Modbus RTU/TCP/ThingWorx Gateway
IOT600-TWX-TS

User Manual

V1.3

REV A

SST Automation

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Catalog

1 Introduction....2
1.1 About This Document....2
1.2 Copyright information....2
1.3 Related Products....2
1.4 Revision History....2
2 Product Overview....3
2.1 Product Function....3
2.2 Product Features....3
3 Hardware Description....5
3.1 Appearance....5
3.2 Indicators....6
3.3 Configuration Switch....6
3.4 Interface....7
3.4.1 Power Interface....7
3.4.2 Ethernet Interface....8
3.4.3 Serial Interface....8
4 Instructions of Configuration Software....11
4.1 Notes before Configuring....11
4.2 Rapid Configuration....11
4.3 Search Equipment....12
4.3.1 Search All Equipment in Ethernet....12
4.3.2 IP Search....12
4.4 Configuration....14
4.4.1 Configuring Ethernet Parameters....15
4.4.2 Configuring Modbus Serial Port Parameters....16
4.4.3 Configuring Modbus TCP Master Parameters....17
4.4.4 Configuring Modbus Command....18
4.4.5 Configuring Modbus TCP Slave Parameters....21
4.5 Locate....21
4.6 Remote Reset....22
4.7 Open/Save/Export EXCEL....23
4.8 Auto Assign Property Name/Download....26
4.9 New....27
5 Typical Application....29
6 Installation....30
6.1 Machine Dimension....30
6.2 Installation Method....31

1 Introduction

1.1 About This Document

This document describes the parameters, use methods and considerations of IOT600-TWX-TS,providing a detailed technical implementation guide for developers. Please read this manual carefully before using the gateway.

1.2 Copyright information

The data and examples in this document cannot be copied without authorization.

SSTCOMM is the registered trade mark of SST Automation.

1.3 Related Products

If you want to get more information about related products, please visit SSTCOMM website: http://www.sstcomm.com.

1.4 Revision History

Revision	Date	Chapter	Description
V1.0	2/15/2017	All	First release version.
V1.2	5/20/2018	All	Added the maximum number of attributes to 2500, added attribute name batch naming instructions.
V1.3 REV A	11/15/2018	All	Added supported maximum number of attributes to 3000, added supported name length of attributes to 120.

2 Product Overview

2.1 Product Function

IOT600-TWX-TS is one of the IOT gateways provided by SST Automation, which supports uploading data of Modbus RTU slave, Modbus TCP master and Modbus TCP slave to the ThingWorx platform. Equipment manufacturers or owners can achieve remote management, monitoring, operation and maintenance of various Modbus devices on the cloud platform. IOT600-TWX-TS supports communication with the cloud platform through the URL configured by the user.

2.2 Product Features

[1] Supports maximum number of properties: 3000 (No TLS encrypted transmission);

[2] The communication mode adopts the WebSocket mode and support TLS encrypted transmission;

[3] Modbus RTU master

- Support connecting 15 Modbus slaves
- Each serial port supports up to 100 Modbus commands
- Support baud rate:1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200bps
- Support 01H, 02H, 03H, 04H, 05H, 06H 0FH and 10H function codes
- The register supports int16, uint16, int32, int32 inverse, uint32, uint32 inverse, float, float inverse, double, double inverse
- Digital support: BOOL

[4] Modbus TCP master

- Supports up to 100 Modbus commands and up to 36 Modbus TCP devices
- Supports 01H, 02H, 03H, 04H, 05H, 06H 0FH and 10H function codes
- The register supports int16, uint16, int32, int32 inverse, uint32, uint32 inverse, float, float inverse, double, double inverse
- Digital support: BOOL

[5] Modbus TCP slave

- Supports 01H, 02H, 03H, 04H, 05H, 06H 0FH and 10H function codes and up to 36 Modbus TCP

master

- Register supports int16, uint16, int32, int32 inverse, uint32, uint32 inverse, float, float inverse, double, double inverse, int64, int64 inverse, uint64, uint64 inverse
- Supports coil status block, input status block, hold register block and input register block, each block supports the maximum 1024 registers or bits

[6] Power supply: 24VDC (11V ~ 30V), 90mA (24VDC);

[7] Working temperature: -4℉~140℉(-20℃~60℃), relative humidity: 5% ~ 95% (non-condensing);

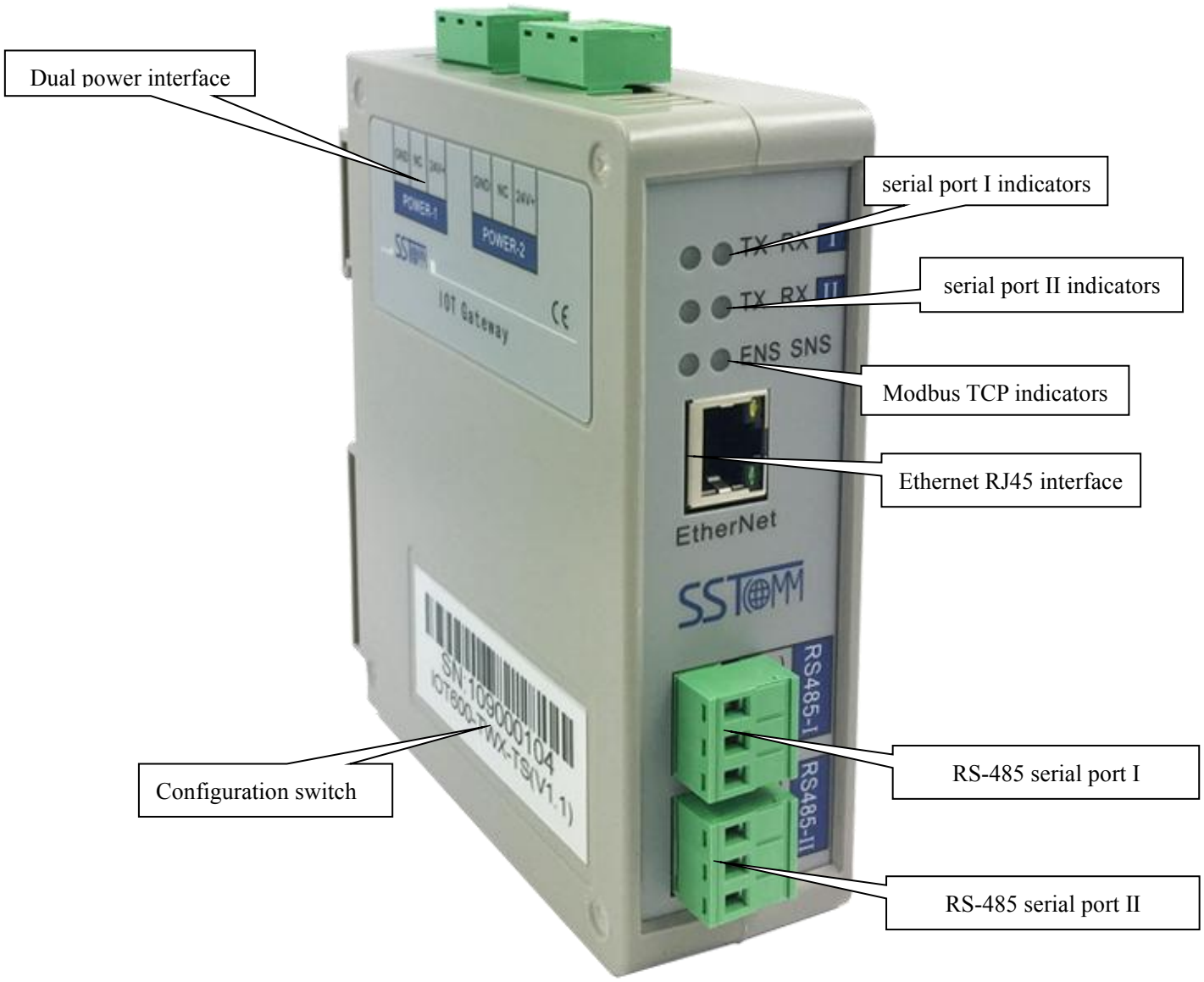
[8] External Dimensions (W*H*D): 1.57 in*4.92 in*4.33 in (40mm*125mm*110mm);

[9] Installation: 35mm rail;

[10] Protection class: IP20;

3 Hardware Description

3.1 Appearance

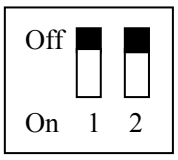


3.2 Indicators

Indicators	Status	Descriptions
ENS	Green on	IP address has not conflict
	Red on	IP address has conflict
	Blinking(Red)	DHCP,IP address conflict detection
	Green on	Modbus TCP interface has data to receive or send.
	Blinking(Green)	Modbus TCP interface has not data to receive or send.
SNS	Green on	Connect to the cloud platform
	Blinking(Green)/Blinking(Red)/Red on	Unconnected to the cloud platform
ENS (Orange) and SNS (Orange) (Orange: Red and green light on at the same time)	Simultaneously on	Start-up state
	Blink alternately	Configuration mode or Retained mode
	Blink alternately (lasts 3 seconds)	Using locate function
serial port I TX	Blinking(Green)	serial port I is sending data
	Off(Green)	serial port I isn't sending data.
serial port I RX	Blinking(Green)	serial port I is receiving data.
	Off(Green)	serial port I isn't receiving data.
serial port II TX	Blinking(Green)	serial port II is sending data
	Off(Green)	serial port II isn't sending data.
serial port II RX	Blinking(Green)	serial port II is receiving data.
	Off(Green)	serial port II isn't receiving data.

3.3 Configuration Switch

The DIP switch is located at the bottom of the gateway, bit 1 is mode bit and bit 2 is function bit.



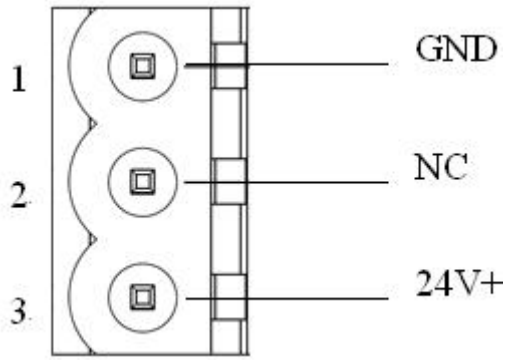
Mode (bit 1)	Function (bit 2)	Description
Off	Off	Run mode, allowing reading and writing of configuration
Off	On	Run mode, forbidding reading and writing configuration
On	Off	Configuration mode, IP address is 192.168.0.10 (fixed),
On	On	Reserved

Notes:Restart IOT600-TWX-TS (power off and power on) or remote reset after resetting the configuration to make the configuration take effect!

3.4 Interface

3.4.1 Power Interface

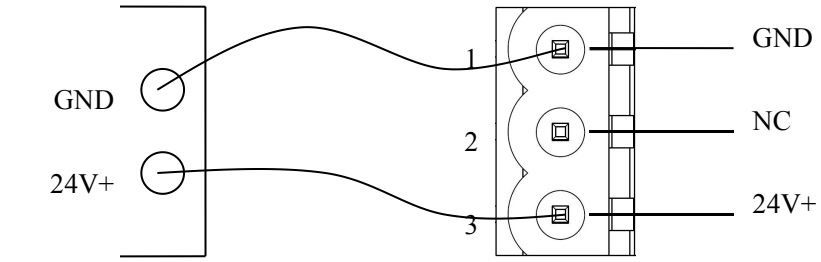
IOT600TWX-TS uses a 24V DC power supply which has two power interfaces and power redundant function. users can use one or two power supply .



Pin	Function
1	GND
2	NC, not connected
3	24V+ , DC 24V

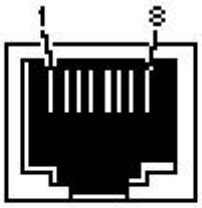
When one power supply fails, the other power supply can continue to supply power to ensure the normal operation of the equipment.

Power supply wiring is shown as below:



DC power: +24V　　Power interface

3.4.2 Ethernet Interface



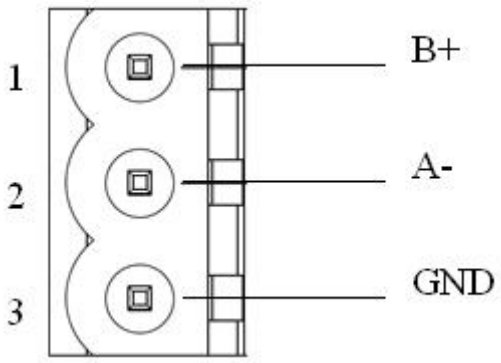
RJ-45 port

Ethernet interface uses RJ-45 connector; its pin (standard Ethernet signal) is defined as below:

Pin	Signal Description
S1	TXD+, Tranceive Data+, Output
S2	TXD-, Tranceive Data-, Output
S3	RXD+, Receive Data+, Input
S4	Bi-directional Data+
S5	Bi-directional Data-
S6	RXD-, Receive Data-, Input
S7	Bi-directional Data+
S8	Bi-directional Data-

3.4.3 Serial Interface

Pin of RS485 interface is defined as below:



Pin	Description
1	B+, RS485
2	A-, RS485
3	GND

The RS485 interface of the IOT600-TWX-TS is a standard one, and the RS485 characteristics of the product are shown as follows:

1. The basic characteristics of RS485 transmission technology

① Network topology: Linear bus, there are active bus terminal resistors at both sides.

② Transmission rate: 1200 bps~115.2Kbps.

③ Media: Shielded twisted-pair cable and also can cancel the shielding, depending on environmental conditions (EMC).

④Site numbers: 32 stations per subsection (without repeater), and can up to 127 stations (with repeater).

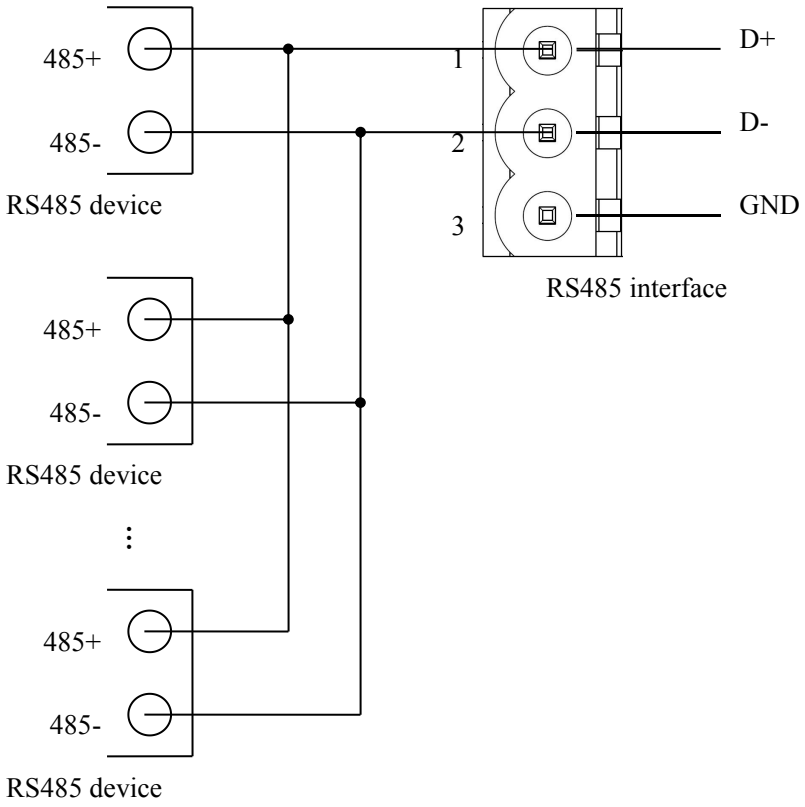
⑤Plug connection: 5-pin pluggable terminal.

2. The main points on RS485 transmission equipment installation

①All the equipment are connected with RS485 bus;

②Subsection can be connected up to 32 sites;

③The farthest end of each bus has a termination resistor—120Ω 1/2W to ensure reliable operation of the network.



When RS485 is in point to multipoint communication, in order to prevent the reflection and interference of the signal, each of a terminal resistance is required at the farthest ends of the line, with a parameter of 120Ω 1/2W. IOT600-TWX-TS serial port side has no parallel terminal resistance.

4 Instructions of Configuration Software

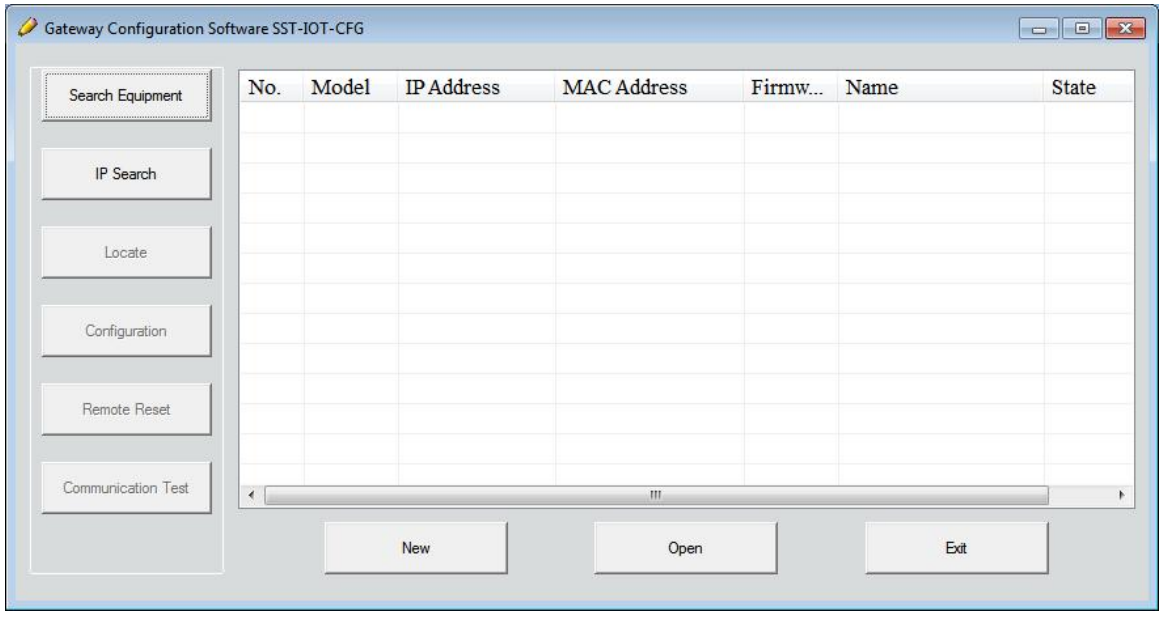
Double click the configuration software (SST-IOT-CFG) and finish the configuration of IOT600-TWX-TS

Notes: The factory setting of IOT600-TWX-TS is 192.168.0.44, if you need to change, set the mode of the configuration switch (bit 1) to the configuration (On) and restart the IOT600-TWX-TS. At this time the IP address of IOT600-TWX-TS is 192.168.0.10(fixed), subnet mask is 255.255.255.0, and gateway address is 192.168.0.1. Change the relevant parameters to the gateway as required, adjust the position of the dial switch to the factory setting, and restart the gateway.

4.1 Notes before Configuring

SST-IOT-CFG is a software based on Windows platform. Before running the software, make sure the user's computer and IOT600-TWX-TS need to be in the same local network.

Double-click the icon to enter configuration interface:



4.2 Rapid Configuration

- Connect the power lines, network lines and RS485 lines correctly;

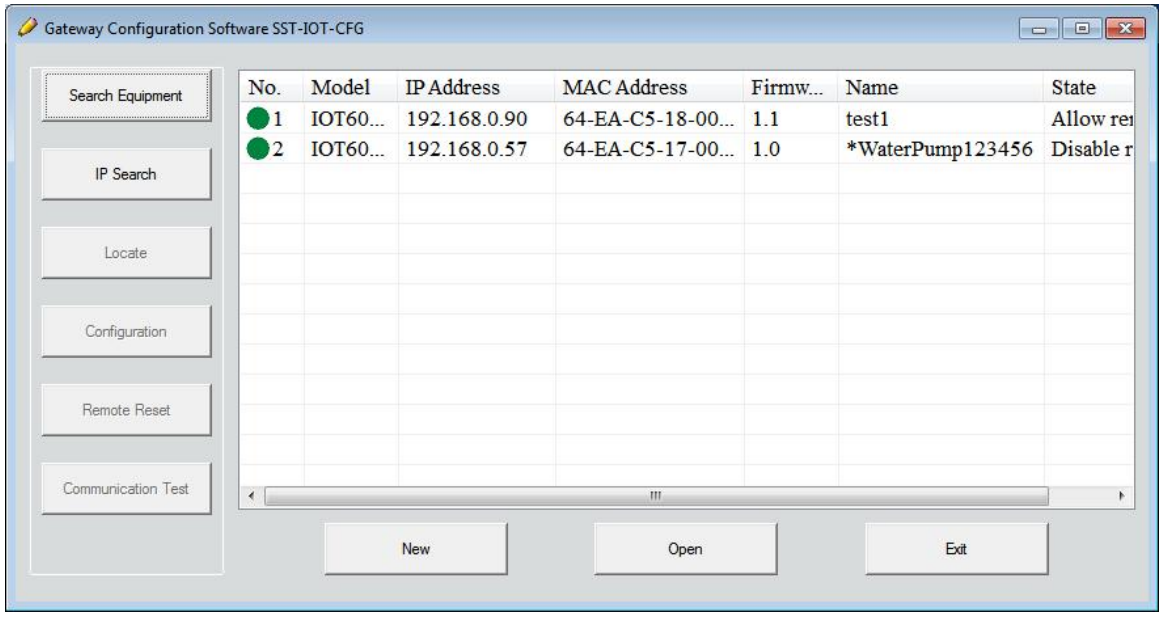
- Power on IOT600-TWX-TS;
- According to the actual situation of Modbus slave equipment, modify the IOT600-TWX-TS configuration according to this specification, and download the configuration to IOT600-TWX-TS;
- Connect Modbus slave equipment;

4.3 Search Equipment

Before configuring parameters of IOT600-TWX-TS, users need to search the gateway using the software. The software provides two ways to search the gateway.

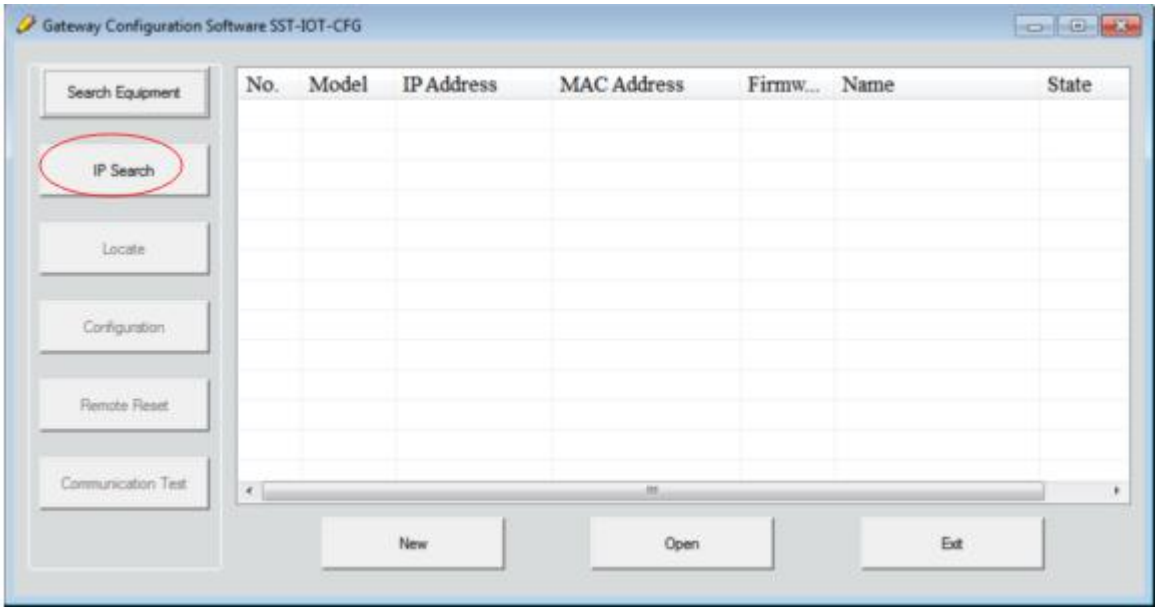
4.3.1 Search All Equipment in Ethernet

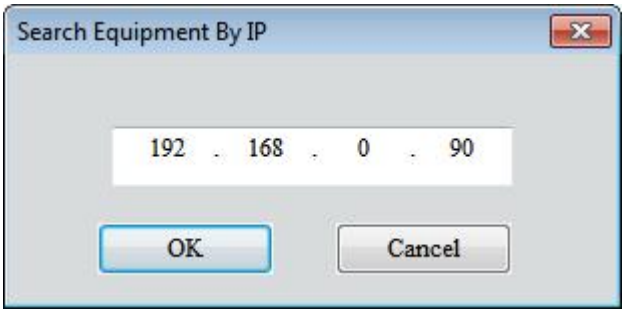
Click "Search Equipment" button of the main interface, the software will search all the available IOT600-TWX-TS equipment and list them in the main interface.



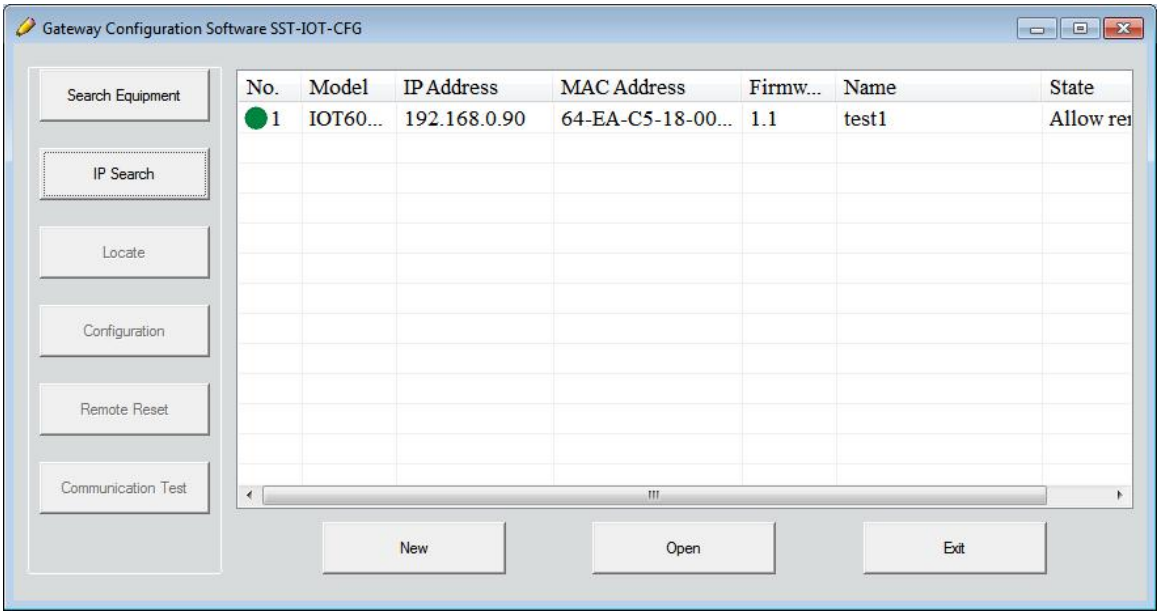
4.3.2 IP Search

Click "IP Search" button of the main interface will pop up a dialog box which demands you to input IP address.





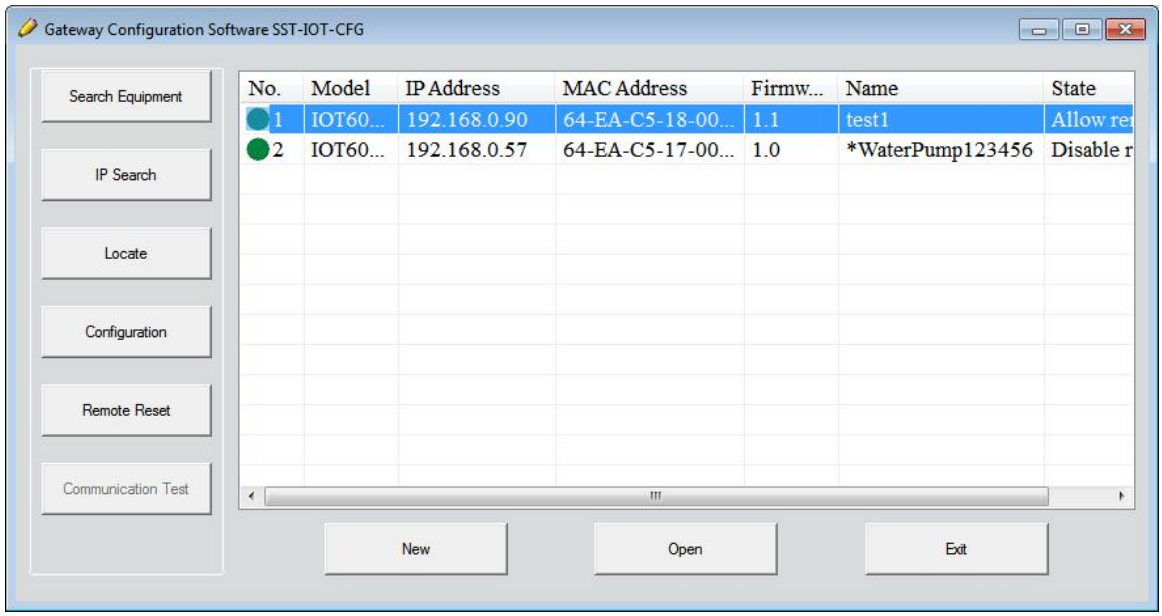
After entering the correct IP address, the software will search IOT600-TWX-TS with this IP address in the network, and list the information of the equipment in the main interface.



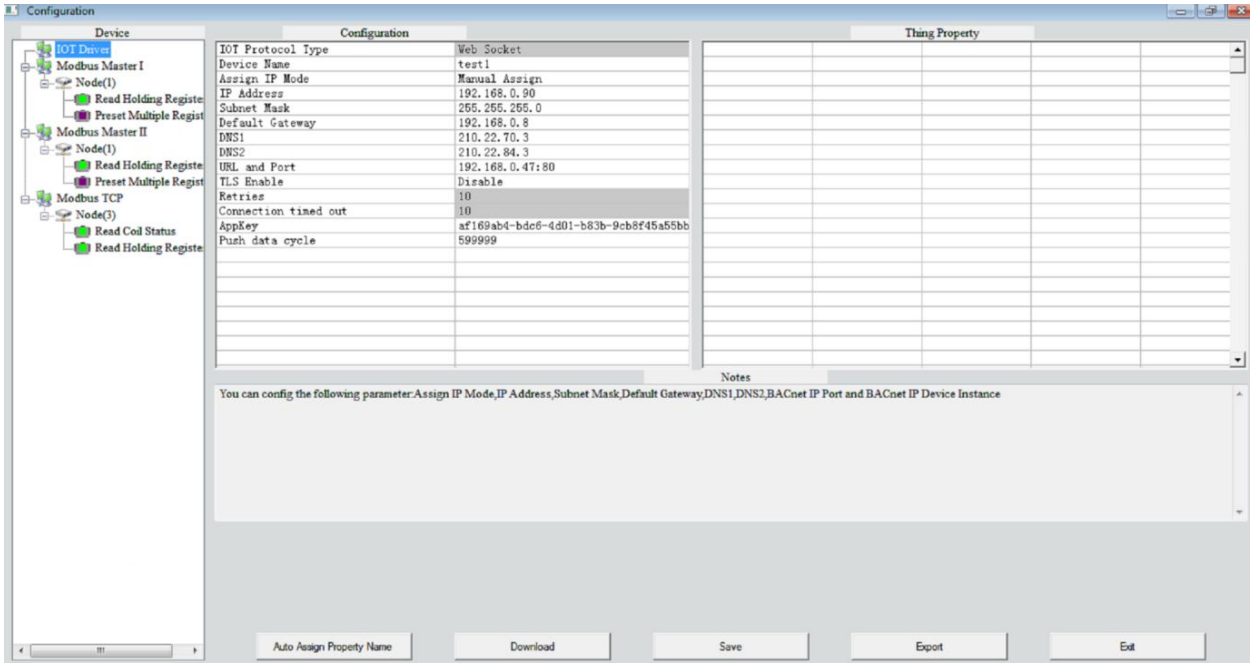
Notes: If users select the "IP Search", users need to enter correct IP address or it will not search equipment.

4.4 Configuration

Select the equipment to be configured in the list, and the "Locate", "Configuration", "Remote Reset", "New", "Open" and "Save" buttons will become available:

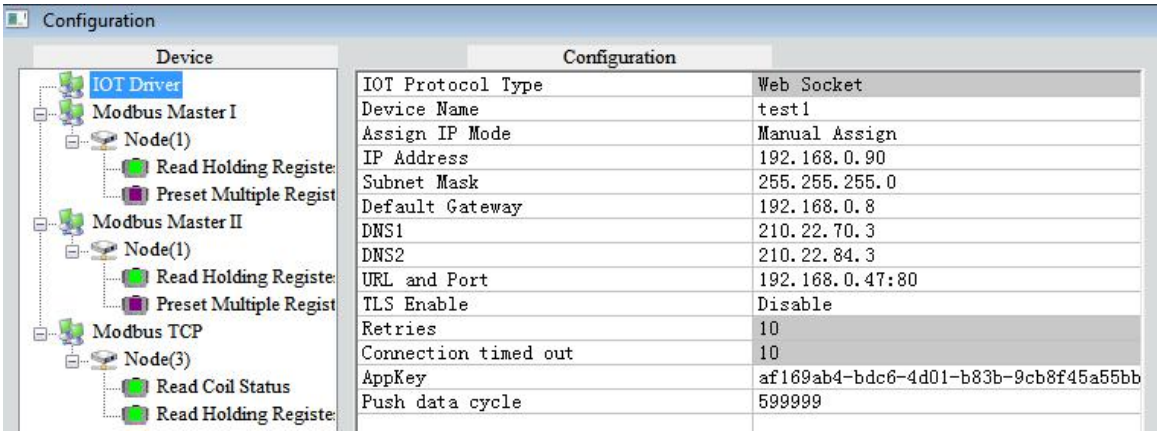


Click "Configuration" button, the following window is popped out:



4.4.1 Configuring Ethernet Parameters

Ethernet parameters include: "Name", "Assign IP Mode", "IP Address", "Subnet Mask", "Default Gateway", "DNS1" and "DNS2".



IOT Protocol Type: WebSocket

Device name: When connecting multiple IOT600-TWX-TS device, that is used to identify different devices

Notes: The name can not have space, up to 32 characters.

Assign IP Mode: Manual Assign and DHCP

IP address: IP Address of IOT600-TWX-TS

Subnet Mask: set subnet mask of the equipment;

Default Gateway: set gateway address of the equipment;

DNS1: Preferred domain name server (LAN can not be set)

DNS2: Standby domain name server

URL and port: URL and Port should separate with ":", and can not exceed 100 characters. Note: The port number is related to the "TLS Enable", and the port number can only be 443 when "TLS Enable" is selected as Enable.

TLS Enable: Whether to use TLS encryption transmission. You can choose: Disable, Enable. Note: The TLS enable is related to the port.

Retries: the connection to the cloud server failed and the number of reconnects. Default: 10

Connection timed out: Send a connection request to the cloud server, waiting for the server to respond to the

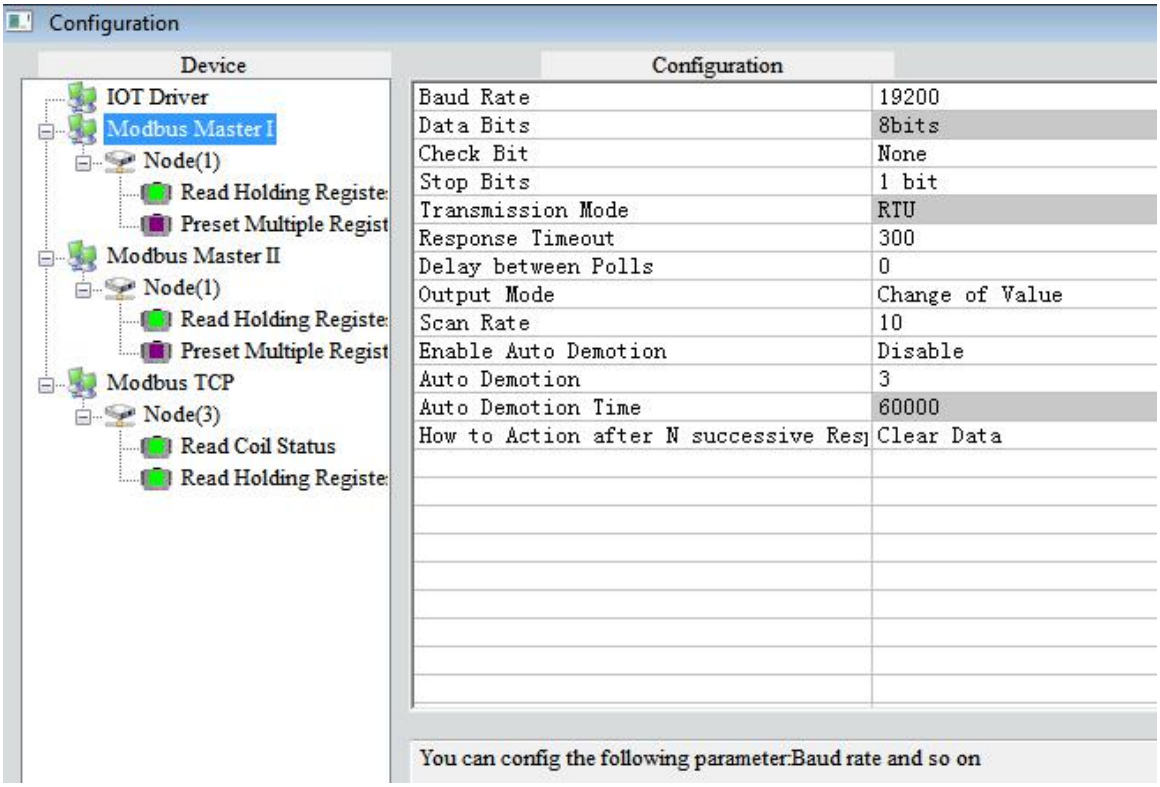
time. Default: 10

AppKey: Connecting to ThingWorx requires AppKey, and can not exceed 64 characters.

Push Data Cycle: After the connection is established with ThingWorx, this parameter is the cycle of the data pushed to the ThingWorx cloud. Range 100 ~ 60000ms, default: 300ms.

4.4.2 Configuring Modbus Serial Port Parameters

Serial parameters include: "Baud Rate", " check bit", "Stop bits" and "Data Bits".



Baud rate: 1200,2400,4800,9600,19200,38400,57600,115200

Data Bits: 8 (currently only support 8 data bits)

check bit: Odd, Even, None, Space and Mark

Stop bits: 1, 2

Transmission mode: RTU

Response timeout: After the gateway sends request, it waits the Modbus slave's response for max time which is in ms. The range of the parameter value is 300 to 60000ms.

Delay between polls: Delay between polls means delay between a response has been received and sending next request. The range of the parameter value is 0 to 2500ms

Output mode: There are two types of output: Cycle, Change of Value

Cycle: the write command will be sent periodically;

Change of Value: when the output data change, the write command will be sent;

Scan rate: Scan Rate is ratio of fast scan to slow scan

Enable Auto Demotion: When Enable Auto Demotion and a command is a fast scan command without correct response for N times, then the command will demote a slow scan command.

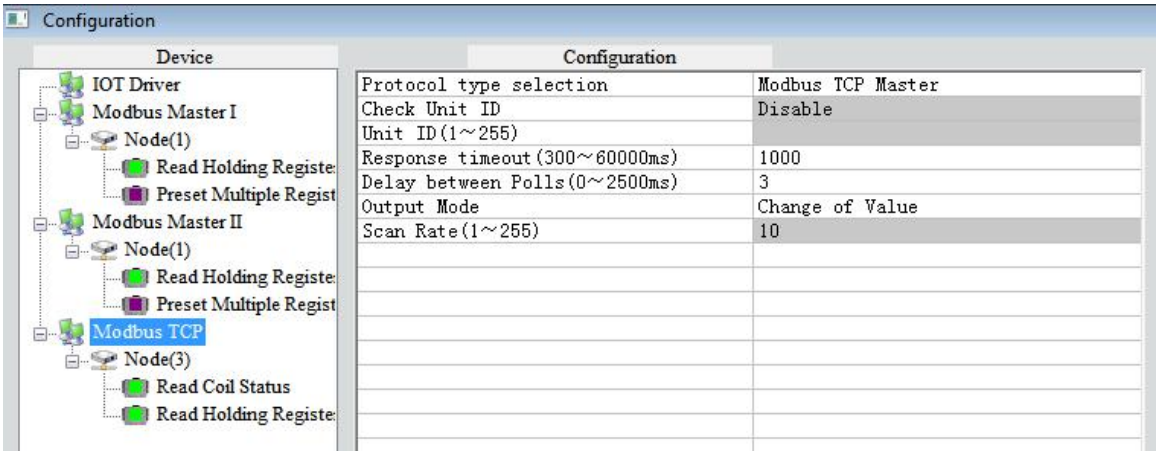
Auto Demotion: Setting Modbus command does not respond to resending the times

Auto Demotion time: When the Demotion Time times out, the command will promote a fast command.

Read command failure handling: How to Action after N successive Response Timeout: Clear Data; Hold Data

Note: the shadow's parameter can not be changed.

4.4.3 Configuring Modbus TCP Master Parameters



Protocol Type selection: Modbus TCP Master, Modbus TCP Slave

Response timeout: After the gateway sends request, it waits the Modbus slave's response for max time Which is in ms. the range of the parameter value is 300 to 60000ms.Default value is 1000ms

Delay between polls: Delay between polls means delay between a response has been received and

sending next request. The range of the parameter value is 0 to 2500ms.Default value is 3ms

Output mode: Cycle, Change of Value

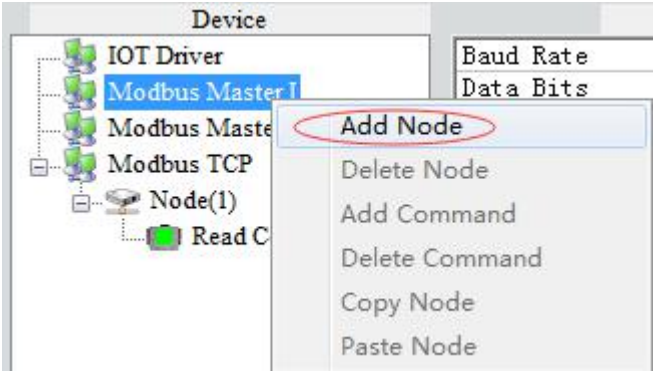
Cycle: the write command will be sent periodically;

Change of Value: when the output data change, the write command will be sent;

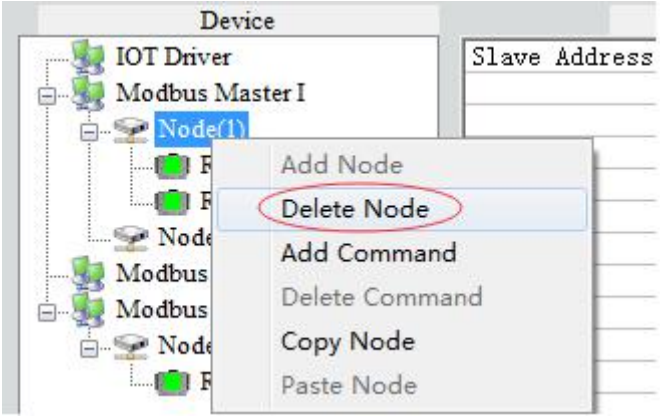
4.4.4 Configuring Modbus Command

1.Add nodes and Delete nodes

Right click "Modbus Master I"and select "Add Node"

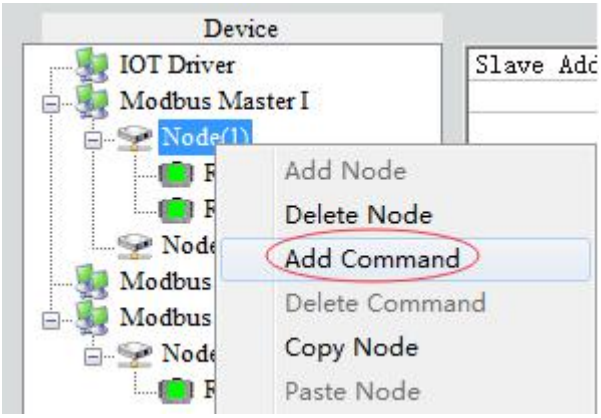


Right click on the node to be deleted and select "Delete Node"



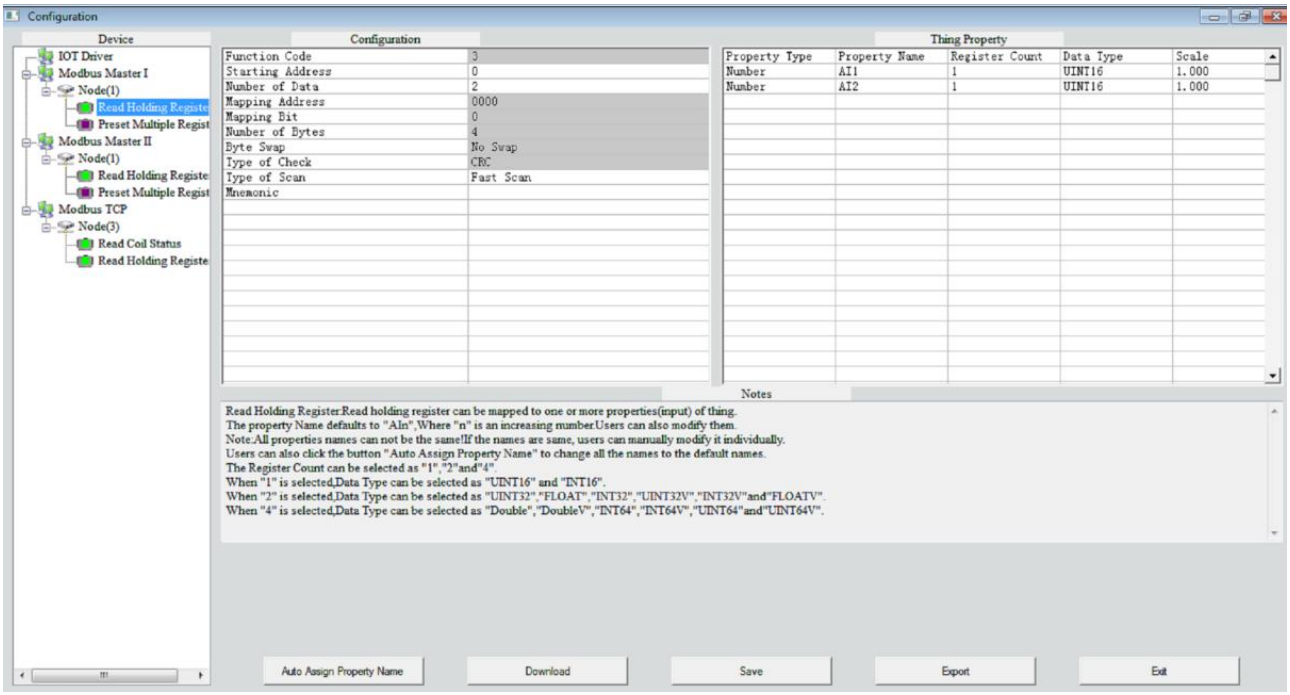
2.Add commands

Right click "Node ()" and select "Add command"



Select the command: Double click the command

For each Modbus command setting, the SST-IOT-CFG software automatically maps the Modbus command to the corresponding attributes after the completion.



"Property type": Number, Boolean;

Read Input Register: Mapping to Number object;

Read Holding Register: Mapping to Number object;

Read Coil Status: Mapping to Boolean object;

Read Input Status: Mapping to Boolean object;

Force Single Coil: Mapping to Boolean object;

Force Multiple Coils: Mapping to Boolean object;

Preset Single Register: Mapping to Number object;

Preset Multiple Registers: Mapping to Number object;

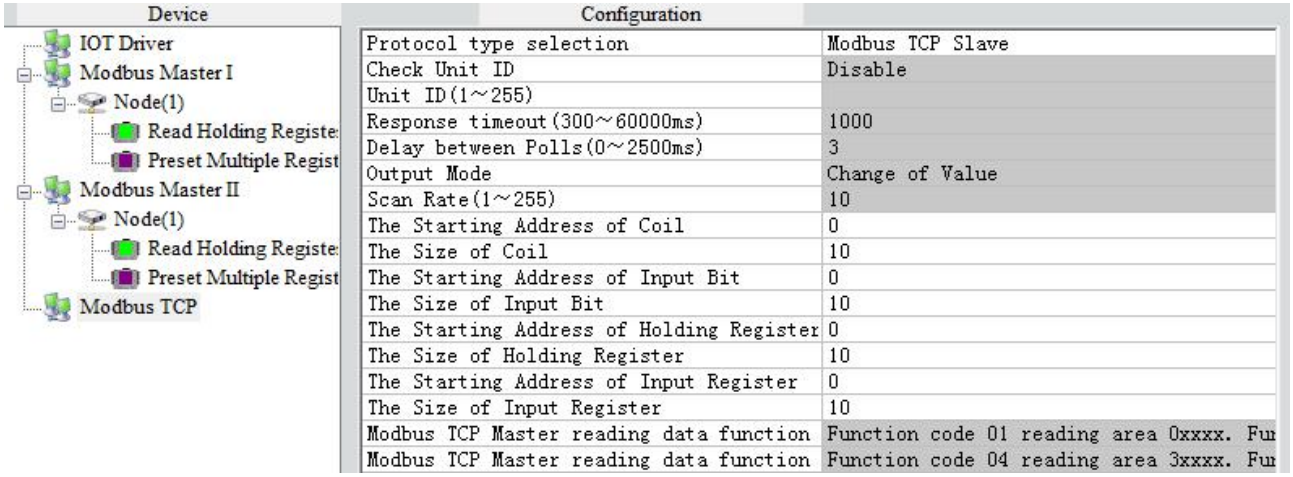
"Property name": you can edit and modify, the maximum data length is 120;

"Register Count ":The Register Count can be selected as "1","2"and"4",Default value is 1;

"Data type": BOOL, UINT16, INT16, UINT32, Float, INT32, UINT32V, INT32V, FloatV, Double, DoubleV, INT64, NT64V, UINT64, UINT64V;

"scale": you can edit and modify, The range of the parameter value is 0.001~1000, Default value is 1.0;

4.4.5 Configuring Modbus TCP Slave Parameters



The Starting Address of Coil: Range 0~65535. Default 0.

The size of Coil: is the length which Modbus TCP master can access from the Starting Address of Coil in IOT600-TWX-TS.

The Starting Address of Input Bit: Range 0~65535. Default 0.

The Size of Input Bit: is the length which Modbus TCP master can access from the Starting Address of Input Bit in IOT600-TWX-TS

The Starting Address of Holding Register: Range 0~65535. Default 0.

The Size of Holding Register: is the length which Modbus TCP master can access from the Starting Address of Holding Register in IOT600-TWX-TS

The Starting Address of Input Register: Range 0~65535. Default 0.

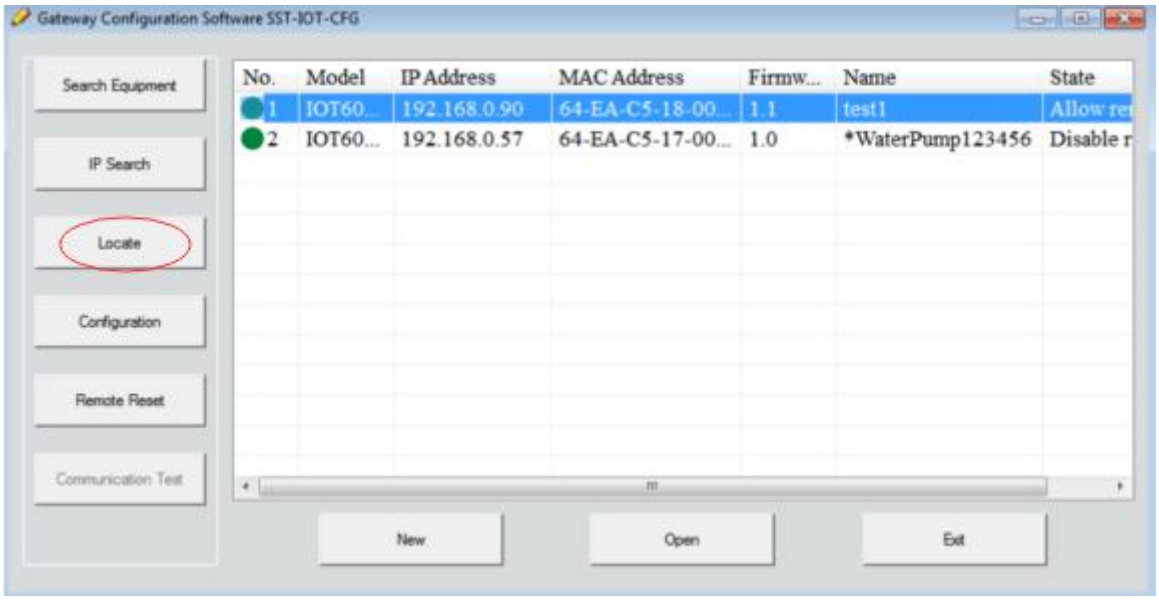
The Size of Input Register: is the length which Modbus TCP master can access from the Starting Address of Input Register in IOT600-TWX-TS

4.5 Locate

When users manage multiple IOT600-TWX-TA, you can use "Locate" function to determine equipment that you want to configure.

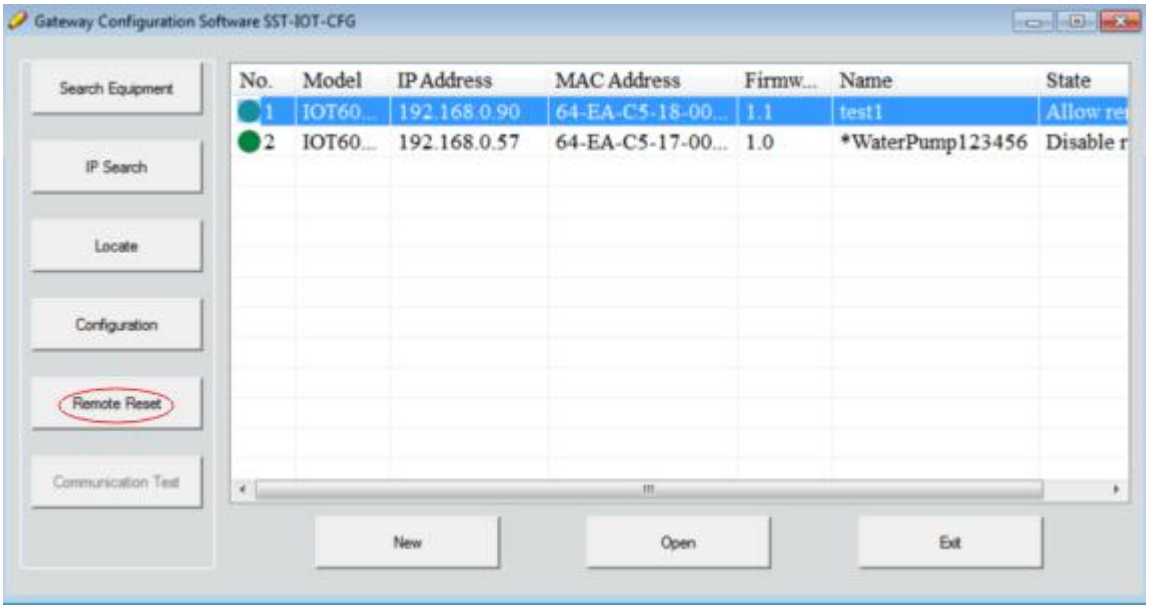
Users click on the "Locate" button, and the equipment is in Ethernet, the ENS and SNS orange indicator of

the equipment will flash alternately then the users can find it.



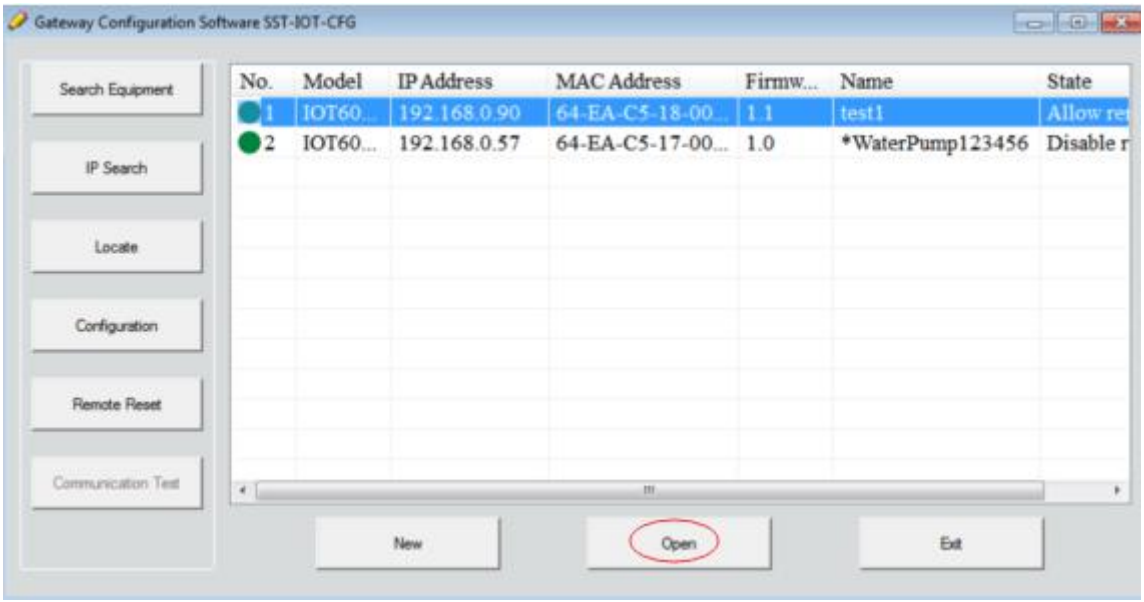
4.6 Remote Reset

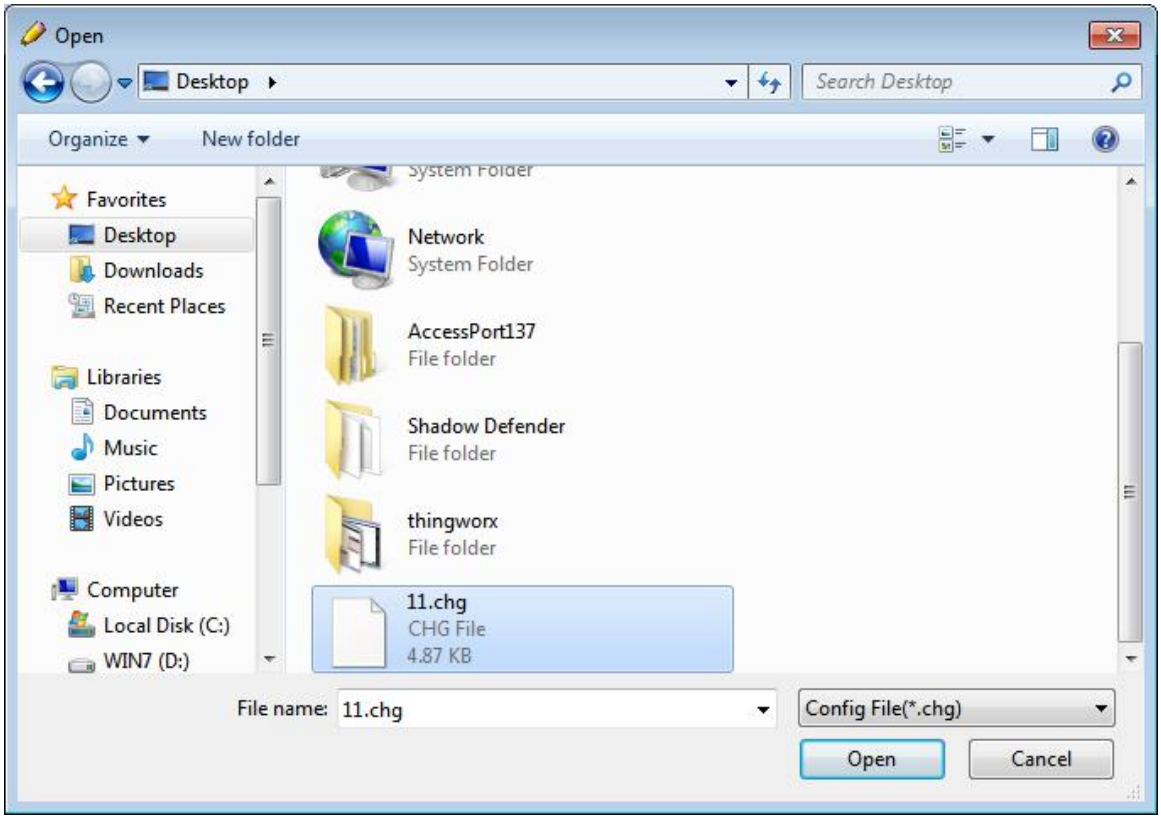
The function of "remote reset" is restarting the selected equipment. Select the equipment in the list first, click "Remote reset" button, it will pop up a confirmation dialog, then click "OK" to complete the operation.



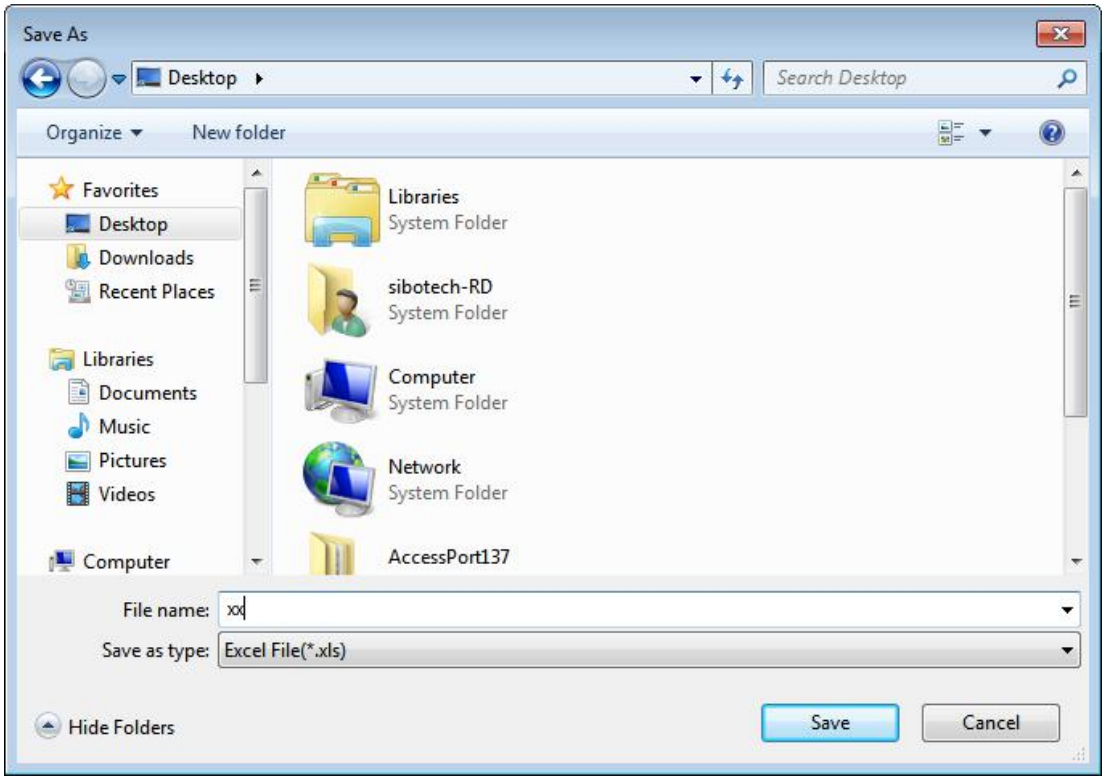
4.7 Open/Save/Export EXCEL

- Open: open and display the saved to the configuration data in a computer;





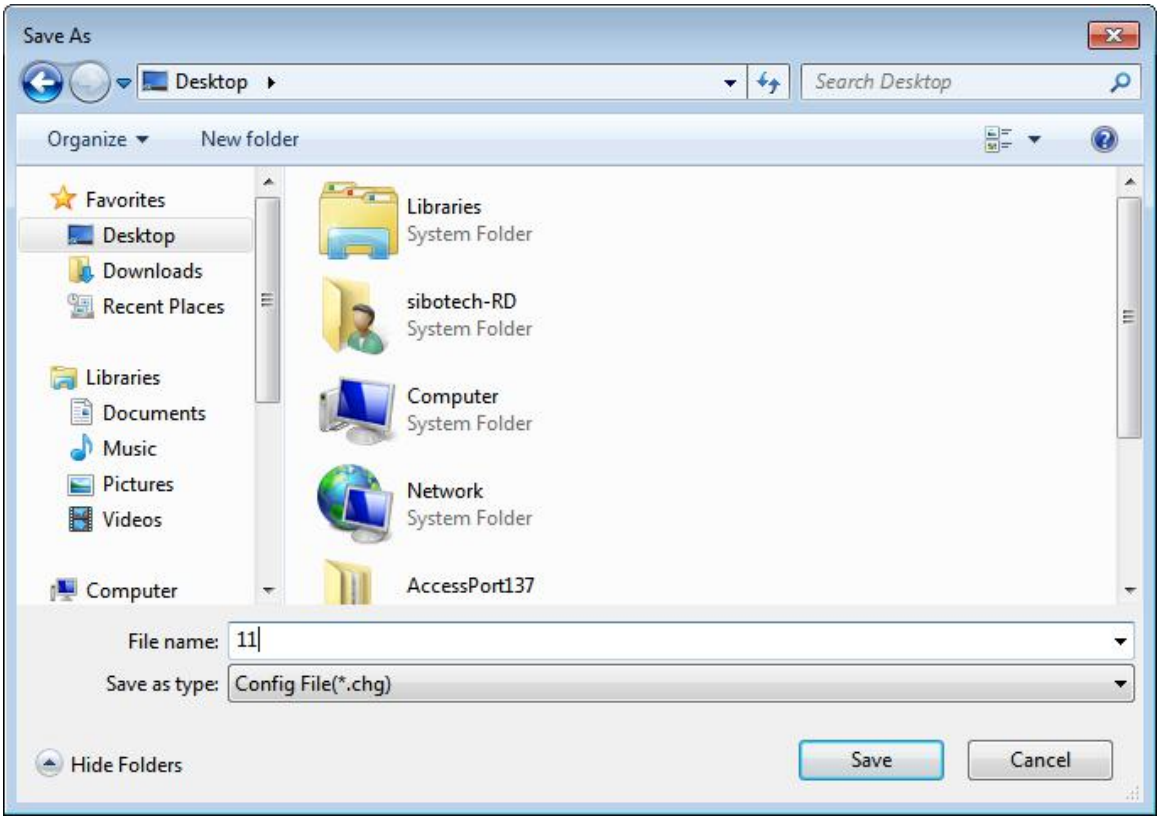
Export EXCEL: Excel document helps users to examine the configuration related

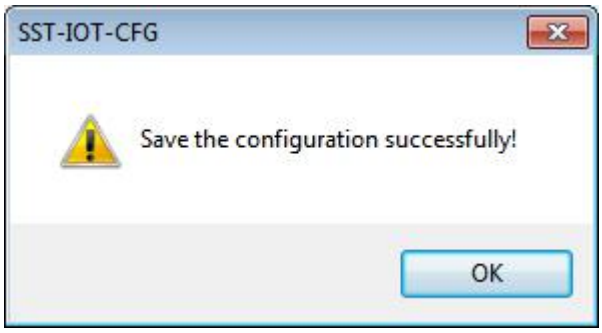


	A	B	C	D	E	F	G	H
1	Type of Protocol about IOT	Device Name	Assign IP Mode	IP Address	Subnet Mask	Default Gateway	DNS1	DNS2
	Web Socket	shanghaisibo	Manual Assign	192.168.0.90	255.255.255.0	192.168.0.8	210.22.70.3	210.22.84.3
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

IOT Driver / Modbus Master I / Modbus Master II / Modbus TCP / Modbus Master I Command-Object / Modbus Master II Command-Object / Modbus TCP-Object / Modbus TCP Slave

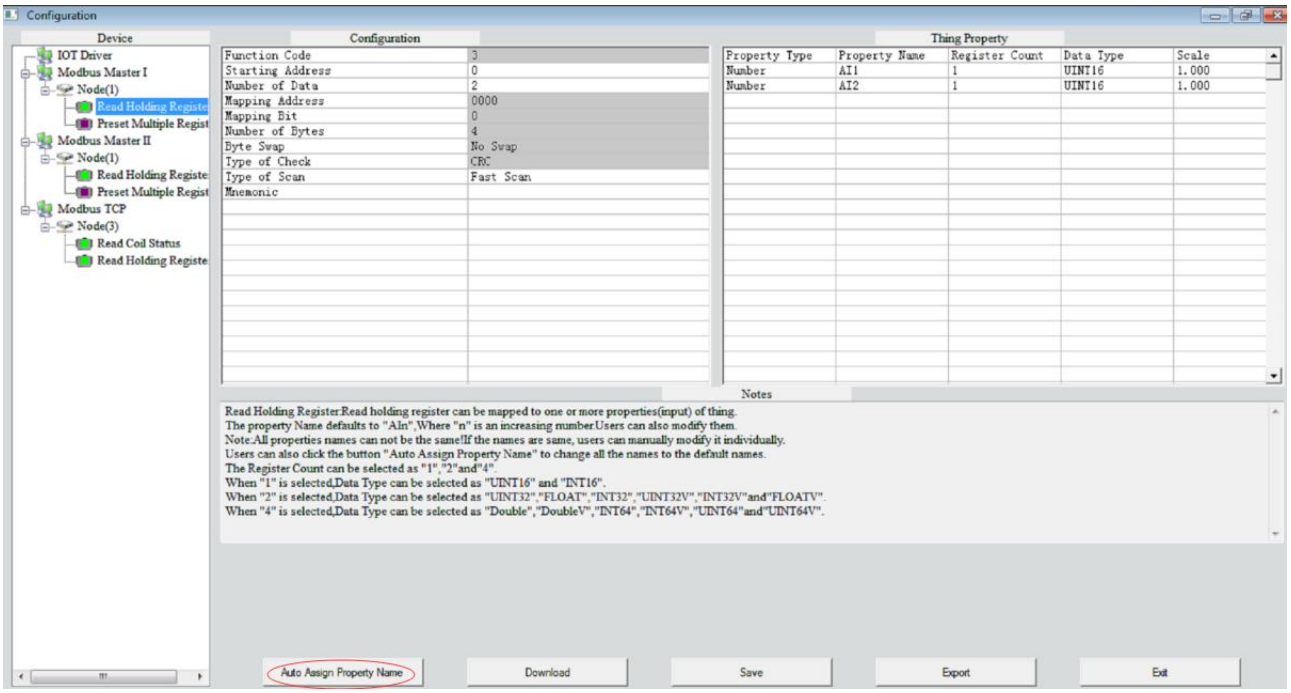
- Save: Save the configuration parameters to the computer (.Chg) for later view, and pay attention to saving the file. Select the device in the list, click "save", select the path to complete the operation.



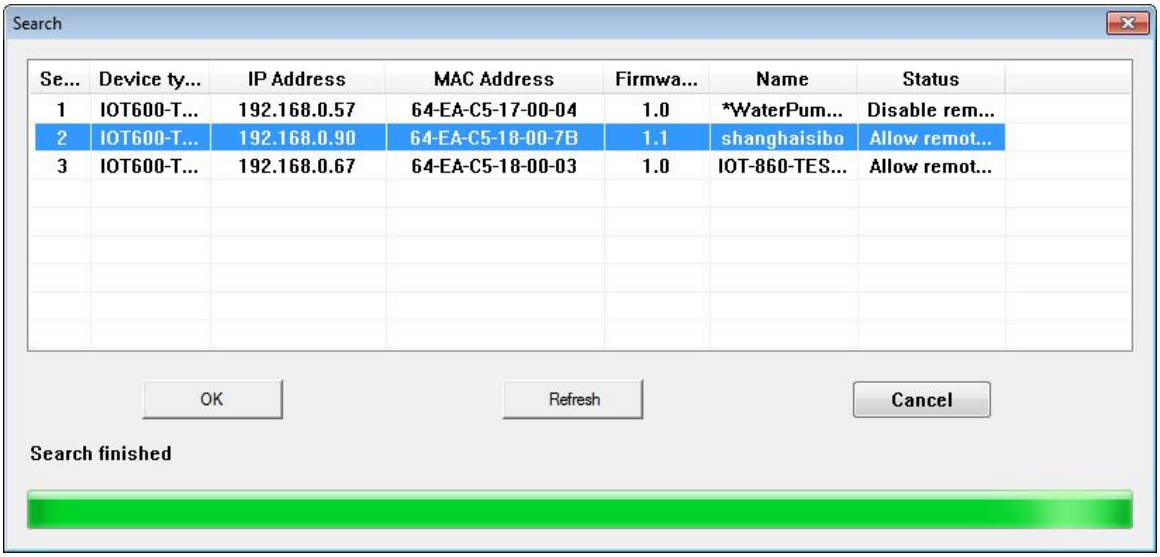


4.8 Auto Assign Property Name/Download

Auto Assign Property Name: Naming the properties of thing automatically

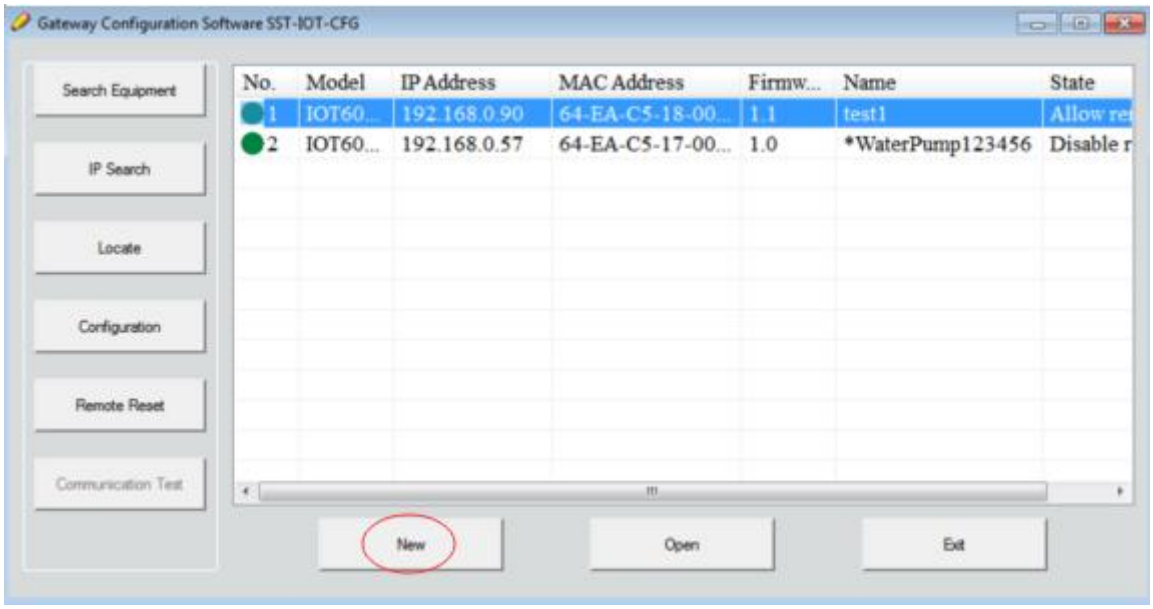


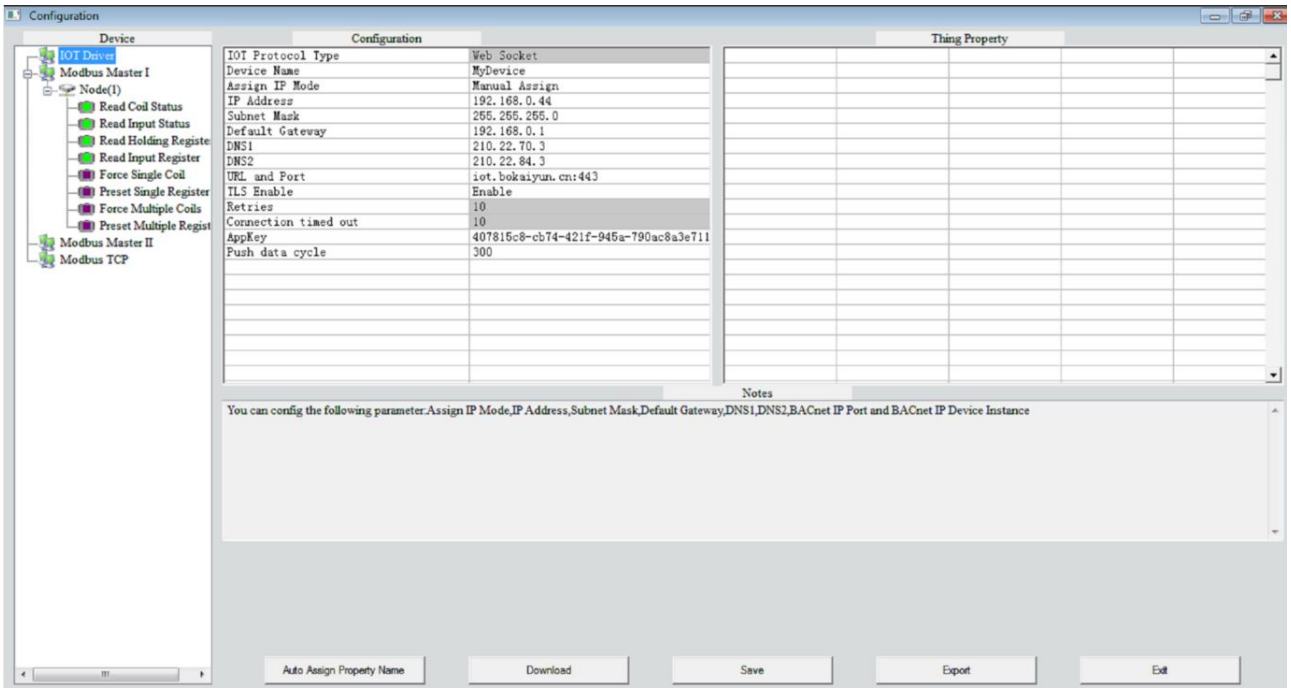
Download: download the configuration information to IOT600-TWX-TS


Search
Se... Device ty... IP Address MAC Address Firmwa... Name Status
1 IOT600-T... 192.168.0.57 64-EA-C5-17-00-04 1.0 *WaterPum... Disable rem...
2 IOT600-T... 192.168.0.90 64-EA-C5-18-00-7B 1.1 shanghaisibo Allow remot...
3 IOT600-T... 192.168.0.67 64-EA-C5-18-00-03 1.0 IOT-860-TES... Allow remot...
OK
Refresh
Cancel
Search finished

SST-IOT-CFG
Download successfully!
OK

4.9 New

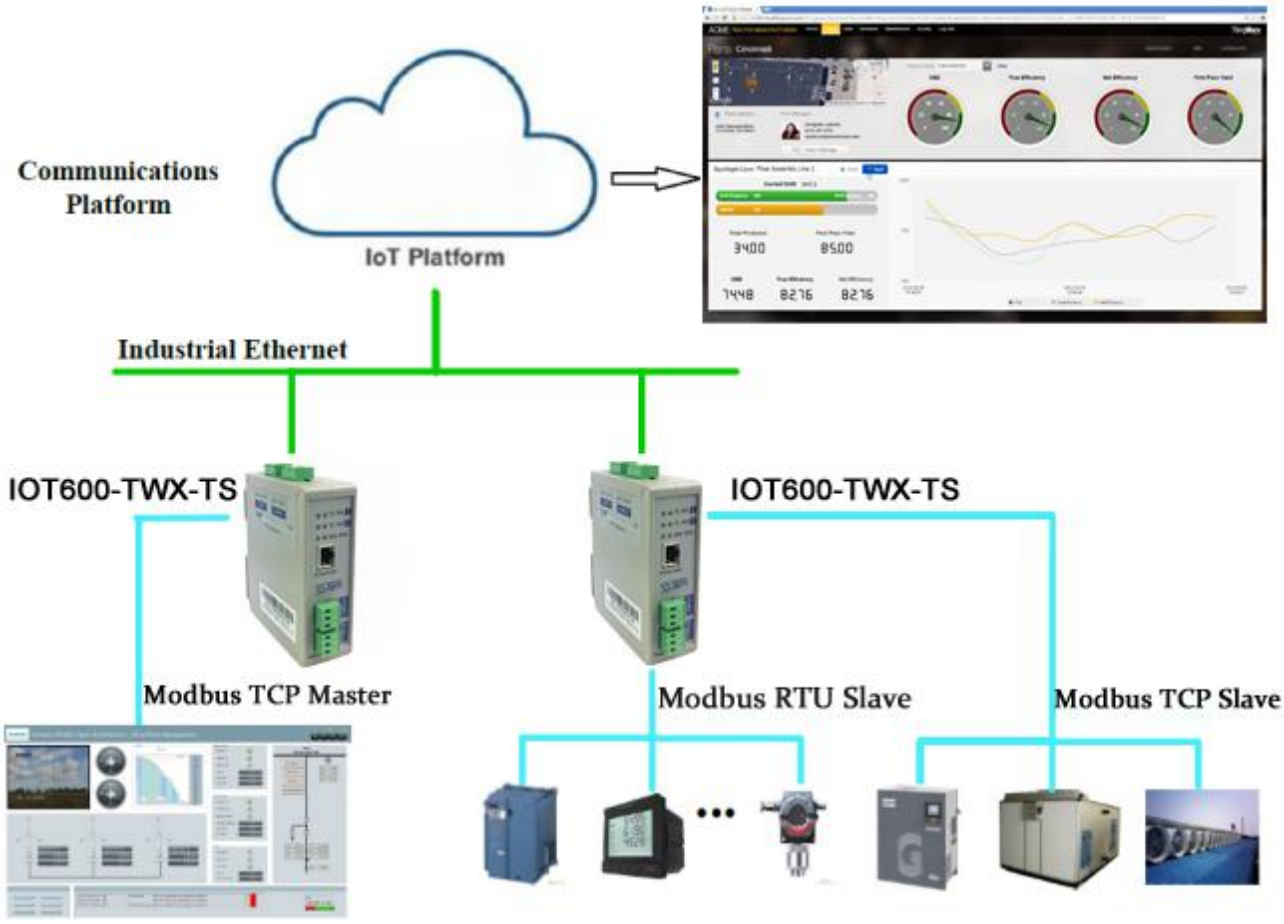

Gateway Configuration Software SST-IOT-CFG
Search Equipment
IP Search
Locate
Configuration
Remote Reset
Communication Test
No. Model IP Address MAC Address Firmw... Name State
1 IOT60... 192.168.0.90 64-EA-C5-18-00... 1.1 test1 Allow re
2 IOT60... 192.168.0.57 64-EA-C5-17-00... 1.0 *WaterPump123456 Disable r
New
Open
Exit


Configuration
Device
IOT Driver
Modbus Master I
Node(1)
Read Coil Status
Read Input Status
Read Holding Registe
Read Input Register
Force Single Coil
Preset Single Register
Force Multiple Coils
Preset Multiple Regist
Modbus Master II
Modbus TCP
Configuration
IOT Protocol Type
Web Socket
Device Name
MyDevice
Assign IP Mode
Manual Assign
IP Address
192.168.0.44
Subnet Mask
255.255.255.0
Default Gateway
192.168.0.1
DNS1
210.22.70.3
DNS2
210.22.84.3
URL and Port
iot.bokaiyun.cn:443
TLS Enable
Enable
Retries
10
Connection timed out
10
AppKey
407815c8-cb74-421f-945a-790ac8a3e711
Push data cycle
300
Thing Property
Notes
You can config the following parameter:Assign IP Mode,IP Address,Subnet Mask,Default Gateway,DNS1,DNS2,BACnet IP Port and BACnet IP Device Instance
Auto Assign Property Name
Download
Save
Export
Exit

5 Typical Application

IOT600-TWX-TS can connect Modbus slave devices to Ethernet in order to realize the communication between Ethernet and serial devices.IOT600-TWX-TS plays a bridging role in communication.

The following is some typical application of IOT600-TWX-TS: Ethernet master connects multiple serial port Slave.

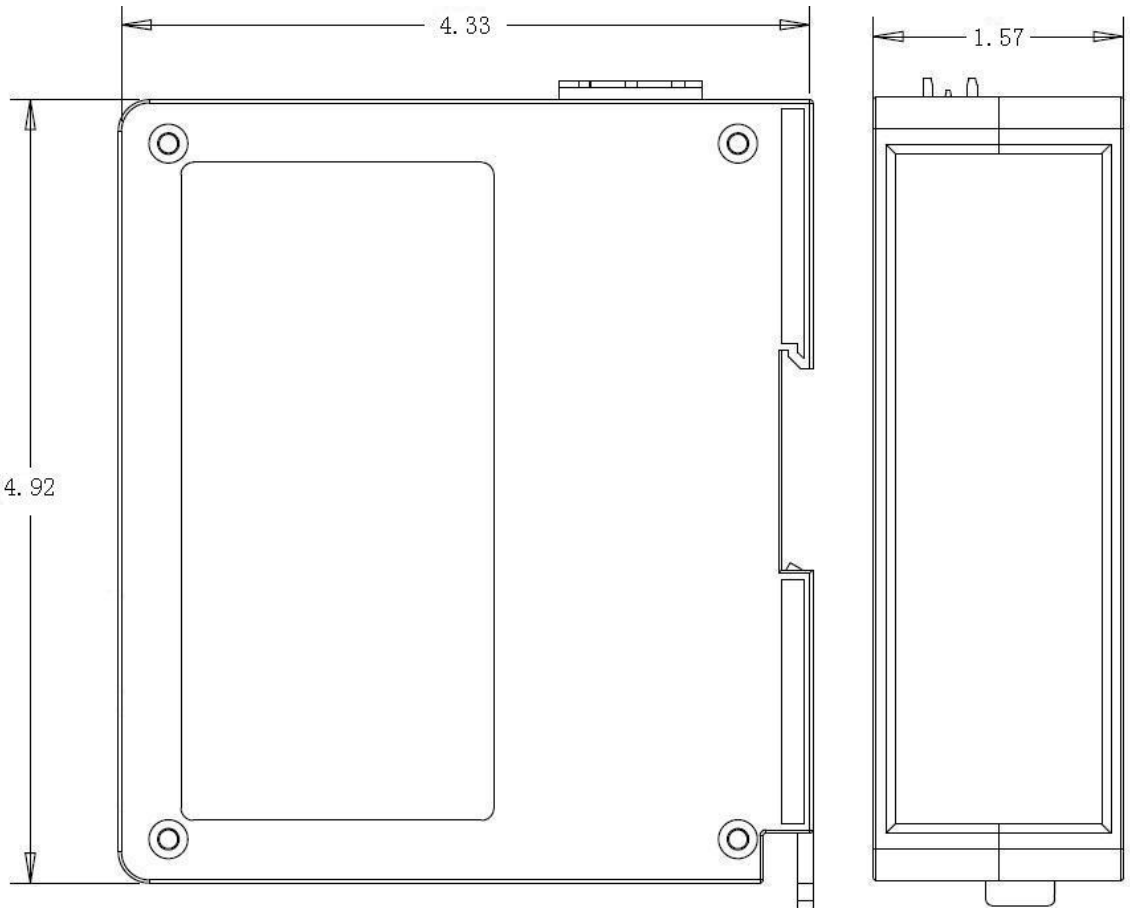


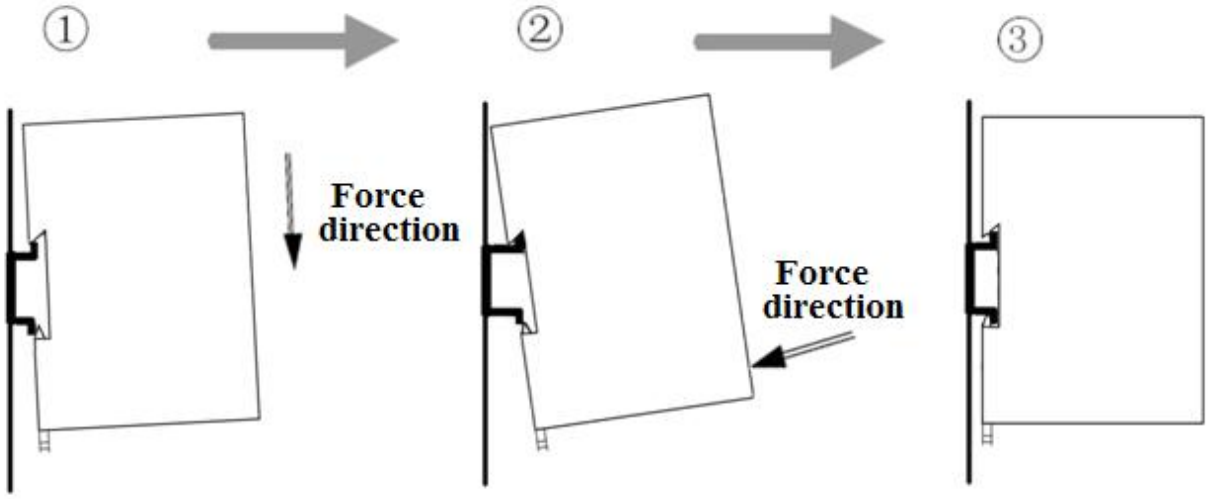
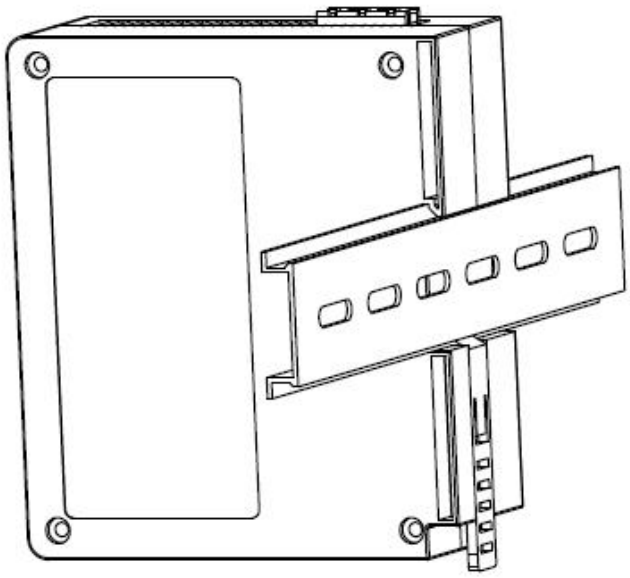
IOT600-TWX-TS collects Modbus RTU/TCP slave equipment data to the cloud, and exchange data

6 Installation

6.1 Machine Dimension

Size: 1.57 in (width)*4.92 in (height)*4.33 in (depth)



6.2 Installation Method

35mm DIN rail mounting