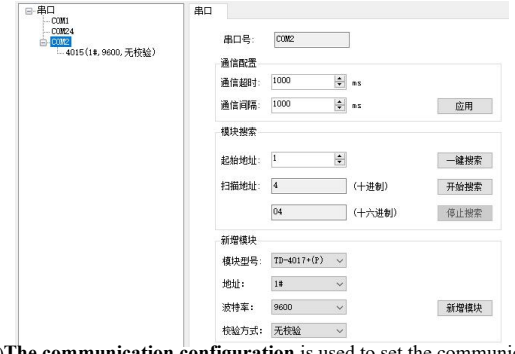
■ Software operation instructions

1、Open the TD-4000 configuration software through the start menu shortcut or desktop shortcut. Right-click the serial port on the left side of the software and select Refresh. The software will automatically search for the serial port on the computer and display the serial port number on the interface;

2、Click the serial port number connected to the module with the left mouse button. There are multiple function areas in the pop-up interface. If the software pops up the prompt box that the serial port cannot be connected, please check whether the serial port is normal or occupied by other software;



(1)**The communication configuration** is used to set the communication timeout and communication interval of the upper computer. The communication timeout refers to the maximum time for the software to wait for the module to return data after sending the command. If the software fails to receive the returned data within this time, it will be deemed that the communication failed. The communication interval refers to the time for the software to send the next command after the software completes sending the command. After entering the value to be set, click Apply;

(2)**The module search** is used to search the module information (device model, communication address, baud rate, and verification method). The one-key search is the software sending the universal search command to the module (the module firmware version must be B0.01 or above, and only one module can be connected on the same serial port). This function can directly obtain the module information, Start search is to poll the search module information from the start address (all firmware versions are supported, and multiple modules with different communication addresses can be connected on the same serial port), and automatically stop when the search address is 255. Stop search is to stop the search in advance during the polling search process. The searched module information will be displayed below the serial port number, as shown in the figure above. The information contents are: device model, communication address, baud rate Verification method.

(3)**The new module** is used to manually add module information. If the information of the module has been learned in advance, select the known module model in the module model, select the known module address in the address, select the known module baud rate in the baud rate, select the known module verification method in the verification method, click the new module, and the new information will be displayed under the serial port number;

3、After the software obtains the module information, directly click the module information software with the left mouse button to automatically connect the module and display the communication parameter page and module function page;

(1)**The communication parameter page** is used to view the current address, baud rate, verification method and firmware version of the module. At the same time, you can also set the address, baud rate and verification method of the module. In the communication parameter setting area, select the address to be modified, baud rate and verification method, and then click the setting button. If the setting is successful, the software will pop up a prompt box. At this time, you need to search the module again, If the modification failure prompt box pops up, check whether there is a fault.

(2)Page TD-4015S is used to view the measured values and configuration parameters of the module and modify the configuration parameters.

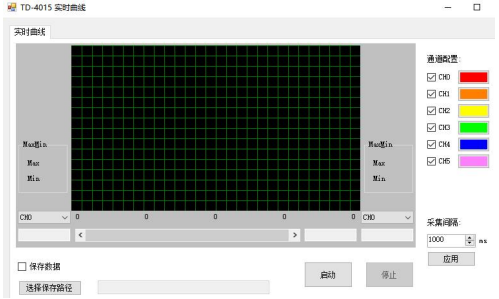
1) **Range configuration**, Select the channel you want to configure in the channel drop-down box, select the range you want to configure in the range drop-down box, and then click Set Range. If you want all channels to be set to the same range, you can check the unified setting and then click Set Range.

2) **Engineering value upper and lower limit configuration**, Select the channel you want to configure in the channel drop-down box, enter the upper and lower limits of the engineering value to be configured in the input box of the upper and lower limits of the engineering value, and click Set Upper and Lower Limits. If you want all channels to be set to the same upper and lower limits of the engineering value, you can check the unified setting, and then click Set Upper and Lower Limits.

3) **Set Enable**, Select the enabling status of the corresponding channel in the selection box on the channel enabling configuration page (check to enable, uncheck to disable), and then click Set Enable.

4) **Real-time curve**, Click the real-time curve button and the software will pop up the real-time curve interface.

(3)The real-time curve interface is shown in the figure.



1) The highest end of the curve interface corresponds to the upper limit of the range, and the lowest end of the curve interface corresponds to the lower limit of the range;

2) Check or cancel the channel configuration selection box to select whether to display the curve of the corresponding channel;

3) Check or cancel the channel configuration selection box to select whether to display the curve of the corresponding channel;

4) Select the channel drop-down box on the left and right sides of the interface to display the measured value and extreme value of the corresponding channel;

5) Enter the acquisition interval and click Apply to set the period for reading data;

6) Check the Save Data box to save the channel measurement data as a. CSV file (Excel can be opened);

7) Click the Select Save Path button to reselect the file name and path to save;

8) Click the start button, and the software starts to record data;

9) Click the stop button, and the software stops recording data;

10) In the stop state, slide the scroll bar under the curve to view the recorded data;

■ FAQ

1、Q: The measurement is normal only when one channel is connected to the signal, and the measurement is abnormal after the signal of other channels is connected?

A: The connected sensors have leakage. Please connect the sensors one by one. If the data is abnormal after connecting a sensor, it indicates that the sensor has leakage. Please eliminate the leakage of this sensor.

2、Q: When inputting a signal larger than half of the range during programming, the data read is abnormal?

A: The programming system used parses unsigned data into signed data. It is recommended to read the measured original value.

TD-4015S
8-Channel Thermal Resistance Acquisition Module Instrations(Usage)

NOTE

- Please check the product packaging, product label model, specifications are consistent with the order contract;
- Please read this manual carefully before installation and use. If you have any questions, please contact our technical support hotline;
- The product need to installed in a safe place;
- 24V DC power supply for instrument, 220V AC power supply is strictly prohibited;
- It is strictly prohibited to disassemble and assemble the instrument without permission to prevent instrument failure or failure.
- The Company reserves the right to change the product without prior notice to the user. In case of any discrepancy between the contents of the instructions and the website, samples and other materials, the instructions shall prevail.
- Please scan the code for more product information and configuration software.

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■ Profile

TD-4015S supports 8-channel three-wire input of PT100, PT1000, Cu50, Cu100, Ge53, BA1, BA2, R5000 and R500 ranges. The AD acquisition part is photoelectric isolated, and the application layer adopts the standard MODBUS-RTU protocol, which is applicable to a variety of industrial occasions and automation systems. It is convenient to communicate with the host computer, and can realize rapid networking and build monitoring system.

PT100	-200~850℃	CU100	-50~150℃	BA2	-200~650℃
PT1000	-200~850℃	Ge53	-50~150℃	R5000	0~5000Ω
CU50	-50~150℃	BA1	-200~650℃	R500	0~500Ω

■ Main Technical Parameters

Input

Number of Channels: 8

Input range:PT100、PT1000、Cu50、Cu100、Ge53、BA1、BA2、R5000 and R500

Input method:Eight-channel three-wire thermistor input

Sampling frequency:≤10Hz,(Channel sampling rate=total sampling rate/number of enabled channels, 1.67Hz when 6 channels are fully enabled, there is a filtering algorithm inside the module, and there is a delay in data update)

Accuracy class：≤0.1%（Accuracy does not include lead error）

Excitation current：Double 250uA（Output by RTD+and RTD - respectively）

Output

Signal type： RS-485 digital signal

Baud rate： 1200、2400、4800、9600、19200、38400、57600、115200bps

Verification method: no verification, odd verification or even verification

Data bits： 8bit Stop bit：1bit

Communication output protocol:MODBUS-RTU

Communication distance:1200m

General Technical Parameters

Power Supply: DC24V, Voltage Range: DC 9~30V

Current Consumption: <1.5W @DC 24V

Dielectric Strength: 1500V DC/1min （between input and output）

Insulation Resistance: ≥ 100MΩ (between input and output)

Electromagnetic Compatibility: In accord with GB/T18268(IEC61326-1)

Suit for Field Equipment: Configuration software, PLC, touch screen, computer and other equipment supporting MODBUS - RTU protocol

Indicator status

1、The indicator light is always on after power-on. If it is not on, it indicates power failure or poor contact；

2、The indicator flashes during normal communication；

3、When there is no communication, the indicator lamp flashes, indicating that the module is faulty.

Default factory parameters

Device address：1 Baud rate：9600bps Verification method: no verification

Data bits： 8bit Stop bit：1bit

Channel range: all are set to PT100 range, and the acquisition status is enabled；

Use environment

(1) The surrounding environment shall be free of strong vibration, impact, large current, spark and other electromagnetic induction effects. The air shall be free of corrosive media for chromium, nickel and silver coatings, and shall not contain flammable and explosive substances;

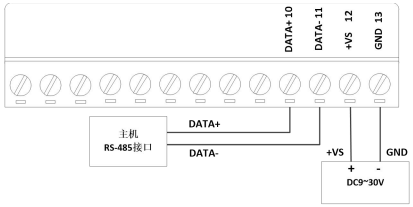
(2) Continuous operating temperature：-40℃~ +85℃；

(3) Relative humidity ： 10 % ~ 90 % R H(No condensation)；

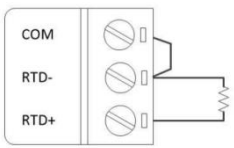
■ Wiring instructions

Communication and power wiring diagram：

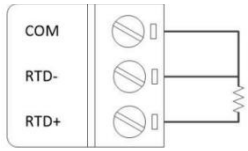
The RS485 communication line is connected by hand. If star connection is required, please add a splitter. The terminal resistance Rt is added at both ends of the communication line as required.



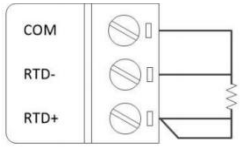
Input signal wiring diagram：



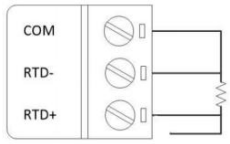
Two-wire heating resistance wiring



Three-wire heating resistance wiring



Four-wire heating resistance wiring 1



Four-wire heating resistance wiring 2

PS:

①When using two-wire thermistor, if the lead is too long, the error will increase；

②Three-wire thermal resistance needs to ensure that the resistance values of the three leads are consistent, otherwise the error will increase；

③The lead of four-wire heating resistor is relatively short, so the four-wire heating resistor wiring method 1 is used for wiring；

④If the lead resistance of the four-wire heating resistor is consistent, the four-wire heating resistor wiring mode 2 shall be used for wiring；

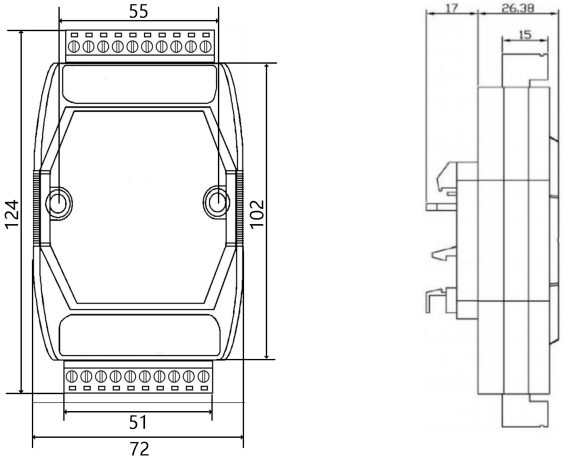
⑤If the lead of four-wire thermal resistor is long and the lead resistance is inconsistent, the error will increase；

■ Connecting terminal description

Terminal number	Terminal name	Text description
1	COM	RTD common side
2	RTD5-	RTD 5 input negative terminal
3	RTD5+	RTD 5 input positive end
4	RTD6-	RTD 6 input negative terminal
5	RTD6+	RTD 6 input positive end
6	COM	RTD common side
7	RTD7-	RTD 7 input negative terminal
8	RTD7+	RTD 7 input positive end
9	NC	Empty end
10	DATA+	RS-485 Positive end of communication interface
11	DATA-	RS-485 Negative terminal of communication interface
12	+VS	Positive terminal of external power supply (9~30V)
13	GND	Negative terminal of external power supply (grounding)
14	RTD0+	RTD 0 input positive end
15	RTD0-	RTD 0 input negative terminal
16	COM	RTD common side
17	RTD1+	RTD 1 input positive end
18	RTD1-	RTD 1 input negative terminal
19	RTD2+	RTD 2 input positive end
20	RTD2-	RTD 2 input negative terminal
21	COM	RTD common side
22	RTD3+	RTD 3 input positive end
23	RTD3-	RTD 3 input negative terminal
24	COM	RTD common side
25	RTD4+	RTD 4 input positive end
26	RTD4-	RTD 4 input negative terminal

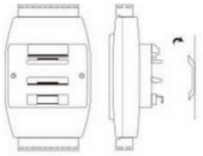
PS：COM0~COM5 Connect together internally

■ Overall Dimension



■ Install

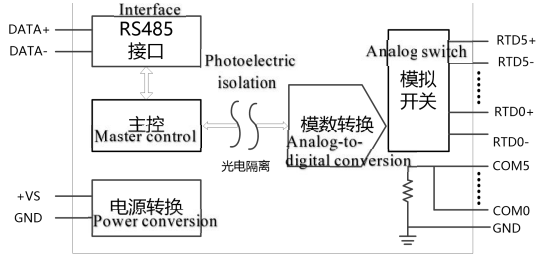
TD-4015S adopts DIN35mm guide rail installation mode. The guide rail shall comply with the installation dimension specification of TH35-7.5 guide rail in the national standard GB/T19334-2003. This standard is equivalent to the international standard of IEC 60715-1981. The installation must be stable and firm.



DIN-Rail Mounting

Overlay installation

■ Internal structure



■ Signal Communication Point Table

Point Table	Attribute	Function	Value range and description
40001	16-bit unsigned read-only register	40001~40008 corresponding Measured digital value of channel 0 to channel 5	0~65535 corresponds to the lower limit and upper limit of the input range, For example, 4~20mA range: 0 corresponds to 4mA, 65535 corresponds to 20mA, in a linear relationship, Some PLCs or software do not support 16-bit unsigned format. It is recommended to read the measured original value.
40002			
40003			
40004			
40005			
40006			
40009	16-bit unsigned read-only register. Only firmware version: B0.01 and above is valid	40009~40016 corresponds to the measured original value of channel 0~5	-32768~32767, Correspondence with measured value: PT100 temperature value 10X PT1000 temperature value 10X CU50 temperature value 100X CU100 temperature value 100X GE53 temperature value 100X BA1 temperature value 10X BA2 temperature value 10X R5000 Resistance value 1X R500 Resistance value 10X For example, if the value read by PT100 range is - 199, the actual measured temperature value is -19.9 ℃.
40010			
40011			
40012			
40013			
40014			
40017	16-bit unsigned read-only register. Only firmware version: B0.01 and above is valid	40017~40022 corresponds to the measured engineering value of channel 0~5	-32768~32767 Related to the upper and lower limit of engineering value and measured value. For example: R500 range, the upper limit of engineering value is 1000, The lower limit of the engineering value is 0. When the resistance of 50 Ω is connected, the engineering value is 100
40018			
40019			
40020			
40021			
40022			
40101	16-bit unsigned Read and write register. Power-off storage Firmware version only: B0.01 and above are valid	Channel 0 Lower limit of engineering value	-32768~32767, The lower limit of engineering value corresponds to the lower limit of measuring range. Engineering value upper limit corresponds to range upper limit 如: For example: R500 range, range 0~500 Ω. If the sensor range is 0~10m, the lower limit of the engineering value can be set as 0, and the upper limit of the engineering value can be set as 10000. When the engineering value of the corresponding channel is read as 5999, the actual value is 5.999m.
40102		Channel 0 Upper limit of engineering value	
40103		Channel 1 Lower limit of engineering value	
40104		Channel 1 Upper limit of engineering value	
40105		Channel 2 Lower limit of engineering value	
40106		Channel 2 Upper limit of engineering value	
40107		Channel 3 Lower limit of engineering value	
40108		Channel 3 Upper limit of engineering value	
40109		Channel 4 Lower limit of engineering value	
40110		Channel 4	
40111		Upper limit of engineering value Channel 5 Lower limit of engineering value	
40112		Channel 5 Upper limit of engineering value	
40201	16-bit read and write register,Power-off storage	40201~40206 Input range corresponding to channel 0 to channel 5	PT100 Code is 0x0050; PT1000 Code is 0x0051; CU50 Code is 0x0052; CU100 Code is 0x0053; GE53 Code is 0x0054; BA1 Code is 0x0055; BA2 Code is 0x0056; R5000 Code is 0x0057; R500 Code is 0x0058;
40202			
40203			
40204			
40205			
40206			

Point Table	Attribute	Function	Value range and description
40211	16-bit read-only register	Module name1	0X4015
40212		Module name2	0X0000
40213		Firmware version	0X0000~0XFFFF
40215	16-bit read and write register power-down storage	Equipment communication address	0X0001~0X00FF Indicates the address of the device
40216		Baud rate	0：1200bps 1：2400bps 2：4800bps 3：9600bps 4：19200bps 5：38400bps 6：57600bps 7：115200bps
40217		Verification method	0：No verification 1：Odd check 2：even parity check

Point Table		Register function description	Value range
00201	Single Bit Read Only Coil	Channel 0 disconnection	When value is 1，thermal resistance is disconnection;When value is 0，thermal resistance is normal.
00202		Channel 1 disconnection	
00203		Channel 2 disconnection	
00204		Channel 3 disconnection	
00205		Channel 4 disconnection	
00206		Channel 5 disconnection	

■ Calculation formula of digital value

Measurement range	Calculation formula (D is digital value, 16-bit unsigned integer)
PT100	D / 65535 * 1050 - 200 (℃)
PT1000	D / 65535 * 1050 - 200 (℃)
Cu50	D / 65535 * 200 - 50 (℃)
Cu100	D / 65535 * 200 - 50 (℃)
Ge53	D / 65535 * 200 - 50 (℃)
BA1	D / 65535 * 850 - 200 (℃)
BA2	D / 65535 * 850 - 200 (℃)
R5000	D / 65535 * 5000 (Ω)
R500	D / 65535 * 500 (Ω)

TD-4015S
8-channel Thermal Resistance Acquisition Module Instrations(Programming)

NOTICE

- Please check the product packaging, product label model, specifications are consistent with the order contract;
- Please read this manual carefully before installation and use. If you have any questions, please contact our technical support hotline;
- The product need to installed in a safe place;
- 24V DC power supply for instrument, 220V AC power supply is strictly prohibited;
- It is strictly prohibited to disassemble and assemble the instrument without permission to prevent instrument failure or failure.
- The Company reserves the right to change the product without prior notice to the user. In case of any discrepancy between the contents of the instructions and the website, samples and other materials, the instructions shall prevail.
- Please scan the code for more product information and configuration software.

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The MODBUS-RTU protocol provides multiple function codes to achieve different functions. TD-4000 series products only support some of the function codes. This manual only explains the function codes used. The function codes supported by TD-4000 series products are: 0X01, 0X03, 0X04, 0X06, 0X05, 0X0F, 0X10, of which TD-4015 does not support function codes 0X05 and 0X0F. The corresponding point table addresses and function descriptions of the function codes are shown in the following table:

Function code	symmetric points address	Function description
0X01	0XXXX	Read the status of multiple coils (single bit data)
0X05	0XXXX	Write single coil (single bit data) status (0X0F can be replaced)
0X0F	0XXXX	Write multiple coils (single bit data) status
0X03	4XXXX	Read the value of multiple registers
0X04	4XXXX	Read the value of multiple registers （0X03 can be replaced）
0X06	4XXXX	Write a single register value （0X10 can be replaced）
0X10	4XXXX	Write multiple register values

Function code 0X01

1、The structure of the request message sent by the host, in which the starting address and the number of coils are represented by the large end. The starting address needs to be reduced by one from the point table address, for example, the address of 00016 is 0X000F,

Description	Number of bytes	Value range
Device address	1 byte	0X0001~0X00FF
Function code	1 byte	0X01
Start address	2 byte	0X0000~0XFFFF
Number of coils	2 byte	0X0001~0X0040
CRC verification	2 byte	0X0000~0XFFFF

2、The slave returns the message structure. Each bit of the coil status data represents a coil status 1=ON and 0=OFF, and the LSB (least significant bit) of the first data byte represents the coil status of the starting address. The other coils are analogized, until the highest bit of this byte, and in the order of low to high in the subsequent bytes.

Description	Number of bytes	Value range
Device address	1 byte	Address of module
Function code	1 byte	0X01
Number of coil status bytes	1 byte	N(Notes)
Coil status	N byte	Big end mode, high byte first
CRC verification	2 byte	0X0000~0XFFFF

NOTE：N=Coil quantity / 8，If the remainder is not equal to 0，N=Coil quantity / 8 + 1

3、EG，Read the 24 coil states of 00001~00024 of the module with address 1，

Host sends message： (The message is in hexadecimal format)

01	01	00	00	00	17	3C	00
Module address	Function code	Start address high byte	Start address low byte	Number of coils high byte	Number of coils low byte	CRC verification	CRC verification

Slave return message： (The message is in hexadecimal format)

01	01	03	01	03	07	2C	BC
Module address	Function code	Number of coil status bytes	Coil status byte 0	Coil status byte 1	Coil status byte 2	CRC verification	CRC verification

The coil status byte of 3 bytes in total in the message returned from the slave：

Byte **0:** 0X01 binary system is 0000 0001，from right to left (That is, from the lowest byte to the highest byte），Representative 00001~00008 status is ON, OFF, OFF, OFF, OFF, OFF, OFF, OFF,

Byte **1:** 0X03 binary system is 0000 0011，from right to left (That is, from the lowest byte to the highest byte),Representative 00009~00016 status is ON, ON, OFF, OFF, OFF, OFF, OFF, OFF,

Byte **2:** 0X07 binary system is 0000 0111，from right to left (That is, from the lowest byte to the highest byte),Representative 00017~00024 status is ON, ON, ON, OFF, OFF, OFF, OFF, OFF,

Function code 0X0F

1、The structure of the request message sent by the host, in which the starting address and the number of registers are expressed in the large-end way, and the starting address needs to be reduced by one point table address. For example, the address of 00008 is 0X0007, each bit of the coil status data represents a coil status 1=ON, 0=OFF, and the LSB (least significant bit) of the first data byte represents the coil status of the starting address. The other coils are analogized, until the highest bit of this byte, and in the order of low to high in the subsequent bytes.

Description	Number of bytes	Value range
Device address	1 byte	0X0001~0X00FF
Function code	1 byte	0X0F
Start address	2 bytes	0X0000~0XFFFF
Number of coils	2 bytes	0X0001~0X0040
Number of coil status bytes	1 byte	N (Notes)
Coil status	Nx byte	
CRCverification	2 bytes	0X0000~0XFFFF

Note：N=Number of coils/8，If the remainder is not equal to 0，N=Number of coils/8 + 1

2、The message structure returned by the slave is equivalent to the first 6 bytes of the host message plus 2 bytes of CRC verification；

Description	Number of bytes	Value range
Device address	1 byte	0X0001~0X00FF
Function code	1 byte	0X0F
Start address	2 bytes	0X0000~0XFFFF
Number of coils	2 bytes	0X0001~0X0040
CRCverification	2 bytes	0X0000~0XFFFF

3、EG，Set the status of 8 coils in modules 00017~00024 with address 1 to：ON，OFF，ON，OFF，OFF，OFF，OFF，OFF;

Host sends message： (The message is in hexadecimal format)

01	0F	00	10	00	08	01	05	FF	55
Module address	Function code	Start address high byte	Start address low byte	Number of coils high byte	Number of coils low byte	Number of coil status bytes	Coil status byte 0	CRC verification	CRC verification

Coil status byte 0：0X05 binary system 0000 0101，from right to left （(That is, from the lowest byte to the highest byte），Representative 00017~00024 status is ON, OFF, ON, OFF, OFF, OFF, OFF, OFF,

Slave return message:(The message is in hexadecimal format)

01	0F	00	10	00	08	55	C8
Module address	Function code	Start address high byte	Start address low byte	Number of coils high byte	Number of coils low byte	CRC verification	CRC verification

Function code 0X03

1、The structure of the request message sent by the host, in which the starting address and the number of registers are represented by the large end. The starting address needs to be removed from the first 4 of the point table address and then subtracted by one,for example,address of 40017 is 0X0010

Description	Number of bytes	Value range
Device address	1 byte	0X0001~0X00FF
Function code	1 byte	0X03
Start address	2 bytes	0X0000~0XFFFF
Number of registers	2 bytes	0X0001~0X0040
CRC verification	2 bytes	0X0000~0XFFFF

2、The slave returns the message structure, and each register occupies 2 bytes. For each register, the first byte is the high byte of the register, and the second byte is the low byte of the register (that is, large-end mode)；

Description	Number of bytes	Value range
Device address	1 byte	Module address
Function code	1 byte	0X03
Number of register value bytes	1 byte	2*N(Notes)
Register value	2*Nx byte	Big end mode, high byte first
CRC verification	2 bytes	0X0000~0XFFFF

Note：N=Number of registers

3、for example，Read the value of two registers from 40009 to 40010 of the module with address 1，

Host sends message:(The message is in hexadecimal format)

01	03	00	08	00	02	45	c9
Module address	Function code	Start address high byte	Start address low byte	Number of registers high byte	Number of registers low byte	CRC verification	CRC verification

Slave return message： (The message is in hexadecimal format)

01	03	04	F1	03	F7	FF	3E	BF
Module address	Function code	Number of register value bytes	Register byte 0	Register byte 1	Register byte 2	Register byte 3	CRC verification	CRC verification

The register value of 4 bytes in the message returned by the slave：

Byte 0 and byte 1 are the values of register 40009, hexadecimal representation is 0XF103, conversion to 16-bit unsigned number is 61699, conversion to 16-bit signed number is - 3837, byte 2 and byte 3 are the values of register 40010, hexadecimal representation is 0Xf7ff, conversion to 16-bit unsigned number is 63487, conversion to 16-bit signed number is - 2049，

Function code 0X10

1、The request message structure sent by the host, in which the starting address and the number of registers are expressed in the big-end mode. The starting address needs to be removed from the first 4 of the address of the point table, and then subtracted by one. For example, the address of 40004 is 0X0003, and each register occupies 2 bytes. For each register, the first byte is the high byte of the register, and the second byte is the low byte of the register (i.e., the big-end mode)；

Description	Number of bytes	Value range
Device address	1 byte	0X0001~0X00FF
Function code	1 byte	0X10
Start address	2 bytes	0X0000~0XFFFF
Number of registers	2 bytes	0X0001~0X0040
Number of register value bytes	1 byte	2*N (Notes)
Register value	2*Nx byte	Big end mode, high byte first
CRC verification	2 bytes	0X0000~0XFFFF

Note：N=Number of registers

2、The message structure returned by the slave is equivalent to the first 6 bytes of the host message plus 2 bytes of CRC verification；

Description	Number of bytes	Value range
Device address	1 byte	Module address
Function code	1 byte	0X10

Start address	2 bytes	0X0000~0XFFFF
Number of registers	2 bytes	0X0000~0X0040
CRC verification	2 bytes	0X0000~0XFFFF

3、For example, set the value of the two registers of the module 40002~40003 with address 1 to 0XF003 (16-bit unsigned: 65283, 16-bit signed: - 4093), 0X0007 (16-bit unsigned: 7, 16-bit signed: 7);

Host sends message：

01	10	00	01	00	02	04
Module address	Function code	Start address high byte	Start address low byte	Number of registers high byte	Number of registers low byte	Number of register value bytes

F0	03	00	07	B0	A1	
Number of register value bytes 0	Number of register value bytes 1	Number of register value bytes 2	Number of register value bytes 3	CRC verification	CRC verification	

Slave return message：

01	10	00	01	00	02	10	08
Module address	Function code	Start address high byte	Start address low byte	Number of registers high byte	Number of registers low byte	CRC verification	CRC verification