

***USER MANUAL***  
***DISPLAY & CONTROL INSTRUMENTS***

***HOLYKELL.COM***

**Intelligent Wireless Data Acquisition Recorder User Manual**

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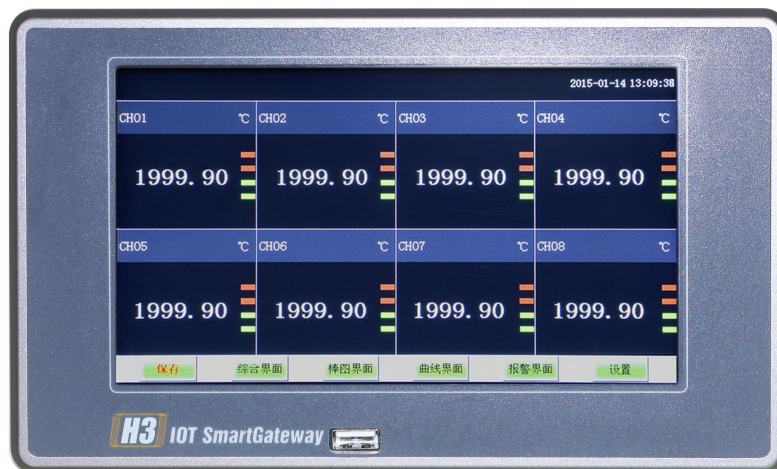
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# Intelligent Wireless Data Acquisition Recorder User Manual

## 1. Overview



The new H3 IoT host has been widely used in all walks of life with its rich display screen, flexible operation mode, powerful recording, calculation, control and management functions, and ultra-thin and beautiful aluminum alloy body. This product absorbs the advantages of various domestic and foreign data loggers and adds new functions such as remote monitoring of the Internet of things, wireless ultra-long-distance communication in the local area network, and the application of the latest display technology, microelectronics technology, data storage and communication technology. It is a product with complete functions, convenient operation, accurate and reliable, and cost-effective features.

This product is equipped with a color LCD touch screen display. It can receive various types of current, voltage and resistance signals, and realize the display, recording, over-limit monitoring, report generation, data communication, signal transmission and flow accumulation of temperature, humidity, pressure, liquid level, flow, composition, and physical quantities such as force, torque, displacement. And it can also provide data communication with PLC, which greatly improves the applicable scenarios of the product.

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

- ▶ It can be equipped with different types of intelligent data acquisition control boards, which can be selected according to application requirements.
- ▶ With built-in large-capacity flash, you can quickly dump the data in the flash to the computer through U disk. The capacity of the built-in flash is 70M or more, up to 2G bytes,

and the 8 channels can record 720 hours if it is recorded once per 10 seconds. And the data of all the channels can be recorded in 1 second at the fastest.

- ▶ Digital display interface, bar graph display screen, real-time (historical) curve screen, alarm data page (and provide interface and function customization services).
- ▶ Historical curve reading cursor function.
- ▶ Basic error of measurement and display:  $\pm 0.2\%$  F.S
- ▶ Multi-point alarm function can be parameterized.

## 2. Features

This product displays a large amount of information, a friendly interface, and simple operation. The followings are the main features:

- ▶ No need recording using pens and paper, very little daily maintenance needed, and low operating cost;
- ▶ Adopt high-brightness touch color TFT LCD screen, CCFL backlight and clear picture;
- ▶ Using arm microprocessor, it can realize simultaneous multi-channel (the instrument host supports up to 64 and more channels) signal acquisition, recording, display and alarm;
- ▶ Use 70MB large-capacity flash memory chip to store historical data, and data will never be lost after power failure;
- ▶ Fully isolated universal input, multiple signals can be input simultaneously, no need to replace the module, just set it directly on the instrument;
- ▶ The numerical range for displaying engineering quantity data is wider, displaying 6-digit numerical values: -999,99~1999.99;
- ▶ It can set parameters, show engineering tag number, engineering unit and has function of flow accumulation, etc.;
- ▶ With red alarm display, it also indicates the lower/ultimate lower/upper/ultimate upper limit of alarm for each channel; 8 relay alarm outputs (customized products);
- ▶ The display accuracy is high, and the basic error is  $\pm 0.2\%$  F.S;
- ▶ Built-in GB2312 Chinese character library, using Quanpin input method;
- ▶ Support external micro printing, built-in printer, manual data and curve printing, automatic timing data printing to meet the users' need of on-site printing (customized products);
- ▶ Equipped with a standard USB2.0 port. Operate using mouse and keyboard, and the output of historical data is quick and convenient.
- ▶ Standard serial communication interface, RS485 and RS232C with optocoupler isolation and Ethernet (10.1 inch large screen type);
- ▶ Support standard ModBus RTU communication protocol (optional function), in addition to supporting the company's data management software, it also supports other configuration software;
- ▶ Provide transmitter with DC24V isolated power distribution;
- ▶ Various types of wireless modules optional used as gateways or RTUs, such as LoRa module or LoRa+4G module optional.
- ▶ Passing EMC III, normal work in harsh environments is guaranteed.

### 3. Technical Index

#### 3.1 Display

7 inch color TFT touch LCD

Four basic interfaces including digital display interface, bar graph interface, real-time (historical) curve interface, and alarm display interface. (Interface and functions can be customized)

The basic error is less than  $\pm 0.2\%$  F.S, and the digital display range is -999.99~1999.99

Measurement resolution: 1/120000, 24-bit AD converter

Real-time curve recording interval is 1 to 9999 seconds, corresponding to the entire screen curve time 30 seconds to 300 minutes

Historical curve viewing interval can be set continuously from 1 to 9999 seconds

#### 3.2 Input Signal

The input signal includes DC, DC voltage, thermal resistance, thermocouple and remote pressure gauge, which can be selected by key or touch screen. Isolated universal input does not need a jumper.

DC: (4~20) mA, (0~10) mA, (0~20) mA;

DC voltage: (0~5)V, (0~10)V, (-20~+20)mV;

Thermal resistance: Pt100, Cu50, Pt1000;

Thermocouple: K, S, R, B, N, E, J, T, WRE3/25, WRE5/26;

Other input signals or graduation numbers should be indicated when ordering.

#### 3.3 Alarm Output

Relay output: contact rating AC 220V, 3A, resistive load;

Output can be set for 16 points according to the value of each alarm point of the channel.

#### 3.4 External Power Supply

DC 24V power supply: used to power the transmitter, the maximum load capacity is  $\leq 200$ mA.

#### 3.5 Communication Interface (Optional Function)

Standard RS232, RS485, Ethernet communication.

Optional GPRS wireless communication, local area wireless communication (visual distance up to 4 km)

Communication rate 9600, 19200, 57600, 115200, selected by setting.

Standard local host computer software, free use of the Internet of Things remote monitoring cloud platform.

The default communication protocol with the host computer is MODBUS-RTU protocol, and the network port is MODBUS-TCP protocol.

#### 3.6 Power Condition

DC 24V power supply instrument:  $24V \pm 10\%$ , power consumption is less than 20VA.

**Note: The actual power consumption is related to the specific functions of the instrument.**

#### 3.7 Environment and Others

Operating temperature range: -10℃~50℃

Storage temperature range: -20℃~70℃

Working humidity range: less than 85%R.H, no condensation

Weight: 2.8Kg max

### 3.8 Recording Time

The length of the recording time is related to the available capacity of the FLASH memory (available capacity = total capacity-used capacity (internal program is generally 10M)), recording interval and the number of input points. In order to facilitate the user to expand the channel in the future, the number of recording channel points is set uniformly as 8. The calculation formula is as follows:

$$\text{The days of recording} = \frac{\text{Available memory } 70 \times 1024 \times 492 \times \text{recording interval}}{\text{The number of channels} \times 24 \times 3600}$$

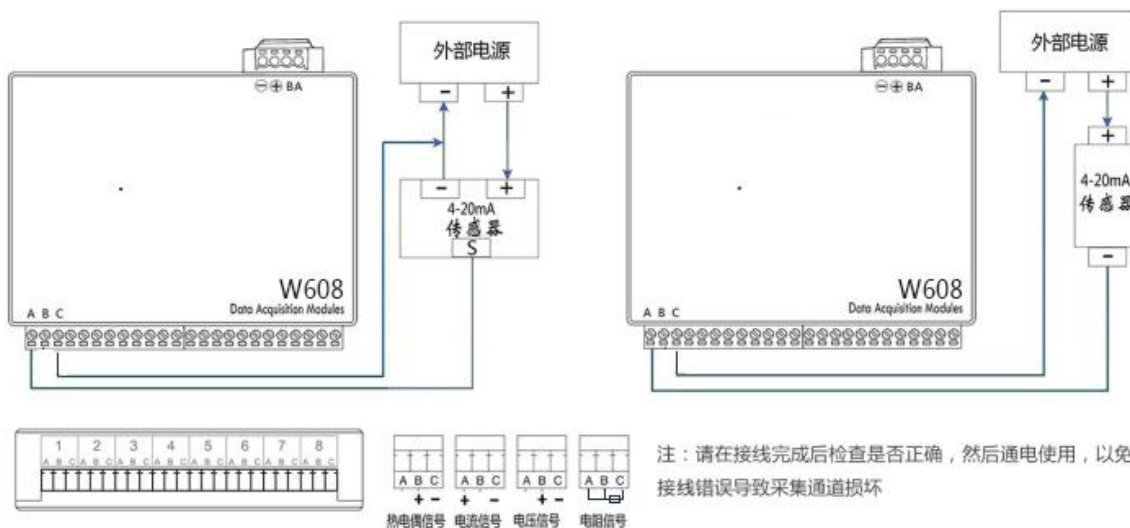
## 4. Installation, Wiring and External Structure



- ① 以太网通讯口
- ② 24V供电口/COM1 (RS232) 通讯口
- ③ COM2 (RS485) /COM3(RS485)通讯口
- ④ 传感器接线端

与三线制4-20ma传感器连接

与两线制4-20ma传感器连接



## 5. Instrument Operation and Parameter Setting

This touch-type data logger has multiple operation display screens and parameter setting



interfaces, with clear display, large amount of information and convenient parameter setting. Users can conveniently operate and use the meter without professional training.

After the instrument is connected to the power supply, the system boot interface is displayed. After starting the system, enter the real-time numerical display interface. The following respectively introduces the keyboard operation of the instrument, display interfaces of various operations and each parameter setting interface.

Click Settings to choose to enter each parameter setting interface. **(There is no password set after the new machine leaves the factory, just leave it blank and click OK to enter)** directly after confirming the key to enter the parameter setting.

### **System Parameter Setting**

The system parameter setting is mainly used to set the system date, system time, storage interval time, local IP address, SMS alarm phone number setting, as described in 5.10 below.

### **Instrument Parameter Settings**

The channel parameter setting interface is used to set the signal type, station number, engineering unit, upper and lower limits of range, filter constant, flow parameter setting (small signal removal, square root), accumulation, lower/ultimate lower/upper/ultimate upper limit of alarm for each channel, etc.

To modify the channel number and measurement unit, click parameter setting.

### **Signal Type**

This instrument supports a variety of signal types, among which analog signals support universal input. To change different signal types, just change the wiring of the terminals and set the corresponding signal type here. When setting the signal type, please note that it must be consistent with the signal of the primary instrument or detection element.

### **Square Root and Small Signal Removal**

Square root and small signal removal are used together, and the range of small signal removal can be set to 0~25.0%. Its function is that when the measured value is small, the measurement error is large, especially below 1%, the accuracy will be greatly reduced, and it is generally treated as zeroing in engineering.

### **Transmission Output**

There are three parameters for the transmission output: output channel, transmission output upper limit, transmission output lower limit. The output signal type has been set at the factory, these parameters are placed in the channel parameter setting screen, the output channel number ranges from 1~8, with instructions attached.

### **About the Calculation Function of the Channel (Virtual Calculation Channel)**

The channels of the recorder are divided into physical channels and virtual computing channels. The physical channels cannot be set or changed after leaving the factory, but computing channels can be added. For example, the measurement values between physical channels can be obtained by simple calculations. The calculation methods include addition, subtraction, multiply and divide. The channel involved in the calculation can only be a physical channel.

**5.1 Run Interface**

The screen displayed during the operation of the data logger is the running screen, including numerical display interface, bar graph screen, curve interface; alarm interface; and screens such as setting button, parameter setting and system setting. The display interface, bar graph screen, and real-time (historical) curve screen are commonly used basic screens. A comprehensive interface is added to the 8-channel screen. The time in the upper right corner of the screen displays the current date and time.

**5.2 Startup Interface**

The screen shows clicking on the screen to enter the startup properties window, then we do not need to click on the screen, let the screen directly enter the display startup screen.

**5.3 Display interface**

The display interface can know more comprehensively the current situation, including channel name, measurement value, engineering quantity unit, alarm indication, alarm output status, etc.

**5.4 Digital Display Interface**

The digital display screen is divided into digital display interfaces of 64, 48, 40, 32, 24, 16 and 8-channel (the 8-channel has a comprehensive display screen). Users can enter the parameter setting by pressing the setting button to select the number of channels so as to achieve the display interface showing the number of desired channel. The following figure shows the 16-channel display interface.



The following figure shows the specific content of a single channel on the display screen, which contains four parts: channel name, unit, measured value and alarm flag. From top to bottom, the alarm signs are ultimate upper limit alarm, upper limit alarm, lower limit alarm, and ultimate lower limit alarm. When the value is normal, the alarm sign is green. When the alarm value is exceeded, the corresponding alarm sign will change from green to red (or: when alarm occurs, the corresponding alarm sign will change from green to red). The alarm value can be set in the parameter.





Click in the area in the box to pop up a small window displaying the basic information of the channel, as shown in the figure above.

Function introduction of the buttons under the display screen:

There are six buttons at the bottom of the interface (save, display, bar graph, curve interface, alarm interface, settings)

**Save:** During parameter setting, the currently set parameters are the initially set parameters and written to the disk to prevent loss of the set parameters if sudden power failure occurs during parameter setting. (The current product has been updated with the instrument system, using the method of automatically saving parameters, no need to use the save button)

**Curve interface:** switch button, press this button to switch to the curve interface, which is divided into real-time and historical display interfaces.

**Alarm interface:** press this button to switch to the alarm interface where is an alarm button at the bottom, press this button to view historical alarm data, you can select the time period to view historical alarm data.



**Settings:** through the setting button under the display interface, you can enter the parameter settings and system settings. Click settings to select parameter settings (the new instrument has no password by default, and the password is left blank and click OK)



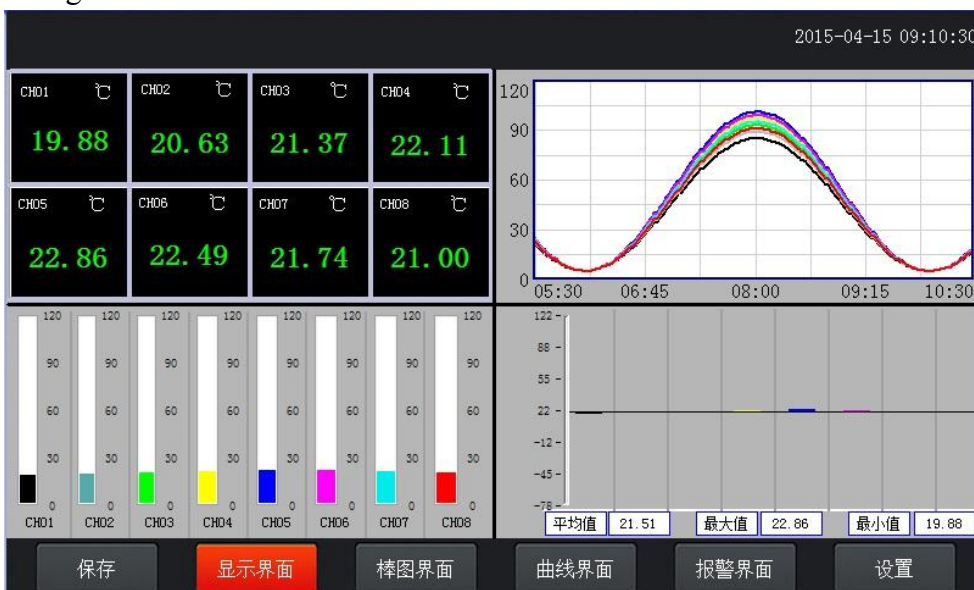
In the parameter setting interface, you can set various parameters such as displaying of the number of channels, channel name, channel number type, range, unit and other parameters. Buttons such as vacuum, accumulation, vacuum, square filter and cut are set for customized products. For setting of gas flow, water flow, etc., details are included in flow test products.

### System Setting Interface

In this interface, you can set "Settings" to enter the password, alarm switch, storage interval time, instrument system time, screen saver switch and screen saver time, network port communication IP address and other information. The telephone number is the mobile phone number used for GPRS SMS alarm for customized models. There is a record about the system version number on the right, for the confirmation of the after-sales maintenance of the system; there is also a brief help instruction about the instrument.

### 5.5 Comprehensive Interface

The comprehensive interface is only for "8-channel display interface", as shown in the figure below. The comprehensive interface integrates the digital display interface, real-time curve interface, bar graph interface and average bar graph display interface. New experience of browsing the overall situation is brought to users.



### 5.6 (Bar graph) Bar Graph Display Screen

**Bar graph interface:** press this button to switch to bar graph interface which is divided into four screens, namely "1-16 bar graph", "17-32 bar graph", "33-48 bar graph", "49-64 bar graph", which uses cycle page mode, the figure below is the 1-16 channel bar graph screen.

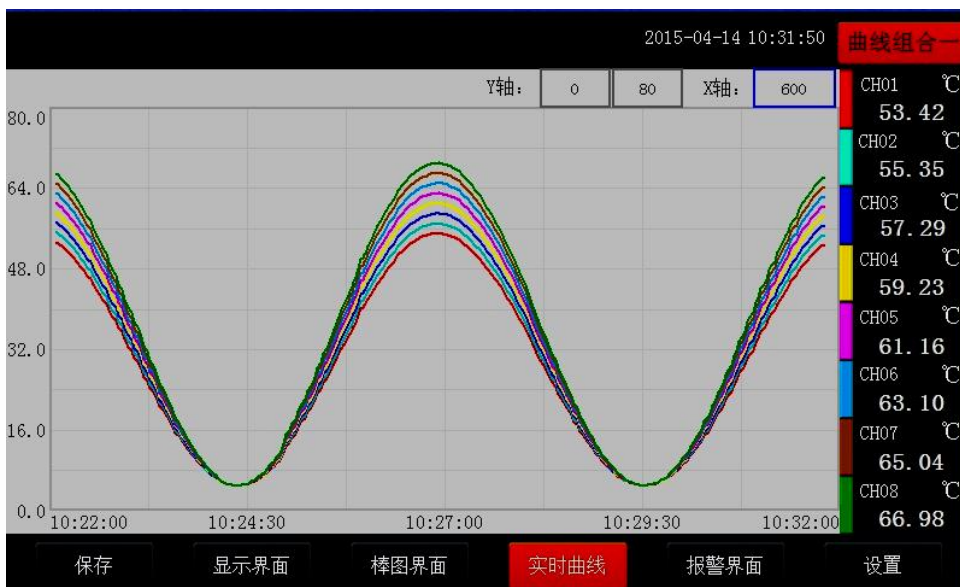


The figure above shows the specific content of the bar graph interface channel, which includes the channel name, value and percentage bar graph display. The bar graph channel also has an alarm function. When the channel value is greater than the upper limit alarm value or less than the lower limit alarm value, the percentage fill color will change to red, and the display unit is percentage.

The button function of the bar graph interface is similar to that of the display interface.

### 5.7 (Curve) Real-time Curve Screen

The current curve record only retains the display data of a single screen. According to the needs of observation, the display refresh speed can be changed by changing the Y axis and the time scale X axis. Each curve is consistent and does not affect the time interval of FLASH recording.



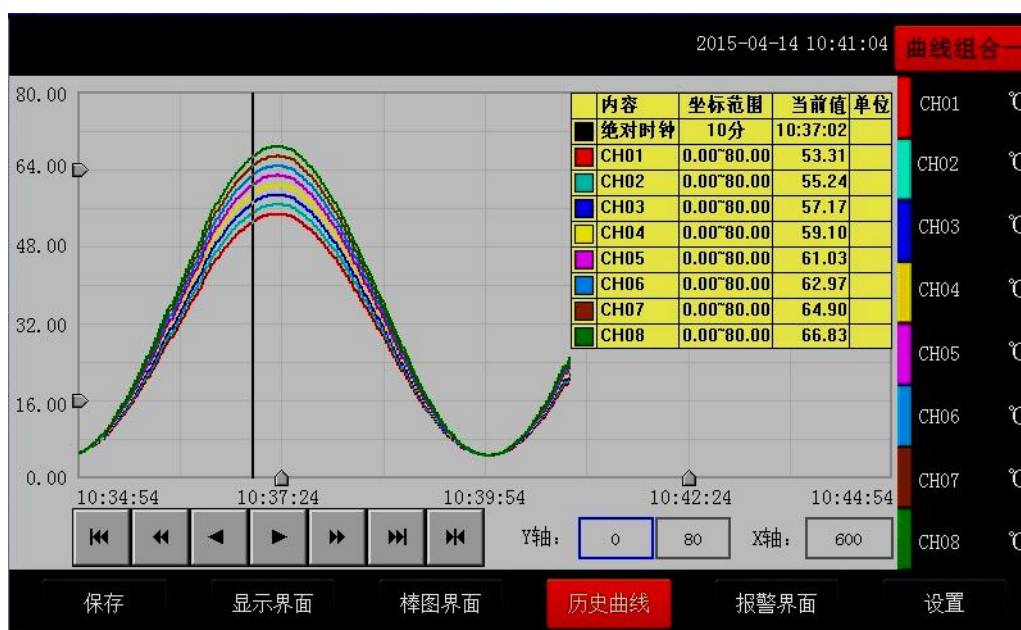
Under the real-time curve, the measured value of the current channel, channel number, station number, engineering unit, curve dot interval, and alarm status are displayed.

**Range setting:** There are labels for setting the X and Y axis ranges on the top of the real-time curve screen, and the curve graph will be changed according to the range you set.

Real-time curve interface button function: The button at the bottom is similar to the display screen and bar graph interface, and the button in the upper right corner is the switch button, through which you can view the real-time curve and elapsed curve of more channels.

### 5.8 Historical Curve Screen

FLASH recording is used for long-term data storage. Generally, the recording interval is set to be quite long; the recording interval is selected from 1 second to 9999 seconds, and the recording interval of each channel is consistent. According to the needs of the production process, reasonable setting of the FLASH recording interval and taking into account the contradiction between the recording interval and time can accurately reflect the change of process parameters. (To set the recording interval time, enter the system parameter test under setting on the display interface, as described as below)



The time scale in the recall mode cannot be changed and is determined by the recording interval stored in FLASH.

In the recall mode, the time is displayed as the time of the starting point on the right side of the curve.

The alarm status in the recall mode is the real-time alarm status instead of the recording status.

The reading cursor mode is used to accurately display the value of each point of the recall curve. The value above the cursor is the actual value of the current channel at the cursor, and the time at the upper right of the screen becomes the time at the cursor position. In cursor mode, you cannot recall forward or backward.

The functions of the buttons shown in the figure below are: scrolling one page of the curve to the left of the X axis, scrolling a half page of the curve to the left of the X axis, scrolling to the left of the X axis by a main line position, and scrolling to the right of the X axis A main dash position, scrolling a half page of the curve to the right end of the X axis, scrolling a page of the curve to the right end of the X axis and settings in turn.





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

**Note:**

1. If the recorder has been powered down, there will be no data record during the power down period, the curve will appear discontinuous during the recall, and the historical data will not be lost.
2. If the recorder changes the recording interval time during operation, there may be discontinuities or inaccurate historical data time when querying historical curves.

### 5.9 Parameter Settings Interface

The channel parameter setting interface is used to set the signal type, station number, engineering unit, upper and lower limits of range, filter constant, flow parameter setting (small signal removal, square root), accumulation, ultimate upper/lower limit of alarm, and upper/lower limit of alarm for each channel, the selection and setting of relay output contact number and etc.



**Number of channels:** the number of channels displayed on the display interface. For example, 8, 16, 24, 32, 40, 48 and 64 respectively indicate that 8, 16, 24, 32, 40, 48, and 64 channels are displayed in one interface. Set different channel numbers according to different needs.

**Channel:** namely the channel selection. Once a channel is selected, the name, type, unit, range, ultimate lower limit, lower limit, upper limit, ultimate upper limit and adjustment are all settings for the channel properties.

**Contact:** used to set the alarm output point of the lower limit or upper limit, and to trigger the channel no. of the relay module actions, which has been introduced in the manual in 4.3.3.

**Name:** The name of the channel.

**Type:** The type of channel.

**Unit:** The unit of the channel.

**Range:** The range of the channel. Setting the range is very important for the bar graph display.

**Ultimate upper limit, upper limit, lower limit, ultimate lower limit:** the four alarm values of the channel.

**Adjustment:** Correction and adjustment of the channel value to display the ideal value. By adjusting the value of k to adjust the multiple of the temperature (multiplication and division),

adjusting the value of b can adjust the positive and negative values of the value.

**Button function**

**Clear accumulation:** clear all saved data.

**Copy:** Copy the parameter settings of a certain channel.

**Paste:** Paste the copied channel parameters to the current channel.

**Data export:** switch the button and press it to enter the "data export" interface (insert the U disk of the imported data into the USB port of the instrument).



There are two buttons "Quick Export Data" and "Export Data" in the data export button. The difference between quick export historical data and export historical data:

**I . Quick data export**

**Advantages:** fast, when the data in the instrument reaches tens of thousands, it takes about 30s to export all the data. When quickly exporting data, it does not support time period selection, that is, export all historical data in the instrument.

**Disadvantages:** 1. The instrument will stop data acquisition and storage during the time period of exporting data, that is, except for the process of quickly exporting historical data, other processes are in a dormant state and will be awakened for execution after the data is exported; 2. The exported data is stored in the data folder of the U disk, and the generated data file can be viewed only by the company's special software for the upper computer.

**II . Data Output**

**Advantages:** 1. when exporting data, the instrument can still perform functions such as data acquisition and storage, that is, other processes are still executing, no need sleep processing, and at the same time, you can set a selected time period for data export. 2. The exported data is saved in the root directory of the U disk and named by time, and can be viewed through Excel (if you want to use the upper computer software to view, you cannot modify this file, otherwise the upper computer software will not recognize the file)

**Disadvantages:** The exporting data speed is slow, that is, the exporting time is quite long. If the data is up to tens of thousands, it may take more than ten minutes or longer.

The above is the difference between the two, users need to operate according to their own needs.

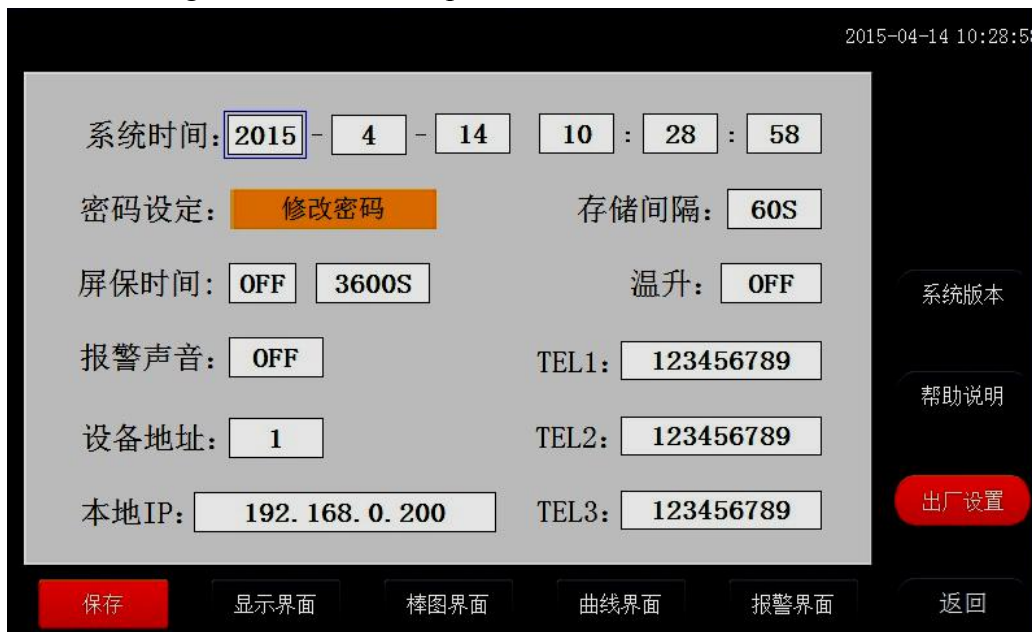
**language:** The language selection switch button can switch the display between Chinese and



English.

### 5.10 System Parameter Settings Interface

System parameter settings include: date, record interval, password setting, network port communication IP setting, buzzer alarm, temperature rise, screen saver, device address.



**Date:** Set the date and time of the current system.

**Recording interval:** The interval for saving data, setting the recording interval has a direct impact on the exported data density.

**Password setting:** Click to enter "User Manager", you can modify user password, adding user, deleting user, etc.

**Buzzer alarm:** Click to switch the buzzer alarm function.

**Screen saver setting:** Set the on and off status of the screen saver. When the screen saver is on, the time of the screen saver can be set. After the set time, the display of the instrument will not light up and the power saving state starts.

**Temperature rise:** used to measure the temperature rise of electrical switch contact devices. When measuring the temperature rise, you can select ON. For normal temperature measurement, it is OFF state. When the ON state is selected, it calculates by subtracting the temperature value of the first channel from that of the second one to the last one, the temperature value of the other channels is the temperature rise from that of the first channel. At this time, the temperature probe of the first channel should be placed in the air.

**Ethernet port communication function setting (IP setting is only applicable to 10-inch screen recorder, 7-inch screen type needs to be customized):**

10-inch screen recorder network port communication IP settings: check the router manual, the IP addresses of different routers are different, some are 192.168.1.1, some are 192.168.0.1; take 192.168.1.1 as an example: the IP address is set to: 192.168.1.\*, \* can be from 2 to 254, and cannot set the used IP address in the LAN. (This Ethernet communication function is only applicable to recorders with 10-inch display)

The IP settings in the software must be consistent with those in the instrument, and the target port is set to 3000.

**SMS Alarm Settings:**

This function is set for the instrument with customized SMS alarm function. It can send SMS with the assistance of GPRS SMS sending module. Just enter the SMS phone number that needs to be received.

**5.11 Alarm Interface**

The alarm interface includes a browse table and a scroll bar to display alarm information. You can query the alarm data of any time by browsing the table, and the scroll bar only displays the current alarm information. You can enter the small window of "Set Time Range" by browsing the "Settings" button in the lower right corner of the table to set the time for alarm information.

The screenshot shows a software interface for alarm management. At the top right, the date and time are displayed as '2015-04-14 11:08:24'. Below this is a table with four columns: '序号' (Serial Number), '开始时间' (Start Time), '结束时间' (End Time), and '报警信息' (Alarm Information). The table contains 9 rows of data, all with a start time of '2015-04-14 11:08:17' and alarm messages ranging from '通道16高于上限' (Channel 16 high limit) to '通道08高于上限' (Channel 08 high limit). A '设置' (Settings) button is located at the bottom right of the table area. Below the table, a status bar shows '通道01高于上限 通道02高于上限 通道03高于上限 通'. At the very bottom, there is a navigation bar with buttons for '保留' (Keep), '显示界面' (Display Interface), '棒图界面' (Bar Chart Interface), '曲线界面' (Curve Interface), '报警界面' (Alarm Interface - highlighted in red), and '设置' (Settings).

序号	开始时间	结束时间	报警信息
1	2015-04-14 11:08:17		通道16高于上限
2	2015-04-14 11:08:17		通道15高于上限
3	2015-04-14 11:08:17		通道14高于上限
4	2015-04-14 11:08:17		通道13高于上限
5	2015-04-14 11:08:17		通道12高于上限
6	2015-04-14 11:08:17		通道11高于上限
7	2015-04-14 11:08:17		通道10高于上限
8	2015-04-14 11:08:17		通道09高于上限
9	2015-04-14 11:08:17		通道08高于上限

**6. Communication Setting and Communication Protocol**

Computer reads the measured value and alarm status of each channel through the communication port and reads all the parameters of the instrument and sets the parameters.

This series of data recorders provide users with two standard interfaces RS-232 and RS-485 for communication with the upper computer. RS-232 is suitable for point-to-point short-distance communication, mainly used for communication between instruments and portable computers; RS-485 communication is suitable for long-distance point-to-multipoint communication, mainly used when multiple networked instruments are communicating with a computer. The specific communication method to be selected is determined by the user according to the needs and specific circumstances. This instrument uses ASC II and MODBUS communication protocol. And provide connection with various industrial control software such as parameter setting software.

**6.1 Overview**

- ▶ RS-232 mode allows only one recorder to be connected to a host computer. This communication method is suitable for users who use portable computers to randomly read data from the recorder; it can also be connected to a wireless data transmission station for remote wireless transmission

or connected to a serial micro printer to print data and curves in the recorder.

- ▶ RS-485 mode allows one host computer to connect multiple recorders at the same time. This kind of communication is suitable for users who use the terminal to form a network with this series of instruments to receive data from the recorder in real time and connect to various control systems.

### 6.2 RS-232 Communication Method

- ▶ RS-232C communication interface, users only need to connect one end of the equipped RS-232 three-core communication line to RS-232C interface, and the other end connected to the serial port of the portable computer (or PDA) to realize RS-232 communication connection.
- ▶ In the recorder system parameter settings, select the communication address and baud rate, set correspondingly in the computer management software, and then RS-232 communication can be carried out.
- ▶ The wiring with the computer is shown in the figure below:

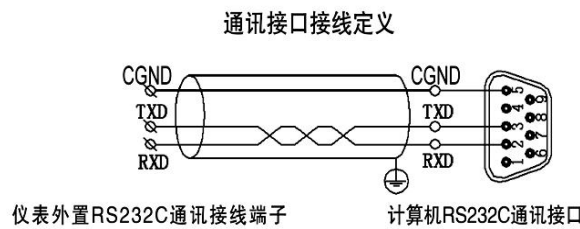
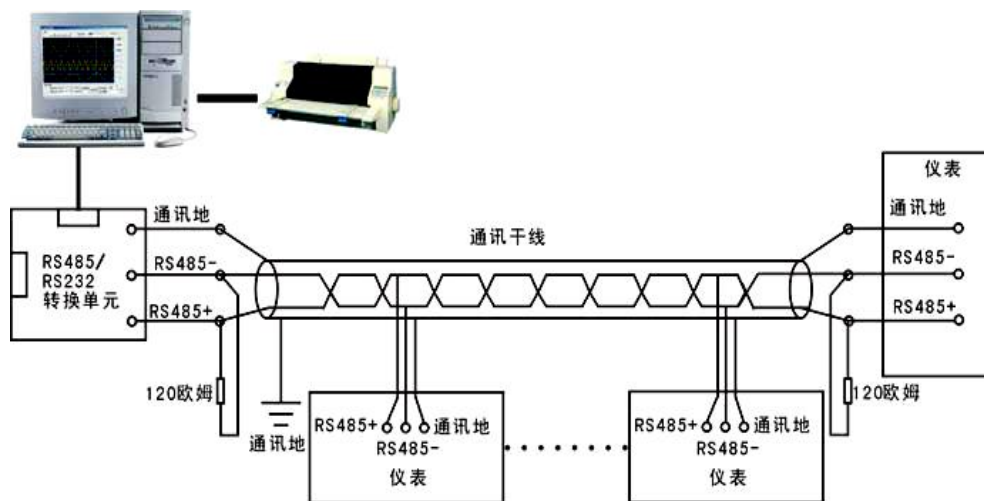


Figure RS-232 Communication Wiring Method (cross connection of 2 and 3 pins inside the instrument)

### 6.3 RS-485 Communication Method

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



The connection method is shown in the figure:

- ▶ In the recorder system parameter settings, select the communication address and baud rate (fixed to 9600).
- ▶ The shielding layer of the dual-core shielded wire is used as the communication ground wire, and it must not be connected to the equipment protective ground. When the transmission distance is long, the two ends of the transmission trunk line need to add a 120Ω terminal resistance respectively, and connect them between the RS-485 communication line "+" and "-".
- ▶ When multiple recorders are connected to a computer, the network topology is a bus type, and each recorder is connected to the main line through a branch line. It should be noted that the terminal resistance should be connected to both ends of the communication trunk, and the transmission line after the branch should be as short as possible to reduce interference.
- ▶ The relay module can be selected when the communication distance is long.

**6.4 Communication Test**

After connecting the computer and the recorder, check whether the baud rate and device address of the host and the recorder match, "Serial Debug Assistant" sends a command to the recorder to see if the recorder responds.

**6.5 Communication Interface**

RS-232/RS-485, Ethernet interface.

**6.6 Modbus RTU**

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

ModbusRTU communication command:

	Function code	Function	Sent Frame	Received Frame
1	0x03	Read the data of one register or more	Device address: 0xXX Function code: 0x03 Starting address High: 0xXX Starting address Low: 0xXX Number of registers High: 0xXX Number of registers Low: 0xXX CRC Low: 0xXX CRC High: 0xXX For example, send: 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 Low: 0xXX CRC High: 0xXX Reply: 01 03 10 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 E4 59
2	0x06	Write the data of single register		
3	0x10	Write the data of multiple registers		
4	0x11	Read device information		

**6.7 Generation of CRC**

The cyclic redundancy check (CRC) field is two bytes and contains a binary 16-bit value. The

value of 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. If the two values are not equal, it is an error.

The process of generating CRC is:

- (1) Load a 16-bit register into hexadecimal FFFF (all 1). Call it 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 1 bit to the right (towards the LSB), 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 the polynomial value 0xA001 (1010 0000 0000 0001) to the CRC register.
- (5) Repeat steps 3 and 4 until 8 shifts are completed. When this operation is completed, the complete operation of the 8-bit byte will be completed.
- (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.

### 6.8 Modbus TCP

ModbusTCP communication command:

	Function Code	Function	Sent Frame	Received Frame
1	0x03	Read the data of one register or more	Transaction identifier High:0xXX Transaction identifier Low:0xXX Protocol High:0x00 Protocol Low:0x00 Length High:0x00 Length Low:0x06 (The length is the number of bytes in the orange part below) Device address: 0xXX Function code: 0x03 Starting address High: 0xXX Starting address Low: 0xXX Number of registers High: 0xXX Number of registers Low: 0xXX CRC Low: 0xXX CRC High: 0xXX For example, send: 00 01 00 00 00 06 01 03 00 00 00 08 42 E9	Transaction identifier High:0xXX Transaction identifier Low:0xXX Protocol High:0x00 Protocol Low:0x00 Length High:0xXX Length Low:0xXX ( The length is the number of bytes in the orange part below ) Device address: 0xXX Function code: 0x03 Data Length n: 0xXX Data 1: 0xXXXX ..... Data n: 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 6D AB
2	0x06	Write the data of single register		
3	0x10	Write the data of multiple registers		
4	0x11	Read device information		





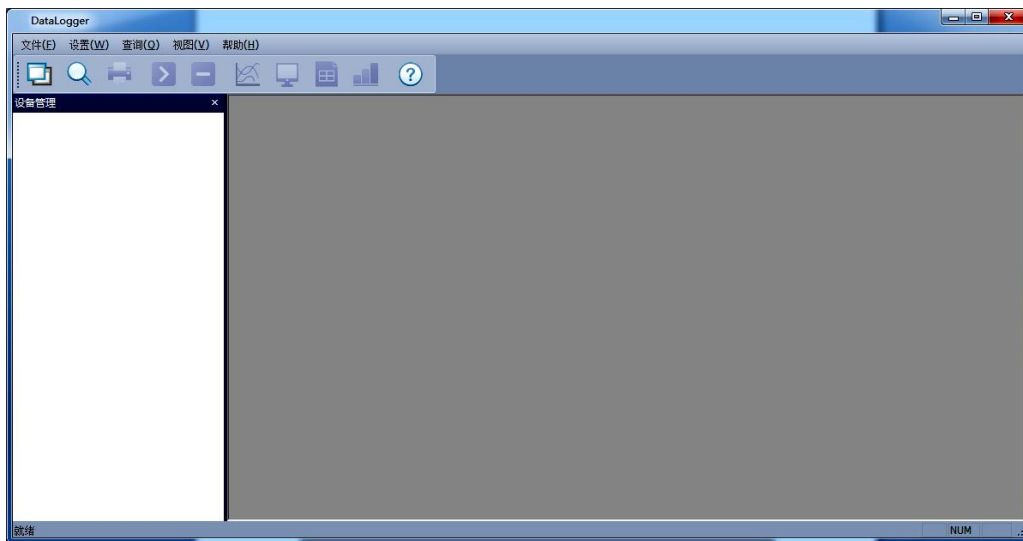


Figure 2-2 DataLogger Main Window

## 7.2.2 System Interface Introduction

1. System name display area: **DataLogger** displays in the upper left corner of the system.
2. Menu bar contains 5 options: "File (F)", "Settings", "Query", "View (V)" and "Help (H)".
  - 2.1 "File (F)" includes 3 operations, including "Add Device", "File Conversion" and "Log out (X)";
  - 2.2 "Settings" are "Alarm Settings".
  - 2.3 "Query", to query historical data;
  - 2.4 "View (V)" sets the display of "Device Management", "Toolbar" and "Status Bar" of the system;
  - 2.5 "Help (H)" provides users with system version information.
3. Toolbar contains 10 options, device management, query history, printing 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, historical data, alarm record query and other display areas.

## 7.2.3 Establish Device and Communication Settings

### 7.2.3.1 Create Device

Click the right mouse button in the "Device Management" area and select "Add Device", a new device dialog box pops up as shown in Figure 2-3. The device name can be self-named, and the device address is that of the lower computer (can be queried in the lower computer system setting interface) and select the corresponding channel number and starting channel according to the needs (the default starting channel is 1). When the number of channels is more than 64 or the channels need to be divided into different categories, various channels can be connected with different devices. For example, the first 8 channels measure the temperature, the last 8 channels measure the humidity, to display them in different windows, operate as following: 1) Create a new 8-channel

device, the device name—>device address is 1 —>Number of channels 8 channels —>Starting channel 1; 2) Create another device with 8 channels, the device name —>device address is 1 —>Number of channels, 8 channels —>Starting channel, 9. The above is the operation of different channels for the same instrument.

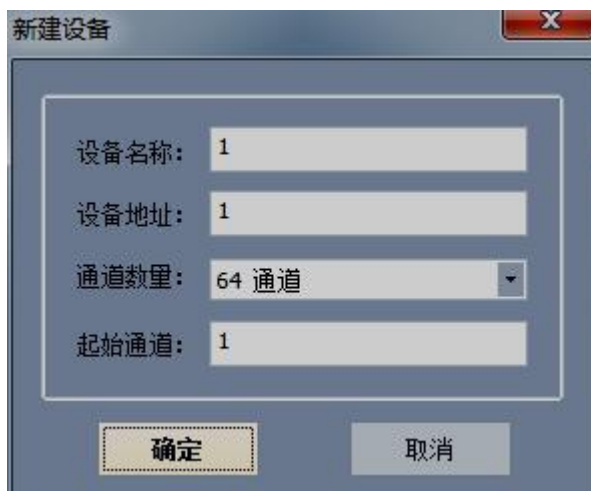


Figure 2-3 Dialogue Box of New Device Creation

This system also provides one-to-multiple communication mode, that is, it can simultaneously monitor multiple instruments. If you have multiple instruments to be monitored at the same time, you can operate as follows: 1) Set the device addresses to different values, such as 1, 2, 3, etc. in the system setting interface of the device; 2) In the system create devices of the corresponding channels respectively, and the device address is set to be consistent with that set by the instrument. If there are two instruments, the first 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, 1 —> the channel number, 16 —>Starting channel, 1; create another device: Device Name—>Device Address, 2—>Number of Channels, 32—>Starting channel, 1.

Place the mouse on the device name, right click and select device properties on device management column 1 (device name), the device properties dialog box pops up as shown in Figure 2-4. Here, you can set the communication mode according to your needs with the lower computer as network port communication or serial communication.

1) Network port communication

Connect the lower computer to the computer with a network cable, check or modify the ip address in the lower computer system setting interface (except for customer requirements, HK700 does not have a network port, that is, it does not support this communication method), and then modify the computer's local connection address to ensure that the ip of the computer and the lower computer is in the same network segment. The default port number is 3000.

2) Serial communication

In addition to the above-mentioned network port communication, the instrument also supports serial communication. The RS232 port of the computer is connected to that of the instrument. The port can be selected by clicking the drop-down box. The baud rate is 9600 by default.

The mobile phone number refers to the tel number in the interface of the lower computer system, which aims to provide users with the SMS alarm function (this function requires an additional SMS alarm module). Click OK to save the setting parameters and close the dialog box.



Figure 2-4 Device Property Setting

### 7.2.3.2 Choose How to Display Data

After setting the parameters, select "Real-time Acquisition" in the main menu bar or directly select a data display mode in the tool bar. Here, here only the digital display mode is selected for explanation. Select "Start real-time acquisition" in "Operation" in the main menu bar or click "Start acquisition" in the toolbar to start communication with the lower computer, as shown in Figure 2-5.

In the curve drawing area of the curve interface, click the right mouse button to select the parameter setting as shown in Figure 2-6, and 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 a channel. The curve properties of each channel can be set by clicking the corresponding channel in the device management area.

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 the period. Hold down the Ctr key and select the corresponding area, you can zoom in the curve along the X axis.

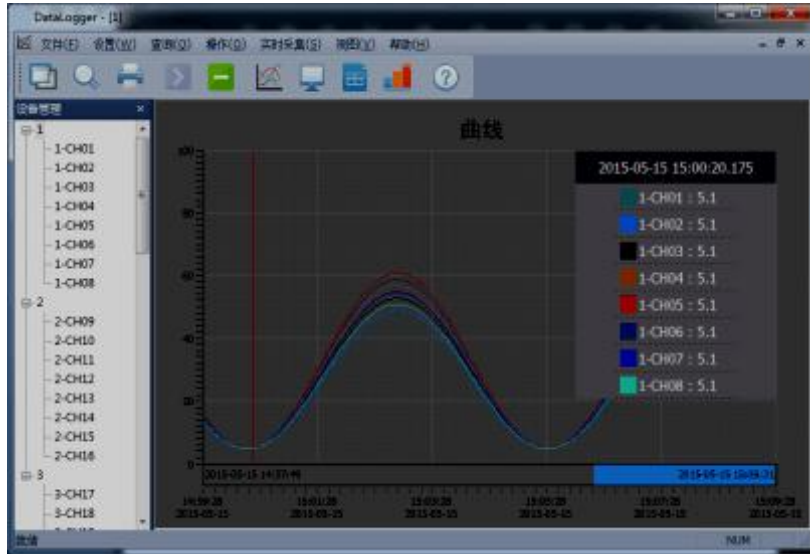


Figure 2-6 Curve Interface



Figure 2-7 Curve Parameter Setting

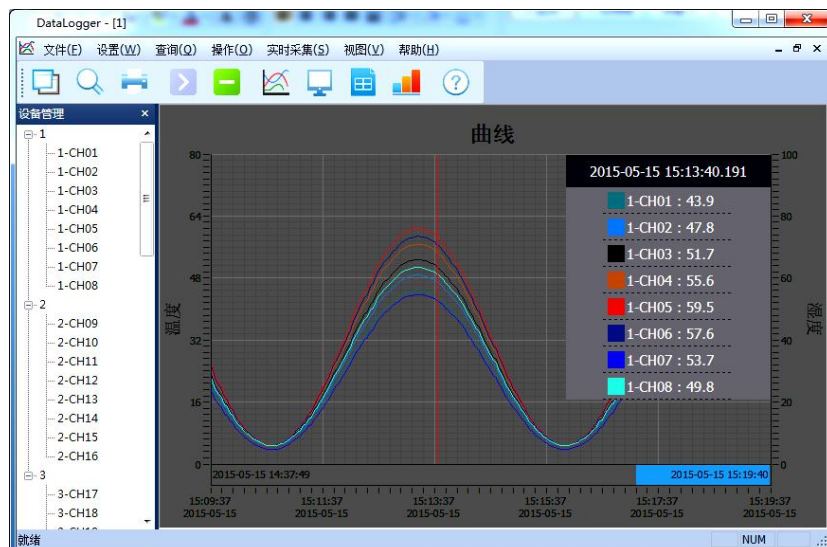


Figure 2-8 Drawing Multiple Y- axes



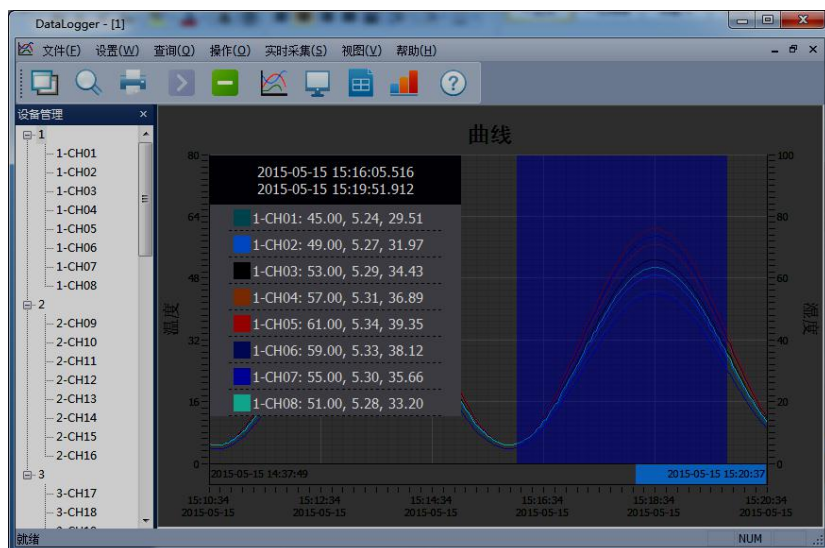


Figure 2-9 Averaging through Shortcut Key

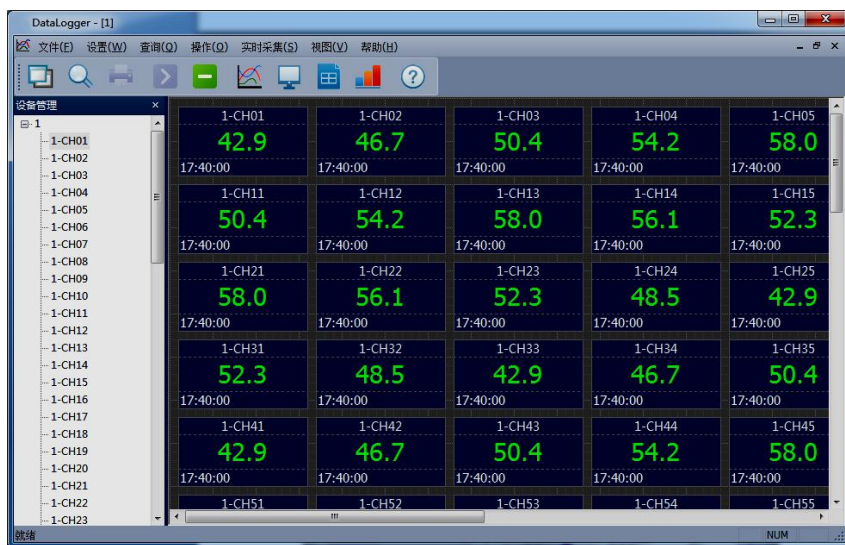


Figure 2-10 Digital Display Interface

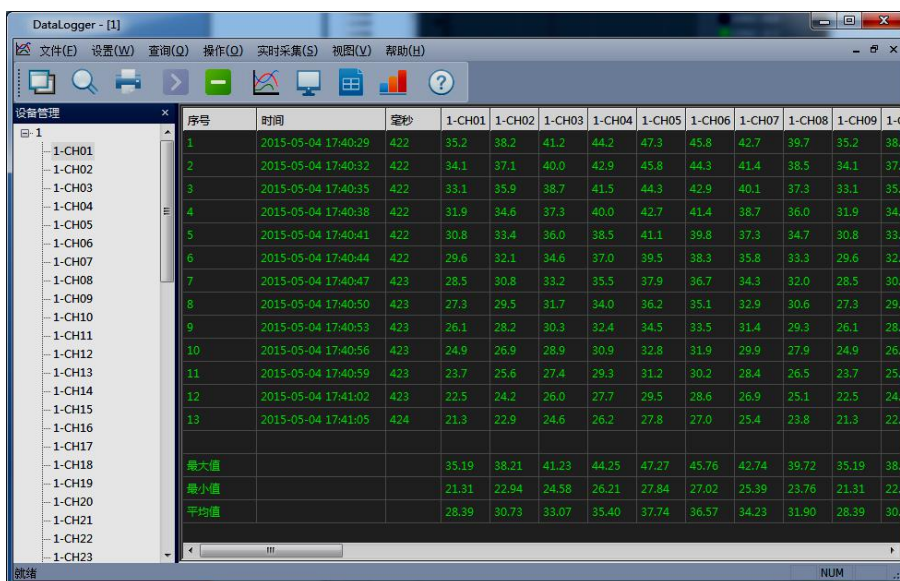


Figure 2-11 List Interface

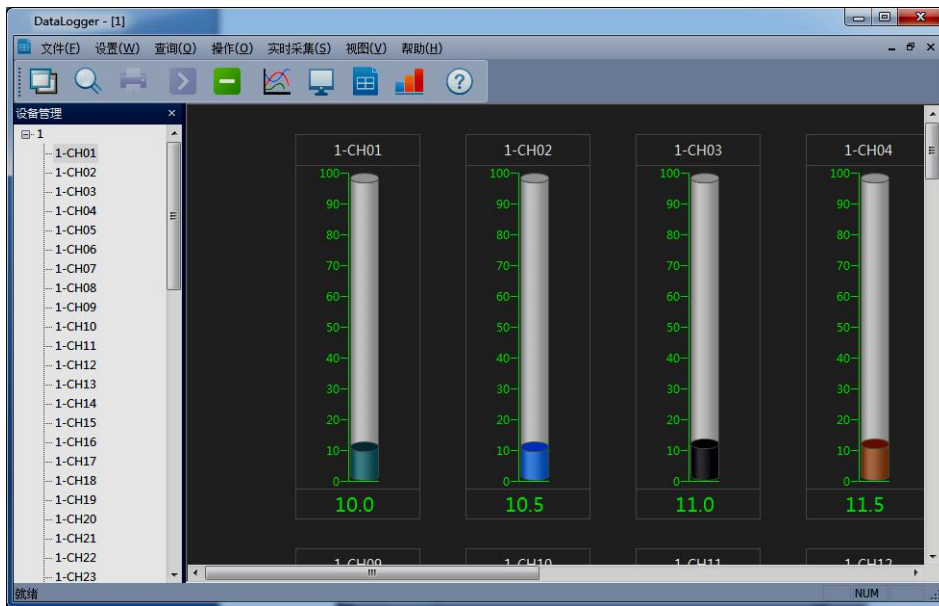


Figure 2-12 Bar Graph Interface

The parameters of each channel can be set in the device management area by selecting the corresponding channel and right-clicking the device properties. As shown in Figure 2-13 Channel Property Settings, in this window you can set the channel name, alarm prohibition, display color, channel unit, decimal places displayed, etc., and can read or write the lower limit and upper limit of the channel to the lower computer.



Figure 2-13 Channel Property Setting

Click save to return to the main interface of the system, as shown in Figure 2-16. You can see in the digital display window that the third channel data exceeds the upper limit set by the system (both data and upper limit are displayed in red), and the system sends message to the administrator's mobile phone once every 20s.



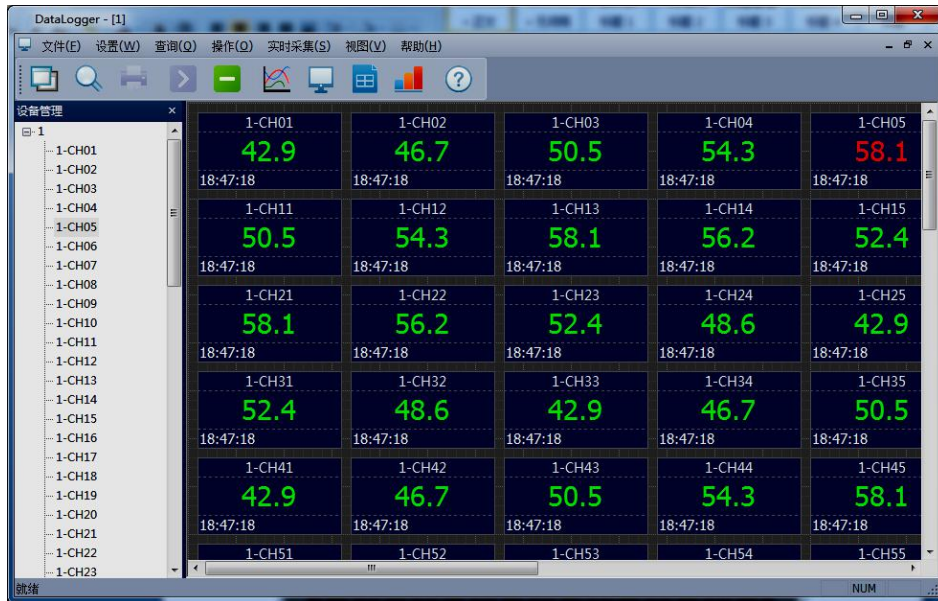


Figure 2-16 Alarm when data exceeds the upper limit

## 7.2.4 Historical Data

### 7.2.4.1 Historical Data and Alarm Record Query and Export

Click "Historical Data" in "Query" in the main menu bar, the interface shown in Figure 2-17 pops up, select the data you need in this interface, and then select the corresponding operation: open historical curve and historical list.

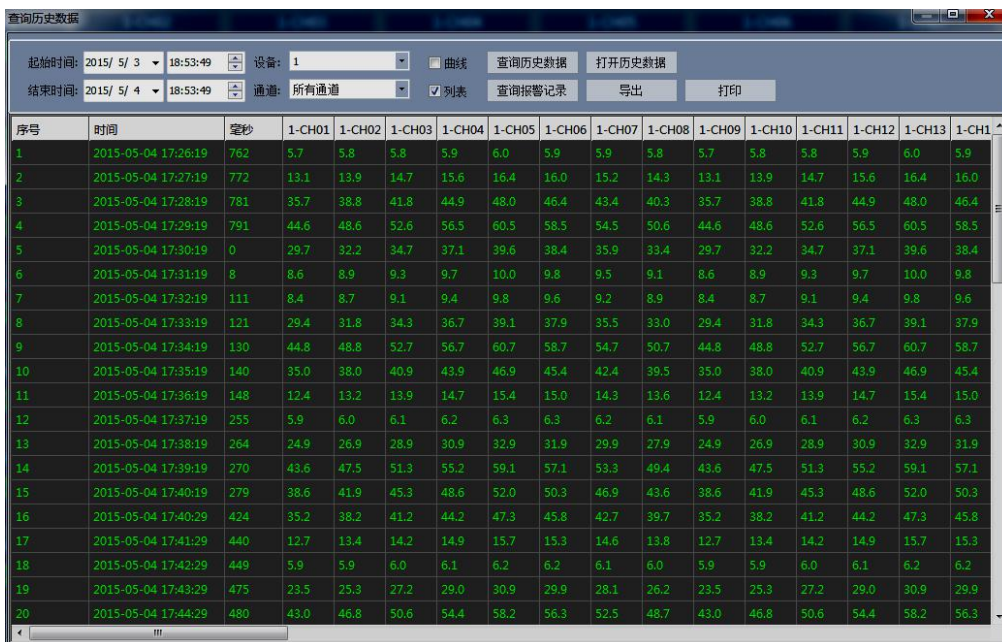


Figure 2-17 Historical Record

Click "Alarm Record" in "Query" in the main menu bar, the interface shown in Figure 2-18 pops up, and select the data you need to query in this interface.



Figure 2-18 Alarm Record

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

### 7.2.4.2 Open the Historical Data Exported by the Lower Computer

This software supports reading the data exported by the lower computer. Clicking “fast export data” in the lower computer, a "data" folder in the root directory of the U disk is generated. Click the file in the menu bar of the software and select "File Conversion", the dialog box as Figure 2-19 pops up, select the appropriate starting time and end time, select MCGS\_DATA file in the U disk, and the export route depends on your own situation, and then click Export.



Figure 2-19 File Conversion Dialogue Box

Then enter the historical data query interface in the query, click "Open historical data" to select the converted file, and click to open "Open historical data". But in the lower computer, you can directly click to export the data, no file is needed, and you can directly enter the historical data query.

### 7.2.4.3 Historical Data Printing

Historical data printing method: Go back to the interface in Figure 2-17, select the data to be exported, click "Open History Curve", select "Print", enter the interface of figure 2-20, and click Print.

打印预览

打印(P)... 下一页(N) 上一页(M) 双页(M) 放大(O) 缩小(O) 关闭(C)

1

打印时间: 2015-05-04 19:13:13

序号	MCGS_Time	MCGS_TN	通道01	通道02	通道03	通道04	通道05	通道06	通道07	通道08	通道09	通道10	通道11	通道12	通道13
1	2015-05-04 16:00:58	109	32.80	35.58	38.36	41.14	43.92	42.53	39.75	36.97	32.80	35.58	38.36	41.14	43.92
2	2015-05-04 16:01:58	366	10.66	11.23	11.80	12.36	12.93	12.65	12.08	11.51	10.66	11.23	11.80	12.36	12.93
3	2015-05-04 16:02:58	642	7.06	7.27	7.48	7.68	7.89	7.79	7.58	7.37	7.06	7.27	7.48	7.68	7.89
4	2015-05-04 16:03:58	896	26.75	28.92	31.10	33.28	35.45	34.36	32.19	30.01	26.75	28.92	31.10	33.28	35.45
5	2015-05-04 16:04:58	224	44.03	47.93	51.83	55.74	59.64	57.69	53.78	49.88	44.03	47.93	51.83	55.74	59.64
6	2015-05-04 16:05:58	494	37.64	40.90	44.16	47.43	50.69	49.06	45.80	42.53	37.64	40.90	44.16	47.43	50.69
7	2015-05-04 16:06:58	753	14.61	15.58	16.54	17.50	18.46	17.98	17.02	16.06	14.61	15.58	16.54	17.50	18.46
8	2015-05-04 16:07:58	7	5.21	5.23	5.25	5.27	5.29	5.28	5.26	5.24	5.21	5.23	5.25	5.27	5.29
9	2015-05-04 16:08:58	289	20.53	22.08	23.63	25.18	26.74	25.96	24.41	22.86	20.53	22.08	23.63	25.18	26.74
10	2015-05-04 16:09:58	539	41.55	45.20	48.86	52.51	56.17	54.34	50.68	47.03	41.55	45.20	48.86	52.51	56.17
11	2015-05-04 16:10:58	876	41.12	44.73	48.34	51.95	55.57	53.76	50.15	46.54	41.12	44.73	48.34	51.95	55.57
12	2015-05-04 16:11:58	124	20.39	21.92	23.46	25.00	26.54	25.77	24.23	22.69	20.39	21.92	23.46	25.00	26.54
13	2015-05-04 16:12:58	381	5.19	5.21	5.23	5.25	5.27	5.26	5.24	5.22	5.19	5.21	5.23	5.25	5.27
14	2015-05-04 16:13:58	644	15.79	16.86	17.94	19.02	20.10	19.56	18.48	17.40	15.79	16.86	17.94	19.02	20.10
15	2015-05-04 16:14:58	899	38.21	41.53	44.85	48.17	51.49	49.83	46.51	43.19	38.21	41.53	44.85	48.17	51.49
16	2015-05-04 16:15:58	188	43.98	47.88	51.78	55.68	59.57	57.63	53.73	49.83	43.98	47.88	51.78	55.68	59.57
17	2015-05-04 16:16:58	451	26.01	28.11	30.21	32.31	34.41	33.36	31.26	29.16	26.01	28.11	30.21	32.31	34.41
18	2015-05-04 16:17:58	721	6.51	6.66	6.81	6.96	7.11	7.04	6.89	6.74	6.51	6.66	6.81	6.96	7.11
19	2015-05-04 16:18:58	980	11.19	11.81	12.43	13.05	13.67	13.36	12.74	12.12	11.19	11.81	12.43	13.05	13.67
20	2015-05-04 16:19:58	238	32.94	35.73	38.53	41.32	44.11	42.72	39.92	37.13	32.94	35.73	38.53	41.32	44.11
21	2015-05-04 16:20:58	498	44.99	48.98	52.98	56.98	60.98	58.98	54.98	50.98	44.99	48.98	52.98	56.98	60.98
22	2015-05-04 16:21:58	815	30.97	33.57	36.17	38.77	41.36	40.07	37.47	34.87	30.97	33.57	36.17	38.77	41.36
23	2015-05-04 16:22:58	62	9.76	10.23	10.71	11.18	11.66	11.42	10.95	10.47	9.76	10.23	10.71	11.18	11.66
24	2015-05-04 16:23:58	327	7.41	7.65	7.89	8.13	8.37	8.25	8.01	7.77	7.41	7.65	7.89	8.13	8.37
25	2015-05-04 16:24:58	581	27.50	29.75	32.00	34.25	36.49	35.37	33.12	30.87	27.50	29.75	32.00	34.25	36.49
26	2015-05-04 16:25:58	848	44.54	48.49	52.44	56.40	60.35	58.37	54.42	50.47	44.54	48.49	52.44	56.40	60.35
27	2015-05-04 16:26:58	105	36.56	39.72	42.87	46.03	49.19	47.61	44.45	41.30	36.56	39.72	42.87	46.03	49.19
28	2015-05-04 16:27:58	360	13.98	14.88	15.78	16.67	17.57	17.12	16.23	15.33	13.98	14.88	15.78	16.67	17.57

Figure 2-20 Printing Preview

### 7.2.5 Log Out

Method 1: Click "X" in the upper right corner of the system

Method 2: Click "File (F)" in the main menu bar of the system, and select "Log out (X)" as shown in Figure 2-21.



Figure 2-21 Log out

## 8. Connect to IoT Platform

### GPRS data transmission platform operation steps:

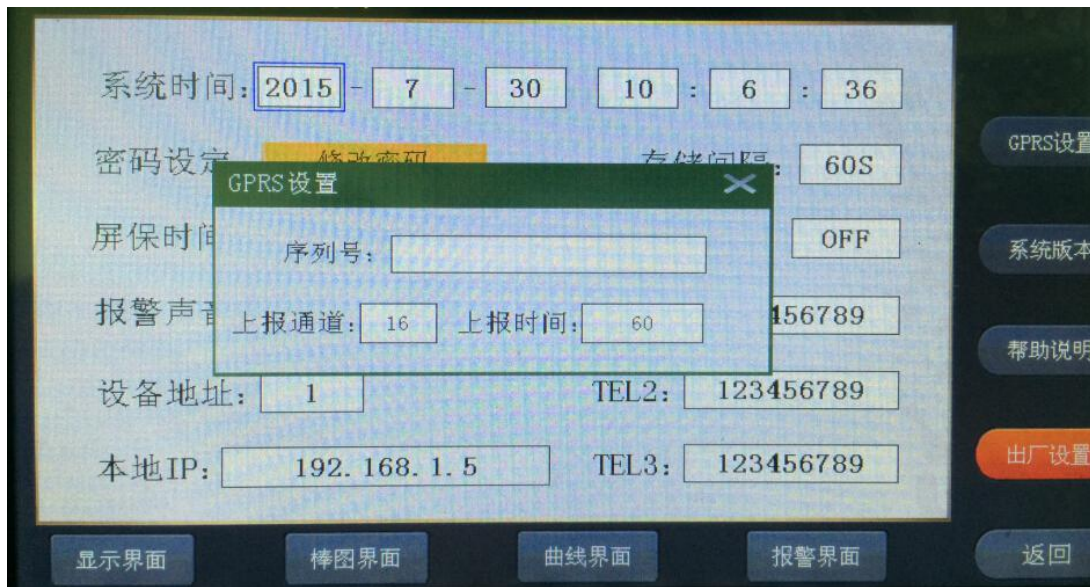
Two parts----a. View the serial number on H3 b. Platform registration and device addition;

#### Part A: View the serial number on the recorder

Plug in the power adapter, turn on the H3 monitoring host, click settings in the lower right corner, select system settings, and then select GPRS settings to view the serial number of the



machine. In order to prevent misoperation, when modifying the serial number, after opening the system settings page, click the top left corner of the screen once and then the top right corner once, and select the GPRS setting button to modify the serial number.



### Part b: Platform Registration and Device Addition

1. Log into [www.holykell-iot.com](http://www.holykell-iot.com), then register the valid personal account. Please remember your account and password.



2. After registration, click the option on the left to add a device.



Fill out the device name by yourself;

The sending cycle is the time interval for the recorder to send to the platform, the data will be automatically saved to the platform, and the EXCEL form can be exported, and the sending cycle can be selected according to your own requirements;

Whether to make it public---If you select "Yes", any account can see the device's information on the main interface of the platform. Otherwise, the device information is not disclosed.

After the parameter configuration is done, press the lower left corner to create a device.

**创建设备**

设备名称:  名称自行输入

发送周期:  自定义  推荐值

传感器可批量追加

传感器:

温度传感器1	数值型	2 (小数位)	°C	删除 MORE...
温度传感器2	数值型	2 (小数位)	°C	删除 MORE...
温度传感器3	数值型	2 (小数位)	°C	删除 MORE...
温度传感器4	数值型	2 (小数位)	°C	删除 MORE...
温度传感器5	数值型	2 (小数位)	°C	删除 MORE...
温度传感器6	数值型	2 (小数位)	°C	删除 MORE...
温度传感器7	数值型	2 (小数位)	°C	删除 MORE...
温度传感器8	数值型	2 (小数位)	°C	删除 MORE...

是否公开:  否  是 选择是否有公开

After the creation is successful, click H3 to configure the connection protocol;









The device just created will automatically generate a serial number. At this time, you can edit the serial number while configuring the protocol. Write the serial number viewed in H3 into the device information. Then click on the blank space, and the system will prompt that the serial number has been updated successfully.





After the configuration is successful, open the monitoring center of the platform. Restart the H3 recorder to view the data in real time.

H3 无线数据记录仪			序列号: 2160KI1P87FNFPTXK
 ID: 4631	<b>温度传感器1</b> 当前状态: <span style="color: green;">已连接</span> 更新时间: 2015-07-29 17:45:59	28.56 ℃	<a href="#">√ 实时曲线</a> > <a href="#">历史查询</a>
 ID: 4632	<b>温度传感器2</b> 当前状态: <span style="color: green;">已连接</span> 更新时间: 2015-07-29 17:45:59	28.36 ℃	<a href="#">√ 实时曲线</a> > <a href="#">历史查询</a>
 ID: 4633	<b>温度传感器3</b> 当前状态: <span style="color: green;">已连接</span> 更新时间: 2015-07-29 17:45:59	28.43 ℃	<a href="#">√ 实时曲线</a> > <a href="#">历史查询</a>
 ID: 4634	<b>温度传感器4</b> 当前状态: <span style="color: green;">已连接</span> 更新时间: 2015-07-29 17:45:59	28.12 ℃	<a href="#">√ 实时曲线</a> > <a href="#">历史查询</a>
 ID: 4635	<b>温度传感器5</b> 当前状态: <span style="color: green;">已连接</span> 更新时间: 2015-07-29 17:45:59	28.35 ℃	<a href="#">√ 实时曲线</a> > <a href="#">历史查询</a>
 ID: 4636	<b>温度传感器6</b> 当前状态: <span style="color: green;">已连接</span> 更新时间: 2015-07-29 17:45:59	28.51 ℃	<a href="#">√ 实时曲线</a> > <a href="#">历史查询</a>
 ID: 4637	<b>温度传感器7</b> 当前状态: <span style="color: green;">已连接</span> 更新时间: 2015-07-29 17:45:59	28.46 ℃	<a href="#">√ 实时曲线</a> > <a href="#">历史查询</a>
 ID: 4638	<b>温度传感器8</b> 当前状态: <span style="color: green;">已连接</span> 更新时间: 2015-07-29 17:45:59	28.53 ℃	<a href="#">√ 实时曲线</a> > <a href="#">历史查询</a>

## 9. Fault Analysis and Troubleshooting

The data logger adopts advanced production process and testing methods, and each one has been strictly tested before leaving the factory, with good reliability. During use, common faults are generally caused by improper operations or parameter settings. If you find a fault that cannot be handled, please record the fault and notify the local agent or dealer in time, or you can contact us directly.

The following are common failures of data loggers in applications:

Fault	Cause Analysis	Actions
The instrument does not work without display after connecting to the power	Poor contact of the power cord	Check the power connector and switch
The signal display does not match the actual	<ol style="list-style-type: none"> <li>1. Incorrect signal setting in parameter setting</li> <li>2. Signal wiring error</li> <li>3. The range type setting is not equal</li> </ol>	<ol style="list-style-type: none"> <li>1. Check parameter settings</li> <li>2. Use a meter to test if the signal line has signal output</li> <li>3. Reconnect to the power, if the phenomenon still exists, please contact the manufacturer</li> </ol>
The temperature test is not accurate, with great difference at room temperature	The sensor type setting may be wrong	Check whether the type setting is correct, and determine what type of sensor is connected
Alarm output is abnormal	<ol style="list-style-type: none"> <li>1. Alarm limit setting error</li> <li>2. The alarm point is shared by other channels</li> </ol>	<ol style="list-style-type: none"> <li>1. Reset the limit value</li> <li>2. Cancel other alarm points</li> </ol>
For all temperature probes under 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 device system parameter setting, "temperature rise" is set as "ON"	Set as "OFF"
Channel measurement value display: 00000	The test module is not inserted well or not inserted	Contact the manufacturer
Channel measurement value display: 1999.9	Open circuit or poor contact of the temperature sensor	Contact the manufacturer