



Power Meter Monitor

**Business and Mission-  
Critical Solutions Provider**

## IEC 101/104 - Modbus Protocol Gateway

# User Manual



**Model:** PMM0403  
**Document:** User Manual  
**Document version:** 1.0  
**Date:** January 2025



## COPYRIGHT NOTICE

The information in this document is subject to change without prior notice to improve reliability, design, and function and does not represent a commitment on the part of the manufacturer.

In no event will the manufacturer be liable for direct, indirect, special, incidental, or consequential damage arising out of the use or inability to use the product or documentation, even if advised of the possibility of such damages.

This document contains proprietary information protected by copyright. All rights are reserved. No part of this manual may be reproduced by any mechanical, electronic, or other means in any form without prior written permission of the manufacturer.

## TRADEMARKS

All registered trademarks and product names mentioned herein are used for identification purposes only and may be trademarks and/or registered trademarks of their respective owners.

AMI is a trademark of American Megatrends Inc.

Intel & Atom are trademarks of Intel Corporation

IBM, PC/AT, PS/2&VGA are trademarks of International Business Machines Corporation. Microsoft Windows is a trademark of Microsoft Corp. RTL is the trademark of Realtek Semiconductor Co., Ltd.

## DECLARATION OF CONFORMITY

This restriction is subject to protect the operational process of the system in the business environment, which will produce, use, and transmit radiofrequency energy. Harmful interference to radio communication could result if instructions to the correct installation and usage were not applied. The interference prevention cannot be guaranteed even with proper installation according to the manual. If the device causes a bad effect on the radio / TV signal. The user could preclude that by turning the device on/off.

When this device produces some harmful interference, the user can use the following measure to solve the interference problem:

- 1-Setting the receiving antenna's direction or location to increase the distance between this device and receiver.
- 2- Plug in the device's power connector into different circuits of the power outlet with the receiver.
- 3- If any technical support is needed, the dealer or experienced radio/TV technical personnel must be informed.

## TECHNICAL SUPPORT AND SERVICE

Visit [Pmm-usa.us](http://Pmm-usa.us) to browse FAQs and get further details.

User should collect the following information before submitting technical support and service requests:

- Product name, model and serial number.
- Installed software (operating system, OS version, installed applications and so on).
- Full description of the problem
- Detailed information about every error.

## SAFETY INSTRUCTIONS

- Only trained and qualified personnel can install, operate, or maintain the device.
- Before starting the installation, all safety precautions must be read, and warning labels affixed to the device must be observed. Doing so protects the device from damage and ensures your safety.
- Safety precautions provided in this document may not cover all safety aspects, note to always remain mindful of safety.
- PMM is not liable for any consequence that results from violation of regulations pertaining to safe operations or safety codes pertaining to design, production, and equipment usage.
- DO NOT use liquids or decontamination spray to clean the device surface and assure that it is totally disconnected while cleaning.
- Take all measures to prevent device drops before or during installation.
- Prior to connecting the device to power source, ensure the source and device voltage and power are 100% matched.
- Keep the cables in a suitable covered place.
- If the device is not used for a long time, shut off the power to avoid the damages by transient overvoltage.
- DO NOT allow any liquid to flow into the device; to avoid fire or short circuit.
- The recommended storage temperature range should NOT be less than 30°C OR higher than 85°C.



### Warning:

- Read the power source and device inlet carefully.
- Handle device with both hands.
- Clean and maintain the device using recommended, safe and suitable methods.



### Caution:

If any unauthorized changes of settings or repairs are done without PMM approval; then user's rights of controlling this device will be canceled.



# Contents

# PAGE

- 1. Introduction..... 4
  - 1.1 DESCRIPTION..... 4
  - 1.2 KEY FEATURES..... 4
- 2. SPECIFICATIONS..... 5
  - 2.1 SOFTWARE SPECIFICATIONS..... 5
  - 2.2 HARDWARE CPU CHASSIS SPECIFICATIONS (3 Options)..... 5
- 3. MECHANICAL INSTALLATION..... 6
  - 3.1 CONNECTIONS..... 6
    - 3.1.1 POWER..... 6
    - 3.1.2 NETWORK..... 7
- 4. Using Software..... 7
  - 4.1 Login..... 7
  - 4.2 About..... 9
  - 4.3 Settings..... 10
    - 4.3.1 Basic Settings..... 10
    - 4.3.2 Network Settings..... 10
    - 4.3.3 WiFi Settings..... 11
    - 4.3.4 Serial Settings..... 12
    - 4.3.5 Server Setting..... 13
    - 4.3.6 Overview..... 14
    - 4.3.7 IEC60870 Protocol Settings..... 14
  - 4.4 IO Mapping..... 30
  - 4.5 IEC 60870 Monitoring..... 31

# 1. Introduction

This Document is a fully descriptive operational manual for PMM's IEC 101/104 - Modbus Protocol Gateway. Providing the operator with the needed information in terms of instruction and screen layout of the monitors, allowing for easy use.

## 1.1 DESCRIPTION

PMM0403 is a highly configurable industrial ethernet gateway device which is capable of reading data from any device containing DLMS protocol like energy meters and converting it to RTU/TCP Modbus protocol. PMM0403 provides the flexibility needed to fulfill the various conditions that arise with field devices that use different communication protocols to connect to the SCADA system.

PMM0402 gateways support a system log function that records events; users can easily review log data remotely through a web interface. The gateways also support status monitoring and fault protection functions. The status monitoring function notifies the SCADA system when a device gets disconnected or does not respond, in such case the SCADA system gets the status of each end device and then issues alarms to notify operators.

PMM0402 can be contained within multiple hardware chassis which are designed with a wide range of highly configurable communication ports needed in the field. All hardware chassis are rugged, powerful, reliable, fanless and cover a wide range of power supply options that offer a high level of performance and low level of power consumption.

## 1.2 KEY FEATURES

- Supports Modbus RTU/TCP
- Supports meters such as: Iskraemeco, Landis+Gyr, EMH meter, Actaris SL7000, Elster A1700, Elster A1500, KAMSTRUP, DPEE
- Effortless configuration via web-based wizard
- Built-in ethernet cascading for easy wiring
- Embedded traffic monitoring as well as diagnostic information for easy troubleshooting
- MicroSD card for configuration backup and duplication for event logs
- Status monitoring and fault protection for easy maintenance
- Redundant dual DC power inputs and relay output
- Operating temperature: -40 to 75°C
- Storage temperature: -40 to 85°C
- EMI, EMS, EMC and shock protected
- Serial port with power surge 2kV isolation protection
- Security features based on IEC 62443

## 2. SPECIFICATIONS

### 2.1 SOFTWARE SPECIFICATIONS

#### Ethernet Software Features

Protocols	Modbus TCP
Configuration Options	Web Console through Ethernet

#### Serial Software Features

Protocols	Modbus RTU
Configuration Options	Web Console through Ethernet

### 2.2 HARDWARE CPU CHASSIS SPECIFICATIONS (3 Options)

The Data logger Software can be installed on different PMM CPU's like: PMM0102, PMM0105, PMM0107. You can visit our website <https://www.pmm-usa.us/Industrial-Computer.php> to choose your hardware based on your needs. Below are some examples for reference.



Option1: PMM0102

Option2: PMM0105

Option3: PMM0107

CPU	All winner H3 processor, Quad-core 64-bit high-performance Cortex A53	All winner H3 processor, Quad-core 64-bit high-performance Cortex A53	Intel® Atom™ x5-Z8350 CPU
DRAM	512 DD3RAM	512 MB	4GB DD3RAM
Storage	8GB eMMC	8GB eMMC	16GB eMMC
RTC CHIP (OPTIONAL)	DS3231	DS3231	CR2032
Pre-installed OS	Ubuntu Core	Linux	Windows 10 lite

#### Computer Interface

Ethernet	2x 10/100 Base-T RJ45	2x 10/100 Base ports	1x 10/100/1000Base-T RJ45
Fiber	N/A	2x 1000Base-X SC fiber optic port	1x 1000Base-X SFP
USB	1x USB2.0 Type A 1x Micro USB	1x USB2.0 type A	1x USB3.0 Type A
Wi-Fi	2.4 GHz	2.4/5 GHz	MediaTek RT5572 2.5/5GHz/2x2 with external antennas
Serial	1x RS485	1x RS485	1x RS485
Optional Interface	16 pins connector on edge with following connectivity options (max 3 options can be chosen upon order to be factory pre-fitted)	2x customizable communication slots:PMM RS485 Module PMM RS232 Module PMM RS422 Module	8 pins connector on edge with following options (max 2 options can be chosen upon order to be factory pre-fitted)

	RS232 RS485 RS422 CAN bus Analog Input Analog Output Digital Input Digital Output		RS232 RS485 RS422 CAN bus Analog Input Analog Output Digital Input Digital Output
SD Slot	1x MicroSD socket for user supplied card up to 64GB	1x MicroSD	1x MicroSD card socket for user supplied card up to 256GB

### Power Parameters

Power Supply Options	10-56 VDC 8-40 VAC 36-72 VDC 25-50 VAC 85-285 VAC / 100-300 VDC	10-56 VDC 8-40 VAC 36-72 VDC 25-50 VAC 85-285 VAC / 100-300 VDC	10-56 VDC 8-40 VAC 36-72 VDC 25-50 VAC 85-285 VAC / 100-300 VDC
Power Connector	Phoenix Contact 4 pins 3.5mm	Phoenix Contact 6 pins 3.5mm	

### Physical Characteristics

Housing	Metal	Metal	Metal
Dimensions	4*4*1.75 inch (103*103*44 mm)	5.27*5.27*1.45 inch (134*134*37 mm)	5.27*5.27*1.45 inch (134*134*37 mm)
Mounting Options	Standard 35mm DIN Rail Direct Panel Mounting Front Panel Mounting 19" rack 1U	Standard 35mm DIN Rail Direct Panel Mounting Front Panel Mounting 19" rack 1U	Standard 35mm DIN Rail Direct Panel Mounting Front Panel Mounting 19" rack 1U

## 3. MECHANICAL INSTALLATION

### 3.1 CONNECTIONS

#### 3.1.1 POWER

Power requirements depend on the chosen hardware option.

PMM0102 and 0105 have customized power supply options including: 10-56 VDC, 8-40 VAC, 36-72 VDC, 25-50 VAC, 85-285 VAC / 100-300 VDC based on these options connect the power line to the CPU terminal block (POWER) as shown in the figure below.

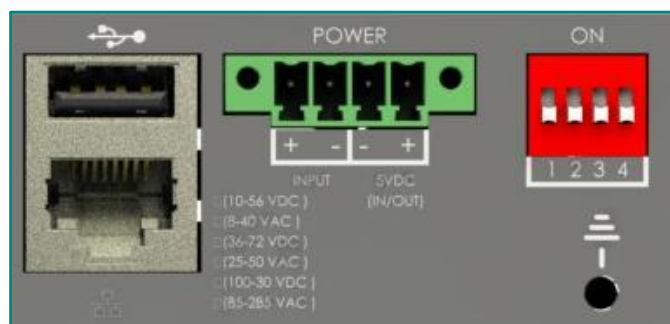


Figure 1 Power Connection

### 3.1.2 NETWORK

Network connection depends on the chosen hardware option.

- PMM0102 has 2x 10/100 ethernet port supports up to twenty clients.
- PMM0105 is the best choice for increasing connectivity as it has 2x 10/100 ethernet port supports up to twenty clients, WIFI connection supports up to 20 clients as well as 2x customizable fiber optic ports

## 4. Using Software

### 4.1 Login

- Type the IP address “127.0.0.1” at your browser then click on “Enter”
- The Login window will be shown as below, type the username “Admin@Israr.com” and the password “12344321”. Click on “Login” to access the IEC 60870 web page

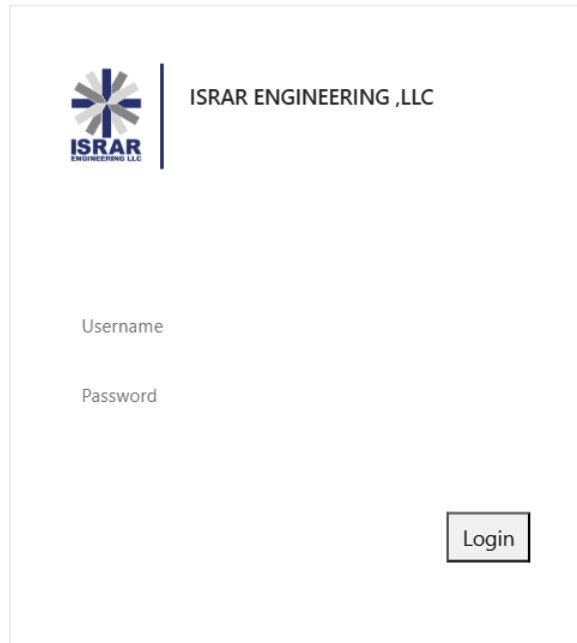


Figure 2 Login

Once the user has logged in successfully general information will be shown below.

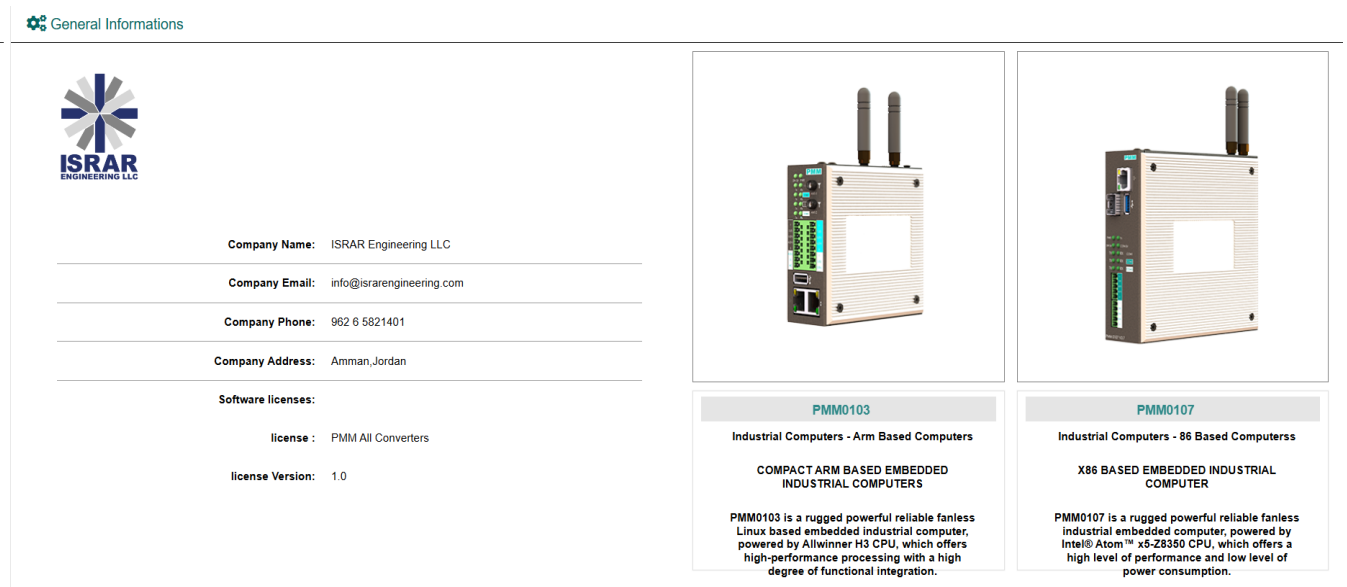


Figure 3 General information

The general information is set by the user as well as the user can redesign his own theme style.

Inserting general information instructions:

- Click on “User”

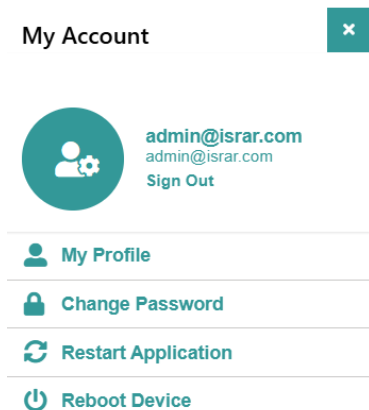


Figure 4 My Account

- Click on “My Profile” to access the account settings

My Profile

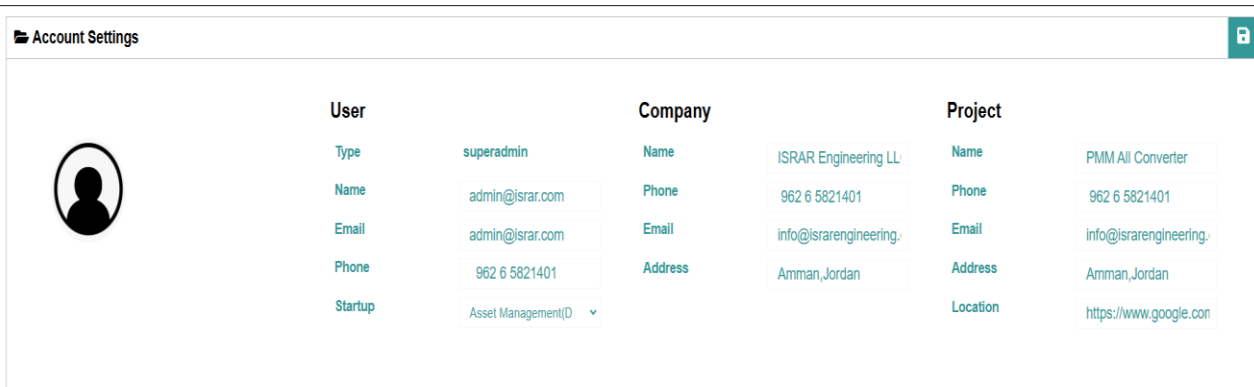


Figure 5 My Profile

- Type the required information accurately
- Click on “Save”

Customize your web page theme

- Click on “Add” then select the theme parameters you want to add, click on “Save”, saved themes will appear in theme name list after the user clicks on “Refresh”
- You can delete themes by selecting any theme from the theme name drop list then click on “Delete”

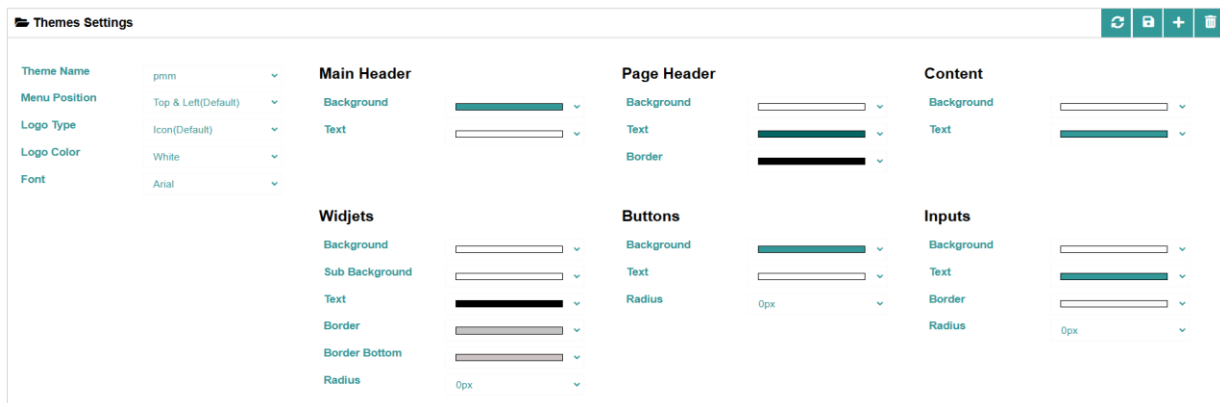


Figure 6 Themes Settings



## 4.2 About

About Page consists of three sections:

1. General Information: Displays general information about the DLMS Gateway including Model Name, Serial Number, Software Version, Firmware Version, Hardware Base and Hardware Version.
2. Project settings & Firmware: Click on “Backup” to create project settings backup. Click on “Restore” to restore a previously created project setting. Click on “Restore Default” to restore the default project settings. The same instructions are applicable for Firmware as the user can create firmware backup or restore a previously created firmware.
3. Alarms & Events Log: The user may adjust the duration of keeping logs, download logs and delete logs.

### 1) Adjust Keeping Alarms & Events Log Duration Instructions:

- Choose the required alarms & events log based on the day and date from the drop list
- Type the number of days you want to keep the logs for in the specified field and check the box to enable the setting
- Click on “Save”

### 2) Download Alarms & Events Log Instructions:

- Choose the required alarms & events log based on the day and date from the drop list
- Click on “Download”

### 3) Delete Alarms & Events Log Instructions:

- Choose the required alarms & events log based on the day and date from the drop list
- Click on “Delete”

The screenshot shows the 'About' page of a web application. The page is organized into several sections:

- General information:** A table with the following data:

Model Name	PMM All Converter
Serial No.	1.0
Software Version	1.0
Firmware Version	1.0
Hardware Base	PMM0103
Hardware Version	1.1
- Project Settings & Firmware:** Two sections, each with 'Backup' and 'Restore' buttons.
  - Settings : [Backup] [Restore]
  - FirmWare : [Backup] [Restore]
- Alarms & Events Log:** Includes 'Alarms Log' and 'Events Log' sections, each with a 'Select Columns' dropdown. Below these is a 'Keep Logs For:' field with a value of '5' and a '(DAYS NUMBER)' label, and a checked checkbox.
- Developed By:** Features the PMM LLC logo and contact information: POWER METER MONITOR, 633 NorthEast 167th street ,suite 1214, North Miami Beach,Florida 33162,USA, WWW.PMM-USA.US.
- Licensed To:** Features the ISRAR ENGINEERING LLC logo and contact information: ISRAR ENGINEERING LLC, Zahran St,Jawhareh Swefieh Complex Bld. 21, Suite 503, AMMAN 11185, JORDAN, WWW.ISRAAR.COM.
- License Status:** Shows 'Demo'.
- Hardware ID:** Displays the ID 'BFEBFBFF000306C3150748255403390'.

Figure 7 About

## 4.3 Settings

### 4.3.1 Basic Settings

Basic settings display the server's name, time zone and local date and time. Time type is adjustable as the user can select meter time which obtains the time from meter, NTP time which obtains the time from NTP server and manual time which requires the user to set date and time manually then click on "Save".



Server Name	<input type="text" value="PMM0403"/>
Local Date	<input type="text" value="25"/> / <input type="text" value="01"/> / <input type="text" value="13"/>
Local Time	<input type="text" value="19"/> : <input type="text" value="46"/> : <input type="text" value="05"/>
Set time to	<input type="text" value="Manual"/>
NTP/IP Address	<input type="text" value="192.168.1.94"/>
RTC	Available

Figure 8 Basic Settings

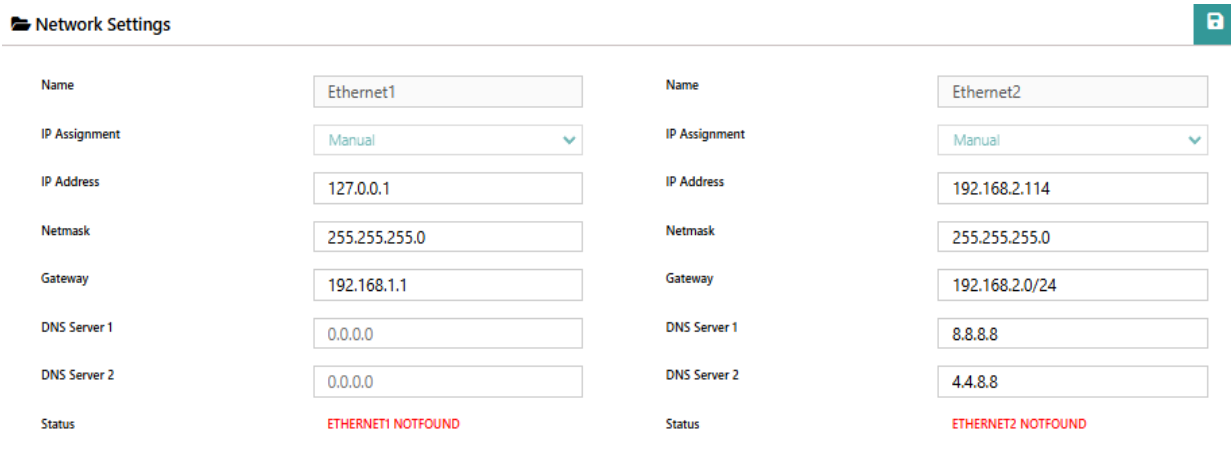
### 4.3.2 Network Settings

PMM0403 has 2x Ethernet ports, it is required to insert the settings for each port manually by the user.

- Insert the IP Assignment, Address, Netmask, Gateway, DNS Server 1 and 2 for each port.
- Click on "Save"

Once the user has set the ports settings the status of each port will be updated as following:

- If the settings are inserted correctly by the user, the status will be **Connected**
- If the settings are not inserted correctly by the user, the status will be **Disconnected**
- If the settings are inserted by the user, however the IP address doesn't match with the Device address the status will be **Connected** then the user must click on the "Refresh" as the settings will be updated correctly, then click on "Save"



Ethernet1		Ethernet2	
Name	<input type="text" value="Ethernet1"/>	Name	<input type="text" value="Ethernet2"/>
IP Assignment	<input type="text" value="Manual"/>	IP Assignment	<input type="text" value="Manual"/>
IP Address	<input type="text" value="127.0.0.1"/>	IP Address	<input type="text" value="192.168.2.114"/>
Netmask	<input type="text" value="255.255.255.0"/>	Netmask	<input type="text" value="255.255.255.0"/>
Gateway	<input type="text" value="192.168.1.1"/>	Gateway	<input type="text" value="192.168.2.0/24"/>
DNS Server 1	<input type="text" value="0.0.0.0"/>	DNS Server 1	<input type="text" value="8.8.8.8"/>
DNS Server 2	<input type="text" value="0.0.0.0"/>	DNS Server 2	<input type="text" value="4.4.8.8"/>
Status	ETHERNET1 NOTFOUND	Status	ETHERNET2 NOTFOUND

Figure 9 Network Setting

Parameter	Value	Description
IP address	127.0.0.1 (or other 32-bit number)	The IP (Internet Protocol) address identifies the server on the TCP/IP network.
Netmask	255.255.255.0 (or other 32-bit number)	This identifies the server as belonging to a Class A, B, or C Network.
Gateway	0.0.0.0 (or other 32-bit number)	This is the IP address of the router that provides network access outside the server's LAN.
DNS server 1	0.0.0.0 (or other 32-bit number)	This is the IP address of the primary domain name server.
DNS server 2	0.0.0.0 (or other 32-bit number)	This is the IP address of the secondary domain name server.

### 4.3.3 WiFi Settings

It is required to insert IP assignment settings manually by the user.

- Insert the IP Assignment, Address, Netmask, Gateway, DNS Server 1 and 2.
- Click on "Save"

#### Connecting/Disconnecting to Wifi Network Instructions:

- Click on "Refresh" icon to display all the available WiFi networks
- Choose the desired WiFi Network from the drop list
- Check the box for Auto Connection
- Click on Connect/Disconnect and the connection status will be updated as connected/disconnected

#### WiFi Settings

Name: WiFi

IP Assignment: DHCP

IP Address: 192.168.1.25

Netmask: 255.255.255.0

Gateway: 192.168.1.1

DNS Server 1: 82.212.71.146

DNS Server 2: 82.212.86.34

Status: Connected

#### WiFi Connections

Wi-Fi Networks: Israr502 2,4

Password: .....

Connect

Disconnect

Status: Disconnected 100

Figure 10 WiFi Setting

### 4.3.4 Serial Settings

There are four serial ports the user must set the required parameters for each port.

4.3.4.1 Select the Baud Rate, Parity, Data Bits, Stop Bits and Flow Control from the drop list for each port. The Interface option is based on the order configuration the user has requested as there are customizable interfaces options for each hardware. At this case the user has ordered RS-485 2 wire

#### 4.3.4.2

Click on “Save”

Port 1 Name	Port 2 Name	Port 3 Name	Port 4 Name
COM1	COM2	COM3	COM4
Baud Rate: 19200	Baud Rate: 9600	Baud Rate: 9600	Baud Rate: 19200
Parity: None	Parity: None	Parity: None	Parity: None
Data Bits: 8	Data Bits: 8	Data Bits: 8	Data Bits: 8
Stop Bits: 1	Stop Bits: 1	Stop Bits: 1	Stop Bits: 1
Flow Control: None	Flow Control: None	Flow Control: None	Flow Control: None
Interface: RS-485 2	Interface: RS-485 2	Interface: RS-485 2	Interface: RS-485 2
Timeout: 3000 (ms)	Timeout: 3000 (ms)	Timeout: 3000 (ms)	Timeout: 3000 (ms)
Status: Not Available	Status: Not Available	Status: Not Available	Status: Not Available

Figure 11 Serial Settings

Parameter	Value	Description
Baudrate	Supports standard baudrates (bps): 50/75/110/134/150/300/600/1200/1800/2400/4800/7200/9600/19200/38400/ 57600/115200/230.4k/460.8k/921.6k	
Parity	None, Odd, Even, Mark, Space	
Data bits	7,8	
Stop bits	1, 2	
Flow control	None, RTS/CTS, RTS Toggle	The RTS Toggle will turn off RTS signal when there is no data to be sent. If there is data to be sent, the RTS toggle will turn on the RTS signal before a data transmission and off after the transmission is completed.
Interface	RS-232, RS-422, RS-485 2 wire, RS-485 4 wire	This is the IP address of the secondary domain name server.

### 4.3.5 Server Settings

#### General Modbus Slave Configuration Instructions:

- 4.3.5.1 Select Modbus Slave Mode from the drop list (Modbus TCP or Modbus RTU) if available
- 4.3.5.2 Modbus TCP slave port is set as standards 502
- 4.3.5.3 Select from the drop list Modbus RTU port if the user has already chosen Modbus RTU Mode
- 4.3.5.4 Type Modbus base address starts from 40000
- 4.3.5.5 Type the number of readings obtained per meter (maximum allowable number is 200 readings per meter)
- 4.3.5.6 Select from the drop list the desired Modbus data format
- 4.3.5.6.1 Click on “Build Modbus Addresses” as the Modbus addresses will be built based on the readings per meter the user inserted (i.e., if the Modbus base address is 40000 and readings per meter are 200 the first Modbus address is 40000-40200)

The screenshot shows a web-based configuration interface titled "General Modbus Slave Configuration". It contains several input fields and a button:

- Modbus Slave Mode:** A dropdown menu with a downward arrow.
- Modbus TCP Slave Port:** A text input field containing the value "502".
- Modbus RTU Port:** A dropdown menu with a downward arrow.
- Modbus RTU Slave ID:** A text input field containing the value "1".
- Modbus Base Address:** An empty text input field.
- Readings Per meter:** An empty text input field.
- Modbus Data Format:** A dropdown menu with "ABCD" selected and a downward arrow.
- Build Modbus Addresses:** A teal button with white text.

Figure 12 General Modbus Slave Configuration

### 4.3.6 Overview

Overview consists of three sections:

1. Run Time Console: for monitoring the connection status of energy meters and shows the reading values obtained from each meter.
2. system Information displays system’s performance measures as it illustrates the usage percentage of CPU, RAM, Disk and CONNECTIONS.
3. System Summary: displays the software version, last time the system started, the status of the Signal-R server connected or disconnected, Signal-R IP Address, the status of RTU/TCP Modbus Slaves, TCP connected client’s number, number of tags, the status of Web API, number of Web API calls, Web API address and system total errors.

**Note:** click on the “Refresh” icon at the System Summary to reboot the device, the reboot process takes up to two minutes.

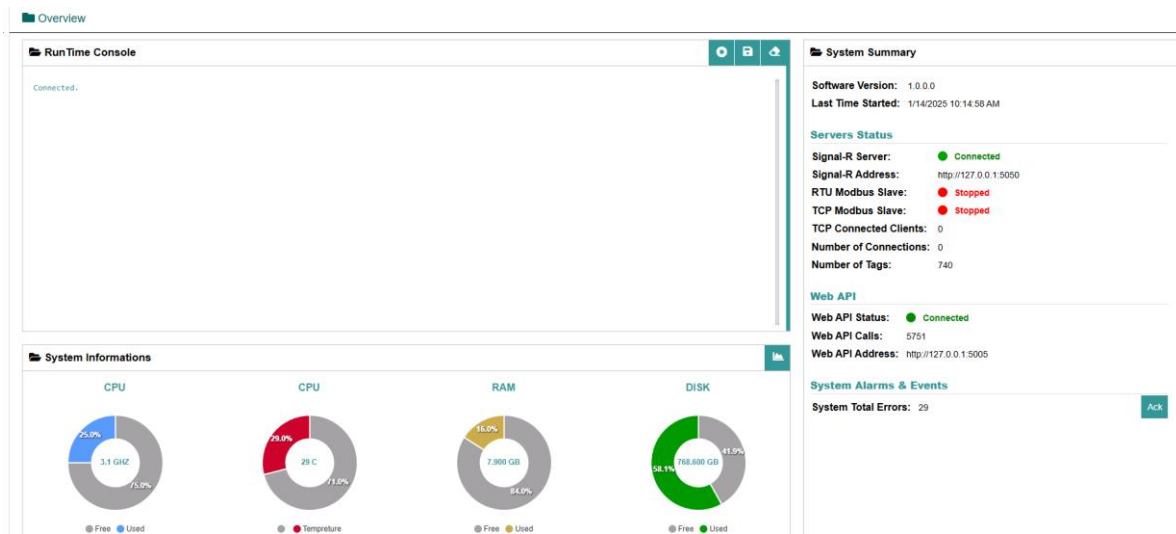


Figure 13 Overview

### 4.3.7 IEC 60870 Protocol Setting

The PMM0403 supports Modbus RTU/ASCII, Modbus TCP, IEC 60870-5-101, and IEC 60870-5-104 protocols. The PMM0403 fulfills a different role on each of its sides. Each role is determined by your device’s settings. Therefore, set the role of each of your devices correctly.

Below are the protocol combinations of PMM0403.

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

After protocol selection, we must configure each side of PMM0403's role. In a typical application, one side of PMM0403 will be set as a server/slave and the other side will be set as a client/master. You will find the corresponding lists under Protocol Settings. The following configuration settings are possible:

- A1. Modbus TCP Client (Master) Settings
- A2. Modbus RTU/ASCII Master Settings
- A3. Modbus TCP Server (Slave) Settings
- A4. Modbus RTU/ASCII Slave Settings
- A5. IEC 60870-5-104 Client Settings
- A6 IEC 60870-5-104 Server Settings
- A7. IEC 60870-5-101 Master Settings
- A8. IEC 60870-5-101 Slave Setting

### 4.3.7.1 A1. Protocol Settings-Modbus TCP Client (Master) Settings

Connections Settings

**Main Connection**

Name:  Enable:

Type: Modbus TCP Client Port: Ethernet 1

**Modbus TCP Client's Server**

Client Settings		Server Settings	
Initial delay	<input type="text" value="0-30000 ms"/>	TCP Port	<input type="text" value="502"/>
Max Retry	<input type="text" value="0-5"/>	Server IP Address	<input type="text" value="0.0.0.0"/>
Response Timeout	<input type="text" value="10-120000 ms"/>	Unit ID	<input type="text" value="0"/>
Trigger	<input type="text" value="Cyclic"/>		
Poll Interval	<input type="text" value="1000"/>		

Figure 14 Connection Settings

Parameter	Value	Default	Description
Initial delay	0-30000 ms	0	Some Modbus servers/slaves may take more time to boot up than other devices. In some environments, this may cause the entire system to suffer from repeated exceptions during the initial boot-up. After booting up, you can force the PMM0403 to wait before sending the first request with the Initial Delay setting.
Max. Retry	0-5	3	This is used to configure how many times the PMM0403 will try to communicate with the Modbus server/slave when the Modbus command times out.
Response Timeout	10-120000 ms	1000	The time taken by a server/slave device to respond to a request is defined by the device manufacturer based on the Modbus standard. A Modbus client/master can be configured to wait a certain amount of time for a server/slave's response. If no response is received within the specified time, the client/master will disregard the request and continue operation. This allows the Modbus system to continue the operation even if a server/slave device is disconnected or faulty. On the PMM0403, the Response timeout field is used to configure how long the gateway will wait for a response from a Modbus sever/slave. Refer to your device manufacturer's documentation to manually set the response timeout.
Trigger	Cyclic Data Change Disable		Disable: The command is never sent Cyclic: The command is sent cyclically at the interval specified in the Poll Interval parameter. Data change: The data area is polled for changes at the time interval defined by Poll Interval. A command is issued when a change in data is detected.
Poll Interval	100-1200000 ms	1000	Polling intervals are in milliseconds. Since the module sends all requests in turns, the actual polling interval also depends on the number of requests in the queue and their parameters. The range is from 100 to 1,200,000 ms.
Server IP Address	0.0.0.0 – 255.255.255.255	0.0.0.0	The IP address of a remote server/slave device.
TCP Port	1 - 65535	502	The TCP port number of a remote server/slave device.
Unit ID	1-255	1	The Modbus slave ID



### 4.3.7.2 A2. Protocol Settings-Modbus RTU/ASCII Master Settings

**Main Connection**

🗑️
✎
+
📄

Name	Enable <input type="checkbox"/>	Type Modbus RTU ASCII Master	Port
------	---------------------------------	---------------------------------	------

---

**Modbus RTU ASCII Master's Slave**

**ModBus Master Settings**

Mode	RTU	Response Timeout	(10-120000 ms)
Initial delay	(0-30000 ms)	Inter frame delay	(0-500 ms)
Max Retry	(0-5)	Inter character timeout	(10-120000 ms)

Figure 15 Main Connection

Parameter	Value	Default	Description
Mode	RTU or ASCII	RTU	The Modbus protocol type
Initial delay	0-30000 ms	0	Some Modbus servers/slaves may take more time to boot up than other devices. In some environments, this may cause the entire system to suffer from repeated exceptions during the initial boot-up. After booting up, you can force the PMM0403 to wait before sending the first request with the Initial Delay setting.
Max. retry	0-5	3	The number of times the client/master will retry the same request when the response times out.
Response timeout	10-120000 ms	1000	According to the Modbus standard, the time it takes for a server/slave device to respond to a request is defined by the device manufacturer. Based on this response time, a client/master can be configured to wait a certain amount of time for a server/slave's response. If no response is received within the specified time, the client/master will disregard the request and continue operation. This allows the Modbus system to continue operations even if a server/slave device is disconnected or faulty. On the PMM0403, the Response timeout field is used to configure how long the gateway will wait for a response from a Modbus ASCII or RTU server/slave. Refer to your device manufacturer's documentation to manually set the response time.
Inter-frame delay	10-500 ms	0	<p>Defines the time interval between an RTU response and the next RTU request. When the baud rate is lower than 19200 bps, the default value is 0, which is 3.5-character time. When the baud rate is larger than 19200 bps, the PMM0403 uses a predefined fixed value that is not user configurable. This function solves the issue that some devices can't handle the RTU requests that quickly, so the PMM0403 opens to user-defined values.</p> <p>How to calculate Modbus character time? E.g., if the baud rate is 9600 bps, 1 character time is about 1 ms. In a serial frame (11 bits, including start bit, data, parity bit, and stop bit), 9600 bps approximately equals to 960 characters/s, so transmitting 1-character needs about <math>1/960 = 1 \text{ ms}</math></p>
Inter-character timeout	10-500 ms	0	The time interval between characters in one frame. When the baud rate is lower than 19200 bps, the default value is 0, which is 1.5-character time. When the baud rate is larger than 19200 bps, the PMM0403 uses a predefined fixed value that is not user configurable. When the serial side of the PMM0403 receives one character, and the next one comes after the "inter-character timeout" defined, the frame will be discarded because of timeout.

### 4.3.7.3 A3. Protocol Settings-Modbus TCP Server (Slave) Settings

**Main Connection**

🗑️
✎
+
🔒

Name <span style="float: right;">▼</span>	Enable <input type="checkbox"/>	Type Modbus TCP Server <span style="float: right;">▼</span>	Port Ethernet 1 <span style="float: right;">▼</span>
---	---------------------------------	--	---

**Modbus TCP Server**

**Server Settings**

Unit ID	<input style="width: 80%;" type="text" value=""/> (1-255)
TCP IP	<input style="width: 80%;" type="text" value="127.0.0.1"/> (127.0.0.1)
TCP Port	<input style="width: 80%;" type="text" value=""/> (502)

Figure 16 Protocol Settings-Modbus TCP Server

Parameter	Value	Default	Description
Unit ID	1-255	1	The Modbus slave ID that this server/slave module will accept.
TCP IP	A unique 32-bit address (IPv4) or 128-bit address (IPv6) used for identifying devices on a network.	It depends on network configuration (e.g., a typical IPv4 default might be 192.168.1.1 in a private network).	IP addresses ensure that data can be routed between devices on a network. IPv4 addresses are represented as four sets of numbers (e.g., 192.168.0.1), while IPv6 addresses use a longer alphanumeric format.
TCP Port	1-65535	502	The TCP port number.

#### 4.3.7.4 A4. Protocol Settings-Modbus RTU/ASCII Slave Settings

**Modbus RTU ASCII Slave**

Basic Settings		Master Settings	
Mode	RTU	Initial delay	(0-30000 ms)
Trigger	Cyclic	Max Retry	(0-5)
Poll Interval	1000	Response Timeout	(10-120000 ms)
Slave ID	1	Inter-Frame delay	(10-500 ms)
		Inter-character timeout	(10-500 ms)

Figure 17 Modbus RTU ASC II Slave

Parameter	Value	Default	Description
Mode	RTU or ASCII	RTU	The Modbus protocol type
Slave ID	1-255	2	The Modbus slave ID that this server/slave module will accept.
Trigger	Cyclic Data Change Disable		Disable: The command is never sent Cyclic: The command is sent cyclically at the interval specified in the Poll Interval parameter. Data change: The data area is polled for changes at the time interval defined by Poll Interval. A command is issued when a change in data is detected.
Poll Interval	100-1200000 ms	1000	Polling intervals are in milliseconds. Since the module sends all requests in turns, the actual polling interval also depends on the number of requests in the queue and their parameters. The range is from 100 to 1,200,000 ms.
Initial delay	0-30000 ms	0	Some Modbus servers/slaves may take more time to boot up than other devices. In some environments, this may cause the entire system to suffer from repeated exceptions during the initial boot-up. After booting up, you can force the PMM0403 to wait before sending the first request with the Initial Delay setting.
Max. retry	0-5	3	The number of times the client/master will retry the same request when the response times out.
Response timeout	10-120000 ms	1000	According to the Modbus standard, the time it takes for a server/slave device to respond to a request is defined by the device manufacturer. Based on this response time, a client/master can be configured to wait a certain amount of time for a server/slave's response. If no response is received within the specified time, the client/master will disregard the request and continue operation. This allows the Modbus system to continue operations even if a server/slave device is disconnected or faulty. On PMM0403, the Response timeout field is used to configure how long the gateway will wait for a response from a Modbus ASCII or RTU server/slave. Refer to your device manufacturer's documentation to manually set the response time.
Inter-frame delay	10-500 ms	0	Defines the time interval between an RTU response and the next RTU request. When the baud rate is lower than 19200 bps, the default value is 0, which is 3.5-character time. When the baud rate is larger than 19200 bps, the PMM0403 uses a predefined fixed value that is not configurable. This function solves the issue that some devices can't handle the RTU requests that quickly, so the

			PMM0403 opens to user-defined values.  How do you calculate Modbus character time? E.g., if the baud rate is 9600 bps, 1 character time is about 1 ms. In a serial frame (11 bits, including start bit, data, parity bit, and stop bit), 9600 bps approximately equals to 960 characters/s, so transmitting 1-character needs about $1/960 = 1 \text{ ms}$
Inter-character timeout	10-500 ms	0	The time interval between characters in one frame. When the baud rate is lower than 19200 bps, the default value is 0, which is 1.5-character time. When the baud rate is larger than 19200 bps, the PMM0403 uses a predefined fixed value that is not user configurable. When the serial side of the PMM0403 receives one character, and the next one comes after the “inter-character timeout” defined, the frame will be discarded because of timeout.

#### 4.3.7.5 A5. Protocol Settings- IEC 60870-5-104 Client Settings

Main Connection

 Enable
 

 Type: IEC 60870-5-104 Client
 

 Port: Ethernet 1

---

**Main Connection Basic Settings**

COT Size:  1  2

ASDU size:  1  2

IOA size:  1  2  3

CA size:  1  2  3

Organitor address:  (0-255)

Common address:

**Main Connection Advanced Settings**

K:  (1-32)

W:  (1-32)

T0 Timeout:  (1-300000 ms)

T1 Timeout:  (1-300000 ms)

T2 Timeout:  (1-300000 ms)

T3 Timeout:  (1-300000 ms)

Figure 18 Protocol Settings/Clint Settings

Parameter	Value	Default	Description
COT size	1-2	2	Set the size of ASDU COT field
ASDU size	1-2	2	Set the size of ASDU COT field
IOA size	1-3	2	is a unique identifier used in industrial communication protocols to address information objects in a system. These information objects represent physical or logical entities like measurements, status indicators, control commands, etc.
CA size	1-3	2	The CA (Common Address) is an important element in the IEC 60870-5-104 and IEC 61850 communication protocols, especially in the context of SCADA systems, remote terminal units (RTUs), and intelligent electronic devices (IEDs). It is used to identify and route communication messages between different devices or components in a control network.

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

#### Basic Settings

Device Name: 0

IP Address: 0.0.0.0

Port: 0

ASDU address: 0

#### General Interrogation Settings

Initial General Interrogation: Enable

Cyclic general Interrogation interval: 600

Cyclic Interrogation group-1 interval: 0

Cyclic Interrogation group-2 interval: 0

Cyclic Interrogation group-3 interval: 0

Cyclic Interrogation group-4 interval: 0

Cyclic Interrogation group-5 interval: 0

Cyclic Interrogation group-6 interval: 0

Cyclic Interrogation group-7 interval: 0

Cyclic Interrogation group-8 interval: 0

Cyclic Interrogation group-9 interval: 0

Cyclic Interrogation group-10 interval: 0

Cyclic Interrogation group-11 interval: 0

Cyclic Interrogation group-12 interval: 0

Cyclic Interrogation group-13 interval: 0

Cyclic Interrogation group-14 interval: 0

Cyclic Interrogation group-15 interval: 0

Cyclic Interrogation group-16 interval: 0

#### Counter Interrogation Settings

Initial counter Interrogation: Enable

Cyclic counter Interrogation interval: 0

Cyclic Interrogation counter group-1 interval: 0

Cyclic Interrogation counter group-2 interval: 0

Cyclic Interrogation counter group-3 interval: 0

Cyclic Interrogation counter group-4 interval: 0

#### Advanced Settings

Timestamp reference: UTC

Enable cse active termination: Enable

Enable cmd active termination: Enable

wait terminate timeout: (1-1000 s)

Initial clock sync: Enable

Cyclic clock sync interval: (0-86400 s)

Endian swap: None

Figure 19 Settings

Parameter	Value	Default	Description
Device name	An alphanumeric string	Device 1	You can enter a name to help you identify the unit, such as the function, etc.
IP address	IP: 0.0.0.0 – 255.255.255.255 TCP port: 1024 - 60000	0.0.0.0:2404	Indicate IP address of IEC 60870-5-104 server that PMM0403 connects to
ASDU address	0-65534	1	Indicate ASDU address of IEC 60870-5- 104 server that PMM0403 connects to
Initial general interrogation	Enable/Disable	Enable	IEC 60870-5-104 client does general interrogation with server after connecting
Cyclic general interrogation interval	0-86400 s; 0 for disable	600	General interrogation polling intervals
Cyclic interrogation group interval	0-86400 s; 0 for disable	0	Interrogation group polling intervals
Initial counter interrogation	Enable/Disable	Enable	IEC 60870-5-104 client does counter interrogation with server after connecting

Cyclic counter interrogation interval	0-86400 s; 0 for disable	600	Counter interrogation polling intervals
Cyclic interrogation counter group interval	0-86400 s; 0 for disable	0	Interrogation counter group polling intervals
Timestamp reference	UTC, Local time	UTC	Command with timestamp refers to UTC or Local time.
Enable cse active termination	Enable/Disable	Enable	IEC 60870-5-104 client expects ACT TERM from slave upon completion of commands CSENA, CSENB, CSENC
Enable cmd active termination	Enable/Disable	Enable	IEC 60870-5-104 client expects ACT TERM from slave upon completion of commands CSCNA, CDCNA, CRCNA, CBONA
Wait termination timeout	1-100 s	10	The period waiting for ACT TERM from server upon completion of all control commands
Initial clock sync	Enable/Disable	Enable	IEC 60870-5-104 client synchronize clock of IEC 60870-5-104 server after connecting
Cyclic clock sync interval	0-86400 s; 0 for disable	600	Cyclic clock sync command polling intervals
Endian swap	None Byte Word Byte and Word	None	Data Byte Swapping <b>None:</b> Don't need to swap <b>Byte:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0B, 0x0A, 0x0D, 0x0C <b>Word:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0C, 0x0D, 0x0A, 0x0B <b>Byte and Word:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0D, 0x0C, 0x0B, 0x0A
Select/Execute mode	Select/Execute, Execute Only	Select/Execute	<b>Select/Execute:</b> Writes occur with a dual command/response from the device. <b>Execute Only:</b> Writes occur with a single command/response from the device.

#### Point Settings

Action	Name	M/A Read	M/A Write	Object Types	IOA	Scale	Pulse Duration	Fault Protecti...	Fault Protecti...	TimeStamp F...
--------	------	----------	-----------	--------------	-----	-------	----------------	-------------------	-------------------	----------------

Figure 20 Point Settings

Parameter	Value	Default	Description
Memory Access—Read/Write	Check or uncheck	Check	To define the read/write capability of the object
Object Type	Single point, Double point, Step position, Bitstring of 32 bit, Measured value (Normalized), Measured value (Scaled), Measured value (Floating), Integrated totals	Single point	The server object that the PMM0403 would like to collect
IOA (start...end)	1 – 16777215	-	Set a range of IOA
Pulse Duration	None, Short Pulse, Long Pulse, Persistent Output	None	-
Fault Protection	Keep latest data Clear all data bits to	Keep latest data	If the PMM0403's connection to the other side (server/slave) fails, the gateway will not be able to receive

	0 Set to user defined value		data, but the gateway will continuously send output data to the Modbus TCP server device. To avoid problems in this case, thePMM0403 can be configured to react in one the following three ways: Keep latest data, clear data to zero, set the data bits to user-defined values.
Fault Protection Timeout	1-86400 s	60s	Defines the communication timeout for the opposite side.

### 4.3.7.6 A6. Protocol Settings- IEC 60870-5-104 Server Settings

Figure 21 IEC 60870-5-104 Server Settings

Parameter	Value	Default	Description
COT size	1-2	2	Set the size of ASDU COT field
ASDU address	1-65534	3	The address of the IEC 60870-5-104 server
Listen port	1024-60000	2404	Set IEC 60870-5-104 server listen port
K	1-32	12	Maximum number of unacknowledged I format transmitted APDUs
W	1-32	8	Maximum number of unacknowledged I format received APDUs
T0 timeout	1-3000000 ms	1000	Timeout of determination if a connection has been lost with the remote server
T1 timeout	1-3000000 ms	15000	Timeout of waiting for acknowledgement of a transmitted APDU
T2 timeout	1-3000000 ms	10000	Timeout of when to send S-format to the host to acknowledge outstation messages received
T3 timeout	1-172800000 ms	20000	Timeout of sending test frame to prevent from long idle state
Timestamp reference	Local time	UTC	Command with timestamp refers to UTC or Local time.
Enable cse active termination	Enable/Disable	Enable	Send ACT TERM to Master upon completion of commands CSENA, CSENB, CSENC.
Enable cmd active termination	Enable/Disable	Enable	Send ACT TERM to Master upon completion of commands CSCNA, CDCNA, CRCNA, CBONA
Select timeout	0-600 s; 0 for executing onl	10	0: Do not need to receive a select command before receiving an execute command Others: A valid execute command must be received during

			timeout after receiving select command
General interrogation time tag	None 24 bits 56 bits	None	General interrogation response with/without time stamp
Event timestamp format	None 24 bits 56 bits	56 bits	Event with/without time stamp
Measured value cyclic timestamp format	None 24 bits 56 bits	None	Measured value cyclic with/without time stamp
Measured value spontaneous	Enable/disable	Enable	Enable/disable spontaneous feature
Measured value (Normalized) cyclic interval	0-2073600 s; 0 for disable	0	Cyclic sends measured value (normalized value)
Measured value (Scaled) cyclic interval	0-2073600 s; 0 for disable	0	Cyclic sends measured value (scaled value)
Measured value (Floating) cyclic interval	0-2073600 s; 0 for disable	0	Cyclic sends measured value (short floating-point number)
Point status timeout	5-3600 s; 0 for disable	60	Check the PMM0403's internal memory to see if the object points updated periodically. Once time happens, the object point's flag will change to "invalid".
Endian swap	None Byte Word Byte and Word	Byte	Data Byte Swapping <b>None:</b> Don't need to swap <b>Byte:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0B, 0x0A, 0x0D, 0x0C <b>Word:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0C, 0x0D, 0x0A, 0x0B <b>Byte and Word:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0D, 0x0C, 0x0B, 0x0A

IEC 60870-5-104 Server

Points Settings

Action	Name	M/A Read	M/A Write	Object Type	IOA	Group	Scale	IOA Threshold	IOA Low Limit	IOA High Limit
--------	------	----------	-----------	-------------	-----	-------	-------	---------------	---------------	----------------

Figure 22 Point Settings- IEC 60870-5-104 Server

Parameter	Value	Default	Description
Memory Access—Read/Write	Check or uncheck	Check	To define the read/write capability of the object
Object Type	Single point, Double point, Step position, Bitstring of 32 bit, Measured value (Normalized), Measured value (Scaled), Measured value (Floating), Integrated totals	Single point	The server object that the PMM0403 would like to collect
IOA (start...end)	1 – 16777215	-	Set a range of IOA



Parameter	Value	Default	Description
Group	Integrated by station interrogation, Integrated by group 1~16 interrogation	Integrated by station interrogation	The definition of the objects
Threshold	Measured value (Normalized): 0 ~ 0xFFFF Measured value (Scaled): 0 ~ 65535 Measured values (Floating): 0 ~ 10000000	0	Event Trigger: Current Reported Value - Last Reported Value   > Threshold
Low Limit	Measured value (Normalized): 0 ~ 0xFFFF Measured value (Scaled): - 32768 ~ 32767 Measured values (Floating): -999999 ~ 10000000	0	Event Trigger: Current Reported Value < Low Limit Current Reported Value returns to above Low Limit
High Limit	Measured value (Normalized): 0 ~ 0xFFFF Measured value (Scaled): - 32768 ~ 32767 Measured values (Floating): -999999 ~ 10000000	0	Event Trigger: Current Reported Value > High Limit Current Reported Value returns to below High Limit

#### 4.3.7.7 A7. Protocol Settings- IEC 60870-5-101 Master Settings

**IEC60870-5-101 Master & Master's Slave**

<p><b>Basic Settings - Link Layer</b></p> <p>Link Mode: <input type="radio"/> Unbalanced Transmission <input type="radio"/> Balanced Transmission</p> <p>Link address size: <input type="text" value="1"/> (0-254)</p> <p>Organitor address: <input type="text" value=""/> (0-255)</p> <p>Slave address: <input type="text" value=""/> (0-255)</p> <p>Common address: <input type="text" value=""/> (0-255)</p>	<p><b>Basic Settings - Application Layer</b></p> <p>ASDU size: <input type="radio"/> 1 <input type="radio"/> 2</p> <p>COT size: <input type="radio"/> 1 <input type="radio"/> 2</p> <p>IOA size: <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3</p> <p>CA size: <input type="radio"/> 1 <input type="radio"/> 2</p>	<p><b>Advanced Settings - Link Layer</b></p> <p>Frame timeout: <input type="text" value=""/> (1-2073600000 ms)</p> <p>Link confirm mode: <input type="text" value="Always"/> (v)</p> <p>Link layer retry: <input type="text" value=""/> (0-254)</p> <p>Offline poll period: <input type="text" value=""/> (1-2073600 s)</p> <p>Use Single Char ACK: <input type="text" value="true"/> (v)</p>
---	--	---

Figure 23 Master Setting

Parameter	Value	Default	Description
Link mode	Unbalanced Transmission/ Balanced Transmission	Unbalanced Transmission	The transmission ways of IEC 60870-5- 101 protocol
Link address size	1-2	2	Set the size of the Link address field specified in Link transactions for the relevant slave session
ASDU size	1-2	2	Set the size of the ASDU address field for the relevant slave session

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

The screenshot shows the PMM Point Settings configuration interface. It is organized into several sections:

- Basic Settings:** Device Name (0), Link Address (0-65534), ASDU Address (0-65534).
- General Interrogation Settings:** Initial General Interrogation (Enable), Cyclic general Interrogation interval (600), and 16 Cyclic Interrogation group intervals (all set to 0).
- Counter Interrogation Settings:** Initial counter Interrogation (Enable), Cyclic counter Interrogation interval (0), and 4 Cyclic Interrogation counter group intervals (all set to 0).
- Advanced Settings - Link Layer:** Link confirm timeout (0), Class 1 poll delay (0), and Class 2 poll delay (0).
- Advanced Settings - Application Layer:** Timestamp reference (UTC), Enable cse active termination (Enable), Enable cmd active termination (Enable), wait terminate timeout (1-1000 s), Initial clock sync (Enable), Cyclic clock sync interval (0-86400 s), and Endian swap (None).

Figure 24 Point Settings

Parameter	Value	Default	Description
Device name	An alphanumeric string	Device 1	You can enter a name to help you identify the unit, such as the function, etc.
Link address	0-65534	3	Indicate link address of IEC 60870-5- 101 slave that the PMM0403 connects to
ASDU address	0-65534	1	Indicate ASDU address of IEC 60870-5- 104 server that PMM0403 connects to
Initial general interrogation	Enable/Disable	Enable	IEC 60870-5-101 master does general interrogation with slave or not
Cyclic general interrogation interval	0-86400 s; 0 for disable	600	Cyclic general interrogation command polling time to IEC 60870-5-101 slave
Cyclic interrogation group interval	0-86400 s; 0 for disable	0	Cyclic interrogation group command polling time to IEC 60870-5-101 slave
Initial counter interrogation	Enable/Disable	Enable	IEC 60870-5-101 master does counter interrogation with slave
Cyclic counter interrogation interval	0-86400s, 0 for disable	600	Cyclic counter interrogation command polling time to IEC 60870-5-101 slave
Cyclic interrogation counter group interval	0-86400s, 0 for disable	0	Cyclic interrogation counter polling time to IEC 60870-5-101 slave

Link confirm timeout	1-2073600000 ms	2000	Timeout for repetition of frames in IECIEC 60870-5-101 data link layer(TO)
Class 1 poll delay	0-2073600000 ms, 0 for disable	0	Set the minimum milliseconds to delay between Class 1 polls for pending data
Class 2 poll delay	0-2073600000 ms, 0 for disable	500	Set the minimum milliseconds to delay between Class 2 polls for pending data
Timestamp reference	Local time	UTC	Command with timestamp references to UTC or Local time.
Enable cse active termination	Enable/Disable	Enable	IEC 60870-5-101 master expects ACT TERM from slave upon completion of commands CSENA, CSENB, CSENC
Enable cmd active termination	Enable/Disable	Enable	IEC 60870-5-101 master expects ACT TERM from slave upon completion of commands CSCNA, CDCNA, CRCNA, CBONA
Wait terminate timeout	1-100s	10	The period waiting for ACT TERM from slave upon completion of all control commands
Initial clock sync	Enable/Disable	Enable	IEC 60870-5-101 master synchronize clock of IEC 60870-5-101 slave or not
Cyclic clock sync interval	0-86400s, 0 for disable	600	Cyclic clock sync command polling time to IEC 60870-5-101 slave
Endian swap	None Byte Word Byte and Word	Byte	Data Byte Swapping <b>None:</b> Don't need to swap <b>Byte:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0B, 0x0A, 0x0D,0x0C <b>Word:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0C, 0x0D, 0x0A, 0x0B <b>Byte and Word:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0D, 0x0C, 0x0B, 0x0A
Select/Execute mode	Select/Execute, Execute Only	Select/Execute	<b>Select/Execute:</b> Writes occur with a dual command/response from the device. <b>Execute Only:</b> Writes occur with a single command/response from the device.

Point Settings



Action	Name	M/A Read	M/A Write	Object Types	IOA	Scale	Pulse Duration	Fault Protection	Fault Protection ...	Timestamp Format
--------	------	----------	-----------	--------------	-----	-------	----------------	------------------	----------------------	------------------

Figure 25 Point Settings

Parameter	Value	Default	Description
Memory Access—Read/Write	Check or uncheck	Check	To define the read/write capability of the object
Object Type	Single point, Double point, Step position, Bitstring of 32 bit, Measured value (Normalized), Measured value (Scaled), Measured value (Floating), Integrated totals	Single point	The server object that the PMM0403 would like to collect
IOA (start...end)	1 – 16777215	-	Set a range of IOA
Pulse Duration	None, Short Pulse, Long Pulse, Persistent Output	None	-

Fault Protection	Keep latest data Clear all data bits to 0 Set to user defined value	Keep latest data	If the PMM0403's connection to the other side (server/slave) fails, the gateway will not be able to receive data, but the gateway will continuously send output data to the Modbus TCP server device. To avoid problems in this case, the PMM0403 can be configured to react in one the following three ways: Keep latest data, clear data to zero, set the data bits to user-defined values.
Fault Protection Timeout	1-86400 s	60s	Defines the communication timeout for the opposite side.

#### 4.3.7.8 A7. Protocol Settings- IEC 60870-5-101 Slave Settings

**IEC 60870-5-101 Slave**

<p><b>Basic Settings - Link Layer</b></p> <p>Link Mode: <input type="radio"/> Unbalanced Transmission <input type="radio"/> Balanced Transmission</p> <p>Link address size: <input type="text" value="1"/></p> <p>Common address: <input type="text" value="0-255"/></p>	<p><b>Basic Settings - Application Layer</b></p> <p>ASDU size: <input type="radio"/> 1 <input type="radio"/> 2</p> <p>COT size: <input type="radio"/> 1 <input type="radio"/> 2</p> <p>IOA size: <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3</p> <p>CA size: <input type="radio"/> 1 <input type="radio"/> 2</p>	<p><b>Basic Settings</b></p> <p>Datalink address: <input type="text" value="0-65534"/></p> <p>ASDU address: <input type="text" value="0-65534"/></p> <p>Organitor address: <input type="text" value="0-255"/></p> <p>Slave address: <input type="text" value="0-255"/></p>
<p><b>Advanced Settings - Link Layer</b></p> <p>Frame timeout: <input type="text" value="1-2073600000 ms"/></p> <p>Link confirm timeout: <input type="text" value="1-2073600000 ms"/></p> <p>Link layer retries: <input type="text" value="1-254"/></p> <p>Single char ack allowed: <input type="text" value="Enable"/></p> <p>single Char Response Allow: <input type="text" value="Enable"/></p> <p>Class 1 Queue Size: <input type="text" value="5-250"/></p>	<p><b>Advanced Settings - Application Layer</b></p> <p>Timeout reference: <input type="text" value="UTC"/></p> <p>Enable cse active termination: <input type="text" value="Enable"/></p> <p>Enable cmd active termination: <input type="text" value="Enable"/></p> <p>Select timeout (select/execute): <input type="text" value="1-2073600 s, 0 for executing only"/></p> <p>General interrogation timestamp f...: <input type="text" value="None"/></p> <p>Event timestamp format: <input type="text" value="None"/></p>	<p><b>Advanced Settings</b></p> <p>Measured value spontaneous: <input type="text" value="Enable"/></p> <p>Measured value(N)cyclic interval: <input type="text" value="0-2073600s, 0 for disable"/></p> <p>Measured value(F)cyclic interval: <input type="text" value="0-2073600s, 0 for disable"/></p> <p>Measured value(S)cyclic interval: <input type="text" value="0-2073600s, 0 for disable"/></p> <p>Point Status Timeout: <input type="text" value="0. Disabled 5 - 3600 second"/></p> <p>Endian swap: <input type="text" value="None"/></p>

Figure 26 Protocol Settings

Parameter	Value	Default	Description
Link mode	Unbalanced Transmission/ Balanced Transmission	Unbalanced Transmission	The transmission ways of IEC 60870-5- 101 protocol
Link address size	1-2	2	Set the size of the Link address field specified in Link transactions for the relevant slave session
ASDU size	1-2	2	Set the size of the ASDU address field for the relevant slave session
COT size	1-2	1	Set the size of ASDU COT field
IOA size	1-3	2	Set the size of the IOA address field for the relevant slave session
Link address	0-65534	3	Indicate the PMM0403's link address of IEC 60870-5-101 slave
ASDU address	1-65534	3	Indicate the PMM0403's ASDU address of IEC 60870-5-101 slave
Frame timeout	1-2073600000 ms	15000	Timeout for serial port to decide whether a frame is completely received or not

Link confirm timeout	1-2073600000 ms	2000	Timeout for repetition of frames in IEC 60870-5-101 data link layer(T0)
Link layer retries	0-254	3	The number of retry when link confirm timeout
Single char ack allowed	Enable/Disable	Disable	Slave will transmit a single character ACK instead of a confirm for SEND-CONFIRM frame
Single char response allow	Enable/Disable	Disable	Slave will transmit a single character response instead of a response for REQUEST-RESPONSE frame
Timestamp reference	UTC, Local Time	UTC	Command with timestamp references to UTC or Local time.
Enable cse active termination	Enable/Disable	Enable	IEC 60870-5-101 master expects ACT TERM from slave upon completion of commands CSENA, CSENB, CSENC
Enable cmd active termination	Enable/Disable	Enable	IEC 60870-5-101 master expects ACT TERM from slave upon completion of commands CSCNA, CDCNA, CRCNA, CBONA
Select timeout	0-2073600s, 0 for executing only	10	0: Do not need to receive a select command before receiving an execute command Others: A valid execute command must be received during timeout after receiving select command
General interrogation time tag	None 24 bits 56 bits	24 bits	General interrogation response with/without timestamp
Event timestamp format	None 24 bits 56 bits	56 bits	Event with/without timestamp
Measured value cyclic timestamp format	None 24 bits 56 bits	None	Measured value cyclic with/without timestamp
Enable cmd active termination	Enable/Disable	Enable	IEC 60870-5-101 master expects ACT TERM from slave upon completion of commands CSCNA, CDCNA, CRCNA, CBONA
Measured value(N)cyclic interval	0-2073600s, 0 for disable	0	Cyclic send Measured value, normalized value
Measured value(S)cyclic interval	0-2073600s, 0 for disable	0	Cyclic send Measured value, scaled value
Measured value(F)cyclic interval	0-2073600s, 0 for disable	0	Cyclic send Measured value, short floating-point number
Point Status Timeout	0: Disabled 5 – 3600 second	60	If the data objects don't update in a period of time, the timeout will be happened with invalid flag for the object.
Endian Swap	None Byte Word Byte and Word	Byte	Data Byte Swapping <b>None:</b> Don't need to swap <b>Byte:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0B, 0x0A, 0x0D,0x0C <b>Word:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0C, 0x0D, 0x0A, 0x0B <b>Byte and Word:</b> 0x0A, 0x0B, 0x0C, 0x0D becomes 0x0D, 0x0C, 0x0B, 0x0A

IEC 60870-5-101 Slave



Points Settings

Action	Name	M/A Read	M/A Write	Object Type	IOA	Group	Scale	IOA Threshold	IOA Low Limit	IOA High Limit	Classes
--------	------	----------	-----------	-------------	-----	-------	-------	---------------	---------------	----------------	---------

Figure 27 Point Settings- IEC 60870-5-101

Parameter	Value	Default	Description
Memory Access—Read/Write	Check or uncheck	Check	To define the read/write capability of the object
Object Type	Single point, Double point, Step position, Bitstring of 32 bit, Measured value (Normalized), Measured value (Scaled), Measured value (Floating), Integrated totals	Single point	The server object that the PMM0403 would like to collect
IOA (start...end)	1 – 16777215	-	Set a range of IOA
Group	Integrated by station interrogation, Integrated by group 1~16 interrogation	Integrated by station interrogation	The definition of the objects
Threshold	Measured value (Normalized): 0 ~ 0XFFFF	0	Event Trigger:  Current Reported Value - Last Reported Value  > Threshold
Low Limit	Measured value (Scaled): 0 ~ 65535	0	Event Trigger: Current Reported Value < Low Limit Current Reported Value returns to above Low Limit
High Limit	Measured value (Floating): 0 ~ 10000000	0	Event Trigger: Current Reported Value - Last Reported Value   > Threshold

#### 4.4 IO Mapping

After you have configured each side (client/master and server/slave) of the PMM0403 settings, the PSCADA/PLC in the master role will start monitoring and controlling the remote slave device. The PMM0403 uses its internal memory to facilitate data exchange. The I/O Data Mapping page shows the complete mapping status. There are two communication directions: read and write directions. You can change the settings of Data flow direction to show read or write mapping status. For example, see the read direction example: The PMM0403 as Modbus RTU/ASCII client/master and IEC 60870-5-104 server. It shows how IEC 60870-5-104 client reads the data from the Modbus RTU/ASCII server/slave device. As you can see, Modbus RTU client/master sends a “Read command” to read the value from the Modbus server/slave device. If IEC 60870-5-104 client wants to read the value from the “read command”, it must read the data from “Measured value(N)” IOA “1” because of same internal address. If you find that the data mapping is not correct, you can change the setting of Mapping address arrangement from “Automatic” to “Manual”. Then, you can adjust the internal address by yourself.

##### ⚙️ Connection Mapping

📁 Points Mapping
+

Connection 1:

Connection 2:

📁 Role 1
+

Action	Index	Name	Connection 1 Po...	Data Flow	Script	Connection 2 Po...	Options

Figure 28 Connection Mapping

## 4.5 IEC 60870 Monitoring

PMM0403 provides easy-to-use and useful troubleshooting tools. If a communication issue occurs, we suggest that you go to Monitoring tab Diagnostic page for the status of the protocol. To analyze the Modbus RTU/ASCII/TCP or IEC 60870-5-101/104 traffic in detail. You can choose the connections name type and statue on the left table if the status is good, it will be in green if not it will be in red.

The screenshot displays the Monitoring interface with two main panels. At the top, there is a 'Monitoring' tab and an 'Auto Refresh' checkbox which is checked. The left panel, titled 'Connections Monitor', features a 'Connect...' dropdown menu and a table with columns: Action, Connection, Status, Time, and Enabled. The table currently shows 'No Data Available Now'. Below the table is a legend with three colored boxes: a green box labeled 'Good', a red box labeled 'Error', and a white box labeled 'Idle'. The right panel, titled 'Tags / Points Monitor', has a 'Connection' dropdown set to 'All' and a 'Tag' dropdown. Below these are two icons. The table in this panel has columns: Action, Tag Name, Raw Value, Ordered Value, Value, and Slave ID. The table is currently empty.

Figure 29 Monitoring