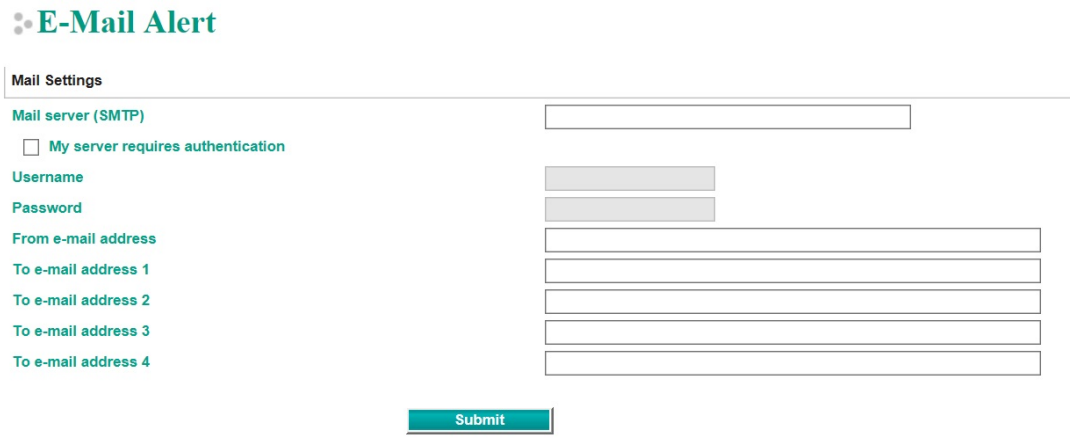
Syslog Settings	Description
Syslog server IP	IP address of a server which will record the log data
Syslog server port	514

System Management—Auto Warning Settings



Auto Warning is triggered by different events. When a checked trigger condition 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 start blinking. To enable an email alert, configure the email address on the **Email Alert** page. Likewise, to enable SNMP trap alerts, configure SNMP trap server on the **SNMP Trap** page.

System Management—Email Alert

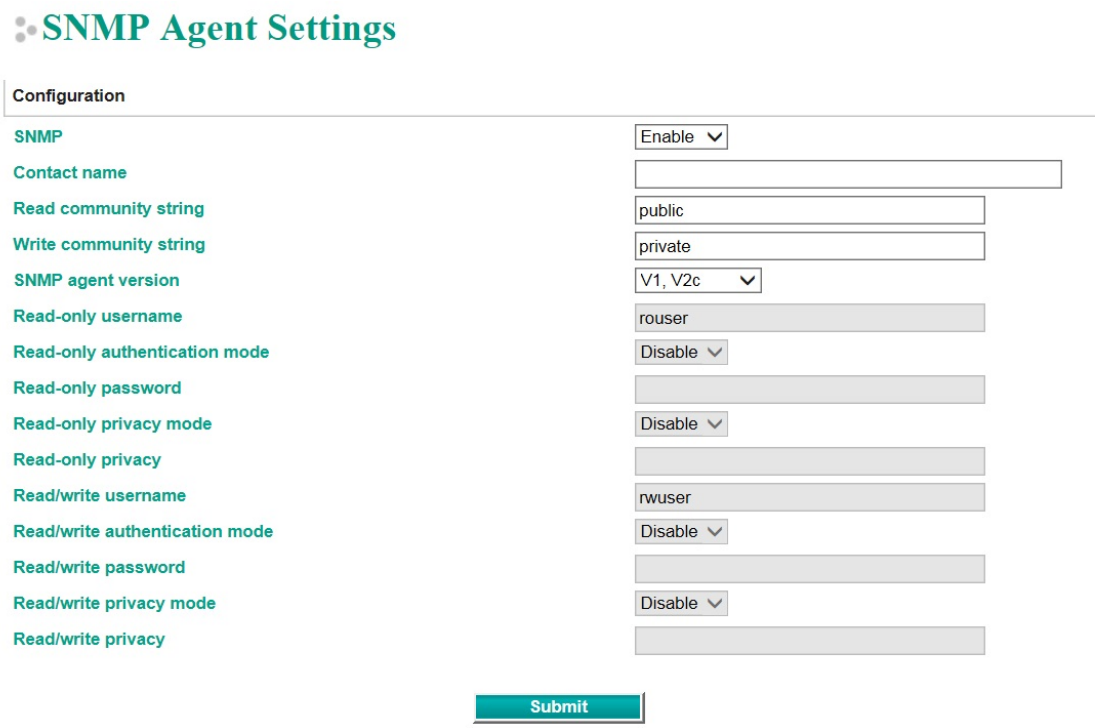


Parameters	Description
Mail server (SMTP)	The mail server's domain name or IP address.
User name	This field is for your mail server's user name, if required.
Password	This field is for your mail server's password, if required.
From email address	This is the email address from which automatic email warnings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

System Management—SNMP Trap

Parameters	Description
SNMP trap server IP	Use this field to indicate 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



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 5114 supports SNMP V1, V2c, and V3.

Read-only and Read/write access control

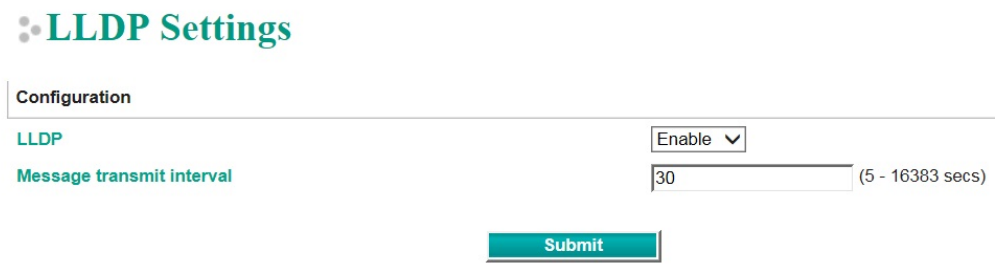
The following fields allow you to define user names, passwords, and authentication parameters for two levels of access: read-only and read/write. The name of the field will indicate which level of access it refers to. For example, **Read-only** authentication mode allows you to configure the authentication 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
User name	Use this optional field to identify the user name 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

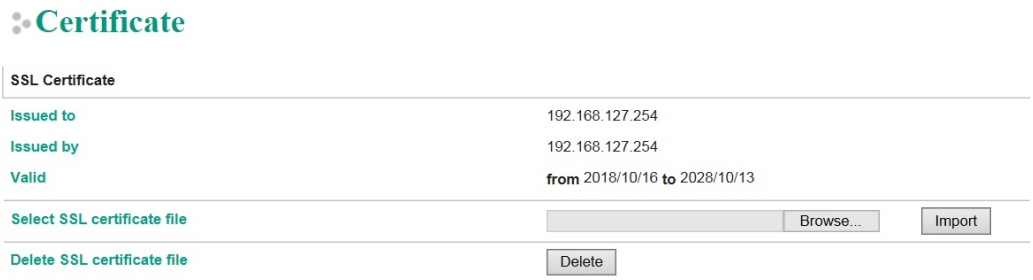
The Link Layer Discovery Protocol (LLDP) standardizes the method that devices on a network use to periodically send information on their configuration and status. This self-identification method keeps all LLDP devices on a network informed of each other's status and configuration. You can use SNMP protocol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

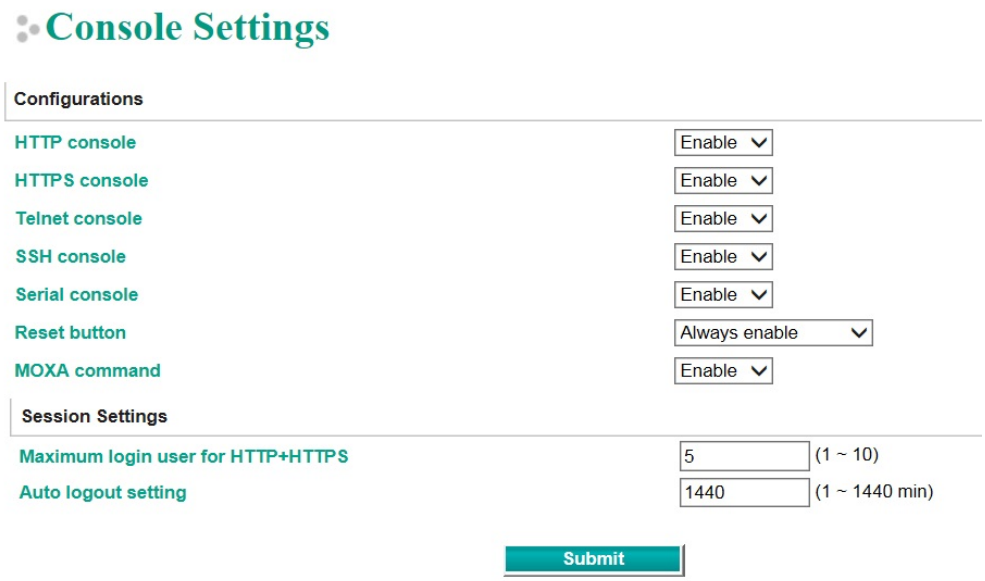


Use this function to load the Ethernet SSL certificate. Select or browse for the certificate file in the Select SSL certificate/key file field. This function is only available in the web console

System Management—Misc. Settings

It includes console settings, password and relay output.

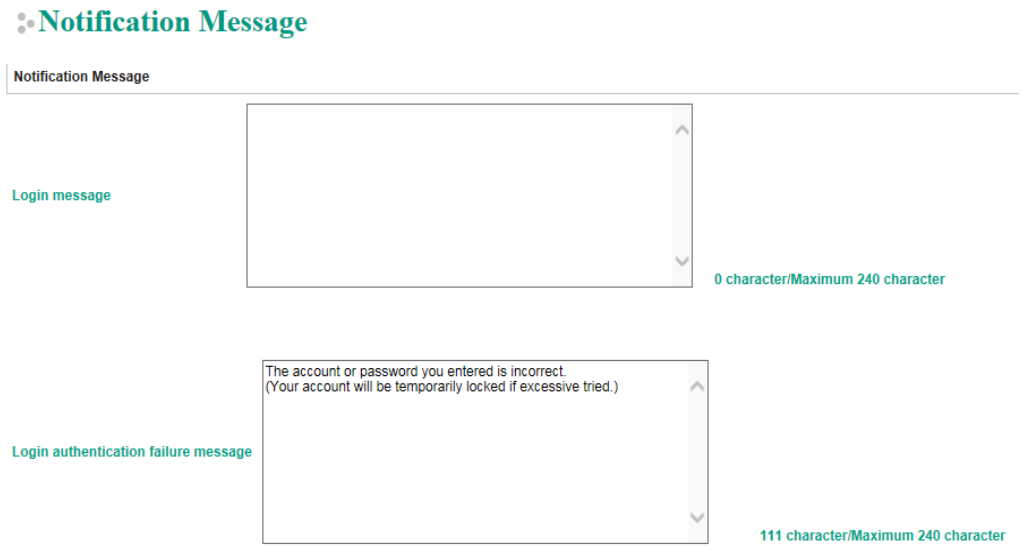
System Management—Misc. Settings—Console Settings



Configuration	Value	Description
HTTP/HTTPS	Enable/Disable	This setting is to enable/disable the web console. For security issues, users can only enable the HTTPS or just disable all settings.
Telnet/SSH	Enable/Disable	The MGate telnet/SSH function can be enabled or disabled.
Serial console	Enable/Disable	The MGate serial console function can be enabled or disabled.
Reset button protect	Disable after 60 sec, Always enable	MGate provides the reset button to clear password or load factory default settings. But for security issues, users can disable this function. In disabled mode, MGate will still enable this function within 60 seconds after boot-up, just in case users really need to reset this function.
MOXA command	Enable/Disable	The MGate can be searched by the DSU. If you have any security concerns, you can choose Disable to deny the DSU the right to access.

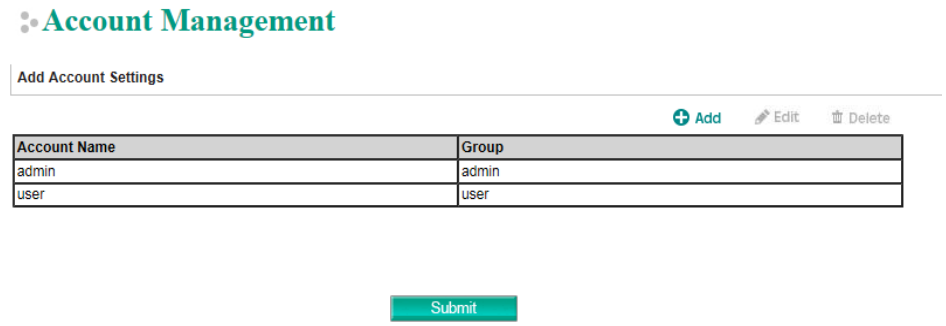
Session Settings	Value	Description
Maximum Login Users for HTTP+HTTPS	1-10	The number of users that can access the MGate at the same time.
Auto Logout Setting	0-1440 min.	Sets the auto logout time period.

System Management—Misc. Settings—Notification Message



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

System Management—Misc. Settings—Account Management



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

System Management—Misc. Settings—Login Password Policy

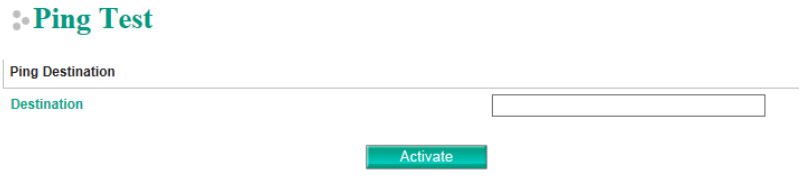
Account Password Policy	Value	Description
Minimum length	4-16	The minimum password length
Enable password complexity strength check		Select how the MGate checks the password's strength
Password lifetime	90-180 days	Set the password's lifetime period.

Account Login Failure Lockout	Value	Description
Retry failure threshold	1-10 time	Indicates 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 of time.

System Management—Maintenance

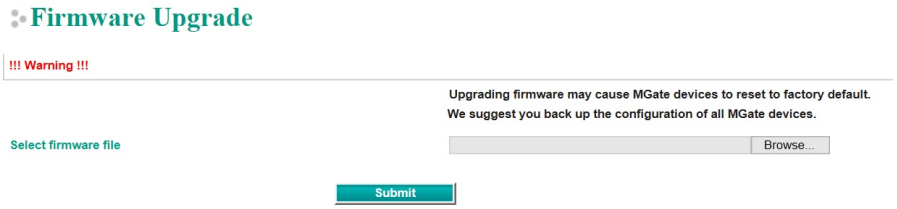
System Management—Maintenance—Ping

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



System Management—Maintenance—Firmware Upgrade

Firmware updates for the MGate 5114 are located 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 5114. Select the desired unit from the list in the web console and click **Submit** to begin the process.



ATTENTION

DO NOT turn off the MGate power before the firmware upgrade process is completed. The MGate will be erasing 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, contact Moxa RMA services.

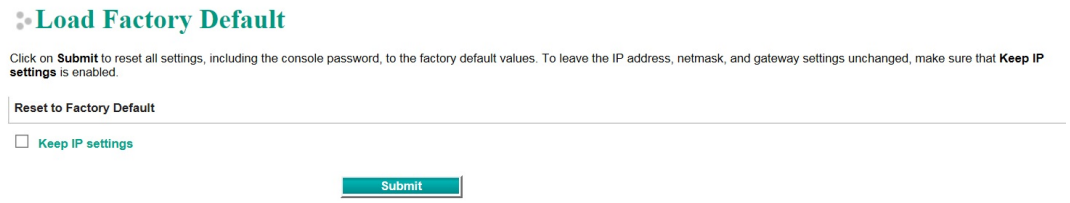
System Management—Maintenance—Configuration Import/Export

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

System Management—Maintenance—Load Factory Default

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



ATTENTION

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

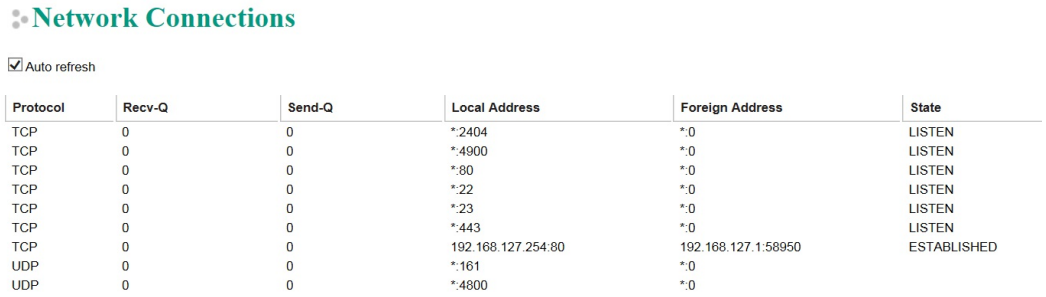
System Monitoring (Troubleshooting)

MGate 5114 provides easy-to-use and useful troubleshooting tools. If a communication issue occurs, we suggest that you first check the **Protocol Status** > **Diagnostic** page for the status of the protocol. To analyze the Modbus RTU/ACSII/TCP or IEC 60870-5-101/104 traffic in detail, view the network logs available at **Protocol Status** > **Traffic**.

System Monitoring—System Status

System Monitoring—System Status—Network Connections

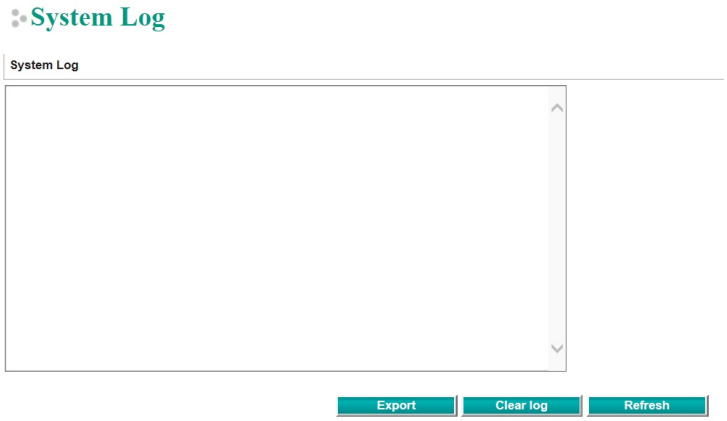
Go to **Network Connections** under **System Status** to view network connection information.



Protocol	Recv-Q	Send-Q	Local Address	Foreign Address	State
TCP	0	0	*:2404	*:0	LISTEN
TCP	0	0	*:4900	*:0	LISTEN
TCP	0	0	*:80	*:0	LISTEN
TCP	0	0	*:22	*:0	LISTEN
TCP	0	0	*:23	*:0	LISTEN
TCP	0	0	*:443	*:0	LISTEN
TCP	0	0	192.168.127.254:80	192.168.127.1:58950	ESTABLISHED
UDP	0	0	*:161	*:0	
UDP	0	0	*:4800	*:0	

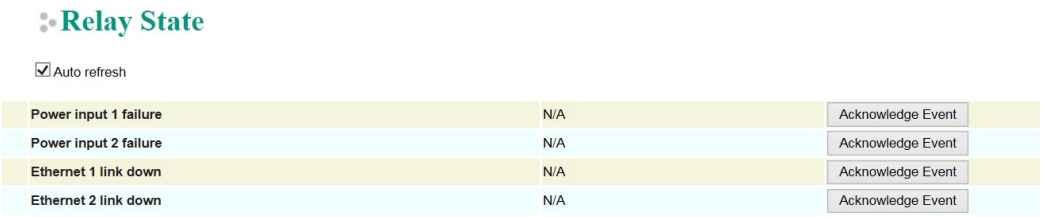
System Monitoring—System Status—System Log

Go to **Network Connections** under **System Status** to view network connection information.



System Monitoring—System Status—Relay State

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



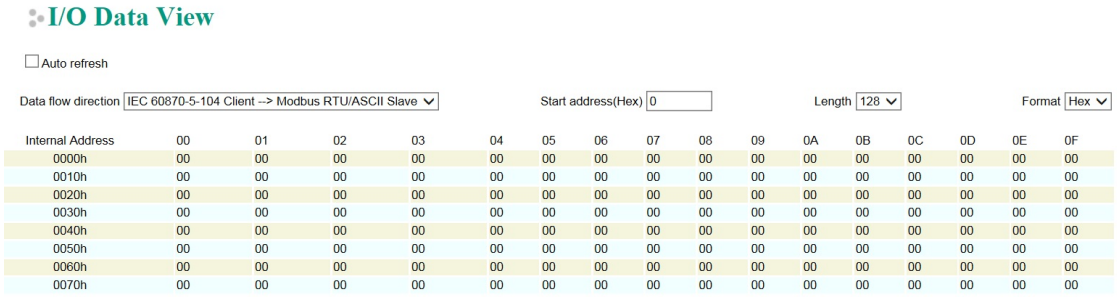
System Monitoring—System Status—LLDP Table

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

System Monitoring—Protocol Status

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 in the web console.



I/O Data View

Auto refresh

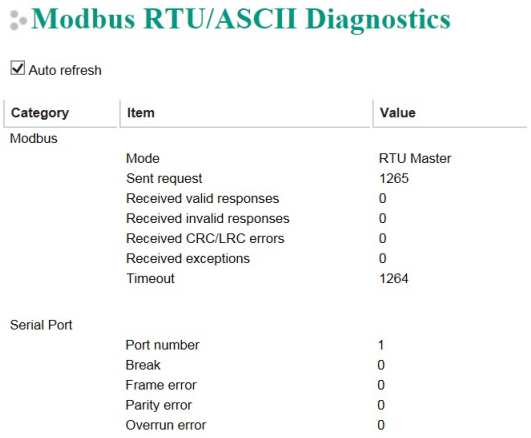
Data flow direction: IEC 60870-5-104 Client --> Modbus RTU/ASCII Slave | Start address(Hex): 0 | Length: 128 | Format: Hex

Internal Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
0000h	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0010h	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0020h	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0030h	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0040h	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0050h	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0060h	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0070h	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 Modbus RTU/ASCII/TCP, IEC 60870-5-101, and IEC 60870-5-104 troubleshooting. Verify data or packet counters to make sure the communications are running smoothly.

Modbus RTU/ASCII Diagnostics (Master)

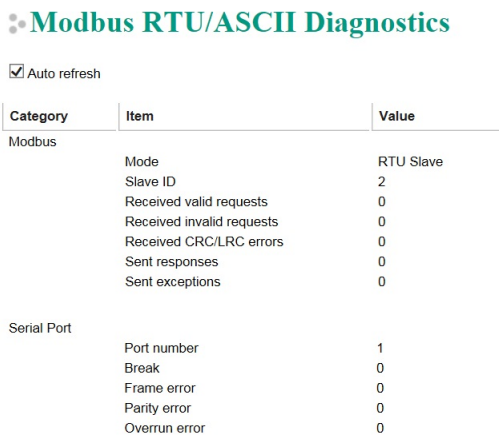


Modbus RTU/ASCII Diagnostics

Auto refresh

Category	Item	Value
Modbus		
	Mode	RTU Master
	Sent request	1265
	Received valid responses	0
	Received invalid responses	0
	Received CRC/LRC errors	0
	Received exceptions	0
	Timeout	1264
Serial Port		
	Port number	1
	Break	0
	Frame error	0
	Parity error	0
	Overrun error	0

Modbus RTU/ASCII Diagnostics (Slave)



Modbus RTU/ASCII Diagnostics

Auto refresh

Category	Item	Value
Modbus		
	Mode	RTU Slave
	Slave ID	2
	Received valid requests	0
	Received invalid requests	0
	Received CRC/LRC errors	0
	Sent responses	0
	Sent exceptions	0
Serial Port		
	Port number	1
	Break	0
	Frame error	0
	Parity error	0
	Overrun error	0

Modbus TCP Diagnostics (Client/Master)

Modbus TCP Diagnostics

Auto refresh

Category	Item	Value
Modbus		
	Mode	Master
	Number of connections	0
	Sent requests	0
	Received valid responses	0
	Received invalid responses	0
	Received exceptions	0
	Timeout	0
Connections		

Modbus TCP Diagnostics (Slave/Server)

Modbus TCP Diagnostics

Auto refresh

Category	Item	Value
Modbus		
	Mode	Slave
	Number of connections	0
	Received valid requests	0
	Received invalid requests	0
	Sent responses	0
	Sent exceptions	0
Connections		

IEC 60870-5-104 Diagnostics (Client)

IEC 60870-5-104 Client Diagnostics

Auto refresh Refresh

Select connected device Device 1

Device Details

Status	Disconnected
Latest COT	0x0000, UNDEFINED
Error Message	OK

Point Information

Single Point

IOA	Value	Flags	Time Tag	Time Updated
1	OFF	VALID	1999-11-30 00:00:00	N/A
2	OFF	VALID	1999-11-30 00:00:00	N/A
3	OFF	VALID	1999-11-30 00:00:00	N/A
4	OFF	VALID	1999-11-30 00:00:00	N/A
5	OFF	VALID	1999-11-30 00:00:00	N/A
6	OFF	VALID	1999-11-30 00:00:00	N/A
7	OFF	VALID	1999-11-30 00:00:00	N/A
8	OFF	VALID	1999-11-30 00:00:00	N/A
9	OFF	VALID	1999-11-30 00:00:00	N/A
10	OFF	VALID	1999-11-30 00:00:00	N/A

IEC 60870-5-104 Diagnostics (Server)

IEC 60870-5-104 Server Diagnostics

☑ Auto refresh Refresh

Server Statictics

Error Message	OK
Received Requests	0
Sent Non-spontaneous Responses	1
Sent Spontaneous Responses	0
Connected Client IP	

Point Information

Single Point

IOA	Value	Flags	Time Tag	Point Status	Time Updated
1	OFF	VALID	2018-10-16 10:05:05	OK	N/A
2	OFF	VALID	2018-10-16 10:05:05	OK	N/A
3	OFF	VALID	2018-10-16 10:05:05	OK	N/A
4	OFF	VALID	2018-10-16 10:05:05	OK	N/A
5	OFF	VALID	2018-10-16 10:05:05	OK	N/A
6	OFF	VALID	2018-10-16 10:05:05	OK	N/A
7	OFF	VALID	2018-10-16 10:05:05	OK	N/A
8	OFF	VALID	2018-10-16 10:05:05	OK	N/A
9	OFF	VALID	2018-10-16 10:05:05	OK	N/A
10	OFF	VALID	2018-10-16 10:05:05	OK	N/A

IEC 60870-5-101 Diagnostics (Master)

IEC 60870-5-101 Master Diagnostics

☑ Auto refresh Refresh

Select connected device Device 1

Device Details

Latest COT	0x0000, UNDEFINED
Error Message	OK

Point Information

Single Point

IOA	Value	Flags	Time Tag	Time Updated
1	OFF	VALID	1999-11-30 00:00:00	N/A
2	OFF	VALID	1999-11-30 00:00:00	N/A
3	OFF	VALID	1999-11-30 00:00:00	N/A
4	OFF	VALID	1999-11-30 00:00:00	N/A
5	OFF	VALID	1999-11-30 00:00:00	N/A
6	OFF	VALID	1999-11-30 00:00:00	N/A
7	OFF	VALID	1999-11-30 00:00:00	N/A
8	OFF	VALID	1999-11-30 00:00:00	N/A
9	OFF	VALID	1999-11-30 00:00:00	N/A
10	OFF	VALID	1999-11-30 00:00:00	N/A

IEC 60870-5-101 Diagnostics (Slave)

IEC 60870-5-101 Slave Diagnostics

☑ Auto refresh Refresh

Slave Statictics

Error Message	OK
Received Requests	0
Sent Non-spontaneous Responses	1
Sent Spontaneous Responses	0

Point Information

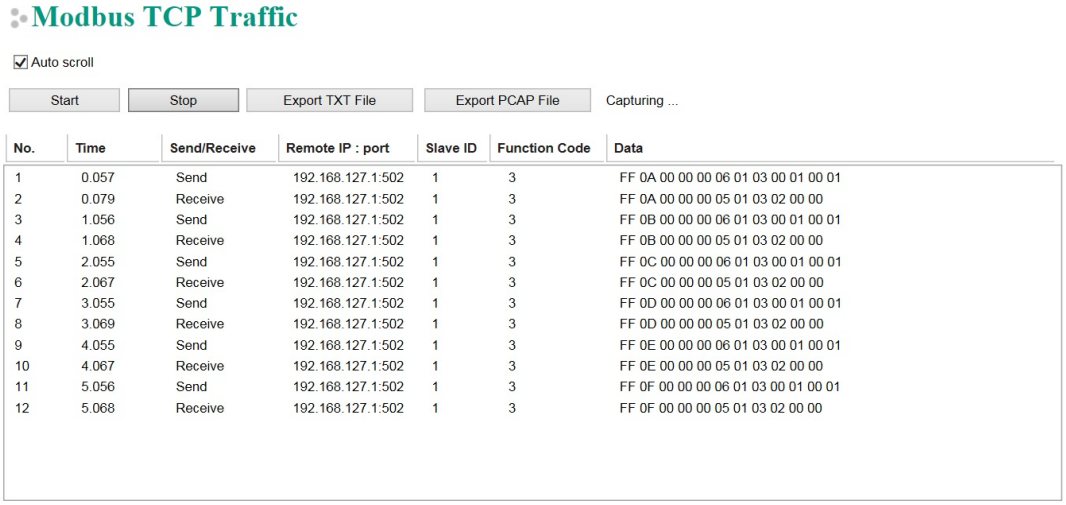
Single Point

IOA	Value	Flags	Time Tag	Point Status	Time Updated
1	OFF	VALID	2018-10-16 10:08:33	OK	N/A
2	OFF	VALID	2018-10-16 10:08:33	OK	N/A
3	OFF	VALID	2018-10-16 10:08:33	OK	N/A
4	OFF	VALID	2018-10-16 10:08:33	OK	N/A
5	OFF	VALID	2018-10-16 10:08:33	OK	N/A
6	OFF	VALID	2018-10-16 10:08:33	OK	N/A
7	OFF	VALID	2018-10-16 10:08:33	OK	N/A
8	OFF	VALID	2018-10-16 10:08:33	OK	N/A
9	OFF	VALID	2018-10-16 10:08:33	OK	N/A
10	OFF	VALID	2018-10-16 10:08:33	OK	N/A

System Monitoring—Protocol Status—Traffic

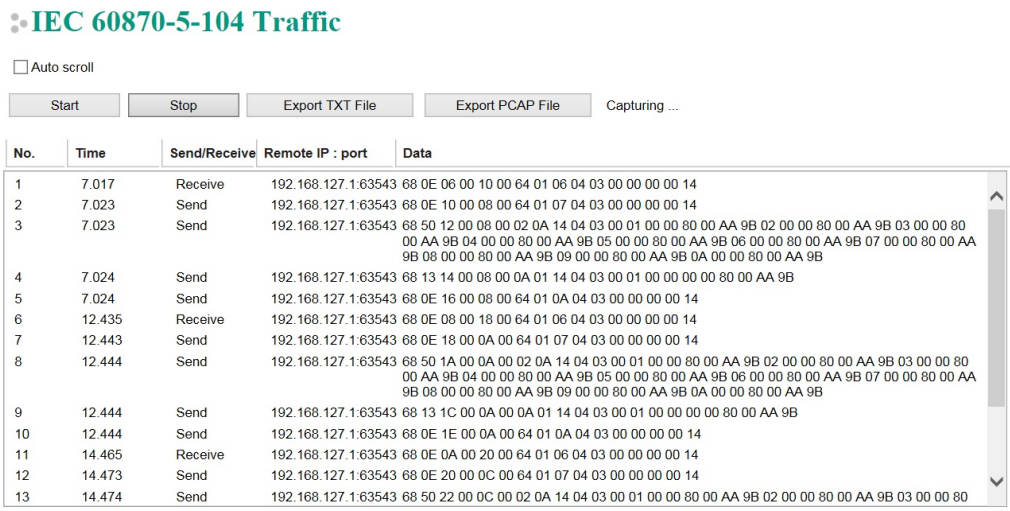
In order to troubleshoot efficiently, the MGate provides a traffic monitoring function that can capture both Modbus RTU/ASCII and Modbus TCP communication logs, respectively. These logs present the data in an intelligent, easy-to-understand format with clearly designated fields, including source, destination, function code, and data. The complete log can be saved in a file by clicking **Export TXT File or Export PCAP File** for later analysis. For the PCAP file specifically, it is compatible with the popular troubleshooting tool Wireshark, with which you can easily find the root cause. Here is an example of Modbus TCP and IEC 60870-5-104 traffic.

Modbus TCP Traffic



No.	Time	Send/Receive	Remote IP : port	Slave ID	Function Code	Data
1	0.057	Send	192.168.127.1:502	1	3	FF 0A 00 00 00 06 01 03 00 01 00 01
2	0.079	Receive	192.168.127.1:502	1	3	FF 0A 00 00 00 05 01 03 02 00 00
3	1.056	Send	192.168.127.1:502	1	3	FF 0B 00 00 00 06 01 03 00 01 00 01
4	1.068	Receive	192.168.127.1:502	1	3	FF 0B 00 00 00 05 01 03 02 00 00
5	2.055	Send	192.168.127.1:502	1	3	FF 0C 00 00 00 06 01 03 00 01 00 01
6	2.067	Receive	192.168.127.1:502	1	3	FF 0C 00 00 00 05 01 03 02 00 00
7	3.055	Send	192.168.127.1:502	1	3	FF 0D 00 00 00 06 01 03 00 01 00 01
8	3.069	Receive	192.168.127.1:502	1	3	FF 0D 00 00 00 05 01 03 02 00 00
9	4.055	Send	192.168.127.1:502	1	3	FF 0E 00 00 00 06 01 03 00 01 00 01
10	4.067	Receive	192.168.127.1:502	1	3	FF 0E 00 00 00 05 01 03 02 00 00
11	5.056	Send	192.168.127.1:502	1	3	FF 0F 00 00 00 06 01 03 00 01 00 01
12	5.068	Receive	192.168.127.1:502	1	3	FF 0F 00 00 00 05 01 03 02 00 00

IEC 60870-5-104 Traffic

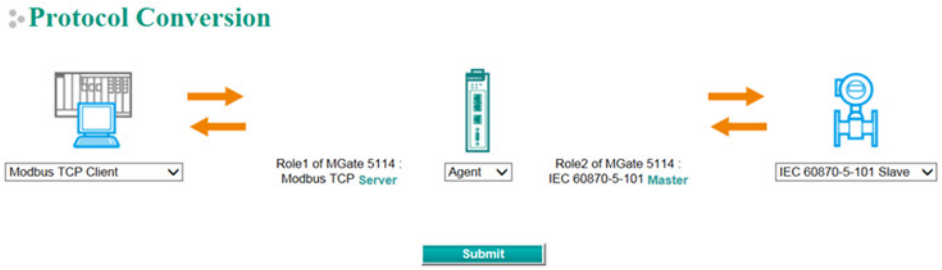


No.	Time	Send/Receive	Remote IP : port	Data
1	7.017	Receive	192.168.127.1:63543	68 0E 06 00 10 00 64 01 06 04 03 00 00 00 00 14
2	7.023	Send	192.168.127.1:63543	68 0E 10 00 08 00 64 01 07 04 03 00 00 00 00 14
3	7.023	Send	192.168.127.1:63543	68 50 12 00 08 00 02 0A 14 04 03 00 01 00 00 80 00 AA 9B 02 00 00 80 00 AA 9B 03 00 00 80 00 AA 9B 04 00 00 80 00 AA 9B 05 00 00 80 00 AA 9B 06 00 00 80 00 AA 9B 07 00 00 80 00 AA 9B 08 00 00 80 00 AA 9B 09 00 00 80 00 AA 9B 0A 00 00 80 00 AA 9B
4	7.024	Send	192.168.127.1:63543	68 13 14 00 08 00 0A 01 14 04 03 00 01 00 00 00 00 80 00 AA 9B
5	7.024	Send	192.168.127.1:63543	68 0E 16 00 08 00 64 01 0A 04 03 00 00 00 00 14
6	12.435	Receive	192.168.127.1:63543	68 0E 08 00 18 00 64 01 06 04 03 00 00 00 00 14
7	12.443	Send	192.168.127.1:63543	68 0E 18 00 0A 00 64 01 07 04 03 00 00 00 00 14
8	12.444	Send	192.168.127.1:63543	68 50 1A 00 0A 00 02 0A 14 04 03 00 01 00 00 80 00 AA 9B 02 00 00 80 00 AA 9B 03 00 00 80 00 AA 9B 04 00 00 80 00 AA 9B 05 00 00 80 00 AA 9B 06 00 00 80 00 AA 9B 07 00 00 80 00 AA 9B 08 00 00 80 00 AA 9B 09 00 00 80 00 AA 9B 0A 00 00 80 00 AA 9B
9	12.444	Send	192.168.127.1:63543	68 13 1C 00 0A 00 0A 01 14 04 03 00 01 00 00 00 00 80 00 AA 9B
10	12.444	Send	192.168.127.1:63543	68 0E 1E 00 0A 00 64 01 0A 04 03 00 00 00 00 14
11	14.465	Receive	192.168.127.1:63543	68 0E 0A 00 20 00 64 01 06 04 03 00 00 00 00 14
12	14.473	Send	192.168.127.1:63543	68 0E 20 00 0C 00 64 01 07 04 03 00 00 00 00 14
13	14.474	Send	192.168.127.1:63543	68 50 22 00 0C 00 02 0A 14 04 03 00 01 00 00 80 00 AA 9B 02 00 00 80 00 AA 9B 03 00 00 80

Status Monitoring

For gateways in agent mode, if a slave device fails or a cable comes loose, generally the gateway will not be able to receive up-to-date data from the slave device. The out-of-date data will be stored in the gateway's memory and will be retrieved by the client/master system, which will not be aware that the slave device is not providing up-to-date data. The 5114 supports the Status Monitoring function, which provides a warning mechanism to report the list of slave devices that are still active.

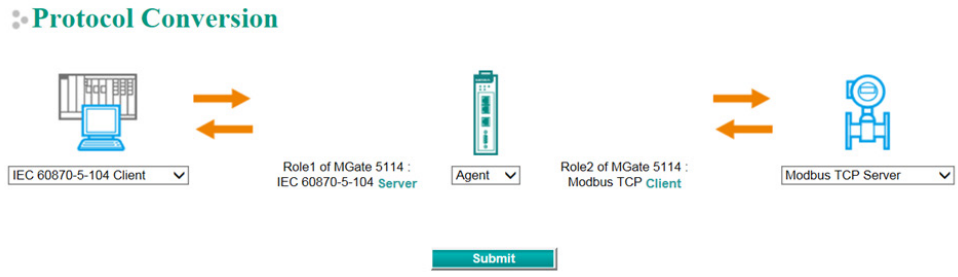
Scenario 1:



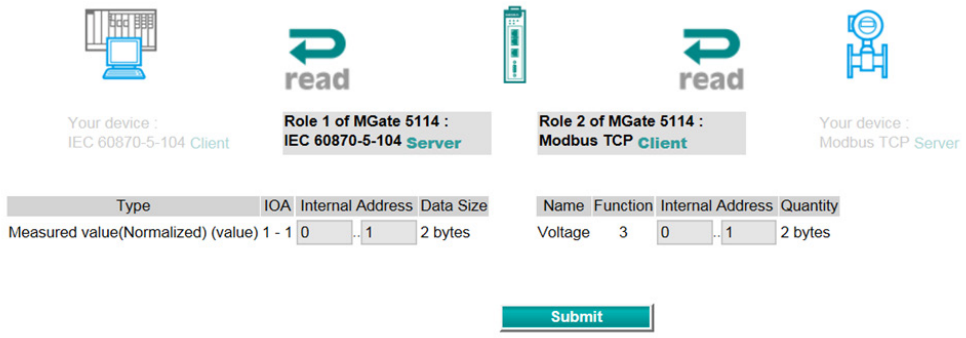
When the MGate acts as an IEC 60870-5-101 master, the MGate can connect up to 31 slave devices. When the MGate as an IEC 60870-5-104 client, the MGate can connect up to 32 connections. The MGate 5114 allocates the gateway's specified memory address to indicate whether the status of each device is normal or abnormal. In other words, the MGate allocates 32 bits (4 bytes) of memory to indicate the status of IEC 60870-5-101/104 slave devices. If a slave device has run successfully, the status value will continue to be 1. On the contrary, if a slave device has failed, the status value will be set to 0. Here is the Modbus address table for status monitoring.

Modbus Address (Function Code 0x03)	Monitor IEC 60870-5-101/104 Slave Devices
4x60000	1 to 16 devices
4x60001	17 to 32 devices

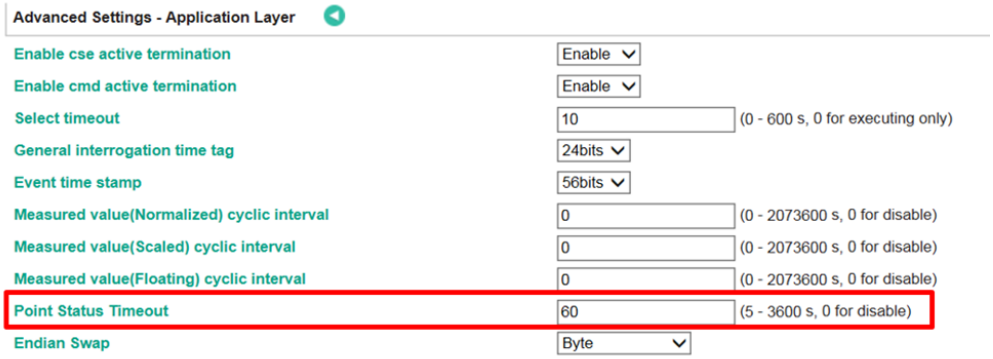
Scenario 2:



In this scenario, the MGate acts as a Modbus RTU/ASCII/TCP client, and the other side as a IEC 60870-5-104 server. When the MGate Modbus communication has an issue, the MGate uses the original IEC 60870-5-101/104 capability, flag, to indicate the object point status. For example, if the Modbus command "Voltage" is mapped to "Measured value (Normalized)", as shown below. When the Modbus command fails in a period of time that causes the internal memory to have no data change, the flag of IEC 60870-5-101/104 object will turn to "invalid."



About the timeout settings, you configure by the following path: **Protocol Settings → IEC 60870-5-101/104 Server/Salve → Advanced Settings – Application Layer → Point Status Timeout**



5

Configuration (Text Mode Console)

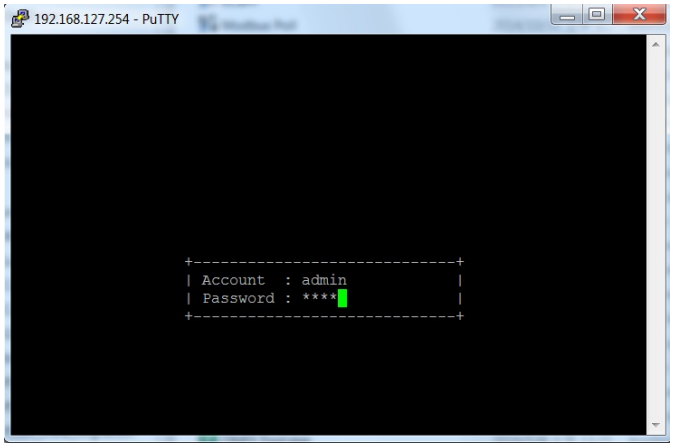
The MGate 5114 supports a text-mode console with serial interface, telnet, and SSH protocol. The user interface is the same in all text mode consoles. Note that the text mode console does not support all configuration items. Some parameters must be configured through the web console.

You must use a DB9-to-RJ45 cable to connect the serial console port on the MGate gateway's front panel to the serial port on the host. The serial console parameters are 115.2 kbps; parity: none; 8 data bits; and one stop bit (115200, 8/N/1).

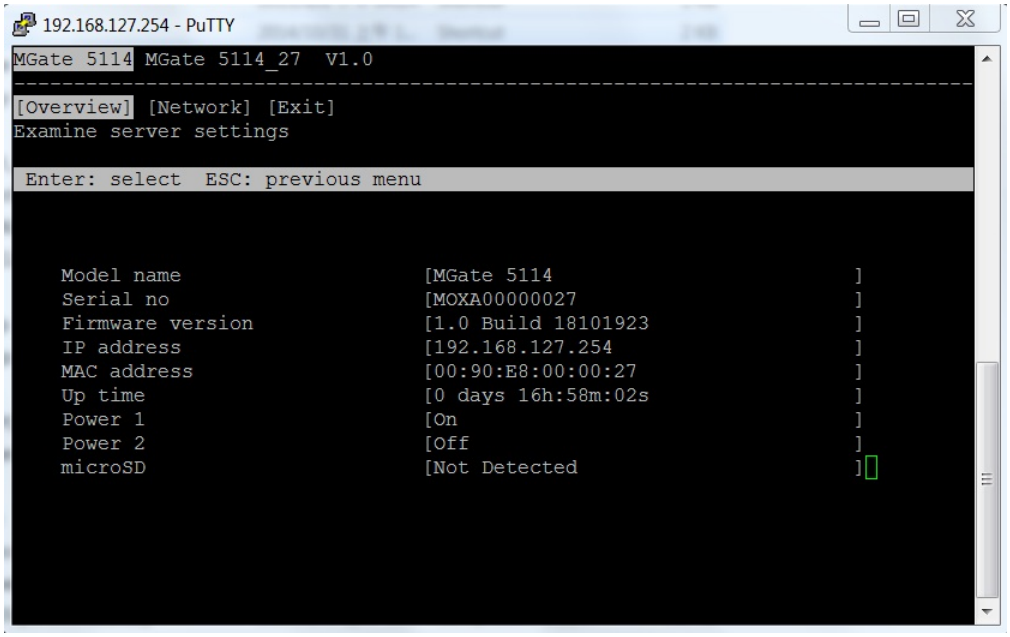
For telnet and SSH, use HyperTerminal or PuTTY to connect to the MGate. Note that the telnet protocol will transfer the account and password information over the Internet using plain text, so telnet is essentially obsolete and should be replaced by the SSH protocol.

To connect to the MGate telnet/SSH console, load the telnet/SSH 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 modify all of the settings, but a "user" account can only review the settings. A "user" account cannot modify the configuration. The default password for **admin** is **moxa**.



The text mode console will display the menu driven interface. Users can use 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, MGate will need to restart to activate the setting.



6

Network Management Tool (MXstudio)

Moxa's MXstudio industrial network management suite includes tools such as MXconfig, MXview and N-Snap. MXconfig is for industrial network configuration; MXview is for industrial management software; and N-Snap is for industrial network snapshot. The MXstudio suite in MGate 5114 includes MXconfig and MXview, which are used for mass configuration of network devices and monitoring network topology, respectively. The following functions are supported:

Tool	Function Support
MXconfig	1. System name and login password modification 2. Network settings 3. Configuration import/export 4. Firmware upgrade
MXview	1. Configuration import/export 2. LLDP for topology analysis 3. Security View**

**Security View can check the security level of devices in accordance with the IEC62443-4-2 standard. MGate 5114 supports Level 2 of the IEC-62443-4-2 standard.

A

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

The MGate 5114 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 Variables**
- **RFC1317 RS-232-Like Groups**

RFC1213 MIB-II Supported SNMP Variables

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

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

RFC1317 RS-232-Like Groups

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

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