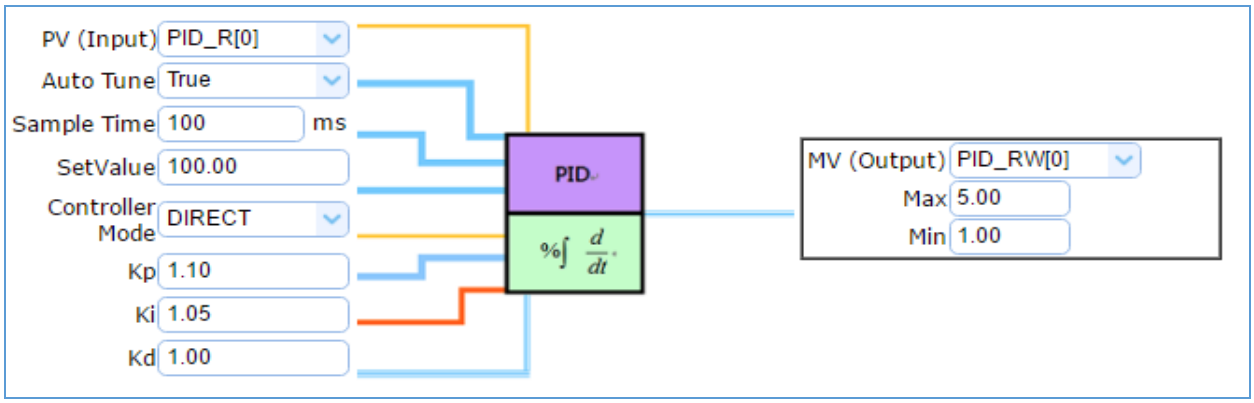
FAQ-PID-01: UA Web UI Function Wizard – PID - How to set up PID function: PID Operation ? (Use M-7026)

In the **PID Operation function**, UA controller collects the module's data to operate via the feedback loop component of PID control. The controller compares the collected data with a reference value and then uses this difference to calculate a new input value whose purpose is to allow the system data to reach or remain at the reference value. This section will introduce the setting steps and the function parameters of the [PID Operation]. **The PID operation is for AI/AO data only, please select the AIO module when use the PID related Function Wizard. This demo uses the M-7026(-G) module.**

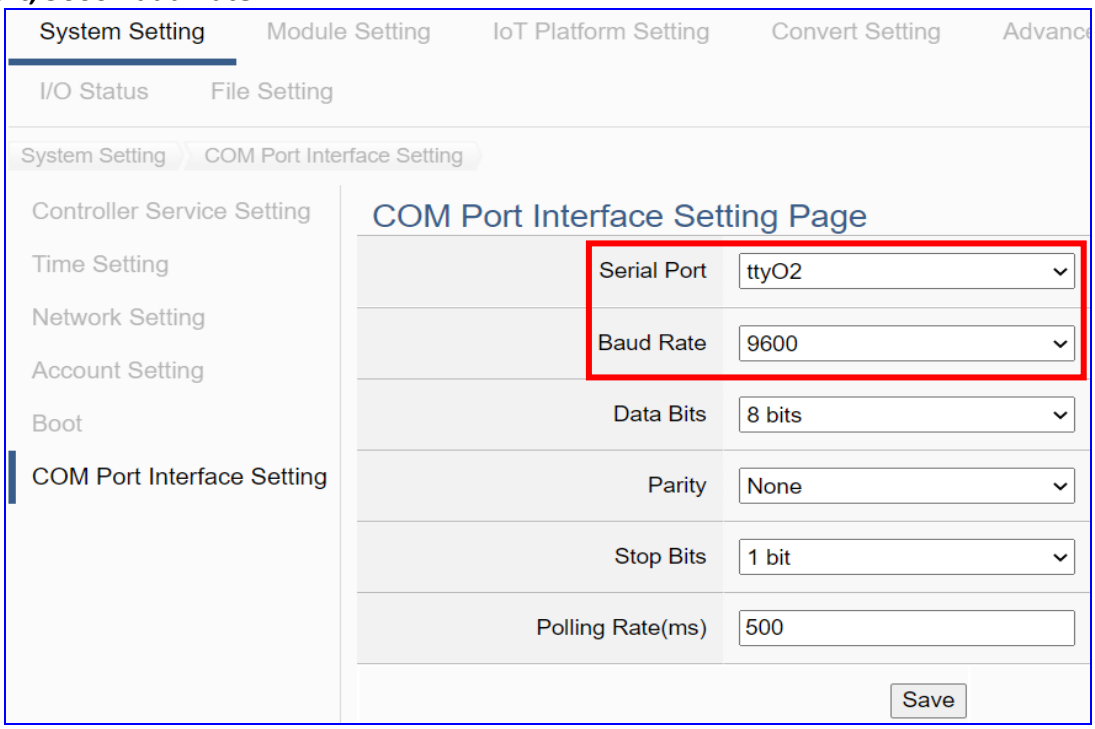
Application Solution Example:



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

Step 1. Controller COM Port Setting

This page allows display and set the COM port interface of the controller for the RS-232/RS-485 serial communication.
The user can find the default communication values of our I/O modules from the module CD, manual or I/O Module website.
In this example: Use ttyO2 port to connect with ICP DAS module M-7026(-G), please choose ttyO2 Serial Port, 9600 Baud Rate.

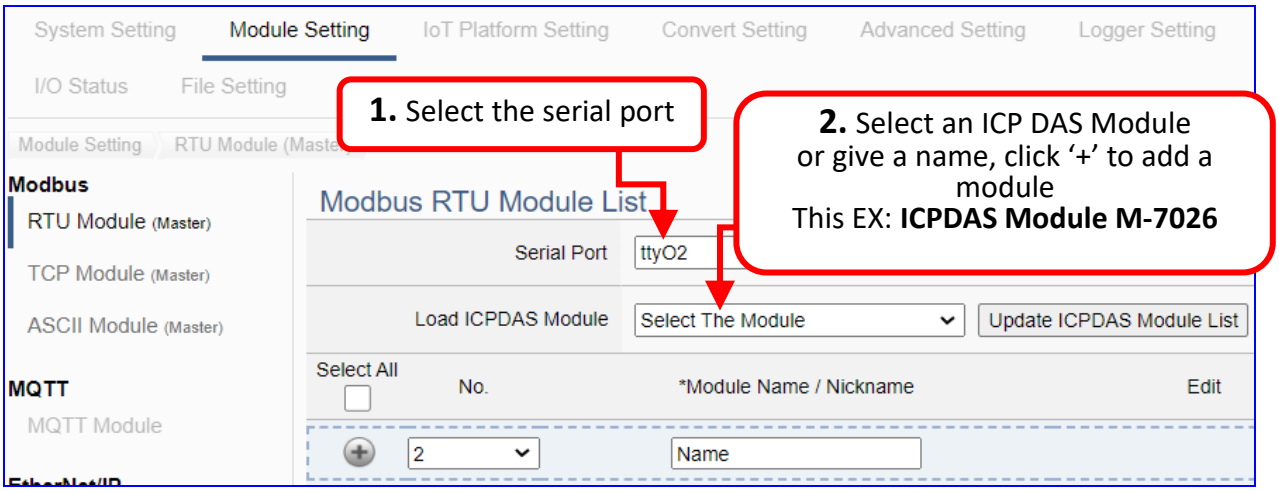


COM Port Interface Setting Page	
Serial Port	Choose the serial port of UA controller that links with the I/O module. ttyO2: RS-485 ; ttyO4: RS-232 ; ttyO5: RS-485
Baud Rate	Choose a baud rate to communicate with the module: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. The UA controller and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

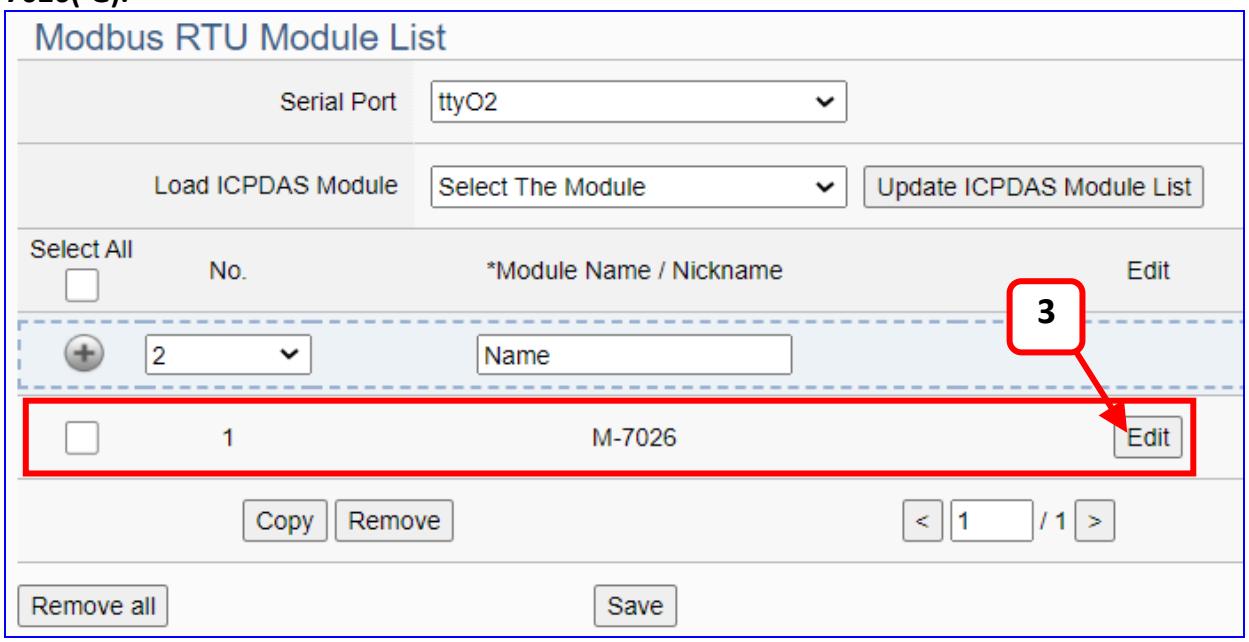
Step 2. Module Setting

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

First, choose the serial port that connected with the module. If use ICP DAS module, select the model to auto load the module setting. If not, give a name (Default: Name), click [⊕] button to add a module. **This EX: select ttyO2, ICP DAS Module M-7026.**

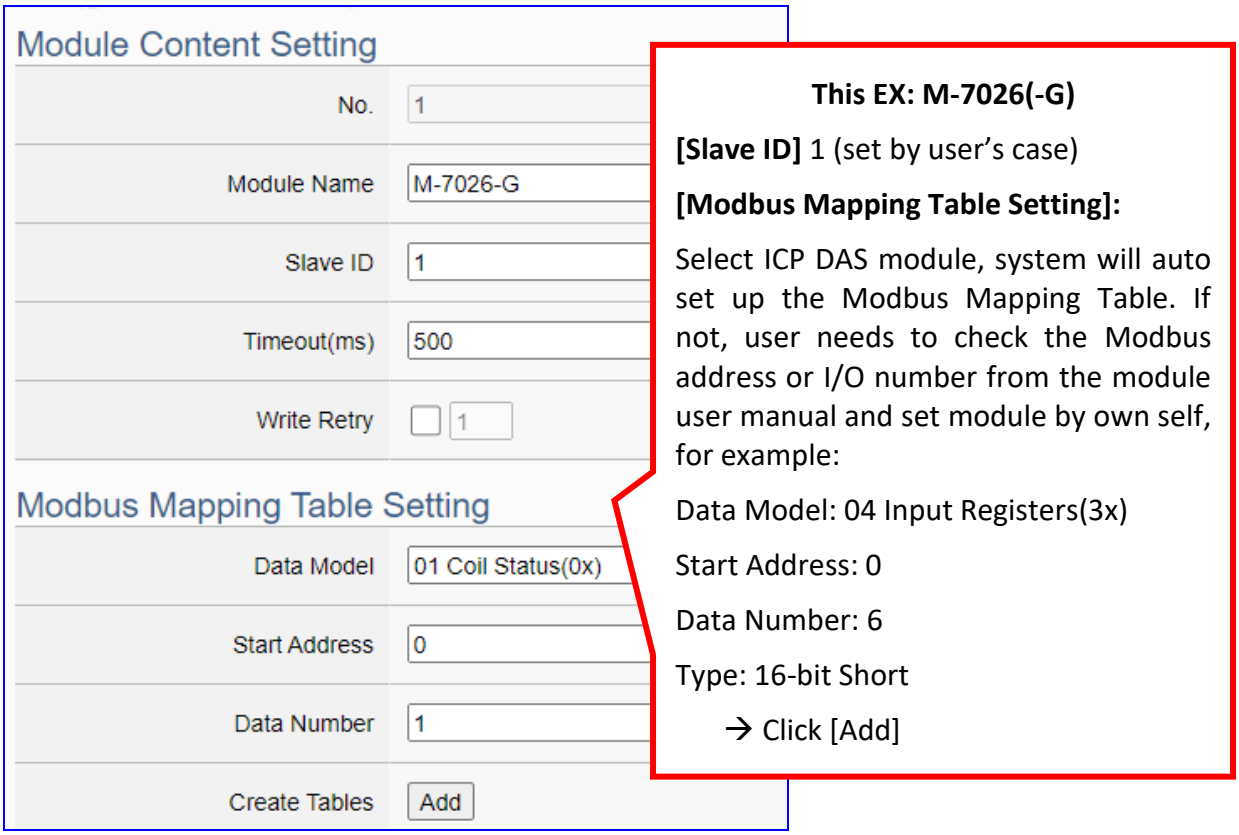


Add a module as below, and then click [**Edit**] button to enter the "Module Content Setting" page. **Ex: M-7026(-G).**



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

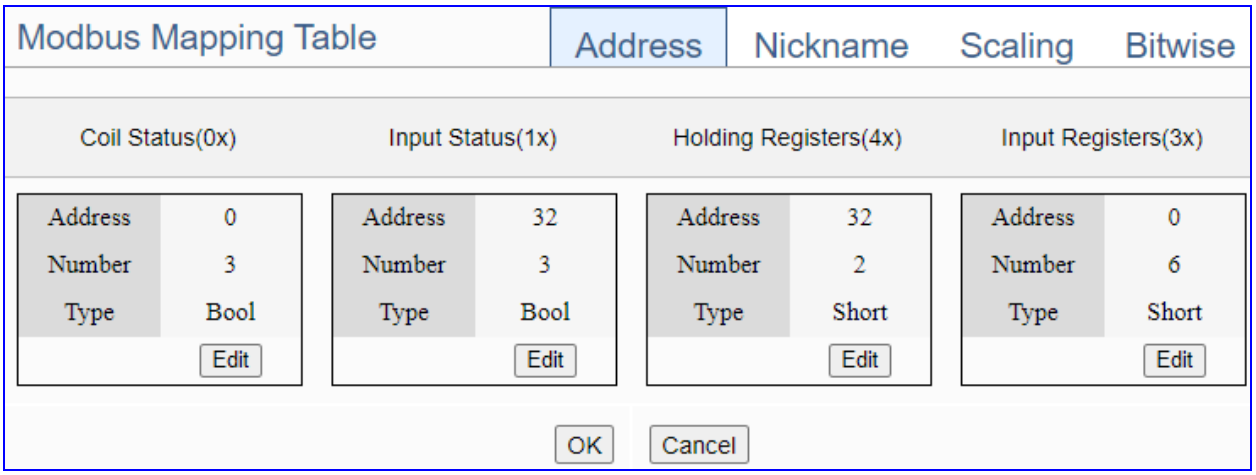
[**Module Content Setting**] page can set up the module and the Modbus address mapping table:



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

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

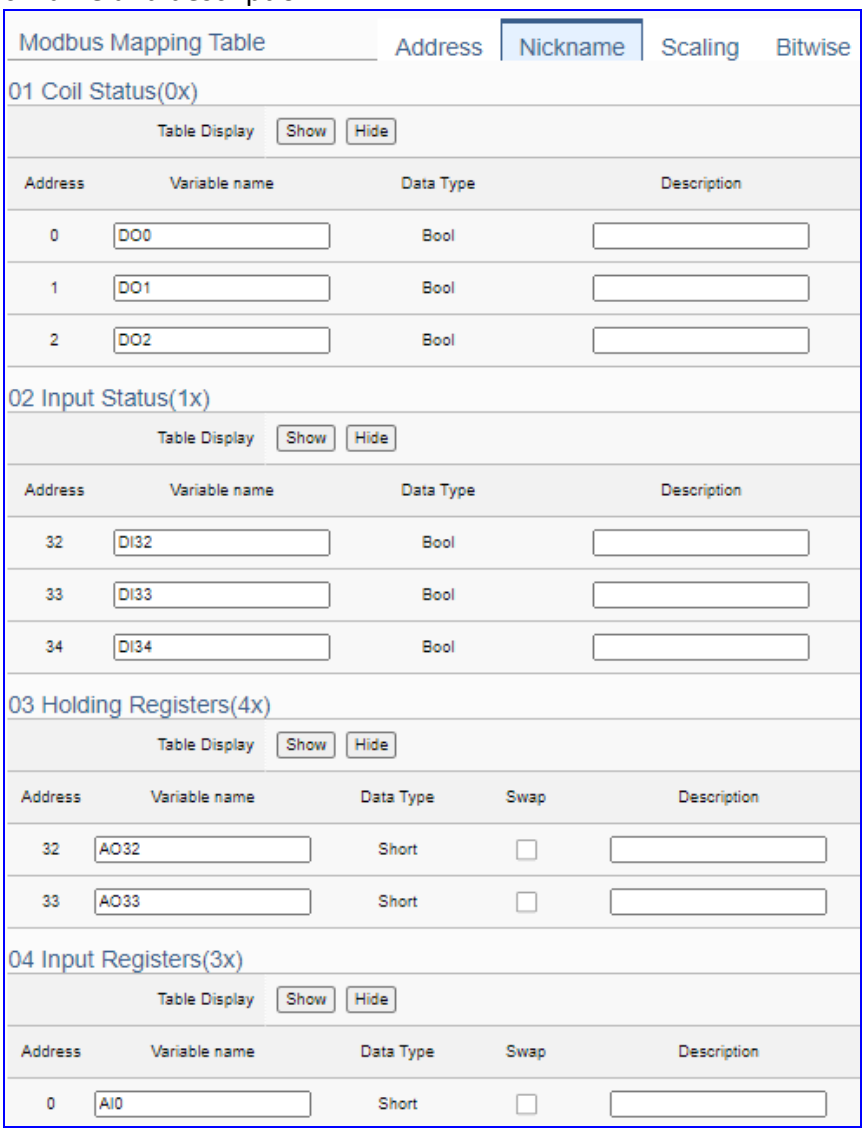
Address:
Display and edit the Modbus Mapping Table.



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

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

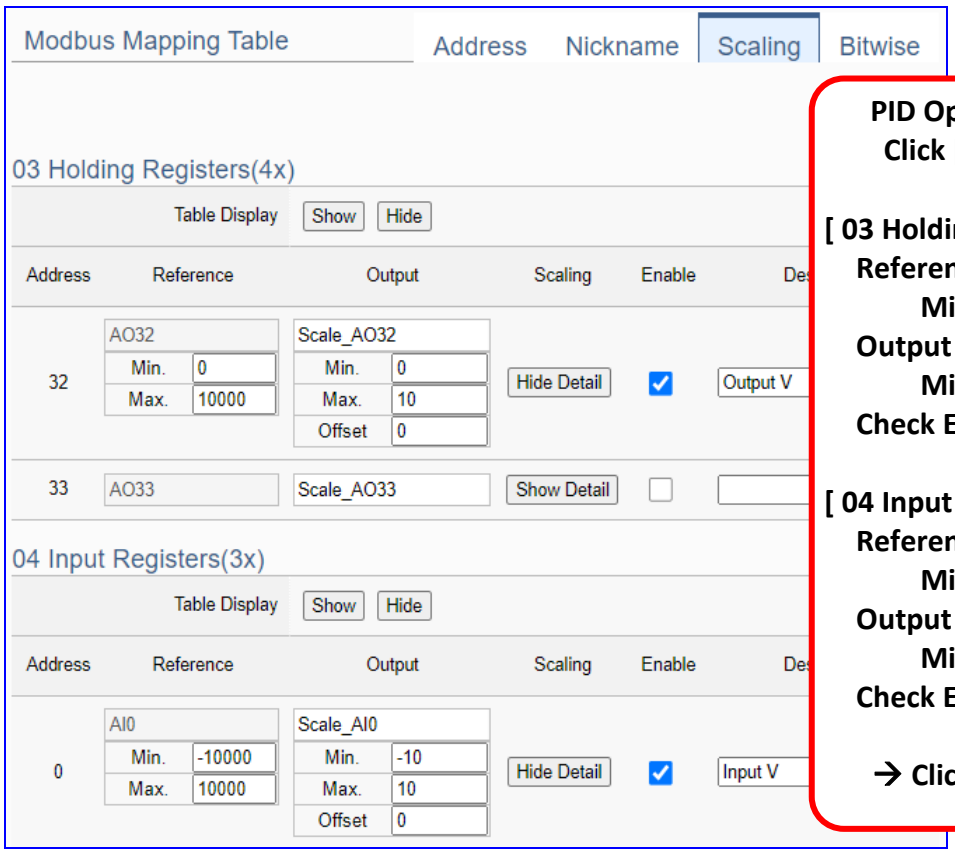
Nickname:
Setting the variable nickname and description.



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

Scaling:

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



PID Operation needs set Scaling
Click [Show Detail] Setting as:

[03 Holding Registers(4x)]
Reference AO32:
Min. 0, Max. 10000
Output Scale_AO32:
Min. 0, Max. 10, Offset 0
Check Enable box

[04 Input Registers(3x)]
Reference AI0:
Min. -10000, Max. 10000
Output Scale_AI0:
Min. -10, Max. 10, Offset 0
Check Enable box

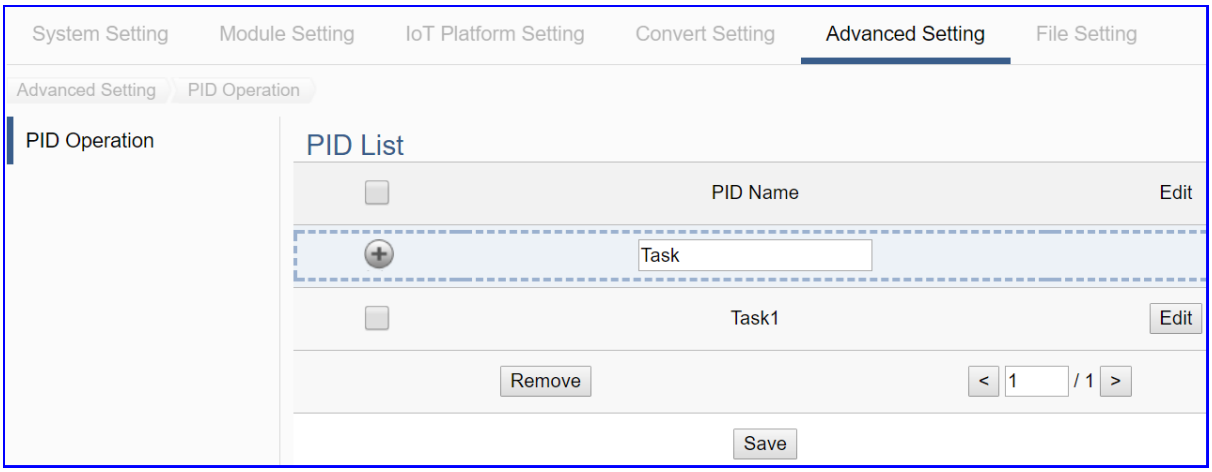
→ Click [OK]

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.

Step 3. PID Operation

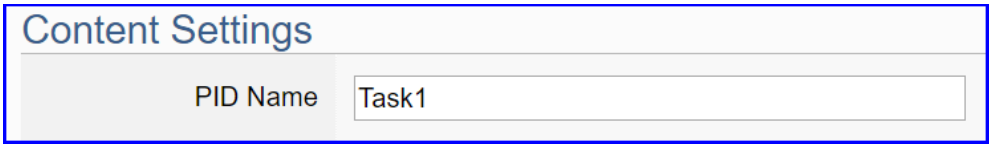
Click the next step, and enter the **Step 3 [PID Operation]** of the UI setting.
This page is for setting the Task and related parameters of the PID Operation, e.g. I/O module, I/O channels, variables, set point, control mode ….

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



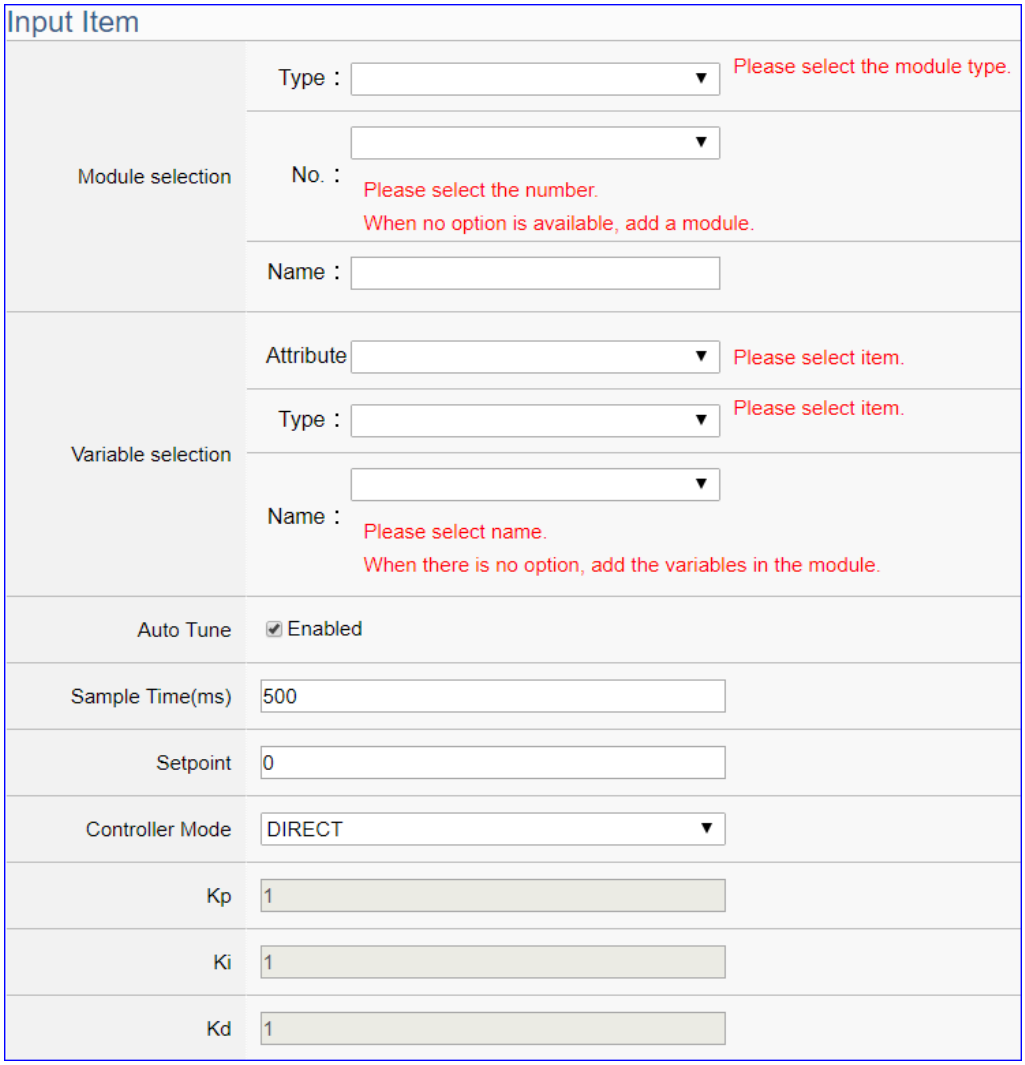
Advanced Setting > PID Operation > PID List	
PID Name	PID name, user can define, e.g. Task1. Default: Task.
⊕	Click to add a new PID Task.
Edit / Remove	Click [Edit] can set the PID content. Click the left box and [remove] can delete the PID list.
< 1 / 1 >	The page number of the PID list: Current page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

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



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

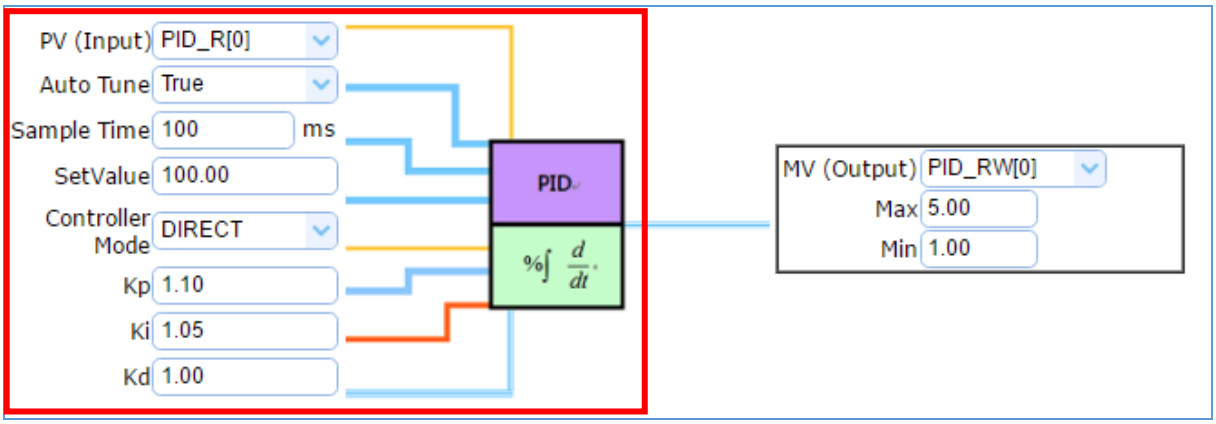
*** Parameters Descriptions for Input Item of PID Operation**



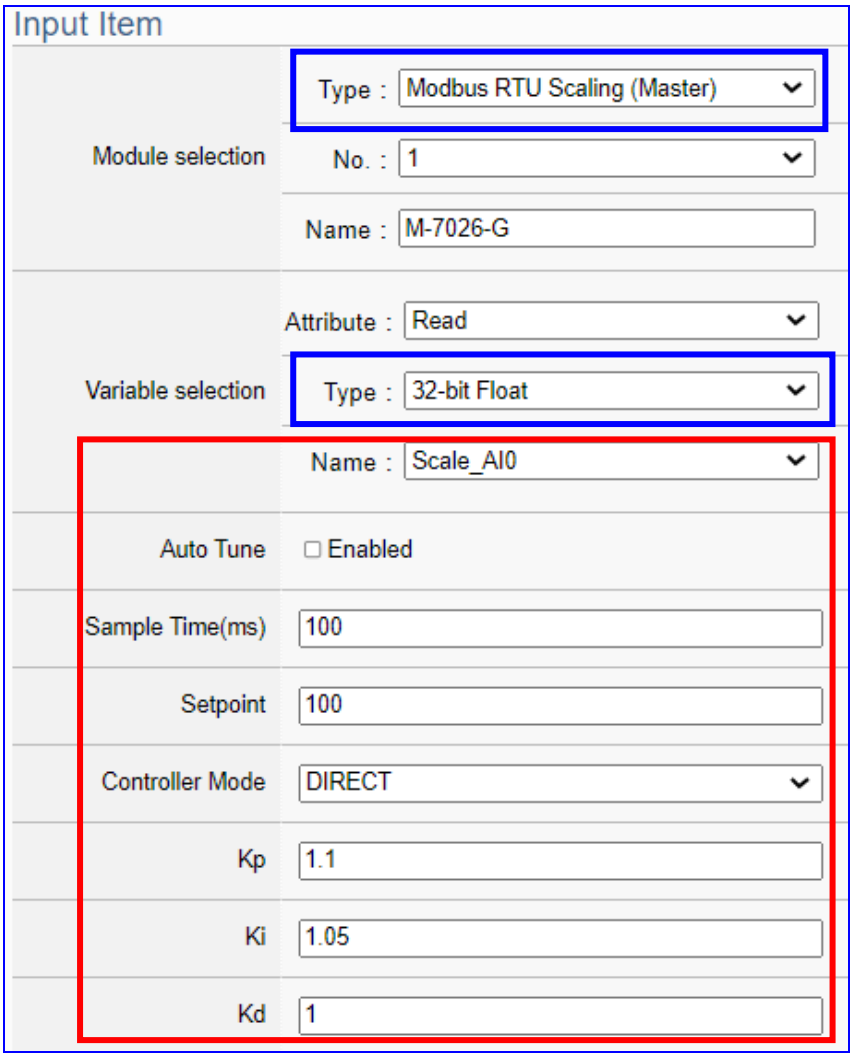
Advanced Setting > PID Operation > Input Item	
Module selection	Choose a predefined module for input data of the PID. Select the type, number and name of the input module. If no option is available, add a new module.
Variable selection	Choose a predefined float variable as the input parameter for PID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

*** Setting Example for Input Item of PID Operation**

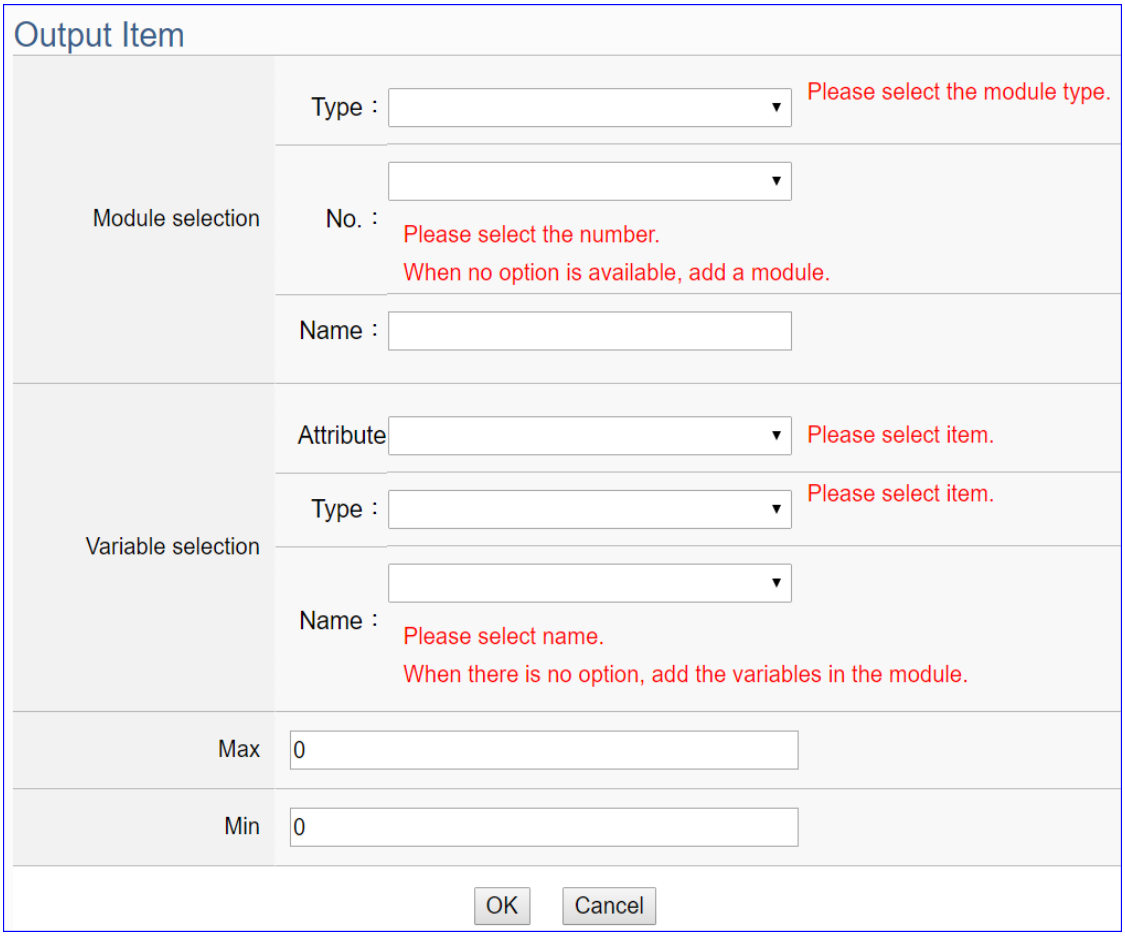
Suppose the example formula is as shown in the figure below, its input items will be as shown in the left side of the figure:



According to the example formula, the Input Items are set as follows:



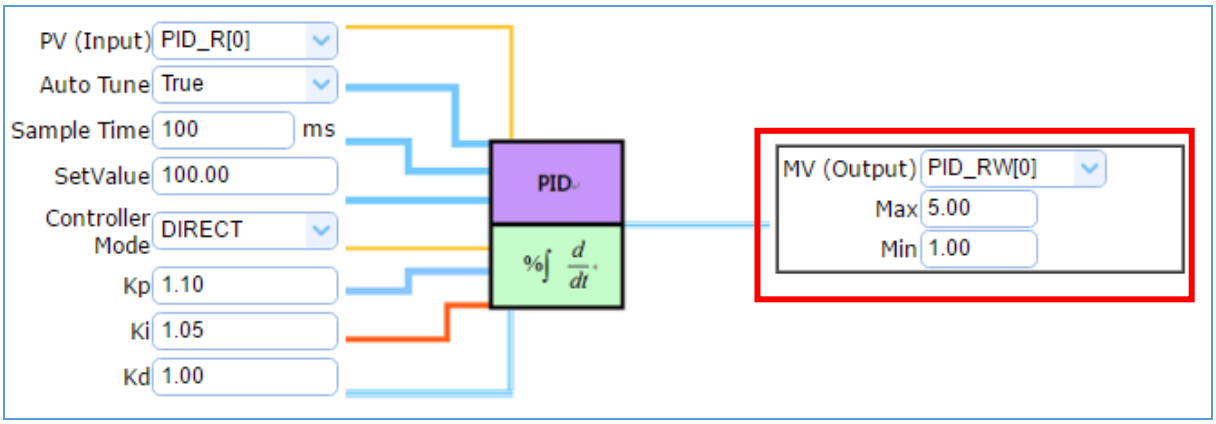
*** Parameters Descriptions for Output Item of PID Operation**



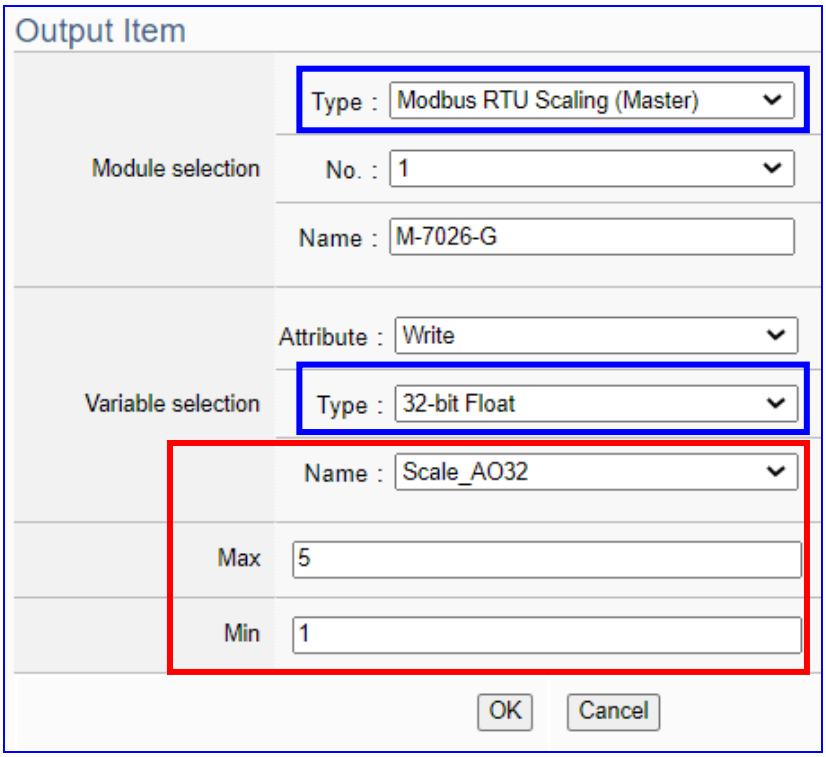
Advanced Setting > PID Operation > Output Item	
Module selection	Choose a predefined module for output data of the PID. Select the type, number and name of the input module. If no option is available, add a new module.
Variable selection	Choose a predefined float variable as the output parameter for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

*** Setting Example for Output Item of PID Operation**

Suppose the example formula is as shown in the figure below, its output items will be as shown in the right side of the figure:

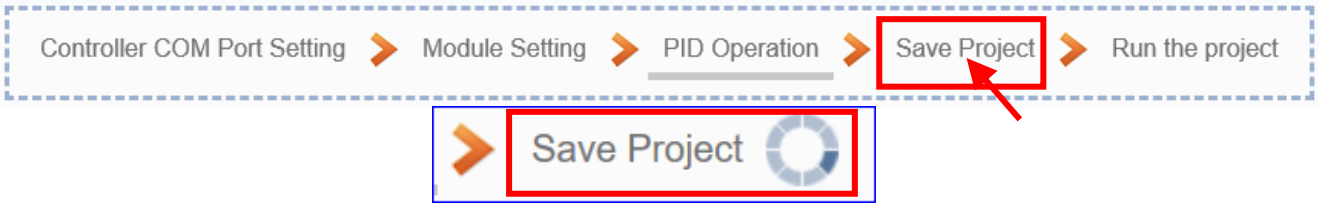


According to the example formula, the Output Items are set as follows:



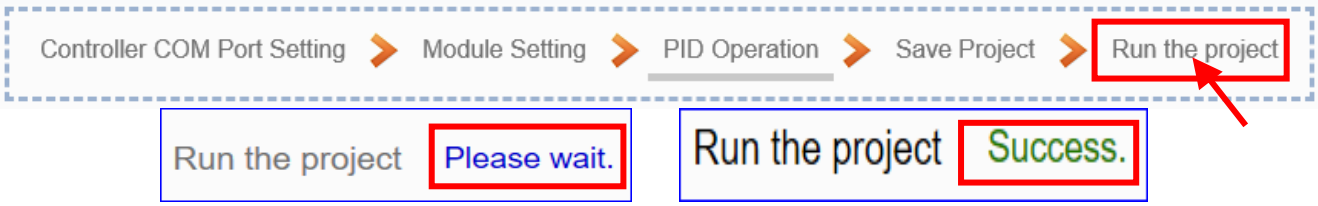
- **Step 4. Save Project**

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



- **Step 5. Run the Project**

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



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

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