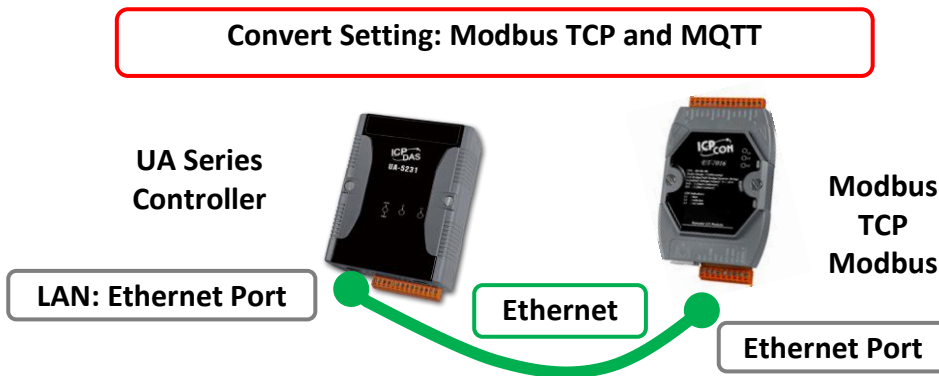


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## FAQ-CNV-04: UA Web UI Function Wizard – Module Communication Conversion - How to Convert Modbus TCP / MQTT ? (Use DL-302)

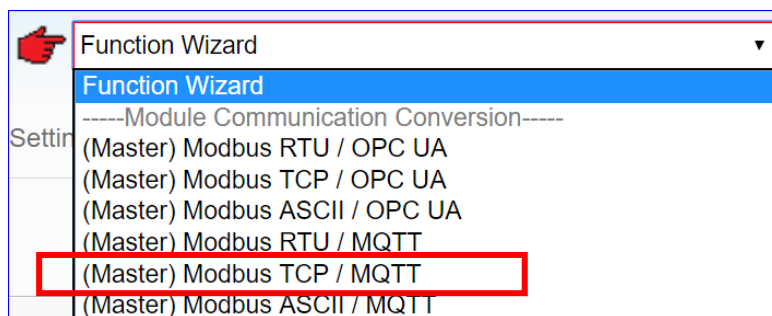
**Modbus / MQTT Conversion** include the conversion of MQTT and Modbus RTU / TCP / ASCII three protocols. With the MQTT Service function, users can set the MQTT client to publish the message to the specified broker or subscribe the topic, and so to read and write the single channel of the Modbus device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

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



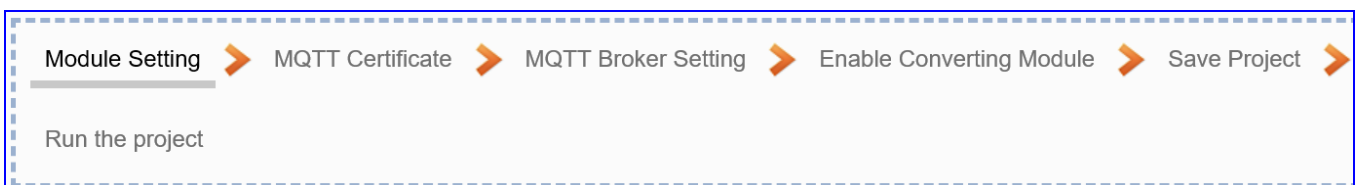
**Note:** The hardware/network connection methods please see the UA Manual [Chapter 2](#).

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.



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● **Step 1. Module Setting**

Module Setting > MQTT Certificate > MQTT Broker Setting > Enable Converting Module > Save Project >

Run the project

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.

System Setting | **Module Setting** | IoT Platform Setting | Convert Setting | Advanced Setting | Logger Setting

I/O Status | File Setting

Module Setting | TCP Module (Master)

**1. Ethernet port: LAN**

**2. Select an ICP DAS module or give a name, click "+\" to add a module.**

Modbus

- RTU Module (Master)
- TCP Module (Master)**
- ASCII Module (Master)

MQTT

- MQTT Module

EtherNet/IP

Modbus TCP Module List

LAN | LAN

Load ICPDAS Module | Select The Module | Update ICPDAS Module List

Select All	No.	*Module Name / Nickname	Edit
<input type="checkbox"/>	2	Name	

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

Modbus TCP Module List

LAN | LAN

Load ICPDAS Module | Select The Module | Update ICPDAS Module List

Select All	No.	*Module Name / Nickname	Edit
<input type="checkbox"/>	2	Name	
<input type="checkbox"/>	1	DL-302	<b>3</b> Edit

Copy Remove < 1 / 1 >

Remove all Save

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 to set up IP and the Modbus address mapping table.

**Module Content Setting**

No.

Module Name

IP

Port

Slave ID

Timeout(ms)

Polling Rate(ms)

**Modbus Mapping Table Setting**

Data Model

Start Address

Data Number

Create Tables

**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	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) <div style="border: 1px solid black; padding: 2px; width: fit-content; margin-top: 5px;"> 01 Coil Status(0x)  02 Input Status(1x)  03 Holding Registers(4x)  04 Input Registers(3x) </div>
Start Address	The start address of the Modbus command. <b>Note:</b> 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.

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**Address:**

Display and edit the Modbus Mapping Table.

Modbus Mapping Table		Address	Nickname	Scaling	Bitwise
Coil Status(0x)	Input Status(1x)	Holding Registers(4x)	Input Registers(3x)		
				Address	0
				Number	6
				Type	Short
				<input type="button" value="Edit"/>	

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. <b>Note:</b> 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	Address	Nickname	Scaling	Bitwise
<b>01 Coil Status(0x)</b>				
Table Display <input type="button" value="Show"/> <input type="button" value="Hide"/>				
Address	Variable name	Data Type	Description	
<b>02 Input Status(1x)</b>				
Table Display <input type="button" value="Show"/> <input type="button" value="Hide"/>				
Address	Variable name	Data Type	Description	
<b>03 Holding Registers(4x)</b>				
Table Display <input type="button" value="Show"/> <input type="button" value="Hide"/>				
Address	Variable name	Data Type	Swap	Description
<b>04 Input Registers(3x)</b>				
Table Display <input type="button" value="Show"/> <input type="button" value="Hide"/>				
Address	Variable name	Data Type	Swap	Description
0	<input type="text" value="CO2"/>	Short	<input type="checkbox"/>	<input type="text"/>
1	<input type="text" value="Relative_humidity"/>	Short	<input type="checkbox"/>	<input type="text"/>
2	<input type="text" value="Temperature_Celsius"/>	Short	<input type="checkbox"/>	<input type="text"/>
3	<input type="text" value="Temperature_Fahrenheit"/>	Short	<input type="checkbox"/>	<input type="text"/>
4	<input type="text" value="Dew_point_temperature_"/>	Short	<input type="checkbox"/>	<input type="text"/>

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.

Modbus Mapping Table – Scaling	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address <b>Scaling do not support 01 Coil Status(0x):DO &amp; 02 Input Status(1x):DI</b>
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	Address	Nickname	Scaling	Bitwise
----------------------	---------	----------	---------	---------

03 Holding Registers(4x)

Table Display	<input type="button" value="Show"/>	<input type="button" value="Hide"/>
---------------	-------------------------------------	-------------------------------------

Address	Reference	Bitwise
---------	-----------	---------

04 Input Registers(3x)

Table Display	<input type="button" value="Show"/>	<input type="button" value="Hide"/>
---------------	-------------------------------------	-------------------------------------

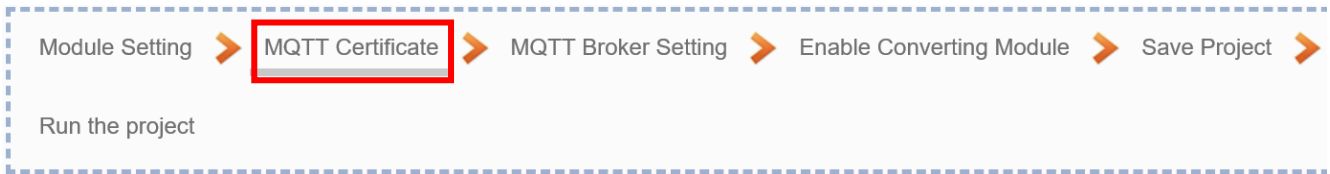
Address	Reference	Bitwise
0	<input type="text" value="CO2"/> <input type="button" value="Bit0"/> <input type="text" value="aa"/> <input type="button" value="Bit2"/> <input type="text" value="bb"/> <input type="button" value="Bit4"/> <input type="text"/> <input type="button" value="Bit6"/> <input type="text"/> <input type="button" value="Bit8"/> <input type="text"/> <input type="button" value="Bit10"/> <input type="text"/> <input type="button" value="Bit12"/> <input type="text"/> <input type="button" value="Bit14"/> <input type="text"/>	<input type="button" value="Hide Detail"/> <input type="button" value="Bit1"/> <input type="text"/> <input type="button" value="Bit3"/> <input type="text"/> <input type="button" value="Bit5"/> <input type="text"/> <input type="button" value="Bit7"/> <input type="text"/> <input type="button" value="Bit9"/> <input type="text"/> <input type="button" value="Bit11"/> <input type="text"/> <input type="button" value="Bit13"/> <input type="text"/> <input type="button" value="Bit15"/> <input type="text"/>

**Modbus Mapping Table – Bitwise**

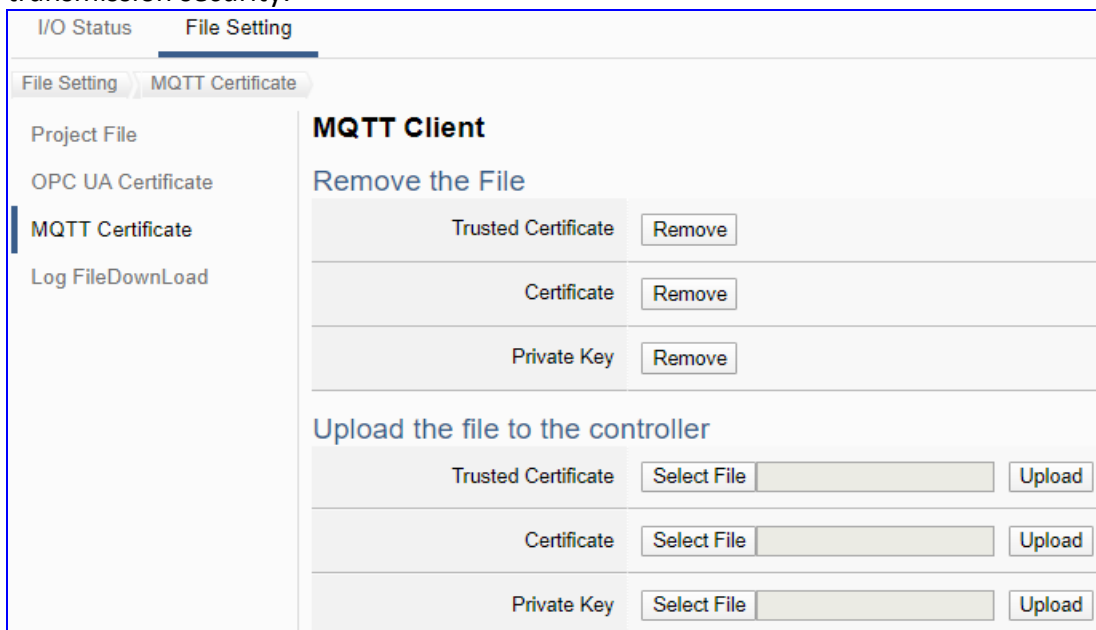
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address <b>Bitwise do not support 01 Coil Status(0x):DO &amp; 02 Input Status(1x):DI</b> <b>Bitwise do not supports 32-bit Float &amp; 64-bit Double data types.</b>
Table Display	Click [Show] 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 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.

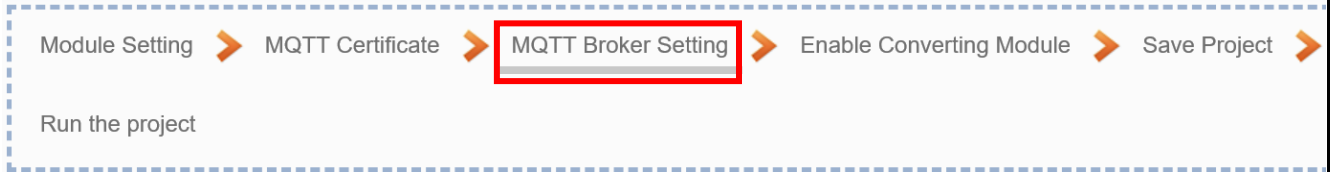


File Setting > MQTT Certificate > Upload the file to the controller	
Trusted Certificate	<p><b>Select File:</b> select the MQTT Trusted Certificate file of the device.</p> <p><b>Upload:</b> upload the MQTT Trusted Certificate file to the UA controller.</p> <ul style="list-style-type: none"> <li>File format must be <b>PEM</b>. Extension name must be <b>“pem / cer / crt”</b>.</li> <li>If select a wrong file, the system will show an error message.</li> </ul> <p style="text-align: center;">Trusted Certificate    Select File    Certificate_192.168.255.10    Certificate type is wrong.    Upload</p>
Certificate	<p><b>Select File:</b> select the MQTT Certificate file of the device.</p> <p><b>Upload:</b> upload the MQTT Certificate file to the UA controller.</p> <ul style="list-style-type: none"> <li>File format must be <b>PEM</b>. Extension name must be <b>“pem / cer / crt”</b>.</li> <li>If select a wrong file, the system will show an error message.</li> </ul>
Private Key	<p><b>Select File:</b> select the MQTT Private Key of the device.</p> <p><b>Upload:</b> upload the MQTT Private Key file to the UA controller.</p> <ul style="list-style-type: none"> <li>File format must be <b>PEM</b>. Extension name must be <b>“.key”</b>.</li> <li>If select a wrong file, the system will show an error message.</li> </ul>



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● **Step 3. MQTT Broker Setting**

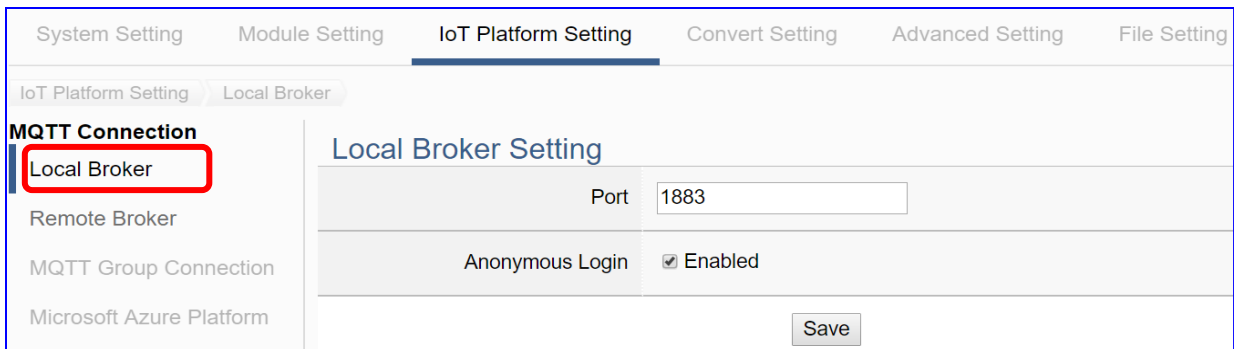


Click the next step, and enter the **Step 3 [MQTT Broker Setting]** of the UI setting. This page is for setting the IoT platform and the MQTT Broker connection, e.g. the local or remote broker, port, login information, etc.

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**

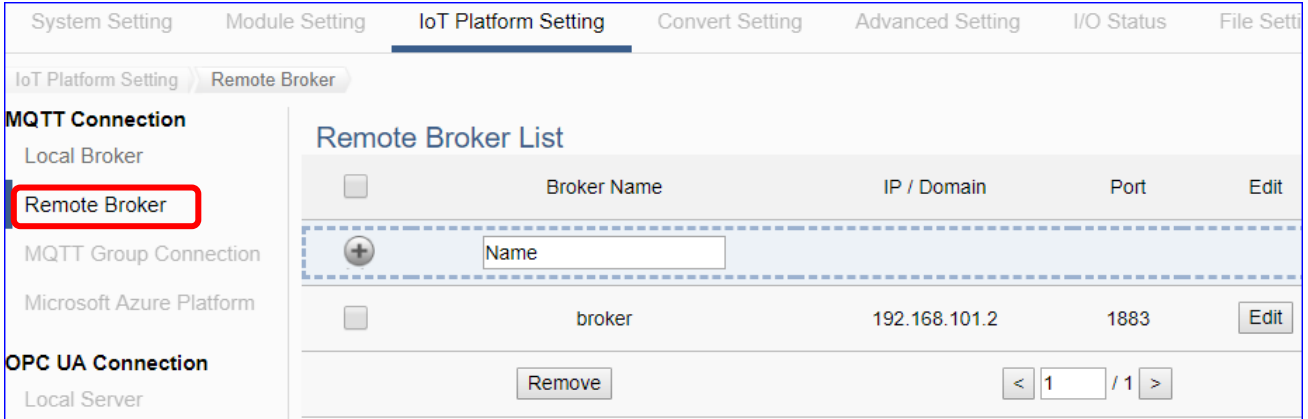


<b>MQTT Connection &gt; Local Broker Setting</b>	
Port	The COM port of the Local MQTT Broker. System default: 1883
Anonymous Login	Check to allow anonymous login. Default: Check.
Save	Click to save the setting of this page.

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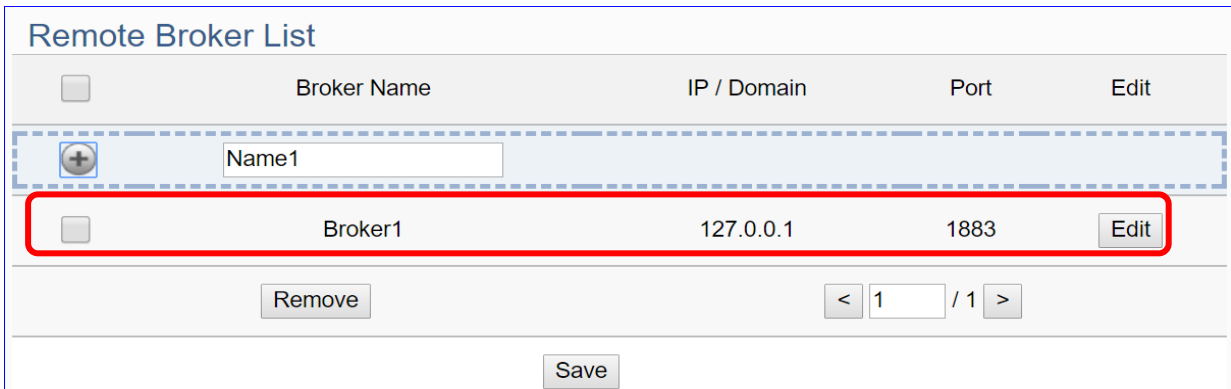
If users apply a remote Broker, the screen will as follow.

**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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### Broker Content Settings

Broker Name	<input type="text" value="Broker1"/>
IP / Domain	<input type="text" value="127.0.0.1"/>
Port	<input type="text" value="1883"/>
Keep Alive Time(second)	<input type="text" value="60"/>
SSL/TLS	<input type="checkbox"/> Enabled
Anonymous Login	<input checked="" type="checkbox"/> Enabled

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.

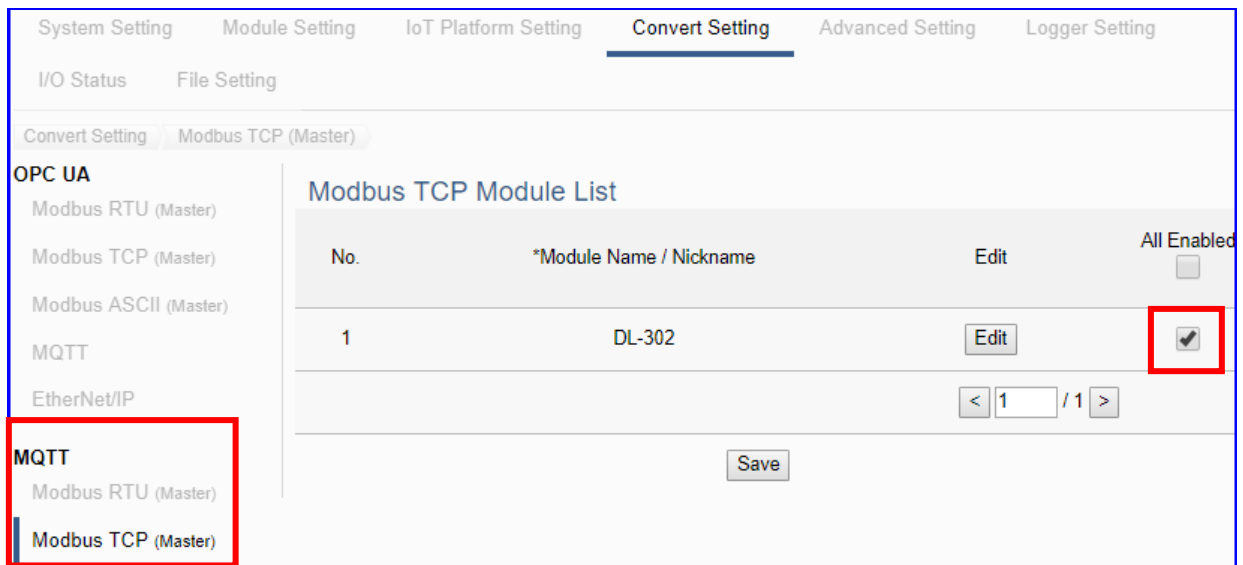
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● **Step 4. Enable Converting Module**



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.

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

### MQTT Client Setting

No.	<input style="width: 80%;" type="text" value="1"/>
Module Name	<input style="width: 80%;" type="text" value="DL-302"/>
Scan Rate(ms)	<input style="width: 80%;" type="text" value="1000"/>
Dead Band	<input style="width: 80%;" type="text" value="0"/>
Will Topic	<input style="width: 80%;" type="text"/>
Will	<input style="width: 80%;" type="text"/>
MQTT Connection	<input checked="" type="checkbox"/> Broker (Local) <input type="checkbox"/> Name (Remote)

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.

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**Publish & Subscribe**

Details

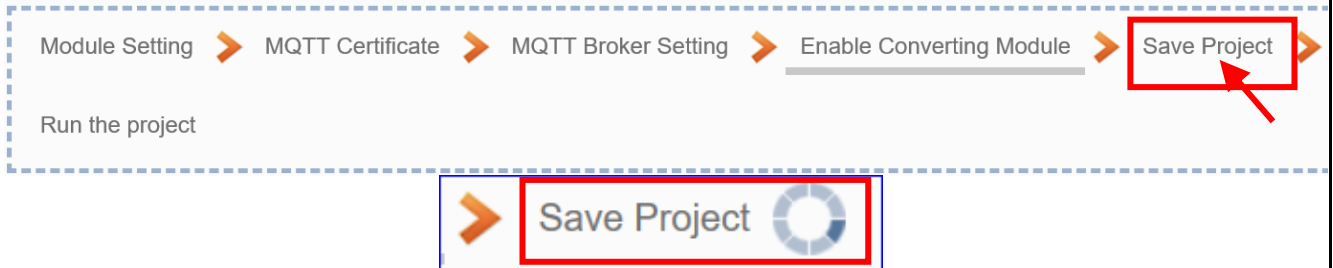
Name	Attribute	Data Type	Subscribe Topic	Subscribe QoS	Publish Topic	Publish QoS	Retain	Enabled
<input type="text" value="Tag0"/>	<input type="text" value="Read"/>	Short	<input type="text"/>	<input type="text" value="2"/>	<input type="text" value="/MTCP_No.1_DL-302/Input_Registers/Tag0/Publish"/>	<input type="text" value="2"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="text" value="Tag1"/>	<input type="text" value="Read"/>	Short	<input type="text"/>	<input type="text" value="2"/>	<input type="text" value="/MTCP_No.1_DL-302/Input_Registers/Tag1/Publish"/>	<input type="text" value="2"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="text" value="Tag2"/>	<input type="text" value="Read"/>	Short	<input type="text"/>	<input type="text" value="2"/>	<input type="text" value="/MTCP_No.1_DL-302/Input_Registers/Tag2/Publish"/>	<input type="text" value="2"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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.

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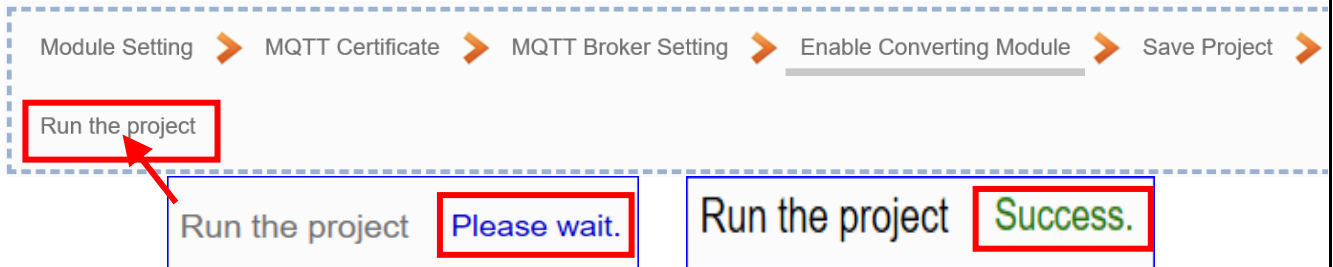
● **Step 5. Save Project**

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.

