ICP DAS

PMC-224xM-iWSN

Power Meter Concentrator Series

User Manual

[Version 1.1.0]

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1 System Introduction

The PMC-224xM-iWSN(Power Meter Concentrator) is an intelligent Power Meter Concentrator developed by ICP DAS. It features various functions such as: power data management, logic control, data logger and alarm notification functions for ICP DAS iWSN wireless power meter. By using PMC-224xM-iWSN; it is no longer required to write programming for power management system. It takes only a few clicks on the specific Web HMI Interface provided by PMC-224xM-iWSN to complete power management and logic control settings for monitoring the iWSN wireless power meters connected to the controller. This easy-to-use solution will dramatically reduce the labor and cost spent on power monitoring and management system.

Following is the specification of PMC-224xM-iWSN series products:

Specification	
Power Meter and I/O module support	● Up to 3 iWSN-200 iWSN data concentrators be connected, supporting up to 93 ICP DAS iWSN wireless modules. ● Supported iWSN wireless module types: ■ Power meter : iWSN-9603 ■ Signal sensing module: iWSN-110X, iWSN-121A, iWSN-1310. Please note: PMC-224xM-iWSN only supports iWSN wireless modules. It cannot connect with ICP DAS PM-3xxx/ PM-4xxx power meter, XV-Board and other wired Modbus I/O module.
Software function support	PMC-2241M-iWSN: The same function supports as PMC-2241M provide. PMC-2246M-iWSN: The same function supports as PMC-2241M provide, and also support WeChat message sending operation.

Through RS-485 or Ethernet interface, PMC-224xM-iWSN allows connection to ICP DAS iWSN-200 data concentrator to collect the power usage data or sensor data of the equipments measured by ICP DAS iWSN wireless power meters and wireless I/O modules; and then real-time record the power data and sensor data in the data log file. PMC-224xM-iWSN also provides data log file auto send-back function; together with PMC Data Server software or SCADA software, it allows collection and analysis of

the power usage information of the equipments measured by ICP DAS iWSN wireless module.

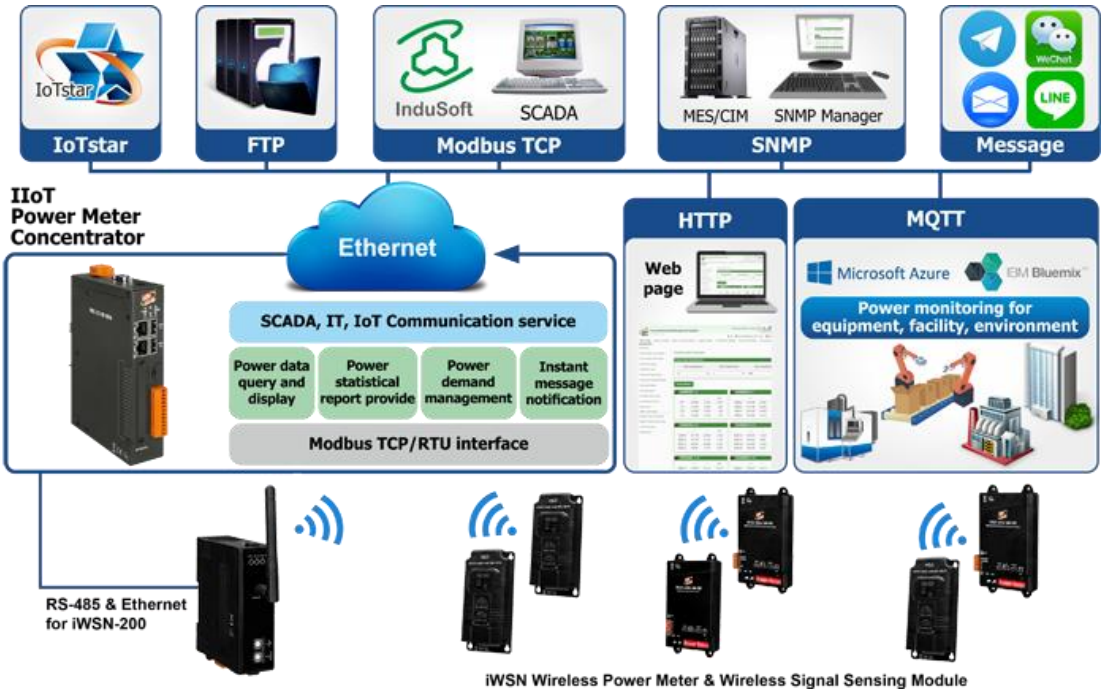


Figure1-1 : System Architecture

With the built-in Web Server, it allows connection to PMC-224xM-iWSN for power meter parameters and system settings via browser and allows viewing the real time or historical power data of the power meters. PMC-224xM-iWSN also provides more thought-out power demand management and alarm notification mechanism through IF-THEN-ELSE logic rule execution capabilities and alarm message sending functions. At the same time, with the Data Logger function on microSD card, the PMC-224xM-iWSN could real-time record the power data and I/O channel data, and automatically sends back the data log file to management center for further statistics and analysis; PMC-224xM-iWSN also offers Modbus TCP/RTU Slave function that allows SCADA software or HMI devices to connect to it to get real-time power data of the devices via Modbus TCP/RTU protocol. They also support the MQTT protocol to connect with the MQTT broker for the message publishing and subscribing mechanism, and can connect with the IoT service which Microsoft Azure and IBM Bluemix provide. In addition, PMC-224xM-iWSN can also connect with ICP DAS IoTstar IoT cloud management software. The flexible integration ability with the SCADA/IoT/IT system make PMC-224xM-iWSN a perfect concentrator of wireless iWSN power meter in the Energy monitoring and management application.

When using PMC-224xM-iWSN to build a power management and monitoring

system, during the whole process of system development, no programming is required; it takes a few clicks on web page to complete all settings; it is easy for the user to quickly view the power data of the devices and furthermore process the data for statistics and analysis. PMC-224xM-iWSN is an easy-to-use and easy-to-build total solution for power management and monitoring that makes more efficient energy usage.

Features of PMC-224xM-iWSN:

- Web-Based Operation
  - ◆ No extra software tool is required; all operations can be done through the Web browsers to build a power monitoring & management solution.
  - ◆ Built-in Web Server allows to set up the parameters of the power meters and view power data via browsers.
- Power Data Display
  - ◆ Support ICP DAS iWSN-9603 wireless power meter for real-time power usage monitoring.
  - ◆ Display real-time or historical power data (in data table or chart form).
  - ◆ Provides Daily and Monthly power data report.
- Power Data Log
  - ◆ Provides real-time power data log of the power meters (in csv format).
  - ◆ Automatically send back power data files at scheduled time via FTP.
  - ◆ Allow to recover Data Log files when the network is resumed after temporary network disconnection.
  - ◆ Together with PMC Data Server software, it allows to import the content of the power data files into the Database system.
- Power Demand Management and Alarm Notification
  - ◆ With built-in IF-THEN-ELSE logic engine that enables thought-out power demand management functions.
  - ◆ Support ICP DAS iWSN-110X, iWSN-121A, iWSN-1310 wireless I/O modules for real-time I/O control and monitoring.
  - ◆ Provides Timer & Schedule function for device operation control.
  - ◆ Provides alarm message notification function.
- Connection with SCADA/IT/IoT system
  - ◆ Support Modbus TCP/RTU Slave protocol that allows seamless integration with SCADA software.
  - ◆ Support MQTT protocol, and can publish the power data to MQTT broker, and receive the message of the Subscribe MQTT Topics which is published by others MQTT device for the using in the IF-THEN-ELSE logic rule.

- ◆ Support the connection ability with the IoT Cloud Platform as Microsoft Azure, IBM Bluemix, etc. It work as the power meter concentrator in the IoT application to connect with power meters, collect and transfer the power data to the Cloud platform for future data analysis. PMC-224xM-iWSN also can receive the message which is published from the Cloud platform for the corresponding actions at the field side.
- ◆ Support the connection ability with ICP DAS IoTstar. It enables the remote management and firmware update on the PMC-224xM-iWSN controller via user-friendly and intuitive Web page interface, and receive the power data and I/O channel data of the Sensors and Power meters from the remote PMC-224xM-iWSN controllers and import them into the Database.

- Others
  - ◆ Provide the Internal Register with Math function. The Internal Register can be used to hold temporary variables. It also can work with the math operators such as plus"+", minus"-", times"*", divide"/", superscript"^", left parenthesis"(" and right parenthesis")" to complete the editing of formula, then PMC-224xM-iWSN will calculate the result of the formula, and save the result into the Internal Register for IF-THEN-ELSE rule checking or data logging.
  - ◆ Offers access management for logic rule settings and encoded function for the content to avoid unauthorized access to the system.

This document is intended to give you a full-range operation of web page to PMC-224**x**M-iWSN. You will be able to learn how to connect to iWSN wireless power meters and wireless I/O modules, how to display and log the power data, how to edit logic of the rules and how to download the rules to PMC-224**x**M-iWSN for conditional execution. In the following document, we use "PMC" to represent PMC-224**x**M-iWSN series controllers.

2 Before Installation

Modify PMC‘s network settings to fit current network environment settings, and the default network settings of PMC is as follow:

- IP：192.168.255.1
- Subnet mask：255.255.0.0
- Gateway address：192.168.0.1
- DNS Server address：8.8.8.8 (default: Google DNS Server)

Steps

(1) Modify the network settings of the PC or Notebook to be the same network segment as PMC. For example:
   - IP：192.168.255.10
   - Subnet mask：255.255.0.0
   - Gateway address：192.168.0.1

(2) Connect PMC **LAN1** to PC by network cable. (PMC is capable of auto-crossover)

(3) Start the browser and input http://192.168.255.1 in the address bar.

(4) Input default administrator password “Admin” to login into the page.

(5) After login in PMC web page, go to System Setting Network Setting, modify the network setting to fit current network environment. More detailed setting information please refers to 6.2 Network Setting.

(6) Save the settings and connect PMC to the network.

3 System Login

When connect to PMC webpage server via Web browser (IE 8 / Firefox 3.6 / Chrome 14.0.8 version or above are recommended), in order to get a better operation experience, 1280x1024 resolution is recommended. The Login page of PMC is shown as below:

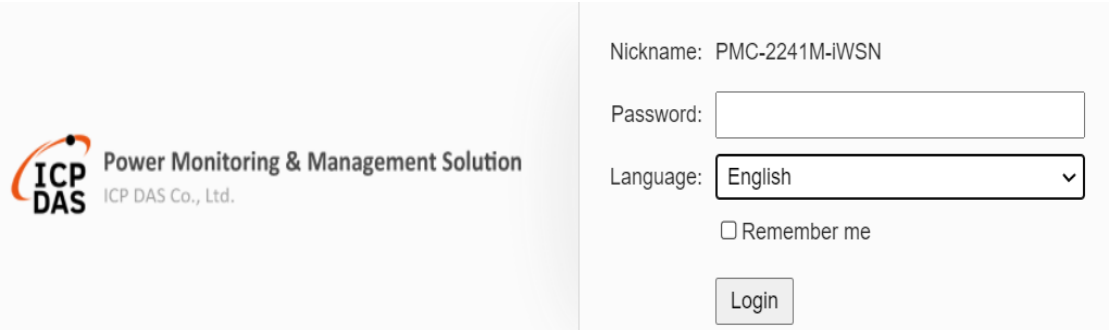


Figure3-1 : PMC Login page

By inputting different passwords, two levels of authority are granted as follow:

- **Administrator (Default password: Admin)**
  Login as an administrator allows performing settings and reviewing of system information, power meter information and I/O modules information, it also allows performing Logic rule edition. Only one administrator is allowed to login into the system at the same time.
- **General User (Default password: User)**
  General users are allowed to view power meter data and I/O module information only; they are not allowed to perform any settings. It allows maximum 5 general users to login and get into the system at the same time.

Select your preferred language from the dropdown list in the “Language” field for the Web page user interface (English, Traditional Chinese, Simplified Chinese). After login into the system, if the user want to change the language again, logout and re-select the language on the Login page.

Please note: Before starting the system, please make sure the browser you are using already enable JavaScript support, otherwise the system will not function properly.

4 System Main Page

After login into the system, PMC default home page will be displayed, and will automatically read settings of the PMC to the webpage.

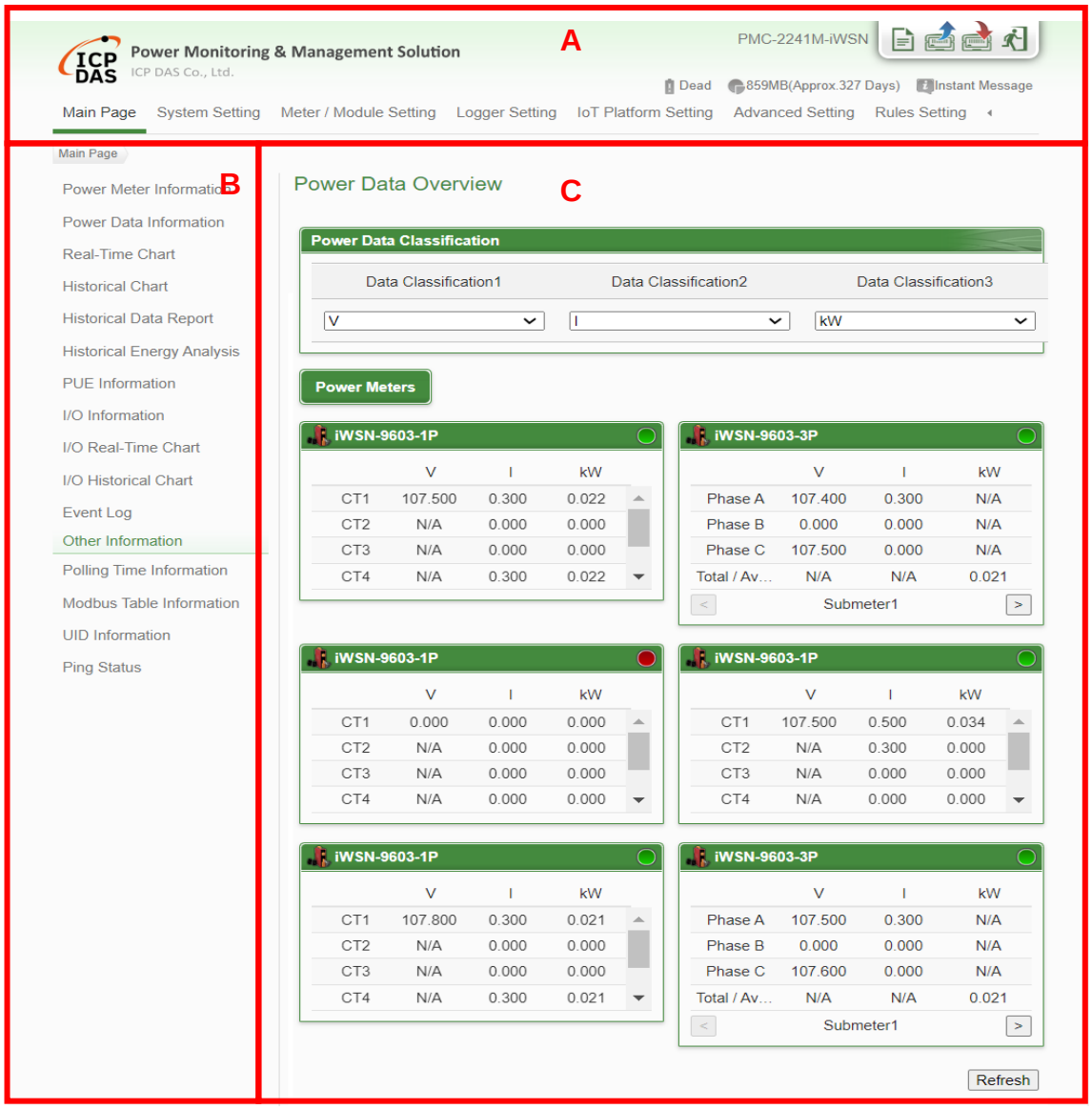


Figure4-1 : Main Page

PMC main page could be divided into 3 areas:

A. System function area
B. Sub-function area
C. Data review/System setting area

More detailed information for each area will be given in the following section.

4.1 System function area

System function area provides immediately access to the main functions of PMC, such as: system settings, system real-time information display, rule files management, etc, shown as below:

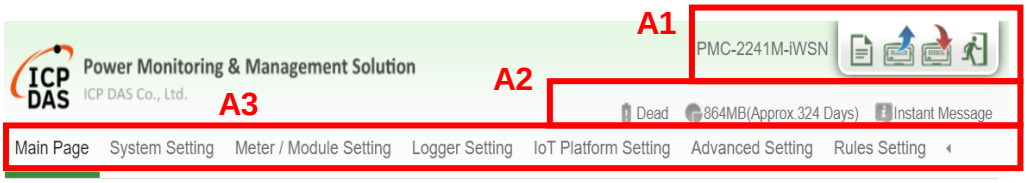


Figure4-2 : System Function Area (login as a Administrator)

System function area includes the following areas:

A1. Rules management toolbar

A2. Real-time information area

A3. System function toolbar

When login as a general user, the setting functions in Rules management toolbar and System function toolbar will be locked, and only allows viewing the power meter data, the I/O module data and Real-time system information. The interface is shown as below:

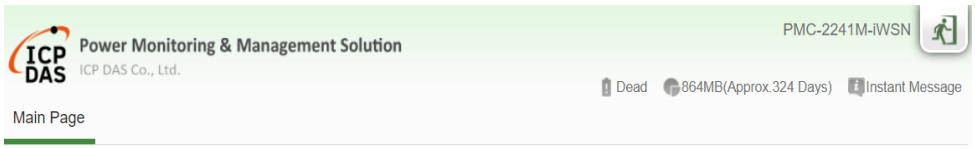


Figure4-3 : System Function Area(login as a General user)

Each function in system function area is as the flowing:

4.1.1 Rules management toolbar

Rules management toolbar allows user to perform different functions. When login into the system as the administrator, the rule management toolbar will be shown as below:

Figure4-4 : Rules management toolbar (login as a Administrator)

If login as a general user, the rule management toolbar will be shown

as below:

Figure4-5 : Rules management toolbar (login as a General user)

The functions of the Rules management toolbar are as follow:

- On the left side of the Rules management toolbar, the user could move the mouse to the nickname field to give a nickname for this PMC in the nickname field for easy recognition.

- "New" button allows resetting the settings of all parameters and Rules. Click on button and click on "OK", the settings on PMC webpage on the browser will be cleared. If the user would like to clear the setting on PMC, then continue to click on "Save" button to save the new settings (cleared settings) to the PMC.

  Please note: once the settings are cleared and save to the PMC, the settings will be cleared permanently.

Figure4-6 : Confirm to clear settings

- "Load" button allows to load all parameter settings and rule settings on PMC. Click on button and click "OK" to load all parameter settings and rules settings from PMC to the web page for further edition.

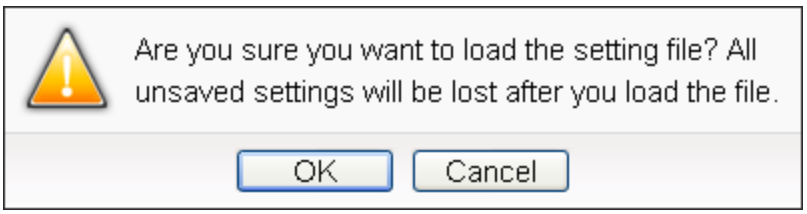


Figure4-7 : Confirm to load settings

- "Save" button allows to save all parameter settings and Rule settings to PMC. Click on button and click "OK" to save all parameter settings and Rule settings from the web page of PMC to

the PMC.

Figure4-8 : Confirm to save settings

- "Logout" button allows to log out the system, click on button and click "OK" to logout the system.

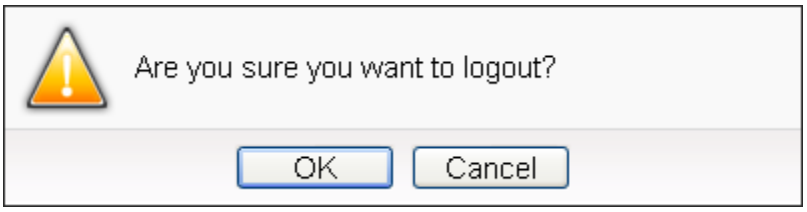


Figure4-9 : Confirm to logout (The settings are saved)

If the settings are not saved to the PMC before performing logout, a warming message will appear as below:

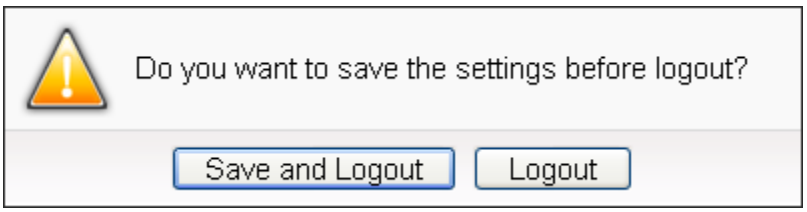


Figure4-10 : Confirm to logout (The settings are not saved)

Please note:

1. All the edited settings on the webpage have to be saved to PMC to make all settings take effect; before click on button, the settings will only be saved on the Web page site, not in the PMC.
2. Please DO NOT logout or close the web page during the process of the edition, otherwise all pre-set settings on the page will be disappeared.

In addition, on the left side of the Rules management toolbar, the user could give a nickname for this PMC in the nickname field for easy recognition.

4.1.2 Real-time information area

Real-time information area allows display of current free space and approximate number of days available to save of the microSD card of the PMC and the real-time system information, shown as below:

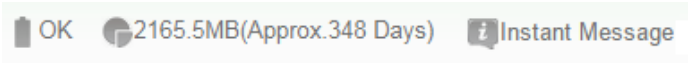


Figure4-11 : Real-time information area

- OK Allows display of the current status of the battery of PMC. Please change the battery when it runs out. Otherwise, the PMC would not keep the system time when it is powered off.
- 2165.5MB(Approx.348 Days) Allows display of the current free space and approxmiate number of days available to save of the micro SD card in PMC.
- Instant Message Allows display of real-time system information, click on "Instant Message"to open up the list of real-time information, maximum 10 information will be kept on the list.

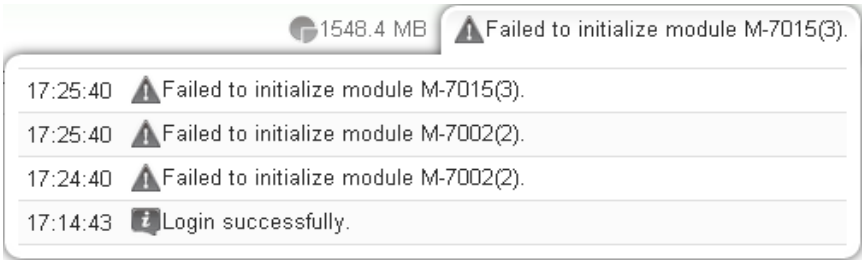


Figure4-12 : Real-time information list

4.1.3 System function toolbar

According to the level of login permission, the System function toolbar will be different. If login as an administrator, all parameter settings and data review function will be enabled; more detailed information of the functions will be give in the following sections.

The System function toolbar includes the following function options:

- Chapter 5: Main Page
- Chapter 6: System Setting
- Chapter 7: iWSN Wireless Power Meter & I/O Module Setting
- Chapter 8: Data Logger Setting
- Chapter 9: IoT Platform Setting
- Chapter 10: Advanced Setting
- Chapter 11: Rule Setting

If login as a general user, they are allowed to view real-time information on Main Page only; they also do not have the permission to edit the settings of the parameters and the rules.

4.2 Sub-function area

Sub-function area will display detailed functions under the selected System function. The user could edit or review detailed function options in the Sub-function area. On the upper Sub-function area, the path of current function will be displayed to show the current function path.

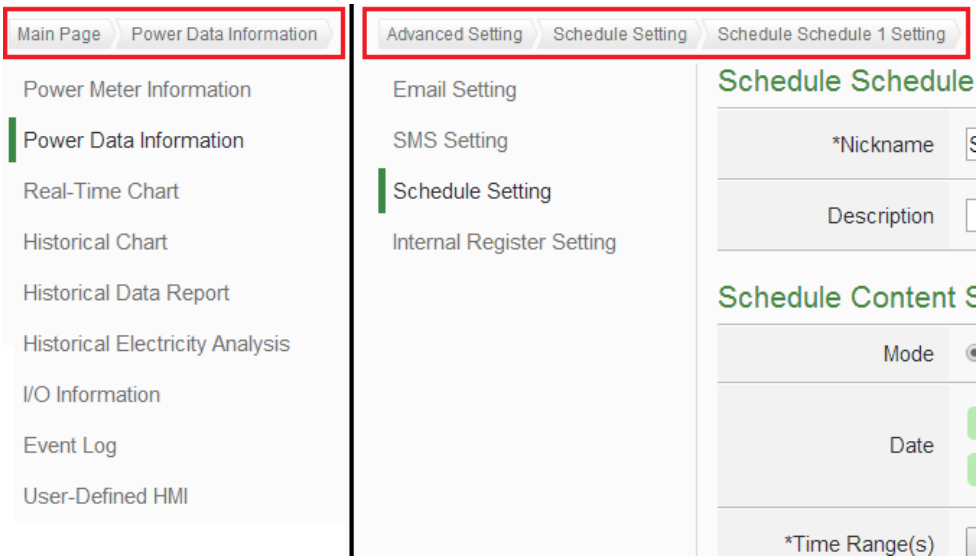


Figure4-13 : Current function path

4.3 Data review/System setting area

Data review/System setting area allows to set system parameters and data review of PMC, the content of this area will be varied according to the sub-function selected. When the user login into the page, the Data review/System setting Area of the Main Page will be Power Data overview page, it will display all power information of the power meters that are connected to the PMC, shown as below:

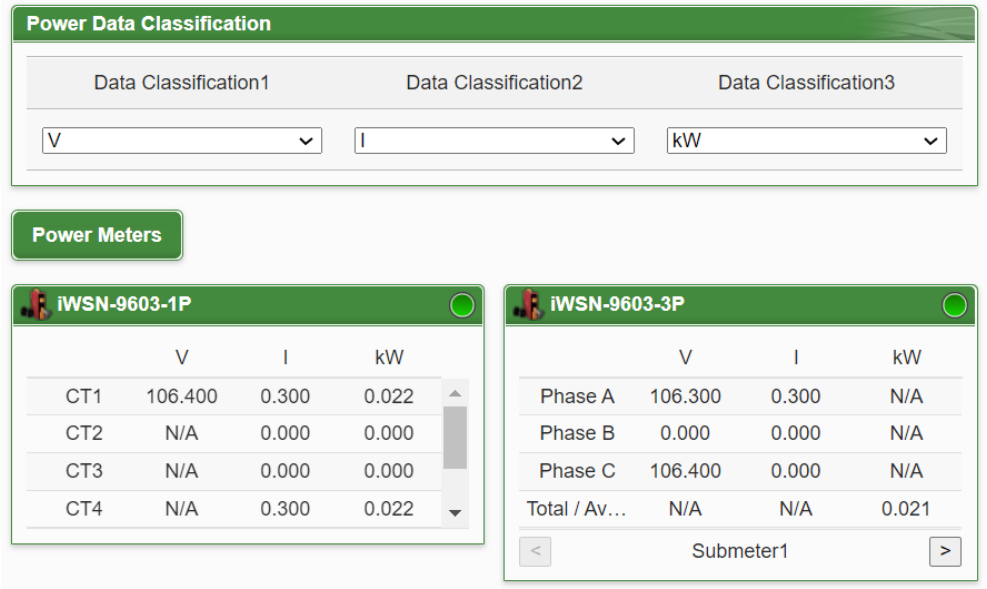


Figure4-14 : Power data Overview page

Power data overview page display the power data of the iWSN power meters that connected to the PMC. Depend on the requirement to select the desired classification of the power data to display the desired power data. The page refreshes every 20 sec, the user could also click “Refresh” button to refresh the data immediately.

The power data classification includes the following options:
V(Voltage), I(Current), kW(Real Power), PF (Power Factor), kWh, Daily Accumulated Electricity, Monthly Accumulated Electricity, Yearly Accumulated Electricity, Daily Carbon Emissions, Monthly Carbon Emissions, Yearly Carbon Emissions, Hourly Maximum Demand, Daily Maximum Demand, Monthly Maximum Demand, Actual Demand and Forecast Demand. The displayed power data will be varied according to the selected power data classification.

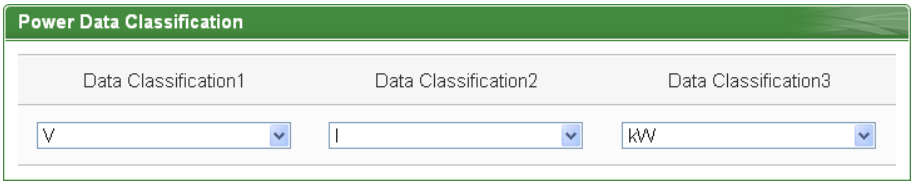


Figure4-15 : Select the classification of Power data

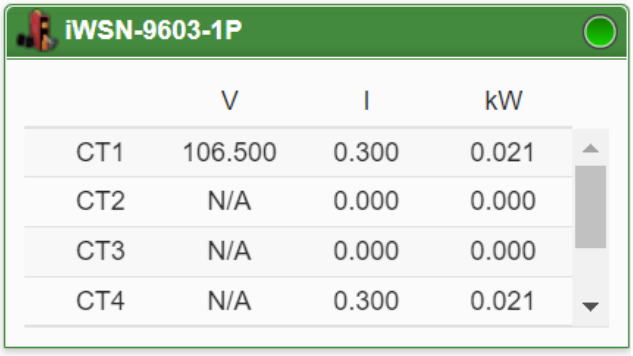


Figure4-16 : Display power data of the selected classification

- "Connection Status" will reveal the connection status between the power meter and PMC, the graphic indicators are as follow:

  : Online : Offline : Connecting

5 Main Page

On the Main Page, the information display options are as follow: Power Meter Information, Power Data Information, Realtime Chart, Historical Chart, Historical Data Report, Historical Electricity Analysis, PUE Information, I/O Information, I/O Realtime Chart, I/O Historical Chart, Event Log, Polling Time Information, Modbus Table Information, UID information and Ping Status, shown as follow:

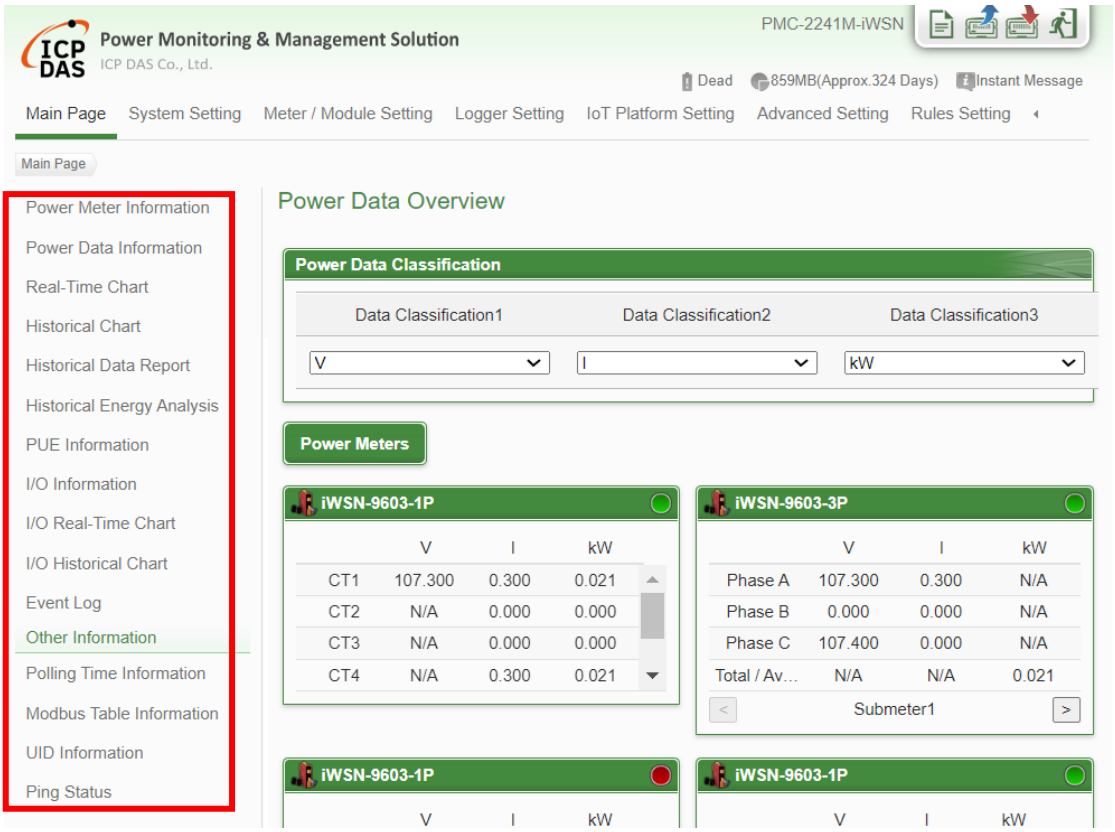


Figure5-1 : Information display options on Main Page

5.1 Power Meter Information

Power Meter Information page displays detailed power data information including: Power Meter Information Overview and Power Meter Statistics Information Overview.

5.1.1 Power Meter Information Overview

After getting into this page, the system will display real-time power information of the selected power meter. To display desired power meter data information, select the power meter from the dropdown list of the “Power Meter List”. The page refreshes every 20 seconds, the user could also click “Refresh” button to refresh the data immediately.

Power Meter Information Overview includes the following sections:

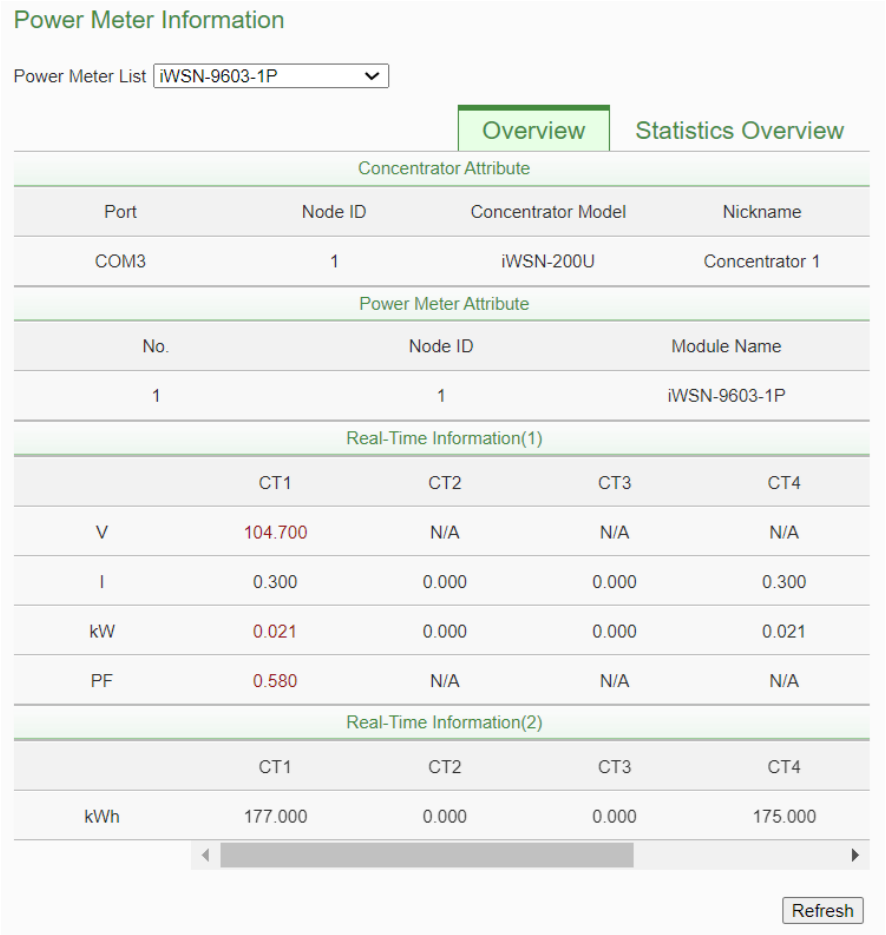
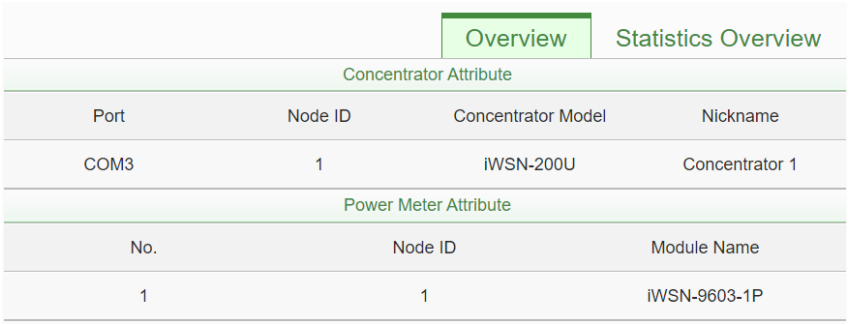


Figure5-2 : Power Meter Information Overview

- Power Meter Attribute

  The Power Meter Attribute section will display different information according to the connection interface between iWSN-200 data concentrator and PMC. Currently PMC supports connection with two iWSN-200 data concentrators as iWSN-200U via Modbus RTU and iWSN-200E via Modbus TCP. If it is iWSN-200U, the Port (Com Port), Node ID, Concentrator model and the iWSN-200U‘s Nickname will be listed, as well as the iWSN power meter number (No.), Node ID, and iWSN power meter’s name; if it is iWSN-200E, the Port (IP address), Node ID, Concentrator model and iWSN-200E’s Nickname will be listed, as well as the power meter number (No.), Node ID, and iWSN power meter’s name.



Overview | Statistics Overview

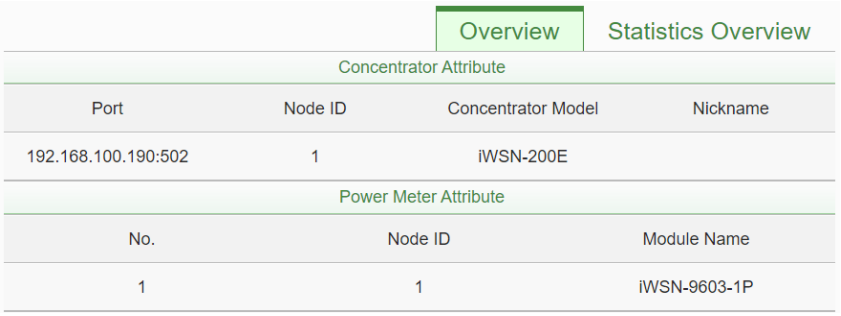
Concentrator Attribute

Port	Node ID	Concentrator Model	Nickname
COM3	1	iWSN-200U	Concentrator 1

Power Meter Attribute

No.	Node ID	Module Name
1	1	iWSN-9603-1P

Figure5-3 : Power Meter Attribute (with iWSN-200U)



Overview | Statistics Overview

Concentrator Attribute

Port	Node ID	Concentrator Model	Nickname
192.168.100.190:502	1	iWSN-200E	

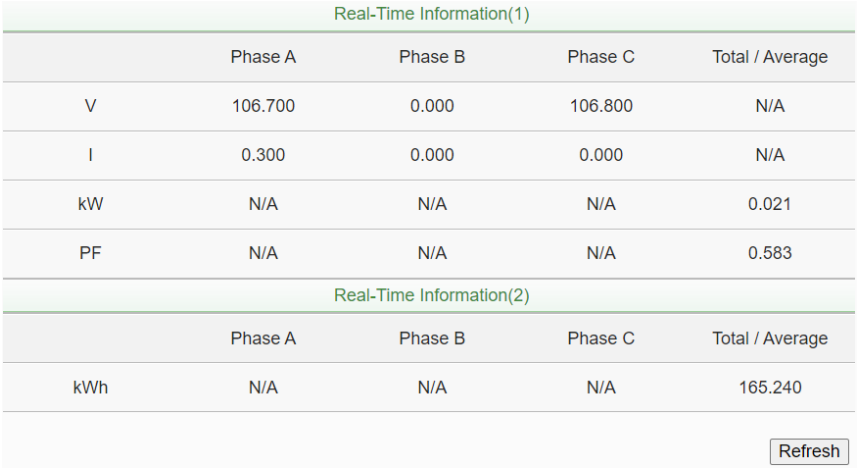
Power Meter Attribute

No.	Node ID	Module Name
1	1	iWSN-9603-1P

Figure5-4 : Power Meter Attribute (with iWSN-200E)

- Real Time Power Information

  In this section, it provides real time iWSN power data information of the selected iWSN Power Meter. For 3 phase power meter, it will display real time information of Phase A, Phase B and Phase C. For single phase power meter, it will display real time information of CT1, CT2, CT3, CT4, CT5 and CT6.



Real-Time Information(1)

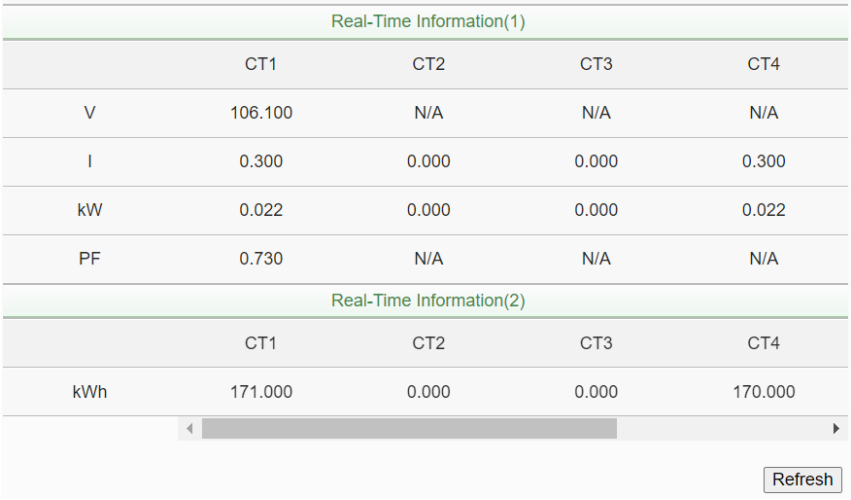
	Phase A	Phase B	Phase C	Total / Average
V	106.700	0.000	106.800	N/A
I	0.300	0.000	0.000	N/A
kW	N/A	N/A	N/A	0.021
PF	N/A	N/A	N/A	0.583

Real-Time Information(2)

	Phase A	Phase B	Phase C	Total / Average
kWh	N/A	N/A	N/A	165.240

Refresh

Figure5-5 : Real Time Power Information (3 phase power meter)



Real-Time Information(1)

	CT1	CT2	CT3	CT4
V	106.100	N/A	N/A	N/A
I	0.300	0.000	0.000	0.300
kW	0.022	0.000	0.000	0.022
PF	0.730	N/A	N/A	N/A

Real-Time Information(2)

	CT1	CT2	CT3	CT4
kWh	171.000	0.000	0.000	170.000

Refresh

Figure5-6 : Real Time Power Information (single phase power meter)

5.1.2 Power Meter Statistics Information Overview

On the Power Meter Statistics Information Overview page, the Demand Information section will display the Actual Demand, Forecast Demand, Contract Capacity, Hourly Maximum Demand, Daily Maximum Demand and Monthly Maximum Demand, etc. In the Statistics Information section, the Daily/Monthly/Yearly Accumulated Electricity and Daily/Monthly/Yearly Carbon Emissions for each loop will be displayed.

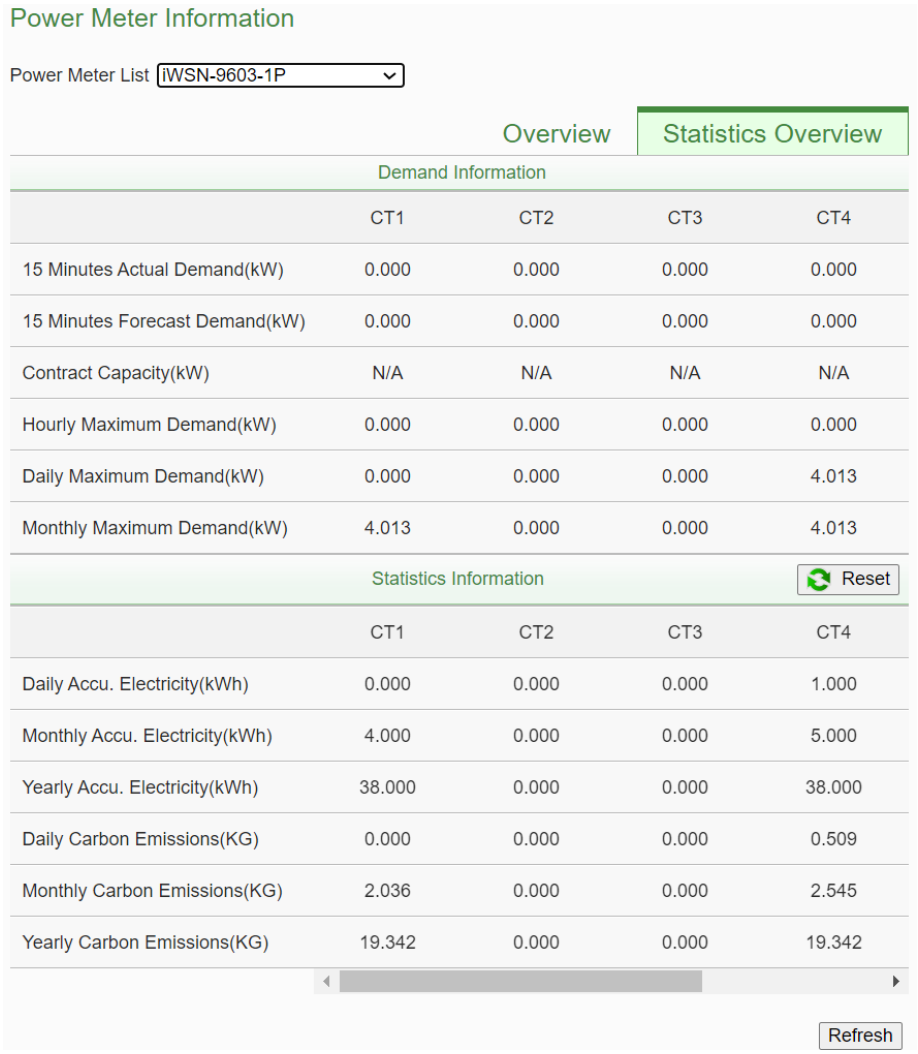


Figure5-7 : Power Meter Statistics Information

- Reset Power Meter Statistics information

  When login as an administrator; the user could click on "Reset" button to set the values such as: Daily/Monthly/Yearly Accumulated Electricity and Daily/Monthly/Yearly Carbon Emissions to default values if required.

5.2 Power Data Information

Power data information can be displayed in two modes (Overview and Group Overview), user can change the viewing mode according to the requirements; more detailed information will be introduced in the following sections.

5.2.1 Overview

Power Data Information overview mode allows display of power data of different power meters at the same time. Select the classification from the dropdown list of the Data Classification field; it will list the requested data from various power meters for easy comparison. The page refreshes every 20 seconds, the user could also click “Refresh” button to refresh the data immediately.

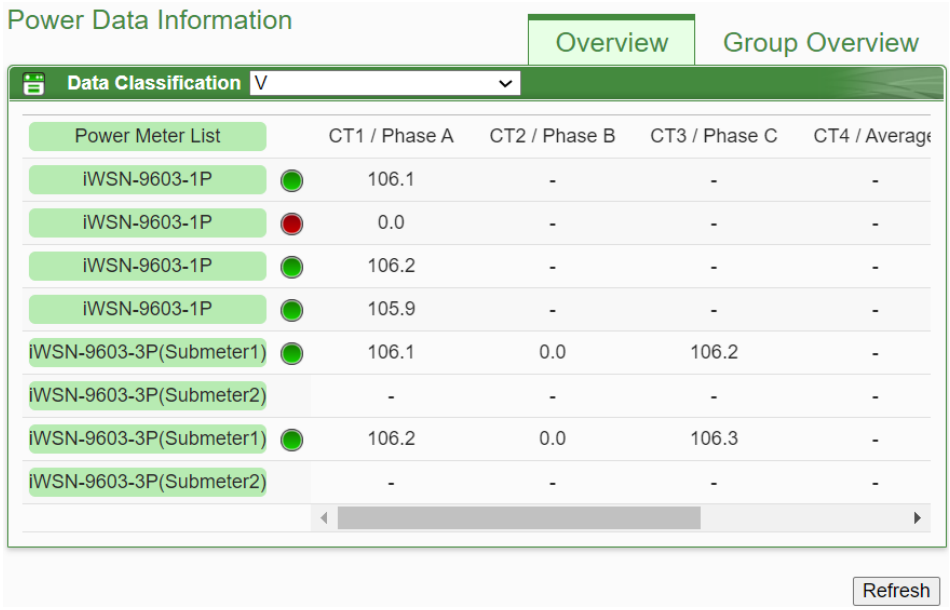


Figure5-8 : Power Data Overview Mode

The graphic indicators next to the power meter will reveal the connection status of the power meter, the indicators are as follow:

: Online : Offline : Connecting

Click on “Change display list” to bring up the Power Meter List window. Select the power meter to be displayed in the power meter list, click “OK” to complete the settings.

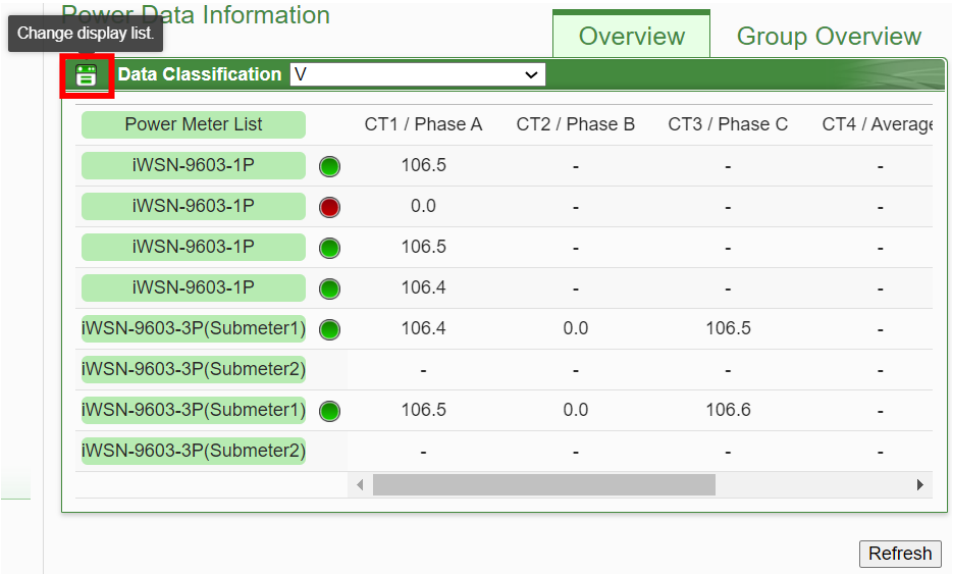


Figure5-9 : Change Display List Button

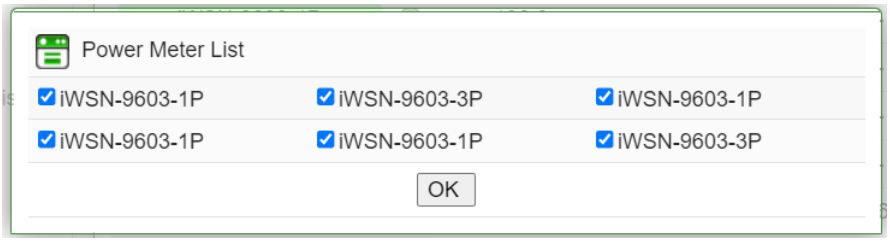


Figure5-10 : The Power Meter List

5.2.2 Group Overview

Power Data Information group overview mode allows display of power data of pre-set group of power meters (please refer to 6.7 Power Meter Group Setting). The page refreshes every 20 seconds, the user could also click “Refresh” button to refresh the data immediately.

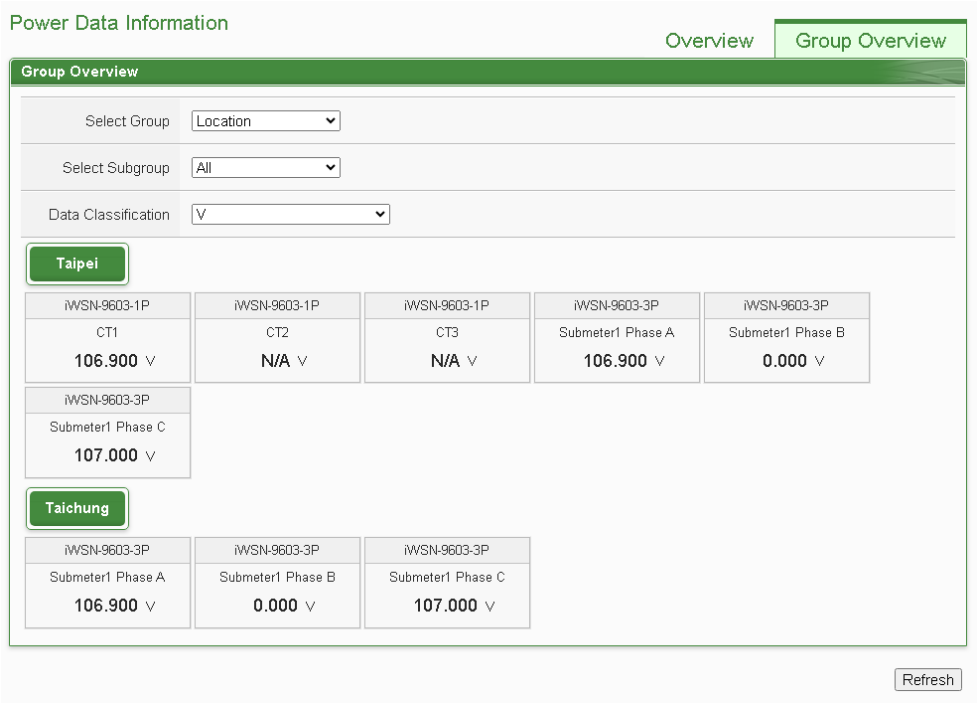


Figure5-11 : Power Data Group Overview Mode

- Select Group

  Select the group from the dropdown list in the “Select Group” field. If no group is pre-set, the inquiry operation will be disabled.

- Select Subgroup

  Select the subgroup from the dropdown list in the “Select Subgroup” field. User can select one subgroup to view or select “All” to view power data of all subgroups.

- Data Classification

  The power data classification includes the following options:

  V(Voltage), I(Current), kW(Real Power), PF (Power Factor), kWh, Daily Accumulated Electricity, Monthly Accumulated Electricity, Yearly Accumulated Electricity, Daily Carbon Emissions, Monthly Carbon Emissions, Yearly Carbon Emissions, Hourly Maximum Demand, Daily Maximum Demand, Monthly Maximum Demand, Actual Demand and Forecast Demand. The displayed power data will be varied according to the selected power data classification.

5.3 Realtime Chart

Realtime Chart allows display of power information of the power meter in real-time trend and pie chart. Realtime Chart can be displayed in two modes

(Power Meter mode and Group mode). The users can change the viewing mode according to their requirements. The detailed description is as follow:

5.3.1 Power Meter Mode

Select the power meter from the dropdown list of the Power Meter List and select the classification from the dropdown list of the Data Classification field, and then click on “Inquiry” button, it will show the chart.

- Power Meter List

  All power meter connected to the PMC will be list on the dropdown list of the Power Meter List, if no power meter is connected, the inquiry operation will not be able to perform.

- Data Classification

  Data Classification allows to inquire various power data options, including: V(Voltage), I(Current), kW(Real Power), PF (Power Factor), kWh, Daily Accumulated Electricity, Daily Carbon Emissions, Actual Demand and Forecast Demand.

Please refer to following figure for an example of Realtime Chart for “Power Meter Mode”. Each time the Realtime Chart displays only one power information classification. If a different power information classification is inquired, previously displayed chart will be closed automatically. The user could choose desired power data classification to view the corresponding Realtime Chart. The chart refreshes every 5 seconds.

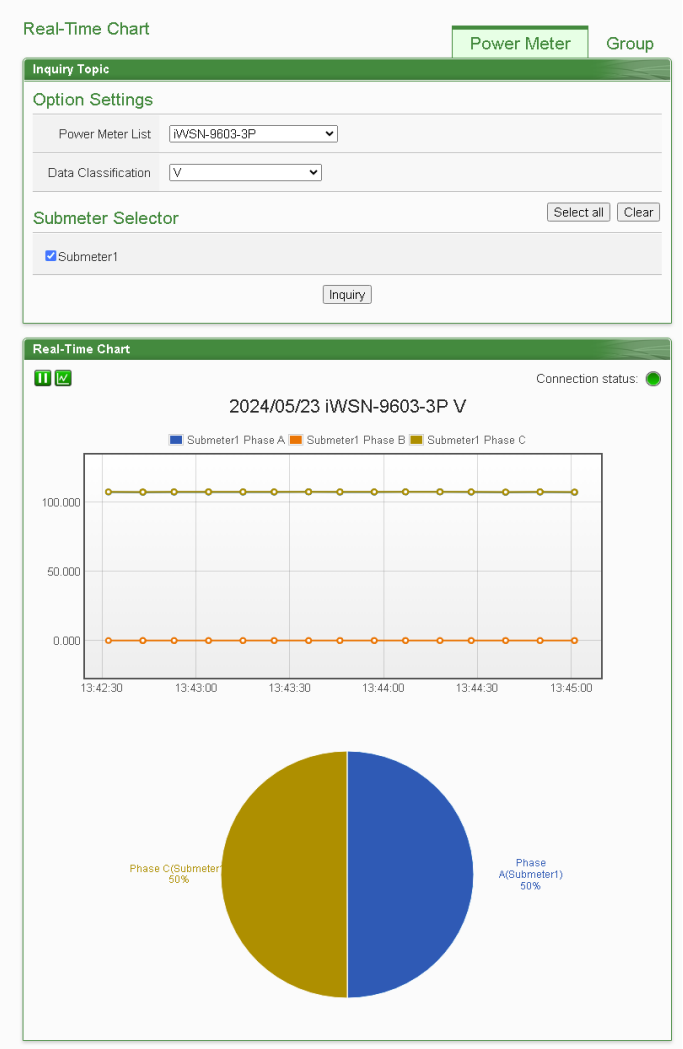


Figure5-12 : Realtime Chart (Power Meter Mode)

There are three function icons on the upper area of the Power Meter Realtime Chart:

- The icon allows to pause the update of the chart, only the data within the 25 minutes will be displayed. The user could click and drag on the chart and move forward or backward to show desired time zone. Click to resume the update of the chart. To view the data on a specific marker, move the mouse over the marker to display the data value.
- icon allows to hide the markers on the chart; click on button to show the markers on the chart.
- "Connection Status" will reveal the connection status of the power meter, the graphic indicators are shown as follow:

  : Online : Offline : Connecting

5.3.2 Group Mode

Select the option from the dropdown lists of the Group, Subgroup and the Data Classification field, and then click on “Inquiry” button, it will show the chart.

- Group

  The preset group lists will be shown on the dropdown list of the Group, if no group is pre-set, the inquiry operation will not be able to perform.

- Subgroup

  According to the selected Group option, the corresponding subgroups will be listed. If the selected Group contains no subgroup or the subgroup doesn’t setup any loop/phase of the power meter, the inquiry operation will not be able to perform.

- Data Classification

  Data Classification allows to inquire various power data options, including: V(Voltage), I(Current), kW(Real Power), PF(Power Factor), kWh, Daily Accumulated Electricity, Daily Carbon Emissions, Actual Demand and Forecast Demand.

Please refer to following figure for an example of Realtime Chart for “Group Mode”. Each time the Realtime Chart displays only one power information classification. If a different power information classification is inquired, the previously displayed chart will be closed automatically. The user could choose desired power data classification to view the corresponding Realtime Chart. The chart refreshes every 5 seconds.

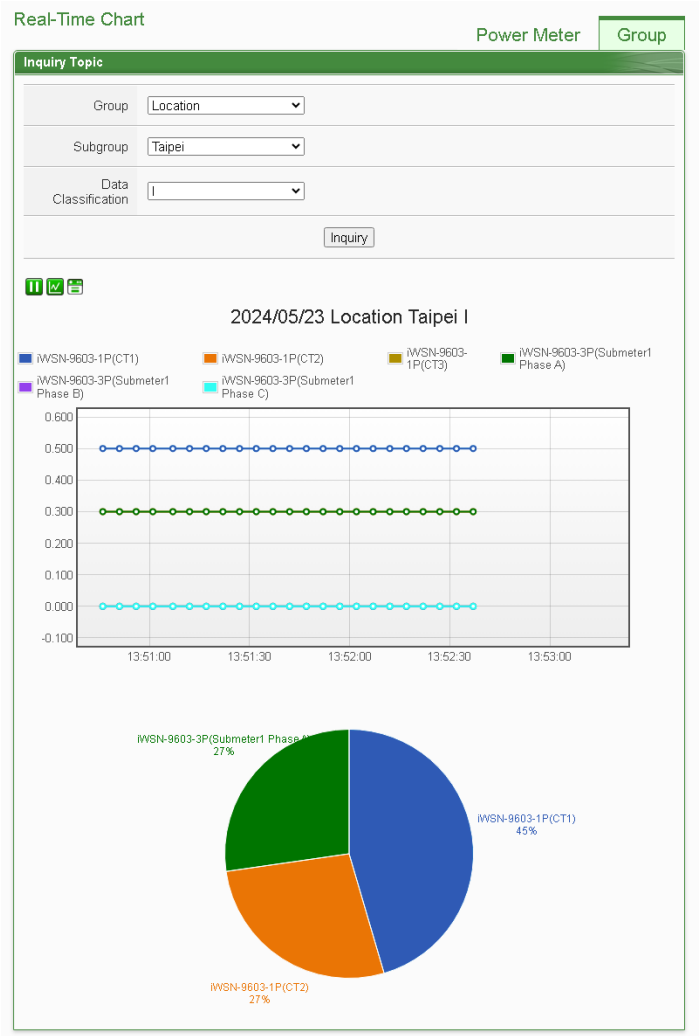


Figure5-13 : Realtime Chart (Group Mode)

There are three function icons on the upper area of the Power Meter Realtime Chart:

- The icon allows to pause the update of the chart, only the data within the 25 minutes will be displayed. The user could click and drag on the chart and move forward or backward to show desired time zone. Click to resume the update of the chart. To view the data on a specific marker, move the mouse over the marker to display the data value.
- icon allows to hide the markers on the chart; click on button to show the markers on the chart.
- icon will show the connection status of the power meters of the subgroup, the graphic indicators are shown as follow:

  : Online : Offline : Connecting

5.4 Historical Chart

Historical Chart allows display of the value and chart of power data in historical trend. Select the power meter from the dropdown list of the Power Meter List, choose the classification from the dropdown list of the Data Classification and then specify the date from the dropdown list of the Date. The interface is shown as below. User also can click the "Download CSV" button to download the csv file of the specify power meter for the specify the date.

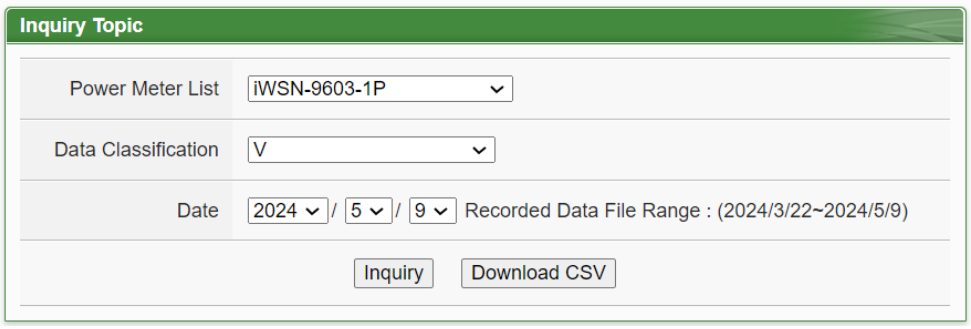


Figure5-14 : Historical Chart Inquiry

- Power Meter List
  All power meter connected to the PMC will be list on the dropdown list of the Power Meter List, if no power meter is connected, the inquiry operation will not be able to perform.
- Data Classification
  Data Classification allows to inquire various power data options, including: V(Voltage), I(Current), kW(Real Power), PF (Power Factor), kWh, Daily Accumulated Electricity, Daily Carbon Emissions, and Actual Demand.
- Date
  The dates that are available for power data retrieval will be displayed. Please note: If no log file is available, the inquiry operation will not be performed.

Click on “Inquiry” to display the power data historical statistic chart and table of the selected date range. If the selected date does not contain the file or exceeds the date of the file storage range, a message “No file exists” will be displayed. The Historical Data Chart and Historical Data Table are shown as below:

- Historical Data Chart

The historical power data of specified classification will be displayed in historical chart. The user could select the range on the below region or drag and move on the chart to adjust the viewing range. Move the mouse cursor close to the marker, the value will be displayed.

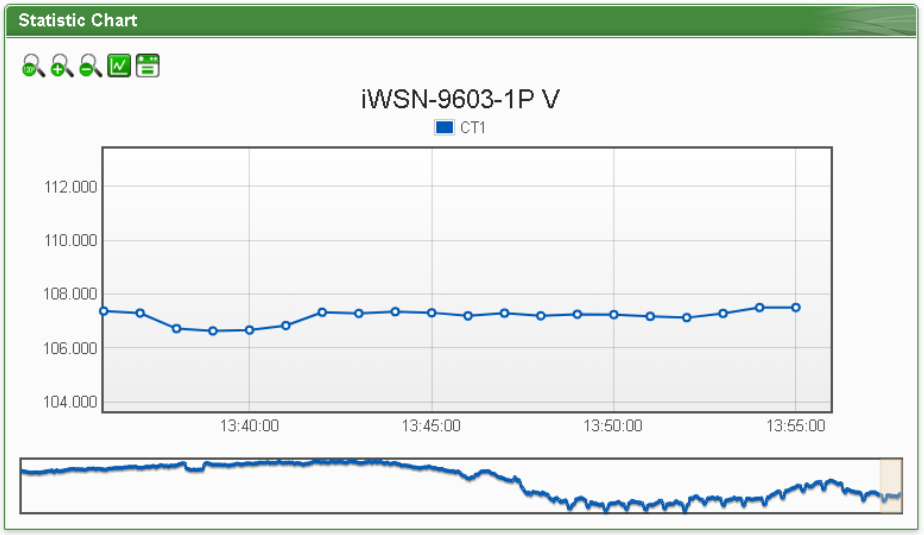


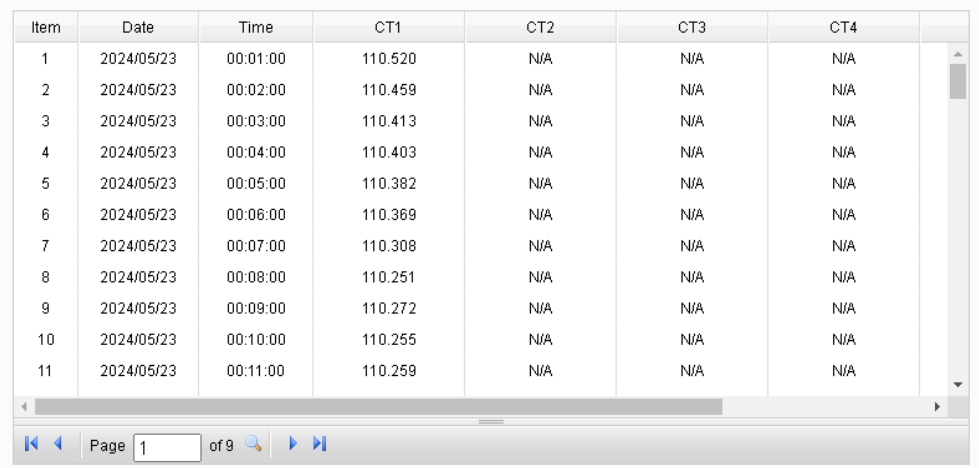
Figure5-15 : Historical Data Chart for power data

On the upper left of the Historical Chart, there are 4 function icons.

- Set the Historical Chart to be default status.
- Zoom in the Y-axis of the Historical Chart
- Zoom out the Y-axis of the Historical Chart
- Hide the markers on the Historical Chart. Show the markers on the Historical Chart

- Historical Data Table

  Historical Data Table will display the requested historical power data; the historical power data of selected classification of each loop (or phase) will be listed.



Item	Date	Time	CT1	CT2	CT3	CT4
1	2024/05/23	00:01:00	110.520	N/A	N/A	N/A
2	2024/05/23	00:02:00	110.459	N/A	N/A	N/A
3	2024/05/23	00:03:00	110.413	N/A	N/A	N/A
4	2024/05/23	00:04:00	110.403	N/A	N/A	N/A
5	2024/05/23	00:05:00	110.382	N/A	N/A	N/A
6	2024/05/23	00:06:00	110.369	N/A	N/A	N/A
7	2024/05/23	00:07:00	110.308	N/A	N/A	N/A
8	2024/05/23	00:08:00	110.251	N/A	N/A	N/A
9	2024/05/23	00:09:00	110.272	N/A	N/A	N/A
10	2024/05/23	00:10:00	110.255	N/A	N/A	N/A
11	2024/05/23	00:11:00	110.259	N/A	N/A	N/A

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Figure5-16 : Historical Data Table for power data

On the lower left of the Historical Data Table, there are 5 function icons.

- Go to the first page.
- Go to previous page.
- Go to specific page.
- Go to next page.
- Go to last page.

5.5 Historical Data Report

The Historical Data Report allows display of the power data report of desired power meter; specify the power meter, power classification and date range to inquire the data, shown as below:

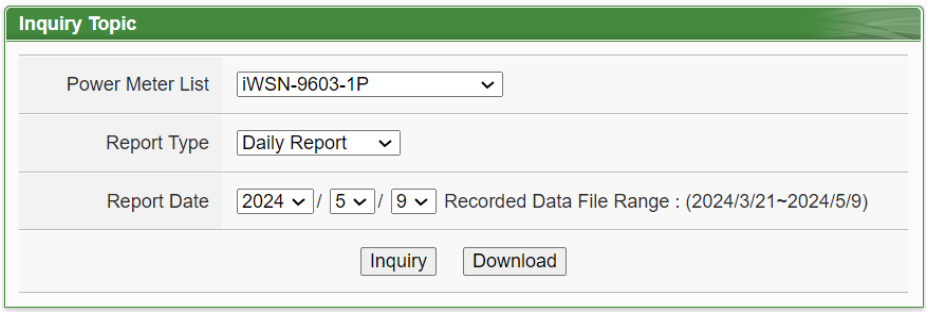


Figure5-17 : Historical Data Report inquiry

- Power Meter List

  All power meter connected to the PMC and the Power Meter Groups will be listed on the dropdown list of the Power Meter List. When a single power meter is selected, a power data report of the specified

power meter will be generated. If a power meter group is selected, a report of the "Total accumulative electricity" of all power meters in this group will be generated. If no power meter is connected to PMC, the inquiry operation will not be able to perform. About the setting of Power Meter Group, please refer to 6.7 Power Meter Group section.

- Report Type

  Allow to inquire Daily Report, Weekly Report, Monthly Report or Annual Report options.

- Report Date

  The dates that are available for data retrieval will be displayed.

  Please note: if no log file is available, the inquiry operation will not be performed.

Click on “Inquiry” or ”Download” to display/download the Historical Data Report of the selected date range. If the selected date does not contain the file or exceeds the date of the file storage range, a message “No file exists” will be displayed. For the number of loops of power meters are different, the data report will be in different format, please refer to Figure 5-18 for the Daily Report of 3-phase power meter and Figure 5-19 for the Daily Report of single phase power meter.

iWSN-9603-3P Submeter1 2024/05/23 Daily Report

Time	Max. Demand(kW)	kWh	Carbon Emissions(kg)	Avg. PF(%)	I_a(A)	I_b(A)	I_c(A)	V_a(V)	V_b(V)	V_c(V)
0	0.04	0.02	0.010	56.7	0.3	0	0	110.385	0	110.489
1	0.041	0.03	0.015	56.7	0.3	0	0	110.743	0	110.848
2	0.041	0.02	0.010	56.7	0.3	0	0	110.96	0	111.067
3	0.041	0.02	0.010	56.7	0.3	0	0	111.287	0	111.394
4	0.041	0.02	0.010	56.7	0.3	0	0	111.454	0	111.558
5	0.041	0.03	0.015	56.7	0.3	0	0	111.474	0	111.579
6	0.041	0.02	0.010	56.7	0.3	0	0	110.673	0	110.778
7	0.04	0.02	0.010	56.7	0.3	0	0	109.507	0	109.61
8	0.041	0.02	0.010	57.8	0.3	0	0	106.805	0	106.906
9	0.041	0.02	0.010	58.2	0.3	0	0	106.057	0	106.158
10	0.041	0.03	0.015	58.3	0.3	0	0	106.382	0	106.482
11	0.041	0.02	0.010	58.3	0.3	0	0	106.758	0	106.86
12	0.041	0.02	0.010	57.6	0.3	0	0	108.385	0	108.488

Daily Maximum Demand: 0.041 kW Time: 2024/05/23 01:41:51 Total: 0.29 kWh
Total Carbon Emissions: 0.148kg (Carbon Emission Factor: 0.509 kg CO_2e/kWh)

Figure5-18 : Daily Report (Three Phase Power Meter)

iWSN-9603-1P CT1 2024/05/23 Daily Report

Time	Max. Demand(kW)	kWh	Carbon Emissions(kg)	PF(%)	I(A)	V(V)
0	0	0	0.000	58.3	0.3	110.486
1	0	0	0.000	58.2	0.3	110.849
2	0	0	0.000	58	0.3	111.063
3	0	0	0.000	57.9	0.3	111.391
4	0	0	0.000	58.1	0.3	111.56
5	0	0	0.000	58	0.3	111.577
6	0	0	0.000	57.9	0.3	110.764
7	0	0	0.000	58.2	0.3	109.598
8	0	0	0.000	58.8	0.3	106.891
9	0	0	0.000	59.2	0.3	106.145
10	0	0	0.000	59.6	0.3	106.478
11	0	0	0.000	59.9	0.3	106.858
12	0	0	0.000	58.9	0.3	108.483

Daily Maximum Demand: 0 kW Time: 2024/05/23 00:00:00 Total: 0 kWh
Total Carbon Emissions: 0kg (Carbon Emission Factor: 0.509 kg CO_2e/kWh)

Figure5-19 : Daily Report (Single Phase Power Meter)

2017/5/9 Factory Lighting Daily Report												
Time	0	1	2	3	4	5	6	7	8	9	10	11
kWh	0.312	0.311	0.318	0.320	0.314	0.312	0.313	0.309	0.313	0.324	0.020	0.312
Time	12	13	14	15	16	17	18	19	20	21	22	23
kWh	0.332	0.329	0.334	0.332	0.333	0.334	0.333	0.335	0.338	0.324	0.323	0.319
Total Accu. Electricity:7.444 kWh												

Figure5-20 : "Total Accu. Electricity" report for Power Meters Group

5.6 Historical Energy Analysis

Historical Energy Analysis can be done in 3 ways: Energy Usage Analysis by Trend, Energy Usage Analysis by Time and Energy Usage Breakdown by Circuit/Group. The user can query electricity analysis for specific date by selecting Chart Type, Data Classification, Date and Loop(s)/Phase(s); the following section will provide more detailed information:

5.6.1 Energy Usage Analysis by Trend

The users could specify the data classification and the time range under this section, and then select the loop(s)/phase(s) to be inquired; the corresponding Energy Usage Analysis will be displayed in Trend chart format.

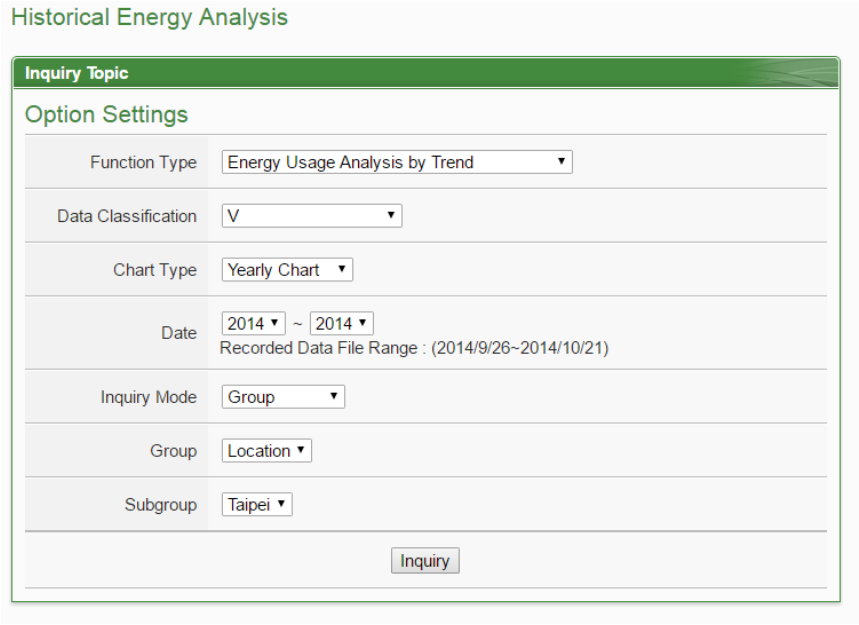


Figure5-21 : Energy Usage Analysis by Trend

- Function Type: The user can select one of the following three options for electricity analysis: Energy Usage Analysis by Trend, Energy Usage Analysis by Time Period and Energy Usage Breakdown by Circuit/Group.
- Data Classification: includes V (voltage), I (current), PF (power factor), Energy Usage (KWh), Carbon Emissions, and Maximum Demand.
- Chart Type: Provides Yearly Chart, Monthly Chart and Daily Chart.
- Date: Select the date range to be queried (the system will provide the date range can be queried)
- Inquiry Mode: The user can select one of the following two options for inquiring: group mode and user-defined mode.
  - Group：

    In group mode, the user can select group and subgroup to inquire the energy usage analysis of loops/phases of the power meters in the format of trend chart. If no group is pre-set, the user will not be able to perform inquiry operation.

Figure5-22 : Inquiry by Group Mode

- User-defined：
  In user-defined mode, all power meters connected to the PMC will be listed. If no power meter is connected, the user will not be able to perform inquiry operation. The minimum loop/phase to be queried is 1 loop/phase.

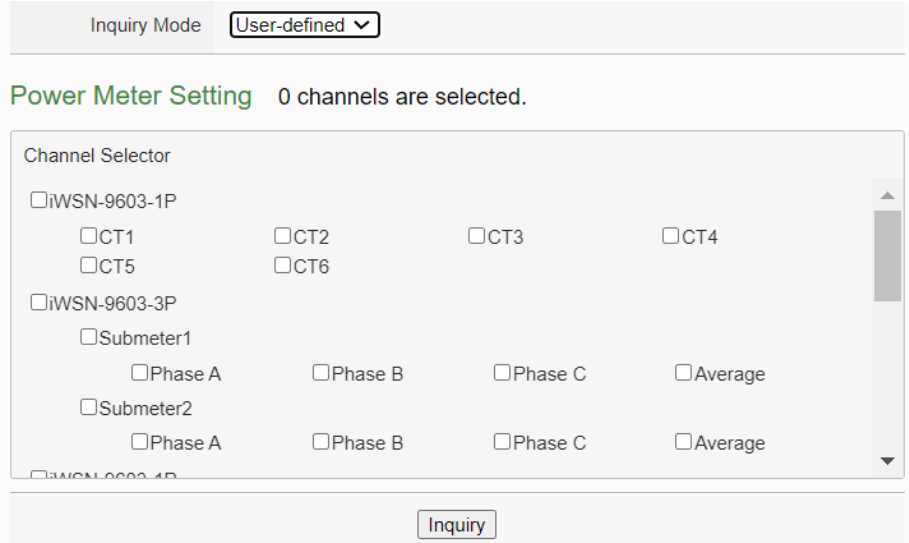


Figure5-23： Inquiry by User-defined Mode

Click on “Inquiry” button to display the trend of Energy Usage Analysis for the specified date range. If the selected date does not contain the file or exceeds the date of the file storage range, a message “No file exists” will be displayed. The trend of Energy Usage Analysis data of specified classification will be displayed in historical chart. The user could select the range on the below region or drag and move on the chart to adjust the viewing range. Move the mouse cursor close to the marker, the value will be displayed.

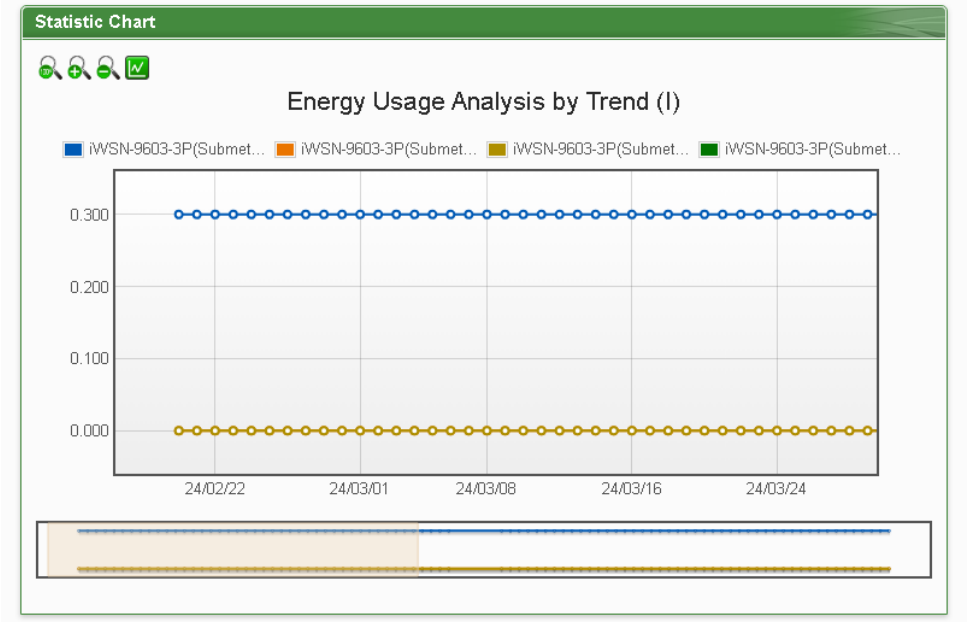


Figure5-24 : Energy Usage Analysis Trend Chart

On the upper left of the Energy Usage Analysis by Trend Chart, there are 4 function icons.

- Set the Energy Usage Analysis by Trend Chart to be default status.
- Zoom in the Y-axis of the Energy Usage Analysis by Trend Chart.
- Zoom out the Y-axis of the Energy Usage Analysis by Trend Chart.
- Hide the markers on the Energy Usage Analysis by Trend Chart. Show the markers on the Energy Usage Analysis by Trend Chart.

5.6.2 Energy Usage Analysis by Time Period

The users could specify the data classification and the time range under this section, and then select the loop(s)/phase(s) to be inquired; the corresponding Energy Usage Analysis by Time Period will be displayed in histogram chart to show the annual, quarterly or monthly energy usage comparison for each year.

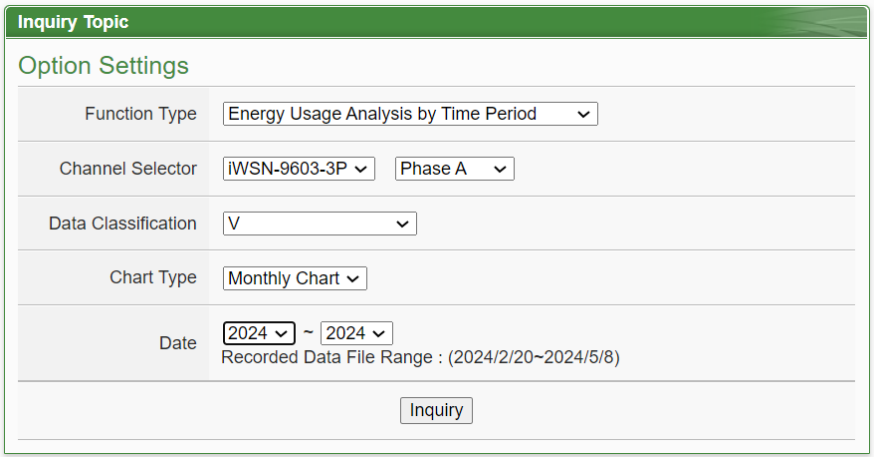


Figure5-25 : Energy Usage Analysis by Time Period

- Function Type: The user can select one of the following three options for energy analysis: Energy Usage Analysis by Trend, Energy Usage Analysis by Time Period and Energy Usage Breakdown by Circuit/Group.
- Select Loop/Phase: All power meters connected to the PMC will be listed. If no power meter is connected, the user couldn't perform inquiry operation.
- Data Classification: includes V (voltage), I (current), PF (power factor), Energy Usage (KWh), Carbon Emissions, and Maximum Demand.
- Chart Type: Provides Yearly Chart, Quarterly Chart and Monthly Chart.
- Date: Select the date range to be queried (the system will provide the date range can be queried)

Click on "Inquiry" button to display the Energy Usage Analysis by Time for the specified date range. If the selected date does not contain the file or exceeds the date of the file storage range, a message "No file exists" will be displayed. The Energy Usage Analysis by Time Period will be displayed in the lower region in histogram chart. Move the mouse cursor close to the histogram chart, the value will be displayed.

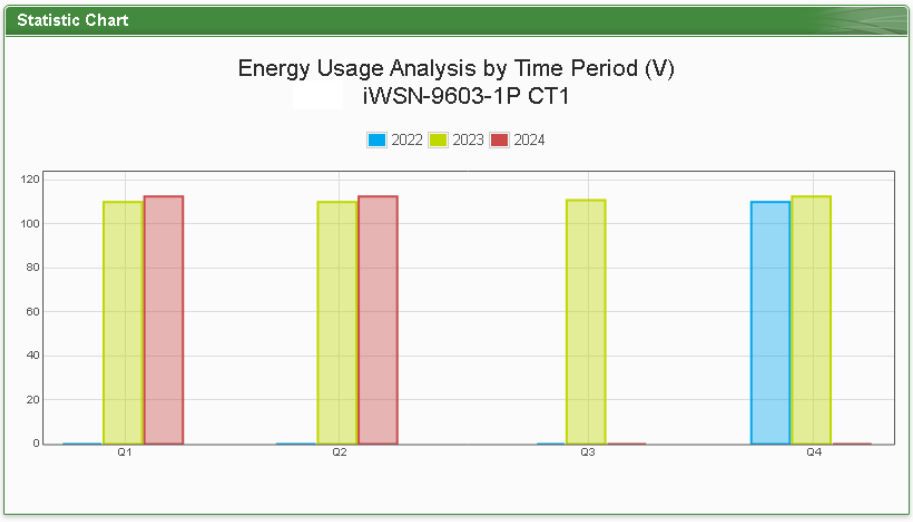


Figure5-26 : Time Period Histogram Chart for Power Usage

5.6.3 Energy Usage Breakdown by Circuit/Group

The users could specify the data classification and the time range under this section, and then select the loop(s)/phase(s) to be inquired; the corresponding Energy Usage Breakdown by Circuit/Group will be displayed in category pie chart to show the Energy Usage Proportion of the loops/phases.

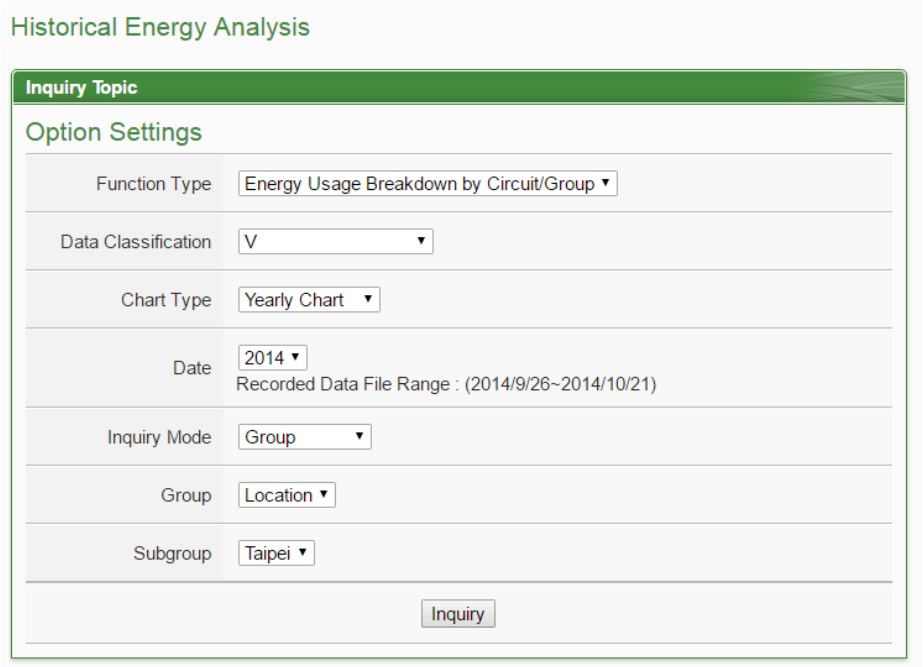


Figure5-27 : Energy Usage breakdown by Circuit/Group

- Function Type: The user can select one of the following three options for energy analysis: Energy Usage Analysis by Trend, Energy Usage

Analysis by Time Period and Energy Usage Breakdown by Circuit/Group.

- Data Classification: includes V (voltage), I (current), PF (power factor), Energy Usage (KWh), Carbon Emissions, and Maximum Demand.
- Chart Type: Provides Yearly Chart, Monthly Chart and Daily Chart.
- Date: Select the date range to be queried (the system will provide the date range can be queried).
- Inquiry Mode: The user can select one of the following two options for inquiring: group mode and user-defined mode.
  - Group:

    In group mode, the user can select group and subgroup to inquiry the energy usage analysis of loops/phases of the power meters in the format of proportion chart. If no group is pre-set, the user will not be able to perform inquiry operation.

Figure5-28 : Inquiry by Group Mode

  - User-defined:

    In user-defined mode, all power meters connected to the PMC will be listed. If no power meter is connected, the user will not be able to perform inquiry operation. The minimum loop/phase to be queried is 1 loop/phase.

Click on “Inquiry” button to display the Energy Usage Breakdown by Circuit/Group for the specified date range. If the selected date does not contain the file or exceeds the date of the file storage range, a message “No file exists” will be displayed. The Energy Usage Breakdown by Circuit/Group will be displayed as category pie chart in the lower region. Move the mouse cursor close to the category pie chart, the value will be displayed. The electricity usage information will be listed as table below. The maximum and minimum value of the loop/phase will be listed on the table. If the Data Classification of the inquired data is Electricity Usage (KWh), the statistic information of total Energy Usage will also be listed on the table.

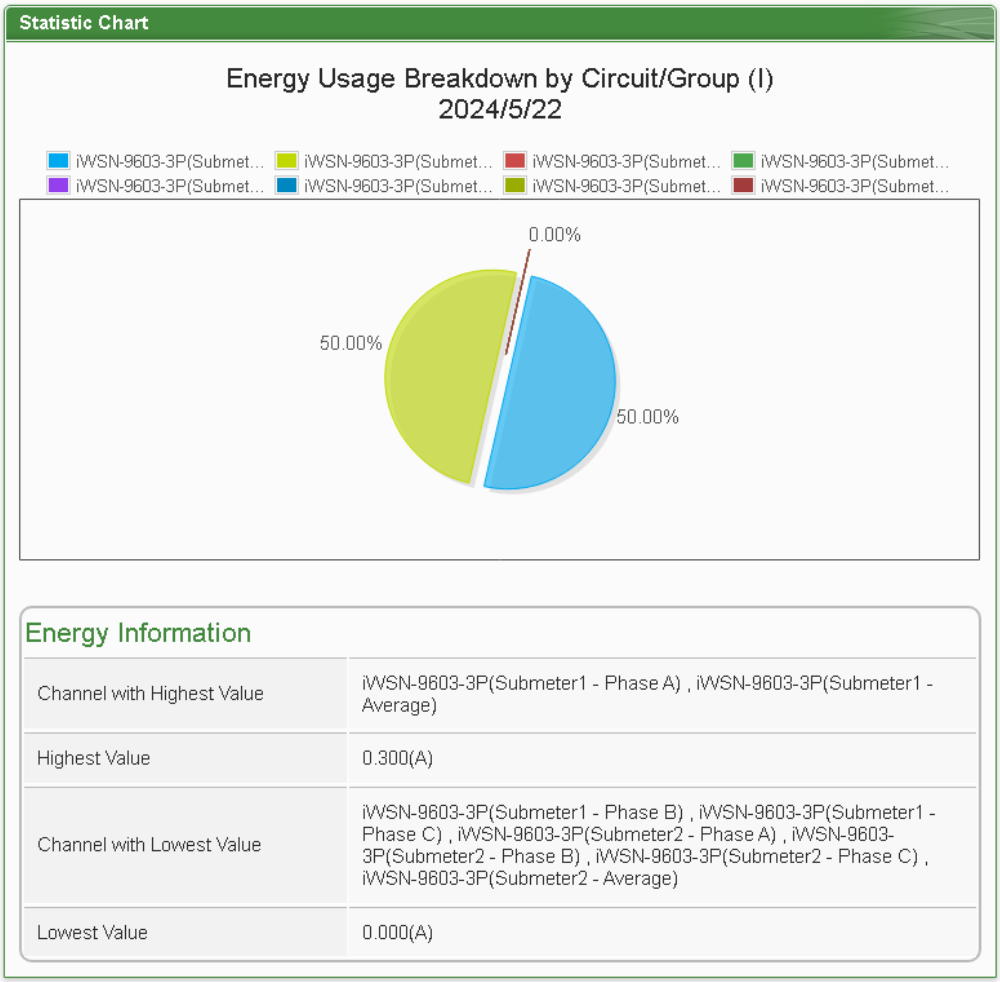


Figure5-29 : Energy Usage Breakdown by Circuit/Group Chart

5.7 PUE Information

Power Usage Effectiveness (PUE) information can be displayed in two modes (Real-Time and History), users can change the viewing mode according to the requirement; More detailed information is as below:

5.7.1 Real-Time

"Real-Time" overview mode allows display of the multiple PUE values which are calculated by "Total Facility Energy" and "IT Equipment Energy" preset by users. The page refreshes every 20 seconds, the user could also click "Refresh" button to refresh the data immediately.

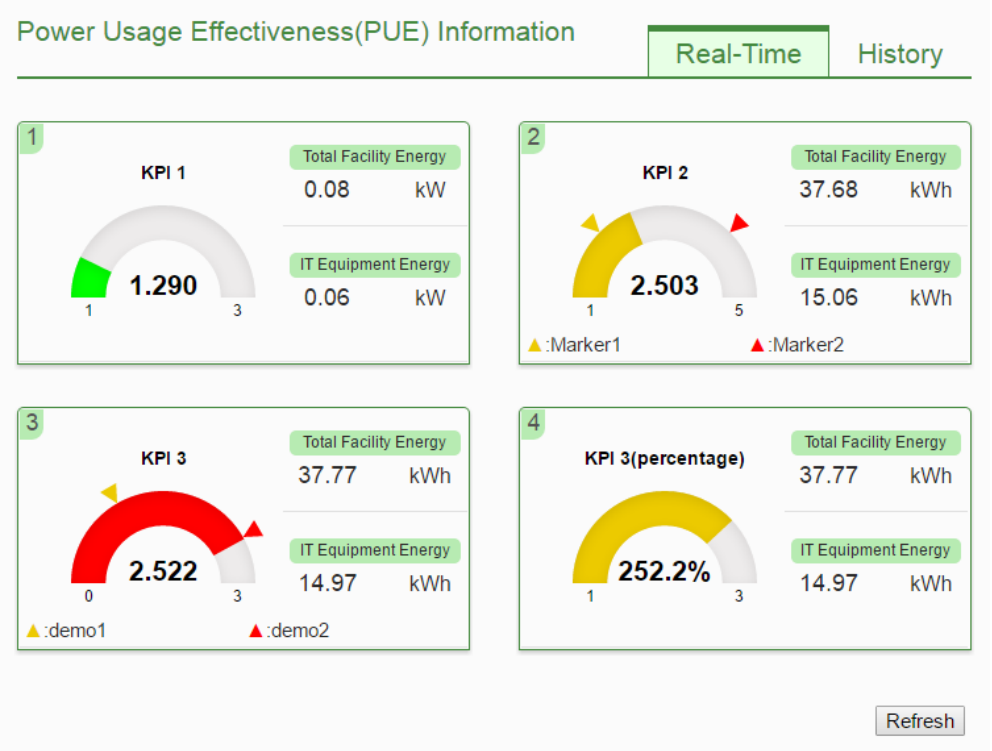


Figure5-30 : PUE information - Realtime

5.7.2 History

"History" overview mode allows display of the PUE data in historical trend. Select the PUE option from the dropdown list of the PUE List, choose the classification from the dropdown list of the Chart Type and then specify the date from the dropdown list of the Date. The interface is shown as below:

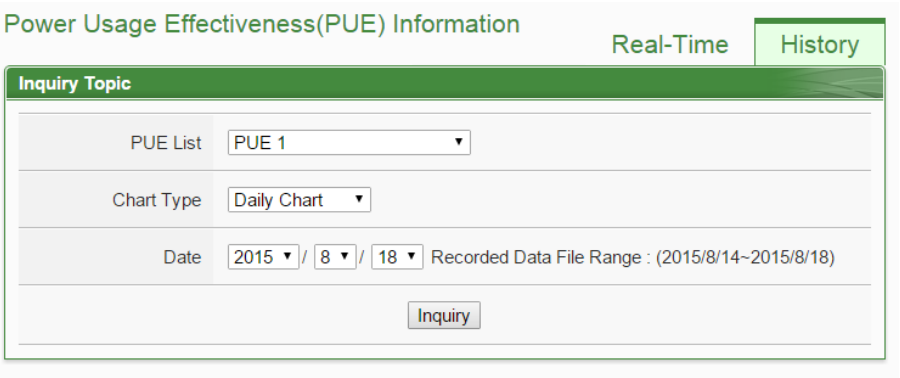


Figure5-31 : PUE information - History(1)

- PUE List：All PUE options which are preset by users will be listed on the dropdown list of the PUE List, if no PUE option is preset, the inquiry operation will not be able to perform.
- Chart Type：Provides Daily Chart and Monthly Chart.
- Date：The dates which are available for PUE data retrieval will be displayed. Please note: If no log file is available, the inquiry operation will not be performed.

Click on "Inquiry" to display the PUE data historical statistic chart of the selected date range. If the selected date does not contain the file or exceeds the date of the file storage range, a message "No file exists" will be displayed.

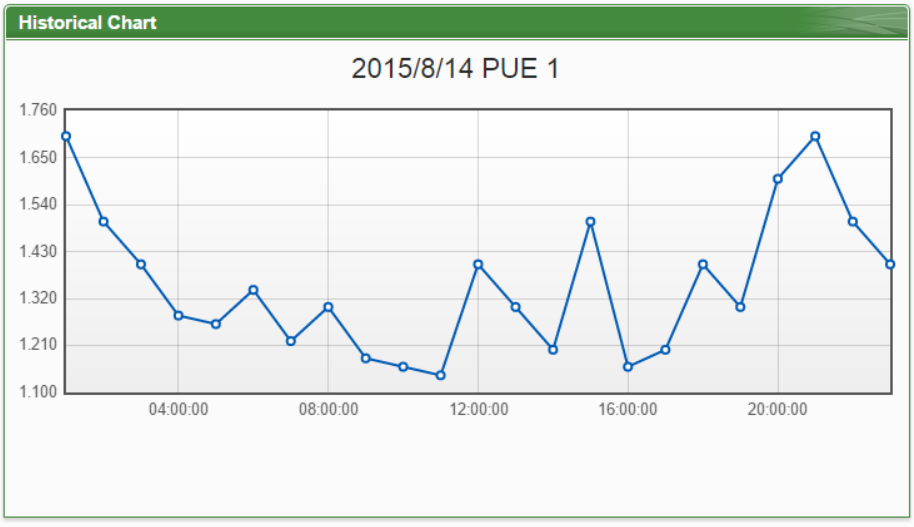


Figure5-32 : PUE information - History(2)

5.8 I/O Information

The I/O Information page will display the real-time values of the Internal Registers of the PMC and the real-time I/O channels values of the iWSN I/O modules that are connected to the PMC. If login as the Administrator, it allows to modify the values of Internal Registers and view the values of the I/O channels. If login as a general user, they are allowed to view the values of Internal Registers and the I/O channels only.

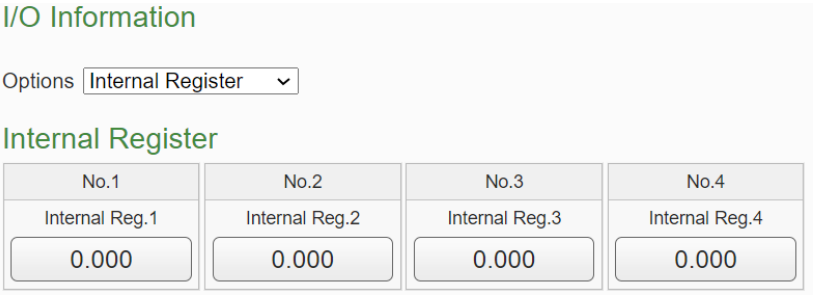


Figure5-33 : I/O Information(login as Administrator)

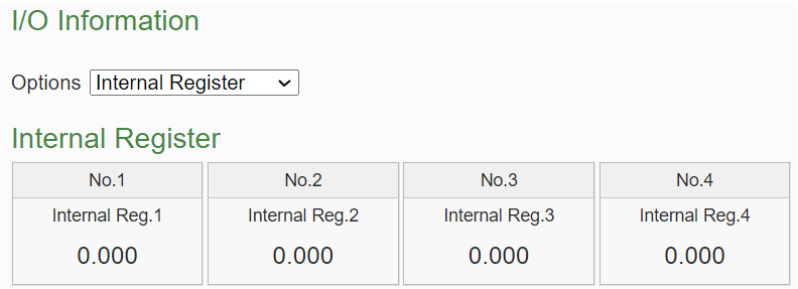


Figure5-34 : I/O Information(login as General User)

The graphic indicator on the right side of the I/O modules will reveal the connection status of the module, the graphic indicators are as follow:

: Online : Offline : Connecting

5.9 I/O Realtime Chart

I/O Realtime Chart allows display of real-time channel data of the iWSN I/O module and Internal Register in trend style. Select data type from the dropdown list of the "Data Model" field, and the I/O channel from the "I/O Channel Selector" field then click on “Inquiry” button, it will show the chart. The interface is shown as below:

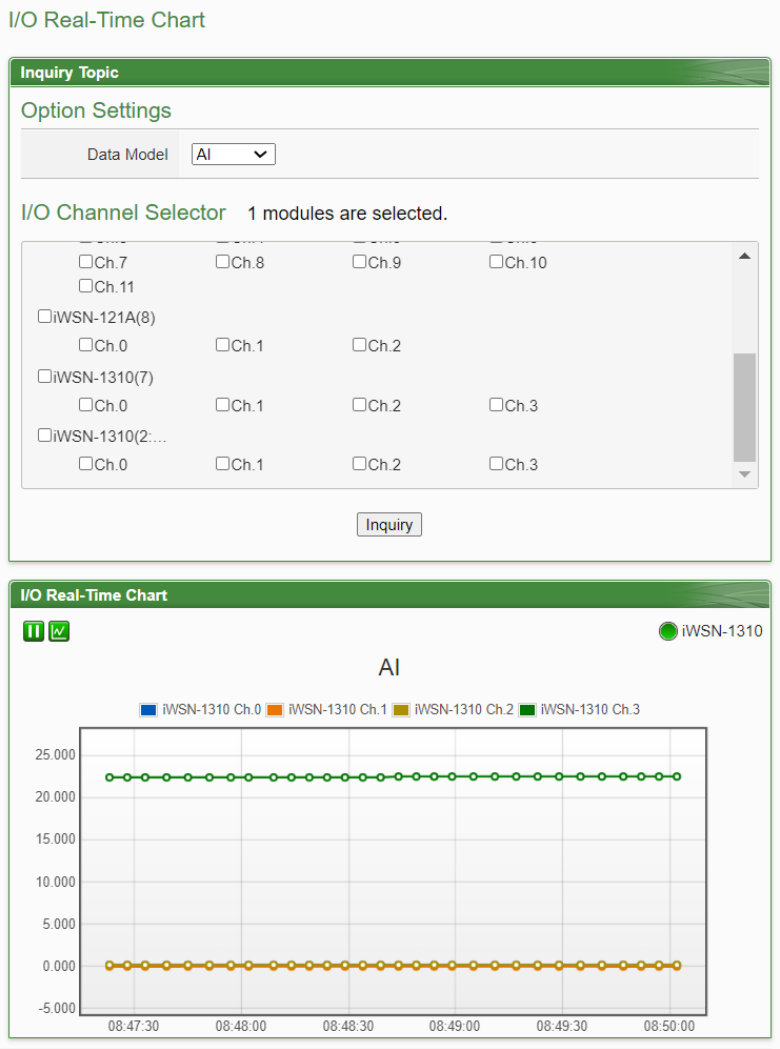


Figure5-35 : I/O Realtime Chart

There are three function icons on the upper area of the I/O Realtime Chart:

- The icon allows to pause the update of the chart, only the data within the 25 minutes will be displayed. The user could click and drag on the chart and move forward or backward to show desired time zone. Click to resume the update of the chart. To view the data on a specific marker, move the mouse over the marker to display the data value.

-  icon allows to hide the markers on the chart; click on  button to show the markers on the chart.
- "Connection Status" will reveal the connection status of the I/O module, the graphic indicators are shown as follow:
   : Online  : Offline  : Connecting

5.10 I/O Historical Chart

I/O Historical Chart allows display the historical data of I/O channel of the iWSN I/O module and Internal Register in trend style. Specify the date from the dropdown list of the "Date" field, select the I/O channel from the "Channel Selector" field, then click on “Inquiry” button, it will show the chart. The interface is shown as below. User also can click the "Download CSV" button to download the csv file of the Data Logger for the specify date:

Please Note: The PMC’s I/O historical data is from I/O Data Logger and User-Defined Data Logger.

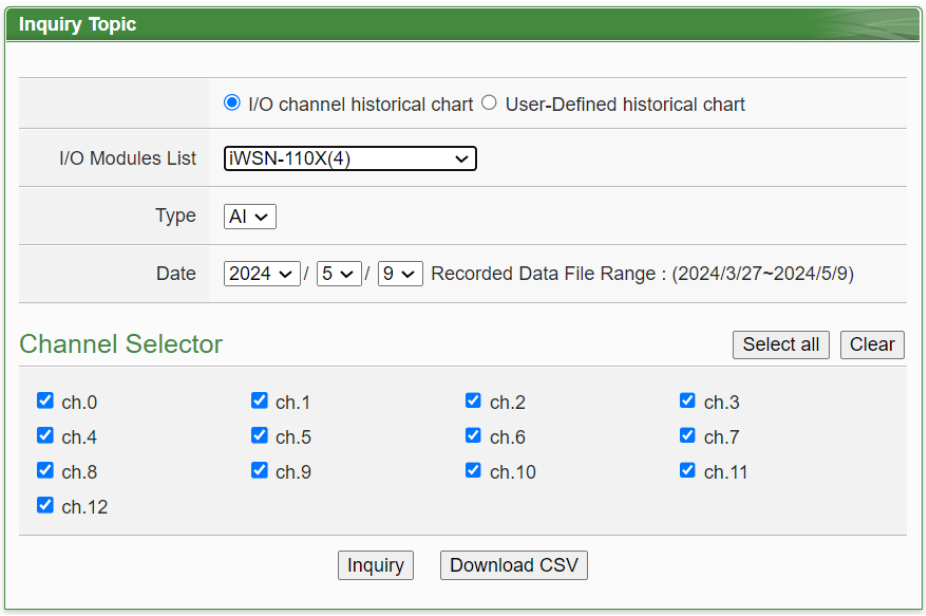


Figure5-36 : I/O Channel Historical Chart

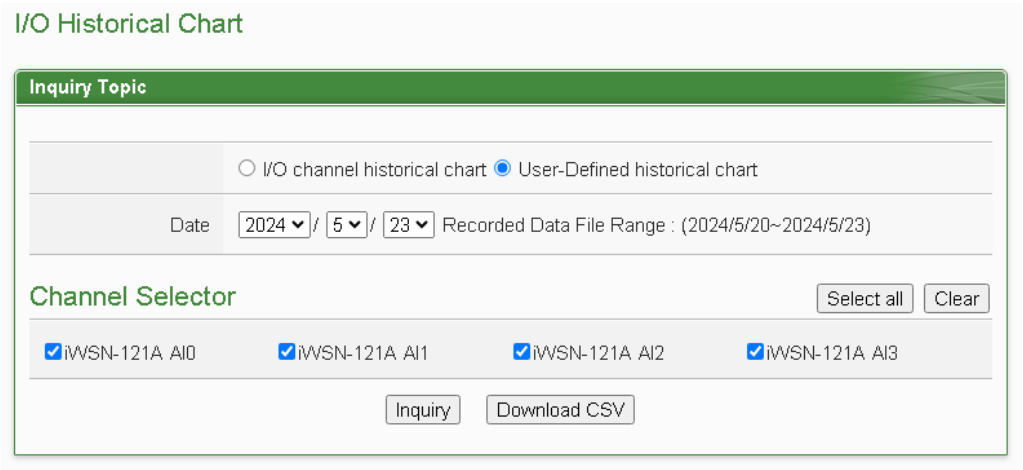


Figure5-37 : User-Defined Historical Chart

- Date

  The dates that are available for channel data retrieval will be displayed. Please note: If no log file is available, the inquiry operation will not be performed.

- Channel Selector

  All Channel of the User-Defined Data Logger will be list on the dropdown list of the "Channel Selector" List, if there is no any channel in the User-Defined Data Logger, the inquiry operation will not be able to perform

Click on “Inquiry” to display the channel data historical statistic chart of the selected date. If the selected date does not contain the file or exceeds the date of the file storage range, a message “No file exists” will be displayed. The Historical Data Chart is shown as below:

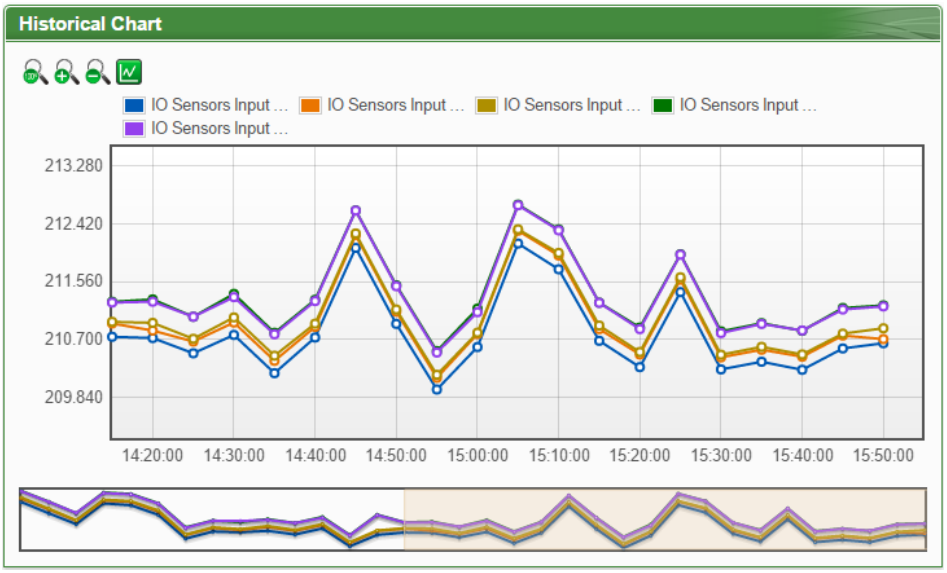


Figure5-38 : I/O Historical Data Chart

On the upper left of the Historical Chart, there are 4 function icons.

- Set the Historical Chart to be default status.
- Zoom in the Y-axis of the Historical Chart
- Zoom out the Y-axis of the Historical Chart
- Hide the markers on the Historical Chart. Show the markers on the Historical Chart

5.11 Event Log

The Event Log page allows to view the list of system event logger information when login as the Administrator.

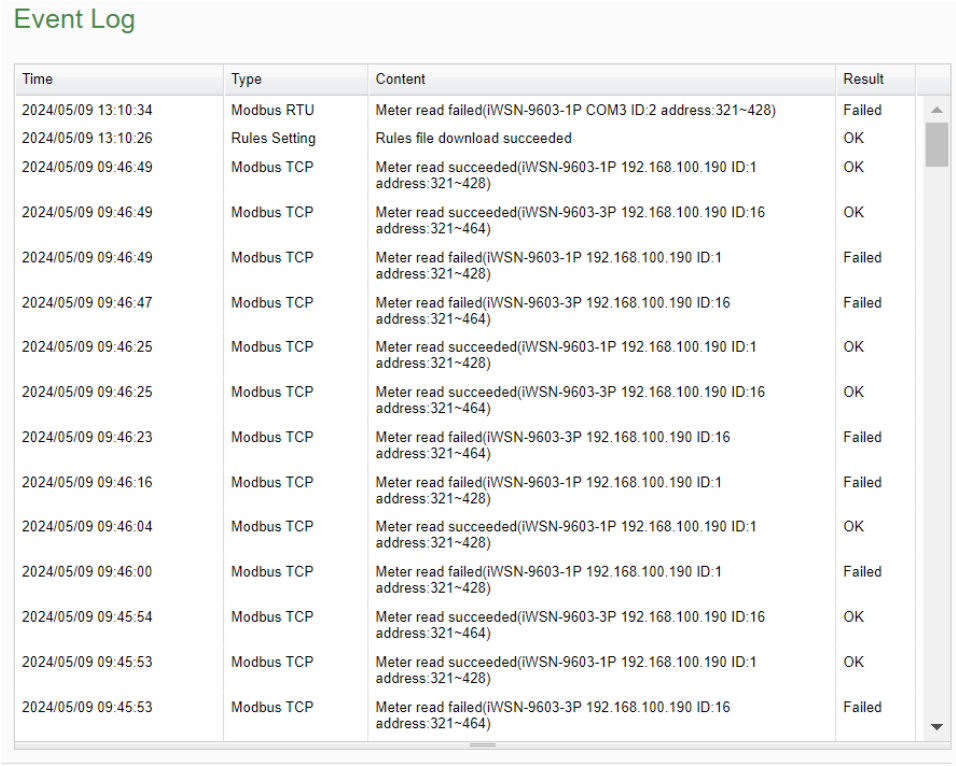


Figure5-39 : Event Log information display

The Event Log record including the following information:

- The PMC failed to read data of the power meter(s).
- Change the network settings on the PMC.
- Save settings to the PMC.
- Change the system time setting.
- Reset accumulated power data of the power meter to 0.
- Transfer Data Logger files to FTP server succeeded or failed.
- When performing firmware upgrade, record the transfer of the firmware file to the PMC is succeeded or failed.
- The upgrade of the firmware is succeeded or failed.

5.12 Polling Time Information

Users can check the polling time of each modules and power meters which are connected with PMC currently. The "Polling Time Information Page" is as below:

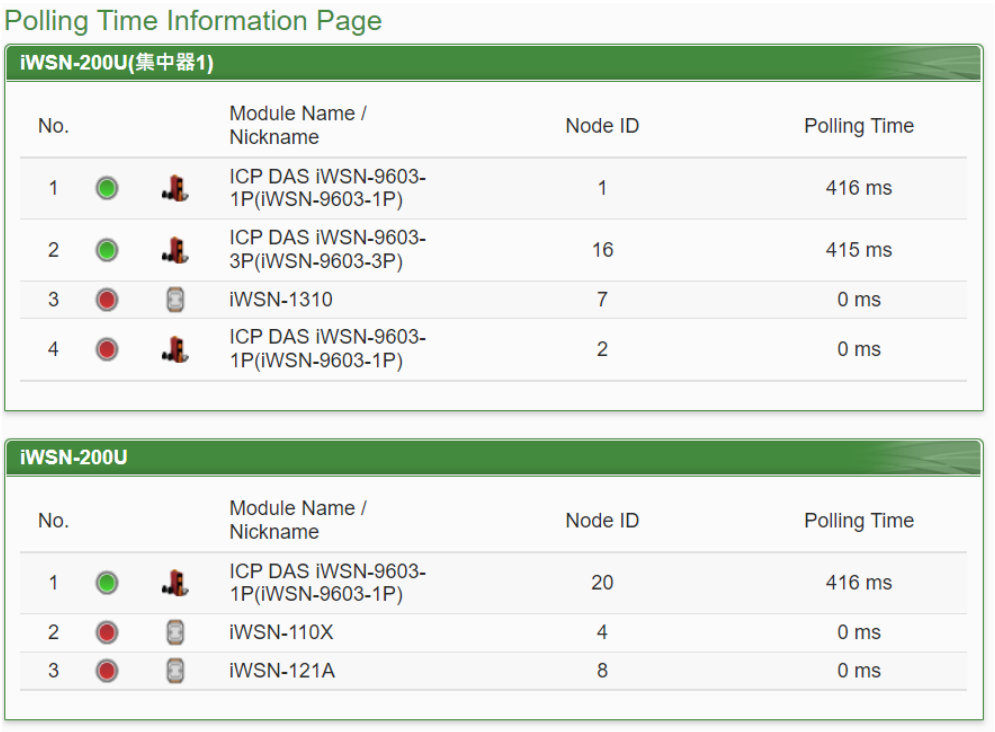


Figure5-40 : Polling Time Information

The graphic indicator on the right side of the No. will reveal the connection status of the module, the graphic indicators are as follow:

: Online : Offline : Connecting

5.13 Modbus Table Information

The user can query and print the detailed modbus address information of the iWSN modules which are connected to PMC and the system information. Please refer to Appendix I for more detailed Modbus address description.

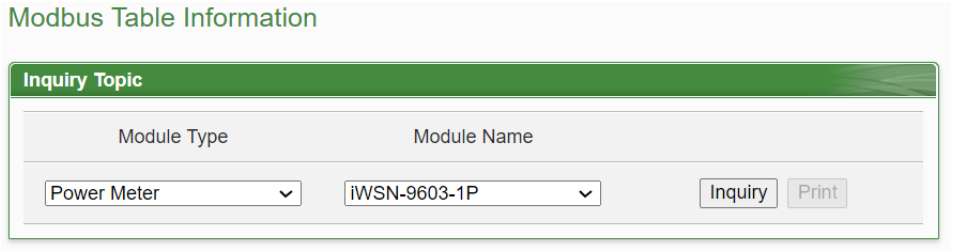


Figure5-41 : The Interface of Modbus Table Information

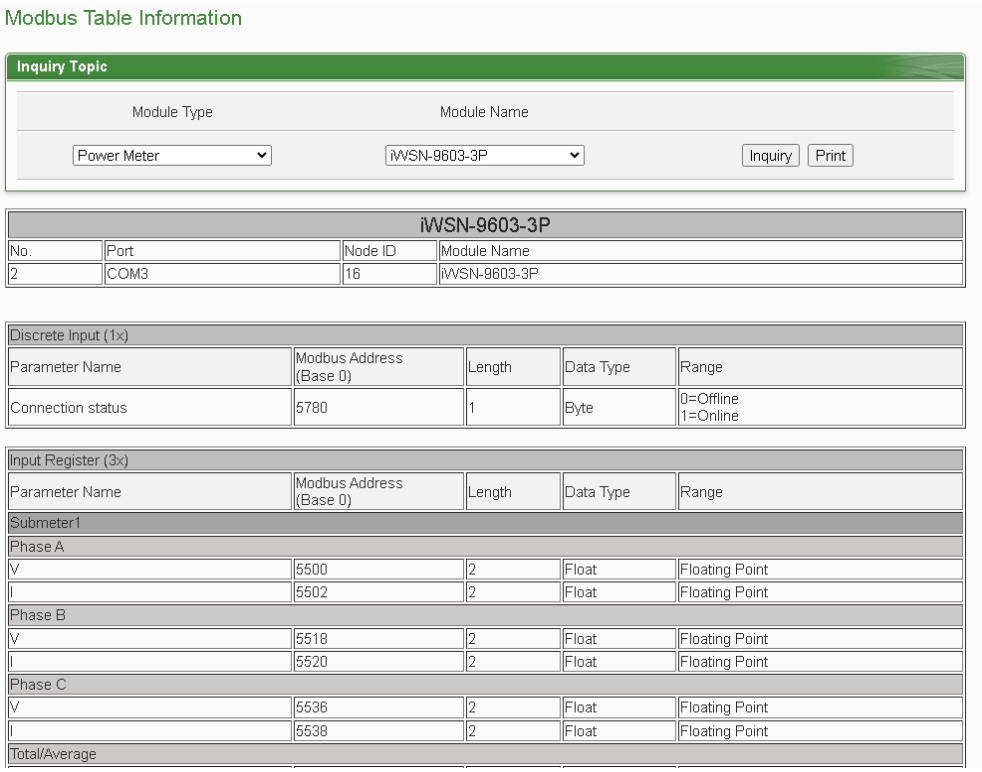
◆ Module Type

"Module Type" includes options as Power Meter, I/O Module and Other Information

◆ Module Name

According to the selected "Module Type" option, the corresponding module name or information of "Module Name" will be listed.

Click on "Inquiry" to display the Modbus table information of the selected module. The users can click on the "Print" button to print this Modbus address table.



iWSN-9603-3P			
No.	Port	Node ID	Module Name
2	COM3	16	iWSN-9603-3P

Discrete Input (1x)				
Parameter Name	Modbus Address (Base 0)	Length	Data Type	Range
Connection status	5780	1	Byte	0=Offline 1=Online

Input Register (3x)				
Parameter Name	Modbus Address (Base 0)	Length	Data Type	Range
Submeter1				
Phase A				
V	5500	2	Float	Floating Point
I	5502	2	Float	Floating Point
Phase B				
V	5518	2	Float	Floating Point
I	5520	2	Float	Floating Point
Phase C				
V	5536	2	Float	Floating Point
I	5538	2	Float	Floating Point
Total/Average				

Figure5-42 : Inquiry result of Modbus Table Information

5.14 UID Information

Users can check the UID information of each power meters which are connected with PMC currently. The "UID Information" page is as below:

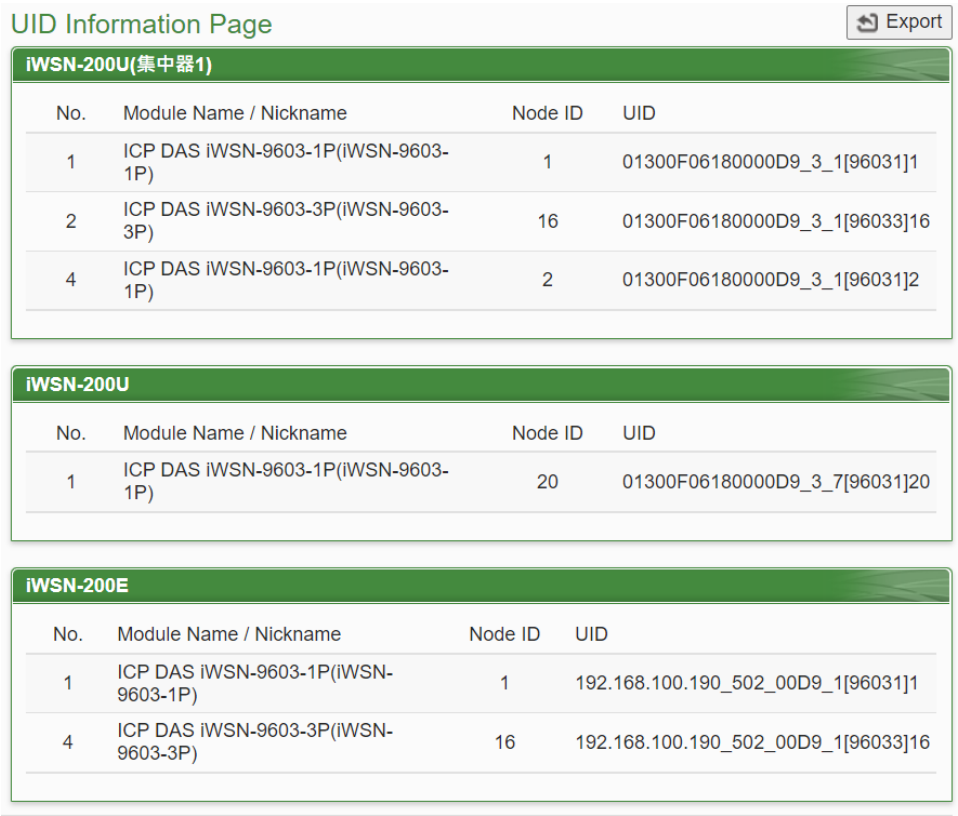


Figure5-43 : Power Meter UID Information Page

Users can click "Export" button to export the UID information as CSV file.

5.15 Ping Status Page

It displays the latest Ping results of all Ping targets. The latest ping result is displayed in the “Result” column, and the response time is displayed in the “Response Time” column. In the “Failed Times/Ratio” column, it displays the continuous failed numbers or the failed ratio that depends on the Failed Condition. The “Last Success Time” column displays the timestamp of the latest successful ping.

Figure5-44 : Ping Status page

6 System Setting

System Setting includes following options: Time Setting, Network Setting, SNMP Setting, Security Setting, I/O Interface Setting, Other Setting, Firmware Update Setting and Export/Import Setting. When you get into the System Setting page, the system settings information of this PMC will be displayed, as shown below:

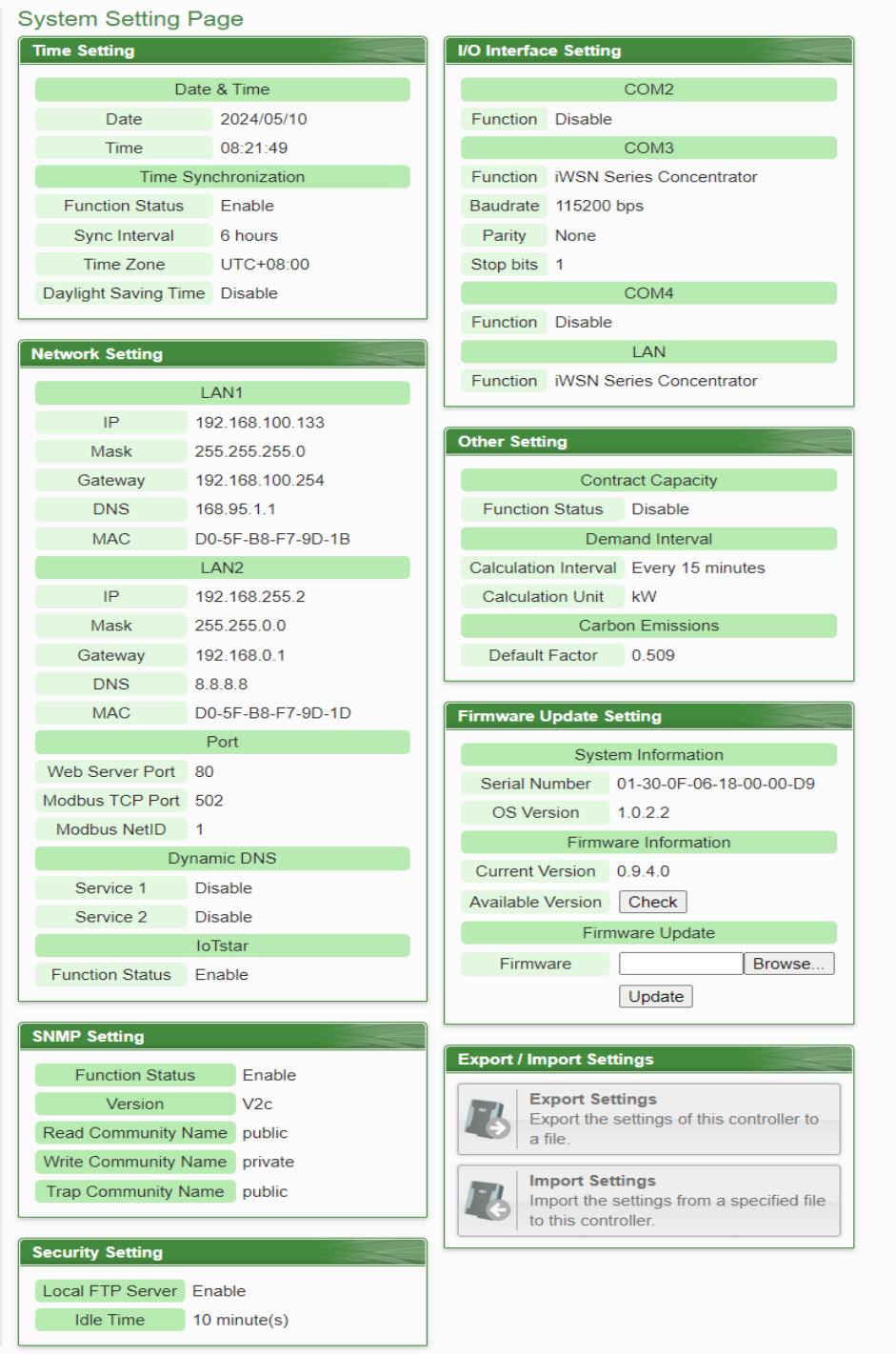


Figure6-1 : System Setting Overview Page

The user could view system setting information of PMC or perform firmware update on this page. For firmware update operations, please refer to 6.8 Firmware Update.

6.1 Time Setting

On the Time Setting page, it allows to set the time of PMC and Time Synchronization function. The setting interface is as below:

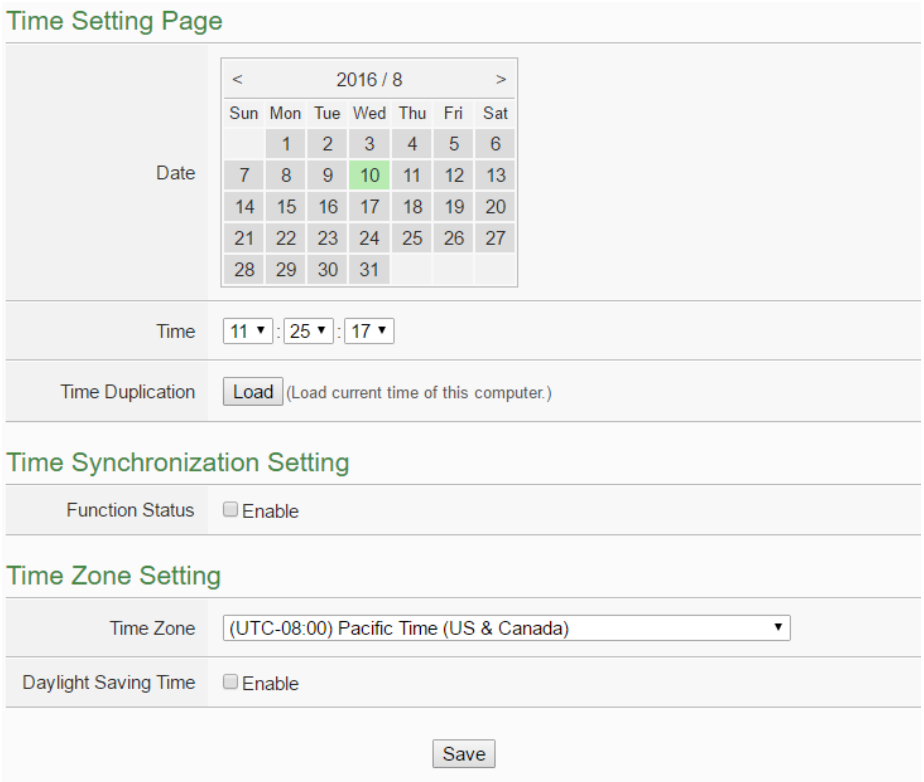


Figure6-2 : Time Setting Page

When get into this page, the system will read and display current time of the PMC. To modify the system time of PMC, set up the date and time on the "Time Setting page section" and then click "save" to complete the settings. The user could click on "Load" in the "Time Duplication" to synchronize the system time of the computer where the browser located and the system time of the PMC. The PMC also provides SNTP Time Server function that allows to set up Time Synchronization to sync the clock through network. The following figure illustrates the set up interface:

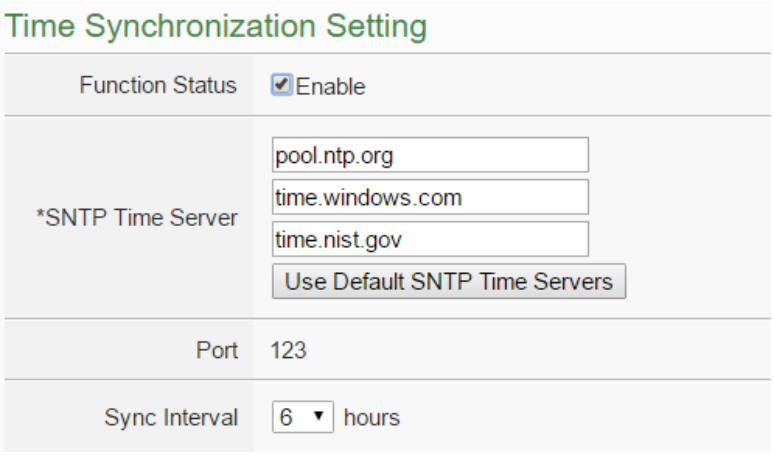


Figure6-3 : Time Synchronization Setting

Follow the steps below to set up Time Synchronization Setting:

i. In the "Function Status" field, check "Enable" to enable the Time Synchronization function.
ii. In the "SNTP Time Server" field, input the IP address or domain name of the SNTP Time Server. There are 3 default SNTP Time Servers, the user could modify the address to use other server. Click "Use Default SNTP Time Servers" to restore the default Time Server settings.
iii. The default Port number setting is "123", currently it is not allowed to be modified.
iv. In the "Sync Interval" field, select the time interval to specify how often will the PMC automatically connect to SNTP time server for time synchronization through the network. The user could set the time interval to be 6, 12, or 24 hours.
v. After all settings are completed, click "Save" button to save the changes.

In addition, users can select the time zone of the PMC location from the dropdown list in the "Time Zone" field, and enable the daylight saving time function in the "Daylight Saving Time" field if required.

6.2 Network Setting

Network Setting allows making a change to network configuration, web server port setting, Modbus settings, Dynamic DNS setting and IoTstar Connection setting on the PMC. The following figure illustrates the configuration interface.

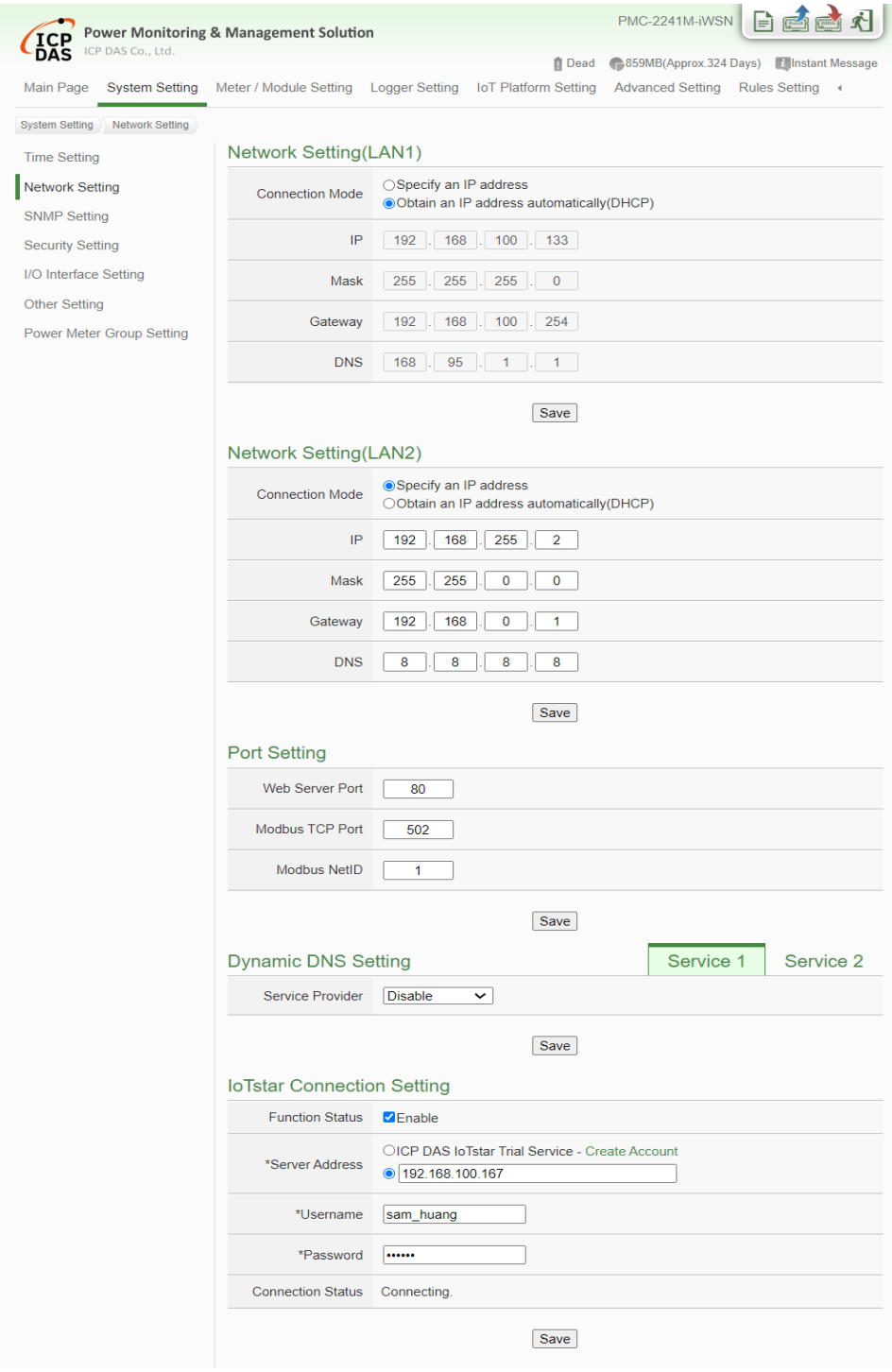


Figure6-4 : Network Setting Page

- Network Setting (LAN)

  Each time when the user enters this page, it will read and display current network configuration and port settings from the PMC. In the "Connection mode" field, please select the connection mode as "Obtain an IP address automatically (DHCP)" or "Specify an IP address", then modify IP/Mask/Gateway/DNS Server IP configuration. After all settings are completed, click "Save" button to save the changes. After the network configuration is completed, the user could login into PMC webpage via LAN1 or LAN2, and is able to retrieve data via Modbus TCP.

  Please note:

  1. PMC adopts Google DNS server as system default DNS server, the default IP is "8.8.8.8", the IP can be modified to other DNS server IP if required.
  2. If the connection mode is "Specify an IP address", then you make modification to the IP address, the system will logout automatically and re-connect to the web page automatically based on the new setting. If the connection mode is "Obtain an IP address automatically (DHCP)", the system may fail to re-connect to the web page because the IP address is changed. Please use PMC Utility to search the PMC, get the new IP address of PMC, and then launch browser to connect to the PMC with the new IP address.

- Port Setting

  In the "Port Setting" section, the user can modify the Web Server Port/ Modbus TCP Port/Modbus NetID. After all settings are completed, click "Save" button to save the changes.

- Dynamic DNS Setting

  PMC provides the Dynamic DNS service. The following figure illustrates the configuration interface:

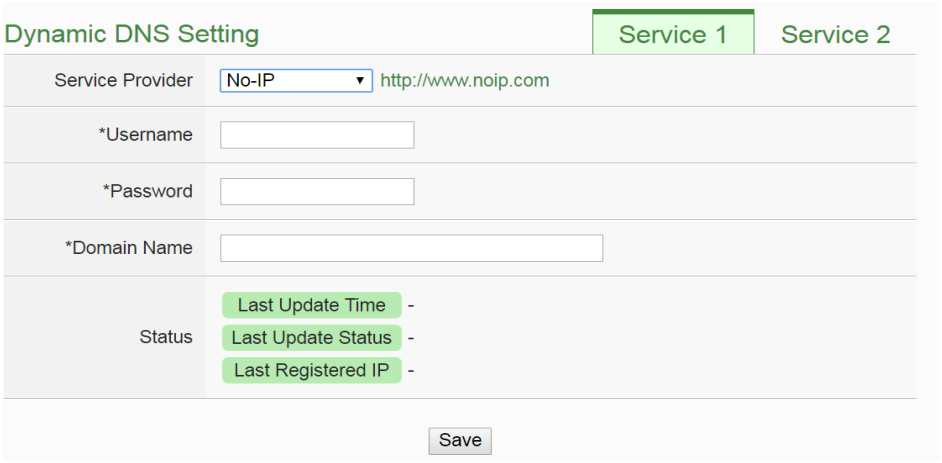


Figure6-5 : DDNS Setting Page

Follow the steps below to set up Dynamic DNS service:

i. Click the services tabs on the right-top corner of “Dynamic DNS service”. System provides two items for selection as “Service 1” and “Service 2”. User can enable one Dynamic DNS service for normal status, or enable two Dynamic DNS services for the redundant service.

ii. In the “Service Provider” field, select the provider of Dynamic DNS services from the dropdown list. Currently system provides 5 service providers for selection as “No-IP”, “ChangeIP”, “Free DNS”, “Dyn” and “DNS-O-Matic”. User can also select “Disable” to disable the service.

iii. If user selects “No-IP”, “ChangeIP”, “Dyn” or “DNS-O-Matic”, please enter the ID, Password and Domain Name to login the service. If user selects “Free DNS”, please insert the Token to login the service.

iv. After all settings are completed, click “Save” button to save the changes.

- Network Priority Setting

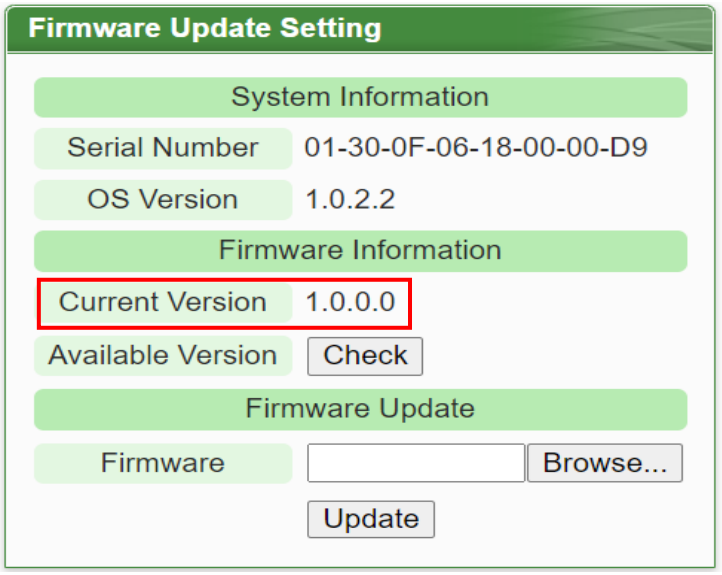
  This section is provide Netowrk Priority Setting to set the priority order of network interfaces (LAN Port and Mobile Network). Allowing users to select specific network interfaces for prioritized connections. After setting the network interface priority using the up and down keys, press the “Save” button. Please note that the network priority settings will only take effect after rebooting PMC/PMD.

Figure6-6 : Network Priority Setting Page

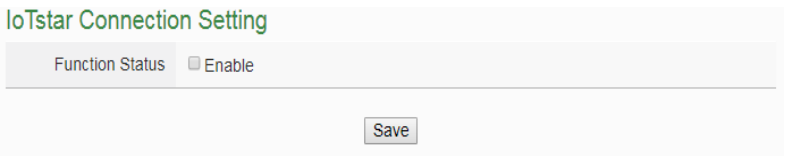
- IoTstar Connection Setting

  The IoTstar Connection Setting section is for user to complete the PMC's setting for the Network connection to the IoTstar. Please follow the steps below for the settings:

  i. Make sure the firmware version of the PMC is V1.0.0 or later version. If the PMC does not install with the right firmware version, please update the firmware before taking the next step.



  ii. Click “Enable” of the “Function Status” to enable the network connection to the ICP DAS IoTstar.



  iii. Two options: “User-built IoTstar” and ”IoTstar Trial” are available for selection.

If user select ”User-built IoTstar”, please click 

in the “Server Address” field, then input the IP address or Domain Name of the PC or Platform (with IoTstar installed). Enter the login username and password in the “Username” and “Password” fields. PMC will login and connect to the IoTstar by the information provided.

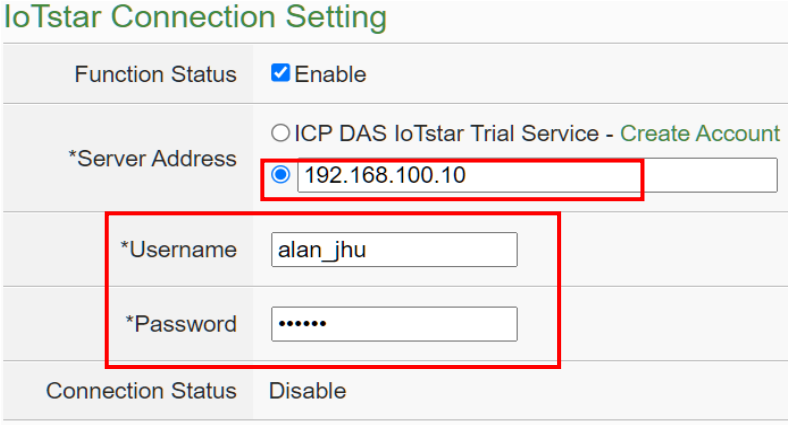
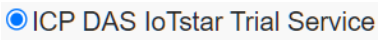


Figure6-7 : IoTstar connection setting page(1)

If user want the PMC to connect the “IoTstar Trial, please click 

in the “Server Address” field, then enter the login username and password (require to apply in advance) in the “Username” and “Password” fields. PMC will login and connect to the “IoTstar Trial” by the information provided.

Please Note: For the account application of the “IoTstar Trial”, please refer to the instructions in "Appendix VIII：ICP DAS “IoTstar Trial” account application".

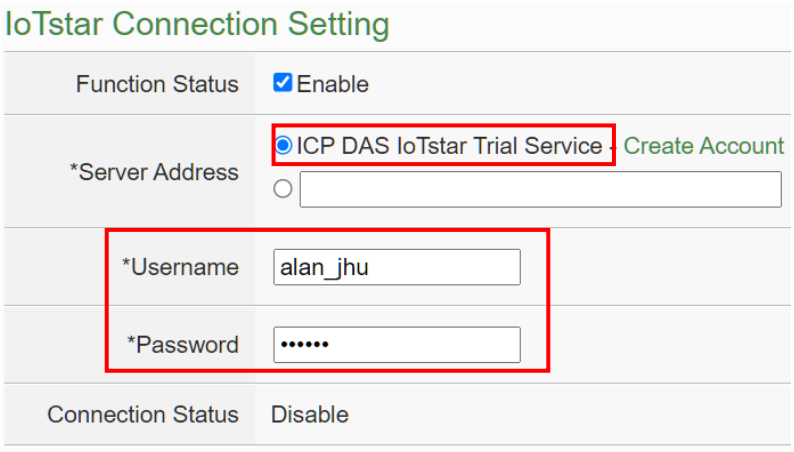
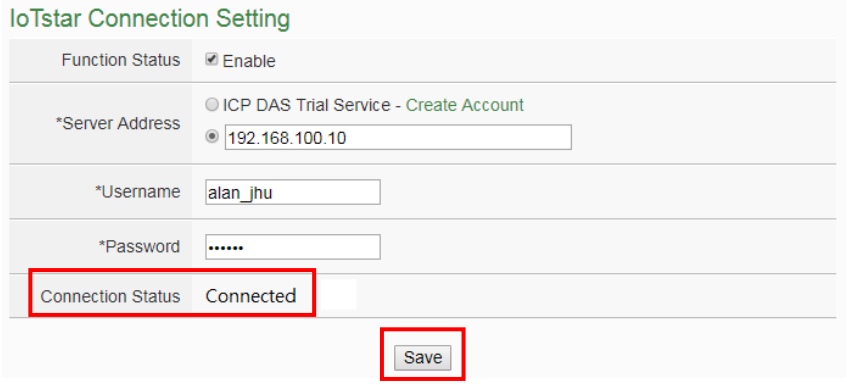


Figure6-8 : IoTstar connection setting page(2)

iv. After all settings are completed, click “Save” button to save the changes. This PMC will connect to the IoTstar immediately. The users can review the current connection status between PMC and IoTstar through the information displayed in the "Connection Status" field.



v. If the "Connection status" field shows the "Connected" message, it means the connection between the PMC and IoTstar is in normal status. The authorized users now can login into the IoTstar (with the username and password set in “Step iii”) to perform remote monitoring and maintenance of the PMC.

6.3 SNMP Setting

The PMC provides SNMP(Simple Network Management Protocol) V1 and V2c to work with the SNMP Network Management software for monitoring the system data, power meter data and I/O module data. The SNMP Setting page allows you to enable or modify the settings of the SNMP function on the PMC. The following figure illustrates the set up interface:

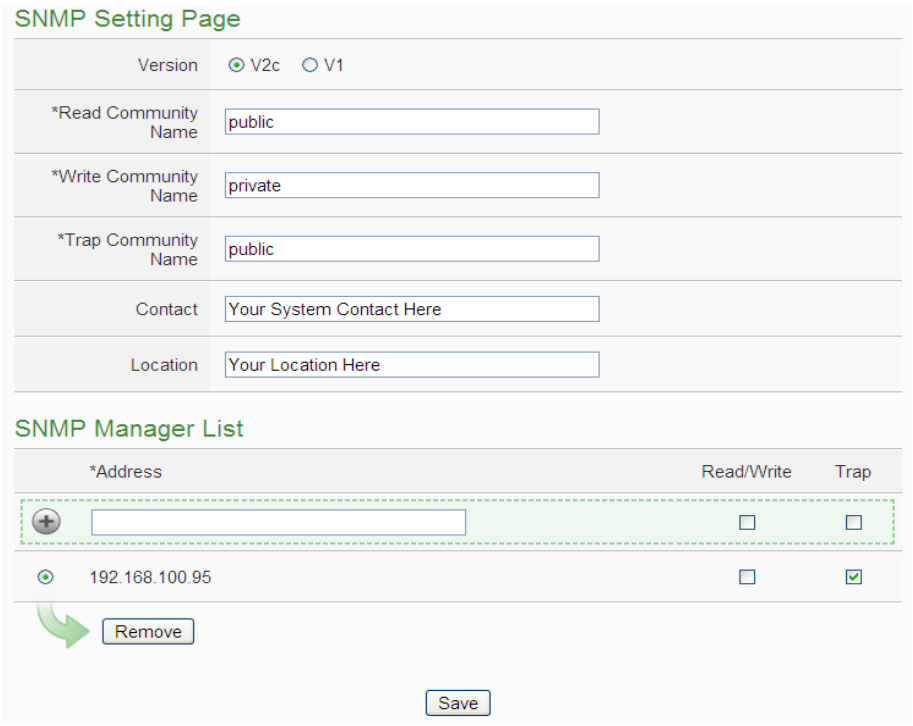


Figure6-9 : SNMP Setting Page

Please follow the steps below for the SNMP Settings：

i. In the “Version” field, select the SNMP version that you want to use. Currently PMC supports SNMP V2c and V1 protocol,
ii. In the “Read Community Name” field, input a string for “Read Community Name” for SNMP function. The default string is “public”.
iii. In the “Write Community Name” field, input a string for “Write Community Name” for SNMP function. The default string is “private”.
iv. In the “Trap Community Name” field, input a string for “Trap Community Name” for the SNMP function. The default string is “public”.
v. In the “Contact” field, input the “Contact” string.
vi. In the “Location” field, input the “Location” string,

The SNMP Manager List is a list for all SNMP Managers which will interact with the SNMP Agent of PMC. Please follow the steps as below to perform the setting for SNMP Managers. After all settings are completed, click “Save” button to save the changes.

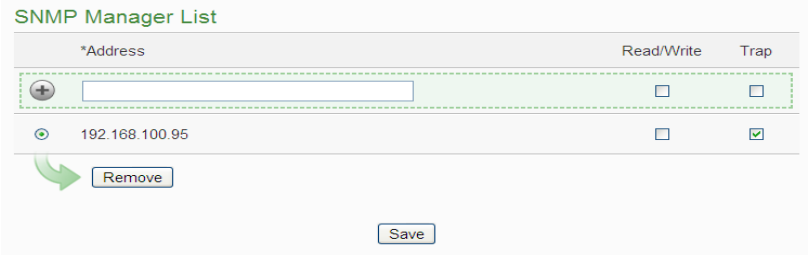


Figure6-10 : SNMP Manager List

i. Set up IP Address or domain name of the SNMP Manager that you want to add. Please set up the Address appropriately, if the settings are not the same as the settings of the SNMP Manager, the interaction between PMC and the SNMP Manager will be failed.

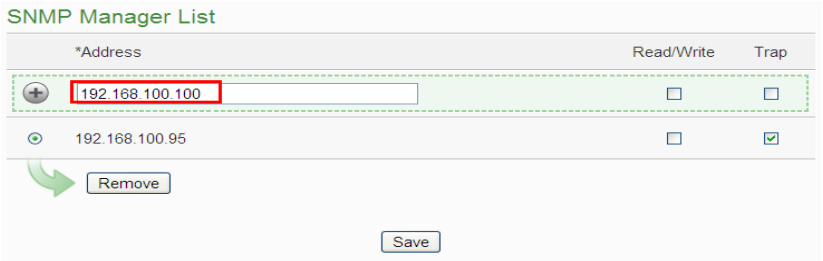


Figure6-11 : The Address Setting for SNMP Manager

ii. Click to Enable (or Disable) the working model between the SNMP Manager and the SNMP Agent of PMC. Currently PMC provides two working models as Read/Write (Polling) and Trap for SNMP Manager.

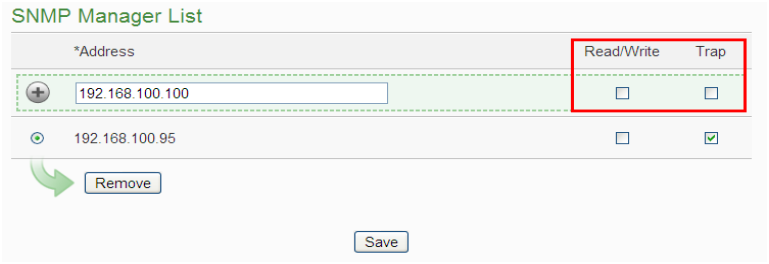


Figure6-12 : The Working Model Setting for SNMP Manager

Please Note: If no "Read/Write" field on the list is enabled to accept the Read/Write commands, indicating that it will allow accepting the Read/Write commands from ANY SNMP Manager.

iii. After completing the IP address and working model setting, please click  button to add the SNMP Manager to the list. After adding

the SNMP Manager, click “Save” button to save the changes.

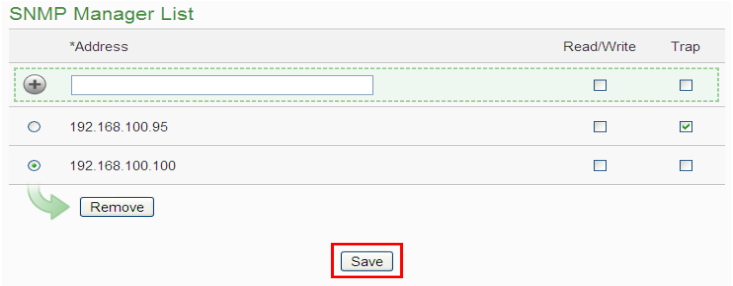


Figure6-13 : Save the SNMP Manager Setting

6.4 Security Setting

Security Setting allows user to change the password that is required when access to PMC. The user could also modify the settings of FTP Server and Idle Time. The Security Setting page is as follow:

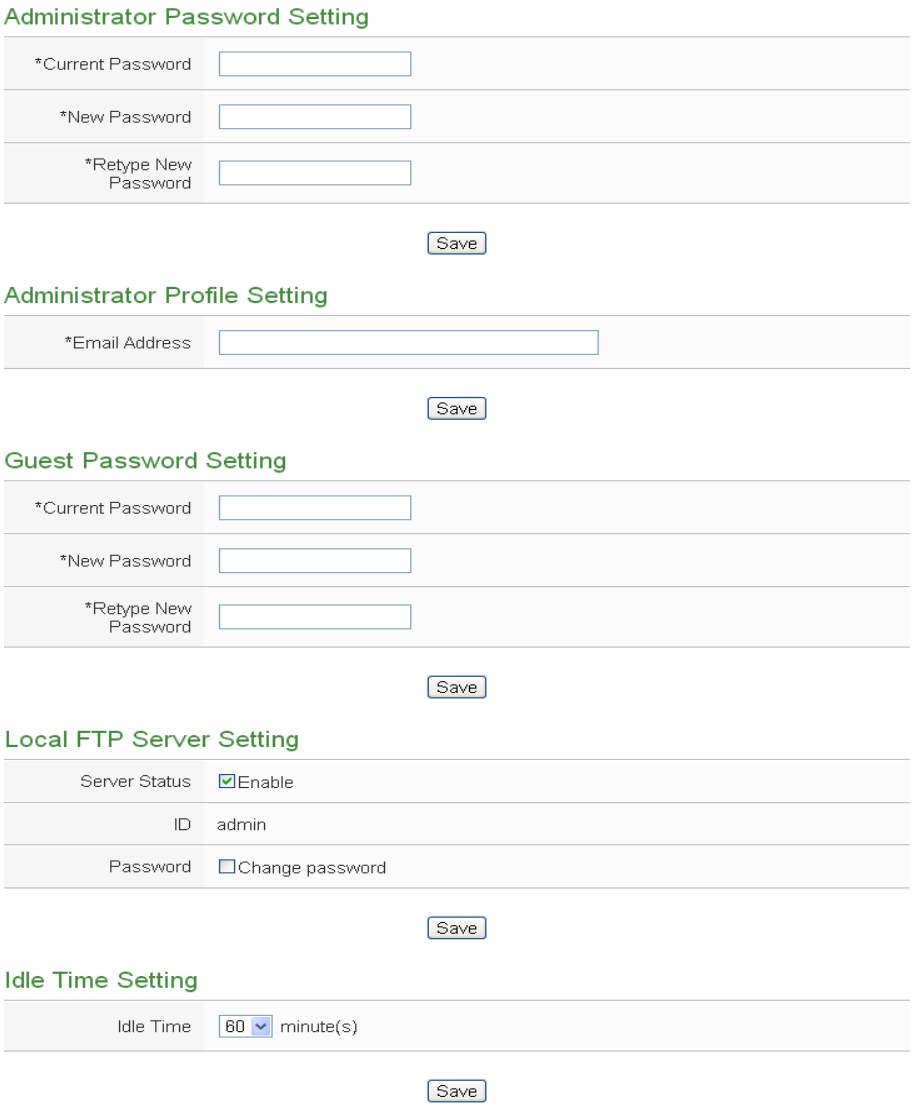


Figure6-14 : Security Setting Page

- Password Setting

  PMC provides two passwords sets, one for Administrator, the other for Guest. The default password for Administrator is “Admin” and “User” for Guest. The user can modify the password in the “Password Setting” section; the Password length is limited to 16 characters. After all settings are completed, click “Save” button to save the changes. In addition, if login as the Administrator, in the “Administrator Profile Setting” section, the users could input an email address, once the password is forgotten or

lost, the PMC could send an email with the passwords (administrator and guest) to this email address, for more detailed information, please refer to Appendix II.

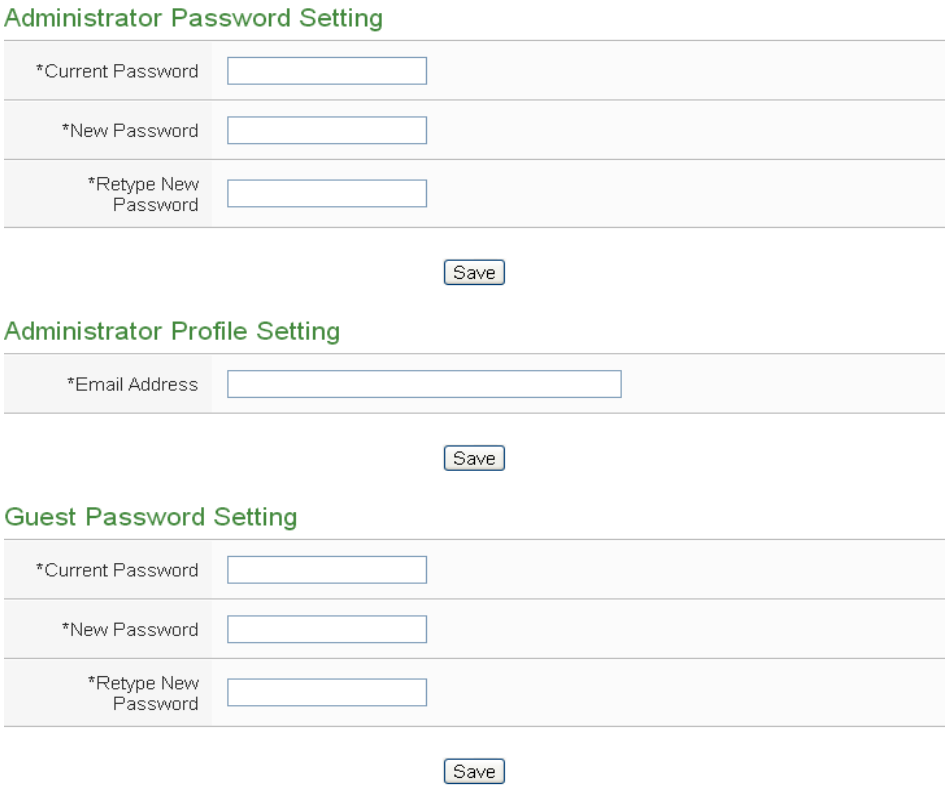


Figure6-15 : Password Setting Page

- Local FTP Server Setting

  In this section, it allows to enable or disable the FTP Server function on the PMC side. The user could connect to PMC FTP Server via FTP software to remotely retrieve event log or data record file. To enable this function, check "Enable" in the "Server Status" field. The default password is "Admin", the user could modify the password of the FTP Server on the PMC side if required.

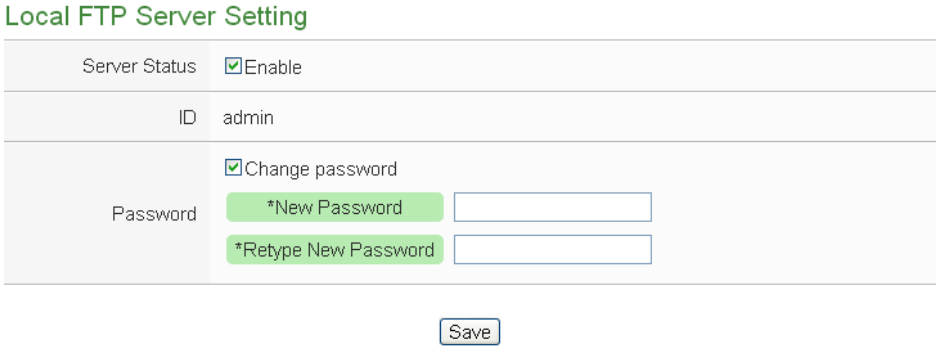


Figure6-16 : Local FTP Server Setting Page

- Idle Time Setting

  After the administrator login into the PMC page, when the idle time exceeds the pre-set time interval (default is 10 minutes), the administrator will be automatically logout. The idle time could be set as Disable/10/20/30/60 minutes, after the setting is completed, click “Save” button to save the changes.

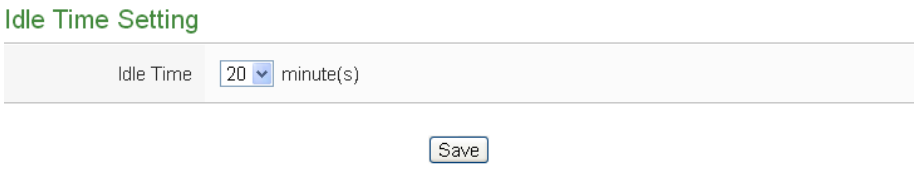


Figure6-17 : Idle Time Setting Page

6.5 I/O Interface Setting

I/O Interface Setting allows to setup the function settings on COM Port or LAN of PMC. The setting interface is shown as below:

Figure6-18 : I/O Interface Setting Page

The I/O interface functions for PMC are as below.

Model	I/O interface function
PMC-224xM-iWSN	● COM2(RS-232)：Reserved specifically for Modbus RTU Slave for connections to HMI or SCADA. ● COM3/COM4(RS-485)：Reserved for connection with ICP DAS iWSN-200U Wireless Data Concentrator or for Modbus RTU Slave to connect HMI or SCADA. ● LAN：LAN connection is by default set for Modbus TCP Slave to connect HMI or SCADA. It can also be set to connect with ICP DAS iWSN-200E Wireless Data Concentrator simultaneously.

The following section will introduce how to set I/O interface for different functions:

◆ Connect to HMI or SCADA via COM Port

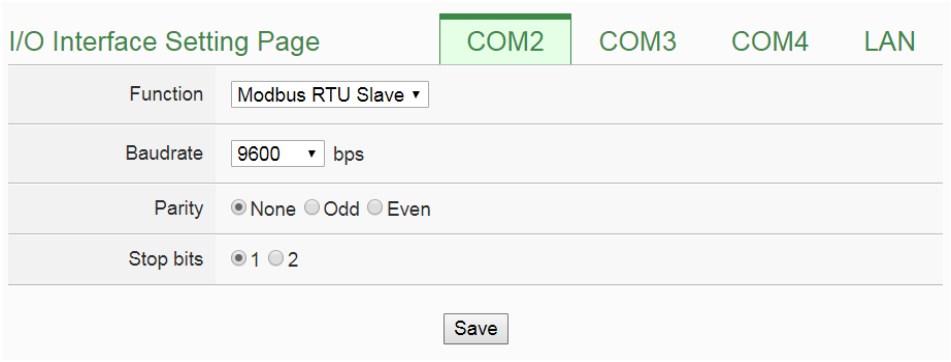


Figure6-19 : Function setting to connect to HMI or SCADA

The settings steps are as below:

i. In the "Function" field, select "Modbus RTU Slave" from the dropdown list.

ii. In the "Baudrate" field, select the Baudrate from the dropdown list, the Baudrate of PMC and HMI or SCADA have to be set the same.

iii. In the "Parity" and "Stop bits" fields, set up the Parity and Stop bits. The Parity and Stop bits of PMC and HMI or SCADA have to be set the same.

iv. After all settings are completed, click "Save" button to save the changes.

◆ Connect to iWSN-200U via COM Port.

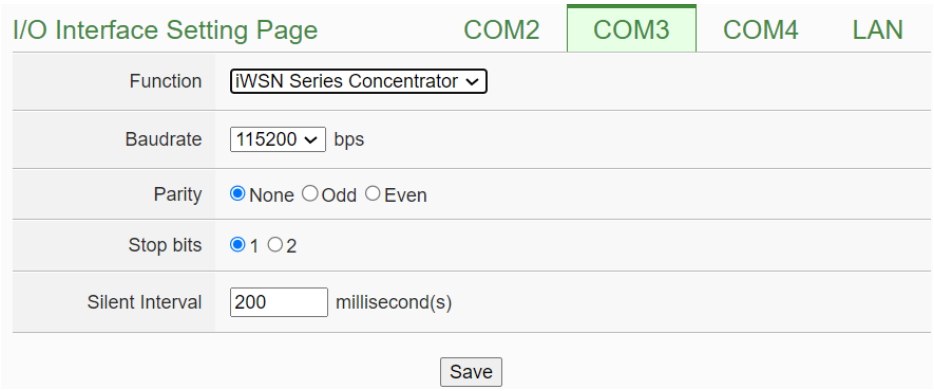


Figure6-20 : Function setting to connect to iWSN-200U

The settings steps are as below:

i In the "Function" field, select "iWSN Series Concentrator" from the

dropdown list.

ii In the “Baudrate” field, select the Baudrate from the dropdown list, the Baudrate of PMC and iWSN-200U have to be set the same.

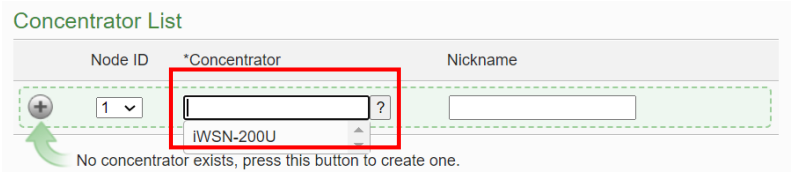
iii In the “Parity” and “Stop bits” fields, set up the Parity and Stop bits. The Parity and Stop bits of PMC and iWSN-200U have to be set the same.

iv In the “Silent Interval” field, input the time interval between successive sending of commands from the PMC to the iWSN-200U, the unit will be millisecond (ms).

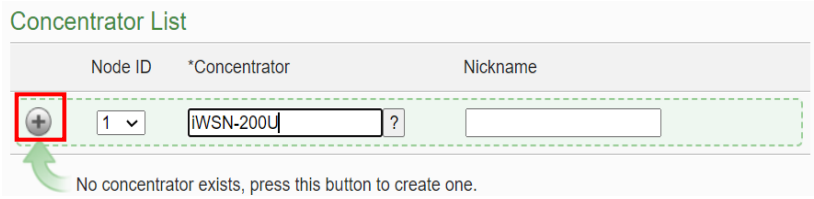
Please Note: After the “Baudrate” is selected, the system will automatically generate a proper value in the “Silent Interval” field. For iWSN-200U has different Modbus command process capability on the different environment, so the response time for sending result from iWSN-200U to PMC might be different. The user can adjust this value to most appropriate time interval, such as: extend this value to make sure iWSN-200U connected to the PMC has enough time to process the Modbus command, or shorten this value to improve the efficiency of the poll mechanism between iWSN-200U and PMC.

v Add New iWSN Concentrator

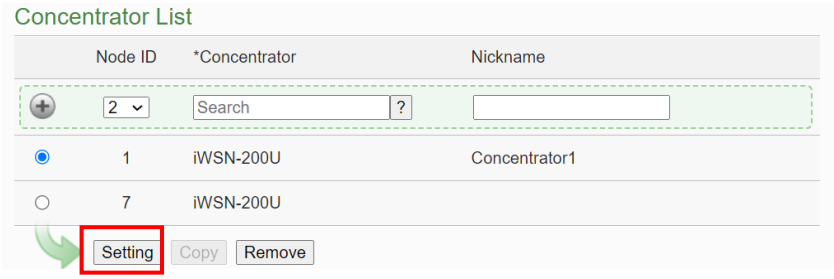
1. In the “Node ID” field, input the Node ID value of this iWSN-200U.
2. Select the iWSN concentrator model from the dropdown list of “Concentrator” field you want to add.



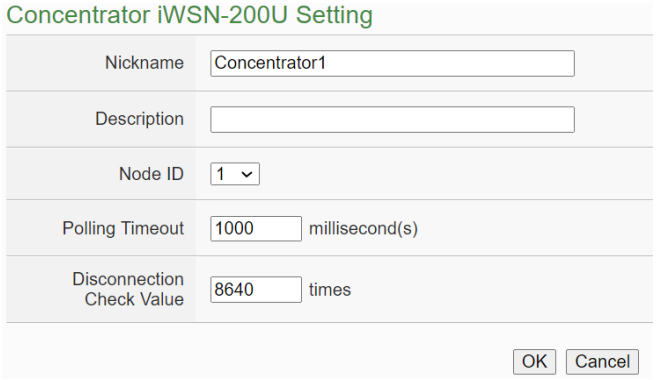
3. Assign the name for the iWSN concentrator in the “Nickname” field. This name will be displayed on the power meter information and logic settings page. The default name is the type of the iWSN concentrator.
4. Click ⊕ to add the iWSN concentrator to the “Concentrator” list. After adding it, please remember to click the "Save" button to save the settings.



5. If need, you can select the iWSN concentrator first, and then modify the parameters setting of the iWSN concentrator selected.



6. Following is the interface for the iWSN concentrator's parameters setting.



- Polling Timeout: The time interval for PMC to send command to the iWSN-200U and wait for the response, the unit will be ms. The setting range will be 1-10000 ms.
- In the "Disconnection Check Value" field, input the wireless module disconnection check value of this iWSN-200U. iWSN-200U will periodically check whether it has received RF packets from the wireless power meter, or not. When the number of RF packets not received is greater than this value, the power meter will be identified is in disconnection status.

vi After all settings are completed, click "Save" button to save the setting.

◆ Connect to HMI (or SCADA) and iWSN-200E via LAN

The LAN interface on PMC is by default set for Modbus TCP Slave to connect HMI or SCADA. PMC also can connect with iWSN-200E through Ethernet simultaneously.

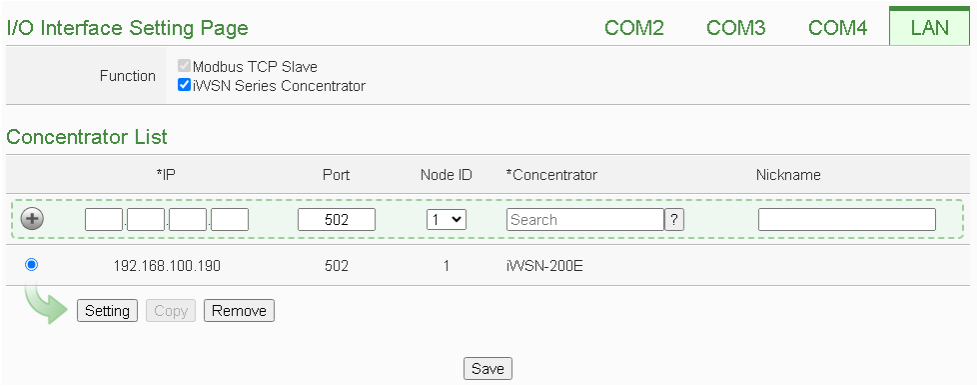


Figure6-21 : Function setting to connect to iWSN-200E

The settings steps are as below:

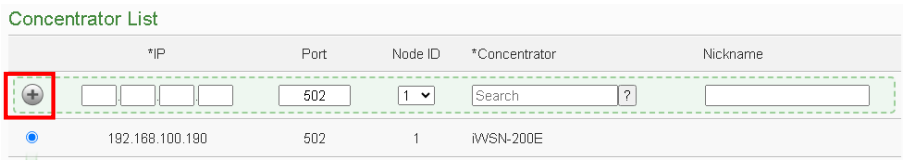
i In the “Function” field, click the “iWSN Series Concentrator” item.

ii In the “IP”, “Port” and “Node ID” fields, input the IP address, Port and Node ID setting value of this iWSN-200E.

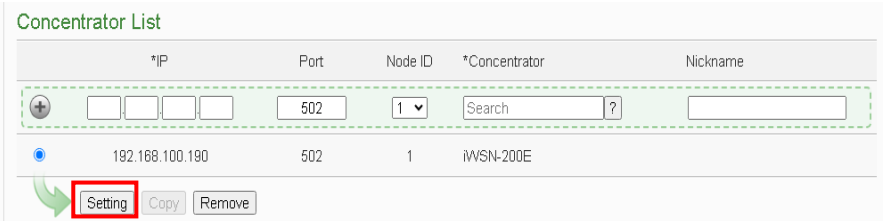
iii Select iWSN concentrator model from the dropdown list of “Concentrator” field.

iv Assign name for the iWSN concentrator in the “Nickname” field. This name will be displayed on the meter information and logic settings page. The default name is the type of the iWSN concentrator.

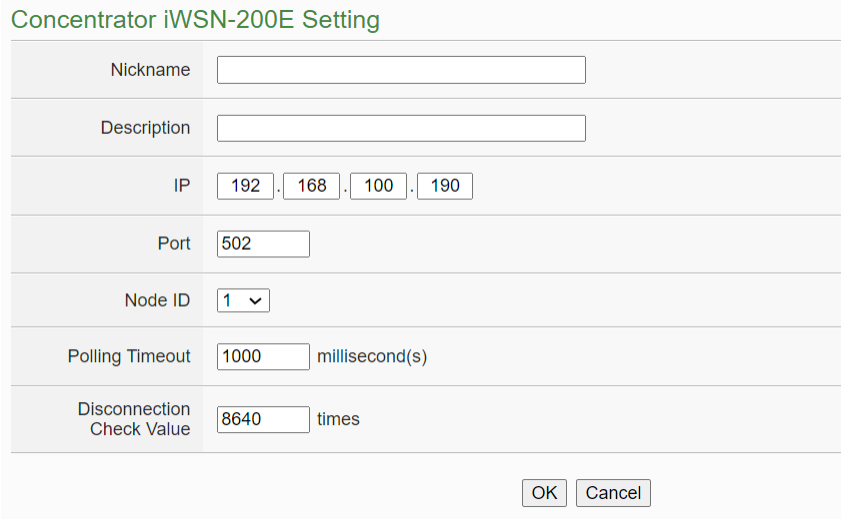
v Click ⊕ to add the iWSN concentrator to the “Concentrator” list. After adding it, please remember to click the "Save" button to save the settings.



vi If need, user can select the iWSN concentrator first, and then modify the parameters setting of the iWSN concentrator selected.



vii Following is the interface for the concentrator's parameters setting.



- Polling Timeout: The time interval for PMC to send command to the iWSN-200E and wait for the response, the unit will be ms. The setting range will be 1-10000 ms.
- In the "Disconnection Check Value" field, input the wireless module disconnection check value of this iWSN-200E. iWSN-200E will periodically check whether it has received RF packets from the wireless power meter, or not. When the number of RF packets not received is greater than this value, the power meter will be identified is in disconnection status.

viii After all settings are completed, click "Save" button to save the setting.

6.6 Other Setting

In the "Other Setting" section, it allows to set up Contract Capacity Setting, Demand Interval Setting and Carbon Emissions Setting. The setting interface is shown as below:

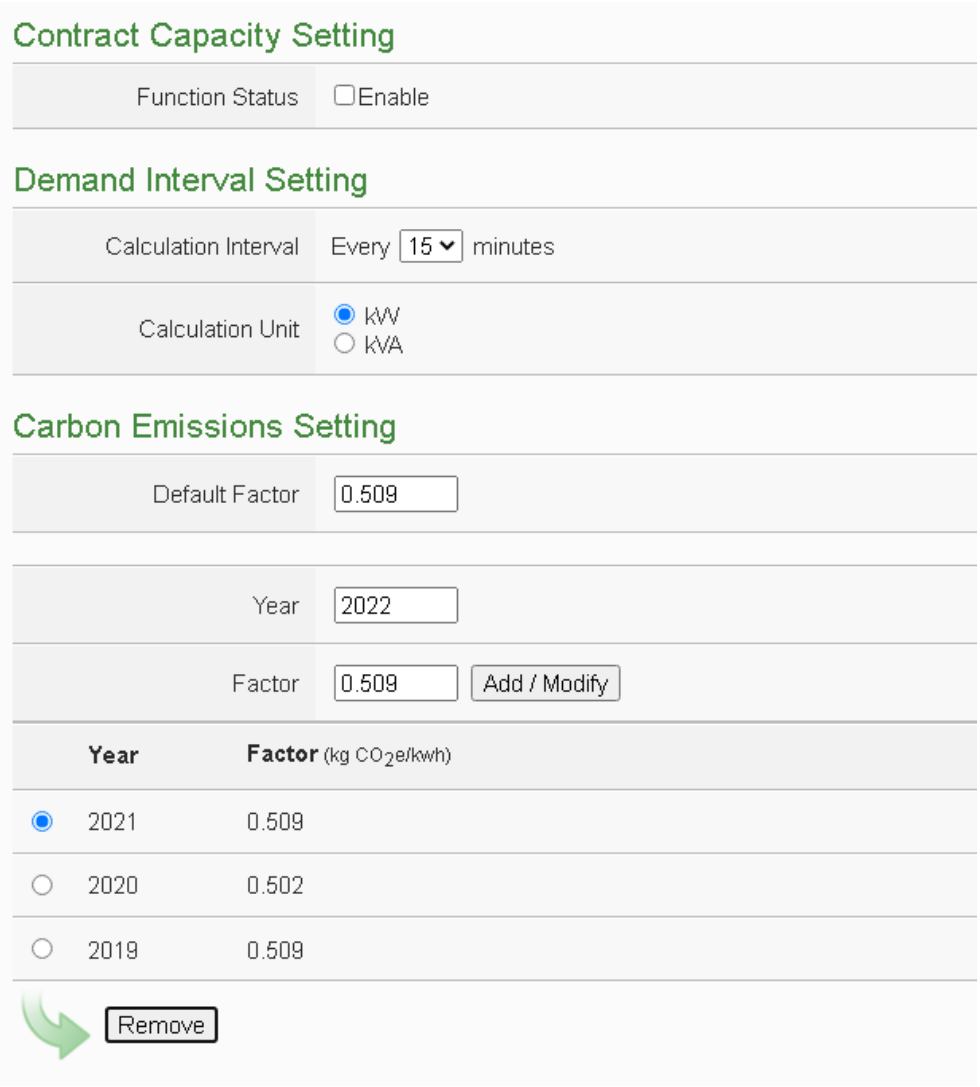


Figure6-22 : Other setting page

- Contract Capacity Setting

  In this section, it allows to enable and set Contract Capacity. To enable the Contract Capacity function, click on "Enable" and input the Contract Capacity. Click "Save" button to save the settings. The Contract Capacity being set will be displayed on the System Setting main page.

- Demand Interval Setting

  In this section, it allows to set Demand Interval Setting. The system will calculate the demand according to this demand interval. The default interval is 15 minutes; the user could set the interval to be 15/30/60 minutes. Click "Save" button to save the settings.

- Carbon Emissions Setting

  In this section, user can assign the electricity carbon emissions factor for each year to let PMC can calculate the electricity carbon emissions. The

setting procedure for electricity carbon emissions factor is as below:

i Input the year user want to assign the carbon emission factor.

ii Input the carbon emissions factor. Please assign the value according to the electricity carbon emissions factor published by the International Energy Agency (IEA) for each country. Please note: When PMC is calculating the electricity carbon emissions, if user does not complete the carbon emission factor setting for the corresponding year, the system will use the value in the "Default Factor" field for calculation.

iii Click Add / Modify button to add the carbon emission factor setting for the specified year.

iv If you need to modify the carbon emission factor setting for the desired year, please input the year to be adjusted first, fill in the new carbon emission factor, then click Add / Modify button to change the setting.

v Repeat step i~iii to complete the carbon emission factor setting for the desired years, then click “Save” button to save the changes.

- Decimal Places Setting

Users can set up the decimal place number for the floating-point value displayed in the Web page of PMC/PMD. The setting interface is as follows:

Figure6-23 : Decimal Places Setting

User can set up the decimal place number to 1~7. After the setting is completed, click the “Save” button to save the setting.

6.7 Power Meter Group Setting

The power meter group setting function allows user to create groups that contain specific loops/phases of power meters for easy group classification. These pre-set groups can be inquired in “Power Data Information” and “Historical Electricity Analysis” pages for power data analysis. The power meter group setting page is shown as below:

Figure6-24 : Power Meter Group Setting

Please refer to the following chapters to setup the group/subgroup and click the “Save” button to save the changes.

6.7.1 Group and Subgroup Viewing

Click the group or subgroup bar to expand/hide the lists.

Please note: The gray group means that this group has no settings and therefore cannot be expanded.

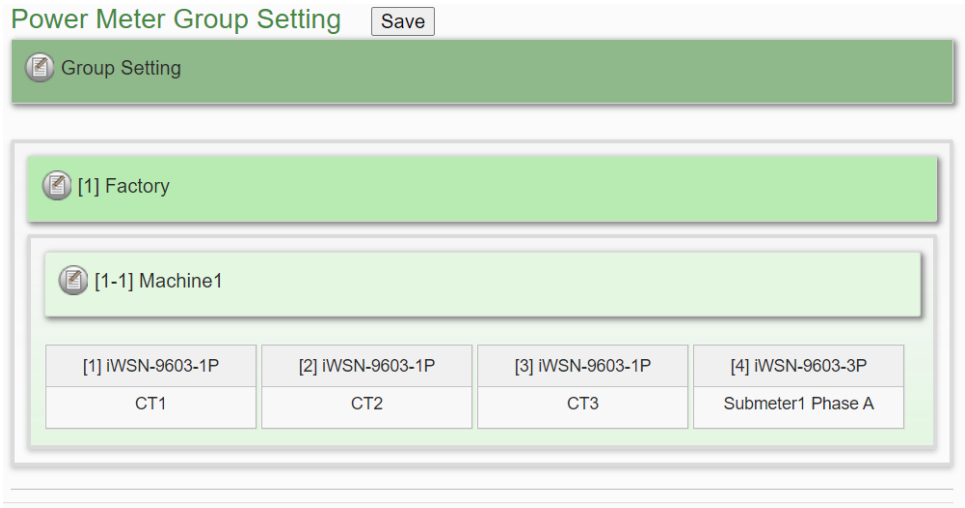


Figure6-25 : Group and Subgroup Viewing

6.7.2 Group and Subgroup Setting

i Click the “Set up” button ( ) of group or subgroup to open the setting window.

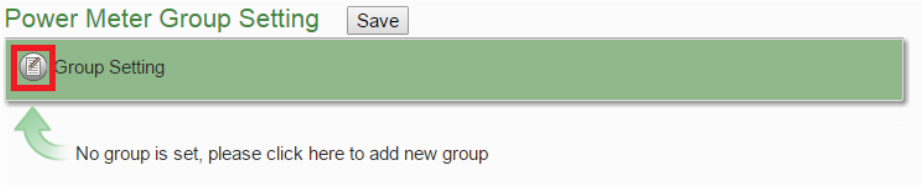


Figure6-26 : Group Setting

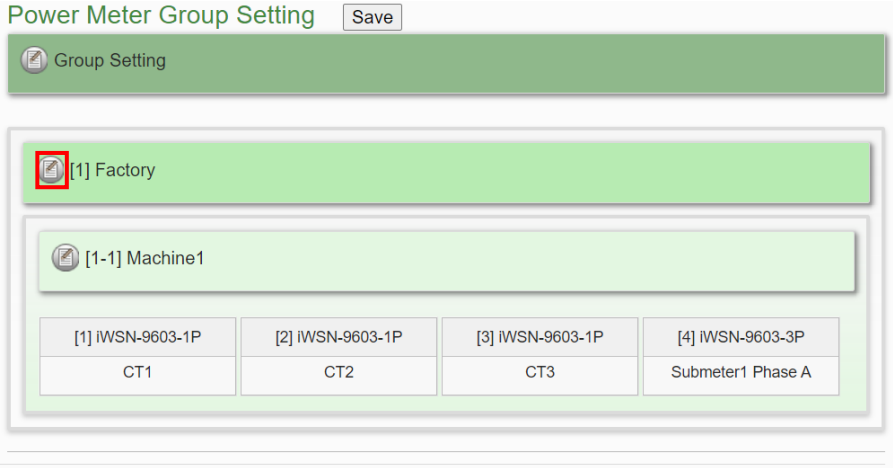


Figure6-27 : Subgroup Setting

ii Input the group/subgroup name and click  to add this group/subgroup to the lists. Click “Close” button to return to group setting page.

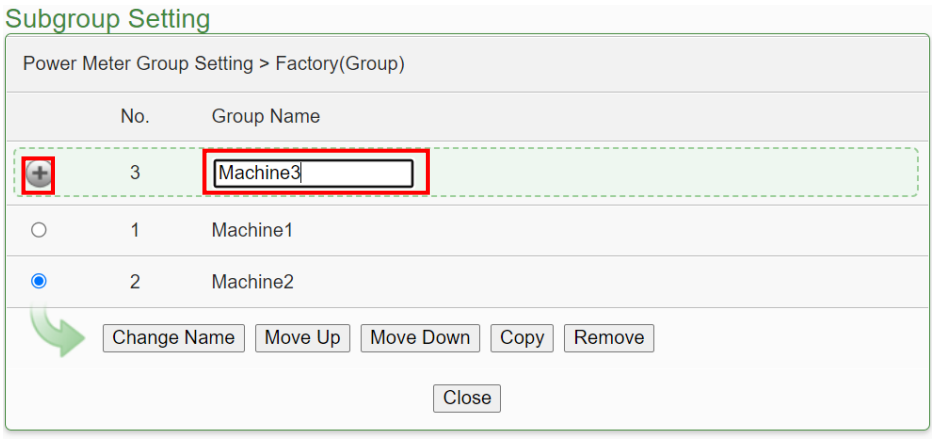


Figure6-28 : Subgroup Setting Window

6.7.3 Group and Subgroup configuration

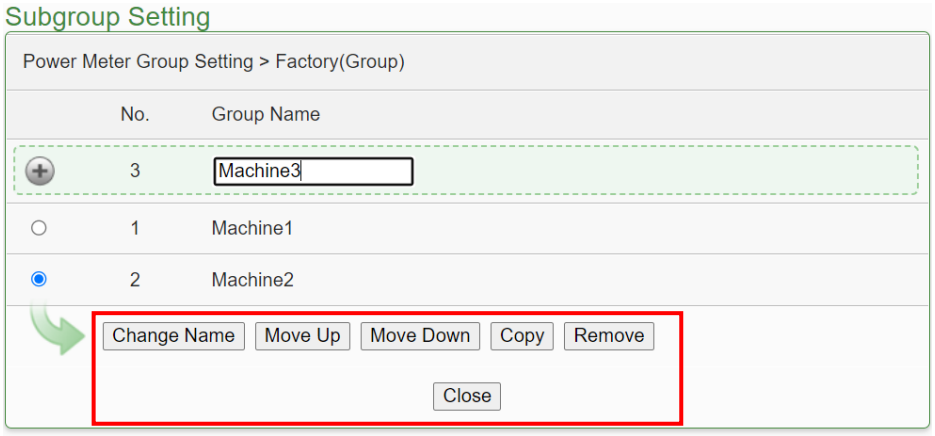


Figure6-29 : Configurations for Subgroup

The group/subgroup configurations can be done on the Group/Subgroup Setting page. Please select the group/subgroup first and click on the function button to perform the configurations:

- Change Name:Click the radio button in front of the group and click on “Change Name” to change the name of selected group. Click “OK” button to save the changes.
- Move Up: Click the radio button in front of the group name and click on “Move Up” to move the group to upper order (upper index number (No.)).
- Move Down: Click the radio button in front of the group and click on “Move Down” to move the group to lower order (lower index number (No.)).
- Copy: To copy the settings of a pre-set group to the new group, please click the radio button in front of the pre-set group and then click on “Copy”, a new group (in sequence) will be added to the list and the settings of the old group will be copied to this newly added group.
- Remove: Click the radio button in front of the group and click on “Remove” to remove the selected group.
- Close: Click the “Close” button to return to group setting page.

6.7.4 Setup the loops/phases of the subgroup

i Click the “Set up” button ( ) of subgroup to open the setting window.

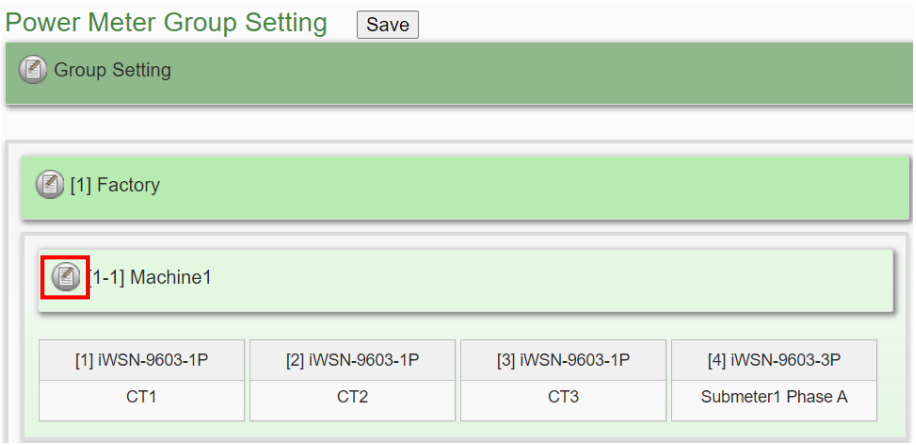


Figure6-30 : Loops/Phases of subgroup Setting

ii Select the loop/phase of the power meter and click ⊕ to add this loop/phase to the lists. Click "Close" button to return to group setting page.

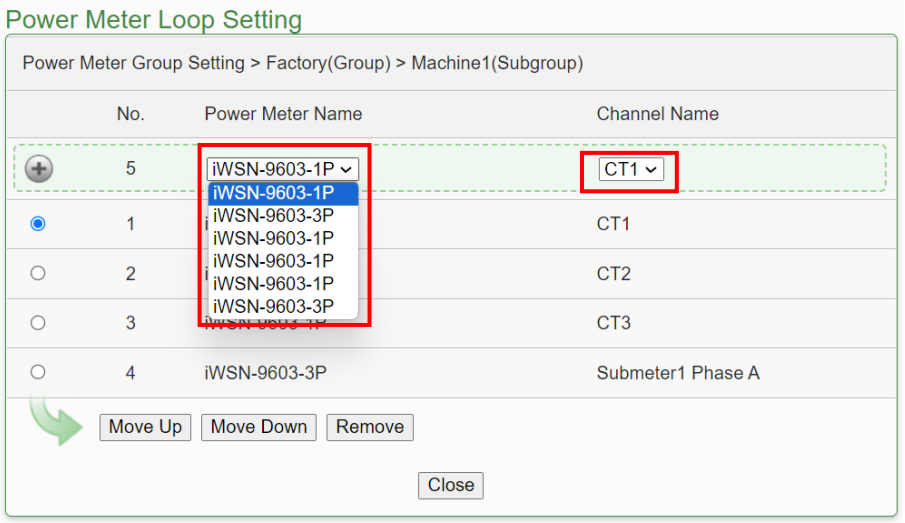


Figure6-31 : Choose Loops/Phased of Subgroup

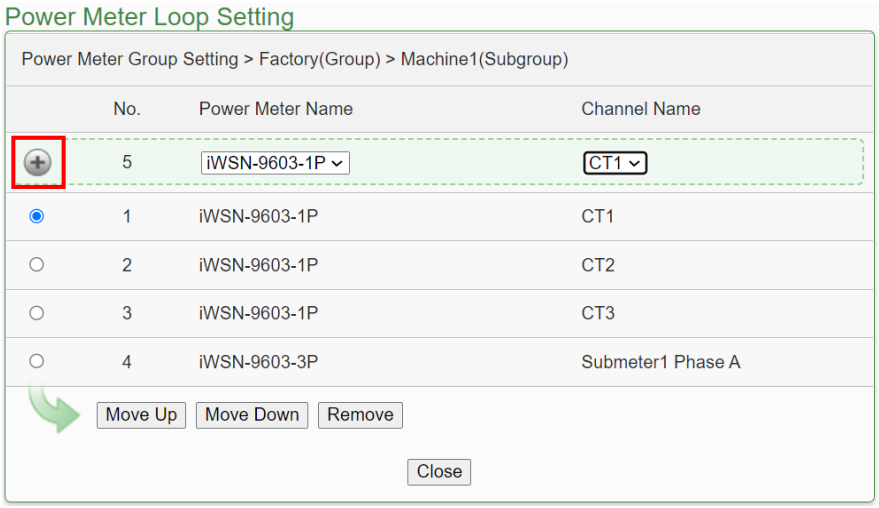


Figure6-32： Add Loops/Phases for Subgroup

6.7.5 Loop/Phase of group configuration

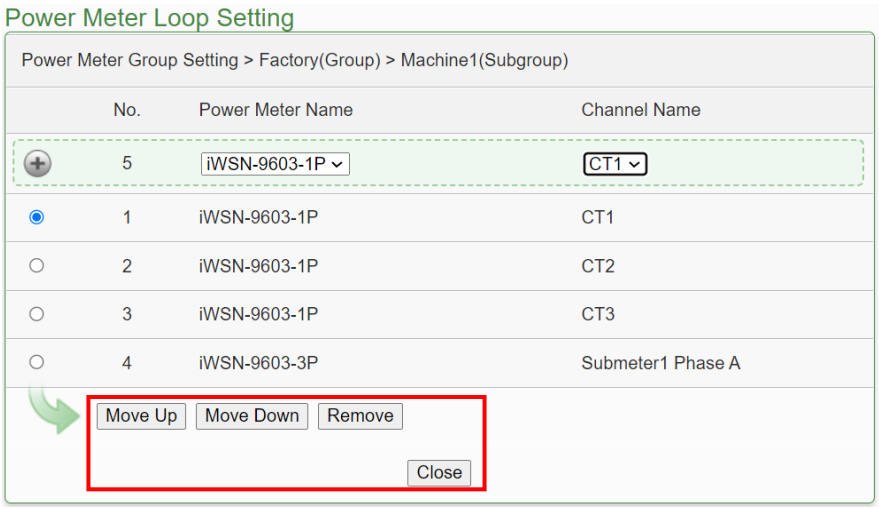


Figure6-33： Configurations for Loops/Phased of Subgroup

The loop/phase of subgroup configurations can be done on the Power Meter Loop Setting page.. Please select the loop/phase first and click on the function button to perform the configurations:

- Move Up：Click the radio button in front of the loop/phase name and click on “Move Up” to move the loop/phase to upper order (upper index number (No.)).
- Move Down：Click the radio button in front of the loop/phase and click on “Move Down” to move the loop/phase to lower order (lower index number (No.)).
- Remove：Click the radio button in front of the loop/phase and click on “Remove” to remove the selected loop/phase.

- Close：Click the “Close” button to return to group setting page.

6.8 Firmware Update

PMC allows to update firmware via browser, after the update is completed; the PMC doesn’t require to reboot. Please follow the steps below:

i. Please contact ICP DAS service to obtain the latest version of the PMC firmware file.

ii. Go to “System Setting” page, under the “Firmware Update Setting”, click on “Browse”.

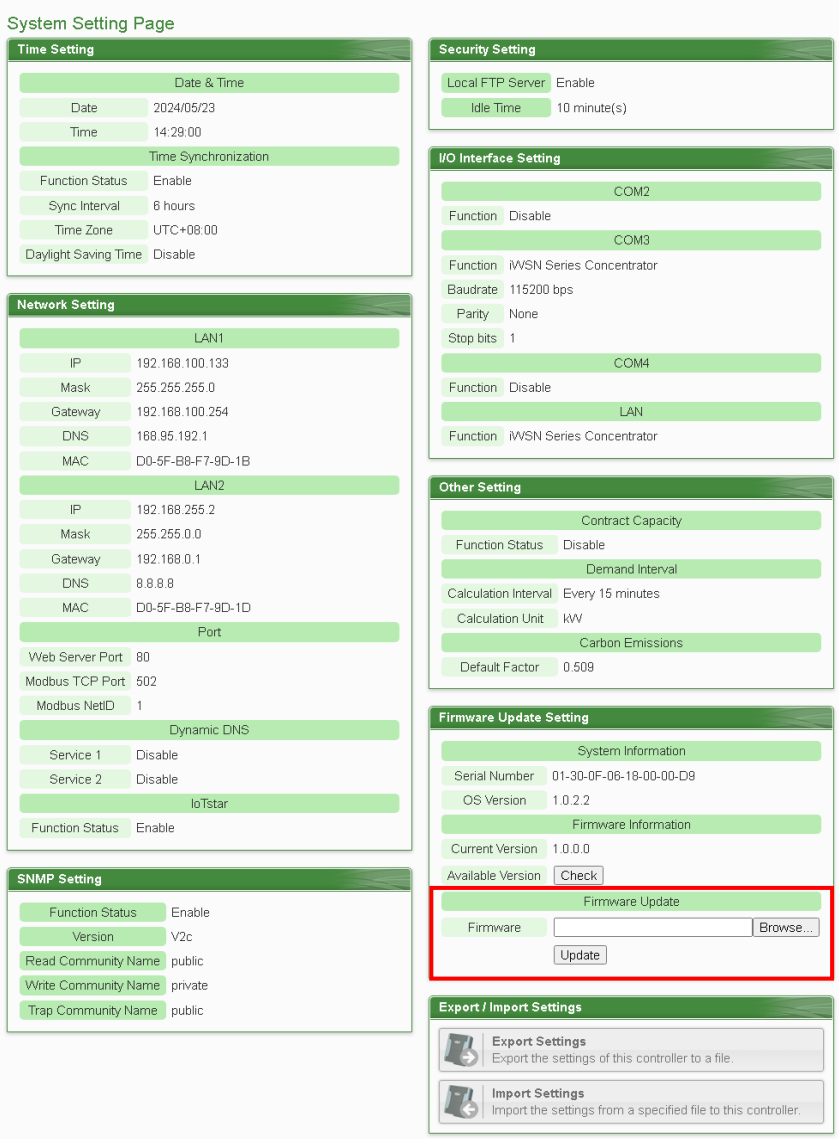


Figure6-34 : Firmware Update(1)

iii. Browse through to select the new firmware file and click “Open”.

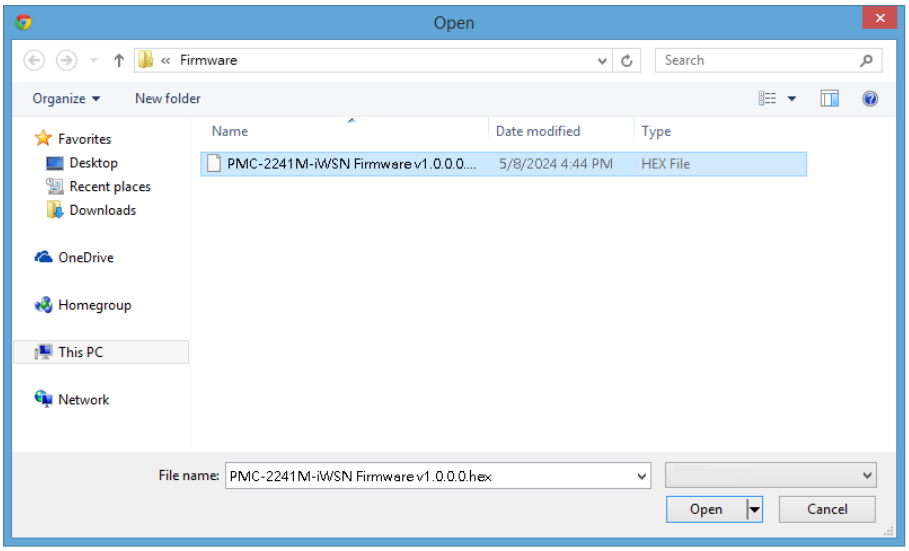


Figure6-35 : Firmware Update(2)

iv. Click “Update” to update the firmware.

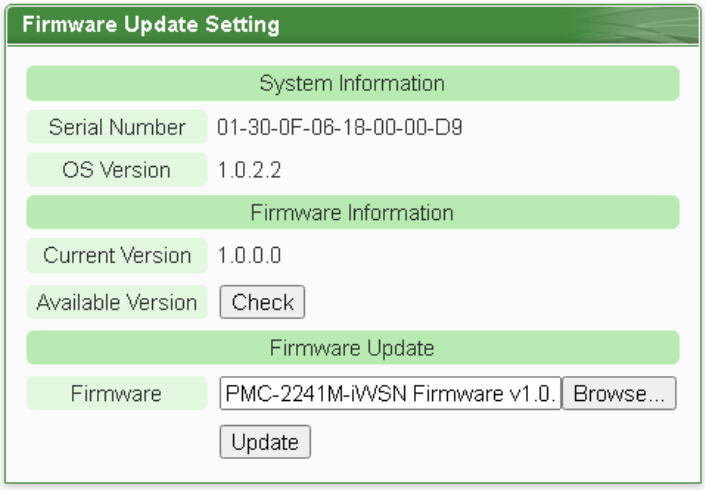


Figure6-36 : Firmware Update(3)

v. Click “OK” to start the firmware update, to cancel the firmware update, click “Cancel”.

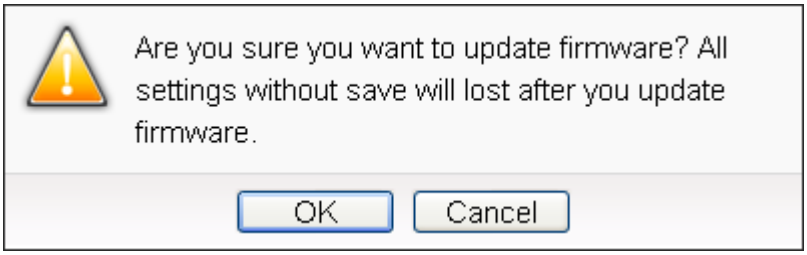


Figure6-37 : Firmware Update(4)

vi. Updating the firmware

Please note: when the firmware update process is started, please DO NOT close the update window or perform any system modification, or may result in unexpected failures.

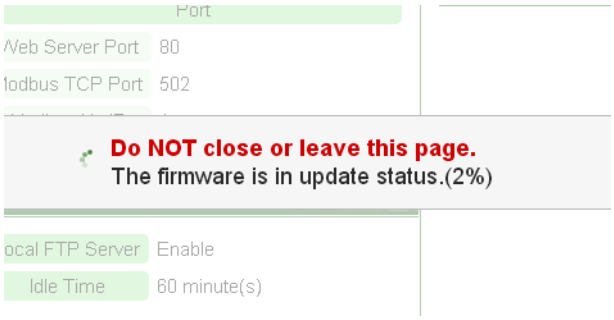


Figure6-38 : Firmware Update(5)

vii. Click "OK" to complete the update process. After the update is completed, please clear the cache and cookies on your browser. If the update process is failed, please perform the update again.

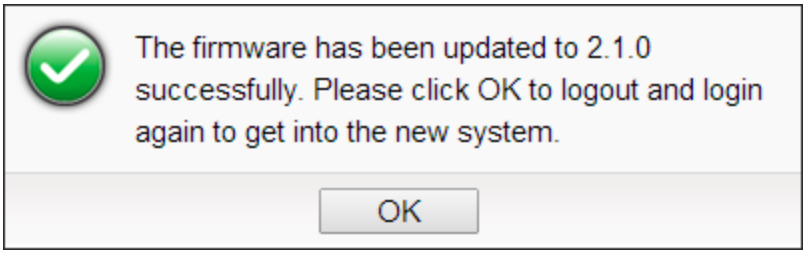


Figure6-39 : Firmware Update(6)

6.9 Rule File Import & Export

PMC can directly perform the PMC's Rule file import and export operations through the Browser to complete the update and backup of the PMC's setting. The "Export/Import Settings" operation can back up all PMC settings, but does NOT include the "Time Setting", "Network Setting", "SNMP Setting", "Account Setting" and "Security Setting". The items of the backup setting is the same as the file backup using PMC Utility, but the files backed up by the two interfaces are not compatible.

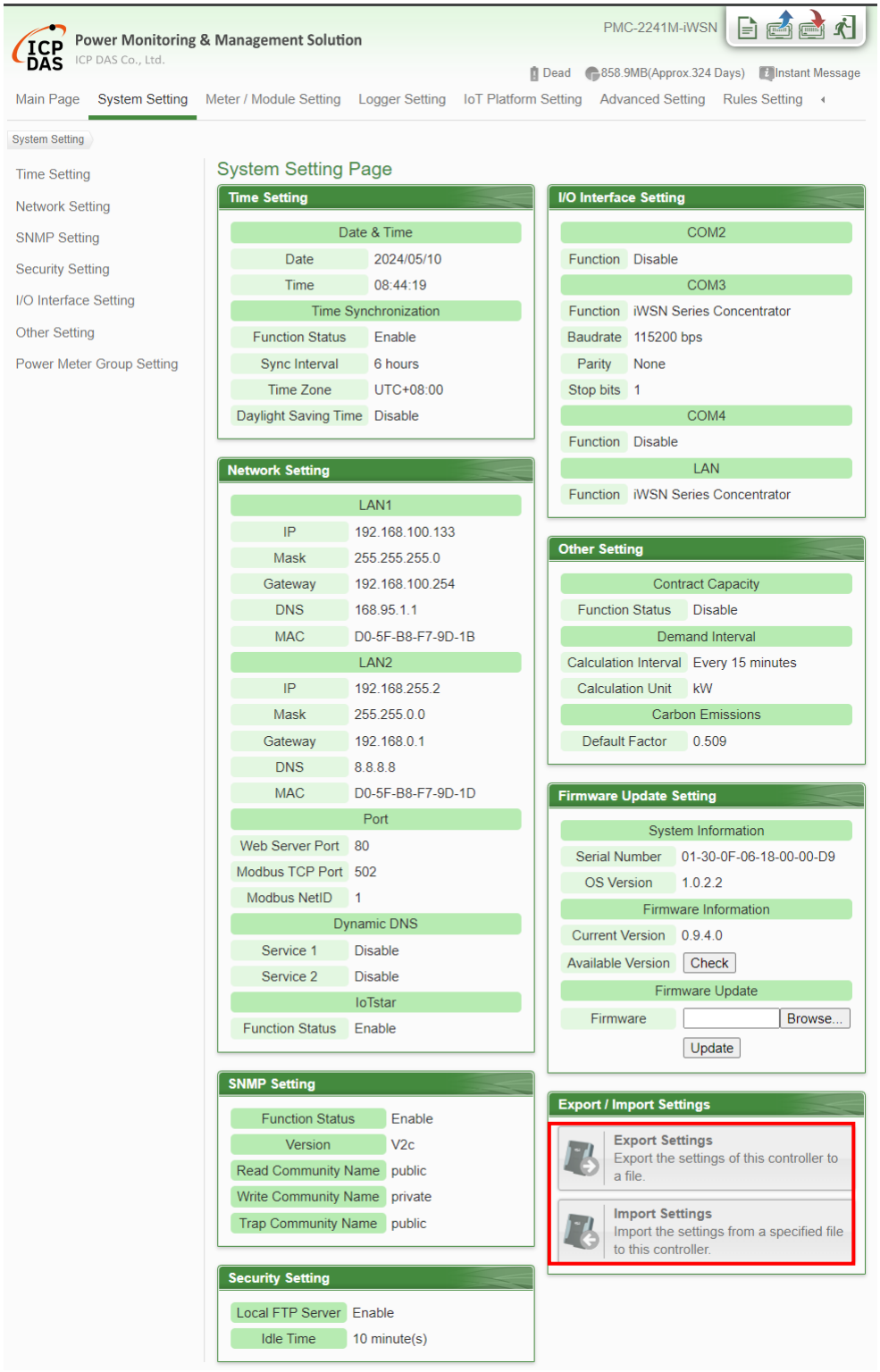


Figure6-40 : Export / Import Setting page and the settings to be backed up

- Export PMC's Rule file:
  1. After click the “Export Settings” button, the rule file would be stored in the default download path according to the browser's setting. If there was setting of PMC has not been saved before the export

operation, it will ask if you want to save the setting before the export operation .

- Import PMC's Rule file:
  1. Click the “Import Settings” button and select the PMC's rule file to be imported from local PC to PMC.
  2. After selecting the file to be imported, the user will be asked whether to abandon the current settings, or not. If user select “Import”, the current settings of PMC will be cleared after the import operation.
  3. After the import process is done, PMC would run with the imported rule automatically. If the imported file is incomplete or is not produced via the "Export PMC's Rule file" operation of PMC web interface, the import operation will be failed.

6.10 Firmware File Check

PMC/PMD allows firmware file checking directly through a web browser. After the check is completed, if any abnormal status are found in the firmware file, the system can proceed to restore the firmware immediately.

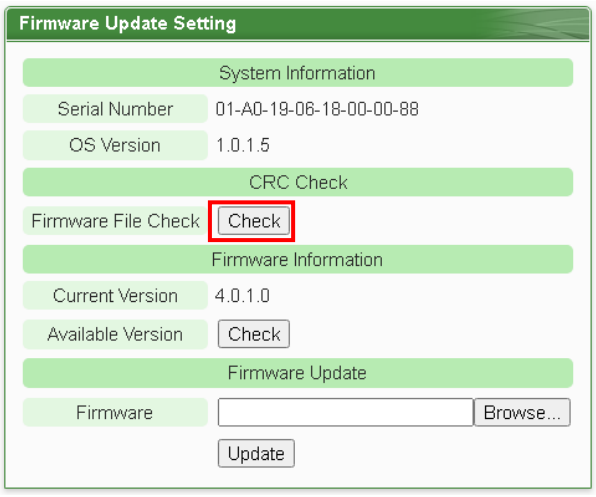


Figure6-41 : Firmware File Check

7 iWSN Power Meter & I/O Module Setting

Meter / Module Setting page allows to perform settings of the iWSN power meters and I/O Modules that are connected to the PMC. After getting into the setting page, the overview page will display current setting of the iWSN power meters and I/O Modules that are connected to the PMC, shown as below:

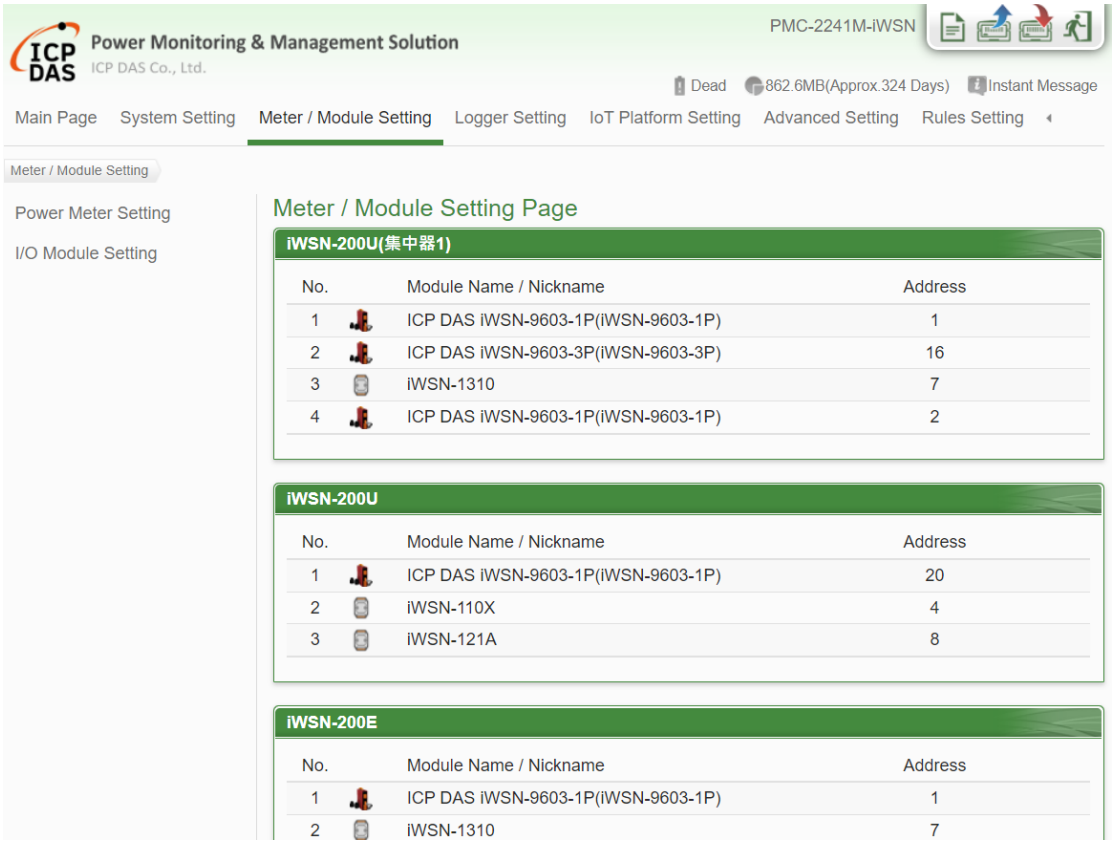


Figure7-1 : iWSN Power Meter / Module Setting Page

More detailed information for each function setting will be given in the following sections:

7.1 iWSN Power Meter Setting

On the “Power Meter Setting” page, user needs to set up and add the iWSN-200U and iWSN-200E concentrators through the I/O Interface Setting first. After complete the setting, it allows user to set up the iWSN power meters that are connected to iWSN-200U and iWSN-200E concentrators. Select the iWSN-200 concentrator in the concentrator list and click “Setting” button to enter the setting page of iWSN power meter. The concentrator list is as shown below:

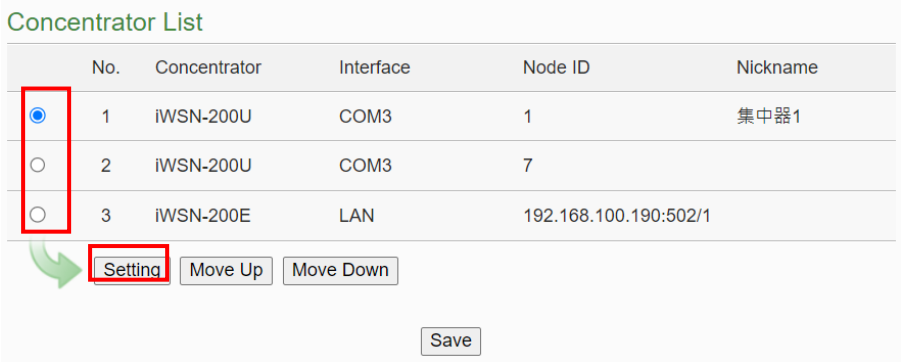


Figure7-2 : iWSN Concentrator list

Now the interface will display the list of iWSN power meters currently connected to the iWSN-200 concentrator you select. Please follow the sections as below to perform settings for iWSN power meters. After all settings are completed, click “Save” button to save the changes.

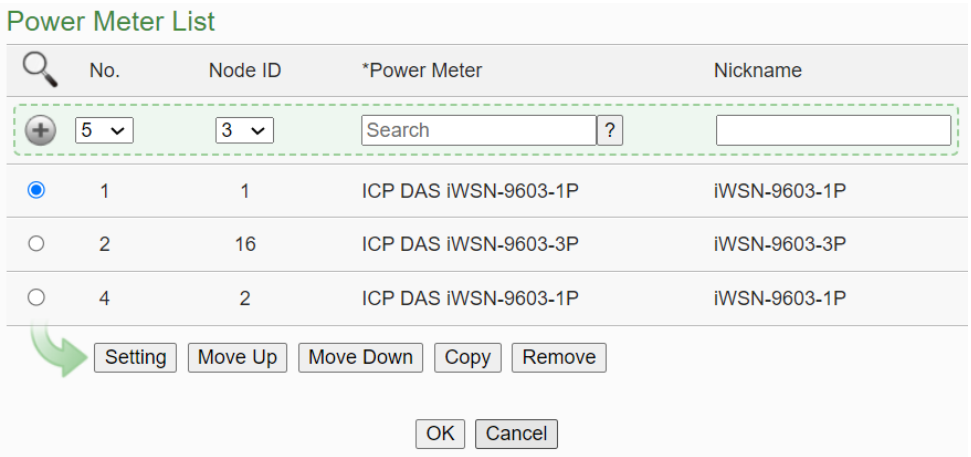


Figure7-3 : iWSN Power Meter list Interface

Please note: Each PMC can connect at most 3 iWSN-200 data contractors, supporting up to 93 ICP DAS iWSN wireless modules (Include iWSN wireless power meter and wireless I/O module).

7.1.1 Scan to add iWSN Power Meters

User could use Scan function to perform "Power Meter Scan mechanism" to automatically build a list of iWSN power meters that are connected to the iWSN-200. The steps are as below:

i Before performing the scan of the iWSN power meters, please make sure the RF channel has been paired and connected correctly between iWSN-200 and iWSN power meters.

ii Click  to start the scan of iWSN power meters that are connected to the iWSN-200.

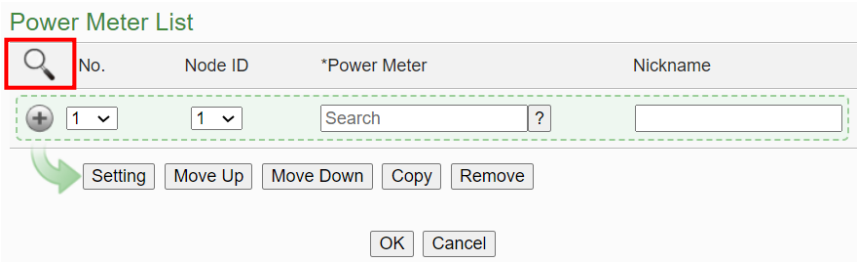


Figure7-4 : The "Scan" button to search iWSN Power Meter

iii When the Scan page appears, click on "Scan", the system will start to scan the iWSN power meters that match the settings previously set, to cancel the scan, click on "Cancel".

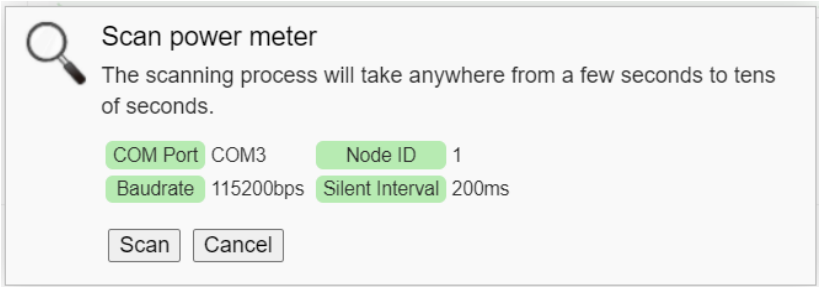


Figure7-5 : Set up the Scanning Range for the iWSN Power Meters

iv When the system is performing the scan, the address that are performing scan will be dynamically shown on the upper left side, please wait till the scan operation is completed. To stop the scan operation, click on "Cancel" to terminal the scan and leave the page.

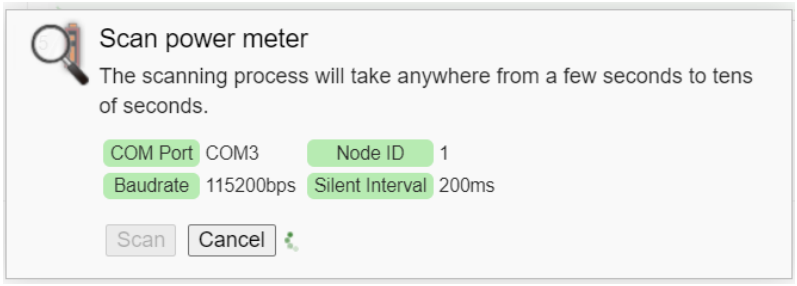


Figure7-6 : Scanning the iWSN Power Meters

v After the Scan operation is completed, a iWSN Power Meter List will appear. If the newly scanted module doesn't match the module previously set on the same address, a window will appear, please select the actual device that are connected to iWSN-200. After all settings are completed, click "Save" button to save the changes.

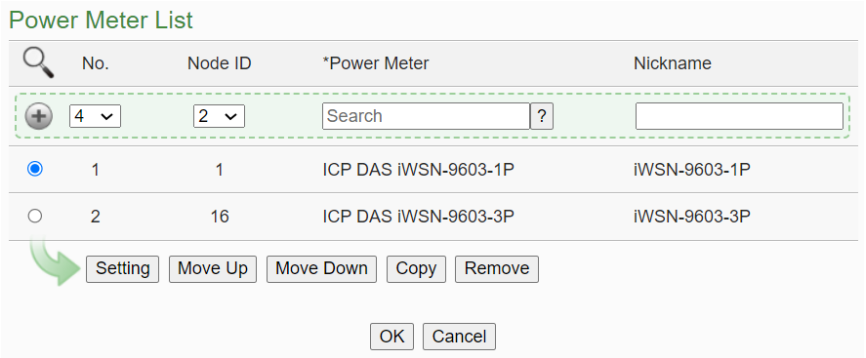


Figure7-7 : The iWSN Power Meter List after Scan operation

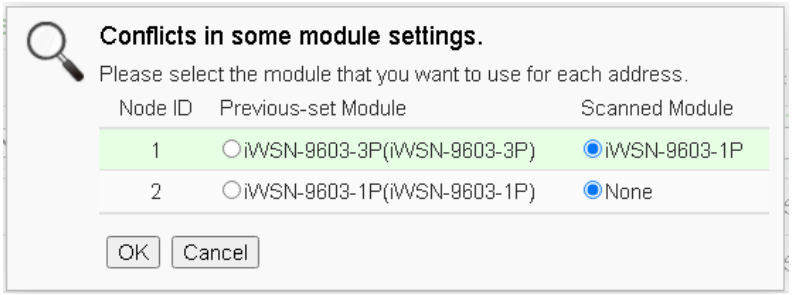


Figure7-8 : Select the actual iWSN Power Meter connected to PMC

7.1.2 Add iWSN Power Meter Manually

In addition to perform Scan operation to automatically add iWSN power meters to the list, user could also add the iWSN power meter manually one by one, the steps are as below:

i No: The number is the display sequence of this iWSN power meter in the power meter list.

ii Node ID: The number is the order that the power data of the iWSN power meter being stored in the PMC Modbus Table. The range is 1~31.

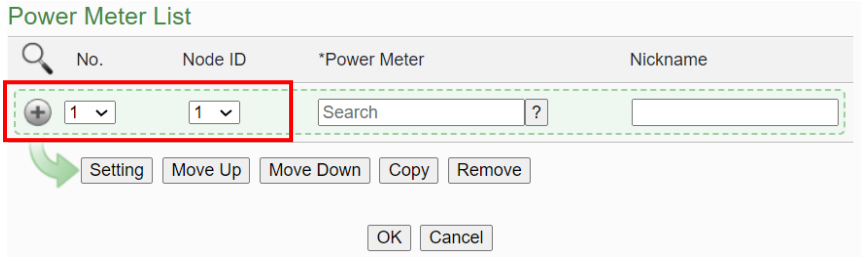


Figure7-9 : Set up the No and Node ID of the iWSN power meter

iii Select the iWSN power meter model:

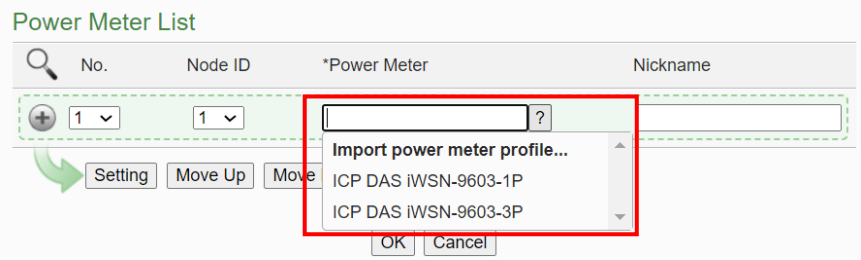


Figure7-10 : Select iWSN Power Meter model

iv Nickname: For user to define a nickname for this iWSN power meter, this nickname will be displayed on the "Power meter Information" and "Rule Setting" pages. Default setting will be the model of the power meter.

v Click  to add the meter to the list. After adding the power meter, click "Save" button to save the changes.

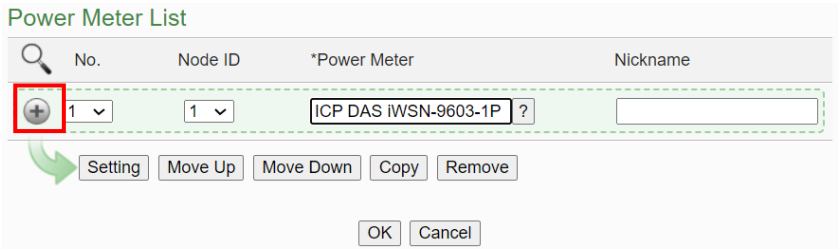


Figure7-11 : Add the iWSN Power Meter manually

7.1.3 iWSN Power Meter List Interface

After the iWSN Power Meters are added to the power meter list via auto scan or manual work, the iWSN Power Meters will be listed as below:

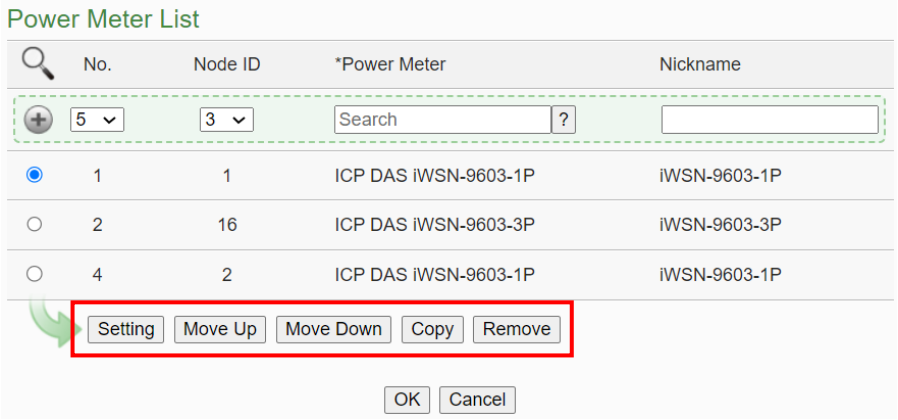


Figure7-12 : Power Meter List Interface

The following functions allow to perform settings or rearrange order of the power meters. Please select the power meter and click on the function button to perform the operations:

- Setting: Click the radio button in front of the power meter and click on “Setting” to get into the setting page of the power meter. The settings for each power meter module will be given in the following section.
- Move Up: Click the radio button in front of the power meter and click on “Move Up” to move the power meter to upper order (upper index number (No)).
- Move Down: Click the radio button in front of the power meter and click on “Move Down” to move the power meter to lower order (lower index number (No)).
- Copy: To copy the settings of a pre-set power meter to the new power meter, please click the radio button in front of the pre-set power meter and then click on “Copy”, a new power meter (in sequence) will be added to the list and the settings of the old power meter will be copied to this newly added power meter.
- Remove: Click the radio button in front of the power meter and click on “Remove” to remove the selected power meter.

After all settings are completed, click “Save” button to save the changes.

7.1.4 iWSN Power Meter Setting

PMC support ICP DAS iWSN-9603 wireless Power Meters. This iWSN power meter support “2-loop 3-phase” or “6-loop single-phase” AC circuits measurement. Following section will give more detailed settings of iWSN power meter setting page.

- The “2-loop 3-phase” AC circuits measurement Setting page is shown as follow:

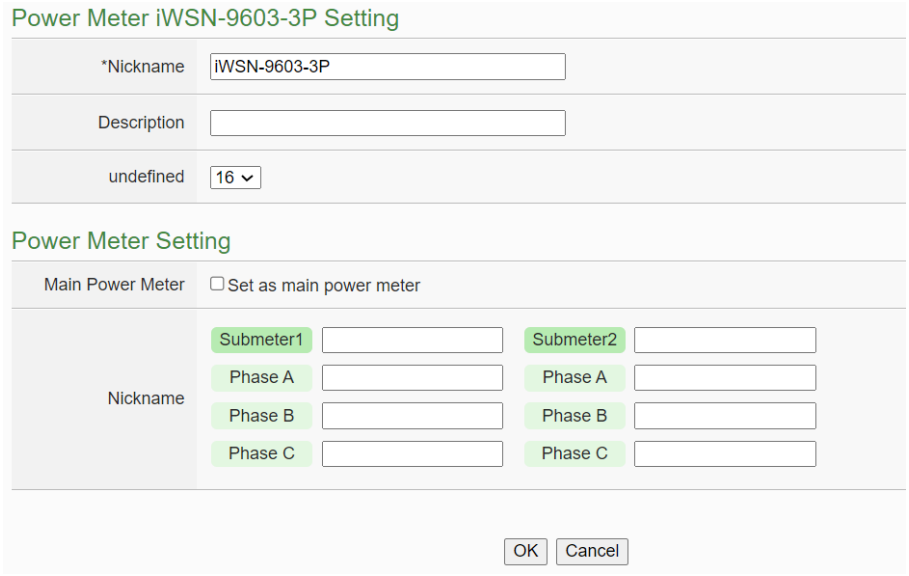


Figure7-13 : “2-loop 3-phase” measurement Setting Page

The settings are as follow:

- ◆ Nickname：For user to define nicknames for each power meter, this nickname will be displayed on the “Power Meter Information” and “Rule Setting” pages.
- ◆ Description: The Description field provides a space for the user to make a brief description of this power meter.
- ◆ Node ID: The number is the order that the power data of the iWSN power meter being stored in the PMC Modbus Table. The range is 1~31.
- ◆ Main Power Meter: When the “Set as main power meter” is selected, this power meter will be set as main power meter and the power data of this meter will be displayed on the Main Power Meter area on the “Power Data Overview” page.
- ◆ CT/Phase Nickname: For user to define nicknames for each CT (or phase), this nickname will be displayed on the “Power

Meter Information" and "Rule Setting" pages. For three-phase power meter, the user could give nicknames to the Phase A/B/C.

After all settings are completed, click "OK" button to return to the Power Meter List.

- The "6-loop single-phase" AC circuits measurement Setting page is shown as follow:

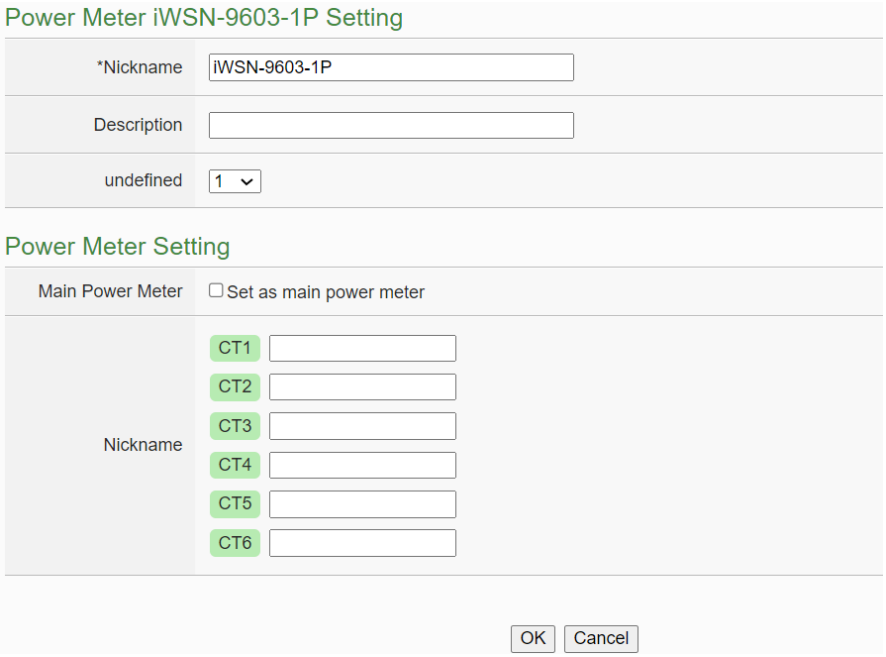


Figure7-14 : "6-loop single-phase" measurement Setting Page

The settings are as follow:

- ◆ For the settings of Nickname, Description, Node ID and Main Power Meter, please refer to "2-loop 3-phase" AC circuits measurement Setting" section.
- ◆ CT / Phase Nickname: For user to define nicknames for each CT (or phase), this nickname will be displayed on the "Power Meter Information" and "Rule Setting" pages. For single-phase power meter, the user could give nicknames to the CT1/CT2/ CT3/CT4/ CT5/CT6.

After all settings are completed, click "OK" button to return to the Power Meter List.

7.2 iWSN I/O Module Setting

On the “I/O Module Setting” page, user needs to set up and add the iWSN-200U and iWSN-200E concentrators through the I/O Interface Setting first. After complete the setting, it allows user to set up the iWSN I/O Modules that are connected to iWSN-200U and iWSN-200E concentrators. Select the iWSN-200 concentrator in the concentrator list and click “Setting” button to enter the setting page of iWSN I/O Module. The concentrator list is as shown below:

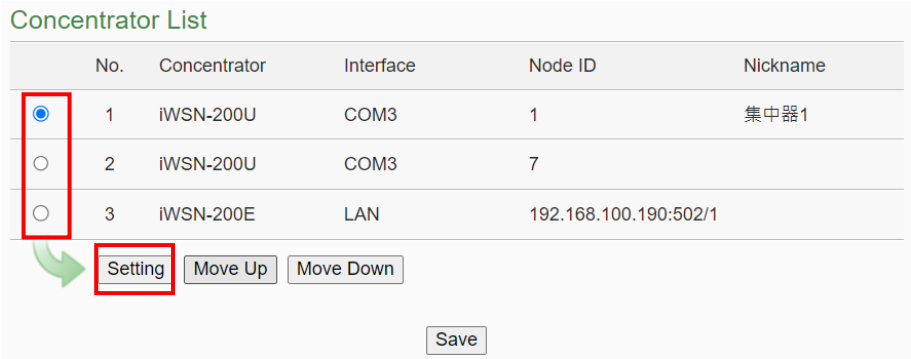


Figure7-15： iWSN Concentrator List

Now the interface will display the list of iWSN I/O modules currently connected to the iWSN-200 concentrator you select. Please follow the sections as below to perform settings for iWSN I/O moduls. After all settings are completed, click “Save” button to save the changes.

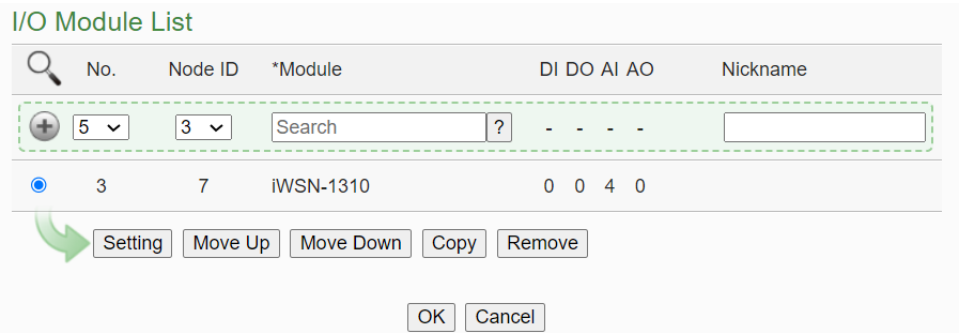


Figure7-16： iWSN I/O Module List Interface

Please note: Each PMC can connect at most 3 iWSN-200 data contractors, supporting up to 93 ICP DAS iWSN wireless modules (Include iWSN wireless power meter and iWSN wireless I/O module).

7.2.1 Scan to Add ICP DAS iWSN I/O Modules

User could use Scan function to perform "I/O Module Scan mechanism" to automatically build a list of iWSN I/O modules that are connected to the iWSN-200. The steps are as below:

i Before performing the scan of the iWSN I/O modules, please make sure the RF channel has been paired and connected correctly between iWSN-200 and I/O modules.

ii Click on  button to scan the iWSN I/O modules that are connected to the iWSN-200.

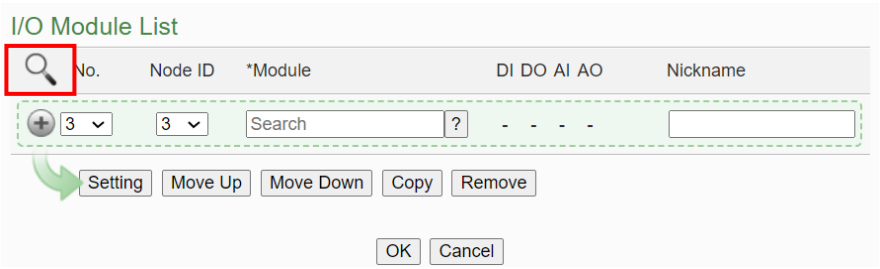


Figure7-17 : The "Scan" button to search iWSN I/O module

iii When the Scan page appears, click on "Scan", the system will start to scan the iWSN I/O modules, to cancel the scan, click on "Cancel".

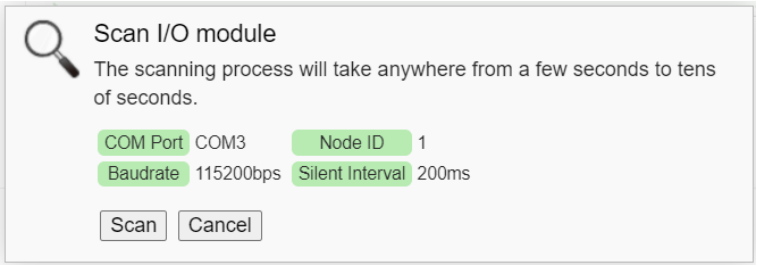


Figure7-18 : Set up the Scanning Range for the iWSN I/O module

iv When the system is performing the scan, the address that are performing scan will be dynamically shown on the upper left side, please wait till the scan operation is completed. To stop the scan operation, click on "Cancel" to terminal the scan and leave the page.

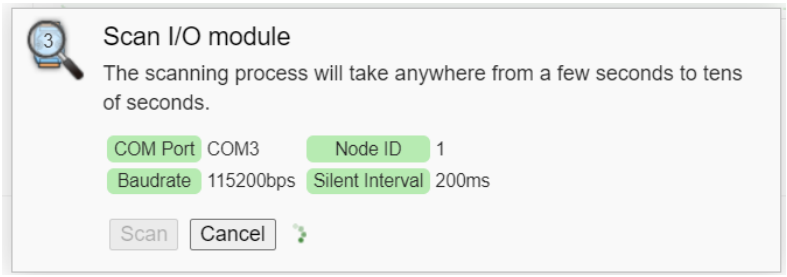


Figure7-19 : Scanning the iWSN I/O module

v After the Scan operation is completed, a iWSN I/O module list will appear. If the newly scanted module doesn't match the module previously set on the same address, a window will appear, please select the actual device that are connected to iWSN-200. After all settings are completed, click "Save" button to save the changes.

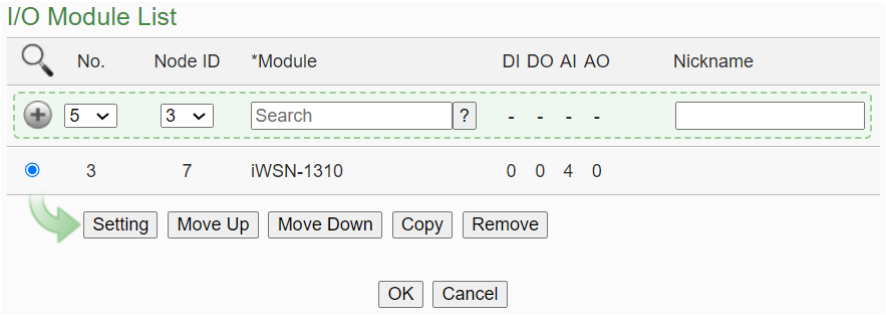


Figure7-20 : The iWSN I/O module list after Scan operation

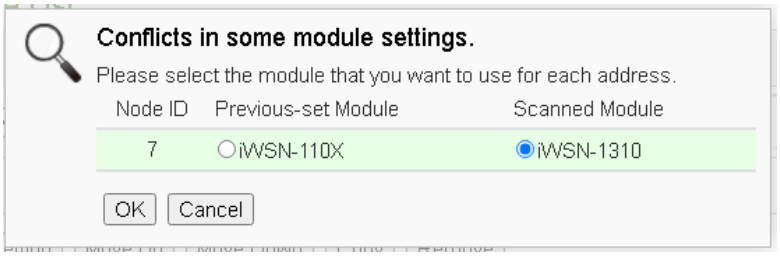


Figure7-21 : Select the actual iWSN I/O module connected to PMC

7.2.2 Add iWSN I/O Module Manually

In addition to perform Scan operation to automatically add iWSN I/O modules to the list, the user could also add the iWSN I/O module manually one by one, the steps are as below:

i No: The number is the display sequence of this iWSN I/O module in

the I/O module list.

ii Node ID: The number is the order that the I/O channel data of the iWSN I/O module being stored in the PMC Modbus Table. The range is 1~31.

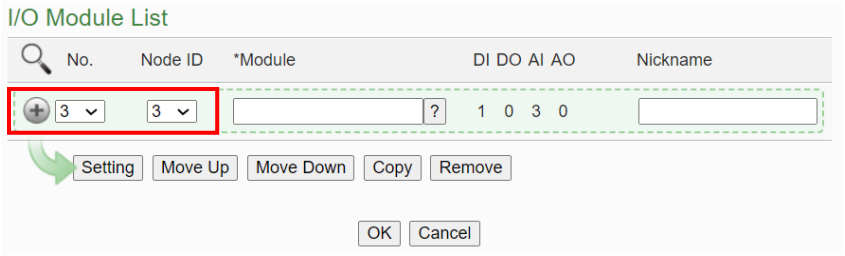


Figure7-22 : Set up the No and Node ID of the iWSN I/O module

iii Select the iWSN I/O module model:

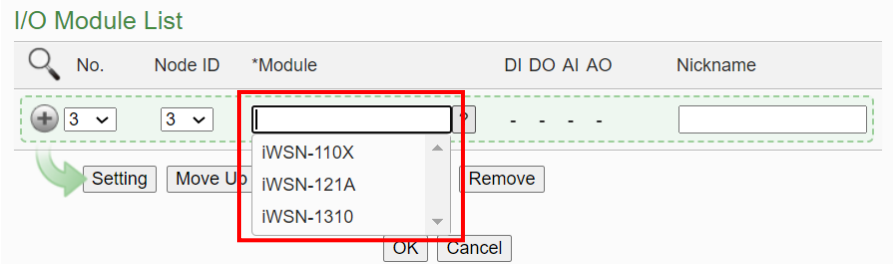


Figure7-23 : Select iWSN I/O module model

iv Nickname: For user to define a nickname for this iWSN I/O module, this nickname will be displayed on the "I/O module Information" and "Rule Setting" pages. Default setting will be the model of the I/O module.

v Click  to add the iWSN I/O module to the list. After adding the power meter, click "Save" button to save the changes.

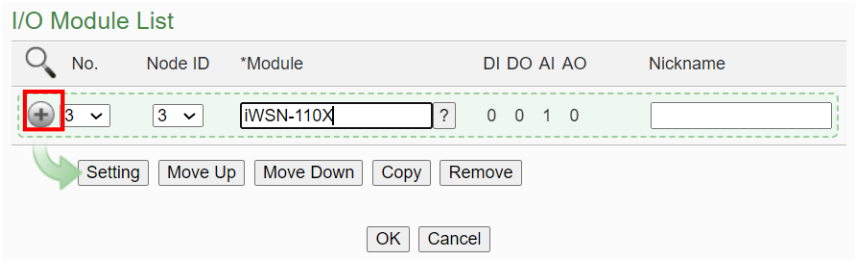


Figure7-24 : Add the iWSN I/O module manually

7.2.3 iWSN I/O Module List Interface

After the iWSN I/O module are added to the I/O Module list via auto

scan or manual work, the iWSN I/O modules will be listed as below:

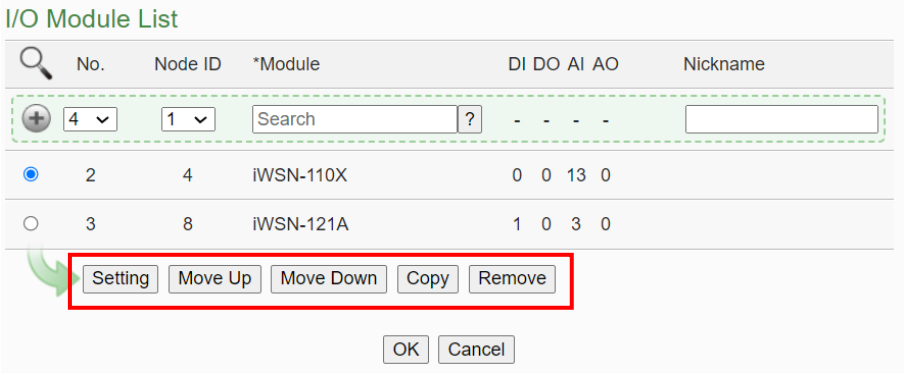


Figure7-25 : iWSN I/O module List

The following functions allow to perform settings or rearrange order of the iWSN I/O modules. Please select the iWSN I/O module and click on the function button to perform the operations:

- Setting: Click the radio button in front of the I/O module and click on “Setting” to get into the setting page of the I/O module. The settings for each I/O module will be given in the following section.
- Move Up: Click the radio button in front of the I/O module and click on “Move Up” to move the I/O module to upper order (upper index number (No)).
- Move Down: Click the radio button in front of the I/O module and click on “Move Down” to move the I/O module to lower order (lower index number (No)).
- Copy: To copy the settings of a pre-set I/O module to the new I/O module, please click the radio button in front of the pre-set I/O module and then click on “Copy”, a new I/O module (in sequence) will be added to the list and the settings of the old I/O module will be copied to this newly added I/O module.
- Remove: Click the radio button in front of the I/O module and click on “Remove” to remove the selected I/O module.

After all settings are completed, click “Save” button to save the changes.

7.2.4 iWSN I/O Module Setting

PMC support ICP DAS iWSN I/O module, the following section will give more detailed settings of ICP DAS iWSN I/O module setting

page.

- Nickname：For user to define nicknames for each iWSN I/O module, this nickname will be displayed on the “I/O Information ” and “Rule Setting” pages.
- Description: The Description field provides a space for the user to make a brief description of this iWSN I/O module.
- Node ID: The number is the order that the I/O channel data of the iWSN I/O module being stored in the PMC Modbus Table. The range is 1~31.

The settings interfaces of the DI and AI and channels on the iWSN I/O Module are as below:

- The DI channel setting for iWSN I/O module

  The iWSN I/O module DI channel setting interface is shown as below

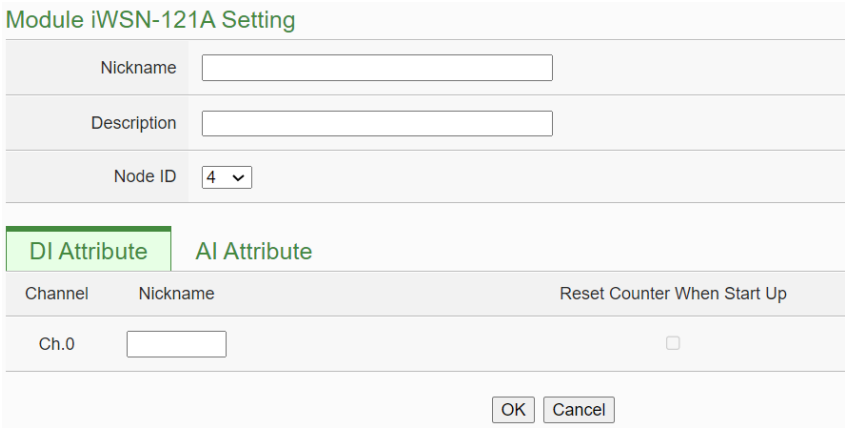


Figure7-26： DI Channel Setting Page

The settings are as below:

◆ Nickname：For user to define nickname for each I/O channel, this nickname will be displayed on the “I/O Information” and “Rule Setting” pages.

◆ Reset counter when power on: If the “Reset counter when power on” is selected for the DI channel, the DI channel counter of this module will be reset to the default value when the PMC is powered on or after loading the rules.(PMC does not support this function currently)

After all settings of the DI channels are completed, continue the

configuration of other channel, and after all channel settings are completed, click “OK” button to save the changes and return to iWSN I/O Module List.

- The AI channel setting for iWSN I/O module

The iWSN I/O module AI channel setting interface is shown as below

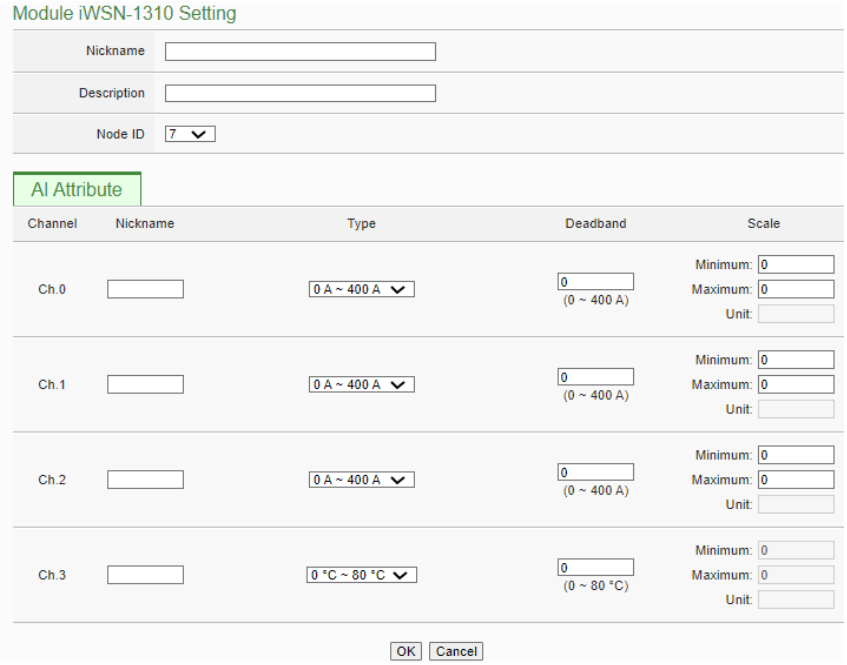


Figure7-27 : AI Channel Setting Page

The settings are as below:

◆ Nickname：For user to define nickname for each I/O channel, this nickname will be displayed on the “I/O Information” and “Rule Setting” pages.

◆ Type: Select the input signal type of the AI channel from the dropdown list.

◆ Deadband: In order to avoid signal oscillation that may result in instability to the measurement of the AI channel value or system operations, the user can set up a Deadband value for the AI channel to reduce the oscillation effect to the channel value. The detailed description of Deadband operation is as below:

There are three operation styles for AI Deadband. The AI Channel setting in following examples is 0mA ~ 20mA.

(a.) In the IF Condition, when AI > or >= a numerical value:

Assuming the Deadband value is set to be 2 mA, and the following statements are defined in the related logic Rule: IF AI>10mA, THEN DO=ON, ELSE DO=OFF, that means, when AI receives a signal that exceed 10mA, the DO channel will change to ON immediately, however, when the AI channel value drops and becomes lower than 10mA, the DO channel will not change back to OFF immediately until the value reaches 8mA (10mA minus the Deadband value 2mA), as shown in the following figure.

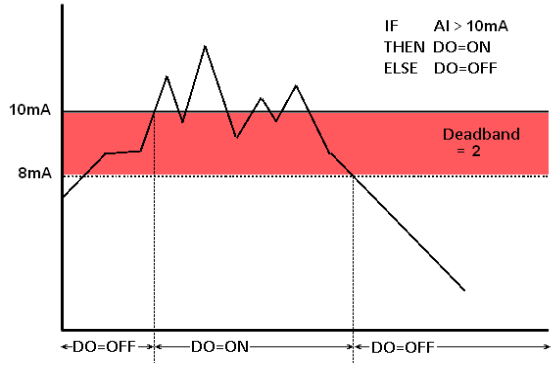


Figure7-28 : AI Deadband Operation(> or >= a numerical value)

(b.) In the IF Condition, when AI < or <= a numerical value:

Assuming the Deadband value is set to be 2 mA, and the following statements are defined in the related logic Rule: IF AI<10mA, THEN DO=ON, ELSE DO=OFF, that means, when AI receives a signal which is lower than 10mA, the DO channel will change to ON immediately, however, when the AI channel value exceed 10mA, the DO channel will not change back to OFF immediately until the value reaches 12mA (10mA plus the Deadband value 2mA), as shown in the following figure.

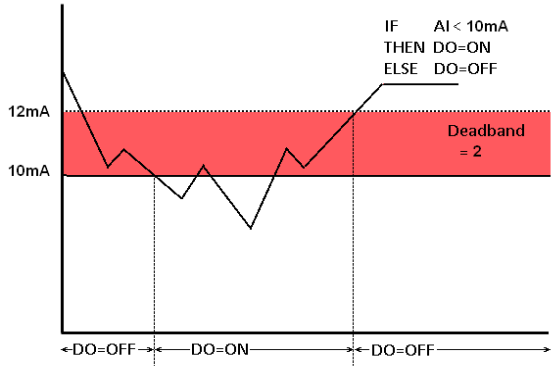


Figure7-29 : AI Deadband Operation(< or <= a numerical value)

(c.) In the IF Condition, when AI = a numerical value:

Assuming the Deadband value is set to be 1 mA, and the following statements are defined in the related logic Rule: IF AI = 9mA, THEN DO=ON, ELSE DO=OFF, that means, when AI receives a signal between 8mA (9mA minus the deadband value 1mA) and 10mA (9mA plus the deadband value 1mA), the DO channel will change to ON immediately. However, when the AI channel value exceed 10mA, or is lower than 8mA, the DO channel will change to OFF, as shown in the following figure.

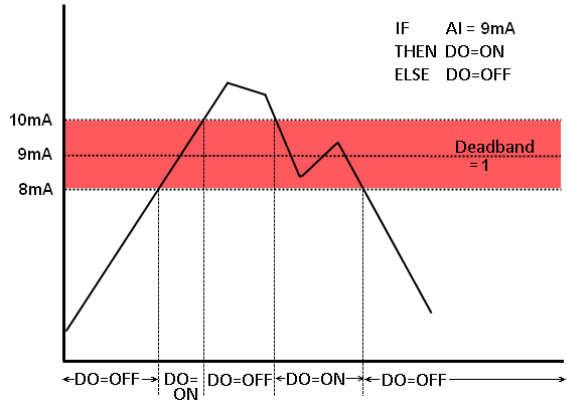


Figure7-30 : AI Deadband Operation(= a numerical value)

◆ Scale: In the “Scale” field, AI channel raw data can be set to operate with linear proportion between “MIN” and “MAX” values. The IF Condition will use this already-adjusted value in the evaluation operation, and the AI value retrieved from the “I/O Information” page or Modbus Table via PMC would be the adjusted value. The default value for MAX and MIN is 0, it means the Scale function is disabled.

After all settings are completed, click “OK” button to save the changes and return to iWSN I/O Module List.

8 Logger Setting

The Logger Setting function of the PMC provides recording of the power data from iWSN power meters and the I/O channel data from iWSN I/O modules. It includes Power Data Logger, I/O Data Logger and User-Defined Data Logger. The Power Data Logger is exclusive for the recording of the all power data, the I/O Data Logger is exclusive for the recording of the all I/O Channel data, and User-Defined Data Logger allows user to define his own data recording options from power data, I/O channel data or Internal Register data. The data log files of these two data loggers are both in CSV format that enables easy integration with the backend database system. In addition, PMC also provides function to set the "Log File Retention Time" to specify how long will the files be kept in the PMC, and then the file will be automatically sent to backend FTP Server at a scheduled time. The data logger setting page is shown as below:

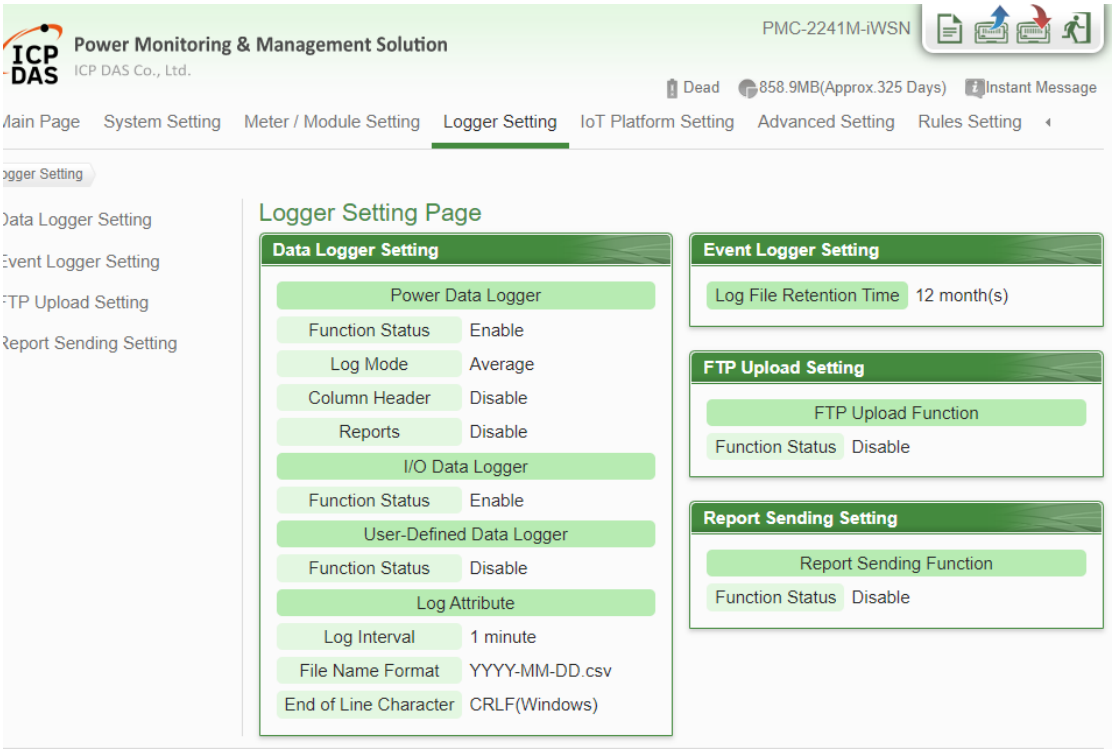


Figure8-1 : Data Logger Setting Page

There are some setting options on the Data Logger Setting page:

- Data Logger Setting
- Event Logger Setting
- FTP Upload Setting

More detailed information of these options will be given in the following section.

8.1 Data Logger Setting

On the Data Logger Setting page, the user could enable the Power Data Logger, I/O Data Logger or User-Defined Data Logger of the PMC if required. The Power Data Logger allows recording the power data of the iWSN power meters that are connected to the PMC, the I/O Data Logger allows recording all the data of the iWSN I/O modules that are connected to the PMC, and the User-Defined Data Logger allows recording user-defined data such as: power data, I/O channel data, internal register values, etc. The setting page is shown as below:

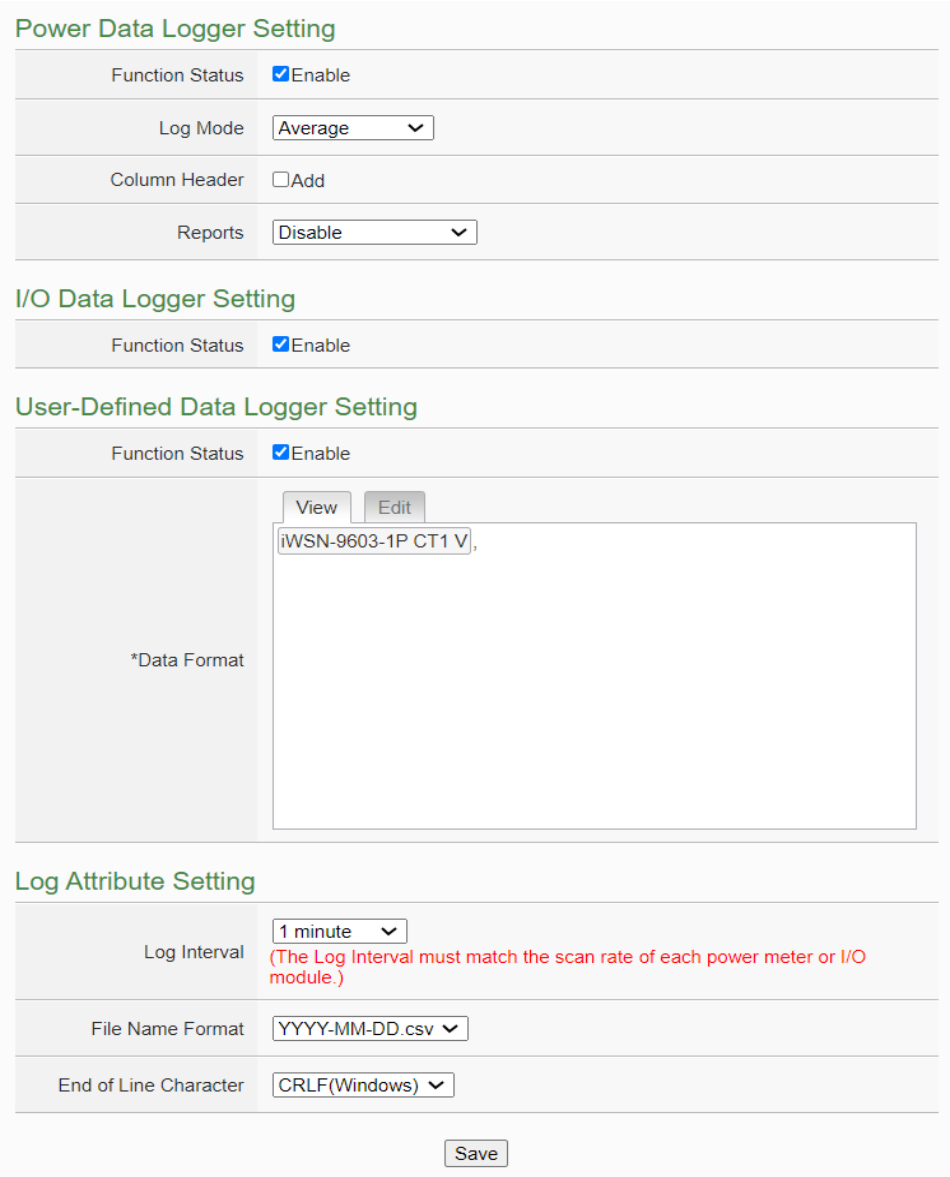


Figure8-2 : Data Logger Setting Page

Follow the steps below:

i Check “Enable” in the “Function Status” field under the Power Data Logger section to enable the Power Data Logger function.

ii Set the data log mode to be “Average” or “Instantaneous” from the dropdown list of the “Log Mode”. If “Average” is selected, the system will record the average value of the power data during the time interval set in “Log Interval”. If “Instantaneous” is selected, the system will record the instantaneous value of the power data when the time reaches the time interval set in “Log Interval”.

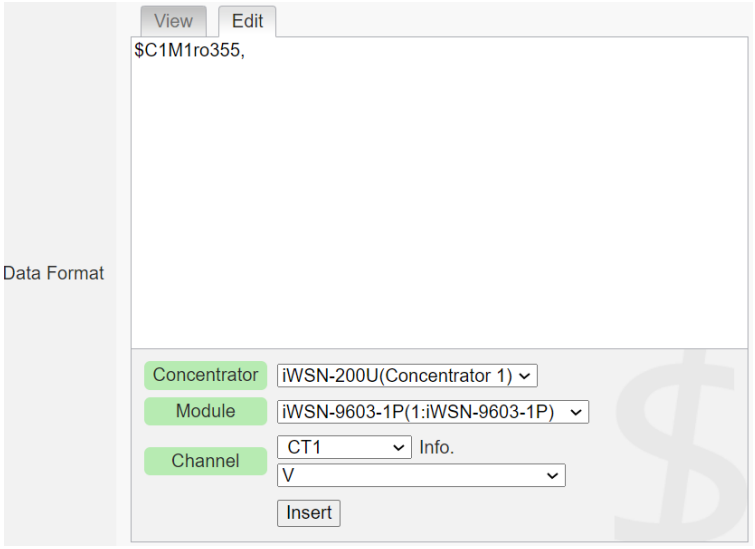
iii If user would like to add a header to the power data to specify the name of the power data; click “Add” in the “Column Header”; the system will add the “Column Header” at the beginning of the power data logger file to specify the name of the power data. Please note：After enable this function, the User-Defined Data Logger will also add the “Column Header” at the beginning of the data logger file to specify the name of the data.

iv Set the language of Excel format file of the report from the dropdown list of the “Reports”. If “Disable” is selected, the system will stop generating the Excel format file of report.

v Check “Enable” in the “Function Status” field under the I/O Data Logger section to enable the I/O Data Logger function.

vi Check “Enable” in the “Function Status” field under the User-Defined Data Logger section to enable the User-Defined Data Logger function.

vii Set up the data format in the “Data Format” field in the “User-Defined Data Logger” section. The User-Defined Data Logger provides encoded strings for user to add real-time power data or I/O channel data to the Data Format content. User can select the “Edit” tab or click on any blank area in the “Data Format” field, and then the “Real-time variable editor” will be shown as below.



Select the “Concentrator”, “Module”,“Channel” and “Info.” from the dropdown list and click “Insert” to add channel value encoded string into the “Data Format” content. The system will record the data the user pre-set in the Data Format, and will save the real data values in the data log file. When editing the content, the user can select the “View” tab , and then the channel encoded string will be displayed in the real index format of the channel for user to check the settings in an easy way.

The figure above shows an example of the encoded strings, the variable $C1M1ro355 indicates the V value of iWSN-9603-1P CT1 on the module 1 connected to COM3. When user select the “View” tab, the channel value encoded string will be displayed as “ iWSN-9603-1P CT1 V” for user to check if the setting is appropriate (please refer to the figure as below).

viii In the “Log Interval” field, select from the dropdown list to set the time interval of the recording session. The Log Interval could be 1 min, 5

mins, 15 min, 1 hour, 3 hours, 6 hours, 12 hours and 24 hours. Default is 5 mins. Each time when reaches the Log Interval, it will perform one-time data recording for the Power Data and User-Defined Data.

ix In the "File Name Format" field, select the File Name Format of the log file from the dropdown list, YYYY indicates western year, MM indicates month, DD indicates date, and the file format is CSV.

x In the "End of Line Character" field, select the appropriate End of Line Character format from the dropdown list: CRLF (applies to Windows), LF (applies to Unix/Linux) or CR (applies to Mac).

xi After all settings are completed, click "Save" button to save the changes.

Please Note:

1. The settings in "Log Attribute Setting" section apply to both Power Data Logger and User-Defined Data Logger.
2. The data logger files of Power Data Logger, I/O Data Logger and User-Defined Data Logger all are saved in the micro SD card. If the micro SD card's free space is less than the required space of one day data recording operation of the Power Data Logger, I/O Data Logger and User-Defined Data Logger, then PMC will delete some old log files to keeps the data logger operation work continuously.

8.2 Event Logger Setting

The Event Logger allows to record system event of the PMC, the setting page is shown as below:

Figure8-3 : Event Logger Setting Page

Follow the steps below:

i In the "Log File Retention Time" field, select the file retention time for the log file from the dropdown list. The retention time can be 1 month, 6 months or 12 months. The default setting will be12 months.

ii After all settings are completed, click "Save" button to save the changes.

8.3 FTP Upload Setting

Power Data logger files, I/O Power Data logger files and User-Defined Data logger files can be upload to remote FTP server of the manage center via FTP protocol. The FTP Upload Setting page allows to set up parameters for FTP Upload, the setting page is shown as below:

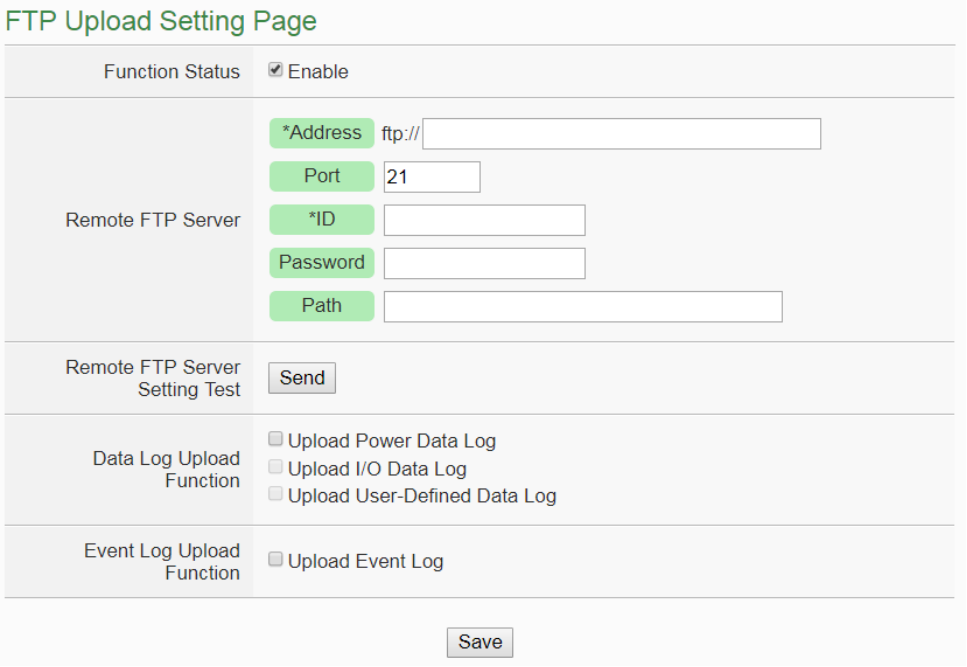


Figure8-4 : FTP Upload Setting Page

Follow the steps below:

i In the “Function Status”, check “Enable” to enable the FTP Upload function.

ii In the “Remote FTP Server” section, input Address, Port, ID, Password and Path

iii The user could test if the FTP settings are correct in the "Remote FTP Server Setting Test" section. After clicking “Send”, the system will create a folder on the remote FTP server and will generate a test file under this folder.

iv In the “Data Log Upload Function” section, select the data log type user would like to upload. The data log type could be “Power Data Log”, “I/O Data Log” or “User-Defined Data Log”. And then select the Frequency from the dropdown list of the “Frequency” field. The Frequency can be set as: 5 mins, 15 mins, 1 hour, 3 hours, 6 hours, 12 hours, or 24 hours. The default setting will be 1 hour.

v In the Event Log Upload Function section, if the user would like to

enable the Upload Event Log function, check “Upload Event Log” field. And then select the Frequency from the dropdown list of the “Frequency” field. The Frequency can be set as: once a day, once a week or once a month.

vi After all settings are completed, click “Save” button to save the changes.

Please Note:

1. All data logger files of PMC will be saved in the microSD card. Before enable the Data Logger function, please make sure the microSD card you use for PMC is FAT32 format.
2. The microSD card given with the PMC is in FAT32 format already before delivery.

8.4 Report Sending Setting Page

The power information report can be sent to the user via email, and the relevant parameters of the function can be set in the "Report Sending Setting Page".

8.4.1 Sending Setting

The "Send Setting" function can automatically send an email to the recipient when the report is generated by PMC. The setting page is shown as below:

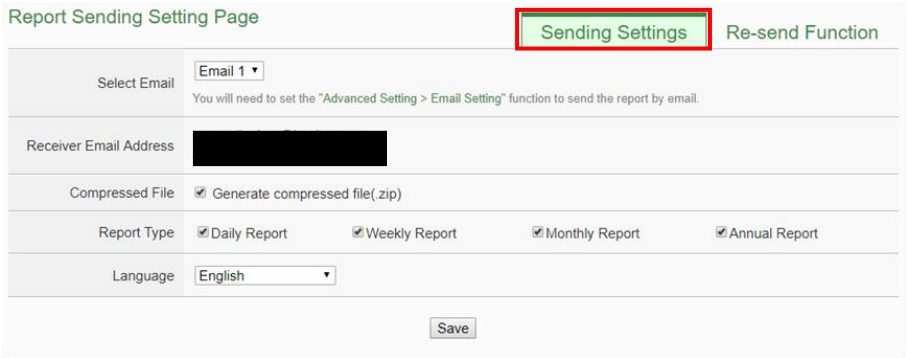


Figure8-5 : Report Sending Setting page – Sending Setting

Follow the steps below:

i. In the "Select Email" field, Select the Email setting in the "Advanced Setting -> Email Setting" section, then the "Receiver Email Address" will automatically import the recipient list from the information of the Email you select.

ii. In the "Compressed File" field, verify if the attachment report file of the email have to be compressed, or not.

iii. In the "Report Type" field, check which type of report need to be sent. There are 4 options as "Daily Report", "Weekly Report"," Monthly Report", and "Annual Report" for selection. After complete the setting, PMC Will automatically send the report file when it is generated. (ex: The daily report will be sent at the end of the day.).

iv. In the "Language" field, select the language of the report .

v. After complete all setting, click "Save" button to save the setting.

8.4.2 Re-send Function

The "Re-send Function" can send the corresponding historical power information reports to recipients immediately by the date user assign. The settings page is shown as below:

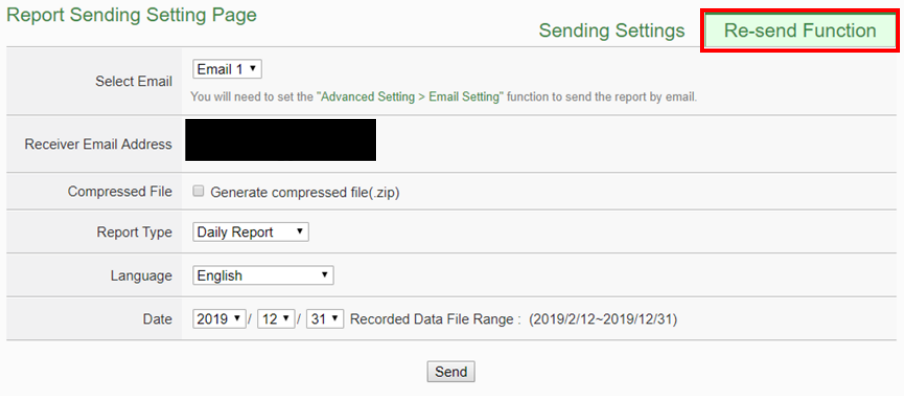


Figure8-6 : Report Sending Setting page – Sending Setting

Follow the steps below:

i. In the "Select Email" field, Select the Email setting in the "Advanced Setting -> Email Setting" section, then the "Receiver Email Address" will automatically import the recipient list from the information of the Email you select.

ii. In the "Compressed File" field, verify if the attachment report file of the email have to be compressed, or not.

iii. In the "Report Type" field, select the report type which need to be sent. There are 4 options as "Daily Report", "Weekly Report"," Monthly Report", and "Annual Report" for selection.,

iv. In the "Language" field, select the language of the report.

v. In the "Date" field, please select the date range of the current historical report prompted by the system.
Please note: If there is no log file in the date range you select., the inquiry operation will not be performed.

vi. Click the "Send" button, then PMC will send the report immediately.

8.5 The Path of Data Log File

The data logger files of PMC will all be saved in the microSD card. The following section will explain the path of the data logger files saved in the microSD card:

- The power data files will be saved in the Log file folder, each power meter will create a specific file folder with the name of its ID, the data file architecture is shown as below:
  - iWSN Power Meter

    Power Meter Data File

    Log \ 01300F06180000D9_3_2[96031]7_info.txt

    Historical Data

    Log \ 01300F06180000D9_3_2[96031]7 \ 2013-05-23.csv

    Daily Report

    Log \ 01300F06180000D9_3_2[96031]7 \ 2013-05-23Rpt.csv

    Monthly Report

    Log \ 01300F06180000D9_3_2[96031]7\ 2013-05Rpt.csv

    Log \ 01300F06180000D9_3_2[96031] 7is the ID of this power meter. 01300F06180000D9 indicates the serial number of the PMC; 3 indicates the power meter is connected to PMC's COM3; 4 indicates the power meter is connected to PMC's COM4; 2 is the Node ID of the iWSN concentrator which the power meter connect; [96031] indicates the module type of the iWSN power meter; 7 is the Node ID of the iWSN power meter; and 2013-05-23 indicates the date the data is recorded. The power meter information file (_info.txt) is used to record the nickname of the power meter and the related information of the PMC which connect to the power meter.

- The I/O Data Log file is also saved under the Log file folder; the data file architecture is shown as below:

  Log \ IO_01A3851F140000D3 \ 2013-05-23.csv

  IO indicates this file folder is for IO Data Log; 01A3851F140000D3

indicates the serial number of the PMC and 2013-05-23 indicates the date the data is recorded.

- The User-Defined Data Log file is also saved under the Log file folder; the data file architecture is shown as below:

  Log \ Custom_01A3851F140000D3 \ 2013-05-23.csv

  Custom indicates this file folder is for User-Defined Data Log; 01A3851F140000D3 indicates the serial number of the PMC and 2013-05-23 indicates the date the data is recorded.

- The Event Log file is saved under the EventLog folder, the data file architecture is shown as below:

  EventLog \ Event-2013-05-23.log

  20130523 indicates that the first event recorded in the Event Log file is starting from May 23, 2013

8.6 The format of the Power Data Logger file

The power data logger files generated are in CSV format. Each line represents one record; each field in the line is separated by a comma. The data sequences from left to right in the line of the power data are as follows:

iWSN-9603-1P Data Logger Field

Date, Time, Power meter ID, **CT1** **[** Voltage, Current, kW, kvar, kVA, PF, kWh, kvarh, kVAh, Daily tot. Electricity(kWh), Current demand(15/30/60 mins) **]**, **CT2** **[** Voltage, Current, kW, kvar, kVA, PF, kWh, kvarh, kVAh, Daily tot. Electricity(kWh), Current demand(15/30/60 mins) **]**,……., **CT6** **[** Voltage, Current, kW, kvar, kVA, PF, kWh, kvarh, kVAh, Daily tot. Electricity(kWh), Current demand(15/30/60 mins) **]**, [Reserved Field].

iWSN-9603-3P Data Logger Field

Date, Time, Power meter ID, **Submeter 1** **Phase A** **[** Voltage, Current, kW, kvar, kVA, PF, kWh, kvarh, kVAh, Daily tot. Electricity(kWh), Current demand(15/30/60 mins) **]**, **Phase B** **[** Voltage, Current, kW, kvar, kVA, PF,

kWh, kvarh, kVAh, Daily tot. Electricity(kWh), Current demand(15/30/60 mins) **]**, **Phase C** **[** Voltage, Current, kW, kvar, kVA, PF, kWh, kvarh, kVAh, Daily tot. Electricity(kWh), Current demand(15/30/60 mins) **]**, **Average/Total** **[** Voltage, Current, kW, kvar, kVA, PF, kWh, kvarh, kVAh, Daily tot. Electricity(kWh), Current demand (15/30/60 mins) **]**, **Submeter 2** **Phase A** **[** Voltage, Current, kW, kvar, kVA, PF, kWh, kvarh, kVAh, Daily tot. Electricity(kWh), Current demand(15/30/60 mins) **]**, **Phase B** **[** Voltage, Current, kW, kvar, kVA, PF, kWh, kvarh, kVAh, Daily tot. Electricity(kWh), Current demand(15/30/60 mins) **]**, **Phase C** **[** Voltage, Current, kW, kvar, kVA, PF, kWh, kvarh, kVAh, Daily tot. Electricity(kWh), Current demand(15/30/60 mins) **]**, **Average/Total** **[** Voltage, Current, kW, kvar, kVA, PF, kWh, kvarh, kVAh, Daily tot. Electricity(kWh), Current demand (15/30/60 mins) **]** , [Reserved Field].

8.7 The format of the Power Report file

The power report files are saved in CSV format. Each line represents one record; each field in the line is separated by a comma. The data sequences from left to right in the line of the power report are as follows.

iWSN-9603-1P Daily Report

Index of hour, Date, Power meter ID, **CT1** [Timing of hourly max kW, hourly max kW, Hourly total Electricity, Average hourly PF, Average hourly current, Average hourly voltage, Average hourly kVA, Average hourly kvar], **CT2** **[** Timing of hourly max kW, hourly max kW, Hourly total Electricity, Average hourly PF, Average hourly current, Average hourly voltage, Average hourly kVA, Average hourly kvar], ... ,**CT6** **[** Timing of hourly max kW, hourly max kW, Hourly total Electricity, Average hourly PF, Average hourly current, Average hourly voltage, Average hourly kVA, Average hourly kvar] ,[Reserved Field].

iWSN-9603-1P Monthly Report

Index of date, Date, Power meter ID, **CT1** [Timing of daily max kW, daily max kW, daily total Electricity, Average daily PF, Average daily current, Average daily voltage, Average daily kVA, Average daily kvar], **CT2** [Timing of daily max kW, daily max kW, daily total Electricity, Average daily PF, Average daily current, Average daily voltage, Average daily kVA, Average daily kvar] , ... , **CT6** [Timing of daily max kW, daily max kW,

daily total Electricity, Average daily PF, Average daily current, Average daily voltage, Average daily kVA, Average daily kvar], [Reserved Field].

iWSN-9603-3P Daily Report

Date, Time, Power meter ID, **Submeter 1** **Phase A** **[**Timing of hourly max kW, hourly max kW, hourly total Electricity, Average hourly PF, Average hourly current, Average hourly voltage, Average hourly kVA, Average hourly kvar**]**, **Phase B** **[**Timing of hourly max kW, hourly max kW, hourly total Electricity, Average hourly PF, Average hourly current, Average hourly voltage, Average hourly kVA, Average hourly kvar**]**, **Phase C** **[**Timing of hourly max kW, hourly max kW, hourly total Electricity, Average hourly PF, Average hourly current, Average hourly voltage, Average hourly kVA, Average hourly kvar**]**, **Average/Total** **[**Timing of hourly max kW, hourly max kW, hourly total Electricity, Average hourly PF, Average hourly current, Average hourly voltage, Total hourly kVA, Total hourly kvar**]**, **Submeter 2** **Phase A** **[**Timing of hourly max kW, hourly max kW, hourly total Electricity, Average hourly PF, Average hourly current, Average hourly voltage, Average hourly kVA, Average hourly kvar**]**, **Phase B** **[**Timing of hourly max kW, hourly max kW, hourly total Electricity, Average hourly PF, Average hourly current, Average hourly voltage, Average hourly kVA, Average hourly kvar**]**, **Phase C** **[**Timing of hourly max kW, hourly max kW, hourly total Electricity, Average hourly PF, Average hourly current, Average hourly voltage, Average hourly kVA, Average hourly kvar**]**, **Average/Total** **[**Timing of hourly max kW, hourly max kW, hourly total Electricity, Average hourly PF, Average hourly current, Average hourly voltage, Total hourly kVA, Total hourly kvar**]** , [Reserved Field].

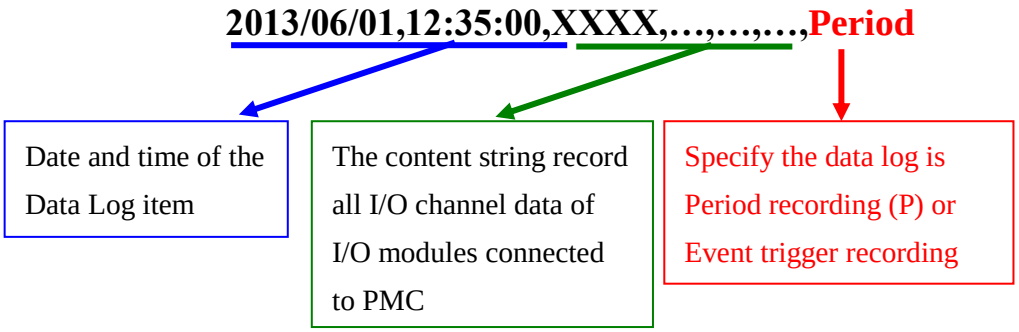
iWSN-9603-3P Monthly Report

Date, Time, Power meter ID, **Submeter 1** **Phase A** **[**Timing of daily max kW, daily max kW, daily total Electricity, Average daily PF, Average daily current, Average daily voltage, Average daily kVA, Average daily kvar**]**, **Phase B** **[**Timing of daily max kW, daily max kW, daily total Electricity, Average daily PF, Average daily current, Average daily voltage, Average daily kVA, Average daily kvar**]**, **Phase C** **[**Timing of daily max kW, daily max kW, daily total Electricity, Average daily PF, Average daily current, Average daily voltage, Average daily kVA, Average daily kvar**]**, **Average/Total** **[**Timing of daily max kW, daily max kW, daily total

Electricity, Average daily PF, Average daily current, Average daily voltage, Total daily kVA, Total daily kvar**]**, **Submeter 2** **Phase A** **[**Timing of daily max kW, daily max kW, daily total Electricity, Average daily PF, Average daily current, Average daily voltage, Average daily kVA, Average daily kvar**]**, **Phase B** **[**Timing of daily max kW, daily max kW, daily total Electricity, Average daily PF, Average daily current, Average daily voltage, Average daily kVA, Average daily kvar**]**, **Phase C** **[**Timing of daily max kW, daily max kW, daily total Electricity, Average daily PF, Average daily current, Average daily voltage, Average daily kVA, Average daily kvar**]**, **Average/Total** **[**Timing of daily max kW, daily max kW, daily total Electricity, Average daily PF, Average daily current, Average daily voltage, Total daily kVA, Total daily kvar**]** , [Reserved Field].

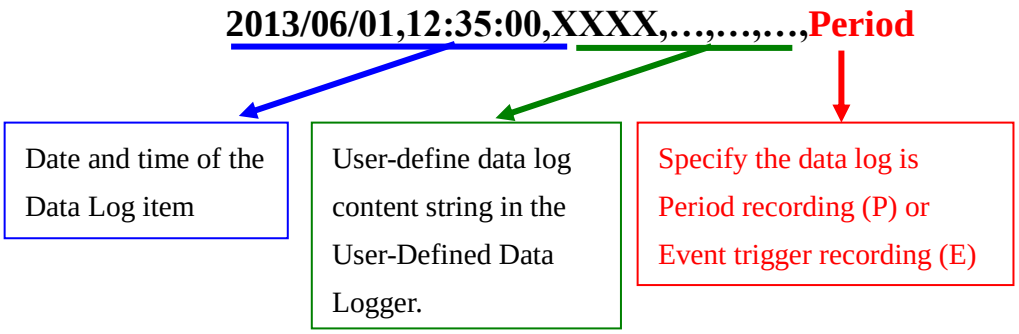
8.8 The Format of I/O Data File

The I/O data logger files generated are in CSV format. Each line represents one record; each field in the line is separated by a comma. The data sequences from left to right in the line of the I/O data are as follows:



8.9 The Format of User-Defined Data File

The User-Defined Data files are saved in CSV format. Each line represents one record, after the log format of the data being set in User-Defined Data Logger, the User-Defined Data Logger will record the data according to the data format and content set by the user. In addition, the system will tag each data log with information such as: date, time and type of the data, etc. The log type could be Period Recording that will record the file periodically or Trigger Recording that will record the file when an event is triggered. The User-Defined Data log file format is shown as below:



9 IoT Platform Setting

The IoT Platform Setting function of the PMC allows to build a connection to Microsoft Azure or IBM Bluemix directly. It can also connect to MQTT Brokers. Based on the IoT Platform Setting function, PMC can publish the power data and I/O channel data of the power meter and I/O modules that are connected to PMC to the IoT Cloud Platform for future data analysis, and receive the command message from IoT Cloud Platform to trigger the corresponding actions of PMC at the field side. With the IoT Platform Setting function the PMC provides, it helps users to implement an IoT system in a easy way.

In additional, PMC supports to connect to the IoT cloud management software: IoTstar designed by ICP DAS. The supported functions for IoTstar includes Real-Time Data Sending Setting, Historical Data Sending Setting, Bot Service Setting, and Alarm Setting can also be set in this page. About the connecion setting of IoTstar, please refer to the section "6.2 Network Setting".

The IoT Platform Settingg page includes the following setting options. More detailed information of these options will be given in the following sections.

- Microsoft Azure Setting
- IBM Bluemix Setting
- MQTT Setting
- IoTstar relative functions:
  - Real-Time Data Sending Setting
  - Historical Data Sending Setting
  - Bot Service Setting
  - Alarm Setting

9.1 Microsoft Azure Setting

On the Microsoft Azure Setting page, the connection to Microsoft Azure IoT Cloud Platform can be built if required. The setting page is shown as below:

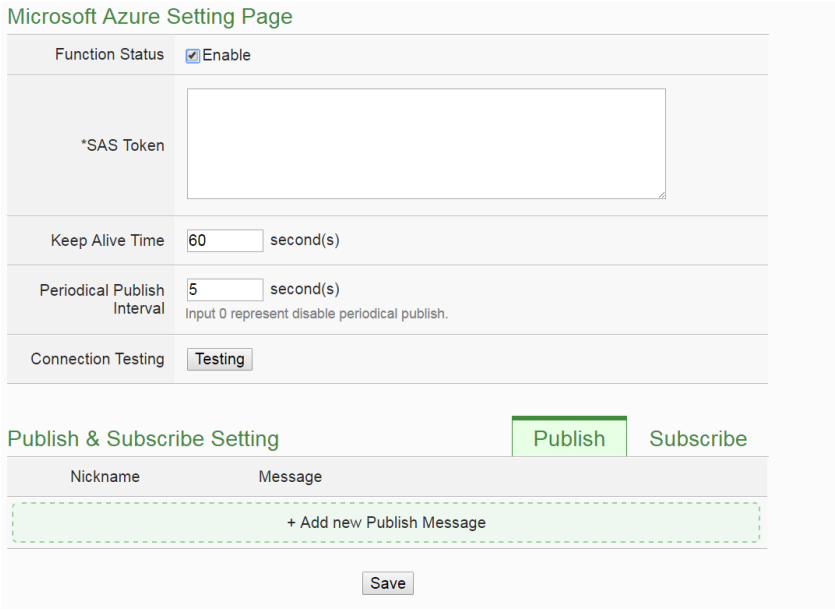


Figure9-1 : Microsoft Azure Setting Page

Follow the steps below:

i Check “Enable” in the “Function Status” field to enable the connection to Microsoft Azure IoT Cloud Platform.

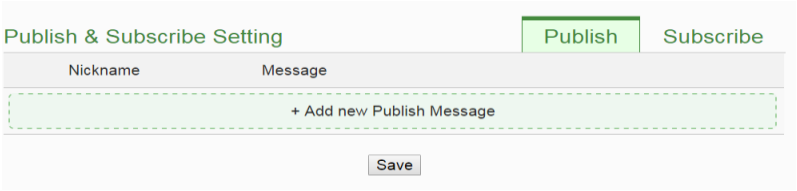
ii In the “SAS Token” field, input the SAS Token which you previously registered for this PMC from Microsoft Azure. For the procedure to generate a SAS Token, please refer to the “Documentation →Azure IoT Hub→IoT Hub MQTT support” section on the Microsoft Azure Web Site for detailed information.

iii The value in “keep alive Time” field defines the maximum amount of time in second that pass away without communication between the PMC and Microsoft Azure. The “keep alive interval” enables Microsoft Azure to detect if the connection to the PMC is no longer available without having to wait for the long TCP/IP timeout.

iv The value in “Periodical Publish Interval” field defines the time interval to automatically and periodically send the Publish Messages which are with the “Periodical Publish” attribute. If the value of the “Periodical Publish Interval” field is 0, it means the “Periodical Publish” operation is disabled. The unit of the value is second.

v To verify whether the SAS Token setting is correct, click “Testing” in the “Connection Testing” field, then PMC will try to connect Microsoft Azure with the SAS Token setting, and reply the connection status.

vi The lower half section on the Microsoft Azure Setting Page is for the Publish Message and Subscribe Topic setting. User can click the tab of “Publish” or “Subscribe” to edit the Publish Message and Subscribe Topic. The Interface will be shown as below:



vii Click the “Publish” tab to edit the Publish Message. User can click on “Add new Publish Message” to add a new Publish Message.

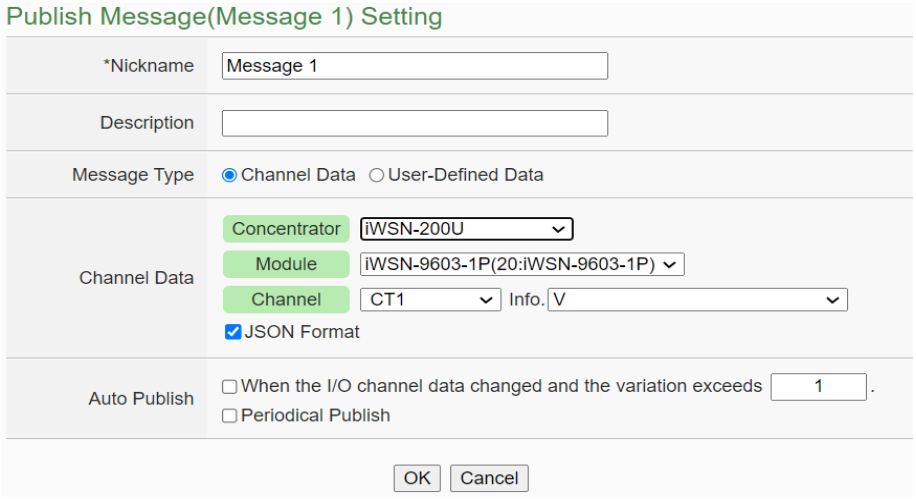


Figure9-2 : Microsoft Azure Publish Message setting page

viii Input a name in the “Nickname” field and you could also input the description of this Publish Message in the “Description” field.

ix In the “Message Type” field, select the “Channel Data” to prepare a Publish Message with the power data or I/O channel value. Based on the “Channel Data” interface, the user can select a specific power data (or I/O channel value) or “All” power data (and I/O channel values) for the Publish Message. If the user selects a specific channel, it means the specific power data (or I/O channel value) of the module will be bound with the Publish Message. If user select “All” channels, it mean all power data (and I/O channel values) of the module will be added in the Publish Message List. If the user click the "JSON Format" check box,

the content of the Publish Message will be packaged in JSON format; if the “JSON” is not selected, the content of the Publish Message will only include the I/O channel value. (For the I/O Channel information in JSON Format, please refer to Appendix VI for more details.) The user can select “User-Defined Data” in “Message Type” field to edit the Publish Message on the free style editing interface. The user interface is shown as below.

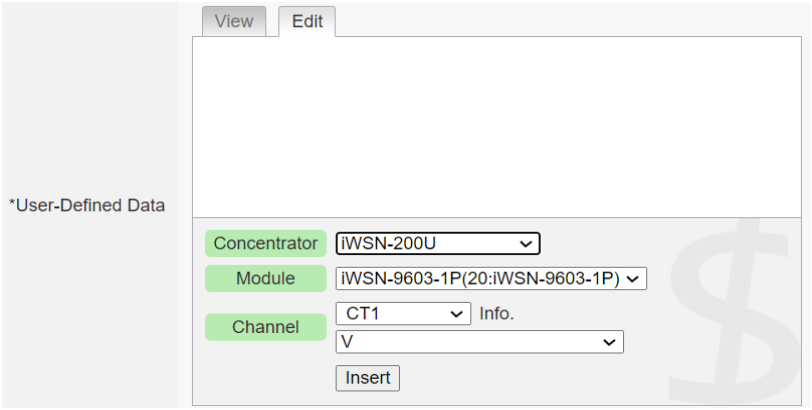


Figure9-3 : “User-Defined Data” Setting Interface of IoT Platform

x The timing to publish message is set in the “Auto Publish” field, there are two options: “When the I/O data changed and the variation exceeds xxx” and “Periodical Publish”. If the “When the I/O data changed and the variation exceeds xxx” is selected, the system will automatically publish the message when the power data or I/O data value is changed and exceeds the evaluation value (This option only support “Channel Data” setting in “Message Type”). If the user selects “Periodical Publish”, it means the message will be published at periodic time schedule based on the value in "Periodical Publish Interval" field at Step iv.

xi After completing all settings of Publish Message, please click “OK” button to add the Publish Message to the Publish Message List.

xii Click the “Subscribe” tab to edit the Subscribe Topic. The user interface is shown as below:

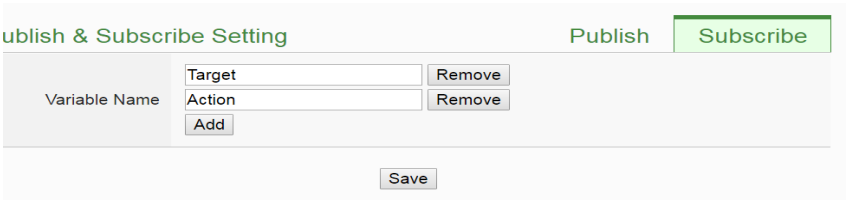


Figure9-4 : Microsoft Azure Subscribe Topic setting page

xiii In the “Variable Name” field, user can input the name of the variable which is defined in the message of the Subscribe Topic. After completing the settings, click the "Add" button to add the variable. For the message the PMC receives from Microsoft Azure is based on JSON format, the PMC will get the corresponding value of the variable from the received message. The following is an example of a message the PMC receives:

```
{
      "Target":"door",
      "Action":"open",
      "Timestamp":"2016/10/17 15-17-22"
 }
```

In this example, the “Target” and “Action” variable setting will be performed first. Each time when the PMC receives the message, it will retrieve the corresponding value of the “Target” and “Action” variables from the message. The value of the variables can be used in the evaluation criteria of IF Condition to trigger THEN/ELSE Action for logic operation.

xiv After completing all settings on the Microsoft Azure Setting Page, please click “Save” button to save the settings. After downloading the settings to PMC, PMC will initiate the connection to the Microsoft Azure, and start the data communication with the Microsoft Azure.

9.2 IBM Bluemix Setting

On the IBM Bluemix Setting page, the user could enable the connection to IBM Bluemix IoT Cloud Platform if required. The setting page is shown as below:

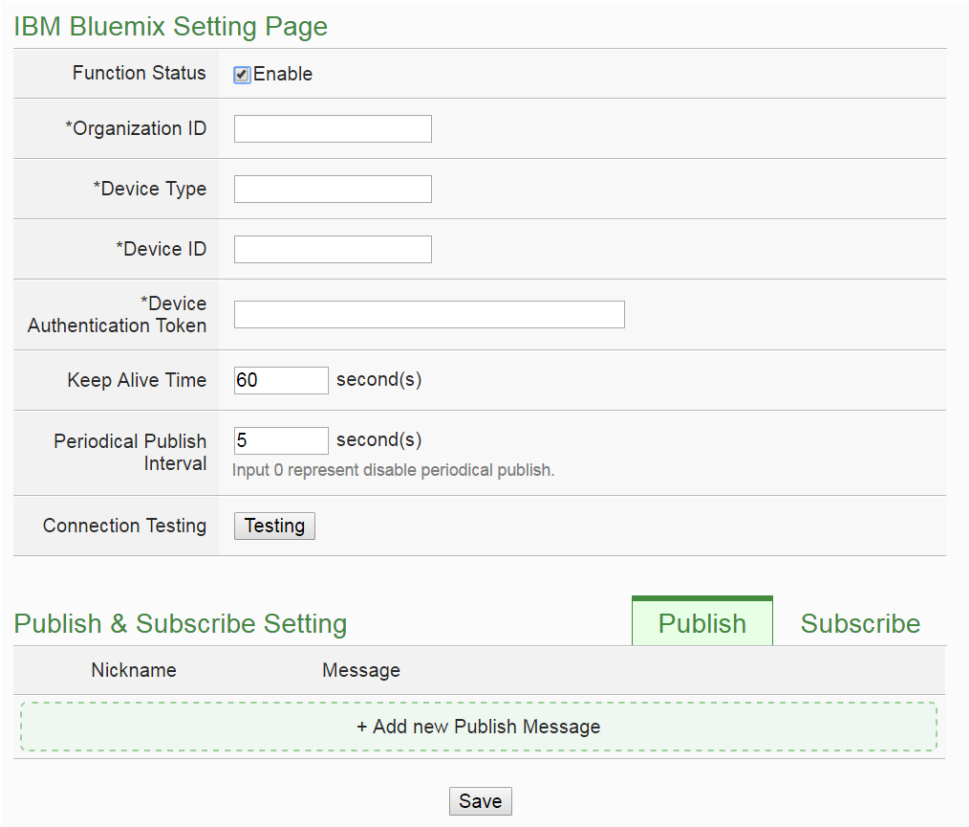


Figure9-5 : IBM Bluemix Setting page

Follow the steps below:

i Check “Enable” in the “Function Status” field to enable the connection to IBM Bluemix IoT Cloud Platform.

ii In the “Organization ID”, “Device Type”, “Device ID” and “Device Authentication Token” fields, input the data you previously registered for this PMC from IBM Bluemix. After you completing the device settings on IBM Bluemix for the PMC, IBM Bluemix will reply you the device information similar as below. Just refer to the information and complete the setting at PMC Web page.

iii The value in “keep alive Time” field defines the maximum amount of time in second that pass away without communication between the PMC and IBM Bluemix. The “keep alive interval” enables IBM Bluemix to detect if the connection to the PMC is no longer available without having to wait for the long TCP/IP timeout.

iv The value in "Periodical Publish Interval" field defines the time interval to automatically and periodically send the Publish Messages which are with the “Periodical Publish” attribute. If the value of the "Periodical Publish Interval" field is 0, it means the “Periodical Publish” operation is disabled. The unit of the value is second.

v Click “Testing” in the “Connection Testing” section, then PMC will try to connect IBM Bluemix, and reply the connection status to verify the setting is correct, or not.

vi The lower half section on the IBM Bluemix Setting Page is for the Publish Message and Subscribe Message setting. User can click the tab of “Publish” or “Subscribe” to edit the Publish Message and Subscribe Message. For the settings of the Publish Message, please refer to “9.1 Microsoft Azure Setting” section.

vii Click the “Subscribe” tab to edit the Subscribe Message. The user interface is shown as below:

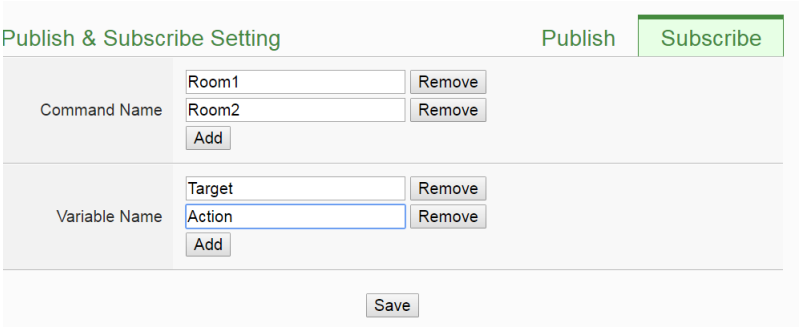


Figure9-6 : IBM Bluemix Subscribe Message setting page

viii In the “Command Name” field, the user can specify the command strings to be sent from the IBM Bluemix to the PMC. The content of “Command Name” setting can be used as the IF Condition of IF-THEN-ELSE logic rule to filter the commands sent from IBM Bluemix. PMC can be set to only receive the commands that are pre-defined in the field, the other commands will be ignored by PMC.

ix In the “Variable Name” field, user can input the name of the variable which is defined in the message of the Subscribe Topic. After completing the setting, click the "Add" button to add the variable. For

the message the PMC receives from IBM Bluemix is based on JSON format, the PMC can also get the corresponding value of the variable from the received message. Following is an example of the message which PMC receives:

```
{
    "Target":"door",
    "Action":"open",
    "Timestamp":"2016/10/17 15-17-22"
}
```

In this example, the “Target” and “Action” variable setting will be performed first. Each time when the PMC receives the message, it will retrieve the corresponding value for the “Target” and “Action” variables from the message. The value of the variables can be used in the evaluation criteria of IF Condition to trigger THEN/ELSE Action for logic operation.

- After completing all settings on the IBM Bluemix Setting Page, please click “Save” button to save the settings. After downloading the settings to the PMC, the PMC will initiate the connection to IBM Bluemix, and start the Publish Message/Subscribe Message mechanism with IBM Bluemix.

9.3 MQTT Setting

PMC provides complete MQTT Client function. The MQTT Client can connect with two (Maximum) MQTT Brokers concurrently. In order to enable the MQTT Client function, user has to complete the setting of the PMC’s Publish Topic and its message content with the MQTT Brokers, and also the setting of the PMC’s Subscribe Topics. In addition, PMC provides the “Topic Import/Export” function. It will help user to organize the MQTT topics from different MQTT devices in an easy way. The configuration page for MQTT setting is shown as below.

9.3.1 Broker Setting

PMC provides the setting for two (Maximum) MQTT Brokers. It can Publish/Subscribe the Topic with the two MQTT Brokers at the same time, and the Topic setting for the two Brokers is also independent. The configuration page of MQTT Broker setting is shown as below:

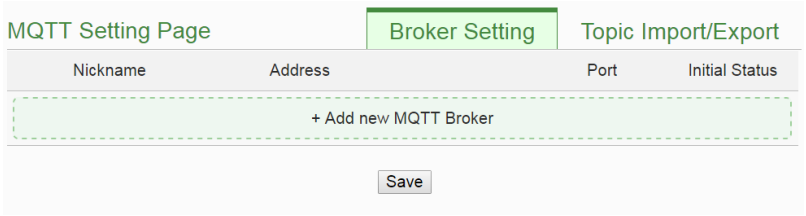


Figure9-7 : MQTT Setting Page (Broker)

The settings steps are as below:

i. Click the "Broker Setting" tab on the right-top corner of "MQTT Setting Page".

ii. Click on "Add new MQTT Broker" to add the new MQTT Broker. After clicking the "Add new MQTT Broker", the MQTT Broker Setting Page will appear. The upper half area of the setting page is about the Broker parameters setting. It will be shown as below:

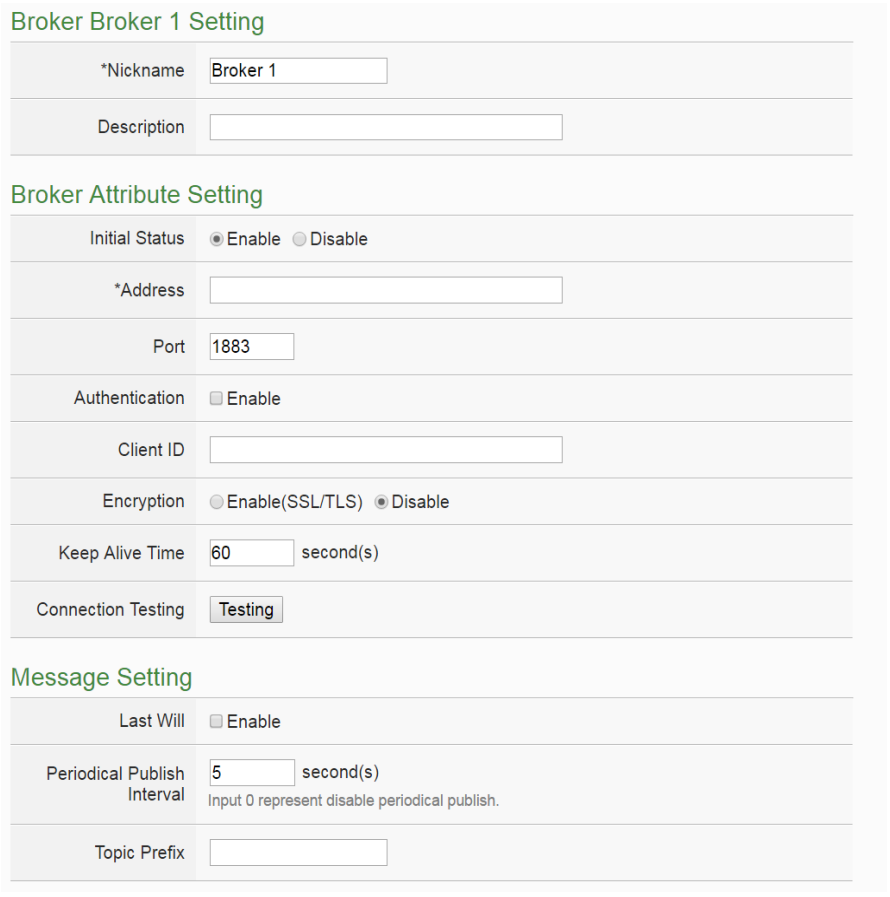


Figure9-8 : MQTT Broker Parameter setting page

iii. In the Broker parameters setting page, you can input the name of the Broker in the "Nickname" field and you could also input the description of this Broker in the "Description" field.

iv. Check “Enable” or “Disable” in the “Initial Status” field to enable the initial connection status with the Broker. If the user clicks “Enable”, it means the PMC will start the communication with the Broker after it is powered on.

v. Enter the Broker IP address (or domain name) in the “Address” field.

vi. Enter the Broker Port number in the “Port” field.

vii. If the Broker requires account and password validation, please select the “Enable” checkbox in the “Authentication” field, and enter the login ID and password in the “ID” and “Password” fields to login into the Broker. If the Broker doesn’t need account and password validation, uncheck the “Enable” checkbox and go directly to next step.

viii. Enter the Client ID information in the “Client ID” field. The Client ID is used for Broker to verify if the MQTT Client is allowed to connect to the Broker or not. If the Broker does not require Client ID for the connection, this field can be ignored.

ix. If the SSL/TLS encryption mechanism is required for the connection between the Broker and the PMC via MQTT, click the "Enable" checkbox of the "Encryption" field to enable this function.

x. The value in "keep alive Time" field defines the maximum time that should pass without communication between the PMC and the Broker. The PMC will ensure that at least one message travels across the network within each keep alive period. In the absence of a data-related message during the time period, the PMC sends a very small MQTT "ping" message, which the Broker will acknowledge. The keep “alive interval” enables the PMC to detect when the Broker is no longer available without having to wait for the long TCP/IP timeout. The unit of the value is second.

xi. To verify whether your Broker setting is correct, click “Testing” in the “Connection Test” section, then PMC will try to connect to the Broker and reply the connection status.

xii. Click the “Enable” checkbox in the “Last Will” field to allow the Broker to send the alarm Topic to other MQTT client devices when PMC lost connection to the Broker. After clicking the “Enable” checkbox, the setting of Last Will Topic, Message content and QoS will be brought up.

xiii. The value in "Periodical Publish Interval" field defines the time interval (in second) to send all Publish Topics with the “Periodical Publish” attribute automatically and periodically. If the value of the "Periodical Publish Interval" field is 0, it means the “Periodical Publish” operation is disabled.

xiv. The “Topic Prefix” field is for setting up a string as Topic Prefix. The prefix can be used in the Publish Topic or Subscribe Topic to simply the Topic editing. The default string of the “Topic Prefix” will be the model name of the PMC. If there are more than one PMC controllers in a system for MQTT connection, please remember to change the “Topic Prefix” setting to distinguish the Publish Topic/Subscribe Topic setting of each PMC controller.

xv. The lower half area of the MQTT Broker Setting Page is for the Publish Message and Subscribe Topic setting. User can click the “Publish” tab or “Subscribe” tab on the right-top corner of “Publish & Subscribe Setting” to edit the Publish Message and Subscribe Topic. The Interface will be shown as below:

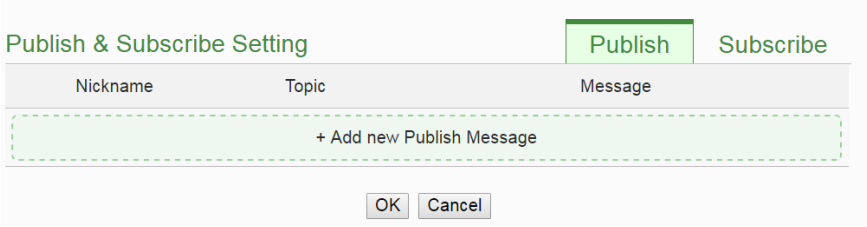


Figure9-9 : Publish Message and Subscribe Topic setting page

xvi. Click the “Publish” tab to edit the Publish Message. Click on “Add new Publish Message” to add a new Publish Message. The Interface will be shown as below:

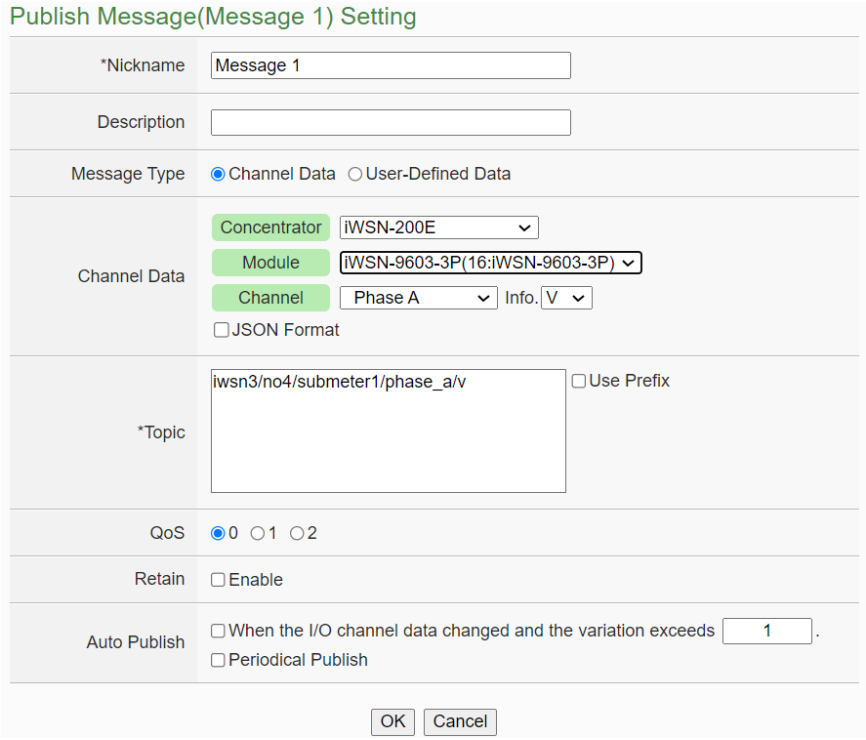


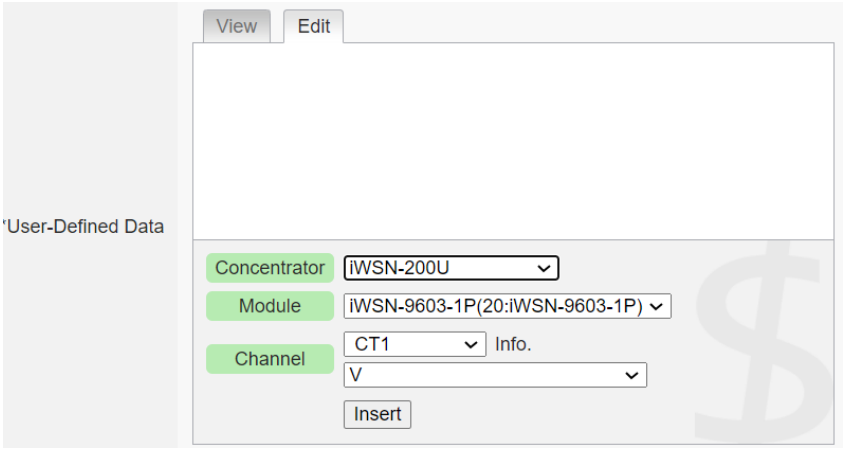
Figure9-10 : Publish Message Setting Page

xvii. Input a name in the “Nickname” field and you could also input the description of this Publish Message in the “Description” field.

xviii. In the “Message Type” field, select the “Channel Data” to prepare a Publish Message with the power data or I/O channel value. Based on the “Channel Data” interface, the user can select a specific power data (or I/O channel value) or “All” power data (and I/O channel values) for the Publish Message. If the user selects a specific channel, it means the specific power data (or I/O channel value) of the module will be bound with the Publish Message. If user select “All” channels, it mean all power data (and I/O channel values) of the module will be added in the Publish Message List. If the user click the "JSON Format" check box, the content of the Publish Message will be packaged in JSON format; if the “JSON” is not selected, the content of the Publish Message will only include the I/O channel value (For the I/O Channel information in JSON Format, please refer to Appendix VI for more details.). After completing the “Channel Data” setting, the system will automatically generate the default Topic content in the “Topic” field. User can modify the content of the “Topic” field if require. If the "Use Prefix" checkbox is enabled, the string in the “Topic Prefix” field will be used as the prefix of the

Publish Topic.

The user can select “User-Defined Data” in “Message Type” field to edit the Publish Topic and its binding message on the free style editing interface. The user interface is shown as below.



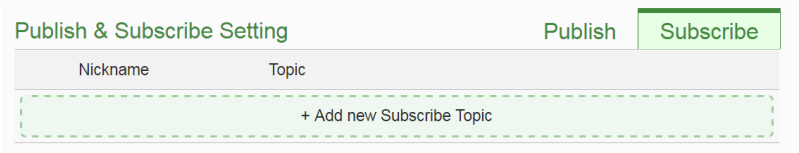
xix. In the “QoS” field, user can select 0, 1, 2 for the QoS(Quality of Service) setting for the Publish Message.

xx. In the “Retain” field, user can click the “Enable” checkbox to keep the Publish Message in the Broker.

xxi. The timing to publish message is set in the “Auto Publish” field, there are two options: “When the I/O channel data changed and the variation exceeds xxx” and “Periodical Publish”. If the “When the I/O channel data changed and the variation exceeds xxx” is selected, the system will automatically publish the topic when the power data or I/O channel data is changed and exceeds the evaluation value (This option only support “Channel Data” setting in “Message Type”). If user selects “Periodical Publish”, it mean the topic will be published at periodic time schedule base on the value in “Periodical Publish Interval” field.

xxii. After completing all settings of Publish Topic, please click “OK” button to add the Publish Topic to the Publish Message List.

xxiii. Click the “Subscribe” tab to edit the Subscribe Topic. The user interface is shown as below.



xxiv. Click on “Add new Subscribe Topic” to add a new Subscribe Topic. The Interface will be shown as below:

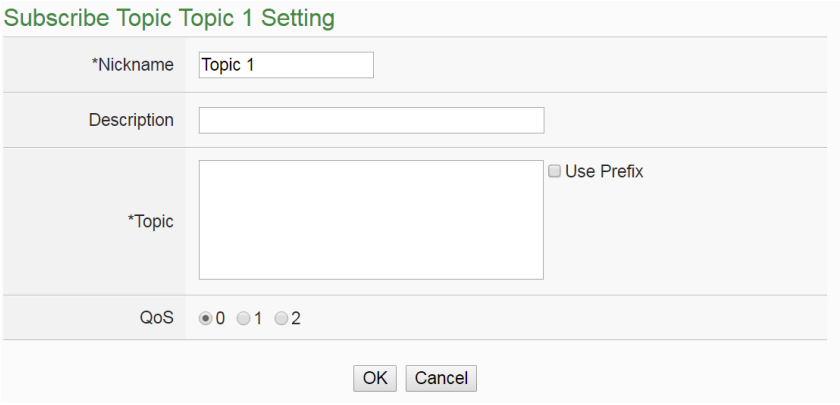


Figure9-11 : Subscribe Topic Setting Page

xxv. Input a name of the Subscribe Topic in the “Nickname” field, and you could also input the description of this Subscribe Topic in the “Description” field. In the “Topic” field, user can input the content of the Subscribe Topic. After completing all settings of Subscribe Topic, please click “Add” button to add the Subscribe Topic to the Subscribe Topic List.

The value of the Subscribe Topic can be used in the IF-THEN-ELSE logic evaluation. In addition, all Internal Registers, power meters and I/O modules connected to PMC have their own default definition of Subscribe Topic. It allows user to change the value of the Internal Register and the value of the output channel of I/O module or power meter by MQTT protocol. Please refer to Appendix VI for detailed information.

xxvi. After completing all settings of the Broker, please click “OK” button to return to add the MQTT Setting Page. And then click “Save” button to save all MQTT Broker settings.

9.3.2 Topic Import/Export Setting

PMC provides the Topic Import function so the users can import the MQTT Topics settings from other MQTT client devices easily. Click on “Topic Import/Export” tab, and click “+ Import Topic” to add new

MQTT Topic setting into the PMC. And select the topics to be imported. The Topic Export function allows to export the MQTT Topics that the PMC is using to a document file, and it can be a reference for integration with the back-end Server. The Topic Import/Export Setting page is shown as below.

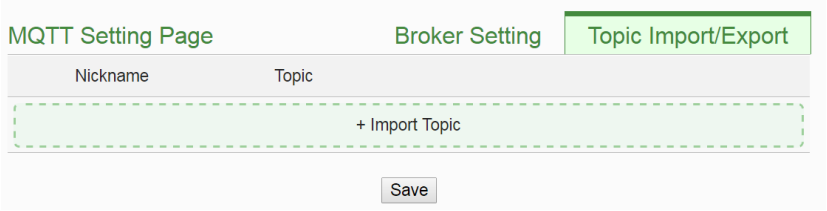


Figure9-12 : MQTT Topic Import/Export setting page

All MQTT Publish Topics and Subscribe Topics that the PMC is using now will be shown in the setting page. Click the “Export” button will collect all topics into the “topics.csv” file. The format of the “topics.csv” file is “The_nickname_of_Topic, Topic message”. Please refer to the following figure:

Figure9-13 : The Export of MQTT Topic

To use the Topic Import function, please prepare a document with the same format as “The_nickname_of_Topic, Topic message”. Click the “+ Import Topic” button, then browse through to select the document which includes the MQTT Topic and click “Open”. If the format is correct and the import process is successful, the system will show an “Import successfully” message box.

After importing the MQTT Topic successfully, there the Imported Topic list will be shown in the “Topic” field of the Publish & Subscribe Setting page. The user can select a specific topic from the Imported Topic list,

and click “Use” button to use this imported topic.

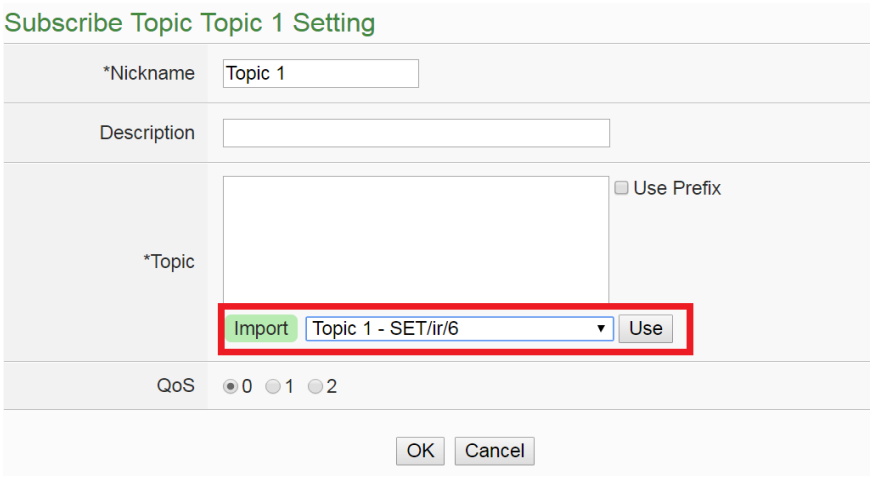


Figure9-14 : The Import of MQTT Topic

9.4 IoTstar Real-Time Data Sending Setting

IoTstar can receive the real-time power data (and I/O data) uploaded by PMC, and import these data into the database it created. The setting page is shown as below:

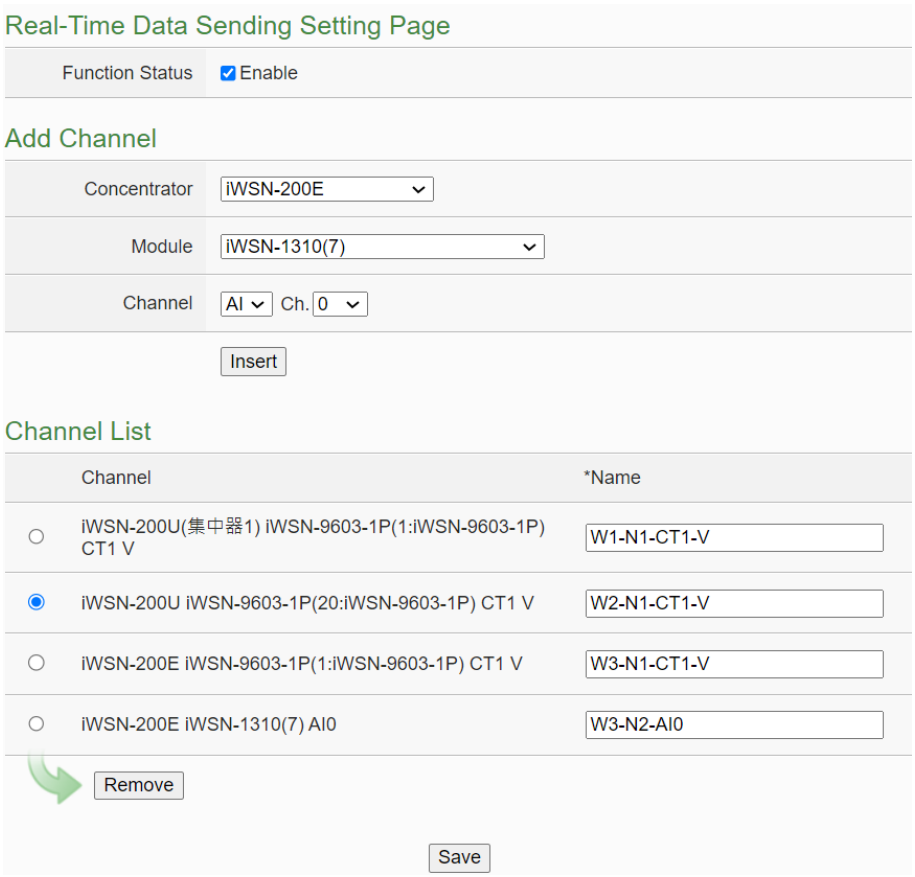


Figure9-15 : IoTstar Real-Time Data Sending Setting page

Follow the steps below:

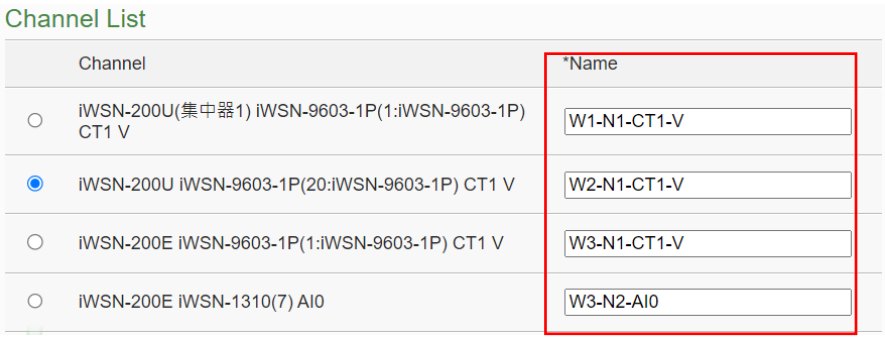
i. In the “Function Status” field, check “Enable” to enable the Real-Time data upload operation.

ii. In the "Add Channel" section, select the “Interface”, “Module” and “Channel” from the dropdown list and click “Insert” to add the power meter loop or I/O channel into the “Channel List" section. User can select "All" in “Channel” field to insert all power meter loops and I/O channels of the power meter or I/O module at once.

iii. PMC will actively send the Real-Time power data and I/O data which is located in the “Channel List" section to IoTstar. User can modify the database field name of the power data (or I/O channel data) in the "*Name" field. To remove a pre-set power meter loop or I/O channel, please click the radio button in front of the pre-set power meter loop or I/O channel and then click “Remove” button.

Please Note:

1. The name inputted in the "*Name" field must be a unique name.
2. The name set in the "*Name" field will be saved in the "Name" field of the Real-Time Data Table that IoTstar creates for the PMC (Please refer to Appendix VI of IoTstar User Manual). These names can be used later for further query operations of the Database.



iv. After all settings are completed, click “Save” button to save the setting.

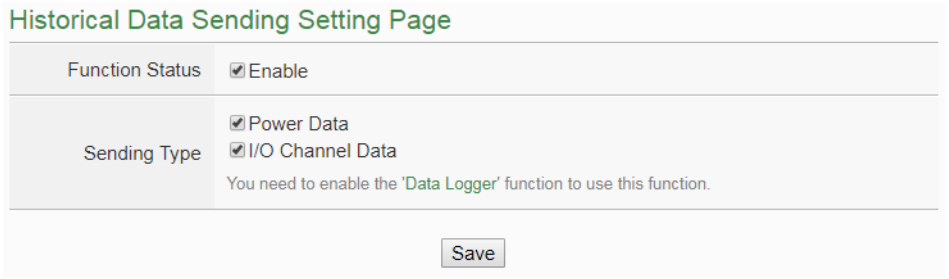
9.5 IoTstar Historical Data Sending Setting

IoTstar can receive the historical power data (and I/O data) uploaded by PMC, and import these data into the database it created. The setting page is shown as below:

Follow the steps below:

i. To enable PMC's historical data upload operation, users need to enable Data Logger function of PMC first. More detailed setting information please refers to the section"8.1 Data Logger Setting".

ii. In the "Function Status" field, check "Enable" to enable the data file upload function and select the type of data log file you would like to upload.

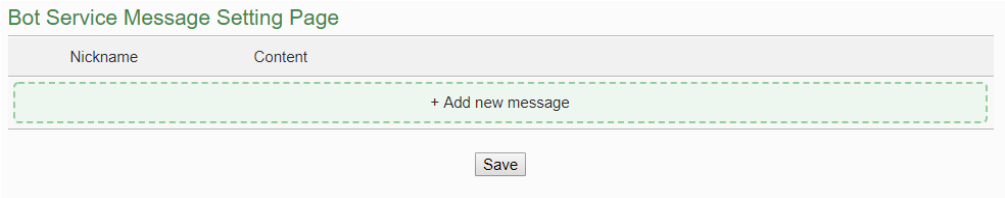


iii. After all settings are completed, click "Save" button to save the setting.

9.6 IoTstar Bot Service Setting

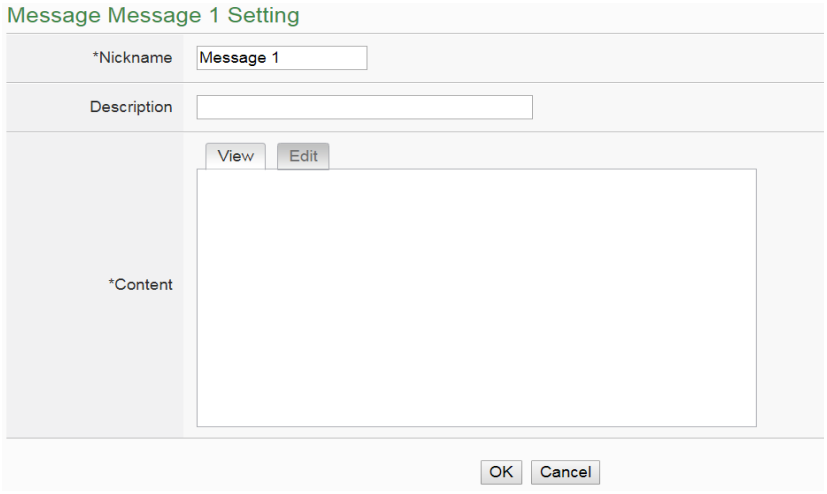
PMC supports the message sending function to IoTstar Bot. When PMC is set to connect to an IoTstar server and the IoTstar server enables IoTstar Bot function, PMC can send message to the LINE App or Telegram App that bind with the IoTstar server. About the detail of IoTstar Bot, please check the IoTstar web page. The configuration page for message setting is shown as below.

In the Message setting page, users can edit the messages which would be sent to IoTstar Bot with the pre-input strings, Power data, I/O channel data and Internal Register value. The configuration page is shown as below:



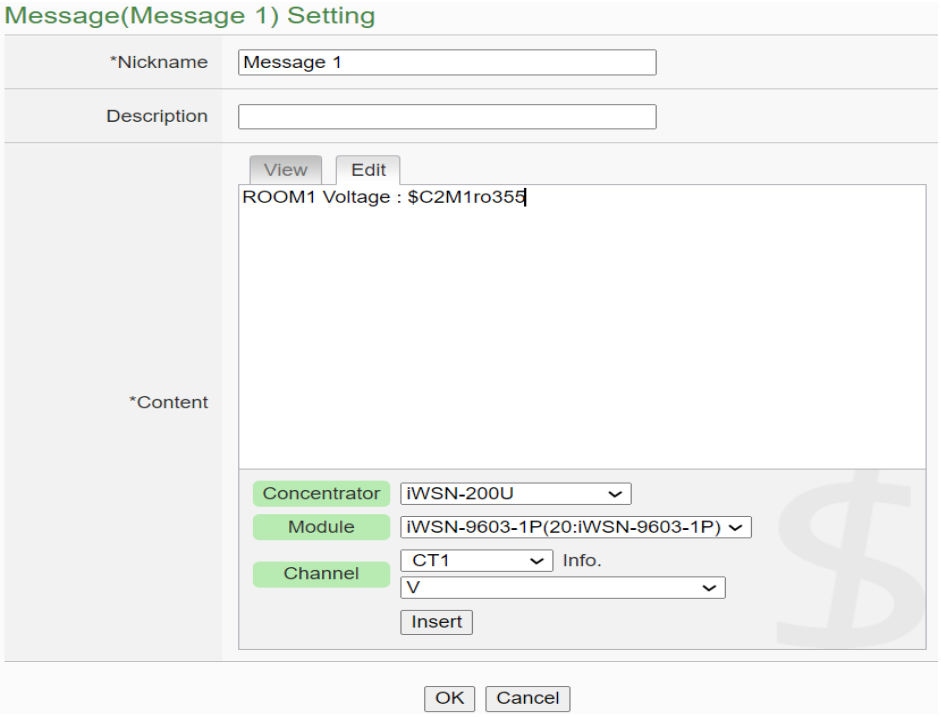
Follow the steps below:

i. Click "Add new message", the Bot Service Message Setting page will appear as following:



ii. Input name in the “Name” field and you could input the description of this message in the “Description” field.

iii. Enter the message content in the “Content” field. PMC provides encoded strings for users to add current I/O channel value, power data or Internal Register value into the messages. To make it easy to add the encoded string, PMC provides “Real-time variable editor”. Please refer to “8.1 Data Logger Setting” for more detailed information of the “Real-time variable editor”.



iv. After complete all settings, click the “OK” button to confirm the message setting, and return to the Message Setting page.

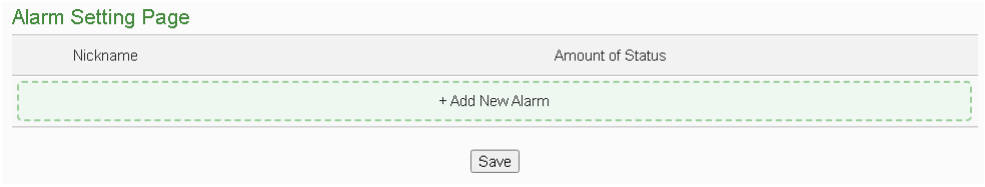
v. Repeat steps ii~ iv to complete settings of all new messages for IoTstar

Bot service.

vi. After you finish all the Message settings, click “Save” button to save the settings.

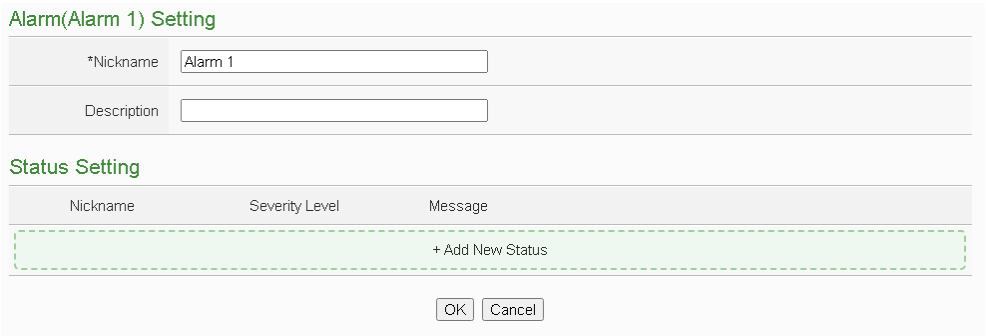
9.7 IoTstar Alarm Setting

When users configure PMC/PMD to connect to the IoTstar server, alarm messages can be sent to IoTstar to alert the control center in specific situations. The alarms can include a severity level, helping administrators prioritize which alerts require immediate attention. Each alarm can independently display five different statuses: **Critical**, **Severe**, **Moderate**, **Minor**, and **No Impact**. Users can adjust the urgency of the alarm by sending corresponding statuses and messages. The configuration page is shown as below:



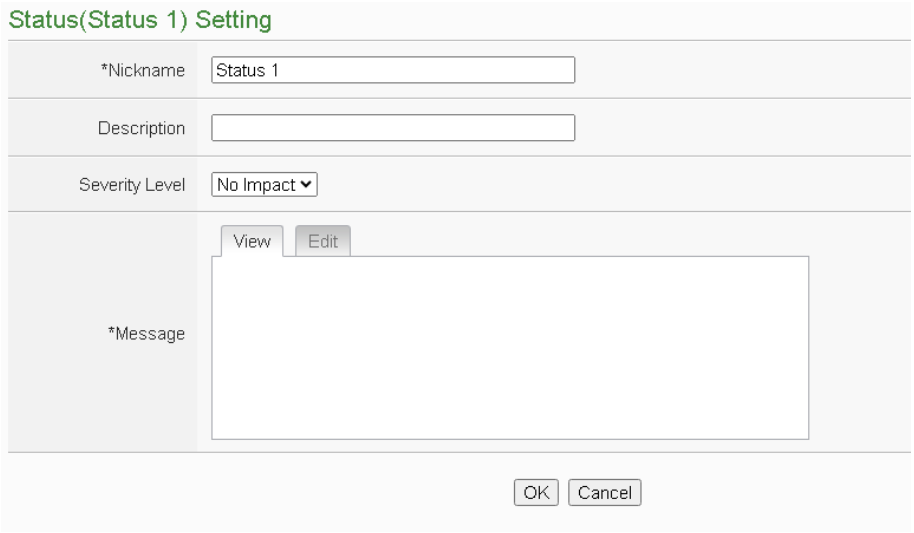
Follow the steps below:

i. Click “Add New Alarm” to open the alarm settings page, as shown below:



ii. Input the name in the “Nickname” field and you could also input the description of this alarm in the “Description” field.

iii. Click “Add New Status” to open the Status setting page for the alarm. You can add a status and the desired alarm message, as shown below:



iv. Input the name in the "Nickname" field and you could also input the description of this status in the "Description" field.
v. In the "Severity Level" field, set the severity level represented by this status.
vi. Enter the message content in the "Message" field. PMC/PMD provides an "Real-time variable editor" to add current I/O channel value, power data or Internal Register value into the messages.
vii. After complete all settings, click the "OK" button to confirm the status setting, and return to the Alarm Setting page.
viii. Repeat steps iii ~ vii to complete settings of all statuses for the alarm.
ix. Repeat steps i ~ viii to complete settings of all alarms.
x. After you finish all the Alarm settings, click "Save" button to save the settings.

10 Advanced Setting

Advanced Setting provides additional features and allows you to perform more setting on the PMC devices. Click on the Advanced Setting button, a column of buttons will appear on the left of the page:

- Email Setting
- SNMP Trap Setting
- LINE Notify Setting (The service will end on March 31, 2025.)
- LINE Messaging API Setting
- Telegram Setting
- Timer Setting
- Schedule Setting
- PUE Setting
- Internal Register Setting(Include Math Formula Editing Function)
- Ping Setting

After complete the Advanced Setting, all the setting you define in the section will be the property in the IF-THEN-ELSE rule setting page. Please note: In order to avoid possible error when performing rule definition (IF-THEN-ELSE), please always finish configuration in Advanced Setting before starting to define Rules. Avoid unnecessary change in Advanced Setting after you finish rule definition. Unexpected errors might occur if you violate this sequence: Advanced Setting→ Rule Setting. In case you make any modification, please double check your settings and Rules definition to make sure no errors are present. The following sections will describe more detailed information for these configurations.

10.1 Email Setting

PMC support Email messages sending function. This function allows sending pre-input Email message(s) to pre-set Email receiver(s) under certain conditions. The configuration page is shown as below:

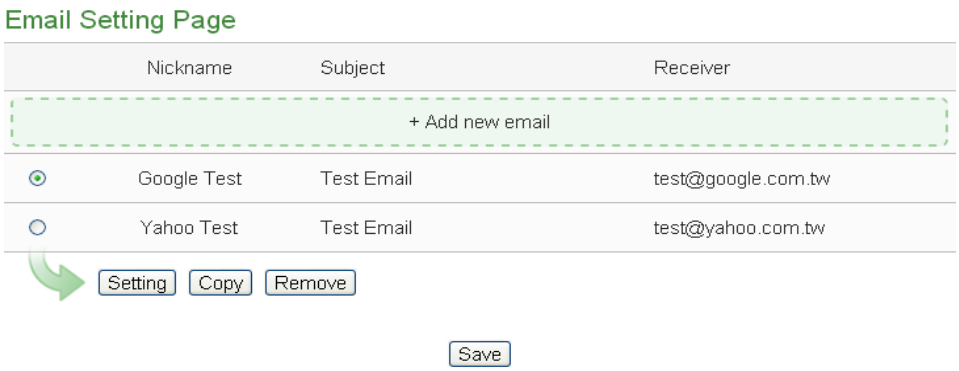


Figure10-1 : Email setting page

The settings steps are as below:

i Click on "Add new email" to add a new email setting.

ii After clicking the "Add new email", a setting page will appear, input name in the "Name" field and you could also input the description of this email in the "Description" field; shown as below:

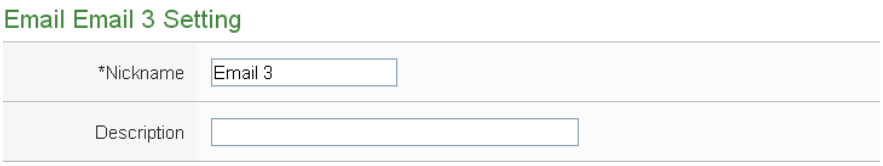


Figure10-2 : Email setting page(Name & Description))

iii In the "SMTP Server" field, enter the IP or the domain name of the SMTP server; or select the SMTP server from the dropdown list. In the dropdown list, PMC provide four public SMTP servers for selection as below:

- Google Gmail
- Yahoo Mail
- Microsoft Outlook / Hotmail
- AOL Mail

After select SMTP server from the dropdown list, PMC will automatically complete the "Port Number" and "Security" setting related to the SMTP server you select. The SMTP Setting page is shown as below:

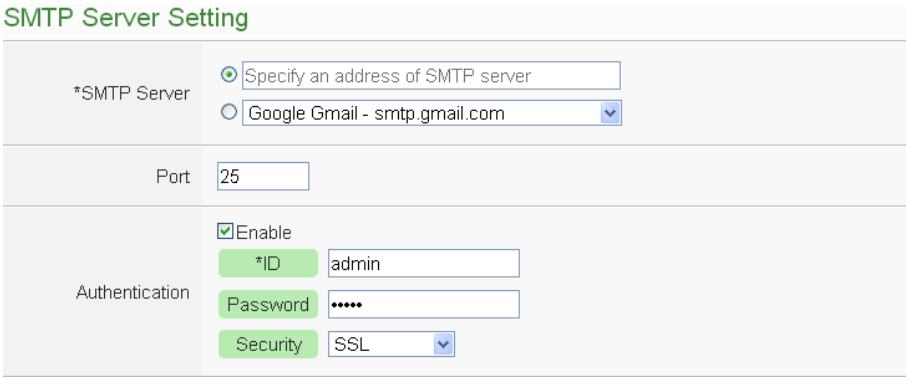


Figure10-3 : Email setting page(SMTP Server)

iv Input the Port number, the default port number is set as 25.

v If the SMTP server requires account and password validation, please select the "Enable" checkbox, and continue steps vi~viii to login into the SMTP server. If the SMTP server doesn't need account and password validation, uncheck the "Enable" checkbox and go directly to step ix.

vi Enter the SMTP server login ID in the "Login ID" field.

vii Enter the SMTP server password in the "Password" field.

viii In the "Security" field, select the security setting to be "No Security", "TLS", or "SSL" from the dropdown list.

ix After complete SMTP server setting, continue to input Email address setting. In the "Sender Name" field, input the name of the sender. The Email Address Setting page is shown as below:

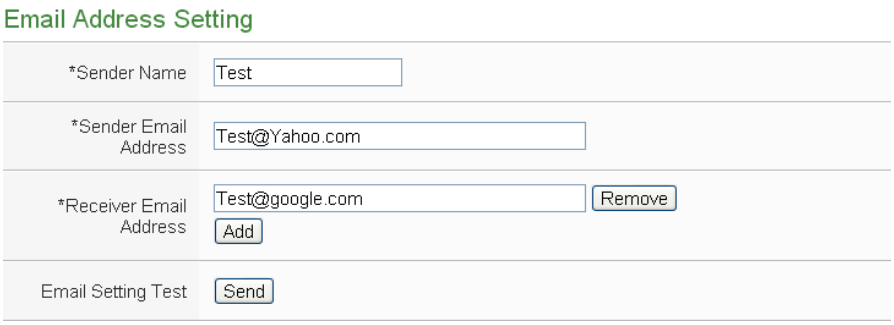


Figure10-4 : Email setting page(Email Address)

x Enter the sender's email address in the "Sender Email Address" field.

xi In the "Receiver Email Address" section, click on "Add" to add the receiver's email address. At least one email address has to be entered.

xii To verify whether your email setting is correct to send the Email, click "Send" in the "Email Setting Test" section, then PMC will send a test Email to the receiver's email address.

xiii After complete Email Address setting, continue to input Email Content setting. Enter the email subject in the “Subject” field. The Email Content Setting page is shown as below:

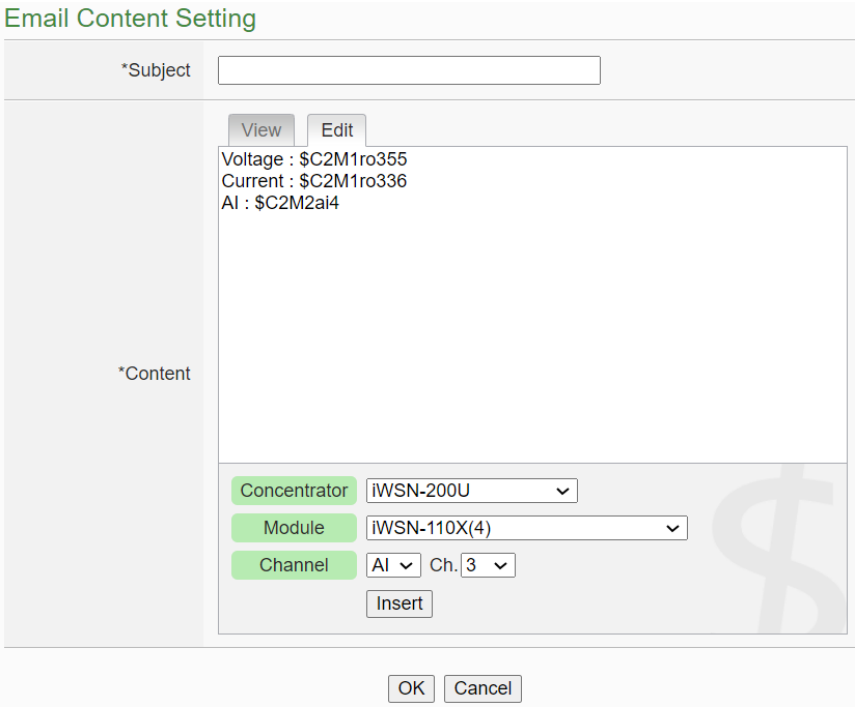


Figure10-5 : Email setting page(Email Content)

xiv Enter the content in the “Content” section. In addition, it provides encoded strings for users to add current I/O channel value, power data or Internal Register value into the Email content. To make it easy to add the encoded string, PMC provides “Real-time variable editor”. Please refer to "8.1 Data Logger Setting“ for more detailed information of the “Real-time variable editor”.

xv Click on “OK” to confirm the setting and leave the setting page.

xvi Repeat steps i~ xv to complete settings of all Emails

xvii To modify the settings of a pre-set Email, please click on the radio button in front of the Email, and then click on “Setting” to modify the settings.

xviii To copy the settings of a pre-set Email to the new Email, please click the radio button in front of the pre-set Email and then click “Copy”, a new Email will be added to the list and the settings of the old Email will be copied to this newly added Email.

xix To remove a pre-set Email, please click the radio button in front of the pre-set Email and then click “Remove”.

xx After you finish all the Email selections and settings, click “Save”

button to save the settings.

10.2 SNMP Trap Setting

SNMP Trap function allows PMC to initiative sending of the system data, power meter data and IO channel data to the SNMP Manager in real time automatically when unusual events occur; so that the SNMP Manager can respond immediately with corresponding operations. The configuration page for SNMP Trap setting is shown as below:

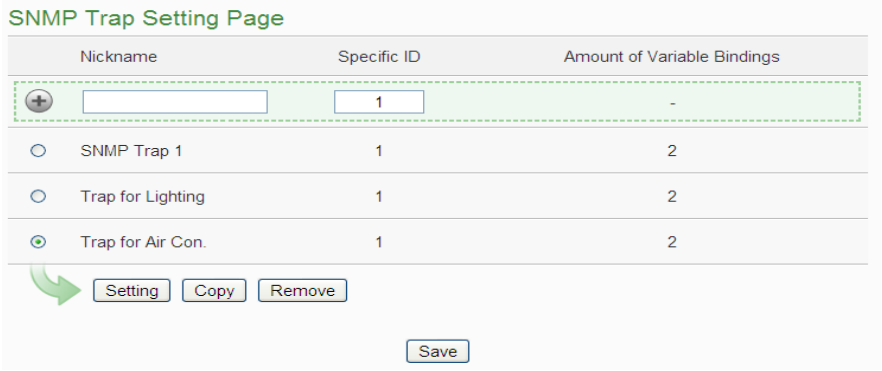


Figure10-6 : SNMP Trap Setting Page

The settings steps are as below:

i Input “Nickname” and “Specific ID” and then click  button to create a new SNMP Trap.

ii To modify the settings of a pre-set SNMP Trap, please click on the radio button in front of the SNMP Trap, and then click on “Setting”, then the SNMP Trap Parameter Setting page will be shown as below. You can modify the settings of the SNMP Trap you selected if required.

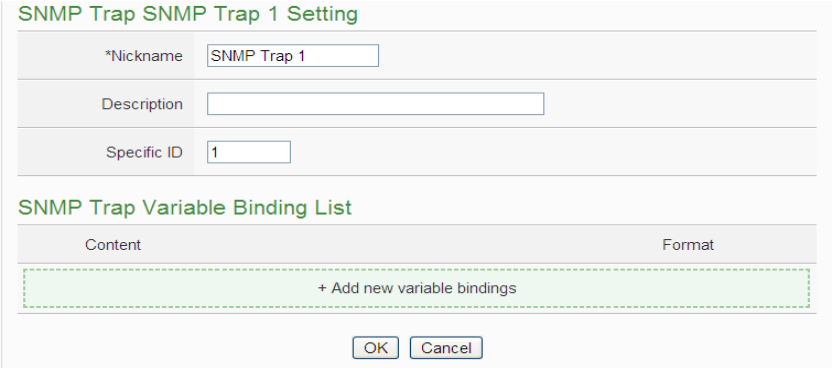


Figure10-7 : SNMP Trap Parameter Setting Page

iii In the SNMP Trap Parameter Setting page, you can input or modify the

name of the SNMP Trap in the “Nickname” field and you could also input the description of this SNMP Trap in the “Description” field.

iv Input the Specific ID value of the SNMP Trap in the “Specific ID” field.

v Click on “Add new variable bindings” to add a new variable binding for the SNMP Trap.

vi After clicking the “Add new variable bindings”, the Variable Binding Setting Page will appear. Select the variable type first. PMC provides two variable types as “Channel Data” and “User-Defined Data” for selection. If you select the variable type as “Channel Data” type, The setting page interface will be shown as below:

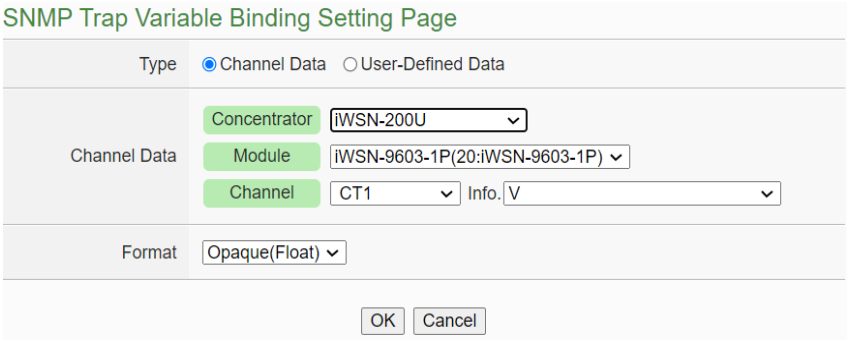


Figure10-8 : “Channel Data”Type Setting Page

Based on the “Channel Data” interface, it provides the encoded string for user to easily add one real-time power data or I/O channel data as the variable binding in SNMP Trap each time. Select the “Concentrator”, “Module”, “Channel”, “Info.” and “Format” from the dropdown list, and click the “OK” button to add the power data or I/O channel to the variable bindings list of the SNMP Trap.

The following figure shows two variable binding examples in “Channel Data” type are included in the SNMP Trap.

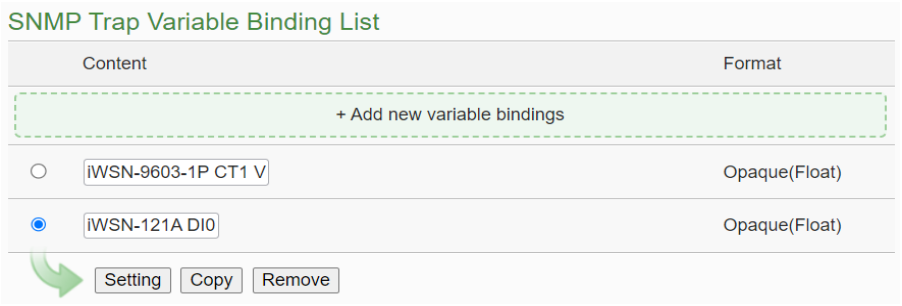


Figure10-9 : Example of “Channel Data” Type Variable Binding List

vii In addition to “Channel Data” type, you can select the “User-Defined Data” as the variable type. The setting page interface will be shown as below:

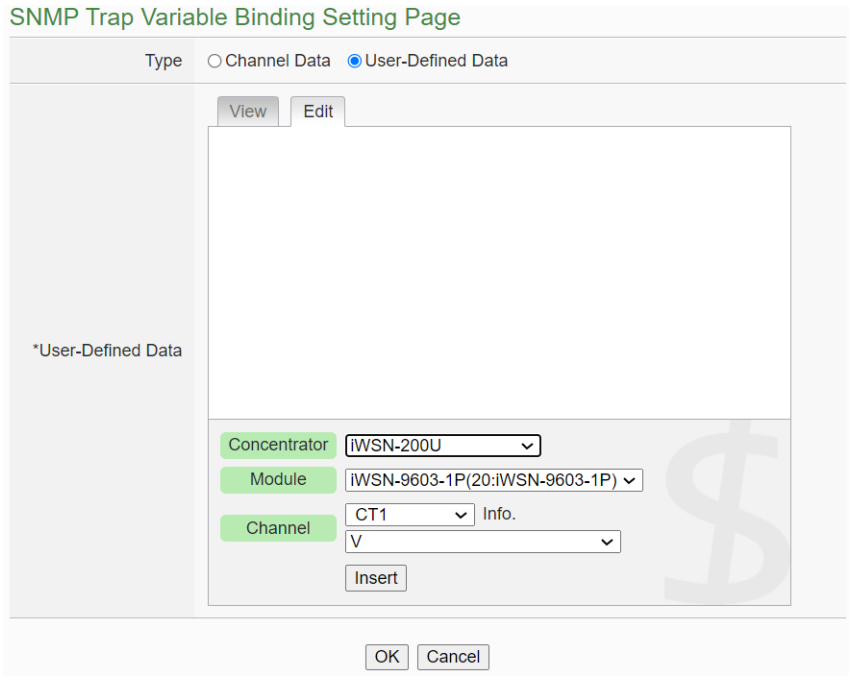


Figure10-10 : “User-Defined Data” Type Setting Page

Set up the content in the “User-Defined Data” field of the SNMP Trap Variable Binding Setting Page. The User-Defined Data provides encoded strings for user to add real-time power data or I/O channel data to the content easily. User can select the “Edit” tab or click on any blank area in the “User-Defined Data” field, and then the “Real-time variable editor” will be shown as below.

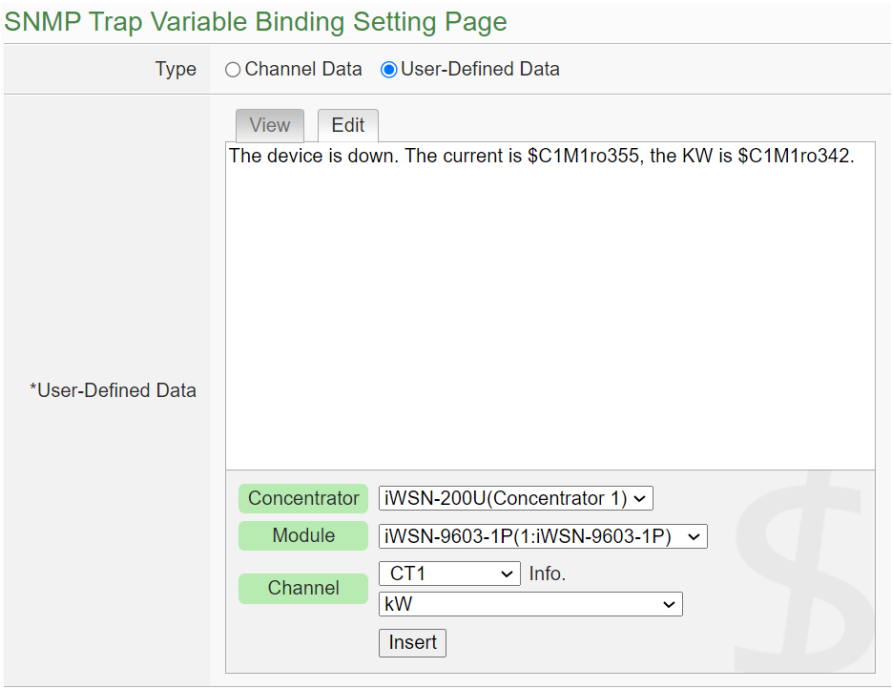


Figure10-11 : "User-Defined Data" Interface in Edit Mode

Input your message in the "User-Defined Data" field, and then select the "Concentration", "Module", "Channel" and "Info" from the dropdown list and click "Insert" to add channel value encoded string into the "User-Defined Data" content. The system will record the data the user pre-set in the User-Defined Data, and save the real data values in the SNMP Trap Variable Binding. When editing the content, the user can select the "View" tab, and then the channel encoded string will be displayed in the real index format of the channel for user to check the settings in an easy way.

The figure above shows an example of the encoded strings, the variable $C1M1ro355 indicates the voltage value of iWSN-9603-1P Loop 1 on the module 1 that is connected to the iWSN Concentrator on COM 3, the variable $C1M1ro342 indicates the kW value of iWSN-9603-1P Loop 1 on the module 1 that is connected to the iWSN Concentrator on COM 3. When users select the "View" tab, the channel value encoded string will be displayed as "iWSN-9603-1P CT1 V" and " iWSN-9603-1P CT1 kW" for user to check if the setting is appropriate.

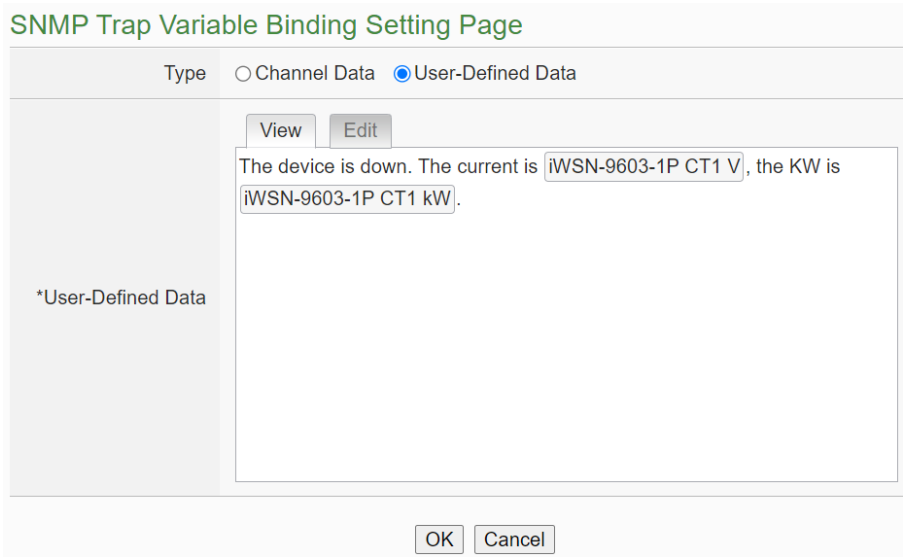


Figure10-12 : "User-Defined Data" Interface in View Mode

viii After completing the setting, click the "OK" button to save the parameters and variable bindings setting, and return to the SNMP Trap Setting Page

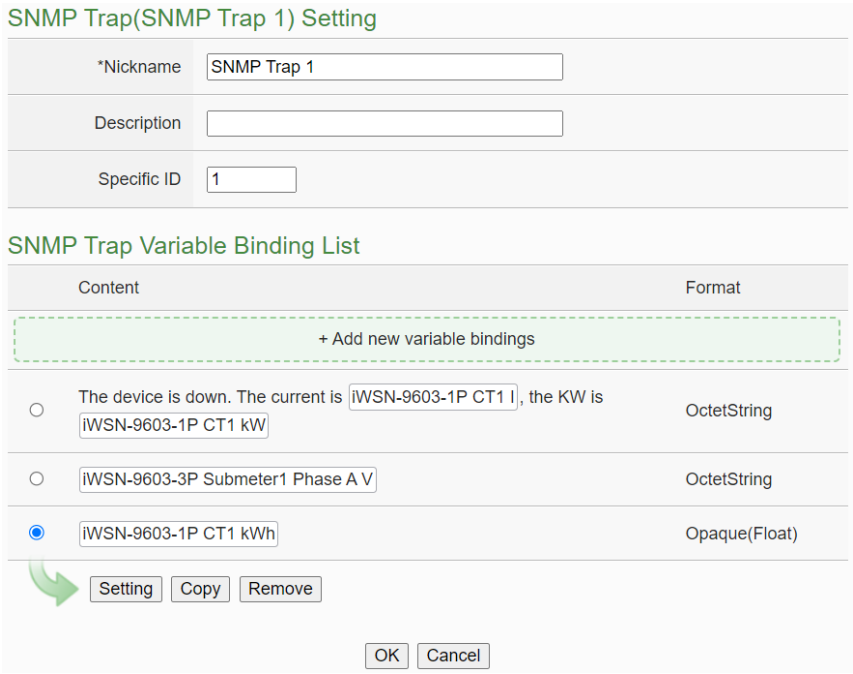


Figure10-13 : SNMP Trap setting with variable bindings list

ix Repeat steps v~ viii to complete settings of all variable bindings.

x To modify the settings of a pre-set variable binding, please click on the radio button in front of the variable binding, and then click on "Setting" to modify the settings.

To copy the settings of a pre-set variable binding to the new variable

binding, please click the radio button in front of the pre-set variable binding and then click “Copy”, a new variable binding will be added to the list and the settings of the old variable binding will be copied to this newly added variable binding.

To remove a pre-set variable binding, please click the radio button in front of the pre-set variable binding and then click “Remove”.

xi After you finish all the SNMP Trap settings, click “OK” button to confirm the settings, and return to SNMP Trap list.

xii Repeat steps i~ xi to complete settings of all SNMP Traps

xiii To modify the settings of a pre-set SNMP Trap, please click on the radio button in front of the SNMP Trap, and then click on “Setting” to modify the settings.

To copy the settings of a pre-set SNMP Trap to the new SNMP Trap, please click the radio button in front of the pre-set SNMP Trap and then click “Copy”, a new SNMP Trap (in sequence) will be added to the list and the settings of the old SNMP Trap will be copied to this newly added SNMP Trap.

To remove a pre-set SNMP Trap, please click the radio button in front of the pre-set SNMP Trap and then click “Remove”.

xiv After you finishing all the SNMP Traps creation and setting, click “Save” button to save the settings.

10.3 LINE Notify Setting (The service will end on March 31, 2025.)

PMC provides LINE Notify message sending function. With this function, PMC can send messages to LINE personal account or group chat rooms via LINE Notify official account. To send the LINE Notify message, users have to apply a LINE Notify service first and connect the service with the personal account or chat room to be sent. Please refer to the LINE Notify guide webpage on PMMS official webpage for the application and connection of LINE Notify service. The configuration page for LINE Notify message setting and chat room setting is shown as below.

10.3.1 Message Setting

In the Message setting page, users can edit the LINE messages with pre-input strings and realtime data. The configuration page is shown as below:

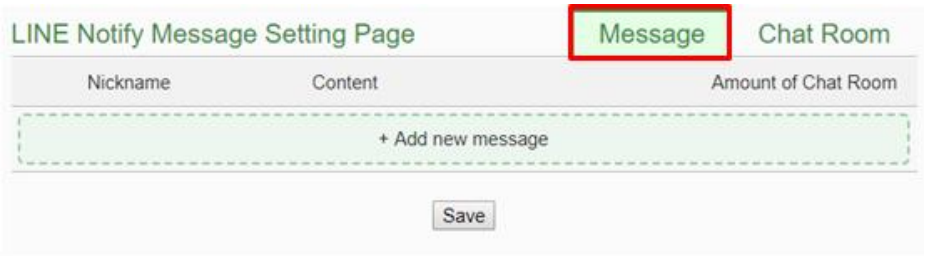


Figure10-14 : LINE Notify Message Setting page (1)

The settings steps are as below:

i. Make sure the "Message" Tab is selected.

ii. Click "Add new message", the LINE Notify Message Setting page will appear as following:

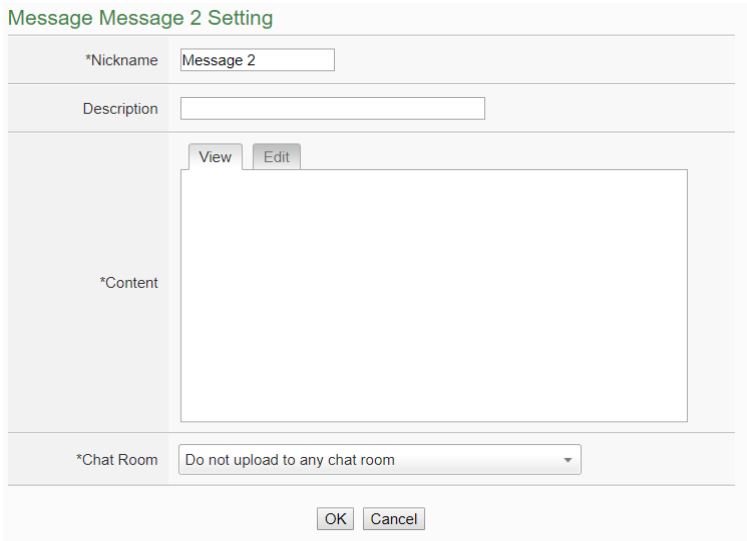


Figure10-15 : LINE Notify Message Setting page (2)

iii. Input name in the "Name" field and you could also input the description of this LINE message in the "Description" field.

iv. Enter the message content in the "Content" field. LINE message provides an encoded string for you to add current power data, I/O channel data or Internal Register data into LINE messages. To make it easy to add the encoded string, PMC provides "Real-time variable editor". Please refer to "8.1 Data Logger Setting" for more detailed information of the "Real-time variable editor".

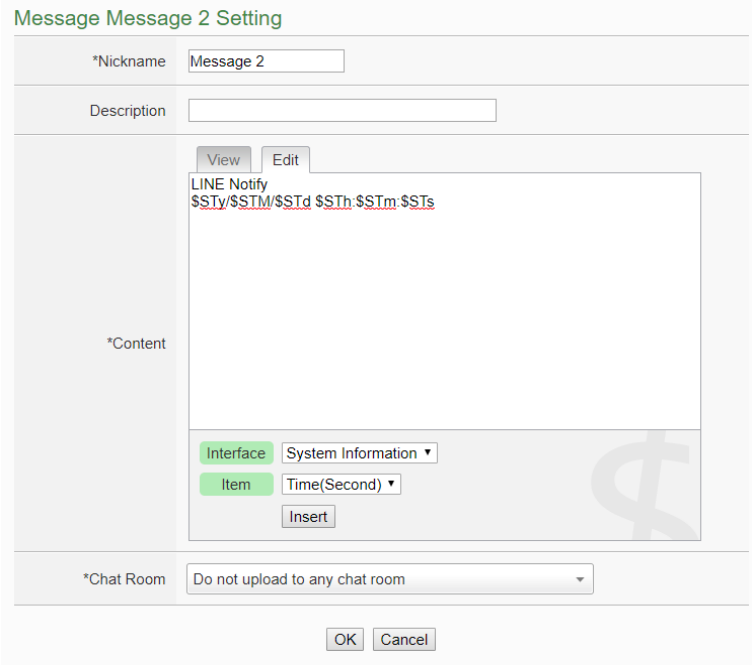


Figure10-16 : LINE Notify Message Setting page (3)

v. In the "Chat Room" field, please specify the Chat rooms which will receive the message PMC send. PMC can send the messages to multi-chat rooms simultaneously. Users can directly click on the "Add new Chat Room" to connect with a new chat room, please refer to the section "10.3.2 Chat Room Setting".

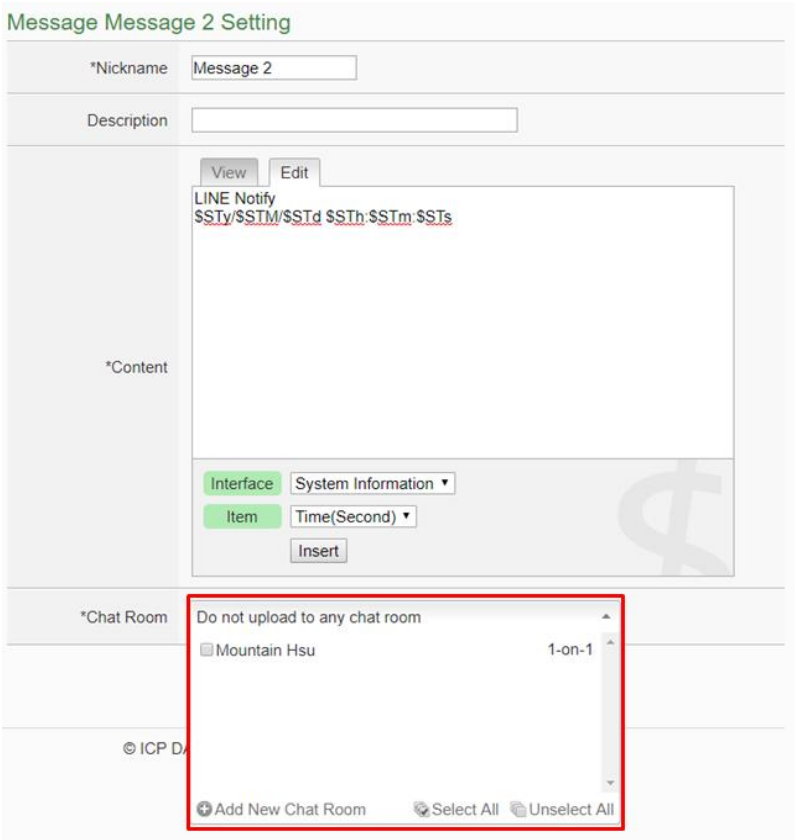


Figure10-17 : LINE Notify Message Setting page (4)

vi. After complete all settings, click the "OK" button to confirm the LINE Notify message setting, and return to the Message Setting page.

vii. Repeat steps ii~ vi to complete settings of all LINE Notify messages.

viii. After you finish all the LINE Notify Message settings, click "Save" button to save the settings.

10.3.2 Chat Room Setting

PMC send LINE messages to the chat room which is connected to the service. Users can add or manage chat rooms via the Chat Room setting page. The setting interface is as below:

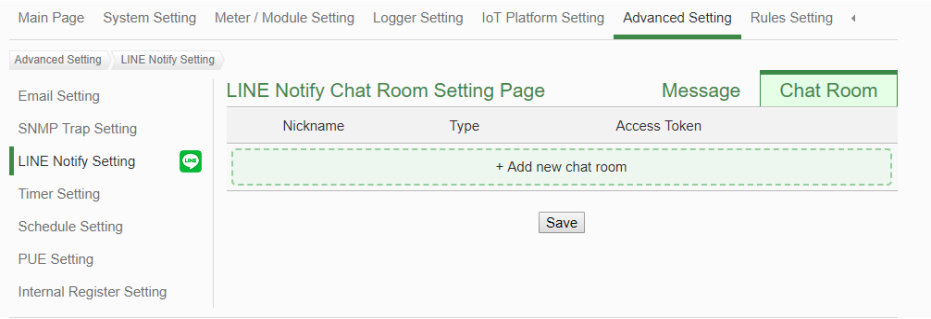


Figure10-18 : LINE Notify Chat Room Setting page (1)

The settings steps are as below:

i. Click “Add new chat room”, the LINE Notify Connection Setting page will appear as below. Input the Client ID and Client Secret of the applied service and click the “Send” button, the LINE login interface will appear if the client data was correct. If you do not apply the service before, click the link of “No Client ID and Client Secret?” at the lower area of the windows. It will lead you to the LINE Notify teaching website on the PMMS official webpage.

Figure10-19 : LINE Notify Chat Room Setting page (2)

ii. When the LINE login interface appears, login with the account which will receive the messages from PMC.

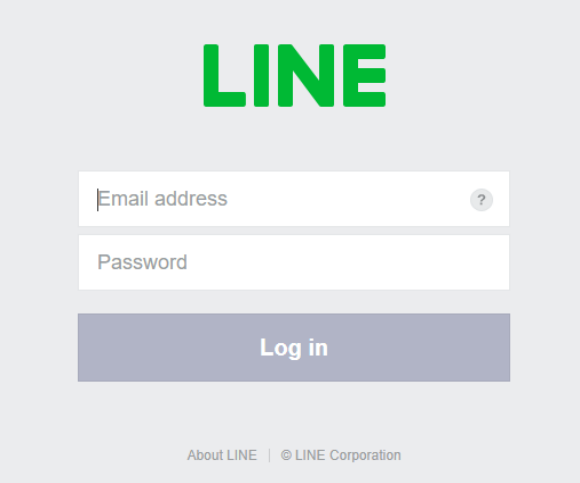


Figure10-20 : LINE Notify Chat Room Setting page (3)

iii. After login, select this account(one-to-one) or a group under this account which PMC will connect to.

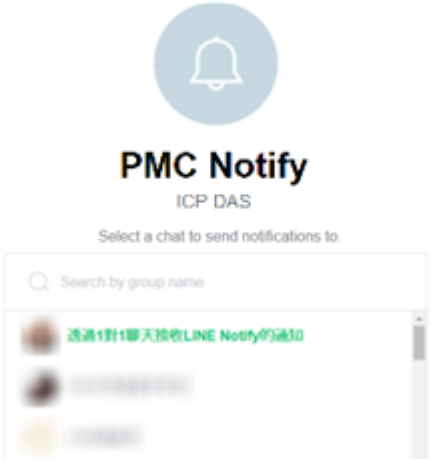


Figure10-21 : LINE Notify Chat Room Setting page (4)

iv. After the connection procedure is complete, the new chat room will appear in the list, and it can be selected in the message setting page.

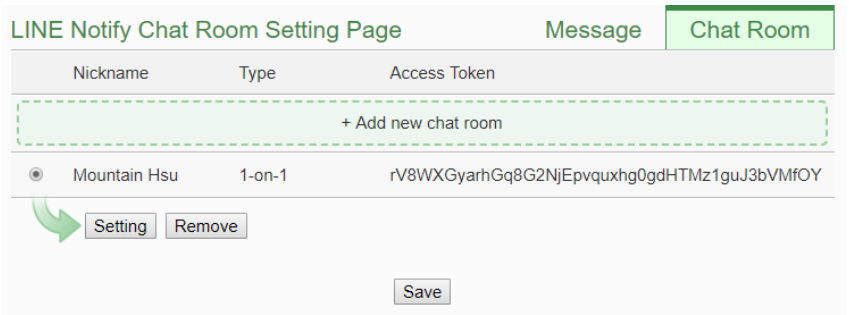


Figure10-22 : LINE Notify Chat Room Setting page (5)

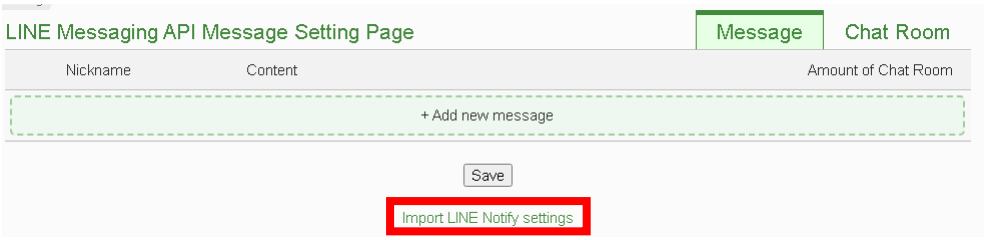
v. After you finish all the LINE Notify Chat Room settings, click "Save" button to save the settings.

Please Note:

- The limit of LINE Notify service to each chat room:
  - The number of text message: 1000 per hour.
  - PMC would not calculate the number of messages sent. The message sending operation would be fail if the number of message sent is over the limitation.
  - If you copy the PMC rule file from one PMC controller to another, they would share the quota of messages. You can re-connect the char room to avoid this problem
  - PMC can only send Text message.
- To send LINE messages to multi-LINE accounts with PMC, We suggest you can create a group with LINE APP first, and connect this group with the LINE Notify service, then you can invite the other LINE accounts to join the group to receive the messages from PMC.

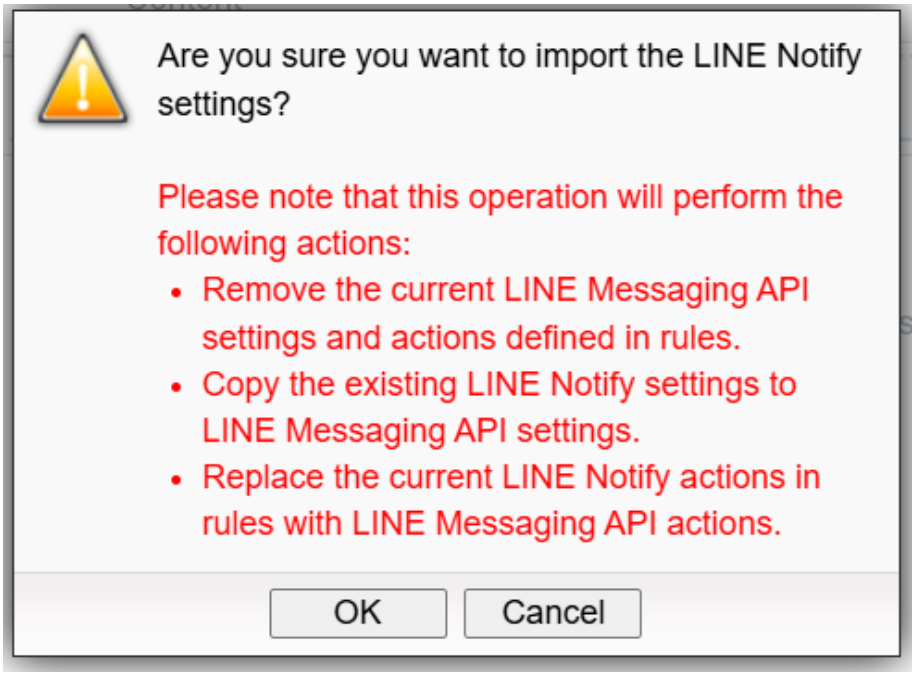
10.4 LINE Messaging API Settings

PMC/PMD provides the function to push text messages via the LINE Messaging API to one-on-one or group chat rooms. Users must first register a LINE Business ID and create a LINE official account to use this function. Below are the message setting interface, chat room setting interface, and steps to create a LINE official account.



At the bottom of the LINE Messaging API message setting page, there is an option to "Import LINE Notify settings". Clicking this will copy the LINE Notify messages and related settings to the LINE Messaging API settings, and logical rules will convert the action of sending LINE Notify messages into sending LINE Messaging API messages. However, due to the structural differences between LINE Messaging API chat rooms and LINE Notify

chat rooms, users still need to manually replace the LINE Notify chat rooms with LINE Messaging API chat rooms.



Note:

- After completing the import action, you still need to click "Save" to take effect.
- Do not click import repeatedly, as this may delete logical actions that have already been converted to LINE Messaging API.
- This import action can only be executed in either LINE Messaging API settings or Telegram settings, but not both.

10.4.1 Message Setting

In the message settings page, you can edit the LINE Messaging API messages to be sent. In addition to entering the message content, you can also edit the LINE messages with pre-input strings and realtime data. Below is the message settings page:

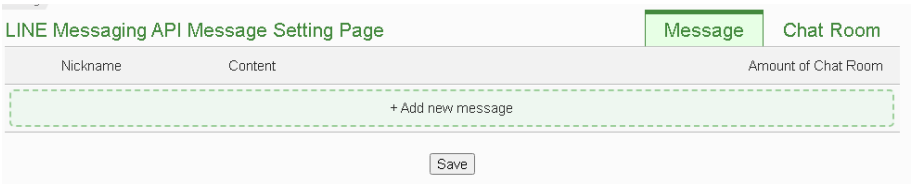


Figure10-23 : LINE Messaging API Message Setting page (1)

The settings steps are as below:

i. Click the “Message” tab at the top right of the “LINE Messaging API Message Settings Page”.
ii. Click “Add new message” to open the LINE Messaging API message settings page.

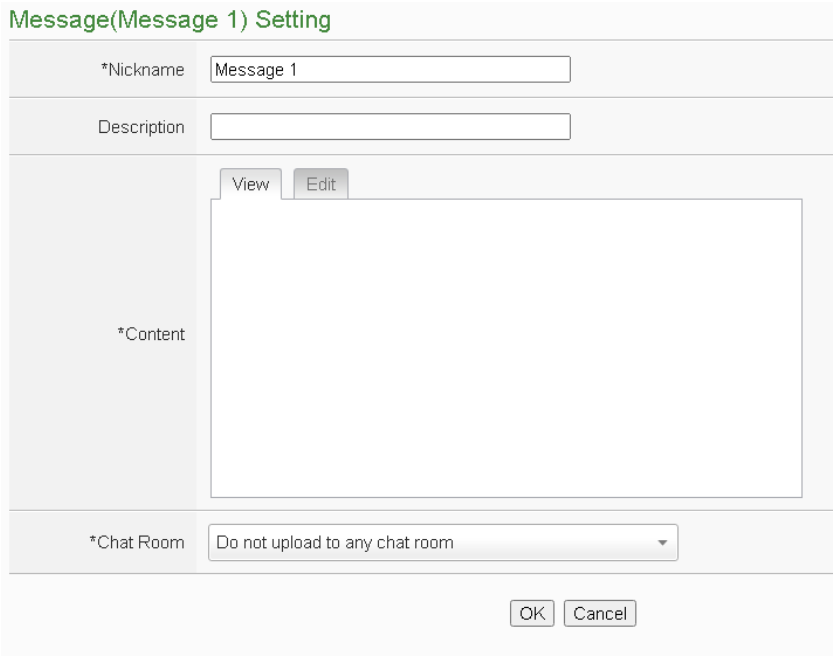


Figure10-24 : LINE Messaging API Message Setting page (2)

iii. Input name in the “Name” field and you could also input the description of this LINE message in the “Description” field.
iv. Enter the message content in the “Content” field. LINE Messaging API message provides an encoded string for you to add current power data, I/O channel data or Internal Register data into the messages. To make it easy to add the encoded string, PMC/PMD provides “Real-time variable editor”. Please refer to “8.1 Data Logger Setting” for more detailed information of the “Real-time variable editor”.

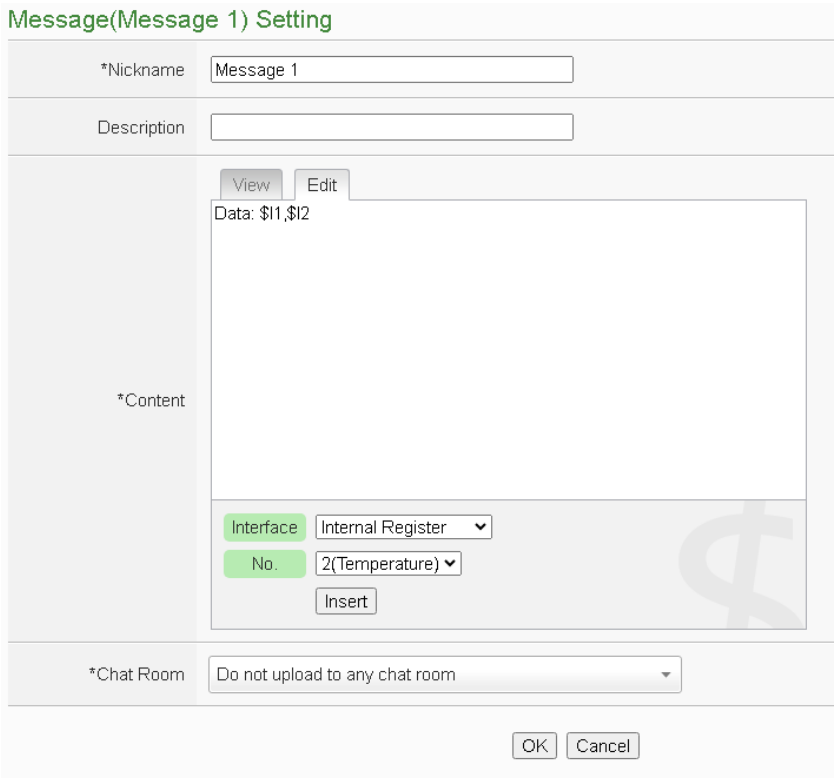


Figure10-25 : LINE Messaging API Message Setting page (3)

v. In the "Chat Room" field, please specify the Chat rooms which will receive the message PMC/PMD send. PMC/PMD can send the messages to multi-chat rooms simultaneously. Users can directly click on the "Add new Chat Room" to connect with a new chat room, please refer to the section "10.4.2 Chat Room Setting".

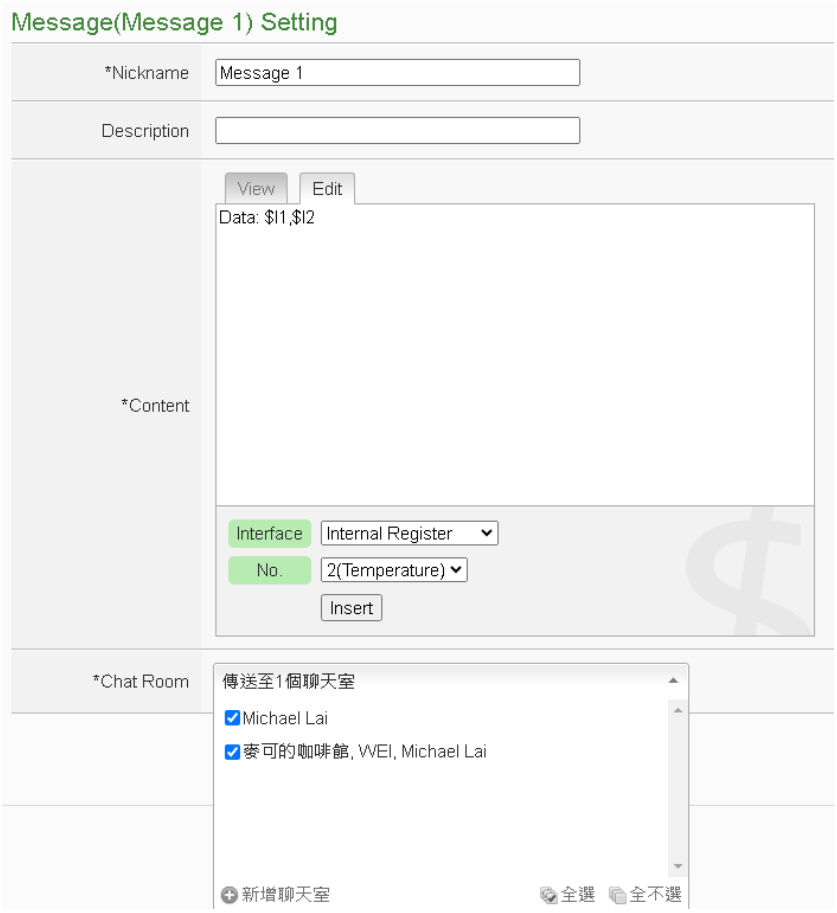


Figure10-26 : LINE Messaging API Message Setting page (4)

vi. After complete all settings, click the "OK" button to confirm the LINE Messaging API message setting, and return to the Message Setting page.

vii. Repeat steps ii~vi to complete settings of all LINE Messaging API messages.

viii. After you finish all the LINE Messaging API Message settings, click "Save" button to save the settings.

10.4.2 Chat Room Setting

Chat rooms are the push targets for LINE Messaging API messages. You can add or manage chat rooms through the settings page. The chat room settings page is as follows:

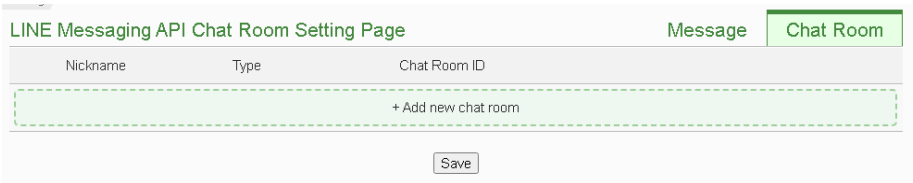


Figure10-27 : LINE Messaging API Chat Room Setting page (1)

The settings steps are as below:

i. After clicking the “Add new chat room” button, PMC/PMD will open a chat room ID recording window as below. Enter the Channel Secret of the official account to be used in the “Channel Secret” field and enter the Channel Access Token of the official account to be used in the “Channel Access Token” field. Click the “Start getting LINE chatroom information” button.

Figure10-28 : LINE Messaging API Chat Room Setting page (2)

ii. Use your phone to chat in the chat room with the official account, and PMC/PMD will record the chat room IDs that have been engaged. After recording all chat room IDs, click the “Finished getting LINE chatroom information” button to stop recording chat room IDs.

Figure10-29： LINE Messaging API Chat Room Setting page (3)

iii. After adding, the newly added chat room will appear in the list and can be used as a message sending target.

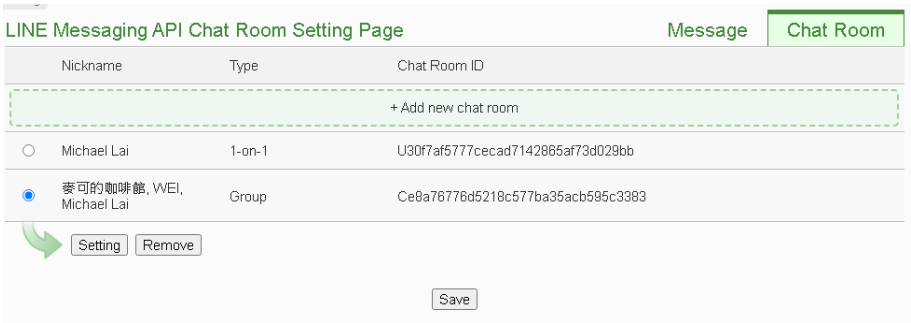


Figure10-30： LINE Messaging API Chat Room Setting page (4)

iv. You can select a chat room and click the “Setting” button to enter the chat room settings page. In addition to setting the chat room's description, you can also click the “Send” button, and PMC/PMD will send a test message to the chat room.

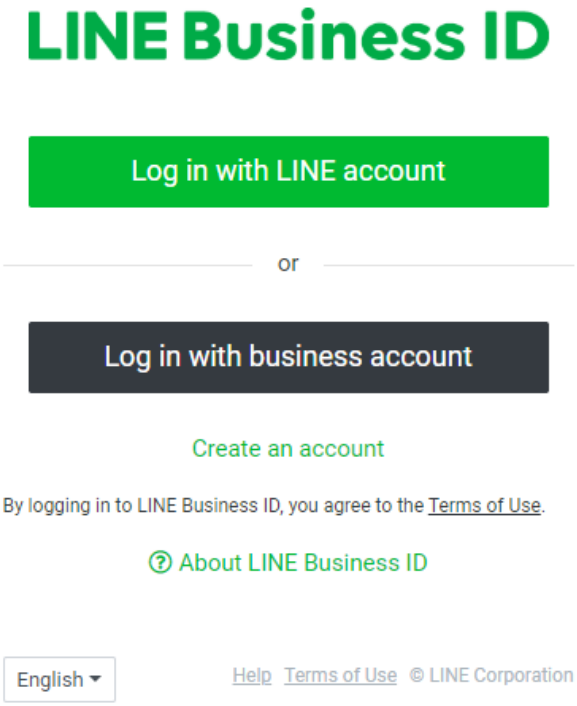
Figure10-31： LINE Messaging API Chat Room Test Function

v. After you finish all the LINE Messaging API Chat Room settings, click “Save” button to save the settings.

10.4.3 Line Official Account Application and Settings

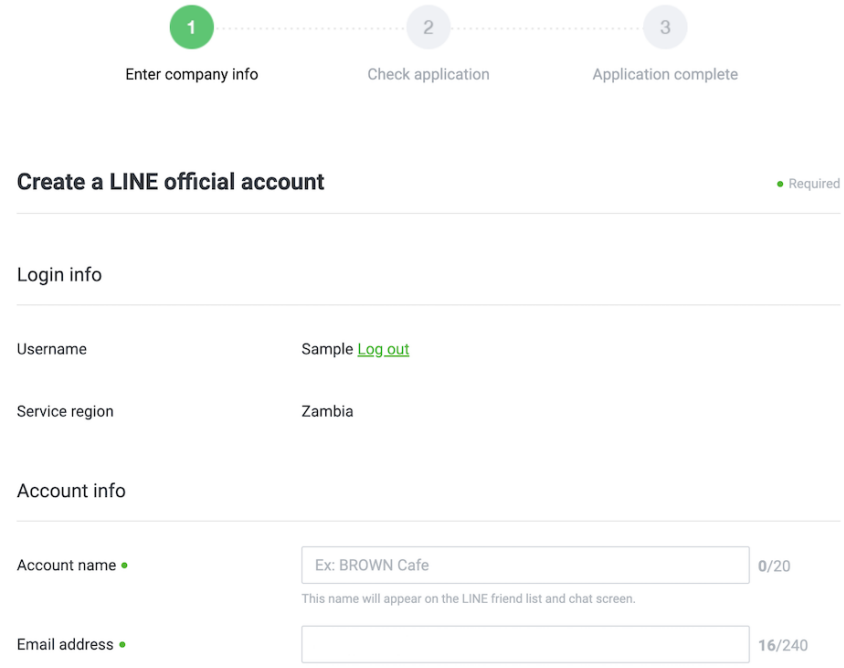
Users must first register a LINE Business ID and create a LINE official account to use the LINE Messaging API message push function. The setup steps are as follows:

i. Before creating a LINE Official Account, you need to log in to LINE Business ID using your LINE account or business account.

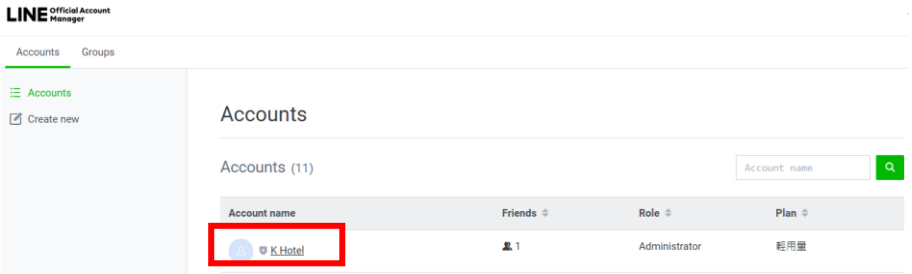


ii. After logging into LINE Business ID, you will be directed to the create a LINE official account page. On the page's form, fill in the

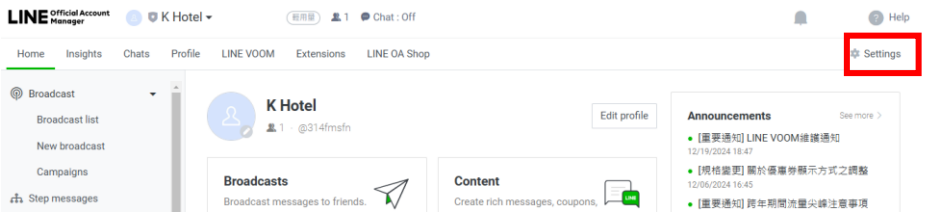
relevant information for the account you want to create and submit it to complete the creation of the LINE Official Account.



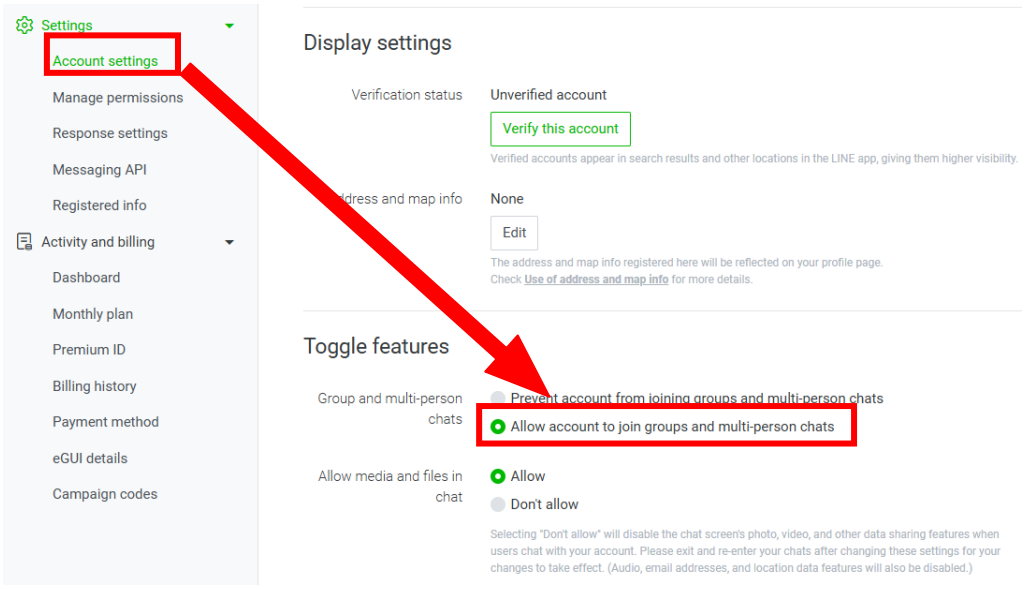
iii. After the official account is created, go to [the LINE Official Account Manager website] to configure it. In the account list, select the account you just created.



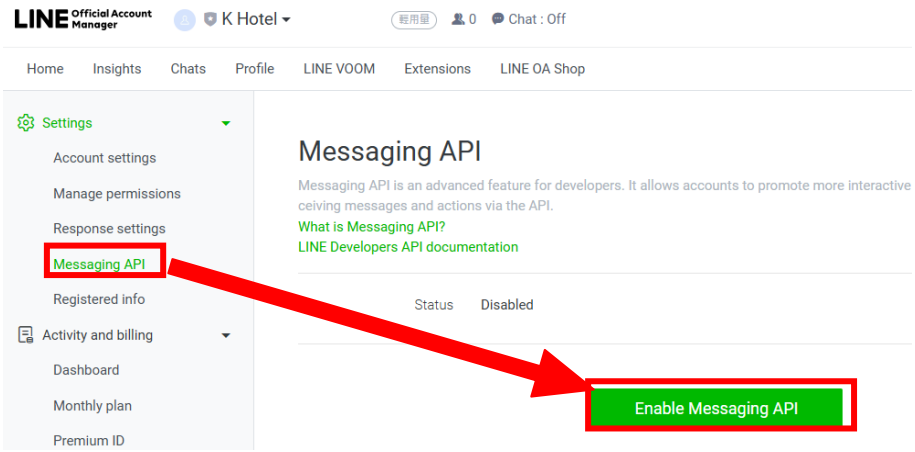
iv. Once on the settings page, click the "Settings" button located at the top right corner.



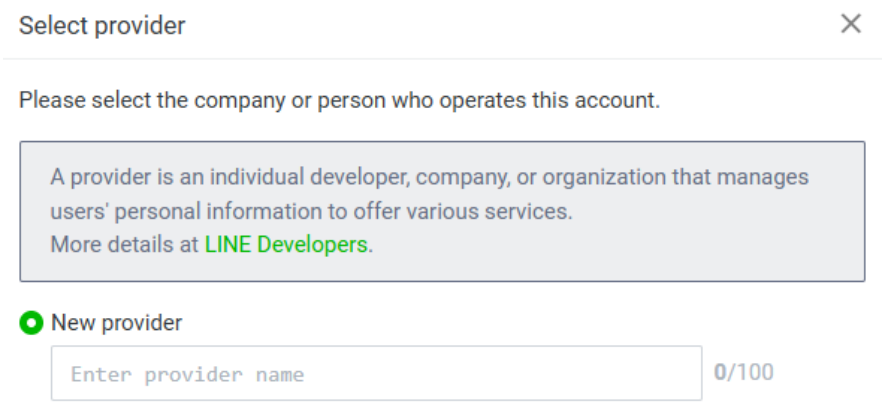
v. Click on "Account Settings" on the left, then toggle the function to "Allow account to join groups and multi-perion chats".



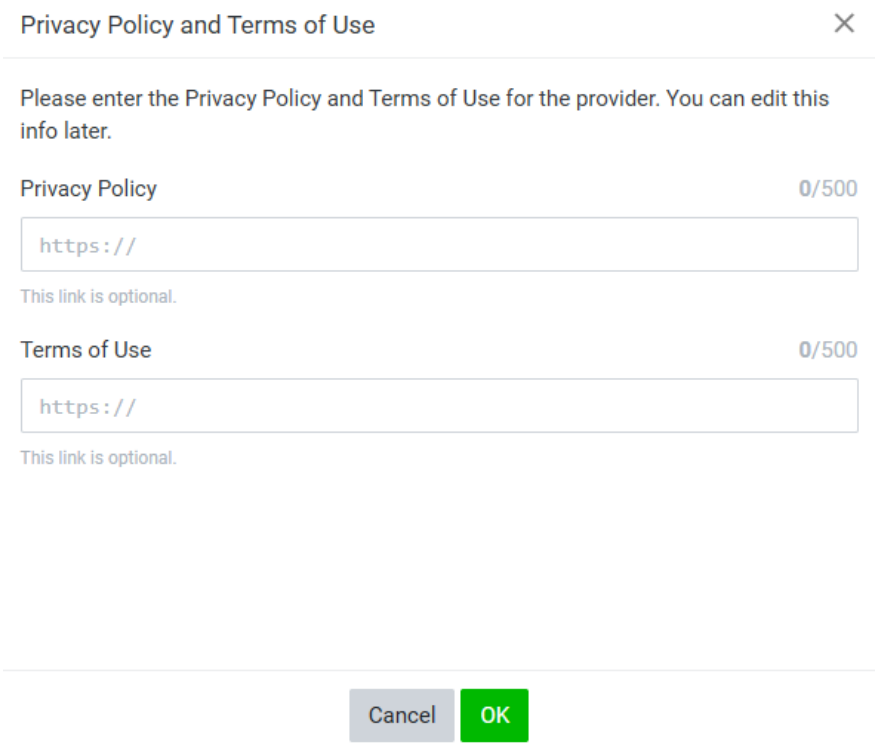
vi. Click on “Messaging API” on the left, and then click “Enable Messaging API”.



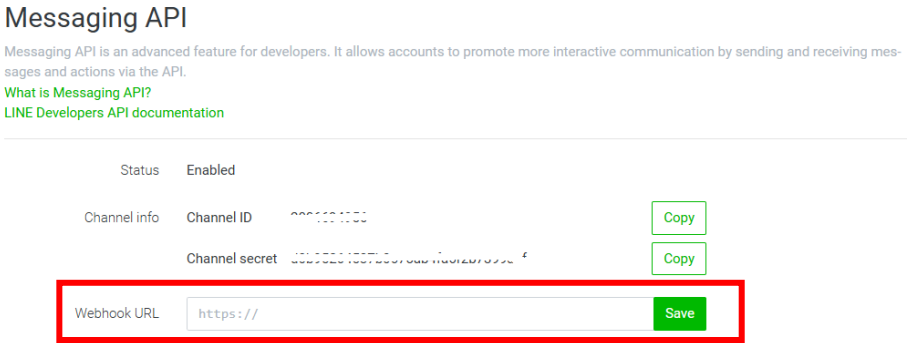
vii. Enter the name of the service provider (enter any name you prefer), then click “Agree”.



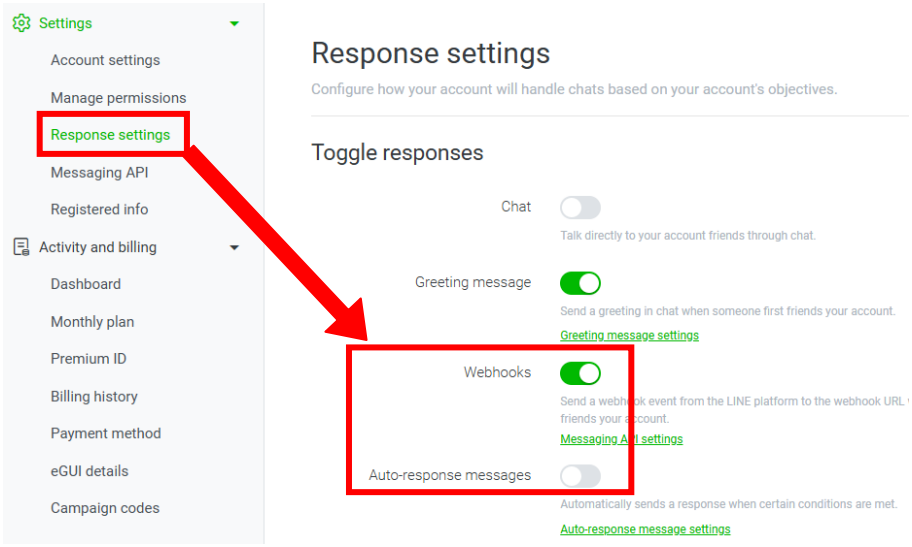
viii. You can skip the Privacy Policy and Terms of Service by clicking “OK”.



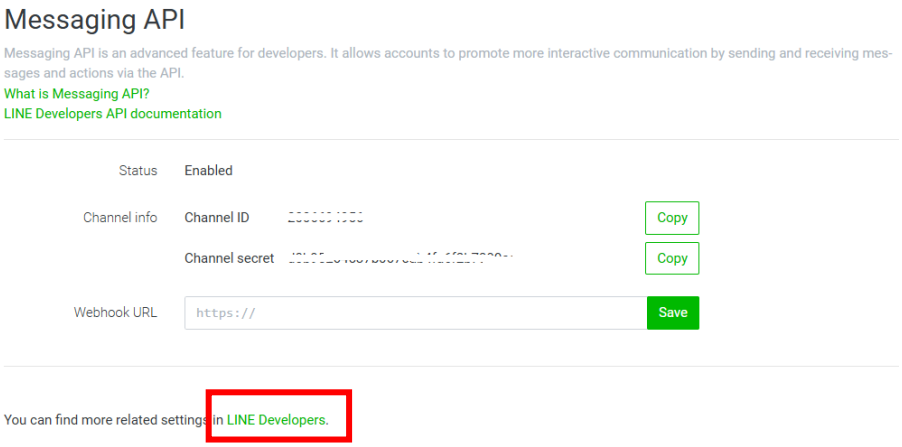
ix. Once the official account is set up, return to the "Messaging API" page, input the following URL in the "Webhook URL" field, and click the "Save" button:
https://pmms.icpdas.com/line/messaging_webhook.php



x. Click on "Response settings" on the left, activate the "Webhook" function and disable the "Auto-response messages" function.

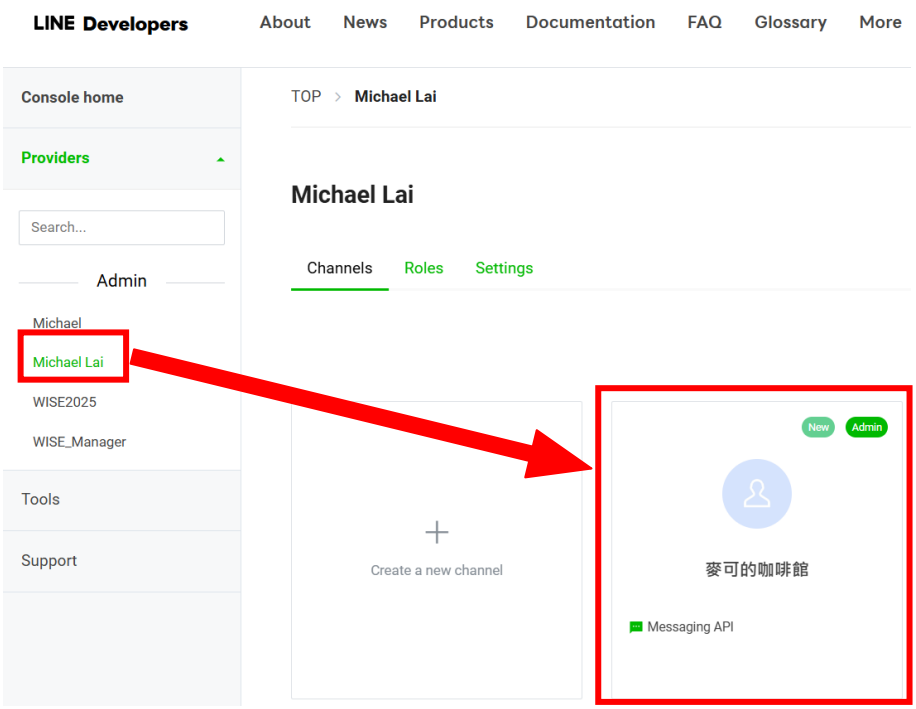


xi. Return to the “Messaging API” page, then click “LINE Developers” at the bottom to navigate to the LINE Developers page.

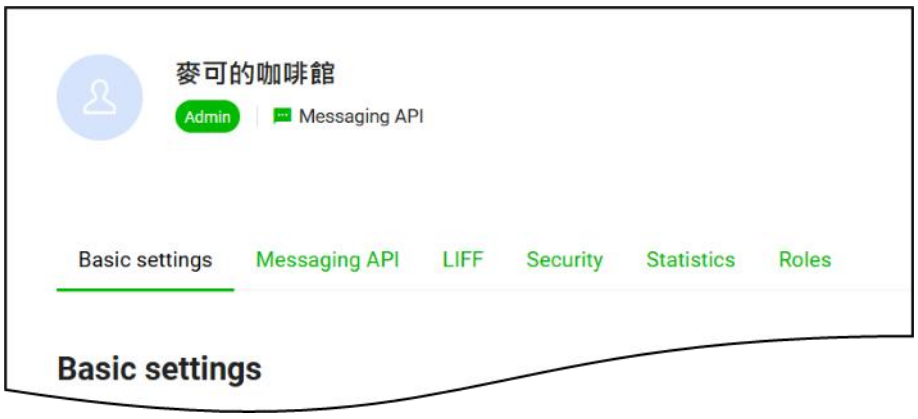


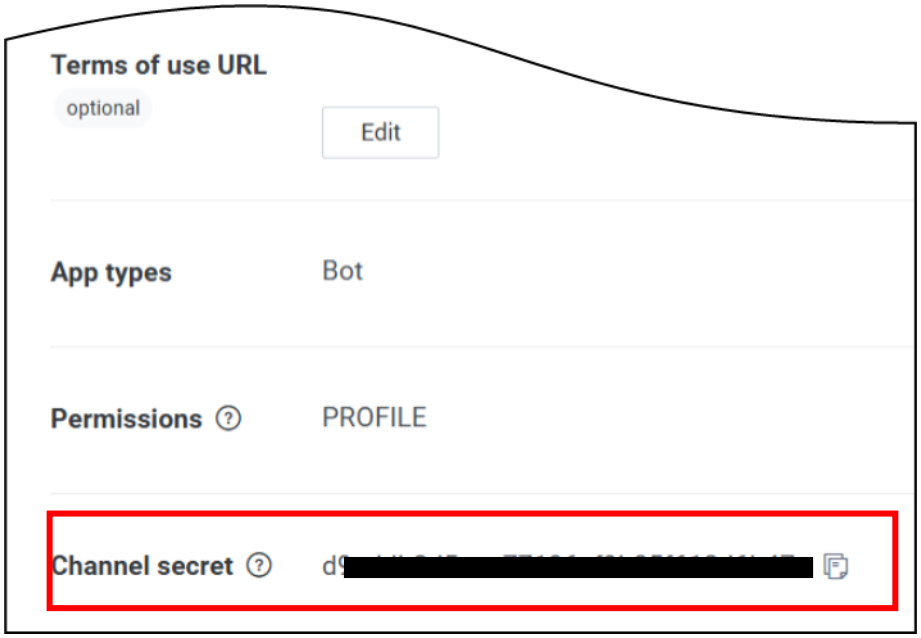
xii. Click “Console” to enter the configuration page.

xiii. Select the service provider name you previously entered, find the official account you created, and click to access its settings page.

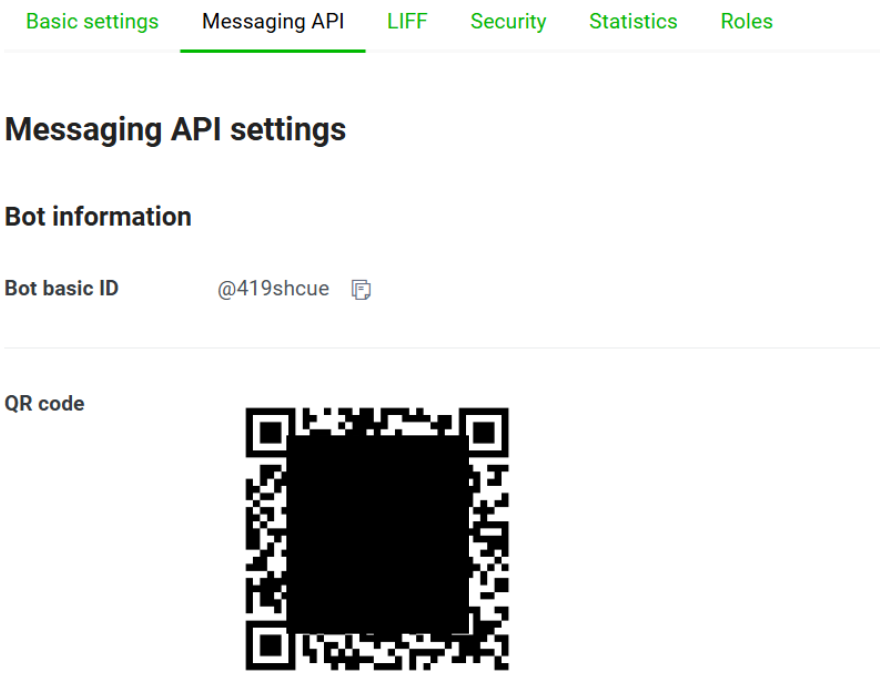


xiv. Go to the "Basic settings" page, find the "Channel secret" information below, this is a necessary parameter for PMC configuration.

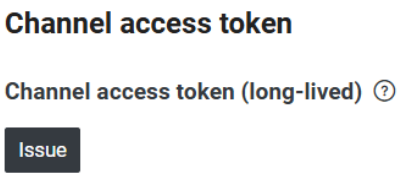




xv. Navigate to the “Messaging API” page, use the QR code on this page to add this official account as a friend and create a chat room.



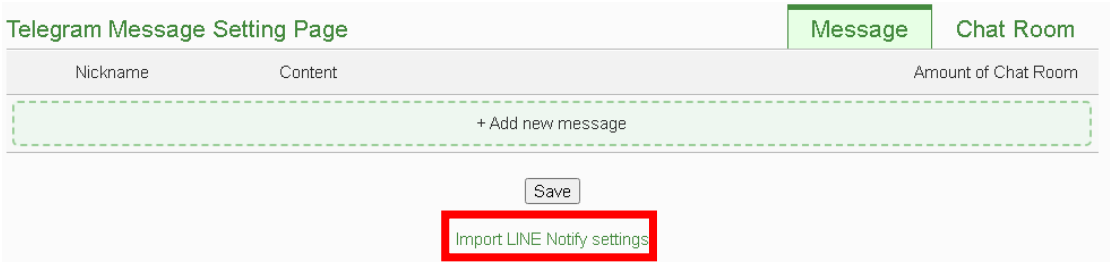
xvi. At the bottom of the “Messaging API” page, find the “Channel access token” section, click the “Issue” button to generate a token and record it. This information is a required parameter for PMC configuration.



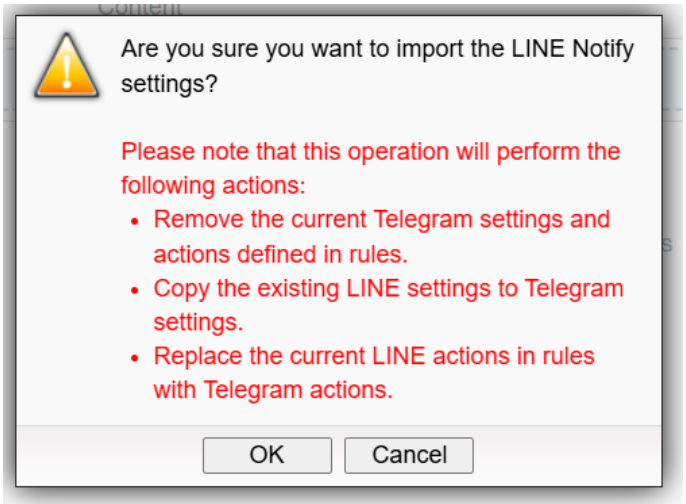
xvii. After obtaining the “Channel secret” and “Channel access token”, you can complete the chat room settings on PMC. This concludes the setup for the LINE Official Account.

10.5 Telegram Setting

PMC/PMD provides Telegram message sending function. With this function, PMC/PMD can send the text messages to Telegram 1-on-1 or group chat rooms via Telegram Bot account. To send the Telegram message, users have to apply a Telegram Bot account first and add the bot account into a group chat room to be sent. The configuration page for Telegram message setting, chat room setting, and the application procedure of Telegram Bot account is shown as below.



At the bottom of the Telegram settings page, there is an option labeled “Import LINE Notify settings”. Clicking this option will copy LINE Notify messages and related settings into the Telegram configuration. The logical rules will also convert the action of sending LINE Notify messages into the action of sending Telegram messages. However, due to structural differences between Telegram chatrooms and LINE Notify chatrooms, users must manually replace the Telegram chatrooms.



Note:

- After completing the import action, you still need to click "Save" to take effect.
- Do not click import repeatedly, as this may delete logical actions that have already been converted to LINE Messaging API.
- This import action can only be executed in either LINE Messaging API settings or Telegram settings, but not both.

10.5.1 Message Setting

In the Message setting page, users can edit the Telegram messages with pre-input strings and realtime data. The configuration page is shown as below:

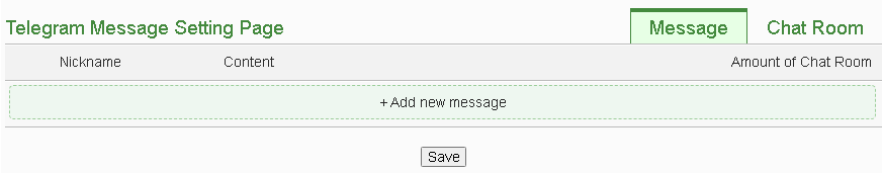


Figure10-32 : Telegram Message Setting page (1)

The settings steps are as below:

i. Make sure the “Message” Tab is selected.
ii. Click “Add new message”, the Telegram Message Setting page will appear as following:

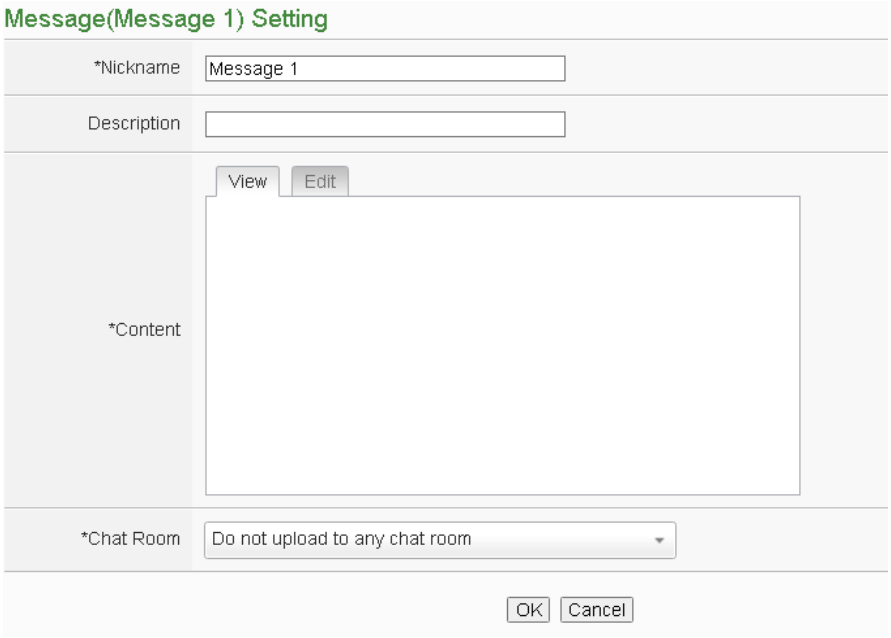


Figure10-33 : Telegram Message Setting page (2)

iii. Input name in the "Name" field and you could also input the description of this message in the "Description" field.

iv. Enter the message content in the "Content" field. Telegram message provides an encoded string for you to add power data, I/O channel data or Internal Register data into Telegram messages. To make it easy to add the encoded string, PMC/PMD provides "Real-time variable editor". Please refer to "8.1 Data Logger Setting" for more detailed information of the "Real-time variable editor".

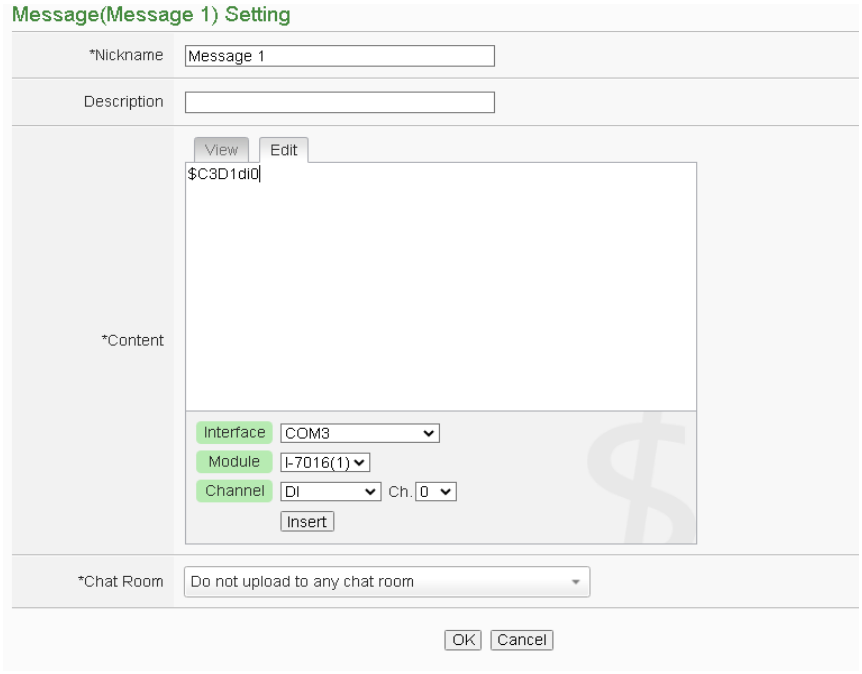


Figure10-34 : Telegram Message Setting page (3)

v. In the “Chat Room” field, please specify the Chat rooms which will receive the message PMC/PMD send. PMC/PMD can send the messages to multi-chat rooms simultaneously. Users have to entry a Bot Token and add new chat rooms before selecting the chat rooms to be sent. To apply a Telegram Bot account, please refer to the section “ Create Telegram Bot Account and Get the Token”. Users can directly click on the “Add new Chat Room” to connect with a new chat room, please refer to the section “10.5.2 Chat Room Setting”.

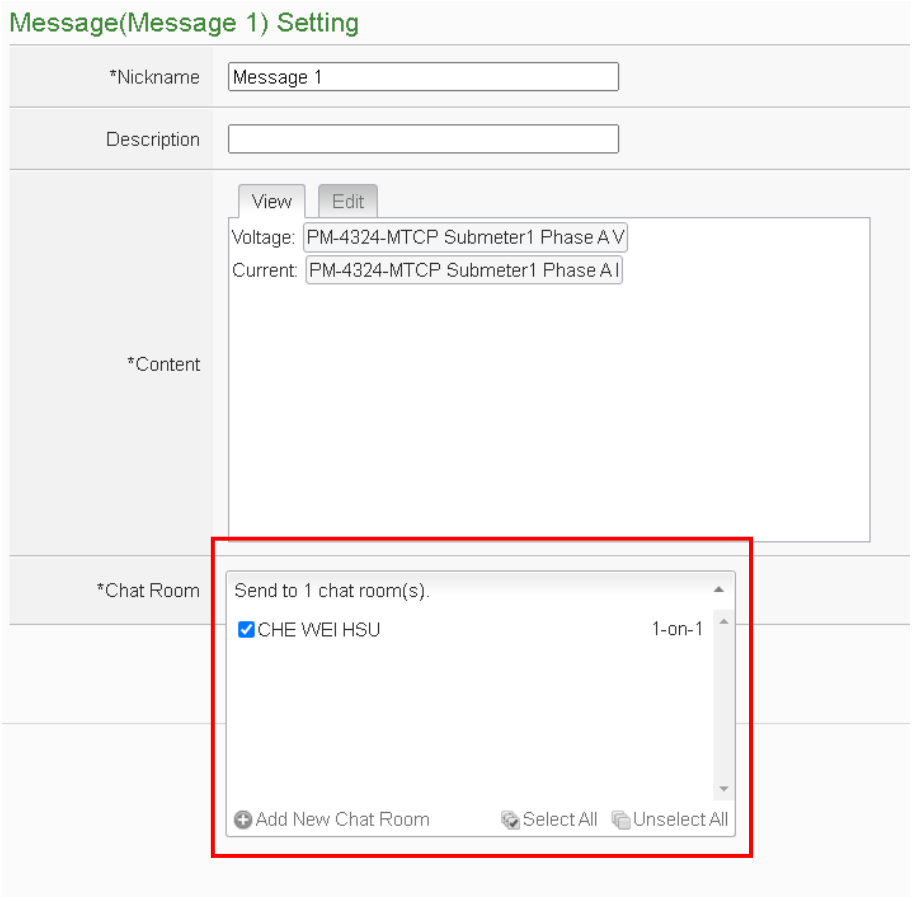


Figure10-35 : Telegram Message Setting page (4)

vi. After complete all settings, click the “OK” button to confirm the Telegram message setting, and return to the Message Setting page.

vii. Repeat steps ii~vi to complete settings of all Telegram messages

viii. After you finish all the Telegram Message settings, click “Save” button to save the settings.

10.5.2 Chat Room Setting

PMC/PMD send messages to the Telegram chat rooms. Users can add or manage chat rooms via the Chat Room setting page. The setting interface is as below:

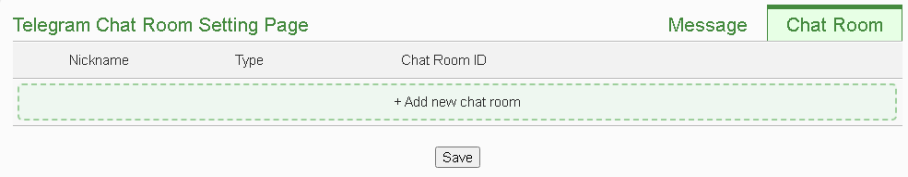


Figure10-36 : Telegram Chat Room Setting page (1)

The settings steps are as below:

i. Click "Add new chat room", in the "Bot Token" field, key in the token of the Telegram Bot account. Please refer to the section "Create Telegram Bot Account and Get the Token" to get the token.

ii. Before add the Telgram chat rooms to PMC/PMD, You have to interact with the chat rooms by Telegram app. To interact with 1-on-1 chat room, you have to send messages to the Bot account. To interact with a Group chat room, you have to add the Bot account into the group chat room. Users must complete the interactions with Telegram app via cell phone or PC, and add the chat rooms on PMC/PMD within 24 hours. Otherwise, you need to interact with the chat rooms again for adding then into PMC/PMD.

iii. Click the "Next" button, the chat rooms that have been interacted within 24 hours would be shown on the list. To add the chat rooms, click on the checkbox in fornt of the chat rooms and press "OK" button.

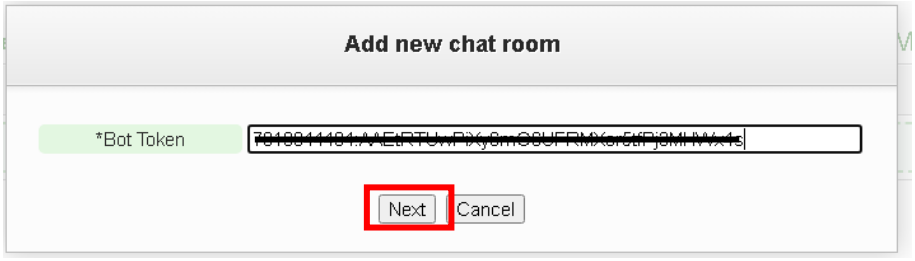


Figure10-37 : Telegram Chat Room Setting page (2)

iv. After the adding procedure is complete, the new chat room will appear in the list, and it can be selected in the message setting page.

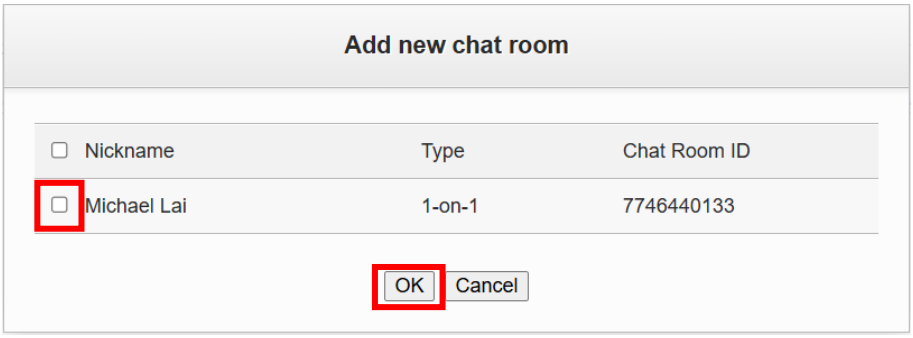


Figure10-38 : Telegram Chat Room Setting page (3)

v. After the adding procedure is complete, the new chat room will appear in the list, and it can be selected in the message setting page.

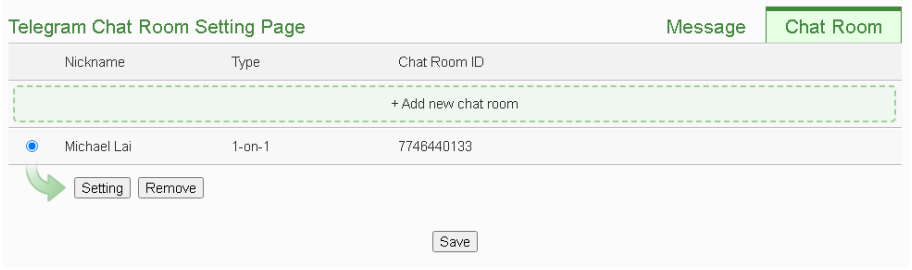


Figure10-39 : Telegram Chat Room Setting page (4)

vi. Select a chat room and click the "Setting" button to enter the setting page of the chat room. Users can make a brief description of this chat room, and click "Testing" button to send a testing message to this chat room.

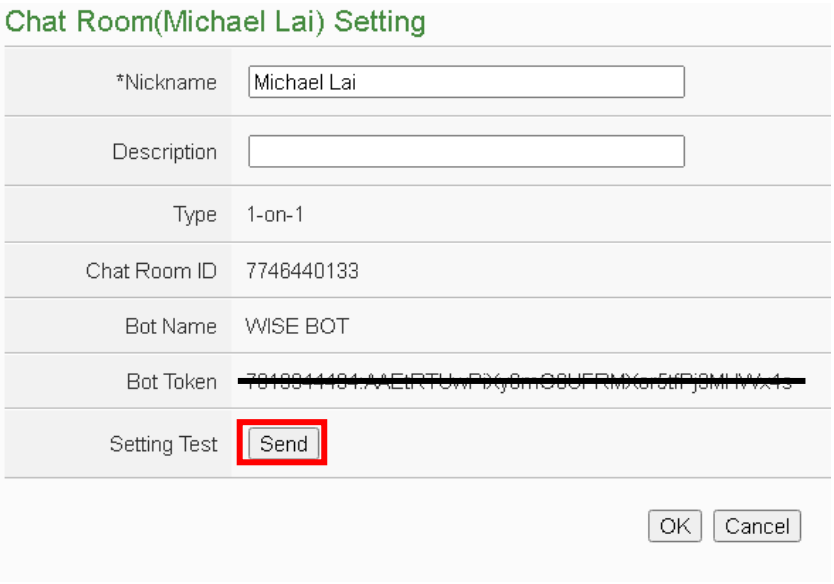


Figure10-40 : Telegram Chat Room Test Function

vii. After you finish all the Telegram Chat Room settings, click “Save” button to save the settings.

- Create Telegram Bot Account and Get the Token
  - Connect to Telegram Web Version and login via Browser. And open Telegram BotFather official webpage, click on “OPEN IN WEB” button to enter the dialog window with BotFather account.

Figure10-41 : Create Telegram Bot Account(1)

  - In the message field, key in the message “/newbot” to create a Bot account, and then input the “Name” and “Username” for the Bot account. The “Username” must be end with the “bot” string. After the Bot is created, click the Bot account link in the following message to enter the dialog window of the Bot account. Click on the Token to copy it, and then paste it on the PMC/PMD Chat Room Setting Page.

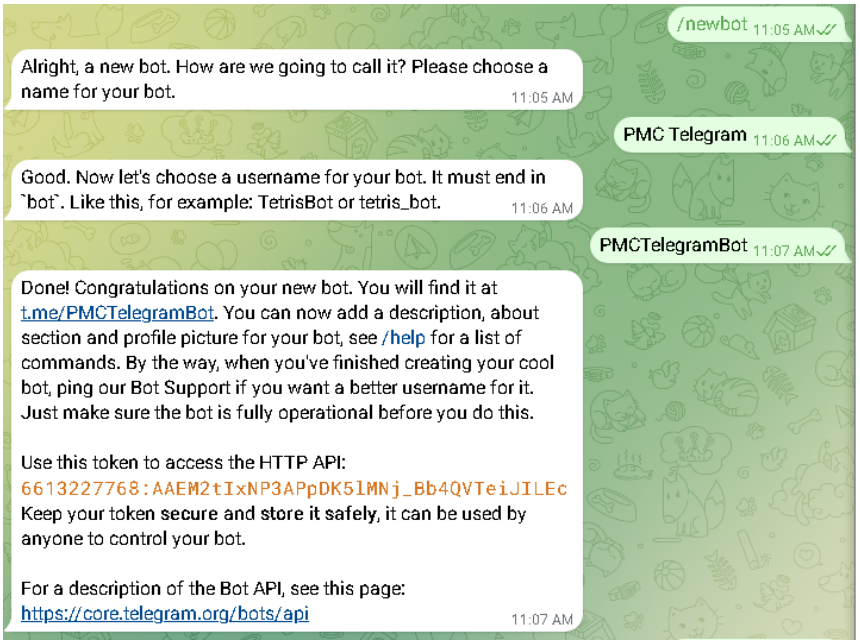
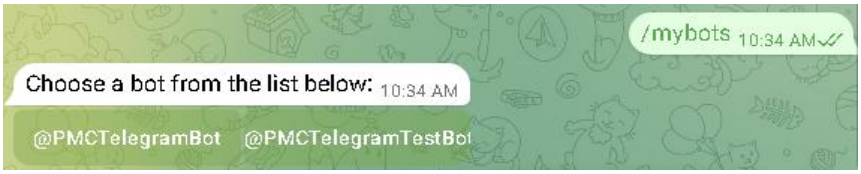
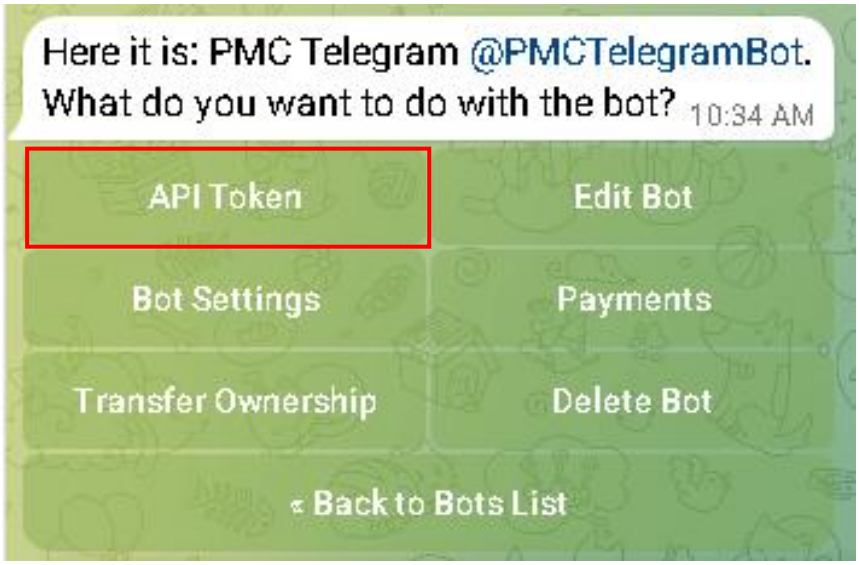


Figure10-42 : Create Telegram Bot Account(2)

- If you had created a bot, key in "/mybots" in the message field, and select the Username of the Bot account, and then click the "API Token" button. Click the Bot account link in the following message to enter the dialog window of the Bot account. Click on the Token to copy it, and then paste it on the PMC/PMD Chat Room Setting Page.





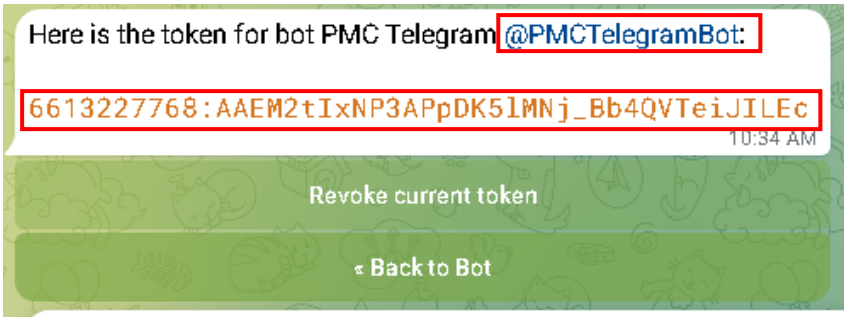


Figure10-43 : Get the Token of Telegram Bot Account

Please Note:

- Telegram Bot account can send message numbers in every chat room: 20 per minute.
- PMC/PMD would not calculate the number of messages sent. The message sending operation would be fail if the number of message sent is over the limitation.
- If you copy the PMC/PMD rule file from one PMC/PMD to another, they would share the quota of messages. You can create new Telegram Bot accounts to avoid this problem.
- PMC/PMD can only send Text message.
- To perform the chat room setting, please confirm that the PMC/PMD is connected with internet. The setting could only be done by connecting with Telegram server.

10.6 Timer Setting

PMC provides “Timer” for timing functions. The Timer status can be “Not Timeout” or “Timeout”. They can be included in the IF Condition statements. The Timer Action can be “Start” or “Reset”. The Start Action will start to run the Timer and if the Start Action is triggered one more time when the Timer is running, the Timer will restart again. The Reset action will reset the Timer and stop running the Timer. The Timer will be in “Timeout” status only when the Timer is running and reached the setting time, otherwise, the status of Timer will remain in “Not Timeout”.

Follow the following steps：

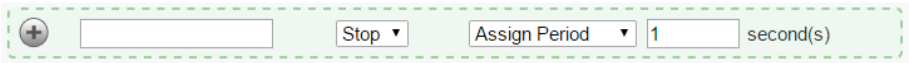
i Input the nickname of the timer in the “Nickname” field.

ii Specify the initial status of the timer from the dropdown list of the “Initial Status” field. The “Initial Status” could be “Stop” or “Start”

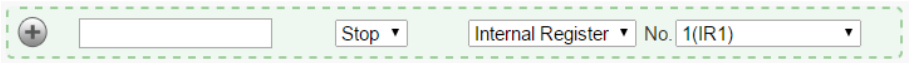
status.

iii Specify the period interval in units of seconds. There are two modes to setup the period interval:

- Assign Period : Input the period interval in units of seconds manually。



- Internal Register：Assign the period interval as the value of selected internal register.



Please note: The user must setup internal register before using internal register as timer period. Please refer to Internal Register Setting to setup internal register.

iv Click  button to create a new Timer.

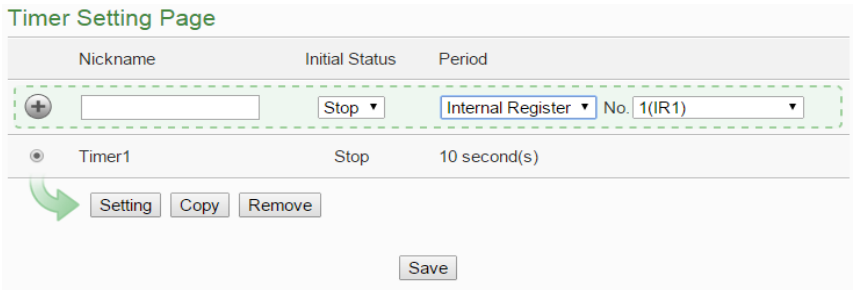


Figure10-44 : Timer creating Page

v Repeat steps i~iv to complete settings of all Timer.

vi To modify the settings of a pre-set timer, please click on the radio button in front of the timer, and then click on “Setting” to modify the settings.

vii After enter the setting interface is as following, you can modify the "Name", "Initial State" and "Period" on the timer setting page, and enter a text description about this timer in the "Description" column.

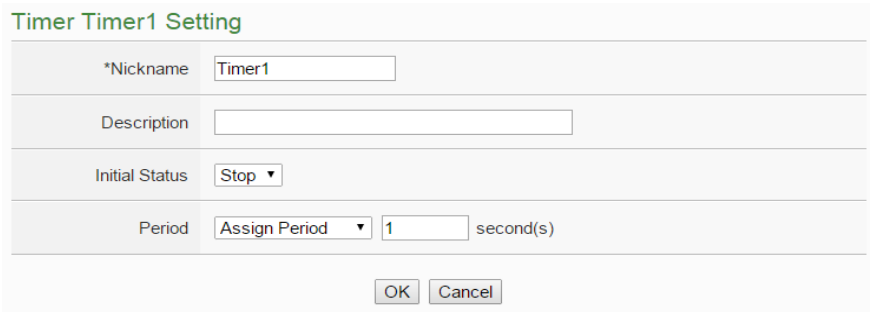


Figure10-45 : Timer setting Page(Assign Period)

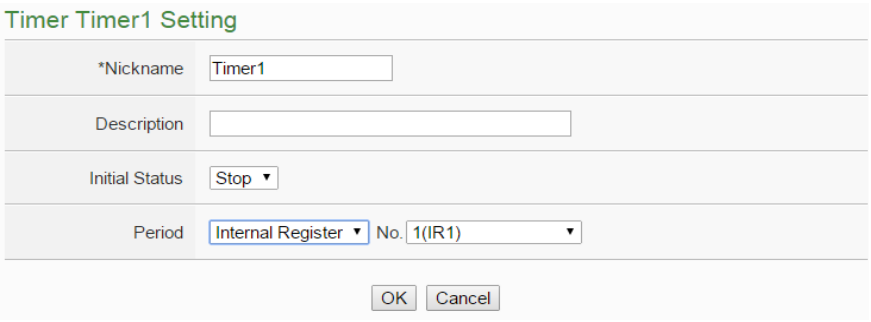


Figure10-46 : Timer setting page(Internal Register)

viii To copy the settings of a pre-set Timer to the new Timer, please click the radio button in front of the pre-set Timer and then click “Copy”, a new Timer (in sequence) will be added to the list and the settings of the old Timer will be copied to this newly added Timer.

ix To remove a pre-set Timer, please click the radio button in front of the pre-set Timer and then click “Remove”.

x After all timer settings are completed, click “Save” button to save the changes.

10.7 Schedule Setting

PMC provides Schedules to setup prescheduled routine tasks. The setting of Schedule can be used to check if the system time of the PMC is in the range of date/time setting of the schedule or not. The checking status can be included in the IF Condition statements. Schedule setting page is shown as below:

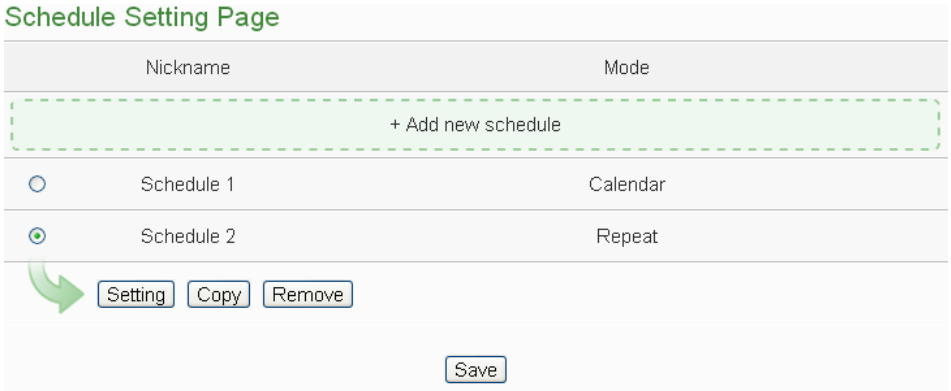


Figure10-47 : Schedule setting page

The settings steps are as below:

i Click on “Add new schedule” to add a new schedule.

ii After clicking the “Add new schedule”, a setting page will appear, input name in the “Name” field and you could also input the description of this schedule in the “Description” field.

iii Select Mode to be “Calendar” or “Repeat”.

- Calendar：

(a.) In the “Date” field, select the “Starting Month” and “Duration” from the dropdown list. The maximum duration can be set is 120 months. After you specify the Year and Month in the Date section, the calendars corresponding to the Year and Month you specified will appear as shown below:

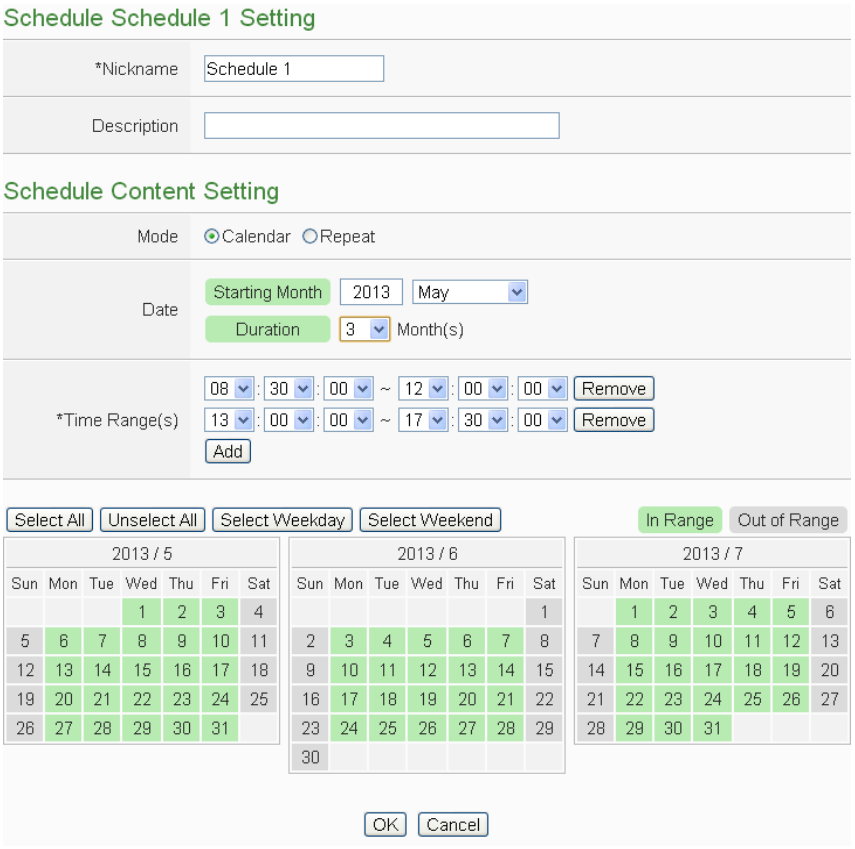


Figure10-48 : Calendar mode of Schedule setting

(b.) In the “Time Range(s)” section, click “Add” to add new Time Range to execute this schedule. Select the start time and the end time from the dropdown list. Each Schedule is required to set at least one Time Range; click on “Add” to add more Time Range. Please note: the time zones you specified can’t be overlapped. If you specify an end time that is earlier than the start time, such

as 20:00:00 ~ 06:00:00, it indicates the end time will be set one day after the start date. Click “Remove” to remove a pre-set Time Range.

(c.) On the calendars, click to toggle highlight on the dates you’d like to execute or not execute the operations for this Schedule. If the date shows a light green background, it indicates the date is “In Range” of the schedule, that is, that date falls into the range that will execute the operations. On the contrary, if the date shows a light grey background, it indicates that date is “Out of Range” of the schedule, that is, that date falls out of the range and will not execute the operations. By default, all dates will be “In Range”, that is, during the date range you select, the operation will be executed every day. “Select All” button is used to set all dates to be “In Range”; whereas “Unselect All” button is for marking all dates to be “Out of Range”. The Weekday button is for you to select all Mondays to Fridays to be “In Range”, and Saturdays and Sundays to be “Out of Range”, that is, the operations will be executed during weekdays only. On the contrary, the Weekend button is for you to set all Saturdays and Sundays to be “In Range”, and all Mondays to Fridays to be “Out of Range”, that is, the operations will be executed during weekends only.

- Repeat：

(a.) In the “Day(s) of week” section, click on the day(s) in a week that is going to execute the schedule; shown as below:

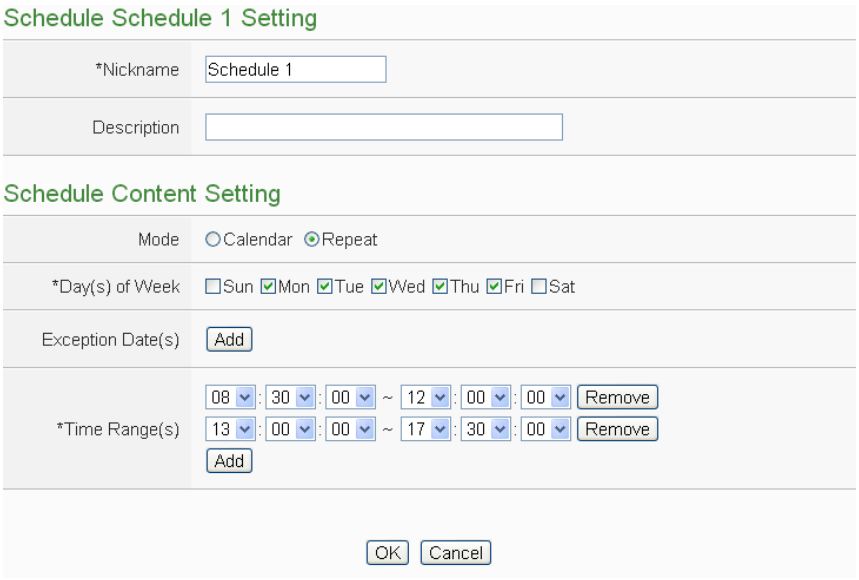


Figure10-49 : Repeat mode of Schedule setting

(b.) In the “Exception Date(s)” selection, click on “Add” to add the date(s) that is/are not going to execute the schedule. Click “Remove” to remove a pre-set Exception Date.

(c.) In the “Time Range(s)” section, click “Add” to add new Time Range to execute this schedule. Select the start time and the end time from the dropdown list. Each Schedule is required to set at least one Time Range; click on “Add” to add more Time Range. Please note: the time zones you specified can’t be overlapped. If you specify an end time that is earlier than the start time, such as 20:00:00 ~ 06:00:00, it indicates the end time will be set one day after the start date. Click “Remove” to remove a pre-set Time Range.

iv Click on “OK” to confirm the setting and leave the setting page.

v Repeat steps i~iv to complete settings of all Schedule.

vi To modify the settings of a pre-set Schedule, please click on the radio button in front of the Schedule, and then click on “Setting” to modify the settings.

vii To copy the settings of a pre-set Schedule to the new Schedule, please click the radio button in front of the pre-set Schedule and then click “Copy”, a new Schedule (in sequence) will be added to the list and the settings of the old Schedule will be copied to this newly added Schedule.

viii To remove a pre-set Schedule, please click the radio button in front of the pre-set Schedule and then click “Remove”.

ix After all schedule settings are completed, click “Save” button to save the changes.

10.8 PUE Setting

PMC provides 10 PUEs; The configuration is shown as below:

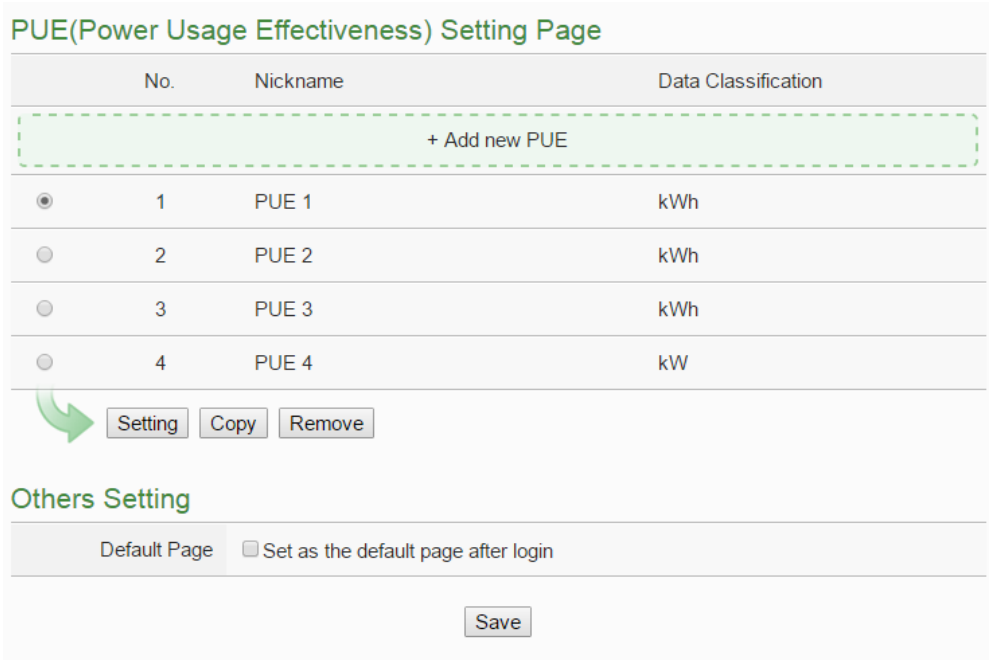


Figure10-50 : PUE Setting Page(1)

The settings steps are as below:

i Click on "Add new PUE" to add a new PUE option.

ii After clicking the “Add new PUE”, a setting page will appear, select the number of the PUE from the dropdown list, input name in the “Name” field and you could also input the description of this PUE in the “Description” field.

iii Setup the calculation expressions of the "Total Facility Energy", and users can click "add" button to modify the expressions.

iv Setup the calculation expressions of the "IT Equipment Energy", and users can click "add" button to modify the expressions

v Select the "Data Classification" of the PUE.

vi Setup the minimum and maximum display value of the chart on the main page.

vii Setup the marker display name and value of the chart on the main page. (This will affect color of the chart. If you do not enable, it to calculate the color change of the chart based on the minimum and maximum values.)

viii Setup the PUE value format on the main page.

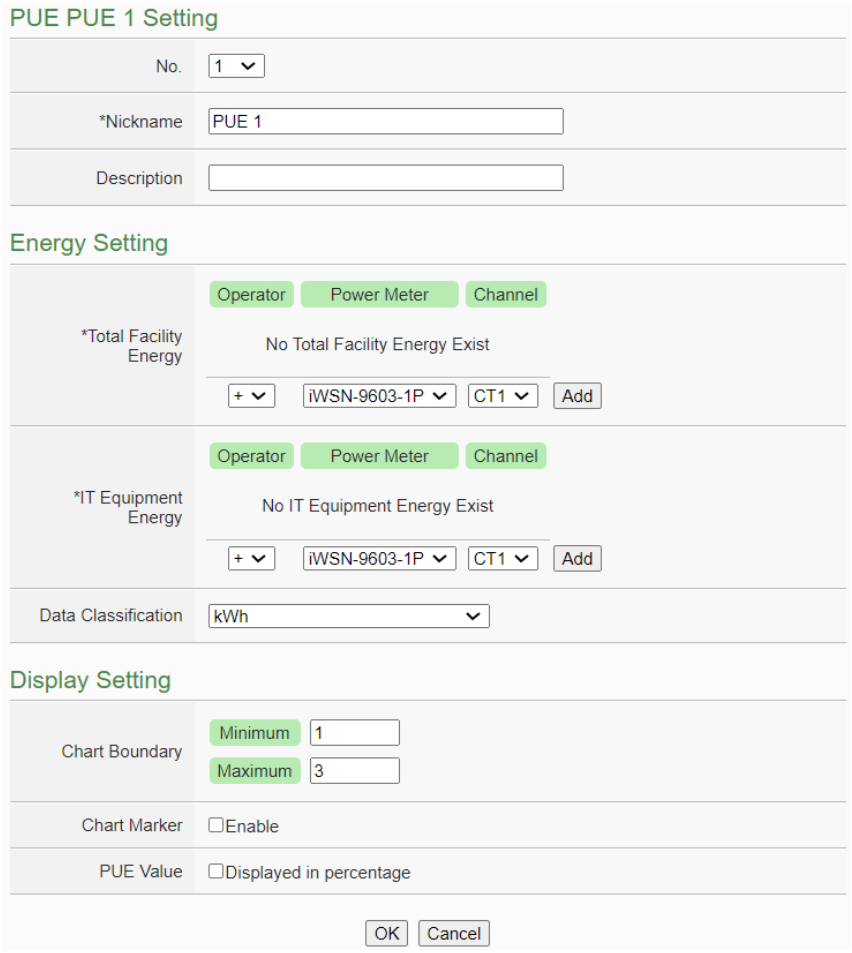


Figure10-51 : PUE Setting Page(2)

ix Click on “OK” to confirm the setting and leave the setting page.

x Repeat steps i~ix to complete settings of all PUE setting.

xi To modify the settings of a pre-set PUE, please click on the radio button in front of the PUE, and then click on “Setting” to modify the settings.

xii To copy the settings of a pre-set PUE to the new PUE, please click the radio button in front of the pre-set PUE and then click “Copy”, a new PUE (in sequence) will be added to the list and the settings of the old PUE will be copied to this newly added PUE.

xiii To remove a pre-set PUE, please click the radio button in front of the pre-set PUE and then click “Remove”.

xiv After all PUE settings are completed, click “Save” button to save the changes.

10.9 Internal Register Setting

PMC provides 70 Internal Registers; the Internal Registers of No.51 to No.70 provide the "Retain Variable" mechanism. It means that the data inside these Internal Registers will be retained even the PMC is in Power Off status.

The Internal Register can be used to hold temporary variables and the data can be read/written on the Registers via Modbus command. The data on the registers can also be read and evaluated in IF Condition and be written after performing a THEN/ELSE Action.

In additional, PMC supports math formula editing function for the Internal Registers. Users can edit different formula in each Internal Register by assing the power data or I/O channels data as the variables, and using the operators as plus"+", minus"-", times"*", divide"/", superscript"^", left parenthesis"(" and right parenthesis")". PMC will calculate the results of all formulas repeatedly, and save the results into the corresponding Internal Registers for logic rule operation or data logging

The configuration page of Internal Register is shown as follow.

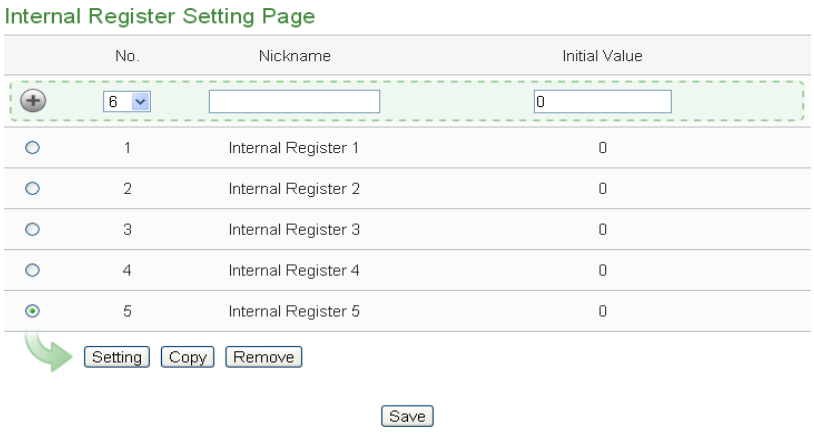


Figure10-52 : Internal Register setting page(1)

The settings steps are as below:

i Select the number of the Internal Register from the dropdown list, input "Name" and "Initial Value" and then click  to add new Internal Register.

Please Note: there are up to 70 Internal Register can be enabled, if the name of the register is not inputted, the name will be automatically set as “Internal Register#”(#is the number of the register), the default initial value will be set as 0.

ii To modify the settings of a pre-set internal register, please click on the radio button in front of the register, and then click on “Setting” to modify the settings. If user want to edit the formula for Internal Register, please check “Enable” in the “Function Status” field of the "Formula Setting" section.

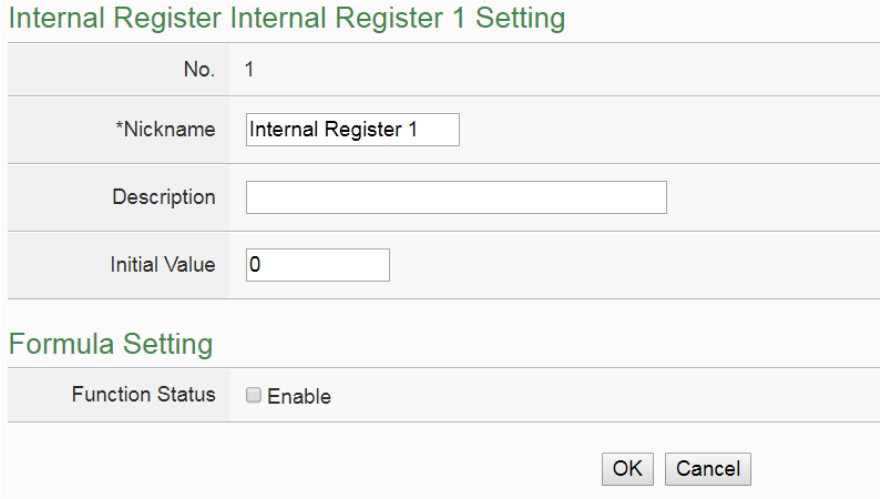
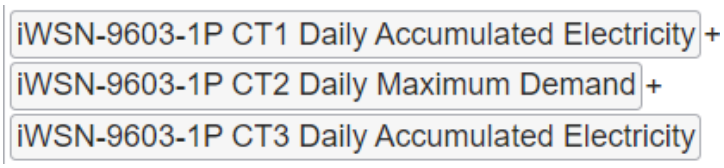


Figure10-53 : Internal Register setting page(2)

iii Edit math formula in the “Formula” field. Users can select the “Interface”, “Module” and “Channel” from the dropdown list and click “Insert” to add a channel value encoded string into the formula, and use the operators as “+”, “-”, “*”, “/”, “^”, “(” and “)” to edit the formula. For example, if user edit a formula as below:
$C2M1m10+$C2M1m22+$C2M1m42

In the “View” tab, it would be displayed in the real index format of the power data and I/O channel as below. User can click the “Test” button to check the result of the formula.



Please note:

1. Do not modify the channel value encoded string when you are editing the formula. It may cause failures when PMC reads the power data or I/O channel value.
2. Before you click the "Test" button, please confirm that the power meter and I/O module setting is saved to PMC if you use the power data or I/O channels in the formula. Otherwise, the test result would be error because the power meter or I/O module is not found.

iv Click on "OK" to confirm the setting and leave the setting page.

v Repeat steps i~iv to complete settings of all Internal Register setting.

vi To modify the settings of a pre-set Internal Register, please click on the radio button in front of the Internal Register, and then click on "Setting" to modify the settings.

vii To copy the settings of a pre-set internal register to the new internal register, please click the radio button in front of the pre-set internal register and then click "Copy", a new internal register(in sequence) will be added to the list and the settings of the old internal register will be copied to this newly added internal register.

viii To remove a pre-set internal register, please click the radio button in front of the pre-set internal register and then click "Remove".

ix After you finish all the Internal Registers selections and settings, click "Save" button to save the settings.

10.10 Ping Setting

PMC provides the Ping function to detect the connection status between the PMC controller and specified Ethernet devices. The results of Ping function can be used as IF conditions. The settings steps are as below:

i Click on "Add new Ping" to add a new Ping target.

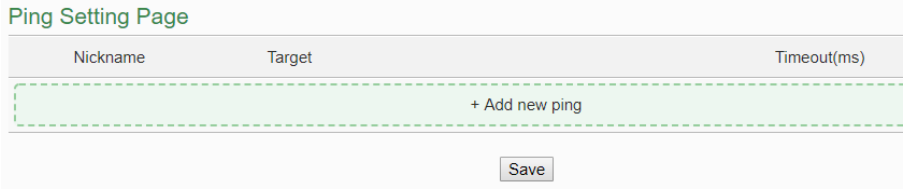


Figure10-54 : Ping List Page

ii After clicking the "Add new Ping", a setting page will appear, input a

name in the “Nickname” field and you could also input the description of this Ping in the “Description” field; shown as below:

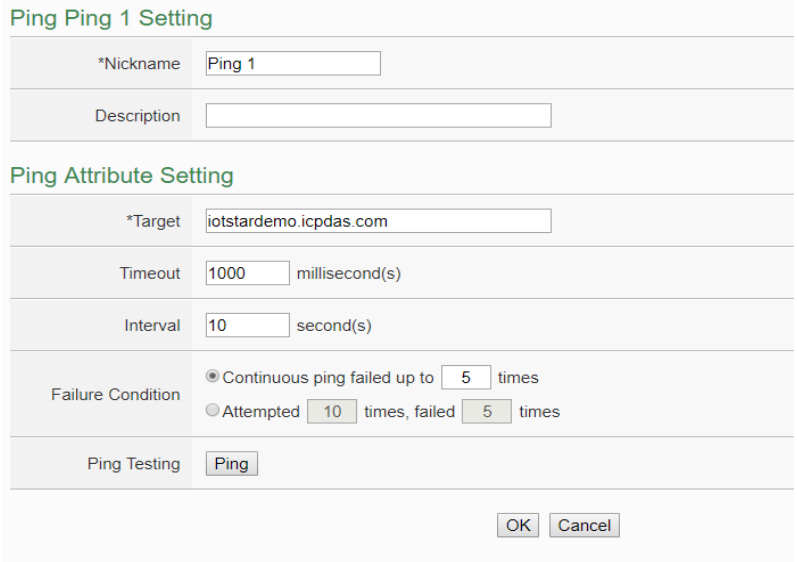


Figure10-55 : Ping List Page

iii In the “Target” field, enter the IP or the domain name of the target to be pinged.

iv In the “Timeout” field, enter the timeout value of the Ping function for waiting the response. The unit will be millisecond (ms).

v In the “Interval” field, set the time interval to specify how often the PMC will automatically ping the target. The unit will be second (sec).

vi In the “Failure Condition” field, select the judgment method to check the Ping IF condition. If you select “Continuous ping failed up to X times”, you can set the continuous failed times with a number between 1 to 60. The Ping status would become failure when the ping action failed continuously and the failed number exceeds the number you set. If you select “Attempted X times, failed Y times”, PMC would check the latest X ping results, if the failed number exceeds the number Y, the Ping status would become failure.

vii User can click the “Ping” button in the “Ping Testing” field to test the Ping status between the PMC controller and the target.

viii Click on “OK” to confirm the setting and return to the Ping list page

ix Repeat steps ii~ viii to complete settings of all Pings.

x After you finish all the Ping settings, click “Save” button to save the settings.

11 Rules Setting

After finishing all Advanced Setting configurations, you can start to edit IF-THEN-ELSE rules. Click the "Rules Setting" button, a list of rules will be displayed on the left side of the page, and at the right side of the page will show detailed content of each rule that was previously defined. The rule setting page is shown as below:

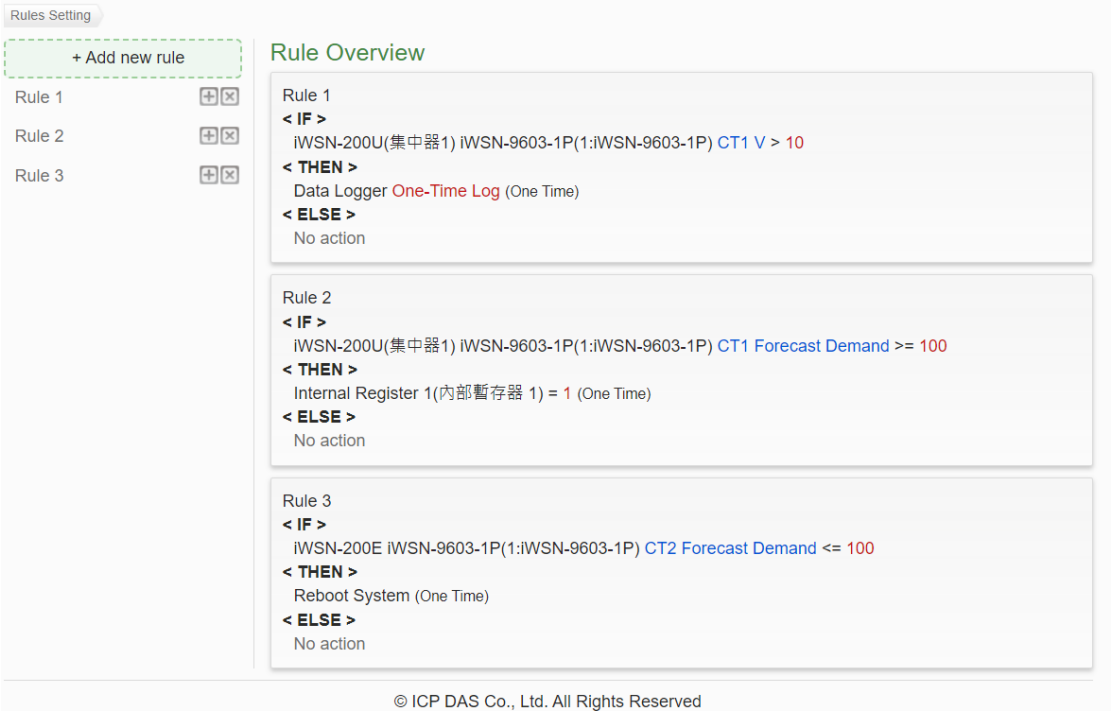


Figure11-1： Rules overview page

In addition to the list of the rules, Rule Management interface will also be shown on the left side of the page. Detailed description is as below:

- **Add new rule**：To add a new rule, please click "Add new rule".
- **Copy**：To copy the settings of an old rule to the new rule, please click on the button on the right side of the old rule, a new rule will be added to the list and the settings of the old rule will be copied to this newly added rule.
- **Remove**：To remove a pre-set rule, please click on the button on the right side of the pre-set rule.
- **Arrange the order**：Right click on the pre-set rule and drag them up or down to arrange the rules into the proper order.

Click "Add new rule" to get into the "Rule Information Setting" page for logic rule edition (shown as below).

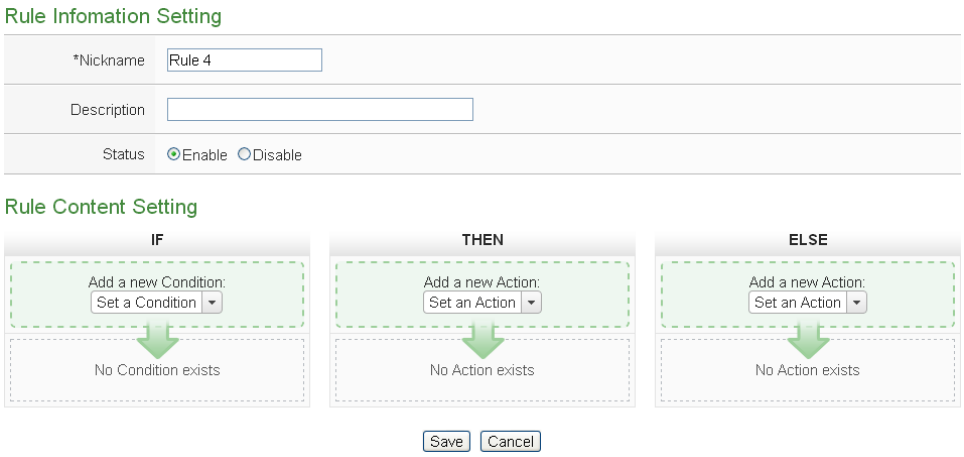
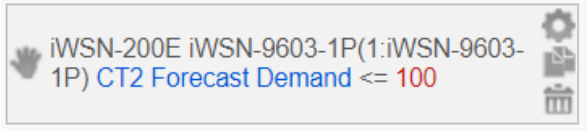


Figure11-2 : Rules setting page

- **Nickname**: Input name in the "Nickname" field and you could also input the description of this Rule in the "**Description**" field.
- **Status**: Select "Enable" or "Disable". If you select "Enable", the rule will be executed after being downloaded. If you select "Disable" the rule will only be stored temporarily and will not be executed after being downloaded.
- **IF Condition Setting**: More detailed information, please refer to 11.1 IF Condition.
- **THEN/ELSE Action Setting**: More detailed information, please refer to 11.2 THEN/ELSE Action.
- **Save**: After finish all IF Condition and THEN/ELSE Action setting, click on "Save" to save the settings.
  Please note: if you make modification in Power meter setting, IO module setting or in Advanced Setting after finish defining the rules, it might cause unexpected error due to the changes, some variables may no longer exist. Therefore, in case you make any modification, please double check your settings and Rules definition to make sure no errors are present.

When user finish settings of an IF Condition or THEN/ELSE Action, after going back to the Rule Information Setting page, a function component will be displayed under the IF Condition or THEN/ELSE Action section(shown as below), the function component will display the settings information of the IF-THEN-ELSE logic rule.



The function component (IF Condition, THEN Action or ELSE Action) provides

various functions such as:

- **Setting**: to edit a pre-set function component, click on to get in to the setting page of the function component.
- **Copy**: to copy a pre-set function component, click on to generate a new component with the same pre-set component settings. The new function component will be listed under the pre-set component.
- **Remove**: to remove a pre-set function component, click on to remove the component.
- **Arrange order**: the order of the function component might result in different outcomes of IF-THEN- ELSE rule execution, therefore, user could click on and drag the component to arrange the components into appropriate order.

The following section will give more detailed information of IF Condition and THEN/ELSE Action settings.

11.1 IF Condition Setting

To add an IF Condition, please select and set the Condition from the dropdown list in the "Add a new Condition" field under the IF Condition setting section.

IF Condition provides the following Condition setting options:

- ICP DAS Module
- Power Meter
- Microsoft Azure
- IBM Bluemix
- MQTT
- Connection Status
- Timer
- Schedule
- FTP Upload Status
- SD Card Status
- Rule Status
- Internal Register
- PUE
- Ping

If PMC is connected to ICP DAS iWSN I/O module or ICP DAS iWSN power meter, the setting options for I/O channel information (AI, DI) or

power data on these modules will be automatically displayed on the dropdown list.

To include subjects other than modules mentioned above in the IF Condition statement; they have to be pre-defined in Advanced Setting first. The setting options of the subjects that already being defined in Advanced Setting will appear on the dropdown list of IF Condition. Select the Condition option from the dropdown list in the "Add a new Condition" field under the IF Condition setting section, a window will pop up for you to edit detailed information. The setting options of IF Condition are as follow:

11.1.1 ICP DAS Module

Click on ICP DAS Module, 2 options will appear as the following: DI, DI Counter, and AI.

11.1.1.1 DI

DI channel value from iWSN I/O module can be used as evaluation criteria for IF condition statement; the setting page for DI Condition Setting is shown as below :

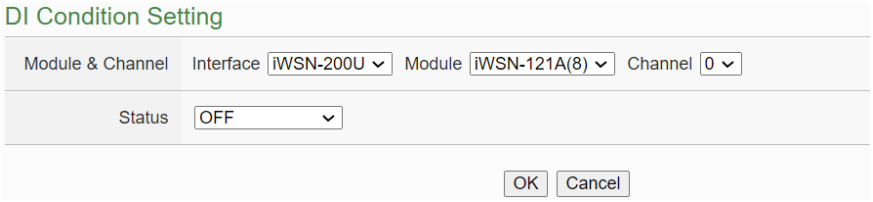


Figure11-3 : DI condition setting page

Follow the steps below:

i Specify the module and channel from the dropdown list of the "Module & Channel" section that you are going to include its value in the IF condition statements.

ii Define the evaluation criteria of the status in IF statement to be "OFF", "ON", "ON to OFF", "OFF to ON" or "Change". Once the DI channel value matches the evaluation criteria, the result of this condition evaluation will be "true". Please note: If the statement involves state transitions: "ON to OFF", "OFF to ON" and "Change", the action will be executed only once and only at the moment when the state transition occurs.

iii Click "OK" button to confirm the settings and return to the

Rule settings page.

11.1.1.2 AI

AI channel value from iWSN I/O module can be included in the IF condition statements; the editing page for AI Condition Setting is shown as below :

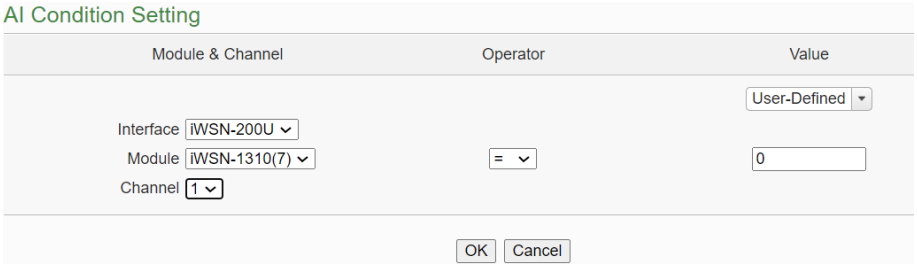


Figure11-4 : AI condition setting page

Follow the steps below:

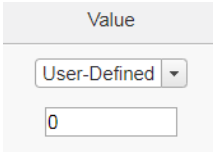
i Specify the module and channel from the dropdown list of the "Module & Channel" section that you are going to include its value in the IF condition statements.

ii Set up the expression statement for this channel value. Select an operator from "=",">","<",">=" or "<=".

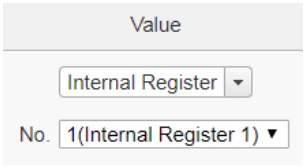
iii And then specify the evaluation value. If this AI channel value match the evaluation criteria, the result of this condition evaluation will be "true".

PMC provides the following 8 values options; you can compare them with the AI value for condition evaluation:

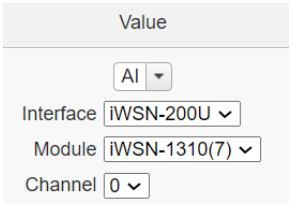
- User-Defined: The "User-Defined" value could be used as evaluation criteria; input the "User-Defined" value under the "Value" field.



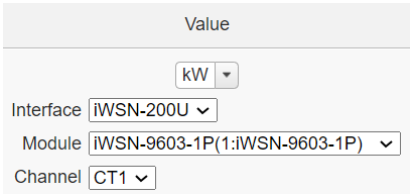
- Internal Register: The "Internal Register" value could be used as evaluation criteria; select the number of the Internal Register from the dropdown list.



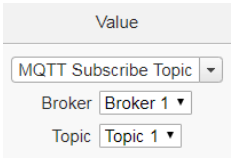
- AI channel: The AI channel value from other ICP DAS iWSN I/O module could be used as evaluation criteria; select the module and channel from the dropdown list to specify which channel value will be used.



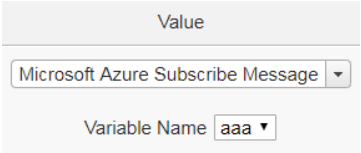
- Power Meter: The power data of the Power Meter could be used as evaluation criteria; select the type of power data from the dropdown list first (It provide as "Basic Values", "Statistical Values" and "Others Information" for selection). And then select module and channel from the dropdown list to specify which power meter and loop(or phase) value will be used.



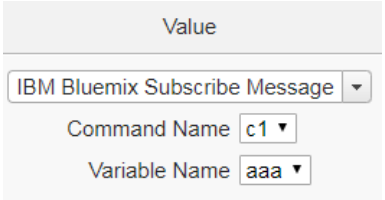
- MQTT: The value of the MQTT subscribe topic could be used as evaluation criteria; select the broker and the subscribe topic from the dropdown list to specify which topic will be used.



- Azure: The value of the Azure received paremeter could be used as evaluation criteria; select the variable name from the dropdown list to specify which variable will be used.



- Bluemix: The value of the Bluemix received paremeter could be used as evaluation criteria; select the command and the variable name from the dropdown list to specify which variable will be used.



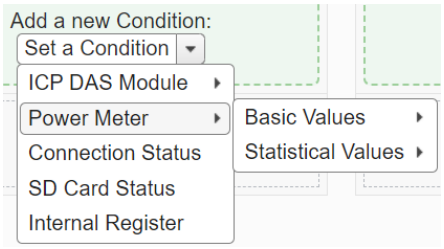
Please Note: The content of received MQTT subscribe topic or Azure / Bluemix parameter must be a number, otherwise 0 will be assigned

- PUE: The PUE value could be used as evaluation criteria; select the PUE from the dropdown list to specify which PUE value will be used.

iv Click “OK” button to confirm the settings and return to the Rule settings page.

11.1.2 Power Meter

The power data of the iWSN Power Meter could be used as evaluation criteria; the power data options are as follow: Basic Value, Statistical Value and Others Informations. The setting page for Power Meter Condition Setting is shown as below:



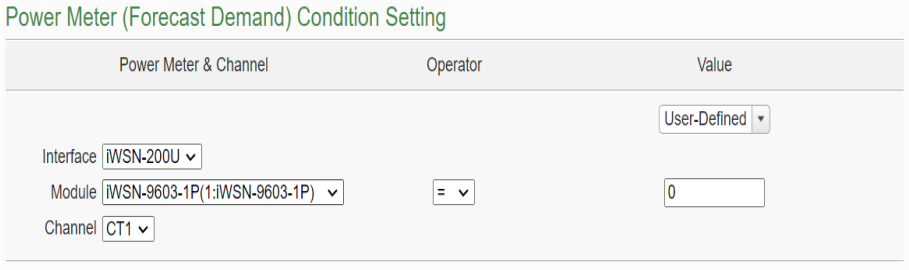


Figure11-5 : Power Meter condition setting page

Select which type of power data of the Power Meter is going to be used and then continue the following steps (taking option V as an example):

i Specify the power meter and loop/phase from the dropdown list of the "Module & Address" section that you are going to include its value in the IF condition statements.

ii Set up the expression statement for this power data value of the Power Meter. Select an operator from "=",">","<",">=" or "<=".

iii And then specify the evaluation value. If this power data value of the Power Meter match the evaluation criteria, the result of this condition evaluation will be "true".

iv PMC provides 8 value options; you can compare them with the power data value of the Power Meter for condition evaluation. Please refer to "11.1.1.2 AI" section for more detailed information.

v Click "OK" button to confirm the settings and return to the Rule settings page.

11.1.3 Microsoft Azure

Click on Microsoft Azure, 2 options will appear as the following: " Connection Status" and " Subscribe Message".

11.1.3.1 Connection Status

The Connection Status between PMC and Microsoft Azure can be used as evaluation criteria for IF condition statement. The editing page for Microsoft Azure Connection Status Condition Setting is shown as below:

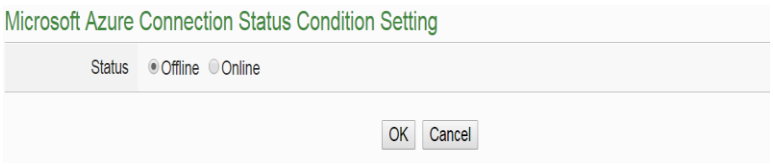


Figure11-6 : Microsoft Azure Connection Status condition setting

Follow the steps below:

i Specify the connection status to be “Offline” or “Online”. If the connection status of Microsoft Azure match the evaluation criteria, the result of this condition evaluation will be “true”.

ii Click “OK” button to confirm the settings and return to the Rule settings page.

11.1.3.2 Subscribe Message

The Variable in the Subscribe Message from Microsoft Azure can be used in the IF condition statements; the editing page for Microsoft Azure Subscribe Message condition setting is shown as below:

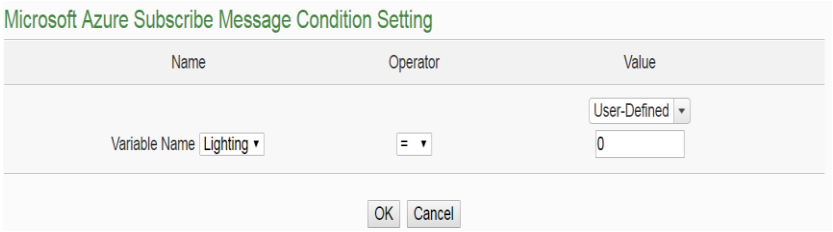


Figure11-7 : Microsoft Azure Subscribe Message condition setting

Follow the steps below:

i Specify the variable from the dropdown list of “Variable Name” field that you are going to include it in the IF condition statements.

ii Set up the expression statement for the content of this Subscribe Topic. Select an operator from “=”, “>”, “=” or “<=”.

iii Specify the user-defined evaluation value. If the content of this variable match the evaluation criteria, the result of this condition evaluation will be “true”. PMC provides 8 values options; you can compare them with the content of this Subscribe Topic for condition evaluation. Please refer to “11.1.1.2 AI” section for more detailed information.

iv Click “OK” button to confirm the settings and return to the Rule settings page.

11.1.4 IBM Bluemix

Click on IBM Bluemix, 2 options will appear as the following: " Connection Status" and " Subscribe Message".

11.1.4.1 Connection Status

The Connection Status between PMC and IBM Bluemix can be used as evaluation criteria for IF condition statement. The editing page for IBM Bluemix Connection Status Condition Setting is shown as below:

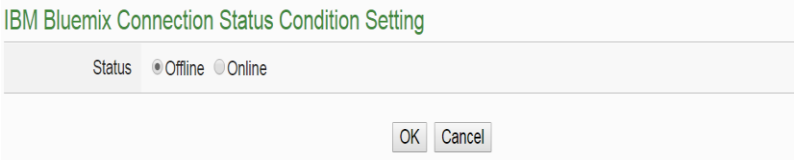


Figure11-8 : IBM Bluemix Connection Status condition setting

Follow the steps below:

i Specify the connection status to be “Offline” or “Online”. If the connection status of IBM Bluemix match the evaluation criteria, the result of this condition evaluation will be “true”.

ii Click “OK” button to confirm the settings and return to the Rule settings page.

11.1.4.2 Subscribe Message

The Command and Variable in the Subscribe Message from IBM Bluemix can be used in the IF condition statements; the editing page for IBM Bluemix Subscribe Message condition setting is shown as below:

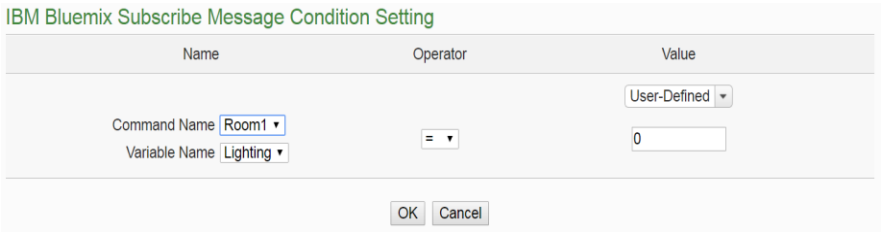


Figure11-9 : IBM Bluemix Subscribe Message condition setting

Follow the steps below:

i Specify the Command and Variable from the dropdown list of “Command Name” and “Variable Name” fields that you are going to include them in the IF condition statements. Only when the Subscribe Message is bound with the setting of the“Command Name”, then the IF condition statements will be

processed. User can select "*" to ignore the criteria.

ii Set up the expression statement for the content of this Subscribe Topic. Select an operator from "=", ">", "=" or "<="

iii Specify the user-defined evaluation value. If the content of this Subscribe Topic match the evaluation criteria, the result of this condition evaluation will be "true". PMC provides 8 values options; you can compare them with the content of this Subscribe Topic for condition evaluation. Please refer to "11.1.1.2 AI" section for more detailed information.

iv Click "OK" button to confirm the settings and return to the Rule settings page.

11.1.5 MQTT

The parameters of MQTT Broker connection status and Subscribe Topic can be included in the IF condition statements; the editing pages for MQTT Broker connection status and Subscribe Topic condition setting are shown as below:

11.1.5.1 Broker Connection Status

The Broker connection status can be included in the IF condition statements; the editing page is shown as below:

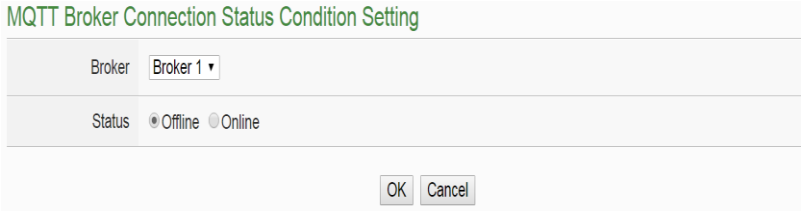


Figure11-10 : Broker Connection Status condition setting

Follow the steps below:

i Specify the Broker from the dropdown list of "Broker" field that you are going to include its connection status in the IF condition statements.

ii And then specify the connection status to be "Offline" or "Online". If the connection status of the Broker match the evaluation criteria, the result of this condition evaluation will be "true".

iii Click "OK" button to confirm the settings and return to the Rule settings page.

11.1.5.2 Subscribe Topic

The content of the Subscribe Topic can be included in the IF condition statements; the editing page is shown as below:

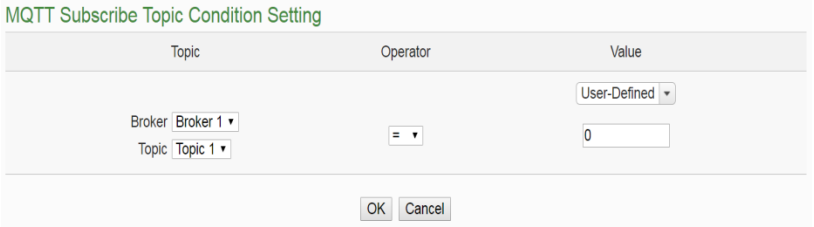


Figure11-11 : Subscribe Topic condition setting

Follow the steps below:

i Specify the Broker and Subscribe Topic from the dropdown list of "Broker" field and "Topic" field that you are going to include them in the IF condition statements.

ii Set up the expression statement for the content of this Subscribe Topic. Select an operator from "=", ">", "=" or "<=".

iii Specify the user-defined evaluation value. If the content of this Subscribe Topic match the evaluation criteria, the result of this condition evaluation will be "true". PMC provides 8 values options; you can compare them with the content of this Subscribe Topic for condition evaluation. Please refer to "11.1.1.2 AI" section for more detailed information.

iv Click "OK" button to confirm the settings and return to the Rule settings page.

11.1.6 Connection Status

Connection Status can be included in the IF condition statements; the editing page for Connection Status Condition Setting is shown as below:

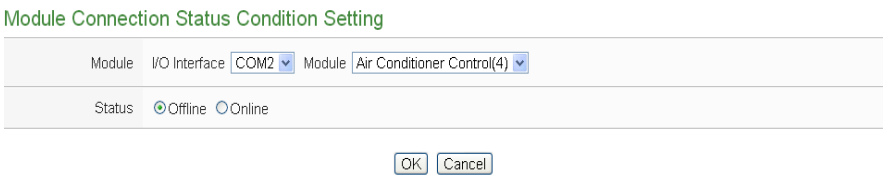


Figure11-12 : Connection Status condition setting page

Follow the steps below:

i Specify the module from the dropdown list of the “Module” section that you are going to include its Connection Status in the IF condition statements.

ii And then specify the Connection Status to be “Offline” or “Online”. If the Connection Status of the module match the evaluation criteria, the result of this condition evaluation will be “true”.

iii Click “OK” button to confirm the settings and return to the Rule settings page.

11.1.7 Timer

Timer condition can be used as evaluation criteria for IF condition statement; the editing page for timer condition setting is shown as follow:

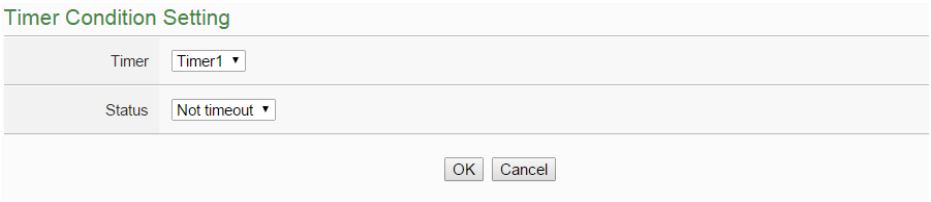


Figure11-13 : Timer condition setting page

Follow the following steps:

i Select the timer that you are going to use its status as evaluation criteria for IF condition statement. Specify the timer from the dropdown list of the “Timer” field.

ii Define the evaluation criteria of the timer status in IF statement to be “Not timeout” or “Timeout”. If the timer status match the evaluation criteria, the result of this condition evaluation will be “true”.

iii Click “OK” button to save the settings. The popup window will be closed and return to the Rule settings page.

11.1.8 Schedule

The Schedule can be used as evaluation criteria for IF condition statement; the editing page for Schedule Condition Setting is shown as follow:

Figure11-14 : Schedule condition setting page

Follow the steps below:

i Select the Schedule that you are going to use for IF condition statement from the dropdown list of "Schedule" field.

ii The "Status" field must be "In Range". If the system time of the PMC is in the range of date/time setting of the schedule, the result of this condition evaluation will be "true".

iii Click "OK" button to confirm the settings and return to the Rule settings page.

11.1.9 FTP Upload Status

The status of FTP Upload Status can be used as evaluation criteria for IF condition statement; the editing page for FTP Upload Status Condition Setting is shown as follow:

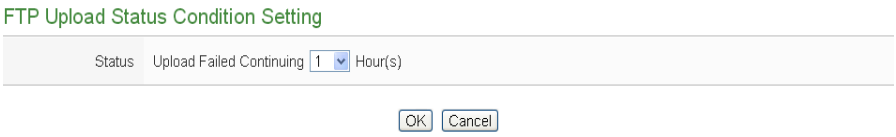


Figure11-15 : FTP Upload Status condition setting page

Follow the steps below:

i In the "Status" field, set up the maximum allowable idle time period when fails to upload files via FTP; once the time period reaches the maximum allowable idle time period, the result of this condition evaluation will be "true".

ii Click "OK" button to confirm the settings and return to the Rule settings page.

11.1.10 SD Card Status

The status of SD Card can be used as evaluation criteria for IF condition statement; the editing page for SD Card Status Condition Setting is shown as follow:

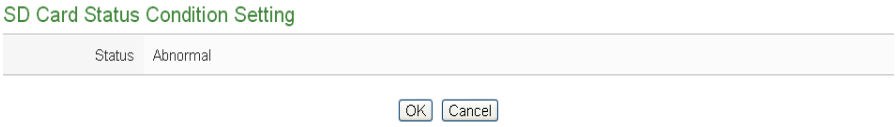


Figure11-16 : SD Card Status condition setting page

Follow the steps below:

i When the status of micro SD Card appears irregular (micro SD Card is not detected or the space is less than 100MB), the result of this condition evaluation will be "true" Click "OK" button to confirm the settings and return to the Rule settings page.

11.1.11 Rule Status

The Rule Status (if the Rule is disabled or enabled) can be used as evaluation criteria for IF condition statement. Please note: there must be at least one edited rule on PMC controller for setting up Rule Status in the IF Condition Setting page. The editing page for Rule Status Condition Setting is shown as below:

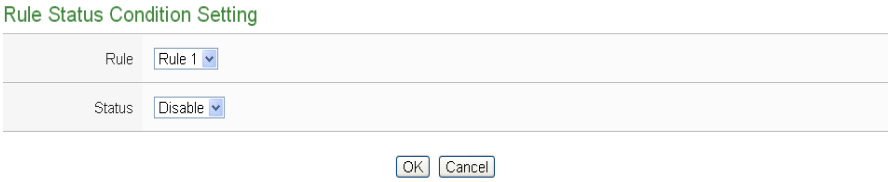


Figure11-17 : Rule Status condition setting page

Follow the steps below:

i Specify the Rule that is going to be used in the IF Condition statement from the dropdown list of the "Rule" field.

ii Specify the Rule status to be "Disable" or "Enable" from the dropdown list of the "Status" field. When the Rule status matches the specified status, the evaluation result will be "true".

iii Click "OK" button to confirm the settings and return to the Rule settings page.

11.1.12 Internal Register

Internal Register value can be used as evaluation criteria for IF condition statement; the editing page for Internal Register Condition Setting is shown as follow:

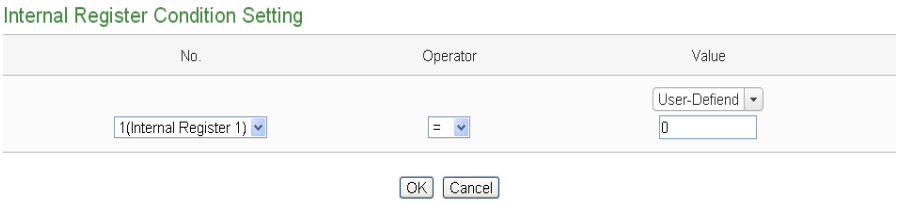


Figure11-18 : Internal register condition setting page

Follow the steps below:

i Select the Internal Register that you are going to use the value as evaluation criteria for IF condition statement. Specify the Internal Register Index from the dropdown list of "No." field.

ii Set up the expression statement for this Internal Register value. Select an operator from "=",">","<",">=" or "<=".

iii And then specify the evaluation value. If this Internal Register value match the evaluation criteria, the result of this condition evaluation will be "true".

iv PMC provides 8 value options; you can compare them with the Input Register value for condition evaluation. Please refer to "11.1.1.2 AI" section for more detailed information.

v Click "OK" button to confirm the settings and return to the Rule settings page.

11.1.13 PUE

PUE value can be used as evaluation criteria for IF condition statement; the editing page for PUE Condition Setting is shown as follow:

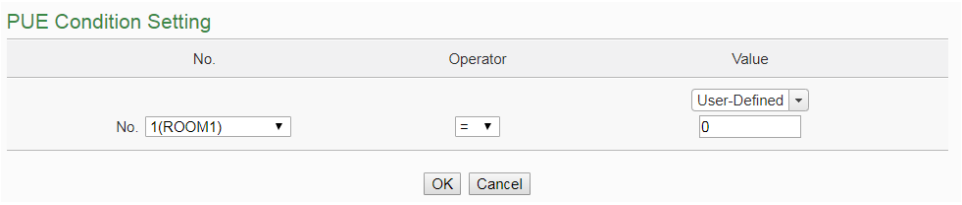


Figure11-19 : PUE condition setting page

Follow the steps below:

i Select the PUE that you are going to use the value as evaluation criteria for IF condition statement. Specify the PUE Index from the dropdown list of "No." field.

ii Set up the expression statement for this PUE value. Select an operator from "=",">","<",">=" or "<=".

iii And then specify the evaluation value. If this PUE value match the evaluation criteria, the result of this condition evaluation will be "true". PMC provides 8 value options; you can compare them with the PUE value for condition evaluation. Please refer to "11.1.1.2 AI" section for more detailed information.

iv Click "OK" button to confirm the settings and return to the Rule settings page.

11.1.14 Ping

The Ping Status can be used as evaluation criteria for IF condition statement. The editing page for Ping Condition Setting is shown as below:

Figure11-20 : Ping condition setting page

Follow the steps below:

i Specify the Ping that is going to be used in the IF Condition statement from the dropdown list of the "Ping" field. When the Ping status was failure, the evaluation result will be "true".

ii Click "OK" button to confirm the settings and return to the Rule settings page.

11.2 THEN/ELSE Action Setting

To add a THEN/ELSE Action, please select and set the Action from the dropdown list in the “Add a new Action” field under the THEN/ELSE Action setting section.

- Microsoft Azure
- IBM Bluemix
- MQTT
- Timer
- Email
- SNMP Trap
- LINE Notify (The service will end on March 31, 2025.)
- LINE Messaging API
- IoTstar Bot Service
- IoTstar Alarm
- Telegram
- Re-boot System
- Data Logger
- Rule Status
- Internal Register
- Delay

About the modules mentioned above in the THEN/ELSE Action statement; they have to be pre-defined in Advanced Setting first. The setting options of the subjects that already being defined in Advanced Setting will appear on the dropdown list of THEN/ELSE Action. Select the Action option from the dropdown list in the “Add a new Action” field under the THEN/ELSE Action setting section, a window will pop up for you to edit detailed information. The THEN Action statement will be executed only when the result of IF condition statement is found “true”; otherwise the ELSE Action statement will be executed. In order to meet application requirement, for some Actions, PMC offers options to execute the Action one-time or repeatedly. The setting options of THEN/ELSE Action are as follow:

- One-Time: when the IF Condition is TRUE, this Action will be executed once and only once. This Action will not be executed again until the IF Condition turns to be TRUE again.
- Repeat: when the IF Condition is TRUE, this Action will be executed repeatedly until the IF Condition turns to be FALSE.

The setting options of THEN/ELSE Action are as follow:

11.2.1 Microsoft Azure

Click on “Microsoft Azure”, 3 options will appear as the following: “Function Status”, “Publish Message” and “Reset Variable”.

11.2.1.1 Function Status

User can execute an action to change the connection operation between Microsoft Azure and PMC in the THEN/ELSE Action statement; the editing page is shown as follow:

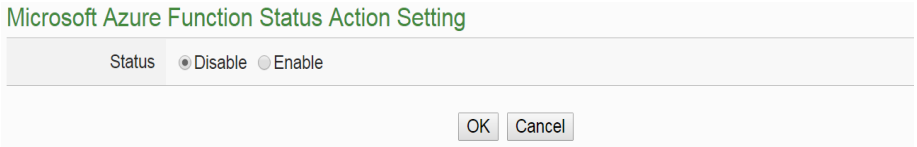


Figure11-21 : Microsoft Azure Function Status action setting

Follow the steps below:

i Specify the connection operation between Microsoft Azure and PMC to be “Disable” or “Enable” from the dropdown list of the “Status” field.

ii Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.1.2 Publish Message

You can publish messages to Microsoft Azure when executing a THEN/ELSE Action statement; the editing page is shown as below:

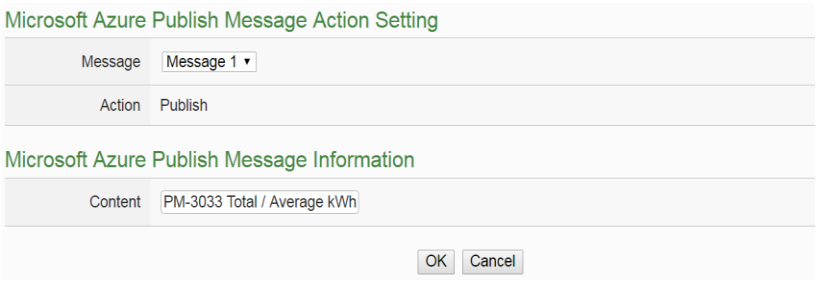


Figure11-22 : Microsoft Azure Publish Message action setting

Follow the steps below:

i Select a pre-set Publish message from the dropdown list of the "Message" field. The Publish message will be displayed for you to verify if this is the message you are going to send to.

ii Click "OK" button to confirm the settings and return to the Rule settings page.

11.2.1.3 Reset Variable

You can reset the saved content of the subscribe variable from Microsoft Azure when executing a THEN/ELSE Action statement; the editing page is shown as below:

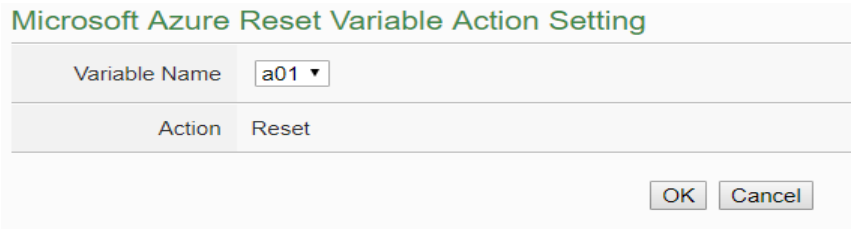


Figure11-23 : Microsoft Azure Reset Variable action setting page

Follow the steps below:

i Select a pre-set Subscribe variable from the dropdown list of the "Variable Name" field. When this action is executed, PMC would reset the content of the variable, and the evaluation result of the IF statement which is associated with the variable will be verified again.

ii Click "OK" button to confirm the settings and return to the Rule settings page.

11.2.2 IBM Bluemix

Click on "IBM Bluemix", 3 options will appear as the following: "Function Status", "Publish Message" and "Reset Variable" .

11.2.2.1 Function Status

User can execute an action to change the connection operation between IBM Bluemix and PMC in the THEN/ELSE Action statement; the editing page is shown as follow:

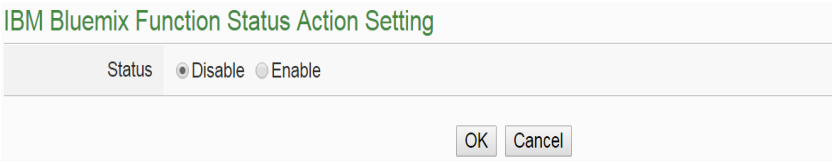


Figure11-24 : IBM Bluemix Function Status action setting

Follow the steps below:

i Specify the connection operation between IBM Bluemix and PMC to be “Disable” or “Enable” from the dropdown list of the “Status” field.

ii Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.2.2 Publish Message

You can publish messages to IBM Bluemix when executing a THEN/ELSE Action statement; the editing page is shown as below:

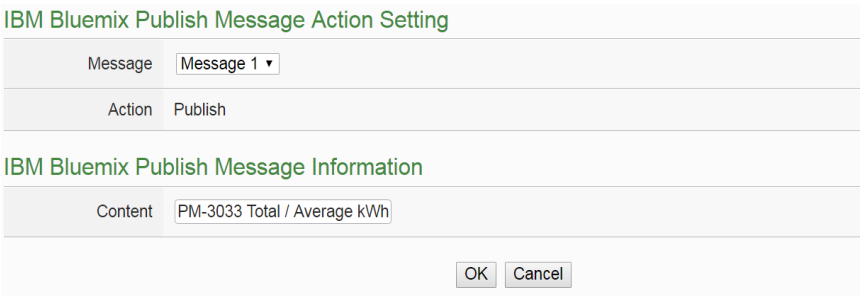


Figure11-25 : IBM Bluemix Publish Message action setting

Follow the steps below:

i Select a pre-set Publish message from the dropdown list of the “Message” field. The Publish message will be displayed for you to verify if this is the message you are going to send to.

ii Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.2.3 Reset Variable

You can reset the saved content of the subscribe variable from IBM Bluemix when executing a THEN/ELSE Action statement; the editing page is shown as below:

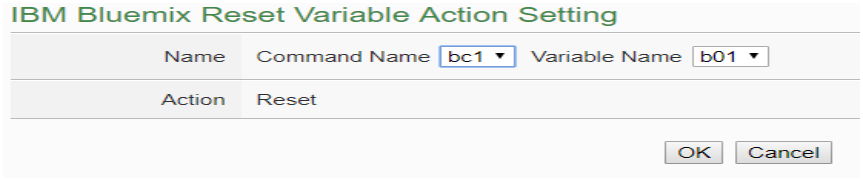


Figure11-26 : IBM Bluemix Reset Variable action setting page

Follow the steps below:

i Select a Command and a Variable from the dropdown list of the "Name" field. When this action is executed, PMC would reset the content of the variable, and the evaluation result of the IF statement which is associated with the variable will be verified again.

ii Click "OK" button to confirm the settings and return to the Rule settings page.

11.2.3 MQTT

Click on "MQTT", 3 options will appear as the following: "Broker Function", "Publish Message" and "Reset Topic".

11.2.3.1 Broker Function

User can execute an action to change the function status of MQTT Broker in the THEN/ELSE Action statement; the editing page is shown as follow:

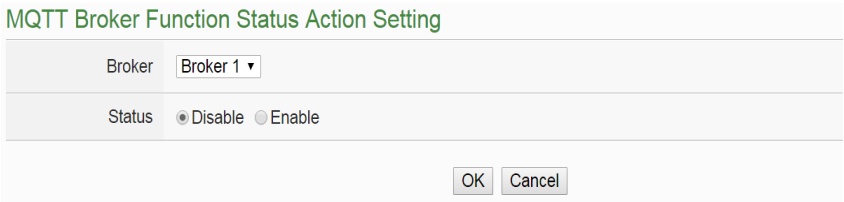


Figure11-27 : Broker Function action setting page

Follow the steps below:

i Select the specific Broker from the dropdown list of the "Broker" field.

ii Specify the Broker Function status to be "Disable" or "Enable" from the dropdown list of the "Status" field. When the Action being executed, the Broker Function status will be changed to specified status.

iii Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.3.2 Publish Message

You can publish a MQTT Topic to the Broker when executing a THEN/ELSE Action statement; the editing page is shown as below:

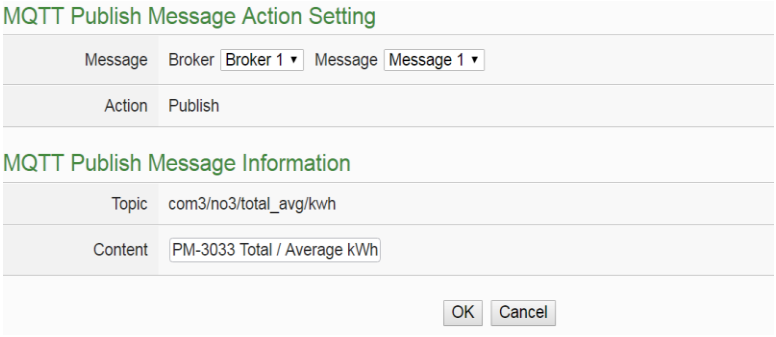


Figure11-28 : Publish Message action setting page

Follow the steps below:

i Select a pre-set MQTT Publish Topic message from the dropdown list of the “Broker” and “Message” fields. The MQTT Publish Topic message will be displayed for you to verify if this is the MQTT Publish Topic message you are going to send to.

ii Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.3.3 Reset Topic

You can reset the saved content of the subscribe topic when executing a THEN/ELSE Action statement; the editing page is shown as below:

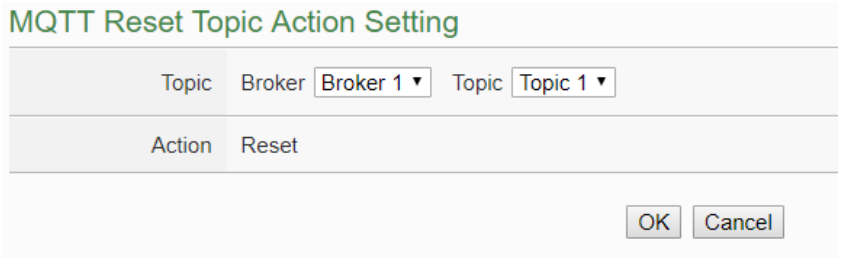


Figure11-29 : MQTT Reset Topic action setting page

Follow the steps below:

i Select a pre-set MQTT Subscribe Topic from the dropdown list of the “Broker” and “Topic” fields. When this action is executed, PMC would reset the message of the topic, and the evaluation result of the IF statement which is associated with the topic will be verified again.

ii Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.4 Timer

You can change the Timer status (to Start or to Reset the Timer) in the THEN/ELSE Action statement; the editing page for Timer Action Setting is shown as below:

Figure11-30 : Timer action setting page

Follow the following steps:

i Select the pre-defined Timer from the dropdown list of the “Timer” field. Please note: the Timer you select has to be created in Advanced Setting.

ii Specify you want to “Reset” or “Start” this Timer when this THEN/ELSE Action statement is executed. The Start Action will start to run the Timer and if the Start Action is triggered one more time when the Timer is running, the Timer will restart again. The Reset action will reset the Timer and stop running the Timer.

iii Click “OK” button to save the settings. The popup window will be closed and return to the Rule settings page.

11.2.5 Email

You can send a Email message to an Email group when executing a THEN/ELSE Action statement; the editing page is as below:

Figure11-31 : Email action setting page

Follow the steps below:

i Select a pre-set Email group from the dropdown list of the "Index" field. Please note: the Email you select has to be enabled in Advanced Setting. The Email group information will be displayed for you to verify if this is the Email group you are going to send the message to.

ii Click "OK" button to confirm the settings and return to the Rule settings page.

11.2.6 SNMP Trap

You can send a specific SNMP Trap when executing a THEN/ELSE Action statement. The setting page is show as below:

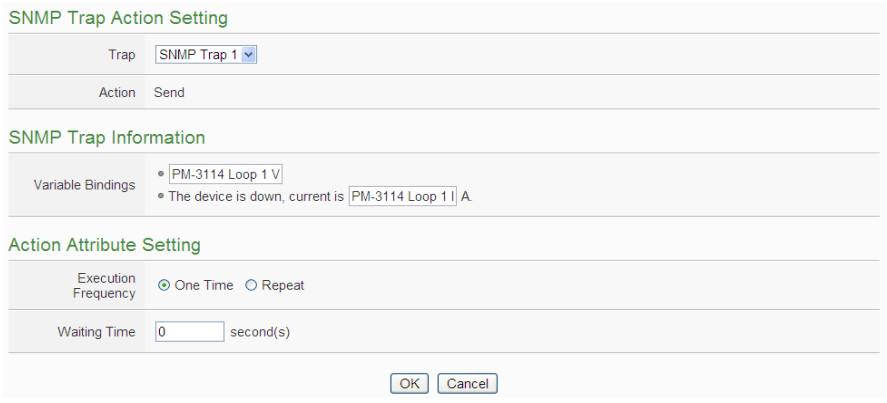


Figure11-32 : SNMP Trap Action Setting Page

Follow the steps below:

i In the "Trap" field, specify the SNMP Trap you want to execute in Action from the dropdown list. Please note, the SNMP Trap you select has to be the pre-set SNMP Trap in the "SNMP Trap Setting of Advanced Setting" section. The selected SNMP Trap message

such as “Variable Bindings” and message content will be displayed for you to verify if this is the SNMP Trap you want to send.

ii Select the Action Execution Frequency, there are two options as “One Time” and “Repeat” for selection. Please refer to “11.2 THEN/ELSE Action Setting” section for the description of “One Time” and “Repeat” operation.

iii Input the value in the “Waiting Time” field, it means after the action be executed, how long the system will delay to execute the next Action. The unit will be second(s).

iv Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.7 LINE Notify (The service will end on March 31, 2025.)

You can send a specific LINE Notify message to LINE personal account or group chat rooms when executing a THEN/ELSE Action statement. The setting page is show as below:

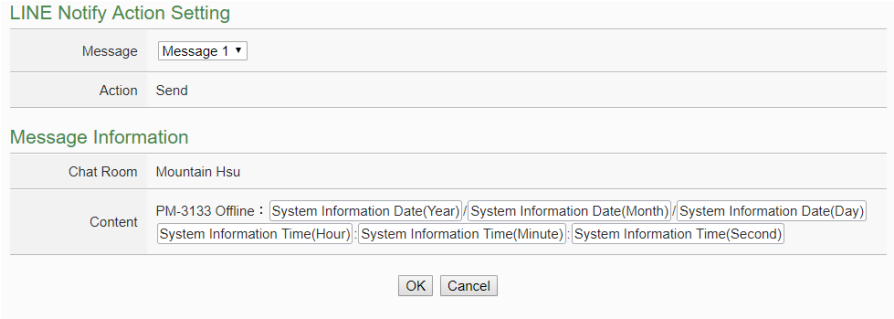


Figure11-33 : LINE Notify action setting page

Follow the steps below:

i In the “Message” field, specify the LINE message you want to send in Action from the dropdown list. The selected LINE Notify message such as “Chat Room” and message content will be displayed for you to verify if this is the LINE message you want to send.

ii Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.8 LINE Messaging API

You can configure the THEN/ELSE actions to send LINE Messaging API messages to a LINE personal account or group chat room when certain conditions are met. The configuration interface is as follows:

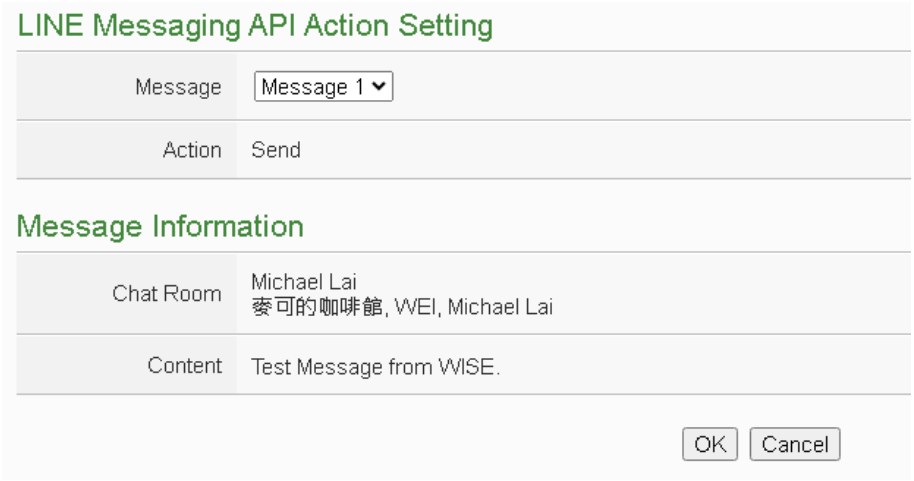


Figure11-34 : LINE Notify action setting page

Follow the steps below:

i In the "Message" field, select a pre-configured LINE Messaging API message. After selecting the LINE Messaging API message, the system will display the chat room to which the message will be sent and the content of the message. This allows the user to verify that the selected LINE Messaging API message will be sent to the correct recipient and with the correct content.

ii Click the "OK" button to save this setting and exit this page to return to the rule configuration page.

11.2.9 IoTstar Bot Service

You can send a specific IoTstar Bot Service message to the LINE personal account or Telegram bot account which is bound with IoTstar when executing a THEN/ELSE Action statement. The setting page is show as below:

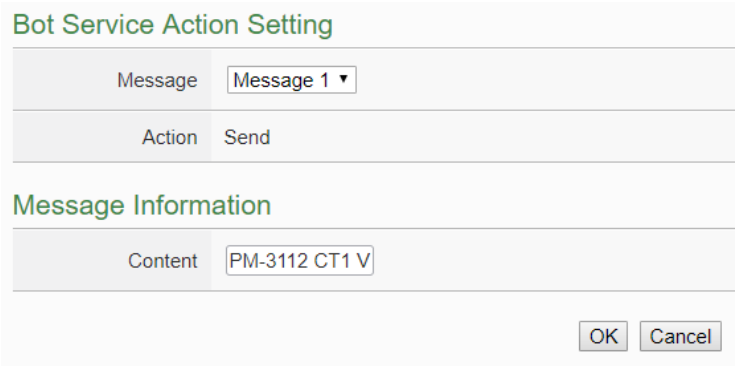


Figure11-35 : IoTstar Bot Service action setting page

Follow the steps below:

i In the “Message” field, specify the message you want to send in Action from the dropdown list. The content of the selected IoTstar Bot Service message will be displayed for you to verify if this is the message you want to send.

ii Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.10 IoTstar Alarm

Users can configure actions to send alarms to the IoTstar server when specific conditions are met, along with the severity level of the alarm. The configuration interface is shown below:

Figure11-36 : IoTstar Alarm action setting page

Follow the steps below:

i. In the “Alarm and Status” field, select the alarm and its corresponding status to be sent.

ii. Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.11 Telegram

You can send a specific Telegram message to Telegram bot account or group chat rooms when executing a THEN/ELSE Action statement. The setting page is show as below:

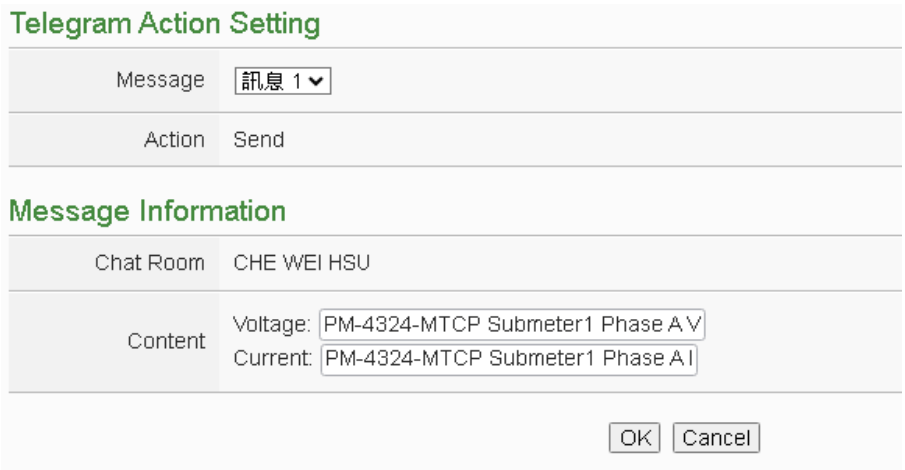


Figure11-37 : Telegram action setting page

Follow the steps below:

i In the “Message” field, specify the Telegram message you want to send in Action from the dropdown list. The selected Telegram message such as “Chat Room” and message content will be displayed for you to verify if this is the Telegram message you want to send.

ii Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.12 Re-boot System

You can reboot the PMC controller when executing a THEN/ELSE Action statement. The setting page is show as below:

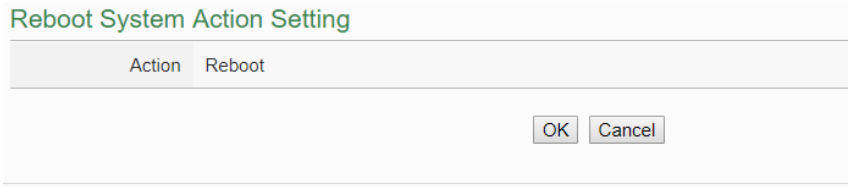


Figure11-38 : Re-boot system Action setting page

Follow the steps below:

i Click “OK” button to confirm the settings and return to the Rule settings page.

11.2.13 Data Logger

You can execute “One-Time Log” in the Action statements to perform data recording one-time only when an event is triggered. User can also perform "Start” or “Stop” operation on data logger. The setting page is

show as below:

Figure11-39 : Data Logger action setting page

Follow the steps below:

i In the "Action" field, specify the data logger operation you want to execute in Action from the dropdown list.

ii Click "OK" button to confirm the settings and return to the Rule settings page.

11.2.14 Rule Status

The Rule Status can be modified to be Disable or Enable in the Action. The editing page for Rule Status Action Setting is shown as below:

Figure11-40 : Rule Status action setting page

Follow the steps below:

i Specify the Rule (It has to be a previously saved Rule) that is going to be changed in the Action Condition statement from the dropdown list of the "Rule" field.

ii Specify the Rule status to be Disable or Enable from the dropdown list of the "Action" field. When the Action being executed, the Rule status will be changed to specified status.

iii Click "OK" button to confirm the settings and return to the Rule settings page.

11.2.15 Internal Register

You can modify the value of Internal Register in the THEN/ELSE Action statement; the editing page for Internal Register Action Setting is shown as below:

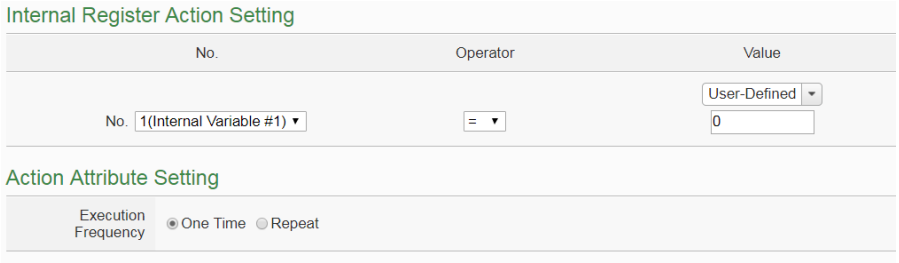


Figure11-41 : Internal Register action setting page

Follow the steps below:

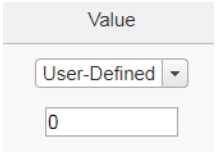
i Select the pre-defined Internal Register from the dropdown list of the "No" field. Please note: the Internal Register you select has to be enabled in Advanced Setting.

ii Specify the Operator in the "Operator" field. The 5 operators are as follow:

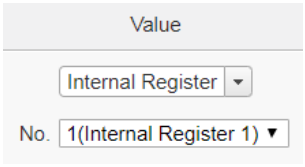
- "=" : Indicate assign the new Internal Register value as the value in "Value" field.
- "+=" : Indicate assign the new Internal Register value as the original Internal Register value plus the value in "Value" field.
- "-=" : Indicate assign the new Internal Register value as the original Internal Register value minus the value in "Value" field.
- "*=" : Indicate assign the new Internal Register value as the original Internal Register value times the value in "Value" field.
- "/=" : Indicate assign the new Internal Register value as the original Internal Register value divided by the value in "Value" field.

iii Set up the value in the "Value" field, PMC provides the following 8 value options to be used in the "Value" field:

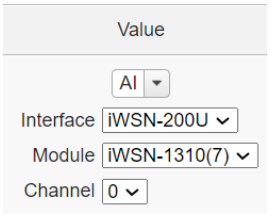
- User-Defined: Input a User-Defined value under the "Value" field.



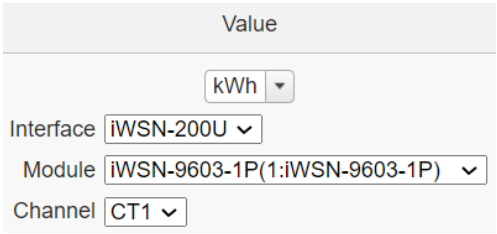
- Internal Register: Select the number of the Internal Register from the dropdown list.



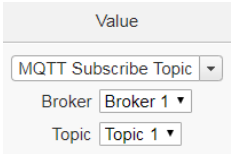
- AI: Using AI channel values from iWSN I/O module, select the module and channel from the dropdown list to specify which channel value will be used.



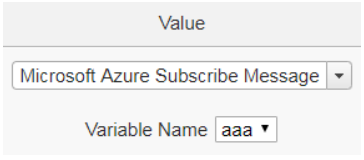
- Power Meter: using the power data of the Power Meter; select the type of power data from the dropdown list first (It provide as "Basic Values", "Statistical Values" and "Others Information" for selection). And then select the power meter and loop(or phase) from the dropdown list to specify which power meter and loop(or phase) value will be used.



- MQTT: using the value of MQTT subscribe topic, select the broker and the subscribe topic from the dropdown list to specify which value will be used.

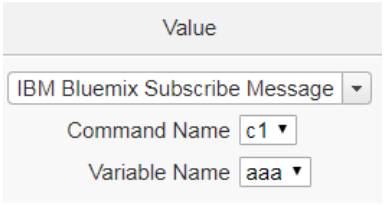


- Azure: using the value of Azure received paremeter, select the parameter from the dropdown list to specify which value will be used.



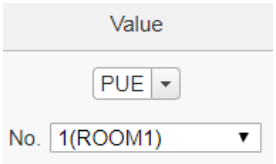
- Bluemix: using the value of Bluemix received paremeter, select

the command and the parameter from the dropdown list to specify which value will be used.



Please Note: The content of received MQTT subscribe topic or Azure / Bluemix parameter must be a number, otherwise 0 will be assigned.

- PUE: using value of PUE, select the No of PUE from the dropdown list to specify which PUE value will be used.



iv Specify the "Frequency" to be "One-Time" or "Repeat".

v Click "OK" button to confirm the settings and return to the Rule settings page.

11.2.16 Delay

Users can add the Delay action to define the delay time before the execution of next actions. The editing page for Delay Action Setting is shown as below:

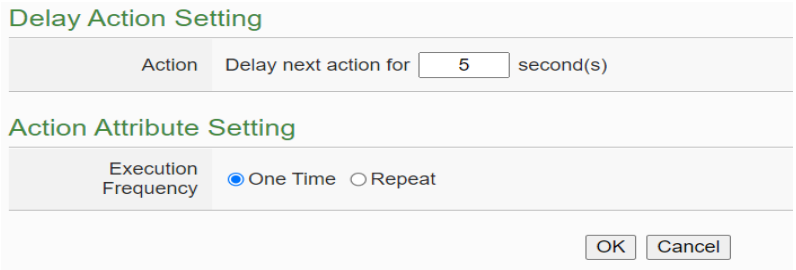


Figure11-42 : Delay action setting page

Follow the steps below:

ii In the "Action" field, set the delay time (unit: second) before the execution of next actions. The counting of the delay time would start when the previous action starts, rather than when the previous action

is done.

iii Specify the “Execution Frequency” to be “One Time” or “Repeat”. Please refer to “11.2 THEN/ELSE Action Setting” for detail.

iv Click “OK” button to confirm the settings and return to the Rule settings page.

Appendix I：Modbus Address Table

PMC allows SCADA software or HMI device to retrieve the power data, I/O channel data and system information via Modbus TCP/RTU protocol. PMC register addresses are specified according to Modbus register mapping tables (more detailed information will follow).

Please Note:

- The addresses are in **Base 0** format
- The addresses are in **Decimal** format
- The **default value of NetID is 1,** and you can modify the NetID value in the Network Setting page. (Please refer to 6.2 Network Setting).
- If the data is displayed in Floating format, each record of data will take two registers to hold the data. The following code example demonstrates how to join the two registers into one floating point value.

```
float register_to_float(short r1, short r2)
{
    float f;
    int *a = &f;
    *a = r1;
    a++;
    *a = r2;
    return f;
}
```

For the compilers are different (big endian or little endian) the floating point composing order might be different. For example: if r1 represent the address of 30100 register and r2 represent the address of 30101 register, to join r1 and r2 to a floating point, if the system is big endian system you will need to call:

float value = register_to_float(r1, r2);

On the other hand, if the system is little endian system, you will need to call:

float value = register_to_float(r2, r1);

Please Note:

1. If you are not sure your compiler belongs to which system, try both ways to find the accurate one.
2. The way to join the two registers value into DWORD is similar to Floating point; change the return value to DWORD or Unsigned Long.

PMC Modbus Address Table

Modbus Address	00000 (Coil Output)	10000 (Discrete Input)	30000 (Input Register)	40000 Holding Register
0~59	PMC System Data			
60~62		Connection Status of iWSN-200 concentrators	Model of iWSN-200 concentrators	Disconnection Check Value of iWSN-200 concentrators
108~171			IP address for iWSN-200E (4*16)	
172~199				
300~319	PUE Data			
400~539				Internal Register Data
1000~10299	The data block for iWSN Power Meter & I/O Module which connect to iWSN Concentrator 1			
11000~20299	The data block for iWSN Power Meter & I/O Module which connect to iWSN Concentrator 2			
21000~30299	The data block for iWSN Power Meter & I/O Module which connect to iWSN Concentrator 3			

More detailed information for each block, please refer to following sections.

(1) PMC System Data

This block stores the system information of PMC, shown as below:

Parameter Name	Modbus Address	Length	Data Type	Range
[1x] Discrete Input, Unit : Coil(8 Bits)				
Local FTP Server	100000	1	Byte	0=Disable 1=Enable
[3x] Input Register, Unit : Register(16 Bits)				
Module Name	300000	1	UInt16	0~65535
Firmware Version	300002	2	Float	Floating Point

Serial Number 1	300004	1	UInt16	0~65535
Serial Number 2	300005	1	UInt16	0~65535
Serial Number 3	300006	1	UInt16	0~65535
Serial Number 4	300007	1	UInt16	0~65535
Serial Number 5	300008	1	UInt16	0~65535
Serial Number 6	300009	1	UInt16	0~65535
Serial Number 7	300010	1	UInt16	0~65535
Serial Number 8	300011	1	UInt16	0~65535
Boot Date(Year)	300012	1	UInt16	1752~
Boot Date(Month)	300013	1	UInt16	1~12
Boot Date(Day)	300014	1	UInt16	1~31
Boot Time(Hour)	300015	1	UInt16	0~23
Boot Time(Minute)	300016	1	UInt16	0~59
Boot Time(Second)	300017	1	UInt16	0~59
Alive Count	300018	1	UInt16	0~65535
Cycle Time	300019	1	UInt16	0~65535(ms)
COM 3 Connection Status	300021	1	UInt16	0=Offline, 1=Online Each bit represents a module.
COM 4 Connection Status	300022	1	UInt16	
LAN Connection Status	300023	1	UInt16	
COM3 Update Rate	300025	1	UInt16	0~65535(ms)
COM4 Update Rate	300026	1	UInt16	0~65535(ms)
Modbus Slave NetID	300028	1	UInt16	1~247
Modbus TCP Port	300029	1	UInt16	1~65535
Web Port	300030	1	UInt16	1~65535
SMS Register Status	300031	1	UInt16	1~65535
Mobile Network Signal Strength	300032	1	Int16	-32768~32767(dbm)
Mobile Network Signal Strength (Percent)	300033	1	Int16	0, 20, 40, 60, 80, 100
micro SD Free Space	300034	1	UInt16	0~65535(MB)
FTP Upload Status	300035	1	Int16	-1=Initializing 0=Failed 1=Success
Contract Capacity	300036	2	Float	0~99999999(kW)
Carbon Emissions Factor	300038	2	Float	0.001~99999999
Calculation Interval for Demand	300040	1	UInt16	15/30/60(minutes)

(2) COM 3 / COM4 / LAN iWSN-200 Concentrator Connection Status

This block stores the connection status of iWSN-200 concentrators that are connected to the PMC, detailed information is shown as below:

Parameter Name	Modbus Address	Length	Data Type	Range
[1x] Discrete Input, Unit : Coil (8 Bits)				
The connection status of iWSN-200 Concentrator 1	100060	1	Byte	0=Offline 1=Online
The connection status of iWSN-200 Concentrator 2	100061	1	Byte	0=Offline 1=Online
The connection status of iWSN-200 Concentrator 3	100062	1	Byte	0=Offline 1=Online

(4) Internal Register Data

This block stores the Internal Register data provided by PMC. For PMC, it provides 70 sets of Internal Register.

Parameter Name	Modbus Address	Length	Data Type	Range
[4x] Holding Register, Unit : Register(16 Bits)				
Internal Register 1	400400	2	Float	Floating Point
Internal Register 2	400402	2	Float	Floating Point
Internal Register 3	400404	2	Float	Floating Point
Internal Register 4	400406	2	Float	Floating Point
Internal Register 5	400408	2	Float	Floating Point
Internal Register 6	400410	2	Float	Floating Point
Internal Register 7	400412	2	Float	Floating Point
Internal Register 8	400414	2	Float	Floating Point
⋮				
Internal Register 45	400488	2	Float	Floating Point
Internal Register 46	400490	2	Float	Floating Point
Internal Register 47	400492	2	Float	Floating Point
Internal Register 48	400494	2	Float	Floating Point
⋮				
Internal Register 67	400532	2	Float	Floating Point
Internal Register 68	400534	2	Float	Floating Point

Internal Register 69	400536	2	Float	Floating Point
Internal Register 70	400538	2	Float	Floating Point

(4) PUE Data

This block stores information of 10 user-defined PUEs.

Parameter Name	Modbus Address	Length	Data Type	Range
[3x] Input Register, Unit : Register(16 Bits)				
PUE 1	300300	2	Float	Floating Point
PUE 2	300302	2	Float	Floating Point
PUE 3	300304	2	Float	Floating Point
PUE 4	300306	2	Float	Floating Point
PUE 5	300308	2	Float	Floating Point
PUE 6	300310	2	Float	Floating Point
PUE 7	300312	2	Float	Floating Point
PUE 8	300314	2	Float	Floating Point
PUE 9	300316	2	Float	Floating Point
PUE 10	300318	2	Float	Floating Point

(5) Module Data

This block is used to store all power data of iWSN power meters and I/O channel data of iWSN I/O modules which connect to PMC through iWSN-200 concentrator. Depend on different configuration of iWSN power meters and I/O modules, the arrangement of data block will be different.

If you need the detail Modbus address information of the iWSN power meters and I/O modules, pleaes refer to “Modbus Table Information” section for detail.

Appendix II：Reset to Factory Default Setting and Send Password to Administrator

During the operation of PMC, if the hardware system setting data is lost or encounters any abnormal problem that you would like to reset the system to factory default, please switch the Rotary Switch to specific positions to restore factory settings or to ask PMC to send the login password to the Email account of the Administrator. In addition, you can switch the Rotary Switch to the specific position to delete the data logger files and reset the accumulated values of the power meter which connect to PMC. The following figure shows the location of the Rotary Switch.

The function of the position of the Rotary Switch：

Rotary Switch	Function
7	Restore network settings to factory default.
8	■ Send the login password to the Email account of the Administrator. ■ Delete the data logger files and reset the accumulated values of the power meter.
9	Reset all password settings.

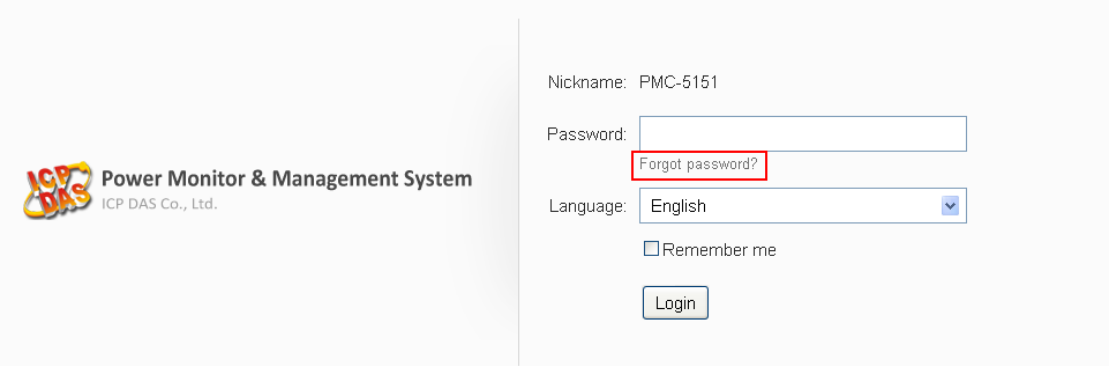
Please follow the steps below to restore network settings to factory default or send the login password to the Email account of the Administrator:

- Restore network settings to factory default
  1. Power off the PMC.
  2. Switch the Rotary Switch to position 7.
  3. Power on the PMC, when the RUN/PWR LED Indicator turns to be Orange(ON state), it indicates that the setting is completed.
  4.

IP Address	LAN1：192.168.255.1 LAN2：192.168.255.2
Subnet Mask	255.255.0.0
Gateway	192.168.0.1
DNS	8.8.8.8
Port for Web Server	80
Port for Modbus TCP	502
Modbus TCP NetID	1

5. Switch the Rotary Switch to position 0

- Send the login password to the Email account of the Administrator
  1. Switch the Rotary Switch to position 8.
  2. Connect to PMC Login webpage via Web browser. Now a “Forget password” message will be displayed under the password field. Click the “Forget password” message, then the system will send the both passwords of the Administrator and the General User to the Email account of the administrator that was previously set by the user in “6.4 Security Setting” section.



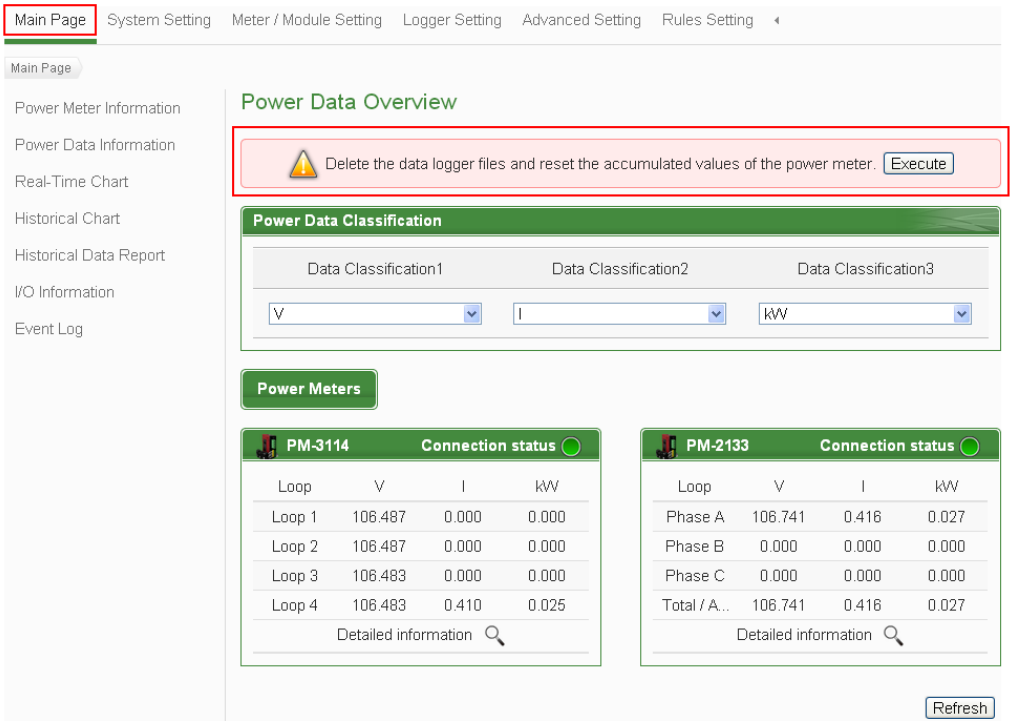
The following figure illustrate an example of the Email the PMC sends to the Email account of the Administrator. The Email content will include the password of the Administrator, the password of the General User and the password of the FTP Server of PMC.

```
Administrator password is "Admin".
Guest password is "User".
Local FTP password is "Admin".
```

3. Switch the Rotary Switch to position 0.

- Delete the data logger files and reset the accumulated values of the power meter.

1. Switch the Rotary Switch to position 8.
2. Connect to PMC login webpage via Web browser, and login as the Administrator.
3. After login into the system, the message box of “Delete the data logger files and reset the accumulated values of the power meter” will be displayed in the PMC Main page. Click the “Execute” button for the reset and files delete operation.



4. Switch the Rotary Switch to position 0.

Appendix III：The SNMP Variables for PMC

The PMC provides SNMP (Simple Network Management Protocol) Agent to work with the SNMP Network Management software for monitoring the system data, power meter data and I/O module data. The following table lists the SNMP variables for the PMC.

●RFC1213 MIB II Supported SNMP Variables

The following SNMP variables are built into the PMC SNMP Agent and are compliant with RFC1213 MIB II.

MIB II	**System**	SysDescr	SysObjectID	SysUpTime
		SysContact	SysName	SysLocation
		SysServices		
	Interface	IfNumber	ifIndex	ifDescr
		IfType	ifMtu	ifSpeed
		ifPhysAddress	ifAdminStatus	ifOperStatus
		ifLastChange	ifInOctets	ifInUcastPkts
		ifInNUcastPkts	ifInDiscards	ifInErrors
		ifInUnknownProtos		ifOutOctets
		ifOutUcastPkts	ifOutNUcastPkts	ifOutDiscards
		ifOutErrors	ifOutQLen	ifSpecific
	IP	ipForwarding	ipDefaultTTL	ipInReceives
		ipInHdrErrors	ipInAddrErrors	ipForwDatagrams
		ipInUnknownProtos		ipInDiscards
		ipInDelivers	ipOutRequests	ipOutDiscards
		ipOutNoRoutes	ipReasmTimeout	ipReasmReqds
		ipReasmOKs	ipReasmFails	ipFragOKs
		ipFragFails	ipFragCreates	ipAdEntAddr
		ipAdEntIfIndex		ipAdEntNetMask
		ipAdEntBcastAddr		ipAdEntReasmMaxSize
		ipRouteDest	ipRouteIfIndex	ipRouteMetric1
		ipRouteMetric2	ipRouteMetric3	ipRouteMetric4
		ipRouteNextHop	ipRouteType	ipRouteProto
		ipRouteAge	ipRouteMask	ipRouteMetric5
		ipRouteInfo		pRoutingDiscards

	ICMP	icmpInMsgs	icmpInErrors	icmpInDestUnreachs
		icmpInTimeExcds	icmpInParmProbs	
		icmpInSrcQuenchs	icmpInRedirects	icmpInEchos
		icmpInEchoReps	icmpInTimestamps	
		icmpInTimestampReps		icmpInAddrMasks
		icmpInAddrMaskReps		icmpOutMsgs
		icmpOutErrors		icmpOutDestUnreachs
		icmpOutTimeExcds		icmpOutParmProbs
		icmpSrcQuenchs	icmpRedirects	icmpOutEchos
		icmpOutEchoReps		icmpOutTimestamps
		impOutTimestampReps		impOutAddrMasks
		impOutAddrMaskReps		
	TCP	tpRtoAlgorithm	tcpRtoMin	tcpRtoMax
		tcpMaxConn	tcpActiveOpens	tcpPassiveOpens
		tcpAttempFails	tcpEstabResets	tcpCurrEstab
		tcpInSegs	tcpOutSegs	tcpRetransSegs
		tcpConnState	tcpConnLocalAddress	
		tcpConnLocalPort	tcpConnRemAddress	
		tcpConnRemPort	tcpInErrs	tcpOutRsts
	UDP	UdpInDatagrams	UdpNoPorts	UdpInErrors
		UdpOutDatagrams	UdpLocalAddress	UdpLocalPort
	SNMP	SnmpInPkts	snmpOutPkts	
		snmpInBadVersions	snmpInBadCommunityNames	
		snmpInBadCommunityUses	snmpInASNParseErrs	
		snmpInTooBigs	snmpInNoSuchNames	
		snmpInBadValues	snmpInReadOnlys	snmpInGenErrs
		snmpInTotalReqVars	snmpInTotalSetVars	
		snmpInGetRequests	snmpInGetNexts	
		snmpInSetRequests	snmpInGetResponses	
		snmpInTraps	snmpOutTooBigs	
		snmpOutNoSuchNames	snmpOutBadValues	
		snmpOutGenErrs	snmpOutGetRequests	
		snmpOutGetNexts	snmpOutSetRequests	
		snmpOutGetResponses	snmpOutTraps	
		snmpEnableAuthenTraps		

● Private MIB File and SNMP Variables

PMC provides the SNMP Agent can be used to monitor the system status, power meter status and I/O module status with the SNMP Network Management software. You can find the PMC SNMP MIB file on the Software CD or from the ICP DAS PMMS Web site.

System	serialNumber	firmwareVersion	nickname
	systemCurrentTime	webserverPort	modbusTcpPort
	modbusTcpNetID	microSDFreeSpace	
	powerMeterAmount	ioModuleAmount	demandInterval
	contractCapacity	carbonEmissionsFactor	
	iwsn1Index	iwsn2Index	iwsn3Index
	iwsn1Interface	iwsn2Interface	iwsn3Interface
	iwsn1NodeID	iwsn2NodeID	iwsn3NodeID
	iwsn1ModuleName	iwsn2ModuleName	iwsn3ModuleName
	iwsn1OfflineGate	iwsn2OfflineGate	iwsn3OfflineGate
	iwsn1ConnectionStatus	iwsn2ConnectionStatus	
	iwsn3ConnectionStatus	iwsn1PollingTimeout	
	iwsn2PollingTimeout	iwsn3PollingTimeout	
iWSN Power Meter1 (On iWSN1)	iwsn1pm1Index	iwsn1pm1Interface	
	iwsn1pm1NodeID	iwsn1pm1ModuleName	
	iwsn1pm1StatusCode		
	iwsn1pm1ChSubmeterIndex	iwsn1pm1ChName	
	iwsn1pm1ChVoltage	iwsn1pm1ChCurrent	
	iwsn1pm1ChKW	iwsn1pm1ChKvar	iwsn1pm1ChKW
	iwsn1pm1ChPF	iwsn1pm1ChKWh	iwsn1pm1ChPF
	iwsn1pm1ChKVAh	iwsn1pm1ChActualDemand	
	iwsn1pm1ChForecastDemand	iwsn1pm1ChMaxDemandH	
	iwsn1pm1ChMaxDemandD	iwsn1pm1ChMaxDemandM	
	IwsnIpm1ChElectricityD	iwsn1pm1ChElectricityM	
	iwsn1pm1ChElectricityY		

The SNMP Variables naming rule of the iWSN Power Meter connected with PMC

1. Every power meter that is connected to PMC-224xM-iWSN provides the SNMP Variables as above (with its specific prefix denoted).
2. **The SNMP Variables naming rule of iWSN power meters on iWSN1**

   The Power Meter1 SNMP Variables are similar as listed information above but with prefix **iwsn1**pm**1**, the Power Meter2 SNMP Variables are similar to listed information above but with prefix **iwsn1**pm**2** instead**,** and the Power Meter31 SNMP Variables are also similar to the listed information above but with prefix **iwsn1**pm**31** instead**.**
3. **The SNMP Variables naming rule of iWSN power meters on iWSN2**

   The Power Meter1 SNMP Variables are similar as listed information above but with prefix **iwsn2**pm**1,** the Power Meter2 SNMP Variables are similar to listed information above but with prefix **iwsn2**pm**2** instead**,** and the Power Meter31 SNMP Variables are also similar to the listed information above but with prefix **iwsn2**pm**31** instead**.**
4. **The SNMP Variables naming rule of iWSN power meters on iWSN3**

   The Power Meter1 SNMP Variables are similar as listed information above but with prefix **iwsn3**pm**1, t**he Power Meter2 SNMP Variables are similar to listed information above but with prefix **iwsn3**pm**2** instead**,** and the Power Meter31 SNMP Variables are also similar to the listed information above but with prefix **iwsn3**pm**31** instead**.**

iWSN I/O Module1 (On iWSN1)	iwsn1io1Index	iwsn1io1Interface
	iwsn1io1NodeID	iwsn1io1ModuleName
	iwsn1io1ConnectionStatus	iwsn1io1DiscInputAmount
	iwsn1io1CoilOutputAmount	iwsn1io1InputRegAmount
	iwsn1io1HoldingRegAmount	iwsn1io1DiscInputIndex
	iwsn1io1DiscInputName	iwsn1io1DiscInputValue
	iwsn1io1DiscInputModbusAdd	iwsn1io1CoilOutputIndex
	iwsn1io1CoilOutputName	iwsn1io1CoilOutputValue
	iwsn1io1CoilOutputModbusAdd	
	iwsn1io1InputRegIndex	iwsn1io1InputRegName
	iwsn1io1InputRegValue	iwsn1io1InputRegModbusAdd
	iwsn1io1InputRegType	iwsn1io1InputRegScaleRatio
	iwsn1io1InputRegOffset	iwsn1io1InputRegDeadband
	iwsn1io1InputRegScaleMin	iwsn1io1InputRegScaleMax
	iwsn1io1HoldingRegIndex	iwsn1io1HoldingRegName
	iwsn1io1HoldingRegValue	iwsn1io1HoldingRegModbusAdd
	iwsn1io1HoldingRegType	iwsn1io1HoldingRegScaleRatio

<table>
<tr><td></td><td>iwsn1io1HoldingRegOffset</td><td>iwsn1io1HoldingRegDeadband</td></tr>
<tr><td colspan="3">The SNMP Variables naming rule of the iWSN I/O modules that are connected to PMC.
1. Every I/O module that is connected to PMC-523x/PMC-224x provides the SNMP Variables as above (with its specific prefix denoted).
2. The SNMP Variables naming rule of the iWSN I/O modules on iWSN1
The I/O Module1 SNMP Variables are shown as above (with prefix iwsn1io1), the I/O Module2 SNMP Variables are similar to listed information above but with prefix iwsn1io2 instead, and the I/O Module31 SNMP Variables are also similar to the listed information above but with prefix iwsn1io31 instead.
3. The SNMP Variables naming rule of the I/O modules on iWSN2
The I/O Module1 SNMP Variables are similar as listed information above but with prefix iwsn2io1, the I/O Module2 SNMP Variables are similar to listed information above but with prefix iwsn2io2 instead, and the I/O Module31 SNMP Variables are also similar to the listed information above but with prefix iwsn2io31 instead.
4. The SNMP Variables naming rule of the I/O modules on iWSN3
The I/O Module1 SNMP Variables are similar as listed information above but with prefix iwsn3io1, the I/O Module2 SNMP Variables are similar to listed information above but with prefix iwsn3io2 instead, and the I/O Module31 SNMP Variables are also similar to the listed information above but with prefix iwsn3io31 instead.</td></tr>
<tr><td rowspan="2">otherInfo</td><td colspan="2">irIndex</td><td>irName</td><td colspan="2">irValue</td></tr>
<tr><td>pueIndex</td><td>pueName</td><td>pueTotalEnergy</td><td>pueITEnergy</td><td>pueValue</td></tr>
</table>

Appendix IV：The format of CGI Query command

PMC supports the HTTP protocol to retrieve the Power data value, I/O channel value, Internal Register value or system information. In addition, PMC also supports the JSON format for message exchange. JSON is a popular format; it can reduce the loading of data transfer, and is easy to be integrated with other Network system.

- **CGI Query command**

  The following is the format of CGI Query command:

  ```
  http://IP address:port/dll/query.dll?command
  ```

  The “IP address” is the actual IP address that the PMC is using now. The default IP address is “192.168.255.1”. The “Port” is the port number of Web server port of PMC. The default port number is “80”. If the port number is 80, you can skip it in the setting.

  The Command consist a set of parameters. Each parameter consist one name and one value. The name and the value of a parameter are linked by symbol “=”. The parameters are linked by symbol “&”. Depended on the query items, follow the format to include the corresponding parameters in each CGI command.

- **CGI Query Authentication**

  The CGI Query Authentication have to be added to the CGI command. It consist two parameters: “id” and “password”. The value of “id” is for the user account, and the value of “password” is for the password.

  The following is an example of the CGI Query command shows querying the value of the Internal Register 1 of PMC with CGI Query Authentication.

  ```
  http://192.168.255.1/dll/query.dll?id=admin&password=Admi
  n&job=get_ir_val&ir_no=1
  ```

  In this example, “admin” is the user account, “Admin” is the password. If the user account or password is in error status, then the system will return the following status message.

  ```
  {
     "status": "PASSWORD_ERROR"
  }
  ```

In the CGI Query command, it consist two parameters: “job=get_ir_val” and “ir_no=1”. For “job=get_ir_val”, “job” is the name of the first parameter, “get_ir_val” is the value of the first parameter. The first parameter is used to query the value of Internal Register of PMC. And then for “ir_no=1”, “ir_no” is the name of the second parameter, “1” is the value of the second parameter. The combination of first parameter and second parameter indicates to query the value of Internal Register 1 of PMC. When PMC receives the CGI Query command, it will reply the following message to the command sender.

```
{
   "status": "OK",
   "result": {
      "value": 2.3
   }
}
```

The returned value will be shown in the JSON format. In the above example, the value of Internal Register 1 is 2.3. It is located in “value” section of the “result” area.

- **JSONP Supported**

If user wants to enable the JSONP, he/she can add an extra parameter “callback” to the original CGI command, and then assign the value of the “callback” parameter to the function which is used to receive the returned values. The following is an example to enable the JSONP.

```
http://192.168.255.1/dll/query.dll?id=admin&password=Admi
n&job=get_ir_val&ir_no=1&callback=foo
```

In this example, the function named “foo” is used to receive the returned values. The returned values are as below.

```
foo({
   "status": "OK",
   "result": {
      "value": 2.3
   }
});
```

The following table gives detailed information of the query command, command parameters and returned values. For parameters “id”, “password” and “callback”, please refer to the examples in section above.

- **Get the specific channel value of the iWSN Power meter or I/O module.**

<table>
<tr><td>Command</td><td>Job=get_channel_val&concentrator_no=val&
module_no=val&ch_type=val&ch_addr=val
&submeter=val&ct_no=val (for Power meter)</td></tr>
<tr><td>Parameters</td><td>
<table>
<tr><td>Name</td><td>concentrator_no</td></tr>
<tr><td>Description</td><td>The index number of the iWSN concentrator</td></tr>
<tr><td>Value</td><td>Integer; start from 1.</td></tr>
</table>
<table>
<tr><td>Name</td><td>module_no</td></tr>
<tr><td>Description</td><td>The Node ID number of the iWSN module.</td></tr>
<tr><td>Value</td><td>Integer; start from 1.</td></tr>
</table>
<table>
<tr><td>Name</td><td>ch_type</td></tr>
<tr><td>Description</td><td>The channel type</td></tr>
<tr><td>Value</td><td>Power Meter：v, i, kw, pf, kwh,
kw_now,kw_predict, maxkw_hour,
maxkw_day, maxkw_month,
mwh_day, mwh_month, mwh_year
I/O Module：di, ai</td></tr>
<tr><td colspan="2">For Power Meter:
v: Voltage
i: Current
kw: kW
pf: PF
kwh: kWh
kw_now: Actual Demand
kw_predict: Forecast Demand
maxkw_hour: Max. Demand (Hourly)
maxkw_day: Max. Demand (Daily)
maxkw_month: Max. Demand (Monthly)
mwh_day: Daily Accumulated Electricity
mwh_month: Monthly Accumulated Electricity
mwh_year: Yearly Accumulated Electricity</td></tr>
</table>
<table>
<tr><td>Name</td><td>ch_addr</td></tr>
</table>
</td></tr>
</table>

	<table><tr><td>Description</td><td>The channel address</td></tr><tr><td>Value</td><td>The ch_addr is the channel sequence number starting from 0.</td></tr></table> For Power Meter: <table><tr><td>Name</td><td>submeter</td></tr><tr><td>Description</td><td>The submeter index of Power module</td></tr><tr><td>Value</td><td>For iWSN-9603 (three Phase), the submeter value is starting from 1 to 2. For iWSN-9603 (single Phase), the submeter value is 1.</td></tr></table> <table><tr><td>Name</td><td>ct_no</td></tr><tr><td>Description</td><td>The CT or phase number of Power meter</td></tr><tr><td>Value</td><td>ct_no: 1/2/3/4/5/6 For iWSN-9603 (single Phase), it refers to CT1/CT2/ CT3/CT4/CT5/CT6 channel For iWSN-9603 (three Phase), it refers to Phase A/ Phase B/ Phase C/ Total-Average channel.</td></tr></table>
Response	The channel is existed.

	<pre>{
	  "status": "OK",
	  "result": {
	  "value": 2.5,
	  "connection": "ONLINE" //or "OFFLINE"
	  }
	}</pre>

	The module or channel does not exist.

	<pre>{
	  "status": "CHANNEL_NOT_EXIST"
	}</pre>

	Password error
	{

	<pre>{
	  "status": "PASSWORD_INCORRECT"
	}</pre>

- **Get all channel value of the iWSN Power meter or I/O module.**

Command	job=get_module_val& concentrator_no=*val*&module_no=*val*
Parameters	<table><tr><td>Name</td><td>concentrator_no</td></tr><tr><td>Description</td><td>The index number of the iWSN concentrator</td></tr><tr><td>Value</td><td>Integer; start from 1.</td></tr></table> <table><tr><td>Name</td><td>module_no</td></tr><tr><td>Description</td><td>The Node ID number of the iWSN module.</td></tr><tr><td>Value</td><td>Integer; start from 1.</td></tr></table>
Response	The module is existed.

	If it is a iWSN Power Meter:
	<pre>{
	  "status": "OK",
	  "result": {
	  "v": [107.9,107.9,…], // list by channel
	  "i": [42.5,0,…],
	  "kw": [2.8,0,…],
	  "kvar": [0,0,…],
	  "kva": [0,0,…],
	  "pf": [0.63,0,…],
	  "kwh": [26696.54,2000.93,…],
	  "kvarh": [0,0,…],
	  "kvah": [0,0,…],
	  "kw_now": [2.873,0,…],
	  "kw_predict":[2.873,0,…],
	  "maxkw_hour": [2.881,0,…],
	  "maxkw_day": [2.892,0,…],
	  "maxkw_month": [3.076172,0,…],
	  "kwh_day": [3.712,0,…],
	  "kwh_month": [432.0645,0,…],
	  "kwh_year": [898.1973,0,…],
	  "connection": "ONLINE"// or "OFFLINE"
	  }
	}</pre>

	If it is a iWSN I/O module:
	{
	"status": "OK",
	"result": {
	"di": [0, 1, …],
	"do": [], //if there is no channel of this type.
	"ai": [0.2, 1.5, …],
	"ao": [], //if there is no channel of this type.
	"connection": "ONLINE" //or "OFFLINE"
	}
	}

	The module does not exist.

	{
	"status": "MODULE_NOT_EXIST"
	}

	Password error

	{
	"status": "PASSWORD_INCORRECT"
	}

- **Get the connection status of all iWSN modules.**

Command	job=get_module_status
Parameters	None
Response	Normal

	{
	"status": "OK",
	"result": {
	"concentrator1": [
	{
	"node_id": 1,
	"connection": "ONLINE"// or "OFFLINE"
	},
	…
	],
	"concentrator2": [
	{
	"node_id": 1,
	"connection": "ONLINE"// or "OFFLINE"
	},

	<pre> …
	    ]
	  }
	}</pre>

	Password error

	<pre>{
	  "status": "PASSWORD_INCORRECT"
	}</pre>

- **Set up the value of a specific Internal Register.**

Command	job=set_ir_val& ir_no=*val*&ir_value=*val*
Parameters	<table><tr><td>Name</td><td>ir_no</td></tr><tr><td>Description</td><td>The index number of the Internal Register.</td></tr><tr><td>Value</td><td>Integer; start from 1.</td></tr></table> <table><tr><td>Name</td><td>ir_value</td></tr><tr><td>Description</td><td>The value you want to assign to the Internal Register.</td></tr><tr><td>Value</td><td>Number</td></tr></table>
Response	The Internal Register is enabled.

	<pre>{
	  "status": "OK"
	}</pre>

	The Internal Register is disabled.

	<pre>{
	  "status": "INTERNAL_REGISTER_NOT_EXIST"
	}</pre>

	Password error

	<pre>{
	  "status": "PASSWORD_INCORRECT"
	}</pre>

- **Get the value of a specific Internal Register.**

<table>
<tr><td>Command</td><td>job=get_ir_val&
ir_no=val</td></tr>
<tr><td>Parameters</td><td>
<table>
<tr><td>Name</td><td>ir_no</td></tr>
<tr><td>Description</td><td>The index number of the Internal Register</td></tr>
<tr><td>Value</td><td>Integer; start from 1.</td></tr>
</table>
</td></tr>
<tr><td rowspan="6">Response</td><td>The Internal Register is enabled.</td></tr>
<tr><td><pre>{
  "status": "OK",
  "result": {
    "value": 12.5
  }
}</pre></td></tr>
<tr><td>The Internal Register is disabled.</td></tr>
<tr><td><pre>{
  "status": "INTERNAL_REGISTER_NOT_EXIST"
}</pre></td></tr>
<tr><td>Password error</td></tr>
<tr><td><pre>{
  "status": "PASSWORD_INCORRECT"
}</pre></td></tr>
</table>

- **Get the value of all Internal Registers which are enabled.**

<table>
<tr><td>Command</td><td>job=get_irs_val</td></tr>
<tr><td>Parameters</td><td>None</td></tr>
<tr><td rowspan="2">Response</td><td>Normal Status</td></tr>
<tr><td><pre>{
  "status": "OK",
  "result": [
    {
      "no": 1,
      "value": 100
    },
    …
  ]</pre></td></tr>
</table>

	}
	Password error
	{ "status": "PASSWORD_INCORRECT" }

- **Get the system time.**

Command	job=get_system_time
Parameters	None
Response	Normal Status
	{ "status": "OK", "result": { "time": "2014/07/24 14:11:28" } }
	Password error
	{ "status": "PASSWORD_INCORRECT" }

- **Get the current free space of the micro SD card.**

Command	job=get_sdcard_space
Parameters	None
Response	Normal Status
	{ "status": "OK", "result": { "free_space": 1560 //Free space. Unit is MB. } }
	No microSD card detected.

	<pre>{
	  "status": "SDCARD_NOT_EXIST"
	}</pre>

	Password error

	<pre>{
	  "status": "PASSWORD_INCORRECT"
	}</pre>

Appendix V：Change the value of output channel of module or Internal Register by MQTT protocol

PMC supports the MQTT protocol. User can use it to change the value of the Internal Register of PMC. Based on MQTT, user just needs to publish the specific topics to Broker, and PMC will automatically subscribe and receive the specific topics to complete the action. Following will list the format of Public topic to the related output channel of module and Internal Register.

- **The Internal Register**

<table>
<tr><td>Topic</td><td>Prefix/SET/ir/ir_no
<table><tr><td>Prefix</td><td>Please refer to 9.3 MQTT Setting</td></tr><tr><td>ir_no</td><td>1~70</td></tr></table></td></tr>
<tr><td>Message</td><td>Floating value</td></tr>
</table>

Appendix VI：The JSON format for the communication with IoT Platform

PMC supports the functions to publish the JSON format messages to Microsoft Azure and IBM Bluemix IoT Cloud platforms, and also subscribe/receive the JSON format messages from IoT Cloud platform to change the value of the output channel of I/O modules or power meter modules that are connected to PMC. The following lists the detailed information of JSON format message with PMC.

- **Message format**

{

<table>
<tr><td>"msg_type" :</td><td><table>
<tr><td>"CHANNEL_UPDATE"</td><td>The "CHANNEL_UPDATE" type of message indicates the message published by PMC to inform IoT Cloud platform the update of the power data or I/O channel data.</td></tr>
<tr><td>"CHANNEL_OUTPUT"</td><td>If PMC receives the message in the type of "CHANNEL_OUTPUT", then PMC will perform the task to change the value of the output channel.</td></tr>
</table></td></tr>
<tr><td>"concentrator_no" :</td><td>The number of iWSN concentrator(1~3)</td></tr>
<tr><td>"module_no" :</td><td>The number indicates the order that the data of the iWSN power module or I/O module being stored in the PMC Modbus Table. The range is 1~31.</td></tr>
<tr><td>"ch_type" :</td><td>It indicates the type of the power data or I/O data. The following table shows the code and the power data type or I/O channel type it represents.<table>
<tr><td>v</td><td>Voltage</td></tr>
<tr><td>i</td><td>Current</td></tr>
<tr><td>kw</td><td>kW</td></tr>
</table></td></tr>
</table>

		pf: PF kwh: kWh kw_now: Actual Demand kw_predict: Forecast Demand maxkw_hour: Max. Demand (Hourly) maxkw_day: Max. Demand (Daily) maxkw_month: Max. Demand (Monthly) mwh_day: Daily Accumulated Electricity mwh_month: Monthly Accumulated Electricity mwh_year: Yearly Accumulated Electricity di: DI Channel ai: AI Channel ir: Internal Register
"ch_addr"	:	It indicates the channel/loop/phase index or Internal Register number.
"nickname"	:	It indicates the nickname of the channel/loop/phase.
"value"	:	It indicates the real-time value of the channel/loop/phase.

}

- **Example**

  The following is the format to publish a message with kwh value of module number 5 to IoT Cloud platform. The module is connected to iWSN concentrator 1.

```
{
    "msg_type":"CHANNEL_UPDATE",
    "concentrator_no":1
    "module_no":5,
    "ch_type":"kwh",
    "ch_addr":2,
    "nickname":"kwh power data",
    "value":"101.33"
}
```

The following is a format to publish the message with the value of Internal Register 13 to IoT Cloud platform.

```
{
    "msg_type":"CHANNEL_UPDATE",
    "ch_type":"ir",
    "ch_addr":13,
    "nickname":"function result 1",
    "value":"63.87"
}
```

Appendix VII：PMC-224xM-iWSN LED Indicators

LED	LED Status	Modules Status
PWR(Green)	ON	The module is powered on.
RUN (Red)	ON	The module is functioning normally.
L1	ON	The mobile network is connected.
L2	Flashing	Data Log Transferring by FTP Upload Function

Appendix VIII：ICP DAS “IoTstar Trial” account application

IoTstar is a software developed by ICP DAS for WISE/PMC controllers in a variety of Industrial IoT applications. Using IoTstar to build the IoT Cloud system, it can provide the following major services:

- Controller Remote Access Service: Status Monitoring, System Setting, and Firmware Update for WISE/PMC controllers.
- Sensor Data Collection Service: Sensor data collected and imported into Database at cloud.
- Sensor Data Visualization Service: Review sensor data through Dashboard interface.
- Sensor Data Report Service: Review sensor data through statistical report.
- Bot Service with Mobile Phone: Query and monitor sensor data by mobile phone Bot service.

During the IoT Cloud system development, there is no-programming-required, and the system setting can be completed only through the web interface operation. In addition, through the SQL command, IoTstar can be quickly integrated with the Cloud platforms, data analysis tools (Power BI, Google Data Studio or SCADA system etc.) to help users quickly build the “IoT + Big Data” Cloud application.

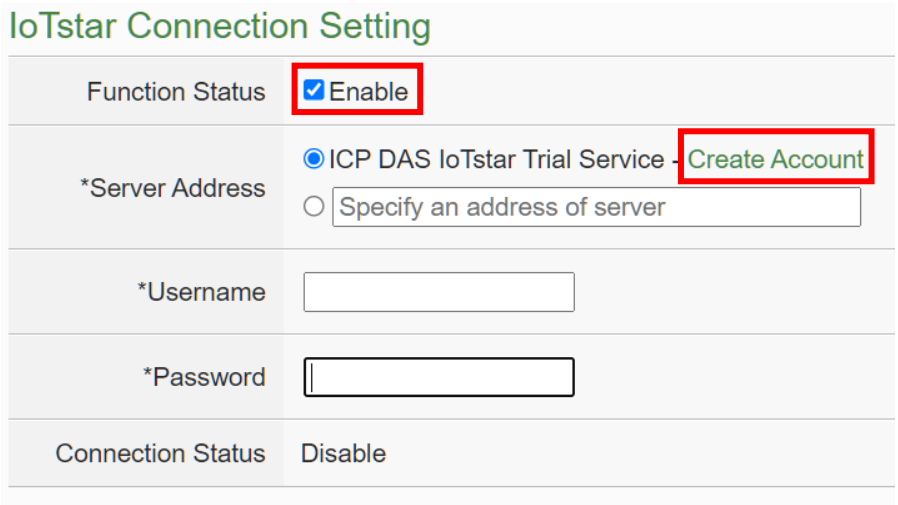
WISE/PMC users are welcome to experience the benefits of building a cloud IoT system through the "IoTstar+WISE/PMC" solution-the “IoTstar Trial” provided by ICP DAS. Users only need to complete the account application for “IoTstar Trial”, and then can use the WISE/PMC controller at hand and the “IoTstar Trial” provided by ICP DAS to actually perform the IoT cloud-based operations for WISE/PMC controllers.

Please note:

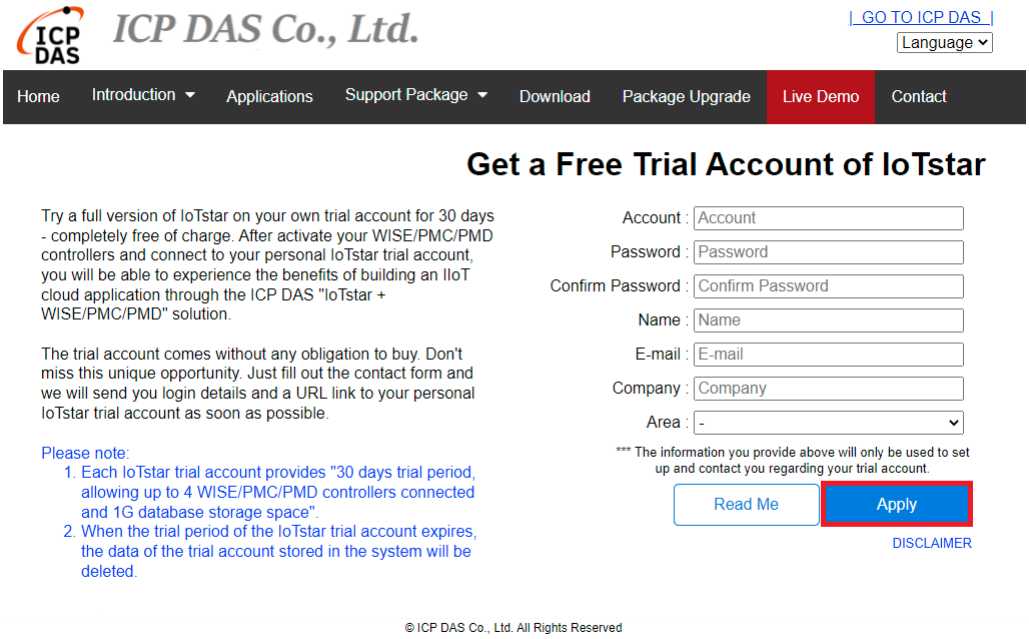
1. Each “IoTstar Trial” account provides "3 months trial period, allowing up to 4 WISE/PMC controllers connected and 1G database storage space".
2. IoTstar supports WISE-523x/WISE-2x4x series (with v1.6.0 or later version firmware), PMC-523x/PMC-2x4x/PMD series (with v3.6.0 or later version firmware) and PMC-224xM-iWSN(with v1.0.0 or later version). If the WISE/PMC does not install with the right firmware version. Please update the firmware.
3. When the trial period of the “IoTstar Trial” account expires, the data of the trial account stored in the system will be deleted.

For the account application of "IoTstar Trial", please refer to the following steps:

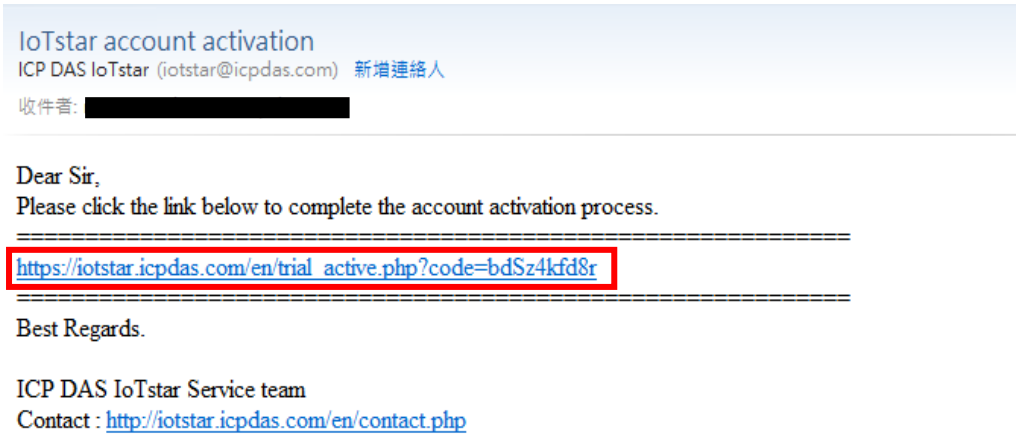
i. Click "Enable" in the "Function Status" field of the "System Setting→Network Setting→IoTstar Connection Setting" on the PMC page to open the parameter setting page of "IoTstar Connection Setting", then click the Create Account button next to "ICP DAS IoTstar Trial Service".



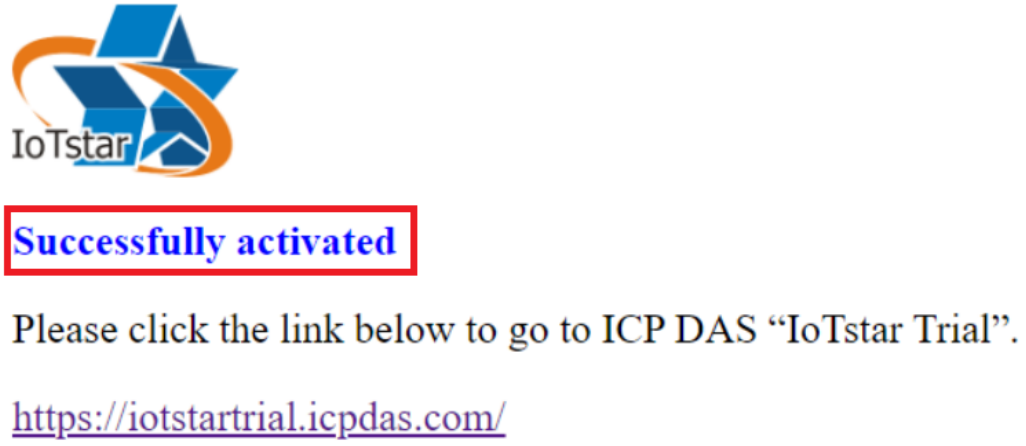
ii. On the account application page of "IoTstar Trial", enter the following information: "Account", "Password", "Name", "Email", "Company", "Area", and then click "Apply" button, the system will send an "Account Activation" email to the email address you entered.



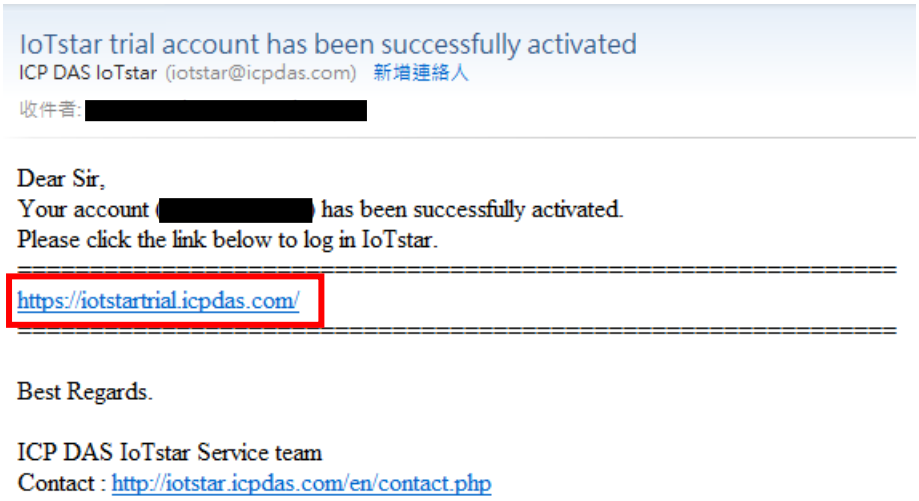
iii. Check your mailbox and find the “Account Activation” email sent by “IoTstar Trial”, and then click the link of the account application of “IoTstar Trial” provided in the email to complete the activation process of the trial account



iv. When the trial account is successfully activated, the page will display the “Successfully activated” message as below.



v. When the trial account is successfully activated, the “IoTstar Trial” will send a “Trial Account Activated” email to the email address you entered, click https://iotstartrial.icpdas.com to visit the login page of the “IoTstar Trial”.

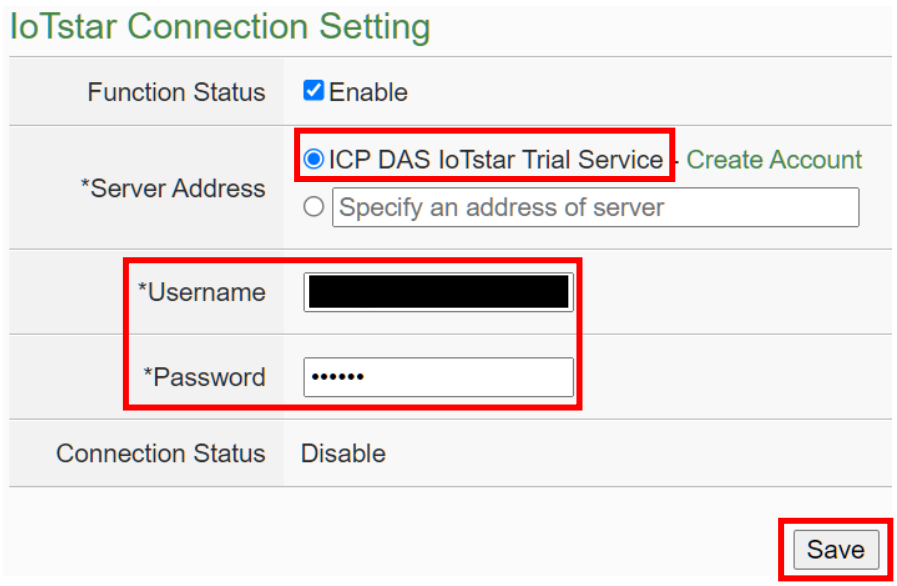

IoTstar trial account has been successfully activated
ICP DAS IoTstar (iotstar@icpdas.com) 新增連絡人
收件者: [redacted]

Dear Sir,
Your account ([redacted]) has been successfully activated.
Please click the link below to log in IoTstar.
==========
https://iotstartrial.icpdas.com/
==========

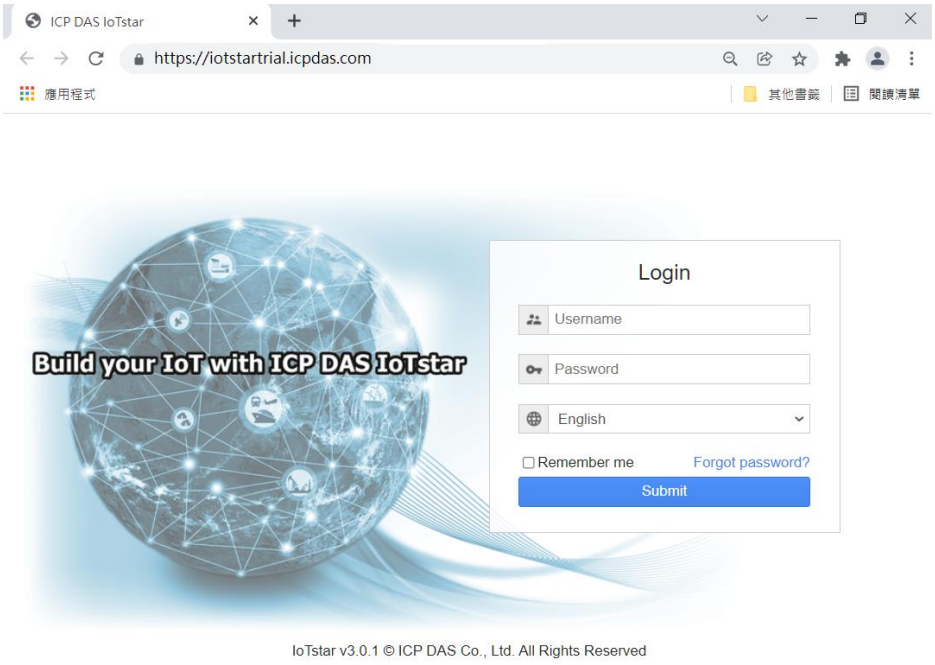
Best Regards.

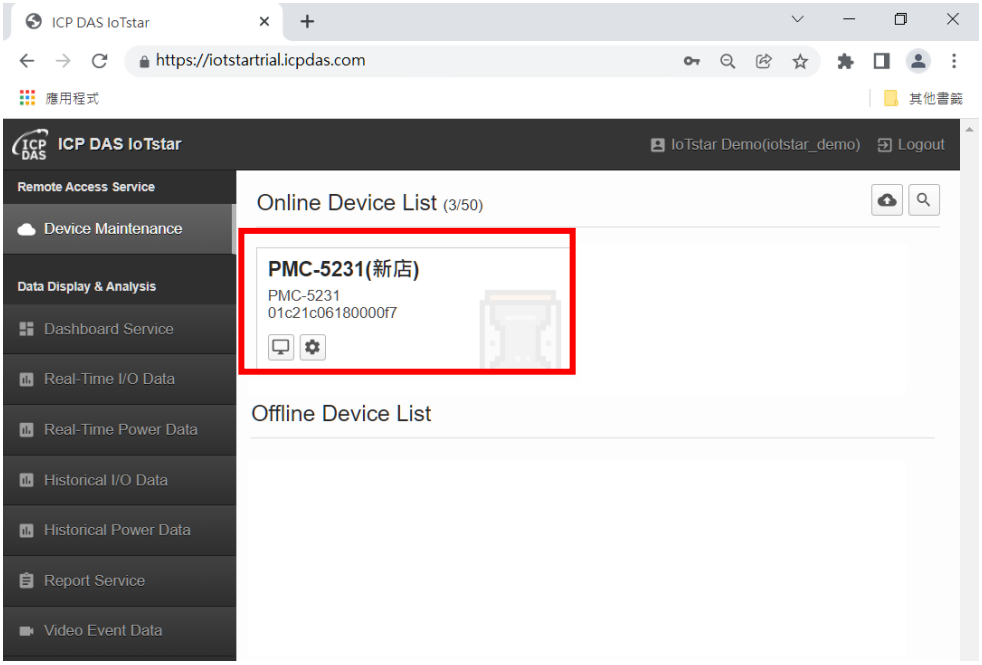
ICP DAS IoTstar Service team
Contact : http://iotstar.icpdas.com/en/contact.php

vi. Go back to the "IoTstar Connection Settings" page of PMC, and enter the "Username" and "Password" information you set in the step ii, click "Save" button to save the setting, then download the settings to PMC. After that, the PMC controller will connect to the "IoTstar Trial" account you applied.



vii. Go to https://iotstartrial.icpdas.com to visit the login page of the "IoTstar Trial", enter the "Account" and "Password" information you set in the step ii, then you can log in to the "IoTstar Trial" through the account you applied.
Now you can manage and change the setting of the PMC controller set in step vi and use the functions provided by IoTstar.





For more information about IoTstar IoT cloud management software, please refer to IoTstar official website.