

AIO-MT623F

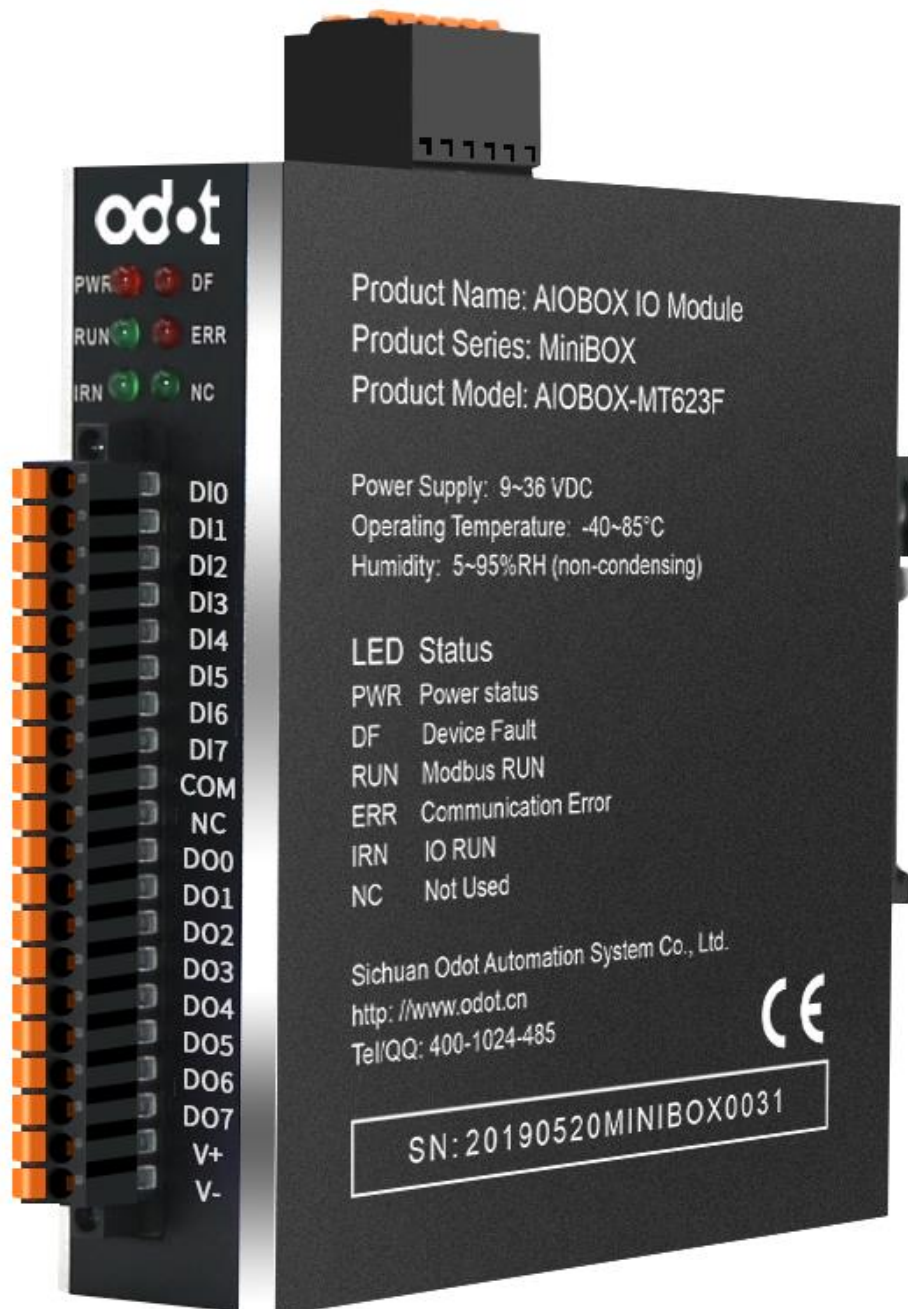
MiniBOX IO Module

User Manual

V1.0

2019.11.01

MODBUS TCP 8 channels digital input and output module



Sichuan Odot Automation System Co., Ltd

2019-6

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1 Product Overview

1.1 Product Introduction

MiniBox series IO module: AIO-MT623F is an Ethernet based integrated IO module, with 8 input channels and 8 output channels. This product supports the use of RS485 interface (Modbus-RTU) and Ethernet interface (Modbus-TCP) for communication, and supports the simultaneous access of 5 Modbus TCP clients. It is simple and convenient to use with stable transmission, full metal shell and strong anti-interference ability. The internal PCB adopts anti-corrosion technique including anti-corrosion, anti-oxidation and anti-salt mist. Its double Ethernet port could support Daisy chain topology and convenient for wiring.

1.2 Technical Parameters

Common Parameter	
Specification	8 Channels DI, supports source link type, with tally function; 8 Channels DO, supports source type
Communication Interface	Dual Ethernet port, with switch function, supports device cascading, 1*Modbus RTU RS485 port
Protocol	Modbus TCP/Modbus RTU
Linking Number	5 Modbus TCP clients
Input Voltage	9-36V DC, Wide Range Input
Working Temperature	-40~85°C
Serial port baud rate	1200-115200bps
IP level	IP20
RS485 Node	Could be configured, Default: 1

Power	Max.65mA@24.0Vdc
Isolation	I/O to internal bus: Optocoupler isolation (3KVrms)
Field voltage	Nominal voltage: 24Vdc, Input range: 22~28Vdc
Wiring	I/O Wiring: Max.1.5mm(AWG-16)
Weight	330g
Dimension	110*110*28mm(L*W*H)

Input Channels Parameter	
Channel numbers	8 Channels
Indicator	8 pcs Green Channel Input Indicator
Input Type	Source (0V)、Sink (24V) Input
Input Isolation	Optocoupler isolation, Isolation voltage 2500Vrms
Input Current	Max: $\pm 15\text{mA}$
Cut-in voltage	High input: Min.10Vdc to Max.28Vdc (Common terminal: 0Vdc)
	Low input: Min.0Vdc to Max.14Vdc (Common terminal: 24Vdc)
Closing voltage	High input: Max.5Vdc (Common terminal: 0Vdc)
	Low input: Min.19Vdc (Common terminal: 24Vdc)
Cut-in current	Min.6mA/channel@14V /Max.15mA/channel@28V
Input impedance	$>1.8\text{k}\Omega$
Input delay	OFF to ON : Max.3ms
	ON to OFF : Max.2ms
Filter time	Default: 10ms
Sampling frequency	500Hz
Count frequency	$<200\text{Hz}$

Output channel parameter	
Channel numbers	8 channels
Indicator	8pcs green channels output indicators
Rated current	Typical value: 500MA
Leakage current	Max.: 10uA
Output impedance	$<0.2\Omega$
Output delay	OFF to ON : Max.200us
	ON to OFF : Max.100us
Protection function	Protection current: Typical value 1.4A
	Temperature protection: Typical value 150°C
	Short-circuit protection Support

2 Hardware Description

2.1 Appearance



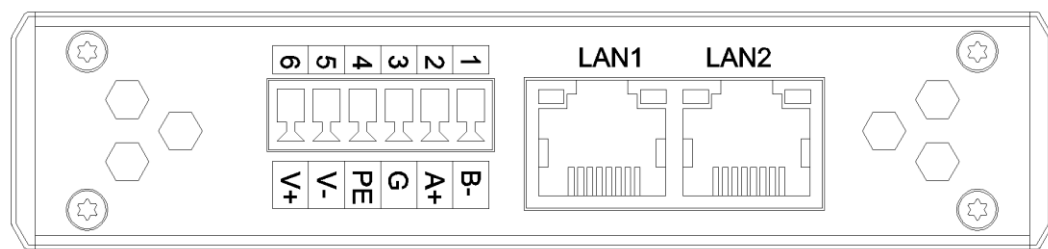
2.2 Indicator Description

Symbol	Definition	Status
PWR	Power indicator	ON: Power connected OFF: No power
DF	Equipment fault indication	ON: Device parameter read failed OFF: Parameter reading properly
RUN	Modbus communication working properly	Blinking: Data exchange
ERR	Modbus communication error	Blinking: Data exchange is abnormal
IRN	IO running indication	ON: IO initialization normal OFF: IO initialization error
NC	Not used	Not used

2.3 System Power and Communication Interface

A、System Power and Communication Ports Definition

It supports standard Modbus-TCP and Modbus-RTU/ASCII protocol access. The Ethernet supports cascade function of dual Ethernet port switch, and the serial port supports RS485 bus connection mode.

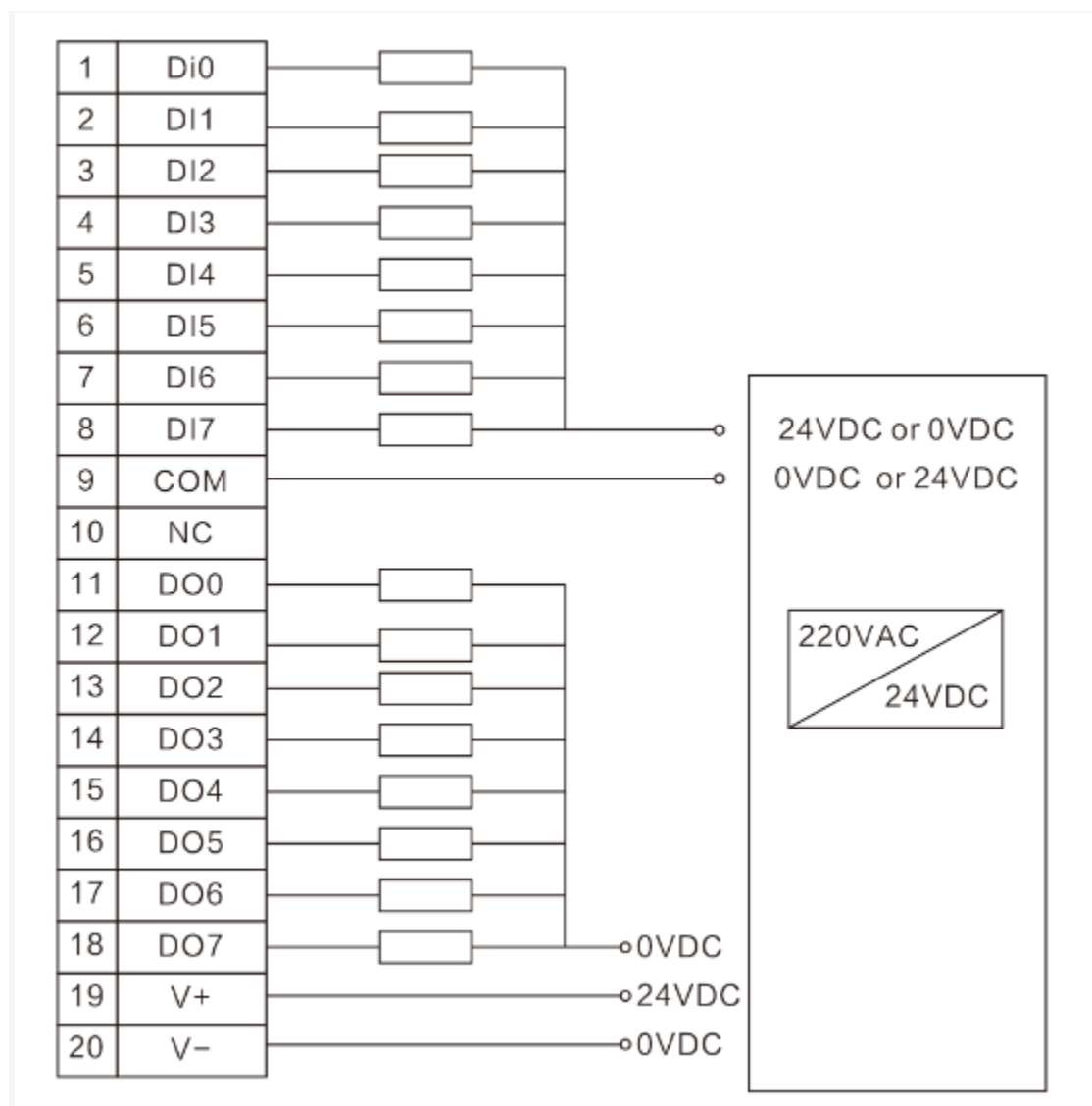


No.	Terminal	Definition
1	B-	RS485-
2	A+	RS485+
3	SGND	Serial port RS485 Signal ground
4	PE	Ground terminal

5	V-	Power input negative
6	V+	Power input positive
RJ45	LAN1/LAN2	MODBUS TCP Communication port

B、Terminal wiring diagram and definition

Digital input and output module AIobox-MT623F has 8 digital input channels and 8 digital output channels. The module is simple for wiring and easy for operation. The specific wiring diagram is as follows.



Terminal No.	Definition	Description	Sequence No.	Definition	Description
1	DI0	Input Signal	11	DO0	Output Signal
2	DI1	Input Signal	12	DO1	Output Signal
3	DI2	Input Signal	13	DO2	Output Signal
4	DI3	Input Signal	14	DO3	Output Signal
5	DI4	Input Signal	15	DO4	Output Signal
6	DI5	Input Signal	16	DO5	Output Signal
7	DI6	Input Signal	17	DO6	Output Signal
8	DI7	Input Signal	18	DO7	Output Signal
9	COMA	+24V/0V	19	V+	+24V
10	NC	Not used	20	V-	0v

2.4 Modbus MAC Address

Register address	Low limit value	High limit value	Reset Value	Read/write	Description
10001-10008	0	1	0	read	DI0-DI7 Digital input
30001-30016	0	4294967295	0	read	DI0-DI7 count value
00001-00008	0	1	0	write	DO0-DO7 Digital output
00009-00016	0	1	0	write	DI0-DI7 zero clearing

2.5 Configuration Data Definition

Modbus TCP parameter	
No.	Description
Byte 0	MAC Address[0]
Byte 1	MAC Address[1]
Byte 2	MAC Address[2]
Byte 3	MAC Address[3]
Byte 4	MAC Address[4]
Byte 5	MAC Address[5]
Byte 6	IP Address[0]
Byte 7	IP Address[1]
Byte 8	IP Address[2]
Byte 9	IP Address[3]
Byte 10	Net Mask[0]
Byte 11	Net Mask[1]
Byte 12	Net Mask[2]
Byte 13	Net Mask[3]
Byte 14	Net Gateway[0]
Byte 15	Net Gateway[1]
Byte 16	Net Gateway[2]
Byte 17	Net Gateway[3]
Byte 18	Modbus Port
Byte 19	
Byte 20	Watchdog Enable
Byte 21	Watchdog Time
Byte 22	

Modbus RTU parameter	
Byte 23	Slave ID
Byte 24	Baud Rate
Byte 25	
Byte 26	
Byte 27	
Byte 28	Data Bits
Byte 29	Parity Bits
Byte 30	Stop Bits
Byte 31	Serial Mode
Byte 32	Char Pitch
Byte 33	Respond Delay

Data description:

MAC Address [0-5]: Device MAC address (read only)

IP Address[0-3]: Device IP address (Default: 192.168.1.100)

Net Mask[0-3]: Device subnet mask (Default: 255.255.255.0)

Net Gateway[0-3]: Device subnet gateway (Default: 192.168.1.1)

Modbus Port: Modbus Port no. (Default: 502)

Effective range: 0-65535

Watchdog Enable: Modbus Watchdog enable (Default: 1)

0: Watchdog disabled

1: Watchdog enabled

Watchdog Time(s): Watchdog time (Default: 10)

Effective range: 1-65535

Slave ID: Modbus 从站 ID 号 (Default: 1)

Effective range: 1-247

Baud rate: serial port baud rate (Default: 9600bps)

Effective range: 2400-115200

Data Bits: data bits (Default: 8)

7: 7 data bits

8: 8 data bits

Parity Bits: Parity bit (Default: 0)

0: No parity

1: Odd

2: Even

Stop Bits: stop bit (Default: 1)

1: 1 stop bit

2: 2 stop bit

Serial Mode: serial mode (Default: 0)

0: RTU mode

1: ASCII mode

Char Pitch: inter-frame space (Default: 2)

0: 1.5t

1: 3.5t

2: 5t

3: 10t

4: 20t

5: 50t

6: 100t

7: 200t

Respond Delay: Slave station replying delay time (Default: 0)

Effective range: 0-65535

Module channel configuration parameters								
Bit No	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 34	Input Filtering Time							
Byte 35								
Byte 36	Counter Value Data Format							
Byte 37	Input holding time							
Byte 38								
Byte 39	Storage enable							
Byte 40	Count Mode Ch#3	Count Mode Ch#2	Count Mode Ch#1	Count Mode Ch#0				
Byte 41	Count Mode Ch#7	Count Mode Ch#6	Count Mode Ch#5	Count Mode Ch#4				

Byte 42	Count Mode Ch#11		Count Mode Ch#10		Count Mode Ch#9		Count Mode Ch#8	
Byte 43	Count Mode Ch#15		Count Mode Ch#14		Count Mode Ch#13		Count Mode Ch#12	
Byte 44	Count Directio n Ch#7	Count Directio n Ch#6	Count Directio n Ch#5	Count Directio n Ch#4	Count Directio n Ch#3	Count Directio n Ch#2	Count Directio n Ch#1	Count Directio n Ch#0
Byte 45	Count Directio n Ch#15	Count Directio n Ch#14	Count Directio n Ch#13	Count Directio n Ch#12	Count Directio n Ch#11	Count Directio n Ch#10	Count Directio n Ch#9	Count Directio n Ch#8

Data description:

Input Filtering Time(ms): channel input filtering time, unit ms (Default: 10)

Counter Value Data Format: The byte transfer sequence of a channel count value
(Default: 0)

0: A-B-C-D

1: B-A-D-C

2: C-D-A-B

3: D-C-B-A

Input Holding Time(ms): input holding time, unit ms(Default: disable)

Storage Enable: storage enabled (Default: disable)

Count Mode Ch#(0-15): input channel count mode (Default: 0)

0: Rising edge count

1: Falling edge count

2: Double edge count

Count Direction Ch#(0-15): input channel count direction (Default: 0)

0: Counting up

1: Counting down

Note: The input channel count Max. frequency is up to 200Hz. When the input signal exceeds this frequency, and the count result may be inconsistent with the actual value.

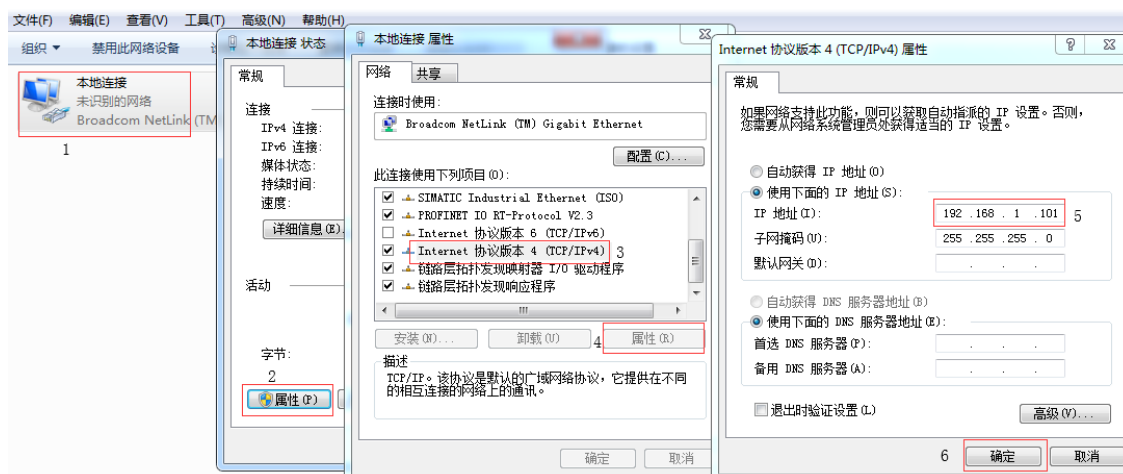
2.6 Installation Dimension

The 16-channel digital output module AIObox-MT623F supports the installation of Din-rail, which is simple and convenient to install and easy to operate. Its working temperature is $-40 \sim 85^{\circ}\text{C}$ and the humidity are within the range of $5 \sim 95\% \text{ RH}$, and the module would be greatly affected if this scope is beyond.

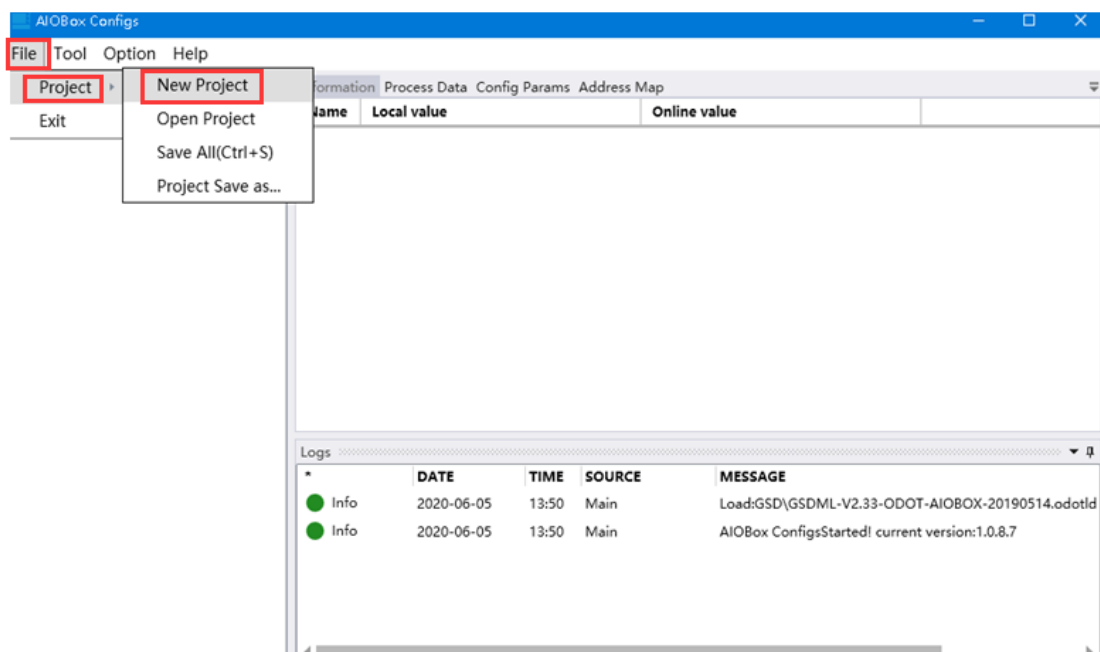


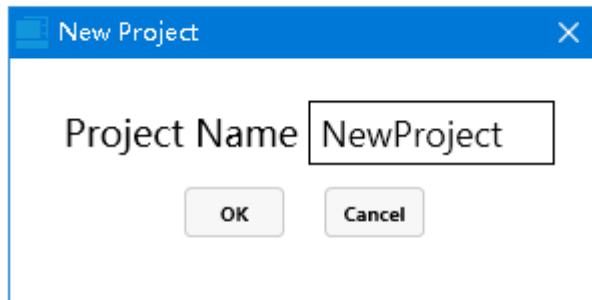
3 Configuration Software Usage

1. Powering on the module and connecting the module to the computer with the network cable then double-click my computer. And it needs to open the network and sharing center under the control panel, and sets the computer IP and the gateway IP in the same network segment. For example, if the gateway default IP is 192.168.1.100 and the computer IP should be 192.168.1. (1~99, 101-254).

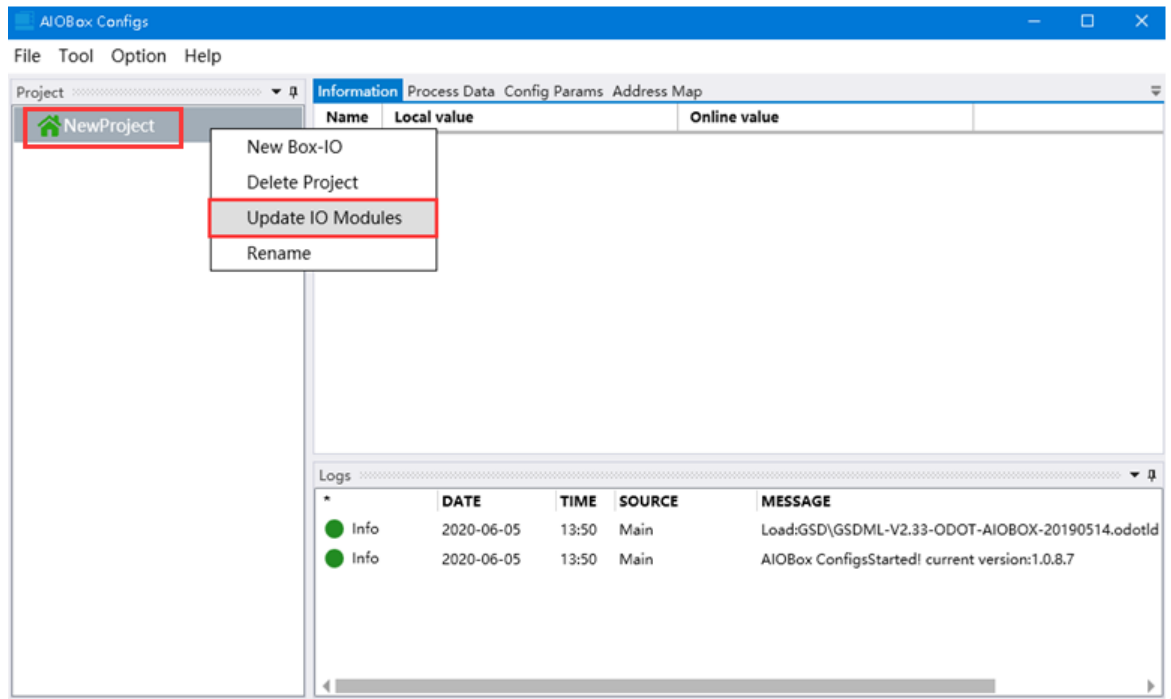


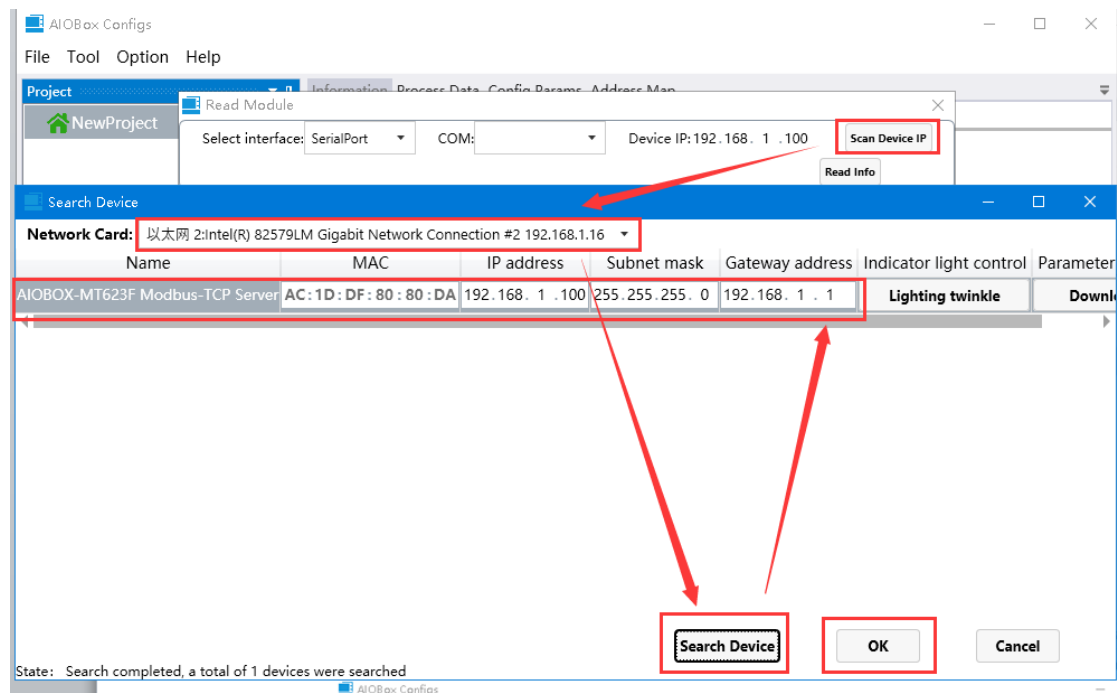
2. After installing AIO-Box config software, opening the configuration software, clicking File → Project → New Project in the menu bar, or right clicking Project → New Project in the project directory bar, and entering the project name manually.



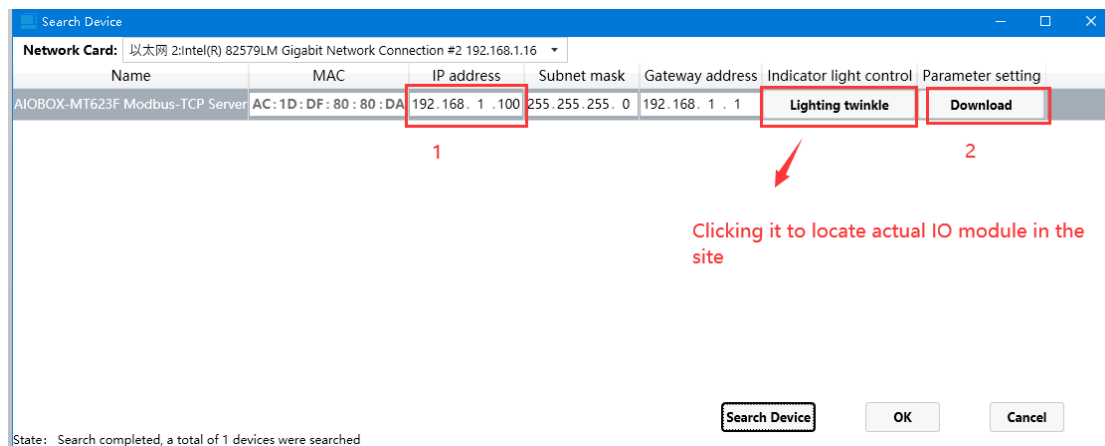


3. In the project directory bar, right-clicking the Project Name → Upload IO module, and selecting scan module in the pop-up dialog box, selecting local network card, and clicking Search Device to scan AIO-MT623F module.

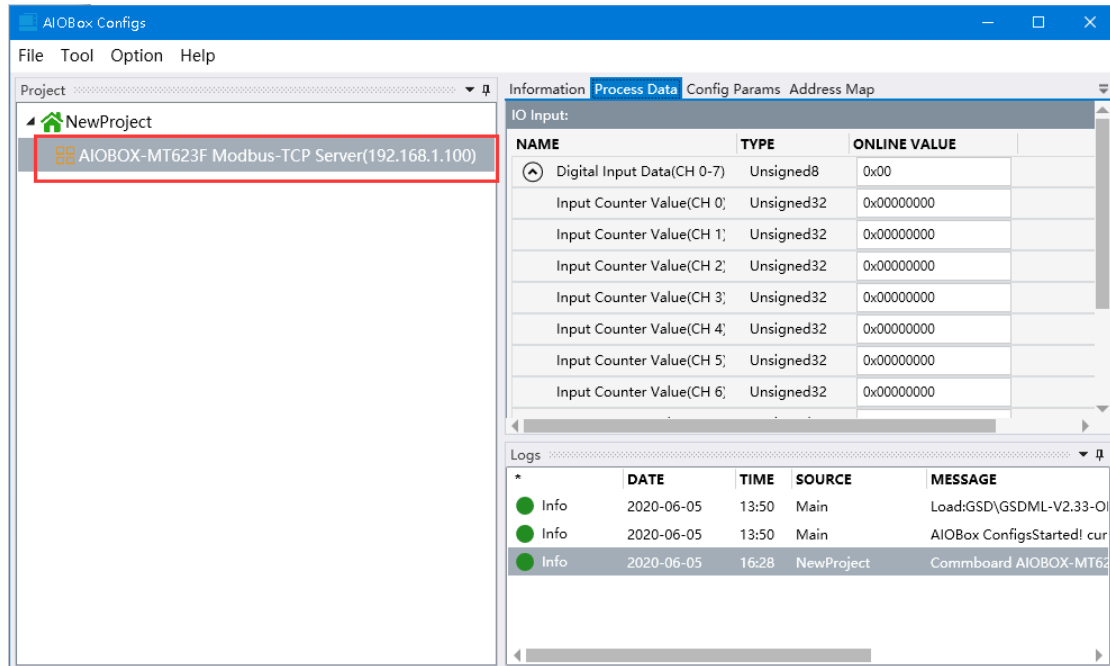




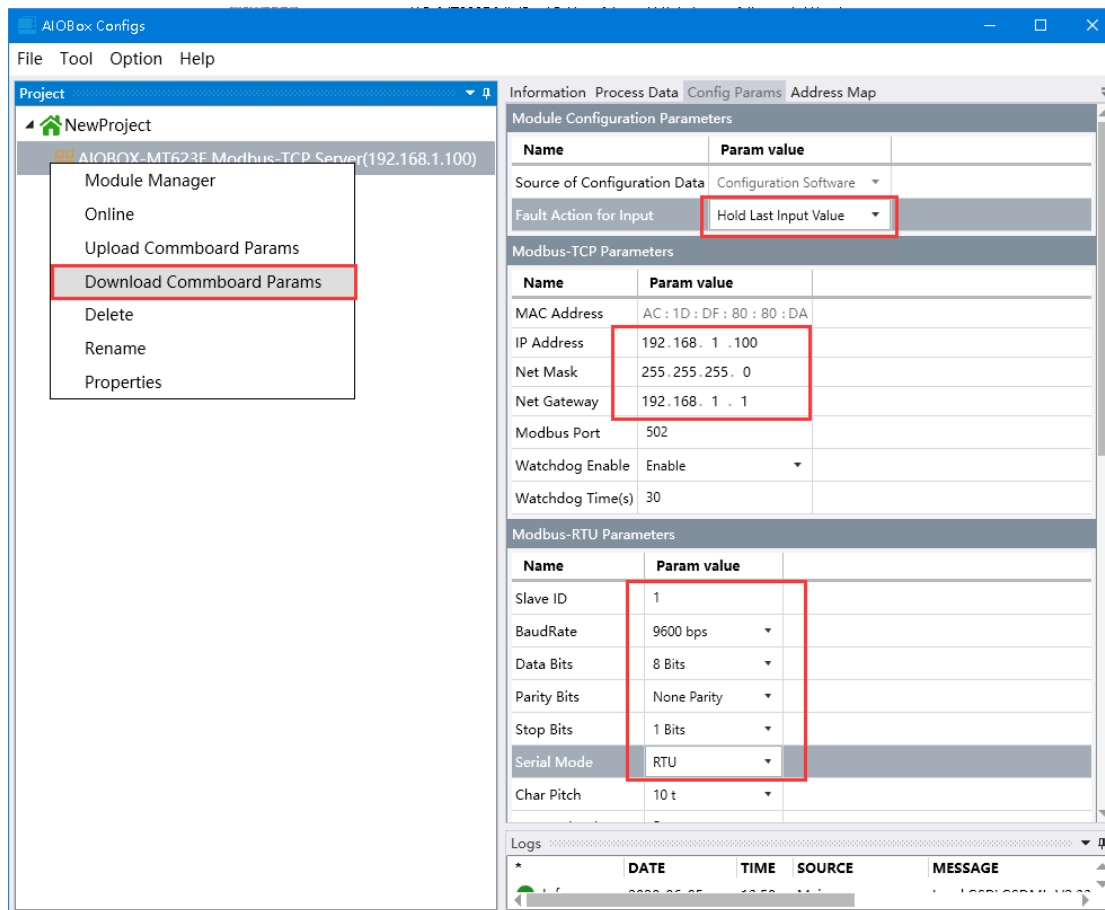
4. When there are multiple modules in the network structure, the Multiple Devices could be popped up on the scanning interface. And IP address could be directly modified on this interface, and then the actual modules in the site could be located by clicking the Lighting twinkle.



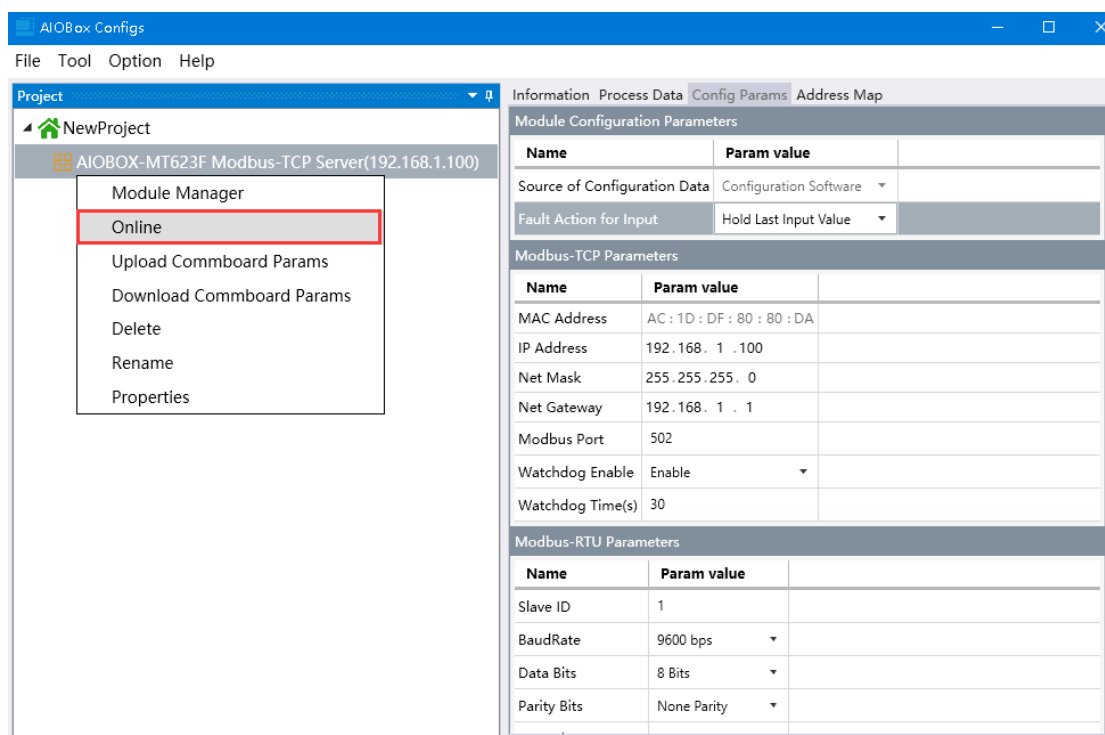
Clicking ok after it is finished, and AIOBOX-MT623F would appear in the project bar.



5. Clicking the configuration to modify the parameters, and right clicking AIOBOX-MT623F to download IO parameters



6. It could right click the adapter module AIO-MT623F to monitor the data of IO module online.



DI example: 0V is wired to IO module (DI0-DI7) terminal COM, and 24VDC is wired at DI0. Now it was a sink module (i.e., DI0-DI7 channel is effective at 24VDC), which could monitor IO module data on the process data interface. As it is shown in the figure, DI0 is given 24VDC signals for 9 times.

The current value of count clearing channel CH0 is setting to 1 and right-clicking in the blank to download the process parameters.

Information **Process Data** Config Params Address Map

IO Input:

NAME	TYPE	ONLINE VALUE
☑ Digital Input Data(CH 0-7)	Unsigned8	0x01
Digital Input Data(CH 0)	Bit	1
Digital Input Data(CH 1)	Bit	0
Digital Input Data(CH 2)	Bit	0
Digital Input Data(CH 3)	Bit	0
Digital Input Data(CH 4)	Bit	0
Digital Input Data(CH 5)	Bit	0
Digital Input Data(CH 6)	Bit	0
Digital Input Data(CH 7)	Bit	0
Input Counter Value(CH 0)	Unsigned32	0x00000009
Input Counter Value(CH 1)	Unsigned32	0x00000000
Input Counter Value(CH 2)	Unsigned32	0x00000000
Input Counter Value(CH 3)	Unsigned32	0x00000000
Input Counter Value(CH 4)	Unsigned32	0x00000000
Input Counter Value(CH 5)	Unsigned32	0x00000000
Input Counter Value(CH 6)	Unsigned32	0x00000000
Input Counter Value(CH 7)	Unsigned32	0x00000000

Logs

TIME	SOURCE	MESSAGE
06-05 16:47	AIIOBOX-MT623F N	PacketlenErr
06-05 16:47	AIIOBOX-MT623F N	watching stopped!

Information **Process Data** Config Params Address Map

IO Input:

NAME	TYPE	ONLINE VALUE
☐ Digital Input Data(CH 0-7)	Unsigned8	0x01
Input Counter Value(CH 0)	Unsigned32	0x00000000
Input Counter Value(CH 1)	Unsigned32	0x00000000
Input Counter Value(CH 2)	Unsigned32	0x00000000
Input Counter Value(CH 3)	Unsigned32	0x00000000
Input Counter Value(CH 4)	Unsigned32	0x00000000
Input Counter Value(CH 5)	Unsigned32	0x00000000
Input Counter Value(CH 6)	Unsigned32	0x00000000
Input Counter Value(CH 7)	Unsigned32	0x00000000

IO Output:

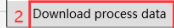
NAME	TYPE	ONLINE VALUE	LOCAL VALUE
☐ Digital Output Data(CH 0-7)	Unsigned8	0x00	0x00
☑ Counter Reset(CH 0-7)	Unsigned8	0x01	0x01
Counter Reset(CH 0)	Bit	1	1
Counter Reset(CH 1)	Bit	0	0
Counter Reset(CH 2)	Bit	0	0
Counter Reset(CH 3)	Bit	0	0
Counter Reset(CH 4)	Bit	0	0
Counter Reset(CH 5)	Bit	0	0

Hex display 2

Download process data

Logs

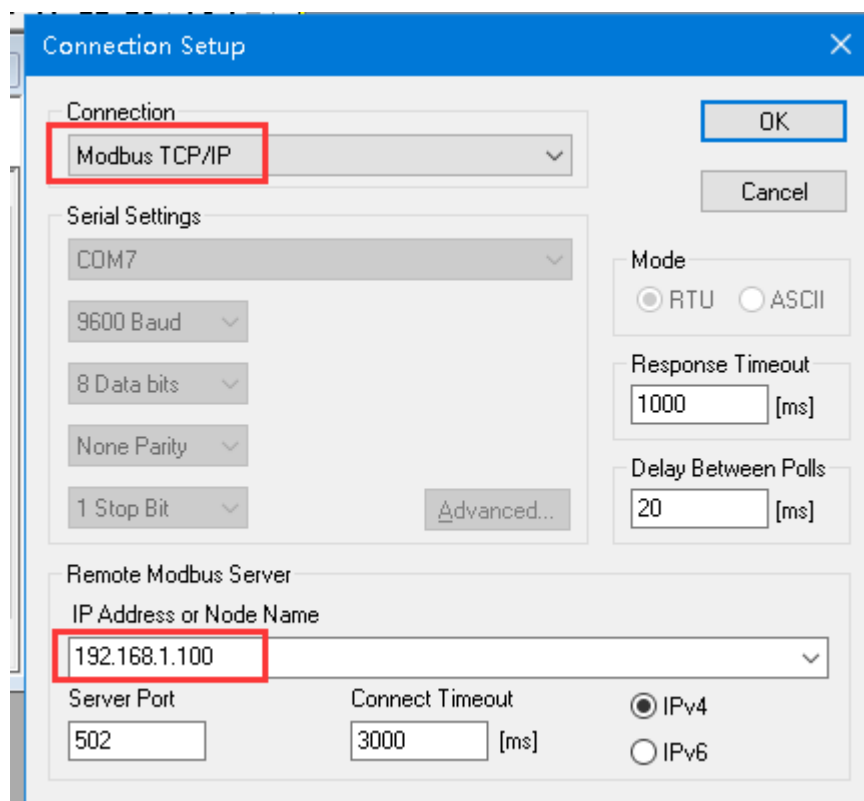
1.



4 MODBUS POLL Software Test

4.1 Test the digital input with the gateway Ethernet port

1. Opening the MODBUS POLL software → selecting the menu Connection/Connect → selecting the MODBUS TCP/IP → inputting gateway IP address 192.168.1.100 → setting Server Port to 502, and clicking OK.



2. Selecting Setup → Read/Write Definition → selecting function code 02, and clicking OK.

Read/Write Definition

Slave ID: OK

Function: 02 Read Discrete Inputs (1x) Cancel

Address: Protocol address. E.g. 10011 -> 10

Quantity:

Scan Rate: [ms] Apply

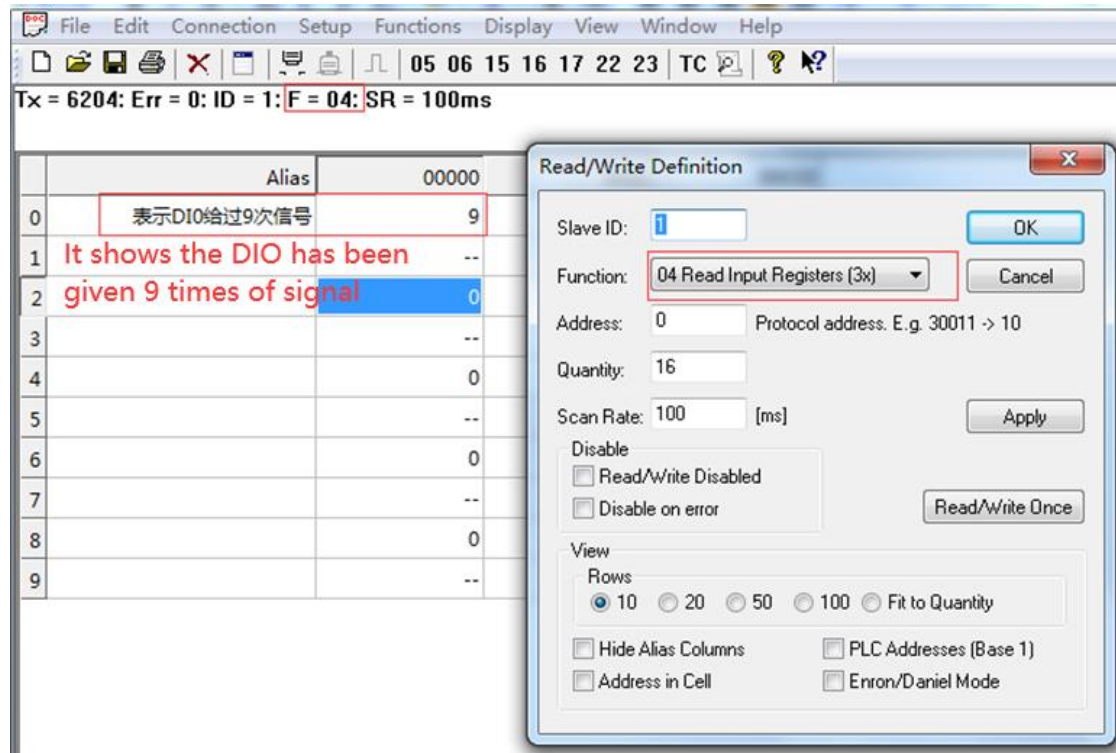
Disable
☐ Read/Write Disabled
☐ Disable on error Read/Write Once

View
 Rows
☒ 10 ☐ 20 ☐ 50 ☐ 100 ☐ Fit to Quantity
☐ Hide Alias Columns ☐ PLC Addresses (Base 1)
☐ Address in Cell ☐ Enron/Daniel Mode

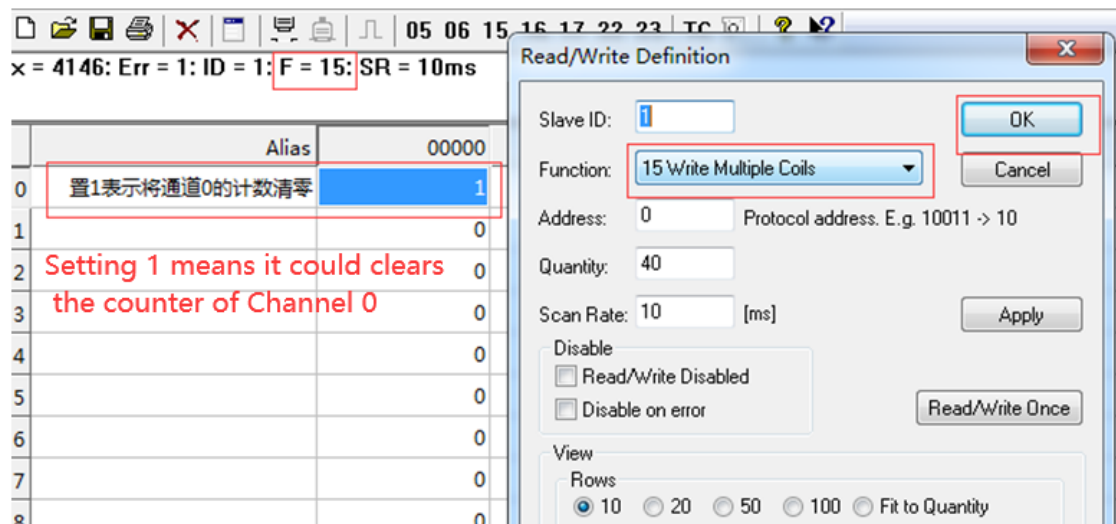
05 06 15
 Tx = 19881: Err = 5: ID = 255: F = 02: SR = 10ms

	Alias	00000
0	表示DI0的状态	1
1		0
2	It shows the status of DI0	0
3		0

3. Selecting Setup → Read/Write Definition → selecting function code 04 → clicking OK and the counter is 32.



4. Selecting Setup → Read/Write Definition → selecting function code 15 and clicking OK. Then writing 1 into channel 0 and it clears the counter.

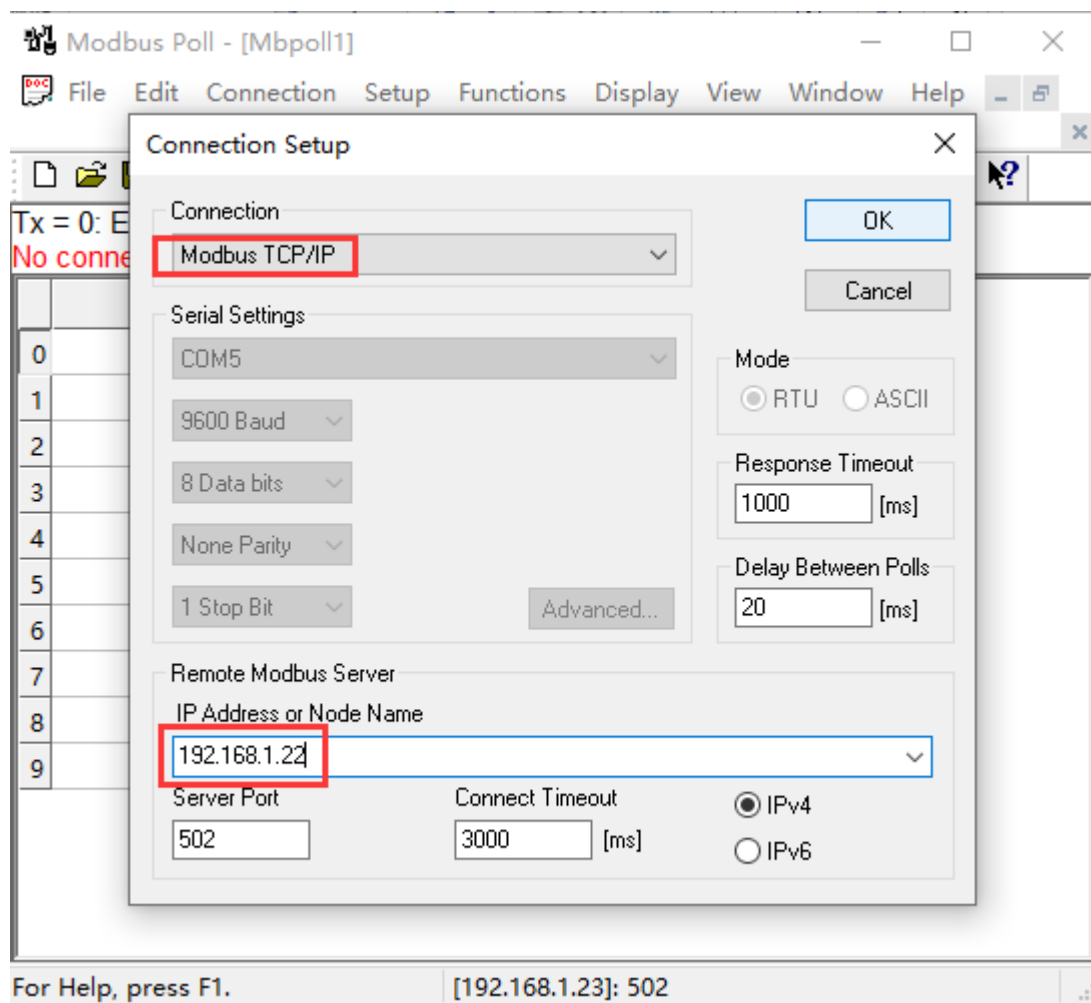


4.2 Test the DO with the gateway Ethernet port

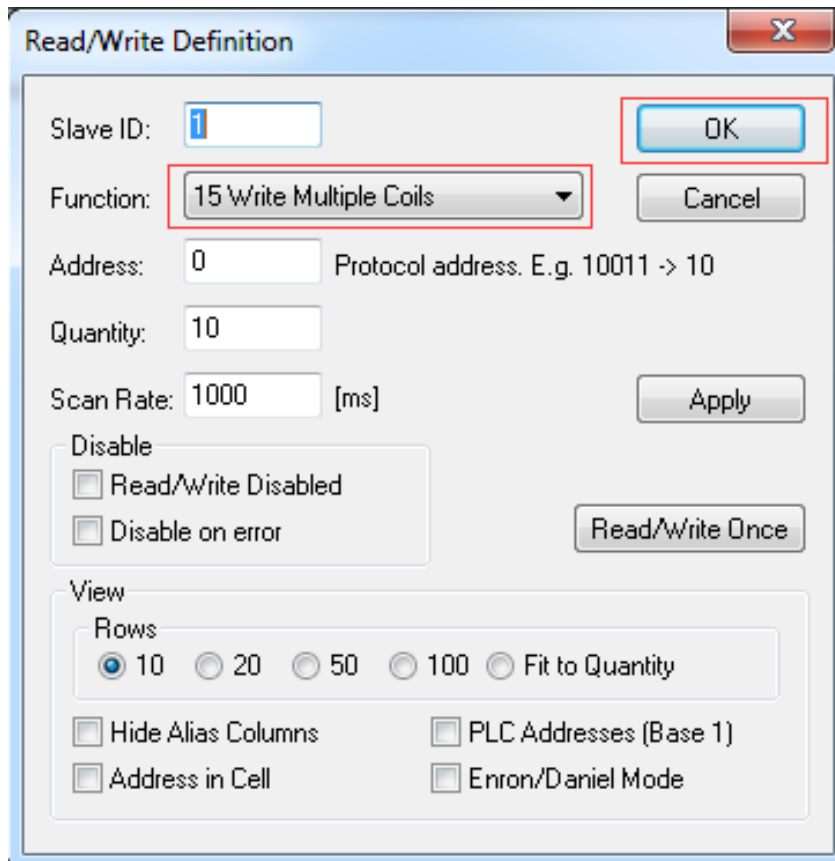
1. Opening MODBUS POLL software → selecting Connection/connect → selecting Modbus TCP/IP → inputting gateway IP address 192.168.1.22 → Setting

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Server Port to 502 → Clicking OK.



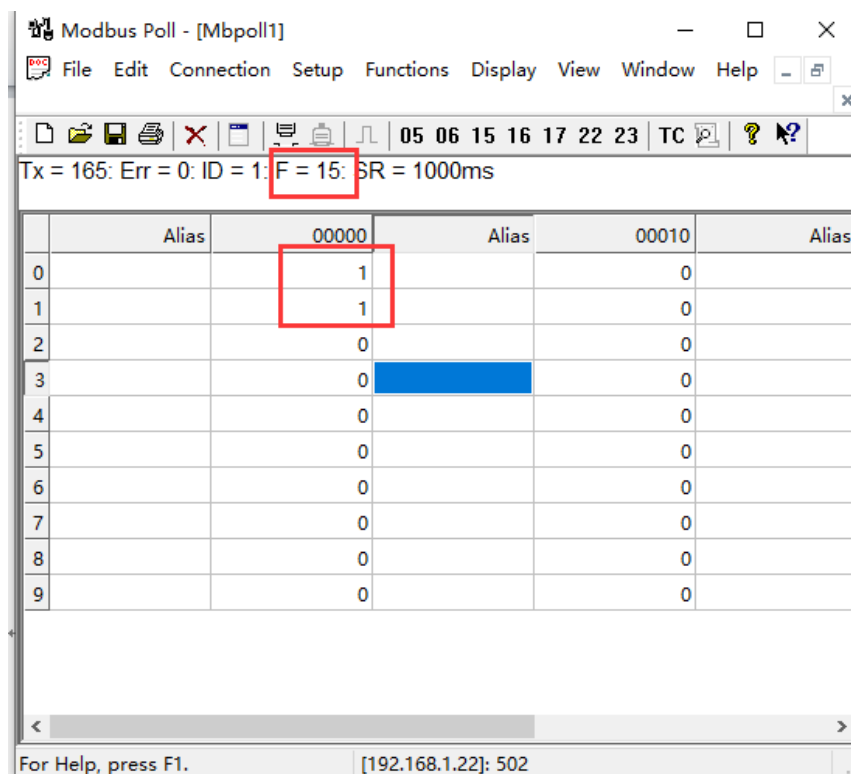
2. Selecting Setup → Read/Write Definition → Selecting Function Code 15
→ Clicking OK.



The 'Read/Write Definition' dialog box is shown with the following settings:

- Slave ID: 1
- Function: 15 Write Multiple Coils
- Address: 0
- Quantity: 10
- Scan Rate: 1000 [ms]
- Buttons: OK, Cancel, Apply, Read/Write Once
- Disable section:
 - ☐ Read/Write Disabled
 - ☐ Disable on error
- View section:
 - Rows: ☒ 10, ☐ 20, ☐ 50, ☐ 100, ☐ Fit to Quantity
 - ☐ Hide Alias Columns
 - ☐ PLC Addresses (Base 1)
 - ☐ Address in Cell
 - ☐ Enron/Daniel Mode

3. Setting the value of corresponding channel to 1 in Modbus poll, as it is shown in the below diagram, it has already set the value to 1 in the channel 0 and channel 1.

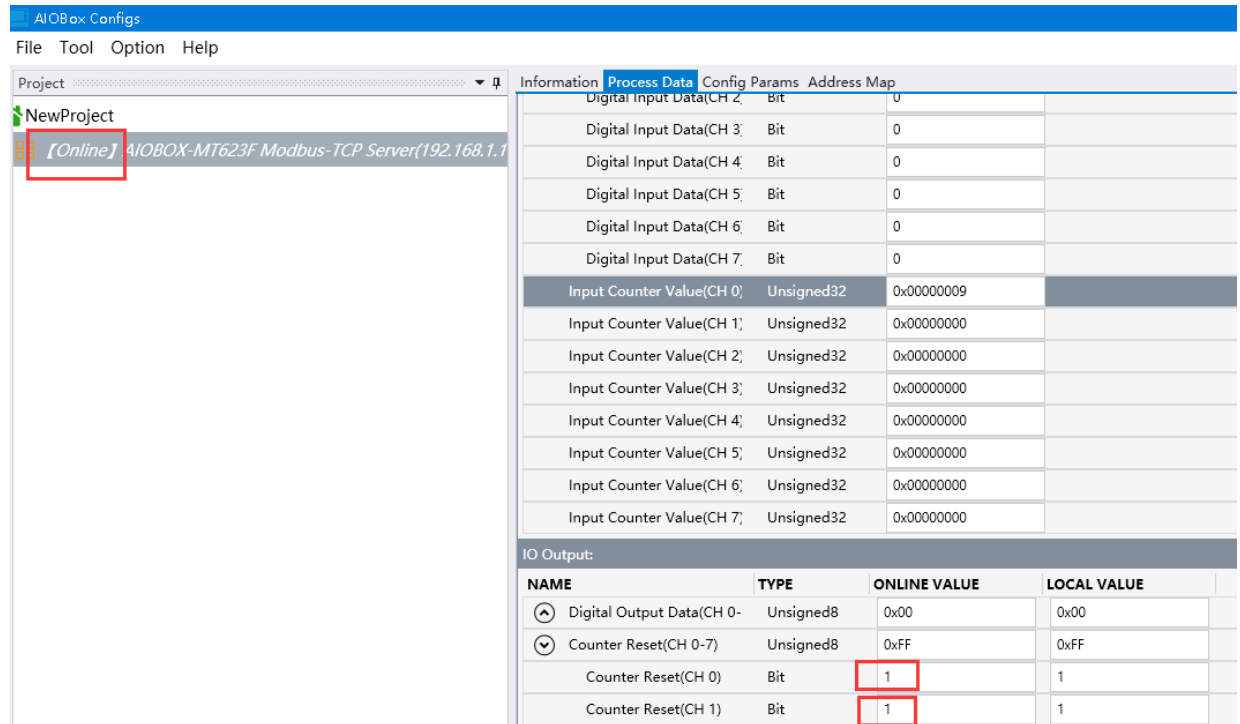


The 'Modbus Poll - [Mbpoll1]' window shows the following status bar: Tx = 165; Err = 0; ID = 1; F = 15; SR = 1000ms.

	Alias	00000	Alias	00010	Alias
0		1		0	
1		1		0	
2		0		0	
3		0		0	
4		0		0	
5		0		0	
6		0		0	
7		0		0	
8		0		0	
9		0		0	

For Help, press F1. [192.168.1.22]: 502

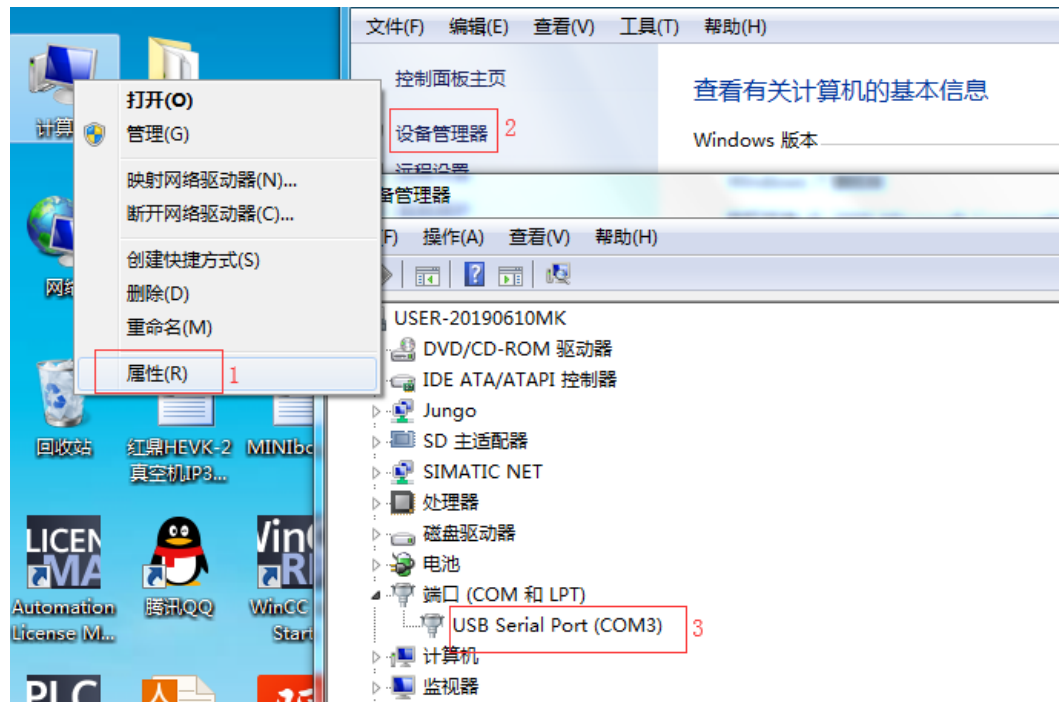
4. Opening AIO-Box configuration software, and selecting online, and then below the process data menu bar, it could be checked the by the corresponding channel online value to see its corresponding channel value is 1 too. So the test is completed, as it is shown in the below diagram:



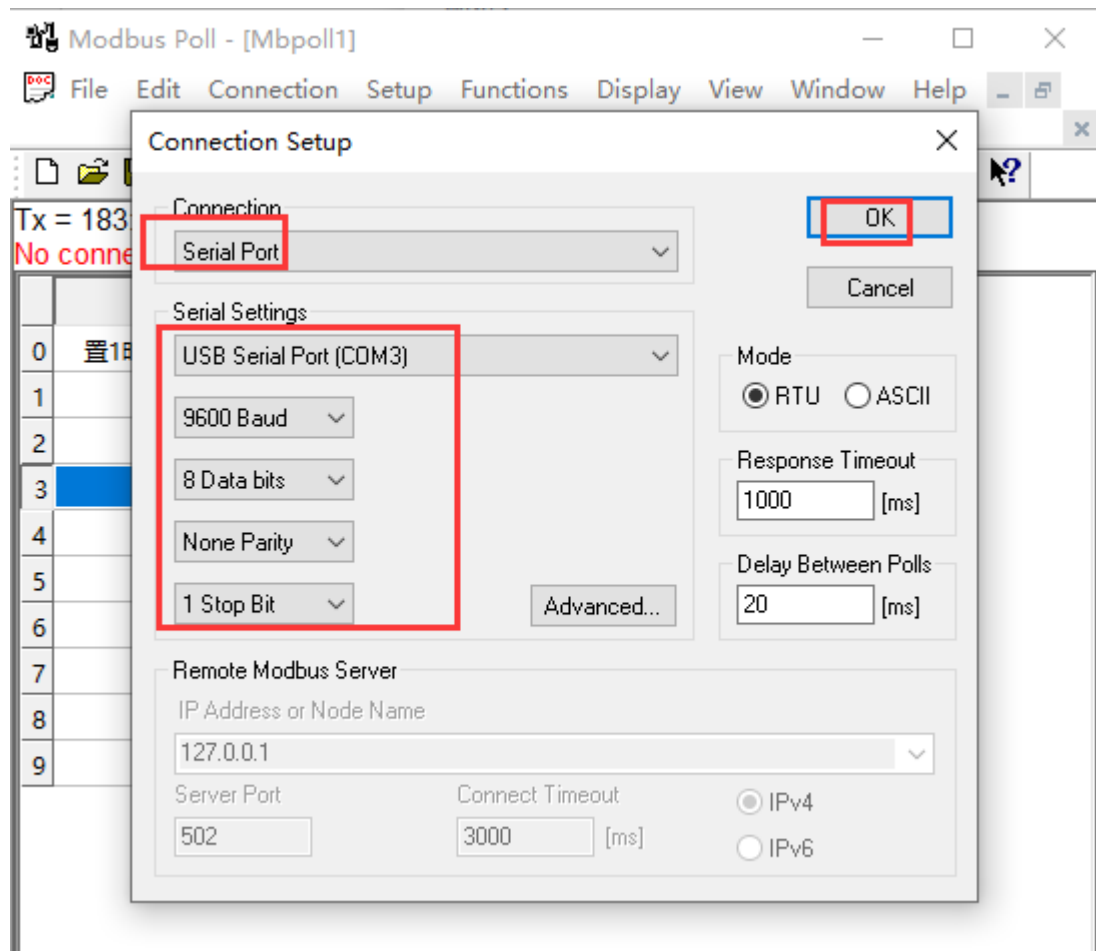
4.3 Test with the gateway serial port

1. It uses RS485 port A+ and B- to separately connect with A+ and B- of the serial port debugging tool. And it uses the USB cable to connect the serial port debugging tool with the PC.

2. Selecting Computer → Right-clicking and selecting properties → Opening device manager to check COM port(here it is COM3) of the serial port debugging tool.

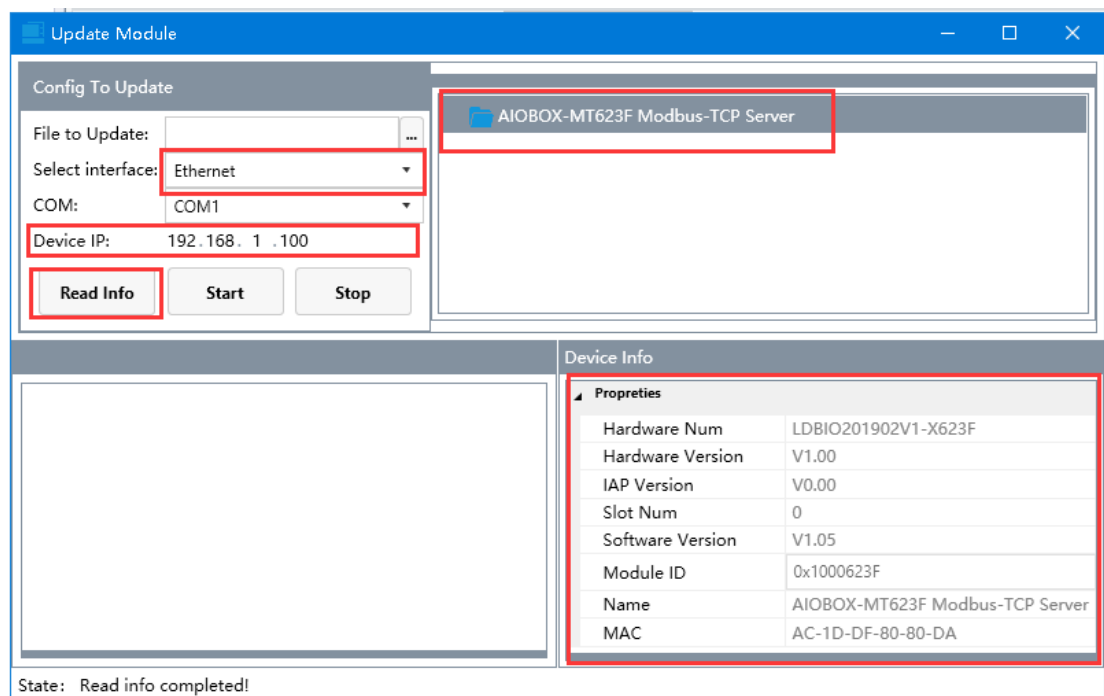
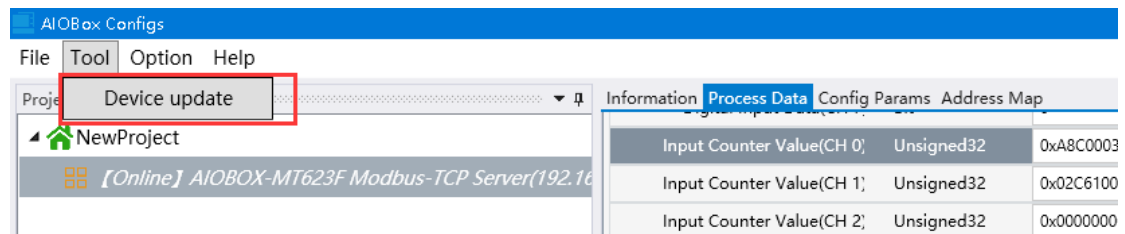



3. Opening Modbus POLL → selecting Connection/connect → selecting Serial Port → selecting the USB COM port in Serial settings → selecting Modbus RTU parameters same with the gateway parameters.

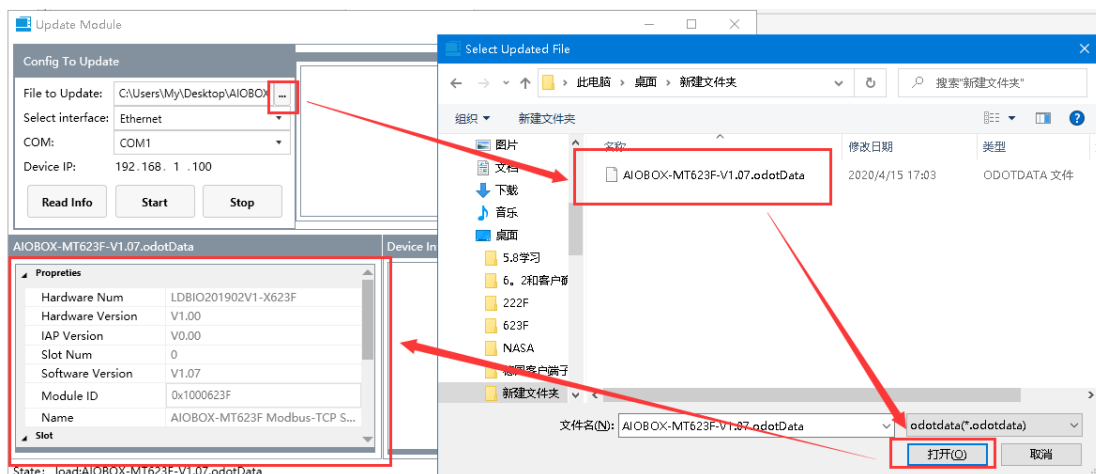


5 Device firmware upgrade

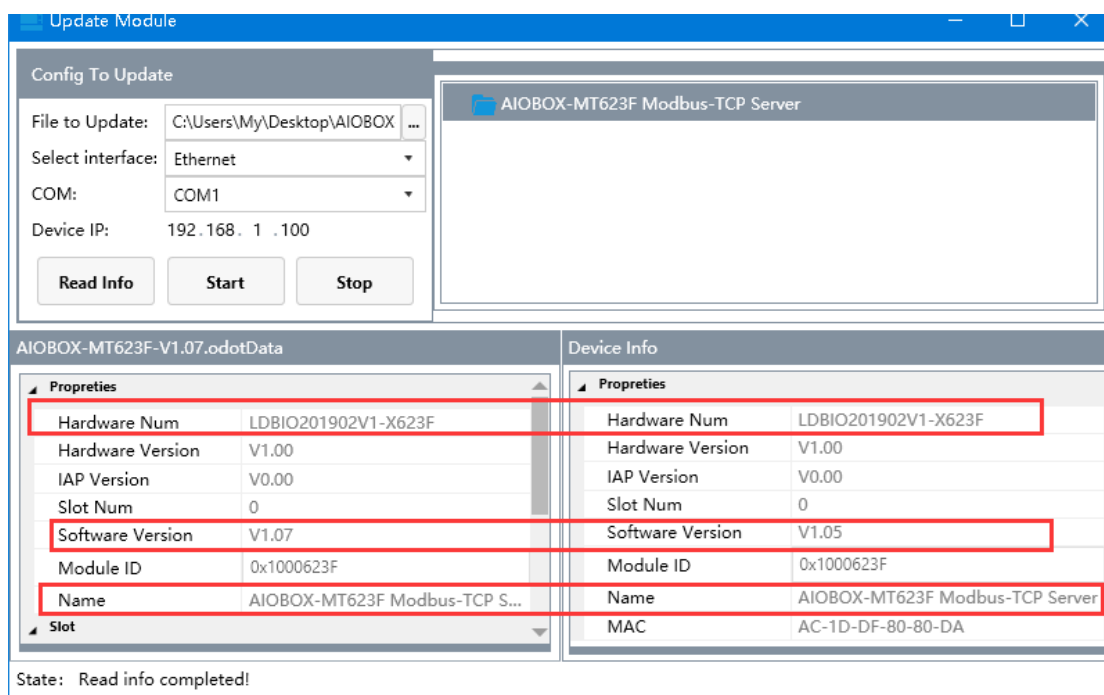
1. In the configuration software of AIO-Box, it could click Tools-Online upgrade
 → selecting "Ethernet" in the pop-up dialog box → clicking "Read Device
 Information" to view the version information of the current adapter module.



2. Clicking the  on the right side of the upgrade menu, and selecting upgrade
 file of adapter module AIO-MT623F in the pop-up window.



3. The upgrade version and other information could be viewed in the lower left side of the upgrade interface. As it is shown in the below diagram, the firmware version does not need to be updated. If the version information is inconsistent and you need to upgrade, so it needs to click the Start upgrading.



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