EBYTE

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Chengdu Ebyte Electronic Technology Co.,Ltd.

Wireless Modem

USER MANUAL

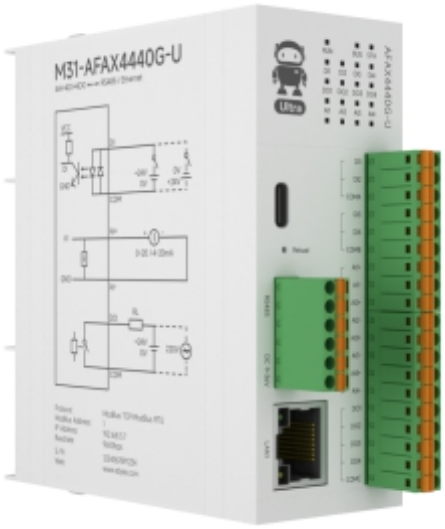
M31-U Series High Performance Distributed IO Host

Table of Contents

I. Product Overview

1.1 Product Introduction

This high-performance distributed IO host supports standard Modbus TCP and Modbus RTU protocols and is suitable for data acquisition and control. The device is equipped with 10/100M adaptive dual Ethernet interfaces and supports switch functions. The internal bus speed can reach up to 1ms. It has the characteristics of switching and analog disconnection output reset to ensure that it can be restored to the preset state when communication is interrupted.



The modular design allows users to flexibly expand according to actual needs. When the existing configuration is not sufficient to meet specific application requirements, users can easily add matching IO expansion modules without replacing the entire system, effectively saving costs and simplifying the field deployment process. The device integrates real-time status diagnostics to help continuously monitor communication conditions.

This product allows the connection of up to 16 IO expansion modules (including the host itself) and is built in compliance with the EMC Level 3 protection standard. The IO input and output, RS485 and power supply are fully isolated, providing excellent electromagnetic compatibility, outstanding performance and high reliability.

1.2 Features

- Support standard Modbus RTU protocol and Modbus TCP protocol;
- Support various configuration software/PLC/touch screen;
- RS485 acquisition control I/O;
- Network port acquisition control I/O, supporting 5-way host access;
- Dual network ports 10/100M adaptive, support switch function;
- Support custom Modbus address settings;
- Support differential analog input, resolution 16 bits, accuracy within 1‰;
- The internal bus speed can reach up to 1ms;
- With IO input and output, RS485 isolation, power supply isolation
- Support 9 baud rate configurations;
- Support DHCP and static IP;
- Support positioning hole and guide rail installation;
- A maximum of 16 IO expansion modules can be connected (including the host itself) ;

- Any combination of switch input and output, analog input and output;
- Industrial-grade hardware design, with multiple protections such as static electricity, lightning surge, fast pulse group , and power reverse connection protection;
- The equipment is designed in accordance with EMC level 3 protection standards ;

1.3 Product Model List

Product Model	Product Specifications	Switch input DI	Switching output DO	Analog input AI	Analog output AO
M31-AFAX4440G-U	4DI+4DO+4AI	4 (NPN, PNP)	4 (Relay)	4 (Differential current)	—
M31-AXAX8080G-U	8DI+8DO	8 (NPN, PNP)	8 (Relay)	—	—

II. Quick Use

【Note】This experiment needs to be carried out using the default factory parameters.

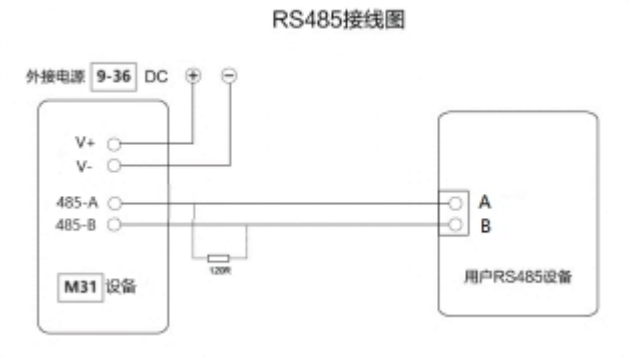
2.1 Equipment preparation

The following table lists the materials required for this test:

		
M31-AFAX4440G-U	12V switching power supply	USB to RS485
		
computer	One network cable	Several cables

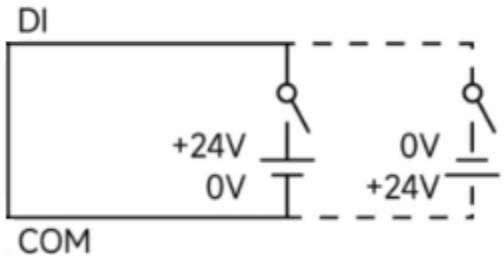
2.2 Device Connection

2.2.1.RS485 Connection



Note: When the 485 bus transmits high-frequency signals, the signal wavelength is shorter than the transmission line. The signal will form a reflected wave at the end of the transmission line, interfering with the original signal. Therefore, a terminal resistor needs to be added at the end of the transmission line to prevent the signal from being reflected after reaching the end of the transmission line. The terminal resistor should be the same as the impedance of the communication cable, with a typical value of 120 ohms. Its function is to match the bus impedance and improve the anti-interference and reliability of data communication.

2.2.2.DI Connection

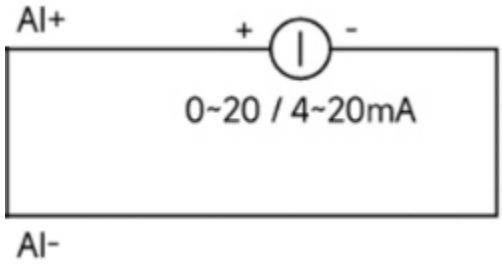


PNP input NPN input

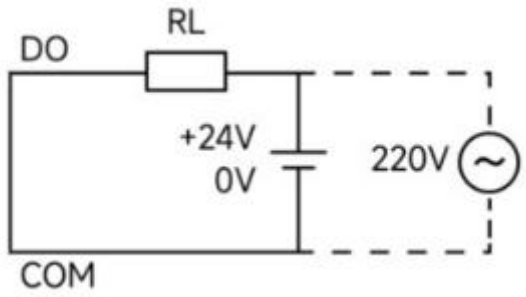
Note: DI is NPN or PNP active input, and the voltage range only supports 10V to 28V .

2.2.3.AI Connectivity

Differential analog current acquisition:

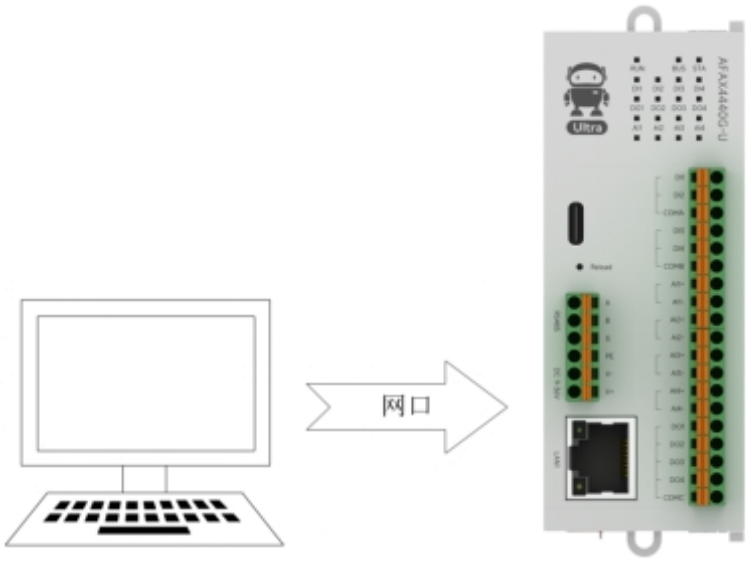


2.2.4.DO Connection



Note: 1. A single relay supports a maximum of 5A.
2. The maximum total current of each group (same COM common terminal) supports 8A.

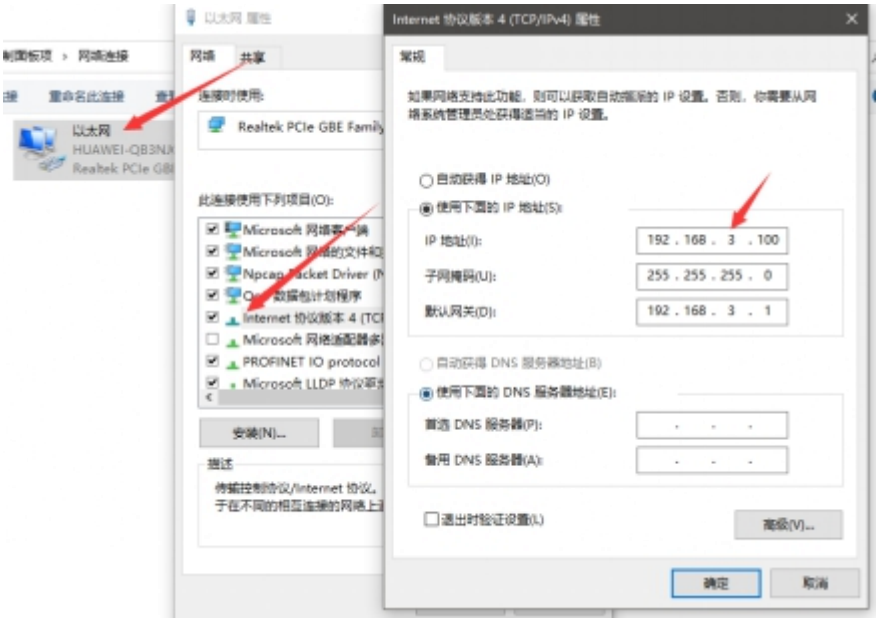
2.2.5.Easy to use



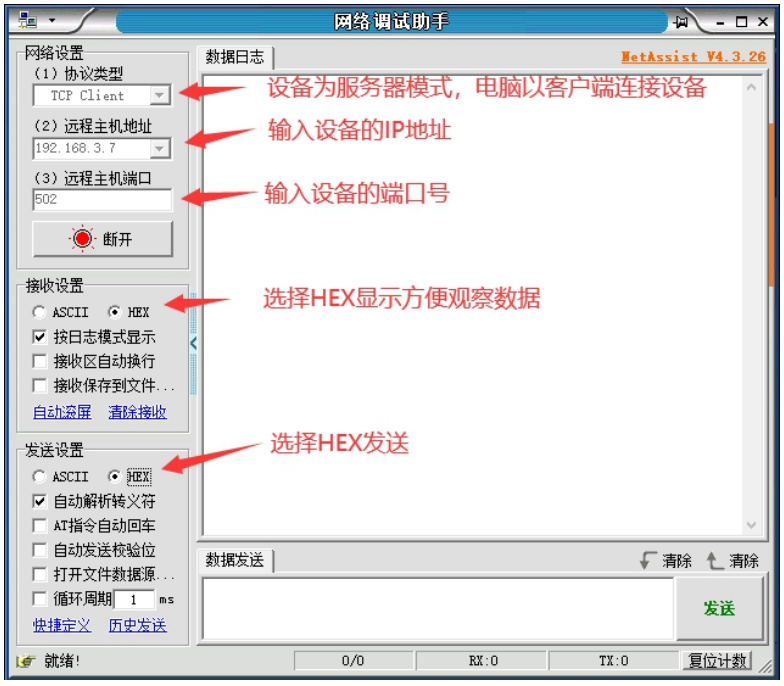
M31-AFAX4440G-U via USB to RS485, A to A, B to B.
Network connection: Insert the network cable into the RJ45 port (the device has dual network ports, both of which can be connected) and connect to the PC.
Power supply: Use a DC-12V switching power supply (DC 9~36V) to power the M31-AFAX4440G-U .

2.3 Parameter configuration

Step 1: Change the IP address of the computer to be consistent with the device. Here I change it to 192.168.3.100 to ensure that it is in the same network segment as the device and the IP address is different. If you cannot connect to the device after the above steps, please turn off the firewall and try again.



Step 2: Open the network assistant, select TCP client, enter the remote host IP : 192.168.3.7 (default parameters), enter the port number 502 (default parameters), and select HEX to send.



2.4 Control Testing

2.4.1.Modbus TCP Control

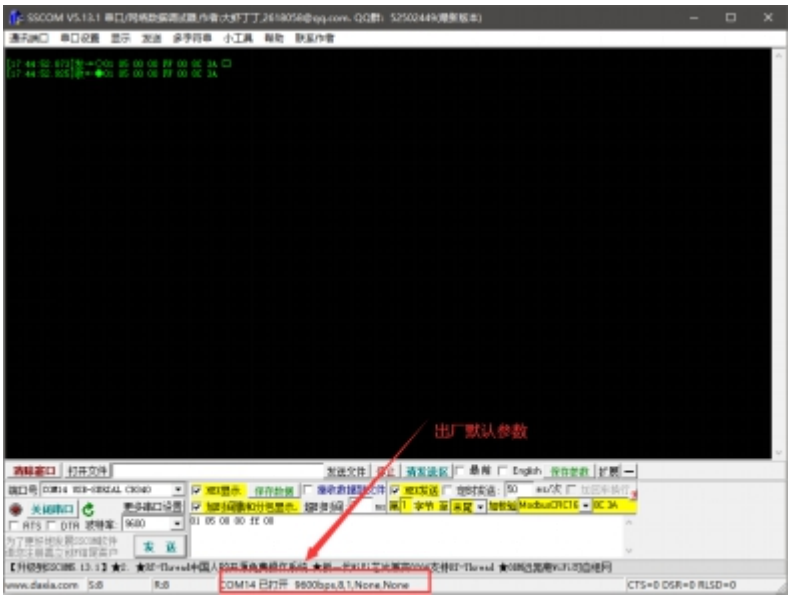
Use the network assistant to control the first DO output of M31-AFAX4440G-U .

Other functions can be tested by the following instructions.

Function (Function code)	Instruction
first coil is attracted (0x05)	01 00 00 00 00 06 01 05 00 00 FF 00
Control 4-way DO full open instruction (0x0F)	02 00 00 00 00 08 01 0F 00 00 00 04 01 0F
Control 4-way DO all-off instruction (0x0F)	02 00 00 00 00 08 01 0F 00 00 00 04 01 00
Read 4-channel DI status (0x02)	01 00 00 00 00 06 01 02 00 00 00 04
Read 4-channel DO status (0x01)	01 00 00 00 00 06 01 01 00 00 00 04

2.4.2.Modbus RTU control

Use the serial port assistant to control the first DO output of M31-AFAX4440G-U .



Other functions can be tested by the following instructions.

Function (function code)	Instruction
first coil is attracted (0x05)	01 05 00 00 FF 00 8C 3A
Control 4-way DO full open instruction (0x0F)	01 0F 00 00 00 04 01 0F 7E 92
Control 4-way DO all-off instruction (0x0F)	01 0F 00 00 00 04 01 00 3E 96
Read 4-channel DI status (0x02)	01 02 00 00 00 04 79 C9
Read 4-channel DO status (0x01)	01 01 00 00 00 04 3D C9

III. Technical Indicators

3.1 Specifications

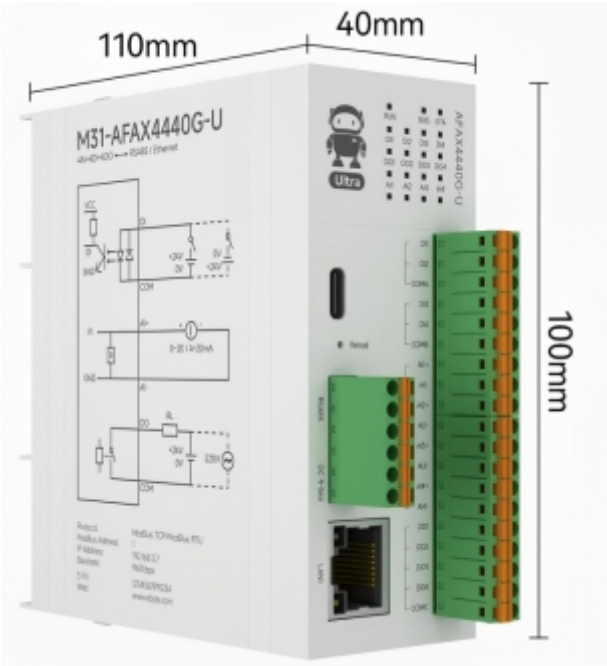
Category	Name	Parameter
Power supply	Operating voltage	DC 9 ~ 36 V ; with reverse connection protection
	Power indicator	PWR red LED indicator
	Power consumption	2～4W
Communication	Communication interface	RJ45 *2 (dual network ports) , RS485
	Baud rate	9600bps (optional)
	Communication Protocol	Standard Modbus TCP, Modbus RTU protocols
	Internal bus	Up to 1ms
Modbus	Device Address	Can be modified through Modbus command, host computer and hardware dial
DI Input	Input Type	NPN, PNP
	Input range	DC 12 ～ 24V
	Isolation method	Each channel is optically isolated
	Input Impedance	7.2kΩ
	Collection frequency	1 000 Hz
	Counting frequency	＜ 500 Hz
	Filter time	Default time 6ms
	Input instructions	DI green LED indicator
AI Input	Acquisition characteristics	Differential input
	Input Type	Differential current: 0-20mA, 4-20mA, ±20mA
	AI Resolution	16 bits (differential)
	AI Precision	1‰(difference)
	Collection frequency	Differential max. 70 Hz
	Input instructions	AI green LED indicator
DO Output	DO output type	Type A relay (normally open)
	DO output mode	Level output , pulse output
	Relay contact capacity	5A 30VDC, 5A 250VAC (the total current of the same COM common terminal supports a

		maximum of 8A)
	Output indication	DO green LED indicator
Other	Product size	110mm * 40mm * 100mm (length * width * height)
	Working temperature and humidity	-40 ～ +85℃, 5% ～ 95%RH (no condensation)
	Storage temperature and humidity	-40 ～ +105℃, 5% ～ 95%RH (no condensation)
	Installation	Positioning holes and guide rail installation

3.2 Device default parameters

Category	Name	Parameter
Basic parameters	Modbus Address	1
	Baud rate	9600bps
	Check digit	None
	Data bits	8
	Stop bits	1
	DI filter parameters	6
	AI Filter Parameters	0
Network parameters	Working Mode	TCP server (up to 5 client connections)
	DHCP	closure
	Gateway Address	192.168.3.1
	Subnet Mask	255.255.255.0
	Local IP	192.168.3.7
	Local port	502
	Target IP	192.168.3.3
	Destination Port	502
	DNS Server	114.114.114.114
	Local MAC	Determined by chip (fixed)

3.3 Dimensions



3.4 Ports, Buttons and LED indicators

3.4.1.M31-AFAX4440G-U

M31-AFAX4440G-U Port and button description:		
Silk Screen Printing	Name	Illustrate
DI1	DI1 switch input	DI1 switch input interface, used with COM A
DI2	DI2 switch input	DI2 switch input interface, used with COM A
COM A	DI switch input common terminal	DI1-DI2 share COM A common terminal
DI3	DI3 switch input	DI3 switch input interface, used with COM B
DI4	DI4 switch input	DI4 switch input interface, used with COM B
COM B	DI switch input common terminal	DI3-DI4 share COM B common terminal
DO1	DO1 switch output	DO1 switch output interface, used with COMC
DO2	DO2 switch output	DO2 switch output interface, used with COMC
DO3	DO3 switch output	DO3 switch output interface, used with COMC
DO4	DO4 switch output	DO4 switch output interface, used with COMC
COM C	COM port of DO	DO1-DO 4 share COMC for use
AI1+	AI1 analog input +	AI1 analog input + interface, used with AI1-
AI1-	AI1 analog input -	AI1 analog input-interface, used with AI1+

AI2+	AI2 analog input +	AI2 analog input + interface, used with AI2-
AI2-	AI2 analog input -	AI2 analog input-interface, used with AI2+
AI3+	AI3 analog input +	AI3 analog input + interface, used with AI3-
AI3-	AI3 analog input -	AI3 analog input-interface, used with AI3+
AI4+	AI4 analog input +	AI4 analog input + interface, used with AI4-
AI4-	AI4 analog input -	AI4 analog input-interface, used with AI4+
Reload	Factory Reset/Auto Negotiation	Press and hold for 5-10 seconds to restore to factory settings; Double-click within 2 seconds to automatically negotiate IO expansion modules
A(RS485)	RS485 A interface	RS485 A interface
B(RS485)	RS485 B interface	RS485 B interface
G(RS485)	RS485 G interface	RS485 G interface
PE	Grounding	Grounding
V- (DC9-36V)	Negative pole of power supply	DC (9-36V) power negative terminal interface
V+ (DC9-36V)	Positive power supply	DC (9-36V) power positive terminal interface
LAN1	Network port	Standard RJ45 network cable interface
LAN 2	Network port	Standard RJ45 network cable interface

M 31-AFAX4440G-U indicator light description:		
Silkscreen	name	illustrate
RUN	Equipment operation status indicator	Red LED light; on/slow flashing/fast flashing: the device is operating normally; when flashing fast, there is data interaction; off: the device is operating abnormally; slow flashing: there is a link connection; fast flashing: there is data interaction on the serial port/network port;
BUS	Device bus status indicator	Yellow LED light; On: The internal bus of the device is running normally; Off: The internal bus of the device is running completely abnormally; Flashing: The internal bus of the device may be abnormal.
STA	Bus communication indicator	Blue LED light; flashing: indicates that there is data exchange between the host and the expansion module; off: indicates that there is no data exchange between the host and the expansion module
DI1	DI1 input indicator	Green LED light; on: DI1 valid input; off: DI1 invalid input
DI2	DI2 input indicator	Green LED light; on: DI2 valid input; off: DI2 invalid input
DI3	DI3 input indicator	Green LED light; on: DI3 valid input; off: DI3 invalid input
DI4	DI4 input indicator	Green LED light; on: DI4 valid input; off: DI4 invalid input
DO1	DO1 output indicator	Green LED light; on: DO1 relay closed; off: DO1 relay open
DO2	DO2 output indicator	Green LED light; on: DO2 relay closed; off: DO2 relay open
DO3	DO3 output indicator	Green LED light; on: DO3 relay closed; off: DO3 relay disconnected
DO4	DO4 output indicator	Green LED light; on: DO4 relay closed; off: DO4 relay disconnected
AI1	AI1 input indicator	Green LED light; On: Normal input reaches 1% or more of the range; Off: No effective access; Fast flashing: Exceeds the range by 10%
AI2	AI2 input indicator	Green LED light; On: Normal input reaches 1% or more of the range; Off:

		No effective access; Fast flashing: Exceeds the range by 10%
AI3	AI3 input indicator	Green LED light; On: Normal input reaches 1% or more of the range; Off: No effective access; Fast flashing: Exceeds the range by 10%
AI4	AI4 input indicator	Green LED light; On: Normal input reaches 1% or more of the range; Off: No effective access; Fast flashing: Exceeds the range by 10%

3.4.2.M31-AXAX8080G-U

M31-AXAX8080G-U port and button description:		
Silk Screen Printing	Name	Illustrate
DO1	DI1 switch input	DI1 switch input interface, used with COMA
DI2	DI2 switch input	DI2 switch input interface, used with COMA
DI3	DI3 switch input	DI3 switch input interface, used with COMA
DI4	DI4 switch input	DI4 switch input interface, used with COMA
COMA	DI switch input common terminal	DI1-DI4 share COMA common terminal
DI5	DI5 switch input	DI5 switch input interface, used with COMB
DI6	DI6 switch input	DI6 switch input interface, used with COMB
DI7	DI7 switch input	DI7 switch input interface, used with COMB
DI8	DI8 switch input	DI8 switch input interface, used with COMB
COMB	DI switch input common terminal	DI5-DI8 share COMB common terminal
DO1	DO1 switch output	DO1 switch output interface, used with COMC
DO2	DO2 switch output	DO2 switch output interface, used with COMC
DO3	DO3 switch output	DO3 switch output interface, used with COMC
DO4	DO4 switch output	DO4 switch output interface, used with COMC
DO5	DO5 switch output	DO5 switch output interface, used with COMC
DO6	DO6 switch output	DO6 switch output interface, used with COMC
DO7	DO7 switch output	DO7 switch output interface, used with COMC
DO8	DO8 switch output	DO8 switch output interface, used with COMC
COMC	COM port of DO	DO1-DO8 share COMC for use
Reload	Factory Reset/Auto Negotiation	Press and hold for 5-10 seconds to restore to factory settings; Double-click within 2 seconds to automatically negotiate the IO expansion module ;
A(RS485)	RS485 A interface	RS485 A interface
B(RS485)	RS485 B interface	RS485 B interface
G(RS485)	RS485 G interface	RS485 G interface
PE	Grounding	Grounding
V- (DC9-36V)	Negative pole of power supply	DC (9-36V) power negative terminal interface

V+ (DC9-36V)	Positive power supply	DC (9-36V) power positive terminal interface
LAN1	Network port	Standard RJ45 network cable interface
LAN 2	Network port	Standard RJ45 network cable interface

M31-AXAX8080G-U indicator light description:		
Silk Screen Printing	Name	Illustrate
RUN	Equipment operation status indicator	Red LED light; on/slow flashing/fast flashing: the device is operating normally; when it flashes quickly, there is data interaction; off: the device is operating abnormally; slow flashing: there is a link connection; fast flashing: there is data interaction on the serial port/network port;
BUS	Device bus status indicator	Yellow LED light; On: The internal bus of the device is running normally; Off: The internal bus of the device is running completely abnormally; Flashing: The internal bus of the device may be abnormal.
STA	Bus communication indicator	Blue LED light; flashing: indicates that there is data exchange between the host and the expansion module; off: indicates that there is no data exchange between the host and the expansion module
DI1	DI1 input indicator	Green LED light; on: DI1 valid input; off: DI1 invalid input
DI2	DI2 input indicator	Green LED light; on: DI2 valid input; off: DI2 invalid input
DI3	DI3 input indicator	Green LED light; on: DI3 valid input; off: DI3 invalid input
DI4	DI4 input indicator	Green LED light; on: DI4 valid input; off: DI4 invalid input
DI5	DI5 input indicator	Green LED light; on: DI5 valid input; off: DI5 invalid input
DI6	DI6 input indicator	Green LED light; on: DI6 valid input; off: DI6 invalid input
DI7	DI7 input indicator	Green LED light; on: DI7 valid input; off: DI7 invalid input
DI8	DI8 input indicator	Green LED light; on: DI8 valid input; off: DI8 invalid input
DO1	DO1 output indicator	Green LED light; on: DO1 relay closed; off: DO1 relay open
DO2	DO2 output indicator	Green LED light; on: DO2 relay closed; off: DO2 relay open
DO3	DO3 output indicator	Green LED light; on: DO3 relay closed; off: DO3 relay disconnected
DO4	DO4 output indicator	Green LED light; on: DO4 relay closed; off: DO4 relay disconnected
DO5	DO5 output indicator	Green LED light; on: DO5 relay closed; off: DO5 relay open
DO6	DO6 output indicator	Green LED light; on: DO6 relay closed; off: DO6 relay open
DO7	DO7 output indicator	Green LED light; on: DO7 relay closed; off: DO7 relay open
DO8	DO8 output indicator	Green LED light; on: DO8 relay closed; off: DO8 relay disconnected

3.5 Dip switch

Diagram of DIP switch:

Device address composition: hardware address + software offset address
The default device address is: 1 (hardware address 0 + software address 1 = device address 1).
Device address setting range: 1 to 255.
Hardware address: It adopts binary form and is realized by the DIP switch (4 bits) (factory default is 0); for example: if DIP switches 1, 2, and 3 are set to ON, it means that the hardware address is 1+2+4=7, and the adjustment range of the hardware address is (0-15).
Software address: It is achieved by setting the “offset address” by the configuration tool software (factory default is 1).
For example: If the hardware address is set to 5 and the software address is set to 113, the device address is 118 (the maximum setting value of the software address is 240, and the value exceeding 240 will not take effect if saved).

IV.Product Features

4.1. IO point quantity expansion

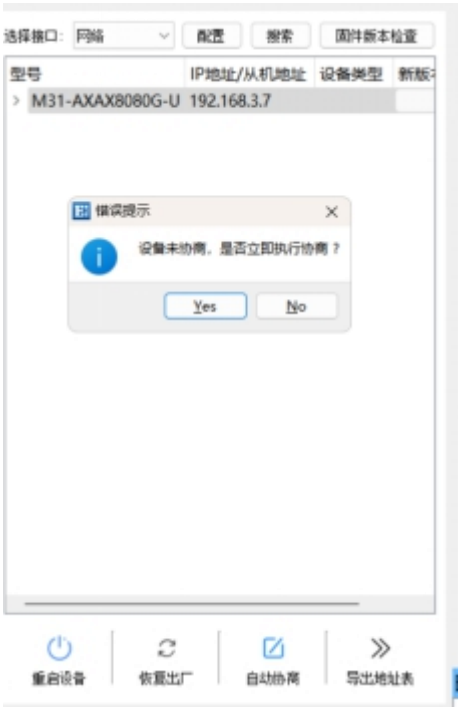
Note: When splicing equipment, do not operate with power on, otherwise it may cause damage to the equipment!

The M31-U series distributed IO host adopts an expandable structure design, in which the IO expansion module can be used for expansion with the M31-U series host. You only need to dock the IO expansion module with the host slot, and then slide the lock down to firmly connect the host and IO expansion module.

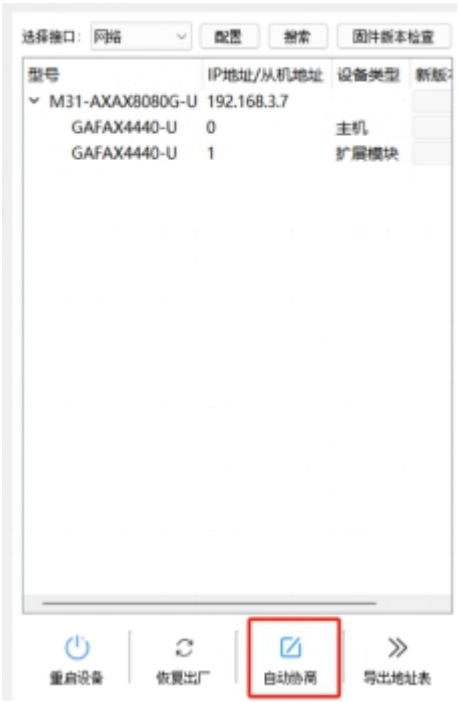
The specific operations are as follows:

- First, make sure the host is not powered on and the host slider is at UNLK. Then connect the IO expansion module to the host, as shown below:

- After the IO expansion module is connected, slide the host to the LOCK position, power on the host, and then insert the network cable. Use the auto-negotiation function through the host computer (or double-click the Reload button on the device within two seconds to automatically negotiate). After the negotiation is successful, the IO expansion module can be operated through the serial port or network port on the host. (When searching through the host computer, clicking the corresponding host will actively trigger the auto-negotiation to check whether the module splicing order has changed . If so, the customer will be prompted to negotiate. If there is no splicing or order change , there will be no prompt.)



Note: When adding a new IO expansion module or removing an already negotiated IO expansion module, the auto-negotiation function must be performed to ensure the sequence and status self-check of the overall device.



4.2 DI Input

4.2.1. Input filtering

(1) Input filter: When the switch input DI collects signals, it needs to maintain multiple sampling cycles before confirmation. The filter parameter can be set in the range of 1 to 65535 (the default is 6 sampling cycles, 6*1kHz)

4.2.2. DI counting function

(1) DI counting function: The switch input DI counting mode has level signal or edge pulse signal (default 0- rising edge, 1- falling edge, 2- level) . The maximum count value is a 32-bit signed integer (negative maximum value after overflow and no longer changes). The clearing mode supports automatic clearing and manual clearing (default automatic clearing)

The byte transmission order of the channel count value is:
(Default value: 0)
0: AB-CD
1: BA-DC
2: CD-AB
3: DC-BA

(2) Count reset: default 0-auto reset, 1-manual reset.

Automatic clearing: After reading the count value, the current value will be automatically cleared.
Manual clear: Write 0 to this register to clear the count value.

4.3 DO Output

4.3.1.DO working mode

The DO output working mode has two options: level mode and pulse output mode (default: 0).

0: Level mode

1: Pulse mode

In pulse output mode, the pulse output width can be set: Relay type setting range: 50-65535ms (default 1000ms) .

4.3.2. DO output status setting when communication failure

When communication between devices is abnormal, the status of DO output can be set.

Offline IO fault output function enable, default 0-disable, 1-enable. Offline time setting range is 1~65535, unit: 0.1 second (default 300*0.1 second).

When the offline IO fault output function is enabled, the IO module will process the output data in this way when it detects an internal bus abnormality and fails to communicate with the host and reaches the offline time. (Default value: 0)

0: Maintain the output status during a fault.

1: Low level output.
2: High level output.

DO power-on state is optional, default is 0-disconnected
0: Disconnect
1: Connect

4.4 AI Input

4.4.1.AI Scope

Differential analog input AI measures current signal:
The acquisition range is 0～20mA or 4～20mA or ±20mA, the accuracy is 1‰, and the resolution is 16 bits. It uses differential input and the sampling frequency is 70 Hz.
Set the sampling range of all AI channels. The valid value is 0 to 2 (default is 2).
Configuration is 0: indicates 0～20mA
Configuration is 1: indicates 4~20mA
Configuration 2: indicates ±20mA

【Note】AI configuration instructions
（1） The AI sampling range of each channel can be set. When the AI channel sampling range is configured as 4-20mA sampling, if the current signal is lower than 3.85mA , it will be displayed as 0.
（2） The starting address of the AI channel sampling range parameter is 0x0DAC, the register type is a holding register, and the function code is 0x03 , 0x06, or 0x10. When writing the AI channel sampling range parameter, if the written parameter value is not within the specified range, it will not take effect, and Modbus will not return an error command.

4.4.2.AI input engineering quantity integer value, engineering quantity floating point value, process quantity

There are three ways to read the analog signal collected by the device:
（1） Read AI engineering value shaping value and directly convert it to input current or voltage. The starting address of AI engineering value shaping value register is 0x0000, the register type is input register, and the read function code is 0x04. The value returned by this method is one register representing one channel.
Single-ended current: The value read is 0 to 20000. The method for calculating the current size is 0 to 20000 corresponds to 0mA to 20mA.
That is: current = engineering value / 1000 (mA)

Differential current: The value read is -20000~20000. The method for calculating the current size is -20000~20000 corresponds to -20mA~20mA.
That is: current = engineering value / 1000 (mA)

The conversion relationship between engineering quantity and process quantity is: engineering quantity = process quantity × 25000 / 32768. It should be noted that the engineering quantity will be limited by the set engineering quantity range.

（2） Read the AI engineering quantity floating point value, use the IEE754 conversion tool to convert the hexadecimal data into floating point numbers to get the input current or voltage. The starting address of the AI engineering quantity shaping value register is 0x03E8, the register type is input register, and the read function code is 0x04. This method returns two registers to represent 1 channel.

（3） Read AI process quantity. The starting address of AI engineering quantity register is 0x0BB8, the register type is input register, and the read function code is 0x04. This method returns 1 register to represent 1 channel. The process quantity acquisition range is to convert the current signal of -25 mA ~25mA into digital quantity -32768~32767. Depending on the set engineering quantity range, the parameter range of the process quantity will change:

When the engineering quantity range is set to a positive range (i.e. 0~20mA, 4~20mA), the parameter range of the process quantity is 0~32767. When the engineering quantity range is set to a negative range (i.e. -20mA~20mA), the parameter range of the process quantity is the entire digital quantity range of -32768~32767.

4.4.3.AI Filter Parameters

You can set the filter parameters of the AI channel. The valid values are 0 - 4 and the default value is 0 .
Filter parameter description:
(1) Filter parameters: The higher the parameter value, the more stable the output value and the slower the response.
(2) AI channel filter parameter address is 0x0DA2, register type is holding register, function code 0x06, 0x10.

4.5 Online monitoring

The device can monitor whether the device is abnormal through relevant registers:

Device exception code	0x7587	4-3008 7	Zone 4	1	Check the abnormal code of the current device. If it is 0, it means there is no abnormality. If it is 1, it means that the slave does not respond. If it is 2, it means that the expansion module sequence is wrong (this error will directly cause the device to not work properly).	R: 0x03

Extension module exception label	0x7588	4-30089	Zone 4	2	Check which expansion module has not responded. There are two 32-bit registers in total, representing the expansion modules in order. If the bit on the corresponding serial number is 1, it means that this expansion module is abnormal.	R: 0x03

4.6 Module Information

4.6.1.Basic parameters

(1) Modbus address: The device address is 1 by default, and the address can be modified. The address range is 1-24 0 .
(2) Serial port baud rate: 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400bps, 9 options are available.
(3) Serial port parity bit: NONE, ODD, EVEN optional.
(4) Modbus32 reply byte sequence: AB-CD (default), BA-DC, CD-AB, DC-AB optional.
(5) DI filter parameters: The filter parameters can be set in the range of 1 to 16 (the default is 6 sampling cycles, 6*1kHz)
(6) AI filter parameters: You can set the filter parameters of the AI channel. The valid values are 0 - 4 and the default value is 0 .

4.6.2.Network parameters

Unless otherwise specified, the following network-related parameters default to IPV4-related parameters.

(1) Working mode: switch the working mode of the module. Server: the device is equivalent to a server, waiting for the user's client to connect, the maximum number of connections is 5 Client: the device actively connects to the target IP and port set by the user.
(2) DHCP: Set the way the device obtains IP: static or dynamic.
(3) Gateway Address: Gateway.
(4) Subnet mask: address mask, readable and writable.
(5) Local IP: Device IP address, readable and writable.
(6) Local port: The port number of the device, which can be read and written.

(7) Target IP: When the device works in client mode, the target IP or domain name that the device connects to.

(8) Target port: When the device works in client mode, the target port to which the device is connected.

(9) DNS server: When the device is in client mode, resolve the server domain name.

(10) Network Modbus protocol: Modbus TCP and Modbus RTU protocols can be selected on the network port.

4.7 Modbus parameter configuration

Note:

1. The DI, DO, AI, and AO registers are all continuous. For example, if an 8DI host is connected to an 8DI expansion module, the DI status register of the expansion module will continue from 0x0000-0x0007 of the host, that is, 0x0008-0x0010.

2.0x_ represents hexadecimal.

3. DI, AI, and DO take the M31-AFAX4440G-U model as an example to show the continuity of registers after splicing.

4.7.1.DI register list

DI status register (each channel occupies 1 register) :

Name	Access location	Register start address (hexadecimal)	Register start address (decimal)	Register area	Related function codes	Default state
DI1	Host	0x0000	1-0001	Zone 1	R: 0x02	0
DI2	Host	0x0001	1-0002	Zone 1	R: 0x02	0
DI3	Host	0x0002	1-0003	Zone 1	R: 0x02	0
DI4	Host	0x0003	1-0004	Zone 1	R: 0x02	0
DI5	IO expansion module	0x0004	1-0005	Zone 1	R: 0x02	0
.....	IO expansion module	.....	.....	Zone 1	R: 0x02	0

DI filter register (each channel occupies 1 register) :

Name	Register start address (hexadecimal)	Register start address (decimal)	Register Type	Data range/description	Related function codes	Default state
DI channel filter	0x1388	4-500 1	Holding Registers	Each DI channel filter parameters,	R: 0x03 W: 0x06,	6

parameters				The filter parameters can be set in the range of 1~65535 (default 6 sampling cycles, 6*1kHz)	0x10	

DI clearing method (each channel occupies 1 register) :

Name	Register start address (hexadecimal)	Register start address (decimal)	Register Type	Data range/description	Related function codes	Default state
DI clear mode	0x2710	4-10001	Holding Registers	0: Automatically clear (read count value cleared) 1: Manual clear	R: 0x03 W: 0x06, 0x10	0

DI count register (each channel occupies 2 registers separately, which is related to the count byte order, please refer to the count function section) :

Name	Register address (hexadecimal)	Register address (decimal)	Register Type	Data range/description	Related function codes	Default state
DI count value	0x 2CEC	4 - 11501	Holding Registers	Count maximum value 32-bit signed integer (after overflow, it becomes the negative maximum value and does not change)	R: 0x03 W: 0x06, 0x10	0

DI counting mode register (each channel occupies 1 register):

Name	Register start address (hexadecimal)	Register start address (decimal)	Register Type	Data range/description	Related function codes	Default state
DI counting method	0x 1F40	4 - 8001	Holding Registers	0: rising edge count 1: Falling edge count 2: Level counting (double edge)	R: 0x03 W: 0x06, 0x10	0

4.7.2. DO Register List

DO status register (each channel occupies 1 register) :

Name	Access location	Register Address (Hexadecimal)	Register Address (decimal)	Register area	Related function codes	Default state
DO1	Host	0x0000	0-0001	Zone 0	R: 0x01 W: 0x05, 0x0F	0
DO2	Host	0x0001	0-0002	Zone 0	R: 0x01 W: 0x05, 0x0F	0
DO3	Host	0x0002	0-0003	Zone 0	R: 0x01 W: 0x05, 0x0F	0
DO4	Host	0x0003	0-0004	Zone 0	R: 0x01 W: 0x05, 0x0F	0
DO5	IO expansion module	0x0004	0-0005	Zone 0	R: 0x01 W: 0x05, 0x0F	0
.....	IO expansion module	.....	.....	Zone 0	R: 0x01 W: 0x05, 0x0F	0

DO fault output status register (each channel occupies 1 register):

Name	Register start address (hexadecimal)	Register start address (decimal)	Register Type	Data range/description	Related function codes	Default state
DO Fault output status	0x1B58	4-7001	Holding Registers	0: Keep the fault status 1: Fault DO output OFF 2: Fault DO output ON	R: 0x03 W: 0x06, 0x10	0

DO power-on status (each channel occupies 1 register) :

Name	Register start address (hexadecimal)	Register start address (decimal)	Register Type	Data range/description	Related function codes	Default state
DO power-on status	0x2904	4-10501	Holding Registers	DO power-on status 1 represents closed 0 means disconnected	R: 0x03 W: 0x06, 0x10	0

DO working mode (each channel occupies 1 register) :

Name	Register start address (hexadecimal)	Register start address (decimal)	Register Type	Data range/description	Related function codes	Default state
DO working mode	0x32C8	4-13001	Holding Registers	0: Level mode 1: Pulse mode	R: 0x03 W: 0x06, 0x10	0

DO pulse output width (each channel occupies 1 register) :

Name	Register start address (hexadecimal)	Register start address (decimal)	Register Type	Data range/description	Related function codes	Default state
DO pulse output width	0x30D4	4-12501	Holding Registers	Transistor setting range: 1-65535ms Relay setting range: 50-65535ms	R: 0x03 W: 0x06, 0x10	0

4.7.3.AI Register List

AI engineering quantity shaping value register (each channel occupies 1 register) :

Name	Access location	Register start address (hexadecimal)	Register start address (decimal)	Register area	Data range/description (For difference, please refer to AI input section)	Related function codes	Default state
AI1	Host	0x0000	3-0001	Zone 3	Engineering quantity 0-20000 represents 0-20ma 2-byte integer, unit (uA)	R: 0x04	0
AI2	Host	0x0001	3-0002	Zone 3	Engineering quantity 0-20000 represents 0-20ma 2-byte integer, unit (uA)	R: 0x04	0
AI3	Host	0x0002	3-0003	Zone 3	Engineering quantity 0-20000 represents 0-20ma 2-byte integer, unit (uA)	R: 0x04	0
AI4	Host	0x0003	3-0004	Zone 3	Engineering quantity 0-20000 represents 0-20ma 2-byte integer, unit (uA)	R: 0x04	0
AI5	IO expansion module	0x0004	3-0005	Zone 3	Engineering quantity 0-20000 represents 0-20ma	R: 0x04	0

					2-byte integer, unit (uA)		
.....	IO expansion module	.....	.....	Zone 3	Engineering quantity 0-20000 represents 0-20ma 2-byte integer, unit (uA)	R: 0x04	0

AI floating point value registers (each channel occupies 2 registers) :

Name	Access location	Register start address (hexadecimal)	Register start address (decimal)	Register area	Data range/description	Related function codes	Default state
AI1	Host	0x03E8	3-1001	Zone 3	Analog signal floating point value, 4-byte floating point number, unit (mA)	R: 0x04	0
AI2	Host	0x03EA	3-1003	Zone 3	Analog signal floating point value, 4-byte floating point number, unit (mA)	R: 0x04	0
AI3	Host	0x03EC	3-1005	Zone 3	Analog signal floating point value, 4-byte floating point number, unit (mA)	R: 0x04	0
AI4	Host	0x03EE	3-1007	Zone 3	Analog signal floating point value, 4-byte floating point number, unit (mA)	R: 0x04	0
AI5	IO expansion module	0x03F0	3-1009	Zone 3	Analog signal floating point value, 4-byte floating point number, unit (mA)	R: 0x04	0
.....	IO expansion module	.....	.....	Zone 3	Analog signal floating point value, 4-byte floating point number, unit (mA)	R: 0x04	0

AI process quantity register (each channel occupies 1 register) :

Name	Access location	Register start address (hexadecimal)	Register start address (decimal)	Register area	Data range/description	Related function codes	Default state
AI1	Host	0x0BB8	3-3001	Zone 3	Analog signal integer value, 2 bytes	R: 0x04	0
AI2	Host	0x0BB9	3-3002	Zone 3	Analog signal integer value, 2 bytes	R: 0x04	0

AI3	Host	0x0BBA	3-3003	Zone 3	Analog signal integer value, 2 bytes	R: 0x04	0
AI4	Host	0x0BBB	3-3004	Zone 3	Analog signal integer value, 2 bytes	R: 0x04	0
AI5	IO expansion module	0x0BBC	3-3005	Zone 3	Analog signal integer value, 2 bytes	R: 0x04	0
.....	IO expansion module	.....	.....	Zone 3	Analog signal integer value, 2 bytes	R: 0x04	0

AI filter register (each channel occupies 1 register) :

Name	Register start address (Hexadecimal)	Register start address (decimal)	Register area	Data range/description	Related function codes	Default state
AI channel filter parameters	0xFA0	4-400 1	Zone 4	Filter parameters of each AI channel, Valid values: 0-4	R: 0x03 W: 0x06, 0x10	6

AI sampling range register (each channel occupies 1 register) :

Name	Access location	Register start address (hexadecimal)	Register start address (decimal)	Register area	Data range/description	Related function codes	Default state
AI1 sampling range	Host	0x0DAC	4-3501	Zone 4	Valid values are 0 , 1 , 2 0 means 0-20mA 1 means 4-20mA 2 means ± 20mA	R: 0x03 W: 0x06, 0x10	0
AI2 sampling range	Host	0x0DAD	4-3502	Zone 4	Valid values are 0 , 1 , 2 0 means 0-20mA 1 means 4-20mA 2 means ± 20mA	R: 0x03 W: 0x06, 0x10	0
AI3 Sampling Range	Host	0x0DAE	4-3503	Zone 4	Valid values are 0 , 1 , 2 0 means 0-20mA 1 means 4-20mA 2 means ± 20mA	R: 0x03 W: 0x06, 0x10	0
AI4 sampling range	Host	0x0DAF	4-3504	Zone 4	Valid values are 0 , 1 , 2 0 means 0-20mA	R: 0x03 W: 0x06, 0x10	0

					1 means 4-20mA 2 means ± 20mA		
AI5 sampling range	IO expansion module	0x0DB0	4-3505	Zone 4	Valid values are 0 , 1 , 2 0 means 0-20mA 1 means 4-20mA 2 means ± 20mA	R: 0x03 W: 0x06, 0x10	0
.....	IO expansion module	.....	.....	Zone 4	Valid values are 0 , 1 , 2 0 means 0-20mA 1 means 4-20mA 2 means ± 20mA	R: 0x03 W: 0x06, 0x10	0

4.7.4.Basic parameters of the equipment

Register Function	Register address (hexadecimal)	Register address (decimal)	Register area	Number	Data range/remarks	Related function codes
Modbus slave offset address	0X0C1C	4-310 1	Zone 4	1	1-240	R: 0x03 W: 0x06, 0x10
Device restart	0X0C1D	4-310 2	Zone 4	1	Write 0X5BB5 to restart	W: 0x06
Restore the device to factory default	0X0C1E	4-310 3	Zone 4	1	Write 0X5BB5 to restore factory settings	W: 0x06
Host firmware version	0X0C1F	4-310 4	Zone 4	1	The high byte is the content before the decimal point of the version. The low byte is the content after the decimal point of the version. For example, in v1.5, the high byte is 0x01 and the low byte is 0x05.	R: 0x03
Host device model	0X0C20	4-310 5	Zone 4	12	Device model register, string type	R: 0x03
Host complete firmware number	0X0C2 C	4-31 17	Zone 4	8	Device firmware number , string type	R: 0x03

Modbus 32-bit registers Reply Byte Order	0X0C 34	4-312 5	Zone 4	1	0:AB-CD 1:BA-DC 2:CD-AB 3:DC-BA	R 0x03 W 0x06,0x10
Offline time	0X0C 35	4-312 6	Zone 4	1	(1-65535)*0.1 seconds Default is 100, i.e. 10 seconds After the offline time is up, all IO outputs will be in fault state	R 0x03 W 0x06,0x10
Offline IO fault output Function Enablement	0X0C 36	4-312 7	Zone 4	1	0: Disable 1: Enable The default value is 0, which means that the offline fault output is disabled.	R 0x03 W 0x06,0x10
Fault output flag	0X0C 37	4-312 8	Zone 4	1	0: No IO fault status output 1: There is IO fault status output	R 0x03 W 0x06,0x10
Does the slave n support Storage function	0X0C 60	4-31 69	Zone 4	16	0: Not supported 1: Support	R 0x03
Slave n storage function enabled	0X0C 70	4-31 85	Zone 4	16	0: Disable 1: Enable Default is 1, enabling storage function	R 0x03 W 0x06,0x10
Slave Model	0X0C 80	4-320 1	Zone 4	8*32	The slave model is stored in this register in the form of a string according to the standard representation method. For example, MF-AAAX4440 has a maximum length of 16 bytes, and non-existent slaves are all marked as "NONE"	R 0x03
Slave firmware version	0x0 D80	4-3 457	Zone 4	1*32	The high byte is the content before the	R 0x03

					decimal point of the version. The low byte is the content after the decimal point of the version. For example, in v1.5, the high byte is 0x01 and the low byte is 0x05.	

4.7.5.Module related registers

Register Function	Register address (hexadecimal)	Register address (decimal)	Register area	Number	Data range/remarks	Related function codes
Serial port baud rate code	0X7530	4-30001	Zone 4	1	1:2400 2:4800 3:9600 4:19200 5:38400 6:57600 7:115200 8:230400	R: 0x03 W: 0x06, 0x10
Serial port check digit	0X7531	4-30002	Zone 4	1	0:NONE 1: ODD 2: EVEN	R: 0x03 W: 0x06, 0x10
Network working mode	0X7532	4-30003	Zone 4	1	0: TCPS 1: TCPC 2: UDPS 3: UDPC	R: 0x03 W: 0x06, 0x10
DHCP	0X7533	4-30004	Zone 4	1	0: Off, 1: On	R: 0x03 W: 0x06, 0x10
Device MAC address	0X7534	4-30005	Zone 4	3		R: 0x03
Local IP address	0X7537	4-30008	Zone 4	2		R: 0x03 W: 0x06, 0x10
Subnet Mask	0X7539	4-30010	Zone 4	2		R: 0x03 W: 0x06, 0x10

Gateway Address	0X753B	4-30012	Zone 4	2		R: 0x03 W: 0x06, 0x10
DNS server address	0X753D	4-30014	Zone 4	2		R: 0x03 W: 0x06, 0x10
Local port	0X7541	4-30018	Zone 4	1	0-65535	R: 0x03 W: 0x06, 0x10
Target IP/Domain Name	0X7542	4-30019	Zone 4	64	Maximum 128-byte string. Domain name is also represented by a string.	R: 0x03 W: 0x06, 0x10
Target server port	0X7582	4-30083	Zone 4	1	1-65535	R: 0x03 W: 0x06, 0x10
Network Modbus protocol	0X7583	4-30084	Zone 4	1	When the network data is TCP data, this item needs to be set to 1. When the network data is RTU data, this item needs to be set to 0.	R: 0x03 W: 0x06, 0x10
Address Negotiation Write Register Protection	0X7584	4-30085	Zone 4	1	This write protection register needs to be turned on before sending the address negotiation command Write 1: represents opening the write protection register	R: 0x03 W: 0x06
Address Negotiation Register	0X7585	4-30086	Zone 4	1	Write 1: represents the start of address negotiation	R: 0x03 W: 0x06
Current negotiation status register	0X7586	4-30087	Zone 4	1	Check whether the current negotiation is completed. 0: Indicates that the negotiation has not yet been completed 1: Negotiation completed	R: 0x03
Device exception code	0X7587	4-30088	Zone 4	1	Check the abnormal code of the current	R: 0x03

					device. If it is 0, it means there is no abnormality. If it is 1, it means that the slave does not respond. If it is 2, it means that the expansion module sequence is wrong (this error will directly cause the device to not work properly).	
Extension module exception label	0X7588	4-30089	Zone 4	2	Check which expansion module has not responded. There are two 32-bit registers in total, representing the expansion modules in order. If the bit on the corresponding serial number is 1, it means that this expansion module is abnormal.	R: 0x03
Expansion module pending negotiation status	0X758A	4-3009 1	Zone 4	1	0: normal configuration sequence, 1: abnormal configuration, negotiation required before use	R 0x03
Web login username	0X758B	4-3009 2	Zone 4	5	String	R 0x03, W 0x06, 0x10
Web login password	0X7590	4-3009 7	Zone 4	3	String	R 0x03, W 0x06, 0x10

Note: According to the usage requirements, some software (such as Kingview) need to add 1 to convert hexadecimal to decimal before operating the register (the decimal in the table has been added 1).

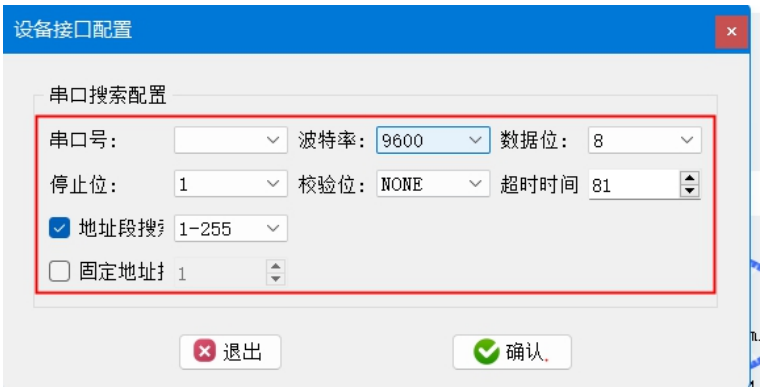
V. Host computer

5.1 Connectivity and Control

Step 1：Host computer connection equipment

（1）You can configure the device by selecting the interface (serial port/network port). If you select the network port, you must first select the network card and then search for the device.

(2) If you select a serial port, you must select the corresponding serial port number, as well as the same baud rate, data bits, stop bits, parity bit, and address segment search range as the device, and then perform the search.



Step 2：Select the corresponding device and operate the corresponding IO.

5.2 Parameter configuration

Step 1：For connecting devices, refer to "Connection and Control"

Step 2：You can configure the basic parameters and network parameters of the device

Step 3：After configuring the parameters, click Save Parameters. When you see the prompt message in the log output that the parameters are saved successfully, restart the device. After the restart is complete, the modified parameters will take effect.

VI.Precautions

(1) Do not splice the device while it is powered on, otherwise there is a risk of damage to the device.
(2) M31-U series mainframe can only be used with U series expansion modules

Revision History

Version	Revision Date	Revision Notes	Maintainer
1.0	2025-5-6	Initial release	LT

The final right of interpretation belongs to Chengdu Ebyte Electronic Technology Co., Ltd.

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