

MGate 5114 User's Manual

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www.moxa.com/product



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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
- Embedded 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 |

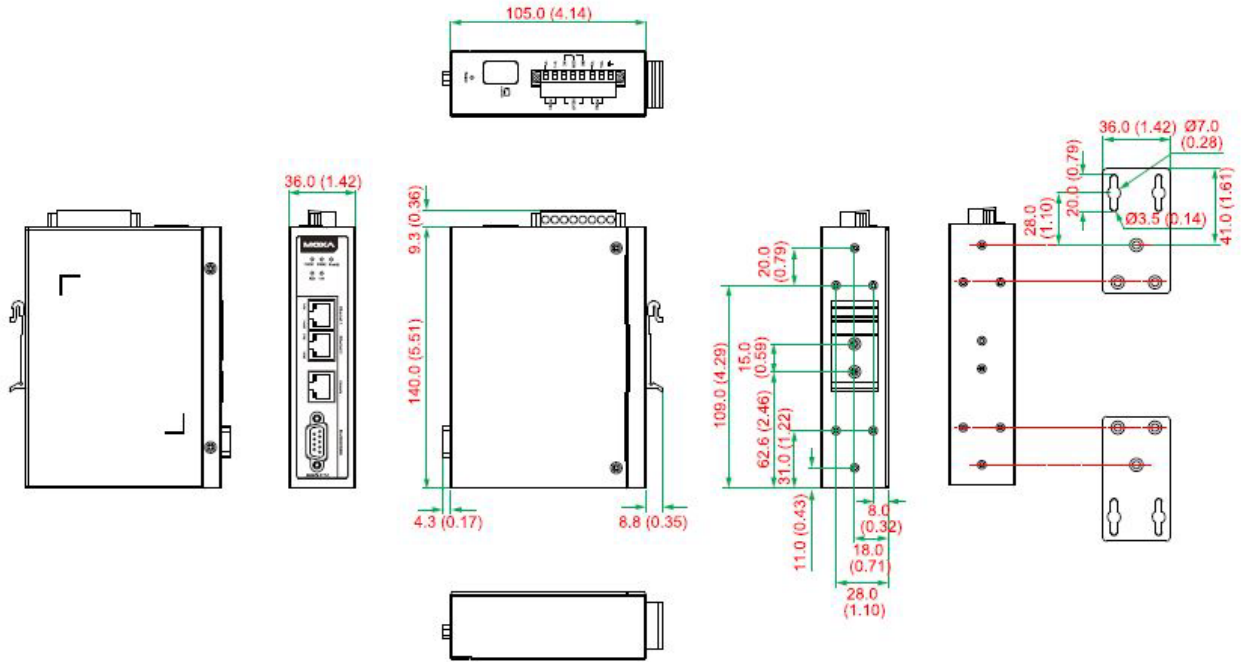
LED Indicators

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: <ol style="list-style-type: none"> Slave device returned an error (exception) Received a frame error (parity error, checksum error) Timeout (the master sends but no response) When the MGate 5114 acts as a Modbus RTU/ASCII slave: <ol style="list-style-type: none"> Received an invalid function code The master accessed an invalid register address or coil address 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

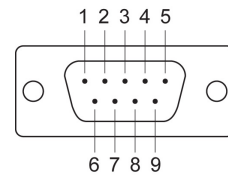


Unit: mm (inch)

Pin Assignments

Serial Port (Male DB9)

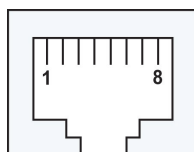
| Pin | RS-232 | RS-422/RS-485 (4W) | RS-485 (2W) |
|-----|--------|--------------------|-------------|
| 1 | DCD | TxD-(A) | - |
| 2 | RXD | TxD+(B) | - |
| 3 | TXD | RxD+(B) | Data+(B) |
| 4 | DTR | RxD-(A) | Data-(A) |
| 5* | GND | GND | GND |
| 6 | DSR | - | - |
| 7 | RTS | - | - |
| 8 | CTS | -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



*Signal ground

Ethernet Port (RJ45)

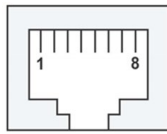
| Pin | Signal |
|-----|--------|
| 1 | Tx+ |
| 2 | Tx- |
| 3 | Rx+ |
| 6 | Rx- |



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 |



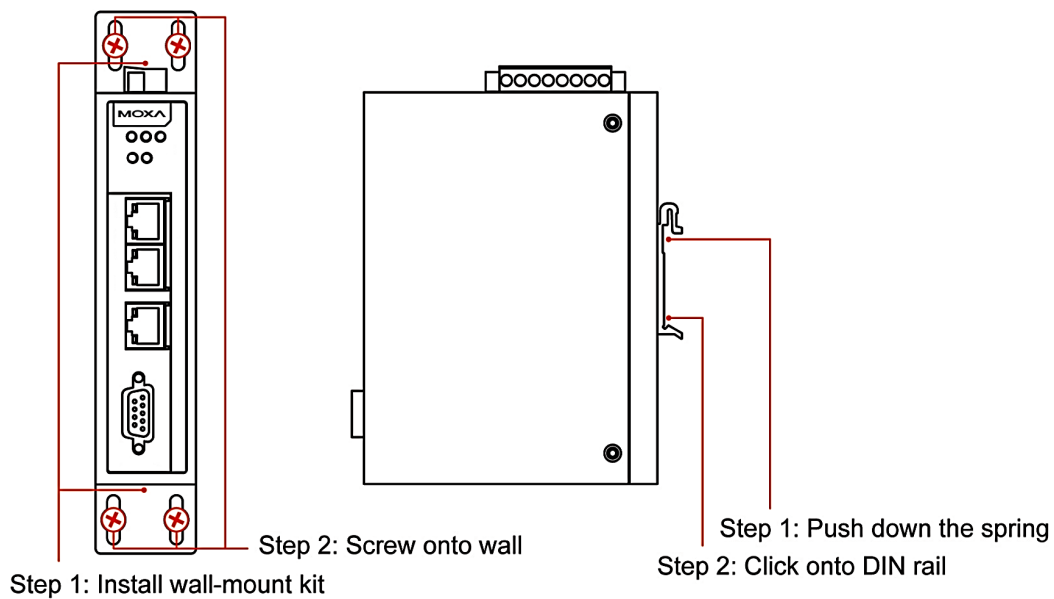
Hardware Installation Procedure

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:

Wall-Mount Installation

DIN-Rail Installation



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 k Ω , 150 k Ω

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

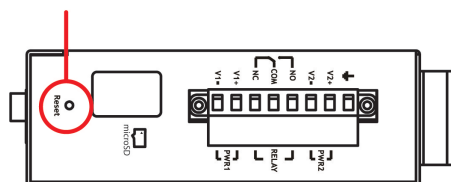
Warranty

Warranty Period: 5 years

Details: See www.moxa.com/warranty

Reset Button

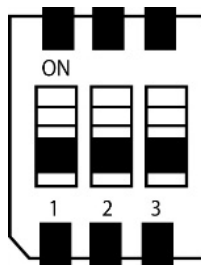
Reset Button



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.

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.

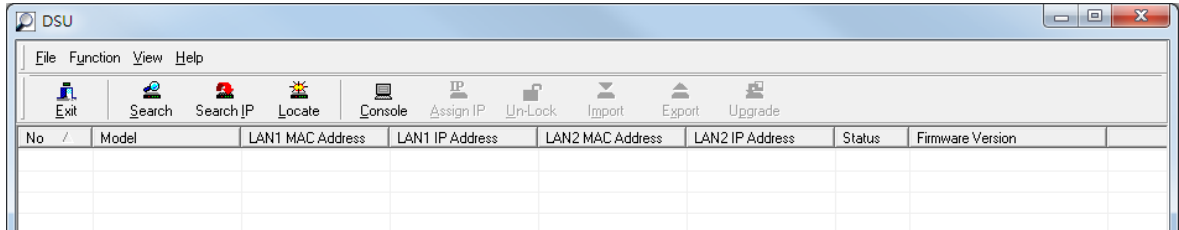
1. Locate and run the following setup program to begin the installation process:

dsu_setup_[Version]_Build_[DateTime].exe

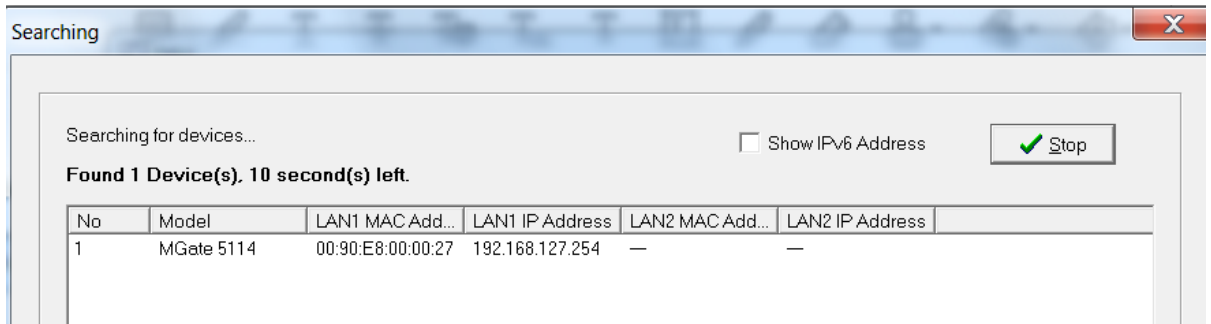
This version might be named **dsu_setup_Ver2.x_Build_xxxxxxx.exe**

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.



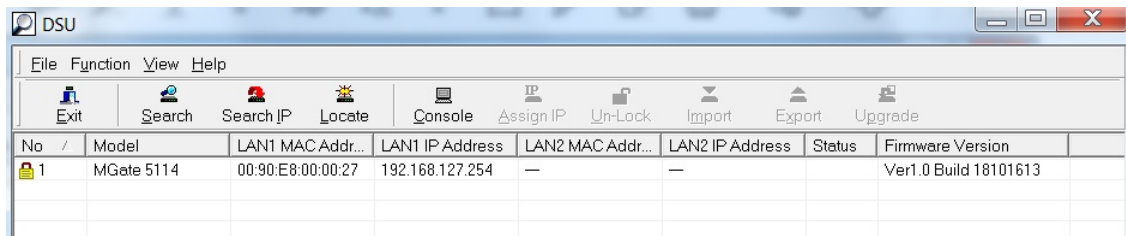
Click **Search** and a new Search window will pop up.



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.

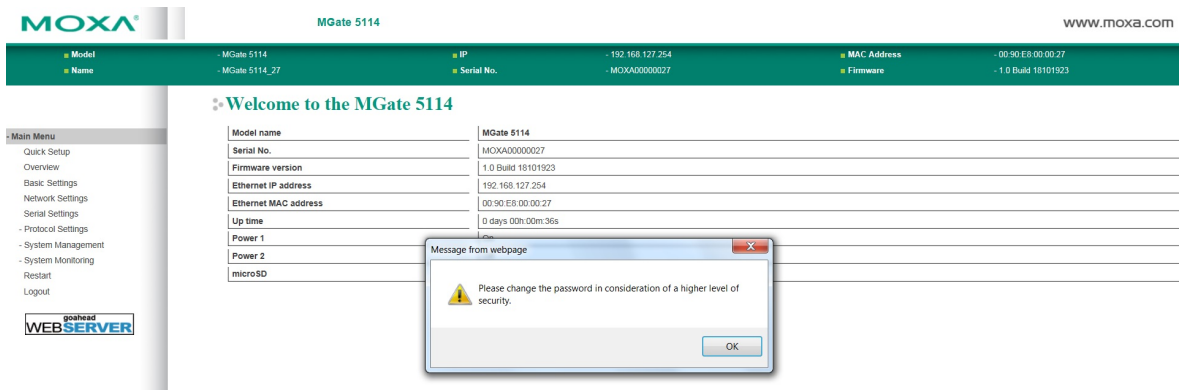


On the first page of the web console, enter **admin** for the default Account name and **moxa** for the default Password.

Account

Password

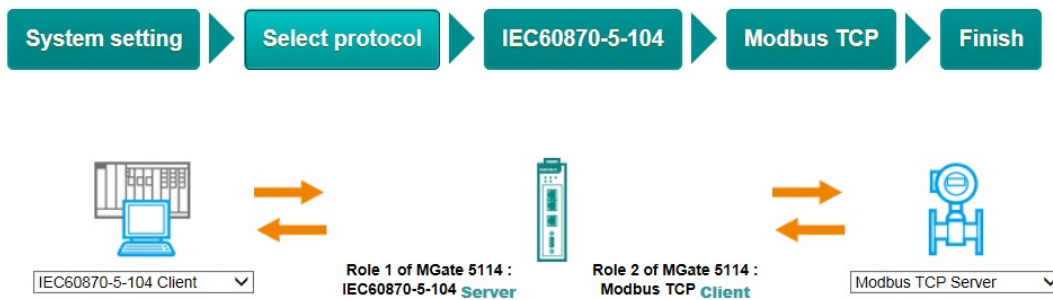
When you log in the web console for the first time, a message will pop up. Emphasizing a higher security level, we suggest you to change the password.



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.



System setting **Select protocol** **IEC 60870-5-104** **Modbus TCP** **Finish**

Server Settings

Server name: MGate 5114_27

Network Settings

IP configuration: Static

IP address: 192.168.127.254


Netmask: 255.255.255.0

Gateway:




Next Exit

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*.



System setting **Select protocol** **IEC 60870-5-104** **Modbus TCP** **Finish**

1    2

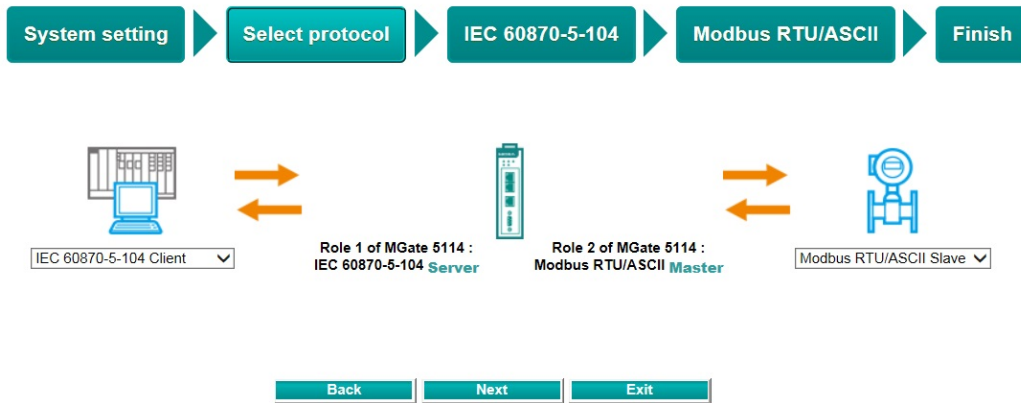
IEC 60870-5-104 Client Role 1 of MGate 5114 : IEC 60870-5-104 **Server** Role 2 of MGate 5114 : Modbus TCP **Client** Modbus TCP Server

↑ Select your device type on each side of the MGate 5114 ↑

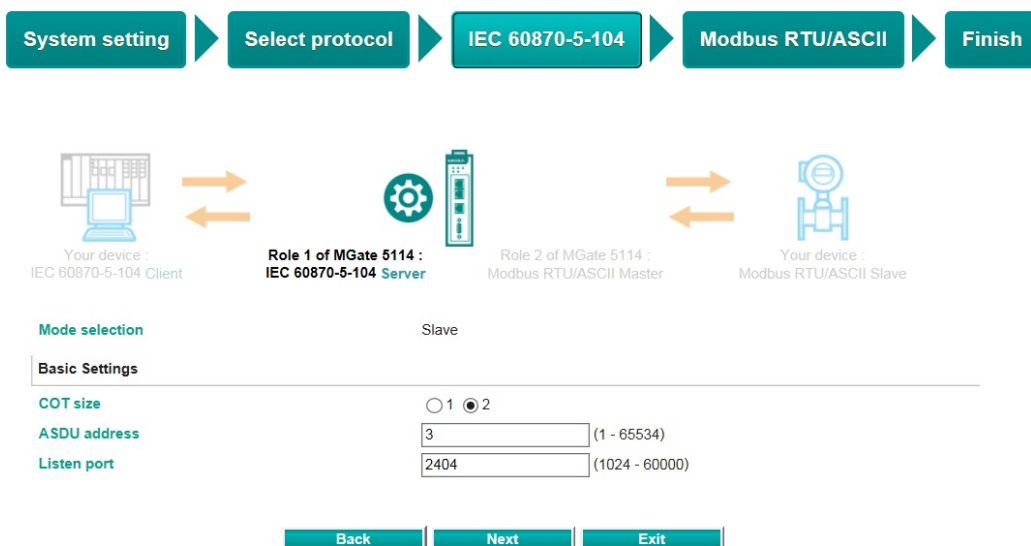
Back Next Exit

Quick Setup—Configure Role 1 and Role 2

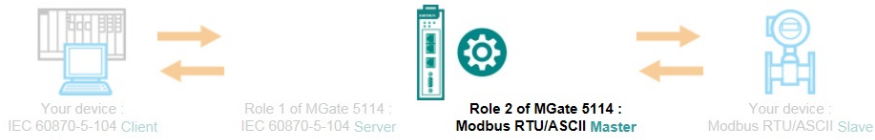
After finishing the device protocol selection, Role 1 and Role 2 of MGate will be confirmed. You will need to configure the roles on each side by the following steps. Here is an example of Role 1 as a IEC 60870-5-104 server, and Role 2 as a Modbus RTU/ASCII master.



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 Mode

Mode selection: Modbus RTU

Serial Parameter Settings

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

Modbus Commands

*Press the control key to select multiple commands!

+ Add
Edit
Clone
Delete
Move

| Index | Name | Slave ID | Function | Address / Quantity |
|-------|------|----------|----------|--------------------|
| | | | | |

Back
Next
Exit

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

Modbus Mode

Mode selection: Modbus RTU

Serial Parameter Settings

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

Modbus Commands

*Press the control key to select multiple commands!

+ Add
Edit
Clone
Delete
Move

| Index | Name | Slave ID | Function | Address / Quantity |
|-------|------|----------|----------|--------------------|
| | | | | |

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.

MGate name: MGate 5114_27
 MGate IP config: 192.168.127.254
 Netmask: 255.255.255.0
 Gateway: --

Your device :
 IEC 60870-5-104 **Client**

Role 1 of MGate 5114 :
 IEC 60870-5-104 **Server**

Role 2 of MGate 5114 :
 Modbus RTU/ASCII **Master**

Your device :
 Modbus RTU/ASCII **Slave**

| MGate Protocol1 Settings | | MGate Protocol2 Settings | |
|--------------------------|------------------------|--------------------------|------------------------|
| Protocol type | IEC 60870-5-104 Server | Protocol type | Modbus Serial Master |
| Number of ranges | 2 | Mode | Modbus RTU |
| | | Serial parameter | 115200 Even,8,1 RS-232 |
| | | Total commands | 2 |

Back
Save
Exit

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.

Wizard Settings OK!

Home
I/O data mapping

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.

⚙️ Welcome to MGate 5114

| | |
|----------------------|--------------------|
| Model name | MGate 5114 |
| Serial No. | MOXA00000027 |
| Firmware version | 1.0 Build 18101517 |
| Ethernet IP address | 192.168.127.254 |
| Ethernet MAC address | 00:90:E8:00:00:27 |
| Up time | 0 days 00h:02m:13s |
| Power 1 | On |
| Power 2 | Off |
| microSD | Not Detected |

Basic Settings

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

⚙️ Basic Settings

Server Settings

Server name

Server location

Time Settings

Time zone

Local time / / : :

Time source

Time server

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.

⚙️ Network Settings

Network Settings

IP configuration

IP address

Netmask

Gateway

DNS server 1

DNS server 2

| 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.

Serial Settings

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

| Parameter | Value | Description |
|---------------|--|---|
| Baudrate | 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.

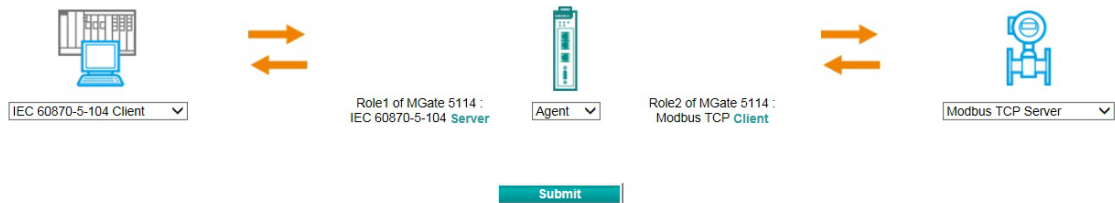
The following sections contain detailed MGate configuration instructions organized as per the above outline.

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.

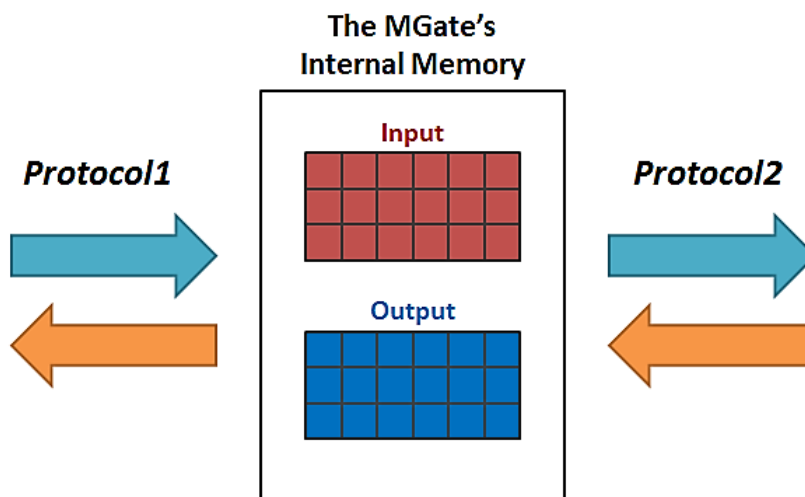
Protocol Conversion



| 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

Modbus TCP Settings

Role Client

Client Settings

Initial delay (0 - 30000 ms)

Max. retry (0 - 5)

Response timeout (10 - 120000 ms)

Modbus Commands

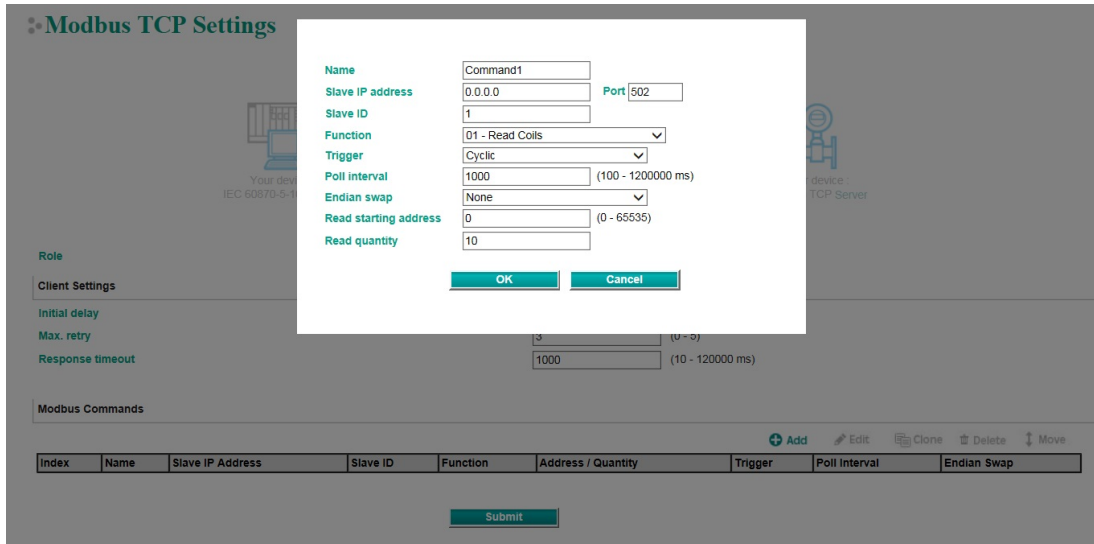
+ Add Edit Clone Delete Move

| Index | Name | Slave IP Address | Slave ID | Function | Address / Quantity | Trigger | Poll Interval | Endian Swap |
|---------------------------------------|------|------------------|----------|----------|--------------------|---------|---------------|-------------|
| <input type="button" value="Submit"/> | | | | | | | | |

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

Modbus RTU/ASCII Settings

Role Master
Mode RTU

Master Settings

Initial delay (0 - 30000 ms)
Max. retry (0 - 5)
Response timeout (10 - 120000 ms)
Inter-frame delay (10 - 500 ms, 0: default)
Inter-character timeout (10 - 500 ms, 0: default)

Modbus Commands

| Index | Name | Slave ID | Function | Address / Quantity | Trigger | Poll Interval | Endian Swap |
|---------------------------------------|------|----------|----------|--------------------|---------|---------------|-------------|
| <input type="button" value="Submit"/> | | | | | | | |

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

Modbus TCP Settings

Role:

Server Settings

Unit ID: (1 - 255)

TCP port:

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

Modbus RTU/ASCII Settings

Role:

Mode:

Slave Settings

Slave ID: (1 - 255)

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

IEC104 Client Setting



Role: Client

Basic Settings

COT size: 1 2

Originator address: (0 - 255)

Advanced Settings

k: (1 - 32)

w: (1 - 32)

T0 timeout: (1 - 3000000 ms)

T1 timeout: (1 - 3000000 ms)

T2 timeout: (1 - 3000000 ms)

T3 timeout: (1 - 172800000 ms)

Server List

| Index | Device Name | IP Port | ASDU Address |
|---------------------------------------|-------------|---------|--------------|
| <input type="button" value="Submit"/> | | | |

| 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

Server Settings

IEC 60870-5-104 Client Settings > Server Settings



Basic Settings

Device name:

IP address: : (1024 - 60000)

ASDU address: (1 - 65534)

General Interrogation Setting

Initial general interrogation:

Cyclic general interrogation interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-1 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-2 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-3 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-4 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-5 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-6 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-7 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-8 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-9 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-10 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-11 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-12 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-13 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-14 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-15 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-16 interval: (0 - 86400 s, 0 for disable)

Counter Interrogation Setting

Initial counter interrogation:

Cyclic counter interrogation interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation counter group-1 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation counter group-2 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation counter group-3 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation counter group-4 interval: (0 - 86400 s, 0 for disable)

Advanced Settings

Timestamp reference:

Enable cse active termination:

Enable cmd active termination:

Wait terminate timeout: (1 - 100 s)

Initial clock sync:

Cyclic clock sync interval: (0 - 86400 s, 0 for disable)

Endian Swap:

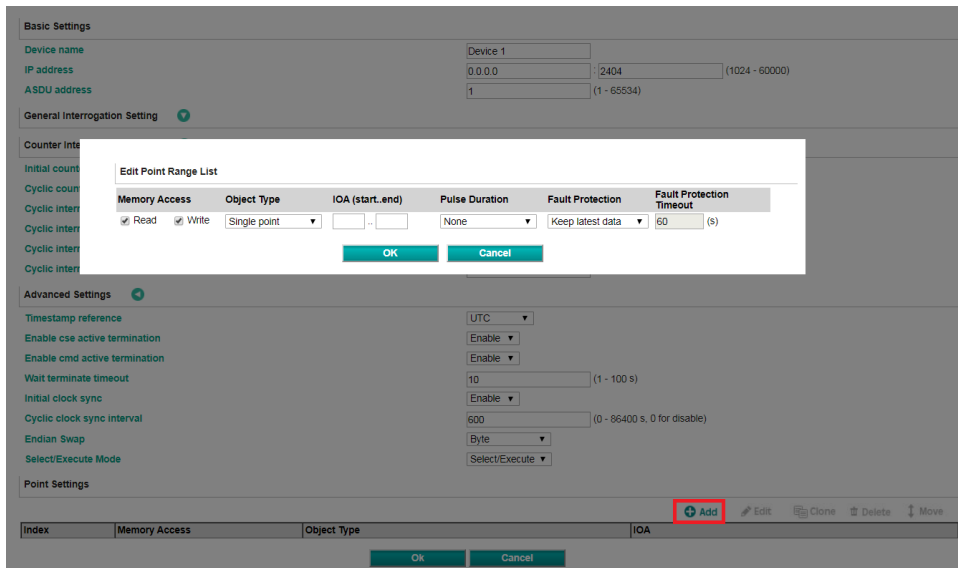
Select/Execute Mode:

| Index | Memory Access | Object Type | IOA |
|---|---------------|-------------|-----|
| + Add ✎ Edit 📄 Clone 🗑 Delete ↕ Move | | | |

| 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 |
| Timestamp reference | UTC, Local time | UTC | Command with timestamp refers to UTC or Local time. |
| 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, |
| Select/Execute mode | Select/Execute, Execute Only | Select/Execute | Select/Execute: Writes occur with a dual command/response from the device. Execute Only: Writes occur with a single command/response from the device. |

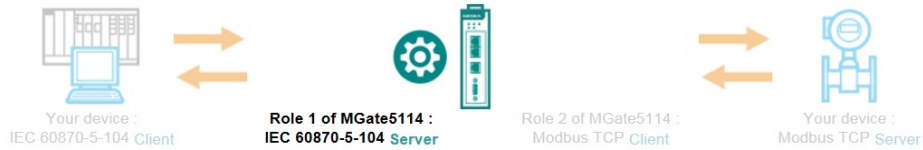
When connecting to an IEC 60870-5-104 server, you have to add the objects you want to collect and configure them.



| 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 |
| Pulse Duration | None, Short Pulse, Long Pulse, Persistent Output | None | - |
| 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

IEC 60870-5-104 Server Setting



Role **Server**

Basic Settings

COT size 1 2

ASDU address (1 - 65534)

Listen port (1024 - 60000)

Advanced Settings ◀

k (1 - 32)

w (1 - 32)

T1 timeout (1 - 3000000 ms)

T2 timeout (1 - 3000000 ms)

T3 timeout (1 - 172800000 ms)

Advanced Settings - Application Layer ◀

Timestamp reference

Enable cse active termination

Enable cmd active termination

Select timeout (Select/Execute) (0 - 600 s, 0 for executing only)

General interrogation timestamp format

Event timestamp format

Measured value cyclic timestamp format

Measured value spontaneous

Measured value(Normalized) cyclic interval (0 - 2073600 s, 0 for disable)

Measured value(Scaled) cyclic interval (0 - 2073600 s, 0 for disable)

Measured value(Floating) cyclic interval (0 - 2073600 s, 0 for disable)

Point status timeout (5 - 3600 s, 0 for disable)

Endian swap

Point Settings

+ Add
✎ Edit
📄 Clone
🗑 Delete
↕ Move

| Index | Memory Access | Object Type | IOA |
|---------------|---------------|-------------|-----|
| Submit | | | |

| 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 |
| T2 timeout | 1-3000000 ms | 10000 | Timeout of when to send S-format to the host acknowledge to acknowledge slave messages received |

| Parameter | Value | Default | Description |
|---|---------------------------------------|---------|--|
| T3 timeout | 1-172800000 ms | 20000 | Timeout of sending test frame to prevent from long idle state |
| Timestamp reference | Local time | UTC | Command with timestamp refers to UTC or Local time. |
| 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 24 bits 56 bits | None | General interrogation response with/without time stamp |
| Event timestamp format | None 24 bits 56 bits | 56 bits | Event with/without time stamp |
| Measured value cyclic timestamp format | None 24 bits 56 bits | None | Measured value cyclic with/without time stamp |
| Measured value spontaneous | Enable/disable | Enable | Enable/disable spontaneous feature |
| 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.

Edit Point Range List

| Memory Access | Object Type | IOA (start..end) | Group |
|--|-------------------|------------------|---------------------------------------|
| <input checked="" type="checkbox"/> Read <input checked="" type="checkbox"/> Write | Measured value(S) | 1 .. 1 | Interrogated by station interrogation |
| IOA Threshold ? Low Limit ? High Limit ? | | | |
| 1: <input checked="" type="checkbox"/> 0 <input type="checkbox"/> 0 <input type="checkbox"/> 0 | | | |

OK Cancel

| 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 |
| Threshold | Measured value (Normalized): 0 ~ 0xFFFF Measured value (Scaled): 0 ~ 65535 Measured value (Floating): 0 ~ 100000000 | 0 | Event Trigger: Current Reported Value - Last Reported Value > Threshold |
| Low Limit | Measured value (Normalized): 0 ~ 0xFFFF Measured value (Scaled): -32768 ~ 32767 Measured value (Floating): -999999 ~ 100000000 | 0 | Event Trigger: Current Reported Value < Low Limit Current Reported Value returns to above Low Limit |
| High Limit | Measured value (Normalized): 0 ~ 0xFFFF Measured value (Scaled): -32768 ~ 32767 Measured value (Floating): -999999 ~ 100000000 | 0 | Event Trigger: Current Reported Value > High Limit Current Reported Value returns to below High Limit |

Protocol Settings—IEC 60870-5-101 Master Settings

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

IEC 60870-5-101 Master Setting

The diagram illustrates the configuration flow for IEC 60870-5-101 Master Settings. It shows three roles: 'Your device: IEC 60870-5-104 Client', 'Role 1 of MGate5114: IEC 60870-5-104 Server', and 'Role 2 of MGate5114: IEC 60870-5-101 Master'. The 'Master' role is further associated with 'Your device: IEC 60870-5-101 Slave'. Arrows indicate the direction of configuration or data flow between these components.

Role Master

Basic Settings - Link Layer

Link mode: Unbalanced Transmission Balanced Transmission

Link address size: 2

Basic Settings - Application Layer

ASDU size: 1 2

COT size: 1 2

IOA size: 1 2 3

Originator address: 0 (0 - 255)

Advanced Settings - Link Layer

Frame timeout: 15000 (1 - 2073600000 ms)

Link confirm mode: Always

Link layer retry: 3 (0 - 254)

Offline poll period: 10 (1 - 2073600 s)

Slave List

| Index | Device Name | Data Link Address | ASDU Address |
|-------|-------------|-------------------|--------------|
| 1 | Device 1 | 3 | 3 |

Buttons: Add, Edit, Clone, Delete, Move

Submit

| 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.

Slave Settings

IEC 60870-5-101 Master Settings > Slave Settings



Basic Settings

Device name:

Link address: (0 - 65534)

ASDU address: (1 - 65534)

General Interrogation Setting

Initial general interrogation:

Cyclic general interrogation interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-1 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-2 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-3 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-4 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-5 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-6 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-7 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-8 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-9 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-10 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-11 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-12 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-13 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-14 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-15 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation group-16 interval: (0 - 86400 s, 0 for disable)

Counter Interrogation Setting

Initial counter interrogation:

Cyclic counter interrogation interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation counter group-1 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation counter group-2 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation counter group-3 interval: (0 - 86400 s, 0 for disable)

Cyclic interrogation counter group-4 interval: (0 - 86400 s, 0 for disable)

Advanced Settings - Link Layer

Link confirm timeout: (1 - 2073600000 ms)

Class 1 poll delay: (0 - 2073600000 ms, 0 for disable)

Class 2 poll delay: (0 - 2073600000 ms, 0 for disable)

Advanced Settings - Application Layer

Timestamp reference:

Enable cse active termination:

Enable cmd active termination:

Wait terminate timeout: (1 - 100 s)

Initial clock sync:

Cyclic clock sync interval: (0 - 86400 s, 0 for disable)

Endian Swap:

Select/Execute Mode:

Point Settings

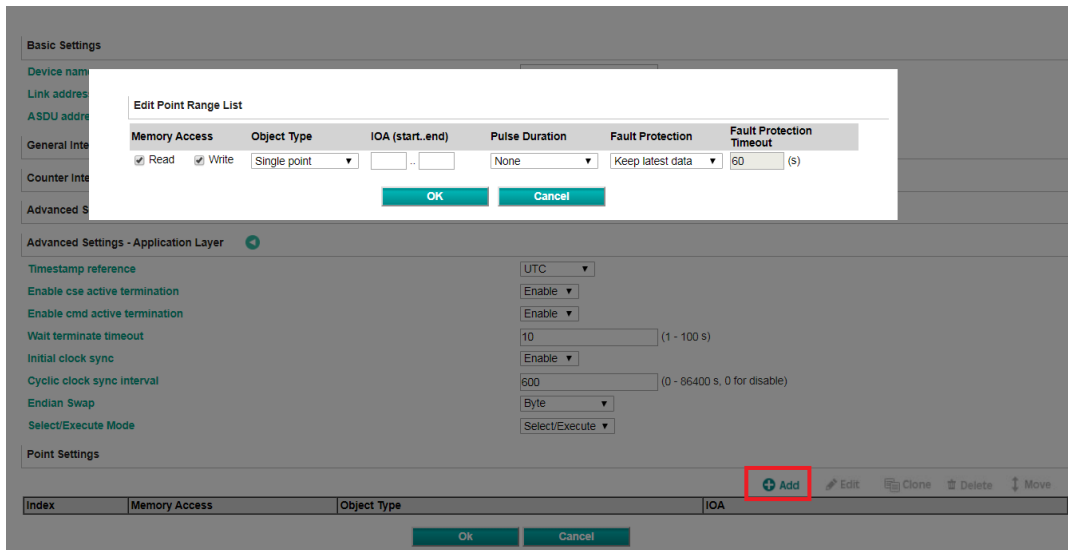
| Index | Memory Access | Object Type | IOA |
|---|---------------|-------------|-----|
| <input type="button" value="Add"/> <input type="button" value="Edit"/> <input type="button" value="Clone"/> <input type="button" value="Delete"/> <input type="button" value="Move"/> | | | |
| <input type="button" value="OK"/> <input type="button" value="Cancel"/> | | | |

| 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 |

| Parameter | Value | Default | Description |
|---|---------------------------------------|---------|--|
| ASDU address | 0-65534 | 3 | Indicate ASDU address of IEC 60870-5-101 slave that the MGate connects to |
| 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 |
| Timestamp reference | Local time | UTC | Command with timestamp references to UTC or Local time. |
| 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. |

| Parameter | Value | Default | Description |
|---------------------|------------------------------|----------------|---|
| Select/Execute mode | Select/Execute, Execute Only | Select/Execute | <p>Select/Execute: Writes occur with a dual command/response from the device.</p> <p>Execute Only: Writes occur with a single command/response from the device.</p> |

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 |
| Pulse Duration | None, Short Pulse, Long Pulse, Persistent Output | None | - |
| 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

IEC 60870-5-101 Slave Setting



Role Slave

Basic Settings - Link Layer

Link mode Unbalanced Transmission Balanced Transmission

Link address size

Basic Settings - Application Layer

ASDU size 1 2

COT size 1 2

IOA size 1 2 3

Basic Settings

Link address (0 - 65534)

ASDU address (1 - 65534)

Advanced Settings - Link Layer

Frame timeout (1 - 2073600000 ms)

Link confirm timeout (1 - 2073600000 ms)

Link layer retry (0 - 254)

Single char ack allowed

Single char response allow

Advanced Settings - Application Layer

Timestamp reference

Enable cse active termination

Enable cmd active termination

Select timeout (Select/Execute) (0 - 2073600 s, 0 for executing only)

General interrogation timestamp format

Event timestamp format

Measured value cyclic timestamp format

Measured value spontaneous

Measured value(Normalized) cyclic interval (0 - 2073600 s, 0 for disable)

Measured value(Scaled) cyclic interval (0 - 2073600 s, 0 for disable)

Measured value(Floating) cyclic interval (0 - 2073600 s, 0 for disable)

Point status timeout (5 - 3600 s, 0 for disable)

Endian swap

Point Settings

+ Add Edit Clone Delete Move

| Index | Memory Access | Object Type | IOA |
|---------------|---------------|-------------|-----|
| Submit | | | |

| 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 |
| 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 |
| Timestamp reference | UTC, Local Time | UTC | Command with timestamp references to UTC or Local time. |
| 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 |
| 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 24 bits 56 bits | 24 bits | General interrogation response with/without timestamp |
| Event timestamp format | None 24 bits 56 bits | 56 bits | Event with/without timestamp |
| Measured value cyclic timestamp format | None 24 bits 56 bits | None | Measured value cyclic with/without timestamp |

| Parameter | Value | Default | Description |
|----------------------------------|---------------------------------------|---------|--|
| 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 |
| 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.

Edit Point Range List

| Memory Access | Object Type | IOA (start..end) | Group |
|---|-------------------|------------------|---------------------------------------|
| <input checked="" type="checkbox"/> Read <input checked="" type="checkbox"/> Write | Measured value(S) | 1 .. 1 | Interrogated by station interrogation |
| IOA Threshold <input type="checkbox"/> Low Limit <input type="checkbox"/> High Limit <input type="checkbox"/> | | | |
| 1: <input checked="" type="checkbox"/> 0 <input type="checkbox"/> 0 <input type="checkbox"/> 0 | | | |

OK Cancel

| 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 |
| Threshold | Measured value (Normalized): 0 ~ 0xFFFF | 0 | Event Trigger: |

| | | | |
|------------|--|---|---|
| | | | Current Reported Value - Last Reported Value > Threshold |
| Low Limit | Measured value (Scaled): 0 ~ 65535 | 0 | Event Trigger: Current Reported Value < Low Limit Current Reported Value returns to above Low Limit |
| High Limit | Measured value (Floating): 0 ~ 100000000 | 0 | Event Trigger: Current Reported Value - Last Reported Value > Threshold |

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.


⚙️ Data Mapping


Data flow direction: IEC 60870-5-104 Client ← Modbus RTU/ASCII Slave


Mapping address arrangement: Automatic



 Your device:
IEC 60870-5-104 Client


read


 Role 1 of MGate 5114:
IEC 60870-5-104 **Server**


read


 Role 2 of MGate 5114:
Modbus RTU/ASCII **Master**


 Your device:
Modbus RTU/ASCII Slave

| Type | IOA | Internal Address | Data Size | Name | Function | Internal Address | Quantity |
|------------------------------------|-------|------------------|-----------|--------------|----------|------------------|----------|
| Measured value(Normalized) (value) | 1 - 1 | 0 .. 1 | 2 bytes | Read_command | 3 | 0 .. 1 | 2 bytes |

System Management

System Management—Accessible IP List

Accessible IP List

- Activate the accessible IP list (Protocol communications are NOT allowed for the IPs NOT on the list)
- Apply additional restrictions (All device services are NOT allowed for the IPs NOT on the list)

| No. | Active | IP | Netmask |
|-----|--------------------------|----------------------|----------------------|
| 1 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 2 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 3 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 4 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 5 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 6 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 7 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |
| 8 | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> |

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.

DoS Defense

Configuration

Null Scan

NMAP-Xmas Scan

SYN/FIN Scan

FIN Scan

NMAP-ID Scan

SYN-Flood

Enable

Limit (pkt/s)

ICMP-Death

Enable

Limit (pkt/s)

Submit

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).

System Log Settings

| Event Group | Syslog | Local Log | Summary |
|-----------------|--------------------------|--------------------------|---|
| System | <input type="checkbox"/> | <input type="checkbox"/> | System cold start, System warm start |
| Network | <input type="checkbox"/> | <input type="checkbox"/> | DHCP/BOOTP get IP/renew, NTP connect fail, IP conflict, Network link down |
| Configuration | <input type="checkbox"/> | <input type="checkbox"/> | Login fail, IP changed, Password changed, Firmware upgrade, SSL certificate import, Config import, Config export, Configuration change, Clear event log |
| Modbus TCP | <input type="checkbox"/> | <input type="checkbox"/> | Modbus TCP communication logs |
| IEC 60870-5-101 | <input type="checkbox"/> | <input type="checkbox"/> | IEC 60870-5-101 communication logs |
| IEC 60870-5-104 | <input type="checkbox"/> | <input type="checkbox"/> | IEC 60870-5-104 communication logs |

Local Log Settings

Enable log capacity warning at (%)

Warning by: SNMP Trap E-mail

Event log oversize action :

Syslog Settings

Syslog server IP

Syslog server port

Submit

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 Settings

| System Event | | | |
|-----------------------|-------------------------------|-------------------------------|--------------------------------|
| Cold start | Mail <input type="checkbox"/> | Trap <input type="checkbox"/> | |
| Warm start | Mail <input type="checkbox"/> | Trap <input type="checkbox"/> | |
| Power input 1 failure | Mail <input type="checkbox"/> | Trap <input type="checkbox"/> | Relay <input type="checkbox"/> |
| Power input 2 failure | Mail <input type="checkbox"/> | Trap <input type="checkbox"/> | Relay <input type="checkbox"/> |
| Ethernet 1 link down | Mail <input type="checkbox"/> | Trap <input type="checkbox"/> | Relay <input type="checkbox"/> |
| Ethernet 2 link down | Mail <input type="checkbox"/> | Trap <input type="checkbox"/> | Relay <input type="checkbox"/> |
| Config Event | | | |
| Console login failed | Mail <input type="checkbox"/> | Trap <input type="checkbox"/> | |
| IP changed | Mail <input type="checkbox"/> | | |
| Password changed | Mail <input type="checkbox"/> | | |

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

E-Mail Alert

Mail Settings

Mail server (SMTP)

My server requires authentication

Username

Password

From e-mail address

To e-mail address 1

To e-mail address 2

To e-mail address 3

To e-mail address 4

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

System Management—SNMP Trap

SNMP Trap

SNMP Trap

SNMP trap server IP or domain name

Trap version v1 v2c

Trap community

| Parameters | Description |
|---------------------|--|
| SNMP trap server IP | Use this field to 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

SNMP Agent Settings

Configuration

| | |
|--------------------------------|--------------------------|
| SNMP | Enable ▾ |
| Contact name | <input type="text"/> |
| Read community string | public |
| Write community string | private |
| SNMP agent version | V1, V2c ▾ |
| Read-only username | rouser |
| Read-only authentication mode | Disable ▾ |
| Read-only password | <input type="password"/> |
| Read-only privacy mode | Disable ▾ |
| Read-only privacy | <input type="password"/> |
| Read/write username | rwuser |
| Read/write authentication mode | Disable ▾ |
| Read/write password | <input type="password"/> |
| Read/write privacy mode | Disable ▾ |
| Read/write privacy | <input type="password"/> |

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

System Management—LLDP Settings

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

LLDP Settings

Configuration

LLDP

Message transmit interval (5 - 16383 secs)

| 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

Certificate

SSL Certificate

Issued to 192.168.127.254

Issued by 192.168.127.254

Valid from 2018/10/16 to 2028/10/13

Select SSL certificate file

Delete SSL certificate file

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

Console Settings

Configurations

| | |
|----------------|-----------------|
| HTTP console | Enable ▾ |
| HTTPS console | Enable ▾ |
| Telnet console | Enable ▾ |
| SSH console | Enable ▾ |
| Serial console | Enable ▾ |
| Reset button | Always enable ▾ |
| MOXA command | Enable ▾ |

Session Settings

| | |
|-----------------------------------|--|
| Maximum login user for HTTP+HTTPS | <input type="text" value="5"/> (1 ~ 10) |
| Auto logout setting | <input type="text" value="1440"/> (1 ~ 1440 min) |

Submit

| 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

Notification Message

Notification Message

Login message

0 character/Maximum 240 character

Login authentication failure message

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

111 character/Maximum 240 character

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

System Management—Misc. Settings—Account Management

Account Management

Add Account Settings

+ Add
✎ Edit
🗑 Delete

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

Submit

| Parameters | Value | Description |
|------------|-------------|--|
| Account | admin, user | Users can 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

⚙️ Login Password Policy

Account Password Policy

Minimum length (4 ~ 16)

Enable password complexity strength check

- At least one digit(0~9)
- Mixed upper and lower case letters(A~Z, a~z)
- At least one special character: ~!@#\$\$%^&*~!@#<>{}[]

Password lifetime (90 ~ 180 days)

Account Login Failure Lockout

Enable

Retry failure threshold (1 ~ 10 time)

Lockout time (1 ~ 60 min)

| Account Password Policy | Value | Description |
|---|-------------|---|
| Minimum length | 4-16 | The minimum password length |
| 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.

⚙️ Ping Test

Ping Destination

Destination

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.

⚙️ Firmware Upgrade

!!! Warning !!!

Upgrading firmware may cause MGate devices to reset to factory default.
We suggest you back up the configuration of all MGate devices.

Select firmware file



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

⚙️ Configuration Import/Export

Configuration Import

Select configuration file

Keep IP settings

Configuration Export

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.

⚙️ Load Factory Default

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

Reset to Factory Default

Keep IP settings

Submit



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.

⚙️ Network Connections

Auto refresh

| 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 Log

System Log

Export
Clear log
Refresh

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.

⚙️ Relay State

Auto refresh

| | | |
|-----------------------|-----|-------------------|
| Power input 1 failure | N/A | Acknowledge Event |
| Power input 2 failure | N/A | Acknowledge Event |
| Ethernet 1 link down | N/A | Acknowledge Event |
| Ethernet 2 link down | N/A | Acknowledge Event |

System Monitoring—System Status—LLDP Table

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

⚙️ LLDP Table

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

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

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

Server Statistics

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

Select connected device

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

Slave Statistics

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

⚙️ Modbus TCP Traffic

Auto scroll

Start Stop Export TXT File Export PCAP File Capturing ...

| 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

⚙️ IEC 60870-5-104 Traffic

Auto scroll

Start Stop Export TXT File Export PCAP File Capturing ...

| 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 14 |
| 2 | 7.023 | Send | 192.168.127.1:63543 | 68 0E 10 00 08 00 64 01 07 04 03 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 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 14 |
| 6 | 12.435 | Receive | 192.168.127.1:63543 | 68 0E 08 00 18 00 64 01 06 04 03 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 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 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 14 |
| 11 | 14.465 | Receive | 192.168.127.1:63543 | 68 0E 0A 00 20 00 64 01 06 04 03 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 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:

Protocol Conversion



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:

Protocol Conversion




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.”

The diagram shows a 'read' operation between two devices. On the left, a computer icon is labeled 'Your device : IEC 60870-5-104 Client'. On the right, a server rack icon is labeled 'Your device : Modbus TCP Server'. In the center, a mobile device icon is labeled 'Role 1 of MGate 5114 : IEC 60870-5-104 Server' and 'Role 2 of MGate 5114 : Modbus TCP Client'. Below this, there are two tables. The first table shows configuration for 'Measured value(Normalized) (value) 1 - 1' with IOA 0, Internal Address 1, and Data Size 2 bytes. The second table shows configuration for 'Voltage' with Function 3, IOA 0, Internal Address 1, and Quantity 2 bytes. A 'Submit' button is at the bottom.

| Type | IOA | Internal Address | Data Size |
|--|-----|------------------|-----------|
| Measured value(Normalized) (value) 1 - 1 | 0 | 1 | 2 bytes |

| Name | Function | Internal Address | Quantity |
|---------|----------|------------------|----------|
| Voltage | 3 | 0 | 1 |
| | | | 2 bytes |

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**

Advanced Settings - Application Layer 

| | | |
|--|-------------------------------------|-----------------------------------|
| Enable cse active termination | <input type="text" value="Enable"/> | |
| Enable cmd active termination | <input type="text" value="Enable"/> | |
| Select timeout | <input type="text" value="10"/> | (0 - 600 s, 0 for executing only) |
| General interrogation time tag | <input type="text" value="24bits"/> | |
| Event time stamp | <input type="text" value="56bits"/> | |
| Measured value(Normalized) cyclic interval | <input type="text" value="0"/> | (0 - 2073600 s, 0 for disable) |
| Measured value(Scaled) cyclic interval | <input type="text" value="0"/> | (0 - 2073600 s, 0 for disable) |
| Measured value(Floating) cyclic interval | <input type="text" value="0"/> | (0 - 2073600 s, 0 for disable) |
| Point Status Timeout | <input type="text" value="60"/> | (5 - 3600 s, 0 for disable) |
| Endian Swap | <input type="text" value="Byte"/> | |

Configuration (Text Mode Console)

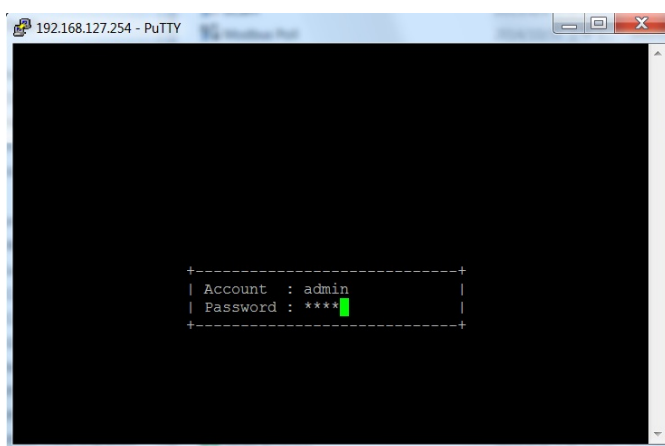
The MGate 5114 supports a text-mode console with serial interface, telnet, and SSH protocol. The user interface is the same in all text mode consoles. Note that the text mode console does not support all configuration items. Some parameters must be configured through the web console.

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).

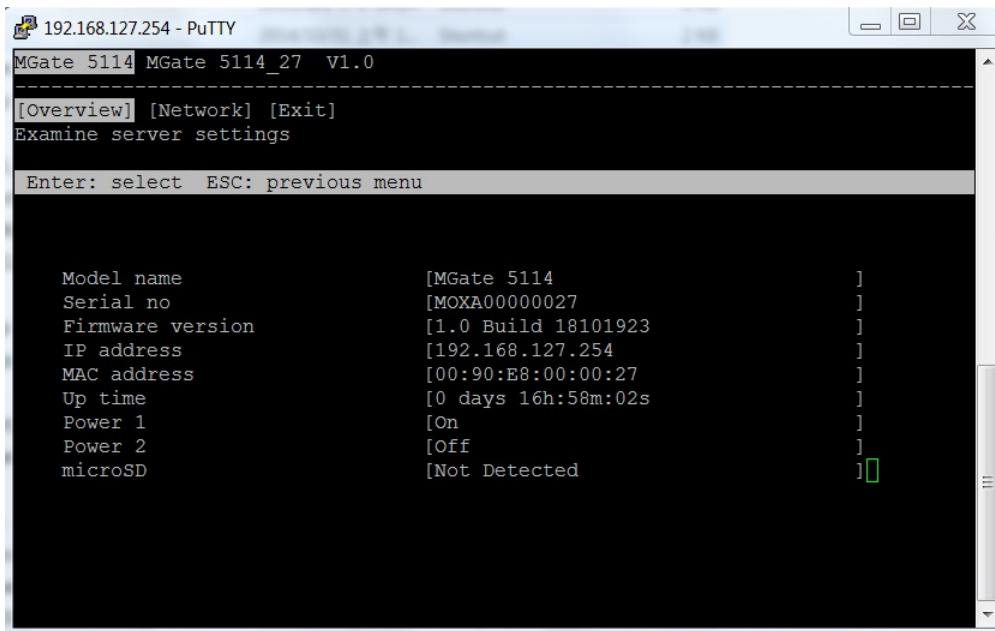
For telnet and SSH, use HyperTerminal or PuTTY to connect to the MGate. Note that the telnet protocol will transfer the account and password information over the Internet using plain text, so telnet is essentially obsolete and should be replaced by the SSH protocol.

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.



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 | <ol style="list-style-type: none">1. System name and login password modification2. Network settings3. Configuration import/export4. Firmware upgrade |
| MXview | <ol style="list-style-type: none">1. Configuration import/export2. LLDP for topology analysis3. 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 |