Data Logger User Manual

Content

1. Overview....4

2. Function Features....4

3. Technical Index....6

3.1 Display....6

3.2 Signal Input and Accuracy....6

3.3 Alarm Output....8

3.4 Power Supply....8

3.5 Communication Printer Interface....8

3.6 Power Conditions....8

3.7 Recording Time....8

4. Installation,Wiring & Dimension....9

4.1 Dimension and Installing Opening Hole Size....9

4.2 Wiring Terminal Pictures....10

4.3 Input Signal Wiring Methods....11

4.4 Current Module TP1748 Input Signal Wiring....11

4.5 Relay Output Signal Wiring and Installation Description....12

5. Instrument Operation and Parameter Setup....12

5.1 Display Interface....14

5.2 Bar Graph....15

5.3 Curve Interface....15

5.4 Alarm Interface....17

5.5 Parameter Settings....18

5.5.1 Numbers of Channel....19

5.5.2 Basic Parameter....20

5.5.3 Limit Value Setup....21

5.5.4 Adjustment(Mapping)....22

5.5.5 Relay Settings....23

5.6 System Settings....23

5.7 Data Export....27

6. Communication Settings and Protocol..... 30
6.1 Communication Overview..... 30
6.2 RS232 Communication Methods..... 31
6.3 RS485 Communication Methods..... 31
6.4 Ethernet Communication..... 32
6.5 Communication Interface..... 33
6.6 Modbus RTU （Series Port Communication）..... 33
6.7 CRC Generation..... 33
6.8 Modbus TCP (Ethernet Communication Protocol）..... 34
6.9 Register Address List..... 35
7. Communication Software Description..... 37
7.1 Host Software Installation..... 37
7.1.1 Download and Install the Host Computer Software..... 37
7.1.2 Pop up and Run..... 37
7.2 System Interface Introduction..... 38
7.3 Create Device and Setup Communication..... 39
7.3.1 Create Device..... 39
7.3.2 Choose Data Display Methods..... 43
7.3.3 Query..... 47
7.3.4 Alarm Setup..... 49
7.4 Historical Data..... 52
7.4.1 Historical Data & Alarm Log Query Export..... 52
7.4.2 Open Device Host to Export Historical Data..... 53
7.4.3 Historical Data Print..... 58
7.5 System Exit..... 59
8. Fault Analytical & Elimination..... 59

1. Overview

Multi-channel touch data loggers have been widely used in all fields of life with their rich display screens, flexible operation methods, and powerful recording, computing, control and management functions. This product absorbs the advantages of various domestic and foreign data recorders, and applies the latest display technology, microelectronic technology, data storage and communication technology. It is a product with complete functions, convenient operation, accurate and reliable, and high cost performance.

This product is configured with a color LCD touch screen for damage and display. It can receive various types of current, voltage and current signals, and realize the display, recording, over-limit monitoring, report generation, data communication of temperature, humidity, pressure, liquid level, flow rate, composition, force, torque, displacement, vibration and other physical quantities , signal transmission and flow accumulation and other functions.

This product is mainly composed of touch LCD screen, buttons, main board with ARM microprocessor as the core, main power supply, external transmitter power supply, data acquisition board, signal output board, large-capacity FLASH, etc.:

It can be equipped with different types of intelligent data acquisition control boards, which can be selected according to application requirements.

- Built-in large-capacity FLASH, can quickly download the data in the FLASH to the U disk and then transfer it to the computer. Record the data of all channels at least once in 1 second, and order a single-type data collector within 32 channels within 0.1 second.

- Digital display interface, bar graph display screen, real-time (historical) curve screen, alarm data page.

- Historical curve reading cursor function.

- Multi-point alarm function can be setup by parameter.

2. Function Features

- Adopt high-brightness touch color TFT LCD screen, CCFL backlight, clear picture;

- Adopt ARM microprocessor, it can realize multi-channel (up to 64 channels and more

channels inside the instrument host) signal acquisition, recording, display and alarm at the same time;

- Adopt 3459MB large-capacity FLASH flash memory chip to store historical data, never lose data when power off;

- Fully isolated universal input, can input a variety of signals at the same time, no need to replace the module, you can set it directly on the instrument;

- The numerical range for displaying engineering quantity data is wider, and 6-digit values can be displayed: -999, 99~1999.99;
- It can set parameters, display project tag number, project unit, and can customize functions such as flow accumulation;

- With red alarm display, it also indicates the lower and lower limit, lower limit, upper limit and upper limit alarm of each channel; 8-channel relay alarm output (optional);

- Built-in GB2312 Chinese character library, use Quanpin input method to input;

- Support internal/external micro-printing, manual printing of data and curves, and automatic timing of printing data to meet the needs of users for on-site printing (optional);

- Equipped with a standard USB2.0 interface, you can use the mouse and keyboard to operate conveniently, and output historical data is quick and convenient;

- Standard serial communication interface, RS485 and RS232 with optocoupler isolation and Ethernet;

- Support the standard Modbus RTU communication protocol, in addition to supporting the company's data management software, but also support other configuration software;

- Adopt international famous brand switching power supply, can work normally in the wide voltage range of AC power supply AC 85V~265V;

- Provide transmitter DC 24V power distribution;

- Through the EMC III level, the instrument is guaranteed to work normally in harsh environments.

3. Technical Index

3.1 Display

- 7 inch color TFT touch LCD
- There are four basic screens: digital display screen, bar graph screen, real-time (historical) curve screen, and alarm display screen. (8 channels with integrated interface)
- Digital display range -999.99~1999.99, 24-bit AD converter;
- The real-time curve recording interval is 1 second to 9999 seconds, corresponding to the whole screen curve time of 30 seconds to 300 minutes;
- The historical curve viewing interval can be continuously set from 1 second to 9999 seconds.
- Other special types can be customized, such as: DC voltage should be measured to 120V, DC current should be measured to 10A (direct lead test, no voltage, current transmitter), etc.;
- AC current, AC voltage, range can be customized according to user requirements;
- AC and DC power parameter acquisition and recording functions can also be customized according to user requirements.

3.2 Signal Input and Accuracy

The input signal includes five types of DC current, DC voltage, thermal resistance, thermocouple, and remote pressure gauge, which can be selected by button, touch screen or USB interface mouse input. Isolated universal input between channels. The input accuracy table of each signal is as following:

Input Type		Measuring Range (Indication range)	Measuring accuracy (quoted error) (absolute error)	Digital display resolution
DC Voltage	0-10V	-0.5V~+11.00V	0.001% F.S ±0.0001V	0.01V
	0-5V	-0.5V~+5.50V	0.002% F.S. ±0.0001V	0.01V
	±100mV	-110mV~+110mV	0.0005% F.S ±0.001mV	0.01mV
	±20mV	-21mV~+21mV	0.0025% F.S. ±0.001mV	0.01mV
DC Current	4-20mA	+3mA~+21mA	0.005% F.S. ±0.001mA	0.01mA
			Measuring accuracy (Related error)	
Thermocouple	K	-60℃~+1372℃	±(0.05% rdg. +0.5℃)	0.01℃
	J	-200℃~+1200℃	±(0.05% rdg. +0.5℃) ≤0℃ ±(0.15%rdg.+0.5℃)	0.01℃
	E	-200℃~+1000℃	±(0.05% rdg. +0.5℃) ≤0℃ ±(0.15%rdg.+0.5℃)	0.01℃
	T	-200℃~+400℃	±(0.05% rdg. +0.5℃) ≤0℃ ±(0.15%rdg.+0.5℃)	0.01℃
	N	-200℃~+1300℃	±(0.05% rdg. +0.7℃) ≤0℃ ±(0.15%rdg.+0.7℃)	0.01℃
	W	+1500℃~+2315℃	±(0.05% rdg. +1.5℃)	0.01℃
		0℃~+1500℃	±(0.05% rdg. +1.0℃)	0.01℃
	R	+800℃~+1768℃	±(0.05% rdg. +1.0℃)	0.01℃
		+400℃~+800℃	±(0.05% rdg. +2.0℃)	0.01℃
	S	+800℃~+1768℃	±(0.05% rdg. +1.0℃)	0.01℃
		+400℃~+800℃	±(0.05% rdg. +2.0℃)	0.01℃
	B	+800℃~+1820℃	±(0.05% rdg. +1.0℃)	0.01℃
		+400℃~+800℃	±(0.05% rdg. +2.5℃)	0.01℃
Thermal resistor	PT100	-200℃~+660℃	±(0.05% rdg. +0.3℃)	0.01℃
	Cu	-50℃~+150℃	±(0.05% rdg. +0.3℃)	0.01℃
	PT1000	-200℃~+300℃	±(0.05% rdg. +0.2℃)	0.01℃
Warm-up time	Over 30 minutes			
Thermocouple measurement			Cold Junction Compensation Accuracy	
Standard operation standard (above accuracy)			Temperature 25+3℃ humidity 55℃±10%RH	
Environmental Adaptation capability	Working temperature		-20℃-+70℃	
	Working humidity		0-95% RH (No condensation)	

3.3 Alarm Output

Relay output:contact Capacitance AC 220V 5A,Resistive load:can be setup upper and lower limit value of each channel

3.4 Power Supply

DC 24V power supply: used to power the transmitter, the maximum load capacity is less than or equal to 500mA; when the data logger is not powered by AC power, it can also be used as a DC24V power supply input port. If there are many external transmitters, a DC24V or DC5V power supply can be selected The output module supplies power to the transmitter.

3.5 Communication Printer Interface

Photoelectric isolation; standard RS232, RS485, Ethernet communication. The communication rate is 9600, configuring test software, providing parameter setting software and application software technical support. Standard Modbus RTU communication protocol communicates with computers and other peripherals.

3.6 Power Conditions

AC power supply:AC85V-AC256V Power consumption<20VA
DC 24V Power supply:12V-24V±10% Power consumption<20VA
Note:Actual Power consumption is related to the numbers of the logger acquisition modules

3.7 Recording Time

The length of recording time and the available capacity of FLASH memory (available capacity = total capacity - used capacity (internal program is generally 10M)), in order to facilitate users to expand channels in the future, the number of recording channels is uniformly set to 64 channels,The calculation formula is as following:

$$Hours = \frac{(55-2) \times 256 \times 8 \times Recording\ interval\ time \times 24}{Numbers\ of\ \ channel \times 24 \times 25}$$

4. Installation,Wiring & Dimension

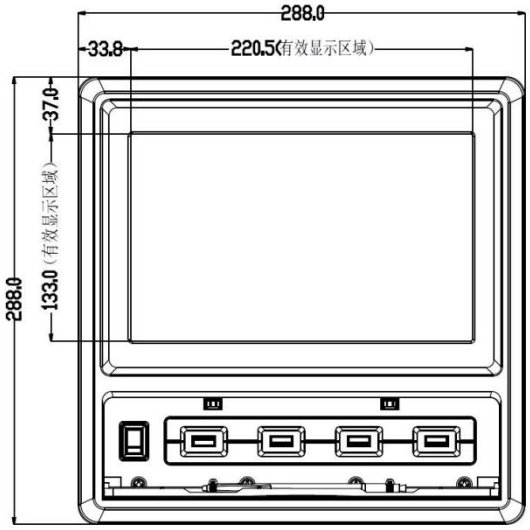
4.1 Dimension and Installing Opening Hole Size

Warning!!!!

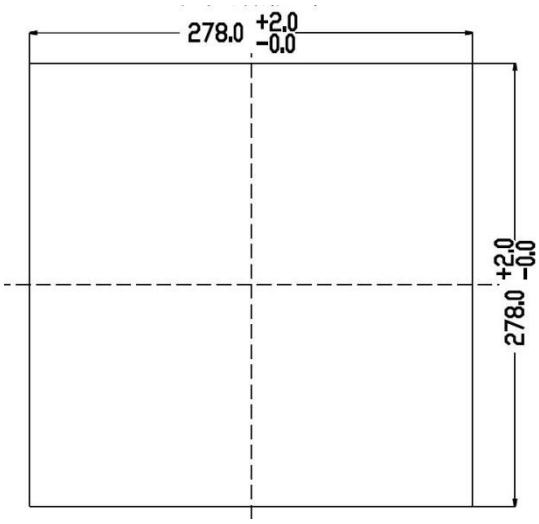
❶ To ensure your safety,please cut off the power before your wiring.

❶ For AC power supply instrument,its ⏚ wiring Ground,It is prohibitted to wiring other terminals together.

The wiring diagram given in this manual is limited by the number of terminals. When the function of the instrument conflicts with the basic wiring diagram, the wiring diagram shall be subject to the instructions at the time of ordering.

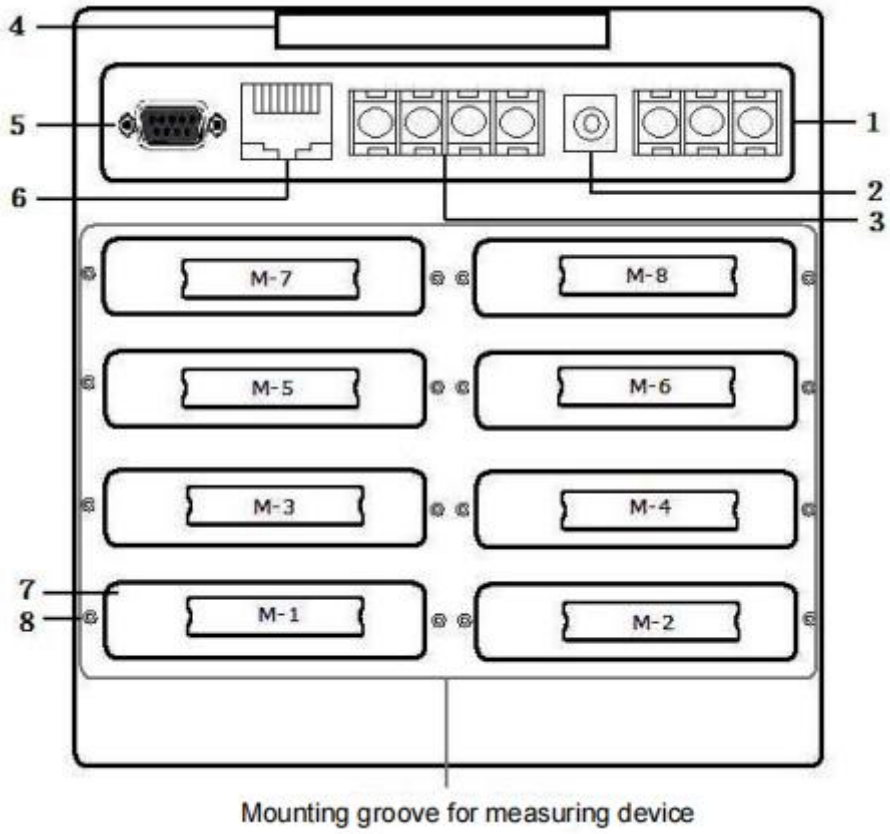


Dimension:288×288×200mm（L×W×H）



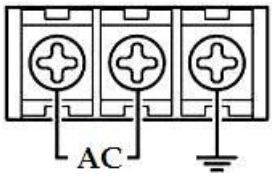
Installing opening hole size 278×278mm

4.2 Wiring Terminal Pictures



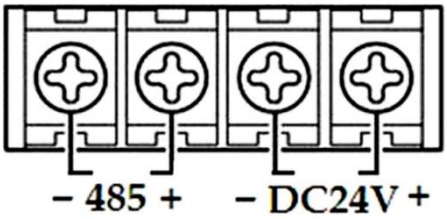
The module installation sequence is from the lower left corner M1 (1-8 channels) to the right M2 (9-16 channels) and then to the upper layer, left M3 to the right M4, layer by layer, the top left M7 is the right M8 (57 ~ 64 channels), the relay signal output module is generally inserted into the M8 position by default.

1——————————AC85V-265V power supply input terminal



2——————————DC 24 power supply input terminal

3——————————DC 24 output and 485 signal input terminal



This RS485 communication port data acquisition module is an external expansion input interface, which cannot be used for communication with PC or other devices (the serial port

RS485 in DB9 is used when communicating with other devices). DC 24V is the output interface for the power supply of external sensors.

4——————————Handle

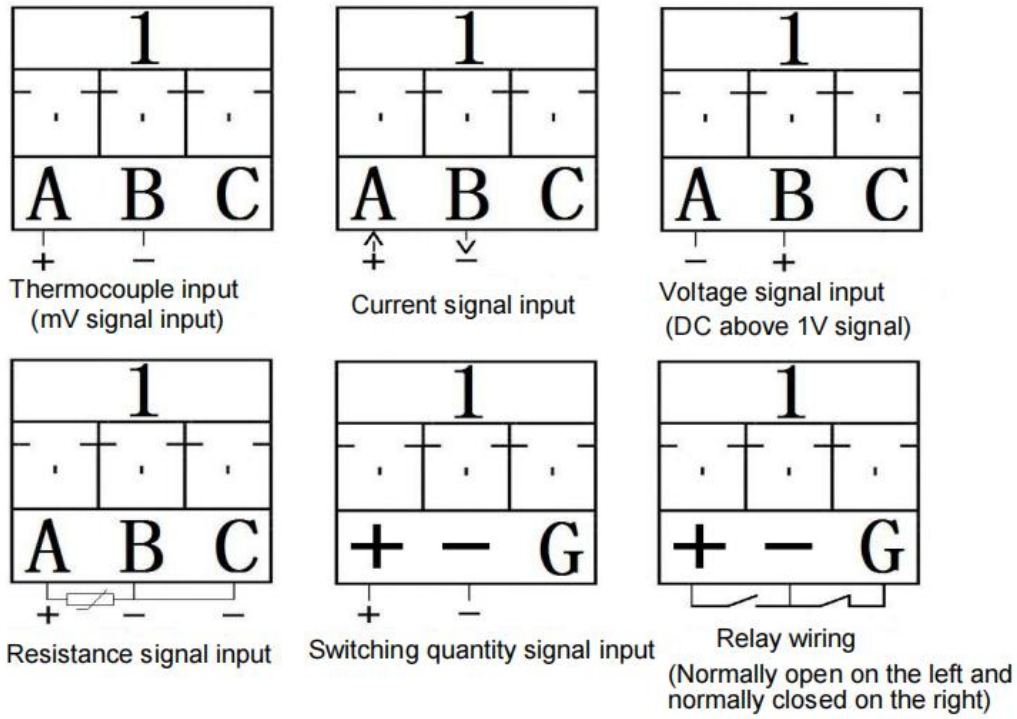
5——————————RS232, RS485 communication interface, the second pin is the "RXD" (RS232) of the instrument, the third pin is the "TXD" (RS232) of the instrument, and the 5th pin is the communication "ground" of the instrument; 1 and 6 are a group of RS485 serial communication , 1 is RS485+, 6 is RS485-.

6——————————RJ 45 Ethernet interface

7——————————Measuring module device mounting slot

8——————————Fixing the measuring device screw

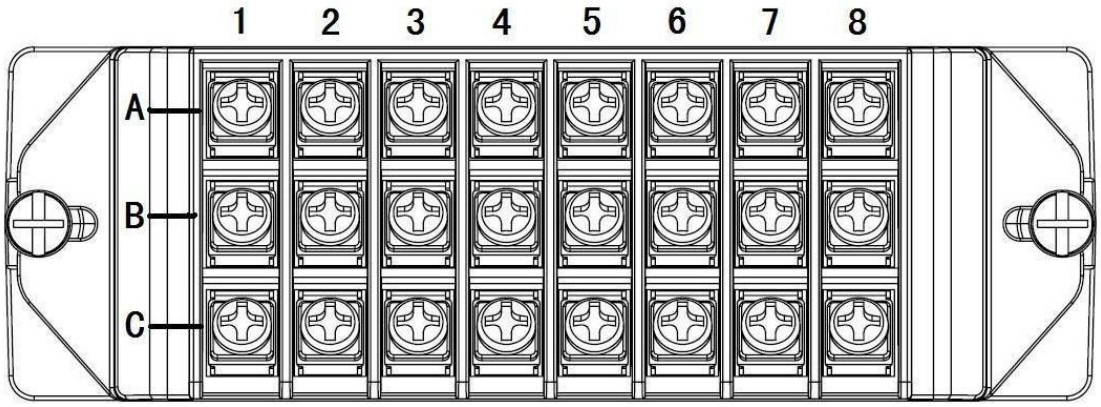
4.3 Input Signal Wiring Methods



In addition to the above signal input and output, there is a temperature and humidity acquisition module (TP1728). The wiring signal of the temperature and humidity acquisition module is a digital signal. There are three wires for the TP2305 temperature and humidity sensor. Before the instrument leaves the factory, the manufacturer will connect the wires well without the customer's own wiring.

4.4 Current Module TP1748 Input Signal Wiring

The wiring of TP1748 high current acquisition module is as shown in the figure below, the current lead is A pin in, B pin out, C pin empty

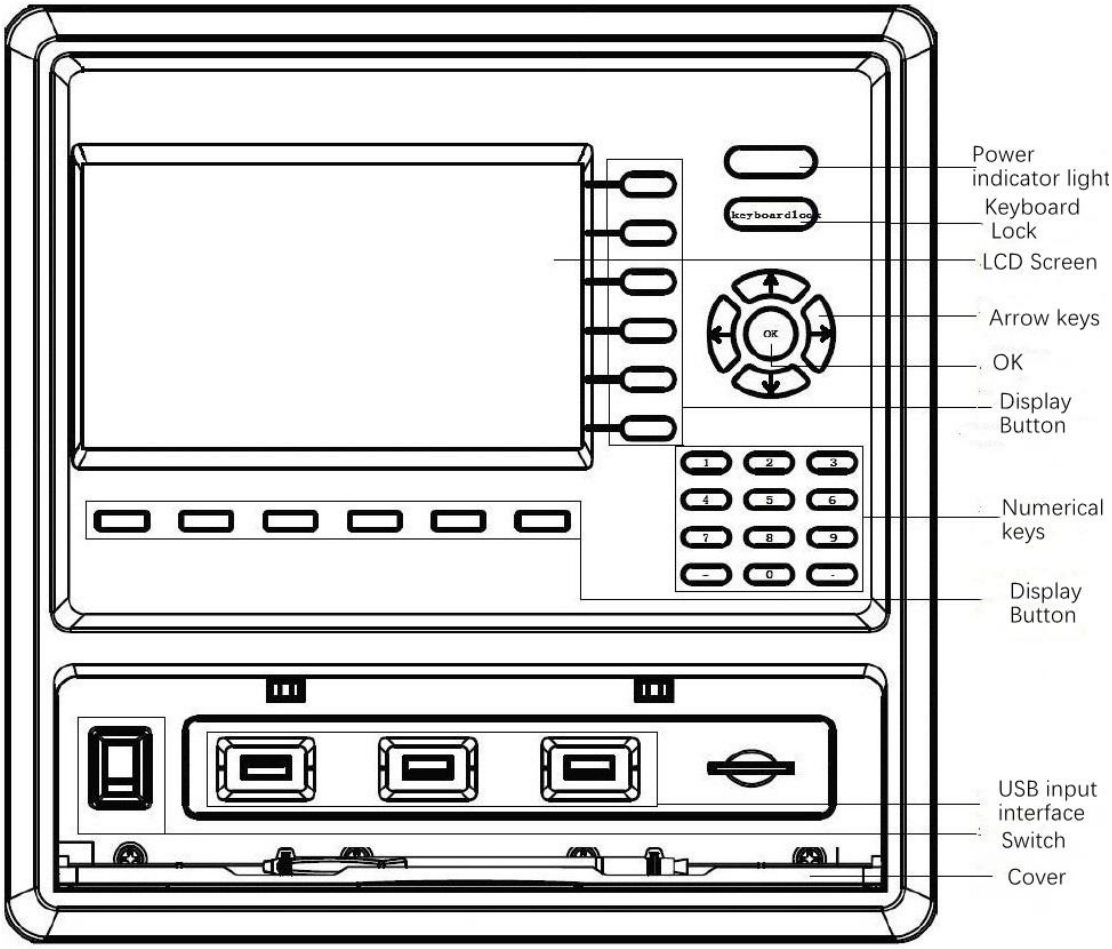


4.5 Relay Output Signal Wiring and Installation Description

Relay + - is normally open interface; G - is normally closed interface. The relay output module TP1708J is inserted into the M-8 slot in the upper right corner of the back of the instrument by default. When setting the upper or lower limit alarm of a certain channel, in In the parameter setting window, set the upper and lower limit values corresponding to the contact number of the position (contact number 1 corresponds to port 1 of the relay module channel..... Contact 8 corresponds to port 8; for example: the upper limit of the first channel is 50, you can Set the corresponding position contact to any one of the relay contacts from 1 to 8. The upper or lower limit value of the second channel can also be set to any one of the contacts from 1 to 8. After setting the set contact, when When the value of this channel exceeds the set upper or lower limit, the relay corresponding to the upper or lower limit will act normally; at the same time, the hysteresis value can also be set. The hysteresis value refers to the display of this channel after the relay works. When the value returns to the difference value within the limit value, the relay stops action (for example, the upper limit value is 50, the value of a channel has exceeded 50, and the hysteresis value is set to 2, at this time, the contact of the relay corresponding to this channel will be turned on, When the display value of this channel is less than 48 (50-2=48), the contact relay corresponding to this channel will be disconnected and stopped).

5. Instrument Operation and Parameter Setup

This multi-channel data recorder has multiple operation display screens and parameter setting interfaces, with clear display, large amount of information and convenient parameter setting. Users can easily operate and use without professional training.

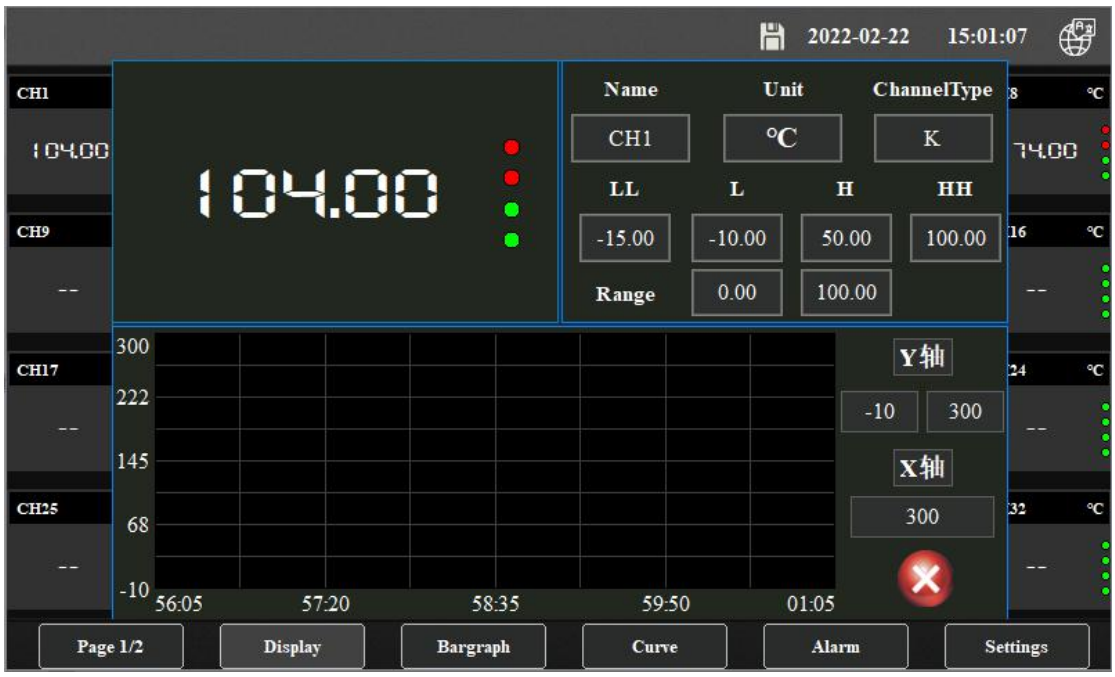


After the instrument is connected to the power supply, the system startup interface will be displayed. After starting the system, enter the real-time numerical display interface. The operation of the instrument, each operation display screen, each button and the parameter setting interface will be introduced separately below.

Each button: display interface, bar graph interface, curve interface, comprehensive interface, alarm interface, parameter setting, system setting, data export, page1/2 (page turning). Among them, the display interface, bar graph interface and curve interface are commonly used basic interfaces.

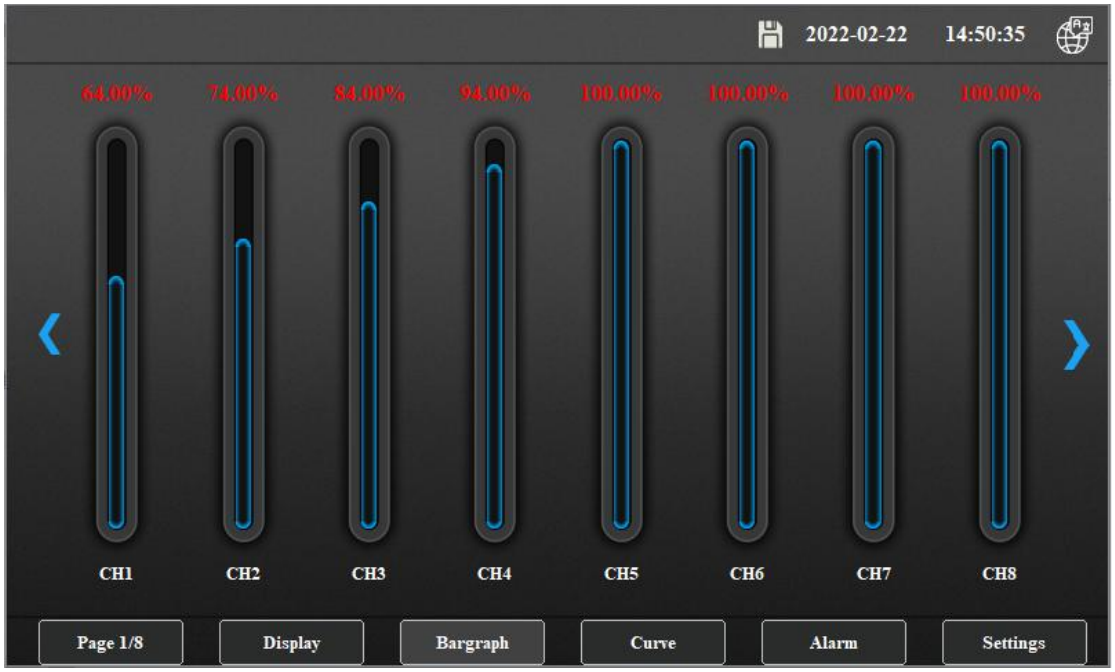
5.1 Display Interface

After the data logger is successfully turned on, it will directly enter the display interface. In the display interface, we can see the value of each channel. There are 4 points to the right of the value of each channel. The uppermost point of these 4 points represents the ulimate upper limit. 2 points represent the upper limit, the 3rd represents the lower limit, and the 4th represents the ultimate lower limit; if the value tested by each of our channels exceeds the limit we set, the 4 points on the right will display red. If we buy a 48~64 channel recorder, there will be two display interfaces, and you can turn the page through the page1/2 button in the lower right corner to view the real-time data on the second side.



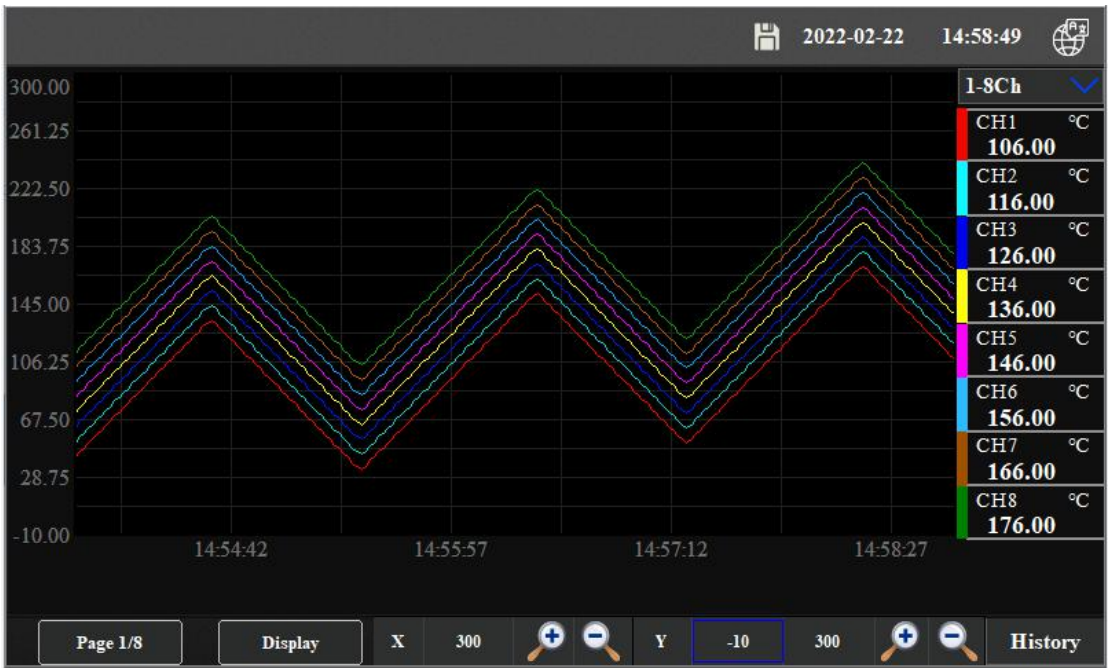
When clicking the display value of each channel in this interface, we can see the parameters of the channel, such as name, unit, type, upper and lower limit, range and real-time curve screen, and can set the name and unit of the channel, You can also set the X-axis time and Y-axis range of the real-time curve.

5.2 Bar Graph



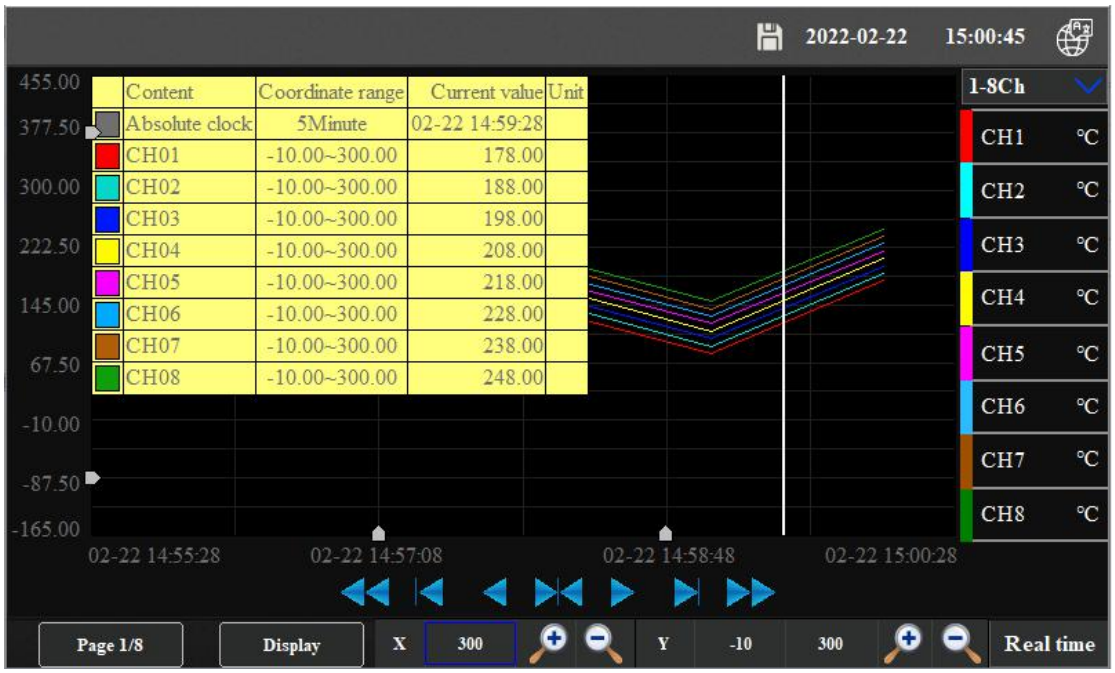
Click the bar graph interface button, we can see 8 bar graphs at the same time. The bar graph is a percentage value displayed according to the ratio of the actual measured value to the channel range range; the direction buttons on both sides of the interface can switch to view each group (8 bar) real-time display of the bar graph.

5.3 Curve Interface



Click the curve interface, and the recorder will start to display 1-8 real-time curves. According to the needs of observation, adjust and change the range of Y axis and X axis of time scale through the identification of magnifying glass and reducing glass at the bottom of the curve interface or directly fill in the display value you actually want in the box, so that you can see the complete curve within the appropriate range. In the upper right corner, we click the "1-8 channels" button, and a drop-down button will appear: real time curve 1 Real time curve 8; We can choose to view the real-time curve of each group of 8 channels. Click the "history curve" button at the bottom right of the real-time curve display interface to enter the history curve interface, which is displayed in the history curve interface.

We can also click the "1-8 channels" button at the top to select and view the historical curve of each group. At the bottom of the historical curve interface, we can click the forward and backward look button To find the x-axis time period of the historical curve you want to view. At the same time, you can enter the time length of the x-axis box (unit: Second) to view the curve in a certain time period (for example, 600 is 600 seconds). At the same time, you can click the cursor on the moving curve to view the historical data of the curve at this time point.



The functions of other interface buttons are similar to the real-time curve display screen

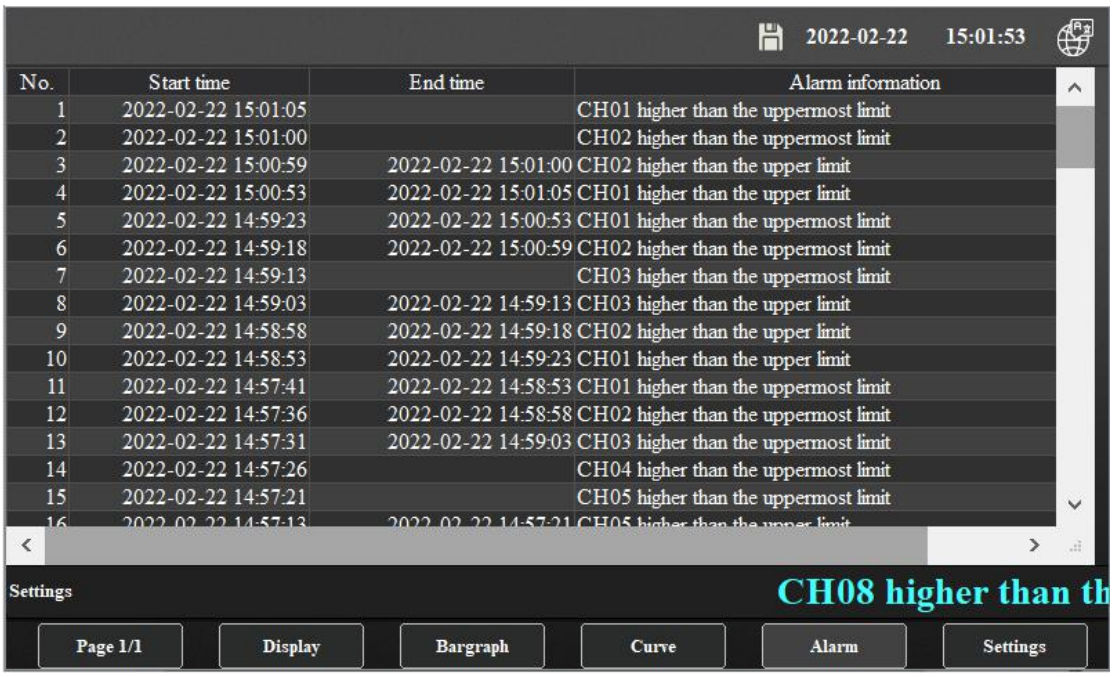
Notice:

1. If the recorder has been powered off, there will be discontinuities in the historical curve due to no data recording during the power-off period, but the historical data in the instrument will not be lost.

2. If the recorder changes the recording interval during the running process, there may be discontinuities or inaccurate historical data time when querying the historical curve.

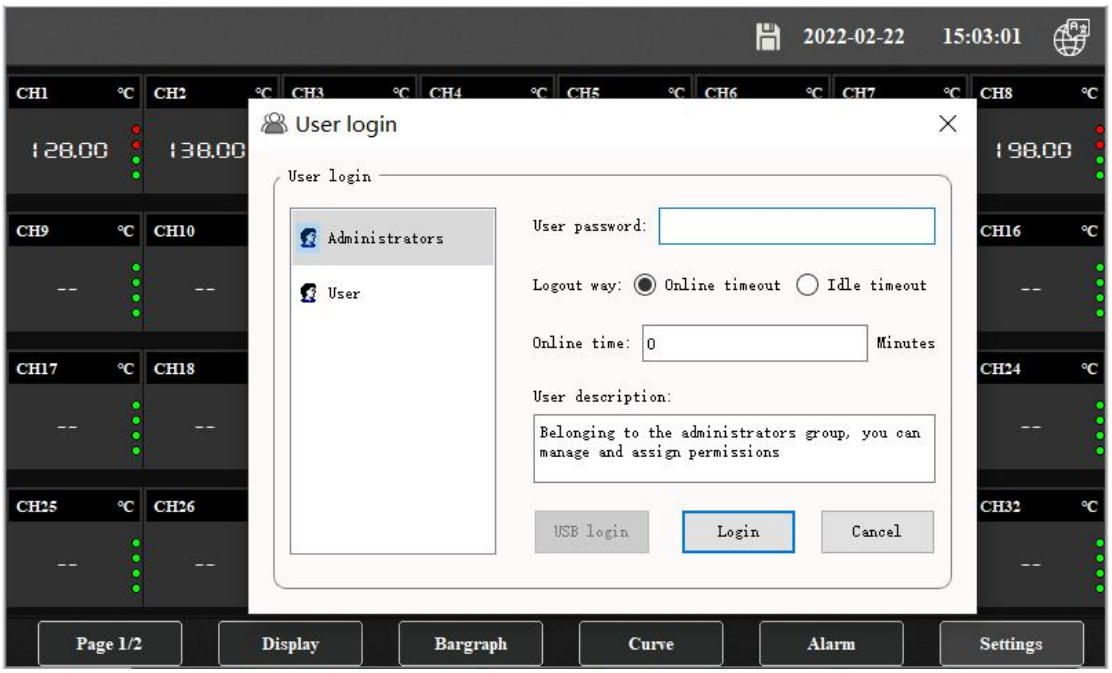
5.4 Alarm Interface

Click the button of the alarm interface, and click the "Settings" button in the lower left corner of the alarm interface to enter to view the historical alarm data. You can also select different time periods to view the historical alarm data.

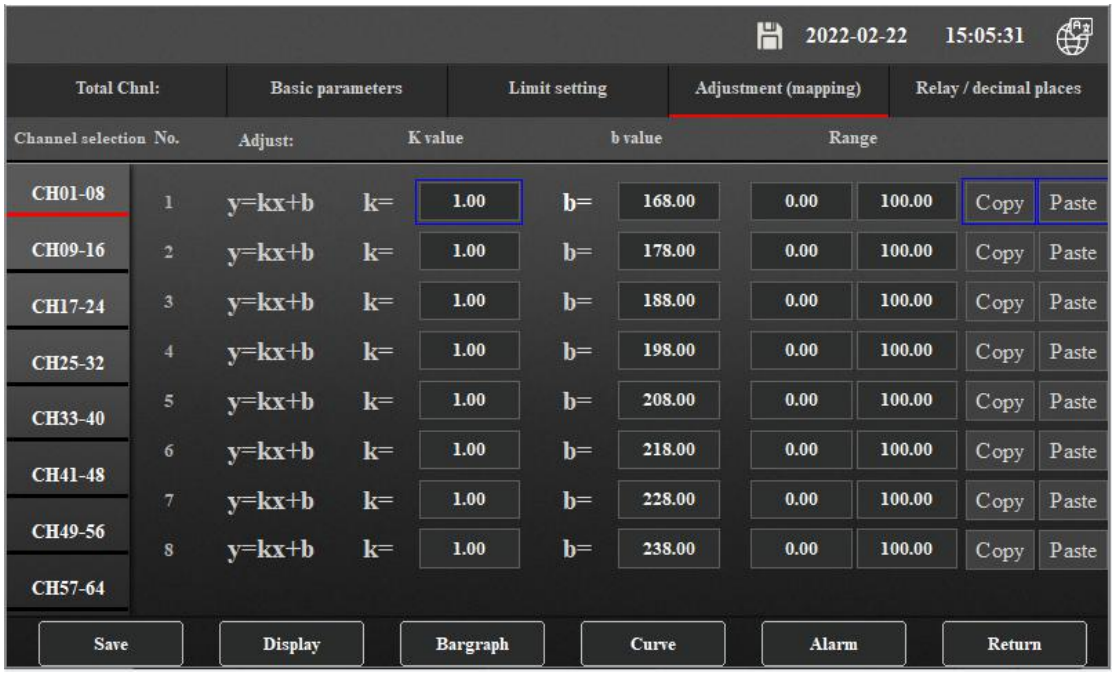


5.5 Parameter Settings

Click the setting interface in the lower right corner, choose to click the parameter setting button, the system will pop up the administrators (administrator) and User (user) password input window, the new machine has no password set after leaving the factory, no need to enter a password, just click "Login" to enter the parameters Set interface.



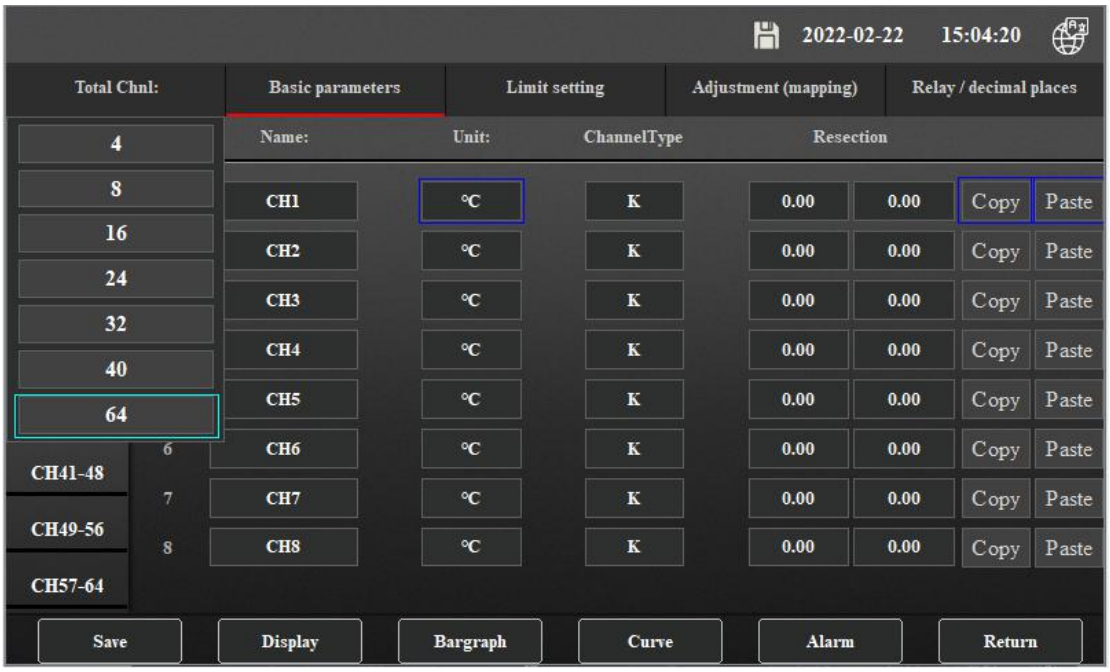
There are 5 buttons at the top of the parameter setting interface, which are the number of channels, basic parameters, limit setting, adjustment (mapping), and relay setting.



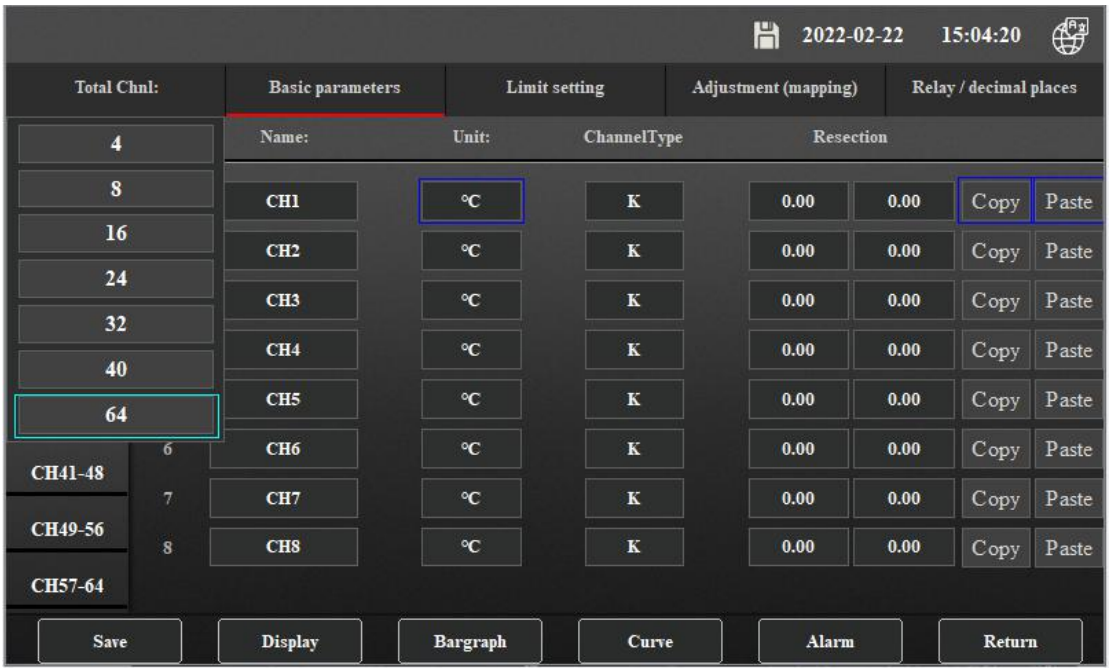
On the left side, there are 8 options of CH01-08...CH57-64 as a group of 8 channels. can be done for each group.

5.5.1 Numbers of Channel

The option channels can be selected between 4 channel and 64 Channel. When the user adds the data acquisition module on the basis of the existing channel number and inserts the module, this item can be used to expand the display channel number.



5.5.2 Basic Parameter



In this parameter, we can set parameters for each channel's name, unit, channel type, and cut minimum/maximum. When setting parameters, if the parameters to be set for multiple channels are the same, we can use the "Copy" button on the right. "Paste" button for quick setting, in case it needs to set each channel parameter one by one.

5.5.2.1 Name

You can input English characters through the window keyboard or click the abc button on

the keyboard to switch pinyin to input Chinese characters.

5.5.2.2 Unit

You can enter the units in the optional list. If the unit you want is not in the optional list, you can click the "Other Units" button in the upper right corner of the window and enter various letters as units.

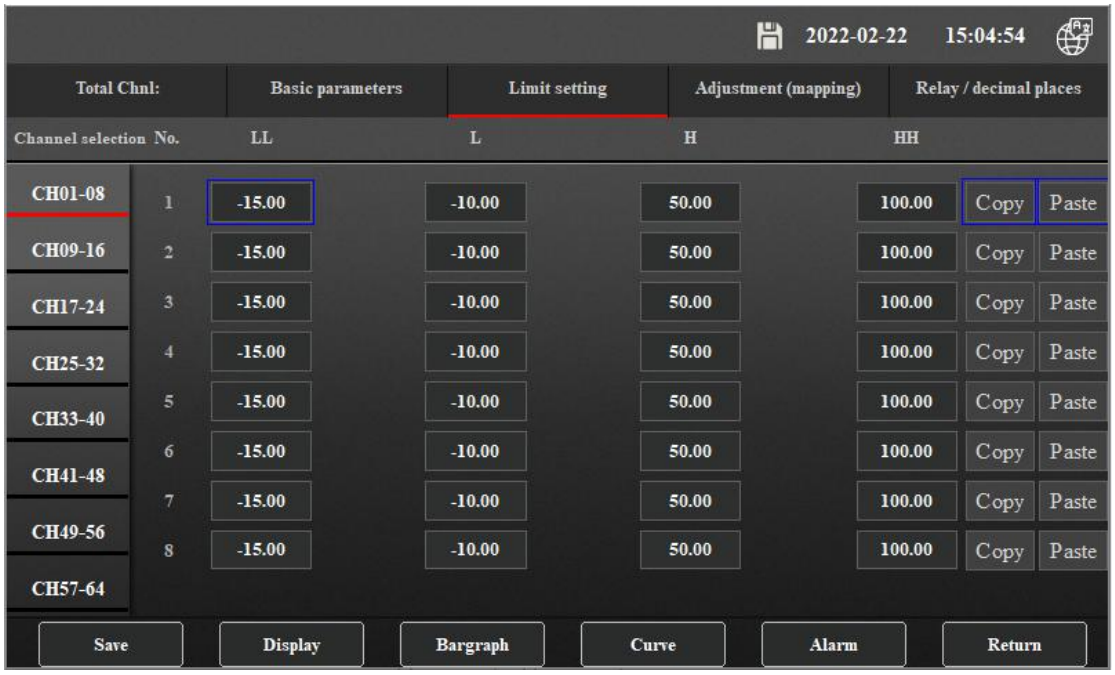
5.5.2.3 Type of Channel

You can select the signal type of the corresponding sensor input in it.

5.5.2.4 Cut Minimum/Maximum

Especially when we input the mV signal or the mA signal, when the sensor is at the minimum signal output, there are often small and weak small signals. At this time, this channel does not display "0", and there will be a smaller value in The fluctuations around "0" are displayed. At this time, we need to use this option to set the range of this small signal value. When the displayed value is in this range, the system will cut it off and not display it. The corresponding channel value "0" is displayed.

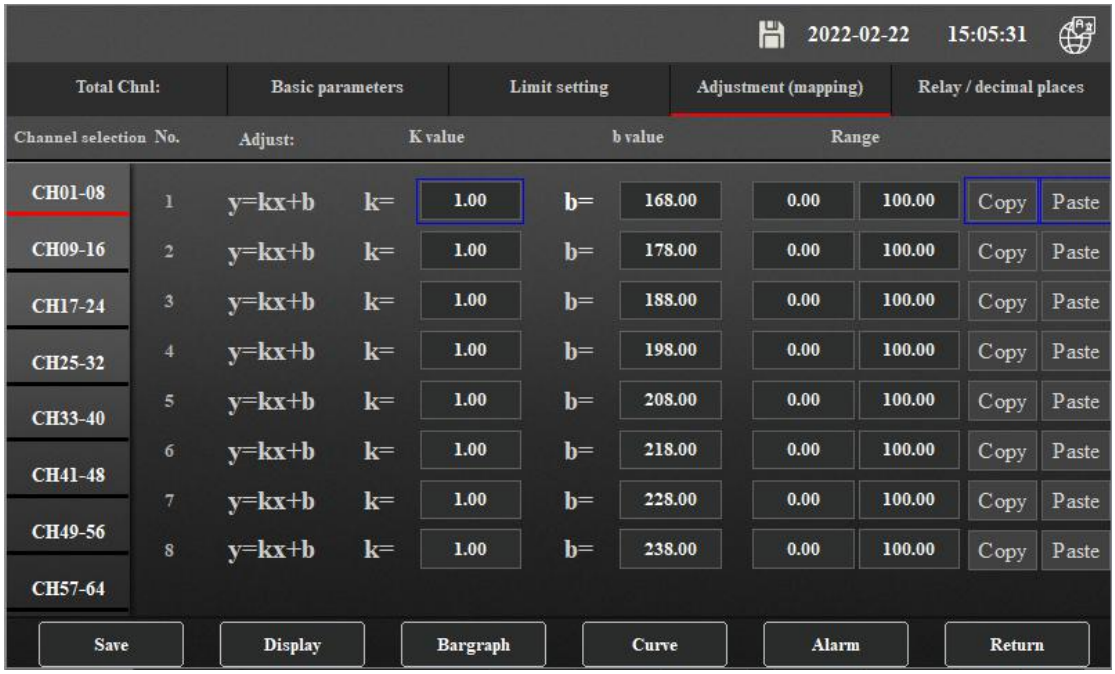
5.5.3 Limit Value Setup



It is to set the ultimate upper limit, upper limit, lower limit and ultimate lower limit of each

channel. When the measured value of a channel value exceeds the set limit, we can see the right side of this channel in the "display interface". 4 dots will have red dots appear. In this way, we can easily find that a channel exceeds the limit. If the upper and lower limits of each channel are the same, then we can also use the "copy" and "paste" on the right to make quick settings.

5.5.4 Adjustment(Mapping)

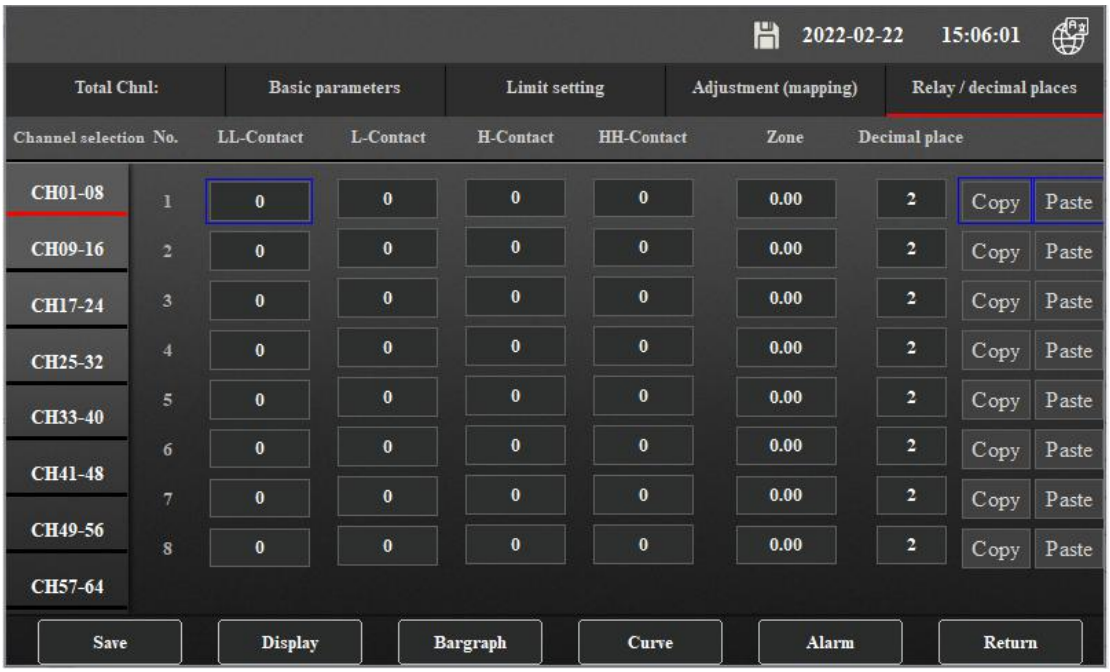


It is to enlarge, reduce or correct the positive and negative values of each channel. Because in different industrial occasions, the measured value will be deviated due to the length of the lead wire of the sensor or the influence of the environment. At this time, we need to correct the value of this channel. y=kx+b, y is the displayed value to be obtained, k is the multiple, x is the display value of the recorder at that time, and b is the value that needs positive and negative correction.

Example: The temperature measured by a channel at 0°C is 3°C, and when the temperature is measured at 100°C, the measured temperature is 110°C. At this time, we need to set the b value of this channel to -3, K=100/(110-3)=0.9346, so fill in the value of K into the box, so that the channel value is corrected so that the displayed value is closer to the actual value.

There is also the item of "small/large range", which means that when we connect to the analog signal (0~5V, 0~10V, 4~20mA, ±100mV) transmitter, the engineering quantities measured by this type of transmitter are all There is a range. When using the transmitter sensor to collect data, we need to fill in the range of the transmitter sensor into this channel, and the recorder will read the actual measured engineering quantity according to the size of the analog signal output by the transmitter. At the same time, the displayed range of all bar graphs in the "bar graph interface" is also represented by the ratio of the measured value to the range.

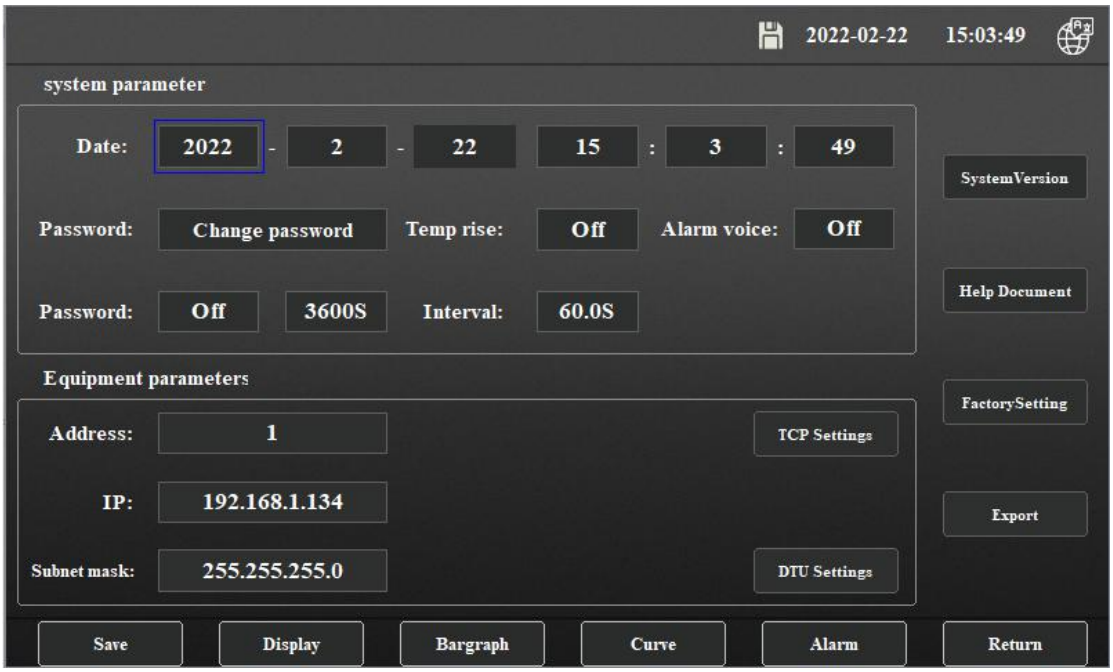
5.5.5 Relay Settings



It is the selection and setting of the relay output contacts for the ultimate upper limit, upper limit, lower limit and ultimate lower limit of each channel. The relay output module also has 8 ports, of which the + - pins are normally open, the - G pins are normally closed, and the maximum current of the closed load supports 5A. Example: The upper limit contact of one of our channels is set to 2, where 2 refers to the No. 2 port of the relay output module. When the upper limit exceeds the value of the previous "limit setting", then No. 2 relay,The + - pin of the electrical appliance will be closed, and the - G pins will be separated. Each relay contact supports the setting of multiple limits for multiple channels, that is, any channel and any limit can be set to a certain one. The relay operates. If the upper and lower limit alarm contacts set by each channel are the same, then the "Copy" and "Paste" buttons can be used to realize the express setting.

5.6 System Settings

Click the settings button in the lower right corner, and select the system settings interface. The Administrators and User password input windows will also pop up. The new machine does not have a password set after leaving the factory. You can directly click "Login" without entering a password to enter the system settings interface.

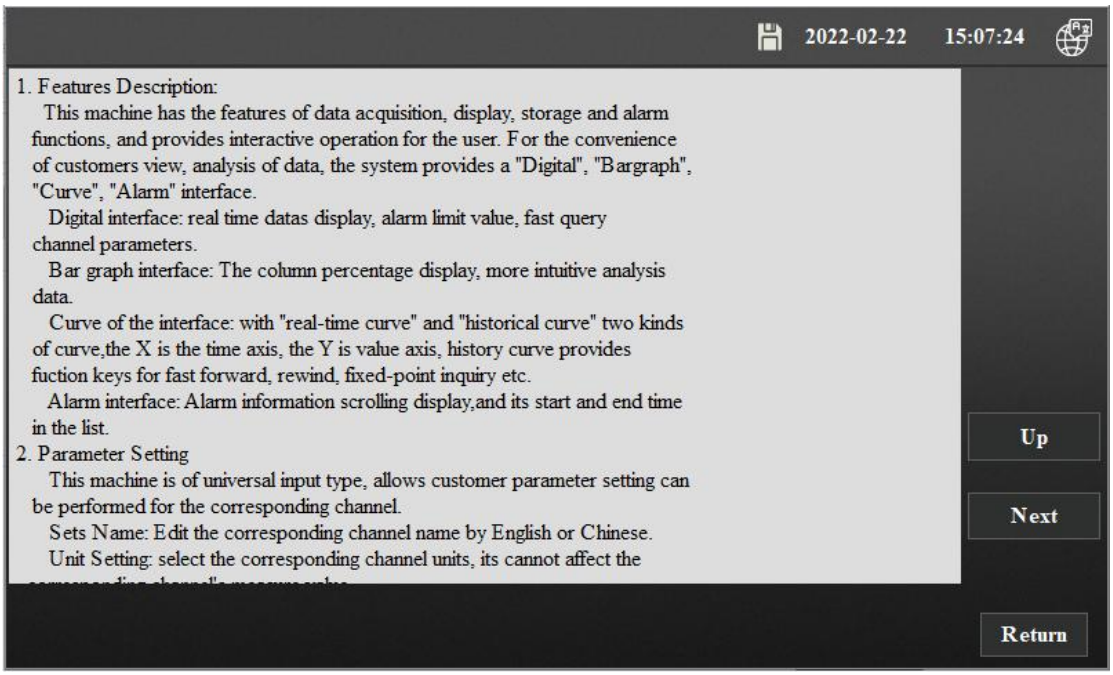


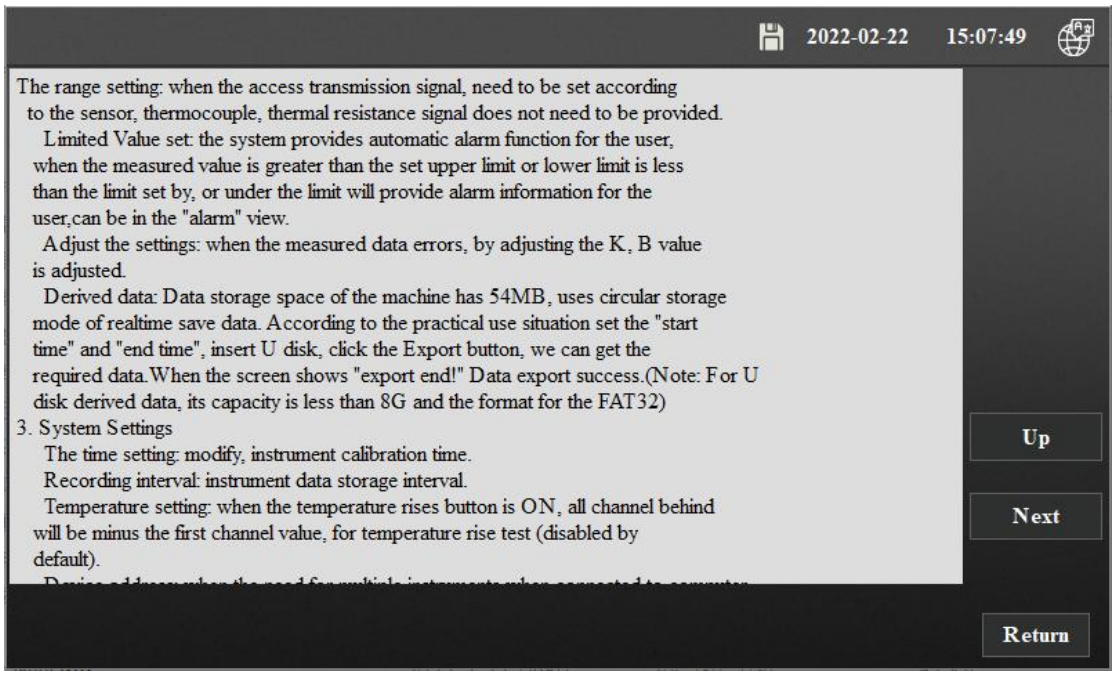
System time:Modify the system time of the recorder and fill in the current time.

English and Chinese switch button:Click right top position

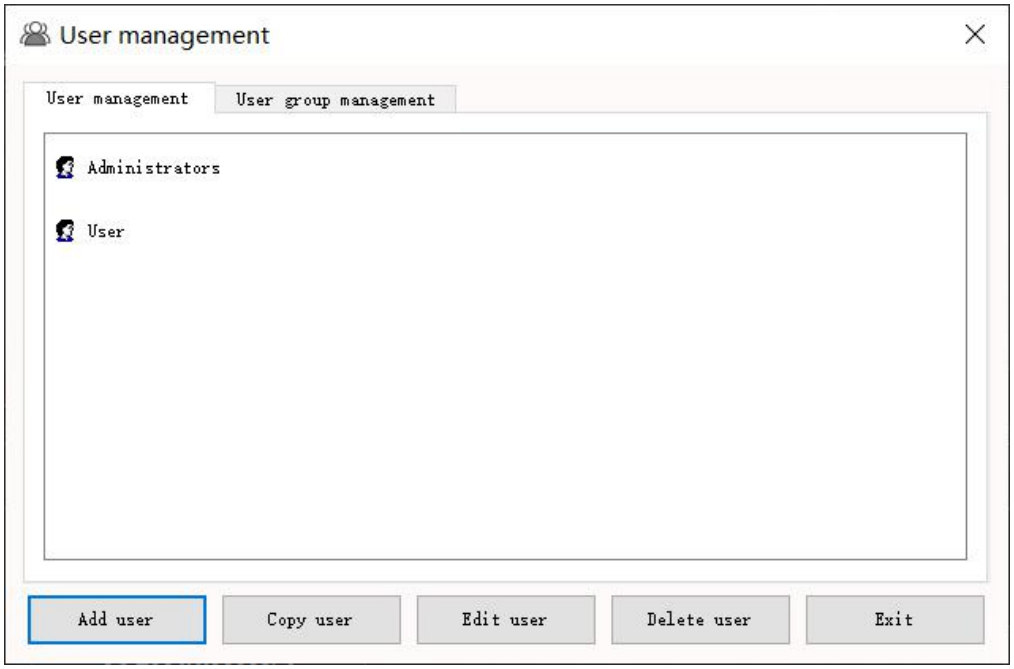
Chinese and English language switching

Screensaver time: The setting of switch (ON/OFF) and screen saver time (unit: second) Example: The screen saver time is set to 10S, that is, after the screen is normally displayed for 10 seconds after booting, the machine will be off the screen and you need to tap the screen to light up Screen. Network port communication IP address and other information, the following phone number is the mobile phone number set for the wireless 4G SMS alarm for customized models, and there is a record of the system version number on the right, which is convenient for after-sales maintenance to confirm the system version; There is also a brief usage help note about the instrument. Factory setting is to restore all parameter settings to the original factory state.

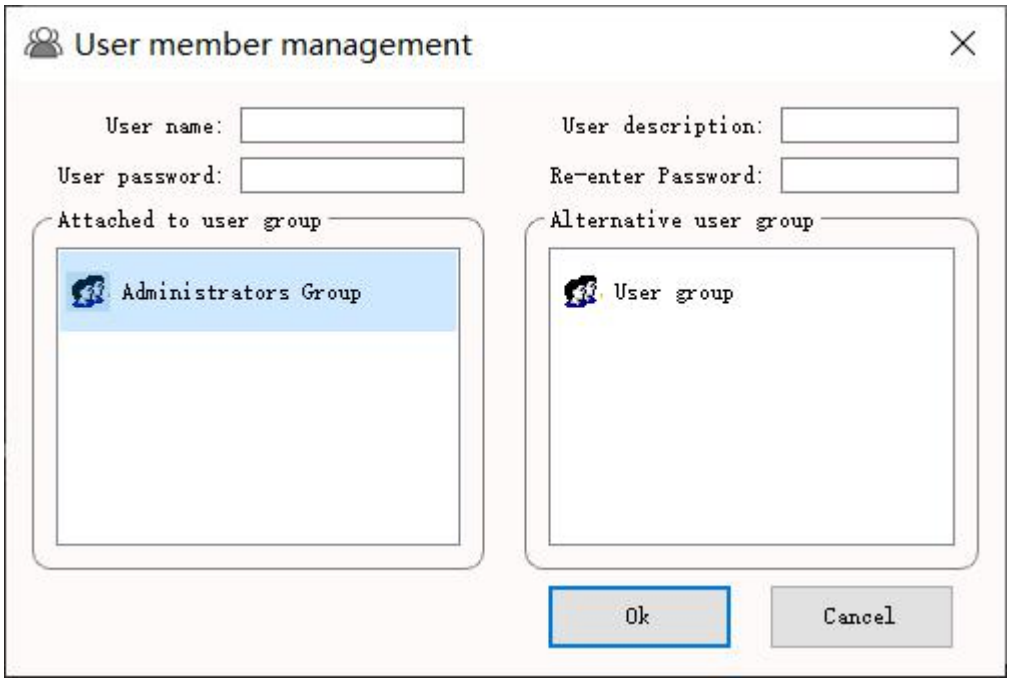




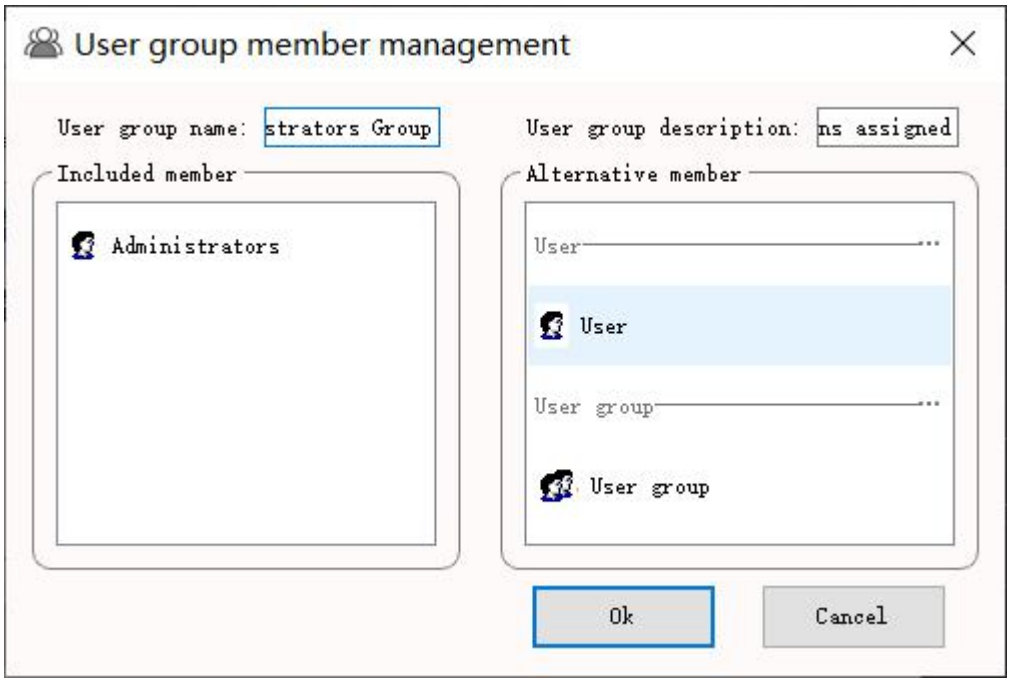
Password Setup:Change passord



Click Modify Password to pop up the User Management window, where users and Administrators can be managed, users can be added and new Administrators can be added, and users can be assigned with Administrators.



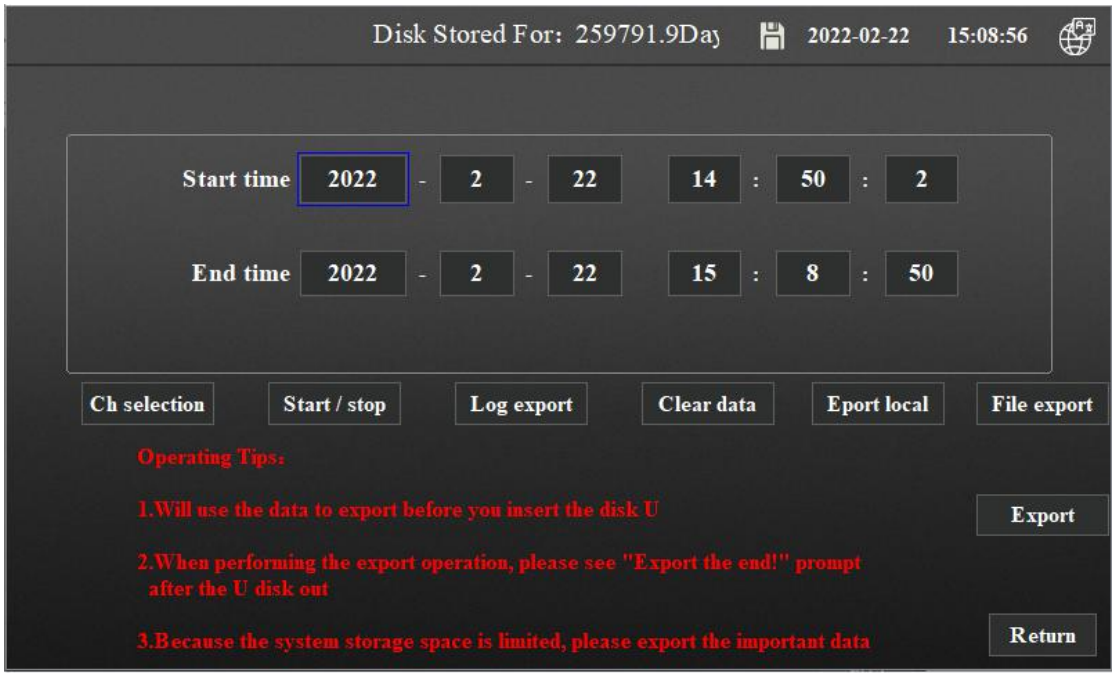
User information: Select User and click Modify User to edit and fill in the User's password and remember the password.



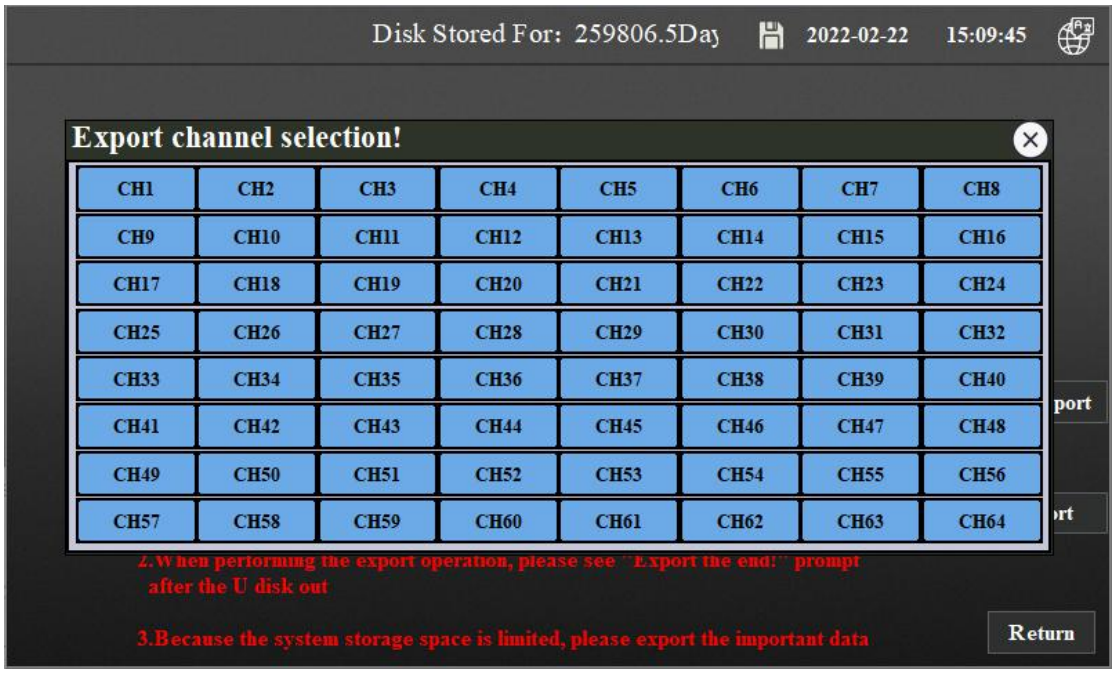
Administrator Management:Select Administrators and click Modify Administrators to edit the password of Administrators.

5.7 Data Export

Click the data export button to enter the data export interface.



The channel selection button is used to select which channel data is used for selection. The bright background color is selected, and the gray background color is not selected.



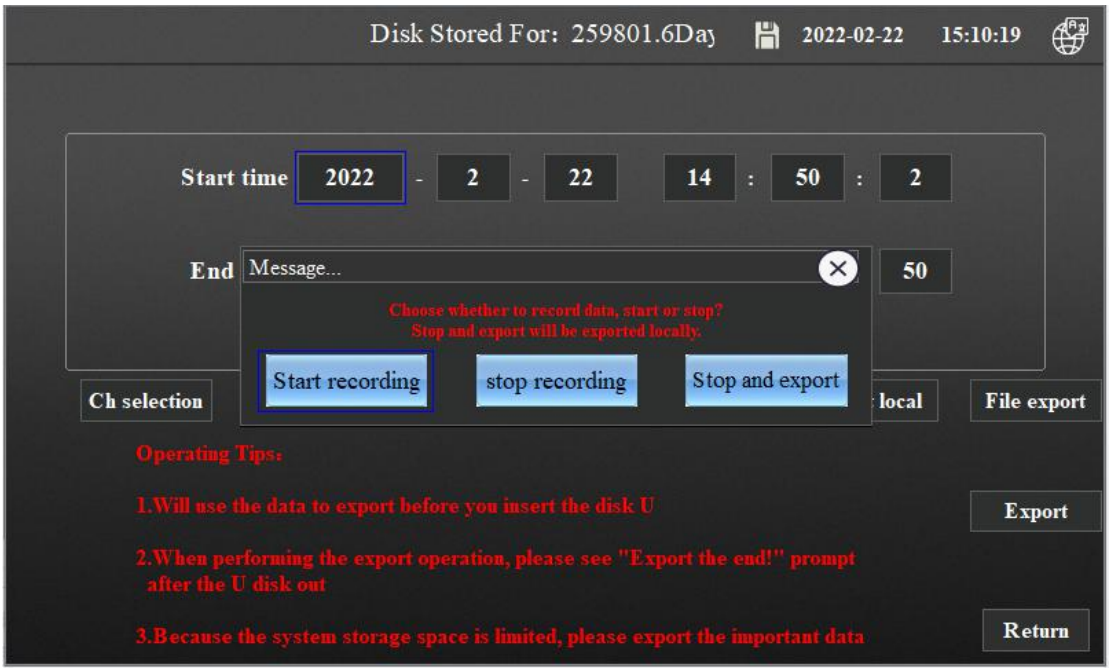
After clicking the start/stop button to enter, click start recording, the instrument starts recording data, and there will be a disk symbol at the top of the display screen

. Clicking the stop recording instrument will store the data in the instrument, and the instrument will no longer record data at this time. The upper right corner of the display also no longer has the symbol of the save symbol. You can export to U disk (FAT32 format) through the data export button on the right. If you directly click the data export button on the right, the data from the boot time to the current time will be exported to the U disk. Of course, you can also set the start time and end time to export data.

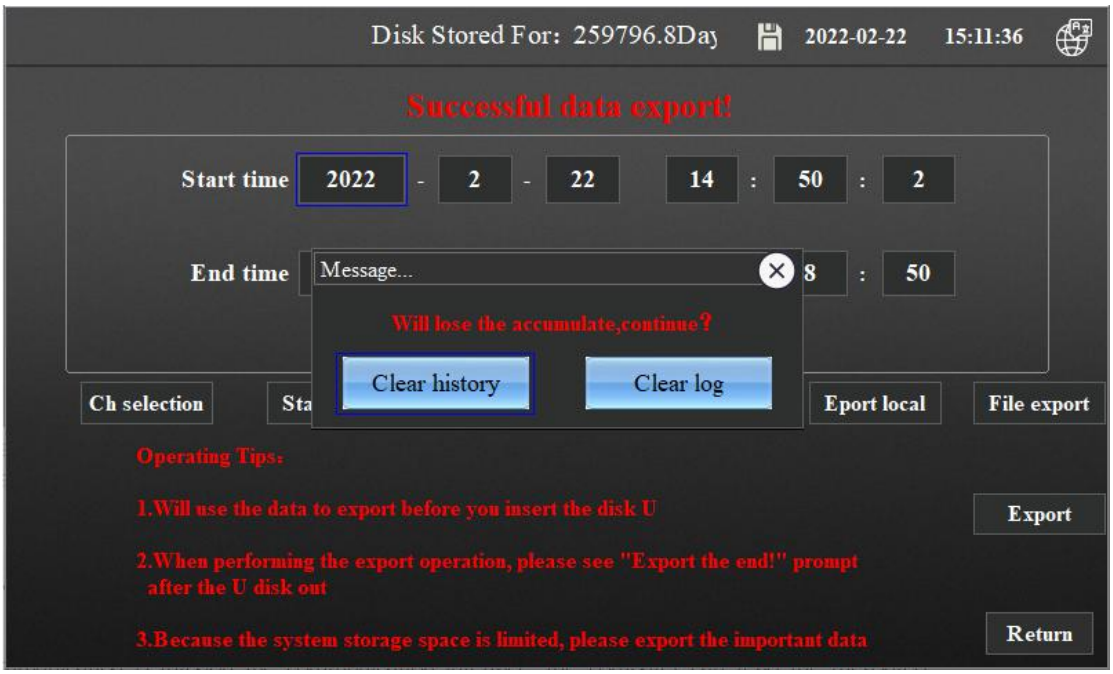
Special Note: If you want to continue to use the recorder, remember to click the start recording button, and a record drive symbol

will appear at the top of the display. As long as there is no record drive letter displayed, the instrument is not recording data.

The log export is to export the record of the parameters and time previously set for the operation of the instrument.



You can also click the stop and export button to automatically generate a CSV table file and store it in the instrument, insert the U disk (FAT32 format) and click the file export button, select the file to be exported (check on the left) and click the bottom to copy it to the U disk. Files can be deleted.



The Clear History button can clear the recorded historical data, and you can also click Clear Log to clear the history of the previous parameter settings.

6. Communication Settings and Protocol

Communication is through the communication interface, the computer can read the measured value and alarm status of each channel. Read all the parameters of the instrument, and set the parameters.

This series of data recorders provides users with three standard interfaces RS-232, RS-485, Ethernet, and RS-232 for communication with the host computer, which are suitable for point-to-point short-distance communication, and are mainly used for the communication between the instrument and the desktop computer; RS-485 communication is suitable for long-distance point-to-multipoint communication, which is mainly used when multiple instruments are networked and communicated with computers. Ethernet is suitable for the communication between the computer and the recorder in the local area network, and which communication method is selected depends on the user's needs. The serial communication of the recorder adopts MODBUS RTU communication protocol, and the network port adopts Modbus TCP communication mode, which can be connected with various industrial control software such as host computer software.

6.1 Communication Overview

- RS-232 mode only allows one computer to hang one recorder. This communication method is suitable for users of computers with serial RS232 communication function to

randomly read the data of the recorder; it can also be connected to a wireless data transmission module for remote wireless transmission or connected to a serial micro-printer to print the data in the recorder.

- The RS-485 method allows one computer to hang multiple recorders at the same time. This communication method is suitable for users who use the terminal to form a network with this series of recorders, receive and record data in real time and connect with various control systems.

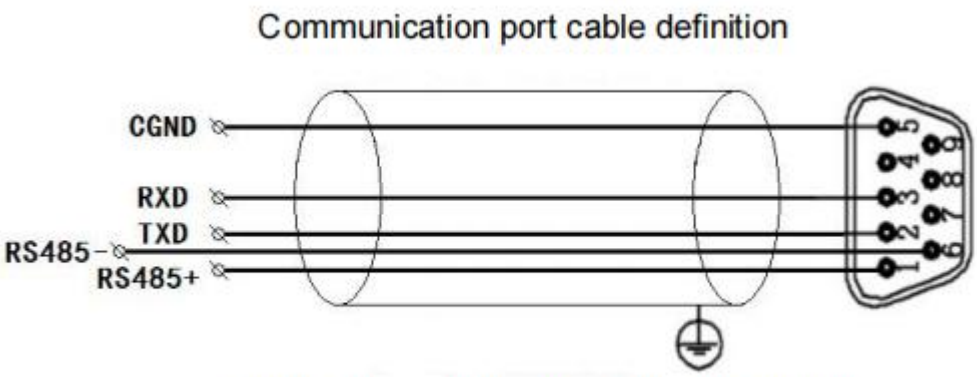
- The Ethernet communication method is a communication method realized by connecting the recorder and the computer with a network cable or by connecting the recorder and the computer to the same router at the same time.

6.2 RS232 Communication Methods

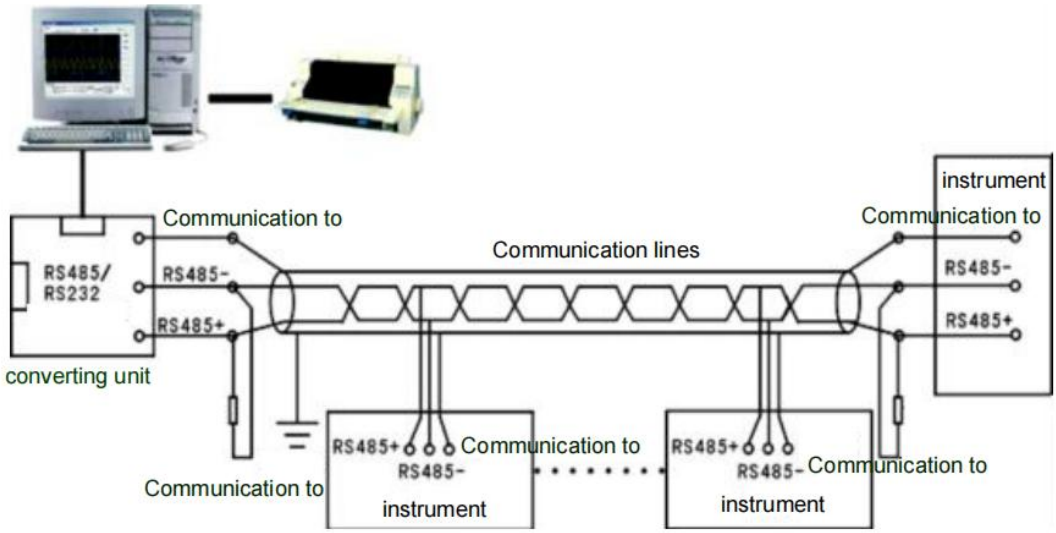
RS-232 communication interface, the user only needs to connect one end of the equipped RS-232 communication line to the 9-pin interface of the recorder, and the other end to the 9-pin serial port of the computer to realize the RS-232 communication connection.

In the system parameter setting of the recorder, select the communication address and baud rate, and make the corresponding settings in the computer software, then the RS-232 communication can be carried out.

The wiring to the computer is shown in the following diagram:



6.3 RS485 Communication Methods



The RS-485 communication line of this series of data recorders adopts shielded twisted pair, one end of which is connected to the serial communication port of the computer through the RS-232/485 conversion module, and the other end is connected to the communication terminal of the recorder.

In the recorder system parameter setting, select the communication address and baud rate (fixed at 9600).

The shielding layer of the double-core shielded wire is used as the communication ground wire, so be careful not to connect it with the protective ground of the equipment. When the transmission distance is long, a 120Ω terminal resistance should be added at both ends of the transmission trunk line, and connected between the "+" and "-" of the RS-485 communication line.

When a computer is hung with multiple recorders, a twisted pair shielded wire is used, the shielding layer is grounded, the network topology is a bus type, and each recorder is connected to the trunk line through a branch line. It should be noted that the terminal resistance should be connected to both ends of the communication trunk line, and the transmission line after the branch should be as short as possible to reduce interference.

When the communication distance is long, you can choose a relay module, twisted pair shielded wire, and the shielding layer is grounded.

6.4 Ethernet Communication

Connect the recorder to the computer through the network cable, set the IP address of the recorder and the IP address of the computer, and then the communication can be realized. If the recorder and the computer are connected under the same router, in addition to setting the IP address, it is also necessary to set the gateway. The recorder and the computer should

be under the same gateway. The specific details are described in the network port communication in the description of the communication software later.

6.5 Communication Interface

RS232,RS485,Ethernet Interface

6.6 Modbus RTU （Series Port Communication）

The communication between the computer and the recorder adopts the Modbus RTU protocol communication.

Modbus RTU Communication Commands

	Function code	Function	Transmit frame	Received frame
1	0x03	Read a or more register data	Device address:0xXX Function code:0x03 Start address High:0xXX Start address Low:0xXX Numbers of register High:0xXX Numbers of Register Low:0xXX CRC Correction Low:0xXX CRC Correction High:0xXX Eg: sending: 01 03 00 00 00 08 44 0C	Device address:0xXX Function code:0x03 Data Length n:0xXX Data 0:0xXXXX …….. Data n-1:0xXXXX CRC Correction Low:0xXX CRC Correction High:0xXX Reply: 01 03 10 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 E4 59
2	0x06	Write a register data		
3	0x10	Write more register data		
4	0x11	Read device information		

6.7 CRC Generation

The CRC field is two bytes containing a binary 16-bit value. The value of the CRC appended to the message is calculated by the sending device. The receiving device recalculates the CRC value when receiving the message, and compares the calculation result with the actually received CRC value. It is an error if the two values are not equal.

The process of generating the CRC is:

(1) Load a 16-bit register into hexadecimal FFFF (all 1s). This is called the CRC register.

(2) XOR the first 8-bit byte of the message with the low byte of the 16-bit CRC register, and place the result in the CRC register.

(3) Shift the CRC register to the right by 1 bit (towards the LSB direction), and fill the MSB with zero. Extract and detect the LSB.

(4) (If LSB is 0): Repeat step 3 (another shift). (If LSB is 1): XOR polynomial value 0xA001 (1010 0000 0000 0001) on the CRC register.

(5) Repeat steps 3 and 4 until 8 shifts are completed. When this is done, the full operation on the 8-bit byte is done.

(6) Repeat steps 2 to 5 for the next byte in the message, and continue this operation until all messages have been processed.

(7) The final content in the CRC register is the CRC value.

(8) When placing the CRC value in the message, the high and low bytes must be exchanged.

CRC language and C + + general code implementation:

```
unsigned int Crc(const unsigned char* data, unsigned char length)
{
	unsigned int check=0;
	unsigned int CRCreg=0xFFFF;
for(int i=0;i<=length-1;i++)
{
	CRCreg=CRCreg^data[i];
	for(int j=1;j<=8;j++)
	{
		if(CRCreg&0x01)
		{
		  CRCreg=(CRCreg>>1)^0xa001;
		}
		else
		{
			CRCreg=CRCreg>>1;
		}
	}
}
	return CRCreg;
}
```

6.8 Modbus TCP (Ethernet Communication Protocol)

Modbus TCP Communication Commands:

	Function code	Function	Transmit frame	Received frame
1	0x03	Read a or more register data	Transcation XID High:0xXX Transcation XID Low:0xXX Protocol High:0xXX Protocol Low:0xXX Length High:0x00 Length Low:0x06 The length is the number of bytes in the following orange part Device address:0xXX Function code:0x03 Start address High:0xXX Start address Low:0xXX Numbers of register High:0xXX Numbers of Register Low:0xXX CRC Correction Low:0xXX CRC Correction High:0xXX Eg: sending: 00 01 00 00 00 06 01 03 00 00 00 08 42 E9	Transcation XID High:0xXX Transcation XID Low:0xXX Protocol High:0xXX Protocol Low:0xXX Length High:0x00 Length Low:0x06 The length is the number of bytes in the following orange part Device address:0xXX Function code:0x03 Data Length n:0xXX Data n:0xXXXX ..... Data 1:0xXXXX Reply: 00 01 00 00 00 13 01 03 10 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 6D AB
2	0x06	Write a register data		
3	0x10	Write more register data		
4	0x11	Read device information		

6.9 Register Address List

When reading 1~4 Channel temperature value

Parameter	Register address	Register	Content	Operation

category			name		
	Hexadecimal	Decimal			
Measuring value	00-7FH	0-127	TempValue [0] …… TempValue	Measurement value total 64 channel	Read only
Parameter setting	A0H	160	ChannelNum	Numbers of channel	Read only
	A1H	161	AlUpLmt	Alarm upper limit value	Read and write
	A2H	162	AlDownLmt	Alarm lower limit value	Read and write
Digits	ABH	171	Dot[0] …… Dot [127]	The number of decimal points corresponding to each channel, a total of 64 channels	Read only

The master station sends a query message: 01 03 00 00 00 08 44 0C
Recorder report: 01 03 10 42 C8 00 00 41 A3 0A 3D 42 20 00 00 41 F7 AE 14 3C 1F
Data segment: 42 C8 00 00 means 100 in decimal 41 A3 0A 3D means 20.38 in decimal

42 20 00 00 means decimal 40 41 F7 AE 14 means decimal 30.96
The hexadecimal message of the data segment starts from the fourth byte, and every 4 bytes is a channel data, which needs to be converted with single-precision floating-point data.

Take C language conversion as an example: convert 30.96 (hexadecimal 41 F7 AE 14)

```
#include<stdio.h>
// use union to implement
union valReg
{
unsigned char data[4];
float fval;
};

int main()
{
union valReg val;
//Put the hexadecimal value into it respectively, if the value obtained is not correct, exchange the position
val.data[3]=0x41;
val.data[2]=0xf7;
val.data[1]=0xae;
```

```
val.data[0]=0x14;
printf("The decimal value of fval=%f\n",val.fval);
return 0;
}
```

7. Communication Software Description

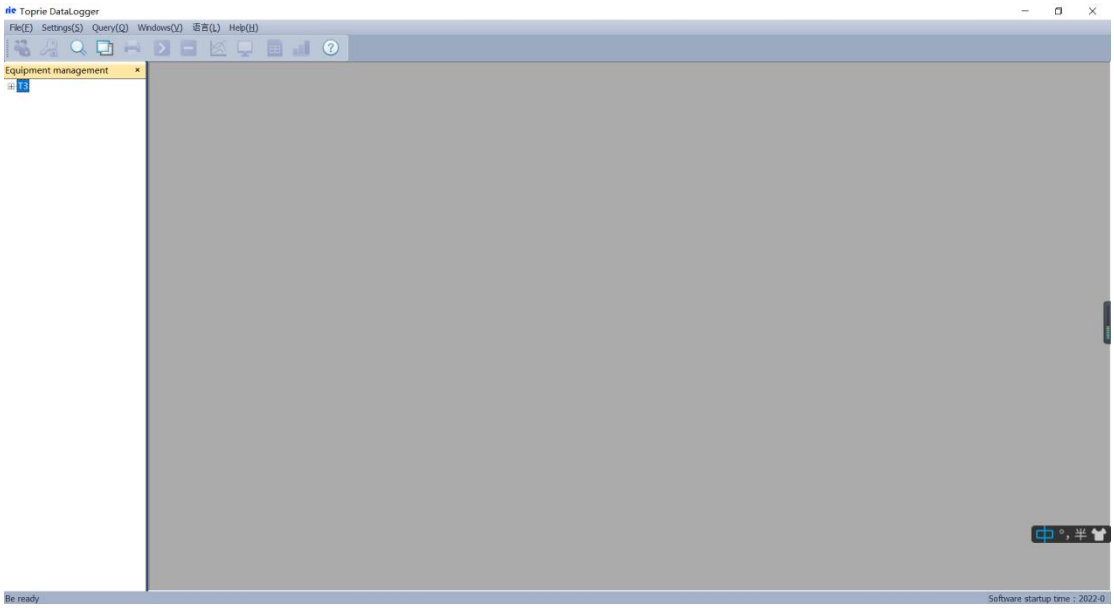
7.1 Host Software Installation

7.1.1 Download and Install the Host Computer Software

Go to the U disk to download and install the host computer software for the recorder--data acquisition system--installation package, temporarily close and exit all anti-virus software and firewall before installation, click the host computer installation package to install the software, if the anti-virus is not exited, there will be security Prompt to jump the window, please click Allow or Agree. After the installation is complete, we double-click the data acquisition system application shortcut to open the software, as shown below.

7.1.2 Pop up and Run

After double-clicking to run, the main interface of the system will pop up, as shown in the figure below.



7.2 System Interface Introduction

1. System name display area: display the data acquisition system in the upper left corner of the system.

2. Main menu bar: Contains 6 options: "File (F)", "Settings", "Query", "View (V)", "Language" and "Help (H)"

2.1 The "File (F)" option includes 3 operations including "Add Device", "File Conversion", and "Exit (X)";

2.2 "Settings" option is "Alarm Settings";

2.3 "Query" option to query historical data;

2.4 "View (V)" option, you can set the display of "Device Management", "Toolbar" and "Status Bar" of the system;

2.5 "Language" can be switched between Chinese and English through this button.

2.6 "Help (H)" option to provide users with system version information.

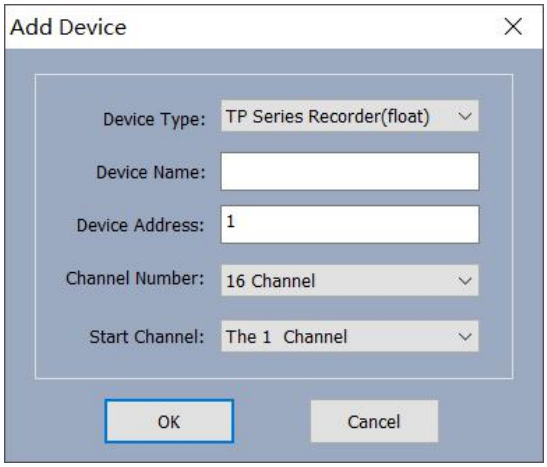
3. Toolbar: Contains 10 options for device management, query history, print preview, start acquisition, stop (data acquisition), curve (data curve), digital display, list, bar graph and version information.

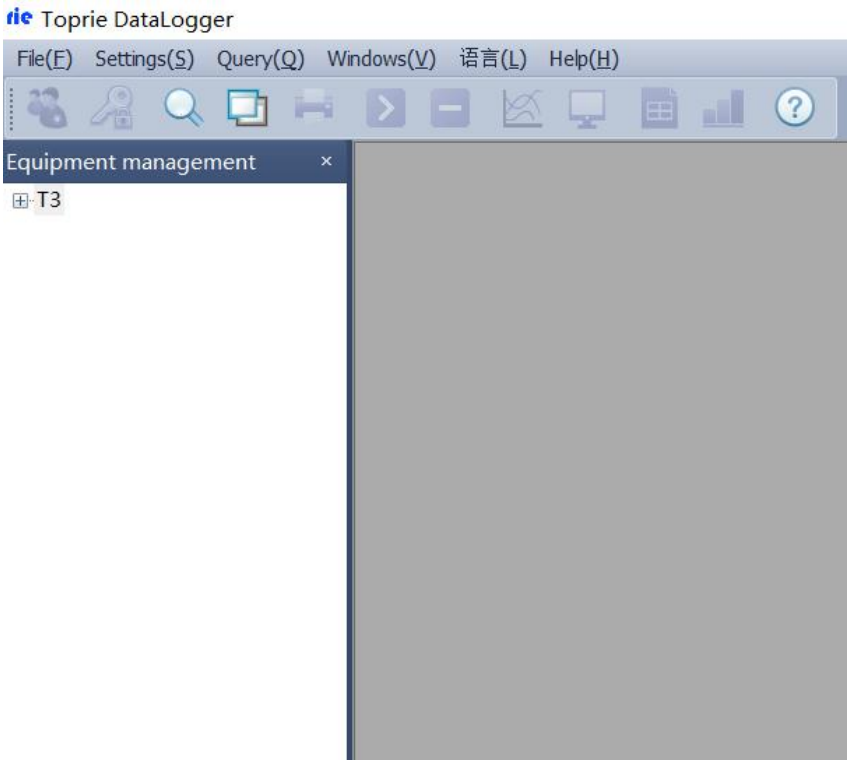
4. Display the main window: the collected data is displayed in different ways, and the historical data, alarm record query and other display areas are displayed.

7.3 Create Device and Setup Communication

7.3.1 Create Device

Click the right mouse button in the "Device Management" area, and select "Add Device" to pop up a new device dialog box as shown in Figure 7-2. The device name can be self-named, and the device address is the address of the recorder (can be found in the recorder's "System Settings" interface. Query, the default communication address between the host computer and one recorder is set to 1), select the corresponding number of channels and the starting channel as needed (the default starting channel is 1). When the number of channels is greater than 64 or the channels need to be divided into different classes, each channel can be linked to different devices. For example, the first 8 channels measure temperature, the latter 8 channels measure humidity and you want to display them in different windows, you can click to operate: 1) Create a new 8-channel device, device type (select the communication protocol, Where **w represents wireless protocol) -> device name -> device address is 1 (the default address of the instrument is 1) -> channel number 8 channels -> initial channel 1; 2) Then create a 24-channel device, device name —> The device address is 1 —> The number of channels is 24 channels —> The starting channel is 9. The above are the operations for different channels of the same instrument.

	Device Type: Logger (float) Device Name: You can fill in according to your own needs or habits Device address: If one computer only connects to one recorder, set it to: 1; take RS485 communication as an example: if one computer only uses one RS485 serial port to connect two or more, the address of each recorder established by it. Then fill in 1, 2, 3...8, 9, etc. in order Number of channels: fill in as required Start channel: generally start from the first channel



New Device dialog

This software system can communicate with one pair of multiple recorders at the same time. If you need to monitor multiple instruments at the same time, you can perform the following operations: 1) In the "System Settings" interface of the instrument, set the device addresses to different values such as 1, 2, 3, etc.; 2) In the system In the software, multiple devices with corresponding channels are established respectively, and the device address setting should be consistent with the address of the instrument device. The first one is a 16-channel device whose address is set to 1, and the second is a 32-channel device whose address is 2; first create a device in the system: device name—>device address is 1—>channel number 16 channels—>initial channel 1; Create another device: device name -> device address is 2 -> channel number 32 channels -> start channel 1.

Move the mouse cursor to the device name, here it is placed on the device management bar +... recorder (device name), right-click to select device properties, and the device properties dialog box will pop up as shown in the figure below. Here, you can set the communication mode with the recorder via Ethernet port communication or serial port communication, which can be set according to your needs.

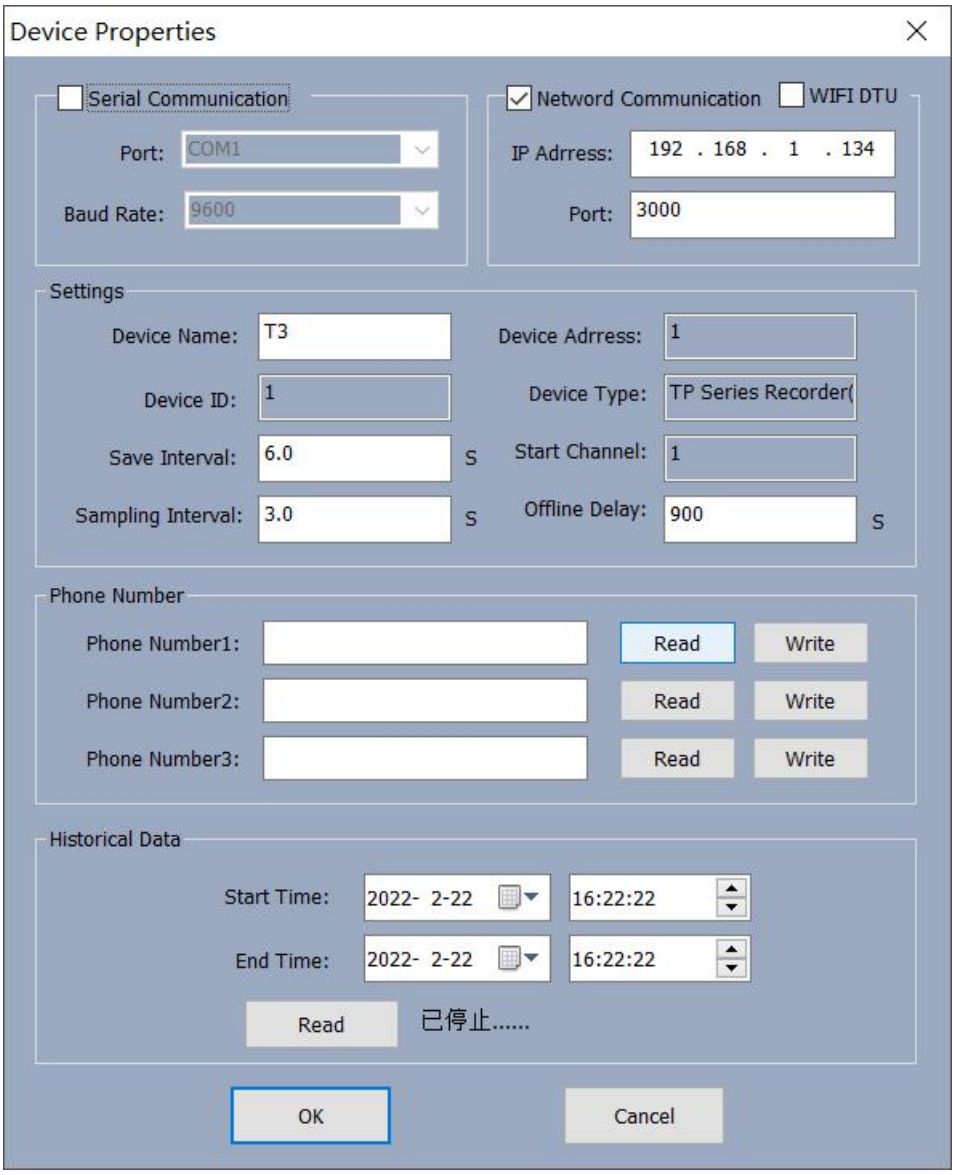
1. Network Communication

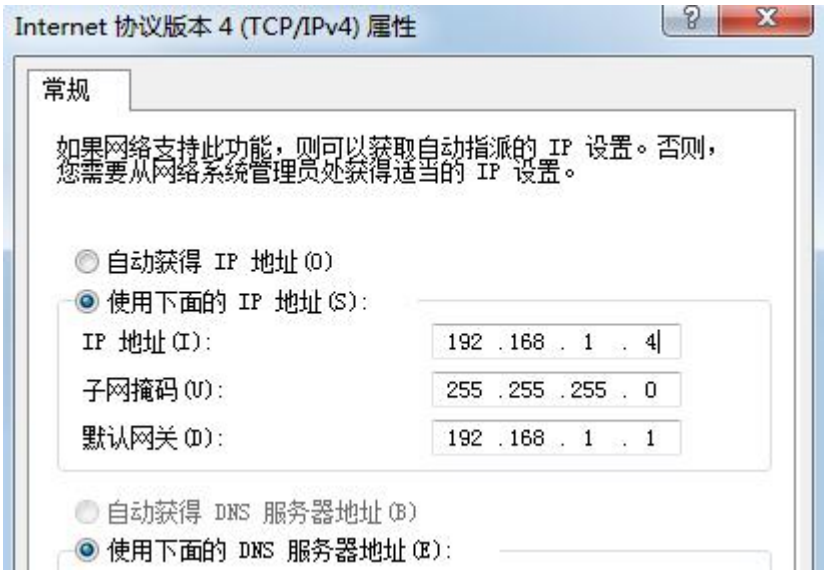
Connect the recorder to the computer with a network cable, mark √ at the network port communication, check or modify the ip address in the recorder system setting interface and fill in the port number by default as 3000, and the collection interval is 1 second.

An example is as follows: For example, in the instrument system settings: IP is 192.168.1.134,

then modify the computer local connection (Ethernet) Internet Protocol version 4 (TCP/IPv4) IP address to: 192.168.1.4, make sure that the computer and the recorder ip are in the same gateway : 192.168.1.1

The mobile phone number in the device properties refers to the tel number in the system interface of the recorder, and its function is to provide the user with the SMS alarm function (this function is a customized function, and an additional SMS alarm module needs to be added to the computer). Click OK to save the settings and close the dialog.



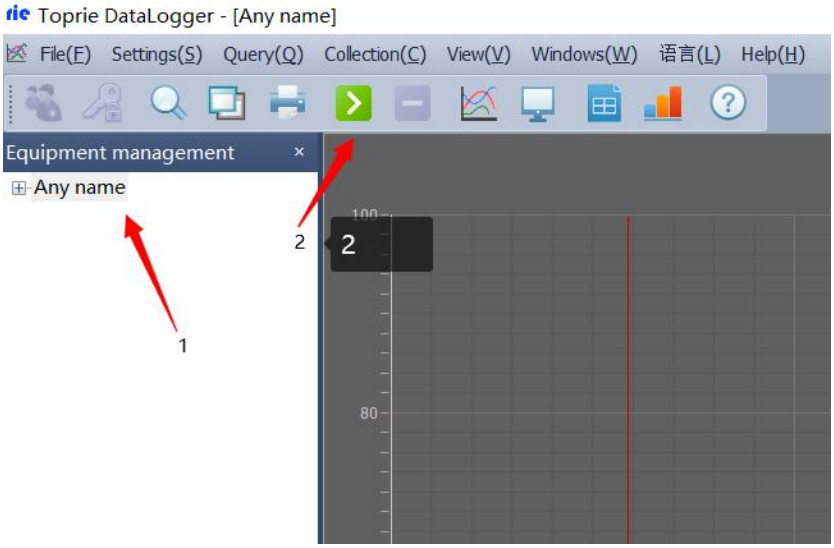


Query the IP address of the recorder, and set the local connection (Ethernet) IP address in the computer. After the setting is completed, double-click the device name in the software device management: data recorder, and then click the top to start the acquisition. After all settings are completed, you can also choose serial communication. The following introduces serial communication.

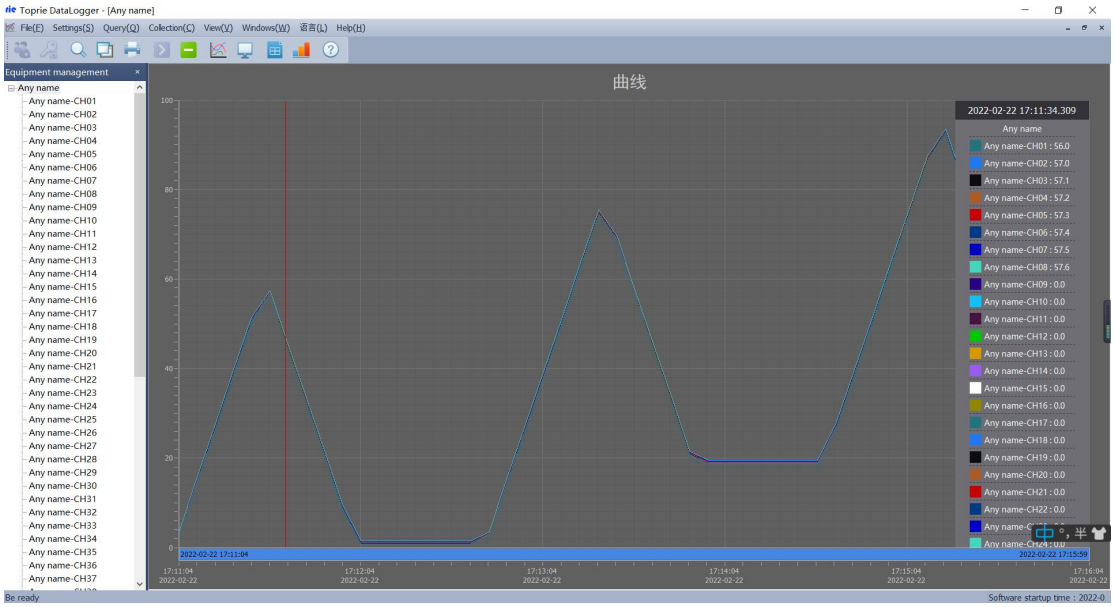
2. Serial Port Communication

Query the IP address of the recorder, and set the local connection (Ethernet) IP address in the computer. After the setting is completed, double-click the device name in the software device management: data recorder, and then click the top to start the acquisition. After all settings are completed, you can also choose serial communication. The following introduces serial communication.

7.3.2 Choose Data Display Methods



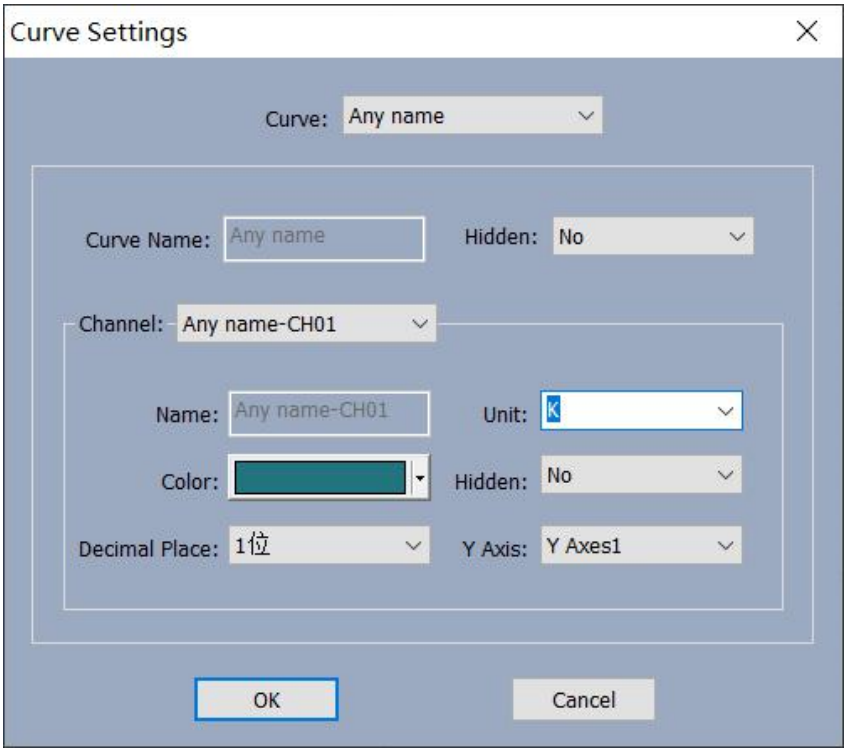
Logger, the display method in the toolbar can be selected (the default is the curve interface as shown in the figure below), after setting the parameters, select a data display method in the "real-time acquisition" option in the main menu bar or directly in the toolbar, Only the digital display mode is selected here for description. In the main menu bar, select "Start real-time acquisition" in "Operation" or click the "Start acquisition" button in the toolbar to establish communication with the recorder.



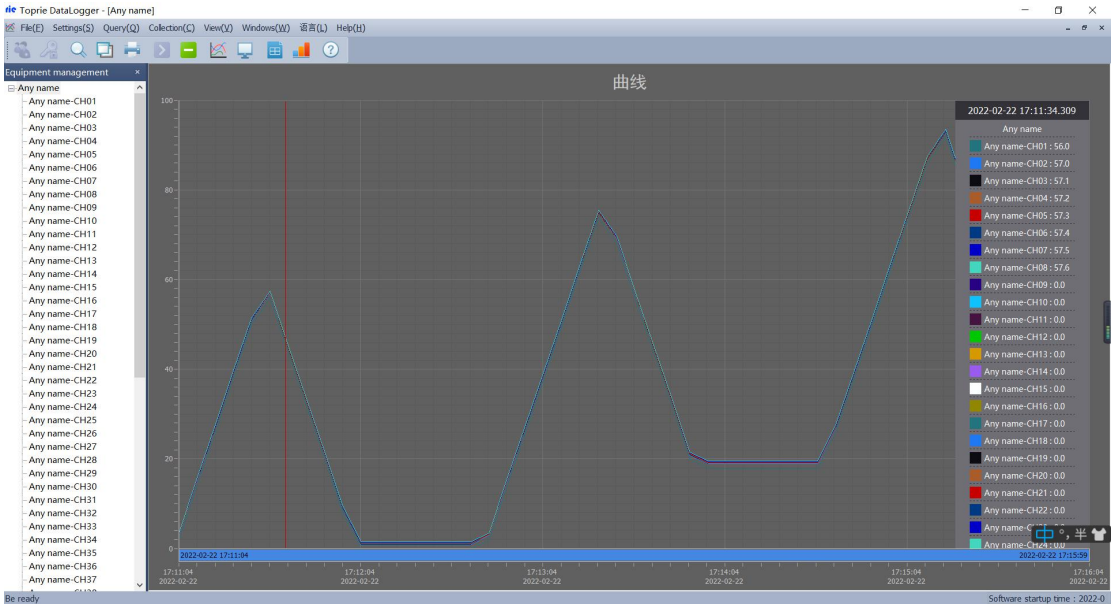
Curve interface

In the curve interface, click the right mouse button in the curve drawing area and select the parameter setting as shown in the figure below to set the curve properties. In this window, 4 different Y axes can be set, and different channels can be selected and corresponding curves can be drawn. But only one Y axis can be selected for one channel. For the curve properties

of each channel, you can click the right button in the device management area to set the corresponding channel.

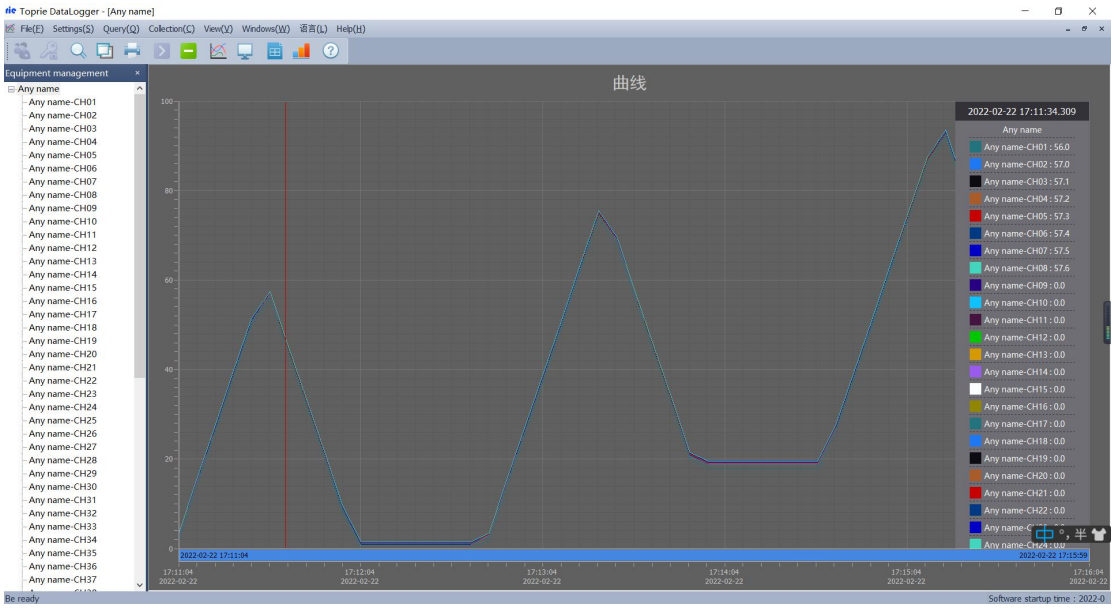


Curve parameter settings

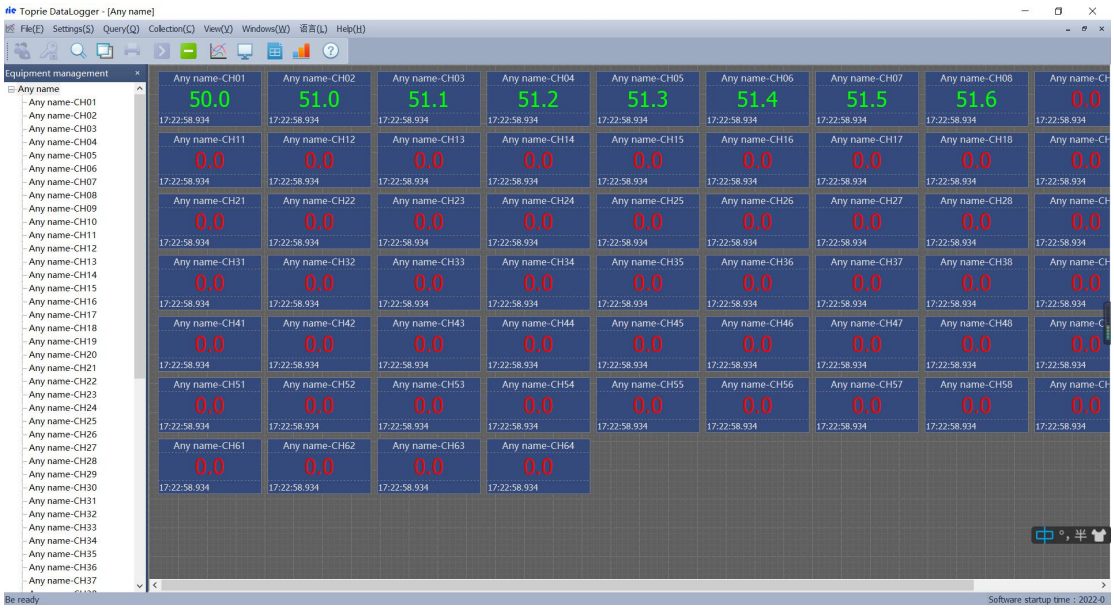


Draw multiple Y axes, one on each left and right

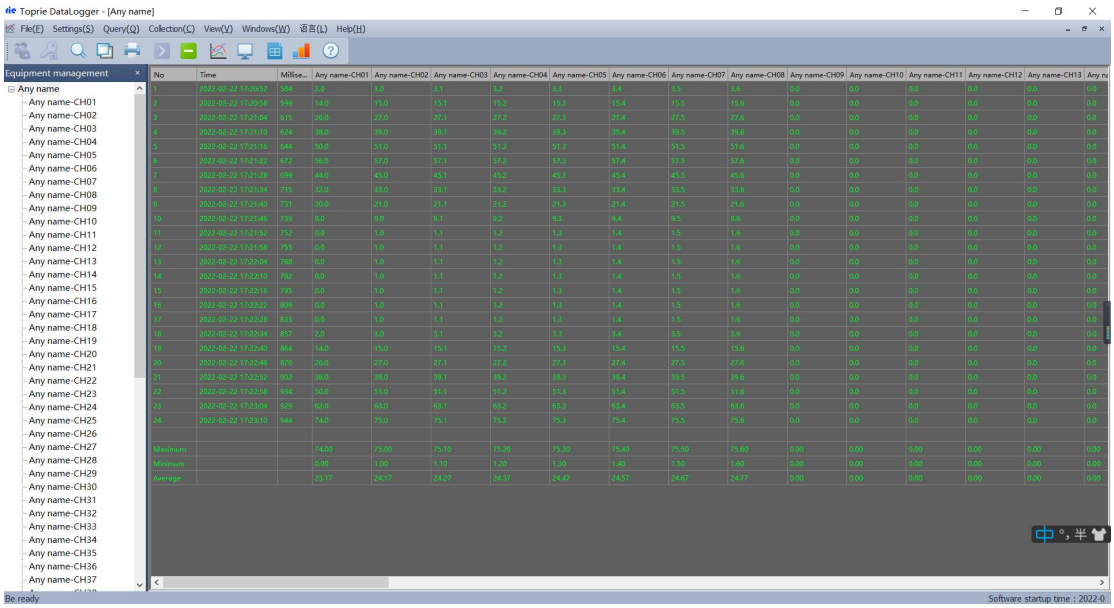
Hold down the Shift key and select the corresponding area on the curve to find the maximum, minimum and average values of each channel during that period. Hold down the Ctrl key and select the corresponding area to zoom in along the X axis. As shown below



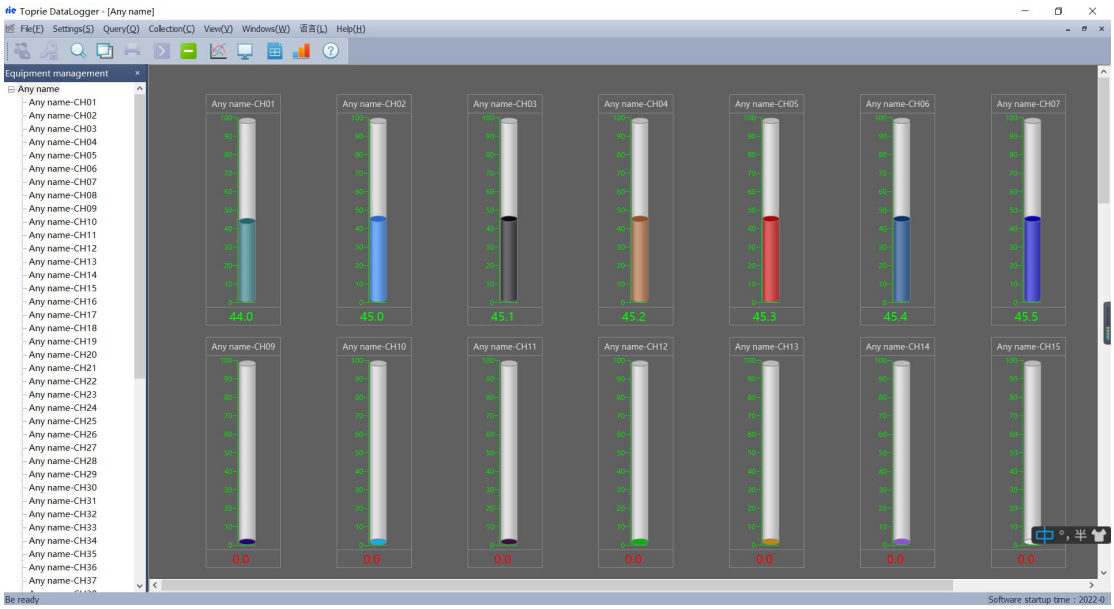
Shortcut to average



Numerical Display

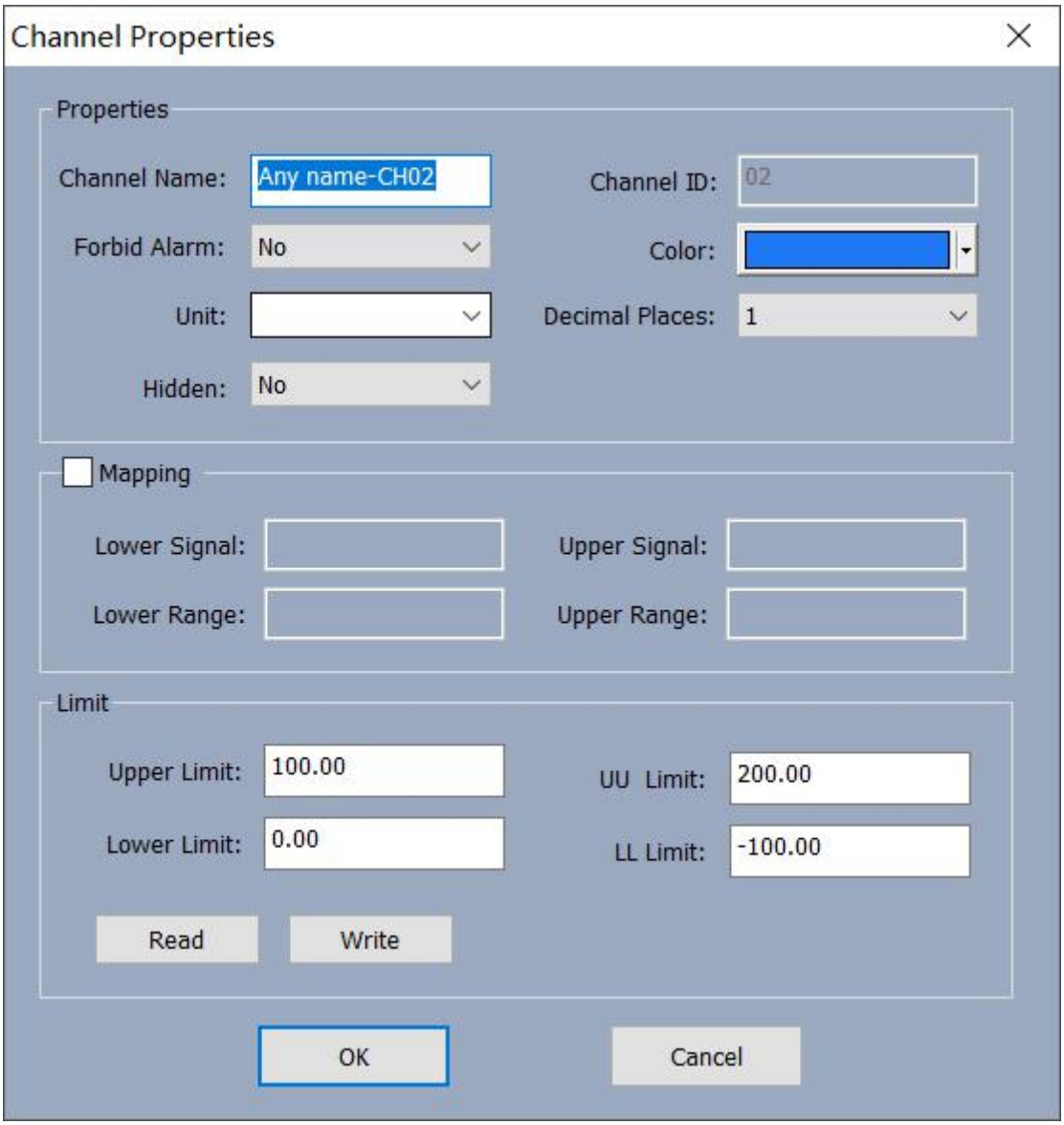


List interface



Bar graph interface

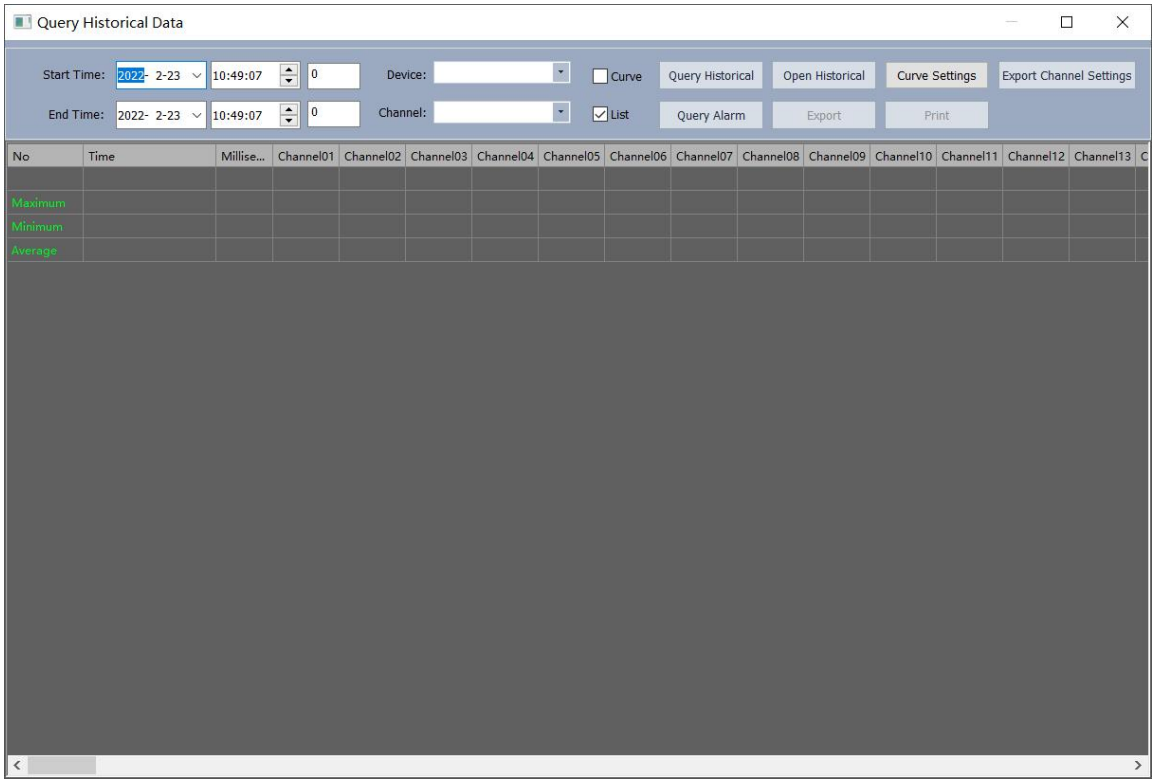
The parameters of each channel can be set in the device management area, select the corresponding channel and right-click the device properties. The channel properties are set as shown in the figure below. In this window, you can set the device name: channel name, disable alarm: yes/no, display color, channel unit, display decimal places, etc., and can read to the recorder, that is, the device can read or write. Operations such as the lower and upper limits of the channel.



Channel property settings

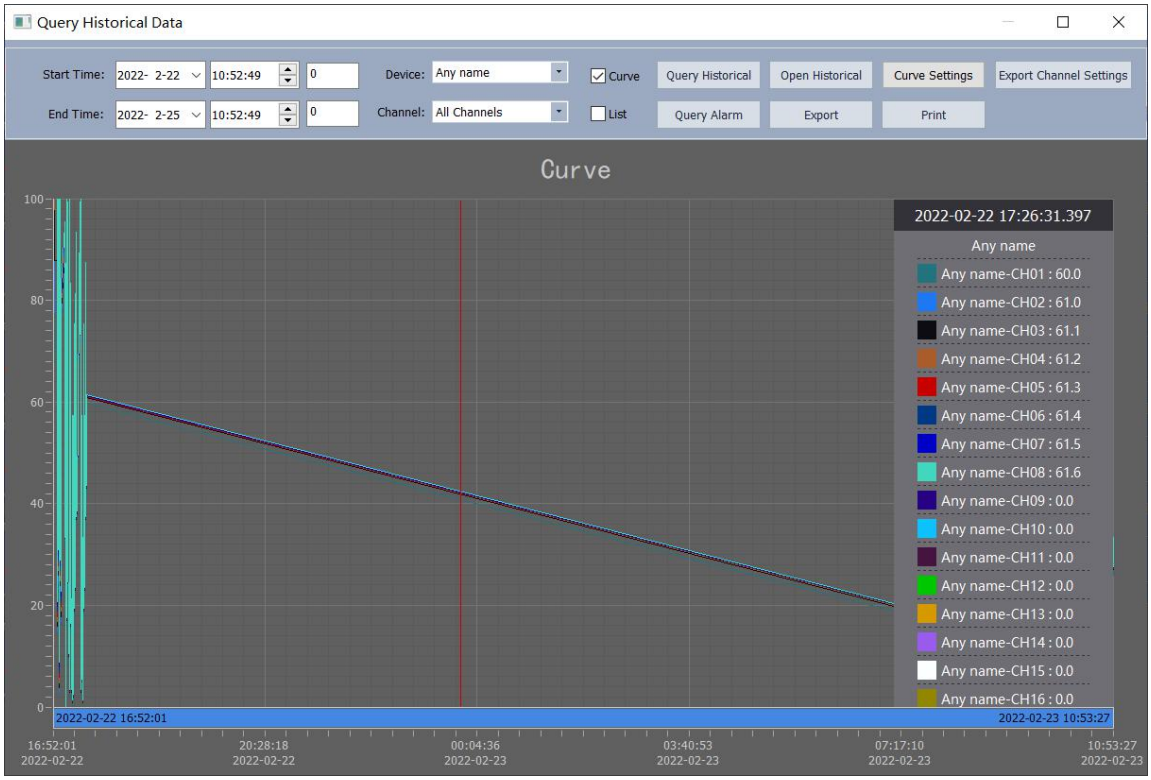
7.3.3 Query

Click Query button,Choose query history, it will pop up query historical Data dialog box.



By selecting the time period on the left and selecting the device name and channel number or all channels to query the historical data recorded in the PC software, you can choose two methods: curve query and list query, click the query historical data button, you can Query the data recorded by the host computer.

The Open Historical Data button is to open and query the .CSV data file downloaded from the U disk from the record. Click Open and then click the browse path to find the downloaded file from the U disk and open the historical data.



Note: Do not modify the downloaded data in the U disk. If the modified data is saved, it cannot be successfully opened through this software and the curve can be generated for viewing.

7.3.4 Alarm Setup

This system provides users with intelligent SMS alarm service, which needs to be connected to an external SMS alarm device (the computer needs an external wireless SMS alarm device, such as T3-DTU device, as shown in Figure 7-14 below, the alarm devices described below all refer to It is a T3-DTU device), the function is to notify the administrator by sending a short message by means of a short message by changing the device, and the management should decide whether to go to the scene according to the content of the short message. Specific setting method: Select the "Settings" option in the main menu bar, select "Alarm Settings" to enter the "Alarm Settings" interface, as shown in Figure 7-15 below.

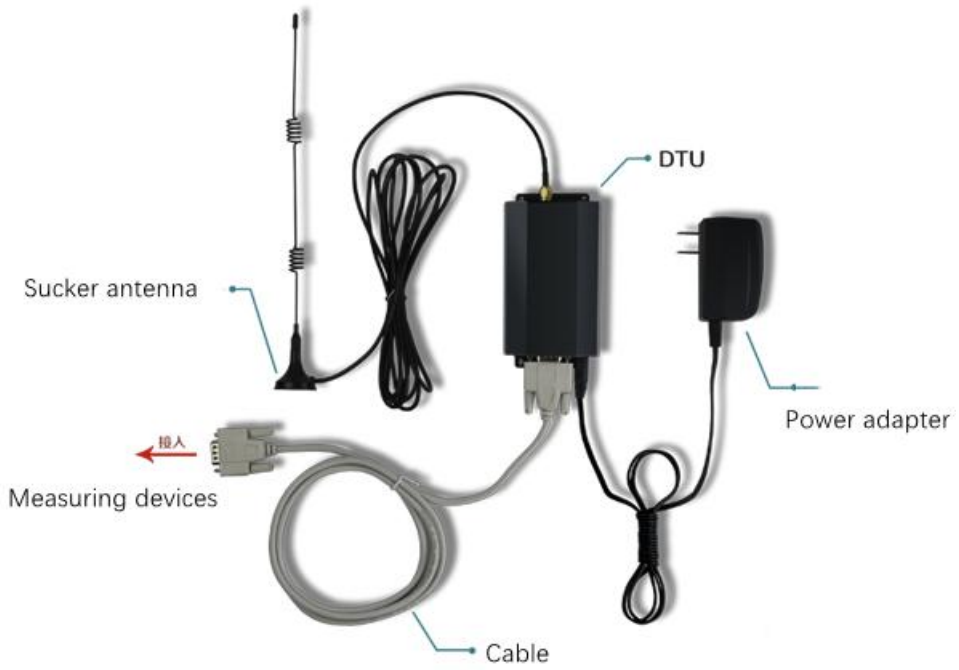


Figure 7-14 Wireless SMS Alarm

Port number: com3 is the serial port occupied by the SMS alarm device (selected by the user according to the connection port of the SMS alarm device identified by the user host).

Baud rate: The default is 9600 (depending on the communication bit rate of the alarm device), and data collection needs to be stopped when the port number and baud rate are set.

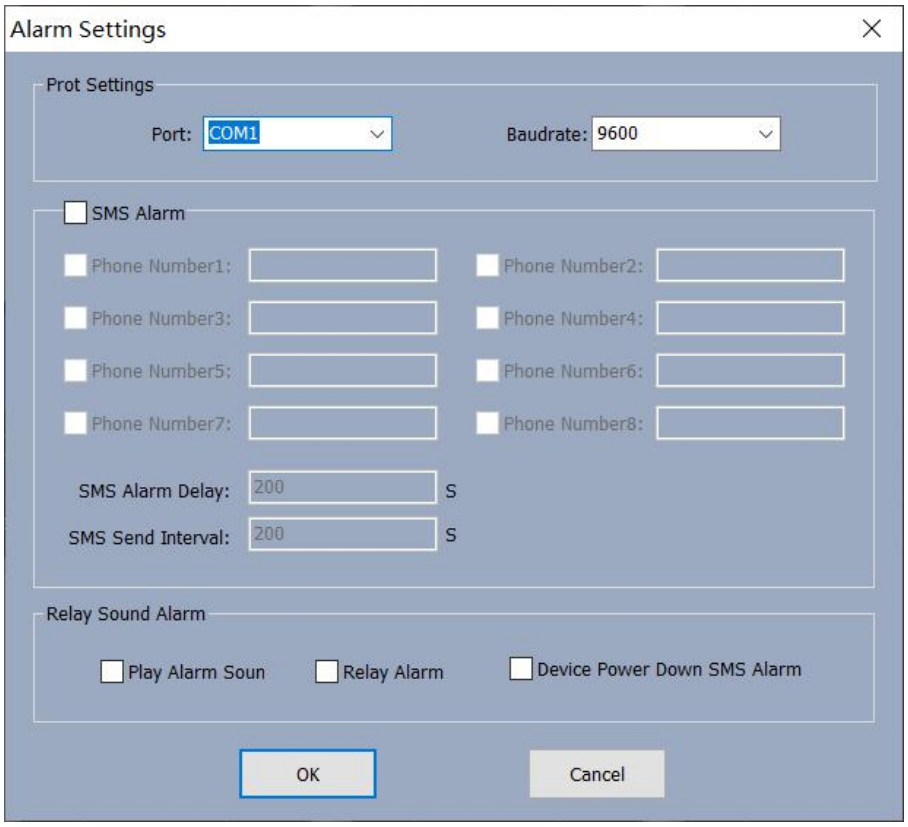
SMS alarm: 8 mobile phone numbers can be associated at the same time (note: only mobile phone cards can be used at present), when the temperature or humidity exceeds the upper limit or lower than the lower limit, the SMS alarm will automatically send a text message to the associated mobile phone number.

Sound alarm: Play the alarm sound, when the alarm trigger condition is reached, the system will issue an alarm sound.

SMS alarm delay: when the alarm condition is triggered, choose how long to delay to send an alarm SMS to the administrator.

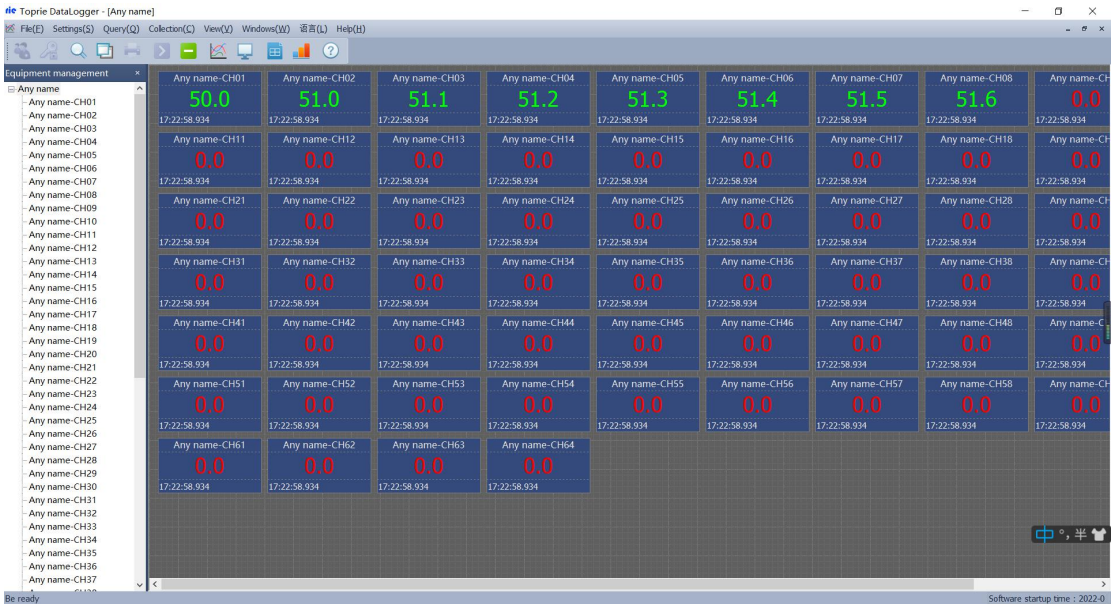
SMS sending interval: Set the period for sending alarm SMS.

The upper and lower limits of each channel of the device can be read or written on the right side of the alarm setting interface. The upper and lower limits are mainly for the alarm service, that is, when the collected data of the channel is greater than the upper limit of the channel or less than the lower limit of the channel, the system will pass the The external alarm device sends alarm information to the administrator.



Alarm Setup

Click Save to return to the main interface of the system, as shown in the figure. At this time, in the digital display window, you can see that the data of the third channel exceeds the upper limit set by the system (both data and upper limit values are displayed in red), and the system will send a message to the administrator's mobile phone every 20s.

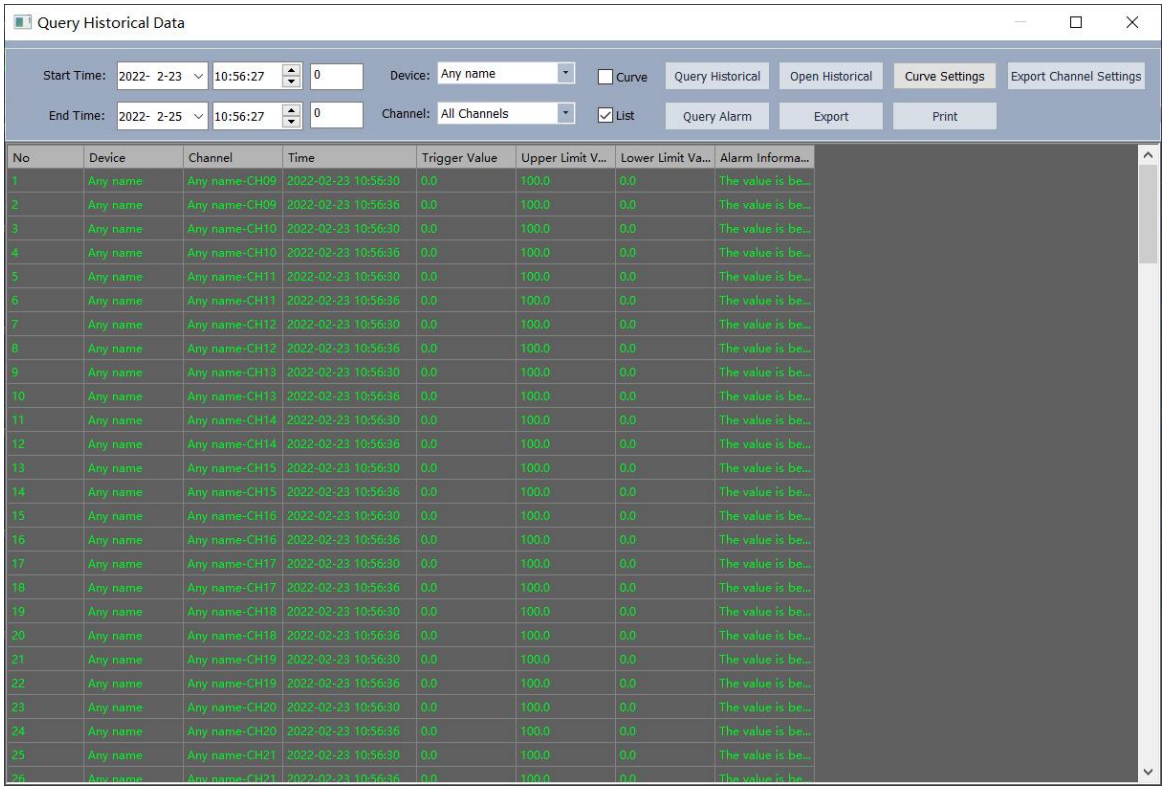


Data over upper and lower limit value alarm

7.4 Historical Data

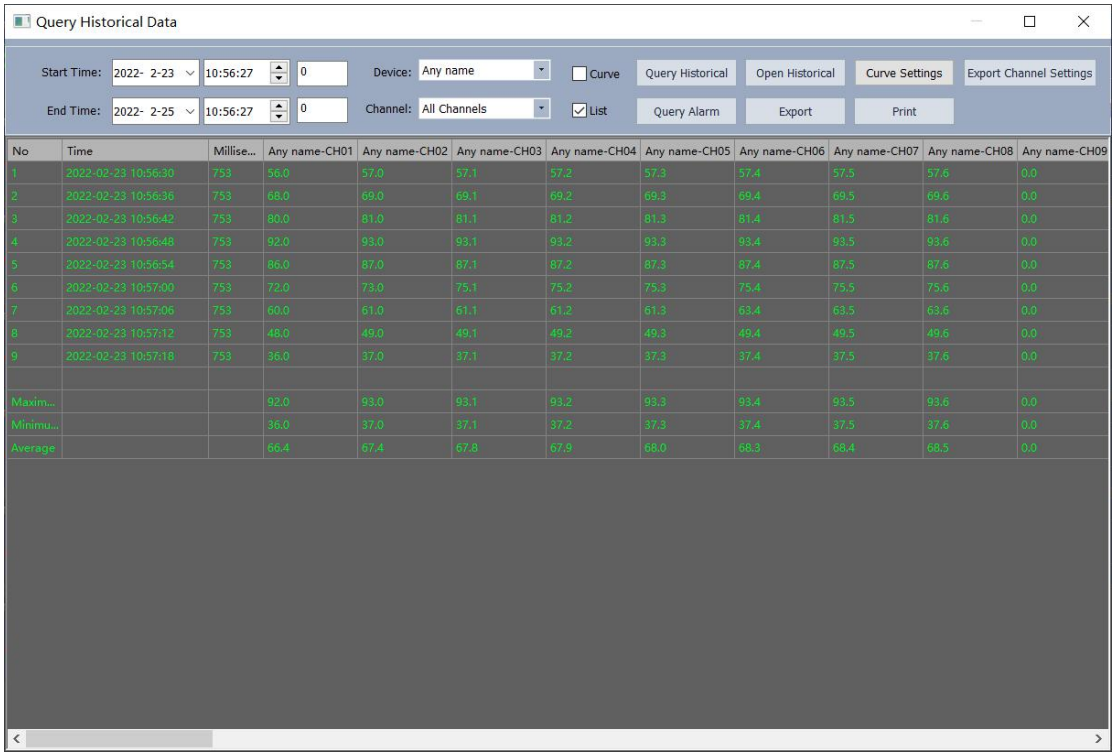
7.4.1 Historical Data & Alarm Log Query Export

Click "Historical Data" in the "Query" option in the main menu bar, the following figure will pop up, select the data you need to query in this interface, and then select the corresponding operation: open history curve, open history list.



History record

Click "Alarm Record" in the "Query" option in the main menu bar to pop up an interface, select the data you need to query in this interface.



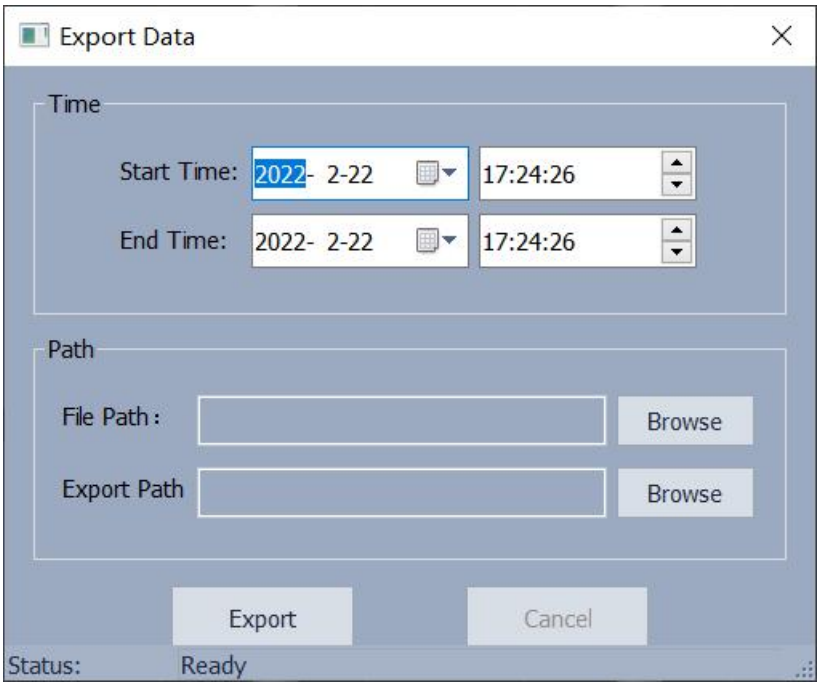
No	Time	Millise...	Any name-CH01	Any name-CH02	Any name-CH03	Any name-CH04	Any name-CH05	Any name-CH06	Any name-CH07	Any name-CH08	Any name-CH09
1	2022-02-23 10:56:30	753	56.0	57.0	57.1	57.2	57.3	57.4	57.5	57.6	0.0
2	2022-02-23 10:56:36	753	68.0	69.0	69.1	69.2	69.3	69.4	69.5	69.6	0.0
3	2022-02-23 10:56:42	753	80.0	81.0	81.1	81.2	81.3	81.4	81.5	81.6	0.0
4	2022-02-23 10:56:48	753	92.0	93.0	93.1	93.2	93.3	93.4	93.5	93.6	0.0
5	2022-02-23 10:56:54	753	86.0	87.0	87.1	87.2	87.3	87.4	87.5	87.6	0.0
6	2022-02-23 10:57:00	753	72.0	73.0	75.1	75.2	75.3	75.4	75.5	75.6	0.0
7	2022-02-23 10:57:06	753	60.0	61.0	61.1	61.2	61.3	63.4	63.5	63.6	0.0
8	2022-02-23 10:57:12	753	48.0	49.0	49.1	49.2	49.3	49.4	49.5	49.6	0.0
9	2022-02-23 10:57:18	753	36.0	37.0	37.1	37.2	37.3	37.4	37.5	37.6	0.0
Maxim...			92.0	93.0	93.1	93.2	93.3	93.4	93.5	93.6	0.0
Minimu...			36.0	37.0	37.1	37.2	37.3	37.4	37.5	37.6	0.0
Average			66.4	67.4	67.8	67.9	68.0	68.3	68.4	68.5	0.0

Alarm Record

Click the Export button to pop up a dialog box, select the corresponding path and file name, and then click Export, the data saved in the software will be saved to the file.

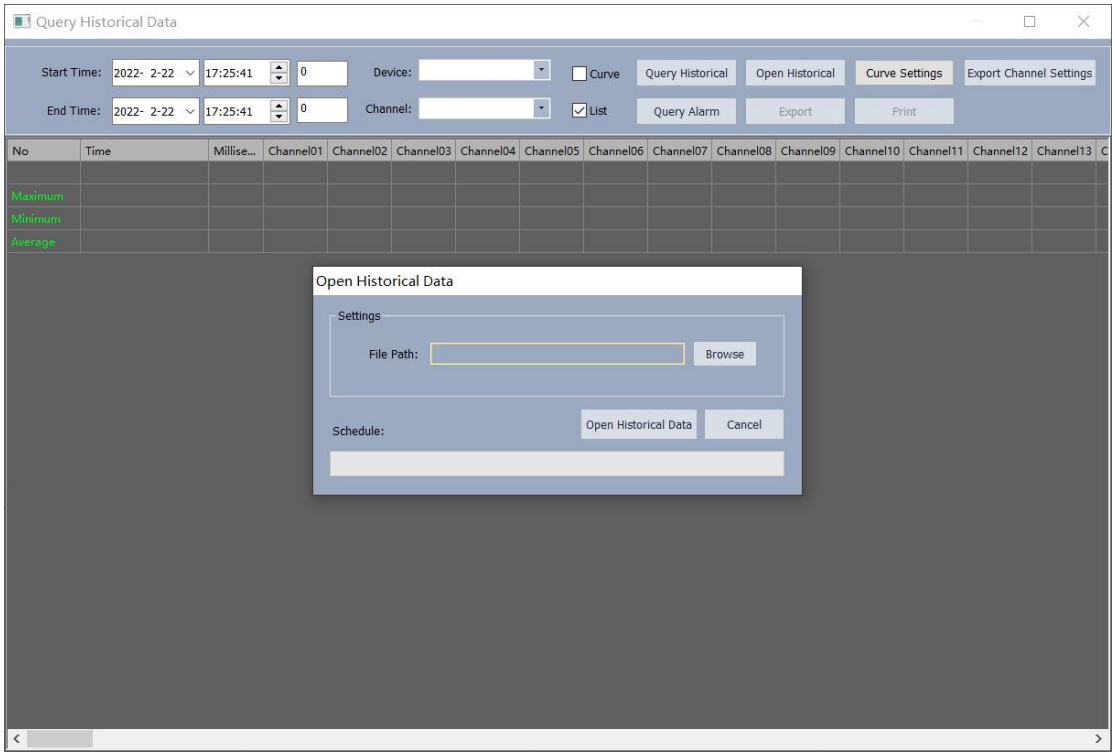
7.4.2 Open Device Host to Export Historical Data

This software supports the function of reading the data exported by the recorder. Click on the instrument host to quickly export data, and a "data" folder will be generated in the root directory of the U disk. Click the file in the menu bar in the software to select "file conversion" The following 7-19 dialog box pops up, select the appropriate start time and end time, select the MCGS_DATA file in the U disk, the export path depends on your own situation, and then click Export.

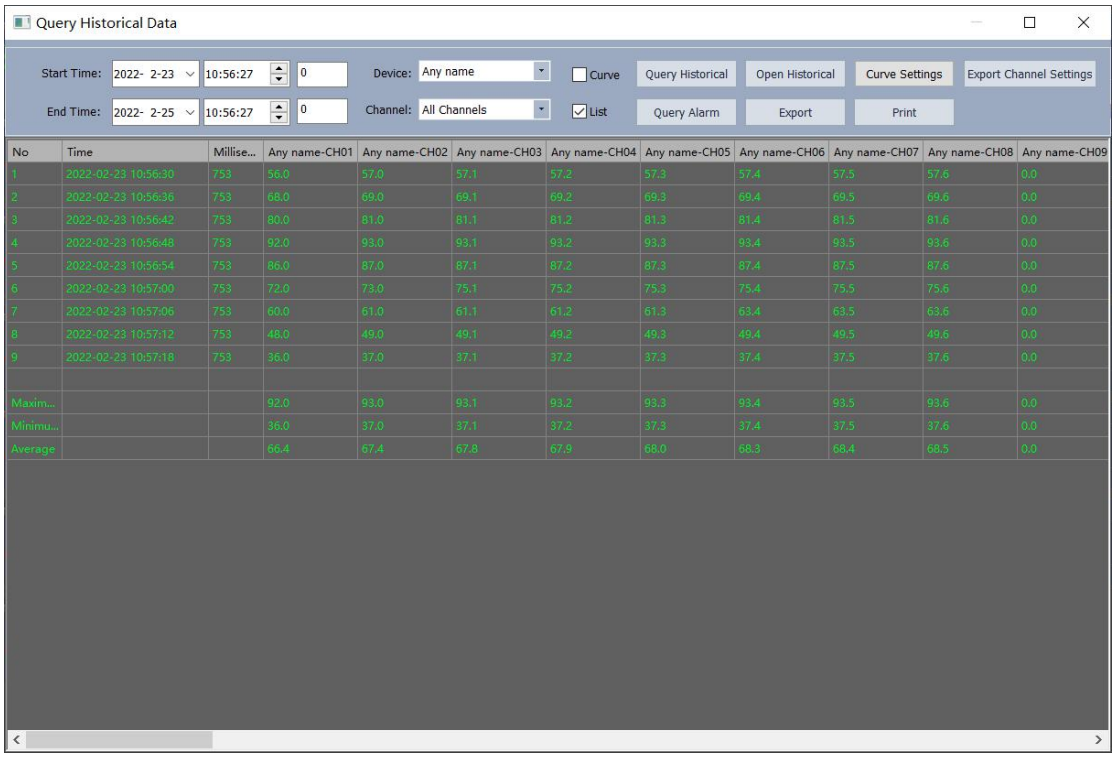


File conversion dialog

Then enter the historical data query interface in the query, click "Open Historical Data" to select the converted file, click to open "Open Historical Data", click Browse, find the folder downloaded and dumped by the recorder, and select *. csv, you can find the file downloaded and transferred by the recorder (as shown in the figure below), click to open, during the opening process, you can choose to view it in two ways: list view and curve view. file, you can directly enter the historical data query.

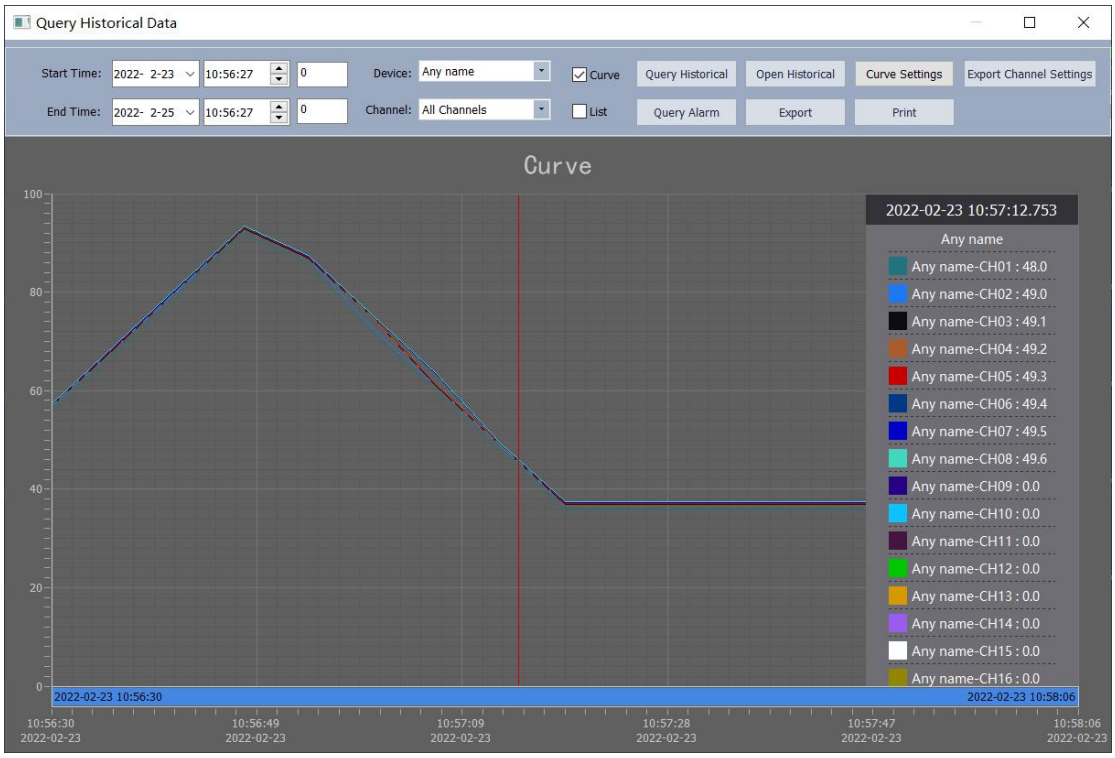


Open the logger and download the data

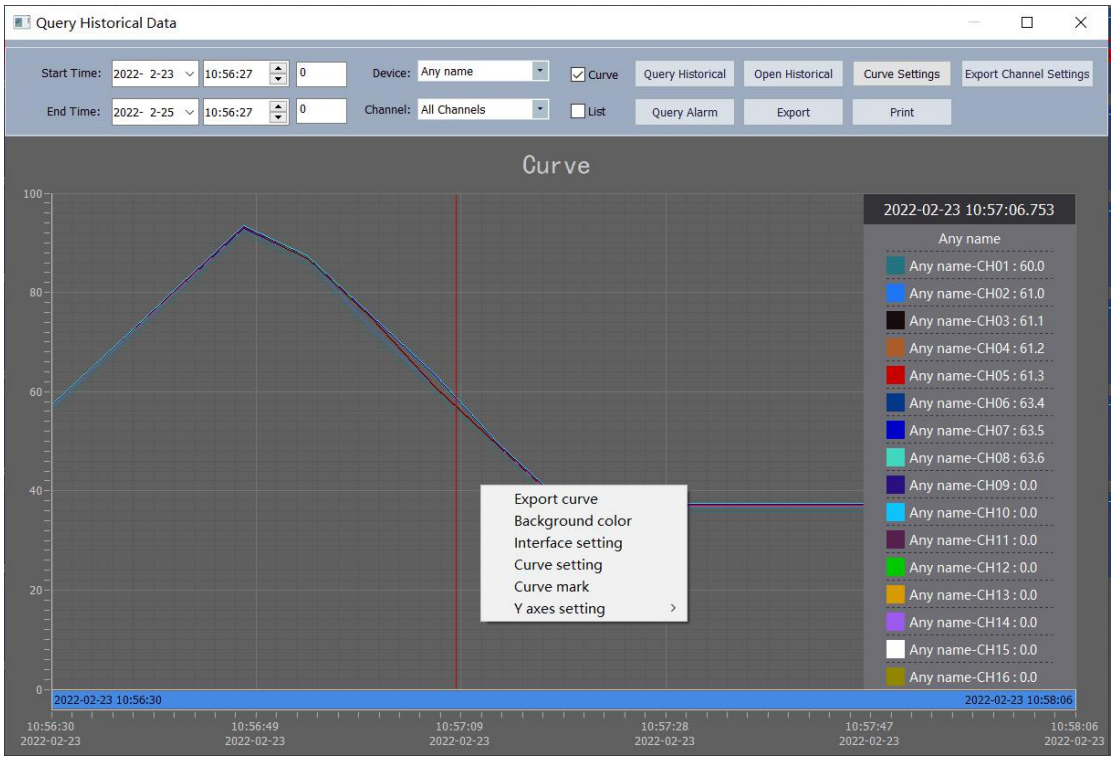


No	Time	Millise...	Any name-CH01	Any name-CH02	Any name-CH03	Any name-CH04	Any name-CH05	Any name-CH06	Any name-CH07	Any name-CH08	Any name-CH09
1	2022-02-23 10:56:30	753	56.0	57.0	57.1	57.2	57.3	57.4	57.5	57.6	0.0
2	2022-02-23 10:56:36	753	68.0	69.0	69.1	69.2	69.3	69.4	69.5	69.6	0.0
3	2022-02-23 10:56:42	753	80.0	81.0	81.1	81.2	81.3	81.4	81.5	81.6	0.0
4	2022-02-23 10:56:48	753	92.0	93.0	93.1	93.2	93.3	93.4	93.5	93.6	0.0
5	2022-02-23 10:56:54	753	86.0	87.0	87.1	87.2	87.3	87.4	87.5	87.6	0.0
6	2022-02-23 10:57:00	753	72.0	73.0	75.1	75.2	75.3	75.4	75.5	75.6	0.0
7	2022-02-23 10:57:06	753	60.0	61.0	61.1	61.2	61.3	63.4	63.5	63.6	0.0
8	2022-02-23 10:57:12	753	48.0	49.0	49.1	49.2	49.3	49.4	49.5	49.6	0.0
9	2022-02-23 10:57:18	753	36.0	37.0	37.1	37.2	37.3	37.4	37.5	37.6	0.0
Maxim...			92.0	93.0	93.1	93.2	93.3	93.4	93.5	93.6	0.0
Minimu...			36.0	37.0	37.1	37.2	37.3	37.4	37.5	37.6	0.0
Average			66.4	67.4	67.8	67.9	68.0	68.3	68.4	68.5	0.0

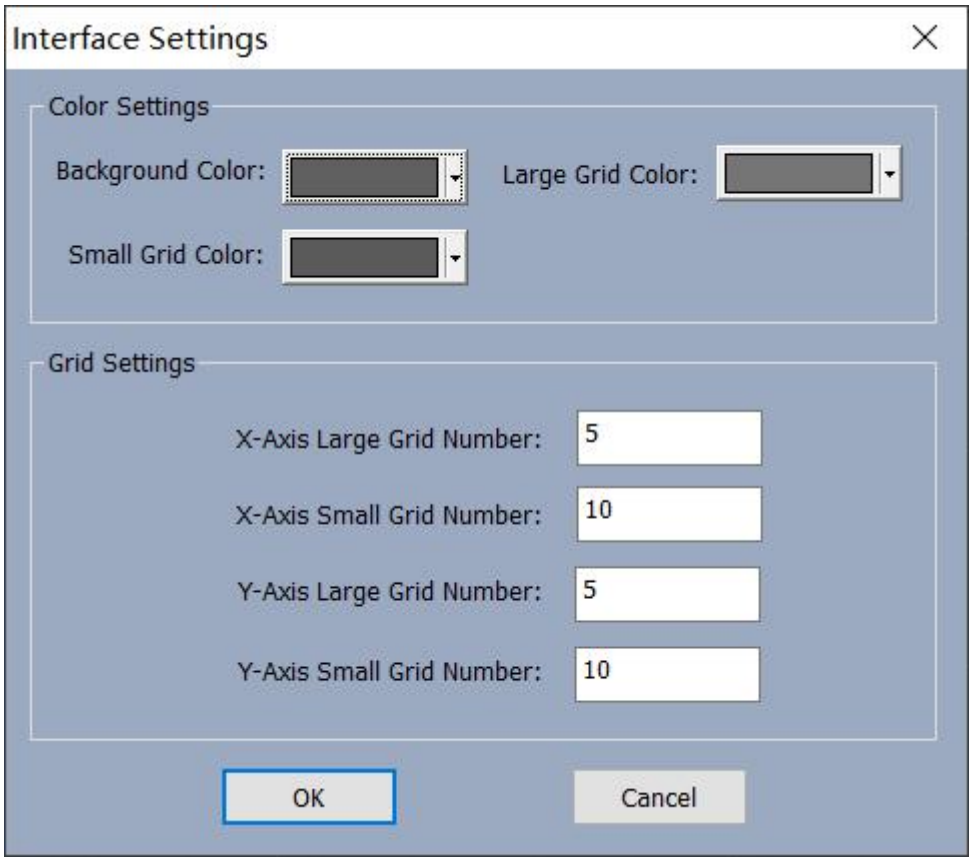
list view

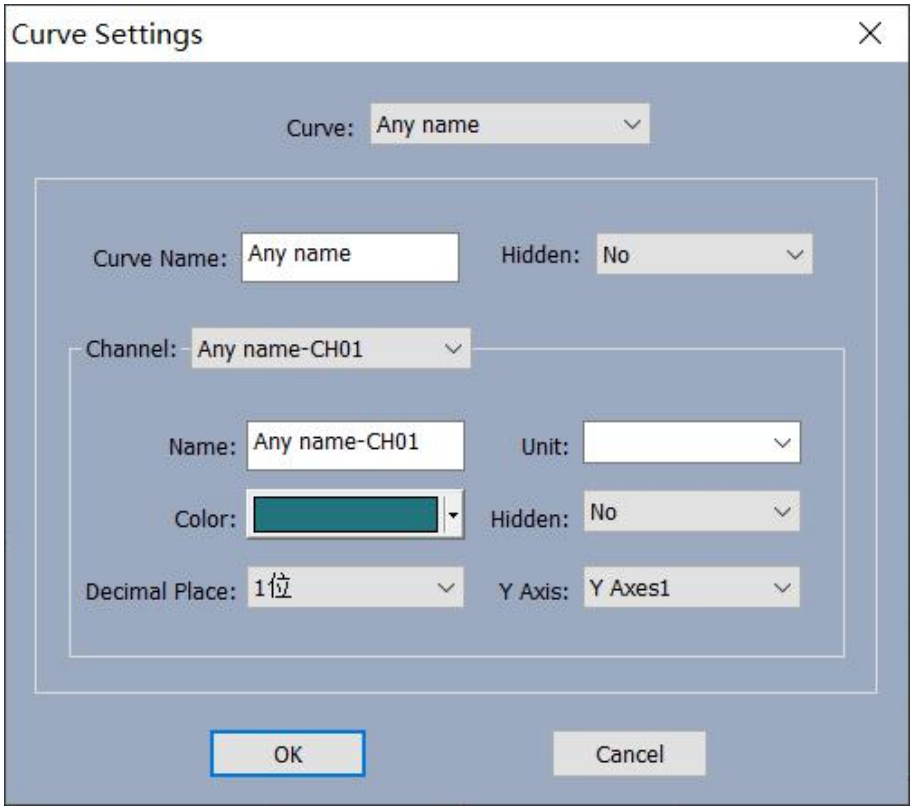


Open historical data curve browsing

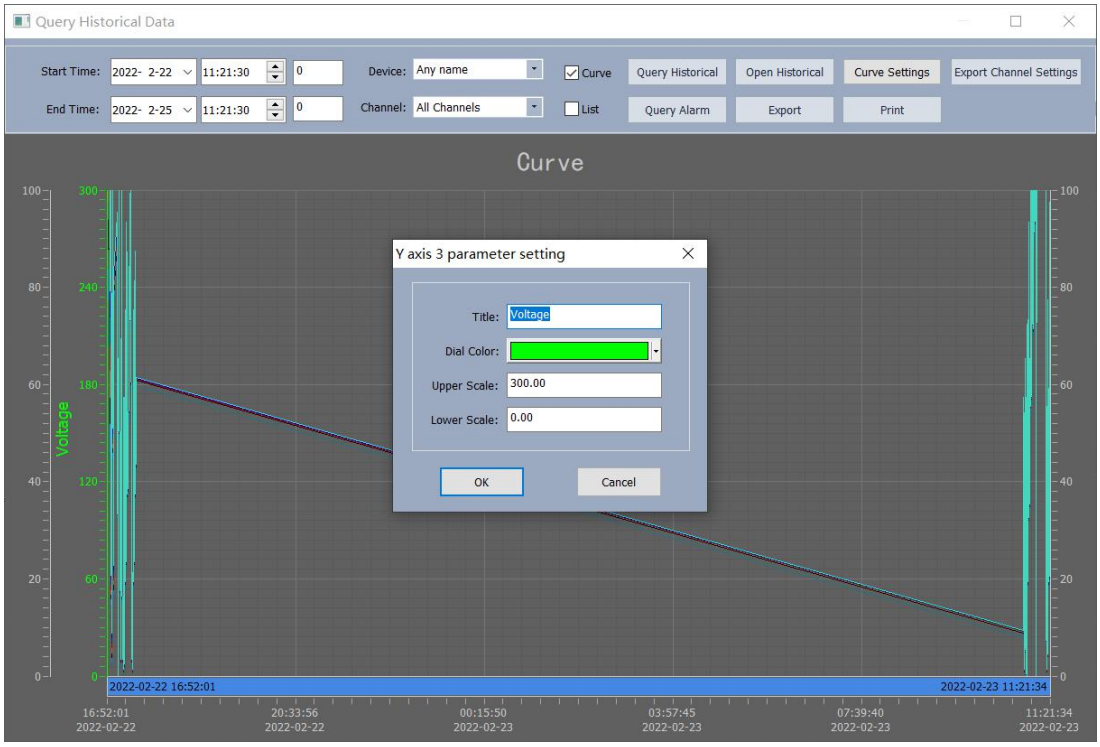


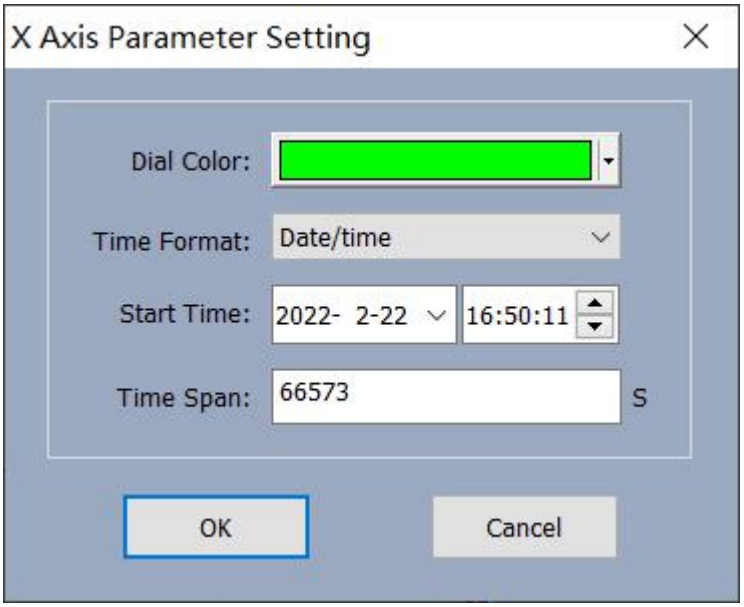
Click the right mouse button on the curve opening page and click the right mouse button to export the curve graph and save it as a background color.





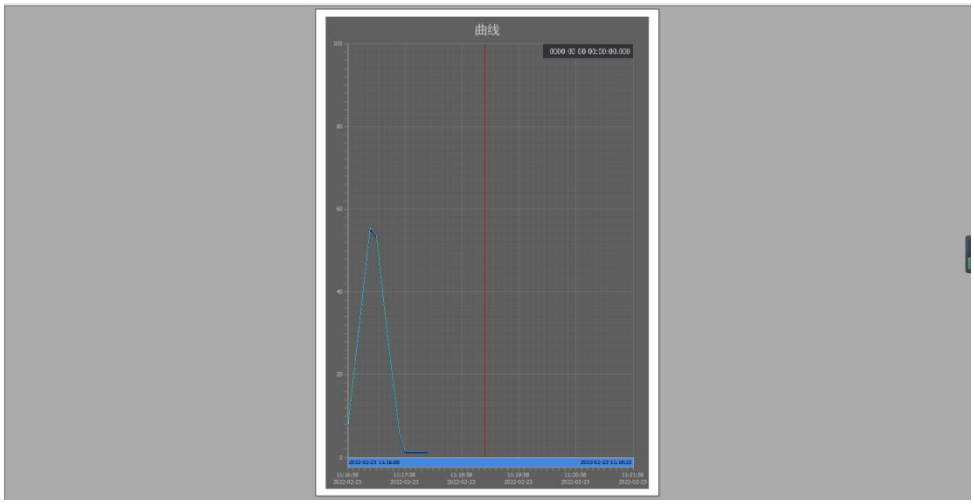
For curve setting, select the curve name first, then name each channel below the curve name, and then perform the operation on the curve, unit, color, whether to hide, the number of displayed decimal places, and the corresponding number of Y-axis. Selection: The selection of Y-axis can set the scale range displayed on the upper and lower sides of the Y-axis by yourself. For the values of different scale ranges, you can select the corresponding Y-axis. For example, when we test the value of AC voltage, we can choose the Y3 axis whose range corresponds to 0 to 300V. For the maximum temperature we measure that can reach 1200 °C, we can choose the correct range is 0 to 1200 °C. The Y1 axis, move the mouse Right-click on the corresponding Y-axis to select the name, color, and upper and lower ranges of this Y-axis. The parameter setting method of the X axis is basically the same as the setting method of the Y axis. You can move the mouse to the X axis and right-click to set the color, time and time span of the tick mark. The time span is in seconds as shown in the figure below.





7.4.3 Historical Data Print

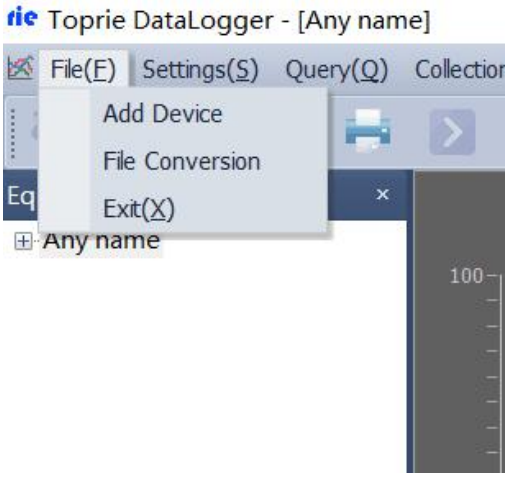
Print historical data method: In the interface, you can choose two modes: print curve and print list. First select the data to be exported, click the "Open History Curve" button, select the curve print option, enter the print preview interface, select the curve and click Print.



Printing preview

7.5 System Exit

1. Click the "X" in the upper right corner of the system.
2. Click the "File (F)" option in the main menu bar of the system, and select "Exit (×)" as shown in the figure below



8. Fault Analytical & Elimination

The data recorder adopts advanced production technology and testing methods, and each one has undergone strict testing before leaving the factory and has good reliability. During use, common faults are generally caused by improper operation or parameter settings. If you find a fault that cannot be handled, please record the fault phenomenon and notify the local agent or distributor in time, or contact the manufacturer or distributor directly.

The following are common failures of data loggers in applications

Fault problem	Analysis	Dealing methods
The instrument is powered on and does not work, no display.	Wrong power cord wiring or bad switch	Check the power connector and switch
Channel display does not match the actual	1. The signal setting in the parameter setting is incorrect 2. Signal wiring error 3. The range type setting is not equal	1. Check the parameter settings 2. Use the meter to measure whether the signal line has signal output or not 3. Re-power on, if the phenomenon still exists, please contact the manufacturer
At room temperature, the temperature test is not allowed to vary greatly	The sensor type setting may be wrong	Check whether the type setting is correct and determine what type of access sensor is
Alarm output is abnormal	1. The alarm limit is set incorrectly. 2. Alarm contacts are shared by other channels.	1. Reset the limit value 2. Cancel other alarm points
All temperature probes are at normal air temperature, the temperature of the first channel is inconsistent with the temperature of all other channels, and the temperature of other channels is close to "0.00"	In the "System Parameters" setting of the instrument, there is a "Temperature Rise" button set to "ON"	Just set it to "OFF"
Channel measurement value display: --	Test module not plugged in properly or not plugged in	Module not working or contact manufacturer
Channel measurement value display: 1999.99	Temperature sensor open circuit or poor contact	Replace or contact the manufacturer