ZHC1921 Application Guidance

Ethernet series

Version: ZHC1921_Application Guide_V1.1

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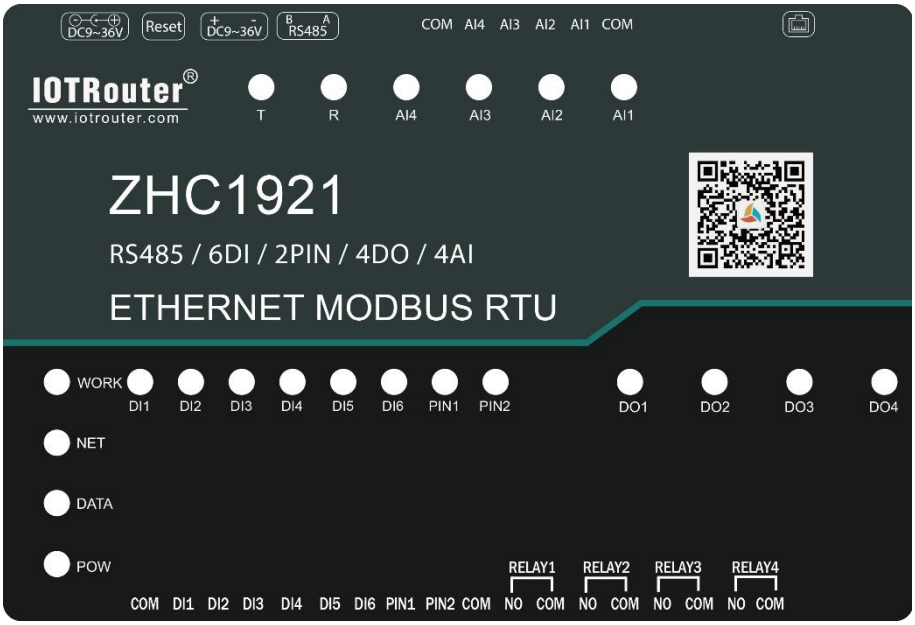
Contents

1 Overview

1.1 Product Introduction

ZHC1921 is a network IO product that supports 6-way dry (wet) node detection, 4-way relay (COM, NO) output, 4-way analog (current 4~20mA) detection, and 1-way serial port transparent transmission, compatible with Modbus RTU/TCP protocol. With "remote control" as the core of the function, it is highly easy to use, and users can easily and quickly integrate into their own systems to achieve remote based on Ethernet and RS485withLocal control.

1.2 Appearance



Ethernet: RJ45interface
DC power supply: 5.5*2.5mm, 9~36V
Reset: Reset button
Serial port: RS485, 5.08mm terminal block

RELAY: RELAY1~RELAY44 relay outputs
DI: DI1~DI6 Input detection for 6 wet/dry nodes
PIN: PIN1~2 is 2 pulse input count
AI: AI1~4Detection for 4 current inputs

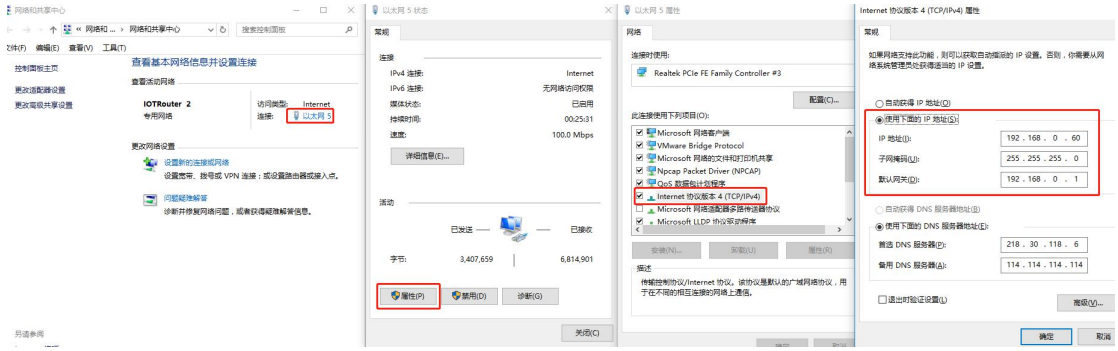
2. Product features

2.1. WEB configuration

2.1.1. Wiring method

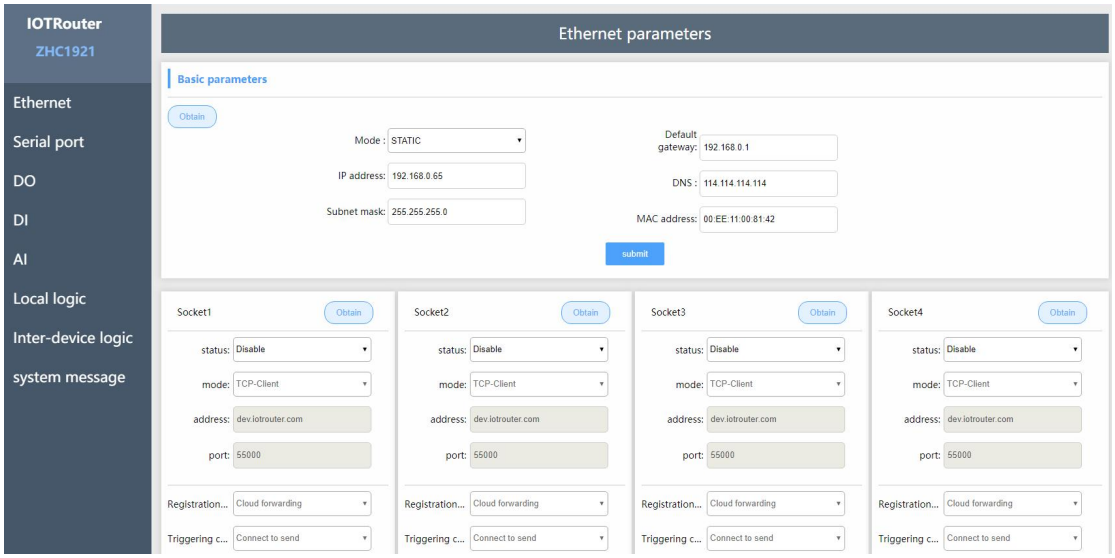
Connect the network port of the computer to the network port of the device with an Ethernet cable. After the device is powered on, observe that the WORK indicator should flash for 3s, indicating that the network hardware environment of the device is normal and Ethernet data can be exchanged.

The default IP address of ZHC1921 is 192.168.0.65. The configuration requires that the computer and ZHC1921 IP be set to the same IP address segment, otherwise the device and the computer cannot communicate. As shown in the figure below:



Open a browser and enter 192.168.0.65 in the address bar.

To enter the configuration page:



2.1.2. Basic functions

ZHC1921 has built-in parameter configuration webpage. Users who use this device do not need to pay attention to the relevant holding registers of the device. They only need to understand the reported data of the device. The following figure shows the recommended registers:

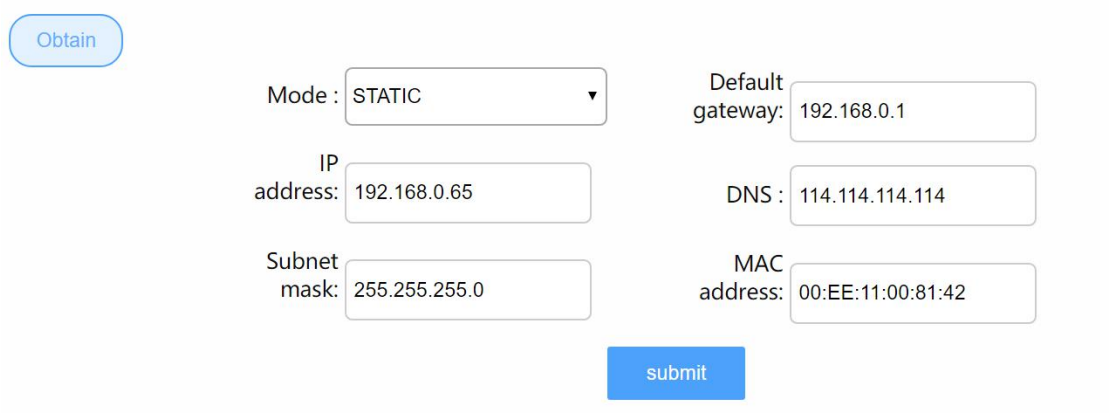
南向接口寄存器								
线圈 0x00	DO	00001	0x0000	1	DO1开关量输出	读/写	0x0000/0xFF00 (0x05功能码) 0_bit/1_bit (0x01、0x0F功能码)	0x01（读线圈） 0x05（写单个线圈） 0x0F（写多个线圈）
		00002	0x0001		DO2开关量输出			
		00003	0x0002		DO3开关量输出			
		00004	0x0003		DO4开关量输出			
	保留							
触点 0x01	DI	10001	0x0000	1	DI1开关量输入	只读	0_bit/1_bit	0x02（读离散量）
		10002	0x0001		DI2开关量输入			
		10003	0x0002		DI3开关量输入			
		10004	0x0003		DI4开关量输入			
		10005	0x0004		DI5开关量输入			
		10006	0x0005		DI6开关量输入			
	保留							
输入寄存器 0x03	AI	30001	0x0000	1	AI1输入值	只读	unsigned short,单位(V/mA)	0x04（读输入寄存器）
		30002	0x0001		AI2输入值			
		30003	0x0002		AI3输入值			
		30004	0x0003		AI4输入值			
	保留							
	PI	30529	0x0210	1	PI1脉冲计数	只读	0~65535	0x04（读输入寄存器）
		30530	0x0211	1	PI2脉冲计数			
	保留							

This document describes the WEB configuration items in the corresponding section.

2.2. Network

2.2.1. Basic parameters

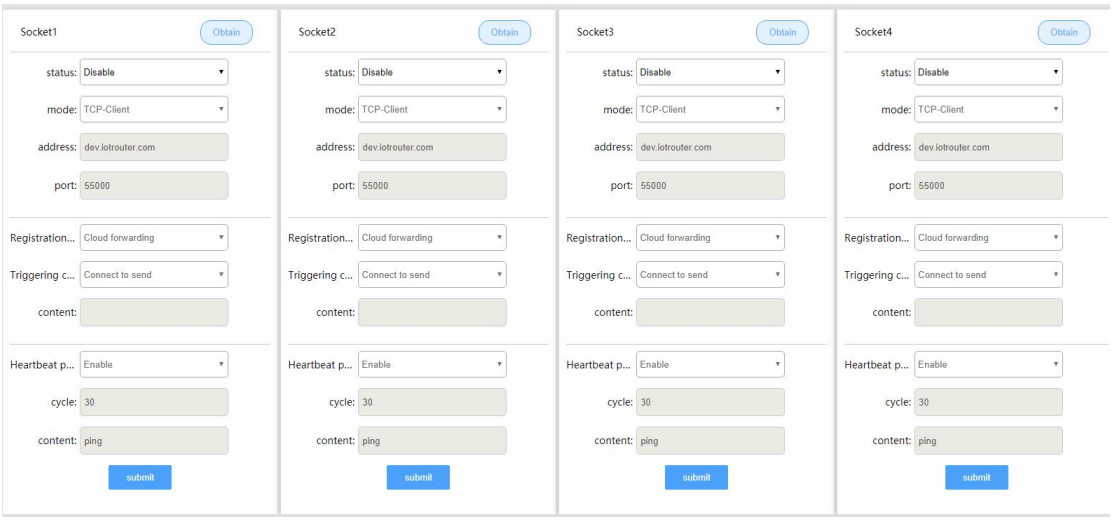
ZHC1921 provides one RJ45 Ethernet communication.



Project	Parameter
Mode	STATIC: Static IP is required to be set manually by the user. In the process of setting, attention should be paid to write IP, subnet mask and gateway at the same time. Static IP is suitable for the scenario that requires statistics of IP and devices and one-to-one correspondence. ◆Advantages: All devices that can not be assigned an IP address can be searched through the broadcast mode of the entire network segment. ◆ Disadvantages: Different network segments in different LANs can't carry out normal TCP/UDP communication. DHCP: The main function of DHCP is to dynamically obtain the IP address, Gateway address, DNS server address and other information from the gateway host, thereby eliminating the tedious steps of setting the IP address. It is applicable to scenarios where there is no requirement for IP, and it is not required to have a one-to-one correspondence between IP and module. ◆Advantages: Access to routers and other devices with DHCP Server can communicate directly, reducing the trouble of setting the IP address gateway and subnet mask. ◆ Disadvantages: access to a network without DHCP Serve, such as directly connected to a computer, the device will not work properly.
IP address	The IP address is the identity of the module in the local area network. It is unique in the local area network, so it cannot be repeated with other devices in the same local area network. ◆The device supports two acquisition methods: static IP and DHCP.
Subnet mask	The subnet mask is mainly used to determine the network number and host number of the IP address, indicate the number of subnets, and determine whether the module is in the subnet. ◆The subnet mask must be set. Our commonly used type C subnet mask: 255.255.255.0, the network number is the first 24 bits, the host number is the last 8 bits, the number of subnets is 255, and the module IP is in 255 Within the range, the module IP is considered in this subnet

Default gateway	Gateway refers to the network number of the module's current IP address. If the device such as router is connected to the external network, the gateway is the IP address of the router; if the setting is wrong, the router cannot be connected to the external network correctly; if the device such as router is not connected, no setting is required and the default is ok
DNS	The DNS server is mainly used to convert the domain name into a network-recognizable IP address. Users can set specific DNS server address.
MAC address	The MAC address is used to confirm the network equipment. ◆Device MAC address is generated based on device ID

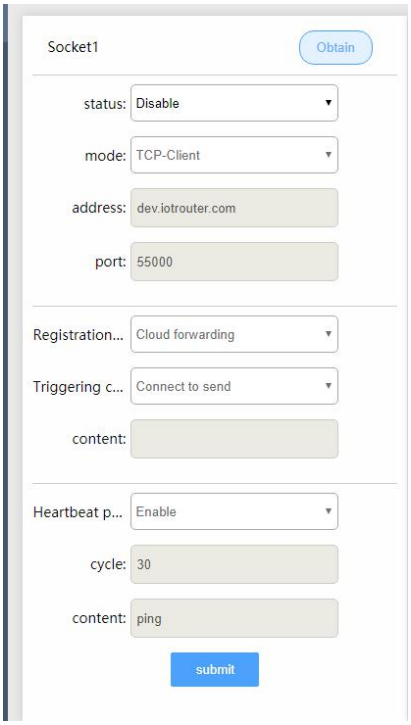
2.2.2. Network Connection



Project	Attributes	Parameter
status	Whether to enable the current socket	Enable/disable
mode	The role of Ethernet communication	TCP Client TCP Server ◆MQTT Client
address	Specify the address of the remote server to connect to as the client	◆Support domain name resolution ◆TCP Sever mode is not selectable
port	Port used to establish connection	In Client mode, the port of the destination server In Server mode, the port of the current socket
Registration package	After establishing a TCP connection, send the specified data to the server to facilitate the server to mark the current socket data source	Cloud forwarding: connect to the necessary registration package of "Horizontal Cloud Platform" Custom: Customize the content of the registration package, support up to 200 bytes DEVID: unique device number Disabled: turn off the registration package function
Triggering conditions	Trigger condition for sending registration package	Connection sending: send specified registration package immediately after establishing TCP connection Data Carrying: temporarily unavailable
content	Registration package content	Customize the content of the registration package, only the "custom" mode is available
Heartbeat bag	Used to maintain a long TCP connection	Enable/disable TCP Client TCP Server mode takes effect

cycle	Heartbeat package cycle	0~65535 s
content	Heartbeat package content	Support customization, up to 40 bytes

◆ZHC1921 Socket1 Support MQTT



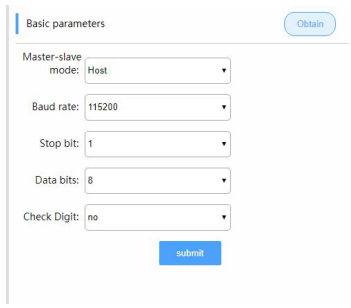
Project	Attributes	Parameter
Client ID	Device ID	Support up to 60 bytes
username	username	Support up to 60 bytes
password	password	Support up to 60 bytes
subscriptionTopic1	subscriptionTopic1	Support 1 Topic temporarily
subscriptionTopic2	subscriptionTopic2	
releaseTopic1	releaseTopic1	Topics in response to requests
Release Topic2	Release Topic2	Unsolicited topic
KeepAlive	MQTT Heartbeat cycle	0~65535s
CleanSession	Clear the session flag	Only "Clean Session" is supported

2.2.3. Wiring Method

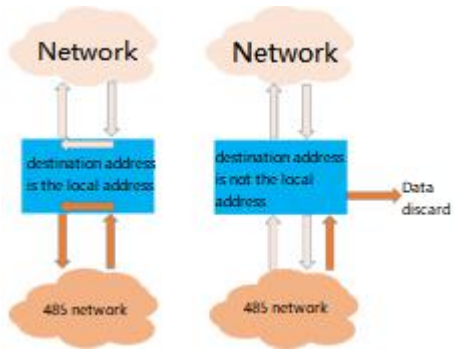
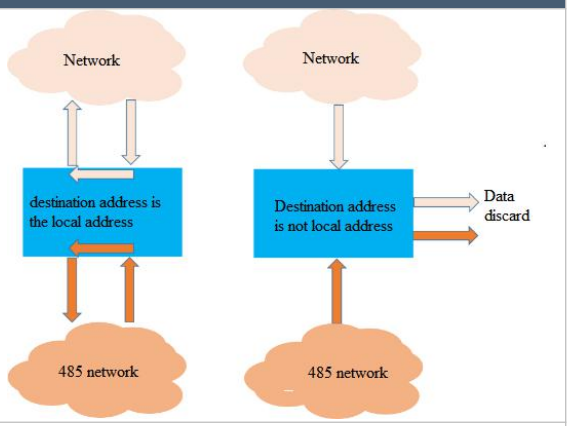
Set up ZHC1921 After the parameters, use the Ethernet cable to connect the network port of the network device (router/switch/other) and ZHC1921The network port of the device is connected. After the device is powered on, observe that the WORK indicator should flash for 3s, indicating that the network hardware environment where the device is located is normal and Ethernet data can be exchanged.


2.3 Serial RS485

2.3.1. Basic Parameters

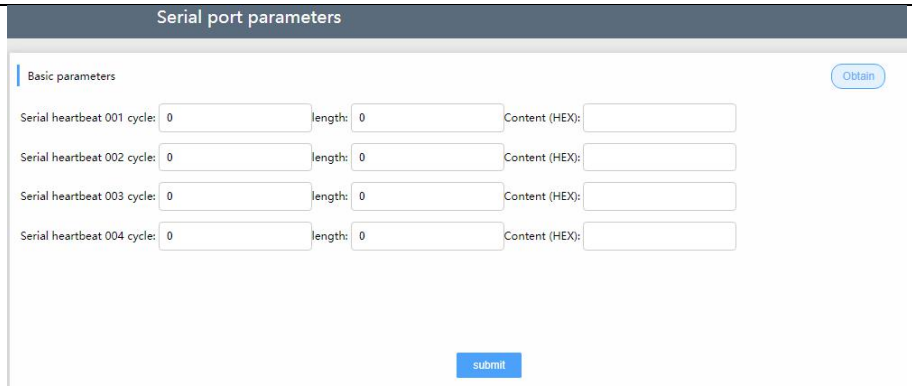


Project		Attributes	Parameter
Master-slave mode		Role in RS485 communication	Master/slave
Baud rate		Serial port speed	1200~921600bit/s
Stop bit		Stop bit	1/1.5/2
Data bit		Data bit	8/7
Check Digit		Check Digit	None/even parity/odd parity

Host mode	Slave mode
	
The server can send Modbus data (the address is the product address) to communicate with the product. If the sent data cannot be recognized by the product, it will forward such data to the RS485 bus where the product is located; other devices that are on the same RS485 bus as the product can also Send Modbus data (the address is the product address) to communicate with the product. If the data cannot be recognized by the product, forward such data to the server.	The server can send Modbus data (the address is the product address) to communicate with the product. If the sent data cannot be recognized by the product, such data is directly discarded and no longer forwarded; other devices that are on the same RS485 bus as the product can also send Modbus The data (the address is the product address) communicates with the product. If the data cannot be identified by the product, such data is directly discarded and no longer forwarded.

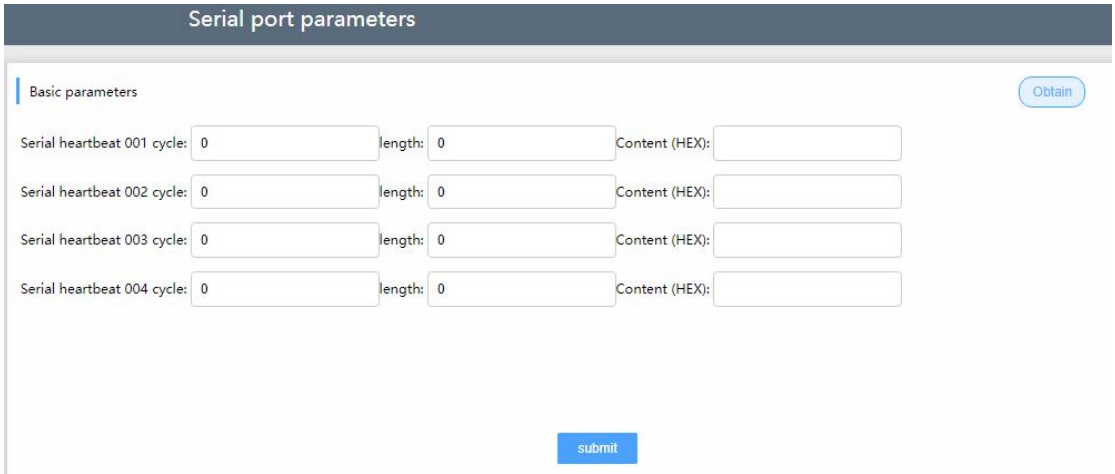
2.3.2. Features

ZHC1921 supports serial sending heartbeat regularly.



Project	Attributes	Parameter
Cycle	Time interval from the heartbeat of the last serial port	0~65535s
Length	Serial heartbeat packet length	0~16
Content	Hex format data	Example: Reading the address code is 0x554 analog inputs 55 04 00 00 00 04 FC 1D

Serial heartbeat application example:



2.4.DO

2.4.1. Read and write status

The Modbus command is sent to the ZHC1921 through the network and the serial port, and the DO state can be read and written.

Project	Parameter
Register address range	00001~00004 (0x0000~0x0003)
Support function code	01, 05, 0F

Take reading the output status of 4-way relay as an example:

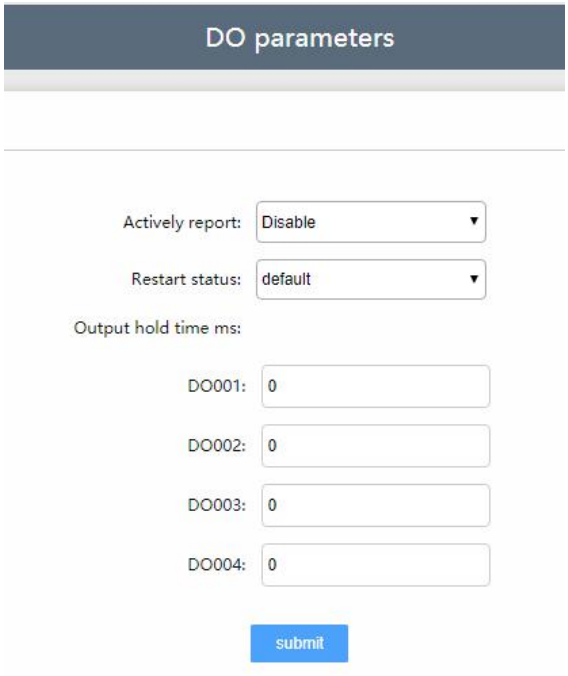
check Inquiries:55 01 00 00 00 04 30 1D
Query response:55 01 01 0F 01 BC

The 1st relay control 05 function code:

Control closed:55 05 00 00 FF 00 8D EB
ring should:55 05 00 00 FF 00 8D EB
Control disconnected:55 05 00 00 00 00 CC 1B
response:55 05 00 00 00 00 CC 1B

2.4.2. Features

ZHC1921 DO supports active reporting, restarting to maintain relay status, output holding time, etc.



Project	Attributes	Parameter
Voluntarily report	Report all DO status values immediately after the DO status changes	Enable/disable
Restart state	Whether the device maintains the last DO output state after power-on	Enable/disable
Output hold time	The new state of DO flips after maintaining the specified time	0,1000~65535ms

2.5.DI

2.5.1. Reading status

The Modbus command is sent to the ZHC1921 through the network and serial port to read the DI status.

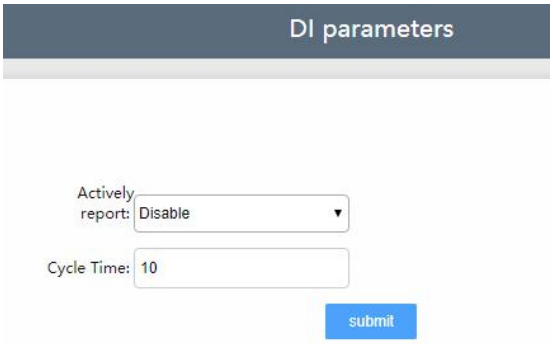
Project	Parameter
Register address range	10001~10006 (0x0000~0x0005)
function code	02

Detection level: The default state is0, The state after giving the input signal is1, The detection method is, Modbus Protocol 02function code.

Take the No. 1 detection as an example:
Inquire:55 02 00 00 00 01 B4 1E
Query response: (detected 0):55 02 01 00 B1 B8
Query response: (detected 1):55 02 01 01 70 78

2.5.2. Features

ZHC1921 DI supports active reporting and periodic reporting.



Project	Attributes	Parameter
Voluntarily report	Whether to enable DI status reporting	Enable/disable
Cycle Time	When there is no change in DI status, the cycle of reporting status	0~65535 s

DI Proactive Reporting Instructions:

If there is no DI status change after power on, press 60s (0x003C) Cyclic reporting. If there is a DI status change, all statuses are reported immediately, and the cycle time is reset.

2.6.AI

2.6.1. Reading status

Calculation formula:

Current value = return value / 1000 Unit: mA

The Modbus command is sent to the ZHC1921 through the network and the serial port, and the AI value can be read.

Project	Parameter
Register address range	30001~30004 (0x0000~0x0003)
function code	04

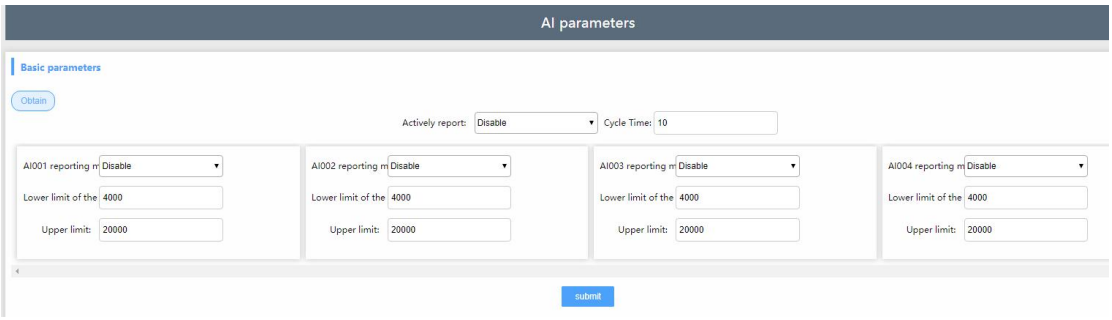
Take the 1st current detection as an example:

check Inquiries:55 04 00 00 00 01 3C 1E

Query response:55 04 02 10 00 82 0C

The returned data is 0x1000, which means 4096uA,I.e. 4.096mA

2.6.2. Features



Project	Attributes	Parameter
Voluntarily report	Whether to enable AI status reporting	Enable/disable
Cycle Time	When there is no change in the AI status, the period for reporting the status	0~65535 s
Reporting mode	Trigger mode for AI status change reporting	Inside/Outside/Disabled
Lower bound	Lower bound of triggering report	4000~20000 uA
Upper bound	Lower bound of triggering report	4000~20000 uA

AI Proactive reporting instructions:

Disable reporting mode: all AI values are reported cyclically according to the set period.

Report within the interval: When the set AI channel value enters the interval from outside the interval, all AI channel values are reported immediately and the cycle time is reset.

Reporting outside the interval: When the set AI channel value enters the interval and goes out of the interval, all AI channel values are reported immediately and the cycle time is reset.

2.7.PI

2.7.1. Reading status

By sending Modbus commands to ZHC1921 through the network and serial port, the PI count value can be read.

Project	Parameter
Register address range	30529~30530 (0x0210~0x0211)
function code	04

Read the two-way PI count:
Inquire:55 04 02 10 00 02 7C 62
Query response: (detected 0):55 04 04 00 00 00 00 EE 41
Query response: (detected 65535):55 04 04 FF FF FF FF EF D5

2.7.2. Clear count

By sending Modbus commands to ZHC1921 through the network and serial port, the PI count value can be cleared.

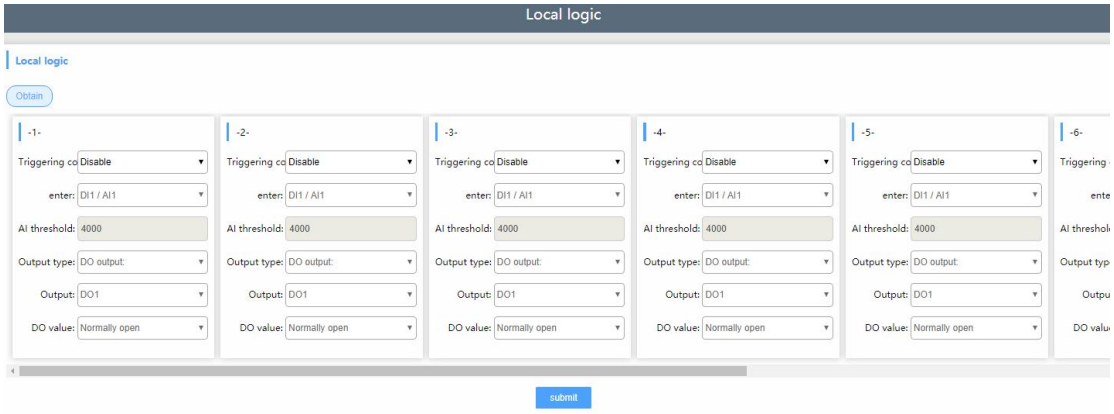
Project	Parameter
Register address range	44481~44482 (0x1180~0x1181)
function code	06, 10

Clear two PI counts:
Write:55 10 11 80 00 02 04 00 00 00 00
Write response:55 10 11 80 00 02 48 C8

2.8. Logic

2.8.1. Local logic

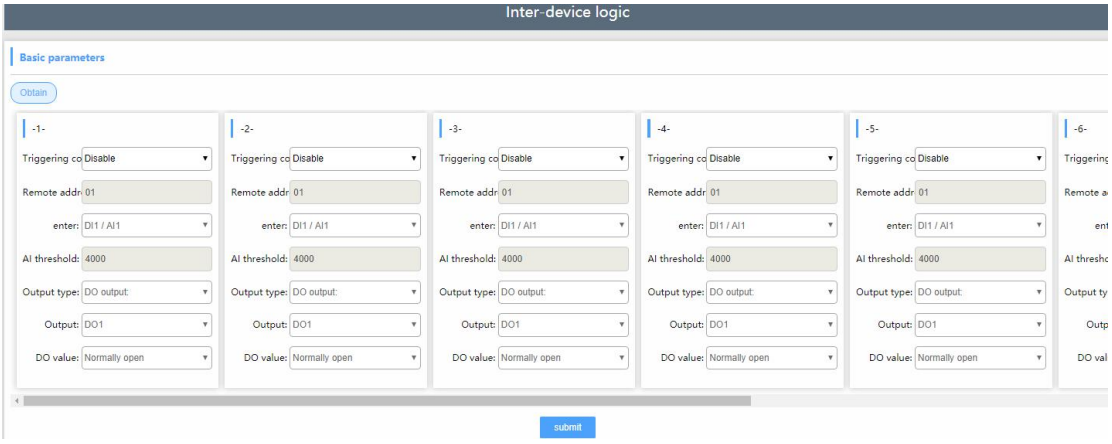
ZHC1921 supports setting 8 local logics.



Project	Attributes	Parameter
Triggering conditions	Logic trigger condition	**Follow positively:**DI closed then DO closed **Follow backwards:**When DI is closed, DO is open, and when DI is open, DO is closed **greater or equal to:**Trigger DO output when AI input is greater than or equal to the set value **Less than or equal to:**Trigger DO output when AI input is less than or equal to the set value **AO follows AI:**AO output value = AI input value Disabled: Turn off local logic
enter	Trigger logic input conditions	Can be specified by DI X, AI X trigger
AI threshold	Trigger logic after AI reaches a certain value **(Greater than or equal to, less than or equal to the mode takes effect)**	0~20000
Output type	Output type after logic trigger	Optional DO
Output	Output channel after logic trigger	DO can be specified X, AO X output
DO value	Specify the value of the DO channel output	Normally open, normally closed, flip

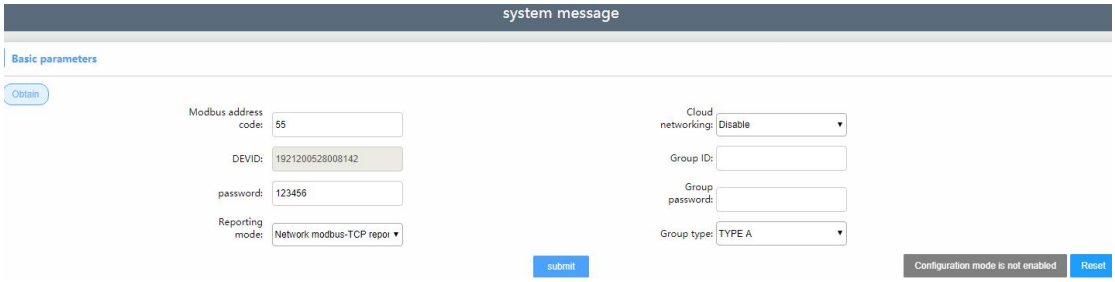
2.8.2. Inter-device logic

ZHC1921 supports setting 8 logics between devices.



Project	Attributes	Parameter
Triggering conditions	Logic trigger condition	**Follow positively:**DI closed then DO closed **Follow backwards:**When DI is closed, DO is open, and when DI is open, DO is closed **greater or equal to:**Trigger DO output when AI input is greater than or equal to the set value **Less than or equal to:**Trigger DO output when AI input is less than or equal to the set value **AO follows AI:**AO output value = AI input value Disabled: Turn off local logic
Remote address	This logic will be triggered when a packet with the specified address code is received	01~FE
enter	Trigger logic input conditions	Can be specified by DI X, AI X trigger
AI threshold	Trigger logic after AI reaches a certain value **(Greater than or equal to, less than or equal to the mode takes effect)**	0~20000
Output type	Output type after logic trigger	Optional DO
Output	Output channel after logic trigger	DO can be specified X , AO X output
DO value	Specify the value of the DO channel output	Normally open, normally closed, flip

2.9. System Information



Project	Attributes	Parameter
Modbus address code	Modbus address code	01~FE
DEVID	The unique factory number	Read only
password	Password used to access the vertical and horizontal cloud platform	Support 16byte
Reporting mode	Format and channel for actively reporting data	Network modbus RTU report Network modbus TCP report Serial Modbus RTU report Serial Modbus TCP report Serial port + network modbus RTU report Serial port + network modbus TCP report
Networking mode	Use networking mode when accessing vertical and horizontal cloud transparent transmission	Enable/Disable
Group ID Group password	Group ID Devices with the same group password can establish a networking mode	Support 16byte
Group type	Within the same group, different types of devices can exchange data	A/B

2.10. Status indicator

Name	Features	Status	State Description
POW	Power Indicator	Always on	System start up
		Always off	System does not start
WORK	System working status indicator	Always off	Network abnormality (IP acquisition failed)
		2000ms off/300ms On/300ms off/300ms on	Abnormal network cable connection detected
		100ms on, 100ms off	Domain name resolution
		Always on	The network is normal
SEND	Network data sending indicator	Always on	default
		Always off	Module does not start
		200ms off	Send network data
RECV	Network data receiving indicator	Always on	default
		Always off	Module does not start
		200ms off	Receive network data
T	Serial port data sending indicator	Always on	Send serial data
		Always off	Serial data not sent
R	Serial port data receiving indicator	Always on	Receive serial data
		Always off	Serial data not received
AI X	Current detection indicator	Always on	Current input >=4mA detected
		Always off	No current input >=4mA detected
DI X	DI level detection indicator	Always on	Dry node closed detected / Wet node input detected
		Always off	No dry node closure detected / No wet node input detected
DO X	DO output indicator	Always on	Relay normally closed
		Always off	Normally open relay

2.11. Restore factory settings

The device can be restored to factory settings by operating the RESET button.

Steps:
Step 1: Power on the device.
Step 2: Hold down the RESET button until the device All the indicators are off, immediately release the reset button, the device restores the factory settings successfully.

If it is found that the serial port of the device starts to actively send JSON data packets after reset, it means that the reset button is pressed for too long, and the device enters the local firmware upgrade mode. At this time, power off the device and restart the reset operation.

2.12. Firmware upgrade

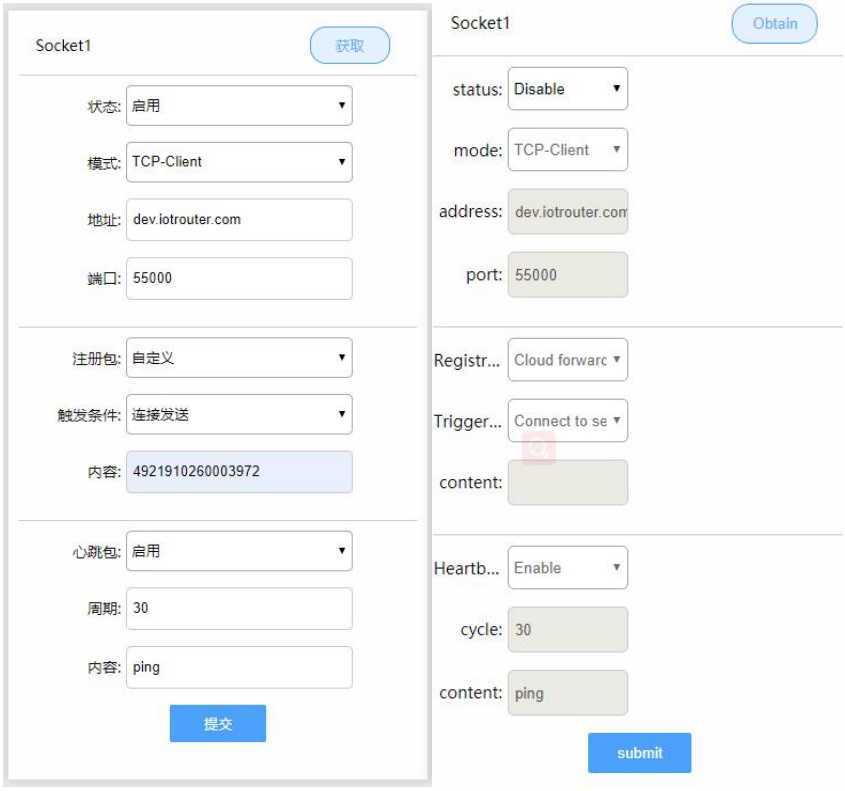
For the firmware upgrade process, please refer to "ZHC1941 Host Computer Instructions"

3. Product Application

3.1. Transparent Cloud

Operation process (take socket1 as an example):

1. Set socket1 parameters



Please confirm the IP address and port of the server to be connected; it is recommended to open the registration package and heartbeat package. If necessary, you can customize it and restart after the setting is completed.

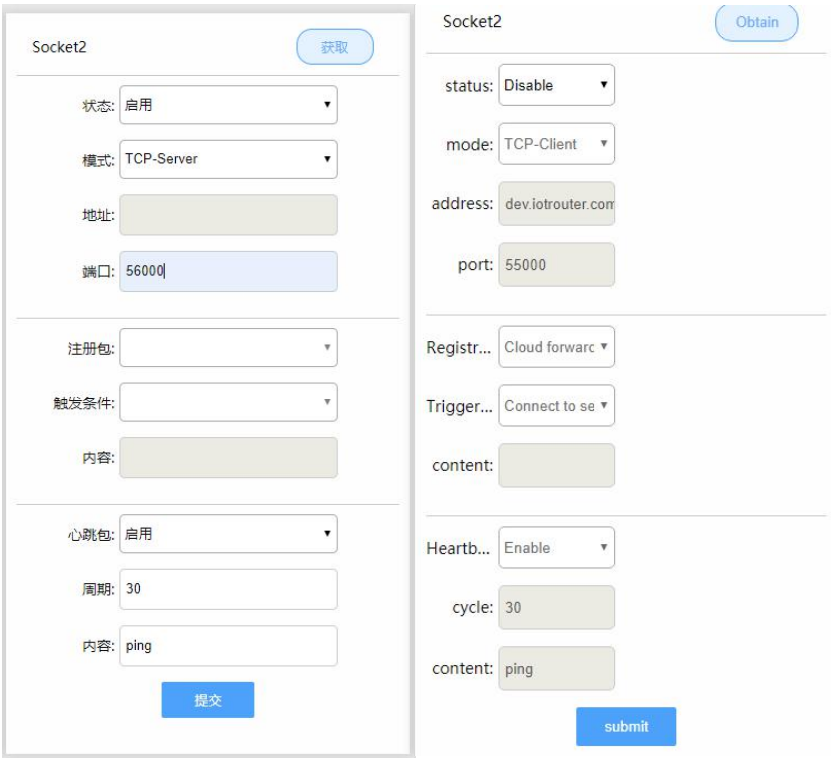
2. Server operation

After the device is connected to the user server, it will send a custom registration package to facilitate the customer to identify the device. After the operation, the customer can Modbus protocol to operate the device, the device adapts to Modbus RTU/TCP protocol.

3.2. Local monitoring

Operation process (take socket2 as an example):

1. Set socket2 parameters



2. Client device operation

Customers can Modbus protocol to operate the device, the device adapts to Modbus RTU/TCP protocol.

3.3. MQTT

Refer to "IOTRouter_Modbus_On_MQTT_Application Guide"

3.4. Vertical and horizontal cloud transparent transmission

Refer to "ZHC1921 Vertical and Horizontal Cloud Transparent Transmission Instructions"

3.5. Vertical and horizontal cloud platform

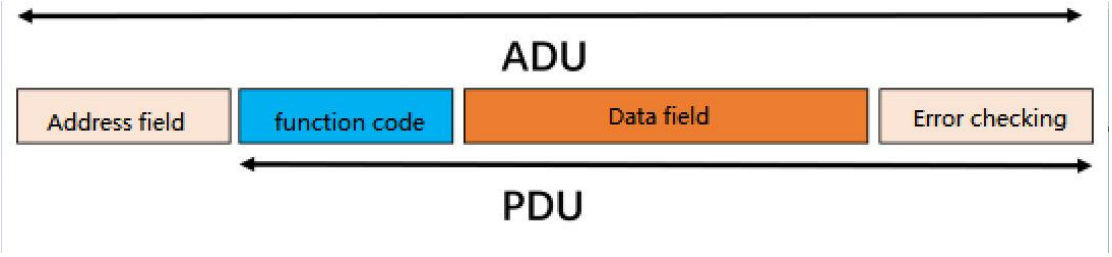
Refer to "ZHC1921 Vertical and Horizontal Cloud Platform User Manual"

4. Modbus command frame

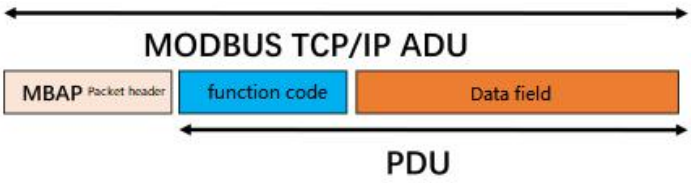
4.1. Modbus command frame

The data format of ZHC1921 follows the general Modbus frame format, and the device can parse Modbus RTU/TCP protocol and perform related operations.

Modbus RTU:



Modbus TCP:



4.2. Register allocation

For register address allocation, please refer to "ZHC1921 Register Address Table"

5. Update history

2020-05-04	nature version V1.0 set up
2020-05-10	Nature versionV1.1 New MQTT application

6. Contact information

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