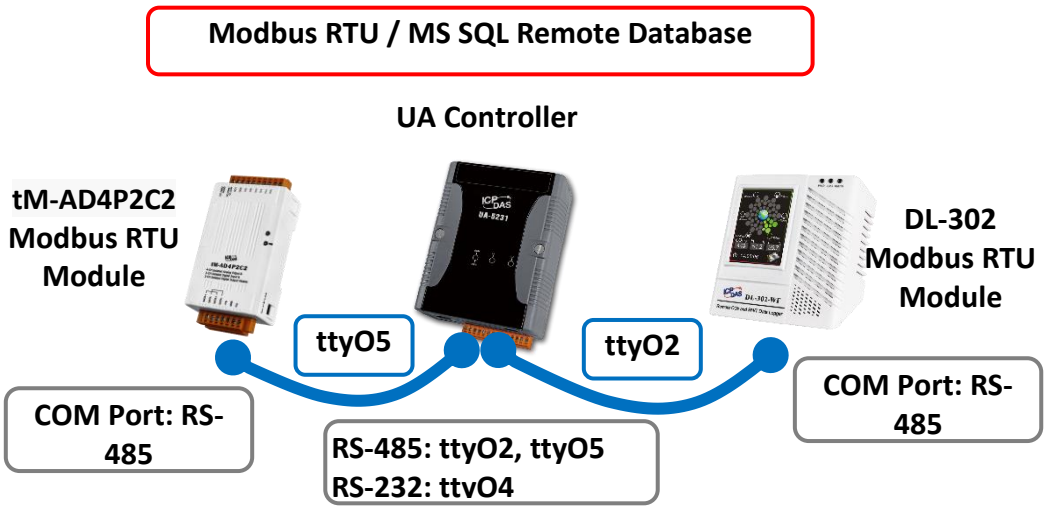
FAQ-DBL-03: UA Web UI Function Wizard – Data Log - How to set up remote database function: Modbus RTU / MS SQL ? (Use tM-AD4P2C2 + DL-302)

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.

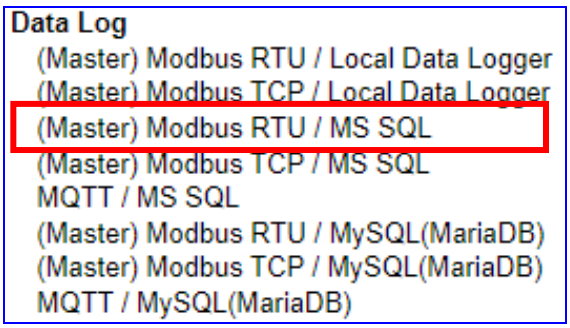
The Modbus / Remote Database settings include Modbus RTU and TCP. Here will introduce **Modbus RTU and multiple modules** as the setting sample.

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



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

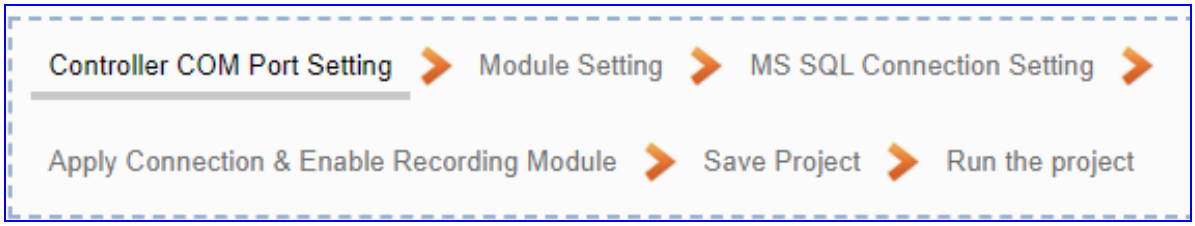
When UA series controller connects the Modbus RTU multiple modules, e.g. **tM-AD4P2C2 (port: ttyO5) and DL-302 (port: ttyO2)**, as the picture. And save the I/O data into the **MS SQL remote database**, user can choose the item [**Modbus RTU / MS SQL**] of the "Data Log" in the Function Wizard.



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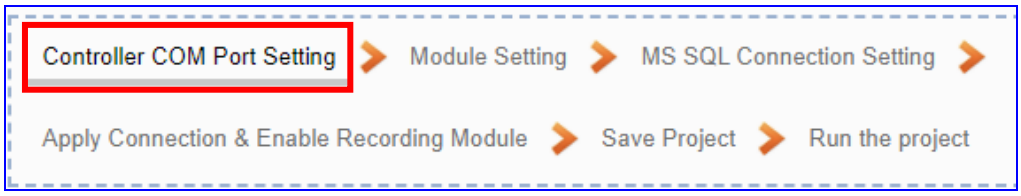
[Step Box]:

The Step Box of the [**Modbus RTU / MS SQL**] has the following 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.



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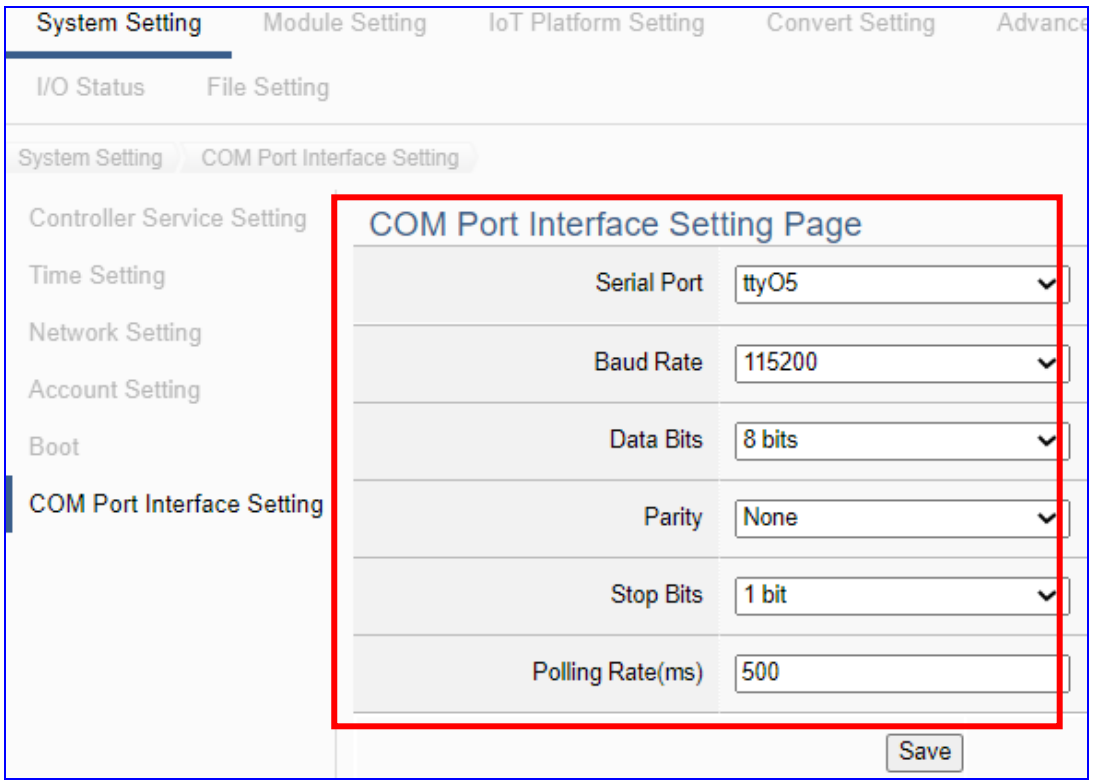
Step 1. Controller COM Port Setting



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.
In this example: the communication data of module **tM-AD4P2C2** can be found in the product website https://www.icpdas.com/en/product/tM-AD4P2C2

COM Ports	
Ports	1 x RS-485
Baud Rate	1200 ~ 115200 bps
Data Format	(N, 8, 1), (N, 8, 2), (O, 8, 1), (E, 8, 1)
Protocol	DCON, Modbus/RTU, Modbus/ASCII

Setting as below. **Note: This example uses ttyO5 port to link tM-AD4P2C2 module.**
After settings, click "Save".



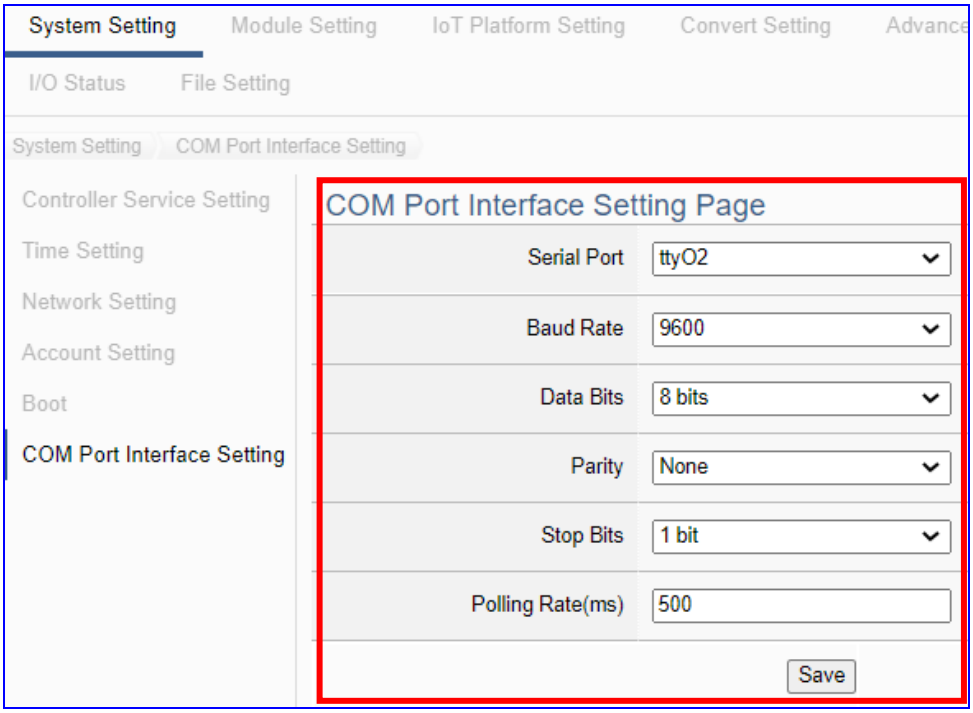
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In this example: the communication data of module **DL-302** can be found in the product user manual. https://www.icpdas.com/en/product/DL-302 (as the following)

Address: Sets the address for a module.
Default: 1 Range: 0 ~ 255
Protocol: Sets the communication protocol.
- ModbusRTU (default) - DCON - DCONChkSum: uses DCON protocol and enables checksum validation feature
Baud Rate
Default: 9600 Support Baud Rate: 1200/ 2400/ 4800/ 9600/ 19200/ 38400/ 57600/ 115200 (unit: bps)
Parity
Default: N,8,1 Support format: N81, N82, E81, O81
Response Delay (ms): Sets the delay time between receiving the command and sending the data.
Default: 0 ms Range: 0 ~ 30 (unit: ms)
Save: Saves the modification and returns to the Settings menu. All the changes take effect immediately after saving changes.
Skip: Returns to the Settings menu without saving any changes.

Setting as below. **Note: This example uses ttyO2 port to link DL-302 module.**
After settings, click “Save”.

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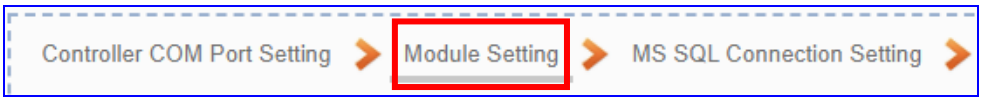


The descriptions for the setting parameters:

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.

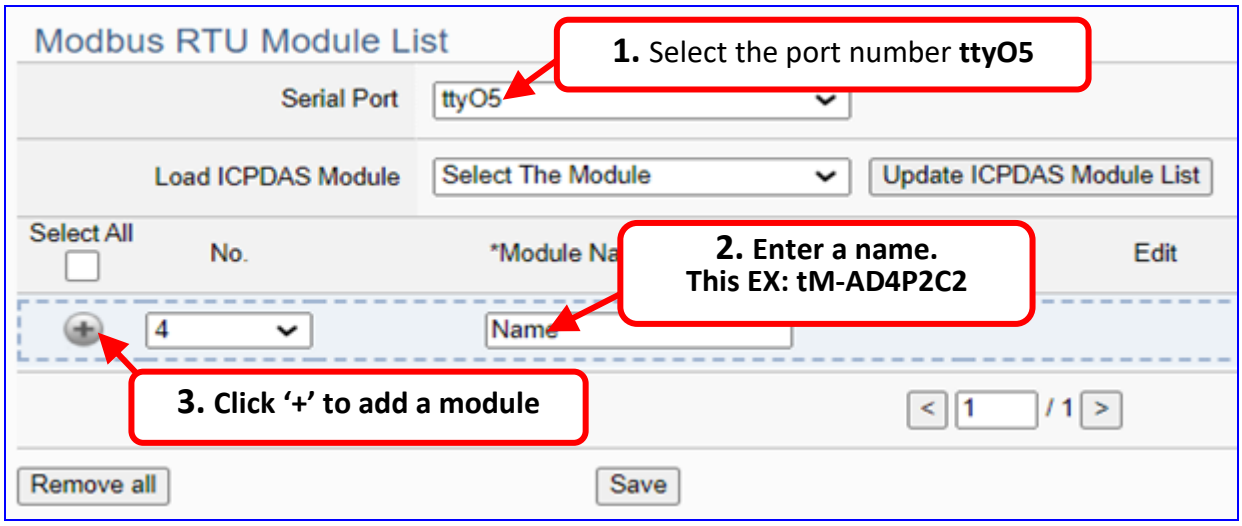
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Step 2. Module Setting

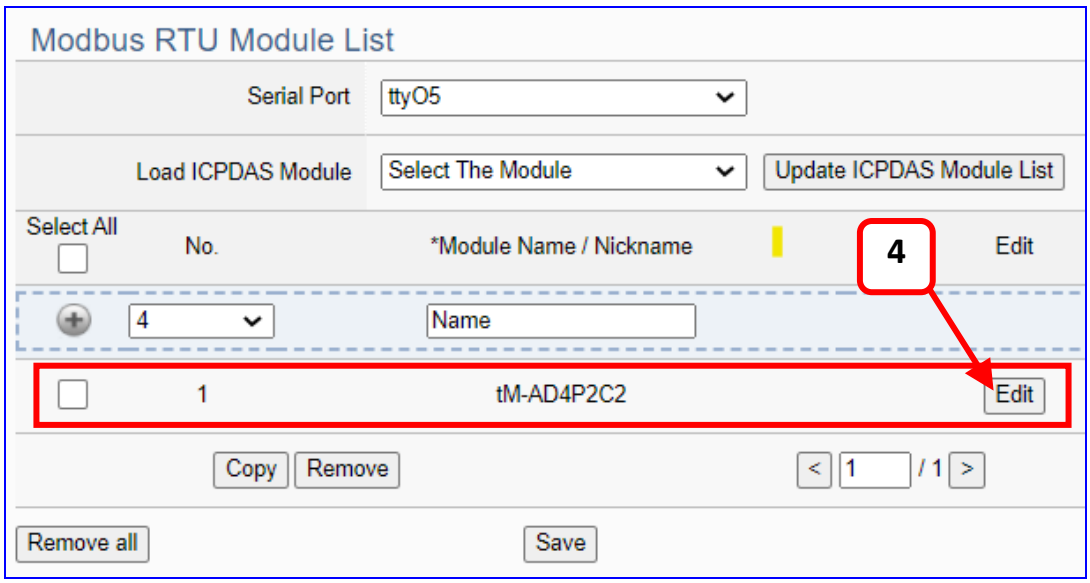


It auto-enter the first step, **Step 2 [Module Setting]** of the UI setting.
This page is for setting the communication values with the connected modules. First check the port that connected with the module, and each module can give a name (Default name: Name). Click [⊕] button could add a new module,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

This example to set up tM-AD4P2C2 : (Port: ttyO5)

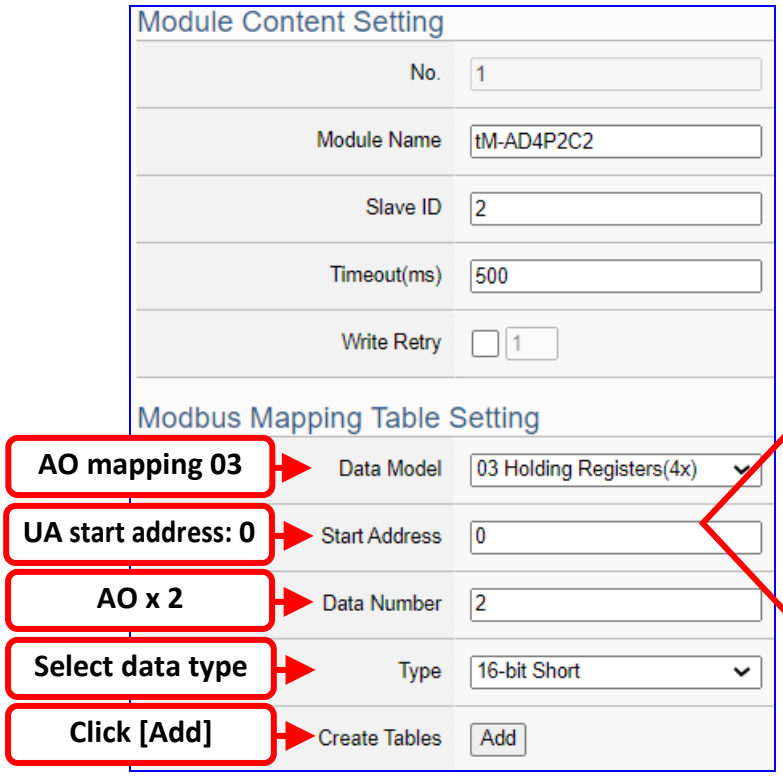


The module (Ex: **tM-AD4P2C2**) is as below, and then click [Edit] button to enter the "Module Content Setting" page.



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



> Modbus Mapping Table Setting:
Set module in the order of Data Model, Start Address and Data Number, then click "Add".
p.s. If select from ICP DAS module list, system will auto setup the Modbus Mapping Table; if not, user can check the Modbus address or I/O number from the module manual or website.

[This Example] tM-AD4P2C2:
Set up **AO x 2**
Data Model: 03 Holding Registers(4x)
Start Address: **0**,
Data Number: **2**,
Type: **16-bit Short**,
click [**Add**], as the left picture.

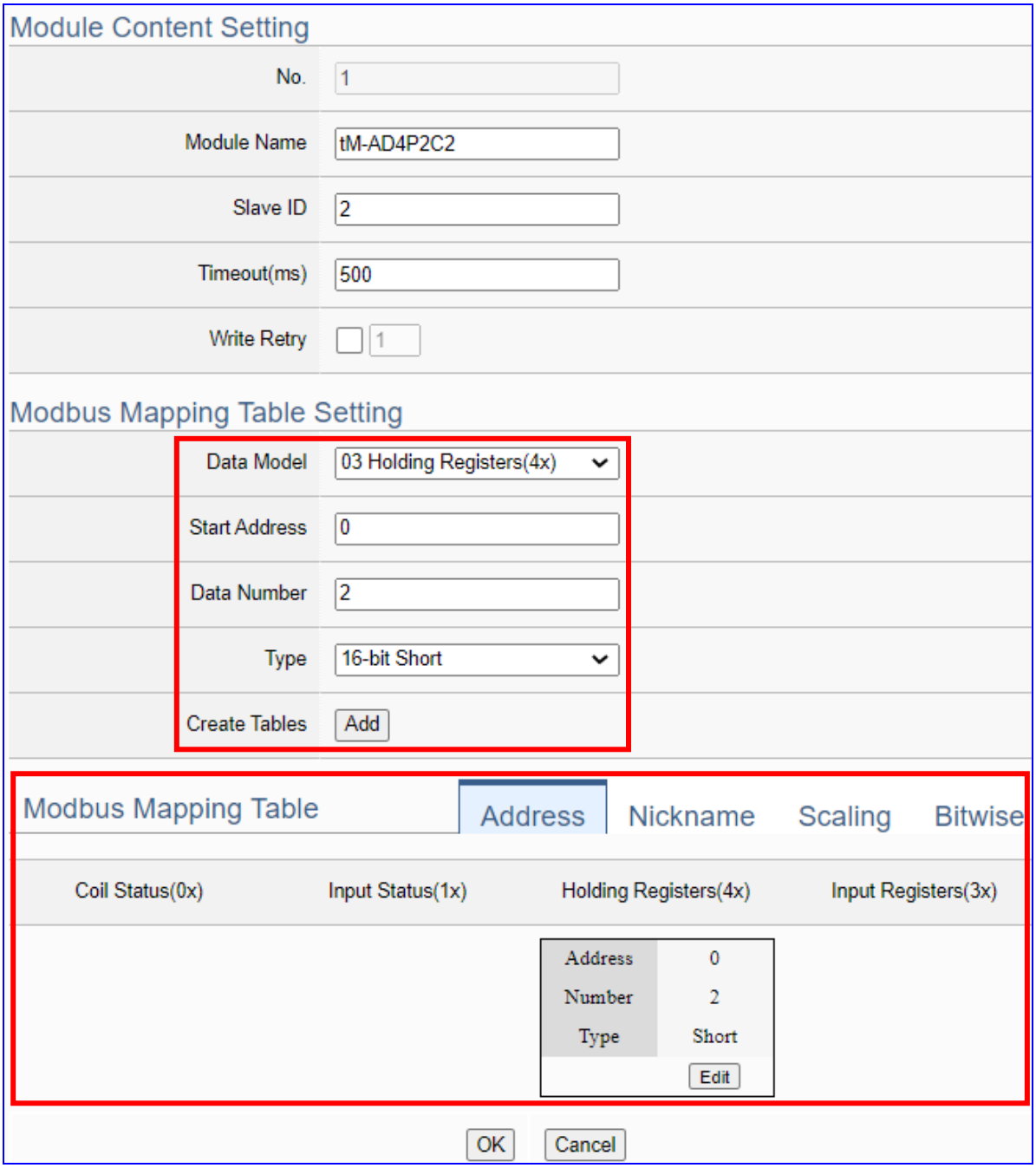
Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Slave ID	Set the module Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Write Retry	Check: If there is no response after the set time, it will retry to write again, max. 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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[**Module Mapping Table**] page can set up the Modbus mapping table.

If select from the ICP DAS module list, system will auto-setup the module and its Modbus Mapping Table. **If not, user needs to check the module data and set up the module.** Such as this example, we check the module manual and set up the tM-AD4P2C2 with 2 AO. The **Address** of the Modbus Mapping Table is as following.

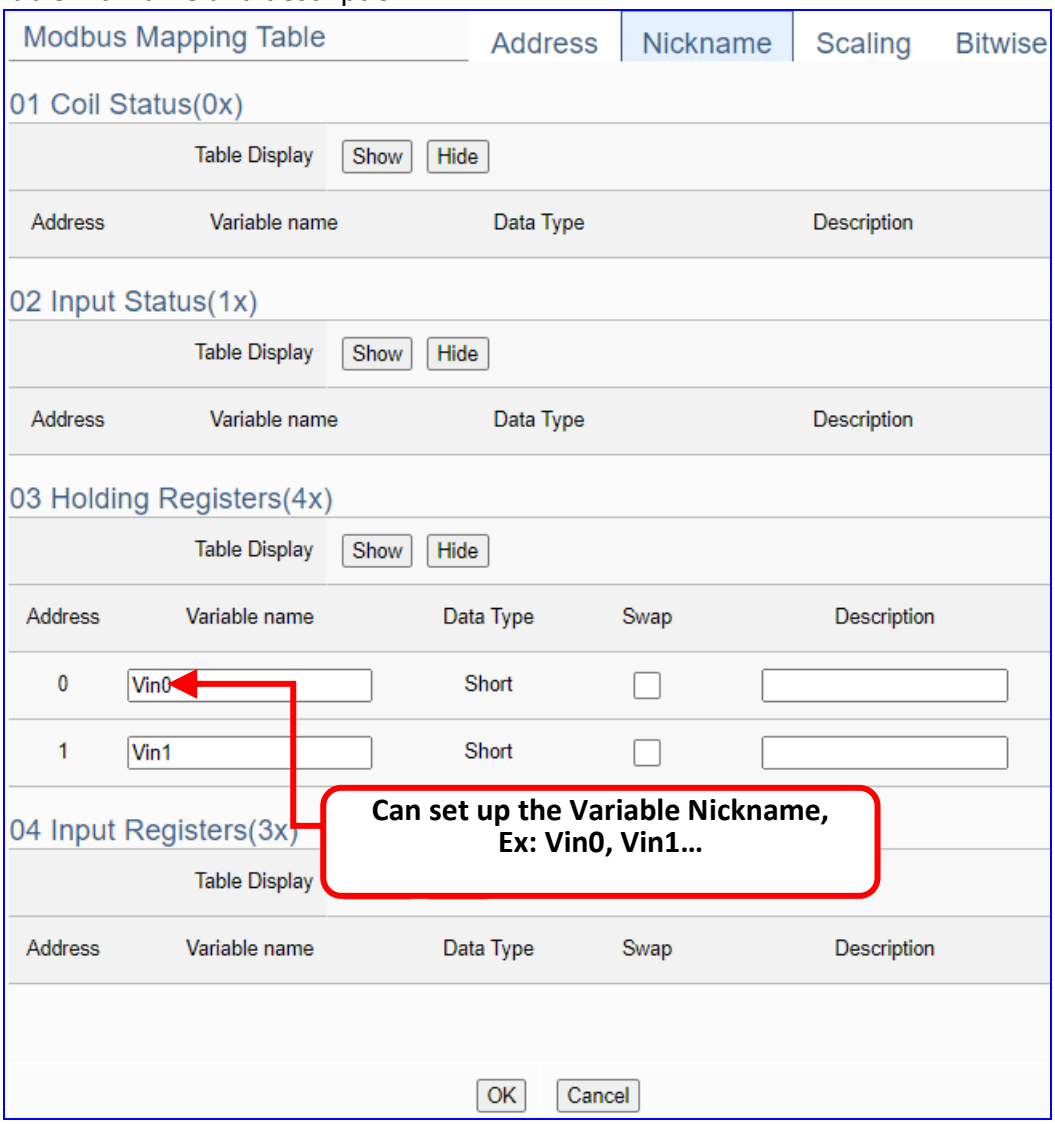
Address:
Display and edit the Modbus Mapping Table.



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Nickname:

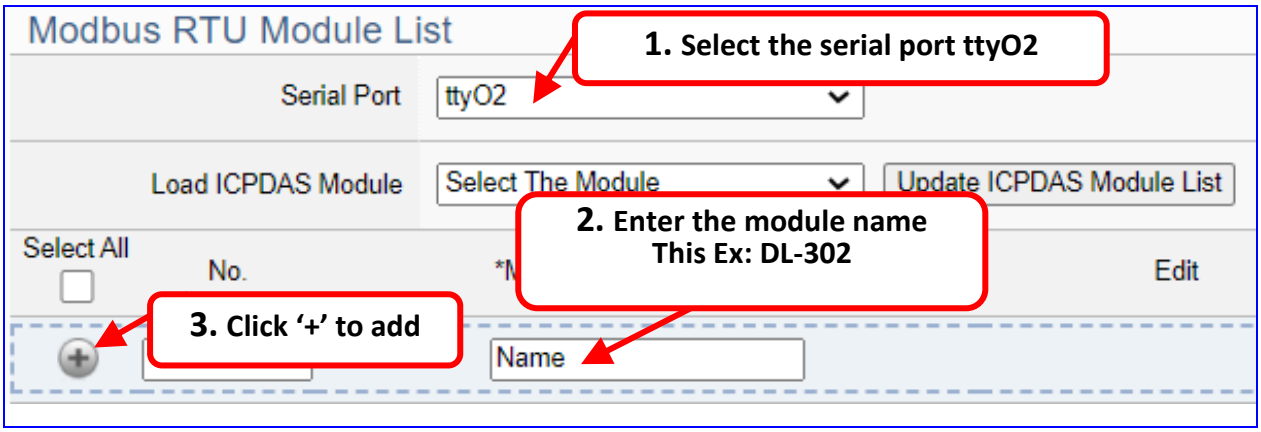
Setting the variable nickname and description.



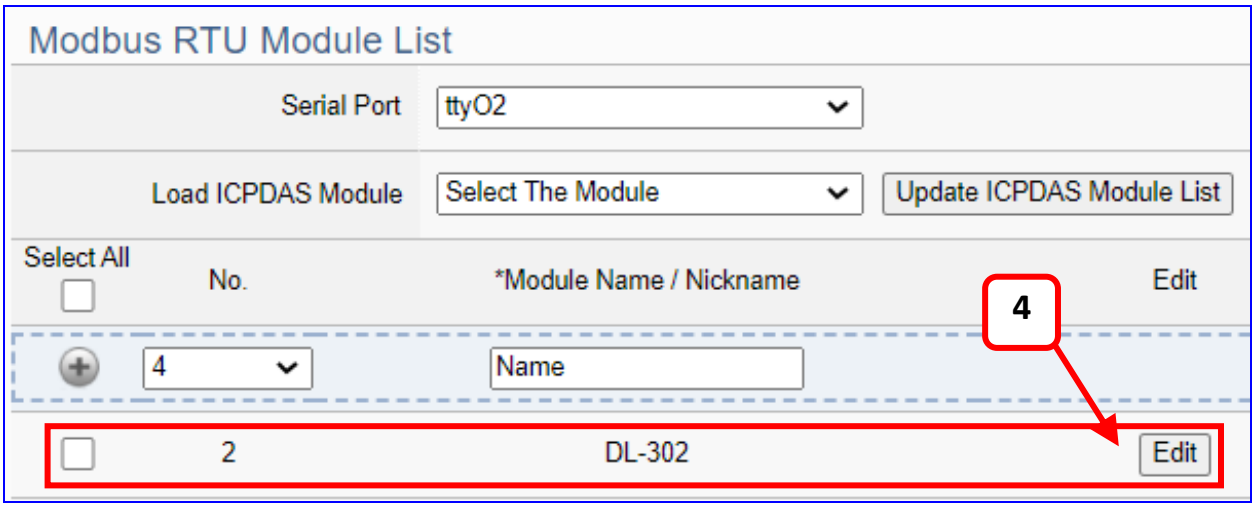
Modbus Mapping Table – Nickname	
Modbus Mapping Table	Coil Status(0x): Mapping to DO Modbus address Input Status(1x): Mapping to DI Modbus address Holding Registers(4x): Mapping to AO Modbus address Input Registers(3x): Mapping to AI Modbus address
Table Display	Click [Show] to display all fields, click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

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This example: use the same way to set up DL-302 (Serial Port: ttyO2)



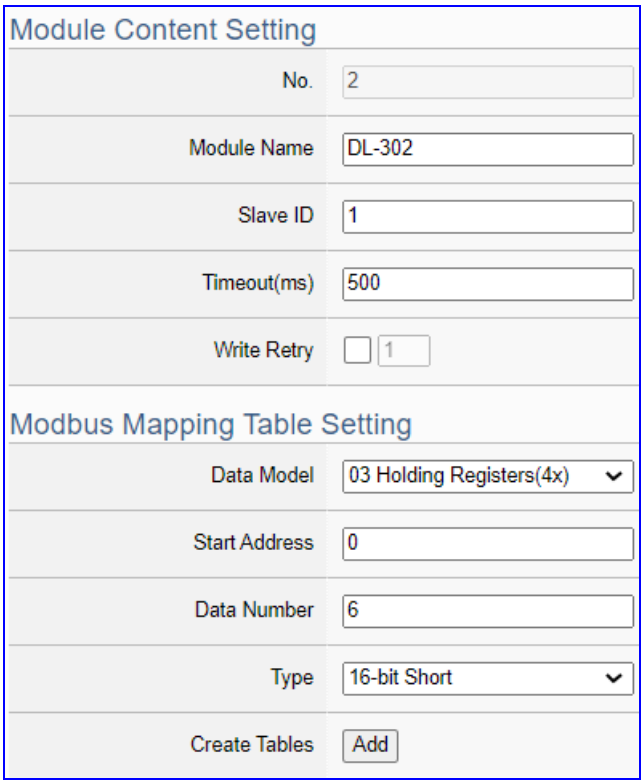
Add a module (as the picture, this example: **DL-302**), and then click the [Edit] of the module to enter the screen of "Module Content Setting".



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 mapping table



This Example: DL-302
Set up AO Short x 6

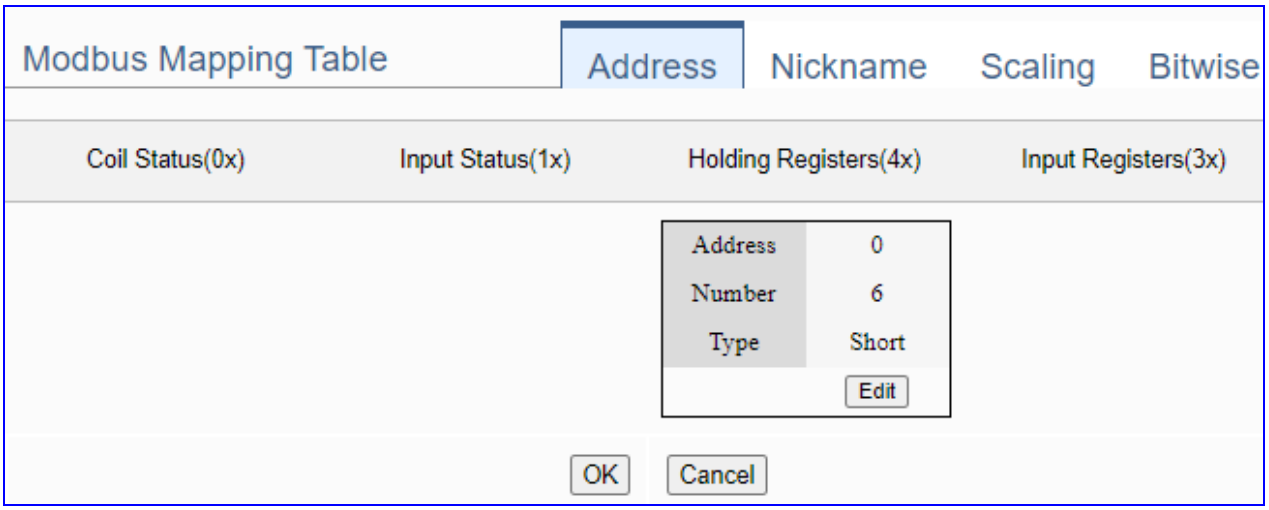
[Modbus Mapping Table Setting]
Data Models: 03 Holding Registers(4x)
Start Address: 0
Data Number : 6
Type: 16-bit Short
→ Click [Add]

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
Write Retry	Check: If there is no response after the set time, it will retry to write again, max. 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.

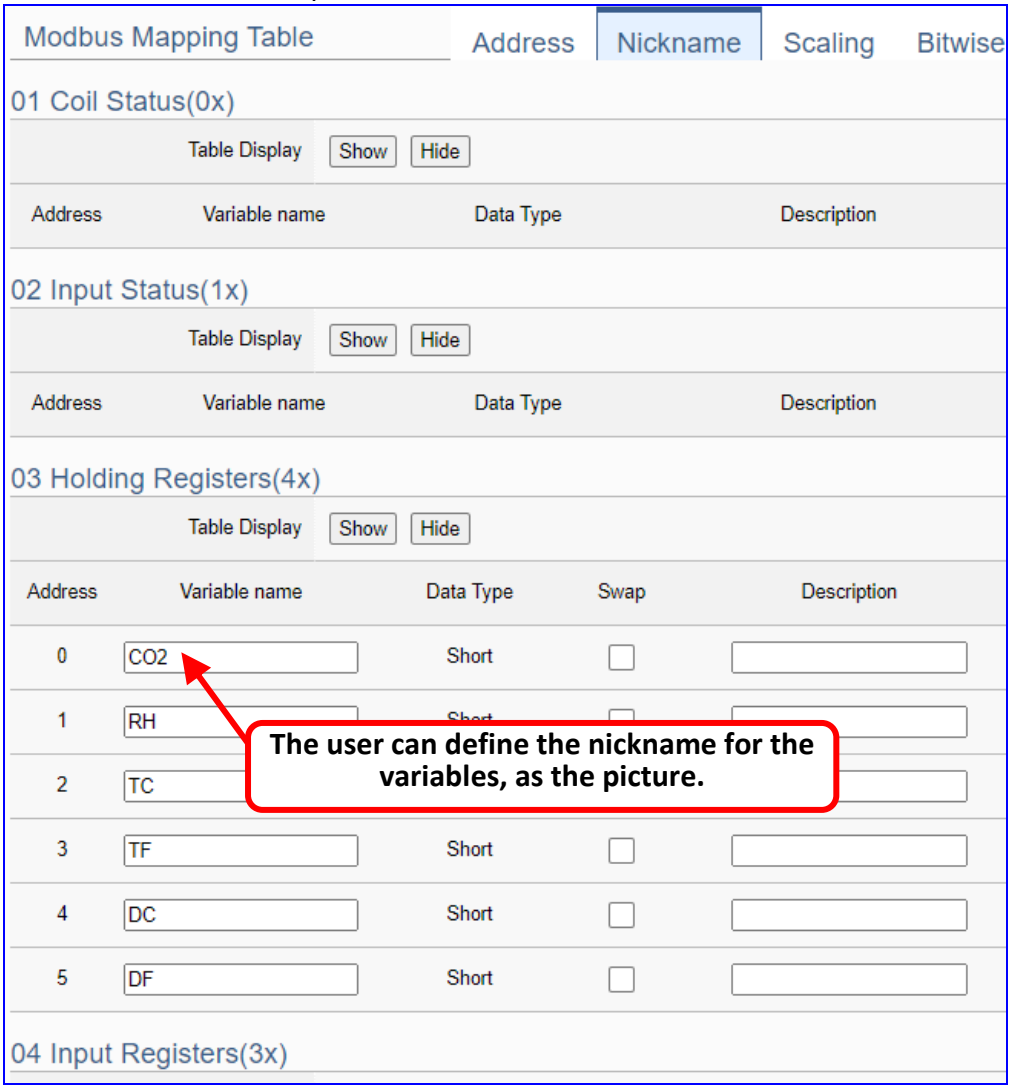
Address:
Display and edit the Modbus Mapping Table.



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.

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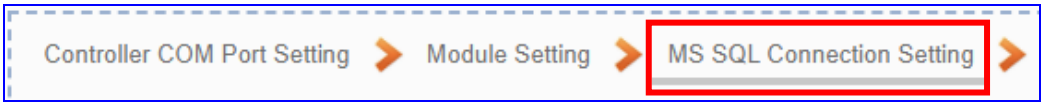
Nickname:
Setting the variable nickname and description.



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.

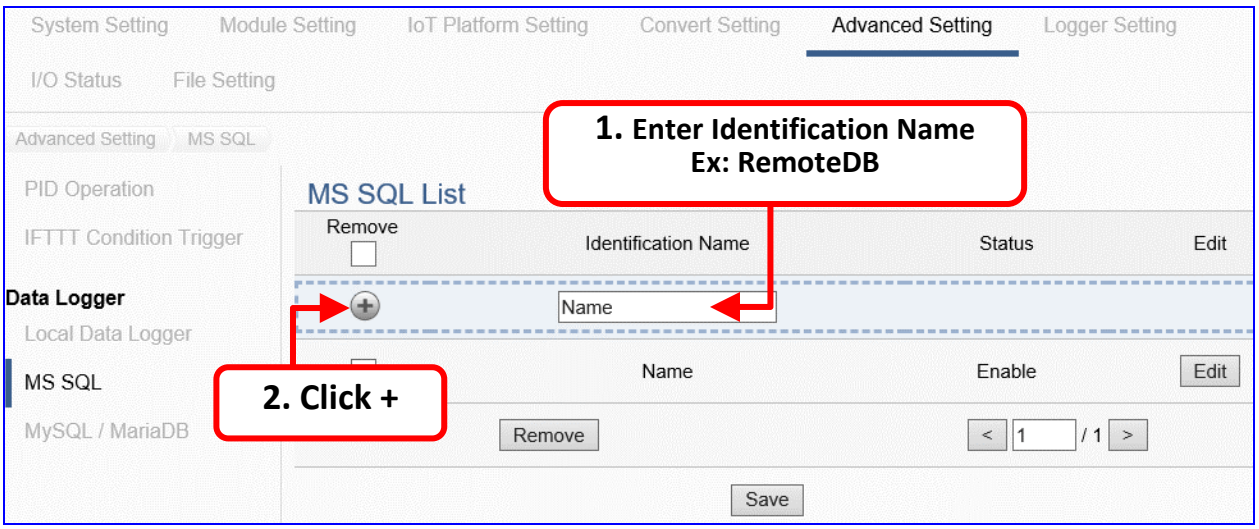
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- **Step 3. MS SQLL Connection Setting**

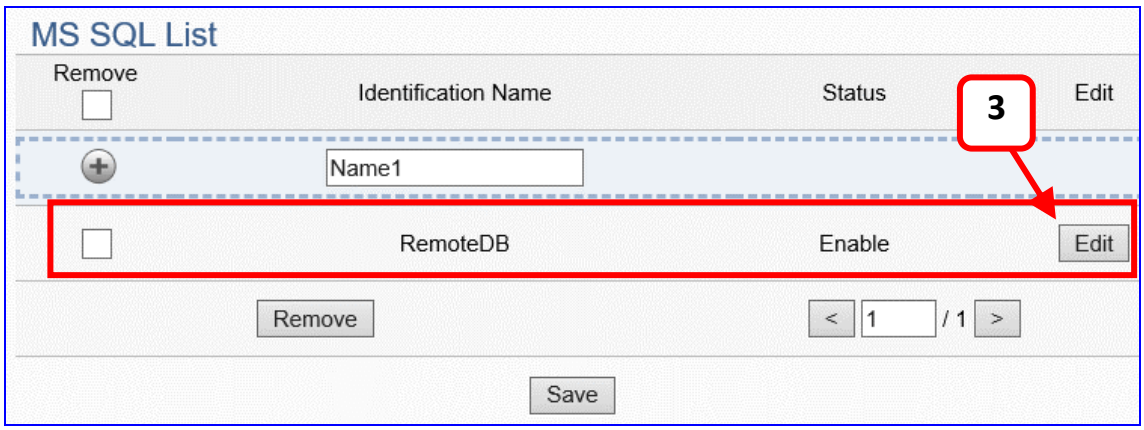


Click the next step, and enter the **Step 3 [MS SQL Connection Setting]** of the UI setting.
This page is for setting the connecting remote database.

We select the "Modbus RTU / MS SQL" 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.



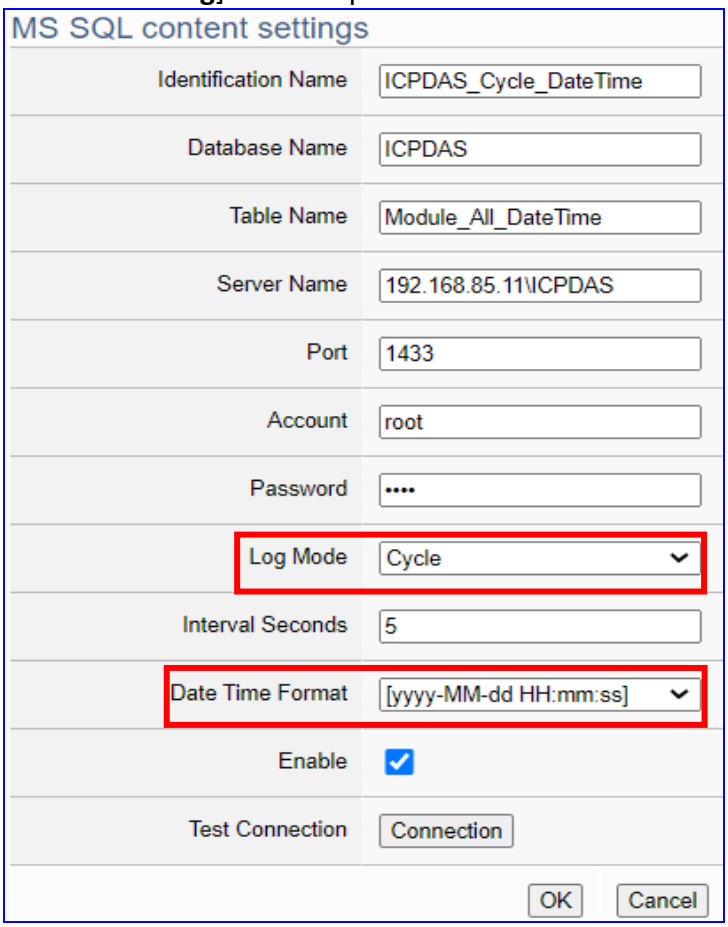
Add a database identification name (Ex: RemoteDB) as below, and then click [**Edit**] button to enter the "MS SQL Content Setting" page.



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.

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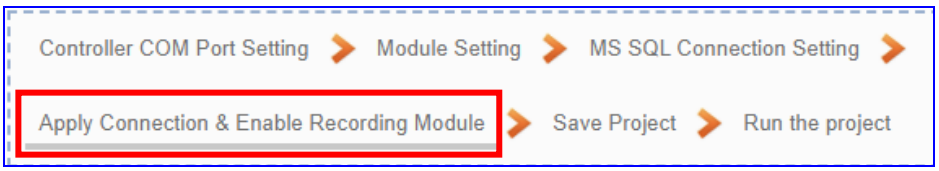
[**MS SQL Content Setting**] can set up the database relational setting.



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.

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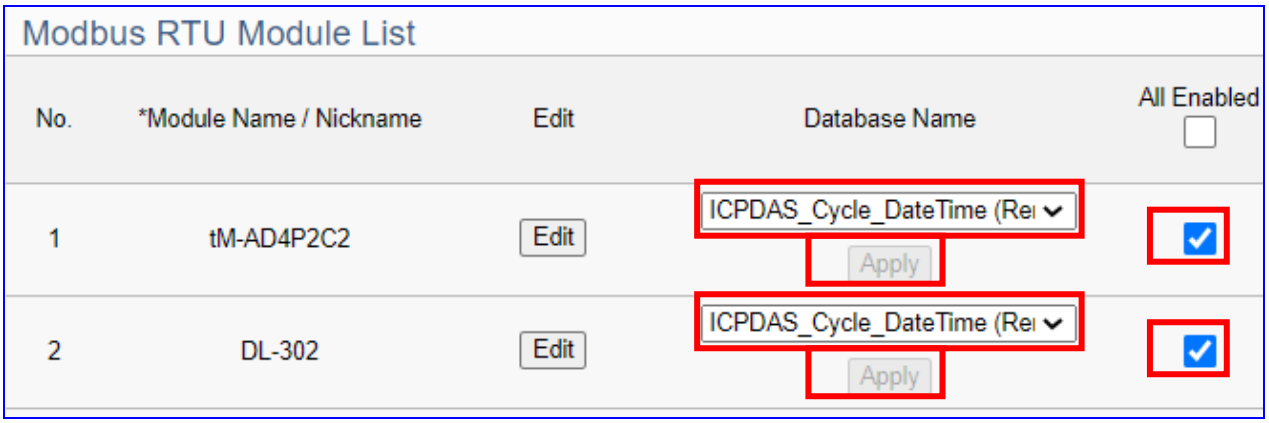
- **Step 4. Apply Connection & Enable Recording Module**



Click the next step, and enter the **Step 4 [Apply Connection & Enable Recording Module]** UI setting. This step is to enable the Modbus TCP module and connection.

We select the “Modbus RTU / MS SQL” of “Data Log” at the beginning, so this step will auto enter the [**Logger Setting > MS SQL > RTU Module (Master)**] setting page.

Follow the steps: 1. Select the Database Name, 2. Click apply, and enable the Modules.

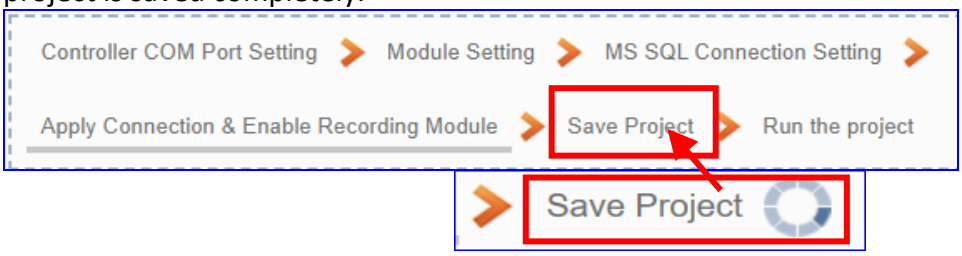


Logger Setting > MS SQL > RTU Module (Master) > Modbus RTU Module List	
No.	The module number in the module list (Not editable here)
*Module Name / Nickname	The module name set in the module list (Not editable here)
Edit	If user wants to enable some I/O channels for data logger, click [Edit] of that 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.
< 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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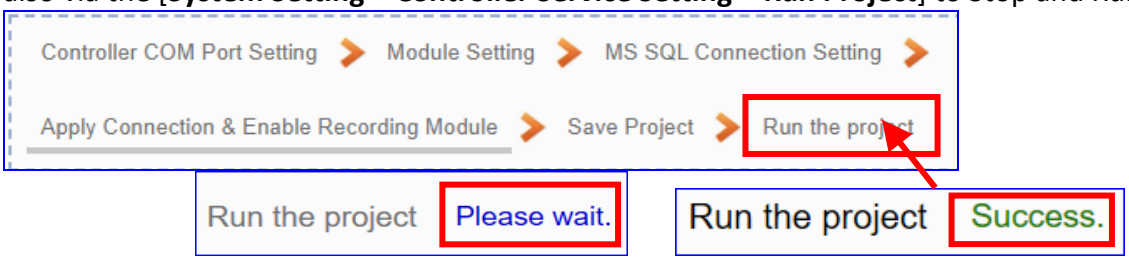
Step 5. Save Project

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.



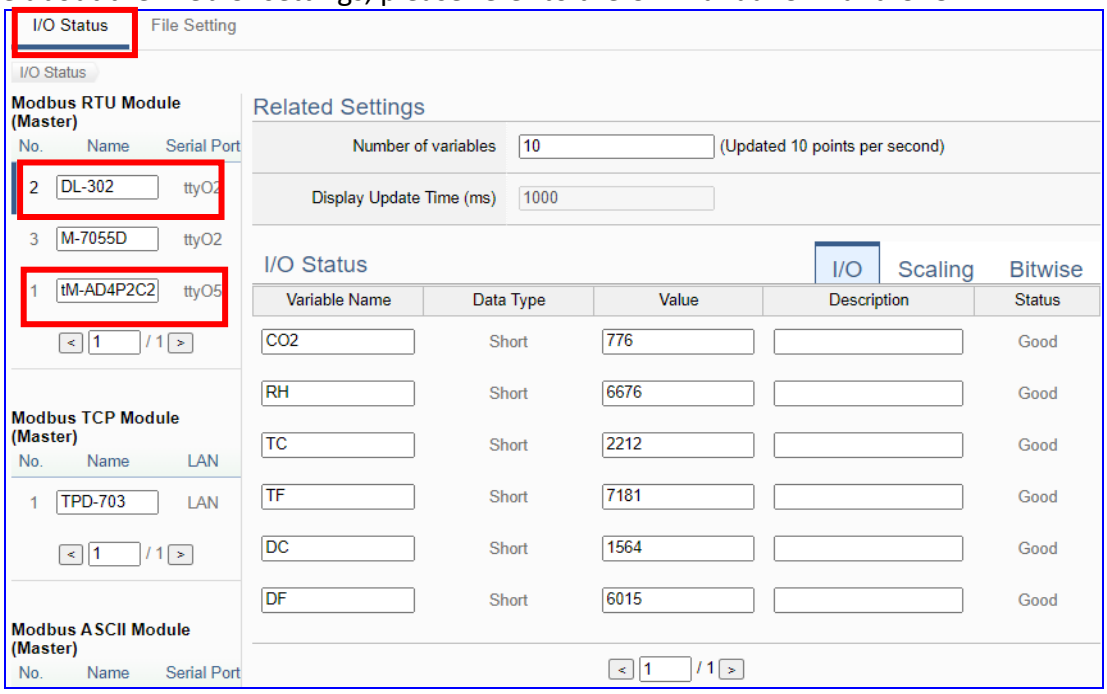
Step 6. Run the Project

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 the UA Manual CH4 and CH5.



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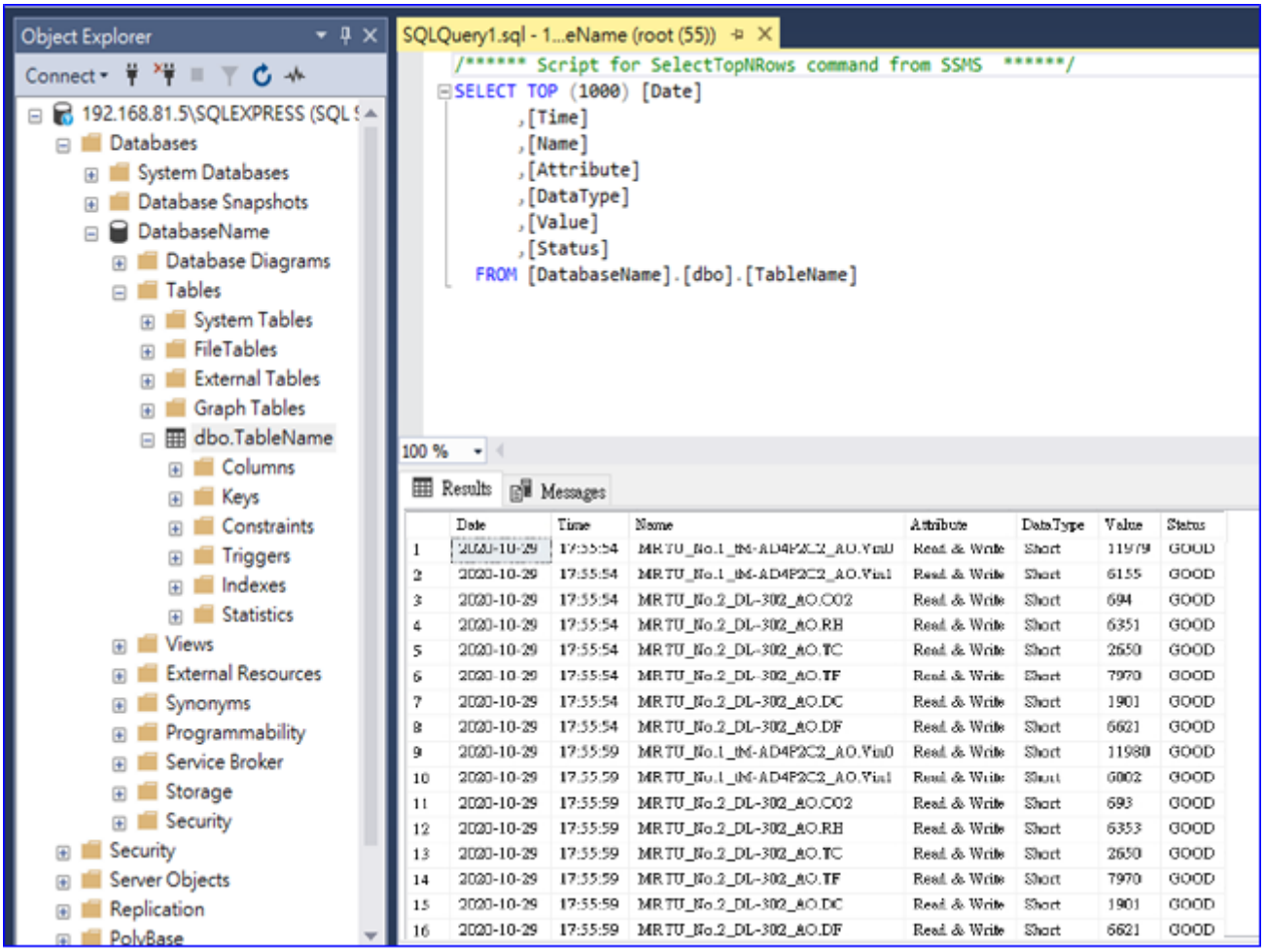
- **MS SQL Remote Database Example Descriptions:**

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)

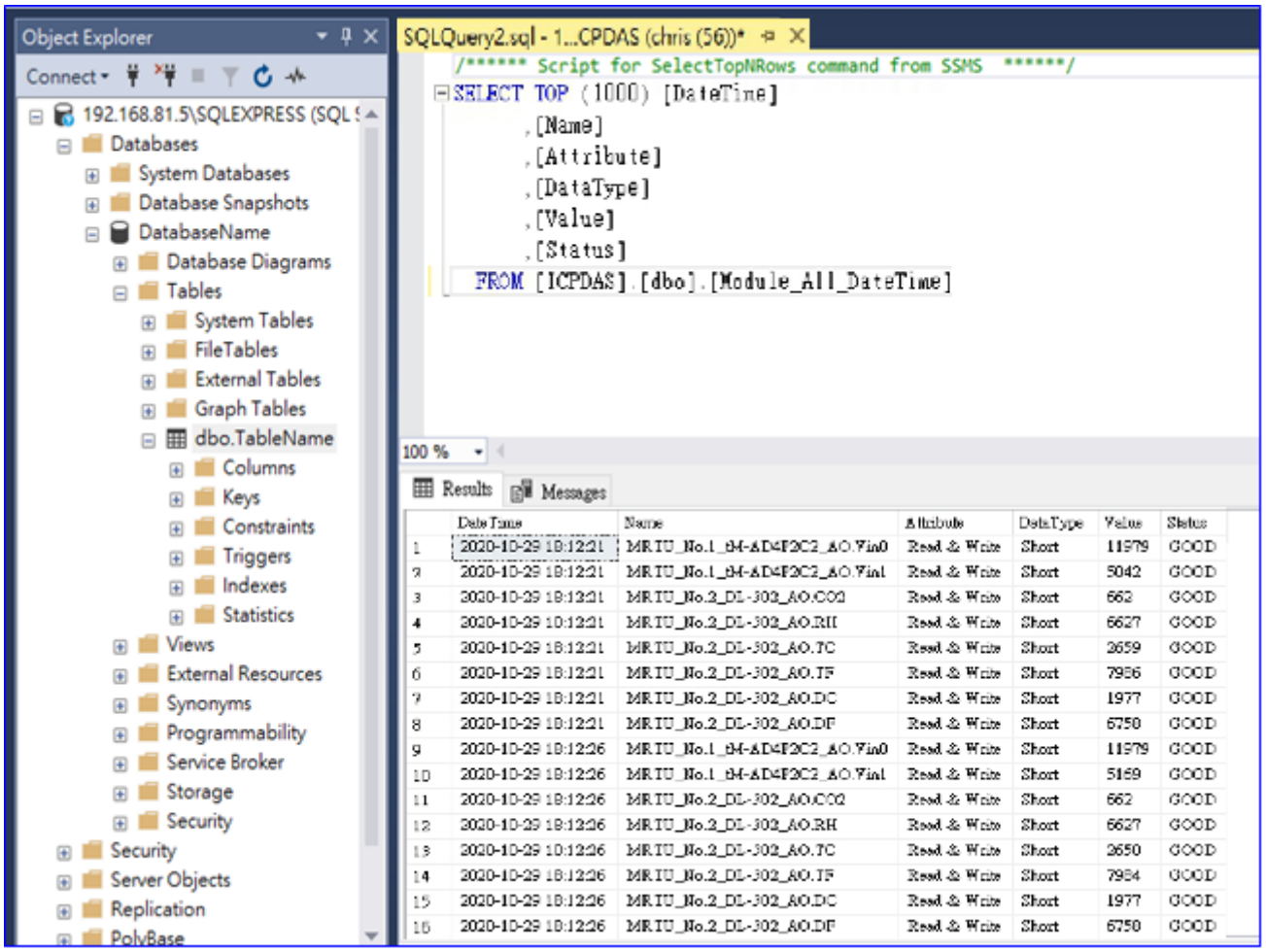
The connection screen view of the MS SQL Remote Database.

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



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



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