

8CH-IO-WF

User Manual

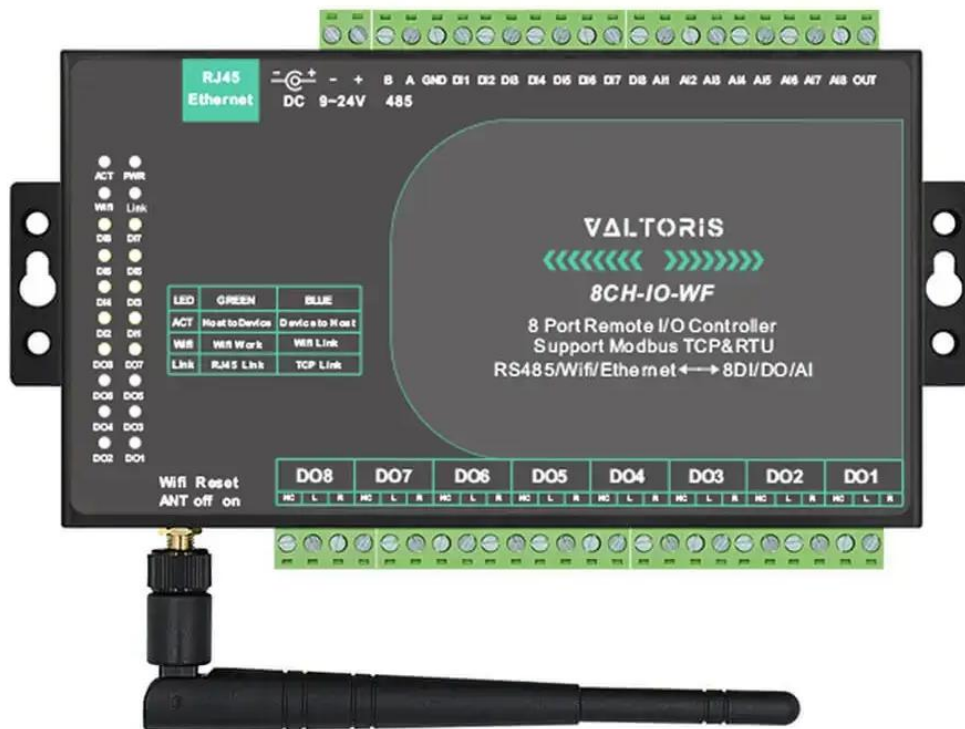


Figure 1 8CH-IO-WF

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1. Overview

8CH-IO-WF Remote IO Controller is an digital input output and analog input based on WIFI transmission. It support Modbus TCP to Modbus RTU, can monitor 8 channels digital input, 8 channels analog input and control 8 channels relay output at the same time. WIFI can be used as an access point (AP) or a stand-alone (STA) to connect to the router.

8CH-IO-WF can be applied to:

- building/e-guard system/security system;
- industry automation system;
- Intelligent home.

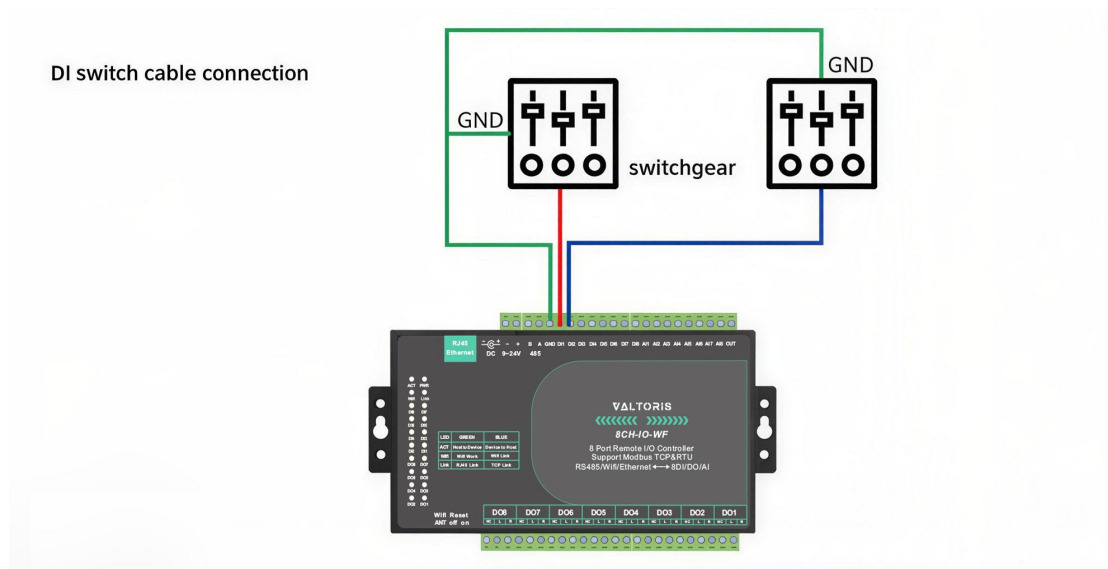
2. Feature

1. 8 channels digital input DI1 to DI8:

Support passive switch value (dry contact) and active level (wet contact). The dry node only needs to short-circuit it with GND to collect the 1 signal. When the node is wet, the difference between the active level and GND is as follows:

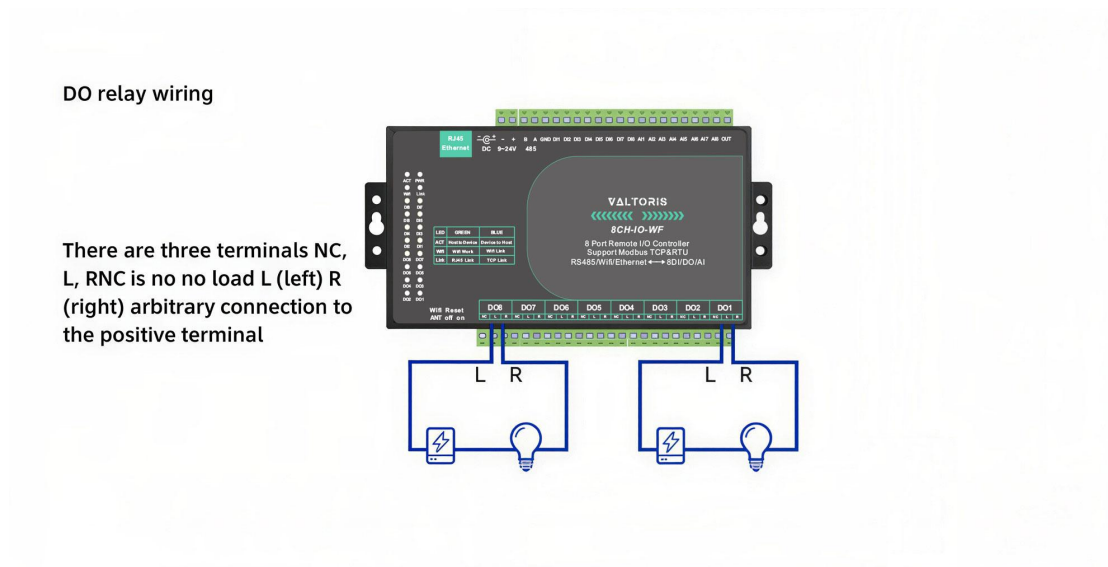
VCC Voltage	Low Level Range	High Level Range
24V	0~17V	17~24V
9V	0~3V	3~9V

Common GND interface is same.



2. 8 channels digital output DO1 to DO8:

The output type is relay output (5A@AC250V/DC30V). Setting 1 indicates that the relay is closed.



3. 8 channels analog input AI1 to AI8:

In default the first 4 channels are 0~5V voltage input, the after 4 channels are 4~20mA. If need customized, can modify any channels to the below 4 types:

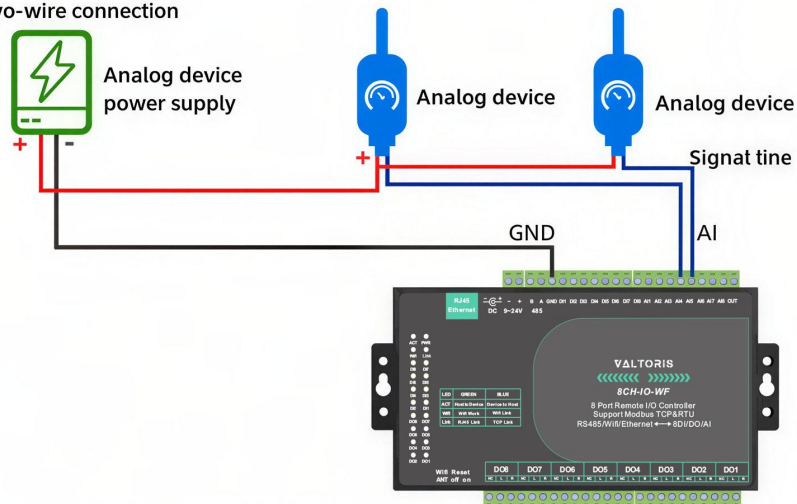
- (1) Current signal input: 4~20mA
- (2) Voltage signal input: 0~5V

(3) Voltage signal input: 0~10V

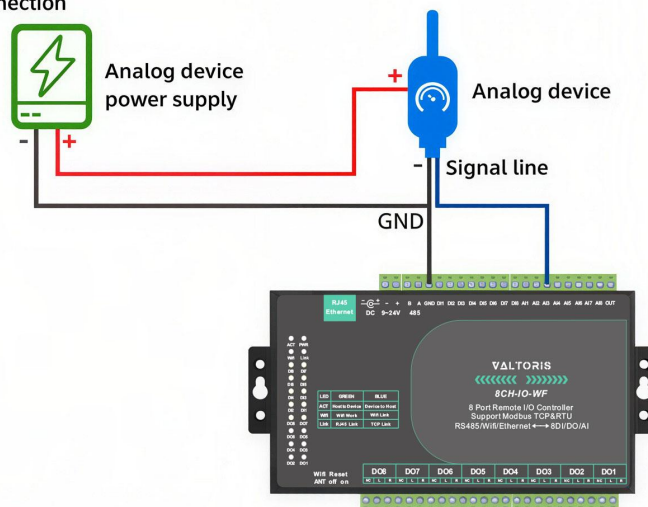
(4) Resistance impedance input: 0~10k or resistor-type temperature humidity sensor, etc.

There are three types of wire connections for analog input:

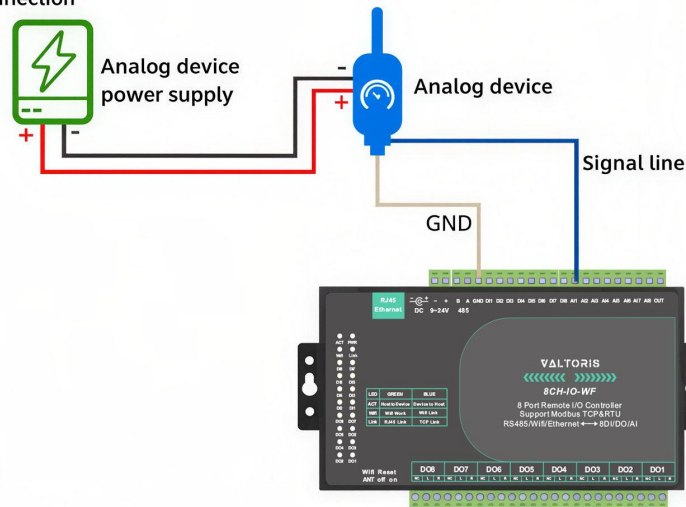
Analog two-wire connection



Analog three wire connection



Analog four wire connection



- 1) 8 channels switch value input state and 8 channels switch value output state both have independent indicator, can immediately know switch input/output state through indicator.
- 2) Provide software Vircom controlled by RS485 or TCP/IP, can demonstrate IO control and AI data acquisition for devices.
- 3) Can provide complete RS485 control instructions and Modbus TCP commands, convenient for integrated development of engineer.
- 4) It is freely equipped Windows virtual port & device management tool Vircom, support Vircom, can one-key search and modify parameters.

3. Technical parameter

Table 1 Technical Parameters

External interface	
Size:	L x W x H =9.2cm×19.7cm×2.5cm
Software	
Network protocol	Modbus TCP/ Modbus RTU

Under protocol	WiFi
Baud rate	1200~115200bps (normal 9600bps)
Parity bit	none
Data bit	8 bits
Stop bit	1 bit
Response Time	< 30ms
AI Input Format	
Current: 4~20mA,0~20mA Votage: 0~5V, 0~10V Resister: 0~10K, temperature/humidity sensor	
Power Consumption	
< 220mA@24V	
Communication	
Wireless standard	802.11b /g
Frequency range	2.412GHz-2.484GHZ
Transmit power	802.11b:+20dBm(Max.);802.11g:+18dBm(Max.);
Receiving sensitivity	802.11b:-89dBm; 802.11g:-81 DBM;
Environment	
Operating temperature	-40~85°C
Storage temperature	-45~165°C
Humidity range	5~95% relative

4. Instruction

4.1 Hardware specifications

The front view of Data Collector 8CH-IO-WF is shown as Figure 2.

Panel Light: from left to right, from up to down

- 1) ACT: communication activity indicator. Green means the device has received commands from RS485/Ethernet/WIFI, blue means the commands had been correctly identified and returned to the sender.
- 2) PWR: Power indicator.
- 3) Wifi Link: The green blink means wifi in working, blue means wifi establishing.
- 4) Link: connection indicator. Green means the Ethernet connecting, blue means host has made TCP connection with the device, can go data communication.
- 5) DI1~DI8: green means DI1~DI8 input are low level or closed.
- 6) DO1~DO8: green means DO1~DO8 output are relay closed.

The upper side interfaces of 8CH-IO-WF shown as Figure 3 & 4.

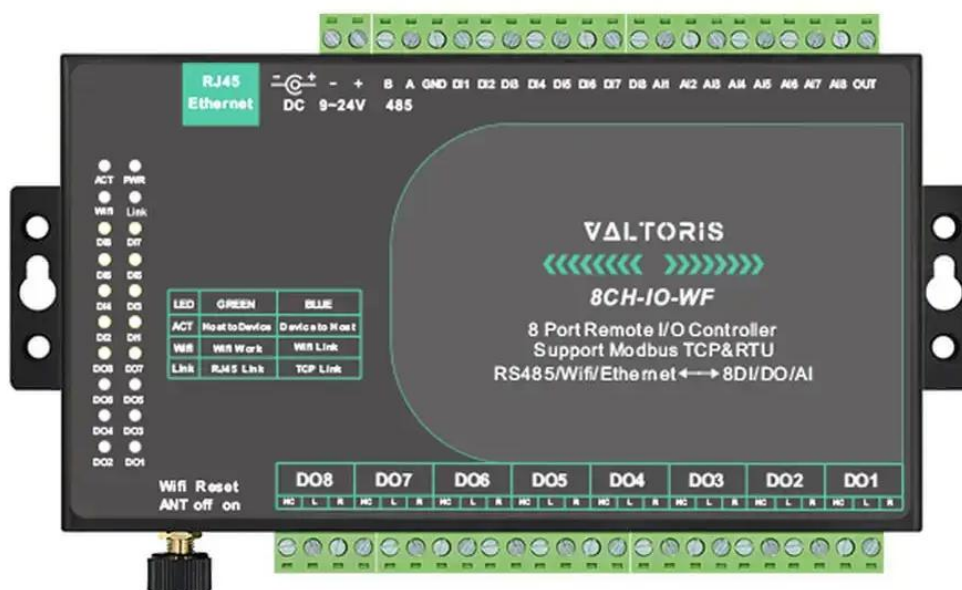


Figure 2 Panel Light



Figure 3 Upper side interfaces

Terminal	Function
RJ45	10M/100M Ethernet port, can do remote IO control via TCP/IP
DC	DC pluggable power input, voltage 9~24V
Power terminal	Terminal power input, voltage 9~24V, optional with DC
RS485 B&A	A & B end of RS485 control port
GND	When dry contact input, bridging switch between the terminal and DI1~DI8, can collect the switch state.
DI1~DI8	8 channels switch value input
AI1~AI4	4 channels 0~5V voltage input
AI5~AI8	4channels 4~20mA current input
OUT	Test output point, can output 5V level, for test usage of AI1~AI8

The down side interfaces of 8CH-IO-WF shown as Figure 4.



Figure 4 Down side interfaces

Interface	Function
Wifi ANT	Wifi antenna port
Reset	To "On" for over 3 seconds, can reset IP address to default 192.168.1.254
DO8~DO1	R and L represent the 2 contacts of relay, here for 8 channels relay output

4.2 Software description

Through the RS485 interface, you can control DO and read DI/AI, using Modbus RTU command.

Alternatively, the modbus tcp/rtu command can be used to communicate over a network port.

The following is the Modbus rtu protocol. Modbus tcp needs to be converted.

Table 2 Summary of Modbus registers

Function code	Function	Address range
01/02	Read DI	0 to 7 (corresponding to DI1 to DI8)
01/02	Read DO	16~23 (corresponding to DO1 to DO8)
05	Set DO	16~23
15	Set multiple DO	16~23
04	Read AI	0~7 (corresponding to AI1 to AI8)

1. DI Description

Read single coil group instruction 0x01, read DI state, instruction format is as follows:

Byte	1	1	1	1	1	1	1	1
Name	Device Address	Instruction type	initial address high	initial address low	length High	length Low	CRC high	CRC low

For eg. Read 8 data: send->01 01 00 00 00 08 3d cc

return->01 01 01 80 50 28

When the DI input is low, the corresponding bit is returned as 1.

2. DO Description

Set DO by imposing the single coil instruction 0x05 in the following format:

Bytes	1	1	1	1	1	1	1	1
No.								
Name	Device address	Instruction Type	initial address high	initial address low	length high	Length low	CRC high	CRC low

For eg. Set up D01 as close, send ->01 05 00 10 ff 00 8d ff

Return ->01 05 00 10 ff 00 8d ff

The current coil state can be read using the 01 instruction, which is used in the same way as the DI instruction.

For eg. Instructions fd instructions as followings :

DO1 close (DO1) 01 05 00 10 ff 00 8d ff

Return: 01 05 00 10 ff 00 8d ff

1 disconnect 01 05 00 10 00 00 cc 0f

Return: 01 05 00 10 00 00 cc 0f

DO2 close(DO2) 01 05 00 11 ff 00 DC 3f

Return: 01 05 00 11 ff 00 DC 3f

2 disconnect 01 05 00 11 00 00 9d cf

Return: 01 05 00 11 00 00 9d cf

DO3 close(DO3) 01 05 00 12 ff 00 2c 3f

Return: 01 05 00 12 ff 00 2c 3f

3 disconnect 01 05 00 12 00 00 6d cf

Return: 01 05 00 12 00 00 6d cf

3. AI Description

Get data by reading hold register instruction 0x04, instruction format:

Bytes	1	1	1	1	1	1	1	1
Name	device address s	Instruction Type	initial address high	initial address s low	Lengt h high	Length low	CRC high	CRC low

For example, read 8 registers at once:

Send->01 04 00 00 00 08 f1 cc

Return->01 04 10 00 00 00 00 00 00 00 00 00 00 00 01 b4 54 cb

The resulting 01 b4 is the value of AI8, converted to 436 in decimal form, real voltage value is $692 * 5 / 1024 = 2.129$ (V) .

If it is the last four current modes, it needs to be converted to the current value, and the corresponding current value is $692 * 5 / 1024 / 100 = 0.02129$ (A) = 21.29 (mA) .

5. Function test

5.1 Configure network parameters

Using VIRCUM software, click Device Management - Auto Search to find the device parameters with the default IP address 192.168.1.200, as shown in the below Figure 5.

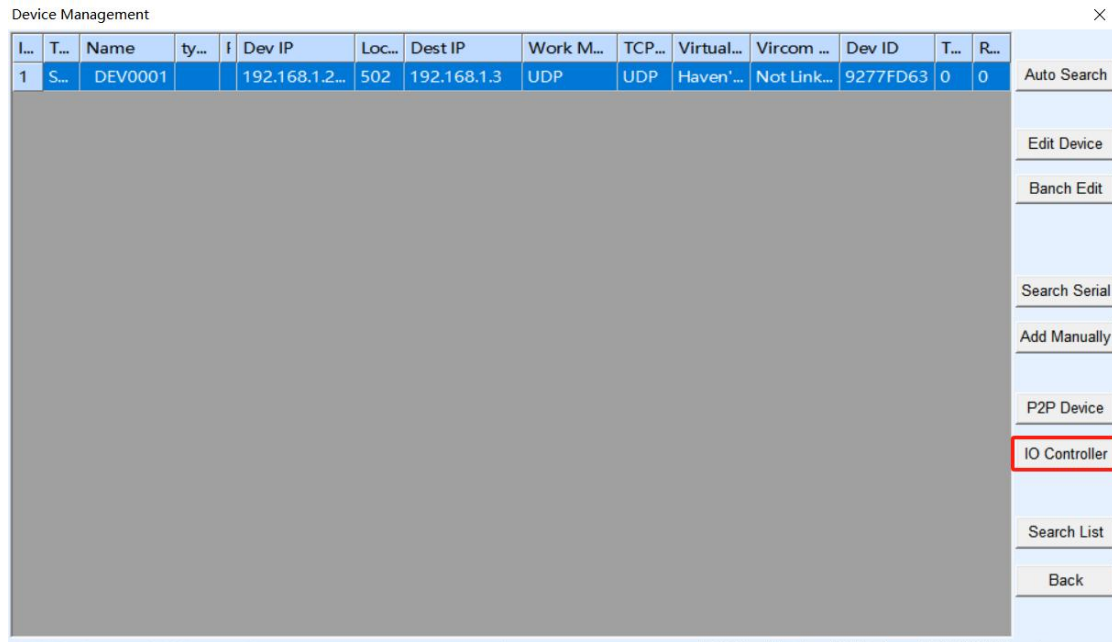


Figure 5 Automatic search

After the device is found, double-click it or click "Edit Device" to enter the configuration page. It requires few configuration parameters; only network parameters and protocol conversion need to be configured. After making changes, click "Modify Settings." A screenshot of the configuration page is shown below.

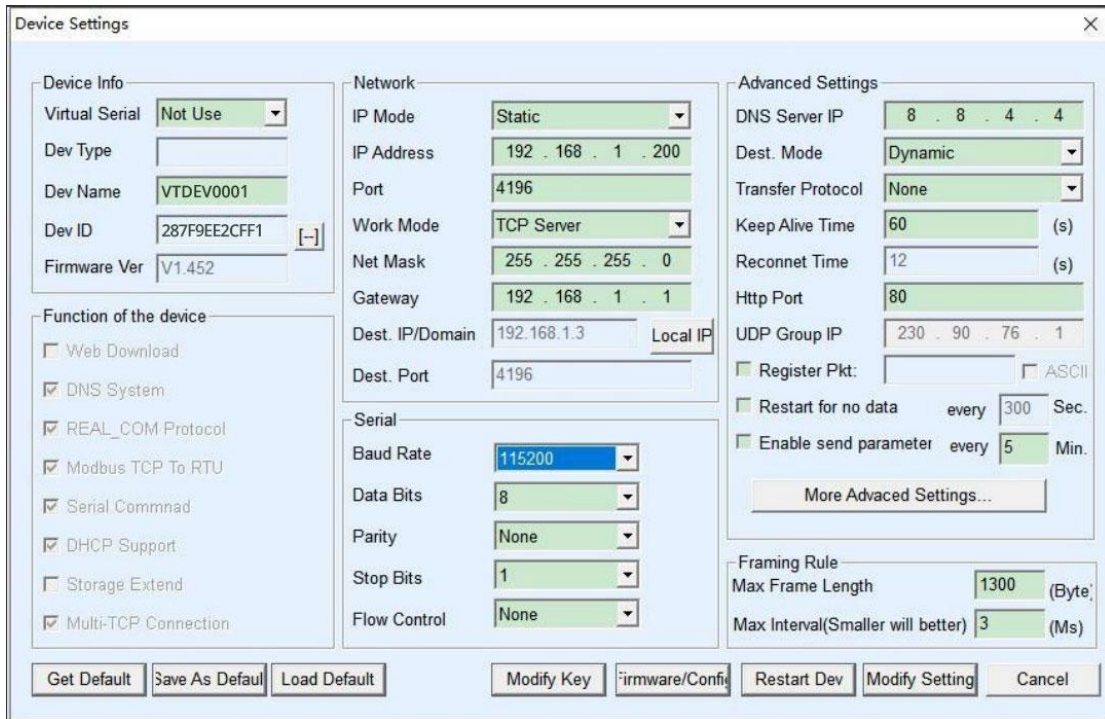


Figure 6 Setting Interface

Network-related parameters that need to be configured include IP address, port, subnet mask, and gateway. These network parameters must be set to the same subnet as the local area network (LAN). As shown in the image below, the left side shows the parameter settings for our device, and the right side shows the parameter settings for computer within the LAN.

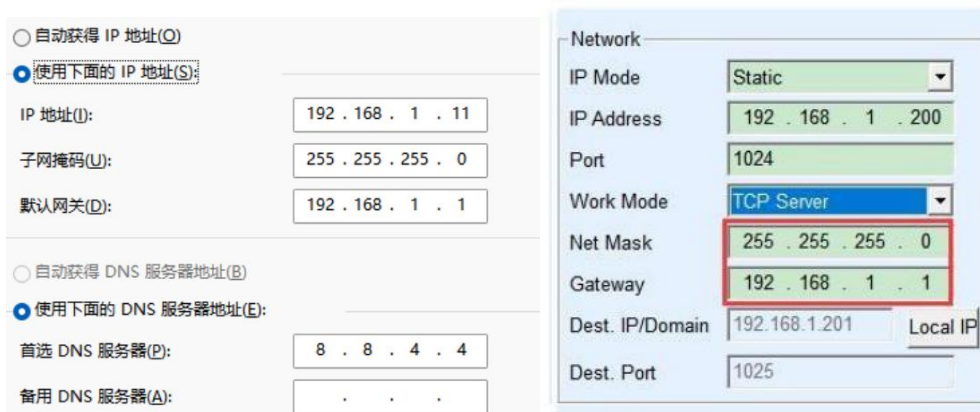


Figure 7 Network Setting

It supports MODBUS RTU and MODBUS TCP protocols. When the conversion

protocol is set to none, 8CH-IO-WF uses the MODBUS RTU protocol. When the conversion protocol is set to MODBUS TCP, 8CH-IO-WF becomes the MODBUS TCP protocol.

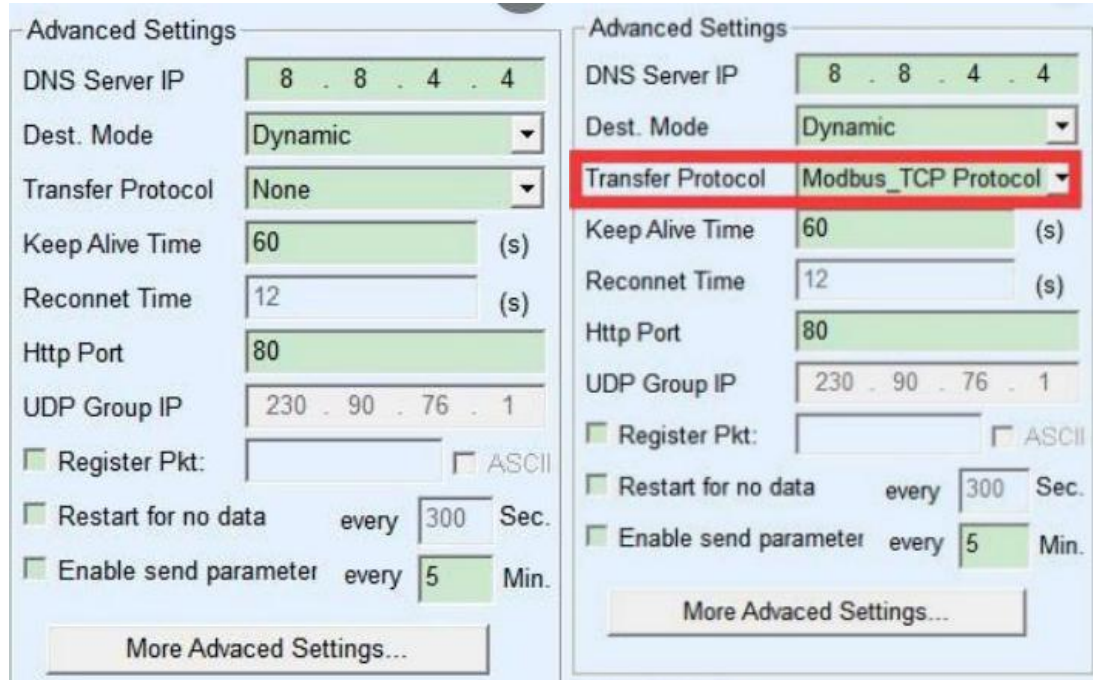


Figure 8 Modbus RTU/TCP Setting

5.2 Software functions Test

Using the latest VIRCOM software, configure the test using the IO controller, as shown in Figure 9. Note that when the conversion protocol in Figure 8 is selected as "None", the device uses the MODBUS RTU protocol. When the conversion protocol is set to MODBUS TCP, please also select MODBUS TCP on the test page.

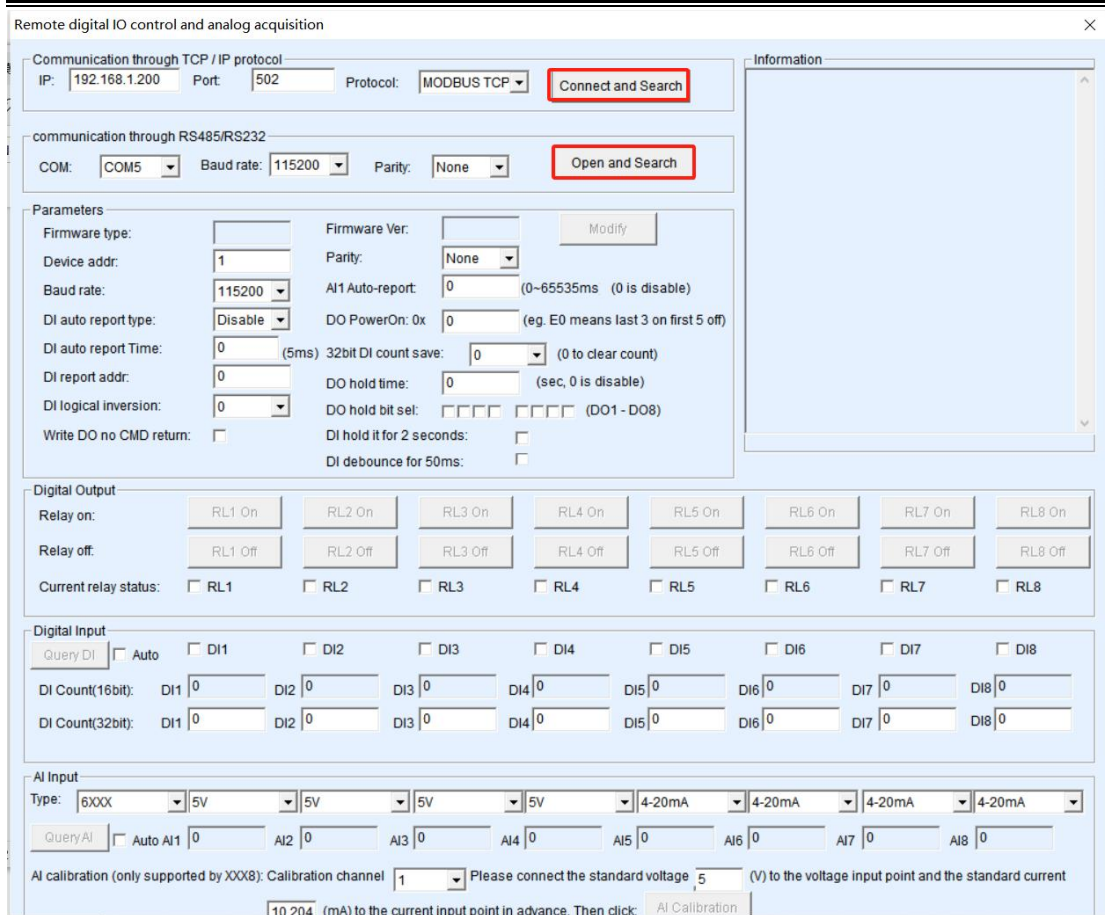


Figure 9 software testing

5.3 Parameter Setting

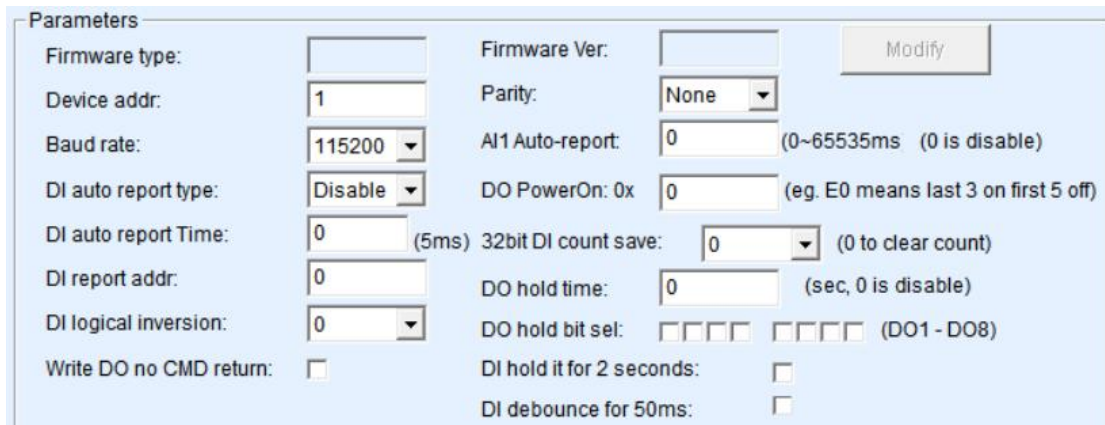


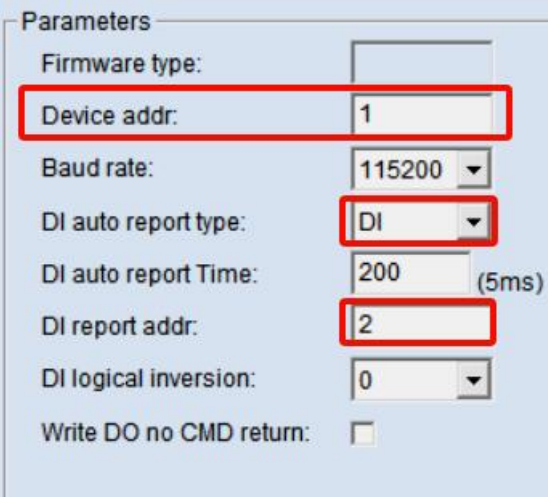
Figure 10 parameter interface

The corresponding baud rate, device address, and active reporting of AI and DI can be configured.

6. DI actively uploads

8CH-IO-WF is standard Modbus device, use question and answer form. Some users want active return function, here we introduce the active reporting function of 8CH-IO-WF.

As Figure 11, set "Enable DI initiative upload" to 1, the function open. The reporting address can be set at 0~255, it will be filled to the address field in the feedback instruction. If want original type, set to 0.



The screenshot shows a 'Parameters' dialog box with the following settings:

Parameter	Value
Firmware type:	
Device addr:	1
Baud rate:	115200
DI auto report type:	DI
DI auto report Time:	200 (5ms)
DI report addr:	2
DI logical inversion:	0
Write DO no CMD return:	<input type="checkbox"/>

Figure 11 DI proactively reports

7. AI Active Reporting

The active reporting function of AI is to enable the collected analog quantity to be automatically sent to the upper computer. This method does not need Modbus instruction query on the host computer, and is very useful for network analog monitoring based on Internet.

The value ranges from 0 to 65535. The unit is ms. If the value is set to 0, active reporting is disabled. You can directly set this parameter in the IO controller dialog box.

Parameters				
Firmware type:	<input type="text"/>	Firmware Ver:	<input type="text"/>	<input type="button" value="Modify"/>
Device addr:	<input type="text" value="1"/>	Parity:	<input type="text" value="None"/>	
Baud rate:	<input type="text" value="115200"/>	AI1 Auto-report:	<input type="text" value="1000"/>	(0~65535ms (0 is disable))
DI auto report type:	<input type="text" value="Disable"/>	DO PowerOn: 0x	<input type="text" value="0"/>	(eg. E0 means last 3 on first 5 off)
DI auto report Time:	<input type="text" value="0"/> (5ms)	32bit DI count save:	<input type="text" value="0"/>	(0 to clear count)
DI report addr:	<input type="text" value="0"/>	DO hold time:	<input type="text" value="0"/>	(sec, 0 is disable)
DI logical inversion:	<input type="text" value="0"/>	DO hold bit sel:	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	(DO1 - DO8)
Write DO no CMD return:	<input type="checkbox"/>	DI hold it for 2 seconds:	<input type="checkbox"/>	
		DI debounce for 50ms:	<input type="checkbox"/>	

Figure 12 Setting the AI active reporting time in the IO controller

The instructions actively uploaded by AI are:

- When converting protocol to Modbus RTU:01 04 10 H1 L1 H2 L2 H3 L3 H4 L4 H5 L15 H6 L6 H7 L7 H8 L8 C1 C2
- When converting protocol to Modbus TCP:00 00 00 00 00 13 01 04 10 H1 L1 H2 L2 H3 L3 H4 L4 H5 L15 H6 L6 H7 L7 H8 L8

Here H1 L1 represents the collection amount of A1, H2 L2 represents the collection amount of A2, and so on, in big-endian format. C1 and C2 are CRC.

If there is a device parameter search before the AI initiative report, the AI initiative report will pause for 5 seconds, which can prevent the AI initiative report and parameter search conflict.

8. Two used in pairs

Considering the user needs to control the DO output through DI input, however, DI input devices and the DO output devices are far apart, so we can connect two 8CH-IO-WF through the Ethernet network, to realize DI remote control the DO output. DI inputs only control the corresponding DO.

For example, DI1 of device 1 control DO1 1 of device 2, DI2 of device 1 control DO2 of device 2, and so on.

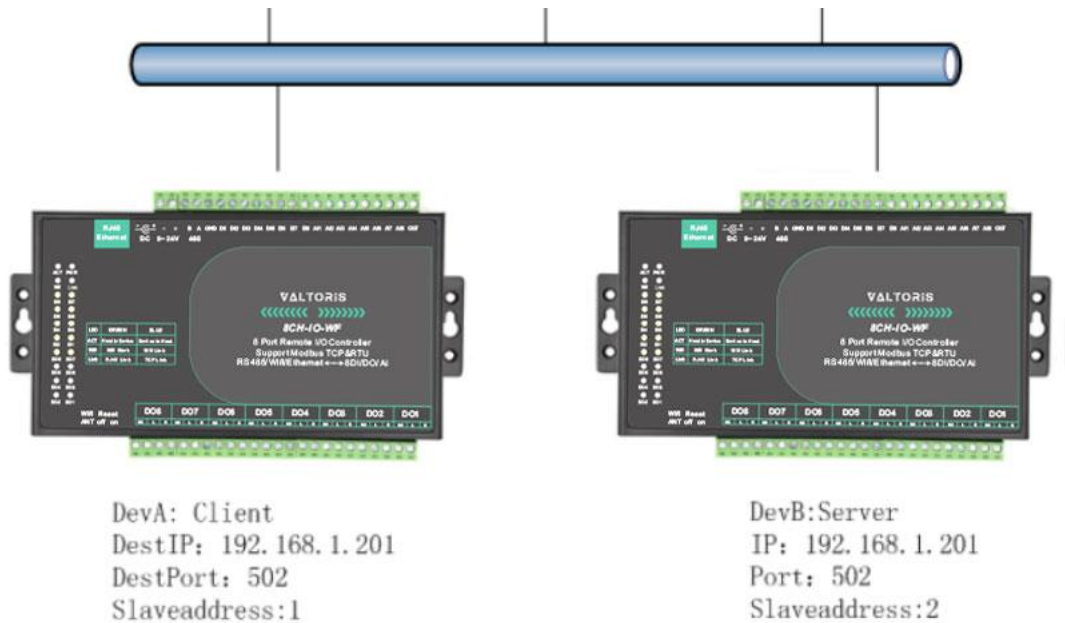


Figure 13 8CH-IO-WF pairs-connection control

As shown in the figure, two IO controllers are connected together via Ethernet. First, you need to set the two IO controllers parameters, including the IP address and whether to report.

Connect device DevA and search for it in the IO controller dialog box. Set device address to 1. Enter 1 in "Report or Not" to enable this function. DevA Settings are complete.

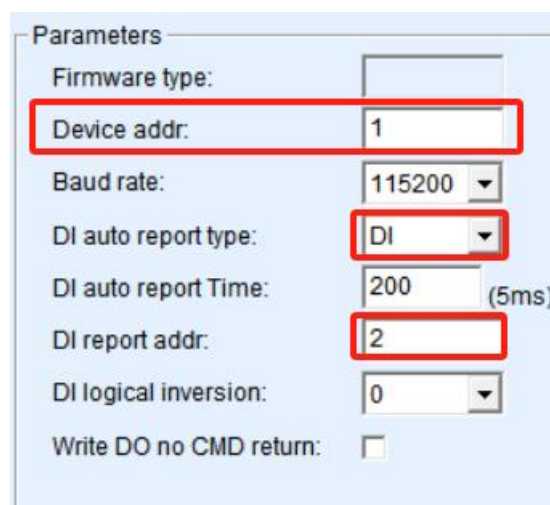
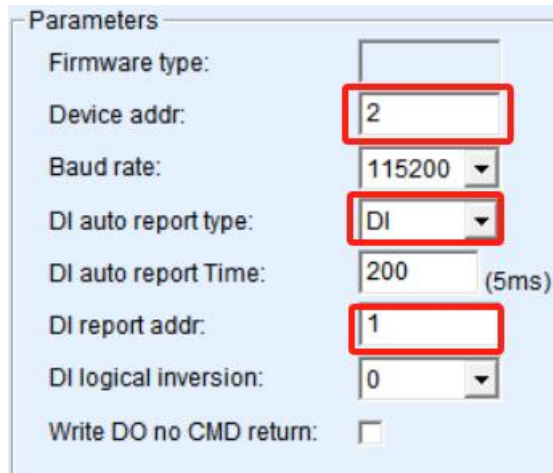


Figure 14 DevA configuration

Then connect the device DevB, search for and set the device address to 2, report whether to set to 1, and report the address to 1 (DevA). With this setup, DevA sends a control DO command to DevB when the DI changes. Similarly, DevB sends a control command to DevA for changes in DI.



Parameters	
Firmware type:	
Device addr:	2
Baud rate:	115200
DI auto report type:	DI
DI auto report Time:	200 (5ms)
DI report addr:	1
DI logical inversion:	0
Write DO no CMD return:	<input type="checkbox"/>

Figure 15 DevB configuration

Configure the DevA and DevB parameters to establish the TCP connection. DevB works in server mode, sets work IP and port, DevA as client mode, sets up DevA's destination IP and port as DevB's IP and port.

9. How to use

Take the software of modbus poll as an example to introduce the use of 8CH-IO-WF.

There are two ways to communicate with 8CH-IO-WF, namely virtual serial port and Modbus TCP. In the case of Modbus TCP, the host software is used as the main station of Modbus TCP to query the corresponding Modbus register address of 8CH-IO-WF, and the conversion protocol parameter of 8CH-IO-WF is configured as "Modbus TCP to RTU". Using the virtual serial port, the host software uses the Modbus RTU protocol to open the virtual serial port created by Vircom and communicates directly with 8CH-IO-WF via virtual serial port.

Open the modbus poll software as shown in figure 16:

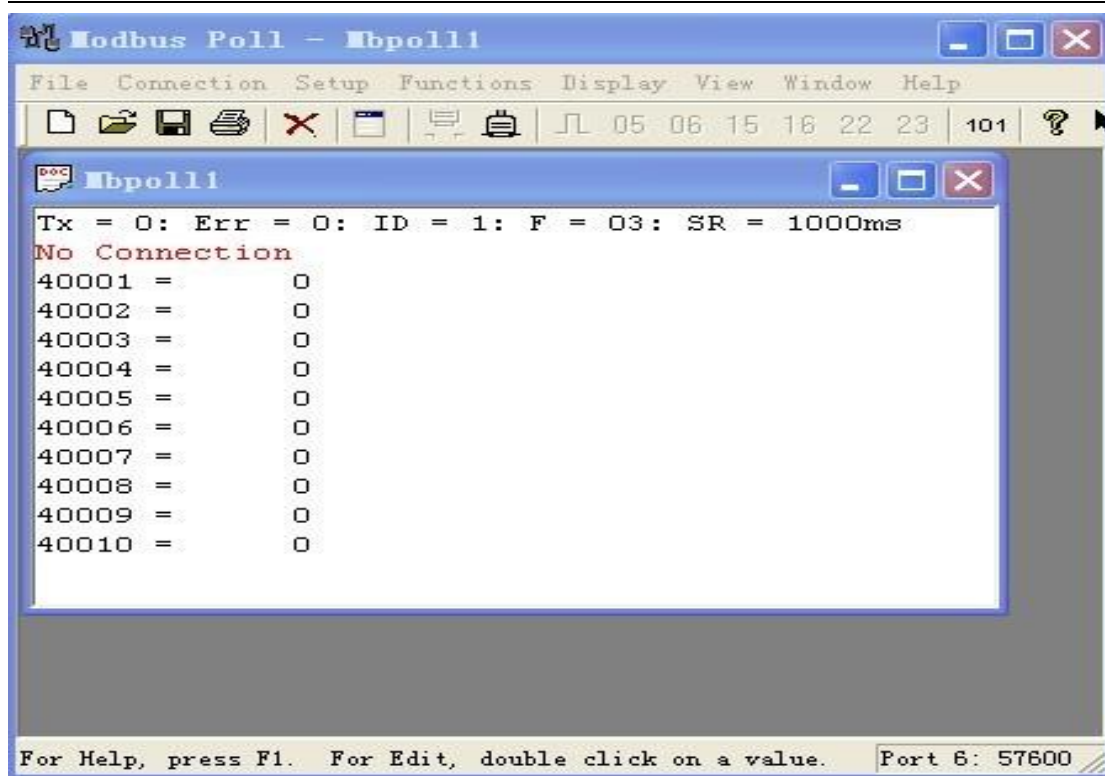


Figure 16

Then click SETUP to configure a POLL1 to query DI as shown in figure 17:

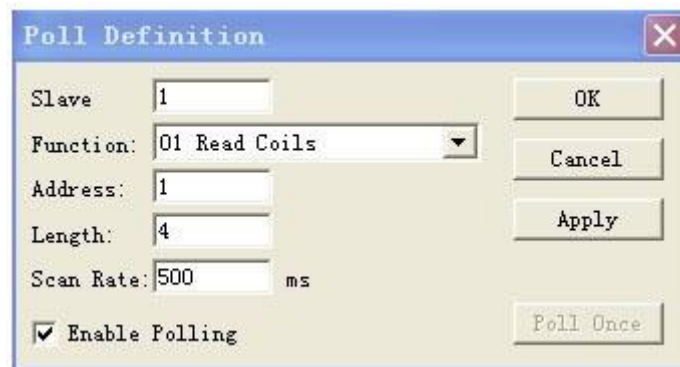
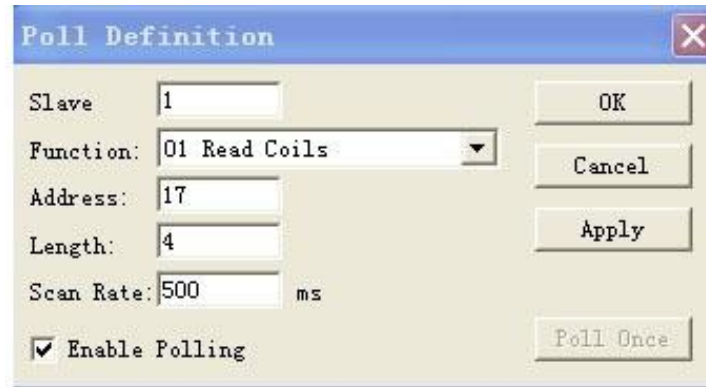


Figure 17

Then create another POLL2 and configure it to query and control DO as shown in figure 18:

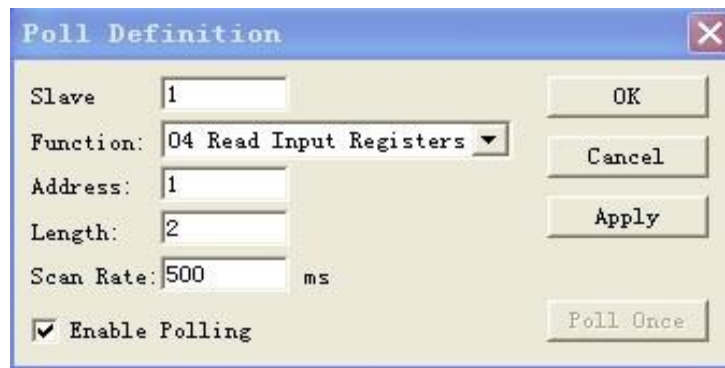


The dialog box titled "Poll Definition" contains the following fields and controls:

- Slave: 1
- Function: 01 Read Coils
- Address: 17
- Length: 4
- Scan Rate: 500 ms
- Enable Polling
- Buttons: OK, Cancel, Apply, Poll Once

Figure 18

Then create another POLL3 and configure it to query and control AI as shown in figure 19:



The dialog box titled "Poll Definition" contains the following fields and controls:

- Slave: 1
- Function: 04 Read Input Registers
- Address: 1
- Length: 2
- Scan Rate: 500 ms
- Enable Polling
- Buttons: OK, Cancel, Apply, Poll Once

Figure 19

When the above operations are completed, you will see the following figure 20:

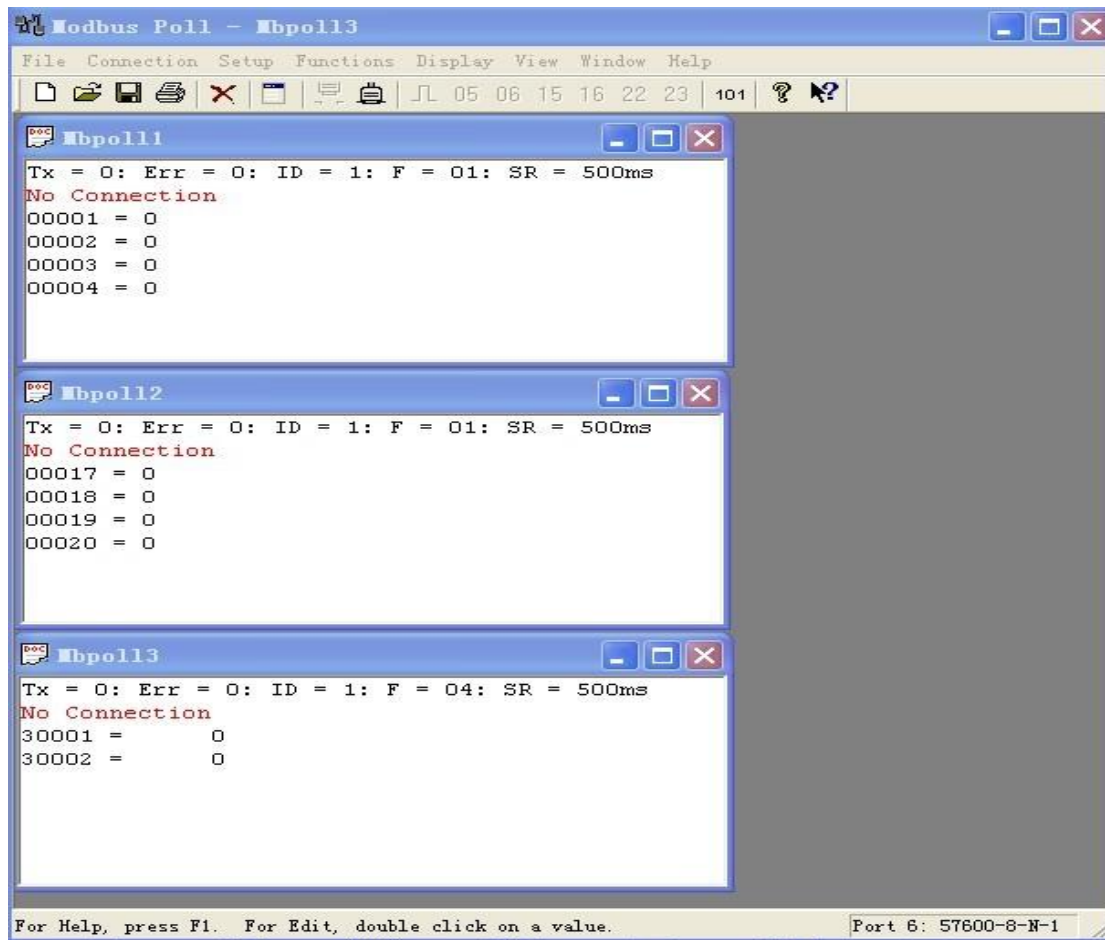


Figure 20

Next, the virtual serial port is shown in figure 21. According to the following configuration, press the OK button to establish the communication with 8CH-IO-WF.

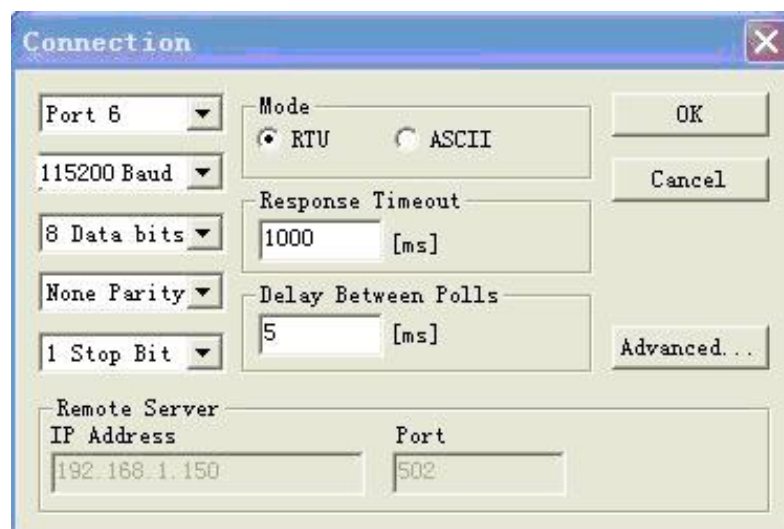


Figure 21

The following is the MODBUS TCP as shown in figure 22, according to the following configuration, press OK button to communicate with 8CH-IO-WF.

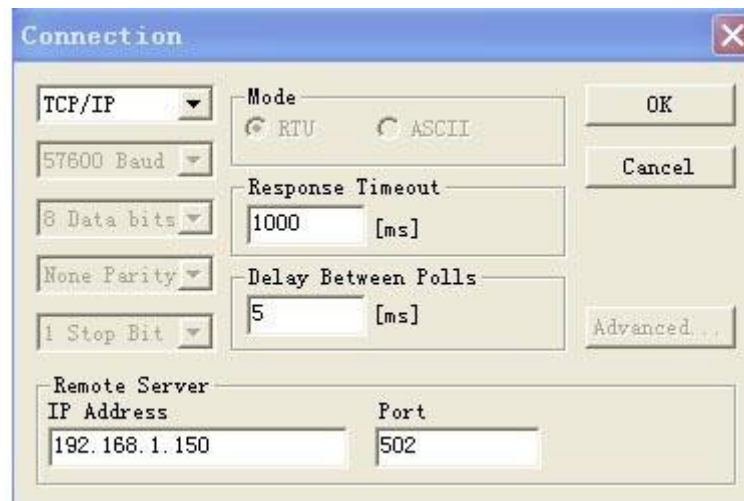


Figure 22

For the configuration of Wifi, please refer to product manual <VT-WF100 >.

10. After-sales service and Technical Support

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