AIG-502 Series User Manual

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www.moxa.com/products

AIG-502 Series User Manual

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Technical Support Contact Information

www.moxa.com/support

Table of Contents

1. Introduction

Overview

The AIG-502 Series advanced IIoT gateways are built around a powerful 7th Gen Intel® Core™ i7 processor, featuring versatile connectivity options with 1 HDMI display port, 3 USB 3.0 ports, 2 gigabit LAN ports, and 2 3-in-1 RS-232/422/485 serial ports. Equipped with a 2.5" HDD/SSD slot and a built-in TPM 2.0 module, the AIG-502 is designed to deliver reliable performance in harsh environments, including extreme temperatures, humidity, vibration, and power surges. Tailored for Industrial IoT applications, it seamlessly integrates Modbus RTU/TCP protocols for easy data collection from Modbus devices and comes preloaded with Azure IoT Edge, enabling secure sensor-to-cloud connectivity. Ideal for heavy industry, solar grids, water/wastewater, oil and gas, and transportation applications, the AIG-502 Series ensures robust and efficient data acquisition even in distributed and unmanned sites.

Package Checklist

- AIG-502 embedded computer
- Terminal block to power jack converter
- DIN-rail mounting kit
- Quick installation guide (printed)
- Warranty card
- Tamper-resistant label

NOTE

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

Product Features

AIG-502 embedded computers come with the following:

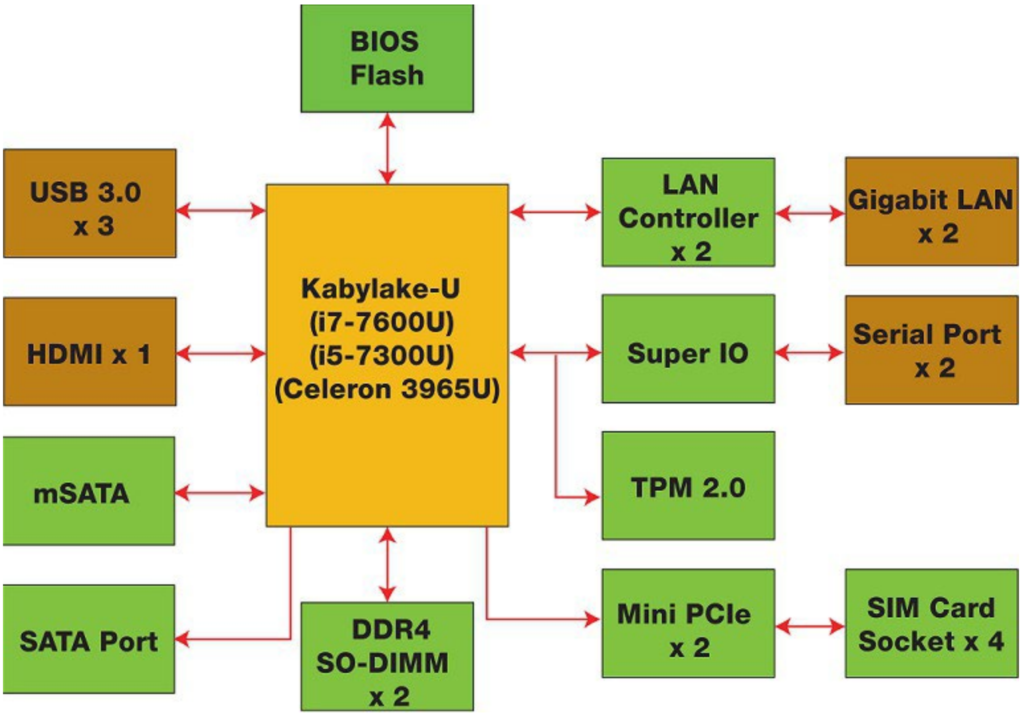
- Mini-PCIe sockets for Wi-Fi expansion modules
- 7th Gen Intel® Core™ processor (Kaby Lake U)
- Built-in 32GB DDR4 memory
- ATEX and IECEx Zone 2 compliance
- Built-in TPM 2.0 module
- Variety of interfaces: 2 serial ports, 2 Giga LANs, 3 USB 3.0 (type A) ports

Hardware Specifications

NOTE

The latest specifications for Moxa's products can be found at https://moxa.com.

Hardware Block Diagram

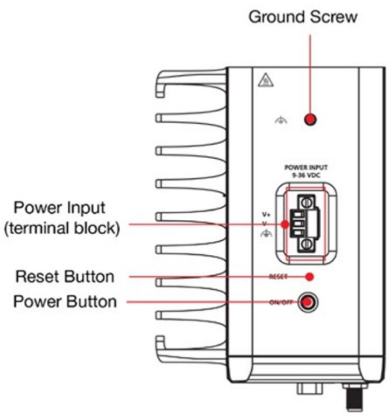


2. Hardware Introduction

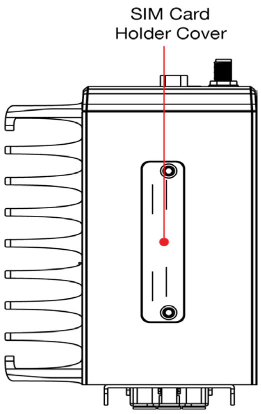
The AIG-502 Series embedded computers are compact, well designed, and rugged enough for industrial applications. LED indicators help you monitor the performance and identify trouble spots. Multiple serial ports allow you to connect different devices for wireless operation and the reliable and stable hardware platform lets you devote your attention to developing your applications.

Appearance

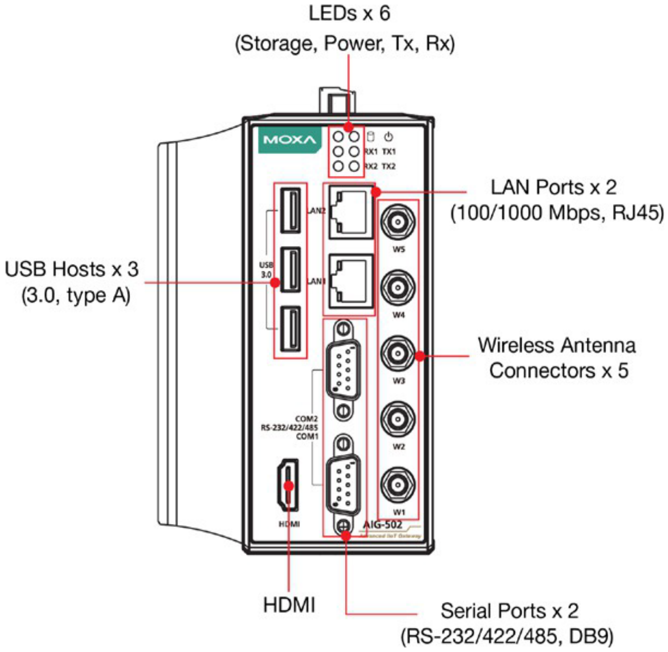
Top View



Bottom View

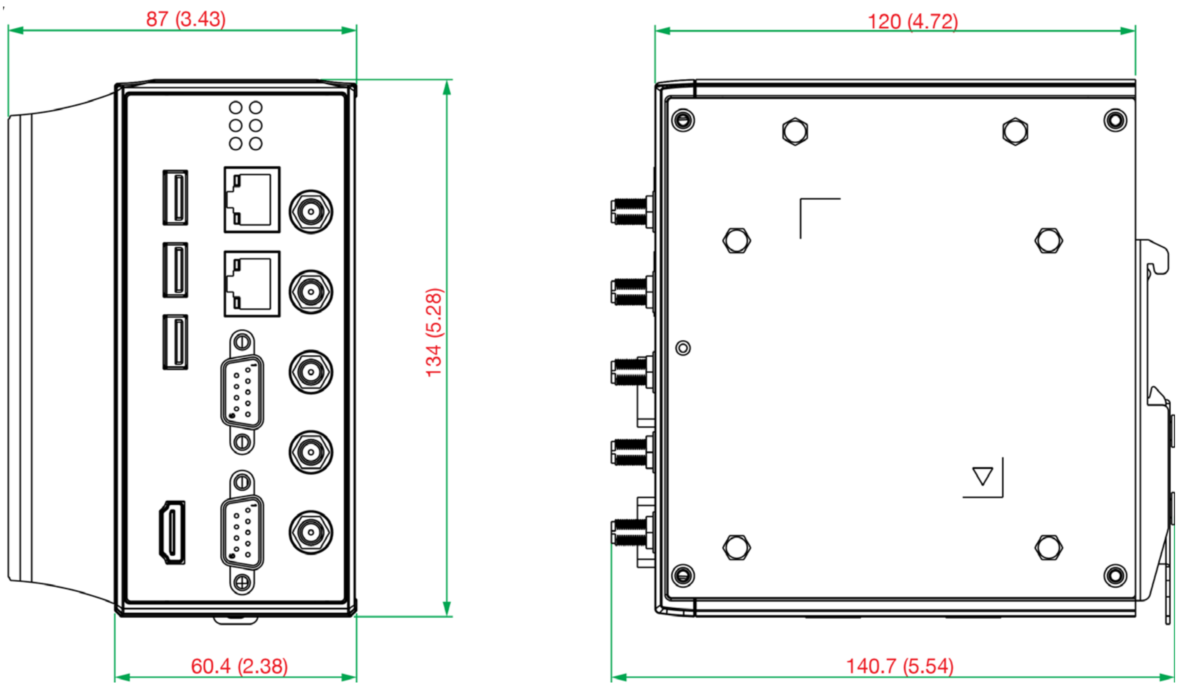


Front View



Dimensions

Unit: mm (inch)



LED Indicators

LED Name	Status	Function
Power ⏻	Green	Power is on and computer is functioning normally
	Off	Power is off
Storage 1 (mSATA) ⛁	Yellow	Blinking: Data transmission
	Off	No data transmission.
LAN 1/2 (Located on connectors)	Green	Steady On: 100 Mbps Ethernet link Blinking: Data is being transmitted
	Yellow	Steady On: 1000 Mbps Ethernet link Blinking: Data is being transmitted
	Off	10 Mbps Ethernet link or LAN is not connected
Tx 1/2	Green	Blinking: Data is being transmitted
	Off	No connection
Rx 1/2	Yellow	Blinking: Data is being transmitted
	Off	No connection

3. Hardware Connection Description

In this chapter, we describe how to connect the embedded computer to the network and to various devices.

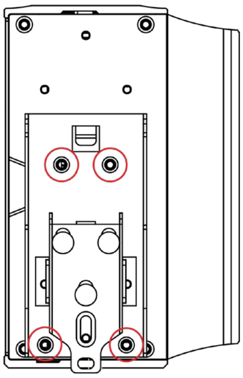
Installing the AIG-502

DIN-rail Mounting

The AIG-502 comes with a DIN-rail mounting kit for installing the computer on a DIN rail.

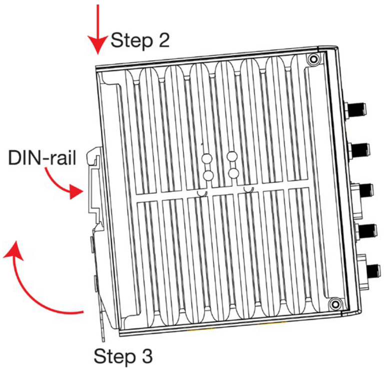
Installation

STEP 1:
Use the 4 screws included with the kit to attach the DIN-rail mounting bracket to the AIG-502's rear panel and tighten the screws to secure the bracket to the AIG-502.



STEP 2:
Insert the top of the DIN rail into the slot just below the upper hook of the DIN-rail mounting kit.

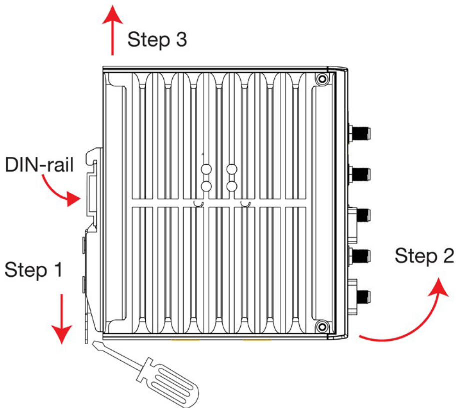
STEP 3:
Press the AIG-502 towards the DIN rail until it snaps into place.



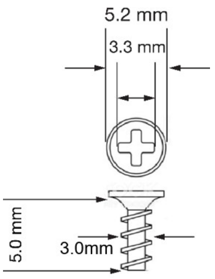
Removal

STEP 1:
Pull down the latch on the mounting kit with a screwdriver.

STEP 2 & 3:
Slightly pull the AIG-502 forward and lift it up to remove it from the DIN rail.



For the specifications of the DIN-rail mounting screws, refer to the illustrations on the right and adhere to these values to tighten the DIN-rail bracket on to the rear of the computer.



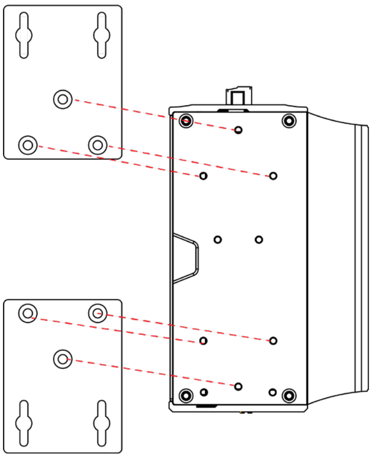
Wall or Cabinet Mounting (DNV)

Use the optional wall-mounting kit to install the AIG-502 on to a wall.

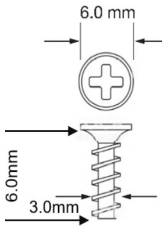
NOTE

The wall-mounting kit can be purchased separately.

STEP 1:
Use three screws for each bracket and attach the brackets to the rear of the AIG-502.



Refer to the figure on the right for the specifications of the screws used to attach the brackets.

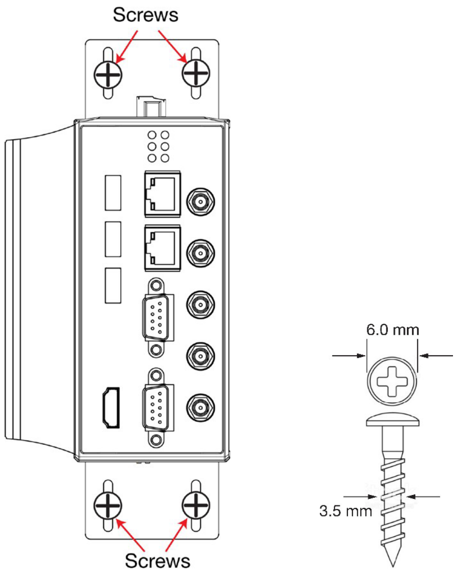


STEP 2:
Use two screws per bracket to attach the AIG-502 to a wall or cabinet.

NOTE:
Mounting the AIG-502 to a wall requires four screws. Use the AIG-502 computer, with the optional wall-mounting brackets attached, as a guide to mark the correct locations of the screws on the wall.

The heads of the screws should be less than 6.0 mm in diameter, the shafts should be less than 3.5 mm as shown in the figure on the right. The recommended length of the screw is more than 10 mm.

Do not drive the screws in all the way; leave a space of about 2 mm to allow room for sliding the wall-mounting bracket between the wall and the screws.



Wiring Requirements

In this section, we describe how to connect serial devices to the AIG-502 embedded computer.

Be sure to read and follow these common safety precautions before proceeding with the installation of any electronic device:

- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the crossing point.

NOTE

Do not run signal or communication wiring together with power wiring in the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.

- Use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.
- Keep input wiring and output wiring separated.
- For future reference, you should label the wiring used for all of your devices.

ATTENTION

Safety First!

Be sure to disconnect the power cord before installing and/or wiring your AIG-502.

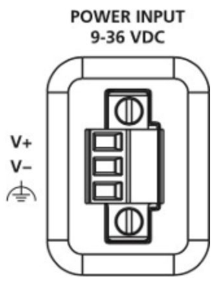
Wiring Caution!

Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size. If the current value goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

Temperature Caution!

Be careful when handling the unit. When the unit is plugged in, the internal components generate heat, and consequently the outer casing may feel hot to the touch.

Connecting the Power



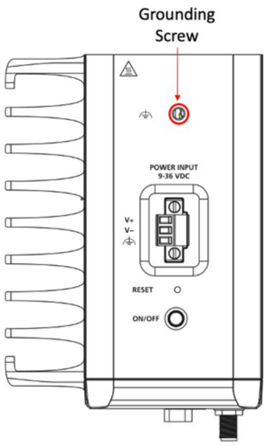
Use an LPS (9-36 VDC) or Class 2 power cord to connect to the AIG-502's terminal block to power jack converter and then turn on the power. If the power is supplied properly, the Power LED will light up. The OS is ready when the Power LED is solid green.

⚠ ATTENTION

This product is intended to be supplied by a Listed Power Supply with output marked LPS and rated to deliver 9 to 36 VDC at a minimum of 8 A. Ensure that the power cord is connected to a socket-outlet with earthing connection, or an equivalent.

Grounding the Unit

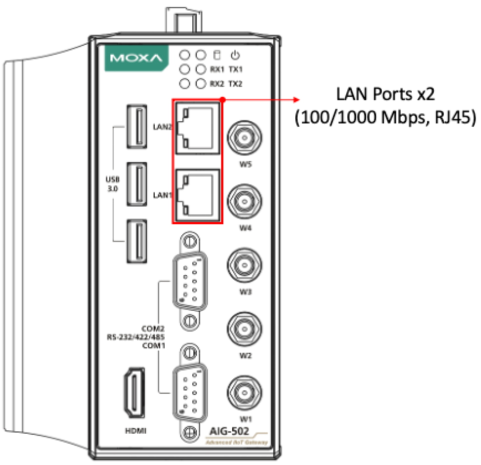
Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the grounding screw (M4) to the grounding surface prior to connecting the power.


Grounding Screw

Connecting to a Network

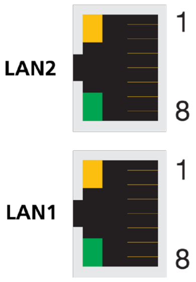
To connect the AIG-502 computer to a network, connect a network cable to the embedded computer’s Ethernet port and connect the other end of the cable to your Ethernet network. When the cable is properly connected, the LEDs on the embedded computer’s Ethernet port turn on to indicate a valid connection.

Two 10/100/1000 Mbps Ethernet ports with RJ45 connectors are located on the front panel of the embedded computer. Refer to the illustration in the right for the location of the Ethernet ports.


LAN Ports x2
(100/1000 Mbps, RJ45)

NOTE

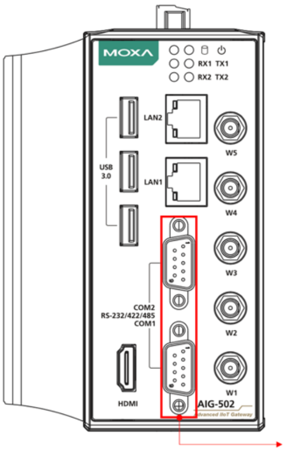
The pin assignments for the AIG-502 computer’s Ethernet port are shown in the following figure. If you want to use your own Ethernet cable, ensure that you match the pin assignments of the connector on the Ethernet cable.



Pin	10/100 Mbps	1000 Mbps
1	ETx+	TRD(0)+
2	ETx-	TRD(0)-
3	ERx+	TRD(1)+
4	–	TRD(2)+
5	–	TRD(2)-
6	ERx-	TRD(1)-
7	–	TRD(3)+
8	–	TRD(3)-

Connecting to a Serial Device

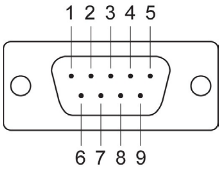
Use a serial cable to connect your serial device to the embedded computer’s serial port. The serial ports P1 to P2 have male DB9 connectors and can be configured for RS-232, RS-422, or RS-485 communication. For information on serial port configuration, refer to the *AIG-502 software manual*.



Serial Ports x 2
(RS-232/422/485, DB9)

The pin assignments of the serial ports are shown in the following table:

DB9 Male Port

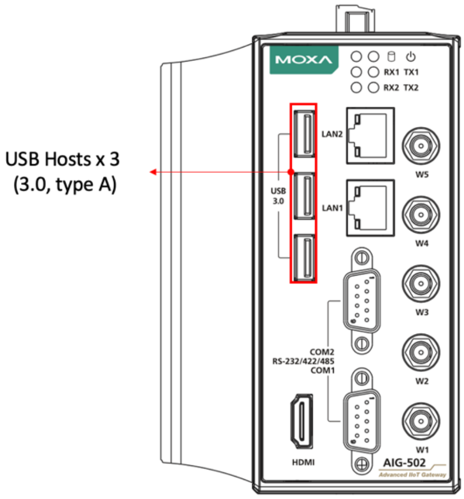


RS-232/422/485 Pinouts

Pin	RS-232	RS-422	RS-485 (4-wire)	RS-485 (2-wire)
1	DCD	TxDA(-)	TxDA(-)	–
2	RxD	TxDB(+)	TxDB(+)	–
3	TxD	RxDB(+)	RxDB(+)	DataB(+)
4	DTR	RxDA(-)	RxDA(-)	DataA(-)
5	GND	GND	GND	GND
6	DSR	–	–	–
7	RTS	–	–	–
8	CTS	–	–	–

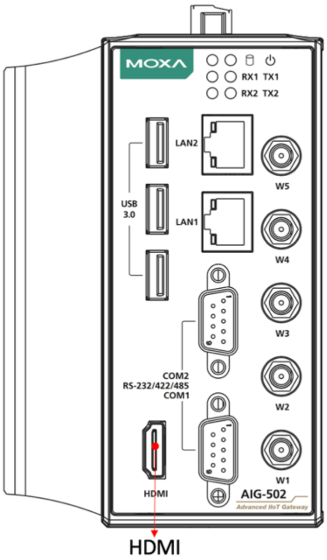
Connecting to a USB Device

The AIG-502 is provided with three USB 3.0 ports with type-A connectors on the front panel. These ports can be used to connect to an external flash disk or hard drive. You can also use these USB ports to connect to a keyboard or a mouse.



Connecting to an HDMI Device

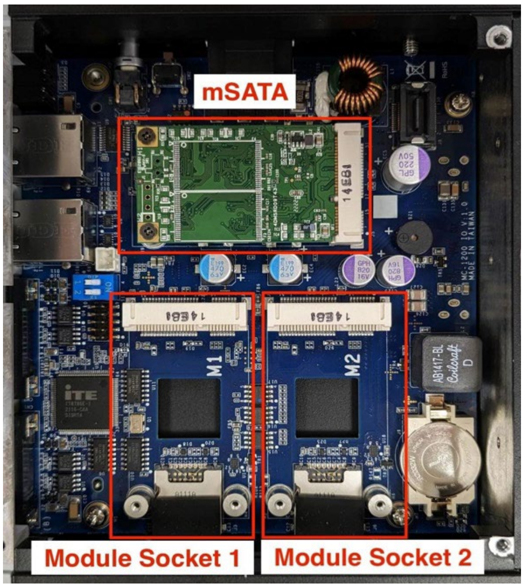
The AIG-502 Series offers an HDMI connector located on the front panel, allowing users to connect to an audio or video device. Make sure you use an HDM-certified cable for a reliable audio or video connection.



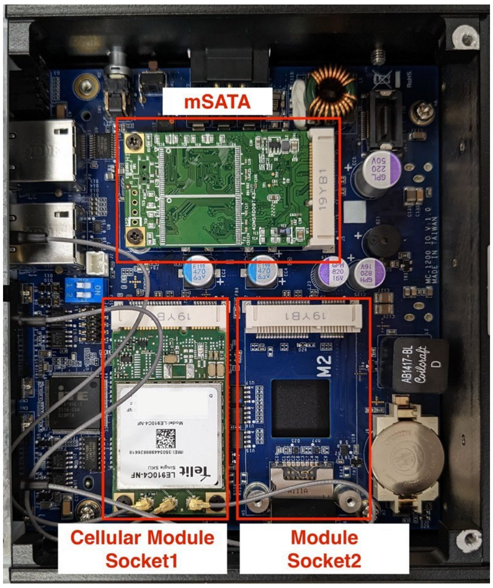
Installing Communications Modules

The AIG-502 Series comes with three sockets for installing various communications modules. Unfasten the screws on the right side of the computer and remove the cover to find the locations of the sockets as indicated in the following images:

AIG-502-T-AZU-LX



AIG-502-T-US/EU/AP-AZU-LX

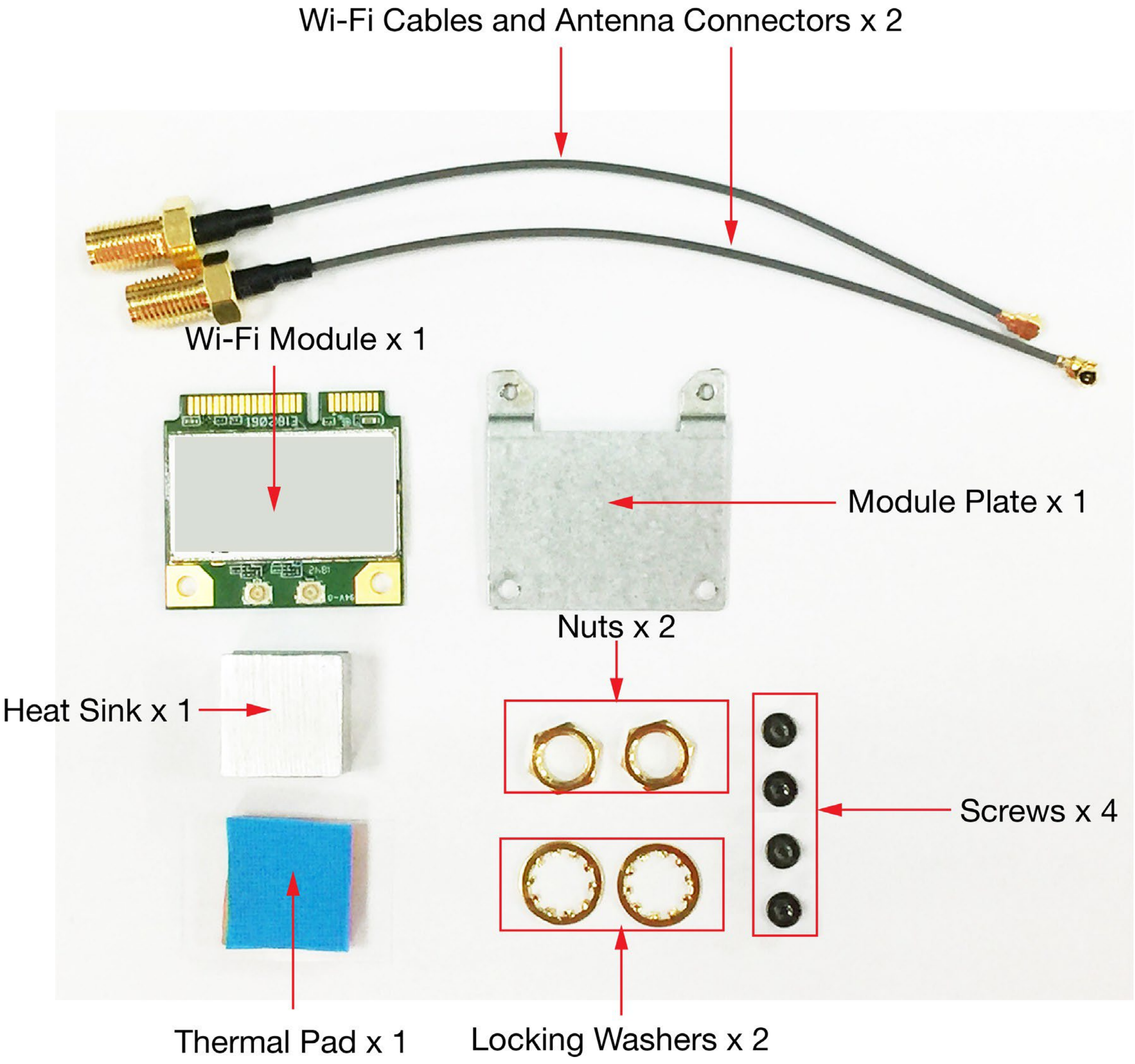


Installing the Wi-Fi Module

The AIG-502 comes with two sockets for users to install a Wi-Fi module for wireless communication.

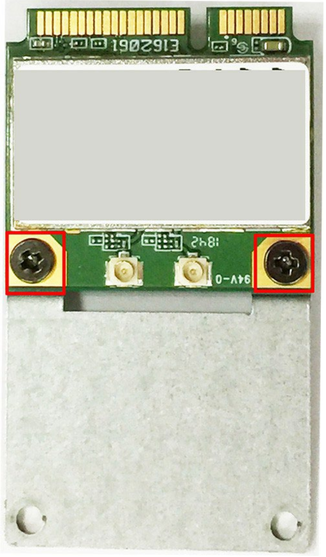
Wi-Fi Module Package

The contents of the Wi-Fi module package are shown in the following image:



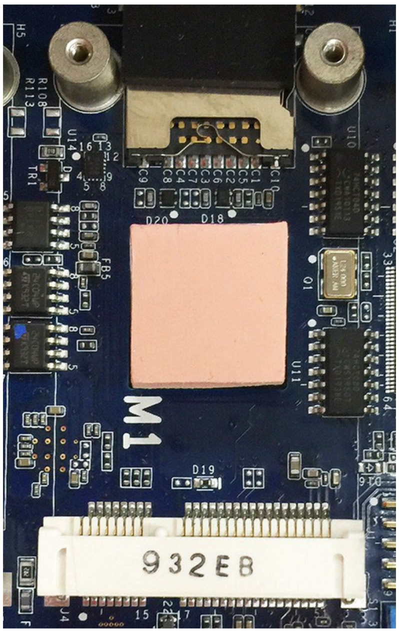
Follow these steps to install the Wi-Fi module in the AIG-502.

1. Attach the Wi-Fi module to the mounting plate with two screws.

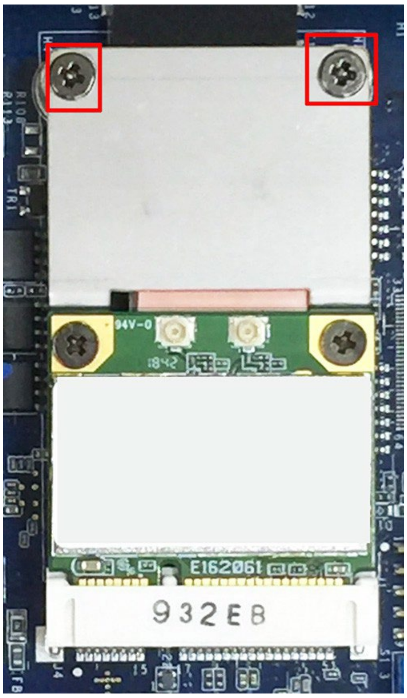


2. Remove the transparent plastic and the blue cover on both sides of the thermal pad and then place it on the top heat sink. Also, remove the blue cover on the heat sink.

3. Place the heat sink with the thermal pad at the center of the wireless module socket.

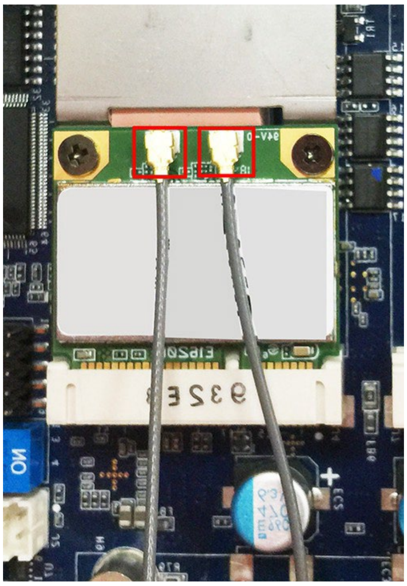


4. Insert the Wi-Fi module (with the mounting plate) into the socket and fasten the two black screws on the mounting plate to secure it.

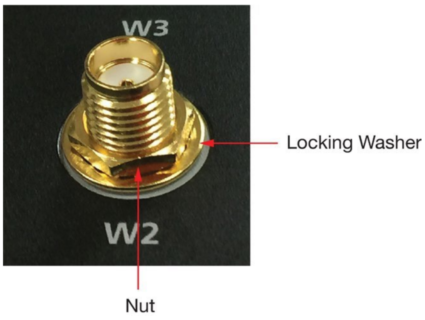


5. Attach one end of the Wi-Fi antenna cable to the connector on the Wi-Fi module and the insert the other end (with the threaded connection ring) through the antenna mounting hole on the front panel of the computer.

   Remove the protection cover on the mounting hole before you do so.



6. Insert the locking washer through the threaded connection ring and hold it against the front panel. Secure the antenna connector in place by tightening a nut onto the threaded protection ring.

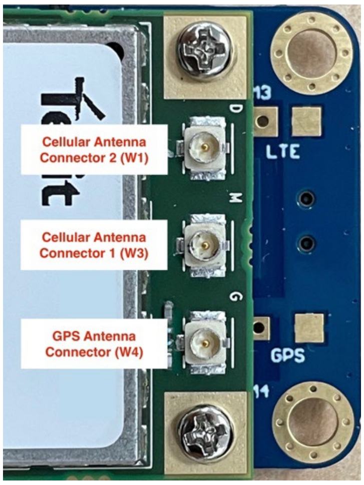


7. Connect the Wi-Fi antenna to the connector on the front panel.

8. Use this method to connect another Wi-Fi antenna, if necessary.

9. Reattach the right side cover on to the computer and fasten the screws to secure it.

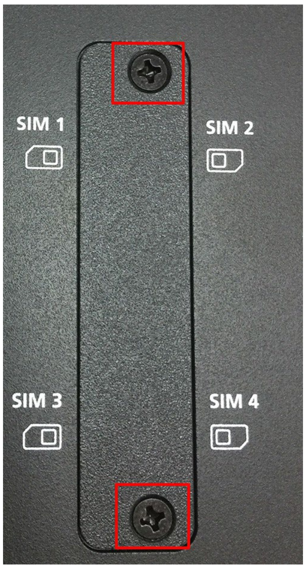
The pre-built cellular module comes with three connectors for a GPS antenna (W4), a primary cellular antenna (W3), and a secondary cellular antenna (w1).


Cellular Antenna Connector 2 (W1)
Cellular Antenna Connector 1 (W3)
GPS Antenna Connector (W4)
LTE
GPS

Installing SIM Cards

Follow these steps to install SIM cards for a cellular module.

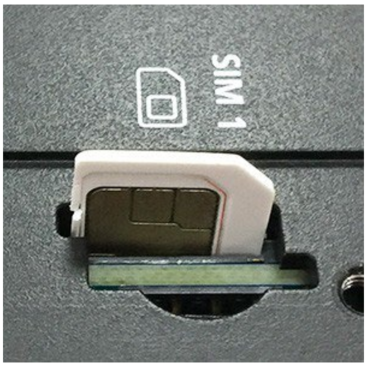
1. Remove the screws on the bottom panel of the computer and remove the cover. You will see four SIM card slots.



2. Insert a card into the SIM 1 slot. Make sure you insert the card in the right direction as indicated in the image beside the slot.

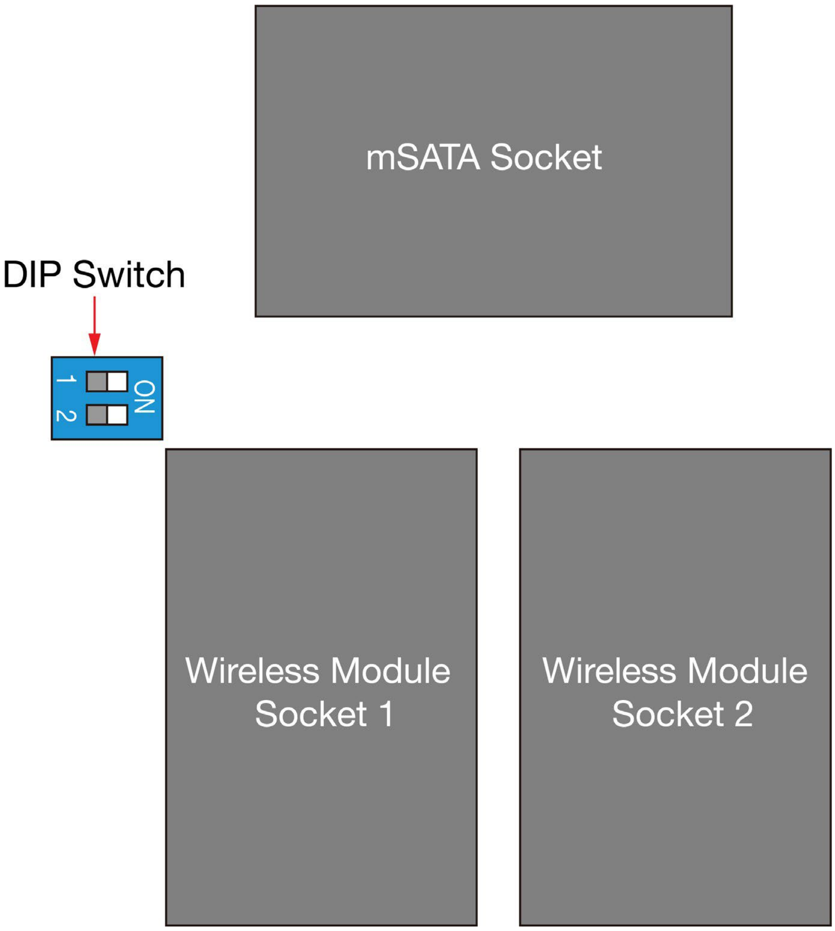
3. Insert the other card into the SIM 2 slot, if necessary.

4. Replace the computer cover and secure it by fastening the screws.

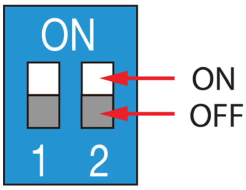


Switching Between the Wireless Module Sockets

As there are two wireless module sockets and you can install a Wi-Fi in both these sockets, a DIP switch is provided to enable selection of the Wi-Fi or cellular module installed. The DIP switch is located below the mSATA socket as shown in the following illustration.



The operation of the DIP switch is as follows:



Status	Switch 1	Switch 2
ON	Wi-Fi	Wi-Fi
OFF (default)	Cellular	Cellular

For example, if you have installed a Wi-Fi module in the first socket, you need to turn the DIP switch 1 to the ON status.

NOTE

- For AIG-502-T-AZU-LX, you can install the Wi-Fi module in either of the sockets, and turn the corresponding socket ON after installation.
- For AIG-502-T-US/EU/AP-AZU-LX, turn the socket 2 ON after the Wi-Fi module is installed.

RTC Battery Replacement

The AIG-502’s real-time clock is powered by a lithium battery. We strongly recommend that you do not replace the lithium battery without help from a qualified Moxa support engineer. If you need to change the battery, contact the Moxa RMA service team.

ATTENTION

There is a risk of explosion if the battery is replaced by an incorrect type of battery.

NOTE

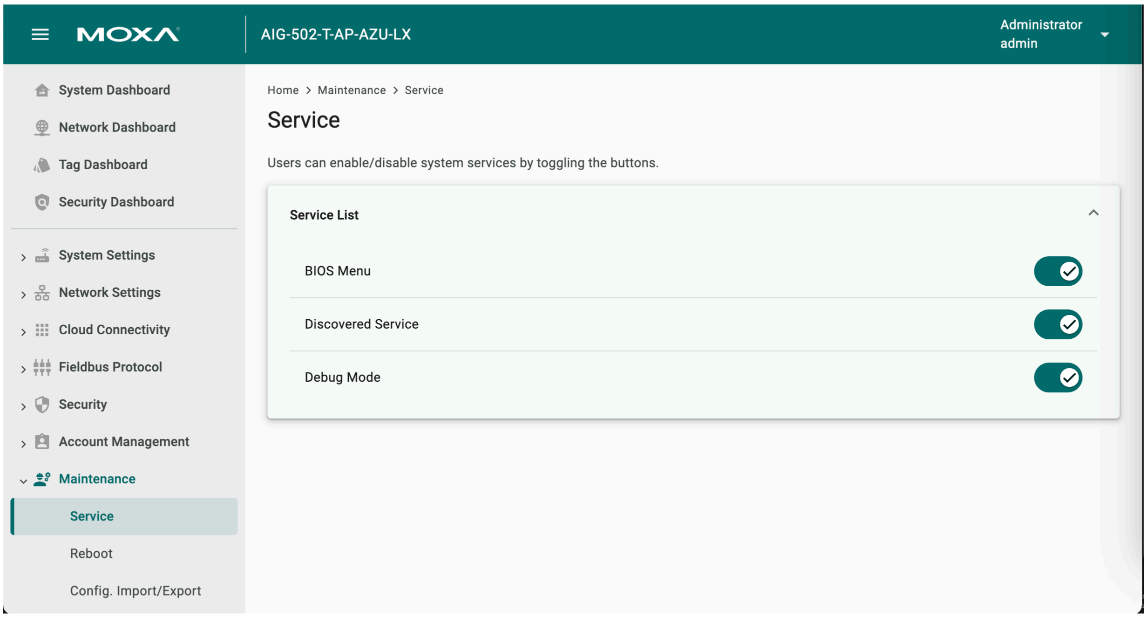
The AIG-502 embedded computer can be customized to support an easy RTC battery replacement function. Please contact your Moxa sales representative for details.

4. BIOS Setup

In this chapter, we describe the BIOS settings for the AIG-502 embedded computer. The BIOS firmware helps boot up the system before the operating system is loaded. All the configurations are stored in the flash ROM.

Entering the BIOS Setup

First, you need to enable BIOS option through the AIG-502 Web Console. You may refer the user manual to configure it by following this path: **Maintenance > Service > BIOS Menu**.



Service

Users can enable/disable system services by toggling the buttons.

Service List

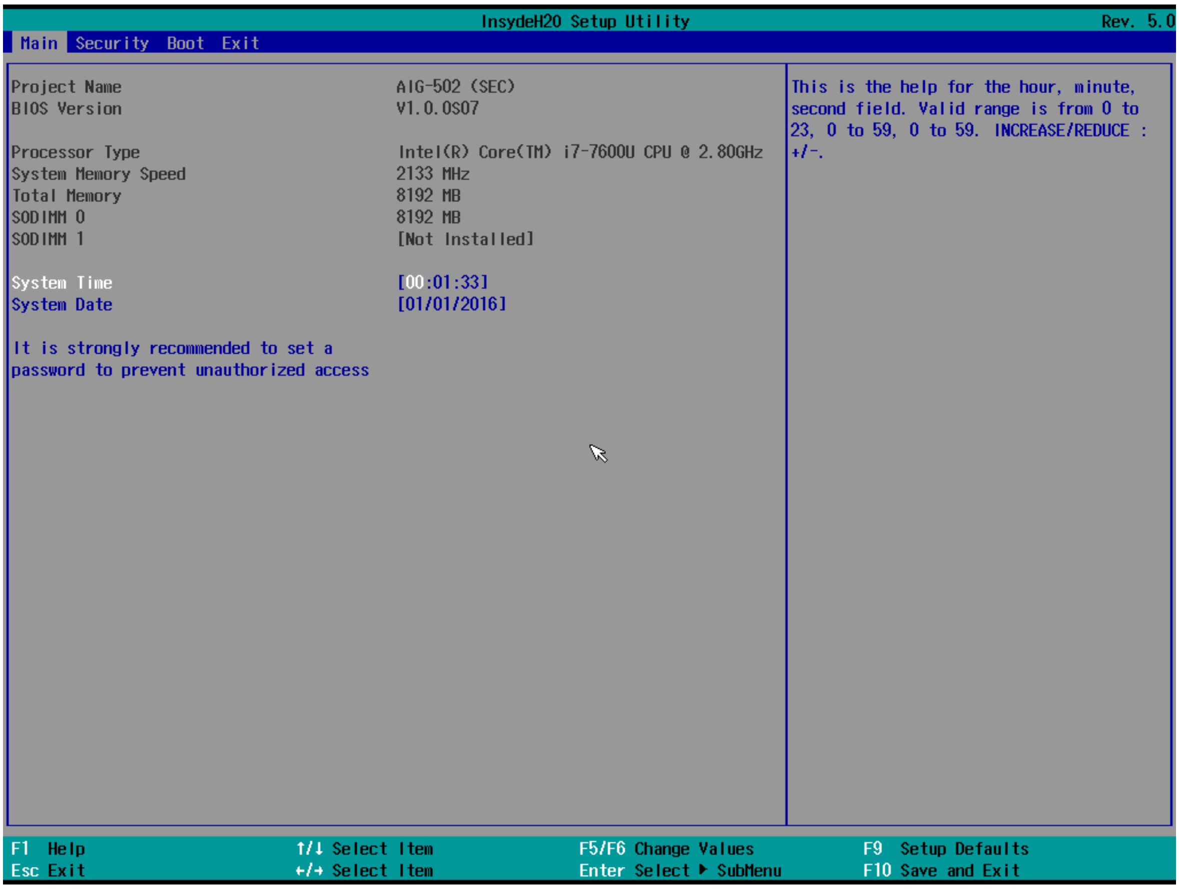
BIOS Menu	✓
Discovered Service	✓
Debug Mode	✓

To enter the BIOS setup utility, press the **F2** key while the system is booting up.

Main Page

The **Main** page displays basic system hardware information, such as model name, BIOS version, and CPU type.

To enter the BIOS, use the default password, which is the product's serial number. You can find the serial number on the product label on the device's cover.

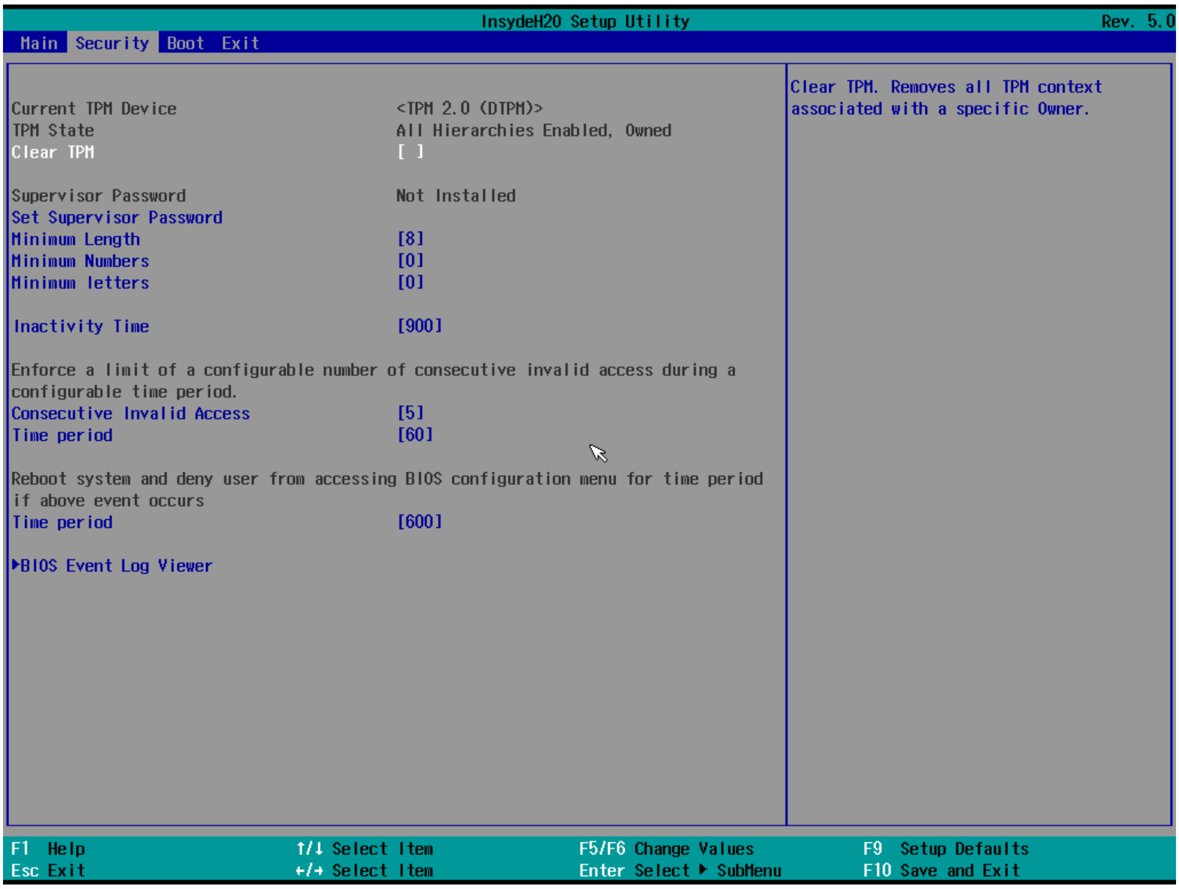


```
                              InsydeH20 Setup Utility                      Rev. 5.0
 Main  Security  Boot  Exit

Project Name                        AIG-502 (SEC)                This is the help for the hour, minute,
BIOS Version                        V1.0.0S07                    second field. Valid range is from 0 to
                                                                 23, 0 to 59, 0 to 59. INCREASE/REDUCE :
Processor Type                      Intel(R) Core(TM) i7-7600U CPU @ 2.80GHz   +/-.
System Memory Speed                 2133 MHz
Total Memory                        8192 MB
SODIMM 0                            8192 MB
SODIMM 1                            [Not Installed]

System Time                         [00:01:33]
System Date                         [01/01/2016]

It is strongly recommended to set a
password to prevent unauthorized access

F1  Help            ↑/↓ Select Item     F5/F6 Change Values        F9  Setup Defaults
Esc Exit            ←/→ Select Item     Enter Select ▸ SubMenu     F10 Save and Exit
```

F1	**General Help**	↑ ↓ .	**Select Item**
F5/F6	**Change Values**	←→	**Select Menu**
F9	**Setup Defaults**	**ESC**	**Exit**
F10	**Save and Exit**	**ENTER**	**Select or go to Submenu.**

Security Settings

This section allows users to configure security-related settings with a supervisor password.



```
                              InsydeH20 Setup Utility                          Rev. 5.0
 Main  Security  Boot  Exit

Current TPM Device                         <TPM 2.0 (DTPM)>               Clear TPM. Removes all TPM context
TPM State                                  All Hierarchies Enabled, Owned associated with a specific Owner.
Clear TPM                                  [ ]

Supervisor Password                        Not Installed
Set Supervisor Password
Minimum Length                             [8]
Minimum Numbers                            [0]
Minimum letters                            [0]

Inactivity Time                            [900]

Enforce a limit of a configurable number of consecutive invalid access during a
configurable time period.
Consecutive Invalid Access                 [5]
Time period                                [60]

Reboot system and deny user from accessing BIOS configuration menu for time period
if above event occurs
Time period                                [600]

▶BIOS Event Log Viewer

F1  Help             ↑/↓ Select Item        F5/F6 Change Values        F9  Setup Defaults
Esc Exit             ←/→ Select Item        Enter Select ▶ SubMenu     F10 Save and Exit
```

Current TPM Device

This item shows if the system has TMP device and its type.

TPM State

This item allows you view the status of current TPM settings.

Clear TPM

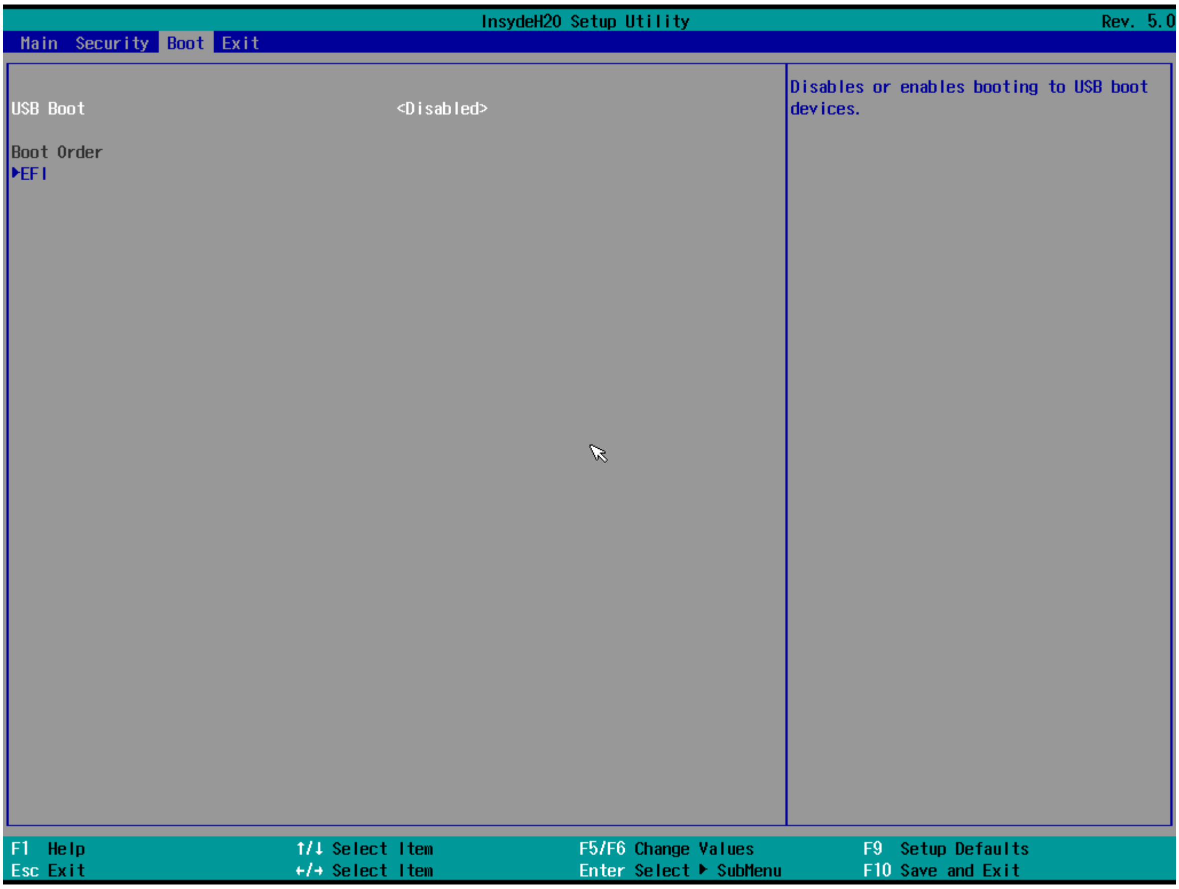
This item allows users to remove all TPM context associated with a specific owner.

Set Supervisor Password

This item allows you to set the supervisor password. Select the **Set Supervisor Password** option and enter the password and confirm the password again.

Boot Settings

The section allows users to configure boot settings.



```
InsydeH2O Setup Utility                                          Rev. 5.0
 Main  Security  Boot  Exit

USB Boot                                  <Disabled>       Disables or enables booting to USB boot
                                                           devices.
Boot Order
▶EFI

F1  Help          ↑/↓ Select Item     F5/F6 Change Values      F9  Setup Defaults
Esc Exit          ←/→ Select Item     Enter Select ▶ SubMenu   F10 Save and Exit
```

USB Boot

Set booting to USB boot devices capability.

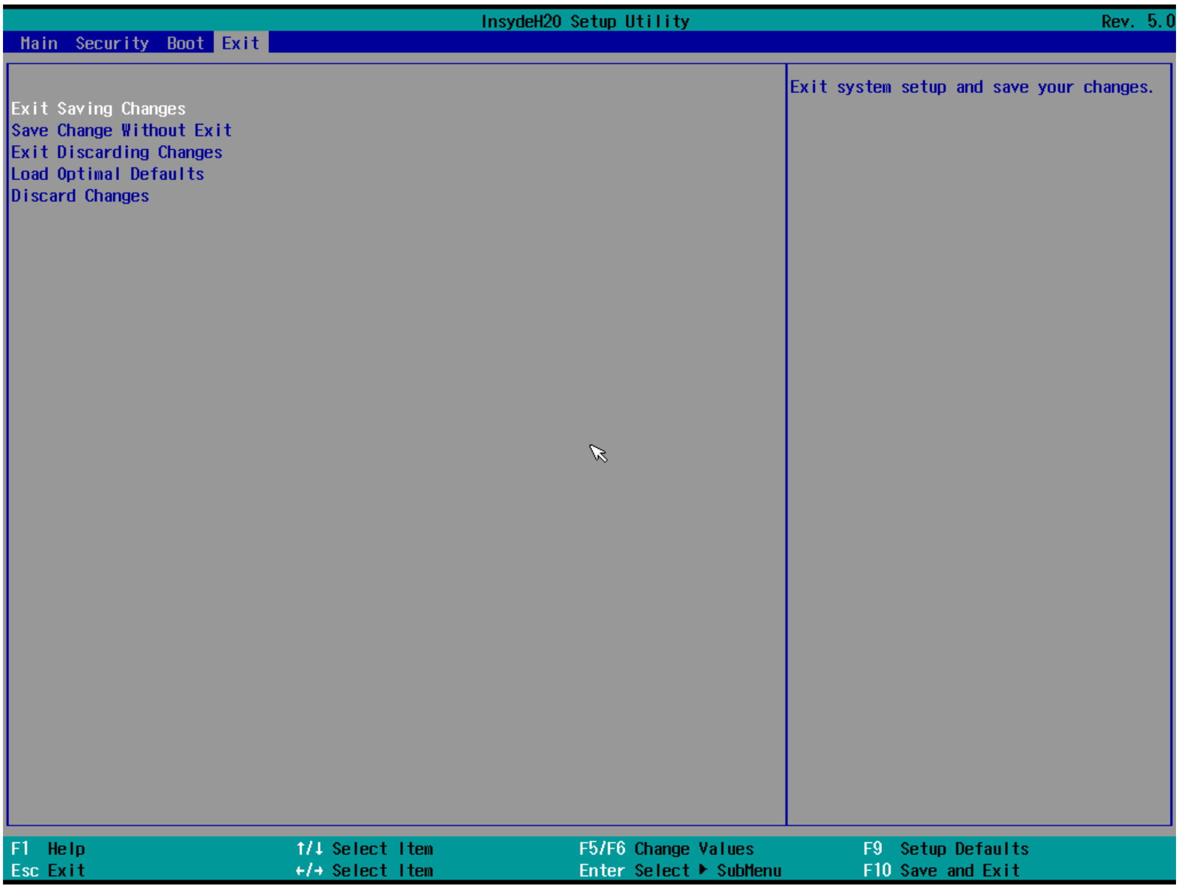
Options: Enabled, Disabled (Default)

EFI

This item allows users to select the boot order. Use F5 (move down) or F6 (move up) to change the value.

Exit Settings

The section allows users to exit the BIOS environment.



```
InsydeH2O Setup Utility                                                  Rev. 5.0
 Main  Security  Boot  Exit

Exit Saving Changes                                   Exit system setup and save your changes.
Save Change Without Exit
Exit Discarding Changes
Load Optimal Defaults
Discard Changes

F1  Help              ↑/↓ Select Item      F5/F6 Change Values        F9  Setup Defaults
Esc Exit              ←/→ Select Item      Enter Select ▸ SubMenu     F10 Save and Exit
```

Exit Saving Changes

This item allows you to exit the BIOS environment and save the values you have just configured.

Options: Yes (default), No

Save Change Without Exit

This item allows you to save changes without exiting the BIOS environment.

Options: Yes (default), No

Exit Discarding Changes

This item allows you to exit without saving any changes that might have been made to the BIOS.

Options: Yes (default), No

Load Optimal Defaults

This item allows you to revert to the factory default BIOS values.

Options: Yes (default), No

Discard Changes

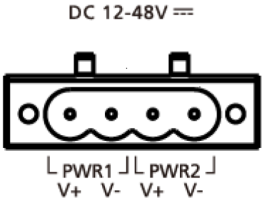
This item allows you to discard all settings you have just configured.

Options: Yes (default), No

5. Getting Started

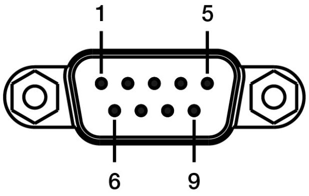
Connecting the Power

Connect the power jack (in the package) to the DC terminal block (located on the top panel), and then connect to a power line with range 12 to 48 VDC. It takes about 3 minutes for the system to boot up. Once the system is ready, the USR LED will light up. All models support dual power inputs for redundancy.



Connecting Serial Devices

The AIG device supports connecting to Modbus serial devices. The serial port uses the DB9 male connector and can be configured by software for the RS-232, RS-422, or RS-485 mode. The pin assignment of the port are shown in the following table:



Pin	RS-232	RS-422	RS-485
1	–	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	–	–	–

Connecting to a Network

Connect one end of the Ethernet cable to the AIG’s 10/100/1000M Ethernet port and the other end of the cable to the Ethernet network. The AIG will show a valid connection to the Ethernet by LAN1/LAN2 maintaining solid green/yellow color. For details on the behavior of the LEDs, refer to the *AIG-502 Series Quick Installation Guide*.

Access to the Web Console

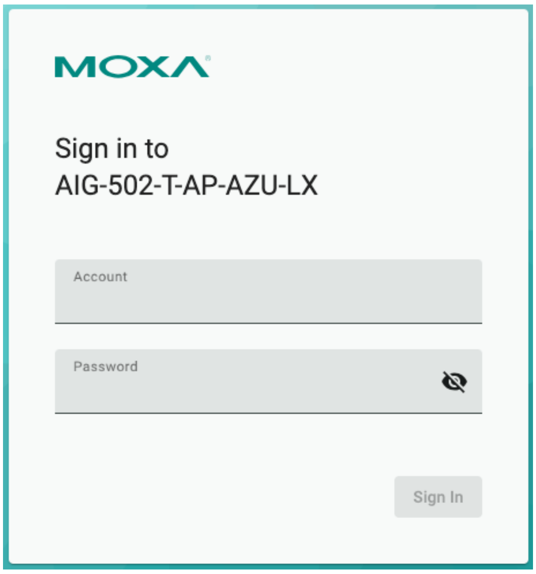
The default LAN2 IP address to access the web console of the AIG is 192.168.4.127.

When you use the default IP address to access the AIG, do the following:

2. Ensure your host and the AIG are in the same subnet (AIG's default subnet mask is 255.255.255.0). Connect to LAN2 and enter `https://192.168.4.127:8443` in your web browser.
3. Read the system notification and click **Agree and Continue**.
4. Enter the account and password information.

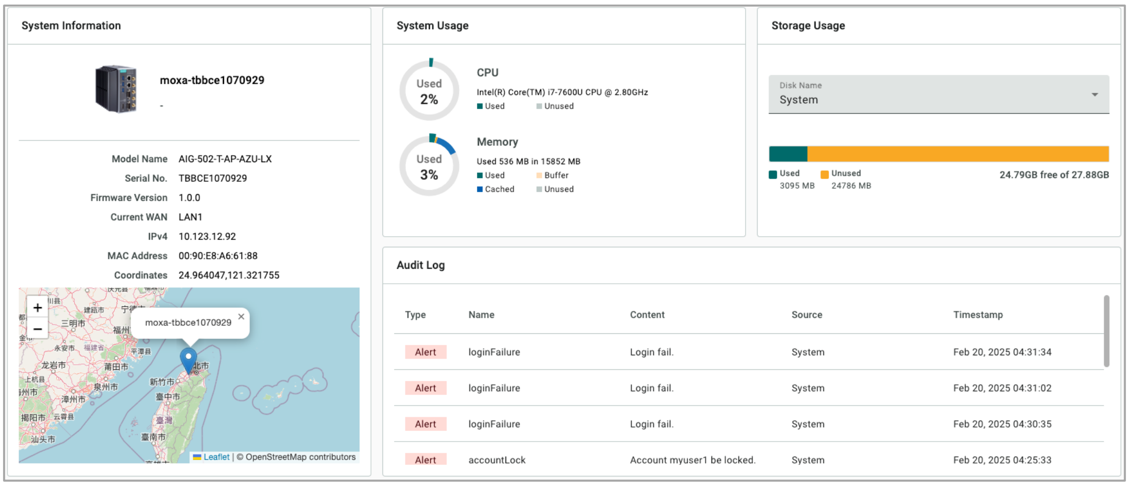
   Default account: **admin**

   Password: **admin@123**



Sign in to
AIG-502-T-AP-AZU-LX

You will see the following homepage after logging in successfully.



System Information

moxa-tbbce1070929

-

Model Name	AIG-502-T-AP-AZU-LX
Serial No.	TBBCE1070929
Firmware Version	1.0.0
Current WAN	LAN1
IPv4	10.123.12.92
MAC Address	00:90:E8:A6:61:88
Coordinates	24.964047,121.321755

System Usage

CPU
Used 2%
Intel(R) Core(TM) i7-7600U CPU @ 2.80GHz
■ Used ■ Unused

Memory
Used 3%
Used 536 MB in 15852 MB
■ Used ■ Buffer
■ Cached ■ Unused

Storage Usage

Disk Name: System

■ Used 3095 MB ■ Unused 24786 MB
24.79GB free of 27.88GB

Audit Log

Type	Name	Content	Source	Timestamp
Alert	loginFailure	Login fail.	System	Feb 20, 2025 04:31:34
Alert	loginFailure	Login fail.	System	Feb 20, 2025 04:31:02
Alert	loginFailure	Login fail.	System	Feb 20, 2025 04:30:35
Alert	accountLock	Account myuser1 be locked.	System	Feb 20, 2025 04:25:33

NOTE

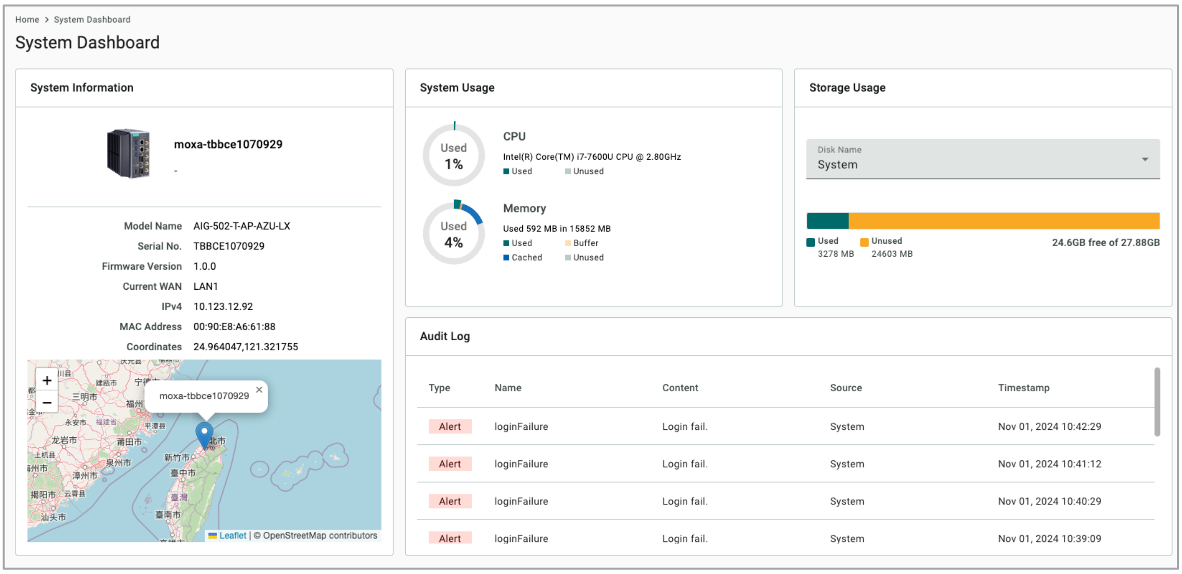
After the first login, we force a password change to comply with general security policies and practices and to increase the security of your device.

6. Web Console

Dashboard

System Dashboard

This page gives you an overview of the gateway's system status. Basic system information such as model name, serial No., firmware version, system usage, storage usage, and audit log are displayed.



Home > System Dashboard

System Dashboard

System Information

moxa-tbbce1070929

-

Model Name	AIG-502-T-AP-AZU-LX
Serial No.	TBBCE1070929
Firmware Version	1.0.0
Current WAN	LAN1
IPv4	10.123.12.92
MAC Address	00:90:E8:A6:61:88
Coordinates	24.964047,121.321755

System Usage

CPU: Used 1%
Intel(R) Core(TM) i7-7600U CPU @ 2.80GHz
■ Used ■ Unused

Memory: Used 4%
Used 592 MB in 15852 MB
■ Used ■ Buffer
■ Cached ■ Unused

Storage Usage

Disk Name: System

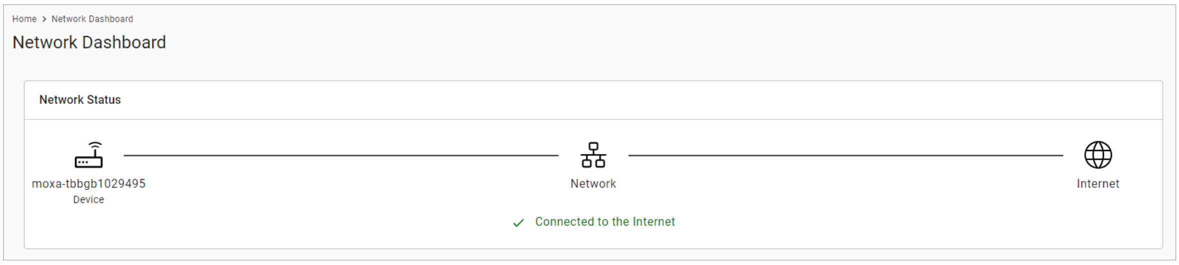
■ Used 3278 MB ■ Unused 24603 MB   24.6GB free of 27.88GB

Audit Log

Type	Name	Content	Source	Timestamp
Alert	loginFailure	Login fail.	System	Nov 01, 2024 10:42:29
Alert	loginFailure	Login fail.	System	Nov 01, 2024 10:41:12
Alert	loginFailure	Login fail.	System	Nov 01, 2024 10:40:29
Alert	loginFailure	Login fail.	System	Nov 01, 2024 10:39:09

Network Dashboard

This dashboard displays information on the WAN and LAN interfaces and the network traffic passing through the interfaces. Network Status shows whether the gateway can connect to the Internet.



Home > Network Dashboard

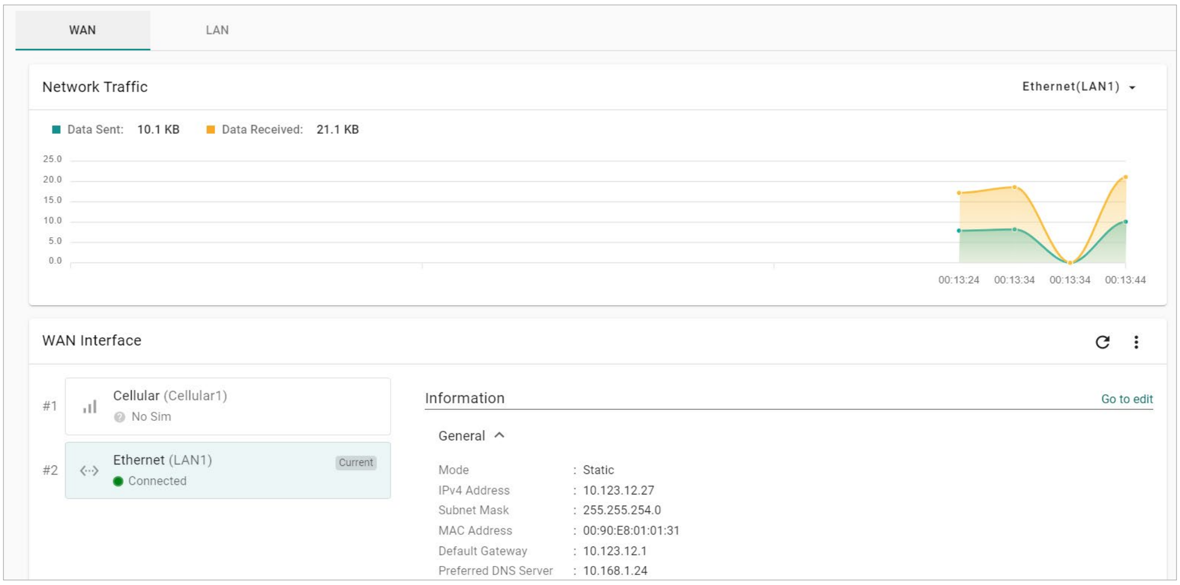
Network Dashboard

Network Status

✓ Connected to the Internet

WAN

WAN displays information of the data sent and received through the WAN interfaces. You can select the interface that you want to monitor. In addition, other details on the usage of the WAN interfaces are displayed on the page. The information is refreshed every 10 seconds.



Data Sent: 10.1 KB

Data Received: 21.1 KB

#1	Cellular (Cellular1) No Sim	
#2	Ethernet (LAN1) ● Connected	Current

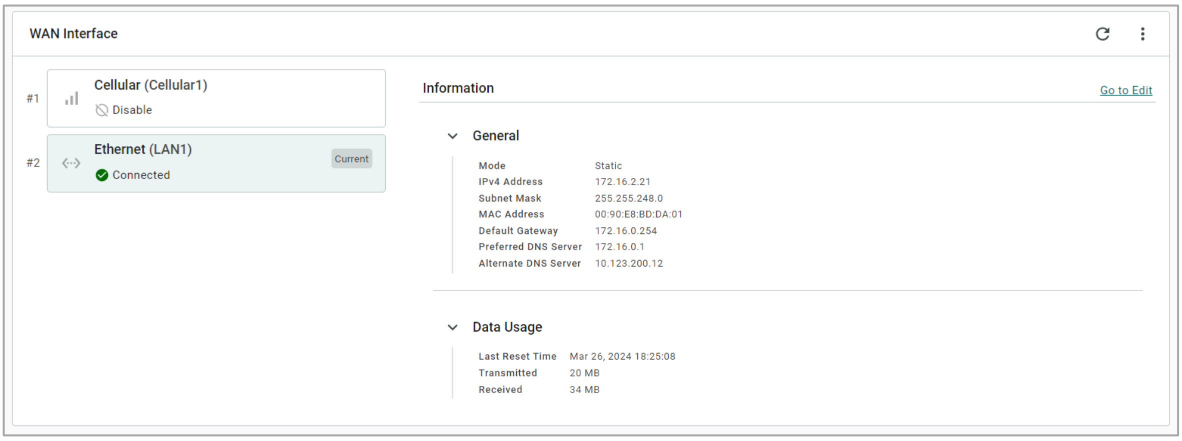
Information

General

Mode	: Static
IPv4 Address	: 10.123.12.27
Subnet Mask	: 255.255.254.0
MAC Address	: 00:90:E8:01:01:31
Default Gateway	: 10.123.12.1
Preferred DNS Server	: 10.168.1.24

LAN

Information on the LAN interfaces is organized under the **LAN** tab and includes information on the usage of the interfaces and the traffic passing through them.



#1	Cellular (Cellular1) Disable	
#2	Ethernet (LAN1) ✓ Connected	Current

Information

General

Mode	Static
IPv4 Address	172.16.2.21
Subnet Mask	255.255.248.0
MAC Address	00:90:E8:BD:DA:01
Default Gateway	172.16.0.254
Preferred DNS Server	172.16.0.1
Alternate DNS Server	10.123.200.12

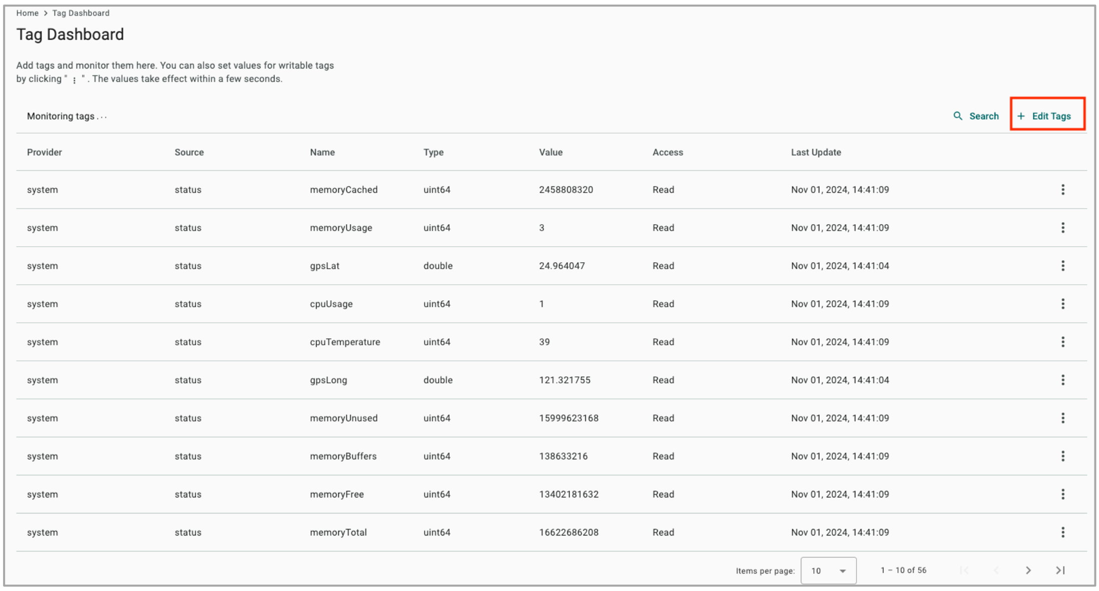
Data Usage

Last Reset Time	Mar 26, 2024 18:25:08
Transmitted	20 MB
Received	34 MB

Tag Dashboard

In this page, you can create and monitor the real-time tag value for troubleshooting purposes. To see the tag's real-time value, do the following steps:

1. Click + **Edit Tags**.



Home > Tag Dashboard

Tag Dashboard

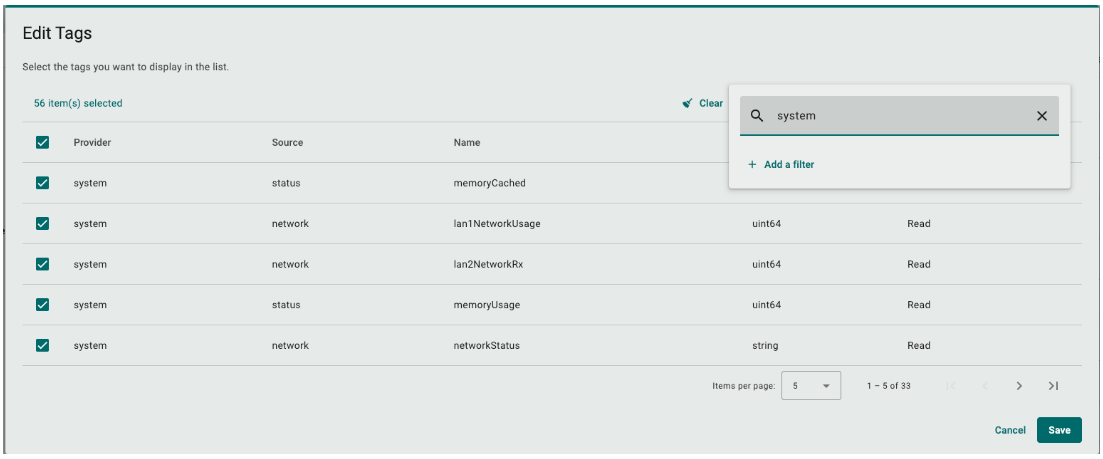
Add tags and monitor them here. You can also set values for writable tags by clicking " ⋮ ". The values take effect within a few seconds.

Monitoring tags . . .

Provider	Source	Name	Type	Value	Access	Last Update	
system	status	memoryCached	uint64	2458808320	Read	Nov 01, 2024, 14:41:09	⋮
system	status	memoryUsage	uint64	3	Read	Nov 01, 2024, 14:41:09	⋮
system	status	gpsLat	double	24.964047	Read	Nov 01, 2024, 14:41:04	⋮
system	status	cpuUsage	uint64	1	Read	Nov 01, 2024, 14:41:09	⋮
system	status	cpuTemperature	uint64	39	Read	Nov 01, 2024, 14:41:09	⋮
system	status	gpsLong	double	121.321755	Read	Nov 01, 2024, 14:41:04	⋮
system	status	memoryUnused	uint64	15999623168	Read	Nov 01, 2024, 14:41:09	⋮
system	status	memoryBuffers	uint64	138633216	Read	Nov 01, 2024, 14:41:09	⋮
system	status	memoryFree	uint64	13402181632	Read	Nov 01, 2024, 14:41:09	⋮
system	status	memoryTotal	uint64	16622686208	Read	Nov 01, 2024, 14:41:09	⋮

Items per page: 10 1 – 10 of 56

2. (Optional) use Search to find the tags quickly.



Edit Tags

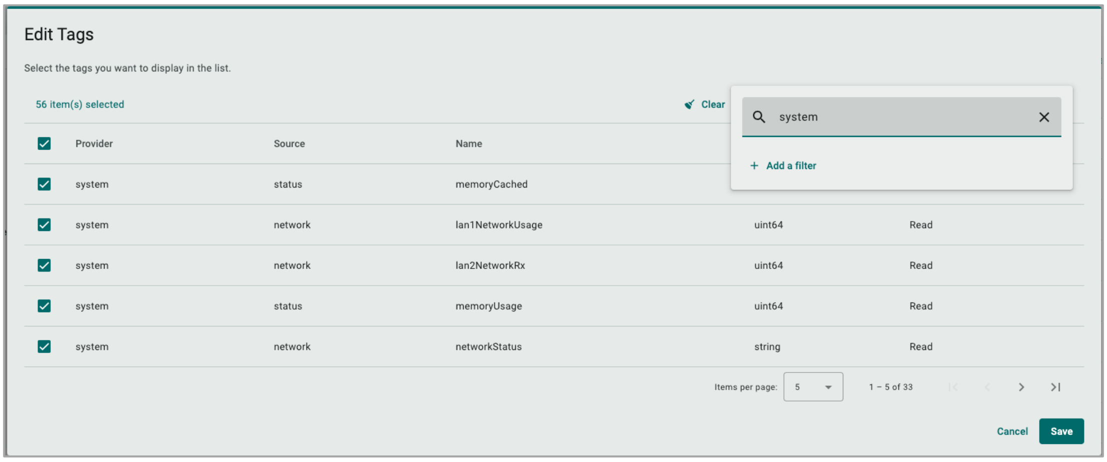
Select the tags you want to display in the list.

56 item(s) selected

☑	Provider	Source	Name		
☑	system	status	memoryCached		
☑	system	network	lan1NetworkUsage	uint64	Read
☑	system	network	lan2NetworkRx	uint64	Read
☑	system	status	memoryUsage	uint64	Read
☑	system	network	networkStatus	string	Read

Items per page: 5 1 – 5 of 33

3. Select the tags to monitor in the list.



Edit Tags

Select the tags you want to display in the list.

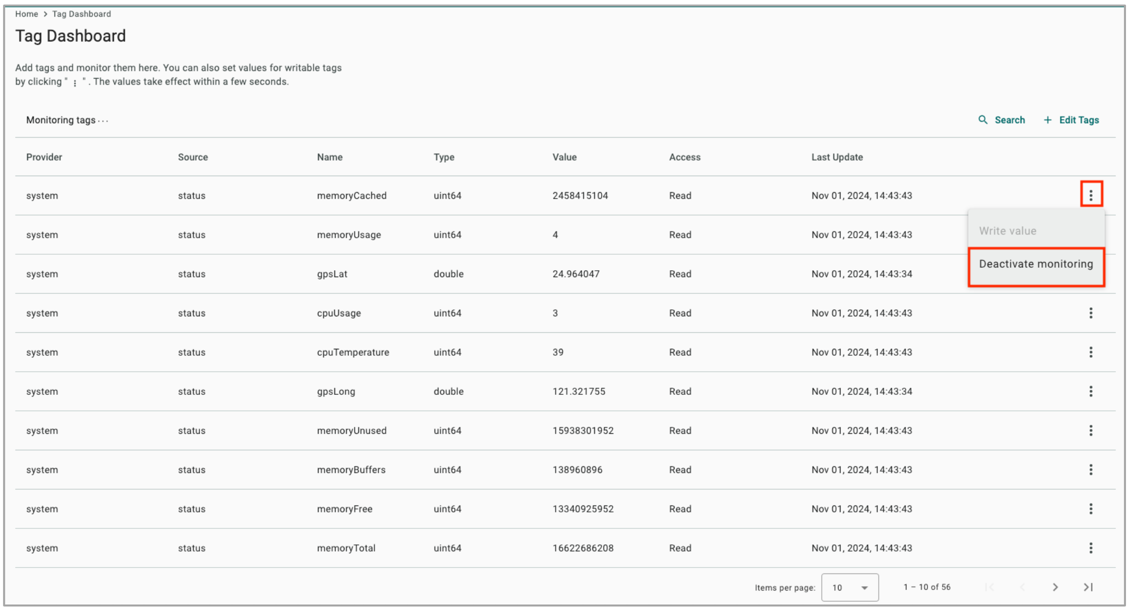
56 item(s) selected

☑	Provider	Source	Name		
☑	system	status	memoryCached		
☑	system	network	lan1NetworkUsage	uint64	Read
☑	system	network	lan2NetworkRx	uint64	Read
☑	system	status	memoryUsage	uint64	Read
☑	system	network	networkStatus	string	Read

Items per page: 5 1 – 5 of 33

4. Click **Save**.

5. (Optional) press the icon to deactivate the monitoring tags.



Home > Tag Dashboard

Tag Dashboard

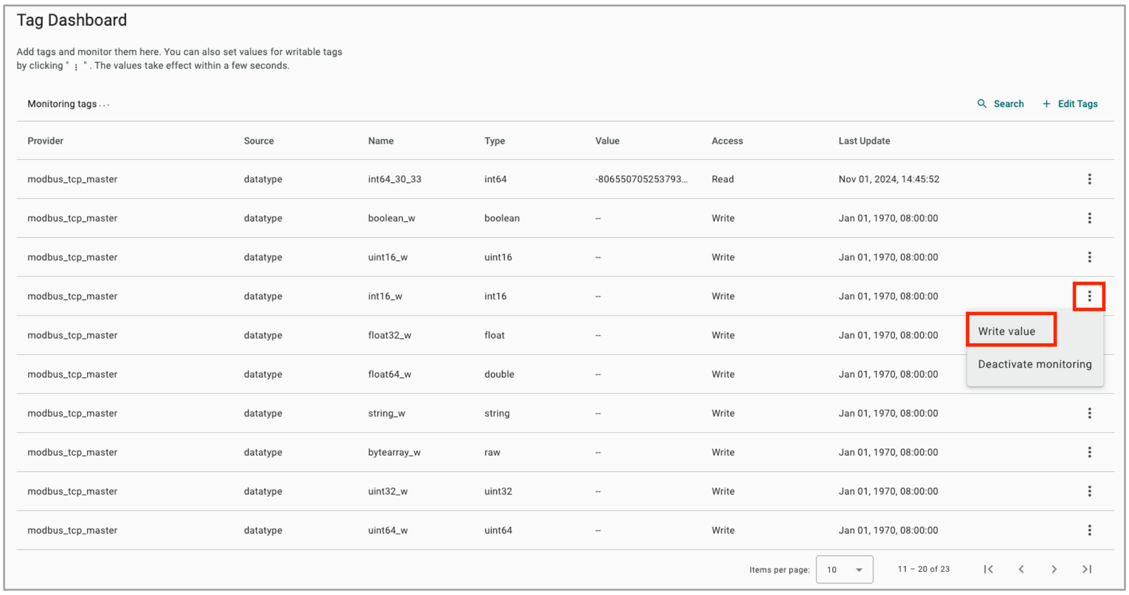
Add tags and monitor them here. You can also set values for writable tags by clicking " ⋮ ". The values take effect within a few seconds.

Monitoring tags . . .

Provider	Source	Name	Type	Value	Access	Last Update	
system	status	memoryCached	uint64	2458415104	Read	Nov 01, 2024, 14:43:43	⋮
system	status	memoryUsage	uint64	4	Read	Nov 01, 2024, 14:43:43	
system	status	gpsLat	double	24.964047	Read	Nov 01, 2024, 14:43:34	
system	status	cpuUsage	uint64	3	Read	Nov 01, 2024, 14:43:43	⋮
system	status	cpuTemperature	uint64	39	Read	Nov 01, 2024, 14:43:43	⋮
system	status	gpsLong	double	121.321755	Read	Nov 01, 2024, 14:43:34	⋮
system	status	memoryUnused	uint64	15938301952	Read	Nov 01, 2024, 14:43:43	⋮
system	status	memoryBuffers	uint64	138960896	Read	Nov 01, 2024, 14:43:43	⋮
system	status	memoryFree	uint64	13340925952	Read	Nov 01, 2024, 14:43:43	⋮
system	status	memoryTotal	uint64	16622686208	Read	Nov 01, 2024, 14:43:43	⋮

Items per page: 10 1 – 10 of 56

6. (Optional) press the icon to write value for test purposes.



Tag Dashboard

Add tags and monitor them here. You can also set values for writable tags by clicking " ⋮ ". The values take effect within a few seconds.

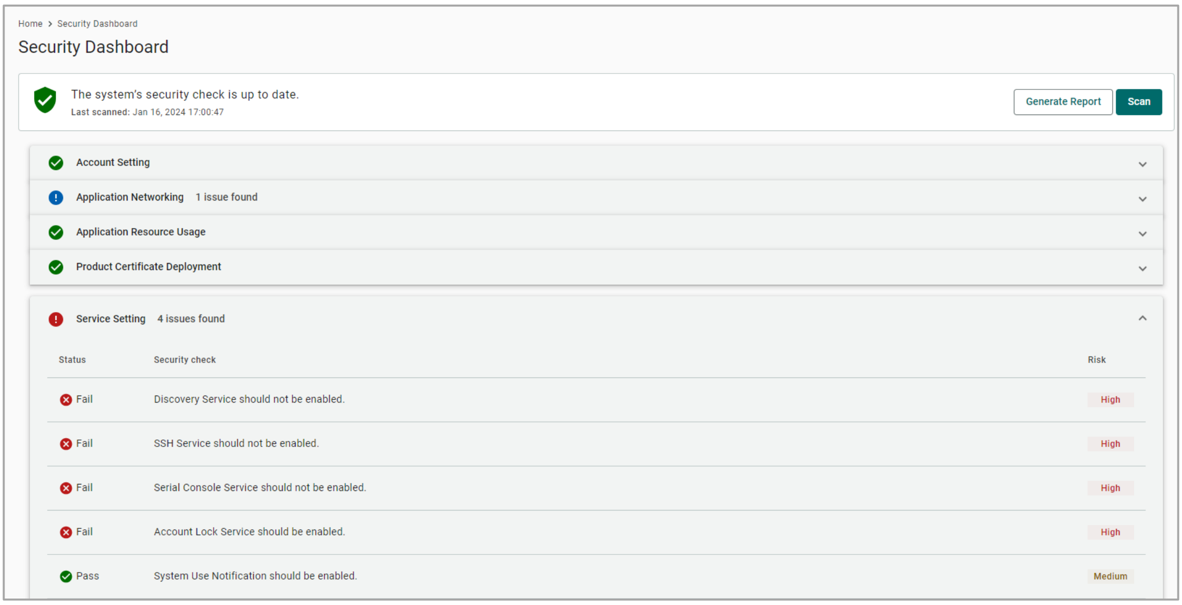
Monitoring tags . . .

Provider	Source	Name	Type	Value	Access	Last Update	
modbus_tcp_master	datatype	int64_30_33	int64	-806550705253793...	Read	Nov 01, 2024, 14:45:52	⋮
modbus_tcp_master	datatype	boolean_w	boolean	--	Write	Jan 01, 1970, 08:00:00	⋮
modbus_tcp_master	datatype	uint16_w	uint16	--	Write	Jan 01, 1970, 08:00:00	⋮
modbus_tcp_master	datatype	int16_w	int16	--	Write	Jan 01, 1970, 08:00:00	⋮
modbus_tcp_master	datatype	float32_w	float	--	Write	Jan 01, 1970, 08:00:00	
modbus_tcp_master	datatype	float64_w	double	--	Write	Jan 01, 1970, 08:00:00	
modbus_tcp_master	datatype	string_w	string	--	Write	Jan 01, 1970, 08:00:00	⋮
modbus_tcp_master	datatype	bytearray_w	raw	--	Write	Jan 01, 1970, 08:00:00	⋮
modbus_tcp_master	datatype	uint32_w	uint32	--	Write	Jan 01, 1970, 08:00:00	⋮
modbus_tcp_master	datatype	uint64_w	uint64	--	Write	Jan 01, 1970, 08:00:00	⋮

Items per page: 10 11 – 20 of 23

Security Dashboard

On this page, you will find a tool that checks the security status of the gateway. Clicking the Scan button initiates the process of identifying potential security risks. Subsequently, you can use the results to configure the gateway and eliminate any identified cyber security threat. Refer to the hardening guide for your product for details.



Home > Security Dashboard

Security Dashboard

The system's security check is up to date.
Last scanned: Jan 16, 2024 17:00:47

- Account Setting
- Application Networking 1 issue found
- Application Resource Usage
- Product Certificate Deployment
- Service Setting 4 issues found

Status	Security check	Risk
Fail	Discovery Service should not be enabled.	High
Fail	SSH Service should not be enabled.	High
Fail	Serial Console Service should not be enabled.	High
Fail	Account Lock Service should be enabled.	High
Pass	System Use Notification should be enabled.	Medium

Parameter	Value	Description
✓	Pass	No risks.
ℹ	Information	There are low-risk failures
⚠	Warning	There are medium-risk failures
❗	Alert	There are high-risk failures

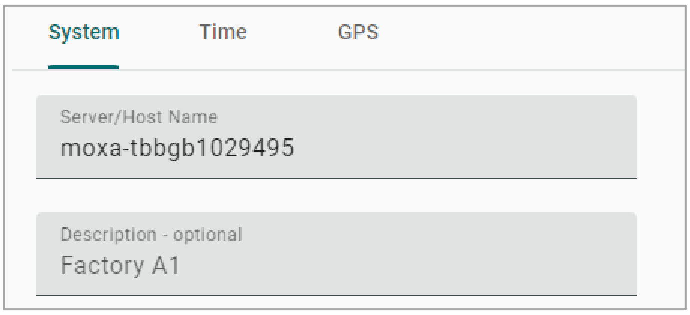
Category	Security Check Criteria	Threat Mitigation/handling
Account Settings	Password should be changed within the set time.	Go to **Account Management > Accounts** to change the password.
	An account should only have one active session at any given time.	Go to **Security > Session Management** to monitor and manage concurrent sessions.
	An account should not have abnormal connections (E.g., more than one session per account from different source IPs).	
Application Networking	System should not have open network ports.	Go to **Security > Firewall** and check the allow list.
Application Resource Usage	IoT Edge modules should not utilize system disk's configurable space.	Ensure that the IoT Edge modules are deployed only in specific directories/paths, such as **/var/run/** and **/tmp/**, in the system storage.
	IoT Edge modules should not utilize system disk's non-configurable space.	
	IoT Edge modules should not be granted direct privileges.	To grant permissions to IoT Edge modules, go to **Cloud Connectivity > Azure IoT Edge > Module Permission**, create a service account, and grant the required permissions to the IoT Edge module.

Category	Security Check Criteria	Threat Mitigation/handling
Product Certificate Deployment	Production certificate should be configured as an Azure IoT Edge downstream certificate.	For enhanced security robustness, we recommend using your own certificate instead of the default one. Go to **Cloud Connectivity > Azure IoT Edge > Downstream Certificate** to upload a certificate.
	Azure IoT Edge should not use a connection string for provisioning.	For enhanced security robustness, we recommend using a TPM or a X.509 certificate.
	All certificates should not expire within the next three months.	Go to **Security > Certificate Center** to check the status of each certificate. If you find that a certificate will expire soon or has already expired, go to **Cloud Connectivity > Azure IoT Edge/Azure IoT Device/MQTT Client or Security > HTTPS** to check and replace the certificates.
	All certificates should not have expired.	
Service Settings	Discovery Service should not be enabled.	Go to **Maintenance > Service** to disable the Discovery Service.
	SSH service should not be enabled.	Go to **Maintenance > Service** to disable the Debug Mode.
	Serial Console Service should not be enabled.	Go to **Security > Service** to disable the local console.
	Account Lock Service should be enabled.	Go to **Security > Login Lockout** to enable the **Login Failure Lockout** option.
	System Use Notification Service should be enabled.	Go to **Security > System Use Notification** to enable the System Use Notification Service.
System Status Check	Product software packages should be up to date.	Go to **Maintenance > Software Upgrade** and click **Check for Upgrade** to retrieve the latest upgrade pack information.
	System backup should be performed at least once a year.	Go to **Maintenance > Backup & Restore** and click **Manage** to back up the system.

System Settings

General

Go to **System Settings > General > System** to specify a new server/host name and enter a description for the device.

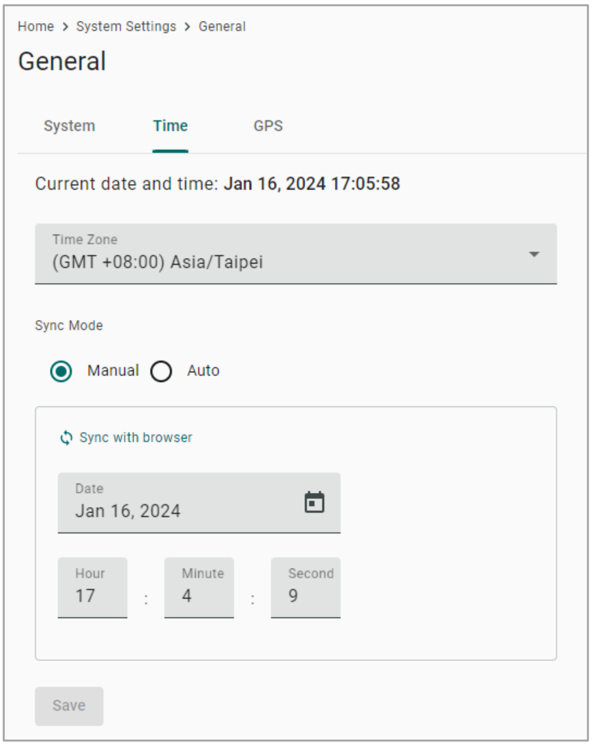


Server/Host Name: moxa-tbbgb1029495

Description - optional: Factory A1

Parameter	Value	Description
Server/Host Name	Alphanumeric string	You can enter a name to identify the unit, such as the function, etc.
Description - optional	Alphanumeric string	You can enter a description to help identify the unit location such as "Cabinet A001."

Go to **System Settings > General > Time** to select a time zone. Choose between the Manual or Auto option to update the system time.



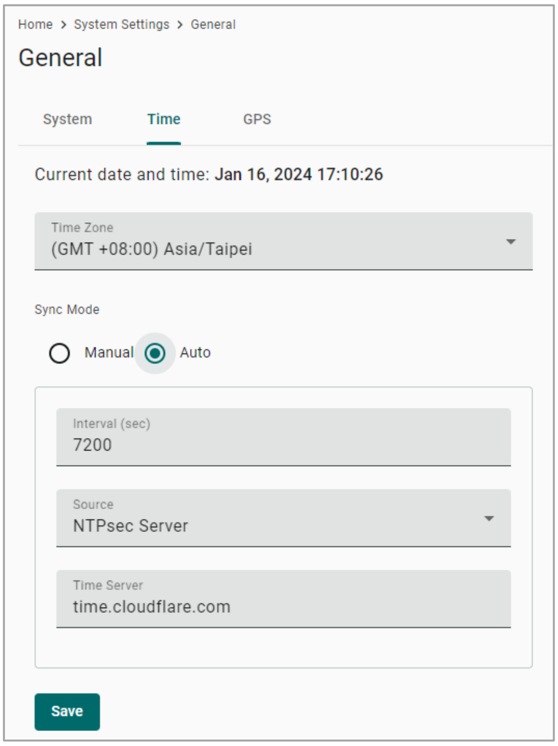
Current date and time: **Jan 16, 2024 17:05:58**

Time Zone: (GMT +08:00) Asia/Taipei

Sync Mode: ● Manual ○ Auto

Date: Jan 16, 2024

Hour: 17 : Minute: 4 : Second: 9



Current date and time: **Jan 16, 2024 17:10:26**

Time Zone: (GMT +08:00) Asia/Taipei

Sync Mode: ○ Manual ● Auto

Interval (sec): 7200

Source: NTPsec Server

Time Server: time.cloudflare.com

Parameter	Value	Description
Time Zone	User's selectable time zone	The field allows you to select a different time zone.
Sync Mode	Manual Auto	Manual: input the time parameters by yourself Auto: it will automatically sync with time source. NTP and GPS can be selected. NOTE: When the Auto mode is selected, in general, it takes 2 to 4 minutes. If the satellite search is slower, it could take up to 12 minutes (worst-case scenario)
Interval (sec)	3600 to 86400	The time interval to sync the time source
Source	NTPsec Server NTP Server GPS	The way to sync the time clock
Time Sever	IP or Domain address (e.g., 192.168.1.1 or time.cloudflare.com)	This field is required to specify your time server's IP or domain name if you choose the NTP server as the source

NOTE

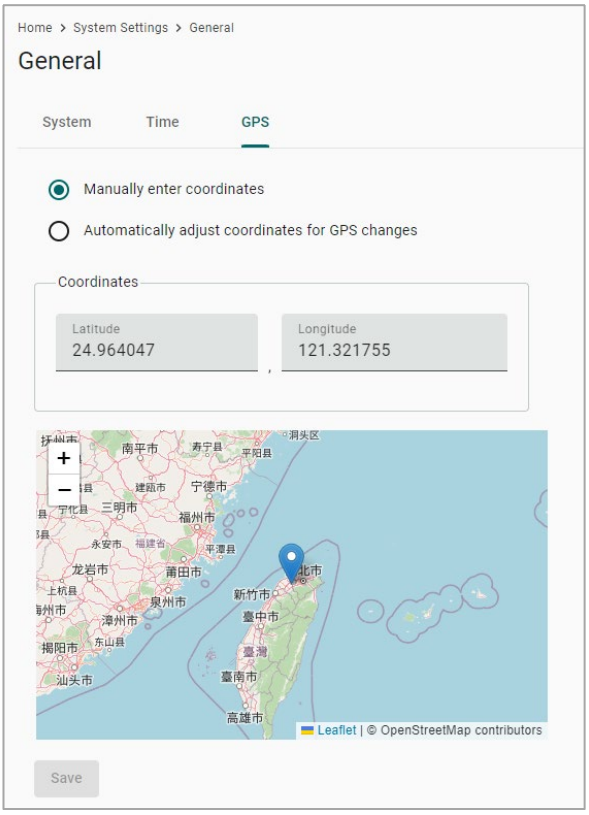
When using GPS as a time-synchronization source, set the GPS mode to **Auto** before entering the configuration page.

CAUTION

For the accuracy of the timestamp on logs, it is critical to ensure the correctness of the system time. Set the system time (if required) during initialization. However, before modifying the time or time zone, you must export the system logs. Also note that, significant time adjustments may require a factory reset. Minor changes can be managed by sorting audit logs based on when the entries were created.

Go to **System Settings > General > GPS** to view the GPS location of the device on a map. There are two options:

- Input latitude and longitude in **manual**.
- check the **Automatically adjust coordinates for GPS changes** option if you want the system to automatically update the device coordinates.



Home > System Settings > General

General

System | Time | GPS

● Manually enter coordinates

○ Automatically adjust coordinates for GPS changes

Coordinates

Latitude: 24.964047

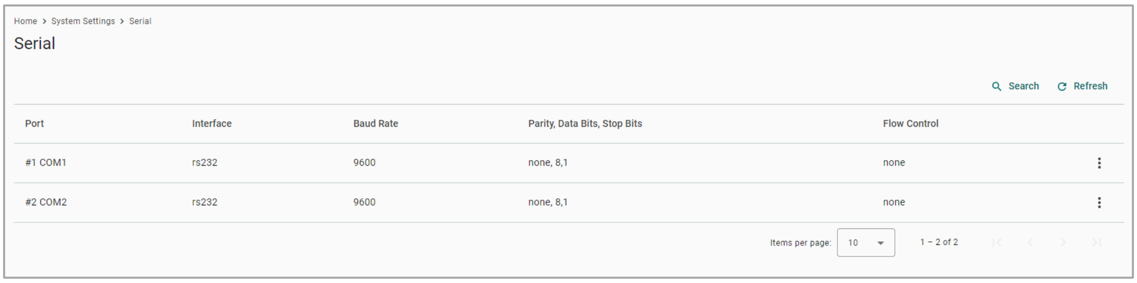
Longitude: 121.321755

Serial

Go to **System Settings > Serial** to view and configure serial parameters.

To configure serial settings, do the following:

1. Choose the COM port to configure.



Home > System Settings > Serial

Serial

Port	Interface	Baud Rate	Parity, Data Bits, Stop Bits	Flow Control
#1 COM1	rs232	9600	none, 8,1	none
#2 COM2	rs232	9600	none, 8,1	none

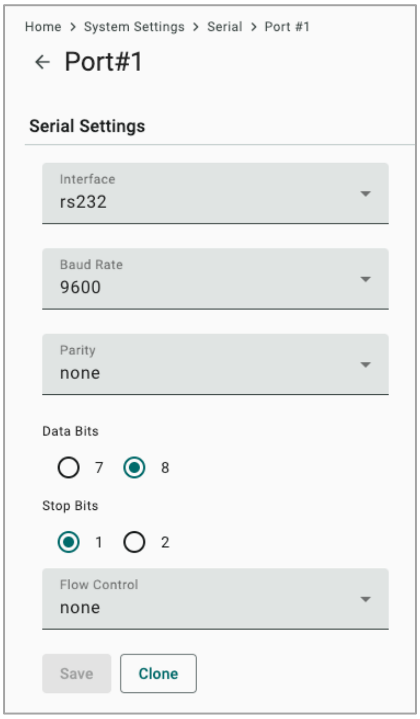
Items per page: 10 1 – 2 of 2

2. Set the baudrate, parity, data bits, and stop bits.

NOTE

Incorrect settings will cause communication failures.

3. Click **Save** for the settings to take effect.



← Port#1

Serial Settings

Interface: rs232

Baud Rate: 9600

Parity: none

Data Bits: ○ 7 ● 8

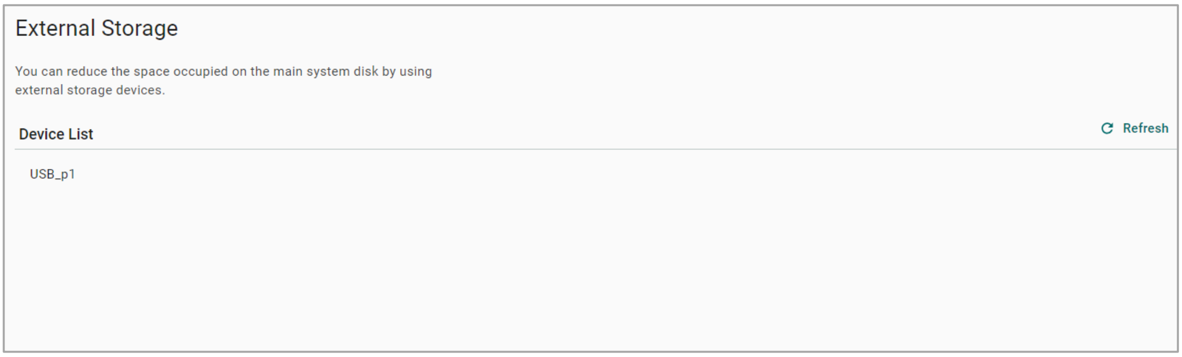
Stop Bits: ● 1 ○ 2

Flow Control: none

Parameter	Value	Description
Interface	rs232, rs422, rs485-2w	For RS-485 4-wire mode, select **rs422** because it shares the same Super I/O UART mode with the RS-485 4-wire mode.
Baud Rate	50 to 115200	
Parity	none, odd, even, space, mark	
Data Bits	7, 8	
Stop Bits	1, 2	
Flow Control	None, hardware, software	Hardware: Flow control using the RTS/CTS signal

External Storage

You can attach external storage to the AIG for saving logs, buffer space for Store and Forward, and creating system backups. Once you attach a storage, you will find it in the **Device List**.


External Storage

You can reduce the space occupied on the main system disk by using external storage devices.

Device List

USB_p1

NOTE

LIMITATION

- AIG does not allow the connection of multiple USB devices through a USB hub.
- The external USB formats supported for AIG are FAT32 and ext4.

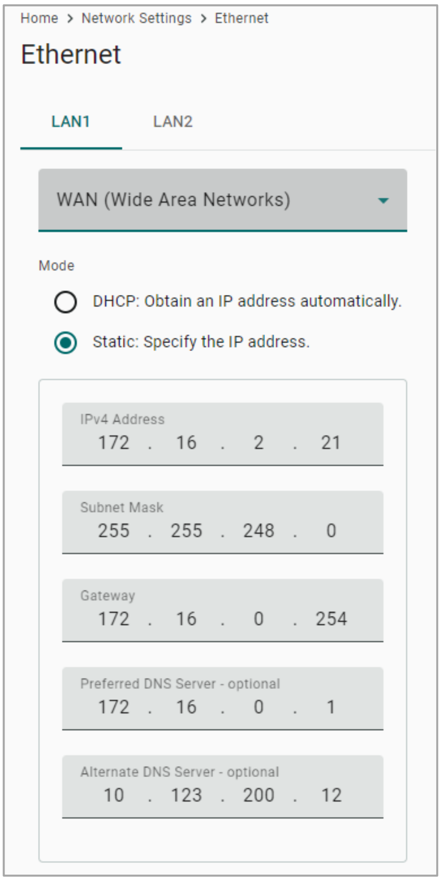
Network Settings

Ethernet

Go to **Network Settings > Ethernet** to view and configure LAN1 and LAN2 network settings.

To configure the network, do the following:

1. Choose **LAN1** or **LAN2** for configuration.
2. Select the **WAN (Wide Area Networks)** or **LAN (Local Area Networks)**.
3. Select **DHCP** or **Static** mode.
4. Configure **IP address, Subnet mask, Gateway,** and **DNS**.



Home > Network Settings > Ethernet

Ethernet

WAN (Wide Area Networks)

Mode

○ DHCP: Obtain an IP address automatically.

● Static: Specify the IP address.

IPv4 Address: 172 . 16 . 2 . 21

Subnet Mask: 255 . 255 . 248 . 0

Gateway: 172 . 16 . 0 . 254

Preferred DNS Server - optional: 172 . 16 . 0 . 1

Alternate DNS Server - optional: 10 . 123 . 200 . 12

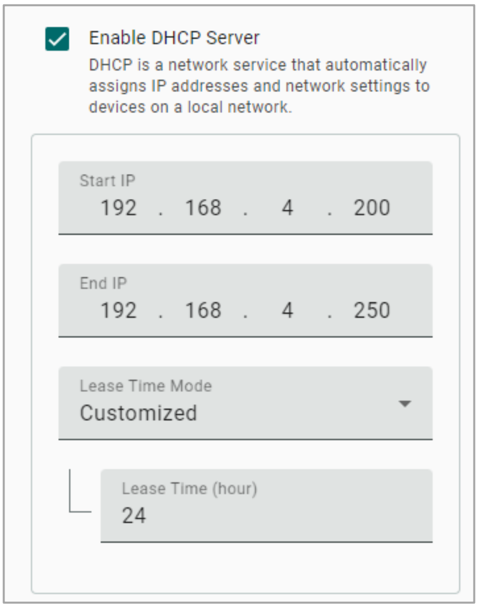
Parameter	Value	Description
Types of connectivity	WAN LAN (NOTE: LAN2 does not support WAN.)	WAN: Wide Area Networks LAN: Local Area Networks
Mode	DHCP Static	DHCP: Gets the IP address automatically. Static: Specify the IP address
IPv4 Address	LAN1 default: DHCP LAN2 default: 192.168.4.127 (or other 32-bit number)	The IP (Internet Protocol) address identifies the server on the TCP/IP network
Subnet Mask	Default: 255.255.255.0 (or other 32-bit number)	Identifies the server as belonging to a Class A, B, or C network.
Gateway—optional	0.0.0.0 (or other 32-bit number)	The IP address of the router that provides network access outside the server's LAN.
Preferred DNS Server—optional	0.0.0.0 (or other 32-bit number)	The IP address of the primary domain name server.

Parameter	Value	Description
Alternate DNS Server— optional	0.0.0.0 (or other 32-bit number)	The IP address of the secondary domain name server.

If the LAN option is selected, the AIG can be configured to operate as a DHCP server, offering the additional benefit of dynamically assigning IP addresses to devices on the network.

To configure DHCP server settings, do the following:

1. Check Enable DHCP Server.
2. Input IP Address Range parameters.
3. Specify Lease Time.
4. Click **Save**.



☑ Enable DHCP Server

DHCP is a network service that automatically assigns IP addresses and network settings to devices on a local network.

Start IP: 192 . 168 . 4 . 200

End IP: 192 . 168 . 4 . 250

Lease Time Mode: Customized

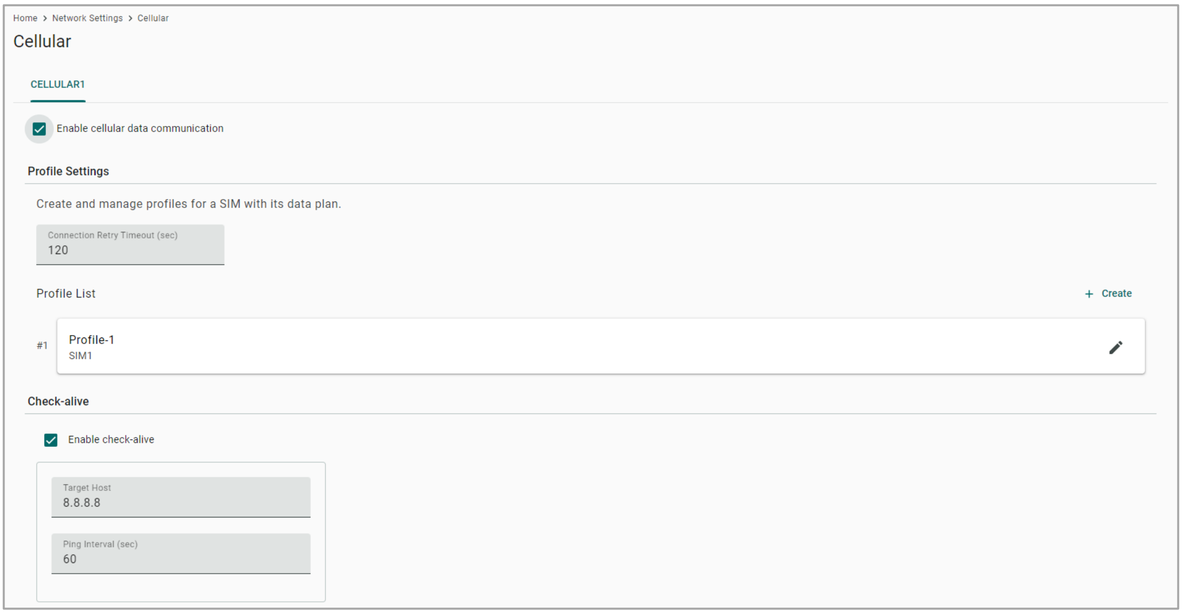
Lease Time (hour): 24

NOTE

Limitation: When AIG acts as the DHCP server, it will not allocate the DNS IP to the DHCP client.

Cellular

Go to **Network Settings > Cellular** to view the current cellular settings. You can enable or disable cellular connectivity on your device, create profiles, manage **Profile Settings**, and enable or disable the connection **Check-alive** function to optimize the cellular connection.



Home > Network Settings > Cellular

Cellular

CELLULAR1

☑ Enable cellular data communication

Profile Settings

Create and manage profiles for a SIM with its data plan.

Connection Retry Timeout (sec): 120

Profile List

+ Create

#1 Profile-1 SIM1

Check-alive

☑ Enable check-alive

Target Host: 8.8.8.8

Ping Interval (sec): 60

You can create customized cellular profiles in the **Profile Settings** section. A list of all the profiles in the system is displayed. **Create**, **Edit**, or **Delete** cellular profiles here.

To create a new cellular connection profile, do the following:

1. Click **+ Create**.
2. Specify a unique **Profile Name**.
3. Specify the target **SIM** card.
4. Enter the **PIN Code** if your SIM card requires it.
5. Input **APN**.

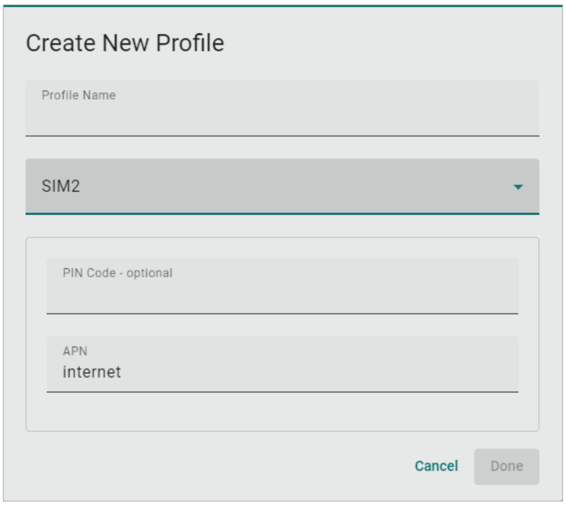
NOTE

To prevent the SIM from being locked due to three incorrect attempts, a mechanism in the AIG stops attempting to unlock the SIM when the PIN Retry count reaches 2 (only one attempt is remaining). At this point, insert the SIM into another device (e.g., cellphone) and attempt to unlock it. This way, when you reinsert the SIM card into the AIG and restart, the PIN Retry count is reset to 3.

NOTE

LIMITATION

AIG does not support hot-plugging of the SIM card; device restart is required after inserting or removing the SIM card.



Create New Profile

Profile Name

SIM2

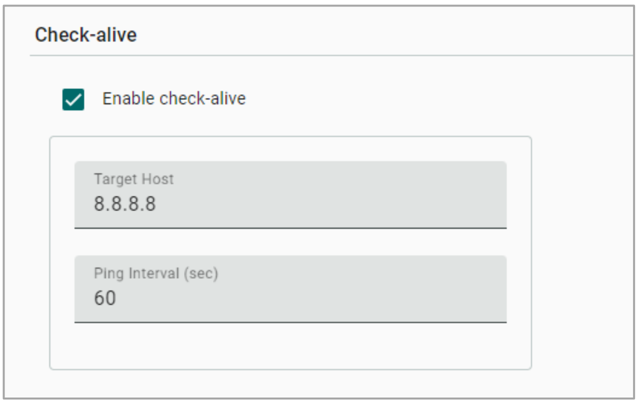
PIN Code - optional

APN: internet

6. Click **Done**.
7. On the **Cellular** setting page, click **Save**.

When you click **Save** on the Cellular section, the module is restarted to apply the changes. The settings will take effect after the cellular module is successfully initialized.

The **Check-alive** function will help you maintain the connection between your device and the carrier service by pinging a specific host on the Internet at periodic intervals.



Check-alive

☑ Enable check-alive

Target Host: 8.8.8.8

Ping Interval (sec): 60

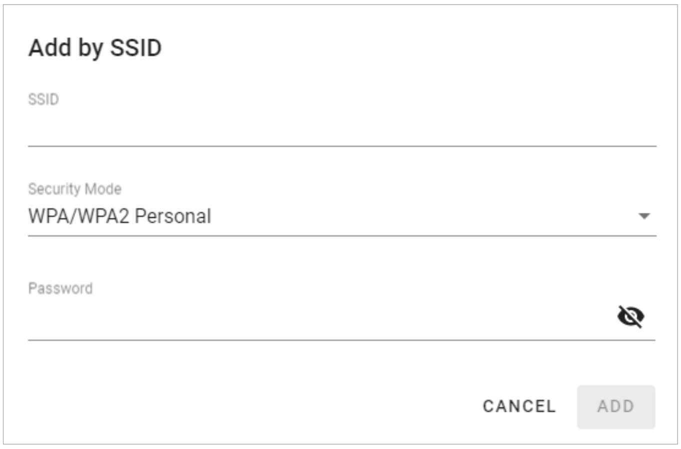
Go to **Network Dashboard > WAN** if you want to check the cellular network's connection status afterwards.

Wi-Fi Client

Go to **Network Settings > Wi-Fi** to view the Wi-Fi settings.

To configure Wi-Fi settings, check **Enable Wi-Fi** and do the following:

1. Click **+create** to manually **Create by SSID** or be **Created by Scan Results**.

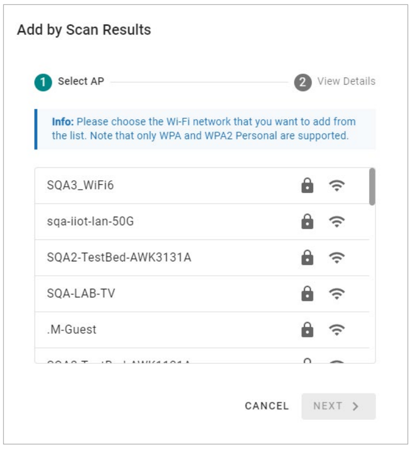


Add by SSID

SSID

Security Mode
WPA/WPA2 Personal

Password

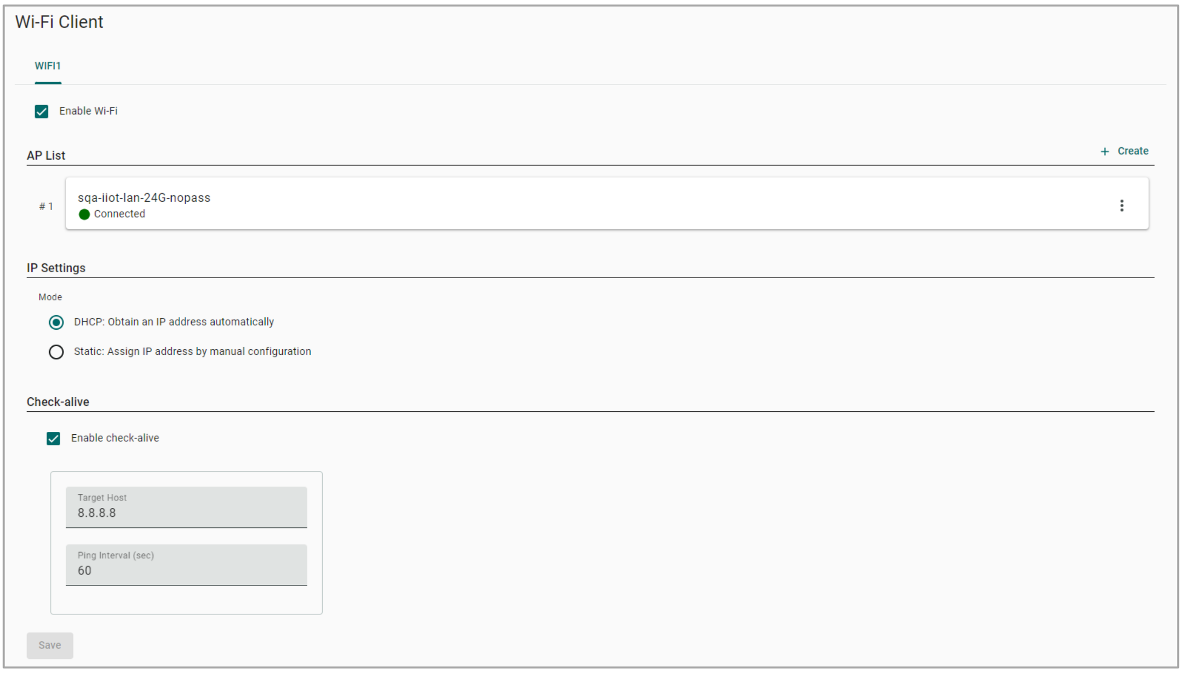


Add by Scan Results

Info: Please choose the Wi-Fi network that you want to add from the list. Note that only WPA and WPA2 Personal are supported.

SQA3_WiFi6
sqa-iiot-lan-50G
SQA2-TestBed-AWK3131A
SQA-LAB-TV
.M-Guest

2. Select **DHCP** or **Static mode**.
3. Check **Check-alive** function which can be used to ensure Internet connectivity.
4. Click **Save**.



Wi-Fi Client

☑ Enable Wi-Fi

AP List

1 sqa-iiot-lan-24G-nopass
● Connected

IP Settings

Mode

● DHCP: Obtain an IP address automatically

○ Static: Assign IP address by manual configuration

Check-alive

☑ Enable check-alive

Target Host
8.8.8.8

Ping Interval (sec)
60

Cloud Connectivity

Azure IoT Edge

Connect to Azure IoT Hub

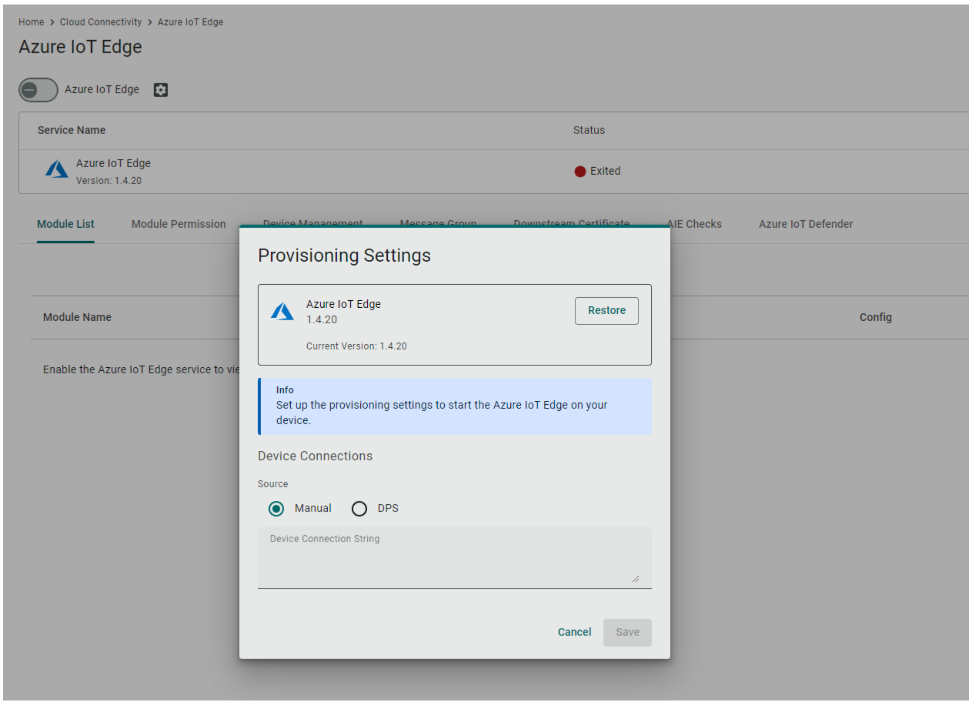
To configure the Azure IoT Edge settings. You can enable/disable the Azure IoT Edge service and enroll the device via manual setting or DPS (Device Provisioning Service) here.

NOTE

A registered Azure account is needed to manage the Azure IoT Edge service for your IoT application.

To manually create an Azure IoT Edge connection for your device, do the following:

1. Enable the Azure IoT Edge service and click on ⚙
2. Select **Manual**.
3. Enter the Device Connection String.
   Copy and paste the string from the Azure IoT Hub.



Service Name	Status
Azure IoT Edge Version: 1.4.20	Exited

Enable the Azure IoT Edge service to vie

Provisioning Settings

Azure IoT Edge
1.4.20
Current Version: 1.4.20

Info
Set up the provisioning settings to start the Azure IoT Edge on your device.

Device Connections

Source

● Manual ○ DPS

Device Connection String

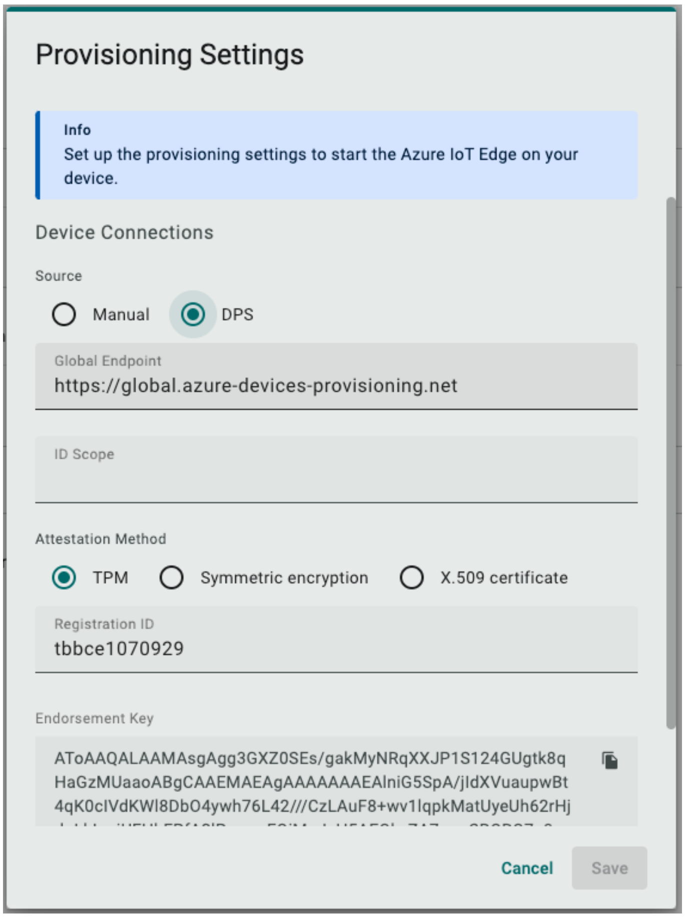
4. Click **Save.**

To create an Azure IoT Edge connection for your gateway via DPS, do the following:

1. Enable the Azure IoT Edge service and click on ⚙
2. Select **DPS**.
3. Select TPM, Symmetric encryption, or X.509 certificate based on your gateway registered with the Azure IoT Hub.

NOTE

TPM attestation is only available for devices with a built-in TPM module.



Provisioning Settings

Info
Set up the provisioning settings to start the Azure IoT Edge on your device.

Device Connections

Source

○ Manual ● DPS

Global Endpoint
https://global.azure-devices-provisioning.net

ID Scope

Attestation Method

● TPM ○ Symmetric encryption ○ X.509 certificate

Registration ID
tbbce1070929

Endorsement Key
AToAAQALAAMAsgAgg3GXZ0SEs/gakMyNRqXXJP1S124GUgtk8q
HaGzMUaaoABgCAAEMAEAgAAAAAAAEAlniG5SpA/jIdXVuaupwBt
4qK0cIVdKWl8DbO4ywh76L42///CzLAuF8+wv1lqpkMatUyeUh62rHj

For the Azure IoT Hub device provisioning service and Symmetric encryption. Enter the Registration ID, and Symmetric Key.

For X.509, upload the X.509 Certificate and Private Key.

4. Click **Save**.

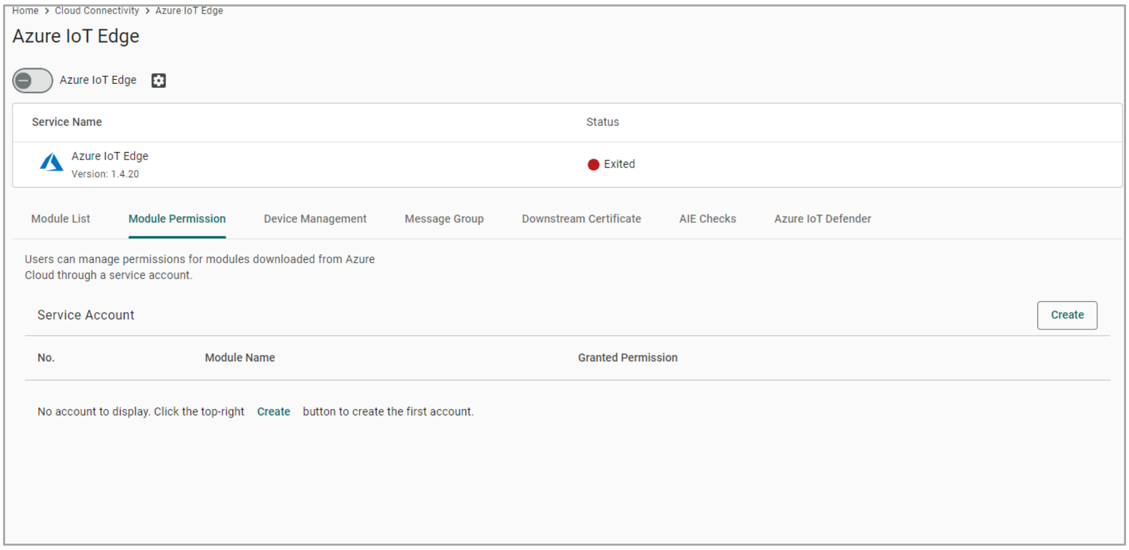
Detailed information about the Azure DPS configuration in the Azure IoT Hub is available at Set up a DPS.

Module Permission

When executing an Azure IoT Edge module, for the sake of gateway security, it is necessary to generate the access key first and then import the environment variables for that module from Azure IoT Hub.

To generate the access key for a module, do the following:

1. Click the Module Permission tab and click **Create**.



Service Name	Status
Azure IoT Edge Version: 1.4.20	● Exited

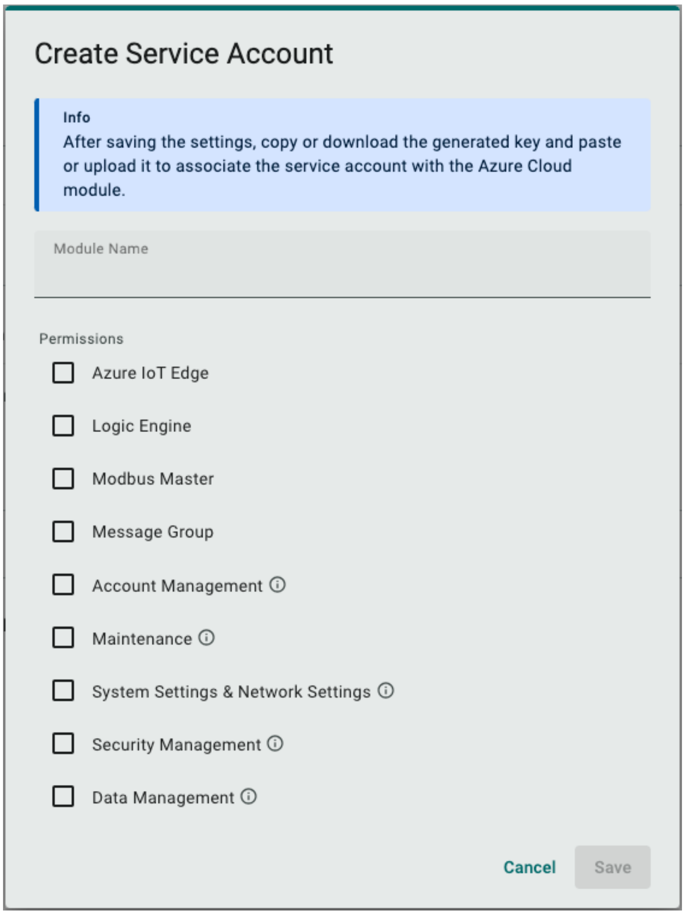
Users can manage permissions for modules downloaded from Azure Cloud through a service account.

Service Account

No.	Module Name	Granted Permission

No account to display. Click the top-right Create button to create the first account.

2. Specify a module name and grant permissions to the module. (NOTE: the module name must be the same as the one created in Azure IoT Hub).



Create Service Account

Info
After saving the settings, copy or download the generated key and paste or upload it to associate the service account with the Azure Cloud module.

Module Name

Permissions

□ Azure IoT Edge

□ Logic Engine

□ Modbus Master

□ Message Group

□ Account Management ⓘ

□ Maintenance ⓘ

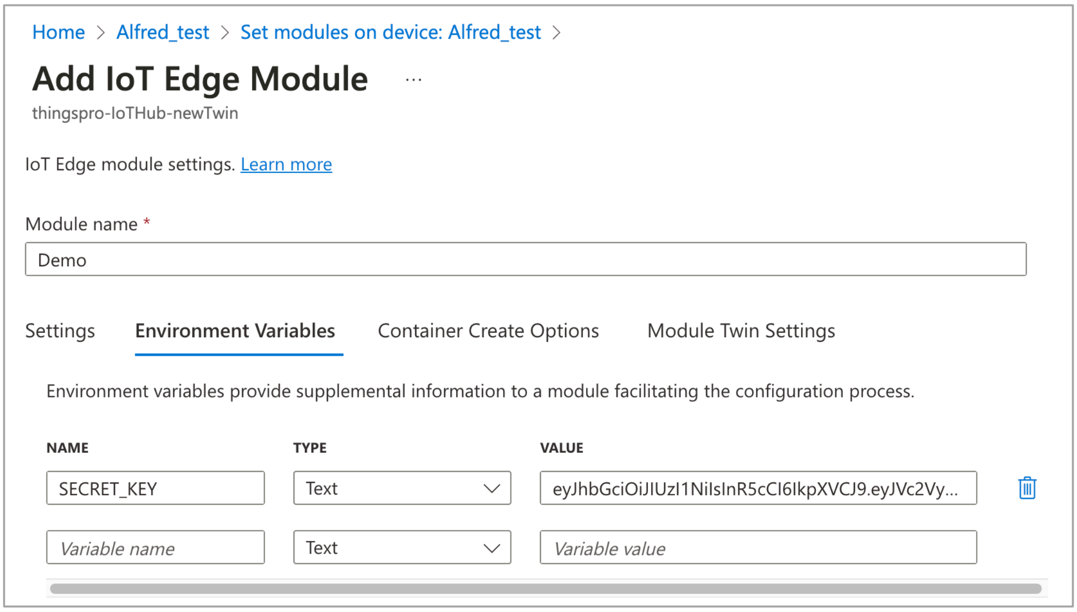
□ System Settings & Network Settings ⓘ

□ Security Management ⓘ

□ Data Management ⓘ

3. Click **Save**.

4. Click Download Key to save the secret access key or click 📋 to copy the key and paste it in the Azure IoT Hub.



Home > Alfred_test > Set modules on device: Alfred_test >

Add IoT Edge Module ...

thingspro-IoTHub-newTwin

IoT Edge module settings. Learn more

Module name *

Demo

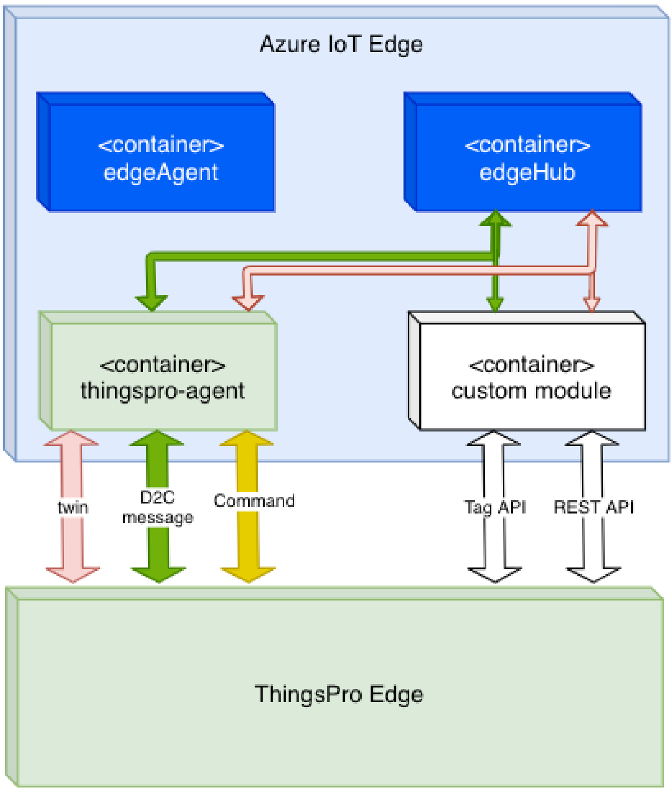
Settings | **Environment Variables** | Container Create Options | Module Twin Settings

Environment variables provide supplemental information to a module facilitating the configuration process.

NAME	TYPE	VALUE
SECRET_KEY	Text	eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJVc2Vy...
Variable name	Text	*Variable value*

ThingsPro Agent

ThingsPro Agent is a module that runs on the Azure IoT Edge to enable the Azure Cloud services including Telemetry Message, Module Twin and Direct Method. The role of the ThingsPro Agent is shown in the diagram here.



To install the ThingsPro Agent, do the following:

1. Create an IoT Edge device.
2. Add a module from the Azure IoT Hub based on the following information

Docker Image:

```
moxa2019/thingspro-agent:3.0.1-amd64
```

Container Create Option:

```
{
  "HostConfig": {
    "Binds": [
      "/var/thingspro/data/azureiotedge/:/var/thingspro/cloud/setting/",
      "/run/tpe/azureiotedge/:/run/tpe/azureiotedge/",
      "/var/thingspro/data/:/var/thingspro/data/"
    ]
  }
}
```

Module Twin

ThingsPro Agent exposes up-to-date configuration of connected devices via Reported Properties and allows you to re-configure devices and turn on/off services via Desired Properties. In the current version, ThingsPro Agent allows the following sections to be updated via Desired Properties.

Reported Properties:

Properties	Sample

httpserver	{
	  "httpserver": {
	    "httpPort": 80,
	    "httpsEnable": true,
	    "httpsPort": 8443,
	    "ipv6Enable": true,
	    "keyFileName": "client_nopassphrase.key",
	    "certFileName": "client.pem",
	    "httpEnable": true
	  }
	}

discovery	{
	   "discovery": {
	     "enable": true,
	     "schedule": {
	       "enable": true,
	       "disableAfterSec": 900
	     }
	   }
	}

Properties	Sample

wan	{
	    "wan": {
	        "displayName": "LAN1",
	        "dns": {
	            "0": "10.128.8.5",
	            "arraySize": 1
	        },
	        "gateway": "10.144.51.254",
	        "ip": "10.144.48.128",
	        "name": "eth0",
	        "netmask": "255.255.252.0"
	    }
	}

route	{
	    "route": {
	        "defaultRoute": "LAN1",
	        "priorityList": {
	            "0": "Cellular1",
	            "1": "LAN1",
	            "arraySize": 2
	        }
	    }
	}

serials	{
	    "serials": {
	        "0": {
	            "baudRate": 9600,
	            "dataBits": 8,
	            "device": "/dev/ttyM0",
	            "displayName": "PORT 1",
	            "flowControl": "none",
	            "id": 1,
	            "mode": "rs232",
	            "parity": "none",
	            "stopBits": 1
	        },
	        "arraySize": 1
	    }
	}

time	{
	    "time": {
	      "lastUpdateTime": "2023-05-24T23:22:05+00:00",
	      "ntp": {
	          "enable": false,
	          "interval": 7200,
	          "server": "time.cloudflare.com",
	          "source": "timeserver"
	      },
	      "timezone": "Asia/Taipei"
	  }
	}

Properties	Sample

ethernets	{
	"ethernets": {
	"0": {
	"enable": true,
	"enableDhcp": false,
	"id": 1,
	"name": "enp0s31f6",
	"status": "connected",
	"displayName": "LAN1",
	"gateway": "10.123.12.1",
	"ip": "10.123.13.11",
	"linkSpeed": 1000,
	"mac": "00:90:E8:A6:61:88",
	"netmask": "255.255.252.0",
	"wan": true,
	"dns": {
	"0": "10.123.200.11",
	"1": "10.123.200.12",
	"arraySize": 2
	}
	},
	"arraySize": 1
	}
	}

general	{
	"general": {
	"biosVersion": "V1.0.0S01",
	"firmwareVersion": "0.15.0",
	"serialNumber": "TBBCE1070929",
	"softwareVersion": "0.15.0+2045",
	"cpu": "Intel(R) Core(TM) i7-7600U CPU @ 2.80GHz",
	"description": "",
	"hostName": "moxa-tbbce1070929",
	"lastBootTime": "2023-05-24T23:06:57+00:00",
	"memorySize": 16635346944,
	"modelName": "AIG-502-T-AP-AZU-LX"
	}
	}

gps	{
	"gps":{
	"mode": "manual",
	"interface": "",
	"location": {
	"lat": 24.984129,
	"lng": 121.551753
	}
	}

SoftwareUpgrade	{
	"softwareUpgrade": {
	"allowOverCellular": true,
	"allowUpdate": true,
	"autoScan": false,
	"autoScanExpression": "0 0 * * 0",
	"snapshotBeforeUpdate": true
	}
	}

Properties	Sample

Cellulars	{
	 "cellulars": {
	  "0": {
	    "operatorName": "",
	    "pinRetryRemain": 3,
	    "profiles": {
	      "0": {
	        "name": "Profile-1",
	        "pdpContext": {
	          "apn": "internet",
	          "auth": {
	            "password": "",
	            "username": ""
	          },
	          "type": "ipv4"
	        },
	        "pinCode": "",
	        "simSlot": 1
	      },
	      "1": {
	        "name": "Profile-2",
	        "pdpContext": {
	          "apn": "internet",
	          "auth": {
	            "password": "",
	            "username": ""
	          },
	          "type": "ipv4"
	        },
	        "pinCode": "",
	        "simSlot": 2
	      },
	      "arraySize": 1
	    },
	    "currentProfileName": "Profile-1",
	    "imsi": "",
	    "keepalive": {
	      "enable": true,
	      "intervalSec": 60,
	      "targetHost": "8.8.8.8"
	    },
	    "mac": "",
	    "gateway": "",
	    "id": 1,
	    "name": "wwan0",
	    "profileTimeout": 120,
	    "cellId": "",
	    "displayName": "Cellular1",
	    "dns": {
	      "arraySize": 0
	    },
	    "enable": false,
	    "status": "sim_pin_locked",
	    "signalStrength": 0,
	    "capabilities": {
	      "sim": 2
	    },
	    "iccId": "89886972203703305466",
	    "ip": "",
	    "mode": "unknown",
	    "imei": "357575100284579",

Properties	Sample
	"lac": "", "netmask": "", "tac": "" }, "arraySize": 1 } }

wifi	{
	"wifi":{
	"0":{
	"client":{
	"checkalive":{
	"enable":false,
	"intervalSec":60,
	"targetHost":"8.8.8.8"
	},
	"connectState":"disabled",
	"currentAp":"",
	"ipSetting":{
	"dns":{
	"arraySize":0
	},
	"enableDhcp":true,
	"gateway":"",
	"mac":""
	},
	"networks":{
	"0":{
	"band":"band24",
	"bssid":"18:62:E4:0F:5E:DB",
	"security":{
	"mode":"wpa2-personal",
	"password":"12345678",
	"support":true
	},
	"signal":0,
	"signalStrength":0,
	"ssid":"TESTAP",
	"uuid":"Z3djNkHNR"
	},
	"1":{
	"band":"band24",
	"bssid":"",
	"security":{
	"mode":"wpa2-personal",
	"password":"admin@123",
	"support":true
	},
	"signal":0,
	"signalStrength":0,
	"ssid":"moxa",
	"uuid":"WqOjNzNHRz"
	},
	"arraySize":2
	},
	"priority":{
	"0":"Z3djNkHNR",
	"1":"WqOjNzNHRz",
	"arraySize":2
	}
	},

Properties	Sample
	"displayName":"WiFi2", "enable":false, "id":1, "mode":"client", "name":"wlp2s0" }, "arraySize":1 } }

Desired Properties:

Properties	Sample

httpserver	{
	"desired": {
	"httpserver": {
	"httpEnable": true,
	"httpsEnable": true,
	"httpsPort": 8443
	"ipv6Enable": true
	}
	}
	}

discovery	{
	"desired": {
	"discovery": {
	"enable": true,
	"schedule": {
	"enable": true,
	"disableAfterSec": 900
	}
	}
	}
	}

serials	{
	"desired": {
	"serials": {
	"0": {
	"mode": "rs232",
	"stopBits": 1,
	"baudRate": 9600,
	"dataBits": 8,
	"parity": "none",
	"flowControl": "none",
	"id": 1
	},
	"arraySize": 1
	}
	}
	}

Properties	Sample

time	Update NTP Settings:
	{
	  "desired": {
	    "time": {
	      "ntp": {
	        "enable": true,
	        "interval": 7200,
	        "server": "time.cloudflare.com",
	        "source": "timeserver"
	      }
	    }
	  }
	}
	
	Update Time zone:
	{
	  "desired": {
	    "time": {
	      "timezone": "Asia/Taipei"
	    }
	  }
	}

general	Update gateway host name:
	{
	    "desired": {
	        "general": {
	            "hostName": "MyHost"
	        }
	    }
	}
	
	Update gateway description:
	{
	    "desired": {
	        "general": {
	            "description": "MyDevice"
	        }
	    }
	}

gps	Update GPS latitude and longitude by manual mode:
	{
	    "desired": {
	        "gps":{
	            "mode": "manual",
	            "location": {
	                "lat": 11,
	                "lng": 12
	            }
	        }
	    }
	}
	Update GPS by auto mode:
	{
	    "desired": {
	        "gps":{
	            "mode": "auto",
	            "interface": "GPS1"
	        }
	    }
	}

Properties	Sample

ethernets	{
	    "ethernets": {
	        "0": {
	            "dns": {
	                "0": "10.128.8.5",
	                "arraySize": 1
	            },
	            "enable": true,
	            "enableDhcp": false,
	            "gateway": "10.144.51.254",
	            "id": 1,
	            "ip": "10.144.48.128",
	            "netmask": "255.255.252.0",
	            "wan": true
	        },
	        "arraySize": 1
	    }
	}

SoftwareUpgrade	{
	  "desired": {
	    "softwareUpgrade": {
	      "allowUpdate": true,
	      "allowOverCellular": false,
	      "snapshotBeforeUpdate": true,
	      "autoScan": false,
	      "autoScanExpression": "0 3 * * 1,2,3,4,5"
	    }
	  }
	}

cellulars	{
	  "cellulars": {
	    "0": {
	      "enable": false,
	      "keepalive": {
	        "enable": false,
	        "intervalSec": 120,
	        "targetHost": "8.8.8.8"
	      },
	      "profileTimeout": 140,
	      "profiles": {
	        "0": {
	          "name": "SIM1",
	          "pdpContext": {
	            "apn": "internet",
	            "auth": {
	              "password": "",
	              "username": ""
	            },
	            "type": "ipv4"
	          },
	          "pinCode": "0000",
	          "simSlot": 1
	        },
	        "arraySize": 1
	      }
	    },
	    "arraySize": 1
	  }
	}

<table>
<tr><th>Properties</th><th>Sample</th></tr>
<tr><td>wifi</td><td><pre>
{
  "desired":{
    "wifi":{
      "0":{
        "client":{
          "checkalive":{
            "enable":false,
            "intervalSec":60,
            "targetHost":"8.8.8.8"
          },
          "ipSetting":{
            "enableDhcp":true
          },
          "networks":{
            "0":{
              "security":{
                "mode":"wpa2-personal",
                "password":"12345678",
                "support":true
              },
              "ssid":"TESTAP"
            },
            "1":{
              "security":{
                "mode":"wpa2-personal",
                "password":"admin@123",
                "support":true
              },
              "ssid":"moxa"
            },
            "arraySize":2
          }
        },
        "enable":true,
        "id":1,
        "mode":"client"
      },
      "arraySize":1
    }
  }
}
</pre></td></tr>
</table>

Direct Method:

ThingsPro Agent offers the following seven direct methods that can be invoked when the gateway is online.

No	Method Name	Description
1	thingspro-api-v1	Universal direct method that invokes all Restful APIs of AIG
2	system-reboot	Restarts the gateway
3	thingspro-software-upgrade-check	Check the status of the product packages for available upgrades
4	thingspro-software-upgrade	Performs over-the-air (OTA) software upgrades with product package
5	message-policy-get	Retrieves the D2C message policy applied to your gateway
6	message-policy-put	Updates the D2C message policy applied to your gateway
7	upload-system-logs	Upload system logs to Azure blob storage

thingspro-api-v1

Method Name:

```
thingspro-api-v1
```

Request Payload: (Example to set HTTP/HTTPS configuration)

```
{
   "path":"/system/httpserver",
   "method":"PATCH",
   "headers":[],
   "requestBody": {
      "httpEnable": true,
      "httpsEnable": true
   }
}
```

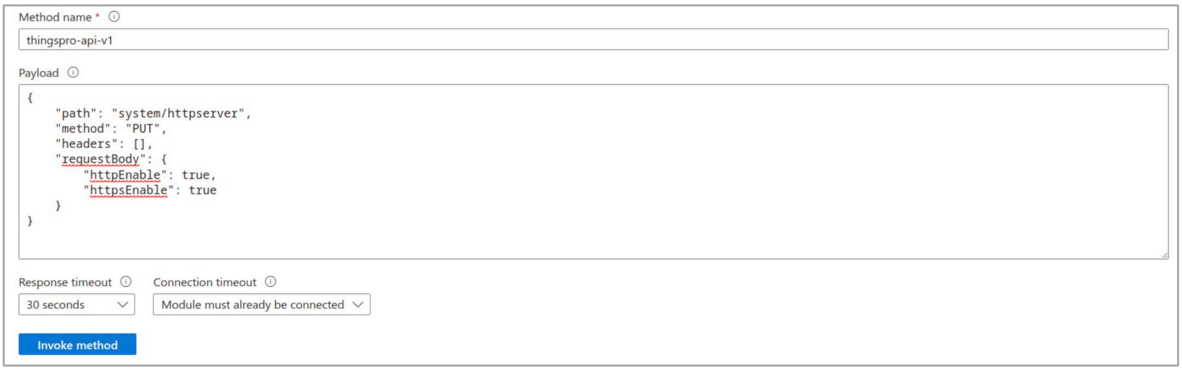
Key	Description
path	AIG-502 Restful API endpoint
method	The method associated with the API endpoint
headers	Required by the application/JSON payload
requestBody	Used to post data required by the API endpoint

Response:

```
{
   "status": 200,
   "payload": {
      "data": {
         "httpEnable": true,
         "httpsEnable": true,
         "ipv6Enable": true,
         "httpPort": 80,
         "httpsPort": 8443,
         "certFileName": "ThingsPro Web",
         "keyFileName": "ThingsPro Web"
      }
   }
}
```

NOTE

We recommend changing the timeout parameters to 30 seconds to prevent system exceptions.



```
thingspro-api-v1
```

```
{
    "path": "system/httpserver",
    "method": "PUT",
    "headers": [],
    "requestBody": {
        "httpEnable": true,
        "httpsEnable": true
    }
}
```

system-reboot

Method Name:

```
system--reboot
```

Request Payload:

```
{}
```

Response

```
{
    "status": 200,
    "payload": {
        "data": "rebooting"
    }
}
```

thingspro-software-upgrade-check

Method Name:

```
thingspro-software-upgrade-check
```

Request Payload:

```
{}
```

Response (available response):

```
{
   "status": 200,
   "payload": {
      "checktime": "2023-04-27T07:51:36Z",
      "count": 1,
      "data": [
         {
            "name": "moxa-aig-502-tpe",
            "size": 31076,
            "currentVersion": "0.11.1",
            "newVersion": "0.12.0+1533",
            "category": "software"
         }
      ]
   }
}
```

Response (up-to-date, unavailable response):

```
{
   "status": 200,
   "payload": {
      "checktime": "2023-04-27T08:08:38Z",
      "count": 0,
      "data": []
   }
}
```

NOTE

AIG-502 allows only one active software upgrade job at a time. We recommend changing the response timeout parameters to 1 minute to prevent system exceptions.

thingspro-software-upgrade

Method Name:

```
thingspro-software-upgrade
```

Request Payload:

```
{}
```

Response:

```
{
   "status": 200,
   "payload": {
      "data": [
         "moxa-aig-502-tpe"
      ],
      "message": "Successfully trigger"
   }
}
```

> **NOTE**
>
> AIG-502 allows only one active software upgrade job at a time. We recommend changing the response timeout parameters to 1 minute to prevent system exceptions.

message-policy-get

Method Name:

```
message-policy-get
```

Request Payload:

```
{}
```

Response:

```
{
  "status": 200,
  "payload": {
    "data": {
      "groups": [
        {
          "id": 1,
          "description": "",
          "enable": true,
          "outputTopic": "sample",
          "format": "{  (.tagName): .dataValue,  ts: .ts}"
          "properties": [ { "key": "messageType", "value": "deviceMonitor" }],
          "tags": {"system": {"status": ["memoryUsage"]}},
          "sendOutThreshold": {
            "mode": "immediately",
            "size": 4096,
            "time": 0,
            "sizeIdleTimer": {
              "enable": true,
              "time": 60
            }
          },
          "minPublishInterval": 1,
          "samplingMode": "allValues",
          "customSamplingRate": false,
          "pollingInterval": 0,
        }
      ]
    }
  }
}
```

Key	Description
groups	Type: array Description: The message group; you can define multiple messages by demand.
id	Type: integer Description: The message ID.
description	Type: string Description: The message description.
enable	Type: boolean Description: Enable or disable this message policy.
outputTopic	Type: string Description: The output topic required by Azure IoT Edge; helps manage the message route in Azure IoT Edge.
format	Type: string Description: A **jq** script to transform a default payload to a custom payload.
properties	Type: string Description: Application properties of the message. This allows cloud applications to access certain messages without deserializing the JSON payload.
tags	Type: string Description: The tag data to send in the message. You can retrieve all available tags defined by ThingsPro Edge RESTful API.
sendOutThreshold	Type: object Define conditions to send out messages to Azure Edge Hub based on: mode Type: string Enum: byTime, bySize immediately size (mode: bySize) Type: integer Unit: bytes time (mode: byTime) Type: integer Unit: second value 0 almost real time sizeIdleTimer (mode: bySize, optional): Description: A fixed publish time between two bySize mode publishes. Type: object enable Type: boolean time Type: integer Unit: second
minPublishInterval	Type: integer Unit: second Description: A fixed interval between the two immediately mode publish
samplingMode	Type: string Enum: allValues, latestValues, allChangedValues, latestChangedValues
customSampling	Type: boolean Description: Enable will use the pollingInterval that user input.
pollingInterval	Type: integer Description: The interval at which to poll tag data. For example, value 10: Every 10 second value 0: when the data is pushed into the tag (almost real time)

message-policy-put

Method Name:

```
message-policy-put
```

Request Payload:

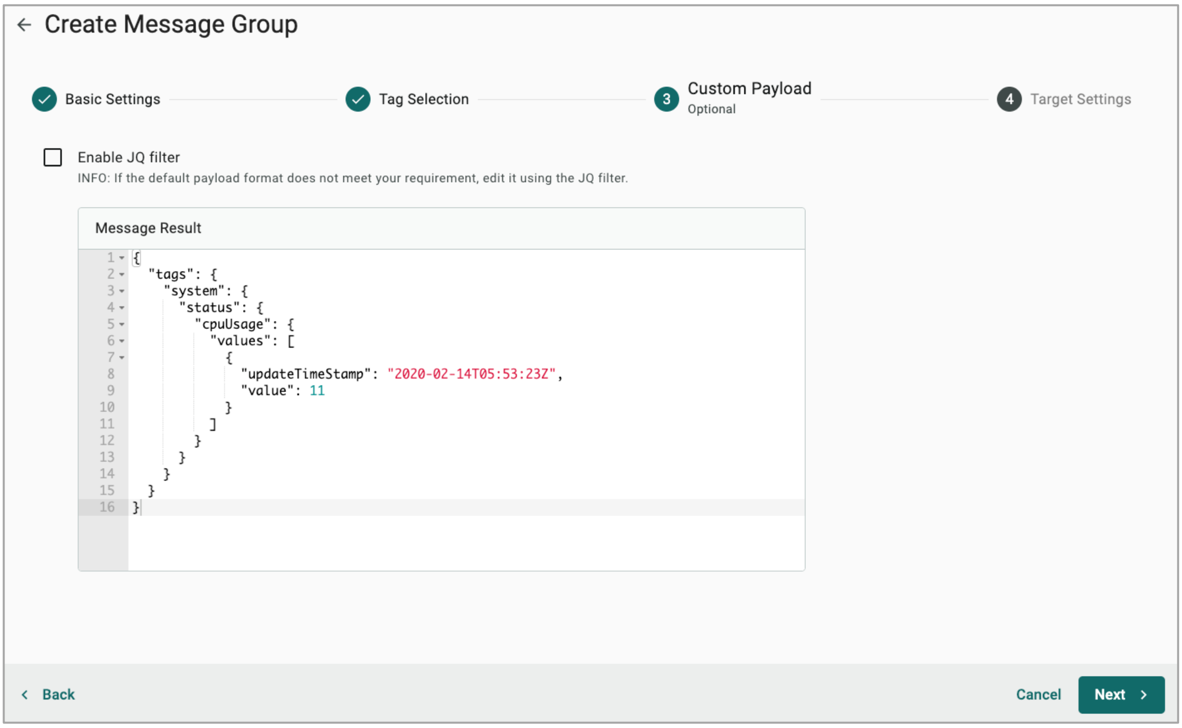
```
{
 "groups": [
 {
  "id": 1,
  "description": "",
  "enable": true,
  "outputTopic": "sample",
  "format": "{  (.tagName): .dataValue,  ts: .ts}"
  "properties": [ { "key": "messageType", "value": "deviceMonitor" }],
  "tags": {"system": {"status": ["memoryUsage"]}},
  "sendOutThreshold": {
   "mode": "bySize",
   "size": 4096,
   "time": 0,
   "sizeIdleTimer": {
    "enable": true,
    "time": 60
   }
  },
  "minPublishInterval": 0,
  "samplingMode": "allValues",
  "customSamplingRate": false,
  "pollingInterval": 0,
  }
 ]
}
```

The D2C message policy allows you to transform a default payload to your desired payload schema via a **jq** filter. For additional details, refer to the jq website (jq Manual <development version>).

The AIG Web GUI offers an easy way to apply the jq filter and test the transformed result as shown in the following examples.

default D2C message schema

Select the tags that you want using the tag selector. The default result for the selected tags will show on the page.



□ Enable JQ filter

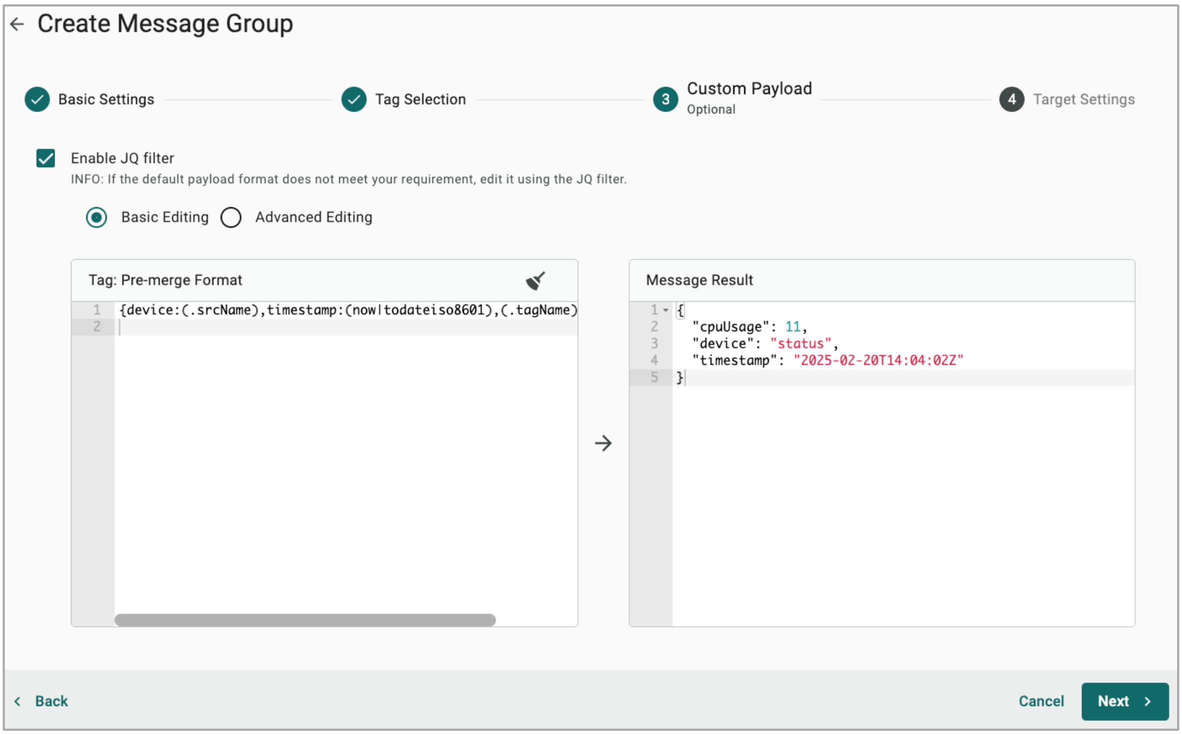
INFO: If the default payload format does not meet your requirement, edit it using the JQ filter.

Message Result

```
{
  "tags": {
    "system": {
      "status": {
        "cpuUsage": {
          "values": [
            {
              "updateTimeStamp": "2020-02-14T05:53:23Z",
              "value": 11
            }
          ]
        }
      }
    }
  }
}
```

Custom payload after transforming the default payload.

Enable custom payload and input the jq Filter to display the custom payload for your selection.



☑ Enable JQ filter

INFO: If the default payload format does not meet your requirement, edit it using the JQ filter.

● Basic Editing ○ Advanced Editing

Tag: Pre-merge Format

```
{device:(.srcName),timestamp:(now|todateiso8601),(.tagName)
```

Message Result

```
{
  "cpuUsage": 11,
  "device": "status",
  "timestamp": "2025-02-20T14:04:02Z"
}
```

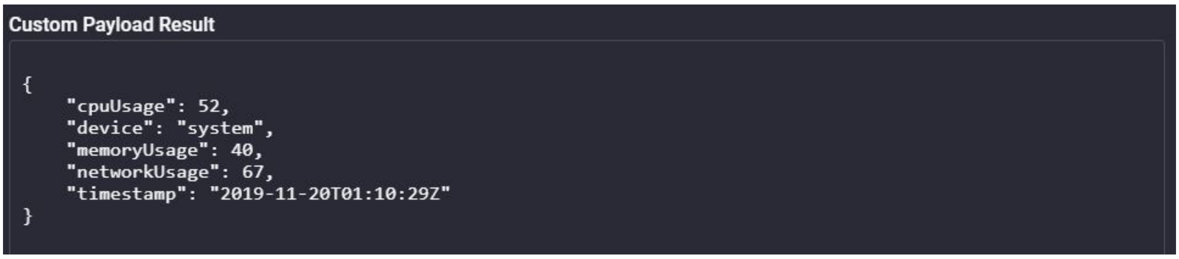
Variable	Description
.srcName	Prints the source of the tag data
.tagName	Prints the tag name
.dataValue	Prints the tag value
.ts	Prints the timestamp of tag value be collected
.dataUnit	Prints data unit of tag value (e.g.: %)
.dataType	Prints data type of tag value (e.g.: int64)

To use the above variables as the key of a JSON element, use parentheses as shown here.

```
(.tagName): .dataValue
```

Example:

```
{device:(.srcName),timestamp:(now|todateiso8601),(.tagName):.dataValue}
```



Custom Payload Result

```
{
    "cpuUsage": 52,
    "device": "system",
    "memoryUsage": 40,
    "networkUsage": 67,
    "timestamp": "2019-11-20T01:10:29Z"
}
```

When the jq Filter has been confirmed, you can include the “format” key into the D2C message policy to enable a custom payload.

```
{
  "groups": [
    {
      "enable": true,
      "outputTopic": "sample",
      "format": "",
      "properties": [
        { "key": "messageType", "value": "deviceMonitor" }
      ],
      "tags": {
        "system": {
          "status": ["cpuUsage", "memoryUsage"]
        }
      },
      "pollingInterval": 2,
      "sendOutThreshold": { "size": 4096, "time": 5 },
      "format": "{device:(.srcName),timestamp:(now|todateiso8601),TagName:(.tagName),
Value:.dataValue}"
    }
  ]
}
```

upload-audit-logs

Method Name:

```
upload-audit-logs
```

Request Payload (Set HTTP/HTTPS configuration as an example):

```
{
  "connectionString":
"DefaultEndpointsProtocol=https;AccountName=thingsproedge;AccountKey=hgnYe/08sWqlcGKd7VR8XN
RvjydebzzSeVZxFvRCmepUqA69LTtNY13UZ5fejgZgcys+jC5B+qf3+AStsEkNzg==;EndpointSuffix=core.w
indows.net",
  "containerName": "aig302"
}
```

Variable	Description
connectionString	The connection string is the access key or shared access signature of the Azure blob storage
containerName	Upload to the container which belongs to the Azure blob storage

Response:

```
{
   "status": 200,
   "payload": {
      "data": "upload successfully"
   }
}
```

NOTE

We recommend changing the timeout parameters to 1 minute to prevent system exceptions. In addition, take the upload speed and log size into consideration when adjusting timeouts.

upload-system-logs

Method Name:

```
upload-system-logs
```

Request Payload (Set HTTP/HTTPS configuration as an example):

```
{
"connectionString":
"DefaultEndpointsProtocol=https;AccountName=thingsproedge;AccountKey=hgnYe/08sWqlcGKd7VR8XN
RvjydebzzSeVZxFvRCmepUqA69LTtNY13UZ5fejgZgcys+jC5B+qf3+AStsEkNzg==;EndpointSuffix=core.w
indows.net",
 "containerName": "aig302"
}
```

Variable	Description
connectionString	The connection string is the access key or shared access signature of the Azure blob storage.
containerName	Upload to the container which belongs to the Azure blob storage.

Response:

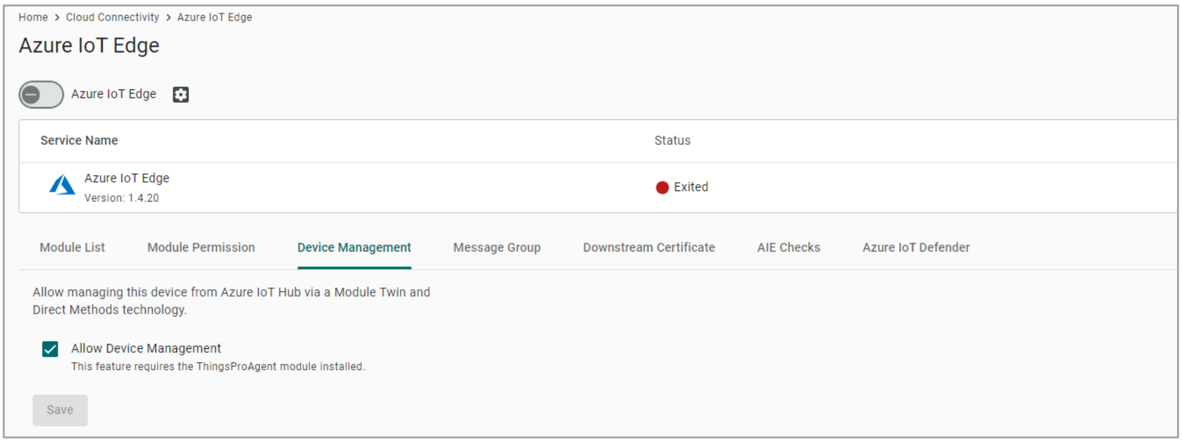
```
{
   "status": 200,
   "payload": {
      "data": "upload successfully"
   }
}
```

NOTE

We recommend changing the timeout parameters to 1 minute to prevent system exceptions. (You may also consider adjusting the corresponding timeout based on the upload speed and log size.)

Device Management

Enabling this feature allows cloud service providers to manage IoT devices remotely using Device Twin and Direct Method technologies.



Home > Cloud Connectivity > Azure IoT Edge

Azure IoT Edge

Azure IoT Edge

Service Name	Status
Azure IoT Edge Version: 1.4.20	● Exited

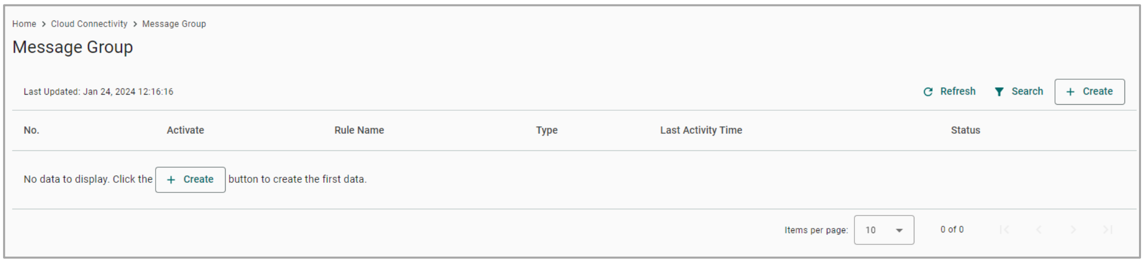
Allow managing this device from Azure IoT Hub via a Module Twin and Direct Methods technology.

☑ Allow Device Management
This feature requires the ThingsProAgent module installed.

Message Group

A telemetry message is the simplest message type for sending IoT device data to your IIoT applications. To create a telemetry message, do the following:

1. Click **+ Create** to create a new message group.



Home > Cloud Connectivity > Message Group

Message Group

Last Updated: Jan 24, 2024 12:16:16

No.	Activate	Rule Name	Type	Last Activity Time	Status

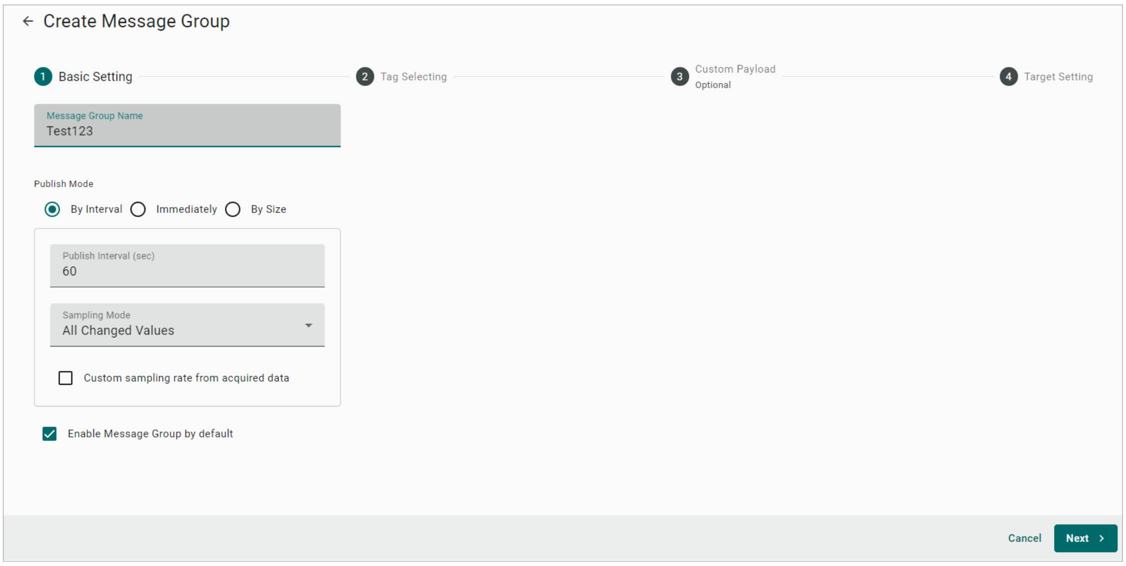
No data to display. Click the + Create button to create the first data.

Items per page: 10 0 of 0

2. Specify a name for the **Message Group**.

3. Select a **Publish Mode**.

   For details, see Publish Mode.



← Create Message Group

1 Basic Setting — 2 Tag Selecting — 3 Custom Payload Optional — 4 Target Setting

Message Group Name: Test123

Publish Mode

● By Interval ○ Immediately ○ By Size

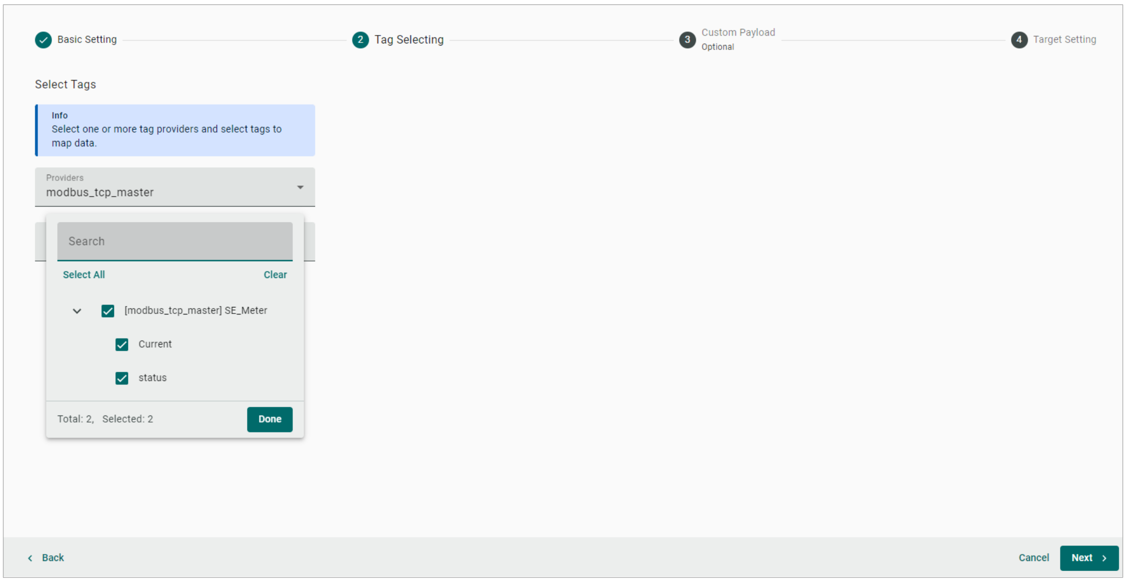
Publish Interval (sec): 60

Sampling Mode: All Changed Values

□ Custom sampling rate from acquired data

☑ Enable Message Group by default

4. Input corresponding parameters such as publish interval, sampling mode, and publish.
5. Click **Next**.
6. Select tags (e.g., Modbus Master).



✓ Basic Setting — 2 Tag Selecting — 3 Custom Payload Optional — 4 Target Setting

Select Tags

Info
Select one or more tag providers and select tags to map data.

Providers: modbus_tcp_master

Search

☑ [modbus_tcp_master] SE_Meter

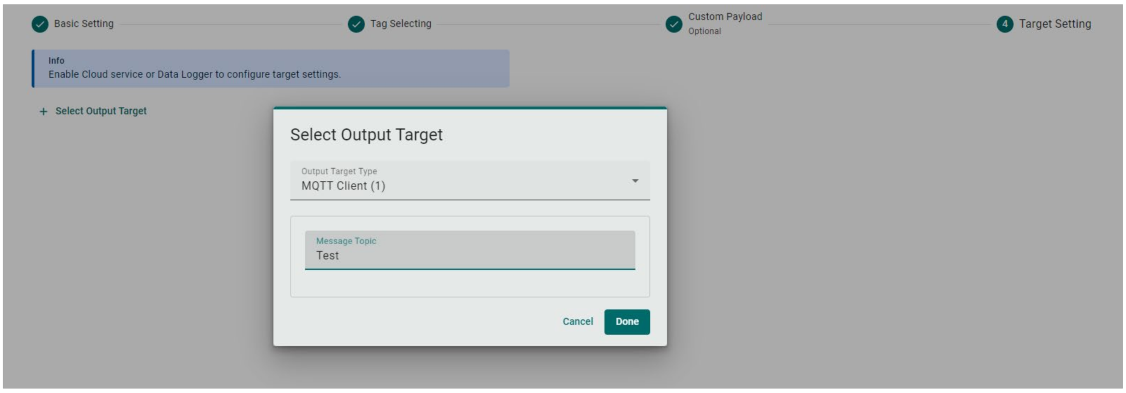
☑ Current

☑ status

Total: 2, Selected: 2

7. (Optional) Enable custom payload by using the **jq** filter.

   The device-to-cloud (D2C) message policy allows you to transform default payload to your desired payload schema via the **jq** filter. For additional information, refer to the jq website link: https://stedolan.github.io/jq/manual/.



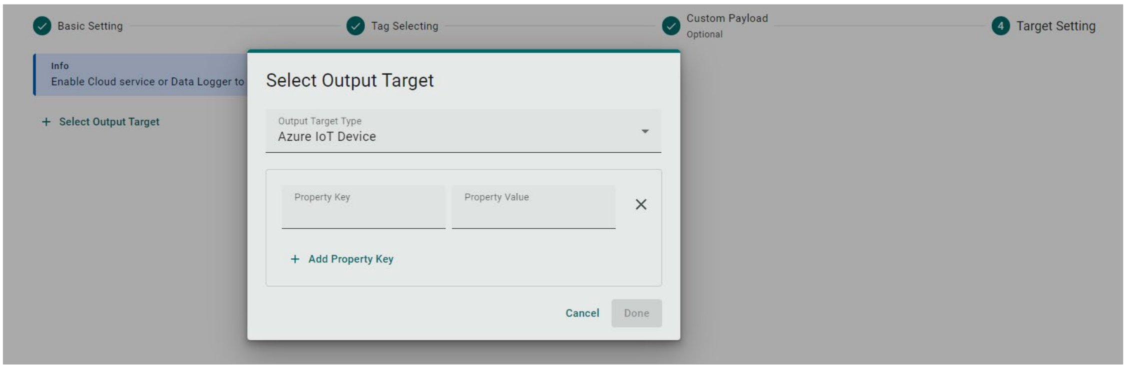
Info
Enable Cloud service or Data Logger to configure target settings.

Select Output Target

Output Target Type: MQTT Client (1)

Message Topic: Test

8. Click **NEXT**.
9. Select **Output Target Type**.
10. (Optional) Enter Property Key and Value.



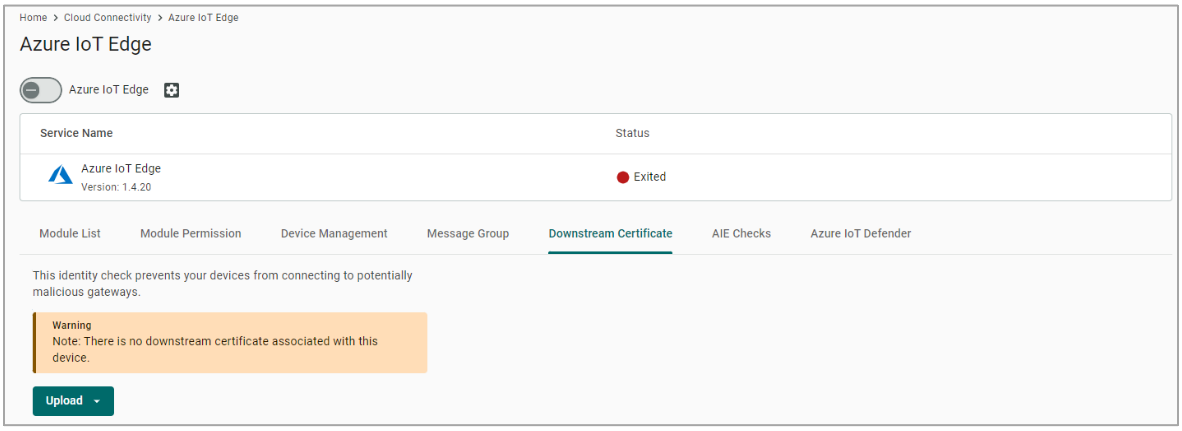
Select Output Target

Output Target Type: Azure IoT Device

11. Click **Done** and **Save**.

Downstream Certification

To prevent your device from connecting to potentially malicious gateways (Azure IoT Edge inside), you can upload X.509 certificate, Private Key, or Trusted CA Certificate. You can generate the certificates and the private key using ThingsPro Edge. For additional information, see Downstream Certificate.



Azure IoT Edge

Azure IoT Edge

Service Name	Status
Azure IoT Edge Version: 1.4.20	● Exited

This identity check prevents your devices from connecting to potentially malicious gateways.

Warning
Note: There is no downstream certificate associated with this device.

Azure IoT Edge (AIE) Configuration Checks

If you want to check the Azure IoT Edge configuration and connectivity for common issues, go to Azure IoT Edge > AIE Checks and click **Check**. ThingsPro Edge provides a result after checking for issues. For additional information on AIE Checks, see https://github.com/Azure/iotedge/blob/master/doc/troubleshoot-checks.md

If an unexpected situation occurs when you upgrade/downgrade to a certain version of Azure IoT Edge, you can restore Azure IoT Edge by clicking Restore in the Provisioning Settings. Using the restore function will remove existing settings including Message Group, Device Management, and Downstream/Upstream credentials.

Azure IoT Defender

The web console is currently unavailable for configuring the Azure IoT Defender; configuration is done via a RESTful API.

Enabling the API

```
curl "http://127.0.0.1:59000/api/v1/azure-iotedge" \
   -X PATCH \
   -H "Content-Type:application/json" \
   -H "Authorization:Bearer $(cat ./token)" \
   -d '{"provisioning":{"defenderEnable":true}}'
```

Using the API to Check the Status of the Defender Service

```
curl "http://127.0.0.1:8443/api/v1/azure-iotedge/defender" \
  -X GET  \
  -H "Content-Type:application/json" \
  -H "Authorization:Bearer ${token}"
```

Using the API to Restart the Defender Service

```
curl "http://127.0.0.1:59000/api/v1/azure-iotedge/defender/reload" \
   -X PUT \
   -H "Content-Type:application/json" \
   -H "Authorization:Bearer $(cat ./token)"
```

Monitoring the Log of the Defender Service

```
sudo journalctl -u defender-iot-micro-agent -f
```

Testing the Defender Service by Triggering a Baseline Violation

```
touch /tmp/DefenderForIoTOSBaselineTrigger.txt
```

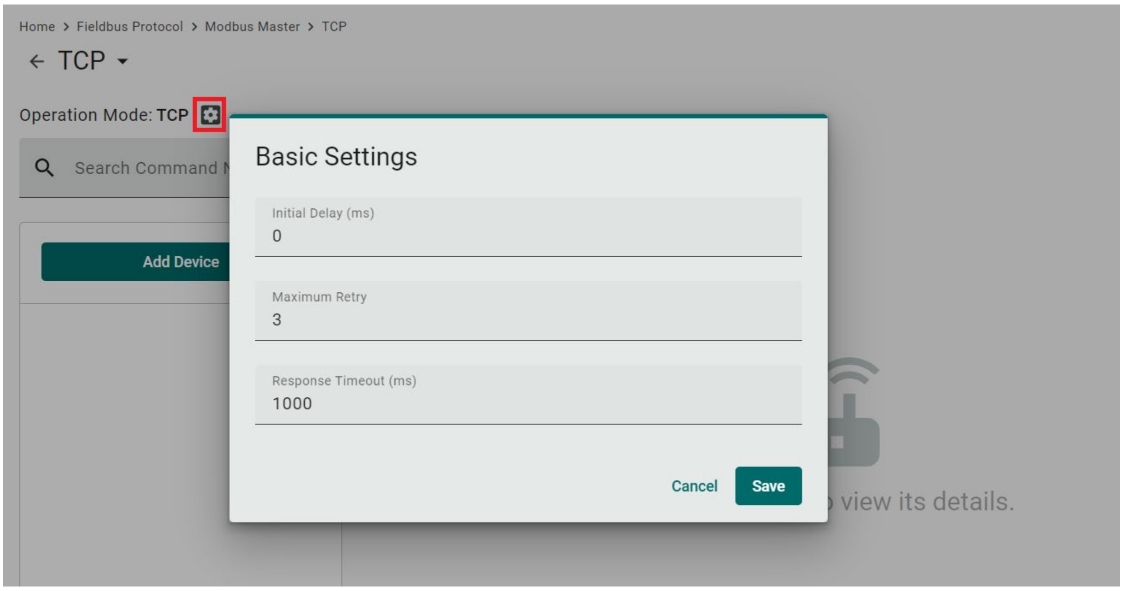
Fieldbus Protocol

Modbus Master

Modbus TCP

Basic Settings

When you access the Modbus TCP setting page, you will first need to configure the basic settings.



Basic Settings

Initial Delay (ms)
0

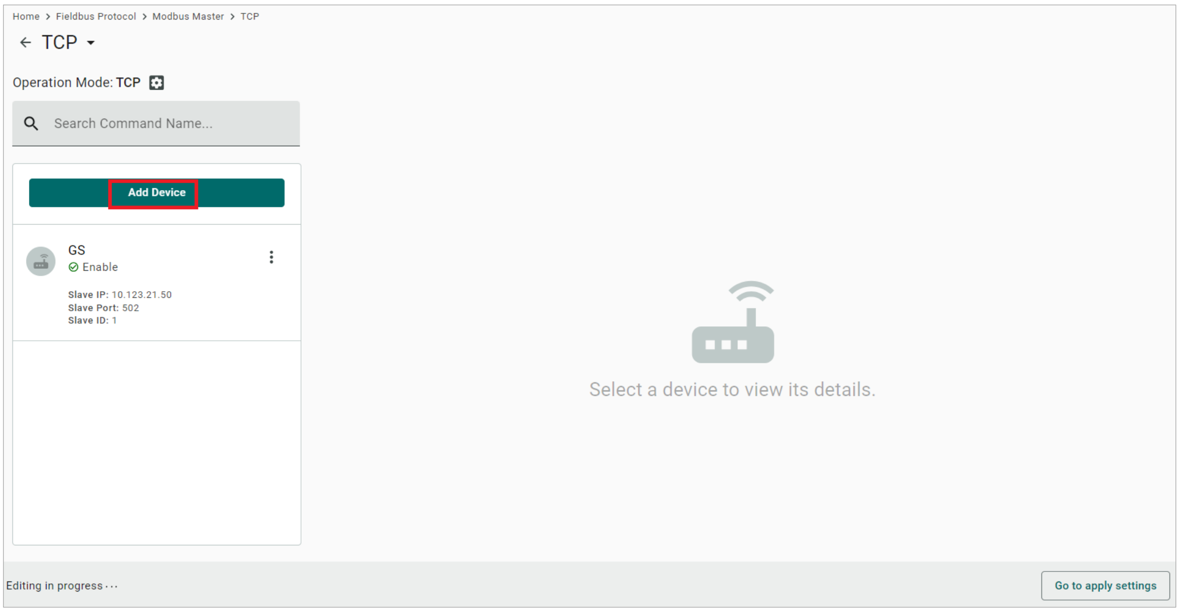
Maximum Retry
3

Response Timeout (ms)
1000

Parameter	Value	Default	Description
Initial Delay (ms)	0 to 30000	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 bootup. After booting up, you can force the AIG to wait some time before sending the first request by setting a value for this parameter.
Maximum Retry	0 to 5	3	This is used to configure how many times AIG will retry to communicate with the Modbus slave when the Modbus command times out.
Response Timeout (ms)	10 to 120000	1000	You can configure a Modbus master to wait a certain amount of time for a slave's response. If no response is received within the configured time, the AIG will disregard the request and continue operation.

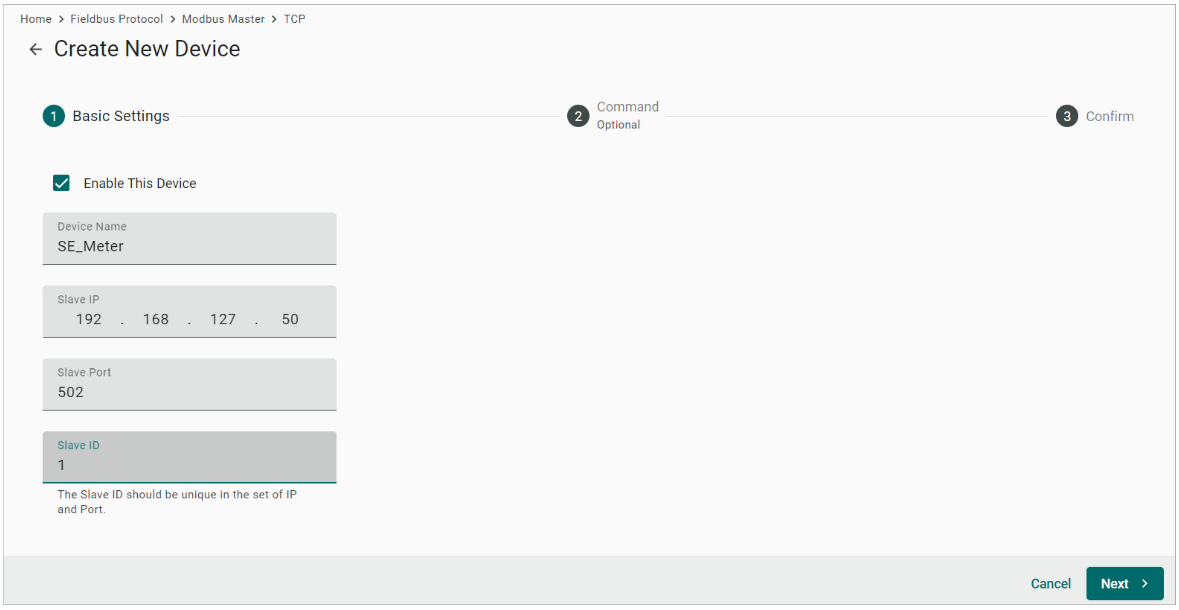
Modbus Device Settings

After configuring the basic settings, configure related parameters to retrieve data from the Modbus device. In the beginning, press **Add Device** and go to the wizard to guide you through the configuration step by step.



Step 1. Basic Settings

Enter in the basic parameters for the Modbus TCP device.



☑ Enable This Device

Device Name: SE_Meter

Slave IP: 192 . 168 . 127 . 50

Slave Port: 502

Slave ID: 1

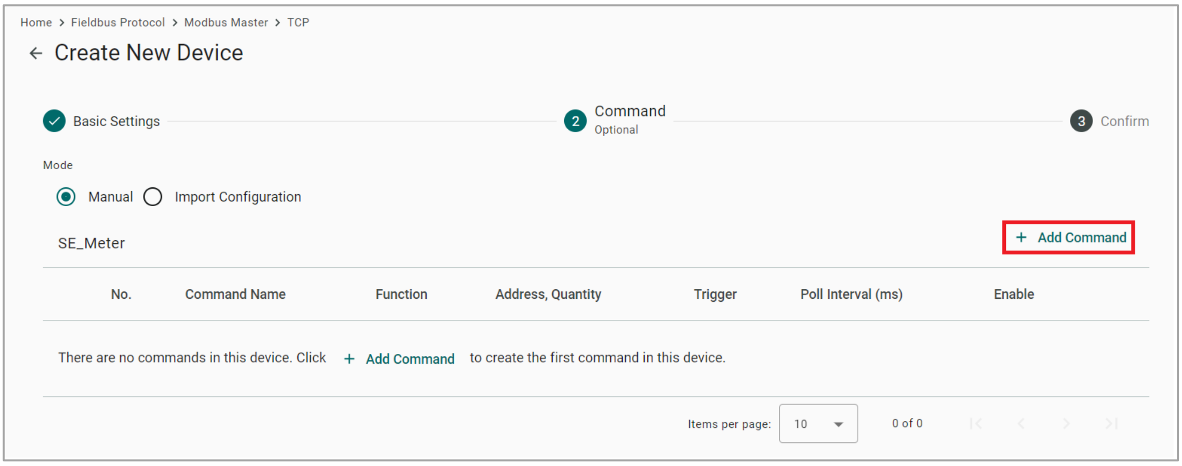
The Slave ID should be unique in the set of IP and Port.

Parameter	Value	Default	Description
Device Name	Alphanumeric string and characters (~ . _ -) are allowed	–	Name your Modbus device
Slave IP	0.0.0.0 to 255.255.255.255	–	The IP address of a remote slave device.
Slave Port	1 to 65535	502	The TCP port number of a remote slave device.
Slave ID	1 to 255	–	The slave ID of a remote slave device.

Step 2. Command

When you configure the device for the first time, select **Manual** mode and press **Add Command.**

The command settings will pop up.



Home > Fieldbus Protocol > Modbus Master > TCP

← Create New Device

✓ Basic Settings — 2 Command Optional — 3 Confirm

Mode

● Manual ○ Import Configuration

SE_Meter

+ Add Command

No.	Command Name	Function	Address, Quantity	Trigger	Poll Interval (ms)	Enable

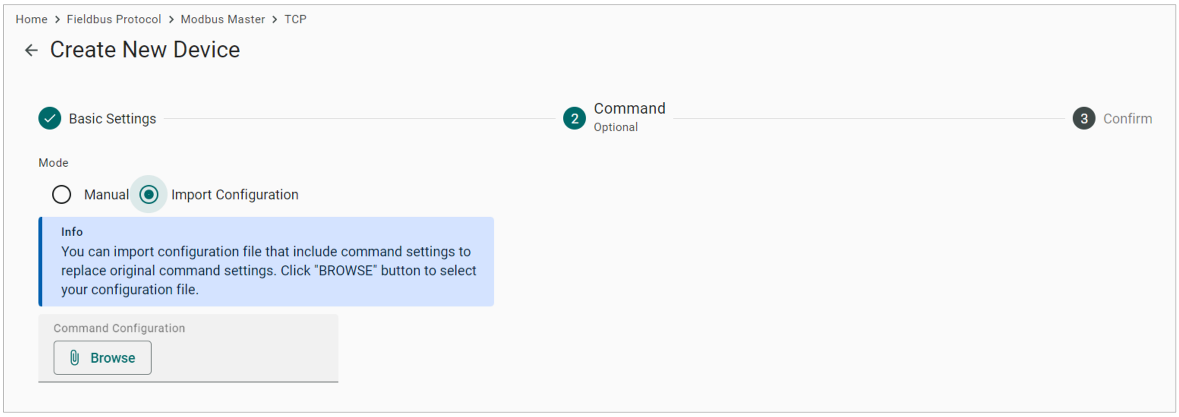
There are no commands in this device. Click + Add Command to create the first command in this device.

Items per page: 10 0 of 0

Parameter	Value	Default	Description
Command Name	Alphanumeric string	–	Name the command
Function	01 – Read Coils 02 – Read Discrete Inputs 03 – Read Holding Registers 04 – Read Inputs Registers 05 – Write Single Coil 06 – Write Single Register 15 – Write Multiple Coils 16 – Write Multiple Registers 23 – Read/Write Multiple Registers	03 – Read Holding Registers	How to collect data from the Modbus device
Read Starting Address	0 to 65535	0	Modbus registers the address for the collected data
Read quantity	Read Coils: 1 to 2000 Read Discrete Inputs: 1 to 2000 Read Inputs Registers: 1 to 125 Read Holding Registers: 1 to 125 Read/Write Multiple Registers: 1 to 125	10	Specifying how much data to read
Write start address	0 to 65535	0	Modbus registers the address for the written data

Parameter	Value	Default	Description
Write quantity	Write Multiple Coils: 1 to 1968 Write Multiple Registers: 1 to 123 Read/Write Multiple Registers: 1to 123	1	Specifying how much data to write.
Trigger	Cyclic Data Change	–	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 (ms)	100 to 1200000	1000	Polling intervals are in milliseconds. Since the module sends all requests in turns, the actual polling interval also depends on the number of requests in the queue and their parameters. The range is from 100 to 1,200,000 ms.
Endian swap	None Byte Word Byte and Word	None	**None:** not 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.
Status Term	Pause Proceed - Clear data to zero Proceed - Set to User-defined value	Pause	The defined value of the Status Term will be effective when a read command encounters an error or times out.
Tag Type	boolean int16 int32 int64 uint16 uint32 uint64 float double string	–	The command will be generated into a meaningful tag by tag type and stored in tag hub.

If you already have a Modbus command file, select **Import Configuration**. Importing a configuration file will help you reduce configuration time.



Mode

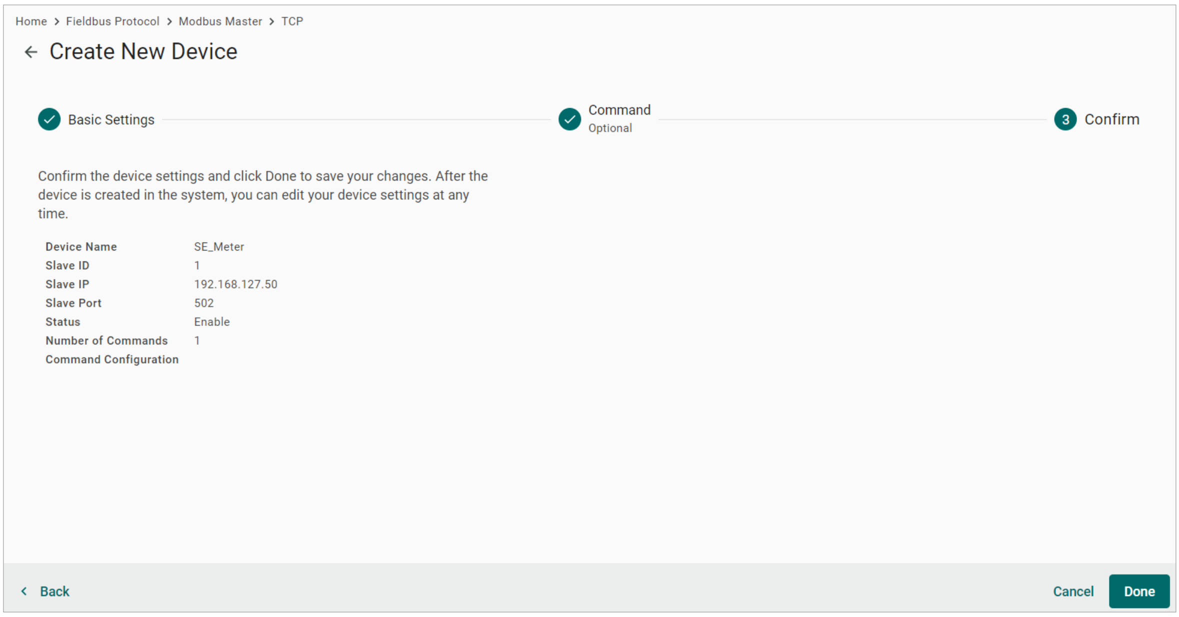
○ Manual ● Import Configuration

Info

You can import configuration file that include command settings to replace original command settings. Click "BROWSE" button to select your configuration file.

Step 3. Confirm

Review whether the information of the settings is correct.

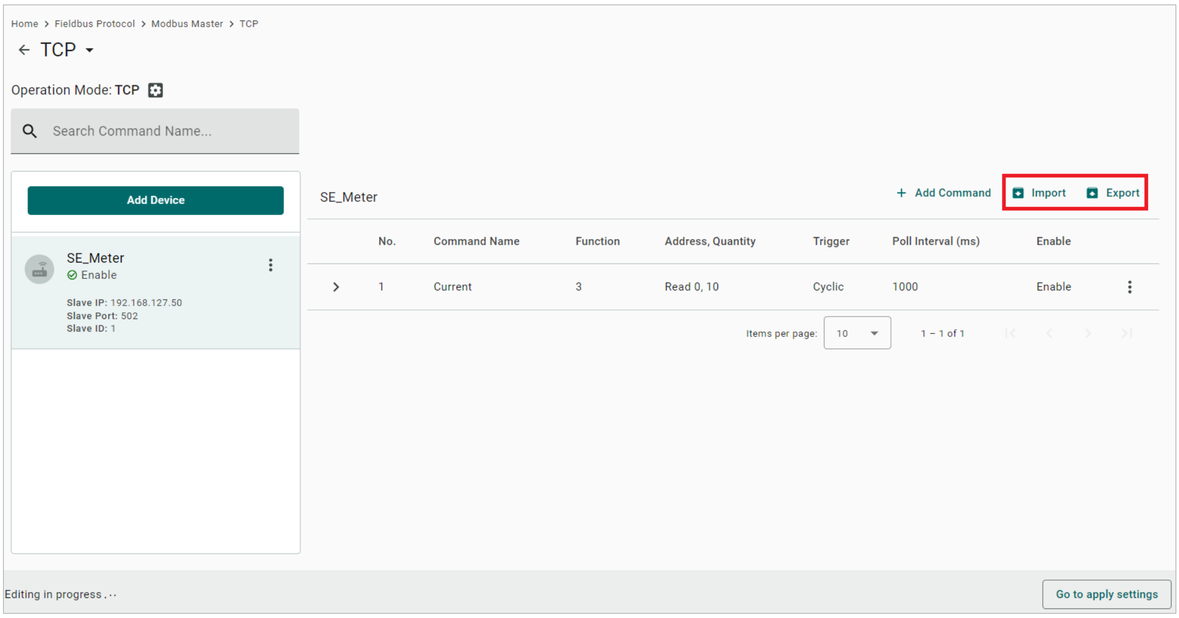


Confirm the device settings and click Done to save your changes. After the device is created in the system, you can edit your device settings at any time.

Device Name	SE_Meter
Slave ID	1
Slave IP	192.168.127.50
Slave Port	502
Status	Enable
Number of Commands	1
Command Configuration	

Then, you will see the setting results.

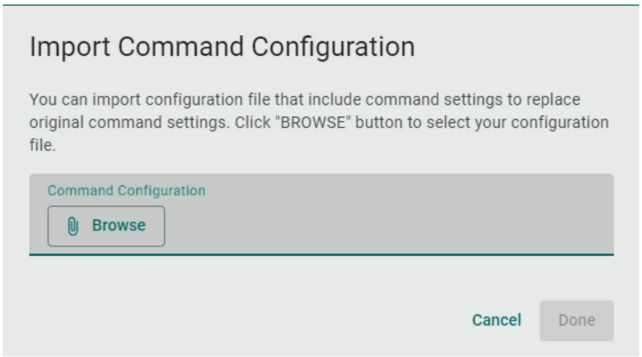
The product provides an easier way for installation and maintenance. You can **Export** all the Modbus commands into a file for backup purposes, or you can **Import** a file (golden sample) to reduce configuration time.



Slave IP: 192.168.127.50
Slave Port: 502
Slave ID: 1

SE_Meter

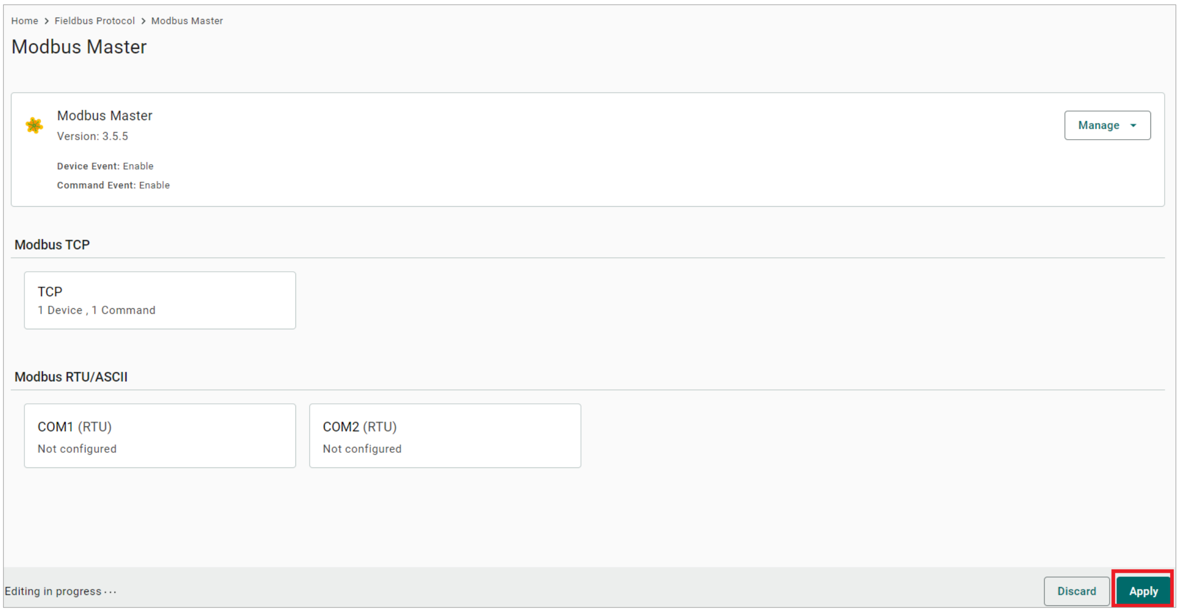
No.	Command Name	Function	Address, Quantity	Trigger	Poll Interval (ms)	Enable
1	Current	3	Read 0, 10	Cyclic	1000	Enable



Import Command Configuration

You can import configuration file that include command settings to replace original command settings. Click "BROWSE" button to select your configuration file.

After finishing all the settings, press **Go to apply settings** and click **Apply** for the settings take effect.


Home > Fieldbus Protocol > Modbus Master

Modbus Master

Modbus Master
Version: 3.5.5
Device Event: Enable
Command Event: Enable

Modbus TCP

TCP
1 Device , 1 Command

Modbus RTU/ASCII

COM1 (RTU)
Not configured

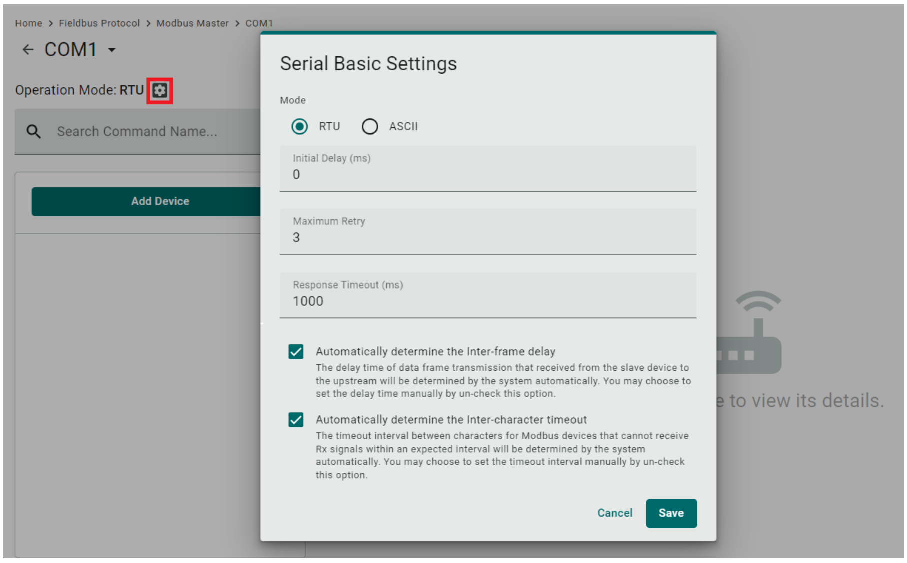
COM2 (RTU)
Not configured

Editing in progress···

Modbus RTU/ASCII

Basic Settings

When you access the Modbus RTU/ASCII settings page, you will first need to configure the basic settings.


Home > Fieldbus Protocol > Modbus Master > COM1

COM1

Operation Mode: RTU

Serial Basic Settings

Mode
● RTU ○ ASCII

Initial Delay (ms)
0

Maximum Retry
3

Response Timeout (ms)
1000

☑ Automatically determine the Inter-frame delay
The delay time of data frame transmission that received from the slave device to the upstream will be determined by the system automatically. You may choose to set the delay time manually by un-check this option.

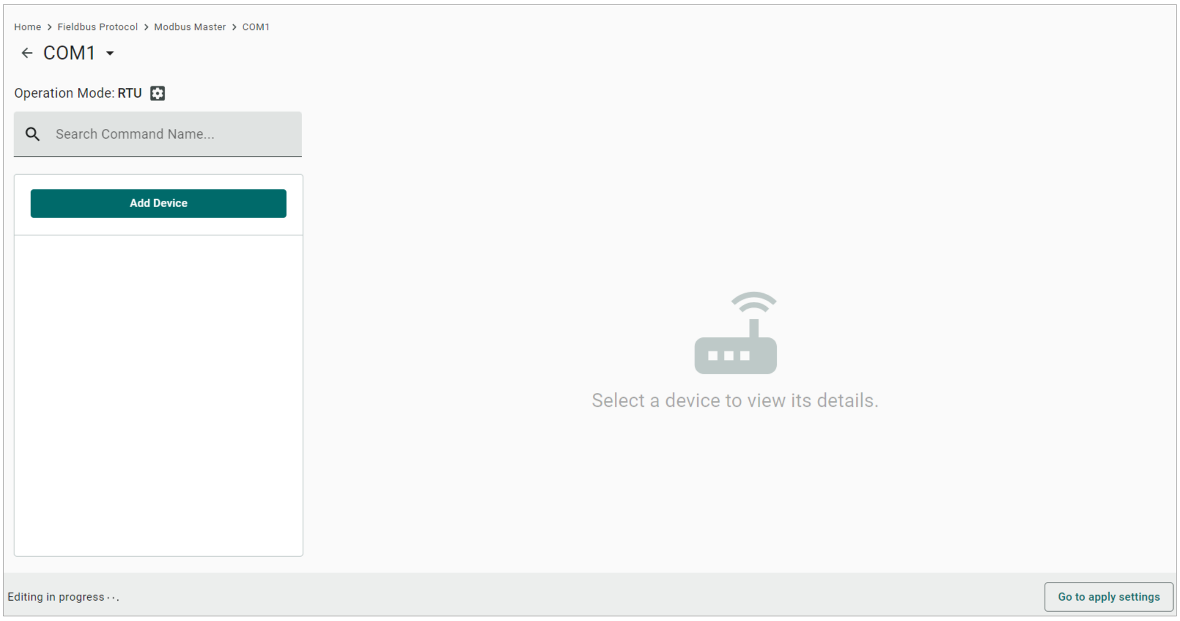
☑ Automatically determine the Inter-character timeout
The timeout interval between characters for Modbus devices that cannot receive Rx signals within an expected interval will be determined by the system automatically. You may choose to set the timeout interval manually by un-check this option.

Parameter	Value	Default	Description
Mode	RTU/ASCII	RTU	
Initial Delay (ms)	0 to 30000	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 bootup. After booting up, you can force the AIG to wait some time before sending the first request by setting a value for this parameter.
Maximum Retry	0 to 5	3	Use this to configure how many times AIG will retry to communicate with the Modbus slave when the Modbus command times out.

Parameter	Value	Default	Description
Response Timeout (ms)	10 to 120000	1000	You can configure a Modbus master to wait a certain amount of time for a slave's response. If no response is received within the configured time, the AIG will disregard the request and continue operation.
Automatically determine the inter-frame delay (ms)	Check uncheck: 10 to 500	check	Inter-frame delay is the time between the response and the next request. This is to ensure a legacy Modbus slave device can handle packets in a short time. **Check:** The AIG will automatically determine the time interval. **Uncheck:** You can input a time interval.
Automatically determines the intercharacter timeout (ms)	Check uncheck: 10 to 500	check	Use this function to determine the timeout interval between characters for receiving Modbus responses. If AIG can't receive Rx signals within an expected time interval, all received data will be discarded. **Check:** The AIG will automatically determine the time out. **Uncheck:** You can input a specific timeout value.

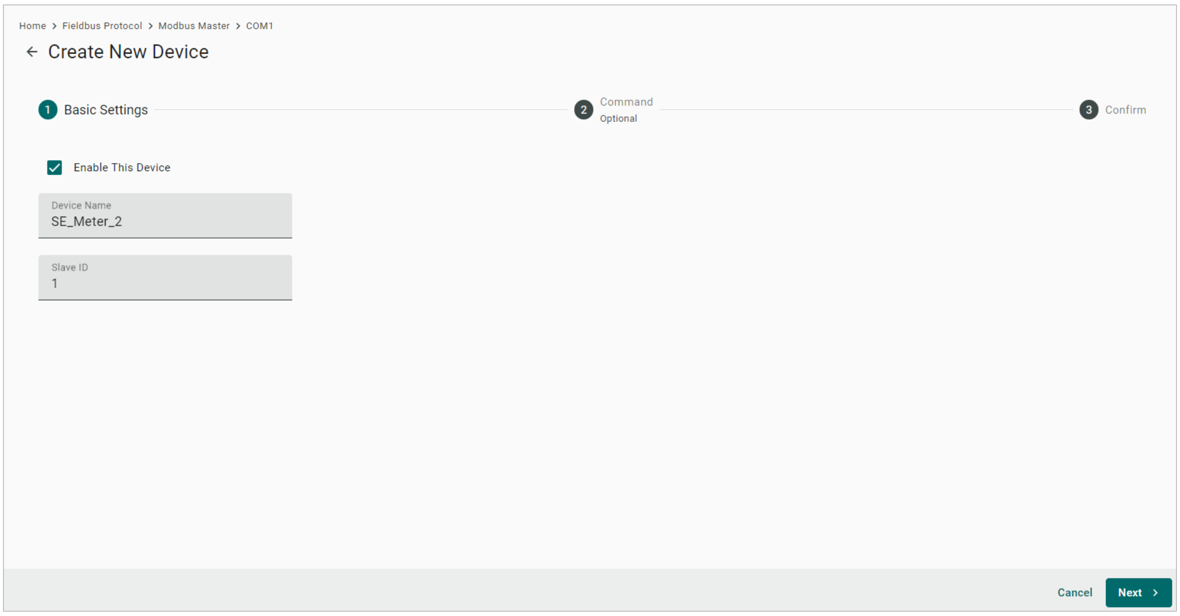
Modbus Device Settings

After basic settings, you must configure related parameters to retrieve data from the Modbus device. In the beginning, press **Add Device** and go to the wizard that guides step-by-step through the configuration process.



Step 1. Basic Settings

Fill in the basic parameters for the Modbus RTU/ASCII device.



Home > Fieldbus Protocol > Modbus Master > COM1

Create New Device

1 Basic Settings — 2 Command Optional — 3 Confirm

☑ Enable This Device

Device Name: SE_Meter_2

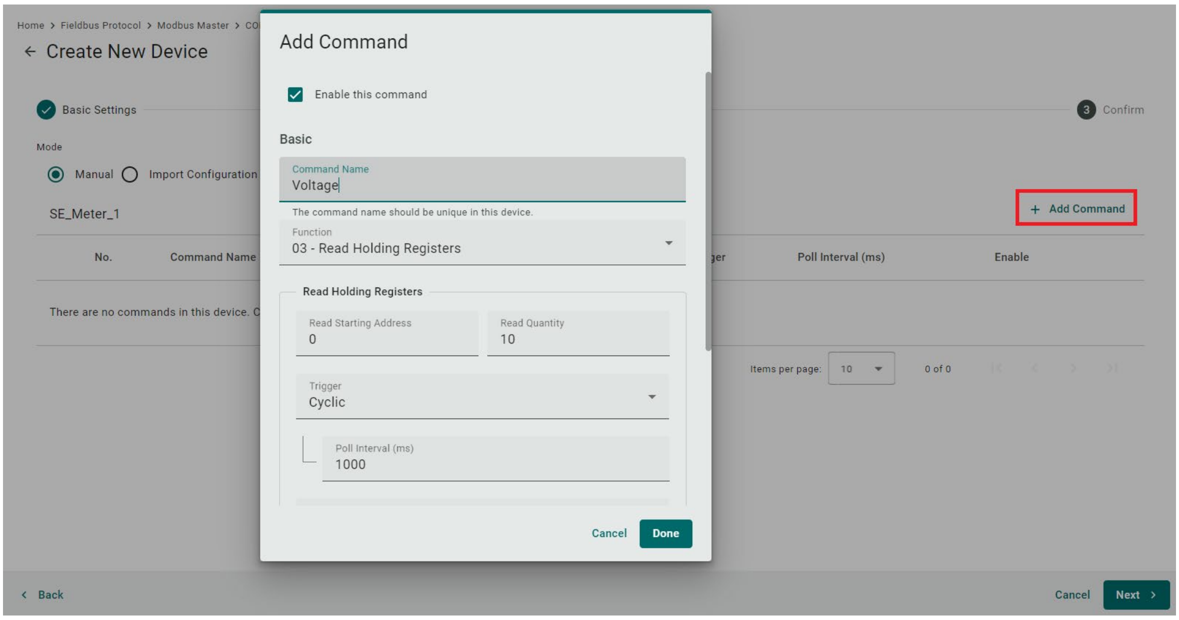
Slave ID: 1

Parameter	Value	Default	Description
Device Name	Alphanumeric string and characters (~ . _ -) are allowed	–	Name your Modbus device
Slave ID	1 to 255	–	The slave ID of a remote slave device.

Step 2. Command

If you are configuring the device for the first time, select the **Manual** and press **ADD COMMAND.**

The command settings will pop up.



Add Command

☑ Enable this command

Basic

Command Name: Voltage

The command name should be unique in this device.

Function: 03 - Read Holding Registers

Read Holding Registers

Read Starting Address: 0

Read Quantity: 10

Trigger: Cyclic

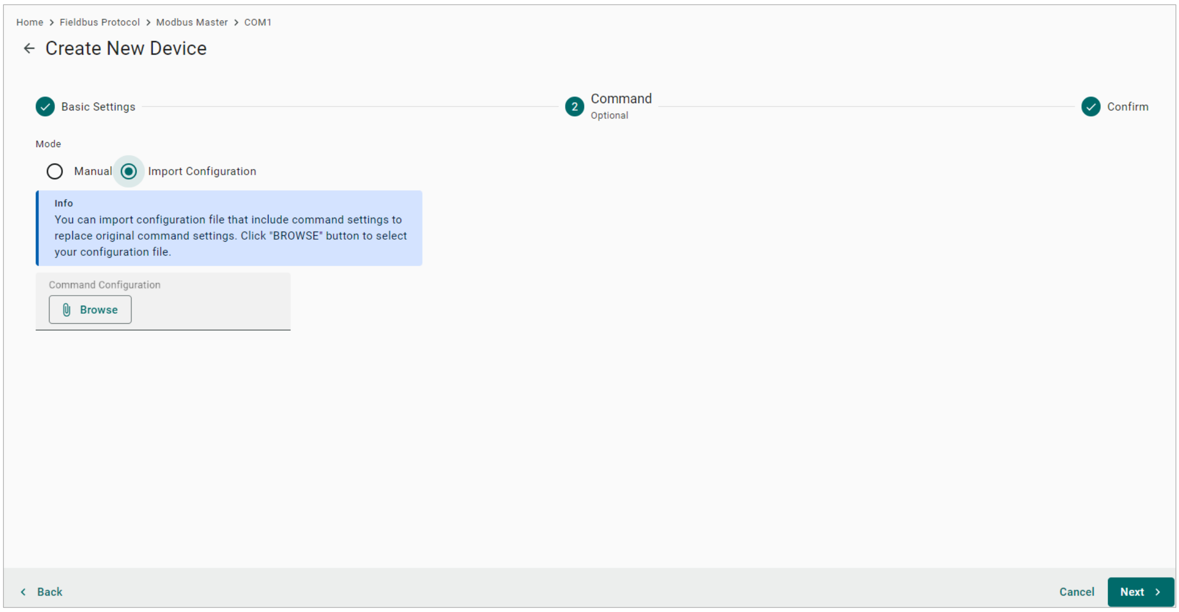
Poll Interval (ms): 1000

Parameter	Value	Default	Description
Command Name	Alphanumeric string and characters (~ . _ -) are allowed	–	Name the command

Parameter	Value	Default	Description
Function	01 – Read Coils 02 – Read Discrete Inputs 03 – Read Holding Registers 04 – Read Inputs Registers 05 – Write Single Coil 06 – Write Single Register 15 – Write Multiple Coils 16 – Write Multiple Registers 23 – Read/Write Multiple Registers	03 – Read Holding Registers	How to collect data from the Modbus device
Read Starting Address	0 to 65535	0	Modbus registers the address for the collected data
Read quantity	Read Coils: 1 to 2000 Read Discrete Inputs: 1 to 2000 Read Inputs Registers: 1 to 125 Read Holding Registers: 1 to 125 Read/Write Multiple Registers: 1 to 125	10	Specifying how much data to read
Write starting address	0 to 65535	0	Modbus registers the address for the written data
Write quantity	Write Multiple Coils: 1 to 1968 Write Multiple Registers: 1 to 123 Read/Write Multiple Registers: 1 to 123	1	Specifying how much data to write.
Trigger	Cyclic Data Change	–	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 (ms)	100 to 1200000	1000	Polling intervals are in milliseconds. Since the module sends requests in turns, the actual polling interval also depends on the number of requests in the queue and their parameters. The range is from 100 to 1,200,000 ms.
Endian swap	None Byte Word Byte and Word	None	**None:** not 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
Status Term	Pause Proceed - Clear data to zero Proceed - Set to User-defined value	Pause	The defined value of the Status Term will be effective when the read command encounters an error or times out.
Tag Type	boolean int16 int32 int64 uint16 uint32 uint64 float double string	–	The command will be generated into a meaningful tag by tag type and stored in the tag hub.

If you already have a Modbus command file on hand, select the **Import Configuration** mode. Importing a configuration file will help you reduce configuration time.



Mode

○ Manual ● Import Configuration

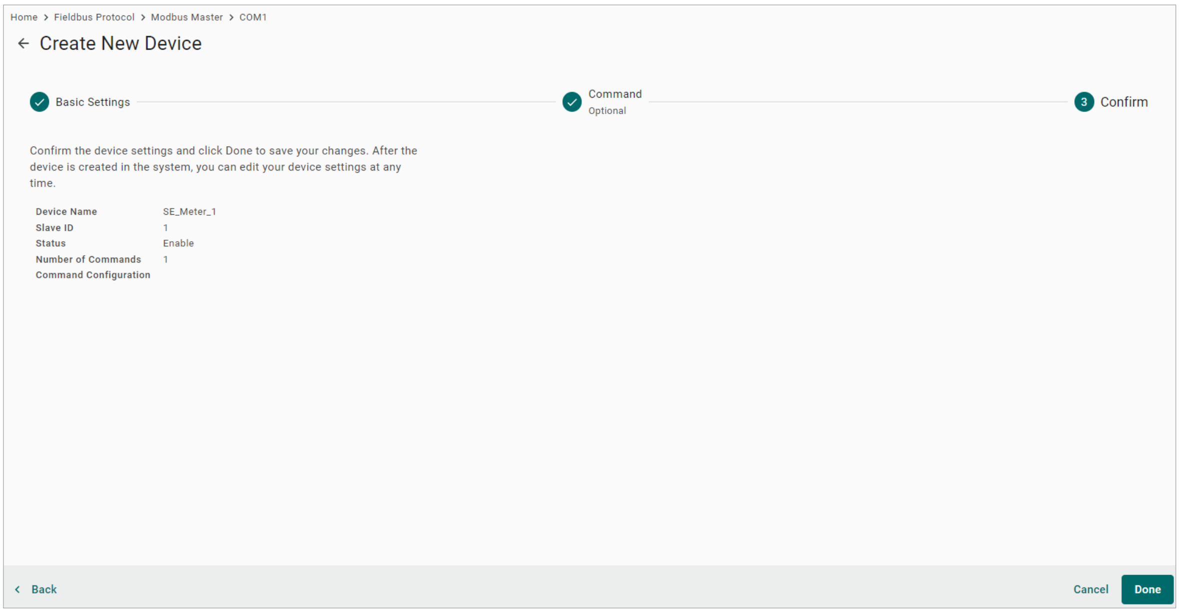
Info

You can import configuration file that include command settings to replace original command settings. Click "BROWSE" button to select your configuration file.

Command Configuration

Step 3. Confirm

Review whether the information of the settings is correct.

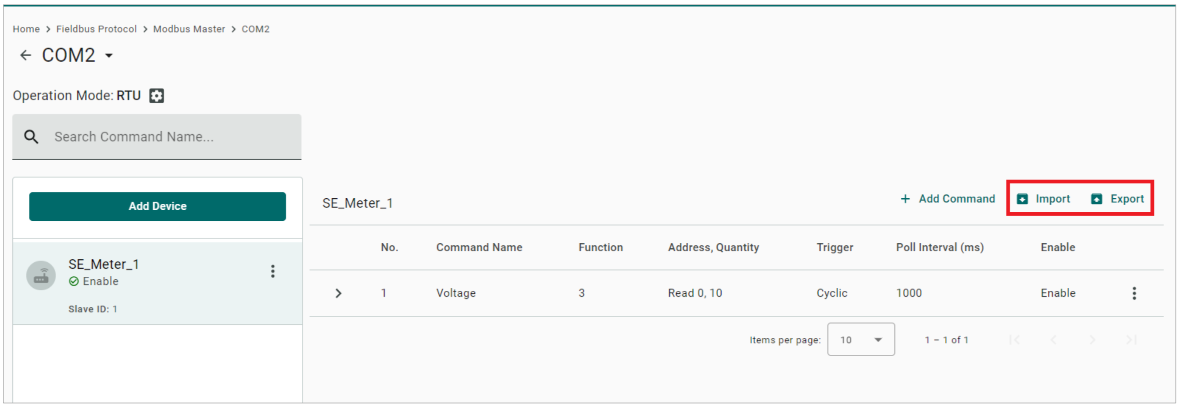


Confirm the device settings and click Done to save your changes. After the device is created in the system, you can edit your device settings at any time.

Device Name	SE_Meter_1
Slave ID	1
Status	Enable
Number of Commands	1
Command Configuration	

Then, you will see the setting results.

Moreover, the product provides an easier way for installation and maintenance. You can **Export** all the Modbus commands into a file for backup purposes; or you can **Import** a file (golden sample) to reduce configuration time.



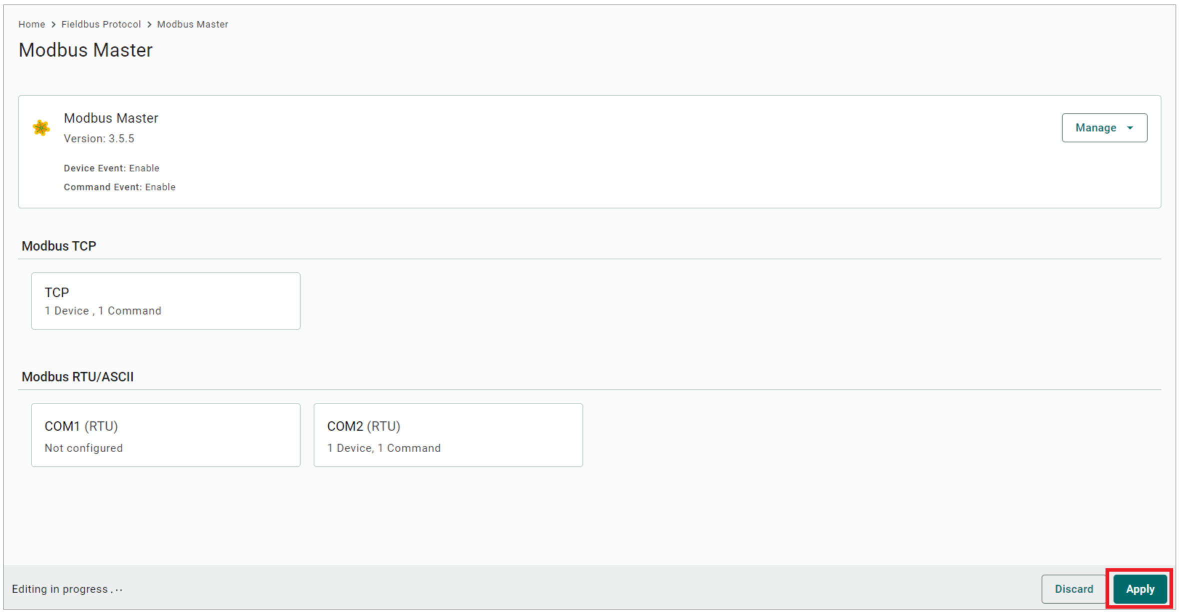
Operation Mode: RTU

SE_Meter_1

	No.	Command Name	Function	Address, Quantity	Trigger	Poll Interval (ms)	Enable
>	1	Voltage	3	Read 0, 10	Cyclic	1000	Enable

Items per page: 10 1 – 1 of 1

After finishing all the settings, press **Go to apply settings** and click **Apply** for the settings to take effect.



Home > Fieldbus Protocol > Modbus Master

Modbus Master

Modbus Master
Version: 3.5.5

Device Event: Enable
Command Event: Enable

Modbus TCP

TCP
1 Device , 1 Command

Modbus RTU/ASCII

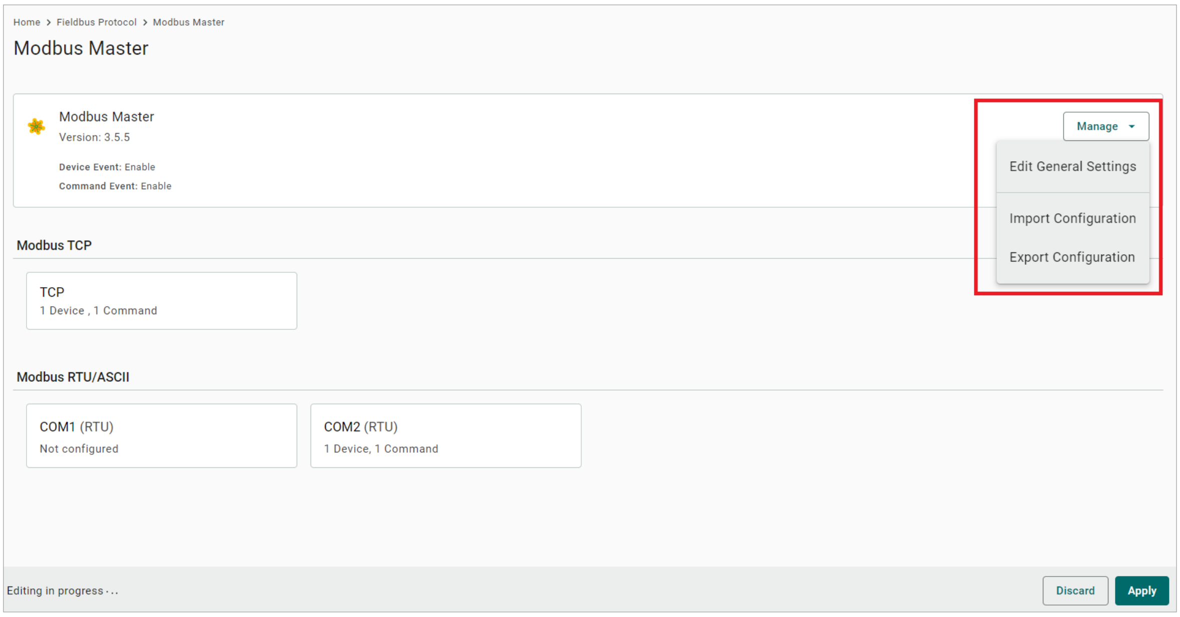
COM1 (RTU)
Not configured

COM2 (RTU)
1 Device, 1 Command

Editing in progress . . .

Manage

The AIG provides advanced features that help save installation time and maintenance efforts.



Home > Fieldbus Protocol > Modbus Master

Modbus Master

Modbus Master
Version: 3.5.5

Device Event: Enable
Command Event: Enable

Modbus TCP

TCP
1 Device , 1 Command

Modbus RTU/ASCII

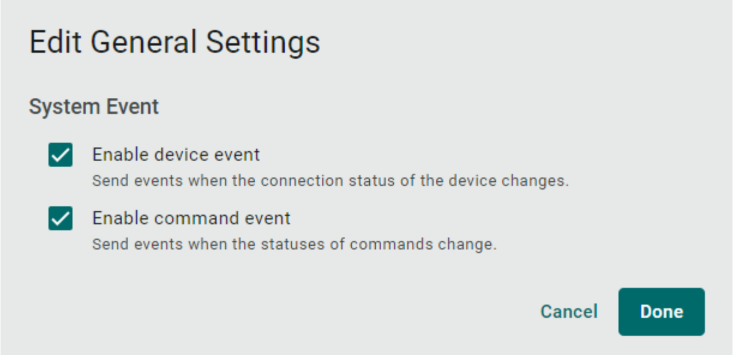
COM1 (RTU)
Not configured

COM2 (RTU)
1 Device, 1 Command

Editing in progress . . .

Edit General Settings

Once your northbound main system wants to monitor the Modbus communication status, you can enable this function.



Edit General Settings

System Event

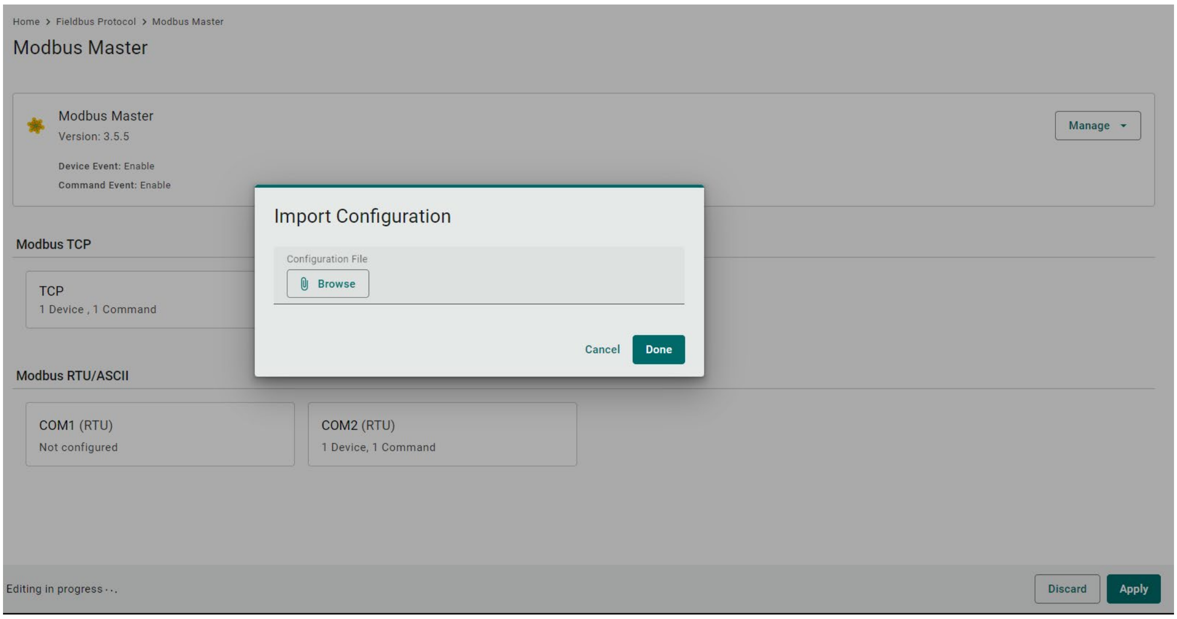
☑ Enable device event
Send events when the connection status of the device changes.

☑ Enable command event
Send events when the statuses of commands change.

Parameter	Value	Default	Description
Enable device event	Check uncheck	Check	**Check:** If the Modbus communication fails, e.g., Modbus exception code is received The Modbus response timeout and the value of the status tag in the tag hub will change to 1. **Uncheck:** Disable the function
Enable command event	Check uncheck	Check	**Check:** If the Modbus command fails, e.g., Modbus exception code is received or Modbus response times out, the value of the status tag in the tag hub will change to 1. **Uncheck:** Disable the function.

Import/Export Configuration

You can Import/Export the **Modbus Master settings,** which will be stored in XML format.



Home > Fieldbus Protocol > Modbus Master

Modbus Master

Modbus Master
Version: 3.5.5

Device Event: Enable
Command Event: Enable

Modbus TCP

TCP
1 Device , 1 Command

Modbus RTU/ASCII

COM1 (RTU)
Not configured

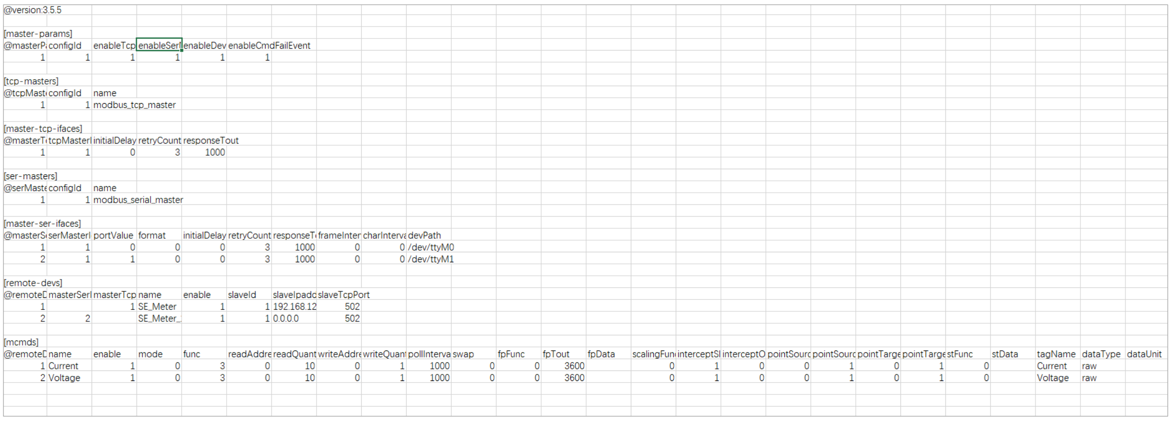
COM2 (RTU)
1 Device, 1 Command

Import Configuration

Configuration File

Editing in progress...

An example of an exported file that can be viewed/edited by EXCEL.



@version:3.5.5																									
[master-params]																									
@masterP	configId	enableTcp	enableSer	enableDev	enableCmdFailEvent																				
1	1	1	1	1	1																				
[tcp-masters]																									
@tcpMast	configId	name																							
1	1	modbus_tcp_master																							
[master-tcp-ifaces]																									
@masterT	tcpMaster	initialDelay	retryCount	responseTout																					
1	1	0	3	1000																					
[ser-masters]																									
@serMaste	configId	name																							
1	1	modbus_serial_master																							
[master-ser-ifaces]																									
@masterS	serMaster	portValue	format	initialDelay	retryCount	responseT	frameInter	charInterva	devPath																
1	1	0	0	0	3	1000	0	0	/dev/ttyM0																
2	1	1	0	0	3	1000	0	0	/dev/ttyM1																
[remote-devs]																									
@remoteD	masterSer	masterTcp	name	enable	slaveId	slaveIpadd	slaveTcpPort																		
1		1	SE_Meter	1	1	192.168.12	502																		
2	2		SE_Meter_	1	1	0.0.0.0	502																		
[mcmds]																									
@remoteD	name	enable	mode	func	readAddre	readQuant	writeAddre	writeQuant	pollInterva	swap	fpFunc	fpTout	fpData	scalingFunc	interceptSl	interceptO	pointSourc	pointSourc	pointTarge	pointTarge	stFunc	stData	tagName	dataType	dataUnit
1	Current	1	0	3	0	10	0	1	1000	0	0	3600		0	1	0	0	1	0	1	0		Current	raw	
2	Voltage	1	0	3	0	10	0	1	1000	0	0	3600		0	1	0	0	1	0	1	0		Voltage	raw	

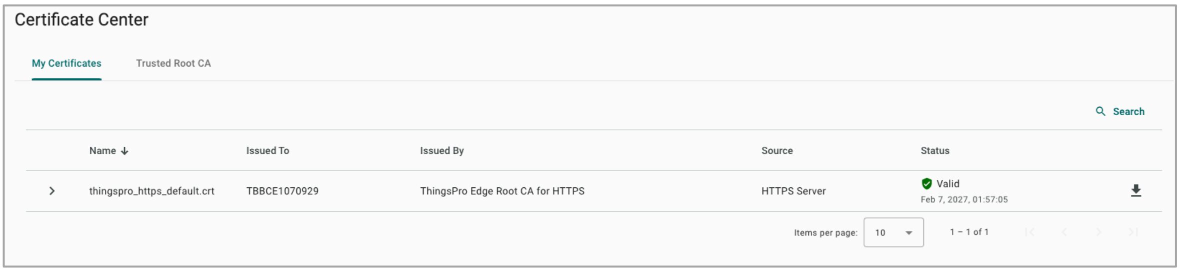
Security

Certificate Center

To check what certificates have been used on the devices, go to **Security > Certificate Center** to view all of them. On this page, you can search, view the status, and download the certificate for backup purposes.

The **ThingsPro Edge Root CA for HTTPS** certificate is used to sign the HTTP SSL X.509 certificate, default.crt. You can download this root CA and import it to your client devices to trust the HTTPS connection between clients and AIG. To import a root CA certificate to Google Chrome, see:

https://docs.moxa.online/tpe/users-manual/security/certificate_center/#import-rootcacer-to-google-chrome



Certificate Center

My Certificates | Trusted Root CA

Search

Name ↓	Issued To	Issued By	Source	Status
thingspro_https_default.crt	TBBCE1070929	ThingsPro Edge Root CA for HTTPS	HTTPS Server	Valid Feb 7, 2027, 01:57:05

Items per page: 10 | 1 – 1 of 1

Firewall

AIG provides a firewall that allows you to create rules for inbound Internet network traffic to protect your IIoT gateway.

Inbound

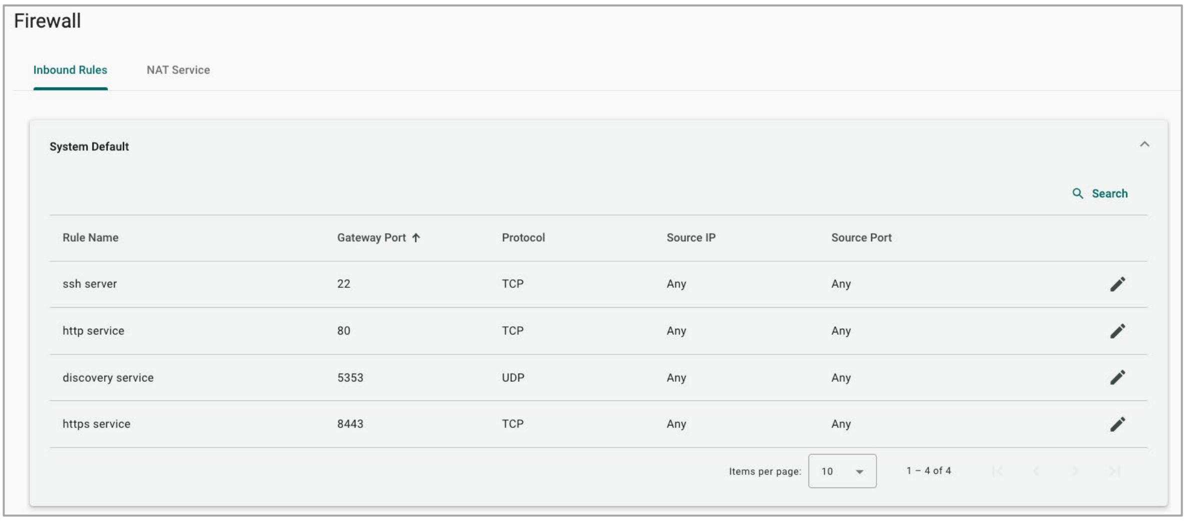
System Default

AIG reserves ports for certain services and purposes as indicated in the following table:

No.	Service/purpose	Port
1	HTTP service	80
2	HTTPS service	8443
3	SSH server	22
4	Discovery service	5353

NOTE

The AIG disables all ports by default excluding the reserved ports mentioned above. To enhance the security of your device, we recommend configuring a rule that includes the source IP and source port, thereby granting access only to specific individuals.



Rule Name	Gateway Port ↑	Protocol	Source IP	Source Port
ssh server	22	TCP	Any	Any
http service	80	TCP	Any	Any
discovery service	5353	UDP	Any	Any
https service	8443	TCP	Any	Any

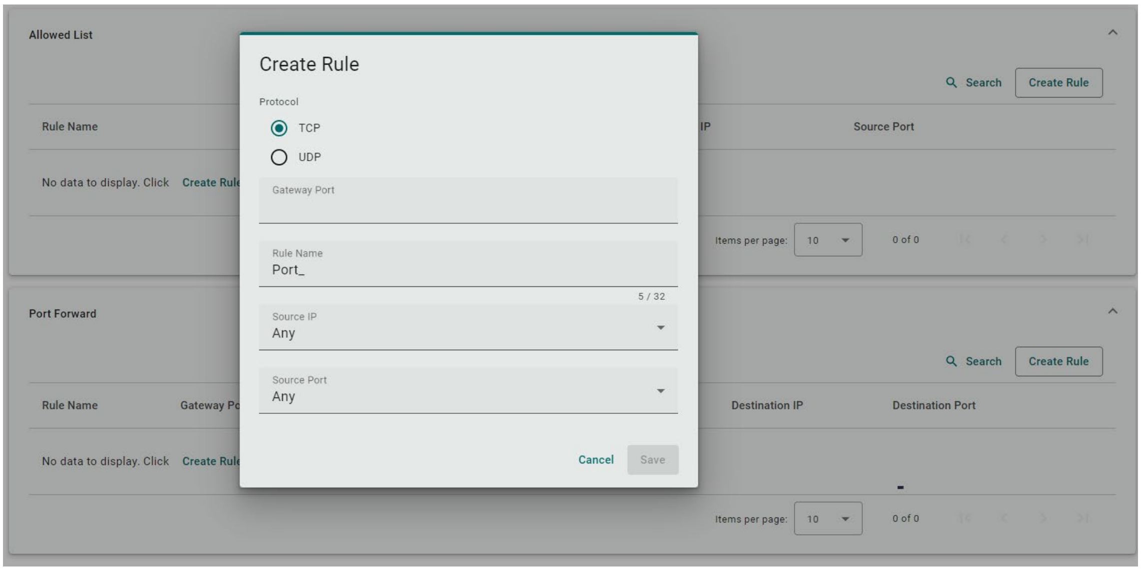
Items per page: 10 1 – 4 of 4

Allowed List

AIG provides an allowed list for creating firewall rules. You can create, edit, and delete firewall rules here.

To create firewall rules, do the following:

1. Click **+ Create Rule.**
2. Specify the protocol, gateway port, and rule name.
3. Specify a source IP or a subnet.
4. Specify a source port or a range of ports.
5. Click **Save**.



Create Rule

Protocol

● TCP

○ UDP

Gateway Port

Rule Name: Port_ 5 / 32

Source IP: Any

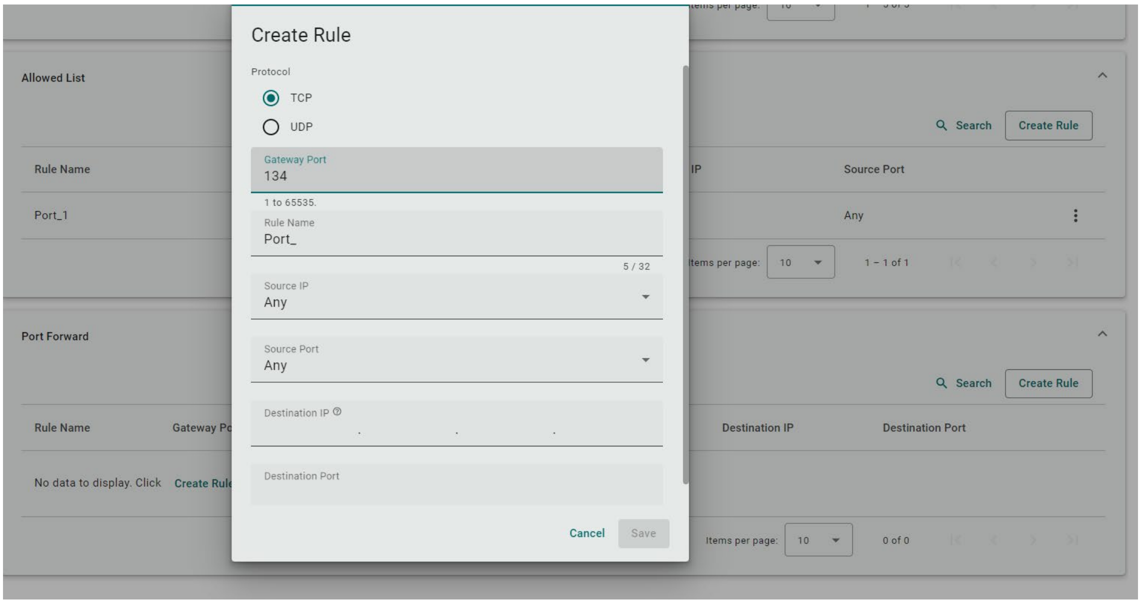
Source Port: Any

Cancel Save

Port Forward

AIG provides port forwarding function. You can create, edit, and delete firewall rules here. To create firewall rules, do the following:

1. Click **+ Create Rule.**
2. Specify the protocol, gateway port, and rule name.
3. Specify a source IP.
4. Specify the destination IP and port.



Create Rule

Protocol

● TCP

○ UDP

Gateway Port: 134

1 to 65535.

Rule Name: Port_ (5 / 32)

Source IP: Any

Source Port: Any

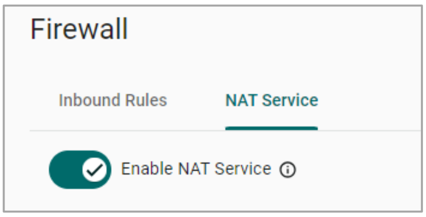
Destination IP

Destination Port

5. Click **Save.**

NAT Service

Enable the NAT service to allow child devices to connect to external networks.



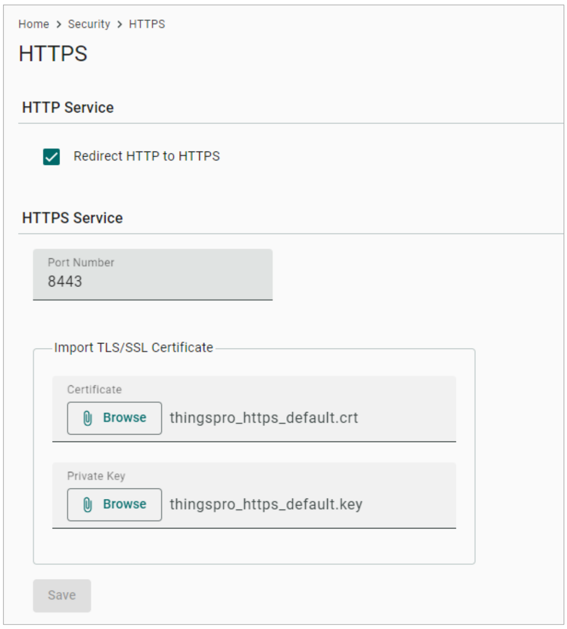
Firewall

☑ Enable NAT Service

HTTPS

To ensure the securely access web console of the device, HTTPS has been enabled by default.

To use the HTTPS console without a certificate warning appearing, you need to import a trusted certificate issued by a third-party certificate authority. If there are no imported certificates, the AIG Series can generate the "ThingsPro Edge Root CA for HTTPS" certificate instead.



Home > Security > HTTPS

HTTPS

HTTP Service

☑ Redirect HTTP to HTTPS

HTTPS Service

Port Number: 8443

Import TLS/SSL Certificate

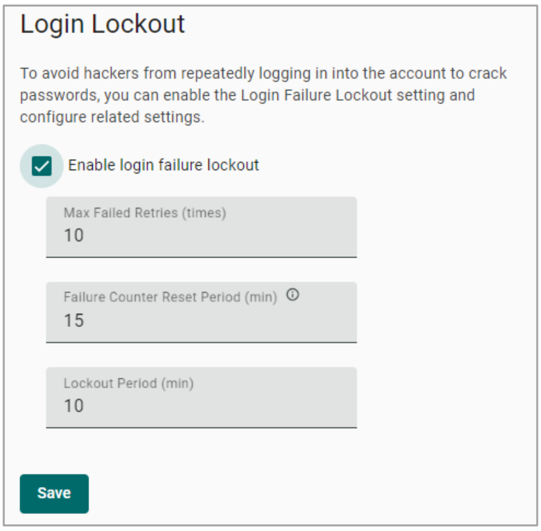
Certificate: Browse thingspro_https_default.crt

Private Key: Browse thingspro_https_default.key

Save

Login Lockout

To avoid hackers repeatedly logging into the account to crack the passwords, you may choose to enable the login failure lockout and configure related settings.



Login Lockout

To avoid hackers from repeatedly logging in into the account to crack passwords, you can enable the Login Failure Lockout setting and configure related settings.

☑ Enable login failure lockout

Max Failed Retries (times): 10

Failure Counter Reset Period (min): 15

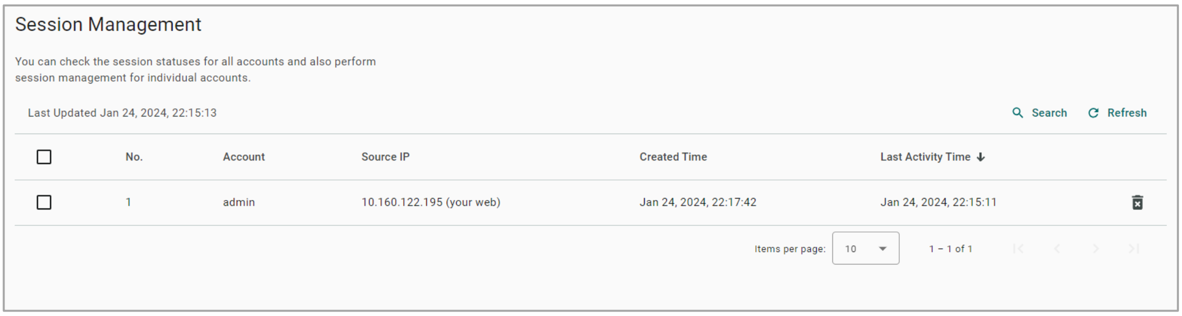
Lockout Period (min): 10

Save

Parameter	Value	Description
Max Failure Retry (times)	3 to 32	The maximum number of failed retries.
Failure Counter Reset Period (min)	1 to 60	The interval for resetting the login failure counter.
Lockout Time (min)	5 to 1440	When the number of login failures exceeds the Max Failure Retry, the AIG will lock out the account for this period.

Session Management

You can review session statuses for all accounts and manage sessions for individual accounts.



Session Management

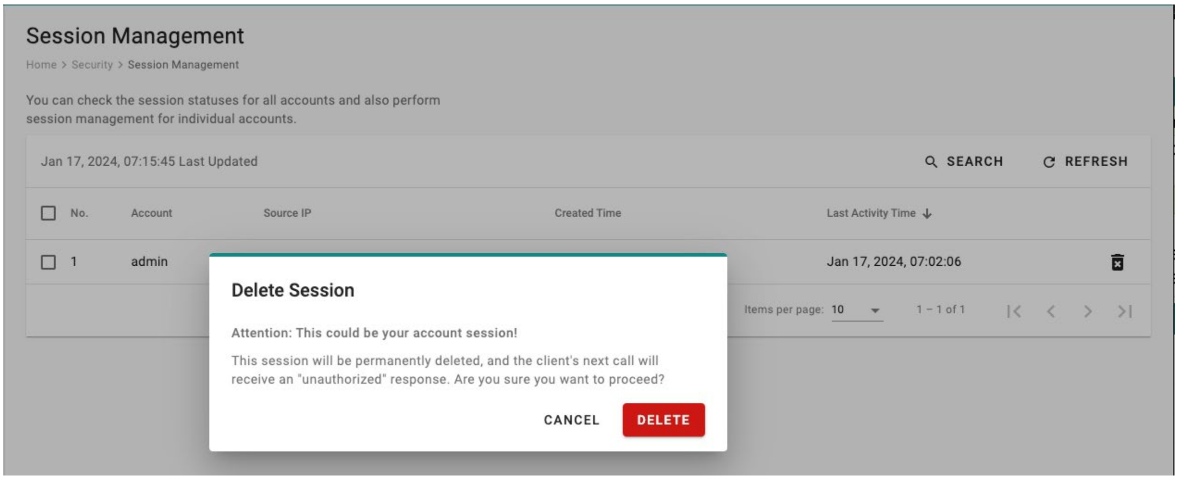
You can check the session statuses for all accounts and also perform session management for individual accounts.

Last Updated Jan 24, 2024, 22:15:13

□	No.	Account	Source IP	Created Time	Last Activity Time ↓	
□	1	admin	10.160.122.195 (your web)	Jan 24, 2024, 22:17:42	Jan 24, 2024, 22:15:11	

Items per page: 10 1 – 1 of 1

In the event of detecting unusual connections, you can enhance the security of your device by deleting the respective session.



Session Management

You can check the session statuses for all accounts and also perform session management for individual accounts.

Jan 17, 2024, 07:15:45 Last Updated

□	No.	Account	Source IP	Created Time	Last Activity Time ↓	
□	1	admin			Jan 17, 2024, 07:02:06	

Items per page: 10 1 – 1 of 1

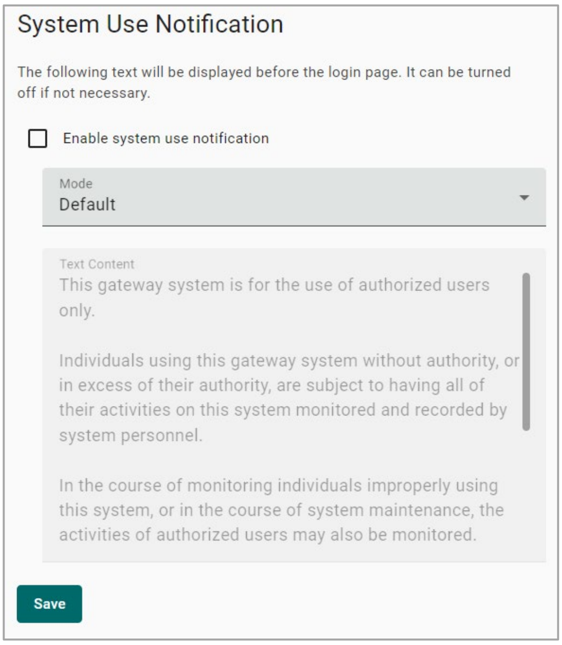
Delete Session

Attention: This could be your account session!

This session will be permanently deleted, and the client's next call will receive an "unauthorized" response. Are you sure you want to proceed?

System Use Notification

The System Use Notification feature is designed to provide users with essential information prior to accessing the main functionalities of the system. These notifications are displayed on the login screen to ensure users are aware of important details before logging in.



System Use Notification

The following text will be displayed before the login page. It can be turned off if not necessary.

□ Enable system use notification

Mode: Default

Text Content:
This gateway system is for the use of authorized users only.

Individuals using this gateway system without authority, or in excess of their authority, are subject to having all of their activities on this system monitored and recorded by system personnel.

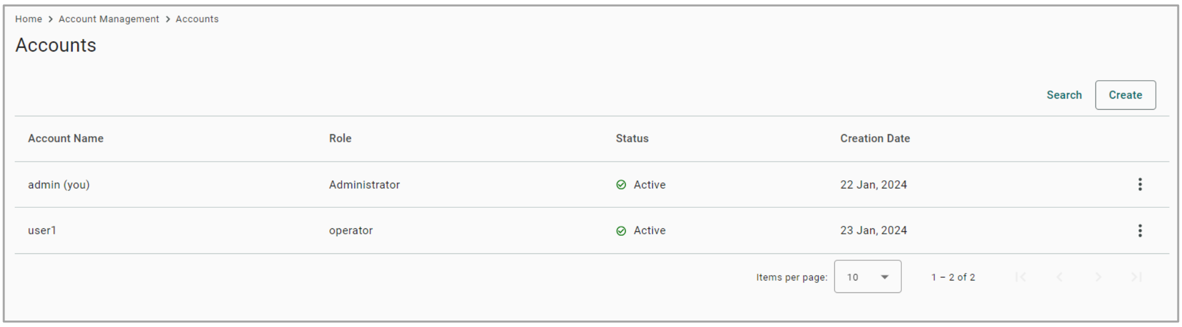
In the course of monitoring individuals improperly using this system, or in the course of system maintenance, the activities of authorized users may also be monitored.

Account Management

You can maintain user accounts and assign a role with specific permissions to each account. These functions allow you to track and control who accesses this device.

Accounts

You can **View**, **Create**, **Edit**, **Deactivate**, and **Delete** user accounts. In the main menu, go to **Account Management > Accounts** to manage user accounts.



Home > Account Management > Accounts

Accounts

Account Name	Role	Status	Creation Date
admin (you)	Administrator	Active	22 Jan, 2024
user1	operator	Active	23 Jan, 2024

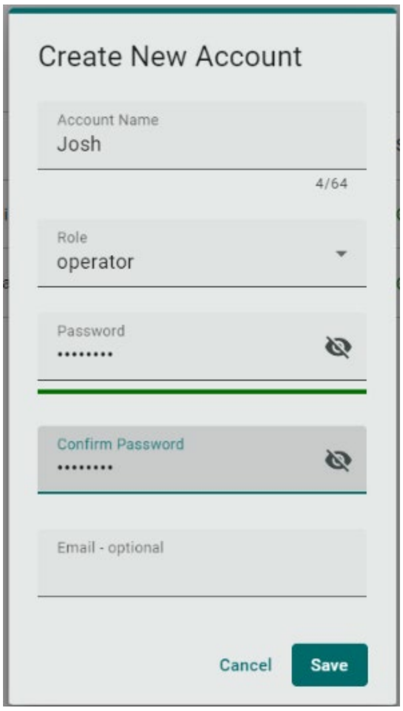
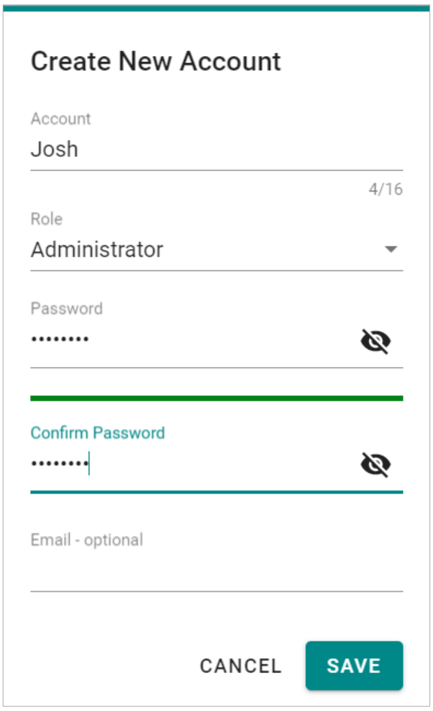
Items per page: 10 1 – 2 of 2

Creating a New User Account

Click on **+ Create** to create a new user account. In the dialogue box that is displayed, fill up the fields and click **SAVE**.

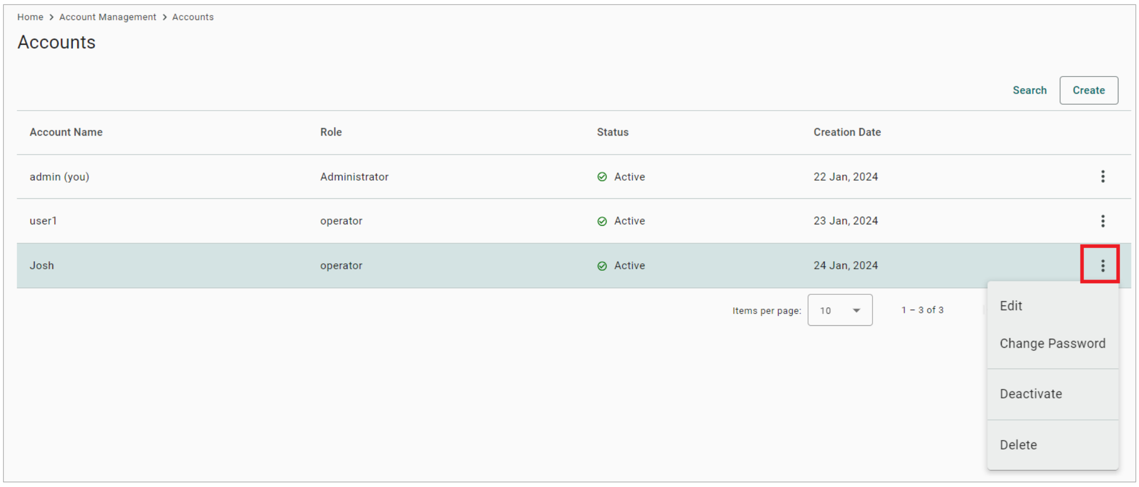
NOTE

To comply with security policy and best practices, specify a strong password that is at least eight characters long, consisting of at least one number and at least one special character.

Password Policy	Valid Password
 Create New Account Account Name: Josh (4/64) Role: operator Password: •••••••• Confirm Password: •••••••• Email - optional Cancel Save	 Create New Account Account: Josh (4/16) Role: Administrator Password: •••••••• Confirm Password: •••••••• Email - optional CANCEL SAVE

Managing Existing User Accounts

To manage an account, click on the pop-up menu icon for the account.



Home > Account Management > Accounts

Accounts

Account Name	Role	Status	Creation Date
admin (you)	Administrator	Active	22 Jan, 2024
user1	operator	Active	23 Jan, 2024
Josh	operator	Active	24 Jan, 2024

Items per page: 10 1 – 3 of 3

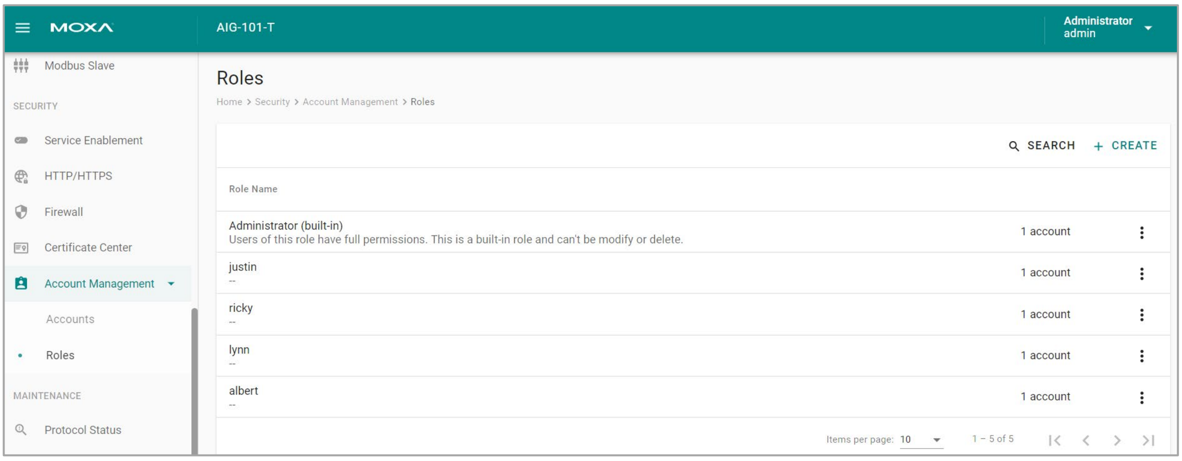
Function	Description
Edit	Change the role, email, or password of an existing account.
Deactivate	Does not allow the user to log in to this device.
Delete	Delete the user account. **(NOTE:** This operation is irreversible.)

NOTE

You cannot **Deactivate** or **Delete** the last remaining account with an Administrator role. This is to prevent an unauthorized account from fully managing this system. When the system detects only one active account when the Administrator role is selected, all items in the pop-up menu will be grayed out.

Roles

You can **View**, **Create**, **Edit**, and **Delete** user roles on your AIG device.



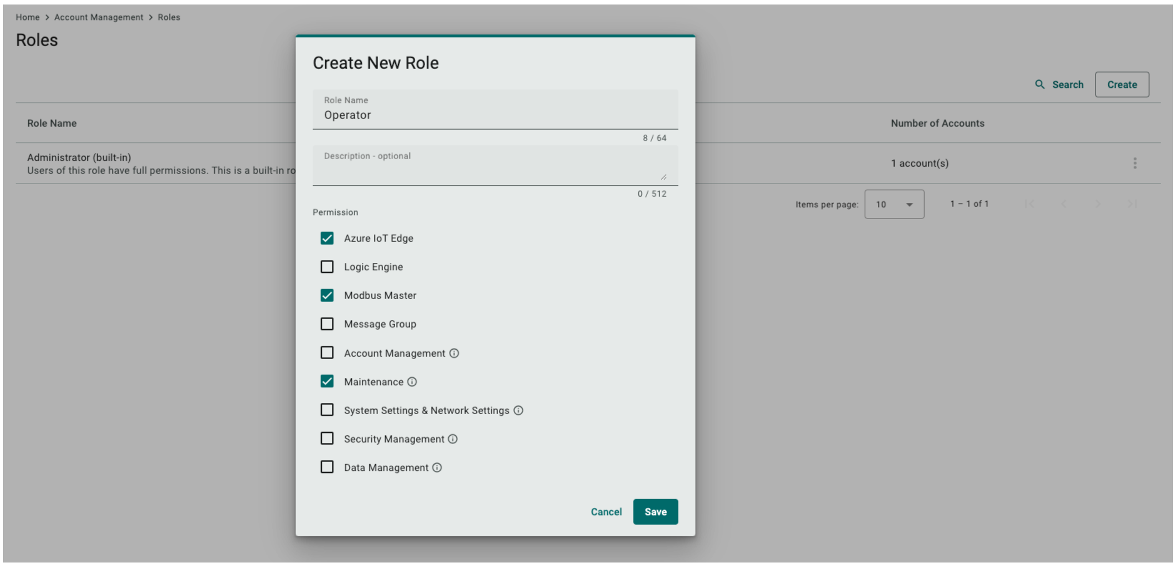
Roles

Home > Security > Account Management > Roles

Role Name		
Administrator (built-in) Users of this role have full permissions. This is a built-in role and can't be modify or delete.	1 account	⋮
justin --	1 account	⋮
ricky --	1 account	⋮
lynn --	1 account	⋮
albert --	1 account	⋮

Items per page: 10 1 – 5 of 5

Click **+ Create** to set up a new user role. Specify a unique name for the role and assign the appropriate permissions. When you are done, click **Save** to create the role in the system.



Create New Role

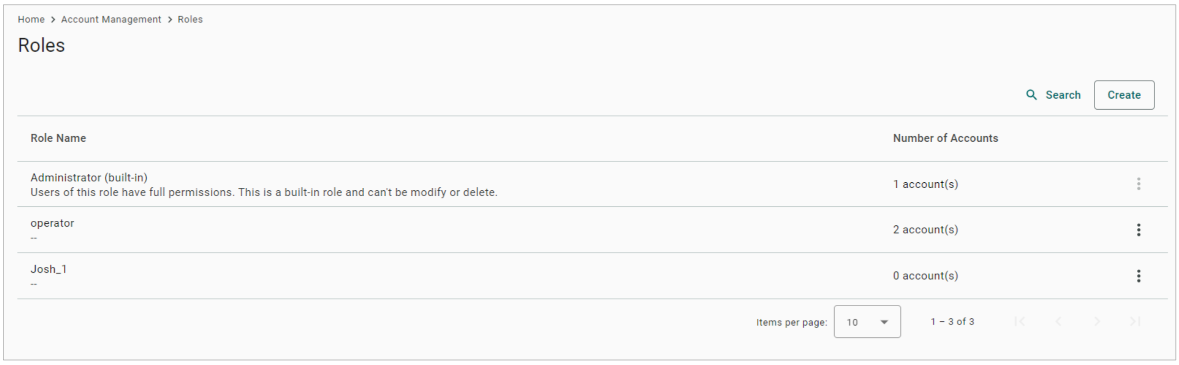
Role Name
Operator
8 / 64

Description - optional
0 / 512

Permission

☑ Azure IoT Edge
☐ Logic Engine
☑ Modbus Master
☐ Message Group
☐ Account Management ⓘ
☑ Maintenance ⓘ
☐ System Settings & Network Settings ⓘ
☐ Security Management ⓘ
☐ Data Management ⓘ

You can **edit** the settings or **delete** an existing role by clicking on the pop-up menu icon next to the role.



Role Name	Number of Accounts	
Administrator (built-in) Users of this role have full permissions. This is a built-in role and can't be modify or delete.	1 account(s)	⋮
operator --	2 account(s)	⋮
Josh_1 --	0 account(s)	⋮

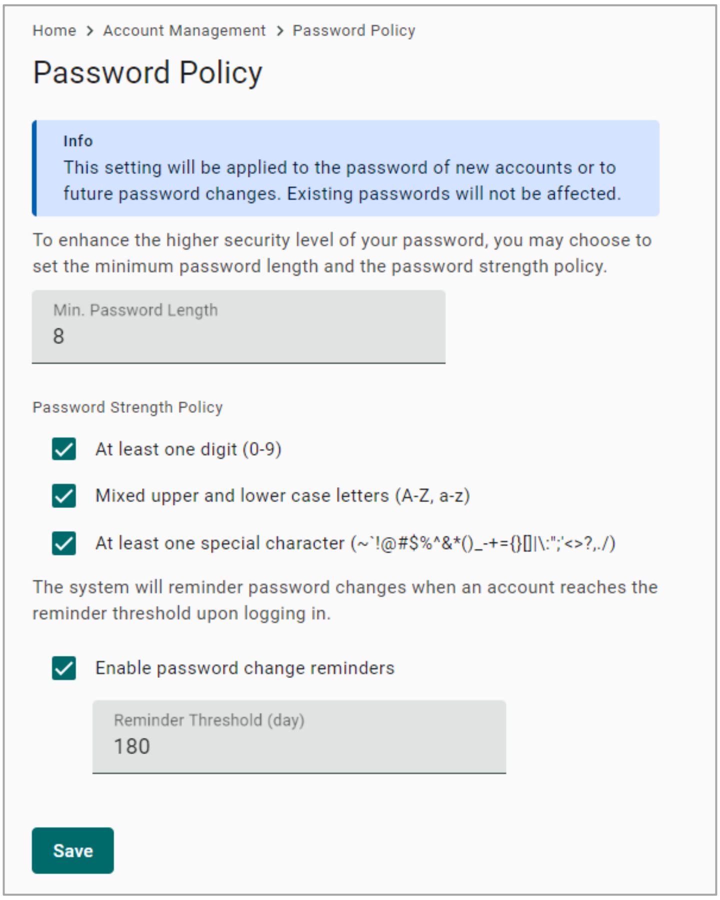
Items per page: 10 1 – 3 of 3

When the Role is set up, it will be available for selection under the Account.

To ensure enhanced security for your AIG-502, create user roles with specific permissions for user accounts. For details, see Account Management. In consideration of the security requirements of the AIG-502, we recommend creating the following roles with the specified permissions.

Role	Permissions
Administrator	All
Monitoring personnel	(default) Monitoring Data Management
OT-field-site operators	(default) Monitoring Security Management Device Configuration Device Maintenance Data Management (optional) Add-on Applications
IT-maintenance personnel	(default) Monitoring Device Configuration Device Maintenance Data Management (optional) Add-on Applications

Password Policy



Home > Account Management > Password Policy

Password Policy

Info

This setting will be applied to the password of new accounts or to future password changes. Existing passwords will not be affected.

To enhance the higher security level of your password, you may choose to set the minimum password length and the password strength policy.

Min. Password Length: 8

Password Strength Policy

☑ At least one digit (0-9)

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

☑ At least one special character (~`!@#$%^&*()_-+={}[]|\:";'<>?,./)

The system will reminder password changes when an account reaches the reminder threshold upon logging in.

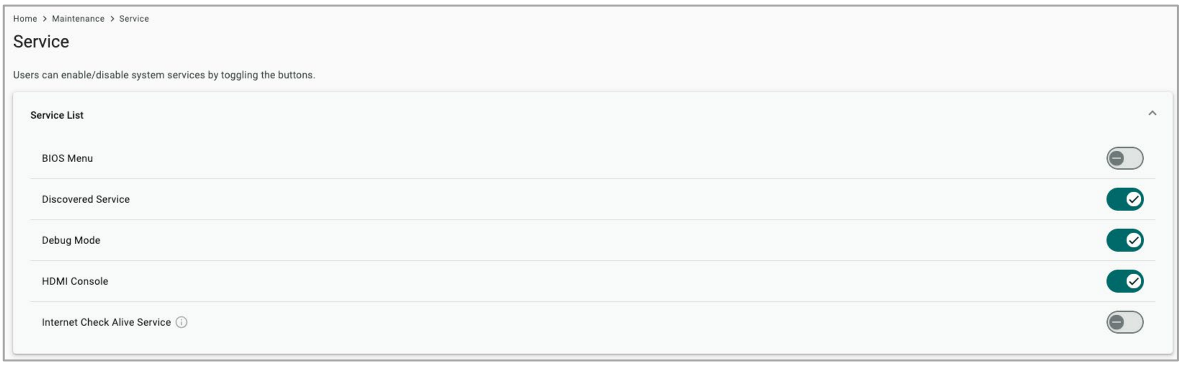
☑ Enable password change reminders

Reminder Threshold (day): 180

Parameter	Value	Description
Min. Password Length	8 to 256	The minimum password length.
Password Strength Policy		To define how the AIG checks the password's strength.
Password Change Reminders	10 to 360 days	Notify user to change the password.

Service

For security reasons, disable all unused services. Go to **Maintenance > Service** to disable or enable the system services by just toggling the buttons.



Home > Maintenance > Service

Service

Users can enable/disable system services by toggling the buttons.

Service List

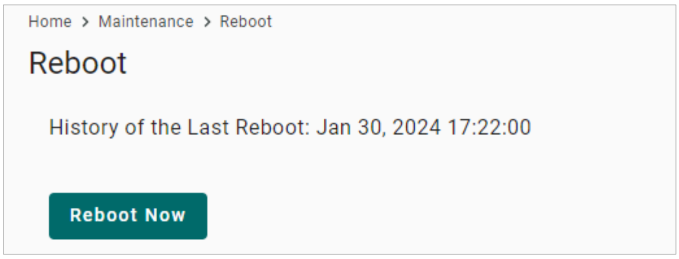
BIOS Menu	○
Discovered Service	✓
Debug Mode	✓
HDMI Console	✓
Internet Check Alive Service ⓘ	○

NOTE

When the HDMI console is disabled, a watchdog service is automatically enabled to allow connection to the system console if the web console is deprecated. The watchdog service uses the **`GET /api/_/ping`** command to periodically check the availability of the web console.

Reboot

If you want to reboot the device, go to **Maintenance > Reboot** and click **Reboot Now**.



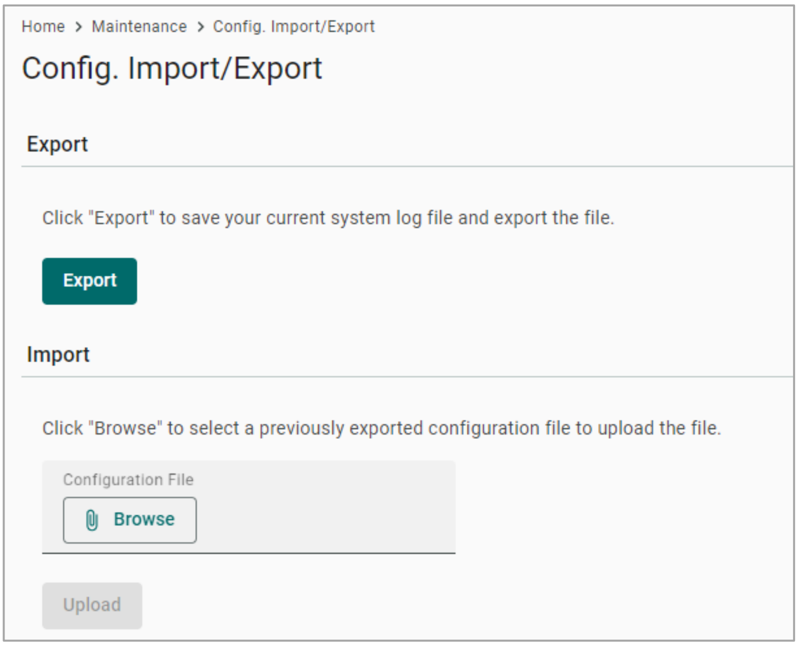
Home > Maintenance > Reboot

Reboot

History of the Last Reboot: Jan 30, 2024 17:22:00

Config. Import/Export

Go to **Maintenance > Config. Import/Export,** where you can import or export the gateway configuration file. The exported configuration file will be compressed to the **tar.gz** format and downloaded on your computer.



Home > Maintenance > Config. Import/Export

Config. Import/Export

Export

Click "Export" to save your current system log file and export the file.

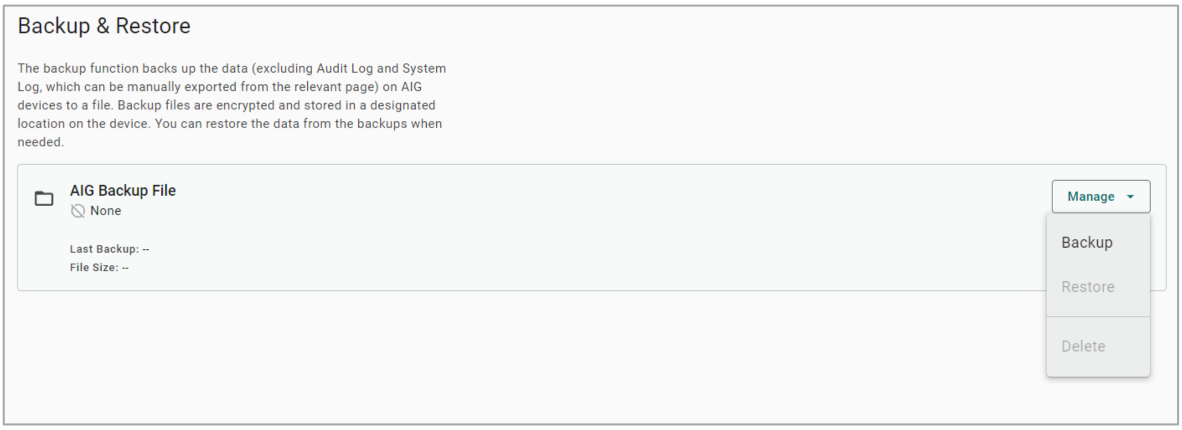
Import

Click "Browse" to select a previously exported configuration file to upload the file.

Configuration File

Backup & Restore

The backup function backs up the data on AIG device to a file (only one back up file can be created at a time). Backup files are encrypted and stored in a designated location on the device. You can restore the data from the backups when needed.



Backup & Restore

The backup function backs up the data (excluding Audit Log and System Log, which can be manually exported from the relevant page) on AIG devices to a file. Backup files are encrypted and stored in a designated location on the device. You can restore the data from the backups when needed.

AIG Backup File

None

Last Backup: --

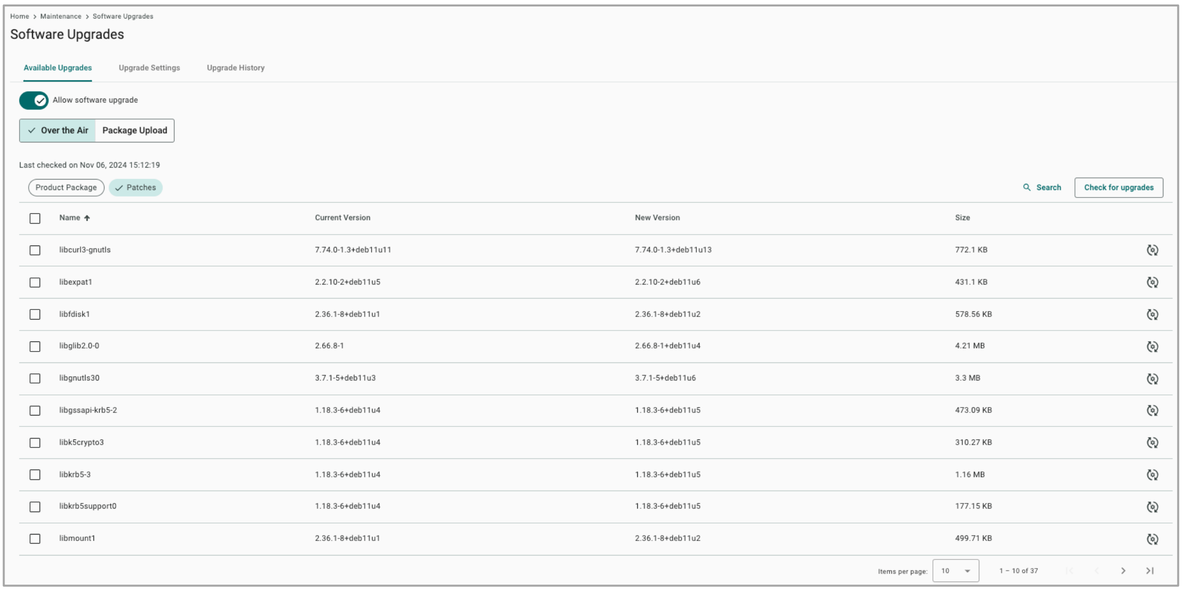
File Size: --

Software Upgrade

There are two approaches to upgrading an AIG: Over the-air and Upload package.

1. Over-the-air

You can press Check for Upgrade to get the latest upgrade information, then select the patches to install. (Patches leverage the Debian APT mechanism, ensuring compatibility and identity. Additionally, all available patches are signed by Moxa, and the communication between AIG-502 and the repository is encrypted for system security.)



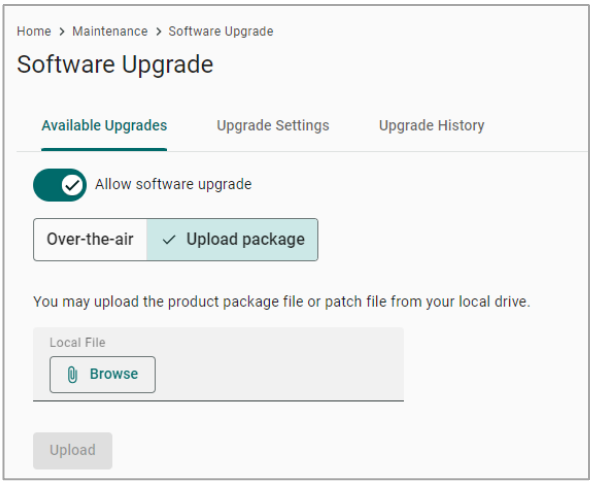
Last checked on Nov 06, 2024 15:12:19

□	Name ↑	Current Version	New Version	Size
□	libcurl3-gnutls	7.74.0-1.3+deb11u11	7.74.0-1.3+deb11u13	772.1 KB
□	libexpat1	2.2.10-2+deb11u5	2.2.10-2+deb11u6	431.1 KB
□	libfdisk1	2.36.1-8+deb11u1	2.36.1-8+deb11u2	578.56 KB
□	libglib2.0-0	2.66.8-1	2.66.8-1+deb11u4	4.21 MB
□	libgnutls30	3.7.1-5+deb11u3	3.7.1-5+deb11u6	3.3 MB
□	libgssapi-krb5-2	1.18.3-6+deb11u4	1.18.3-6+deb11u5	473.09 KB
□	libk5crypto3	1.18.3-6+deb11u4	1.18.3-6+deb11u5	310.27 KB
□	libkrb5-3	1.18.3-6+deb11u4	1.18.3-6+deb11u5	1.16 MB
□	libkrb5support0	1.18.3-6+deb11u4	1.18.3-6+deb11u5	177.15 KB
□	libmount1	2.36.1-8+deb11u1	2.36.1-8+deb11u2	499.71 KB

Items per page: 10 1 – 10 of 37

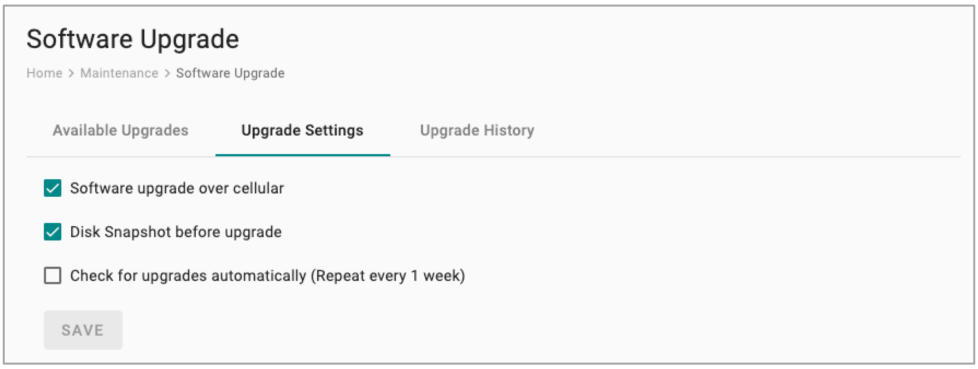
2. Upload Package

A pack that integrates all patches between two versions (e.g., from version 1.0 to version 1.1.) This scenario is applicable when the AIG cannot access the Internet. The upgrade pack can also be downloaded from the Moxa SRS at https://moxa-srs.thingsprocloud.com/home



You may upload the product package file or patch file from your local drive.

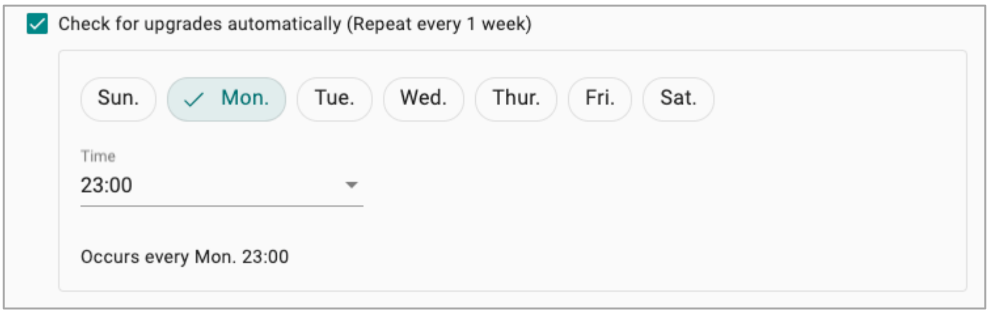
Upgrade Settings



☑ Software upgrade over cellular

☑ Disk Snapshot before upgrade

□ Check for upgrades automatically (Repeat every 1 week)



☑ Check for upgrades automatically (Repeat every 1 week)

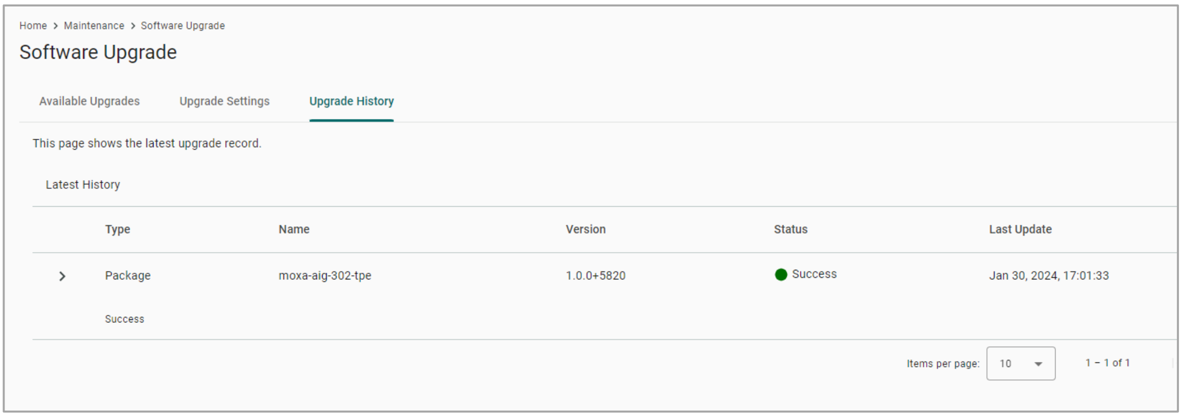
Time: 23:00

Occurs every Mon. 23:00

Parameter	Default	Description
Software upgrade over cellular	Checked	Allows upgrading the system via cellular. If you have a budget data plan for the cellular network, you may uncheck this option to save on data costs.
Disk Snapshot before upgrade	Checked	Takes a snapshot to record the system status before upgrading. We strongly recommend checking this option to mitigate unexpected system failures.
Check for upgrades automatically (repeat every 1 week)	Unchecked	Specify a regular time to check for upgrades every week.

Upgrade History

The installed patches are listed here.



This page shows the latest upgrade record.

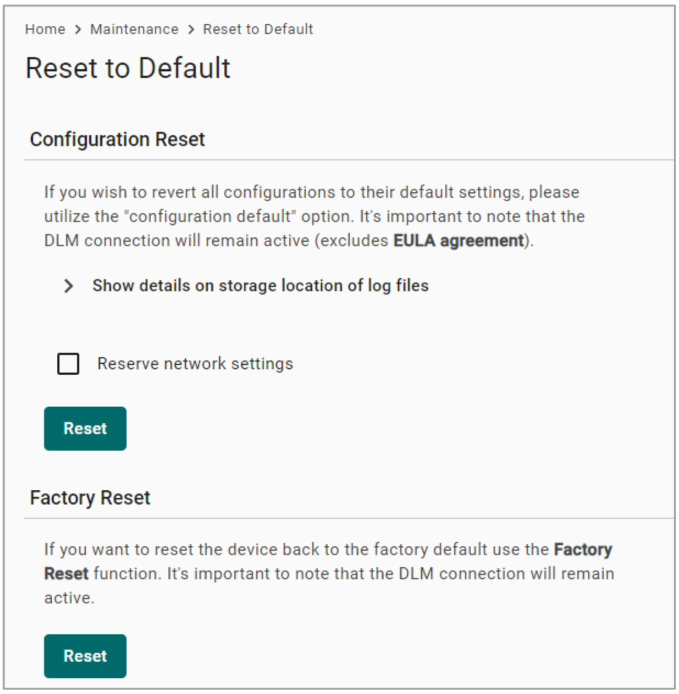
Latest History

Type	Name	Version	Status	Last Update
Package	moxa-aig-302-tpe	1.0.0+5820	● Success	Jan 30, 2024, 17:01:33
Success				

Reset to Default

There are two methods for resetting to default settings:

1. If you only wish to reset the configuration settings, use the **Reset** under **Configuration Reset**.
2. If you want to reset both the configuration settings and revert to the factory default firmware simultaneously, use the **Reset** under **Factory Reset**.



Home > Maintenance > Reset to Default

Reset to Default

Configuration Reset

If you wish to revert all configurations to their default settings, please utilize the "configuration default" option. It's important to note that the DLM connection will remain active (excludes **EULA agreement**).

> Show details on storage location of log files

□ Reserve network settings

Reset

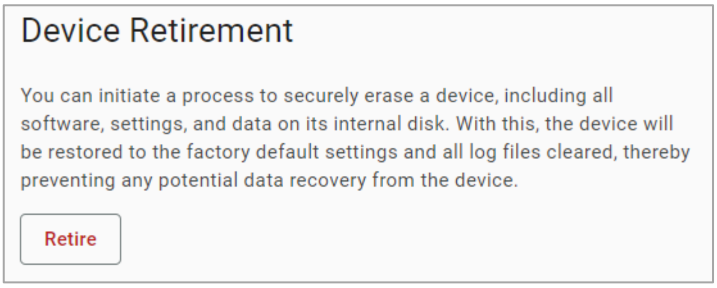
Factory Reset

If you want to reset the device back to the factory default use the **Factory Reset** function. It's important to note that the DLM connection will remain active.

Reset

Device Retirement

Utilize this function when the device is being retired and you wish to securely delete all files and logs for security purposes to ensure the data cannot be recovered. Due to thorough lower-level formatting of the memory that is required to erase the data, it may take approximately 1.5 hours to complete.



Device Retirement

You can initiate a process to securely erase a device, including all software, settings, and data on its internal disk. With this, the device will be restored to the factory default settings and all log files cleared, thereby preventing any potential data recovery from the device.

Retire

The AIG-502 comes with encrypted mSATA system storage for the highest level of data protection. Even if the storage is physically removed or stolen, your sensitive data remains completely unreadable, safeguarding your information until the device’s retirement and beyond.

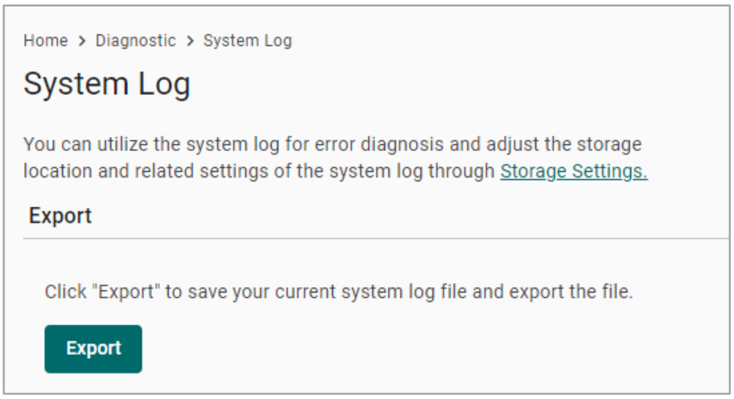
Diagnostics

System Log

The main purpose of system log is to help Moxa engineers with troubleshooting. When you encounter an issue that you are not able to solve by yourself, export the log file and send it to Moxa TS for analysis.

Go to **Diagnostic** > **System Log** to export the system log file and specify the location to save the system logs.

Click **Storage Settings** to specify the location to store the event logs. To optimize the use of storage space on your AIG, you can check the Enable **Time to Live** option and specify the maximum storage space for the system logs. Click **Save** to confirm your settings.



Home > Diagnostic > System Log

System Log

You can utilize the system log for error diagnosis and adjust the storage location and related settings of the system log through Storage Settings.

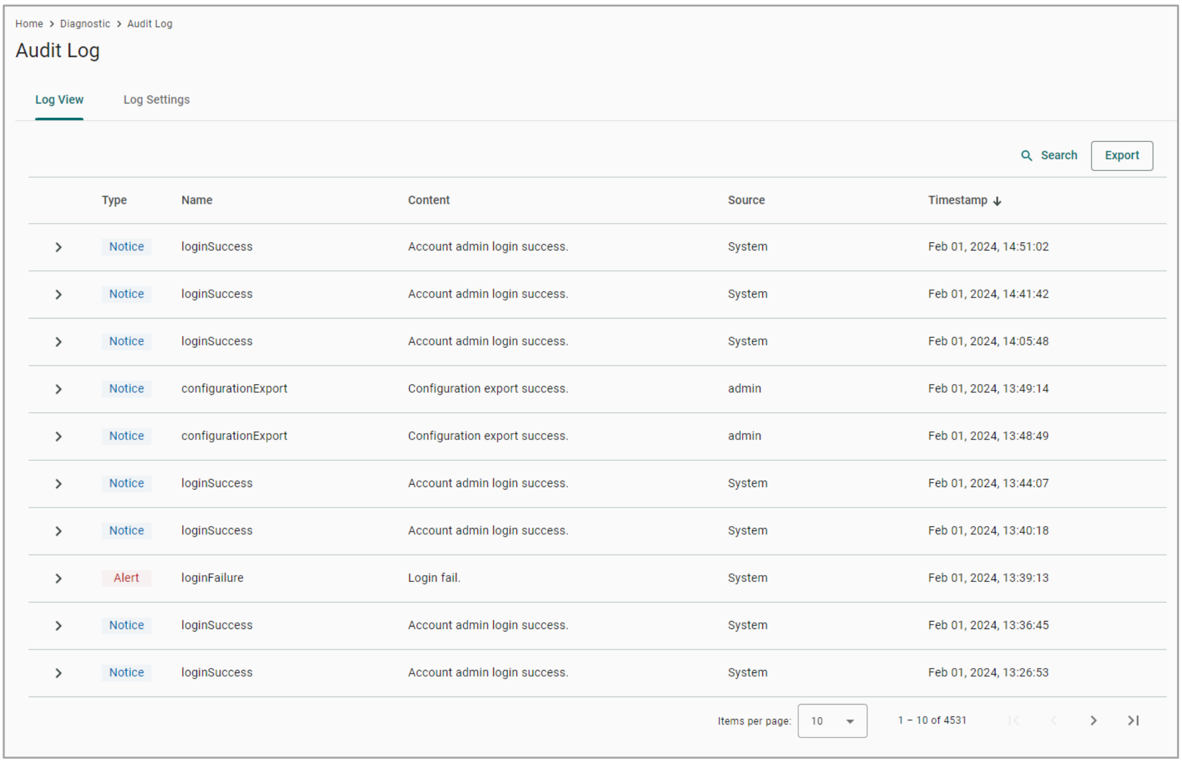
Export

Click "Export" to save your current system log file and export the file.

Audit Log

When you face issues, you can go to **Diagnostic** > **Audit Log** check historical events that help you to narrow down the problems. If there are plenty of event logs, you can export the log to read easily.

The audit logs can be exported and downloaded onto your computer.



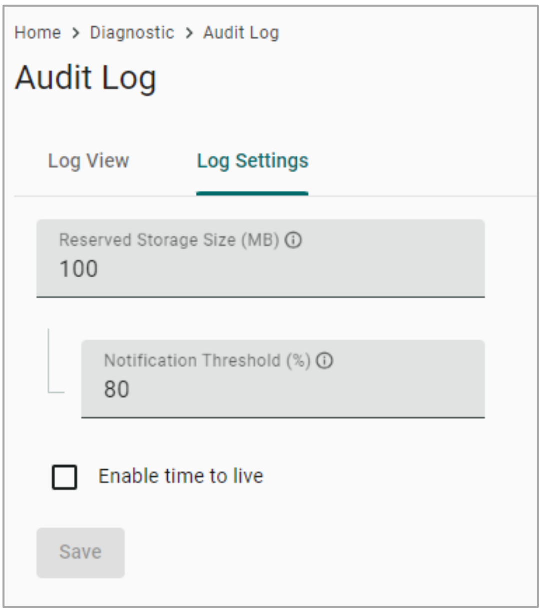
Home > Diagnostic > Audit Log

Audit Log

	Type	Name	Content	Source	Timestamp ↓
>	Notice	loginSuccess	Account admin login success.	System	Feb 01, 2024, 14:51:02
>	Notice	loginSuccess	Account admin login success.	System	Feb 01, 2024, 14:41:42
>	Notice	loginSuccess	Account admin login success.	System	Feb 01, 2024, 14:05:48
>	Notice	configurationExport	Configuration export success.	admin	Feb 01, 2024, 13:49:14
>	Notice	configurationExport	Configuration export success.	admin	Feb 01, 2024, 13:48:49
>	Notice	loginSuccess	Account admin login success.	System	Feb 01, 2024, 13:44:07
>	Notice	loginSuccess	Account admin login success.	System	Feb 01, 2024, 13:40:18
>	Alert	loginFailure	Login fail.	System	Feb 01, 2024, 13:39:13
>	Notice	loginSuccess	Account admin login success.	System	Feb 01, 2024, 13:36:45
>	Notice	loginSuccess	Account admin login success.	System	Feb 01, 2024, 13:26:53

Items per page: 10 1 – 10 of 4531

In the **Log Settings**, you can specify the storage size to store the logs and notification threshold. Also, you also can enable time to live for maximum stored days.



Home > Diagnostic > Audit Log

Audit Log

Log View | Log Settings

Reserved Storage Size (MB): 100

Notification Threshold (%): 80

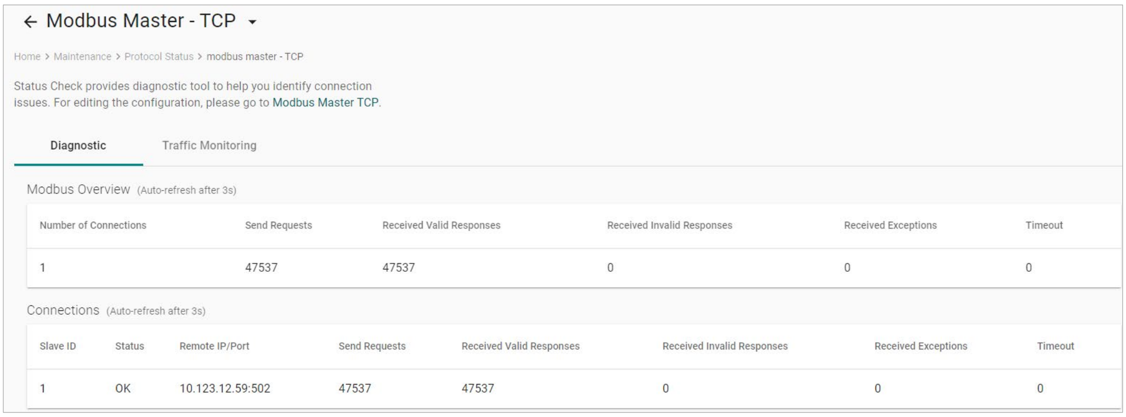
☐ Enable time to live

Protocol Status

In case of a communication issue, go to **Diagnostic > Protocol Status**. The device provides comprehensive troubleshooting tools to help you identify the issue easily. When you access the page, you can see an overview of the status for Fieldbus Protocol.

For Modbus troubleshooting, do the following:

1. Click **CHECK**.
2. Choose **TCP** or **COMx**.
3. View the diagnostic information.



← Modbus Master - TCP

Home > Maintenance > Protocol Status > modbus master - TCP

Status Check provides diagnostic tool to help you identify connection issues. For editing the configuration, please go to Modbus Master TCP.

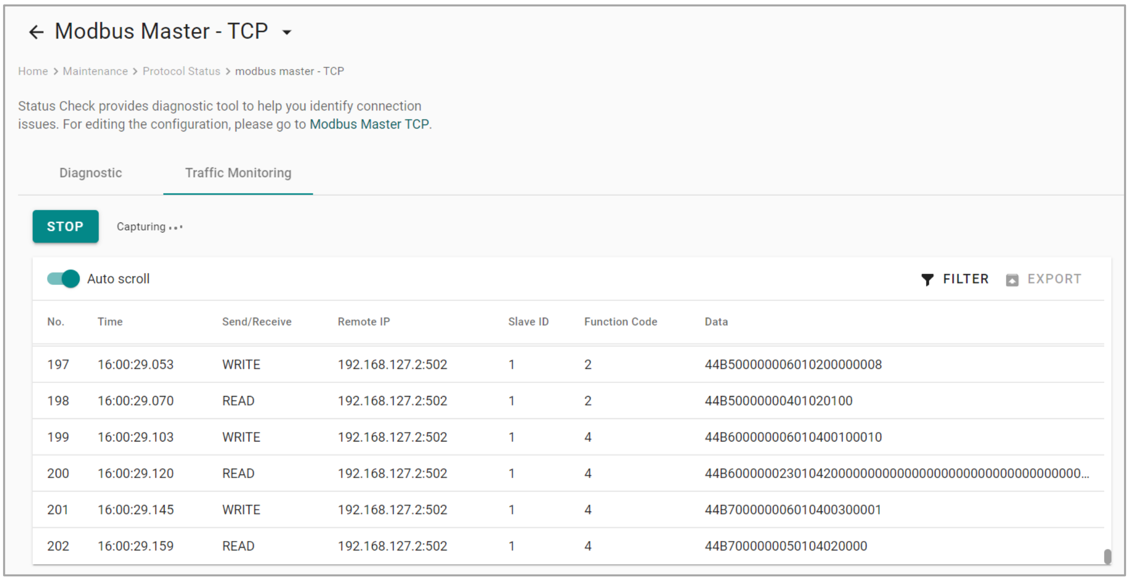
Modbus Overview (Auto-refresh after 3s)

Number of Connections	Send Requests	Received Valid Responses	Received Invalid Responses	Received Exceptions	Timeout
1	47537	47537	0	0	0

Connections (Auto-refresh after 3s)

Slave ID	Status	Remote IP/Port	Send Requests	Received Valid Responses	Received Invalid Responses	Received Exceptions	Timeout
1	OK	10.123.12.59:502	47537	47537	0	0	0

4. Click the Traffic Monitoring tab to capture the traffic logs.



Status Check provides diagnostic tool to help you identify connection issues. For editing the configuration, please go to Modbus Master TCP.

No.	Time	Send/Receive	Remote IP	Slave ID	Function Code	Data
197	16:00:29.053	WRITE	192.168.127.2:502	1	2	44B5000000060102000000008
198	16:00:29.070	READ	192.168.127.2:502	1	2	44B50000000401020100
199	16:00:29.103	WRITE	192.168.127.2:502	1	4	44B6000000060104000100010
200	16:00:29.120	READ	192.168.127.2:502	1	4	44B60000002301042000000000000000000000000000000000000...
201	16:00:29.145	WRITE	192.168.127.2:502	1	4	44B7000000060104000300001
202	16:00:29.159	READ	192.168.127.2:502	1	4	44B700000005010402000 0

5. (Optional) **Export** the traffic logs to send to experienced engineers for further analysis.

7. Security Capability

In this chapter, we will introduce the key security functions of the AIG-502 and a security hardening guide to deploy and operate the AIG-502 in a secure manner.

Communication Integrity and Authentication

Below is a list of network communication services and protocols available in the AIG-502.

Communication Interface	Protocol	TCP/ UDP Port	Authenticator	Default Configuration
WEB	HTTP	TCP 80	password	Disabled
	HTTPS	TCP 443	password	Enabled
NTP client	NTP	UDP 123	Key string	Disabled
DHCP client	DHCP	UDP 67, 68	N/A	Enabled (LAN1)
DHCP server	DHCP	UDP 67, 68	N/A	Disabled
DNS client	DNS	TCP 53	N/A	Disabled
Azure IoT Edge	MQTT	TCP 8883	Symmetric Key, X.509 certificate	Enabled
	MQTT over WebSockets	TCP 443	Symmetric Key, X.509 certificate	Disabled
	AMQP	TCP 5671	Symmetric Key, X.509 certificate	Disabled
	AMQP over WebSockets	TCP 443	Symmetric Key, X.509 certificate	Disabled
	HTTPS	TCP 443	Symmetric Key, X.509 certificate	Disabled
Modbus Master	TCP	TCP 502	N/A	Disabled
	RTU	RS232	N/A	Disabled
openssh-server (Debug mode used)	SSH	TCP 22	password	Disabled
mDNS	mDNS	UDP 5353	N/A	Enabled

Account Management

- **Permissions**
  - (Default) Monitoring – system and network status monitoring
  - Account Management – user access and permission allocation
  - Security Management – management for certification, Firewall settings, session monitoring etc.
  - Device Configuration – system configurations such as protocol settings, network settings etc.
  - Device Maintenance – software upgrade, backup & restore, etc.
  - Data Management – tag service and monitoring
  - Add-on Applications – Azure IoT Edge, Modbus Master

- **Role-based design:**

  Considering the security context of AIG-502, we suggest creating roles with allocated permissions.

Role	Permissions
Administrator	All
Monitoring personnel	(Default) Monitoring Data Management
OT – Field site operator	(Default) Monitoring Security Management Device Configuration Device Maintenance Data Management (Optional) Add-on Applications
IT – maintenance personnel	(Default) Monitoring Device Configuration Device Maintenance Data Management (Optional) Add-on Applications

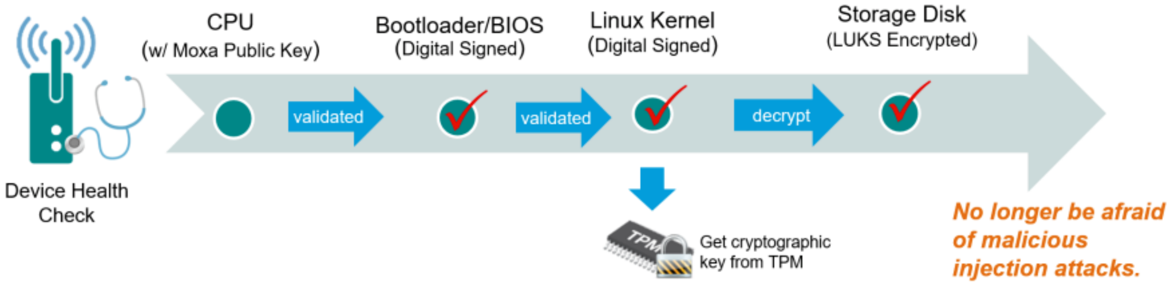
Login Policy

To avoid unauthorized users repeatedly login the account to crack the passwords, AIG-502 is capable of configuring a login policy including the max. amount of the failure retry, failure counter reset period and the lockout time. To configure it, please refer to the chapter 6 Web Console > Security > Login Lockout.

Secure Boot and Disk Encryption

Moxa’s Secure Boot process begins from CPU as hardware root-of-trust to ensure integrity and authenticity of bootloaders and Linux kernels are validated with Moxa digital signature before execution, preventing malicious or unauthenticated bootloaders and kernels to run on Moxa Arm-based computer.

Next, only after BIOS and kernel have been validated, the LUKS (Linux Unified Key Setup) encrypted root file system (rtfs) will be decrypted by a key provisioned in TPM during factory production. The disk encryption prevents confidential data from being read without authorization when the device is stolen or lost.


Device Health Check
CPU (w/ Moxa Public Key)
validated
Bootloader/BIOS (Digital Signed)
validated
Linux Kernel (Digital Signed)
decrypt
Storage Disk (LUKS Encrypted)
TPM
Get cryptographic key from TPM
No longer be afraid of malicious injection attacks.

- Public Key Infrastructure (PKI)

  Moxa Secure Boot uses X.509 public key infrastructure (PKI) to validate authenticity and integrity of BIOS and Linux kernel.

- Private Keys Protection

  Private keys used to digitally sign Moxa software are stored in an on-premises tamper and intrusion-resistant hardware security module (HSM), where strict access authorization and 24-hour video surveillance are applied.

- Key lifecycle and revocation

  In an unlikely scenario where the private key stored in HSM is compromised, Moxa will announce the news on Moxa Security Advisory, including instructions to revoke the compromised public key burned in the CPU via a utility downloadable from Moxa APT repository. Then update the BIOS and system image signed by a new private key.

Managing Resources

- Core service protection: Grants higher privileges to elevate CPU priority and Block IO, preventing OOM killer incidents.
- Limit IoT Edge module resources: Sets maximum CPU and memory allocations at 90% and 70%, respectively.

Audit Logs

AIG-502 provides the capability to generate security-related audit records for the following:

IEC 62443 requirement	AIG-502 audit log's categories
access control	• **Account & Access**
request errors	• **Command & Message** ➢ commandRequestError
control system events	• **Maintenance** • **Connection & Interface** • **Performance & Health**
backup and restore event	• **Maintenance** ➢ systemBackup ➢ systemRestore ➢ configurationExport ➢ configurationImport
configuration changes	• **Configuration Update**
audit log events	• **Maintenance** ➢ auditLogExport • **Performance & Health** ➢ auditLogOutOfSpace ➢ auditLogSizeReachThreshold

For details of the audit logs list, refer to the Appendix C, Audit Log Index.

- The audit process (auditd) is an independent system service that doesn't impact other essential services, even if the audit process unexpectedly crashes.
- A dedicated system partition is allocated for audit logs, ensuring read-only access.
- Capable of configuring the desired storage and retention policy. You may refer to the Chapter 6 Web Console > Diagnostics > Audit Log.

Security Advisories

AIG-502 offers a comprehensive list of security check items. To swiftly assess security, utilize the Security Dashboard for system scanning and aid in configuring your gateway securely. To configure it, please refer to the chapter 6 Web Console > Security Dashboard

Category	Security Check	Threat mitigated/ handled	Risk
Account Setting	Password not changed within the set time.	To ensure there is no default password to access the gateway.	Medium
	More than one session is active for the same account.	To monitor the sessions, go to Security > Session Management to manage concurrent sessions.	Medium
	More than one session is active for the same account with different source IP address.		Medium
Application Networking	System has open network port	Go to Security > Firewall and check the allow list.	Low
Application Resource Usage	IoT Edge modules utilize system disk's configurable space.	To ensure the IoT Edge modules are deployed in the specific path /var/run/ and /tmp/ in the system storage.	Low
	IoT Edge modules utilize system disk's non-configurable space.		Medium
	IoT Edge module MODULE_NAME has been granted privilege.	To grant permissions to the IoT Edge module, go to Cloud Connectivity > Azure IoT Edge > Module Permission and create a service account with the granted permission to the IoT Edge module.	High
Product Certificate Deployment	Production Certificate hasn't been configured for Azure IoT Edge Downstream Certificate.	For enhanced security robustness, it is recommended to use your own certificate instead of the default one. Go to Cloud Connectivity> Azure IoT Edge > Downstream Certificate, and upload the certificate.	Medium
	Azure IoT Edge is using connection string for provisioning.	For enhanced security robustness, it is recommended to use TPM or X.509 certificate.	Medium
	Any certificates have expired within the last three months.	Go to Cloud Connectivity > Azure IoT Edge or Security > HTTPS to check the certificates.	Medium
	Any certificates have expired.		High
Service Setting	Discover Service is enabled.	Go to Maintenance > Service to disable Discovered Service.	High
	SSH Service is enabled.	Go to Maintenance > Service to disable Debug Mode.	High
	Account Lock Service is disabled.	Go to Security > Login Lockout to enable login failure lockout.	High
	System Use Notification is disabled.	Go to Security > System Use Notification to enable system use notification.	Medium
System Status Check	New package updates are available for product software upgrade.	Go to Maintenance > Software Upgrade and click CHECK FOR UPGRADE to retrieve the latest upgrade pack information.	Medium
	No system backup performed in over a year or never.	Go to Maintenance > Backup & Restore and click Manage to back up the system.	Medium

8. Security Hardening Guide

In this chapter, we have included some recommendations to guide you on securely operating the AIG-502.

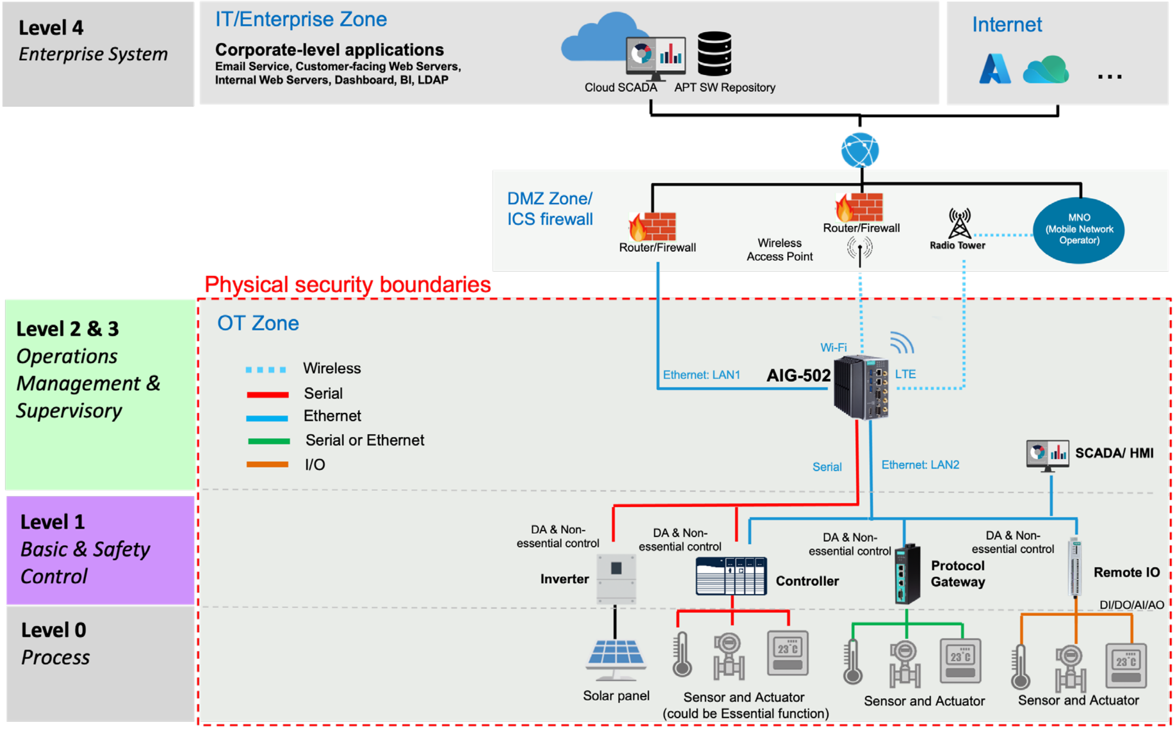
Communication Integrity and Authentication

Below is a list of network communication services and protocols available in the AIG-502.

Communication Interface	Protocol	TCP/ UDP Port	Authenticator	Default Configuration
WEB	HTTP	TCP 80	password	Disabled
	HTTPS	TCP 443	password	Enabled
NTP client	NTP	UDP 123	Key string	Disabled
DHCP client	DHCP	UDP 67, 68	N/A	Enabled (LAN1)
DHCP server	DHCP	UDP 67, 68	N/A	Disabled
DNS client	DNS	TCP 53	N/A	Disabled
Azure IoT Edge	MQTT	TCP 8883	Symmetric Key, X.509 certificate	Enabled
	MQTT over WebSockets	TCP 443	Symmetric Key, X.509 certificate	Disabled
	AMQP	TCP 5671	Symmetric Key, X.509 certificate	Disabled
	AMQP over WebSockets	TCP 443	Symmetric Key, X.509 certificate	Disabled
	HTTPS	TCP 443	Symmetric Key, X.509 certificate	Disabled
Modbus Master	TCP	TCP 502	N/A	Disabled
	RTU	RS232	N/A	Disabled
openssh-server (Debug mode used)	SSH	TCP 22	password	Disabled
mDNS	mDNS	UDP 5353	N/A	Enabled

Potential Threats and Corresponding Security Measures

A list of potential security threats that can harm AIG-502 and the corresponding security measures that need to be taken by the asset owner to mitigate the threats is illustrated in the following diagram.



Threat ID	Threat mitigated/handled	Security measures
1	Unauthorized access to nginx configuration allows an attacker to alter execution flow	Enabling HTTP to HTTPS redirection make sure secure protocol with encryption and authentication are used for data transmission.
2	An attacker via WAN spoofs a browser, mimicking an external entity.	
3	An intruder gains elevated privileges through impersonation tactics	
4	An unauthorized party intercepts data flow, capturing sensitive information in transit.	
5	An attacker masquerades as the nginx web server process, deceiving users and gaining unauthorized access	
6	Excessive resource usage by edgeHub (container) or system storage (mSATA), like frequent log writing, could lead to system slowdowns or data loss, especially when storage space is low.	• Configure maximum storage capacity for individual Azure IoT Edge modules. • Secure crucial data, like telemetry messages, on encrypted external storage (e.g., USB). • Utilize the IoT Edge device metrics monitor on Azure IoT Hub for monitoring Azure IoT modules. See https://learn.microsoft.com/en-us/azure/iot-edge/how-to-collect-and-transport-metrics?view=iotedge-1.5&tabs=iothub.

Threat ID	Threat mitigated/handled	Security measures
7	Excessive resource usage by audit or system logs might dominate storage space, reducing room for critical information or telemetry message buffers when the network is down.	• Back up the logs to Azure Blob storage for safekeeping. • Store system logs on external storage, freeing the log partition for audit logs exclusively. AIG-502 originally supports: • A reserved partition in the primary system for audit/system logs is provided. • Logs don't override each other. • A log generation mechanism to reduce redundancy, capturing crucial logs.
8	Network data flow could be potentially interrupted, crashed or stopped by DOS attack.	• Configure an alternative WAN interface for connection failover, like Ethernet or Wi-Fi • Configure keep-alive for cellular connections
9	Excessive write-tag requests from an IoT Edge module affect Modbus data acquisition.	Restrict internal HTTPS API server usage to 10 requests per second maximum. • Find the corresponding API "limit_req". See https://github.com/TPE-TIGER/TPE-TIGER.github.io. Note that there's no public access to the shared memory used by tagHub. For data sampling from tagHub, we recommend intervals of at least 1 second.
10	Frequent telemetry message uploads from an IoT Edge module impact other uploads via edgeHub (container).	
11	High volumes of HTTPS requests from an IoT Edge module, like massive data downloads, slow down web GUI interaction.	
12	An excessive number of tags generated by an IoT Edge module can overwhelm tagHub (system service), causing it to be busy while refreshing or monitoring tag values.	

Installation

- Physical Installation
  a. AIG-502 MUST be protected by physical security that can include CCTV surveillance, security guards, protective barriers, locks, access control, perimeter intrusion detection, etc. The proper form of physical security should apply depending on the environment and the physical attack risk level.
  b. AIG-502 has anti-tamper labels on the enclosures. This allows the administrator to tell whether the device has been tampered with.
  c. AIG-502 uses security screw on the enclosures as physical tamper resistance measure to increase the difficulty of probing the product internals in case of physical security breach.
  d. AIG-502 MUST not be used to control the operation of mission-critical IACS component which failure to maintain control of such device could result in threat to human, safety, environment or massive financial lost.
- Environmental Requirement
  a. If AIG-502 connects to an untrusted network (e.g., Internet) via Ethernet or Wi-Fi, it MUST NOT directly connected to the untrusted network, which means a firewall must be setup between Ethernet and Wi-Fi connections from AIG-502 and the untrusted network.
  b. For security-critical applications, we strongly recommend using a private APN for cellular networks.
- Access Control
  a. The default password policy requires the password to be at least 8 characters in length.
  b. Update user passwords on a timely manner. For administrator, we recommend refreshing password at least every 3 months.
  c. BIOS configuration menu comes with a single administrator account shared by all users. Asset owner MUST have access and identity records of the personnel who accessed the BIOS to ensure non-repudiation in case of security breach incidents.
  d. Enabling debug mode activates the SSH server service for remote terminal access. Asset owners MUST disable debug mode in the production stage.

- Operation
  a. Disabled communication interfaces that are not in use.
  b. Make sure only trusted and reliable people are registered to access the AIG-502.
  c. Frequently run the scan from the Security Dashboard, and execute the corresponding configuration or actions.
  d. We recommend you reset AIG-502 to factory default upon receiving it to avoid the risk of potential software tampering before the AIG-502 reaches your hand.
- Maintenance
  a. Perform software upgrade frequently to enhance features, security patches or fix bugs.
  b. Perform backup of system on timely manner.
  c. Examine audit logs frequently to detect any anomalies.
  d. To report vulnerabilities of Moxa products, please submit your finding on the following webpage: https://www.moxa.com/en/support/product-support/security-advisory/report-a-vulnerability.
- Retirement

  To avoid any sensitive information such as your account password or certificate from being disclosed, always use Device Retire to reset the AIG-502 to factory default and further wipe out all user data, including logs, in an unrecoverable manner before removing the AIG-502 from.

A. Appendix A

Publish Modes

Publish Mode	Parameters	Value	Description
By Interval	Publish Intervals (sec)	1 to 86400	The frequency of data uploads to the cloud.
	Sampling Mode	All Values Latest Values All Changed Values Latest Changed Values	All Values: All values recorded within a specified interval will be sent to the cloud. Latest Values: Only the most recent value will be sent to the cloud. All Changed Values: All values that have changed within the configured interval will be sent to the cloud. Latest Changed Values: Only the most recent value that has changed will be sent to the cloud.
	Custom Sampling Rate From Acquired Data (sec)	0 to 86400	The frequency to synchronize the tag value with tag hub.
Immediately	Sampling Mode	Enable/disable	Enable: Only publish the changed values to the cloud immediately. Disable: Publish all data to the cloud immediately when one of data item changes in the topic.
	Minimal Publish Interval (sec)	0 to 60	To avoid transmitting a large amount of data to the cloud in a short period, it is possible to set a time interval that ensures a delay between each data transmission.
By Size	Publish Size (bytes)	1 to 262144	Once the data size reaches the specified threshold, the data will be transmitted to the cloud.
	Sampling Mode	All Values All Changed Values	All Values: All values recorded within the specified size will be sent to the cloud. All Changed Values: All values that have changed within the configured size will be sent to the cloud.
	Custom Sampling Rate From Acquired Data (sec)	0 to 86400	The frequency to synchronize the tag values with the tag hub.
	Idle Timer (sec)	1 to 86400	To avoid situations where the data takes a long time to reach the desired size, a threshold can be set to ensure that the data is sent out as soon as it reaches the specified timer setting.

B. Appendix B

Useful Links and Upgrade Information

You can access all the reference information at: https://github.com/TPE-TIGER

Information on all device APIs is available at: https://tpe-tiger.github.io/

There are a couple of methods to upgrade the software on your AIG device. Some of the most common methods are listed here.

Method 1. Upgrade from downloaded packages (web console)

Download all the upgrade packs from https://moxa-srs.thingsprocloud.com/home to your local drive and upgrade your device from the local drive.

Method 2. Upgrade over the air (web console)

The device can receive the most recent upgrade information and then choose which patches to install. For further details, see **Software Upgrade**.

C. Audit Log Index

Account & Access

ID	Name	Content	Source (Operator)	Type
AA01	roleCreate	Role:$roleName be created	$Account Name	NOTICE
AA02	roleDelete	Role:$roleName be deleted	$Account Name	NOTICE
AA03	roleUpdate	Role:$roleName be updated	$Account Name	NOTICE
AA04	accountCreate	Account:$accountName be created	user: $Account Name service: $APP Name	NOTICE
AA05	accountDelete	Account:$accountNamee be deleted	user: $Account Name service: $APP Name	NOTICE
AA06	accountUpdate	Account:$accountName be updated	user: $Account Name service: $APP Name	NOTICE
AA07	passwordChange	Account:$accountName password changed	$Account Name	NOTICE
AA08	loginSuccess	Account:$accountName login success	System	NOTICE
AA09	loginFailure	Login Fail	System	ALERT
AA10	accountLock	Account:$accountName be locked	System	ALERT
AA11	accountUnlock	Account:$accountName unlocked	System	NOTICE

Configuration Update

ID	Name	Content	Source (Operator)	Type
CU01	configurationChange	$serviceName configuration changed	user: $Account Name service: $APP Name	NOTICE

Connection & Interface

ID	Name	Content	Source (Operator)	Type
CI01	ipRenew	IP renew on interface:$interfaceName	System	NOTICE
CI02	connectionStatusConnect	Interface:$interfaceName connected	System	NOTICE
CI03	connectionStatusDisconnect	Interface:$interfaceName disconnected	System	NOTICE
CI04	appServerConnectionEstablish	Service:$serviceName accepted connection request from client	$APP Name	NOTICE
CI05	appServerConnectionDrop	Service:$serviceName drop connection from client	$APP Name	NOTICE
CI06	appClientConnectionConnect	Service:$serviceName connected	$APP Name	NOTICE
CI07	appClientConnectionDisconnect	Service:$serviceName disconnected	$APP Name	NOTICE
CI11	ethernetPortPlugIn	Ethernet port:$interfaceName plugged-in	System	NOTICE
CI12	ethernetPortPlugOut	Ethernet port:$interfaceName plugged-out	System	NOTICE
CI13	externalStoragePlugIn	External storage:$interfaceName plugged-in	System	NOTICE
CI14	externalStoragePlugOut	External storage:$interfaceName plugged-out	System	NOTICE
CI15	internetConnectionStatusChange	Internet Connection changed to $status	System	NOTICE
CI16	externalStorageEncrypted	New External storage $status	$Account Name	NOTICE
CI17	appOpenPortSuccess	Service:$serviceName port opened	$APP Name	NOTICE
CI18	appOpenPortFailure	Service:$serviceName failed to open port	$APP Name	ALERT

Command & Message

ID	Name	Content	Source (Operator)	Type
CM01	commandReceive	Service received command:$commandName	$APP Name	NOTICE
CM02	commandRequestError	Service request failed	$APP Name	ALERT
CM03	commandRequestRecover	Service request recover	$APP Name	NOTICE

Maintenance

ID	Name	Content	Source (Operator)	Type
MA01	systemBackup	System backup success	$Account Name	NOTICE
MA02	systemRestore	System restore success	$Account Name	NOTICE
MA03	configurationExport	Configuration export success	$Account Name	NOTICE
MA04	configuraitonImport	Configuration import success	$Account Name	NOTICE
MA05	deviceReboot	Device reboot	manual: $Account Name schedule: System	NOTICE
MA06	softwarePackageUpdate	Software package update $status	$Account Name	NOTICE
MA07	newSoftwareAvailable	New software package available	System	NOTICE
MA08	auditLogExport	Audit log export success	$Account Name	NOTICE
MA09	systemLogExport	System log export success	$Account Name	NOTICE
MA10	resetToFactoryDefault	Reset to Factory Default	$Account Name	NOTICE
MA11	resetToConfigurationDefault	Reset to configuration Default	$Account Name	NOTICE
MA12	timeUpdate	System Time update success.	manual: $Account Name NTP: System	NOTICE
MA13	timeUpdateFailure	System Time update failure.	manual: $Account Name NTP/GPS: System	ALERT
MA14	systemBackupFailure	System backup failure.	$Account Name	ALERT
MA15	systemRestoreFailure	System restore failure.	$Account Name	ALERT

Performance & Health

ID	Name	Content	Source (Operator)	Type
PH01	untrustExecutionEnvironment	ThingsPro Edge is running on an untrusted execution environment.	System	ALERT
PH02	storageUsageAlarm	System detects $diskName storage usage reach 95%. You must take necessary actions immediately, before allocated disk space runs out.	System	ALERT
PH03	storageUsageNotice	System detects $diskName storage usage reach 80%. You must take necessary actions before allocated disk space runs out.	System	NOTICE
PH04	systemLoadingAlarm	System detects unexpected system loading. You may upgrade device hardware spec or reduce unnecessary processes, to avoid system outage risk.	System	NOTICE
PH05	auditLogReachThreshold	Audit log ran out of space, log rotation triggered.	System	ALERT
PH06	httpMaxSessionExceeded	Reach max HTTP/HTTPS session limit	System	ALERT
PH07	certificateExpired	Certificate:$certDisplayName is going to expired	System	NOTICE
PH08	certificateAdd	Certificate($certDisplayName) be added	$APP Name	NOTICE
PH09	certificateRemove	Certificate($certDisplayName) be removed	$APP Name	NOTICE
PH11	auditLogReachAlertThreshold	System detects audit log storage usage reach $configurePercentage%	System	ALERT
PH12	systemInitialize	System initialized	System	NOTICE
PH13	unlockPinFailure	Failed to unlock SIM card's PIN code on interface:$interfaceName	System	ALERT
PH14	certificateUpdate	Certificate($certDisplayName) be updated	$APP Name	NOTICE
PH15	secretsAdd	Secrets($secretsDisplayName) be added	$APP Name	NOTICE
PH16	secretsUpdate	Secrets($secretsDisplayName) be updated	$APP Name	NOTICE
PH17	secretsRemove	Secrets($secretsDisplayName) be removed	$APP Name	NOTICE
PH18	auditLogReachTTL	Audit logs have exceeded the configured live time, log rotate triggered.	System	ALERT

D. System Tag List

Provider Name	Source Name	Tag Name	Data Type	Publish Interval
system	status	cpuUsage	unit64	1
system	status	cpuTemperature	unit64	1
system	status	memoryBuffers	unit64	1
system	status	memoryUsed	unit64	1
system	status	memoryUnused	unit64	1
system	status	memoryCached	unit64	1
system	status	memoryUsage	unit64	1
system	status	memoryFree	unit64	1
system	status	memoryTotal	unit64	1
system	status	gpsLat	double	1
system	status	gpsLong	double	1
system	network	netowrkStatus	string	10
system	network	networkTx	unit64	10
system	network	networkRx	unit64	10
system	network	networkUsage	unit64	10
system	network	$(name)NetworkUsage	unit64	10
system	network	$(name)NetworkRx	unit64	10
system	network	$(name)NetworkTx	unit64	10
system	network	$(name)Signal	double	60
system	network	$(name)SignalLevel	int32	60
system	storage	systemDiskUsed	uint64	1
system	storage	systemDiskFree	uint64	1
system	storage	systemDiskPercent	double	1
system	storage	$(storage)Used	uint64	1
system	storage	$(storage)Free	uint64	1
system	storage	$(storage)Percent	double	1

E. Regulatory Approval Statement

FCC Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device and its antenna must not be co located or operating in conjunction with any other antenna or transmitter.

IC Statement

The radiated output power of the Wireless Device is below the Innovation, Science and Economic Development Canada (ISED) radio frequency exposure limits. The Wireless Device should be used in such a manner that the potential for human contact during normal operation is minimized.

This device has also been evaluated and shown compliant with the ISED RF Exposure limits under mobile exposure conditions. (antennas are greater than 20cm from a person's body).

La puissance de sortie rayonnée du dispositif sans fil est inférieure aux limites d'exposition aux radiofréquences d'Innovation, Sciences et Développement économique Canada (ISED). Le dispositif sans fil doit être utilisé de manière à minimiser le potentiel de contact humain pendant le fonctionnement normal.

Cet appareil a également été évalué et montré conforme aux limites d'exposition RF ISED dans des conditions d'exposition mobiles. (Les antennes sont à plus de 20 cm du corps d'une personne).