

PAPERLESS RECORDER

USER MANUAL



SKU: ATO-PLR-CH48

I. Overview.....	1
II. Main Technical Parameters.....	1
III. Notes for Use and Installment.....	2
3.1 Notes for Use.....	2
3.1.1 Notes for Use of this Instrument.....	2
3.1.2 Notes for Use of the External Storage Media.....	2
3.2 Instrument Installment.....	2
3.2.1 Installment Site.....	2
3.2.2 Installment Method.....	3
IV. Instrument Function and Operation.....	5
4.1 Switching of Operating.....	5
4.2 Status Display.....	5
4.3 Real-time Curve Menu.....	6
4.4 Bar Graph Menu.....	7
4.5 Digital Display Menu.....	7
4.6 Historical Curve Menu.....	8
4.7 Alarm List Menu.....	9
4.8 File List Menu.....	10
4.9 Menu for Printing (available for instruments with printing function).....	11
4.10 Menu for Backup (available for instruments with backup function).....	13
4.11 Menu for power-down recording.....	14
4.12 Menu for Configuration.....	15
4.12.1 System Configuration.....	16
4.12.2 Recording Configuration.....	17
4.12.3 Displaying Configuration.....	18
4.12.4 Channel Configuration.....	18
4.12.4.1 Introduction of the Input Method of the "Bit Number" of the Channel Configuration.....	20
4.12.4.2 Introduction of the Input Method of the "Unit" of the Channel Configuration.....	24
4.12.5 Analog Output.....	26
4.12.6 Function List.....	27
V. Communication.....	27
VI. Instrument Accessories.....	33

I. Overview

Universal input of color paperless recorder (capable of inputting by means of configuration: standard voltage, standard current, thermocouple, thermal resistance, millivolt, etc.). It can be equipped with 18-channel alarm

output or 12-channel analog transmitting output, RS232/485 communication interface, Ethernet interface, mini-printer interface, USB interface and SD card socket; can provide sensor distribution; is equipped with powerful display function, real-time curve display, historical curve retrospection, bar graph display, alarm list display, etc. The meter is of high cost effectiveness due to its humanized design, perfect function, reliable hardware quality and exquisite craft.

II. Main Technical Parameters

Input measurement	
Input signal	<p>Current: 0~20mA, 0~10mA, 4~20mA, 0~10mA square root, 4~20mA square root</p> <p>Voltage: 0~5V, 1~5V, 0~10V, $\pm 5V$, 0~5V square root, 1~5V square root, 0~20 mV, 0~100mV, $\pm 20mV$, $\pm 100mV$</p> <p>Thermal resistance: Pt100, Cu50, Cu53, Cu100, BA1, BA2</p> <p>Linear resistance: 0~400 Ω</p> <p>Thermocouple: B, S, K, E, T, J, R, N, F2, Wre3-25, Wre5-26</p>
Output	
Output signal	<p>Analog output: 4~20mA (load resistance $\leq 380 \Omega$), 0~20mA (load resistance $\leq 380 \Omega$), 0~10mA (load resistance $\leq 760 \Omega$), 1~5V (load resistance $\geq 250K \Omega$), 0~5V (load resistance $\geq 250K \Omega$), 0~10V (load resistance $\geq 500K \Omega$)</p> <p>Alarm output: normally open relay contact output, where the contact capacity is 1 A/250 VAC (resistive load) (! Note: Please do not carry load directly in case the load exceeds the contact capacity of relay.)</p> <p>Feed output: DC24 V ± 1, load current ≤ 250 mA</p> <p>Communication output: RS485/RS232 communication interface, 1,200 ~ 57,600 bps baud rate (able to be set); standard MODBUS RTU communication protocol is adopted; the communication distance of RS-485 can be as long as 1 kilometer; the communication distance of RS-232 can be as long as 15 m; EtherNet communication interface is adopted, where the communication speed is 10 M.</p>
Comprehensive parameters	
Measurement accuracy	0.2%FS \pm 1d
Sampling period	1 s
Setting mode	The button is set in the form of panel soft touch; setting values of parameters are locked with passwords and will be saved permanently in case of outage.
Display method	<p>7-inch 800 * 480 dot-matrix widescreen TFT high brightness color graphics and LCD display;</p> <p>LED backlight; with clear pictures and wide visual angle.</p> <p>Display contents can be composed of characters, figures, conditional curves, bar graphs, etc.; through panel button, page turning, forward and backward search of historical data, time scale change of curves, etc. can be realized.</p>
Data backup	Data backup and conversion storage of USB flash disk and SD card are support, where the maximum capacity is 8 GB; FAT and FAT32 formats are supported.
Storage capacity	The capacity of the internal Flash memory is 64 M Byte.
Recording interval	Nine options including 1, 2, 4, 6, 15, 30, 60, 120 and 140 s can be selected.
Storage length (continuous record without power-off)	24 days (1 s interval) – 5825 days (240 s interval)

	$\text{Calculation formula: recorded time (day)} = \frac{64 * 1,024 * 1,024 * \text{recording interval (S)}}{\text{Channel number} * 2 * 24 * 3,600}$ <p>(! Note: For calculation of channel number, the program divides the channel number into five options, namely 4, 8, 16, 32 and 64, and the bigger figure should be regarded as the channel number for calculation in case the channel number of the instrument is between the said two options. For example: If the channel number of the instrument is 12, then 16 should be adopted in the formula.)</p>
Environment condition	<p>Environment temperature: -10 ~ 50°C; Relative humidity: 10 ~ 90% RH (without condensation of moisture); Avoidance of contact of high corrosive gas. (! Note: If the field environment is poor, special instruction should be given when ordering.)</p>
Working power supply	<p>AC 85 ~ 264 V (power supply of the switches), 50/60 Hz; DC12 ~ 36 V (power supply of the switches);</p>
power consumption	<p>≤20 W.</p>

III. Notes for Use and Installment

3.1 Notes for Use

3.1.1 Notes for Use of this Instrument

- Please do not make charged goods close to signal terminals for it may result in failure.
- Please do not bring charged items closely to signal terminals as it may result in failure.
- Please do not shock this instrument.
- If you confirm occurrence of such abnormal circumstances as smoke emission from the instrument, smelling of peculiar smell, abnormal noise sent out by the instrument, etc., please cut off the power supply immediately and contact the supplier or our company timely.
- To ensure the instrument can operate normally, please power the instrument with electric machine for 30 minutes before using it.

3.1.2 Notes for Use of the External Storage Media

- For storage medium is a kind of precision product, please take care in applications.
- Except from inserting and removing the storage media, please close the operation cover in case of operating. Contact with the dust should be reduced in terms of the storage media and the USB interfaces to get protected.
- Please take notice of static protection when using USB flash disk and SD card.
- Products from our company are recommended.
- When using the storage media under high temperature (above 40° C approximately), please insert the storage medium at the time of saving data, remove it after the data are saved, and do not insert it in the instrument for a long time.
- Please remove the storage medium before opening/closing power supply.
- For general notes for use of the storage media, please refer to the instruction manual attached by the used storage medium.

3.2 Instrument Installment

3.2.1 Installment Site

Please install the instrument at the following sites.

- Installment disk

This instrument is with disk mounted type.

- Installed places

The instrument should be installed in the interior, where wind and rain as well as direct solar radiation should be avoided.

- Places with good ventilation

To prevent the interior temperature of the instrument from increasing, please install the instrument at the places with good ventilation.

- Places with less mechanical vibration

Please choose places with less mechanical vibration to install the instrument.

- Horizontal places

Please do not tend to the left or the right when installing this instrument, but should try best to keep horizontal (able to tend to the back with the maximum of 30°).

! Note

* When moving the instrument from the place with low temperature and humidity to the place with high temperature and humidity, if the temperature is under great change, condensation of moisture may sometimes occur and measurement errors may appear when thermocouple is inputted. In such situation, please adapt to the surrounding environment for over 1 hour before using the instrument.

* If the instrument is used under high temperature for a long time, the service life of LCD may be shortened (reduction of image quality, etc.). Please try not to use the instrument under high temperature (above 40°C approximately).

Please do not install the instrument at the following places:

- Please choose the places with small temperature change and approximate to the normal temperature (23°C) to install the instrument. If the instrument is installed at the places that can be directly shined by sunlight or places near thermal appliances, then bad influences may be imposed on the inside part of the instrument.

- Places with surplus oil smoke, steam, humid gas, dust, corrosive gas, etc.

Oil gas, steam, humid gas, dust, corrosive gas, etc. may impose adverse effects on the instrument.

- Places near galvanomagnetic generating sources

Please do not make magnetic appliances or magnets close to this instrument. If the instrument is installed near the generating sources of the strong electromagnetic field, the influences brought by the magnetic field may result in display errors.

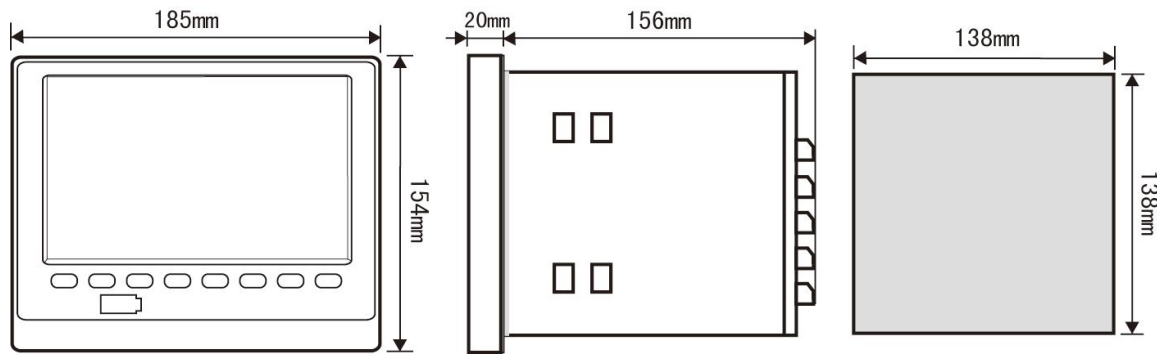
To avoid abnormal operation of the instrument, a distance above 20 cm should be kept from the instrument when radiofrequency generator is used on the spot.

- Places inconvenient to watch images

7-inch TFT true-color LCD is adopted for the display part of this instrument. For display contents cannot be seen clearly from an extremely eccentric angle, so please install the instrument at the places where observers can watch from the front face.

3.2.2 Installment Method

- Installment dimensions (Unit: mm)



● Instrument installment

(1) Instrument method

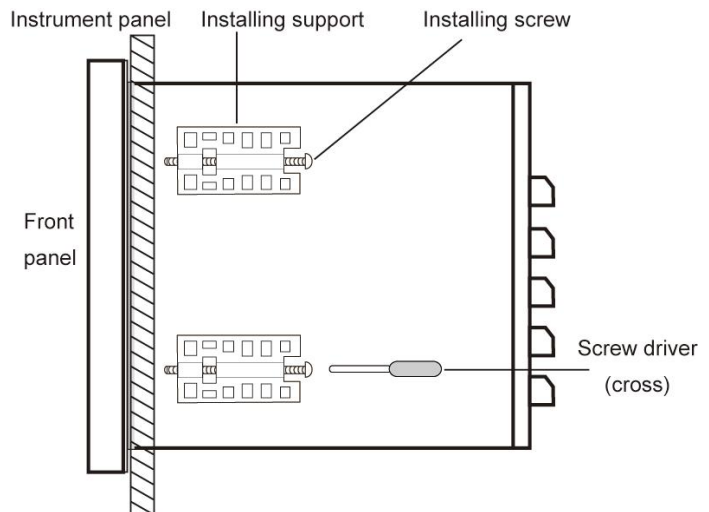
A. Insert the instrument from the front of the instrument panel

B. Utilize the installing supports equipped by the instrument

Installment method is as shown on the right figure.

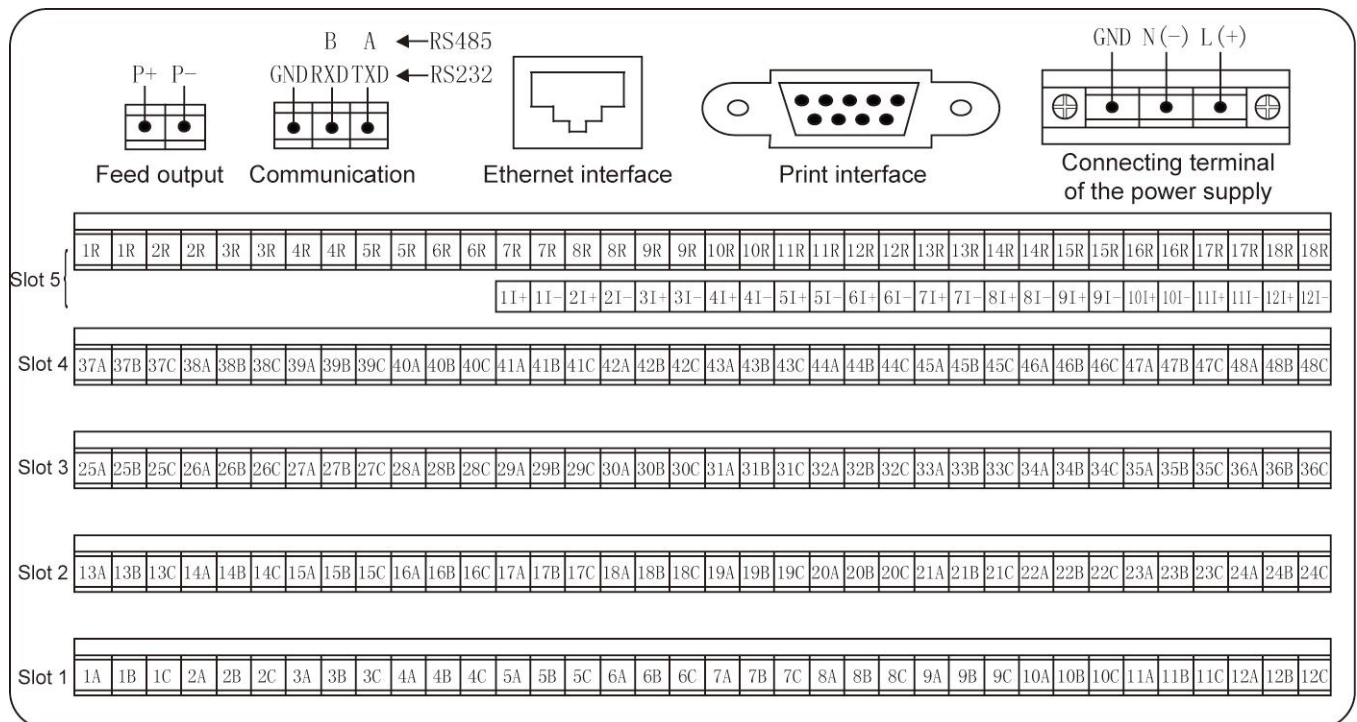
▲ Two sides of the instrument are fixed by four installing supports.

(2) Refer to the right figure for the installment figure.

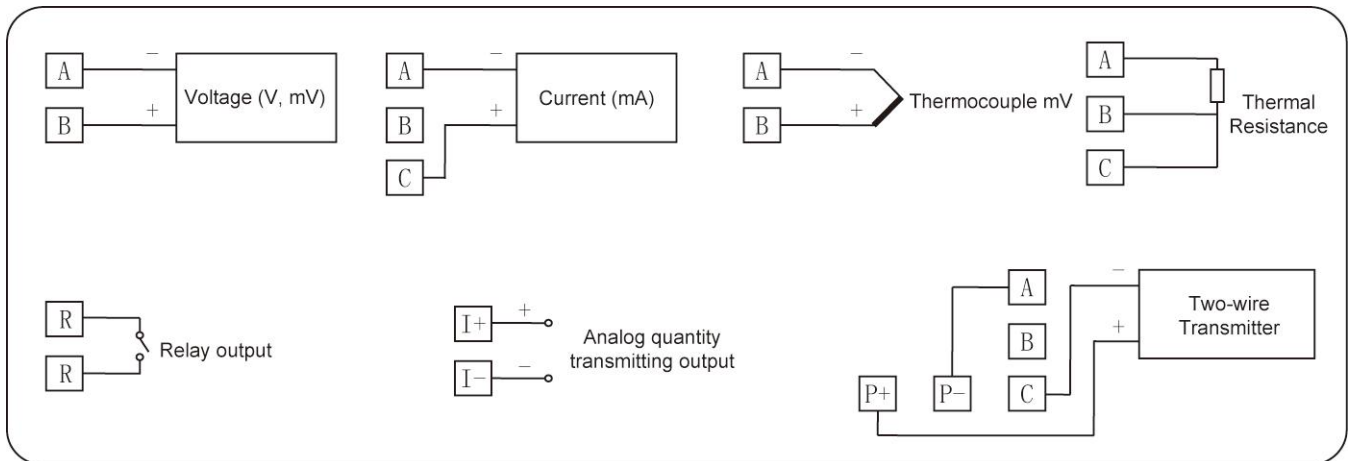


● Wiring diagram of the instrument

Tail Terminal Figure of the Instrument



Wiring instruction



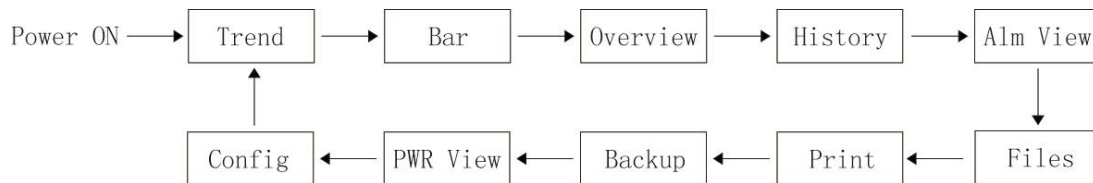
IV. Instrument Function and Operation

Color paperless recorder is equipped with multiple operation display menus and configuration menus, where the displays are clear, the information quantity is large and the configuration is convenient. Users can easily operate and use the instrument without the need of professional training. After connected to the power supply, the instrument displays the initial menu, and then enters into the real-time curve menu after the system is initialized. The following part is an introduction to each operation display menu and configuration menu.

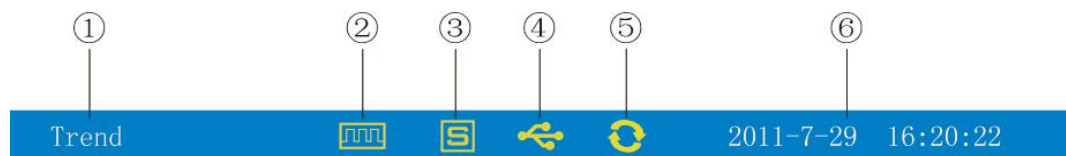
4.1 Switching of Operating Menus

Operating menus are composed of real-time curve menu, bar graph menu, digital display menu, historical curve menu, alarm list menu, file list menu, menu for printing, menu for backup, menu for power-down recording and menu of configuration parameters.

The "Switch" key is used to realize switching of each menu.



4.2 Status Display



①: Display name of each operating menu

②: Record mark

"With display" means the file is under cycling recording.

"With display and arrow mark" means the file is not under cycling recording.

"Without display" means the file has stopped recording.

③: SD card mark

"With display" means there is SD card connected.

"Without display" means no SD card is connected.

④: USB flash disk mark

"With display" means there is USB flash disk connected with the instrument.

"Without display" means no USB flash disk is connected with the instrument.

⑤: Cycling display mark

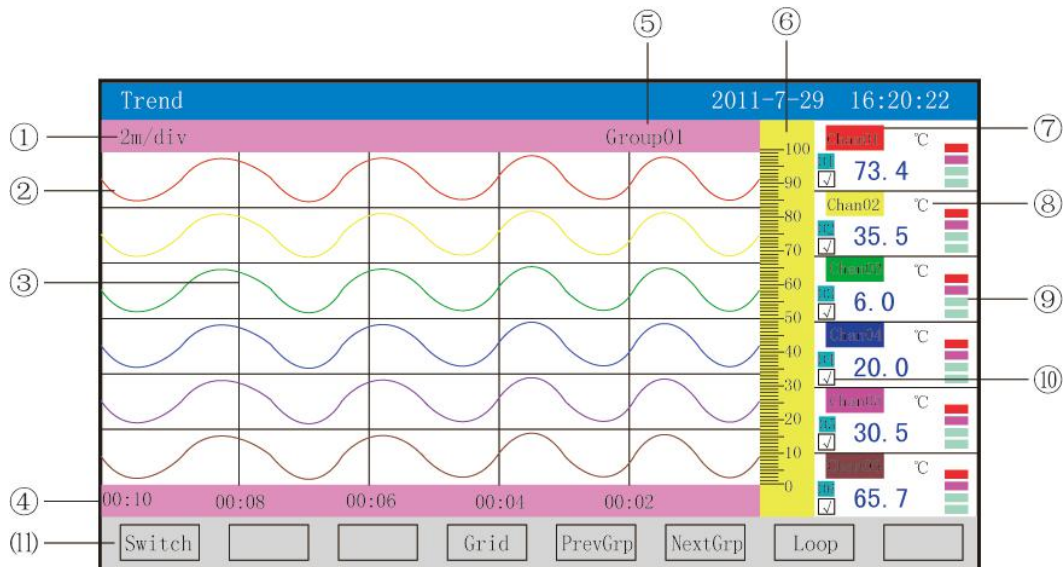
"With display" means each group is under recycling display.

"Without display" means the menu is fixed without cycling display.

⑥: Display the operating date and time of the instrument

4.3 Real-time Curve Menu

This menu can be set according to the curve combination, and is for simultaneously displaying the real-time curves and data of six channels (the curve precision is $0.5\% \pm 1$ word).



①: Time scale: It means the length of time per grid and the time scale is related to the recording interval, as shown in the table below:

Recording interval	1 s	2 s	4 s	6 s	15 s	30 s	1 min	2 min	4 min
Time scale	2 min/grid	4 min/grid	8 min/grid	12 min/grid	30 min/grid	1 h/grid	2 h/grid	4 h/grid	8 h/grid
	4 min/grid	8 min/grid	16 min/grid	24 min/grid	1 h/grid	2 h/grid	4 h/grid	8 h/grid	16 h/grid
	8 min/grid	16 min/grid	32 min/grid	48 min/grid	2 h/grid	4 h/grid	8 h/grid	16 h/grid	32 h/grid
	16 min/grid	32 min/grid	64 min/grid	96 min/grid	4 h/grid	8 h/grid	16 h/grid	32 h/grid	64 h/grid

②: Data curve: 6 curves can be displayed simultaneously on the common screen at most (6 curve colors, which can be set through display configuration).

③: Grid: It is for users to estimate time and data values.

④: Time represented by the current grid

⑤: Curve combination: The name of the current curve combination is displayed. (Each curve combination can include 6 curves; users can put the associated channels into a curve combination according to their own demands so as to facilitate the comparison of data between channel groups.)

⑥: Scale: The percentile scale of the curves is displayed.

⑦: Channel name: It can be set, and the background color is the same as the color of the corresponding curve. (Please refer to 4.12.4.1 Input Method of Channel Bit Number for the setting method.)

⑧: Unit: Data unit of such channel is displayed and can be set. (Please refer to 4.12.4.2 Input Method of Channel Unit for the setting method.)

⑨: Indication of the ultralimit alarm: From the upper to the bottom, the squares represent the ultralimit alarm marks of ultimate upper limit, upper limit, lower limit and ultimate lower limit respectively; grey means there is no alarm function; green means not to conduct alarm; red/pink means to conduct alarm.

⑩: Display/hidden mark of curves: "✓" means to display the curve, or means to hide the curve.

(11): Operation keys:

Press the "Switch" key to switch to other displays

Press the "Time scale" key to switch time scale

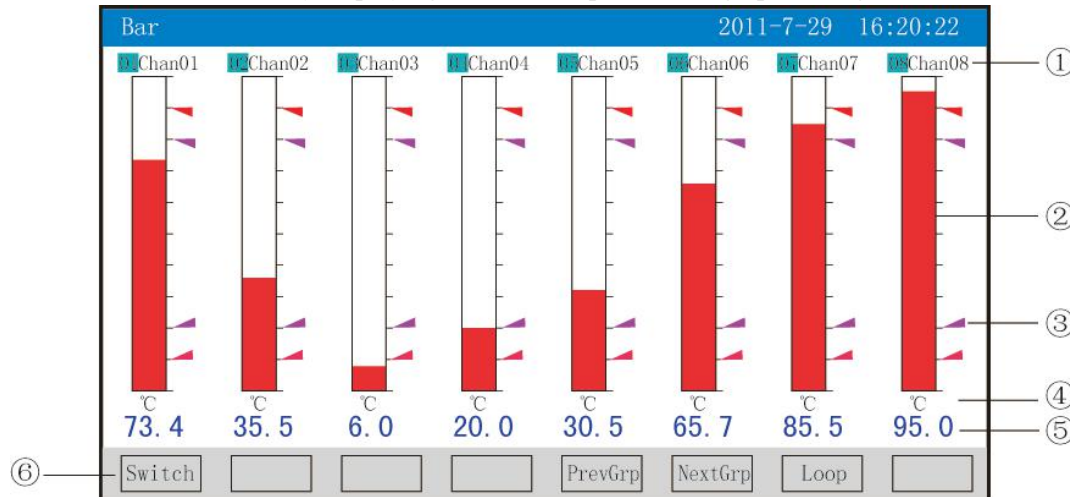
Press the "Previous group" key to check the previous curve combination

Press the "Latter group" key to check the latter curve combination

Press the "Cycling" key and the "🔄" cycling icon will be displayed on the menu, and the next curve combination will be automatically switched according to the cycling interval set in the display configuration.

4.4 Bar Graph Menu

This menu is for simultaneously displaying the data and percent bar graphs of eight channels.



①: Channel name: It means the corresponding project bit number of each channel and can be set. (Please refer to 4.12.4.1 Input Method of Channel Bit Number for the setting method.)

②: Bar graph: The scale length of the bar graph is 10 grids; filling length of color blocks means the percentile in the measuring range of the measured values. Blue means the measured value is not under the state of alarm, while red means the measured value is under state of alarm.

③: Alarm mark

If the ultimate upper limit alarm mark turns red, it means ultralimit alarm is conducted;

If the upper limit alarm mark turns pink, it means ultralimit alarm is conducted;

If the ultimate lower limit alarm mark turns pink, it means ultralimit alarm is conducted;

If the ultimate lower limit alarm mark turns red, it means ultralimit alarm is conducted.

④: Unit: Data unit of such channel is displayed and can be set. (Please refer to 4.12.4.2 Input Method of Channel Unit for the setting method.)

⑤: Data of quantities: They are the current data of quantities of such channel; blue means the measured value fails to meet the alarm output, while red means the measured value meets the alarm output.

⑥: Operation keys:

Press the "Switch" key to switch to other displays

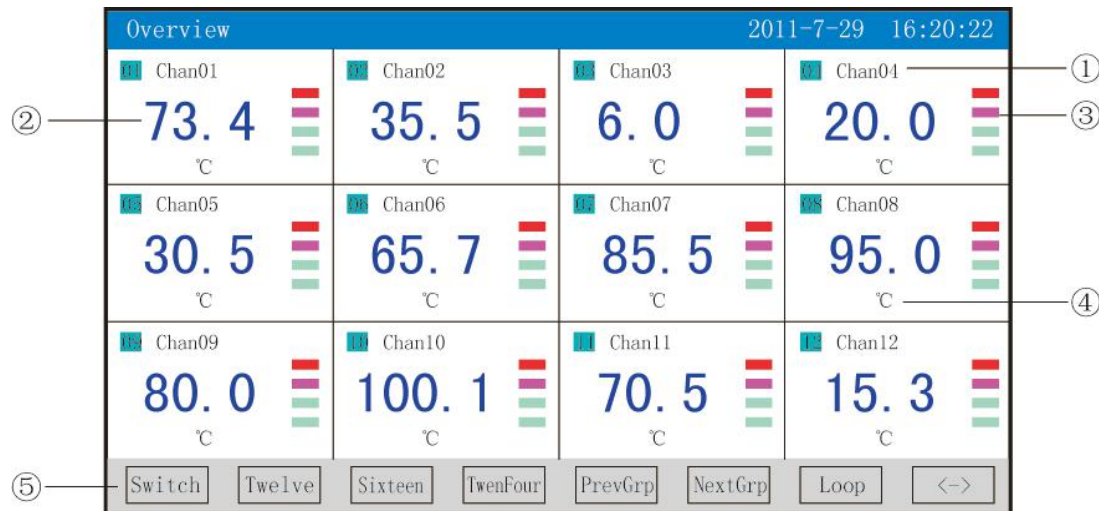
Press the "Previous group" key to check the previous bar graph combination

Press the "Latter group" key to check the latter bar graph combination

Press the "Cycling" key and the "🔄" cycling icon will be displayed on the menu, and the next bar graph combination will be automatically switched according to the cycling interval set in the display configuration.

4.5 Digital Display Menu

This menu is for simultaneously displaying the real-time data and the states of alarm of multiple flow input channels.



①: Channel name: It means the corresponding project bit number of each channel and can be set. (Please refer to 4.12.4.1 Input Method of Channel Bit Number for the setting method.)

②: Data of quantities: They are the current data of quantities of such channel.

③: Indication of the ultralimit alarm: From the upper to the bottom, the squares represent the ultralimit alarm marks of ultimate upper limit, upper limit, lower limit and ultimate lower limit respectively; grey means there is no alarm function; green means not to conduct alarm; red/pink means to conduct alarm.

④: Unit: Data unit of such channel is displayed and can be set. (Please refer to 4.12.4.2 Input Method of Channel Unit for the setting method.)

⑤: Operation keys:

Press the "Switch" key to switch to other displays

Press the " <—> " key to switch the channels of the display menus, where the channels include 2, 4, 6, 12, 16 and 24

Press the "2 channels" key to simultaneously display the channel bit numbers, data of quantities, the states of alarm and the engineering units of 2 channels

Press the "4 channels" key to simultaneously display the channel bit numbers, data of quantities, the states of alarm and the engineering units of 4 channels

Press the "6 channels" key to simultaneously display the channel bit numbers, data of quantities, the states of alarm and the engineering units of 6 channels

Press the "12 channels" key to simultaneously display the channel bit numbers, data of quantities, the states of alarm and the engineering units of 12 channels

Press the "16 channels" key to simultaneously display the channel bit numbers, data of quantities, the states of alarm and the engineering units of the 16 channels

Press the "24 channels" key to simultaneously display the channel bit numbers, data of quantities, the states of alarm and the engineering units of the 24 channels

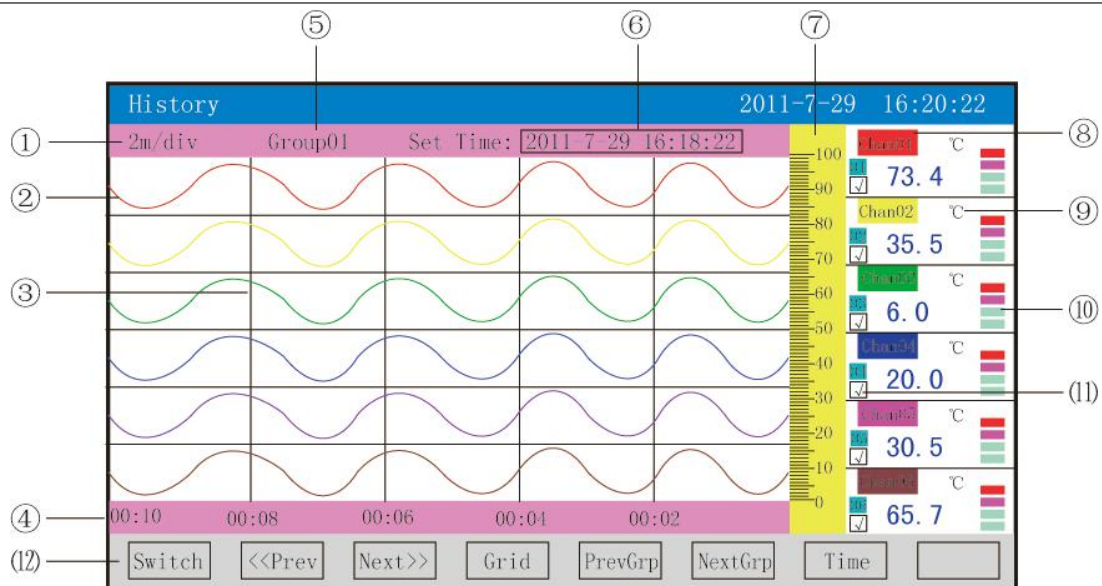
Press the "Previous group" key to check the previous digital display combination

Press the "Latter group" key to check the latter digital display combination

Press the "Cycling" key and the "🔄" cycling icon will be displayed on the menu, and the next digital display combination will be automatically switched according to the cycling interval set in the display configuration.

4.6 Historical Curve Menu

This menu can be set according to the curve combination, and is for simultaneously displaying the curves of historical data of six channels (the curve precision is $0.5\% \pm 1$ word).



①: Time scale: It means the length of time per grid and the time scale is related to the recording interval. Please refer to the instruction described in 4.3 Real-time Curve Menu for details.

②: Data curve: 6 curves can be displayed simultaneously on the common screen at most (6 curve colors, which can be set through display configuration).

③: Grid: It is for users to estimate time and data values.

④: Time represented by the current grid

⑤: Curve combination: The name of the current curve combination is displayed. (Each curve combination can include 6 curves; users can put the associated channels into a curve combination according to their own demands so as to facilitate the comparison of data between channel groups.)

⑥: Retrospection time: It is written in the type of "year-month-day, hour-minute-second".

⑦: Scale: The percentile scale of the curves is displayed.

⑧: Channel name: It can be set. (Please refer to 4.12.4.1 Input Method of Channel Bit Number for the setting method.) The background color is the same as the color of the corresponding curve.

⑨: Unit: Data unit of such channel is displayed and can be set. (Please refer to 4.12.4.2 Input Method of Channel Unit for the setting method.)

⑩: Indication of the ultralimit alarm: From the upper to the bottom, the squares represent the ultralimit alarm marks of ultimate upper limit, upper limit, lower limit and ultimate lower limit respectively; grey means there is no alarm function; green means not to conduct alarm; red/pink means to conduct alarm.

⑪: Display/hidden mark of curves: "√" means to display the curve, or means to hide the curve.

⑫: Operation keys:

Press the "Switch" key to switch to other displays

Press the "<< Forward" key to retrospect data forwardly based on the current retrospection time

Press the "Backward >>" key to retrospect data backwardly based on the current retrospection time

Press the "Time scale" key to switch time scale

Press the "Previous group" key to check the previous curve combination

Press the "Latter group" key to check the latter curve combination

Press the "Time" key to modify retrospection time

4.7 Alarm List Menu

This menu is for displaying the alarming records of channels, and is under the state of relay output. At most 100 alarming records can be kept, and the new alarming records will replace the former ones when there are 100 records.

		②	③	④	⑤		
		Alm View				2011-7-29 16:20:22	
		No.	Chan	Name	Alarm Time	Clear Time	Type
①		013	01	Chan01	2011-7-29 16:00:22	2011-7-29 16:00:22	HH
		012	01	Chan01	2011-7-29 16:01:22	2011-7-29 16:01:22	HH
		011	01	Chan01	2011-7-29 16:02:22	2011-7-29 16:02:22	H
		010	01	Chan01	2011-7-29 16:03:22	2011-7-29 16:03:22	HH
		009	01	Chan01	2011-7-29 16:04:22	2011-7-29 16:04:22	H
		008	01	Chan01	2011-7-29 16:05:22	2011-7-29 16:05:22	HH
		007	01	Chan01	2011-7-29 16:06:22	2011-7-29 16:06:22	H
		006	01	Chan01	2011-7-29 16:07:22	2011-7-29 16:07:22	HH
		005	01	Chan01	2011-7-29 16:08:22	2011-7-29 16:08:22	H
		004	01	Chan01	2011-7-29 16:09:22	2011-7-29 16:09:22	HH
		003	01	Chan01	2011-7-29 16:10:22	2011-7-29 16:10:22	H
		002	01	Chan01	2011-7-29 16:11:22	2011-7-29 16:11:22	HH
		001	01	Chan01	2011-7-29 16:12:22	2011-7-29 16:12:22	HH
		⑦					
		⑧					
		Switch Up Down PgUp PgDn					

①: Serial number: It is the serial number for the alarm generated, and is arranged in time order. The smaller the interval between the occurrences of an alarm, the larger the serial number is.

②: Channel: It is the number of the input channel for the alarm generated.

③: Bit number: It is the corresponding bit number of the input channel for the alarm generated.

④: Alarm time: It means the starting time of an alarm.

⑤: Time of cancelling alarm: It is the end time of an alarm.

⑥: Alarm type: The symbol for ultimate upper limit alarm is "HH", and that for upper limit alarm is "H", for lower limit alarm "L", for ultimate lower limit alarm "LL".

⑦: Current state of relay: From the left to the right, it means the current states of 1-18 limit relays respectively; green means the relay contact is off, while red means the relay contact is closed.

⑧: Operation keys:

Press the "Switch" key to switch to other displays

Press the "Up" key to check the alarm list upwardly

Press the "Down" key to check the alarm list downwardly

Press the "Page Up" key to check the alarm list of the previous page

Press the "Page Down" key to check the alarm list of the latter page

Note: 13 alarm records are displayed on one screen in terms of this list.

4.8 File List Menu

This menu is for displaying the stored information and storage states of the files. At most 100 file list records can be kept, and the new records will replace the former ones when there are 100 records.

- ①: Serial number: It is the serial number for the file generated, and is arranged in time order. The smaller the value between the occurrences of a file, the larger the serial number is.
- ②: Starting time: It is the starting time for recording the data of a file.
- ③: End time: It is the end time for recording the data of a file.
- ④: Interval: It is the time interval for recording with the recording interval set in the recording configuration displayed.
- ⑤: Trigger of recording: It is the condition for triggering of recording with the triggering conditions set in the recording configuration displayed.
- ⑥: State: The recording state of the current file is displayed, and the file states are as follows:
 - Under recording: It means the file is recording data.
 - Manual stop: It means the file ends recording for the configuration data are modified.
 - Power-down stop: It means the file ends recording for the instrument is powered off.
 - Alarm stop: It means the file ends recording for the alarm is cancelled.
 - Timing stop: It means the file ends recording for the set end time is reached.
- ⑦: Total time for recording: Calculate the total time for recording.
- ⑧: Progress bar of storage capacity (Note: It appears when the recording mode in the recording configuration is non-cycling.)
- ⑨: Operation keys:

Note: 13 stored records are displayed on one screen in terms of this list.

Print
2011-7-29 16:20:22

①
File No.

②
Start Time

③
End Time

④
Channel
 ▼

⑤
Interval

⑥

①: Document No.: recording the serial number of the documents

②: Starting time: starting time of the printing of the data segments

③: End time: end time of the printing of the data segments

④: Printing channel: choose the channel for the printing

⑤: Printing interval: choose the time interval between data printing with the set printing interval * recording interval as the unit (only effective for data printing)

⑥: Operation keys:

Press the "Switch" key to switch to other displays.

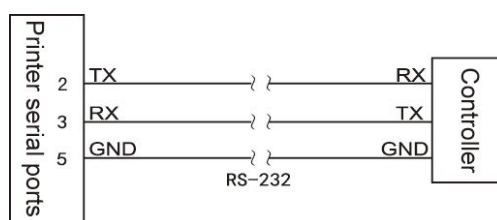
Press the "Up" key to move up the cursor and correct the places the cursor staying by pressing the "OK" key, and then exit from the display by pressing the "OK" key.

Press the "Down" key to move up the cursor and correct the places the cursor staying by pressing the "OK" key, and then exit from the display by pressing the "OK" key.

Press "Data" key to print the data of certain time.

Press "Curve" key to print the Curve of certain time

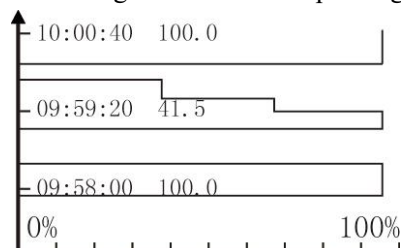
Diagram of the connection of the instrument and the the serial printer:



A: Manual printing

The instrument will start to print data or curve after the "Data" or "Curve" key is pressed.

Recording format of curve printing:



CH1: °C

End: 11-09-24 10-00-00

Start: 11-09-24 09:58-00

Data printing formats are as follows:

```

110924142610: 100 -----Measured value of end time
110924142609: 100
110924142608: 101
110924142607: 100
110924142606: 100
110924142605: 101
110924142604: 101
110924142603: 100
110924142602: 99
110924142601: 100 -----Measured value of start time
CH1: °C -----Name of channel
  
```

B: Timed printing

The printing interval and the starting time of the system configuration should be set for the timed printing, so the instrument will control the printer to start timed printing when the system time moves to the set time interval.

Timed printing formats:

```

-----
CH48: 100.0°C -----Measured value of channel 48
CH47: 100.0°C -----Measured value of channel 47
. . . . .
CH2: 100.0°C -----Measured value of channel 2
CH1: 100.0°C -----Measured value of channel 1
Time: 10-02-23 14-36-02 -----Date and time
-----
  
```

Notes: for manual printing, data printing and curve printing are available, while only data printing is available when choosing timed printing.

4.10 Menu for Backup (available for instruments with backup function)

The paperless recorder can backup and transfer the recorded data in instruments with USB flash disks or the SD cards. The USB ports are on the front panel of the instruments, and the SD card ports are on the left side of the instruments. The USB flash disks or the SD cards can be inserted into the instrument after opening the operation covers for data backup. Automatic backup function of the SD cards: the instrument will back up the historical data being recorded to the SD cards automatically at 00:00 each day after the SD cards are inserted into the driver; and the instrument also will back up the historical data to the SD cards automatically when the recording is stopped or the triggering conditions set out by the users are met.

Storage directory of the documents formed by automatic backup:

1. Storage directory of the documents formed by automatic backup occurred on 00:00 of each day: TIMEAUTO (file name)/date showed on the instrument (YY/MM/DD)/time showed on the instrument (hour/minute)
2. Storage directory of the documents formed by automatic backup occurred upon stop of the recording: RECAUTO (file name)/date showed on the instrument (YY/MM/DD)/time showed on the instrument (hour/minute)

The users can back up the recorded historical data of all the channels of the instruments to the USB flash disks or the SD cards with this operation menu. The backup data can be reproduced, analyzed and printed with the

upper computer software DTM after it is input into computers.

Backup 2011-7-29 16:20:22

① Backup One HisFile ▼

② File No. 001

③ Start Time 2011-7-29 16:10:22

④ End Time 2011-7-29 16:20:22

⑤ File Name DAT0001.NHD

⑥ Notice: No SD Card

⑦ Switch Down Up Backup Enter

①: Backups: back-up single historical data or all historical data, optional.

②: Document No.: recording the serial number of the documents

③: Starting time: starting time of the data segment backup.

④: End time: end time of the data segment backup.

(Note: the starting time and the end time are automatically generated by the system. The time of the starting and end time are changeable only for single historical data backup other than backup of all historical data)

⑤: File name/folder name: choose the file name of the data back-upped in the USB flash disk. In case of the single historical data, the file extension is .NHD; while for all historical data, the folder prefix is F111110.

⑥: If the SD card is not connected to the instrument, the interface will remind the users of "SD card unavailable", otherwise, there is no prompt and the corresponding icon will be displayed in the status display column; if the USB flash disk is not connected to the instrument, the interface will remind the users of "USB flash disk unavailable" after the "Backup" key is pressed, otherwise, the corresponding icon will be displayed in the status display column.

⑦: Operation keys:

Press the "Switch" key to switch to other displays.

Press the "Up" key to move up the cursor and correct the places the cursor staying by pressing the "OK" key, and then exit from the display by pressing the "OK" key.

Press the "Down" key to move up the cursor and correct the places the cursor staying by pressing the "OK" key, and then exit from the display by pressing the "OK" key.

The instrument will display "backup" after the "Backup" key is pressed, and display "backup finished" when the progress bar of USD ends. The instrument will display "cancelled" and the data backup is stopped when the "Cancel" key is pressed during the movement of the progress bar.

! Note: in case of all historical data, the parameters will be in shadow, indicating that these parameters are unable to be set.

4.11 Menu for power-down recording

This menu is used for displaying the relevant records of power-down and power-on time, including the records of the power-down and power-on time, total power-down times and time. At most 100 alarming records can be kept, and the new power-down records will replace the former ones when there are 100 records.

PWR View				2011-7-29 16:20:22
No.	PWR Off Time	PWR On Time	PWR Off Length	
① 009	2011-7-29 10:50:50	2011-7-29 11:00:00	0000d-00h:10m:10s	
008	2011-7-29 10:30:30	2011-7-29 10:40:40	0000d-00h:10m:10s	
007	2011-7-29 10:10:10	2011-7-29 10:20:20	0000d-00h:10m:10s	
006	2011-7-29 09:50:50	2011-7-29 10:00:00	0000d-00h:10m:10s	
005	2011-7-29 09:30:30	2011-7-29 09:40:40	0000d-00h:10m:10s	
004	2011-7-29 09:10:10	2011-7-29 09:20:20	0000d-00h:10m:10s	
003	2011-7-29 08:40:50	2011-7-29 09:00:00	0000d-00h:10m:10s	
002	2011-7-29 08:20:30	2011-7-29 08:30:40	0000d-00h:10m:10s	
001	2011-7-29 08:00:10	2011-7-29 08:10:20	0000d-00h:10m:10s	
⑤ PWR Off Counts: 00009 Off Time Length: 0000d-01h:31m:30s				
Switch Up Down PgUp PgDn				

①: Serial number: the serial number of the power-down records ranking in time order and the smaller the intervals between two occurrences of power-down, the larger the serial number.

②: Power-down time: the time when the instrument is power-down

③: Power-on time: the time when the measurement display of the instrument is turned on after the power is on

④: Power-down duration: the duration of each power-down

⑤: Total power-down times: the power-down times in total

Total time: aggregation of each power-down duration

⑥: Operation keys:

Press the "Switch" key to switch to other displays

Press the "Up" key to check the power-down record list upward

Press the "Down" key to check the power-down record list downward

Press the "Page Up" key to check the power-down record list of the previous page

Press the "Page Down" key to check the power-down record list of the next page.

4.12 Menu for Configuration

Config		2011-7-29 16:20:22	
Password 000000 *			
SYSTEM		RECORD	
DISPLAY		INPUT	
OUTPUT		ABOUT	
Left	Right	Up	Down
Enter		Exit	

The password comprises 6 numbers and "*"Notes: none of the configuration menus is accessible if the password is incorrectly set. And the default password is 000000. Hereunder is the brief introduction of each configuration menu:

4.12.1 System Configuration

- * Language: simplified Chinese and English are available
- * Password: the password can be set based on user's demands
- * Date: the time is showed in form of "YY-MM-DD hh:mm:ss". Time can be corrected or adjusted.
- * Cold side adjustment: the temperature at the cold side can be adjusted and displayed
- * Disconnection handling: lower limit of the measurement range, upper limit of the measurement range and

keeping at previous value are optional

- * Address: range: 1 ~ 255
- * Baud rate: 1200, 2400, 4800, 9600, 19200, 38400 and 57600 are optional
- * IP address: IP address of the Ethernet
- * Port: port number of the Ethernet
- * Timed printing: the printing time can be set
- * Starting time: the starting time of the timed printing can be set
- * Alarm printing: turn-on and turn-off are optional
- * Data clear: all the data stored in the instrument, including historical data, alarm list, file list, and

power-down list, can be cleared

Operation: in this menu

The cursor can be moved by pressing the "Left" or the "Right" key;

The values can be adjusted by pressing "Up", "Down", "Increase", or "Decrease" key;

"OK" key can be pressed to confirm the execution; the dialogue window of "Are you sure to clear all the data" will pop up when the cursor is moved to the "Data Clearing" part and the "OK" key is pressed, and press the "Yes" key to clear data and press "No" key to give up clearing data;

The "Exit" key can be pressed to exit from this menu.

4.12.2 Recording Configuration

* Record model: non-cycling and cycling available.

Non-cycling: the cycling recording will stop automatically when there is no recording space left or there are already 100 records: when the recording space is used up, the recording will continue from the first file and record the historical data in the circle of replacing the previous files with new files; and when there are already 100 files, the first file will be deleted at first, the document number of the rest files will be changed to those of the previous ones, and the new file will be created to continue the recording.

* Recording interval: 1 s, 2 s, 4 s, 6 s, 15 s, 30 s, 1 minute, 2 minute and 4 minute are optional.

* Record type: real-time value, average value, maximum, and minimum are optional.

Real-time value: it is the real-time value corresponding to the recording time.

Average value: it is the average value of the values of two successive recording points calculated with weighted average calculation method.

Maximum: it is the maximum value of the real-time values of two successive recording points.

Minimum: it is the minimum value of the real-time values of two successive recording points.

* Recording after power-on: new file and before power-down are optional.

New file: the recording is carried out by creating new files after the power is on.

Before power-down: the recording is continued following the files created before power-down; the data during the outage period is showed as -.—when this function is selected.

* Triggering conditions: manual, power-on, alarm, relay and timing are optional (Notes: the following changeable triggering methods will be displayed when the corresponding triggering condition is selected)

Manual trigger: the data storage recording can be stopped or started manually after the storage interface of the instrument is opened.

Power-on: new files will be created and data recording will be started after the power is on and the instrument is started.

Alarm trigger: the data storage recording will be started when there is certain alarm corresponding to certain channel, and the recording will be stopped when the alarm ends.

Relay trigger: the data storage recording will be started when certain relay alarms, and the recording will be stopped when the alarm ends.

Timed trigger: the timed cycle period is fixed at 24 h, and the starting time and end time can be set, so the instrument will record the stored data within specified period.

Operation: in this menu

The cursor can be moved by pressing the "Left" or the "Right" key;

The values can be adjusted by pressing "Up", "Down", "Increase", or "Decrease" key;

The "OK" key can be pressed to confirm the execution; and the "Exit" key can be pressed to exit from this menu, the dialogue window of "the recording of the above changes will be stopped and new files will be created to continue the recording" will pop up, and the "OK" key should be pressed to finally exit from the menu.

4.12.3 Displaying Configuration

* LCD off: 5 m later, 10 m later, 30 m later, 1 h later and Never are optional;

* Cycling interval: the time intervals between the present and the next group of things and there is 4 s, 8 s, 15 s and 30 s optional;

* Startup picture: the real-time curve, bar chart, digital display, historical curve, file list and power-down record are optional for startup picture

* Curve group: each curve group concludes 6 curves, and there are 10 curve groups available that users can choose any one based on their demands. The selected curve group will be displayed on the real-time curve menu;

* Start: the curve group will be displayed on the real-time curve menu if "Yes" is selected and will not be displayed if "No" is selected;

* Curve 1-6: the name of the channel to be displayed, and "Display" and color of the curve should be selected.

Operation: in this menu

The cursor can be moved by pressing the "Left" or the "Right" key;

The required contents can be selected by pressing "Up", "Down", "Page Down", and "Page Up" keys;

Exit from the menu by pressing "Exit". The dialog box of "Save changed parameters?" will pop up in case of any change to the contents, and then select "Yes" to save the changed parameters while select "No" if not.

4.12.4 Channel Configuration

* Configuration channel: choose the channel number of the display configuration

* Bit number: bit number symbolizes the project bit number corresponding to the display channel and see 4.17.4.1 Inputting Method of “Bit Number” for methods for setting the bit number.

* Type of signal: B, S, K, E, T, J, R, N, F2, Wre3-25, Wre5-26, Cu50, Cu53, Cu100, Pt100, BA1, BA2, 0~400 Ω, 0~20mV, 0~100mV, ±20mV, ±100mV, 0~20 mA, 0~10 mA, 4~20 mA, 0~5V, 1~5V, ±5V, 0~10V, √0~10 mA, √4~20 mA, √0~5V, √1~5V, and no signal.

The instructions of allowed measurement range of each signal are as follows:

Type of Signal	Measurement Range	Type of Signal	Measurement Range
B	400~1800℃	0~400 Ω Linear resistance	-9999~99999
S	-50~1600℃	0~20mV	-9999~99999
K	-200~1300℃	0~100mV	-9999~99999
E	-200~1000℃	±20mV	-9999~99999
T	-200.0~400.0℃	±100mV	-9999~99999
J	-200~1200℃	0~20mA	-9999~99999
R	-50~1600℃	0~10mA	-9999~99999
N	-200~1300℃	4~20mA	-9999~99999
F2	700~2000℃	0~5V	-9999~99999
Wre3-25	0~2300℃	1~5V	-9999~99999
Wre5-26	0~2300℃	±5V	-9999~99999
Cu50	-50.0~150.0℃	0~10V	-9999~99999
Cu53	-50.0~150.0℃	0~10mA square root	-9999~99999
Cu100	-50.0~150.0℃	4~20mA square root	-9999~99999
Pt100	-200.0~650.0℃	0~5V square root	-9999~99999
BA1	-200.0~600.0℃	1~5V square root	-9999~99999
BA2	-200.0~600.0℃		

* Unit: unit symbolizes the project unit corresponding to the display channel and see 4.12.4.2 Inputting Method of “Unit” for methods for setting the unit.

* Measurement range: it means the range between the upper limit and the lower limit of the recorded data with the setting range among -9999 ~ 19999. The number of the decimal point places of each channel can be confirmed by modifying the place of the decimal point of the upper limit.

* Accumulation: “Yes” and “No” are optional and this function is limited to aggregation operation of the flow rate.

* Filtering time: modifying sampling times of the instrument to avoid hopping of displayed measurement values. Range: -1999~9999.

Example of link between displayed value of the instrument and the filtering time: when the instrument is under analog input in, and the filtering time is set at 3.0 s, it will

Carry out the calculation of filtering time (3 s) * sampling cycle (1 s) automatically, namely calculation of the average of the sampling value within 3 s, and update the displayed value with the recurrence method.

* Small signal elimination: if measured value < (upper limit of the measurement range - lower limit of the measurement range) × percentage of the small signal elimination + lower limit value of the measurement range, the displayed value is the lower limit value of the measurement range, and the small signal elimination function is turned off if it is set at 0. Range: -1999~9999

* Linear correction: the linear correction will be performed for the project quantity based on the formula of $y = Kx + b$, where k is the linear coefficient and b means zero correction. By default, K = 1.0, b = 0.0, which means no correction is conducted. x refers to the displayed project quantity of the channel before the correction

and y refers to the displayed value after the correction.

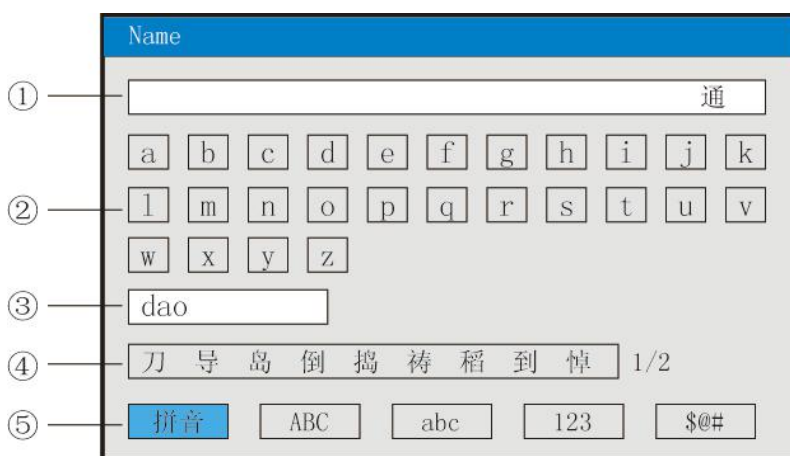
* As for the ultra-lower limit, lower limit, upper limit, ultra-upper limit alarms and value of return difference, attention should be paid to: the range of the ultra-lower limit, lower limit, upper limit, ultra-upper limit alarms and value of return difference is -9999~19999, and the input methods are the same as those of the measurement range.

Alarm function: Off: the alarm function is turned off, and On: the alarm function is turned on. Alarming contact: choose the serial number of the relay contact, D001 to D018 corresponds to No. 1 to No. 18 relay contact output, and No means there is no output.

Operation: press "Left" and "Right" keys to move the cursor; press the "Up", "Down", "Page Down" and "Page Up" to choose the content needed, press "Ok" key to confirm the operation, and press "Exit" Key to exit from this menu. (The dialogue window for storage prompt will pop up of the "Exit" key is pressed when there is any correction to bit number, signal type, unit, or measurement range, and then the "OK" key can be pressed to exit from the menu). The parameters of the configuration channel number to be copied can be copied to other channel by using "Copy" and "Paste" key. For example, the parameters of channel 01 can be copied to channel 02 by pressing "Copy" key when the cursor is stopped on channel 01 of the configuration channel and pressing "Paste" key when the cursor is moved to channel 02. The configuration time will be greatly reduced if the configurations of several channels are the same.

4.12.4.1 Introduction of the Input Method of the "Bit Number" of the Channel Configuration

This instrument adopts T6 input method, a input method similar to that of the cellphone keyboard that can realize the input of Chinese characters, number, English words and special symbols. It uses the international code that resolves the problems regarding Chinese characters' bit number and input special units that is easy to learn to operate. The following menu for the input method will appear when the cursor is moved to "Bit number" and then the "Ok" key is pressed.



①: Display field: show the input characters

②: Soft keyboard: 26 phonetic alphabets will be displayed if it is under Pinyin input method, and 26 capital letters will be displayed if it is under Capital Letter input method;

26 lowercase letters will be displayed if it is under lowercase letter input method, and the number from 0 ~ 9 will be displayed if it is under numeric input method, and 30 special symbols will be displayed if it is under the special symbol input method, such as short horizontal line and decimal points.

③: Pinyin group display field (limited to the Pinyin input method).

④: Character field (limited to Pinyin input method).

⑤: Input method field for choosing the needed input method.

⑥: Operation keys:

Press the "Left", "Right", and "Up" keys to move the cursor to choose the characters in need.

Press the "Cursor" key: move the cursor to the input method field to switch the input method; ▲ will pop

up when the "cursor" key is pressed, and the characters can be selected by pressing "Left" and "Right" keys.

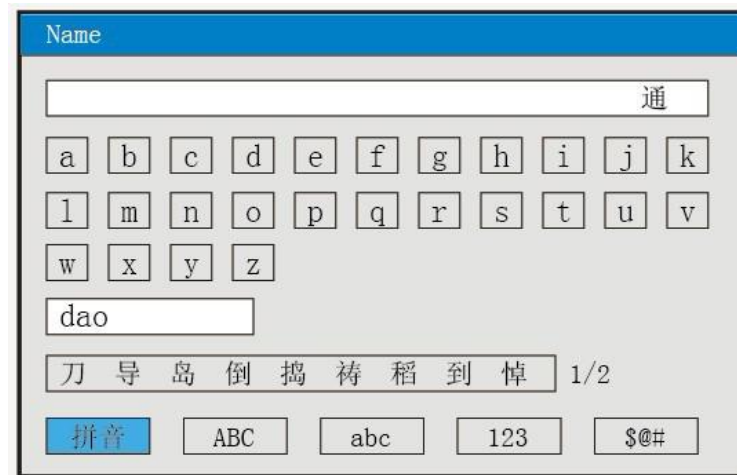
Press "Delete" key to delete the character on which the cursor stays.

Press "Delete" key to delete the character on which the cursor stays.

Press "Finish" key to exit from the input method to finish the bit number input.

Press "Cancel" key to exit from the input method menu.

I. Pinyin Input Method



Use the Pinyin input method: Pinyin input method refers to the method to symbolize the pronunciation of the Chinese characters by using the pinyin.

Input the character "道" with Pinyin input method:

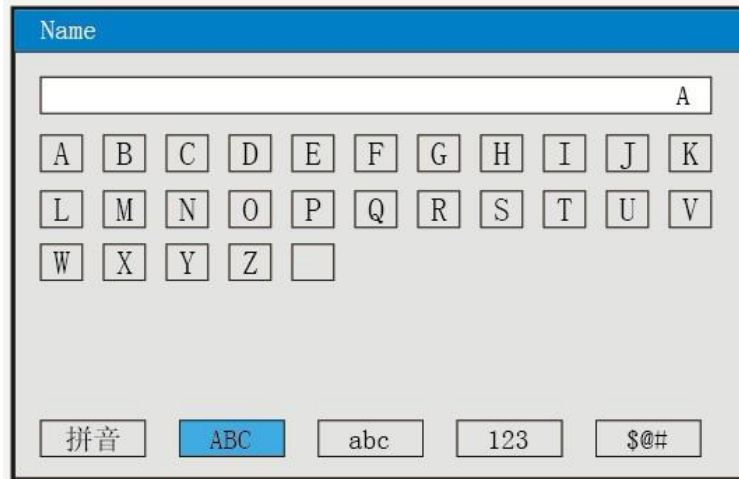
1. Press "Ok" key to enter the input method menu (it is Pinyin input method by default);
2. Press the "Left", "Right", and "Up" keys to move the cursor to choose the characters "d";
3. Press "Choose" key and the "d" will be displayed in the Pinyin group filed;
4. Press the "Left", "Right", and "Up" keys to move the cursor to choose the characters "a";
5. Press "Choose" key and the "a" will be displayed in the Pinyin group filed;
6. Press the "Left", "Right", and "Up" keys to move the cursor to choose the characters "o";
7. Press "Choose" key and the "dao" will be displayed in the Pinyin group filed;

The Chinese character "道" will be displayed in the character field;

8. Press the "Cursor" key, and then the ▲ will be showed under the character field.
9. Press "Left" and "Right" keys to choose the Chinese character "道";
10. Press "Choose" key to input the character "道" that will be displayed in the input field;
11. Press "Finish" key to exit from the input method to finish the bit number input.

Notes: the "Right" key should be pressed to move to the next page if the Pinyin has more than 9 letters.

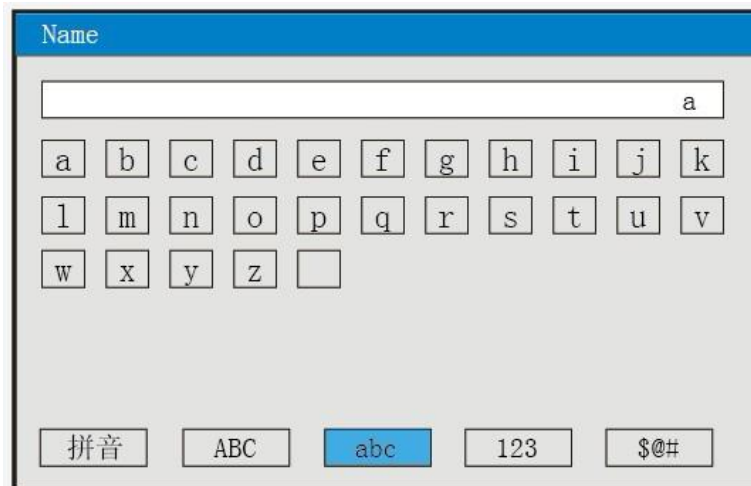
II. Capital letter input method menu



Input capital letter "A":

1. Press "Ok" key to enter the input method menu;
2. Press "Cursor" key to move the cursor to the input method field;
3. Press the "Left" and "Right" keys to move the cursor ;
4. Move the cursor to the soft key board for inputting capital letter by pressing "Cursor" key;
5. Press "Choose" key to input the character "A" that will be displayed in the input field;
6. Press "Finish" key to exit from the input method to finish the bit number input.

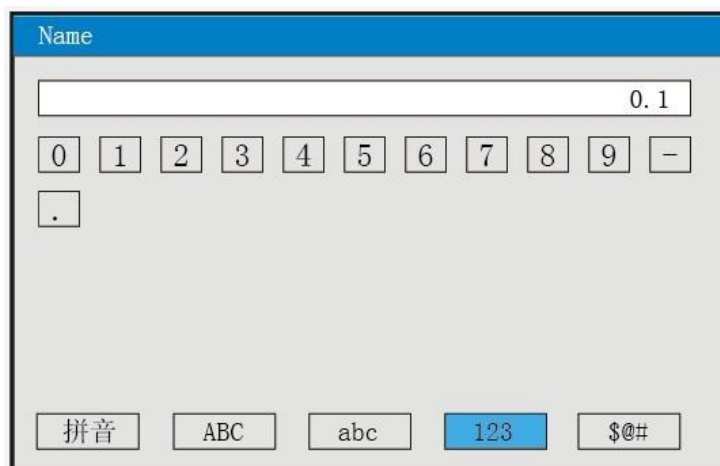
III. Lowercase letter input method menu



Input lowercase letter "a":

1. Press "Ok" key to enter the input method menu.
2. Press "Cursor" key to move the cursor to the input method field;
3. Press the "Left" and "Right" keys to move the cursor ;
4. Move the cursor to the soft key board for inputting lowercase letter by pressing "Cursor" key;
5. Press "Choose" key to input the character "a" that will be displayed in the input field;
6. Press "Finish" key to exit from the input method to finish the bit number input.

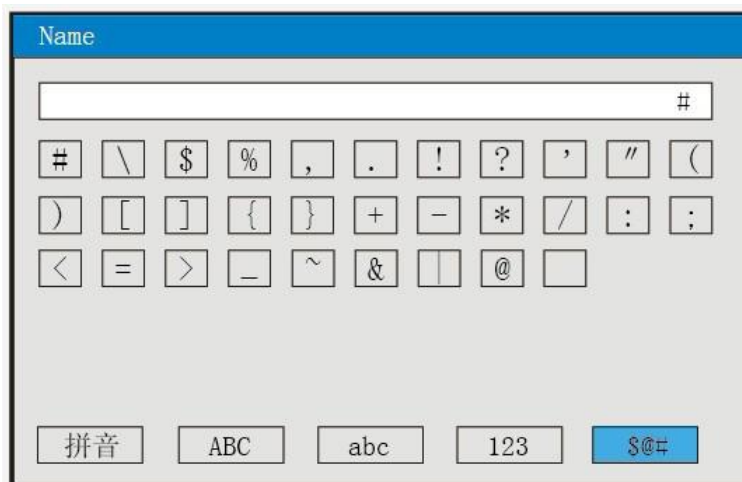
IV. Numeric input method



Input number "0.1"

1. Press "Ok" key to enter the input method menu;
2. Press "Cursor" key to move the cursor to the input method field;
3. Press the "Left" and "Right" keys to move the cursor ;
4. Move the cursor to the soft key board for inputting numeric by pressing "Cursor" key;
5. Press "Choose" key to input the character "0" that will be displayed in the input field;
6. Press the "Left", "Right" and "Up" keys to move the cursor;
7. Press "Choose" key to input the character "0" that will be displayed in the input field;
8. Press the "Left", "Right" and "Up" keys to move the cursor to choose "1";
9. Press "Choose" key to input the character "0.1" that will be displayed in the input field;
10. Press "Finish" key to exit from the input method to finish the bit number input.

V. Special Character Input Menu

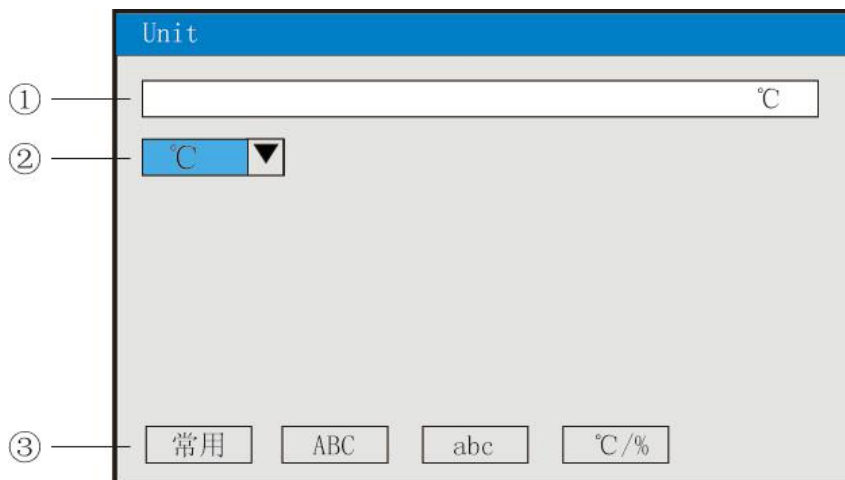


Input special symbol "#"

1. Press "Ok" key to enter the input method menu;
2. Press "Cursor" key to move the cursor to the input method field;
3. Press the "Left" and "Right" key to move the cursor ;
4. Move the cursor to the soft key board for inputting special symbol by pressing "Cursor" key;
5. Press "Choose" key to input the character "#" that will be displayed in the input field;
6. Press "Finish" key to exit from the input method to finish the bit number input.

4.12.4.2 Introduction of the Input Method of the "Unit" of the Channel Configuration

The following menu for the input method will appear when the cursor is moved to "Unit" and then the "Ok" key is pressed.



①: Display field: show the input unit symbol;

②: Soft keyboard: input common units;

26 capital letters will be displayed if it is under capital letter input method;

26 capital letters will be displayed if it is under capital letter input method;

16 special symbols will be displayed if it is under special symbol input method.

③: Input method field for choosing the needed input method.

④: Operation keys:

Press the "Left", "Right", and "Up" keys to move the cursor to choose the characters in need.

Press "Cursor" key to move the cursor to the input method field to switch the input method;

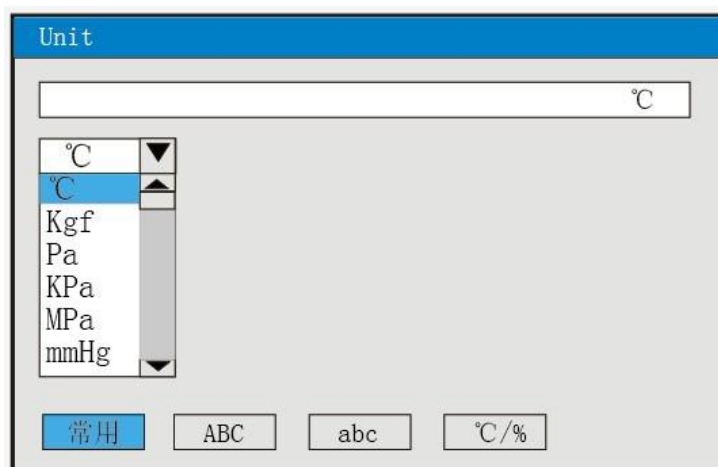
Press "Delete" key to delete the unit character on which the cursor stays;

Press "Delete" key to delete the unit character on which the cursor stays.

Press "Finish" key to exit from the input method to finish the unit input.

Press "Cancel" key to exit from the input method menu.

I. Menu of Input Method Menu of Common Units



Input common unit "°C":

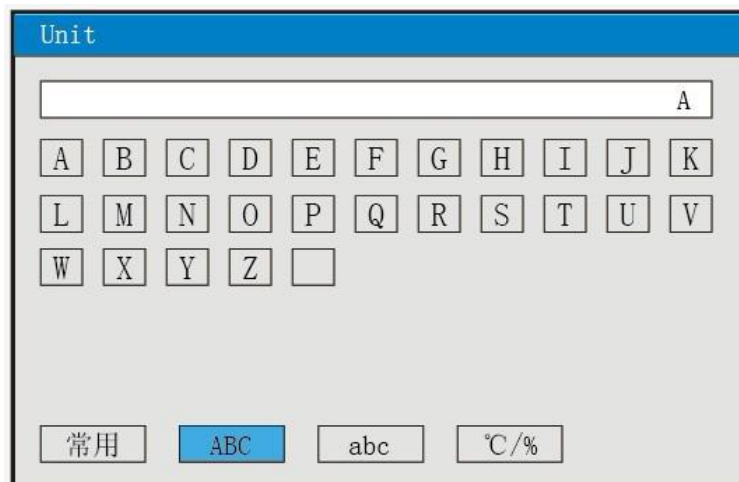
1. Press "Ok" key to enter the unit input method menu (it is common units input method by default);

2. The drop-down menu will pop up when the "Ok" key is pressed with the following common units: °C、

Kgf、Pa、KPa、MPa、mmHg、mmH2O、bar、t/h、Kg/h、L/h、m³/h、Nm³/h、t/m、Kg/m、L/m、m³/m、Nm³/m、t/s、Kg/s、L/s、m³/s、Nm³/s、t、Kg、g、Nm³、m³、L、KJ/h、KJ/m、KJ/s、MJ/h、MJ/m、MJ/s、GJ/h、GJ/m、GJ/s、KJ、MJ、GJ、V、A、KW、Hz、%、mm、rpm;

3. The needed unit "°C" can be selected by pressing "Up", "Down", "Page Down", and "Page Up" keys;
4. Press "Ok" key and the unit "°C" will be displayed in the common units input field;
5. Press "Choose" key to input the "°C" that will be displayed in the input field;
6. Press "Finish" key to exit from the input method to finish the unit input.

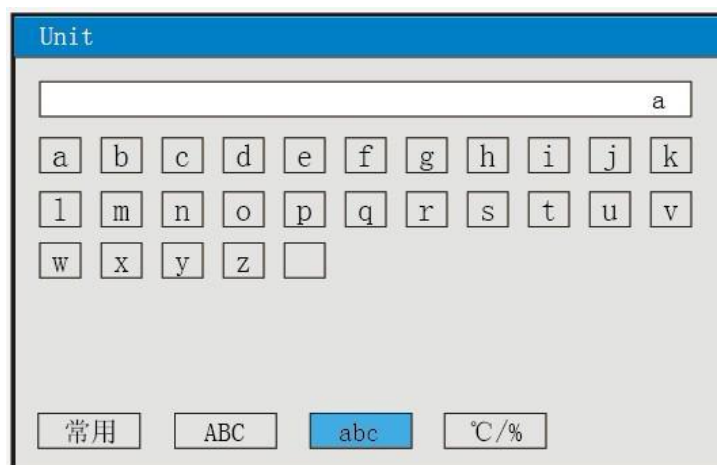
II. Capital Letter Input Method Menu



Input capital letter "A":

1. Press "Ok" key to enter the input method menu;
2. Press "Cursor" key to move the cursor to the input method field;
3. Press the "Left" and "Right" keys to move the cursor ;
4. Move the cursor to the soft key board for inputting capital letter by pressing "Cursor" key;
5. Press "Choose" key to input the character "A" that will be displayed in the input field;
6. Press "Finish" key to exit from the input method to finish the unit input.

III. Lowercase letter input method menu



Input lowercase letter "a":

1. Press "Ok" key to enter the input method menu;
2. Press "Cursor" key to move the cursor to the input method field;

3. Press the "Left" and "Right" key to move the cursor ;
4. Move the cursor to the soft key board for inputting lowercase letter by pressing "Cursor" key;
5. Press "Choose" key to input the character "a" that will be displayed in the input field;
6. Press "Finish" key to exit from the input method to finish the unit input.

IV. Special Unit Input Menu

Input special unit "%":

1. Press "Ok" key to enter the input method menu;
2. Press "Cursor" key to move the cursor to the input method field;
3. Press the "Left" and "Right" key to move the cursor ;
4. Move the cursor to the soft key board for inputting special unit by pressing "Cursor" key;
5. Press "Choose" key to input the "%" that will be displayed in the input field;
6. Press "Finish" key to exit from the input method to finish the unit input.

4.12.5 Analog Output

	Input	Type	Low	High	kx+b:b	kx+b:k
AOut01:	Chan01	4-20mA	0.0	100.000	0.0	1.000
AOut02:	Chan02	4-20mA	0.0	100.000	0.0	1.000
AOut03:	Chan03	4-20mA	0.0	100.000	0.0	1.000
AOut04:	Chan04	4-20mA	0.0	100.000	0.0	1.000
AOut05:	Chan05	4-20mA	0.0	100.000	0.0	1.000
AOut06:	Chan06	4-20mA	0.0	100.000	0.0	1.000

* Output channel: 01-06 and 07-12 are optional;

* Input channel: input channels corresponding to the output channels. For example: Output 02 corresponds to Channel 05, the analog output of Output 2 will be transmitted and output along with the measured values of Channel 05.

* Output type: 0 ~ 10 mA, 0~20 mA, 4~20 mA, 0 ~ 5 V, 1 ~ 5 V, 0 ~ 10 V, and No are optional;

* Lower output limit and upper output limit: adjust the upper limit and lower limit of the measurement range

of the transmitting output among the range of -9999 ~ 19999. The number of the decimal point places of each channel can be confirmed by modifying the place of the decimal point of the upper limit.

* $kx+b$: linear output formula of analog output, where b refers to zero shift of the output, and k refers to the magnification of the output.

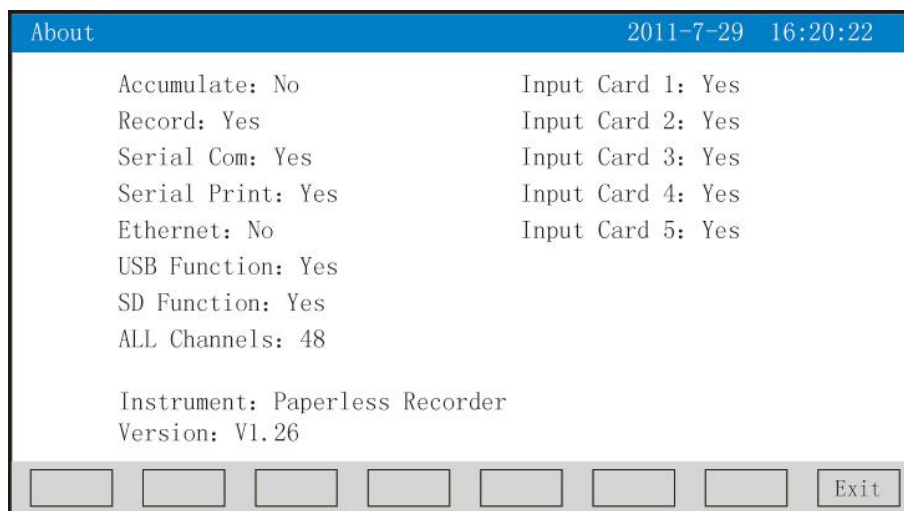
Operation: The cursor can be moved by pressing the "Left" or the "Right" keys in this menu;

Press "Up", "Down", "Page Down", and "Page Up" keys to choose the needed contents;

Press "Ok" key to confirm the actions;

Press the "Exit" key to exit from this menu.

4.12.6 Function List



* Check the function list of the instrument: it is easy to find the functions of the instrument from this menu as if there is certain function, it shows "Yes" and if there no certain function, it shows "No".

Operation: in this menu, press "Exit" key to exit from this menu.

V. Communication

The instrument is able to communicate with the principal computer, which can realize parameter setting, data collection, monitoring and other functions of lower computers. Through coordinating industrial control software under Chinese WINDOWS, the instrument has various functions including dynamic screen display, instrument data setting, graph generation, save record and report printing. By use of our software for management of the principal computer, it can also conduct real-time collection of data and curves, and record historical data and curves, which can be exported to Excel to realize data processing.

The instrument provides 3 standard interfaces for users to communicate with the principal computer, namely RS-232, RS-485 and EtherNet.

* In terms of the RS-232 mode, one principal computer is allowed to connect with only one recorder, and it is applicable for users using portable computers to randomly read the data on the recorder, connect with the wireless digital radio to conduct remote wireless transmission or to connect with the serial mini-printer to print data and curves.

* In terms of the RS-485 mode, one principal computer is allowed to connect with several recorders, and it is applicable for terminal users to form a network with this recorder so as to realize real-time receipt of the data on the recorder and connection with various control system..

* In terms of the EtherNet communication mode, several instruments are allowed to get linked to the principal computer; data exchange is conducted at the communication speed of 10 M; it is applicable for the

terminal machine to communicate with mass data of the instrument. Besides, optical network can be adopted to realize communication when the communication distance exceeds 300 m. Ethernet communication can be realized in the system configuration of the recorder with IP address selected and relevant setting made in the software for computer management.

Refer to Tables 1 and 2 for the specific parameters.

Table 1 Table of the Corresponding Input Register Address of 0 * 04 Read Command

No.	Input Register Address (Decimal System)	Parameter Name	Data Format	Type	Remarks
Dynamic variables					
1	00	Measured value of channel 1	Float	Read only	
2	02	Measured value of channel 2	Float	Read only	
.....	Float	Read only	
n	2(n-1)	Measured value of channel n	Float	Read only	n: channel number
.....	Float	Read only	
59	116	Measured value of channel 59	Float	Read only	
60	118	Measured value of channel 60	Float	Read only	
61	120	Output state of contact	Long	Read only	<p>Digits from 0 to 17 represent the output states of the contacts from 1 to 18 respectively, where 0 means "Off" and 1 means "Close".</p> <p>In terms of the address 120:00000000 00000000, the previous digits, from low to high, represent the states of alarms from 1 to 8 respectively, while the latter digits, from low to high, represent the states of alarms from 9 to 16 respectively;</p> <p>The latter digits of the previous digits of 120:00000000 00000000, from low to high, represent the states of alarms of the alarms 17 and 18 respectively.</p>

Table 2 Table of the Corresponding Holding Register Addresses of 0 * 03 Read Command and 0 * 10 Write Command

No.	Input Register Address (Decimal System)	Parameter Name	Data Format	Type	Remarks
Instrument model					
1	0	Instrument models	Char	Read only	Paperless recorder 0 * 62
Configuration parameters of the instrument					
1	1	Language selection	Char	Read-write	0: Chinese; 1: English
					After changing the display language of upper computer, the meter should be powered on after power off.
2	2	Reservation	Char		
3	3	Cold side adjustment	Short	Read-write	The communication data are the values 10 times larger than the adjusted values. For example: If the cold side adjusted value is -1.0, then the communication datum is -10.
4	4	Device address	Char	Read-write	
5	5	Disconnection handling	Char	Read-write	0: Upper limit of the measurement range; 1: lower limit of the measurement range; 2: keeping at previous value
6	6	Baud rate	Char	Read-write	0 ... 6 represent baud rates of 1200...57600 respectively.
7	7	The 1st and 2nd bytes of the IP address	Short	Read-write	For example: If the IP address is 192.168.100.2, then the 2 bytes of the register address from low to high

					are 192 and 168 respectively.
8	8	The 3rd and 4th bytes of the IP address	Short	Read-write	For the IP address 192.168.100.2, the 2 bytes of the register address from low to high are 100 and 2 respectively.
9	9	Port number of the Ethernet	Short	Read-write	
10	10	Print interval	Short	Read-write	
11	11	Hour of the starting time of printing	Char	Read-write	
12	12	Minute of the starting time of printing	Char	Read-write	
13	13	Alarm print	Char	Read-write	0: Turn-off; 1: Turn-on
14	14	Input channel number	Char	Write only	Value range: 0...59 corresponding to channels 1...60 (Note 1).
15	15	The 1st and 2nd characters of the bit number	Short	Read-write	Refer to the "channel parameters" of the instruction manual for the instrument and use ASCII code to indicate the Chinese characters in the bit numbers and units
16	16	The 3rd and 4th characters of the bit number	Short	Read-write	
17	17	The 5th and 6th characters of the bit number	Short	Read-write	
18	18	The 7th and 8th characters of the bit number	Short	Read-write	
19	19	Input type	Char	Read-write	
20	20	The 1st and 2nd characters of the unit	Short	Read-write	
21	21	The 3rd and 4th characters of the unit	Short	Read-write	
22	22	The 5th and 6th characters of the unit	Short	Read-write	
23	23	Decimal point of channel	Char	Read-write	
24	24	Lower limit of the measurement range	Float	Read-write	
25	26	Upper limit of the measurement range	Float	Read-write	
26	28	Accumulation function	Char	Read-write	
27	29	Filtering coefficient	Char	Read-write	It is the value 10 times larger than

					the parameter.
28	30	Signal elimination	Short	Read-write	It is the value 10 times larger than the parameter.
29	31	Proportional coefficient k of linear connection	Float	Read-write	Refer to the "channel parameters" of the instruction manual for the instrument
30	33	Zero coefficient b of linear connection	Float	Read-write	
31	35	Alarm type	Char	Write only	0...3 corresponding to: low-lower limit, lower limit, upper limit, up-upper limit (Note 2)
32	36	Alarm function	Char	Read-write	0: OFF 1: ON
33	37	Alarm contact	Char	Read-write	
34	38	Alarm value	Float	Read-write	
35	40	Alarm return difference	Float	Read-write	
36	42	Output channel number	Char	Write only	Range: 0 ~ 11 (Note 3)
37	43	Input channel	Char	Read-write	Value range: 0...59 corresponding to channels 1...60 (Note 1).
38	44	Output type	Char	Read-write	0...6 respectively correspond to none ... (0-10 V) of the output type.
39	45	Output lower limit	Float	Read-write	Refer to the "output parameters" of the instruction manual for the instrument
40	47	Output upper limit	Float	Read-write	
41	49	Output correction proportion factor k	Float	Read-write	
42	51	Output correction zero factor b	Float	Read-write	
43	53	LCD off	Char	Read-write	0...4 respectively correspond to parameters: 5 min ... never.
44	54	Time display cycling	Char	Read-write	0-3 respectively corresponds to parameters: 4-30 seconds.

45	55	Startup display screen	Char	Read-write	
46	56	Serial number of curve combination	Char	Write only	0...9 corresponding to the curve group from 1 to 10
47	57	Enabled or not	Char	Read-write	0: No; 1: Yes
48	58	Serial number of curve	Char	Write only	0...5 respectively correspond to the serial numbers of 1...6; there are 6 curves for a combination.
49	59	Corresponding channel number of curves	Char	Read-write	Value range: 0...59 corresponding to channels 1...60 (Note 1).
50	60	Curve display or not	Char	Read-write	0: not display 1: display
51	61	Curve color	Char	Read-write	0...5 respectively correspond to red...brown.
52	62	Record model	Char	Read-write	0: Non-cycling; 1: cycling
53	63	Recording interval	Char	Read-write	0...8 respectively correspond to 1 second...4 minutes.
54	64	Record type	Char	Read-write	0...3 respectively correspond to real-time value...minimum.
55	65	Recording after power-on	Char	Read-write	
56	66	Trigger of recording	Char	Read-write	0...4 respectively correspond to manual...timing.
57	67	Manual trigger	Char	Read-write	0: Stop; 1: Start
58	68	Input channel of alarm trigger	Char	Read-write	Value range: 0...59 corresponding to channels 1...60 (Note 1).
59	69	Alarm type of alarm trigger	Char	Read-write	0...3 respectively correspond to ultimate lower limit...ultimate upper limit.
60	70	Relay and trigger relay bit numbers	Char	Read-write	0 ... 17 respectively correspond to alarm

					contacts ALM1...ALM18.
61	71	Starting of timed trigger: hour	Char	Read-write	Refer to the "recording parameters" of the instruction manual for the instrument
62	72	Starting of timed trigger: minute	Char	Read-write	
63	73	Starting of timed trigger: second	Char	Read-write	
64	74	Ending of timed trigger: hour	Char	Read-write	
65	75	Ending of timed trigger: minute	Char	Read-write	
66	76	Ending of timed trigger: second	Char	Read-write	

Note 1: 48-input channel parameters share one common register address, and the transmitting channel number (register address 14) is used to determine the channel the parameters belonging to. Therefore, to read the parameters of a channel, the input channel number should be given first.

Note 2: Each input channel includes 4 groups of alarm types, namely ultimate lower limit alarm, lower limit alarm, upper limit alarm and ultimate upper limit alarm, which share a common register address and where alarm type (register address 35) is used to determine the group, to which the parameters belonging. Therefore, to read the alarm parameters of an input channel, the alarm type should be written first.

Note 3: Parameters of 12 transmitting channels share a common register address, and transmitting channel number (register address 42) is used to determine the channel, to which the parameters belonging. Therefore, to read the parameters of a transmitting channel, the transmitting channel number should be written first.

VI. Instrument Accessories

Name	Quantity	Remarks
Instruction manual	1	This manual
Certificate of conformity	1	Data of production
Installing support	4	Used for panel installing and fixing
Screw driver	1	Used for instrument terminal wiring
Optical disk	1	Software for management of the principal computer
USB flash disk	1	Equipped when users order for the conversion storage function of USB flash disks and with its capacity determined by that the users order for
SD card	1	Equipped when users order for the storage function of SD cards and with its capacity determined by that the users order for