User Manual for ICP DAS Power Management IoT Kit

-Microsoft Azure IoT Starter Kit-

[Version 1.0.0]

ICP DAS CO., LTD.

泓格科技股份有限公司

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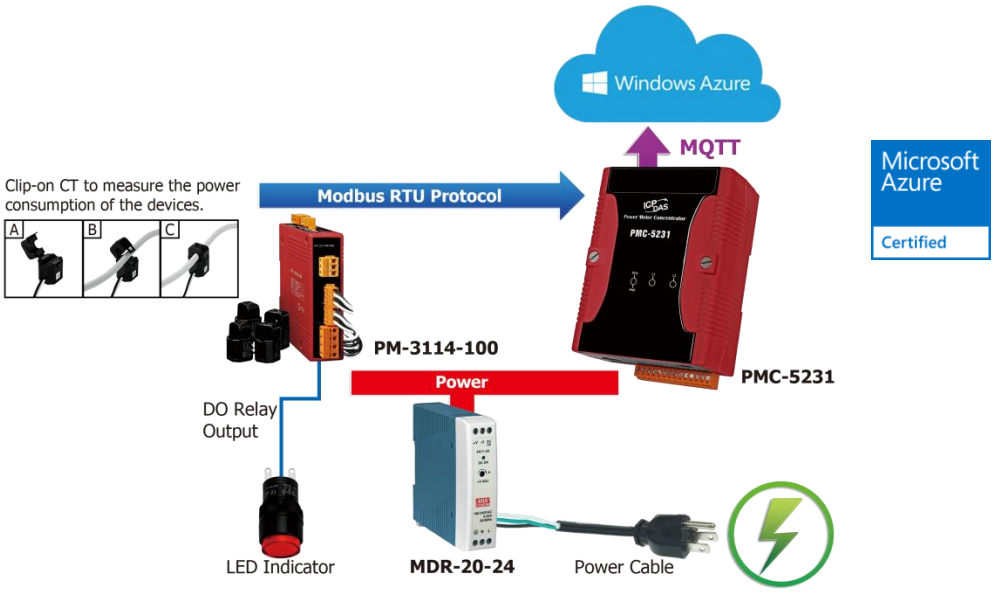
Table of Contents

1 Introduction

Microsoft and ICP DAS have teamed up to bring you the easy way to implement the Energy monitoring and management IoT (Internet of Things) Cloud system. The ICP DAS Power Management IoT Kit has been designed to help you seamlessly connect the ICP DAS power meters to the cloud with the Microsoft Azure IoT. This kit includes an ICP DAS PMC-5231, a ICP DAS PM-3114-100 4 Loops single-phase Power Meter, and a 24W Industrial Power Supply. There are also a LED Indicator and wires to help you set up your Energy monitoring and management system. Once your PMC-5231 is connected to Microsoft Azure you can start visualizing and analyzing your data.

Microsoft Azure is a leading provider of cloud computing and Microsoft Azure IoT Hub enables secure, reliable bi-directional communications between IoT endpoints such as sensors and the cloud. Azure IoT Hub supports a broad set of operating systems (Linux, Windows, RTOS etc.), protocols and common languages, so you can configure your connections to the devices.

PMC-5231 is a product developed by ICP DAS that functions as concentrator of ICP DAS Power Meter for the Energy monitoring and management system in the IoT age. It provides flexible integration with the ICP DAS power meters, and features various functions such as: measure the power consumption of the devices, data logger, energy usage analysis, power demand management and alarm notification functions. PMC-5231 offers a user-friendly and intuitive web site interface that allows users to implement an Energy monitoring and management system just a few clicks away; no programming is required. PMC-5231 also supports powerful Network connection ability for seamless integration with the Microsoft Azure IoT. So that the administrator can monitor the status of power consumption of each device and perform statistics and analysis of the power information, thus improving the overall efficiency in electricity consumption to save costs on utility bills. All of these features make PMC-5231 a perfect concentrator of power meter in the Energy monitoring and management application for Microsoft Azure IoT Cloud platform in the IoT age.



Features:

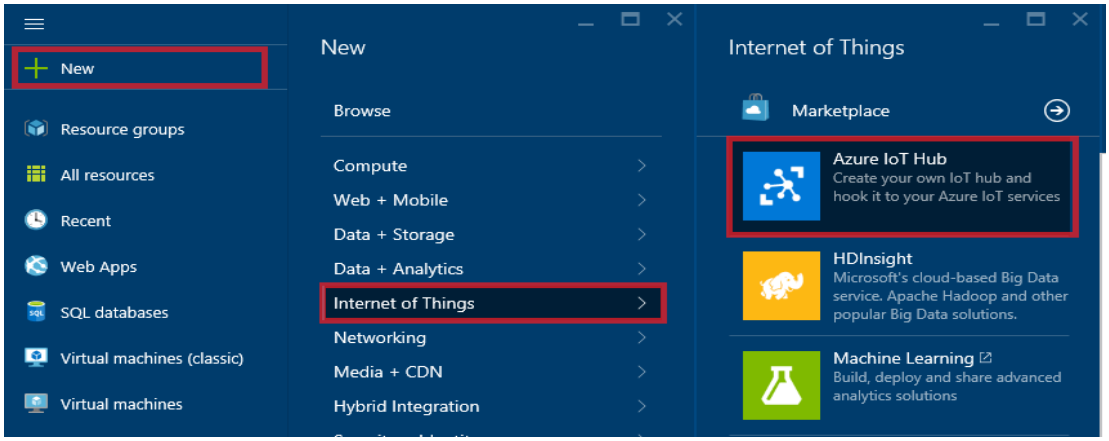
- ◆ Runs on browsers, no extra software tool is required.
- ◆ No more programming, user-friendly web pages are provided for building the IoT Cloud system.
- ◆ Ready-to-run Energy monitoring and management IoT Cloud solution: Includes an Intelligent Power Meter Concentrator, a power meter, and Microsoft Azure service.
- ◆ Completed Application Scenario: the power consumption measurement, power demand management and alarm notification can be performed at the field-site, and the power data can be transferred to Microsoft Azure IoT platform for energy using analysis.
  - ✧ Flexible integration with the power meter to measure the power consumption of the devices by Modbus protocol.
  - ✧ Flexible power demand management, data logger and alarm notification functions at field site.
  - ✧ Seamless integration with Microsoft Azure IoT service without programming.

What's in the Box?

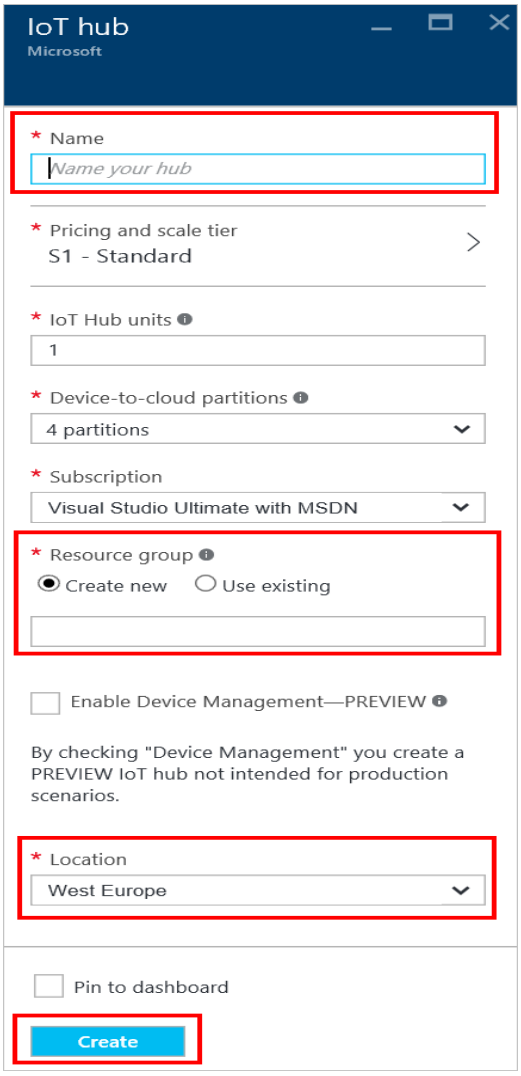
ICP DAS PMC-5231 Industrial IoT Power Meter Concentrator	**ICP DAS PM-3114-100** 4 Loops single-phase Power Meter	**ICP DAS MDR-20-24** 24W Industrial Power Supply
		
LED Indicator (RED)	**Power cable**	
		

2 Create an IoT Hub

i. In the Azure portal, click **New** > **Internet of Things** > **IoT Hub**.

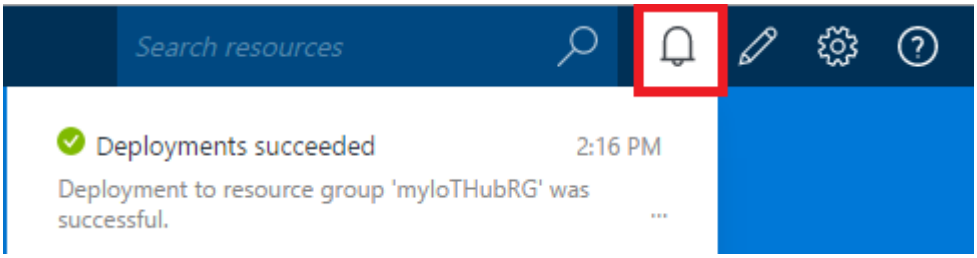


ii. In the IoT hub pane, enter the following information for your IoT hub:

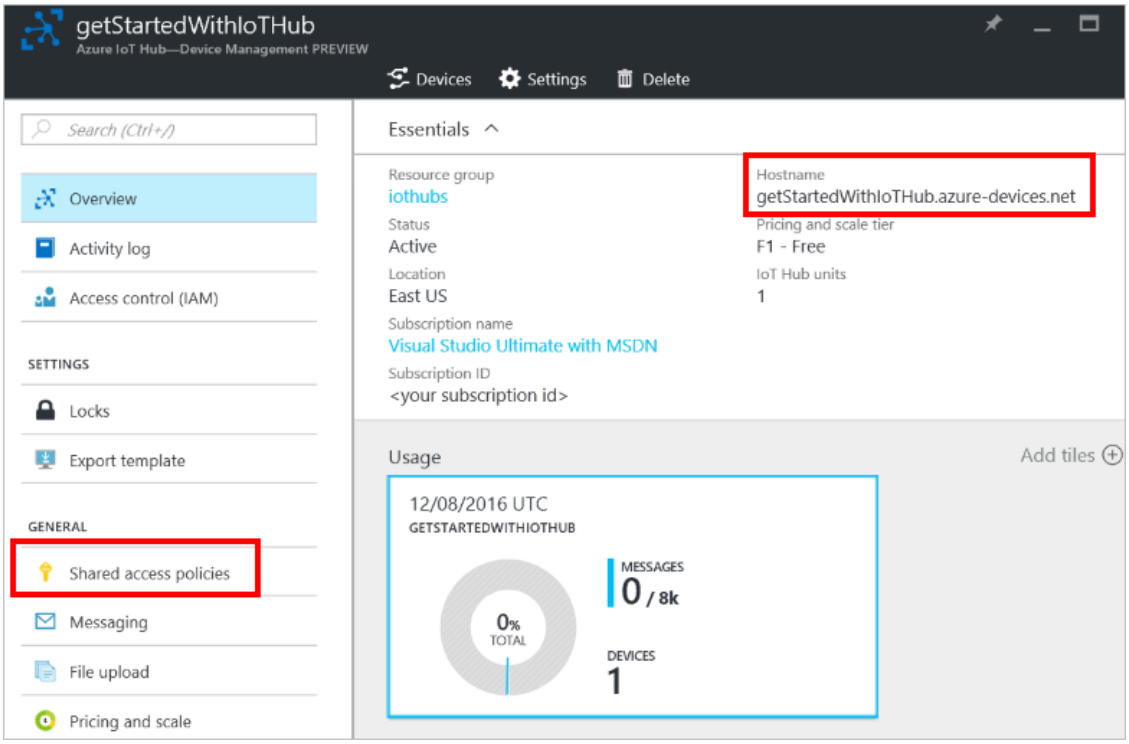


- In the **Name** box, enter a name to identify your IoT hub. When the **Name** is validated, a green check mark appears in the **Name** box.
- Change the **Pricing and scale tier** as desired. The getting started samples do not require a specific tier.
- In the **Resource group** box, create a new resource group, or select and existing one. For more information, see Using resource groups to manage your Azure resources.
- Use **Location** to specify the geographic location in which to host your IoT hub.

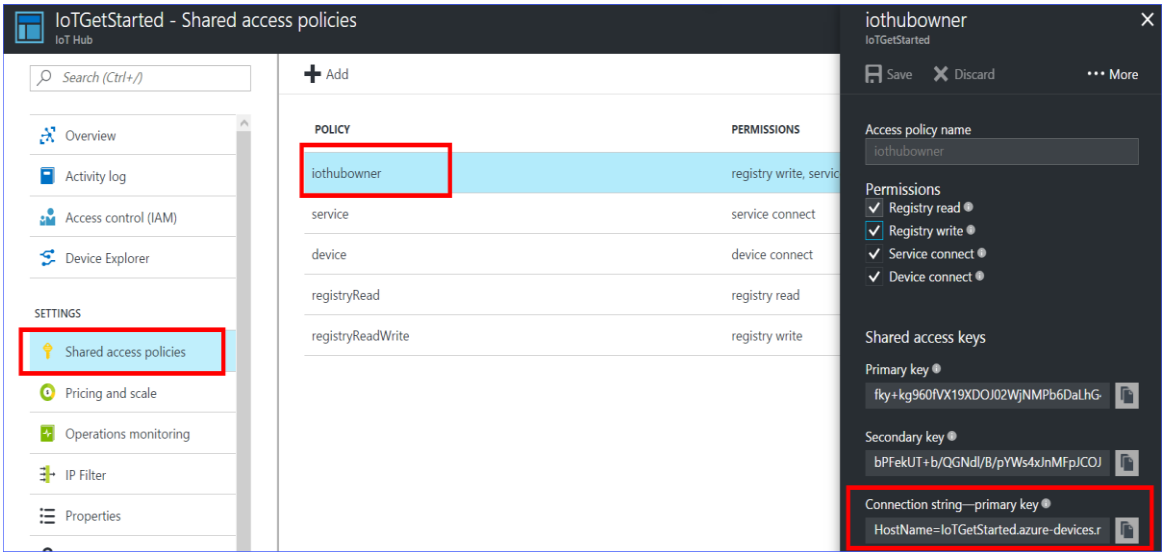
iii. Once the new IoT hub options are configured, click **Create**. It can take a few minutes for the IoT hub to be created. To check the status, you can monitor the progress on the Startboard. Or, you can monitor your progress from the Notifications section.



iv. After the IoT hub has been created successfully, open the blade of the new IoT hub, take note of the hostname URI, and click **Shared access policies**.

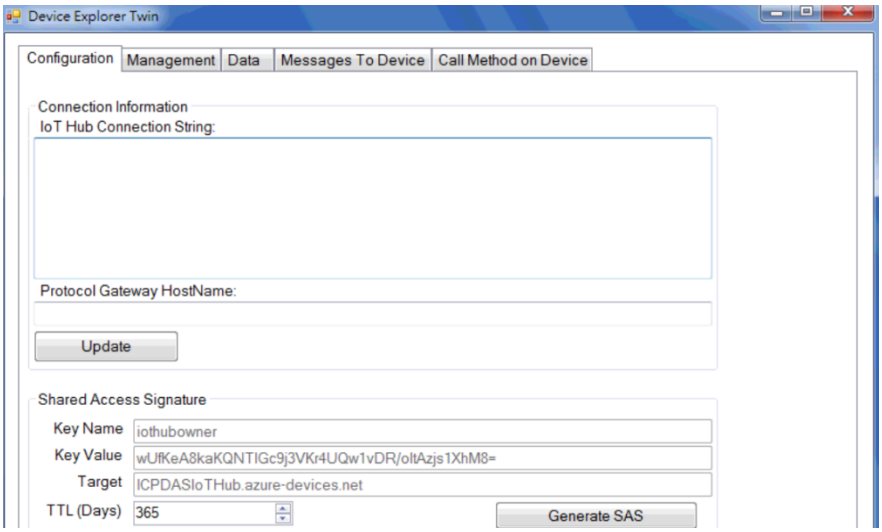


v. In the **Shared access policies** pane, click the **iothubowner** policy, and then copy and make a note of the **Connection string** of your IoT hub. For more information, see Control access to IoT Hub.

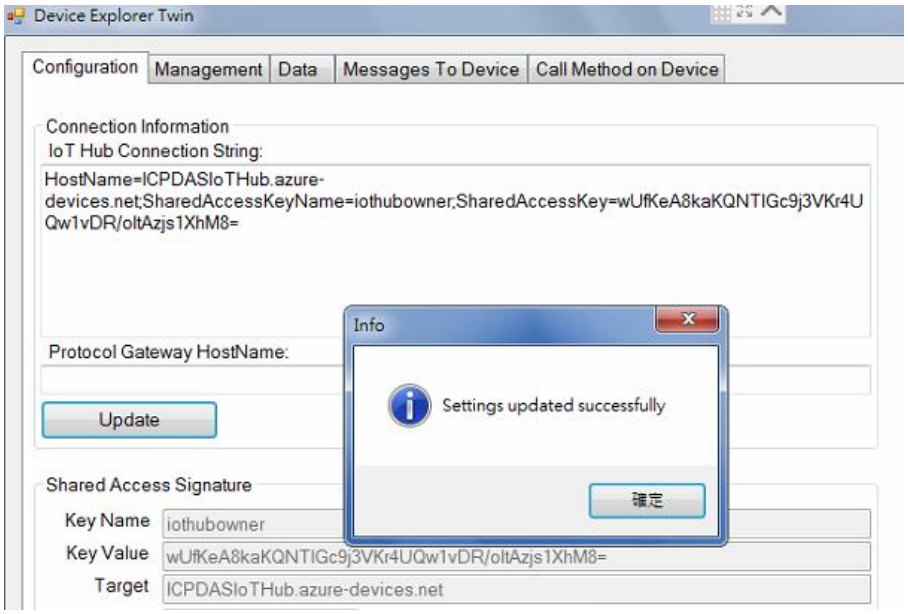

IoTGetStarted - Shared access policies
IoT Hub
Search (Ctrl+/)
Overview
Activity log
Access control (IAM)
Device Explorer
SETTINGS
Shared access policies
Pricing and scale
Operations monitoring
IP Filter
Properties
Add
POLICY
PERMISSIONS
iothubowner
registry write, servic
service
service connect
device
device connect
registryRead
registry read
registryReadWrite
registry write
iothubowner
IoTGetStarted
Save
Discard
More
Access policy name
iothubowner
Permissions
Registry read
Registry write
Service connect
Device connect
Shared access keys
Primary key
fky+kg960fVX19XDOJ02WjNMPb6DaLhG
Secondary key
bPFekUT+b/QGNdl/B/pYWs4xJnMFpJCOJ
Connection string—primary key
HostName=IoTGetStarted.azure-devices.r

3 Register a device for PMC-5231 in the IoT Hub

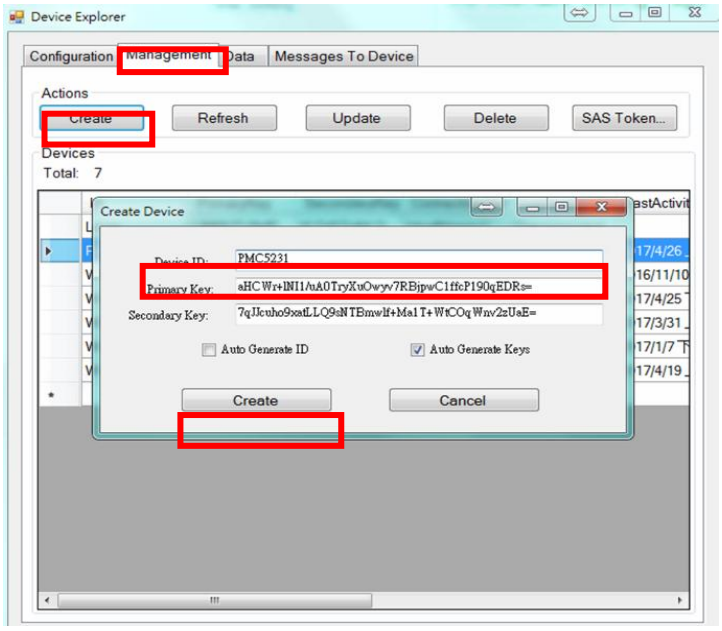
i. Download **SetupDeviceExplorer.msi** like link as below and install it.
https://github.com/Azure/azure-iot-sdks/releases



ii. Open and go to **Configuration** window, paste the **Connection String** of your IoT hub, and click the Update button, and then the Device Explorer connects to your IoT hub successfully

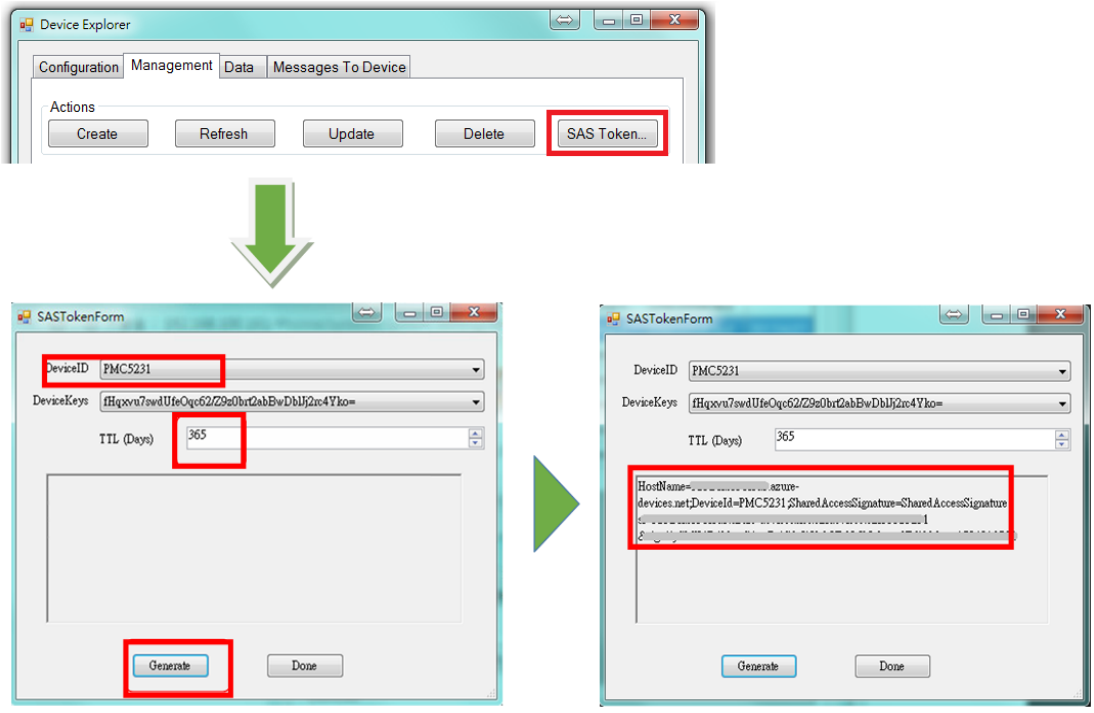


iii. Switch to the **Management** window and click the Create button to add the device. Key in the Device ID and press the Create button to create a new device in your IoT hub.



iv. Click the **SAS Taken** button to get SAS Token of the new device:

- Select the Device ID of PMC-5231.
- Set the TTL (Days) to 365. The TTL (Days) means the Time-To-Live days of this SAS Token.
- Press the **Generate** button.
- Copy and make a note of this SAS Token.

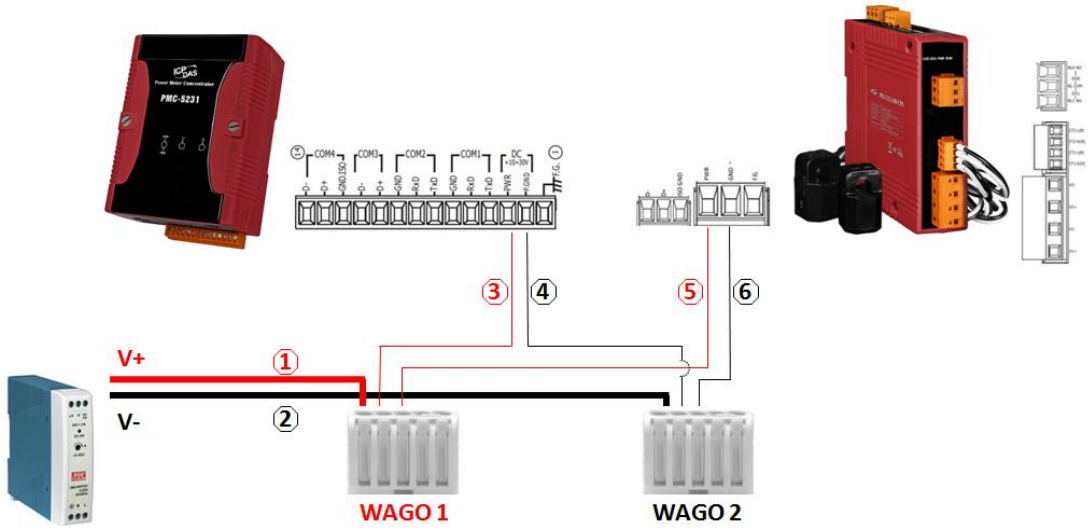


4 Setup Power Management IoT Kit

Connect the modules as bellow provided by the IoT Kit.

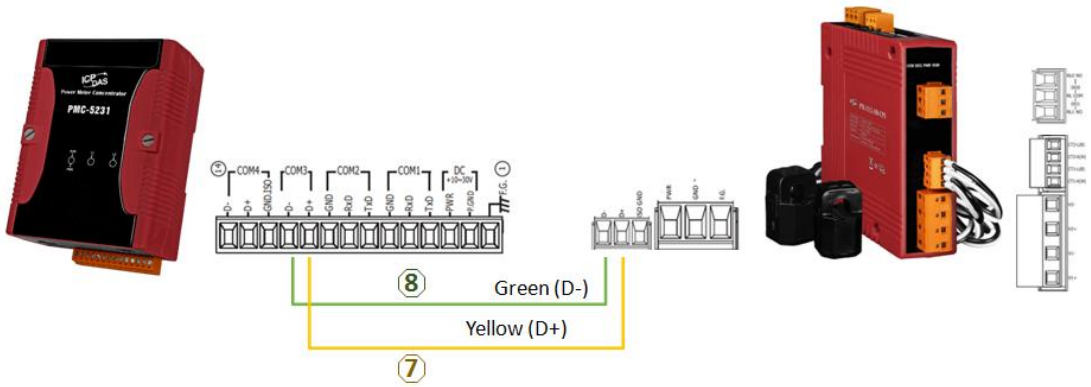
- PMC-5231
- PM-3114-100
- MDR-20-24
- LED Indicator (Red)
- Power cable

i. Please refer to the figure as below for the wiring of power.



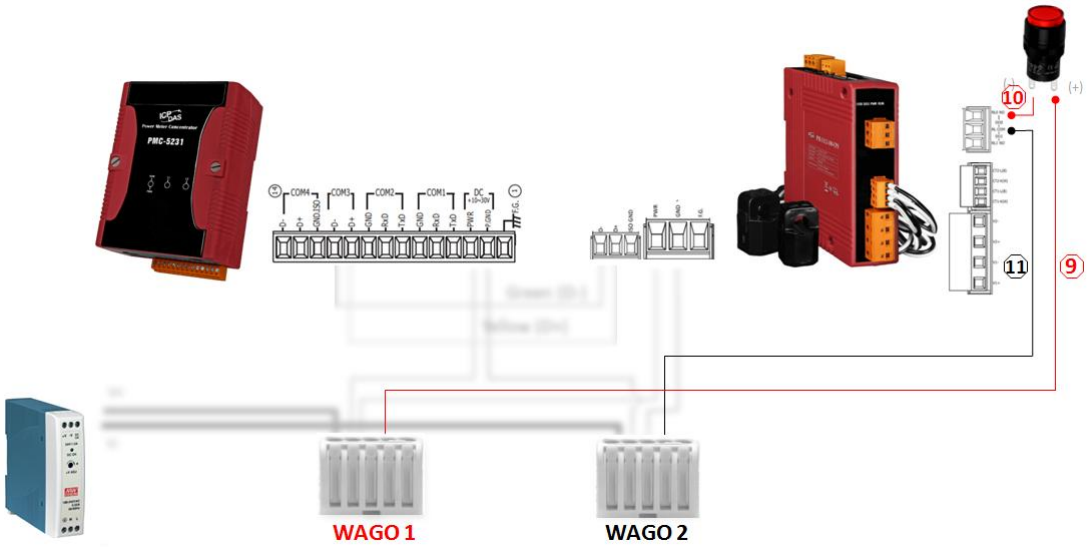
Step	Description
1	Use the red wire(30CM) to connect MDR-20-24 DC V+ with WAGO 1
2	Use the black wire(30CM) to connect MDR-20-24 DC V- with WAGO 2
3	Use the red wire(15CM) to connect PMC-5231 PWR with WAGO 1
4	Use the black wire(15CM) to connect PMC-5231 P.GND with WAGO 2
5	Use the red wire(15CM) to connect PM-3114 PWR with WAGO 1
6	Use the black wire(15CM) to connect PM-3114 GND with WAGO 2

ii. Please refer to the figure as below for the wiring of RS-485 communication.



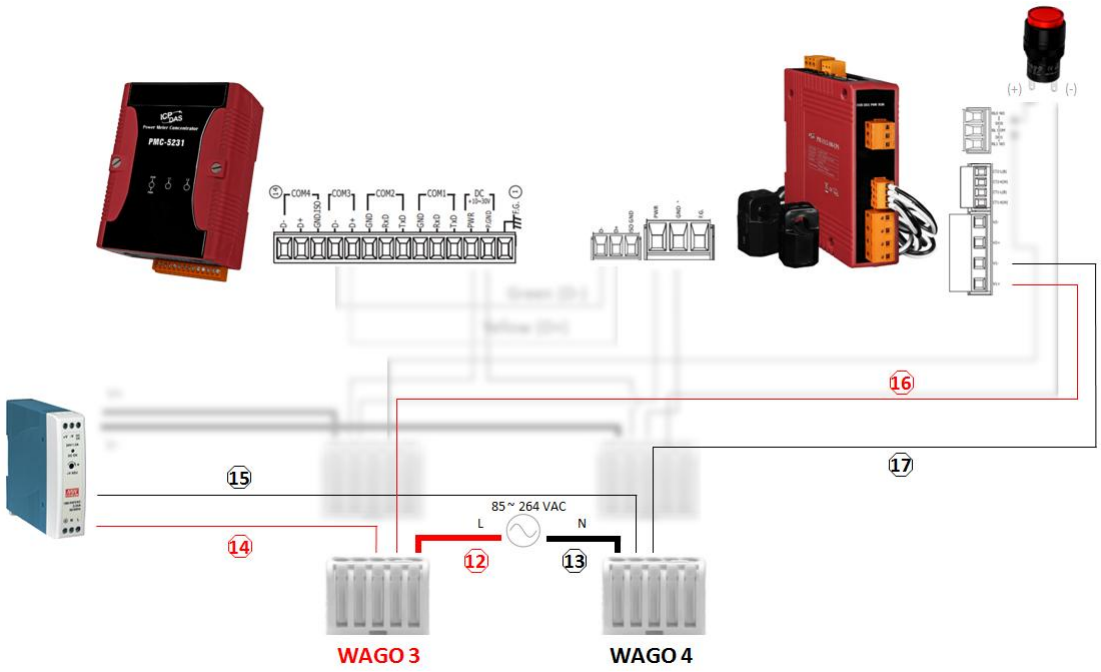
Step	Description
7	Use the yellow wire(30CM) to connect PM-3114 D+ with PMC-5231 COM3 D+
8	Use the green wire(30CM) to connect PM-3114 D- with PMC-5231 COM3 D-

iii. Please refer to the figure as below for the wiring of LED.



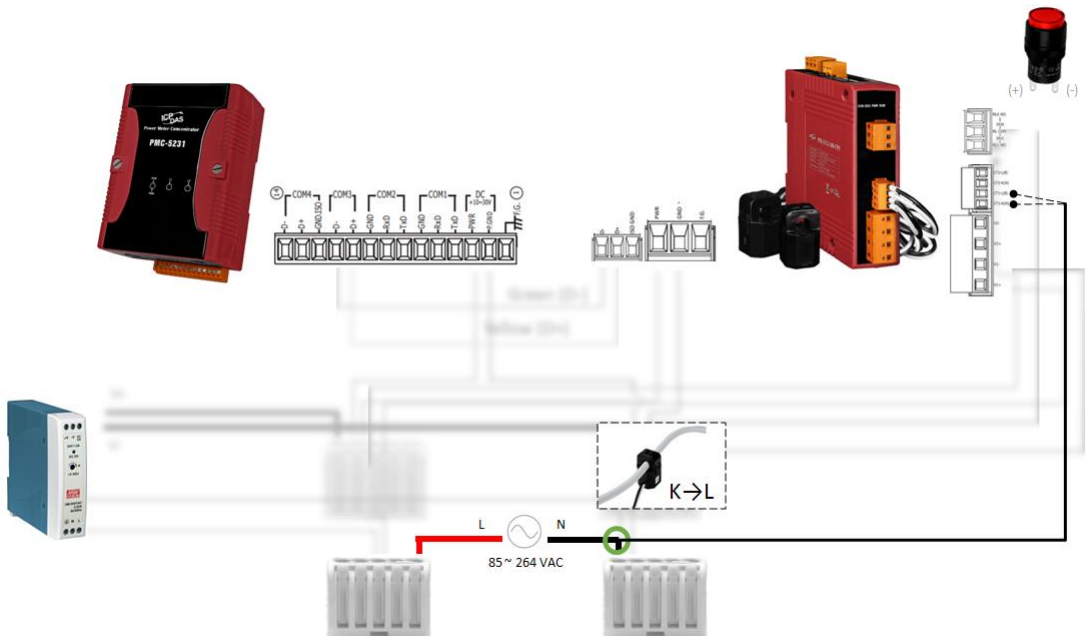
Step	Description
9	Connect LED Pin+ with WAGO1
10	Connect LEDPin- with PM-3114 RL0 NO
11	Use the black wire(30CM) to connect PM-3114 RL COM0 with WAGO 2

iv. Please refer to the figure as below for the wiring of AC power.



Step	Description
12,13	Connect the Power Cable with WAGO 3 and WAGO 4
14	Use the red wire(15CM) to connect MDR-20-24 AC L pin with WAGO 3
15	Use the black wire(15CM) to connect MDR-20-24 AC N pin with WAGO 4
16	Use the red wire(15CM) to connect PM-3114 V1+ with WAGO 3
17	Use the black wire(15CM) to connect PM-3114 V1- with WAGO 4

v. Please refer to the figure as below to connect CT for the wiring of power measurement(If you don't need to measure the load, skip this section.)



5 Connect PMC-5231 to Azure IoT Hub

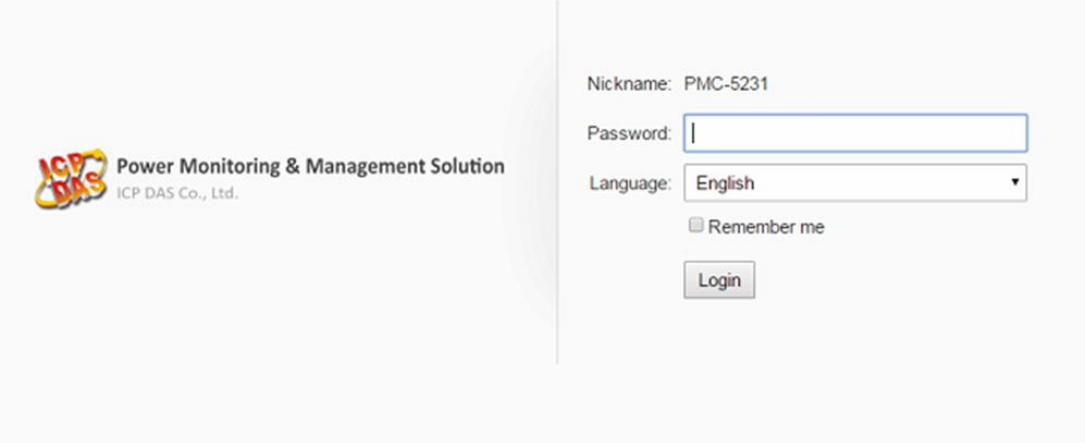
Step1: Prepare your Device

- Follow the instruction described in this Quick Start to Connect to the Web interface of PMC-5231.
- Follow the instruction described in this Quick Start to set PM-3133-100 and Meter parameters following table.

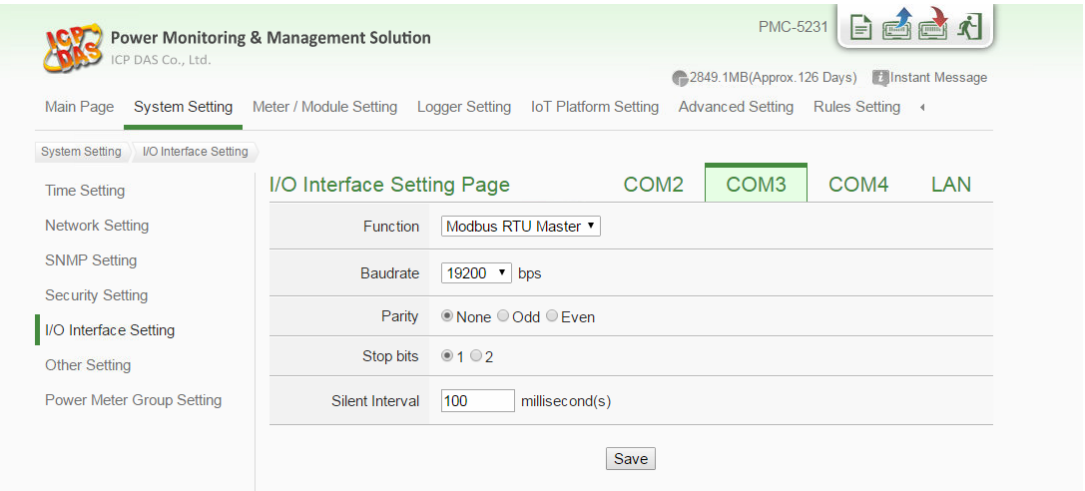
Module Name	Serial port parameters	Modbus Address
DL-100tM-485	19200 N,8,1 (Default)	1 (Default)

Step 2: Build the sample

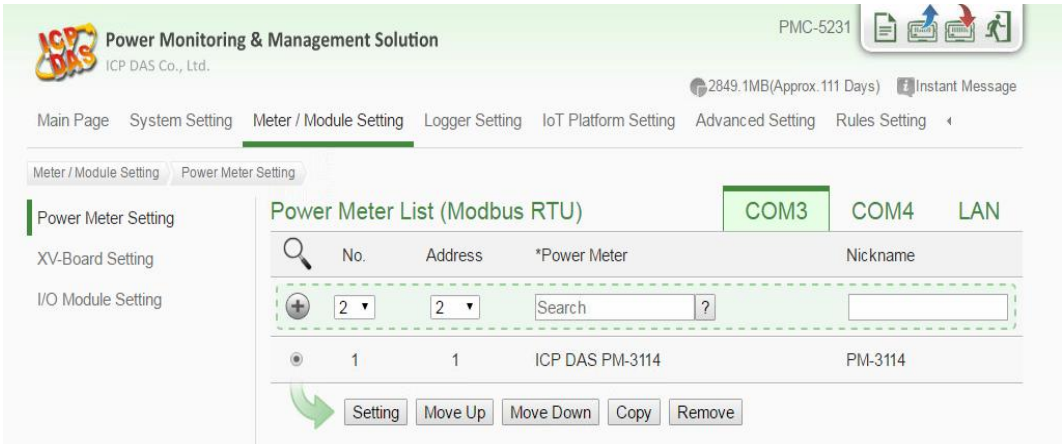
i. Connect to PMC-5231's webpage server via browser, login with the default password "**Admin**".



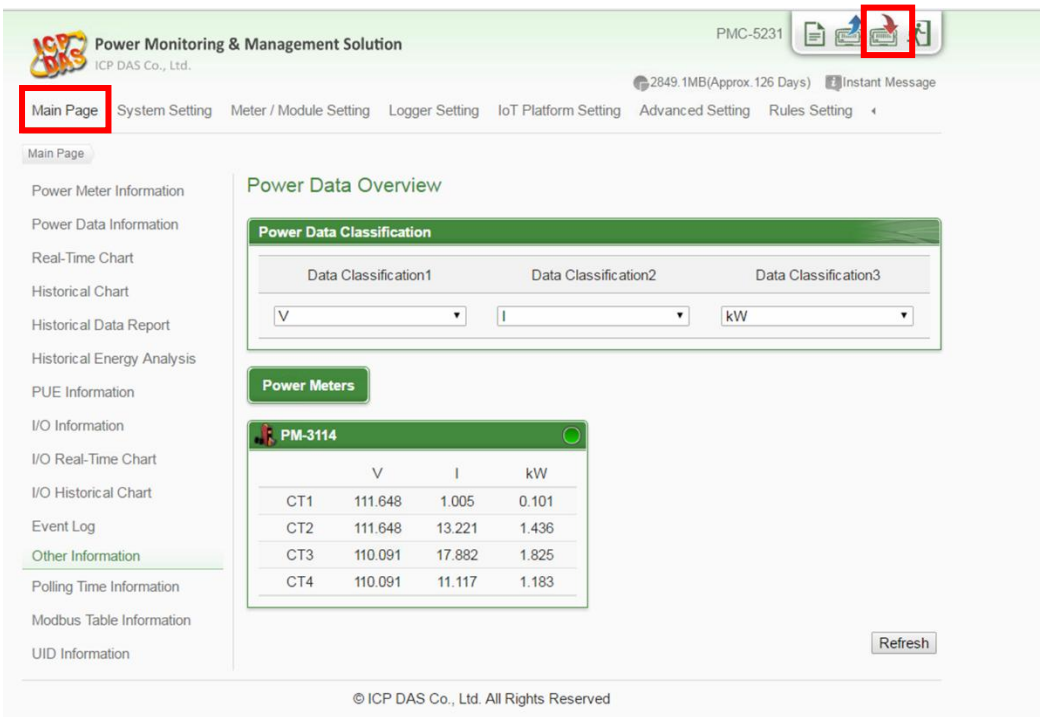
ii. Go to the "**System setting** >> **COM Port Interface Setting**" page to complete the setting of COM3.



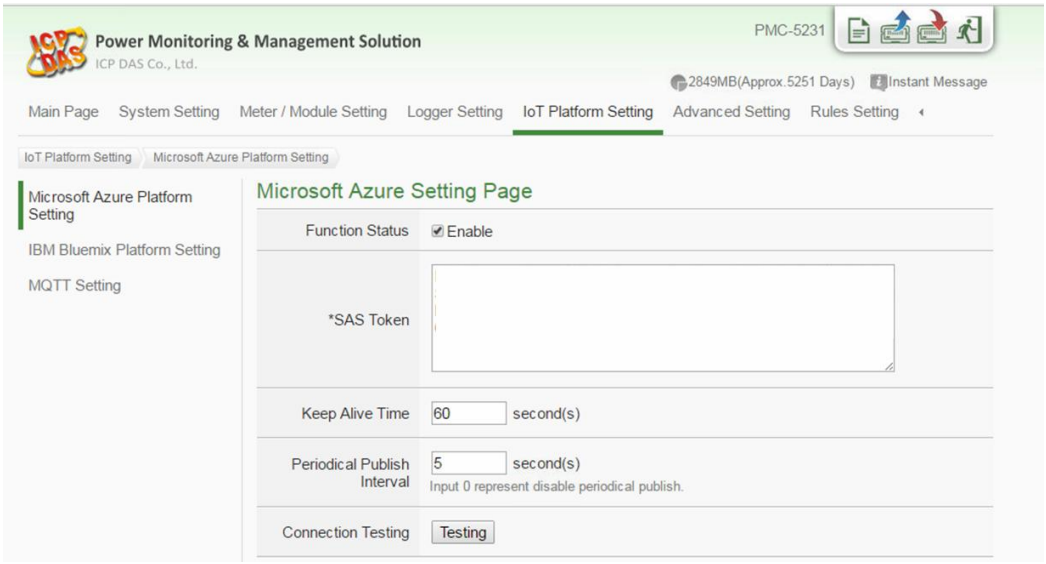
iii. Go to the "**Meter/Module Setting** >> **Power Meter Setting**" page to add the PM-3114 power meter.



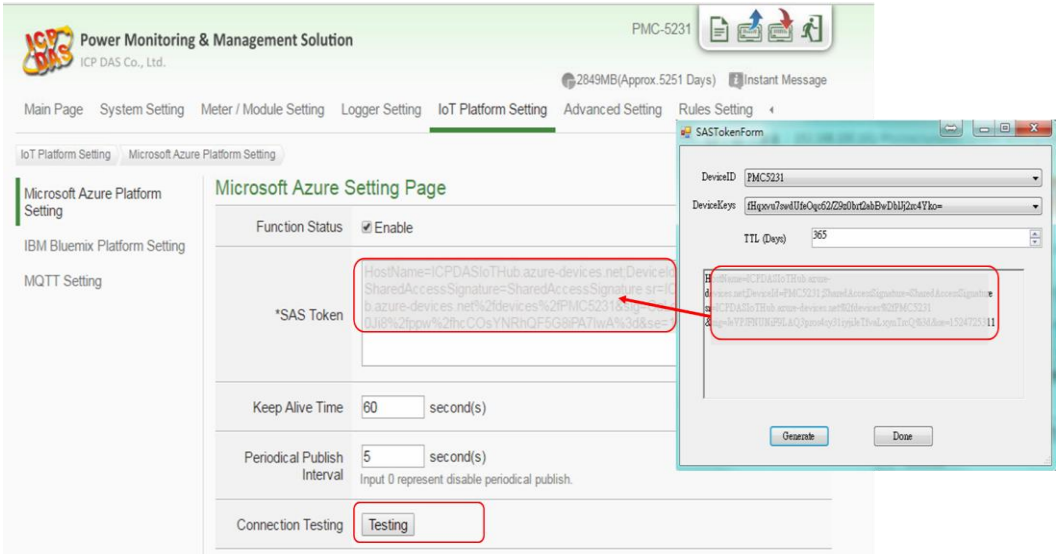
iv. Complete the settings, download the setting to PMC-5231, and then go to the "**Main Page**" to check the communication status with the power meter.



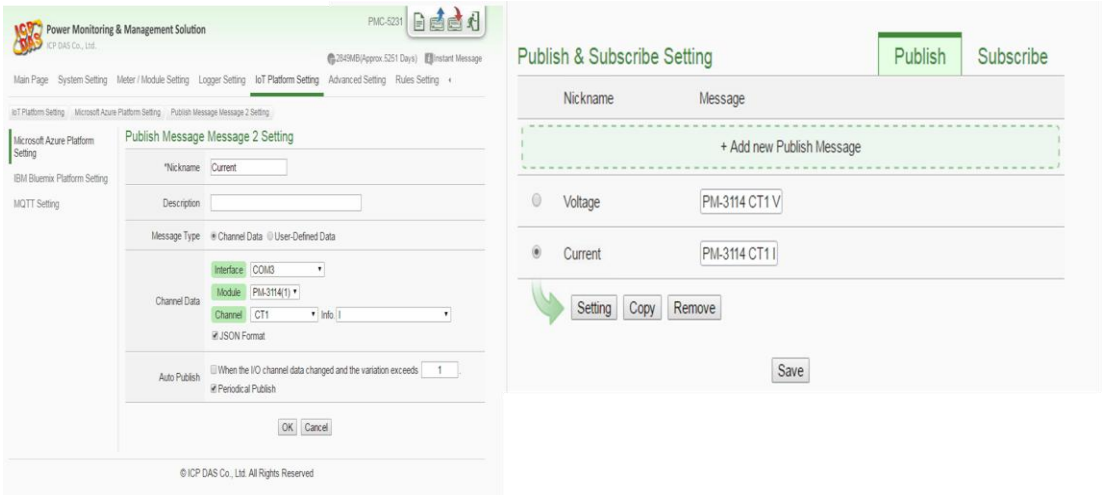
v. Go to the "**Microsoft Azure Platform Setting**" page.



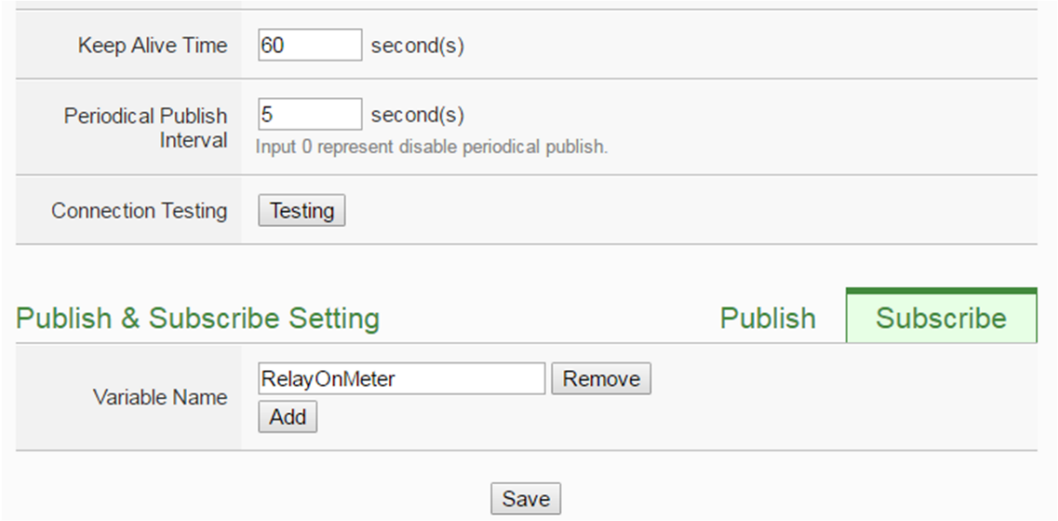
vi. Input the SAS Token generated by Device Explorer. (please refer previous section)



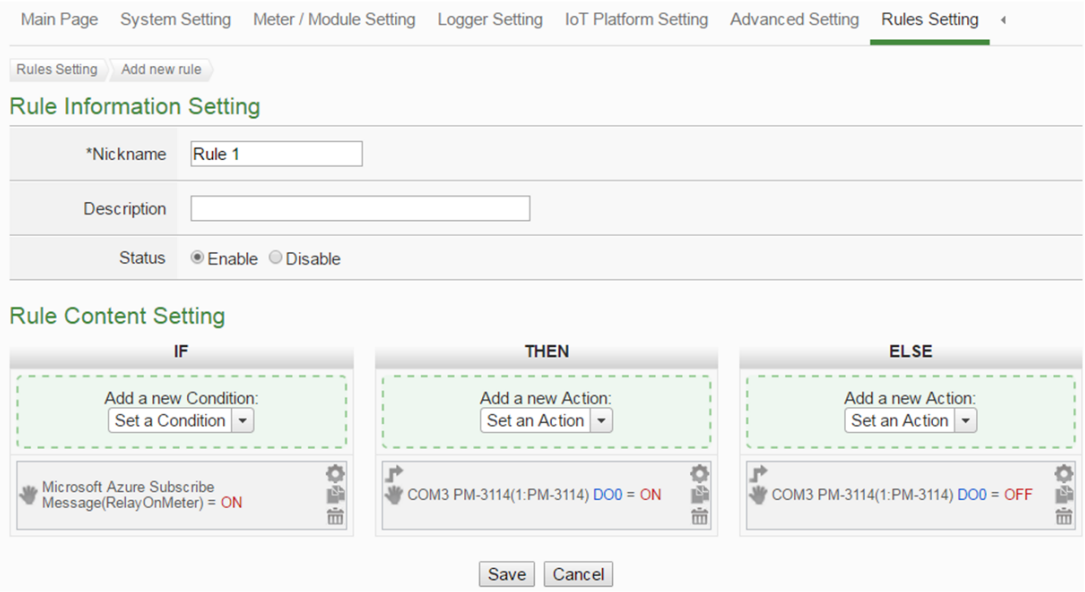
vii. Complete the Publish Message editing.



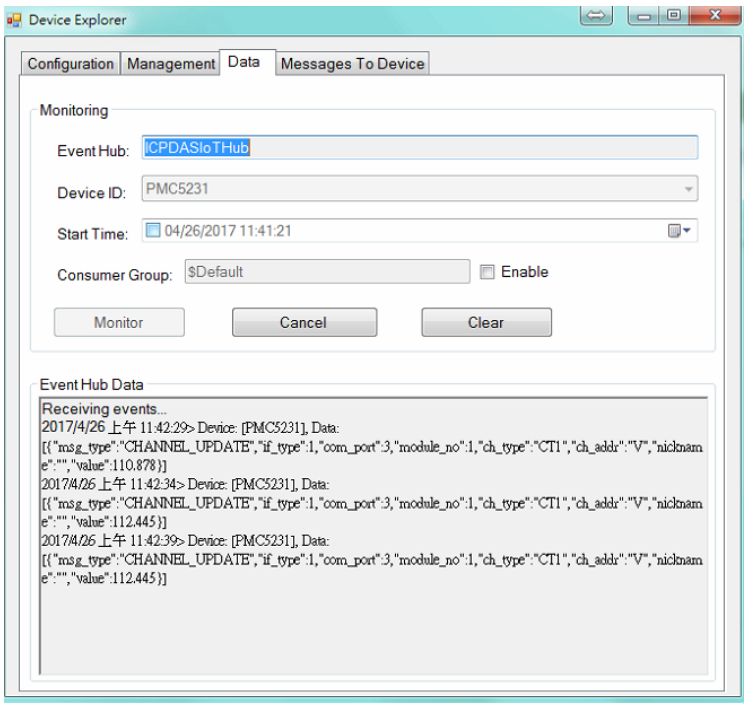
viii. Complete the Subscribe Message editing and click the "**Save**" button to save the settings.



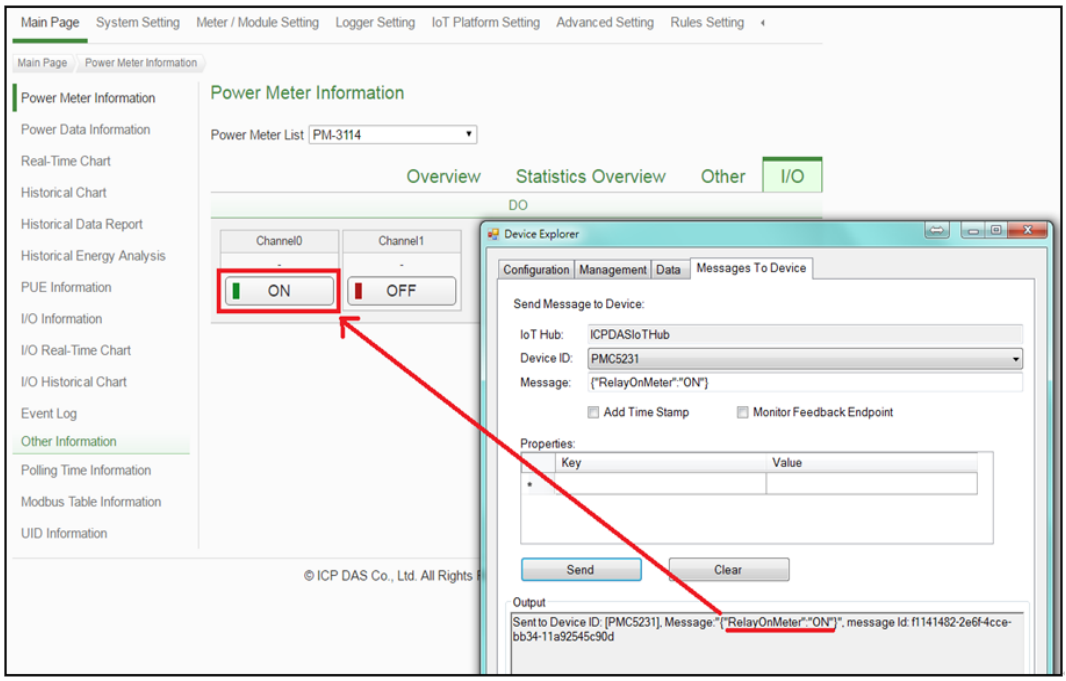
ix. Go to the "**Rule Setting**" page to add a rule to turn the relay on when receive the message from Azure, then remember to download the setting to PMC-5231.

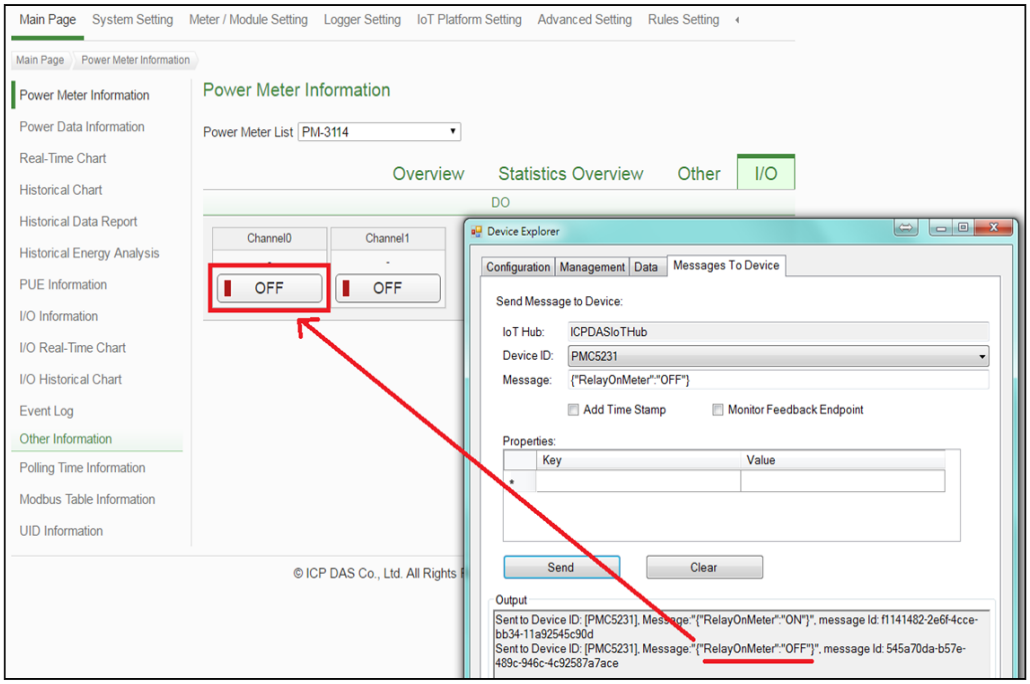


x. Use the Device Explorer utility to verify if the IoT Hub receives the messages from PMC-5231.



xi. Go to the "**Main Page** >> **Power Meter Information** >> **I/O(Tab)**" page to observe that the relay status changes when PMC-5231 gets the message send by Device Explorer.





6 Resource

- ICP DAS Power Management IoT Kit URL: http://pmms.icpdas.com/en/PMC_IoTKit_01.html
- Microsoft Azure IoT Starter Kits URL: http://aka.ms/iotstarterkits