X2IEC104 User Manual

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Singapore Milesgo IIoT Pte

Content

1 Preface

1.1 Disclaimer

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1.2 Technical Support

- Email：support@opcmaster.com
- TEL：021-58776098
- website：http://www.opcmaster.com/english/

  http://www.bacnetchina.com/english/

1.3 Version History

Date	Version	Remark
2021.9.20	Sep 20 2021(Unicode)	English Version
2013.12.16	Dec 13 2013(Unicode)	Added Chinese Version

2 Overview

2.1 Feature

- X2IEC104 is a protocol gateway, X means different kind of communication protocol, 2 means to. IEC104 means support standard

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IEC104 electronic protocol. The software supports simulation test. Users can configure it according to the communication protocol of the onsite device and convert it to the standard IEC104 protocol. After PC simulation runs correctly, upload to hardware protocol conversion gateway. Note that the base addresses of the IEC104 registers at both the collecting and forwarding ends of the gateway start from 0.

- Working Principle: X2IEC104 as a communication bridge, it transfer different protocol to IEC104 Protocol. The upper computer system supporting IEC104 protocol can communicate with different devices through the hardware protocol gateway, convenient system integration.

- Advantage:

1. Green installation free, Easy to Configure and Operation,
2. Support JS scripts to achieve logical control.
3. Support Chinese and English switching, convenient operation.
4. User can simulator in PC monitoring mode by X2IEC104
5. The gateway has a built-in WEB server. Users can view real-time changing data and communication status through a browser, facilitating on-site debugging. In addition, you can also download the configuration software X2 IEC104 and engineering files.
6. Support different protocols to be converted to IEC104 protocols at the same time.
7. Analog gateway support linear conversion, support bit function, high and low byte exchange function.

2.2 Operation Platform

- Support Windows XP/2000/2003/Win 7/Win8/Win Server 2003/Win Server2008/Win Vista

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- WEB with above IE8 version, Opera, Safari of apple, Google Chrome and firefox.

2.3 Application product models

IEC1001-ARM, IEC1002-ARM, IEC2004-ARM, IEC204-A9.

2.4 Register types and numbers

IEC104 Gateway support IEC104 server, support single point telemetry and Measure Float two register types. It's points are dynamically allocated, telemetry and telemetry support a total of 1024 points. Table 2-3-1 shows the range of different types of addresses.

Note: When configuring the project, ensure that addresses are arranged from small to large consecutively (do not leave any space in the middle) to improve the total call efficiency of the main station.

Table 2-3-1 IEC104 register addresses table

IEC104 Register Type	IEC2004 Register address
Single Point	1-16384
Measure Float	16385-20480

2.5 Application Areas

Hardware Gateway IEC2004-ARM (2 Ethernet 4 RS485) support any protocols to IEC104 server. DDC, PLC, central air conditioning, precision air conditioning, elevator, fire control, lighting control system, electricity meter, water meter and other different on-site equipment used in building control and industrial control automation are integrated into the power system through IEC104 protocol.

3 Configuration and Operation

X2IEC104 is a configuration software that runs on the PC and is used to configure projects. After the project is configured, the software is uploaded to the hardware gateway.

First open and run the main program X2IEC104.exe. Enter the main program interface, click the View menu and choose "Language Settings", as shown in Figure 3-1.

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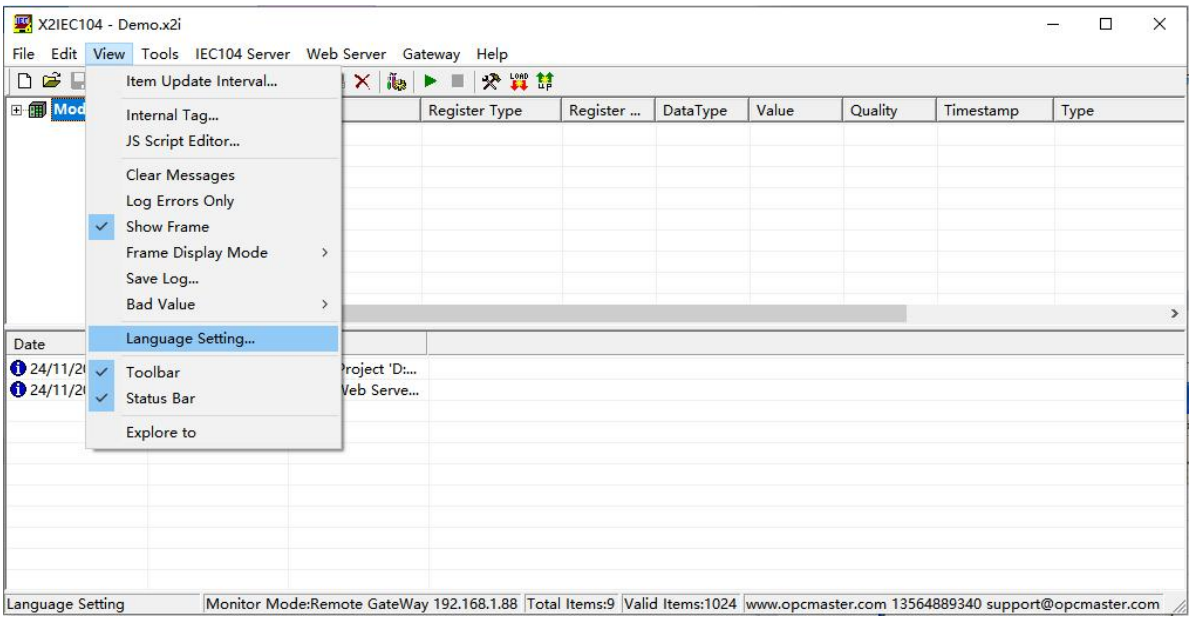

Figure 3-1 Selecting language Settings

Select language in the pop-up dialog box, as shown in Figure 3-2.

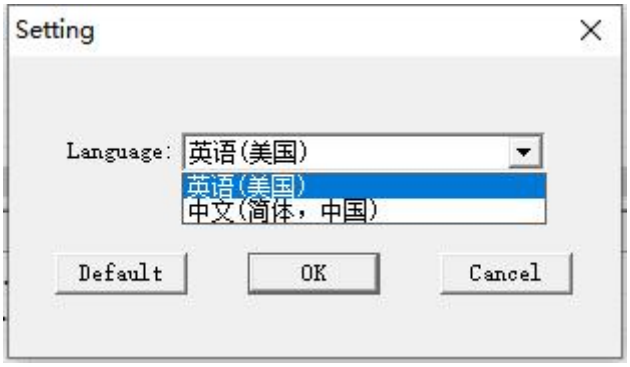

Figure 3-2 Selecting language

3.1 New Driver

Click “Edit“ of the menu bar to choose "New driver" or click on the toolbar icon , open the Driver Properties window as the following figure 3-1-1.

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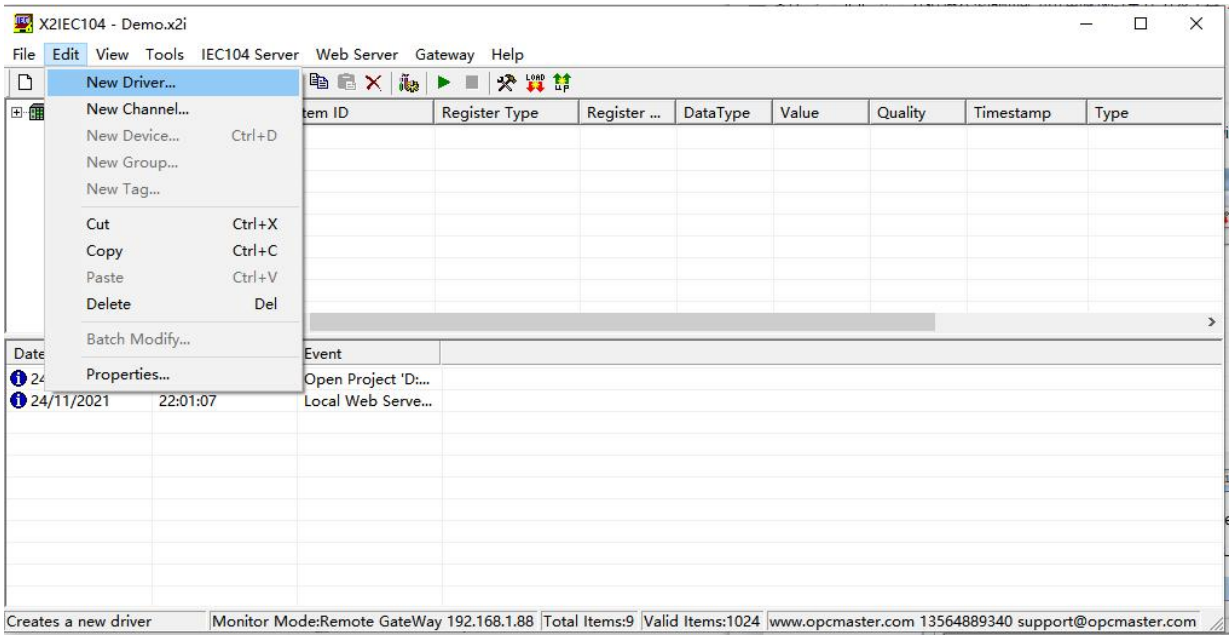

Figure 3-1-1 New Driver

In the pop-up window, Choose Driver Modbus RTU，As the below Figure 3-1-2。

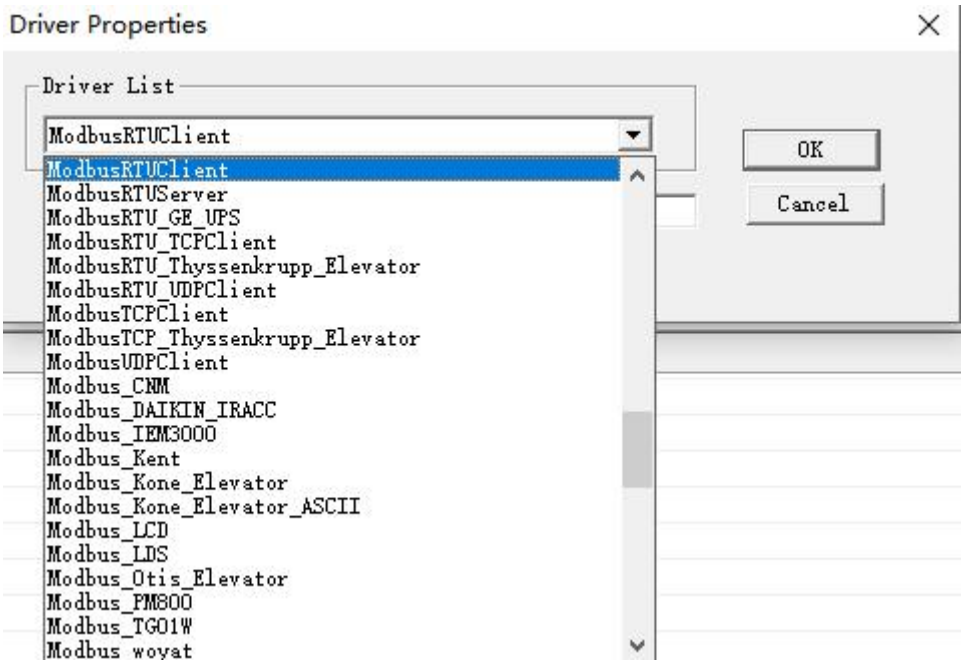

Figure 3-1-2 choose Driver

Input driver name in the name of the project, the default Scan Rate is 1000 milliseconds. Scan Rate can adjust the frequency of access to all devices. If the time required to access all the devices is greater than the set scan rate, this time is invalid. if the time required to access all the devices is less than the set scan rate, the waiting time needs to reach the set scan rate for the next visit. user can according to the actual situation, change the scan rate.

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After finish adding driver, as the below figure 3-1-3.

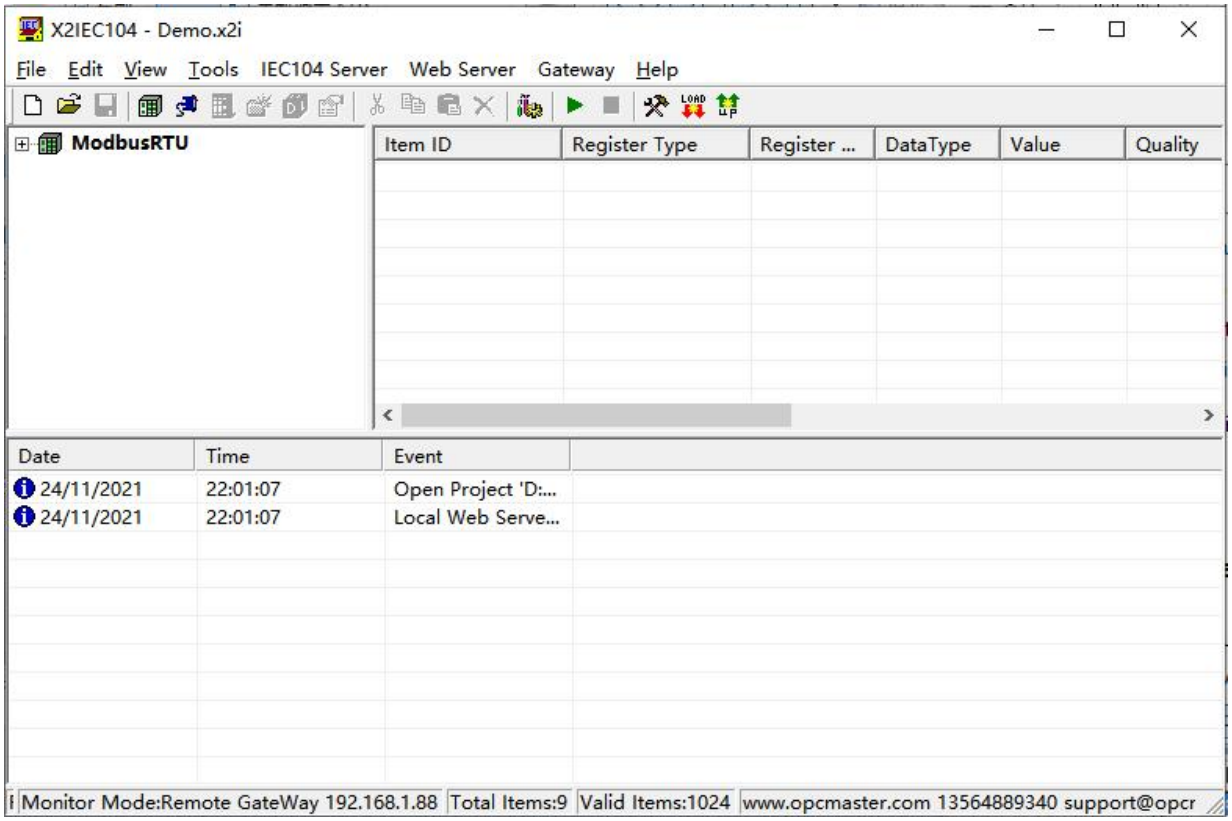

Figure 3-1-3 Finish adding driver

3.2 New Channel

In the current driver, right click to select "New Channel" or click on the toolbar  , As the following figure 3-2-1.

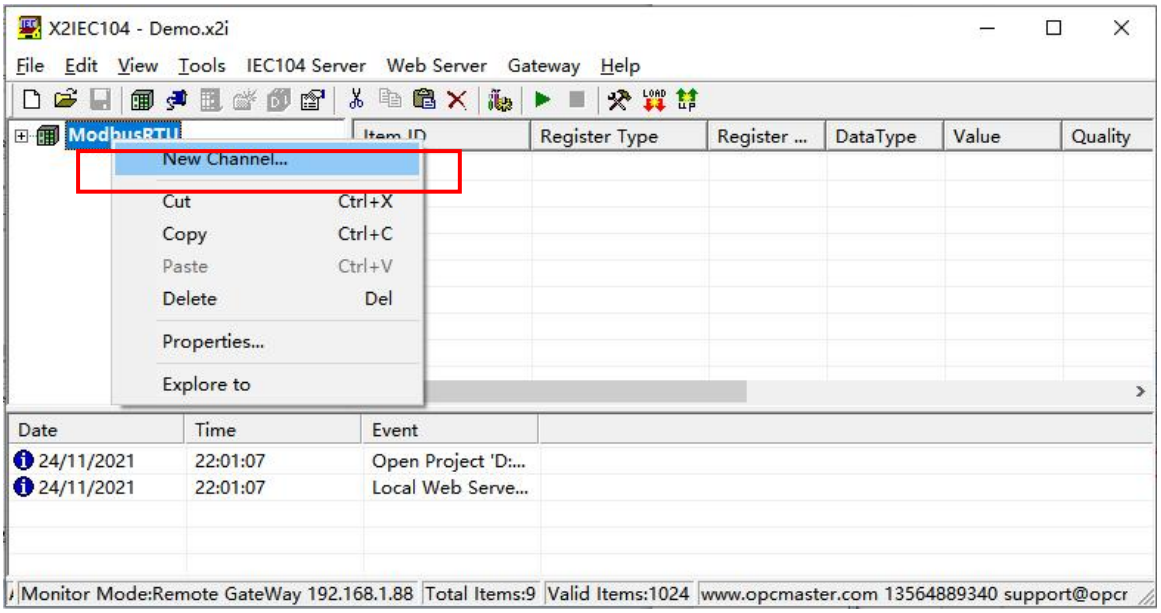

Figure 3-2-1 New Channel

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In the pop-up window, according to corresponding set by the driver communication protocol channel names can be arbitrary naming, As the following figure 3-2-2.

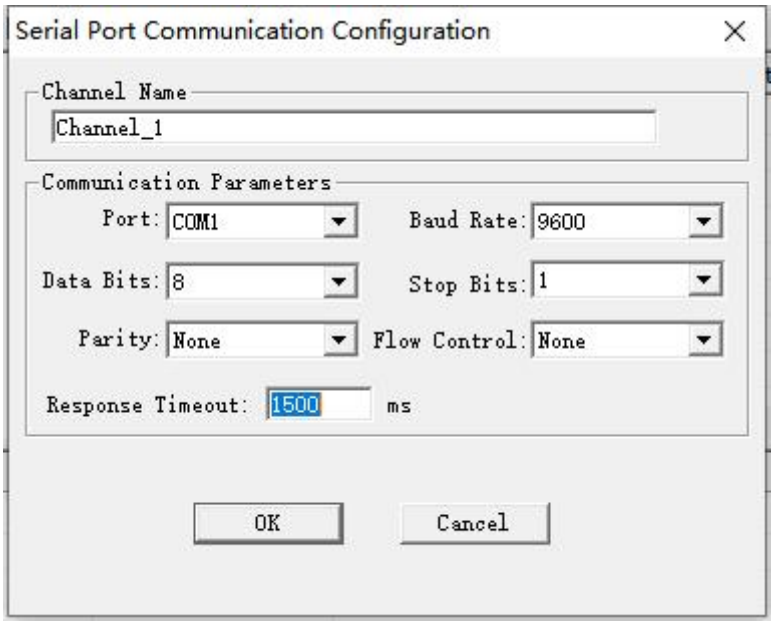

Figure 3-2-2 Set communication parameters

Since the acquisition terminal is intended to collect data from Modbus slave stations, so the setting of the setting of serial communication parameters should be consistent with the parameters in Modbus Slave.

When communication is normal, response timeout set longer does not affect communication speed. If the response speed of the device is relatively slow, it is recommended to set up a bit longer to avoid communication failure, As the following figure 3-2-3.

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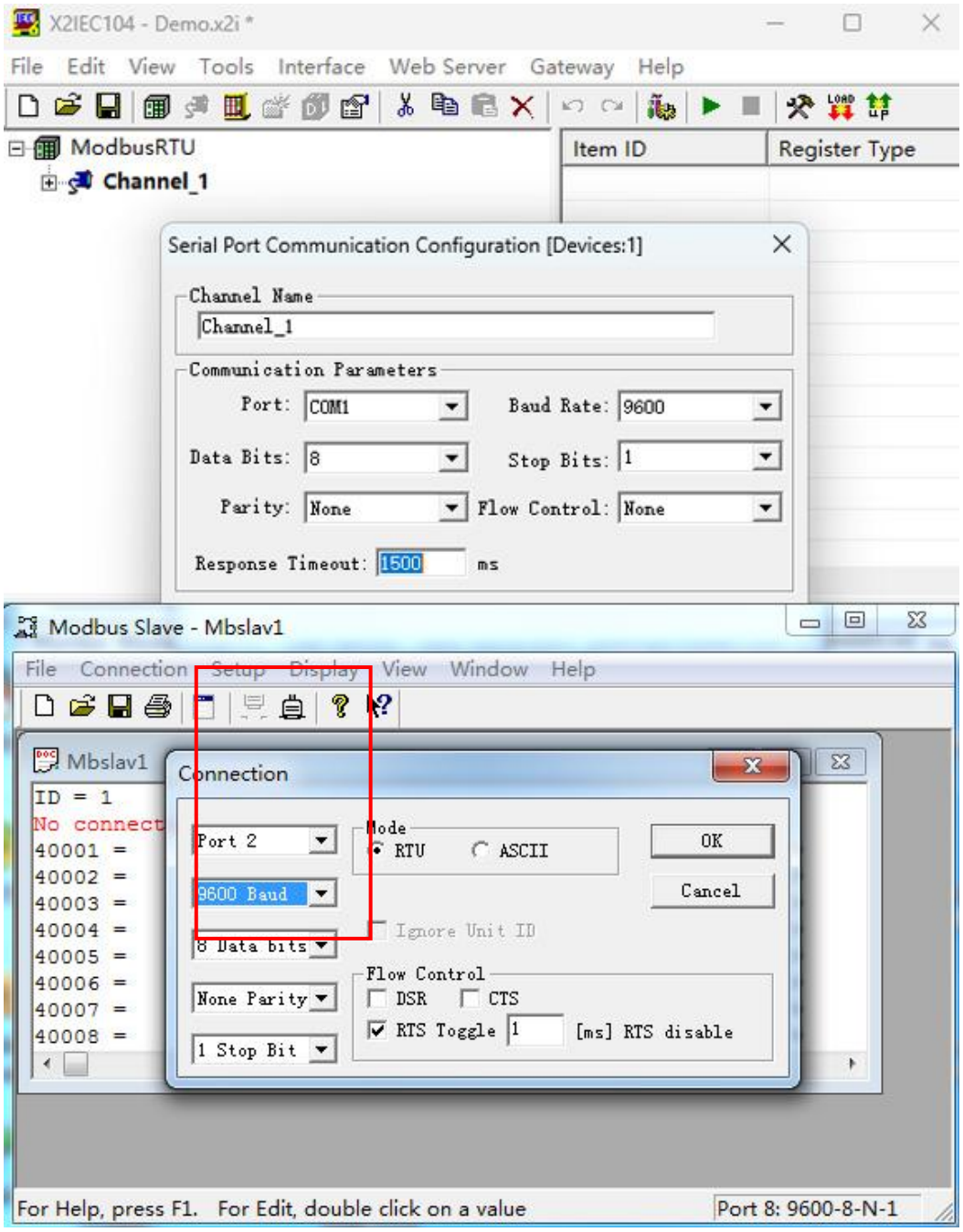

Figure 3-2-3 Channel parameters are consistent

After finish adding the channel, As the following figure 3-2-4.

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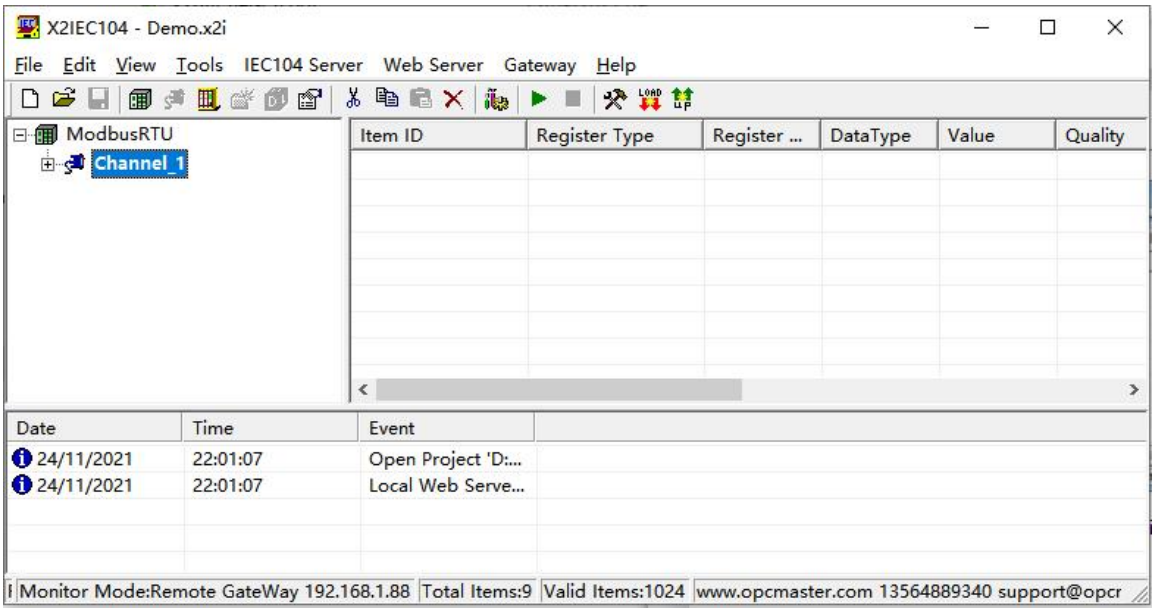

Figure 3-2-4 finish adding Channel

3.3 New Device

In the current Channel, Right-click to choose "New Device", or click on the toolbar  , As the following figure 3-3-1.

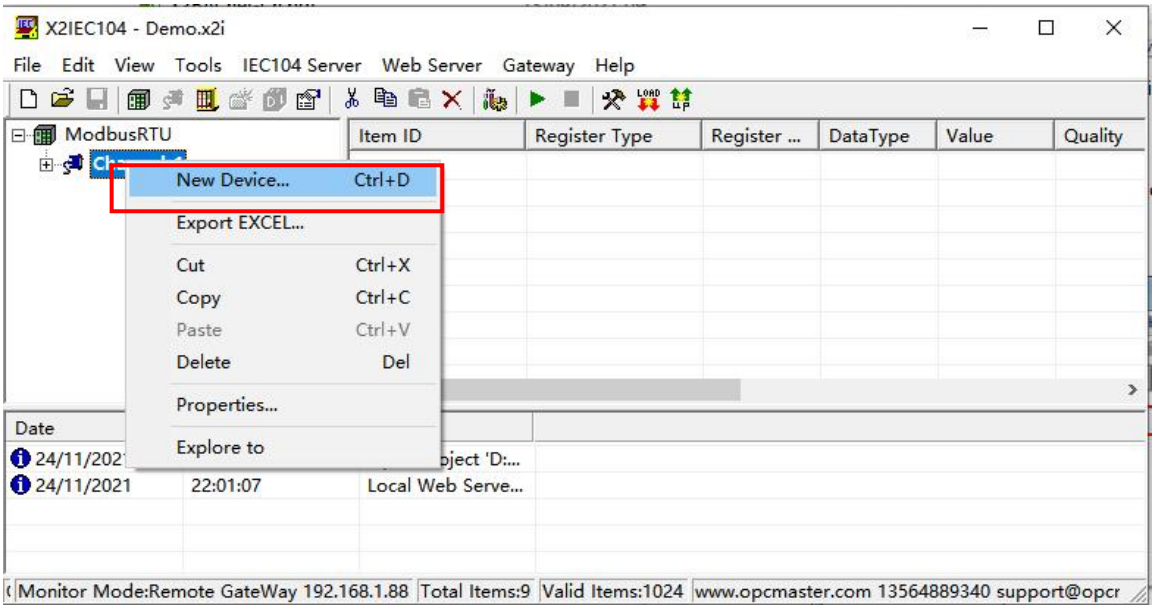

Figure 3-3-1 New Device

In the pop-up window set device properties , As the following figure 3-3-2.

Add: 28 Senang Crescent,#05-11,Bizhub 28,Singapore 416601 Tel: +65 80385403 URL: www.bacnetchina.com
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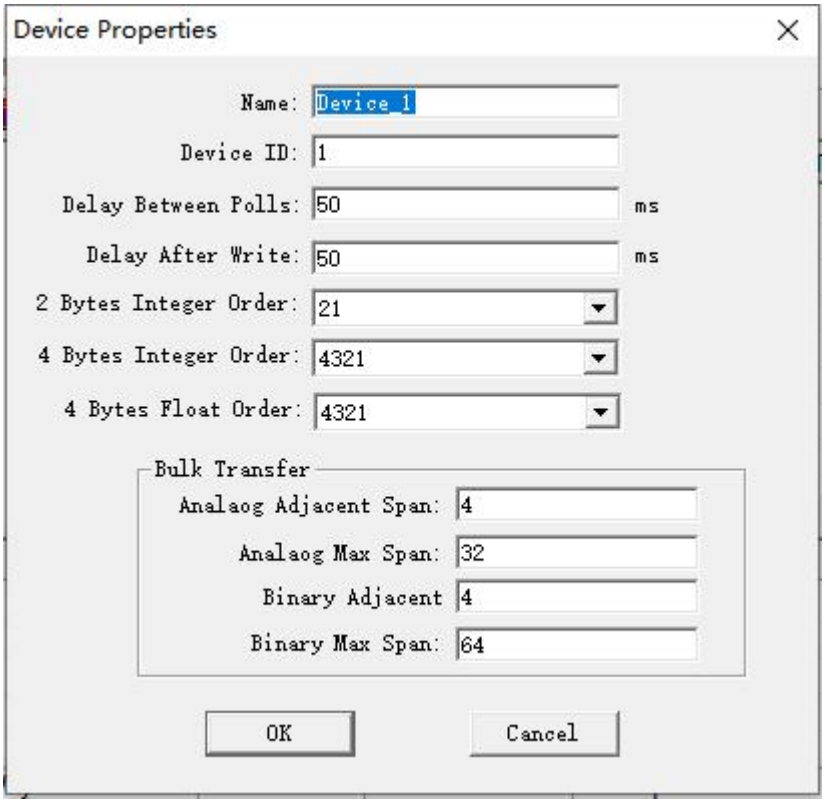

Figure 3-3-2 Device Properties

In order to improve the communication speed, the packet register communication can be realized under the continuous register address. When the device does not support packet communication, the parameters of the group package should be set to 0. In addition, when the response time of the device is slow, you can set the time interval between the data frame and the frame (that is Delay Between Polls) . The default of Delay Between Polls is 100 microseconds. As the following figure 3-3-3.

2 Bytes Integer Order, 4Bytes Integer Order, and 4 Bytes Float Order means the combination of integer or floating point byte order, the default is 4321. These parameters are used in combination with field devices for data transmission.For example, some meters adjust the sequence of high and low byte in the transmission of data, which will be used at this time. The default parameters are generally used, As the following figure 3-3-3.

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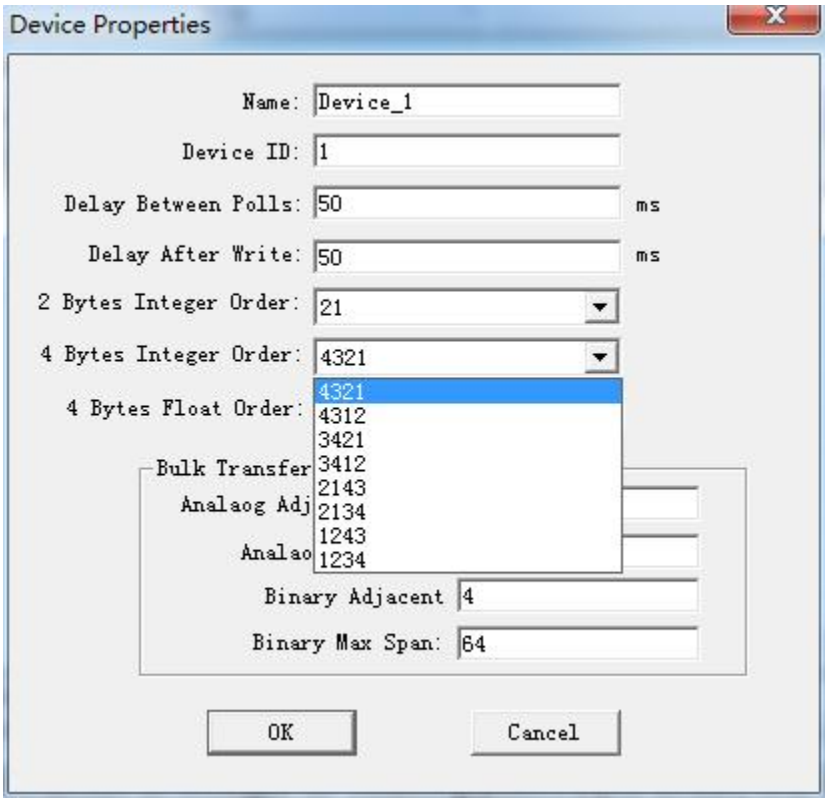

Figure 3-3-3 Byte order

After finish adding the device, As the following figure 3-3-4.

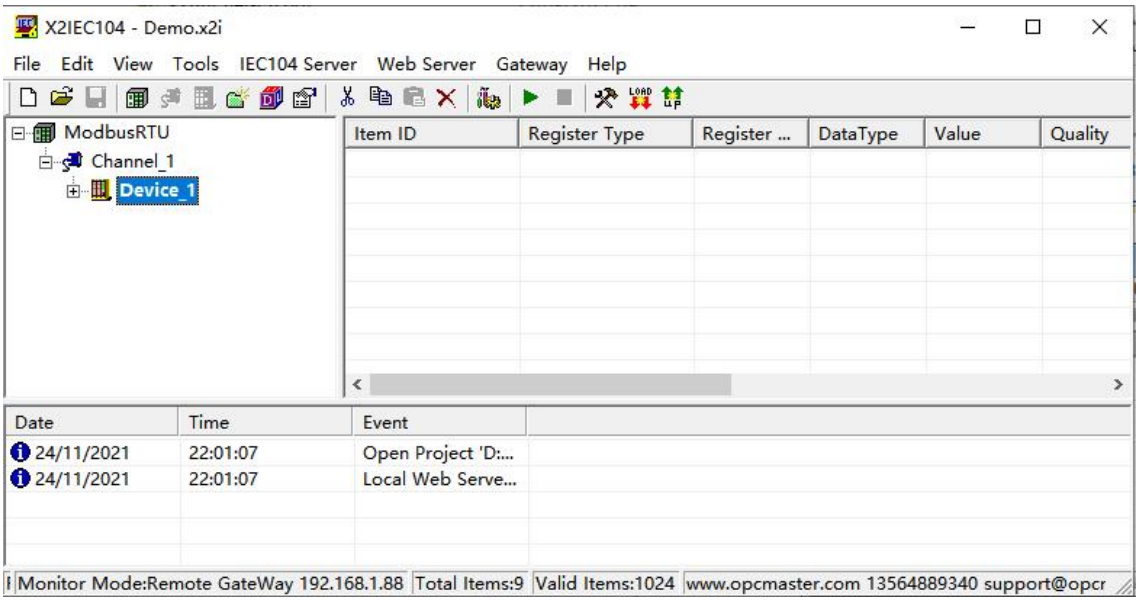

Figure 3-3-4 finish adding device

3.4 New Tag

In the current Channel, Right-click to choose directly add tag (also add group first, and then new tag in the group), or click on the toolbar, As the following figure 3-4-1.

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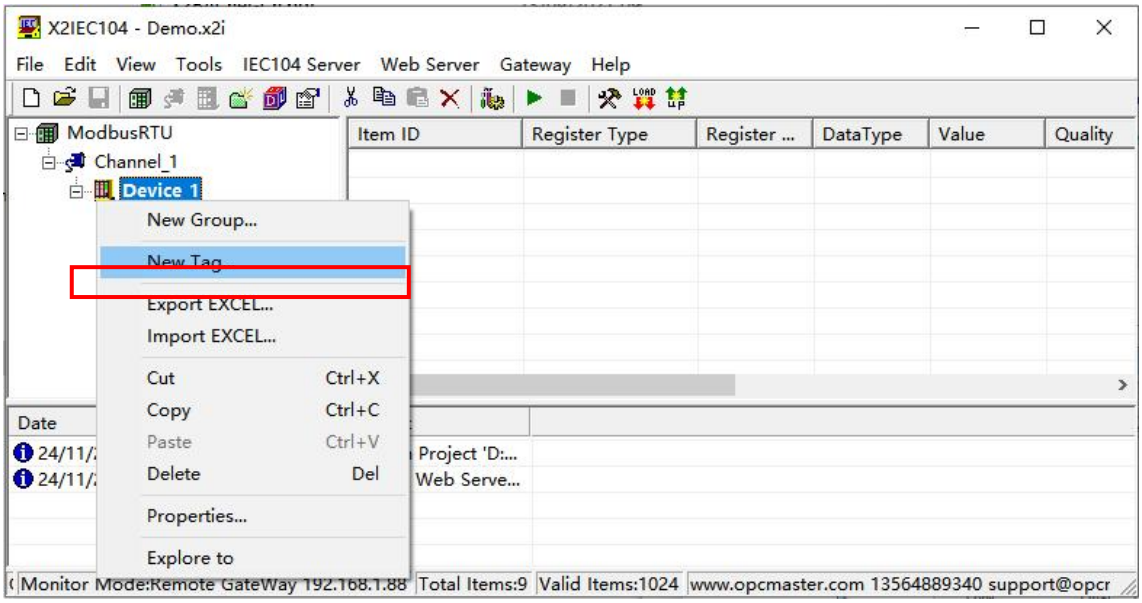

Figure 3-4-1 New Tag

Or right-click on the right side of the edit box blank space, add a new tag. As the following figure 3-4-2.

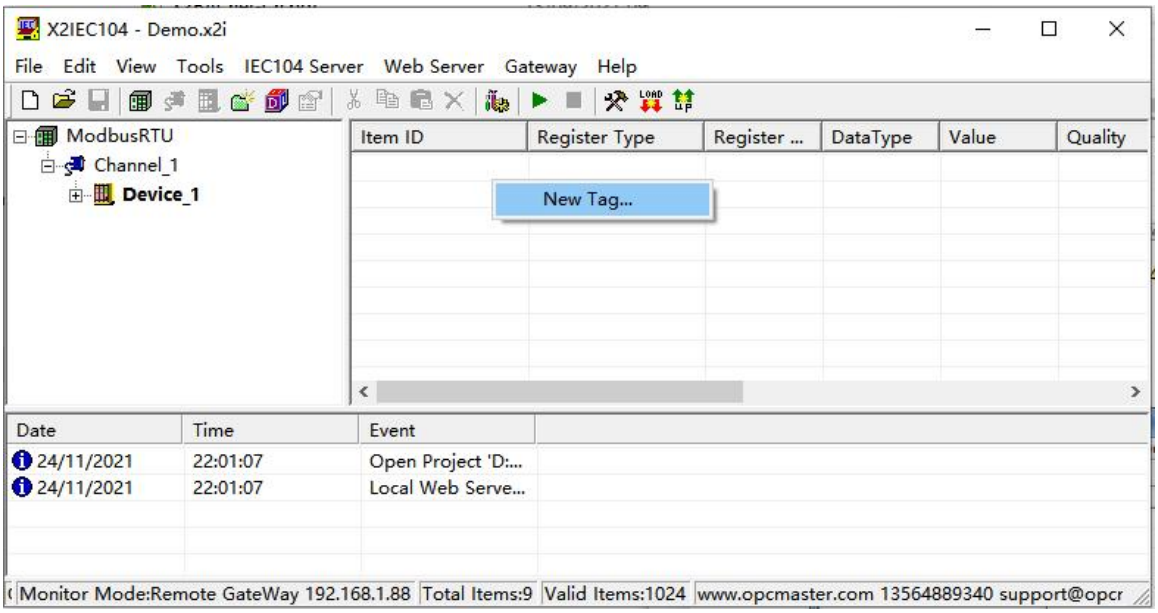

Figure 3-4-2 New Tag

In the pop-up window, Set the parameters of collection and transfer(IEC104 Server), As the following figure 3-4-3.

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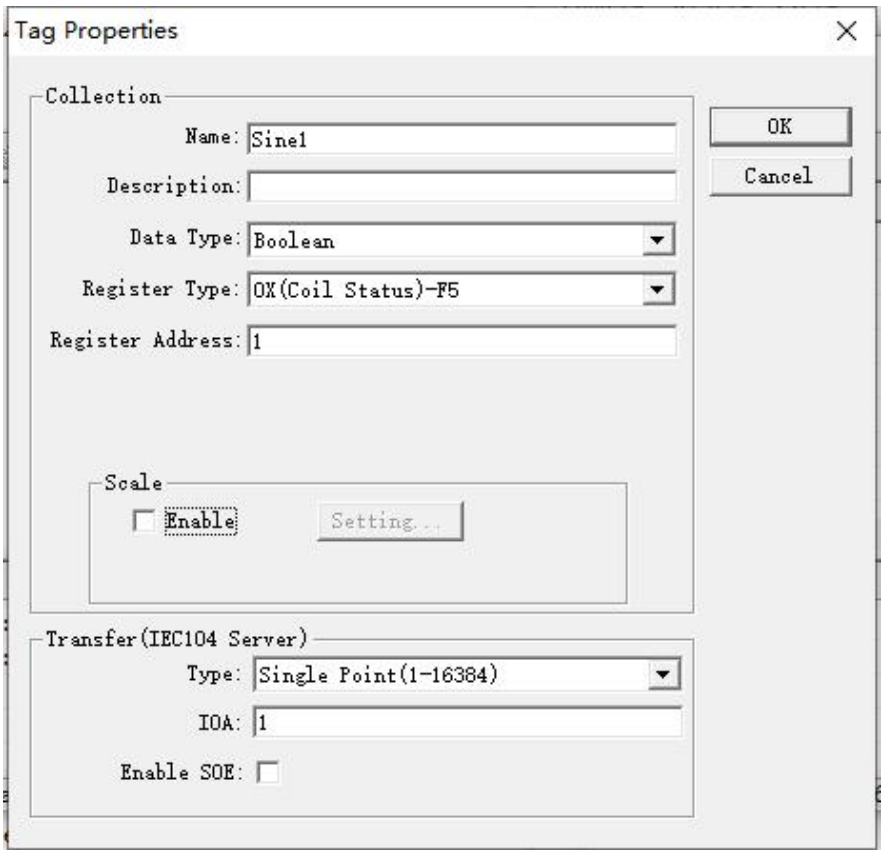

Figure 3-4-3 Tag Properties

In the tag properties pop-up window ,fill in the Name, Description, Data type, register, Register Type, Register address etc. As above figure, a register address of collection end is 40001 , data type is Word .

The supported type of registers are 0X, 1X, 3X, 4X. For the 0X and 4X register types, 0x (Coil Status) -F5 and 4x (Holding Register) -F6 are generally chosen by default. A write function code Behind the bar line.

Click “Scale”, You can do the linear transformation, and two minimum value is invalid, you just need to set a maximum. To expand 100 times, Raw Data is set to 1, Engineer Date can be set to 100. As the following figure 3-4-5.

Add: 28 Senang Crescent,#05-11,Bizhub 28,Singapore 416601 Tel: +65 80385403 URL: www.bacnetchina.com
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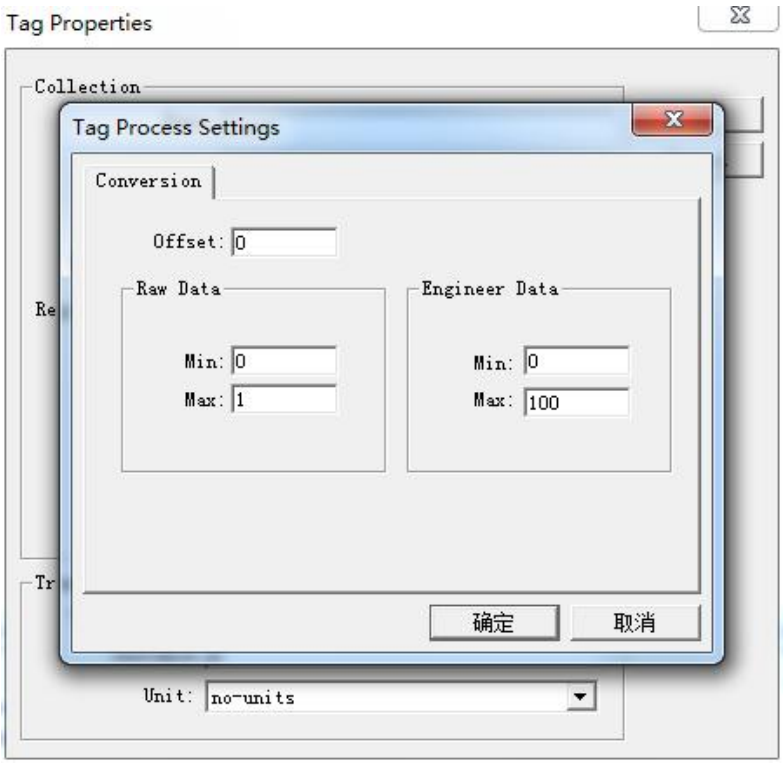

Figure 3-4-5 Tag Process Settings

After finish adding a tag, As the following figure 3-4-6.

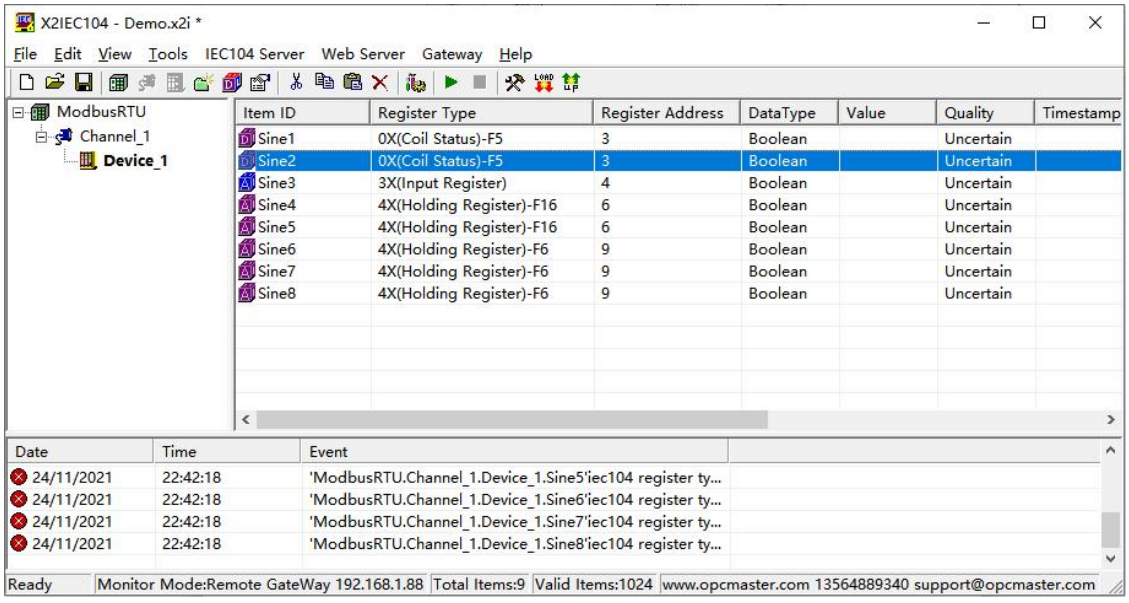

Figure 3-4-6 finish adding a tag

You can continue to add steps one by one, and suggest using the copy and paste of the toolbar. Select a tag to copy, click the copy button in the toolbar, or choose the copy on the right button, or use shortcut key Ctr+C and Ctrl+V.

It can also be edited in the EXCEL table, and then edit the engineering point by

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importing excel and exporting excel functions.

Right-click the device to choose “Export Excel”, As the figure 3-4-8. Save as xls file.

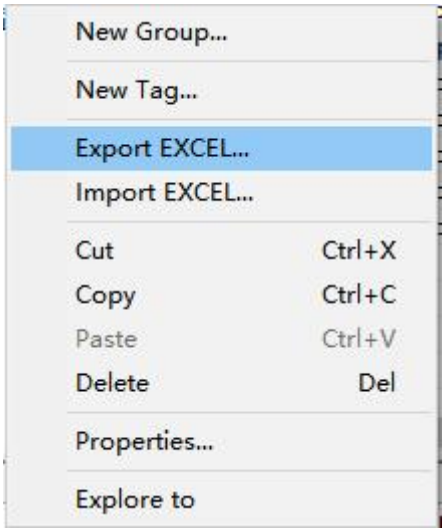

Figure 3-4-8 Export EXCEL

Save the completed, open the EXCEL for editing, As the figure 3-4-9.

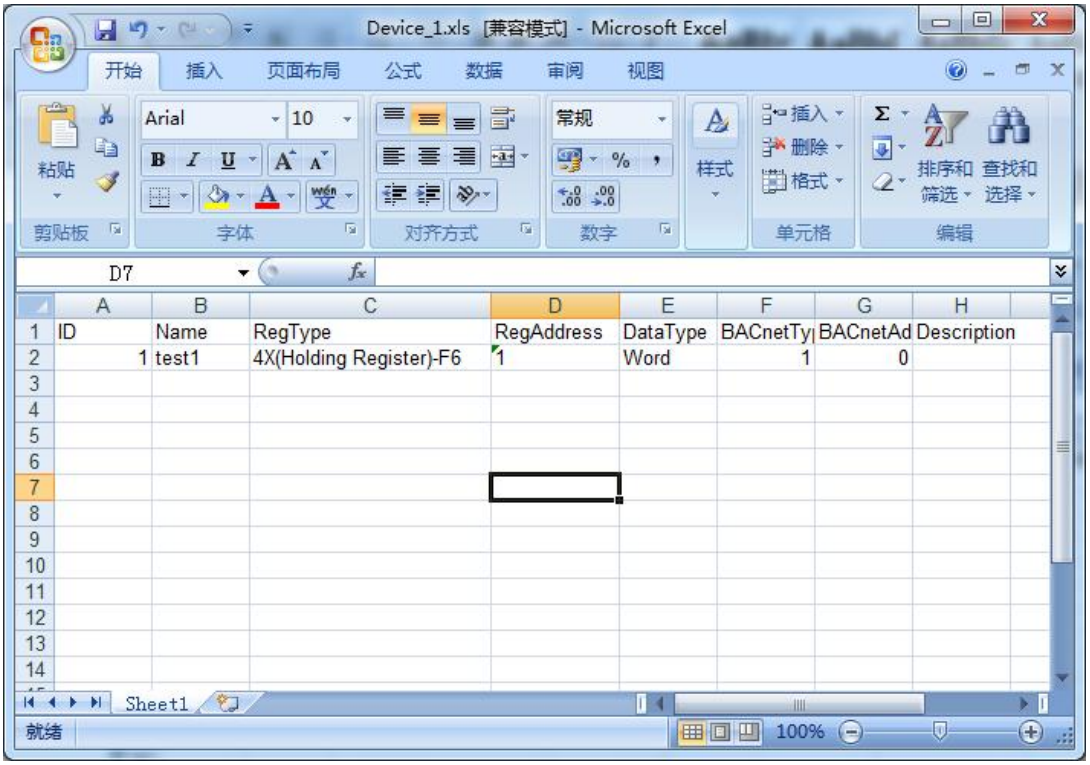

Figure 3-4-9 Open the EXCEL

After editing the Excel file, As the figure 3-4-10.

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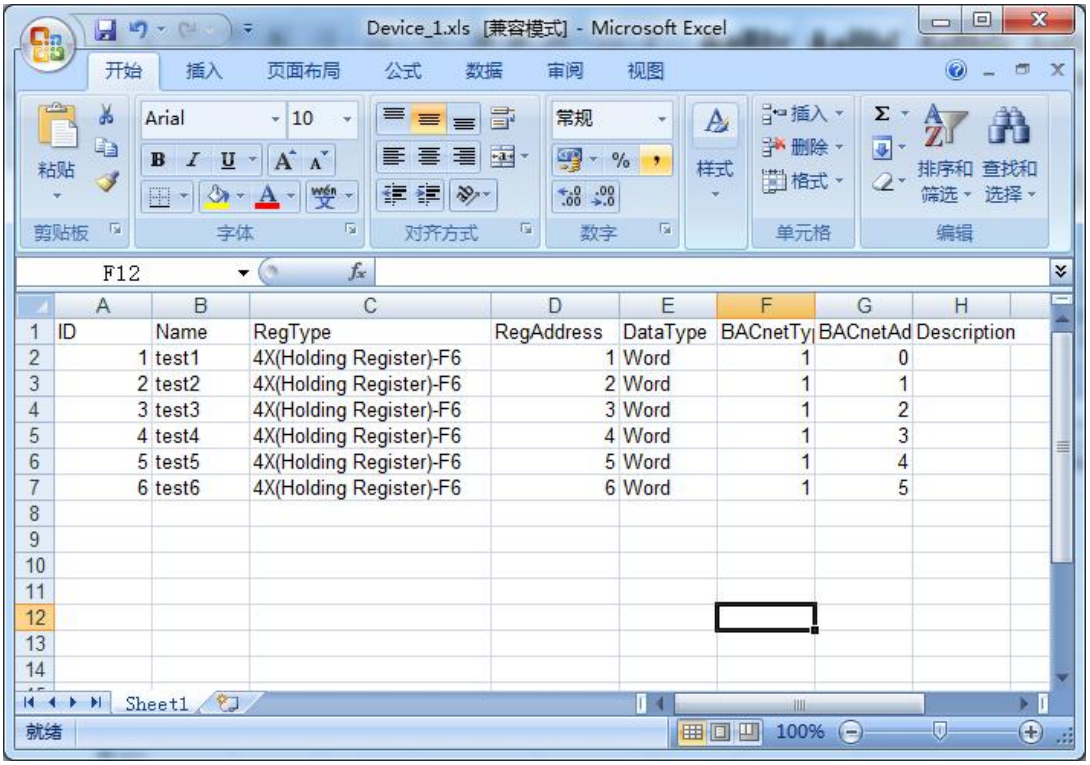

	A	B	C	D	E	F	G	H
1	ID	Name	RegType	RegAddress	DataType	BACnetTy	BACnetAd	Description
2	1	test1	4X(Holding Register)-F6	1	Word	1	0	
3	2	test2	4X(Holding Register)-F6	2	Word	1	1	
4	3	test3	4X(Holding Register)-F6	3	Word	1	2	
5	4	test4	4X(Holding Register)-F6	4	Word	1	3	
6	5	test5	4X(Holding Register)-F6	5	Word	1	4	
7	6	test6	4X(Holding Register)-F6	6	Word	1	5	

Figure 3-4-10 Edit the EXCEL

Back to X2BACnet software, Right-click the device to choose “Import Excel”, find the edited Excel file to import. As the following figure 3-4-11.

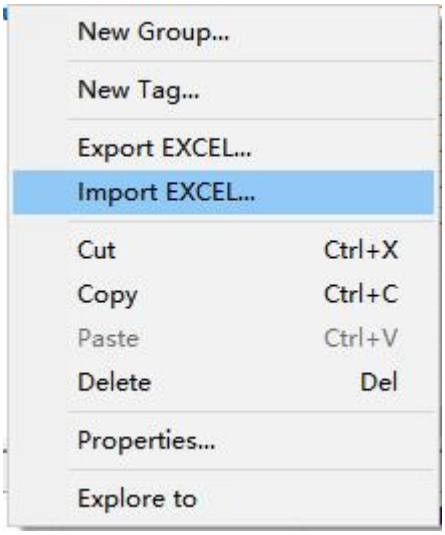

Figure 3-4-11 Import EXCEL

The import is complete, the following figure 3-4-12.

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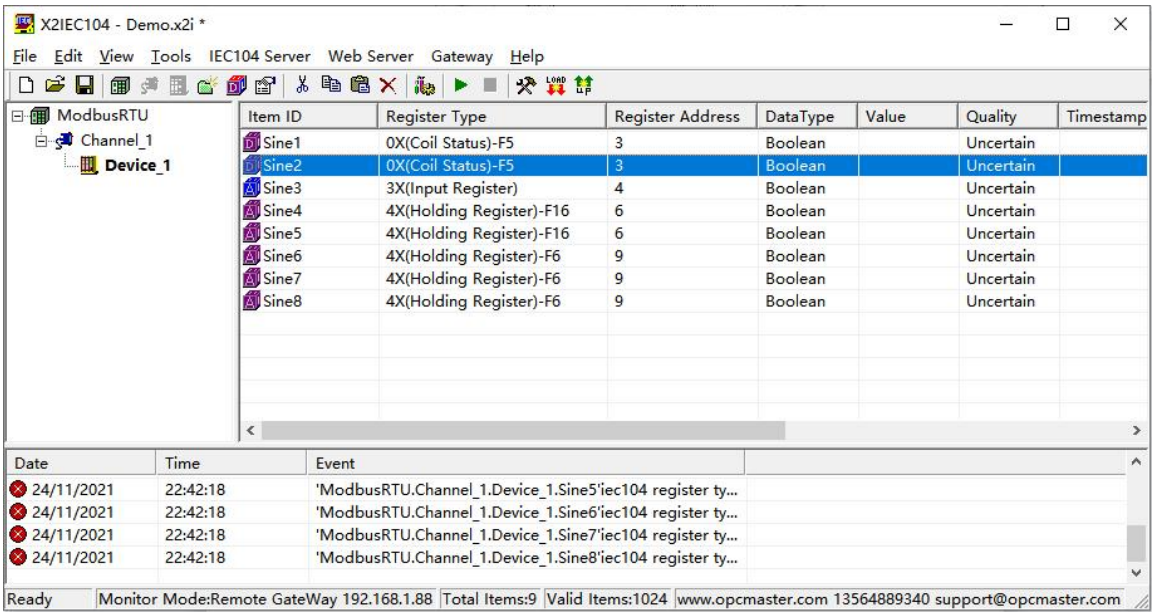

Figure 3-4-12 Complete the import

3.5 IEC104 Server

3.5.1 IEC104 Setting

The default port number of the IEC104 server is 2404, and the default public address is 1. If no special requirements are set for other parameters, use the default values. If users need to change, they can click "IEC104 Server" and select "IEC104 Settings" as shown in Figure 3-5-1-1.

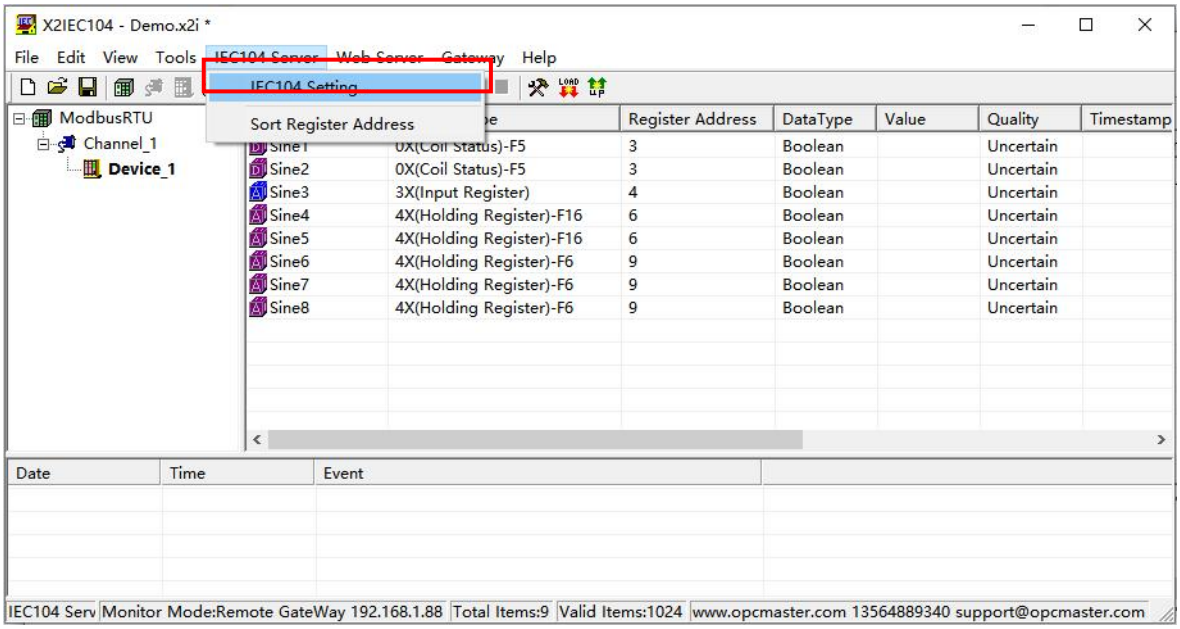

Figure 3-5-1-1 IEC104 Setting

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In the displayed dialog box, set the IEC104 server parameters, as shown in Figure 3-5-1-2.

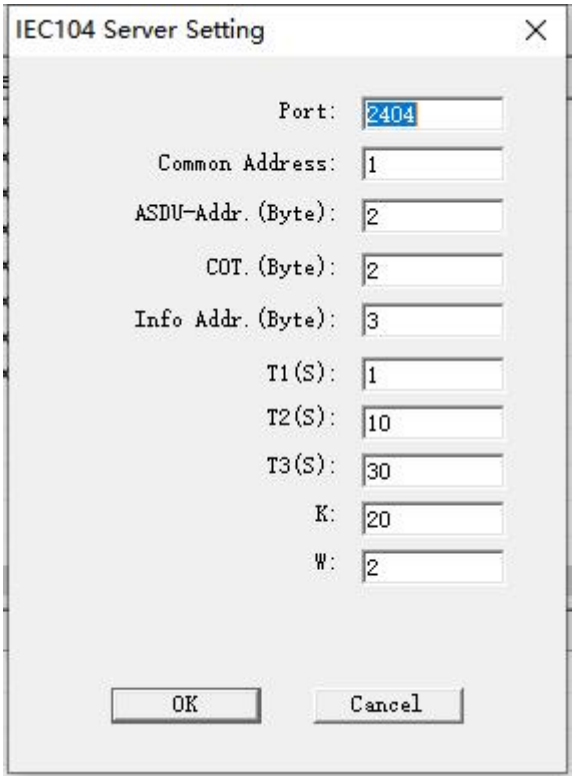

Figure 3-5-1-2 IEC104 Parameter Setting

3.6 Upload the project(Remote Gateway Monitor Mode)

Before uploading project, we must ensure that the monitoring mode is Remote Gateway mode, and the specific mode switching operation is as follows.

- on the menu bar , monitor mode under the tool need to be chosen “Remote Gateway”.
- Double click the “Monitor Mode” of the status bar at the bottom of the software can also switch monitoring mode.

After Configuring the project, the project can be uploaded to the hardware gateway(IEC2004-ARM) to debug by starting monitor.

If the project is modified, it is necessary to upload the project to the gateway for debugging until there is no problem, finally monitor by hardware gateway.

Click "Gateway" on the menu bar to choose "Upload " or click on the toolbar to upload the project, as the Figure 3-6-1.

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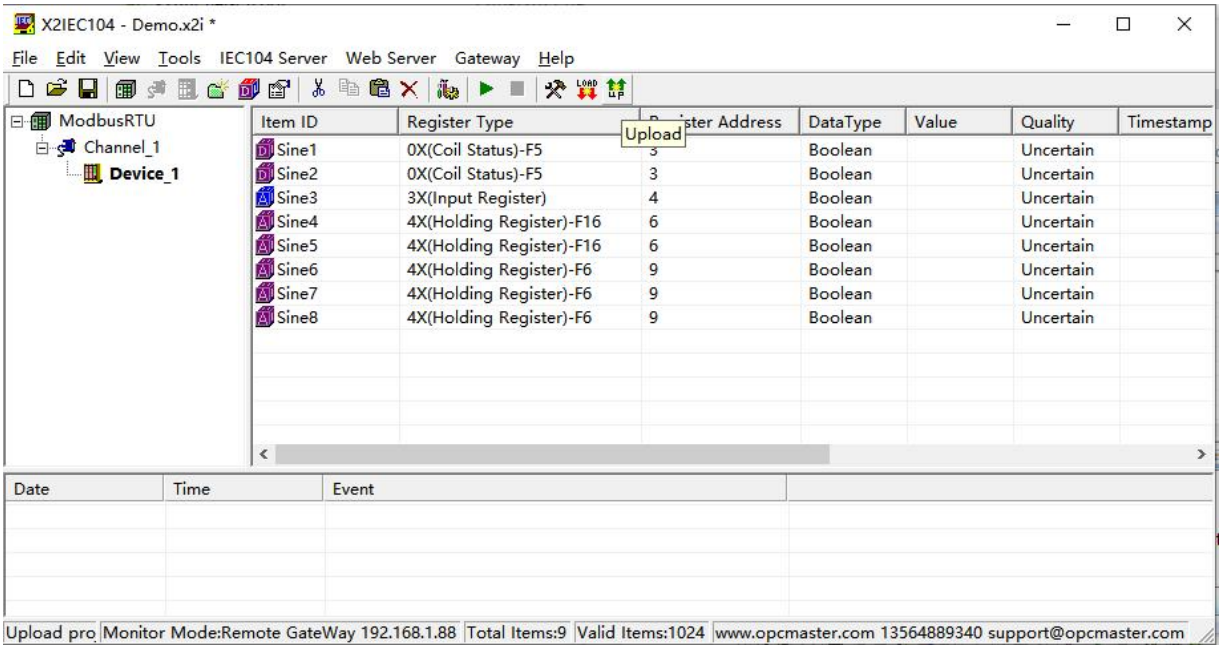

Figure 3-6-1 Upload the project

In the pop up dialog box enter the gateway IP address, click the "Upload"，As the Figure 3-6-2.

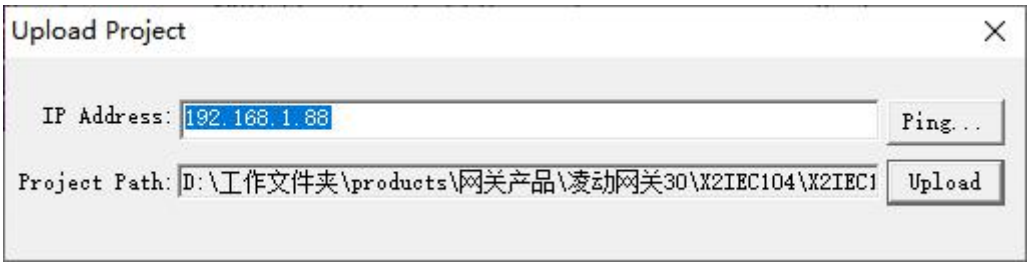

Figure 3-6-2 Upload

After uploading, the pop-up dialog prompt succeed to upload, As the Figure 3-6-3.

If uploading is failed, it will also pop up the failure prompt box.

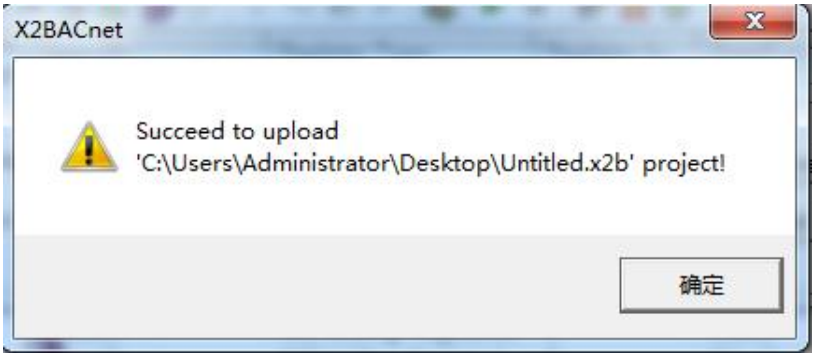

Figure 3-6-3 Succeed to upload

Note: the IP address of the gateway must be correct.

the default gateway IP address is 192.168.1.88, the IP address of PC to set up to

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the same network segment, the project can be uploaded after successfully Ping.

After uploading the project, click the menu bar "Tools" to select "Start Monitor" or click the toolbar icon ,you can see real time data on the device. As the Figure 3-6-4, The collected data is consistent with the slave simulated data.

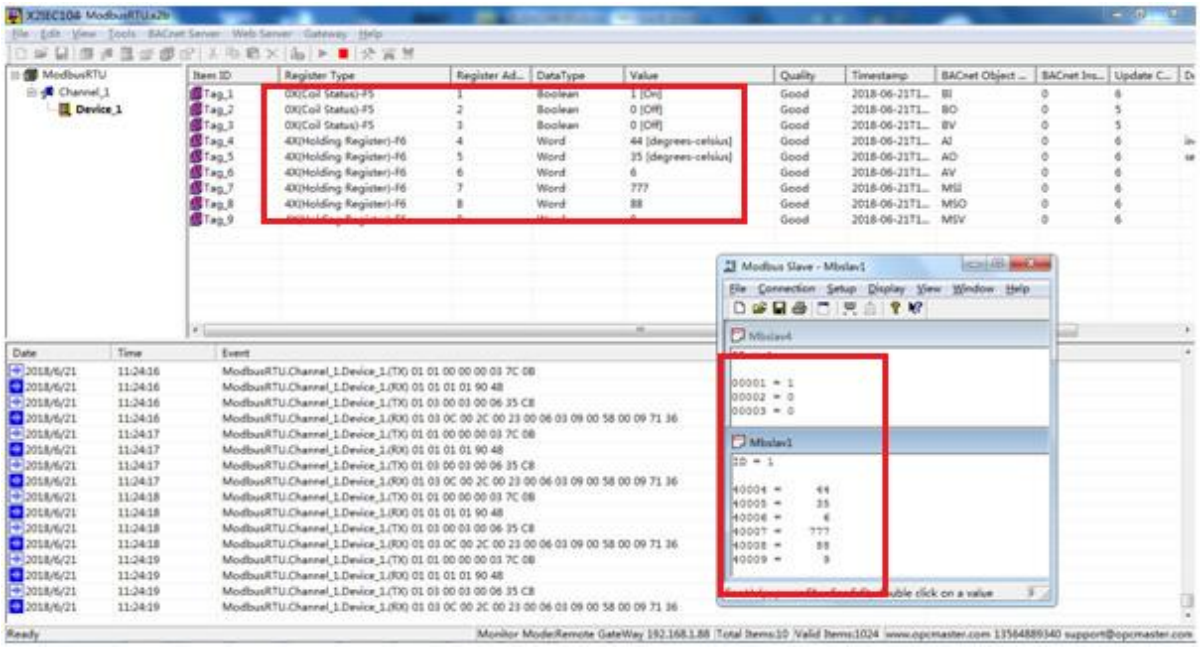

Figure 3-6-4 Remote gateway monitor

3.7 Download the Project

Before uploading project, we must ensure that the monitoring mode is Remote Gateway mode, and the specific mode switching operation is as follows.

- on the menu bar , monitor mode under the tool need to be chosen “Remote Gateway”.
- Double click the “Monitor Mode” of the status bar at the bottom of the software can also switch monitoring mode.

Download project is to download the last configuration project from the hardware gateway to PC, and edit the project and view real-time data on the PC to facilitate user debugging. Click on the "Gateway" choose "Download ", user name: admin, password: admin123456. As the Figure 3-7-1.

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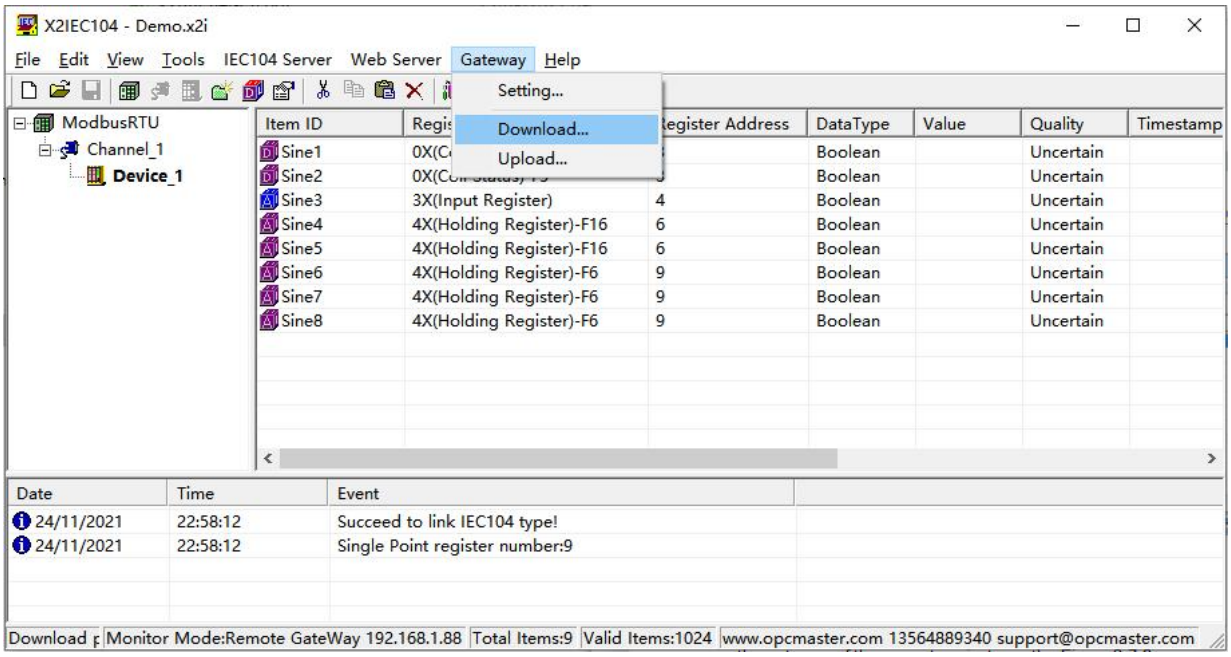

Figure 3-7-1 Download Project

In the pop up dialog box enter the gateway IP address, can be downloaded from the gateway of the current project，as the Figure 3-7-2.

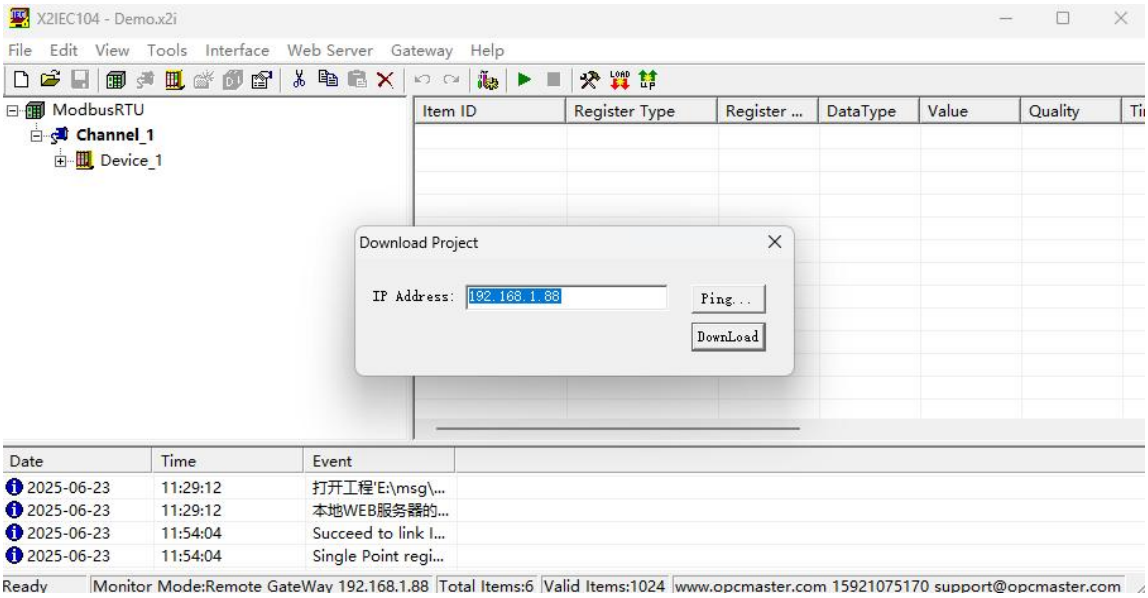

Figure 3-7-2 Download Project

Users can also through the WEB server log in to the gateway, download the project.

3.8 Local PC Monitor

After completing the project configuration, click the menu bar "Tools" to select "Start Monitor" or click the toolbar icon , as shown in figure 3-8-1 below. It will start

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the X2BACnetRunTime.exe program. User only need to start the program in the background to realize the function of gateway conversion on PC.

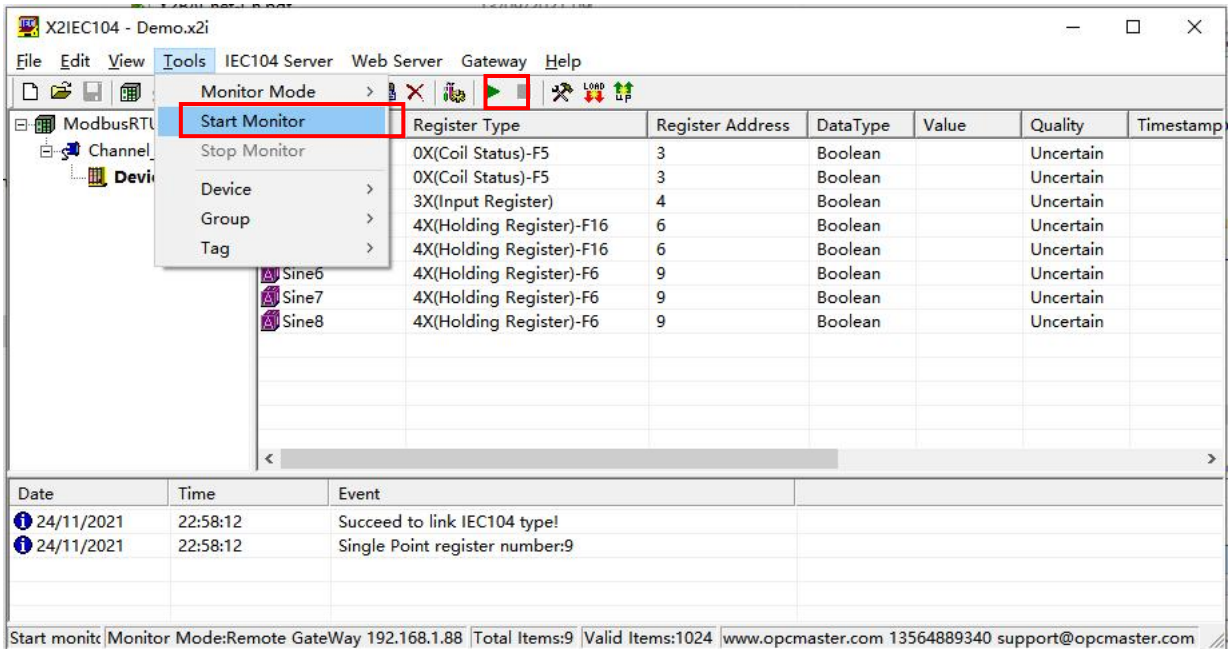

Figure 3-8-1 Start Monitor

X2IEC104RunTime run successfully. We can view the running log .As the Figure 3-8-2.

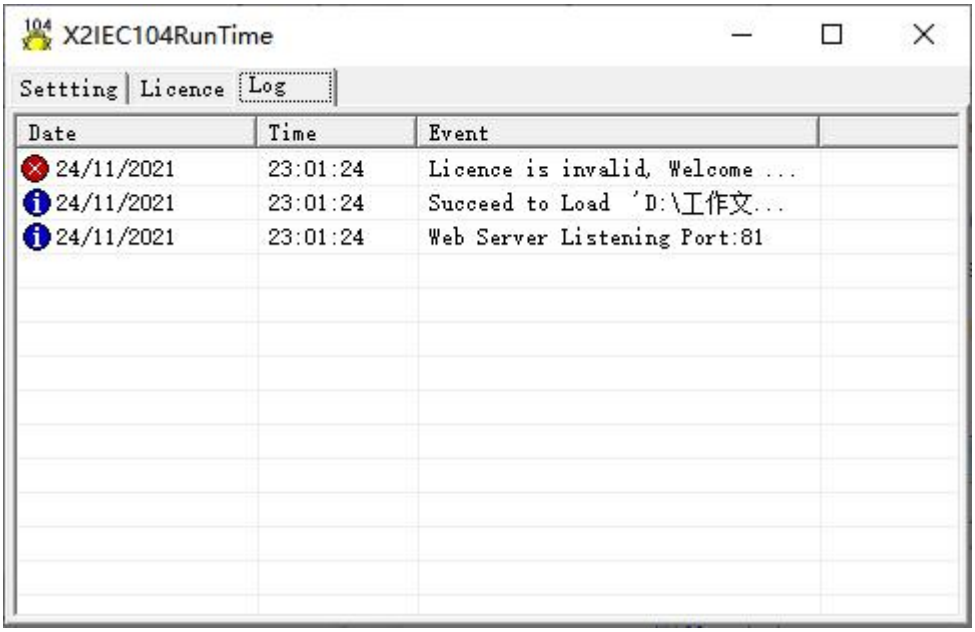

Figure 3-8-2 Log

Return procedure monitoring interface, can see some real time data on the device and the data on the interface is consistent, As the Figure 3-8-3.

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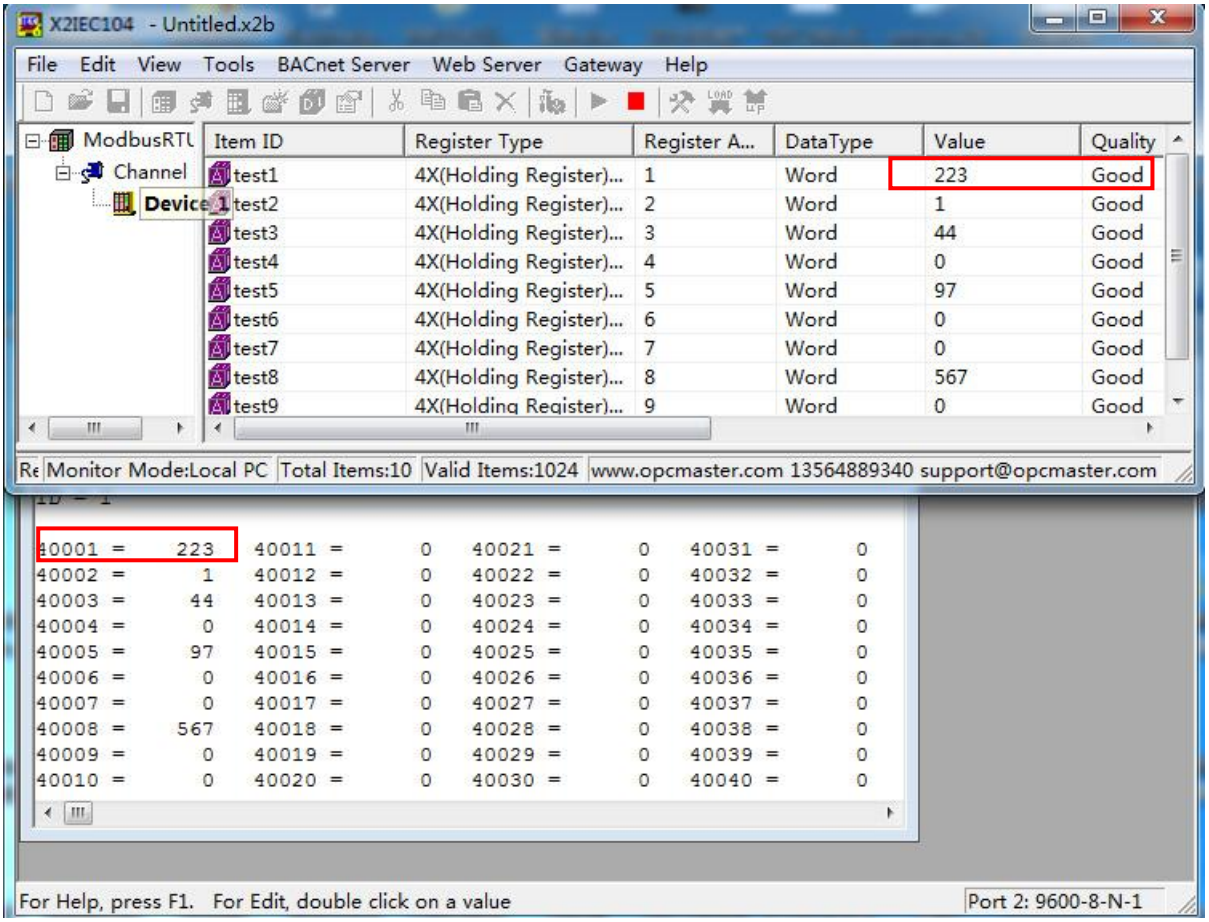

Figure 3-8-3 Successful Communication

4 Visit IEC104 Client

(1) Use the IEC test software (IEC870-5-104 Simlator) to access X2IEC. The test process is as follows. First, start the IEC test software (IEC870-5-104 Simlator) and establish the corresponding master station, as shown in Figure 4-1.

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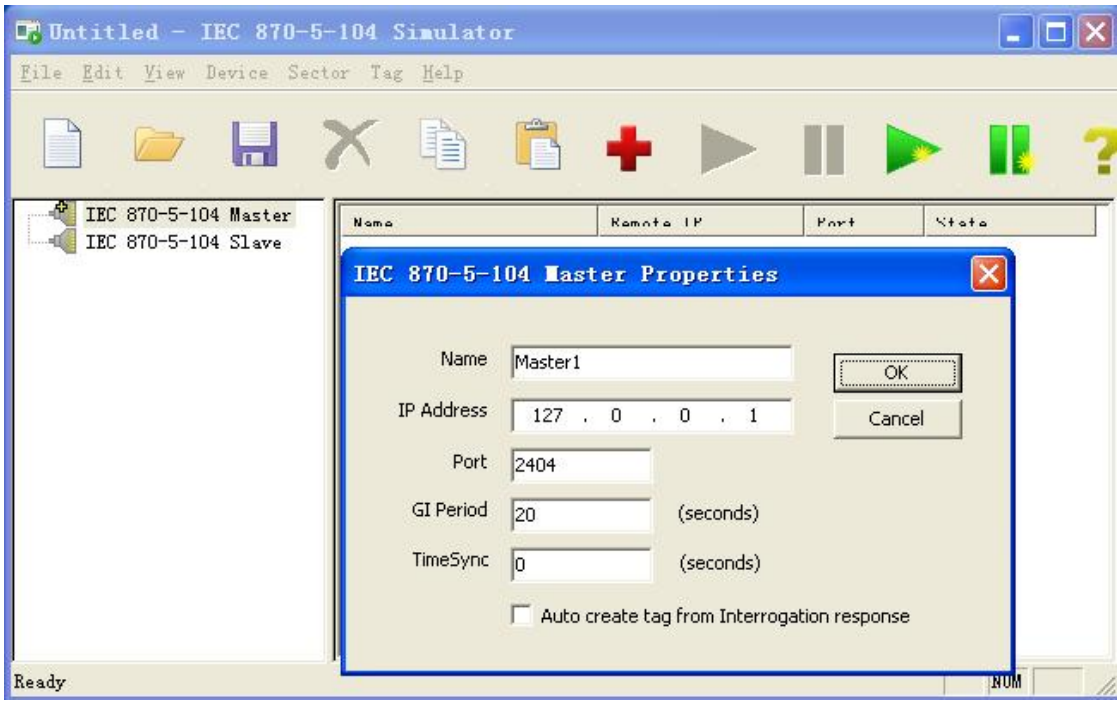

Figure 4-1 IEC Client access

(2) Set the Port number (Port) to 2404, set the preceding X2IEC slave station parameters to the same, set the public number to 1, set the preceding X2IEC slave station parameters to the same. See Figure 4-2.

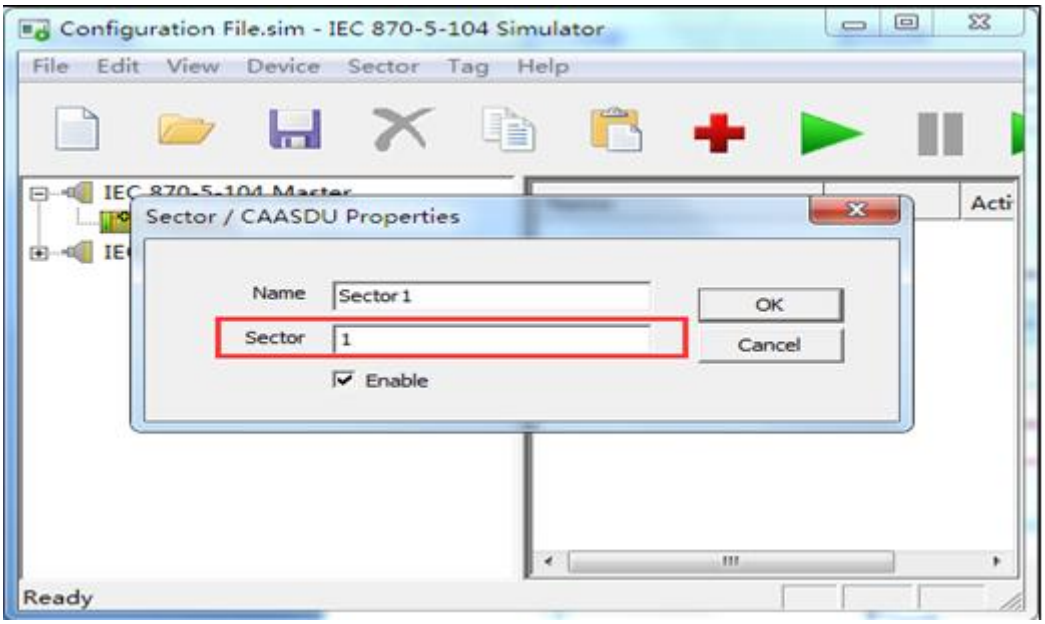

Figure 4-2 Public Address is 1

(3) Add Tag, as the below figure4-3

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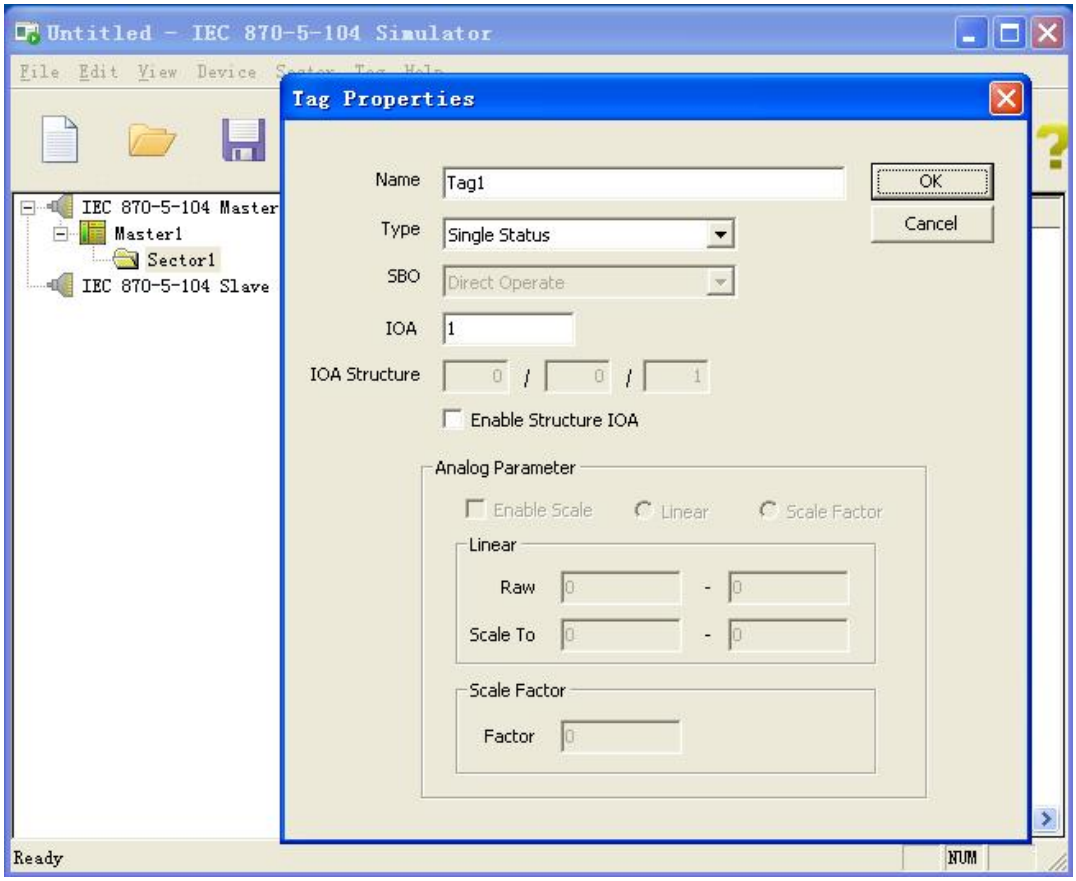

figure4-3 Tag

(4) Click IEC870—5—104 Simlator "  ", You can read the value of single point remote data, 1, which is on, and then change the value of this point in the OPC server to 0. It can be seen that the relevant data value in the IEC master station changes from ON to OFF, indicating that X2IEC104 has successfully converted ModbusRTU into IEC slave station.

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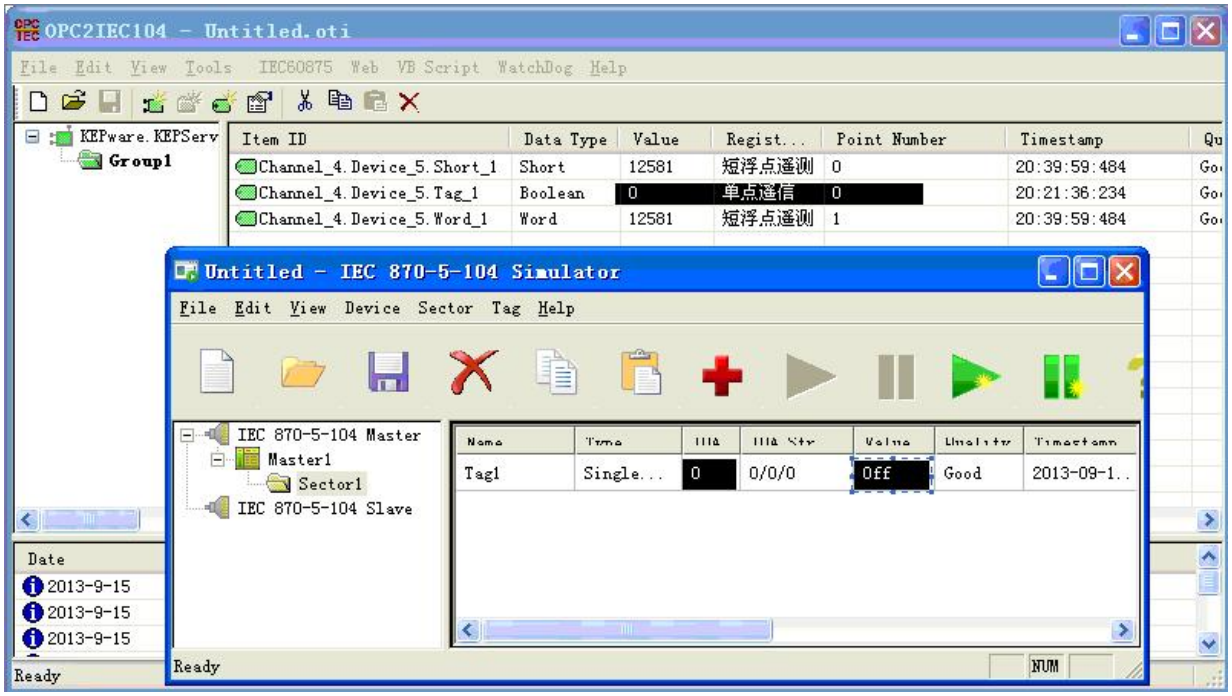
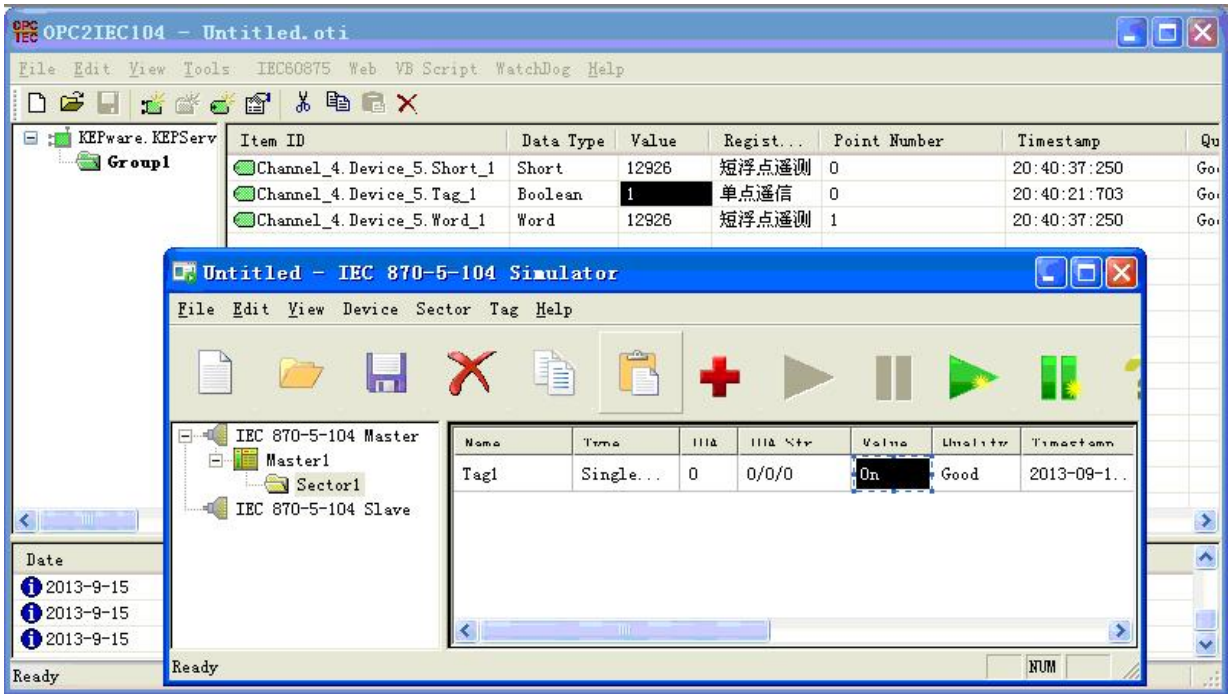


(5) Change the value of channel_4.device_5.tag_1 on the OPC server to 0, and the data whose address is 0 in the IEC remote variable also changes from on to OFF, as shown in Figure 4-5.



5 JS Script Editor

Hardware gateway also has JS script editor. Users can achieve some logic control by editing script language. There are some common functions in the script editor. The user can select some functions to edit the language. After the editor is complete, click

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"Syntax Check", and the syntax will be checked automatically. If there are any grammatical errors, it will prompt which specific line of grammar has problems.

5.1 Operation steps

Click the menu bar view to select the JS script editor, or click the toolbar to open the script editor, as shown in figure 5-1-1.

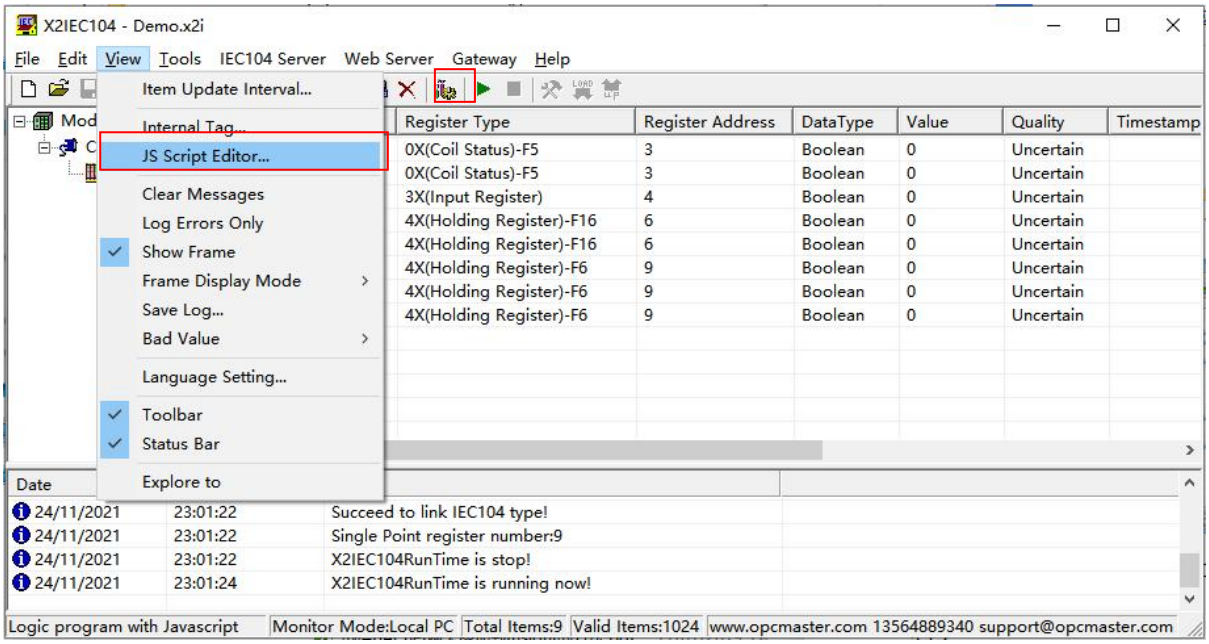

Figure 5-1-1 Open JS Script editor

Right click on the script editor to choose “New JS Script”, as shown in figure 5-1-2.

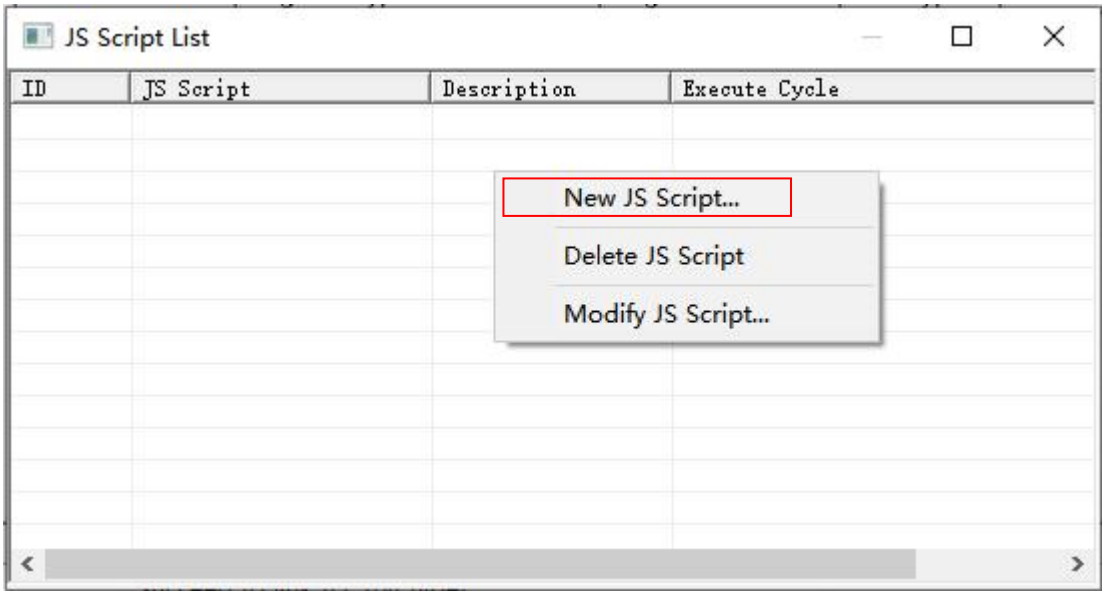

Figure 5-1-2 New JS Script

Open to see JS editing script, as shown in figure 5-1-3 below.

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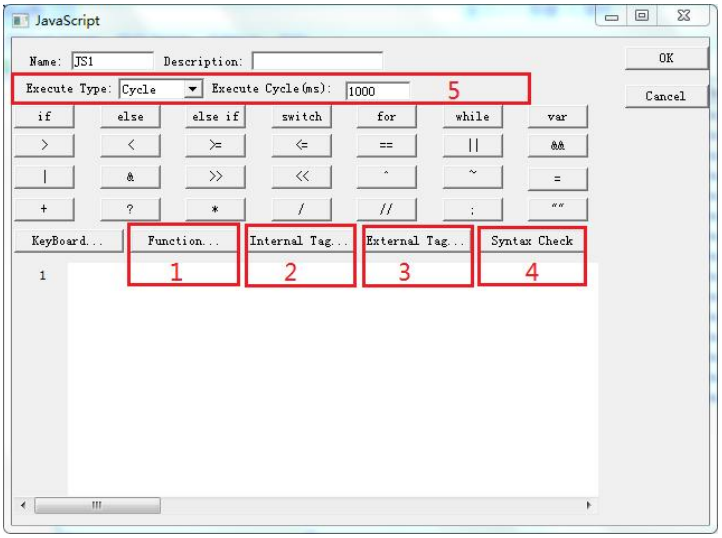

Figure 5-1-3 JS Script Editor

1. Function

Users can choose different functions to implement logical functions. See the 5-2 chapter for specific functions. As shown in figure 5-1-4.

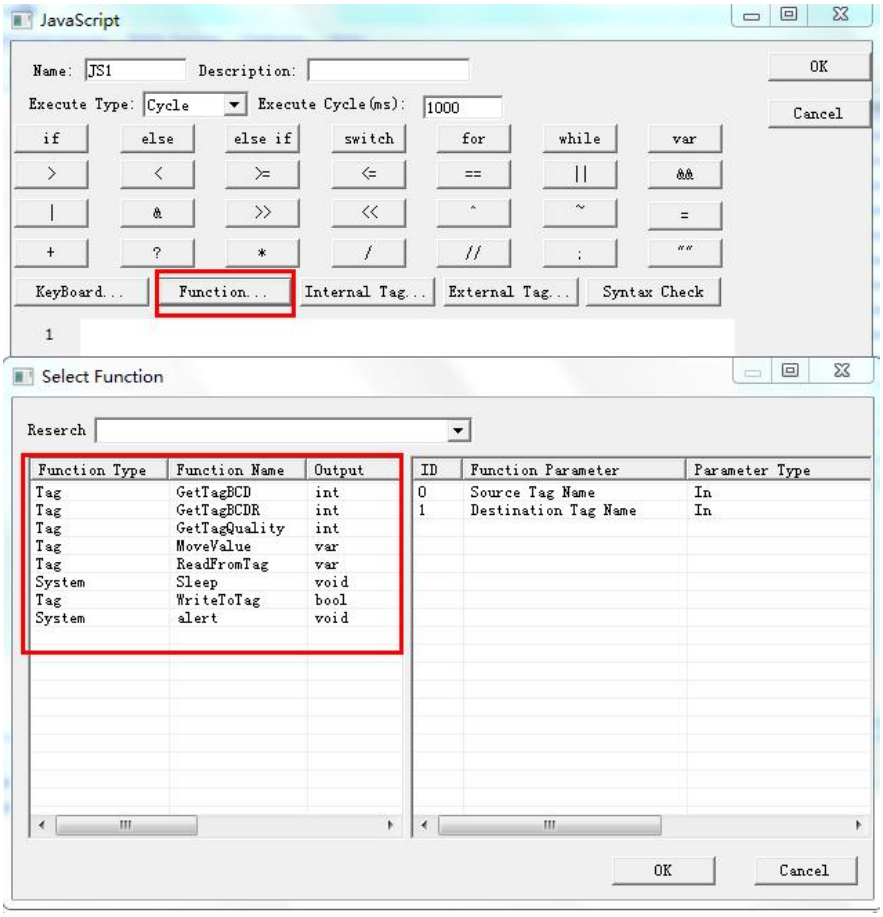

Figure 5-1-4 select Function

2. Internal Tag

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Users can use the " Internal Tag" function to build a new variable and related functions, used to receive or store variable data, such as taking the current value of Tag, and mapping to a new internal variable. In the script editor, click the "Internal Tag", or In menu bar click “view” to select “Internal Tag”, open the window of Internal tag list. In the pop-up window, right click “New” ,as shown in figure 5-1-5.

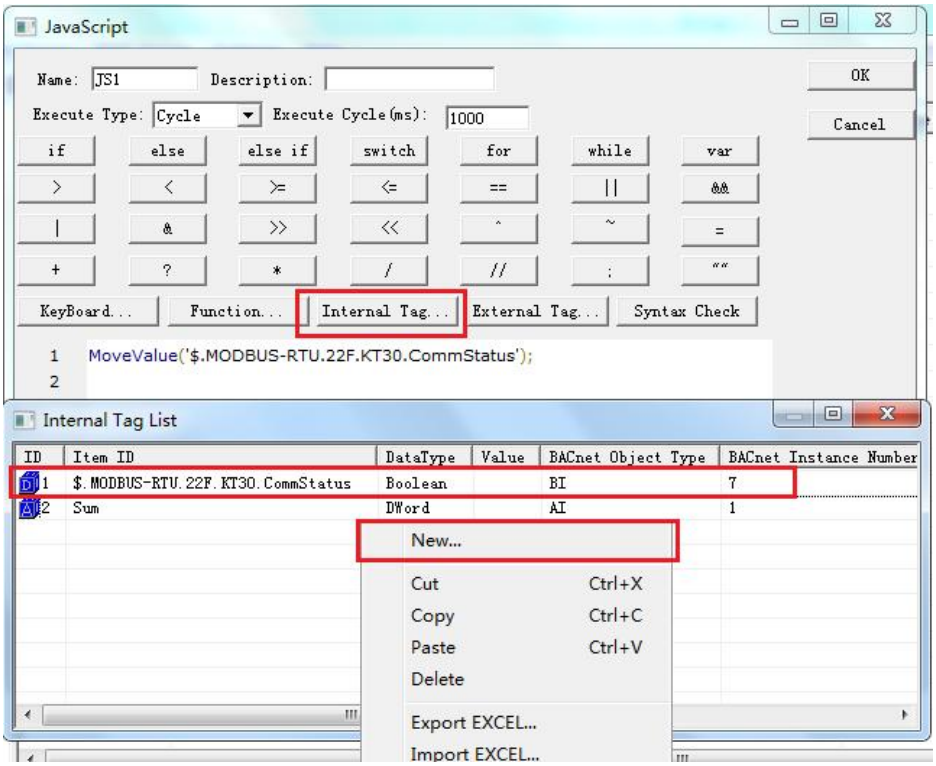

Figure 5-1-5 New Internal tag

Note: in the above figure, there is an internal variable BI point that address is 7, which represents the communication state of the Device”KT30”. at least one point is communicated normally under the device, the value of the internal variable is 1, if all the points under the device are not normal (that is, the device is off-line), this internal change The value of the quantity is 0. If there are currently N devices, it will automatically generate N internal variables. Users should avoid duplication of register addresses when configuring the project.

In the pop-up window, set the variable related properties. If you want to quickly view the current value of the internal variable, you can click the menu bar "view" option and select the "internal variable" to see the real time data in the pop-up window, as shown in figure 5-1-6.

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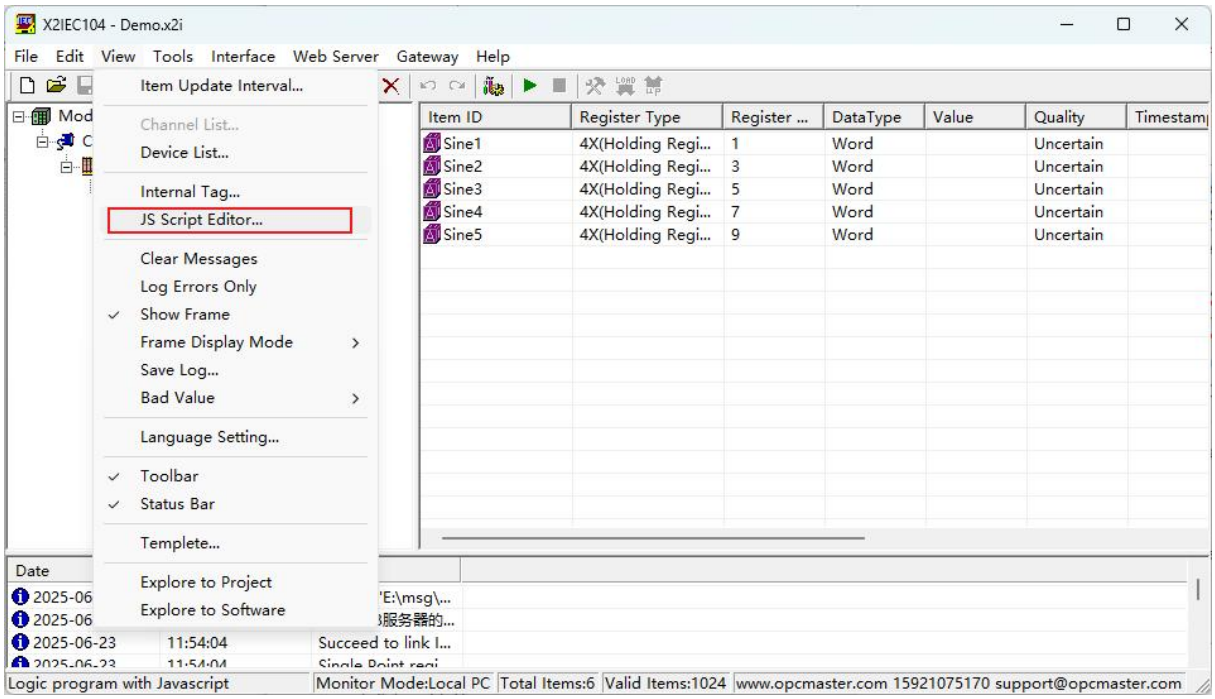

Figure 5-1-6 Open Internal tag to check real-time data

Click on the internal variable, as shown in figure 5-1-7.

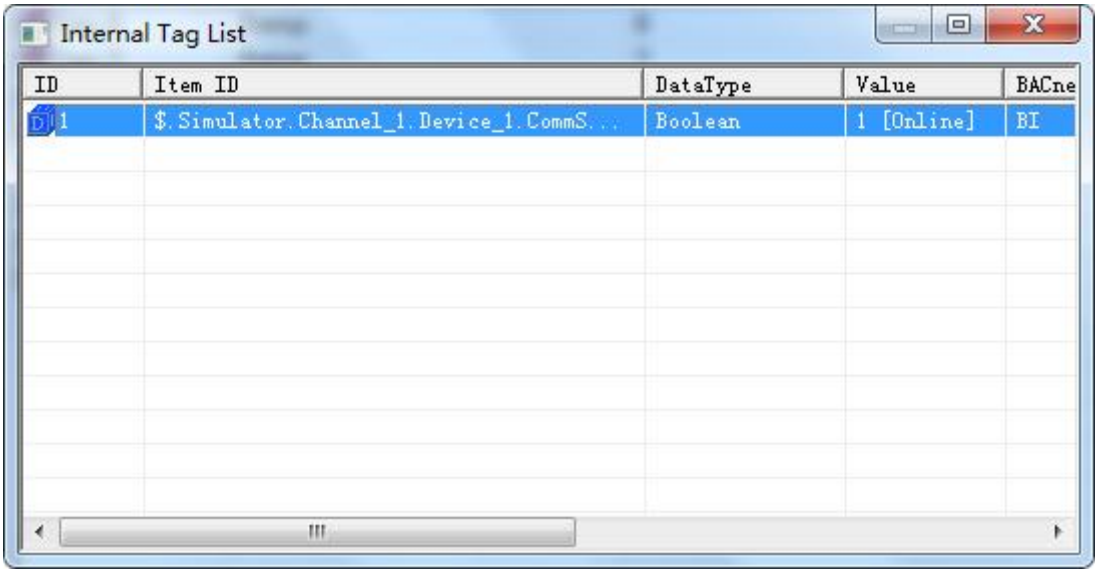

Figure 5-1-7 real-time data

3. external variables

In addition, users can also use relevant functions for logical control according to the changes in the data of external variables, such as different logical controls based on the range of numerical changes of an external variable. In the script editor, click "external variables", and double-click on a variable in the expanded variable table, as shown in figure 5-1-8.

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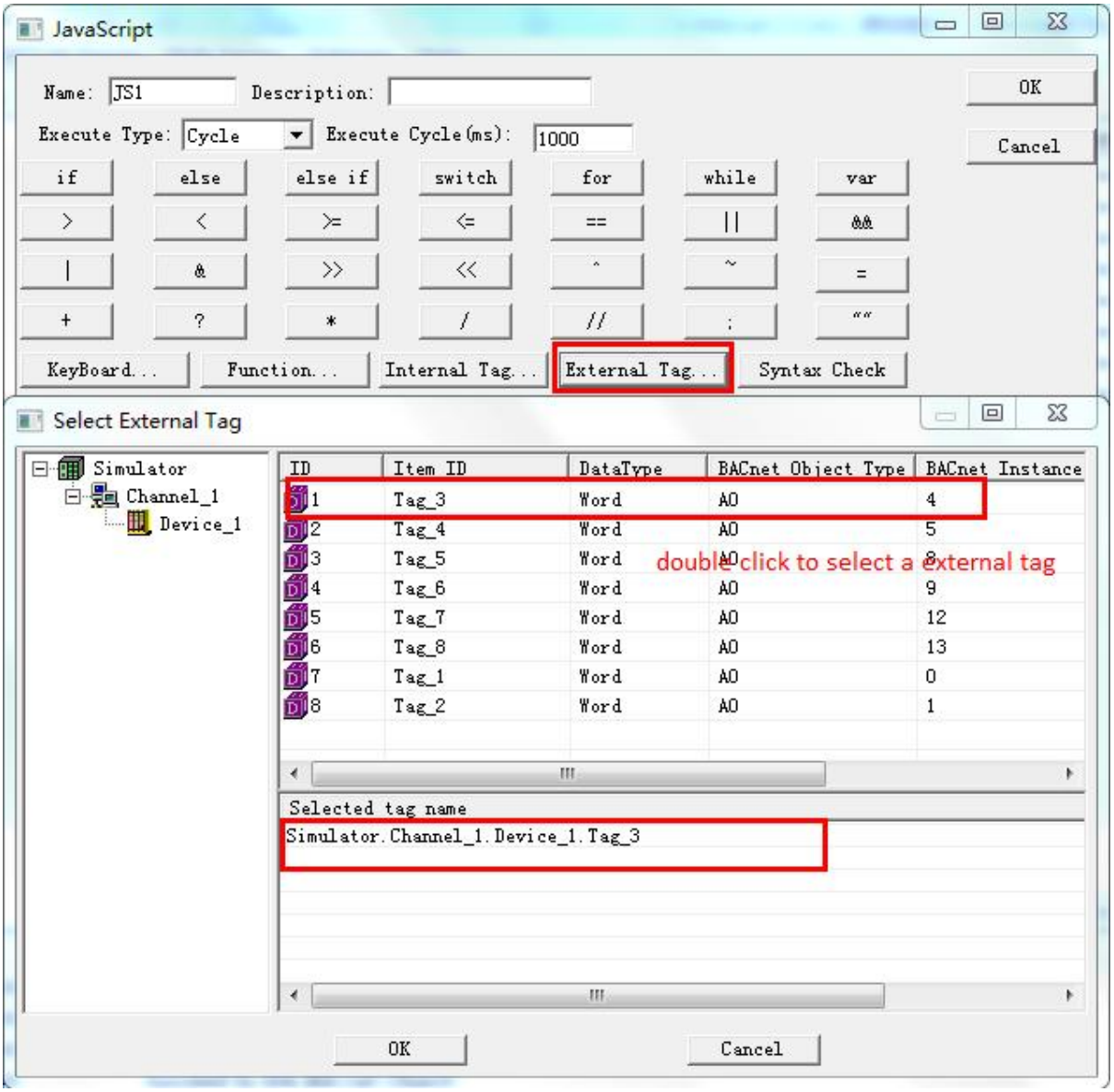

Figure 5-1-8 select the external tag

4. grammar check

After completing the programming, users can check the grammatical error with the syntax check function, and give hints if the program has problems.

5. execution mode

✧ execution mode selection cycle, cycle (MS): 1000, which represents a script execution every 1000ms.

✧ change of execution mode. Roll call needs input. The following figure 5-1-9, which assigns the value of internal variable VarName_1 to the return Tag_3 and Tag, The initial value of the internal variable VarName_1 can be assigned to batch names.

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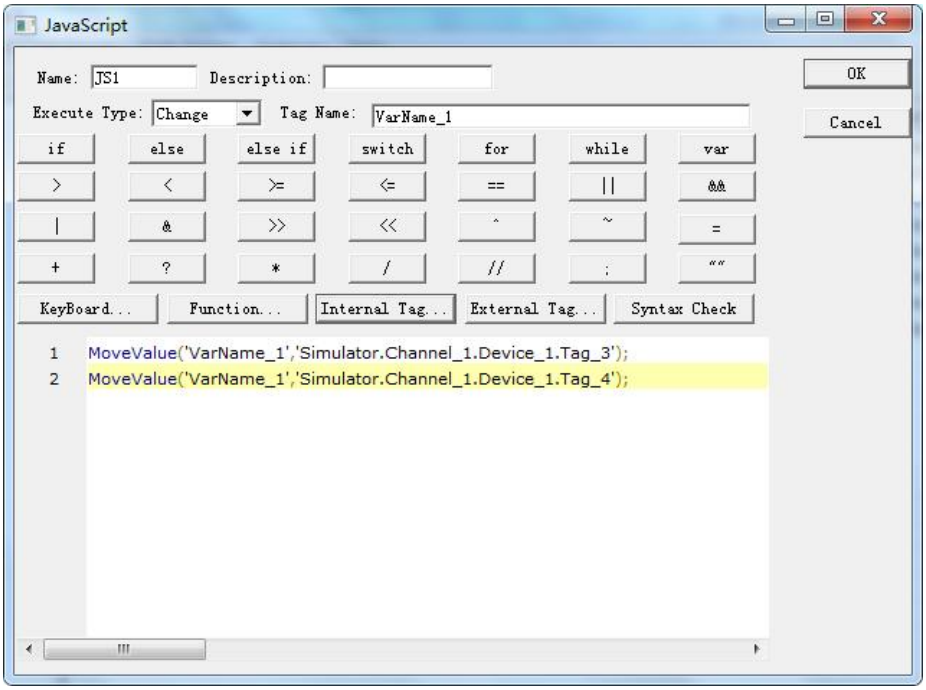

Figure 5-1-9 change script

Note:

- In order to prevent the mistake, you can point out external variables, or internal variables in the script force box, double click to select a name and then copy it from the script box to the top name box.
- Only when the value of internal variable VarName_1 changes, can script be executed to save resources.

✧ execution mode selection timing, select a time point, after the arrival of this time, the implementation of the script. It can be applied to the timing switchgear.

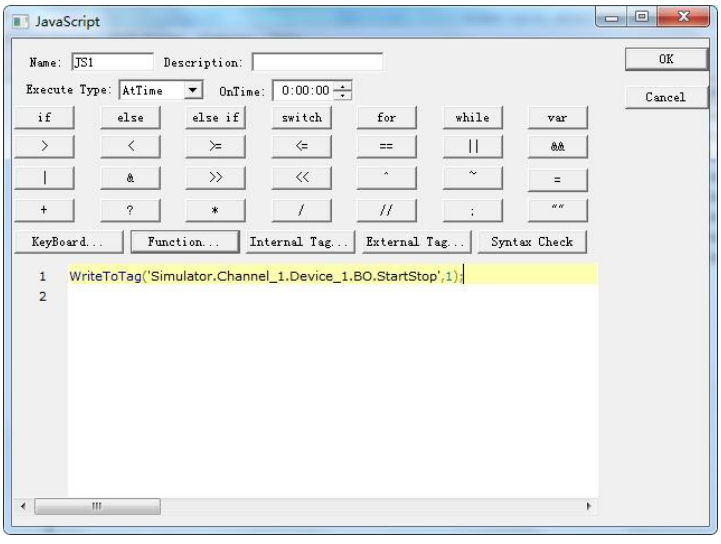

Figure 5-1-10 timing switchgear

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5.2 Function description

The commonly used functions in the JS script editor are as follows:

Operating function

5.2.1 ReadFromTag

It is a value function from Tag.

Grammar:

Var szValue = ReadFromTag ("ModbusRTU.Channel_1.Device_1.tag_1");

5.2.2 WriteToTag

It is a write value to a Tag function, used to assign an external variable to a Tag, to perform a write operation on the device, or to assign a new internal variable to the user.

Grammar:

var szValue = 100;

WriteToTag('ModbusRTU.Channel_1.Device_1.tag_1',0); //write the value to the 'tag_1'

5.2.3 GetTagQuality

It is a quality stamp from Tag.

The results returned conformed to the OPC specification. That is, Good returns 192, Bad returns 0, Uncertainn is 64, indicating that the value is not assigned and has not been updated.

Var varQuality = GetTagQuality ('szTagName'); //where 'szTagName' is selected from external variables.

5.2.4 MoveValue

It is implements the transfer of source data to destination data and data transfer between different points.

Grammar:

MoveValue ('Source Tag Name', 'Destination Tag Name'); //Source Tag Name is

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the name of the source data point, and Destination Tag is the destination data name. The parameters here can be either external variables or internal variables. As shown in figure 5-1-9.

MoveValue function application scenario:

(1) the gateway collection side can access and control each other (no matter what protocol can be interchanged).

Gateway acquisition gateway uses two COM ports to collect different ModbusRTU slave devices, one for collecting temperature points of air conditioning equipment, and one for collecting IO modules. According to the temperature of the air conditioner, the IO module is controlled by the output of a sound and light alarm, that is, the MoveValue function can be used for logical editing, and the data of two acquisition terminals are accessed and controlled by each other.

(2)use one internal variable point to control all external variables.

MoveValue ('internal variable', 'external variable 1' ');

MoveValue ('internal variable', 'external variable 2' ');

MoveValue ('internal variable', 'external variable 3' ');

MoveValue ('internal variable', 'external variable 4' ');

MoveValue ('internal variable', 'external variable n' ');

This is the realization that when the internal variables change, the external variable 1-N can change at the same time.

For example, if you change the temperature on the interface, the setting temperature of the N thermostat of the gateway will be changed together.

5.2.5 GetTagBCD

It is used to get the BCD code of a label.

Grammar:

Var mBCD = GetTagBCD ('szTagName');

If the single register (Word, Short) value is 4660 (0x1234), the GetTagBCDR function is used to get BCD data to be decimal number 1234.

If the double register (Dword, Long) value is 305419896 (0x12345678), the

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GetTagBCDR function is used to get BCD data to be decimal number 12345678.

5.2.6 GetTagBCDR

It is used to get the BCD code of a tag, but the value is BCD code with high and low inversion.

Grammar:

Var mBCDR = GetTagBCDR ('szTagName');

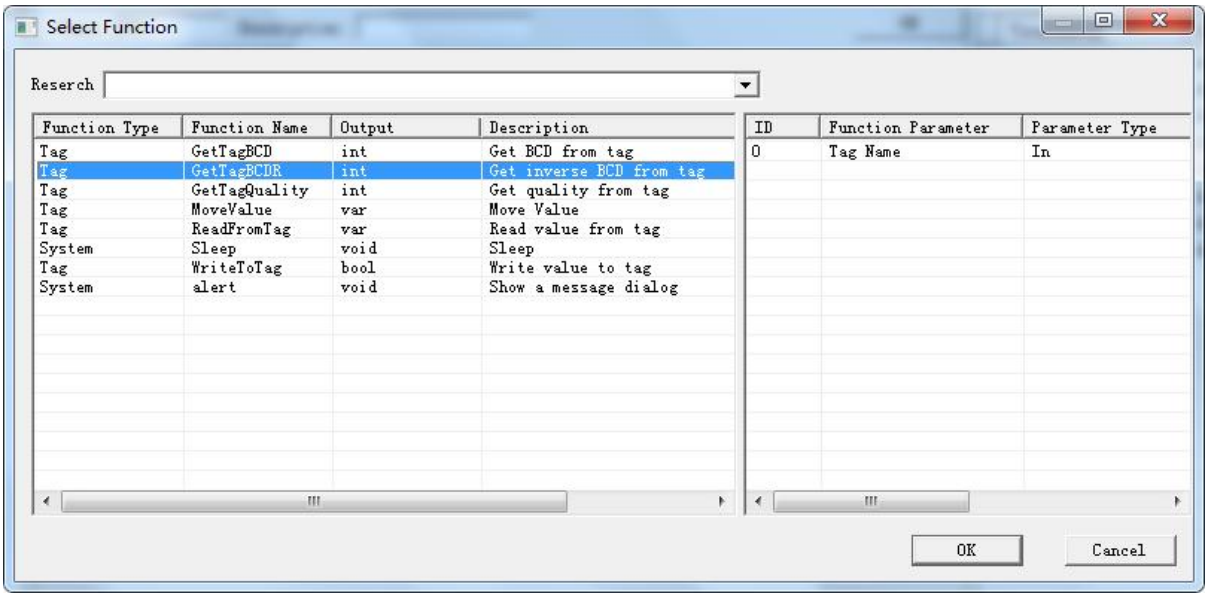

figure 5-2-6-1 Get BCDR

If the single register (Word, Short) value is 4660 (0x1234), the GetTagBCDR function is used to get BCD data to be decimal number **3412**.

If the double register (Dword, Long) value is 305419896 (0x12345678), the GetTagBCDR function is used to get BCD data to be decimal number **56781234**.

For an example:

If you need to get the BCD code of'Simulator.Channel_1.Device_1.Tag_1', assign it to T1. Get the'Simulator.Channel_1.Device_1.Tag_2'inverse BCD code and assign it to T2. The code is shown as shown in figure 5-2-6-2.

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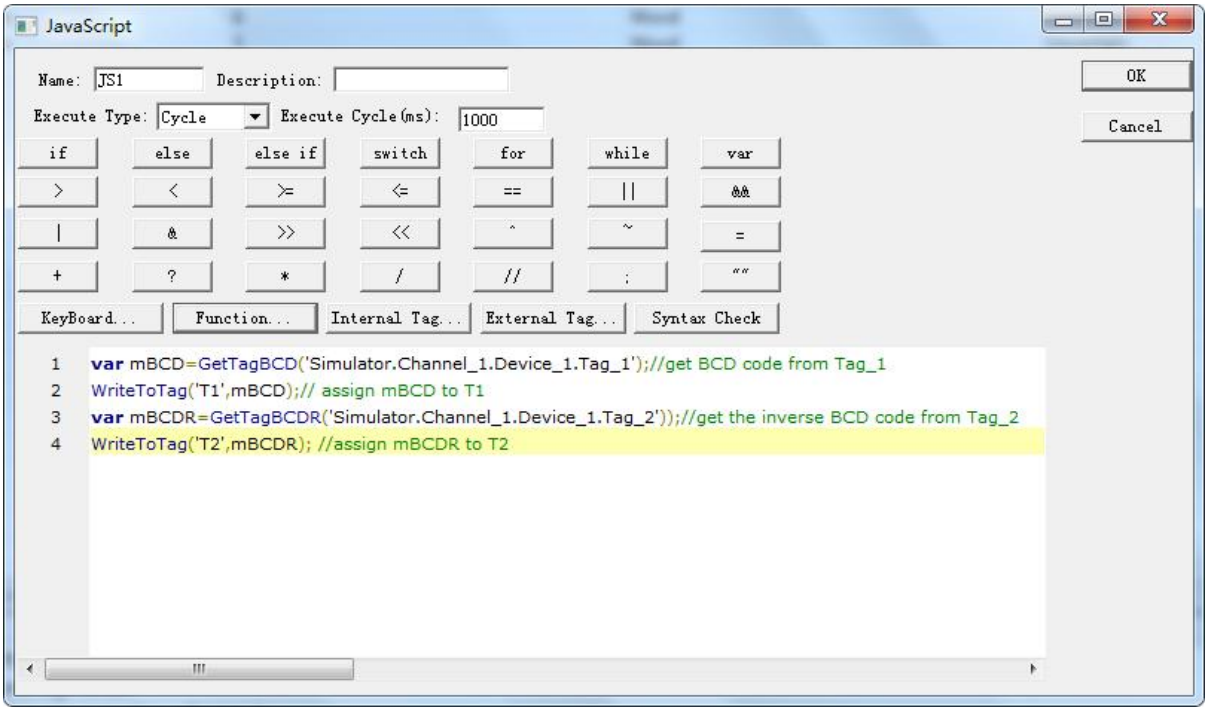

figure 5-2-6-2 Get BCD

Start monitor later, in the Internal tag list value display is as the figure 5-2-6-3.

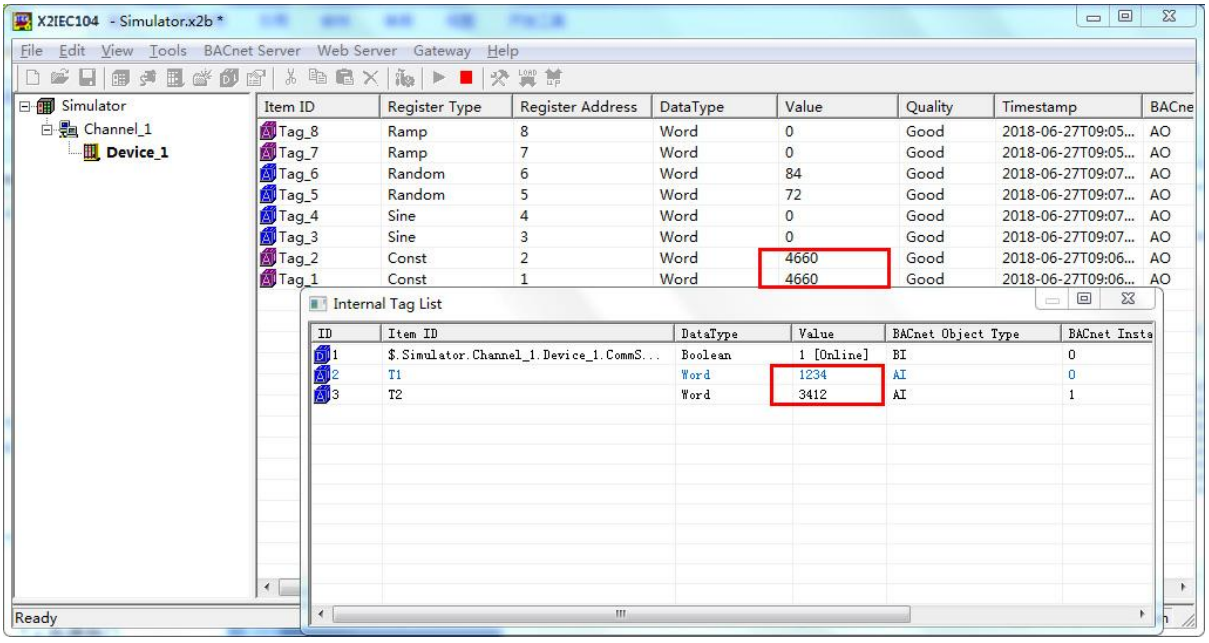

figure 5-2-6-3 check BCD value

System function

The output string of alert () function is mainly used for debugging. The results returned are displayed on the log of Runtime.exe. It can also be displayed on the state of the web communication.

Grammar:

For example, the return value of the output quality stamp

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Alert (varQuality.toString ());

The Sleep (1000) function is used for latency, indicating a delay of 1 seconds. Unit milliseconds.

5.3 Example

Open the script editor to reduce the current value of Tag " Simulator.Channel_1.Device_1.Tag_1" by 20 times and map it to the internal variable T1.

```
var szValue=ReadFromTag('Simulator.Channel_1.Device_1.Tag_1');
var newValue=Number(szValue);//String strongly transformed integer
newValue=newValue*0.5;
WriteToTag("T3",newValue.toString());
```

The script editor supports all mathematical calculations, such as taking random numbers between 0-255.

Examples are as follows:

```
Var Rand = Math.round (Math.random () * 255);
Alert (rand.toString ());
```

Note: Excute Type represents how long the execution of a script!

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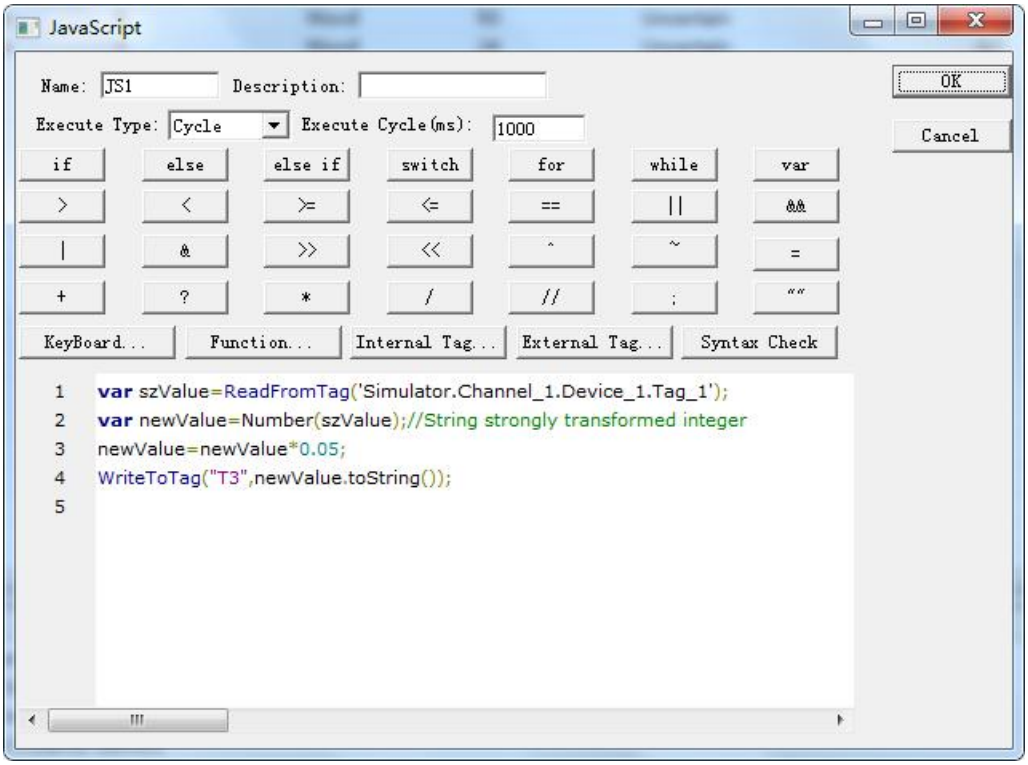

Figure 5-3-1 script example

View the T1 real-time data under the internal variables in the View menu bar. As shown in figure 5-3-2.

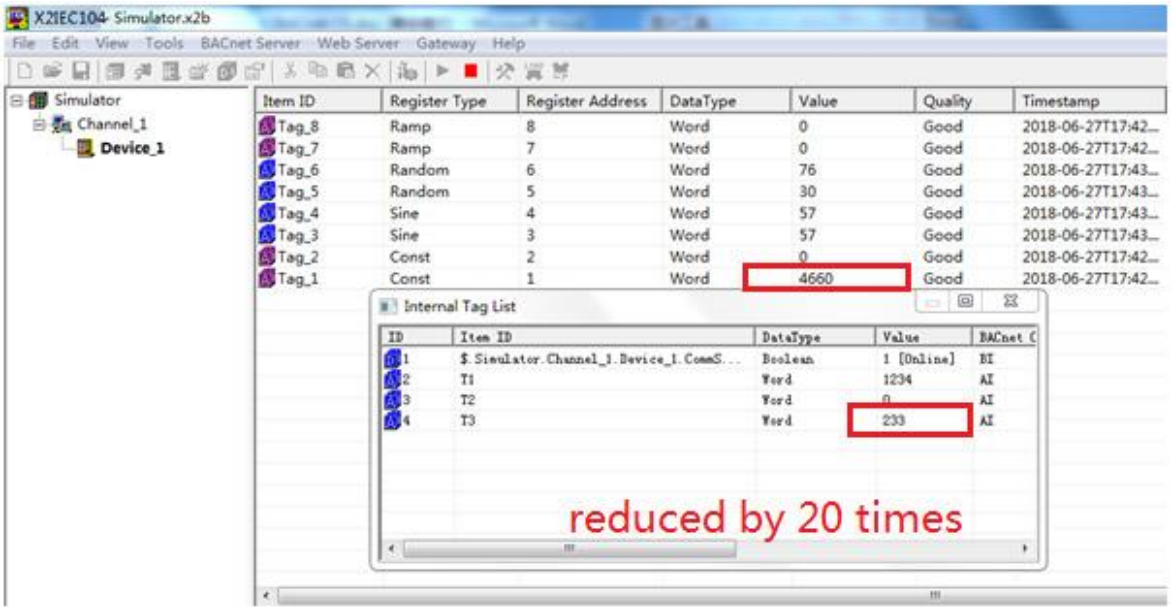

Figure 5-3-1 reduced by 20 times

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