ICP DAS CO., LTD.

UA-5000 Series User Manual

IIoT Communication Server

www.icpdas.com

Warranty

All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year, starting from the date of delivery to the original purchaser.

Warning

ICP DAS Inc., LTD. assumes no liability for damages consequent to the use of this product. ICP DAS Inc., LTD. reserves the right to change this manual at any time without notice. The information furnished by ICP DAS Inc. is believed to be accurate and reliable. However, no responsibility is assumed by ICP DAS Inc., LTD. for its use, or for any infringements of patents or other rights of third parties resulting from its use.

Copyright and Trademark Information

Trademark of Other Companies

The names used for identification only maybe registered trademarks of their respective companies.

License

The user can use, modify and backup this software on a single machine. The user may not reproduce, transfer or distribute this software, or any copy, in whole or in part.

Technical Service:

Please contact local agent or email problem-report to service@icpdas.com .
For more product information, please refer to www.icpdas.com .

Technique: Sun Chen; Translation & Edition: Eva Li/Janice Hong ; R&D Dept., ICP DAS CO., LTD.
V.1.0.0 , Aug. 2015

Table of Contents

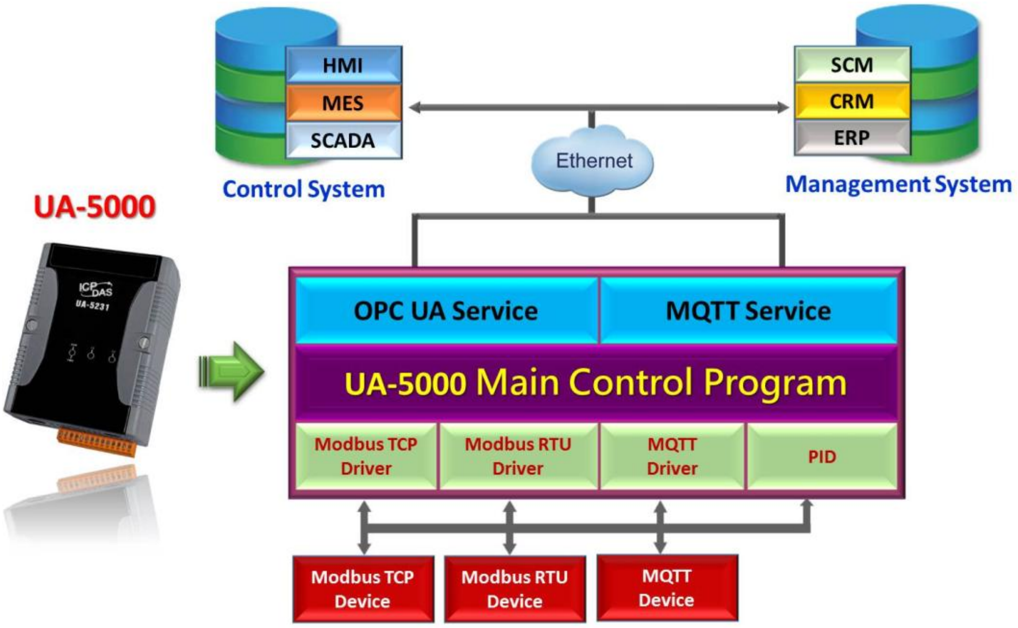
1. UA-5000 IIoT Communication Server

This chapter introducts the UA-5000 and its functions, software/hardware specifications...

1.1. Introduction

The **UA-5000** is a series of data acquisition controller and also an IIoT communication server by ICP DAS (IIoT: Industrial Internet of Things). The UA-5000 built-in **OPC UA Server** and **MQTT Client Service** support a variety of common industrial communication protocols. Its RISC-based CPU architecture has the advantages of small size and low power consumption that lets this series can be placed in a small space to fit variety of rooms, equipment and case environment. In the hardware, it provides a variety of communication interfaces, such as Gigabit Ethernet, USB, RS-232 and RS-485… ports to connect diverse devices.

Applying **OPC UA** can integrate the I/O products of ICP DAS with the third-party devices, import the data information to the SCADA, database or decision-making systems for the back-end management, and satisfy the reliability, interoperability and security needs of the industrial automation system. Using **MQTT** communication can bridge the system with the Internet of Things (IoT) to meet the current trend of the smart internet.



1.2. Function Features

- **Web-based UI**

  With the Web-based User Interface, users can log in and configure the controller via a normal web browser that only need a mobile device or computer with web browsing capabilities.

- **OPC UA Server: IEC 62541 Standard**

  The OPC UA Server certified by the OPC Foundation can assist the integration for the local-end devices, actively upload data to the application system, and support to across the multiple platforms.

- **PID Logic Operation**

  The PID function can dynamically combine the remote I/O devices for the PID logic control to provide temperature control and case field solutions.

- **Support Modbus TCP/RTU Master**

  Through the controller's RS-485, RS-232 and Ethernet ports can connect to the Modbus TCP/RTU Slave devices. Build systems with scalability and flexibility to meet the diverse application needs and expansion at any time.

- **MQTT Broker Inside**

  Compliance with MQTT v3.1.1 protocol. Support MQTT message distribution management. Users do not need to build Broker system when using MQTT communications.

- **Support MQTT Protocol**

  Support MQTT to allow the IoT devices communicating with the OPC UA system and the UA-5000 conducting the data acquisition and management; and also can convert and publish the devices' data under the UA-5000 to the IoT system.

UA-5000 Function Overview		
Web-based UI	Built-in Web-based User Interface	
Flexible System Configuration	Variable Table/Communication Task Dynamic Editor	
OPC UA	Compliance with IEC 62541 Standard Cross-platform Data Integration (DA/AE/HDA) Transmission Security SSL Encryption Active Transmission Support Redundancy Support Remote Function Call	
MQTT Broker Inside	Compliance with MQTT V.3.1.1 Protocol	
PID Logic Operation	Dynamic Combination of I/O Devices for PID Logic Control	
Service Up to Interact with the Host	Protocol	OPC UA Server MQTT
	Interface	Ethernet Data Transmission
Driver Down to Interact with the I/O Modules	Protocol	Modbus RTU/TCP MQTT
	Interface	RS-232/RS-485 Ethernet Data Transmission

1.3. Hardware Specifications

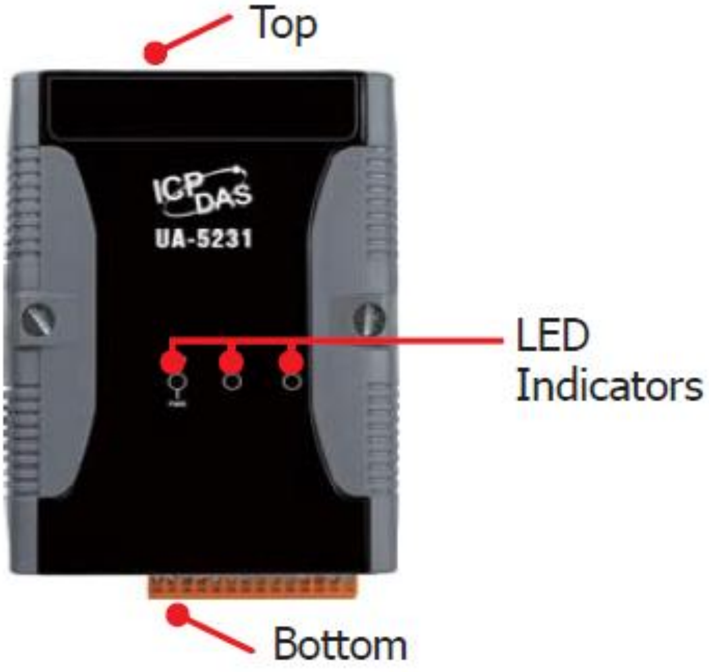
Model	UA-5231	UA-5241
System Software		
OS	Linux Kernel 3.2.14	
Embedded Service	SFTP server, Web server, SSH	
CPU Module		
CPU	AM3352, 720 MHz	
DDR3 SDRAM	512 MB	
Flash	256 MB	
FRAM	64 KB	
Expansion Flash Memory	microSD socket with one 4 GB microSD card (support up to 32 GB microSDHC card)	
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year	
64-bit Hardware Serial Number	Yes, for Software Copy Protection	
Dual Watchdog Timers	Yes	
LED Indicators	4 LEDs (Power, Running and 2 user defined LEDs)	
Rotary Switch	Yes (0 ~ 9)	
VGA & Communication Ports		
VGA & Communication Ports	Yes, resolution: 640 × 480, 800 × 600, 1024 × 768, 1280 x 720	
Ethernet	RJ-45 x 1	RJ-45 x 2
	10/100/1000 Based-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators)	
USB 2.0 (host)	1	
Console Port	RS-232 (RxD, TxD and GND); Non-isolated	
ttyO2	RS-485 (Data+, Data-); Non-isolated	
ttyO4	RS-232 (RxD, TxD and GND); Non-isolated	
ttyO5	RS-485 (Data+, Data-); 2500 V_{DC} isolated	
Mechanical		
Dimensions (W x L x H)	91 mm x 132 mm x 52 mm	
Installation	DIN-Rail Mounting	
Environmental		
Operating Temperature	-25 ~ +75°C	
Storage Temperature	-30 ~ +80°C	
Ambient Relative Humidity	10 ~ 90% RH (non-condensing)	
Power		
Input Range	+12 ~ +48 VDC	
Consumption	4.8 W	

1.4. Software Specifications

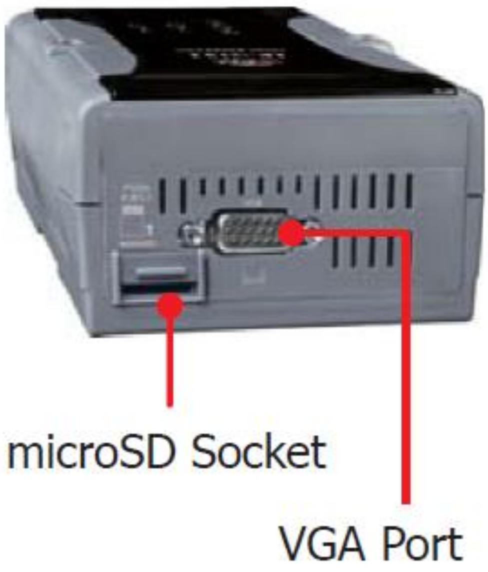
Model	**UA-5000 Series**
OPC UA	
OPC UA Server	● OPC Unified Architecture: 1.02 ● Core Server Facet ● Data Access Server Facet ● Method Server Facet ● Client Redundancy Facet ● UA-TCP UA-SC UA Binary ● User Token User Name Password & X509 Certificate ● Security Policy ◦None ◦Basic128Rsa15 • Sign • Sign & Encrypt ◦Basic256 • Sign • Sign & Encrypt
Modbus Master	
Modbus TCP	To read or control the devices that support standard Modbus TCP Slave protocol. Recommend to keep the maximum number of devices within 100 connections.
Modbus RTU	A max. of 3 ports: ttyO2, ttyO4, ttyO5 to connect other Modbus RTU Slave devices (e.g. M-7000). Recommend no more than 32 devices per port for better communication quality.
MQTT	
MQTT Client	Connect the MQTT Broker to read/control the devices supporting the MQTT protocol.
MQTT Service	Connect the MQTT Broker to externally read/control the devices supporting other protocols that linking with the UA-5000 series.
MQTT Broker	Compliance with MQTT v3.1.1 protocol. Support MQTT message distribution management. Recommend to keep the connection number of Client within 400.
Virtual Device	
PID Function	Combine the remote I/O devices for the PID logic control system.

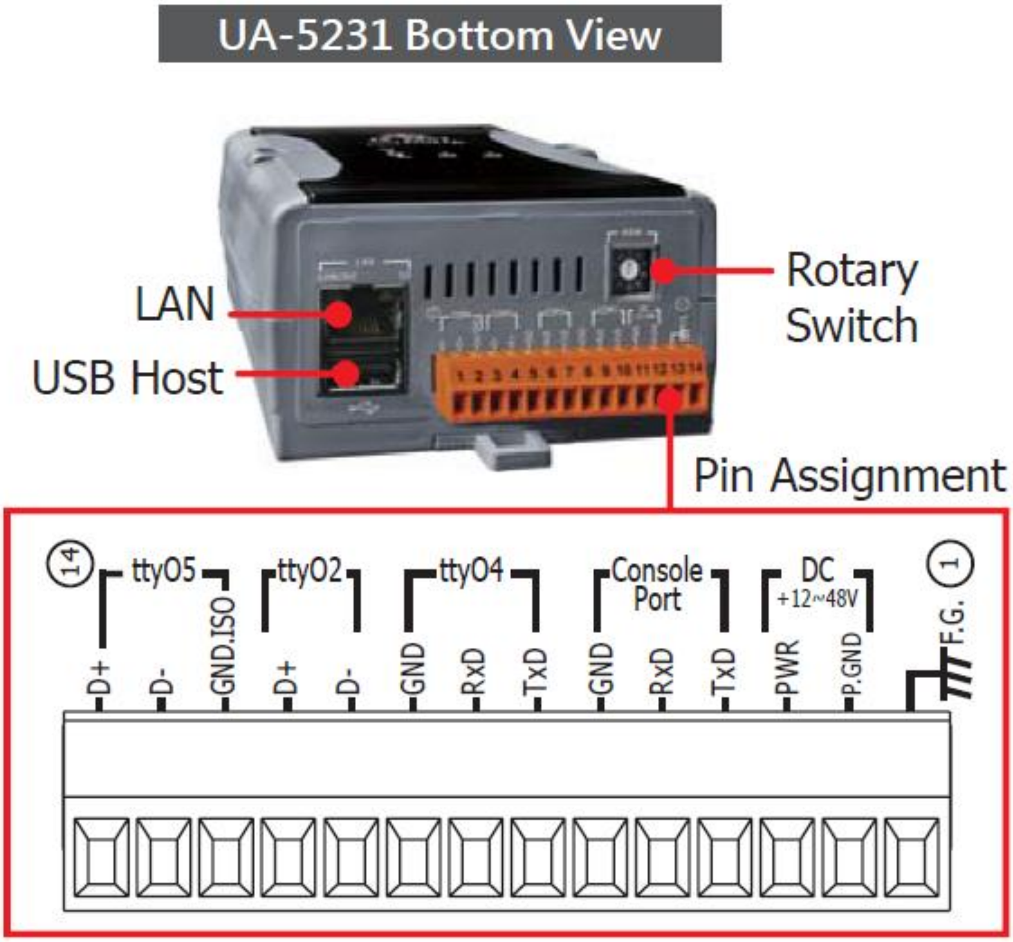
1.5. Appearance

Front View



Top View




UA-5231 Bottom View
LAN
USB Host
Rotary Switch
Pin Assignment
14
tty05
tty02
tty04
Console Port
DC +12~48V
1
D+
D-
GND.ISO
D+
D-
GND
RxD
TxD
GND
RxD
TxD
PWR
P.GND
F.G.

2. Quick Start

This chapter describes the process of creating a UA-5000 project, including how to connect to the UA-5000 web-based UI via a browser, set web functions step-by-step, and complete a project.

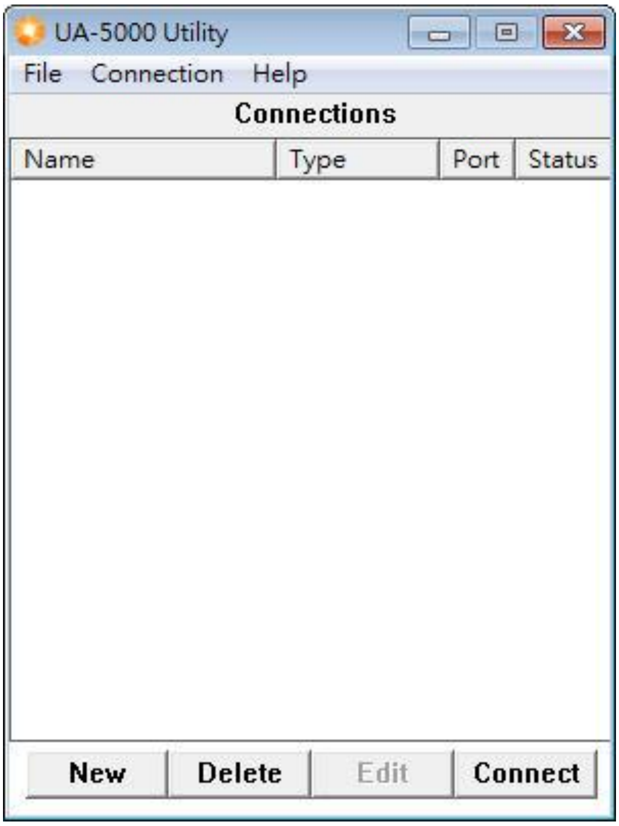
2.1. Link to UA-5000 Web-based UI

The following steps will show you how to connect to the UA-5000 web interface.

Using the **UA-5000 Utility** (named “UA-5000utility.exe”) at the path of the companion CD (i.e., **CD:/UA-5000/Utility/**). Please copy this file to your PC, and then run it to connect the device.

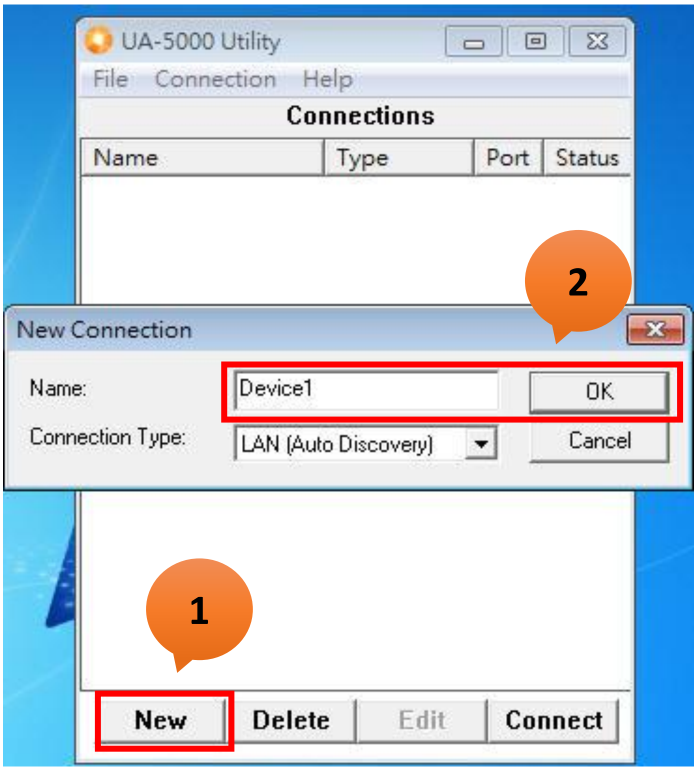
Step 1

Run the UA-5000 Utility (file name: **UA-5000utility.exe**).



Step 2

Add a connection item and give a name for it.

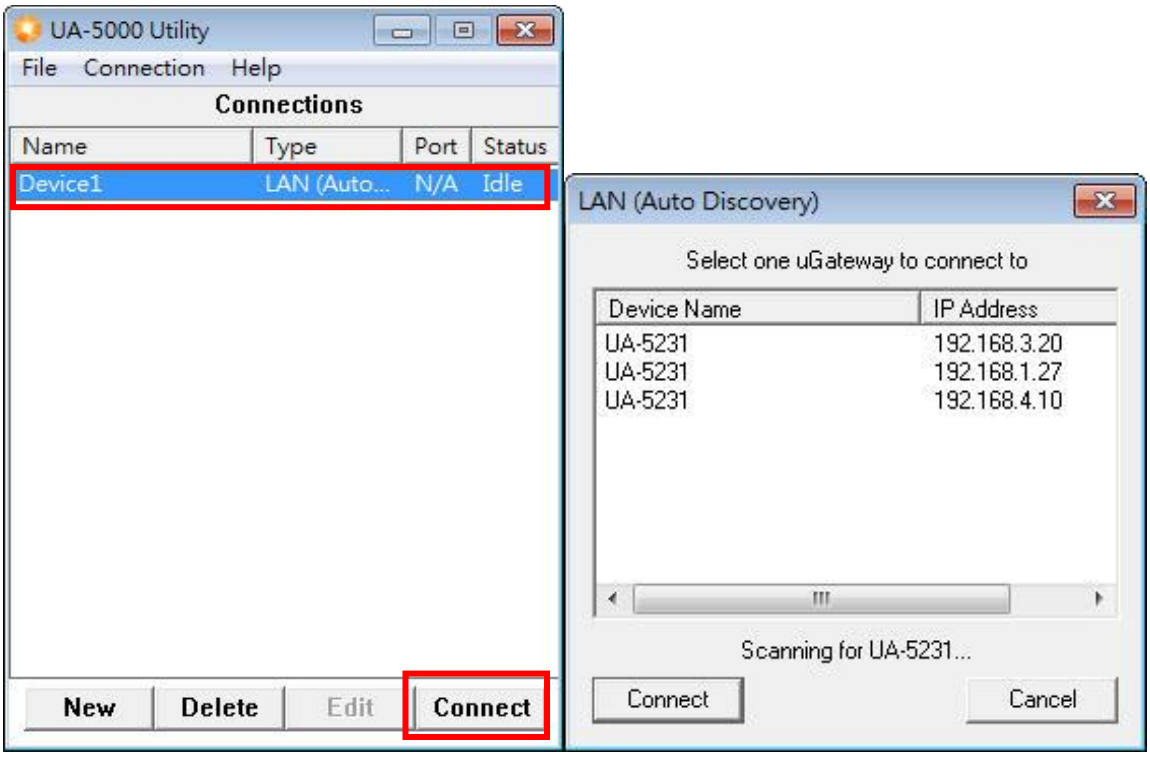


Name: Device1

Connection Type: LAN (Auto Discovery)

Step 3

Mouse double-click on the name you created (or single-click and then click the "Connect" button), this utility will search and list all devices over the network.



Name	Type	Port	Status
Device1	LAN (Auto...	N/A	Idle

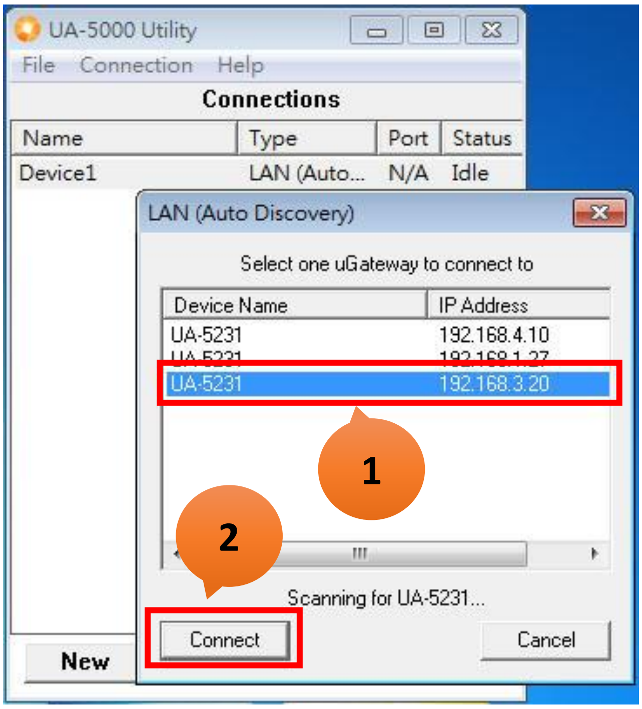
Select one uGateway to connect to

Device Name	IP Address
UA-5231	192.168.3.20
UA-5231	192.168.1.27
UA-5231	192.168.4.10

Scanning for UA-5231...

Step 4

Click the device name you want to connect to, and then click the “Connect” button. It will connect to the UA-5000 web interface via the default browser.



Name	Type	Port	Status
Device1	LAN (Auto...	N/A	Idle

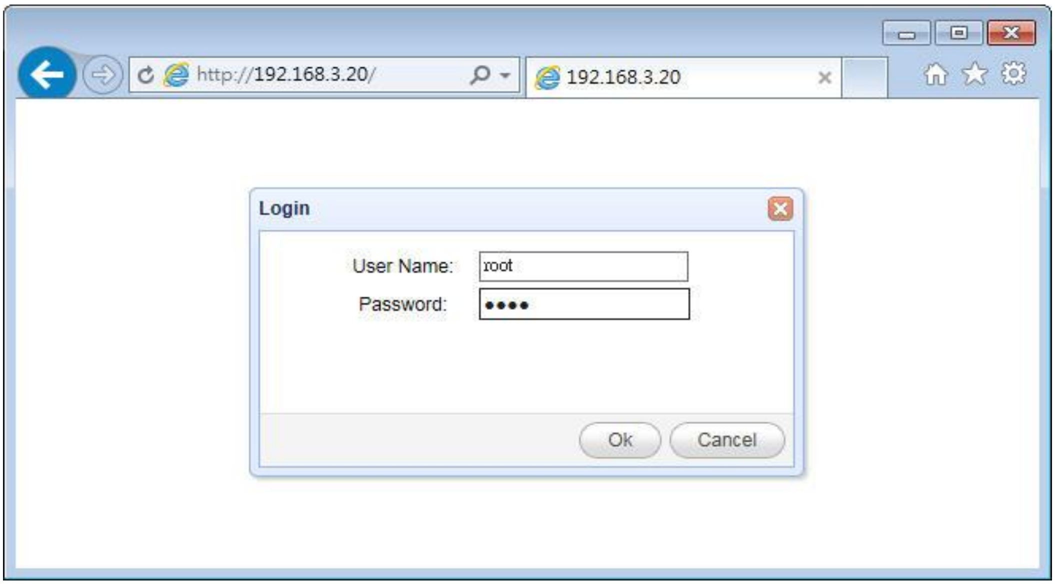
Select one uGateway to connect to

Device Name	IP Address
UA-5231	192.168.4.10
UA-5231	192.168.1.27
UA-5231	192.168.3.20

Scanning for UA-5231...

Step 5

A login dialog box will appear, entering your user name and password, and then click “OK”. The factory default user name and password are “root”.

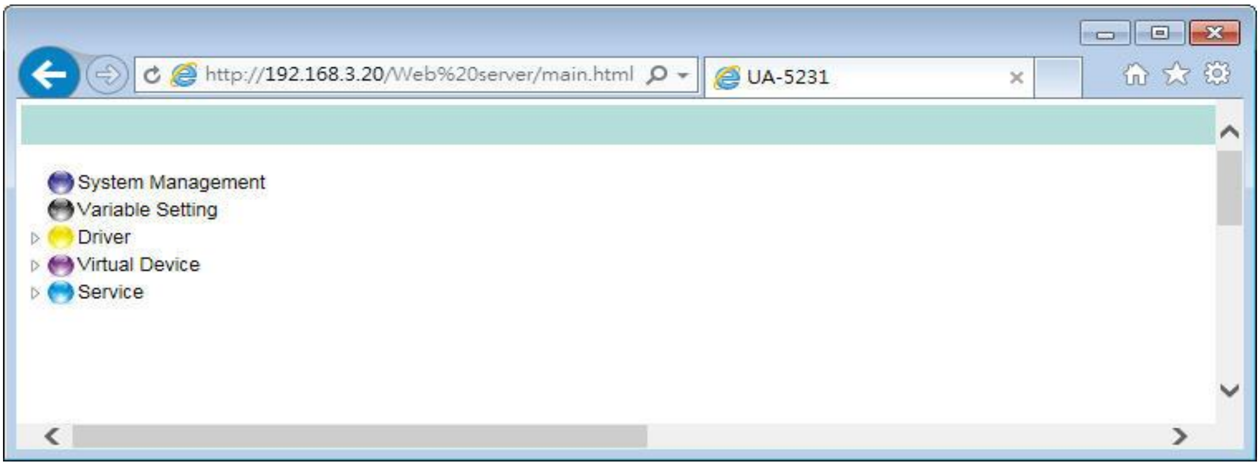


User Name: root

Password: ••••

Finish

After logging into the web interface, you can see the main configuration screen.

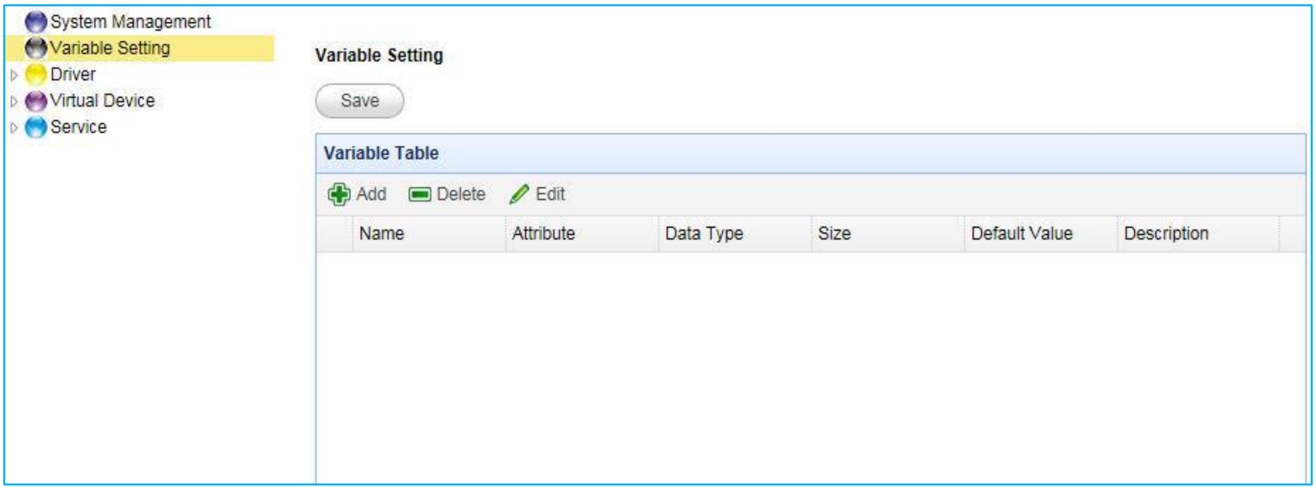


2.2. Add Variables in the Variable Table

The following steps will show you how to add variables in the variable table.

Step 1

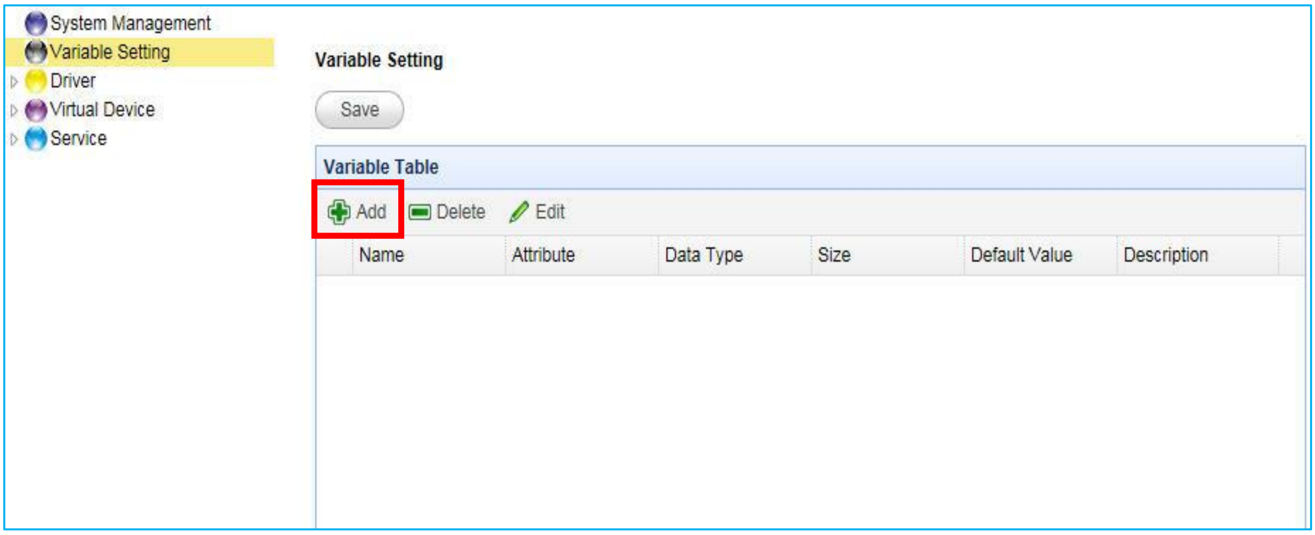
Click “Variable Setting” on the left to open the setting page.



Name	Attribute	Data Type	Size	Default Value	Description

Step 2

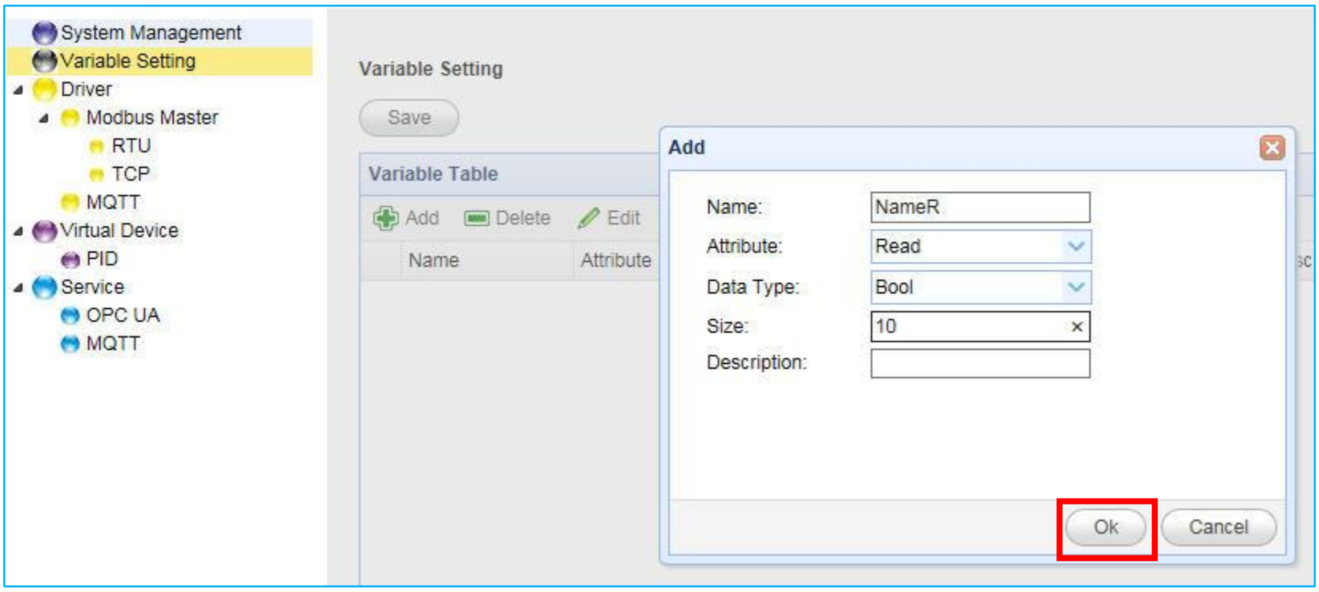
Click “Add” to add the needed variable.



Name	Attribute	Data Type	Size	Default Value	Description

Step 3

Enter all related information for this variable and then click “OK”.



Name: NameR

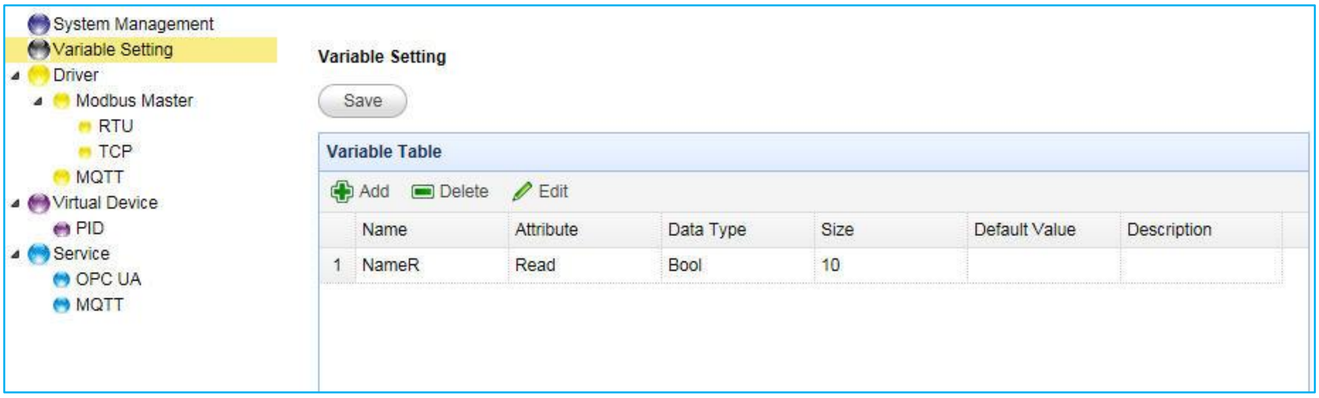
Attribute: Read

Data Type: Bool

Size: 10

Description:

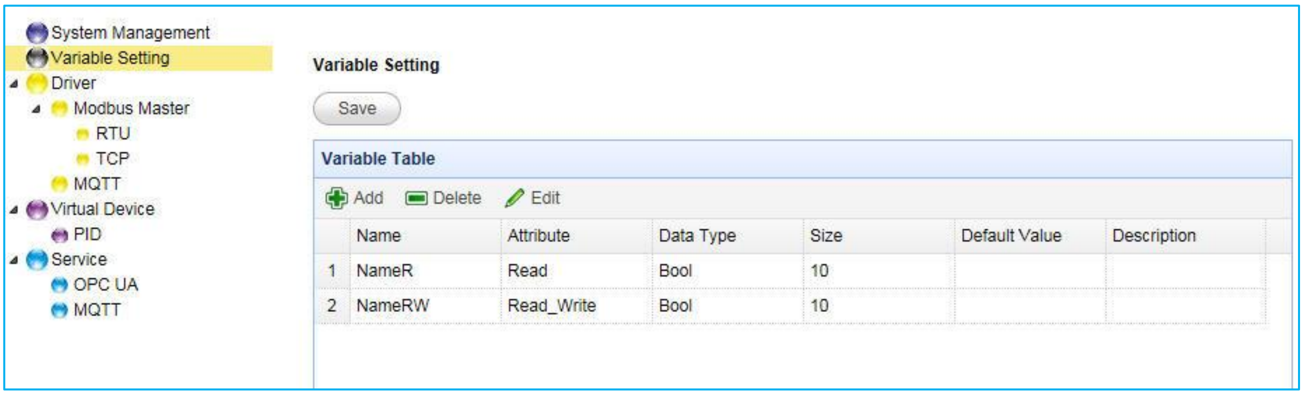
Now that your variable is set up.



	Name	Attribute	Data Type	Size	Default Value	Description
1	NameR	Read	Bool	10		

Step 4

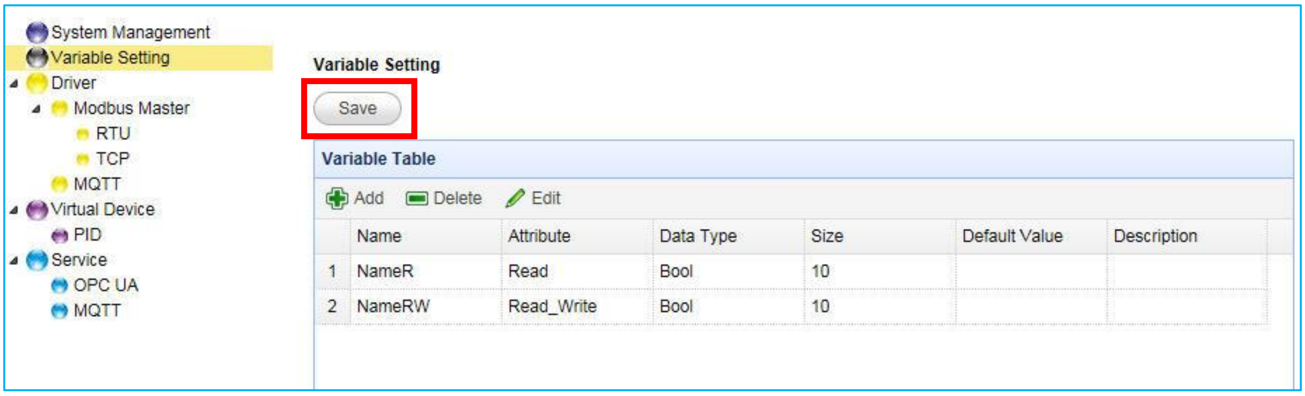
Repeat the previous steps to add more wanted variables.



	Name	Attribute	Data Type	Size	Default Value	Description
1	NameR	Read	Bool	10		
2	NameRW	Read_Write	Bool	10		

Step 5

Click the “Save” button to save the settings.

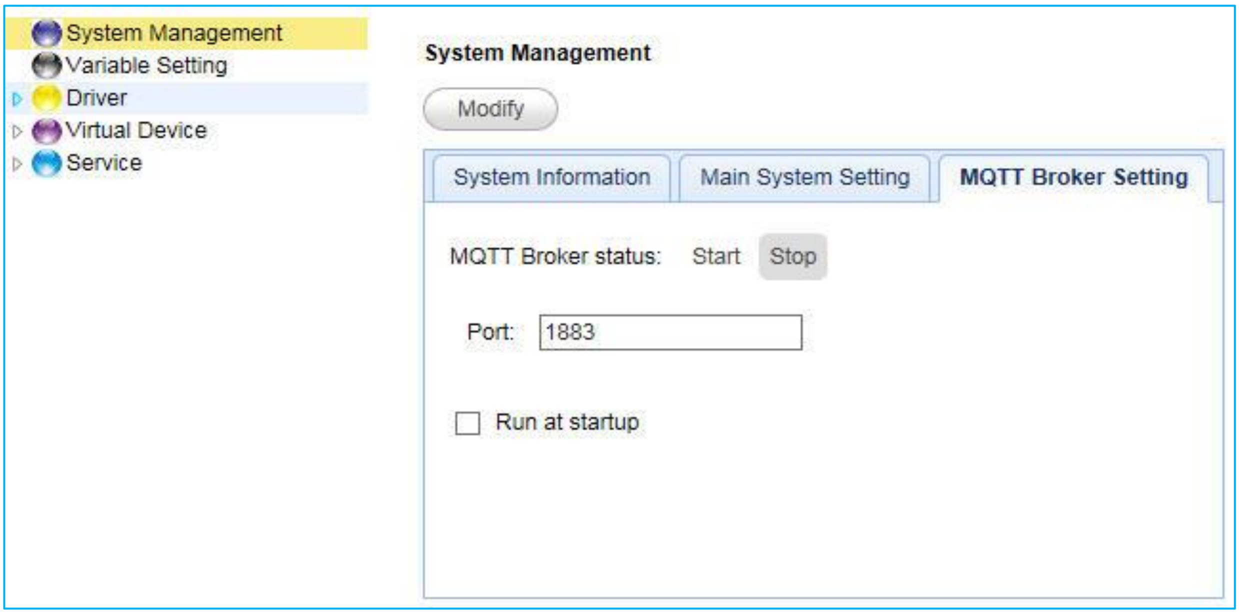


	Name	Attribute	Data Type	Size	Default Value	Description
1	NameR	Read	Bool	10		
2	NameRW	Read_Write	Bool	10		

2.3. Start a Built-in MQTT Broker

Step 1

Click “System Management” on the left tree-menu, and then click the “MQTT Broker Setting” tab in the right panel.



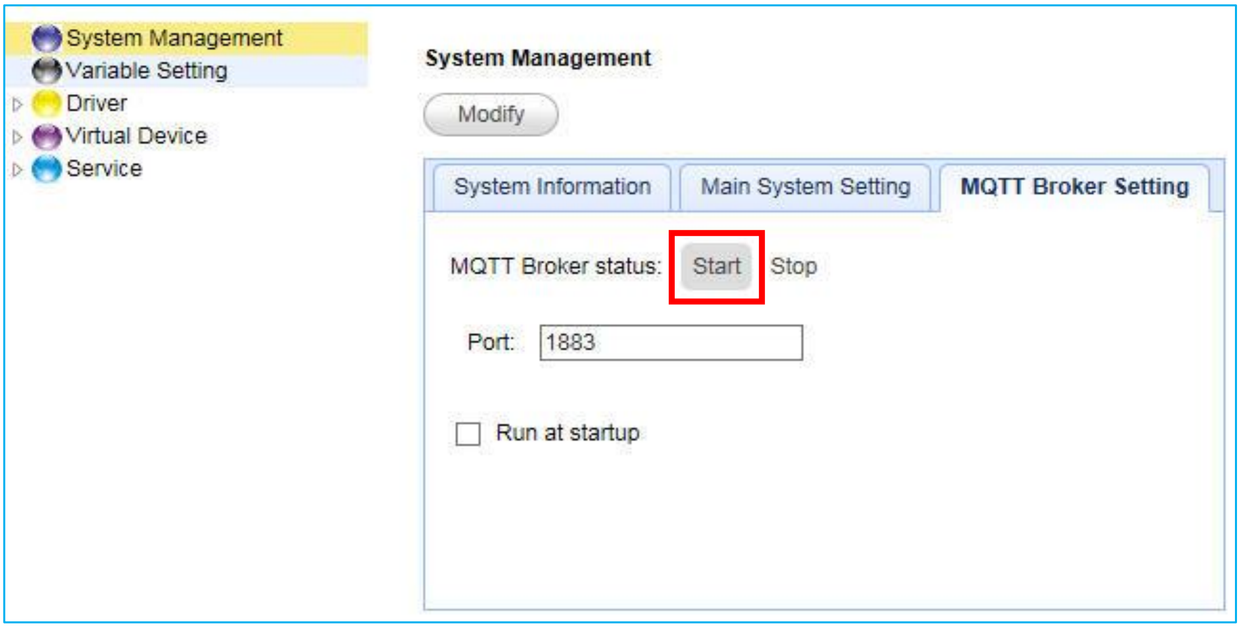
MQTT Broker status: Start Stop

Port: 1883

□ Run at startup

Step 2

Click “Start” to execute the Broker. When it marked in gray that means the Broker is running.



MQTT Broker status: Start Stop

Port: 1883

□ Run at startup

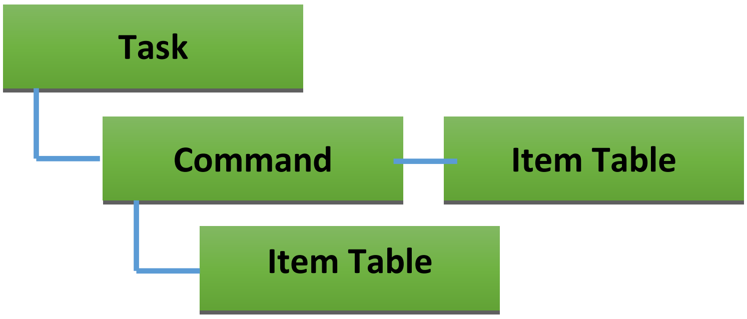
2.4. Set Up the Driver, Virtual Device and Service

This article will describe the Driver, Virtual Device, and Service settings.

The user can also refer the Chapter 3 : System Function Description to view all features, properties and configuration notice on each setup item mentioned as follows.

Section 3.3 Driver
Section 3.4 Virture Device
Section 3.5 Service

All features follow the task-oriented and hierarchical architecture as the logical design. First of all, the user can add a connection task depends on device properties, and add the related command or the item table. Finally, you can complete two-level or three-level settings.



Description of the tool button:

➕ : Add a task, command, or item.
➖ : Delete a task, command, or item.
✏ : Modify a task, command, or item.

2.4.1. Set up the Driver

The Driver setting is divided into the Modbus Driver setting and the MQTT Driver setting.

2.4.1.1. Example of the Modbus Driver settings

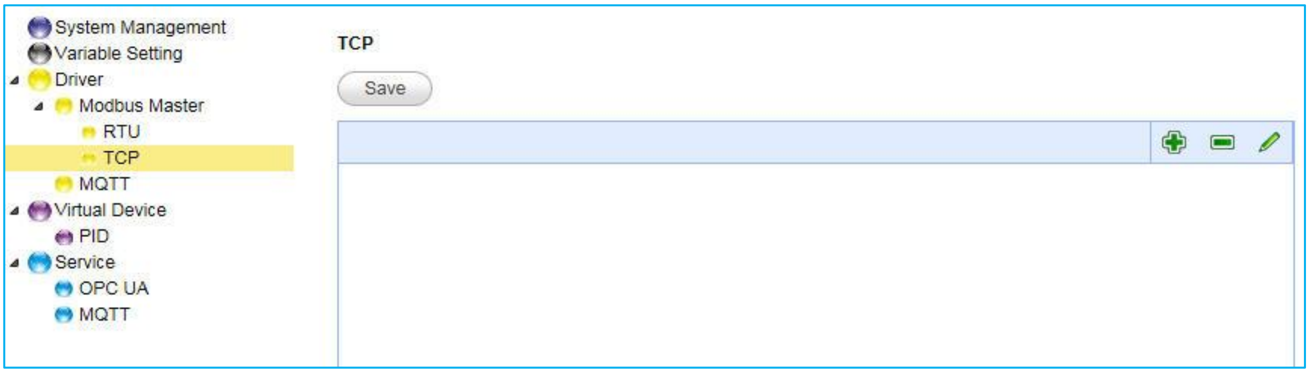
In this example, we use Modbus TCP protocol to conduct the Modbus Driver setting. The user can also refer the Chapter 3 - System Function Description - Section 3.3 Driver to view all features, properties and configuration notice for each item mentioned in this section.

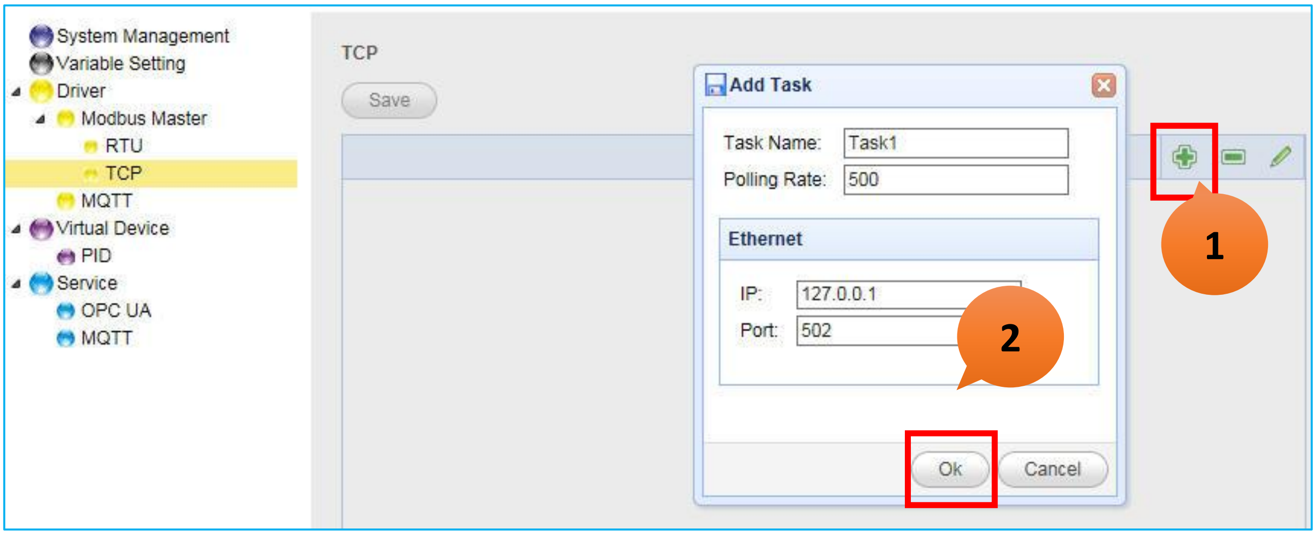
Step 1

Add all needed variables in the variable table. (See Section 2.2)

Step 2

On the tree menu to the left, click "Driver > Modbus Master > TCP", and add a connection task.

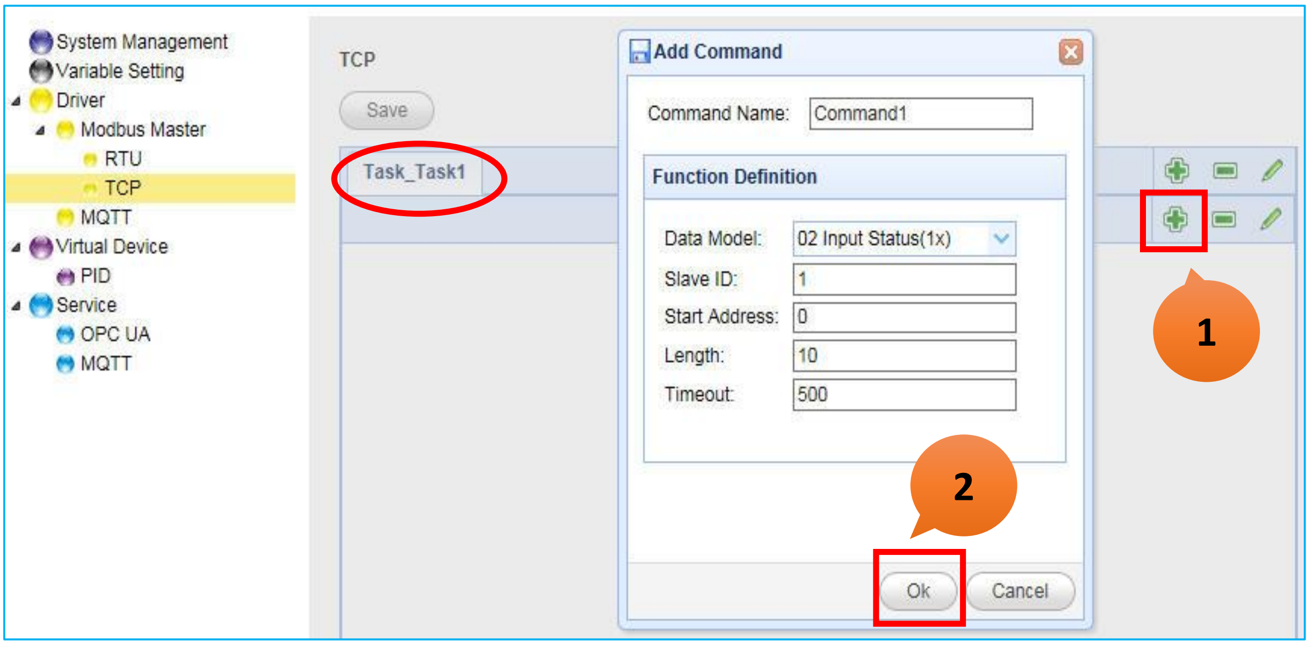




Task Name: Task1
Polling Rate: 500
IP: 127.0.0.1
Port: 502

Step 3

In the Task table, add a Modbus command and enter all parameters.



Add Command

Command Name: Command1

Function Definition

Data Model: 02 Input Status(1x)

Slave ID: 1

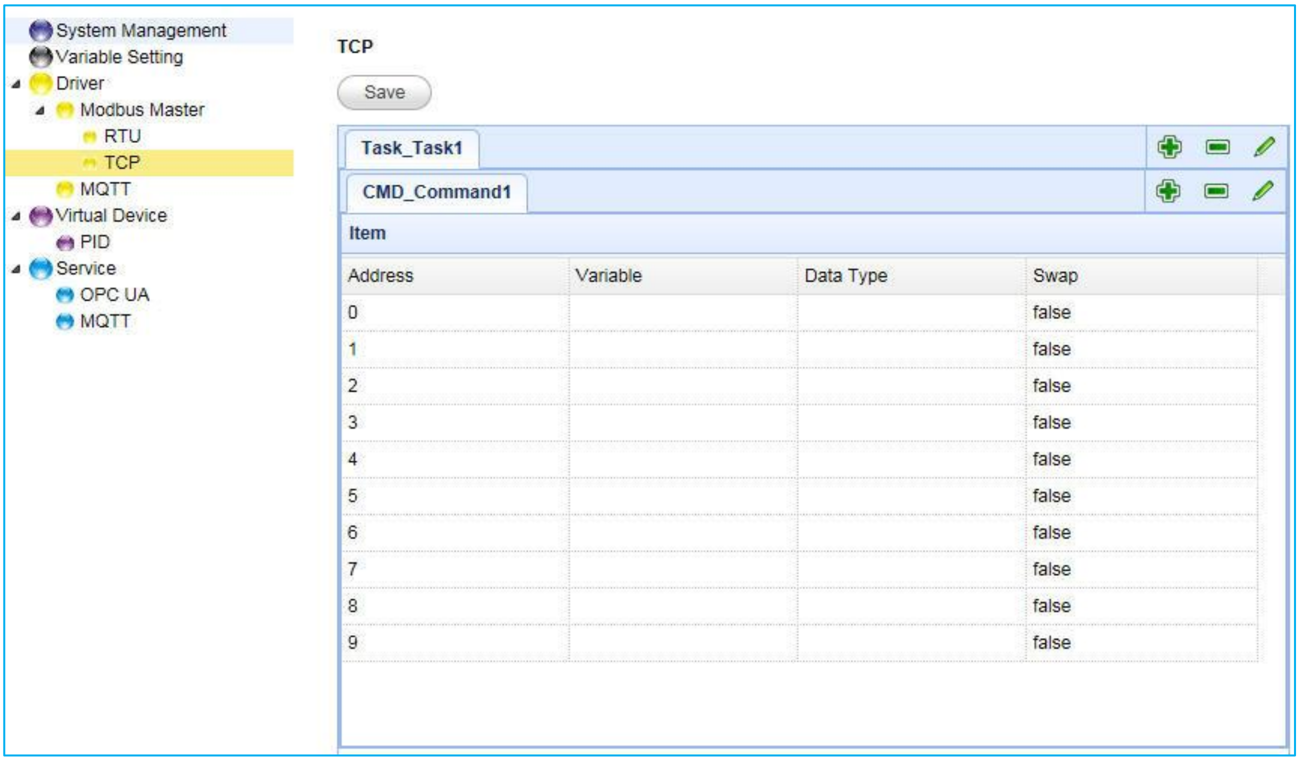
Start Address: 0

Length: 10

Timeout: 500

Step 4

After completing it, you can see this two-level (Task > Command) table.

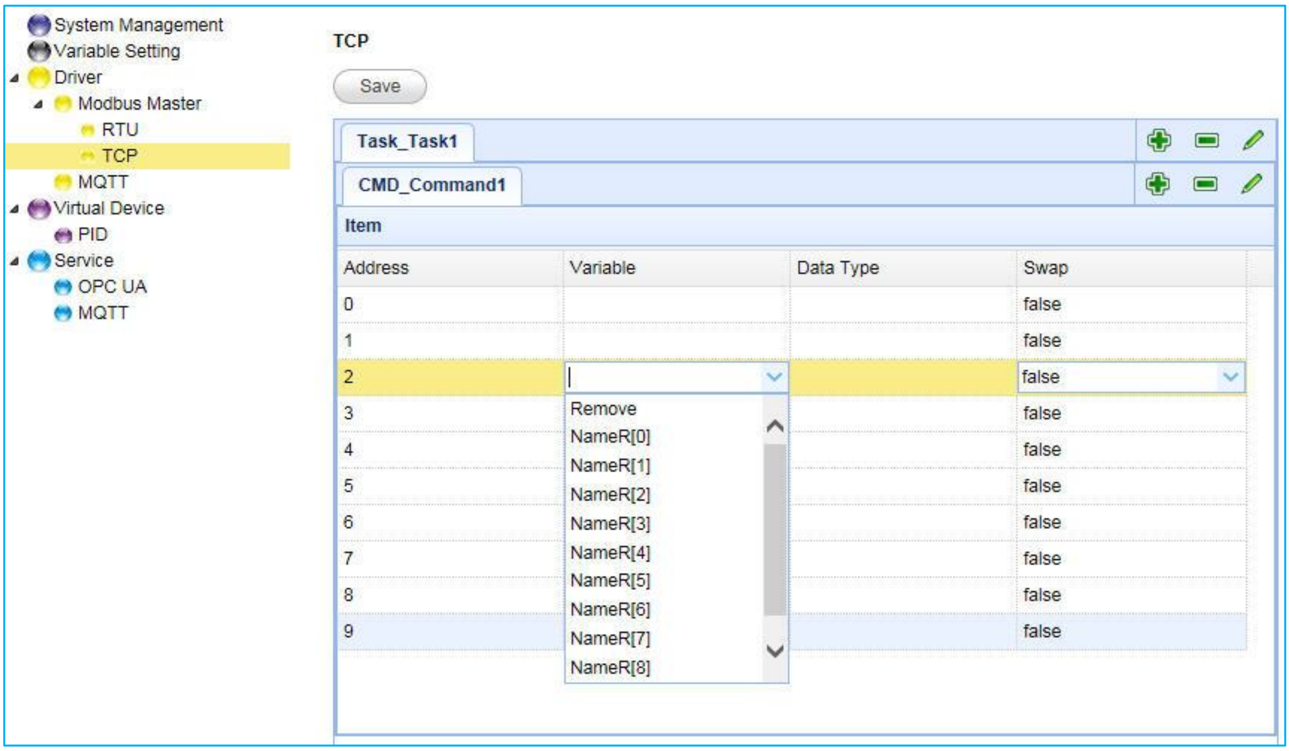


Item

Address	Variable	Data Type	Swap
0			false
1			false
2			false
3			false
4			false
5			false
6			false
7			false
8			false
9			false

Step 5

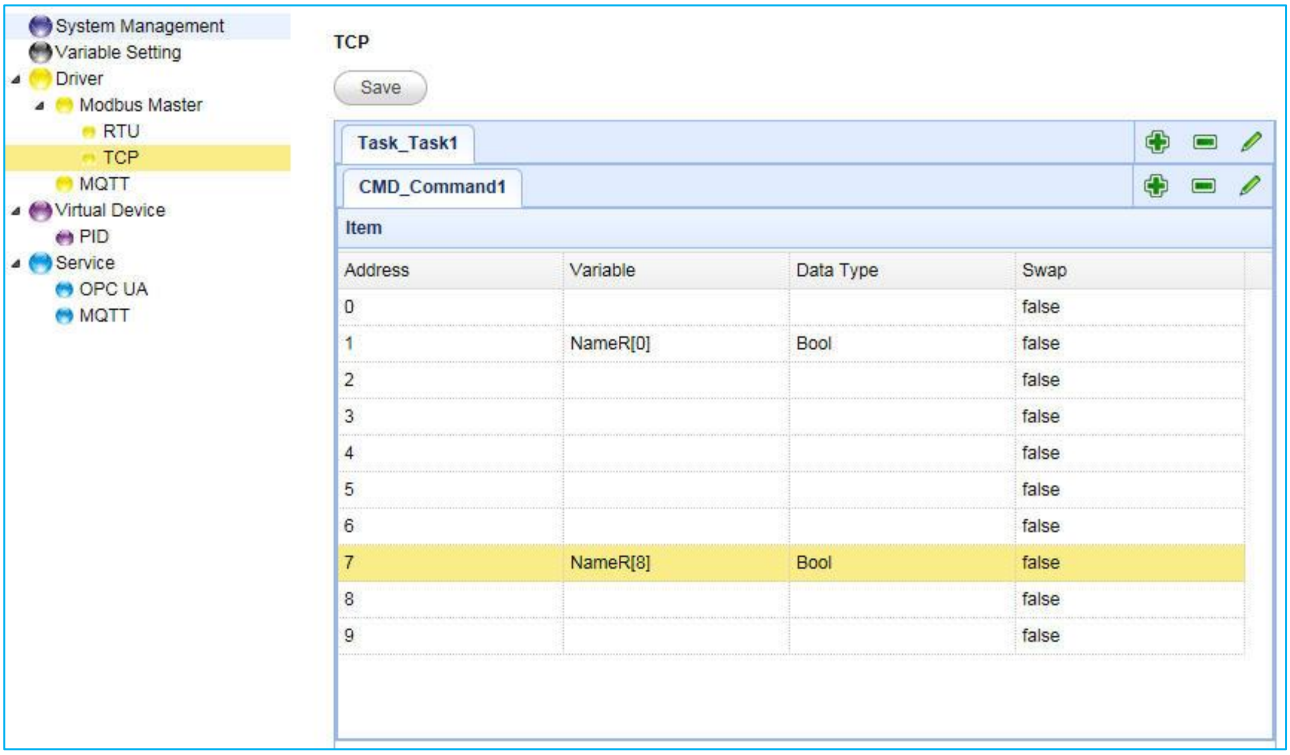
Then, you can choose a proper variable for a Modbus Address in the Item table.



Address	Variable	Data Type	Swap
0			false
1			false
2			false
3			false
4			false
5			false
6			false
7			false
8			false
9			false

Step 6

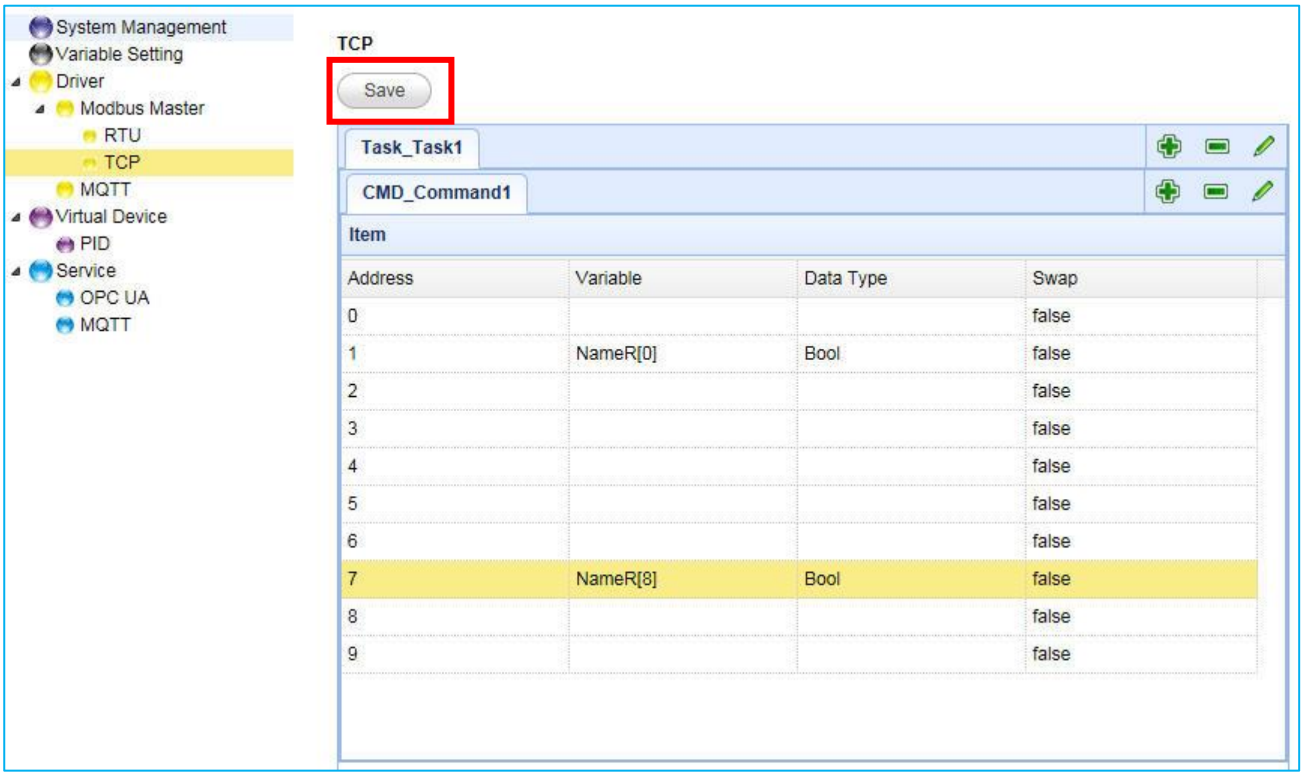
Repeat the previous steps to set up this table.



Address	Variable	Data Type	Swap
0			false
1	NameR[0]	Bool	false
2			false
3			false
4			false
5			false
6			false
7	NameR[8]	Bool	false
8			false
9			false

Step 7

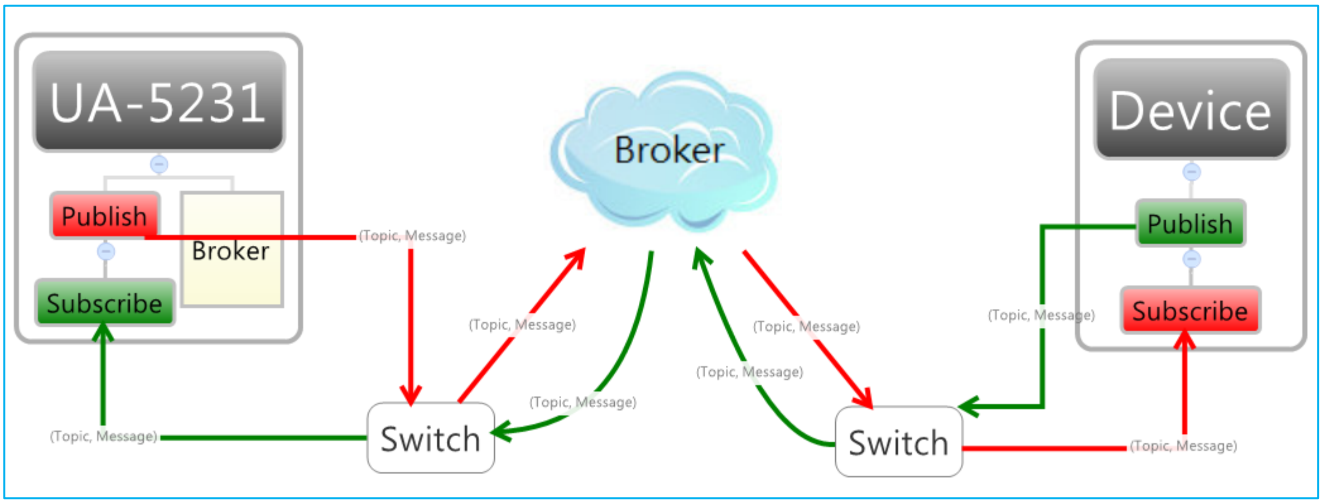
Save all settings.



Address	Variable	Data Type	Swap
0			false
1	NameR[0]	Bool	false
2			false
3			false
4			false
5			false
6			false
7	NameR[8]	Bool	false
8			false
9			false

2.4.1.2. Example of the MQTT Driver settings

In this case, we will describe how does the MQTT Driver of UA-5000 series (i.e., UA-5231) communicate with the MQTTdevice. The user can also refer the Chapter 3 - System Function Description - Section 3.3 Driver to view all features, properties and configuration notice for each item mentioned in this section.

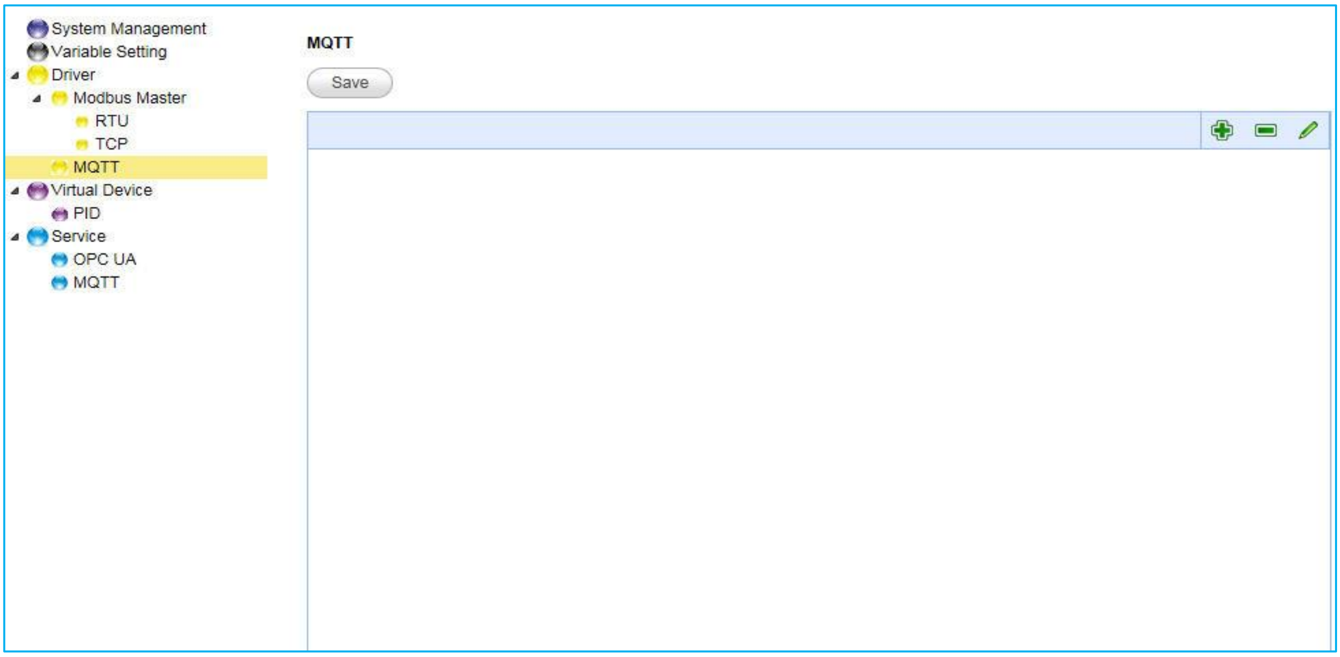


Step 1

Add all needed variables in the variable table. (See Section 2.2)

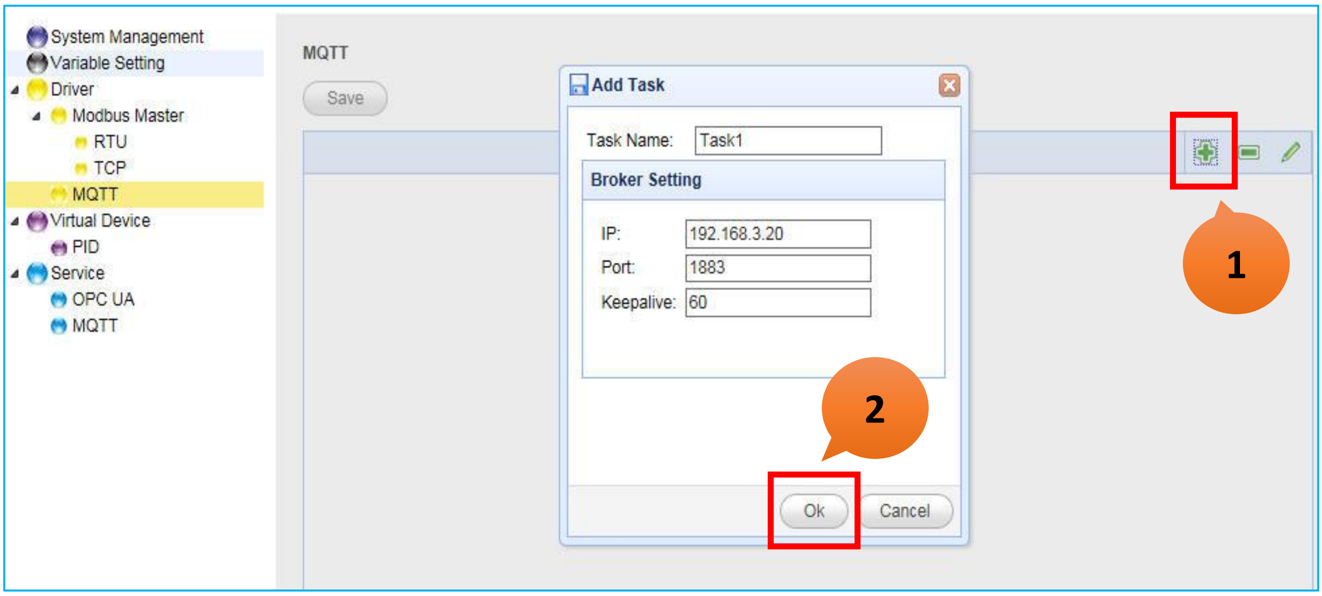
Step 2

Click "Driver" > "MQTT" on the left tree-menu to open the MQTT Driver page.



Step 3

Add a MQTT Driver task. Enter task name and Broker settings, and then click “OK”.



Task Name: Task1

Broker Setting

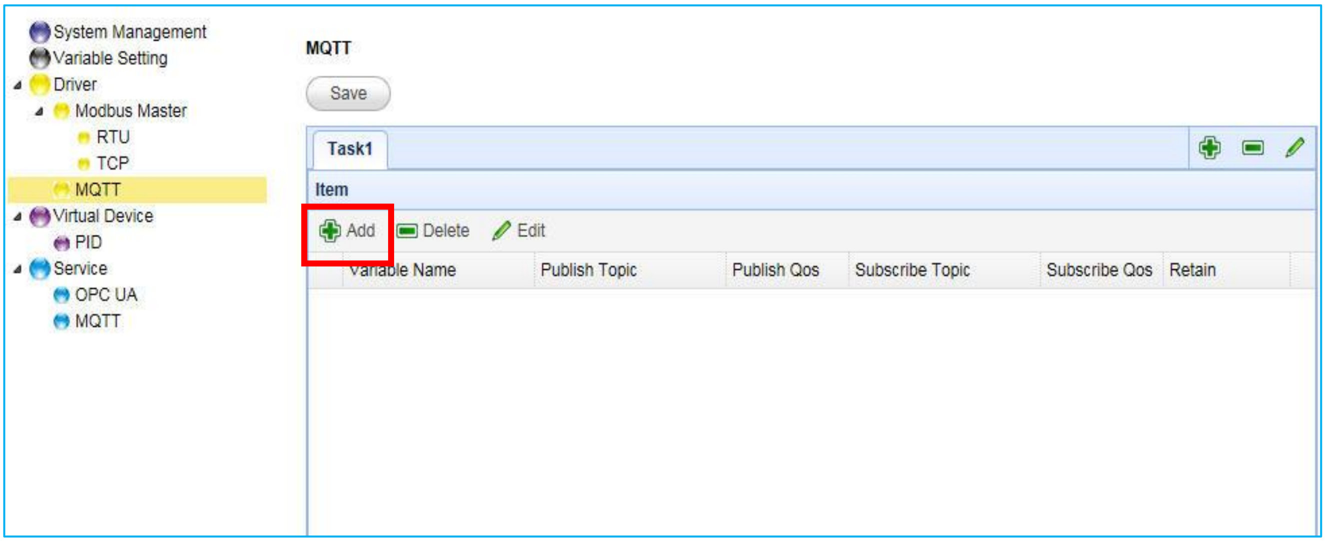
IP: 192.168.3.20

Port: 1883

Keepalive: 60

Step 4

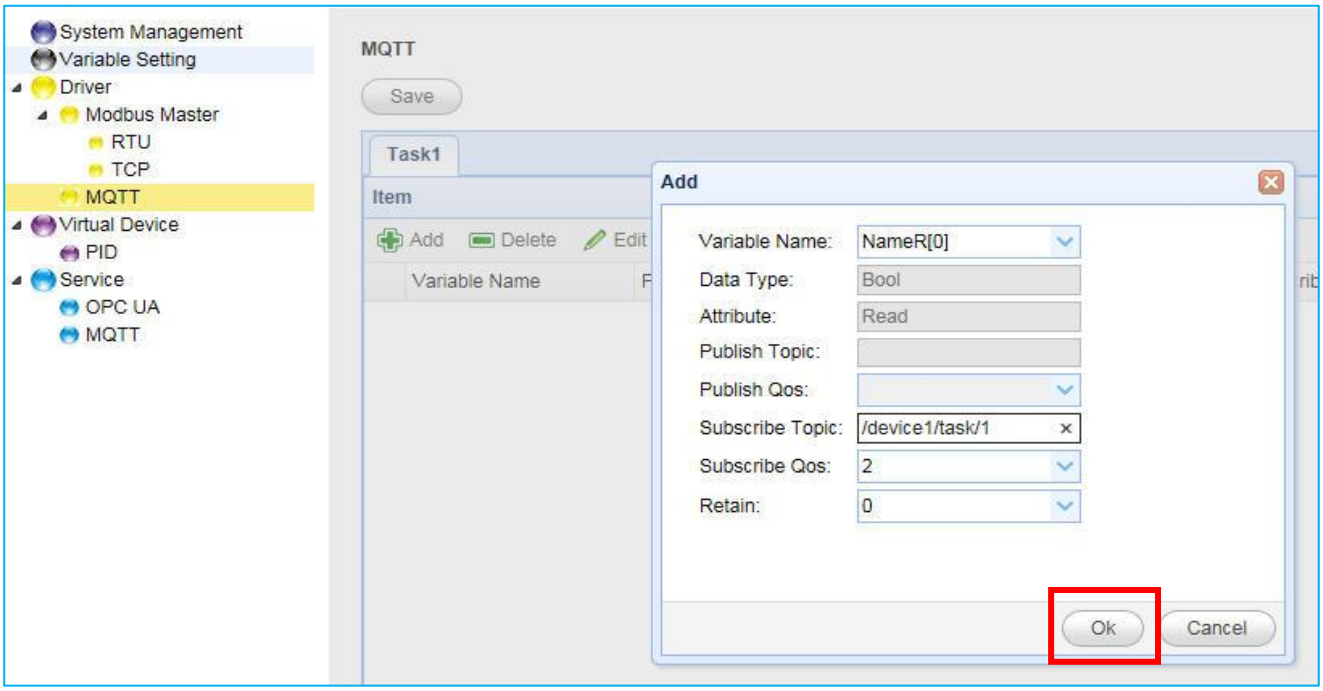
In the Item table, click “Add” to add variable and edit its topic.



Variable Name	Publish Topic	Publish Qos	Subscribe Topic	Subscribe Qos	Retain

Step 5

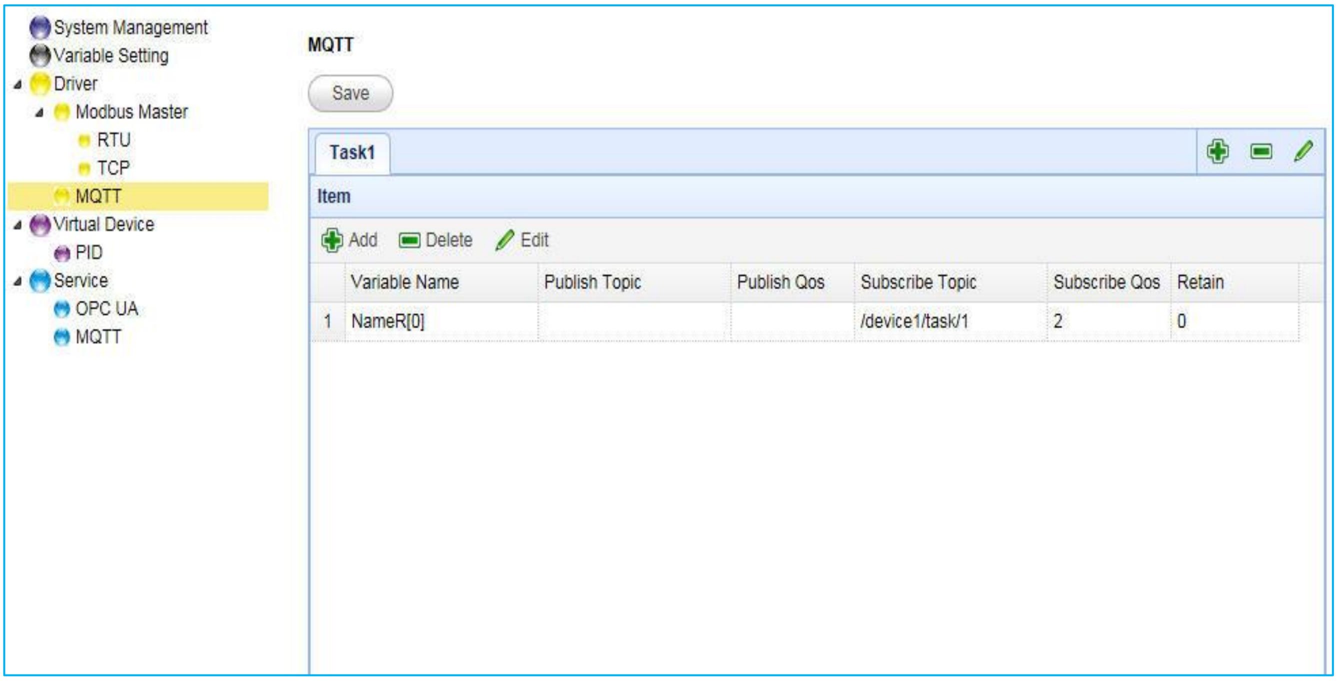
Enter the needed parameters, and then click “OK”.



Variable Name: NameR[0]
Data Type: Bool
Attribute: Read
Publish Topic:
Publish Qos:
Subscribe Topic: /device1/task/1
Subscribe Qos: 2
Retain: 0

Step 6

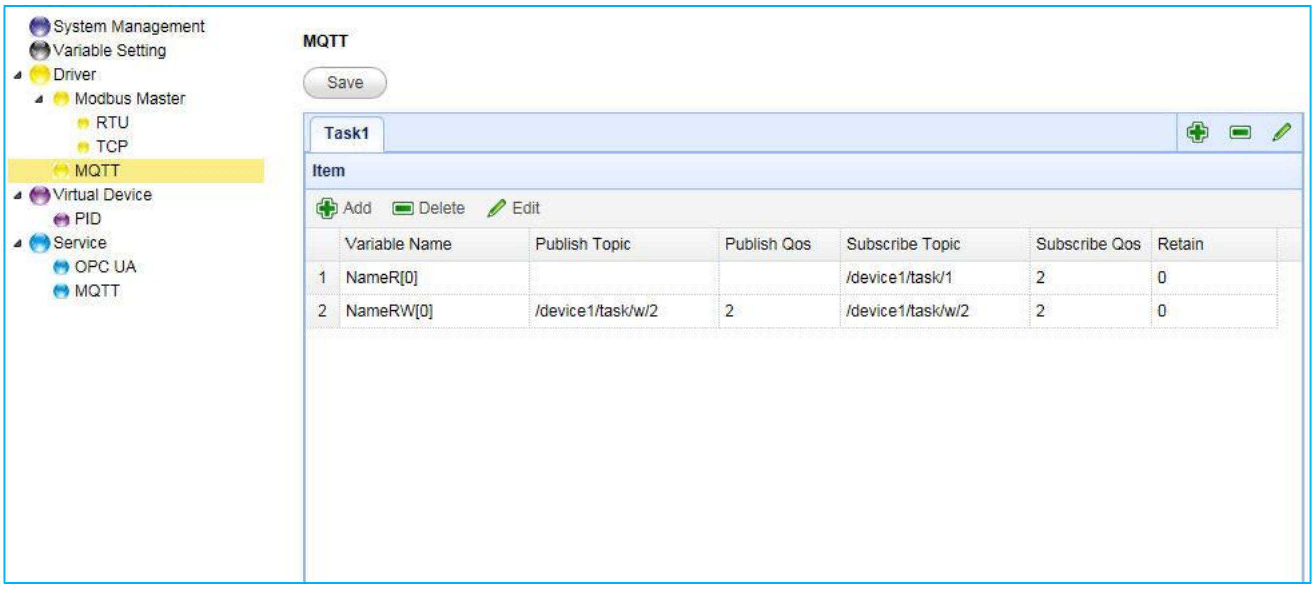
Now, you have successfully added this item.



	Variable Name	Publish Topic	Publish Qos	Subscribe Topic	Subscribe Qos	Retain
1	NameR[0]			/device1/task/1	2	0

Step 7

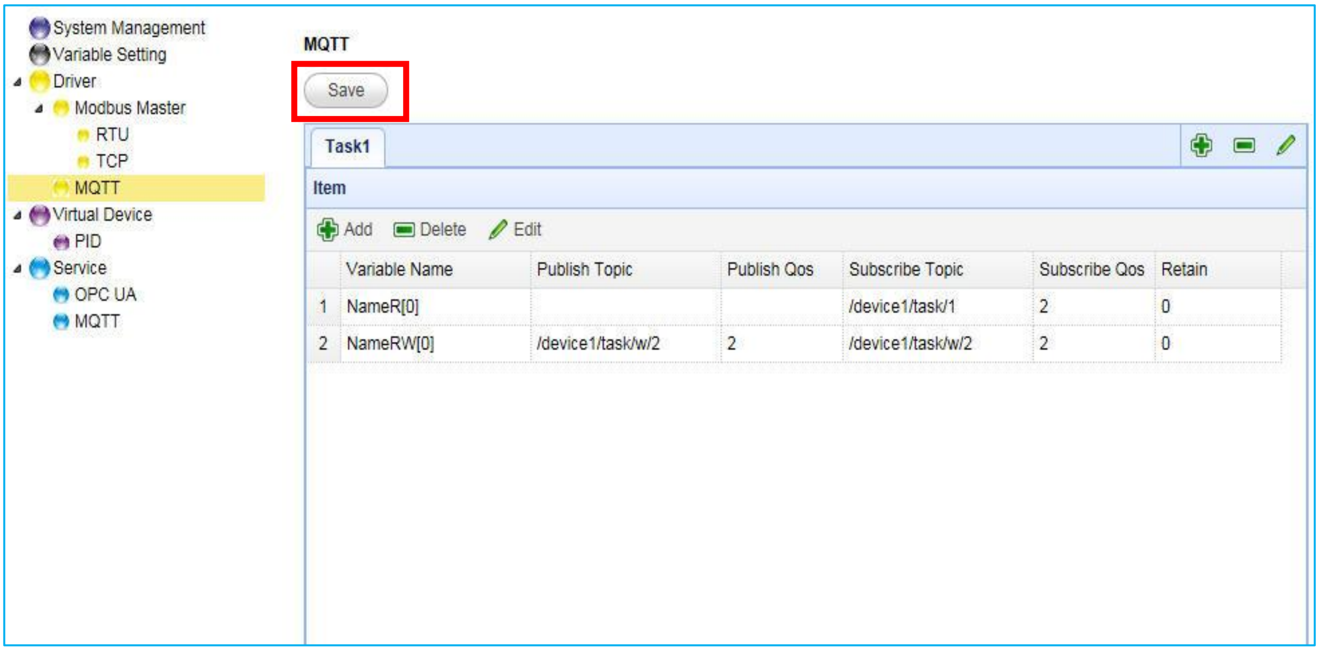
Follow the previos steps to add several settings.



	Variable Name	Publish Topic	Publish Qos	Subscribe Topic	Subscribe Qos	Retain
1	NameR[0]			/device1/task/1	2	0
2	NameRW[0]	/device1/task/w/2	2	/device1/task/w/2	2	0

Step 8

Save the settings.



	Variable Name	Publish Topic	Publish Qos	Subscribe Topic	Subscribe Qos	Retain
1	NameR[0]			/device1/task/1	2	0
2	NameRW[0]	/device1/task/w/2	2	/device1/task/w/2	2	0

2.4.2. Set Up the Virtual Device

Including the PID setting.

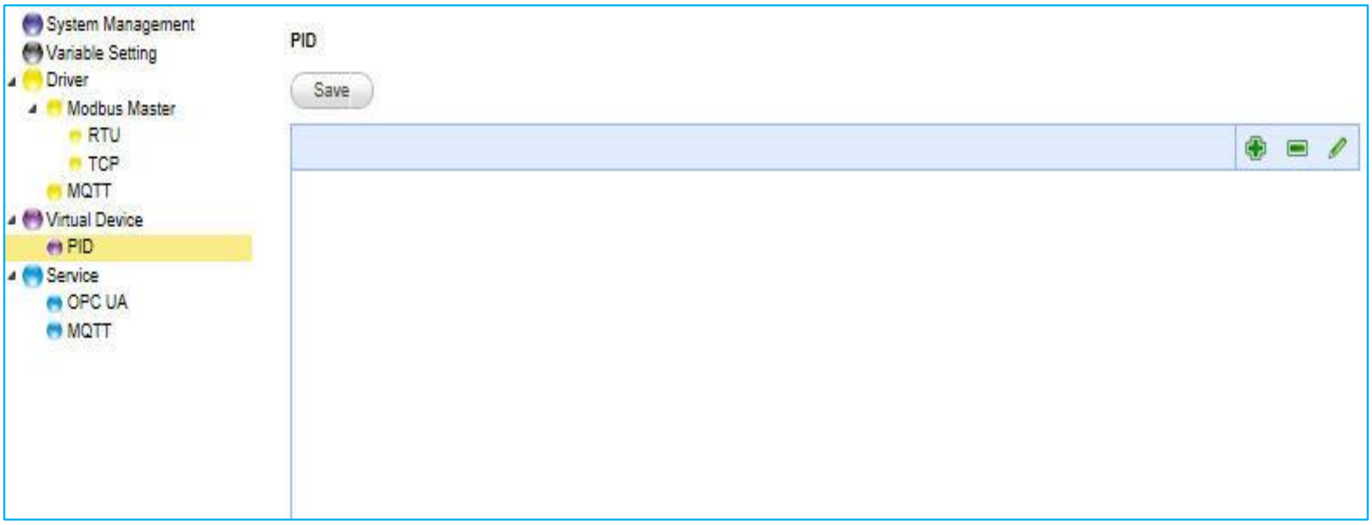
2.4.2.1. Example of the PID settings

In this section, we will describe the PID settings.
The user can also refer the Chapter 3 - System Function Description - Section 3.4 Virture Device to view all features, properties and configuration notice for each item mentioned in this section.

Step 1
Add all needed variables in the variable table. (See Section 2.2)

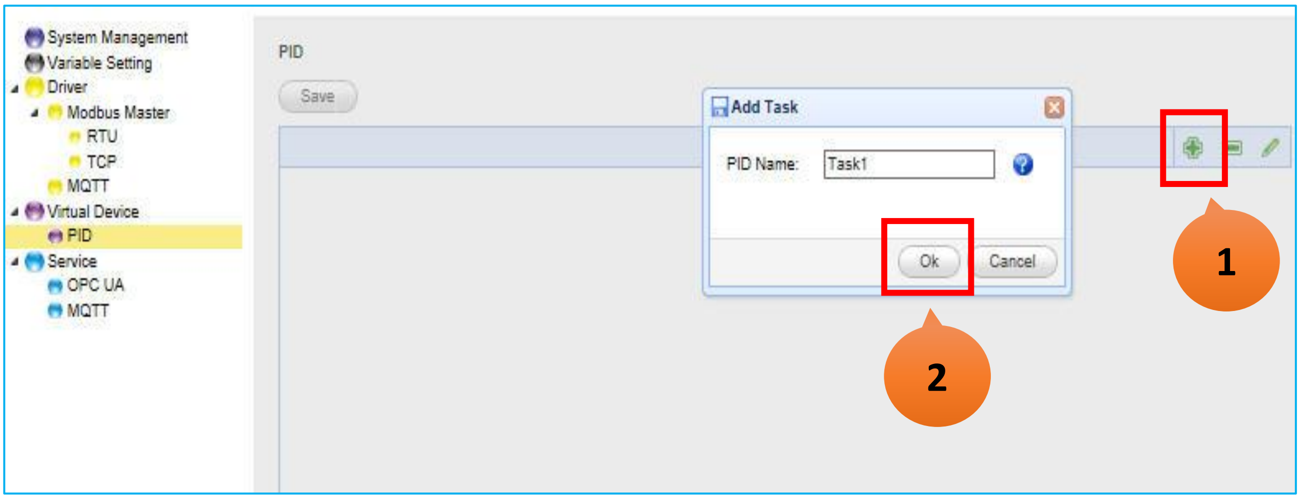
Step 2
Set up the driver for the corresponding physical I/O. (See Section 2.4.1)

Step 3
Click on “Virtual Device” > “PID” to set up the PID.



Step 4

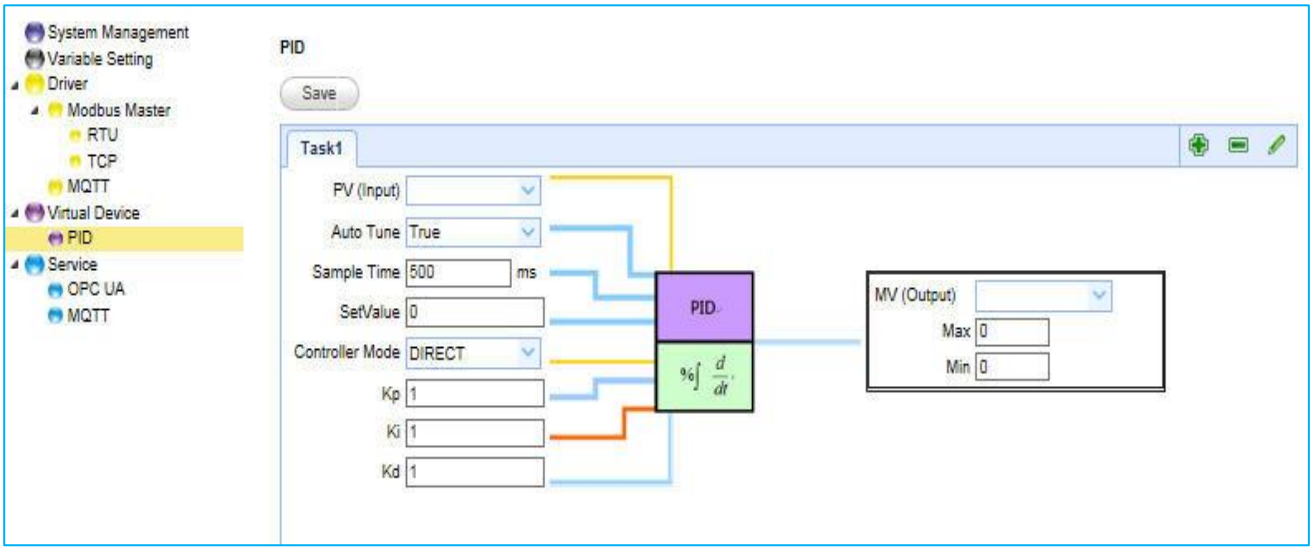
Add one PID setting.



PID Name: Task1

Step 5

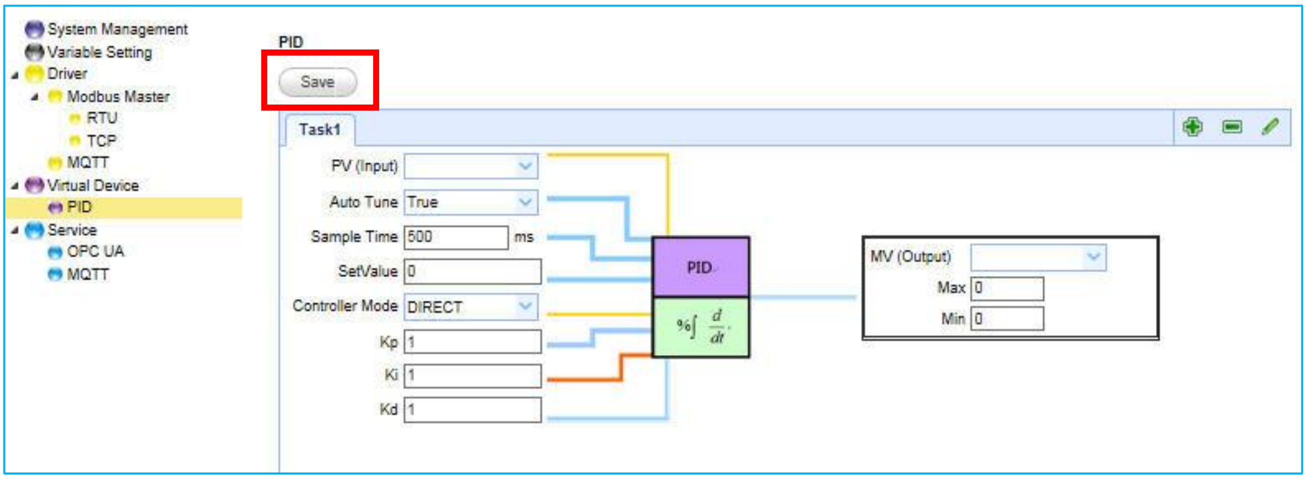
Set up all parameters.



PV (Input):
Auto Tune: True
Sample Time: 500 ms
SetValue: 0
Controller Mode: DIRECT
Kp: 1
Ki: 1
Kd: 1
MV (Output):
Max: 0
Min: 0

Step 6

Save all settings.



PV (Input)

Auto Tune True

Sample Time 500 ms

SetValue 0

Controller Mode DIRECT

Kp 1

Ki 1

Kd 1

MV (Output)

Max 0

Min 0

2.4.3. Set Up the Service

The Service setting is divided into the OPC UA Service and the MQTT Service.

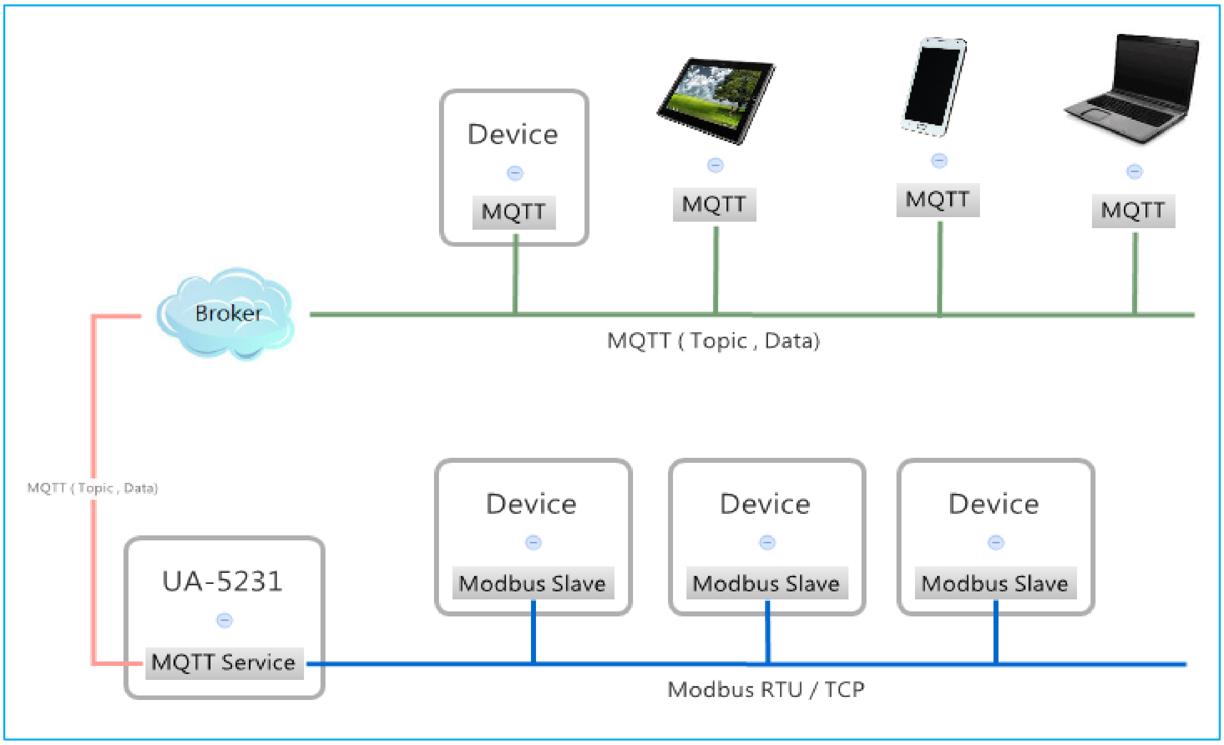
2.4.3.1. Set up the OPC UA Service

The OPC UA Server is a system service and enabled by default. When the user assign variables in the Driver and Virtual Device panels, the configuration for the OPC UA Server will also be done, that is, no more settings to do.

2.4.3.2. Example of the MQTT Service

The UA-5000's MQTT Service is used to convert other Driver's data into the MQTT message. Using a user-defined topic as an index to receive the data sending from other MQTT devices.

The following steps will show you the way to convert the Modbus Master Driver's data into the MQTT message. The user can also refer the Chapter 3 - System Function Description - Section 3.5 Service to view all features, properties and configuration notice for each item mentioned in this section.



Step 1

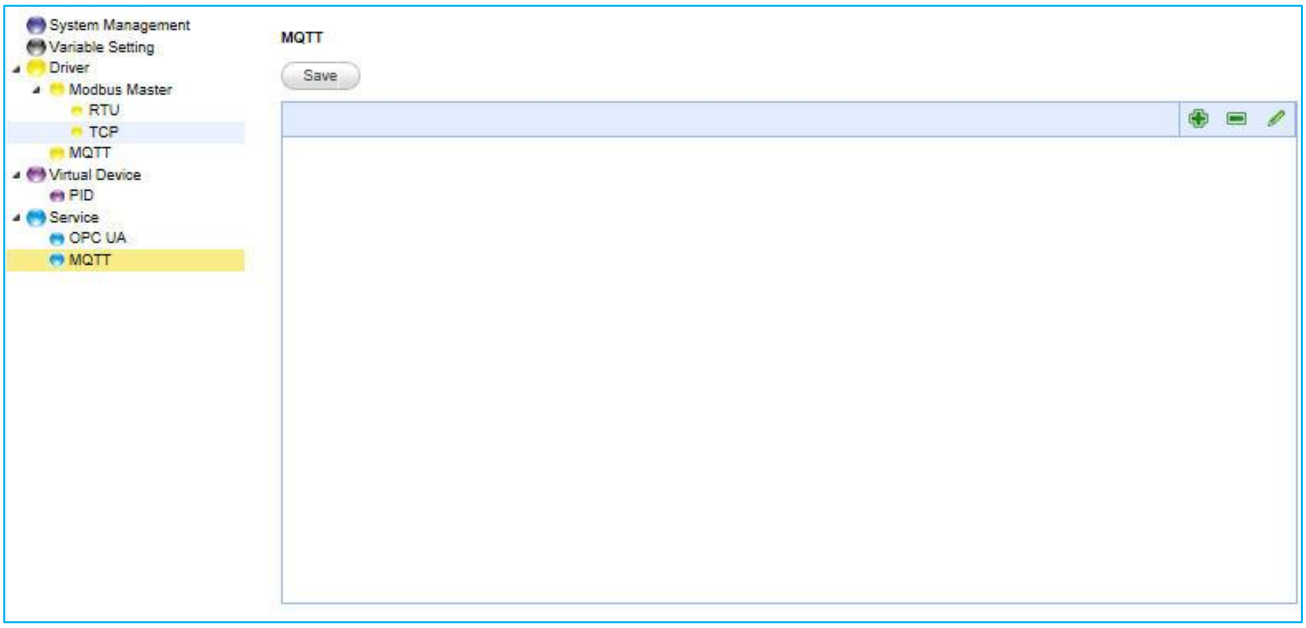
Add all needed variables in the variable table. (See Section 2.2)

Step 2

Set up the Modbus Driver, and assign variables to the Driver. (See Section 2.4.1)

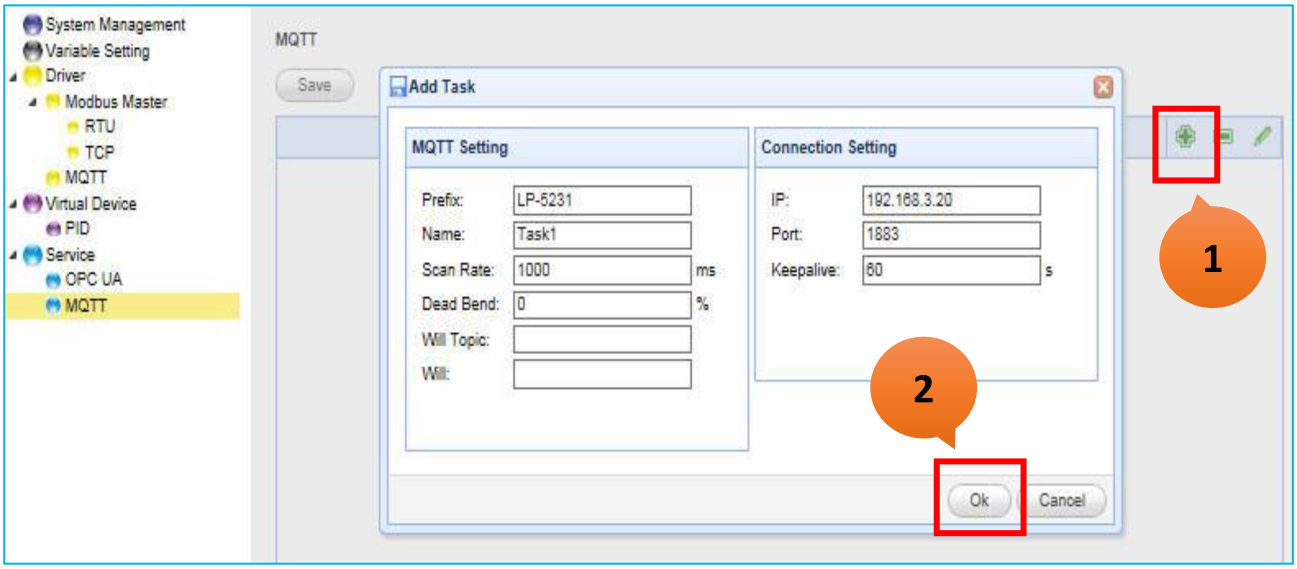
Step 3

Set up the MQTT Service. Click "Service" > "MQTT" on the left.



Step 4

Add a task for this MQTT service. After completing it, click "OK".



MQTT Setting

Prefix: LP-5231

Name: Task1

Scan Rate: 1000 ms

Dead Bend: 0 %

Will Topic:

Will:

Connection Setting

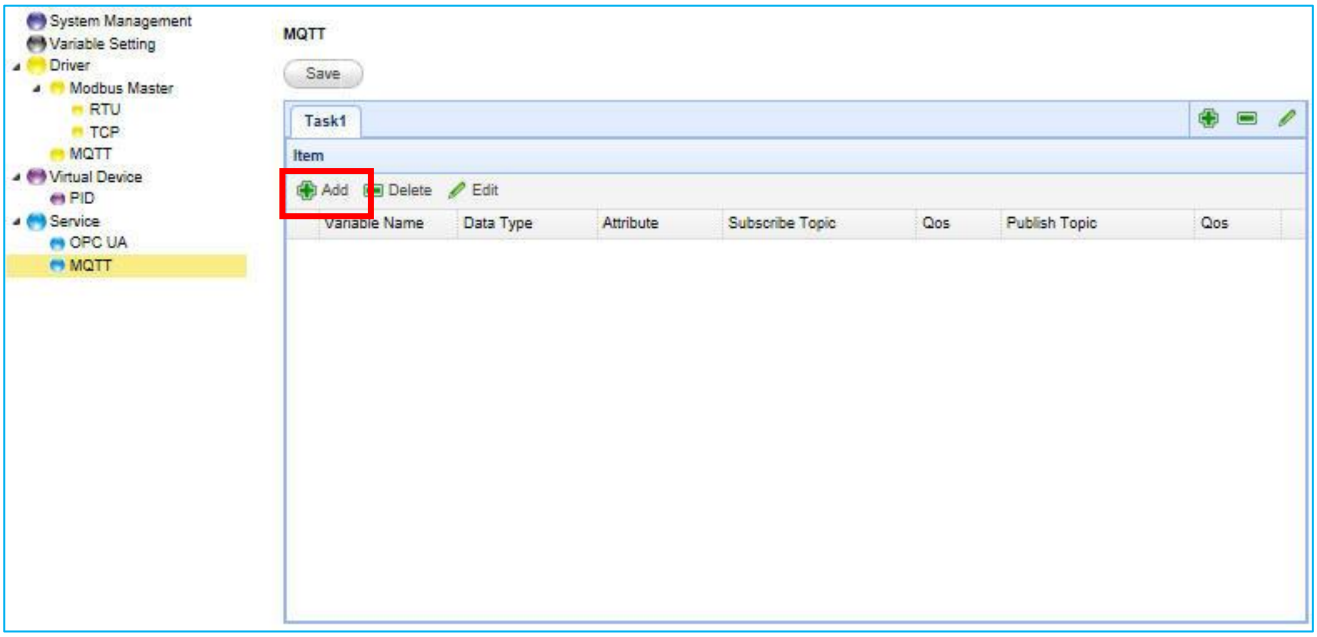
IP: 192.168.3.20

Port: 1883

Keepalive: 60 s

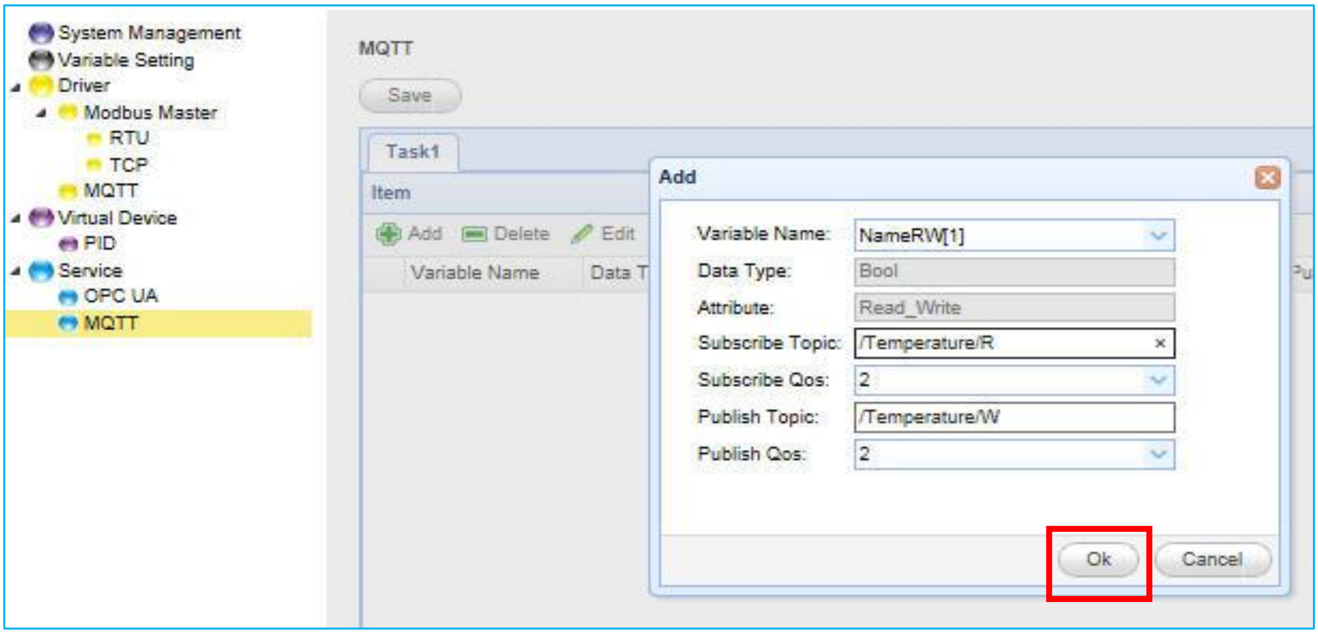
Step 5

Click the “Add” button under the “Task” tab you added before.



Step 6

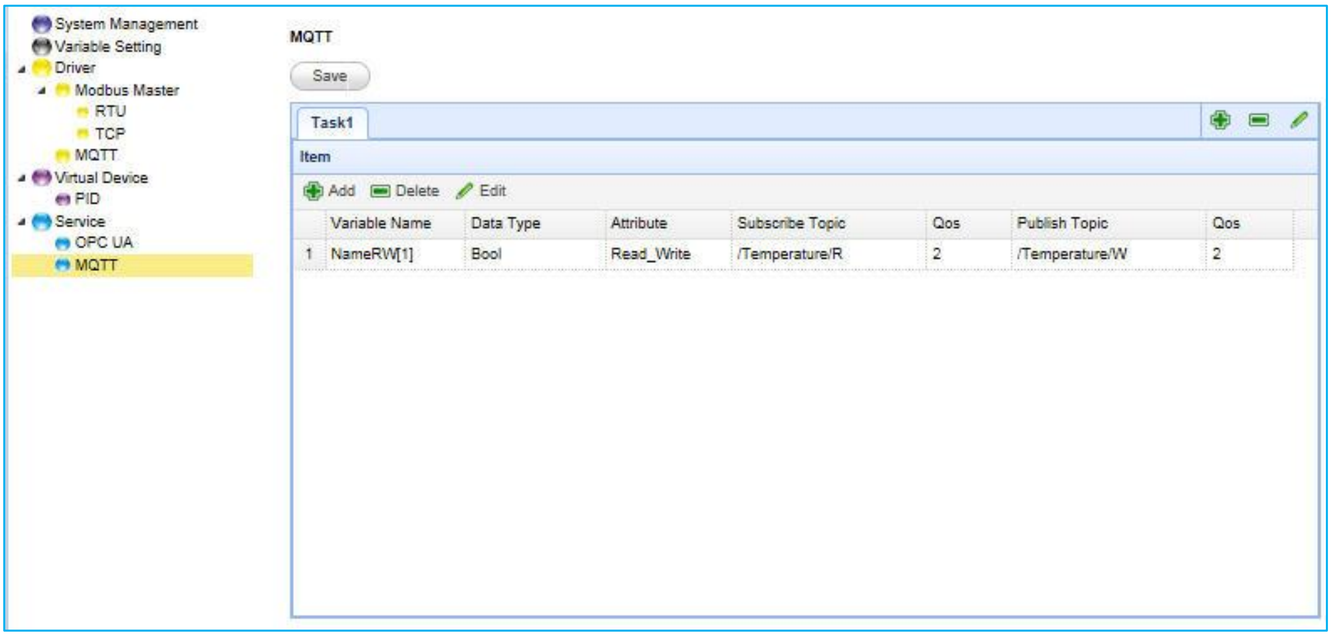
In the pop-up “Add” dialog box, enter the needed variable and parameters. Then, click “OK”.



Variable Name: NameRW[1]
Data Type: Bool
Attribute: Read_Write
Subscribe Topic: /Temperature/R
Subscribe Qos: 2
Publish Topic: /Temperature/W
Publish Qos: 2

Step 7

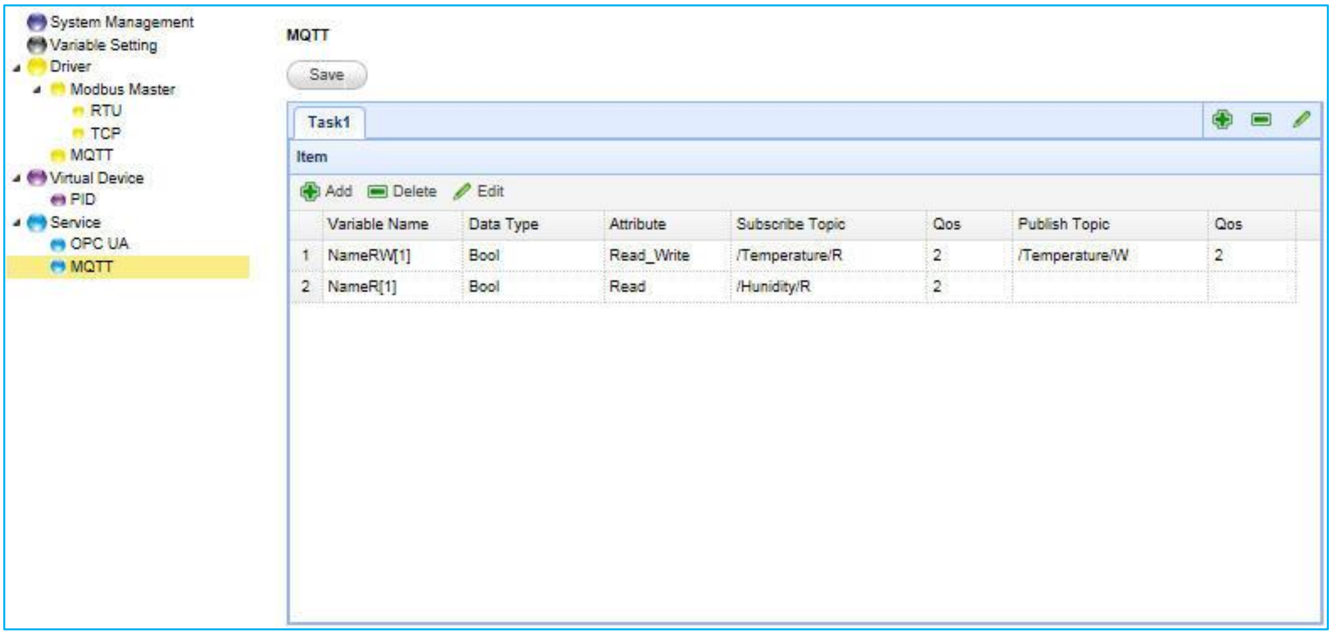
Now, you have successfully added this item.



	Variable Name	Data Type	Attribute	Subscribe Topic	Qos	Publish Topic	Qos
1	NameRW[1]	Bool	Read_Write	/Temperature/R	2	/Temperature/W	2

Step 8

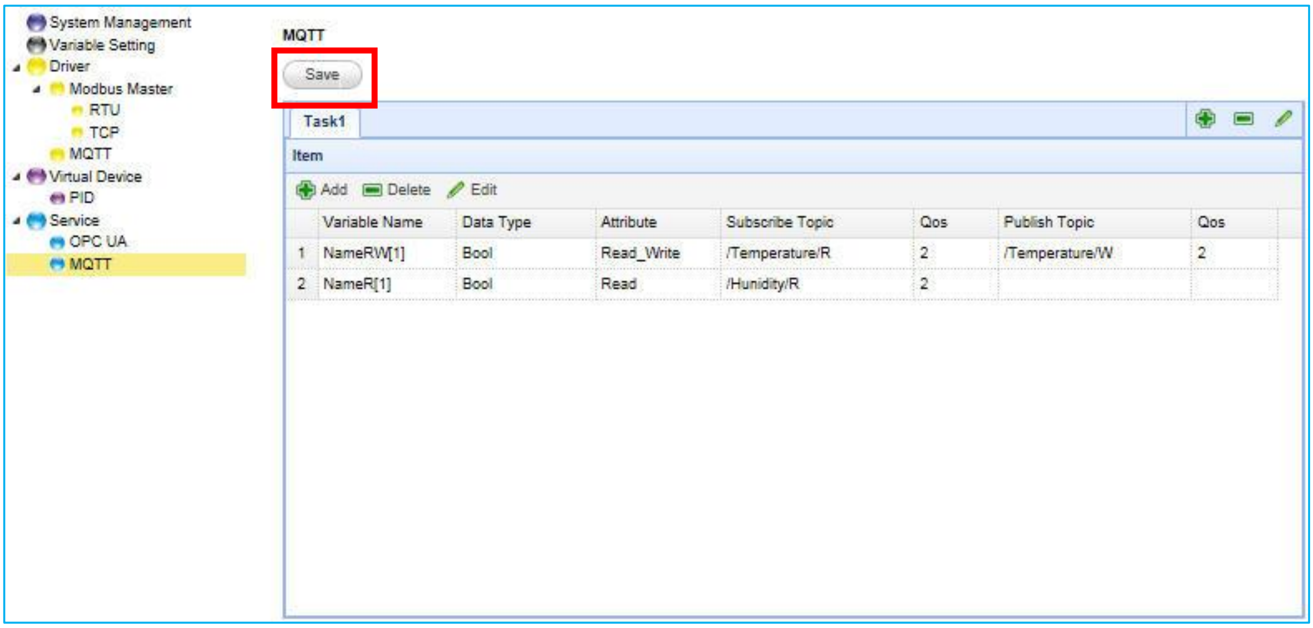
Repeat the previous steps to add several items.



	Variable Name	Data Type	Attribute	Subscribe Topic	Qos	Publish Topic	Qos
1	NameRW[1]	Bool	Read_Write	/Temperature/R	2	/Temperature/W	2
2	NameR[1]	Bool	Read	/Hunidity/R	2		

Step 9

Save all settings.

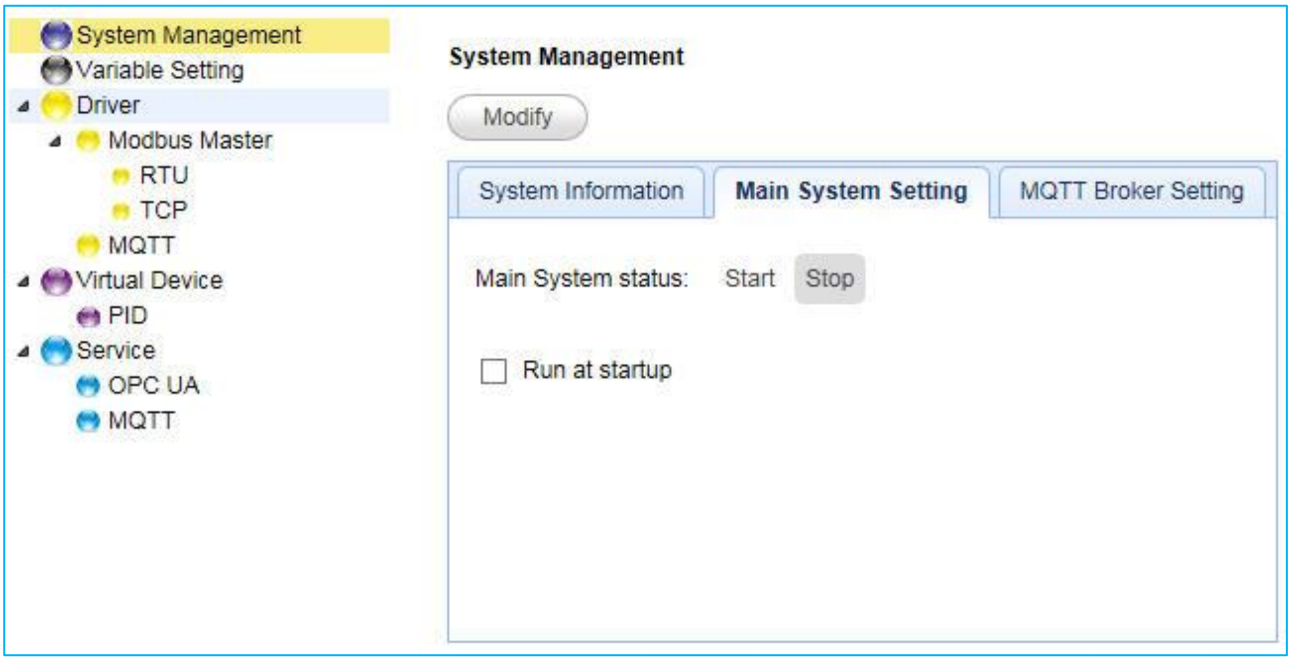


	Variable Name	Data Type	Attribute	Subscribe Topic	Qos	Publish Topic	Qos
1	NameRW[1]	Bool	Read_Write	/Temperature/R	2	/Temperature/W	2
2	NameR[1]	Bool	Read	/Hunidity/R	2		

2.5. Start the RunTime

This section will describe how to start the UA-5000 series's RunTime.

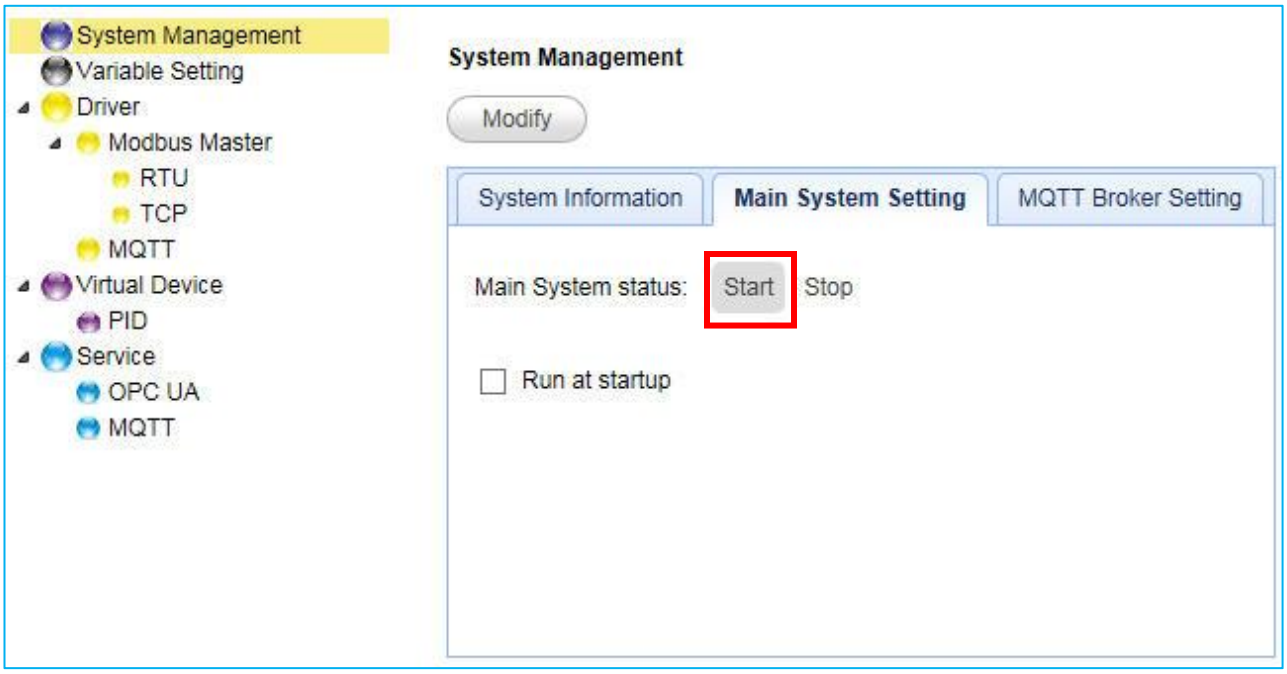
When the user finish the project setting and want to start the system runtime, simply switch to the "Main System Setting" page in the "System Management" panel, and then click "Start".



Main System status: Start Stop

□ Run at startup

While "Start" is marked in gray, it means the system is running.



Main System status: Start Stop

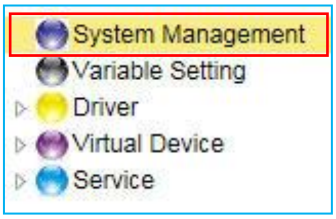
□ Run at startup

3. System Functional Description

In the chapter, we will explain all functions and parameters on the following topics that listed in the UA-5000's Web UI (as the figure below).

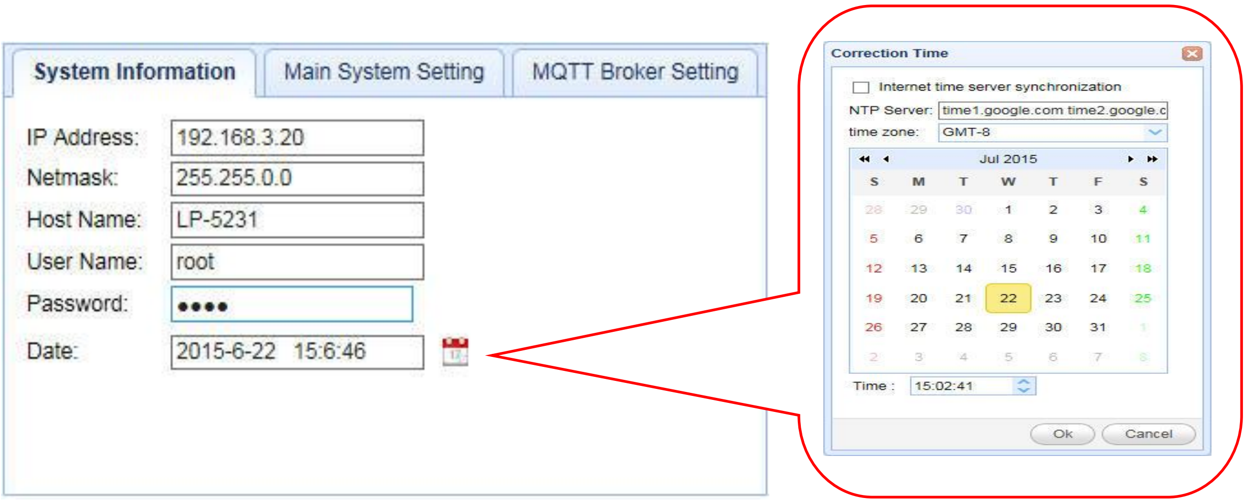
3.1. System Management

This section will describe how to use the "System Management" function and save all settings. It includes the "System Information", "Main System" and "MQTT Broker" settings.



3.1.1. System Information

To display or modify the system information.



IP Address: 192.168.3.20
Netmask: 255.255.0.0
Host Name: LP-5231
User Name: root
Password: ●●●●
Date: 2015-6-22 15:6:46

Correction Time

□ Internet time server synchronization
NTP Server: time1.google.com time2.google.c
time zone: GMT-8

Jul 2015

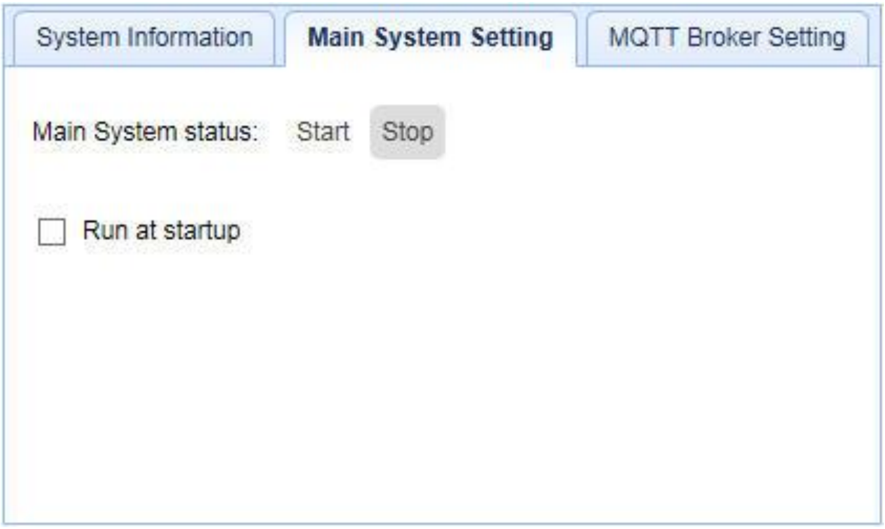
S	M	T	W	T	F	S
28	29	30	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1
2	3	4	5	6	7	8

Time : 15:02:41

Function items	Description	Default
IP Address	The IP address of the UA-5000.	System value
Netmask	The mask address of the UA-5000.	System value
Host Name	The host name of the UA-5000.	System value
User Name	The login name for the UA-5000's Web UI.	
Password	The login password for the UA-5000's Web UI.	
Date	Time/Time zone setting, NTP network time synchronization.	System value

3.1.2. Main system setting

To display or modify the current status for the main system setting.



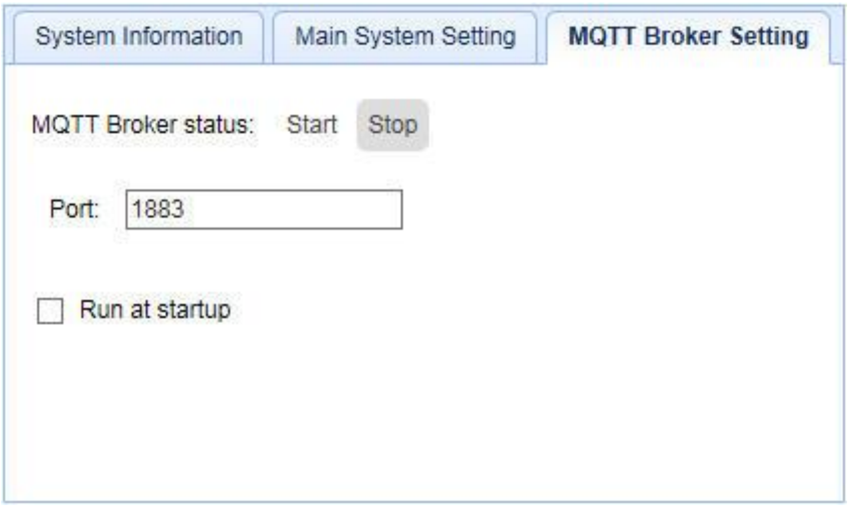
Main System status: Start Stop

□ Run at startup

Function items	Description	Default
Main System status	Display the current status of the main system and allows switching this function.	Stop
Run at startup	Whether to run at startup.	Uncheck

3.1.3. MQTT Broker Setting

To display or modify the current status for the MQTT Broker setting.



MQTT Broker status: Start

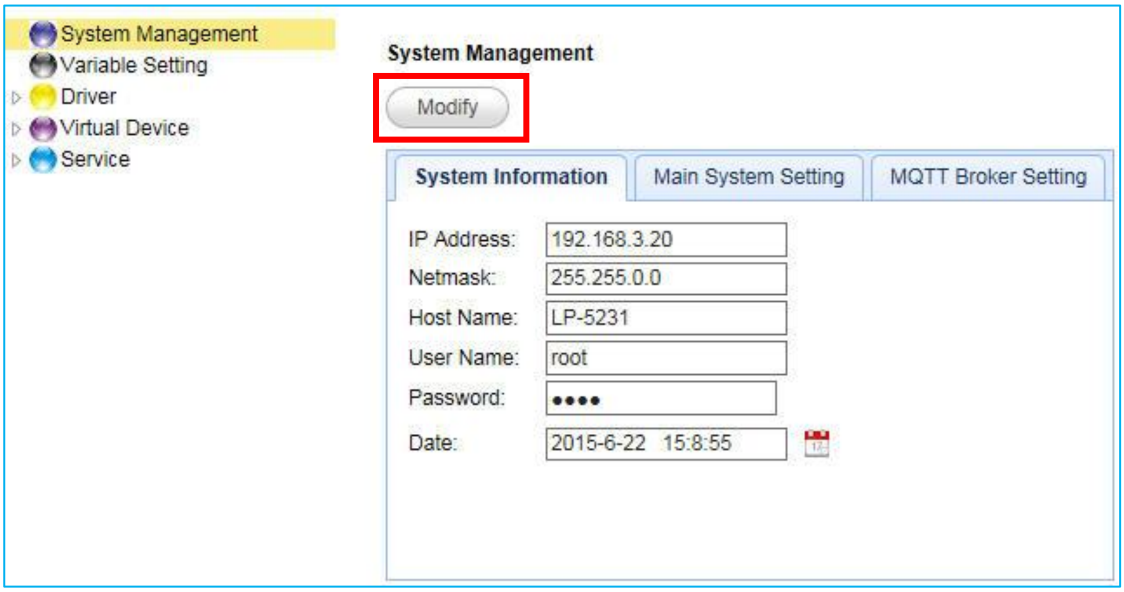
Port: 1883

□ Run at startup

Function items	Description	Default
MQTT Broker status	Display the current status of the Broker and allows switching this function.	Start
Port	MQTT Broker's COM port.	1883
Run at startup	Whether to run at startup.	Uncheck

3.1.4. Save the System Management settings

Click the "Modify" button to save the currnt settings.



IP Address: 192.168.3.20

Netmask: 255.255.0.0

Host Name: LP-5231

User Name: root

Password: ●●●●

Date: 2015-6-22 15:8:55

3.2. Variable Setting

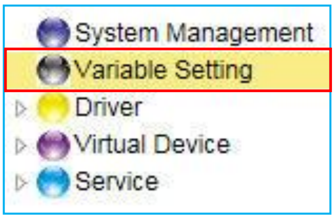
This section will describe how to add, edit and delete variables in the variable table, and then save the settings.

Description of the tool button:

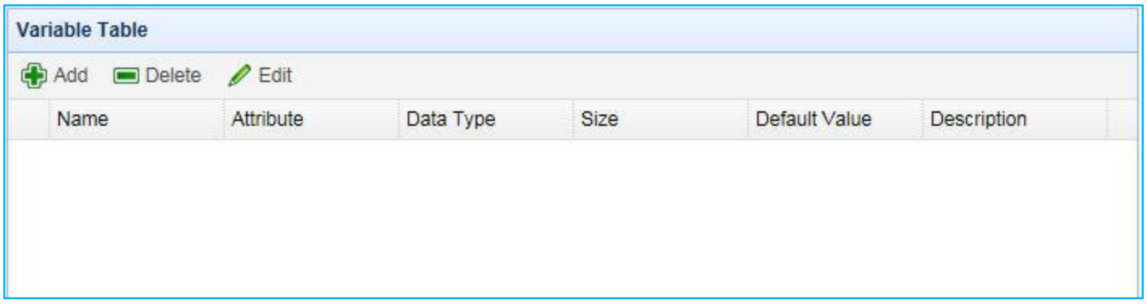
➕ : Add a variable

▬ : Delete the selected variable

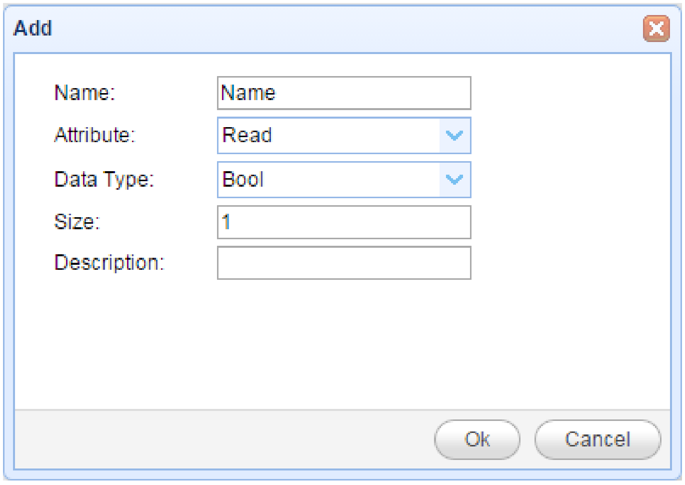
✎ : Edit the selected variable



1. In the Variable Table, you can add, edit and delete variables (as the figure below).



2. Add/Edit the variable.



Name: Name

Attribute: Read

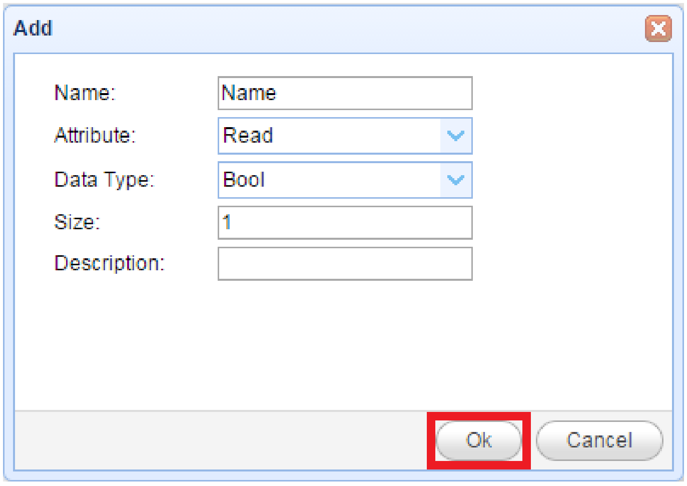
Data Type: Bool

Size: 1

Description:

Function items	Description	Default
Name	Variable name.	Name
Attribute	Variable attribute. Options : Read, Write, Read_Write	Read
Data Type	Variable data type. Options: Bool, Short, Unsigned Short, Long, Unsigned Long, Float, Double, String	Bool
Size	Variable size. If this value is greater than 1, this variable will be declared as an array.	1
Description	Write a note for this variable.	

3. Click “Ok” to complete the setting.



Add

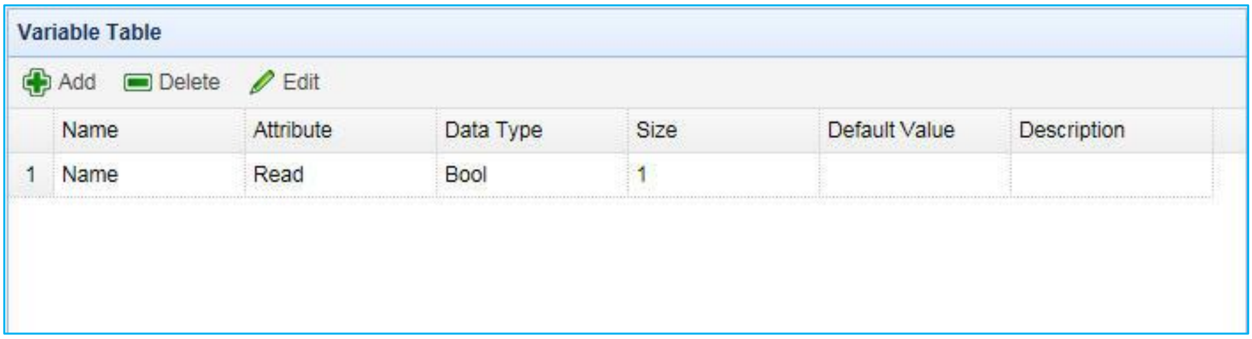
Name: Name

Attribute: Read

Data Type: Bool

Size: 1

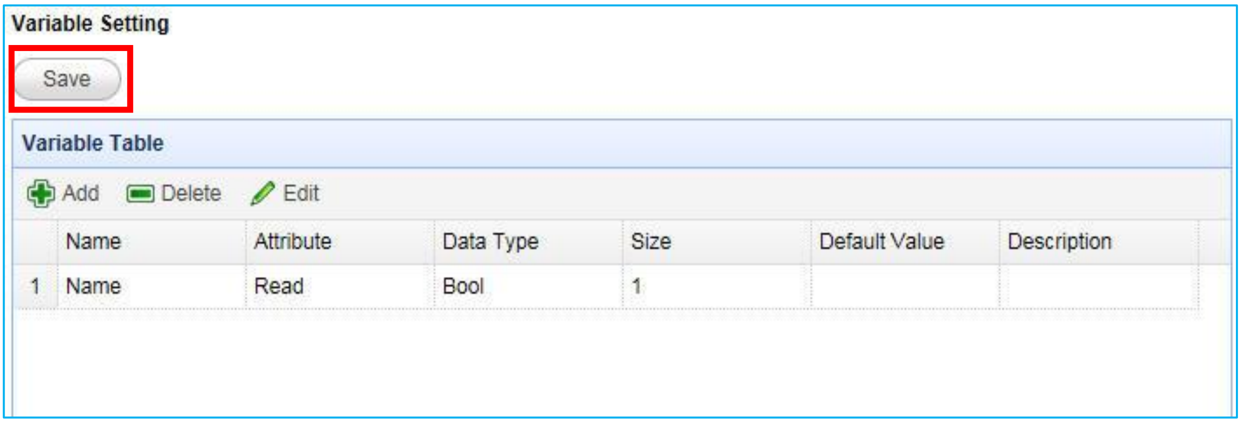
Description:



Variable Table

	Name	Attribute	Data Type	Size	Default Value	Description
1	Name	Read	Bool	1		

4. Click “Save” to save the current settings.



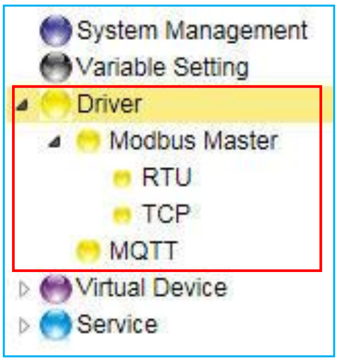
Variable Setting

Variable Table

	Name	Attribute	Data Type	Size	Default Value	Description
1	Name	Read	Bool	1		

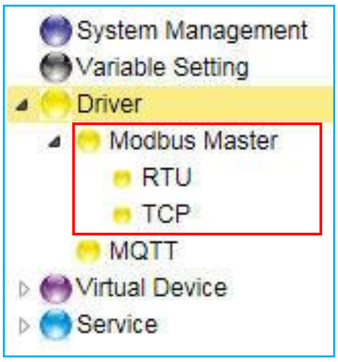
3.3. Driver

This section will describe the Driver setting and all related parameters for the UA-5000 series. This topic includes the Modbus Master (RTU and TCP) and the MQTT items.



3.3.1. Modbus Master

The following article will show you how to set up the Modbus Master Driver which is divided into RTU and TCP protocols.



Description of the tool button:

✚ : Add a task, command, or item.

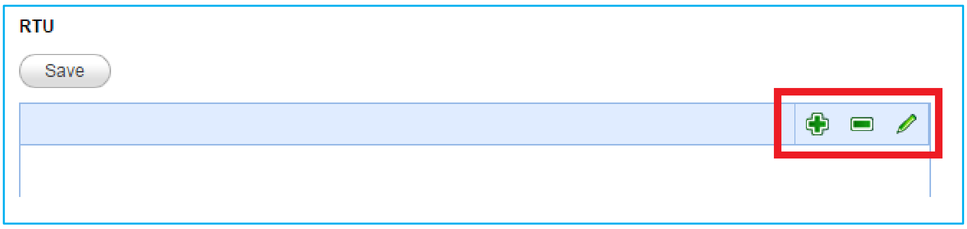
▬ : Delete a task, command, or item.

✎ : Modify a task, command, or item.

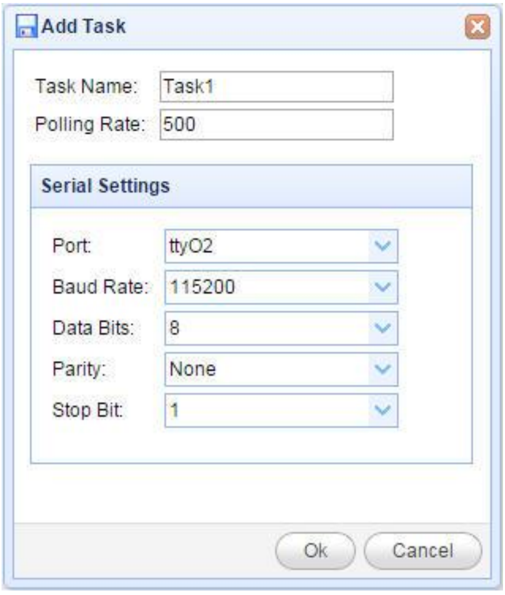
3.3.1.1. RTU

This section will show you the way to add, edit, and delete the Modbus RTU Master Driver in the RTU page.

1. Edit the RTU task.



The Task settings:



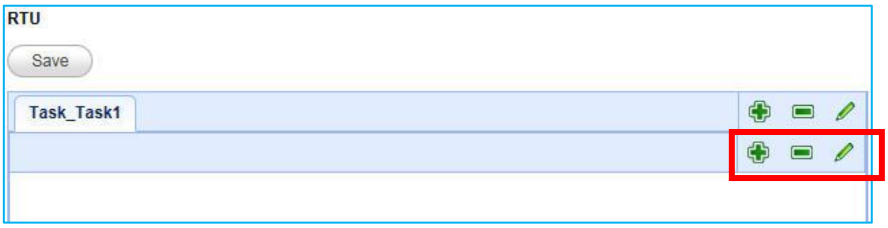
Task Name: Task1
Polling Rate: 500

Serial Settings

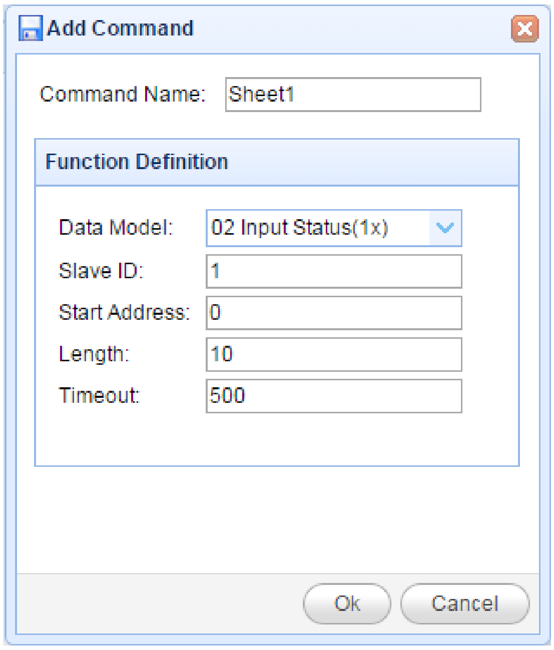
Port: ttyO2
Baud Rate: 115200
Data Bits: 8
Parity: None
Stop Bit: 1

Function items	Description	Default
Task Name	Give a task name.	Task1
Polling Rate	Set a time interval for the command.	500
Serial Settings		
Port	Choose a serial port number. Please check which RS-232/485 port is in use. Note: The wrong setting will cause the communication error.	TtyO2
Baud Rate	Choose a baud rate. Make sure the module's baud rate is correct. Note: The wrong setting will cause the communication error.	115200
Data Bits	The number of bits used to represent one byte of data.	8
Parity	Choose one way for the parity checking. Options: None, Even, and Odd.	None
Stop Bit	Choose the number of stop bit.	1

2. Configure the command under the task tab.



The Command settings:



Command Name: Sheet1

Data Model: 02 Input Status(1x)

Slave ID: 1

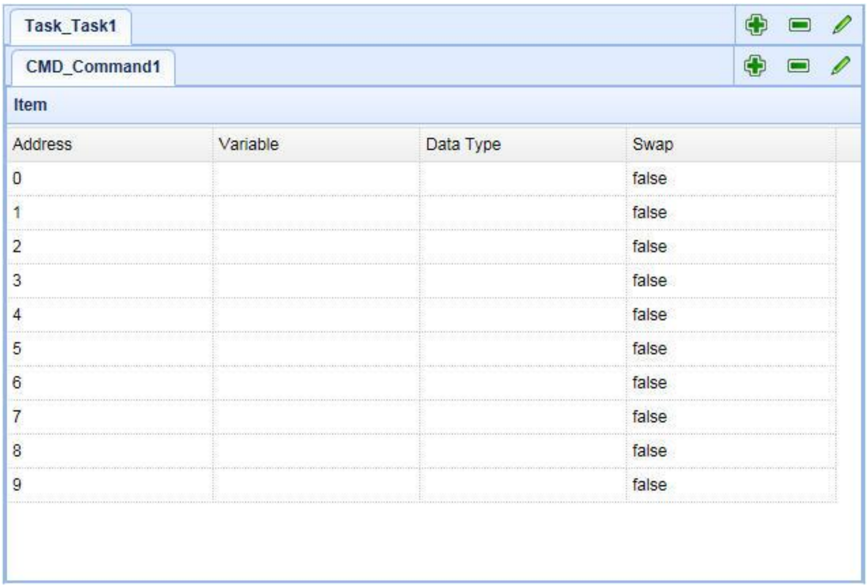
Start Address: 0

Length: 10

Timeout: 500

Function items	Description	Default
Command Name	Give a command name.	Command1
Function Definition		
Data Model	Choose the data type for the Modbus command.	02 Input Status(1x)
Slave ID	Set the Slave ID of the UA-5000. (Range: 1 ~ 247)	1
Start Address	The start address of the Modbus command.	0
Length	The number of the Modbus address.	10
Timeout	Set the timeout value for the module.	500

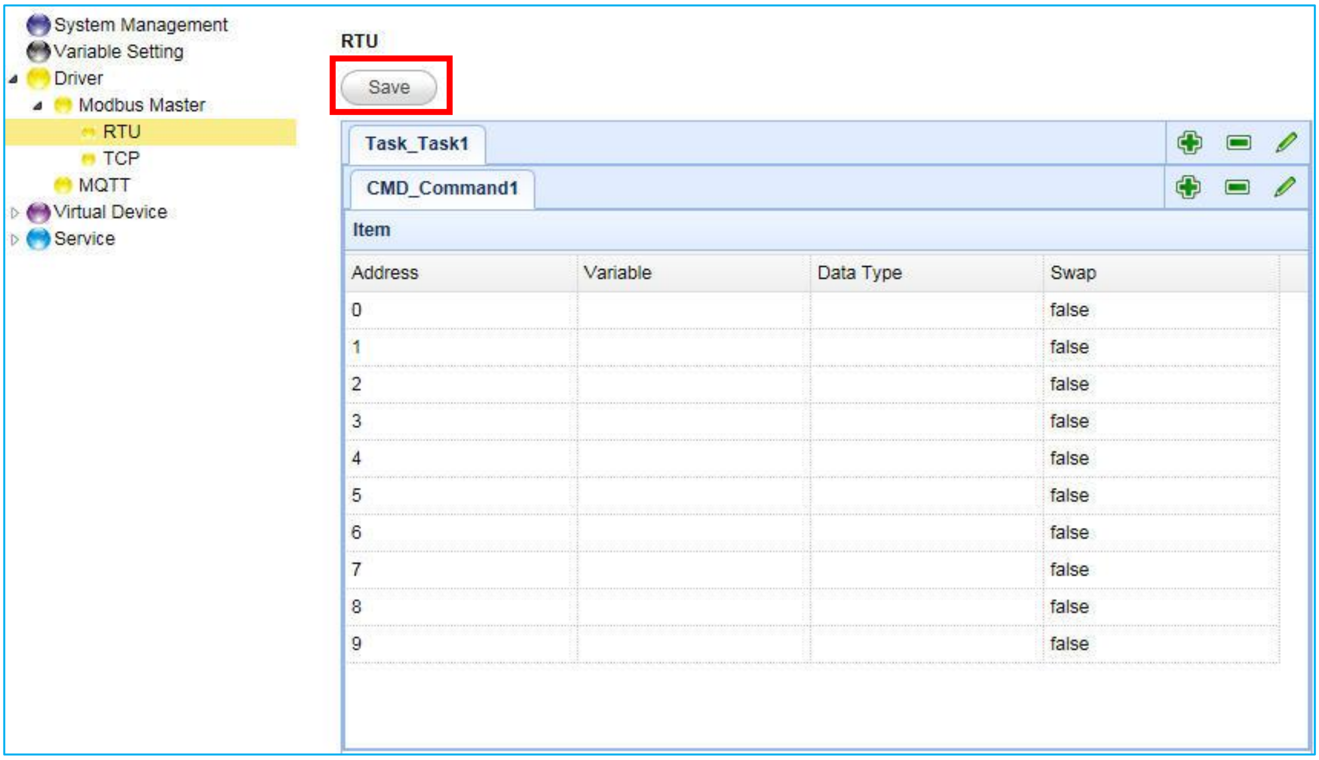
3. Set up the Variable and Swap items in the command tab.



Address	Variable	Data Type	Swap
0			false
1			false
2			false
3			false
4			false
5			false
6			false
7			false
8			false
9			false

Function items	Description	Default
Address	Modbus address.	Auto arrange
Variable	Choose the variable you set before. (See 3.2 Variable Setting)	
Data Type	After selecting the variable, its data type will automatically display. (Not editable)	
Swap	To swap 4-byte or 8-byte data into Low-to-High/High-to-Low order values.	True (enable) False (disable)

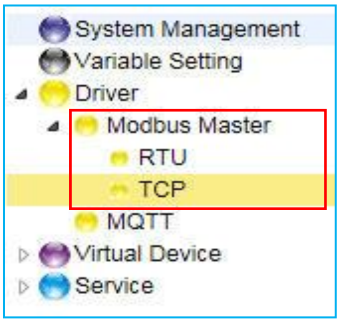
4. Click “Save” to save current settings.



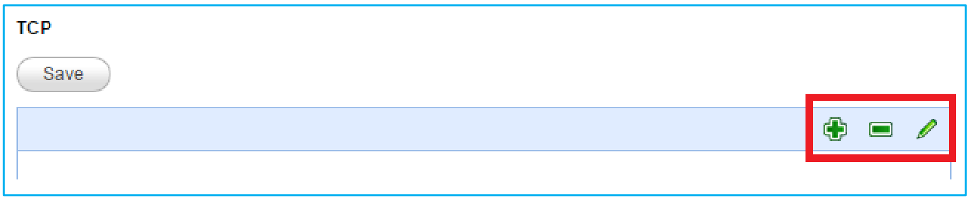
Address	Variable	Data Type	Swap
0			false
1			false
2			false
3			false
4			false
5			false
6			false
7			false
8			false
9			false

3.3.1.2. TCP

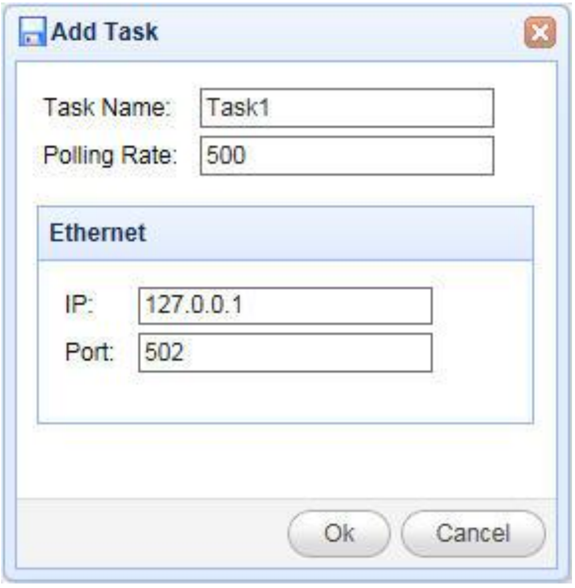
This section will show you the way to add, edit, and delete the Modbus RTU Master Driver in the TCP page.



1. Edit the TCP task.



The Task settings:


Add Task

Task Name: Task1

Polling Rate: 500

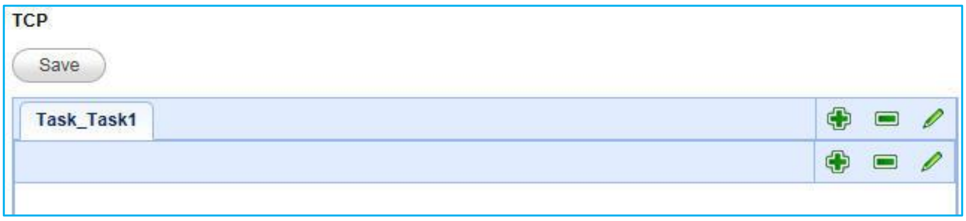
Ethernet

IP: 127.0.0.1

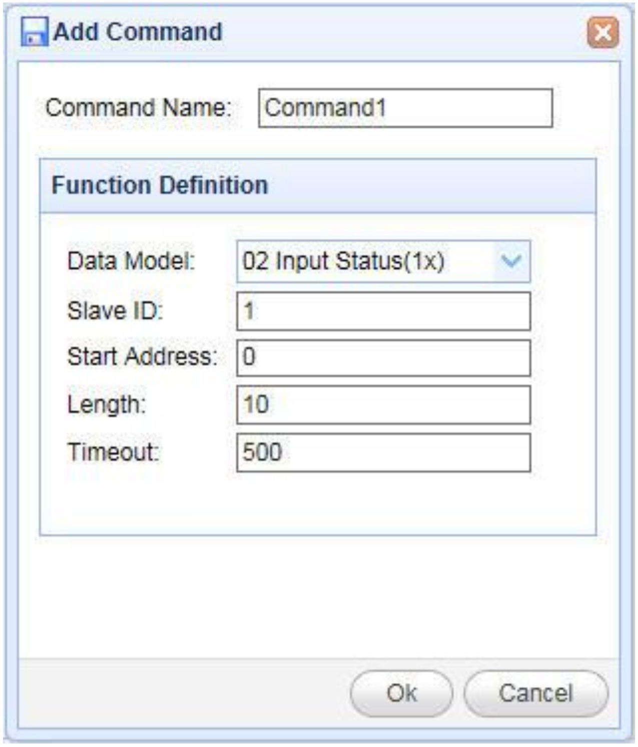
Port: 502

Function items	Description	Default
Task Name	Give a task name.	Task1
Polling Rate	Set an interval time for each command.	500
	Ethernet	
IP	The IP address of the connected device.	127.0.0.1
Port	The port number for Modbus TCP.	502

2. Configure the command under the task tab.



The Command settings:



Command Name: Command1

Data Model: 02 Input Status(1x)

Slave ID: 1

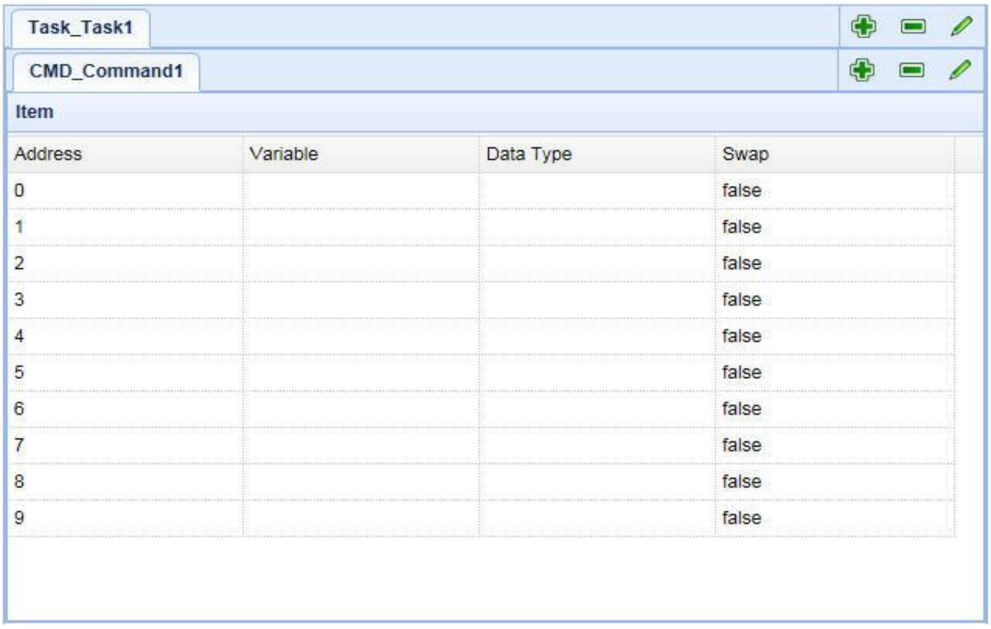
Start Address: 0

Length: 10

Timeout: 500

Function items	Description	Default
Command Name	Give a command name.	Command1
Function Definition		
Data Model	Choose the data type for the Modbus command.	02 Input Status(1x)
Slave ID	Set the Slave ID of the UA-5000. (Range: 1 ~ 247)	1
Start Address	The start address of the Modbus command.	0
Length	The number of the Modbus address.	10
Timeout	Set the timeout value for the module.	500

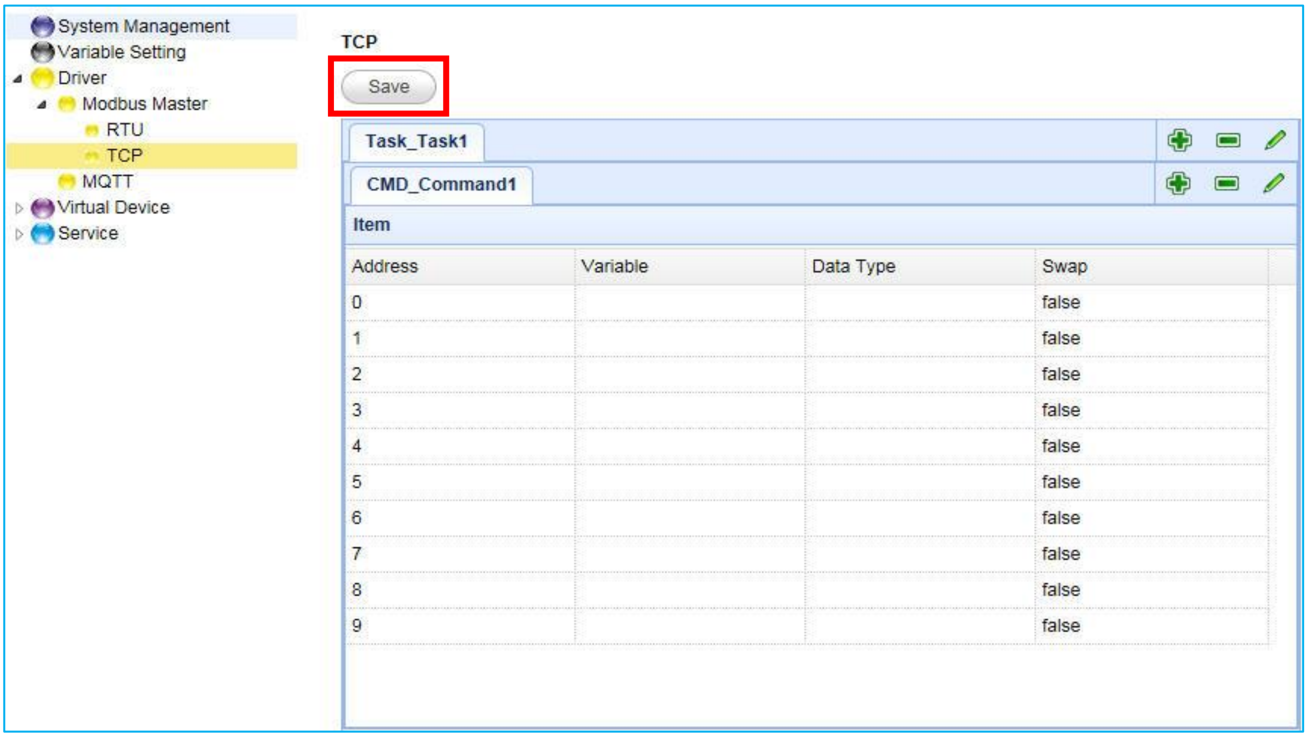
3. Choose the variable and the swap options in the command tab.



Address	Variable	Data Type	Swap
0			false
1			false
2			false
3			false
4			false
5			false
6			false
7			false
8			false
9			false

Function items	Description	Default
Address	Modbus address.	Auto arrange
Variable	Choose the variable you set before. (See 3.2 Variable Setting)	
Data Type	After selecting the variable, its data type will automatically display. (Not editable)	
Swap	To swap 4-byte or 8-byte data into Lo-to-Hi / Hi-to-Lo order values.	True (enable) False (disable)

4. Click “Save” to save the current settings.



Address	Variable	Data Type	Swap
0			false
1			false
2			false
3			false
4			false
5			false
6			false
7			false
8			false
9			false

3.3.2. MQTT

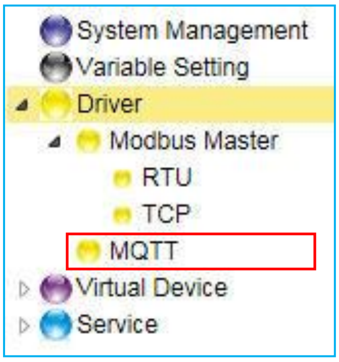
This section will show you the way to add, modify, and delete the MQTT driver in the MQTT page.

Description of the tool button:

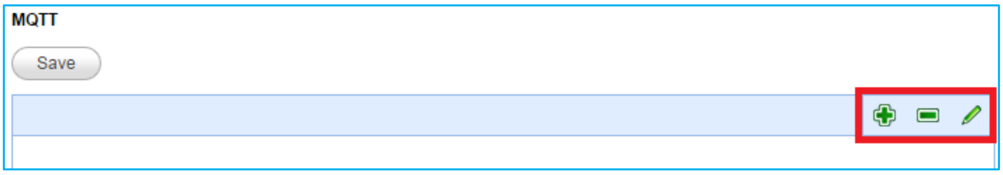
➕ : Add a task, command, or item.

➖ : Delete a task, command, or item.

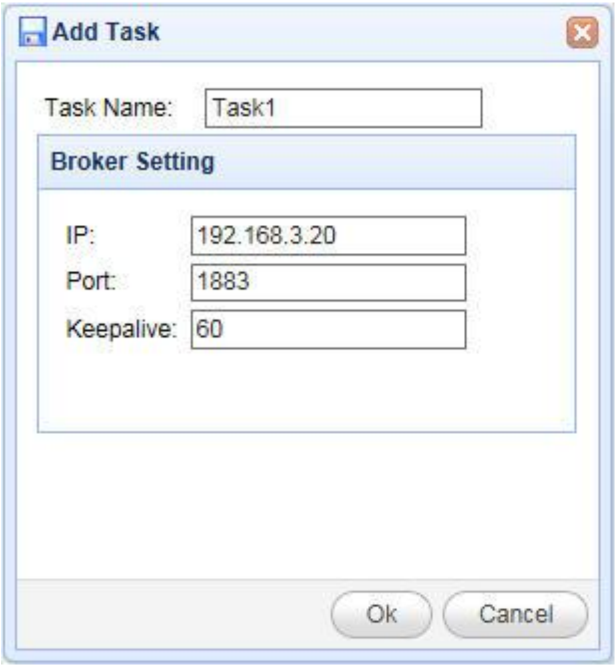
✎ : Modify a task, command, or item.



1. Edit the MQTT task.



The Task settings:



Task Name: Task1

Broker Setting

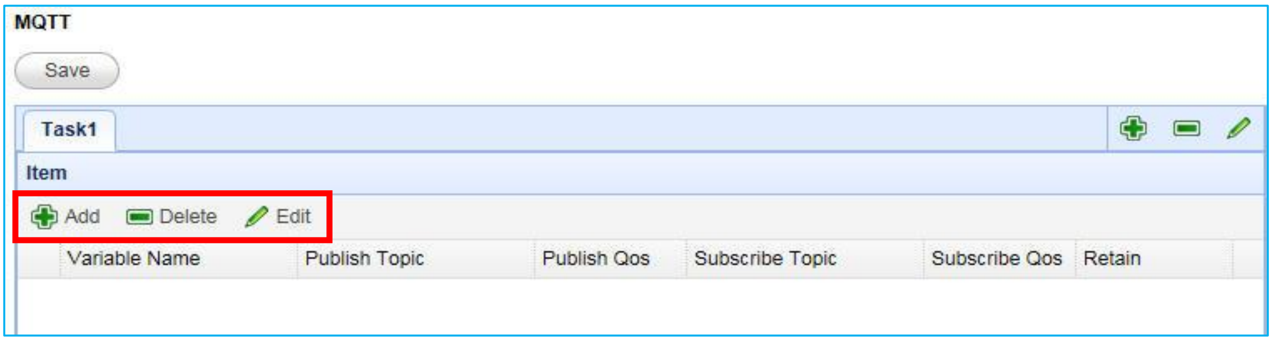
IP: 192.168.3.20

Port: 1883

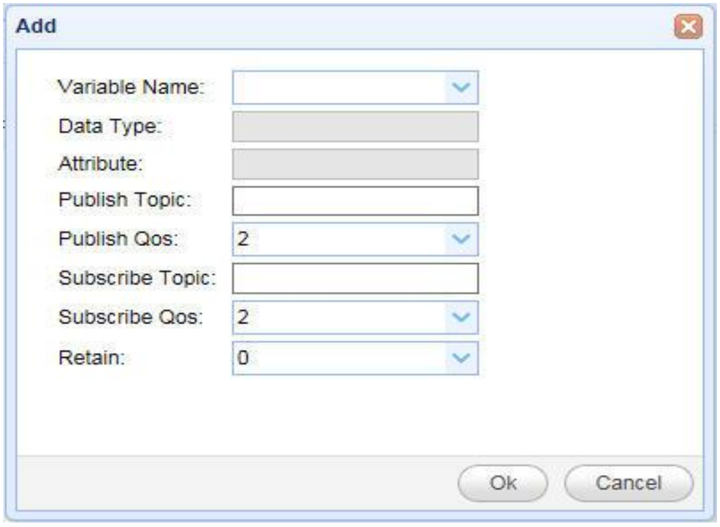
Keepalive: 60

Function items	Description	Default
Task Name	Give a task name.	Task1
Broker Setting		
IP	The IP address of the Broker.	Syatem value
Port	The Broker port.	1883
Keepalive	Keepalive time.	60

2. Configure the variable and related parameters under the MQTT task tab.



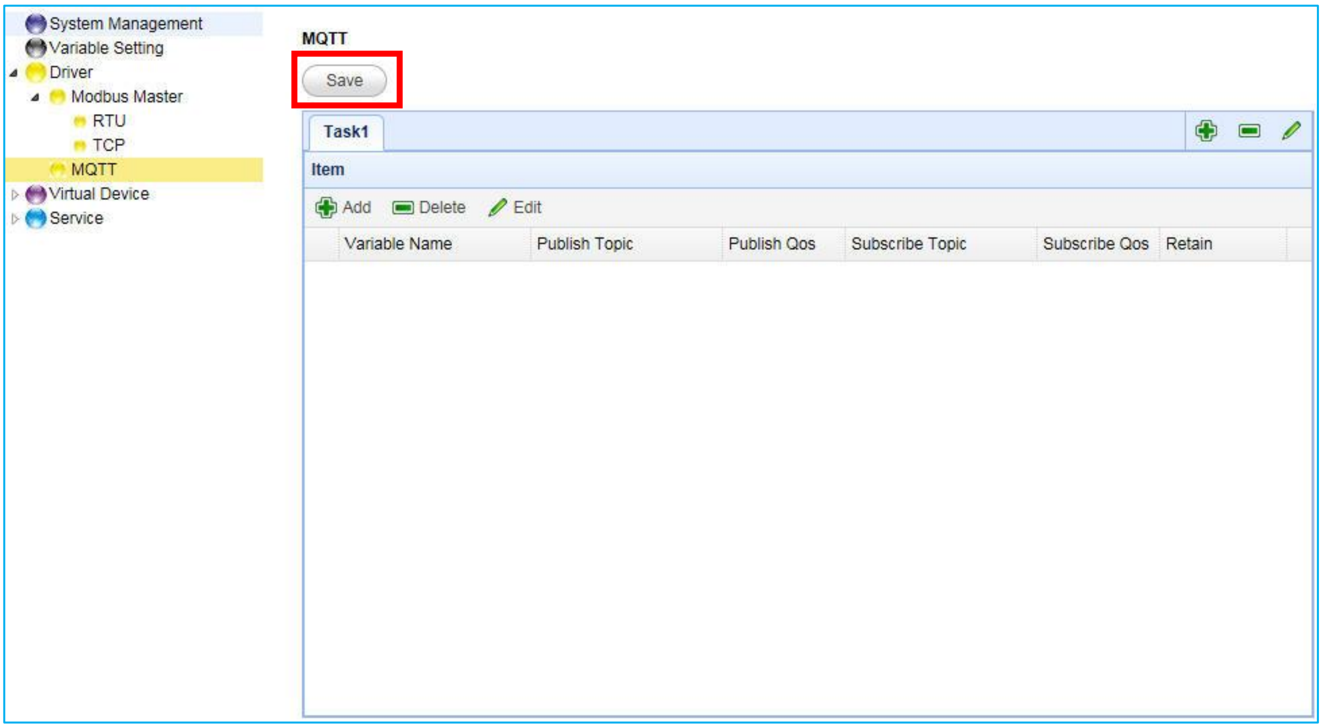
The settings:



Variable Name:
Data Type:
Attribute:
Publish Topic:
Publish Qos: 2
Subscribe Topic:
Subscribe Qos: 2
Retain: 0

Function items	Description	Default
Variable Name	Choose a variable which pre-defined in the variable table.	
Data Type	Not editable. It will show the data type of a variable.	System value
Attribute	Not editable. It will show the variable attribute.	System value
Publish Topic	The topic of sending data or publishing messages.	
Publish Qos	The Quality of Service (Qos) levels. 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.	2
Subscribe Topic	The topic of receiving data or subscribing messages.	
Subscribe Qos	The Quality of Service (Qos) levels. 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.	2
Retain	Whether to store a broker message. (0: No ; 1: Yes)	0

3. Click “Save” to save the current settings.



Variable Name	Publish Topic	Publish Qos	Subscribe Topic	Subscribe Qos	Retain

3.4. Virtual Device

This Virtual Device function allows the user to simulate various devices with the real I/O by using the PID tuning function. This article includes the PID function.

3.4.1. PID

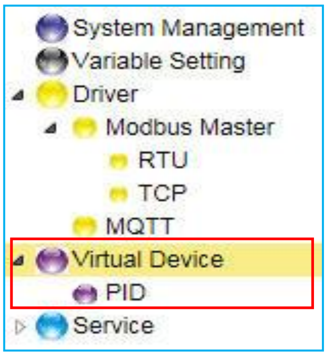
This section will show you the way to add, modify, and delete the virtual PID device in the PID page. Proportional-Integral-Derivative control is the most widely used in industrial control systems. A regulator which is controlled in accordance with Proportional, Integral and Derivative is called PID contol for short, also called PID regulator. When the user cannot fully grasp or measur parameters of the control system, the PID regulator is the best solution.

Description of the tool button:

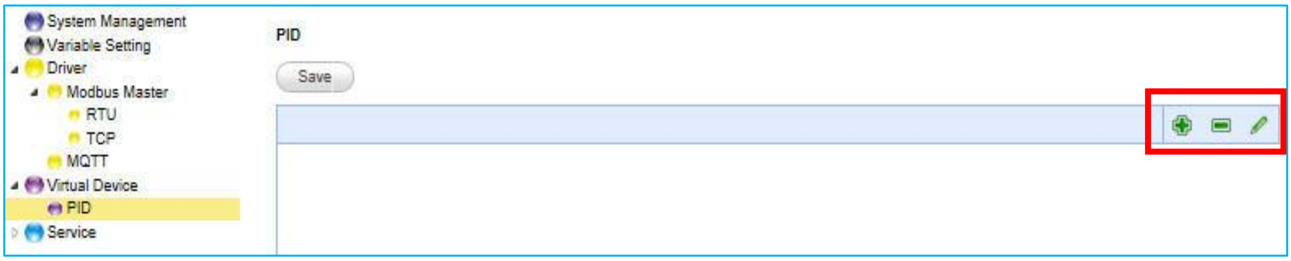
➕ : Add a task, command, or item.

➖ : Delete a task, command, or item.

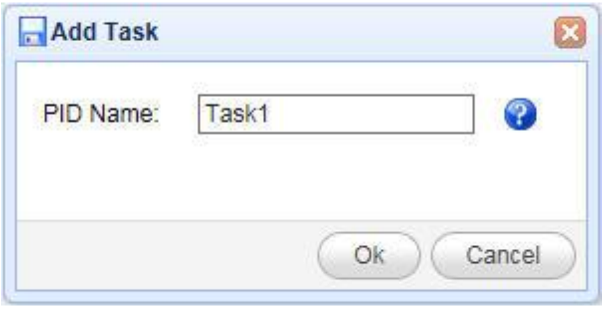
✎ : Modify a task, command, or item.



1. Configure a task in the PID Device page.



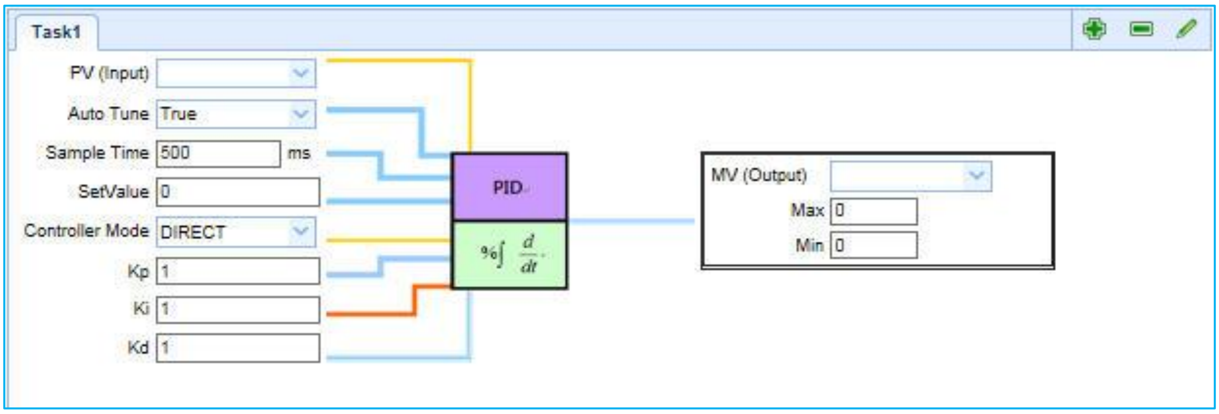
The settings:



PID Name: Task1

Function items	Description	Default
PID Name	Give a PID task name.	Task1

2. Configure related parameters for the PID device in the Task tab.


Task1

PV (Input):

Auto Tune: True

Sample Time: 500 ms

SetValue: 0

Controller Mode: DIRECT

Kp: 1

Ki: 1

Kd: 1

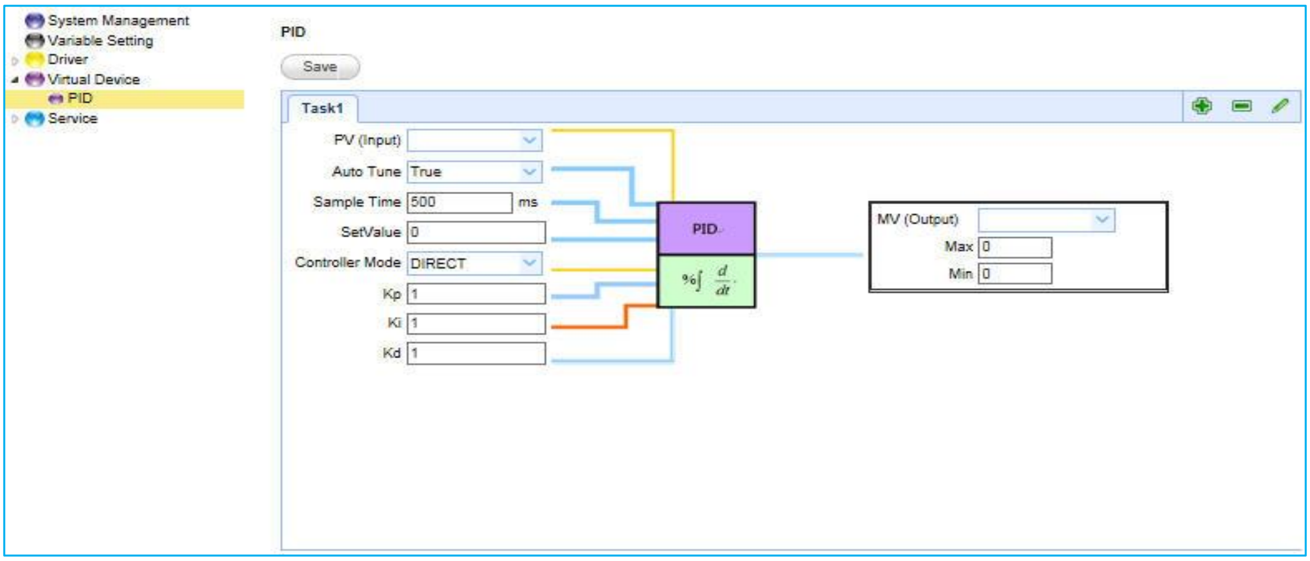
MV (Output):

Max: 0

Min: 0

Function items	Description	Default
PV(Input)	Choose a predefined float variable as the input parameter.	
Auto Tune	True: Auto-tuning PID parameters for your system. False: Tuning PID parameters manually.	True
Sample Time	Set the samping time.	500
Setvalue	The target value for PID control.	0
Controller mode	DIRECT: Set it as positive output value. REVERSE: Set it as reverse output value.	DIRECT
Kp	Set the Proportional gain.	1.0
Ki	Set the Integral gain.	1.0
Kd	Set the Derivative gain.	1.0
MV(Output)	Choose a preset floating variable as output.	
Max	Set the upper-limit value for the variable.	0
Min	Set the lower-limit value for the variable.	0

3. Click “Save” to save the current settings.



PV (Input):

Auto Tune: True

Sample Time: 500 ms

SetValue: 0

Controller Mode: DIRECT

Kp: 1

Ki: 1

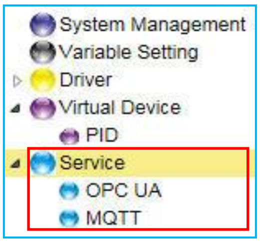
Kd: 1

MV (Output):

Max: 0

Min: 0

3.5. Service

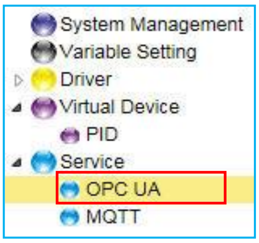


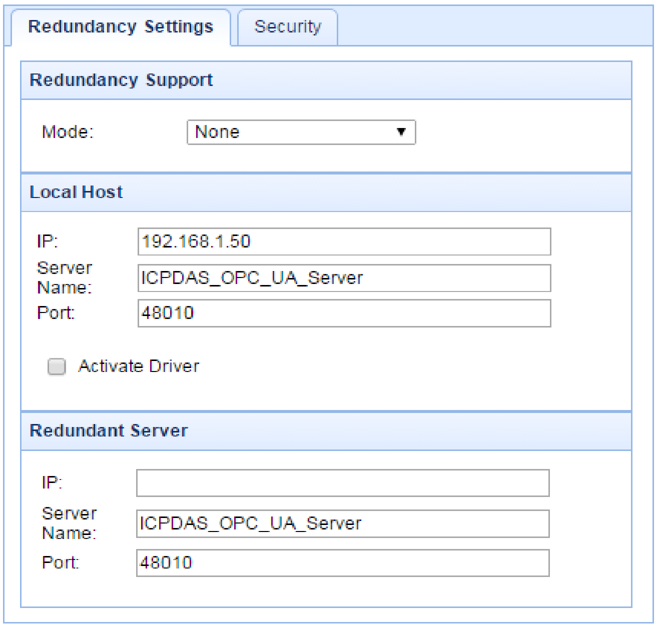
This section will describe how to configure the “Service” funtion.
It includes the OPC UA and MQTT items.

3.5.1. OPC UA

This section will show you the way to configure the Redundancy and Security settings.

3.5.1.1.Redundancy Settings





Redundancy Support

Mode: None

Local Host

IP: 192.168.1.50

Server Name: ICPDAS_OPC_UA_Server

Port: 48010

□ Activate Driver

Redundant Server

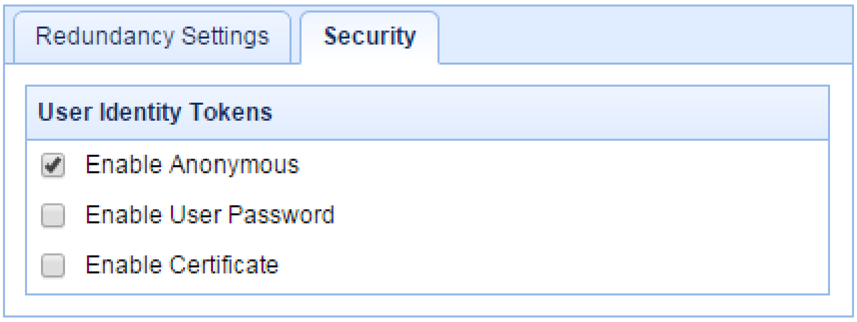
IP:

Server Name: ICPDAS_OPC_UA_Server

Port: 48010

Function items	Description	Default
	Redundancy Support	
Mode	Select the redundant mode.	System value
	Local Host	
IP	Display the IP address of the active OPC UA Server.	System value
Server Name	Display the active OPC UA Server name. Not editable.	ICPDAS_OPC_UA_Server
Port	The TCP port number of the active OPC UA Server.	48010
Activate Driver	Check: Driver will run at system startup. Uncheck: Driver will run if a network is available.	Uncheck
	Redundant Server	
IP	The IP address of the redundant OPC UA Server.	
Server Name	Display the redundant OPC UA Server name. Not editable.	ICPDAS_OPC_UA_Server
Port	The TCP port number of the redundant OPC UA Server.	48010

3.5.1.2. Security



User Identity Tokens

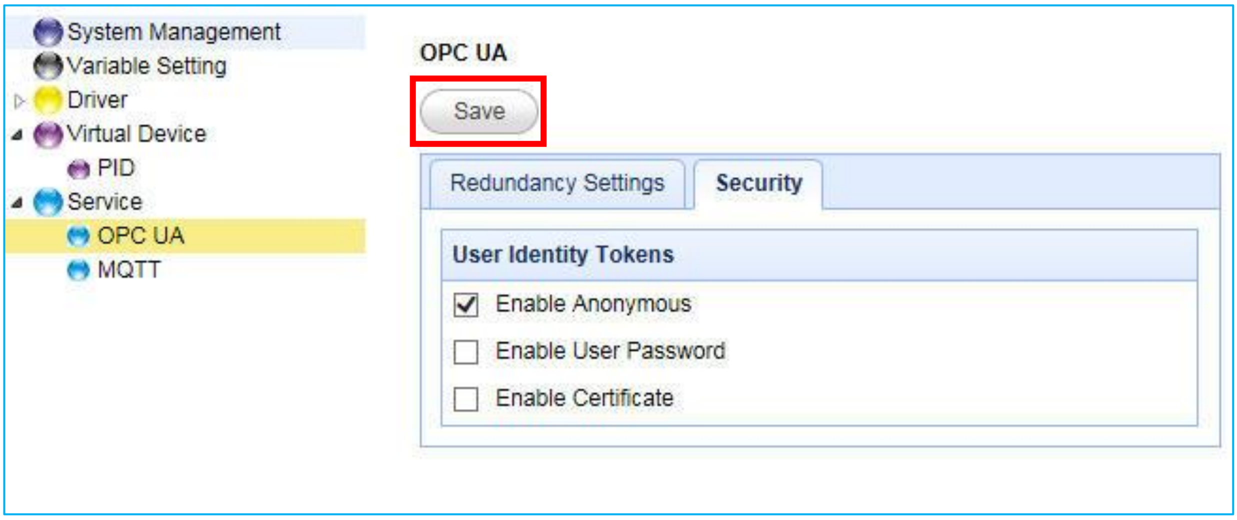
☑ Enable Anonymous

□ Enable User Password

□ Enable Certificate

Function items	Description	Default
User Identity Tokens		
Enable Anonymous	Check: Allow clients to use anonymous access . Uncheck: No anonymous login.	Check
Enable User Password	Check: Allow to log in with username/password. Uncheck: Not supported this way.	Uncheck
Enable Certificate	Check: Allow to log in with certificates Uncheck: Not supported this way.	Uncheck

Click “Save” to save the OPC Ua settings.



User Identity Tokens

☑ Enable Anonymous

□ Enable User Password

□ Enable Certificate

3.5.2. MQTT

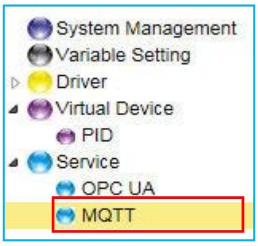
This section will show you the way to add, modify, and delete an MQTT task in the MQTT Service page.

Description of the tool button:

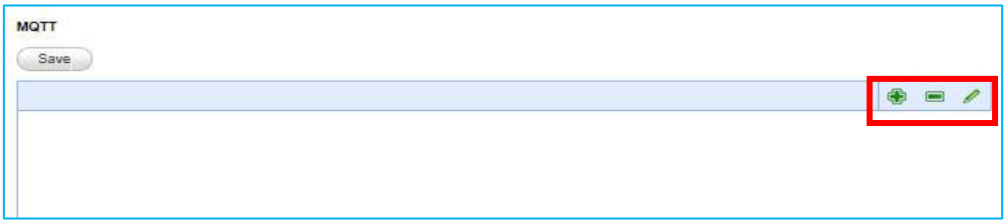
✚ : Add a task, command, or item.

▬ : Delete a task, command, or item.

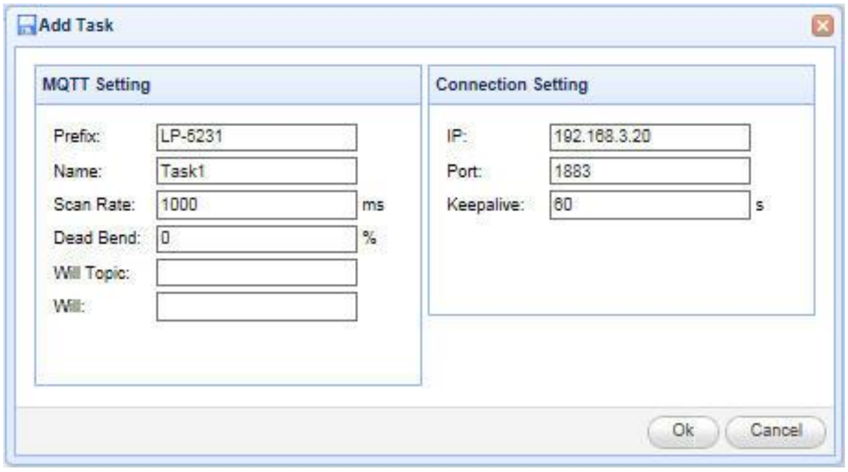
✎ : Modify a task, command, or item.



1. Configure a task in the MQTT Service page.



The settings:



Add Task

MQTT Setting

Prefix: LP-5231

Name: Task1

Scan Rate: 1000 ms

Dead Bend: 0 %

Will Topic:

Will:

Connection Setting

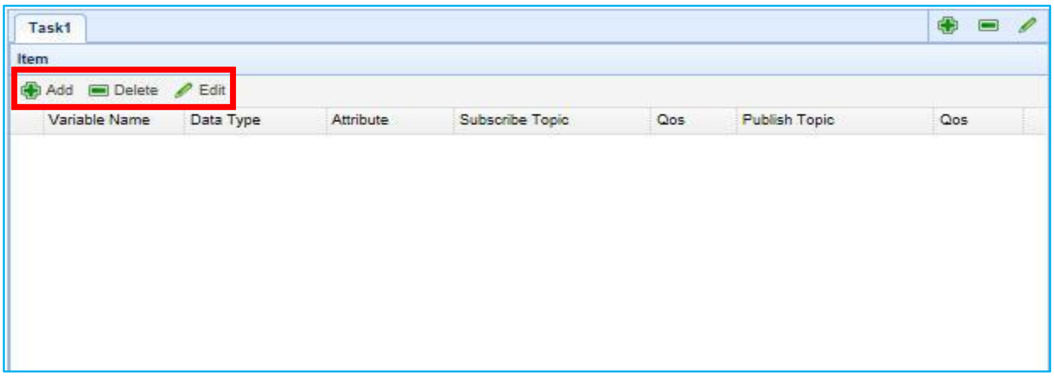
IP: 192.168.3.20

Port: 1883

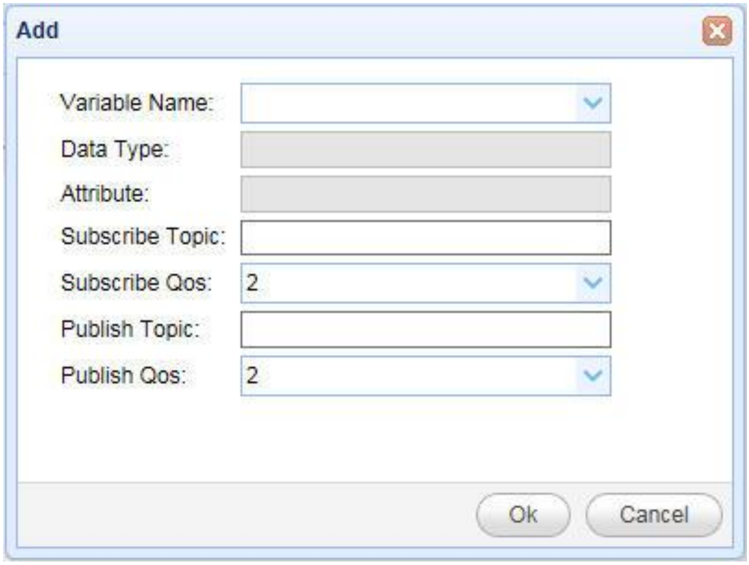
Keepalive: 60 s

Function Items	Description	Default
MQTT Setting		
Prefix	Set up the prefix for the MQTT topic.	System value
Name	Give a task name.	Task1
Scan Rate	Set an update frequency for the task data. (Unit: ms)	1000
Dead Bend	Give a deadbend value for updating a float signal. (Unit: %)。	0
Will Topic	Enter the title of a disconnect notice.	
Will	Enter a disconnect notice.	
Connection Setting		
IP	Set the Broker’s IP address.	System value
Port	Set the Broker port.	1883
Keepalive	Set a time to check whether or not the connection to the Broker is working. (Unit: second)	60

2. Configure the variable, topic and related parameters in the MQTT task item.



Settings:



Variable Name:

Data Type:

Attribute:

Subscribe Topic:

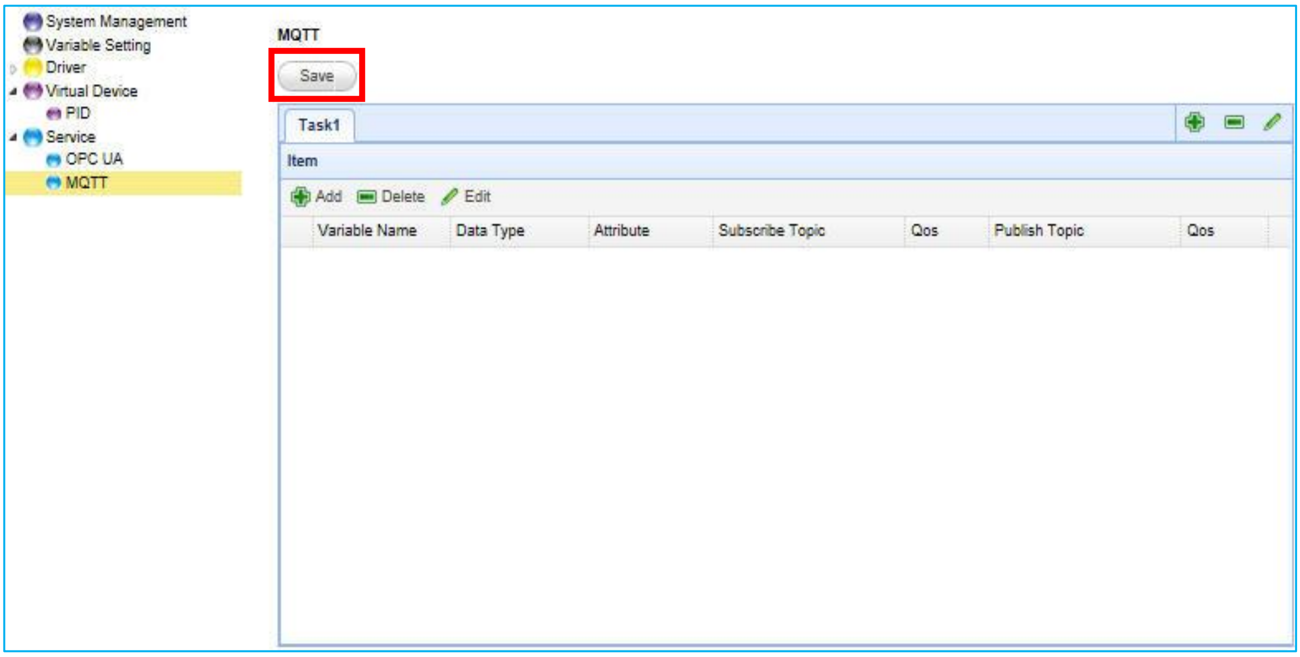
Subscribe Qos: 2

Publish Topic:

Publish Qos: 2

Function items	Description	Default
Variable Name	Choose a variable in the pre-defined variable table.	
Data Type	Not editable. It will show the data type of a variable.	System value
Attribute	Not editable. It will show the variable attribute.	System value
Subscribe Topic	The topic of receiving data or subscribing messages.	
Subscribe Qos	The Quality of Service (Qos) levels. 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.	2
Publish Topic	The topic of sending data or publishing messages.	
Publish Qos	The Quality of Service (Qos) levels. 0: Delivering a message at most once. 1: Delivering a message at least once. 2: Delivering a message at exactly once.	2

3. Click "Save" to save current settings.



4. Technical Reference Websites

OPC UA

https://opcfoundation.org/

MQTT

http://mqtt.org/

Modbus

http://modbus.org/