WS200 Fluoride/pH/Conductivity 7-in-1 Portable Meter Kit

User Manual

RoHS compliant CE ISO 9001:2015

APERA INSTRUMENTS, LLC

www.aperainst.com

v2.0

Table of Contents

1 Overview

Thank you for purchasing the Apera Instruments WS200 pH/Condivity/Fluoride 7-in-1 Portable Meter (Hereon after referred as the meter). Before using the product, please read this manual carefully to help you properly use and maintain the instrument For technical support, please contact us at info@aperainst.com or +1 (614)-285-3080.

The WS200 meter is widely used for drinking water, surface water and other water treatment applications, ideal for both in-field and laboratory testing.

1.1 Basic Functions

- Automatic calibration and temperature compensation (ATC), data storage, self-diagnostics, automatic shutdown, low-battery reminder
- Adopting digital filtering and intelligence to improve the instrument's responsiveness and accuracy of measurement data.
- Meets IP57 Waterproof and dustproof rating, ideal for use under harsh environment.

1.2 Features of Fluoride Ion Measurement

- Patented structure of the 3-in-1 ion electrode contains fluoride ion-selective electrode, reference electrode, and temperature electrode. This design generates quick stability, fast response, and is easy to use.
- No need for stirring or added reagents, directly measuring the ion concentration of fluoride in a quick and simple manner, directly measure the fluoride concentration with three different units: mg/L, ppm and pF.

1.3 Features of pH Measurement

- 1-3 points of automatic calibration, with calibration icons and self diagnosis function.
- Automatic recognition of up to 12 different pH standard buffer solutions, there are three series of standard buffer solutions to choose from: U.S.A, NIST, and China.

1.4 Features of Conductivity Measurement

- 1-3 points of automatic calibration, with calibration icons and self diagnosis function.

- Automatically recognize up to 8 kinds of conductivity standard solutions. User can choose from two series of standard solutions: Europe & USA and CHINA.
- Automatically adjusts conductivity measuring range, the meter will do perform automatic temperature compensation test for purified water and high purified water less than 10μS/cm, which greatly improves the measuring accuracy. It is especially suitable for use in electrical power, microelectronics, and medicine industries.

2 Technical Parameters：

2.1 Fluoride Ion

Measuring range	0.02 ppm to 1900 ppm
Display units	mg/L, ppm, pF
Accuracy	±0.02 ppm or ±5% of reading (whichever is greater)
Temperature Compensation Range	(0-80) ℃ (Automatic)
pH range requirement for accurate fluoride ion measurement	5.00 to 6.00 pH

2.2 pH

Measuring range	(-2.00 to 19.99) pH
Resolution	0.1/0.01 pH
Accuracy	± 0.01 pH ± 1 digit
Temperature Compensation Range	(0 - 100) ℃ (Automatic)

2.3 mV

Measuring range	-1999mV ~ 0 ~ 1999mV
Resolution	1mV
Accuracy	±0.1% FS

2.4 Conductivity:

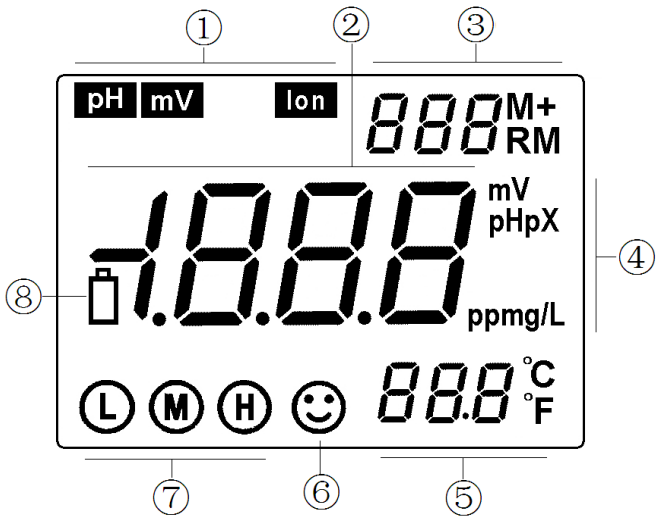
Measuring Range	Conductivity：（0.00~19.99）μS/cm （20.0~199.9）μS/cm （200~1999）μS/cm （2.00~19.99）mS/cm （20.0~199.9）mS/cm TDS: （0～100）g/L Salinity：（0～100）ppt Resistivity：（0～100）MΩ·cm
Resolution	0.01/0.1/1μS/cm 0.01/0.1 mS/cm
Accuracy	±1.0% F.S
ATC Range	（0 - 50）℃（Auto）
Electrode Constant	0.1 / 1 / 10 cm^{-1}
Base Temperature	25℃、20℃ and 18℃

2.5 Other technical parameters:

Data Storage	800 Sets
Storage Content	Numberings, measurements, units of measurement and a temperature values
Power Supply	AA Battery (1.5VX2)
Size and Weight	Instrument:(65X120X31) mm/180g ; Suitcases:(360X270X76) mm/1.5Kg
Quality and Safety Certification	ISO 9001:2015, CE, RoHS
IPClass	IP57 Dustproof and waterproof

3 Instrument Description

3.1 LCD Display



① —— Parameter mode
② —— Measuring value
③ —— Measured value storage and display of numbers, symbols indicate:
M+ — Store Measured value
RM - Recall measurement values Icon ;
④ —— Measurement unit
⑤ —— Temperature measurement and unit
⑥ —— Smiley face; icon indicates stable readings
⑦ —— Instrument calibration indicator
⑧ —— Low battery reminder

3.2 Operation keys

The meter has 5 operation keys in total.

3.2.1 ON/OFF — Switch on / off key

3.2.2 CAL — Calibration key

(a) When in the measurement mode, press this key to enter calibration mode.

(b) When in the parameter setting mode, press this key to change the number or the ON/OFF state.

3.2.3 MODE — Function key

(a) When in pH measurement mode, short press to change measurment parameters, long press this key to enter parameter setting mode P1, P2, P3 ……

(b) When in Conductivity measurement mode, press this key to enter parameter settings mode P1, P2, P3 ……

(c) When in Fluoride measurement mode, press this key to enter parameter setting mode P1, P2, P3 ……

3.2.4 ☼/ENTER — Backlight and enter key

(a) When in the measurement mode, short press (< 1.5s) to turn the backlight display on or off;

(a) When in the calibration mode or the parameter setting mode, press this key to confirm, and to make the meter enter measuring state;

(c) When in pH measurement mode, press this key to change resolution simultaneously: 0.01→0.1 pH

(d) When in Conductivity measurement mode, press this key to change parameter simultaneously: TDS→SAL→RES→COND.

(e) When in Ion measurement mode, press this key to change parameter mode simultaneously: mg/L → ppm → pX

3.2.5 M+/RM — The combination key of memory storage and recall memory.

(a) When in the measurement mode, short press this button (< 1.5s) to save the measuring data.

Long press this button(> 2s) to display the stored measuring data.

(b) When in the parameter setting mode, press this button to change the unit % → mol → g/cm3 → g/L or turn the meter ON/OFF.

3.3 Data Storage, Recall Data, and Clear Data

3.3.1 Data Storage

While in the measurement mode, when the measurement data is stable and the smiley face icon appears, short press M+/RM key (< 1.5s), LCD will display " M+" icon and a storage serial, and meanwhile storing all of the measurement information. It can store up to 300 groups.

3.3.2 Display measurement information

(a) While in the measurement mode, long press M+/RM (> 2s), meter will display the last stored information, and the storage number and "RM" icon will appear in the lower right corner of the LCD, and the complete measurement information. Again short press M+/RM or CAL meter will in turn display all the saved data. Hold M+/RM or CAL to quickly check the data.

(b) In the data displaying mode (there are **RM** and storage number in the upper right corner of the LCD), press ☼/ENTER key to return to measurement mode.

Clear the stored data: In the data displaying mode, press ☼/ENTER key for 5 seconds, LCD will appear **CLr** for 2 seconds. It means that all the storage has been eliminated, and returns to measurement mode.

4 Fluoride Ion Concentration Measurement

4.1 Preparation

4.1.1 Press ON/OFF key to power on, connect F501-S fluoride ion electrode (pay attention to inserting direction), the meter automatically switches to fluoride ion concentration measurement mode.

4.1.2 Hold ☼/ENTER to change fluoride ion concentration unit from mg/l, ppm to pX , release the button after selection.

4.1.3 If it is a new electrode or if it is your first time use, activate the electrode by soaking it in 19.00 mg/L calibration solution for 1 hour. For regular usage, soak 10 to 20 minutes to activate it. When the

reading is fully stabilized (☺ stays on screen), the electrode activation is finished. Then you can start calibration and measurement. (Please note that the reading during activation is random).

4.1.4 If the pH range of your measured solution is between 5.00 to 6.00 pH, then you can start the calibration and then measurement directly; if the pH range of your measured solution is beyond that range, we recommend that you add the Fluoride Ion TISAB (Total Ionic Strength Adjustment Buffer, SKU: AI1401) to your measured solution at the ratio of 1:1, and also add the TISAB to the calibration solution at the ratio of 1:1, and re-calibrate the electrode before measurement. This method stabilizes ionic strength and pH, reduces interference from other ions, and ensures consistent and accurate readings across different samples.

4.2 Calibration

4.2.1 Press CAL, LCD displays 0.19 mg/L, and LCD top right corner CAL and the bottom left L will be blinking, indicating that the meter has entered the 1st point calibration mode and the calibration solution is 0.19 mg/l; Rinse the fluoride-ion electrode in distilled or deionized water and shake off the excess water; dip the electrode into 0.19 mg/L calibration solution, stir gently and let it stand still.

4.2.2 When the reading is stable and icon ☺ stays on screen , press CAL key again to finish 1st point calibration. End and 19.0 mg/L will be displayed after a few seconds. CAL and H will be flickering on the screen, indicating the meter has entered the 2nd point calibration mode and the calibration solution is 19.00 mg/L.

4.2.3 Take out the electrode and shake off excess solution, then dip it into 19.00 mg/L calibration solution, stir gently and let it stand still. When the reading is stable and ☺ stays on screen, press CAL key again to finish 2nd point calibration. After a few seconds End shows up, indicating the end of calibration; LCD' left corner shows two-point calibration icons L and H; The instrument automatically enters measurement mode.

4.3 Sample Measurement

4.3.1 Rinse the fluoride-ion electrode in distilled or deionized water and shake off excess water or blot dry with filter paper. Soak the electrode into your sample solution, stir gently and let it stand still; get the measurement when the reading is stable and ☺ stays on screen.

4.3.2 Hold ☼ ENTER to show Fluoride concentrations in different units, release after selection.

4.3.3 Short press MODE key, the meter enters the **mV** mode and displays the mV value of the fluoride ion concentration.

4.3.4 After test, rinse off the electrode with distilled water, shake off excess water, and store dry with the cap on.

4.4 Parameter Settings

Table (4-3)

Symbol	Parameter sets the project	Code	Parameters
P1	Temperature unit selection		˚C / ˚F
P2	Backlight display time setting	bL	0-1-3-6 min
P3	Auto power off time setting	AC	0-10-20 min
P4	Restore to factory default settings		OFF-ON

4.4.1 Temperature units ° C/ºF selection (P1)

Long Press MODE to enter P1，remaining operations see section 5.4.5

4.4.2 Backlight display time setting (P2)

In P1, long press MODE to enter P2，remaining operations see section 5.4.6

4.4.3 Auto-off time setting (P3)

In P2, press MODE to enter P3，remaining operations see section 5.4.7

4.4.4 Restore factory default (P4)

In P3, press MODE to enter P4，remaining operations see section 5.4.8

4.5 **Notes**

4.5.1 The meter does not automatically recognize calibration solutions. Please make sure to use correct calibration solution according to the displayed reminders "0.19 mg/L" or "19.00 mg/L".

4.5.2 The calibration solution can be easily polluted, especially for low concentration solution (0.19 mg/l). Please pay attention to avoid contamination otherwise a large measurement error will occur. Replace the solution after 4~5 times of use.

4.5.3 When storing the electrode, just rinse it out and shake off excess water, then store dry with the electrode cap on.

4.5.4 When testing solutions in the order from low-concentration to high-concentration, the electrode does not need to be rinsed. Just shake off excess water or blot dry with filter paper. If it's from high-concentration to low-concentration, you need to rinse the electrode with distilled or deionized water, otherwise it will affect the accuracy significantly.

4.5.5 Typically the meter needs to be calibrated before use every time. But when requirement of accuracy is low, calibration is not necessary. Or try the electrode in the calibration solution, if the error is very small, calibration is not necessary.

4.5.6 According to the theory of Isothermal measurements of ion-selective electrode, the smaller the difference of temperature between test solution and the calibration solution, the higher the measurement accuracy is. Typically, temperature difference between test solution and calibration solution should ≤±15℃; for high accuracy measurement, the temperatures should be the same.

4.5.7 When the meter is functioning abnormally, please set P4 as "ON" to reset the meter to factory default mode, and then perform calibration and measurements again.

5 pH Measurement

5.1 **Preparion**

Connect the 201T-S pH Electrode to the meter (pay attention to the inserting direction); loosen the cap of the storage bottle of electrode; screw off the storage bottle; Press 

to turn on meter. The meter automatically switches to pH measurement mode.

5.2 **Meter Calibration**

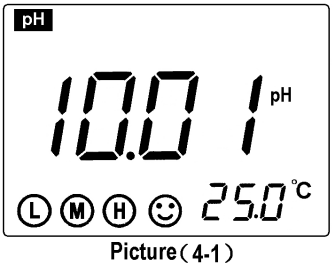
5.2.2. Use distilled water to rinse off electrode and then dry it with clean tissue, then soak it into the pH7.00

buffer solution, stir the electrode gently and let it stand still,

5.2.1. Press CAL to enter calibration mode, LCD displays C1, indicating the first point of calibration; Wait for a stable reading and ☺ to appear and stay, then press CAL again, the LCD will show a blinking **7.00 pH**, indicating the 1st point of calibration is completed; a stable pH value and a blinking **C2** will be displayed, indicating the first point calibration has been finished and the meterenters the second point of calibration.

5.2.3. Rinse the pH electrode in di CAL water and dry it, then soak it into the pH4.00 buffer solution, stir the electrode gently and let it stand still, waiting for a stable reading and a smiley face icon to appear and stay, then again press , the LCD will show a blinking **4.00 pH**, a stable pH value and a blinking **C3** will be displayed, indicating the second-point calibration has been finished and the meter enters the third-point calibration.

5.2.4. Rinse the pH electrode in distilled water and dry it, then soak it into the pH 10.01 buffer solution, stir the electrode gently and let it stand still,, waiting for a stable reading and a smiley face icon to appear and stay, then again press CAL , the LCD will show a blinking **10.01 pH.** A stable reading and **L M H** calibration icons will be displayed, see picture (4-1), indicating the three-point calibration has been finished and the meter automatically returns to measurement mode.



Picture（4-1）

5.2.5. **Notes**

(a) This meter can perform one-point, two-point or three-point automatic calibrations. After the first point calibration (see item 5.2.2.), press ENTER to confirm one-point calibration and return to measurement mode. The indication icon **M** standing for one-point calibration will appear on the lower left corner of LCD. When the requirement of accuracy is ≤±0.1pH, users can perform a one-point calibration with the pH7.00 buffer solution.

(b) After the second-point calibration, (see item 5.2.3.), press ENTER to confirm two-point calibration and return to measurement mode. The indication icon **L and M** for twp-point calibration will appear

on the lower left corner of LCD. User can choose pH4.00 and pH7.00 to calibrate if the measurement is within the acidity range and choose pH7.00 and pH10.01 to calibrate if within the alkalinity range.

(c) Users should perform a three-point calibration to reach a more accurate measurement if the measuring range is wide, or if the electrode has been used for long or has aging phenomenon. If it's a new electrode, a three-point calibration is necessary to adjust the meter's slope to match the pH electrode.

5.3 Sample Test

Soak the pH electrode into the sample solution after rinsing and drying, hold the electrode still. Take the readings when the smiley face icon shows up and stays on screen (indicates a stable reading).

isothermal measurement principle

According to the theory of Isothermal measurements, the smaller the difference of the temperatures between test solution and the calibration solution, the higher the measument accuracy is. Typically, temperature difference between test solution and calibration solution should ≤±15℃; for high accuracy measurement, the temperatures should be the same.

5.4 Parameter Settings

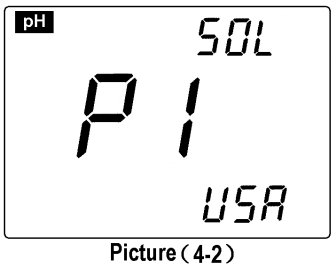
5.4.1. pH measuring parameter setting (Chart (5-1))

Chart (5-1)

Prompt	Parameter Setting Items	Code	Parameters
P1	pH buffer solution series selection	**SOL**	USA(U.S.A series) NIS (NIST series) CH (China series)
P2	Purified water pH temperature compensation setting	**PU1**	OFF-On
P3	Ammonia added purified water pH temperature compensation setting	**PU2**	OFF-On

P4	Temperature unit setting		℃ ℉
P5	Back light display time setting	**BL**	0-1-3-6min
P6	Auto power off setting	**AC**	0-10-20min
P7	Restore to Factory Default		OFF-On

5.4.2. pH buffer solution series selection (P1)



Picture (4-2)

(a) Press MODE key, meter enters P1 mode: see picture (4-2).

(b) Press CAL or M+ RM key to choose buffer solution series:

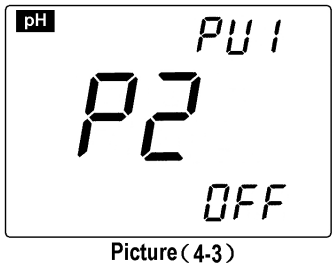
USA (Europe & U.S.A series) —1.68, 4.00, 7.00,10.01 and 12.45 pH

nIS NIST series) — 1.68, 4.01, 6.86, 9.18 and 12.45 pH

CH (China series) — 1.68, 4.00, 6.86, 9.18 and 12.46 pH

(c) Press MODE key to enter next parameter setting or press ENTER key to confirm and return to measurement mode.

5.4.3. Purified water pH temperature compensation setting (P2)



Picture (4-3)

(a) Short press MODE key in the mode P1, the meter enters mode P2, see picture (4-3).

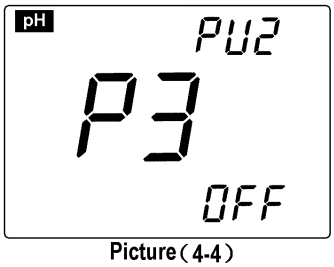
(b) Press CAL or M+ RM to choose **ON** or **OFF.**

(c) Press MODE key to enter next parameter setting or press ENTER key to confirm and return to measurement mode.

(d) The default setting is " OFF ".

Note: A PU-1 icon will appear in the upper right corner of the LCD if purified water temperature compensation function is set by the user.

5.4.4. Ammonia added purified water pH temperature compensation setting (P3)



Picture (4-4)

(a) Short press MODE key in mode P2 to enter mode P3, see picture (4-4).

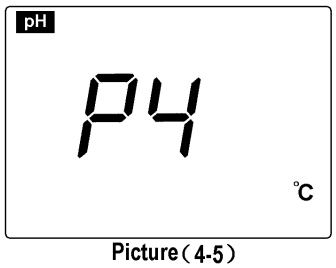
(b) Press CAL or M+ RM key to choose **ON** or **OFF**

(c) Press MODE key to enter next parameter setting or press ENTER key to confirm and return to measurement mode.

(d) The default setting is **“ OFF ”**.

Note: A PU-2 icon will appear in the upper right corner of the LCD if purified water temperature compensation function is set by the user.

5.4.5. Temperature unit ℃/℉ setting (P4)



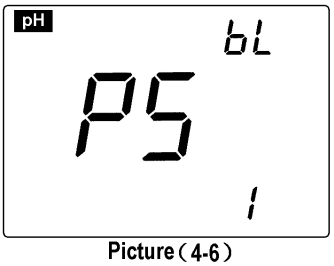
Picture（4-5）

(a) Short press MODE key in mode P3 to enter mode P4, see picture (4-5).

(b) Press CAL or M+ RM key to choose temperature unit: ℃ or ℉.

(c) Press MODE key to enter next parameter setting or press ENTER key to confirm and return to measurement mode.

5.4.6. Backlight display time setting (P5)



Picture（4-6）

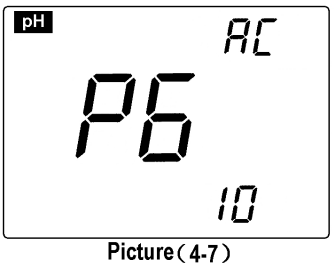
(a) Short press MODE key in mode P4 to enter mode P5, see picture (4-6).

(b) Press CAL or M+ RM key to choose the time of back light auto power off: 0 min, 1 min, 3 min or 6 min. The back light display function will be closed if choosing a 0min.

(c) Press MODE key to enter next parameter setting or press ENTER key to confirm and return to measurement mode.

(d) The default setting for P5 is 1min.

5.4.7. Auto power off time setting (P6)



Picture（4-7）

(a) Short press MODE key in mode P5 to enter mode P6, see picture (4-7).

(b) Press CAL or M+ RM key to choose the time: 0min, 10min or 20min. The auto power off function will be closed if choosing

0min.

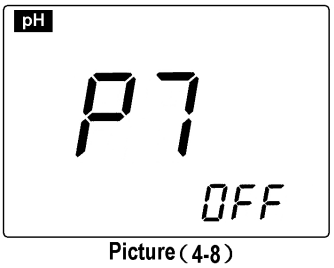
(c) Press MODE key to enter next parameter setting or press ENTER key to confirm and return to measurement mode.

(d) The default setting for P6 is 10min.

5.4.8. Restore to producer setting (P7)

(a) Short press MODE key in mode P6 to enter mode P7, see picture (4-8).

(b) Press CAL or M+/RM key to choose **"ON"**, means that all the pH measuring parameters have been restored to the factory default setting.



Picture (4-8)

5.5 Notes

5.5.1. The frequency that you need to calibrate your meter depends on the tested samples, performace of electrodes, and the requirement of the accuracy. For high-accuracy meaustements (≤ ±0.02pH), the meter should be calibrated before test every time; For ordinary-accuracy measurements (≥±0.1pH), once calibrated, the meter can be used for about a week or longer. In the following cases, the meter must be re-calibrated before testing:

a) The electrode hasn't been used for a long time or a new electrode is connected.
b) After measuring strong acid (pH<2) or strong base (pH>12) solutions.
c) After measuring fluoride-containing solution and strong organic solution
d) There is a significant difference between the temperature of the test sample and the temperature of the buffer solution that is used in the last calibration.

5.5.2. The soaking solution contained in the supplied protective bottle is used to maintain activation in the glass bulb and junction. Loosen the capsule, remove the electrode and rinse in distilled water before taking a measurement. Insert the electrode and tighten the capsule after measurements to prevent the solution from leaking. If the soaking solution is turbid or moldy, replace the KCL solution (Product# AI1107).

5.5.3. For calibration accuracy, the pH of the standard buffer solution must be reliable. The buffer solution should be refreshed often, especially after heavy use. We recommend 10-15 times of use before replacing the pH buffers.

5.5.4. Always keep the meter clean and dry; especially around the socket connecting the meter and electrode, otherwise it may lead to inaccurate measurements or a damaged probe/meter. To clean, dry them with medical cotton and rubbing alcohol if the connectors appear dirty.

5.5.5. The sensitive glass bulb at the front of the combination electrode should not contact with hard surfaces. Scratches or cracks on the electrode will cause inaccurate readings. Before and after each measurement, the electrode should be rinsed with distilled water and dried. If a sample sticks to the electrode or it's contaminated, the electrode should be thoroughly cleaned using a soft brush with soap water and then rinsed with distilledwater. After that, soak it in the KCL solution again for 6 hours.

5.5.6. **How to clean and renew your pH electrode**

For general contaminants, soak the electrode in Apera's cleaning solution (AI1166) or detergent water for 30 minutes. Then use a soft brush to remove the contaminants. Afterwards, soak the probe in Apera 3M KCL soaking solution (AI1107) for at least 1 hour. Rinse it off, then re-calibrate the tester before using.

For other special contaminants, refer to Table-8

Table-8 Clean contaminated glass bulb and junction

Contamination	Cleaning Solutions
Inorganic metal oxide	Dilute acid less than 1mol/L
Organic lipid	Dilute detergent (weak alkaline)
Resin macromolecule	Dilute alcohol, acetone, ether
Proteinic haematocyte sediment	Acidic enzymatic solution (saccharated yeast tablets)
Paints	Dilute bleacher, peroxide

a) Every pH electrode gradually loses its sensitvty and will eventually fail. The lifespan period for the 201T-S pH Electrode is about 1-2 years depending on how it's used and maintained.
b) When an abnormal reading appears during calibration or measurement, please set P7 to **"ON"** to restore the meter to Factory Default settings, then re-calibrate the meter before measurement.
c) Electrodes that have been used for a long period of time will become aged. Submerge the electrode in 0.1mol/L hydrochloric acid for 24 hours, then rinse the electrode in distilled water, then submerge it in 3M KCL soaking solution for 24 hours. The method to prepare 0.1mol/L hydrochloric acid: dilute 9mL hydrochloric acid in distilled or deionized water to 1000mL.

5.6 The Self-diagnosis Information

When using the meter, the following icons might appear. This is the meter's self-diagnosis information, which helps users identify problems occurring with the meter or the electrode.

5.6.1 A still display of -2.00 pH or 19.99 pH — this icon appears when the value has surpassed the measuring range. There will also appear such signs when the electrode is not well connected with the meter or when the electrode is not immerged into the solution. This is a normal phenomenon.

5.6.2 **Err1** — Abnormal electrode zero potential (<-60mV or >60mV)

5.6.3 **Err2** — Abnormal electrode slope (< 85% or >105%)

When **"Err1"** or **"Err2"** appears, the meter can not work properly, please take the following steps to check and fix the problem:

a) Check if the electrode bulb has air bubble, if has, please shake the electrode with force for a few times to eliminate the air bubble inside the sensor.

b) Check the quality of buffer solution, if it is expired or contaminated. If so, please replace with new ones.

c) Set the meter to factory default mode then recalibrate it.

d) If the meter still can not recover to the normal state after doing the above steps, please replace a new pH electrode.

6 ORP Measurement

6.1 Sample Test

6.1.1. Press ON/OFF key to turn on, and short press MODE to switch to **mV** mode;

6.1.2. Connect the ORP probe (301Pt-S, sold separately), soak it into sample solution, stir gently and let it stand still. Get the readings when the smiley face ion appears and stay on the screen.

7 Conductivity Measurement:

7.1 Preparation

7.1.1. Press ON/OFF key to turn on the meter;

7.1.2. Connect the 2301-S conductivity electrode into the meter.

7.2 Meter's Calibration

Press CAL key, **" CAL"** will be flashing on the LCD, indicates the meter enters the calibration mode; rinse the conductivity electrode with distilled or deionized water and dry it with clean tissue, then insert it into the 1413μS/cm calibration solution, hold still after stirring, when ☺ appears and stays, press CAL again, LCD will display flashing **"**1413μS/cm **"** and **End** icon after a few seconds. And the meter will return to

measurement mode automatically.

Calibration Note:

1) The meter's conductivity mode has been calibrated before leaving factory, so generally users can use it directly.

2) The conductivity can only can be calibrated under the mode of **COND**. Resistivity (**RES**), **TDS**, Sailinity (**SAL**) are coverted from conductivity so they don't need calibration as long as conductivity is calibrated.

7.3 Sample Test:

7.3.1 Connect the 2301T-S probe to the meter, soak it into sample solution, stir gently and let it stand still. Get the readings when the smiley face ion appears and stay on the screen.

7.3.2 Press ENTER key to display the value of TDS, salinity or resistivity, which are converted from conductivity.

7.4 Notes

7.4.1. This meter build-in below two kinds of calibration solution series, please set up in the parameters P1;

(a) USA (U.S.A. series) — 84μS/cm, 1413μS/cm, 12.88 mS/cm and 111.9 mS/cm

(b) CH (China series) — 146.6μS/cm, 1408μS/cm, 12.85mS/cm and 111.3 mS/cm

7.4.2. This meter has a unique one-point calibration function, to choose one calibration solution whose conductivity is close to the test samples. In general the most common calibration solution is 1413 μS/cm. Use the equipped 2301-S conductivity electrode (K = 1 cm^{-1}), and do calibration with 1413 μS/cm calibration solution, the range can reach up to 100 mS/cm.

Chart (7-1)

Measuring range	0.05 to 20μS/cm	0.5μS/cm to 200mS/cm		
Electrode constant	K=0.1cm^{-1}(flow test)	K=1.0cm^{-1}		
Calibration solution	84μS/cm	84μS/cm	1413μS/cm	12.88 mS/cm 111.9 mS/cm
Calibration indication icon	L	L	M	H

7.4.3. The temperature compensation coefficient of the meter setting is 2.00%/℃ by default. However, the conductivity temperature coefficient is different for different solutions. Users can refer chart (7-2), as well as the data which they receive from experiments to set in the parameters setting of P4. At the same time, meter will do automatic non-linear temperature compensation in the high purified water which less than 10 μ S / cm.

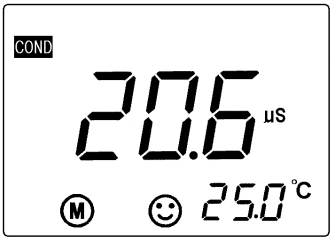
Note: When the coefficient of temperature compensation is set to be 0.00, that is, there is no temperature compensation when testing, the measuring value is based on current temperature.

Chart (7-2)

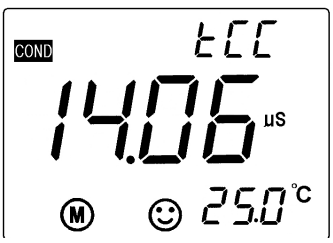
Solution	Temperature compensation coefficient
NaCl salt solution	2.12%/℃
5%NaOH solution	1.72%/℃
Dilute ammonia solution	1.88%/℃
10% hydrochroric acid solution	1.32%/℃
5% sulfuric acid solution	0.96%/℃

7.4.5. The other parameters setting, please see the chart (7-3)

7.4.6. Attention: when the content of parameter setting is consistent with content of factory default setting, conductivity measuring interface will display as picture (6-1); when the content of parameter setting is different with content of factory default setting, conductivity measuring interface will display as picture (6-2); the code icon will appear on the upper right of LCD, when parameters with code icon to be set more than two, LCD just displays one of the codes; user should enter the parameter setting and carefully check the contents of setting or restore the meter to factory default setting and set up the parameters again.



Picture (6-1)



Picture (6-2)

7.5 **Parameter Setting:**

7.5.1. Conductivity parameter setting (chart (7-3))

Chart (7-3)

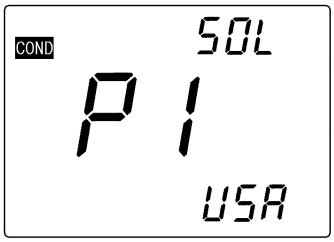
Prompt Mark	Parameter Setting Items	Code	Parameter
P1	Standard solution series selection	SOL	USA (84μS/cm, 1413μS/cm, 12.88 mS/cm, 111.9 mS/cm) CH (146.6μS/cm, 1408μS/cm, 12.85mS/cm, 111.3mS/cm)
P2	Electrode constant selection	Con	0.1, 1, 10
P3	Benchmark temperature selection	rEF	25℃ 20℃ 18℃
P4	Temperature compensation coefficient setting	tCC	0.00 to 9.99%
P5	Electrode constant setting	**CC**	
P6	Temperature unit setting		℃ ℉
P7	Back light display time setting	**BL**	0-1-3-6min
P8	Auto power off time setting	**AC**	0-10-20min
P9	Restore to producer setting		OFF-On

7.5.2. Conductivity calibration solution series selection (P1)

(a) Press MODE key, meter enters P1 mode, see picture (4-3);

(b) Press CAL or M+/RM key to choose the standard solution series

(c) Press MODE key to enter the next parameter setting or press ENTER key return to measurement mode.



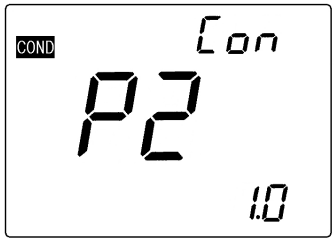
Picture (4-3)

7.5.3. Electrode constant selection (P2)

(a) Under P1 mode to short press MODE key and enters P2 mode, see picture (4-4);

(b) Press CAL or M+/RM key to change the constant setting: 0.1→1.0→10.0.

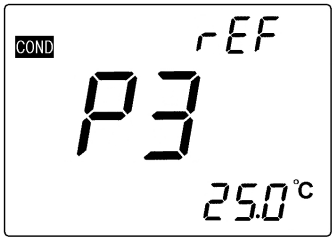
(c) Press CAL key to enter the next parameter setting or press ENTER to return to measurement mode.



Picture (4-4)

(d) The producer setting of P2 is K=1.

7.5.4. Benchmark temperature selection (P3)



Picture（4-5）

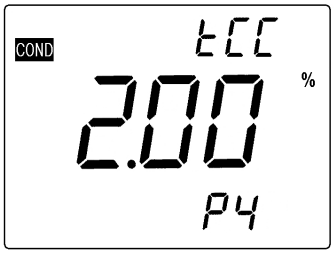
(a) Under P2 mode to short press MODE key to enter P3 mode, see picture (4-5);

(b) Press CAL or M+/RM key to choose the benchmark temperature: 25℃→20℃→18℃;

(c) Press MODE key to enter the next parameter setting or press ENTER key return to measurement mode.

(d) The factory default setting of P3 is 25℃.

7.5.5. Temperature compensation coefficient setting (P4)



Picture（4-6）

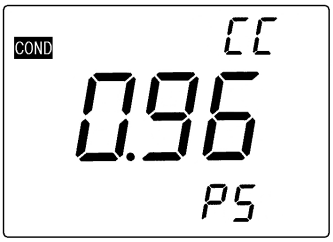
(a) Under P3 mode to short press MODE key and enter P4 mode, show as the picture (4-6);

(b) Press CAL or M+/RM key to change the number, the changing range of data is from 0.00 to 9.99; Hold CAL or M+/RM to quickly change it.

(c) Press MODE key to enter the next parameter setting or press ENTER key return to measurement mode.

(d) The producer setting of P4 is 2.00%.

7.5.6. Constant calibration setting (P5)



Picture（4-7）

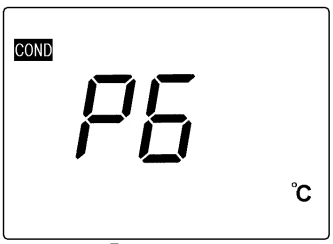
(a) Under P4 mode to press MODE key and enter P5 mode, LCD display last calibration constant. For example the 0.96cm^{-1} shown as picture (4-7);

(b) Press CAL or M+/RM key to change number when the number is flashing, and finish setting the constant that is marked on the housing of conductivity electrode.

(c) Press MODE key to enter the next parameter setting or press ENTER key to return to measurement mode.

(d) If need to do calibration for other conductivity electrode whose constant is not 1, such as conductivity electrode with constant 10.3, users should enter constant setting P2 to set the constant to be “10”, then enter P5 mode and set the constant to be 10.3.

7.5.7. Temperature unit ℃/℉ setting (P6)



Picture（4-8）

(a) Short press MODE key in mode P5 to enter mode P6, see picture (4-8).

(b) Press CAL or M+/RM key to choose temperature unit: ℃or℉.

(c) Press MODE key to enter next parameter setting or press ENTER key to confirm and return to measurement mode.

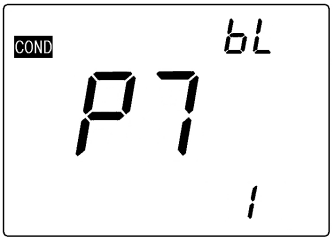
7.5.8. Backlight display time setting (P7)

(a) Short press MODE key in mode P6 to enter mode P7, see picture (4-9).

(b) Press CAL or M+/RM key to choose the time of backlight auto power off: 0 min, 1 min, 3 min or 6 min. The backlight display function will be closed if choosing a 0min.

(c) Press MODE key to enter next parameter setting or press ENTER key to return to measurement mode.

(d) The default setting for P7 is 1min.



Picture(4-9)

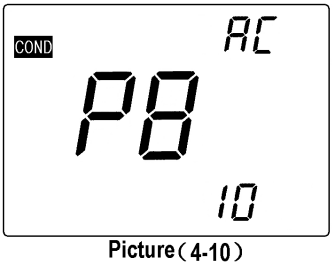
7.5.9. Auto. power off time setting (P8)

(a) Short press MODE key in mode P7 to enter mode P8, see picture (4-10).

(b) Press CAL or M+/RM key to choose the time: 0min, 10min or 20min. The auto power off function will be closed if choosing 0min.

(c) Press MODE key to enter next parameter setting or press ENTER key to conform and return to measurement mode.

(d) The default setting for P8 is 10 min.

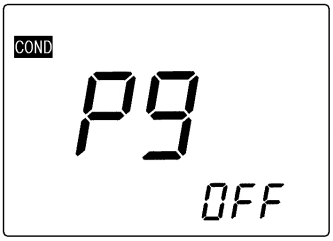


Picture(4-10)

7.5.10. Restore to producer setting (P9)

(a) Short press MODE key in mode P8 to enter mode P9, see picture (4-11).

(b) Press CAL or M+/RM key to choose **" ON "**, meaning that parameters have been restored to the default setting mode, and restore to measurement mode after 2 seconds.



Picture(4-11)

7.6 Notes

7.6.1 We recommend calibrating once every month under the normal circumstances; It is necessary to calibrate the newly purchased conductivity electrode or an electrode that hasn't been used for a long time;

7.6.2 The surface of 2301-S conductivity electrode is plated with a layer of metal platinum black to lower the electrode polarization and enlarge measuring range. Do not brush the surface of platinum black, only rinse it with purified water, in case damaging the platinum black coating; organic pollutants can be washed with warm soap water.

7.6.3 Conductivity electrode before use can be immersed in purified water to prevent the platinum black from passivation. If the platinum black plated electrode is invalid, users can immerse it into 10% nitric

acid solution or 10% hydrochloric acid for 2 minutes, then rinse with purified water and test again. If the situation does not improve, then users need to replace a new conductivity electrode.

7.6.4 When it appears an abnormal reading when calibrating or displaying, please set P9 as **"**ON**"** to make the meter restore to default setting mode, and then recalibrate and measure again.

8 Complete Kit

8.1 WS200 pH/ Fluoride meter *1 pc

8.2 201T-S 3-in-1 plastic pH/ATC electrode *1 pc

8.3 2301T-S Conductivity electrode (K=1, ATC) *1pc

8.4 F501-S Fluoride combination electrode *1pc

8.5 pH standard buffer solution (pH4.00, pH7.00and pH10.01, 50mL) *1pc/each

8.6 1413μS/cm conductivity buffer solution (50ml) *1pc

8.7 Fluoride calibration solution (0.19ml/L and 19mg/L, 50mL) *1pc/each

8.8 Screw driver *1pc

8.9 Spare AA batteries *3pcs

8.10 Operation manual *1pc

8.11 Carrying case *1pc

9 Warranty

We warrant this instrument to be free from defects in material and workmanship and agrees to repair or replace free of charge, at option of APERA INSTRUMENTS, LLC, any malfunctioned or damaged product attributable to responsibility of APERA INSTRUMENTS, LLC for a period of **two years** from the delivery (a **six-month** limited warranty applies to electrodes). This warranty does not apply to defects resulting from actions such as misuse (violation of the instructions in this manual or operations in the manner not specified in this manual), improper maintenance, or unauthorized repairs. Warranty period is the time limit to provide free service for the products purchased by customers, not the service life of the tester or probe.

10 Appendix 1. Fluoride Concentration Conversion Table

mol/L	pF	mg/L	ppm
1×10^{-3}	3.00	19.00	19.00
1×10^{-4}	4.00	1.90	1.90
1×10^{-5}	5.00	0.19	0.19

APERA INSTRUMENTS, LLC

Address: 6656 Busch Blvd, Columbus Ohio 43229

Tel: 1-614-285-3080

Email: info@aperainst.com

Website: www.aperainst.com