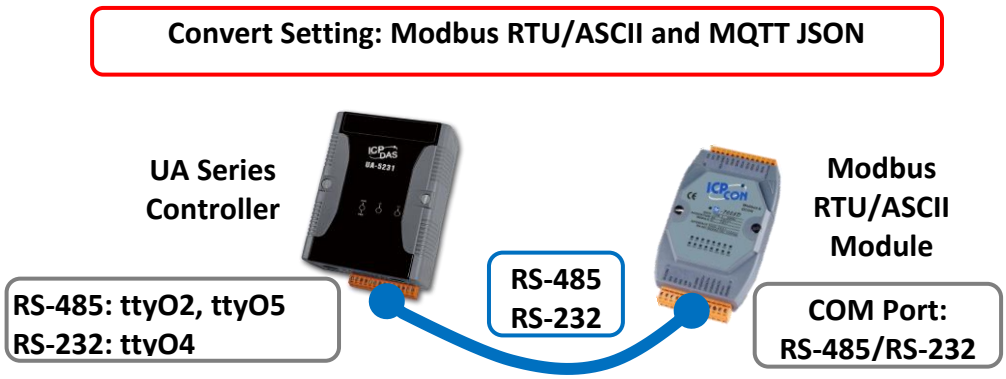
FAQ-CNV-06: UA Web UI Function Wizard – Module Communication Conversion - How to Convert Modbus RTU / MQTT JSON or Modbus ASCII / MQTT JSON ? (Use M-7055D)

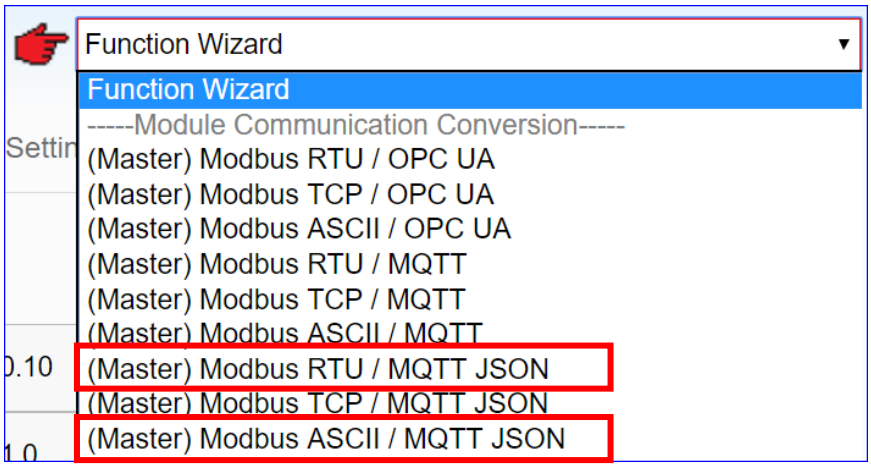
Modbus / MQTT JSON Conversion include the conversion of **MQTT** and **Modbus** RTU / TCP / ASCII three protocols. With the **MQTT Service** function, users can set the **MQTT client** to publish the message to the specified broker or subscribe the topic, and combine several messages that converted in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

- **Convert Setting: Modbus RTU / ASCII and MQTT JSON**



Note: The hardware/network connection methods please see the UA Manual 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.



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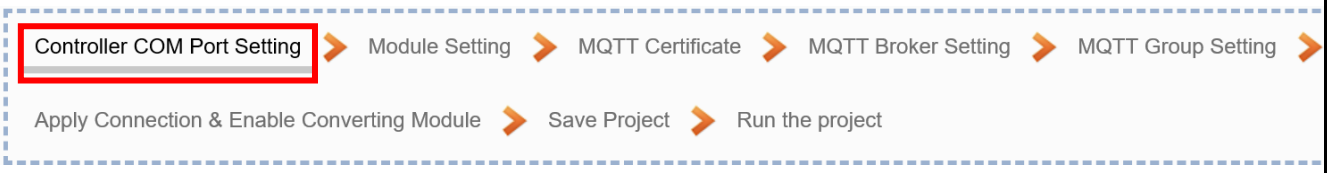
[Step Box]:

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.

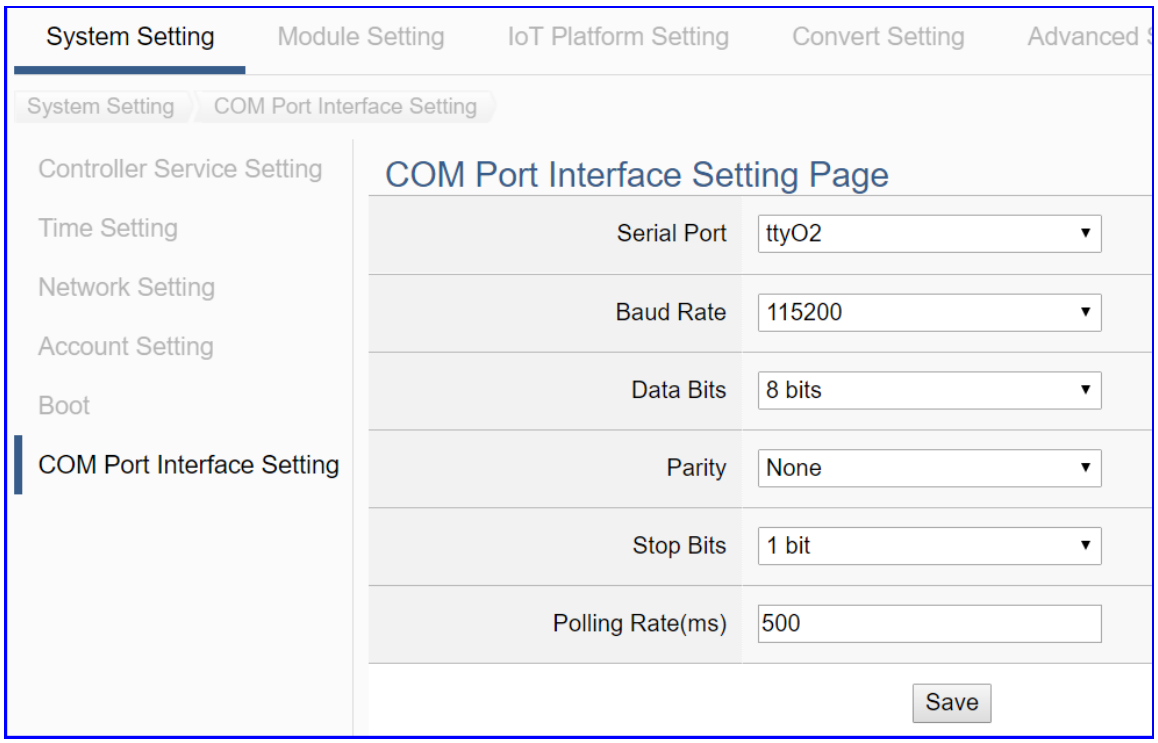


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Step 1. Controller COM Port Setting



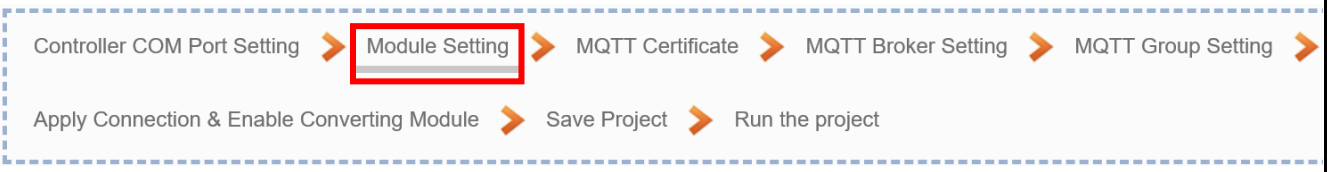
This page allows display and set the COM port interface of the controller for the RS-232/RS-485 serial communication. The user can find the default communication values of our I/O modules from the module CD, manual or I/O Module website.



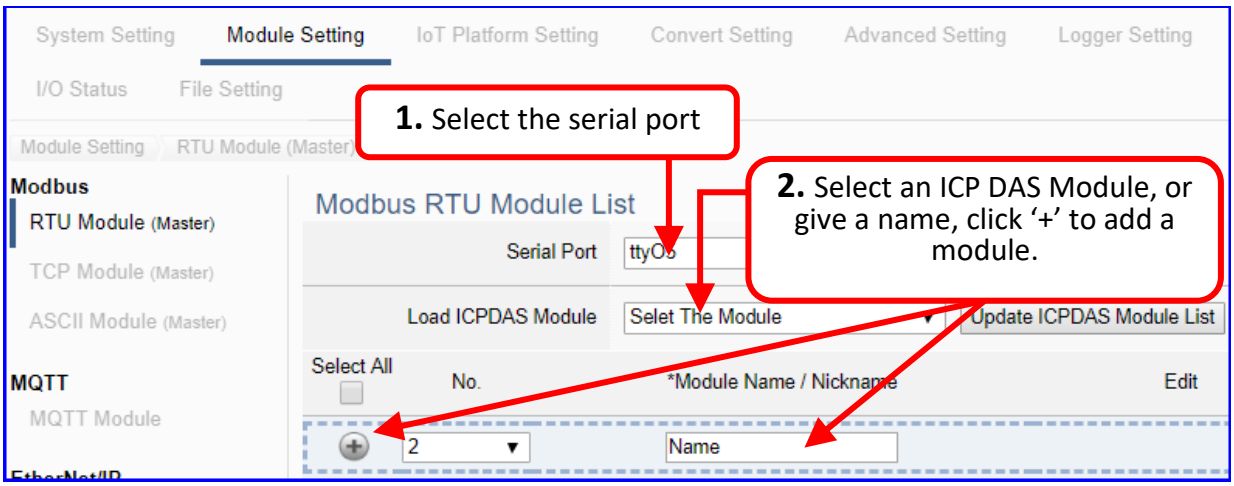
COM Port Interface Setting Page	
Serial Port	Choose the serial port of UA controller that links with the I/O module. ttyO2: RS-485 ; ttyO4: RS-232 ; ttyO5: RS-485
Baud Rate	Choose a baud rate to communicate with the module: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. The UA controller and 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.

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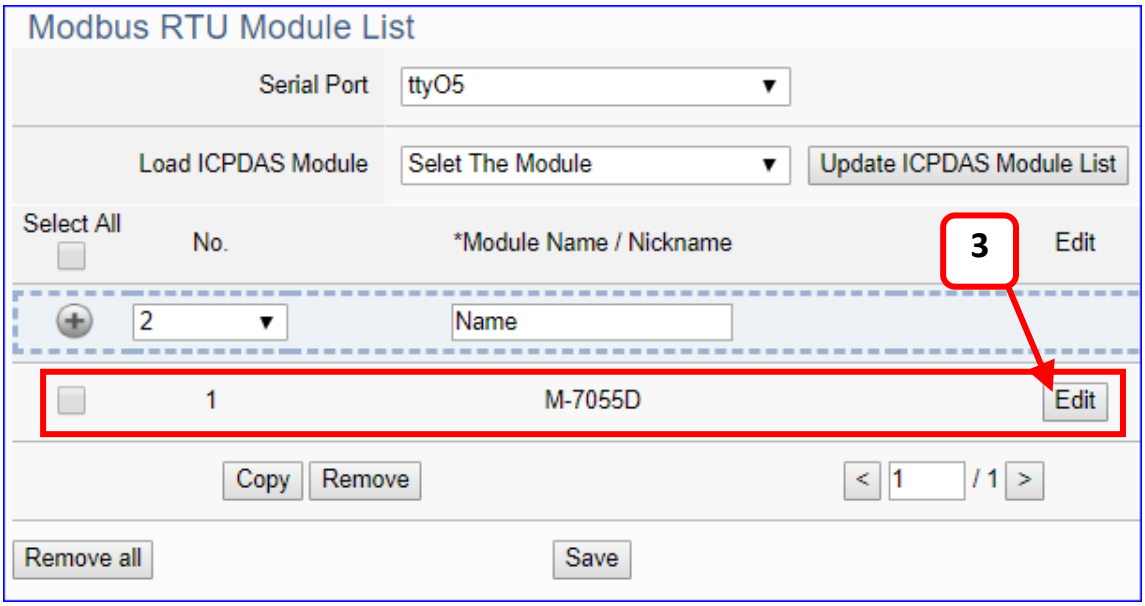
Step 2. Module Setting



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.



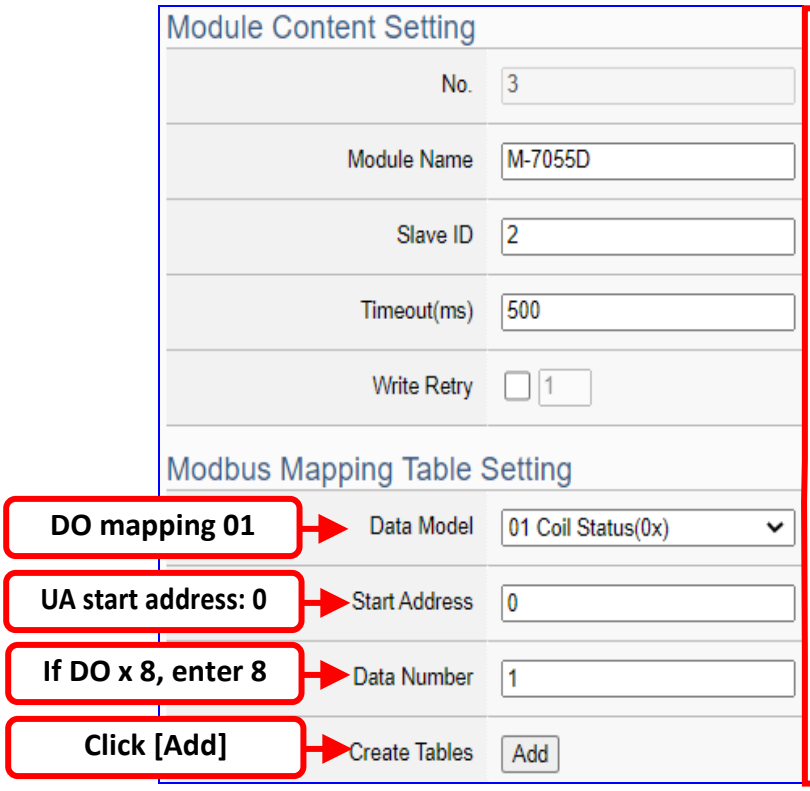
Add a module (No.: 1, Name: M-7055D) as below, and then click [Edit] button to enter the "Module Content Setting" page.



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.

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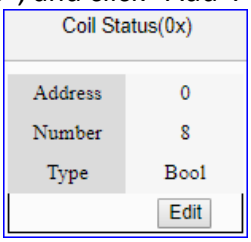
[**Module Content Setting**] page can set up the module and the Modbus address mapping table:



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".

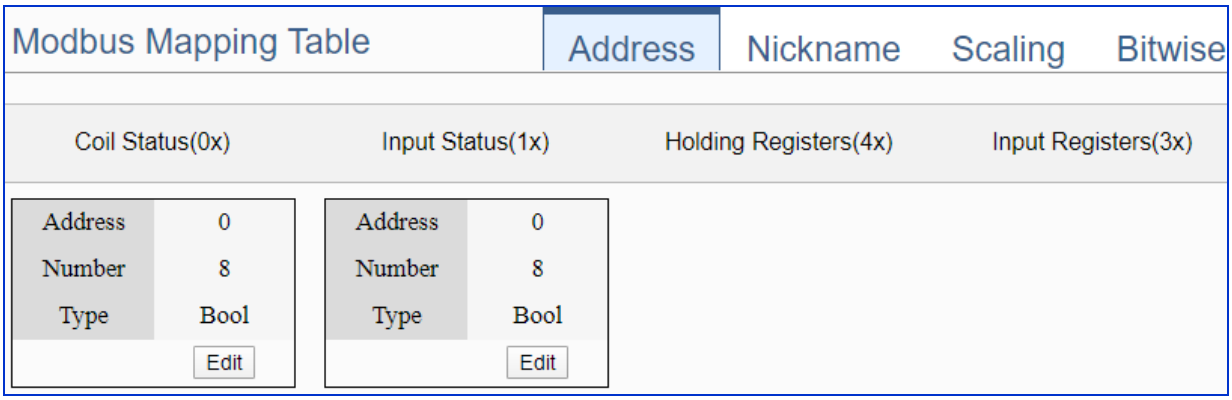


Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Slave ID	Set the module Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Write Retry	Check to retry writing again when there is no response after the set time is up, and it can be set up to retry 3 times
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.

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

Address:
Display and edit the Modbus Mapping Table.

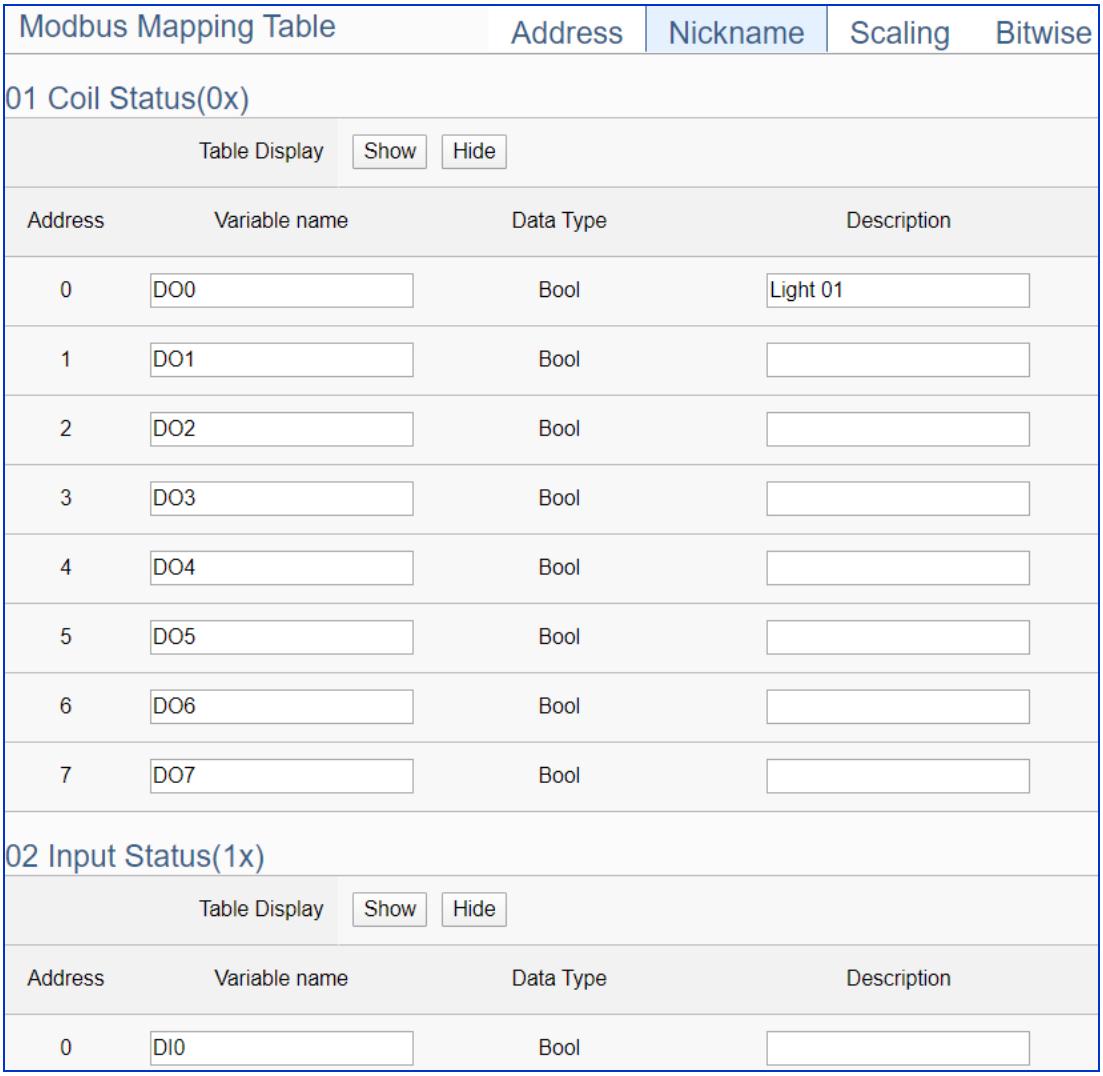


If user selects ICP DAS module, the system will auto set up the Modbus Mapping Table. If not, user needs to check the module Modbus address or I/O number from the module user manual.

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.

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Nickname:
Setting the variable nickname and description.



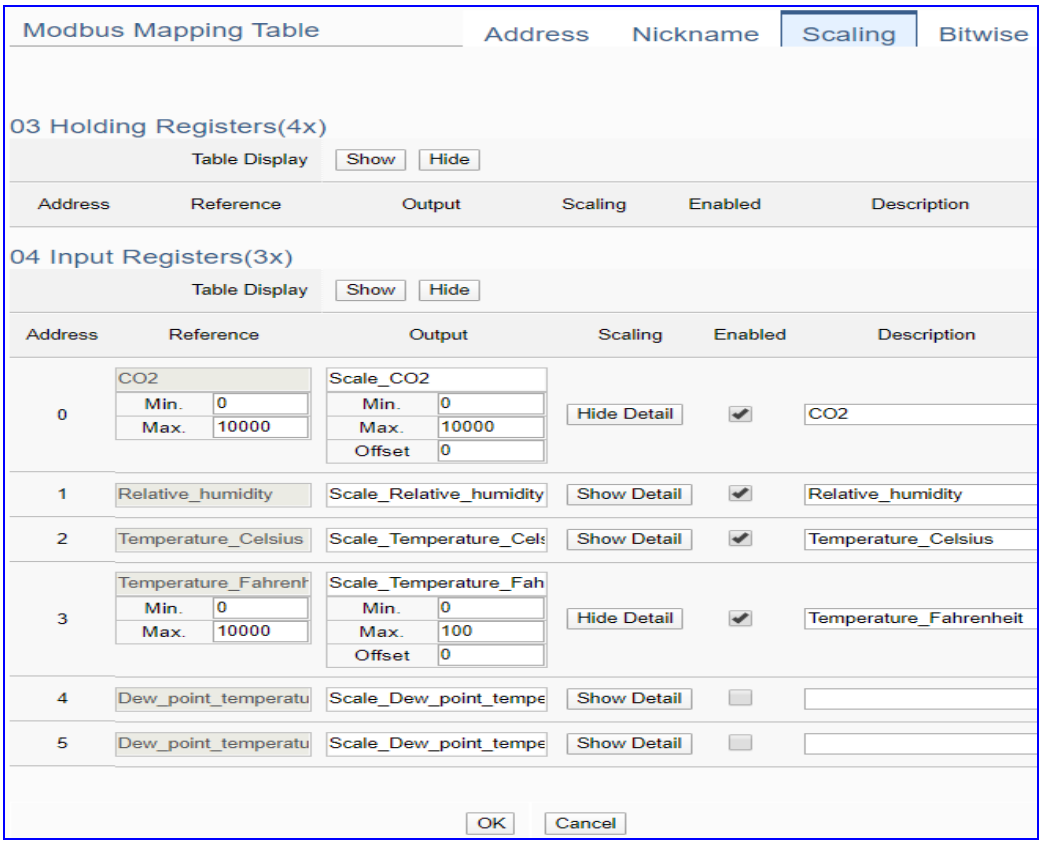
Modbus Mapping Table – Nickname Setting	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, 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.

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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.



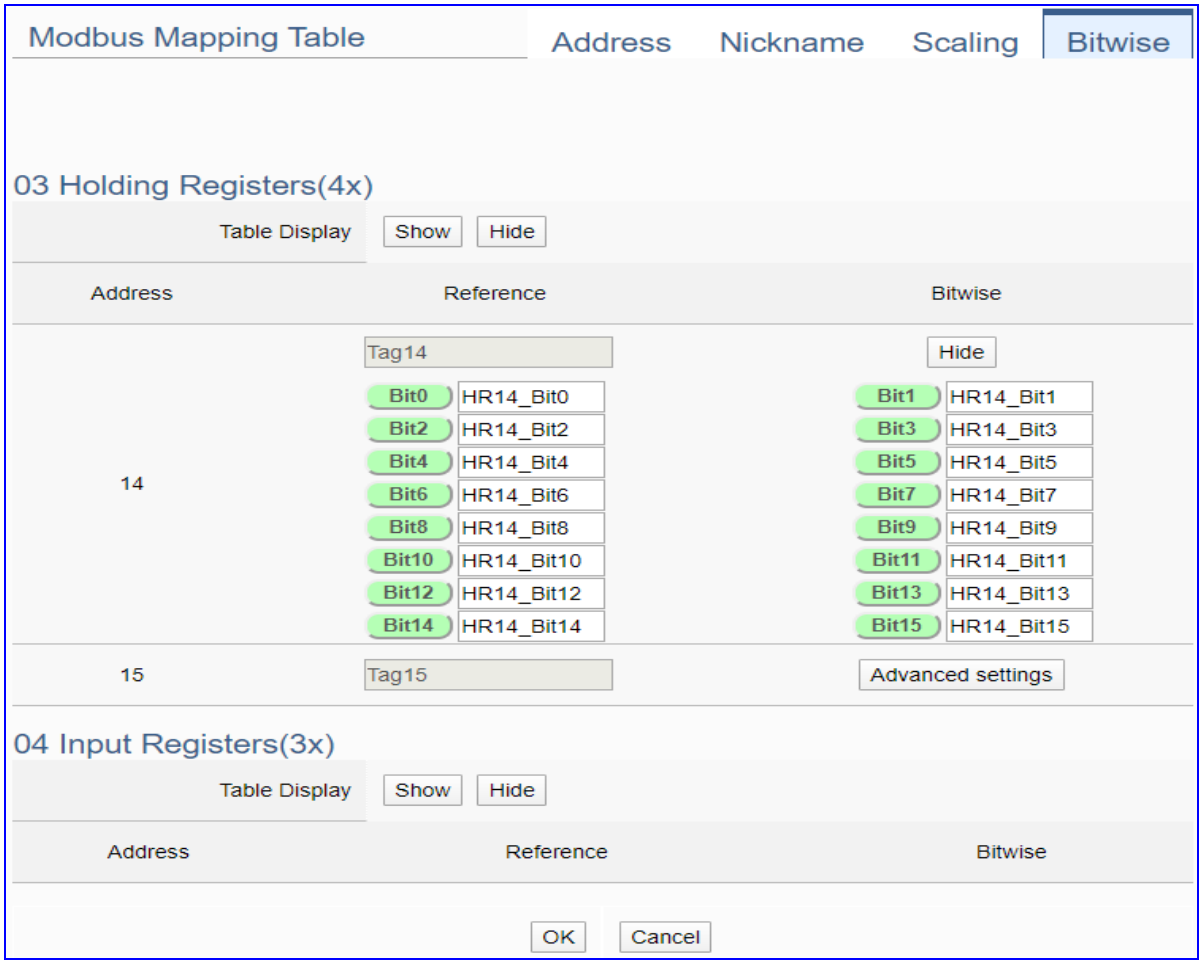
Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Scaling do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI**
Table Display	Click [Show] to display all fields, click [Hide] to hide some 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.

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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.



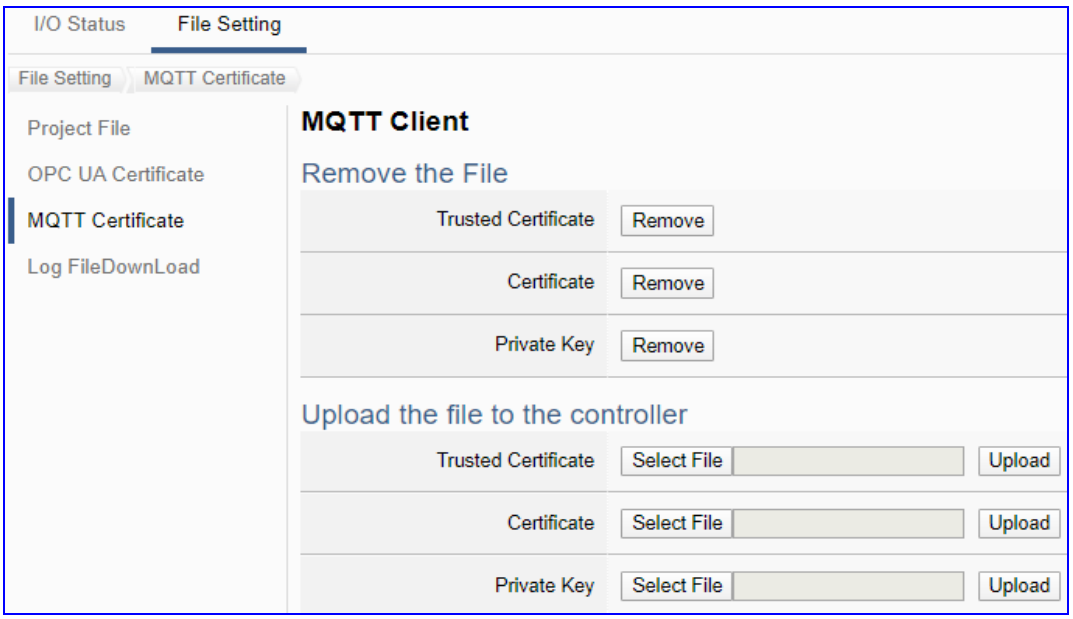
Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO** & **02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float** & **64-bit Double data types.**
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.

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Step 3. MQTT Certificate



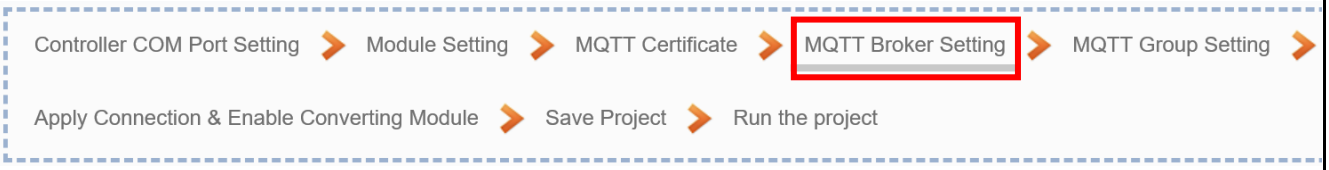
The **[MQTT Certificate]** is for setting up security communications to upload the **MQTT Trusted Certificate, Certificate and Private Key**. The users upload the file to the UA controller according to the type of obtained certificate. If you want to perform **Broker authentication**, you need to upload 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.

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Step 4. MQTT Broker Setting

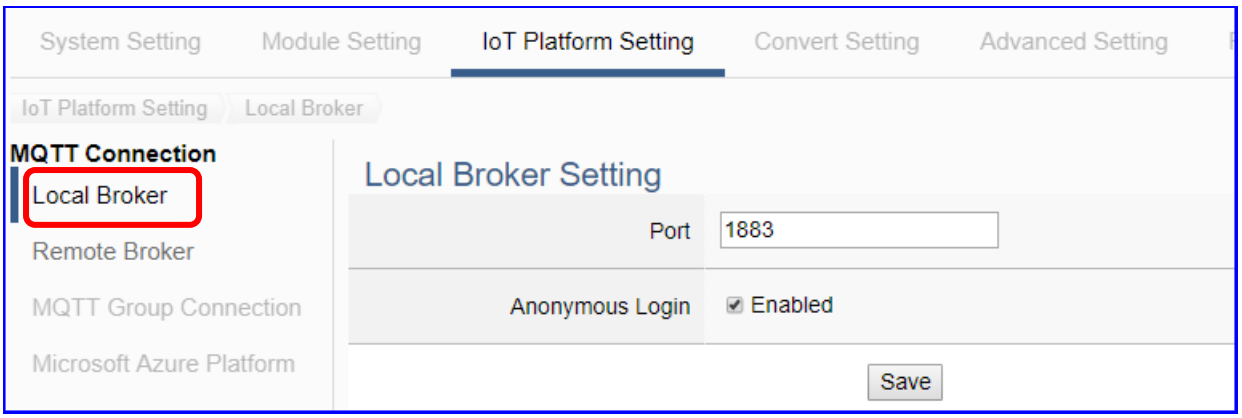


Click the next step, and enter the **Step 4 [MQTT Broker Setting]** of the UI setting.
This page is for setting the IoT platform and the MQTT Broker connection, e.g. the local or remote broker, port, login information, etc.

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

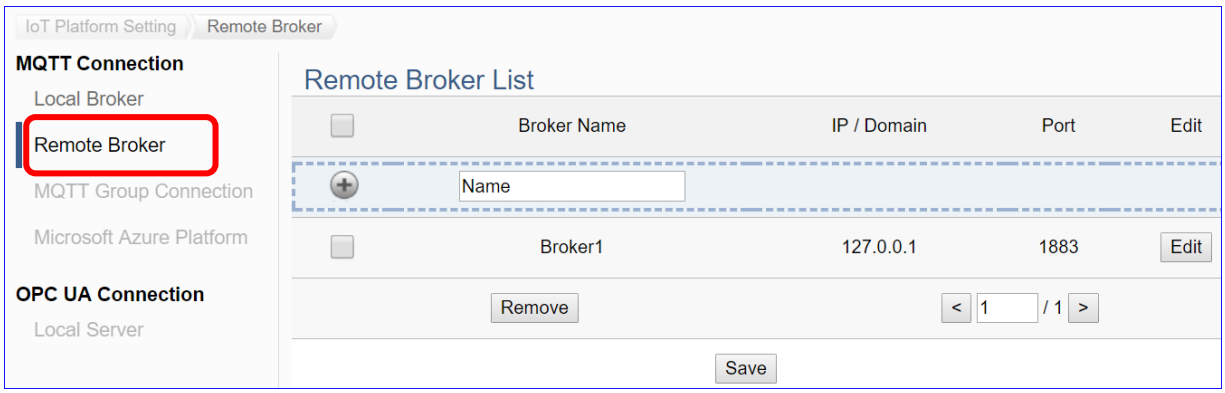


MQTT Connection > Local Broker Setting	
Port	The COM port of the Local MQTT Broker. System default: 1883
Anonymous Login	Check to allow anonymous login. Default: Check.
Save	Click to save the setting of this page.

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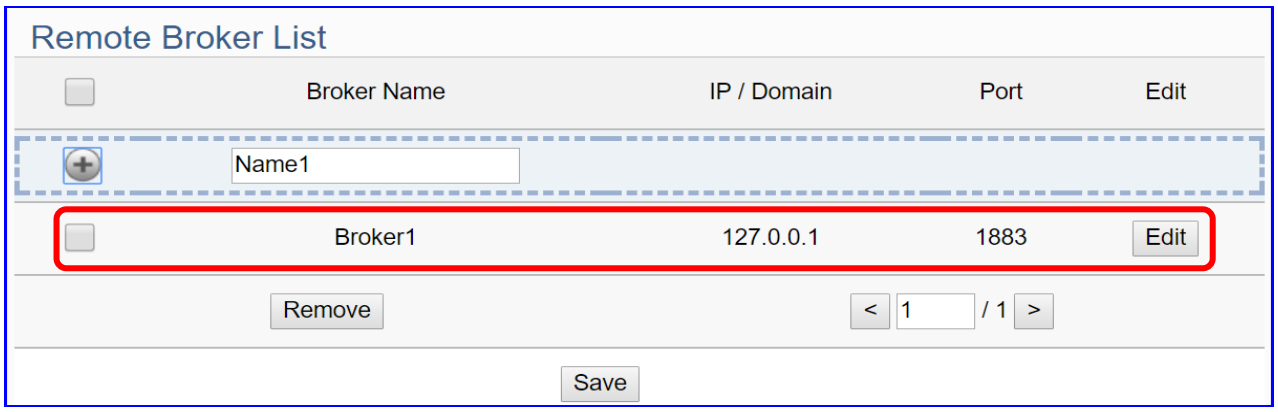
If users apply a remote Broker, the screen will as follow.

Remote Broker:



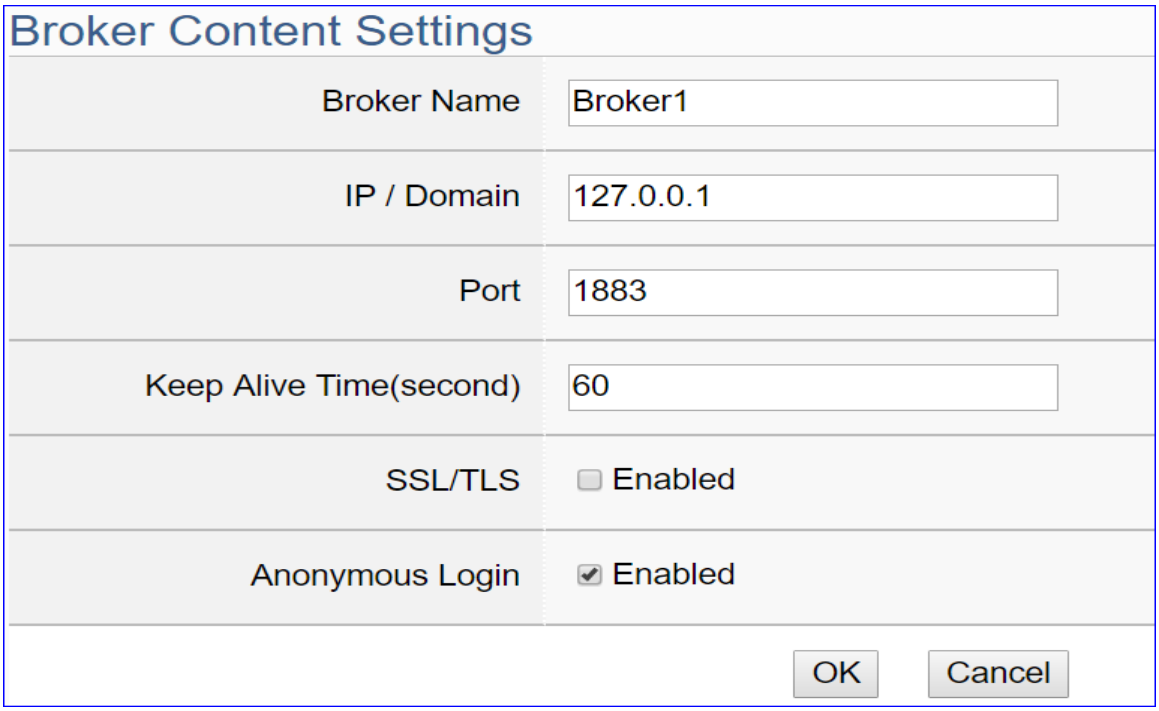
MQTT Connection > Remote Broker List	
Broker Name	The name of the remote MQTT Broker. User can define the name, e.g. Broker1. Default: Name.
	Click to add a new remote Broker.
Save	Click to save the settings of this page.

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.

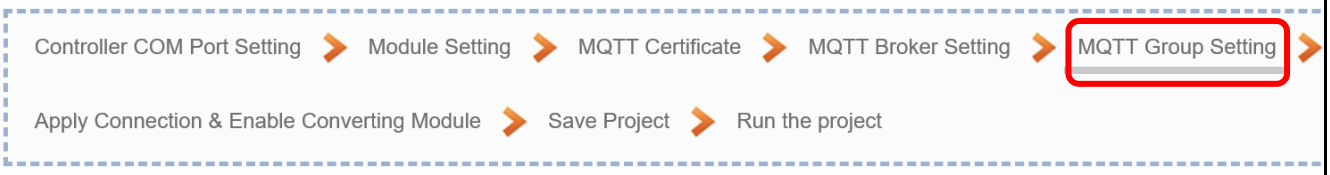
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MQTT Connection > Remote Broker > Broker Content Settings	
Broker Name	The name of the remote MQTT Broker. (Editable)
IP / Domain	The IP address of the remote Broker. Default: 127.0.0.1
Port	The COM port of the remote Broker. Default: 1883
Keep Alive 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.

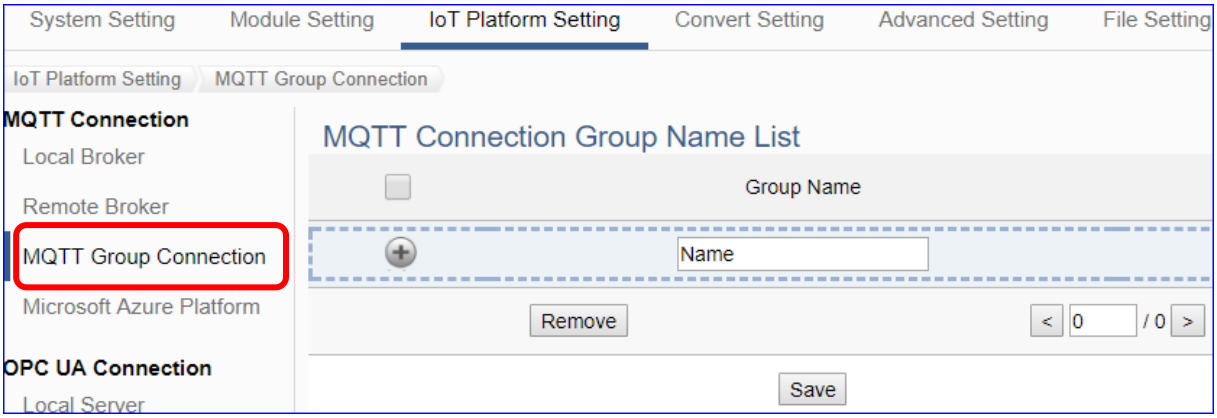
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Step 5. MQTT Group Setting



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.

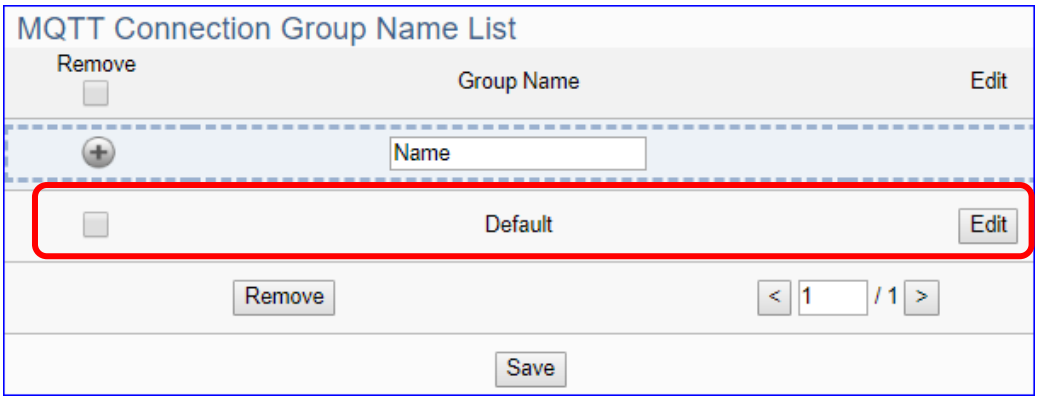
We select the “Modbus RTU (or ASCII) / MQTT JSON” conversion at the beginning, so this step will auto enter the [**MQTT Connection > MQTT Group Connection**] page of IoT Platform Setting. The “Step Box” will prevent from selecting the wrong platform.



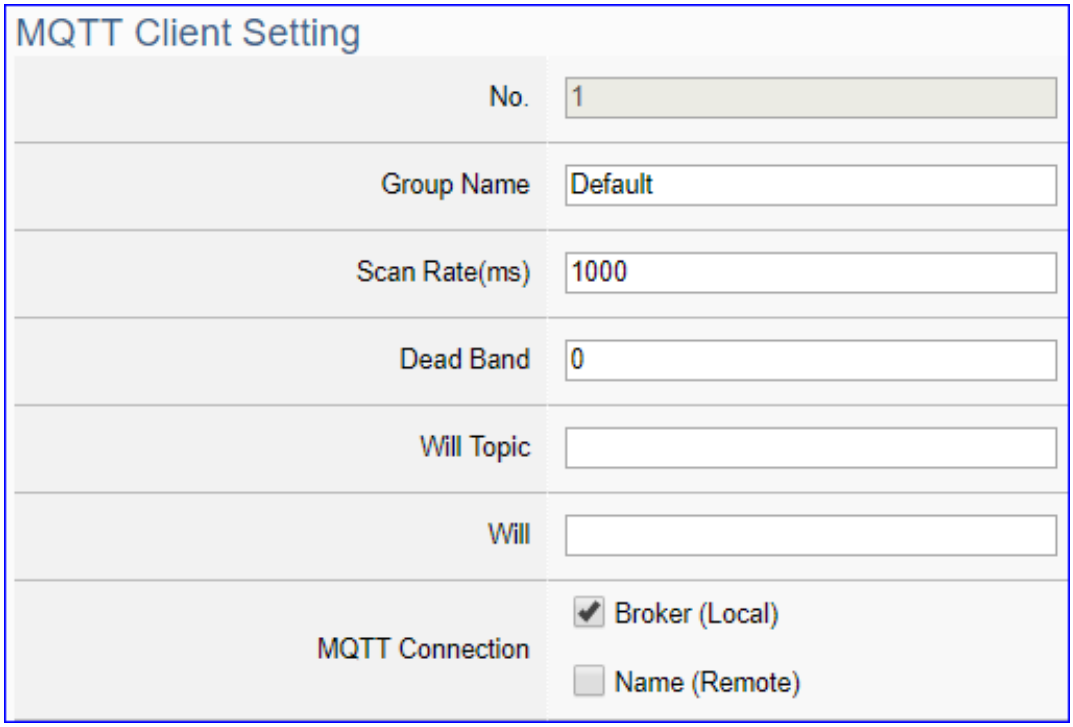
MQTT Connection > MQTT Group Connection > MQTT Connection Group Name List	
Group Name	MQTT group name, user can define, e.g. Group1. Default: Name.
⊕	Click add button to add a new MQTT Group.
< 1 / 1 >	The page number of the group list: Current page / Total pages. Click < or > to go to the previous or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

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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.

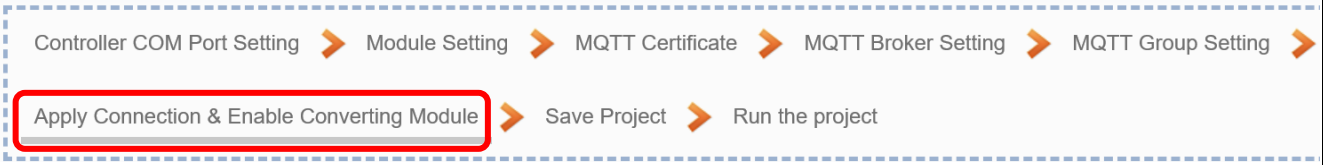
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IoT Platform Setting > MQTT Group Connection > MQTT Client Setting – Publish & Subscribe	
Publish Topic	The topic of sending/publishing data message.
Publish Qos	The publish Qos (Quality of Service) levels. Default: 2 0: Delivering a message at most 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.

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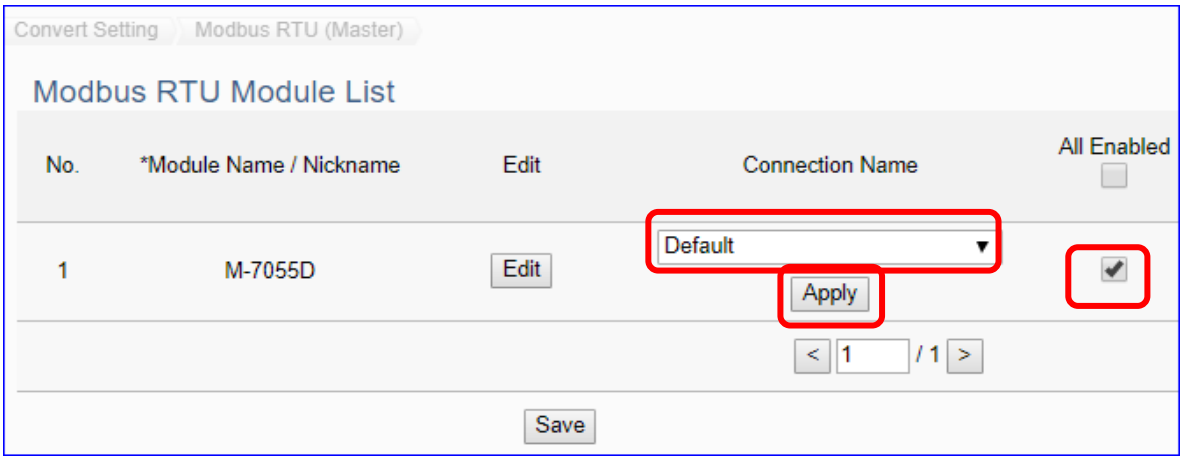
Step 6. Apply Connection & Enable Converting Module



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.

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

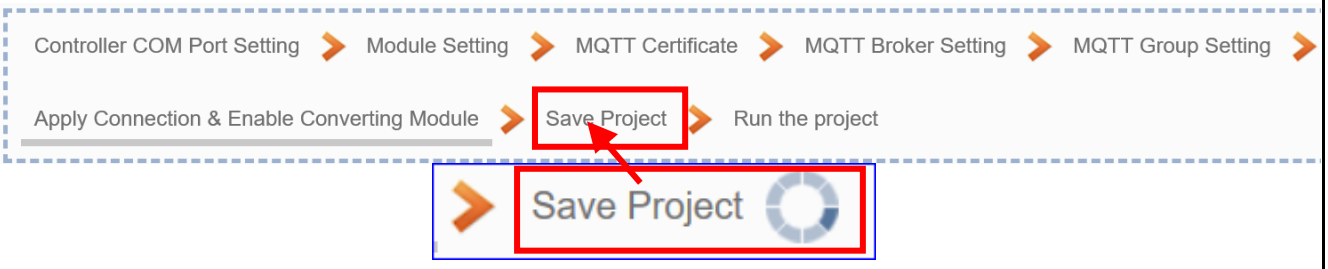


Convert Setting > MQTT JSON > Modbus RTU (Master) Module List	
No.	The module number in the module list (Not editable here)
*Module Name	The module name set in the module list (Not editable here)
Connection Name	Select a group connection name, and then click [Apply].
All Enabled	Check [All Enabled] box 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.

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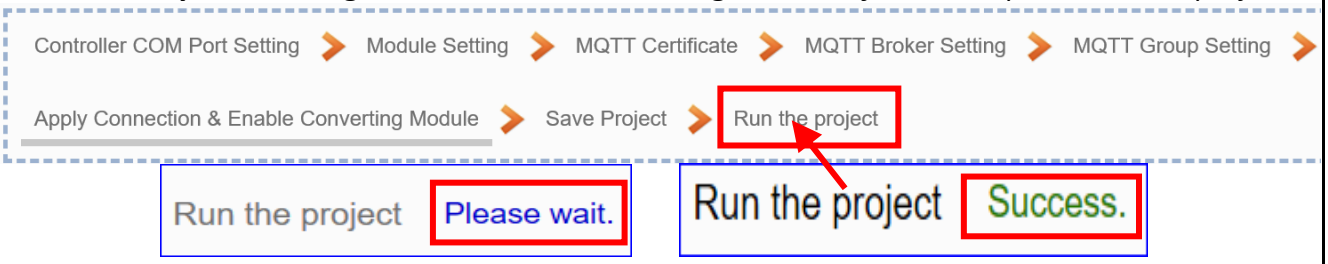
Step 7. Save Project

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.



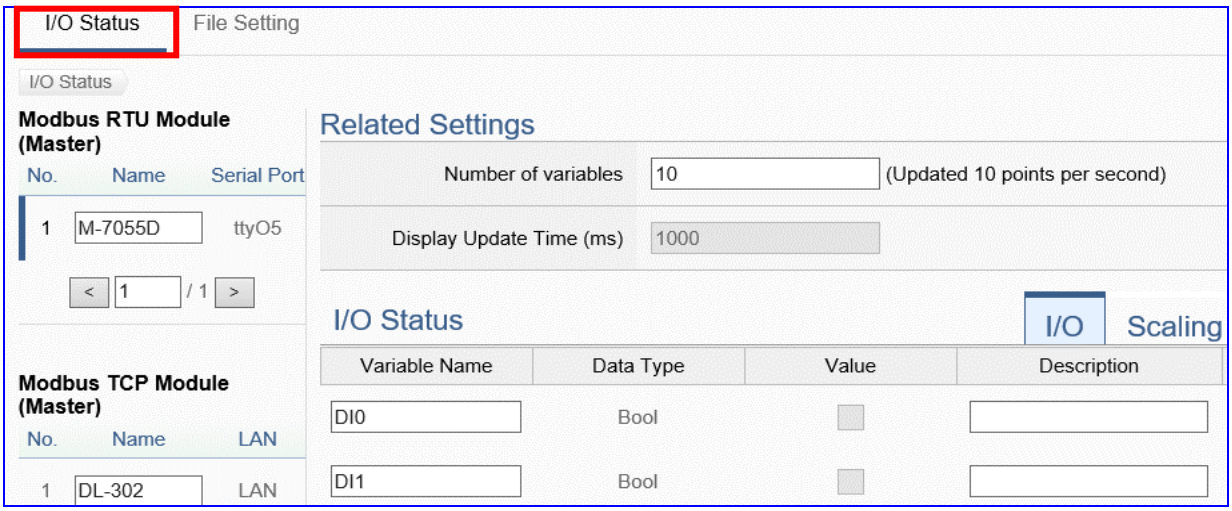
Step 8. Run the Project

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 UA Manual CH4 and CH5.



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