ICP DAS CO., LTD.

UA-2200 / UA-5200 User Manual

IIoT Communication Server

UA-2241 **UA-5231** **UA-5231M** **UA-5231M-4GE**
UA-5231M-4GC
UA-5231M-3GWA

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Document Version Modify List:

Version	Description
V6.3	Date: 2020/03 1. The manual version number is updated to V6.3 and changed to follow the web interface version number, because the user manual has been greatly revised, including: adding a number of new features, software Firmware to Firmware, web interface update and new logo icon. 2. The chapter structure is greatly modified: the chapters related to the menu setting CH5-CH12 are combined to CH5. New CH5: Main Menu: Parameter Settings. New CH4: Function Wizard: Project Quick Setup. Other CH: update new data. 3. New function: support new remote database **MySQL** and **MariaDB**. The original remote database changed the name to **MS SQL**. (CH4.3, CH5.5) 4. New function: add new function **Scaling** and **Bitwise**. (CH4, CH5.2) 5. New function: 4G Network Setting add **unlock the SIM card Pin#** (CH5.1.3) 6. New function: add **Log File Download** (CH5.8) 7. New/Modify function: **Certificate** management (CH4 new step, CH5.8 UI) 8. Firmware update: combine 2 methods to one chapter. The microSD method move to CH6.3 together with the CH6.2 USB method. (CH6) 9. Appendix D: update the LED indicators descriptions. 10. Add Appendix F: Add Mounting the XV-board for UA-2241M
V4.7	Date: 2019/08 1. CH1.4 UA-2241M supports one I/O expansion bus for optional XV-board. ex: optional XV511i to expand 4 RS-485 ports 2. CH1.5 Add the I/O expansion into the appearance figure of UA-2241M. 3. Add appendix G: Mounting the XV-board for UA-2241M
V4.6	Date: 2019/07 1. UA-2241M supports ttyO2(RS-485) 2500 VDC isolated 2. Cloud Support: Add MS Azure and Amazon Web Service Delete IoTstar 3. CH1 Introductions, Features, Functions: follow the new DS 4. Add LAN2 settings (for UA-2200) and Note of System Setting > Network

	5. Appendix: change 3G/4G illustrators of LED Indicators
V4.5	Data 2019/01 1. Add new model: UA-2241M (Two Ethernet ports) 2. Add new function: support EtherNet/IP protocol (Max. 50 EIP-2000) 3. Add new function: Data Logger (Local Log, Remote Database) 4. Add new function: support IoTstar cloud software (coming soon) 5. Web UI supports auto-setting ICP DAS Modbus RTU/TCP and EIP modules 6. Delete CDS setting in Azure connection 7. Add Appendix F: Changing OS Password
V4.3	Date: 2018/07 1. Add 4G new products: UA-5231M-4GE / UA-5231M-4GC (CH1, CH5) 2. Modify introduction, features, function diagram and function features (CH1) 3. Update specifications, appearance and dimensions (CH1) 4. Add LED Indicators descriptions for UA Series (Appendix E.) 5. Update Document Version List (Postscript)
V4.2	Date: 2018/04 1. Add new 3G function: UA-5231M-3GWA (CH1~3) 2. Add new function in the Function Wizard: (CH4) a. Module Communication Conversion: Add MQTT / OPC UA b. Add ”APP Message Notify” new type, and add new function “IFTTT Condition Trigger (Line, Facebook, Twitter)” 3. Add function: System Setting > Network Setting > Mobile Network (3G) (CH5) 4. Add new function: Module Setting > MQTT Module (CH6) 5. Add new function: Convert Setting > OPC UA > MQTT (CH8) 6. Add new function: Advanced Setting > IFTTT Condition Trigger (CH9) 7. Add new function menu: I/O Status (CH10) 8. Modify: Recovering to Factory Setting (Rotary Switch: 8) (CH12) 9. Add IFTTT Website Setting (Appendix C) 10. Add Updating Middleware via MicroSD Card Manually (CH12.2 & Append. D) 11. Add: Postscript: Document Version List

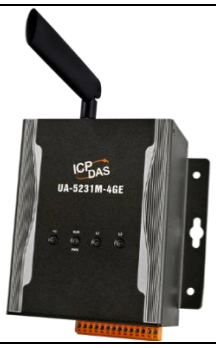
1. UA-2200/UA-5200: IIoT Communication Server

This chapter introduces UA series and its functions, software/hardware specifications.

1.1. Introduction

UA-2200/UA-5200 Series is a series of **IIoT** (Industrial IoT) **Communication Server** for integrating the system and devices of IT and OT. UA features the IIoT Gateway function that allows users to access the remote I/O modules and controllers via Modbus TCP/RTU/ASCII, MQTT, and EtherNet/IP communication protocols. IIoT gateway function can also convert these I/O data to OPC UA or MQTT protocols for the needs of connecting with the MES, ERP, SCADA and Cloud services. Besides, UA features the Data Logger function that allows users to write the I/O data directly into the remote database, and save to the local fi le as the historical records. UA supports Cloud platform that can connect to Amazon AWS, Microsoft Azure or other Cloud platforms to send over the I/O data; and support Cloud logic service platform "IFTTT" which can connect many web APPs that allows users to receive first-hand notification messages through the most commonly used mobile APPs when an event triggered. UA Series enhances the networking and interoperability between IT and OT. Through UA series, users can easily deploy for Industrial IoT.

- **UA Series:**

<table>
<tr><td rowspan="2">UA-2200</td><td></td><td>UA-2241M</td><td></td></tr>
<tr><td></td><td> </td><td></td></tr>
<tr><td rowspan="2">UA-5200</td><td>UA-5231</td><td>UA-5231M</td><td>UA-5231M-4GE
UA-5231M-4GC
UA-5231M-3GWA</td></tr>
<tr><td> </td><td> </td><td>  </td></tr>
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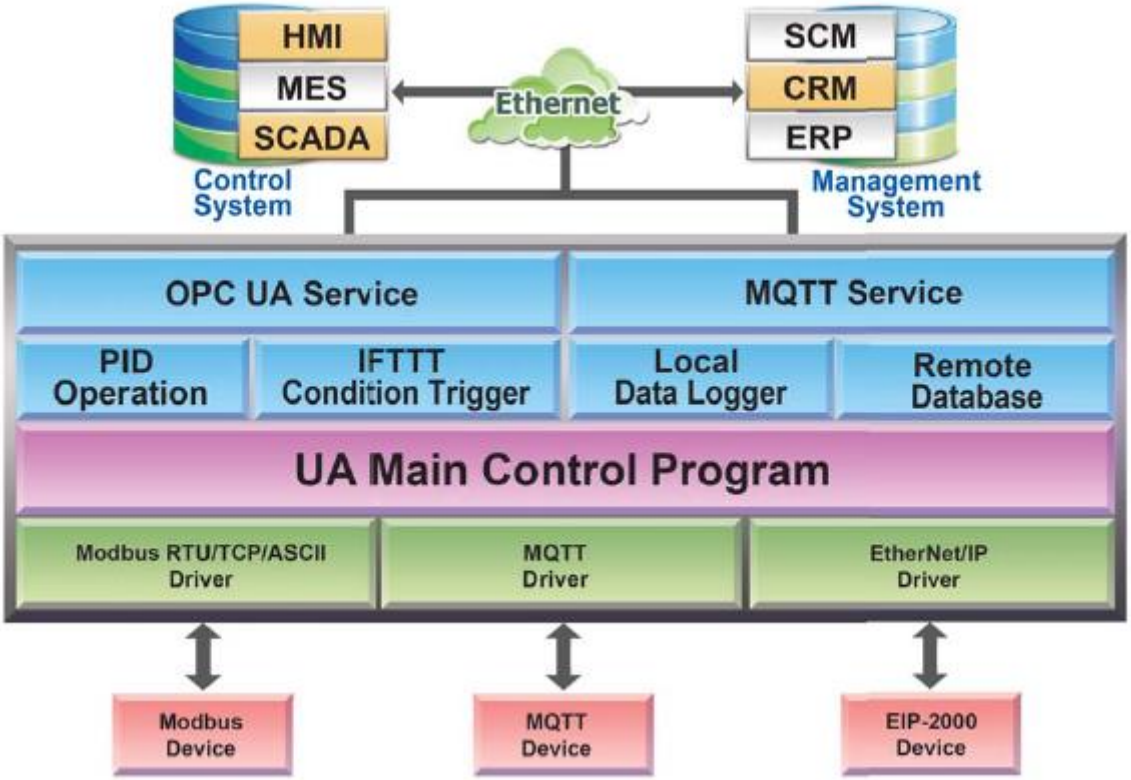
1.2. Features

- OPC UA Server Service
- MQTT Client Service
- MQTT Broker Inside
- ARM CPU, 1.0 GHz
- 512 MB RAM and 512 MB Flash
- Linux kernel 3.2.14 OS
- Real-Time Capability
- Support Local Data Logger / Remote Database
- Support IFTTT Logic Control & APP Notify
- Support PID Logic Operation
- 10/100/1000 Mbit/s Ethernet Port
- 4 Serial Ports (RS-232/RS-485)
- Operating Temperature: -25 ~ +75°C

1.3. Functions



- **Built-in OPC UA Server Service**

  Compliable with IEC 62541 Standard. Provides functions of Active Transmission, Transmission Security Encryption (SSL/TLS), User Authentication (X.509 Certificates/Account password), Communication Error Detection and Recovery, etc. to connect SCADA or OPC UA Clients. Allowed up to 8000 OPC UA tags and up to 20 sessions for the OPC UA Client connection.

- **Built-in MQTT Broker Service**

  MQTT Broker inside and compliable with MQTT V.3.1.1 protocol. Provides functions of IoT Active M2M Transmission, QoS Quality Service, Retain Mechanism, Identity Verification, Encryption, Last Will, MQTT Client Drivers, etc. The Broker can connect up to 400 MQTT Clients.

- **Save I/O Data Directly into Remote Database & Local Side LOG File**

  UA series can collect devices I/O status and then directly save into remote side SQL Database. UA series can also save I/O data into a CSV log file on the local side. Furthermore, users can set the time interval of which CSV file to generate and divide on the local side.

Support Logic Control IFTTT to Send Event Messages to LINE, FB... APPs

UA can combine the IFTTT cloud platform functions and send messages over 460 Web APPs (such as Line, Facebook, Twitter, etc.) when the special events occur. The device I/O change can be set to trigger the event of the IFTTT cloud service, and the IFTTT logic control (If This, Then That) will immediately let the pre-set Web Service (Such as LINE) send a message to one user or group to handle the event immediately.

Support Ethernet and Serial Communication Modules

- Under the Ethernet communication, UA supports Modbus TCP, MQTT and ICP DAS EtherNet/IP modules:
  * Up to 100 Modbus TCP Slave module connections
  * Up to 200 MQTT module connections
  * Up to 50 EtherNet/IP EIP-2000 module connections
- Under the Serial communication, UA provides 3 RS-232/RS-485 Serial ports to support Modbus RTU/ASCII modules:
  * Up to 32 Modbus RTU/ASCII Slave modules per COM
- Through the UA Web UI, users can quickly set up the modules and display the real-time status.

Provide Function Wizard Web UI for easily step-by-step setup

The Web UI of UA provides a wizard-like “Step Box” in the Function Wizard area to guide user step-by-step to complete the project or function. It provides many items for setting the Communication Conversion, Azure Connecting, Function Configuration, PID Operation, Condition Trigger the APP Message Notification, and will be more. It will help users to set projects easily and quickly.

Support IoT Cloud Platforms Connection

UA can actively connect to Amazon AWS, Microsoft Azure or other IoT Cloud platforms to send over the I/O data.

1.4. Specifications

- **Hardware Specifications:**

UA-2200 Series	UA-2241M
System Software	
OS	Linux Kernel 3.2.14
Embedded Service	SFTP server, Web server, SSH
CPU Module	
CPU	ARM CPU, 1.0 GHz
DDR3 SDRAM	512 MB
Flash	512 MB
FRAM	64 KB
Expansion Flash Memory	microSD socket with one 4 GB microSD card (support up to 32 GB microSDHC card)
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year
LED Indicators	PWR(Power)/RUN(Running), L1, L2, L3
Rotary Switch	Yes (0 ~ 9)
Communication Ports	
VGA	1 (Resolution: 640×480, 800×600, 1024×768, 1280x720), reserved
Ethernet	2 x RJ-45, 10/100/1000 Based-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators)
USB 2.0 (host)	2
Console Port	RS-232 (RxD, TxD and GND); Non-isolated
ttyO2	RS-485 (Data+, Data-); 2500 VDC isolated
ttyO4	RS-232 (RxD, TxD and GND); Non-isolated
ttyO5	RS-485 (Data+, Data-); 2500 VDC isolated
I/O Expansion	
I/O Expansion Bus	Yes, one optional XV-board; Ex: XV511i to expand 4 RS-485 ports
Mechanical	
Dimensions	35 x 167 x 119 (W x L x H) (mm)
Installation	DIN-Rail Mounting
Environmental	
Operating Temperature	-25 ~ +75°C
Storage Temperature	-40 ~ +80°C
Ambient Relative Humidity	10 ~ 90% RH (non-condensing)
Power	
Input Range	+12 ~ +48 VDC
Consumption	4.8 W

UA-5200 Series	UA-5231	UA-5231M	UA-5231M-3GWA	UA-5231M-4GE UA-5231M-4GC
System Software				
OS	Linux Kernel 3.2.14			
Embedded Service	SFTP server, Web server, SSH			
CPU Module				
CPU	ARM CPU, 1.0 GHz			
DDR3 SDRAM	512 MB			
Flash	512 MB			
FRAM	64 KB			
Expansion Flash Memory	microSD socket with one 4 GB microSD card (support up to 32 GB microSDHC card)			
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year			
64-bit Hardware Serial Number	Yes, for Software Copy Protection			
LED Indicators	PWR(Power)/RUN(Running), L1, L2		PWR/RUN, L1, L2	
			3G	4G
Rotary Switch	Yes (0 ~ 9)			
Communication Ports				
VGA	1 (Resolution: 640×480, 800×600, 1024×768, 1280x720), reserved			
Ethernet	1 x RJ-45, 10/100/1000 Based-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators)			
USB 2.0 (host)	1			
Console Port	RS-232 (RxD, TxD and GND); Non-isolated			
ttyO2	RS-485 (Data+, Data-); Non-isolated			
ttyO4	RS-232 (RxD, TxD and GND); Non-isolated			
ttyO5	RS-485 (Data+, Data-); 2500 V_{DC} isolated			
Mechanical				
Dimensions (W x L x H)(mm)	91 x 132 x 52	117 x 126 x 58		
Installation	DIN-Rail Mounting			
Environmental				
Operating Temperature	-25 ~ +75°C			
Storage Temperature	-40 ~ +80°C			
Ambient Relative Humidity	10 ~ 90% RH (non-condensing)			
Power				
Input Range	+12 ~ +48 VDC			

UA-5200 Series	UA-5231	UA-5231M	UA-5231M-3GWA	UA-5231M-4GE UA-5231M-4GC
Consumption	4.8 W		6.5 W	
Wireless Communication				
3G System	-		3GWA: WCDMA 850/900/1900/2100 MHz 4GE : WCDMA 850/900/2100 MHz 4GC : WCDMA 900/2100 MHz; TD-SCDMA 1900/2100 MHz; CDMA2000 (BC0) 800 MHz	
4G System	-		4GE : FDD LTE: B1/B3/B5/B7/B8/B20 MHz 4GC : FDD LTE: B1/B3/B8 MHz; TDD LTE: B38/B39/B40/B41 MHz	

4GE/4GC Frequency Band Descriptions:

UA-5231M-4GE: Frequency Band for EMEA, Korea, Thailand, India and Taiwan
UA-5231M-4GC: Frequency Band for China

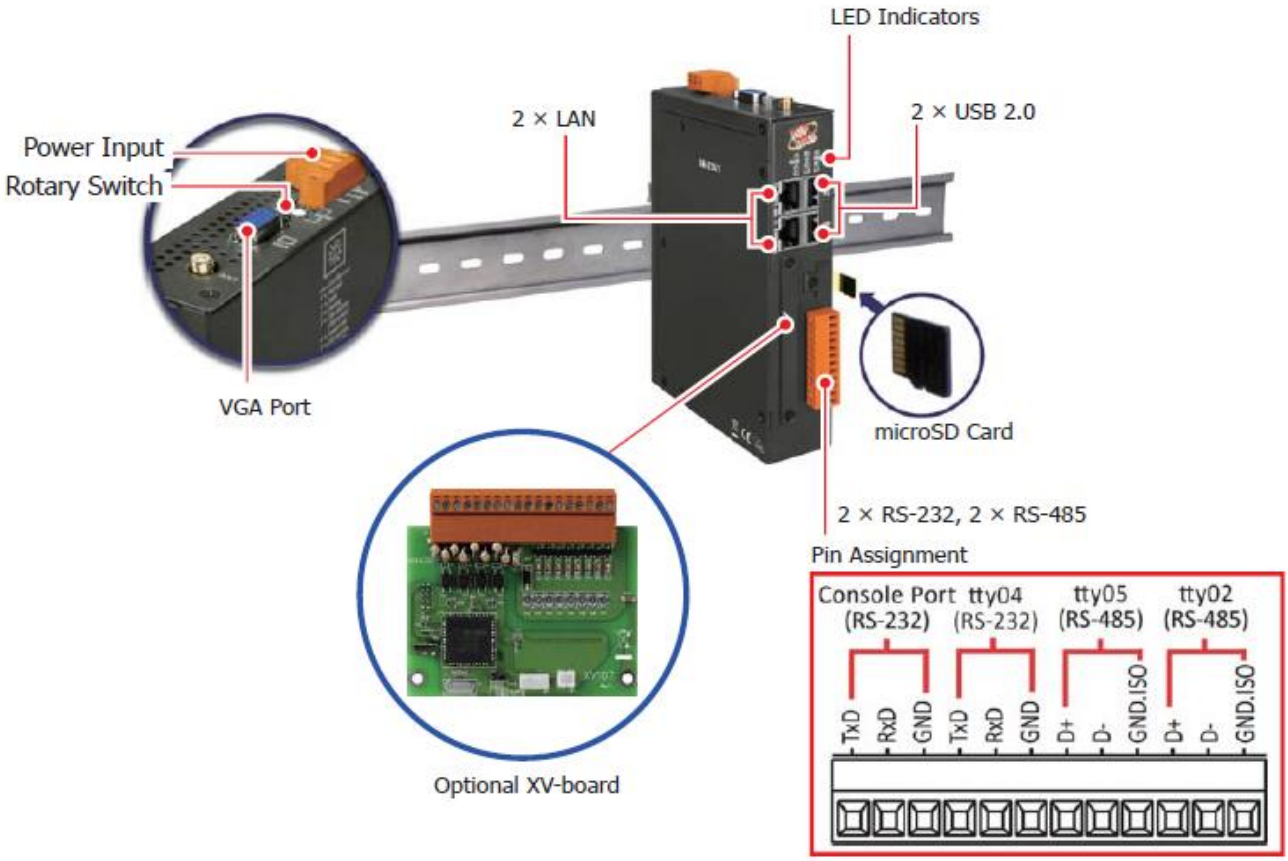
Software Specifications:

Software Specifications:	UA Series
OPC UA	
OPC UA Server	● OPC Unified Architecture: 1.02 ● Core Server Facet ● Data Access Server Facet ● Method Server Facet ● UA-TCP UA-SC UA Binary ● User Token User Name Password & X509 Certificate ● Security Policy ◦None ◦Basic128Rsa15 • Sign • Sign & Encrypt ◦Basic256 • Sign •Sign & Encrypt Recommend to keep the maximum number of sessions within 20 connections.
Modbus Master	
Modbus TCP	To read or control the devices that support standard Modbus TCP Slave protocol. Recommend to keep the maximum number of devices within 100 connections.
Modbus RTU/ASCII	A max. of 3 ports: ttyO2, ttyO4, ttyO5 to connect other Modbus RTU Slave devices (e.g. M-7000). Recommend no more than 32 devices per port for better communication quality.
MQTT	
MQTT Client	Connect the MQTT Broker to read/control the devices supporting the MQTT protocol.
MQTT Service	Connect the MQTT Broker to externally read / control the devices supporting other protocols that linking with the UA series.
MQTT Broker	Compliance with MQTT v3.1.1 protocol. Support MQTT message distribution management. Recommend to keep the connection number of Client within 400.
EtherNet/IP	
Scanner	Support connect EIP-2000 series modules of ICP DAS. Recommend no more than 50 devices per UA.
Data Logger	

Software Specifications:	**UA Series**
Local Data Logger	Record I/O data, and save to the local MicroSD card in CSV format.
Remote Database	Record I/O data, and send to the remote database of MS SQL, MySQL, and Maria DB. Recommend to keep only one database connected.
Cloud Support	
Microsoft Azure	MQTT Service can connect to MS Azure IoT Hub.
Amazon Web Services	MQTT Service can connect to AWS IoT Core
IFTTT	Support Logic event sending to IFTTT
Virtual Device	
PID Function	Combine the remote I/O devices for the PID logic control system.

1.5. Appearance

UA-2241M



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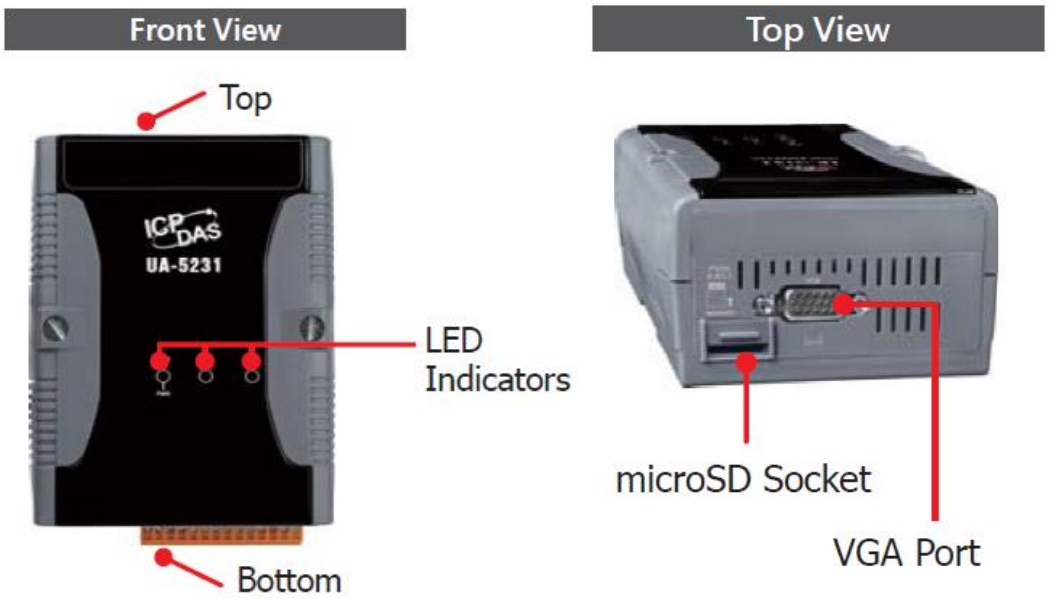
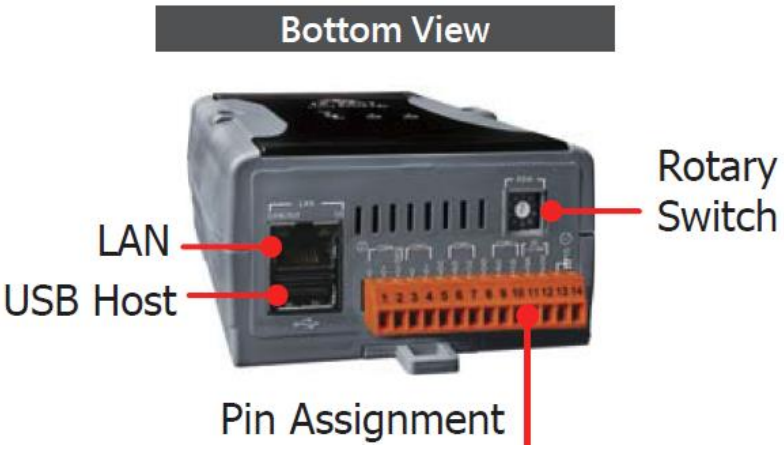
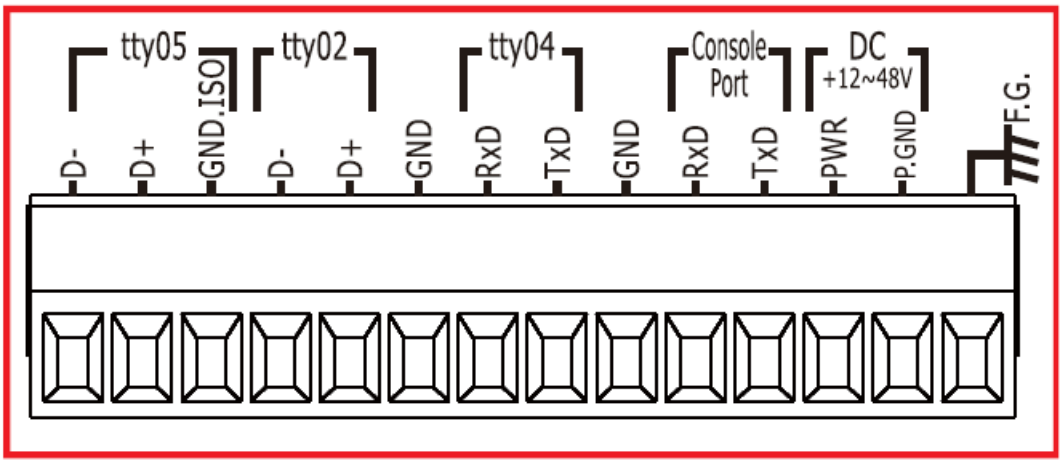

Front View
Top
ICP DAS
UA-5231
LED
Indicators
Bottom
Top View
microSD Socket
VGA Port


Bottom View
LAN
USB Host
Rotary
Switch
Pin Assignment


tty05
tty02
tty04
Console
Port
DC
+12~48V
D-
D+
GND,ISO
D-
D+
GND
RxD
TxD
GND
RxD
TxD
PWR
P.GND
F.G.

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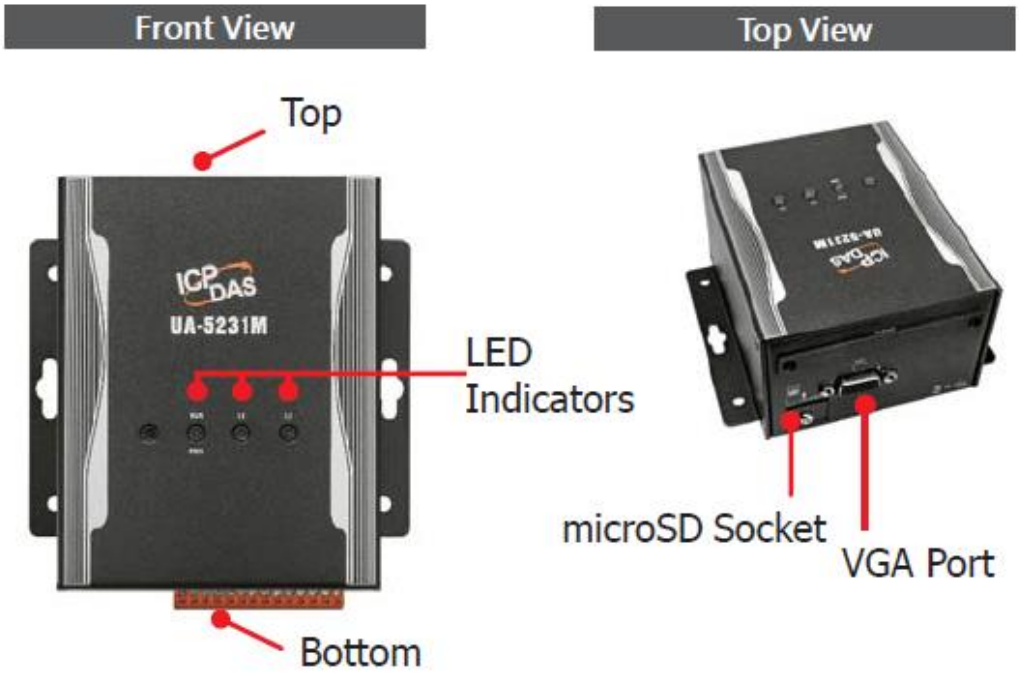
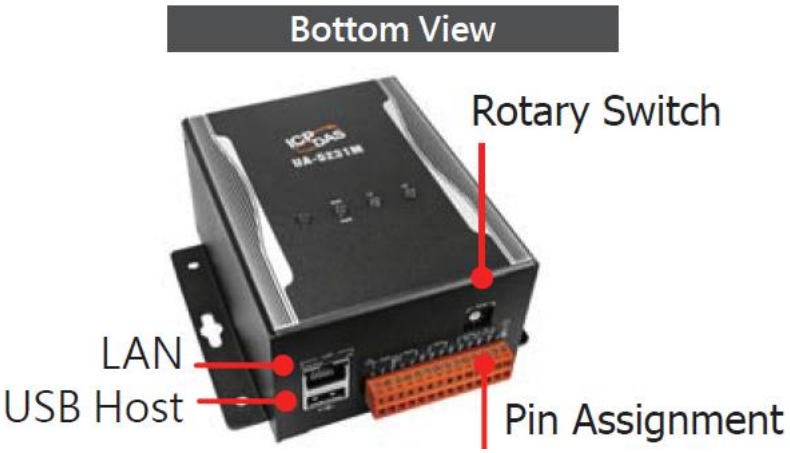
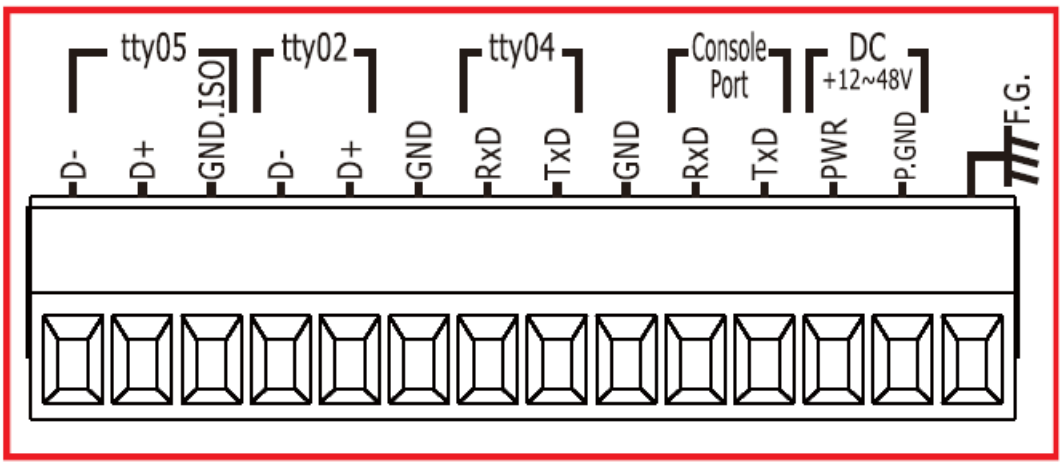
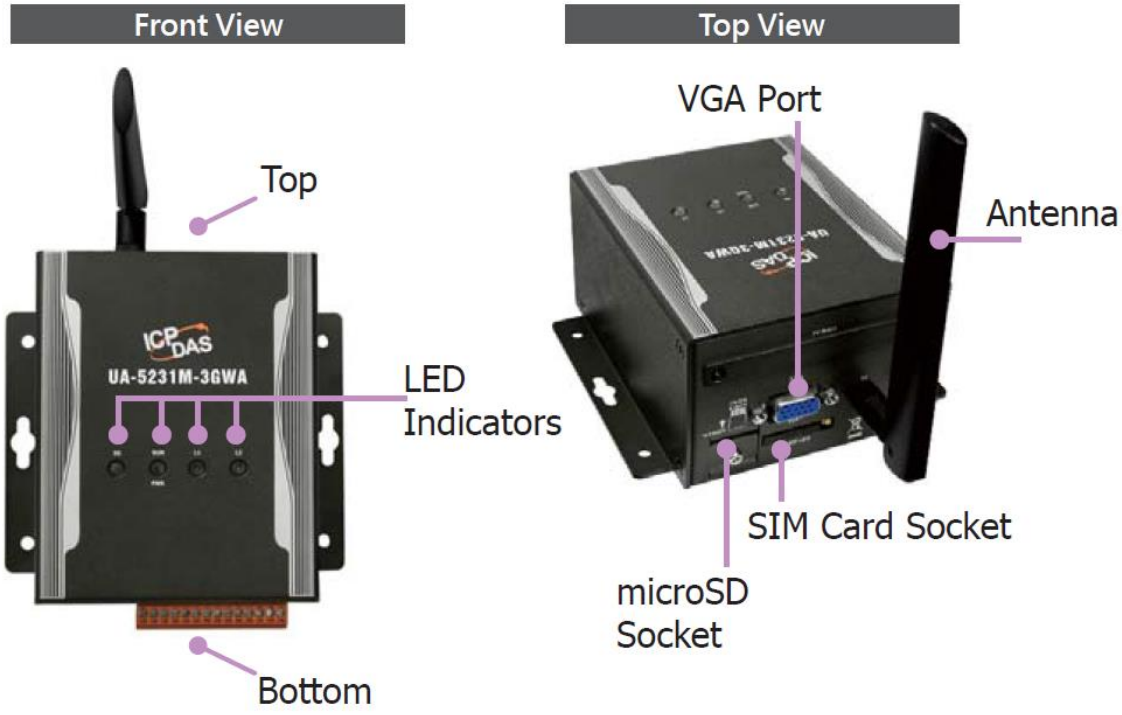
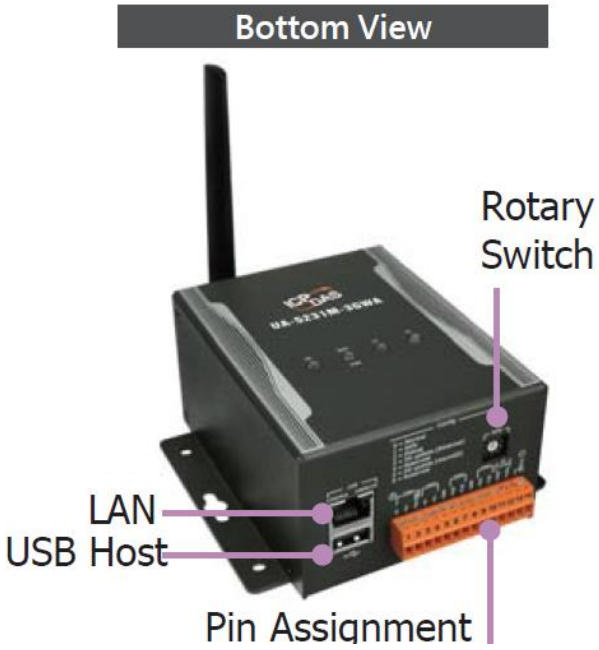

Front View
Top View
Top
LED
Indicators
Bottom
microSD Socket
VGA Port

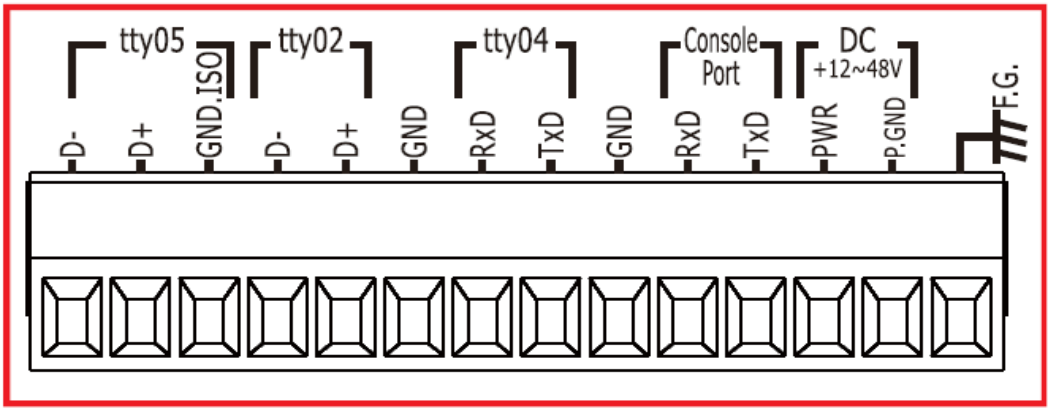

Bottom View
Rotary Switch
LAN
USB Host
Pin Assignment


tty05
tty02
tty04
Console Port
DC +12~48V
D-
D+
GND.ISO
D-
D+
GND
RxD
TxD
GND
RxD
TxD
PWR
P.GND
F.G.

UA-5231M-3GWA / 4GE / 4GC



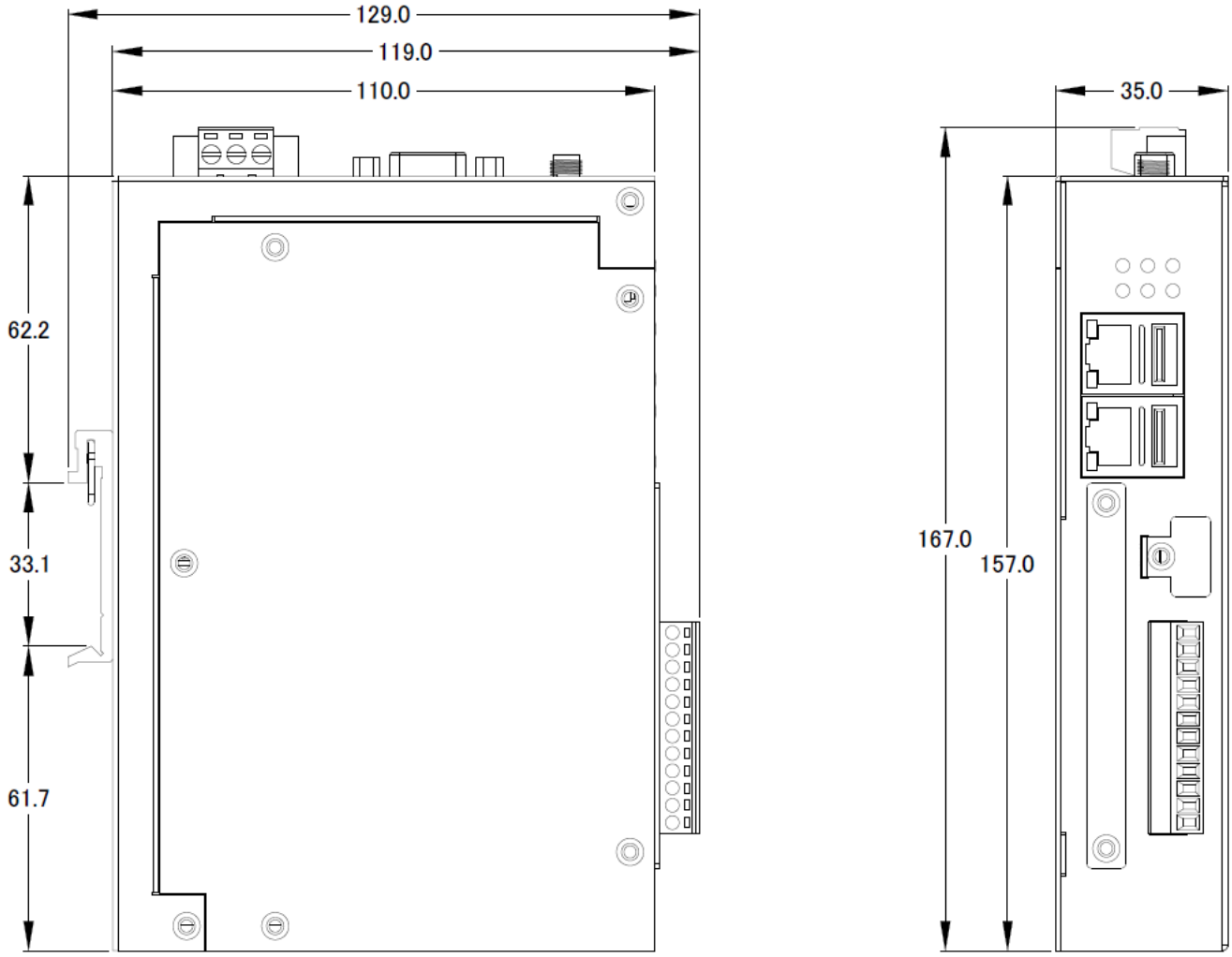




1.6. Dimensions

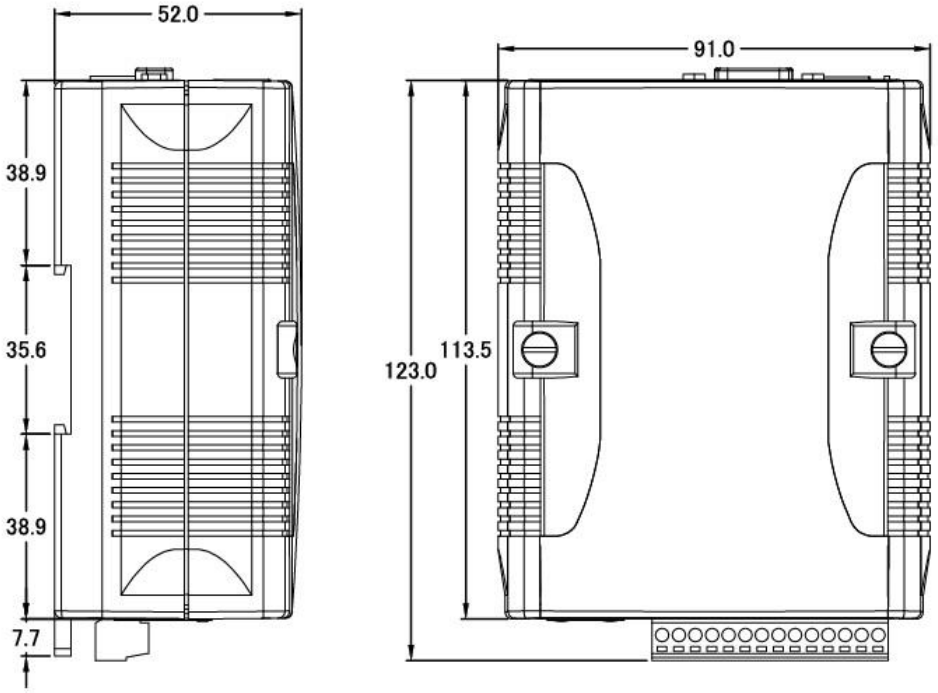
UA-2241M

Unit: mm



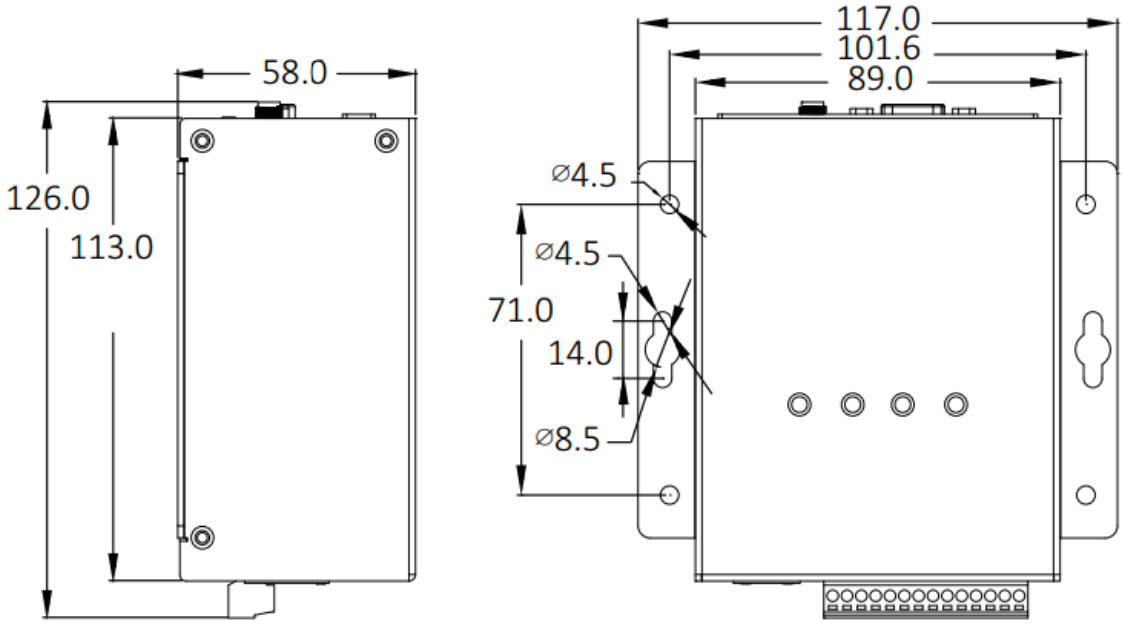
UA-5231

Unit: mm



UA-5231M / UA-5231M-3GWA / UA-5231M-4GE / UA-5231M-4GC

Unit: mm



2. Quick Start 1: Hardware/Network Connection

This chapter describes the devices hardware connection, network connection and quick setting for the UA Controller, and how to connect to the UA controller web-based UI via a browser. Nest chapter will set up web functions, and complete an example project.

2.1. Hardware Connection

This section describes the hardware wiring and connection for the UA Controller.

2.1.1. Preparations for Devices

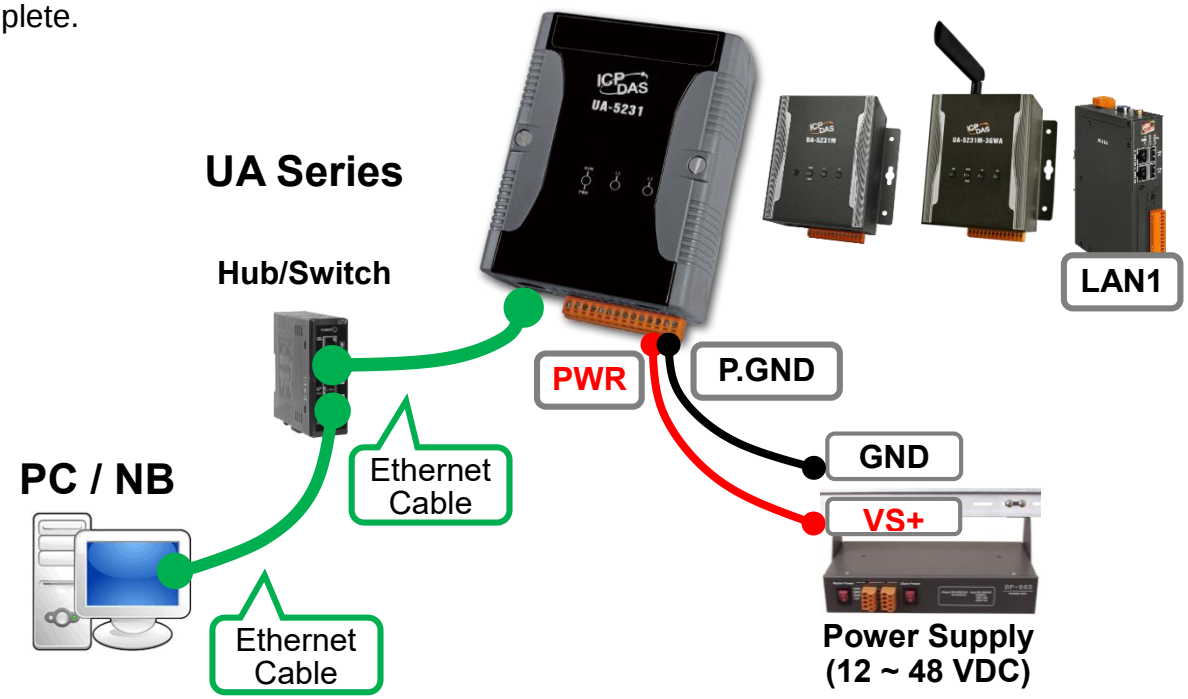
In addition to the UA series controllers (Ex: UA-5231), please prepare the following:

1. **Power Supply: +12 ~ +48 VDC** (Ex: DP-665)
2. **Ethernet Hub or Switch** (Ex: NS-205)
3. **PC/NB**: Can connect to the network and set the network

2.1.2. Hardware Wiring

Connect the UA with the RJ-45 Ethernet port LAN1 to an Ethernet hub/switch and PC. You can also link directly the UA to PC with an Ethernet cable.

After power is connected, please [**wait 1 minute**] for UA start-up procedure. When the "RUN/PWR" light ("RUN" "PWR" lights for UA-2200) starts flashing, it represents the boot is complete.



2.2. Network Connection

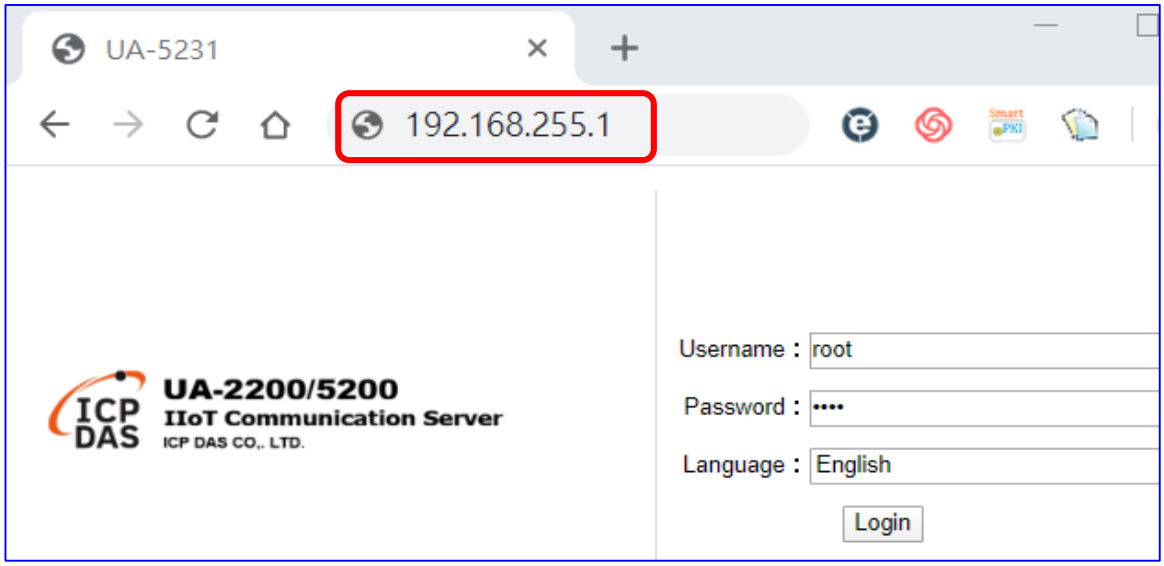
This section introduces how to connect to the UA Web User Interface (UA Web UI).
Setting new UA or the new user please uses the method A in the Chapter 2.2.1 (The same method as the “UA Series Quick Start” manual). Other users please see the following introductions to choose method B or C.

The methods to login the UA series Web UI:

A. Using Factory Default Setting: **Suitable for setting a new UA controller and the PC network IP is not in the same domain with UA.** This method changes the PC network IP to be the same domain with the UA factory default network IP to login the Web UI. (Refer Section 2.2.1)

B. Using Software Utility: **Suitable for quick setting when many UA controllers are in the network but the IP are unknown.** UA Series provides a free software utility for auto searching UA controllers in the network and can quick jump to the login web page of UA. (Refer Section 2.2.2)

C. Using IP Address: **Suitable for the UA has a fixed IP and in the same domain with the PC.** If the UA has a fixed IP and in the same domain with the PC, users can directly enter the IP in the address bar of a web browser and log in to the Web UI of the UA.



After login the UA Web UI, then can set up the UA project.

2.2.1. Connection by Factory Default Settings (For New UA)

The factory default settings of the UA series are as the following table:

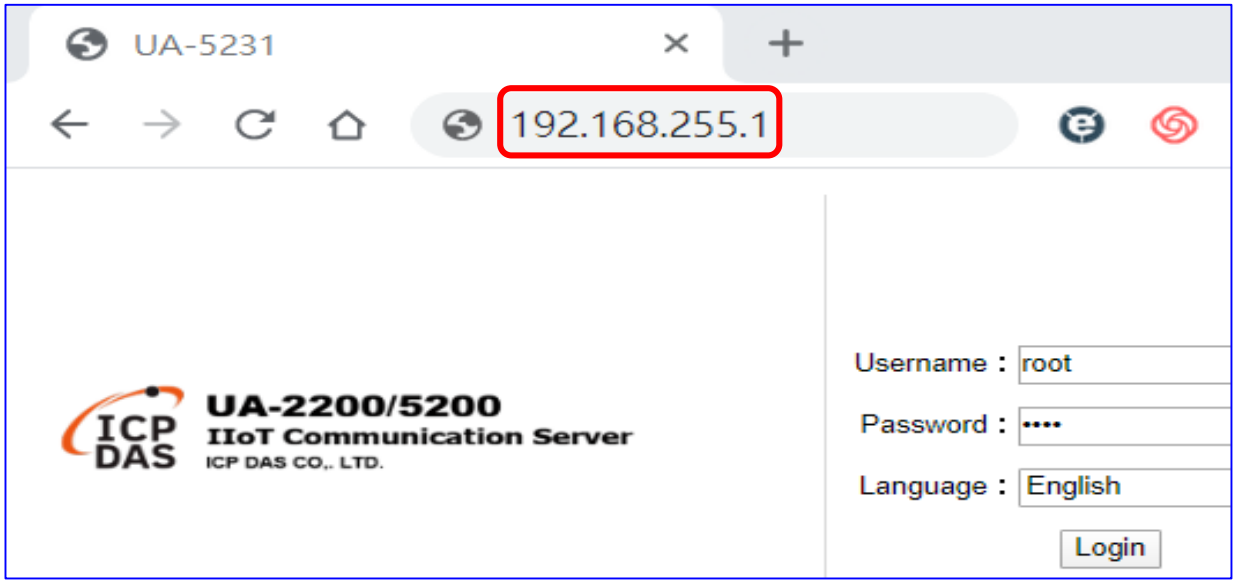
Factory Default Settings of UA Series			
Network	**IP**	**LAN1: 192.168.255.1** **LAN2: 10.0.0.1**	Assign UA a new IP setting according to your case. **UA-2200** series uses LAN1 to connect PC.
	Netmask	**255.255.0.0**	
	Gateway	**LAN1: 192.168.1.1** **LAN2: 10.168.1.1**	
OS Account	**Username**	**root**	**After login, change your password as soon as possible.** (Section 5.1.4 for Web UI) (Appendix E for OS)
	Password	**icpdas**	
Web UI Account	**Username**	**root**	
	Password	**root**	

1. Change the PC's IP setting as following. (Write down the PC original network settings before modify.)

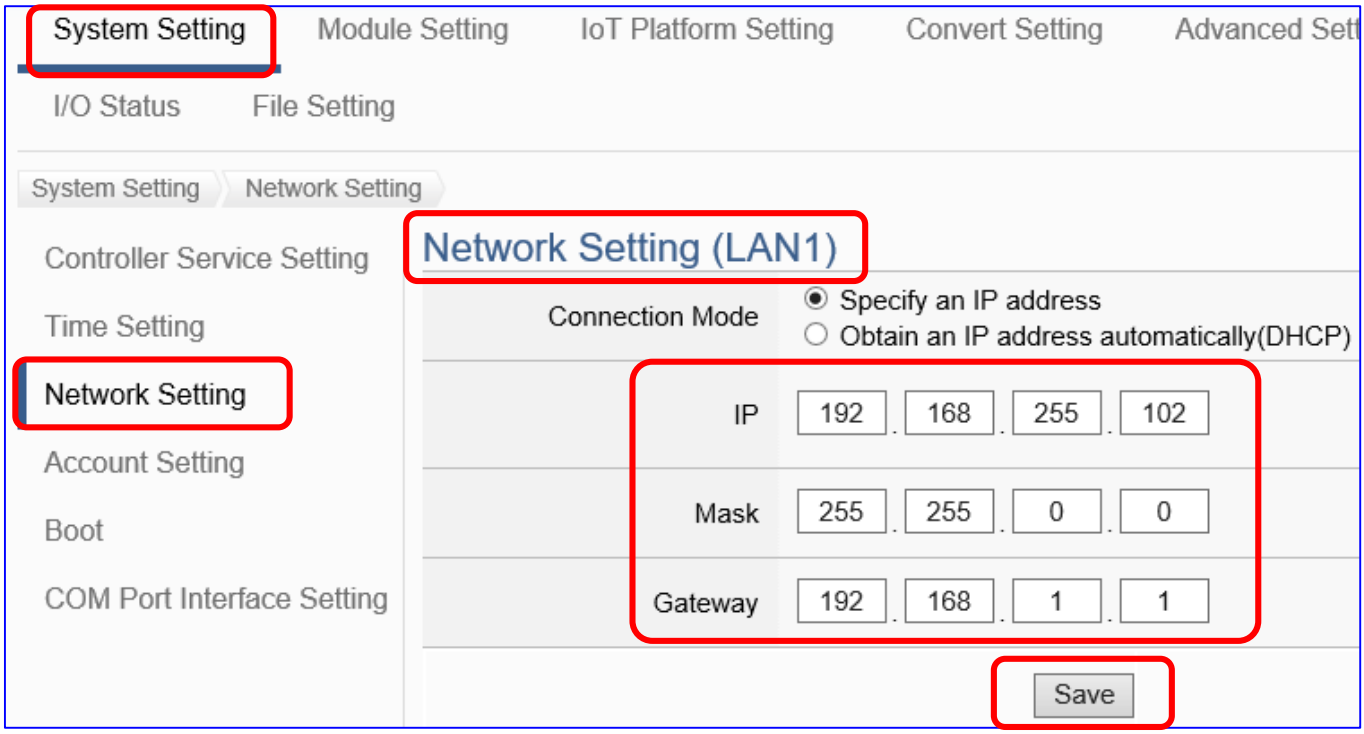
IP	**192.168.255.10**
Subnet mask	**255.255.0.0**
Gateway address	**192.168.1.1**

2. Make sure the PC and UA is connecting through Ethernet. Then open a PC side browser (Ex: Chrome, IE…).

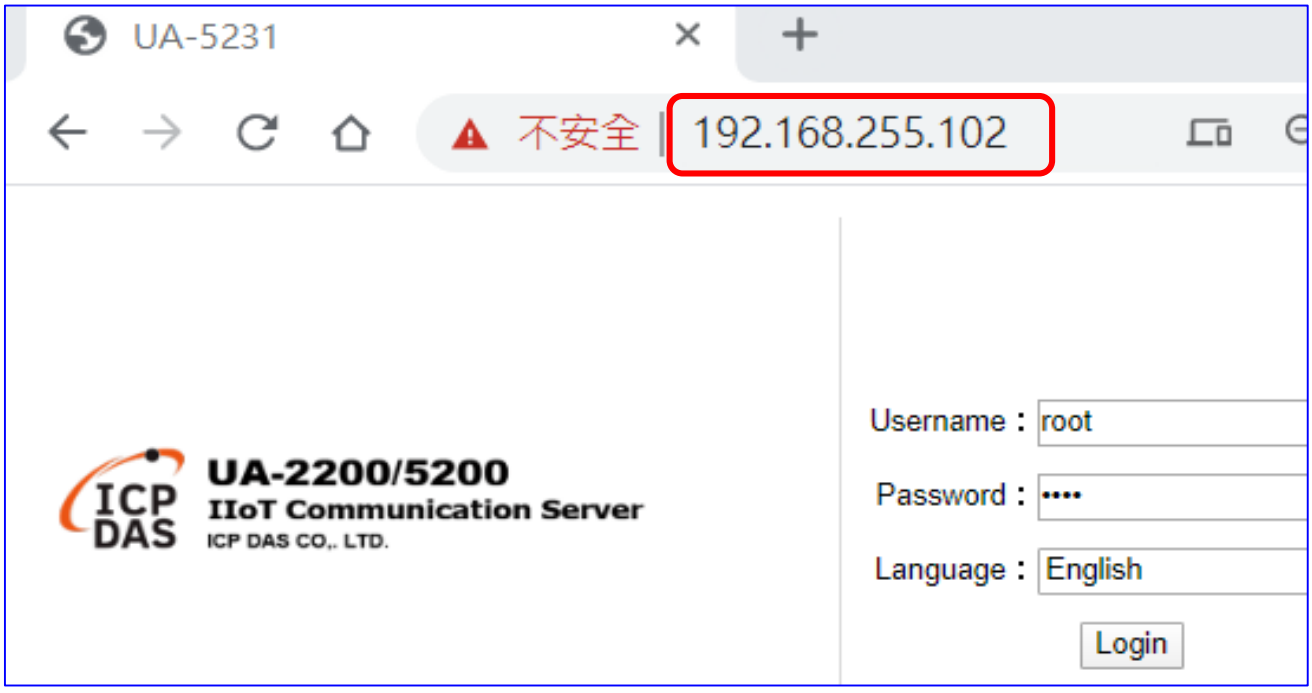
3. Type **http://192.168.255.1** in the URL address. Use default Web UI username / password "**root**" / "**root**" to login the system.



4. Click【System Setting】➔【Network Setting】➔【Network Setting(LAN1)】to change the IP setting by user network.



5. Save the IP setting, restore the PC original IP settings, and type the new IP in the browser as step-2 to login the Web UI of UA series. Then configure user's UA project.



2.2.2. Connection by Utility Searching

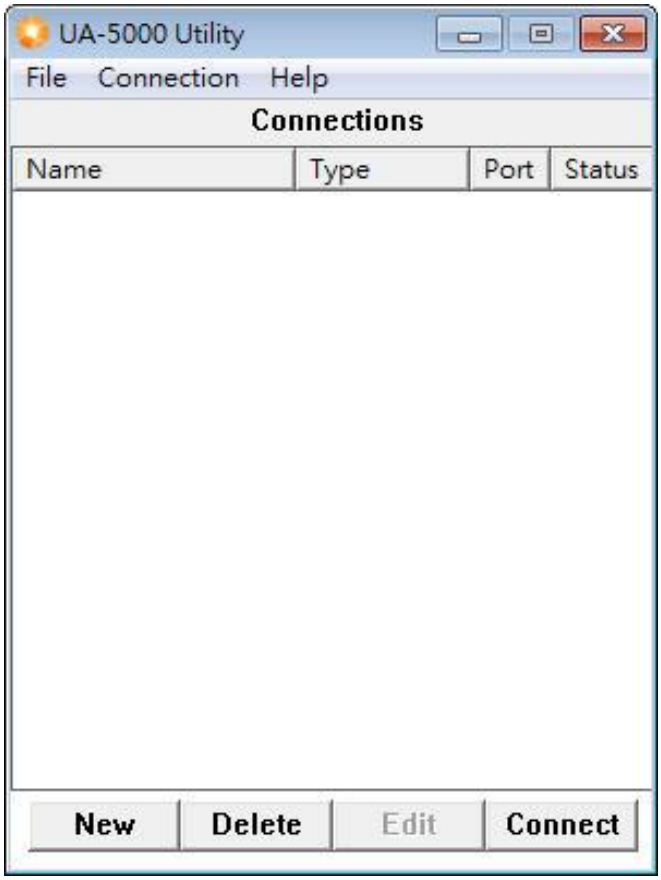
Setting new UA or the new user please uses the method in the Chapter 2.2.1.
If the UA has a fixed IP and in the same domain as the PC, users can directly enter the IP in the address bar of a web browser and log in to the Web UI of the UA.

This chapter introduces the 2nd method that users use the UA Utility to search the Network IP. This method is suitable for connecting multiple UA series controllers to the Internet, but the IP addresses of UA are unknown or need to modify the UA controller quickly.

UA Utility is a free tool software to quickly search each UA controller on the network and connect to its Web UI for setting UA series controller and project.

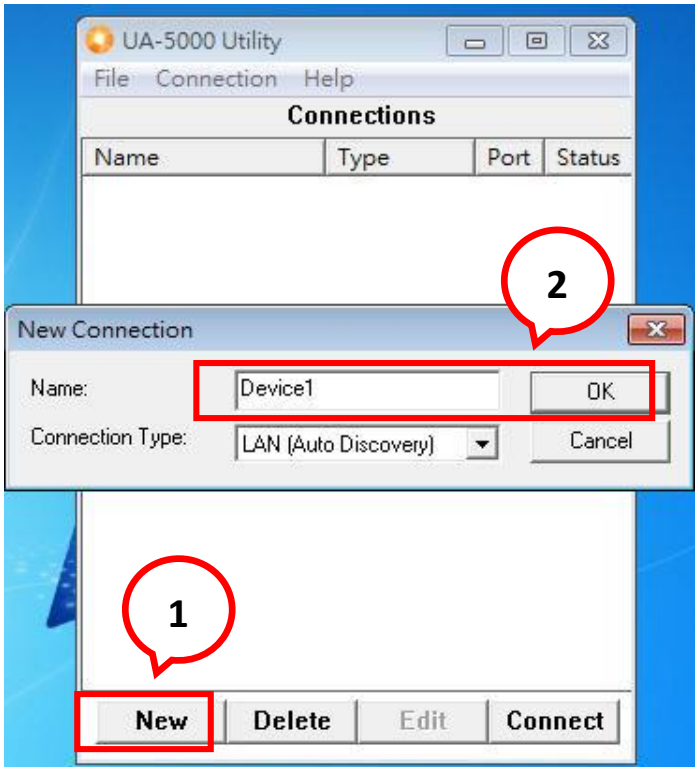
In the PC, install the **UA-5000 Utility** (named "**UA-5000utility.exe**") at the path of the companion CD (i.e., **CD:/UA-5000/Utility/**). Please copy this file to the user PC, and then run it to connect the device, or download the utility program from the website:
http://ftp.icpdas.com.tw/pub/cd/UA-Series/utility/

1. **Install and execute the Utility**
   Run the UA-5000 Utility (file name: **UA-5000utility.exe**) to install the Utility program.



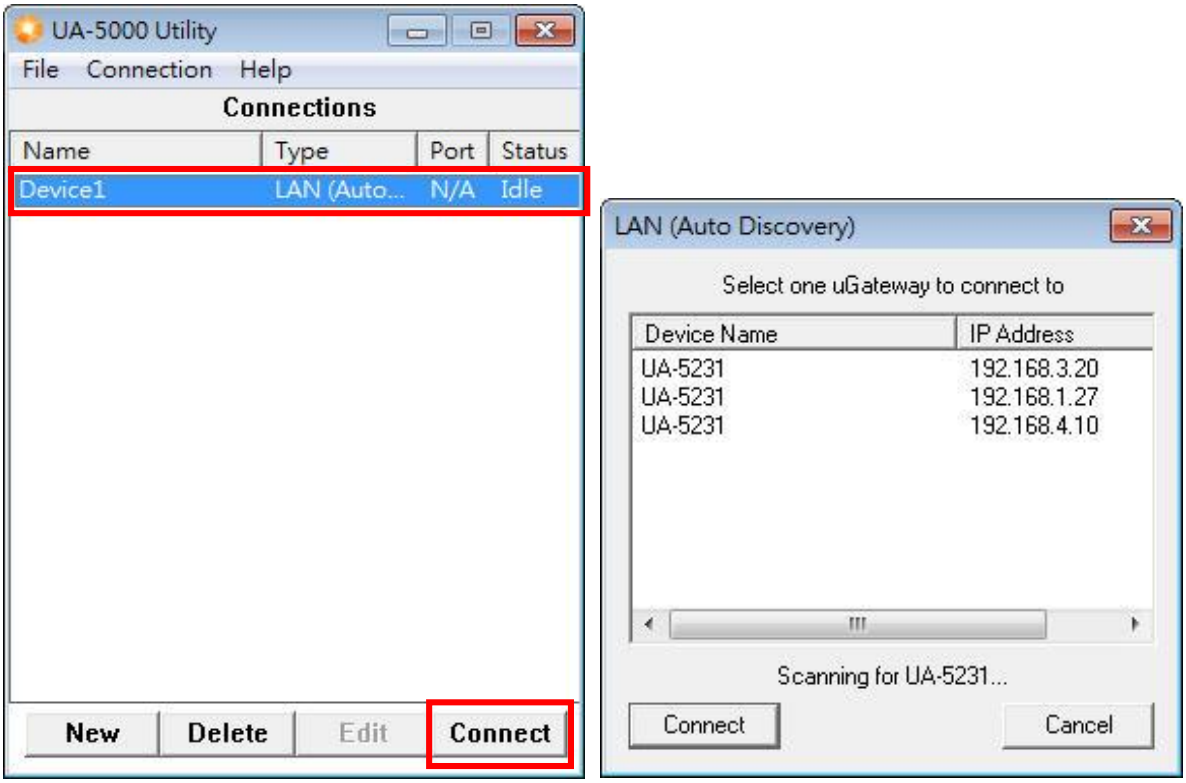
2. Create a new connection

Click “New” to add a connection item and give a name for it.



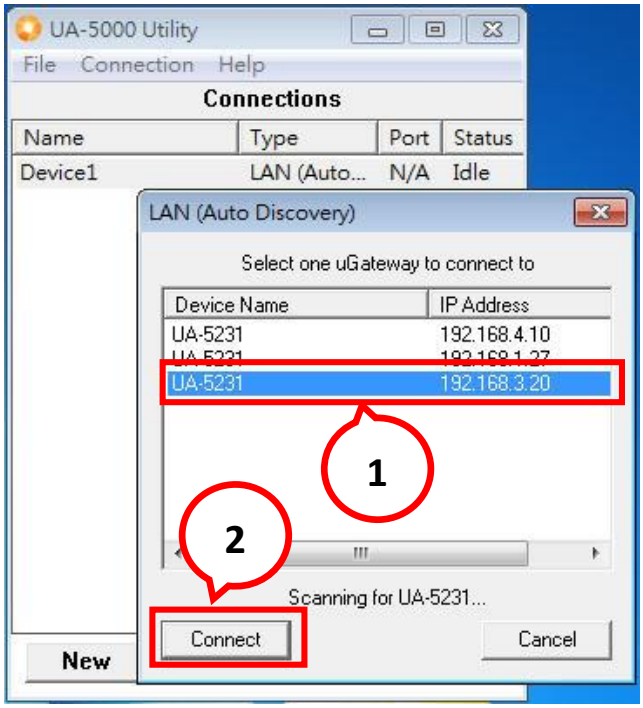
3. Search the UA controller

Mouse double-click on the name you created (or single-click and then click the “Connect” button), this utility will scan and list all UA devices over the network.



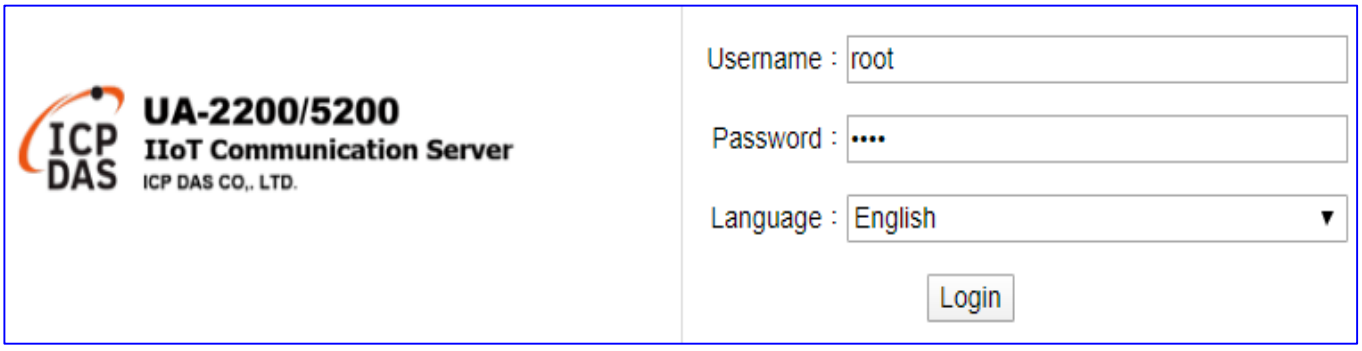
4. Connect to the UA controller

Click the device name you want to connect to, and then click the “Connect” button. It will connect to the UA webpage via the default Web browser (IE/Chrome…).



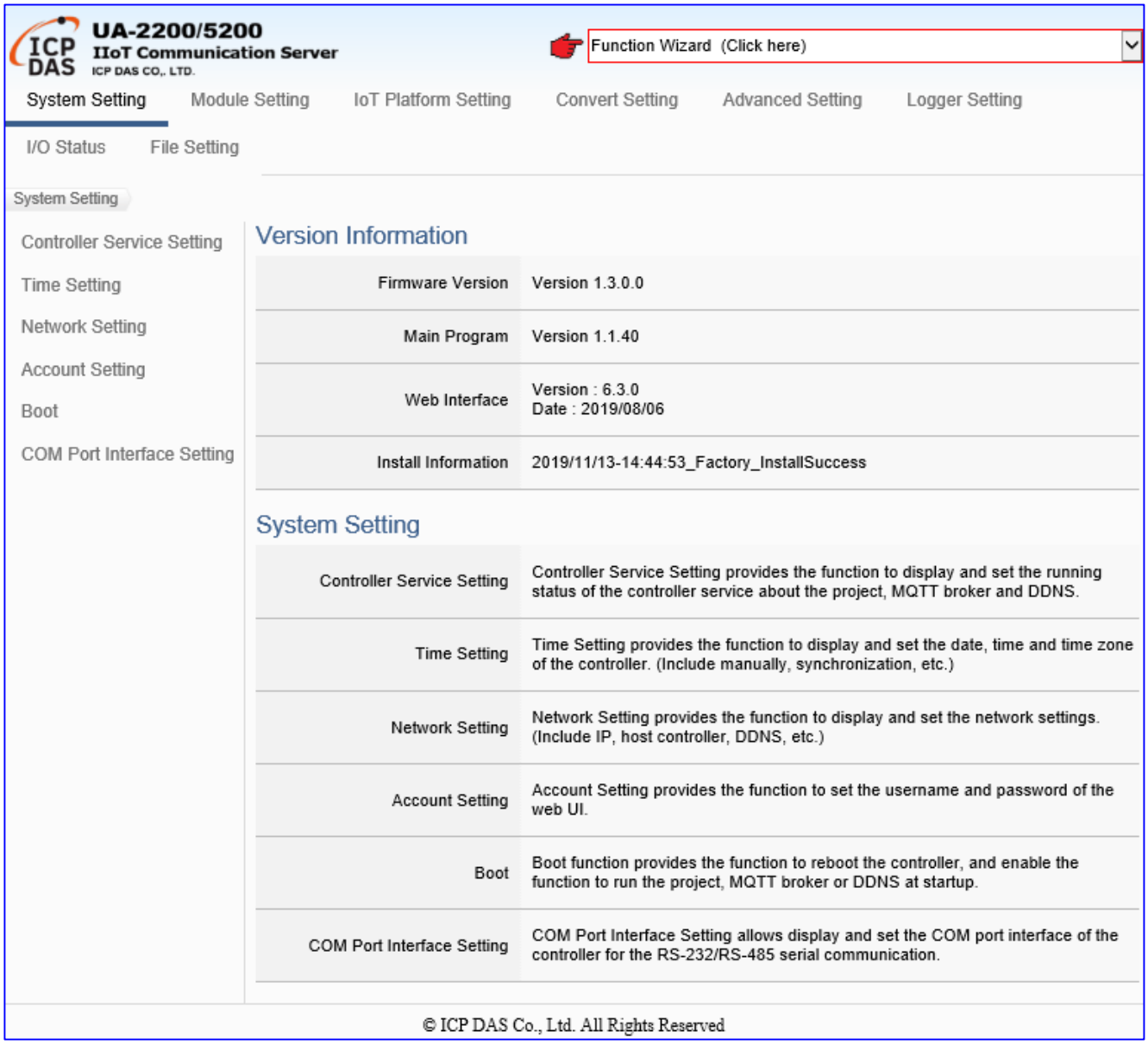
5. Connect to the UA controller

The default web browser will be run and direct go to the UA login web site. Please enter the username and password to login the UA series Web UI. The factory default username: **root**. The factory default password: **root**.



6. Login the Web UI of the UA controller

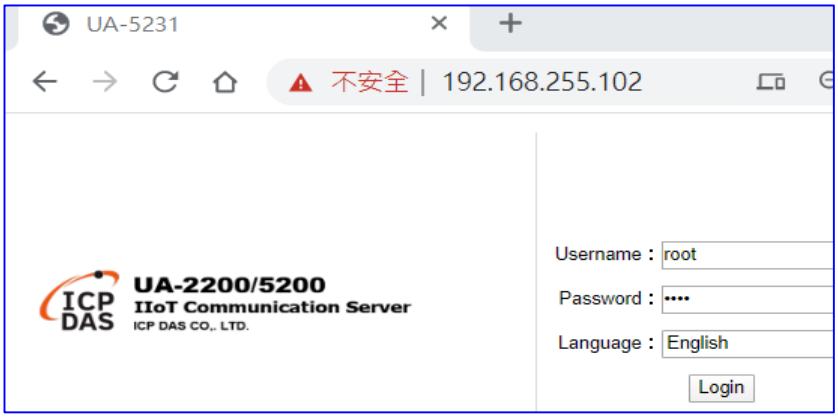
When login into the web interface, the UA default home page (the main configuration screen) will as below, and will automatically read setting of that UA to the webpage.



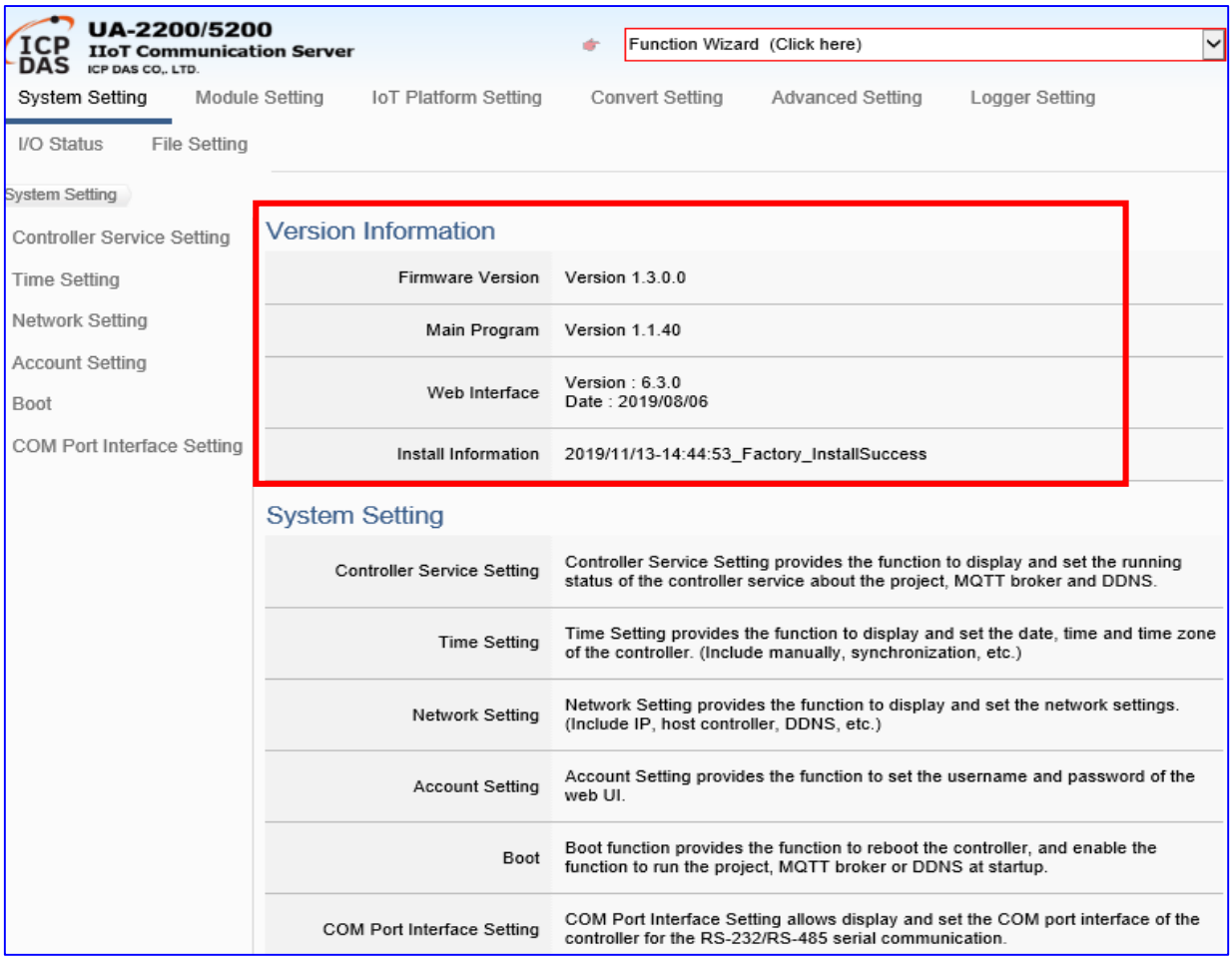
3. Quick Start 2: Web UI / Steps / Project Example

This chapter introduces the UA Web User Interface (UI), the steps for project / function / list settings, and a project example. For more project examples please see Chapter 4. The detail parameters of the menus, functions, etc. will introduce in the next chapters Chapter 5.

First, login the UA Web UI as below. (Default username/password: **root/root**)
If your UA is not connect to the network yet, please refer to Chapter 2.



After log in the Web UI, users can see the version information, including the version of the install Firmware program, main program and Web Interface (and date).



3.1. Web UI Environment Overview

The function areas of the Web UI:

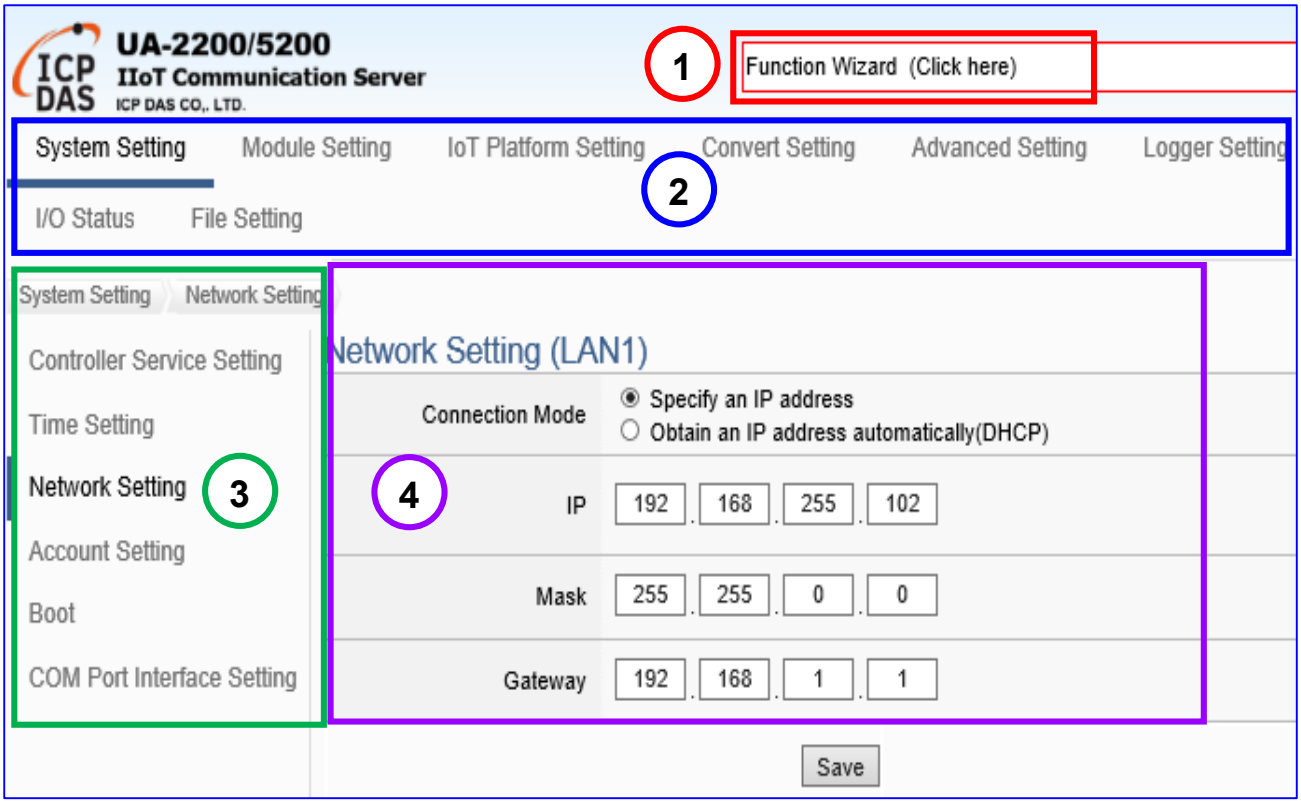
This chapter will overview these areas. The following chapters will introduce the settings of the functions and parameters.

1. **Function Wizard**: A quick setup area for commonly used projects or functions. The Web UI will enable a Wizard mode and show a “Step Box”. The user just follows the “Step Box” step-by-step and then can complete the project quickly and rightly. (Refer to Chapter 4)

2. **Main Menu Area**: The main menu contains all the setting functions that classified into several categories. Click the main menu item, the sub-menu will appear on the left of the page, and the function descriptions will appear under the main menu area. (Refer to Chapter 5)

3. **Sub-Menu Area**: The sub-menu will display detailed functions under the selected main menu. The user could setup or review detailed function options in the setting area. (Refer to Chapter 5)

4. **Setting Area**: The setting area is for displaying and setting the functions and parameters of UA series controller. The content of this area will be vary according to the selected main menu and sub-menu.



3.2. Setting Steps for Project / Function / List

- **【Steps for Project / Function Setting】:**

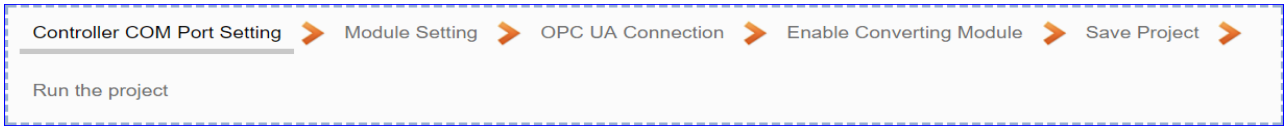
The setting for UA series controller is to set up from the left to the right of the main menu functions. The “Function Wizard” even provides the “Step Box” for users to follow the steps and prevent from selecting the wrong function, e.g. the setting steps of the Modbus communication conversion with the OPC UA protocol are as below:

Steps for Project/ Function:

Controller Setting > Module Setting > Connecting OPC UA (in IoT Platform) > Conversion > File Setting > Execution

Main Menu:

Step Box of the Function Wizard:

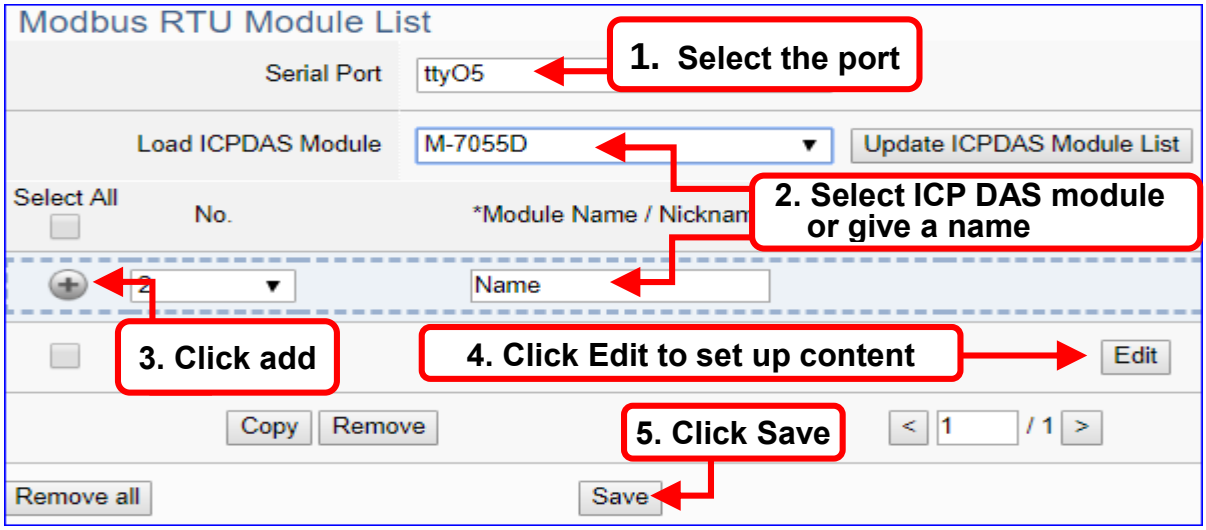


- **【Steps for List Setting】:**

About the List setting of module, connection…, they have the similar steps as below:

1. Select the connection port for the module (or connection…)
2. Select ICP DAS module or give a name/nickname, default name: Name
3. Click the button [⊕] to add a module, connect… list
4. Click the button [Edit] to enter the Content Setting page
5. Set up the list content, click [Save] to back, and then [Save] the list page.

Steps for List: e.g. Modbus RTU Module List.



The chapter 3.3 provides an example for user to know the setting steps, and the chapter 4 provides various commonly projects and functions for user to apply.

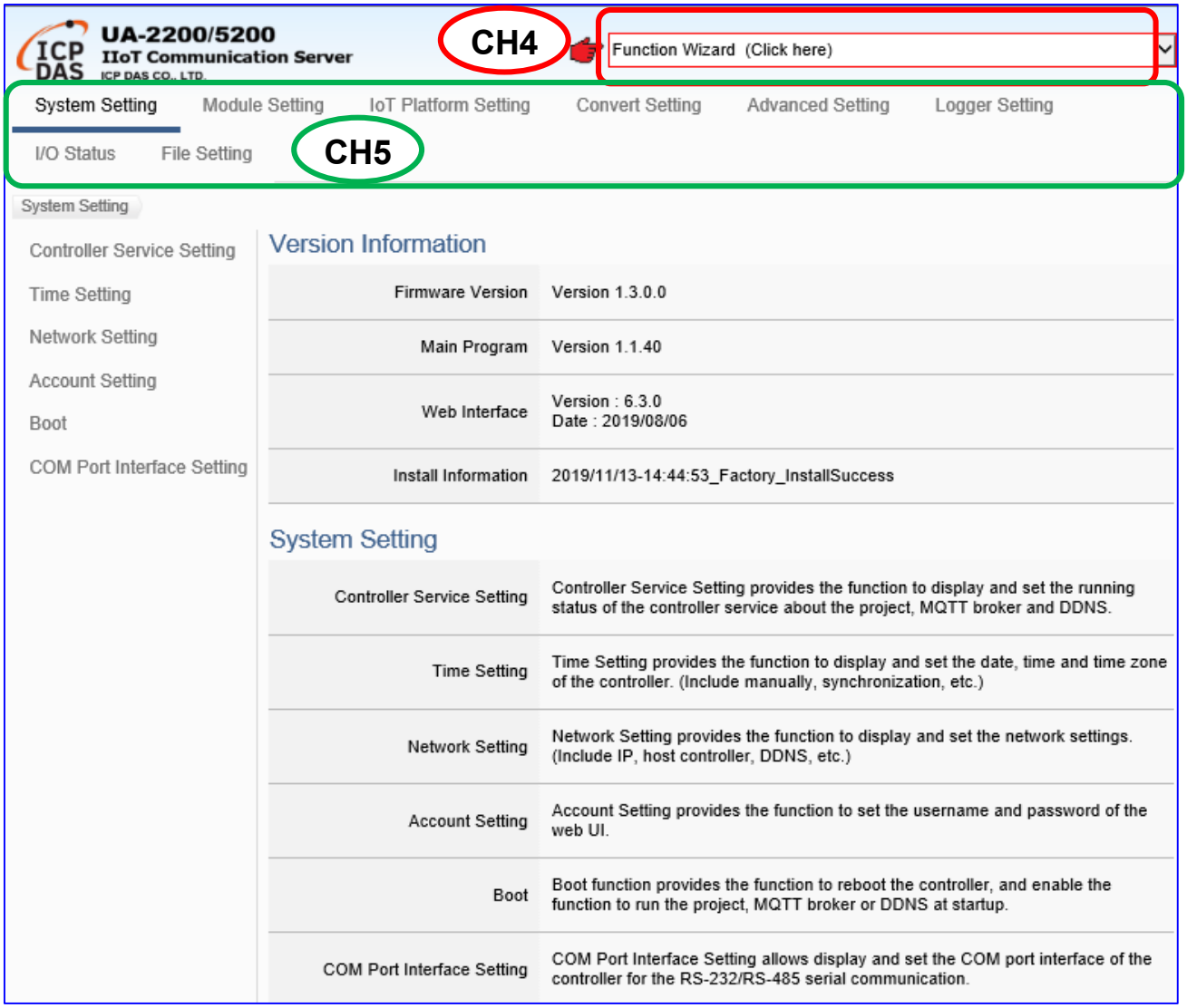
3.3. Project Setting Example

After login, the UA Web UI (Web User Interface) screen view is as below picture. Then can start to setup the UA controller. If your UA has not connected to the Web UI, please refer to Section 2.1 Hardware Connection and Section 2.2 Network Connection.

This section will introduce a quick method to set up a simple project example to allow users learning about the project steps (step-box) and list steps.

The quick method is to use the **[Function Wizard]** at the up-right corner of the Web UI. The Function Wizard provides several items for quick setting the projects or functions via a Wizard guide. The users just follow the “step box” and then can complete the project quickly and well. For more information of the Function Wizard, please refer to Chapter 4.

The user can also select the main menu function of the Web UI to setup the project. The complete detail description of the menu functions, please see Chapter 5 .

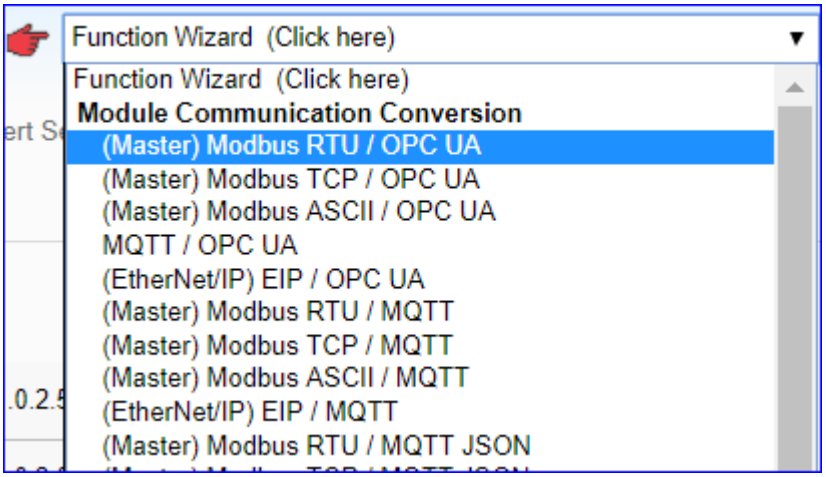


3.3.1. A Quick Setup Project Example

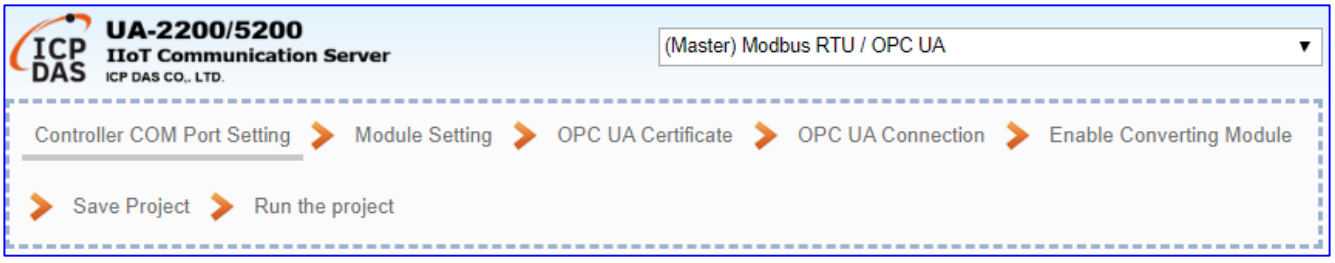
This example will setup a project for conversion of OPC UA and Modbus RTU (Master) communication protocol using the Function Wizard. The devices include a UA-5231 controller and an M-7055D module that wired with RS-485 interface to read/write the Modbus RTU I/O data and need the convert setting. The wiring is show as the picture below.

Note:【Function Wizard】at the up-right corner of the Web UI is a quick setup area. The hardware/network connection methods please see the CH. 2 .

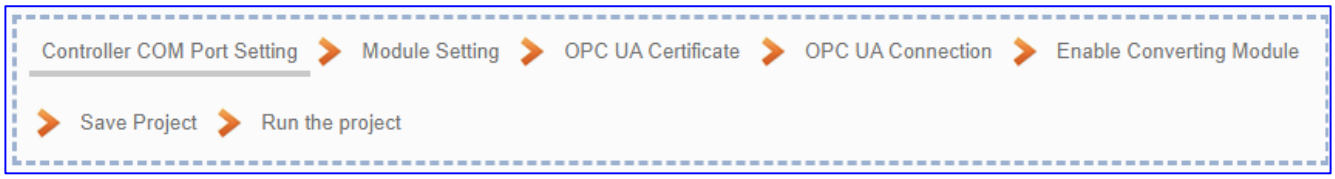
This sample uses the conversion function of the Function Wizard to convert the Modbus RTU / OPC UA. First, click the "**(Master) Modbus RTU / OPC UA"** item of the Function Wizard.



The Web UI will enable a Wizard guide mode and show a "Step Box" (as below picture). The user just needs to follow the "Step Box" step-by-step and then can complete the project quickly and correctly.



After click the【**(Master) Modbus RTU / OPC UA**】, follow the "**Step Box**" to complete the 7 steps: (The step with a **bold underline** means it is the current step.)



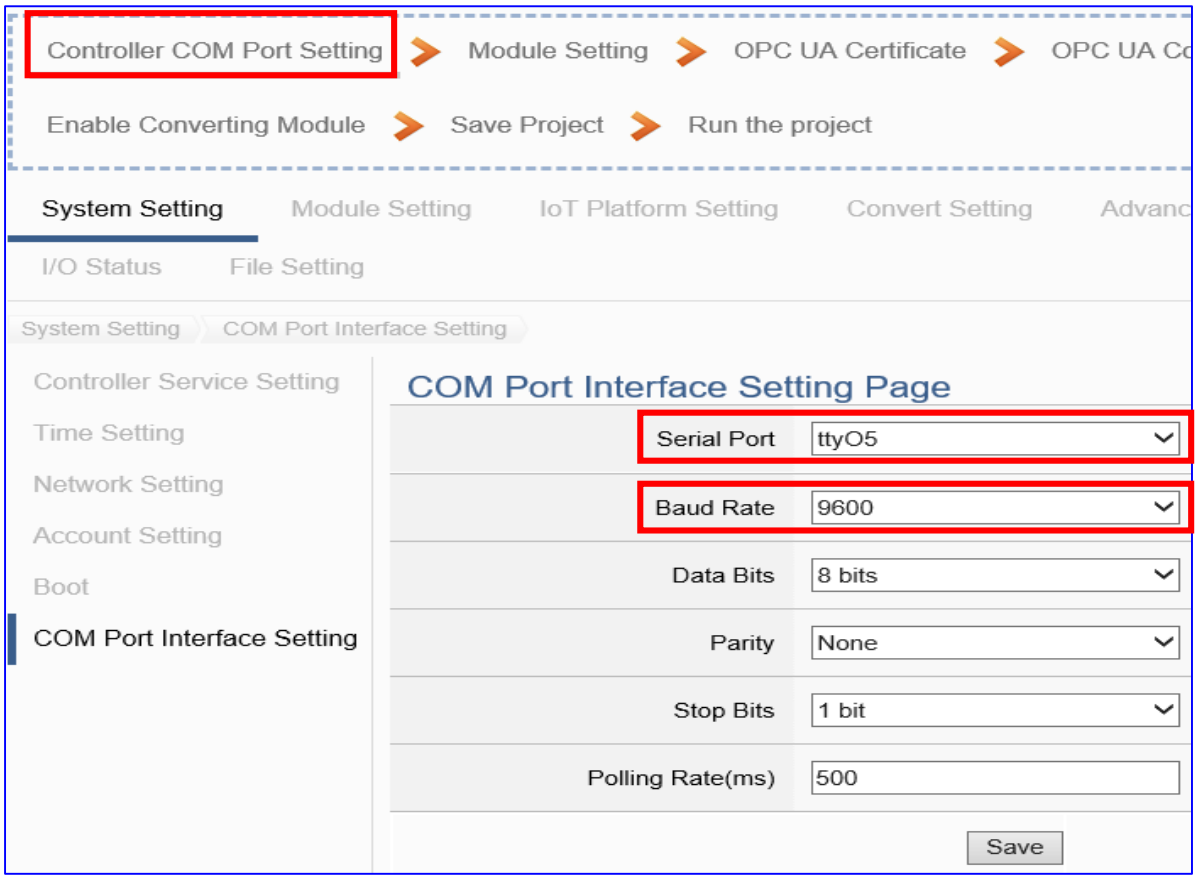
Step 1. Controller COM Port Setting

This step sets up the COM port interface of the UA controller to connect with the module and the communication setting.

<This Example>

The UA uses the ttyO5 port to connect with the M-7055D, so set the **Serial Port: ttyO5**. The M-7055D module default setting is "9600, 8, N, 1", so set **Baud Rate: 9600**, **others need not to change**. After setting, click [Save] button to store this page setting. (The user also can save the whole project until the step 5 of "Save Project".)

Note: If user uses other port to link other module, or the module is not in the default state, please set this step according to your case. The user can find the M-7055D default state in the Module CD or its Product Web Site .



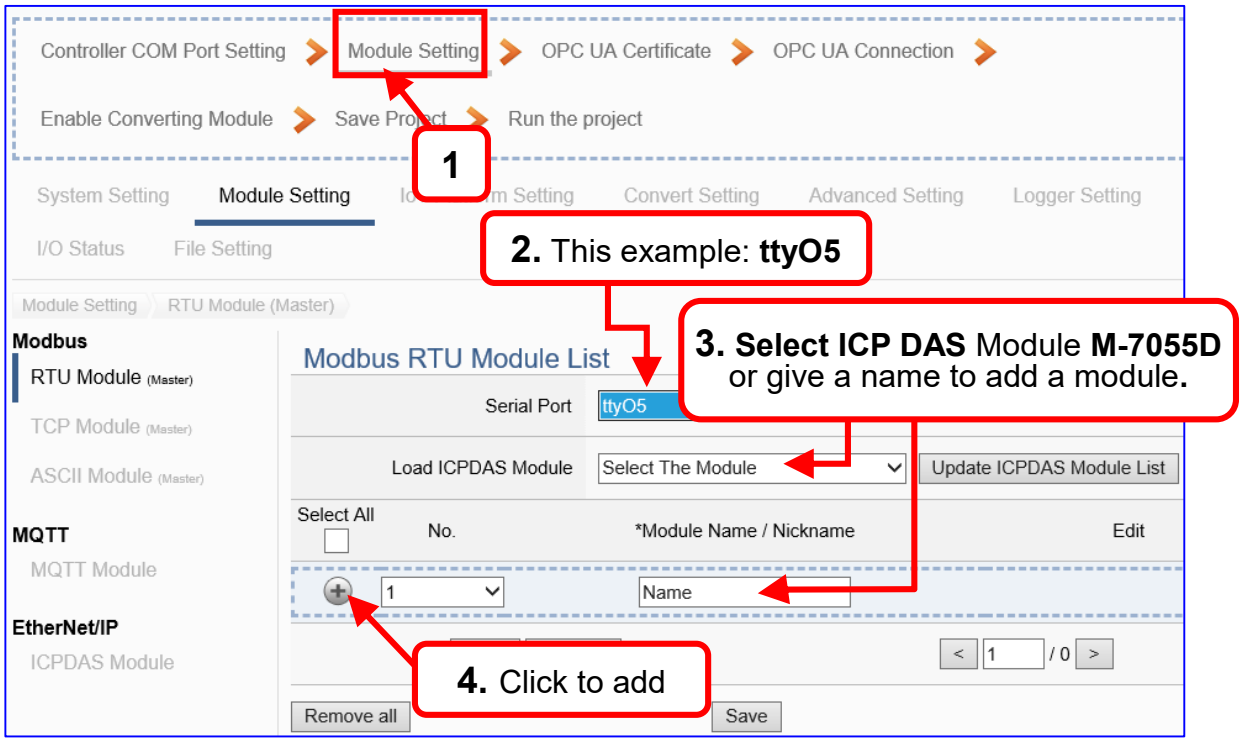
Step 2. Module Setting

Click the next step, and enter the **Step 2 [Module Setting]** of the UI setting.

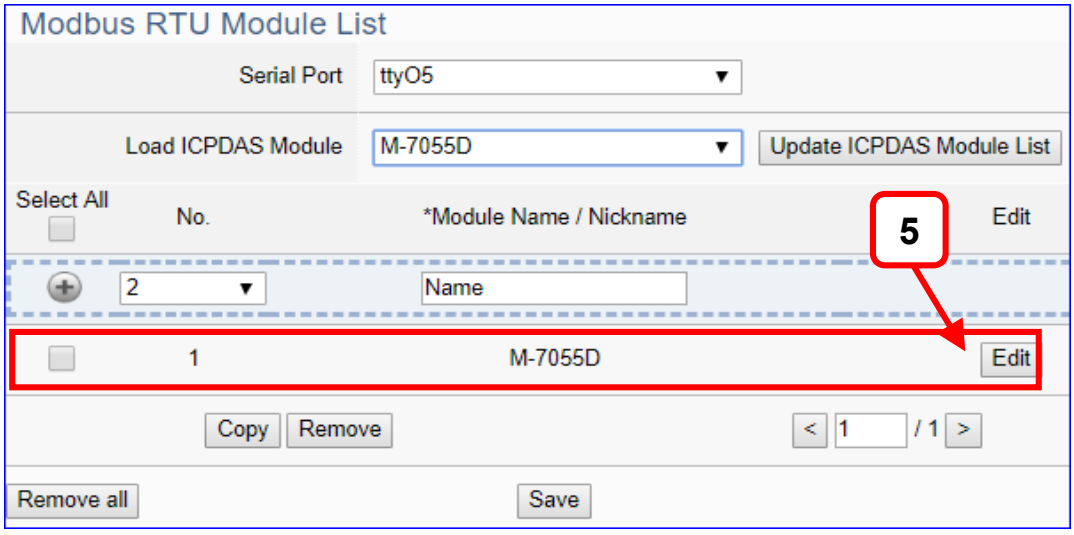
This step is for setting the connected modules. The user can set each module a name (Default name: Name), click [ ] button to create a new module, and click [Edit] button to configure the module content and Modbus mapping table.

<This Example>

In “Module Setting”, select the **Serial Port: ttyO5**, and select **ICP DAS Module: M-7055D**, the system will auto setup the ICP DAS module. If not use ICP DAS module, please give a name and click the button [ ] to add a Module List.

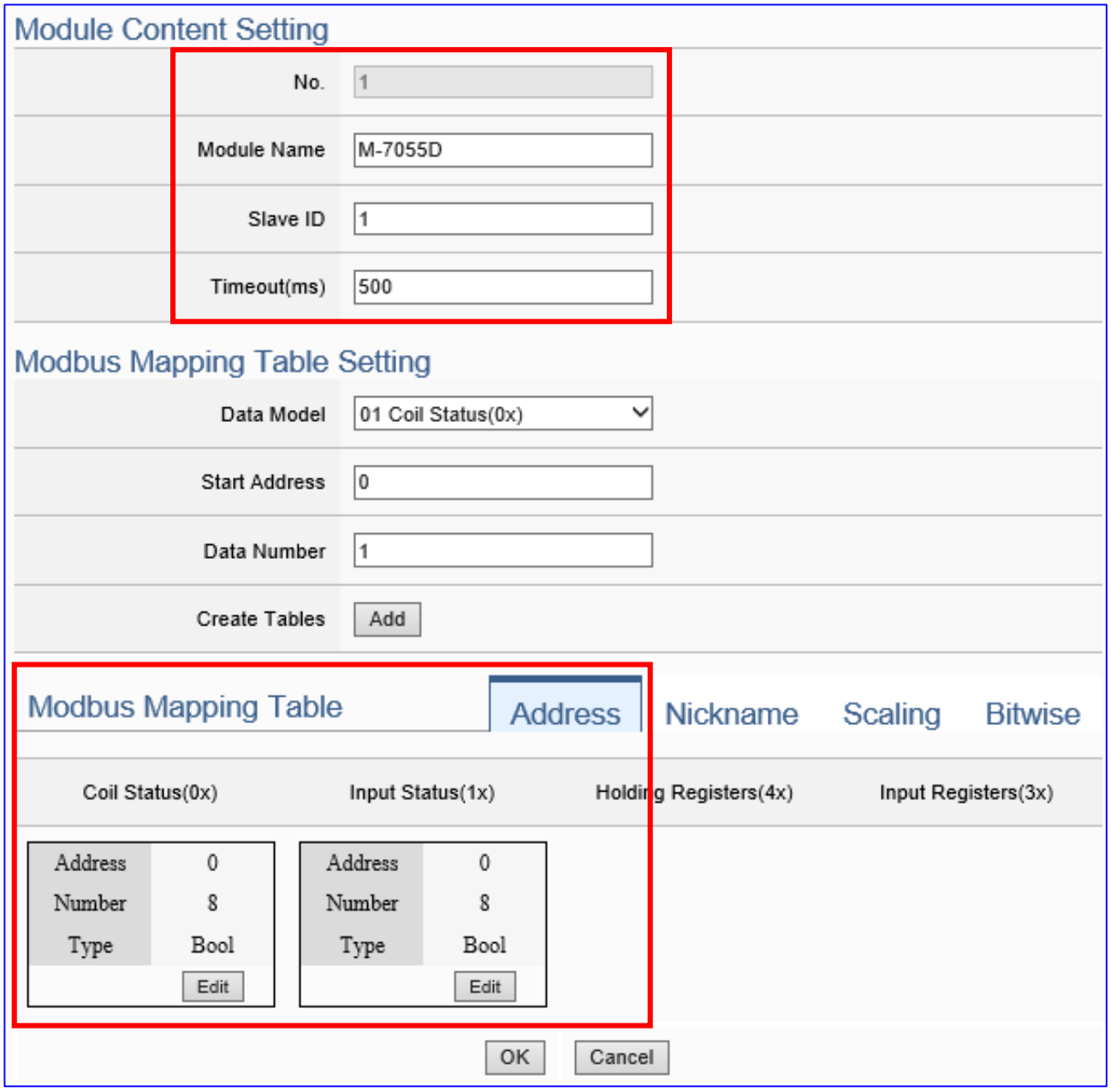


Add a module M-7055D as below, and then click [Edit] button to enter the “Module Content Setting” page.



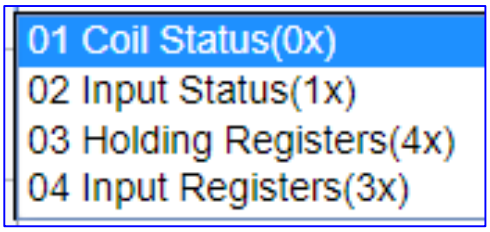
[**Module Content Setting**] page can set the module and its Modbus mapping table.

If use ICP DAS module, system will auto-setup the module and its Modbus Mapping Table. Such as this example, we select the module from “Load ICP DAS Module”, it auto-shows the M-7055D (DO x 8, DI x 8) module content and Modbus Mapping Table as below.



If not use ICP DAS Module, please check the module's user manual to find out the module Modbus Address, and refer to the chapter "Module Setting" of the UA manual as below.

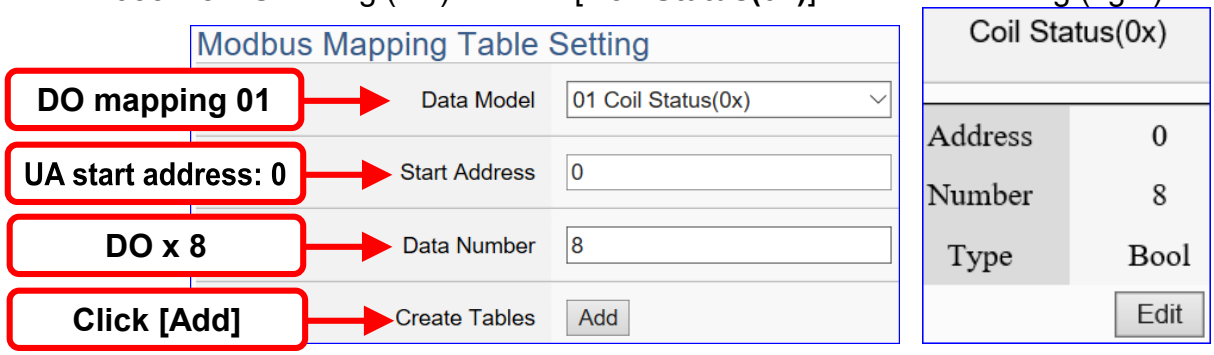
Please set up the addresses mapping with the module I/O channels in the [**Modbus Mapping Table Setting**]. The system provides 4 Modbus data models (as below) **"01" to "04"** for mapping to the **DO, DI, AO and AI** channels.



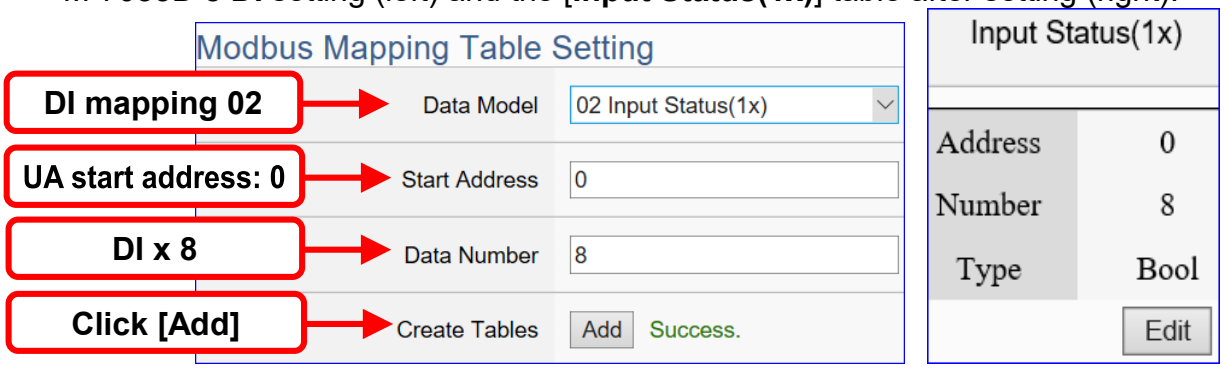
Note: the start address of UA series is bass on **"0"**. Some modules start address are bass on "1", but please note UA is follow the rule of start address "**0**", and set enough Data Number for mapping to the I/O channels of the linking module.

In this example, M-7055D has 8 DO and 8 DI channels, please create the table as following pictures of the [**Modbus Mapping Table Setting**]. After complete the setting, the DO and DI Modbus address settings will show in the [**Modbus Mapping Table**].

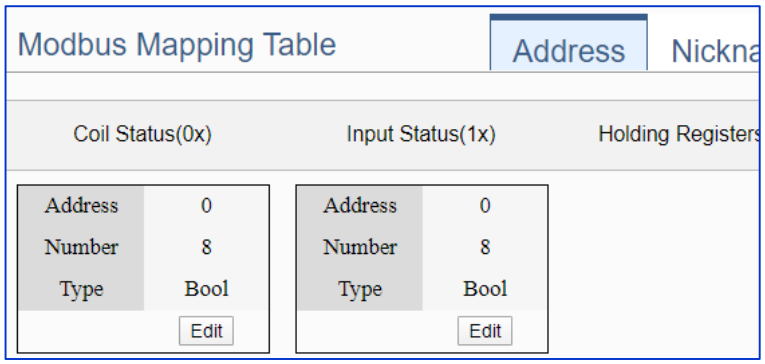
M-7055D **8 DO** setting (left) and the [**Coil Status(0x)**] table after setting (right):



M-7055D **8 DI** setting (left) and the [**Input Status(1x)**] table after setting (right):



The Modbus Mapping table is showing as below. Click [OK] to save and exit.



For more setting item descriptions, please refer to chapter Chapter 5.2. Module Setting.

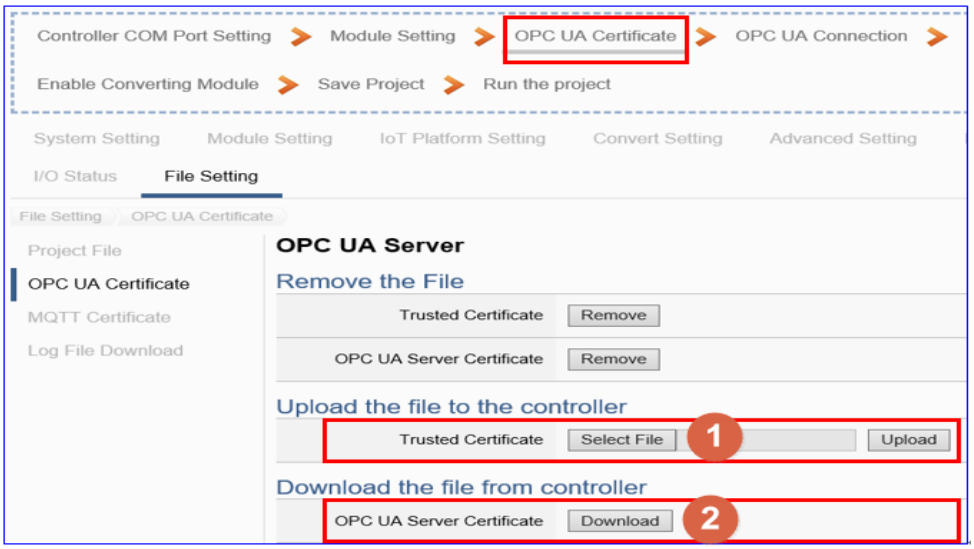
Step 3. OPC UA Certificate

Click the next step, and enter the **Step 3 [OPC UA Certificate]** of the UI setting.
This step is about setting the OPC UA Certificate for the security and encryption, e.g. upload, download, remove certificate. **If user's project does not need to use the secure encryption connection, please skip this step and click the next step directly.**

The connected **Server/Client** adds the certificate to each other for secure encryption:

① Get the Trusted Certificate file from the connecting **OPC UA Client** and save it in the PC. In this step, select the file and upload it to the UA controller.

② Provide the **OPC UA Server** certificate of this UA controller to the Client device. In this step, **download** the certificate file (**Certicate_IPAddress_.tar**), decompress it (**icpdasuaserver.der**) and upload it to the client device.



File Setting > OPC UA Certificate > Upload the file to the controller	
Trusted Certificate	**Select File**: select the OPC UA Trusted Certificate file in PC to upload to the UA controller. **Upload**: upload the Trusted Certificate file to the UA controller. • File format must be **DER**. Extension name must be "**der / cer / crt**". Trusted Certificate Select File icpdasuaserver.der Upload • If select a wrong file, the system will show an error message. Trusted Certificate Select File Certificate_192.168.255.10 Certificate type is wrong. Upload
File Setting > OPC UA Certificate > Download the file from controller	
OPC UA Server Certificate	**Download**: Download the OPC UA Server Certificate file to the current using computer. • File format: **DER**. File name: **Certicate_IP-address_.tar** e.g. Certificate_192.168.255.102_.tar. Before using, decompress to **icpdasuaserver.der**, as below. icpdasuaserver.der

For more settings, refer to the [5.8.3 OPC UA Certificate] in the Chapter 5.8 File Setting .

Step 4. OPC UA Connection

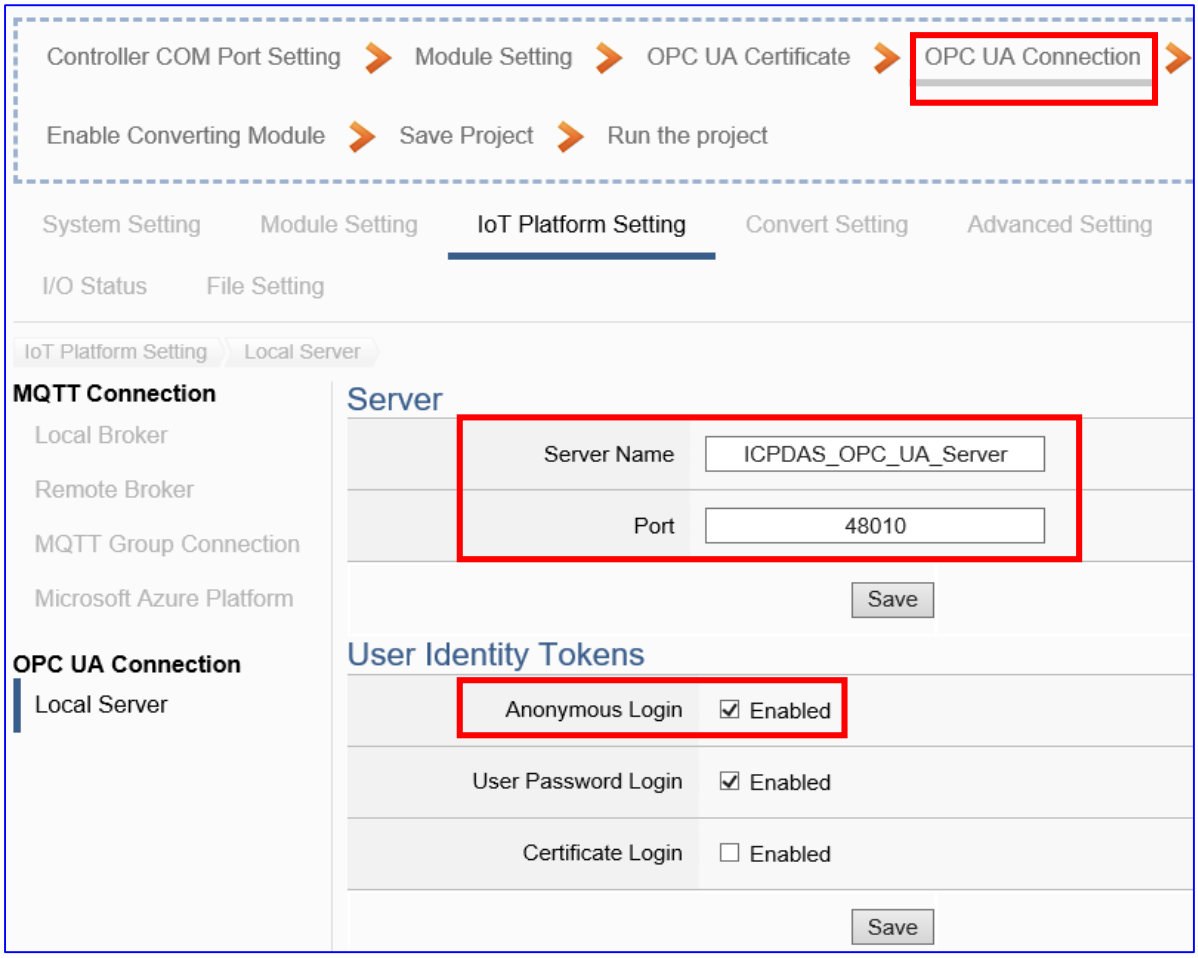
Click the next step, and enter the **Step 4 [OPC UA Connection]** of the UI setting

This step is for setting the IoT platform and the OPC UA connection, e.g. the server name, port, login identity information, etc.

We select the “Modbus RTU / OPC UA” conversion at the beginning, so this step will auto enter the [**OPC UA Connection > Local Server**] page of IoT Platform Setting. The “Step Box” will prevent the user from selecting the wrong platform.

<This Example>
The server name and port of [**OPC UA Connection**] will auto show up, user needs not to change in this example, but can change the port if needs.

The Anonymous Login default enables, you need not to change in this example. At last, click [Save] button.



For enabling other logins, please see the [OPC UA Connection] in the Chapter 5.3 IoT Platform Setting .

Step 5. Enable Converting Module

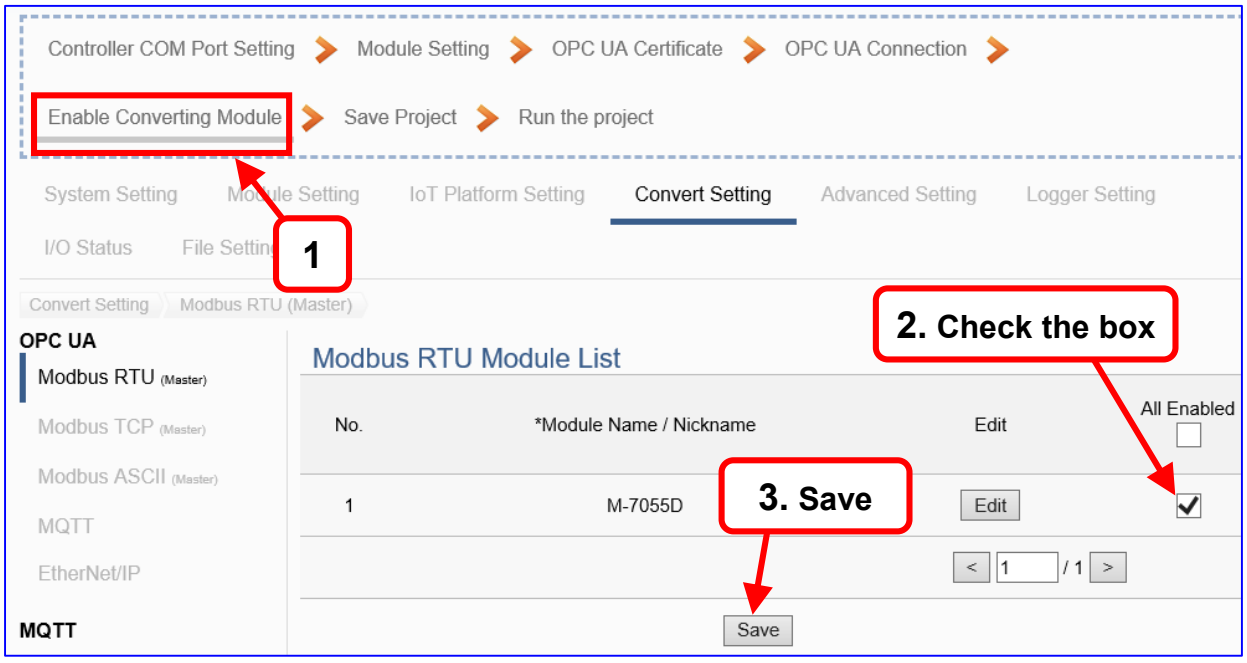
Click the next step, and enter the **Step 5 [Enable Converting Module]** UI setting

This step is for enabling the Modbus RTU / OPC UA conversion.

This step will auto enter the [**OPC UA > Modbus RTU (Master)**] page of Conversion setting because we select the “Modbus RTU / OPC UA” conversion at the beginning. The “Step Box” will prevent the user from selecting the wrong platform.

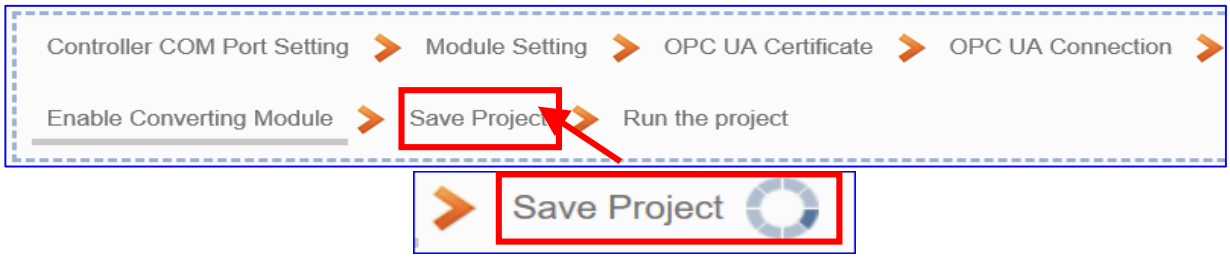
<This Example>
In this setting page, please **check** the enable box of the module **M-7055D** we set up in the previous steps. Then click [Save] button.

The above action will enable all I/O channels of the M-7055D for communication conversion. If users need to enable some channels only, please click [Edit] to enable individual channels. (Refer to Chapter 5.4)



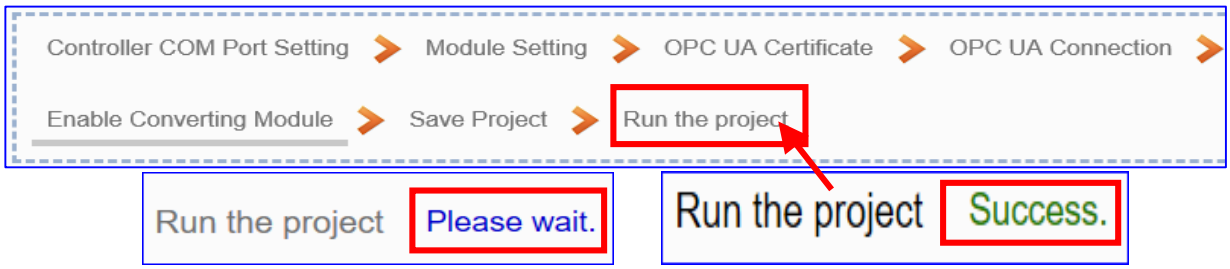
Step 6. Save Project

The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation disappears, the project is saved completely.



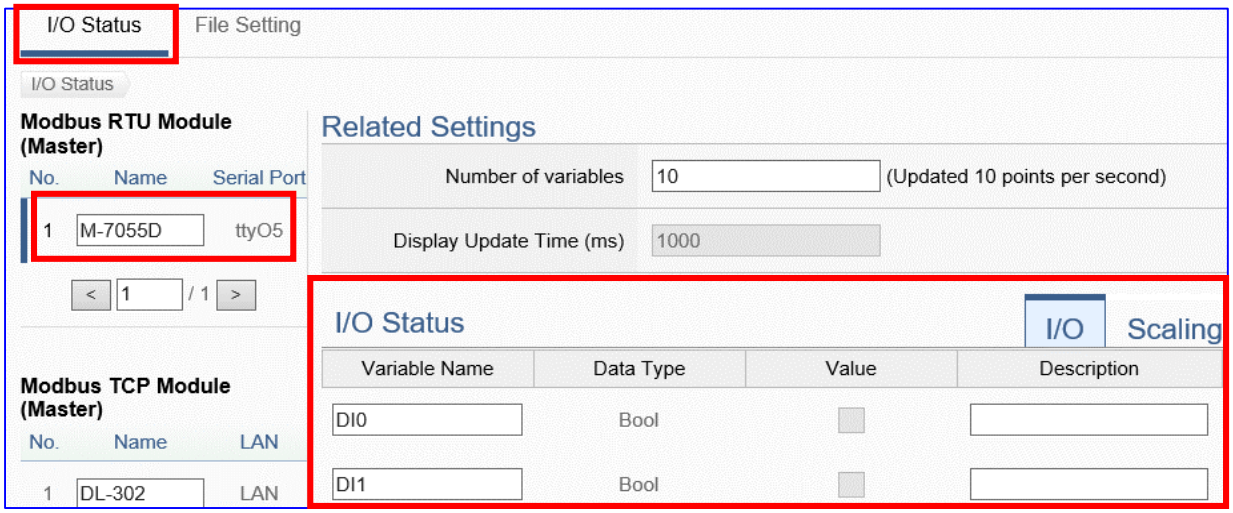
Step 7. Run the Project

The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.



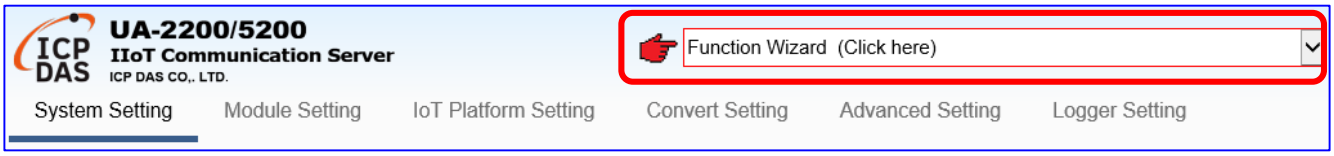
When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

The new project now completes the setting, uploading and running in the UA controller and can process the conversion communication. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.

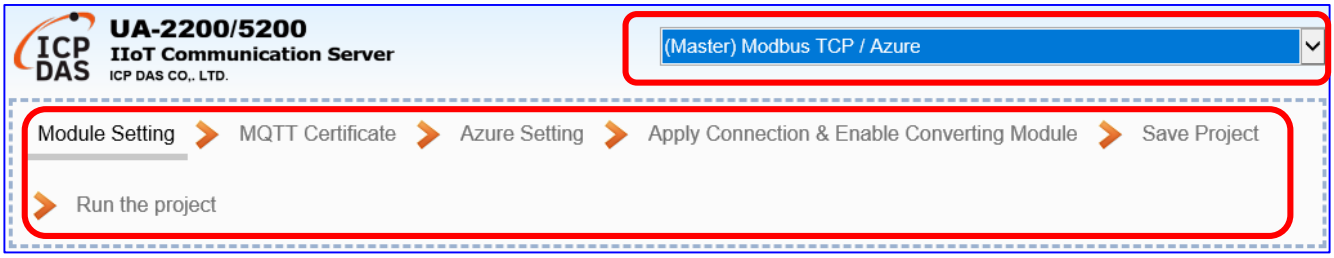


4. Function Wizard: Project Quick Setup

Chapter 4 is main for UA project setting. [**Function Wizard**] in the up-right corner of the Web UI provides an **easy and quick** setting "**Step Box**" that **very suitable for the new users**.



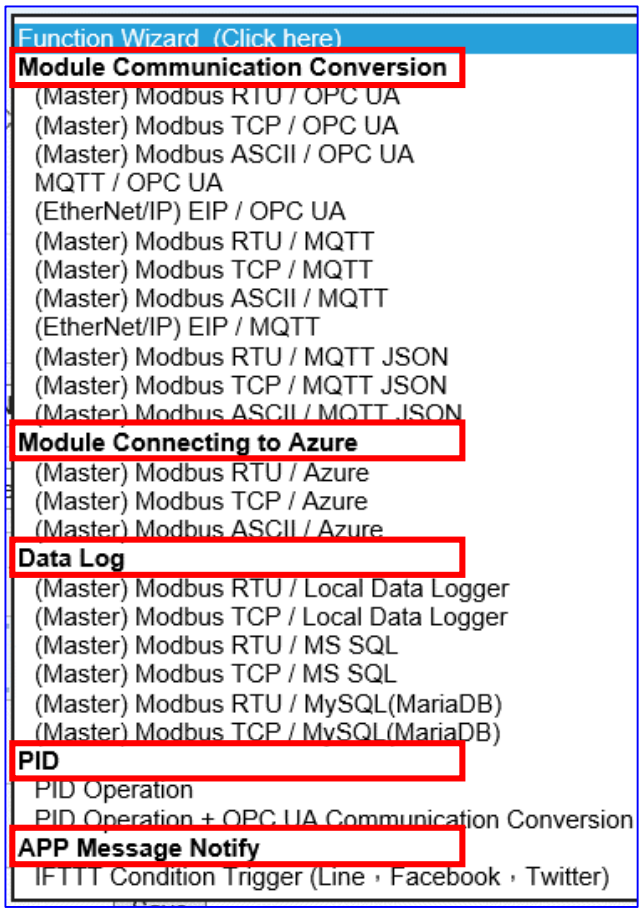
[**Step Box**] is a step guide of the Function Wizard. When users select a function item of the Function Wizard, the Web UI will enable a Wizard mode and show a "Step Box". The user just needs to follow the "Step Box" step-by-step and then can complete the project easily & quickly.



This chapter will focus on the setting steps for the projects or functions that are divided in several **categories (in red box,** that also are the **section** names) and will introduce the step box settings of them in each section.

ICP DAS will develop more Function Wizard items for more functions or projects. Please choose an item from a category to begin the project setting.

About the real module setting steps, please refer to Section 3.3 , there is a project using UA and M-7055D, and converting Modbus RTU with OPC UA protocol. The user could see that section and this chapter to know more concept about the setting steps and tips.

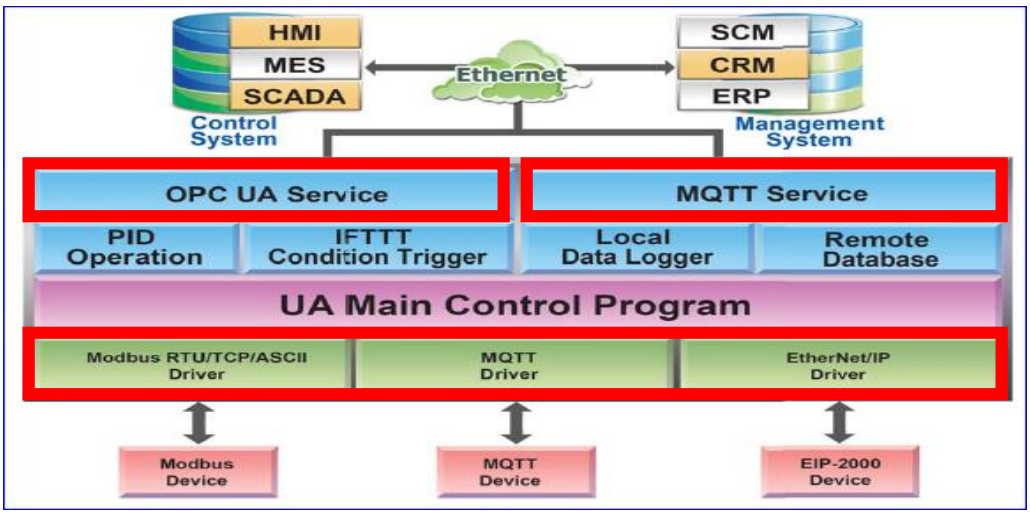


4.1. Module Communication Conversion

"Module Communication Conversion" of UA series, a very commonly used function, can effectively communicate the IoT devices or systems (e.g. cloud, database…) with I/O data of the module (e.g. Modbus module). This section will introduce the setting steps and the function parameters of the "Module Communication Conversion". In the category, there are several items that can be divided into the following protocol types and will introduce them in the sub-sections: OPC UA, MQTT, and MQTT JSON.

Module Communication Conversion
(Master) Modbus RTU / OPC UA
(Master) Modbus TCP / OPC UA
(Master) Modbus ASCII / OPC UA
MQTT / OPC UA
(EtherNet/IP) EIP / OPC UA
(Master) Modbus RTU / MQTT
(Master) Modbus TCP / MQTT
(Master) Modbus ASCII / MQTT
(EtherNet/IP) EIP / MQTT
(Master) Modbus RTU / MQTT JSON
(Master) Modbus TCP / MQTT JSON
(Master) Modbus ASCII / MQTT JSON

Modbus / OPC UA	Using the **OPC UA** Service to convert with **Modbus** RTU/TCP/ ASCII protocols. **(Section 4.1.1)**
MQTT / OPC UA	Using the **OPC UA** Service to convert with **MQTT** protocols. **(Section 4.1.2)**
EIP / OPC UA	Using the **OPC UA** Service to convert with **EtherNet/IP** protocols. **(Section 4.1.3)**
Modbus / MQTT	Using the **MQTT** Service function to convert with **Modbus** RTU/TCP/ ASCII protocols. **(Section 4.1.4)**
EIP/ MQTT	Using the **MQTT** Service function to convert with **EtherNet/IP** protocols. **(Section 4.1.5)**
Modbus / MQTT JSON	Using the **MQTT** Service function in-group of **JSON** format to convert with **Modbus** RTU/TCP/ ASCII protocols. **(Section 4.1.6)**

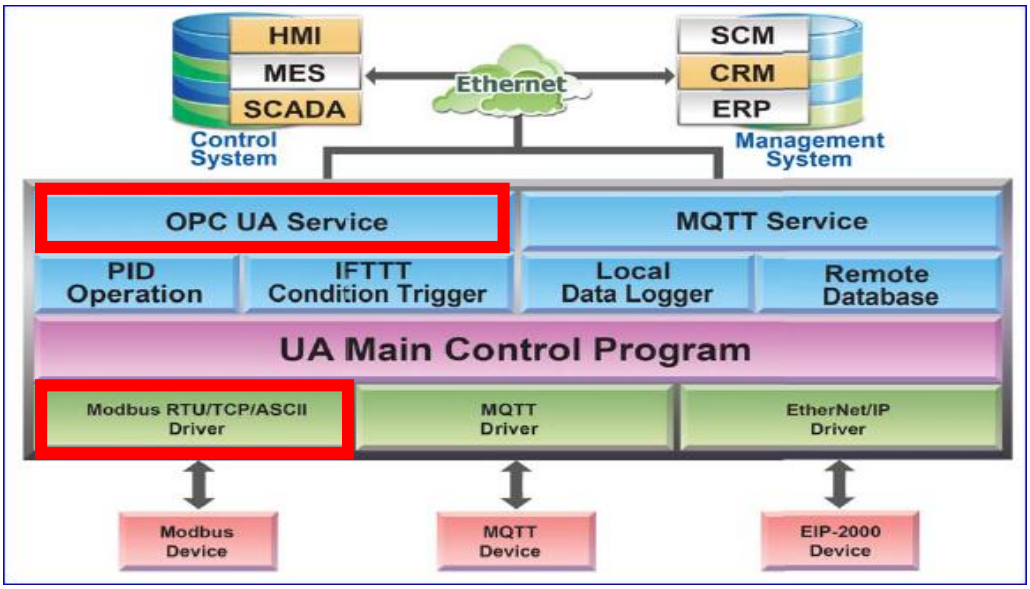


4.1.1. Function Wizard: Modbus / OPC UA Conversion (RTU Example)

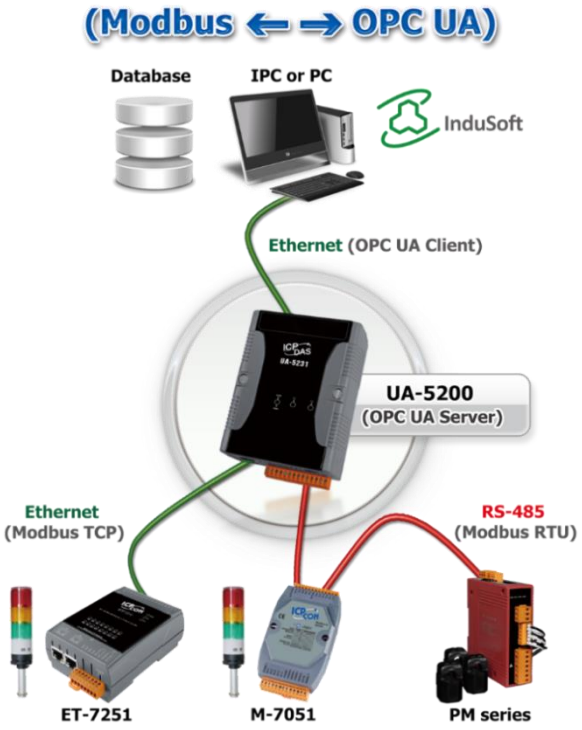
Modbus / OPC UA Conversion include the conversion of **OPC UA** and **Modbus RTU / TCP / ASCII** three protocols. With the OPC UA Service function, the OPC UA Server can read and write the Modbus RTU/TCP/ASCII devices that connected to the controller.

The settings of Modbus RTU/ASCII are the same. Here will introduce them together for a setting sample.

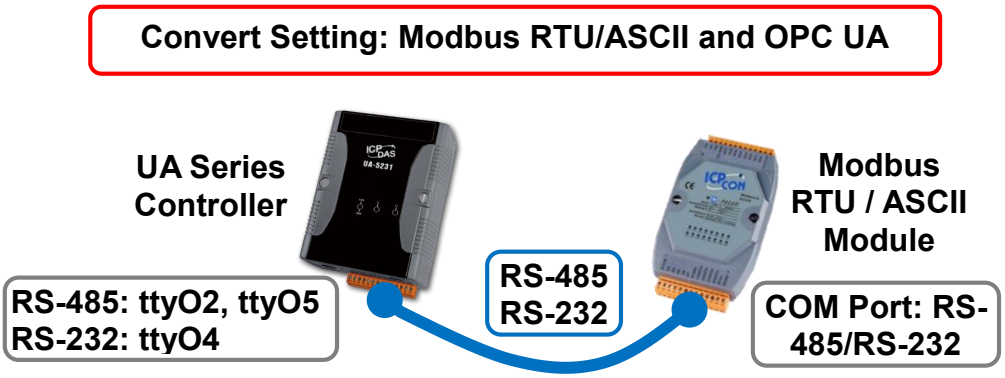
Modbus / OPC UA Function Diagram:



Application Solution:

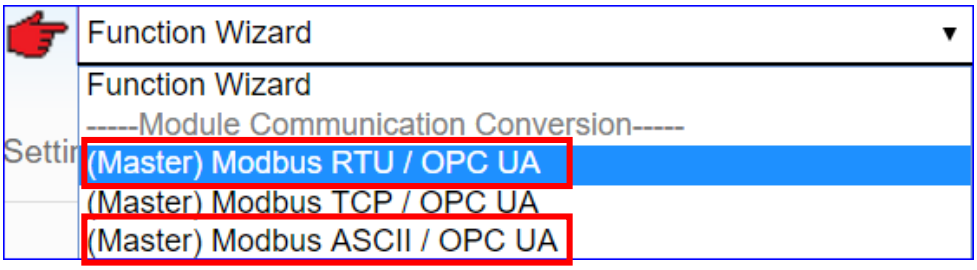


- **Convert Setting: Modbus RTU/ASCII and OPC UA**



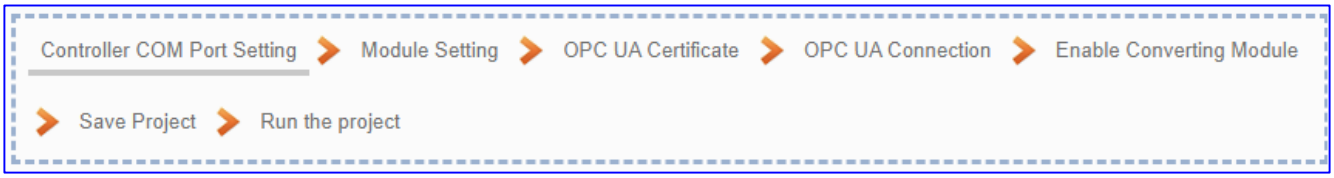
Note: The hardware/network connection methods please see the Chapter 2.

When UA series controller connects the Modbus RTU or ASCII module (via RS-485 / RS-232, as the picture) and read/write the Modbus I/O by OPC UA Server, user can choose the item [**Modbus RTU / OPC UA**] or [**Modbus ASCII / OPC UA**] of the "Module Communication Conversion" in the Function Wizard.

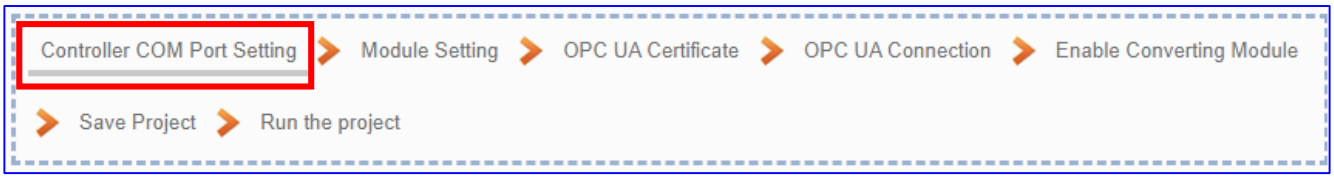


[Step Box]:

The Step Box of the [**Modbus RTU / OPC UA**] and [**Modbus ASCII / OPC UA**] has the same steps, here will introduce them together. When enabling the Step Box, it auto-enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the "Step Box" step-by-step and then can complete the project quickly and rightly.

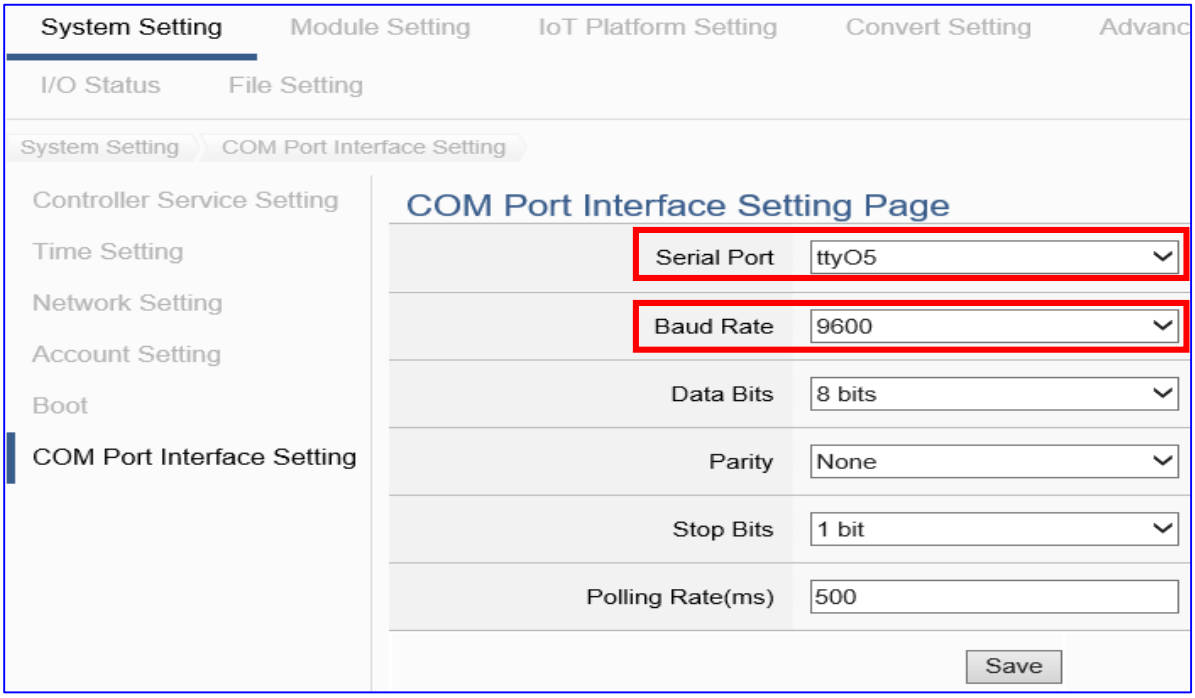


Step 1. Controller COM Port Setting



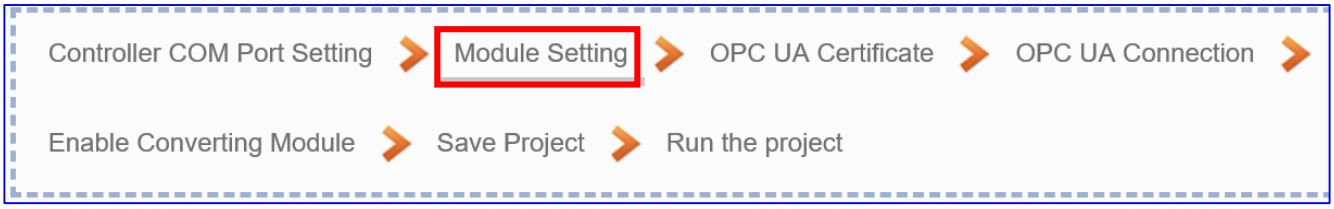
This step allows display and set the COM port interface of the controller for the RS-232/RS-485 serial communication.

The user can find the default communication values of our I/O modules from the module CD, manual or I/O Module website.



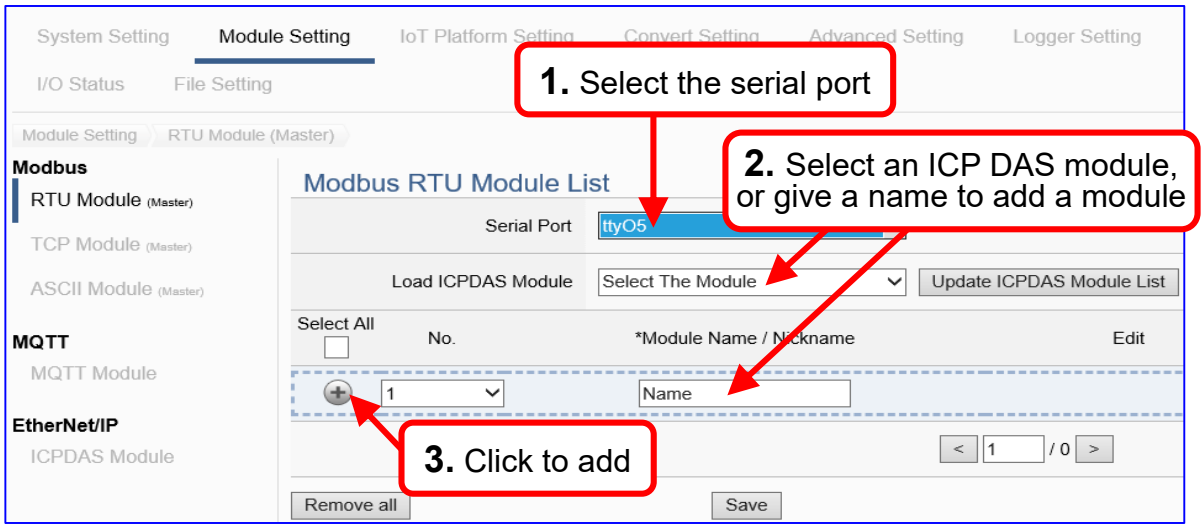
COM Port Interface Setting Page	
Serial Port	Choose the serial port of UA controller that links with the I/O module. ttyO2: RS-485 ; ttyO4: RS-232 ; ttyO5: RS-485
Baud Rate	Choose a baud rate to communicate with the module: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. The UA controller and the I/O module need have the same baud rate.
Data Bits	The number of bits used to represent one byte of data: 7 bits or 8 bits. Default: 8 Bits.
Parity	Choose one way for the parity checking. Options: None, Even, and Odd. Default: None.
Stop Bits	Choose the number of stop bit: 1 bit or 2 bits. Default: 1.
Polling Rate(ms)	Set a time interval for the command. Default: 500 ms
Save	Click [Save] button could save the settings of this page.

Step 2. Module Setting

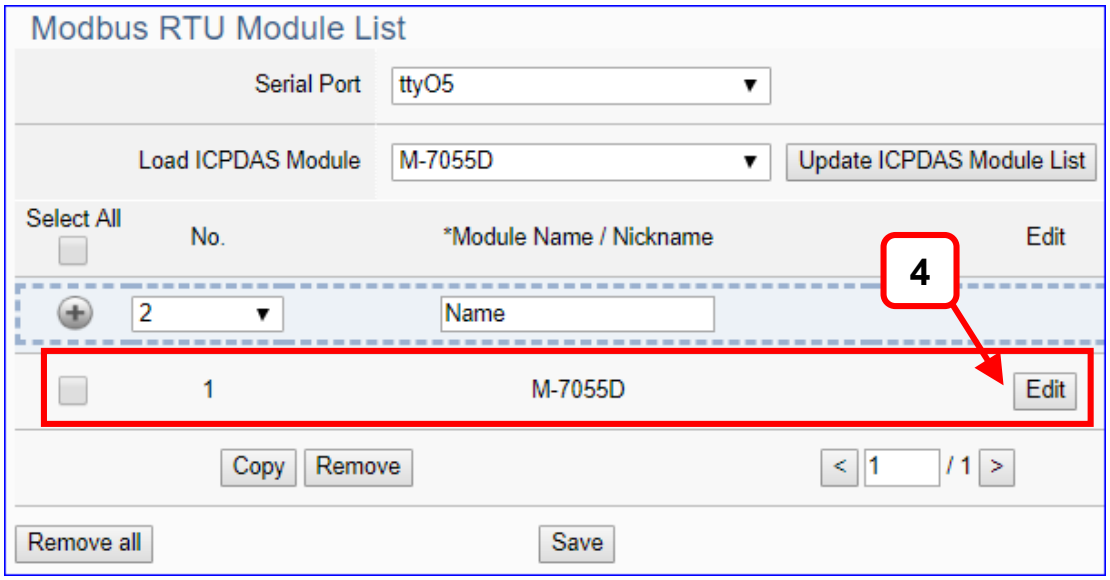


Click the next step, and enter the **Step 2 [Module Setting]** of the UI setting.

This page is for setting the communication values with the connected modules. If using ICP DAS module, user just need to select the model number, system will auto add and setup the module. If not, give a module name (Default: Name), click [⊕] button to add a new module, and then click [Edit] button to configure the module content and the Modbus mapping table.

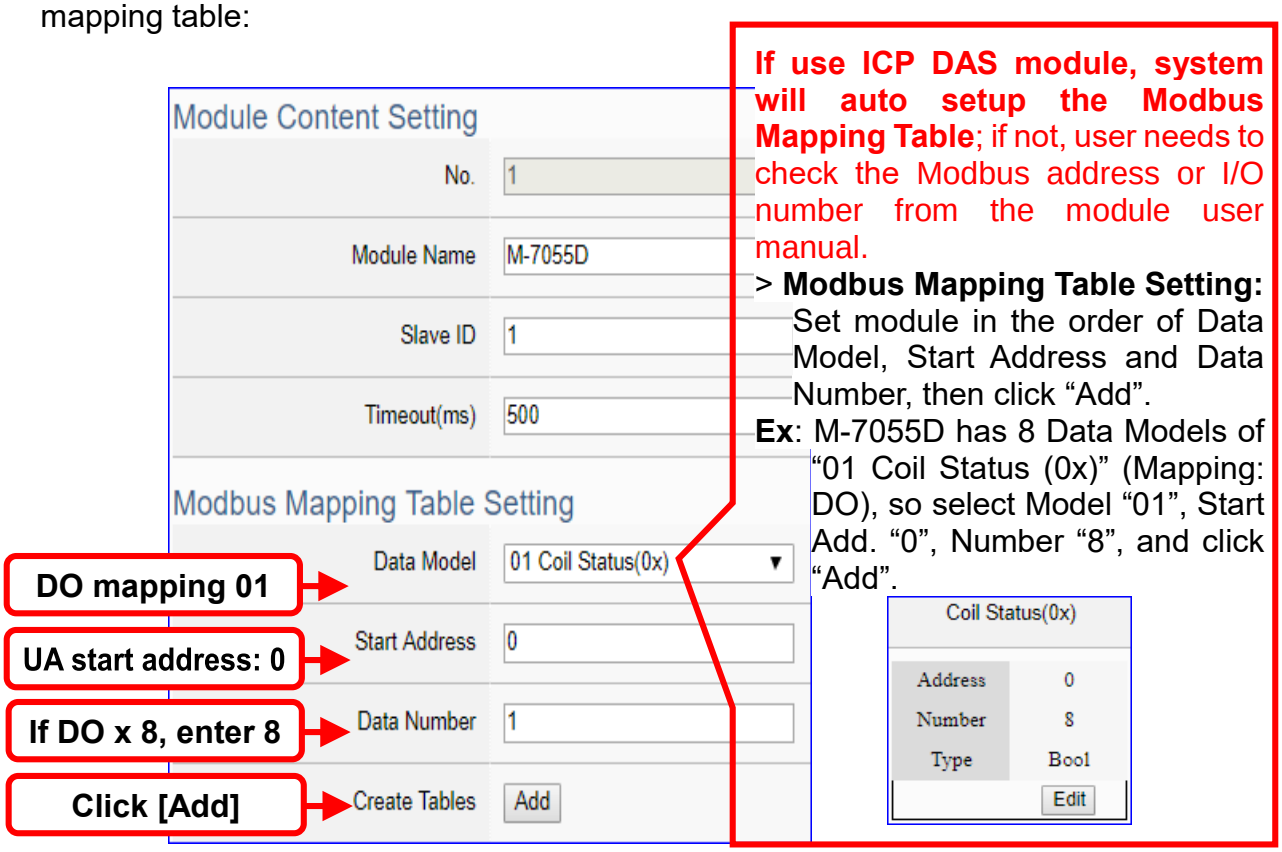


Add a module (ex: No.: 1, Name: M-7055D) as below, and then click [Edit] button to enter the “Module Content Setting” page.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

[**Module Content Setting**] page can set up the module and the Modbus address mapping table:

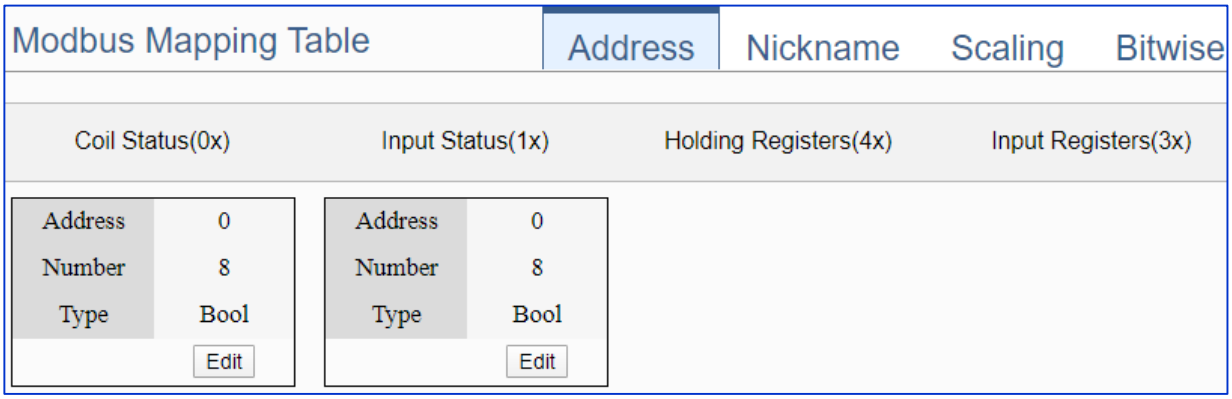


Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Slave ID	Set the module Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models "01" ~ "04" for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

The finished Modbus Mapping Table as below is in order of DO, DI, AO and AI.

Address:

Display and edit the Modbus Mapping Table.

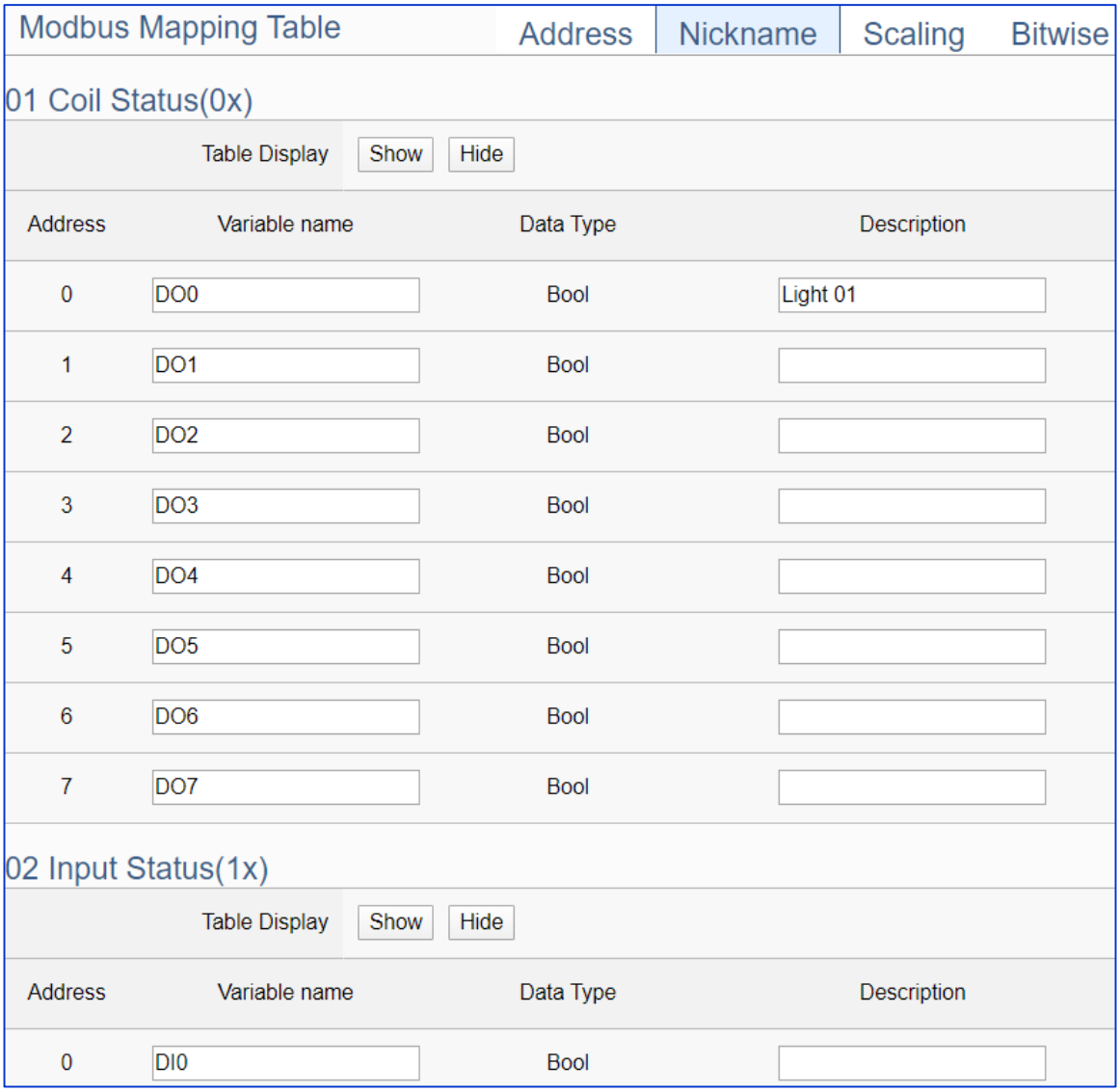


If user selects ICP DAS module, the system will auto set up the Modbus Mapping Table. If not, user needs to check the module Modbus address or I/O number from the module user manual.

Modbus Mapping Table – Address	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname:

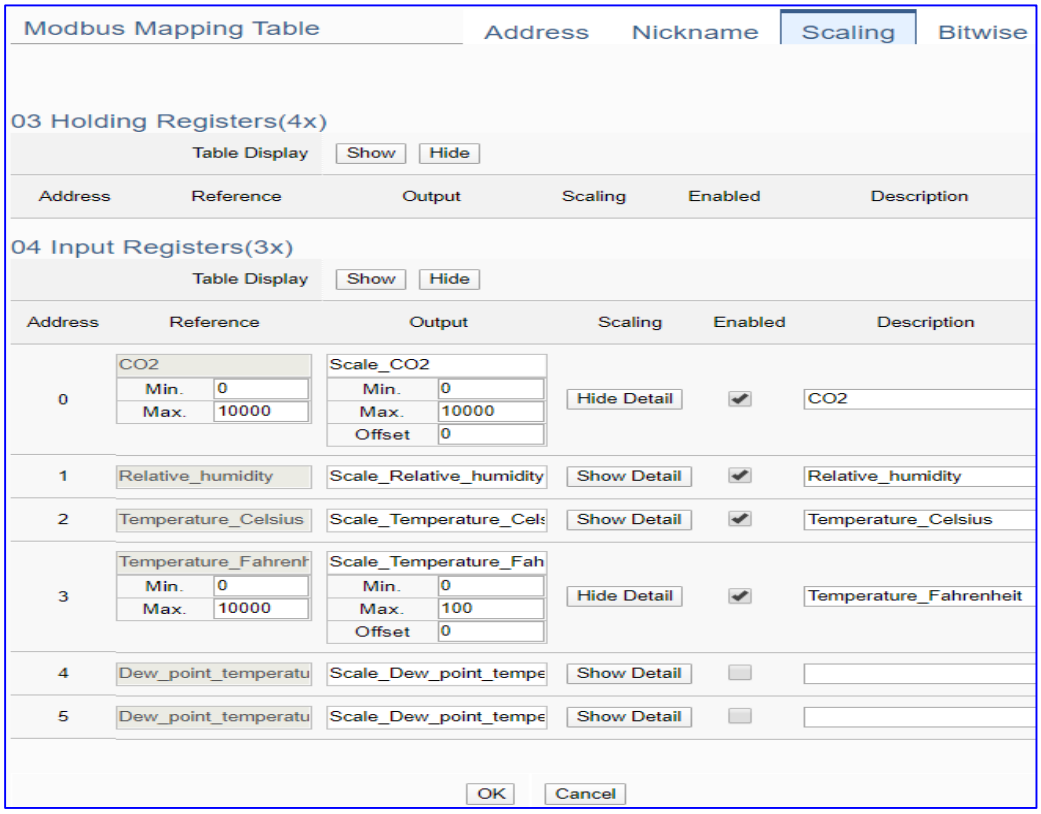
Setting the variable nickname and description.



Modbus Mapping Table – Nickname	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Scaling:

Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated. The M-7055D has no AI/AO, so here uses the screen of DL-302 for an example.

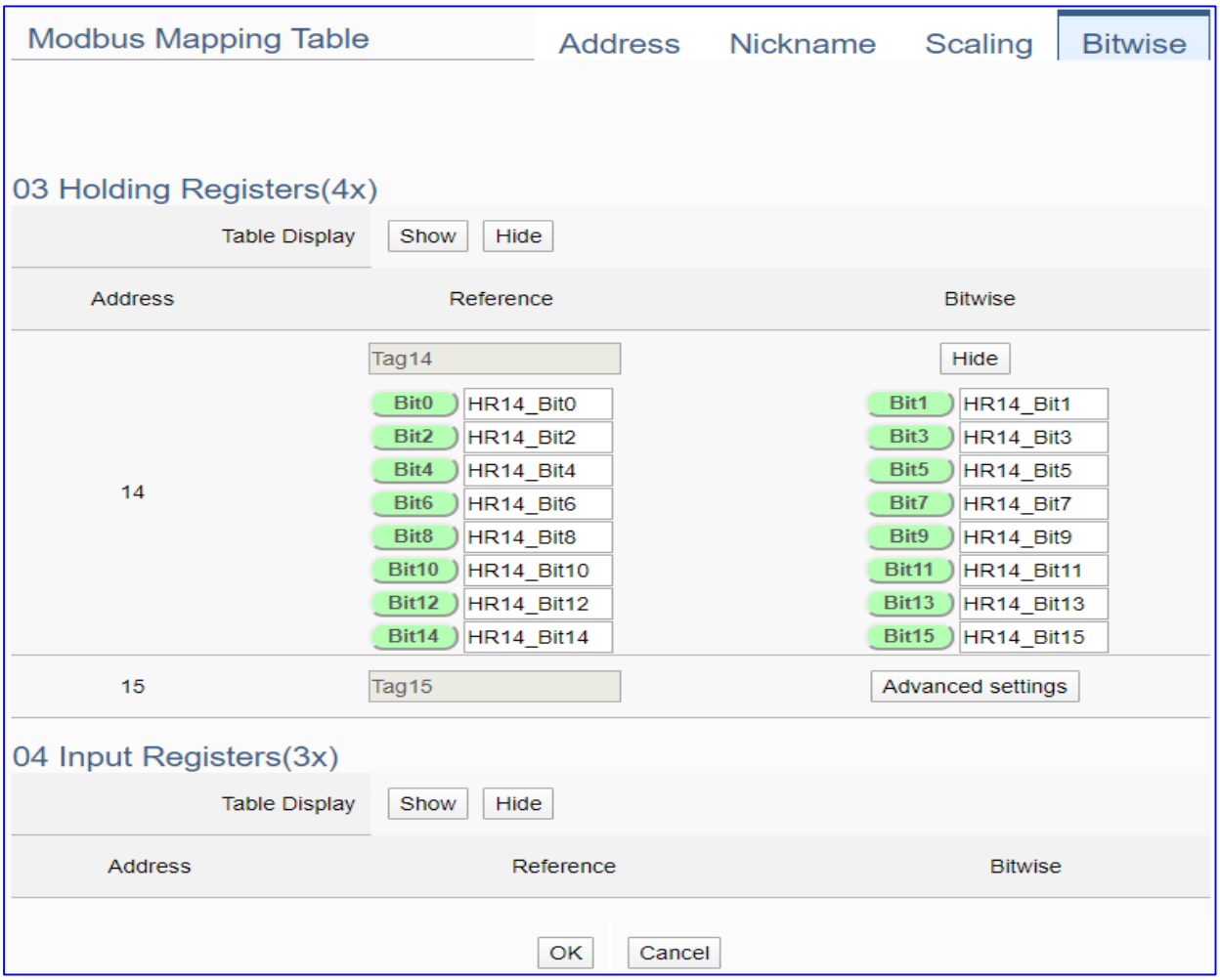


Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The I/O variable of the Modbus address.
Output	The scaling variable for scaling output. User can define the variable name.
Scaling	Click [Show Detail] to set up the Scaling parameters, and click [Hide Detail] to hide the parameters. Fill in the Min/Max range values of the source in the Reference column. Fill in the Min/Max range values after scaling in the Output column. If needs offset, fill the offset value in the Offset item. Remember check “Enable” box.
Enable	Check the box of the variable can enable just that variable for scaling.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Bitwise:

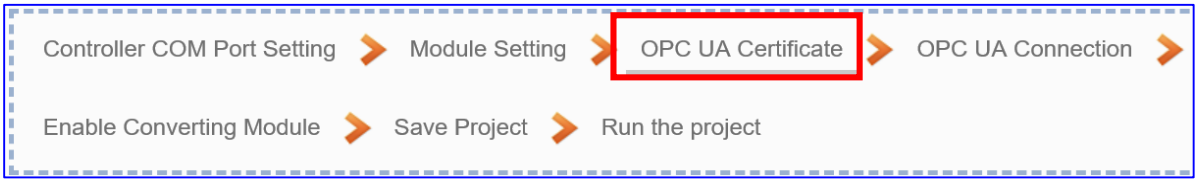
Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.

The M-7055D has no AI/AO, so here uses other module's setting screen as an example.



Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The Bit# variables of the Modbus address.
Bitwise	Set up the variables for Bitwise. Click [Advanced Settings] to set up the Bitwise parameters, and click [Hide] to hide the parameters. Fill in the variable names to the Bit# that wanted to do the Bitwise. The value in the fixed bit number will be assigned into the variable.
OK	Click to save this page settings and back to the module list page.

Step 3. OPC UA Certificate



Click the next step, and enter the **Step 3 [OPC UA Certificate]** of the UI setting.

This step is about setting the OPC UA Certificate for the security and encryption, e.g. upload, download, delete certificate. **If the user's project does not need to use the secure encryption connection, please skip this step and click the next step directly.**

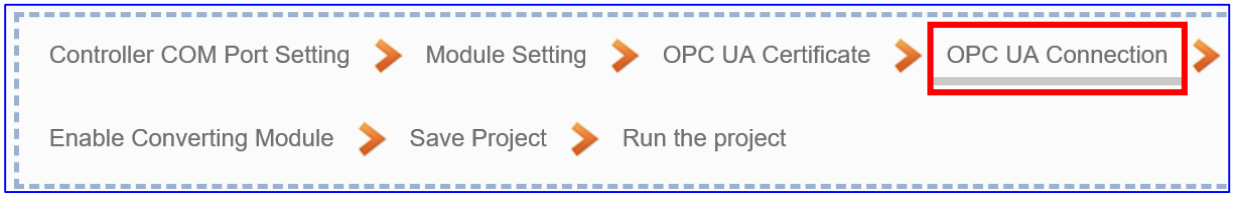
In the [**OPC UA Certificate**] step, users can add mutual credentials on both side's devices to strengthen security encryption.

① First, obtain the **OPC UA Client** trust certificate file of the device from the connected party, save it to the PC. In this step, select this file and upload it to the UA controller. (If there was an old certificate file in UA, remove it first.)

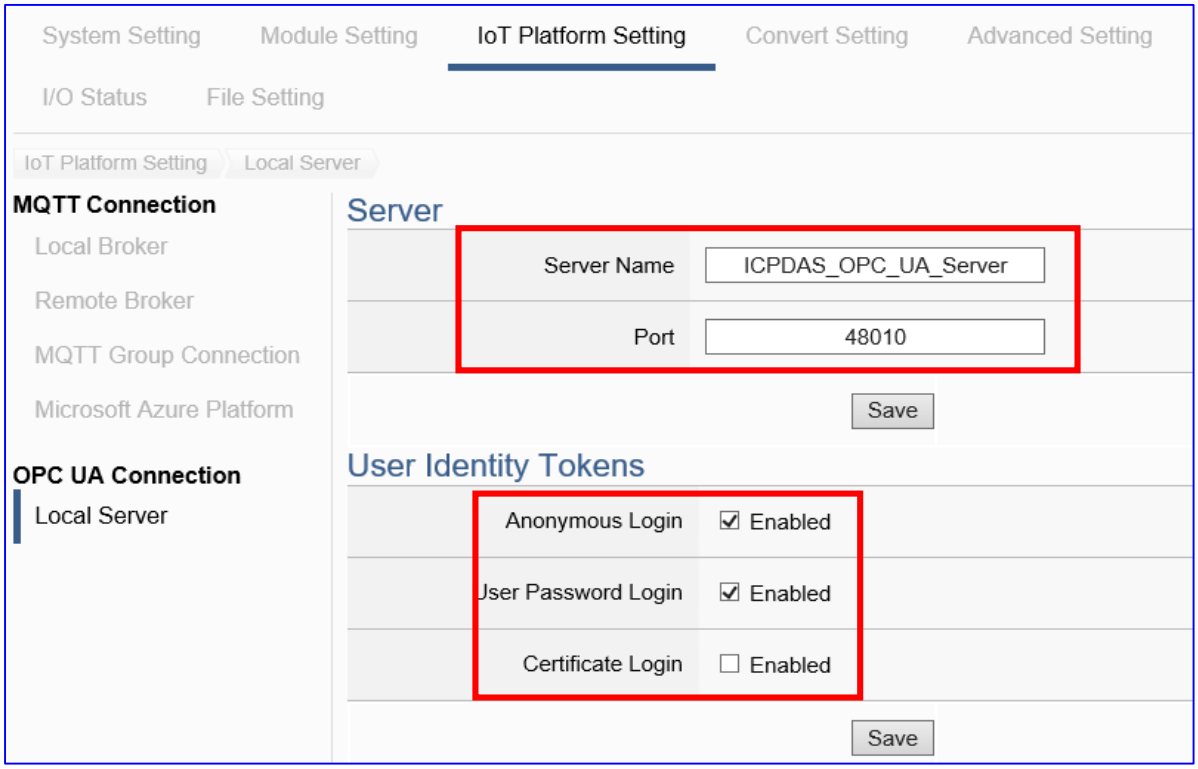
② The device of the other side needs the UA certificate also. In this step, download the **OPC UA Server** certificate file (**Certicate_IPAddress_.tar**) to the other party, so that they can decompress the file (**icpdasuaserver.der**) and upload to their device.

File Setting > OPC UA Certificate > Upload the file to the controller	
Trusted Certificate	**Select File**: select the OPC UA Trusted Certificate file in PC. **Upload**: upload the Trusted Certificate file to the UA controller. • File format must be **DER**. Extension name must be "**der / cer / crt**". Trusted Certificate Select File icpdasuaserver.der Upload • If select a wrong file, the system will show an error message.
File Setting > OPC UA Certificate > Download the file from controller	
OPC UA Server Certificate	**Download**: Download the OPC UA Server Certificate file to the PC. • File format: **DER**. File name: **Certicate_IP-address_.tar** e.g. Certificate_192.168.255.102_.tar. Before using, decompress to **icpdasuaserver.der**, as below. icpdasuaserver.der

Step 4. OPC UA Connection

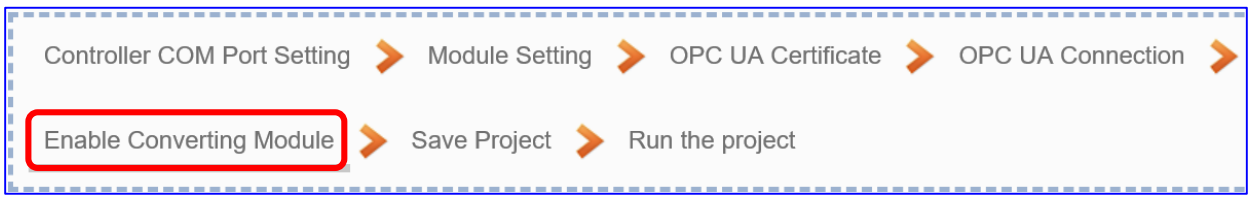


Click the next step, and enter the **Step 4 [OPC UA Connection]** of the UI setting. This page is for setting the IoT platform and the OPC UA connection, e.g. the server name, port, login identity information, etc.



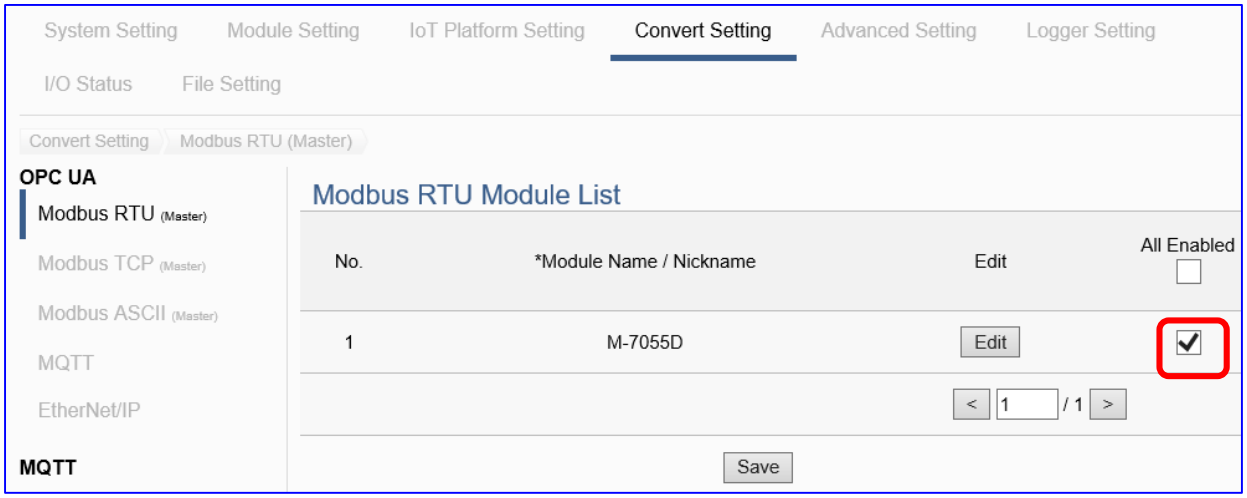
OPC UA Connection > Local Server Setting –Server	
Server Name	Display the active OPC UA Server name. Not editable. System values: ICPDAS_OPC_UA_Server
Port	The communication port number of the OPC UA Server. System Default: 48010.
Save	Click to save the settings of this item.
OPC UA Connection > Local Server Setting –User Identity Tokens	
Anonymous Login	Check to enable the anonymous login of clients. Default: check.
User Password Login	Check to enable the user password login of clients. Default: uncheck.
Certificate Login	Check to enable the certificate login of clients. Default: uncheck.
Save	Click to save the settings of this item.

Step 5. Enable Converting Module



Click the next step, and enter the **Step 5 [Enable Converting Module]** UI setting
This step is for enabling the Modbus RTU (or ASCII) / OPC UA conversion.

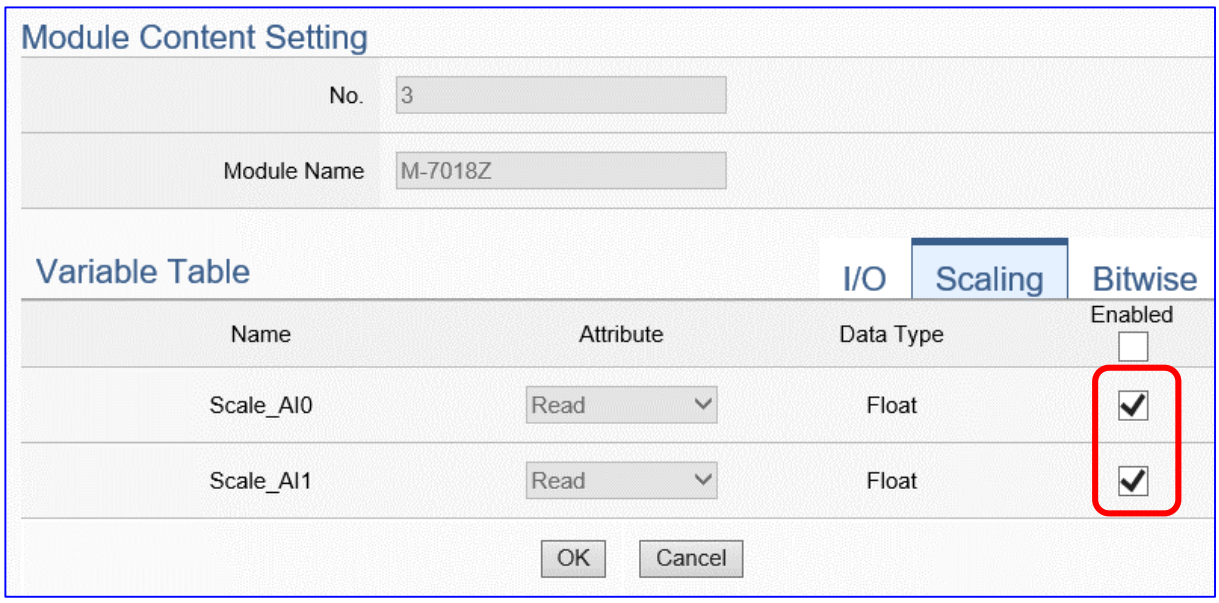
In this step, user just need check the enabled box of the module. If user want to enable some I/O only, please click “Edit” to check the I/O one by one.



Convert Setting > OPC UA > Modbus RTU (Master) Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
All Enabled	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	If user wants to enable some I/O channels for conversion, click [Edit] of that module to enter the “Variable Tale” setting. It is normal to set all channels as enabled, and the conversion will not affect the unconnected channels.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

If users need to enable some channels only, please click [Edit] to enable individual channels. (Refer to Chapter 5.4)

If there had set up the Scaling or Bitwise in the step 2, the Scaling or Bitwise function will available only when the Enabled box is checked. So, in this step, be sure to check the Enabled box (as picture). For the setting method, please refer the Step 2.



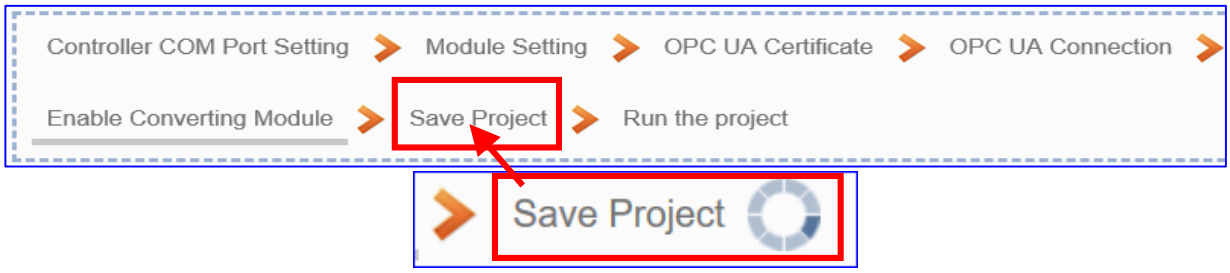
More Descriptions:

1. **Scaling:**
   Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated.

2. **Bitwise:**
   Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.

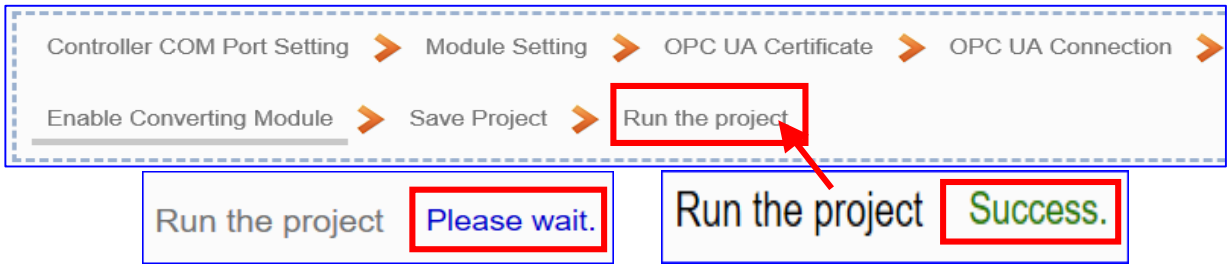
Step 6. Save Project

The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.



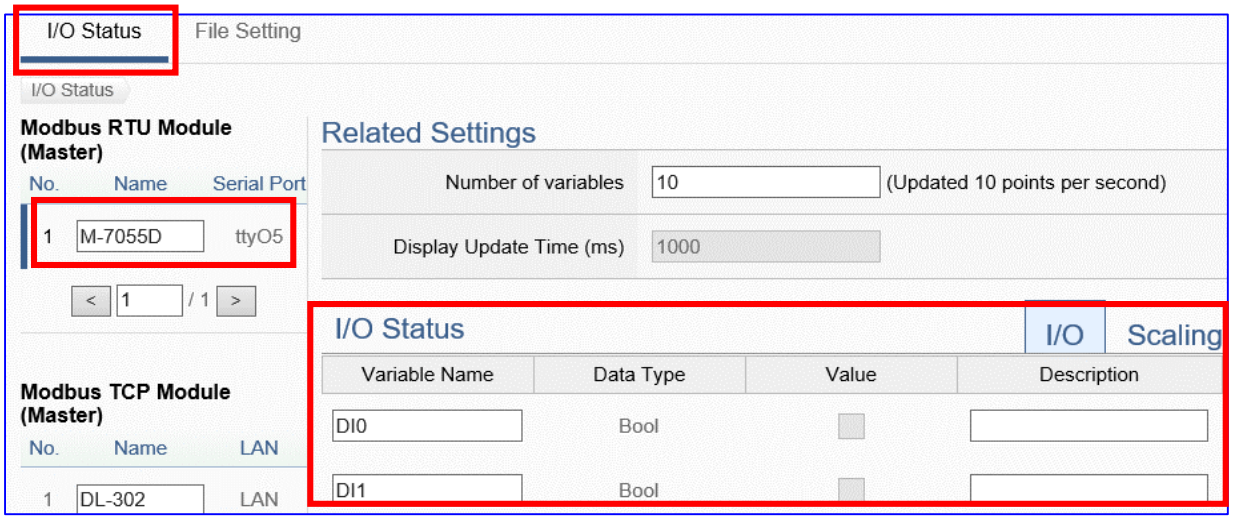
Step 7. Run the Project

The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.



When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

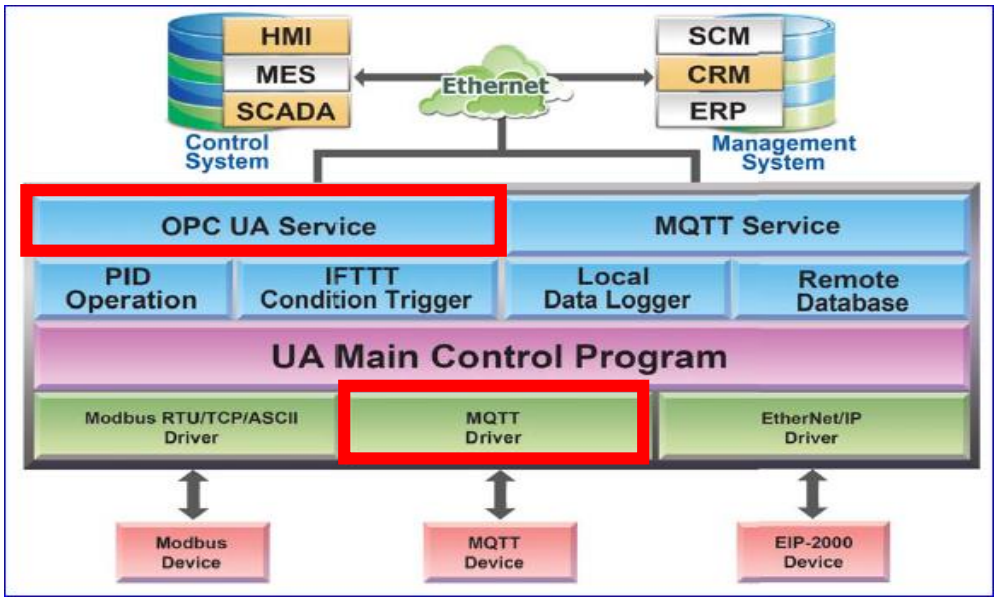
The new project now completes the setting, uploading and running in the UA controller and can process the conversion communication. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.



4.1.2. Function Wizard: MQTT / OPC UA Conversion

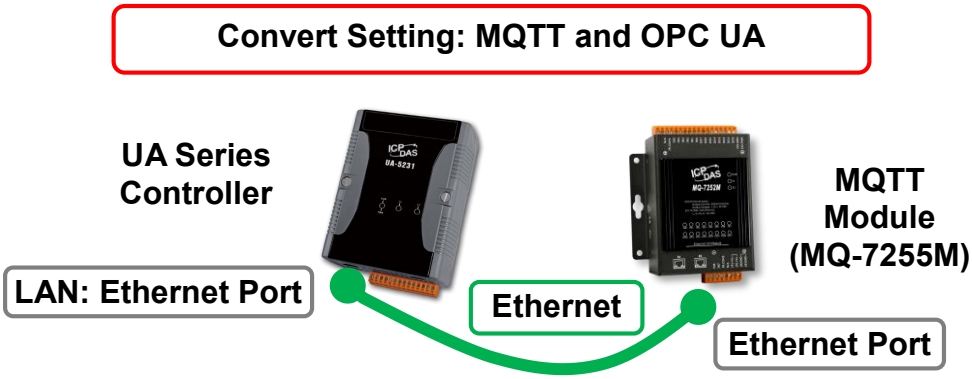
MQTT / OPC UA Conversion include the conversion of OPC UA and MQTT protocols. With the **OPC UA Service** function, the OPC UA Server can read and write the MQTT device that connected to the controller.

MQTT / OPC UA Function Diagram:



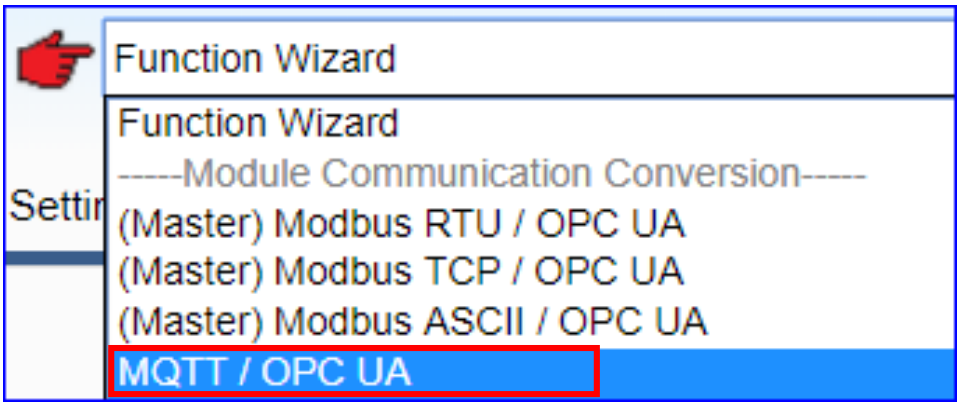
Application Solution:

- **Convert Setting: MQTT and OPC UA**



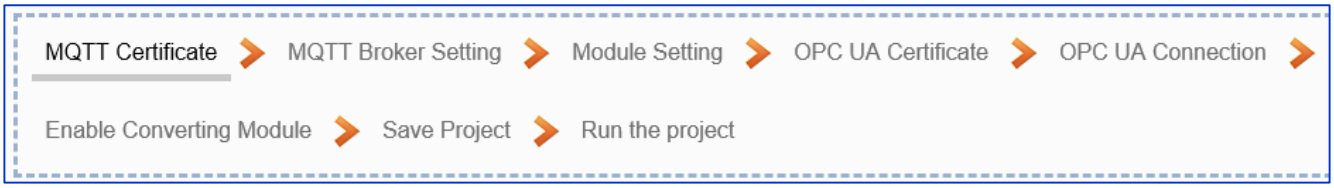
Note: The hardware/network connection methods please see the Chapter 2 .

When UA series controller connects the MQTT module (via Ethernet, as MQ-7255M in the picture) and through the OPC UA server to read/write the I/O data of the MQTT module, user can choose the item [**MQTT / OPC UA**] of the "Module Communication Conversion" in the Function Wizard.

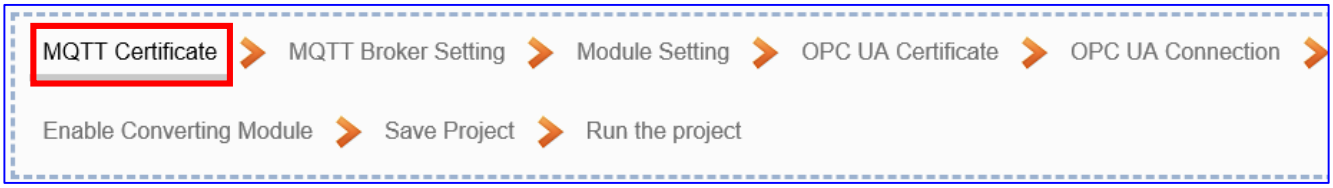


[Step Box]:

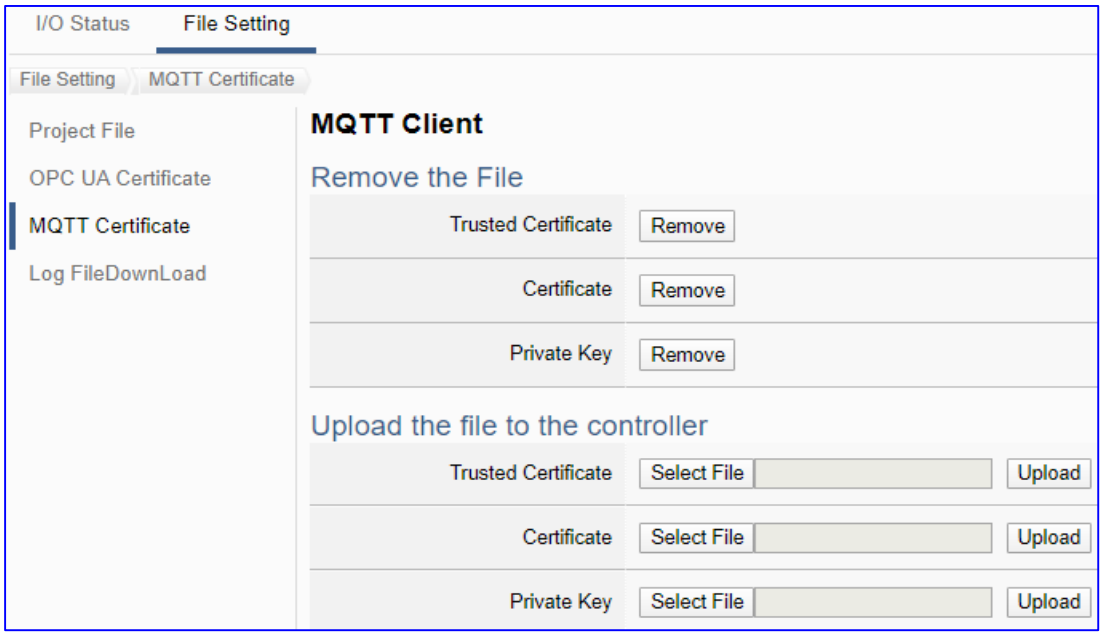
The Step Box of the [**MQTT / OPC UA**] has the steps as below. When enabling the Step Box, it auto-enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the "Step Box" step-by-step and then can complete the project quickly and rightly.



Step 1. MQTT Certificate

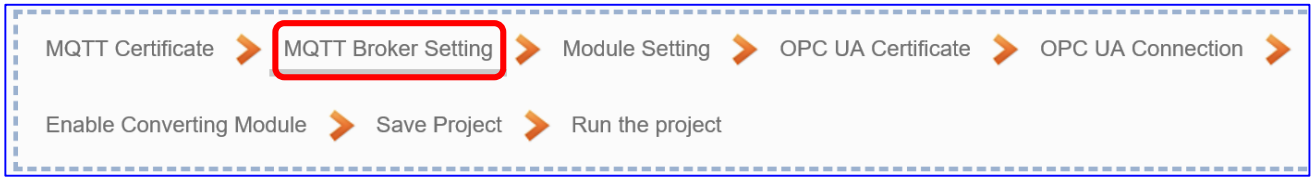


The **[MQTT Certificate]** is for setting up security communications to upload the **MQTT Trusted Certificate, Certificate and Private Key**. The users upload the file to the UA controller according to the type of obtained certificate. If you want to perform **Broker authentication**, you need to upload the **Trusted Certificate**. If you want to perform the **Broker/Client two-way authentication**, you need to upload the **Credential and Private Key additionally**. The user can skip this step if the user project does not use certificate transmission security.



File Setting > MQTT Certificate > Upload the file to the controller	
Trusted Certificate	**Select File**: select the MQTT Trusted Certificate file of the device. **Upload**: upload the MQTT Trusted Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message. Trusted Certificate Select File Certificate_192.168.255.10 Certificate type is wrong. Upload
Certificate	**Select File**: select the MQTT Certificate file of the device. **Upload**: upload the MQTT Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message.
Private Key	**Select File**: select the MQTT Private Key of the device. **Upload**: upload the MQTT Private Key file to the UA controller. • File format must be **PEM**. Extension name must be ".**key**". • If select a wrong file, the system will show an error message.

Step 2. MQTT Broker Setting

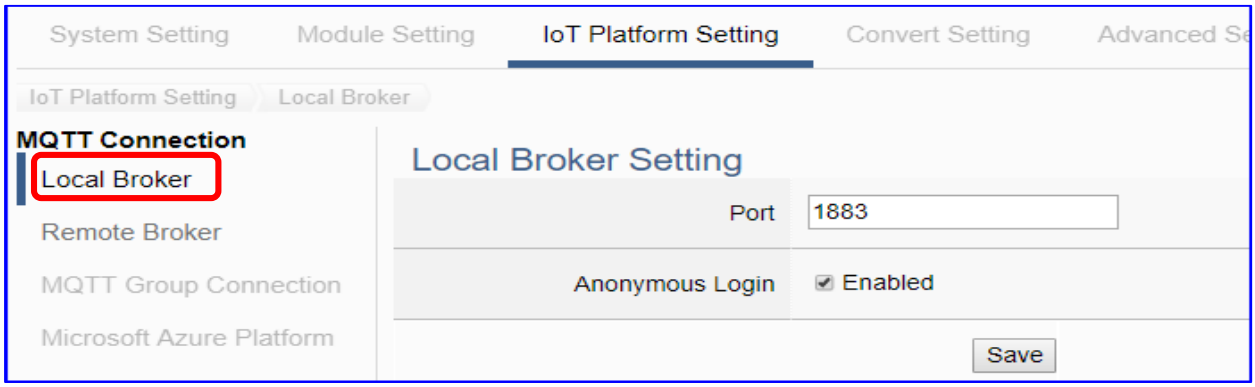


The **[MQTT Broker Setting]** is for setting the IoT platform and the MQTT Broker connection, e.g. the local or remote broker, port, login information, etc.

We select the “MQTT / OPC UA” conversion, so this step will auto enter the [**IoT Platform Setting > MQTT Connection > Local Broker**] page. The “Step Box” will prevent the user from selecting the wrong platform. User can choose the **local or remote** broker for the MQTT connection.

The example uses local Broker.

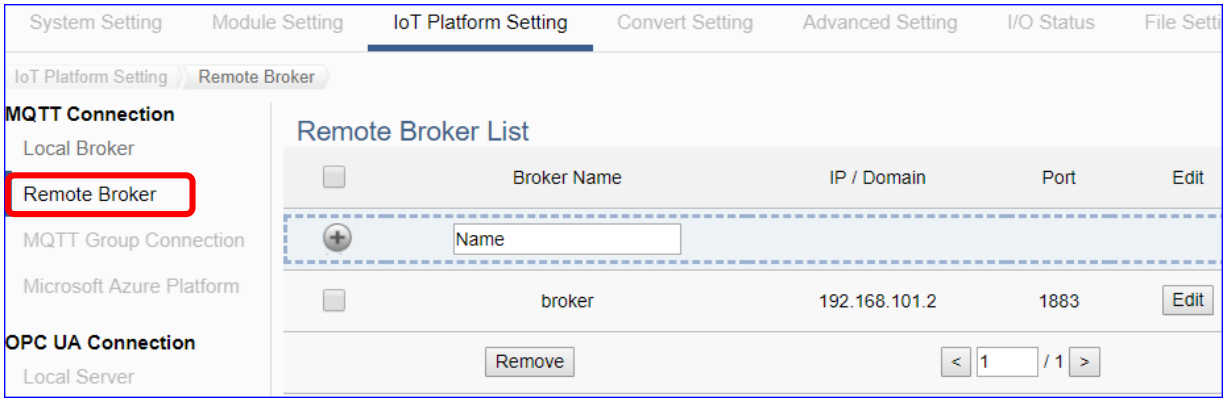
Local Broker



MQTT Connection > Local Broker Setting	
Port	The COM port of the Local MQTT Broker. System default: 1883
Anonymous Login	Check to allow anonymous login. Default: Check.
Save	Click to save the setting of this page.

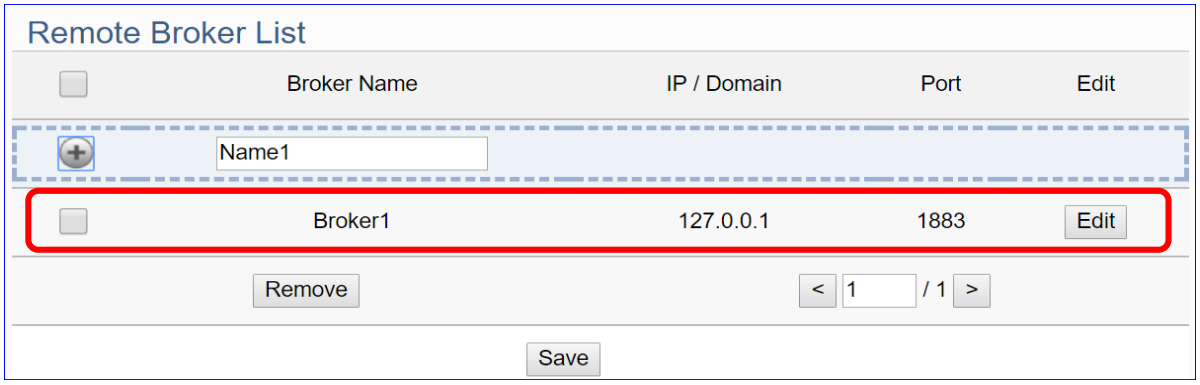
If users apply a remote Broker, the screen will as follow.

Remote Broker:

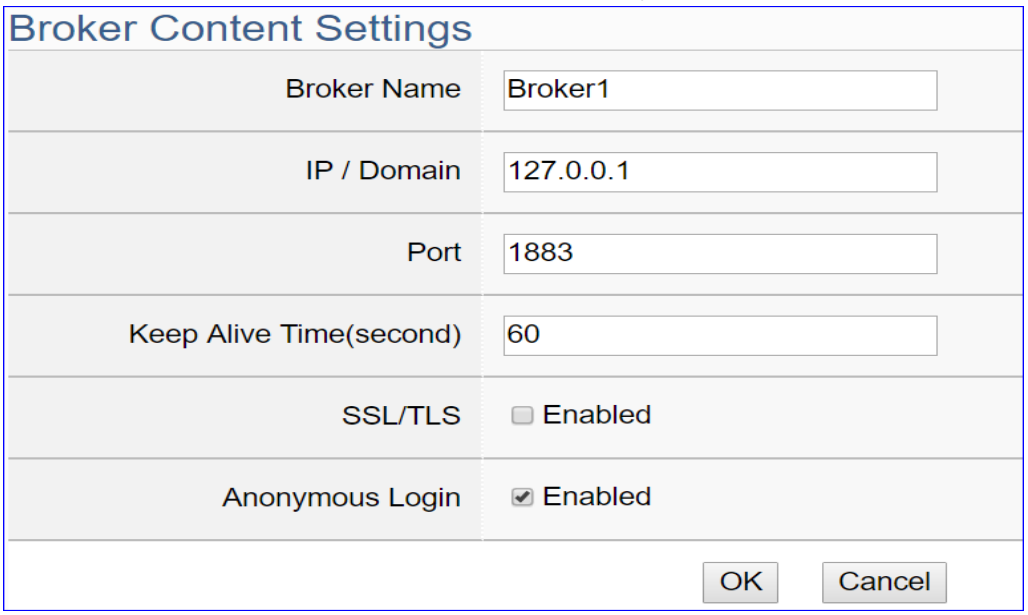


MQTT Connection > Remote Broker List	
Broker Name	The name of the remote MQTT Broker. User can define the name, e.g. Broker1. Default: Name.
	Click to add a new remote Broker.
Save	Click to save the settings of this page.

After creating a new Remote Broker (as below):

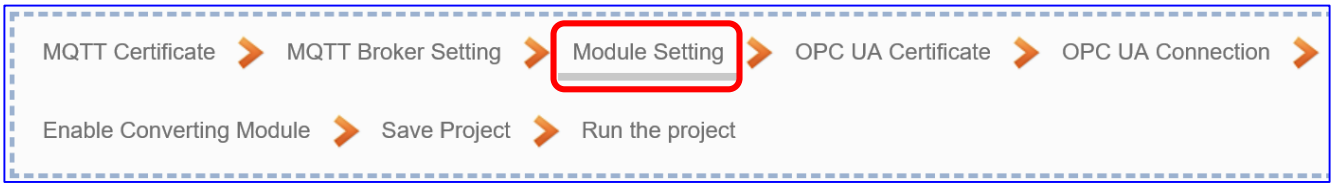


MQTT Connection > Remote Broker List	
Broker Name	The name of the remote MQTT Broker. User can define the name, e.g. Broker1. Default: Name.
IP / Domain	The IP address of the remote Broker. Default: 127.0.0.1
Port	The COM port of the remote Broker. Default: 1883
Edit / Remove	Click [Edit] can set the Broker. Click the left box and [remove] can delete the Broker.
Save	Click to save the settings of this item.



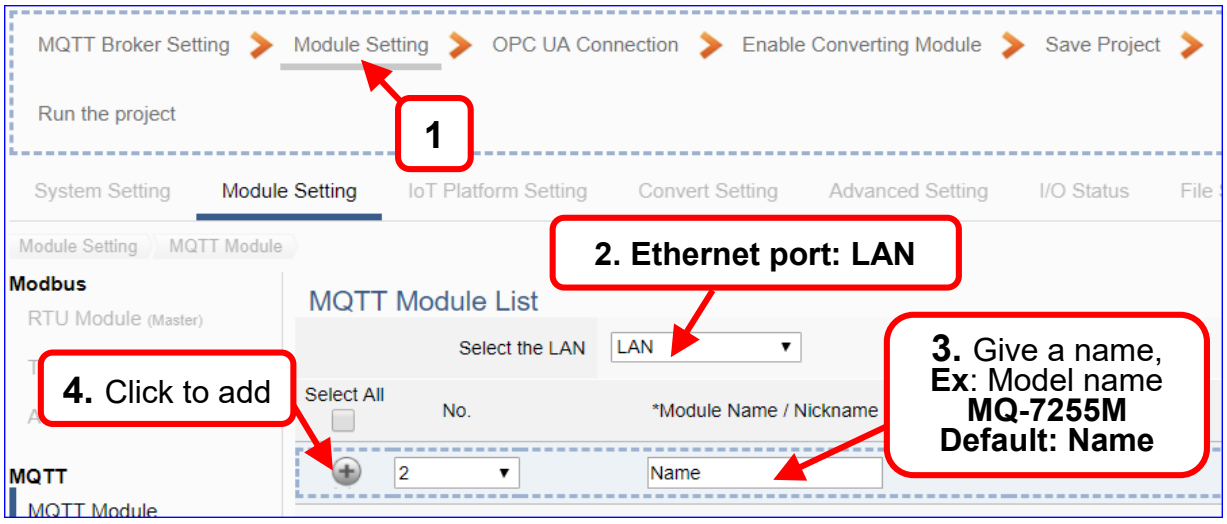
MQTT Connection > Remote Broker > Broker Content Settings	
Broker Name	The name of the remote MQTT Broker. (Editable)
IP / Domain	The IP address of the remote Broker. Default: 127.0.0.1
Port	The COM port of the remote Broker. Default: 1883
Keep Alive Time	The keep alive time. Default: 60 (second)
SSL/TLS	Check to enable the supporting of SSL/TLS security communication. Default: uncheck.
Anonymous Login	Check to allow anonymous login. Default: Check.
OK	Click to save the settings and exit.

Step 3. Module Setting

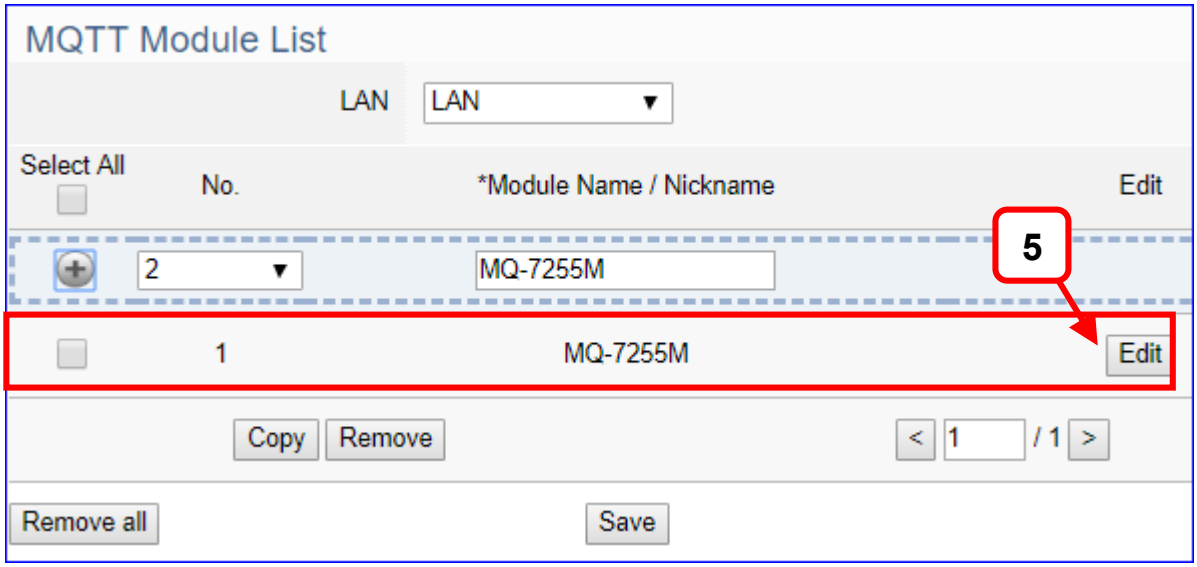


Click the next step, and enter the **Step 3 [Module Setting].** This page is for setting the communication values of the connected modules.

The Ethernet port is LAN for connecting with the TCP module, and each module can give a name (Default name: Name). Click [⊕] button could add a new module, and then click [Edit] button to configure the module content and the Modbus mapping table.

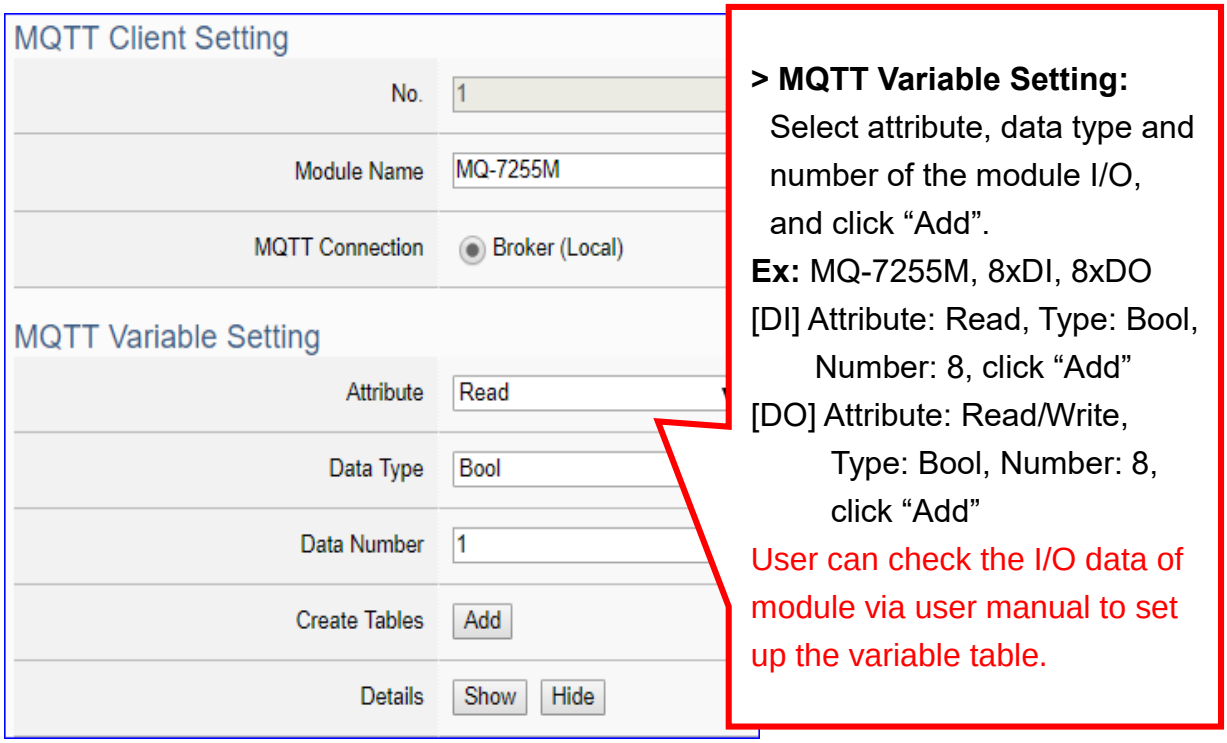


Add a module (No.: 1, Name: MQ-7255M) as below, and then click [Edit] button to enter the “Module Content Setting” page.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

[**MQTT Client Setting**] page:

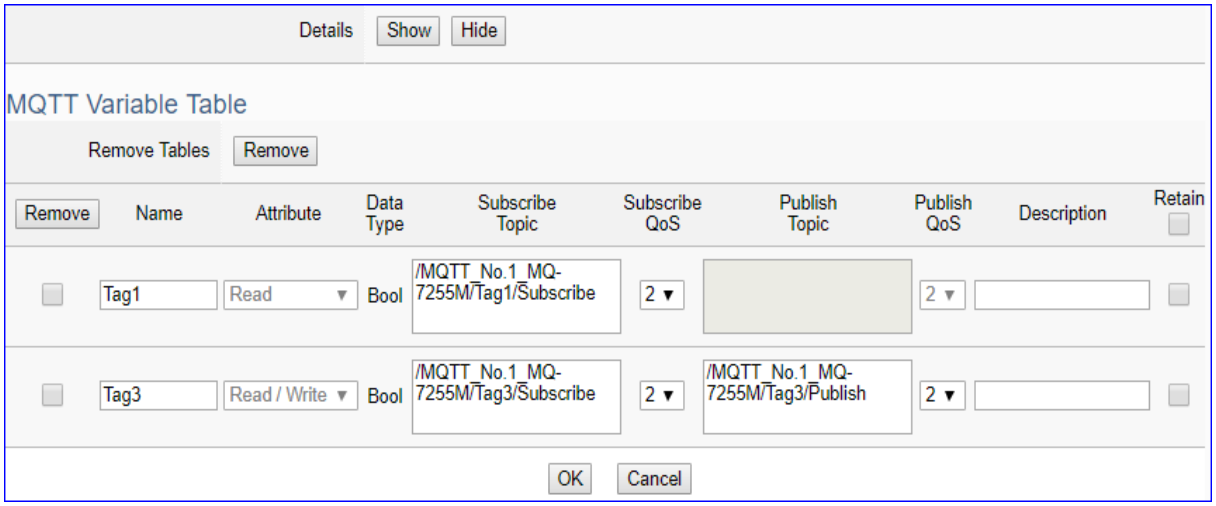


MQTT Client Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
MQTT Connection	The used Broker: Local Broker.
MQTT Variable Setting	
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the MQTT variable. Include: Bool, Short, Unsigned Short, Long, Unsigned Long, Float, Double, String.
Data Number	The number for the I/O variables of the module. Default: 1.
Create Tables	Click [Add] button, it will add a variable list in the MQTT Variable Table.
Details Show / Hide	Click [Show] to display all fields, click [Hide] to hide some fields. The hide fields: Subscribe QoS, Publish QoS, Retain.

Please create the variable table in the page. Select “Attribute”, “Data Type” and “Data Number”, and click “Add” button to create a variable table.

Note: The different “Attribute” variables need to create separately.

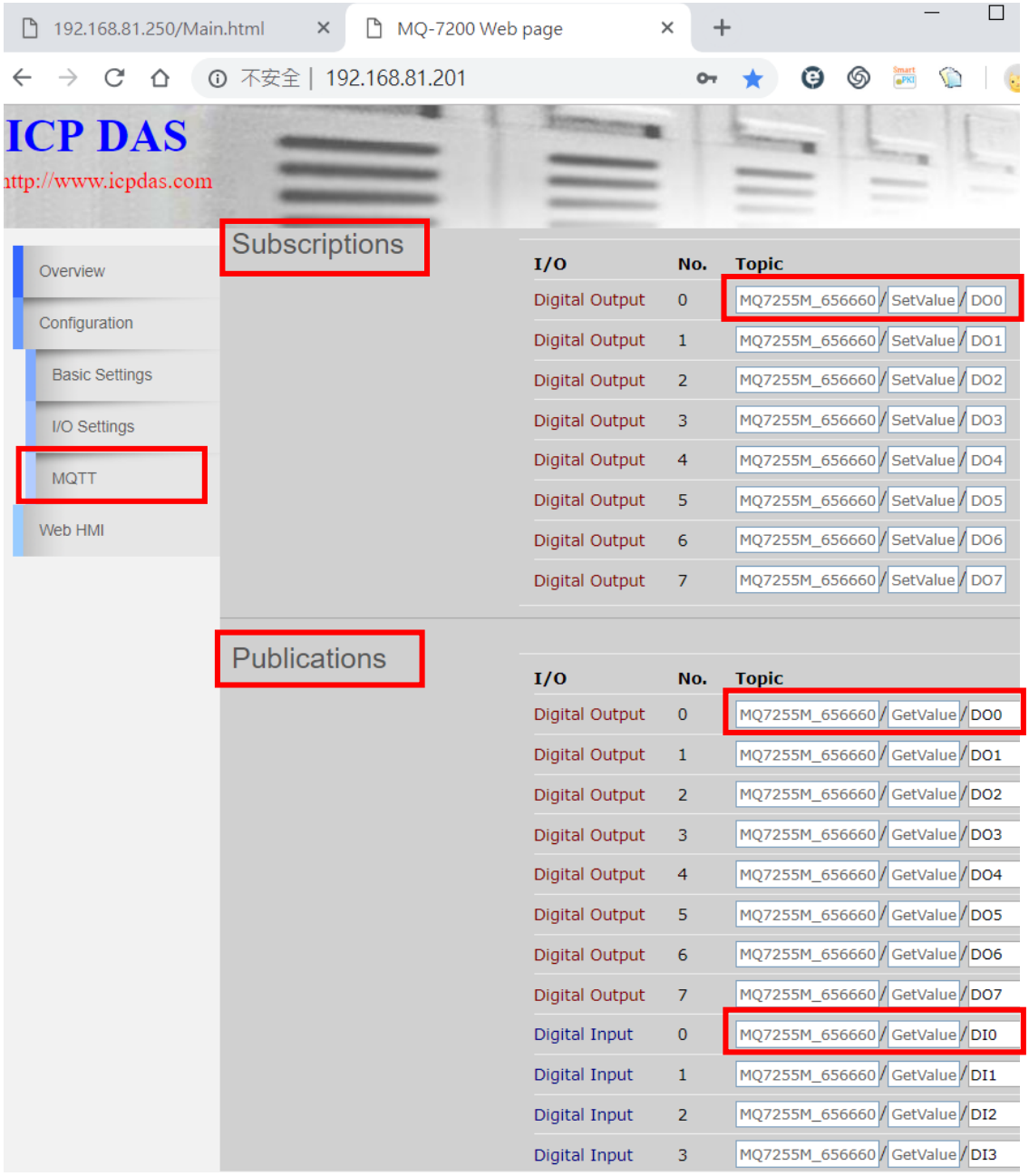
[**MQTT Variable Table**] :



MQTT Variable Table	
Details Show / Hide	Click [Show] to display all fields, click [Hide] to hide some fields. The hide fields: Subscribe QoS, Publish QoS and Retain.
Remove Table / Remove	Check the box in the left of the variable is to select that variable list, and click the “remove” on the box can delete that variable list. Click the “Remove” of the “Remove Table” will delete all lists.
Name	The name of the MQTT variable. Default: Tag#
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable. Include: Bool, Short, Unsigned Short, Long, Unsigned Long, Float, Double, String
Subscribe Topic	The topic of receiving/subscribing data message. It can copy the Publish Topic of linked module, e.g. MQ-7255M in this example.
Subscribe Qos	The subscribe Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Publish Topic	The topic of sending/publishing data message. It can copy the Subscribe Topic of linked module, e.g. MQ-7255M in this example.
Publish Qos	The publish Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Description	For users set up the description for the variables.
Retain	Check [Retain] box of the top row can store the broker message for all variables in list. Check the box of each variable can store the broker message just that variable. Default: Uncheck.

MQTT Variable Table	
OK / Cancer	Click [OK] to save and exit the page settings. Click [Cancer] to exit without saving.

The Subscribe / Publish Topic items must fill the related Topics of the connected MQTT module, e.g. UA connects with MQ-7255M in this case.
User can find the Topics from the MQTT setting of MQ-7200 Web page, and copy them to the UA setting:
Copy the Subscriptions I/O Topic of MQ-7200 to the I/O Publish Topic of UA, and copy the Publications I/O Topic of MQ-7200 to the I/O Subscribe Topic of UA.



● Step 4. OPC UA Certificate

Click the next step, and enter the **Step 4 [OPC UA Certificate]** of the UI setting.
This step is about setting the OPC UA Certificate for the security and encryption, e.g. upload, download, delete certificate. **If the user's project does not need to use the secure encryption connection, please skip this step and click the next step directly.**

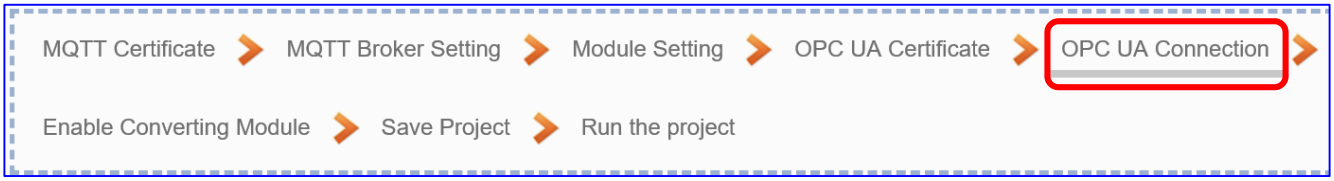
In the [**OPC UA Certificate**] step, users can add mutual credentials on both side's devices to strengthen security encryption.

① First, obtain the **OPC UA Client** trust certificate file of the device from the connected party, save it to the PC. In this step, select this file and upload it to the UA controller. (If there was an old certificate file in UA, remove it first.)

② The device of the other side needs the UA certificate also. In this step, download the **OPC UA Server** certificate file (**Certicate_IPAddress_.tar**) to the other party, so that they can decompress the file (**icpdasuaserver.der**) and upload to their device.

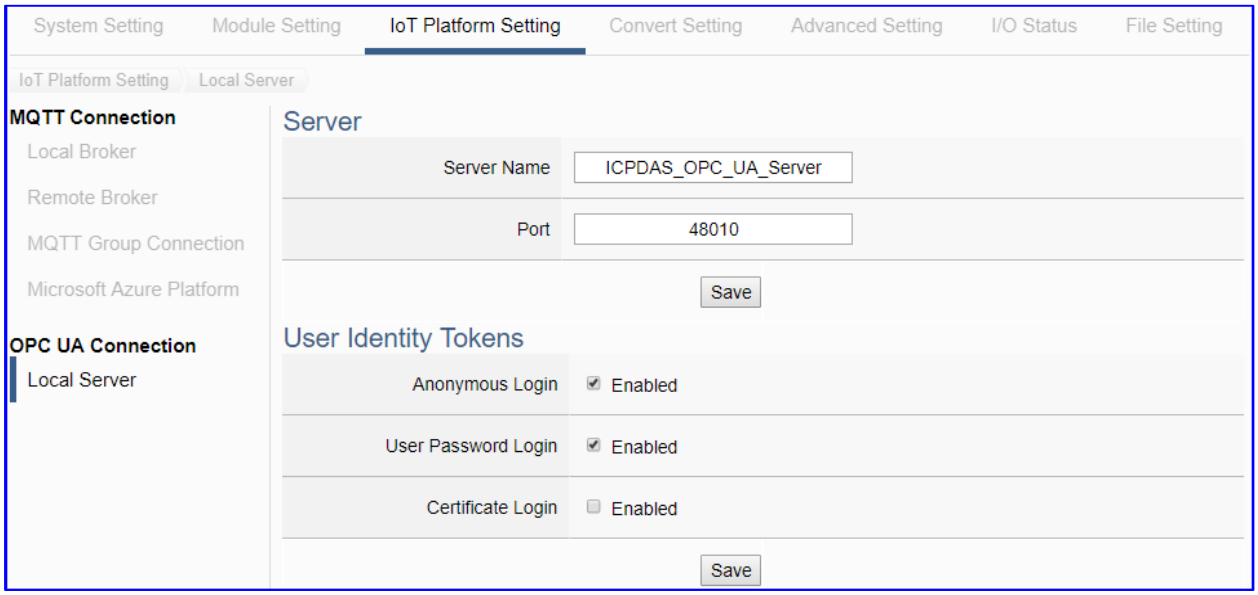
File Setting > OPC UA Certificate > Upload the file to the controller	
Trusted Certificate	**Select File**: select the OPC UA Trusted Certificate file in PC. **Upload**: upload the Trusted Certificate file to the UA controller. • File format must be **DER**. Extension name must be "**der / cer / crt**". Trusted Certificate | Select File | icpdasuaserver.der | Upload • If select a wrong file, the system will show an error message.
File Setting > OPC UA Certificate > Download the file from controller	
OPC UA Server Certificate	**Download**: Download the OPC UA Server Certificate file to the PC. • File format: **DER**. File name: **Certicate_IP-address_.tar** e.g. Certificate_192.168.255.102_.tar. Before using, decompress to **icpdasuaserver.der**, as below. icpdasuaserver.der

Step 5. OPC UA Connection



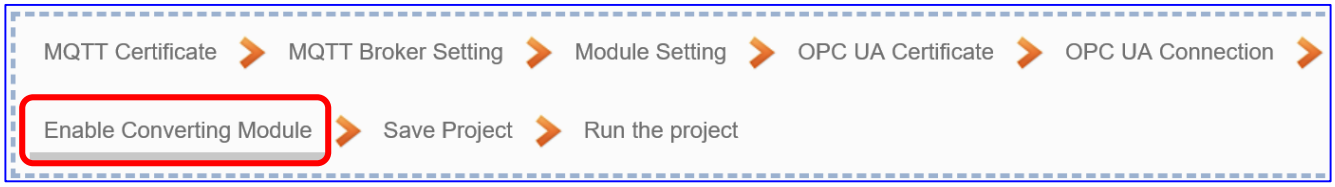
Click the next step, and enter the **Step 5 [OPC UA Connection]** of the UI setting. This page is for setting the IoT platform and the OPC UA connection, e.g. the server name, port, login identity information, etc.

We select the “MQTT / OPC UA” conversion at the beginning, so this step will auto enter the [**OPC UA Connection > Local Server**] page of IoT Platform Setting. The “Step Box” will prevent the user from selecting the wrong platform.



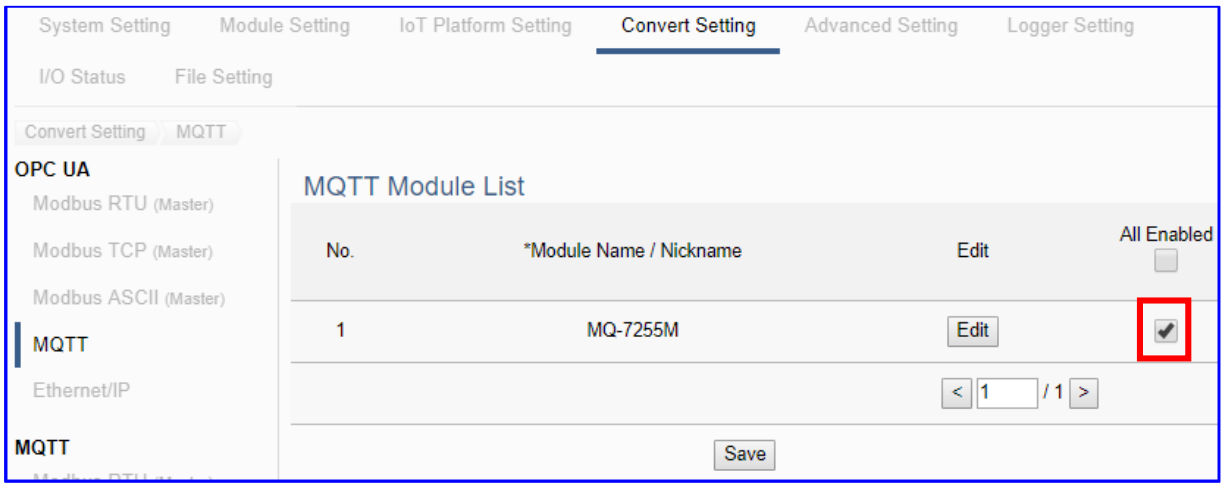
OPC UA Connection > Local Server Setting –Server	
Server Name	Display the active OPC UA Server name. Not editable. System value: ICPDAS_OPC_UA_Server
Port	The communication port number of the OPC UA Server. System Default: 48010.
Save	Click to save the settings of this item.
OPC UA Connection > Local Server Setting –User Identity Tokens	
Anonymous Login	Check to enable the anonymous login of clients. Default: check.
User Password Login	Check to enable the user password login of clients. Default: uncheck.
Certificate Login	Check to enable the certificate login of clients. Default: uncheck.
Save	Click to save the settings of this item.

Step 6. Enable Converting Module



Click the next step, and enter the **Step 6 [Enable Converting Module]** UI setting
This step is for enabling the MQTT / OPC UA conversion.
We select the “MQTT / OPC UA” conversion at the beginning, so this step will auto enter the [**OPC UA > MQTT**] page of Conversion setting. The “Step Box” will prevent the user from selecting the wrong platform.

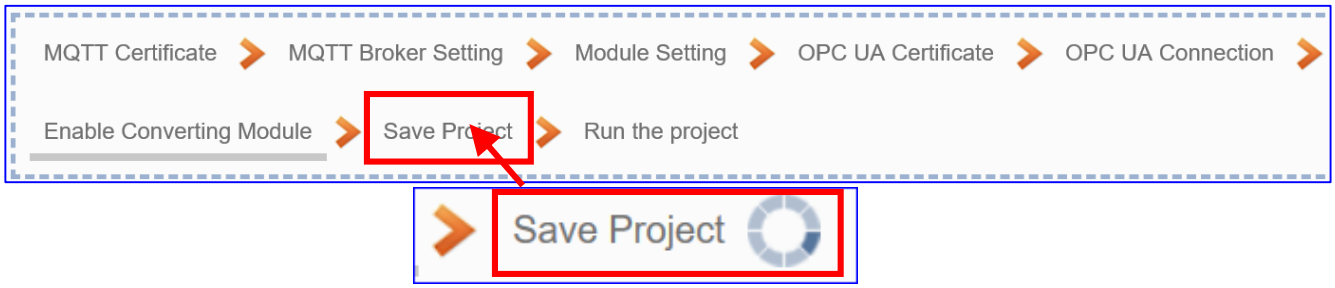
This step: Please check the box of the module to enable the converting.



Convert Setting > OPC UA > MQTT - MQTT Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
Edit	If user wants to enable some I/O channels for conversion, click [Edit] of that module to enter the “Variable Tale” setting. It is normal to set all channels as enabled, and the conversion will not affect the unconnected channels.
All Enabled	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

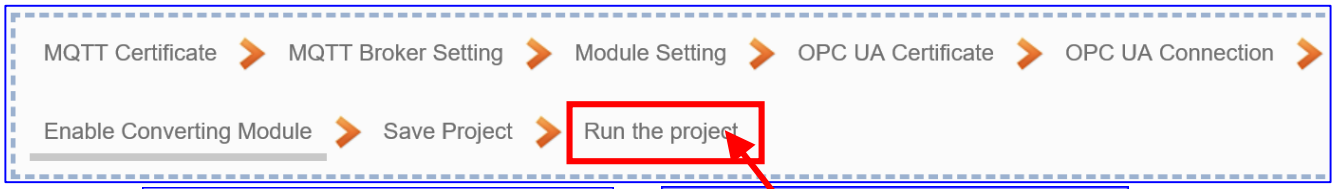
Step 7. Save Project

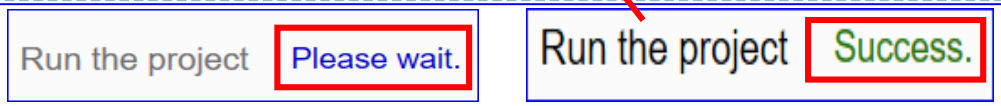
The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.



Step 8. Run the Project

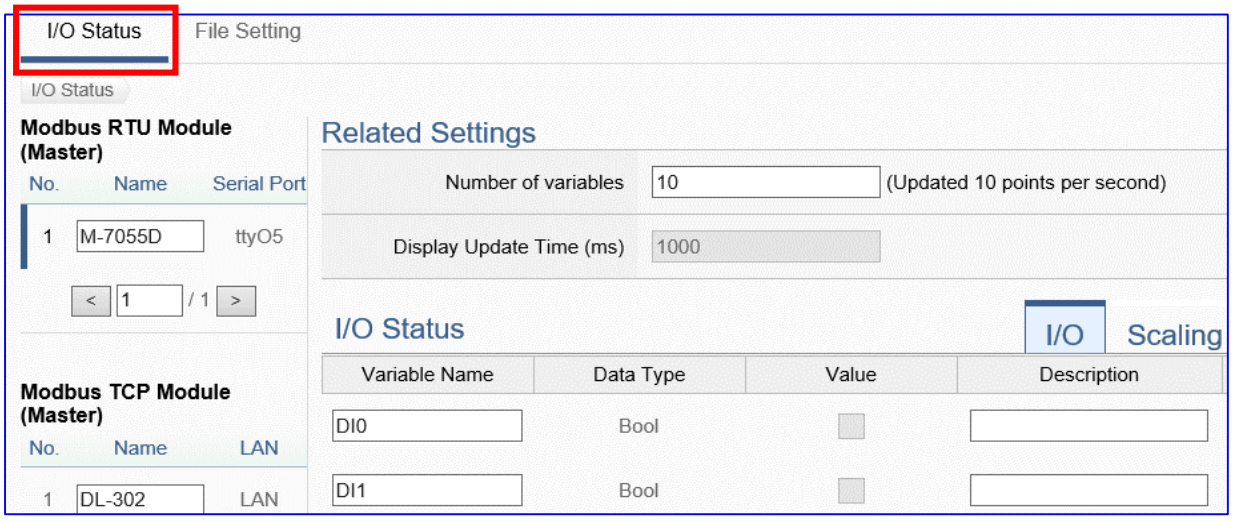
The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.





When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

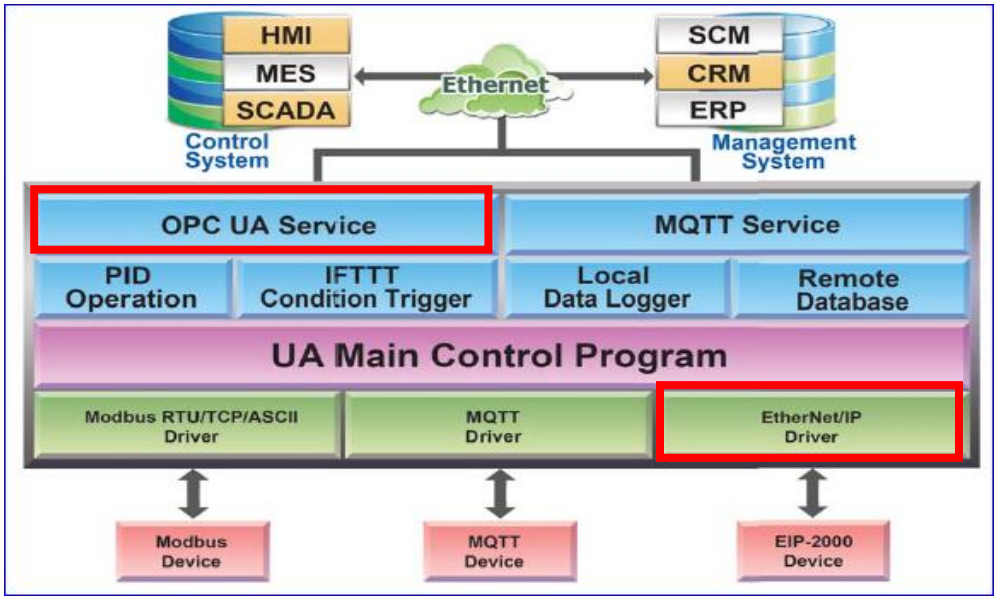
The new project now completes the setting, uploading and running in the UA controller and can process the conversion communication. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.



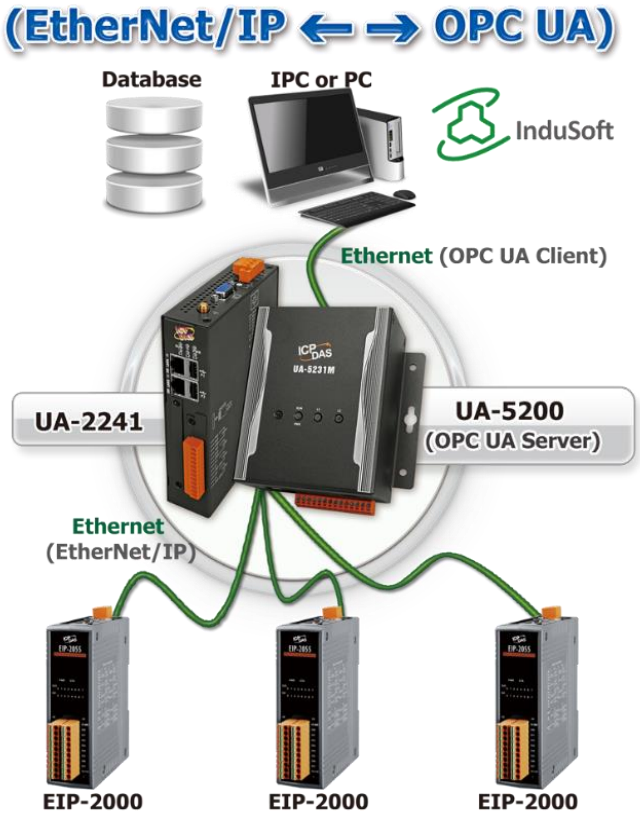
4.1.3. Function Wizard: EIP / OPC UA Conversion

EIP / OPC UA Conversion include the conversion of OPC UA and **EtherNet/IP** protocols. With the **OPC UA Service** function, the OPC UA Server can read and write the EIP-2000 device that connected to the controller.

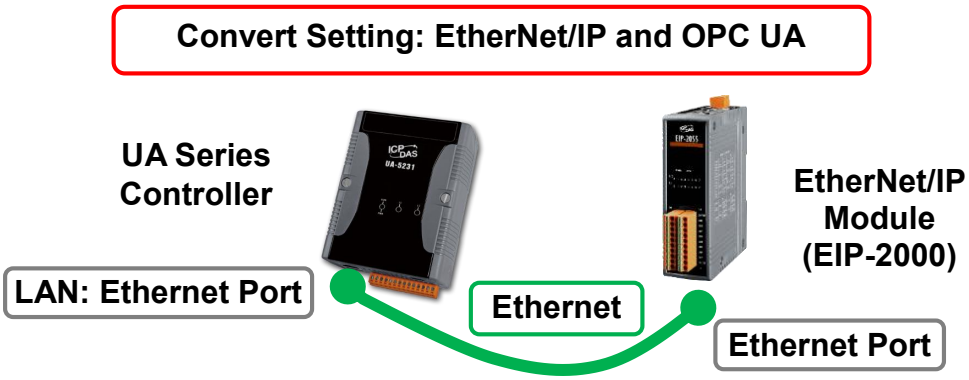
(EtherNet/IP) EIP / OPC UA Function Diagram:



Application Solution:

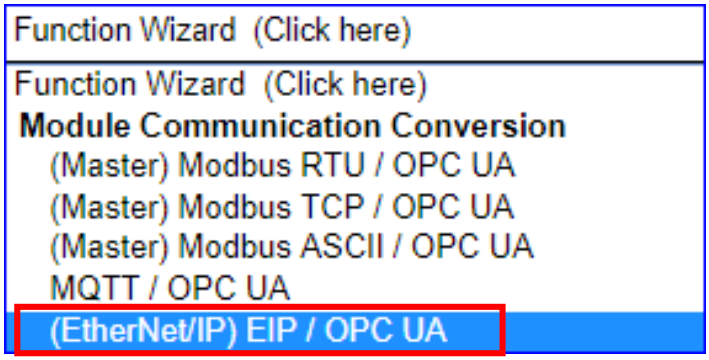


- **Convert Setting: EIP and OPC UA**



Note: The hardware/network connection methods please see the Chapter 2 .

When UA series controller connects the EIP-2000 module (via Ethernet, as EIP-2060 in the picture) and through the OPC UA server to read/write the I/O data of the EIP-2000 module, user can choose the item [**(EtherNet/IP) EIP / OPC UA**] of the "Module Communication Conversion" in the Function Wizard.



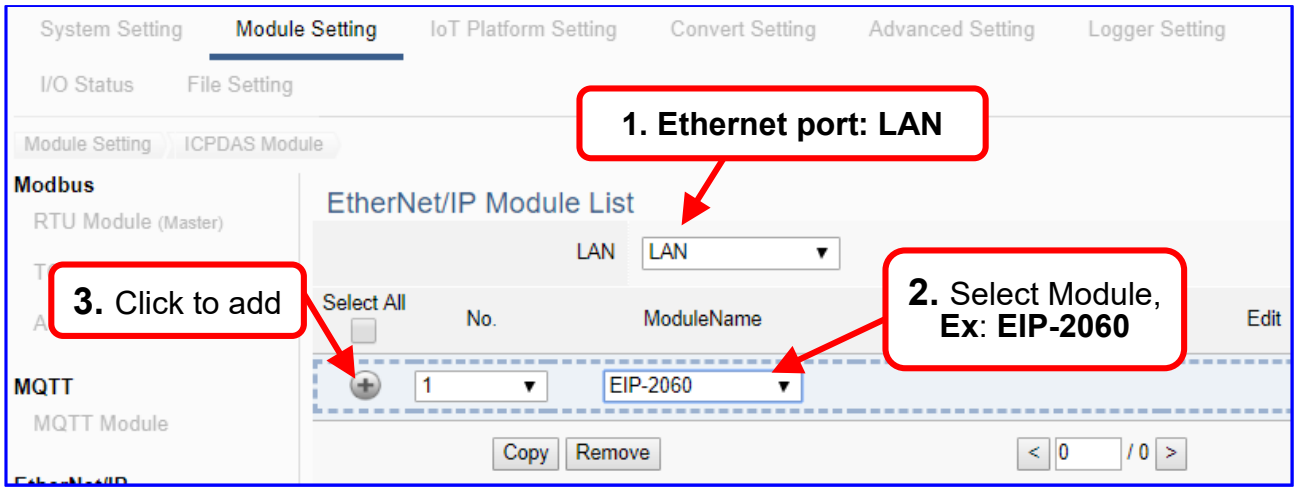
[Step Box]:

The Step Box of the [**(EtherNet/IP) EIP / OPC UA**] has the steps as below. When enabling the Step Box, it auto enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the "Step Box" step-by-step and then can complete the project quickly and rightly.

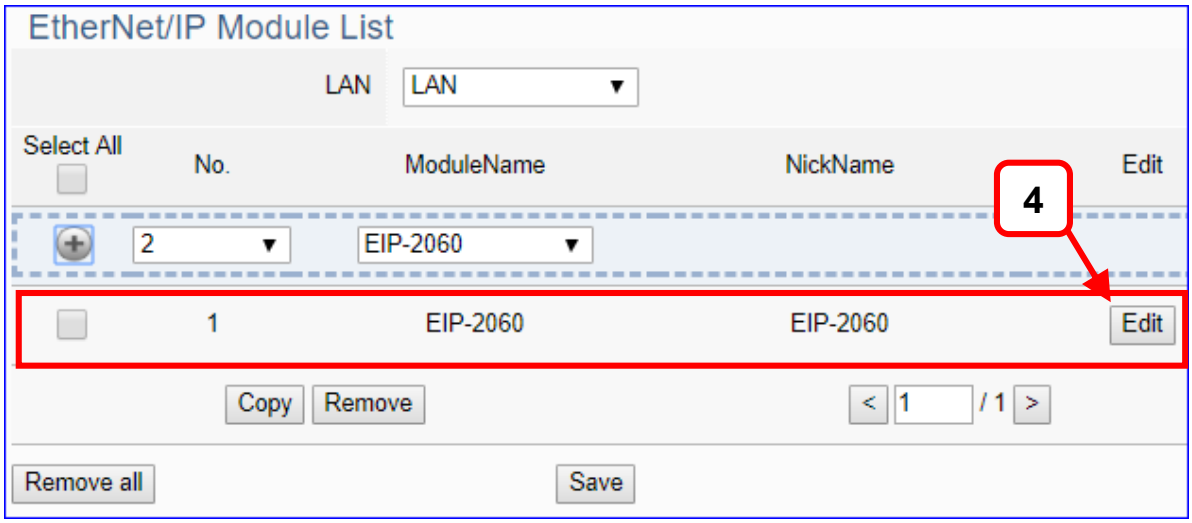
Step 1. Module Setting

It auto-enters the first step of **Step 1 [Module Setting].** This page is for setting the communication values of the connected modules.

The Ethernet port is LAN for connecting with the EtherNet/IP module. Select one EIP-2000 series model and click [⊕] button could add a new module.

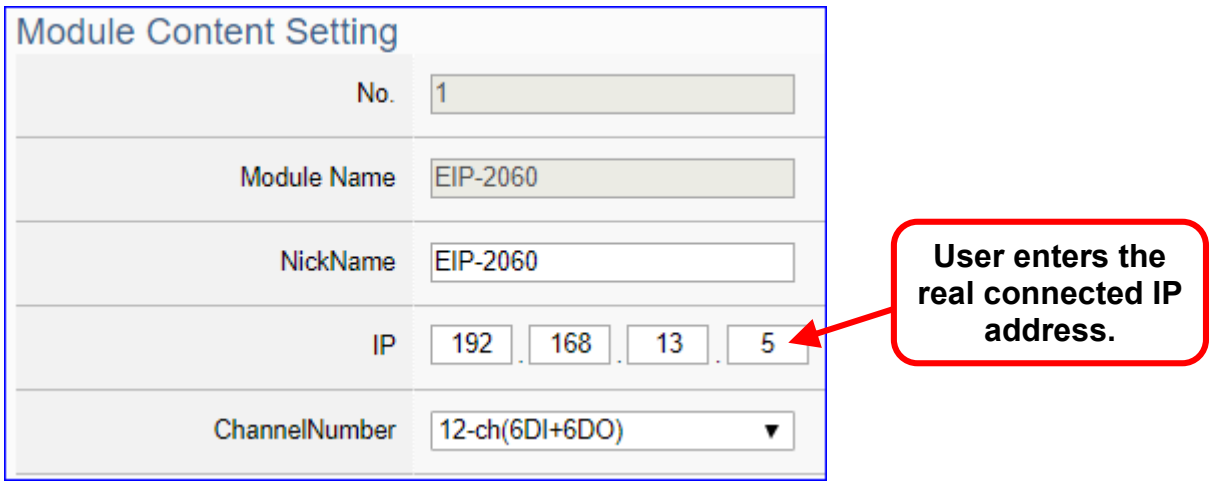


Add a module (No.: 1, Name: EIP-2060) as below. Then click [Edit] button to enter the "Module Content Setting" page.



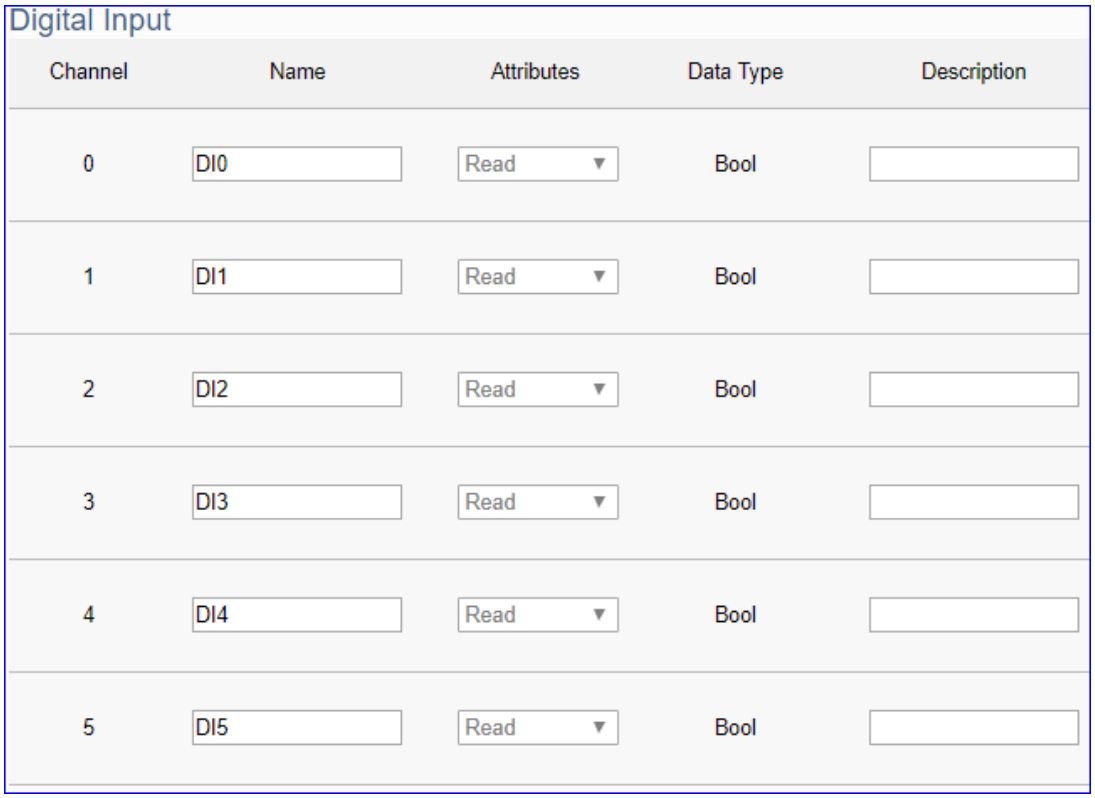
If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

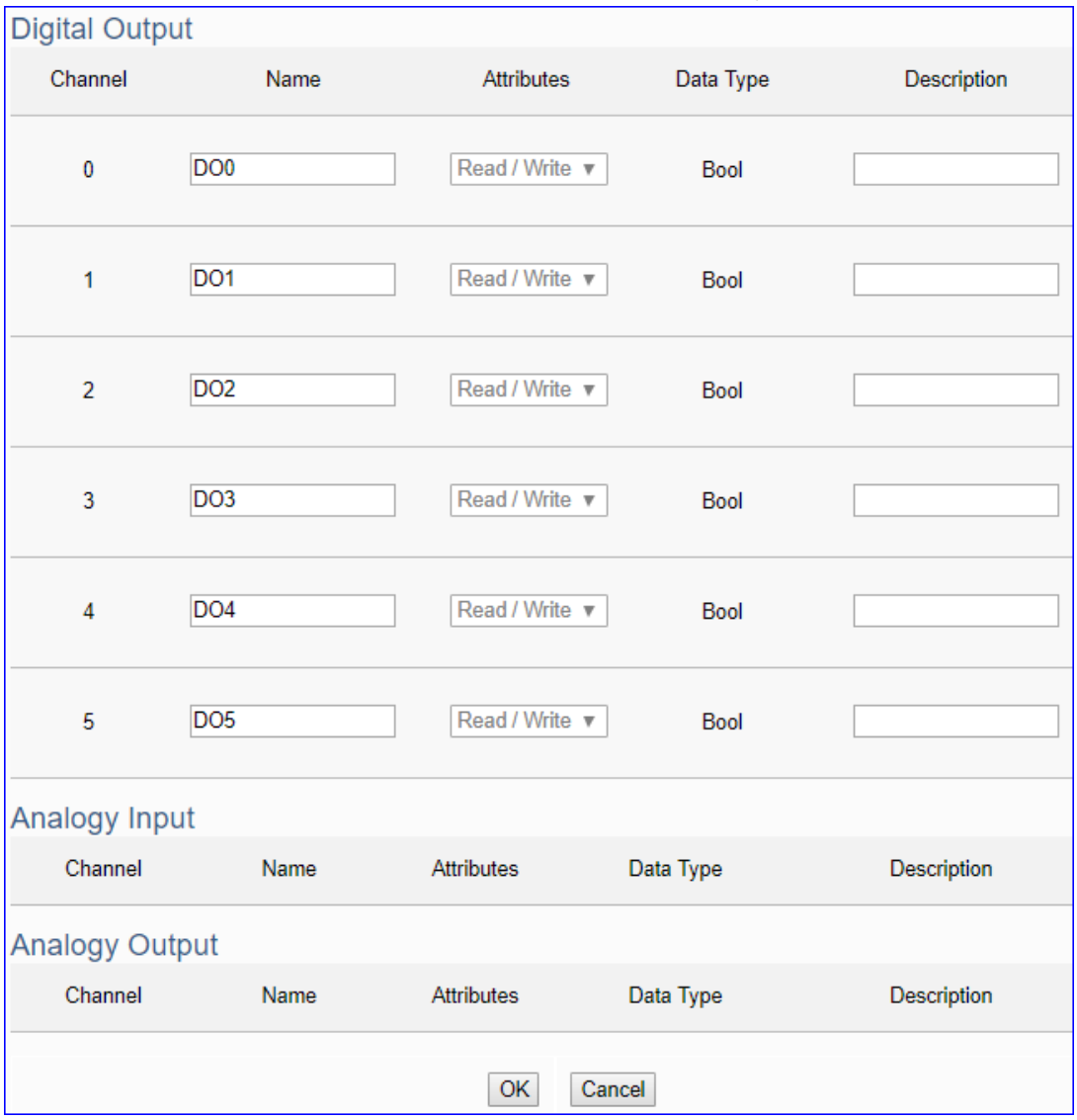
[**Module Content Setting**] page:



Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	The selected model number. (Not editable here)
NickName	User can give a nick name, default: selected model number
IP	Enter the IP address of the connected EIP module. This example: IP address of the EIP-2060 is 192.168.13.5
ChannelNumber	Select the number of the I/O channels.

The system will auto-display the selected I/O table by the order of Digital Input / Digital Output / Analogy Input / Analogy Output. This example: EIP-2060 have 6 DI and 6 DO.





Digital Input / Digital Output / Analogy Input / Analogy Output	
Channel	Channel number will auto-display according to the model. (Not editable) Default: Number from 0.
Name	User can define the name. Default: DI#, DO#, AI#, AO# Available: number, English character, underline “_”, dash line "-", cannot be a space, slash "/", Chinese character, and other symbols.
Attributes	Display data attribute of the variable. (Not editable) Include Read, Read/Write…
Data Type	Display data type of the variable. Include: Bool, Short, Unsigned Short, Long, Unsigned Long, Float, Double, String
Description	For users set up the description for the channel.
OK / Cannel	Click [OK] to save and exit the page settings. Click [Cancer] to exit without saving.

Step 2. OPC UA Certificate

Click the next step, and enter the **Step 2 [OPC UA Certificate]** of the UI setting.

This step is about setting the OPC UA Certificate for the security and encryption, e.g. upload, download, delete certificate. **If the user's project does not need to use the secure encryption connection, please skip this step and click the next step directly.**

In the [**OPC UA Certificate**] step, users can add mutual credentials on both side's devices to strengthen security encryption.

① First, obtain the **OPC UA Client** trust certificate file of the device from the connected party, save it to the PC. In this step, select this file and upload it to the UA controller. (If there was an old certificate file in UA, remove it first.)

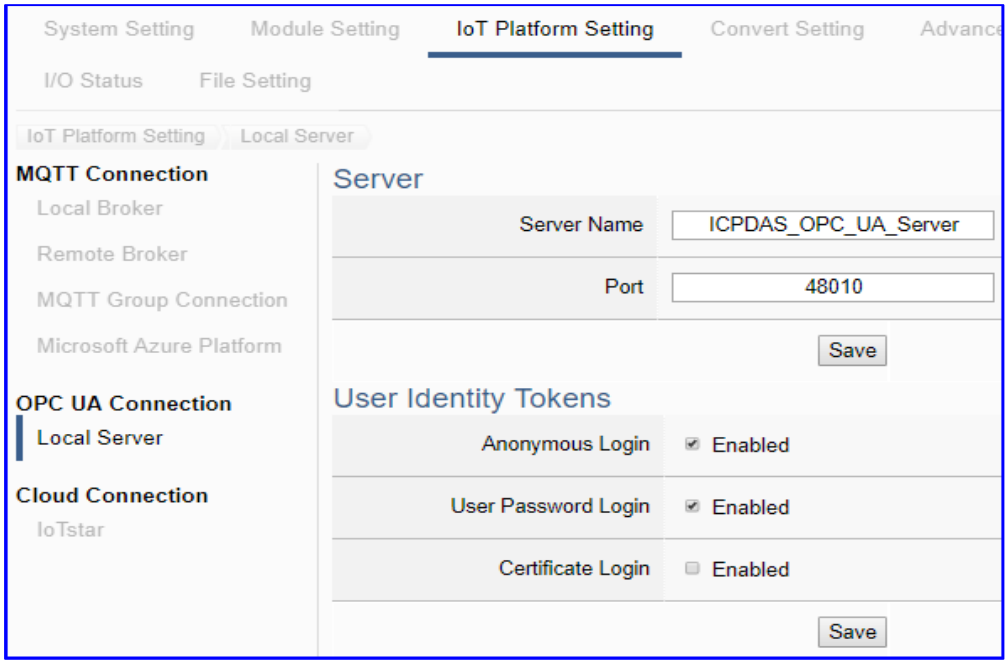
② The device of the other side needs the UA certificate also. In this step, download the **OPC UA Server** certificate file (**Certicate_IPAddress_.tar**) to the other party, so that they can decompress the file (**icpdasuaserver.der**) and upload to their device.

File Setting > OPC UA Certificate > Upload the file to the controller	
Trusted Certificate	**Select File**: select the OPC UA Trusted Certificate file in PC. **Upload**: upload the Trusted Certificate file to the UA controller. • File format must be **DER**. Extension name must be "**der / cer / crt**". Trusted Certificate | Select File | icpdasuaserver.der | Upload • If select a wrong file, the system will show an error message.
File Setting > OPC UA Certificate > Download the file from controller	
OPC UA Server Certificate	**Download**: Download the OPC UA Server Certificate file to the PC. • File format: **DER**. File name: **Certicate_IP-address_.tar** e.g. Certificate_192.168.255.102_.tar. Before using, decompress to **icpdasuaserver.der**, as below. icpdasuaserver.der

Step 3. OPC UA Connection

Click the next step, and enter the **Step 3 [OPC UA Connection]** of the UI setting. This page is for setting the IoT platform and the OPC UA connection, e.g. the server name, port, login identity information, etc.

We select the “EIP / OPC UA” conversion at the beginning, so this step will auto enter the [**OPC UA Connection > Local Server**] page of IoT Platform Setting. The “Step Box” will prevent the user from selecting the wrong platform.



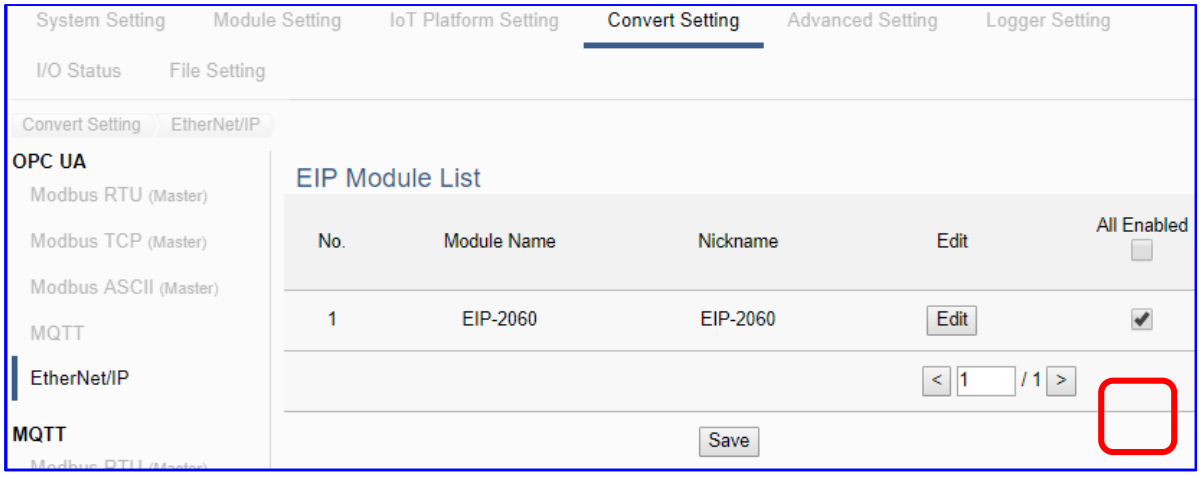
OPC UA Connection > Local Server Setting –Server	
Server Name	Display the active OPC UA Server name. Not editable. System value: ICPDAS_OPC_UA_Server
Port	The communication port number of the OPC UA Server. System Default: 48010.
Save	Click to save the settings of this item.
OPC UA Connection > Local Server Setting –User Identity Tokens	
Anonymous Login	Check to enable the anonymous login of clients. Default: check.
User Password Login	Check to enable the user password login of clients. Default: uncheck.
Certificate Login	Check to enable the certificate login of clients. Default: uncheck.
Save	Click to save the settings of this item.

Step 4. Enable Converting Module

Click the next step, and enter the **Step 4 [Enable Converting Module]** UI setting
This step is for enabling the EIP / OPC UA conversion.

We select the “EIP / OPC UA” conversion at the beginning, so this step will auto enter the [**OPC UA > EtherNet/IP**] page of Conversion setting. The “Step Box” will prevent the user from selecting the wrong platform.

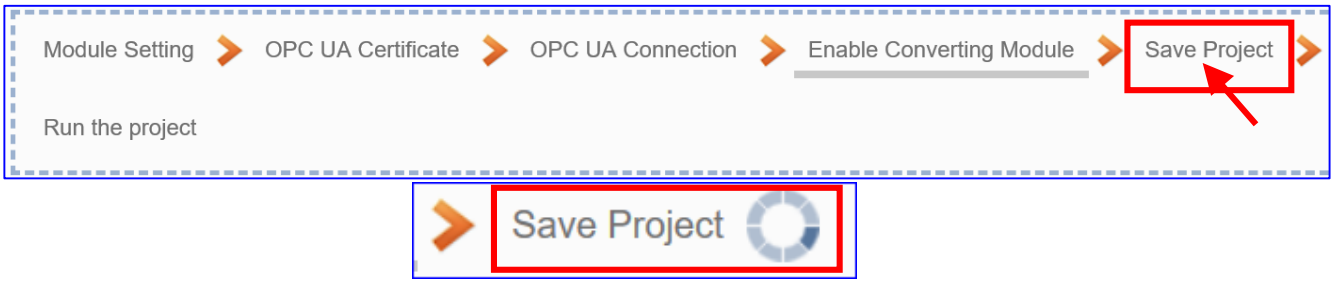
Check the box of the module to enable all I/O. If want to enable some I/O, click “Edit” to select I/O one by one.



Convert Setting > OPC UA > EtherNet/IP - EIP Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
Edit	If user wants to enable some I/O channels for conversion, click [Edit] of that module to enter the “Variable Tale” setting. It is normal to set all channels as enabled, and the conversion will not affect the unconnected channels.
All Enabled	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

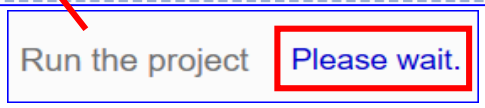
Step 5. Save Project

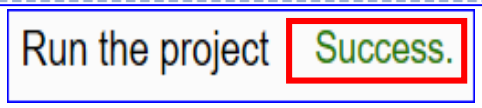
The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.



Step 6. Run the Project

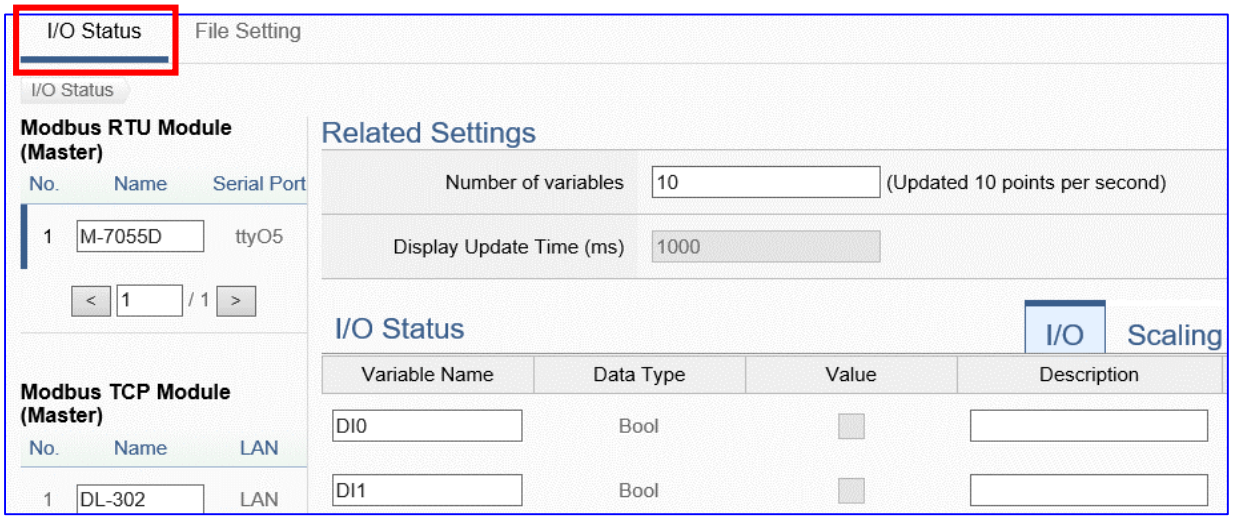
The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.





When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

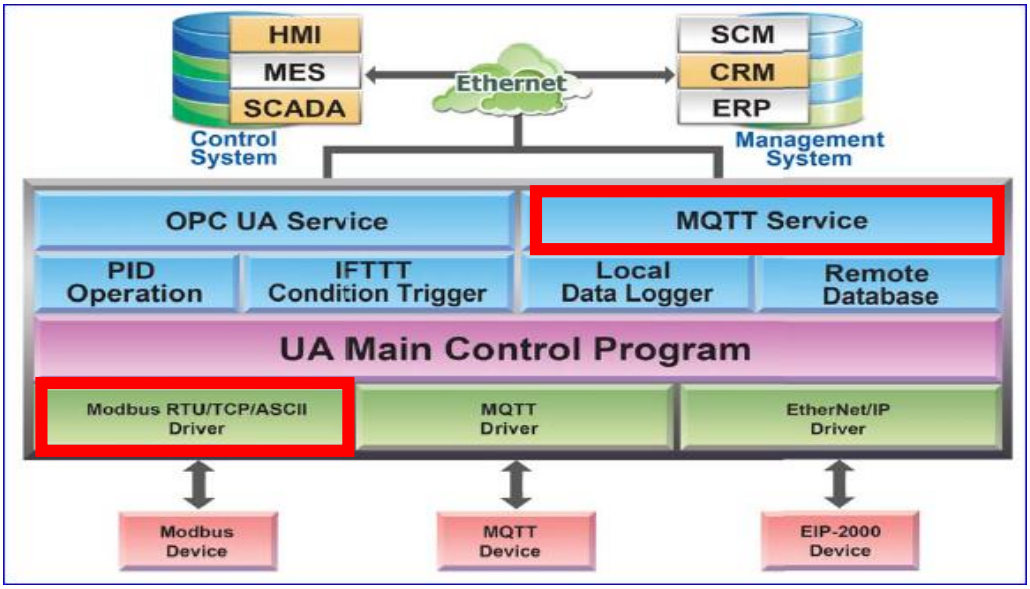
The new project now completes the setting, uploading and running in the UA controller and can process the conversion communication. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.



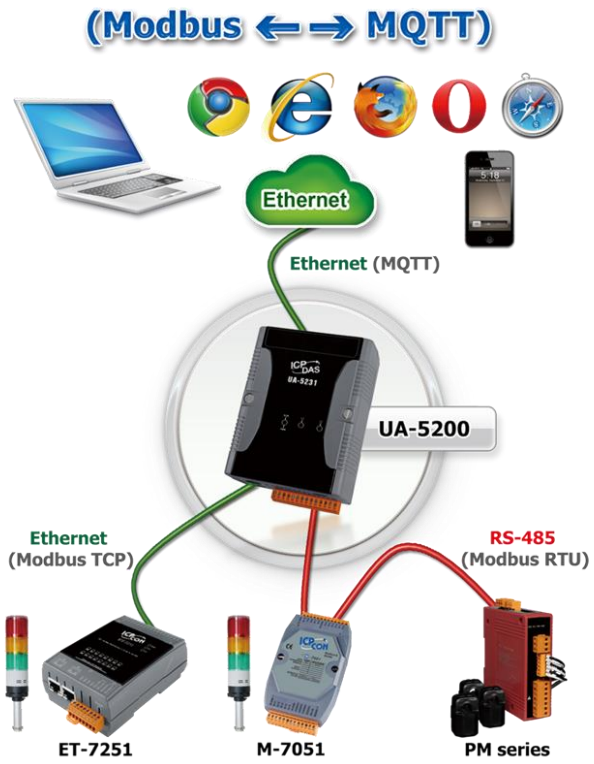
4.1.4. Function Wizard: Modbus / MQTT Conversion

Modbus / MQTT Conversion include the conversion of MQTT and Modbus RTU / TCP / ASCII three protocols. With the MQTT Service function, users can set the MQTT client to publish the message to the specified broker or subscribe the topic, and so to read and write the single channel of the Modbus device that connected to the controller.

Modbus / MQTT Function Diagram:

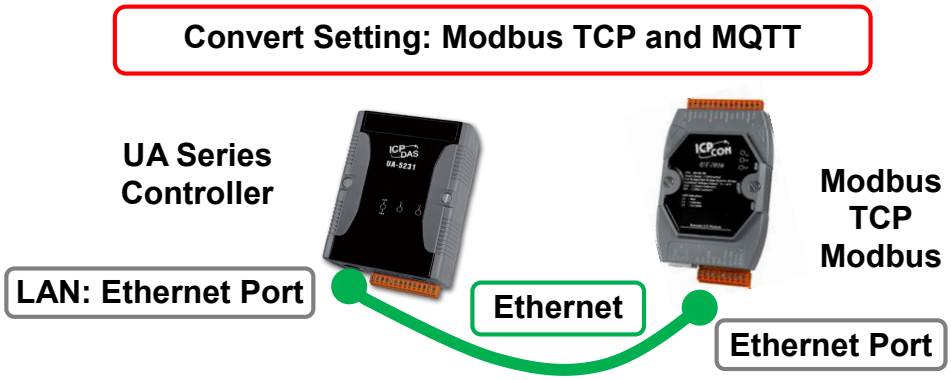


Application Solution:



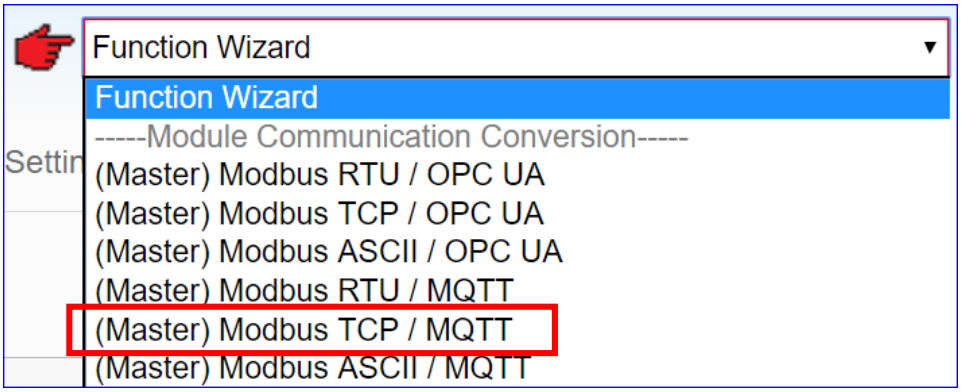
This section introduces the Modbus / MQTT conversion through the conversion of Modbus TCP and MQTT protocol.

- **Convert Setting: Modbus TCP and MQTT**



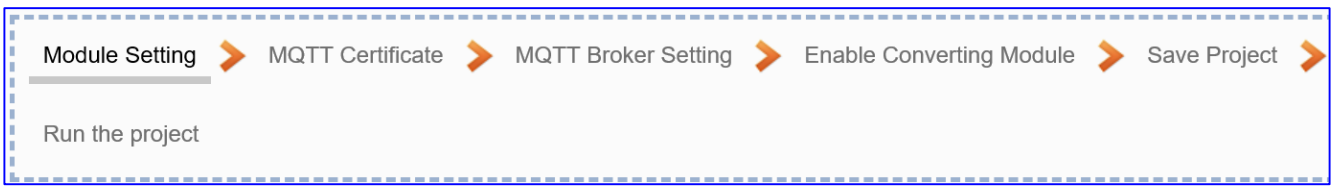
Note: The hardware/network connection methods please see the Chapter 2 .

When UA series controller connects the Modbus TCP (via Ethernet, as the picture) and read/write the Modbus I/O via MQTT Broker, user can choose the item [**Modbus TCP / MQTT**] of the “Module Communication Conversion” in the Function Wizard.

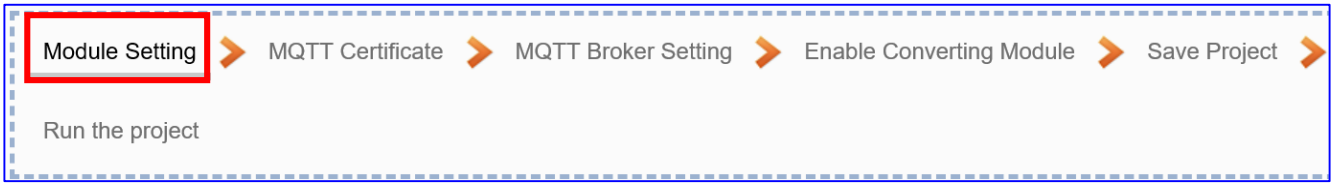


[Step Box]:

The Step Box of the [**Modbus TCP / MQTT**] has the steps as below. When enabling the Step Box, it auto-enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the “Step Box” step-by-step and then can complete the project quickly and rightly.

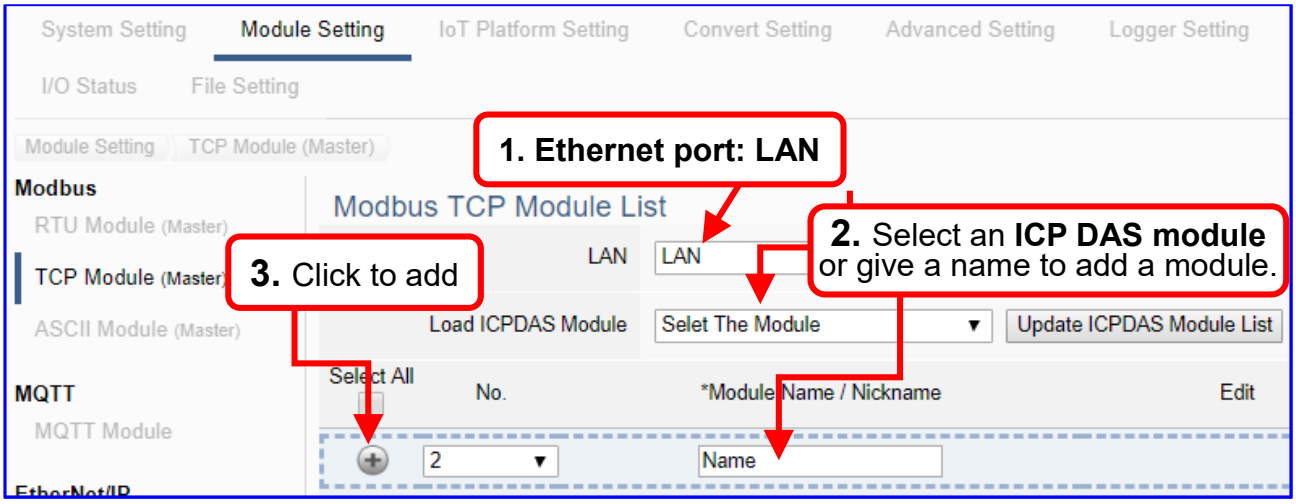


Step 1. Module Setting

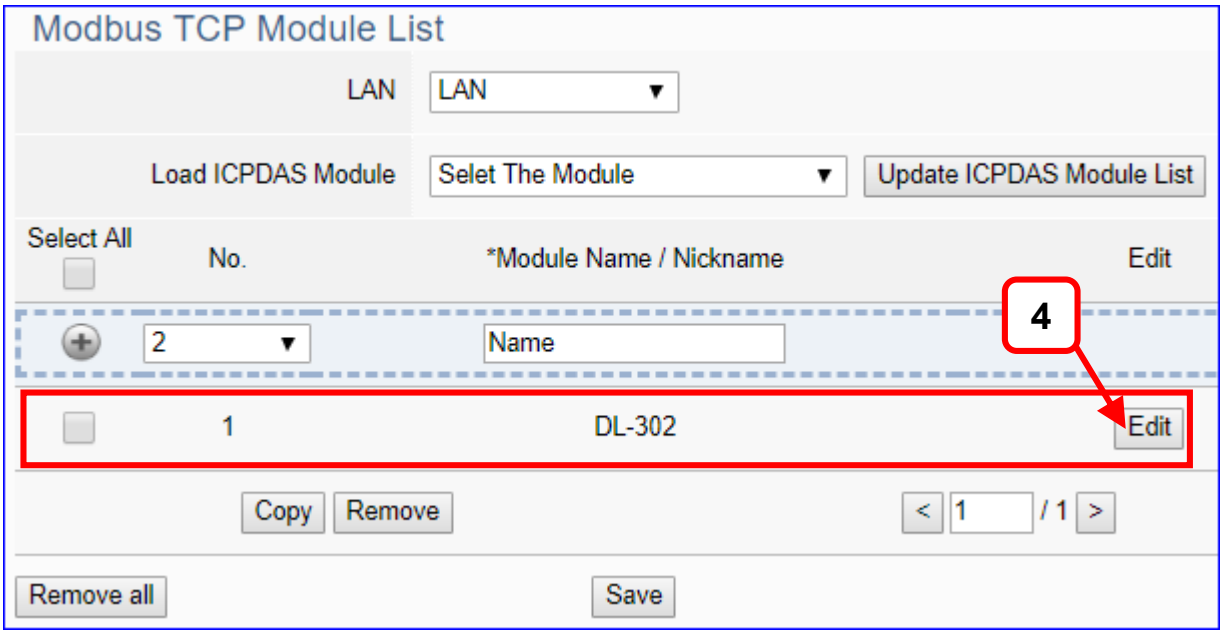


This page is for setting the communication values of the connected modules.

The Ethernet port is LAN for connecting with the TCP module. If using ICP DAS module, select the module and system will auto load the module data. If not, give a module name (Default: Name), click [⊕] button to add a new module.

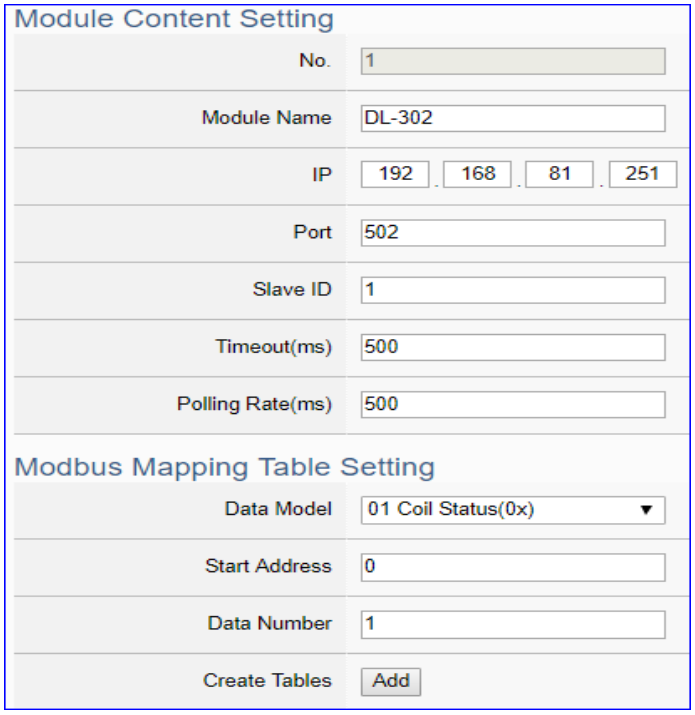


Add a module (e.g. No.: 1, Name: DL-302) as below, and then click [Edit] button to enter the “Module Content Setting” page.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

[**Module Content Setting**] page to set up IP and the Modbus address mapping table.



This Example: DL-302

[IP] 192.168.81.251 (by user case)

[Modbus mapping Table Setting]
Data Model: 04 Input Registers(3x)
Start Address: 0
Data Number: 3
Type: 16-bit Short
→ Click [Add]

Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
IP	Give the IP address of the connected module. Default: 0.0.0.0
Port	The port number for Modbus TCP. Default: 502
Slave ID	Set the Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Polling Rate	Set a time interval for the command. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models “01” ~ “04” for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

The finished Modbus Mapping Table as below is in order of DO, DI, AO and AI.

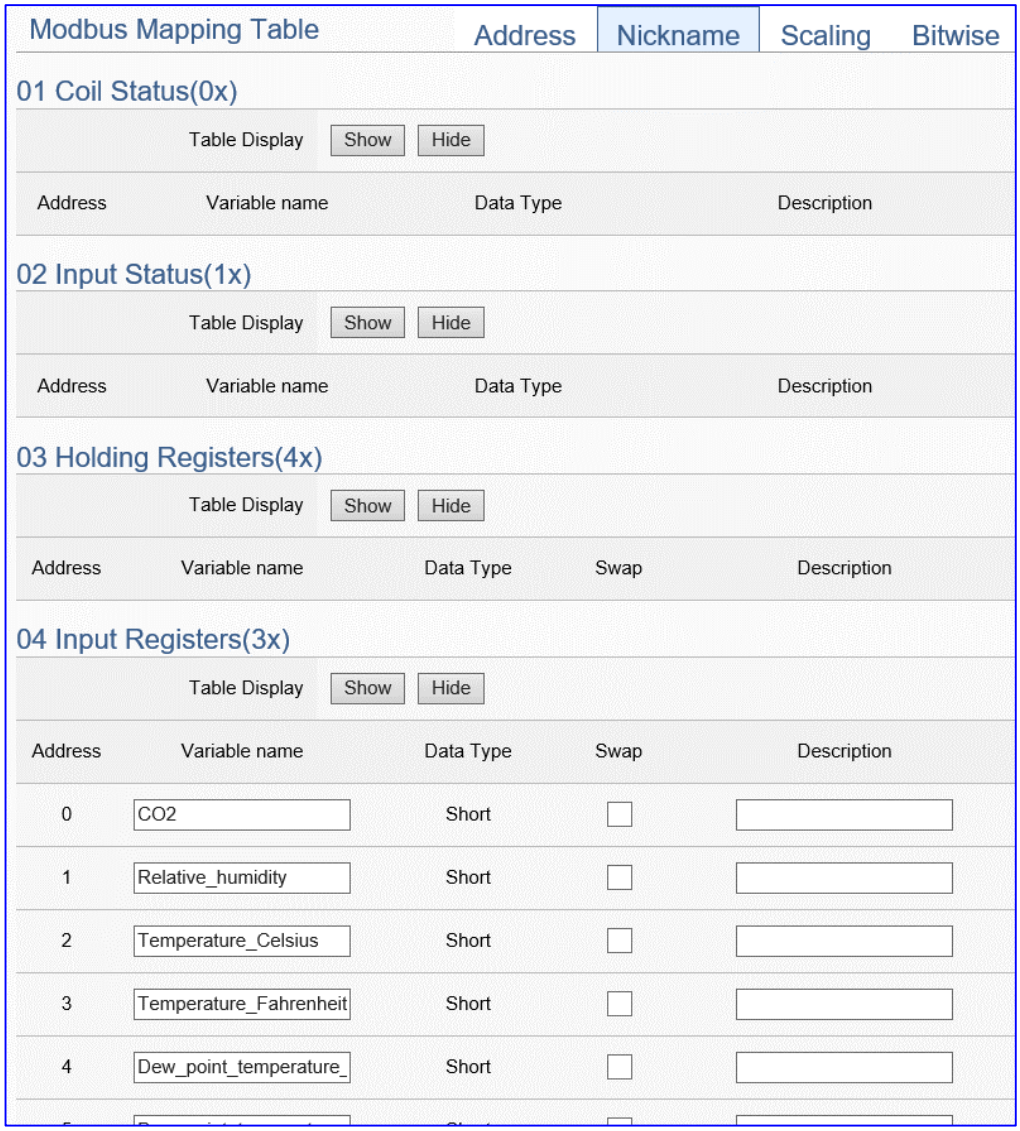
Address:

Display and edit the Modbus Mapping Table.

Modbus Mapping Table – Address Setting	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname:

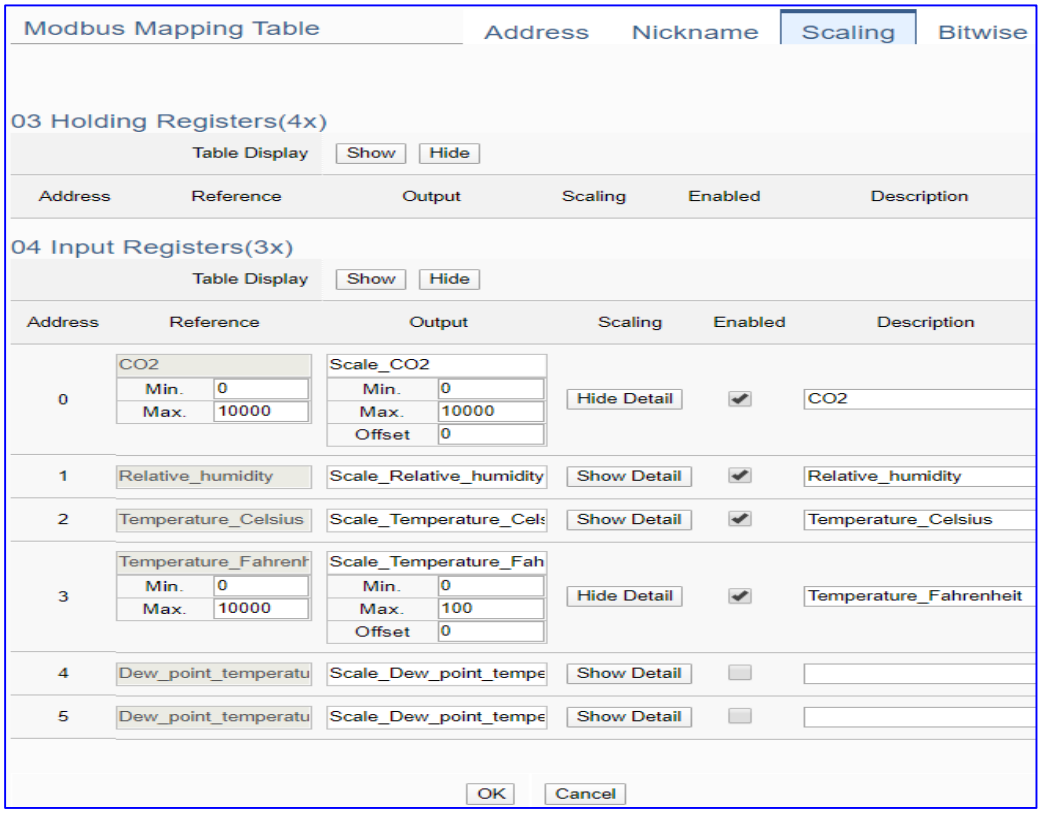
Setting the variable nickname and description.



Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Scaling:

Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated. The M-7055D has no AI/AO, so here uses the screen of DL-302 for an example.

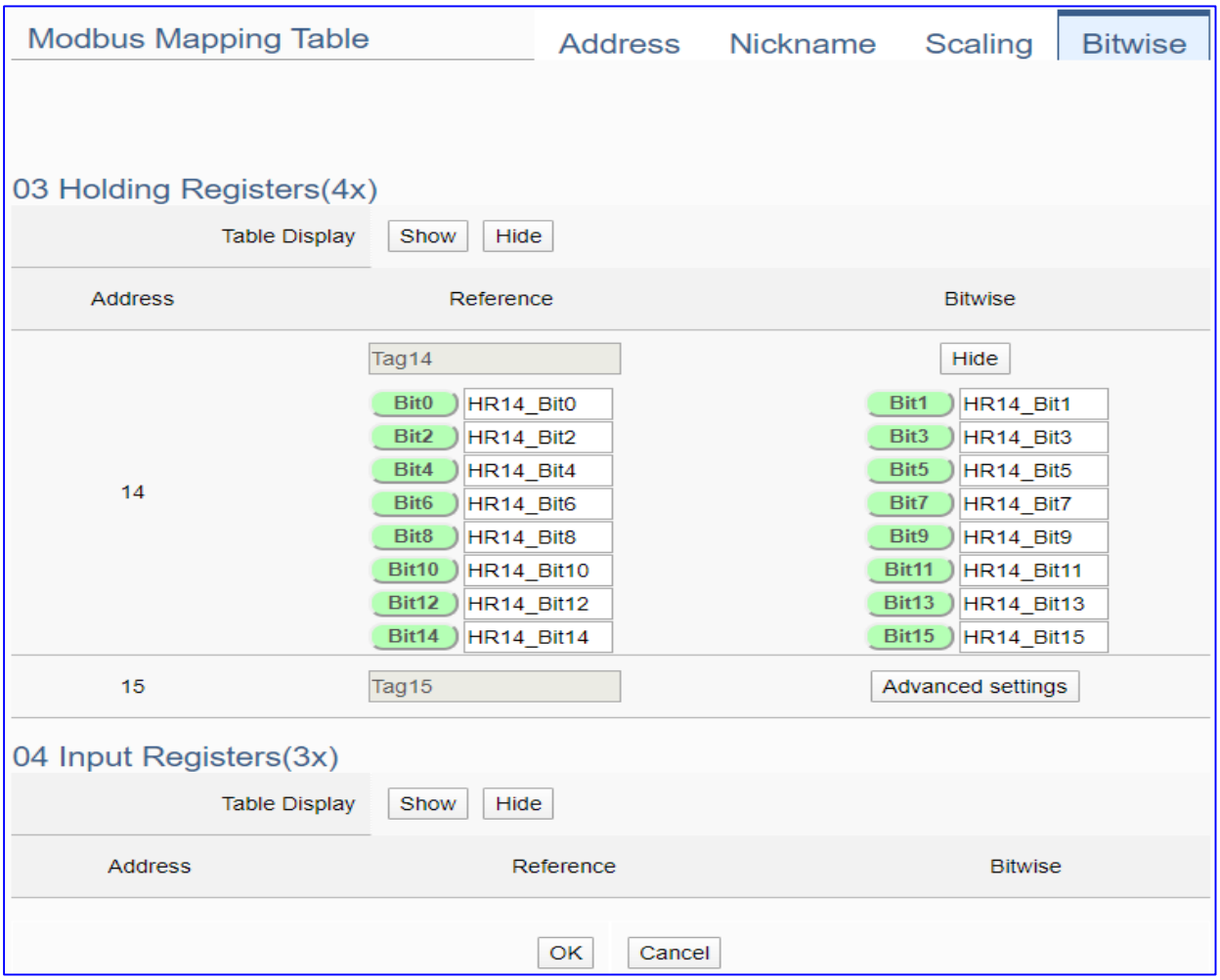


Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The I/O variable of the Modbus address.
Output	The scaling variable for scaling output. User can define the variable name.
Scaling	Click [Show Detail] to set up the Scaling parameters, and click [Hide Detail] to hide the parameters. Fill in the Min/Max range values of the source in the Reference column. Fill in the Min/Max range values after scaling in the Output column. If needs offset, fill the offset value in the Offset item. Remember check “Enable” box.
Enable	Check the box of the variable can enable just that variable for scaling.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Bitwise:

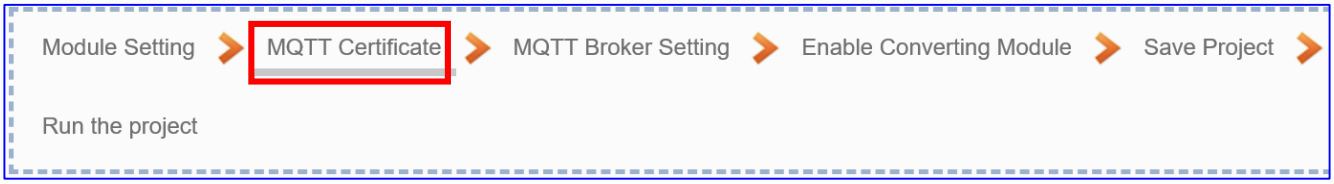
Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.

The M-7055D has no AI/AO, so here uses other module's setting screen as an example.

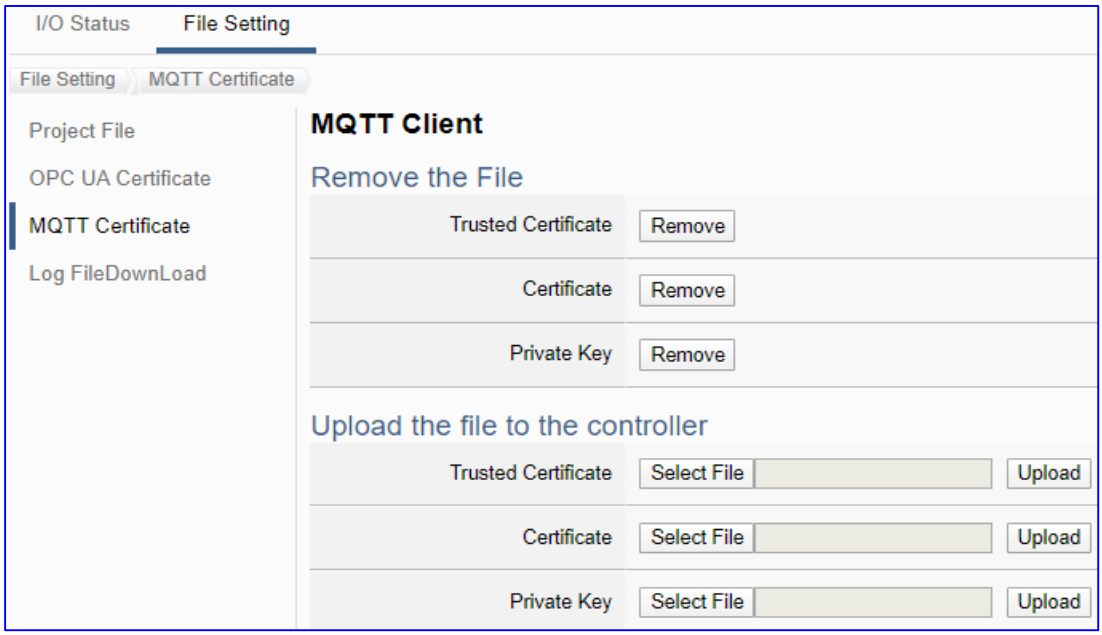


Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The Bit# variables of the Modbus address.
Bitwise	Set up the variables for Bitwise. Click [Advanced Settings] to set up the Bitwise parameters, and click [Hide] to hide the parameters. Fill in the variable names to the Bit# that wanted to do the Bitwise. The value in the fixed bit number will be assigned into the variable.
OK	Click to save this page settings and back to the module list page.

Step 2. MQTT Certificate

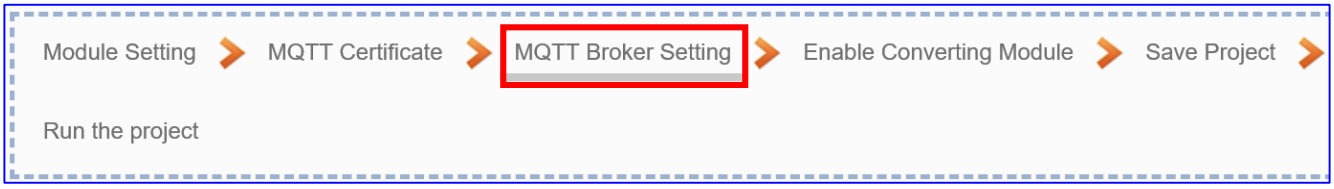


The **[MQTT Certificate]** is for setting up security communications to upload the **MQTT Trusted Certificate, Certificate and Private Key**. The users upload the file to the UA controller according to the type of obtained certificate. If you want to perform **Broker authentication**, you need to upload the **Trusted Certificate**. If you want to perform the **Broker/Client two-way authentication**, you need to upload the **Credential and Private Key additionally**. The user can skip this step if the user project does not use certificate transmission security.



File Setting > MQTT Certificate > Upload the file to the controller	
Trusted Certificate	**Select File**: select the MQTT Trusted Certificate file of the device. **Upload**: upload the MQTT Trusted Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message. Trusted Certificate Select File Certificate_192.168.255.10 Certificate type is wrong. Upload
Certificate	**Select File**: select the MQTT Certificate file of the device. **Upload**: upload the MQTT Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message.
Private Key	**Select File**: select the MQTT Private Key of the device. **Upload**: upload the MQTT Private Key file to the UA controller. • File format must be **PEM**. Extension name must be ".**key**". • If select a wrong file, the system will show an error message.

Step 3. MQTT Broker Setting

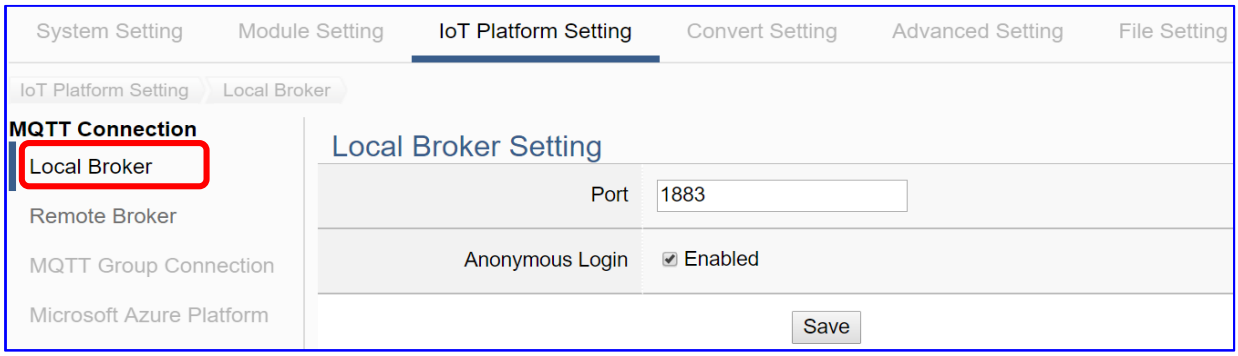


Click the next step, and enter the **Step 3 [MQTT Broker Setting]** of the UI setting.
This page is for setting the IoT platform and the MQTT Broker connection, e.g. the local or remote broker, port, login information, etc.

We select the “Modbus RTU / MQTT” conversion at the beginning, so this step will auto enter the [**MQTT Connection > Local Broker**] page of IoT Platform Setting. The “Step Box” will prevent the user from selecting the wrong platform. User can choose the local or remote broker for the MQTT connection.

The example uses local Broker.

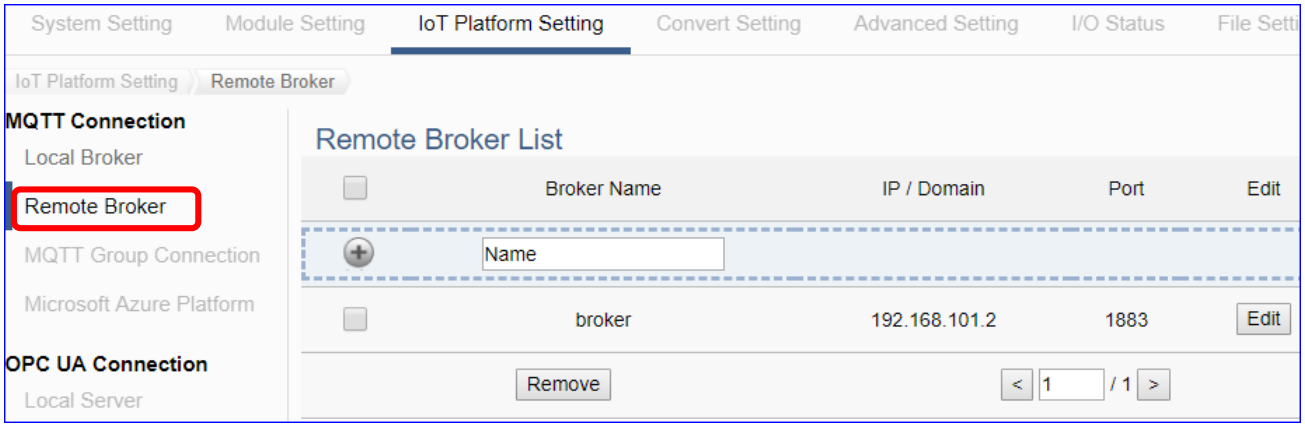
Local Broker



MQTT Connection > Local Broker Setting	
Port	The COM port of the Local MQTT Broker. System default: 1883
Anonymous Login	Check to allow anonymous login. Default: Check.
Save	Click to save the setting of this page.

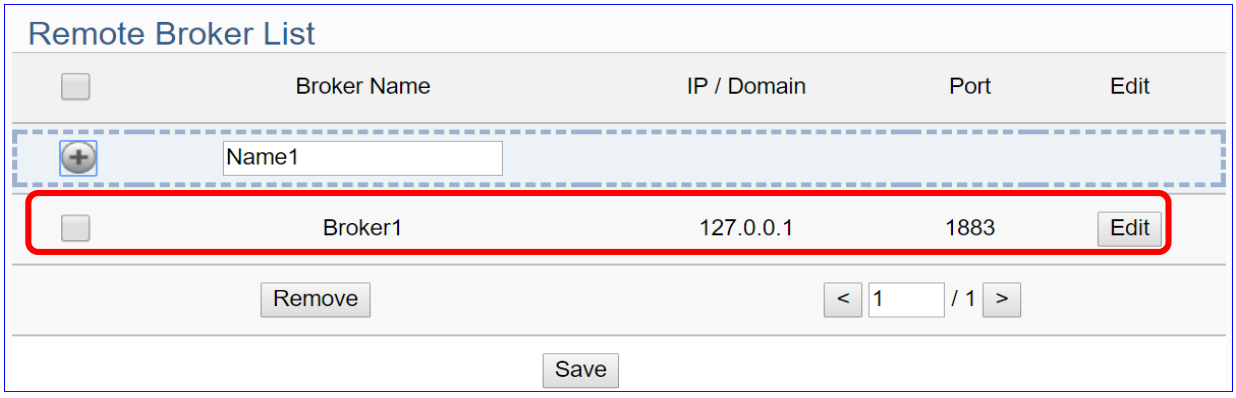
If users apply a remote Broker, the screen will as follow.

Remote Broker:

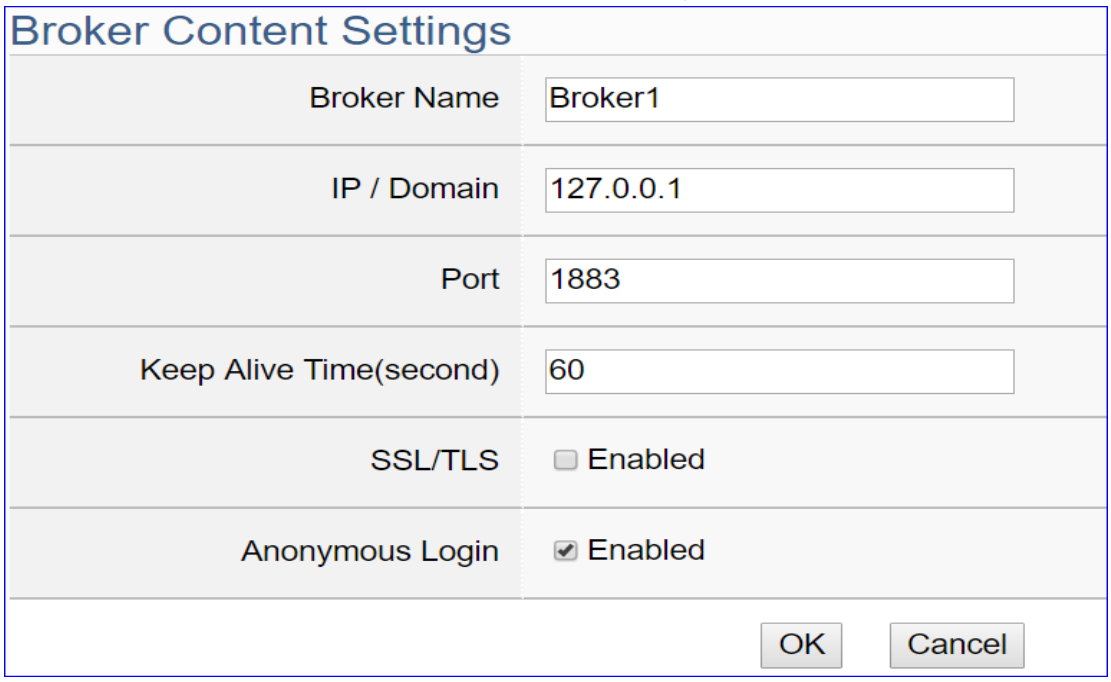


MQTT Connection > Remote Broker List	
Broker Name	The name of the remote MQTT Broker. User can define the name, e.g. Broker1. Default: Name.
	Click to add a new remote Broker.
Save	Click to save the settings of this page.

After creating a new Remote Broker (as below):

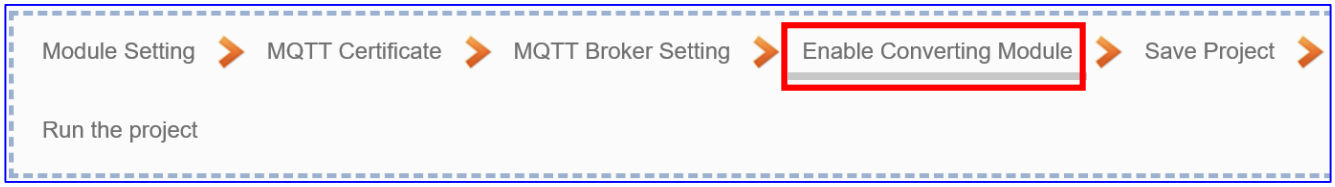


MQTT Connection > Remote Broker List	
Broker Name	The name of the remote MQTT Broker. User can define the name, e.g. Broker1. Default: Name.
IP / Domain	The IP address of the remote Broker. Default: 127.0.0.1
Port	The COM port of the remote Broker. Default: 1883
Edit / Remove	Click [Edit] can set the Broker. Click the left box and [remove] can delete the Broker.
Save	Click to save the settings of this item.



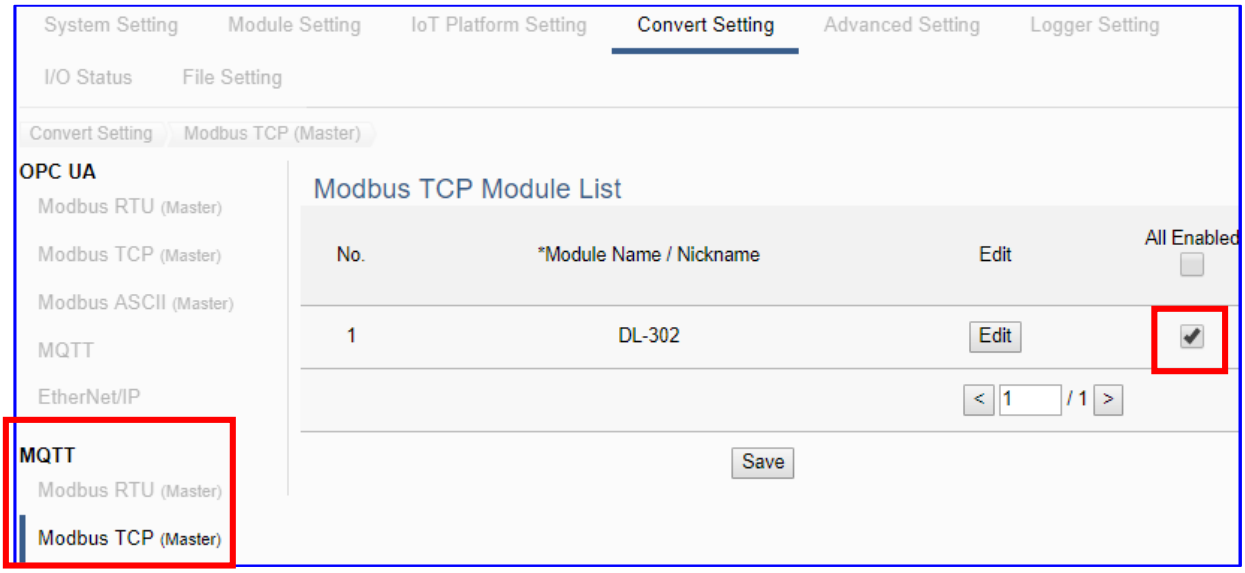
MQTT Connection > Remote Broker > Broker Content Settings	
Broker Name	The name of the remote MQTT Broker. (Editable)
IP / Domain	The IP address of the remote Broker. Default: 127.0.0.1
Port	The COM port of the remote Broker. Default: 1883
Keep Alive Time	The keep alive time. Default: 60 (second)
SSL/TLS	Check to enable the supporting of SSL/TLS security communication. Default: uncheck.
Anonymous Login	Check to allow anonymous login. Default: Check.
OK	Click to save the settings and exit.

Step 4. Enable Converting Module



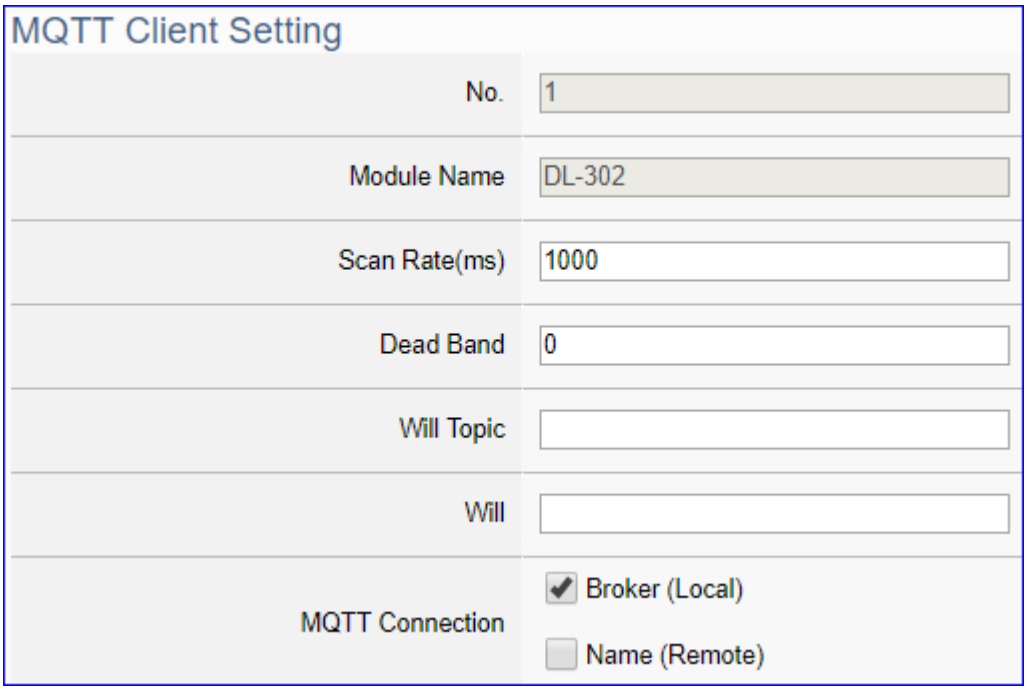
Click the next step, and enter the **Step 3 [Enable Converting Module]** UI setting
This step is for enabling the module for the Modbus TCP / MQTT conversion.

We select the “Modbus TCP / MQTT” conversion at the beginning, so this step will auto enter the [**MQTT > Modbus TCP (Master)**] page of Conversion setting. The “Step Box” will prevent the user from selecting the wrong platform.

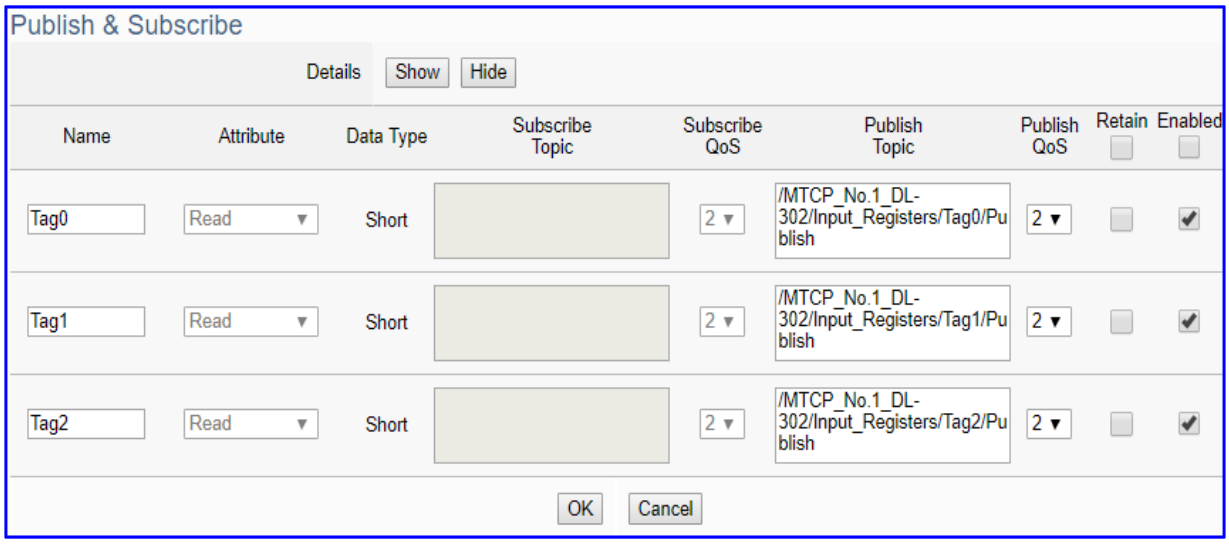


Convert Setting > MQTT > Modbus TCP (Master) Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
All Enabled	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	Click to enter the “MQTT Client Setting” page to set up the Topic, QoS, Publish, Subscribe …
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

Click [Edit] button cauld enter the “MQTT Client Setting” page:



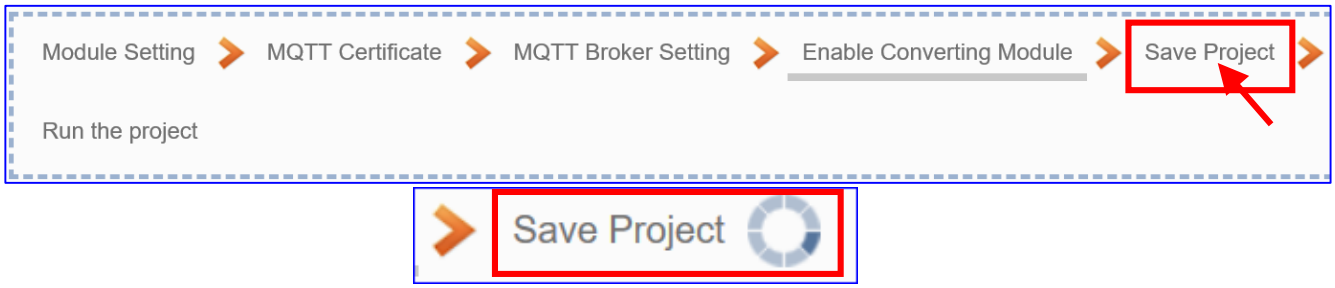
Convert Setting > MQTT > Modbus TCP (Master) – MQTT Client Setting	
No.	The module number in the module list (Not editable here)
Module Name	The module name set in the module list (Not editable here)
Scan Rate(ms)	Set an update frequency for the task data. Default: 1000 (Unit: ms)
Dead Bend	Give a dead bend value for updating a float signal. Default: 0
Will Topic	Enter the title of a disconnect notice. Default: Null.
Will	Enter a disconnect notice. Default: Null.
MQTT Connection	Check the Broker want to use Local Broker or Remote Broker.



Convert Setting > MQTT > Modbus TCP (Master) – Publish & Subscribe	
Details	Click [Show] to display all fields, click [Hide] to hide some fields.
Name	The variable name of the mapping address. (Not editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Subscribe Topic	The topic of receiving/subscribing data message.
Subscribe Qos	The subscribe Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Publish Topic	The topic of sending/publishing data message.
Publish Qos	The publish Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Retain	Check [Retain] box of the top row can store the broker message for all variables in list. Check the box of each variable can store the broker message just that variable. Default: Uncheck.
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK	Click to save this page settings and back to the module list page.

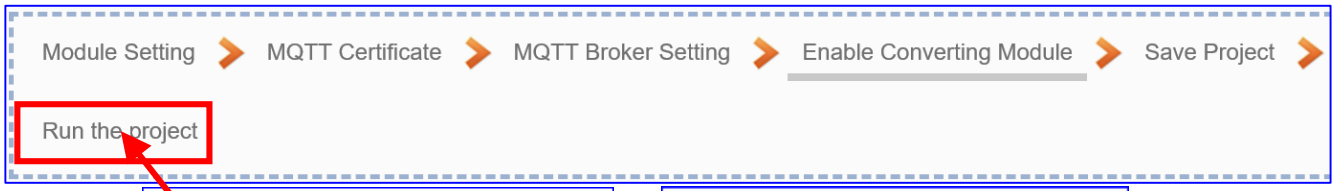
Step 5. Save Project

The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.



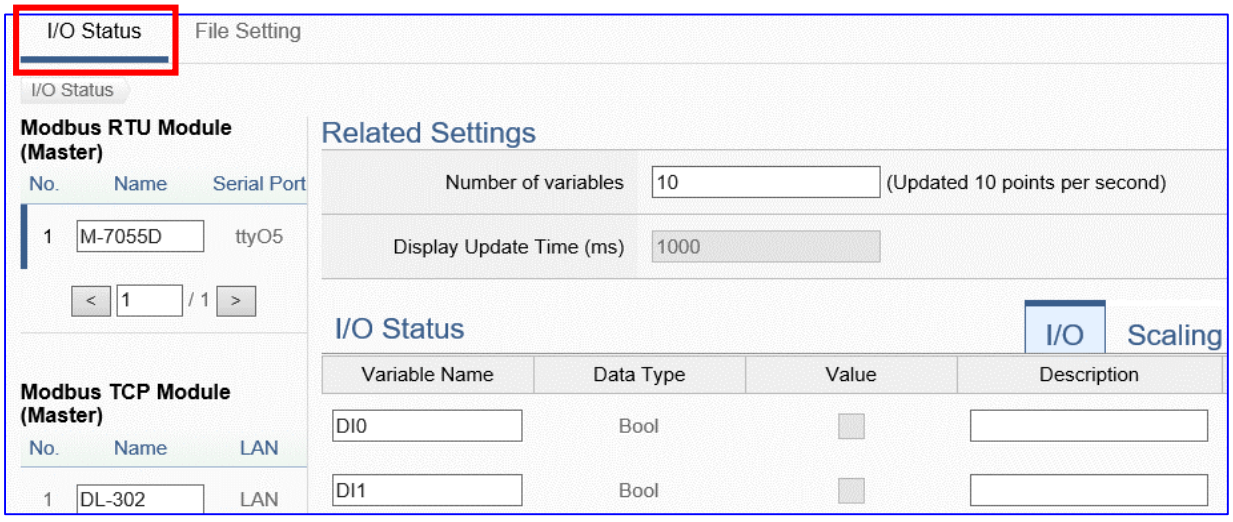
Step 6. Run the Project

The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.



When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

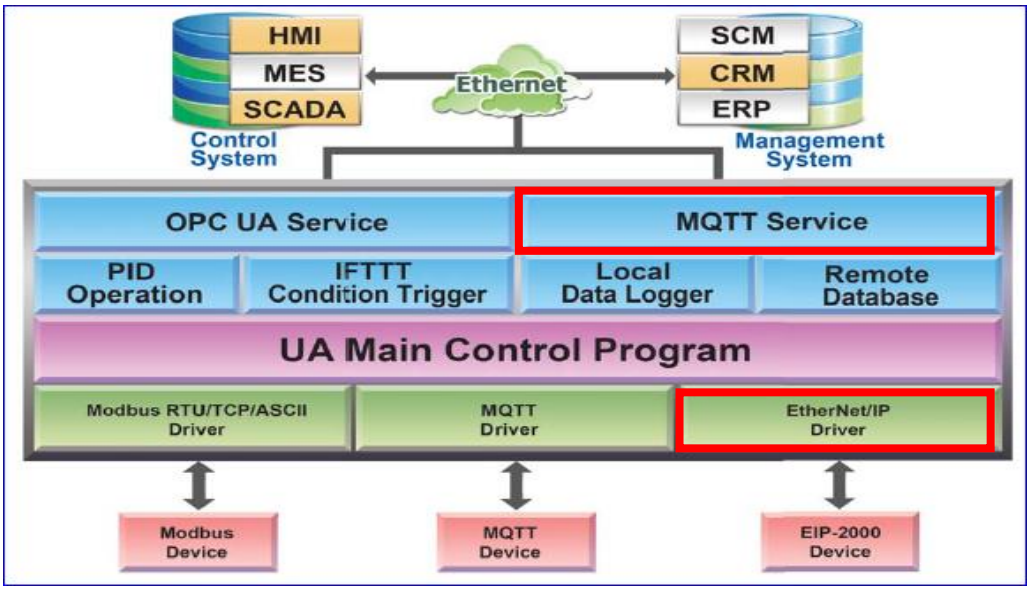
The new project now completes the setting, uploading and running in the UA controller and can process the conversion communication. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.



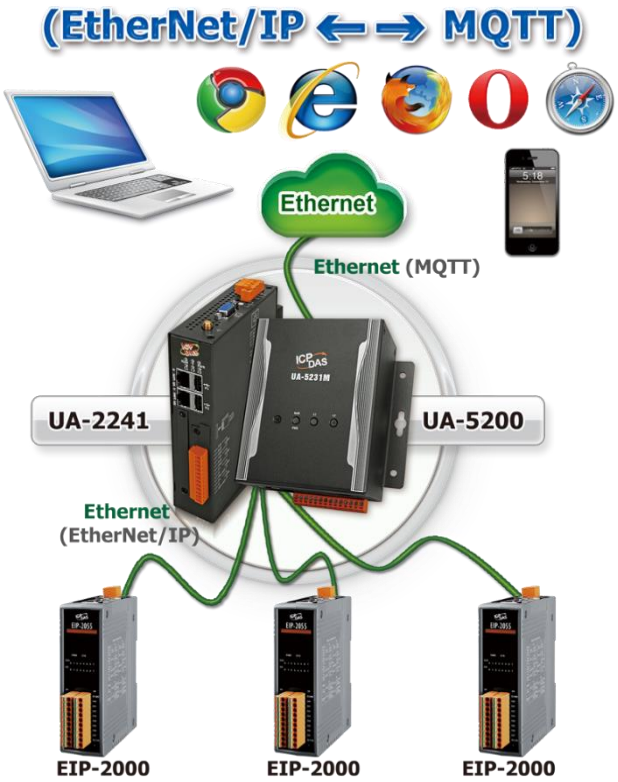
4.1.5. Function Wizard: EIP / MQTT Conversion

EIP / MQTT Conversion include the conversion of **MQTT** and **EtherNet/IP** protocol. With the MQTT Service function, users can set the MQTT client to publish the message to the specified broker or subscribe the topic, and so to read and write the single channel of the **EIP-2000** module that connected to the controller.

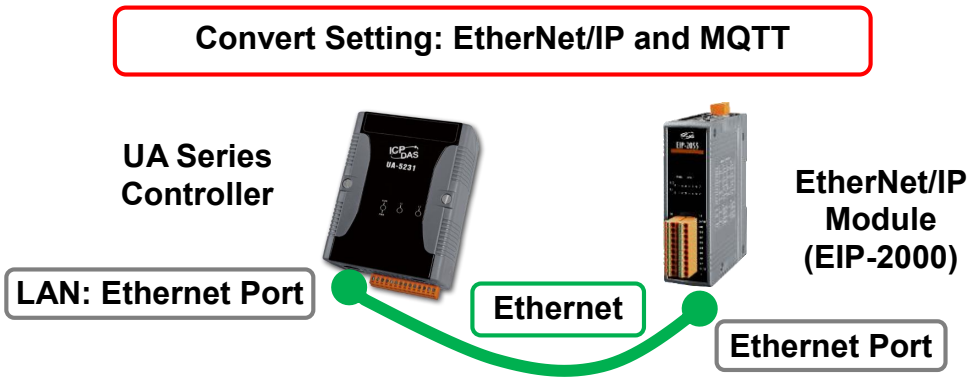
EIP / MQTT Function Diagram:



Application Solution:

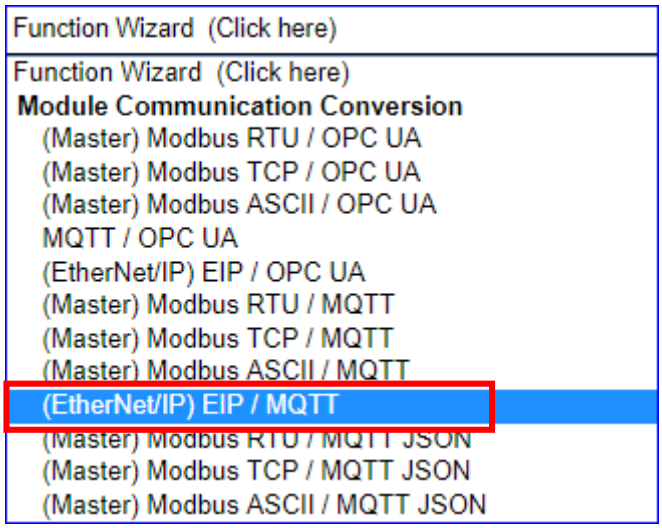


- **Convert Setting: EtherNet/IP and MQTT**



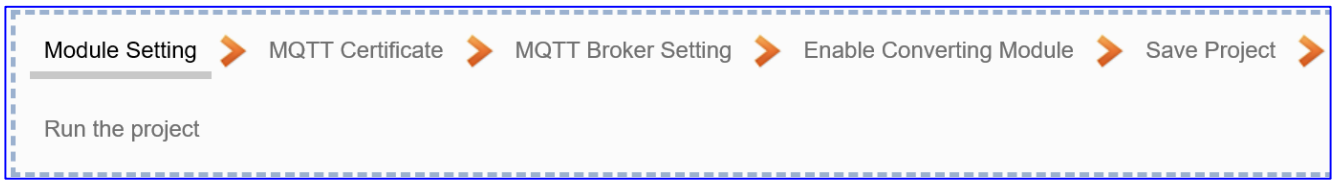
Note: The hardware/network connection methods please see the Chapter 2 .

When UA series controller connects the EIP-2000 (via Ethernet, as the picture) and read/write the EIP-2000 I/O via MQTT Broker, user can choose the item [**(EtherNet/IP) EIP / MQTT**] of the "Module Communication Conversion" in the Function Wizard.

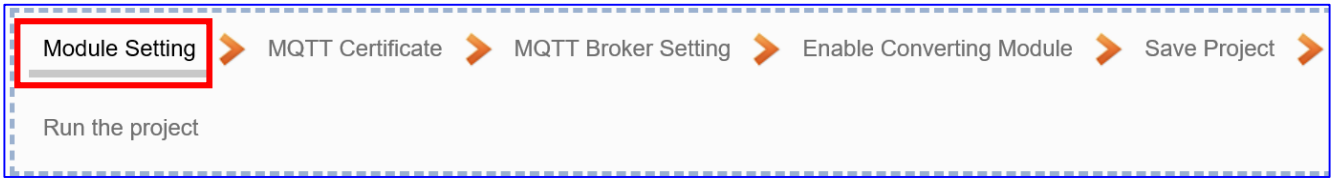


[Step Box]:

The Step Box of the [**(EtherNet/IP) EIP / MQTT**] has the steps as below. When enabling the Step Box, it auto enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the "Step Box" step-by-step and then can complete the project quickly and rightly.

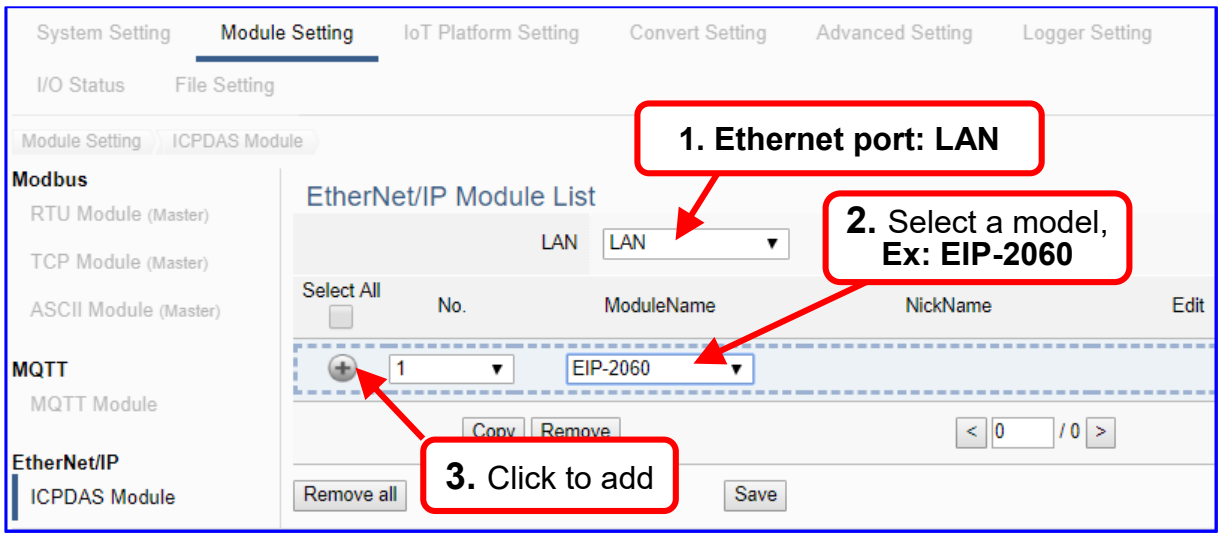


Step 1. Module Setting

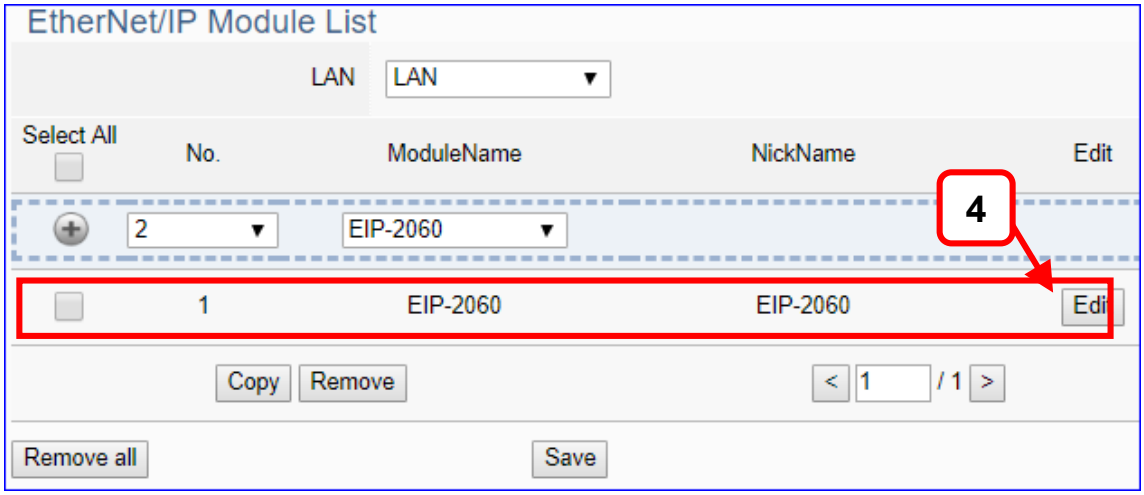


This page is for setting the communication values of the connected modules.

The Ethernet port is LAN for connecting with the EtherNet/IP module EIP-2000 Series by ICP DAS, and select the connected module (This example: EIP-2060). Click [ ] button could add a new module, and then click [Edit] button to configure the module content and I/O.



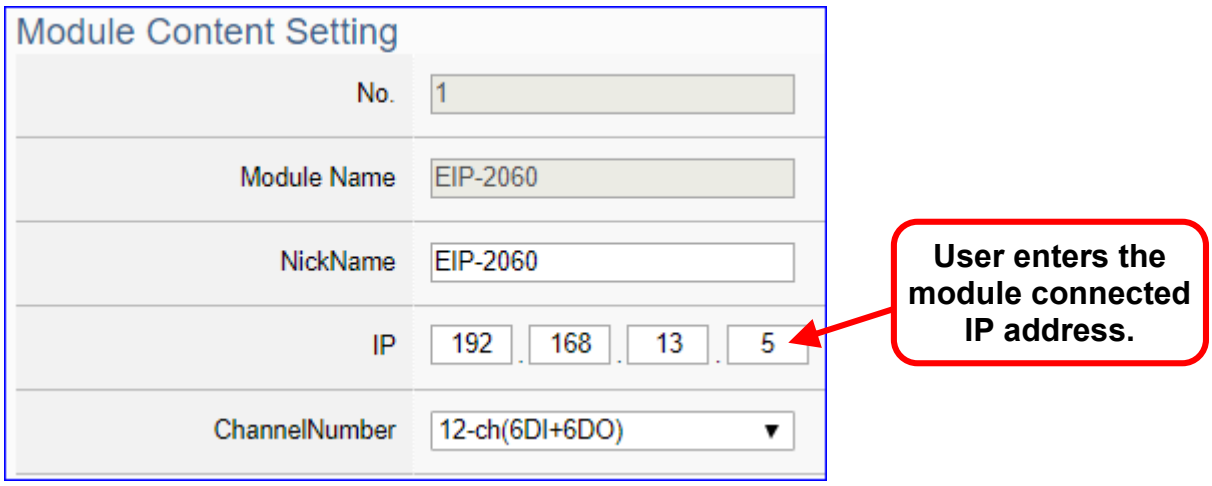
Add a module (No.: 1, Name: EIP-2060) as below.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

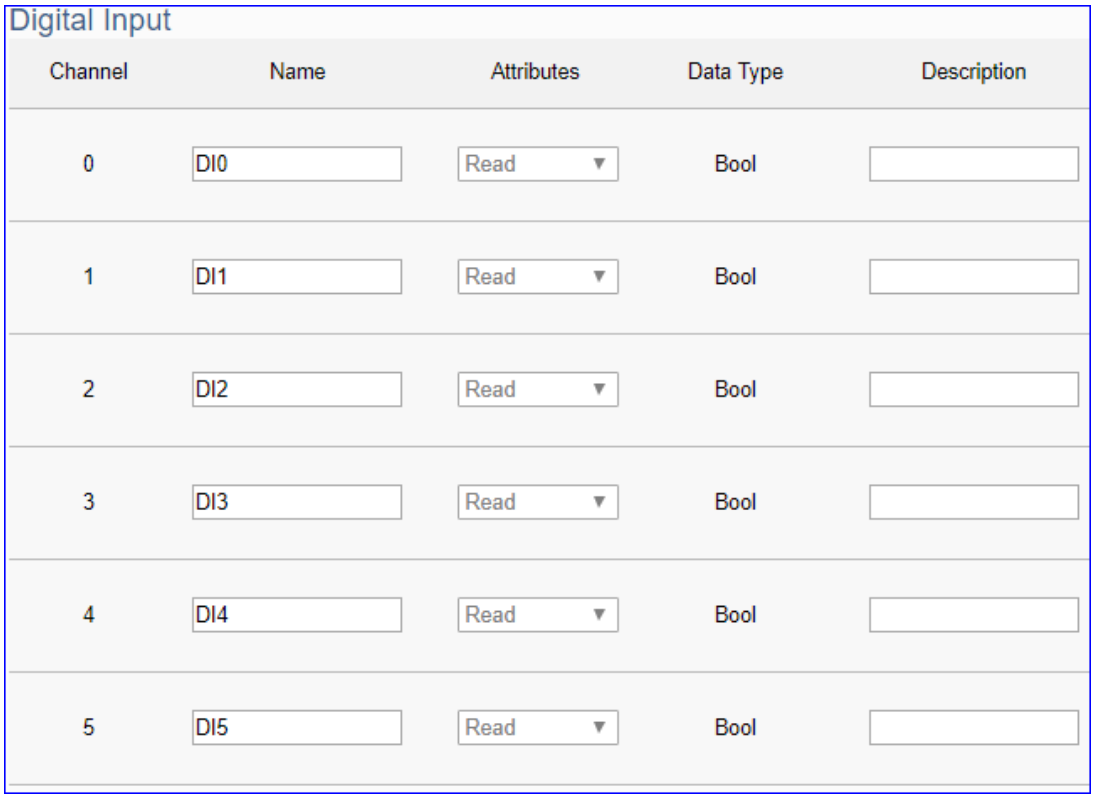
Click [Edit] button to enter the “Module Content Setting” page.

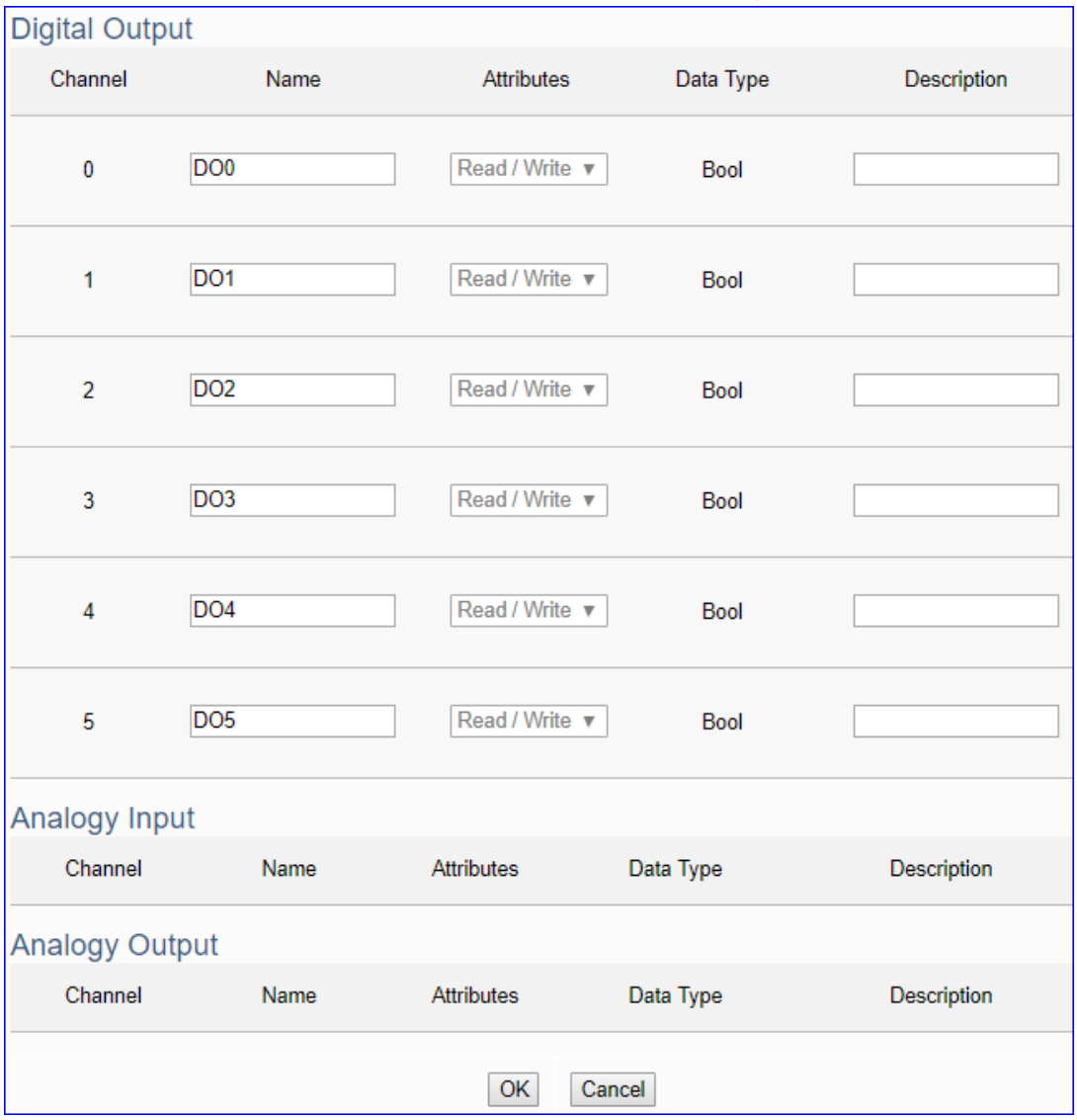
[**Module Content Setting**] page:



Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	The selected model number. (Not editable here)
NickName	User can give a nick name, default: selected model number
IP	Enter the IP address of the connected EIP module. This example: IP address of the EIP-2060 is 192.168.13.5
ChannelNumber	Select the number of the I/O channels.

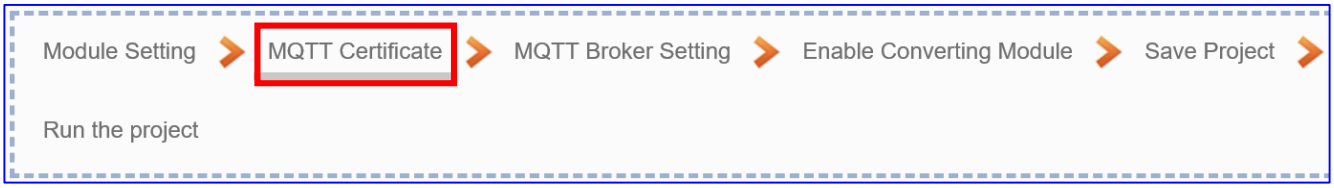
The system will auto-display the selected I/O table by the order of Digital Input / Digital Output / Analogy Input / Analogy Output. This example: EIP-2060 have 6 DI and 6 DO.



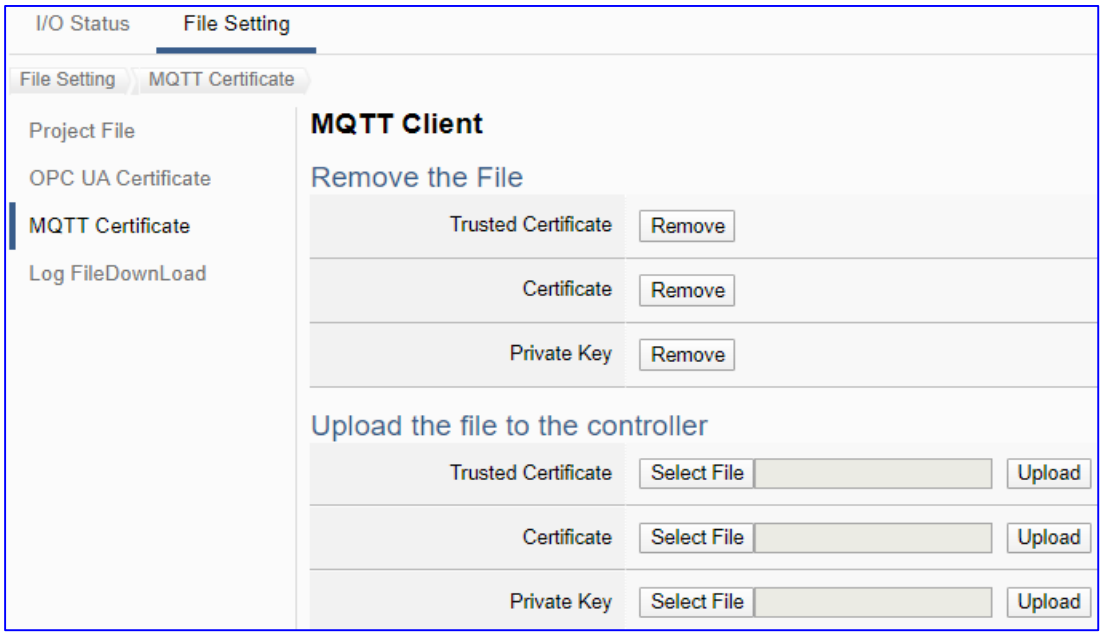


Digital Input / Digital Output / Analogy Input / Analogy Output	
Channel	Channel number will auto-display according to the model. (Not editable) Default: Number from 0.
Name	User can define the name. Default: DI#, DO#, AI#, AO# Available: number, English character, underline “_”, dash line "-", cannot be a space, slash "/", Chinese character, and other symbols.
Attributes	Display data attribute of the variable. (Not editable) Include Read, Read/Write…
Data Type	Display data type of the variable. Include: Bool, Short, Unsigned Short, Long, Unsigned Long, Float, Double, String
Description	For users set up the description for the channel.
OK / Cannel	Click [OK] to save and exit the page settings. Click [Cancer] to exit without saving.

Step 2. MQTT Certificate

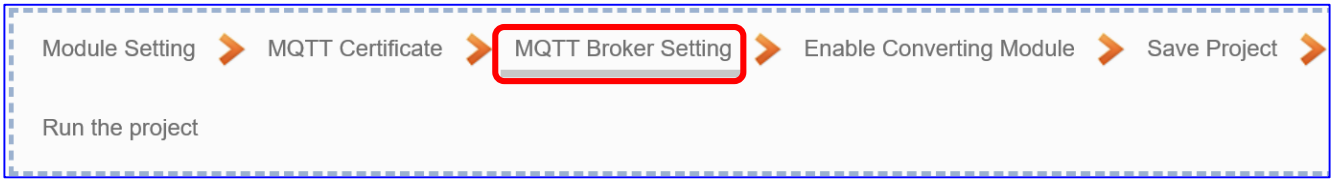


The **[MQTT Certificate]** is for setting up security communications to upload the **MQTT Trusted Certificate, Certificate and Private Key**. The users upload the file to the UA controller according to the type of obtained certificate. If you want to perform **Broker authentication**, you need to upload the **Trusted Certificate**. If you want to perform the **Broker/Client two-way authentication**, you need to upload the **Credential and Private Key additionally**. The user can skip this step if the user project does not use certificate transmission security.



File Setting > MQTT Certificate > Upload the file to the controller	
Trusted Certificate	**Select File**: select the MQTT Trusted Certificate file of the device. **Upload**: upload the MQTT Trusted Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message. Trusted Certificate Select File Certificate_192.168.255.10 Certificate type is wrong. Upload
Certificate	**Select File**: select the MQTT Certificate file of the device. **Upload**: upload the MQTT Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message.
Private Key	**Select File**: select the MQTT Private Key of the device. **Upload**: upload the MQTT Private Key file to the UA controller. • File format must be **PEM**. Extension name must be ".**key**". • If select a wrong file, the system will show an error message.

Step 3. MQTT Broker Setting

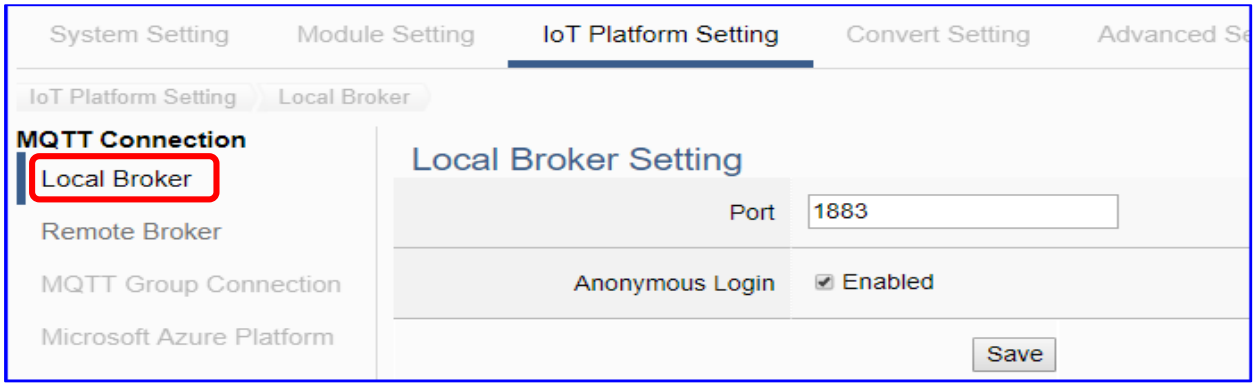


Click the next step, and enter the **Step 3 [MQTT Broker Setting]** of the UI setting. This page is for setting the IoT platform and the MQTT Broker connection, e.g. the local or remote broker, port, login information, etc.

We select the “EIP / MQTT” conversion at the beginning, so this step will auto enter the [**MQTT Connection > Local Broker**] page of IoT Platform Setting. The “Step Box” will prevent the user from selecting the wrong platform. User can choose the local or remote broker for the MQTT connection.

The example uses local Broker.

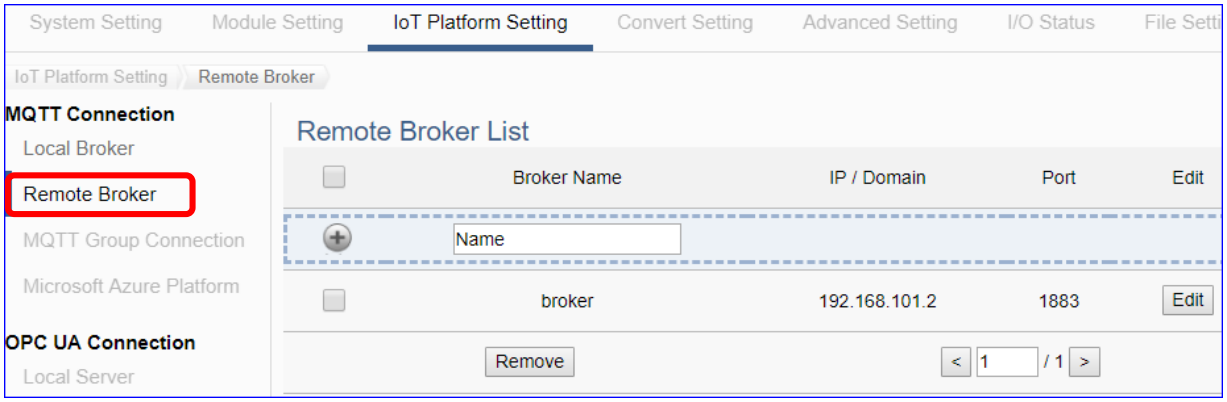
Local Broker



MQTT Connection > Local Broker Setting	
Port	The COM port of the Local MQTT Broker. System default: 1883
Anonymous Login	Check to allow anonymous login. Default: Check.
Save	Click to save the setting of this page.

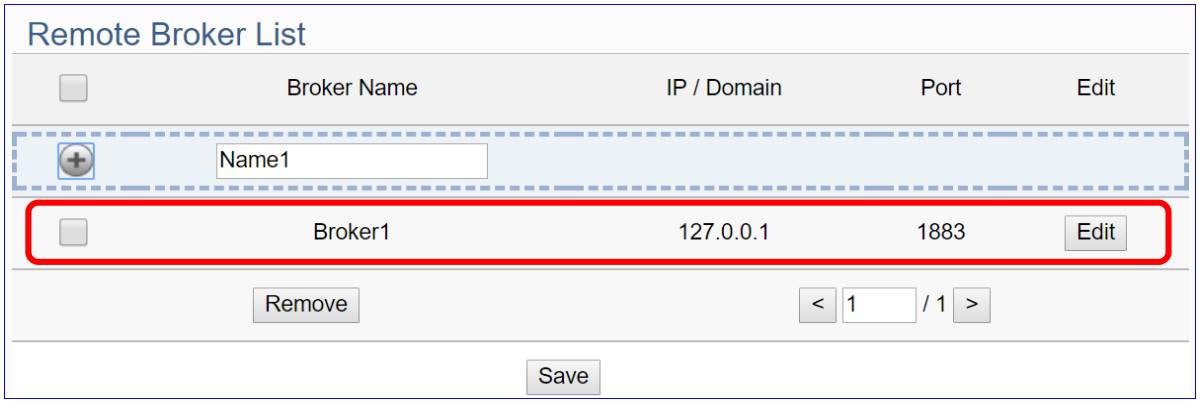
If user wants to use the remote Broker, please click the “Remote Broker” to set up.

Remote Broker:

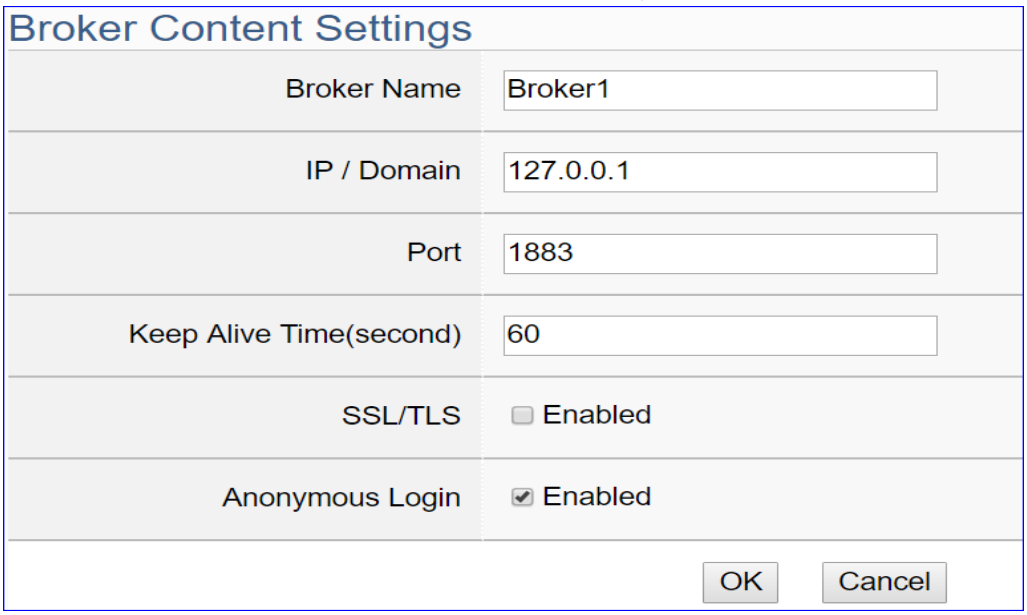


MQTT Connection > Remote Broker List	
Broker Name	The name of the remote MQTT Broker. User can define the name, e.g. Broker1. Default: Name.
	Click to add a new remote Broker.
Save	Click to save the settings of this page.

After creating a new Remote Broker (as below):

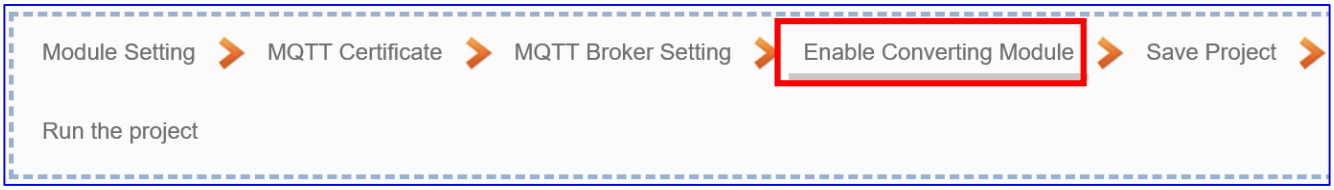


MQTT Connection > Remote Broker List	
Broker Name	The name of the remote MQTT Broker. User can define the name, e.g. Broker1. Default: Name.
IP / Domain	The IP address of the remote Broker. Default: 127.0.0.1
Port	The COM port of the remote Broker. Default: 1883
Edit / Remove	Click [Edit] can set the Broker. Click the left box and [remove] can delete the Broker.
Save	Click to save the settings of this item.



MQTT Connection > Remote Broker > Broker Content Settings	
Broker Name	The name of the remote MQTT Broker. (Editable)
IP / Domain	The IP address of the remote Broker. Default: 127.0.0.1
Port	The COM port of the remote Broker. Default: 1883
Keep Alive Time	The keep alive time. Default: 60 (second)
SSL/TLS	Check to enable the supporting of SSL/TLS security communication. Default: uncheck.
Anonymous Login	Check to allow anonymous login. Default: Check.
OK	Click to save the settings and exit.

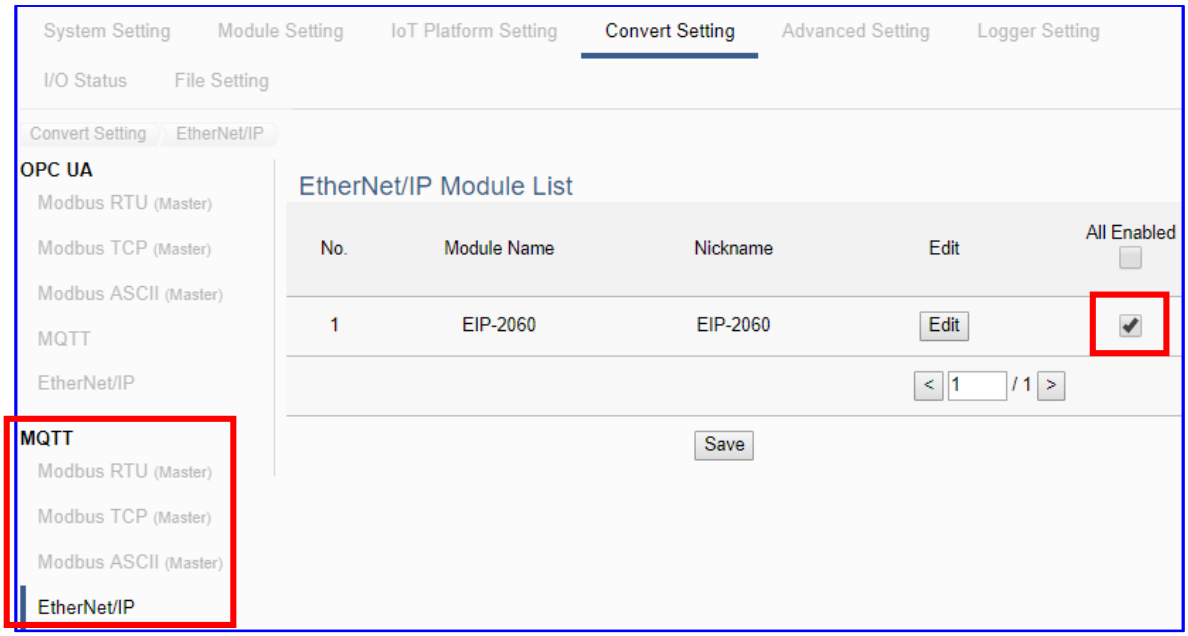
Step 4. Enable Converting Module



Click the next step, and enter the **Step 4 [Enable Converting Module]** UI setting
This step is for enabling the module for the EtherNet/IP / MQTT conversion.

We select the “EIP / MQTT” conversion at the beginning, so this step will auto enter the [**MQTT > EtherNet/IP**] page of Conversion setting. The “Step Box” will prevent the user from selecting the wrong platform.

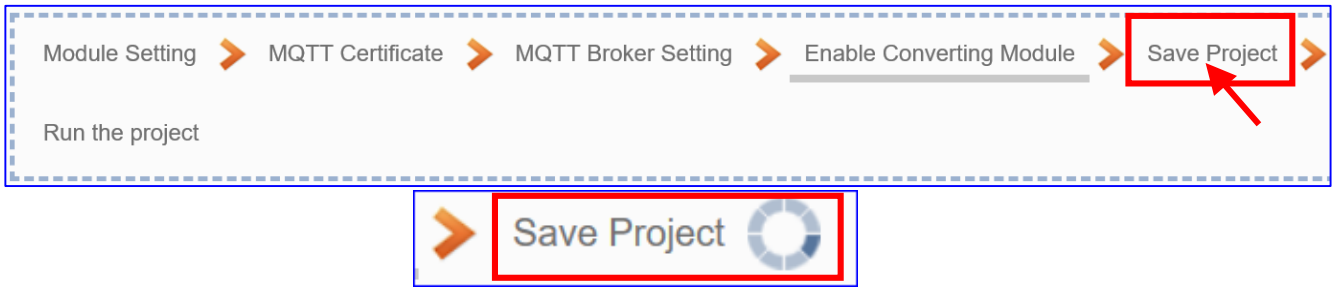
Please check the Enabled box of the module.



Convert Setting > MQTT > EtherNet/IP –EtherNet/IP Module List	
No.	The module number in the module list (Not editable here)
Module Name	The module user selected (Not editable here)
Nickname	The module name set in the module list (Not editable here)
All Enabled	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	Click to enter the “MQTT Client Setting” page to set up the Topic, QoS, Publish, Subscribe …
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

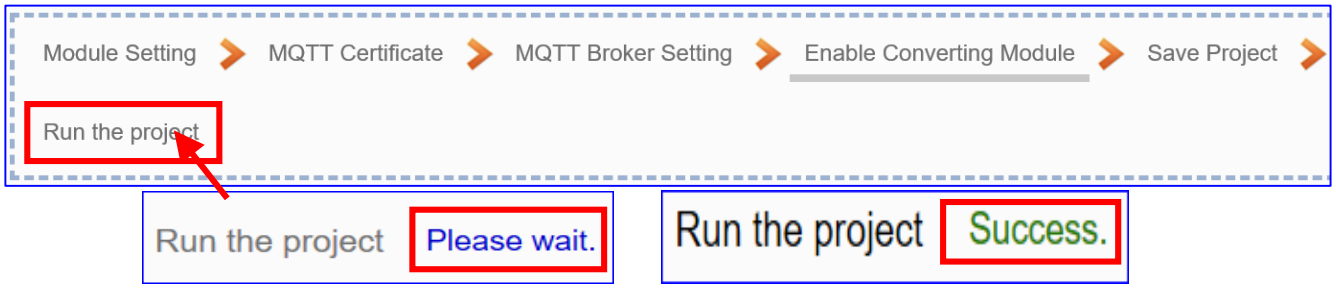
Step 5. Save Project

The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.



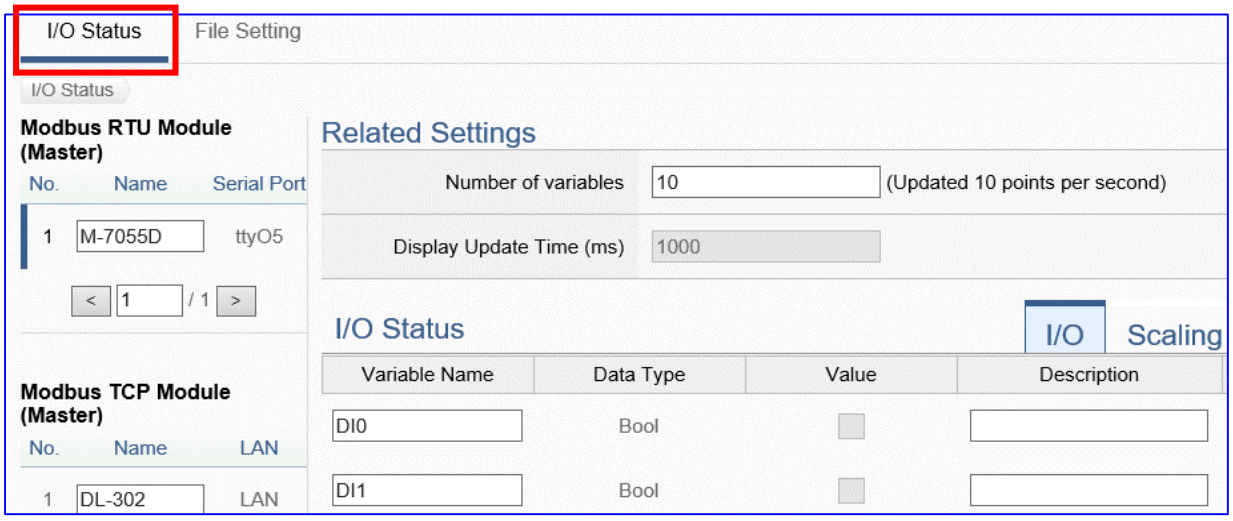
Step 6. Run the Project

The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.



When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

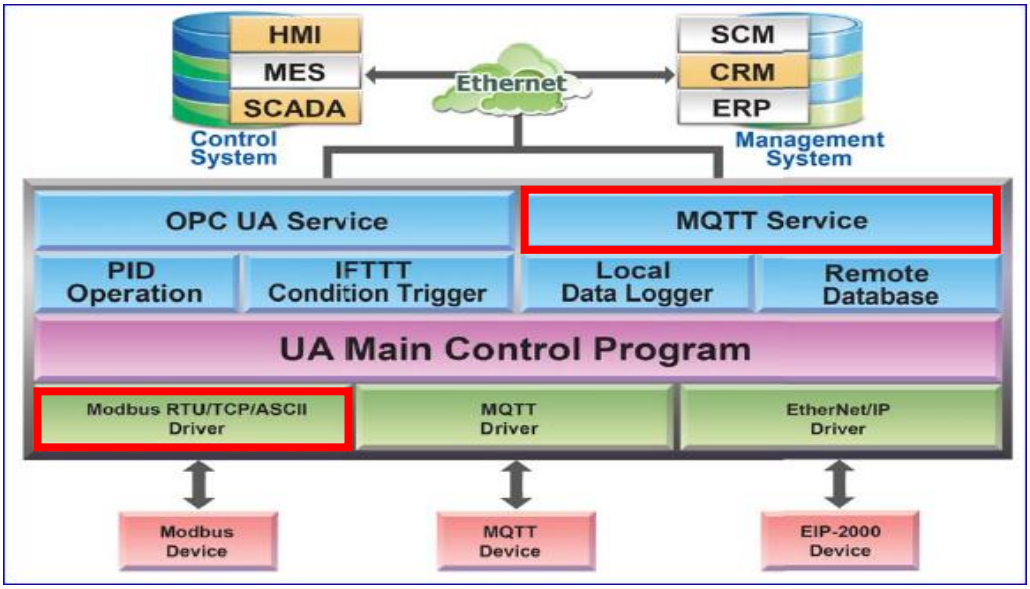
The new project now completes the setting, uploading and running in the UA controller and can process the conversion communication. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.



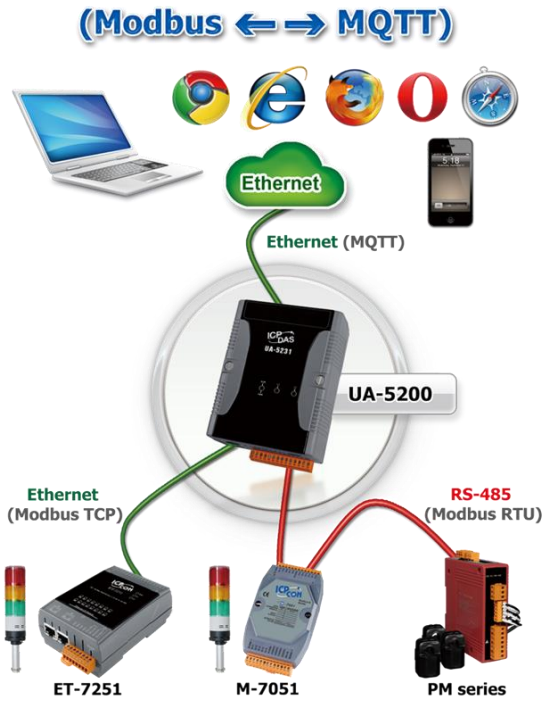
4.1.6. Function Wizard: Modbus / MQTT JSON Conversion

Modbus / MQTT JSON Conversion include the conversion of **MQTT** and **Modbus** RTU / TCP / ASCII three protocols. With the **MQTT Service** function, users can set the **MQTT client** to publish the message to the specified broker or subscribe the topic, and combine several messages that converted in JSON format into a group to read and write the multiple channels of the Modbus RTU devices that connected to the controller.

Modbus / MQTT JSON Function Diagram:

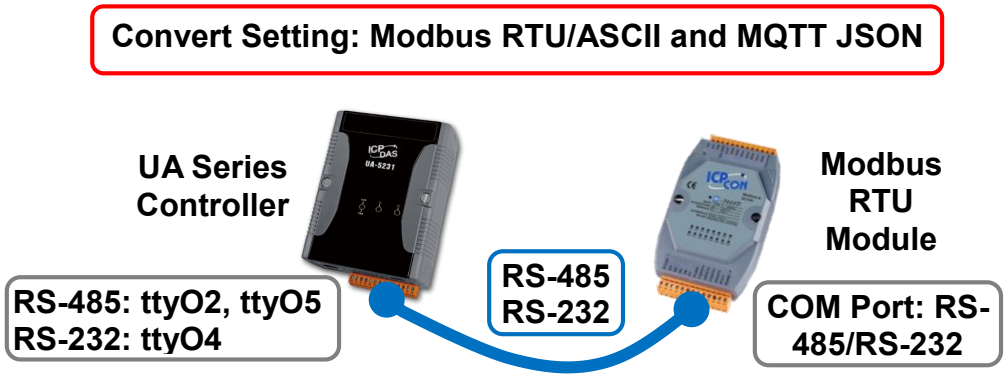


Application Solution:



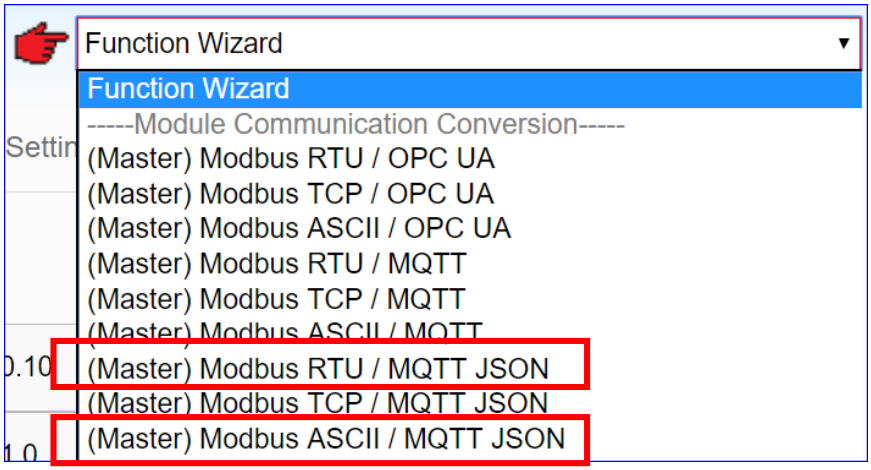
The settings of Modbus RTU/ASCII are the same. Here will introduce them together as a setting sample for Modbus / MQTT JSON conversion.

- **Modbus RTU / ASCII 與 MQTT JSON 轉換傳輸:**



Note: The hardware/network connection methods please see the Chapter 2.

When UA series controller connects the Modbus RTU or ASCII module (via RS-485 / RS-232, as the picture) and read/write the Modbus I/O via MQTT Broker, user can choose the item [**Modbus RTU / MQTT JSON**] or [**Modbus ASCII / MQTT JSON**] of the "Module Communication Conversion" in the Function Wizard.

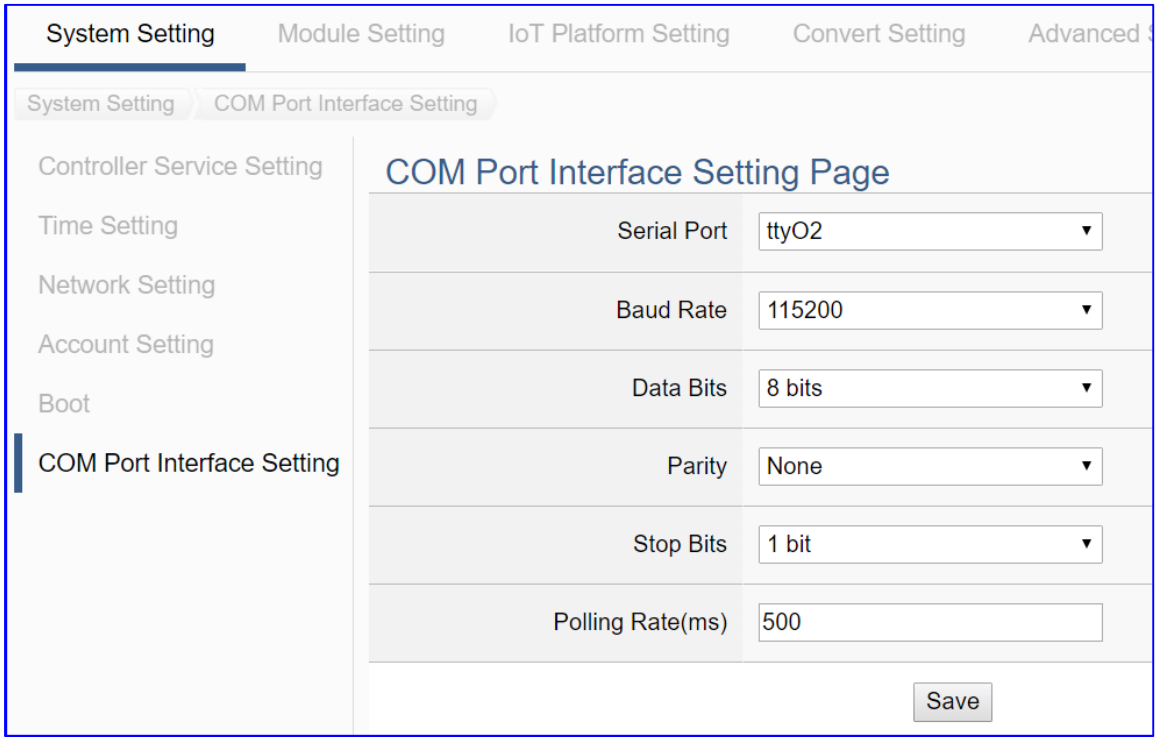


[Step Box]:

The Step Box of the [**Modbus RTU / MQTT JSON**] and [**Modbus ASCII / MQTT JSON**] has the same steps, here will introduce them together. When enabling the Step Box, it auto enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the "Step Box" step-by-step and then can complete the project quickly and rightly.

Step 1. Controller COM Port Setting

This page allows display and set the COM port interface of the controller for the RS-232/RS-485 serial communication. The user can find the default communication values of our I/O modules from the module CD, manual or I/O Module website.

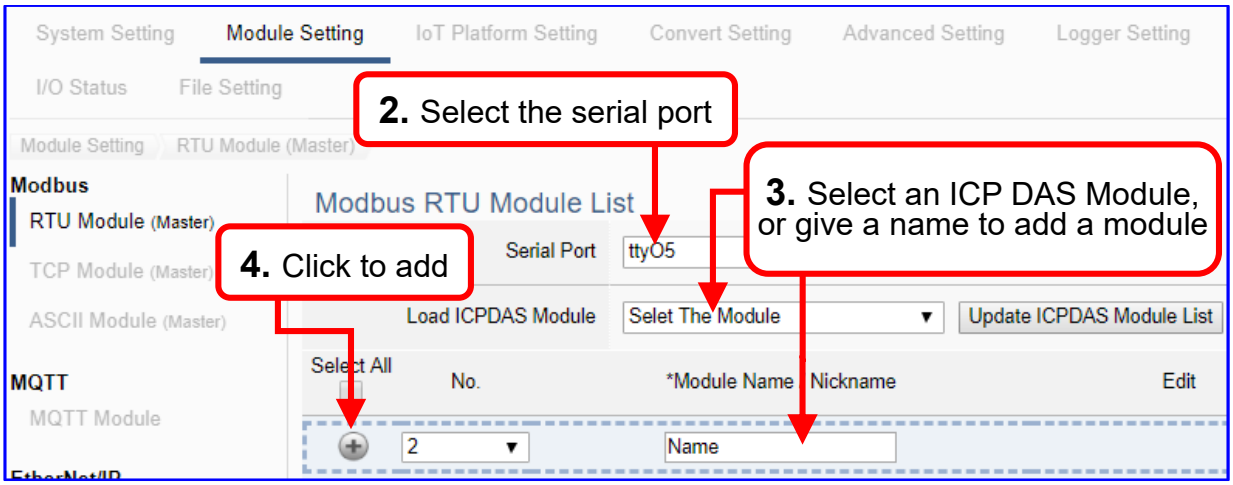


COM Port Interface Setting Page	
Serial Port	Choose the serial port of UA controller that links with the I/O module. ttyO2: RS-485 ; ttyO4: RS-232 ; ttyO5: RS-485
Baud Rate	Choose a baud rate to communicate with the module: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. The UA controller and the I/O module need have the same baud rate.
Data Bits	The number of bits used to represent one byte of data: 7 bits or 8 bits. Default: 8 Bits.
Parity	Choose one way for the parity checking. Options: None, Even, and Odd. Default: None.
Stop Bits	Choose the number of stop bit: 1 bit or 2 bits. Default: 1.
Polling Rate(ms)	Set a time interval for the command. Default: 500 ms
Save	Click [Save] button could save the settings of this page.

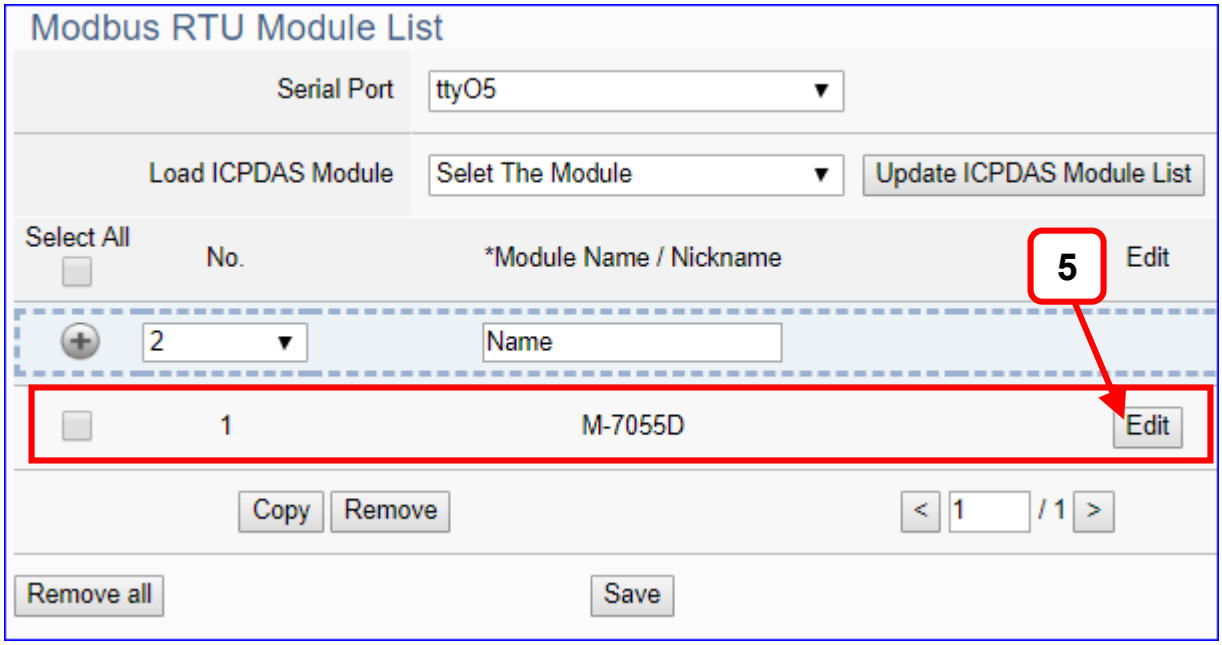
Step 2. Module Setting

Click the next step, and enter the **Step 2 [Module Setting]** of the UI setting.

This page is for setting the communication values with the connected modules. First, choose the connected port with the module. If using ICP DAS module, select the model to auto load and setup the module. If not, give a module name (Default: Name) and click [⊕] button to add a new module.

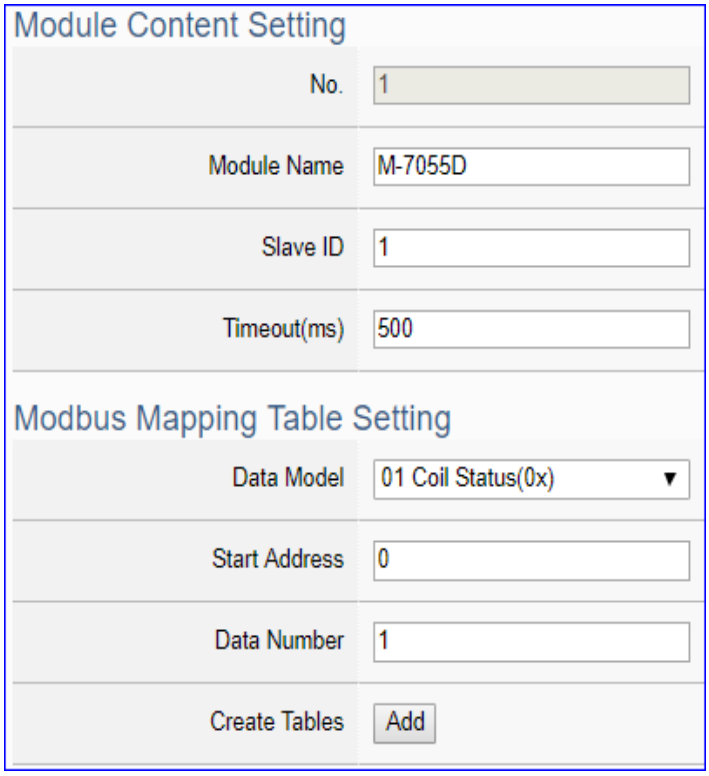


Add a module (No.: 1, Name: M-7055D) as below, and then click [Edit] button to enter the “Module Content Setting” page.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

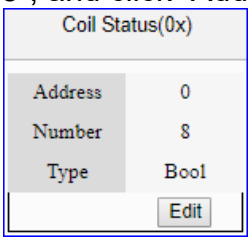
[**Module Content Setting**] page can set up the module and the Modbus address mapping table:

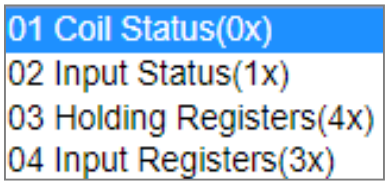


If select ICP DAS module, system will auto set up the Modbus Mapping Table, or user needs to check the module Modbus address or I/O number from the module user manual.

> **Modbus Mapping Table Setting:** Set module in the order of Data Model, Start Address and Data Number, then click "Add".

Ex: M-7055D has 8 Data Models of "01 Coil Status (0x)" (Mapping: DO), so select Model "01", Start Add. "0", Number "8", and click "Add".

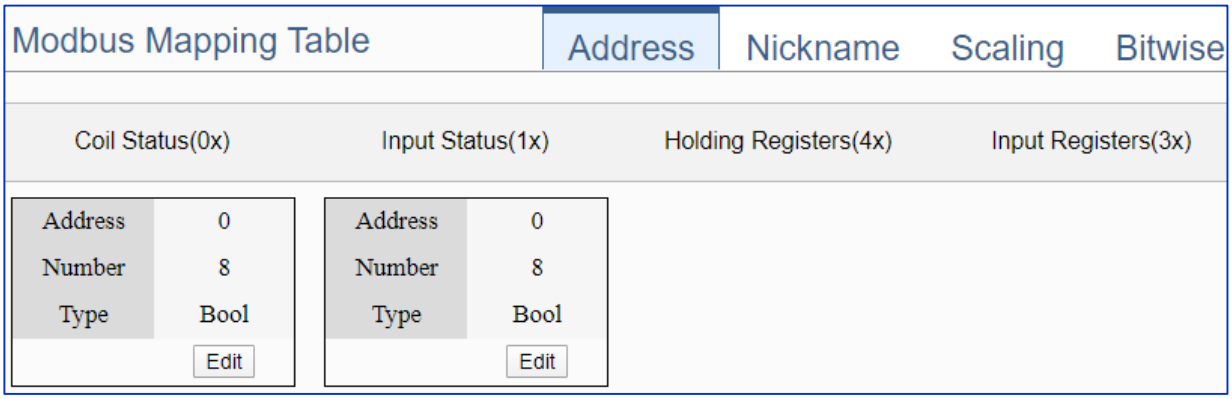


Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Slave ID	Set the module Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models "01" ~ "04" for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

The finished Modbus Mapping Table as below is in order of DO, DI, AO and AI.

Address:

Display and edit the Modbus Mapping Table.

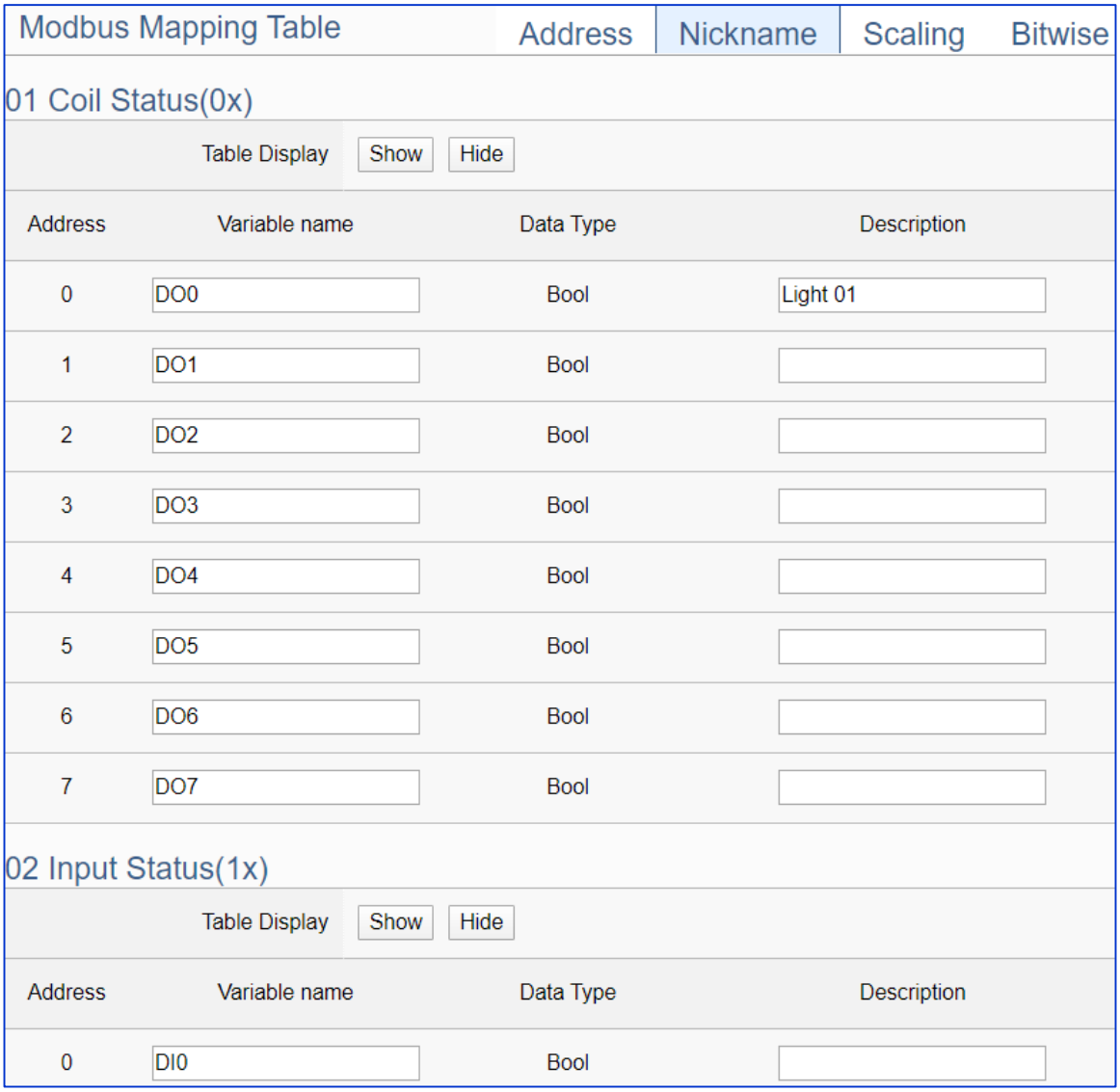


If user selects ICP DAS module, the system will auto set up the Modbus Mapping Table. If not, user needs to check the module Modbus address or I/O number from the module user manual.

Modbus Mapping Table – Address Setting	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname:

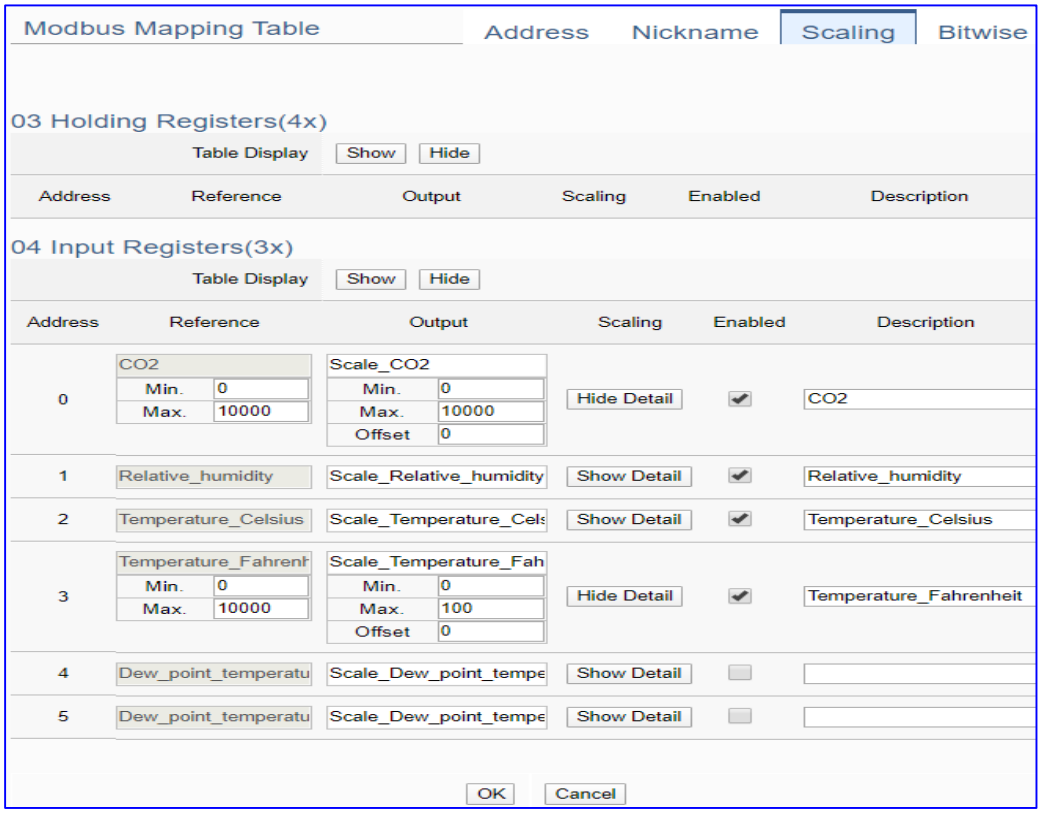
Setting the variable nickname and description.



Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Scaling:

Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated. The M-7055D has no AI/AO, so here uses the screen of DL-302 for an example.

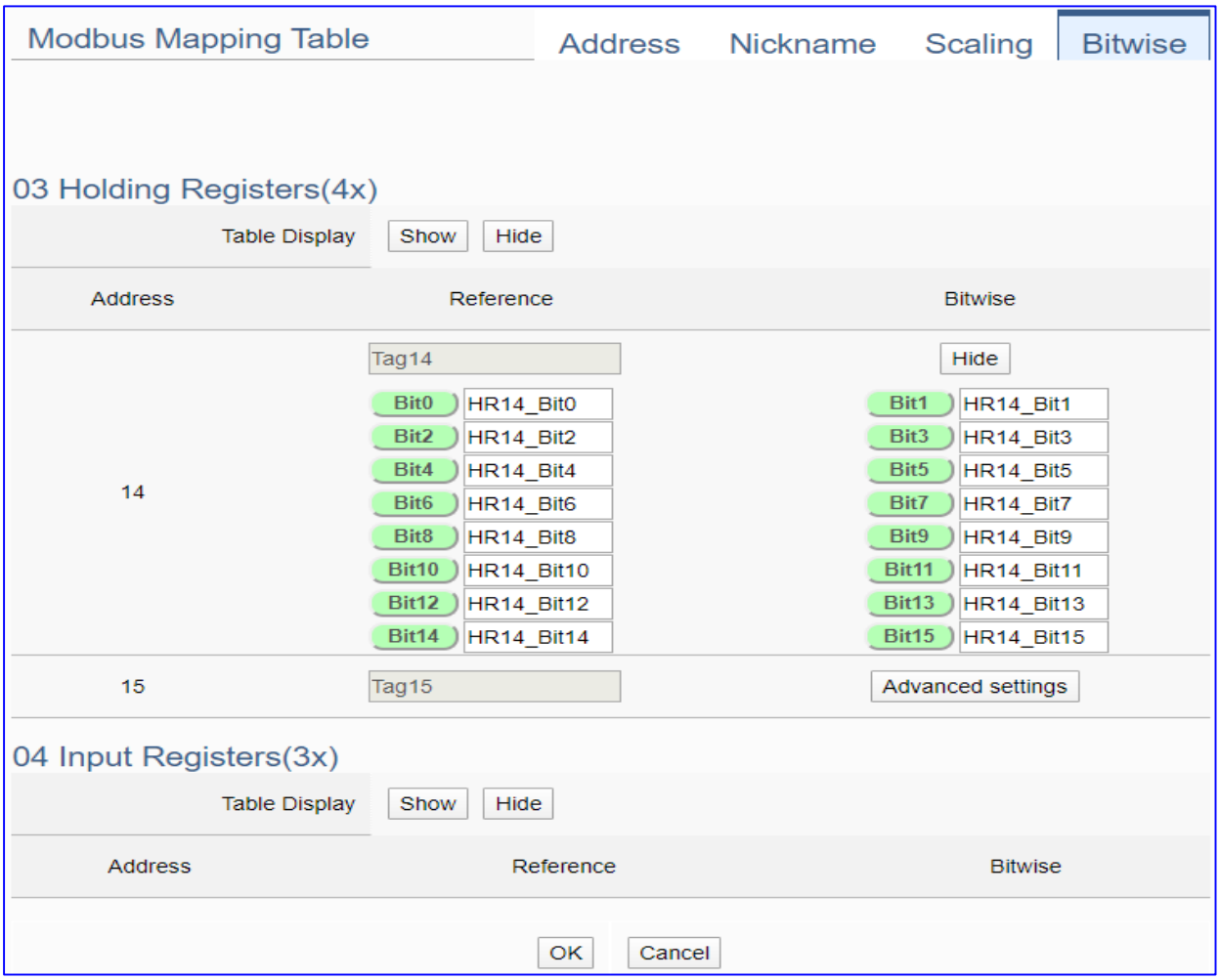


Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The I/O variable of the Modbus address.
Output	The scaling variable for scaling output. User can define the variable name.
Scaling	Click [Show Detail] to set up the Scaling parameters, and click [Hide Detail] to hide the parameters. Fill in the Min/Max range values of the source in the Reference column. Fill in the Min/Max range values after scaling in the Output column. If needs offset, fill the offset value in the Offset item. Remember check “Enable” box.
Enable	Check the box of the variable can enable just that variable for scaling.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Bitwise:

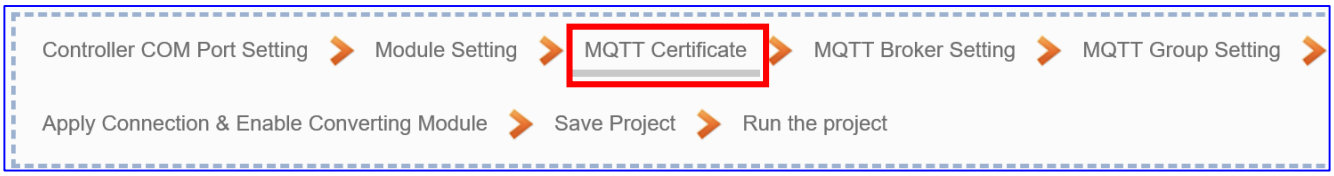
Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.

The M-7055D has no AI/AO, so here uses other module's setting screen as an example.

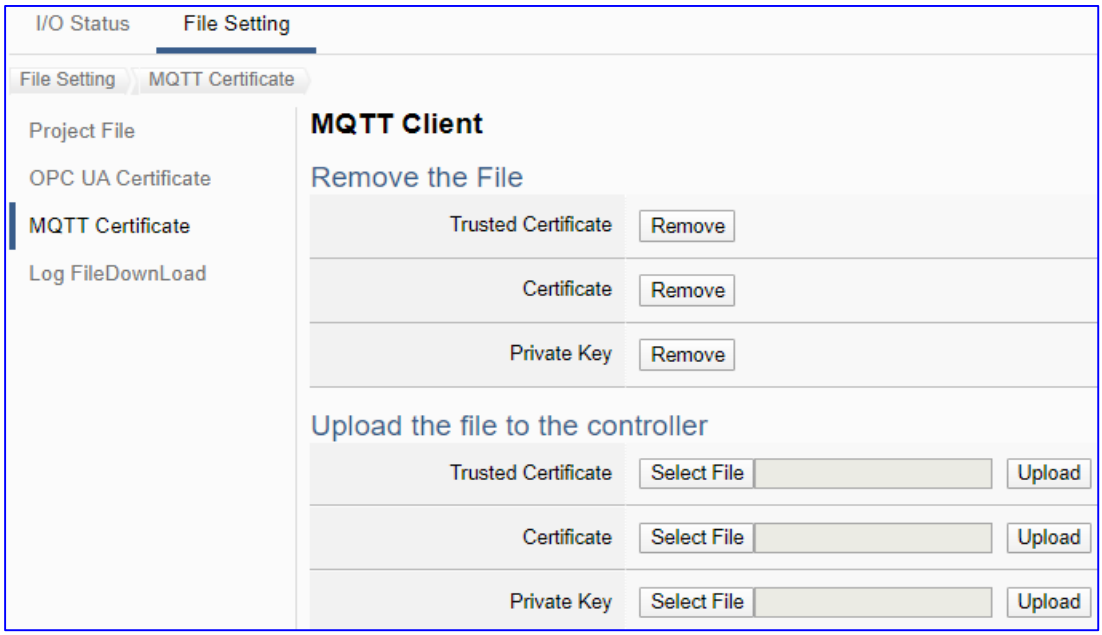


Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The Bit# variables of the Modbus address.
Bitwise	Set up the variables for Bitwise. Click [Advanced Settings] to set up the Bitwise parameters, and click [Hide] to hide the parameters. Fill in the variable names to the Bit# that wanted to do the Bitwise. The value in the fixed bit number will be assigned into the variable.
OK	Click to save this page settings and back to the module list page.

Step 3. MQTT Certificate



The **[MQTT Certificate]** is for setting up security communications to upload the **MQTT Trusted Certificate, Certificate and Private Key**. The users upload the file to the UA controller according to the type of obtained certificate. If you want to perform **Broker authentication**, you need to upload the **Trusted Certificate**. If you want to perform the **Broker/Client two-way authentication**, you need to upload the **Credential and Private Key additionally**. The user can skip this step if the user project does not use certificate transmission security.



File Setting > MQTT Certificate > Upload the file to the controller	
Trusted Certificate	**Select File**: select the MQTT Trusted Certificate file of the device. **Upload**: upload the MQTT Trusted Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message. Trusted Certificate Select File Certificate_192.168.255.10 Certificate type is wrong. Upload
Certificate	**Select File**: select the MQTT Certificate file of the device. **Upload**: upload the MQTT Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message.
Private Key	**Select File**: select the MQTT Private Key of the device. **Upload**: upload the MQTT Private Key file to the UA controller. • File format must be **PEM**. Extension name must be ".**key**". • If select a wrong file, the system will show an error message.

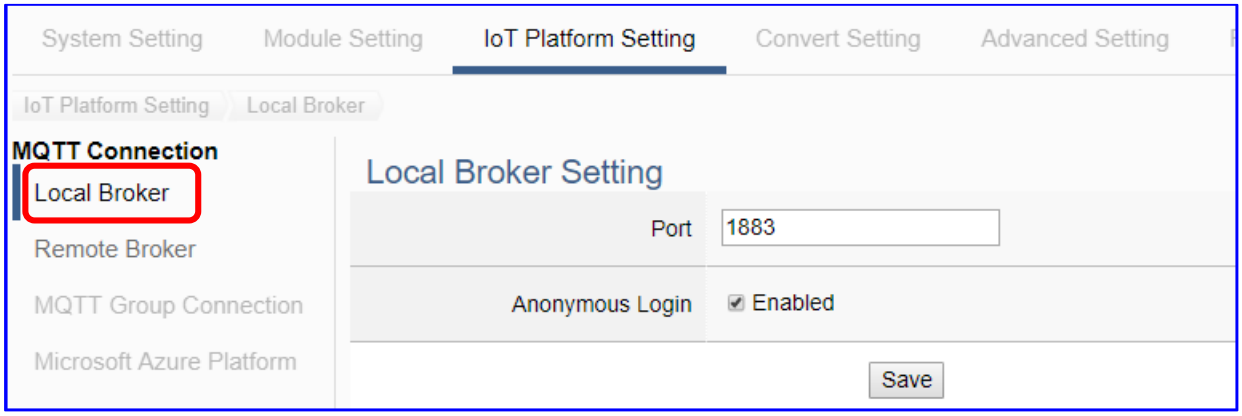
Step 4. MQTT Broker Setting

Click the next step, and enter the **Step 4 [MQTT Broker Setting]** of the UI setting. This page is for setting the IoT platform and the MQTT Broker connection, e.g. the local or remote broker, port, login information, etc.

We select the “Modbus RTU (or ASCII) / MQTT JSON” conversion at the beginning, so this step will auto enter the [**MQTT Connection > Local Broker**] page of IoT Platform Setting. The “Step Box” will prevent the user from selecting the wrong platform. User can choose the local or remote broker for the MQTT connection.

The example uses local Broker.

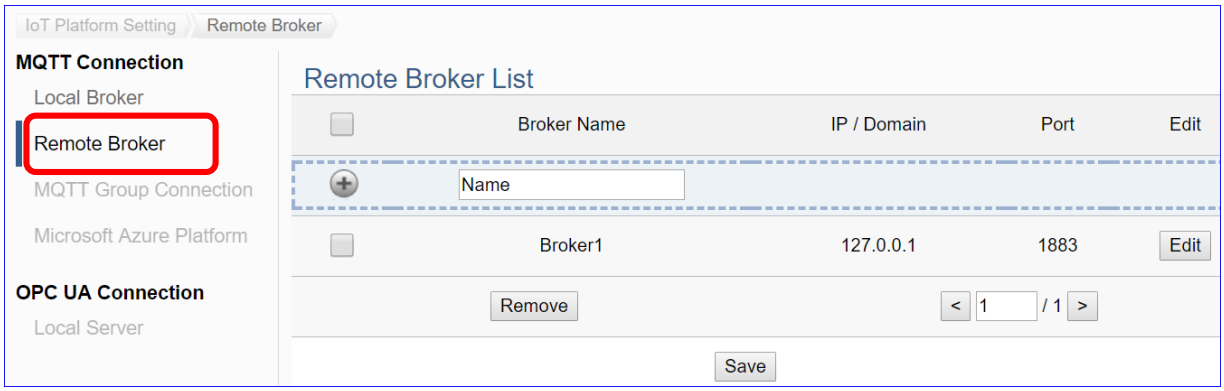
Local Broker



MQTT Connection > Local Broker Setting	
Port	The COM port of the Local MQTT Broker. System default: 1883
Anonymous Login	Check to allow anonymous login. Default: Check.
Save	Click to save the setting of this page.

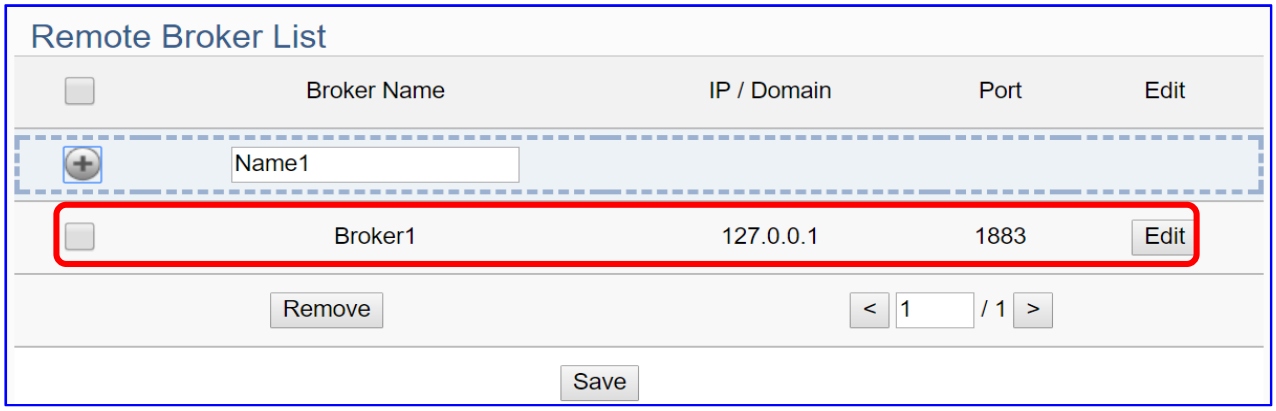
If users apply a remote Broker, the screen will as follow.

Remote Broker:

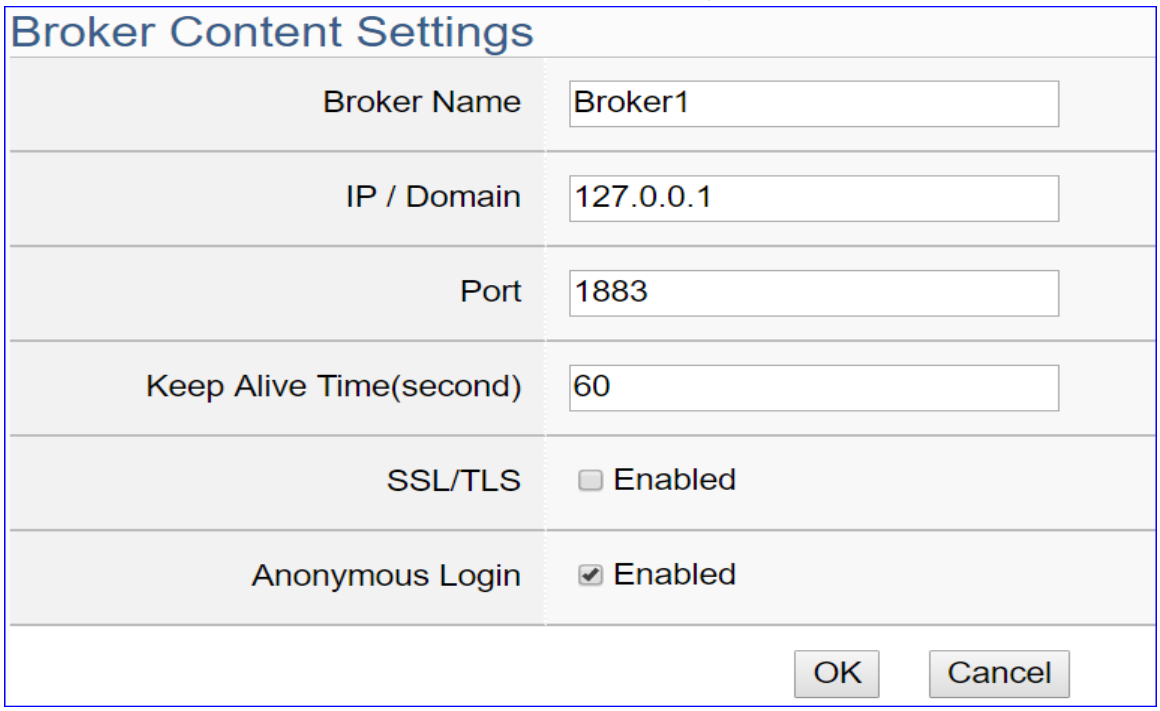


MQTT Connection > Remote Broker List	
Broker Name	The name of the remote MQTT Broker. User can define the name, e.g. Broker1. Default: Name.
	Click to add a new remote Broker.
Save	Click to save the settings of this page.

After creating a new Remote Broker (as below) :



MQTT Connection > Remote Broker List	
Broker Name	The name of the remote MQTT Broker. User can define the name, e.g. Broker1. Default: Name.
IP / Domain	The IP address of the remote Broker. Default: 127.0.0.1
Port	The COM port of the remote Broker. Default: 1883
Edit / Remove	Click [Edit] can set the Broker. Click the left box and [remove] can delete the Broker.
Save	Click to save the settings of this item.

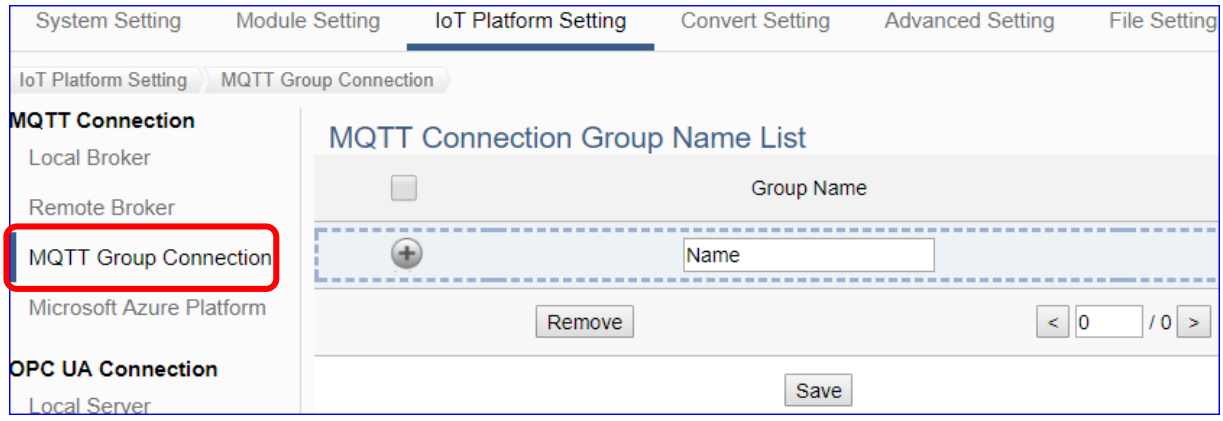


MQTT Connection > Remote Broker > Broker Content Settings	
Broker Name	The name of the remote MQTT Broker. (Editable)
IP / Domain	The IP address of the remote Broker. Default: 127.0.0.1
Port	The COM port of the remote Broker. Default: 1883
Keep Alive Time	The keep alive time. Default: 60 (second)
SSL/TLS	Check to enable the supporting of SSL/TLS security communication. Default: uncheck.
Anonymous Login	Check to allow anonymous login. Default: Check.
OK	Click to save the settings and exit.

Step 5. MQTT Group Setting

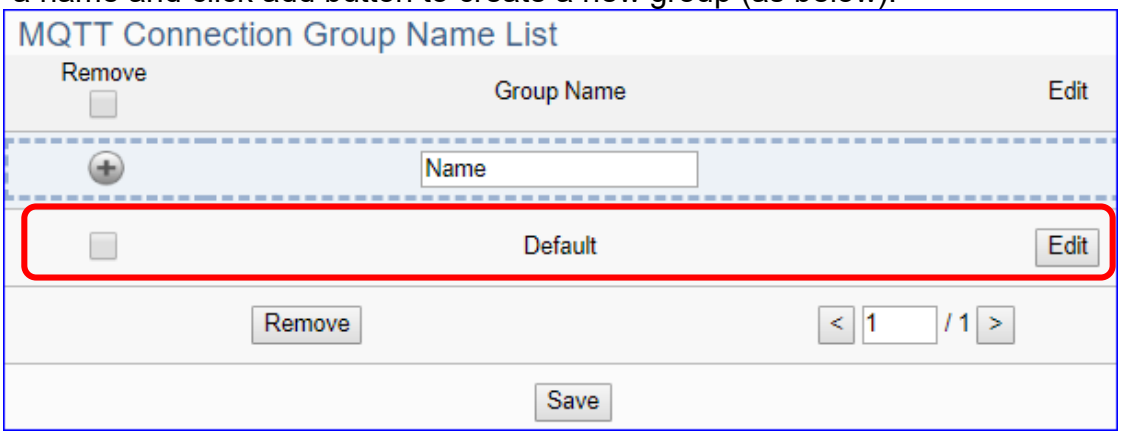
Click the next step, and enter the **Step 5 [MQTT Group Setting]** of the UI setting. This page is for setting the MQTT Group connection, setting with the MQTT JSON function in the Convert Transmission, It can make the I/O module messages in groups and then mapping to the user-defined publish and subscribe topics.

We select the “Modbus RTU (or ASCII) / MQTT JSON” conversion at the beginning, so this step will auto enter the [**MQTT Connection > MQTT Group Connection**] page of IoT Platform Setting. The “Step Box” will prevent from selecting the wrong platform.

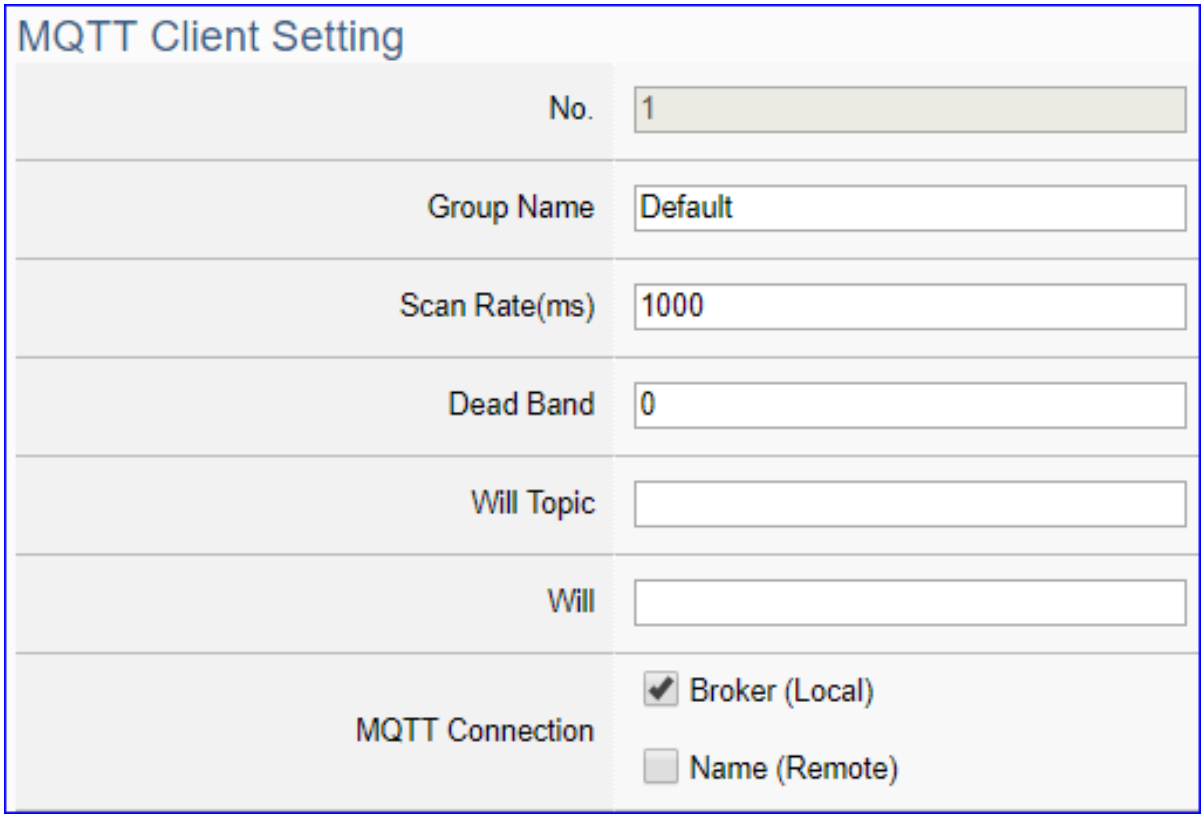


MQTT Connection > MQTT Group Connection > MQTT Connection Group Name List	
Group Name	MQTT group name, user can define, e.g. Group1. Default: Name.
⊕	Click add button to add a new MQTT Group.
< 1 / 1 >	The page number of the group list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the setting of this page.

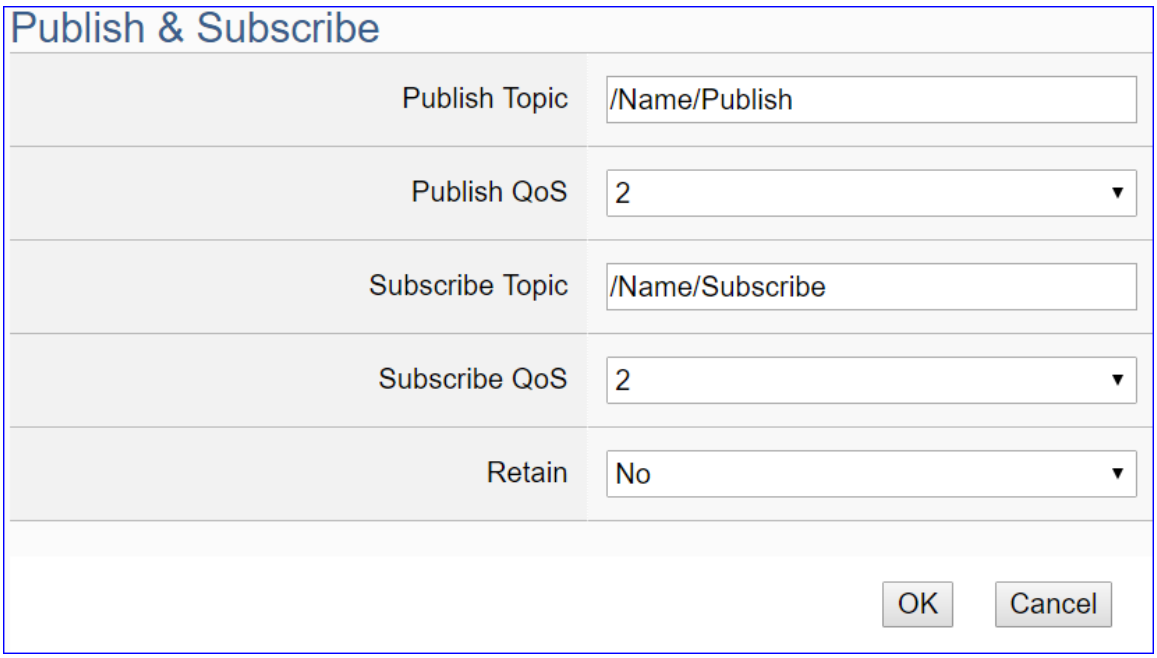
Enter a name and click add button to create a new group (as below).



Click [Edit] botton to enter the [MQTT Client Setting] page:



IoT Platform Setting > MQTT Group Connection > MQTT Client Setting	
No.	The group number in the MQTT Client list (Not editable here)
Group Name	Give a name, e.g. Group1. Default: Name.
Scan Rate(ms)	Set an update frequency for the data. Default: 1000 (Unit: ms)
Dead Bend	Give a dead bend value for updating a float signal. Default: 0
Will Topic	Enter the title of a disconnect notice. Default: Null.
Will	Enter a disconnect notice. Default: Null.
MQTT Connection	Check the Broker want to use Local Broker or Remote Broker.

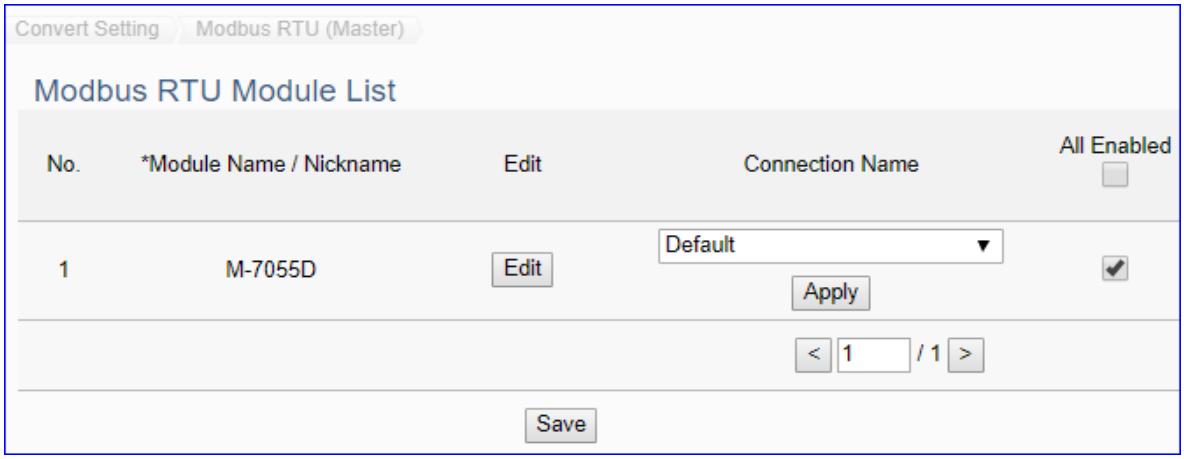


IoT Platform Setting > MQTT Group Connection > MQTT Client Setting – Publish & Subscribe	
Publish Topic	The topic of sending/publishing data message.
Publish Qos	The publish Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Subscribe Topic	The topic of receiving/subscribing data message.
Subscribe Qos	The subscribe Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Retain	Whether to store a broker message. Default: No
OK	Click to save the settings and exit.

Step 6. Apply Connection & Enable Converting Module

Click the next step, and enter the **Step 6 [Apply Connection & Enable Converting Module]** UI setting. This page is for applying the connection and enabling the converting module.

We select the “Modbus RTU (or ASCII) / MQTT JSON” conversion at the beginning, so this step will auto enter the [**Convert Setting > MQTT JSON - Modbus RTU (or ASCII) (Master)**] page of Convert setting. The “Step Box” will prevent the user from selecting the wrong platform.



Convert Setting > MQTT JSON > Modbus RTU (Master) Module List	
No.	The module number in the module list (Not editable here)
*Module Name	The module name set in the module list (Not editable here)
Connection Name	Select a group connection name, and then click [Apply].
All Enabled	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	If user wants to enable some I/O channels for conversion, click [Edit] of that module to enter the “Variable Tale” setting.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

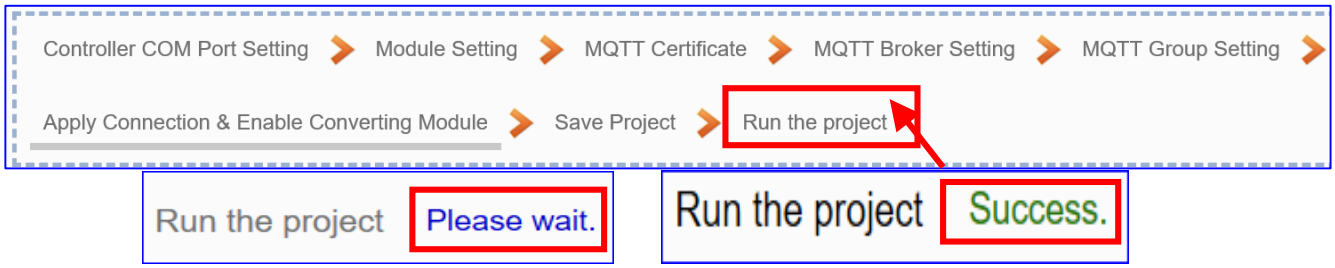
Check the enabled box of the module, select the connection name and click “Apply”.

Step 7. Save Project

The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.

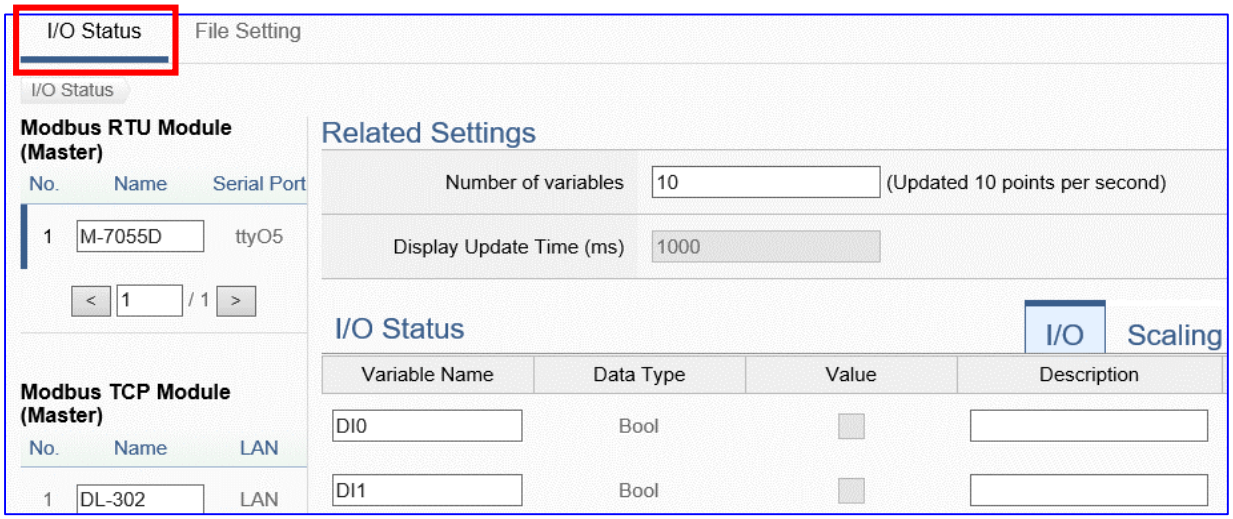
Step 8. Run the Project

The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.



When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

The new project now completes the setting, uploading and running in the UA controller and can process the conversion communication. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.

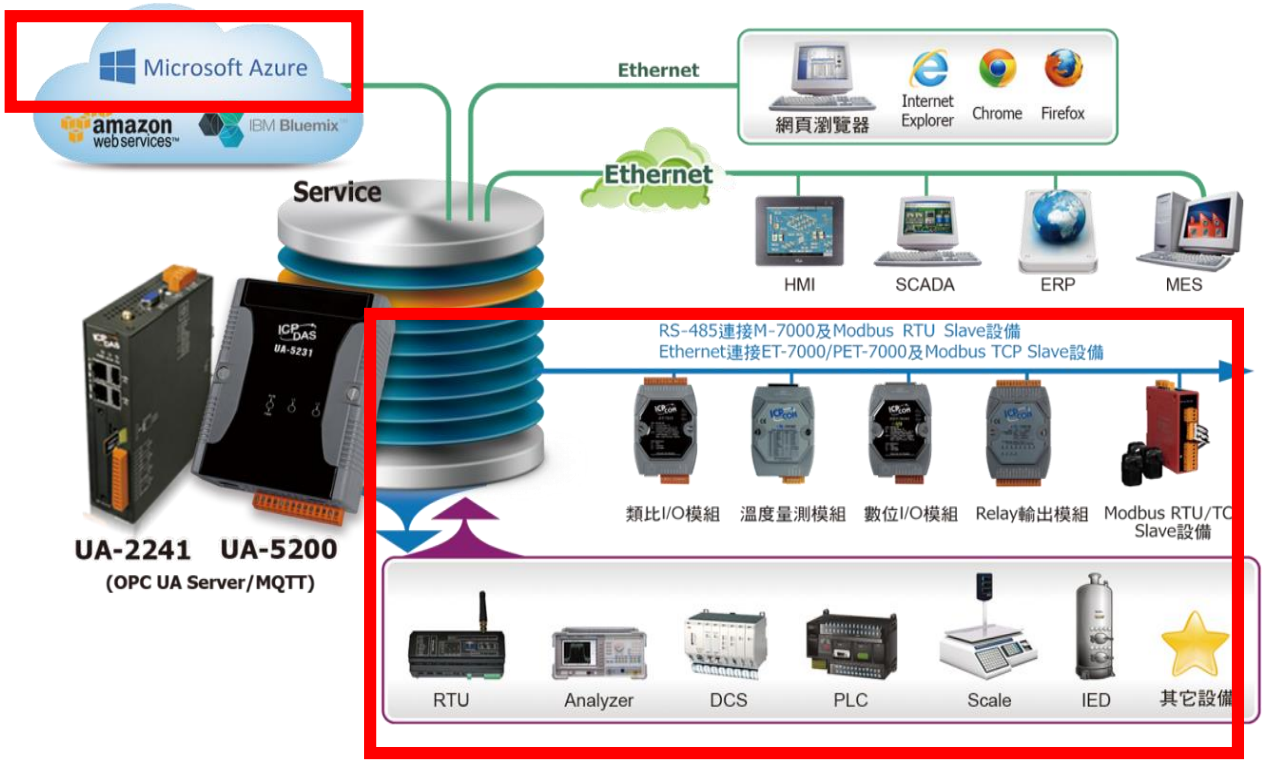


4.2. Module Connecting to Azure

"Module Connecting to Azure" is a common way to integrate IoT devices into the cloud. Many of the applications use MQTT connection to the cloud for the setting is fast and easy. The UA series also provides the MQTT function for module to connect to the Azure platform and allows users to publish messages to Microsoft Azure and receive messages from Microsoft Azure. This section will introduce the setting steps and the function parameters of the “Module Connecting to Azure”. There are 3 items in this category for 3 protocol types. Here will introduce the Modbus TCP / Azure for this category.

-----Module Connecting to Azure-----
(Master) Modbus RTU / Azure
(Master) Modbus TCP / Azure
(Master) Modbus ASCII / Azure

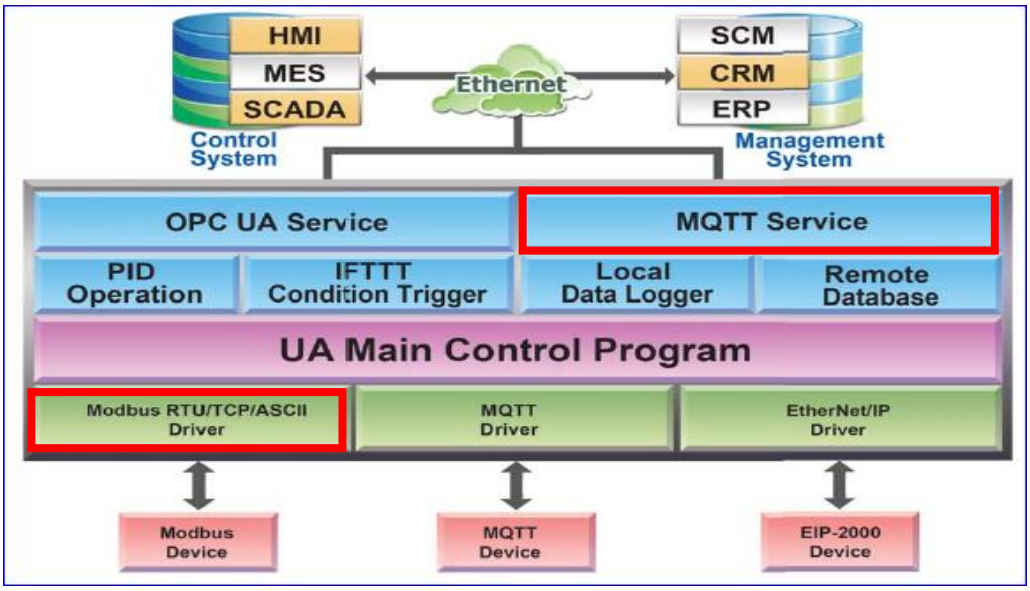
Modbus RTU / Azure	Allow the Modbus RTU connecting to the Microsoft Azure platform and can publish messages to Microsoft Azure and receive messages from Microsoft Azure.
Modbus TCP / Azure	Allow the Modbus RTU connecting to the Microsoft Azure platform and can publish messages to Microsoft Azure and receive messages from Microsoft Azure. **(Section 4.2.1)**
Modbus ASCII / Azure	Allow the Modbus RTU connecting to the Microsoft Azure platform and can publish messages to Microsoft Azure and receive messages from Microsoft Azure.



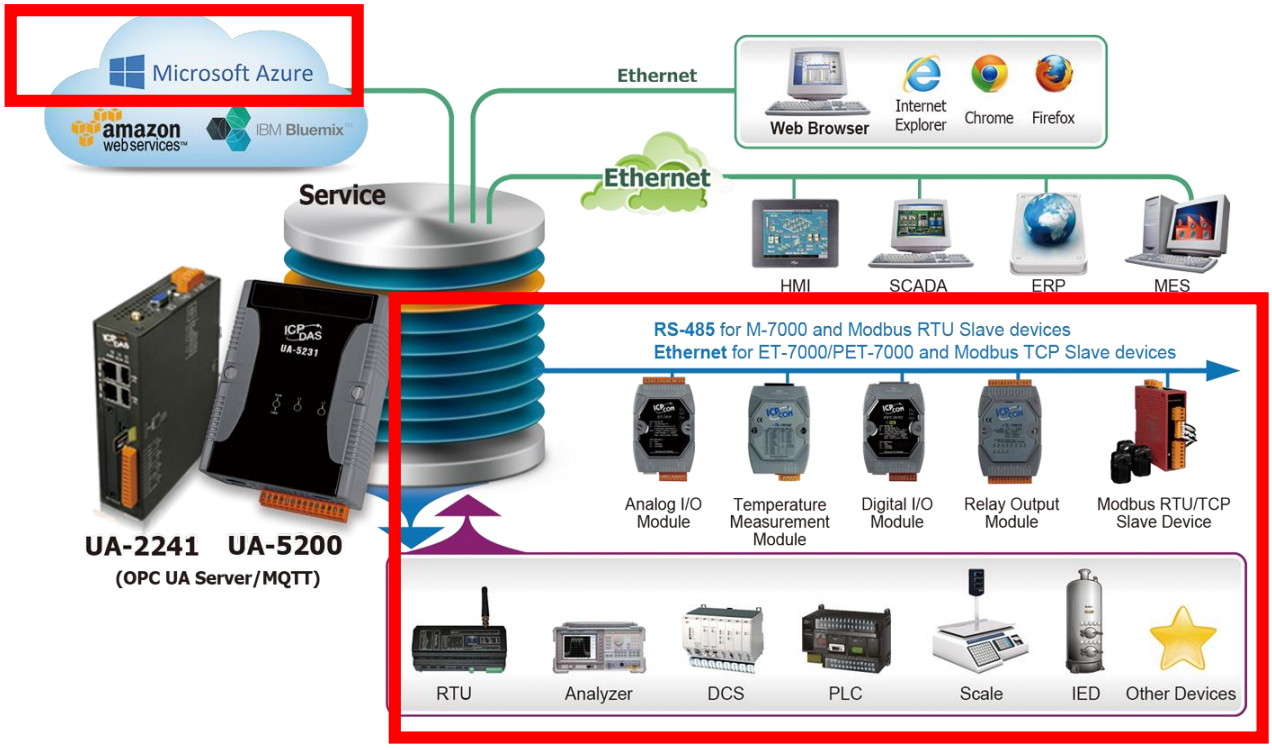
4.2.1. Function Wizard: Modbus TCP / Azure Connecting

The UA series provides the MQTT function for module to connect to the Microsoft Azure platform and allows users to publish messages to Azure and receive messages from Azure. Before setting the Azure connection, user needs to apply user **SAS Token** and **Root CA** from Microsoft Azure. This section will introduce the setting steps and the function parameters. There are 3 items about Azure function in the “Function Wizard”. Here will introduce the Modbus TCP / Azure.

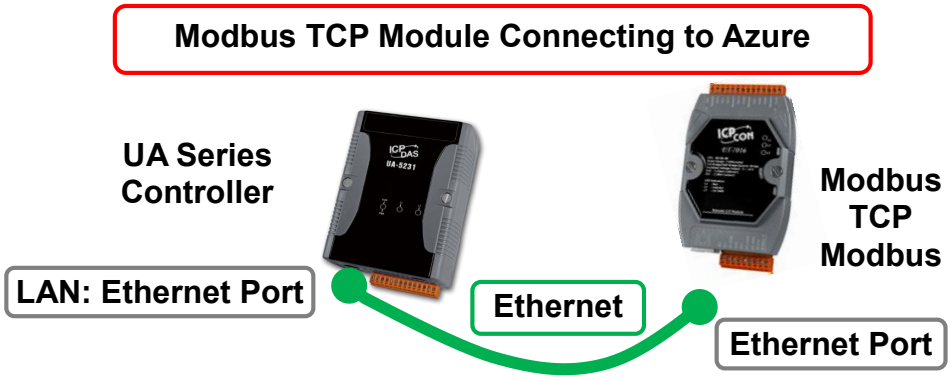
Function Diagram for Modbus TCP / Azure:



Application Solution:

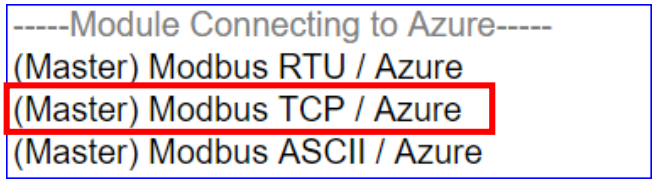


- **Modbus TCP Module Connecting to Azure**



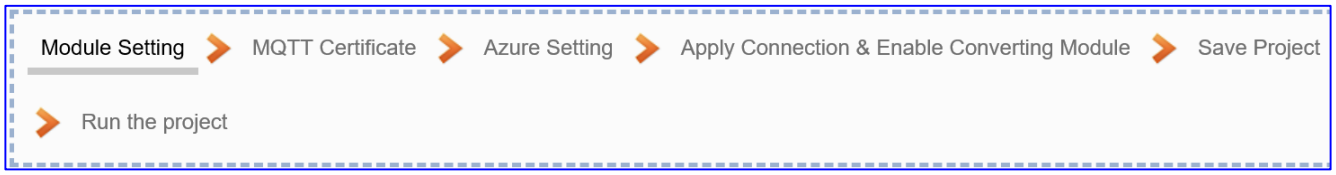
Note: The hardware/network connection methods please see the Chapter 2 .

When UA series controller connects the Modbus TCP (via Ethernet, as the picture), read/write the Modbus I/O via MQTT Broker and transfer the data to the Microsoft Azure platform, user can choose the item [**Modbus TCP / Azure**] of the "Module Connecting to Azure" in the Function Wizard.

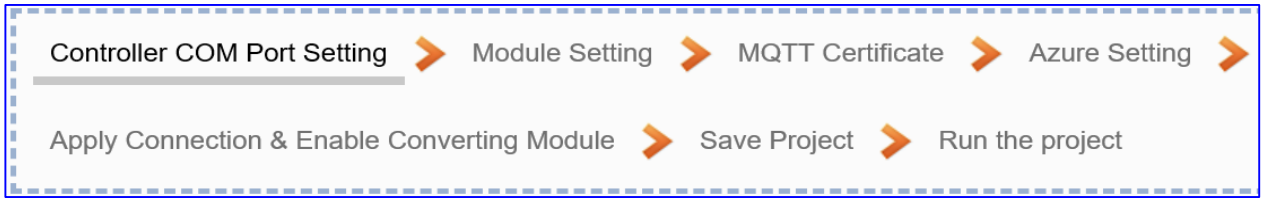


[Step Box]:

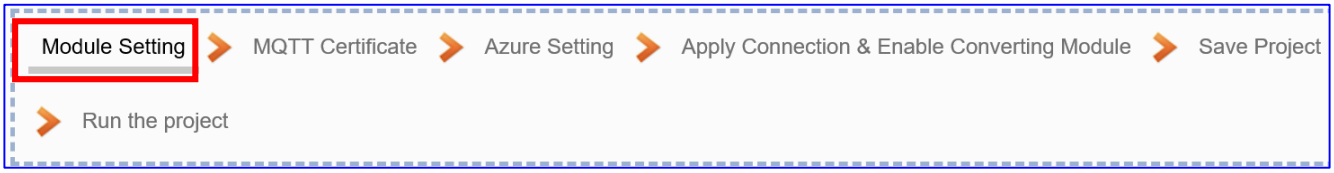
The Step Box of the [**Modbus TCP / Azure**] has the steps as below. When enabling the Step Box, it auto enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the "Step Box" step-by-step and then can complete the project quickly and rightly.



In addition, the Step Box of [**Modbus RTU / Azure**] or [**Modbus ASCII / Azure**] has the steps. The different step is "Controller COM Port Setting" that can refer to Section 4.1.1 or 4.1.3.

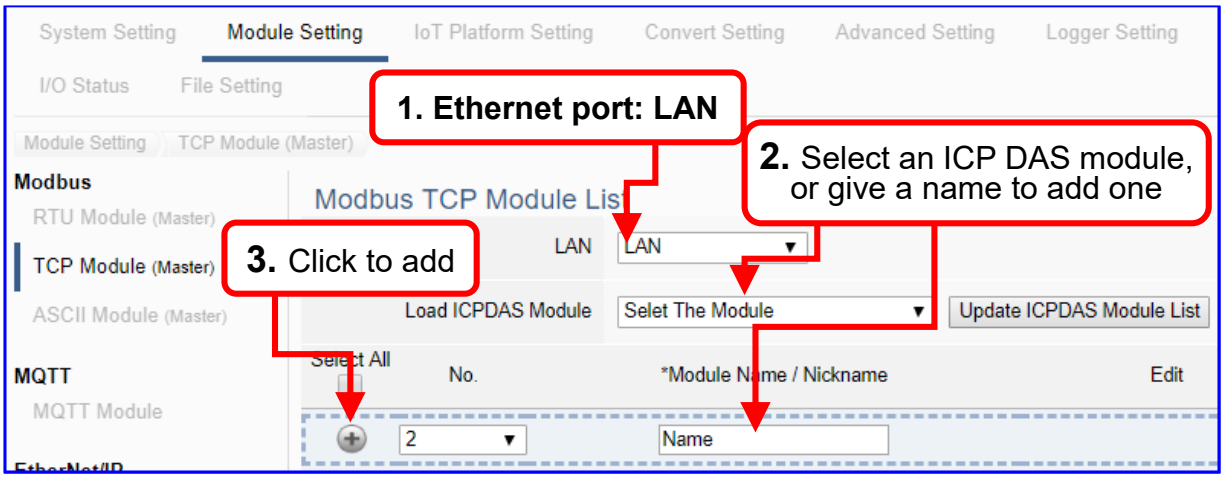


Step 1. Module Setting

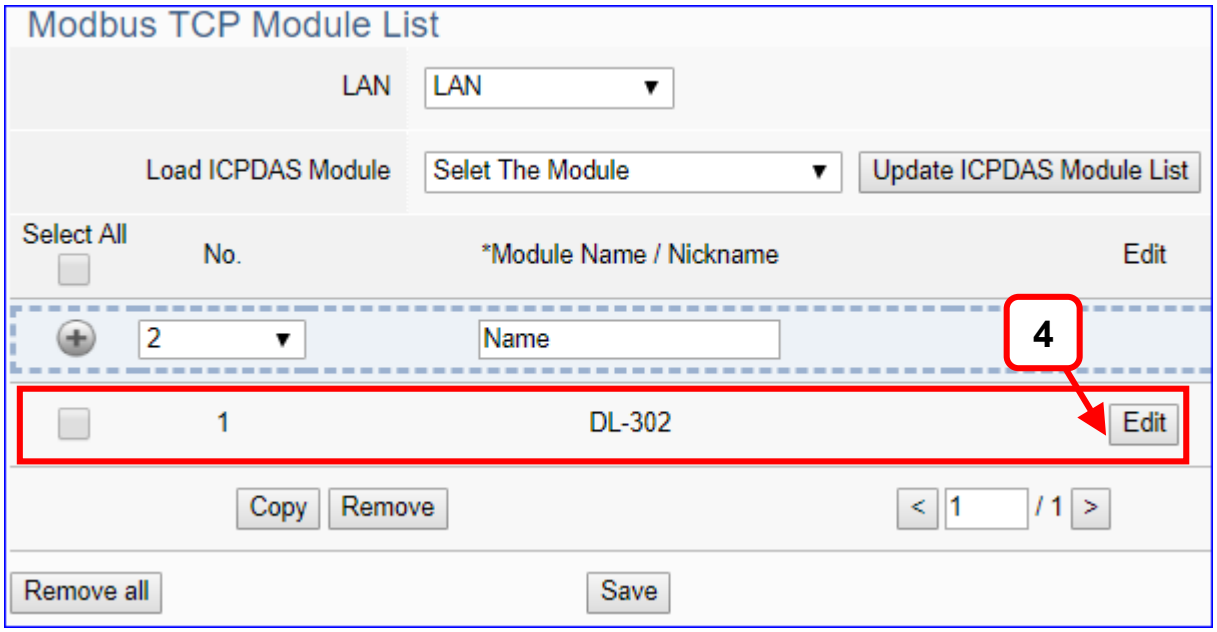


This page is for setting the communication values of the connected modules.

The Ethernet port is LAN for connecting with the TCP module, and each module can give a name (Default name: Name). Click [⊕] button could add a new module, and then click [Edit] button to configure the module content and the Modbus mapping table.



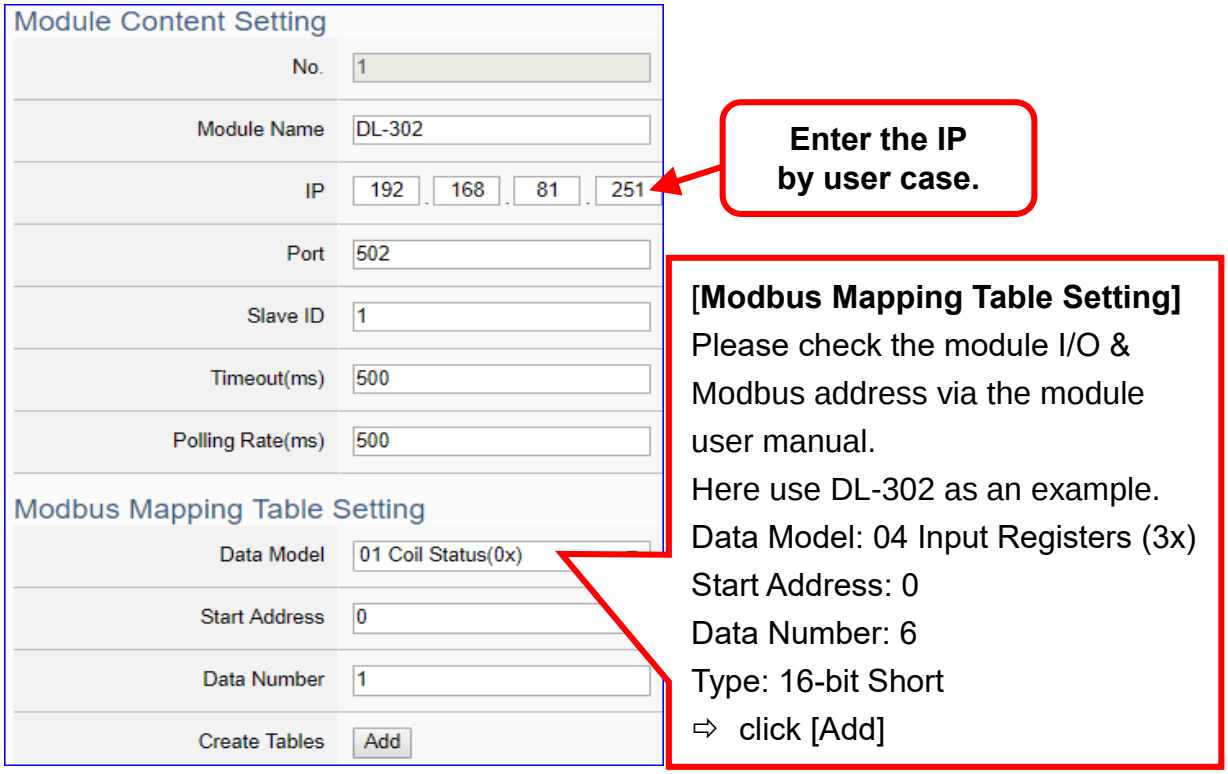
Add a module (No.: 1, Name: DL-302) as below, and then click [Edit] button to enter the “Module Content Setting” page.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

Click [Edit] can enter the [**Module Content Setting**] page to set up the module and the Modbus address mapping table.

[**Module Content Setting**] page:



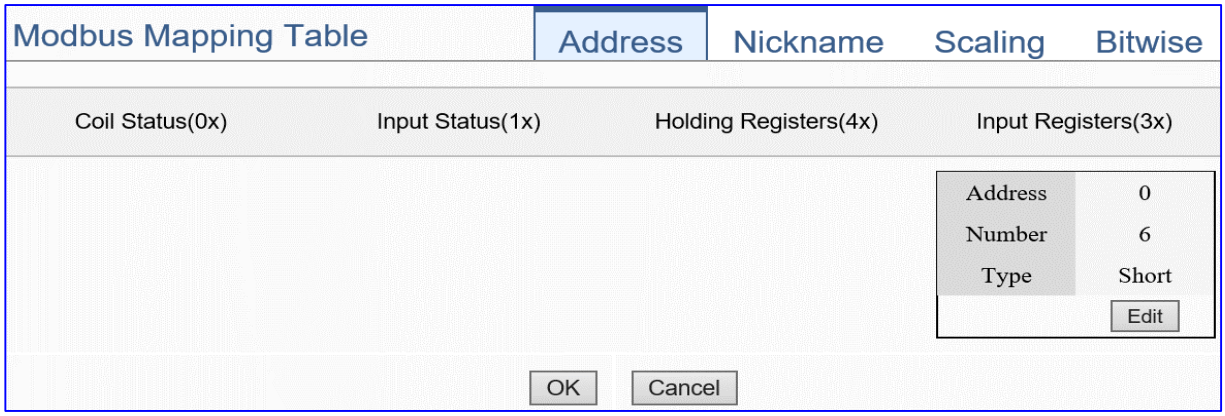
Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
IP	The IP address of the connected module. Default: 0.0.0.0
Port	The port number for Modbus TCP. Default: 502
Slave ID	Set the Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Polling Rate	Set a time interval for the command. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models “01” ~ “04” for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

If user selects ICP DAS module, the system will auto set up the Modbus Mapping Table. If not, user needs to check the module Modbus address or I/O number from the module user manual.

The finished Modbus Mapping Table as below is in order of DO, DI, AO and AI.

Address:

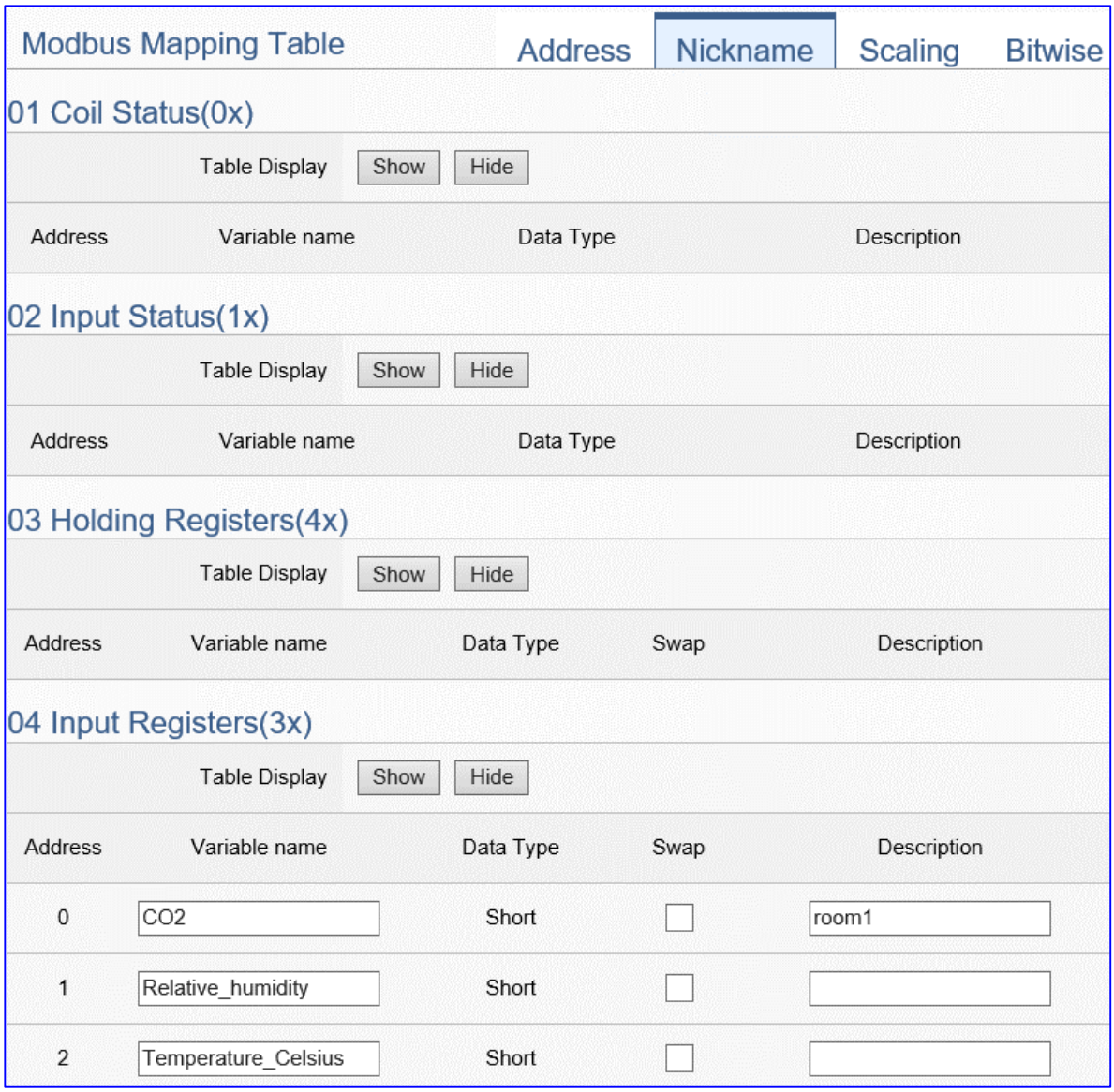
Display and edit the Modbus Mapping Table.



Modbus Mapping Table – Address Setting	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname:

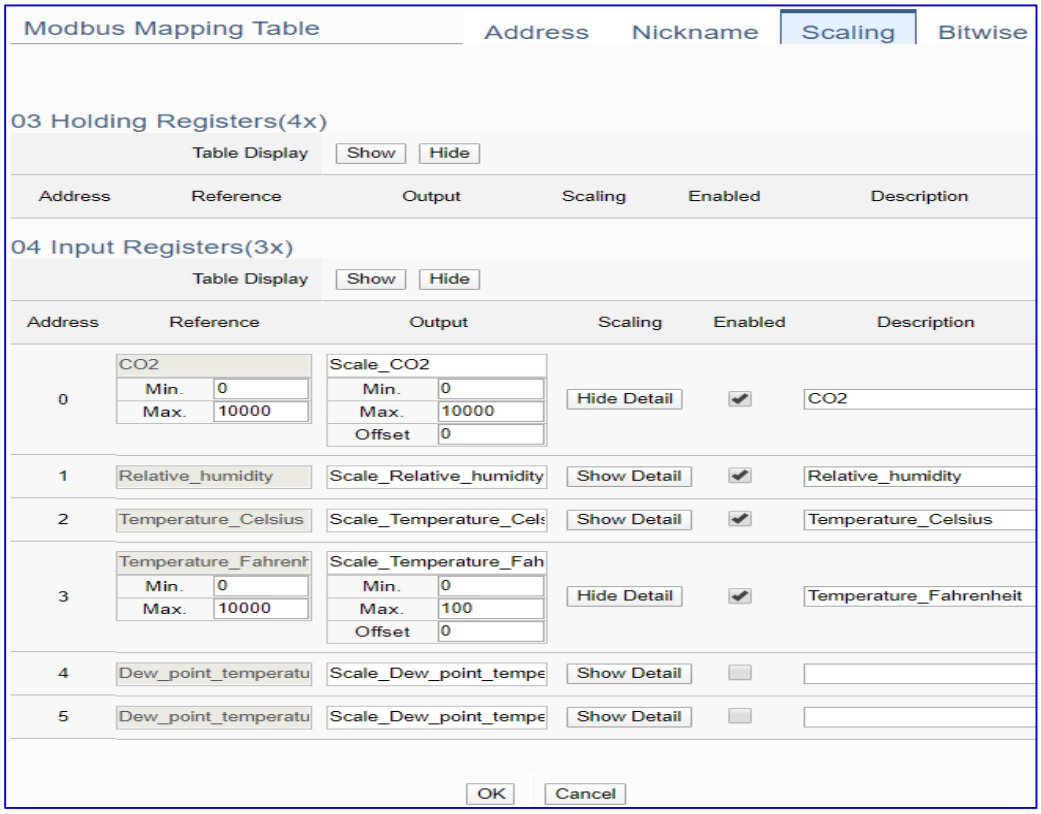
Setting the variable nickname and description.



Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Scaling:

Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated. The M-7055D has no AI/AO, so here uses the screen of DL-302 for an example.

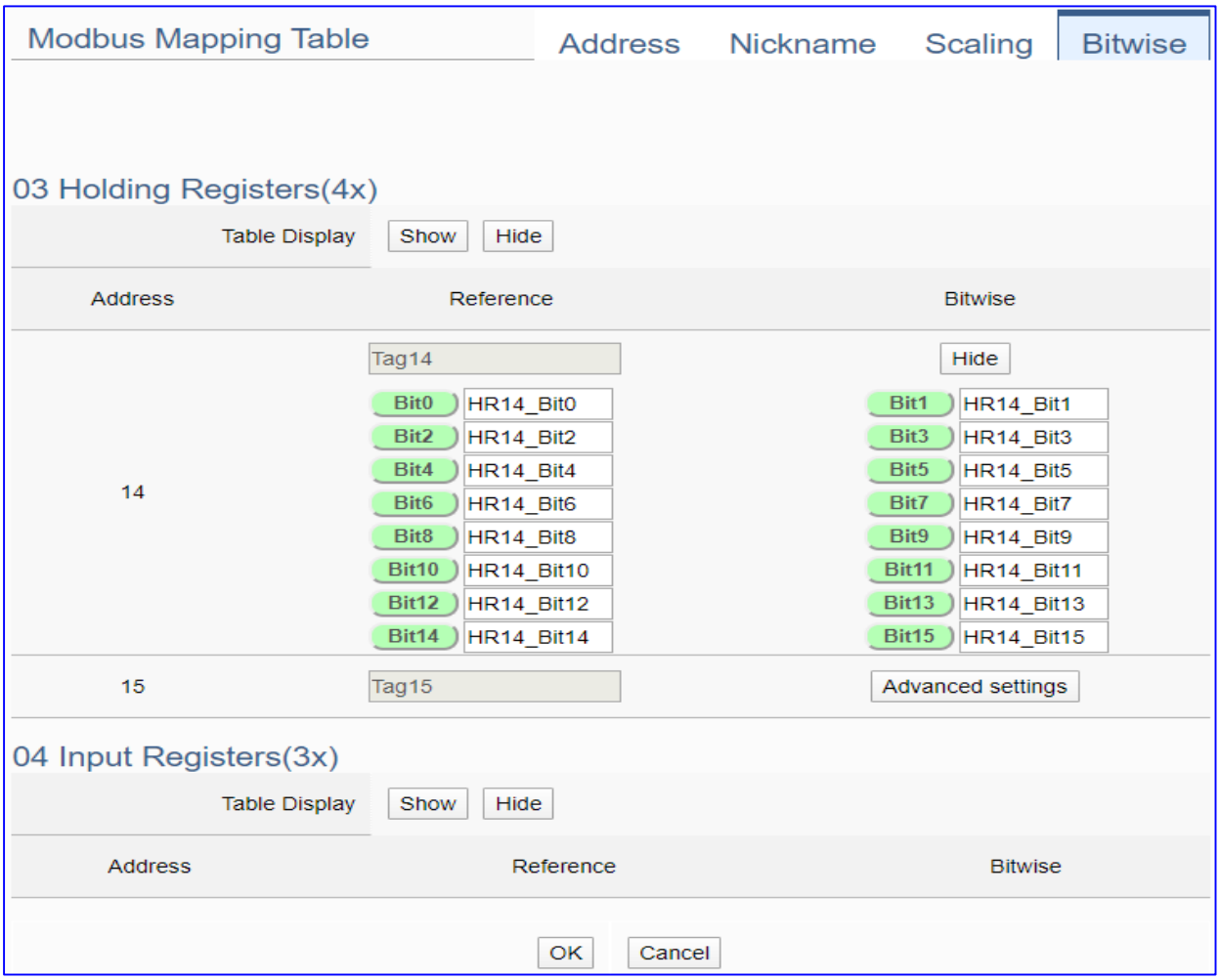


Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The I/O variable of the Modbus address.
Output	The scaling variable for scaling output. User can define the variable name.
Scaling	Click [Show Detail] to set up the Scaling parameters, and click [Hide Detail] to hide the parameters. Fill in the Min/Max range values of the source in the Reference column. Fill in the Min/Max range values after scaling in the Output column. If needs offset, fill the offset value in the Offset item. Remember check “Enable” box.
Enable	Check the box of the variable can enable just that variable for scaling.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Bitwise:

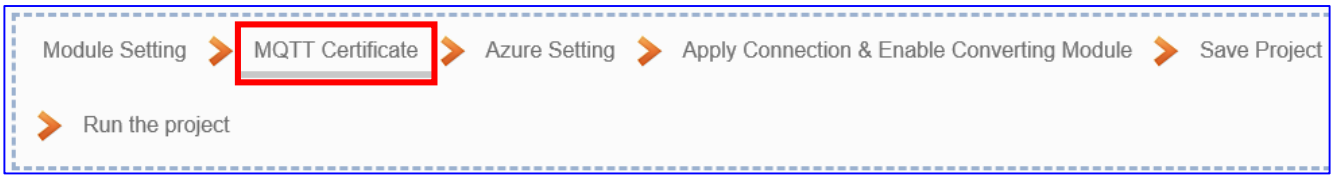
Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.

The M-7055D has no AI/AO, so here uses other module's setting screen as an example.

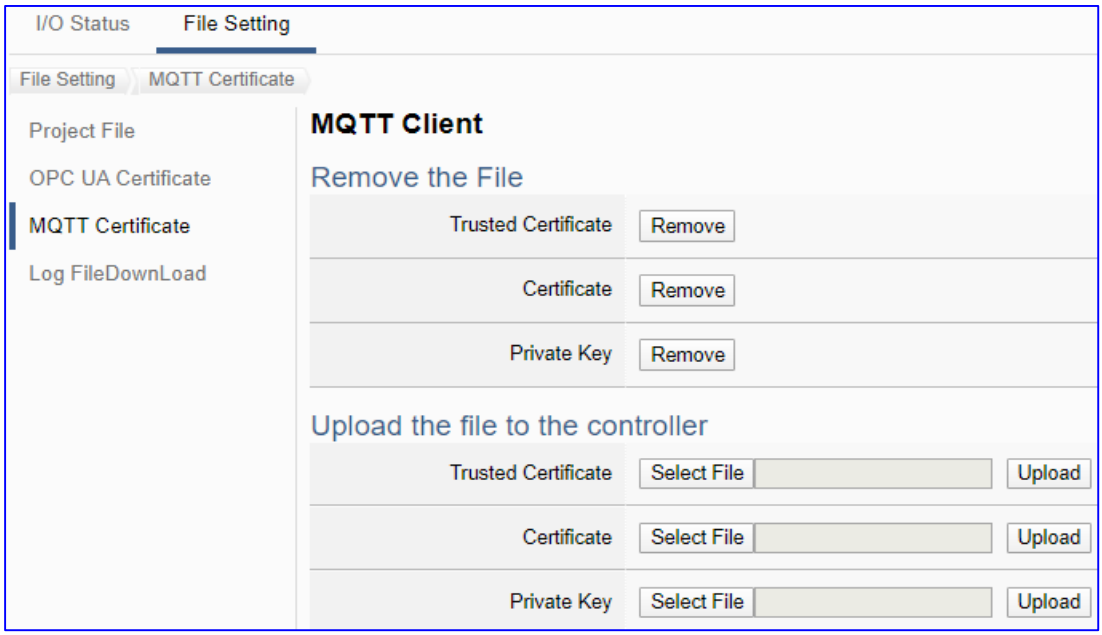


Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The Bit# variables of the Modbus address.
Bitwise	Set up the variables for Bitwise. Click [Advanced Settings] to set up the Bitwise parameters, and click [Hide] to hide the parameters. Fill in the variable names to the Bit# that wanted to do the Bitwise. The value in the fixed bit number will be assigned into the variable.
OK	Click to save this page settings and back to the module list page.

Step 2. MQTT Certificate

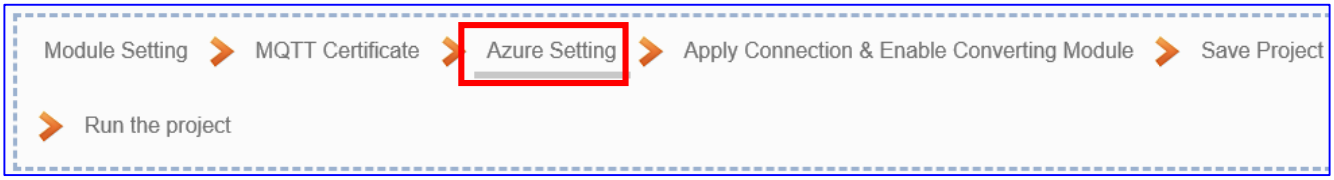


The **[MQTT Certificate]** is for setting up security communications to upload the **MQTT Trusted Certificate, Certificate and Private Key**. The users upload the file to the UA controller according to the type of obtained certificate. If you want to perform **Broker authentication**, you need to upload the **Trusted Certificate**. If you want to perform the **Broker/Client two-way authentication**, you need to upload the **Credential and Private Key additionally**. The user can skip this step if the user project does not use certificate transmission security.



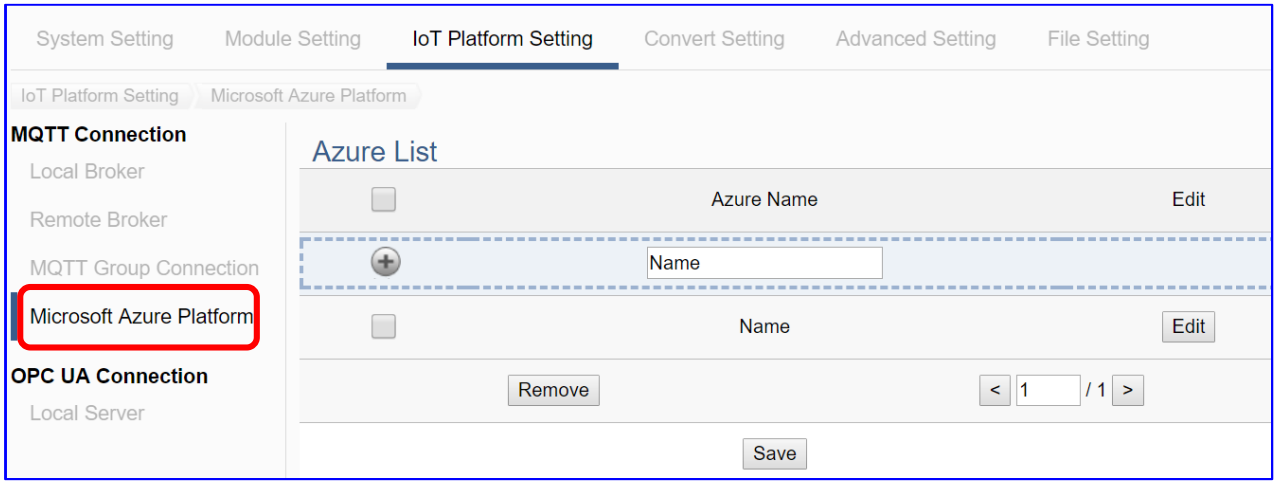
File Setting > MQTT Certificate > Upload the file to the controller	
Trusted Certificate	**Select File**: select the MQTT Trusted Certificate file of the device. **Upload**: upload the MQTT Trusted Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message. Trusted Certificate Select File Certificate_192.168.255.10 Certificate type is wrong. Upload
Certificate	**Select File**: select the MQTT Certificate file of the device. **Upload**: upload the MQTT Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message.
Private Key	**Select File**: select the MQTT Private Key of the device. **Upload**: upload the MQTT Private Key file to the UA controller. • File format must be **PEM**. Extension name must be ".**key**". • If select a wrong file, the system will show an error message.

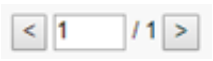
Step 3. Azure Setting



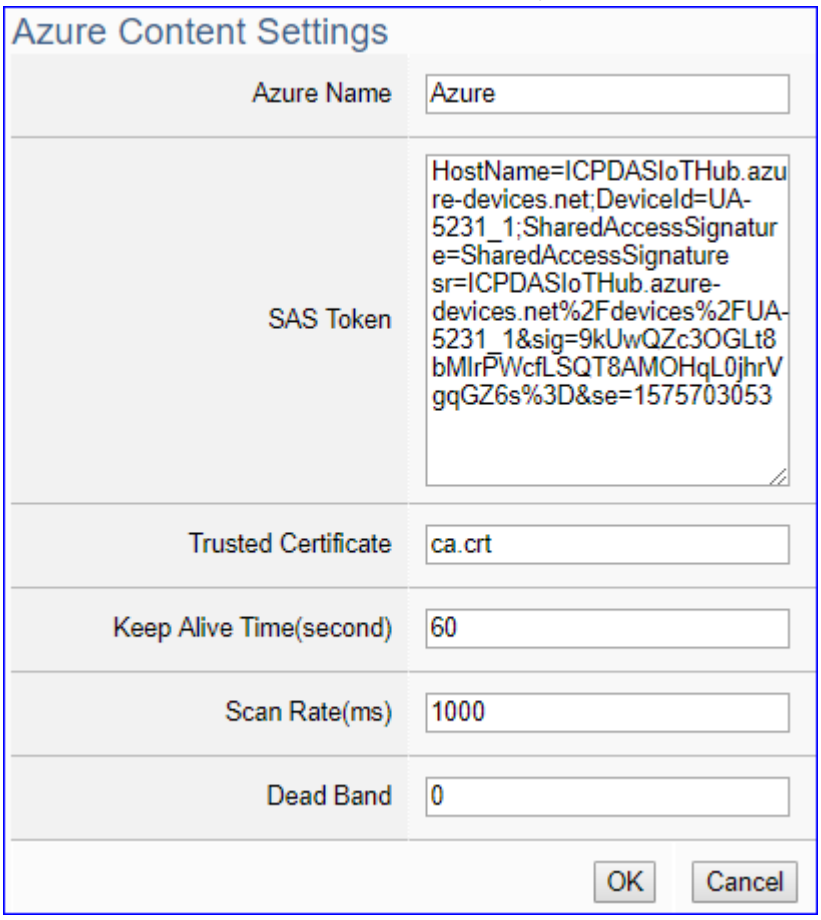
Click the next step, and enter the **Step 3 [Azure Setting]** of the UI setting.
This page is for setting the Microsoft Azure Platform related information of the MQTT Connection in the IoT platform, e.g. the name, SAS Token, etc.

We select the “Modbus TCP / Azure” connecting item at the beginning, so this step will auto enter the [**MQTT Connection > Microsoft Azure Platform**] page of IoT Platform Setting. The “Step Box” will prevent the user from selecting the wrong platform.



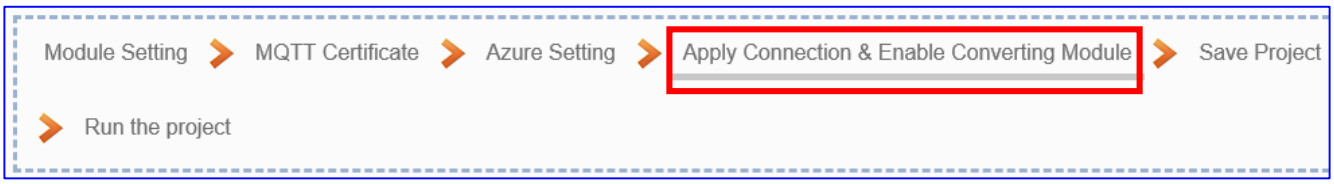
MQTT Connection > Microsoft Azure Platform > Azure List	
Azure Name	Azure name. User can define the name. Default: Name.
	Click to add a new Azure list.
Edit / Remove	Click [Edit] can set the Azure list. Click the left box and [remove] can delete the Azure list.
	The page number of the Azure list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

Click [Edit] button cauld enter the “**Azure Content Settings**” page:



MQTT Connection > Microsoft Azure Platform > Azure List > Azure Content Settings	
Azure Name	Azure name. User can define the name. Default: Name.
SAS Token	Input the SAS Token user previously registered for the UA controller 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.
Trusted Certificate	Input the Root CA file you previously downloaded for the UA controller from Microsoft Azure.
Keep Alive Time(second)	Set the time in second that pass away without communication between the UA controller and Microsoft Azure. Default: 60 second.
Scan Rate(ms)	Set an update frequency for the task data. Default: 1000 (Unit: ms)
Dead Band	Give a dead bend value for updating a float signal. Default: 0
OK	Click to save and exit this page.

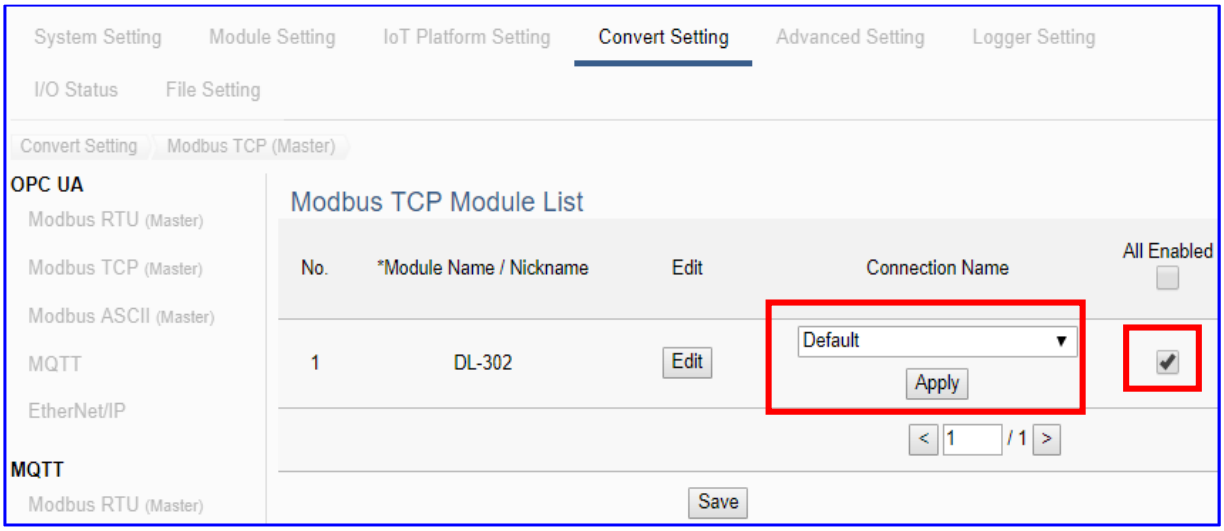
Step 4. Apply Connection & Enable Converting Module



Click the next step, and enter the **Step 4 [Apply Connection & Enable Converting Module]** UI setting. This page is for applying the connection and enabling the converting module.

We select the “Modbus TCP / Azure” at the beginning, and UA system connecting to Azure through MQTT JSON group method, so this step will auto enter the [**Convert Setting > MQTT JSON - Modbus TCP (Master)**] page of Convert setting. The “Step Box” will prevent the user from selecting the wrong platform.

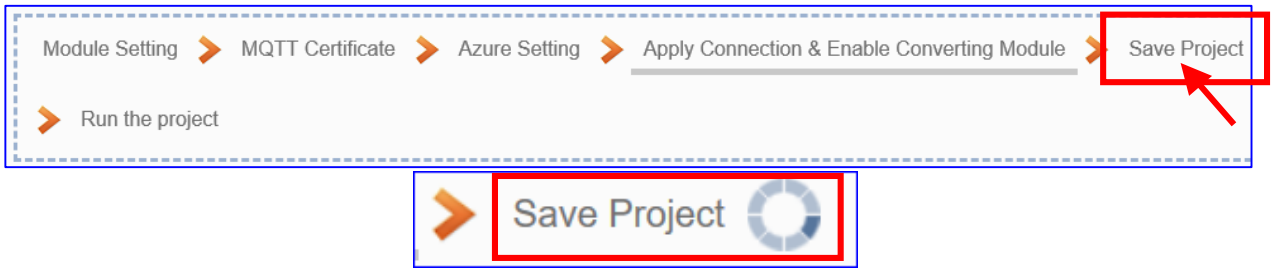
Select and apply the connection name, check the module enabled box,.



Convert Setting > MQTT JSON > Modbus TCP (Master) Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
Edit	If user wants to enable some I/O channels for conversion, click [Edit] of that module to enter the “Variable Tale” setting.
Connection Name	Select an Azure connection name, and then click [Apply].
All Enabled	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

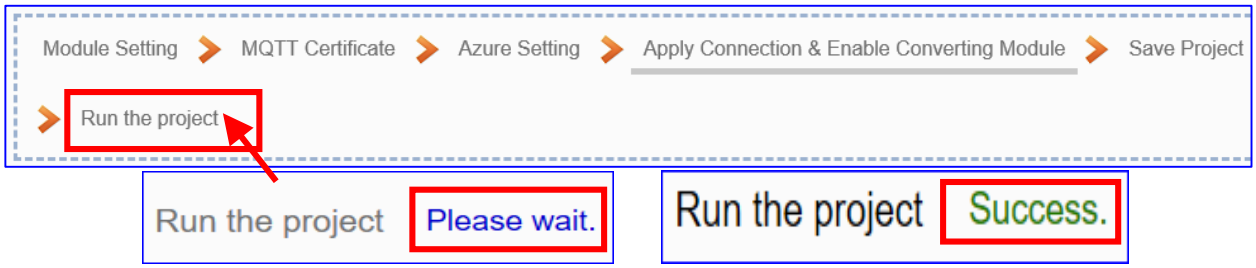
Step 5. Save Project

The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.



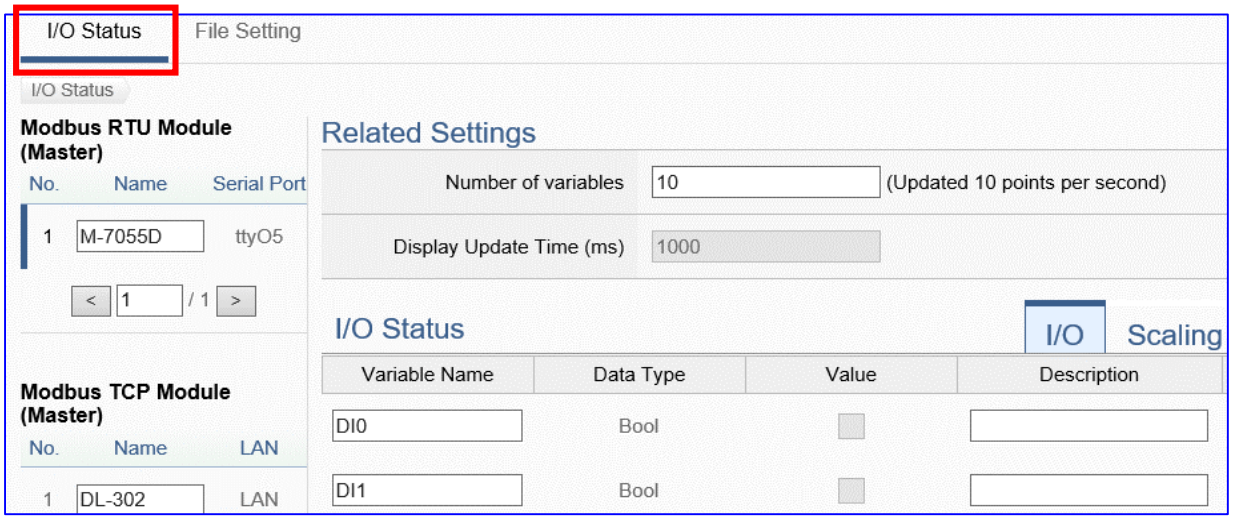
Step 6. Run the Project

The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.



When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

The new project now completes the setting, uploading and running in the UA controller and can process the Azure communication. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.



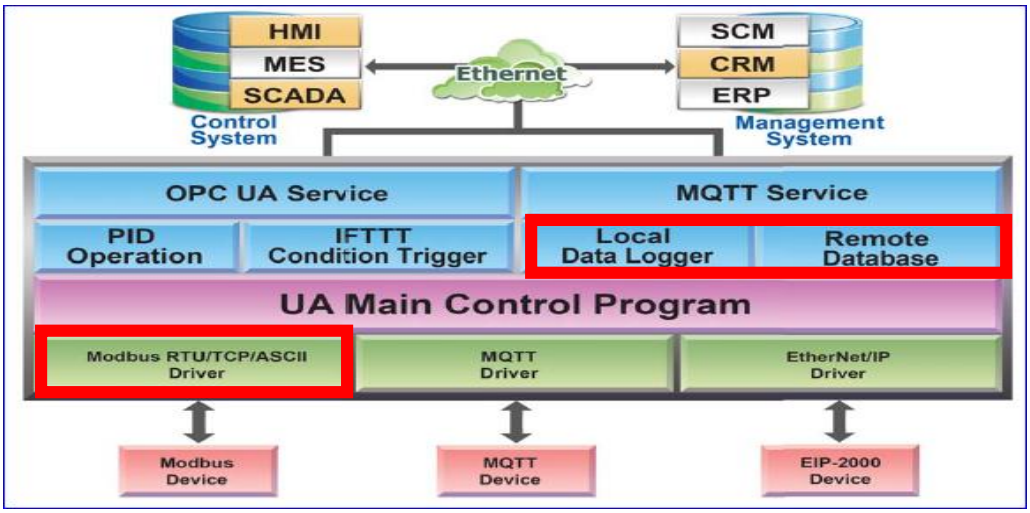
4.3. Data Log

UA series supports Data Logger function. Its Local Data Logger can save I/O data log to local CSV file, and record I/O status at the scheduled time. Furthermore, users can set the time interval of which CSV file to generate and divide on the local side. Its Remote Database can import I/O data collection directly into the remote SQL database, e.g. MS SQL, MySQL, Maria …, for the Big Data analysis.

This section will introduce the setting steps and the function parameters of the “Data Log”. In the category, there are 6 items about Modbus RTU/TCP module for Local Data Logger or MS SQL, MySQL/MariaDB… Remote Database. This section will introduce the function items in 3 sub-sections.

Data Log
- (Master) Modbus RTU / Local Data Logger
- (Master) Modbus TCP / Local Data Logger
- (Master) Modbus RTU / MS SQL
- (Master) Modbus TCP / MS SQL
- (Master) Modbus RTU / MySQL(MariaDB)
- (Master) Modbus TCP / MySQL(MariaDB)

Modbus RTU / Local Data Logger **Modbus TCP / Local Data Logger**	Provide users to record I/O data of Modbus RTU/TCP module to internal register. **(Section 4.3.1)**
Modbus RTU / MS SQL **Modbus TCP / MS SQL**	Provide users to record I/O data of Modbus RTU/TCP module into remote database MS SQL. **(Section 4.3.2)**
Modbus RTU / MySQL (MariaDB) **Modbus TCP / MySQL (MariaDB)**	Provide users to record I/O data of Modbus RTU/TCP module into MySQL/MariaDB remote database. **(Section 4.3.3)**

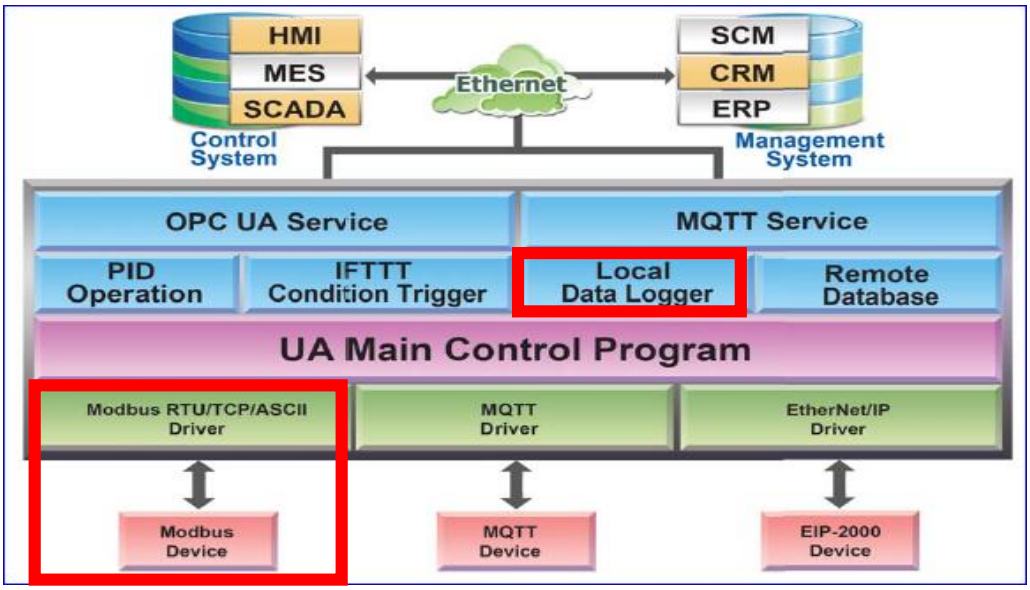


4.3.1. Function Wizard: Modbus / Local Data Logger (TCP Example)

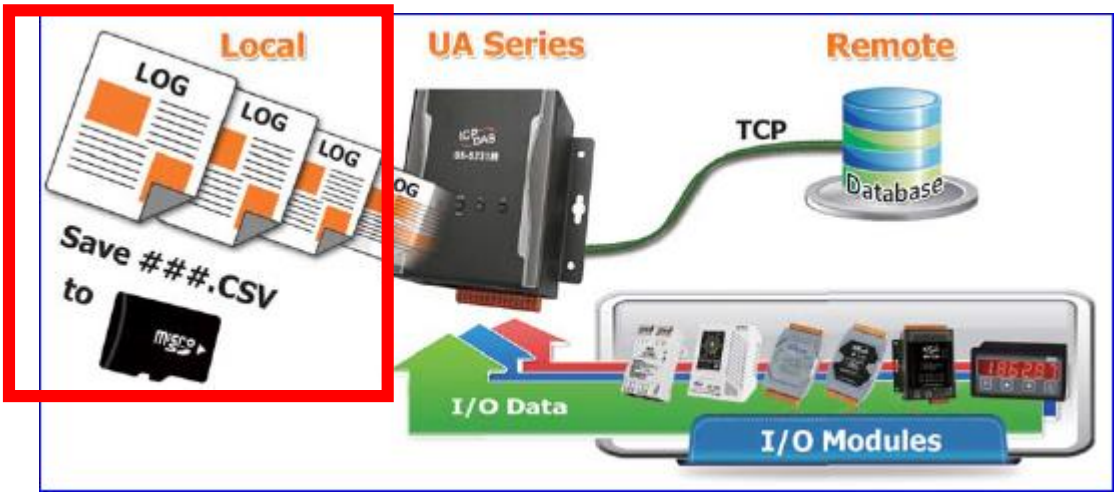
Local Data Logger supports to save I/O data log to Local CSV file in the SD card of the UA, and can record I/O status at the scheduled time. Furthermore, users can set the time interval of which CSV fi le to generate and divide on the local side.

The Modbus / Local Data Logger settings include Modbus RTU and TCP. Here will introduce Modbus TCP as the setting sample.

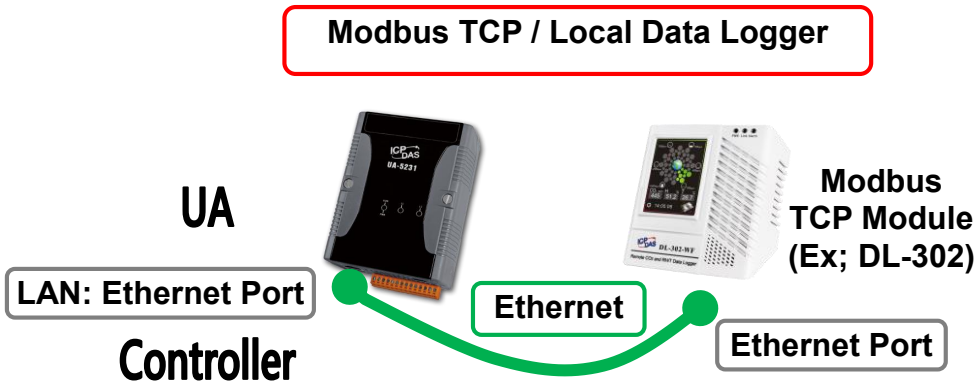
Modbus / Local Data Logger Function Diagram:



Application Solution:

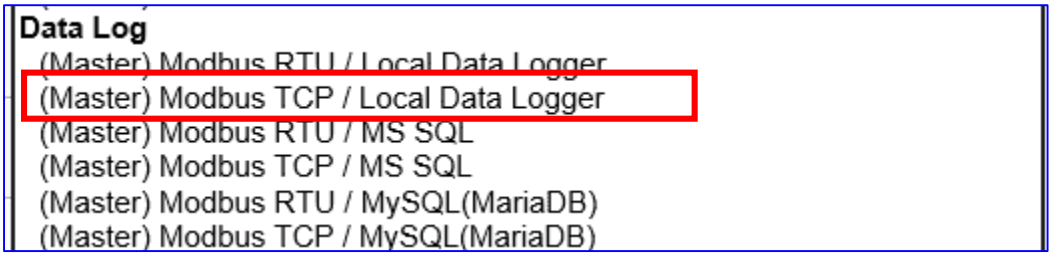


- **Modbus TCP / Local Data Logger**



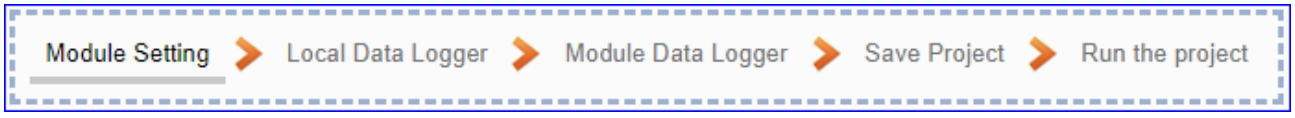
Note: The hardware/network connection methods please see the Chapter 2.

When UA series controller connects the Modbus TCP module (via Ethernet, as the picture) and save the data logger record to the microSD card in the UA, user can choose the item [**Modbus TCP / Local Data Logger**] of the "Data Log" in the Function Wizard.



[Step Box]:

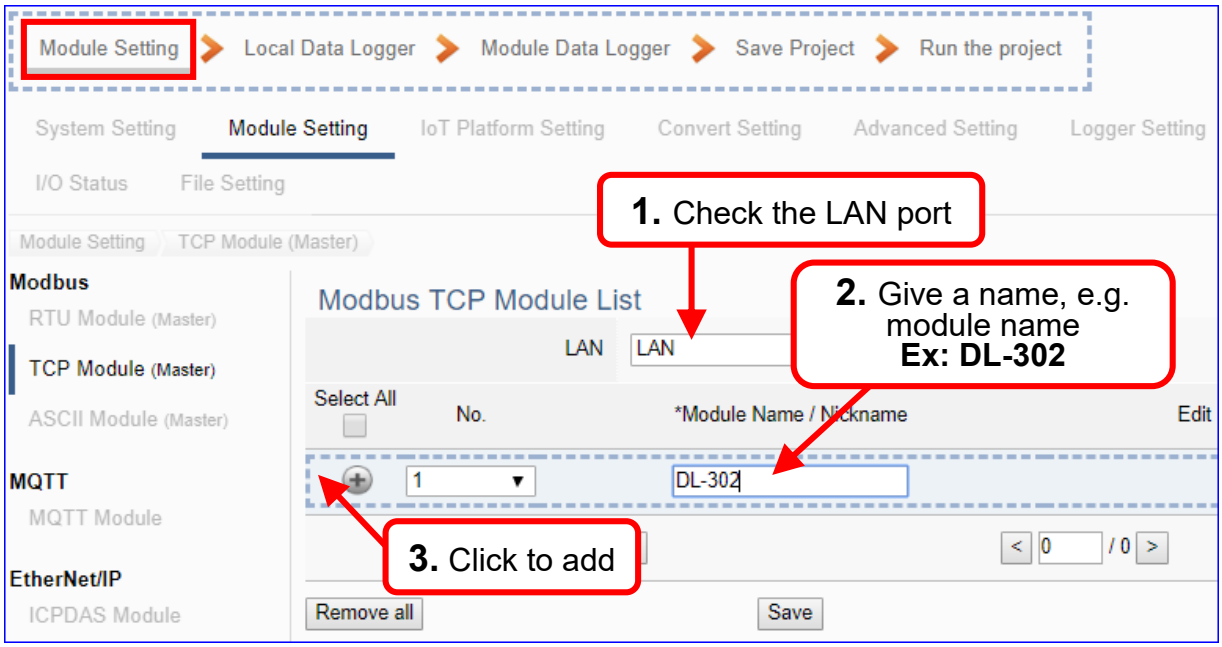
The Step Box of the [**Modbus TCP / Local Data Logger**] has 5 steps. When enabling the Step Box, it auto enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the "Step Box" step-by-step and then can complete the project quickly and rightly.



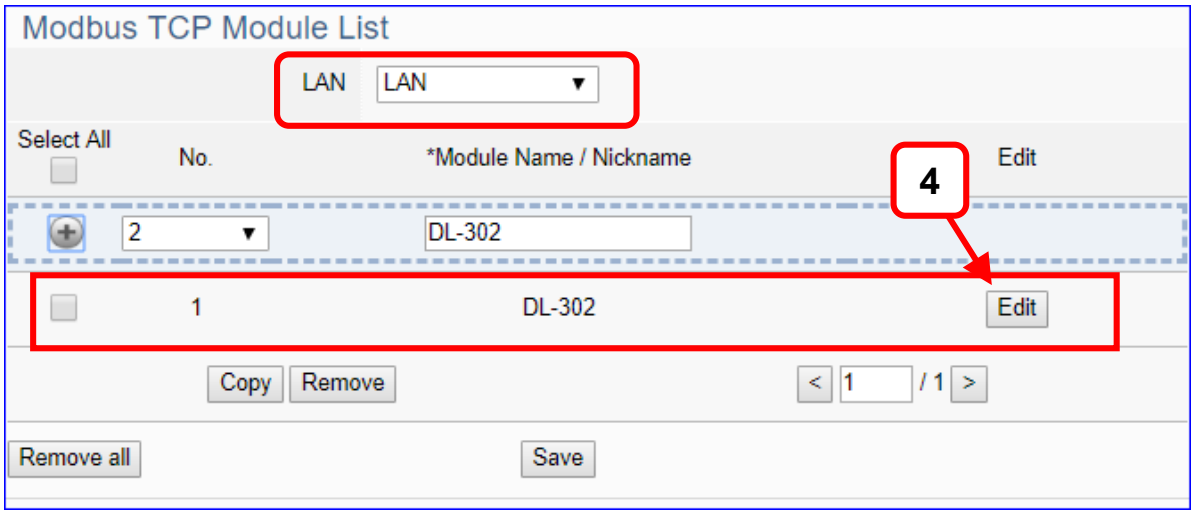
Step 1. Module Setting

It auto-enter the first step, **Step 1 [Module Setting]** of the UI setting.

This page is for setting the communication values with the connected modules. First check the LAN port that connected with the module, and each module can give a name (Default name: Name). Click [ ] button could add a new module, and then click [Edit] button to configure the module content and the Modbus mapping table.

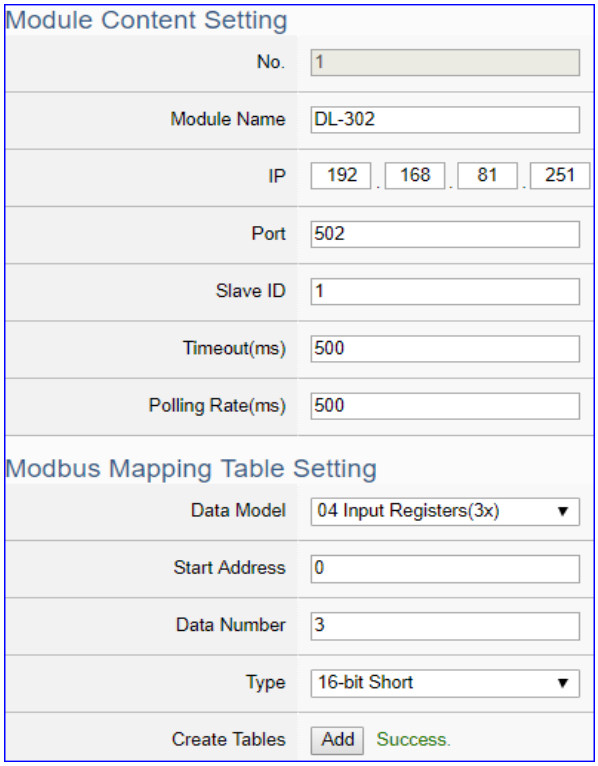


Add a module (No.: 1, Name: DL-302) as below, and then click [Edit] button to enter the "Module Content Setting" page.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

[**Module Content Setting**] can set up the module and the Modbus mapping table:



This Example: DL-302

[IP] 192.168.81.251 (by user case)

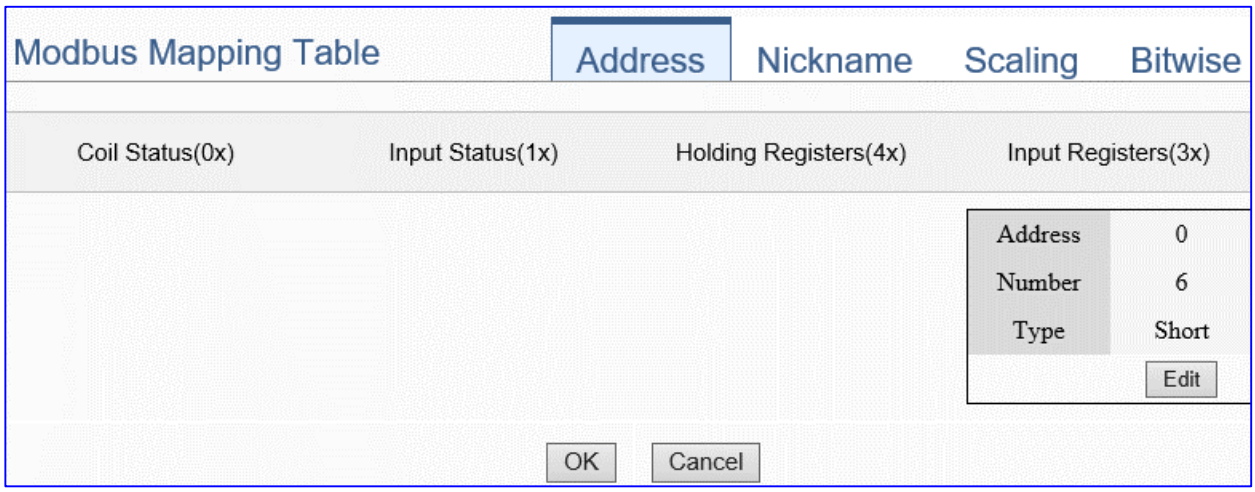
[Modbus mapping Table Setting]
Data Model: 04 Input Registers(3x)
Start Address: 0
Data Number: 6
Type: 16-bit Short
→ Click [Add]

Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
IP	The IP address of the connected module. Default: 0.0.0.0
Port	The port number for Modbus TCP. Default: 502
Slave ID	Set the Slave ID of the UA. (Range: 1 ~ 247)
Timeout(ms)	Set the timeout value for the module. Default: 500 ms
Polling Rate	Set a time interval for the command. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models “01” ~ “04” for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

The finished Modbus Mapping Table as below is in order of mapping DO, DI, AO & AI.

Address:

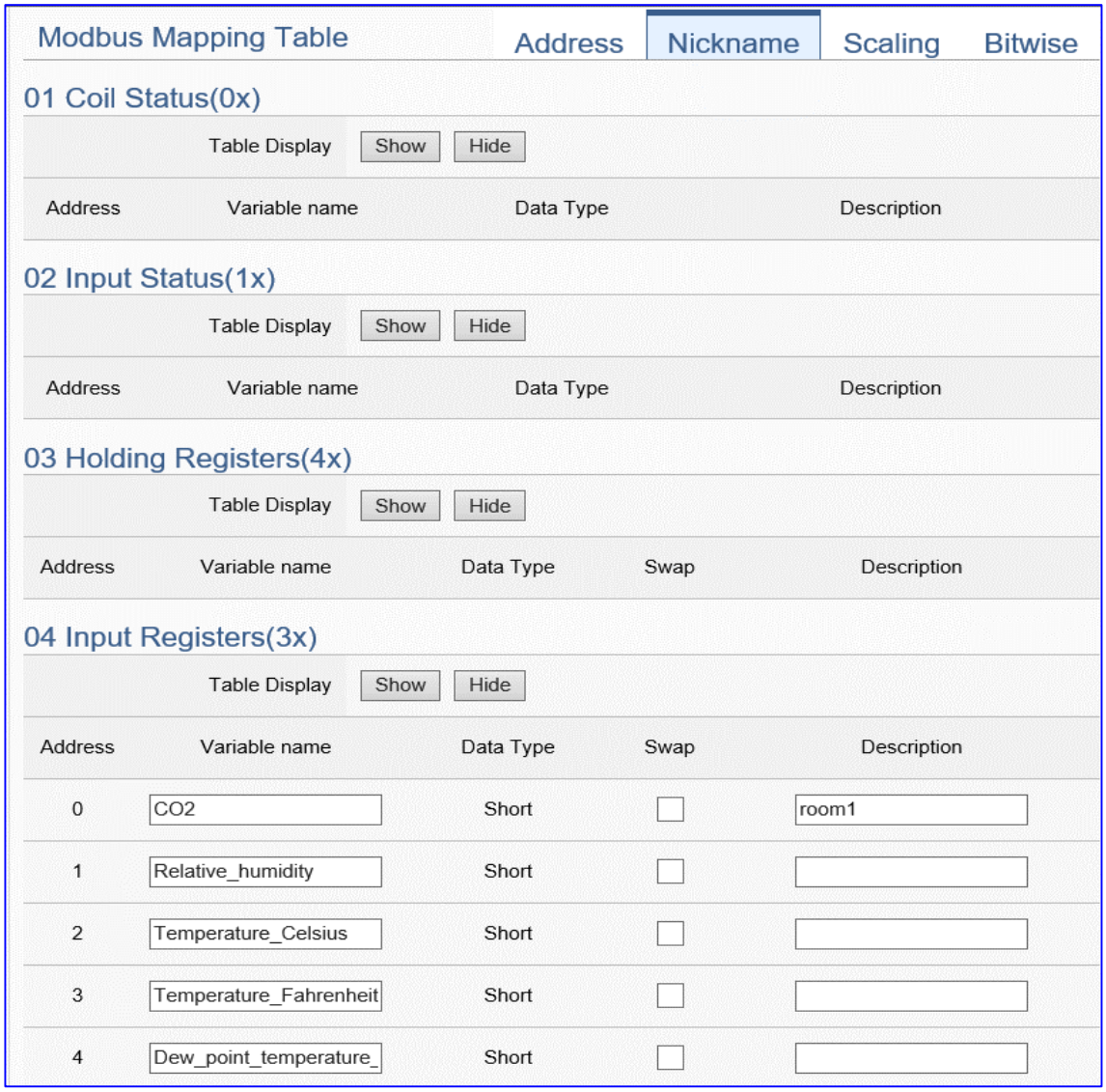
Display and edit the Modbus Mapping Table.



Modbus Mapping Table – Address Setting	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname:

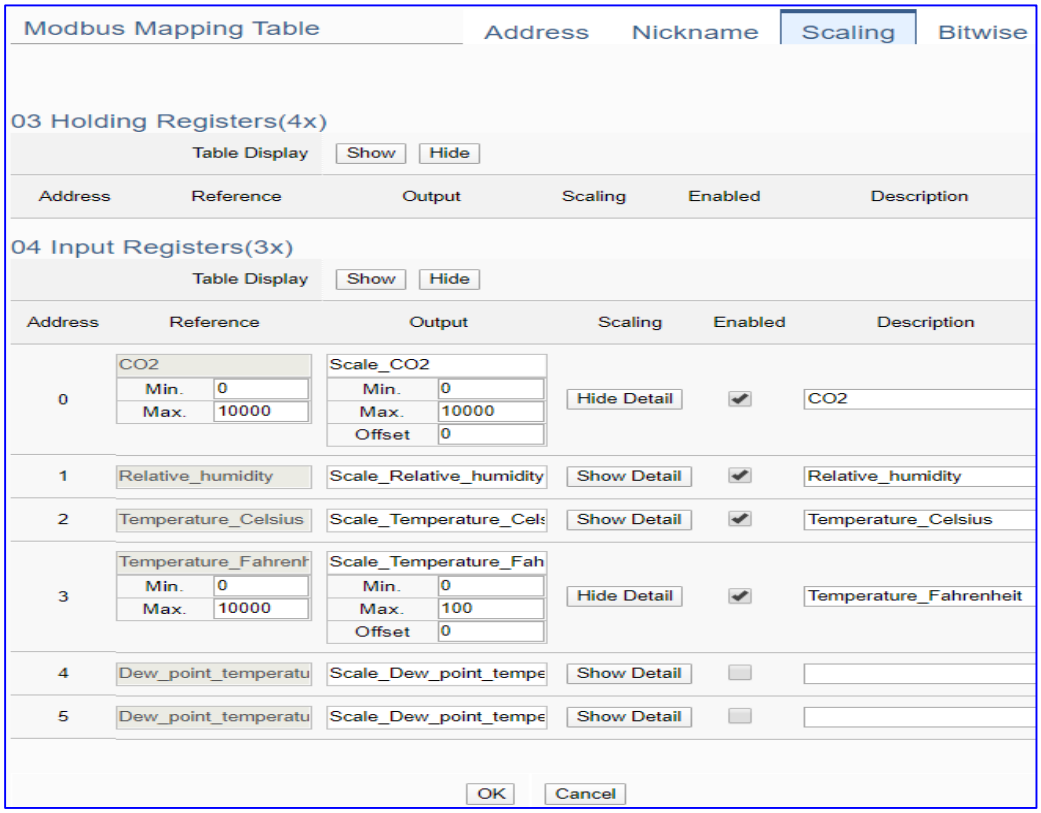
Setting the variable nickname and description.



Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Scaling:

Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated. The M-7055D has no AI/AO, so here uses the screen of DL-302 for an example.

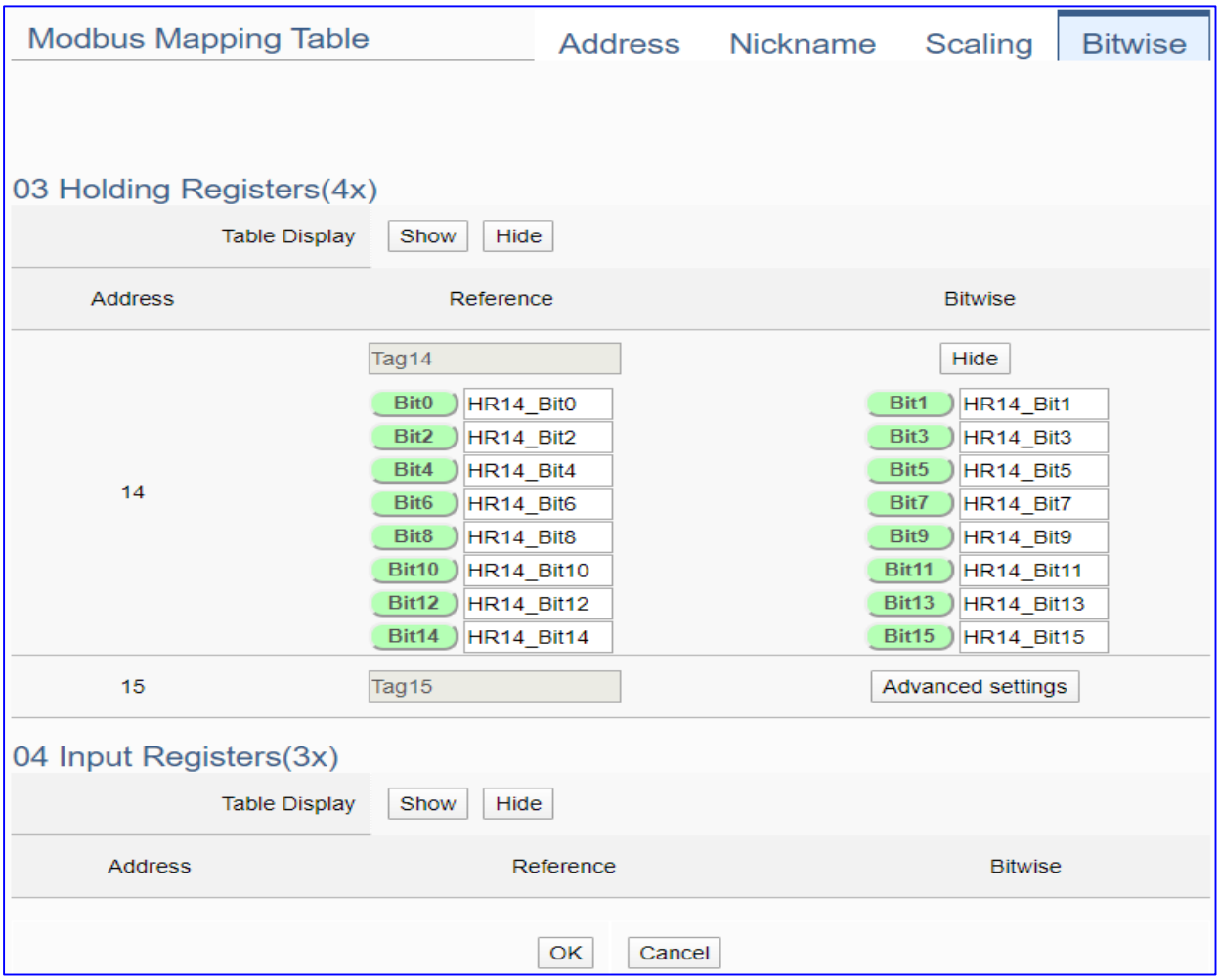


Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The I/O variable of the Modbus address.
Output	The scaling variable for scaling output. User can define the variable name.
Scaling	Click [Show Detail] to set up the Scaling parameters, and click [Hide Detail] to hide the parameters. Fill in the Min/Max range values of the source in the Reference column. Fill in the Min/Max range values after scaling in the Output column. If needs offset, fill the offset value in the Offset item. Remember check “Enable” box.
Enable	Check the box of the variable can enable just that variable for scaling.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Bitwise:

Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.

The M-7055D has no AI/AO, so here uses other module's setting screen as an example.

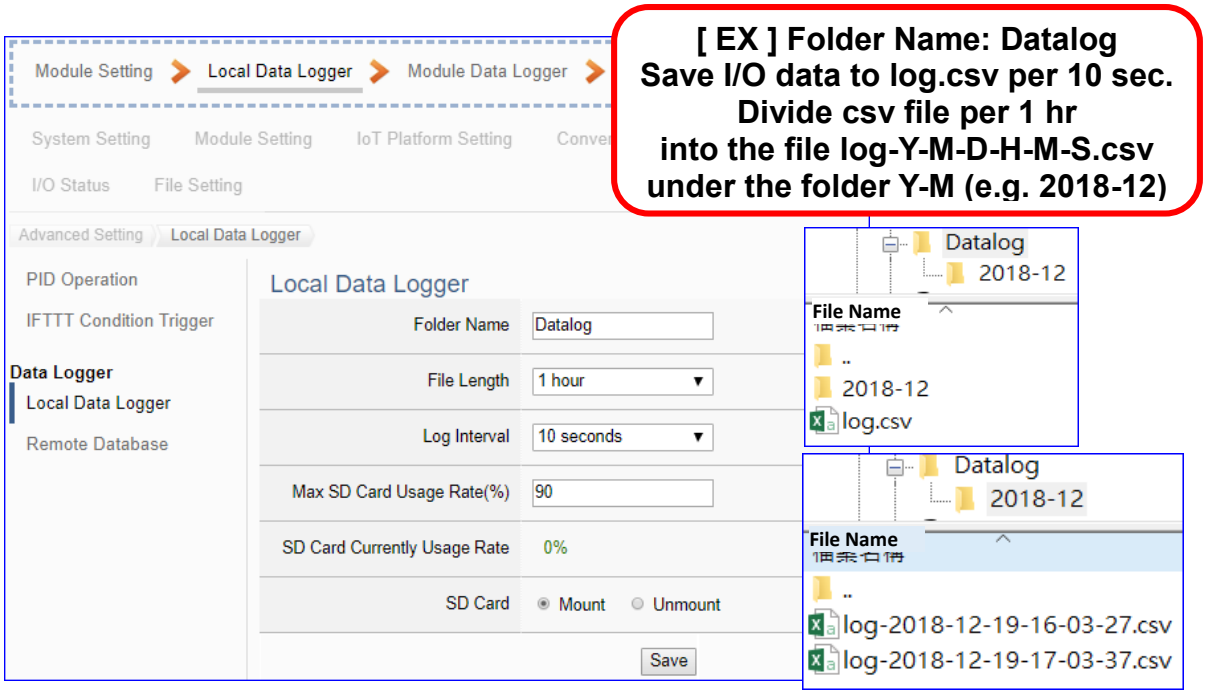


Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The Bit# variables of the Modbus address.
Bitwise	Set up the variables for Bitwise. Click [Advanced Settings] to set up the Bitwise parameters, and click [Hide] to hide the parameters. Fill in the variable names to the Bit# that wanted to do the Bitwise. The value in the fixed bit number will be assigned into the variable.
OK	Click to save this page settings and back to the module list page.

Step 2. Local Data Logger

Click the next step, and enter the **Step 2 [Local Data Logger]** of the UI setting. This page is for setting the saving microSD card, e.g. the folder name, file length, log interval, card usage rate, and mount/unmount.

We select the “Modbus TCP / Local Data Logger” conversion at the beginning, so this step will auto enter the [**Data Logger > Local Data Logger**] page of Advanced Setting. The “Step Box” will prevent the user from selecting the wrong platform.

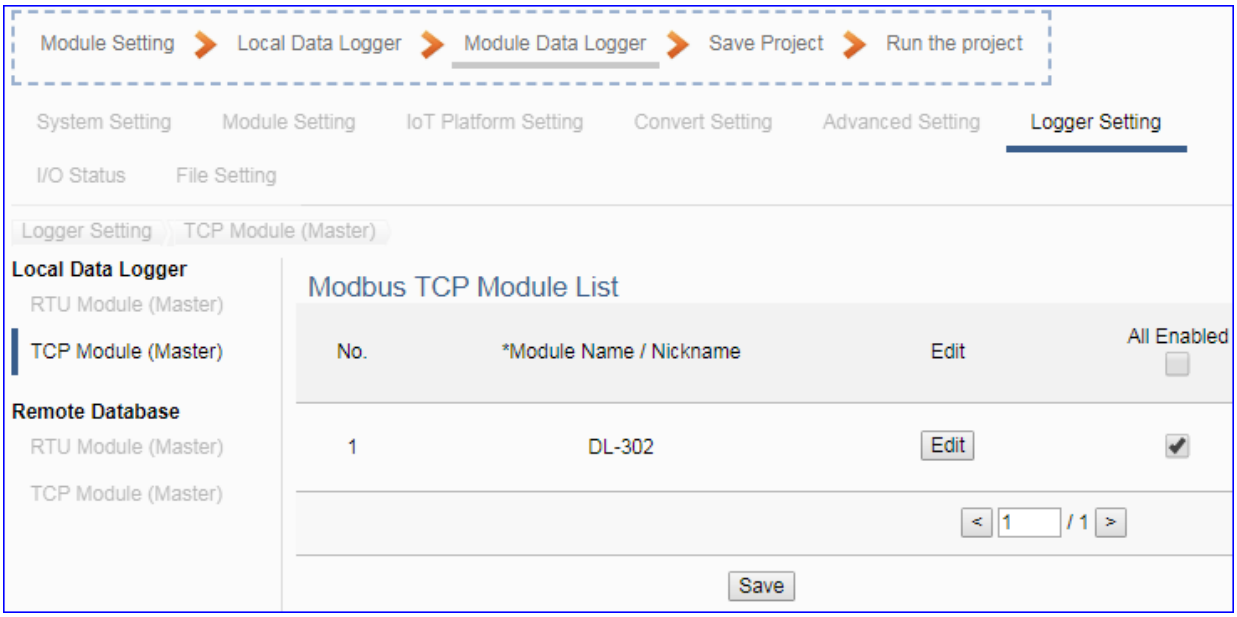


Advanced Setting > Data Logger > Local Data Logger	
Folder Name	The folder name in microSD card of UA, user definable. The I/O data will save into the file “log.csv” under this folder.
File Length	Unit: hour. User can select per 1, 2, 3, … 8, 12, or 24 hours to divide the log.csv into the file “log-Y-M-D-H-M-S.csv” under the folder “Y-M”. (e.g. 2018-12)
Log Interval	The interval to save I/O data per seconds, minutes or hours.
Max SD Card Usage Rate (%)	Set up the maximum usage rate (Unit: %) of UA microSD card. If the data current rate meet the max rate, the oldest data will be removed first.
SD Card Currently Usage Rate	Display the current usage rate of UA microSD card (show %).
SD Card	Mount: Click to mount microSD card and begin to record data. Unmount: Click to unmount microSD card and stop record data.
Save	Click to save the settings of this item.

Step 3. Module Data logger

Click the next step, and enter the **Step 3 [Module Data logger]** UI setting. This step is for enabling the Modbus TCP module for Local Data Logger.
We select the “Modbus TCP / Local data logger” of Data Log at the beginning, so this step will auto enter the [**Local Data Logger > TCP Module (Master)**] page of Logger Setting. The “Step Box” will prevent the user from selecting the wrong platform.

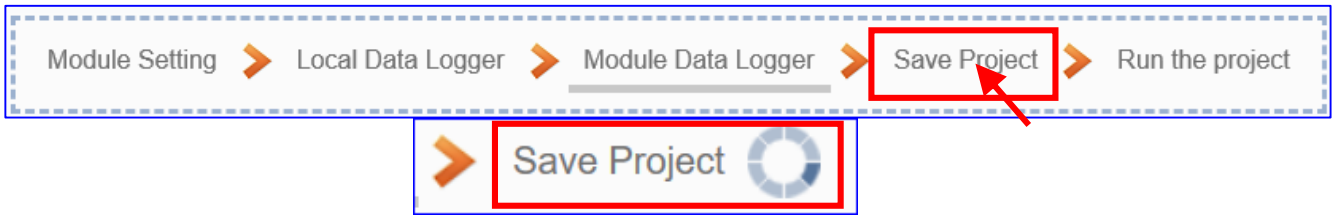
Please check the box of the module user wants to do the data logger, e.g. DL-302.



Logger Setting > Local Data Logger > TCP Module – Modbus TCP Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
All Enabled	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	If user wants to enable some I/O channels for data logger, click [Edit] of that module to enter the “Content Setting”. It is normal to set all channels as enabled, and the function will not affect the unconnected channels.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

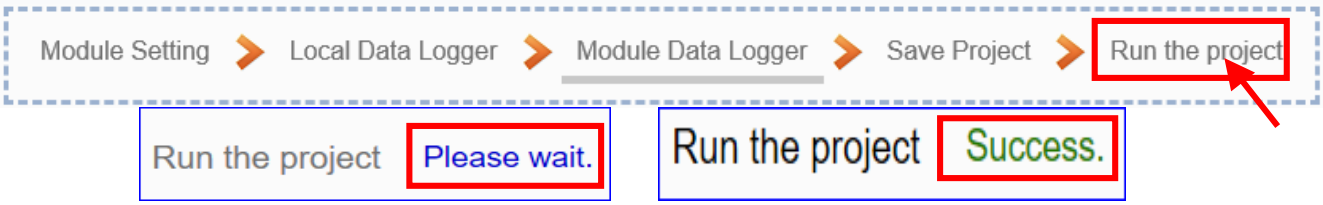
Step 4. Save Project

The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.



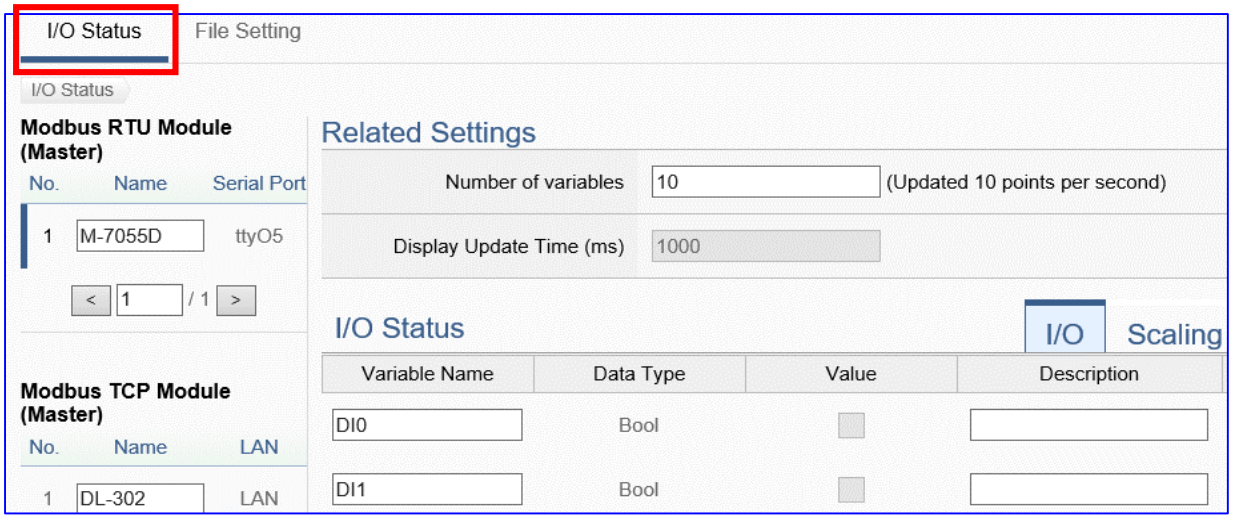
Step 5. Run the Project

The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.



When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

The new project now completes the setting, uploading and running in the UA controller and can process the Data Logger function. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.

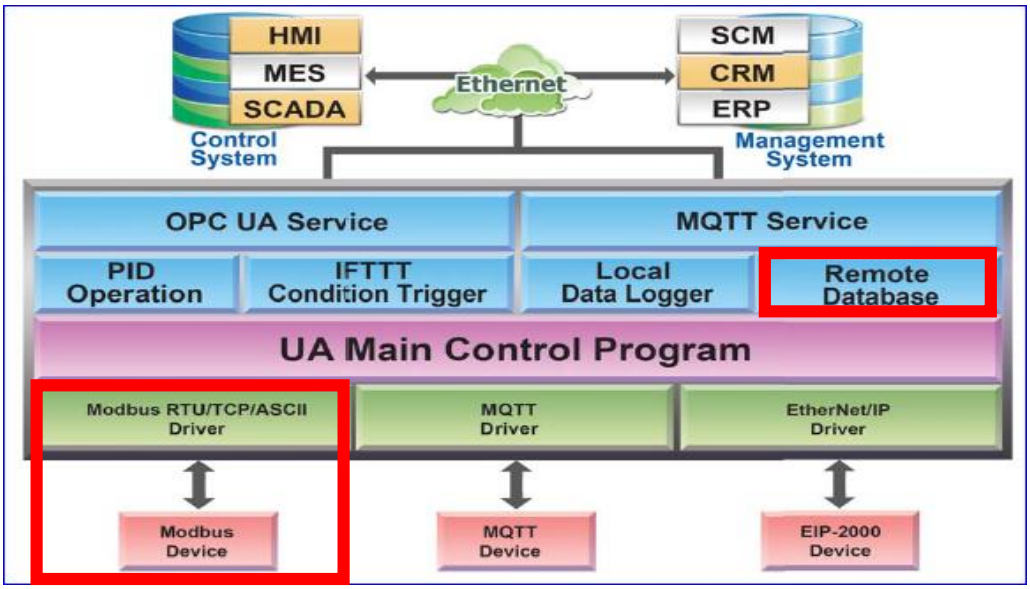


4.3.2. Function Wizard: Modbus / MS SQL (TCP Example)

UA Data Logger supports to collect devices I/O status and then directly write into remote side MS SQL Database for the Big Data analysis.

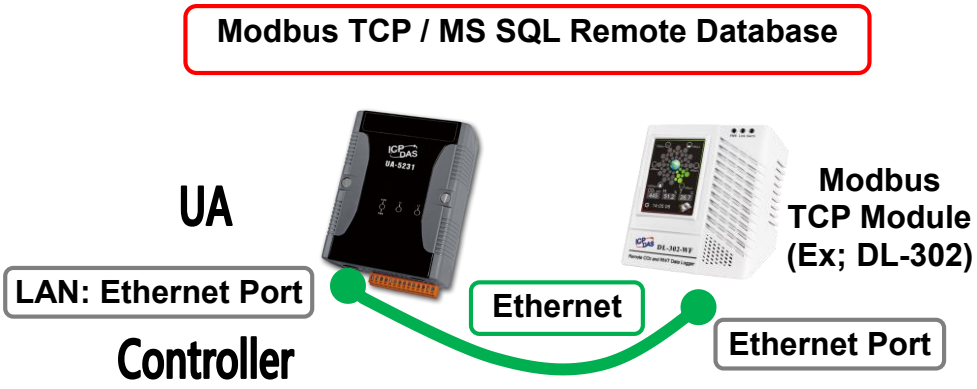
The Modbus / Remote Database settings include Modbus RTU and TCP. Here will introduce Modbus TCP as the setting sample.

Modbus / Remote Database Function Diagram:



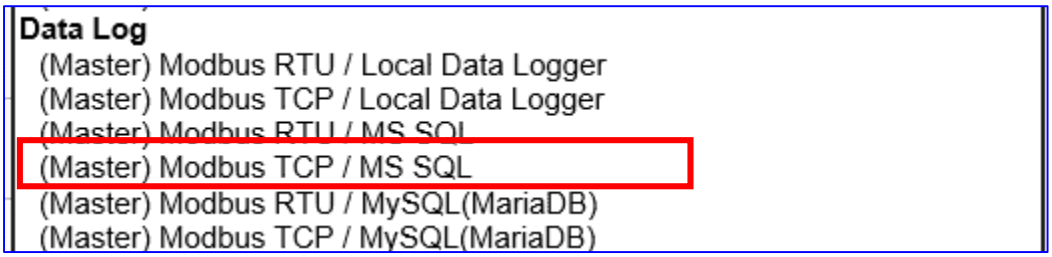
Application Solution:

- **Modbus RTU / MS SQL Remote Database**



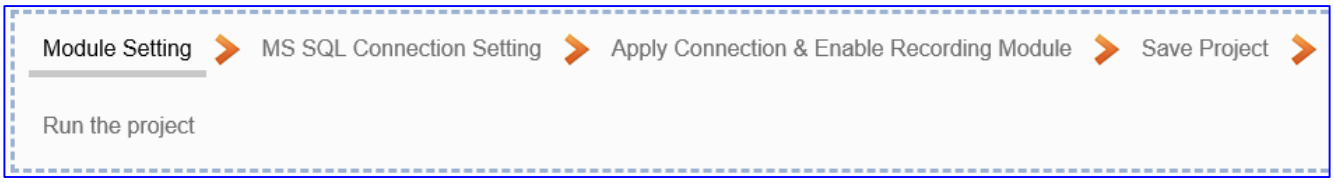
Note: The hardware/network connection methods please see the Chapter 2.

When UA series controller connects the Modbus TCP module (via Ethernet, as the picture), user can choose the item [**Modbus TCP / MS SQL**] of the “Data Log” in the Function Wizard.

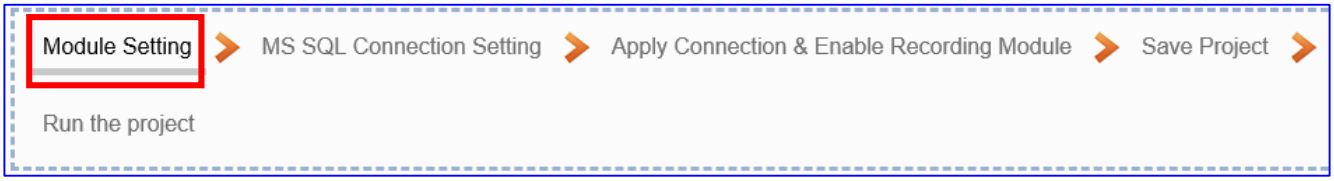


[Step Box]:

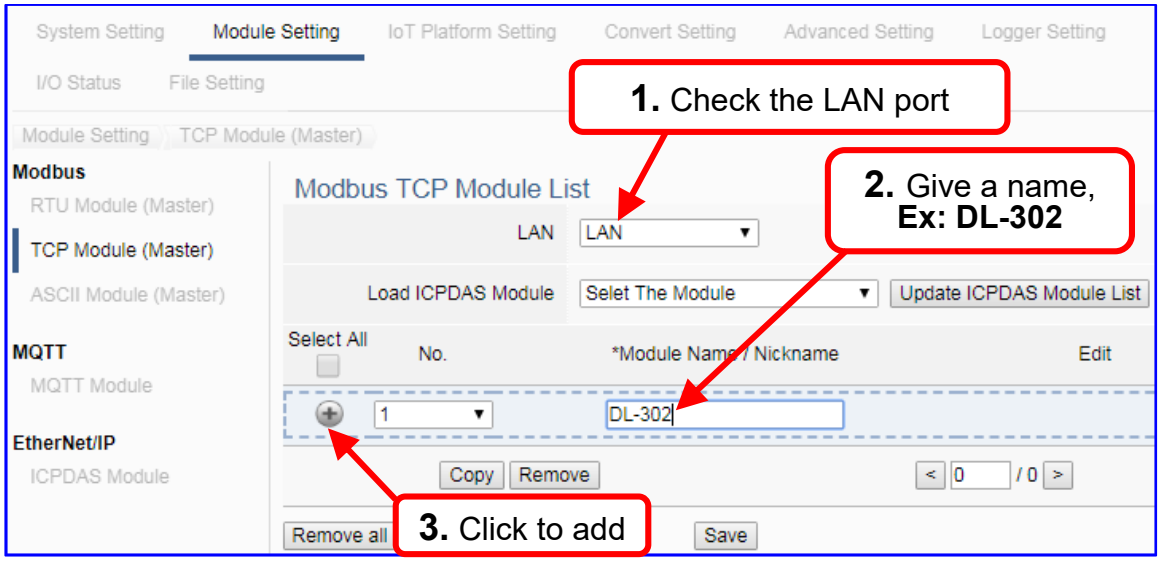
The Step Box of the [**Modbus TCP / MS SQL**] has 5 steps. When enabling the Step Box, it auto enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the “Step Box” step-by-step and then can complete the project quickly and rightly.



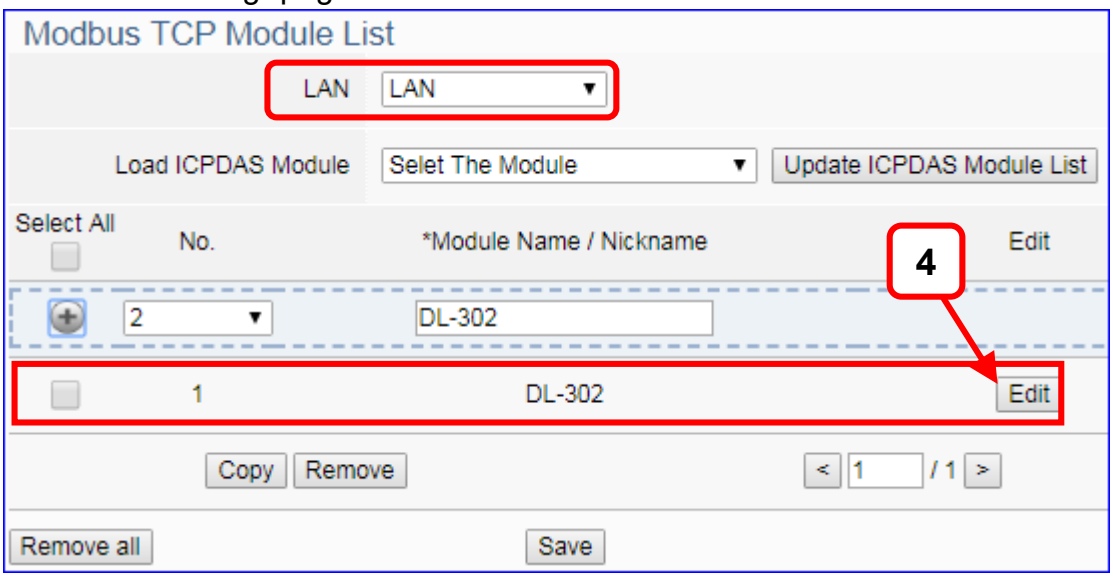
Step 1. Module Setting



It auto-enter the first step, **Step 1 [Module Setting]** of the UI setting.
This page is for setting the communication values with the connected modules. First check the port that connected with the module, and each module can give a name (Default name: Name). Click [ ] button could add a new module, and then click [Edit] button to configure the module content and the Modbus mapping table.

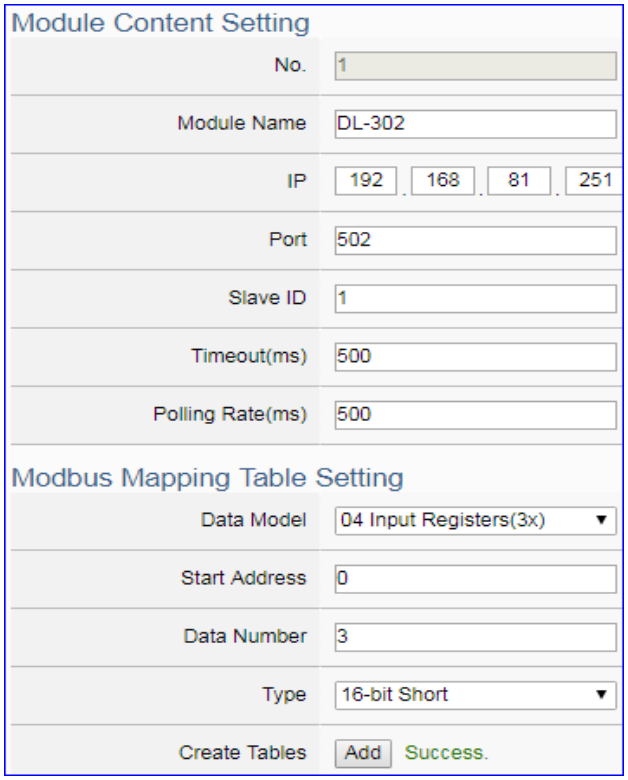


Add a module (No.: 1, Name: DL-302) as below, and then click [Edit] button to enter the "Module Content Setting" page.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

[**Module Content Setting**] page can set up the module and the Modbus mapping table:



Example: DL-302

[IP] 192.168.81.251 (by user case)

[Modbus Mapping Table Setting]
Data Model: 04 Input Registers(3x)
Start Address: 0
Data Number: 6
Type: 16-bit Short
→ Click [Add]

Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Slave ID	Set the module Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models “01” ~ “04” for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

The finished Modbus Mapping Table as below is in order of mapping DO, DI, AO & AI.

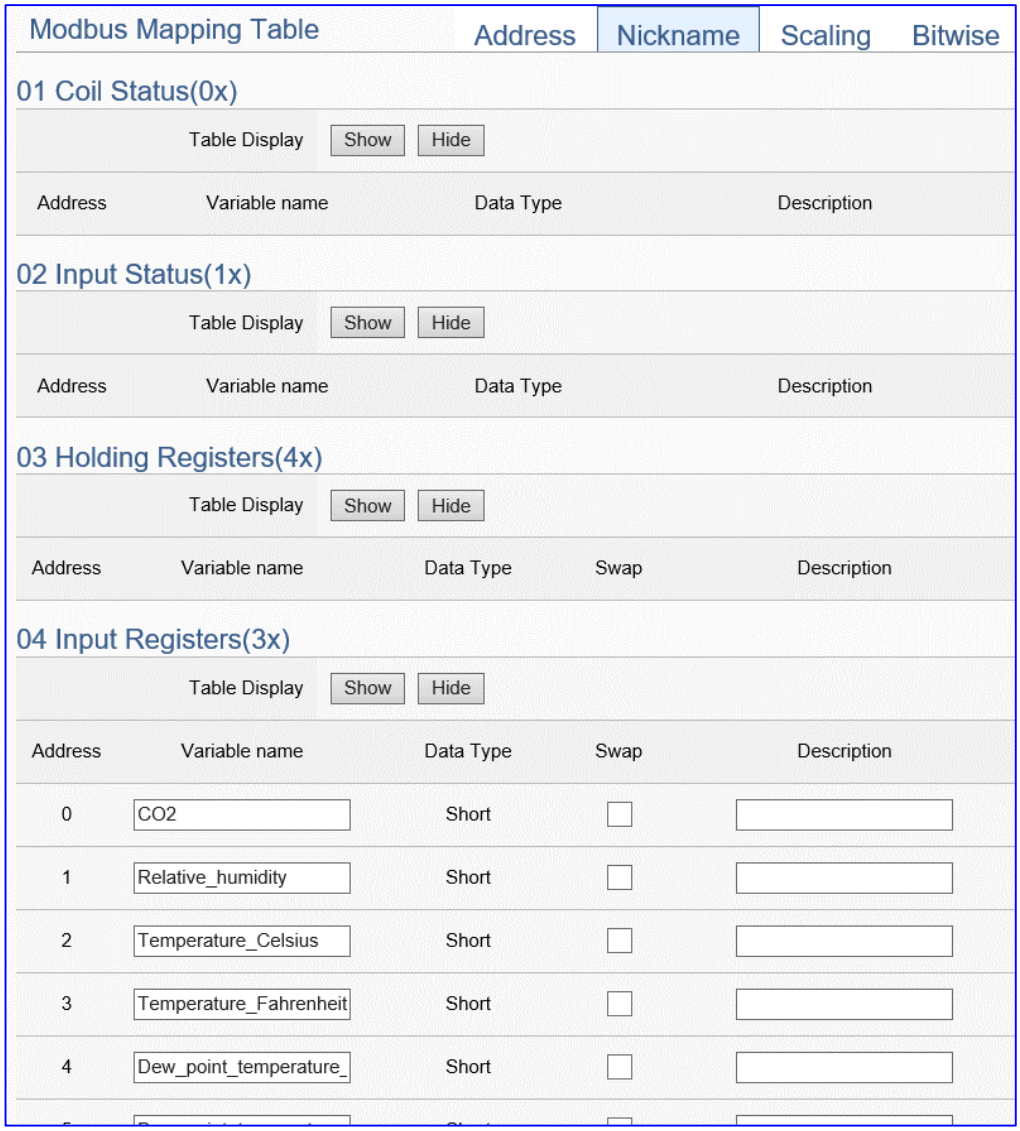
Address:

Display and edit the Modbus Mapping Table.

Modbus Mapping Table – Address Setting	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname:

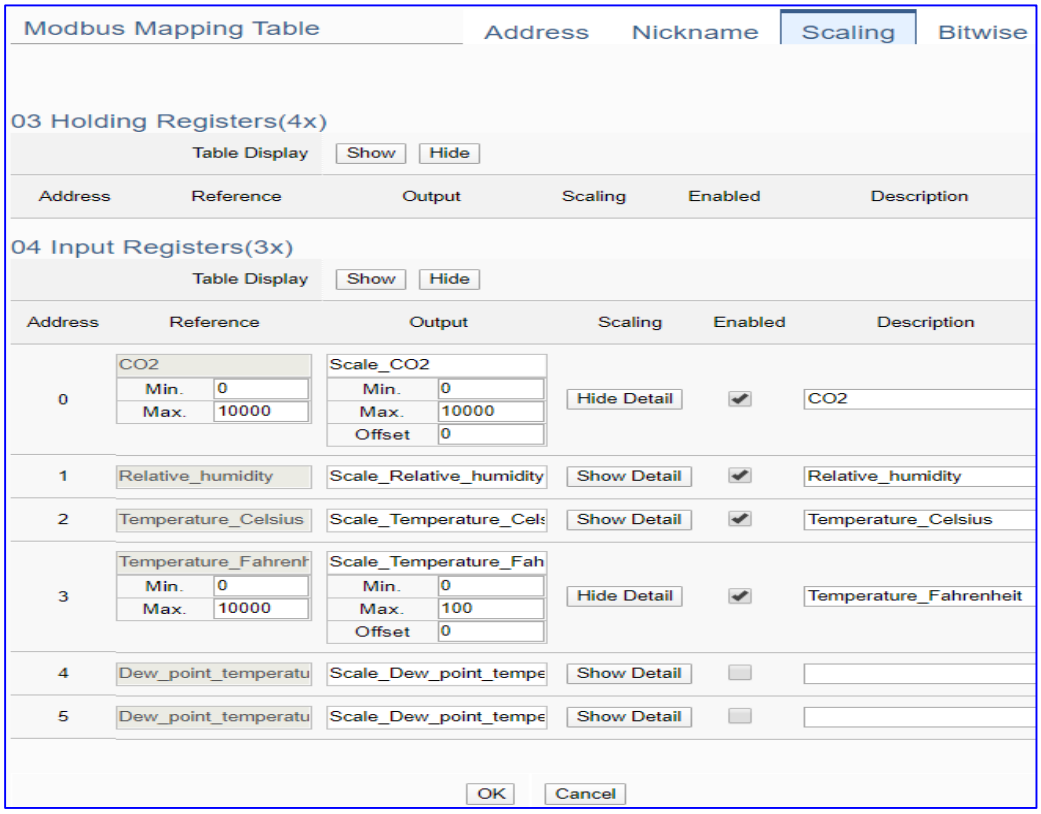
Setting the variable nickname and description.



Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Scaling:

Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated. The M-7055D has no AI/AO, so here uses the screen of DL-302 for an example.

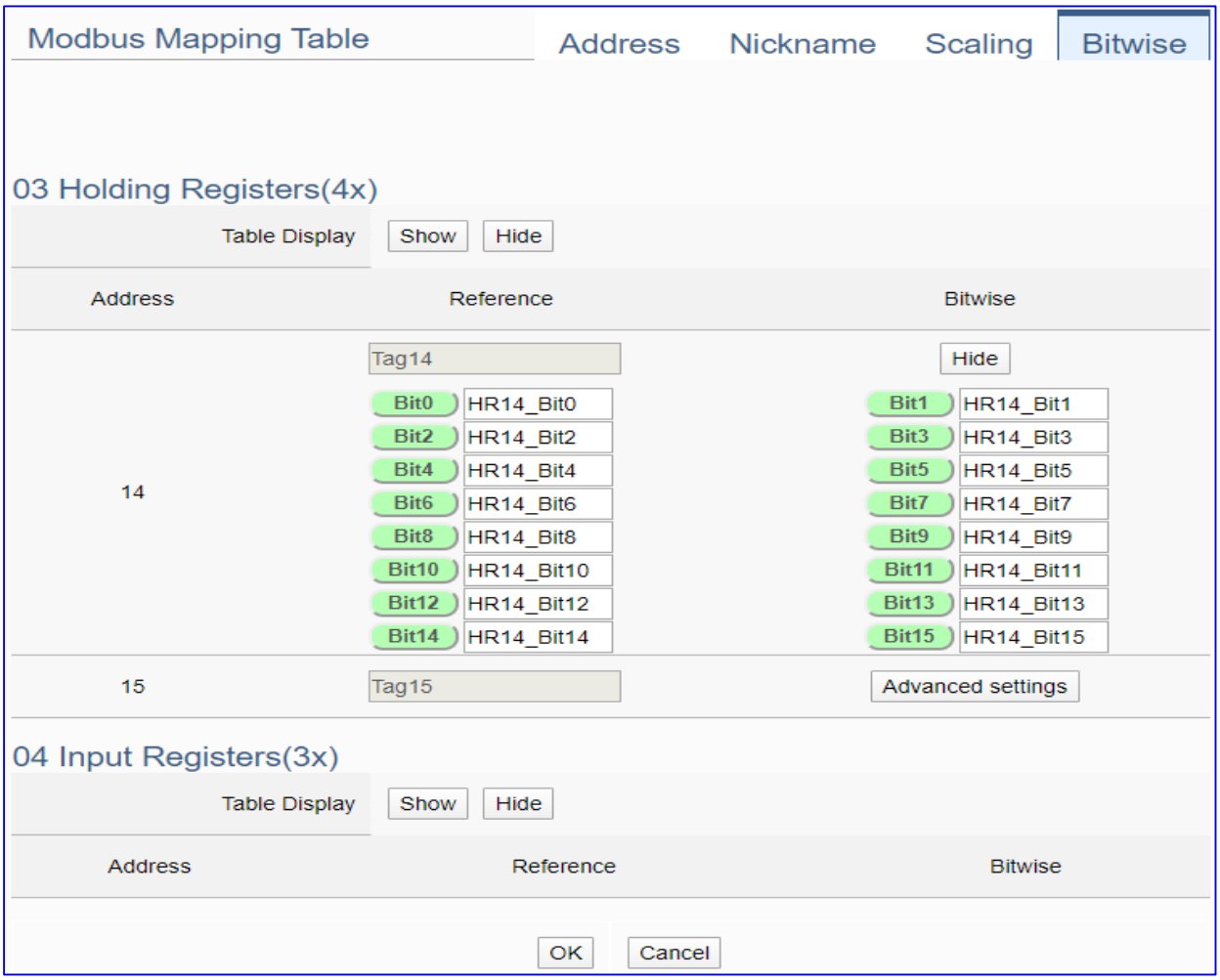


Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The I/O variable of the Modbus address.
Output	The scaling variable for scaling output. User can define the variable name.
Scaling	Click [Show Detail] to set up the Scaling parameters, and click [Hide Detail] to hide the parameters. Fill in the Min/Max range values of the source in the Reference column. Fill in the Min/Max range values after scaling in the Output column. If needs offset, fill the offset value in the Offset item. Remember check “Enable” box.
Enable	Check the box of the variable can enable just that variable for scaling.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Bitwise:

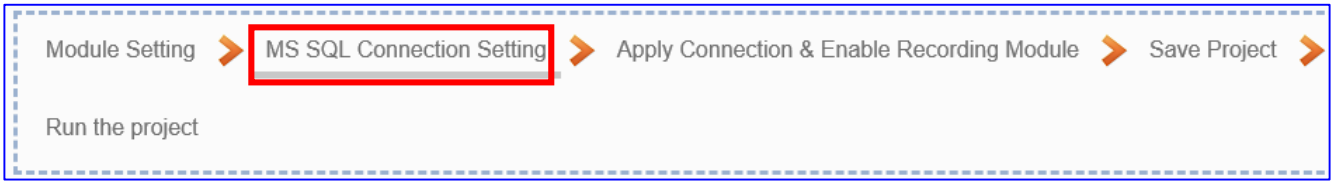
Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.

The M-7055D has no AI/AO, so here uses other module's setting screen as an example.



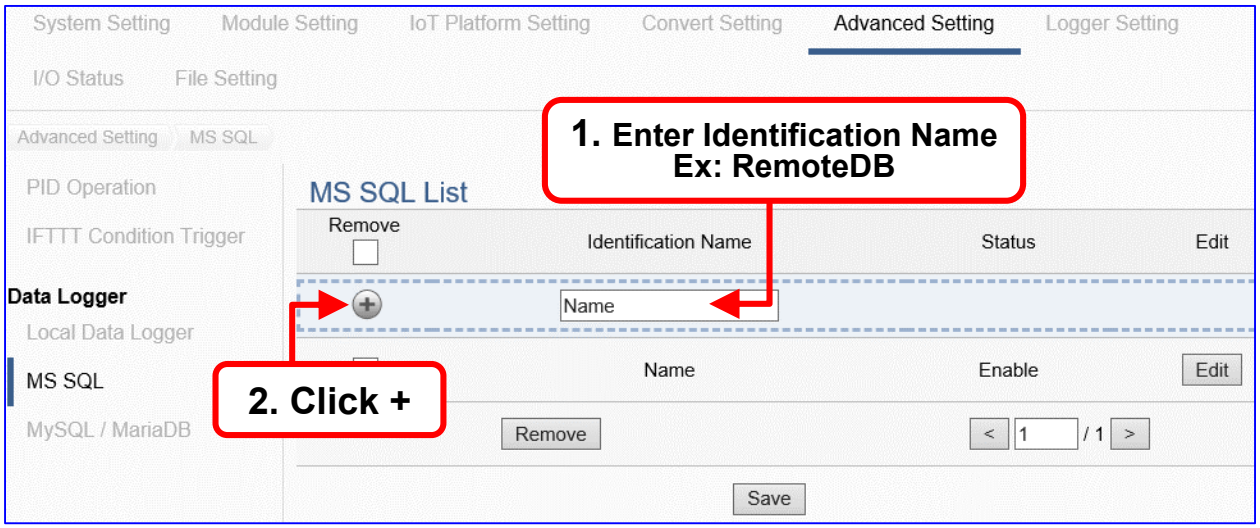
Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The Bit# variables of the Modbus address.
Bitwise	Set up the variables for Bitwise. Click [Advanced Settings] to set up the Bitwise parameters, and click [Hide] to hide the parameters. Fill in the variable names to the Bit# that wanted to do the Bitwise. The value in the fixed bit number will be assigned into the variable.
OK	Click to save this page settings and back to the module list page.

Step 2. MS SQL Connection Setting

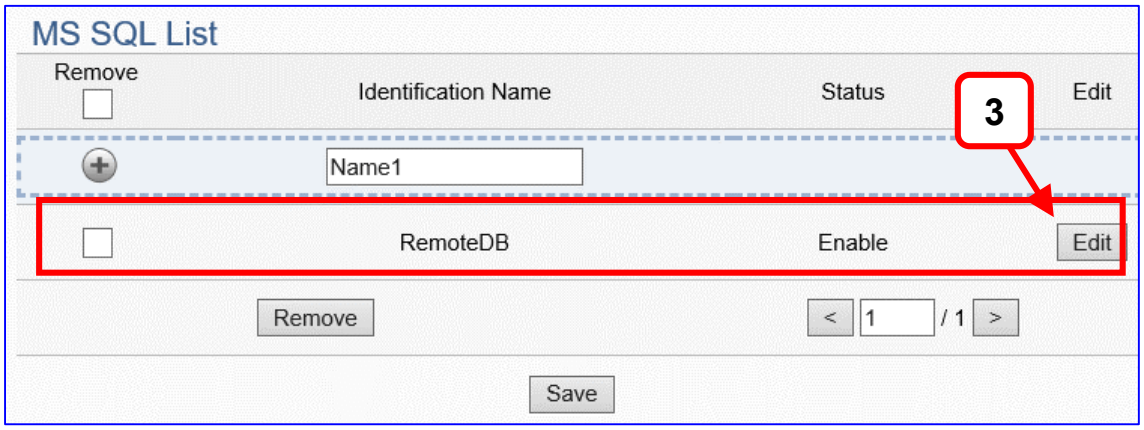


Click the next step, and enter the **Step 2 [MS SQL Connection Setting]** of the UI setting.
This page is for setting the connecting remote database.

We select the “Modbus TCP / Remote Database” at the beginning, so this step will auto enter the [**Advanced Setting > Data Logger > MS SQL**] Setting. The “Step Box” will prevent the user from selecting the wrong platform.

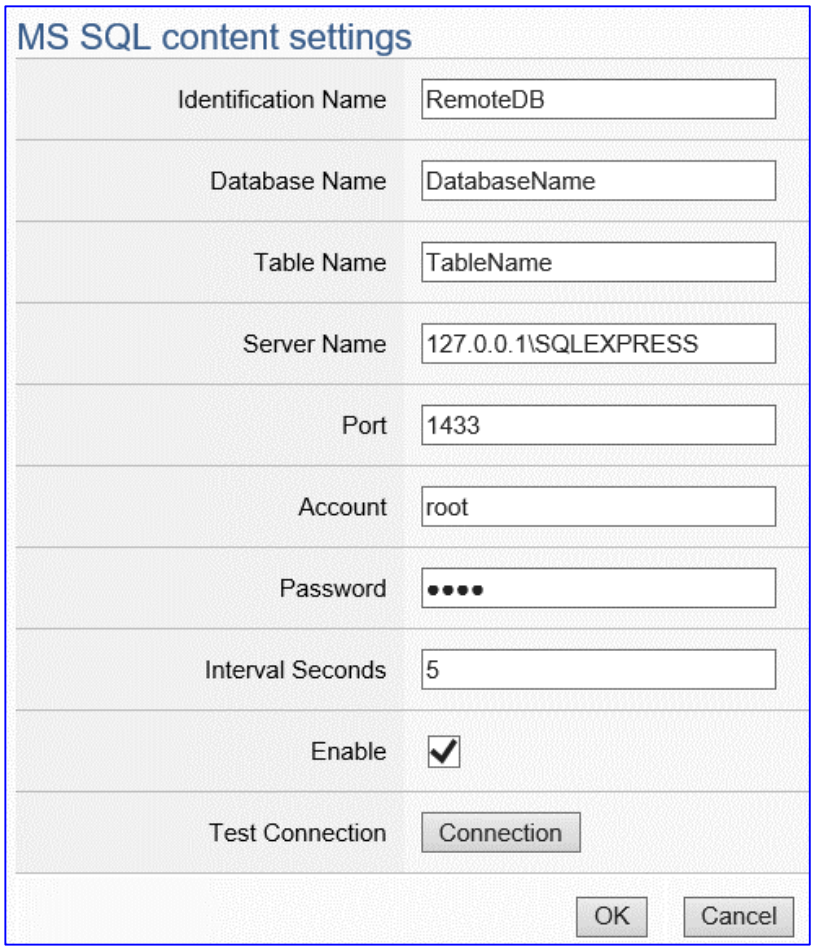


Add a database identification name (Ex: RemoteDB) as below, and then click [**Edit**] button to enter the “MS SQL Content Setting” page.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

[**MS SQL Content Setting**] can set up the database relational setting.

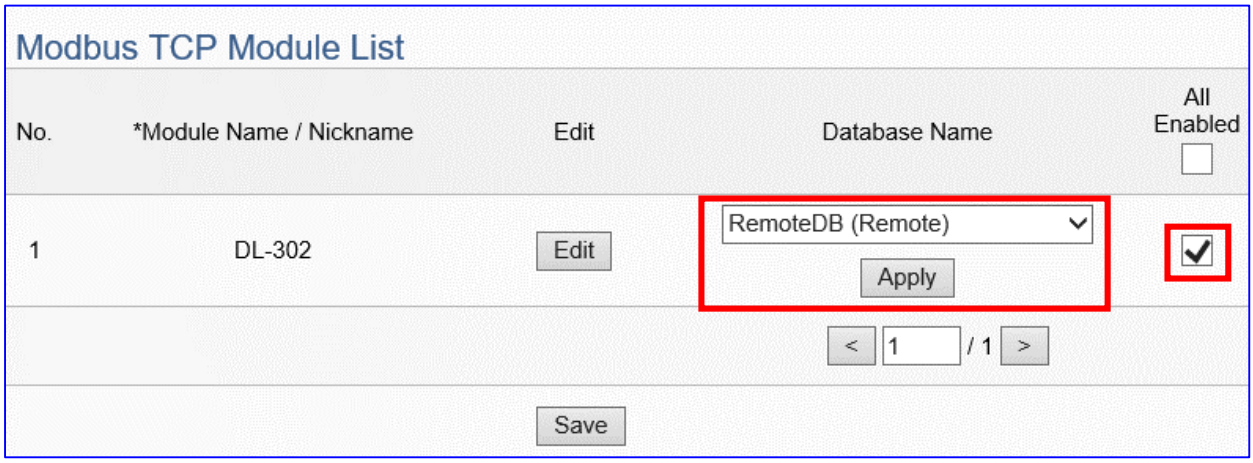


Advanced Setting > Data Logger > MS SQL – Content Setting	
Identification Name	User defined name to identify the database.
Database Type	Select the MSSQL type for the Microsoft SQL database.
Database Name	The name of the remote database.
Table Name	The table name of the remote database.
Server Name	The Server IP and name of the remote database.
Port	The port to link with database. Default: 1433 (for MS SQL)
Account	The login name of the remote database.
Password	The login password of the remote database.
Interval Seconds	Set up the interval time to save the I/O data to the remote database. Unit: Second.
Enable	Check to enable the data logger to the remote database. Default: check.
Test Connection	Click to test the connection to the remote database. Result: Success or Failure.
OK / Cancel	Click “OK” to save the settings of this page. Click “Cancel” to exit the setting page without saving.

Step 3. Apply Connection & Enable Recording Module

Click the next step, and enter the **Step 3 [Apply Connection & Enable Recording Module]** UI setting. This step is to enable the Modbus TCP module and connection. We select the “Modbus TCP /MS SQL” of “Data Log” at the beginning, so this step will auto enter the [**Logger Setting > MS SQL > TCP Module (Master)**] setting page. The “Step Box” will prevent the user from selecting the wrong platform.

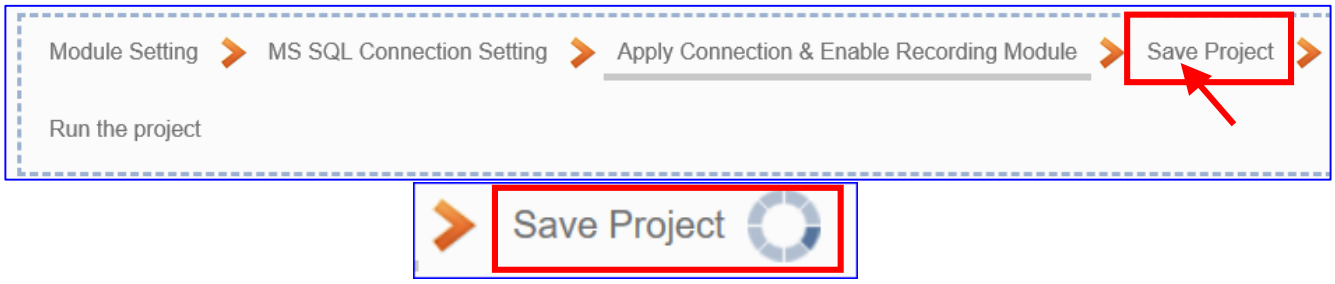
Here **select** and **apply** the Database name (Ex: RemoteDB), and **enable** the DL-302.



Logger Setting > MS SQL > TCP Module (Master)	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
Edit	If user wants to enable some I/O channels for data logger, click [Edit] of that module to enter the “Content Setting”. It is normal to set all channels as enabled, and the function will not affect the unconnected channels.
Database Name	Select and apply the recording remote database name.
All Enabled	Check [All Enabled] box to enable all modules in list for data logger. Default: Uncheck. Check the “box” of each module can enable just that module for data logger.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

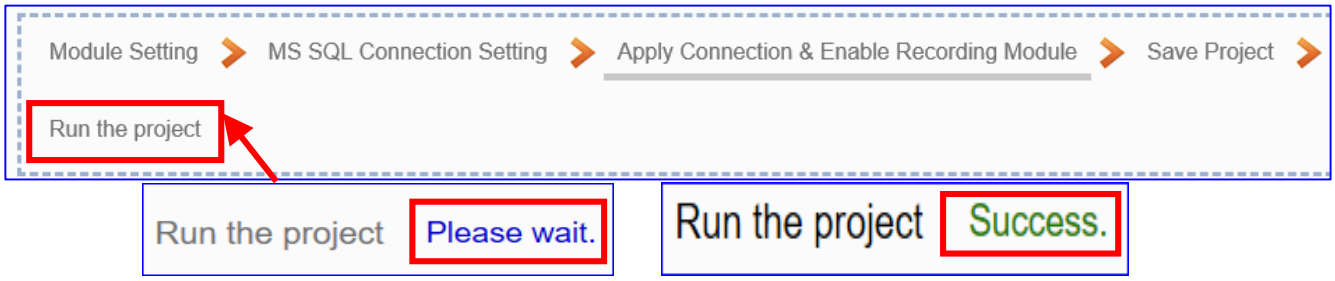
Step 4. Save Project

The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.



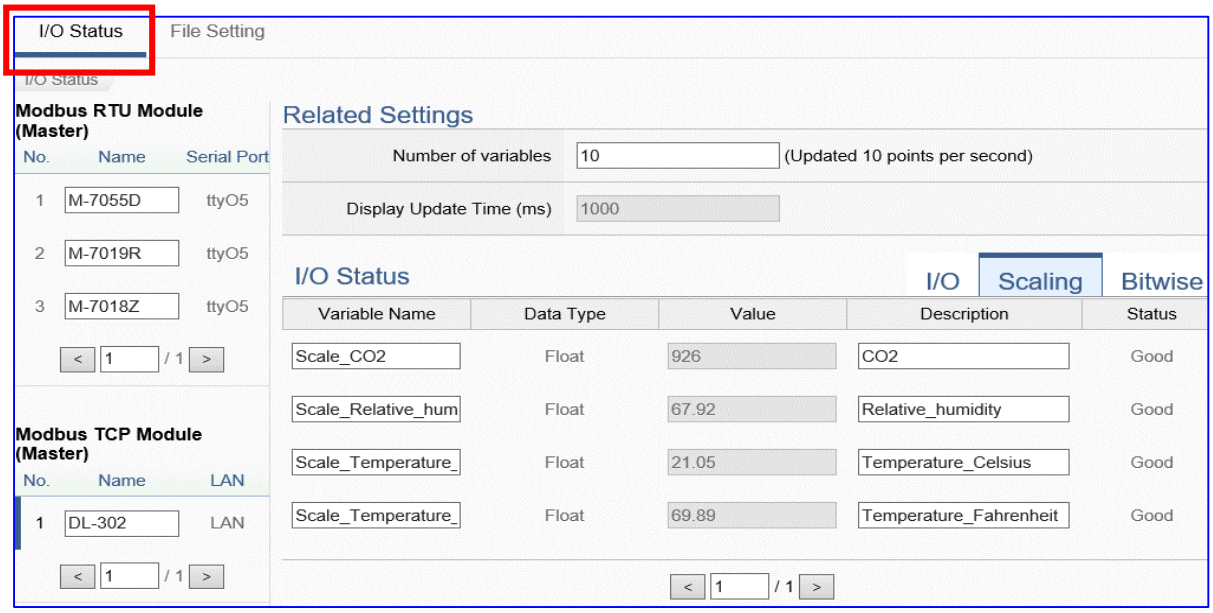
Step 5. Run the Project

The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.

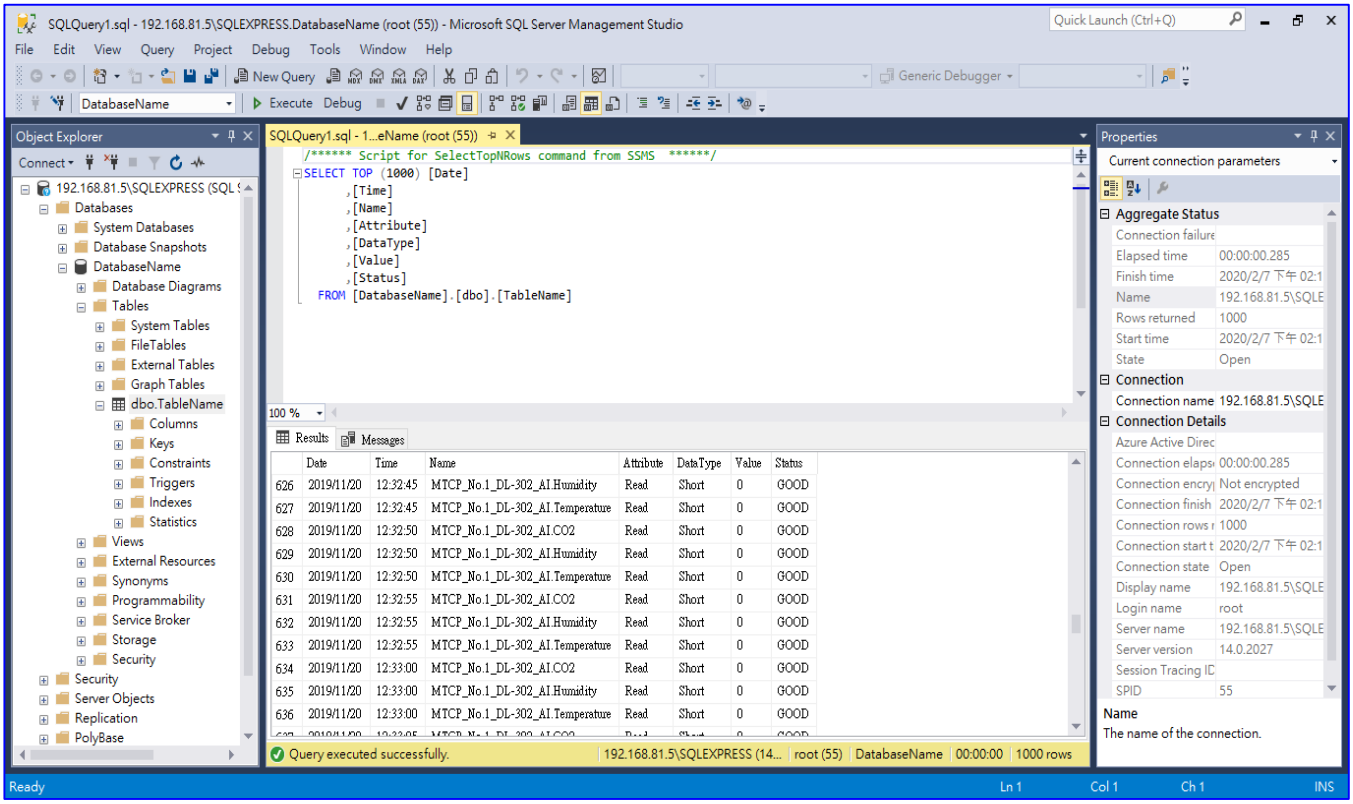


When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

The new project now completes the setting, uploading and running in the UA controller and can process the new project communication. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.



The following picture is the connection screen view of the **MS SQL Remote Database.**

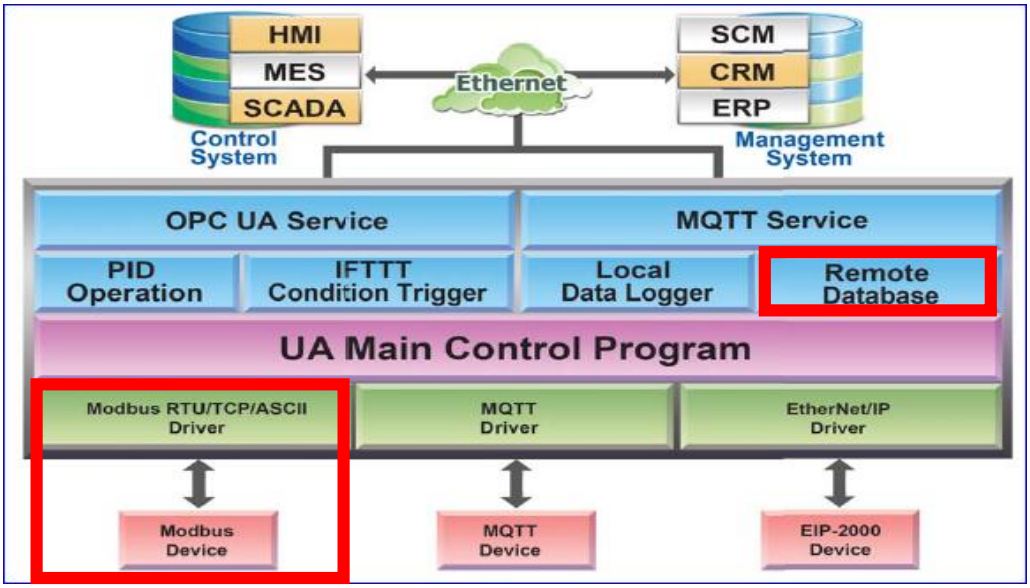


4.3.3. Function Wizard: Modbus / MySQL(MariaDB) (RTU Example)

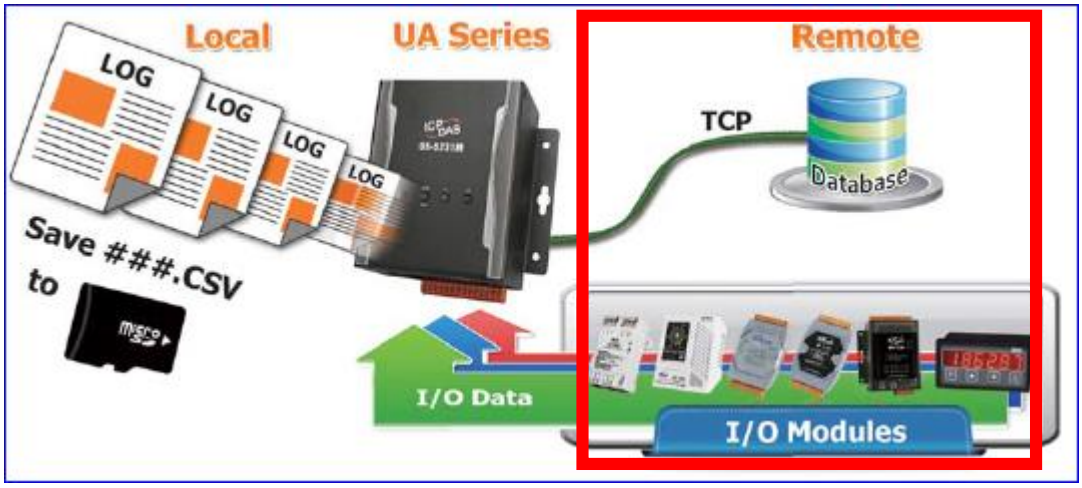
UA Data Logger supports to collect devices I/O status and then directly write into remote side MySQL/MariaDB Database for the Big Data analysis.

The connection steps for MySQL and MariaDB is the same, so here will introduce them together. The Modbus / MySQL and MariaDB Remote Database settings include Modbus RTU and TCP. Here will introduce Modbus RTU as the setting sample.

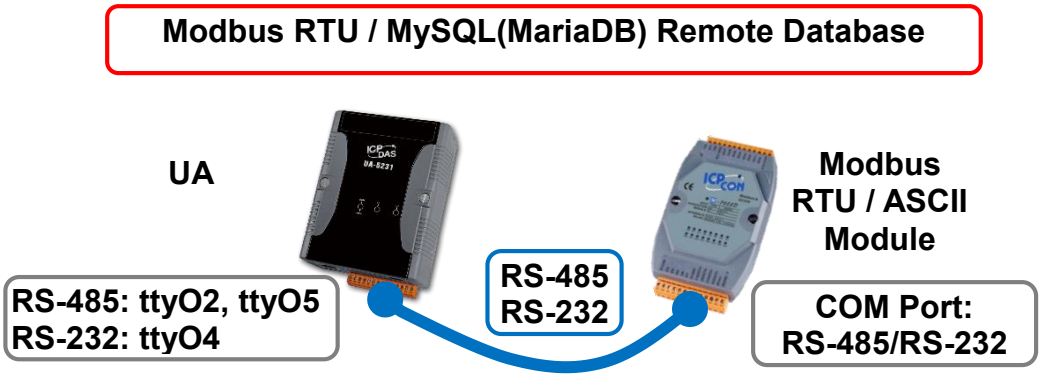
Modbus / Remote Database Function Diagram:



Application Solution:

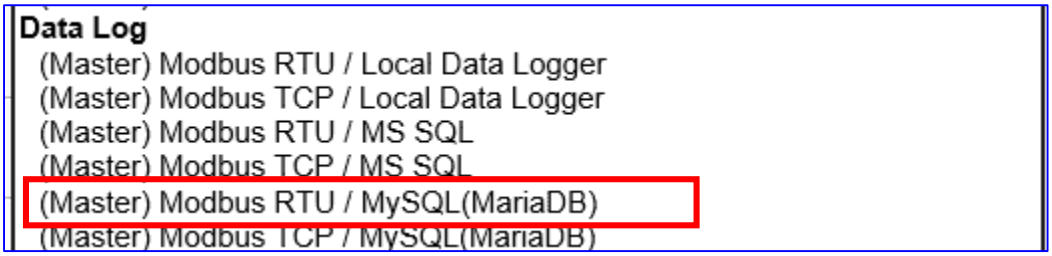


- **Modbus RTU / MS SQL Remote Database**



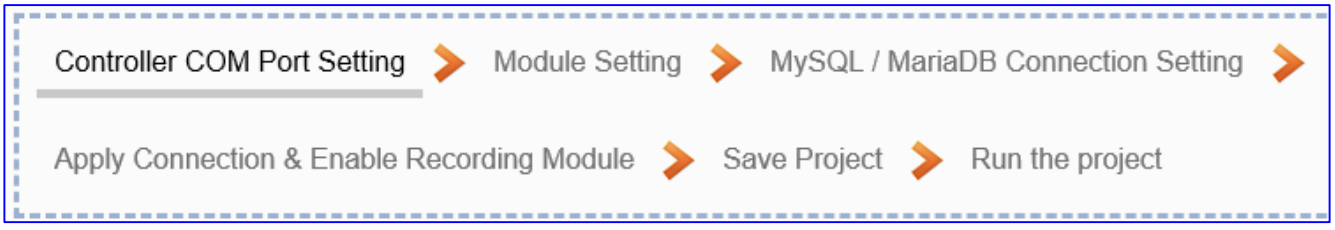
Note: The hardware/network connection methods please see the Chapter 2.

When UA series controller connects the Modbus RTU module (via RS-485/232, as the picture), user can choose the item [**Modbus RTU / MySQL(MariaDB**] of the "Data Log" in the Function Wizard.



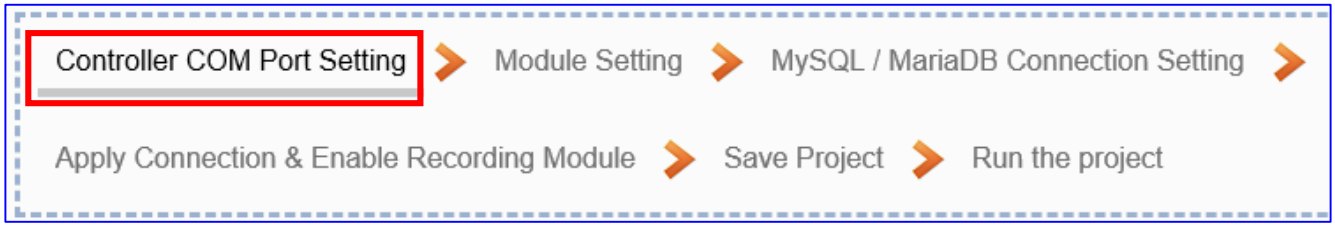
[Step Box]:

The Step Box of the [**Modbus RTU / MySQL(MariaDB**] has 6 steps. When enabling the Step Box, it auto enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the "Step Box" step-by-step and then can complete the project quickly and rightly.

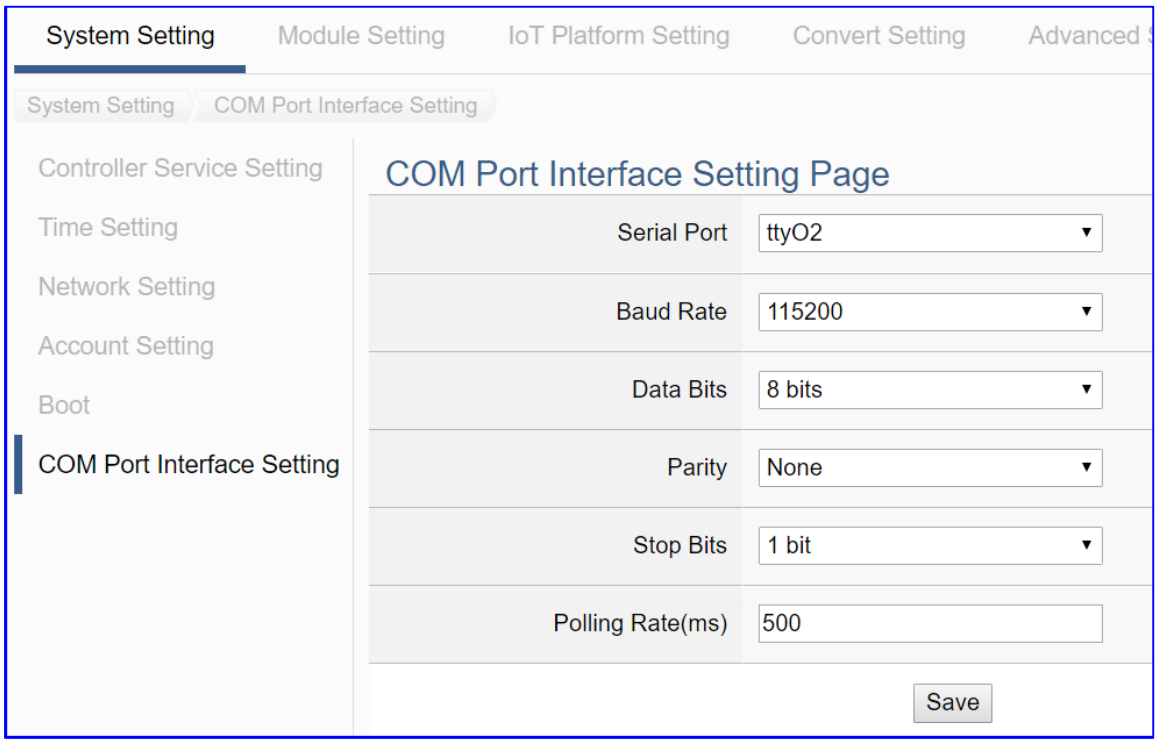


This example: UA-5231M-4GE via ttyO2 port to connect the device M-7026.

Step 1. Controller COM Port Setting

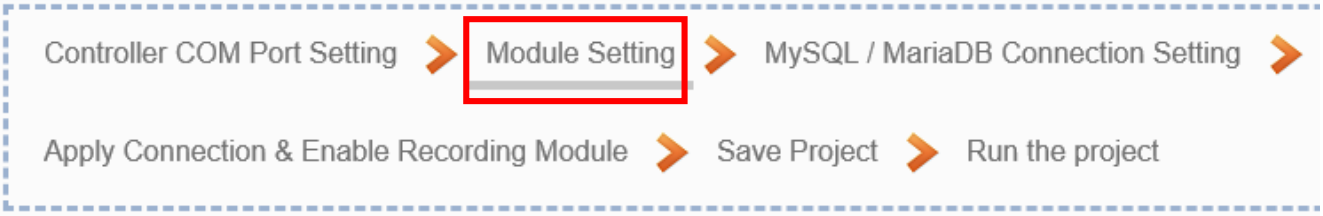


This page allows display and set the COM port interface of the controller for the RS-232/RS-485 serial communication. The user can find the default communication values of our I/O modules from the module CD, manual or I/O Module website.

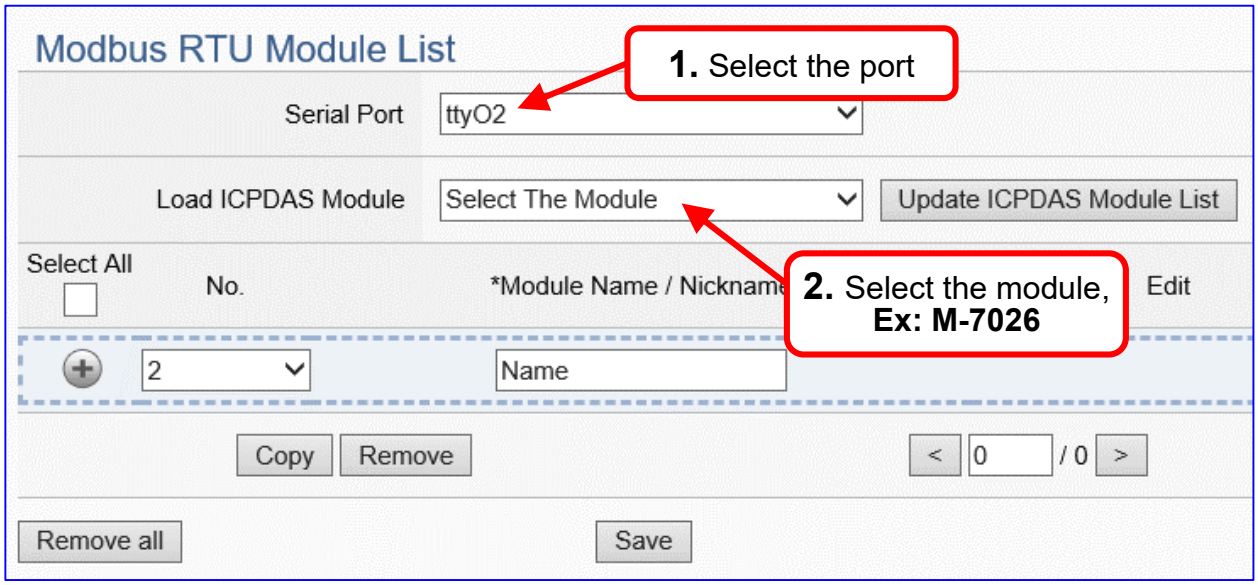


COM Port Interface Setting Page	
Serial Port	Choose the serial port of UA controller that links with the I/O module. ttyO2: RS-485 ; ttyO4: RS-232 ; ttyO5: RS-485
Baud Rate	Choose a baud rate to communicate with the module: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. The UA controller and the I/O module need have the same baud rate.
Data Bits	The number of bits used to represent one byte of data: 7 bits or 8 bits. Default: 8 Bits.
Parity	Choose one way for the parity checking. Options: None, Even, and Odd. Default: None.
Stop Bits	Choose the number of stop bit: 1 bit or 2 bits. Default: 1.
Polling Rate(ms)	Set a time interval for the command. Default: 500 ms
Save	Click [Save] button could save the settings of this page.

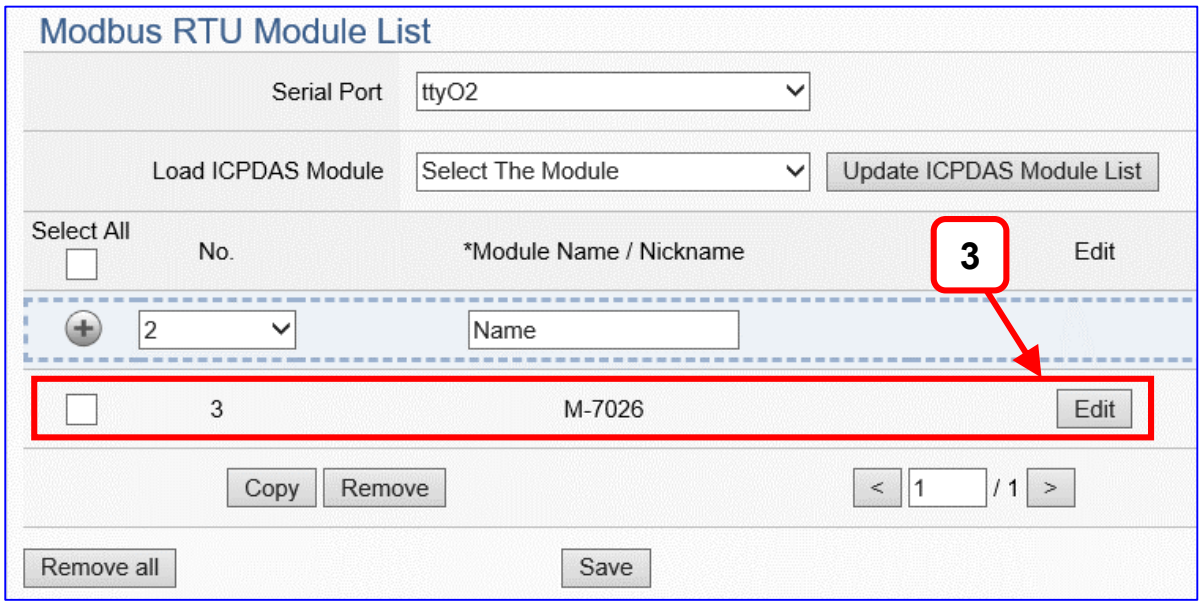
Step 2. Module Setting



It auto-enter the first step, **Step 2 [Module Setting]** of the UI setting.
This page is for setting the communication values with the connected modules. First check the port that connected with the module, and each module can give a name (Default name: Name). Click [ ] button could add a new module, and then click [Edit] button to configure the module content and the Modbus mapping table.

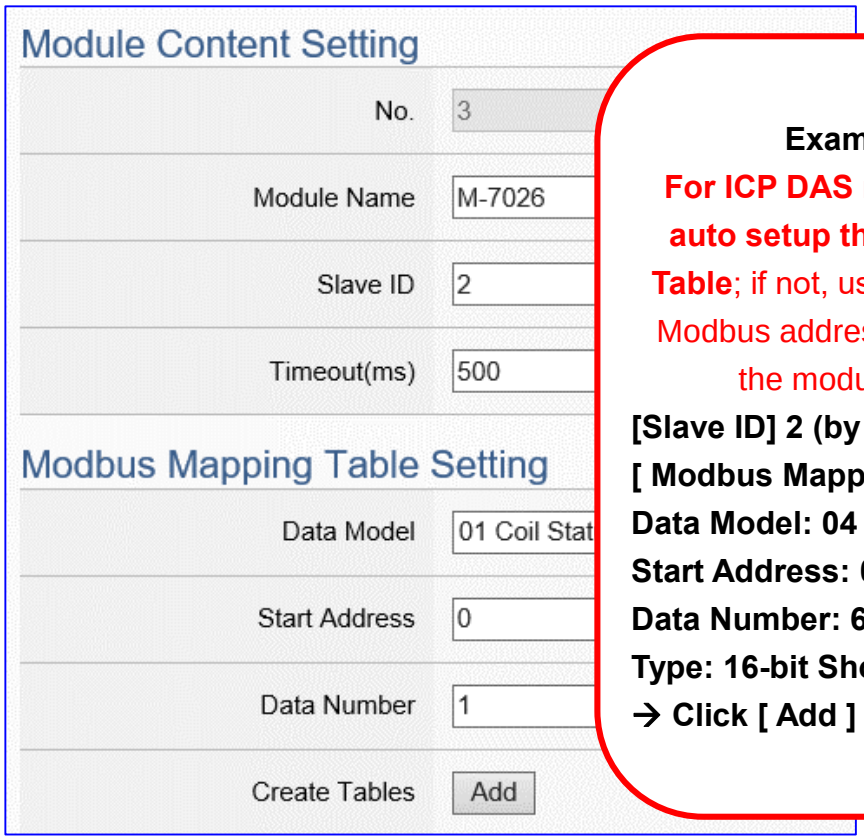


The module (No.: 1, Name: M-7026) is as below, and then click [Edit] button to enter the "Module Content Setting" page.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

[**Module Content Setting**] page can set up the module and the Modbus mapping table:



Example: M-7026

For ICP DAS module, system will auto setup the Modbus Mapping Table; if not, user needs to check the Modbus address or I/O number from the module user manual.

[Slave ID] 2 (by user's real case)

[Modbus Mapping Table Setting]

Data Model: 04 Input Registers(3x)

Start Address: 0

Data Number: 6

Type: 16-bit Short

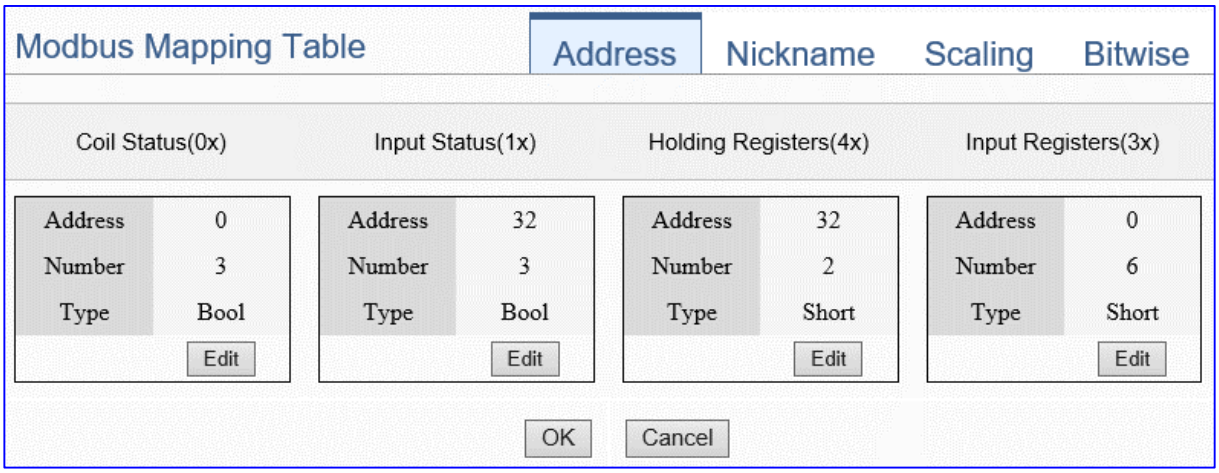
→ Click [Add]

Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Slave ID	Set the module Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models "01" ~ "04" for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

The finished Modbus Mapping Table as below is in order of mapping DO, DI, AO & AI.

Address:

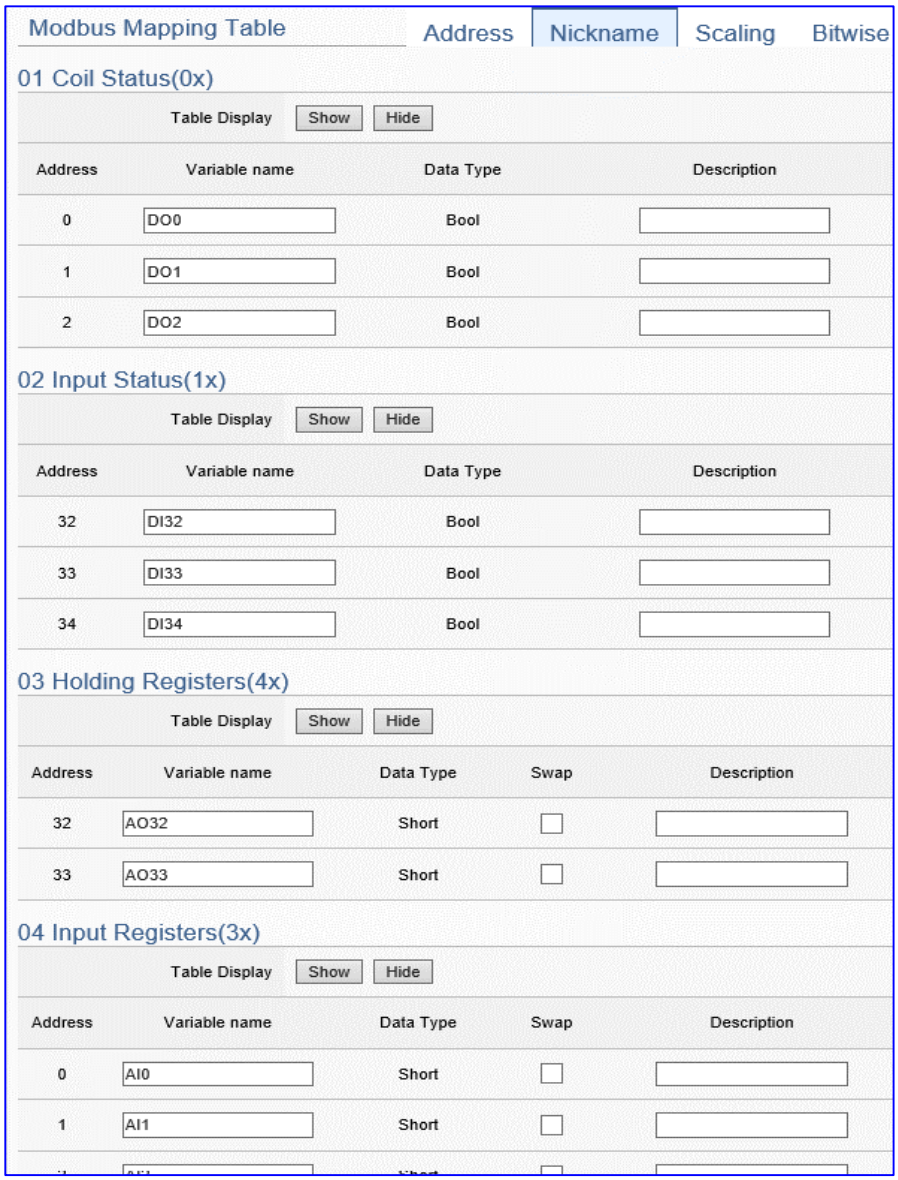
Display and edit the Modbus Mapping Table.



Modbus Mapping Table – Address Setting	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname:

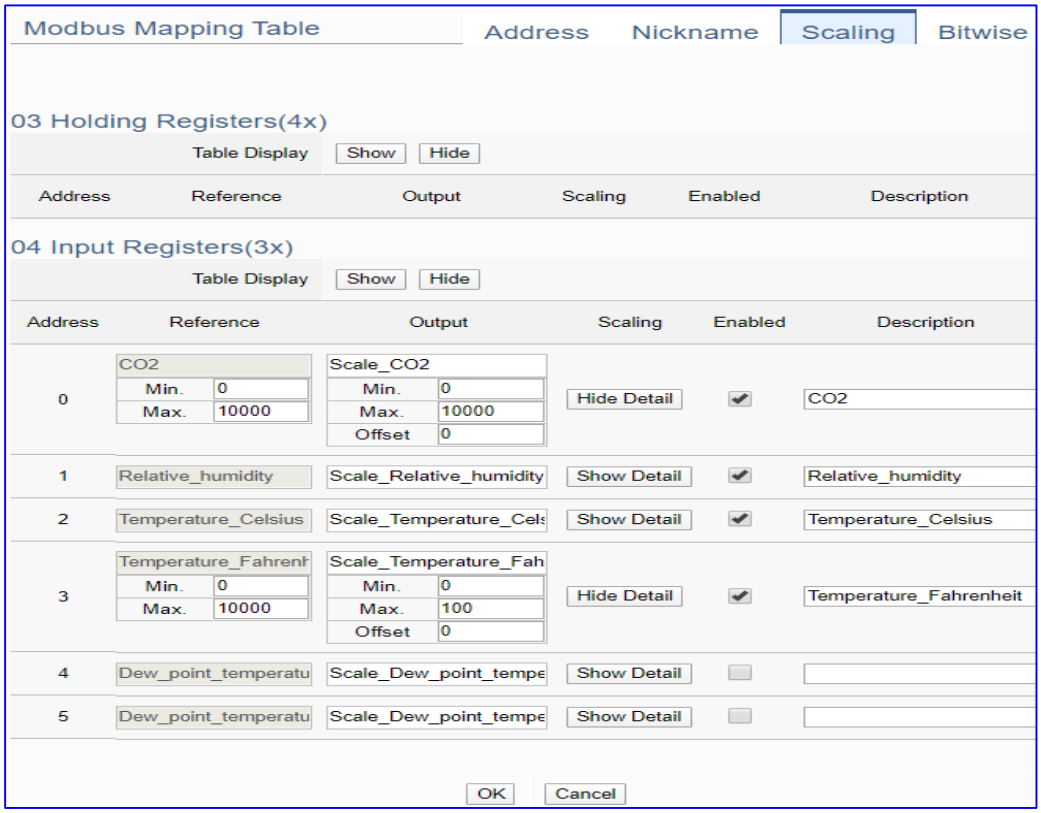
Setting the variable nickname and description.



Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Scaling:

Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated. The M-7055D has no AI/AO, so here uses the screen of DL-302 for an example.

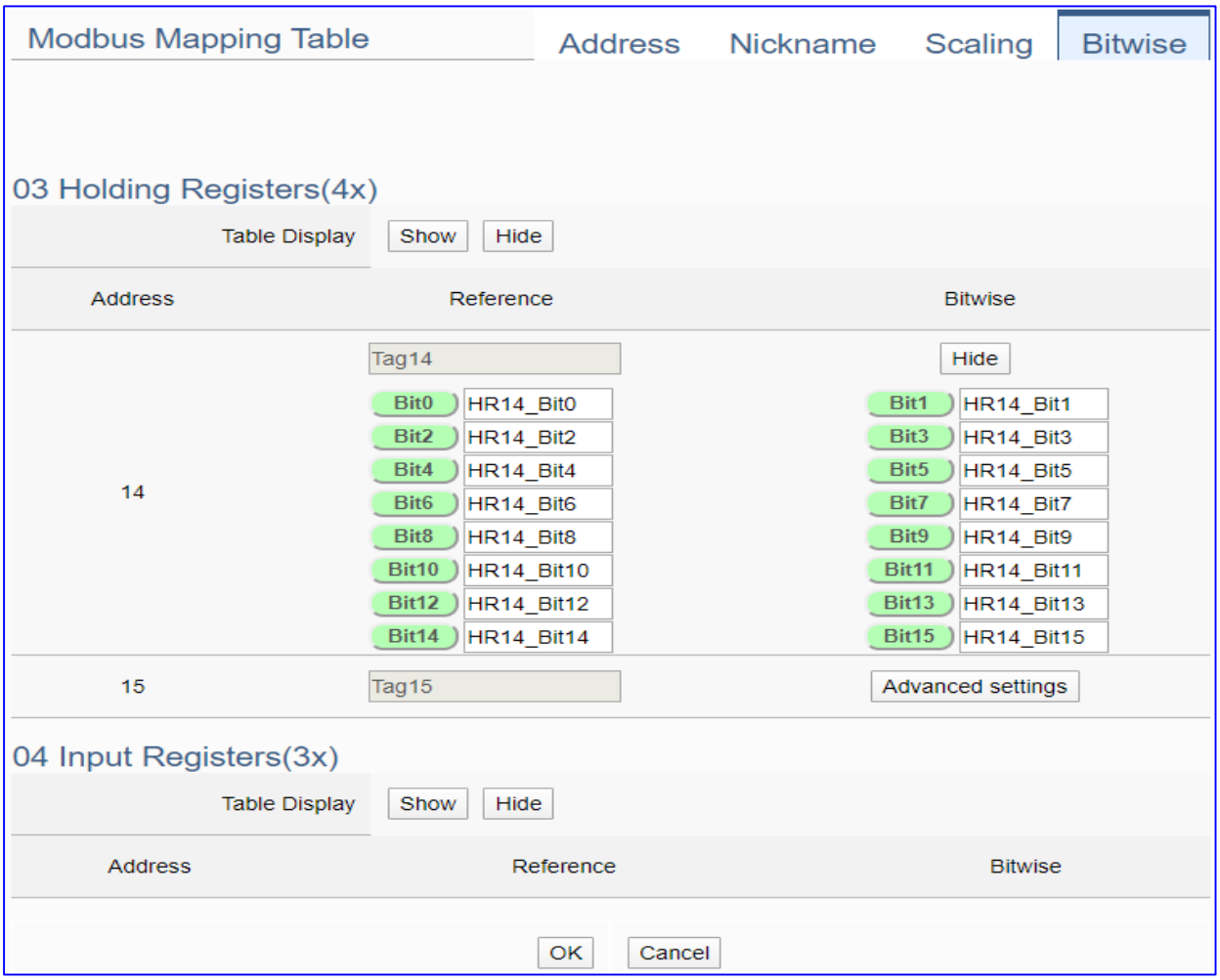


Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The I/O variable of the Modbus address.
Output	The scaling variable for scaling output. User can define the variable name.
Scaling	Click [Show Detail] to set up the Scaling parameters, and click [Hide Detail] to hide the parameters. Fill in the Min/Max range values of the source in the Reference column. Fill in the Min/Max range values after scaling in the Output column. If needs offset, fill the offset value in the Offset item. Remember check “Enable” box.
Enable	Check the box of the variable can enable just that variable for scaling.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Bitwise:

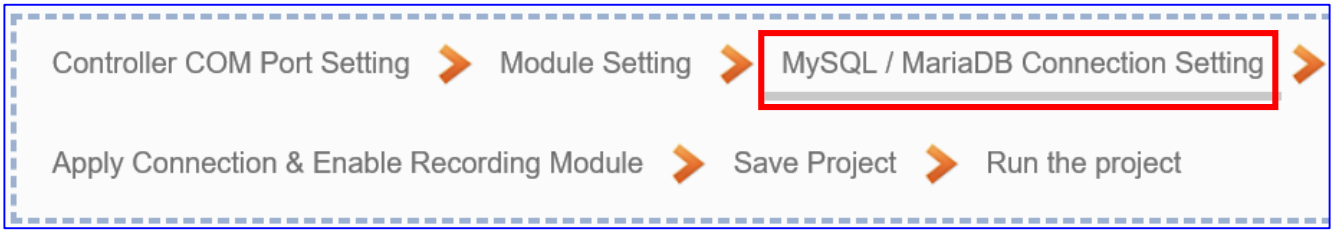
Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.

The M-7055D has no AI/AO, so here uses other module's setting screen as an example.



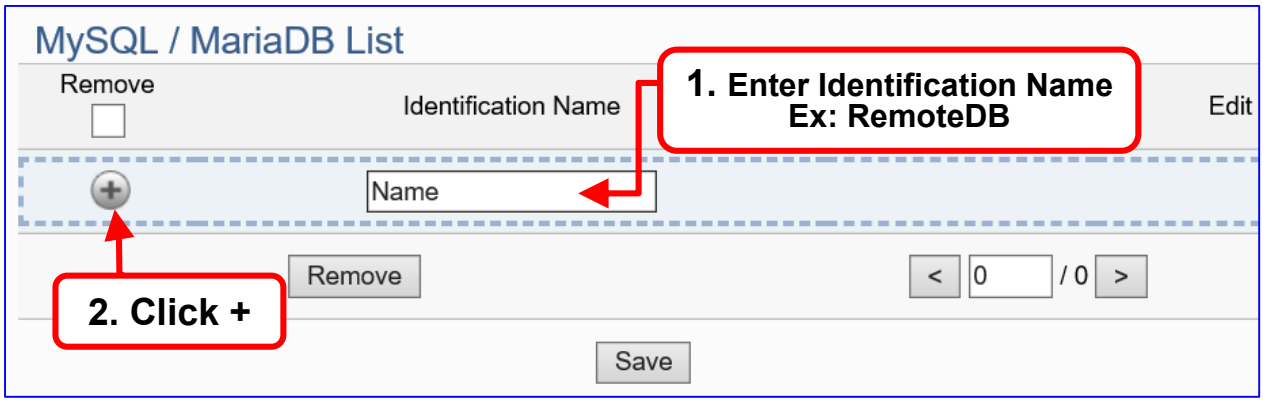
Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The Bit# variables of the Modbus address.
Bitwise	Set up the variables for Bitwise. Click [Advanced Settings] to set up the Bitwise parameters, and click [Hide] to hide the parameters. Fill in the variable names to the Bit# that wanted to do the Bitwise. The value in the fixed bit number will be assigned into the variable.
OK	Click to save this page settings and back to the module list page.

- **Step 3. MySQL/MariaDB Connection Setting**

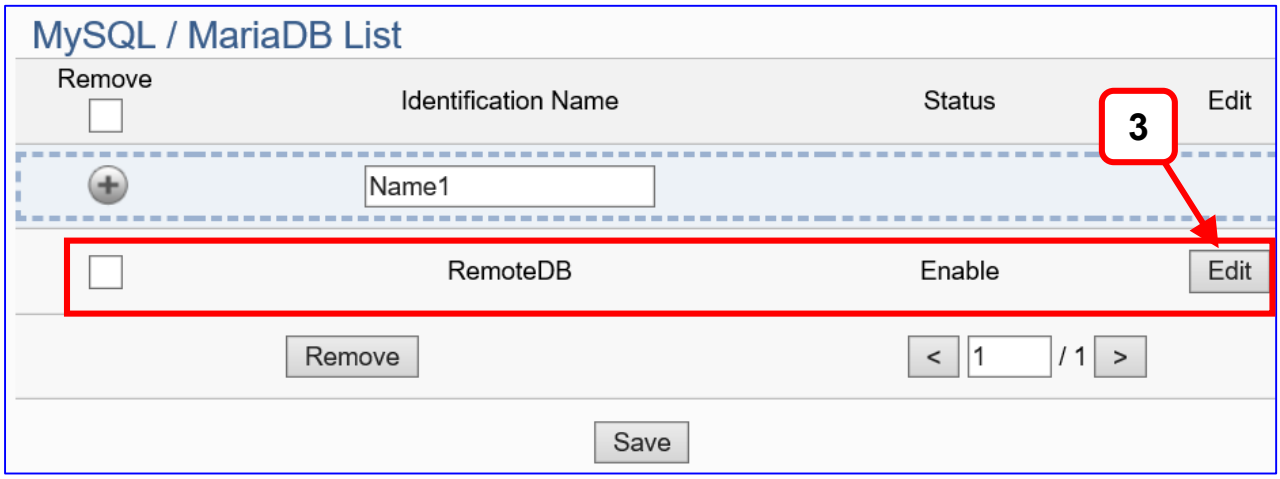


Click the next step, and enter the **Step 3 [MySQL/MariaDB Connection Setting]** of the UI setting. This page is for setting the connecting remote database.

We select the “Modbus TCP / Remote Database” at the beginning, so this step will auto enter the [**Advanced Setting > Data Logger > MySQL / MariaDB**] Setting. The “Step Box” will prevent the user from selecting the wrong platform.



Add a database identification name (Ex: RemoteDB) as below, and then click [**Edit**] button to enter the “MySQL / MariaDB Content Setting” page.

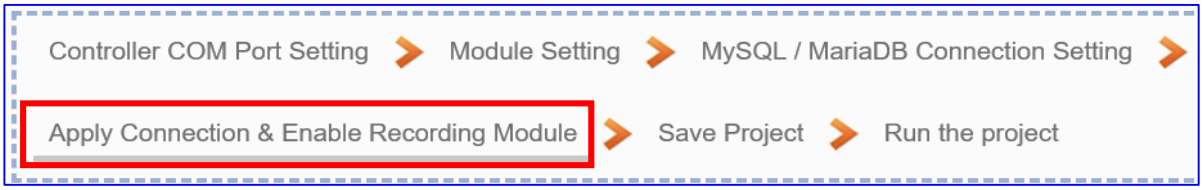


If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

[**MySQL / MariaDB Content Setting**] can set up the database relational setting.

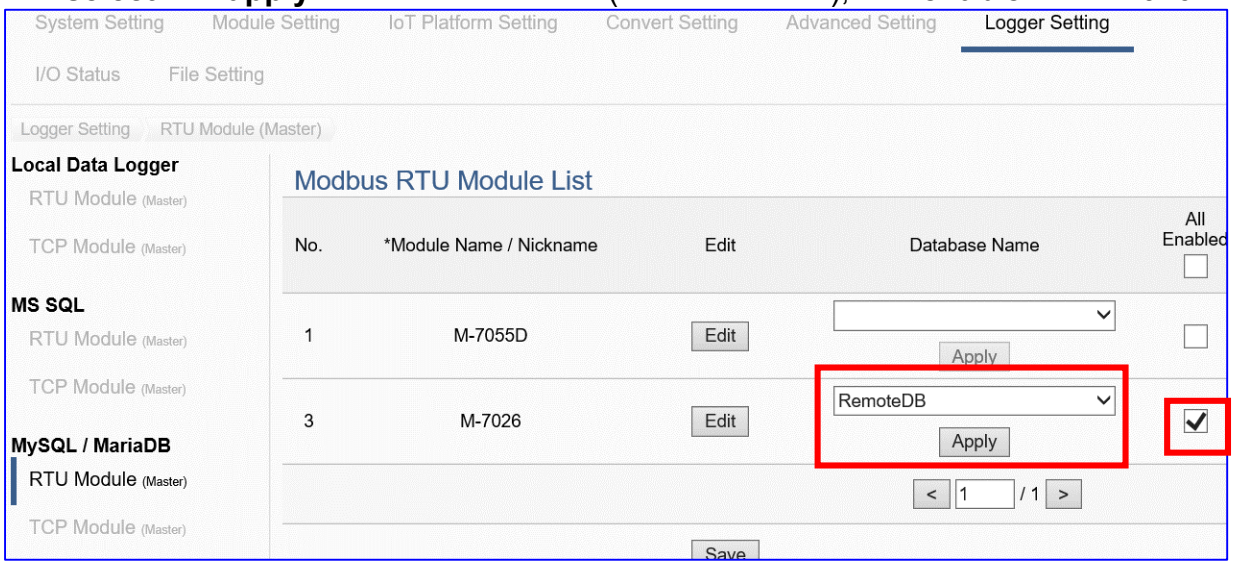
Advanced Setting > Data Logger > MySQL/MariaDB – Content Setting	
Identification Name	User defined name to identify the database.
Database Name	The name of the remote database. If the DB name not exist, it will create one DB.
Table Name	The IP address of the remote database. If the table name not exist, it will create one table.
IP	The Server IP and name of the remote database.
Port	The port to link with database. Default: 3306 (for MySQL), user defined.
Account	The login name of the remote database.
Password	The login password of the remote database.
Interval Seconds	Set up the interval time to save the I/O data to the remote database. Unit: Second.
Enable	Check to enable the data logger to the remote database. Default: check.
Test Connection	Click to test the connection to the remote database. Result: Success or Failure.
OK / Cancel	Click “OK” to save the settings of this page. Click “Cancel” to exit the setting page without saving.

Step 4. Apply Connection & Enable Recording Module



Click the next step, and enter the **Step 4 [Apply Connection & Enable Recording Module]** UI setting. This step is to enable the Modbus RTU module and connection. We select the “Modbus RTU /MySQL(MariaDB)” of “Data Log” at the beginning, so this step will auto enter the [**Logger Setting > MySQL/MariaDB > RTU Module (Master)**] setting page. The “Step Box” will prevent the user from selecting the wrong platform.

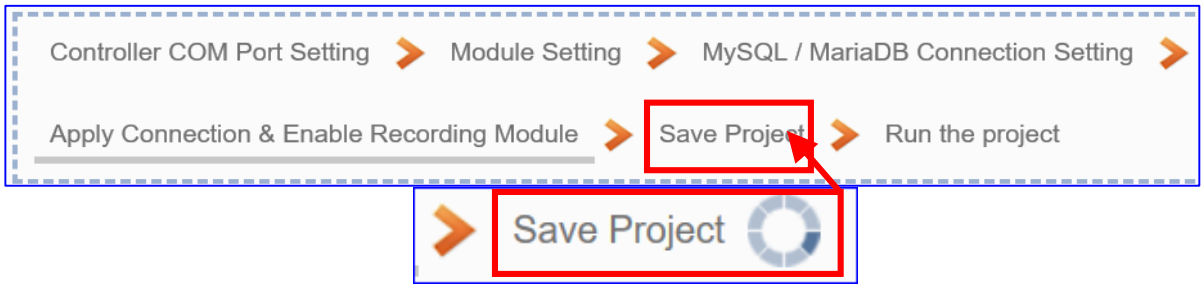
Here **select** and **apply** the Database name (Ex: RemoteDB), and **enable** the M-7026.



Logger Setting > MySQL/MariaDB > RTU Module (Master)	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
Edit	If user wants to enable some I/O channels for data logger, click [Edit] of that module to enter the “Content Setting”. It is normal to set all channels as enabled, and the function will not affect the unconnected channels.
Database Name	Select and apply the recording remote database name.
All Enabled	Check [All Enabled] box to enable all modules in list for data logger. Default: Uncheck. Check the “box” of each module can enable just that module for data logger.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

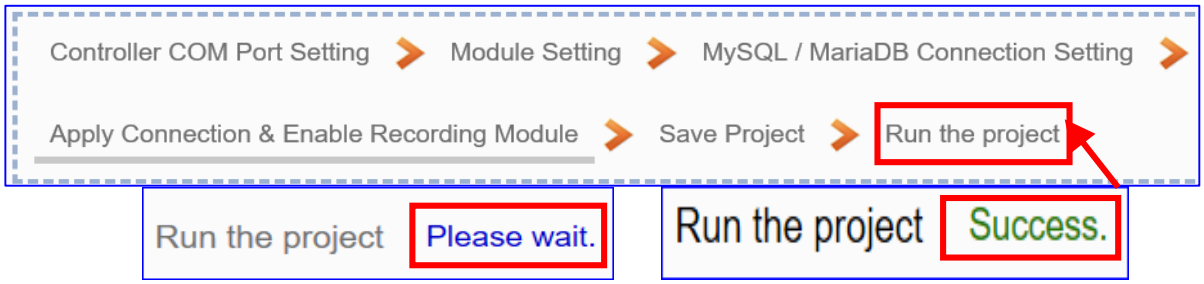
Step 5. Save Project

The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.



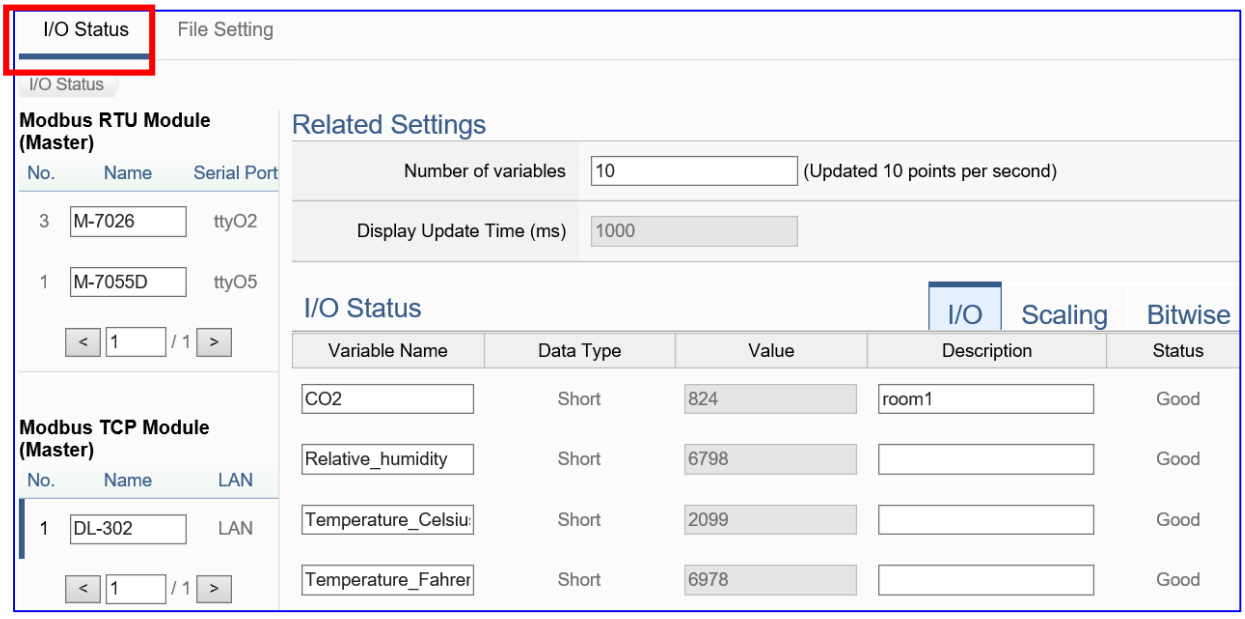
Step 6. Run the Project

The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.

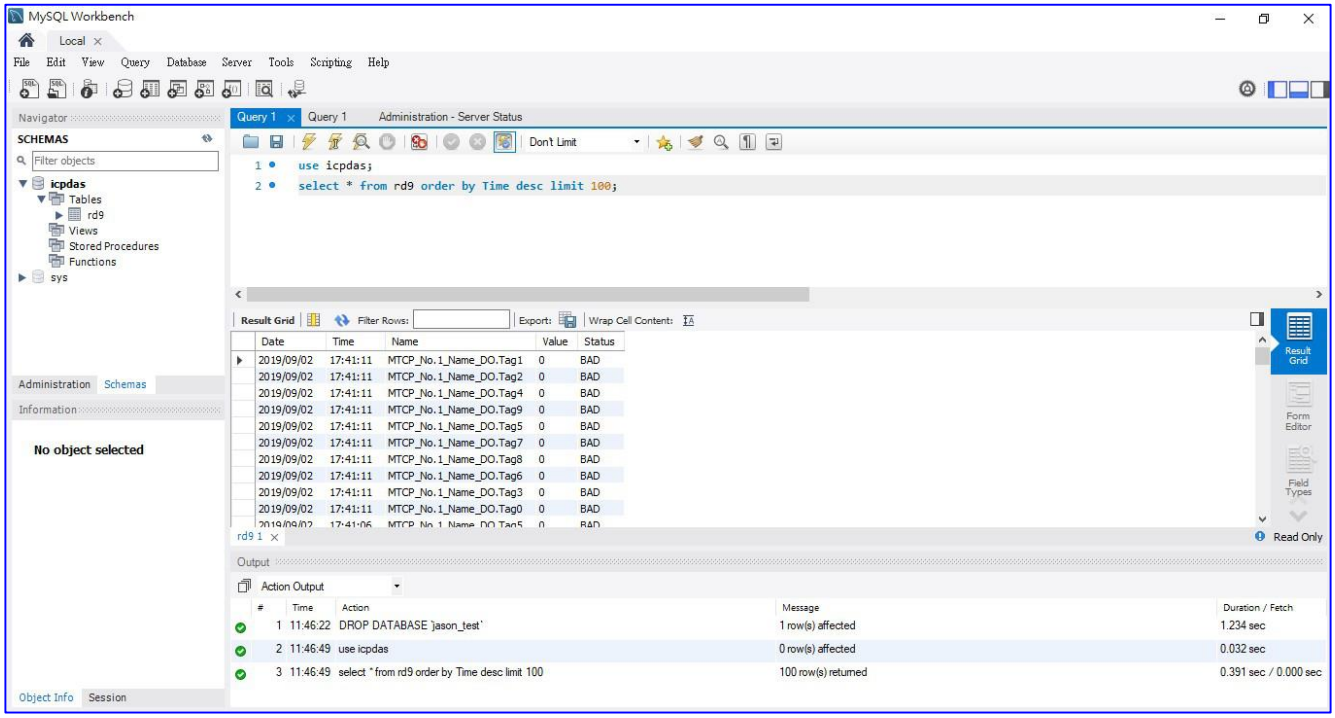


When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

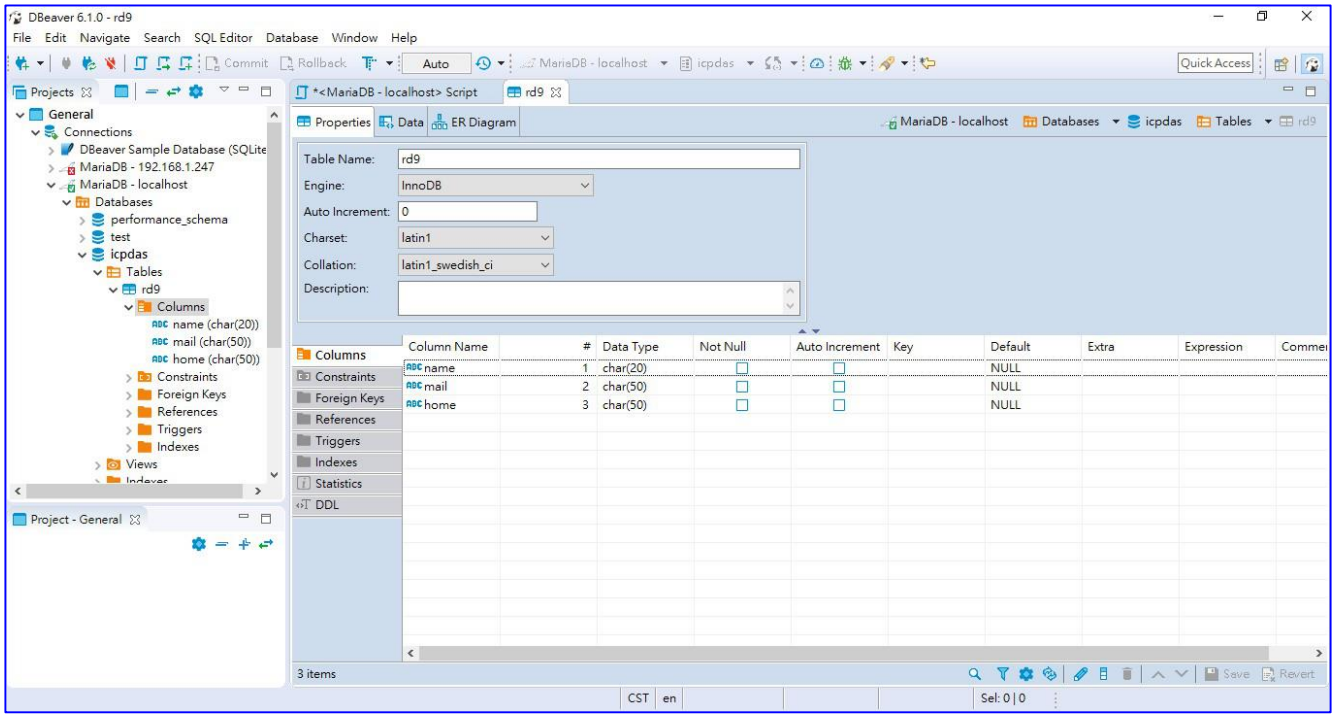
The new project now completes the setting, uploading and running in the UA controller and can process the new project communication. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.



The following picture is the connection screen view of the **MySQL Remote Database.**



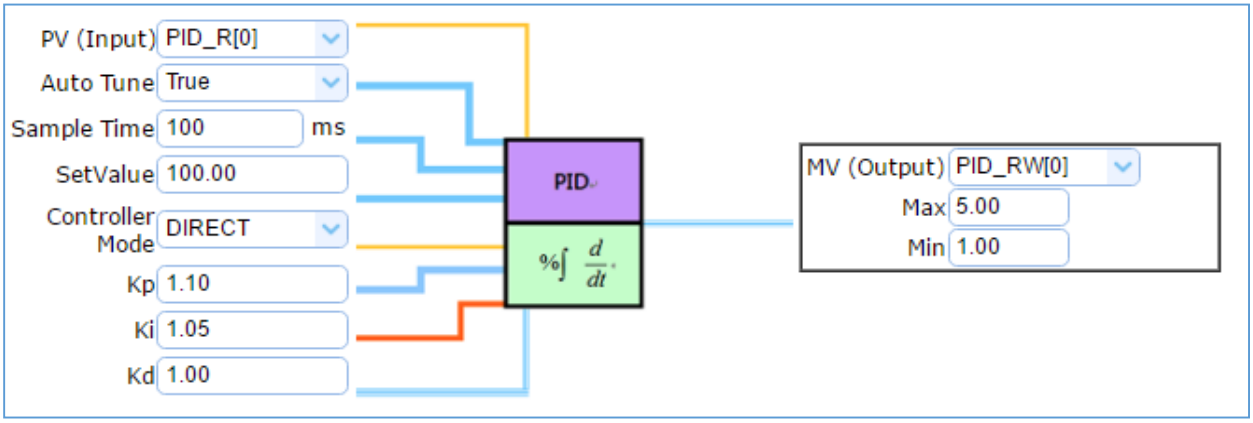
The following picture is the connection screen view of the **MariaDB Remote Database.**



4.4. PID

PID (Proportional-Integral-Derivative) control is the most widely used in industrial control systems. A regulator that controlled in accordance with Proportional, Integral and Derivative is called PID control for short, also called PID regulator. When the user cannot fully grasp or measure parameters of the control system, the PID regulator is the best solution.

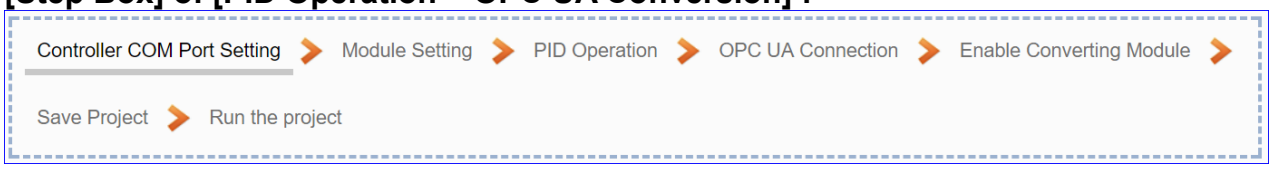
The PID controller is a common feedback loop component in industrial control applications. The controller compares the collected data with a reference value and then uses this difference to calculate a new input value whose purpose is to allow the system data to reach or remain at the reference value.



This section introduces the setting steps and the function parameters of the PID. There are 2 items about “PID” function in the “Function Wizard”. The 2nd item [PID Operation + OPC UA Communication Conversion] is combining the 1st item [PID Operation] and the Section 4.1.1 Modbus / OPC UA Conversion .

[Step Box] of [PID Operation] :

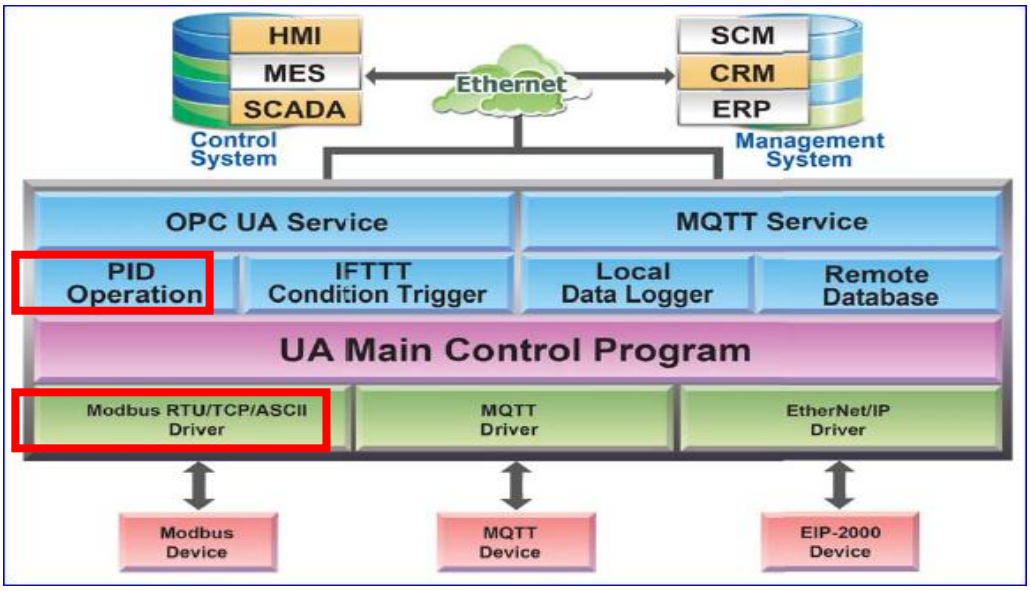
[Step Box] of [PID Operation + OPC UA Conversion] :



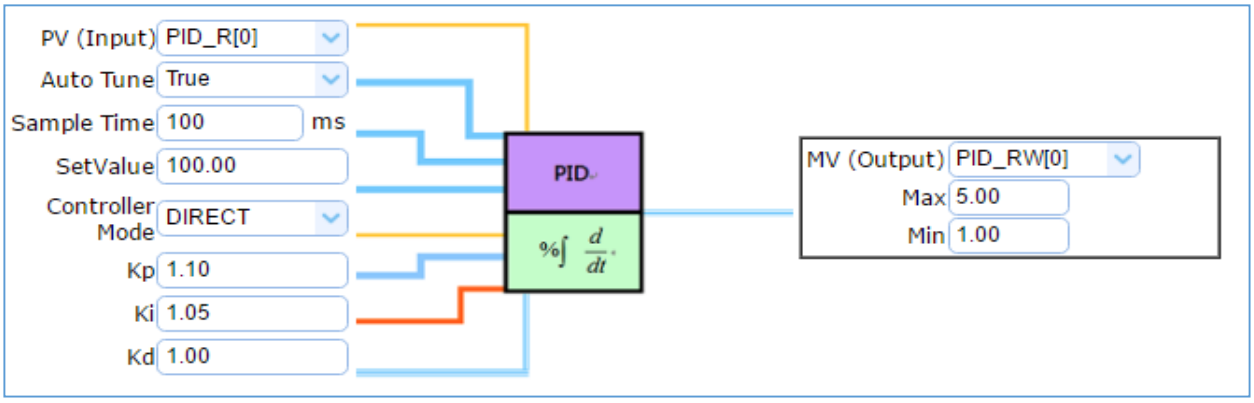
4.4.1. Function Wizard: PID Operation

In the PID Operation function, UA controller collects the module's data to operate via the feedback loop component of PID control. The controller compares the collected data with a reference value and then uses this difference to calculate a new input value whose purpose is to allow the system data to reach or remain at the reference value. This section will introduce the setting steps and the function parameters of the [PID Operation].

Function Diagram for PID Operation:



Application Solution Example:

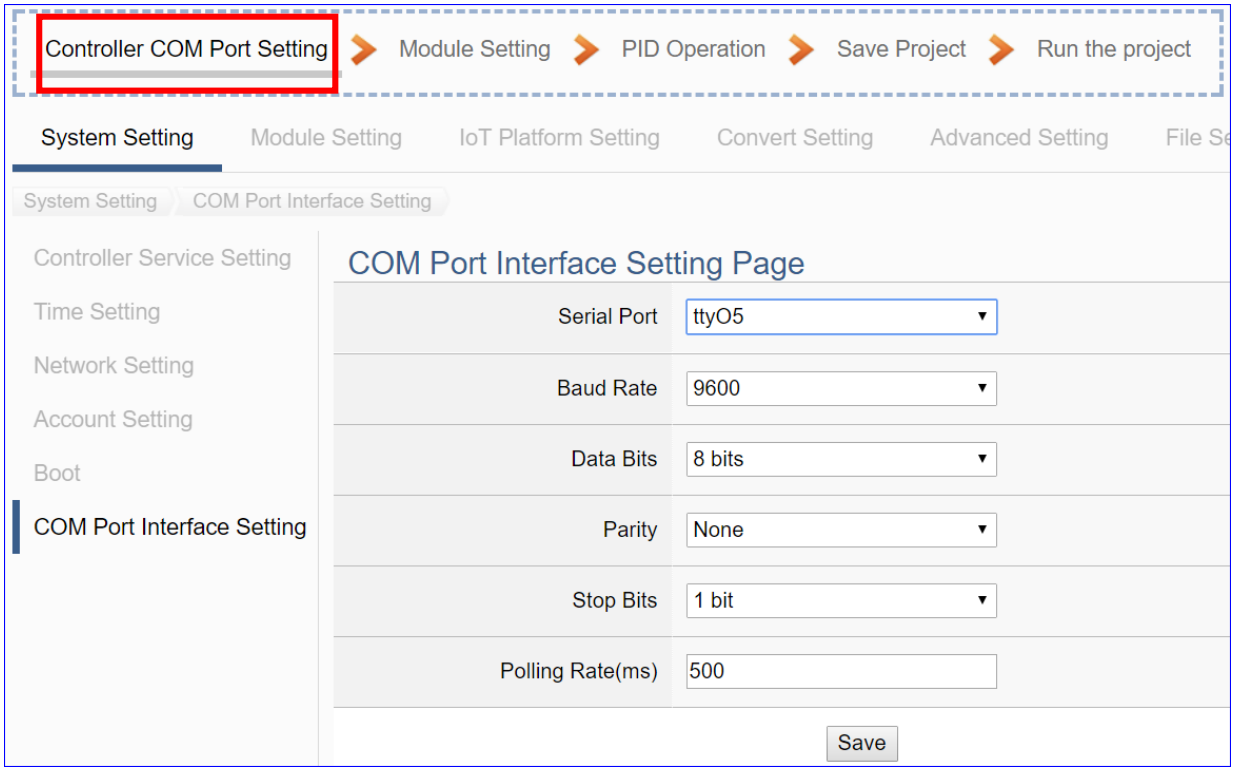


[Step Box]:

The Step Box of the [**PID Operation**] has 5 steps as below. When enabling the Step Box, it auto enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the "Step Box" step-by-step and then can complete the project.

Step 1. Controller COM Port Setting

This page allows display and set the COM port interface of the controller for the RS-232/RS-485 serial communication.
The user can find the default communication values of our I/O modules from the module CD, manual or I/O Module website.

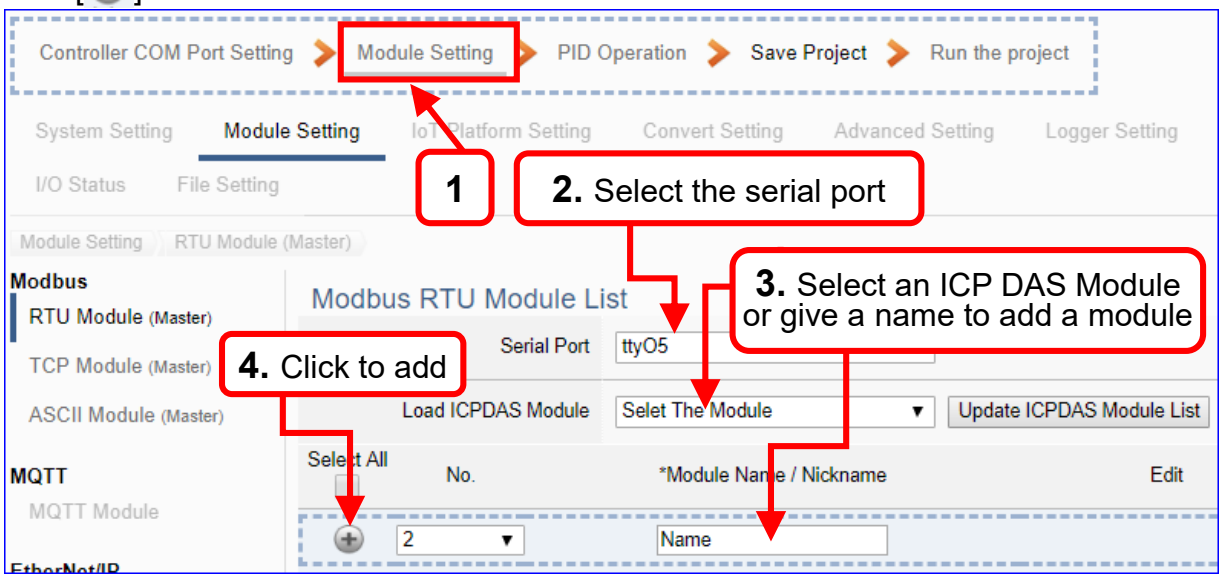


COM Port Interface Setting Page	
Serial Port	Choose the serial port of UA controller that links with the I/O module. ttyO2: RS-485 ; ttyO4: RS-232 ; ttyO5: RS-485
Baud Rate	Choose a baud rate to communicate with the module: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. The UA controller and the I/O module need have the same baud rate.
Data Bits	The number of bits used to represent one byte of data: 7 bits or 8 bits. Default: 8 Bits.
Parity	Choose one way for the parity checking. Options: None, Even, and Odd. Default: None.
Stop Bits	Choose the number of stop bit: 1 bit or 2 bits. Default: 1.
Polling Rate(ms)	Set a time interval for the command. Default: 500 ms
Save	Click [Save] button could save the settings of this page.

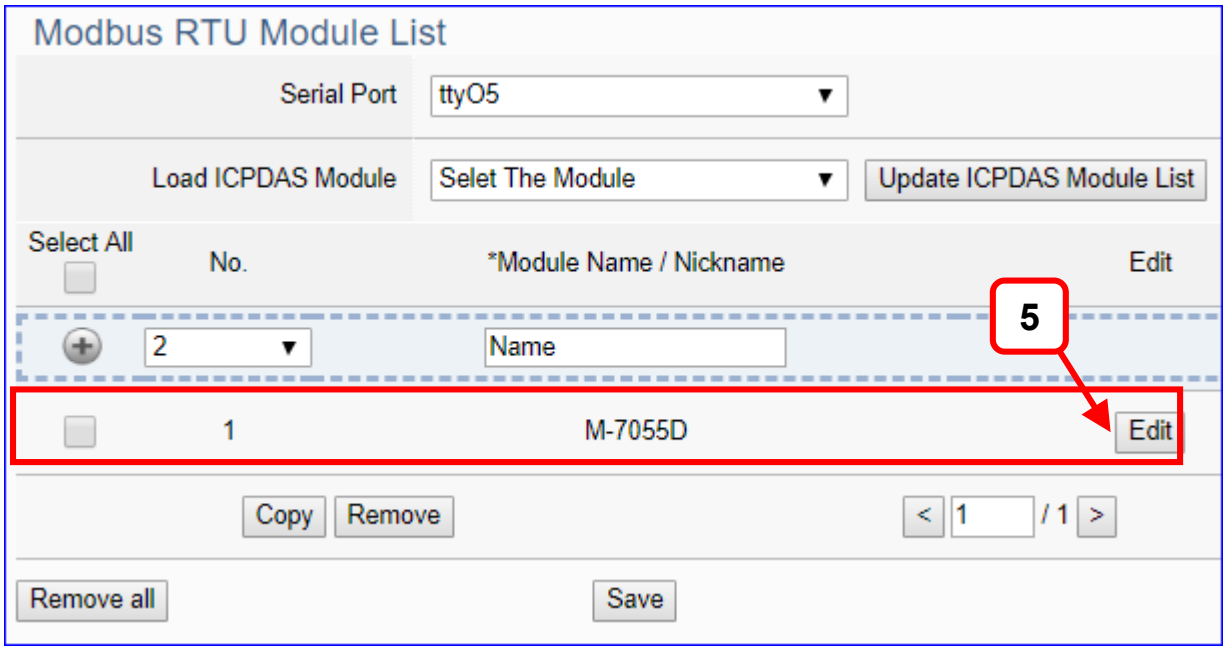
Step 2. Module Setting

Click the next step, and enter the **Step 2 [Module Setting]** of the UI setting. This page is for setting the communication values with the connected modules.

First, choose the serial port that connected with the module. If use ICP DAS module, select the model to auto load the module setting. If not, give a name (Default: Name), click [⊕] button to add a module.

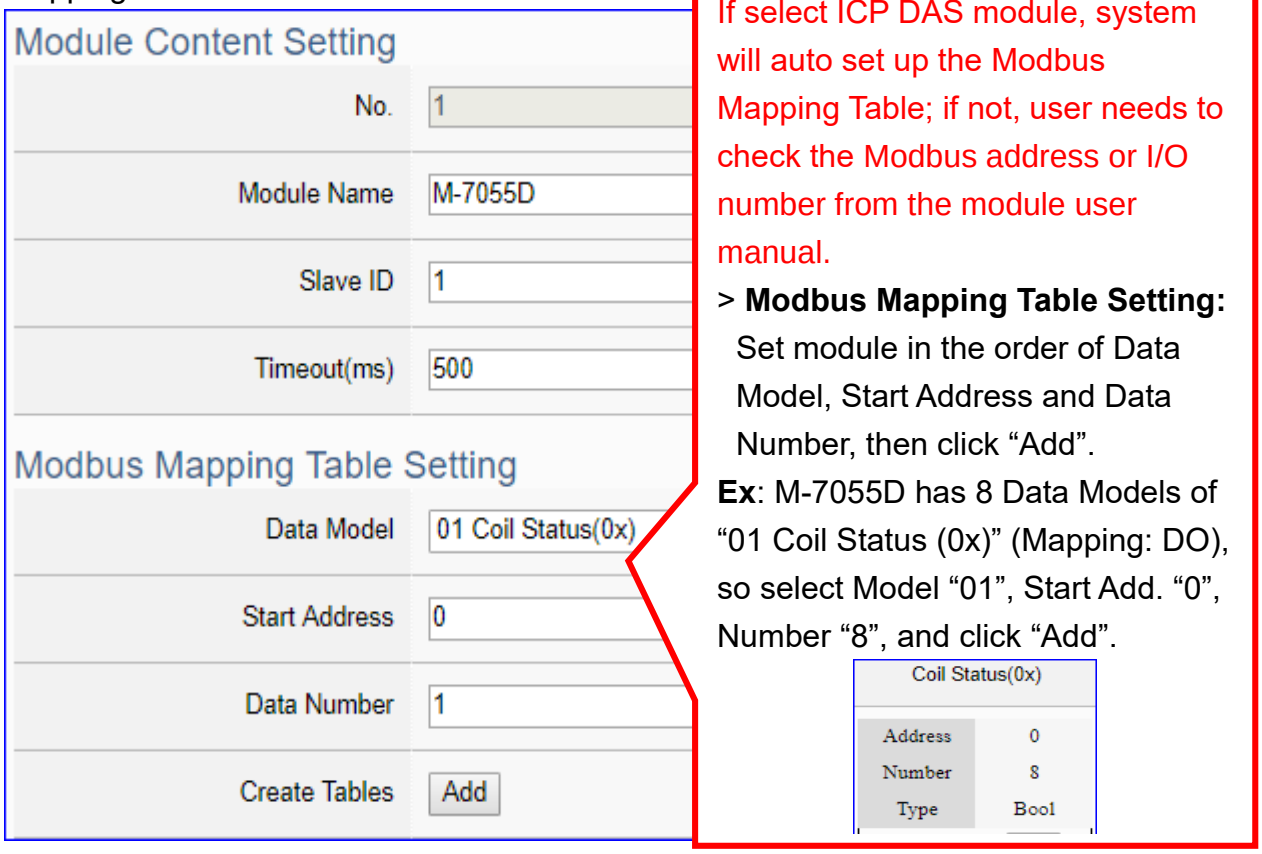


Add a module (No.: 1, Name: M-7055D) as below, and then click [Edit] button to enter the “Module Content Setting” page.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

[**Module Content Setting**] page can set up the module and the Modbus address mapping table:

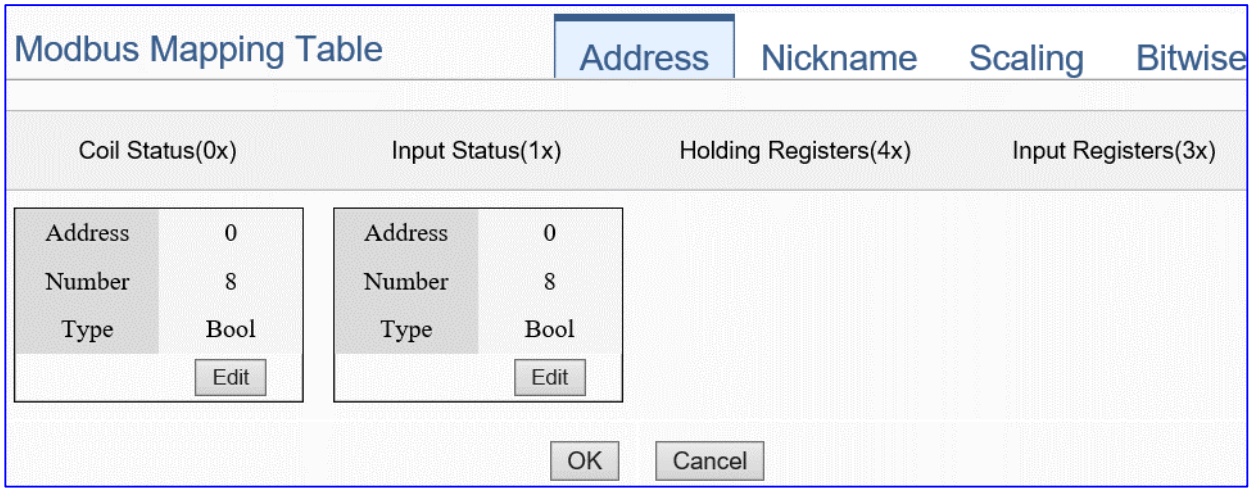


Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Slave ID	Set the module Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models "01" ~ "04" for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

The Modbus Mapping Table as below is in order of DO, DI, AO and AI.

Address:

Display and edit the Modbus Mapping Table.

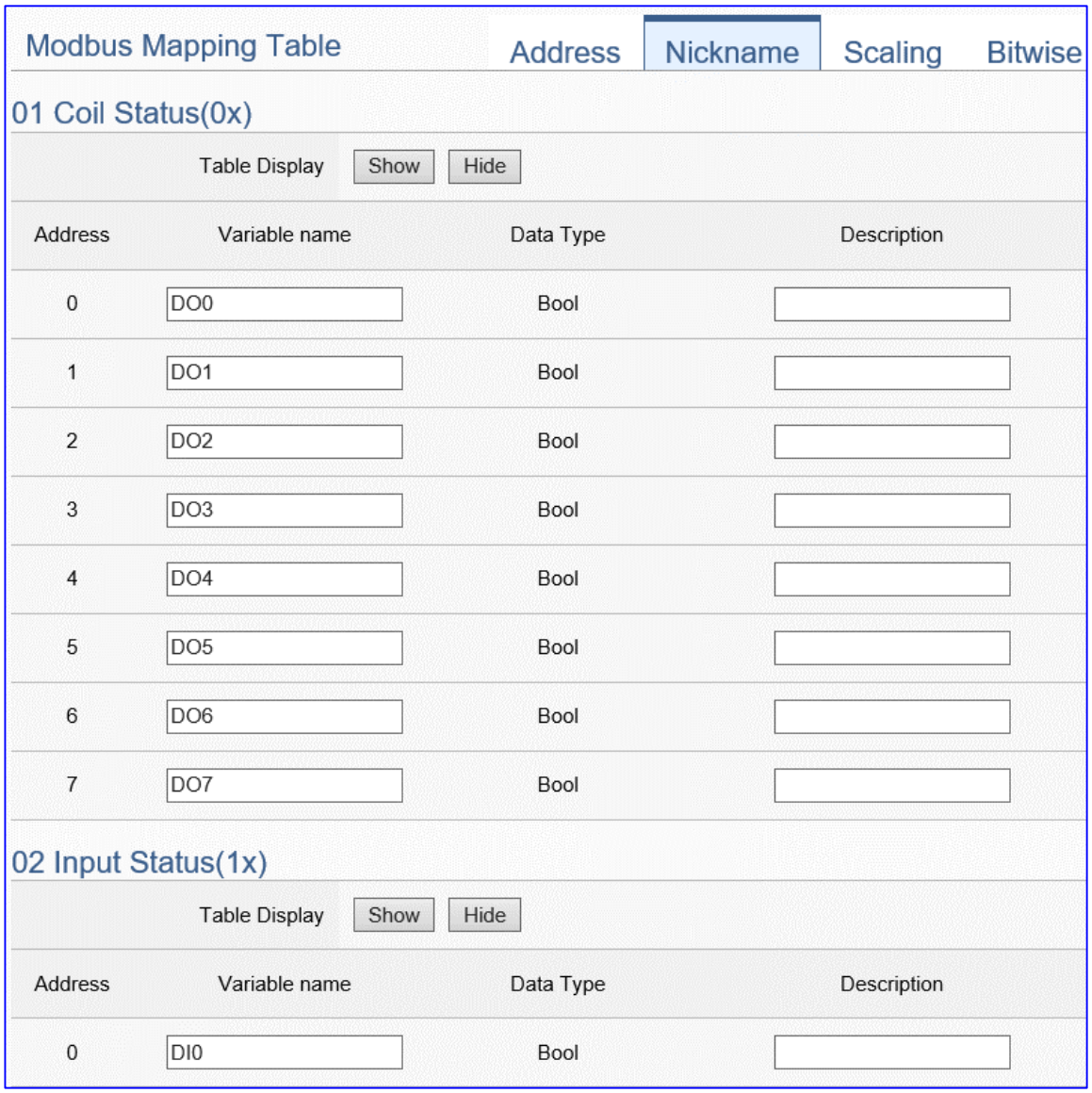


If user selects ICP DAS module, the system will auto set up the Modbus Mapping Table. If not, user needs to check the module Modbus address or I/O number from the module user manual.

Modbus Mapping Table – Address Setting	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname:

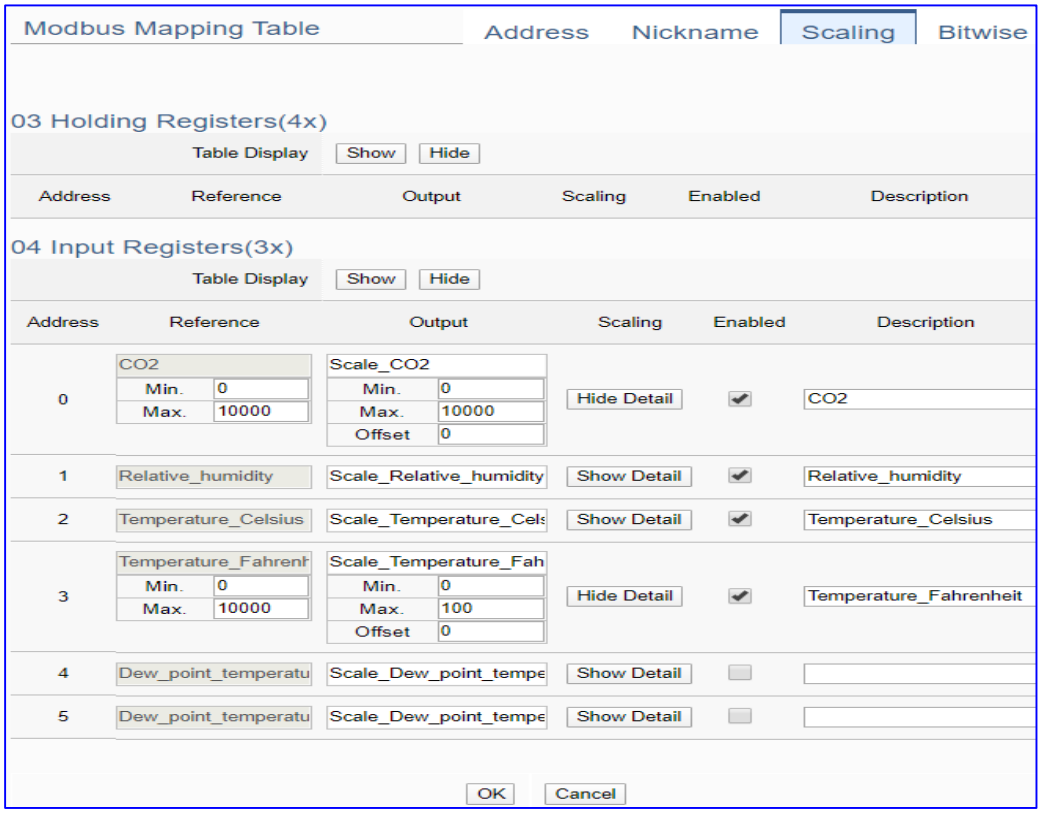
Setting the variable nickname and description.



Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Scaling:

Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated. The M-7055D has no AI/AO, so here uses the screen of DL-302 for an example.

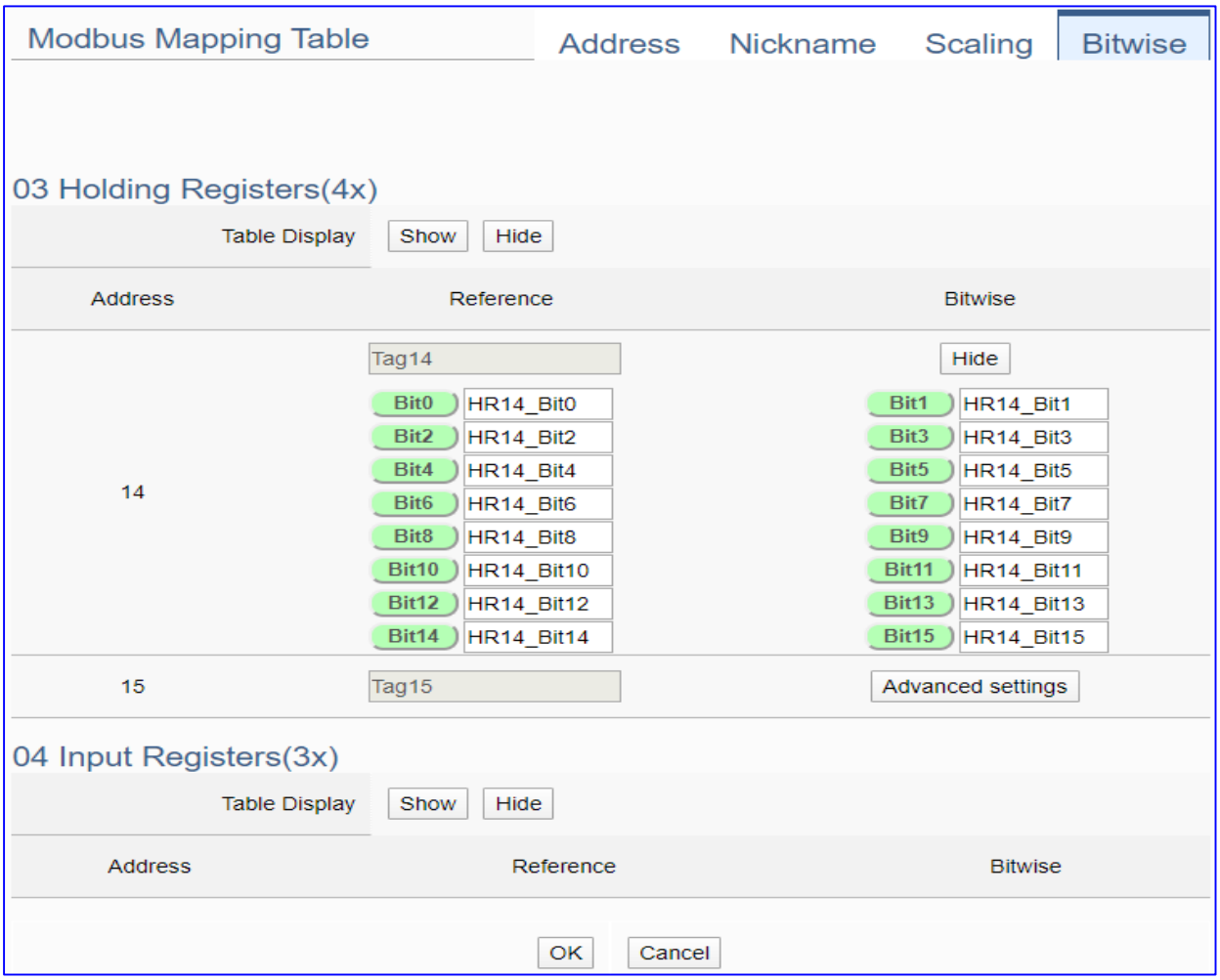


Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The I/O variable of the Modbus address.
Output	The scaling variable for scaling output. User can define the variable name.
Scaling	Click [Show Detail] to set up the Scaling parameters, and click [Hide Detail] to hide the parameters. Fill in the Min/Max range values of the source in the Reference column. Fill in the Min/Max range values after scaling in the Output column. If needs offset, fill the offset value in the Offset item. Remember check “Enable” box.
Enable	Check the box of the variable can enable just that variable for scaling.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Bitwise:

Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.

The M-7055D has no AI/AO, so here uses other module's setting screen as an example.

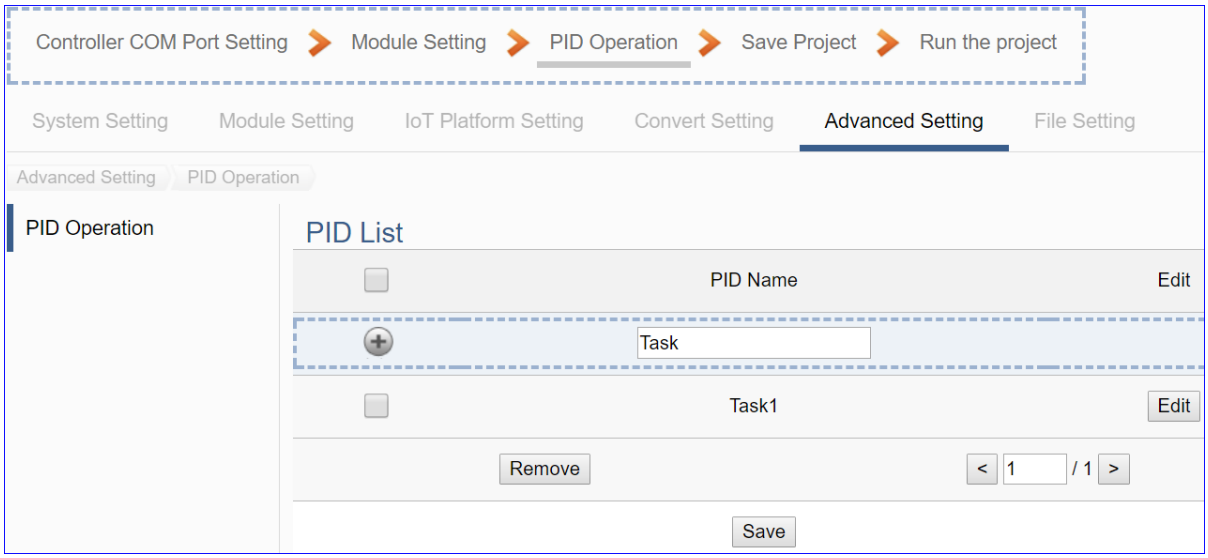


Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The Bit# variables of the Modbus address.
Bitwise	Set up the variables for Bitwise. Click [Advanced Settings] to set up the Bitwise parameters, and click [Hide] to hide the parameters. Fill in the variable names to the Bit# that wanted to do the Bitwise. The value in the fixed bit number will be assigned into the variable.
OK	Click to save this page settings and back to the module list page.

Step 3. PID Operation

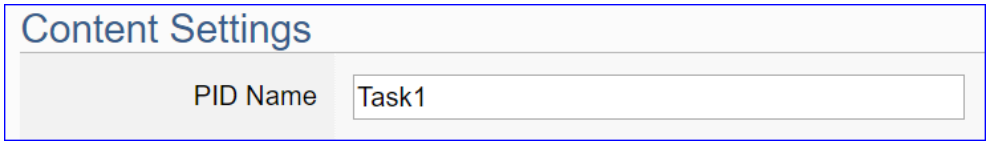
Click the next step, and enter the **Step 3 [PID Operation]** of the UI setting.
This page is for setting the Task and related parameters of the PID Operation, e.g. I/O module, I/O channels, variables, set point, control mode ….

We select the "**PID Operation**" at the beginning, so this step will auto enter the setting page [**Advanced Setting > PID Operation**]. The "Step Box" will prevent the user from selecting the wrong platform.



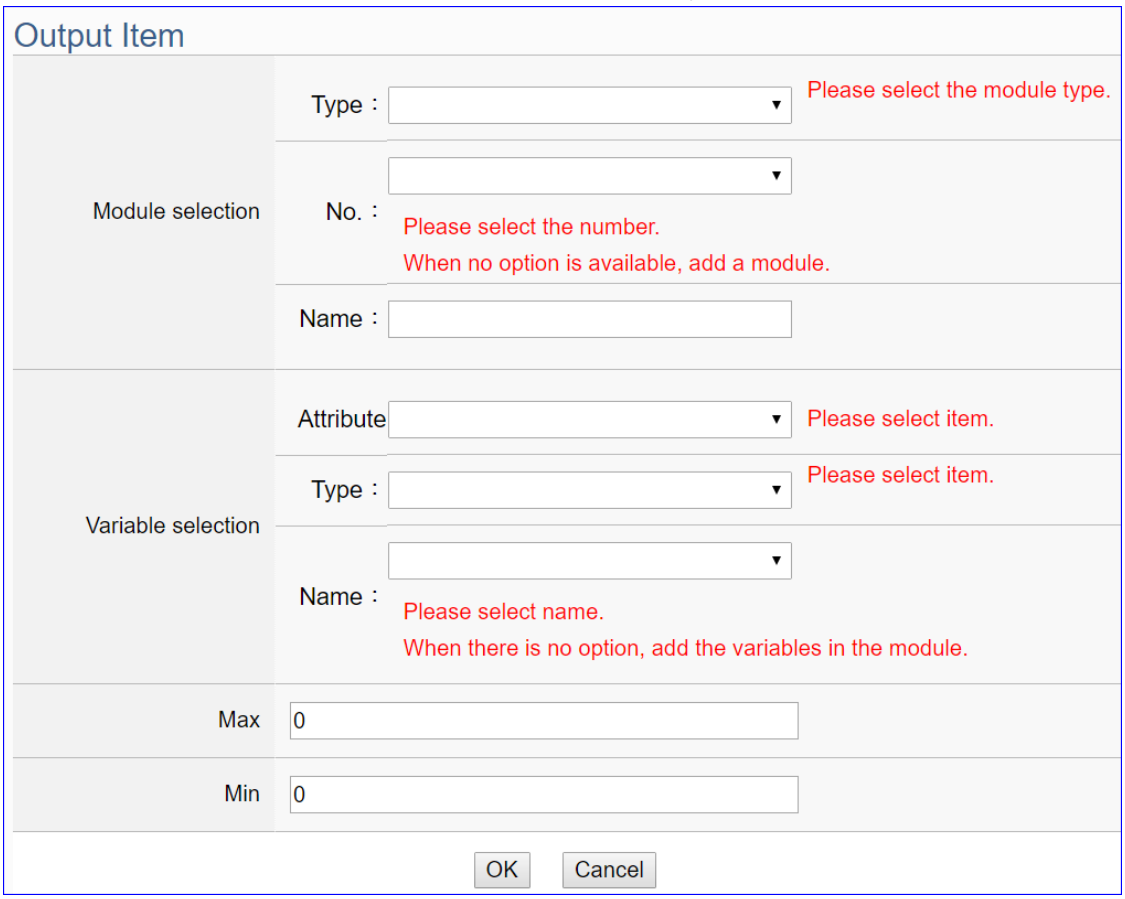
Advanced Setting > PID Operation > PID List	
PID Name	PID name, user can define, e.g. Task1. Default: Task.
⊕	Click to add a new PID Task.
Edit / Remove	Click [Edit] can set the PID content. Click the left box and [remove] can delete the PID list.
< 1 / 1 >	The page number of the PID list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the setting of this page.

Click ⊕ to add a PID Task, and click [Edit] botton to enter the [Content Settings] page:



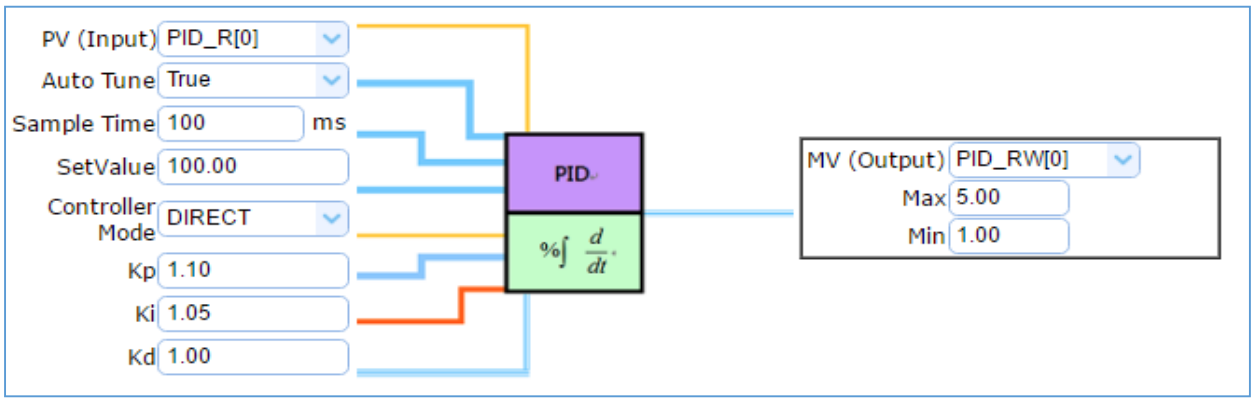
Advanced Setting > PID Operation > Content Settings	
PID Name	PID name, user can define, e.g. Task1. Default: Task.

Advanced Setting > PID Operation > Input Item	
Module selection	Choose a predefined module for input data of the PID. Select the type, number and name of the input module. If no option is available, add a new module.
Variable selection	Choose a predefined float variable as the input parameter for PID operation. Select the attribute, type and name of the float variable.
Auto Tune	Enable: Auto-tuning PID parameters for your system. Default: check. Un-Enable: Tuning PID parameters manually, e.g. Kp, Ki, Kd.
Sample Time (ms)	Set the sampling time. (Unit: ms) Default: 500 ms.
Setpoint	The target value for PID control. Default: 0.
Controller Mode	DIRECT: Set it as positive output value. Default: DIRECT. REVERSE: Set it as reverse output value.
Kp	Set the Proportional gain. Default: 1.
Ki	Set the Integral gain. Default: 1.
Kd	Set the Derivative gain. Default: 1.



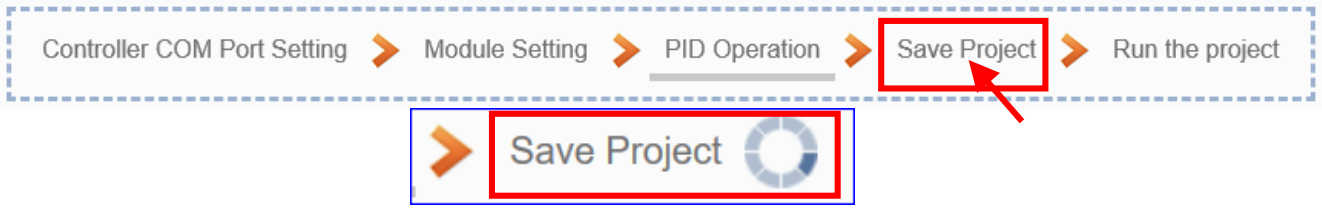
Advanced Setting > PID Operation > Output Item	
Module selection	Choose a predefined module for output data of the PID. Select the type, number and name of the input module. If no option is available, add a new module.
Variable selection	Choose a predefined float variable as the output parameter for PID operation. Select the attribute, type and name of the float variable.
Max	Set the upper-limit value for the variable. Default: 0.
Min	Set the lower-limit value for the variable. Default: 0.
OK	Click to save the settings of the page and back to the PID list page.

Example:



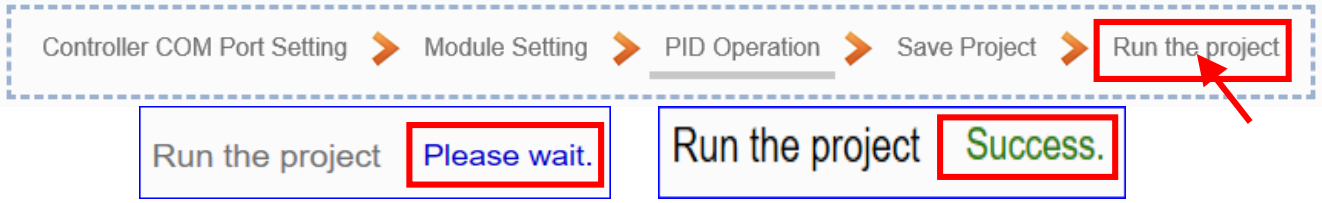
Step 4. Save Project

The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.



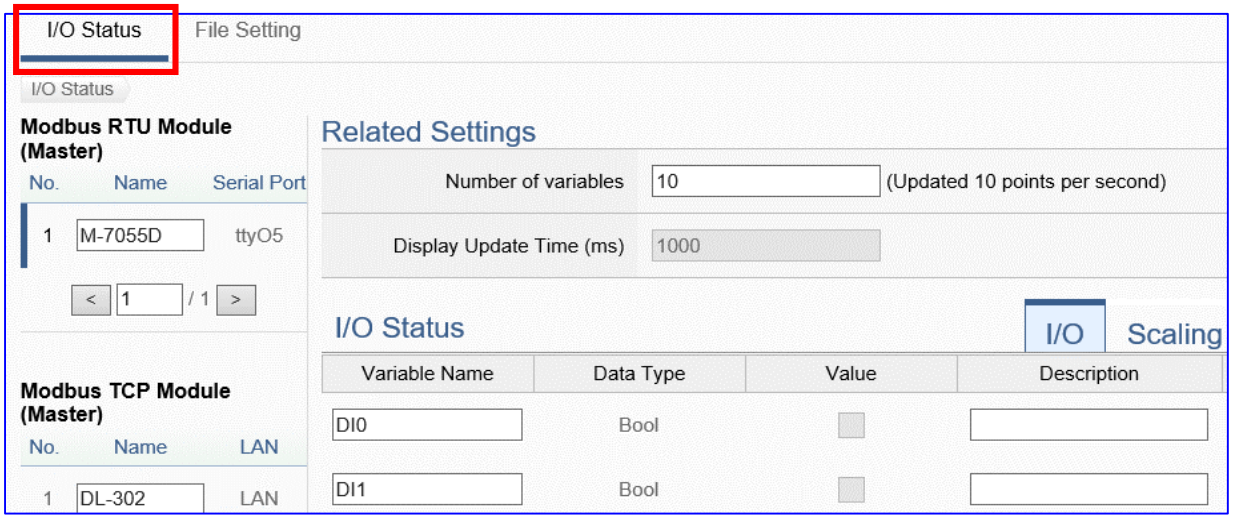
Step 5. Run the Project

The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.



When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully. Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.

The new project now completes the setting, uploading and running in the UA controller and can process the PID function. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.

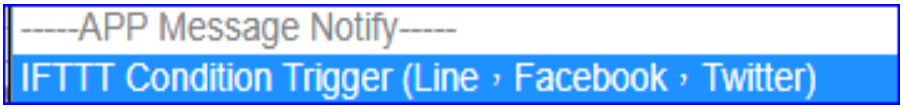


4.5. APP Message Notify

The "APP Message Notify" in the UA Function Wizard provides a condition trigger of IFTTT.

IFTTT (if this then that) is a cloud service platform that easy to get your apps and devices working together via creating chains of simple conditional statements (applets). An applet is triggered by changes that occur within other web services such as Line, Facebook, Twitter, Gmail, Instagram, etc. For example, “if” Facebook (Service A) has a new message, “then” send an email to Gmail (Service B). With the IFTTT cloud platform and UA functions, the users can send messages to IFTTT-related cloud services such as Line, Facebook, Twitter, etc. when the special events occur.

This section introduces the setting steps and the function parameters of the “APP Message Notify” and its item of “IFTTT Condition Trigger (Line, Face, Twitter)” function in the “Function Wizard” (Detail in Section 4.4.1).



[Step Box] of [IFTTT Condition Trigger (Line, Facebook, Twitter)] :

4.5.1. Function Wizard: IFTTT Condition Trigger (Line, Facebook, Twitter)

The “IFTTT Condition Trigger (Line, Facebook, Twitter)” combines the functions of the UA and IFTTT cloud platform. When the modules occur the special events that setting in the UA condition, it will trigger the IFTTT and send the message to the IFTTT-related cloud services (such as Line, Facebook, Twitter, etc.)

The settings for sending the message to the APP with the "IFTTT Condition Trigger (Line, Facebook, Twitter)" function includes two parts:

1. UA Web Interface Setting:
   In the UA Web HMI, set up the UA controller, modules, IFTTT trigger conditions, the condition variable table, and the IFTTT event connection.

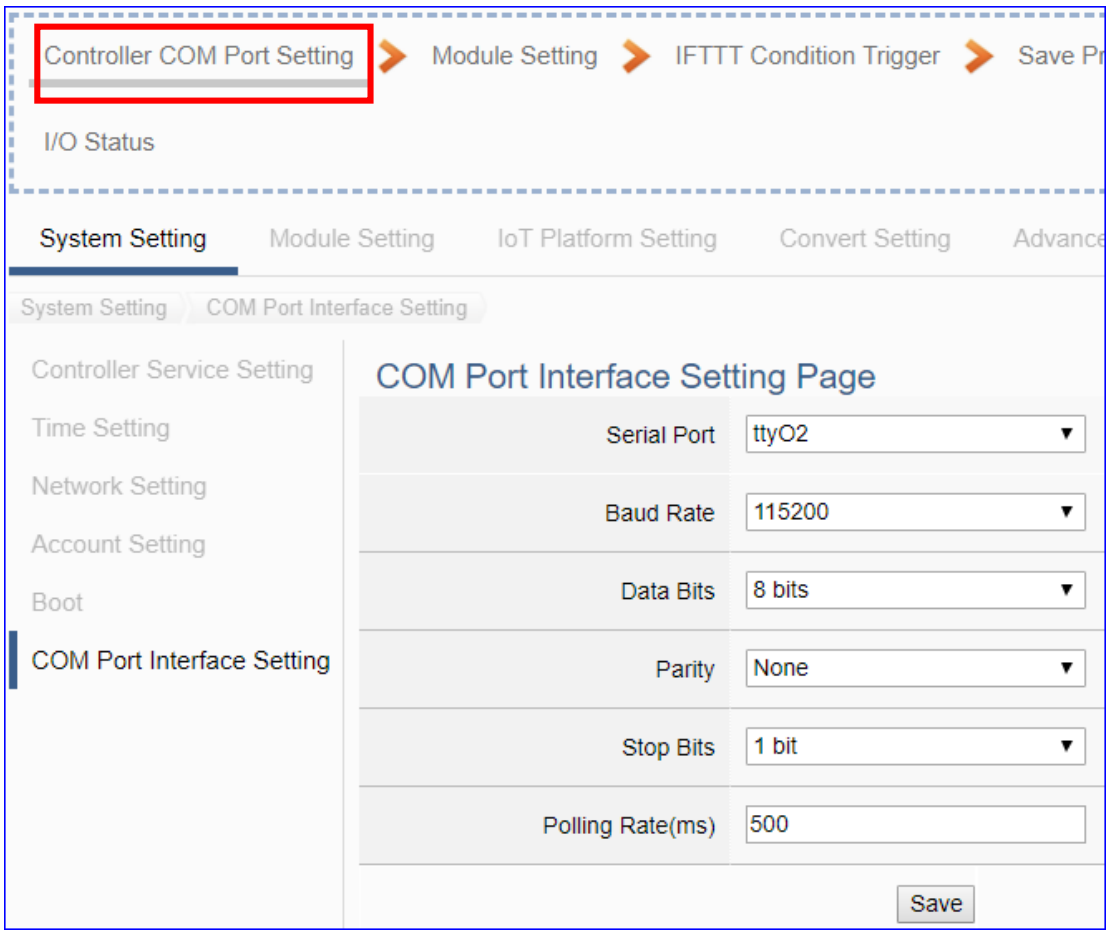
2. IFTTT Cloud Platform Setting:
   In the IFTTT website, set up the “**if**” side service and event (**this**: use **webhooks** for the UA), the “**then**” side service and action (**that**: user can select the service, such as the Line, Facebook, twitter, etc.). And then fill the “**Event Name**” and “**Key**” getting from the IFTTT website setting into the “**Content Setting**” of the UA We HMI. (Detail in the Appendix C.)

[Step Box]:

The Step Box of the [**IFTTT Condition Trigger (Line, Facebook, Twitter)**] has 6 steps as below. When enabling the Step Box, it auto enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the “Step Box” step-by-step and then can complete the project.

Step 1. Controller COM Port Setting

This page allows display and set the COM port interface of the controller for the serial communication. The user can find the default communication values of our I/O modules from the module CD, manual or I/O Module website.

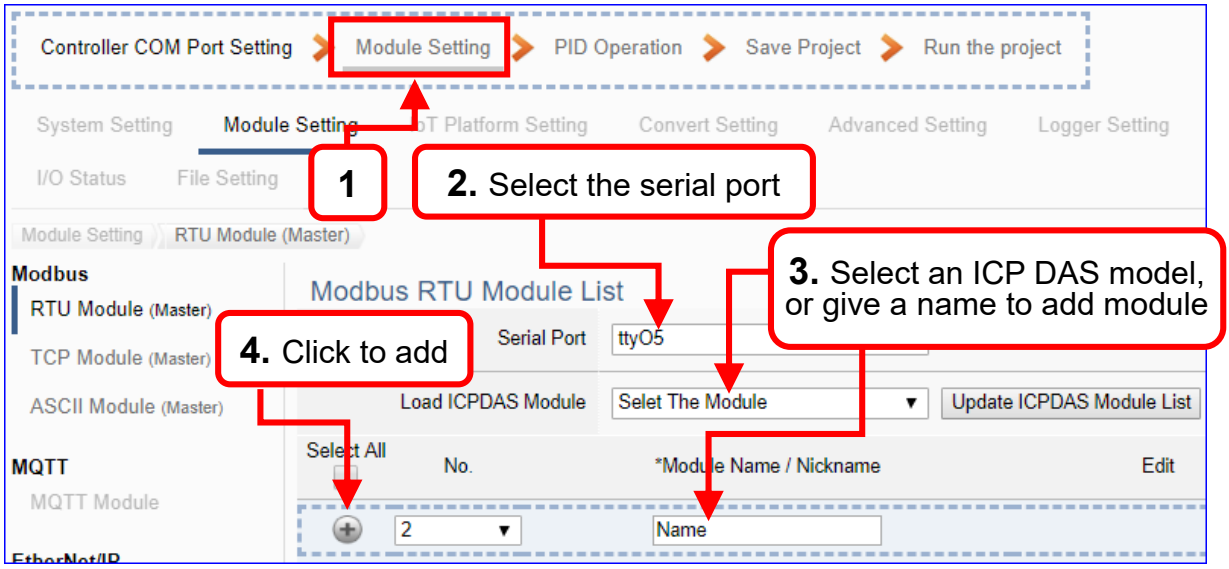


COM Port Interface Setting Page	
Serial Port	Choose the serial port of UA controller that links with the I/O module. ttyO2: RS-485 ; ttyO4: RS-232 ; ttyO5: RS-485
Baud Rate	Choose a baud rate to communicate with the module: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. The UA controller and the I/O module need have the same baud rate.
Data Bits	The number of bits used to represent one byte of data: 7 bits or 8 bits. Default: 8 Bits.
Parity	Choose one way for the parity checking. Options: None, Even, and Odd. Default: None.
Stop Bits	Choose the number of stop bit: 1 bit or 2 bits. Default: 1.
Polling Rate(ms)	Set a time interval for the command. Default: 500 ms
Save	Click [Save] button could save the settings of this page.

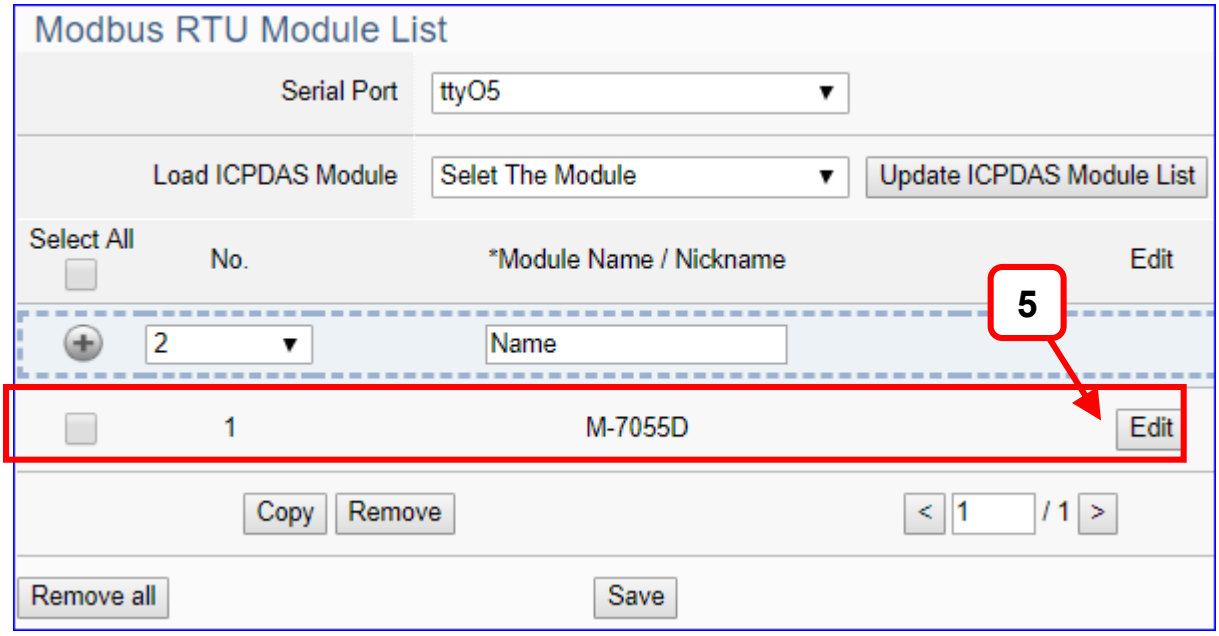
Step 2. Module Setting

Click the next step, and enter the **Step 2 [Module Setting]** of the UI setting. This page is for setting the communication values with the connected modules.

First, choose the serial port that connected with the module. If use ICP DAS module, select the model to auto load the module setting. If not, give a name (Default: Name), click [⊕] button to add a module.

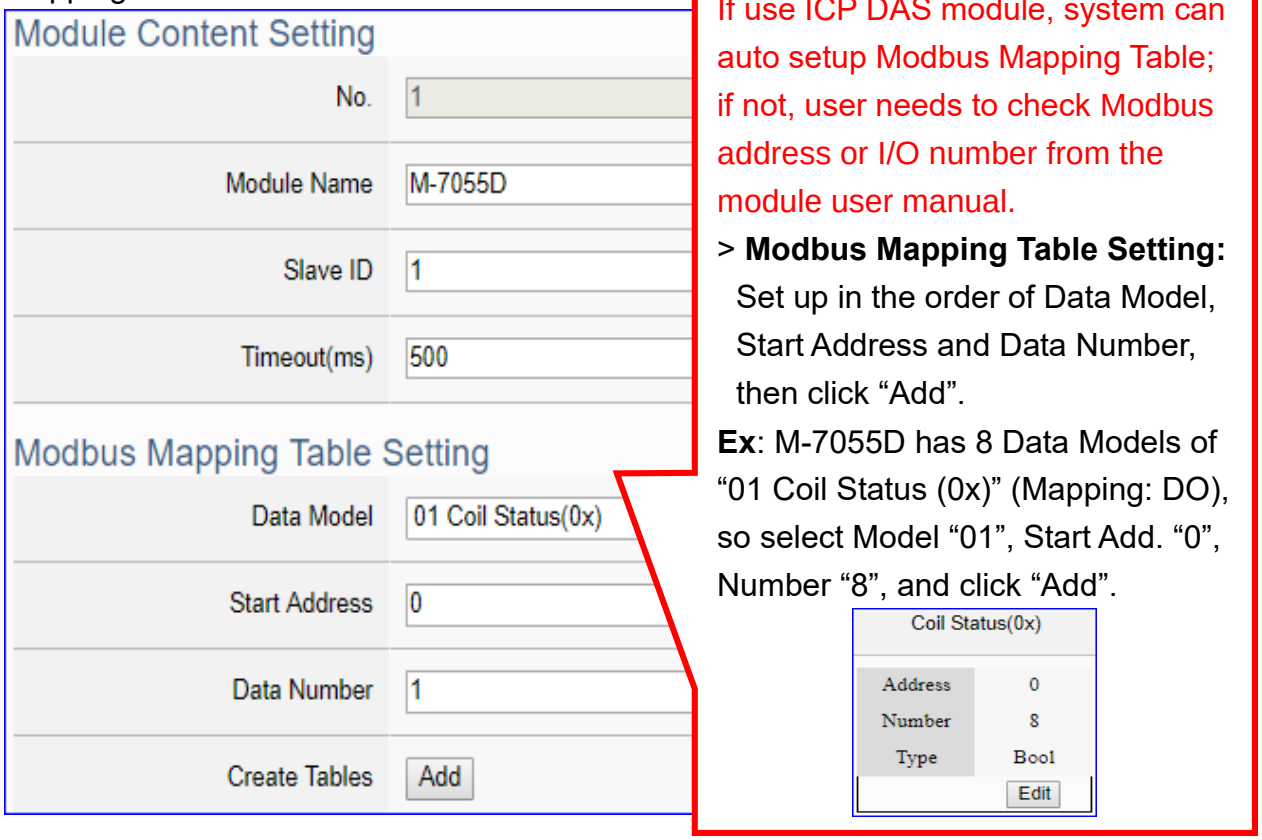


Add a module (Ex: No.: 1, Name: M-7055D) as below, and then click [Edit] button to enter the “Module Content Setting” page.



If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

[**Module Content Setting**] page can set up the module and the Modbus address mapping table:

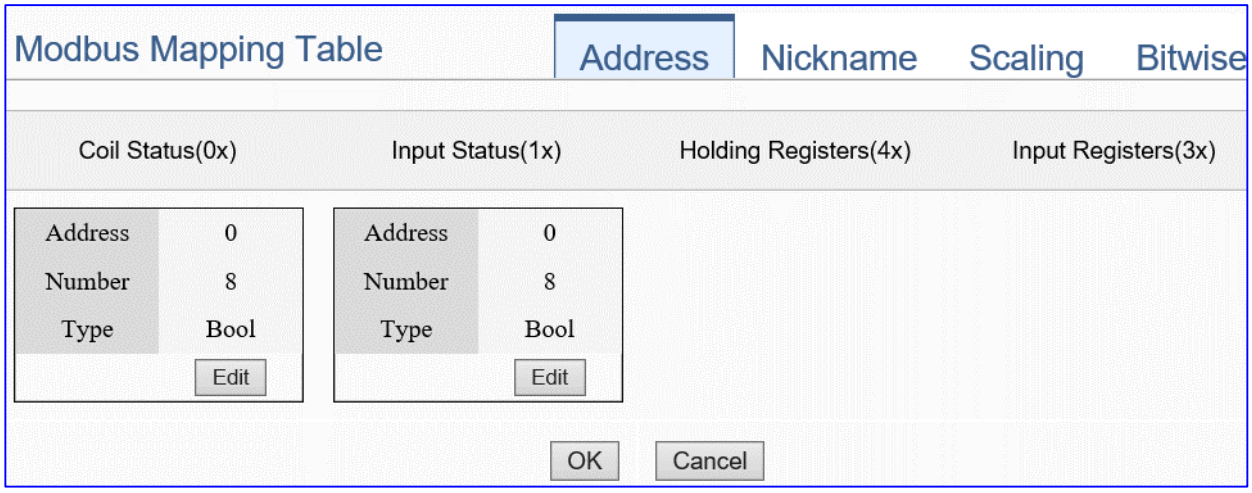


Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Slave ID	Set the module Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models “01” ~ “04” for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

The finished Modbus Mapping Table as below is in order of DO, DI, AO and AI.

Address:

Display and edit the Modbus Mapping Table.

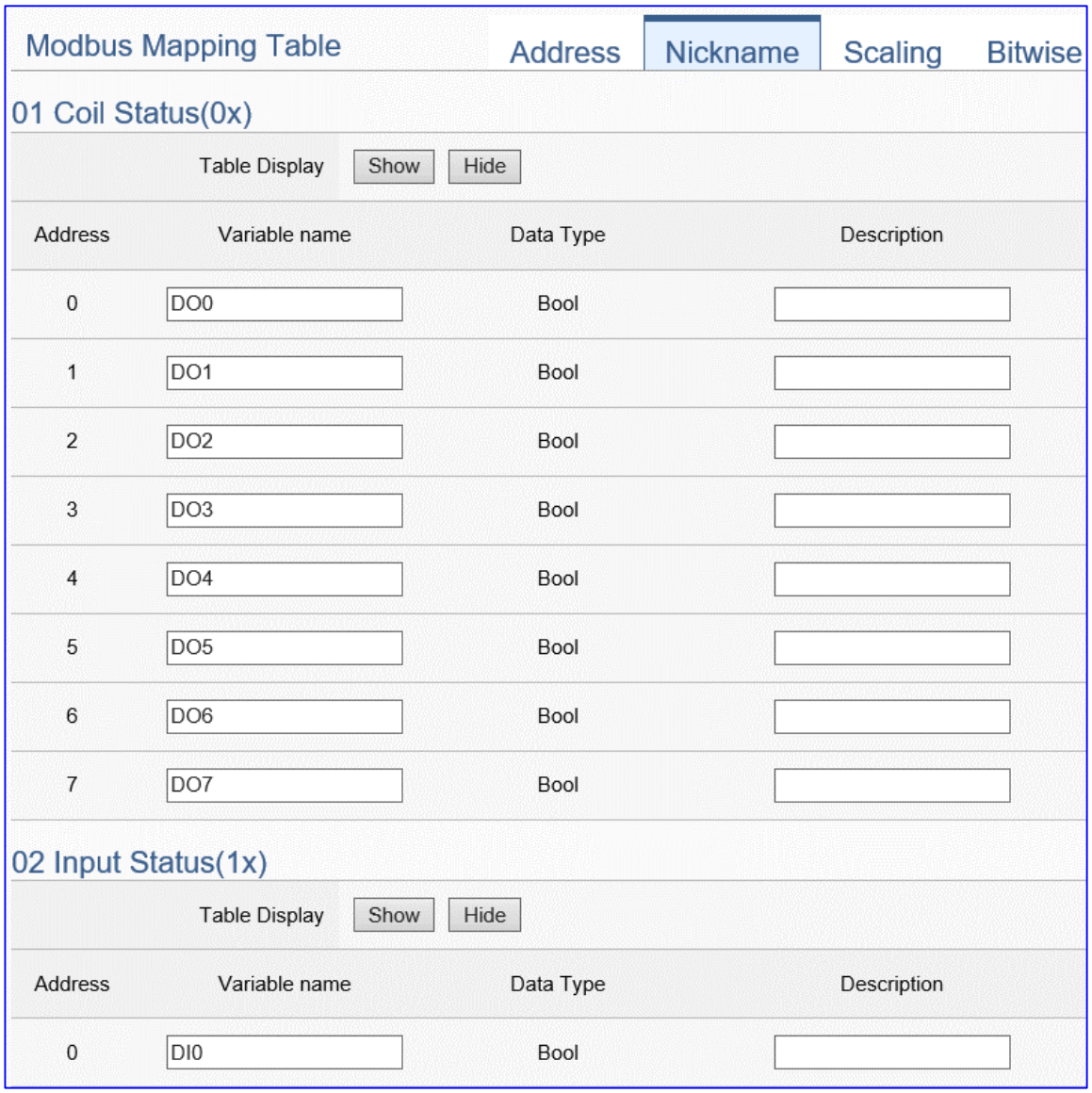


If user selects ICP DAS module, the system will auto set up the Modbus Mapping Table. If not, user needs to check the module Modbus address or I/O number from the module user manual.

Modbus Mapping Table – Address Setting	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname:

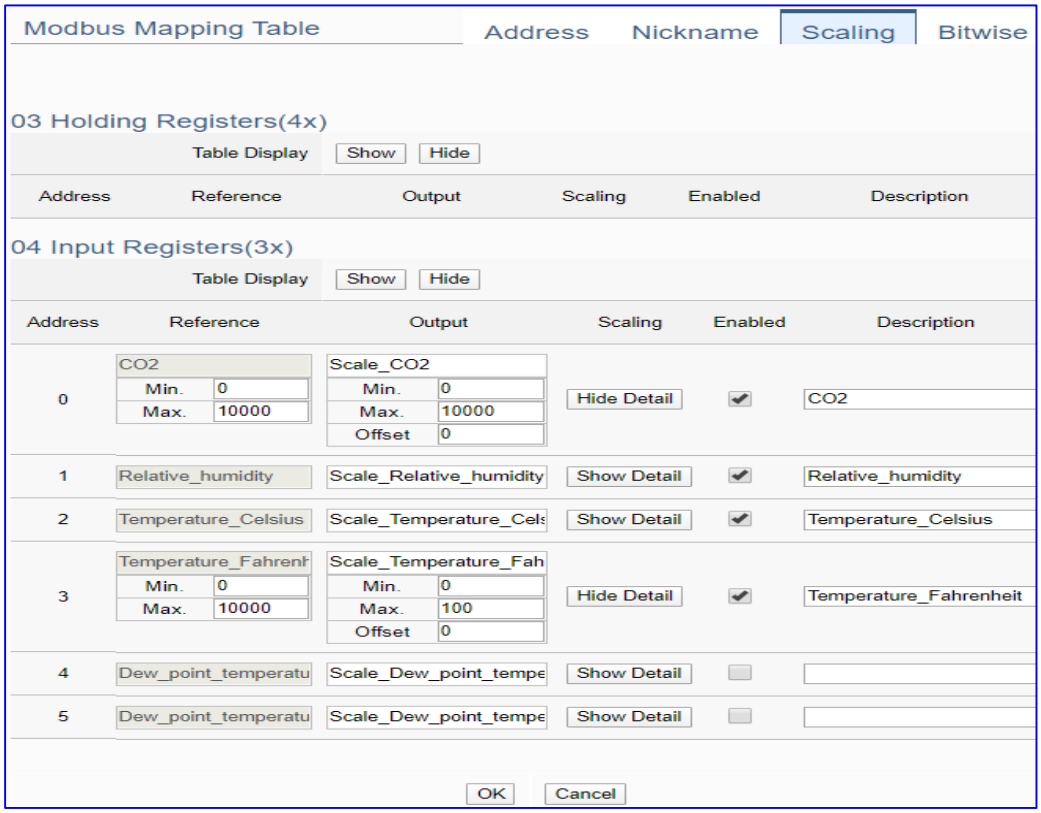
Setting the variable nickname and description.



Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Scaling:

Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated. The M-7055D has no AI/AO, so here uses the screen of DL-302 for an example.

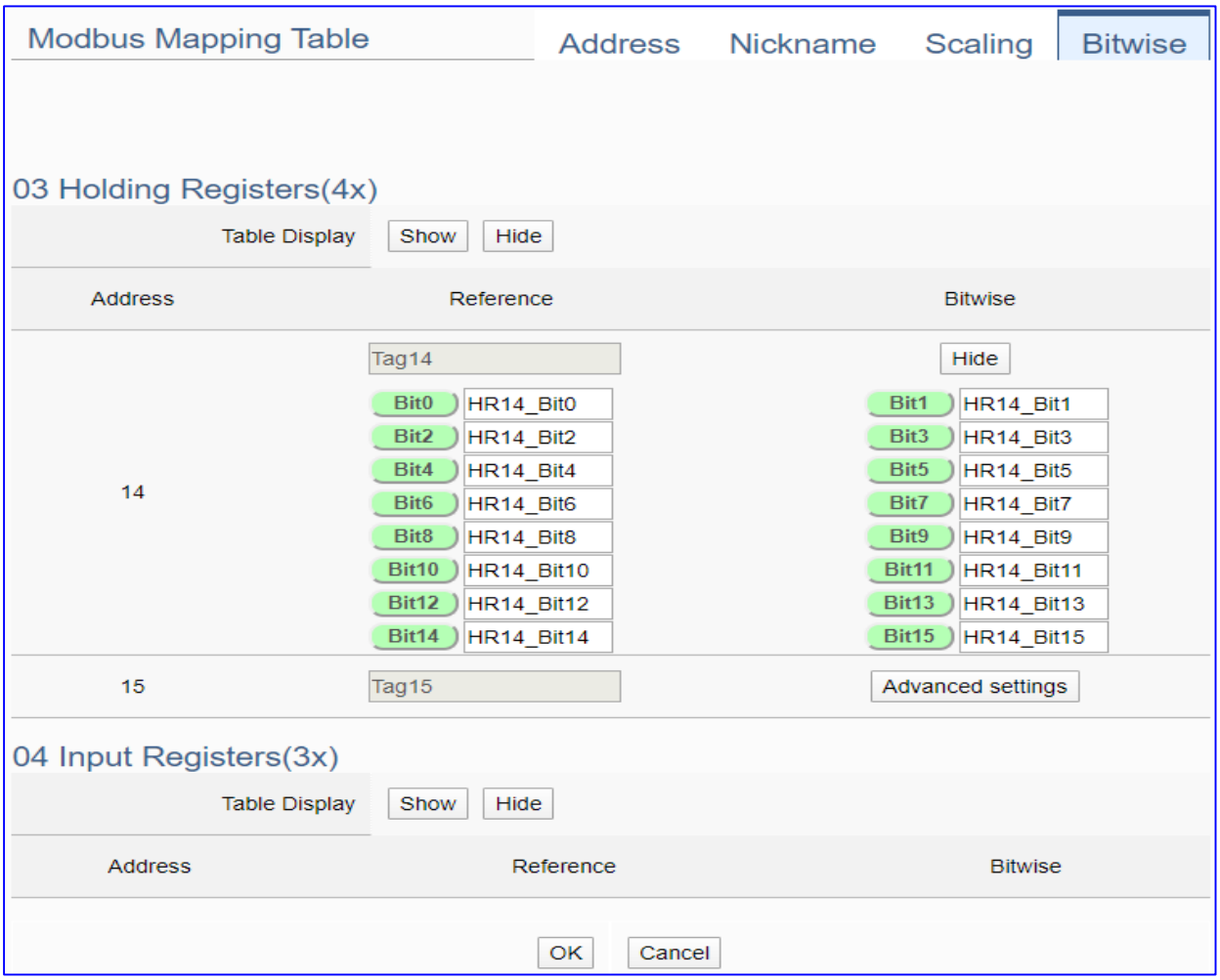


Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The I/O variable of the Modbus address.
Output	The scaling variable for scaling output. User can define the variable name.
Scaling	Click [Show Detail] to set up the Scaling parameters, and click [Hide Detail] to hide the parameters. Fill in the Min/Max range values of the source in the Reference column. Fill in the Min/Max range values after scaling in the Output column. If needs offset, fill the offset value in the Offset item. Remember check “Enable” box.
Enable	Check the box of the variable can enable just that variable for scaling.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

Bitwise:

Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.

The M-7055D has no AI/AO, so here uses other module's setting screen as an example.

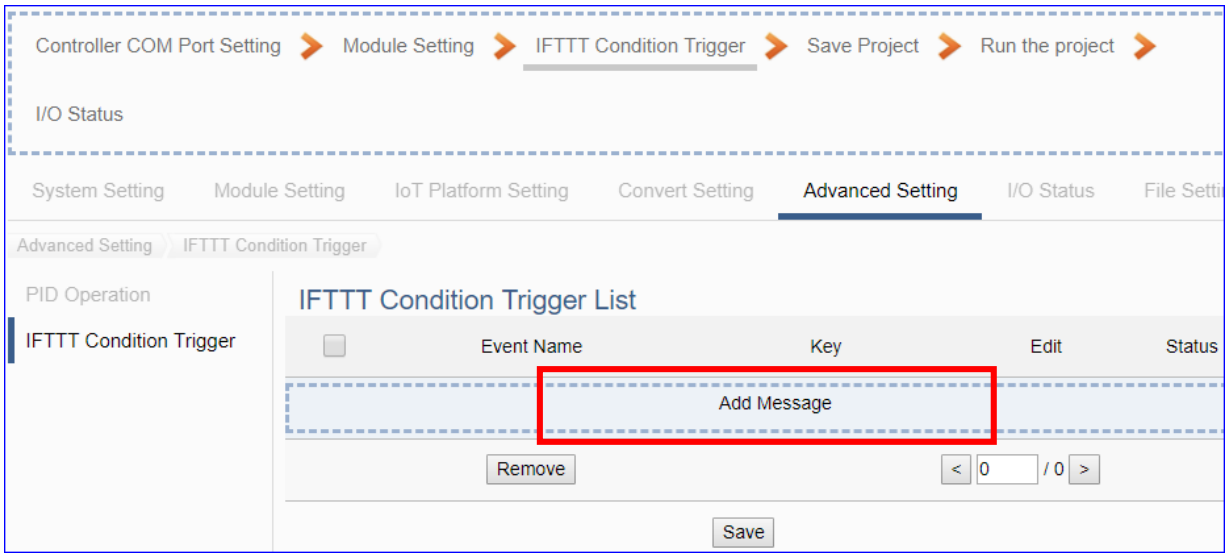


Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The Bit# variables of the Modbus address.
Bitwise	Set up the variables for Bitwise. Click [Advanced Settings] to set up the Bitwise parameters, and click [Hide] to hide the parameters. Fill in the variable names to the Bit# that wanted to do the Bitwise. The value in the fixed bit number will be assigned into the variable.
OK	Click to save this page settings and back to the module list page.

Step 3. IFTTT Condition Trigger

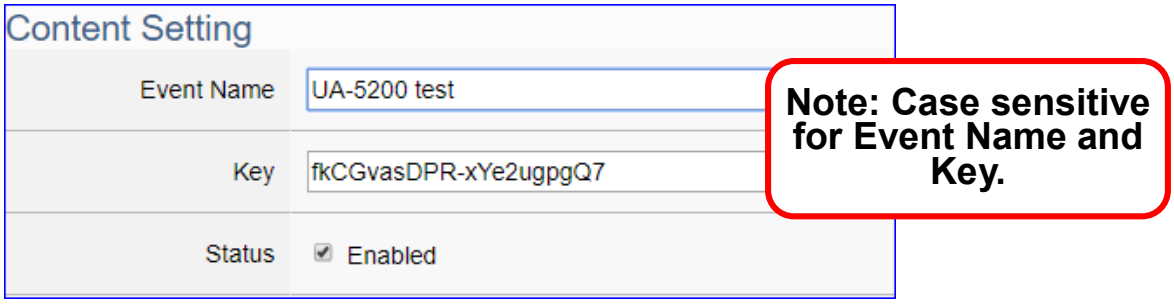
Click the next step, and enter the **Step 3 [IFTTT Condition Trigger]**.
This page is for the APP message related setting, e.g. IFTTT event name, key, trigger condition, I/O variables ….

We select the "**IFTTT Condition Trigger (Line, Facebook, Twitter)**" at the beginning, so this step will auto enter the setting page [**Advanced Setting > IFTTT Condition Trigger**]. The "Step Box" will prevent the user from selecting the wrong platform.



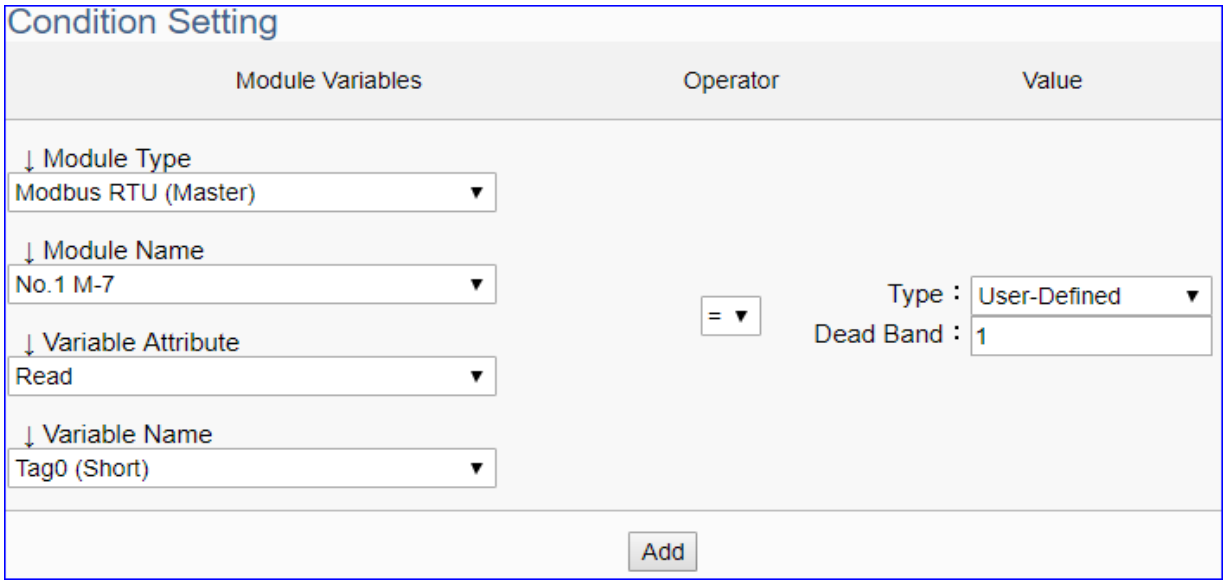
Advanced Setting > IFTTT Condition Trigger > FTTT Condition Trigger List	
Add Message	Click to add a new IFTTT message. After setting, an IFTTT condition trigger list will show on the bottom includes left box, event name, key and status.
☐	Check the box in the left of the list is to select and to delete the list. Check the box on the top will select all lists.
Event Name	Display the "Event Name" setting in the IFTTT website. (Append. C)
Key	Display the "Key" getting from the IFTTT website. (Append. C)
Edit	Click [Edit] can set the IFTTT condition trigger content.
Status	Display the enable status of the IFTTT condition trigger list.
Remove	Click the left box and [remove] can delete the IFTTT list.
< 1 / 1 >	The page number of the IFTTT list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the setting of this page.

Click [Add Message] botton to enter the IFTTT [Content Settings] page:



Note: The “Event Name” and “Key” are set in the IFTTT website. If you are not familiar with IFTTT, please see the Appendix C for the setting introductions.

Advanced Setting > IFTTT Condition Trigger > Content Setting	
Event Name	Input the “Event Name” setting in the IFTTT website. (Appendix C)
Key	Input the “Key” getting from the IFTTT website. (Appendix C)
Status	Check to enable the IFTTT condition trigger event.

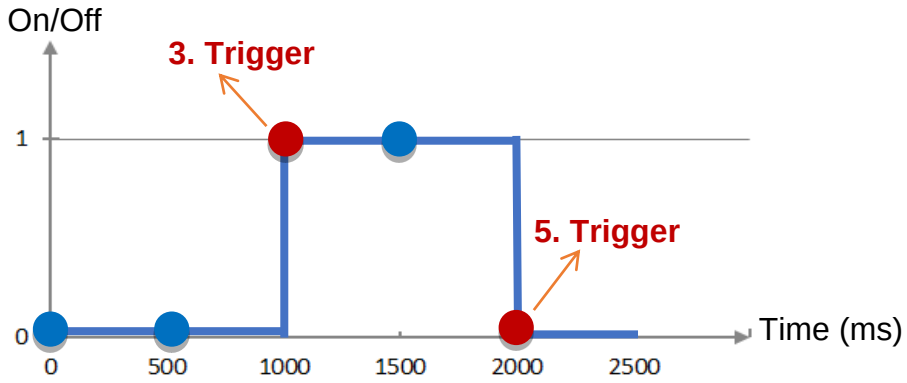


Advanced Setting > IFTTT Condition Trigger > Condition Setting	
Module Variables	Select the module and variable for the condition trigger. Module Type: select the module type, Modbus RTU/TCP/ASCII… Module Name: select the module that set for condition trigger. Variable Attribute: select the variable attribute for condition trigger. Variable Name: select the variable name for condition trigger.
The following condition fields may different depending on the selected variable attribute. The condition trigger method will be descripted after this table.	
Operator	Select the operator for the trigger condition.
Value	Set up the value for the condition, include Type and Dead Band.
Status	Set up the status for the condition. Default: 0.
Add	Click to add a condition trigger list in the Condition Table..

Condition Trigger Descriptions:

The condition trigger method will different depending on the attribute of the selected variable and the trigger will be different. There are two operation styles: **DIO** and **AIO**.

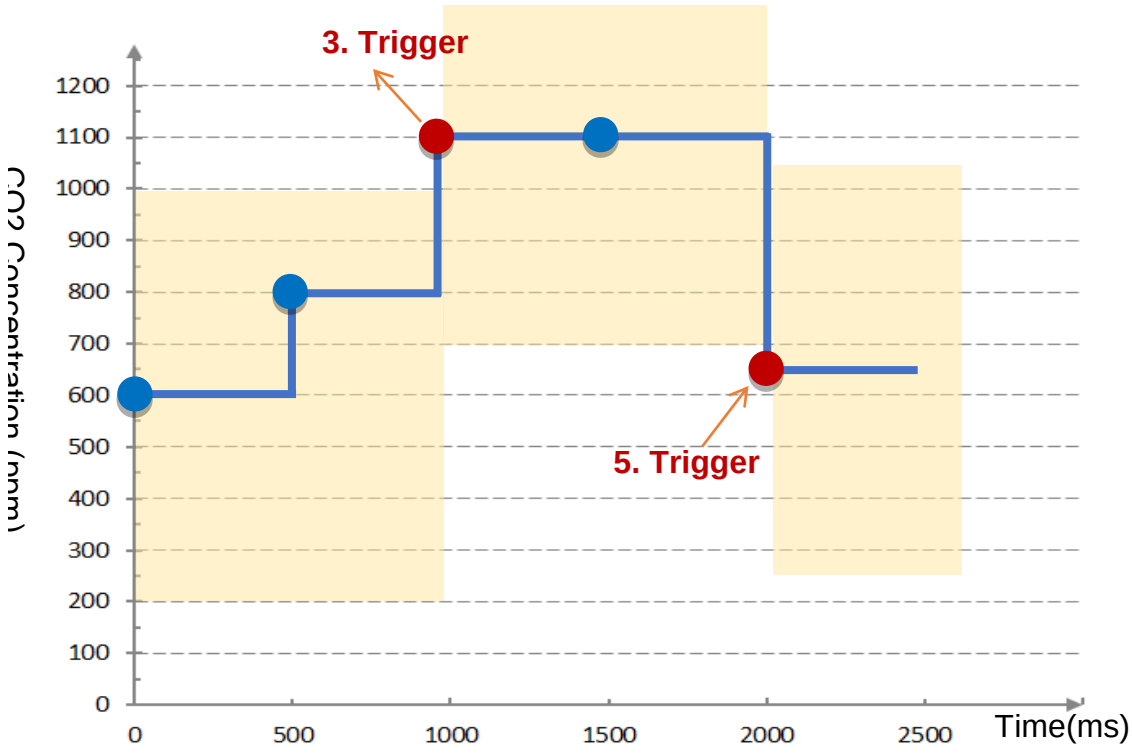
(A) If select **DIO variable**, then Condition is “Status Change”. When detecting the status is changed, it will trigger the event and send the assigned message. (Below is a switch detecting example.)



DIO Trigger: (Detect per 500 ms)

1. Detect initial switch status "Off" (status = 0)
2. Detect "Off" (status = 0, status no change), no trigger
3. Detect "On" (status = 1, status changed), **trigger** a message notification
4. Detect "On" (status = 1, status no change), no trigger
5. Detect "Off" (status = 0, status changed), **trigger** a message notification

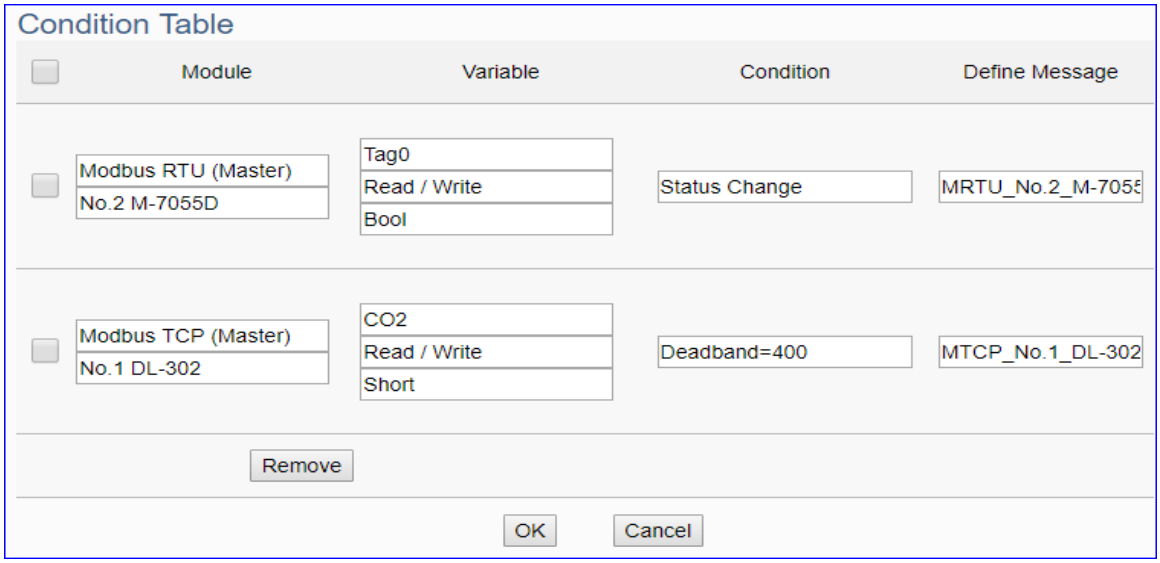
(B) If select **AIO variable**, then Condition is “Value” and can set the “Dead Band”. The condition will be triggered and send the message when the detected value exceeds the upper or lower Dead Band. (Below is a CO2 example. Detect per 500 ms)



AIO Trigger: (Detect per 500 ms. The yellow block means the Dead Band.)

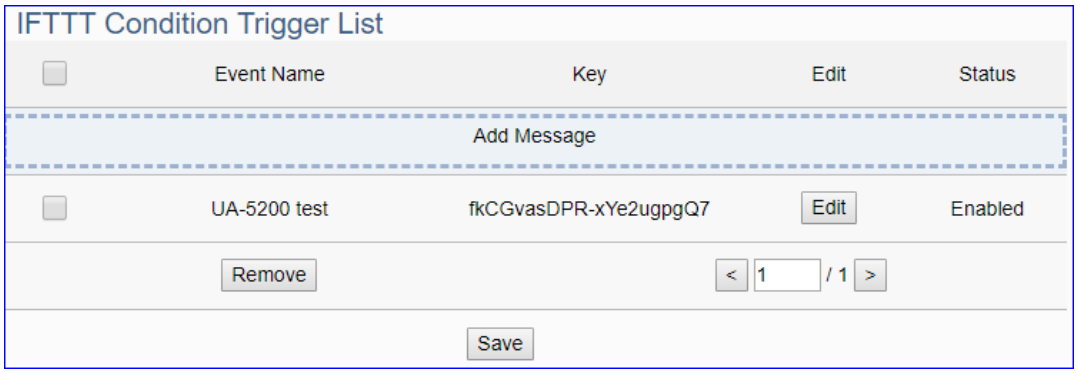
1. Detect initial CO2 concentration 600 (ppm).
   Set Dead Band=400 (Initial Trigger Condition: **>=** 1000 **or <=** 200)
2. Detect CO2 concentration 800. It is in the range of Dead Band.
3. Detect CO2 concentration 1100. It exceeds the upper value (>= 1000) of Dead Band, so **trigger** a message for danger notification.
4. Detect CO2 concentration 1100. It is in the new range of Dead Band.
   Dead Band=400 (New Trigger Condition: **>=** 1500 **or <=** 700)
5. Detect CO2 concentration 650. It is below the lower value (<= 700) of Dead Band, so **trigger** a message for safety notification.

Please refer to the previous Condition Trigger Descriptions to set up your Condition. When complete, click the “Add” button. The setting will show in the Condition Table. Below Table is setting 2 conditions.



Advanced Setting > IFTTT Condition Trigger > Condition Table	
Module	Display the module type and name of the condition. (Not editable here)
Variable	Display the variable attribute and name of the condition. (Not editable here)
Condition	Display the trigger condition. (Not editable here)
Define Message	Default Message: module code_variable code. The user can define own message in the format of English character, number, general symbol…
Remove	Click the left box and [remove] can delete the IFTTT list.
OK	Click to save this page settings and back to the module list page.
Cancel	Click to exit without saving and back to the module list page.

When back to the IFTTT Condition Trigger List, the condition trigger message will show as below picture. If need more trigger conditions, click the “Add Message” again to combine the IFTTT APP message sending and the UA system. At last, click the Save button.

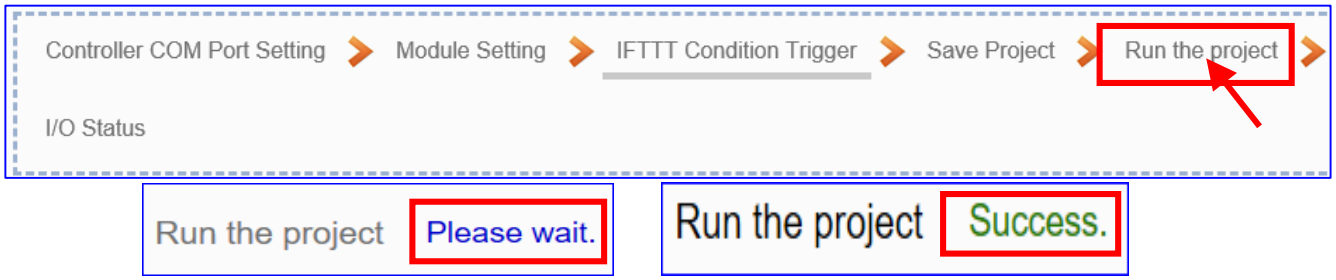


- **Step 4. Save Project**

The setting of this example is finished now. Click the next step **[Save Project],** the Step Box will show an animation as below picture, that means the project is saving. When the animation vanished, the project is saved completely.

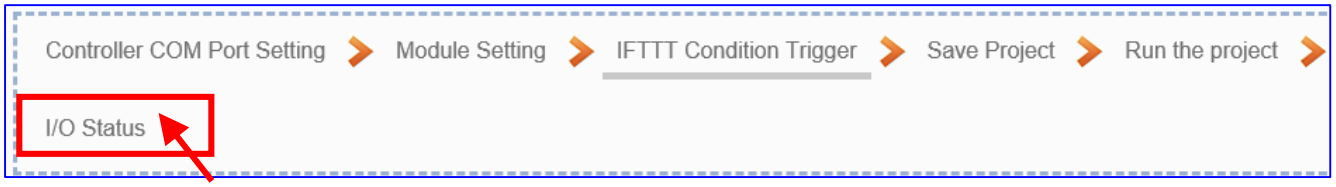
- **Step 5. Run the Project**

The project, after saving, needs to be executed. Click the next step **[Run the Project]**. This step can also via the [**System Setting** > **Controller Service Setting** > **Run Project**] to Stop and Run the project.



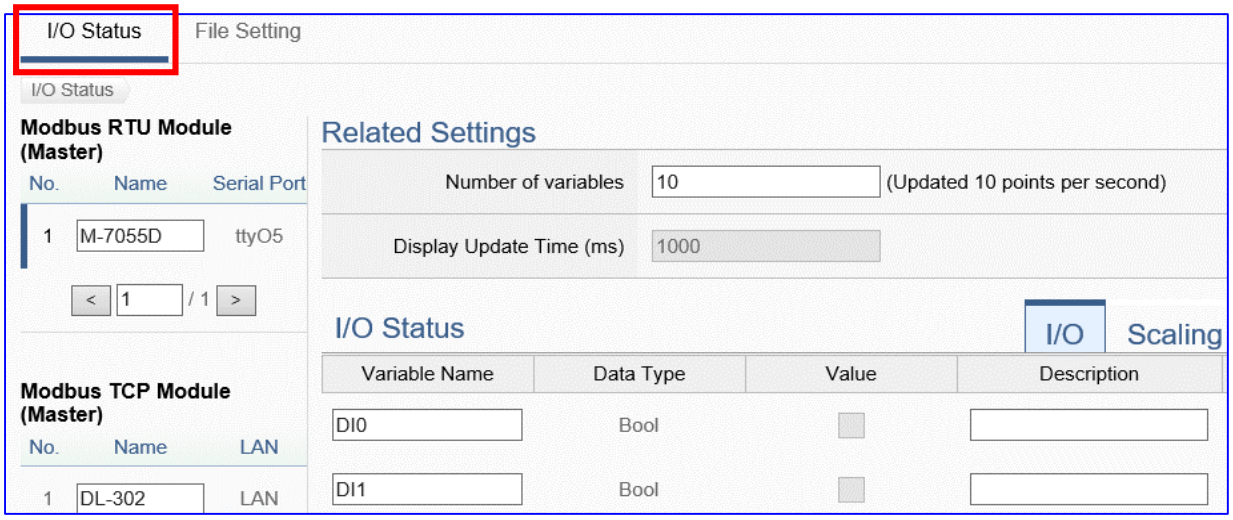
When the words "**Please wait**" disappears, the new words "**Success**" appears, that means the UA controller is running new project successfully.

- **Step 6. I/O Status**



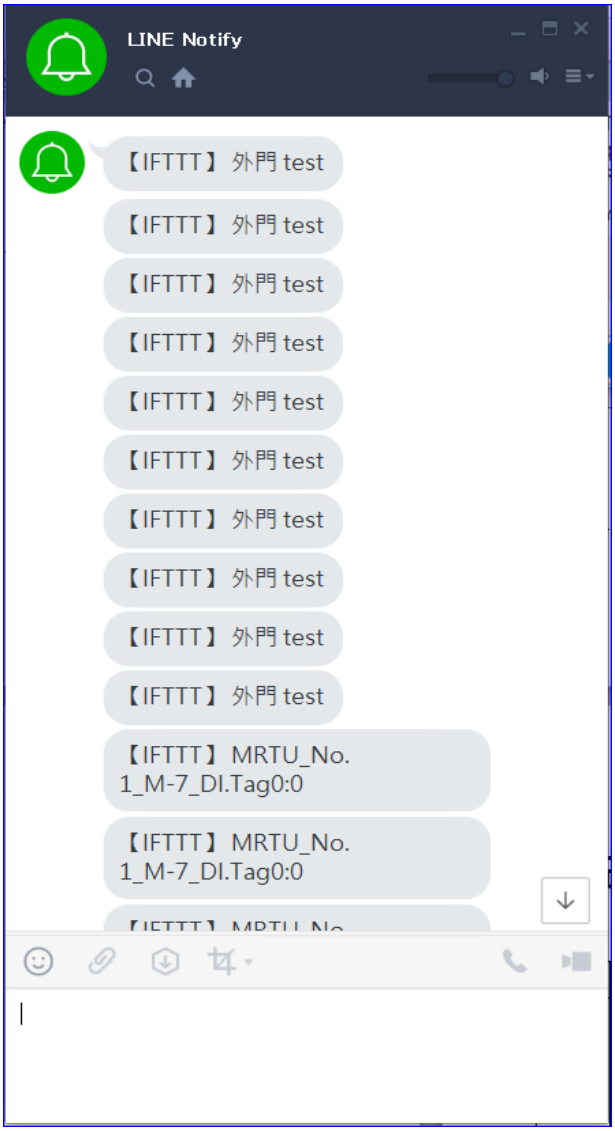
This step will go to the Main Menu [I/O Status]. The users can click the setup module to see its real time I/O status.

Then the Step Box will disappear automatically now, and back to the first screen view of the Web UI.



The new project now completes the setting, uploading and running in the UA controller and can process the PID function. Users can see the I/O status from the menu [**I/O Status**]. For more about the Web UI settings, please refer to CH4 and CH5.

The project for APP message notifies via the IFTTT condition trigger (Lind, Facebook, Twitter) is now done.

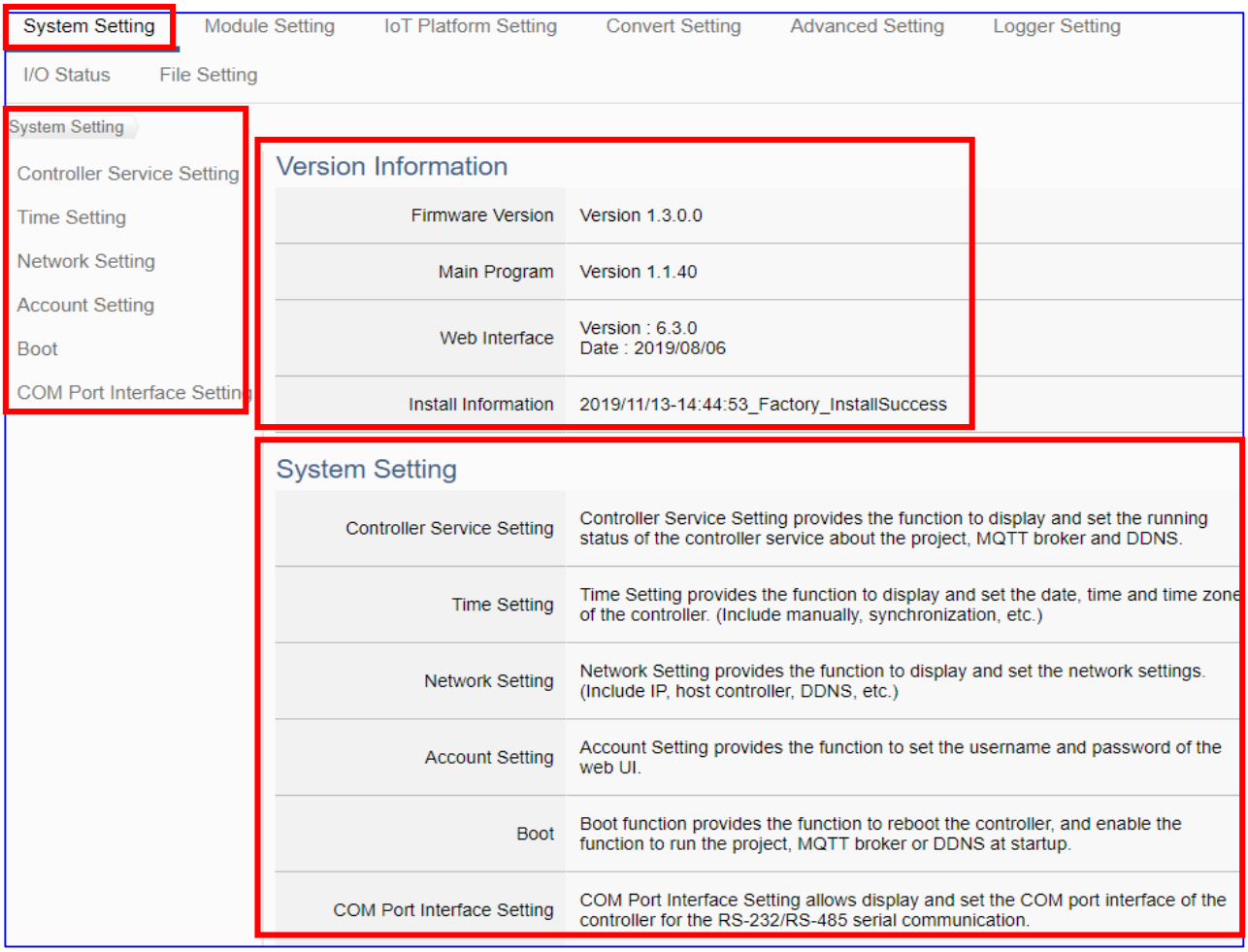


5. Main Menu: Parameter Settings

5.1. Main Menu: System Setting

System Setting is the first item of the Main Menu and the first screen view when login the UA Web UI. The System Setting provides the functions for system management of UA series controller and displays the version information of the system (Higher-left picture).

[System Setting] includes several sub-menu functions (Left picture) and the function descriptions are listed on the page of the Main Menu, such as the controller service, time, network, account, boot and COM port interface settings. This chapter will introduce these function items and setting parameters.

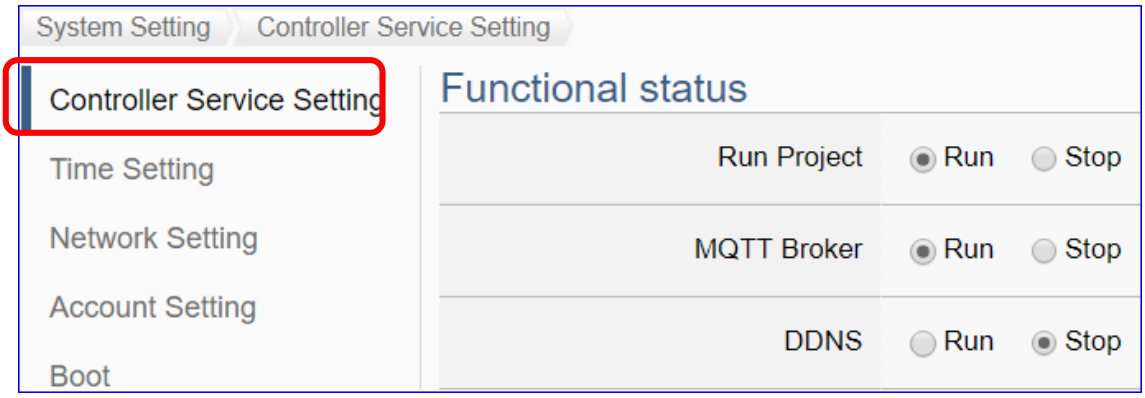


The setting for UA series controllers is to set up from the left to the right of the main menu functions. User can find the setting step and Web UI information in the following chapters.

CH2 Quick Start 1: Hardware/Network Connection
CH3 Quick Start 2: Web UI / Steps / Project Example
CH4 Function Wizard: Project Quick Setup

5.1.1. Controller Service Setting

Controller Service Setting provides the function to display and set the running status of the controller service about the project, MQTT Broker and DDNS.

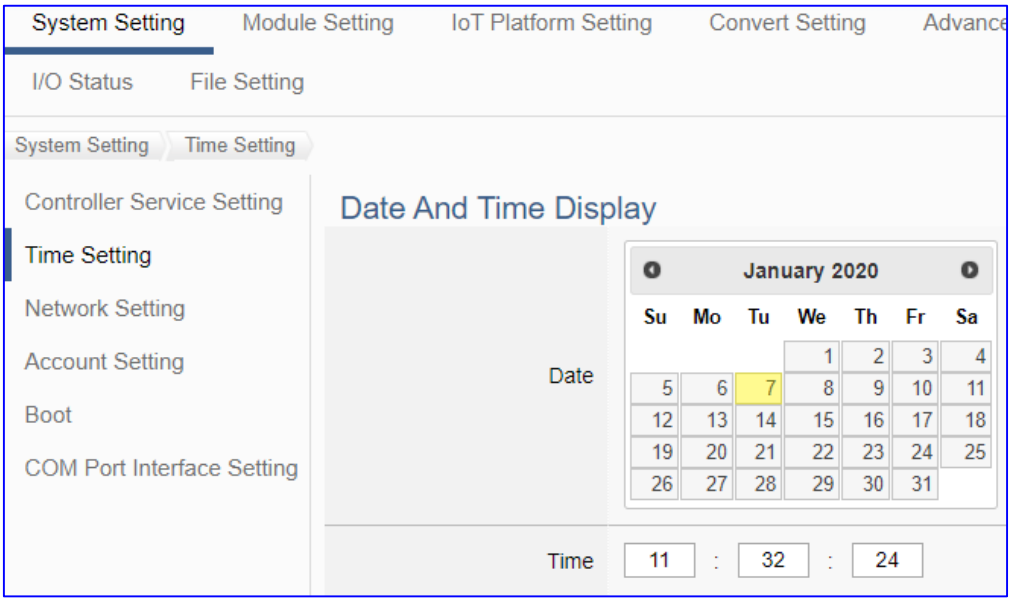


System Setting > Controller Service Setting > Functional status	
Run Project	Display the current status of project running in the UA series controller and provide “Run” and “Stop” button to switch the status. Default: Run.
MQTT Broker	Display the current status of MQTT Broker of the UA series controller and provide “Run” and “Stop” button to switch the status. Default: Run.
DDNS	Display the current status of DDNS Client of the UA series controller and provide “Run” and “Stop” button to switch the status. Default: Stop.

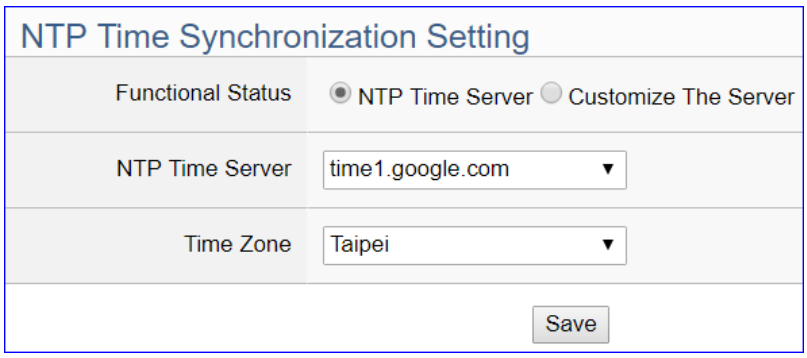
5.1.2. Time Setting

Time Setting provides the function to display and set the date, time and time zone of the controller, including manually, synchronization, etc.

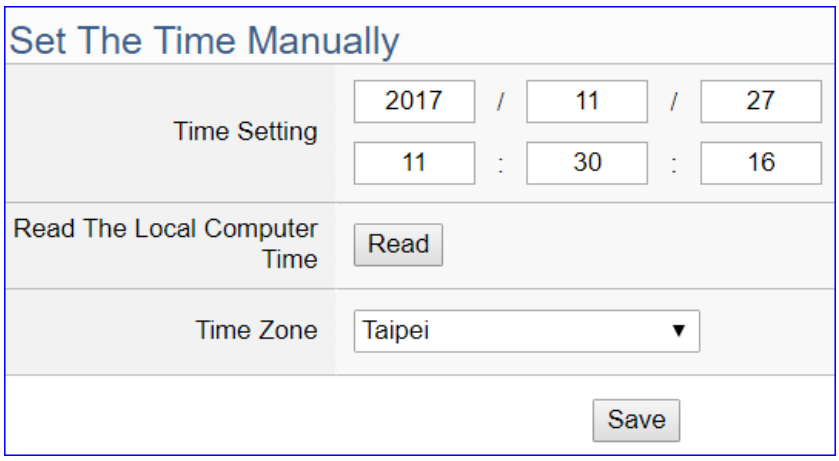
Time Setting provides 3 functions: Data and Time Display, NTP Time Synchronization Setting and Set the Time Manually.



System Setting > Time Setting > Date And Time Display	
Date	Display the date of the UA series controller. The yellow block means current day. User can switch to show the date in other month.
Time	Display the current time of the UA series controller, including hour, minute and second.



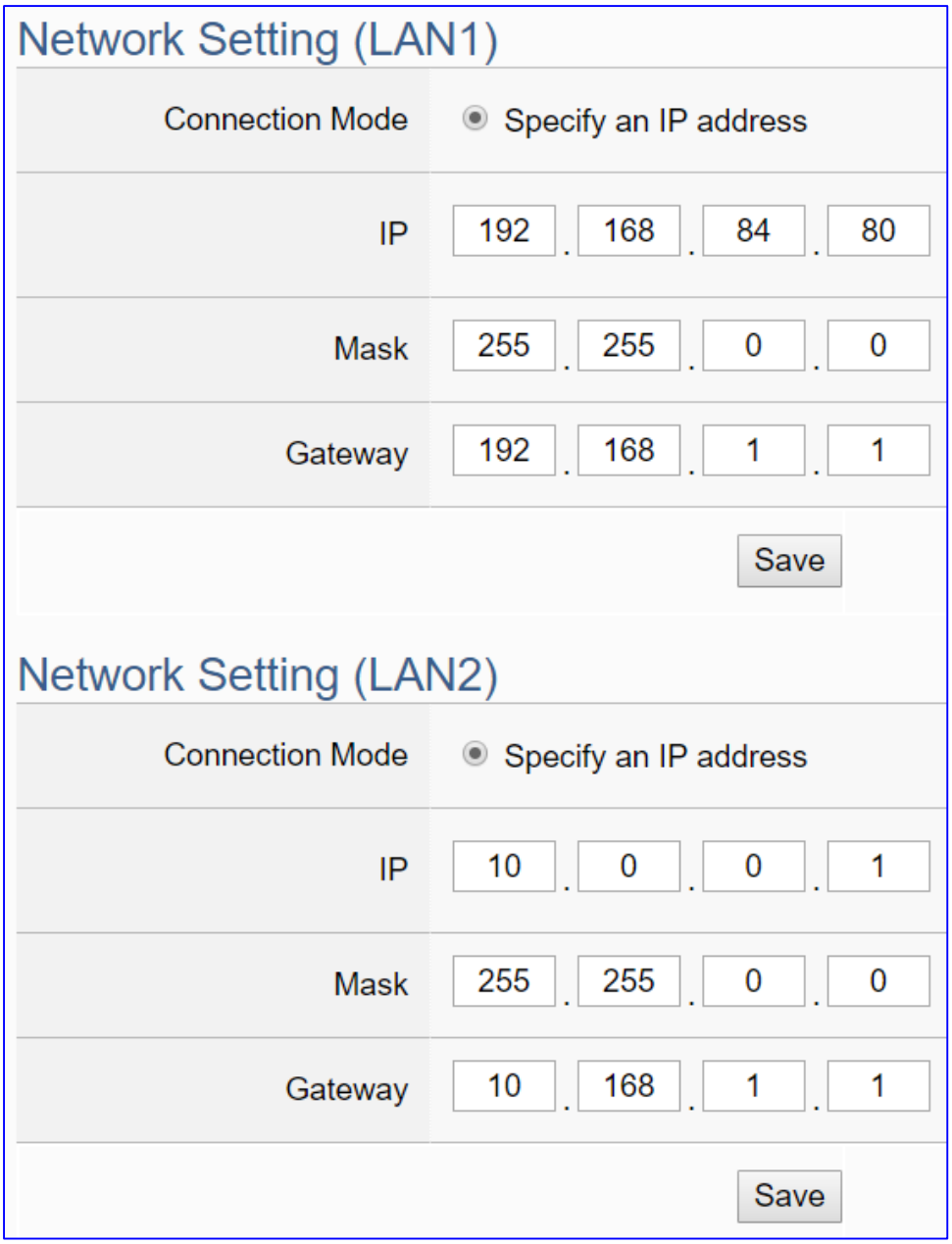
System Setting > Time Setting > NTP Time Synchronization Setting	
Functional Status / NTP Time Server	Set up one NTP Time Server from the google (4), windows and nist (4) servers for synchronization. Click “Customize The Server” and enter the IP address or the domain name can set up user own time server.
Time Zone	Set up the time zone.
Save	Click to save the settings of this item.



System Setting > Time Setting > Set The Time Manually	
Time Setting	Set the system time of the UA controller by manually. Directly enter the new year/month/date and hour:minute:second.
Read The Local Computer Time	Click [Read] can copy the current time of the using computer to the “Time Setting” of this item.
Time Zone	Set up the time zone.
Save	Click to save the settings of this item and update the data of “Time Setting” to the “Date And Time Display” on the top of this page.

5.1.3. Network Setting

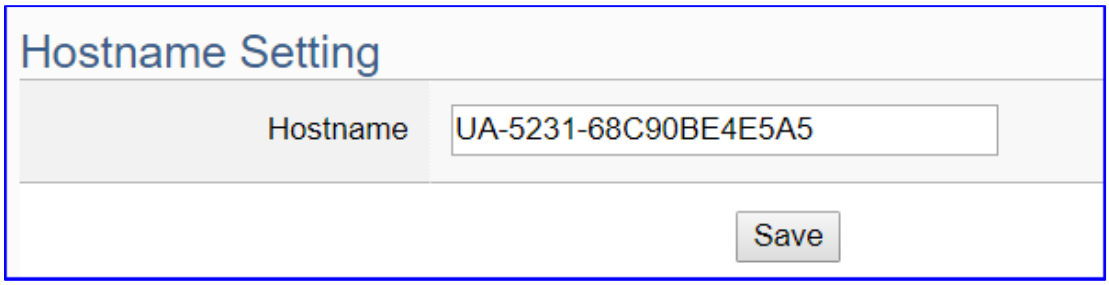
Network Setting provides the function to display and set the network settings, including IP address, host controller, DDNS, etc.



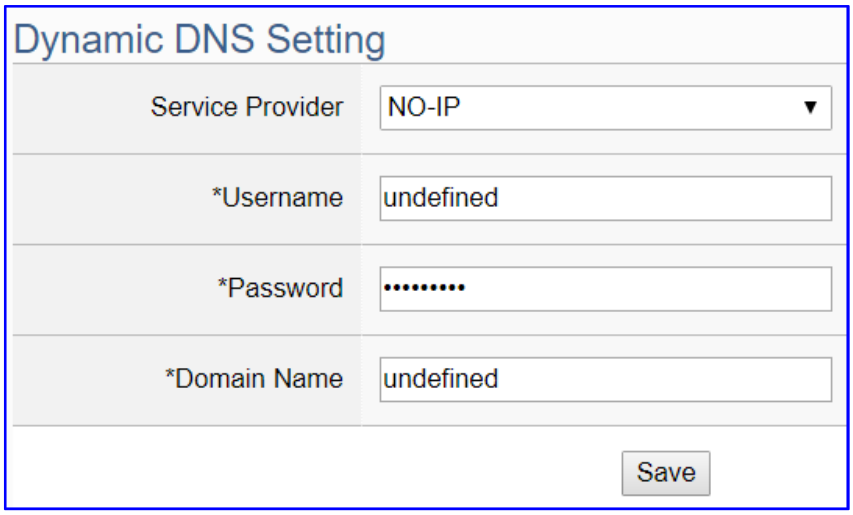
NOTE:

3. **UA-5200 series has 1 LAN (LAN1); UA-2200 series has 2 LANs (LAN1 / LAN2).**
4. **UA-2200 series supports static IP only, so it needs to specify an IP address for each LAN1 and LAN2.**
5. **UA-2200 series uses LAN1 to connect PC. LAN1 and LAN2 must set to different domains. Ex: Set LAN1 IP to "192.168.84.80", and set LAN2 to a different domain, such as, "10.0.0.1".**

System Setting > Network Setting > Network Setting (LAN1)	
Connection Mode	**Specify an IP address**: Users input the values in the fields of IP, Mask and Gateway according to customer's network. Detail information for the factory default value of UA controller network refers to the Section 2.2.1.
IP	The LAN1 IP address of this UA. Factory Default: 192.168.255.1
Mask	The LAN1 mask address of this UA. Factory Default: 255.255.0.0
Gateway	The LAN1 gateway address of this UA. Factory Default: 192.168.1.1
Save	Click to save the settings of LAN1 item.
System Setting > Network Setting > Network Setting (LAN2)	
Connection Mode	**Specify an IP address**: Users input the values in the fields of IP, Mask and Gateway according to customer's network. Detail information for the factory default value of UA controller network refers to the Section 2.2.1.
IP	The LAN2 IP address of this UA. Factory Default: 10.0.0.1
Mask	The LAN2 mask address of this UA. Factory Default: 255.255.0.0
Gateway	The LAN2 gateway address of this UA. Factory Default: 10.168.1.1
Save	Click to save the settings of LAN2 item.



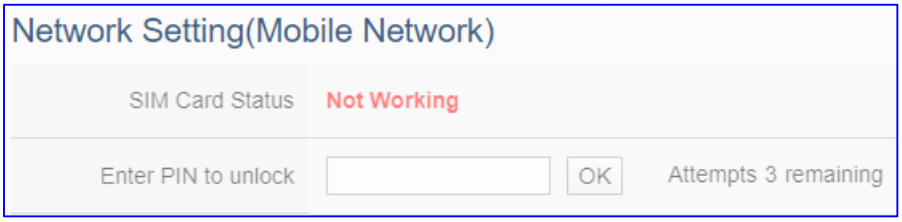
System Setting > Network Setting > Hostname Setting	
Hostname	The host name of this UA. Default: system value. User can give a new name, but cannot be null.
Save	Click to save the settings of this item.



System Setting > Network Setting > Dynamic DNS Setting	
Service Provider	Select the company of the DDNS service. Default: NO-IP. Supports: NO-IP, ChangeIP.com, DynDNS, FreeDNS.
*Username	Set up the login user name. The star * means the field cannot be null. Default: undefined.
*Password	Set up the login password. The star * means the field cannot be null.
*Domain Name	Define the parked domain name of the DDNS. The star * means the field cannot be null. Default: undefined.
Save	Click to save the settings of this item.

* The star " * " means the field cannot be null.

- **** Network Setting (Mobile Network):**

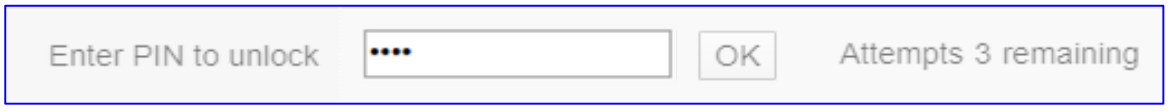


Setting Steps & Notice:

1. This "**Mobile Network**" setting items appears only on the **mobile model** of UA controller (**-4GE/4GC/3GWA**).
2. **Insert the SIM card** into the **SIM card socket** of UA, and then **power on or restart** the UA. Login the web UI again. When the "**SIM Card Status**" item appears "**Working**", the network connection is successful. Users can check the **3G/4G LED Status** of UA Series to know the module status.

LED	LED Status	Module Status
3G	Green: ON	The modem is functioning normally, and the SIM card inside.
	OFF	The modem is not functioning, no SIM card inside, or the PIN is still locked.
4G	Green Light Flash: ON for 2 seconds, OFF for 1 sec, and flashing alternately.	The modem is functioning normally, and the SIM card inside.
	Green Light Flash: ON for 1 second, OFF for 2 secs, flashing alternately, or OFF .	The modem is not functioning, no SIM card inside, or the PIN is still locked.
	Green Light Flash: Quickly	Data is transmitting.

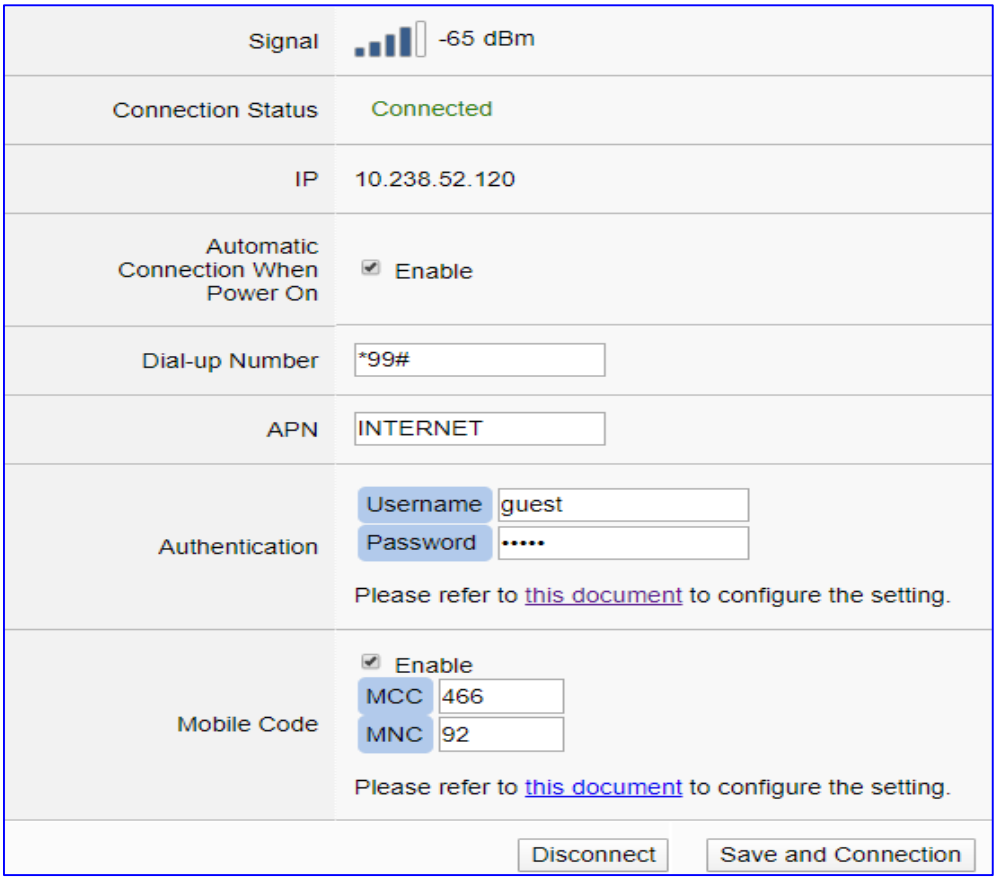
3. **Enter the PIN number** to unlock the SIM card:



* The SIM card of a telecom company is usually locked and protected by a PIN number. Please **unlock the PIN before setting the Mobile Network function**.

* The PIN access will be locked out after **three fault attempts**. The user needs to contact the telecom company of the SIM card to unlock it before proceeding.

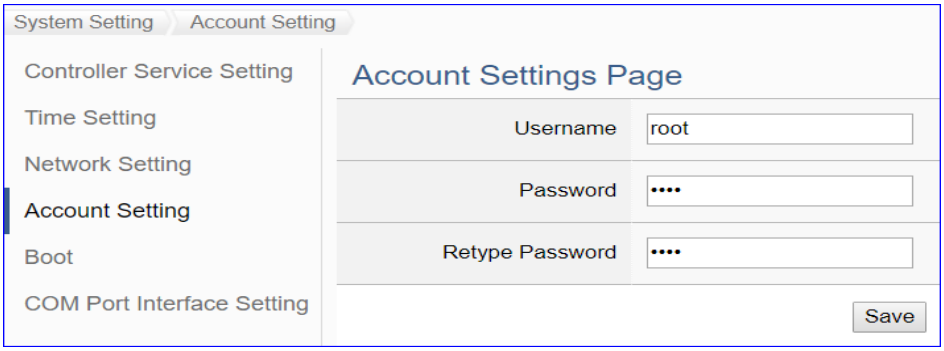
4. Set up the network settings (see next page), check the "Enable" items, and click the "Save and Connect" button. When the "Connection Status" becomes "Connected", the connection is successful.
5. When the mobile network is enabled, the mobile network will serve as the main route to the external network.



System Setting > Network Setting > Network Setting(Mobile Network)	
Signal	Display the strength level of the Mobile Network Signal. Signal strength range: (The strongest signal) -51 ~ -113 (No signal)
Connection Status	Display the connection status: Connected or Disconnected.
IP	Display the IP address that UA occupies through Mobile Network.
Automatic Connection When Power On	If check the “Enable” box, it will enable the UA controller to complete the Mobile Network connection automatically when power on UA controller.
Dial-up Number	Default: *99#. User can change it by the proprietary number provided by the Telecommunication Service Company.
APN	Please refer to “this document” provided on the UA Web HMI page to configure the setting.
Authentication	Please refer to “this document” provided on the UA Web HMI page to configure the setting.
Mobile Code	It is an optional setting. It depends on the service the Telecommunication Service Company provides
Disconnect	Click button can disconnect the Mobile Network connection.
Save and Connection	Click button to save the setting and start to connect the Mobile Network.

5.1.4. Account Setting

Account Setting provides the function to set the login username and password of the UA web UI.



System Setting > Account Setting > Account Settings Page	
Username	The login username for the UA Web UI. Factory default: root
Password	The login password for the UA Web UI. Factory default: root
Retype Password	Retype the password for the operation conform when setting the new account information.
Save	Click to save the settings of this page.

After first login, change your password as soon as possible for your system safety.

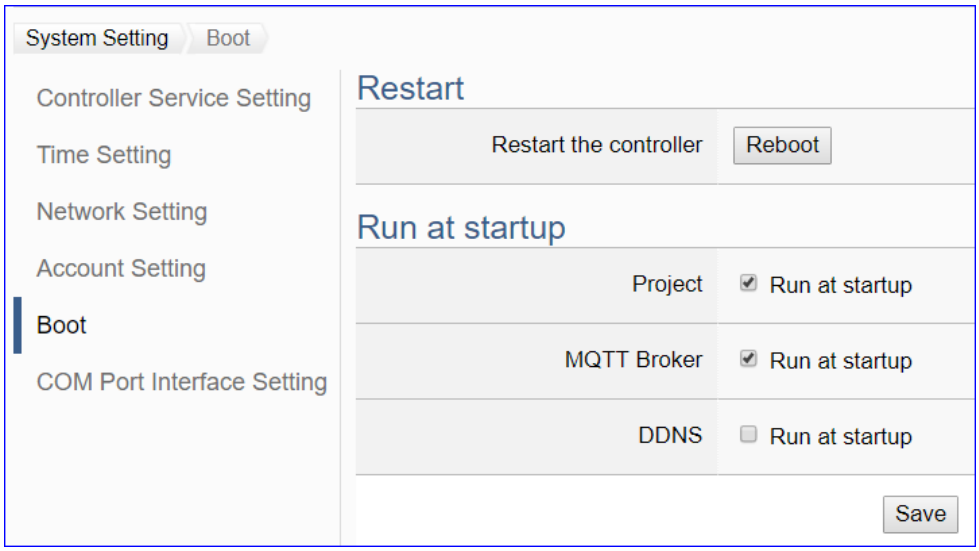
Steps to change the username and password:

1. Type the new username in the “Username” item.
2. Type the new password in the “Password” item.
3. Retype the new password in the “Retype Password” item.
4. Click the “Save”. Then re-login the UA Web UI with the new username and password.

Factory Default Settings of UA Series			
Network	**IP (LAN1)** **IP (LAN2)**	**192.168.255.1** **10.0.0.1**	Assign UA a new IP address according to your case. For UA-2200 series, set the LAN1 for the connection.
	Netmask	**255.255.0.0**	
	Gateway	**192.168.1.1**	
OS Account	**Username**	**root**	**After login, change your password as soon as possible.** (Section 5.1.4 for Web UI) (Appendix E for OS password)
	Password	**icpdas**	
Web UI Account	**Username**	**root**	
	Password	**root**	

5.1.5. Boot

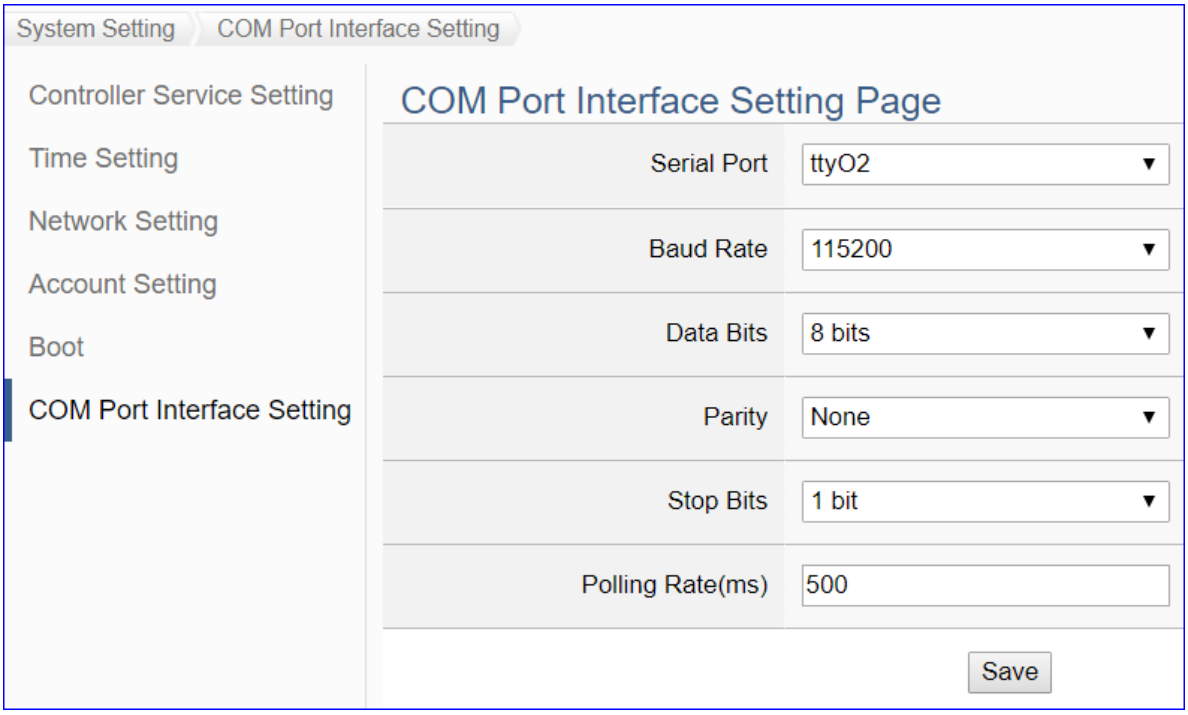
Boot function provides the function to reboot the UA series controller, and enable the function to run the project, MQTT broker or DDNS at startup.



System Setting > Boot > Restart	
Restart the controller	Click “Reboot” can restart the UA controller at once.
System Setting > Boot > Run at startup	
Project	Check the “Run at startup” box can set the project to run at the UA controller startup. Default: check.
MQTT Broker	Check the “Run at startup” box can set the MQTT Broker to run at the UA controller startup. Default: check.
DDNS	Check the “Run at startup” box can set the DDNS to run at the UA controller startup. Default: uncheck.
Save	Click to save the settings of this page.

5.1.6. COM Port Interface Setting

COM Port Interface Setting allows display and set the COM port interface of the UA series controller for the RS-232/RS-485 serial communication.

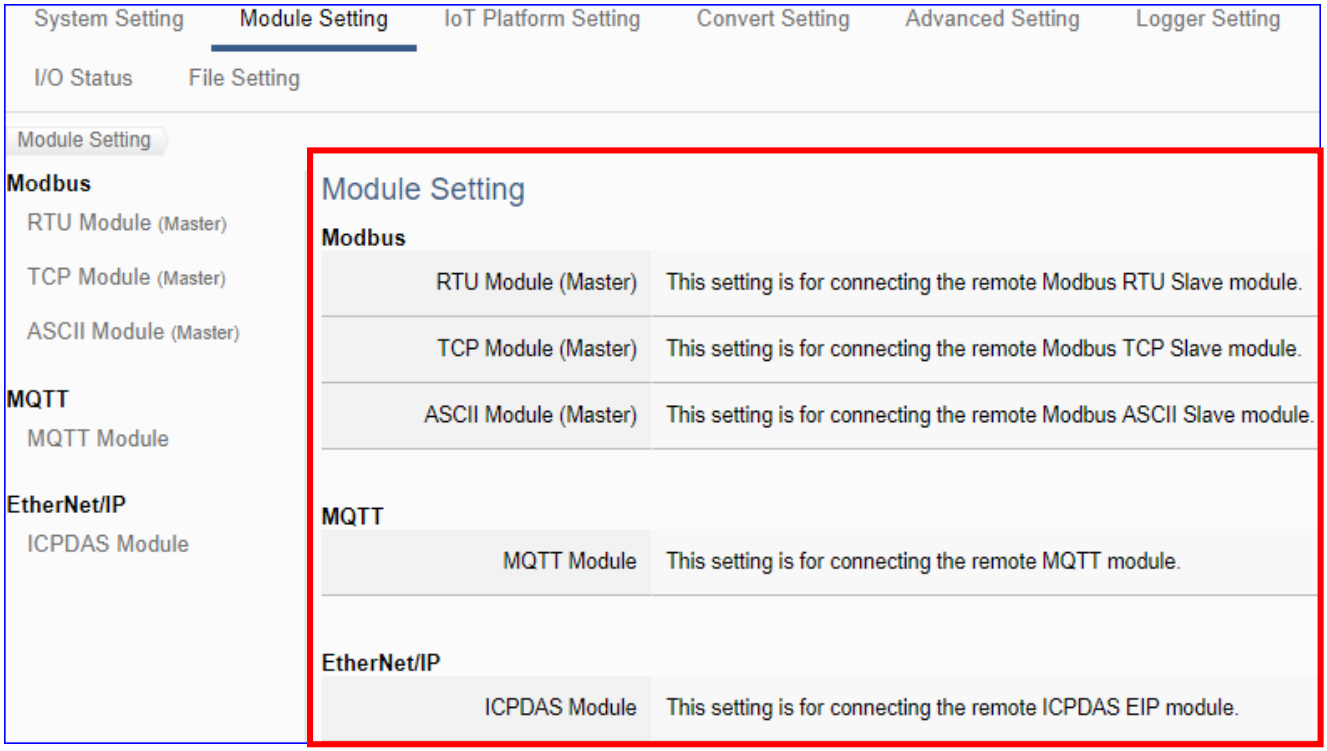


System Setting > COM Port Interface Setting > COM Port Interface Setting Page	
Serial Port	Choose the serial port of UA controller that links with the I/O module. ttyO2: RS-485 ; ttyO4: RS-232 ; ttyO5: RS-485. Default: ttyO2.
Baud Rate	Choose a baud rate to communicate with the module: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. The UA controller and the I/O module need have the same baud rate. Default: 115200.
Data Bits	The number of bits used to represent one byte of data: 7 bits or 8 bits. Default: 8 Bits.
Parity	Choose one way for the parity checking. Options: None, Even, and Odd. Default: None.
Stop Bits	Choose the number of stop bit: 1 bit or 2 bits. Default: 1.
Polling Rate(ms)	Set a time interval for the command. Default: 500 ms
Save	Click to save the settings of this page.

5.2. Main Menu: Module Setting

Module Setting is the second item of the Main Menu. The Module Setting provides the functions for UA series controller to connect the remote Modbus (RTU/TCP/ASCII module), remote MQTT and remote EtherNet/IP module.

[Module Setting] includes three sub-menu functions (see the picture below) and the function descriptions are listed on the page of the Main Menu, such as the Modbus RTU Module (Master), TCP Module (Master), ASCII Module (Master), MQTT and ICP DAS EIP Module. The Module Setting will support more modules in the future. This chapter will introduce the current function items and setting parameters.

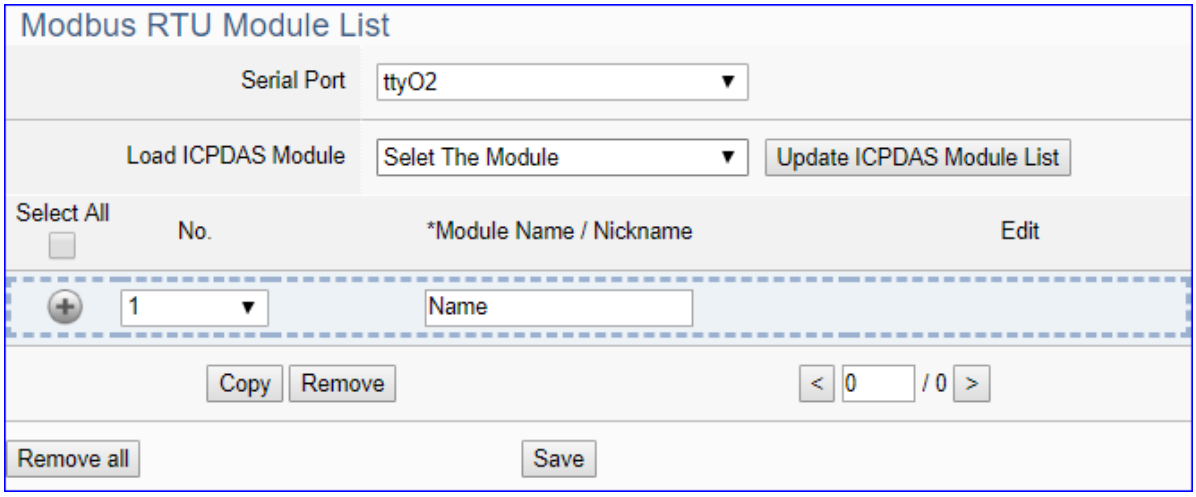


The setting for UA series controllers is to set up from the left to the right of the main menu functions. User can find the setting step and Web UI information in the following chapters.

CH2 Quick Start 1: Hardware/Network Connection
CH3 Quick Start 2: Web UI / Steps / Project Example
CH4 Function Wizard: Project Quick Setup

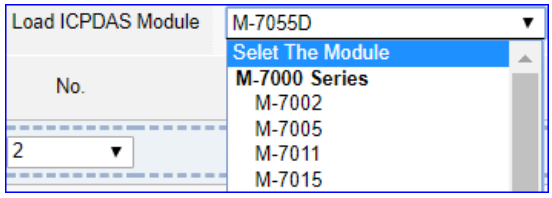
5.2.1. Modbus RTU (Master)

This setting is for UA Controller connecting the remote Modbus RTU Slave module.

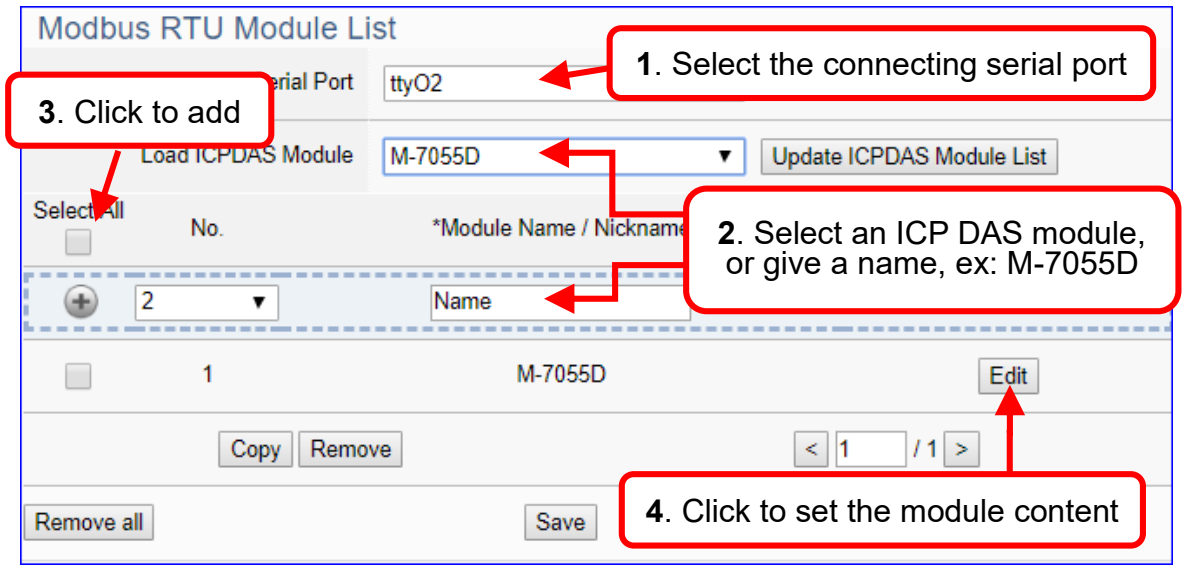


This page is for setting the communication values with the connected modules. First choose the serial port that connected with the module, and each module can give a name (Default: Name). Click [⊕] button could add a new module. If using ICP DAS module, user just need to select the model number, system will auto add and setup the module. Click [Edit] button can configure the module content and the Modbus mapping table.

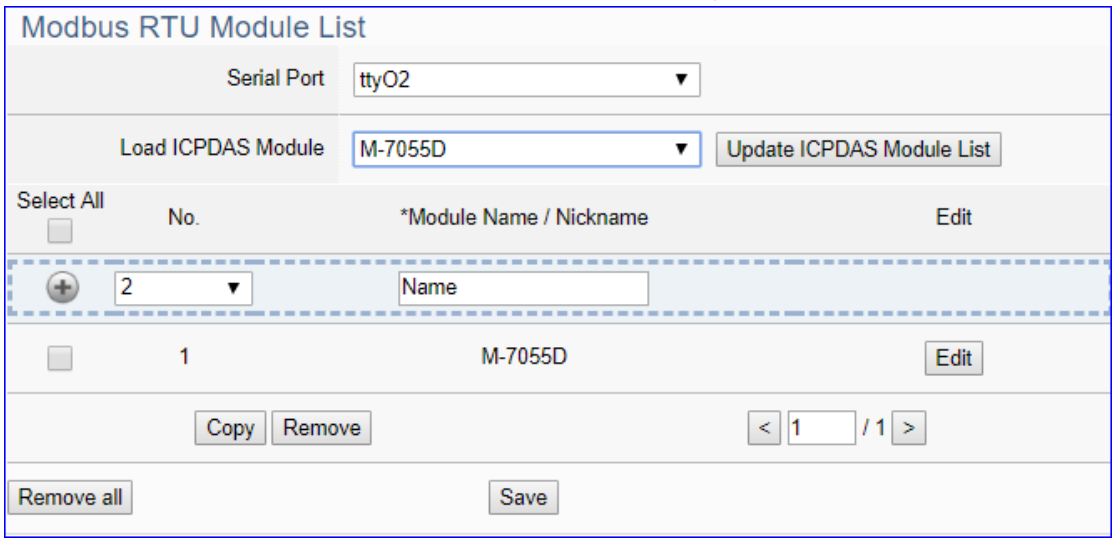
Setting Steps:

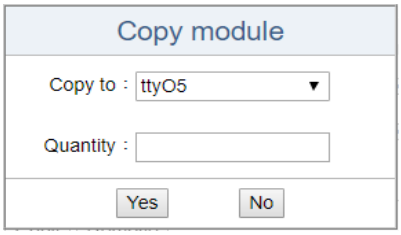
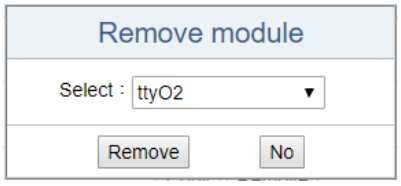
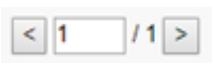


6. Select the module Serial port
7. a) Select an ICP DAS model (as the pic), system will auto load/setup the module.
   b) Give the module name or nickname, e.g. M-7055D. Click [⊕] to add a new module
8. Click the button [Edit] to enter the Module Content Setting page
9. Set up the Modbus Mapping Table for the UA controller and module I/O channels

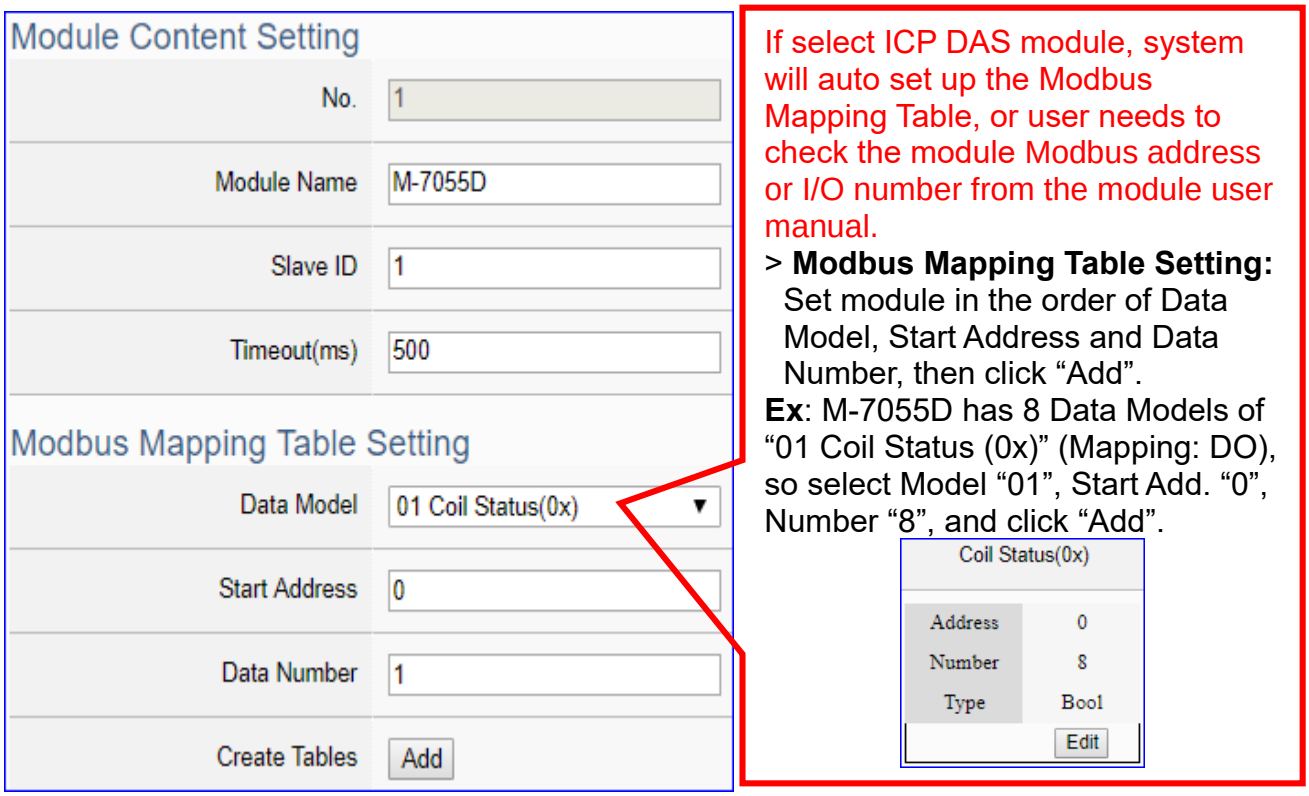


The function items and setting parameters of the [Modbus RTU Module List]:



Module Setting > Modbus - RTU Module (Master) > Modbus RTU Module List	
Serial Port	Choose the serial port of UA controller that links with the I/O module. ttyO2: RS-485; ttyO4: RS-232; ttyO5: RS-485. Default: ttyO2.
Load ICPDAS Module	Select the ICP DAS module number, system will auto add and setup the module. Click “Update ICPDAS Module List” can update new list.
	Click to add a list of module.
	Check the box in the left of the module is to select that module list, can delete or copy the module. Check the box “Select All” will select all modules in the list.
No.	The module number in the module list (System arrange, not editable)
*Module Name / Nickname	Module name or nickname. User can give a new name. (The star * means this field cannot be null.)
Edit	Click to set the module in the Module Content Setting page.
Copy	Select the module wants to copy by check the box and click [Copy] can copy module by assigning port and Number. Yes: copy the module and exit. No: exit without copy. 
Remove	Click to delete the checked module(s)
Remove all	Click to delete all modules linked with the selected port. Remove: delete the modules and exit. No: exit without delete module. 
	The page number / total pages of the module list. Click < or > to go to the previous or the next page.
Save	Click to save the settings of this page.

Click [Edit] button to enter the “Module Content Setting” page.

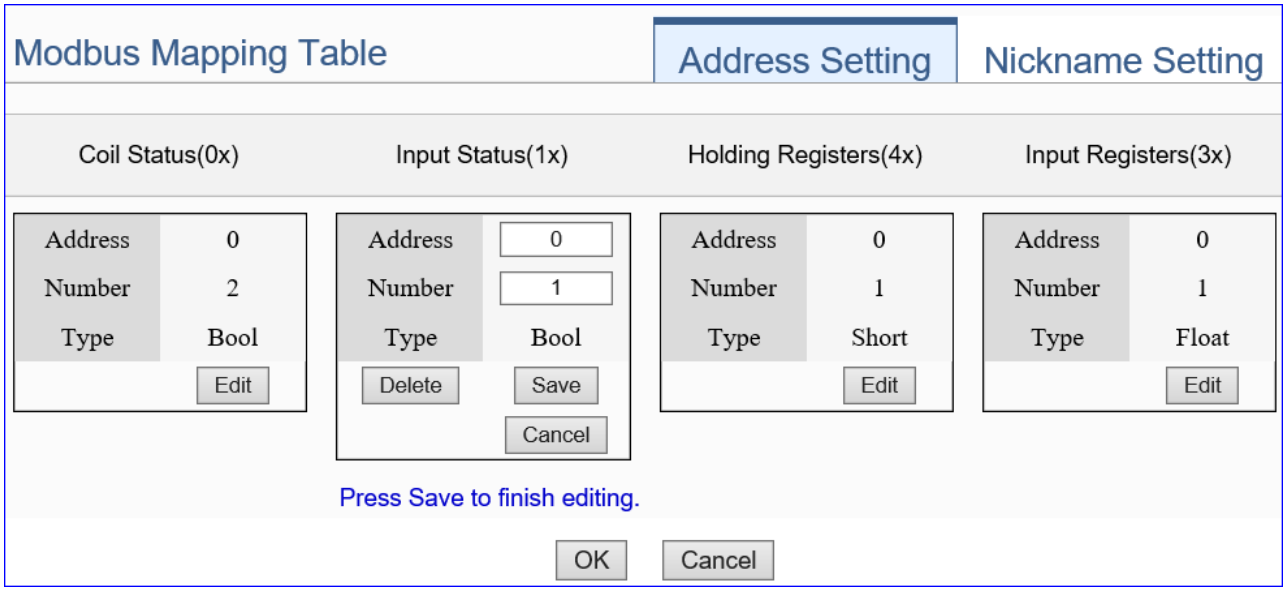


Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Slave ID	Set the module Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models “01” ~ “04” for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

The finished Modbus Mapping Table as below is in order of DO, DI, AO and AI.

Address Setting:

Display and edit the Modbus Mapping Table.

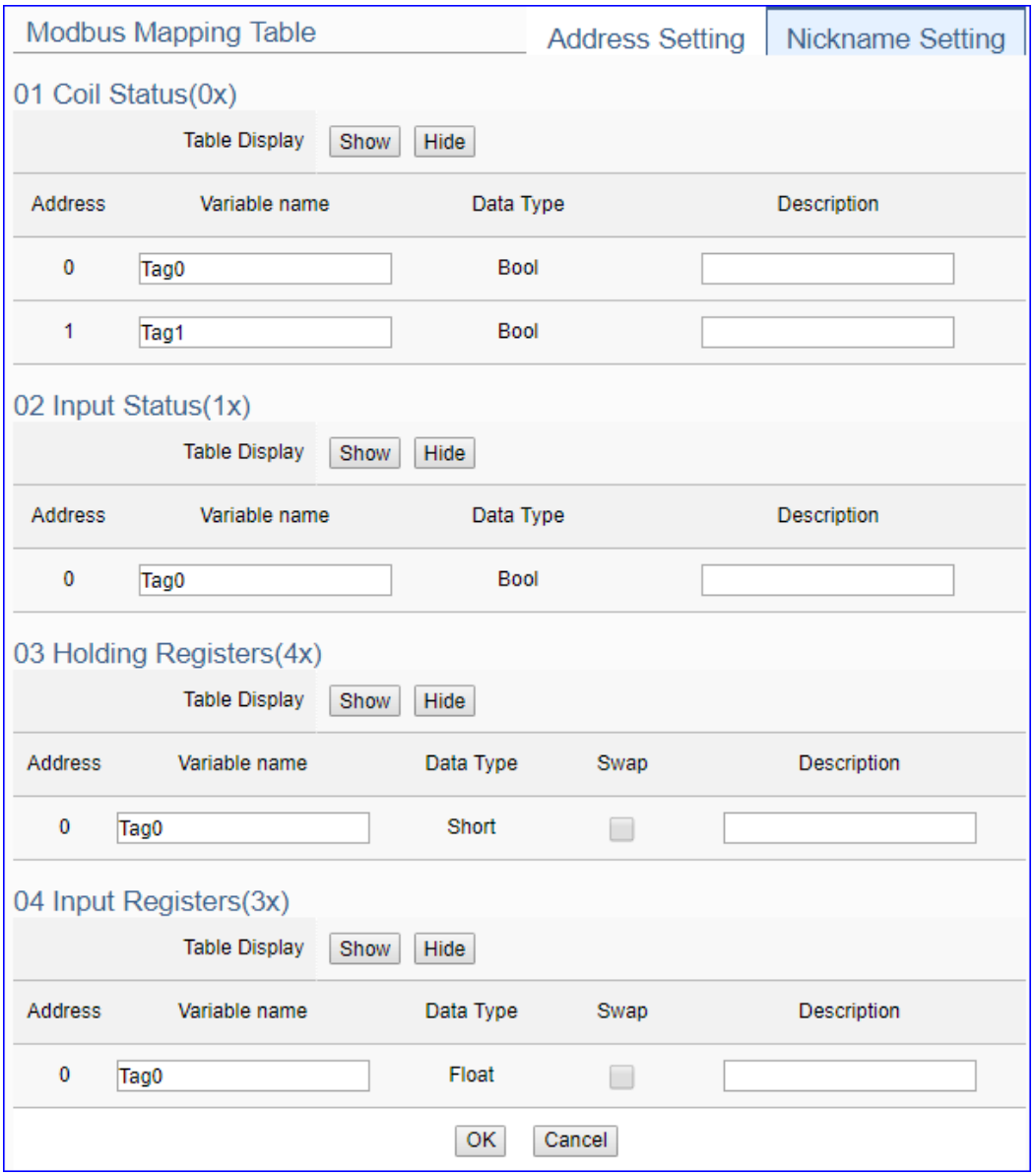


If user selects ICP DAS module, the system will auto set up the Modbus Mapping Table. If not, user needs to check the module Modbus address or I/O number from the module user manual.

Modbus Mapping Table – Address Setting	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname Setting:

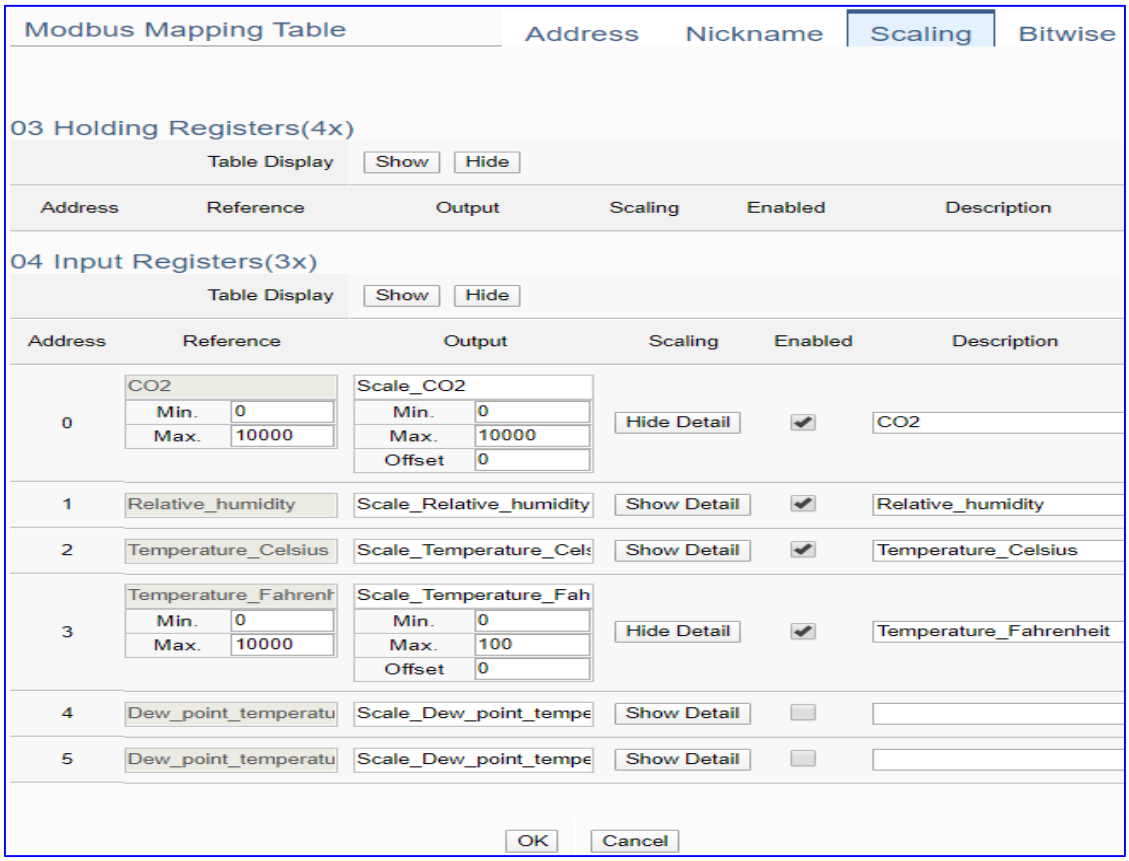
Setting the variable nickname and description.



Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

● ** Scaling

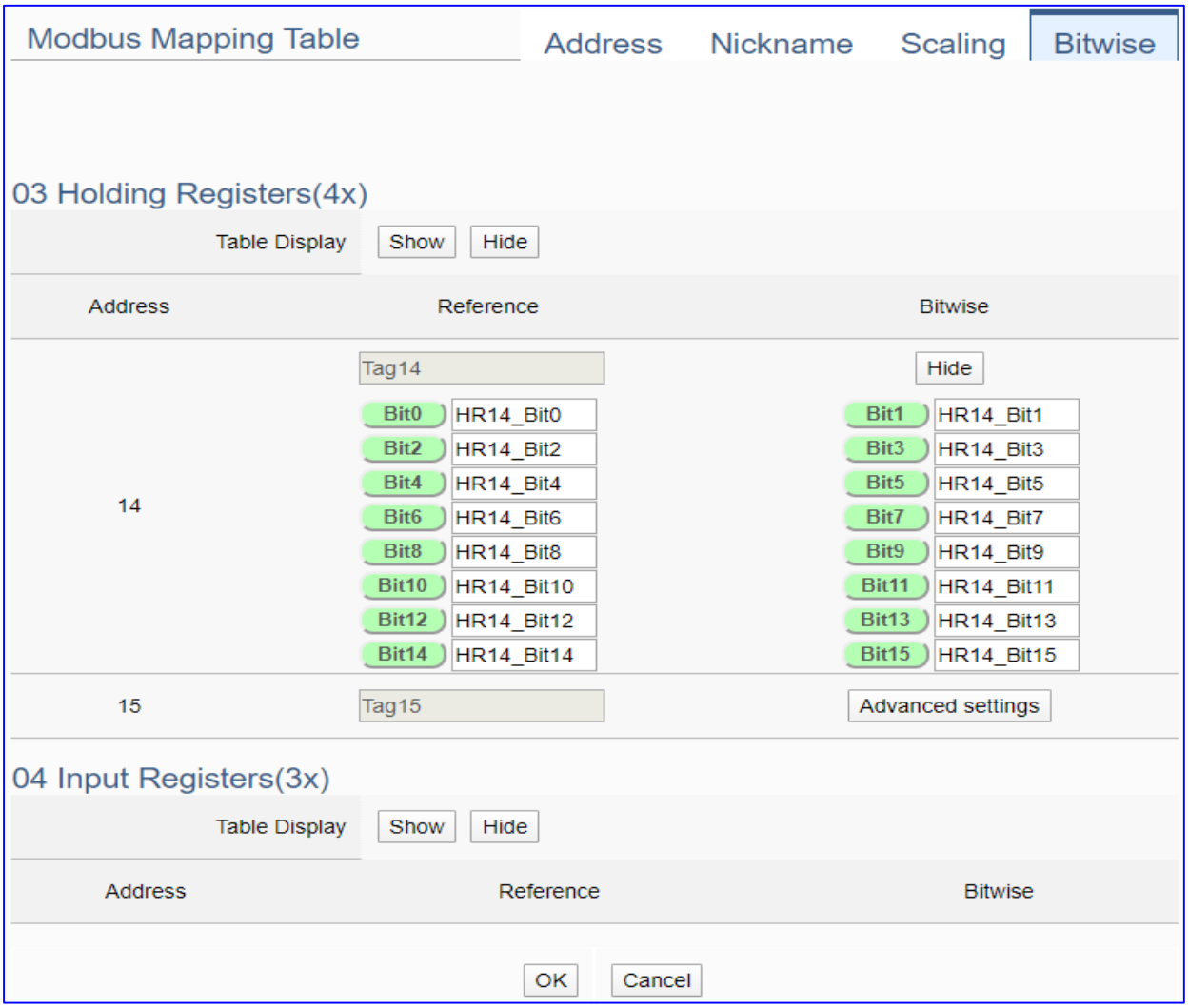
Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated.



Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The I/O variable of the Modbus address.
Output	The scaling variable for scaling output. User can define the variable name.
Scaling	Click [Show Detail] to set up the Scaling parameters, and click [Hide Detail] to hide the parameters. Fill in the Min/Max range values of the source in the Reference column. Fill in the Min/Max range values after scaling in the Output column. If needs offset, fill the offset value in the Offset item. Remember check “Enable” box.
Enable	Check the box of the variable can enable just that variable for scaling.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

- **** Bitwise**

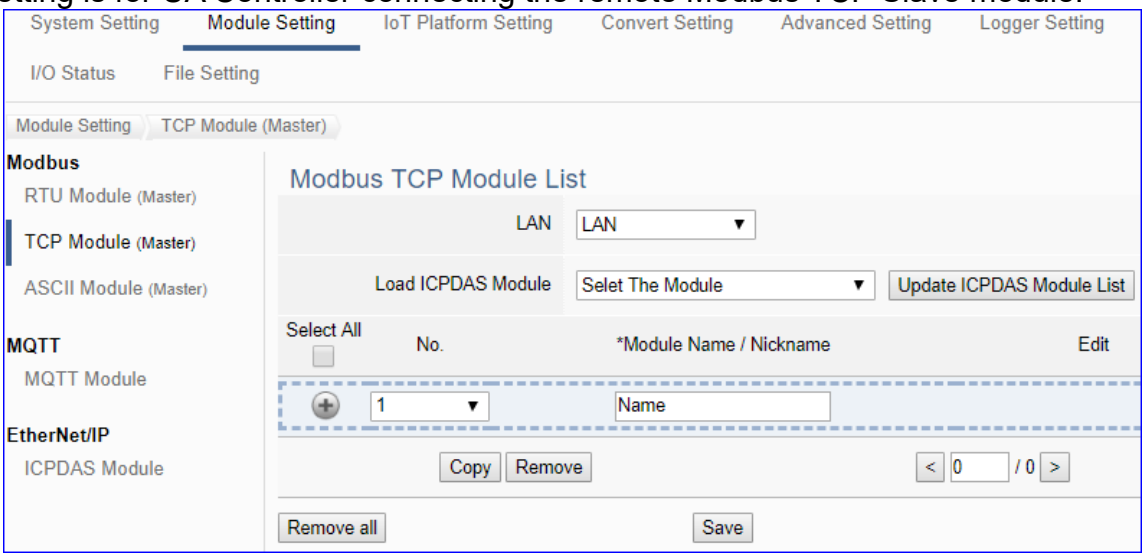
Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.



Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The Bit# variables of the Modbus address.
Bitwise	Set up the variables for Bitwise. Click [Advanced Settings] to set up the Bitwise parameters, and click [Hide] to hide the parameters. Fill in the variable names to the Bit# that wanted to do the Bitwise. The value in the fixed bit number will be assigned into the variable.
OK	Click to save this page settings and back to the module list page.

5.2.2. Modbus TCP (Master)

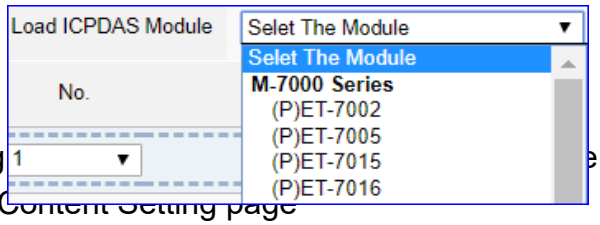
This setting is for UA Controller connecting the remote Modbus TCP Slave module.

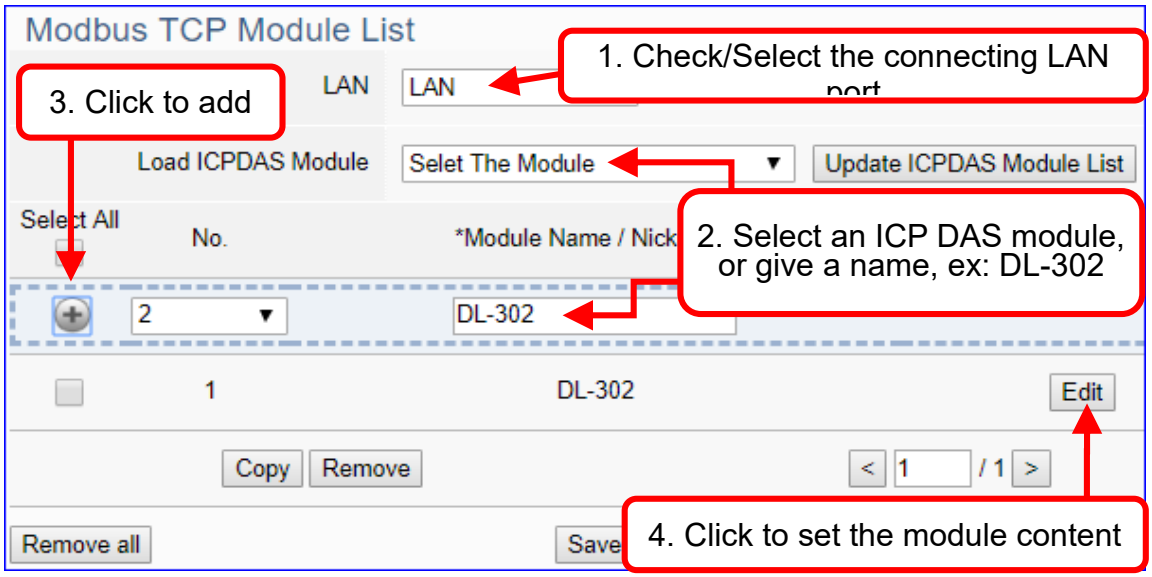


This page is for setting the communication values with the connected modules. First choose the Ethernet LAN port that connected with the module, and each module can give a name (Default: Name). Click [⊕] button could add a new module. If using ICP DAS module, user just need to select the model number, system will auto add and setup the module. Click [Edit] button to configure the module content and the Modbus mapping table.

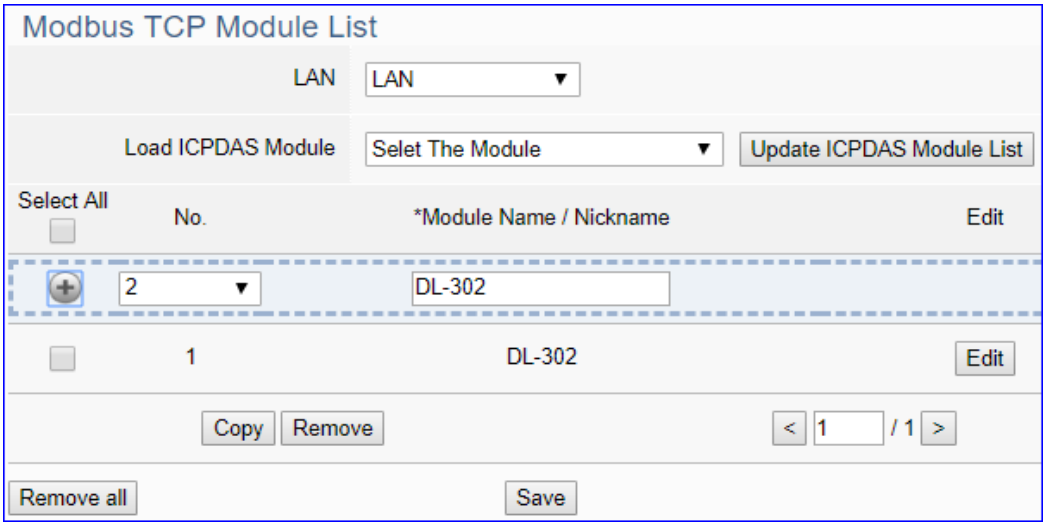
Setting Steps:

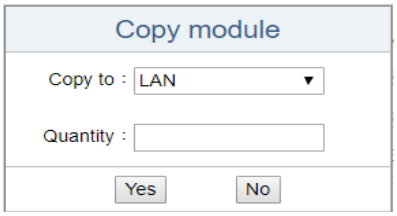
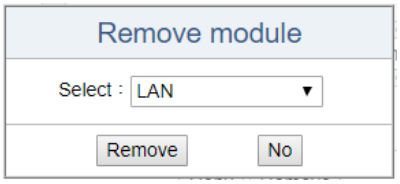
1. Check/Select the module LAN port
2. a) Select an ICP DAS model (as the pic), system will auto load/setup the module.
   b) Give the module name or nickname, e.g
3. Click the button [Edit] to enter the Module Content Setting page
4. Set up the Modbus Mapping Table for the UA controller and module I/O channels



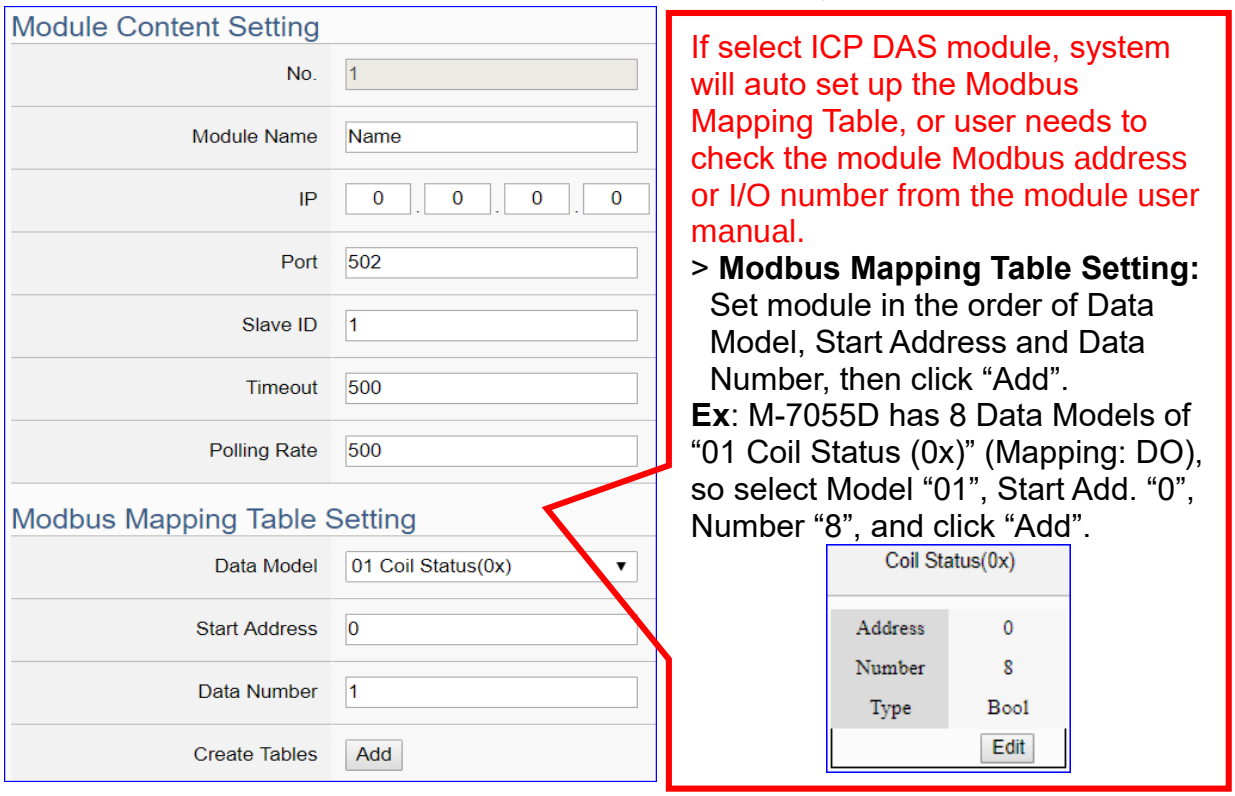


The function items and setting parameters of the [Modbus TCP Module List]:



Module Setting > Modbus - RTU Module (Master) > Modbus RTU Module List	
LAN	Choose the LAN port of UA controller that links with the TCP module. UA-52xx has one LAN port; the coming UA-2xxx has 2 LAN ports.
	Click to add a list of module.
	Check the box in the left of the module is to select that module list, can delete or copy the module. Check the box “Select All” will select all modules in the list.
No.	The module number in the module list (System arrange, not editable)
*Module Name / Nickname	Module name or nick name. User can give a new name. (The star * means this field cannot be null.)
Edit	Click to set the module in the Module Content Setting page.
Copy	Select the module wants to copy by check the box and click [Copy] can copy module by assigning port and quantity. Yes: copy the module and exit. No: exit without copy. 
Remove	Click to delete the checked module(s)
Remove all	Click to delete all modules linked with the selected port. Remove: delete the modules and exit. No: exit without delete module. 
	The page number / total pages of the module list. Click < or > to go to the previous or the next page.
Save	Click to save the settings of this page.

Click [Edit] can enter the [**Module Content Setting**] page to set up the module and the Modbus address mapping table.

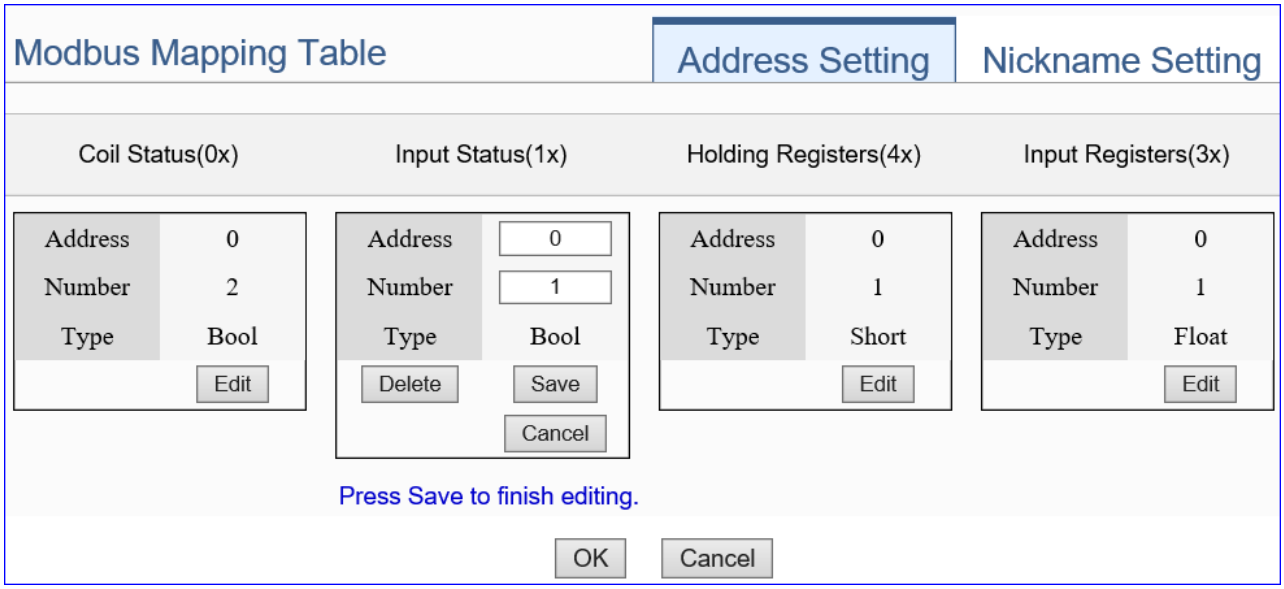


Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
IP	The IP address of the connected module. Default: 0.0.0.0
Port	The port number for Modbus TCP. Default: 502
Slave ID	Set the Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Polling Rate	Set a time interval for the command. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models “01” ~ “04” for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

The finished Modbus Mapping Table as below is in order of DO, DI, AO and AI.

Address Setting:

Display and edit the Modbus Mapping Table.

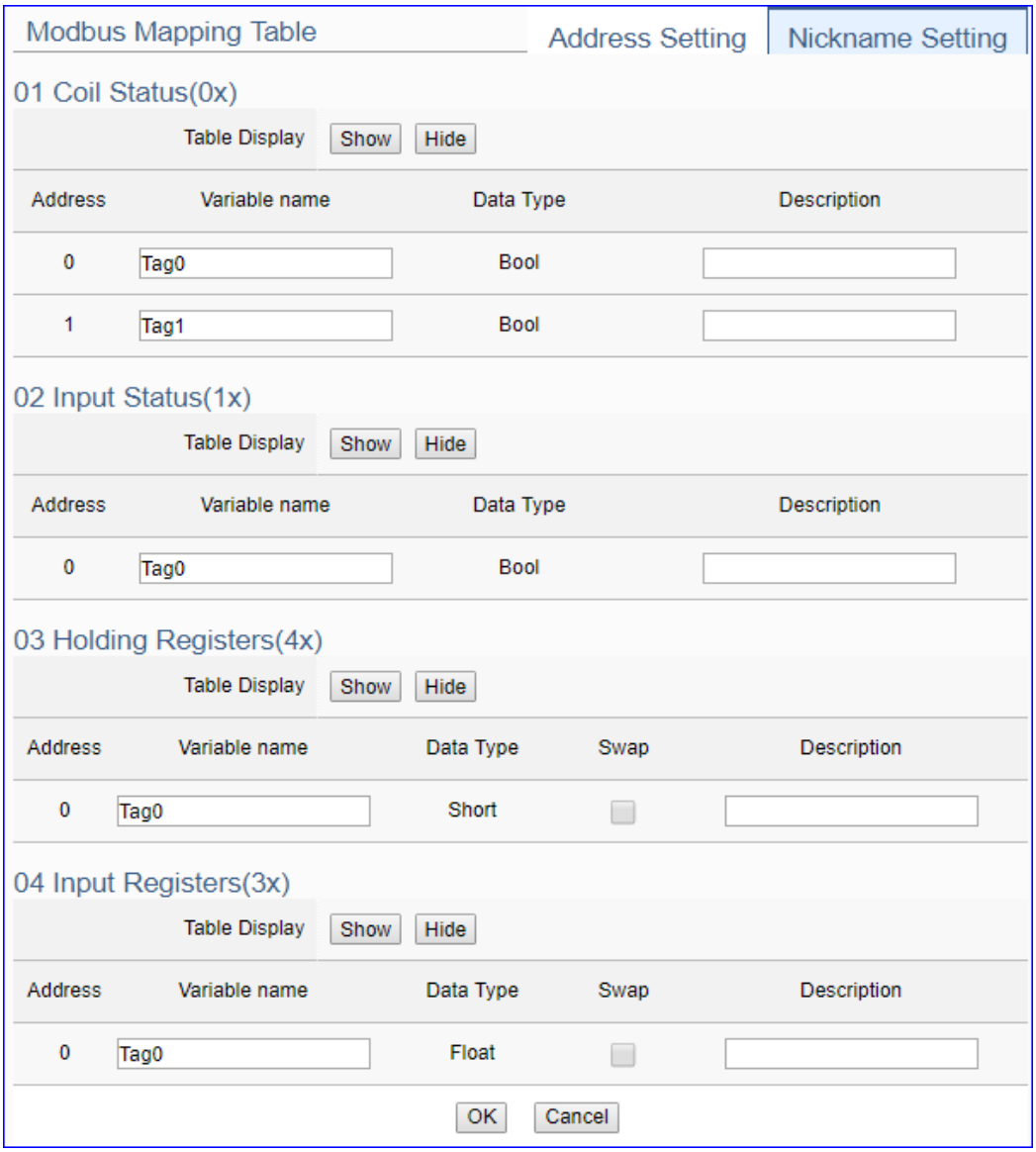


If user selects ICP DAS module, the system will auto set up the Modbus Mapping Table. If not, user needs to check the module Modbus address or I/O number from the module user manual.

Modbus Mapping Table – Address Setting	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname Setting:

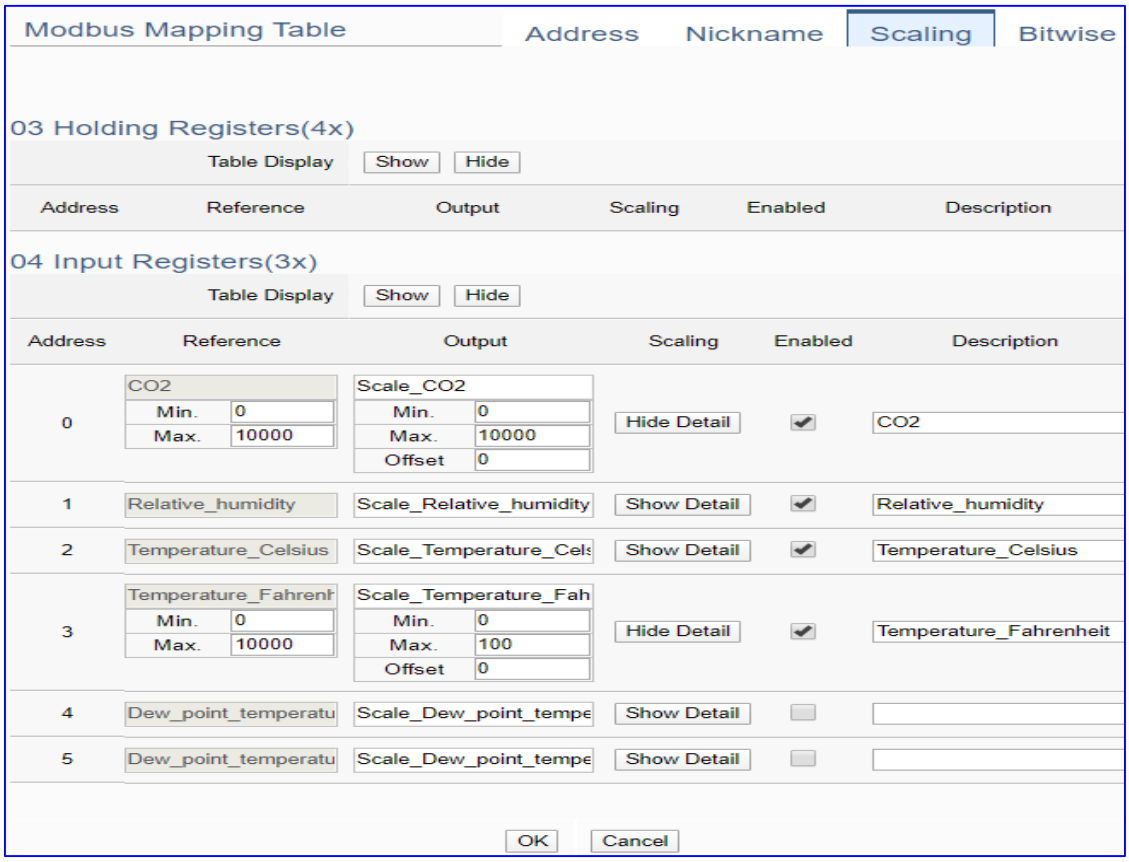
Setting the variable nickname and description.



Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

● ** Scaling

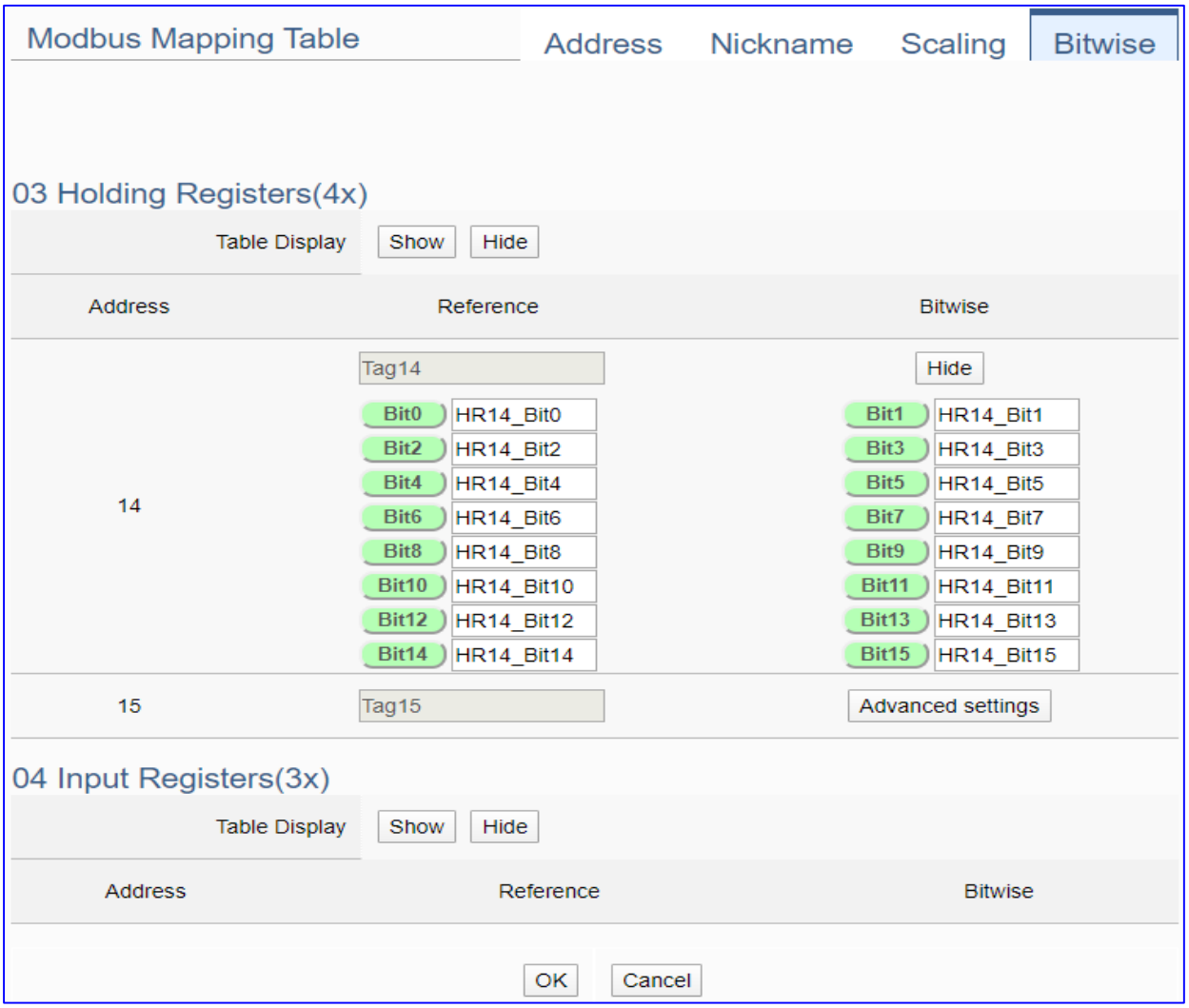
Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description, and check "**Enable**" box, The Scaling conversion function will be activated.



Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The I/O variable of the Modbus address.
Output	The scaling variable for scaling output. User can define the variable name.
Scaling	Click [Show Detail] to set up the Scaling parameters, and click [Hide Detail] to hide the parameters. Fill in the Min/Max range values of the source in the Reference column. Fill in the Min/Max range values after scaling in the Output column. If needs offset, fill the offset value in the Offset item. Remember check “Enable” box.
Enable	Check the box of the variable can enable just that variable for scaling.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

- **** Bitwise**

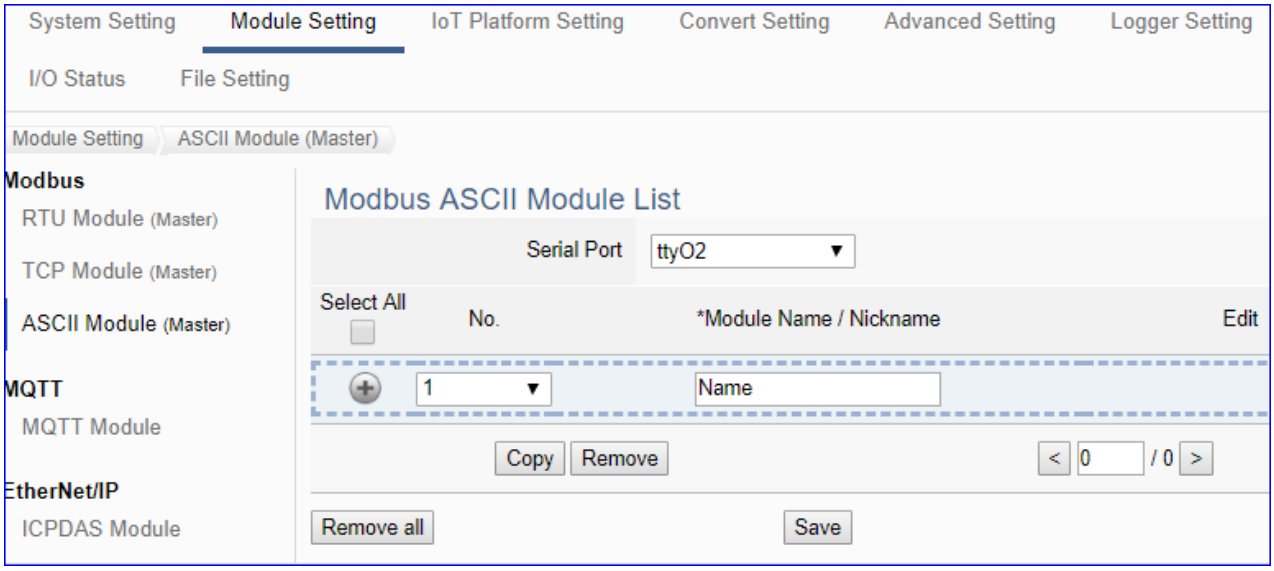
Bitwise is only available in the AI/AO settings of Modbus RTU/TCP. When the data needed to take out the value of the specified bit, fill in the variable name in the specified Bit# of the required address, and the value of the bit can be output to the filled variable.



Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Reference	The Bit# variables of the Modbus address.
Bitwise	Set up the variables for Bitwise. Click [Advanced Settings] to set up the Bitwise parameters, and click [Hide] to hide the parameters. Fill in the variable names to the Bit# that wanted to do the Bitwise. The value in the fixed bit number will be assigned into the variable.
OK	Click to save this page settings and back to the module list page.

5.2.3. Modbus ASCII (Master)

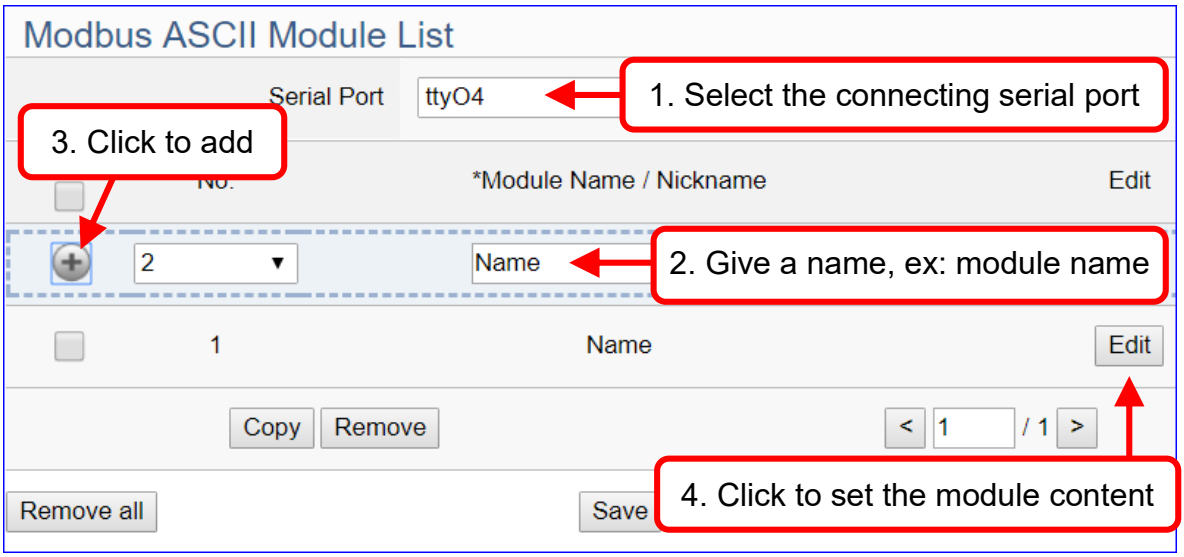
This setting is for UA Controller connecting the remote Modbus ASCII Slave module.



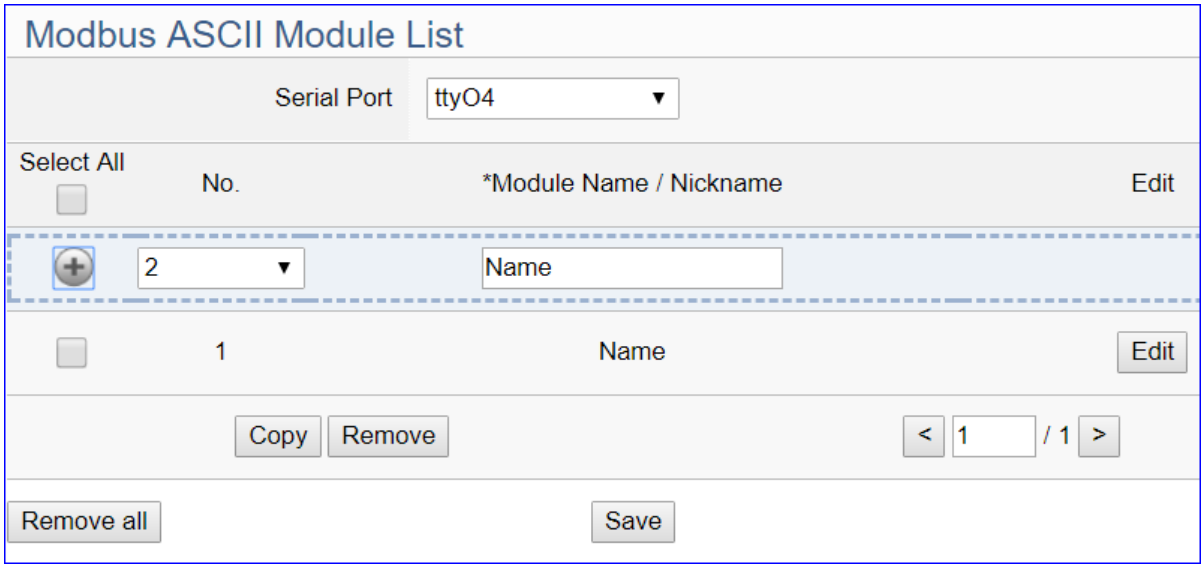
This page is for setting the communication values with the connected modules. First choose the serial port that connected with the module, and each module can give a name (Default name: Name). Click [⊕] button could add a new module, and then click [Edit] button to configure the module content and the Modbus mapping table.

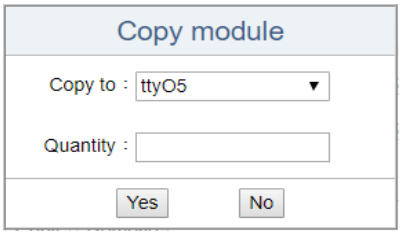
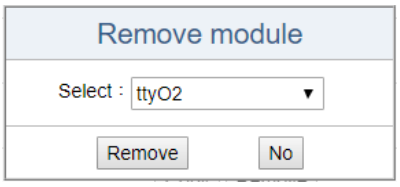
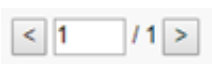
Setting Steps:

1. Select the module connecting Serial port
2. Give the module name or nickname, e.g. Example2. Default: Name
3. Click the button [⊕] to add a new module
4. Click the button [Edit] to enter the Module Content Setting page
5. Set up the Modbus Mapping Table for the UA controller and module I/O channels

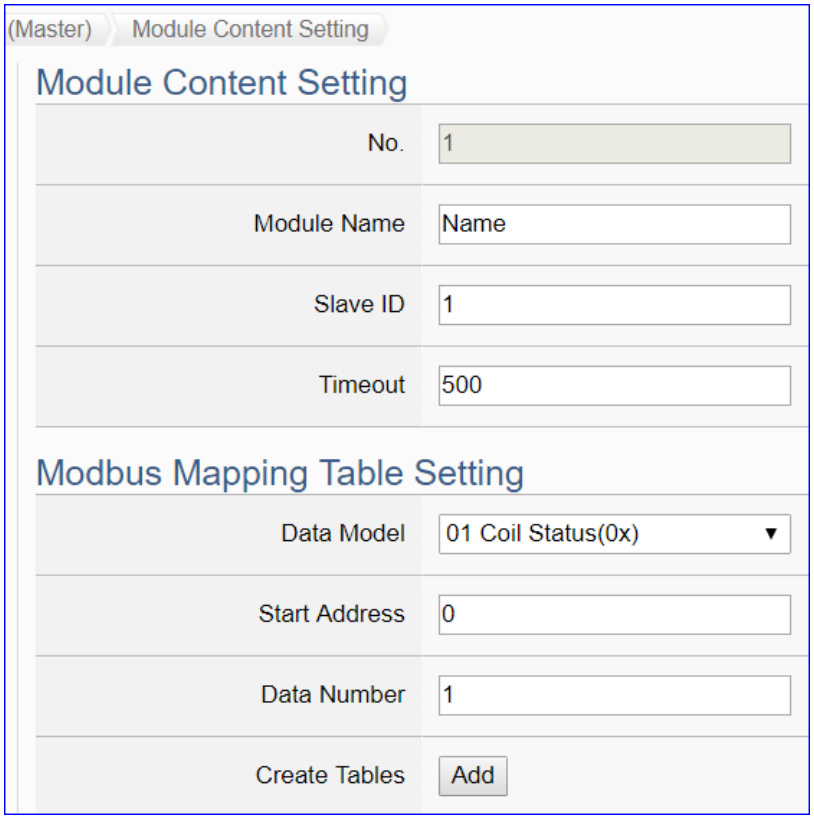


The function items and setting parameters of the [Modbus ASCII Module List]:



Module Setting > Modbus - ASCII Module (Master) > Modbus ASCII Module List	
Serial Port	Choose the serial port of UA controller that links with the I/O module. ttyO2: RS-485; ttyO4: RS-232; ttyO5: RS-485. Default: ttyO2.
	Click to add a list of module.
	Check the box in the left of the module is to select that module list, can delete or copy the module. Check the box “Select All” will select all modules in the list.
No.	The module number in the module list (System arrange, not editable)
*Module Name / Nickname	Module name or nick name. User can give a new name. (The star * means this field cannot be null.)
Edit	Click to set the module in the Module Content Setting page.
Copy	Select the module wants to copy by check the box and click [Copy] can copy module by assigning port and Quantity. Yes: copy the module and exit. No: exit without copy. 
Remove	Click to delete the checked module(s)
Remove all	Click to delete all modules linked with the selected port. Remove: delete the modules and exit. No: exit without delete module. 
	The page number / total pages of the module list. Click < or > to go to the previous or the next page.
Save	Click to save the settings of this page.

Click [Edit] button to enter the “Module Content Setting” page.

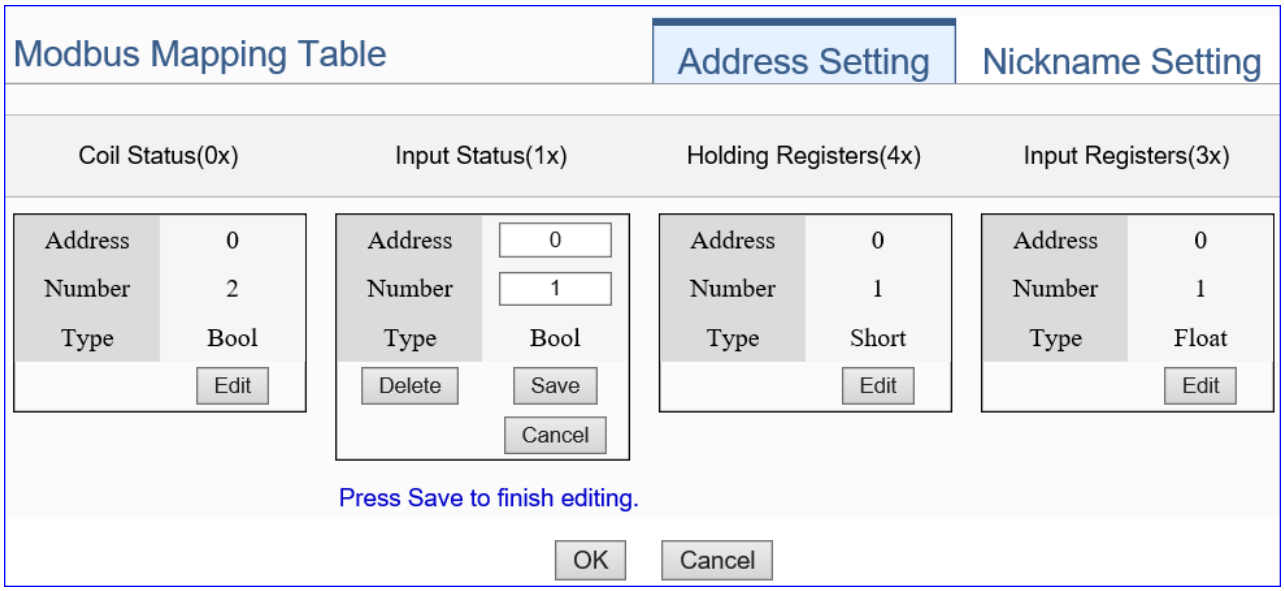


Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Slave ID	Set the module Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models “01” ~ “04” for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

The finished Modbus Mapping Table as below is in order of DO, DI, AO and AI.

Address Setting:

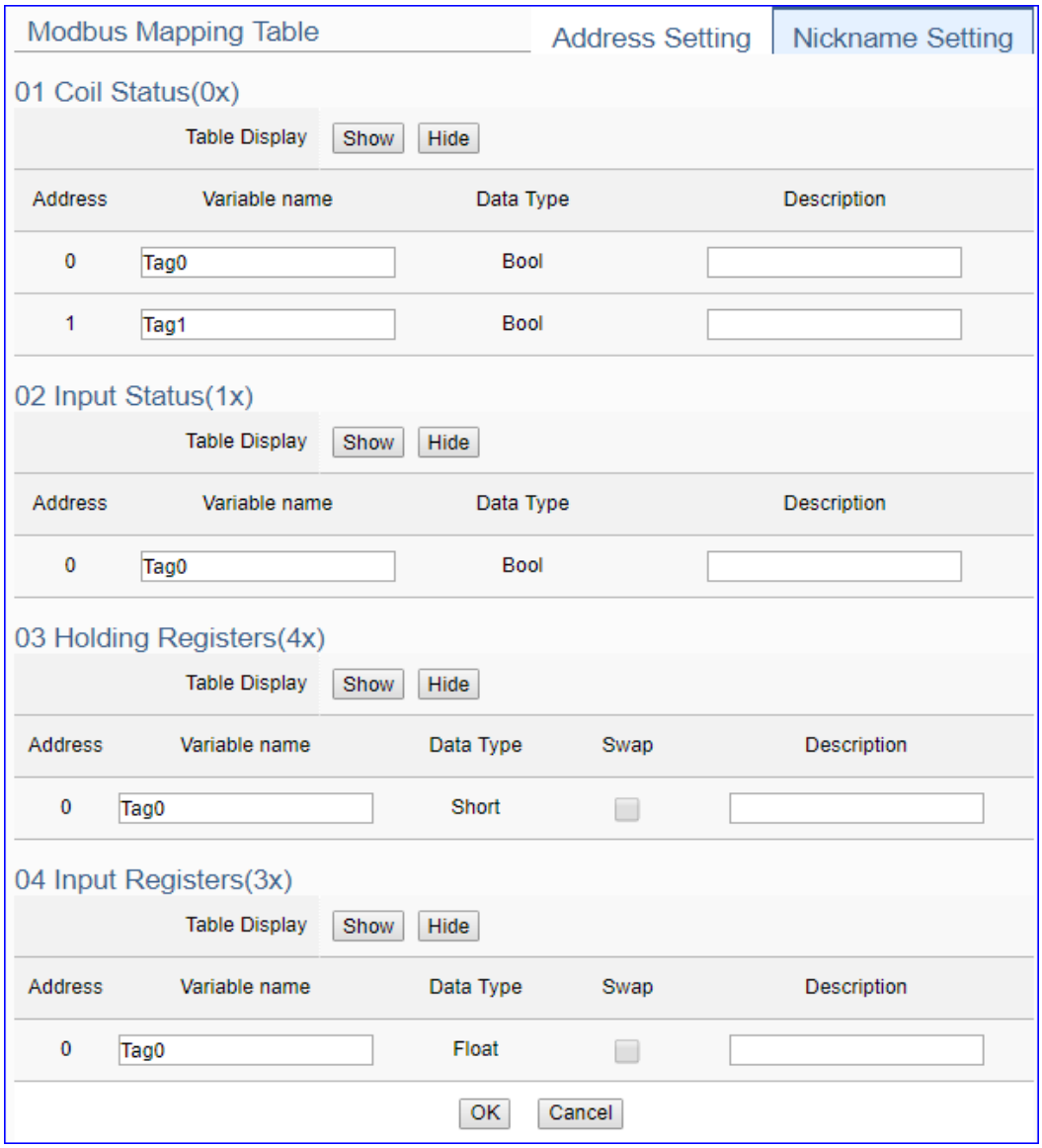
Display and edit the Modbus Mapping Table.



Modbus Mapping Table – Address Setting	
Address Setting	The “Address Setting” page of the Modbus Mapping Table
Nickname Setting	Click can switch to the The “Nickname Setting” page of the Modbus Mapping Table. (Next page)
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Address	The start address of the Modbus command. Default: 0. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. At least 1.
Type	DO/DI type: Bool (Boolean) AO/AI type: depend on setting of [Modbus Mapping Table Setting]
Edit	Click to change the address and Number.
Delete	Click to delete this address table.
Save	Click to save and exit this table editing.
Cancel	Click to exit without saving and back to the module list page.
OK	Click to save this page settings and back to the module list page.

Nickname Setting:

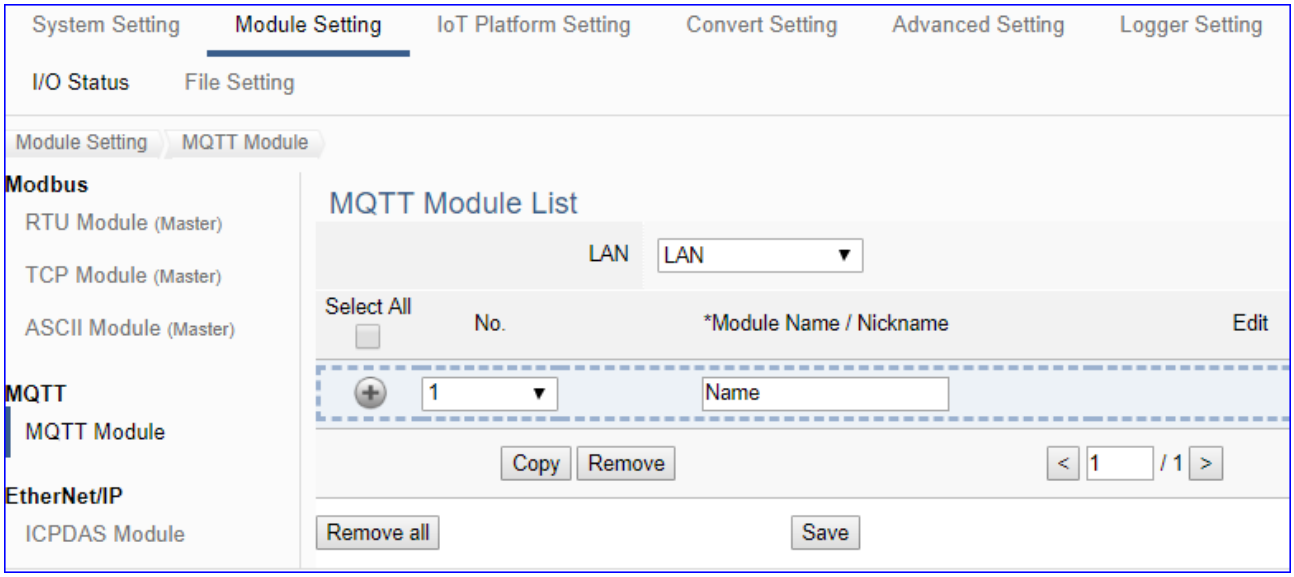
Setting the variable nickname and description.



Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click [Hide] to hide some fields.
Address	Modbus address. System auto arrange.
Variable name	The variable name of the mapping address. Default: Tag0 and auto arrange the number. User can define the name.
Data Type	Display data type of the variable. (Not editable)
Swap	Check to swap the byte order (Lo-Hi/Hi-Lo) for 4-byte or 8-byte.
Description	Write a note for this variable.
OK	Click to save this page settings and back to the module list page.

5.2.4. MQTT Module

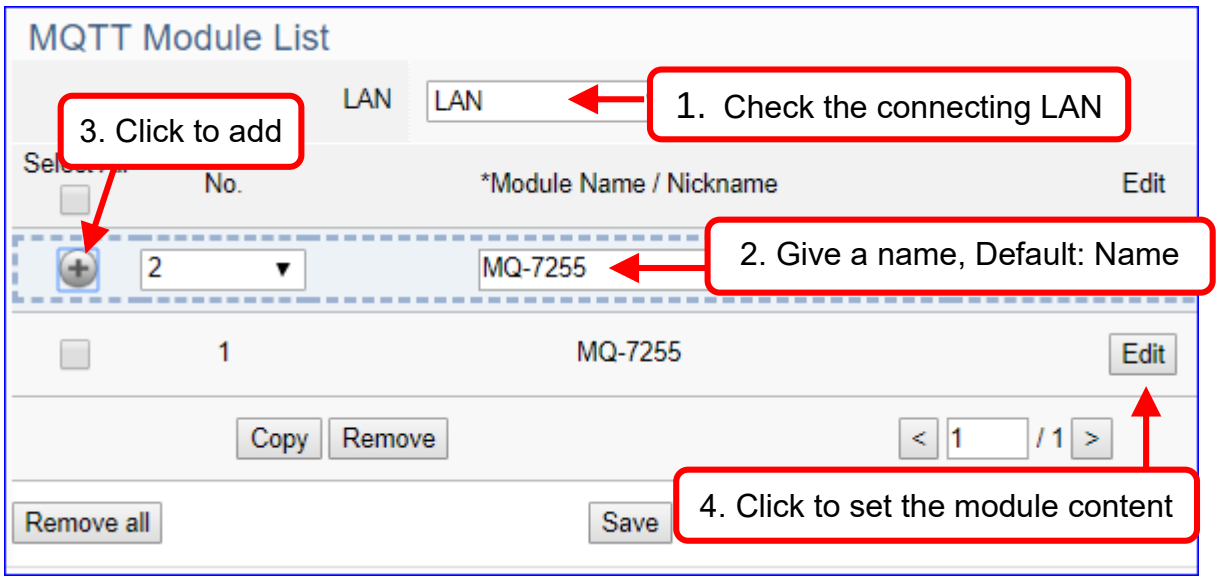
This setting is for UA Controller connecting the remote MQTT module.



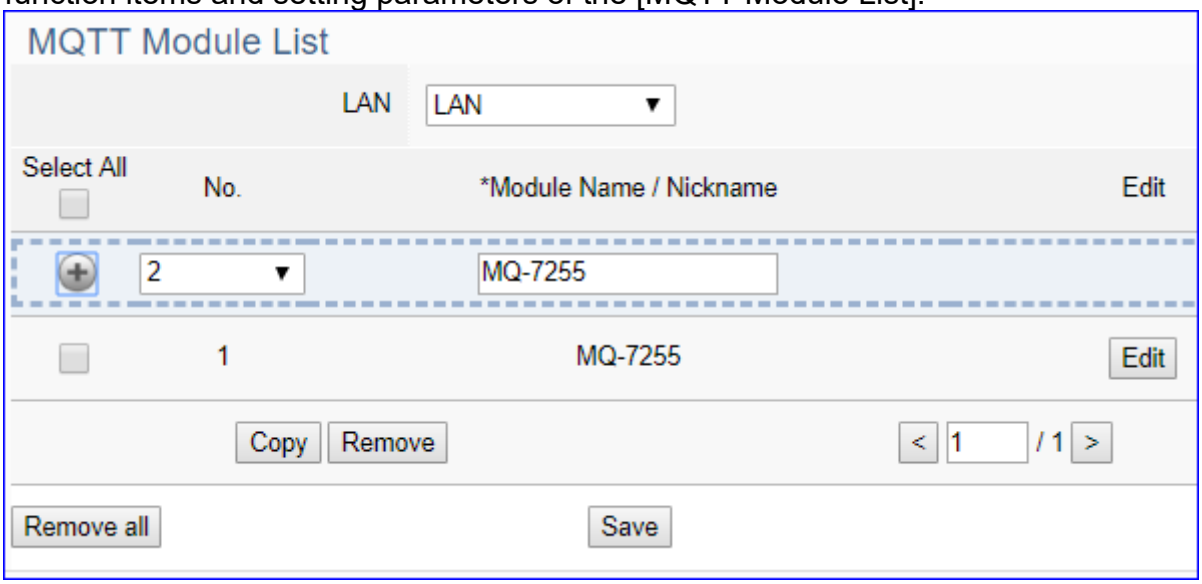
This page is for setting the communication values with the connected modules. First choose the Ethernet LAN port that connected with the module, and each module can give a name (Default name: Name). Click [⊕] button could add a new module, and then click [Edit] button to configure the module content and the MQTT variable table.

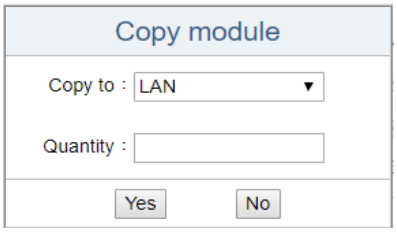
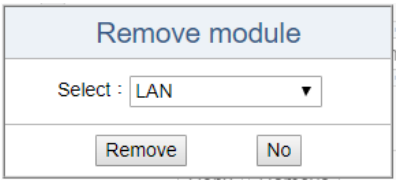
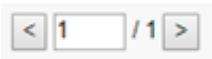
Setting Steps:

1. Select the module connecting Ethernet LAN port
2. Give the module name or nickname, e.g. MQ-7255, DL-302. Default: Name
3. Click the button [⊕] to add a new module
4. Click the button [Edit] to enter the Module Content Setting page
5. Set up the Modbus Mapping Table for the UA controller and module I/O channels



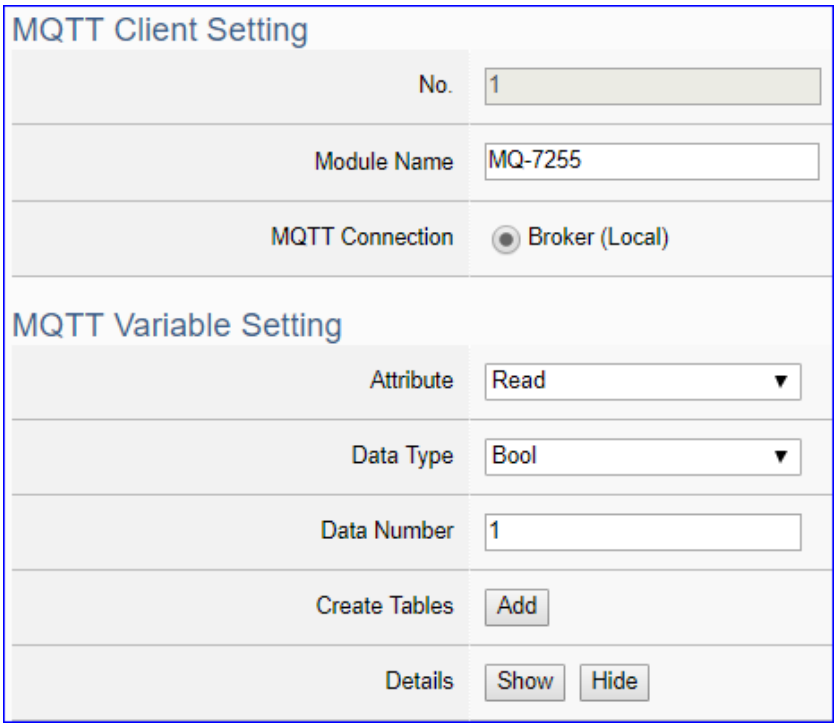
The function items and setting parameters of the [MQTT Module List]:



Module Setting > MQTT - MQTT Module > MQTT Module List	
LAN	Choose the LAN port of UA controller that links with the MQTT module.
	Click to add a list of module.
	Check the box in the left of the module is to select that module list, can delete or copy the module. Check the box “Select All” will select all modules in the list.
No.	The module number in the module list (System arrange, not editable)
*Module Name / Nickname	Module name or nick name. User can give a new name. (The star * means this field cannot be null.)
Edit	Click to set the module in the Module Content Setting page.
Copy	Select the module wants to copy by check the box and click [Copy] can copy module by assigning port and quantity. Yes: copy the module and exit. No: exit without copy. 
Remove	Click to delete the checked module(s)
Remove all	Click to delete all modules linked with the selected port. Remove: delete the modules and exit. No: exit without delete module. 
	The page number / total pages of the module list. Click < or > to go to the previous or the next page.
Save	Click to save the settings of this page.

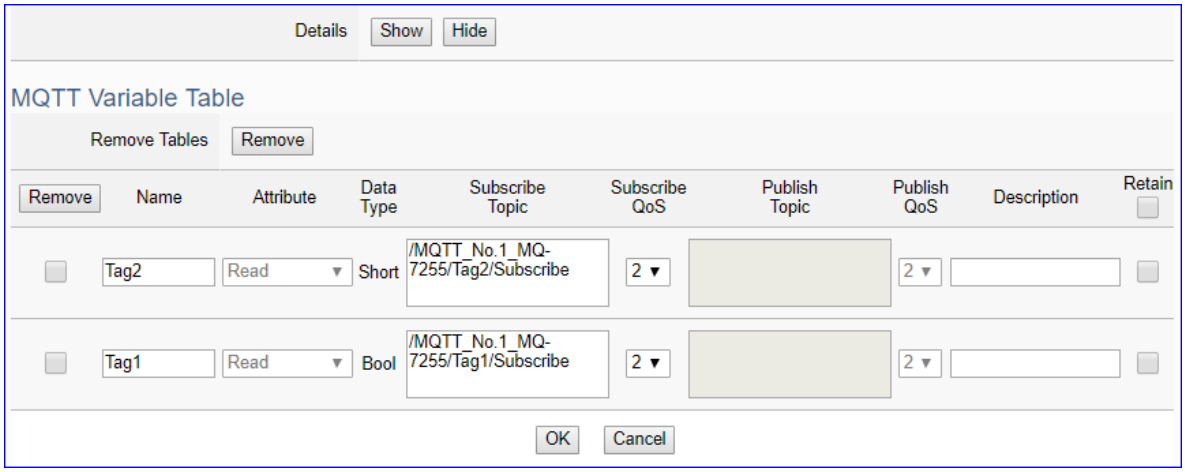
Click [**Edit**] can enter the [**MQTT Client Setting**] page to set up the module and the variable table.

[**MQTT Client Setting**] page:



MQTT Client Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
MQTT Connection	The using Local Broker.
MQTT Variable Setting	
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the MQTT variable. Include: Bool, Short, Unsigned Short, Long, Unsigned Long, Float, Double, String.
Data Number	The number for the I/O variables of the module. Default: 1.
Create Tables	Click [Add] button, it will add a variable list in the MQTT Variable Table.
Details Show / Hide	Click [Show] to display all fields, click [Hide] to hide some fields. The hide fields: Subscribe QoS, Publish QoS, Retain.

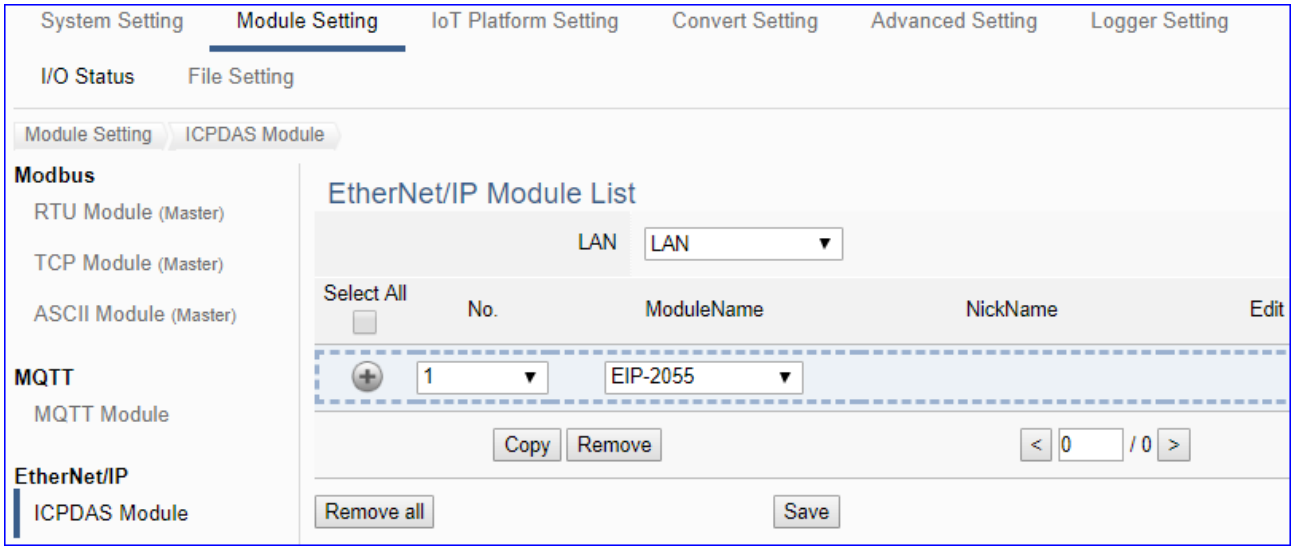
[**MQTT Variable Table**] :



MQTT Variable Table	
Details Show / Hide	Click [Show] to display all fields, click [Hide] to hide some fields. The hide fields: Subscribe QoS, Publish QoS and Retain.
Remove Table / Remove	Check the box in the left of the variable is to select that variable list, and click the “remove” on the box can delete that variable list. Click the “Remove” of the “Remove Table” will delete all lists.
Name	The name of the MQTT variable. Default: Tag#
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable. Include: Bool, Short, Unsigned Short, Long, Unsigned Long, Float, Double, String
Subscribe Topic	The topic of receiving/subscribing data message.
Subscribe Qos	The subscribe Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Publish Topic	The topic of sending/publishing data message.
Publish Qos	The publish Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Description	For users set up the description for the variables.
Retain	Check [Retain] box of the top row can store the broker message for all variables in list. Check the box of each variable can store the broker message just that variable. Default: Uncheck.
OK / Cancer	Click [OK] to save and exit the page settings. Click [Cancer] to exit without saving.

5.2.5. EtherNet/IP ICP DAS Module

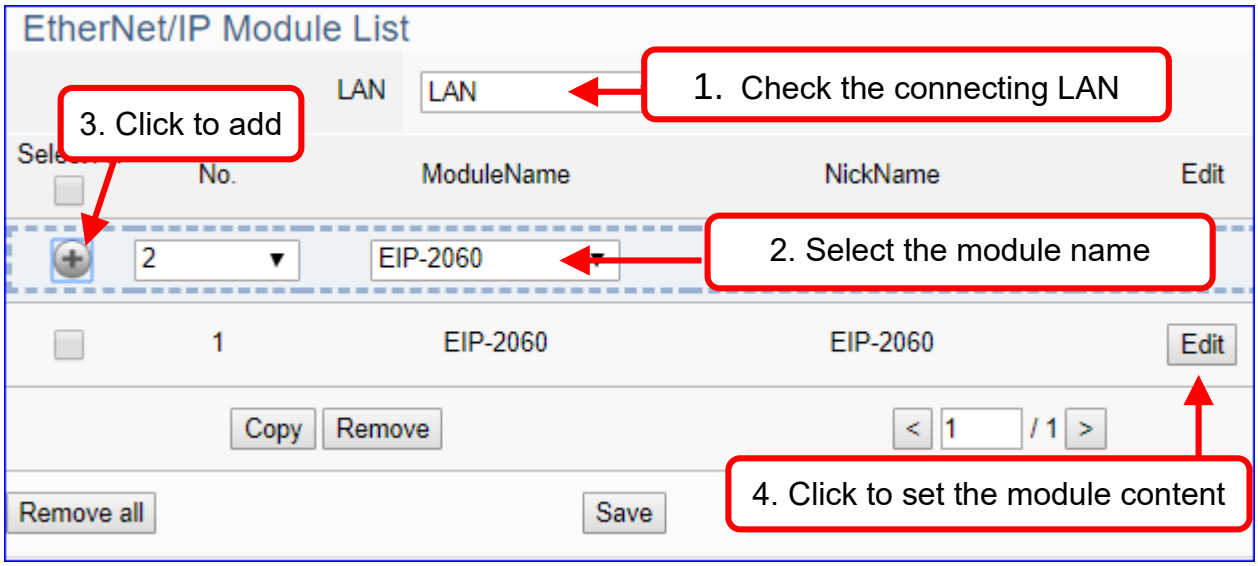
This setting is for UA Controller connecting the remote ICP DAS EIP module.



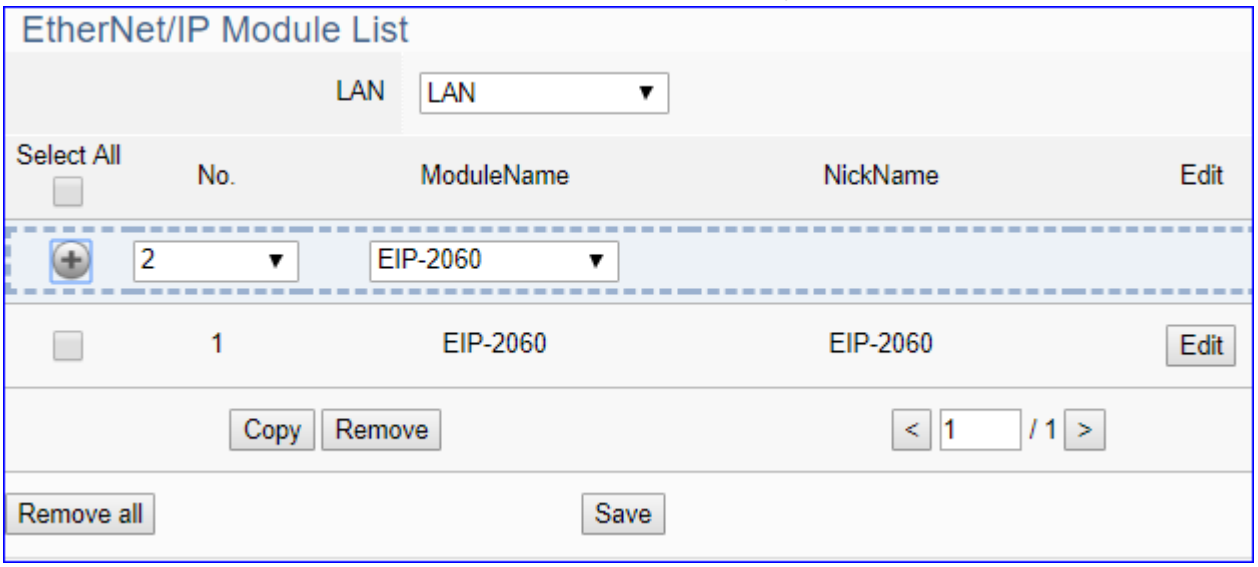
This page is for setting the communication values with the connected EIP modules. First, choose the Ethernet LAN port that connected with the module, and select the name of EIP module. Click [⊕] button could add a new module, and then click [Edit] button to configure the module content and the MQTT variable table.

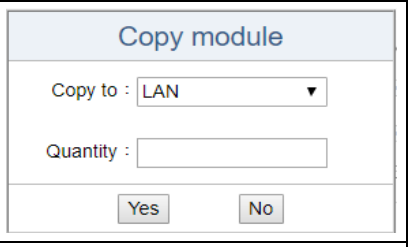
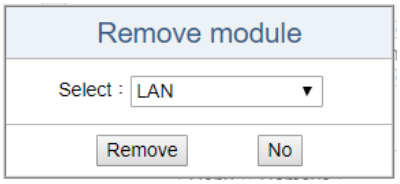
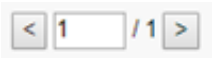
Setting Steps:

1. Select the module connecting Ethernet LAN port
2. Select the module name of EIP-2000
3. Click the button [⊕] to add a new module
4. Click the button [Edit] to enter the Module Content Setting page
5. Set up the module IP and module I/O channels



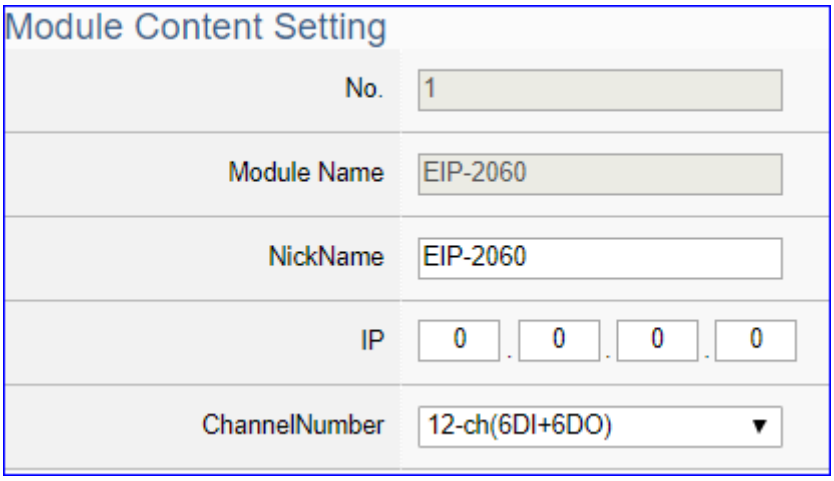
The function items and setting parameters of the [EtherNet/IP Module List]:



Module Setting > EtherNet/IP – ICPDAS Module > EtherNet/IP Module List	
LAN	Choose the LAN port of UA controller that links with the EIP module. UA-5200 has 1 LAN port; UA-2200 has 2 LAN ports.
	Click to add a list of module.
	Check the box in the left of the module is to select that module list, can delete or copy the module. Check the box “Select All” will select all modules in the list.
No.	The module number in the module list (System arrange, not editable)
ModuleName	Select the connecting EIP-2000 module name.
NickName	User can define a nickname for the EIP-2000 module.
Edit	Click to set the module in the Module Content Setting page.
Copy	Select the module wants to copy by check the box and click [Copy] can copy module by assigning port and quantity. Yes: copy the module and exit. No: exit without copy. 
Remove	Click to delete the checked module(s)
Remove all	Click to delete all modules linked with the selected port. Remove: delete the modules and exit. No: exit without delete module. 
	The page number / total pages of the module list. Click < or > to go to the previous or the next page.
Save	Click to save the settings of this page.

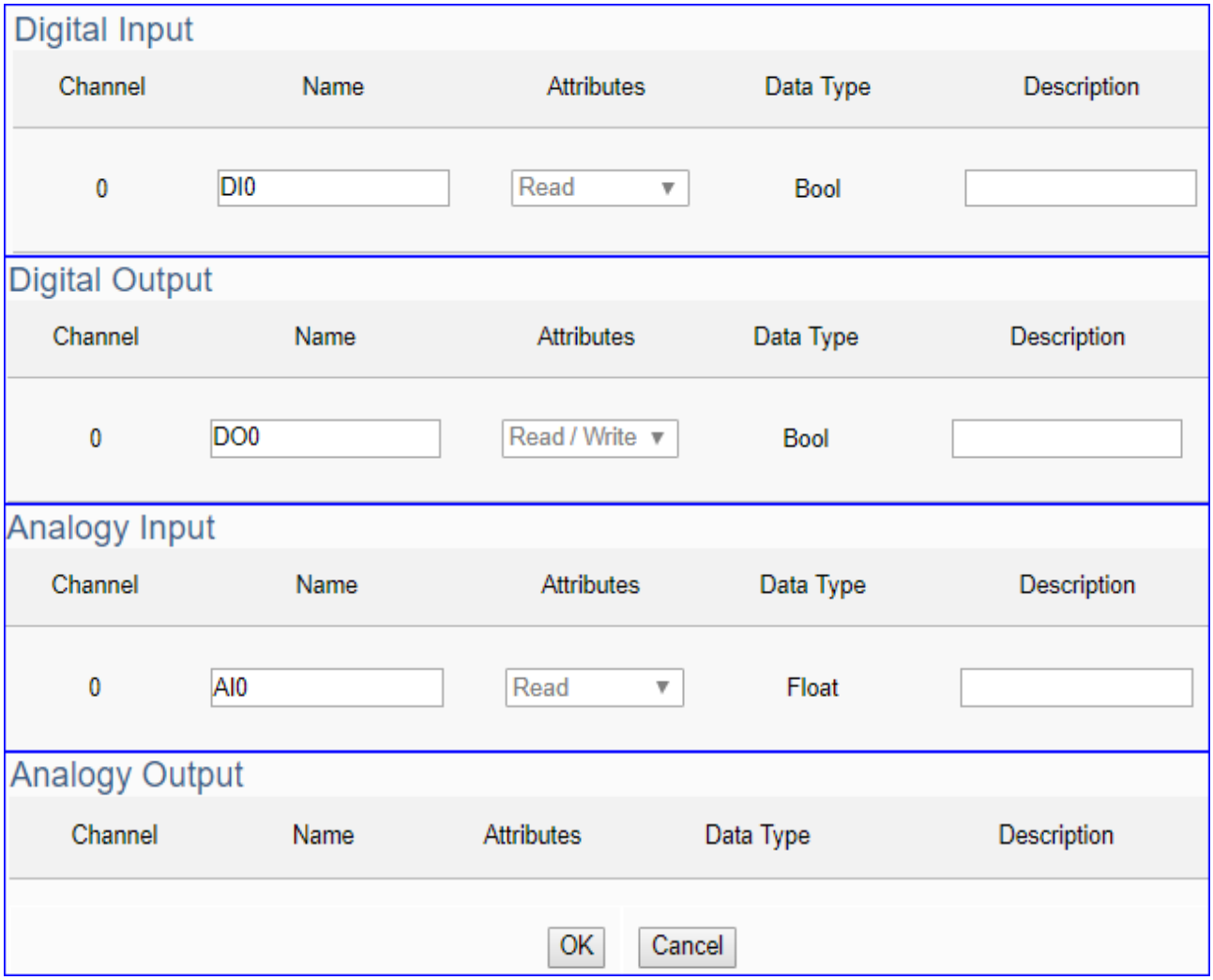
Click [**Edit**] can enter the [**Module Content Setting**] page to set up the module.

[**Module Content Setting**] page:



Module Setting > EtherNet/IP – ICPDAS Module > Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	The selected EIP module number.
NickName	User can define a nickname for the module. Default: Module name.
IP	Enter the IP address of the module. Default: 0.0.0.0
ChannelNumber	System auto setup the I/O channel numbers and the I/O table. Some module provides 2 or more channel mode needed user to select one.

DI/DO/AI/AO Channel Table: System auto setup the table according to the module name.

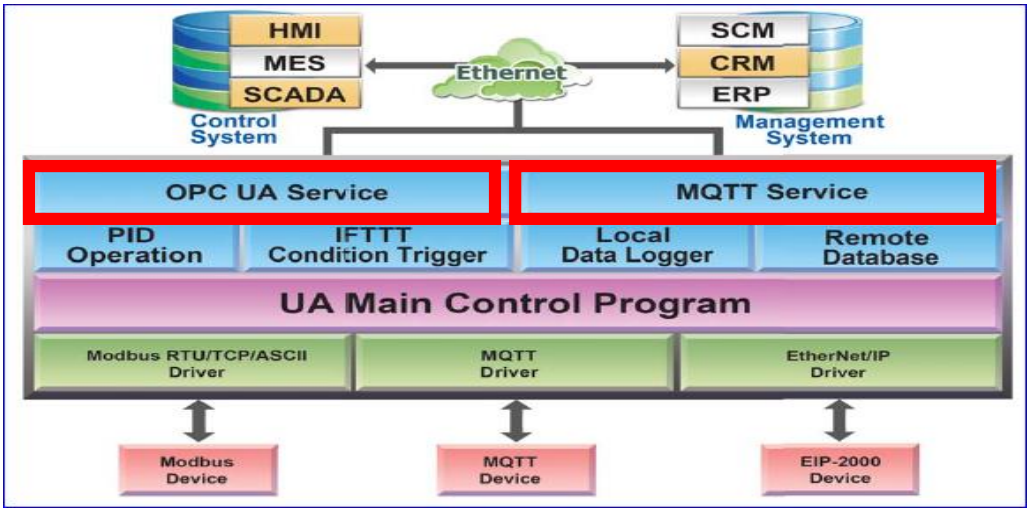


Module Setting > EtherNet/IP – ICPDAS Module > Di/Do/AI/AO Channel Table	
Channel	Channel number set by system. (Not editable)
Name	Channel name. User can define a new channel name.
Attribute	Display data attribute of the channel. (Not editable) Include: Read, Read / Write…
Data Type	Display data type of the channel. Include: Bool, Short, Float, … according to the module.
Description	User can set up the description for the channel.
OK / Cancer	Click [OK] to save and exit the page settings. Click [Cancer] to exit without saving.

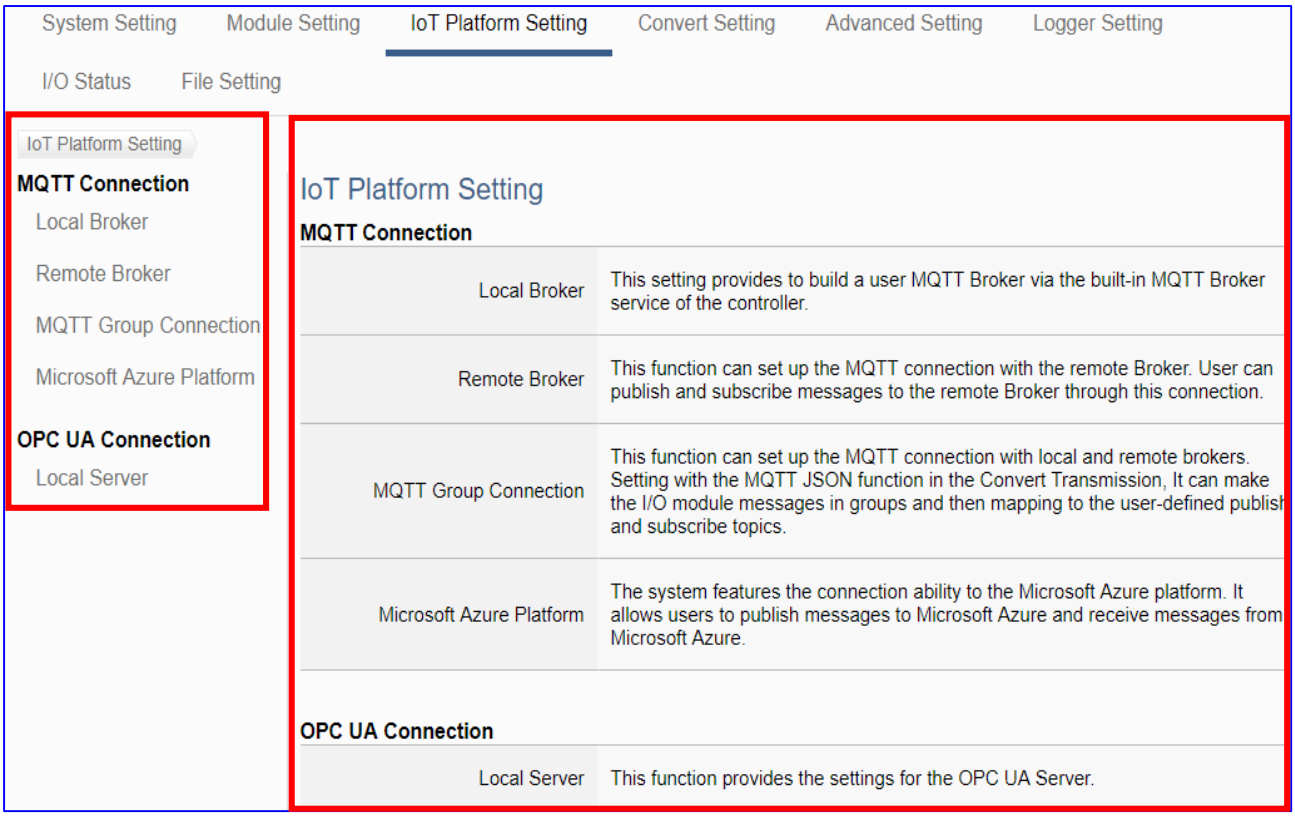
5.3. Main Menu: IoT Platform Setting

UA series can connect to Amazon AWS, IBM Bluemix, Microsoft Azure or other IoT Cloud platforms. The Azure connection is more complicated and will set up in another setting item.

IoT Platform Setting is the third item of the Main Menu. It manages the interaction of the UA series connecting with the host computer in the Internet of Things. It provides OPC UA and MQTT protocols connection services via the Ethernet interface for data transmission.

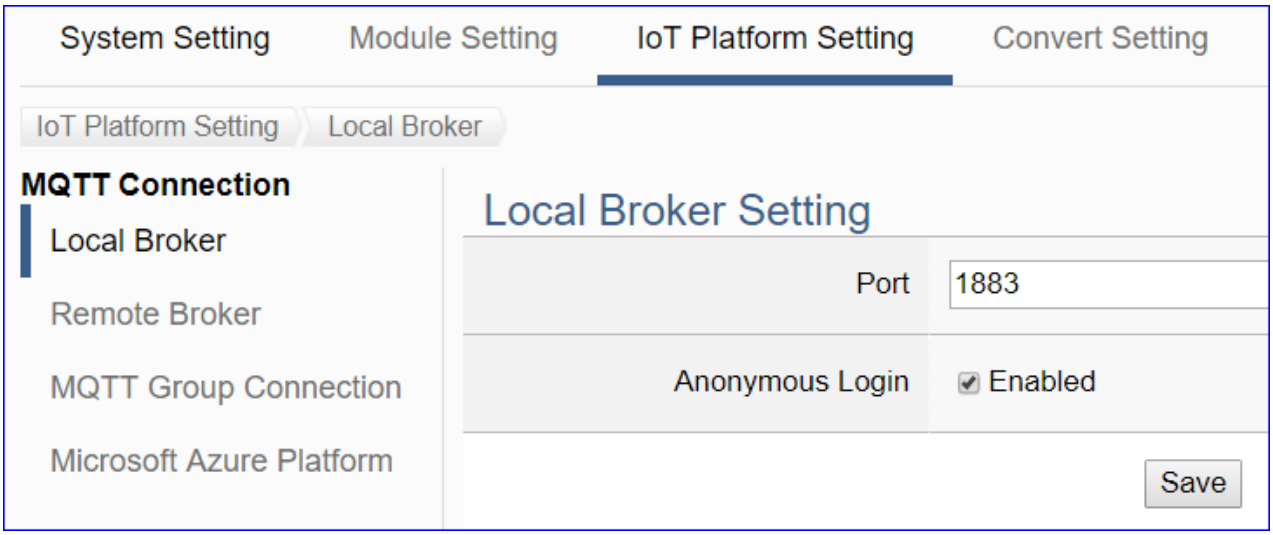


[IoT Platform Setting] includes five sub-menu functions in MQTT and OPC UA two connections and the function descriptions are listed on the page of the Main Menu, such as the Local Broker, Remote Broker, MQTT Group Connection and Microsoft Azure Platform in the MQTT Connection category, and the Local Server in the OPC UA Connection category. This chapter will introduce these function items and setting parameters.



5.3.1. MQTT Local Broker

UA series controller built-in MQTT Broker that compliance with MQTT v3.1.1 protocol and supporting MQTT message distribution management. When using MQTT communication, there is no need to build a new Broker system.



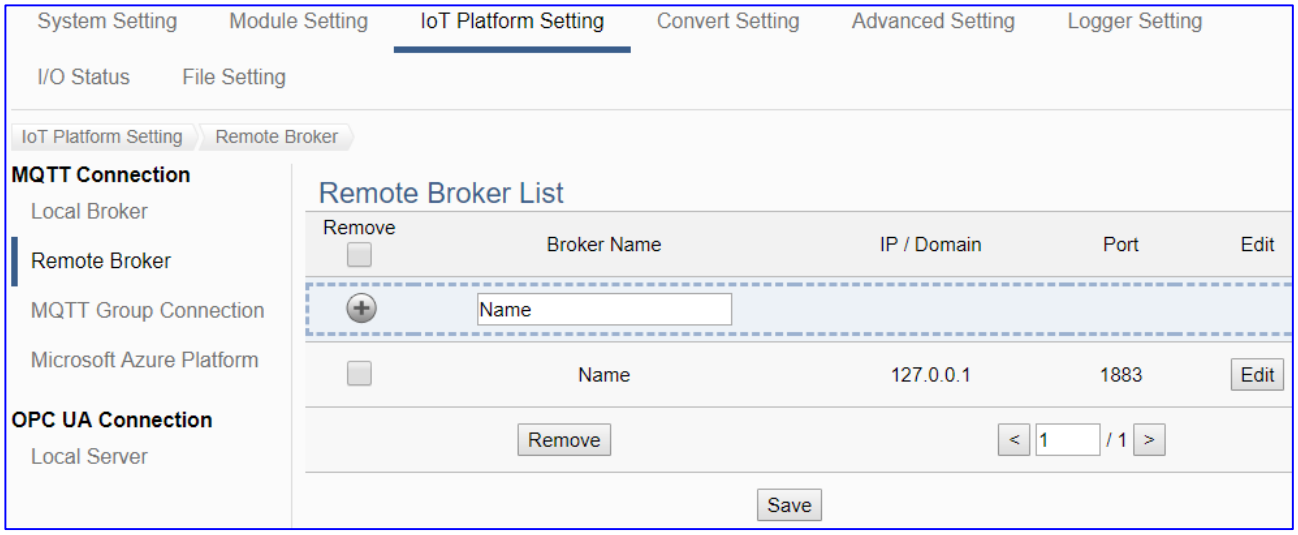
MQTT Connection > Local Broker Setting	
Port	MQTT Local Broker's COM port. System default: 1883
Anonymous Login	Check to allow anonymous login. Default: Check Enabled.
Save	Click to save the settings of this page.

5.3.2. MQTT Remote Broker

UA series can connect to Amazon AWS, IBM Bluemix, Microsoft Azure or other IoT Cloud platforms. The Azure connection is more complicated and will set up in another setting item.

UA series controller built-in MQTT Broker, but when users want to use the external MQTT Broker, UA system also provides the settings to connect and publish/subscript messages with the MQTT Remote Broker.

This page can set up the MQTT connection with the remote Broker. User can publish and subscribe messages to the remote Broker through this connection.



Setting Sequence for the MQTT Connection:

1. Add and set up a connection Broker name in the Remote Broker List.

2. Set up the contents of the Topic messages published/subscribed by other external MQTT devices for mapping to the Variables Table of the UA controller.

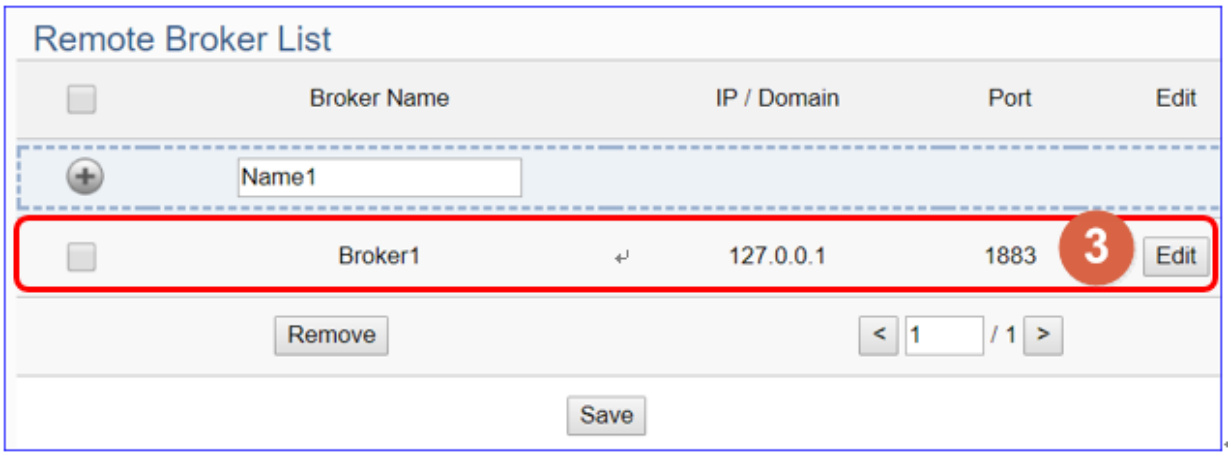
3. Convert the data contents of the MQTT device to communicate with other protocols.

For the certificate about the communication security, please refer to Chapter 7.

This section will introduce the function items and setting parameters.

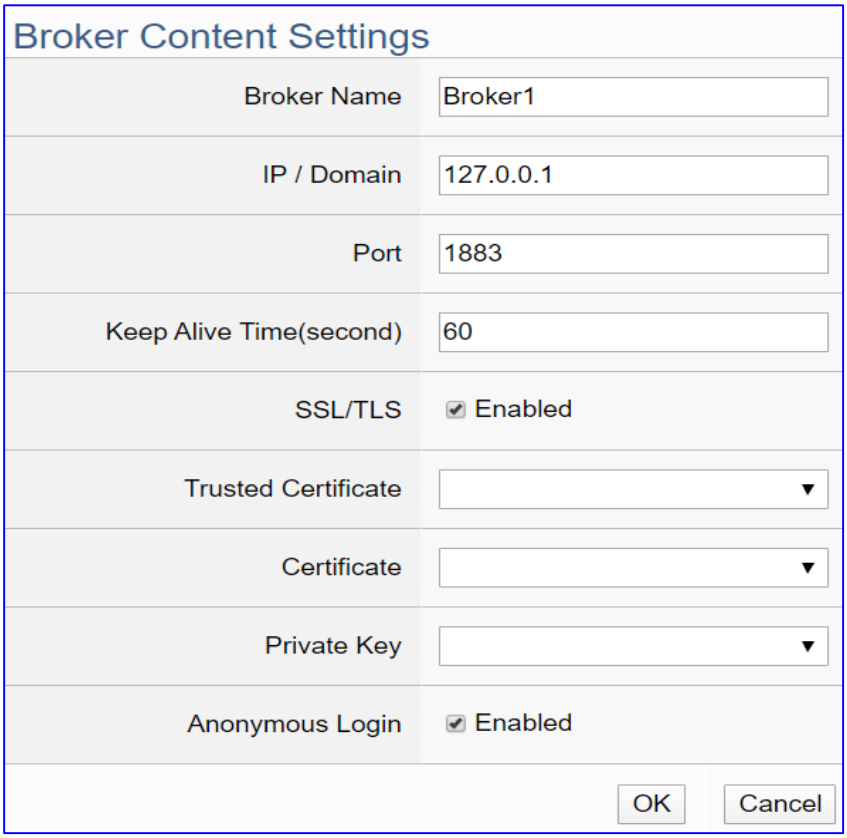
MQTT Connection > Remote Broker > Remote Broker List	
Broker Name	MQTT Remote Broker name. User can give a new name, e.g. Broker1. Default: Name.
	Click to add a list of remote Broker.
Save	Click to save the settings of this page.

After adding a list of the Remote Broker:



MQTT Connection > Remote Broker > Remote Broker List	
Broker Name	The MQTT remote Broker name.
IP / Domain	The IP address or domain name of the remote Broker.
Port	The communication port of the remote Broker.
	Check the box in the left of the Broker is to select that Broker, can delete or copy the Broker. Check the box on the top of the list will select all Brokers in the list.
Edit	Click to set up the remote Broker in the Broker Content Setting page.
Remove	Click to delete the checked Broker(s)
< 1 / 1 >	The page number / total pages of the Broker list. Click < or > to go to the previous or the next page.
Save	Click to save the settings of this page.

Click [Edit] to set up the group in the Broker Content Setting page.

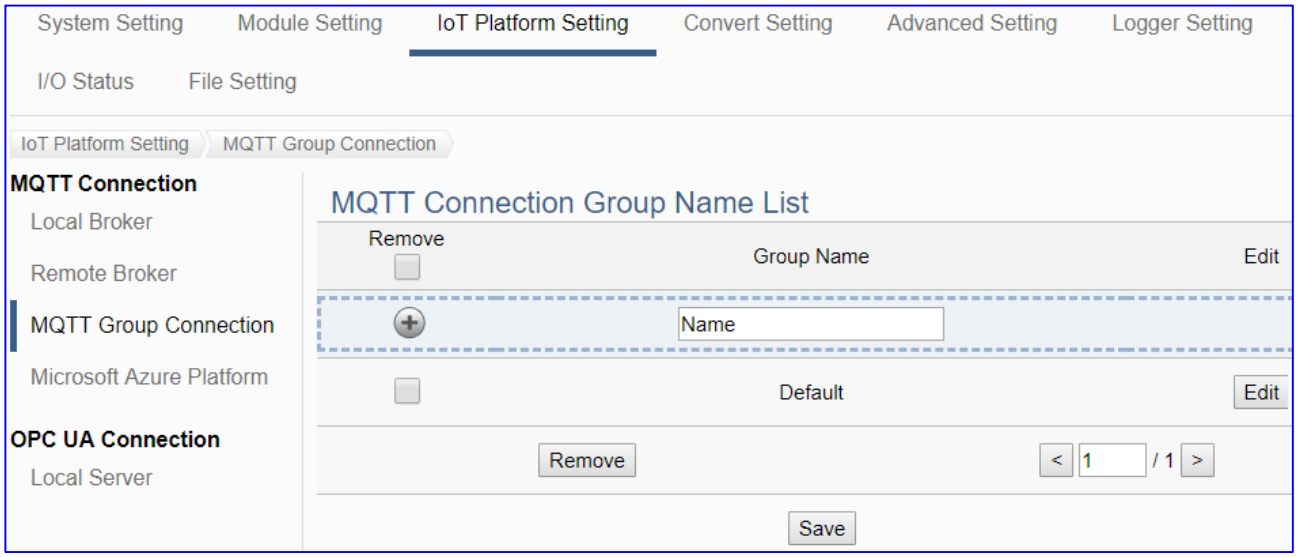


MQTT Connection > Remote Broker List > Broker Content Settings	
Broker Name	The name of the remote MQTT Broker. User can define a new name.
IP / Domain	Set the IP address or domain name of the Remote MQTT Broker. Default: 127.0.0.1
Port	The remote Broker port. Default: 1883.
Keep Alive Time (second)	Set the time in second that pass away without communication between the UA controller and Cloud platform. Default: 60 second.
SSL/TLS	Check to enable SSL/TLS security communication. Default: Uncheck. Sub-item: Trusted Certificate/Certificate/Private Key. Before enabling, upload the needed file from [File Setting] function menu.
Trusted Certificate	Select the trusted root CA file name uploaded to the controller via the File Setting function to verify the broker side certificate.
Certificate	Select the name of the certificate file uploaded to the controller via the File Setting function as the client side certification. When the "Certificate" field is not empty, the "Private Key" field cannot be empty.
Private Key	Select the name of the Private Key file uploaded to the controller via the File Setting function as the client side Private Key. When the "Private Key" field is not empty, the "Certificate" field cannot be empty.
Anonymous Login	Check to allow anonymous login. Default: Check Enabled.
OK / Cancel	Click: save the setting and exit this page. Cancel: exit without saving.

5.3.3. MQTT Group Connection

This function can set up the MQTT connection with local and remote brokers. Setting with the MQTT JSON function in the Convert Setting, It can make the I/O module messages in groups and then mapping to the user-defined publish and subscribe topics.

If the MQTT Group connection needs to use an external MQTT remote Broker, you need to set the remote Broker connection first and then set the connection group list. This page is for the setting of new, remove and set up the connection group list and their function parameters.

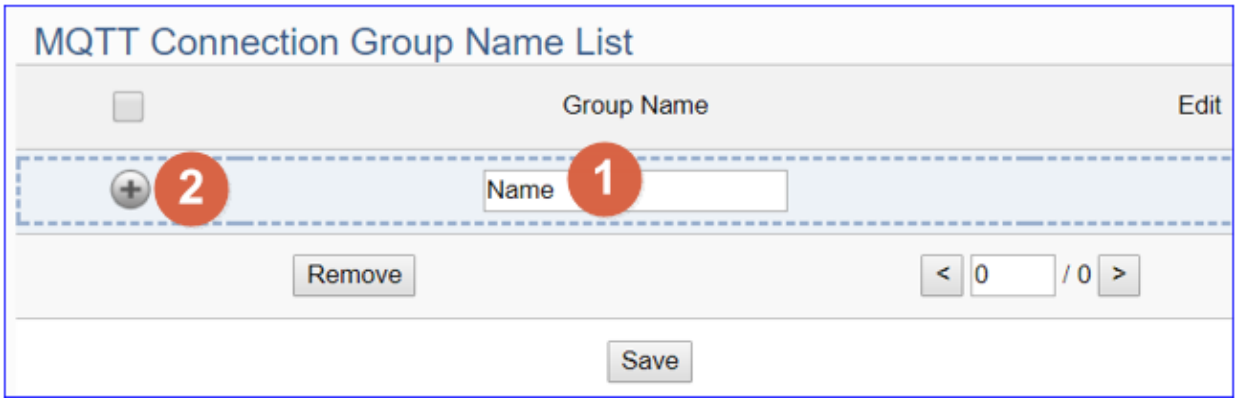


Setting Sequence for the MQTT Group Connection:

1. Set up a connection MQTT Broker of Local or Remote Broker.
2. Add and set up a MQTT connection group name in the List.
3. Set up the contents of the Topic messages published/subscribed by other external MQTT devices that supporting JSON format for mapping to the Variables Table of the UA controller.
4. Convert the data contents of the MQTT device into JSON format of groups to communicate with other protocols.

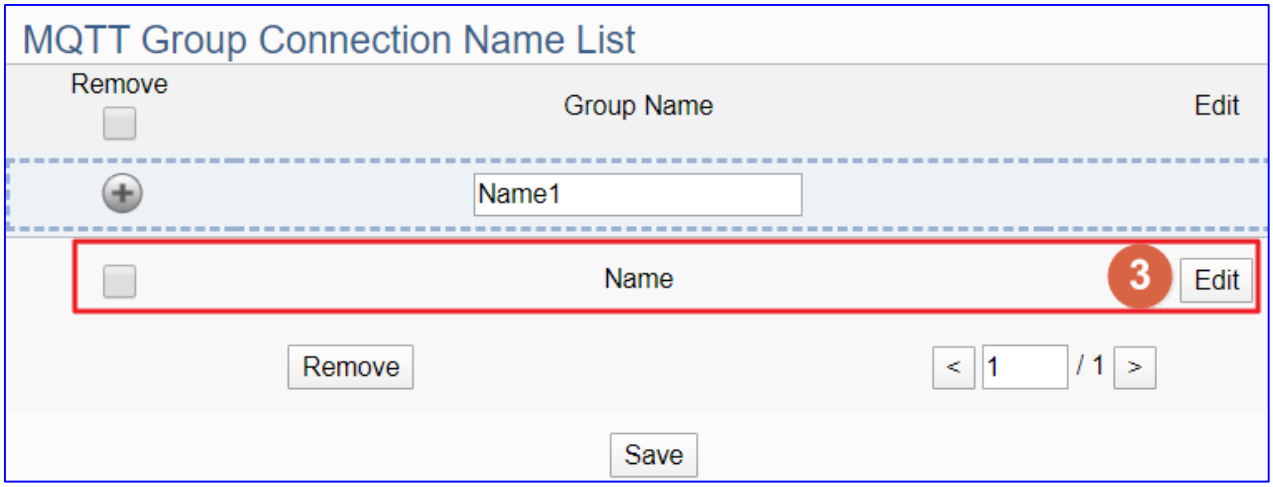
For the certificate about the communication security, please refer to Chapter 7.

This section will introduce the function items and setting parameters.



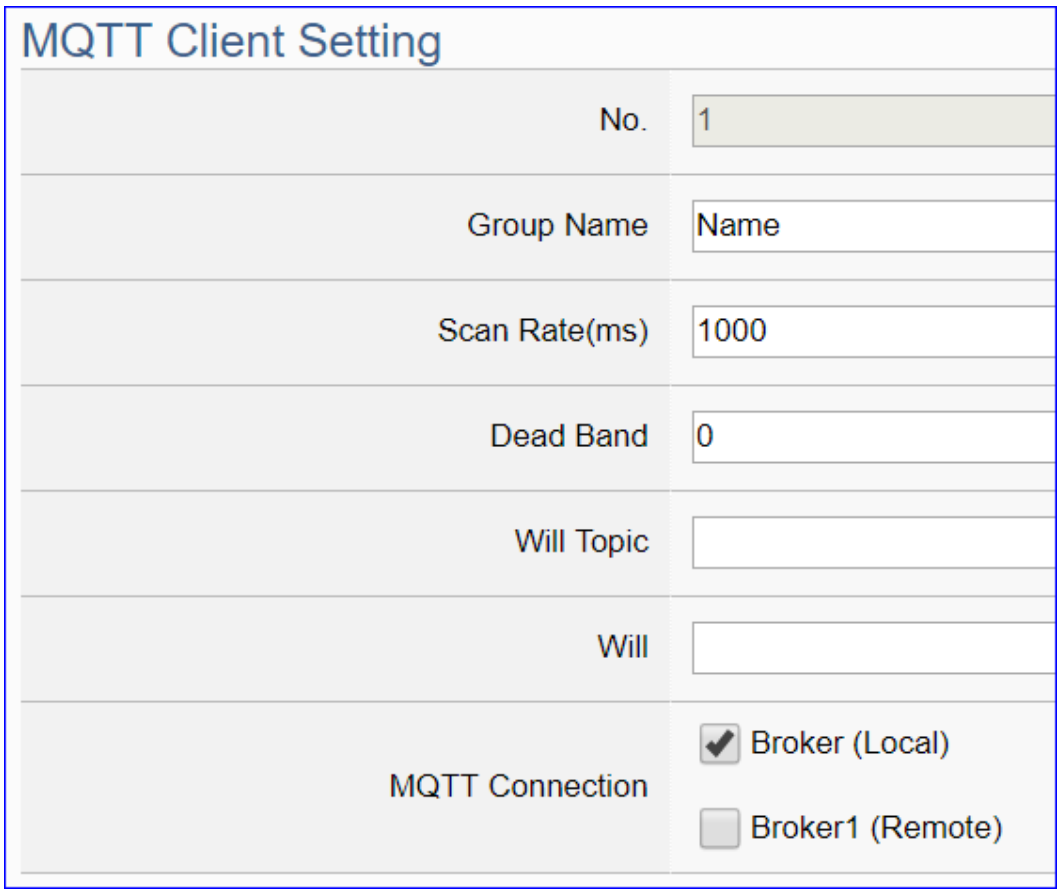
IoT Platform Setting > MQTT Connection > MQTT Connection Group Name List	
Group Name	MQTT connection group name. User can give a new name, e.g. Group1. Default: Name.
⊕	Click to add a list of MQTT connection group.
Save	Click to save the settings of this page.

After adding a list of the MQTT connection group:

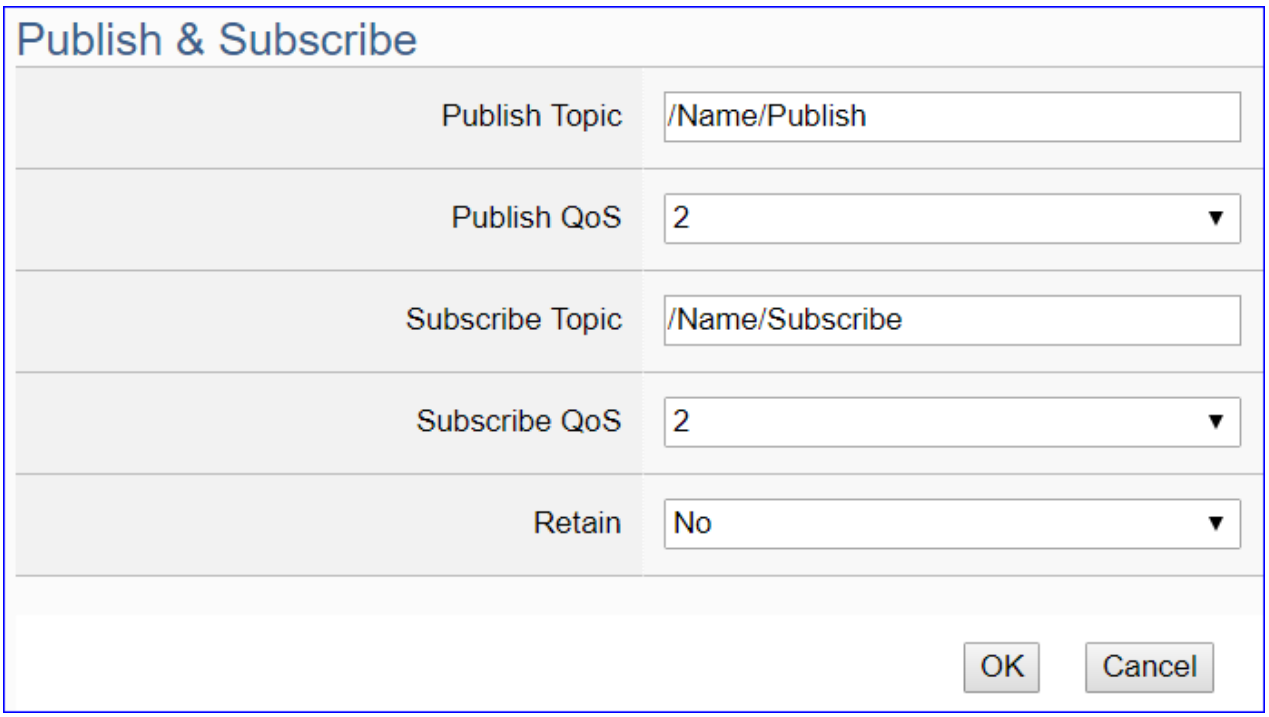


IoT Platform Setting > MQTT Connection > MQTT Connection Group Name List	
Group Name	The MQTT connection group name.
☐	Check the box in the left of the Group name is to select that group, can delete or copy the group. Check the box on the top of the list will select all groups in the list.
Edit	Click to set up the group in the MQTT Client Setting page.
Remove	Click to delete the checked group(s)
< 1 / 1 >	The page number / total pages of the group list. Click < or > to go to the previous or the next page.
Save	Click to save the settings of this page.

Click [Edit] to set up the group in the MQTT Client Setting page.



IoT Platform Setting > MQTT Connection > MQTT Client Setting	
No.	The MQTT Client Number. (Un-editable)
Group Name	The name of the Group. User can define a new name.
Scan Rate(ms)	Set an update frequency for the data. Unit: ms. Default: 1000 ms.
Dead Band	Give a dead bend value for updating a float signal. Default: 0
Will Topic	The title of a disconnect notice. Default: Null.
Will	The disconnect notice. Default: Null.
MQTT Connection	Check the Broker for this MQTT connection, Local Broker or Remote Broker. Remote Broker option will appear only when set in advance.

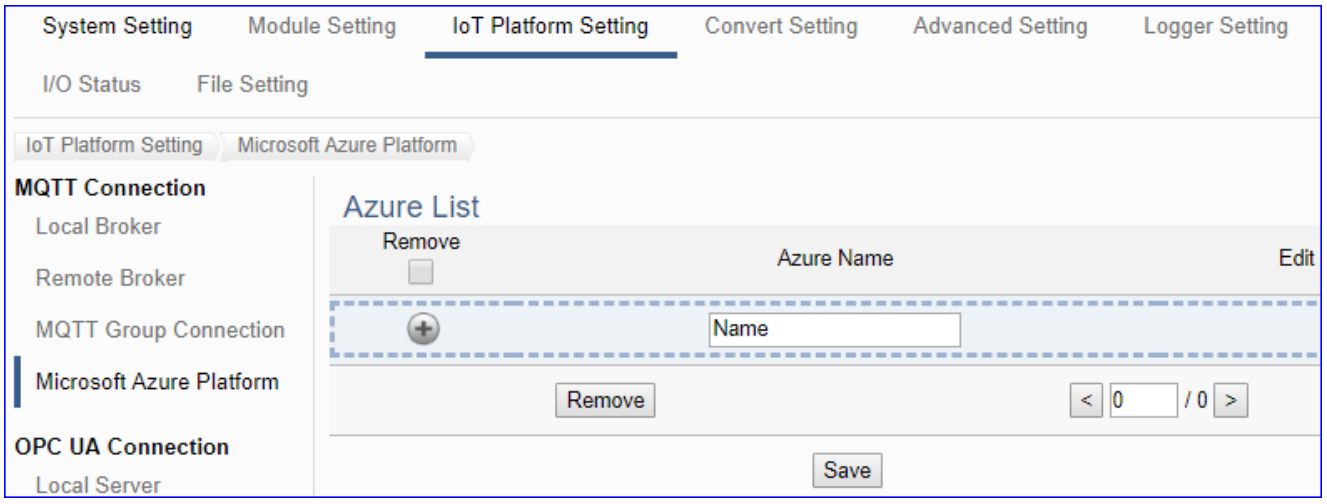


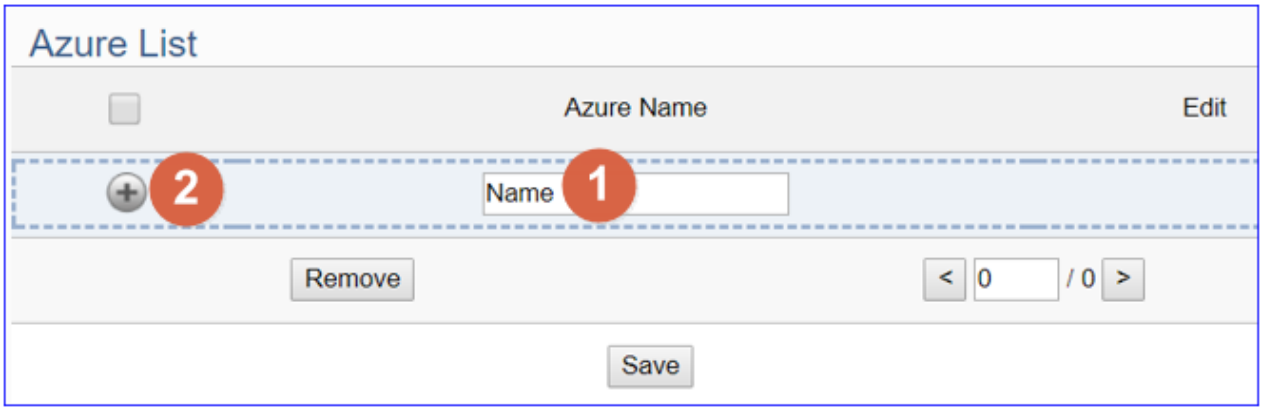
IoT Platform Setting > MQTT Connection > MQTT Client Setting – Publish & Subscribe	
Publish Topic	The topic of sending/publishing data message.
Publish Qos	The publish Qos (Quality of Service) levels. Default: 2. 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Subscribe Topic	The topic of receiving/subscribing data message.
Subscribe Qos	The subscribe Qos (Quality of Service) levels. Default: 2. 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Retain	Whether the Broker to store the message. Default: No.
OK	Click to save the setting and exit this page. Click [Cancel] to exit this page without saving.

5.3.4. MQTT Connection - Microsoft Azure Platform

Microsoft Azure Platform is a common platform to integrate IoT devices into the cloud. Many of the applications use MQTT connection to the cloud for the setting is fast and easy. The UA series also provides the MQTT function for module to connect to the Azure platform and allows users to publish messages to Microsoft Azure and receive messages from Microsoft Azure.

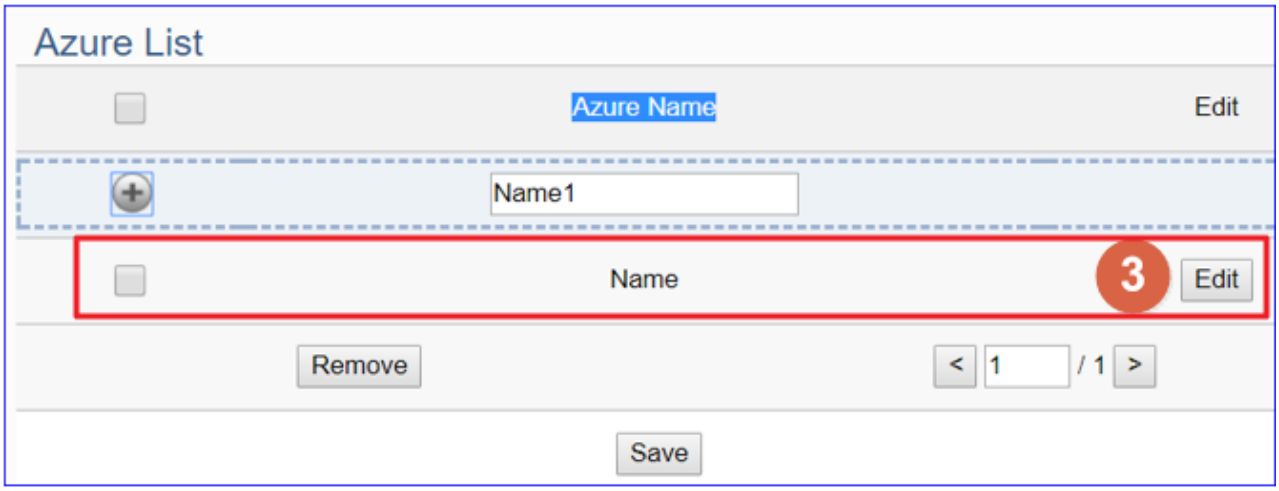
This page will introduce the settings for UA series controller using MQTT service to connect to the Microsoft Azure Platform. It includes new, remove and set up the Azure list and the function parameters





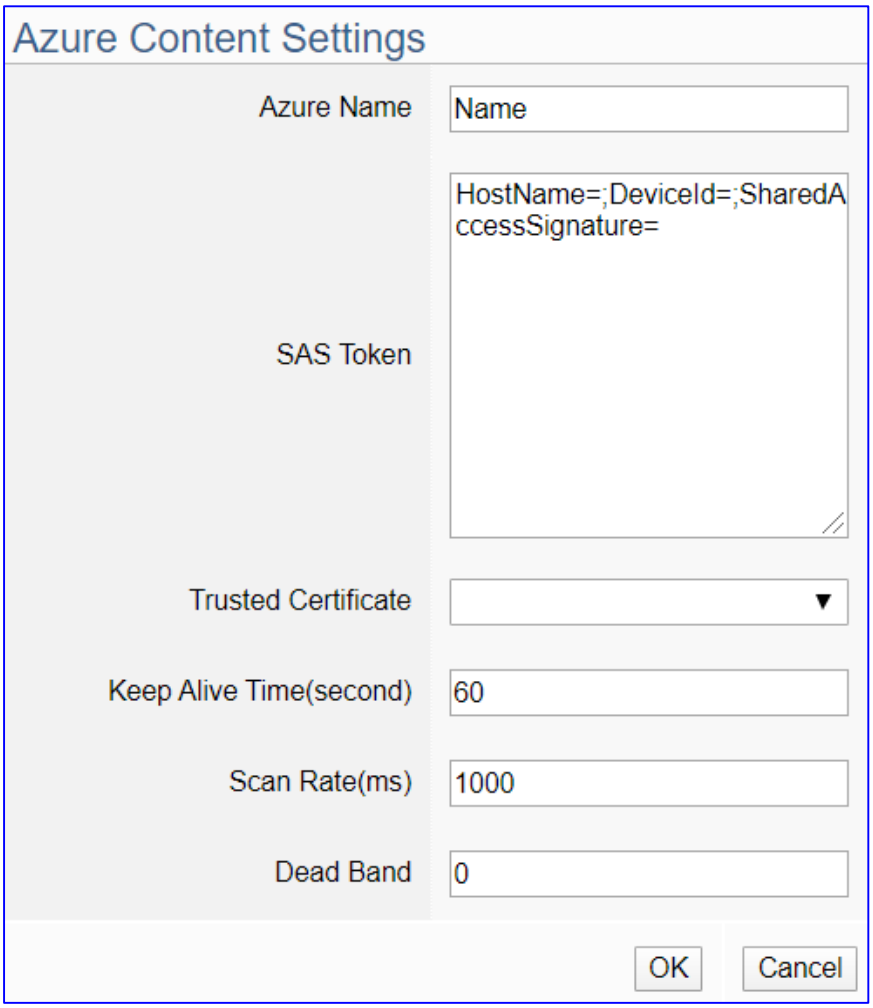
IoT Platform Setting > MQTT Connection > Microsoft Azure Platform > Azure List	
Azure Name	Azure name. User can give a new name1. Default: Name.
	Click to add a list of Azure.

After adding a list of the Azure:



IoT Platform Setting > MQTT Connection > Microsoft Azure Platform > Azure List	
Azure Name	Azure name. User can define the name. Default: Name.
	Click to add a new Azure list.
	Check the box in the left of a Azure name is to select that Azure, can delete or copy the Azure. Check the box on the top of the list will select all Azures in the list.
Edit	Click to set up the Azure in the Azure Content Setting page.
Remove	Click to delete the checked Azure(s).
< 1 / 1 >	The page number / total pages of the Azure list. Click < or > to go to the previous or the next page.
Save	Click to save the settings of this page.

Click [Edit] to set up the Azure in the Azure Content Setting page.

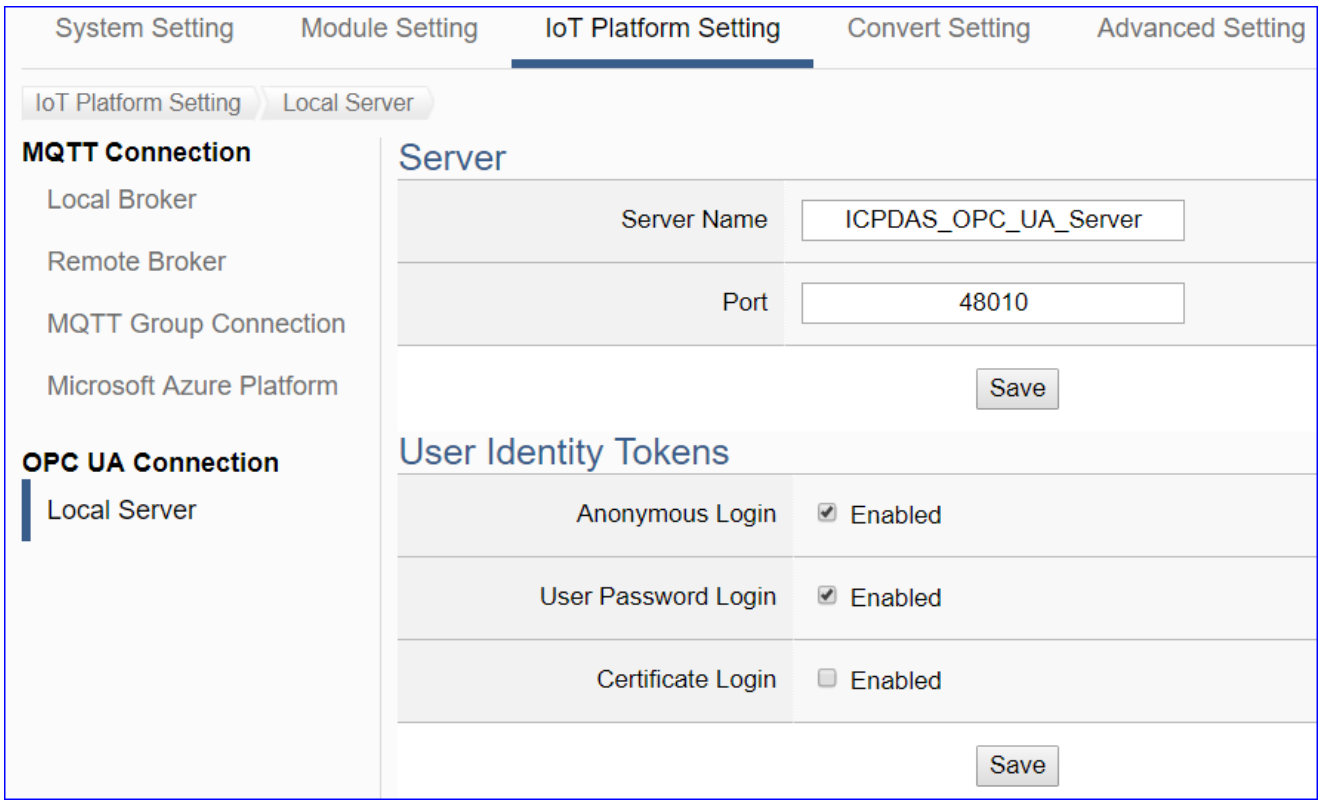


IoT Platform Setting > MQTT Connection > Microsoft Azure Platform > Azure Content Settings	
Azure Name	Azure name. User can define the name. Default: Name.
SAS Token	Input the SAS Token which you previously registered for the UA controller from Microsoft Azure. For the procedure to generate a SAS Token, please refer to the “Documentation > Azure IoT Hub > IoT Hub MQTT support” section on the Microsoft Azure Web Site for detailed information.
Trusted Certificate	Select the Trusted Certificate file that you previously got for the UA controller from Microsoft Azure, and uploaded in the menu [MQTT Certificate] of [File Setting] function. Sub-filename: **.crt**
Keep Alive Time(second)	Set the time in second that pass away without communication between the UA controller and Microsoft Azure. Default: 60 second.
Scan Rate(ms)	Set an update frequency for the task data. Default: 1000 (Unit: ms)
Dead Band	Give a dead bend value for updating a float signal. Default: 0
OK / Cancel	OK: save and exit this page. Cancel: exit without saving.

5.3.5. OPC UA Connection - Local Server

UA series controller built-in OPC UA Server service can integrate the I/O products and the third-party devices, import their data to the back-end SCADA management system or the big-data analysis/decision system, to satisfy the reliability, interoperability and security needs of the Industrial 4.0 automation system.

This page provides the settings for the UA series built-in OPC UA Server.



OPC UA Connection > Local Server – Server	
Server Name	Display the active OPC UA Server name. Not editable. System values: ICPDAS_OPC_UA_Server
Port	The communication port number of the OPC UA Server. System Default: 48010.
Save	Click to save the settings of this item.
OPC UA Connection > Local Server – User Identity Tokens	
Anonymous Login	Check to enable the anonymous login of clients. Default: check.
User Password Login	Check to enable the user password login of clients. Default: uncheck.
Certificate Login	Check to enable the certificate login of clients. Default: uncheck.
Save	Click to save the settings of this item.

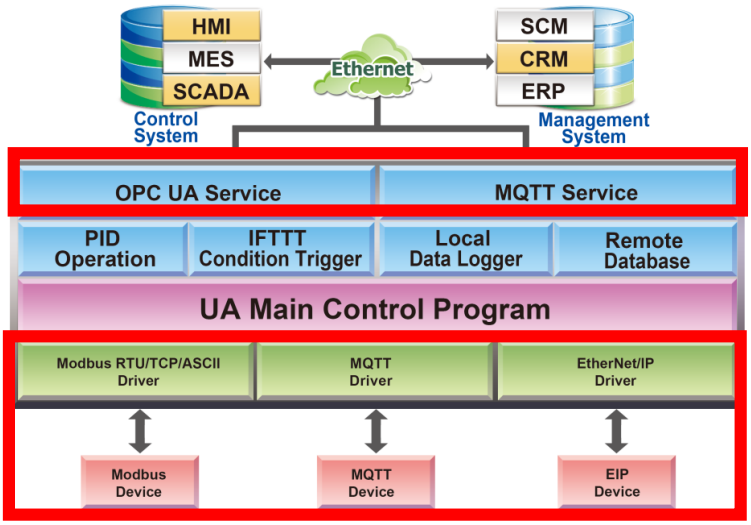
5.4. Main Menu: Convert Setting

Convert Setting is the 4th item of the Main Menu for the communication conversion. It has 3 converting types: OPC UA, MQTT & MQTT JSON. Each type has some convert settings items for conversion with the Modbus RTU/TCP/ASCII (Master), MQTT and EtherNet/IP protocols. The function descriptions are on the home page of the Main Menu. This chapter will introduce these function items and setting parameters.

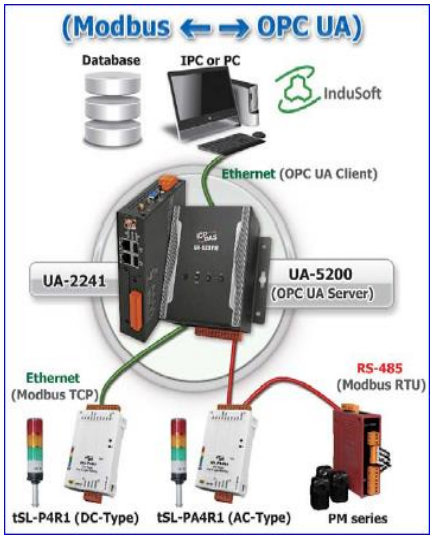
The settings of Modbus RTU/ASCII are the same. Here will introduce them together.

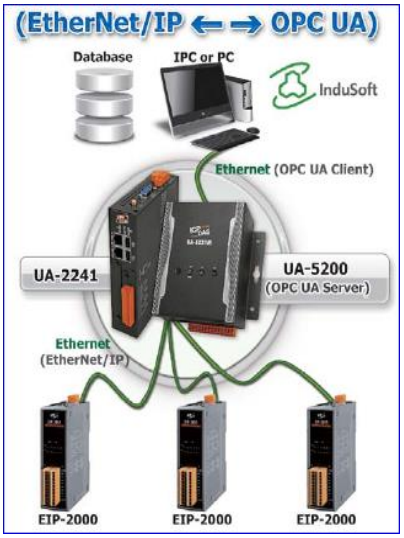
OPC UA	Use **OPC UA** Service to convert with **Modbus RTU/ASCII** protocol. **(5.4.1)** Use **OPC UA** Service to convert with **Modbus TCP** protocol. **(5.4.2)** Use **OPC UA** Service to convert with **MQTT** protocol. **(5.4.3)** Use **OPC UA** Service to convert with **EtherNet/IP** protocol. **(5.4.4)**
MQTT	Use **MQTT** Service to convert with **Modbus RTU/ASCII** protocol. **(5.4.5)** Use **MQTT** Service to convert with **Modbus TCP** protocol. **(5.4.6)** Use **MQTT** Service to convert with **EtherNet/IP** protocol. **(5.4.7)**
MQTT JSON	Use **MQTT** Service in group of JSON format to convert with **Modbus RTU/ASCII** protocol. **(5.4.8)** Use **MQTT** Service in group of JSON format to convert with **Modbus TCP** protocol. **(5.4.9)**

UA Series Function Diagram:



Application Solution:



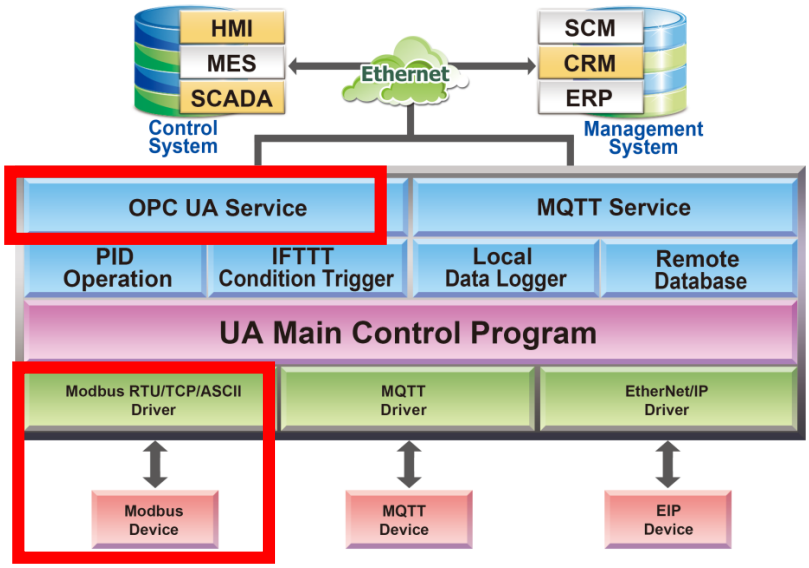


5.4.1. OPC UA and Modbus RTU/ASCII Conversion

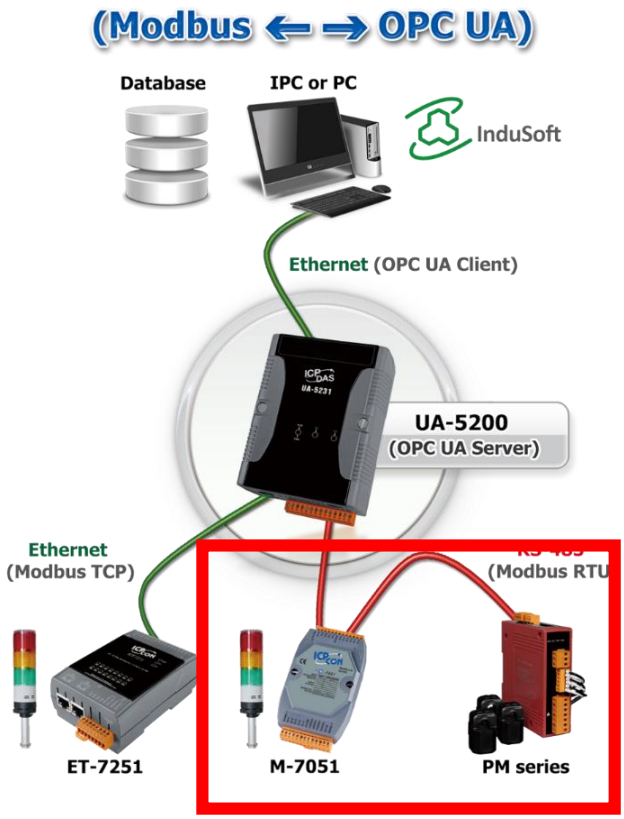
This page provides OPC UA and Modbus RTU/ASCII (Master) communication protocol conversion. With this function, the OPC UA Server can read and write the Modbus RTU / ASCII device that connected to the controller.

The settings of Modbus RTU/ASCII are the same. Here will introduce them together.

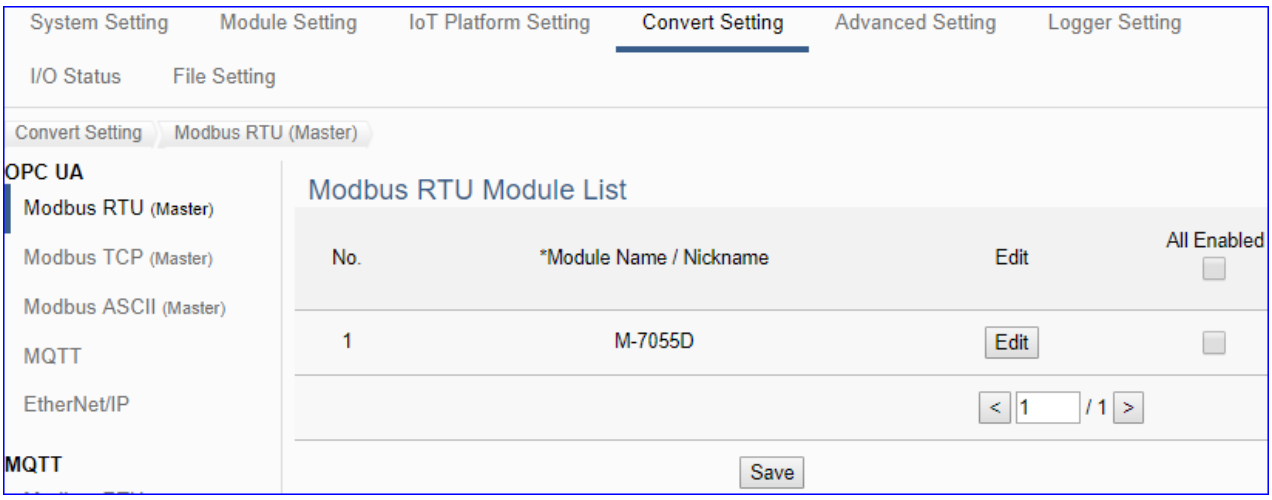
Function Diagram:



Application Solution:



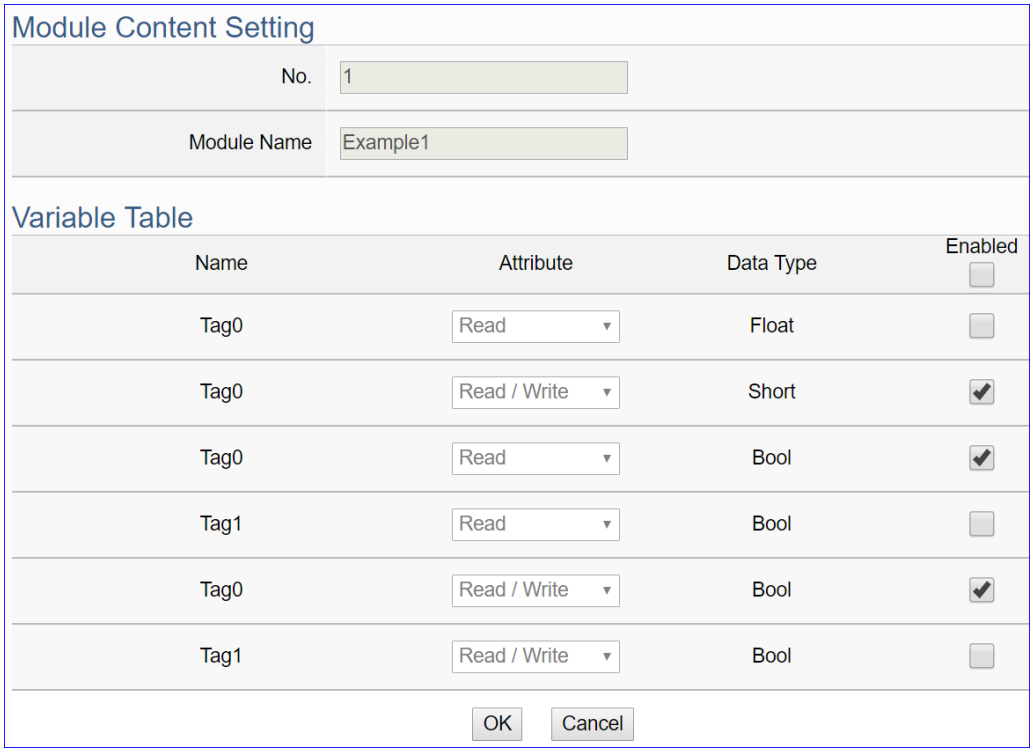
When entering the menu [**Convert Setting**] and the sub-menu [OPC UA] > Modbus RTU (Master) or Modbus ASCII (Master), the Modbus RTU/ASCII modules preset in the [Module Setting] will show up in the Module List. (Refer to Chapter 5.2 for the Module Setting.)



Convert Setting > OPC UA > Modbus RTU (Master) Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
All Enabled Enable	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	If user wants to enable some I/O channels for conversion, click [Edit] of that module to enter the “Variable Tale” setting. It is normal to set all channels as enabled, and the conversion will not affect the unconnected channels.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the communication conversion module, please check the box of the converting module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “Module Content Setting” page.

The “Module Content Setting” page after clicking the [Edit] button:



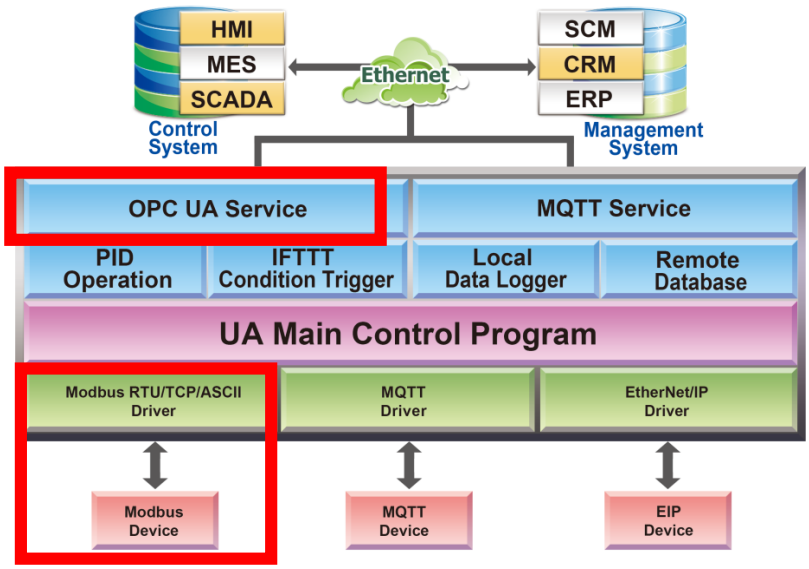
Convert Setting > OPC UA > Modbus RTU (Master) – Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	The module name set in the module list (Not editable here)
Convert Setting > OPC UA > Modbus RTU (Master) – Variable Table	
Name	Display the variable name that set in the Modbus Address Mapping Table page (Not editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK	Click to save this page settings and back to the module list page.

When complete the setting, click [OK] to save this page settings and back to the module list page. Remember to click [Save] to save the Convert Setting.

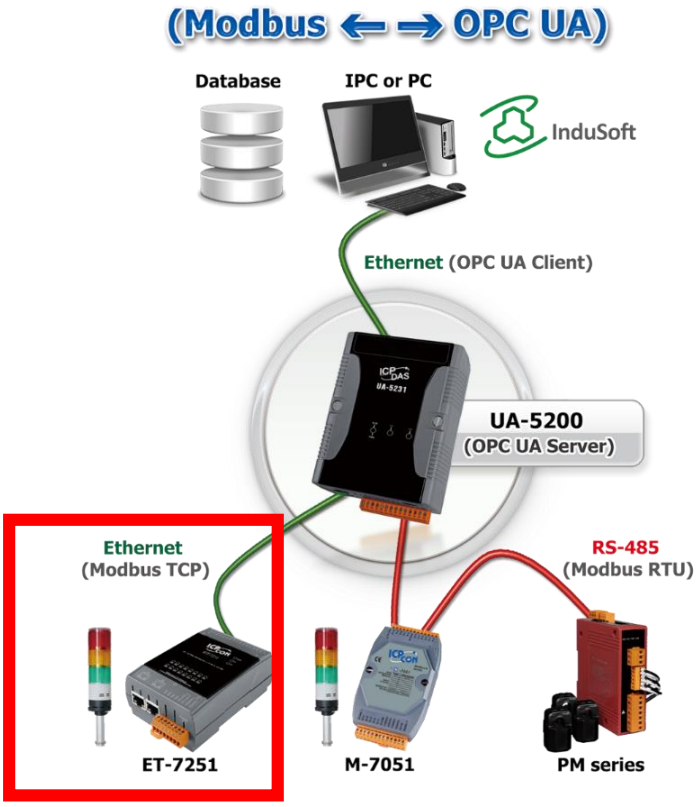
5.4.2. OPC UA and Modbus TCP Conversion

This page provides OPC UA and Modbus TCP (Master) communication protocol conversion. With this function, the OPC UA Server can read and write the Modbus TCP device that connected to the controller.

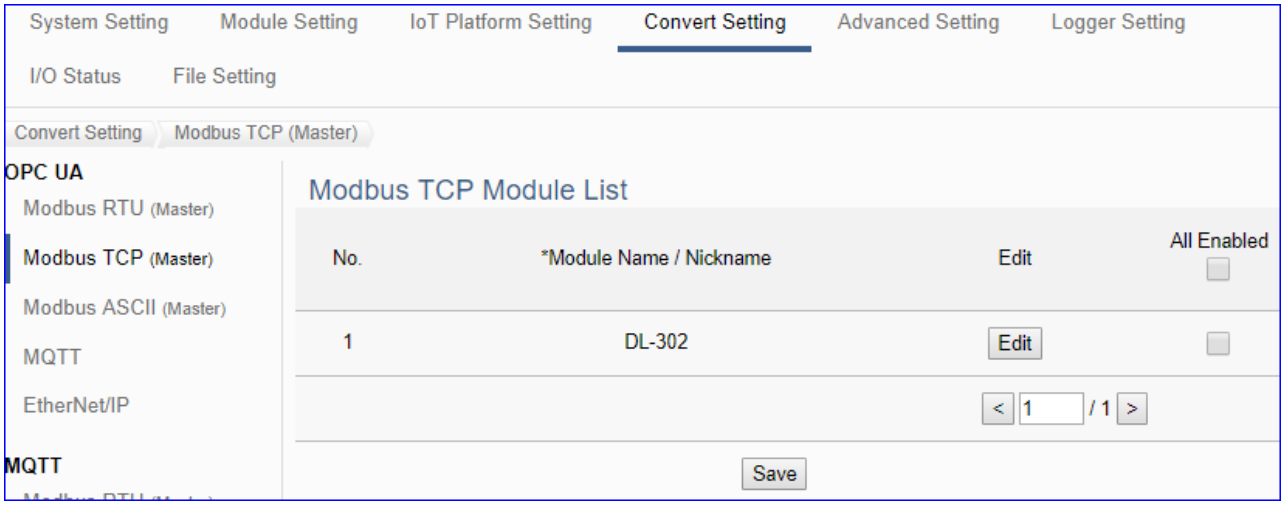
Function Diagram:



Application Solution:



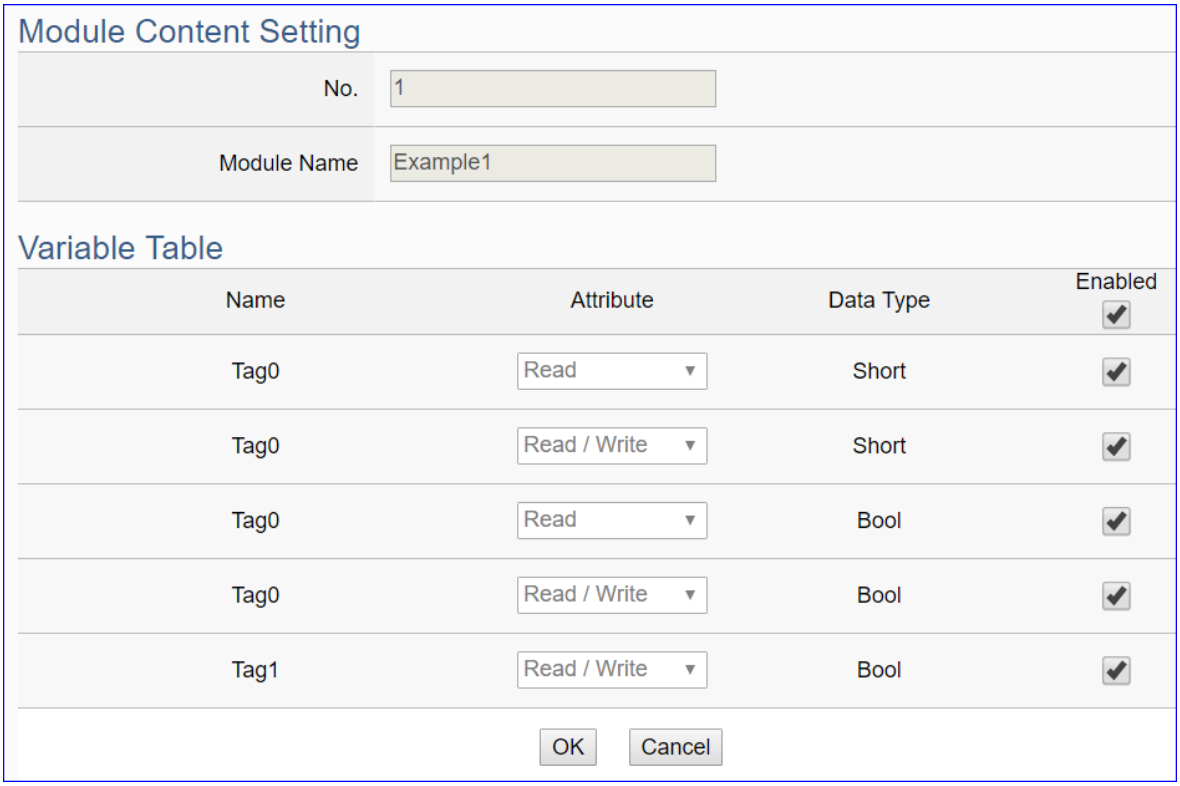
When entering the menu [Convert Setting] and the sub-menu [OPC UA] > Modbus TCP (Master), the Modbus TCP modules preset in the [Module Setting] will show up in the Module List. (Refer to Chapter 5.2 for the Module Setting.)



Convert Setting > OPC UA > Modbus TCP (Master) Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
All Enabled Enable	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	Click to enter the “Module Content Setting” page to set up and enable the I/O.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the communication conversion module, please check the box of the converting module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “Module Content Setting” page.

The “Module Content Setting” page after clicking the [Edit] button:



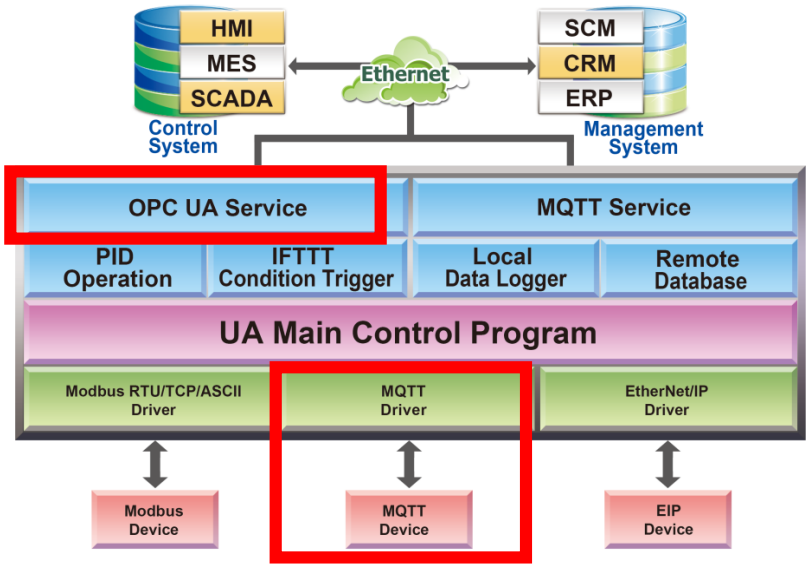
Convert Setting > OPC UA > Modbus TCP (Master) – Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	The module name set in the module list (Not editable here)
Convert Setting > OPC UA > Modbus TCP (Master) – Variable Table	
Name	Display the variable name that set in the Modbus Address Mapping Table page (Not editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK	Click to save this page settings and back to the module list page.

When complete the setting, click [OK] to save this page settings and back to the module list page. And remember to click [Save] to save the Convert Setting.

5.4.3. OPC UA and MQTT Conversion

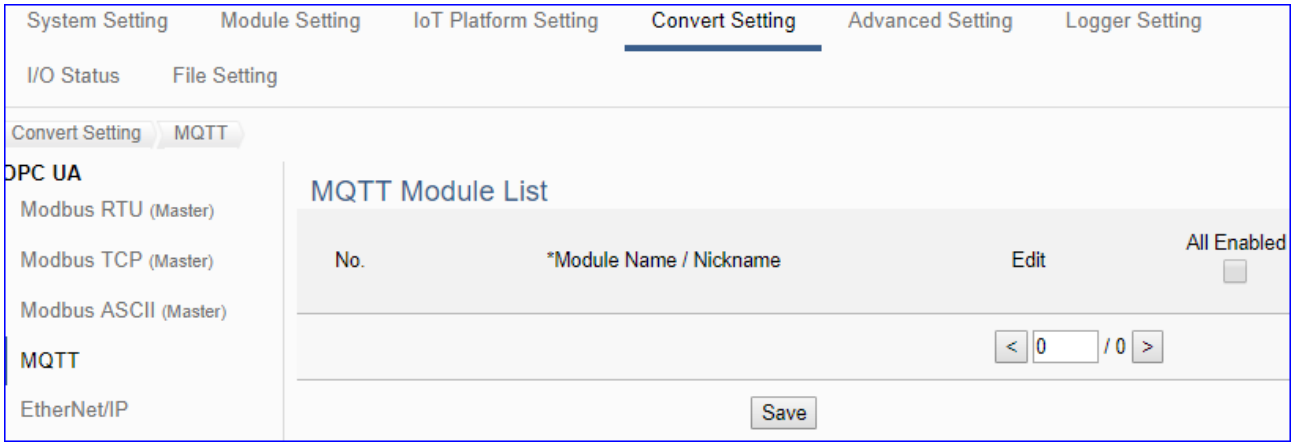
This page provides OPC UA and MQTT communication protocol conversion. With this function, the OPC UA Server can read and write the MQTT device that connected to the controller.

Function Diagram:



Application Solution:

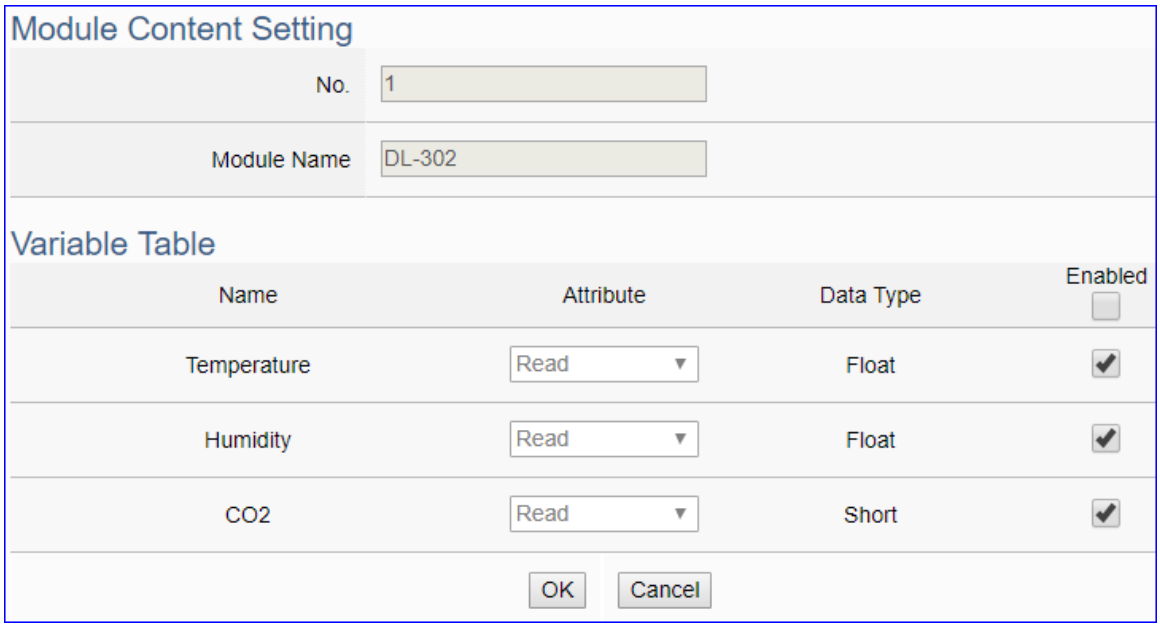
When entering the menu [Convert Setting] and the sub-menu [OPC UA] > MQTT, the MQTT modules preset in the [Module Setting] will show up in the Module List. (Refer to Chapter 5.2 for the Module Setting.)



Convert Setting > OPC UA > MQTT - MQTT Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
All Enabled Enable	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	Click to enter the “MQTT Client Setting” page to enable the I/O.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the communication conversion module, please check the box of the converting module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “Module Content Setting” page.

[**Module Content Setting**] page:

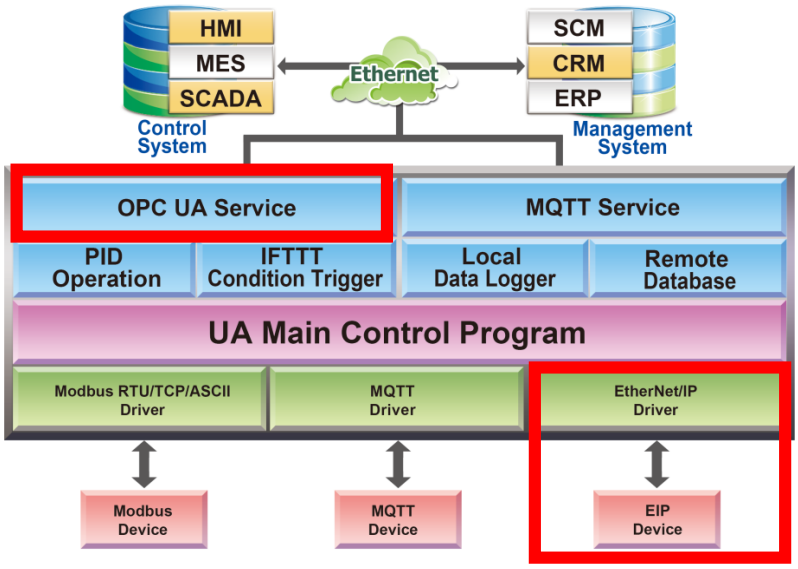


Convert Setting > OPC UA > MQTT - MQTT Module List > Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Convert Setting > OPC UA > MQTT - MQTT Module List > Variable Table	
No.	The module name in the module list (Not editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the MQTT variable. Include: Bool, Short, Unsigned Short, Long, Unsigned Long, Float, Double, String.
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK / Cancer	Click [OK] to save and exit the page settings. Click [Cancer] to exit without saving.

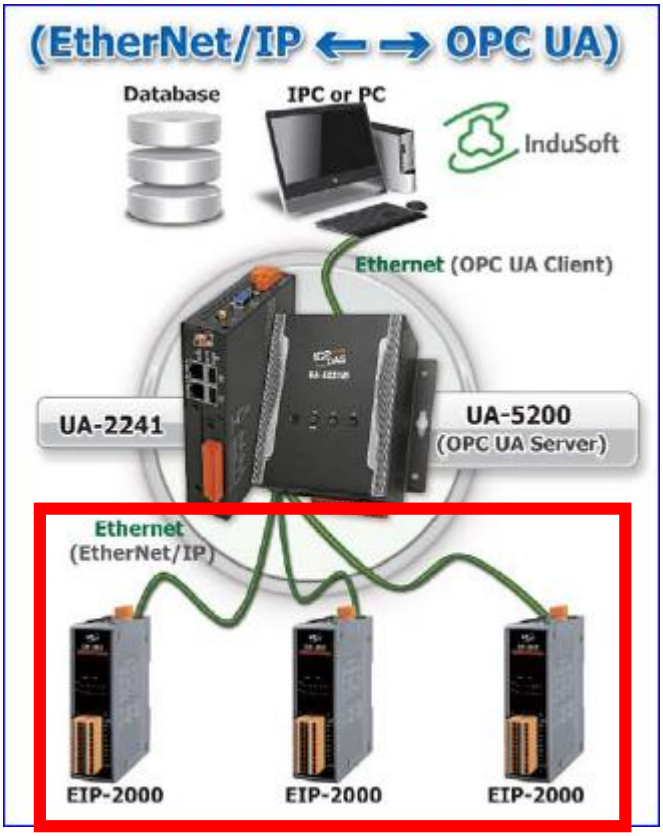
5.4.4. OPC UA and EtherNet/IP Conversion

This page provides OPC UA and EtherNet/IP communication protocol conversion. With this function, the OPC UA Server can read and write the EtherNet/IP EIP-2000 device that connected to the controller.

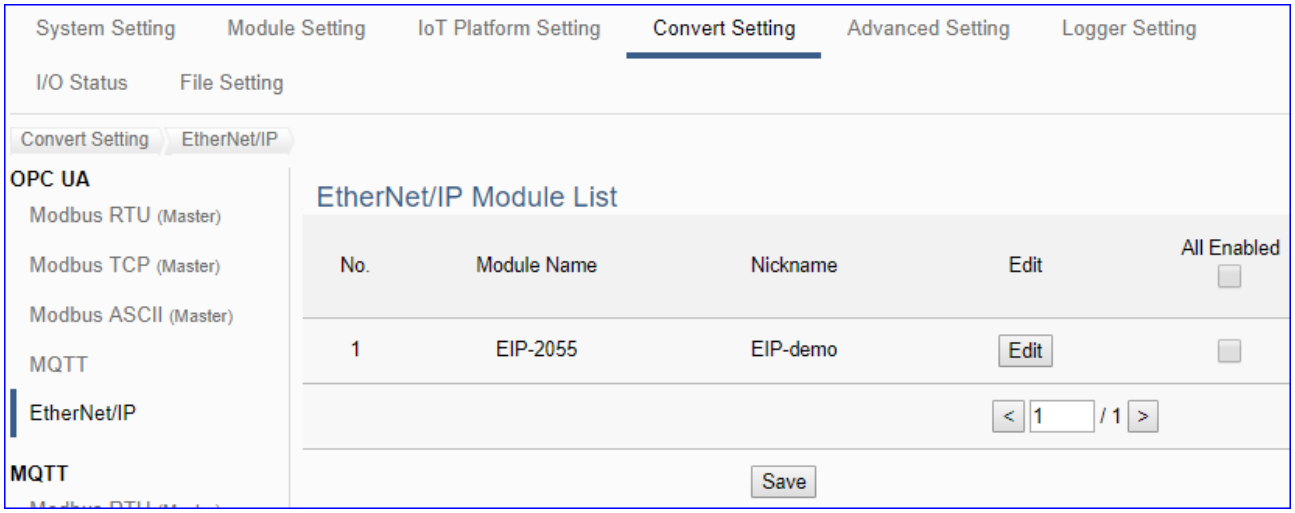
Function Diagram:



Application Solution:



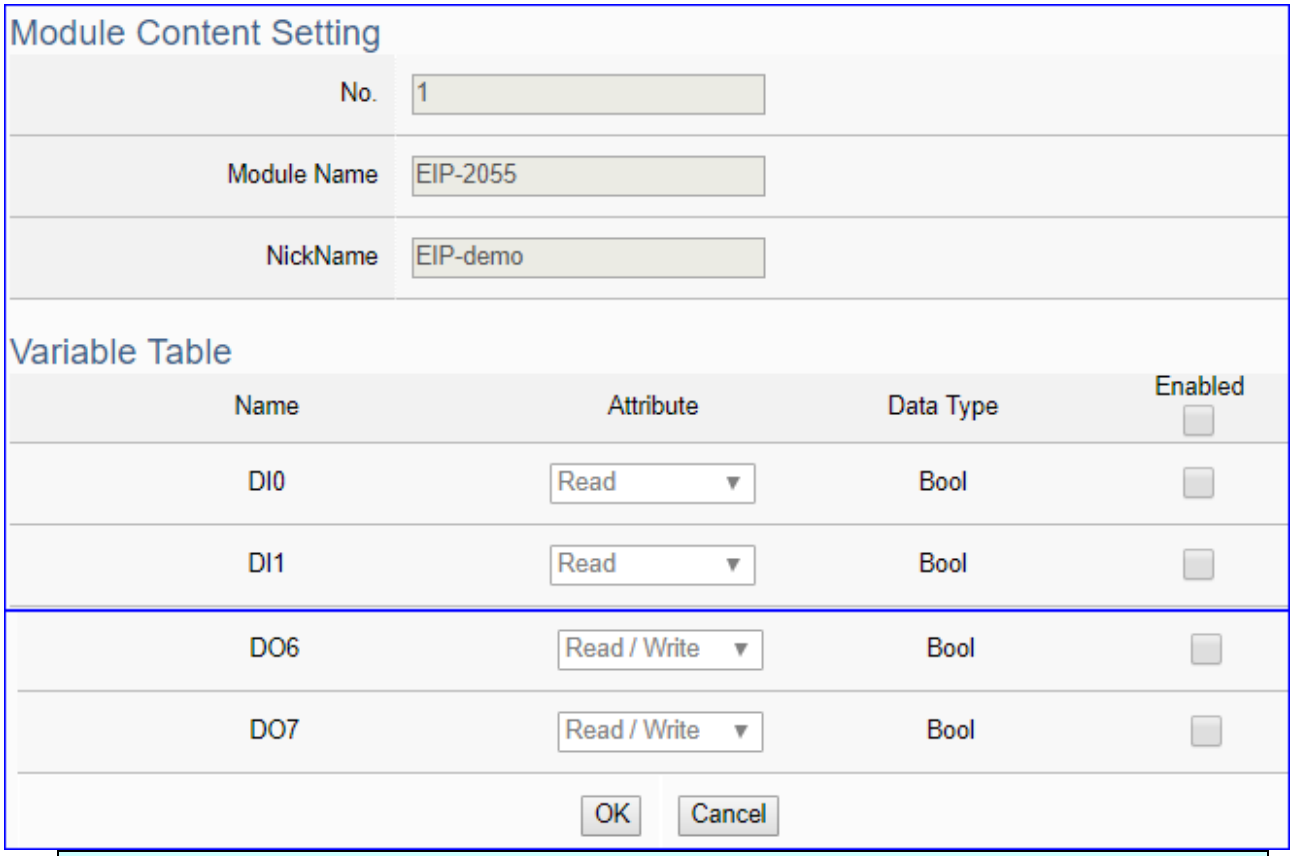
When entering the menu [Convert Setting] and the sub-menu [OPC UA] > EtherNet/IP, the EIP-2000 modules preset in the [Module Setting] will show up in the Module List. (Refer to Chapter 5.2 for the Module Setting.)



Convert Setting > OPC UA > EtherNet/IP Module List	
No.	The module number in the module list (Not editable here)
Module Name	The module name selected in the module list (Not editable here)
Nickname	The user defined name for the module (Not editable here)
All Enabled Enable	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	Click to enter the “Module Content Setting” page to set up and enable the I/O.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the communication conversion module, please check the box of the converting module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “Module Content Setting” page.

The “Module Content Setting” page after clicking the [Edit] button:



Convert Setting > OPC UA > EtherNet/IP – Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	The module name set in the module list (Not editable here)
Convert Setting > OPC UA > EtherNet/IP – Variable Table	
Name	Display the variable name that set in the Modbus Address Mapping Table page (Not editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK	Click to save this page settings and back to the module list page.

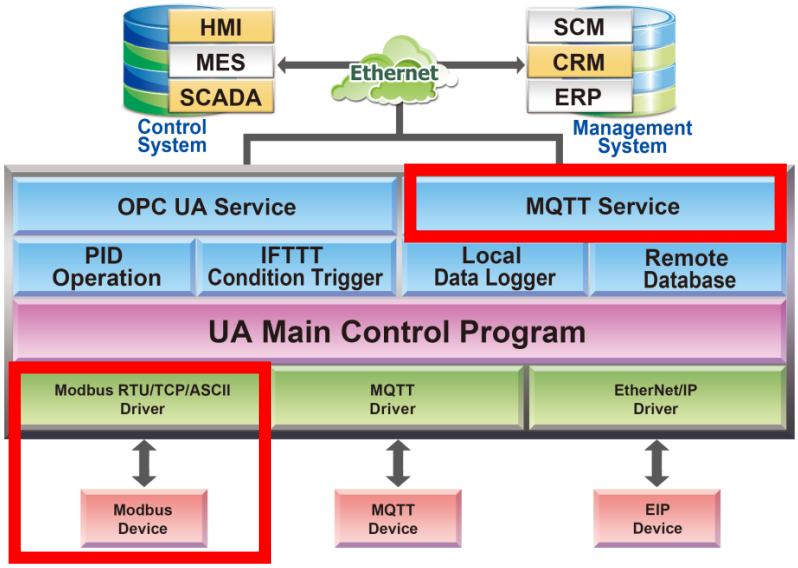
When complete the setting, click [OK] to save this page settings and back to the module list page. Remember to click [Save] to save the Convert Setting.

5.4.5. MQTT and Modbus RTU/ASCII Conversion

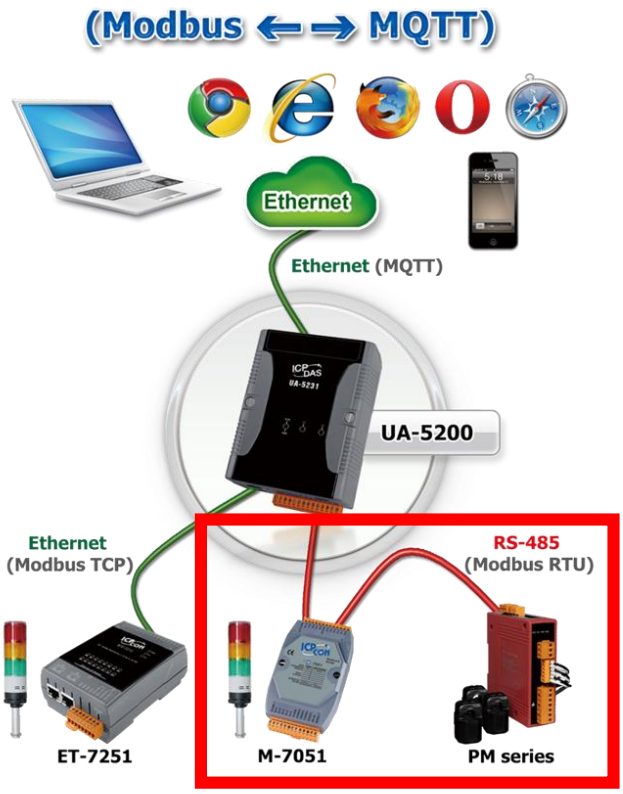
This page provides MQTT and Modbus RTU/ASCII (Master) communication protocol conversion. With the MQTT Service function, users can set the MQTT client to publish the message to the specified broker or subscribe the topic, and so to read and write the single channel of the Modbus device that connected to the controller.

The settings of Modbus RTU/ASCII are the same. Here will introduce them together.
For the certificate about the communication security, please refer to Chapter 7.

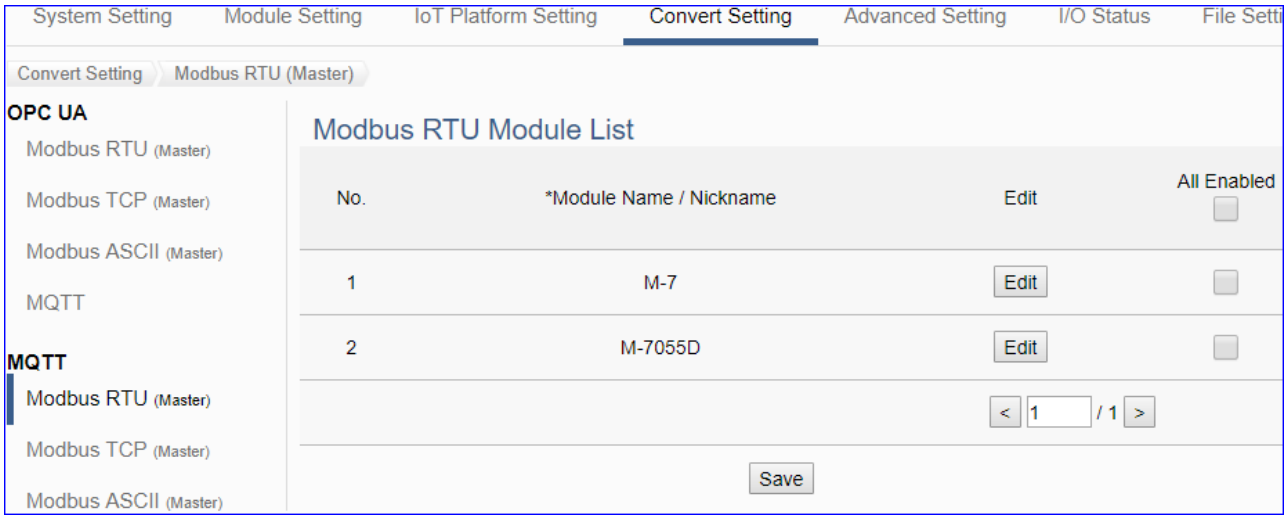
Function Diagram:



Application Solution:



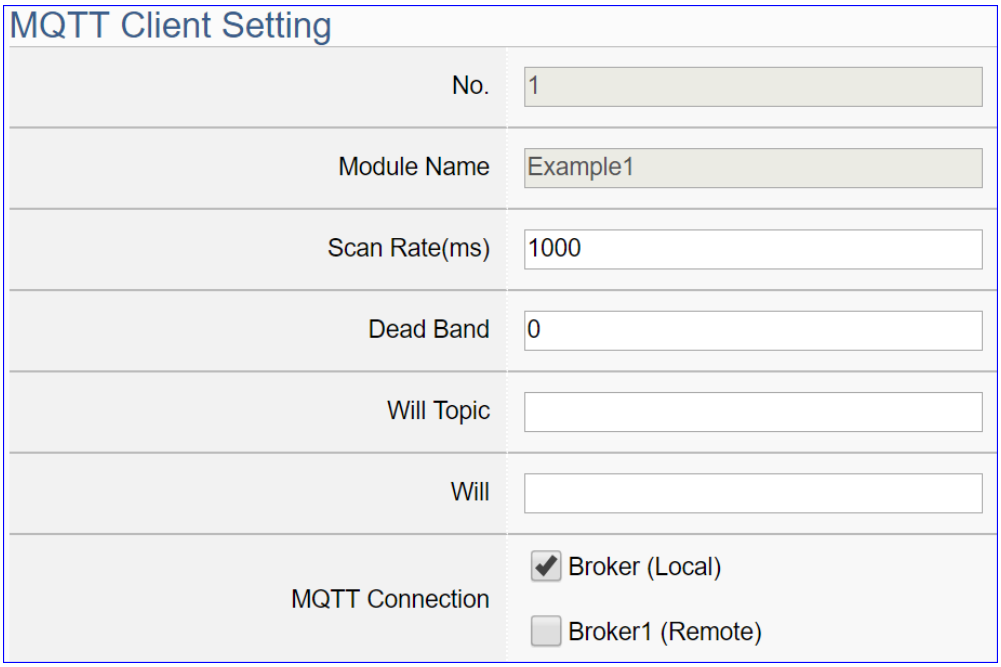
When entering the menu [Convert Setting] and the sub-menu [MQTT] > Modbus RTU (Master) or Modbus ASCII (Master), the Modbus RTU/ASCII modules preset in the [Module Setting] will show up in the Module List. (Refer to Chapter 5.2 for the Module Setting.)



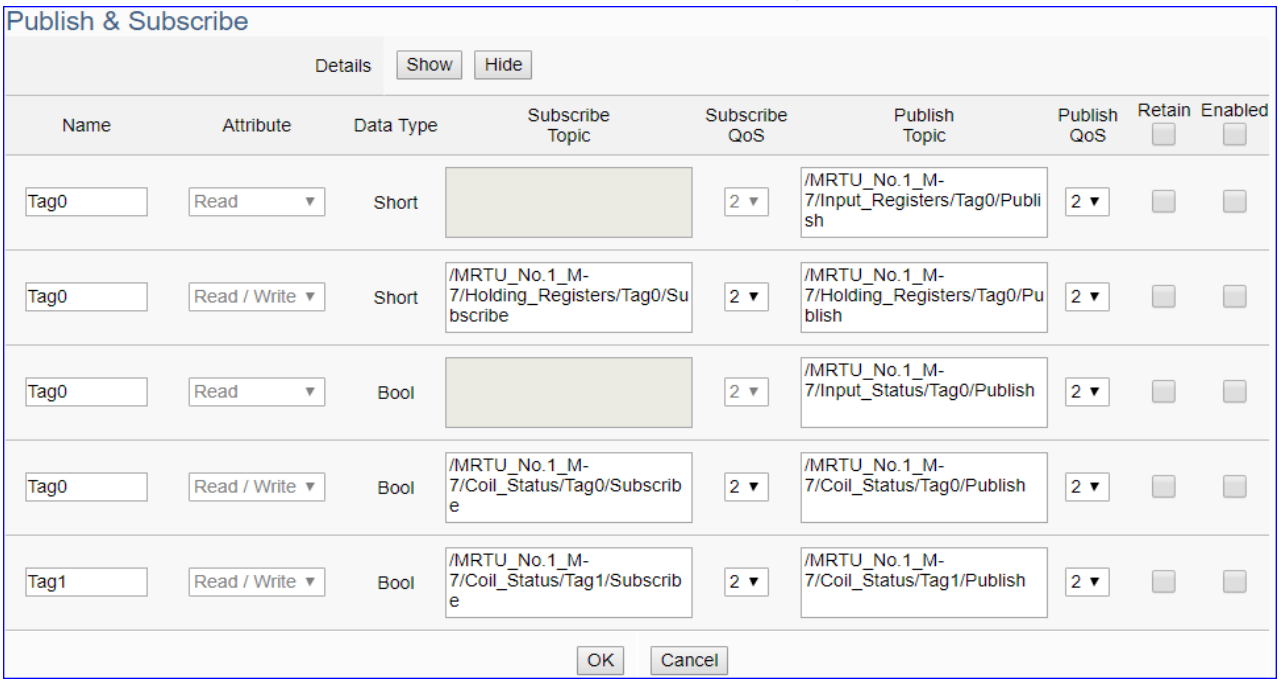
Convert Setting > MQTT > Modbus RTU (Master) Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
All Enabled Enable	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	Click to enter the “MQTT Client Setting” page to enable I/O or set up the Topic, QoS, Publish, Subscribe …
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the communication conversion module, please check the box of the converting module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “MQTT Client Setting” page.

The “MQTT Client Setting” page after clicking the [Edit] button:



Convert Setting > MQTT > Modbus RTU (Master) – MQTT Client Setting	
No.	The module number in the module list (Un-editable)
Module Name	The module name set in the module list (Not editable here)
Scan Rate(ms)	Set an update frequency for the task data. Default: 1000 (Unit: ms)
Dead Bend	Give a dead bend value for updating a float signal. Default: 0
Will Topic	Enter the title of a disconnect notice. Default: Null.
Will	Enter a disconnect notice. Default: Null.
MQTT Connection	Check the Broker for this MQTT connection, Local Broker or Remote Broker. Remote Broker option will appear only when set in advance.



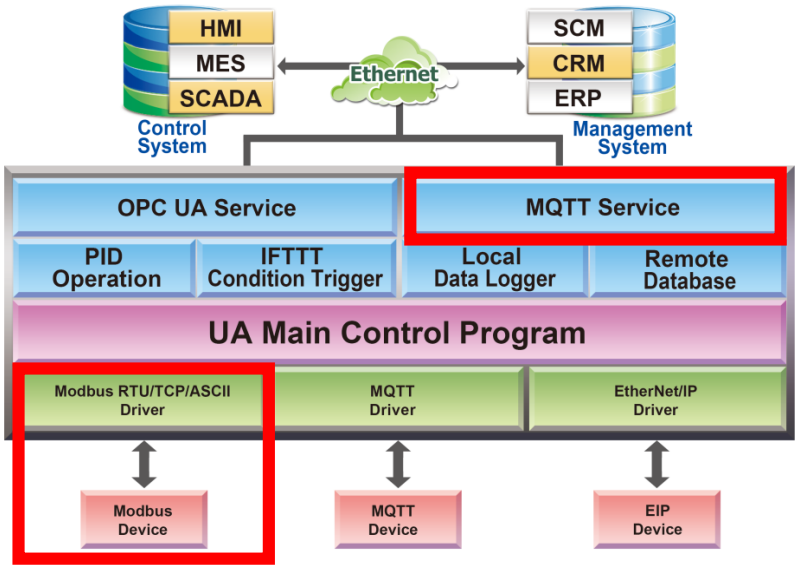
Convert Setting > MQTT > Modbus RTU (Master) – Publish & Subscribe	
Details	Click [Show] to display all fields, click [Hide] to hide some fields.
Name	The variable name of the mapping address. (Not editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Subscribe Topic	The topic of receiving/subscribing data message.
Subscribe Qos	The subscribe Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Publish Topic	The topic of sending/publishing data message.
Publish Qos	The publish Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Retain	Check [Retain] box of the top row can store the broker message for all variables in list. Check the box of each variable can store the broker message just that variable. Default: Uncheck.
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK	Click to save this page settings and back to the module list page.

5.4.6. MQTT and Modbus TCP Conversion

This page provides MQTT and Modbus TCP (Master) communication protocol conversion. With the MQTT Service function, users can set the MQTT client to publish the message to the specified broker or subscribe the topic, and so to read and write the single channel of the Modbus device that connected to the controller.

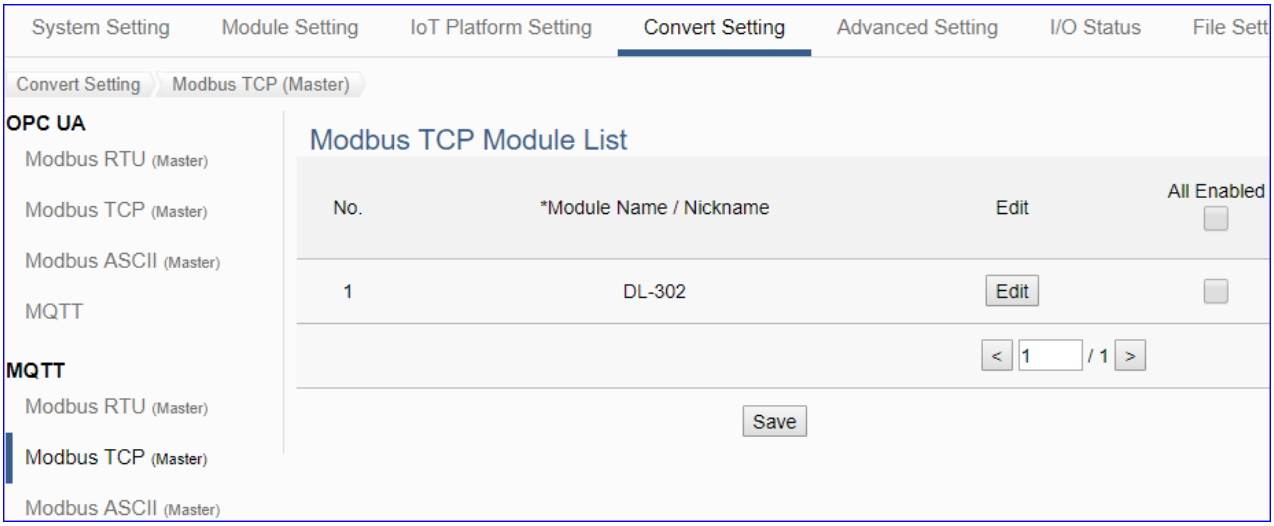
For the certificate about the communication security, please refer to Chapter 7.

Function Diagram:



Application Solution:

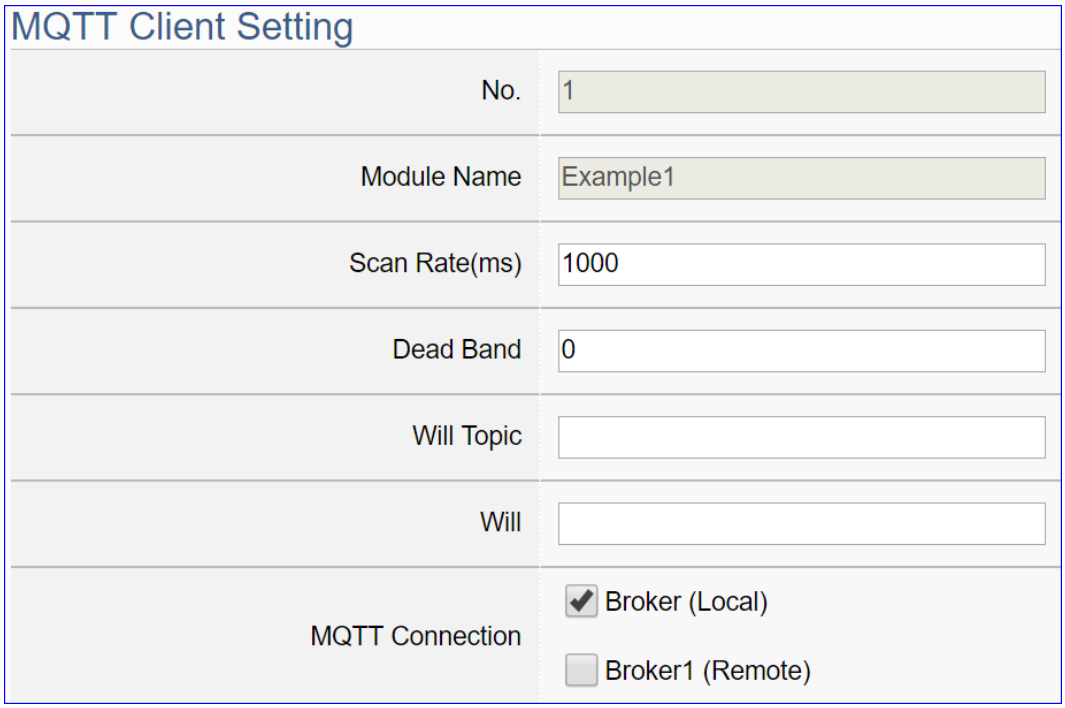
When entering the menu [Convert Setting] and the sub-menu [MQTT] > Modbus TCP (Master), the Modbus TCP modules preset in the [Module Setting] will show up in the Module List. (Refer to Chapter 5.2 for the Module Setting.)



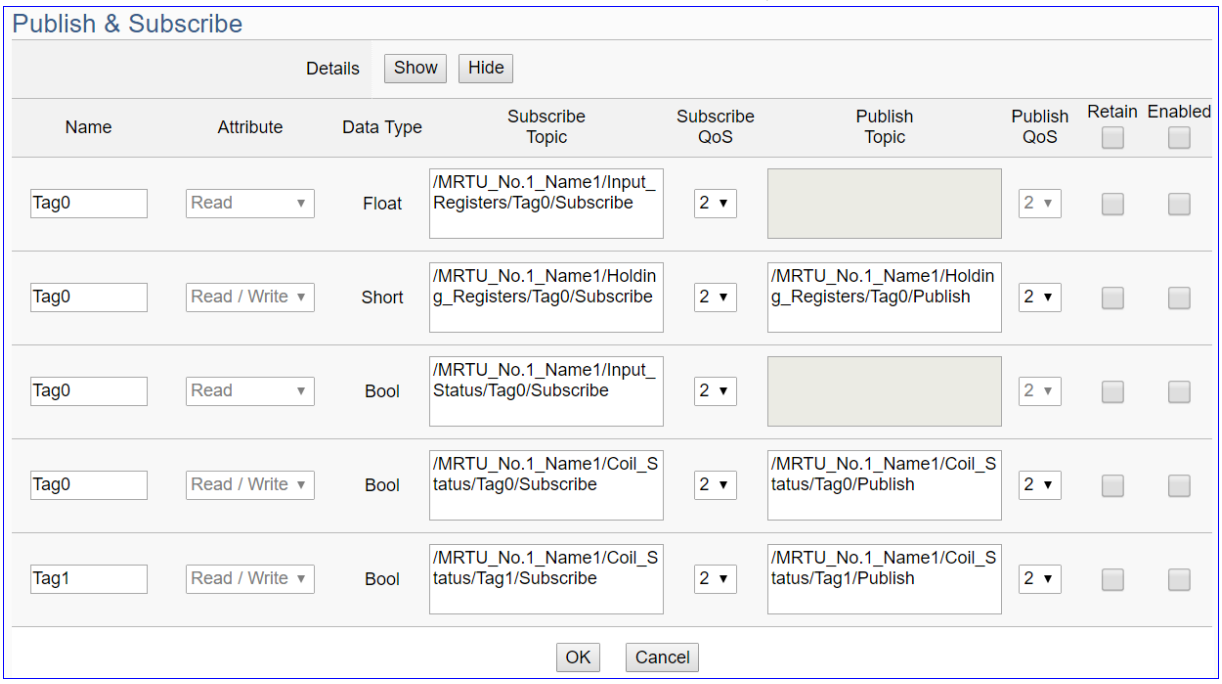
Convert Setting > MQTT > Modbus RTU (Master) Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
All Enabled Enable	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	Click to enter the “MQTT Client Setting” page to enable I/O or set up the Topic, QoS, Publish, Subscribe …
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the communication conversion module, please check the box of the converting module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “MQTT Client Setting” page.

The “MQTT Client Setting” page after clicking the [Edit] button:



Convert Setting > MQTT > Modbus TCP (Master) – MQTT Client Setting	
No.	The module number in the module list (Un-editable)
Module Name	The module name set in the module list (Not editable here)
Scan Rate(ms)	Set an update frequency for the task data. Default: 1000 (Unit: ms)
Dead Bend	Give a dead bend value for updating a float signal. Default: 0
Will Topic	Enter the title of a disconnect notice. Default: Null.
Will	Enter a disconnect notice. Default: Null.
MQTT Connection	Check the Broker for this MQTT connection, Local Broker or Remote Broker. Remote Broker option will appear only when set in advance.



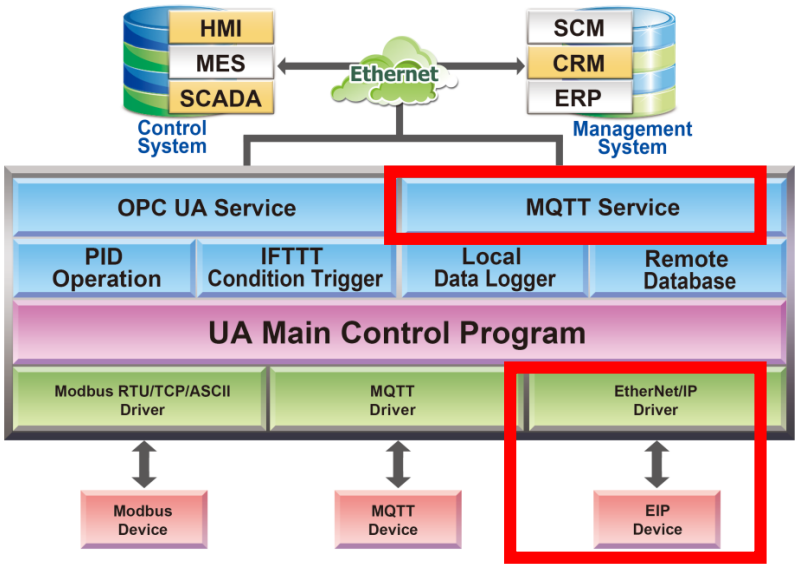
Convert Setting > MQTT > Modbus TCP (Master) – Publish & Subscribe	
Details	Click [Show] to display all fields, click [Hide] to hide some fields.
Name	The variable name of the mapping address. (Not editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Subscribe Topic	The topic of receiving/subscribing data message.
Subscribe Qos	The subscribe Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Publish Topic	The topic of sending/publishing data message.
Publish Qos	The publish Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Retain	Check [Retain] box of the top row can store the broker message for all variables in list. Check the box of each variable can store the broker message just that variable. Default: Uncheck.
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK	Click to save this page settings and back to the module list page.

5.4.7. MQTT and EtherNet/IP Conversion

This page provides MQTT and EtherNet/IP communication protocol conversion. With this MQTT Service function, users can set the MQTT client to publish the message to the specified broker or subscribe the topic, and so to read and write the single channel of the ICP DAS EIP-2000 device that connected to the controller.

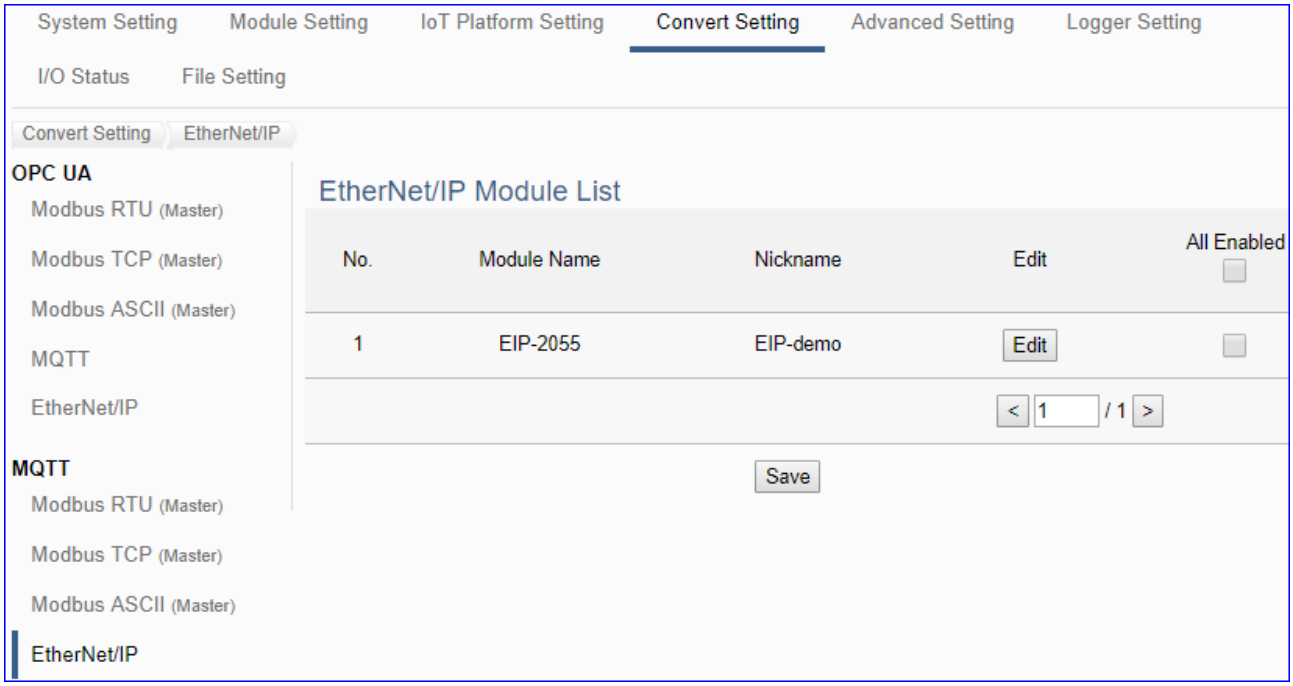
For the certificate about the communication security, please refer to Chapter 7.

Function Diagram:



Application Solution:

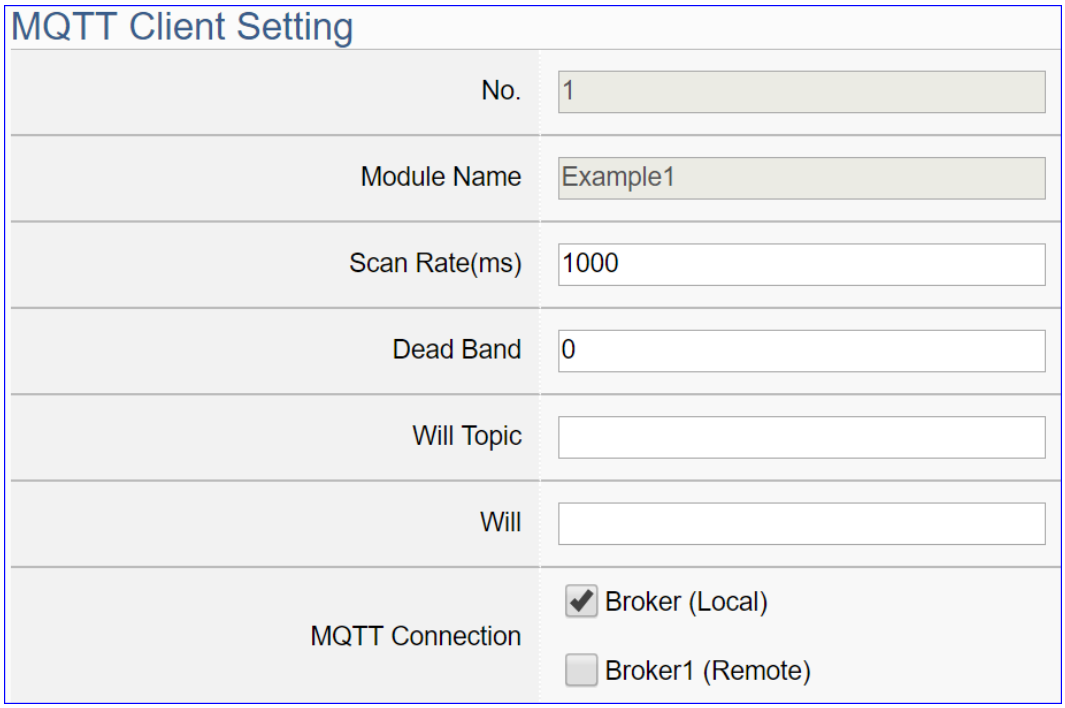
When entering the menu [Convert Setting] and the sub-menu [MQTT] > EtherNet/IP, the ICP DAS EtherNet/IP modules EIP Series preset in the [Module Setting] will show up in the Module List. (Refer to Chapter 5.2 for the Module Setting.)



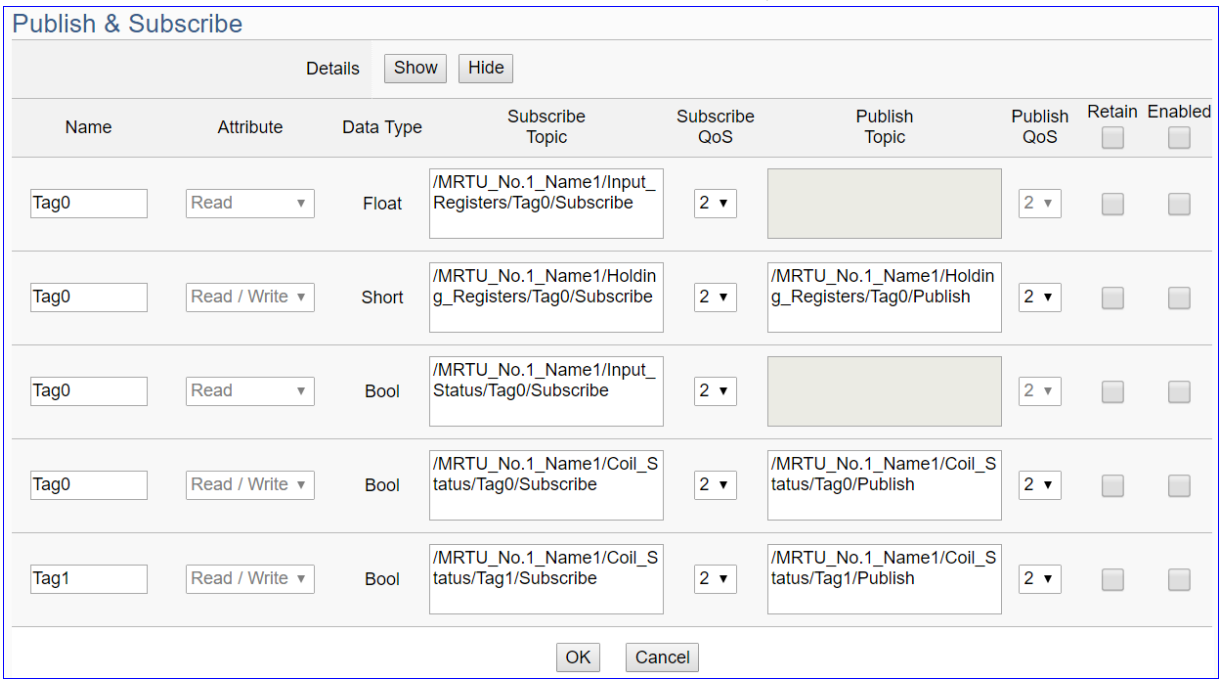
Convert Setting > MQTT > EtherNet/IP Module List	
No.	The module number in the module list (Not editable here)
Module Name	The EIP series model selected in the module list (Not editable here)
Nickname	The user defined name for the module (Not editable here)
All Enabled ☐ ☐ Enable	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	Click to enter the “MQTT Client Setting” page to enable I/O or set up the Topic, QoS, Publish, Subscribe …
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the communication conversion module, please ☑ check the box of the converting module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “MQTT Client Setting” page.

The “MQTT Client Setting” page after clicking the [Edit] button:



Convert Setting > MQTT > Modbus TCP (Master) – MQTT Client Setting	
No.	The module number in the module list (Un-editable)
Module Name	The module name set in the module list (Not editable here)
Scan Rate(ms)	Set an update frequency for the task data. Default: 1000 (Unit: ms)
Dead Bend	Give a dead bend value for updating a float signal. Default: 0
Will Topic	Enter the title of a disconnect notice. Default: Null.
Will	Enter a disconnect notice. Default: Null.
MQTT Connection	Check the Broker for this MQTT connection, Local Broker or Remote Broker. Remote Broker option will appear only when set in advance.



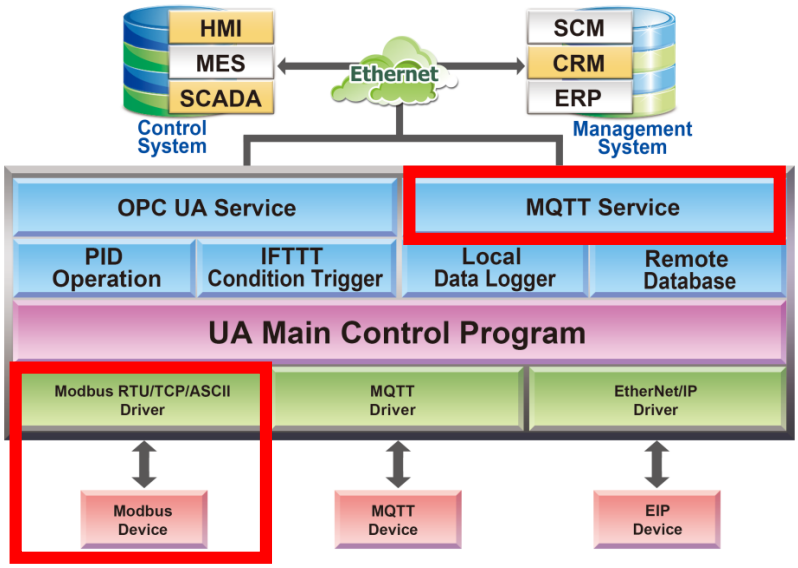
Convert Setting > MQTT > Modbus TCP (Master) – Publish & Subscribe	
Details	Click [Show] to display all fields, click [Hide] to hide some fields.
Name	The variable name of the mapping address. (Not editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Subscribe Topic	The topic of receiving/subscribing data message.
Subscribe Qos	The subscribe Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Publish Topic	The topic of sending/publishing data message.
Publish Qos	The publish Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.
Retain	Check [Retain] box of the top row can store the broker message for all variables in list. Check the box of each variable can store the broker message just that variable. Default: Uncheck.
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK	Click to save this page settings and back to the module list page.

5.4.8. MQTT JSON and Modbus RTU/ASCII Conversion

This page provides MQTT JSON and Modbus RTU/ASCII (Master) communication protocol conversion. With the MQTT Service function, users can set the MQTT client to publish the message to the specified broker or subscribe the topic, and combine several messages that converted in JSON format into a group to read and write the multiple channels of the Modbus RTU/ASCII devices that connected to the controller.

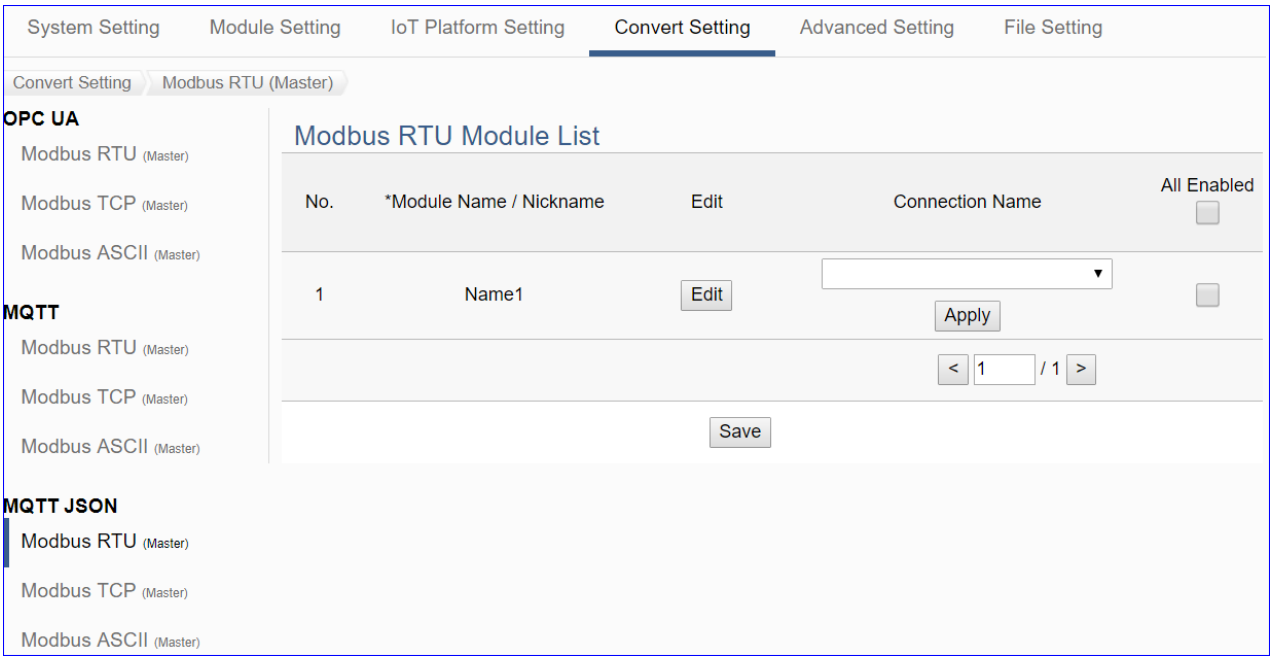
The settings of Modbus RTU/ASCII are the same. Here will introduce them together.
For the certificate about the communication security, please refer to Chapter 7.

Function Diagram:



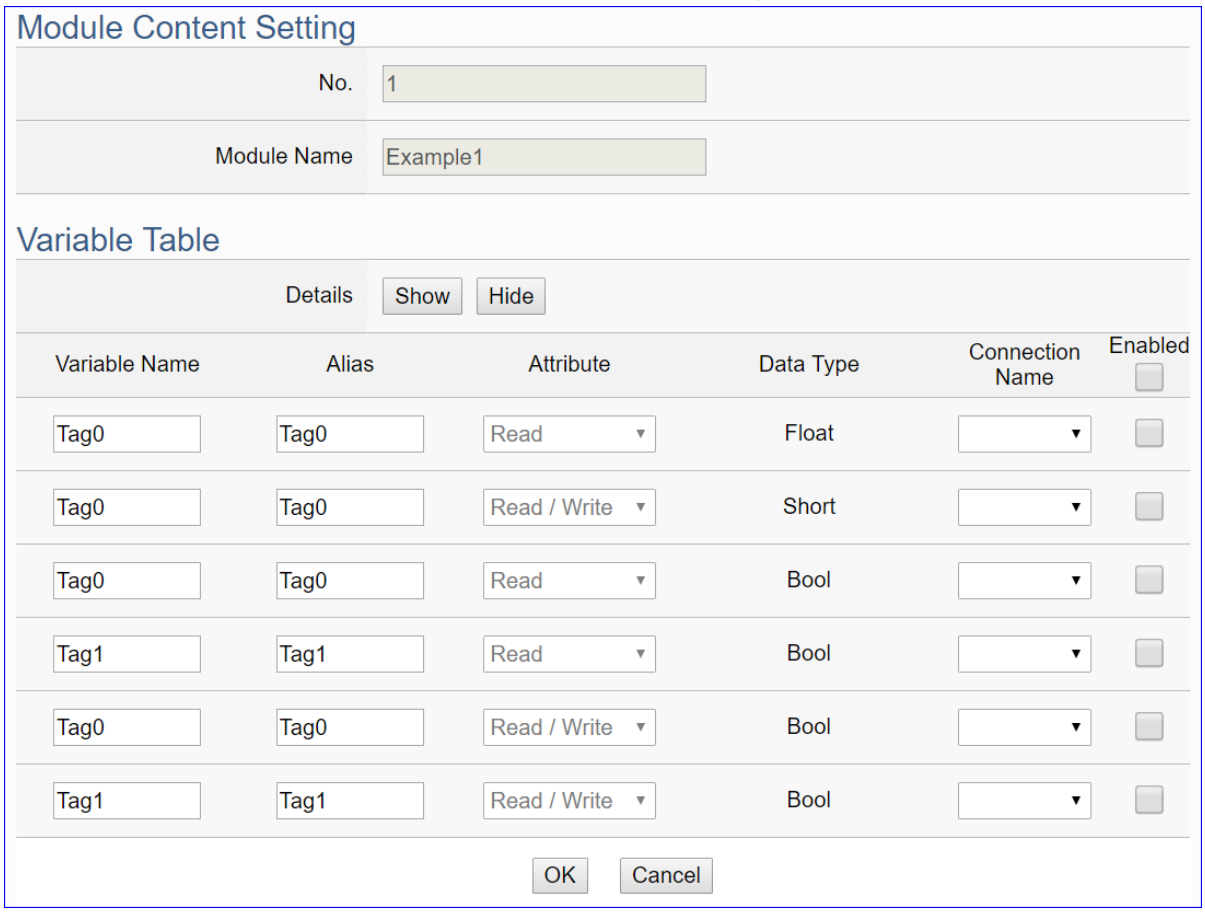
Application Solution:

When entering the menu [Convert Setting] and the sub-menu [MQTT JSON] > Modbus RTU or Modbus ASCII (Master), the Modbus RTU/ASCII modules preset in the [Module Setting] will show up in the Module List. (Refer to Chapter 5.2 for the Module Setting.)



Convert Setting > MQTT JSON > Modbus RTU (Master) Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
Connection Name	Select a group connection name, and then click [Apply].
All Enabled Enable	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
Edit	If user wants to enable some I/O channels for conversion, click [Edit] of that module to enable I/O or check the “Module Content Setting” and “Variable Tale” page.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the communication conversion module, please check the box of the converting module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “Module Content Setting” page.



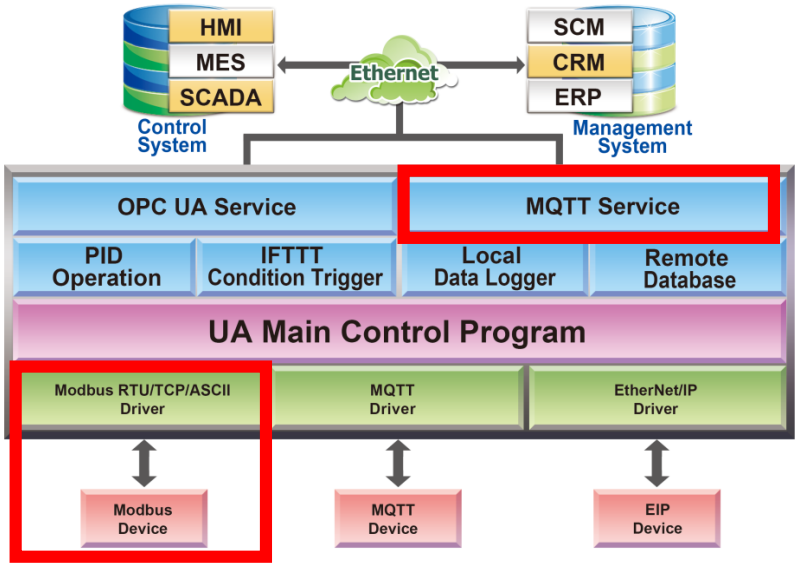
Convert Setting > MQTT JSON > Modbus RTU (Master) – Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	The module name set in the module list (Not editable here)
Convert Setting > MQTT JSON > Modbus RTU (Master) – Variable Table	
Details	Click [Show] to display all fields, click [Hide] to hide some fields.
Variable Name	The variable name of the mapping address. (Not editable here)
Alias	The alias name for the variable. (Editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Connection Name	Select the group name that set in the group list page.
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK	Click to save this page settings and back to the module list page.

5.4.9. MQTT JSON and Modbus TCP Conversion

This page provides MQTT JSON and Modbus TCP (Master) communication protocol conversion. With the MQTT Service function, users can set the MQTT client to publish the message to the specified broker or subscribe the topic, and combine several messages that converted in JSON format into a group to read and write the multiple channels of the Modbus TCP devices that connected to the controller.

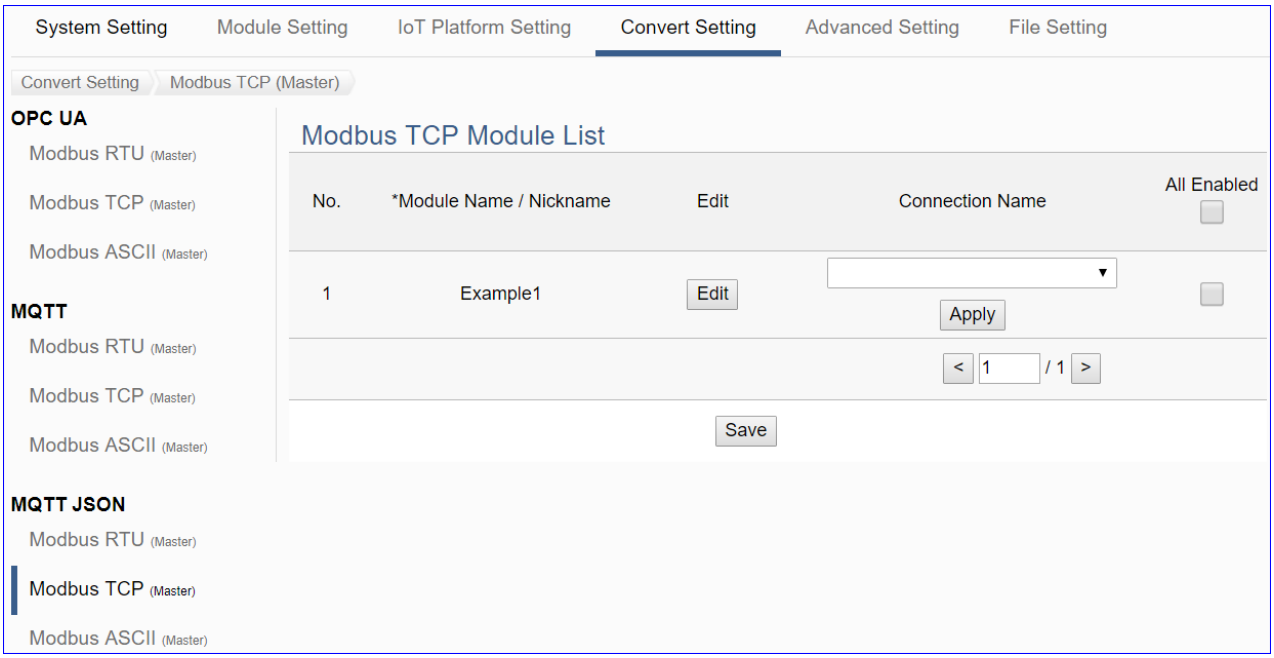
For the certificate about the communication security, please refer to Chapter 7.

Function Diagram:



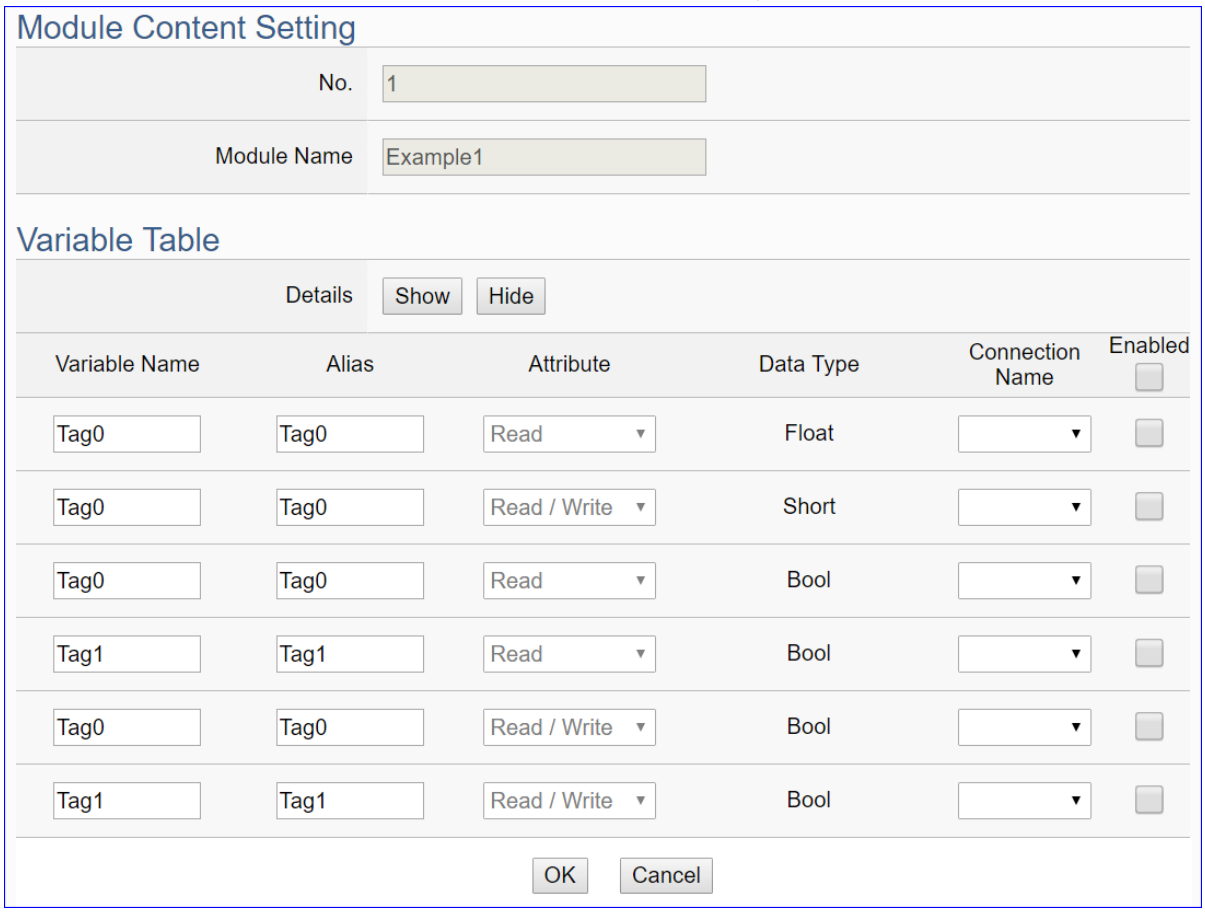
Application Solution:

When entering the menu [Convert Setting] and the sub-menu [MQTT JSON] > Modbus TCP (Master), the Modbus TCP modules preset in the [Module Setting] will show up in the Module List. (Refer to Chapter 5.2 for the Module Setting.)



Convert Setting > MQTT JSON > Modbus TCP (Master) Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
Connection Name	Select a group connection name, and then click [Apply].
Edit	If user wants to enable some I/O channels for conversion, click [Edit] of that module to enter the “Module Content Setting” and “Variable Tale” page.
All Enabled Enable	Check [All Enabled] box to enable all modules in list for conversion. Default: Uncheck. Check the box of each module can enable just that module for conversion.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the communication conversion module, please check the box of the converting module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “Module Content Setting” page.

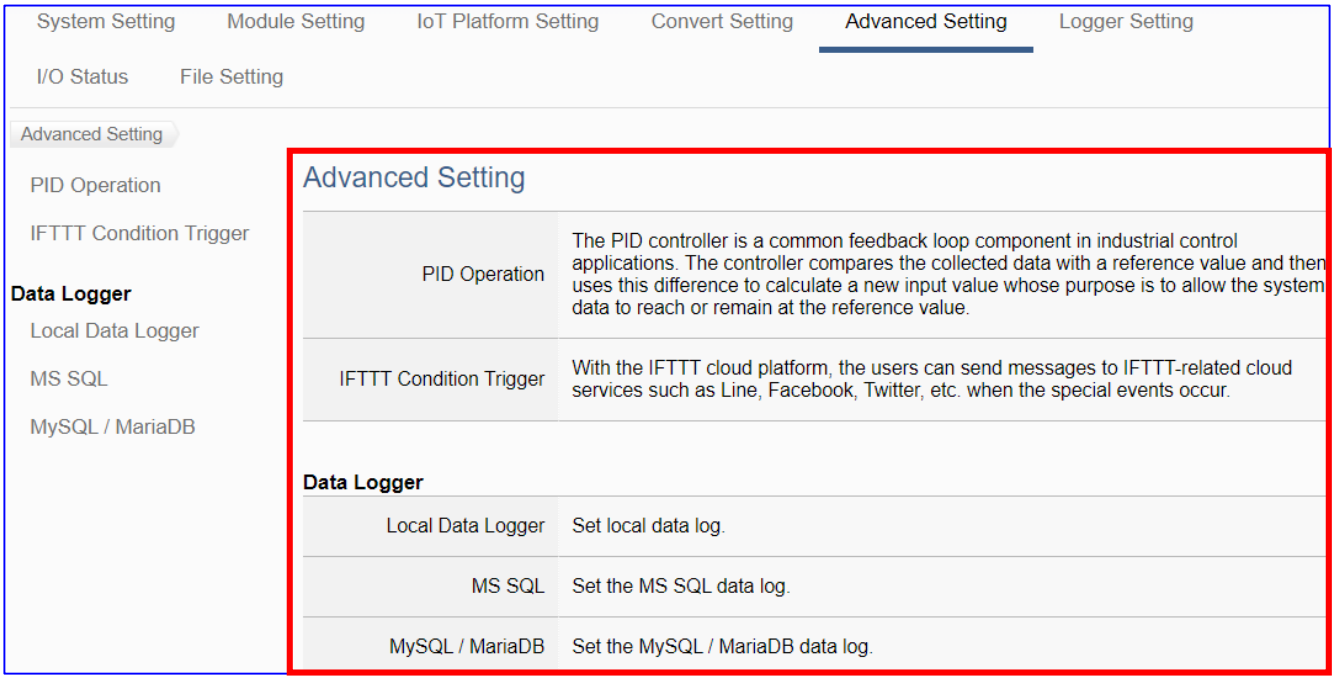


Convert Setting > MQTT JSON > Modbus TCP (Master) – Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	The module name set in the module list (Not editable here)
Convert Setting > MQTT JSON > Modbus TCP (Master) – Variable Table	
Details	Click [Show] to display all fields, click [Hide] to hide some fields.
Variable Name	The variable name of the mapping address. (Not editable here)
Alias	The alias name for the variable. (Editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Connection Name	Select the group name that set in the group list page.
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK	Click to save this page settings and back to the module list page.

5.5. Main Menu: Advanced Setting

Advanced Setting is the fifth (5th) item of the Main Menu, mainly to provide advanced monitoring and control related settings.

Advanced Setting provides virtual device function or cloud service function. The description is on the page of the Main Menu. It will support more functions in the future.
The items in the advanced setting functions are “PID Operation” and “IFTTT Condition Trigger” and “Data Logger” that includes “Local Data Logger”, “MS SQL” and “MySQL / MariaDB”. This chapter will introduce the function items and setting parameters.

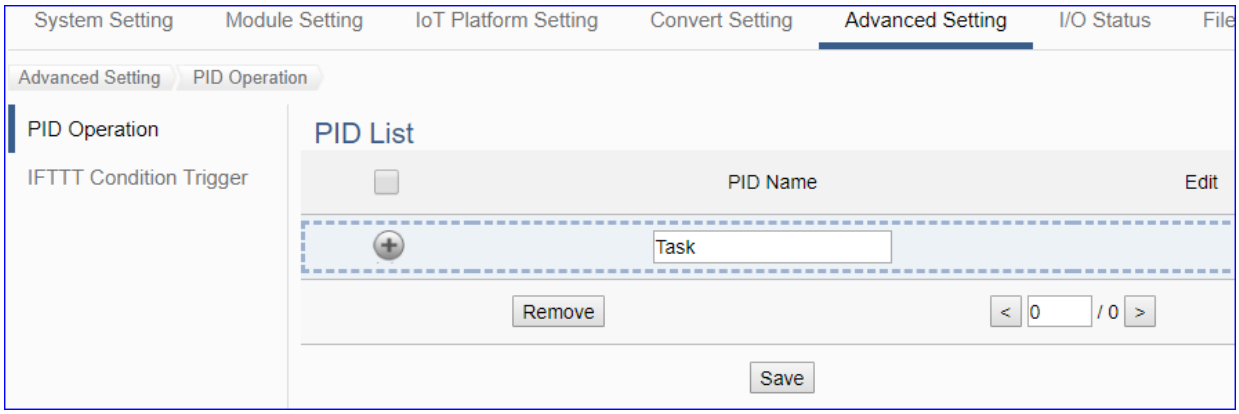


The setting for UA series controllers is to set up from the left to the right of the main menu functions. User can find the setting step and Web UI information in the following chapters.

CH2 Quick Start 1: Hardware/Network Connection
CH3 Quick Start 2: Web UI / Steps / Project Example
CH4 Function Wizard: Project Quick Setup

5.5.1. PID Operation

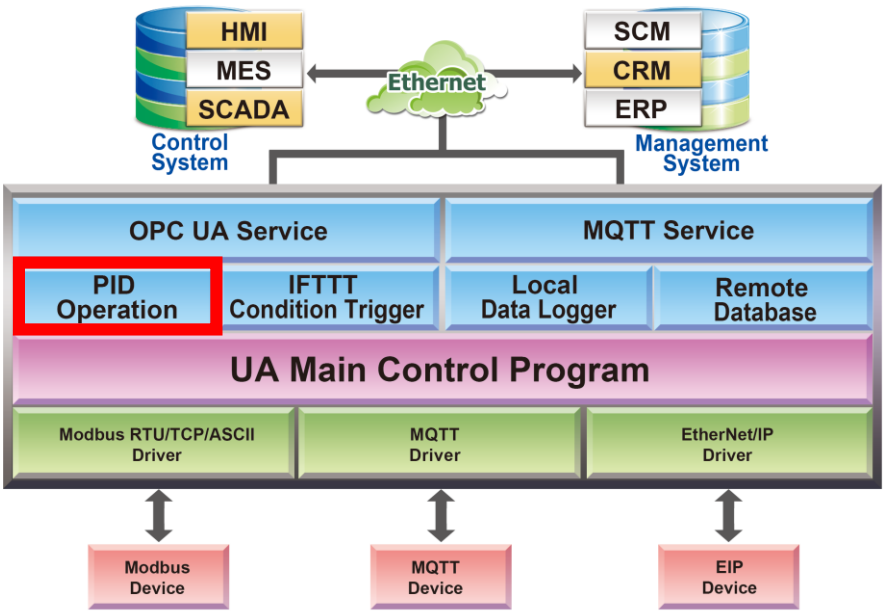
This page is about the virtual device function to allow users to simulate various devices with the real I/O by using the tuning function of PID operation.



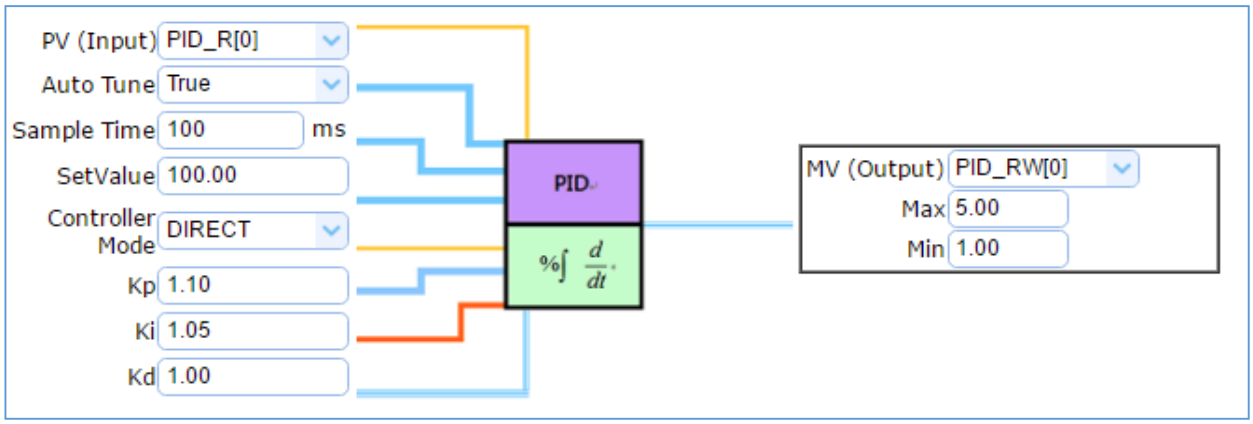
PID (Proportional-Integral-Derivative) control is the most widely used in industrial control systems. A regulator which is controlled in accordance with Proportional, Integral and Derivative is called PID control for short, also called PID regulator. When the user cannot fully grasp or measure parameters of the control system, the PID regulator is the best solution.

The PID controller is a common feedback loop component in industrial control applications. The controller compares the collected data with a reference value and then uses this difference to calculate a new input value whose purpose is to allow the system data to reach or remain at the reference value.

Function Diagram:



PID Operation Solution Example:



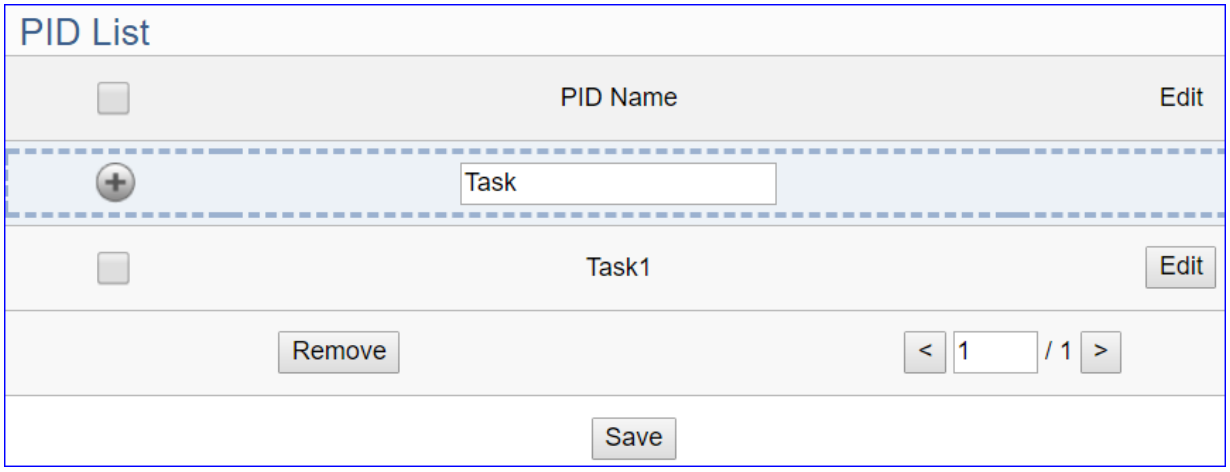
In the PID Operation function, UA controller collects the module's data to operate via the feedback loop component of PID control. The controller compares the collected data with a reference value and then uses this difference to calculate a new input value whose purpose is to allow the system data to reach or remain at the reference value.

The setting steps of the PID Operation are as below. The descriptions for the steps setting please refer to Section 4.3 "PID" items in the Function Wizard.

[Step Box] of [PID Operation] :

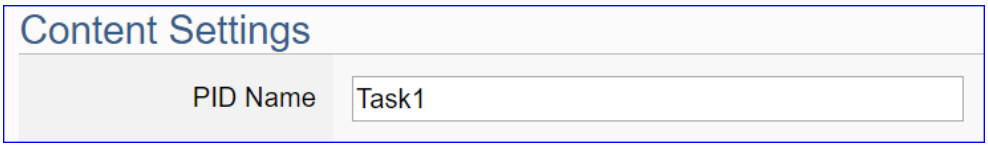
[Step Box] of [PID Operation + OPC UA Conversion] :

This section will introduce the function items and setting parameters of the PID Operation.

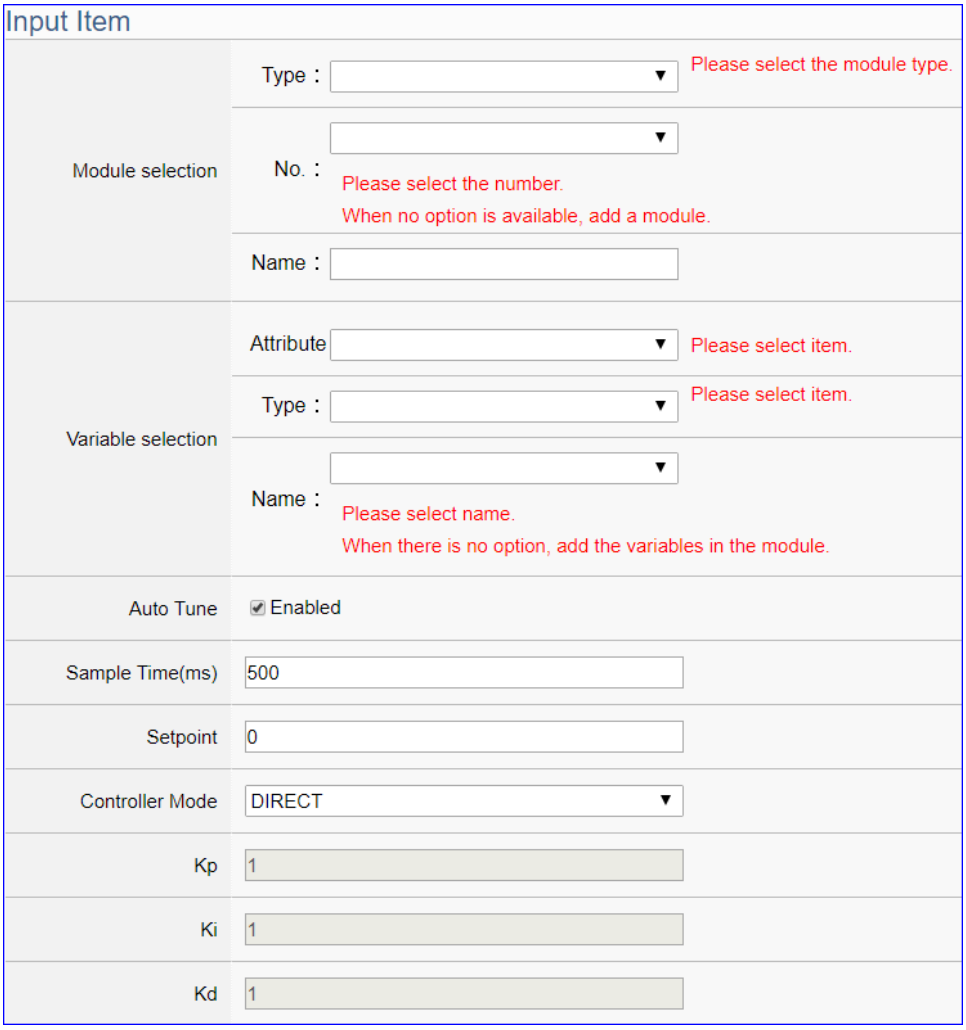


Advanced Setting > PID Operation > PID List	
PID Name	PID name, user can define, e.g. Task1. Default: Task.
	Click to add a new PID Task.
Edit / Remove	Click [Edit] can set the PID content. Click the left box and [remove] can delete the PID list.
	The page number of the PID list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the setting of this page.

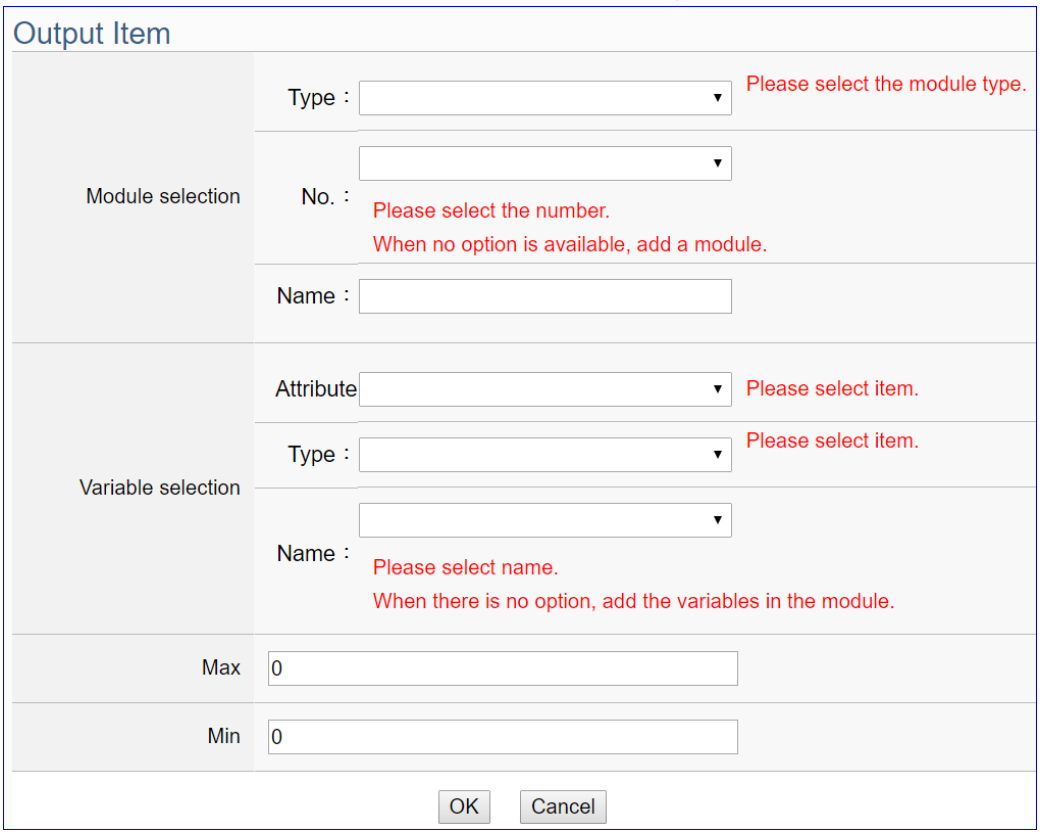
Click [Edit] botton to enter the [Content Settings] page:



Advanced Setting > PID Operation > Content Settings	
PID Name	PID name, user can define, e.g. Task1. Default: Task.

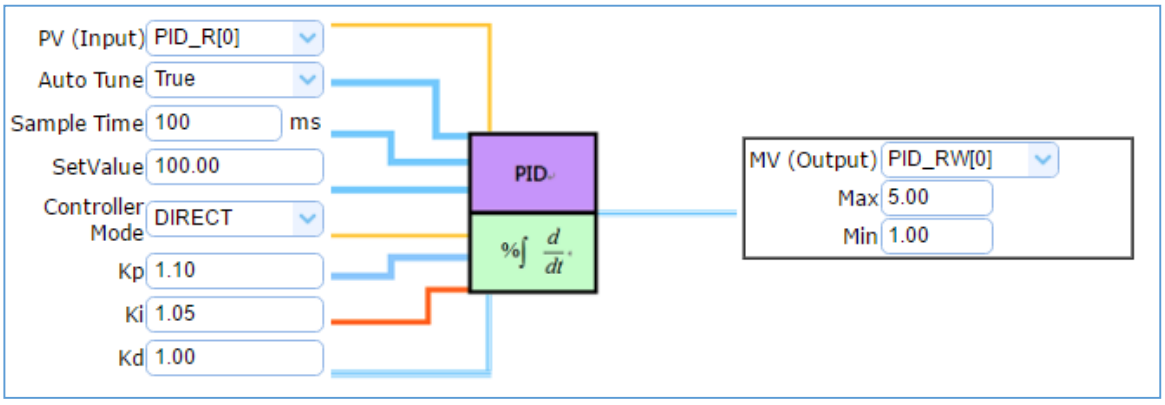


Advanced Setting > PID Operation > Input Item	
Module selection	Choose a predefined module for input data of the PID. Select the type, number and name of the input module. If no option is available, add a new module.
Variable selection	Choose a predefined float variable as the input parameter for PID operation. Select the attribute, type and name of the float variable.
Auto Tune	Enable: Auto-tuning PID parameters for your system. Default: check. Un-Enable: Tuning PID parameters manually, e.g. Kp, Ki, Kd.
Sample Time (ms)	Set the sampling time. (Unit: ms) Default: 500 ms.
Setpoint	The target value for PID control. Default: 0.
Controller Mode	DIRECT: Set it as positive output value. Default: DIRECT. REVERSE: Set it as reverse output value.
Kp	Set the Proportional gain. Default: 1.
Ki	Set the Integral gain. Default: 1.
Kd	Set the Derivative gain. Default: 1.



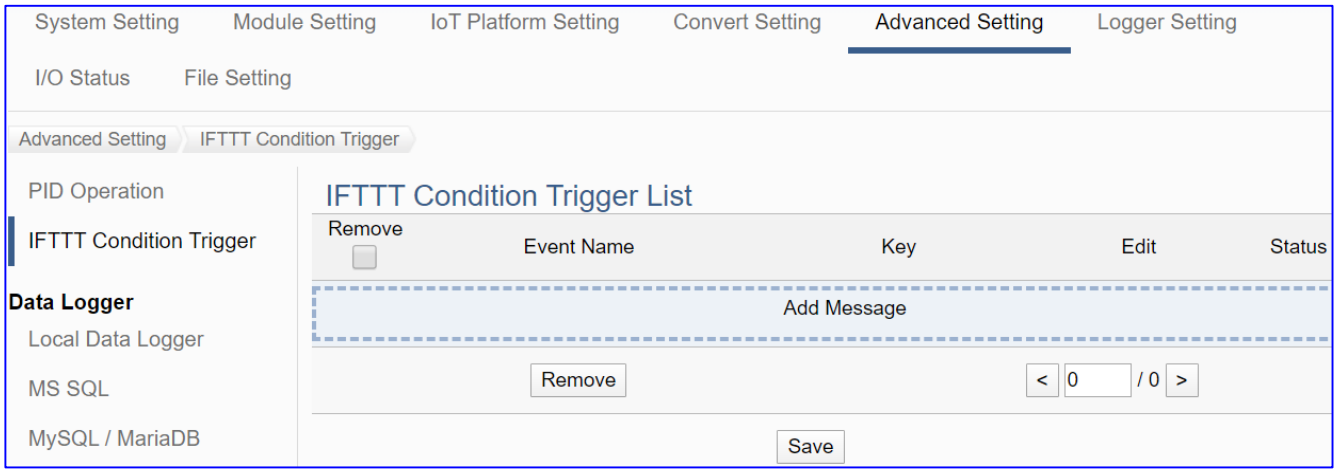
Advanced Setting > PID Operation > Output Item	
Module selection	Choose a predefined module for output data of the PID. Select the type, number and name of the input module. If no option is available, add a new module.
Variable selection	Choose a predefined float variable as the output parameter for PID operation. Select the attribute, type and name of the float variable.
Max	Set the upper-limit value for the variable. Default: 0.
Min	Set the lower-limit value for the variable. Default: 0.
OK	Click to save the settings of the page and back to the PID list page.

PID Operation Solution Example:



5.5.2. IFTTT Condition Trigger

This page is about use the IFTTT cloud platform function. Combine with the IFTTT Condition Trigger function, when the special events occur, the users can send messages to IFTTT-related cloud services (such as Line, Facebook, Twitter, etc.).



IFTTT (if this then that) is a cloud service platform that easy to get your apps and devices working together via creating chains of simple conditional statements (applets). An applet is triggered by changes that occur within other web services such as Line, Facebook, Twitter, Gmail, Instagram, etc. For example, “if” Facebook (Service A) has a new message, “then” send an email to Gmail (Service B).

UA using the IFTTT cloud platform functions, the users can send messages to cloud services such as Line, Facebook, Twitter, etc. when the special events occur.

Ex:

The settings for sending the message to the APP with the "IFTTT Condition Trigger (Line, Facebook, Twitter)" function includes two parts:

3. **UA Web Interface Setting:**
   In the UA Web HMI, set up the UA controller, modules, IFTTT trigger conditions, the condition variable table, and the IFTTT event connection.

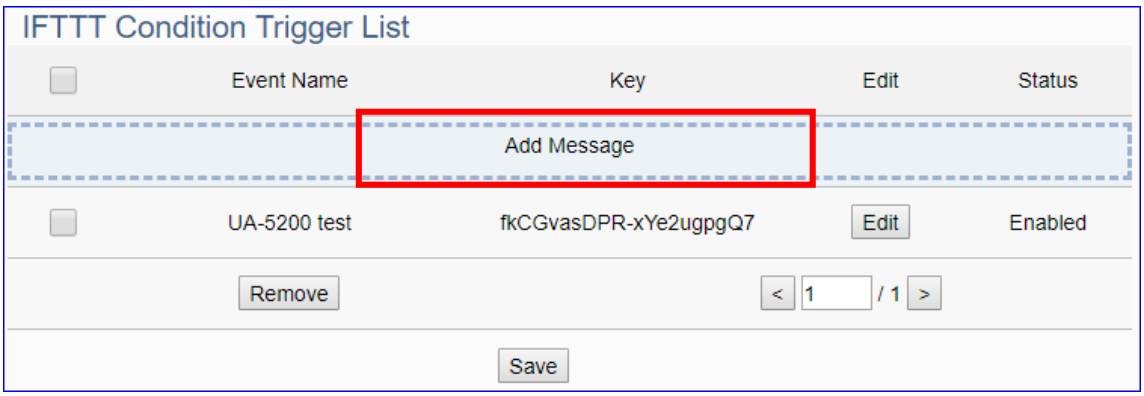
4. **IFTTT Cloud Platform Setting:**
   In the IFTTT website, set up the "**if**" side service and event (**this**: use **webhooks** for the UA), the "**then**" side service and action (**that**: user can select the service, such as the Line, Facebook, twitter, etc.). And then fill the "**Event Name**" and "**Key**" getting from the IFTTT website setting into the "**Content Setting**" of the UA We HMI. (Detail in the Appendix C.)

This section introduces the setting part on the UA Web Interface, including the IFTTT trigger condition, variable table and the event message. About the setting on the IFTTT Cloud Platform, user can set up on the IFTTT website and get the "**Event Name**" and "**Key**" for the configuration here. If you are not familiar about the IFTTT, please refer to the Appendix C.

For the whole steps to send the message to an APP from setting the UA controller, module, I/O variables to the IFTTT Condition Trigger, the users can refer to the Section 4.4 and the step box below.

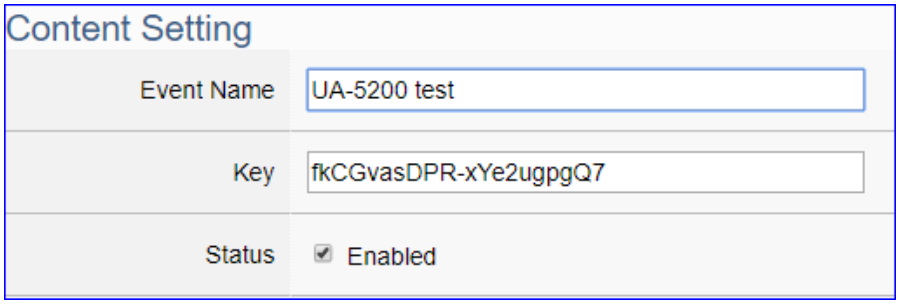
[Step Box : IFTTT Condition Trigger (Line, Facebook, Twitter)]:

This section will introduce the setting of the IFTTT condition trigger list, variable table and the event message.



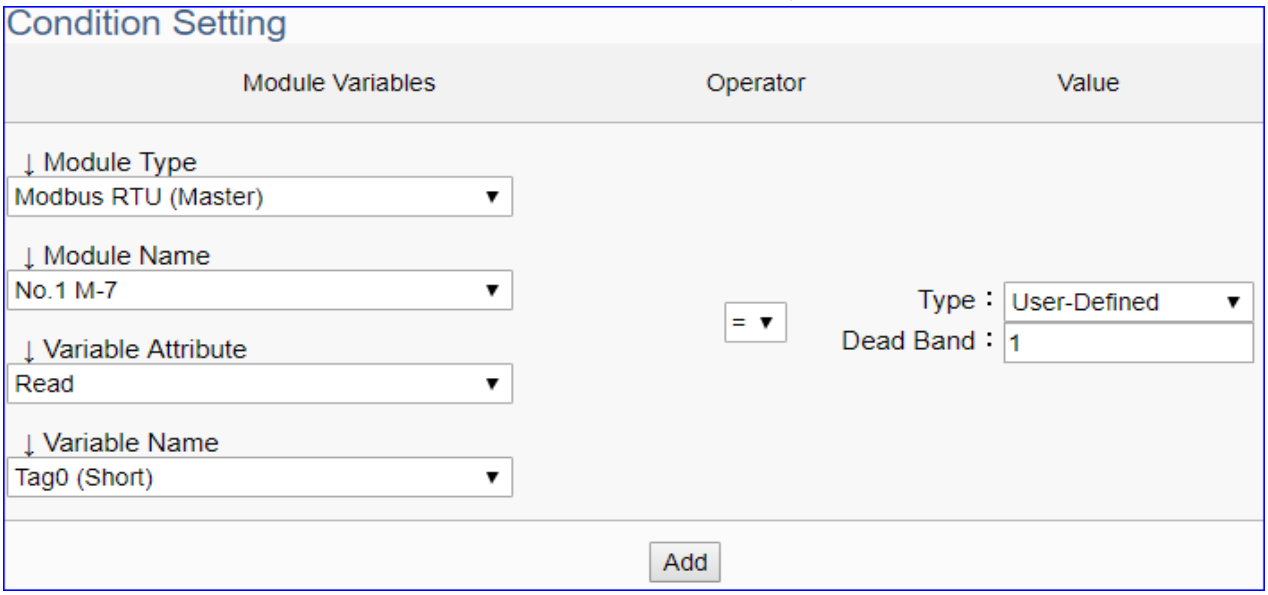
Advanced Setting > IFTTT Condition Trigger > FTTT Condition Trigger List	
Add Message	Click to add a new IFTTT message. After setting, an IFTTT condition trigger list will show on the bottom, includes left box, event name, key and status.
☐	Check the box in the left of the list is to select and to delete the list. Check the box on the top will select all lists.
Event Name	Display the “Event Name” setting in the IFTTT website. (Append. C)
Key	Display the “Key” getting from the IFTTT website. (Append. C)
Edit	Click [Edit] can set the IFTTT condition trigger content.
Status	Display the enable status of the IFTTT condition trigger list.
Remove	Click the left box and [remove] can delete the IFTTT list.
< 1 / 1 >	The page number of the IFTTT list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the setting of this page.

Click [**Add Message**] botton to enter the IFTTT [Content Settings] page:

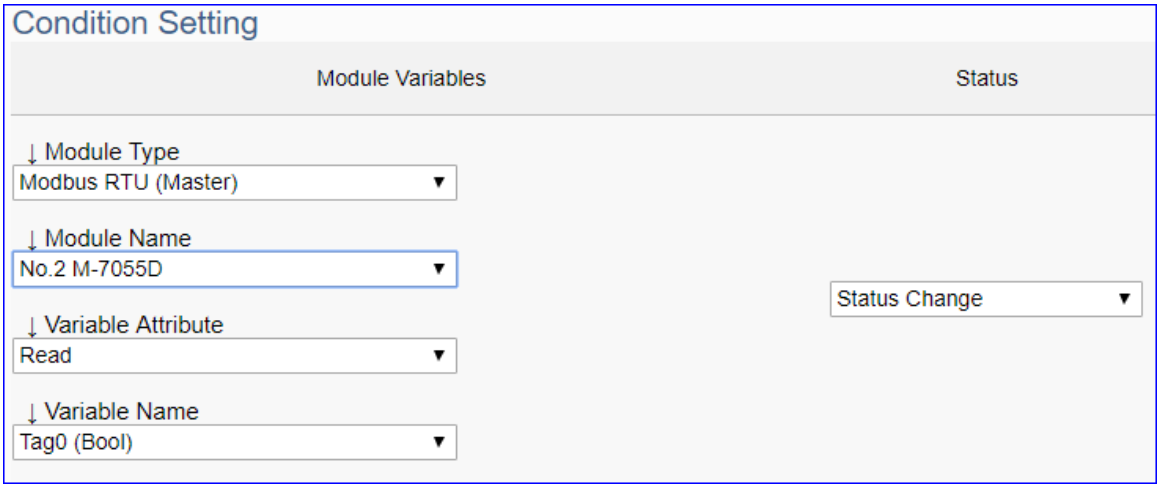


Note: The “Event Name” and “Key” are set in the IFTTT website. If you are not familiar with IFTTT, please see the Appendix C for the setting introductions.

Advanced Setting > IFTTT Condition Trigger > Content Setting	
Event Name	Input the “Event Name” setting in the IFTTT website. (Append. C)
Key	Input the “Key” getting from the IFTTT website. (Append. C)
Status	Check to enable the IFTTT condition trigger event.



The condition setting field may different depending on the selected variable attribute.

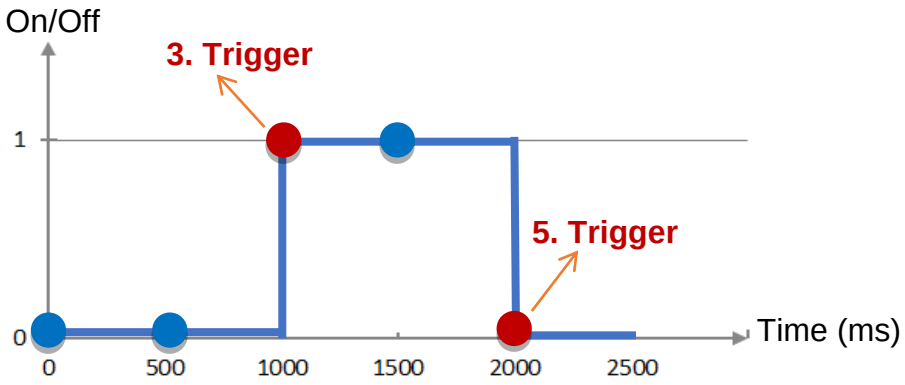


Advanced Setting > IFTTT Condition Trigger > Condition Setting	
Module Variables	Select the module and variable for the condition trigger. Module Type: select the module type, Modbus RTU/TCP/ASCII… Module Name: select the module that set for condition trigger. Variable Attribute: select the variable attribute for condition trigger. Variable Name: select the variable name for condition trigger.
The following condition fields may different depending on the selected variable attribute. The condition trigger method will be descripted after this table.	
Operator	Select the operator for the trigger condition.
Value	Set up the value for the condition, include Type and Dead Band.
Status	Set up the status for the condition. Default: 0.
Add	Click to add a condition trigger list in the Condition Table..

Condition Trigger Descriptions:

The condition trigger method will different depending on the attribute of the selected variable and the trigger will be different. There are two operation styles: **DIO** and **AIO**.

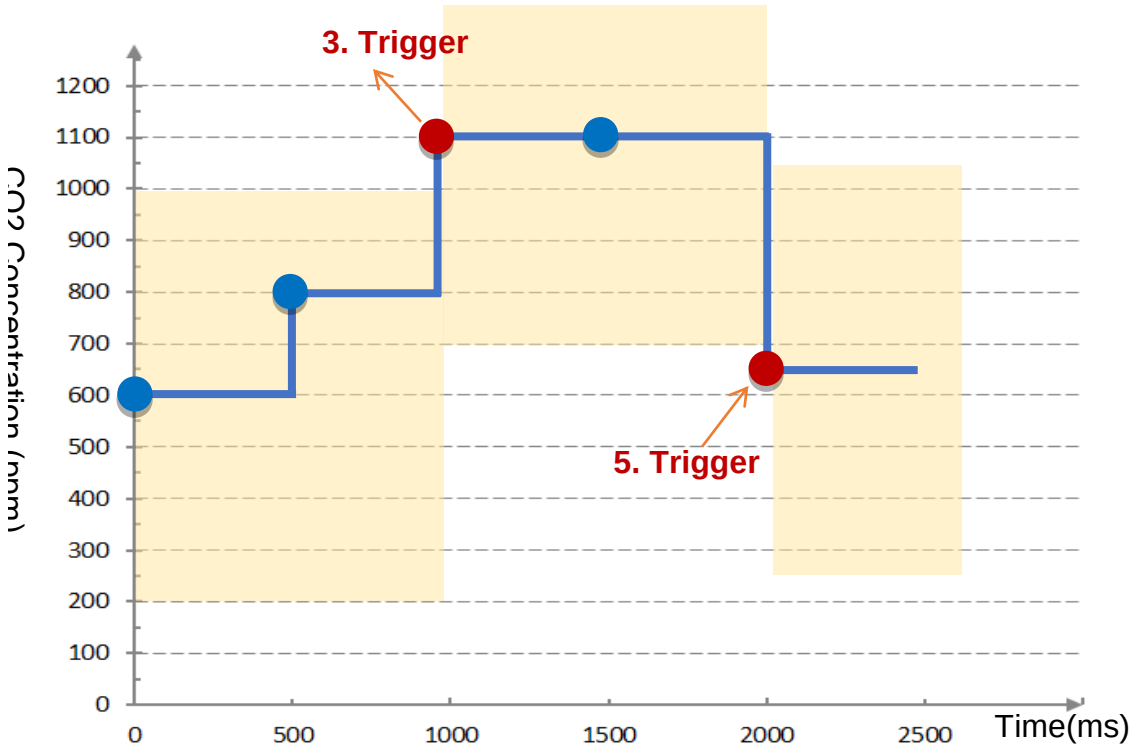
(A) If select **DIO variable**, then Condition is “Status Change”. When detecting the status is changed, it will trigger the event and send the assigned message. (Below is a switch detecting example.)



DIO Trigger: (Detect per 500 ms)

1. Detect initial switch status "Off" (status = 0)
2. Detect "Off" (status = 0, status no change), no trigger
3. Detect "On" (status = 1, status changed), trigger a message notification
4. Detect "On" (status = 1, status no change), no trigger
5. Detect "Off" (status = 0, status changed), trigger a message notification

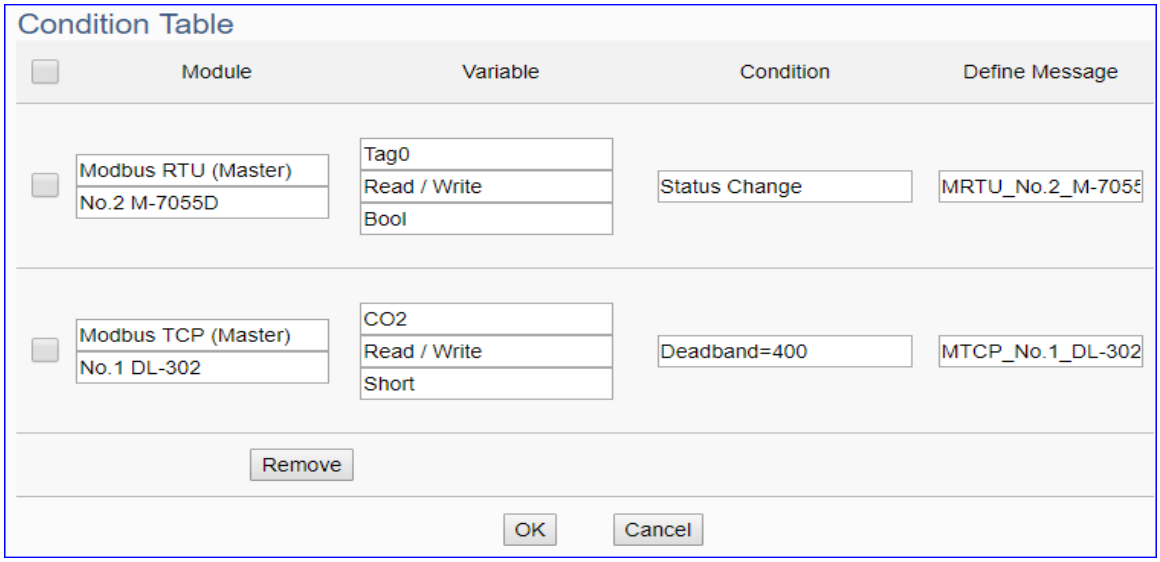
(B) If select **AIO variable**, then Condition is “Value” and can set the “Dead Band”. The condition will be triggered and send the message when the detected value exceeds the upper or lower Dead Band. (Below is a CO2 example. Detect per 500 ms)



AIO Trigger: (Detect per 500 ms. The yellow block means the Dead Band.)

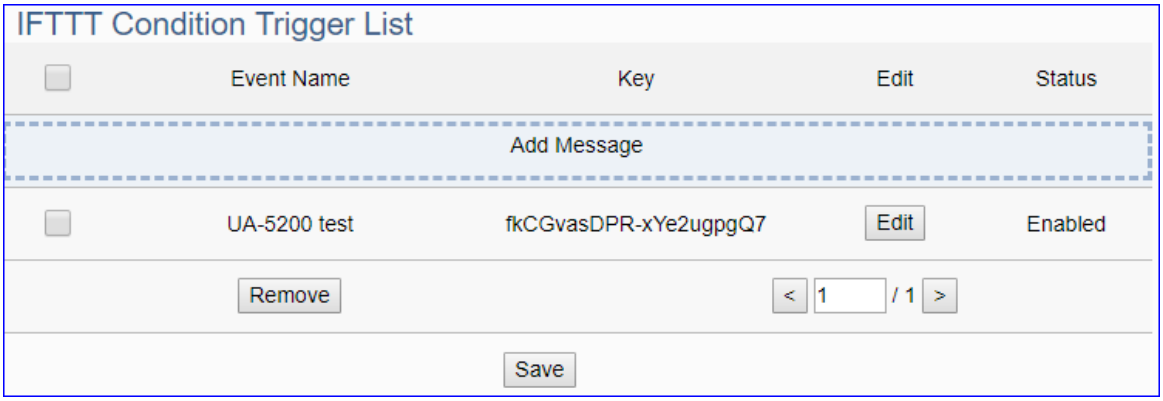
1. Detect initial CO2 concentration 600 (ppm).
   Set Dead Band=400 (Initial Trigger Condition: **>=** 1000 **or <=** 200)
2. Detect CO2 concentration 800. It is in the range of Dead Band.
3. Detect CO2 concentration 1100. It exceeds the upper value (>= 1000) of Dead Band, so trigger a message for danger notification.
4. Detect CO2 concentration 1100. It is in the new range of Dead Band.
   Dead Band=400 (New Trigger Condition: **>=** 1500 **or <=** 700)
5. Detect CO2 concentration 650. It is below the lower value (<= 700) of Dead Band, so trigger a message for safety notification.

Please refer to the previous Condition Trigger Descriptions to set up your Condition. When complete, click the “Add” button. The setting will show in the Condition Table. Below Table is setting 2 conditions.



Advanced Setting > IFTTT Condition Trigger > Condition Table	
Module	Display the module type and name of the condition. (Not editable here)
Variable	Display the variable attribute and name of the condition. (Not editable here)
Condition	Display the trigger condition. (Not editable here)
Define Message	Default Message: module code_variable code. The user can define own message in the format of English character, number, general symbol…
Remove	Click the left box and [remove] can delete the IFTTT list.
OK	Click to save this page settings and back to the module list page.
Cancel	Click to exit without saving and back to the module list page.

When back to the IFTTT Condition Trigger List, the condition trigger message will show as below picture. If need more trigger conditions, click the “Add Message” again to combine the IFTTT APP message sending and the UA system. At last, click the Save button.

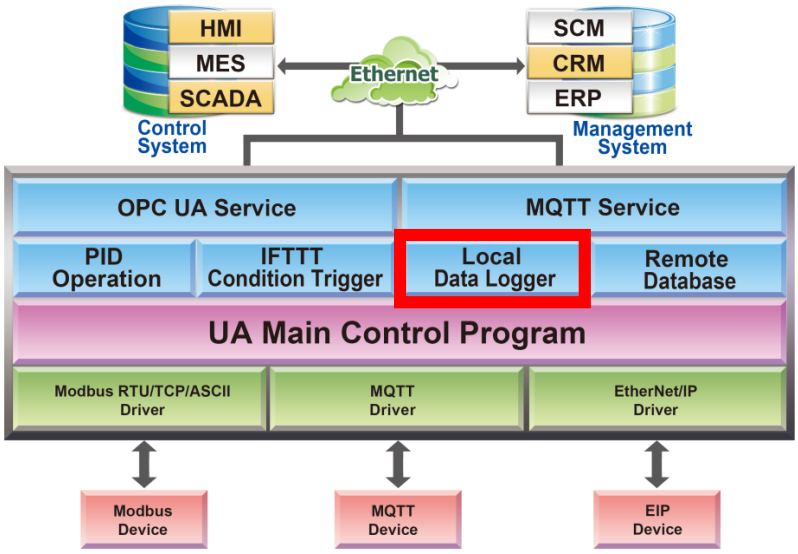


5.5.3. Data Logger: Local Data Logger

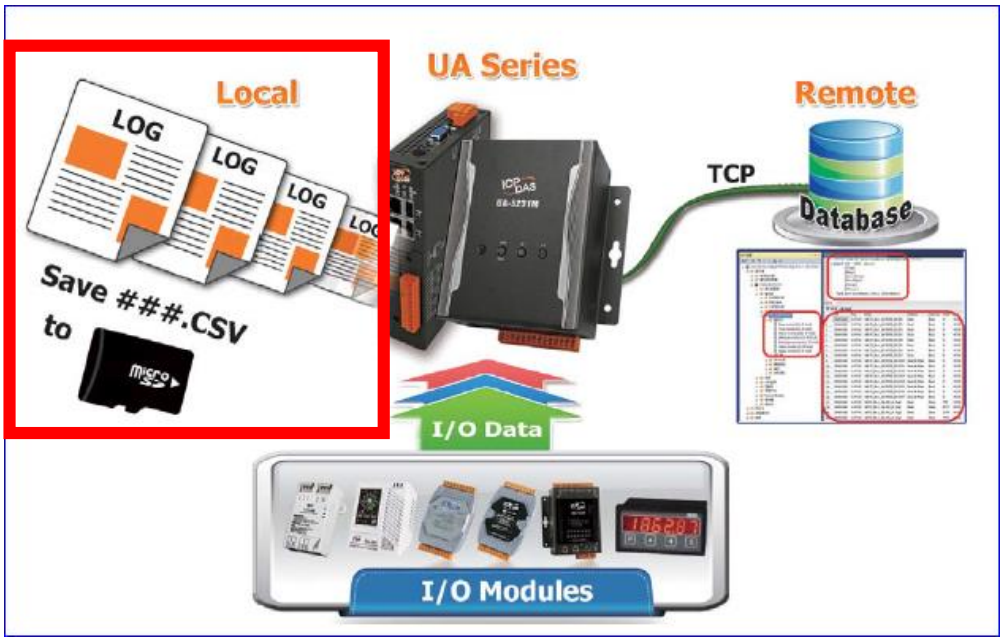
UA supports Data Logger function to save I/O data into Local CSV log files of the microSD card in UA, or import the I/O data into remote database directly.

This function is for setting the local data logger and the microSD card. For the setting about the logger and module, please refer to Chapter 5.6.

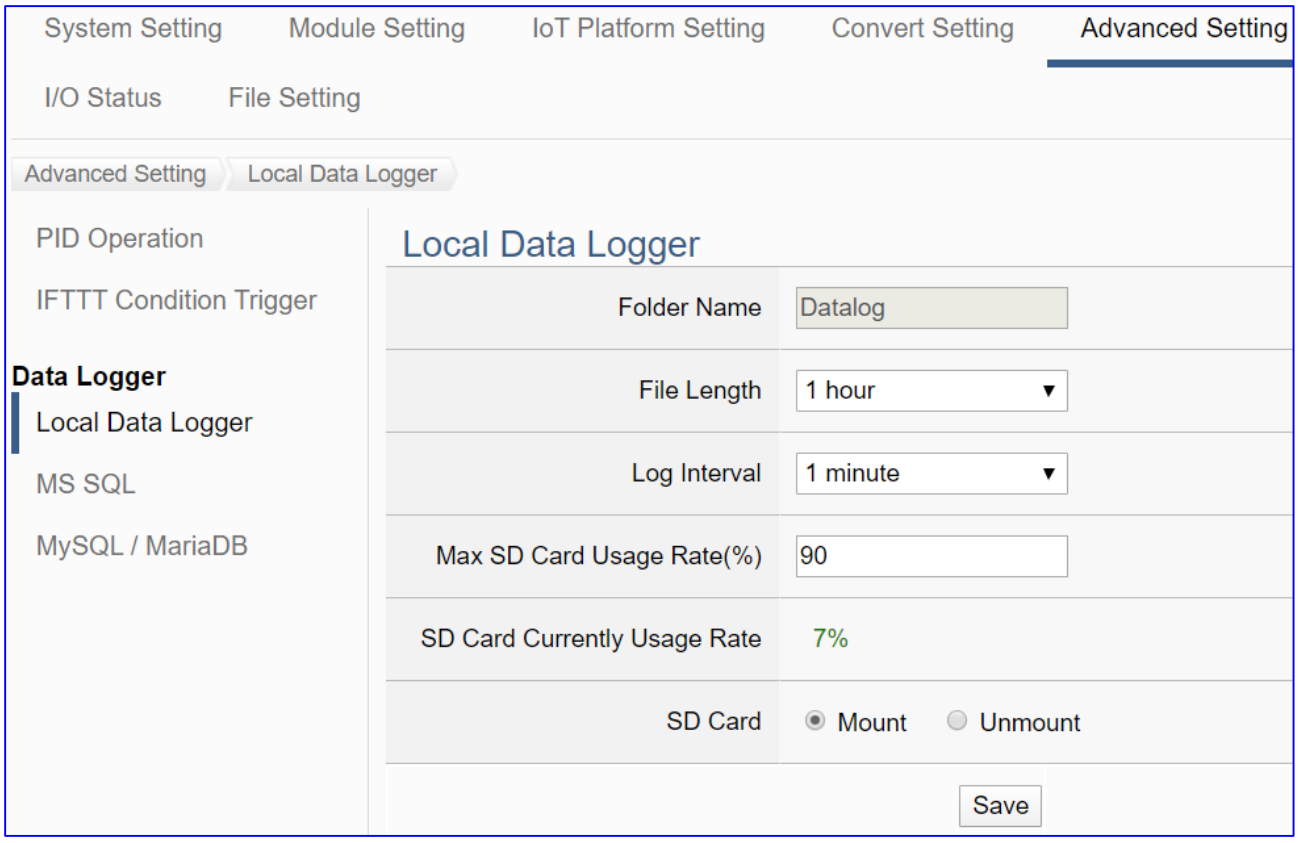
Function Diagram:



Application:



Enter the main menu [Advanced Setting] > [Data Logger] > [Local Data Logger]:



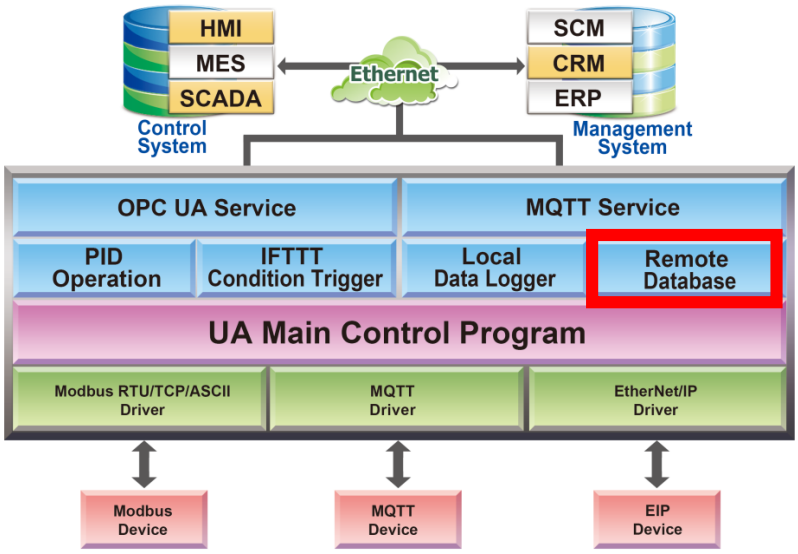
Advanced Setting > Data Logger > Local Data Logger	
Folder Name	The folder name in microSD card of UA, user definable. The I/O data will save into the file “log.csv” under this folder.
File Length	Unit: hour. User can select per 1, 2, 3, … 8, 12, or 24 hours to divide the log.csv into the file “log-Y-M-D-H-M-S.csv” under the folder “Y-M”. (e.g. 2018-12)
Log Interval	The interval to save I/O data per seconds, minutes or hours.
Max SD Card Usage Rate (%)	Set up the maximum usage rate (Unit: %) of UA microSD card. If the data current rate meet the max rate, the oldest data will be removed first.
SD Card Currently Usage Rate	Display the current usage rate of UA microSD card (show %).
SD Card	Mount: Click to mount microSD card and begin to record data. Unmount: Click to unmount microSD card and stop record data.
Save	Click to save the settings of this item.

5.5.4. Data Logger: MS SQL

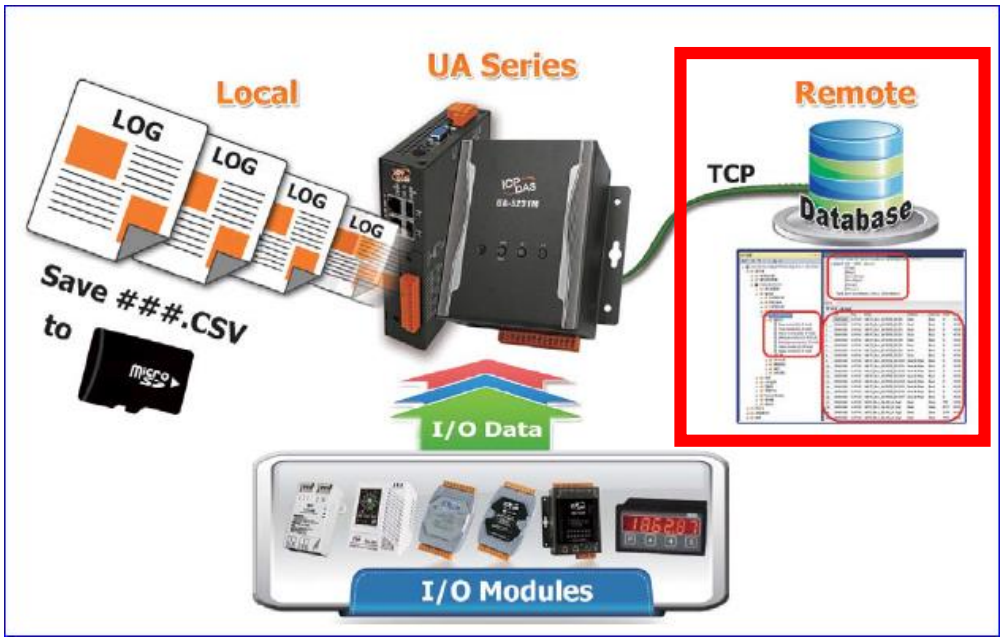
UA supports Data Logger function to save I/O data into Local CSV log files of the microSD card in UA, or write the I/O data directly into the remote database, e.g. MS SQL, MySQL or MariaDB.

This function is for setting the remote database connection. For the setting about the logger and module, please refer to Chapter 5.6.

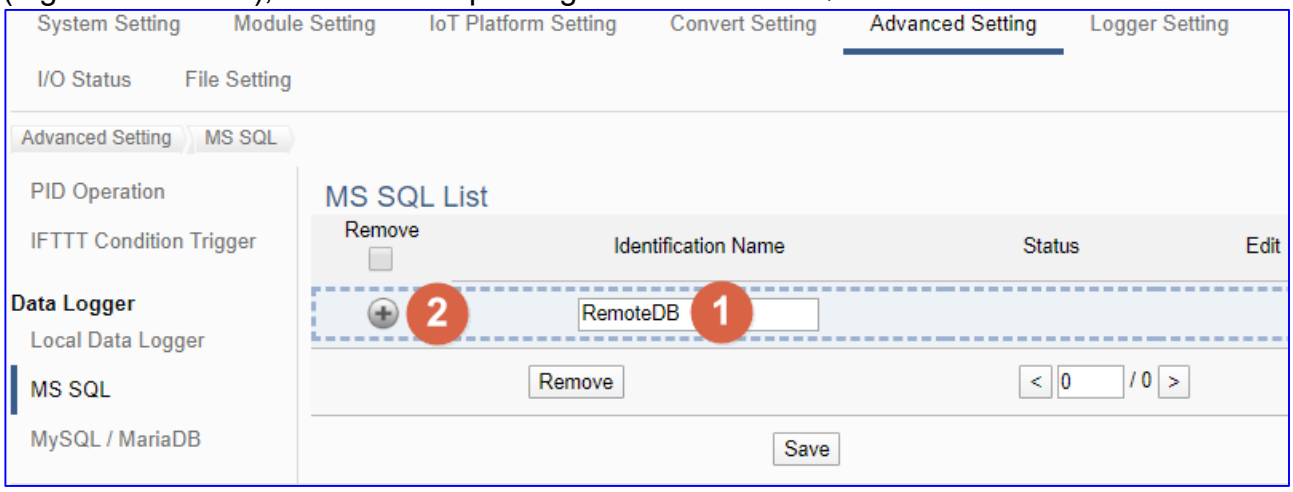
Function Diagram:

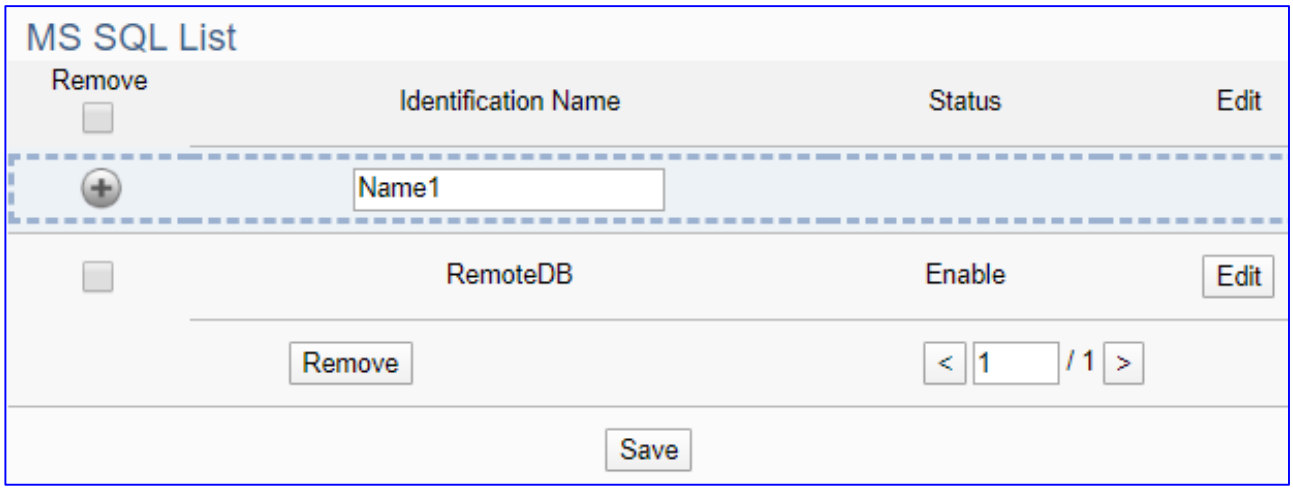


Application:



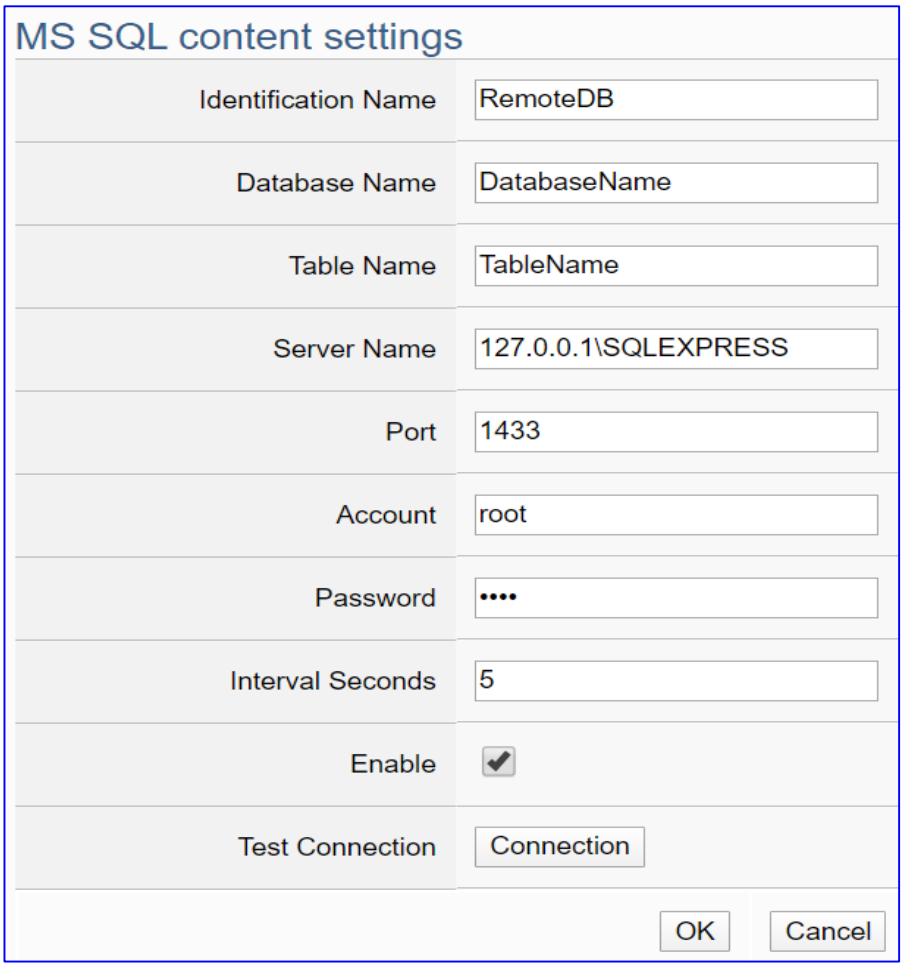
Enter the main menu [Advanced Setting] > [Data Logger] > [MS SQL] screen, enter a Name (e.g. “RemoteDB”), and click the plus sign to add a MS SQL remote database list as below.





Advanced Setting > Data Logger > MS SQL List	
Remove	Check Remove box to remove all database connection in list. Check the box of each database and click the “Remove” button can remove just that database connection.
Identification Name	User defined name to identify the remote database. Default: Name.
Status	Display the status (Enable/Disable) of the database connection. Default: Enable.
	Click to add a new remote database connection.
Edit	Click to enter the “Content Setting” page of the remote database.
< 1 / 1 >	The page number of the database list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

Click “Edit” to enter the “Remote database connect settings” page.



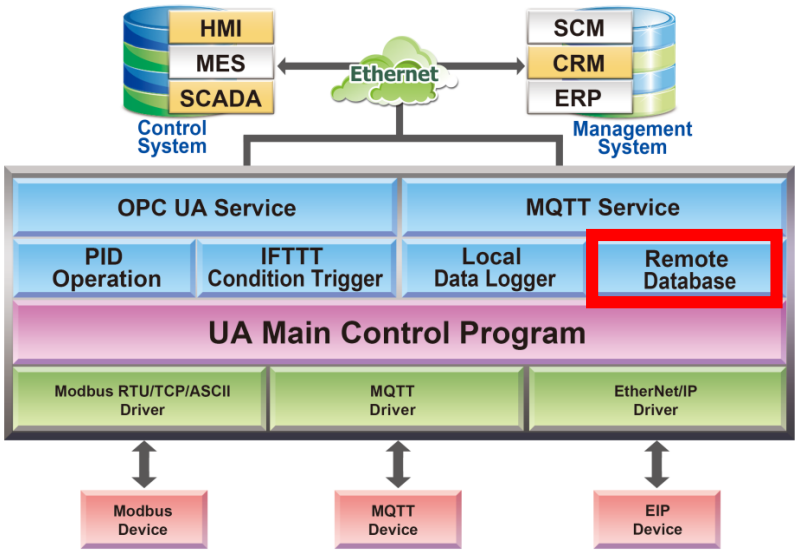
Advanced Setting > Data Logger > MS SQL – Content Settings	
Identification Name	User defined name to identify the database.
Database Name	The name of the remote database. If it does not exist, it will add a new database with this name.
Table Name	The table name of the remote database. If it does not exist, it will add a new table with this name.
Server Name	The Server IP and name of the remote database.
Port	The port to connect with database. Default: 1433 (for MS SQL)
Account	The login name of the remote database.
Password	The login password of the remote database.
Interval Seconds	Set up the interval time to save the I/O data to the remote database. Unit: Second.
Enable	Check to enable the data logger to the remote database. Default: check.
Test Connection	Click to test the connection to the remote database. Result: Success or Failure.
OK / Cancel	Click “OK” to save the settings of this page. Click “Cancel” to exit the setting page without saving.

5.5.5. Data Logger: MySQL / MariaDB

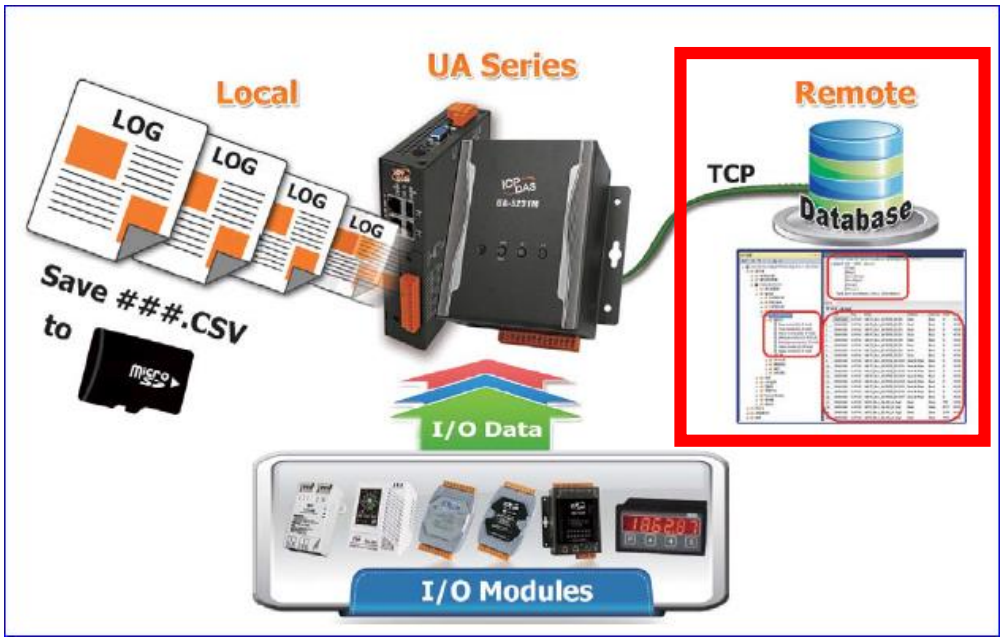
UA supports Data Logger function to save I/O data into Local CSV log files of the microSD card in UA, or write the I/O data directly into the remote database, e.g. MS SQL, MySQL or MariaDB.

This function is for setting the remote database connection. For the setting about the logger and module, please refer to Chapter 5.6.

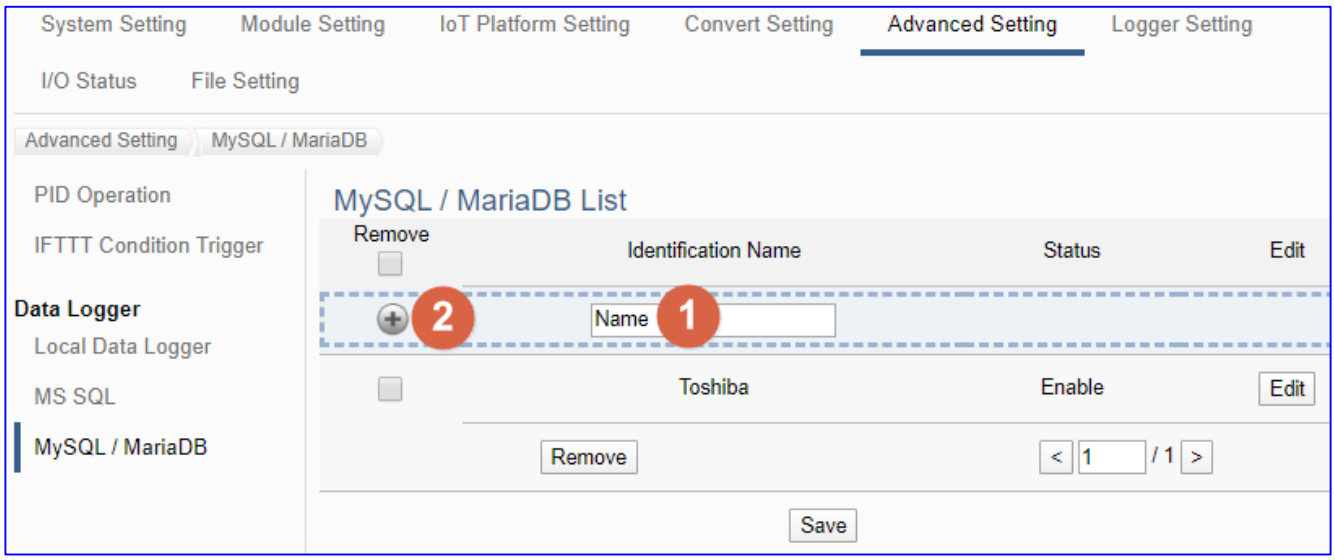
Function Diagram:

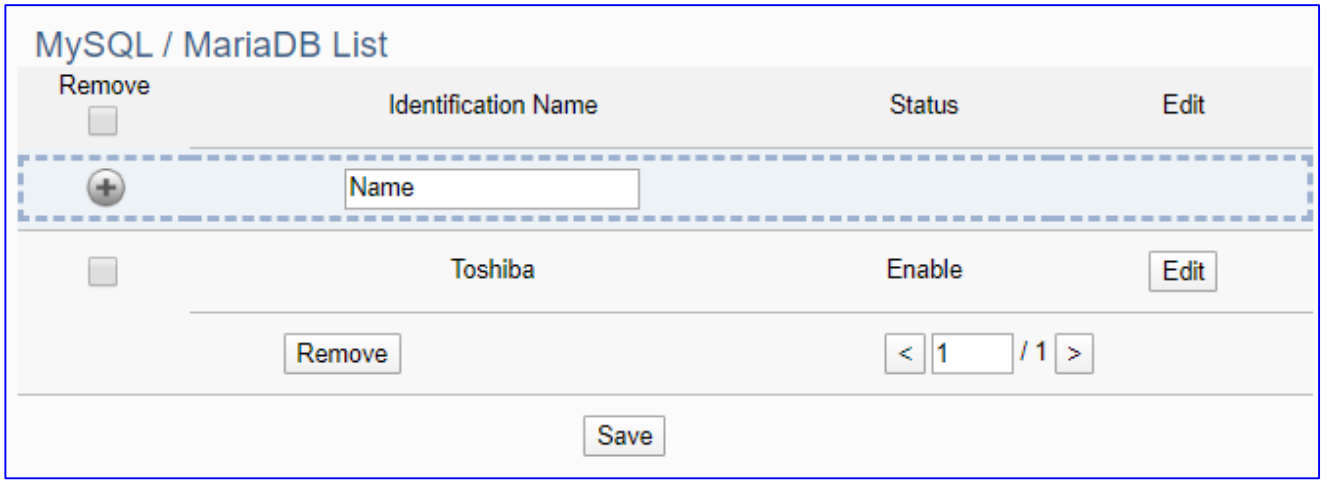


Application:



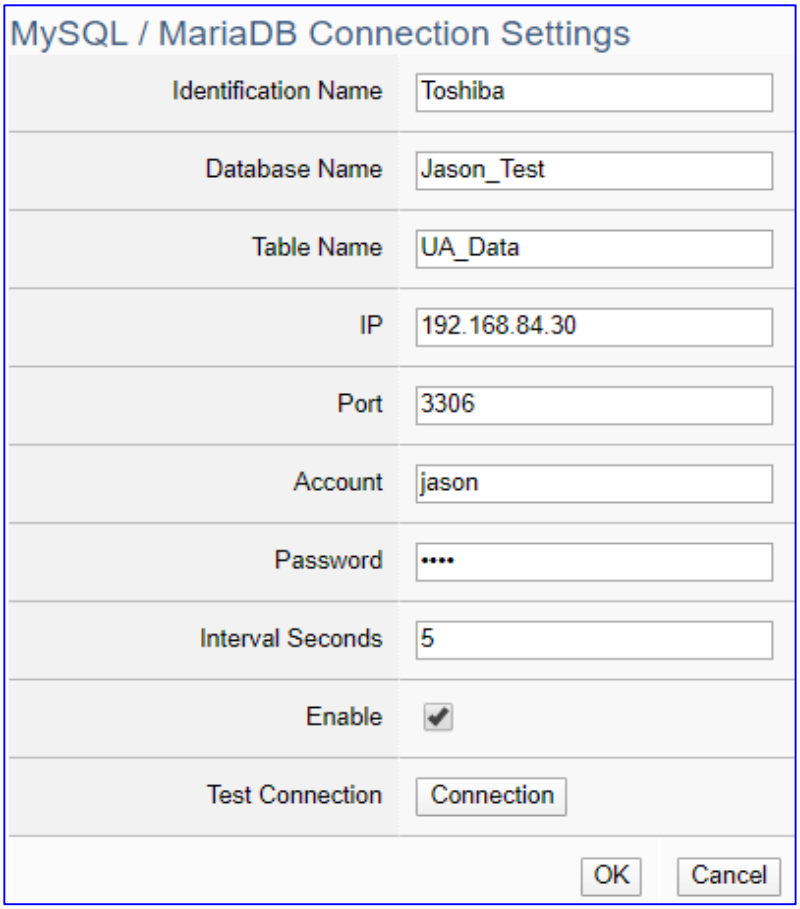
Enter the main menu [Advanced Setting] > [Data Logger] > [MySQL/MariaDB], enter a name (e.g. “Toshiba”), and click the plus sign to add a MySQL or DariaDB remote database list.





Advanced Setting > Data Logger > MySQL/MariaDB – MySQL/MariaDB List	
Remove	Check Remove box to remove all database connection in list. Check the box of each database and click the “Remove” button can remove just that database connection.
Identification Name	User defined name to identify the remote database. Default: Name.
Status	Display the status (Enable/Disable) of the database connection. Default: Enable.
	Click to add a new remote database connection.
Edit	Click to enter the “Content Setting” page of the remote database.
< 1 / 1 >	The page number of the database list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

Click “Edit” to enter the “Remote database connect settings” page.

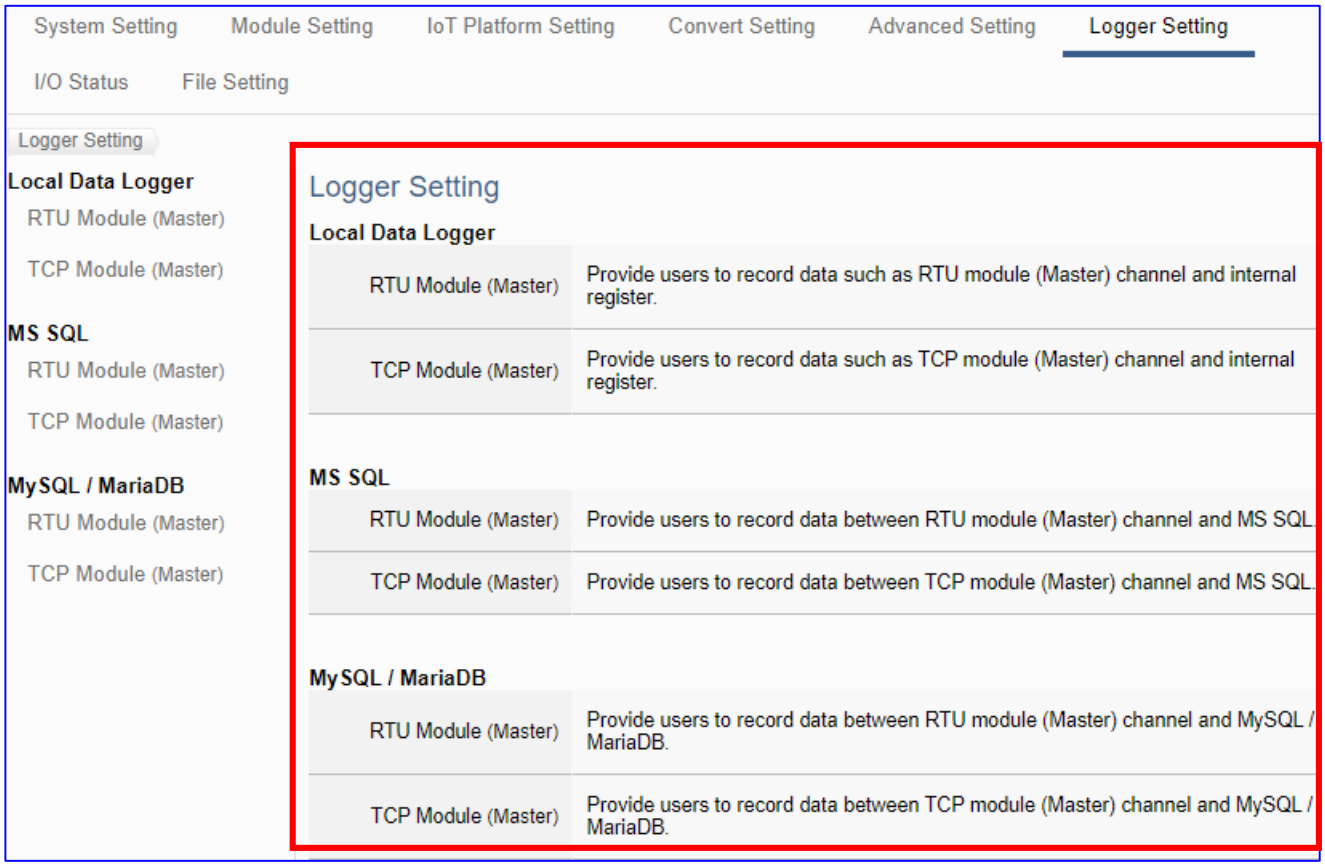


Advanced Setting > Data Logger > MySQL/MariaDB – Content Settings	
Identification Name	User defined name to identify the database.
Database Name	The name of the remote database. If it does not exist, it will add a new database with this name.
Table Name	The table name of the remote database. If it does not exist, it will add a new table with this name.
IP	The Server IP and name of the remote database.
Port	The port to connect with database. Default: 3306 (for MySQL/MariaDB)
Account	The login name of the remote database.
Password	The login password of the remote database.
Interval Seconds	Set up the interval time to save the I/O data to the remote database. Unit: Second.
Enable	Check to enable the data logger to the remote database. Default: check.
Test Connection	Click to test the connection to the remote database. Result: Success or Failure.
OK / Cancel	Click “OK” to save the settings of this page. Click “Cancel” to exit the setting page without saving.

5.6. Main Menu: Logger Setting

Logger Setting is the 6th item of the Main Menu, mainly to provide the data logger and the connecting modules related settings.

"Logger Setting" provides "Local Data Logger", "MS SQL" and "MySQL/MariaDB", and all have RTU/TCP module two setting items. The Local Data Logger provides users to record data such as RTU/TCP module (Master) channel data into Local CSV log files of the microSD card in UA. The "MS SQL" or "MySQL / MariaDB" Remote Database provides users to record data between RTU/TCP module (Master) channel data directly into remote database, such as SQL DB.



The setting for UA series controllers is to set up from the left to the right of the main menu functions. User can find the setting step and Web UI information in the following chapters.

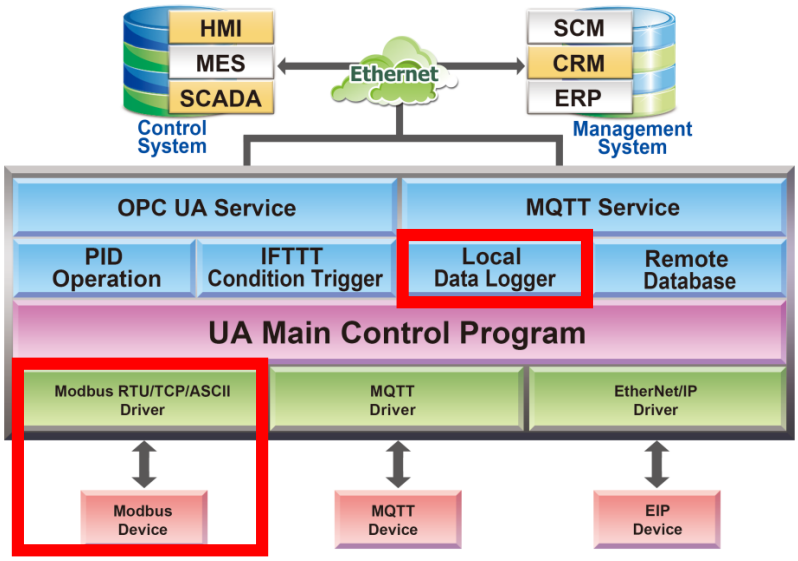
CH2 Quick Start 1: Hardware/Network Connection
CH3 Quick Start 2: Web UI / Steps / Project Example
CH4 Function Wizard: Project Quick Setup

5.6.1. Local Data Logger: RTU / TCP Module (Master)

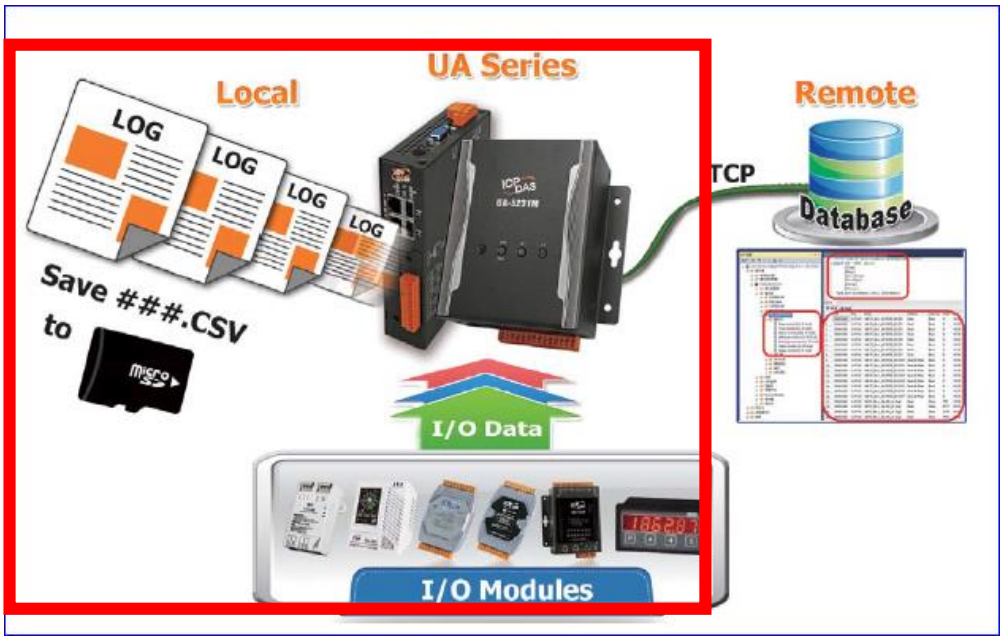
"Local Data Logger" of "Logger Setting" provides users to record I/O log data of the connecting RTU/TCP module (Master) into the local microSD card.

This function is for setting the local data logger and the RTU/TCP modules, using "RTU" module setting as an example. For the setting about the logger and microSD card, please refer to Chapter 5.5.3.

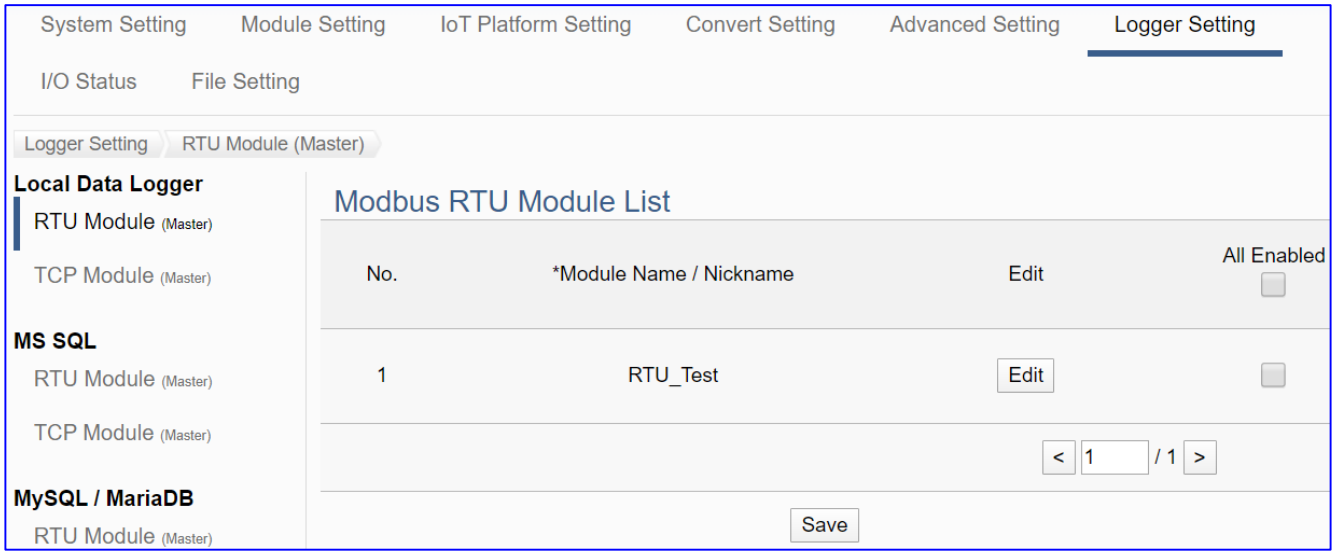
Function Diagram:



Application:



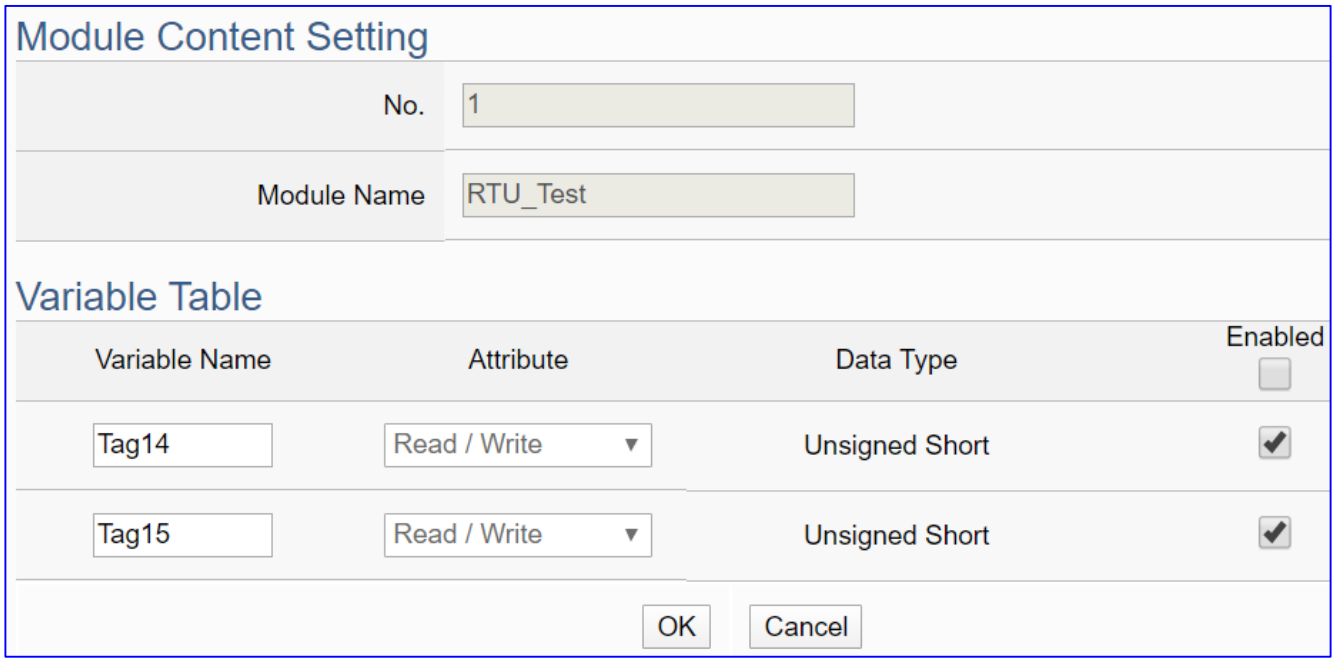
Enter the main menu [Logger Setting] > [Local Data Logger] > [RTU Module (Master)].
This setting page is to enable the module(s) or I/O channels for data logger.



Logger Setting > Local Data Logger - RTU Module (Master) – Modbus Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
Edit	If user wants to enable some I/O channels for data logger, click [Edit] of that module to enter the “Variable Tale” setting. It is normal to set all channels as enabled, and the conversion will not affect the unconnected channels.
All Enabled Enable	Check [All Enabled] box to enable all modules in list for data logger. Default: Uncheck. Check the box of each module can enable just that module for data logger.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the module for data logger, please check the box of the module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “Module Content Setting” page.

The “Module Content Setting” page after clicking the [Edit] button:



Logger Setting > Local Data Logger > RTU Module (Master) – Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	The module name set in the module list (Not editable here)
Logger Setting > OPC UA > Modbus RTU (Master) – Variable Table	
Variable Name	Display the variable name that set in the Modbus Address Mapping Table page (Not editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for data logger. Default: Uncheck.
OK	Click to save this page settings and back to the module list page.

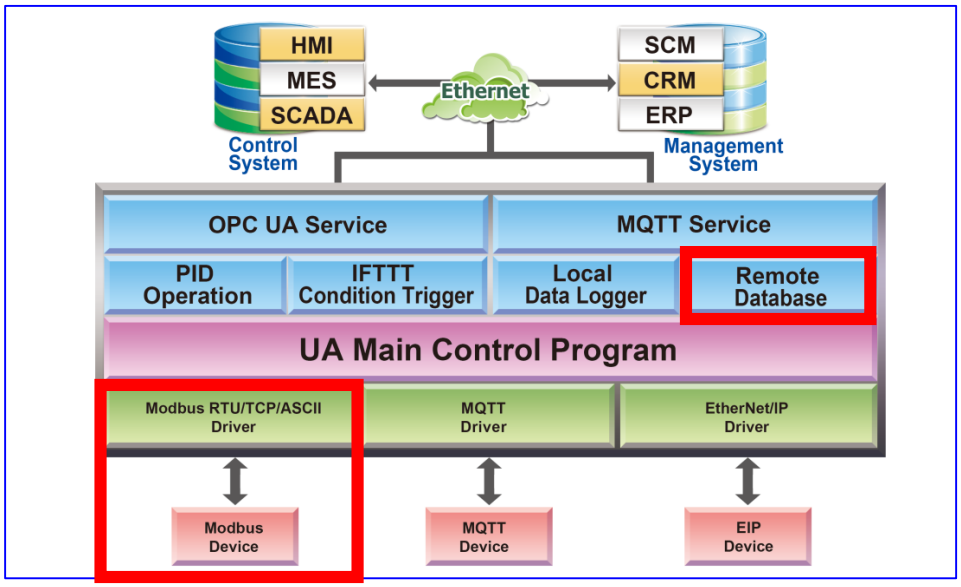
When complete the setting, click [OK] to save this page settings and back to the module list page. Remember to click [Save] to save the Convert Setting.

5.6.2. MS SQL: RTU / TCP Module (Master)

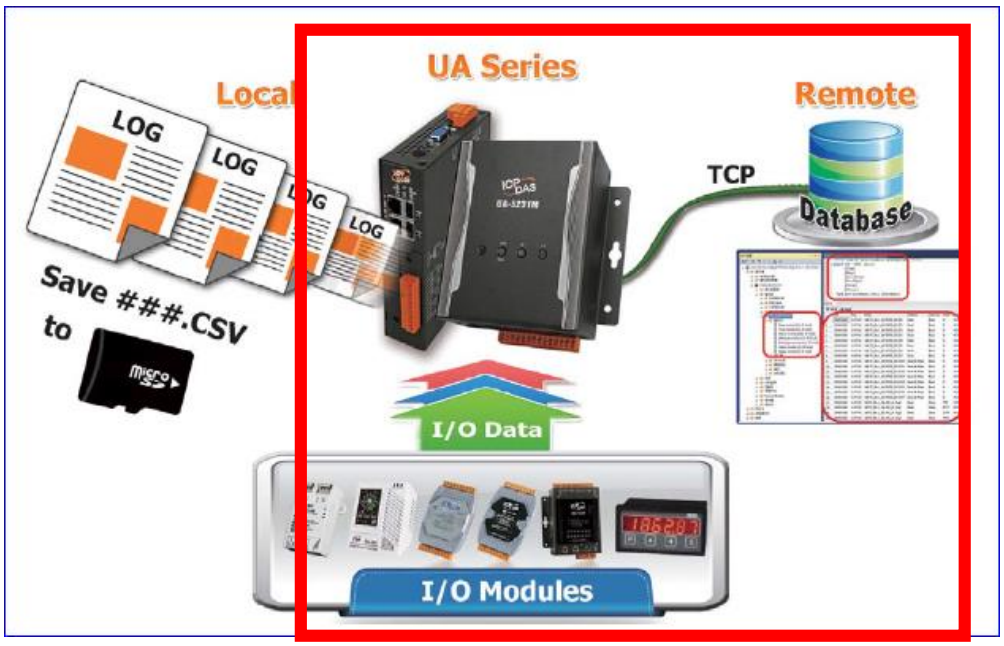
“MS SQL” of “Logger Setting” provides users to record I/O log data of the connecting RTU/TCP module (Master) into the MS SQL remote database.

This function is for setting the remote data logger and the RTU/TCP modules, using “**TCP module**” setting as an example. For the setting about the MS SQL data logger, please refer to Chapter 5.5.4.

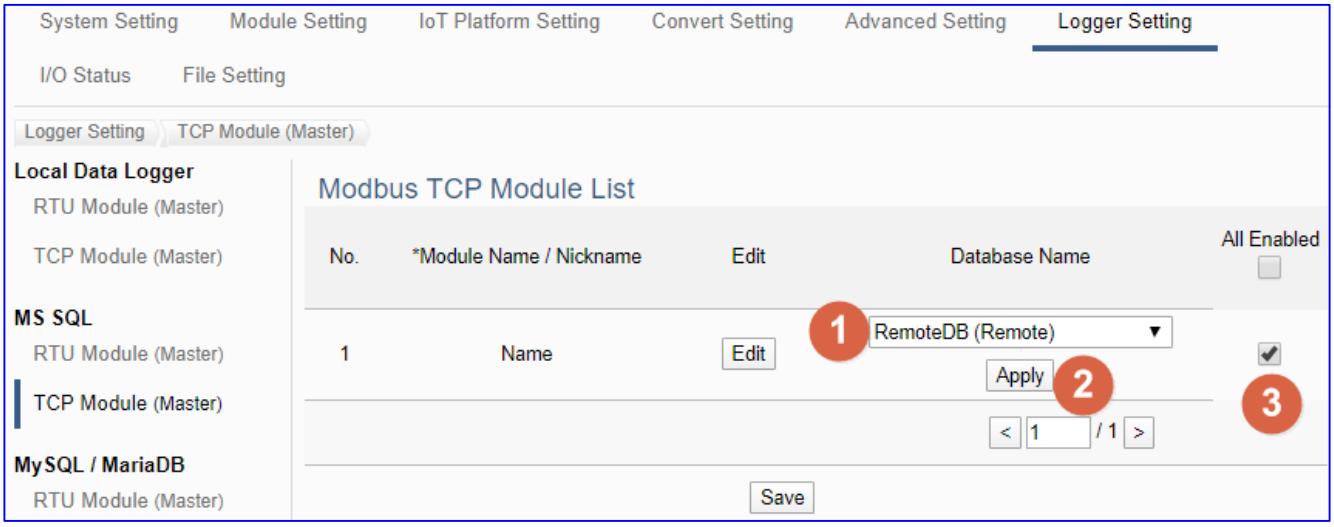
Function Diagram:



Application:

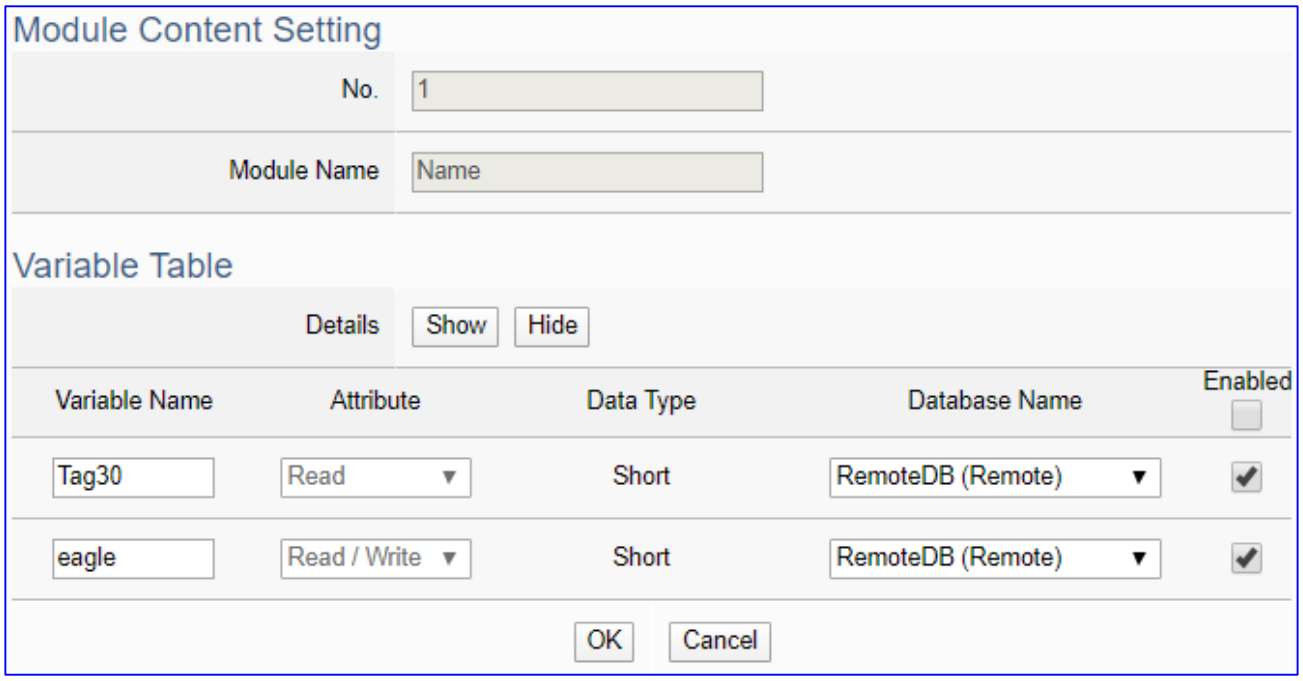


Enter the main menu [Logger Setting] > [MS SQL] > [TCP Module (Master)], e.g. the remote database Name “RemoteDB”, as below.



Logger Setting > MS SQL - TCP Module (Master) > Modbus TCP Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
Edit	If user wants to enable some I/O channels for data logger, click [Edit] of that module to enter the “Variable Tale” setting. It is normal to set all channels as enabled, and the conversion will not affect the unconnected channels.
Database Name Apply	Select the database name set in the “MS SQL” of the “Advanced Setting”. Click “Apply” (Text color will change from black to gray).
All Enabled ☐ ☐ Enabled	Check [All Enabled] box to enable all modules in list for data logger. Default: Uncheck. Check the box of each module can enable just that module for data logger.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the module for data logger, please check ☑ the box of the module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “Module Content Setting” page.



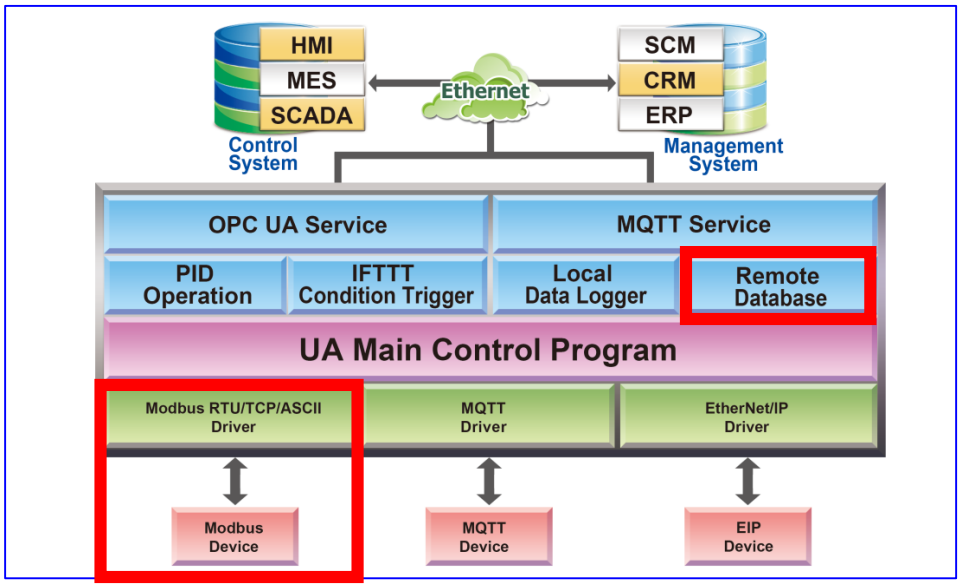
Logger Setting > MS SQL > TCP Module (Master) – Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	The module name set in the module list (Not editable here)
Logger Setting > MS SQL > TCP Module (Master) – Variable Table	
Variable Name	Display the variable name that set in the Modbus Address Mapping Table page (Not editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Database Name	Display the database name select in previous setting page. (Not editable here)
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK / Cancel	Click “OK” to save this page settings and back to the module list page. Click “Cancel” to leave this page without save.

5.6.3. MySQL / MariaDB: RTU / TCP Module (Master)

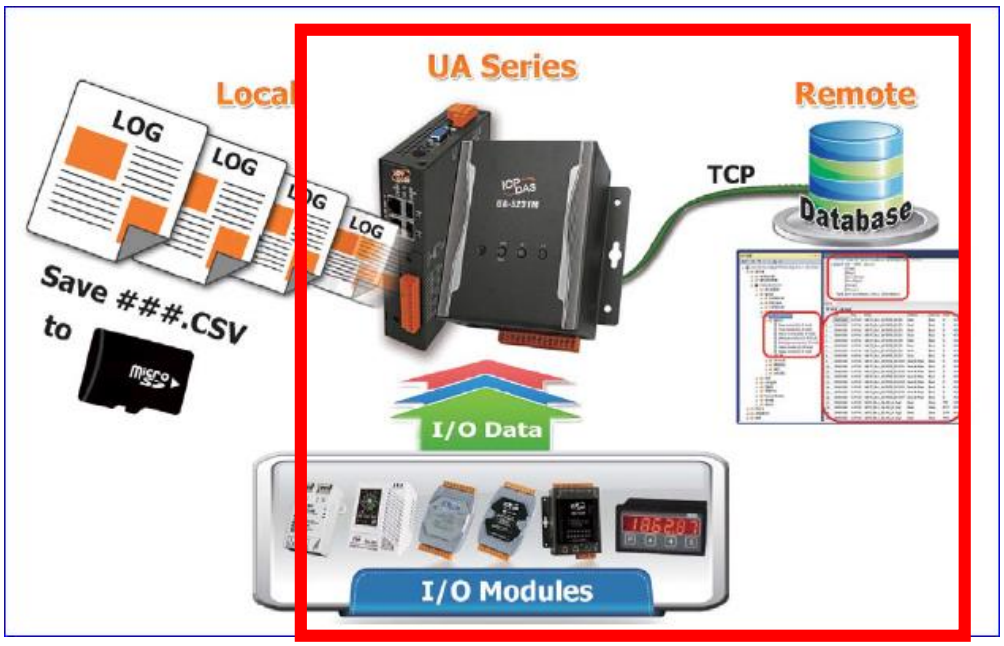
"MySQL / MariaDB" of "Logger Setting" provides users to record I/O log data of the connecting RTU/TCP module (Master) into the MySQL / MariaDB remote database.

This function is for setting the remote data logger and the RTU/TCP modules, using "**RTU module**" setting as an example. For the setting about the MySQL / MariaDB data logger, please refer to Chapter 5.5.5.

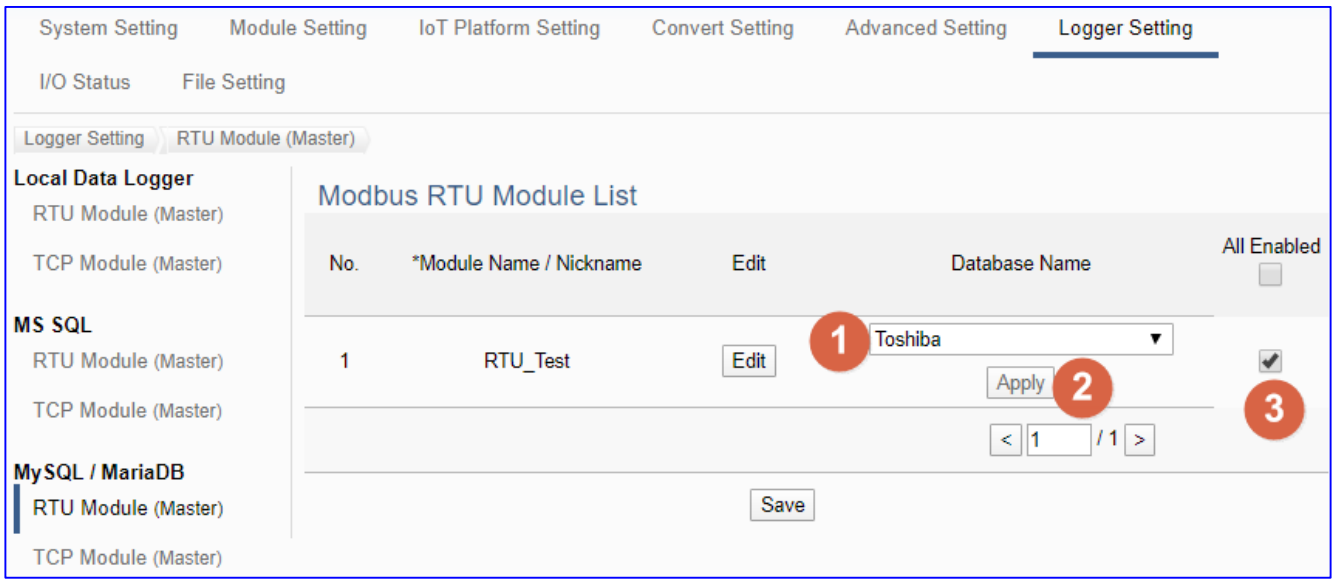
Function Diagram:



Application:

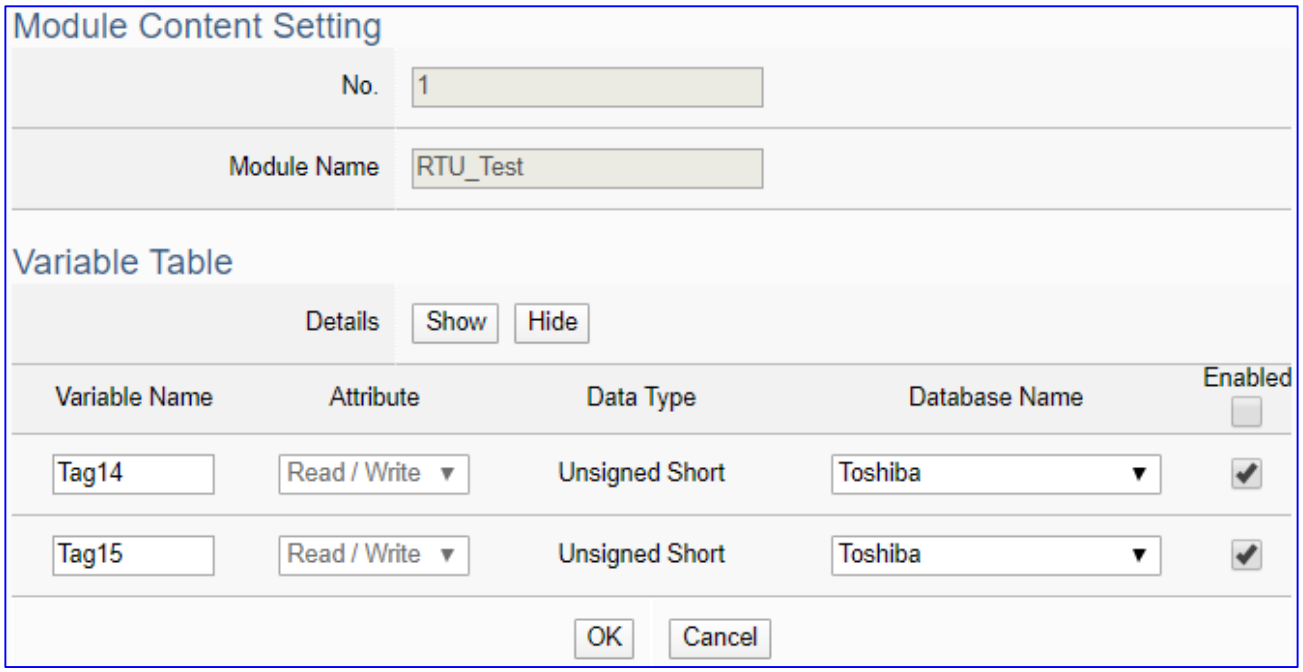


Enter the main menu [Logger Setting] > [MySQL / MariaDB] > [RTU Module (Master)], e.g. the remote database Name “Toshiba”, as below.



Logger Setting > MySQL/MariaDB - RTU Module (Master) - Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
Edit	If user wants to enable some I/O channels for data logger, click [Edit] of that module to enter the “Variable Tale” setting. It is normal to set all channels as enabled, and the conversion will not affect the unconnected channels.
Database Name Apply	Select the database name set in the “MS SQL” of the “Advanced Setting”. Click “Apply” (Text color will change from black to gray).
All Enabled ☐ ☐ Enabled	Check [All Enabled] box to enable all modules in list for data logger. Default: Uncheck. Check the box of each module can enable just that module for data logger.
< 1 / 1 >	The page number of the module list: Current page / Total pages. Click < or > to go to the previous or next page.
Save	Click to save the settings of this page.

This function is to enable the module for data logger, please check ☑ the box of the module. If user wants to enable some I/O of the module, please click [Edit] button to enter the “Module Content Setting” page.



Logger Setting > MySQL/MariaDB - RTU Module (Master) – Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	The module name set in the module list (Not editable here)
Logger Setting > MySQL/MariaDB - RTU Module (Master) – Variable Table	
Variable Name	Display the variable name that set in the Modbus Address Mapping Table page (Not editable here)
Attribute	Display data attribute of the variable. (Not editable) Include: Read, Read/Write…
Data Type	Display data type of the variable that set in the Modbus Address Mapping Table page. (Not editable) Include: Bool, Short, Float…
Database Name	Display the database name select in previous setting page. (Not editable here)
Enabled	Check [Enabled] box of the top row can enable all variables in list. Check the box of each variable can enable just that variable for conversion. Default: Uncheck.
OK / Cancel	Click “OK” to save this page settings and back to the module list page. Click “Cancel” to leave this page without save.

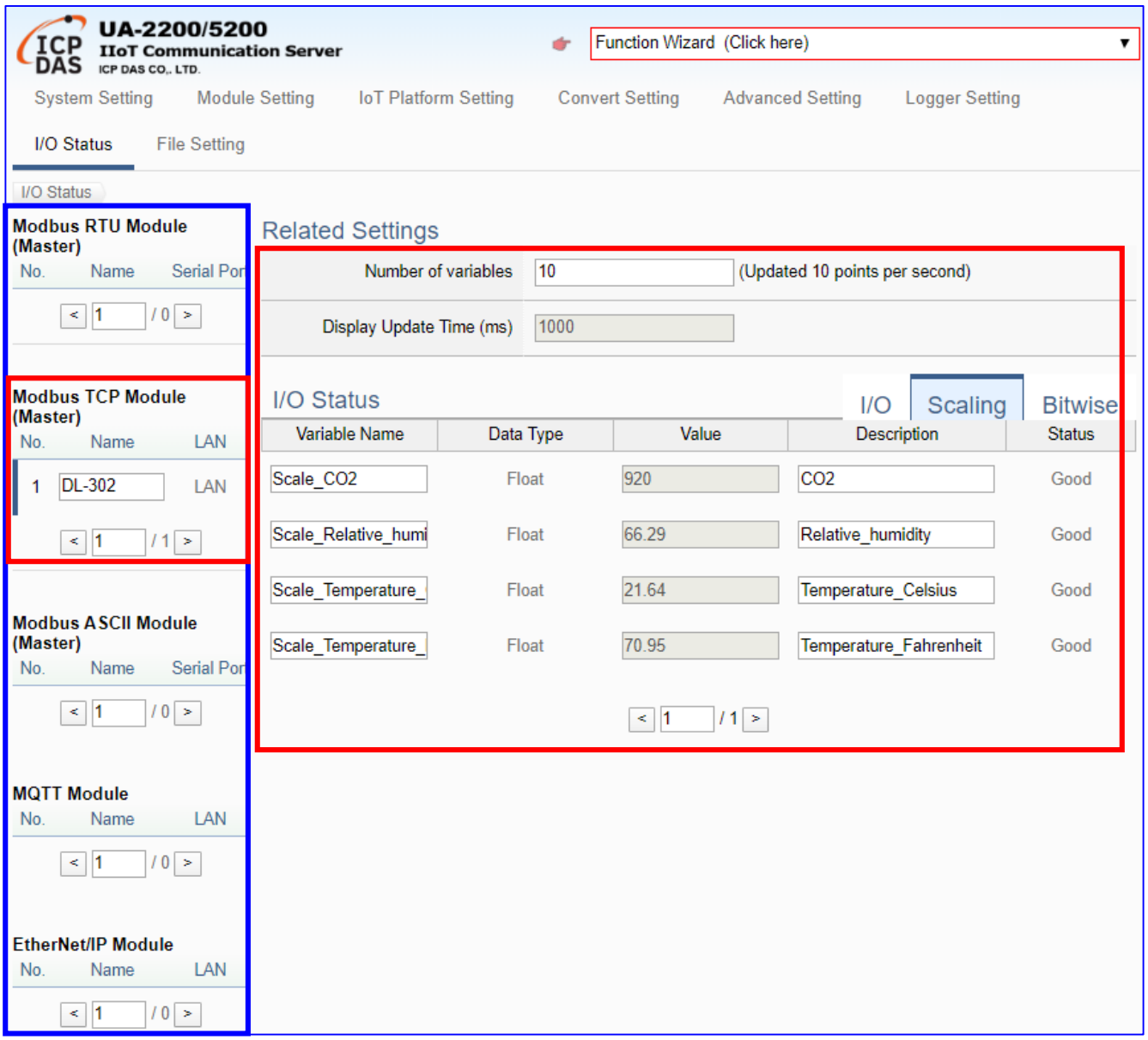
5.7. Main Menu: I/O Status

I/O Status is the 6th item of the Main Menu, mainly to display the retime I/O status of all the modules.

I/O Status page offers an easy way to view monitoring page that allows you to view important controller information in real time. The I/O Status page includes the following information.

i. System default I/O Status page: It displays the all I/O channel information based on the sorting of all I/O Modules.
ii. Related settings and the user-defined I/O Status page: It displays the I/O channel status based on the user-defined arrangement.

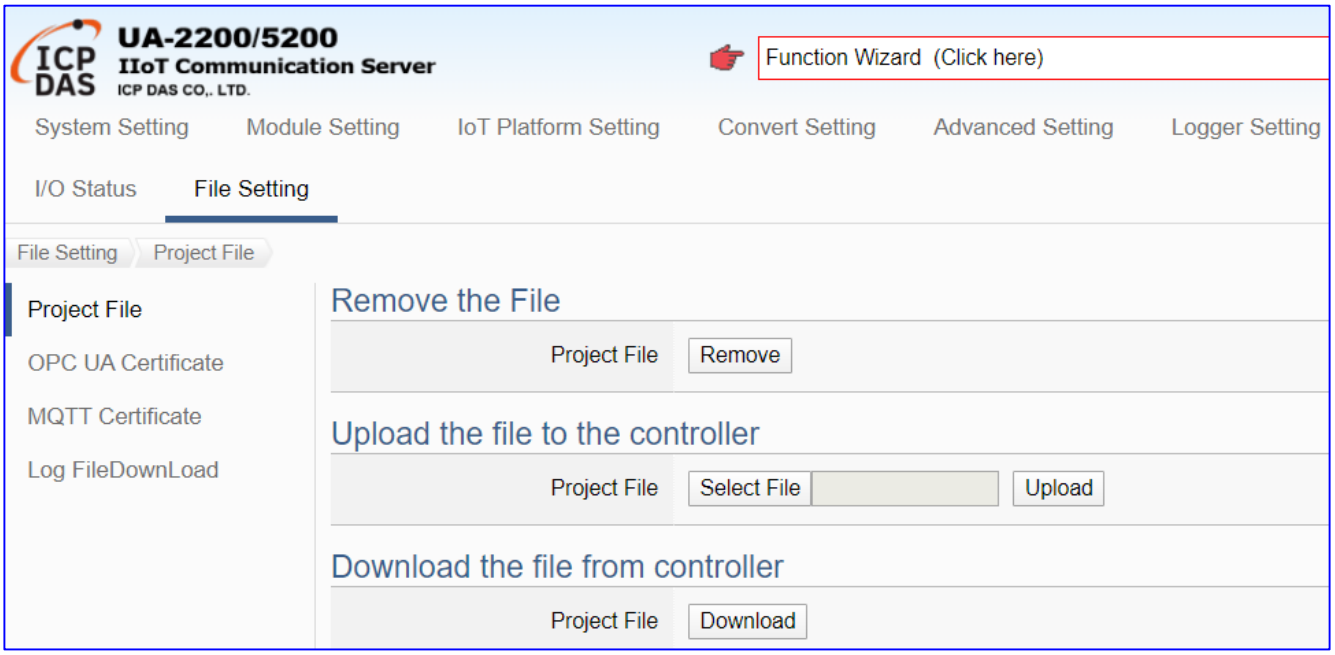
The user can click the module name on the left site, and the right will show all the real time I/O status of the selected module.



5.8. Main Menu: File Setting

File Setting is the last item of the Main Menu, mainly to provide the settings about the files, such as remove, update, upload and download the files of the project and certificate.

File Setting provides 4 sub-menu functions. This chapter will introduce the function items and setting parameters.

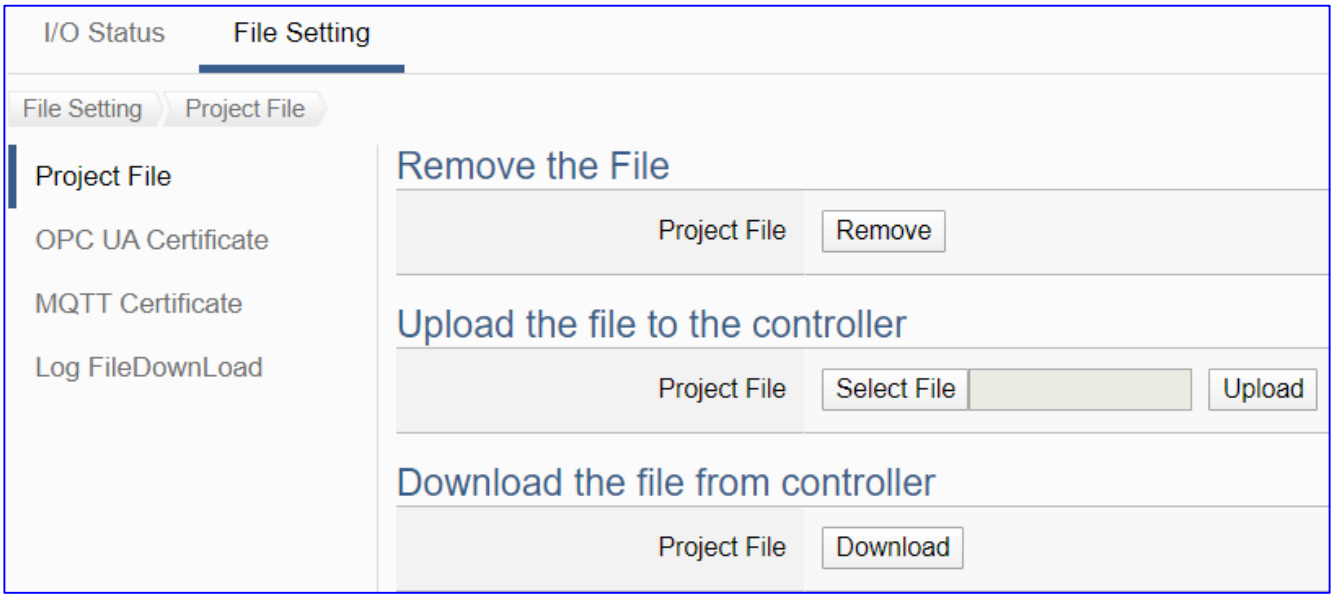


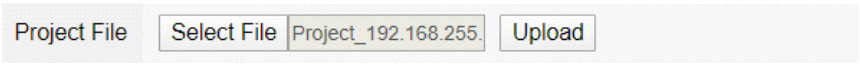
The setting for UA series controllers is to set up from the left to the right of the main menu functions. User can find the setting step and Web UI information in the following chapters.

CH2 Quick Start 1: Hardware/Network Connection
CH3 Quick Start 2: Web UI / Steps / Project Example
CH4 Function Wizard: Quick Setup

5.8.1. Project File

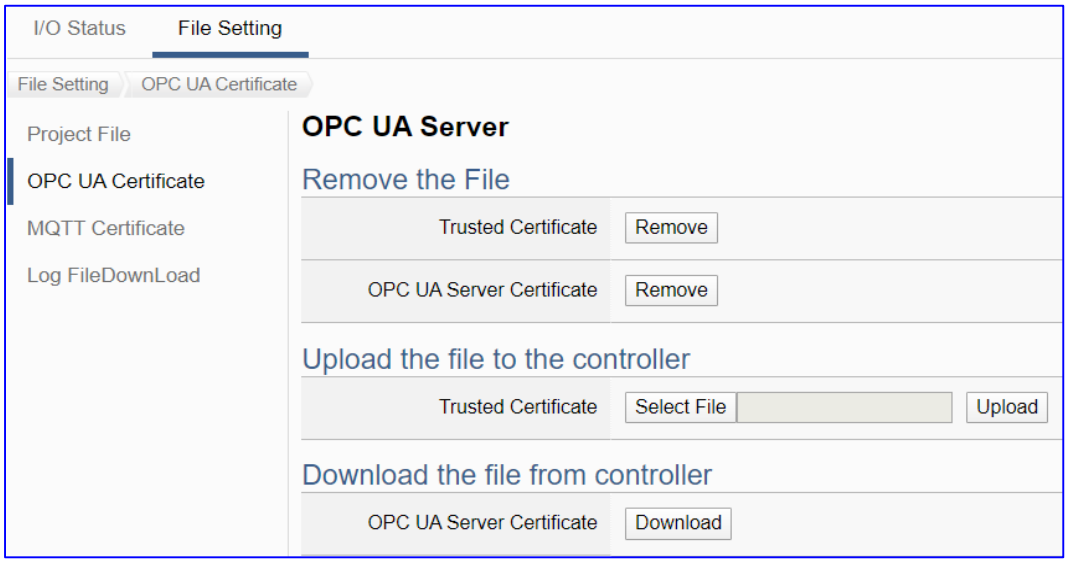
This page provides 3 setting items: Remove the file, Upload the file to the controller, and Download the file to the local computer.



File Setting > Project File > Remove the File	
Project File	Click [Remove] to delete all project settings current in the UA series controller.
File Setting > Project File > Upload the file to the controller	
Project File	**Select File**: click to select the project that want to upload to the UA controller. (Extension name of the project file: "**.tar**") **Upload**: upload the project file into the UA controller. If select a wrong file (extension name is not ".tar"), the system will show an error message. Select a right format file with extension name of ".tar", as below. 
File Setting > Project File > Download the file to the local computer	
Project File	**Download**: Download the project with all Web UI settings to the current computer. (Extension name of the project file: "**.tar**")

5.8.2. OPC UA Certificate

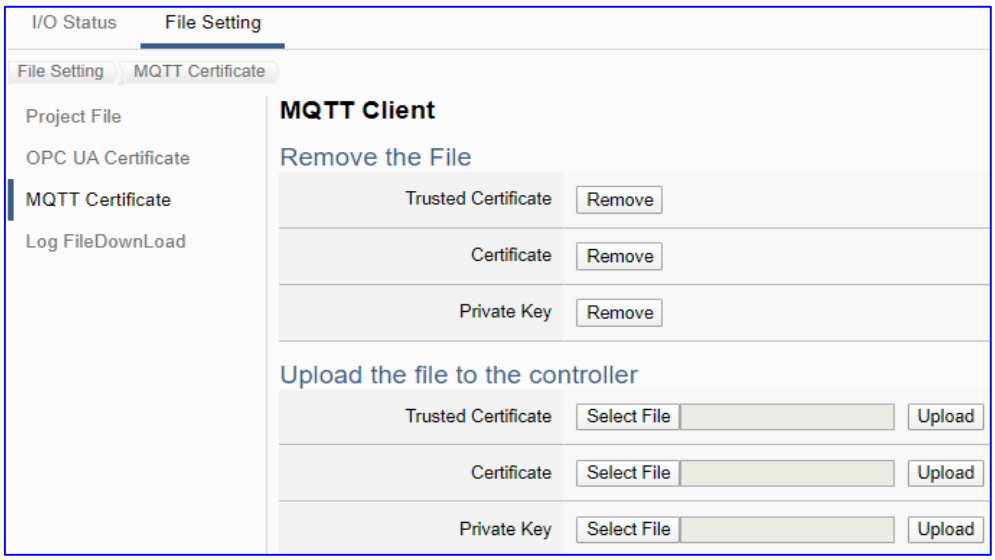
UA controller supports OPC UA Server security connection, including identity authentication, data encryption, data signature. Server and Client authenticate each other through x.509 certificate. This function is the certificate file management function of **OPC UA Server**. There are 3 setting items about OPC UA Certificate: Remove, Upload the file to the controller, download the file from the controller.



File Setting > OPC UA Certificate > Remove the File	
Trusted Certificate	**Remove**: Click to delete the OPC UA client Trusted Certificate current in the UA controller.
OPC UA Server Certificate	**Remove**: Click to delete the OPC UA Server Certificate current in the UA controller.
File Setting > OPC UA Certificate > Upload the file to the controller	
Trusted Certificate	**Select File**: select the OPC UA Trusted Certificate file in PC to upload to the UA controller. **Upload**: upload the Trusted Certificate file to the UA controller. • File format must be **DER**. Extension name must be "**der / cer / crt**". Trusted Certificate Select File icpdasuaserver.der Upload • If select a wrong file, the system will show an error message. Trusted Certificate Select File Certificate_192.168.255.10 Certificate type is wrong. Upload
File Setting > OPC UA Certificate > Download the file from controller	
OPC UA Server Certificate	**Download**: Download the OPC UA Server Certificate file to the current using computer. • File format: **DER**. File name: **Certicate_IP-address_.tar** e.g. Certificate_192.168.255.102_.tar. Before using, decompress to **icpdasuaserver.der**, as below. icpdasuaserver.der

5.8.3. MQTT Certificate

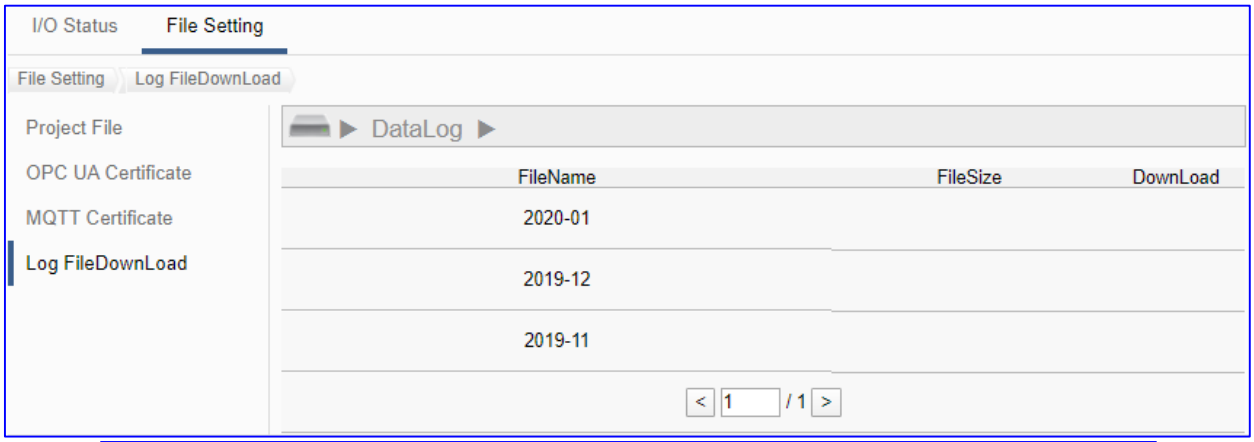
UA controller supports MQTT Client secure encrypted certificate file management. There are three types of files: Trusted Certificate, Certificate, and Private Key. The users upload the file to the UA controller according to the type of obtained certificate. If you want to perform **Broker authentication**, you need to upload the **Trusted Certificate**. If you want to perform the **Broker/Client two-way authentication**, you need to upload the **Credential and Private Key additionally**.

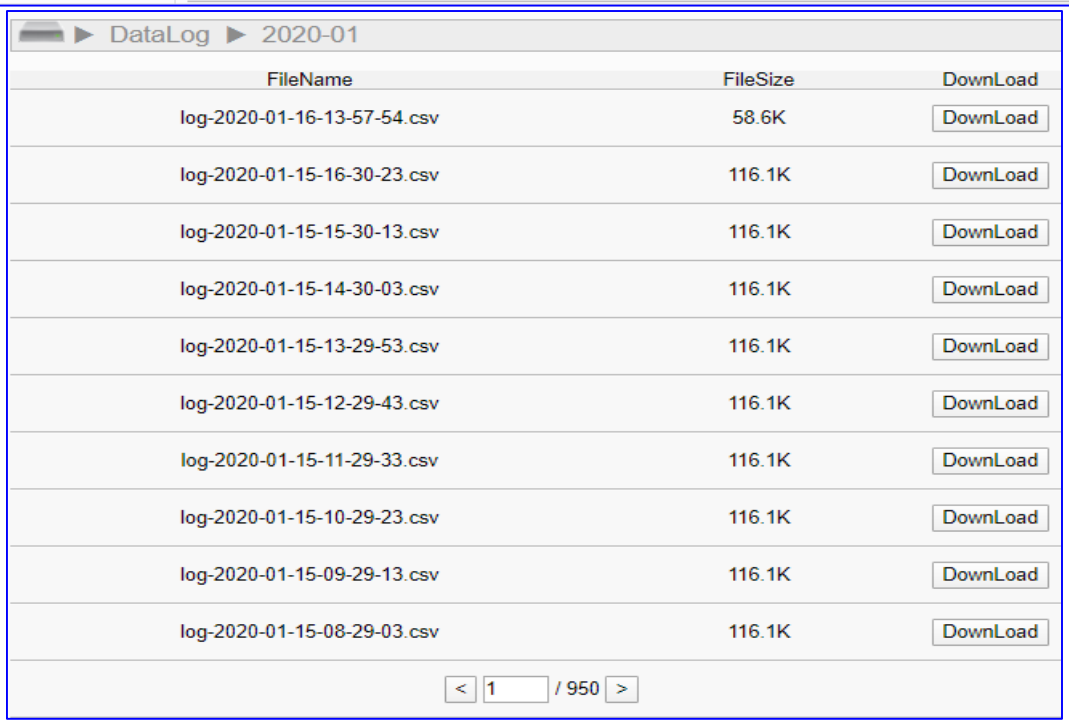


File Setting > MQTT Certificate > Remove the File	
Trusted Certificate	**Remove**: delete the MQTT Trusted Certificate current in the UA series controller.
Certificate	**Remove**: delete the MQTT Certificate current in the UA series controller.
Private Key	**Remove**: delete the MQTT Private Key current in the UA series controller.
File Setting > MQTT Certificate > Upload the file to the controller	
Trusted Certificate	**Select File**: select the MQTT Trusted Certificate file of the device. **Upload**: upload the MQTT Trusted Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message. Trusted Certificate Select File Certificate_192.168.255.10 Certificate type is wrong. Upload
Certificate	**Select File**: select the MQTT Certificate file of the device. **Upload**: upload the MQTT Certificate file to the UA controller. • File format must be **PEM**. Extension name must be "**pem / cer / crt**". • If select a wrong file, the system will show an error message.
Private Key	**Select File**: select the MQTT Private Key of the device. **Upload**: upload the MQTT Private Key file to the UA controller. • File format must be **PEM**. Extension name must be ".**key**". • If select a wrong file, the system will show an error message.

5.8.4. Log File Download

This page provides 2 setting items: Remove the file, and Upload the file to the controller for the MQTT Trusted Certificate, Certificate and Private Key.





File Setting > Log File Download > DataLog	
File Name	At first, display the year-month folder (e.g. 2020-01), click the year-month folder to list all log files in this month, with the file name "log-year-month-day-hour-minute-second.csv ".
File Size	The size of the log file. Unit: KB
Download	Click to download the Log file to the specific folder of the PC.
< 1 / 950 >	The page number of the Log file list: Current page / Total pages. Click < or > to go to the previous or next page.

6. Factory Setting Recovering and Firmware Updating

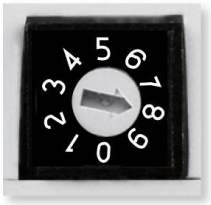
This chapter will introduce the settings by hardware Rotary Switch, including “Factory Setting Recovering” and “Firmware Updating” that supported since Version 1.0.0.3.

6.1. Recovering to Factory Setting (Rotary Switch: 8)

Turn the Rotary Switch of UA series to “8” can recover to the factory setting. Before that, first to connect the UA controller via a network cable to a PC or a Switch.

The steps:

1. After connecting the network, power off the UA hardware, and turn the Rotary Switch to “8”.



2. Reboot the UA and wait a long buzzer sound that means of doing the recovering.

3. Wait about 3 minutes until **2** long buzzer sounds, and then turn the Rotary Switch to “**0**”.
   Note: If the buzzer makes **4** short beeps, it means the network is not connected properly. Please check the network cable again.

4. Reboot the UA again, and the system will recover to the factory settings.

Factory Default Settings of UA Series			
Network	**IP (LAN1)** **IP (LAN2)**	**192.168.255.1** **10.0.0.1**	Assign UA a new IP address according to your case. For UA-2200 series, set the LAN1 for the connection.
	Netmask	**255.255.0.0**	
	Gateway	**192.168.1.1**	
OS Account	**Username**	**root**	**After login, change your password as soon as possible.** (Section 5.1.4 for Web UI) (Appendix E for OS password)
	Password	**icpdas**	
Web UI Account	**Username**	**root**	
	Password	**root**	

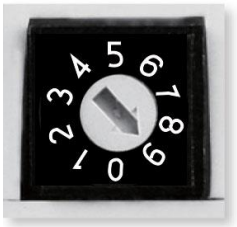
6.2. Updating Firmware via USB (Rotary Switch: 9)

Turn the Rotary Switch of UA series to “9” can update the Firmware version via USB.

Note: After the system version is updated, only the last network environment settings (IP, Netmask and Gateway) of the UA series controller will be retained and the rest will be factory recovered.

The steps:

1. Power off the UA hardware, and turn the Rotary Switch to “9”.



2. Download the Firmware package file of the UA hardware corresponding model. The download website: ftp.icpdas.com/pub/cd/UA-Series/middleware/UA-5231_UA-2241

3. Save the Firmware package file into an empty FAT32 format USB drive and put to the UA USB port.

4. Reboot the UA and wait a long buzzer sound that means of doing the version updating.

5. Wait about five minutes until **two** long buzzer sounds, and then turn the Rotary Switch to “0”.

   Note:

   * If the buzzer makes 2 short beeps, it means the USB is not connected properly. Please check and connect the USB again.

6. Reboot the UA again, and the system will update to the version of the package file.

Note:

If the updating Firmware via USB still fails, please refer to nest section for using the MicroSD card to manually update the Firmware version.

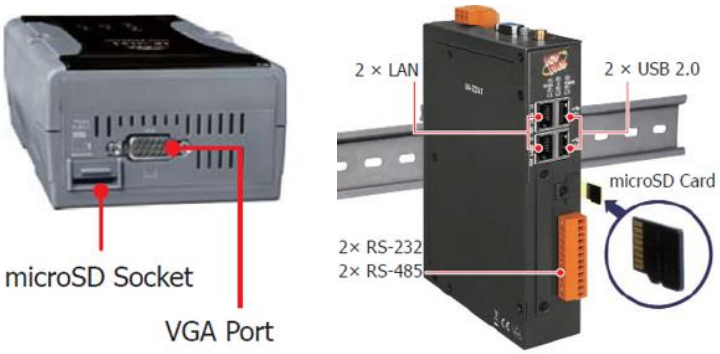
6.3. Updating Firmware via MicroSD Card Manually

If the updating Firmware (UA version file) via USB still fails, please refer to the following steps for using the microSD card to manually update the Firmware version.

- **Preparations:**
  - ✓ PC * 1
  - ✓ SSH / Telnet Software, Ex: PuTTY
  - ✓ UA Series * 1, Ex: UA-5231 (Must wire with a networked device, ex: PC or Switch)
  - ✓ MicroSD Card Reader * 1
  - ✓ CA-0910 Cable * 1 (In the shopping box of the UA Series)
  - ✓ Power Supply * 1 (10 ~ 30 VDC)

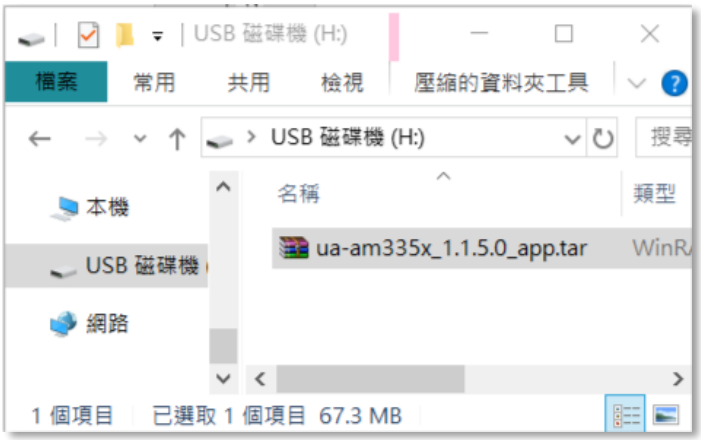
- **The Steps to Update Firmware via MicroSD Card :**

1. Take the microSD card from the socket of the UA, and connect the card with PC via the card reader.

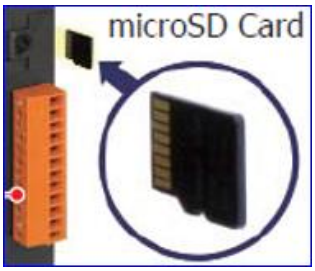


2. Download the Firmware file and save to the microSD card. (Save one Firmware file only)
   From: http://ftp.icpdas.com/pub/cd/UA-Series/middleware/UA-5231_UA-2241/
   ua-am335x_x.x.x.x_app.tar

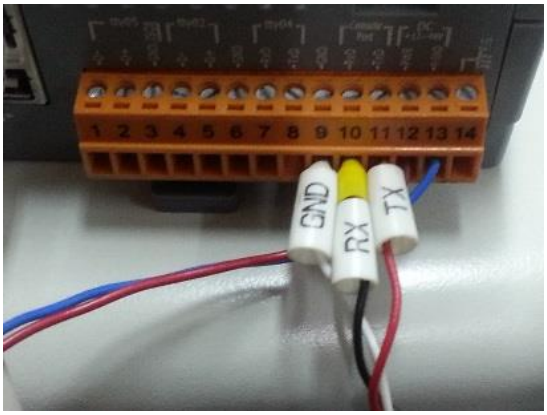
NOTE:
Save the file directly into the card,
DO NOT decompress the file.



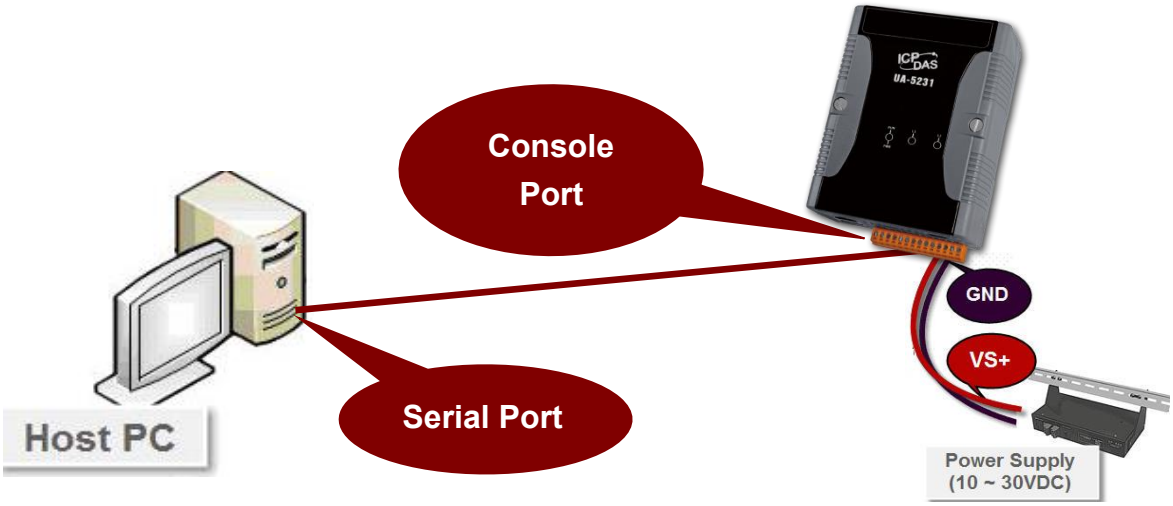
3. Insert the microSD card into the UA again.



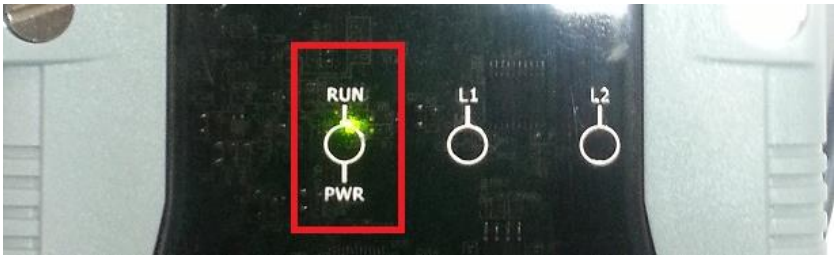
4. Wire the female head of CA-0910 cable to the network PC, and the other head to the "Console Port" of UA.



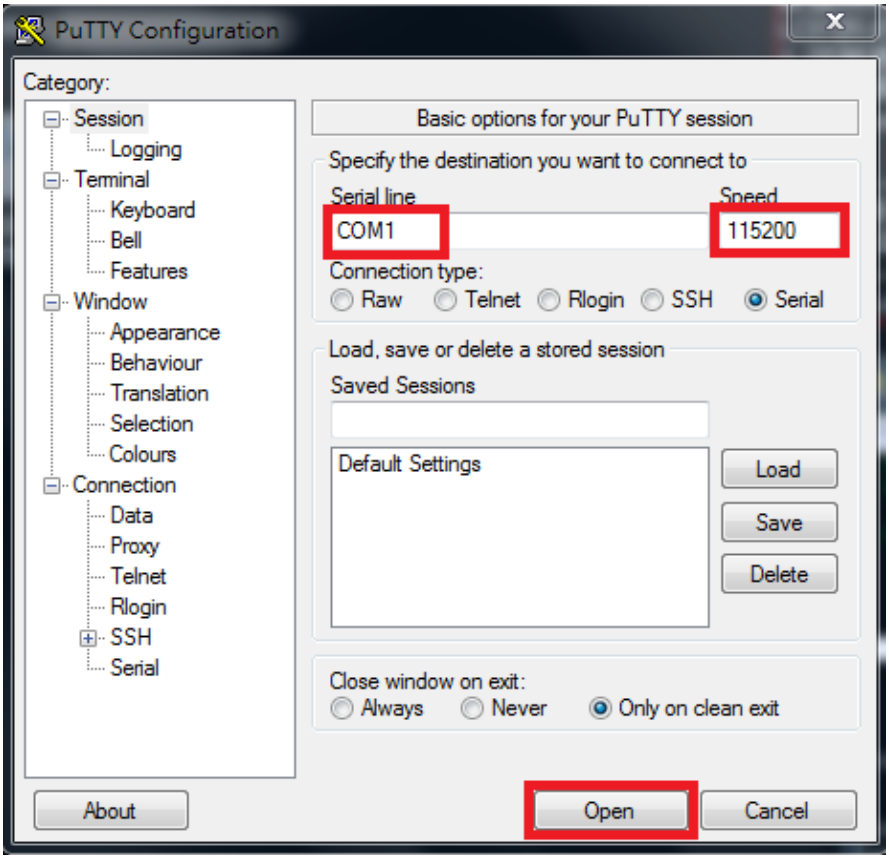
(Wire CA-0910 cable to the Console port of UA)



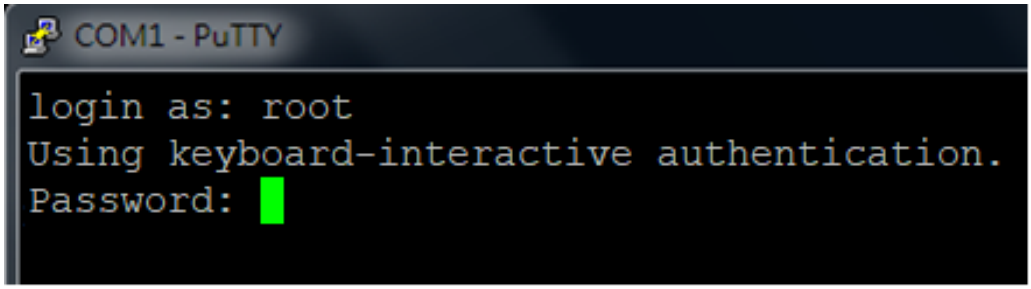
5. Turn on the power of the UA. When the lights are left with ONE LED, the boot is completed.



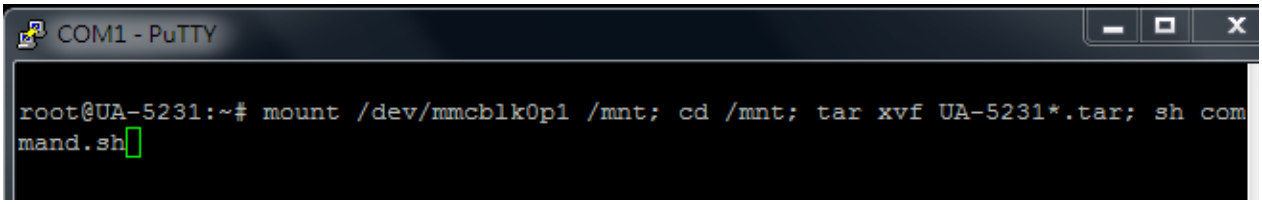
6. Use an SSH/Telnet software, e.g. PuTTY, to connect to UA via the Serial connection. Input your Serial line (default: COM1) and Speed (115200 for UA). And then click “Open” button.



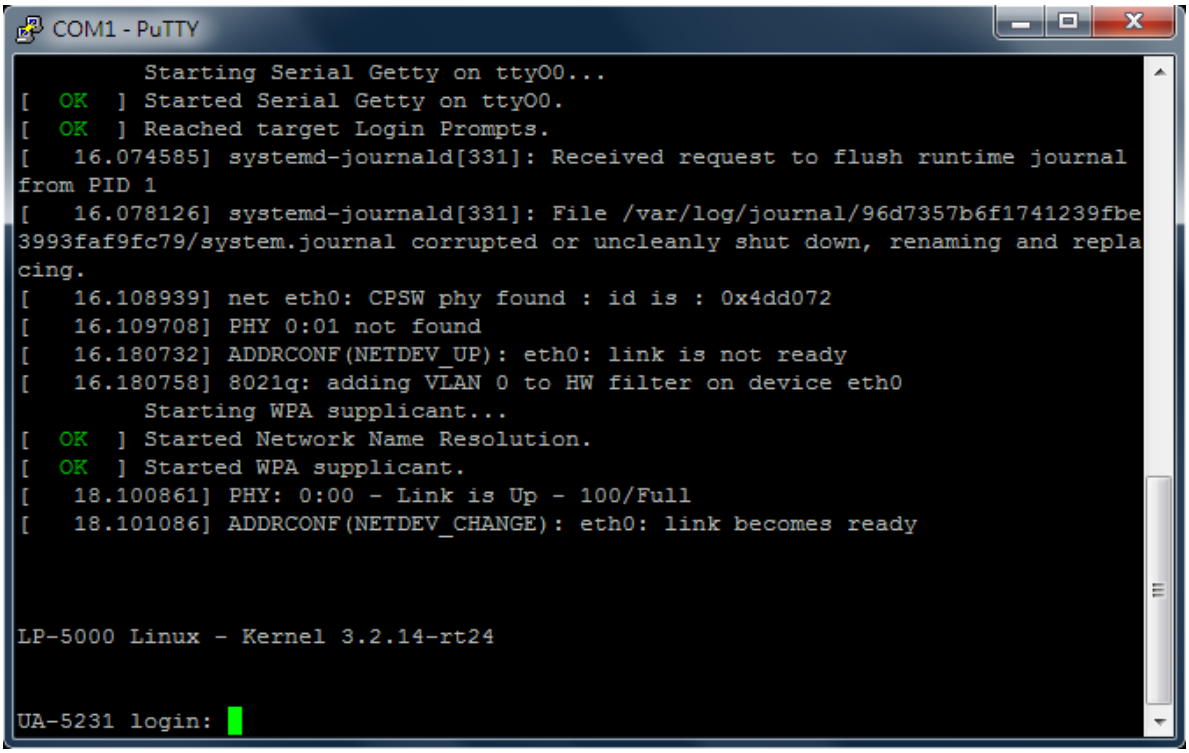
7. After the login message, enter the default **username** (**root**) and **password** (**icpdas**).



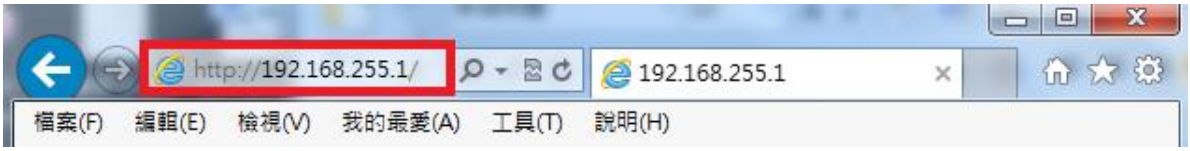
8. Configure the UA environment:
Copy the following red strings “mount /dev/mmcblk0p1 /mnt; cd /mnt; tar xvf ua-am335x*.tar; sh command.sh” to the PuTTY screen and press the Enter key.



9. Please wait a while for the UA controller configuration until the login screen appears again.



10. Open a web browser on the PC (ex: Google Chrome, IE...) and enter "**192.168.255.1**" in the address bar.

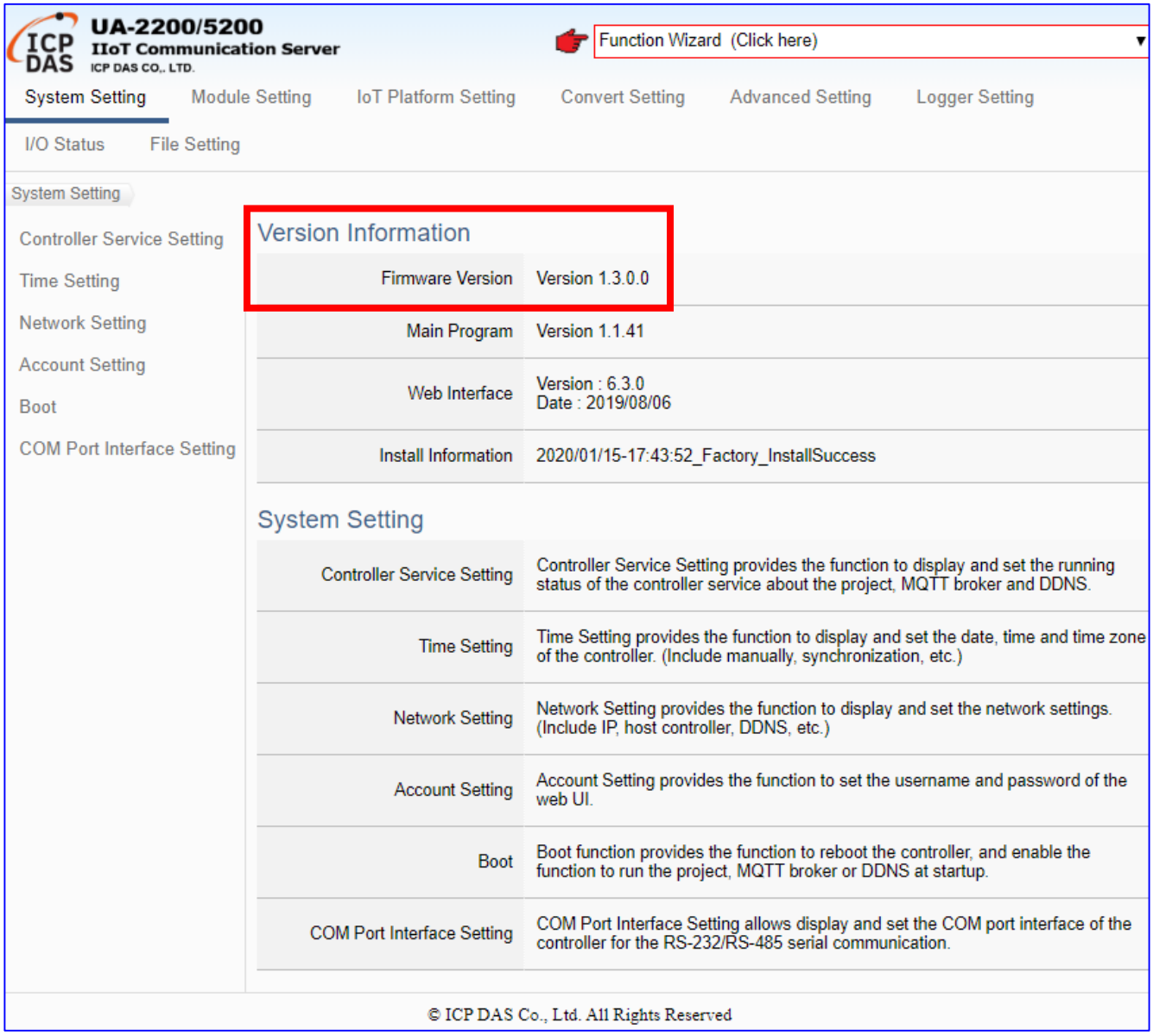


11. The web browser will run and go to the UA login web site as below. Please enter the default username/password and click the “Login” button.

Default Username: root

Default Password: root

12. When login to the web interface, the UA home page will be displayed as below. If the Firmware Version number is the same as your download version, the updating is successful.



7. Security Certificate: Download / Upload

In communication security, UA provides the username/password protection, SSL/TLS (Secure Socket Layer / Transport Layer Security Transport Layer Security) secure communication mechanism, and OPC UA trust certificate to protect data transmission security. OPC UA secured by default-enabled encryption and advanced certificate that includes authentication, authorization, confidentiality and Integrity.

UA controllers support OPC UA and MQTT two types of Certificate Management:

- **OPC UA Server Certificate management**

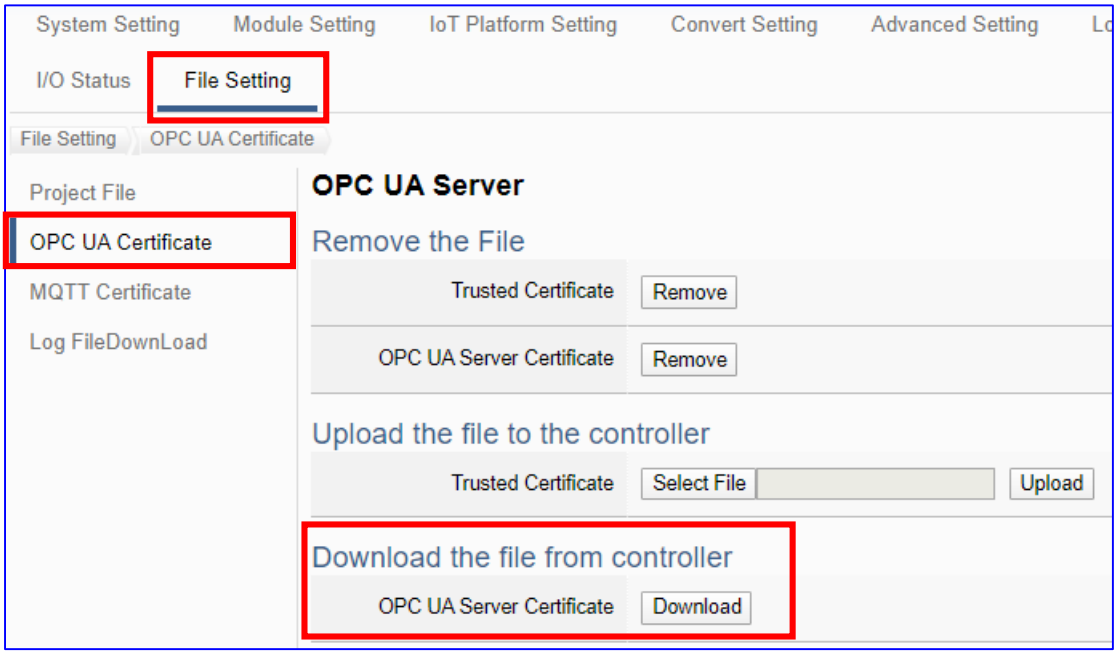
UA controller supports OPC UA Server security connection, including identity authentication, data encryption, data signature. Server and Client authenticate each other through x.509 certificate. This function is the certificate file management function of **OPC UA Server**. There are 3 setting items about OPC UA Certificate: Remove, Upload the file to the controller, download the file from the controller.

- **MQTT Client Certificate management**

UA controller supports MQTT Client secure encrypted certificate file management. There are three types of files: Trusted Certificate, Certificate, and Private Key. The users upload the file to the UA controller according to the type of obtained certificate. If you want to perform **Broker authentication**, you need to upload the **Trusted Certificate**. If you want to perform the **Broker/Client two-way authentication**, you need to upload the **Credential and Private Key additionally**.

The upload and download of OPC UA and MQTT Certificates are in the main menu [**File Setting**]. Before setting this function, you need to download or upload the relevant certificates. This chapter is divided into two sections, download/upload, to explain the setting steps and notices.

7.1. Download the Certificate from UA Controller



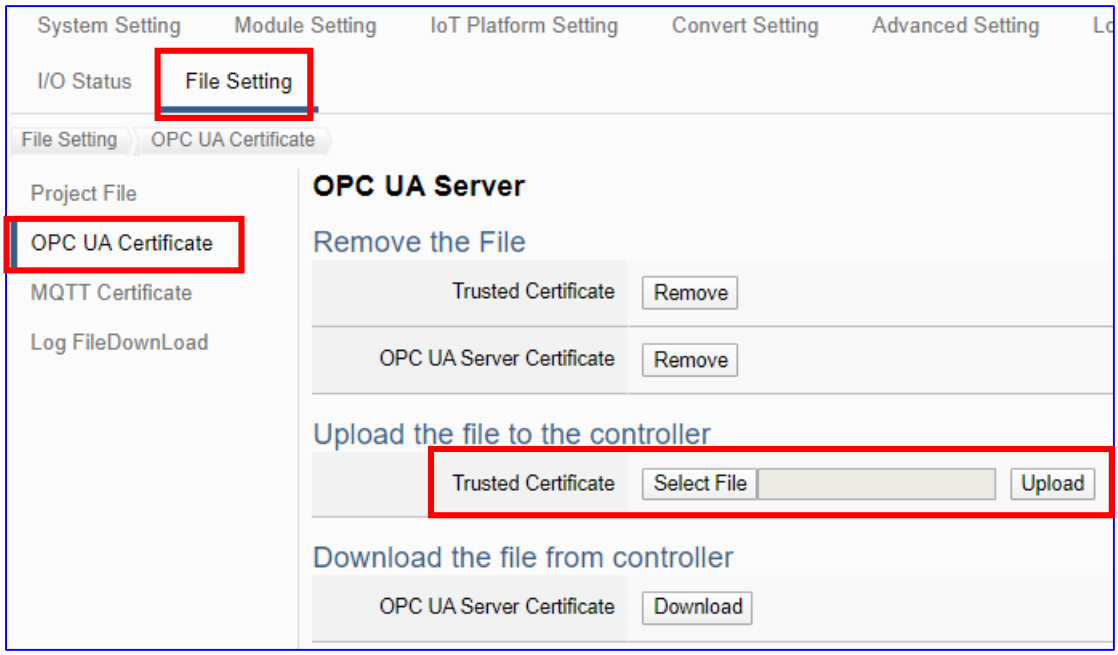
1. Click the main menu [**File Setting > OPC UA Certificate > Download the file from the controller** – OPC UA Server Certificate] and then click on the button [**Download**].

2. Save the OPC UA Server certificate file to your designated folder. The downloaded certificate file (***.tar**) of the UA series controller looks similar to the figure below.

7.2. Upload/Update the Certificate to UA Controller

The user can store trusted certificates of the OPC UA client or the MQTT Broker from other device into the UA project for setting up security communications.

7.2.1. OPC UA Certificate



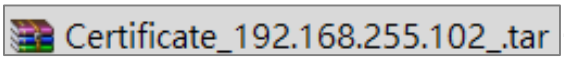
1. Get the trusted certificates from OPC UA Client and save in the PC.

2. Click the main menu [File Setting > OPC UA Certificate > Upload the file to the controller – Trusted Certificate], click on the button [Select File] to select the trusted certificates from OPC UA Client, and click on the button [Upload]. Then select the certificate folder to open the file. The certificate will be uploaded to the UA controller.

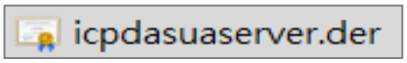
3. Click the button [Upload], then can upload and exchange the certificate authentication.

Notes for OPC UA Certificate:

- The supported code format: "**DER**".
- The supported file extension name: " ***.der / *.cer / *.crt** " .
- The OPC UA Server Certificate downloaded from UA series:

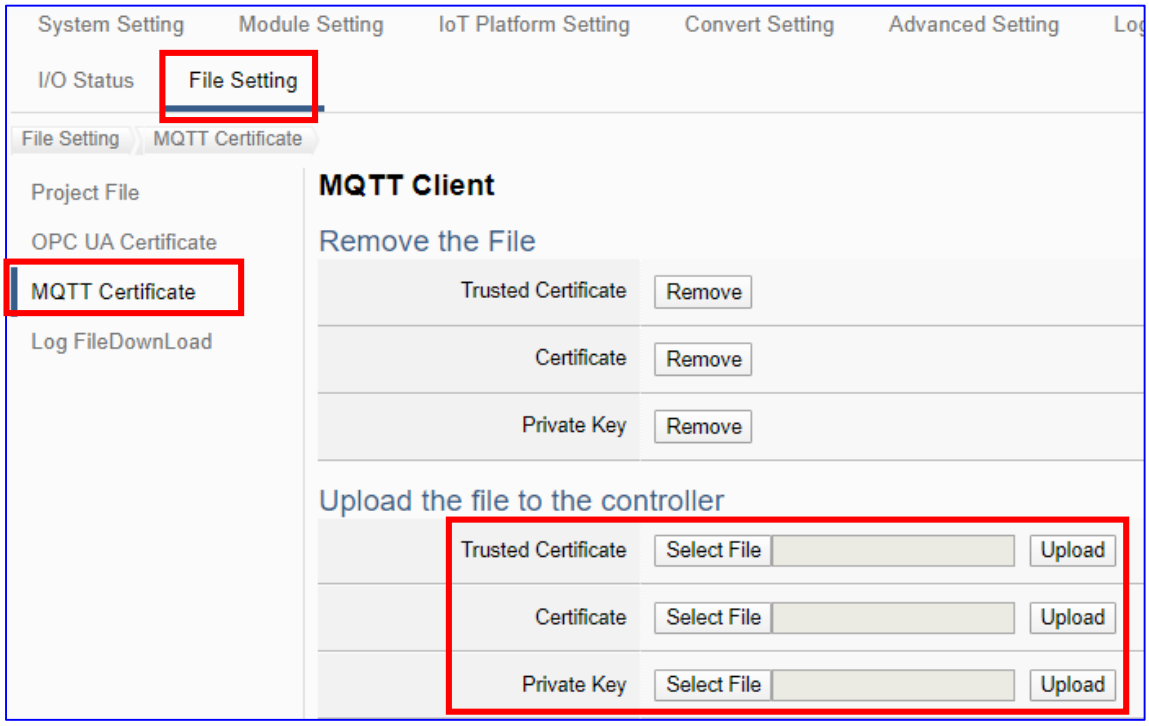
  File name: **Certicate_IP-address_.tar,** e.g. 

.

  Before using, decompress to **icpdasuaserver.der**, e.g. 

- Refer to 5.8.2 for detail parameter descriptions.

7.2.2. MQTT Certificate



1. Get the trusted certificates from MQTT Client and save in the PC.

2. Click the main menu [**File Setting > MQTT Certificate > Upload the file to the controller** – **Trusted Certificate / Certificate / Private Key**], click on the button [**Select File**] to select the Trusted Certificate, Certificate or Private Key from MQTT Client, and click on the button [**Upload**]. Then select the folder and open the file. The file will be uploaded to the UA controller.

3. Click the button [Upload], then UA system can exchange the certificate authentication.

Notes for MQTT Client Certificate:

- The supported code format: "**PEM**".
- The supported file extension name for Certificates: " ***.pem / *.cer / *.crt** " .
- The supported file extension name for Private Key: " ***.key** " .
- Refer to 5.8.3 for detail parameter descriptions.

Appendix A. MQTT JSON Format of the UA Series

MQTT JSON Example & Format Descriptions:

```
{
   "Variable" : [ {
      "Name" : "Bool_R[0]",
      "Attribute" : "R",
      "Datatype" : "Bool",
      "Value" : 0,
      "Quality" : "Uncertain"
   }, {
      "Name" : "Short_R[0]",
      "Attribute" : "R",
      "Datatype" : "Int16",
      "Value" : 0,
      "Quality" : "Uncertain"
   }, {
      "Name" : "Short_R[1]",
      "Attribute" : "R",
      "Datatype" : "Int16",
      "Value" : 0,
      "Quality" : "Uncertain"
   }, {
      "Name" : "Short_R[2]",
      "Attribute" : "R",
      "Datatype" : "Int16",
      "Value" : 0,
      "Quality" : "Uncertain"
   }, {
      "Name" : "Short_RW[2]",
      "Attribute" : "RW",
      "Datatype" : "Int16",
      "Value" : 0,
      "Quality" : "Uncertain"
   } ]
}
```

Name	Descriptions
Variable	The array name of JSON. Its structure includes several member data as below.
Name	The member name of the array element
Attribute	The member attribute of the array element: “R” : can read “W” : can write ”RW” : can read and write
Datatype	The member’s data type of the array element: "Bool" "Int8" "UInt8" "UInt16" "Int16" "UInt32" "Int32" "UInt64" "Int64" "Float" "Double" "String"
Value	The member’s current value of the array element
Quality	The member’s current status of the array element: "Uncertain" "Good" "Bad"

Appendix B. Protocol Technical Reference

- **OPC UA**

https://opcfoundation.org/

- **MQTT**

http://mqtt.org/

- **Modbus**

http://modbus.org/

Appendix C. IFTTT Website Setting

UA Function combines the IFTTT cloud platform. When the special events occur, it will trigger the IFTTT and send the message to the IFTTT-related cloud services (such as Line, Facebook, Twitter, etc.)

The settings for sending the message to the APP with the "IFTTT Condition Trigger (Line, Facebook, Twitter)" function includes two parts:

1. **UA Web Interface Setting: (Refer to Section 9.2 Advanced Setting > IFTTT …)**
   In the UA Web HMI, set up the UA controller, modules, IFTTT trigger conditions, the condition variable table, and the IFTTT event connection.

2. **IFTTT Cloud Platform Setting: (Introduced in this Appendix C)**
   In the IFTTT website, set up the "**if**" side service and event (**this**: use **webhooks** for the UA), the "**then**" side service and action (**that**: user can select the service, such as the Line, Facebook, twitter, etc.). And then fill the "**Event Name**" and "**Key**" getting from the IFTTT website setting into the "**Content Setting**" of the UA We HMI.

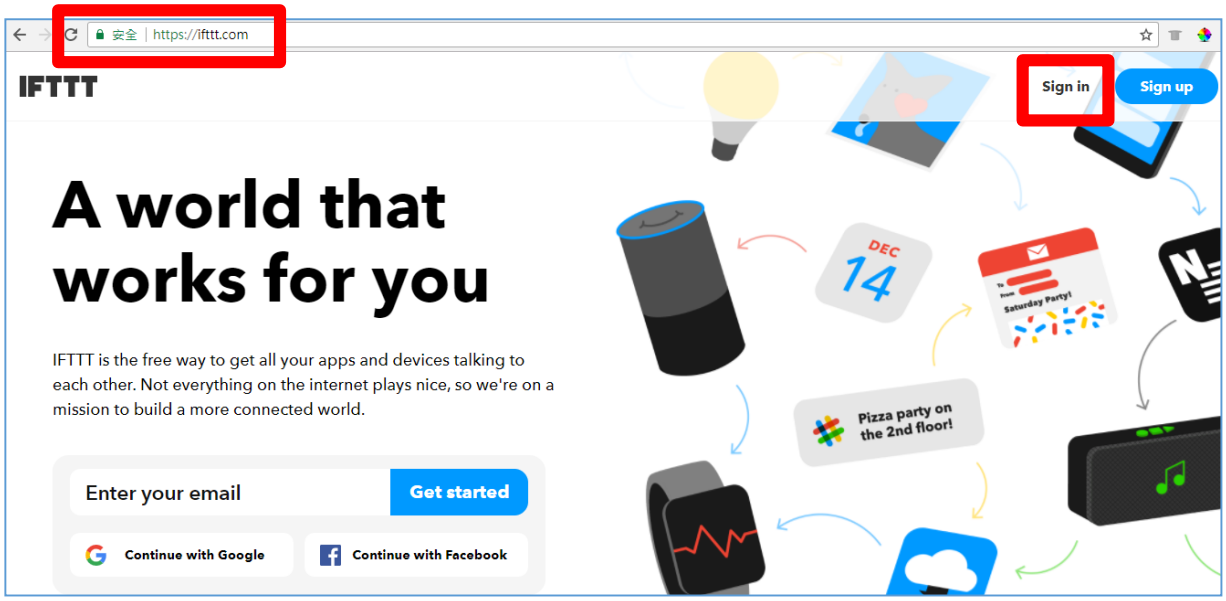
This Appendix C introduces the IFTTT website setting for the second part. After complete the setting, the user will set up an "**Event Name**" and get a "**Key**", please input them to the IFTTT Condition Trigger setting page in the UA Web HMI setting.

This IFTTT setting example will **send a message to the APP Line service**. IFTTT provides hundreds of Web or APP services (Ex: Line, Facebook, Twitter, Gmail...). The setting is in a similar way. Users can follow the steps below for **Line** to set up own APP.

● IFTTT Website Setting Steps

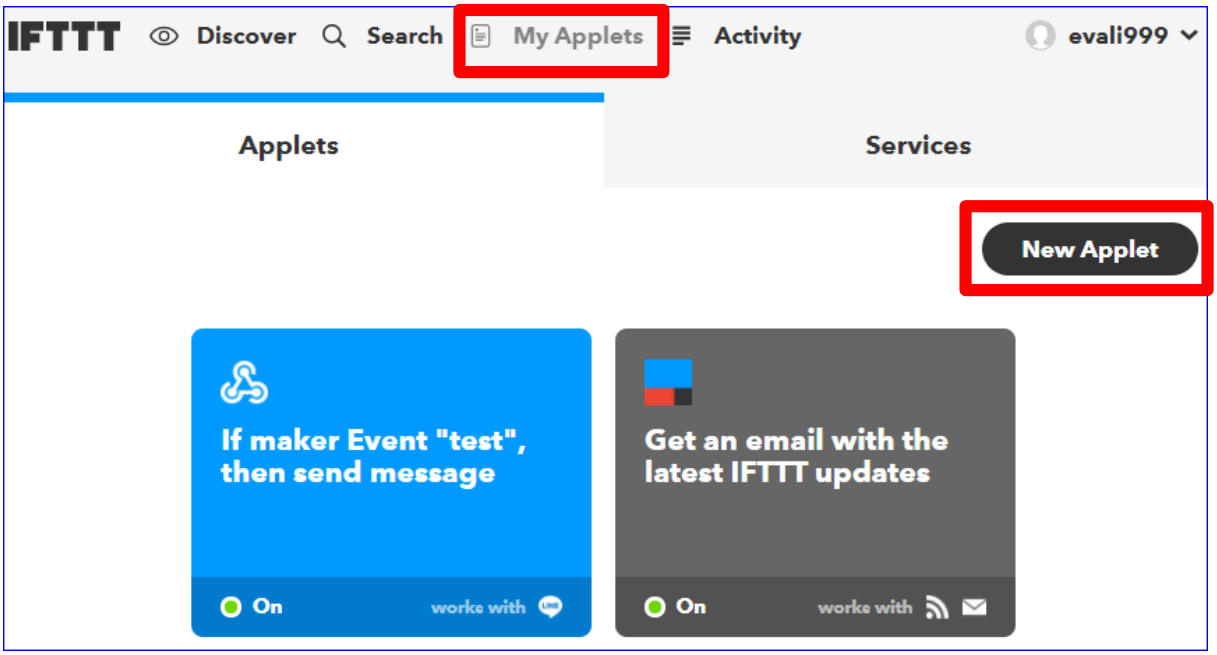
1. Login in IFTTT website

Sign in IFTTT: https://ifttt.com/. If you never use the IFTTT, sign up a member.



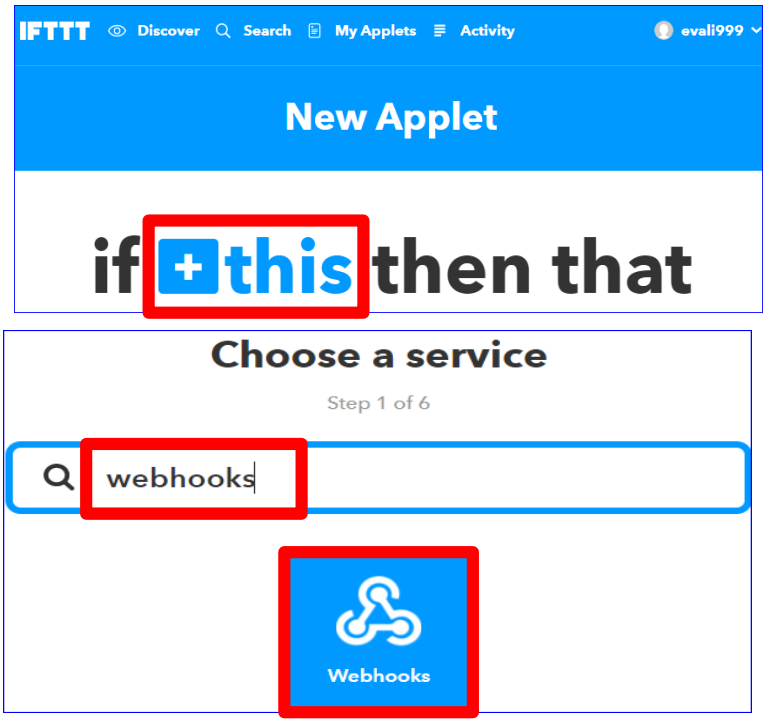
2. New an Applet

Click the “May Applets” > “New Applet”.

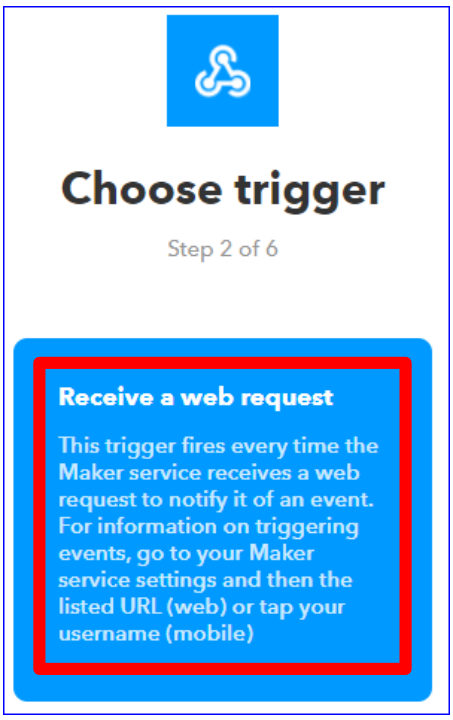


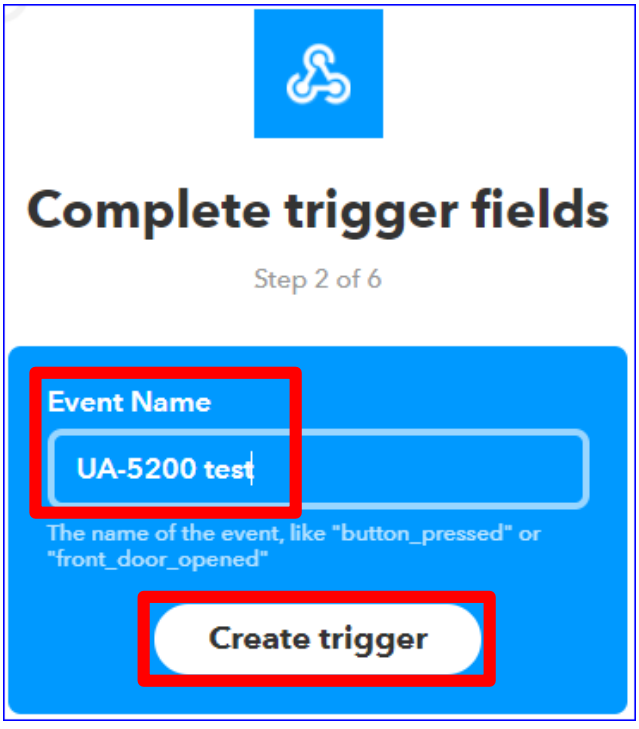
3. Set up this

Click the button “+this”, and then search and choose the service “**webhooks**”.



Choose the trigger of “Receive a web request”, and then enter the **“Event Name”** you want, for example **“UA test”**. The user can define a new name and copy into the **“Event Name”** setting field in the **UA Web HMI [Advanced Setting > IFTTT Condition Trigger > Add Message > Content Setting] (See Section 9.2).** At last, click the “Create trigger” to complete the setting of “**this**”.

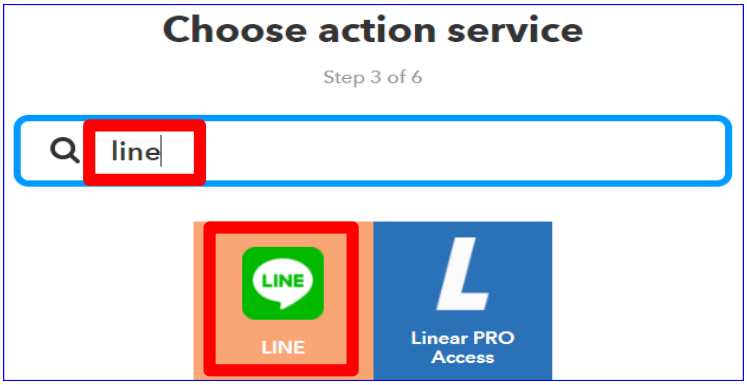




4. Set up that

The “+this” setting is completed (as the picture below).

Now click the button “+that”, and then search and choose the service for the action. In this example, we search and choose the service “**LINE**”.



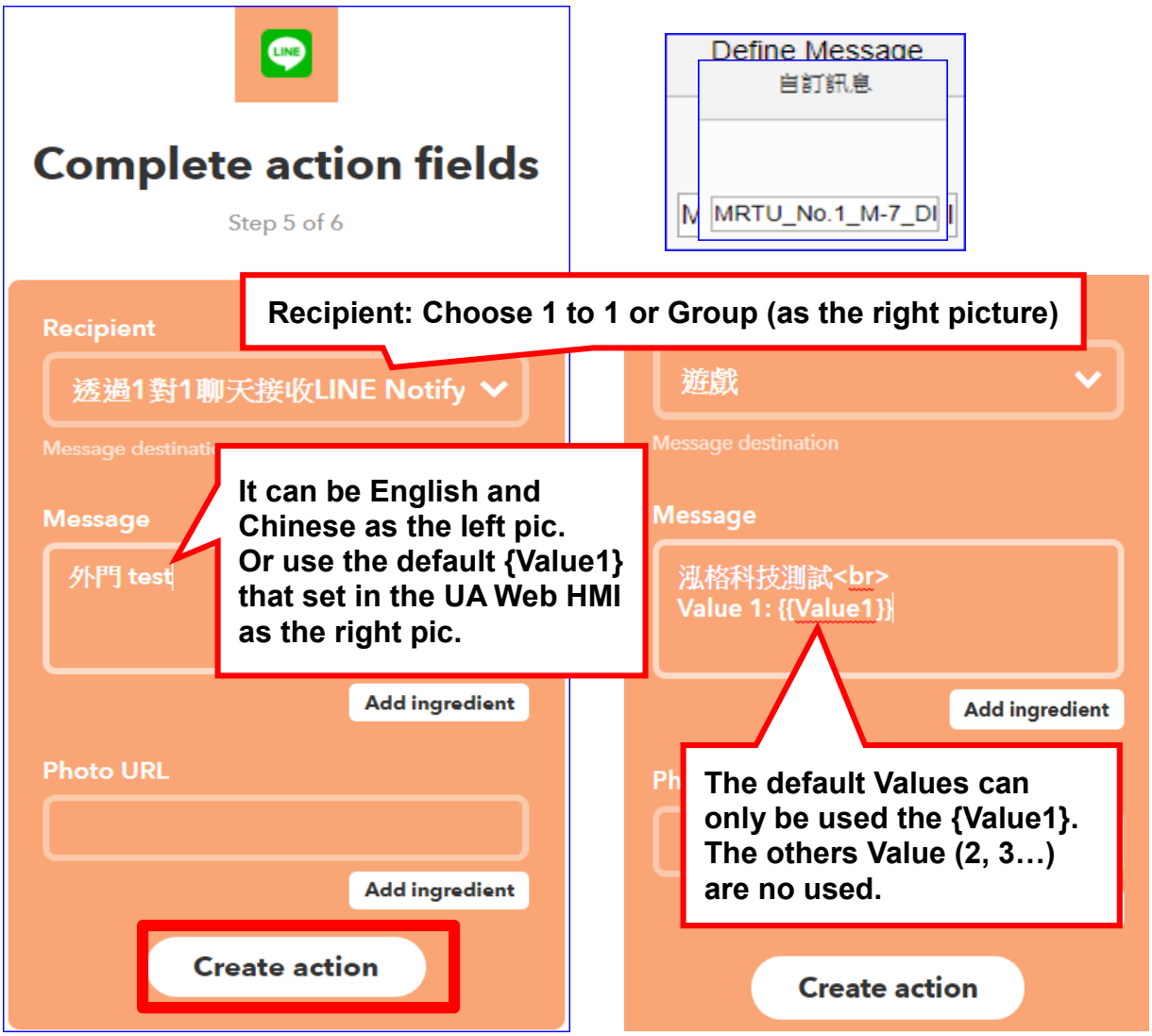
Choose the action “Send message” to send message to the service “LINE”.

Step Descriptions:

“**Recipient**”: Choose a name in the field to receive the LINE Notify message. It can be a LINE user or LINE group (It will auto show the names and groups of the connecting LINE account. If choose a LINE group, all the members in the LINE group will receive the message.)

“**Message**”: Set up the message content. It can be English or Chinese, Ex: “外門 test”.

The user also can use the default value “Value1: {{Value1}}”, it will send the message content that setting in the “Define Message” field of the UA Web HMI [IFTTT Condition Trigger > Condition Table]. (The message will list the module name code plus the I/O variable code as the picture below. Refer Section 9.2). The user can choose one depending on your need.

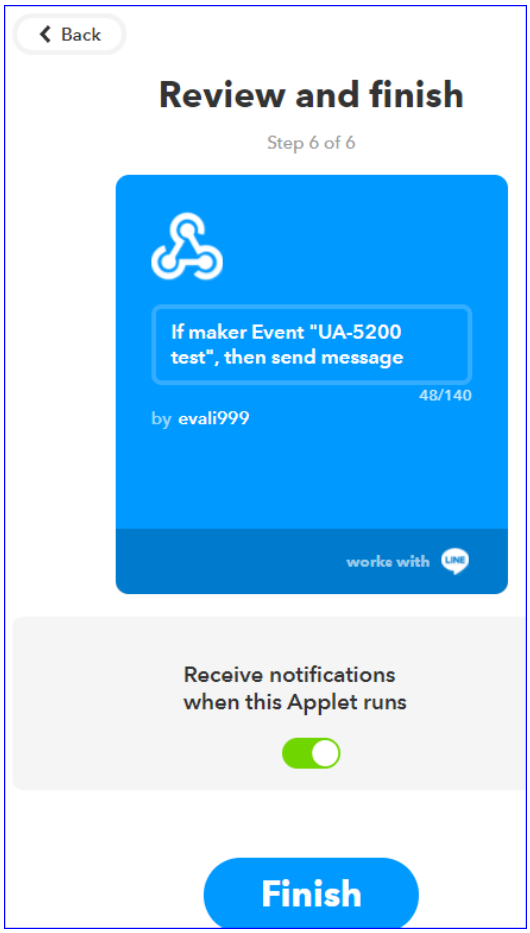


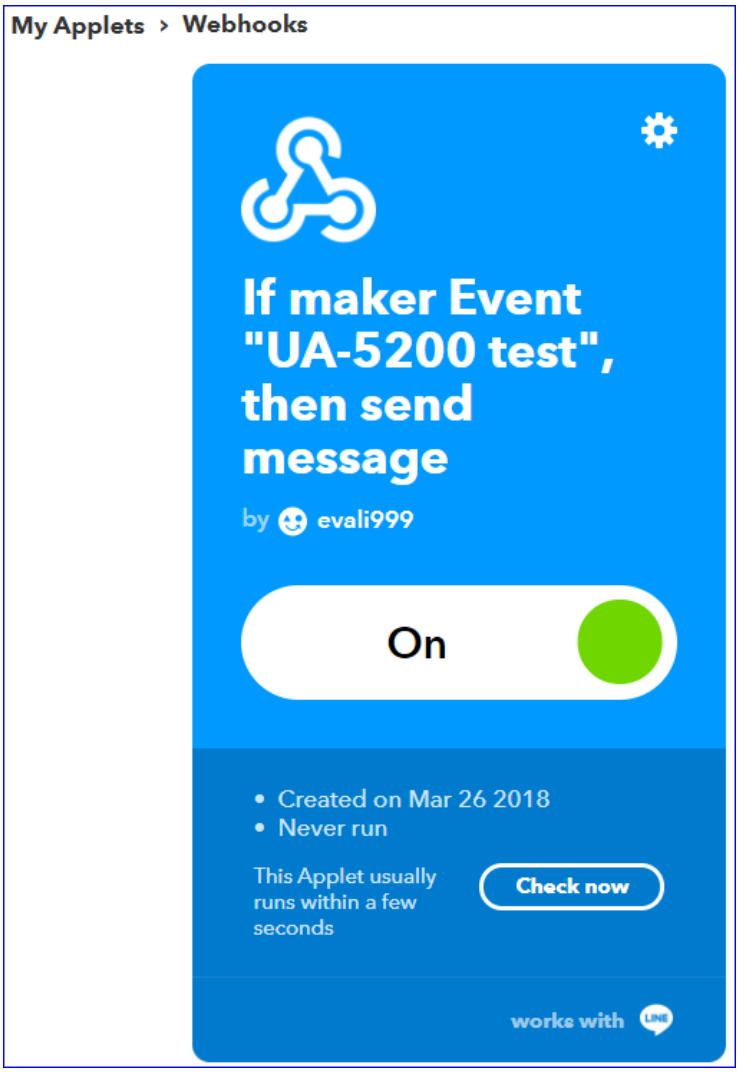
5. Finish IFTTT Setting

When complete the Applet setting, the picture is like the left picture. You can click “Back” button to review and change the setting.

Click “Finish” button when all set. The “Applet” will show in the “My Applets”, and link the “Webhooks” and “LINE”, and has a UA test” event to send a message.

Next, we will introduce how to get the “Key” and test the event message.



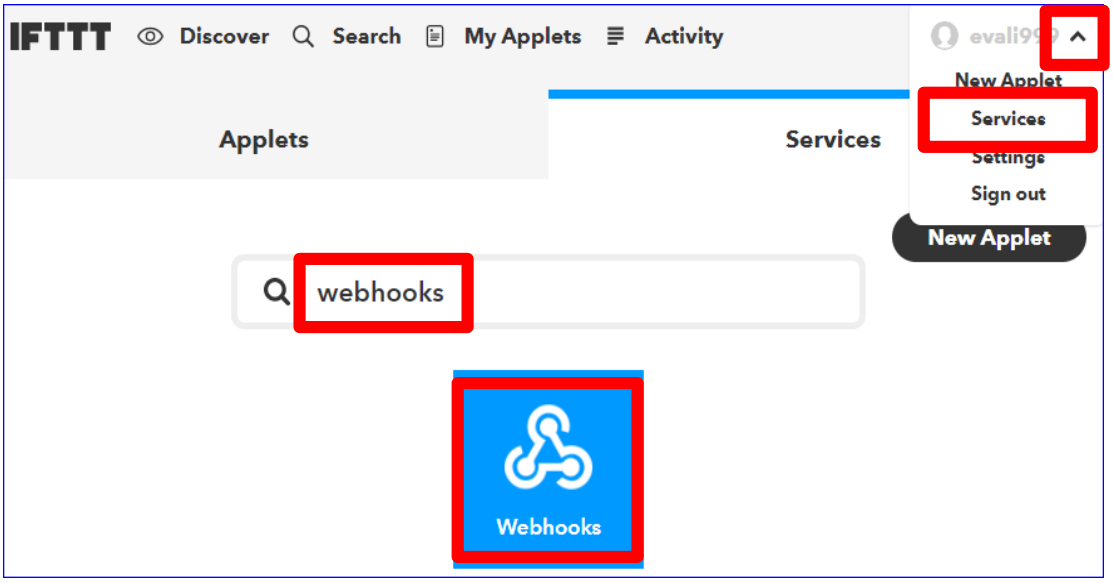


● Test IFTTT Event

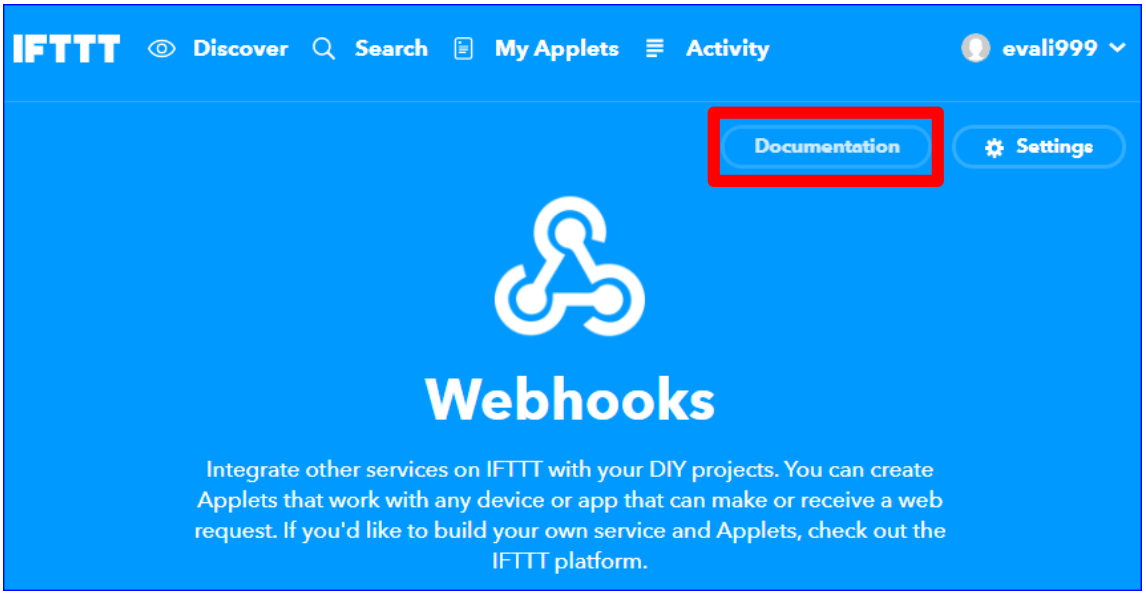
The IFTTT Website setting is set up in the previous steps. Now we will check the event "Key" and test the message sending.

1. Go to "Webhooks" service

Click the account function menu of "Services" on the up-right corner. Search and choose the Services "Webhooks".

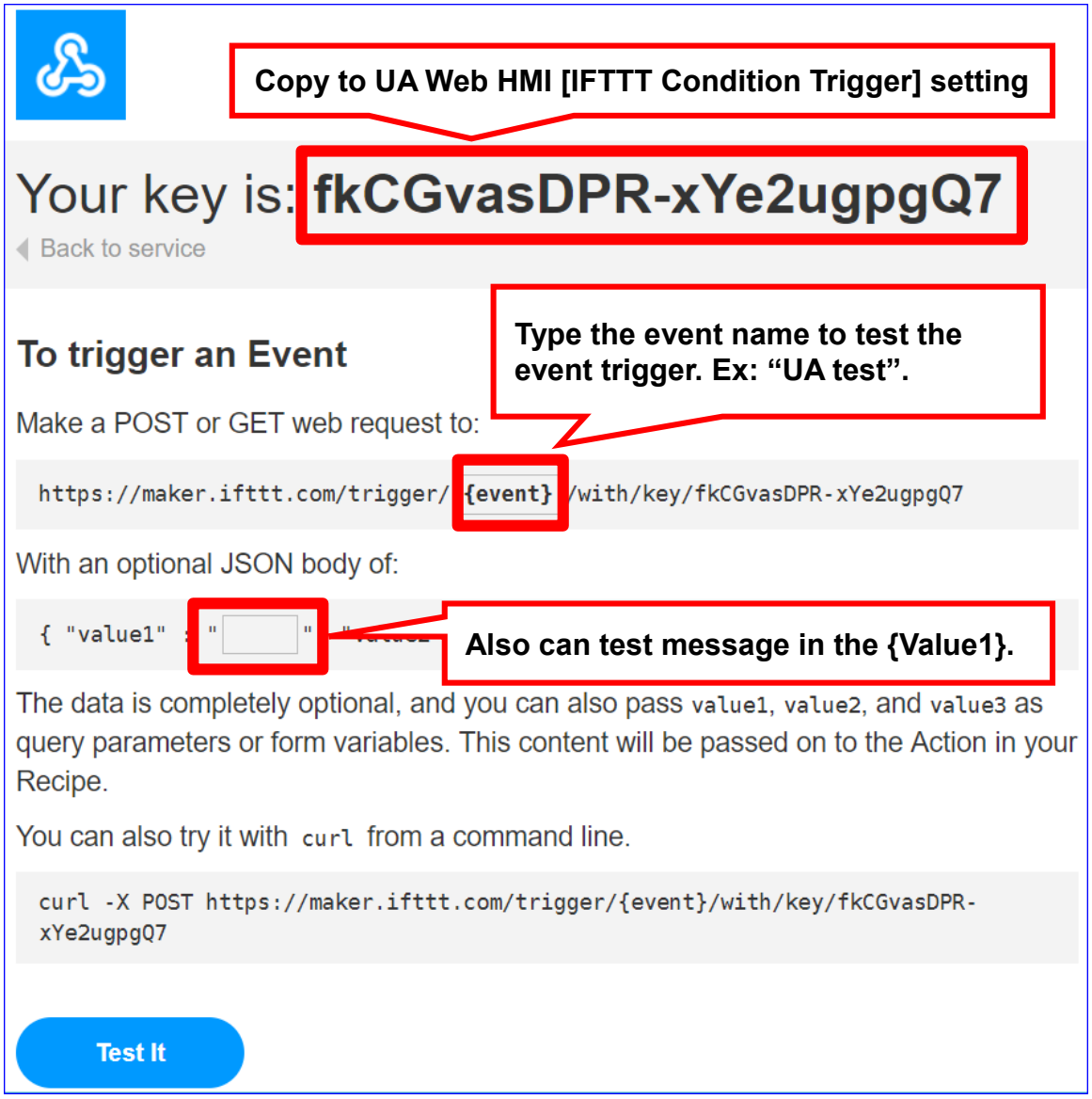


Click "Documentation" can switch to the test web page.



2. The Key and the Event Message

On the test web page, please copy the “Key” into the setting field “Key” in the **UA Web HMI [Advanced Setting > IFTTT Condition Trigger > Add Message > Content Setting] (See Section 9.2).**



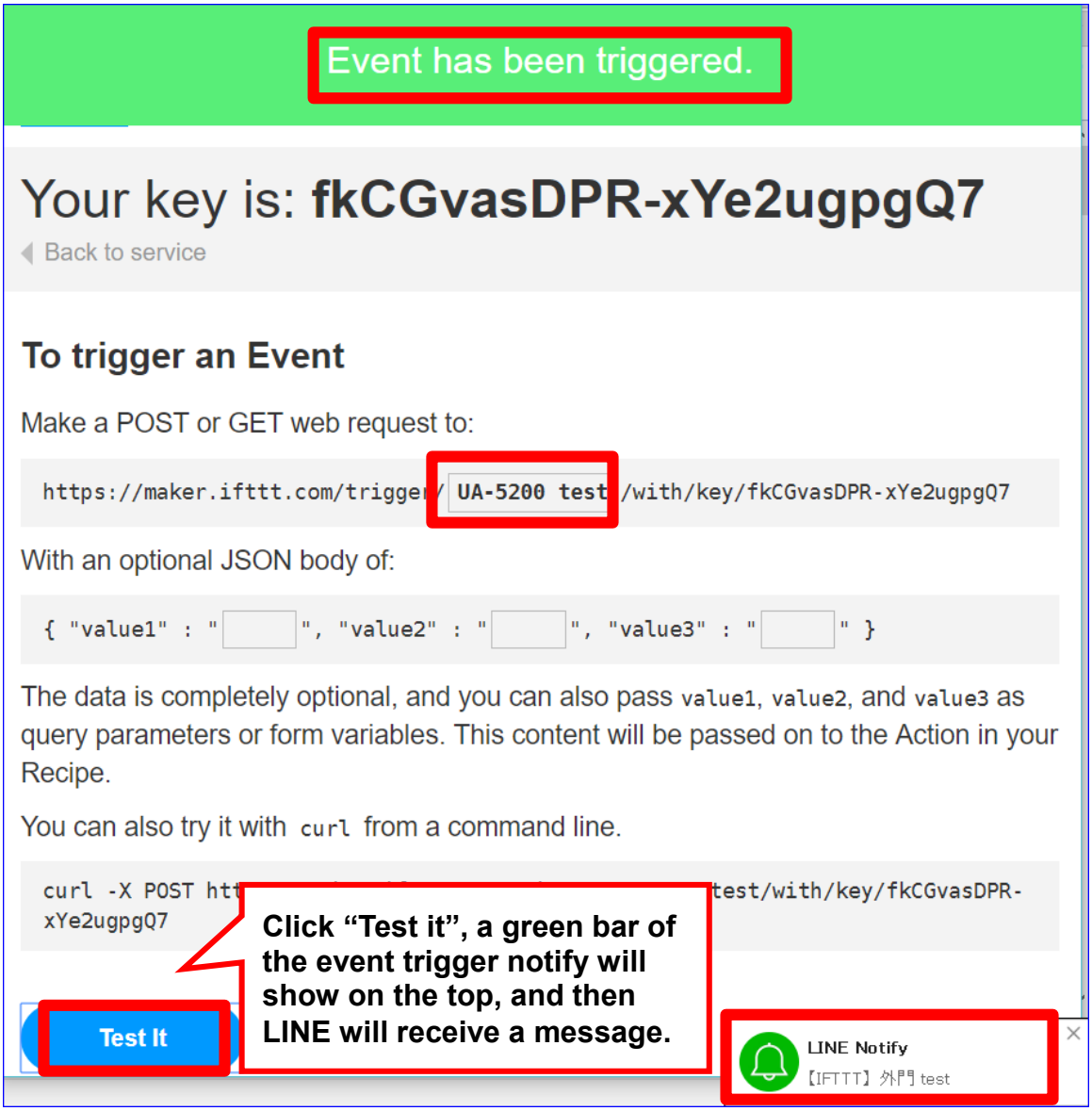
3. Test the Event

After giving the event information (This example: “UA test”), click the “Test it” on the bottom to test the message sending (This example: LINE).

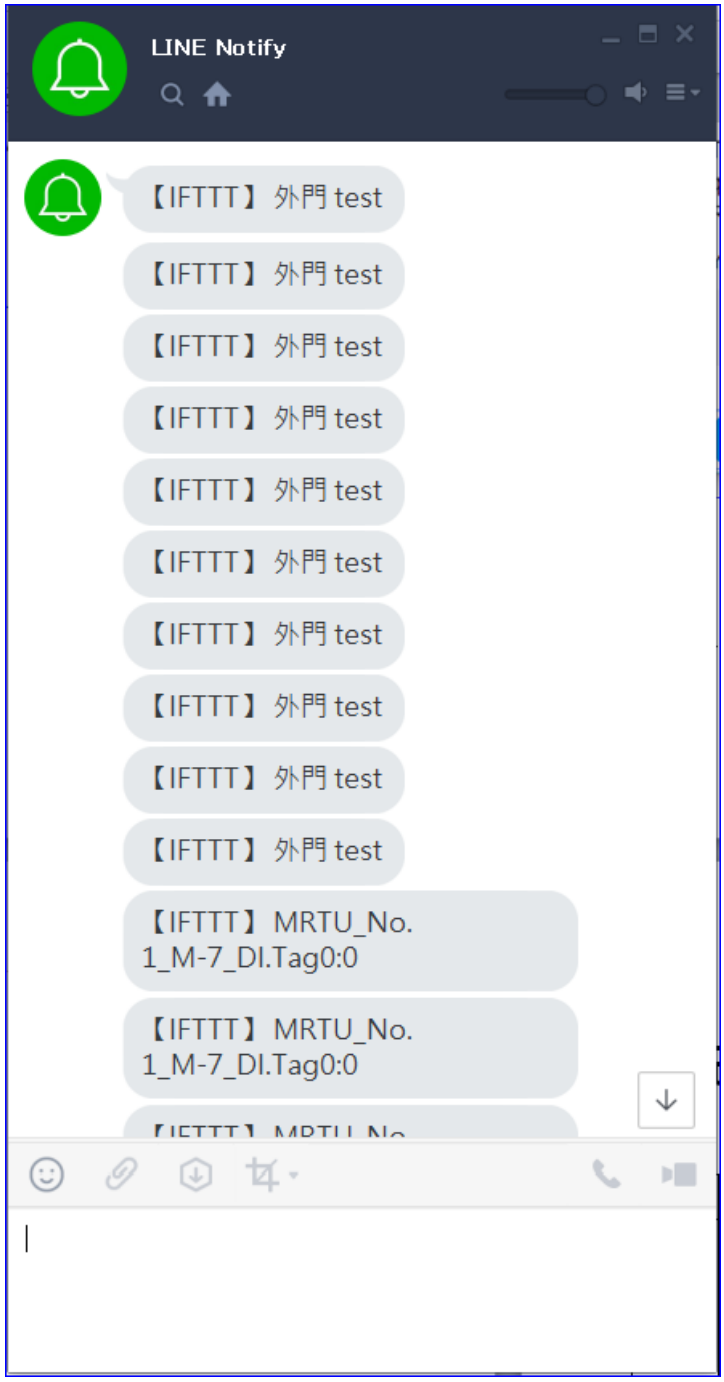
The result and descriptions:

After click the “Test it” button, the green trigger bar shows on the top.

And then, the LINE receives a message “[IFTTT] 外門 test” (This notify is received on the PC version LINE. See the bottom right corner.) It means the IFTTT website setting is successful. The mobile phone is also received the LINE APP message. (See the next page)



The LINE APP messages received on the mobile phone:



Appendix D. LED Indicators

LED indicators of UA Series provide a very convenient way of status indications for faster, easier diagnostics.

UA-5231 / UA-5231M		
LED	LED Status	Module Status
PWR	Green: ON	The module is powered on.
RUN	Red: Blinking	The module is functioning normally. When power on UA, please wait about one minute for completing the start-up procedure until the "RUN" LED starts blinking.
L1	OFF	Function reserved
L2	Green: Blinking, then ON, and then OFF.	When install or update the Firmware, L2 will blinking. When complete the process, L2 will steady ON to notify user and then OFF.

UA-5231M-3GWA / UA-5231M-4GE / UA-5231M-4GC		
LED	LED Status	Module Status
PWR	Green: ON	The module is powered on.
RUN	Red: Blinking	The module is functioning normally. When power on UA, please wait about one minute for completing the start-up procedure until the "RUN" LED starts blinking.
3G	Green: ON	The modem is functioning normally, and SIM card inside.
	OFF	The modem is not functioning, or no SIM card inside.
4G	Green Light Flash: ON for 2 seconds, OFF for 1 sec, and flashing alternately.	The modem is functioning normally, and the SIM card inside.
	Green Light Flash: ON for 1 second, OFF for 2 secs, flashing alternately, or OFF .	The modem is not functioning, no SIM card inside, or the PIN is still locked.
	Green Light Flash: Quickly	Data is transmitting.
L1	OFF	Function reserved
L2	Green: Blinking, then ON, and then OFF.	When install or update the Firmware, L2 will blinking. When complete the process, L2 will steady ON to notify user and then OFF.

UA-2241M		
LED	LED Status	Module Status
PWR	Green: ON	The module is powered on.
RUN	Red: Blinking	The module is functioning normally. When power on UA, please wait about one minute to complete the start-up procedure until the "RUN" LED starts blinking.
L1 / L3	OFF	Function reserved
L2	Yellow: Blinking, then ON, and then OFF.	When install or update the Firmware, L2 will blinking. When complete the process, L2 will steady ON to notify user and then OFF.

Appendix E. Changing OS Password

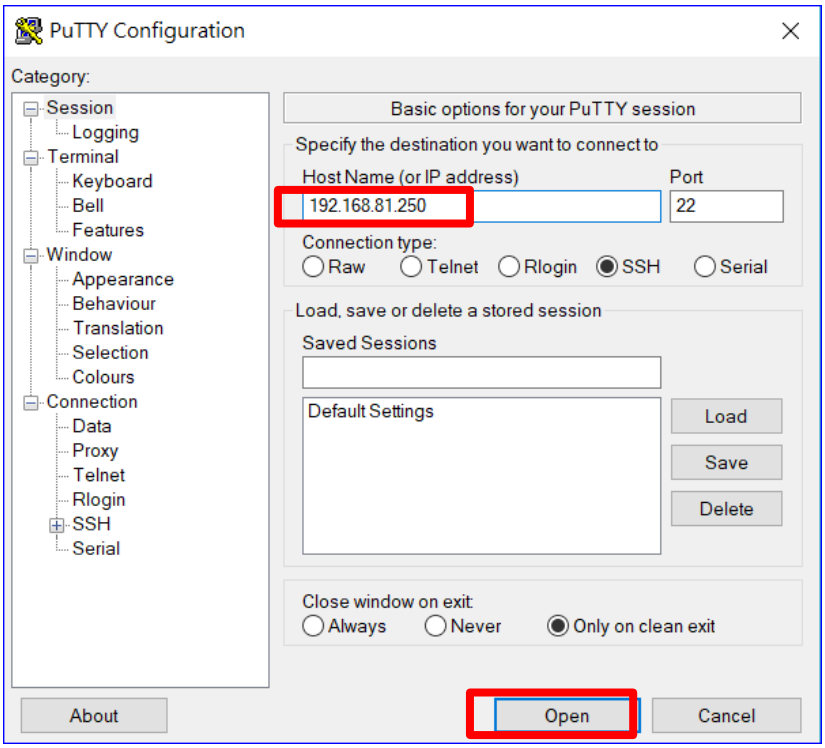
This appendix introduces the method to change the password of OS account.

After first login, change your password as soon as possible for your system safety.

Steps to change the password of OS account:

1. **Login UA via a connection software (Ex: Putty, here use Putty as a sample.)**

   Connect UA with the PC (Refer to Chap. 2 and 3 Quick Start 1 and 2). Open the Putty, enter the IP address of UA, and click “Open” button.

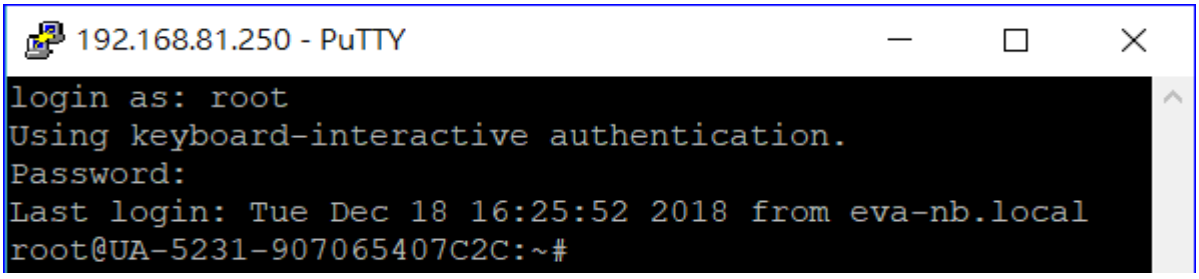


   In the Login screen of Putty, enter the login-name and password of UA:

   Default Login Name: **root**

   Default Password: **icpdas** (The password will not show up when typing)

   When it show up “root@UA-5231..... :~#”, it is login successfully.



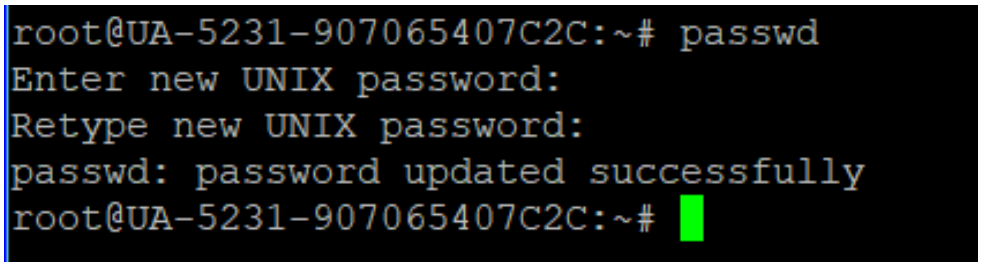
2. **Use command “passwd” to change the OS password of UA**

a. Type “passwd” and press Enter.

b. Type new password after the words “(Enter new UNIX password:)”.

c. Type the password again.

When “passwd: password updated successfully” show up, the changing is successful. Please login the UA with the new password next time.

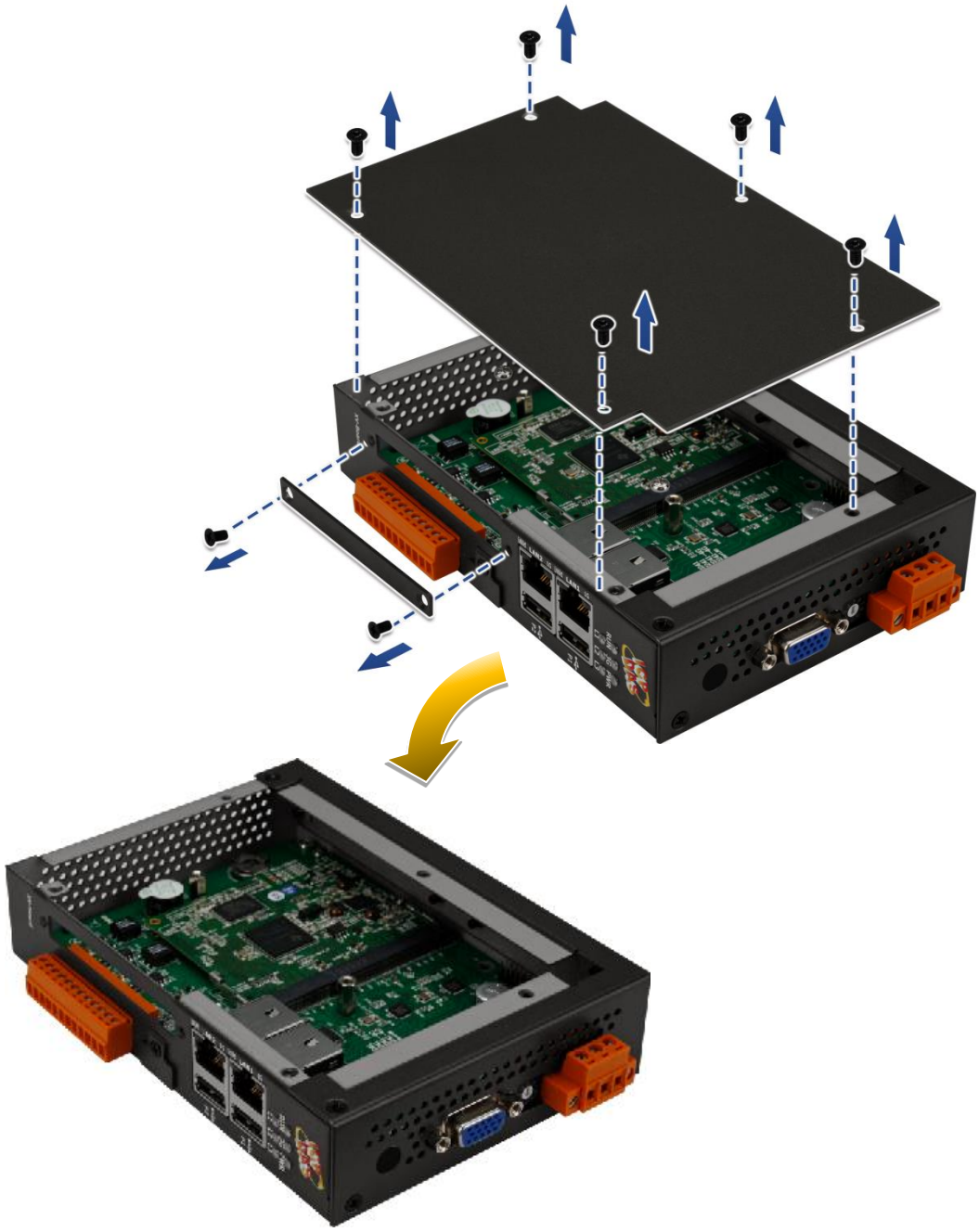


Appendix F. Mounting the XV-board for UA-2241M

UA-2241M has one I/O expansion bus to expand the functions by insert one optional XV-board. The supported XV-boards are listed after the mounting steps below.

Mounting Steps:

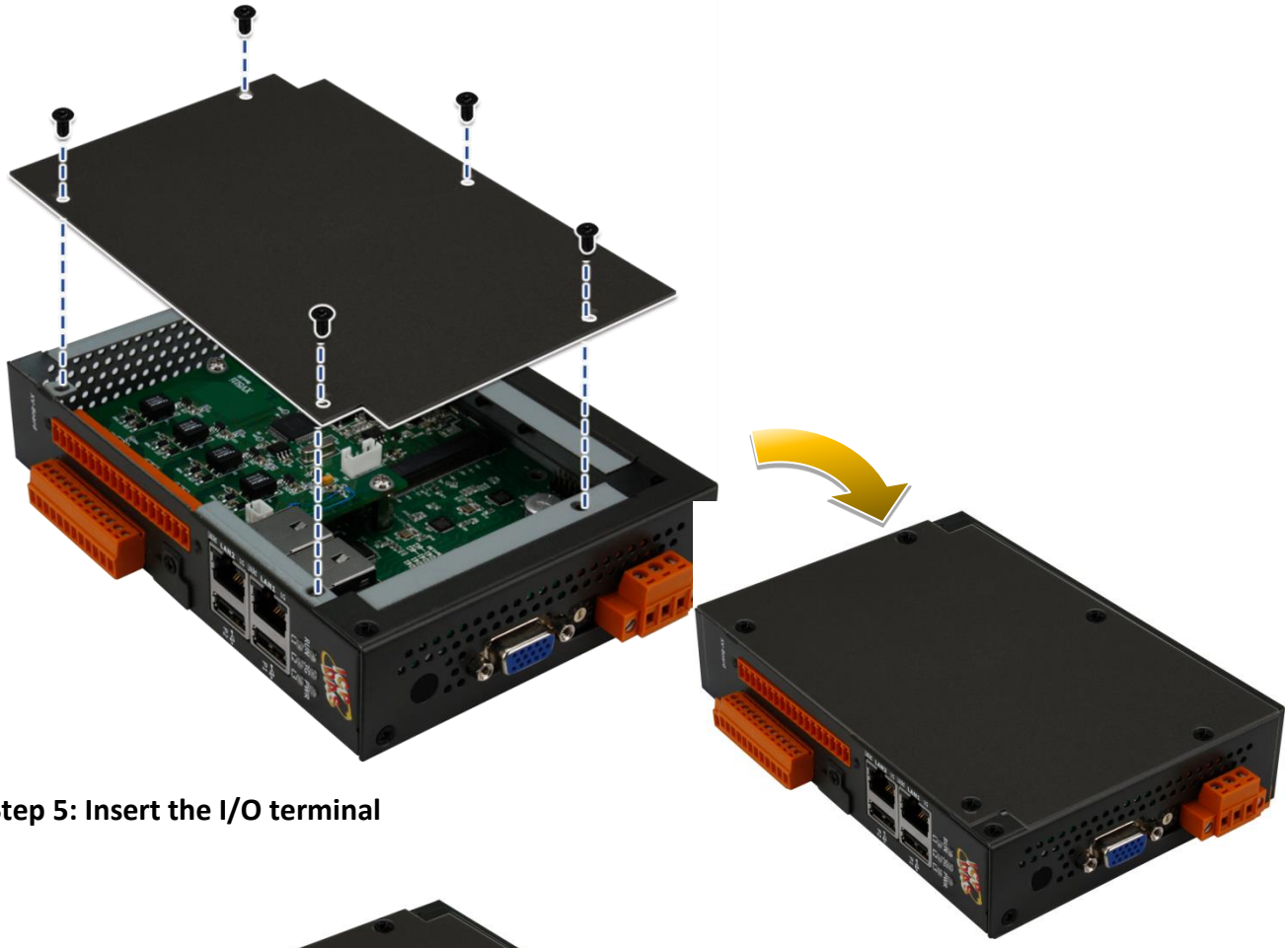
Step 1: Remove stripped screws and then remove the cover



Step 2: Hold the XV-board vertically and align the socket, and then carefully press the XV-board onto the I/O expansion bus

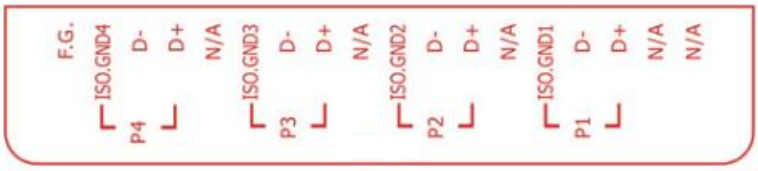
Step 3: Fasten the XV-board using the screws supplied

Step 4: Close the cover and then fasten the screws



Step 5: Insert the I/O terminal

Supported XV-board for UA-2241M:

Model	Descriptions
XV511i	4-channel RS-485 I/O Expansion Board (RoHS) PIN Assignment:  P4: ttyO9 P3: ttyO8 P2: ttyO7 P1: ttyO6

For more detailed information about the XV-board specifications, please refer to the XV-Board Modules.
http://www.icpdas.com/root/product/solutions/hmi_touch_monitor/touchpad/xv-board_selection.html