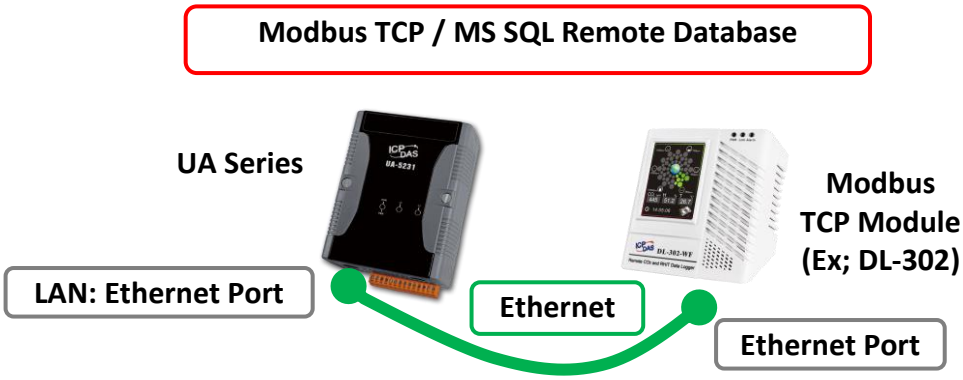
FAQ-DBL-04: UA Web UI Function Wizard – Data Log - How to set up remote database function: Modbus TCP / MS SQL ? (Use DL-302)

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.

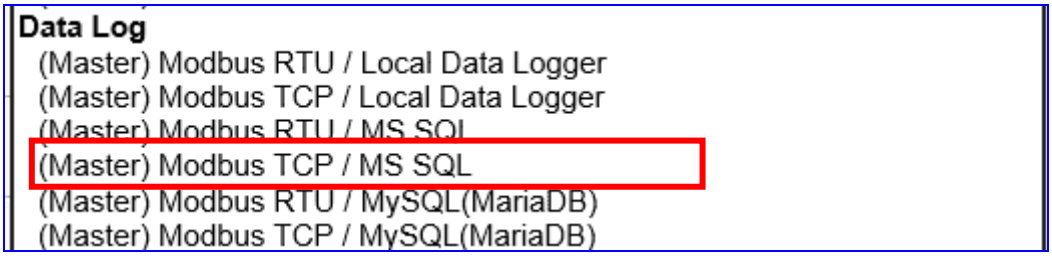
The Modbus / Remote Database settings include Modbus RTU / TCP and MQTT devices. Here will introduce **Modbus TCP** as the setting sample.

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

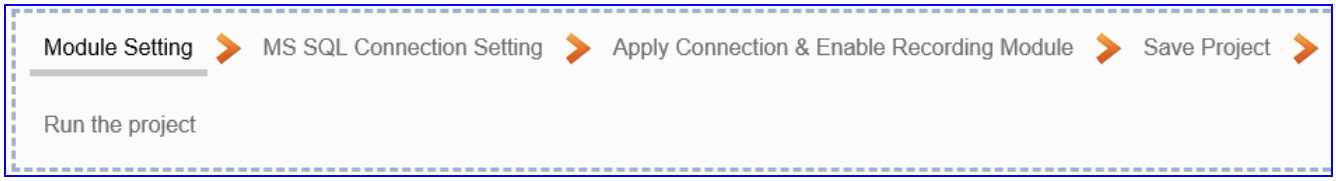


Note: The hardware/network connection methods please see the UA Manual Chapter 2.

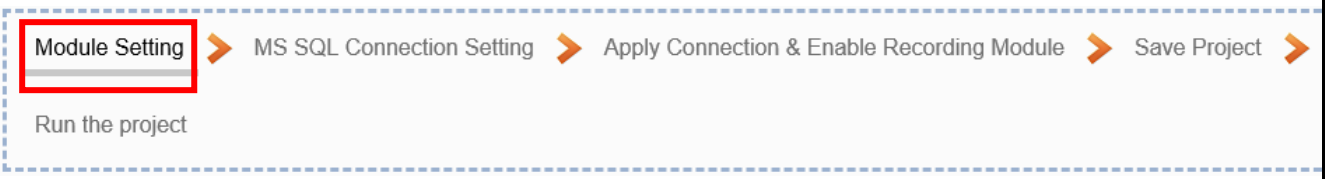
When UA series controller connects the Modbus TCP module (via Ethernet, as the picture), user can choose the item [**Modbus TCP / MS SQL**] of the "Data Log" in the Function Wizard.



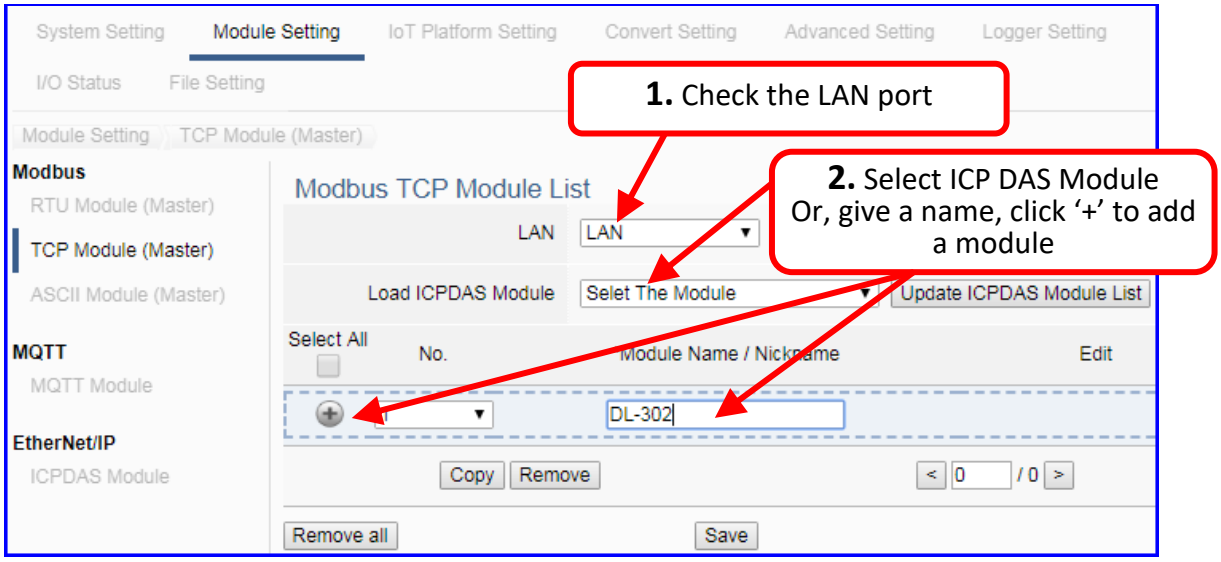
[Step Box]:
The Step Box of the [**Modbus TCP / MS SQL**] has 5 steps. When enabling the Step Box, it auto enters the first step setting page (The step with a bold underline means it is the current step.). The user just needs to follow the "Step Box" step-by-step and then can complete the project quickly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



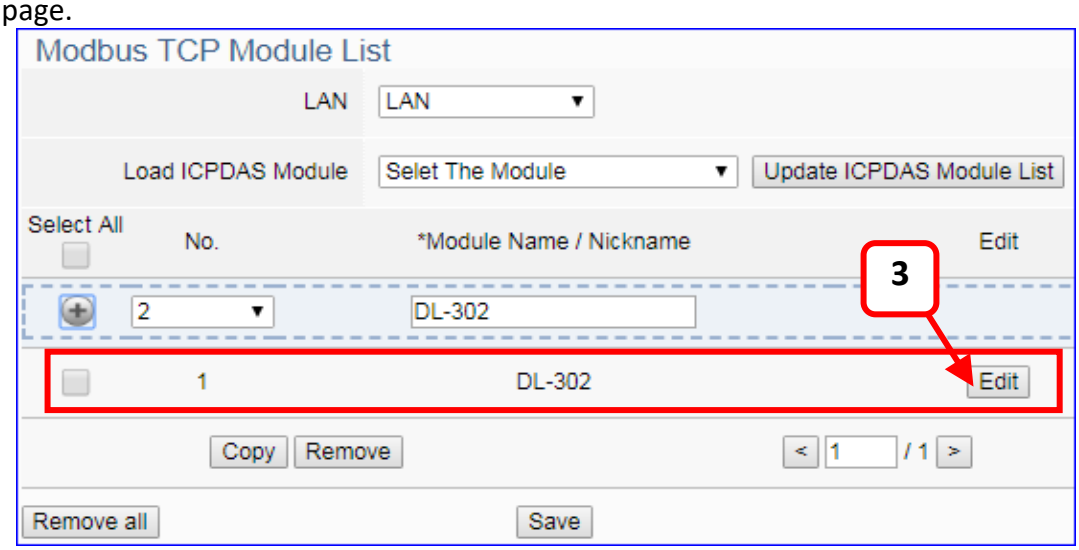
Step 1. Module Setting



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.

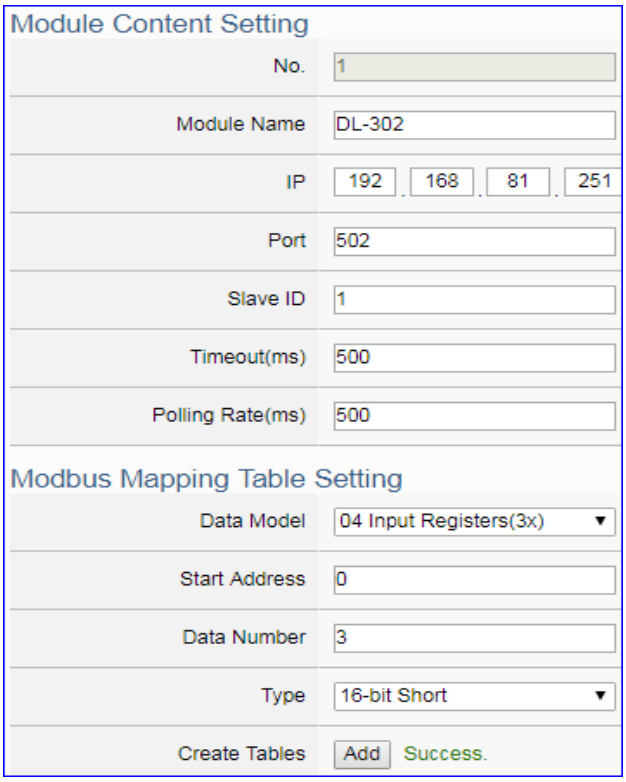


Add a module (Ex: DL-302) as below, and then click [Edit] button to enter the "Module Content Setting" page.



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

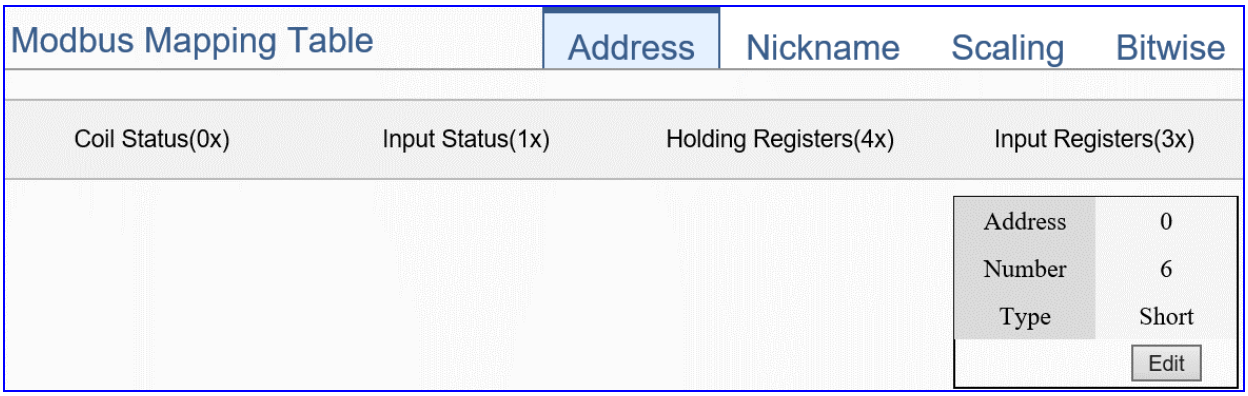
[IP] 192.168.81.251 (by user case)

[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.

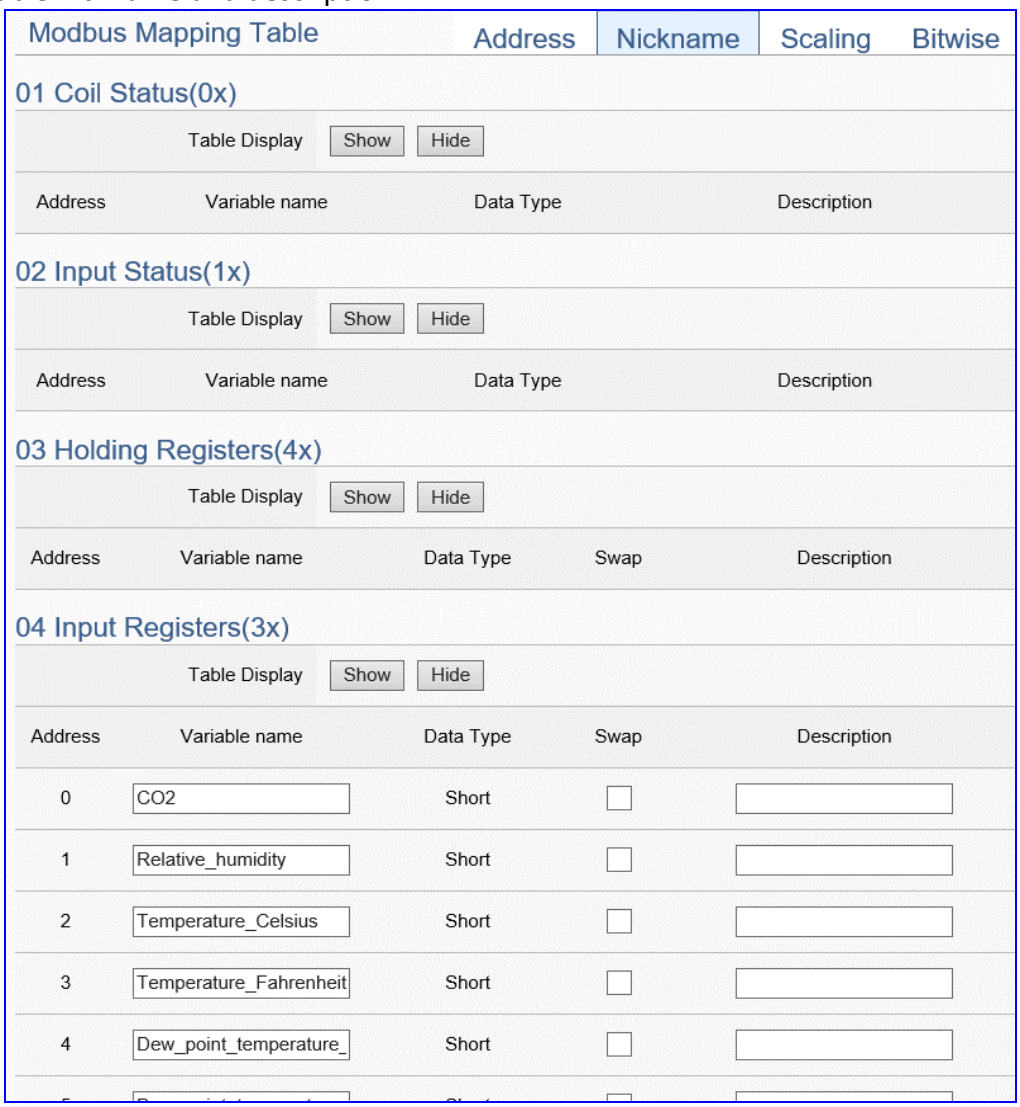
Address:
Display and edit the Modbus Mapping Table.



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:

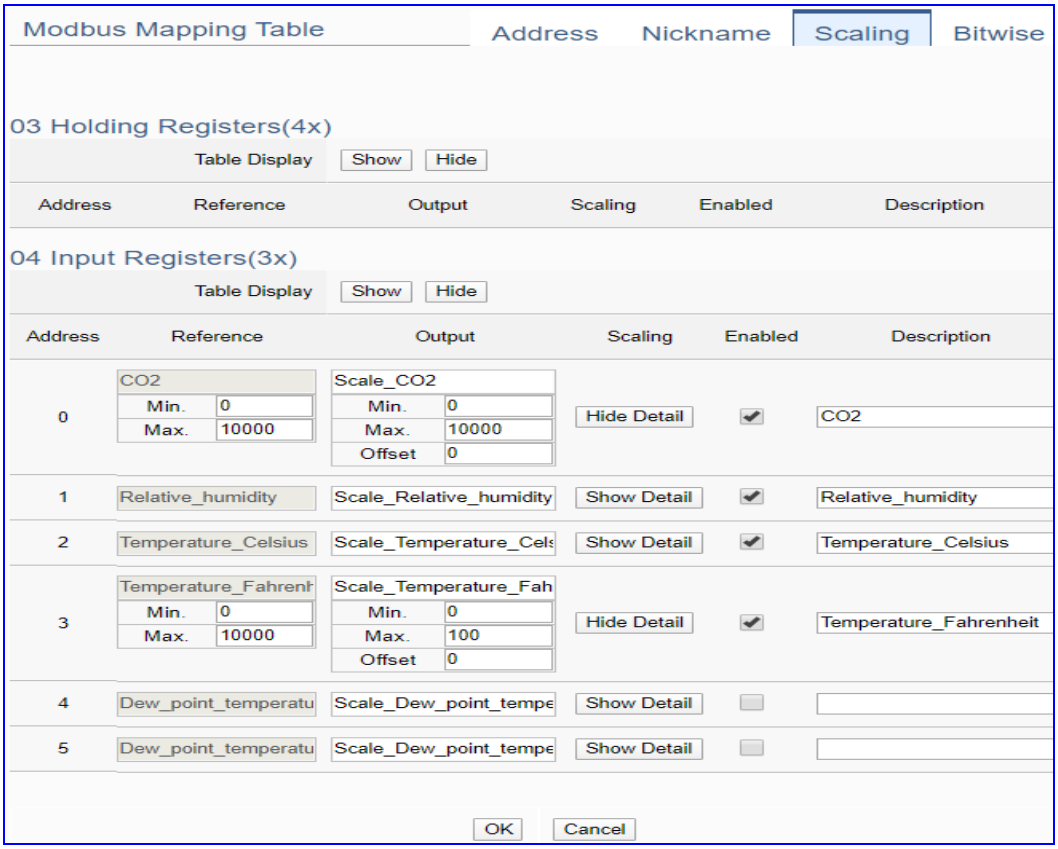
Setting the variable nickname and description.



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:

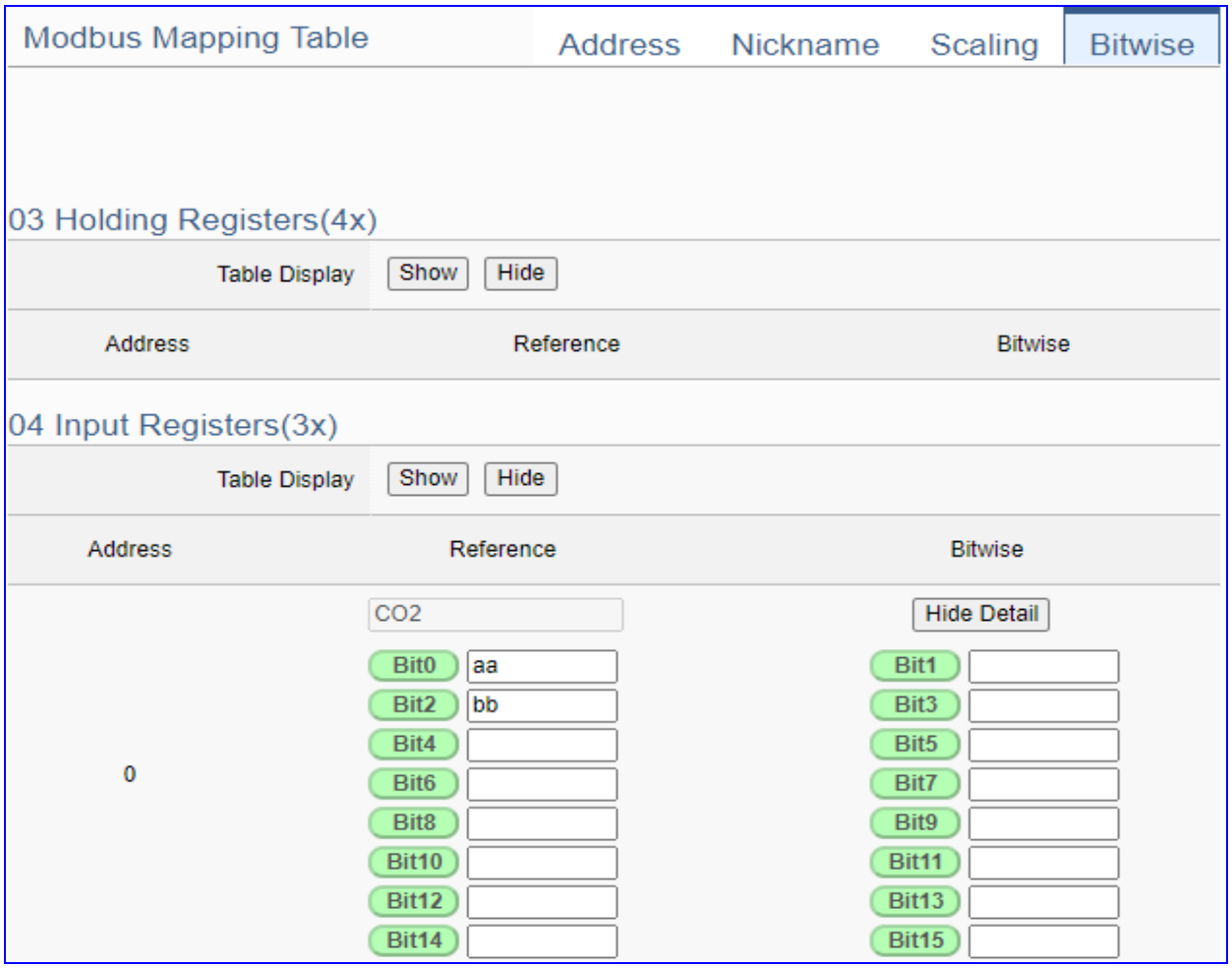
Scaling is only available in the AI/AO settings of Modbus RTU/TCP. When the variable value needs to be scaled or converted before output, click the "**Advanced Setting**" button of the variable on the **Scaling** page, input the **Min**./**Max**./**Offset** of the Reference/Output items, add a description,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



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.

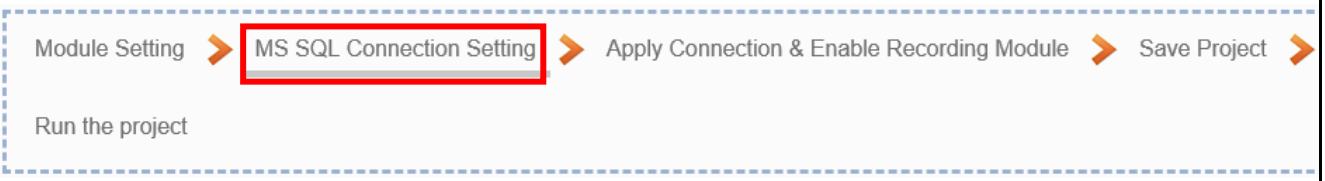
Bitwise:

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.



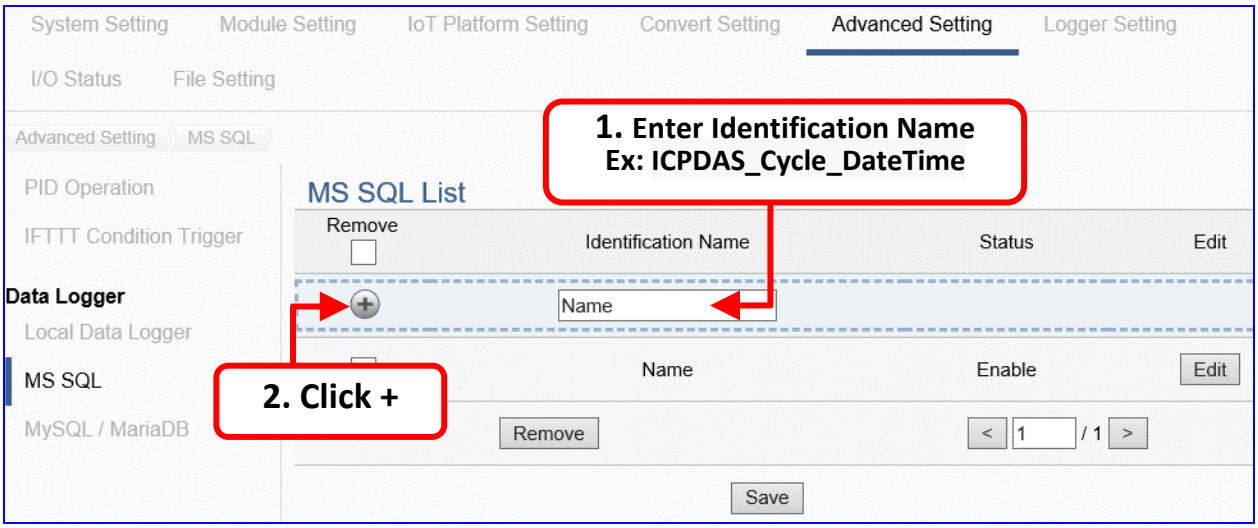
Modbus Mapping Table – Bitwise	
Modbus Mapping Table	Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address **Bitwise do not support 01 Coil Status(0x):DO & 02 Input Status(1x):DI** **Bitwise do not supports 32-bit Float & 64-bit Double data types.**
Table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

- **Step 2. MS SQL Connection Setting**

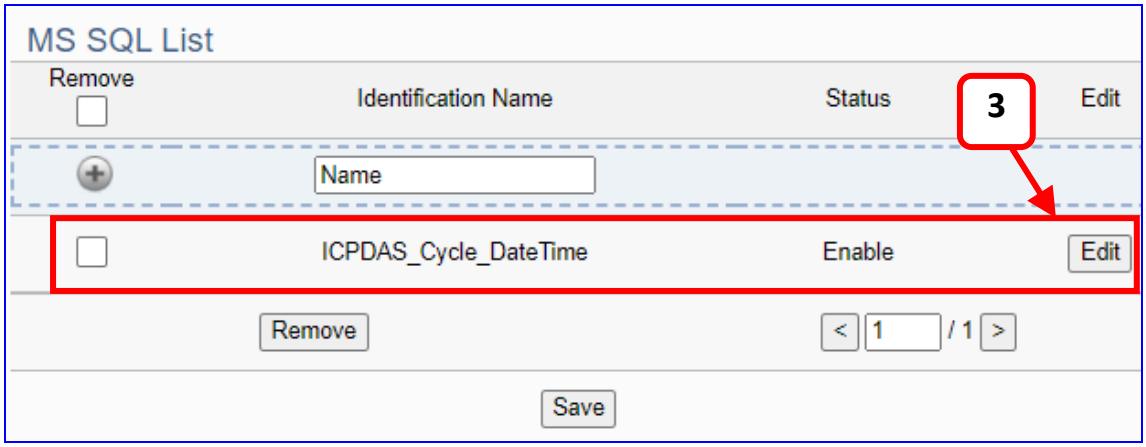


Click the next step, and enter the **Step 2 [MS SQL Connection Setting]** of the UI setting.
This page is for setting the connecting remote database.

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.

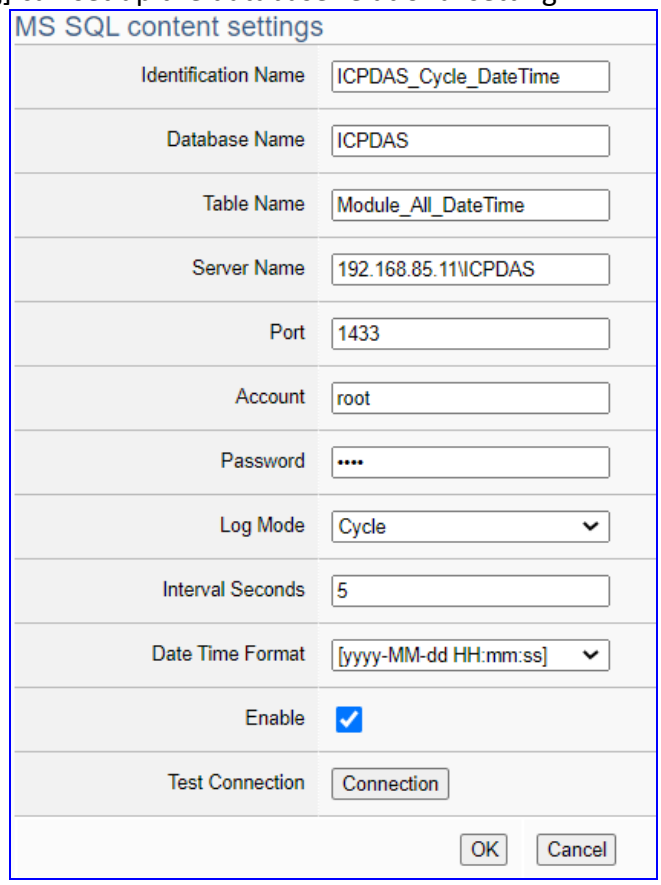


Add a database identification name (Ex: **ICPDAS_Cycle_DateTime**) as below, and then click [**Edit**] button to enter the "MS SQL Content Setting" page.



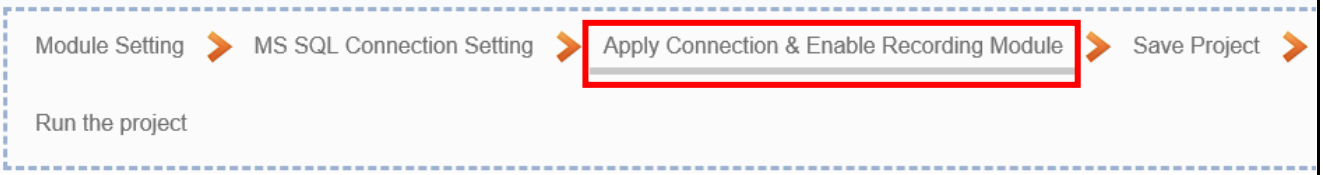
If set up a wrong module, user can click the box in the left side of the module number and click the [Remove] button to delete the module.

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



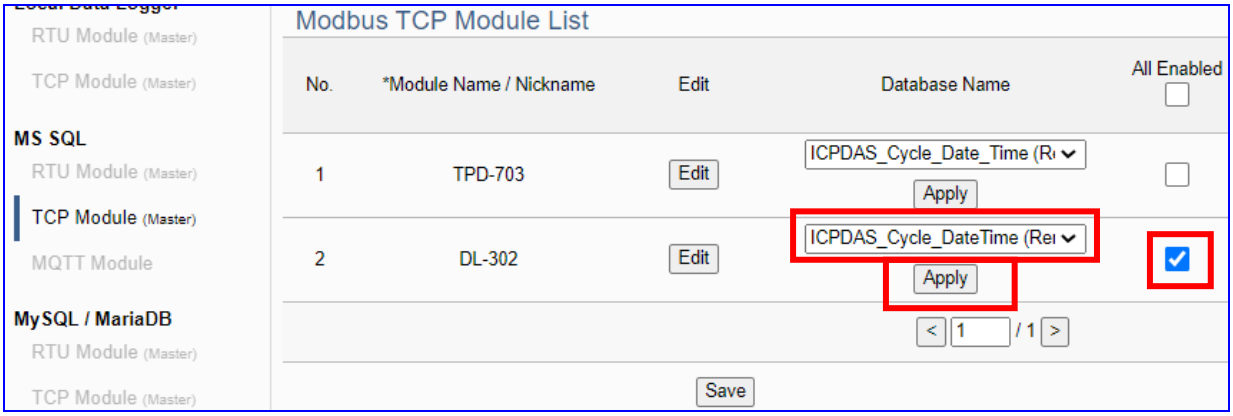
Advanced Setting > Data Logger > MS SQL – Content Setting	
Identification Name	User defined name to identify the database.
Database Name	The name of the remote database. If not exist, It will create one.
Table Name	The table name of the remote DB. If not exist, It will create one.
Server Name	The Server 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.
Log Mode	**Cycle**: Record one log data at the interval time set below. **Data Change**: Only record when the data has changed.
Interval Seconds	Set up the interval time to save the I/O data to the remote database. Unit: Second.
Date Time Format	Select to separate the date and time into two [Columns] or combine the date and time in one [Column].
Enable	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.

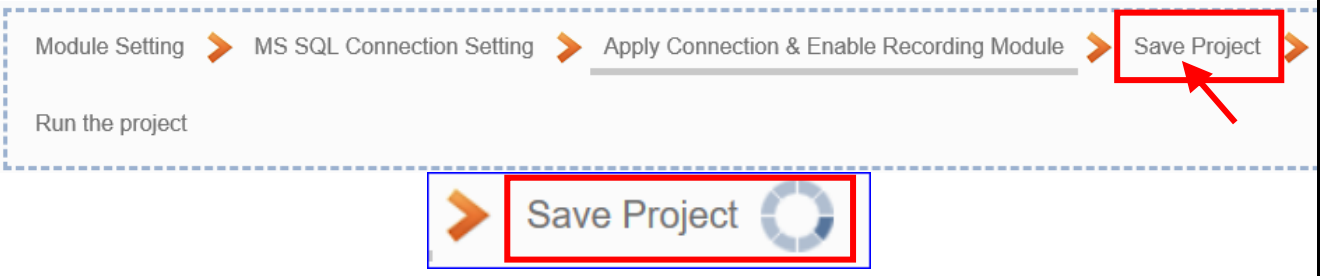
Here **select** and **apply** the Database name (Ex: **ICPDAS_Cycle_DateTime**), and **enable** the DL-302.



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 "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.
	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.

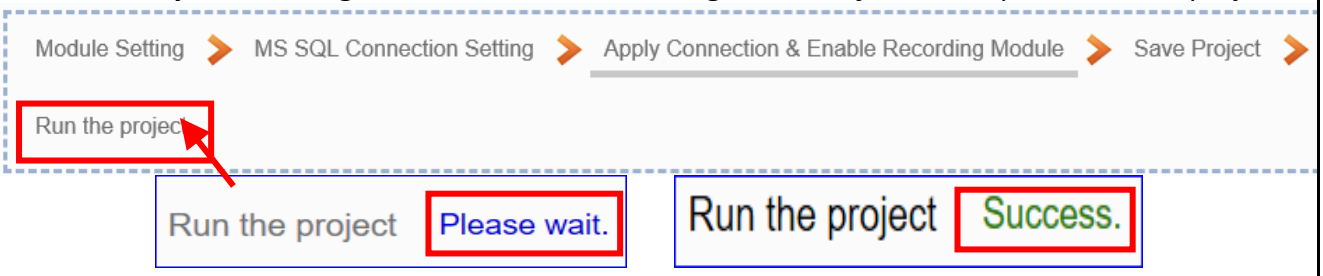
- **Step 4. Save Project**

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.



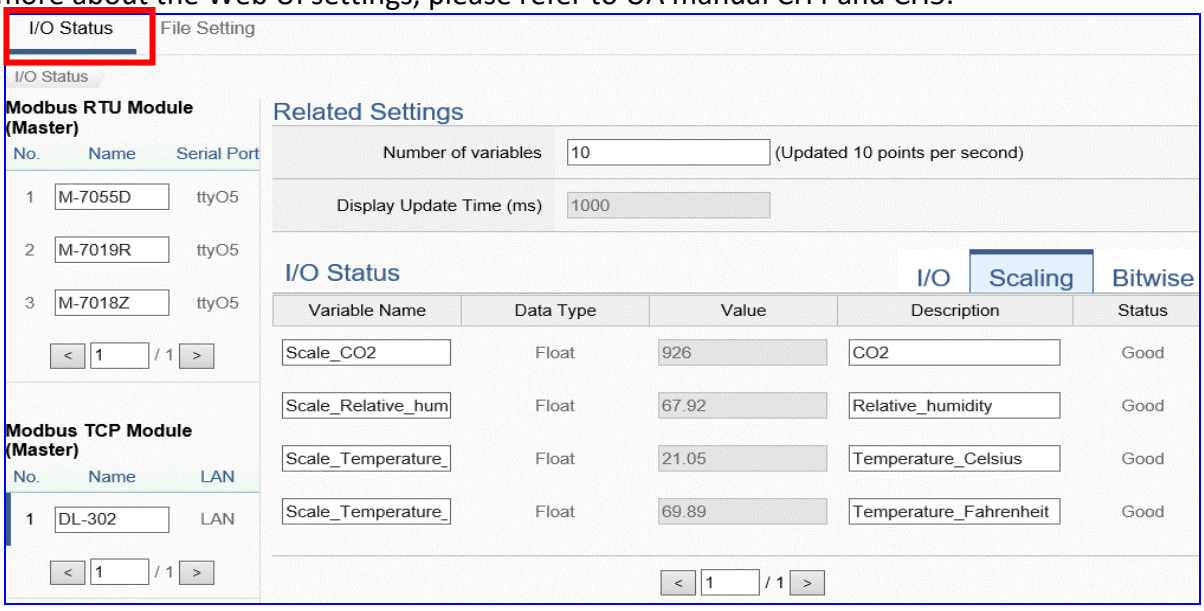
- **Step 5. Run the Project**

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 UA manual CH4 and CH5.



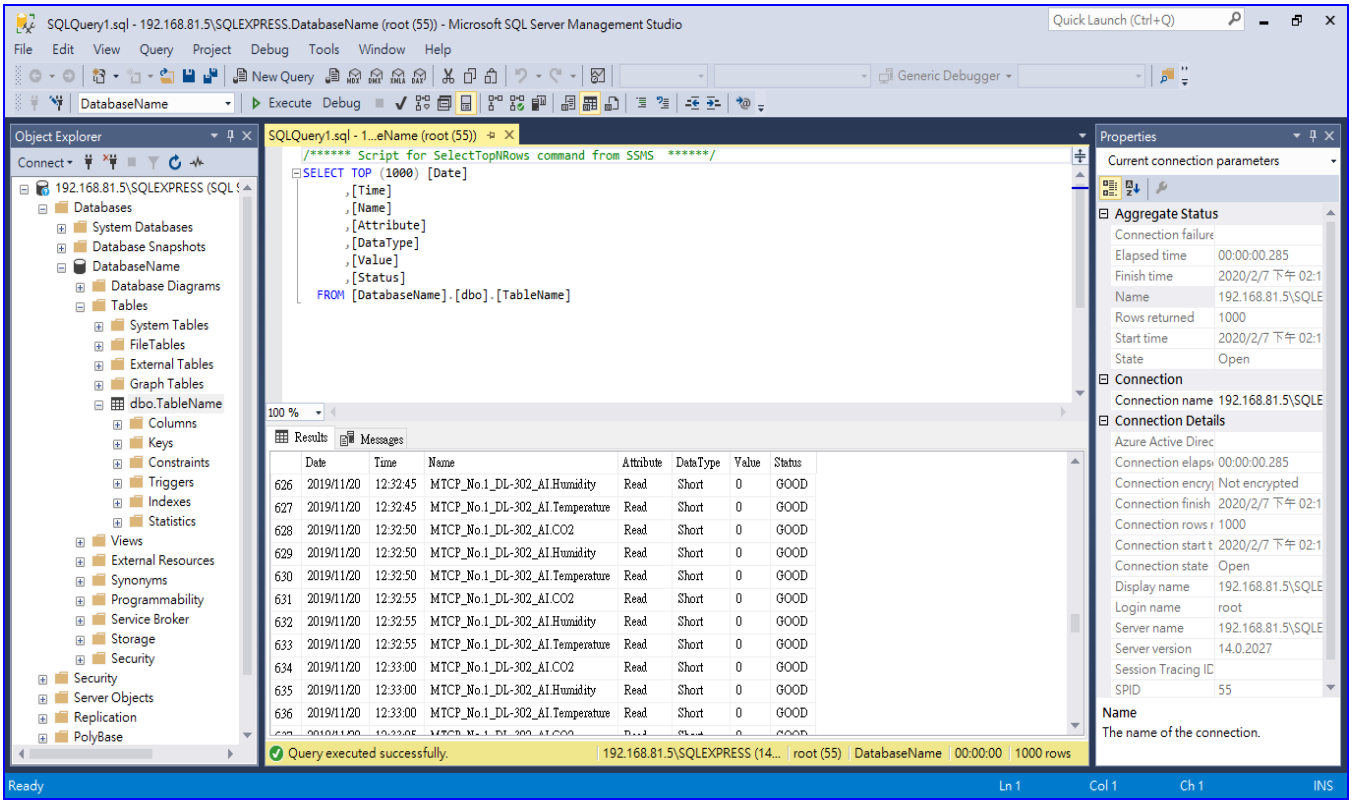
- **MS SQL Remote Database Example Descriptions:**

Each tag data and status are recorded in each separate row, the row is added down for each interval, and the tag data is recorded in time sequence.

For database operation, please refer to **FAQ-001** of the **UA series FAQ list**:
FAQ-001 How to save the UA collected data into SQL and then show trend chart in InduSoft? (Take MS SQL 2017 Express as an example)

The connection screen view of the MS SQL Remote Database.

1. MS SQL database screen view: Date/Time column separated (Reference)



2. MS SQL database screen view: Date/Time column combined (Reference)