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## Chapter 1 Overview

PFG-3085 Industrial online Fluorine Ion analyzer is our company's latest micro-computer based high-end instrument. It is characterized by complete English display, English menu operation, intelligence, multiple functions, high measuring performance, and strong environment adaptability. It is designed to measure fluorine ion on-line monitoring. It is suitable for the occasion of containing fluoride ion.

### Basic Function

**Intelligent:** On-line Fluorine Ion Detector adopts high-precision AD conversion and single chip microcomputer processing technologies. It can be used for the measurement of the Fluorine ion concentration value and temperature, automatic temperature compensation, self-checking etc various functions

**Reliability:** All the components are arranged on one circuit board. No complicated functional switch and adjusting knob.

**Strong interference immunity:** Its current output adopts optoelectronic isolating technology. This meter has strong interference immunity and the capacity of long-distance transmission as well as excellent electromagnetic compatibility.

**Waterproof and dust-proof design:** Its protection grade is IP54. It is applicable for outdoor use.

**Automatic timing calibration:** It can ensure the stability and reliability of the measurement instrument.

**RS485 communication interface:** It can be easily connected to a computer to perform monitoring and communication.

**Solution grounding:** It can eliminate all the disturbance of the ground circuit.

### Main Features

**English LCD display, English menu operation, English notepad:** It adopt menu structure similar to computer operation, simple operation, the steps throughout the English tips, without instructions, it can be completed.

**Multi-parameter display:** The concentration value, temperature, time and status can be displayed on the screen at the same time.

**Notepad function:** Recording instrument operation and the alarm occurrence time, easy to manage.

**Monitoring electrode function:** Each calibration mode, the time and the results are recorded, easy to query, analyzer variation regulation of electrodes.

**Digital clock function:** Provide all kinds of functions of time reference

**Display mode:** select excellent backlit 192 \* 64 dot matrix diagram form liquid crystal display screen, the realization of graphics and Chinese display. Adjustable uniform background light, can

clearly observe the operating outdoors in dark conditions.

**Instrument not crash:** Watchdog procedures to ensure that the instrument will not working continuously crash.

**Software set current output:** software selection is 0 ~ 10mA and 4 ~ 20mA output.

**Two calibration methods:** One point and manual input zero E0 and slope S satisfy the use in all cases.

**Network function:** Instrument retains the traditional isolation current output function. With RS485 communication interface, can make the instrument monitoring and communication easily into the computer. With two twisted pairs can be up to 254 table are directly linked to the microcomputer, monitoring network, the realization of multi variable distance (10 km) digital transmission and instrument remote control and remote operation.

## Chapter 2 Technical Indexes

1. Measuring range: fluorine ion concentration: 0.2ug/L~2300mg/L temperature: 0~99.9℃
2. Resolution: fluorine ion concentration: 0.1ug/L, temperature: 0.1℃
3. Automatic temperature compensation range: 0 ~ 99.9℃ ,with 25℃ as the reference temperature
4. Accuracy:  $\pm 2.5\%$ ,  $\pm 0.3^\circ\text{C}$
5. Solution tested: 0~99.9℃, 0.6MPa
6. Stability:  $\pm 1.5\%/24\text{h}$
7. Response speed: 32/s 25℃, 50/s 15℃
8. Clock accuracy:  $\pm 1$  minute/month
9. Isolated current output: 0-10mA (load resistance  $<15\text{K}\ \Omega$ );  
4-20mA (load resistance  $<750\ \Omega$ )
10. Output current error:  $\leq \pm 1\% \text{FS}$
11. Data storage capacity: 1 month (1 point/5 minutes)
12. Alarm relay: AC220V, 3A
13. Communication Interface: RS485(optional)
14. Power supply: AC220V  $\pm 22\text{V}$ , 50Hz  $\pm 1\text{Hz}$ , 24V DC (optional)
15. Protection grade: IP54, it is applicable for outdoor use.
16. Overall dimension: 146 (length) x 146 (width) x 150 (depth) mm;  
dimension of the hole: 138 x 138mm
17. Weight: 1.5kg
18. Working conditions: ambient temperature: 0-60℃; relative humidity  $<85\%$

**Attention:**

Output signal 4~20mA: current output of measured fluorine ion value

If you need a temperature corresponding to the 4~20mA current output of dual output, because of requires special order, you must specify when ordering.

## Chapter 3. Selection And Maintenance Of Electrode

### 3.1 Selection Of Electrode

Solid electrode membrane using a relatively insoluble inorganic salts. Solid electrode with homogeneous and heterogeneous methods exist. Both types of ion exchange processes due to the formation of the membrane potential. Such electrodes include silver / sulfide ion, lead ions, copper ions, fluoride, sulfur fluoride acid radical, fluoride and fluoride ion selective electrode.

How the accuracy and stability of the electrode, is one of the key factors to decide the quality of the ion gauge. Especially low conductivity water quality, higher requirement on the electrode. If using ordinary electrode to measure, the stability is poor, and the service life is short, can't satisfy to ion selective electrode (ISEs) is an electrochemical sensor based on sensitive film, this layer of film is the electrode selective response element to specific ion.

According to the different membrane materials can be divided into 4 kinds of ion selective electrode:

- glass membrane (such as Na<sup>+</sup>), solid films (such as Pb<sup>2+</sup>)
- polymer membrane (such as K<sup>+</sup>), gas permeable membrane (such as CO<sub>2</sub>)

The electrode is placed in a solution within the film will form a potential difference. When the concentration of changes within the sample of the analyte ion, ion selective electrode and a built-in or external reference electrode used together can measure the changes of electric potential difference. In principle, the settings can be described as follows:

Ion of the measured potential E and a sample of active relation degree between AI with Nernst mathematical mode can be expressed as follows:

$$E = E_0 + \text{slope} \log a_i \quad (\text{slope equal to } 2.3 RT/Z_i F)$$

Among: R is the gas constant, 8.314 JK<sup>-1</sup>mol<sup>-1</sup>

T is the absolute temperature of K

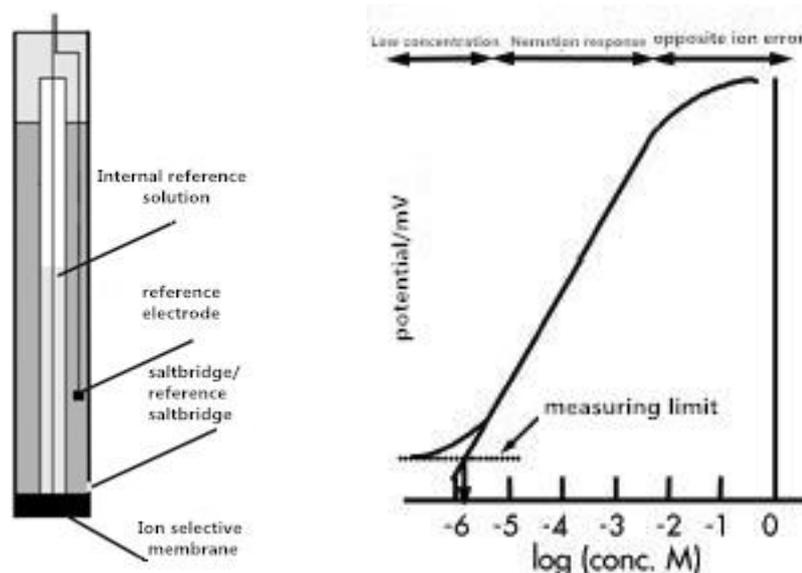
F is a Faraday equivalent, 9.6487 x 10<sup>4</sup> Cmol<sup>-1</sup>

Z<sub>i</sub> is measured ion charge

The slope at 25 °C as 59.16mV / Z<sub>i</sub>. If the measured ion is like that of monovalent ions of potassium ion (Z<sub>i</sub> = 1), when the concentration occurred idecimal changes, at 25 °C can be observed the change of 59.16mV potential. Similarly, as the calcium ion as the divalent ion (Z<sub>i</sub> = + 2), at 25 °C can be observed potential change of 59.16mV / 2 = 29.58mV

E<sub>0</sub> is every one of ion selective electrode with specific reference potential when combined with the constant potential. AI is the ion activity, but only in the solution is diluted and ion concentration equal. Ion activity depends on the sample solution was determined by ion content of the ionic strength.

The measured ion concentration will occur linear offset in the high and low end, the offset determines the measurement of high low end limit. Ion electrode can be accurate measurement to the concentration of the sample solution  $10^{-6}$ M. Under the condition of high concentration (usually higher than 0.1M) linear offset is caused by ions of opposite charge effect.



### 3.2 Maintenance Of Electrode

Ion concentration meter use is good or bad, largely depends on the maintenance to the electrode. Often should clean the electrode, ensure it is free of pollution; every once in a while to calibration electrode; in the water period, should ensure that the electrode immersed in the tested, otherwise it will shorten its service life; must keep the cable connecting head cleaning, not damp or water. Indeed instrument is out of the question, please do not repair itself, please contact us.

#### Clean

Good ion selective electrode within a minute or two to stabilize. But as the electrode film is oil or particles in the dirty solution after its response will be slower. The glass electrode head can be cleaned by alcohol or warm detergent, such as laboratory cleaning utensils with detergent. Polishing a solid-state ion selective electrodes can be used for recovery of very fine particles clean. PVC ion selective electrode rinse water can be. After thorough rinsing with deionized water, should be put into the lowest standard electrode for liquid correction for 2 to 4 hours to re calibration. Such as the electrode slope or response time does not meet the requirements, solid electrode before calibration soaking time should be longer, such as overnight.

#### Storage

Solid, PVC and a gas ion sensing electrode in the measurement gap can be stored in the low concentration standard solution. If the solid electrode for several hours without, PVC and gas ion selective electrode for many days without, it should be dry preservation. Specific circumstances please refer to instruction.

## Chapter 4 Instrument Installation

### 4.1 Unpacking

Industrial fluorine ion concentration meter consists of two tables, the fluoride ion selective electrode, composed of two parts.

After unpacking, according to packing list, please check the instrument the number, specifications and accessories, which comprises the following parts:

- 1.The fluoride ion concentration secondary meter one
- 2.Fluorine ion electrode one
- 3.User manual one
- 4.Certification one

### 4.2 Dimension and installation of the secondary meter

The instrument can be installed far away from control room of the scene, but also can be installed on site together with the measuring cell. The required connection from the two table behind the wiring column extraction.



overall dimension: 146 (length) x 146 (width) x 150 (depth) mm;

dimension of the hole: 138 x 138mm

Secondary meter have four installation modes: open hole type, hanging type, pipe type and outdoor installation

#### **Installation should pay attention to:**

1. Instrument and the measuring cell the closer the better, usually not more than 30 meters. The best will be secondary meter is fixed on the best eye level, the surface should be clean, dry, avoid water drops straight splash, must have a good grounding.
2. Electrode and instrument connection cable laid in parallel and not close to power lines, to avoid adverse effects on the signal.

### 4.3 Installation of electrode

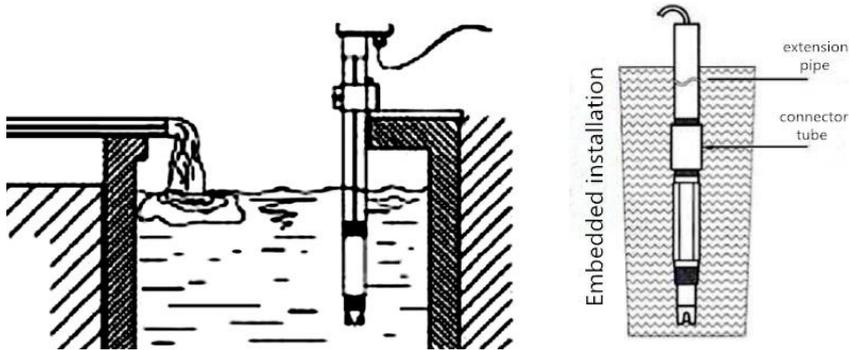


Figure 4.3.1 Installation of the measuring cell and electrode figure

The configuration of the measuring electrode and measuring device according to the different requirements of different water quality, ion meter measurement.

Can be customized according to user's: circulation type, pipe type, side wall is installed.

### 4.4 Instrument wiring

The front cover of the instrument has the following wiring diagrams can only be connected to the corresponding electrode in Figure

Fluorine ion meter Electrode connection mode (from top to bottom)	Temperature compensation
	Temperature compensation
	Measuring
	Reference
	Grounding

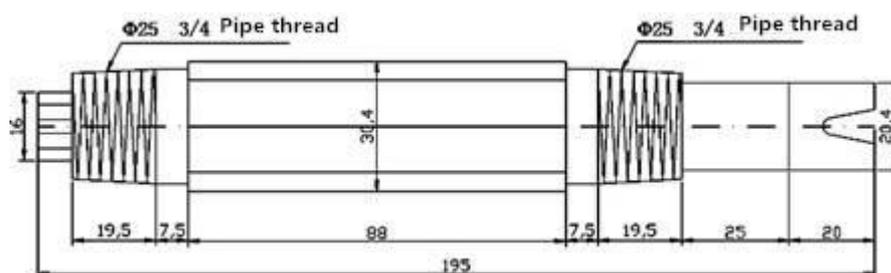


Figure 4.4.1 Electrode dimension figure

The rear of the instrument has the following wiring diagram, used for connecting a 220V AC power supply, high and low limit alarm, current output user only needs to be connected to the appropriate terminals according to their own needs.



## Chapter 5. Instrument Use

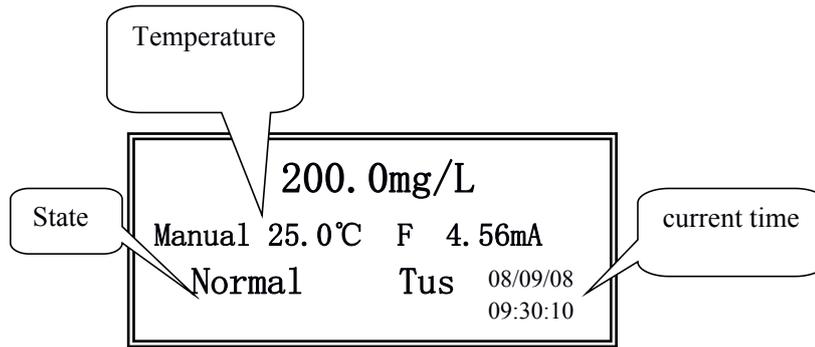
### 5.1 Function keys operation instruction

“ESC”key	<p>In the state of measurement, press "ESC" key will enter main menu display and operation interface Press "ESC" key to return to operation last state (interface). Enter any menu, press "ESC" button to return to the previous menu, continuous press can return to the measuring state.</p> <p style="padding-left: 40px;">Modify the parameters, press "ESC" key can modify the value in the back before the automatic storage.</p>
“ENTER”key	<p>Press the "ENTER" key indicates that the project (menu) or parameter the cursor is selected.</p> <p>① When the cursor is pointing to the menu name and press "ENTER" key to enter on the menu, the parameters can be modified within the menu settings;</p> <p>② When the cursor is pointing to the parameters within the menu and press "ENTER" key (or "ESC" key) indicates the selected parameters, the system will complete the parameter set, the cursor returns to the project name at the parameter belongs;</p> <p>③ into the "historical data" sub-menu, when displaying the historical trend, press "ENTER" key to enter the upper (lower) limit and the number of days in advance to modify the interface to display.</p>
<p style="text-align: center;">▲▼ ◀▶ key</p>	<p>① These four keys are the arrow keys, respectively: up, down, left and right, you can move the cursor to the item to be selected (menu) or the parameter;</p> <p>② When entering values to modify the state, press ▲▼ key can be added separately, decrease the value, continuous press and hold, will accelerate the rate of change in value. Press ◀ or ▶ key can initialization parameter values.</p>

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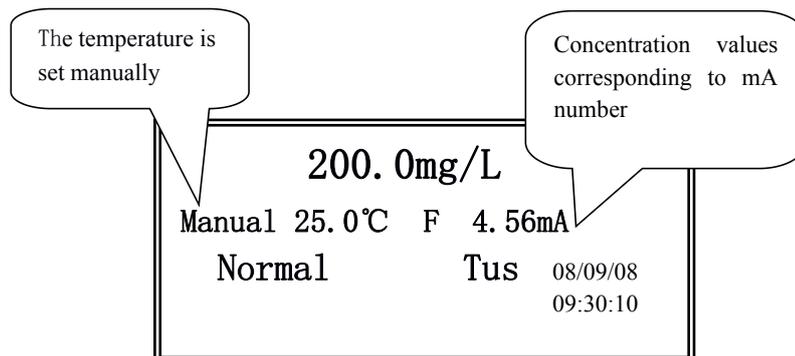
### 5.2 Measuring status and display

1. Instrument power-on after completion self-test automatically enter the measurement status , display as follows:



The status line displays the following information: normal, high alarm, low alarm, the slope is too high, slope is too low. In addition to "normal", and the rest are displayed flashes to alert the user. **Note:** "The slope is too high" refers to the slope of the S more than 1.200 "slope too low" refers to the slope of S is less than 0.700.

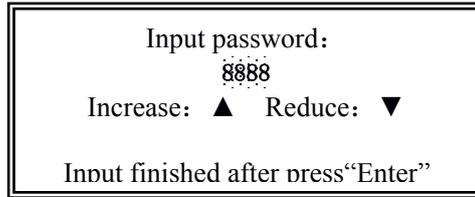
2. The manual measurement mode when the set temperature: to meet in each case, the temperature may be manually set in the range of 0 ~ 80 °C . Once the temperature is set to "manual", the instrument does not detect the actual temperature of the test solution, the temperature at the front will have a "hand" word on the main display. The setting method, see "Parameters" submenu.



3. Overtime automatically returned to the measuring state: Press the "Menu" key to enter the main menu. Once entering the main menu (except for electrode calibration menu item), each time the key is pressed, the internal timer will start counting, no more than 2 minutes operation will automatically return to the measurement state to avoid careless operation, no refund after use to the measurement state, resulting in a longer time can not be measured.

### 5.3 Password inputting and changing

In order to avoid misoperation irrelevant personnel, on entering certain will affect the instrument operation menu items such as: parameter setting, calibration, manual current source and system maintenance, first asked to enter a password, the instrument system test correctly before being allowed to enter. But no effect on the meter running operation, such as historical data and parameter display, you do not need to enter the password. The password input interface is as follows:

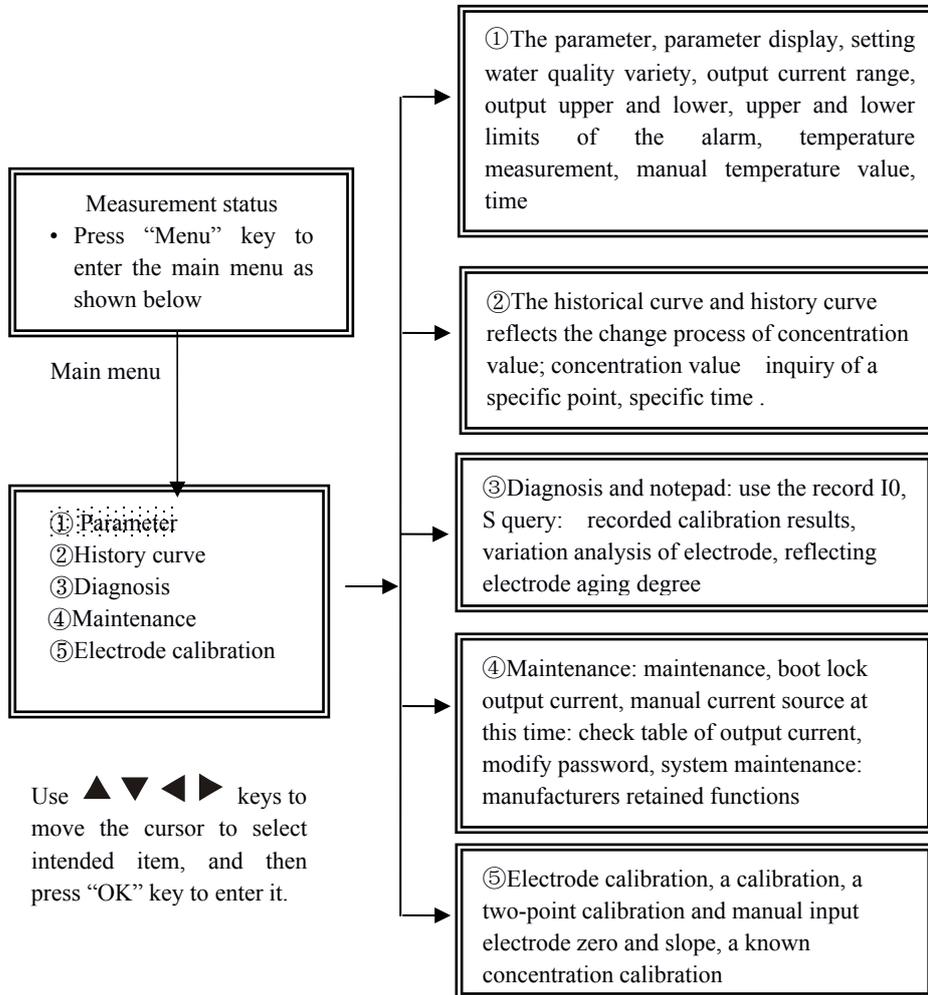


The system has only one password, factory default password is 6666. In the password entry screen, press ▲▼ key, can increase or decrease the value of the password entered, press the other two arrow keys can cause the password entered value back to 6666. Press the Escape key to return to the previous menu, press the "OK" button, the system will automatically check the password. If the password is correct, you can automatically enter the next level menu; wrong password, the user will be prompted for a password error, after three seconds to automatically return to the previous menu.

To change the password, select the "Maintenance" menu item in the "Change Password" submenu. First enter the old password, test instrumentation system correctly before entering the password modification interface, on-screen prompts to enter a new password and press the "OK" button to complete the modification. If you forget your password, please contact us.

## Chapter 6. Detailed Explanation Of Menus And Functions

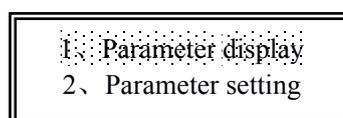
### 6.1 List of menus and functions



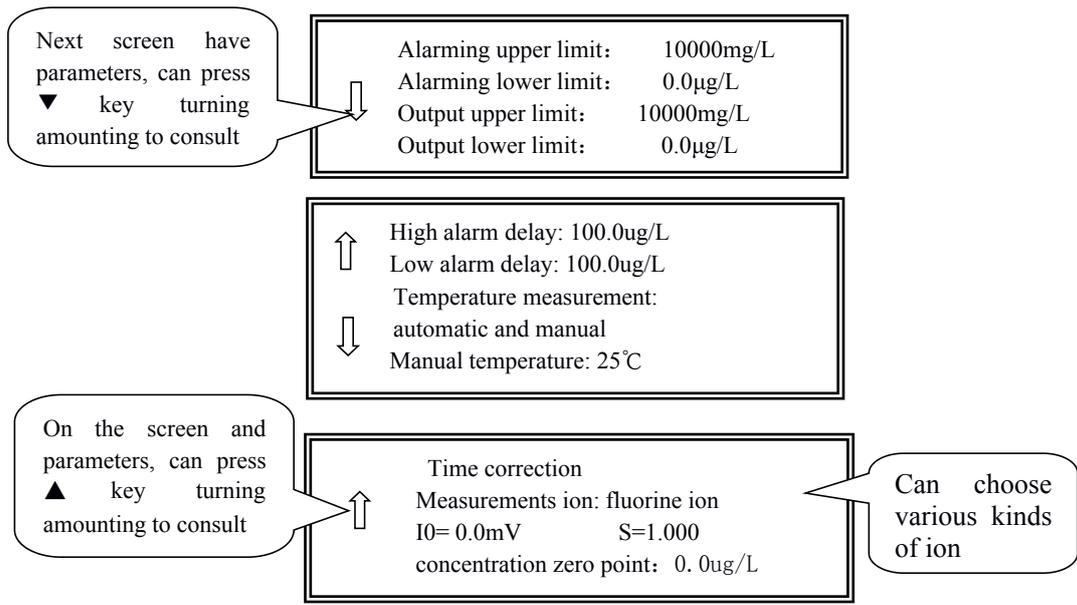
### 6.2 “Parameter” sub-menu

This sub-menu is used for parameter display and setting. If “parameter display” is selected, parameters can be viewed only there but not modified. To avoid access of unauthorized persons, password is required to enter the “parameter setting” item.

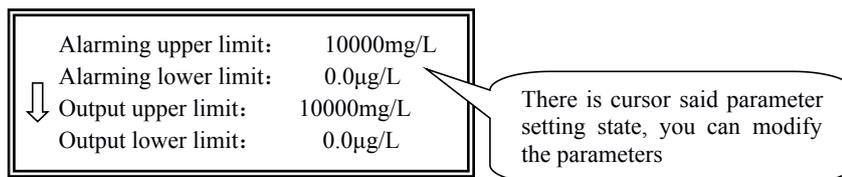
Before measurement, parameters should be set according to the site conditions. If not, the default settings (for new instrument) or previous settings (for instrument used before) will apply.



1. Parameter display: current value display a variety of parameters, three screen, and they can be viewed only but not modified.



2. Parameter setting: input the password correctly, can enter the "parameter setting" project. This parameter in the screen name will have the cursor shadow, that can modify the parameters of. There are three screen:

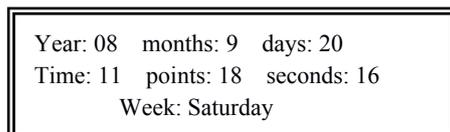


**Example 1. Output upper and lower limit settings**

When the cursor is pointing to "output ceiling", press "OK" button, the cursor is pointing to the upper limit of the output. Button loop initialization can limit the output of 100.0ug / L, 1mg / L, 100mg / L, 1000mg / L, 10000mg / L, Press ▲ to increase the value, ▼ button to decrease the value, when the value displayed is all you need when you press the "OK" button (or the "Exit" button), the output of the upper limit set, the cursor returns to the "output ceiling," the name of place. The same output limit setting method.

**Example 2. The time correction**

The secondary meter is with the time table for storing data. If the wrong time, the recording will be wrong, after the "historical curve" function will not be the correct data. Enter the "time correction" setting interface as follows:

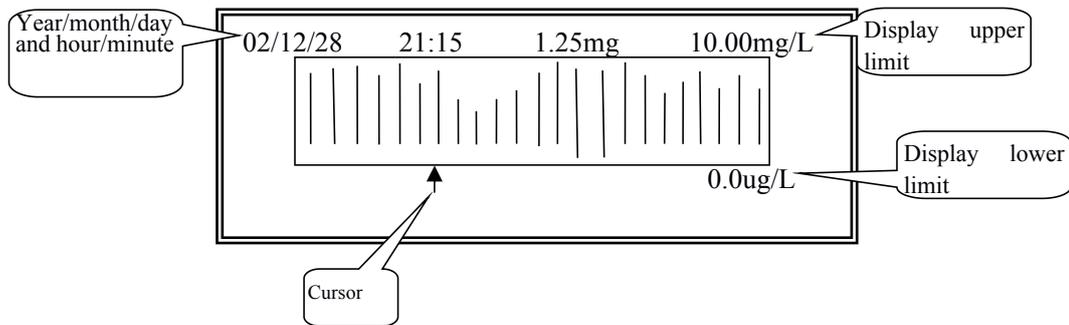


**6.3 “History curve” sub-menu**

The sub menu contains functions of digital recorder instrument, achieved at the same time on the same screen: the history curve shows the fluoride ion concentration and the specific point, specific time value of inquiry.

"History curve" from the overall reflect the trend and process quality, is very conducive to discover and solve problems. "Specified point/time" will be get concentration value of specified point/time.

Secondary meter can be stored from now, a recent months of data, every 5 minutes to save a little, a month before the data will automatically be covered. To enter the menu after half a day, recent data show as below:



Press "Enter" key to enter the screen for modifying the display upper limit and lower limit and display previous time curve or data inquiry. Points without data are displayed as 0.0.

Note: There is a cursor below the graph, and press ◀▶ key to move it to select specific point. Above the graph there displays time and concentration value corresponding to the cursor position, which is very useful for positioning in the case of abnormal points. For example:

### 1. Inquiry concentration value at specified time point

Backward inquiry: press ▶ key, the cursor will move to the right and the time displayed above the graph will become closer to the current time. When the cursor has moved to the rightest position, press ▶ key to display the curve of the next half day.

Forward inquiry: press ◀ key, the cursor will move to the left and the time displayed above the graph will become farther from the current time. When the cursor has moved to the leftest position, press ◀ key to display the curve of the previous half day.

### 2. Quick inquiry of concentration curve of a specified period or concentration value of specified point or time

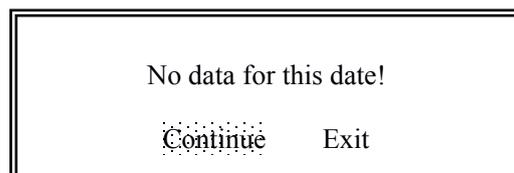
After entering "history curve" sub-menu, and the screen displays history curve, press "Enter" key to enter the screen for modifying the upper/lower limit and the advance days. The screen is shown as follows:

Display upper limit:	10.00 mg/L
Display lower limit:	0.0 ug/L
Advance days:	0 days
Time of inquiry:	Dec 20, 2008

Use the direction keys to select the item to be changed, press “Enter” key to enter the modifying screen, and press ▲ ▼ keys to modify the values. Items that can be modified include display upper/lower limit and advance days. The time of inquiry is automatically displayed on the bottom line.

Press “ESC”, the second half day curve of the selected date will be displayed. Then, use ◀ ▶ to inquire specified points.

If the time specified is beyond the effective range, the following will be displayed:

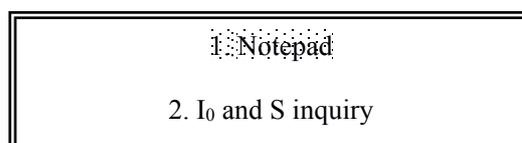


At this time, select “continue” to go back to date entering screen. If “exit” button is pressed, the display date will remain unchanged, then the direction key point query available

Different measurement points have different values, and the “display upper limit” and “display lower limit” of the “history curve” should be appropriate. If the upper limit is too low, all lines will take up the whole screen, without showing the change tendency. If the lower limit is too high, there will be no line in the screen. So appropriate upper limit and lower limit should be set according to the range of the measured values. See the previous section for the steps of setting. After modification is completed, press “ESC” key to apply the new display upper limit and lower limit.

## 6.4 “Diagnosis” sub-menu

“Diagnosis” sub-menu is used to monitor and inquire the conditions of the instrument and the electrode.



### 1. Notepad

The instrument can record 200 latest events, including powering on, powering off, starting of high alarming, end of high alarming, starting of start-up maintenance, end of start-up maintenance, starting of manual current source, end of manual current source, modifying atmospheric pressure, changing current output manner, changing system password, starting of one-point calibration, end of one-point calibration, starting of two-point calibration, end of two-point calibration, starting of slope calibration, end of slope calibration, manually inputting I<sub>0</sub> and S, reset or instant power failure, changing temperature measurement manner, changing manual temperature, and so on. See

the example below:

08 / 09 / 08	>	Run on electricity	Event type
08 : 30 : 28	>		
08 / 11 / 28	>	Change the alarm limit	
18 : 20 : 38	>		
08 / 11 / 28	>	Change of temperature measuring method	
18 : 20 : 38	>		
08 / 11 / 28	>		
18 : 21 : 15	>	High limit alarm start	

Time of the event  
year/month/day  
hour/minute/second

There are other events below

Use ▲ key to view earlier events and use ▼ key view later events.

## 2. I<sub>0</sub> and S inquiry

I<sub>0</sub> is the zero current of the electrode and S is the slope rate of the electrode.

This function of inquiry I<sub>0</sub> and S can faithfully record the changing course and aging degree of the electrode, helpful for judging whether the electrolyte is used up and the sensitive membrane needs to be changed.

The instrument stores the calibration results of the last 50 calibrations. In the inquiry screen, there are only 7 calibration results in one screen. Use ▲ key to move forward and inquire earlier calibration results, and use ▼ key to move backward. These data to the user can be viewed only but not modified.

Calibration method	Time	I <sub>0</sub>	S	Calibration results
2	02. 12. 28	-0. 012	-238. 1	
1	03. 03. 29	-0. 022	-236. 1	
4	03. 06. 20	-0. 033	-235. 83	
3	03. 09. 30	-0. 036	-233. 6	
3	03. 10. 01	-0. 038	-232. 5	
4	03. 09. 30	-0. 036	-233. 3	
4	03. 09. 30	-0. 039	-232. 1	

Time of calibration

Note: the calibration method -- "1" indicates a point calibration standard solution; "3" means manual input of I<sub>0</sub> and S; Time calibration time.

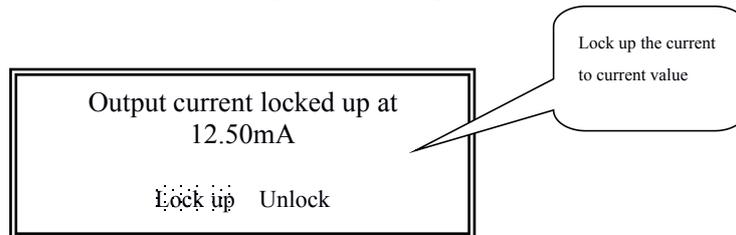
## 6.5 "Maintenance" sub-menu

1. Start-up maintenance
2. Manual power supply
3. Password changing
4. System maintenance

### 1. Start-up maintenance

During operation of the instrument, when the electrode or measurement pool is being maintained, the sample supply is interrupted or the electrode has been taken out, the data collected, the output current and the data saved are false data. To avoid such condition, this instrument is provided with the function of start-up maintenance to lock up the output current. When it is used on-line, computer will detect that this instrument is under maintenance and thus stop recording data and automatically follow up the duration of the maintenance.

Entering this item, the screen will display the following:



The current is locked up at current value, and a signal indicating start-up maintenance is sent to the computer. After completion of the start-up maintenance, select “unlock” button or press “ESC” key.

Attached: provide calculation instrument output current of 4 ~ 20mA current output signal, but the concentration of corresponding value interval can be set by the user, measured concentration values following corresponding relations with the output current:

For 4 ~ 20 ma output way:  $I = 4 \text{ ma} + \{D - X\} / \{S - X\} \times 16 \text{ mA}$  formula (2) :

I, the concentration of the corresponding output current value;

D - the current measured density;

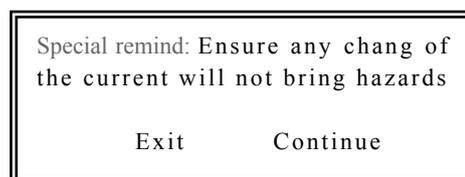
S - the user the corresponding set of 20 mA current density, the maximum output;

X - the user to set the corresponding four ma current density, the output limit.

## 2. The current source manually

Into the current to enter the password, the password right before entering. In the project, the range of output current is set in the "parameter setting" project scope. Set the purpose of this function is to allow the user to set the output range check the accuracy of the instrument output current.

After entering show as follows:



Special remind: when using this function, because the output current arbitrarily set by the user, and may change in the whole range, to ensure the control output does not produce harmful consequences.

D/A Adjustment:	0.000%
Out-H:	10000mg/L
Out-L:	0.00ug/L
Set current:	12.06 mA

If according to current value and output current value is not equal, press "ok" button, the cursor point to D/A benchmark fine-tuning the values of the parameters, key changes. The value of the D/A benchmark fine-tuning can make according to current value and equal output current value. There are three way check at least:

1. In the output termination multimeter, check the correctness of the output current;
2. Plug in recorder, contrast examination;
3. The output connected to the computer sampling system, contrast examination.

Attached: the calculation of output current, instrument provides 4 ~ 20 ma current output signal, and the matching of the ion density range can be set by the user based on measuring the ion density and the corresponding relation of the output current is as follows:

$$I = 4 \text{ ma} + \{D - X\} / \{S - X\} \times 16 \text{ mA} \text{ formula (2) :}$$

I - current ion concentration of the corresponding output current value;

D - the current measured ion density;

S - the user setting of 20 mA current corresponding to the ion density, namely the upper limit of output;

X - the user to set the corresponding four ma current ion density, namely output limit.

3. See section 5.3 for password change.

4. System maintenance

"System maintenance" reserved for manufacturers, users don't generally enter, otherwise it will affect the normal operation of the instrument. When the cursor is pointing to the digital serial number, press the key to the transformation of digital serial number, press "confirm button" into the corresponding

menu. Recover passwords, notepad, delete curve and delete I0, S these four functions according to the "key" under the cursor automatically return after the corresponding function. Attach display on/off, D/A is on/off according to these two functions under the "key", "key" on the pass. If users find record wrong data function is clear curve, notepad function is clear notepad can return to normal.

## 6.6 "electrode calibration" submenu

### 1. Overview

Because of the zero potential is not the same in each ion electrode, electrode for the conversion coefficient of the solution density (i.e., slope) and cannot be accurately do the theoretical value, has the certain error, and more major is zero potential and slope in use process will continue to change, aging, this needs from time to time by measuring standard buffer solution to obtain actual

zero potential of electrode and the slope, namely "calibration".

**Calibration:** using only a standard buffer solution to calibrate the electrode and electrode of the slope is constant, the zero potential of electrode were calculated. But in the case of measurement accuracy is not high adopt this method simplify the operation.

**Two-point calibration:** six standard buffer solution in any of the two. The electrode used for the first time, have to use two calibration, every once in a while after calibration. Such as measurement accuracy is not high, a calibration are available, and to ensure the accuracy of measurement, two point calibration must be used. A bit after calibration, display value if not satisfied, should be with a two point calibration.

**Manual input zero slope:** in the case of known electrode zero and the slope can be directly input electrode zero slope, you can also manually enter zero concentration compensation.

**Known concentration value calibration:**

According to the screen prompt operation, very convenient to carry on the calibration. After the calibration can enter "parameters" submenu observation zero and slope. To enter a password first, after verification, in the "calibration" electrode submenu, show as follows:

Regardless of the choice of the kind of standard solution before calibration, are applied in deionized water rinse the electrodes to the calibration of more than two times. Then the electrode at the bottom of the water drop gently dry with a clean paper, do not go to clean the electrode with filter paper, in order to avoid electrode with static electricity, resulting in unstable readouts. The standard buffer solution into the calibration beaker, insert ion electrode. According to the following screen prompt steps to do.

**2. One point calibration standard solution**

Select the concentration of buffer solution is close to the standard value and the measured water sample was used as the calibration solution

The output current is locked in the 11.18mA	
Please put the electrode taken out, washed, blot with the filter paper into water droplets, standard solution	
Wait	Finish

With fluoride as an example, the choice of standard solution menu:

Please select standard solution:	
1900m	1.900m
190.0m	190.0u
19.00m	19.00u

The choice of a good standard solution using the ▲ ▼ key, press the "OK" key to enter the calibration. Enter the calibration will be displayed as follows:

23.6 °C	-8.0mV
Wait for the numerical stability	
Unstable	Stable

Waiting for numerical stability, see part of liquid, and whether the same standard solution selected electrode wiring is connected tightly or error etc.. If the deviation is not big choice theory and "stable", click "OK" button to show the calibration results, shown as follows:

08 Y 10 M 13 D Calibrate:	
I <sub>0</sub> = - 2.3 mV	
S = 1.000	
Qualified	Fail

The error of zero point is in line with the requirements of electrode. Identification of the user is not successful, the election of "failure", "back electrode calibration" sub menu. If choose "qualified", results are automatically stored calibration, in the "diagnosis" sub menu "I<sub>0</sub>, the S query" or "parameters" sub menu "parameter display" project can query to.

13 Y 10 M 25 D Calibrate:	
I <sub>0</sub> = - 2.3	
Data storage is complete!	

After three seconds, the display as follows:

Please plug it back in the pool of electrode measurement and installed	
Confirm	

According to the prompt the instrument damage control work is finished, click "OK" button is shown as follows:

Release the lock output current	
---------------------------------	--

Tip three seconds automatically return to the state of measurement. Standard solution concentration meter display current temperature values.

### 3. Two point standard liquid calibration:

User electrode used for the first time or requirements for measuring accuracy of the two calibration, into two calibration, display as follows:

The output current is locked in the 11.18mA  
Please put the electrode taken out, washed, blot with the filter paper into water droplets, standard solution  
Wait                  Finish

Calibration method of the same point of the calibration standard solution. The difference is, the need for automatic indicating instrument screen basis, a choice of two standard solution for calibration, the instrument automatically calculate the electrode zero and the slope value.

### 4. Manual input $I_0, S$

If the user is known at the electrode slope under the condition of zero and can be directly input  $I_0$  electrode, S. After entering the show are as follows:

The output current is locked in the 11.80mA  
Please input  $I_0, S$   
Electrode zero point: 0.5  
Electrode slope: 0.988

When the cursor is pointing to "electrode zero" when the key that is initialized to 0; when the cursor is pointing to initialize "electrode slope" button to 1; finished press "exit" button to return to the previous menu.

After entering known concentrations of calibration, the interface is as follows:

The output current is locked in the 11.80mA  
Please enter the tested concentration value:  
1900mg/L

The input is the liquid concentration, waiting for the numerical stability after "stable" button:

25.0°C                  0.0mV  
Known concentration is 1900mg/L  
To be mV number and temperature stability  
Unstable                  Stable

This method is suitable for the known calibration solution concentration, calibration after the end,

is shown as follows:

08 Y 10 M 25 D Calibrate:	
Concentration zero point:	0.0ug/L
Qualified	Fail

The error of zero point is in line with the requirements of concentration. Identification of the user is not successful, the election of "failure", "back electrode calibration" sub menu. If choose "qualified", results are automatically stored calibration.

Two if the composite electrode, should ensure that the standard solution of electrode and the temperature of electrode placement of known concentration value at the same time. When ready, choose "finish", is shown below:

Please select standard solution:		
1900mg/L	190.0mg/L	19.00mg/L
1.900ug/L	190.0ug/L	19.00ug/L

Click "OK" button, the cursor will be between the values in the "electrode zero" and "electrode slope" conversion,

The choice of a good standard solution with the ▲ ▼ keys, press the "OK" key to enter the calibration.

For example, selected standard solution 355.0mg/L, enter the calibration will be displayed as follows:

23.6 °C	+8.0
Wait for the numerical stability	
Unstable	Stable

Wait for the numerical stability, numerical and theoretical numerical display to see whether the difference is too large, if you should find out the reasons, at the part of liquid, and whether the same standard solution selected electrode wiring is connected tightly or error etc.. If with the numerical error has little choice "stable", click "OK" button to show the calibration results, shown as follows:

08 Y 10 M 13 D Calibrate:	
I <sub>0</sub> = - 2.3	
Qualified	Fail

See the I<sub>0</sub> error is in line with the requirements of. Identification of the user is not successful, the election of "failure", "back electrode calibration" sub menu. If choose "qualified", results are

automatically stored calibration, in the "diagnosis" sub menu "I0, S query" project and the "parameters" sub menu "parameter display" project can query to.

08 Y 10 M 25 D Calibrate:  
I<sub>0</sub>= - 2.3  
Storage is completed

After three seconds, the display as follows:

Please plug it back in the pool of  
electrode measurement and  
installed  
Confirm

According to the prompt the instrument damage control work is finished, click "OK" button is shown as follows:

Release the lock output current

Tip three seconds automatically return to the state of measurement. The instrument shows the standard solution of the current temperature values.

## Chapter 7. Caution And Maintenance

1. Secondary meter generally does not require routine maintenance, in apparent failure, please don't open repair itself, contact us as soon as possible!
2. After the power supply is turned on, the instrument should be displayed, if no show or display is not normal, should be immediately shut off the power supply, power check whether it is normal.
3. Must maintain the cable connecting head cleaning, not damp or water, or will the uncertainty.
4. We should often clean the electrode, ensure it is free of pollution.

## **Appendix 1. The preparation of fluorine ion standard solution**

1. 1900ppm fluoride ion standard solution configuration: weigh 4.1990 grams of pure sodium fluoride in quantitative analysis of 1000mL bottle, and then adding deionized water to the mark, to be completely dissolved in the sodium fluoride, fluoride ion solution for 1900ppm standard solution.
2. 190ppm fluoride ion standard solution configuration: weigh 0.4199 grams of pure sodium fluoride in quantitative analysis of 1000mL bottle, and then adding deionized water to the mark, to be completely dissolved in the sodium fluoride, fluoride ion solution for 190ppm standard solution.
3. 19.0ppm fluoride ion standard solution configuration: weigh 0.04199 grams of pure sodium fluoride in quantitative analysis of 1000mL bottle, and then adding deionized water to the mark, to be completely dissolved in the sodium fluoride, fluoride ion solution for 19.0ppm standard solution. Also available with 1900ppm fluoride ion standard solution accurately diluted 100 times or 190ppm fluoride ion standard solution accurately diluted 10 times.

**Note:** 1. Other concentration and so on.

2. 1ppm=1mg/L.