SANXIN

Model MP511 Lab pH Meter

Operation Manual

Shanghai San-Xin Instrumentation, Inc.

MP500 Series of Electrochemical Meters

一. Multi-parameter Meter

Model MP551pH/mV/ISE/Cond/DO Meter

二. Double Parameter Meters

1. Model MP521 Lab pH/Cond Meter (pH: ±0.01 pH; Conductivity: ±1.0% FS)
2. Model MP522 Precise pH/Cond Meter (pH: ±0.002 pH; Conductivity: ±0.5% FS)
3. Model MP523 pH/ISE Meter
4. Model MP525 pH/DO Meter
5. Model MP526 Cond/DO Meter

三. Single Parameter Meters

1. **MP511 Lab pH Meter（±0.01 pH）**
2. MP512 Precise pH Meter（±0.002 pH）
3. MP513 Lab Conductivity Meter（±1.0% FS）
4. MP515 Precise Conductivity Meter（±0.5% FS）
5. MP516 DO Meter
6. MP517 Sodium Ion Concentration Meter
7. MP518 Calcium Ion Concentration Meter
8. MP519 Fluoride Ion Concentration Meter

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1. Brief Introduction:

Thanks for buying and using the Model MP511 Lab pH Meter (the following called “meter” in short).

Before using this meter, please read the operation manual carefully in order to help use and maintain it correctly. On the basis of improving instrument performance constantly, we reserve the right of changing the content of this manual and accessories in case of not notifying in advance.

This meter is a perfect combination with the most advanced electronic, sensor technology and software design which is suitable for lab measuring aqueous solution pH value and ORP value, and also suitable for measuring the electrode potential of all kinds of ion selective electrodes.

Built-in microprocessor chip, beautiful appearance and convenient operations, this meter has the following prominent features:

1.1. Meter meets with the requirement of international GLP standards. Its features up to automatic calibration, automatic temperature compensation, data storage, timing measurement, RS-232 output, clock display, function setting and self-diagnose information etc.

1.2. Adopts digital filter and step slipping technology to improve meter’s response speed and result accuracy. “ ☺ ” will appear when reading to be stable.

1.3. Automatically recognize pH buffer solution. User can choose anyone from three series of standard buffer solutions: Europe & USA series, NIST series and China series.

1.4. Meter’s circuit board adopts SMT film-covering technology to improve meter’s reliability.

1.5. Meter has the only product serial number.

1.6. Dustproof and waterproof meter meets IP54 standards. All sockets are seal protected by the silica gel caps.

2. Technical Parameters:

2.1. pH:

Measuring range	(-2.00 to 19.99) pH
Resolution	0.1/0.01pH
Accuracy	Meter: ±0.01pH, connect meter with electrode: ±0.02pH
Input current	$\leqslant 2\times10^{-12}$ A
Input impendance	$\geqslant 1\times10^{12}$ Ω
Stability	±0.01 pH/3h
Temp. compensation range	(0 to 100) ℃ (automatic or manual)

2.2. mV:

Measuring range(mV/ORP)	-1999mV to 0 to 1999mV
Resolution	1mV
Accuracy	±0.1% FS

2.3. Temperature:

Measuring range	-10℃ to 110℃
Resolution	0.1℃
Accuracy	5 to 60℃ range: ±0.5℃ other range: ±1℃

2.4. Other Technical Parameters:

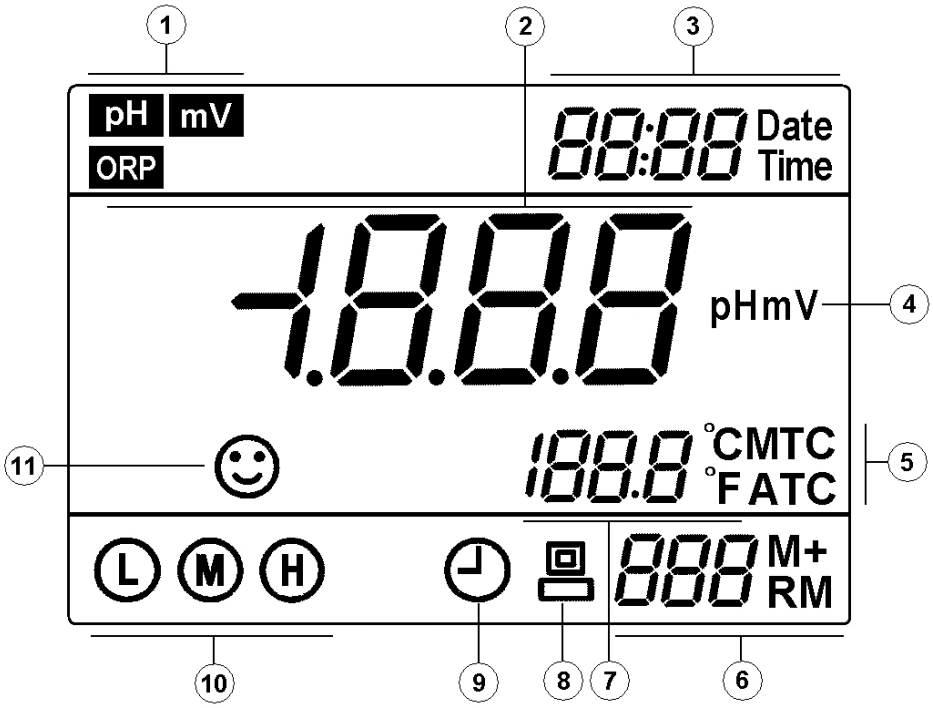
Data storage	600 groups
Storage content	Measuring value serial number, measuring value, temperature, ATC or MTC state, measuring date and time
Power	DC9V/300mA
Communication connector	RS-232
Size and weight	160 × 190 × 70mm/880g
Quality and safety certification	ISO9001:2000, CE and CMC

2.5. Working Condition:

Environment temperature	5 to 35℃
Environmental humidity	⩽85%
IP rating	IP54 Dustproof and waterproof

3. Introductions to the Meter:

3.1. LCD Display:



① —— Parameter mode icon

② —— Measuring value

③ —— Time and date

④ —— Measuring unit

⑤ —— Temperature compensation icon:

ATC — automatic temperature compensation

MTC — manual temperature compensation

⑥ —— Serial number and icon of the measuring value stored and recalled.

M+ — measuring value to be stored icon;

RM — reading to be recalled icon; The left digit means serial number.

⑦ —— Temperature measuring value and unit

⑧ —— RS-232 communication icon. When this icon appears, means meter has

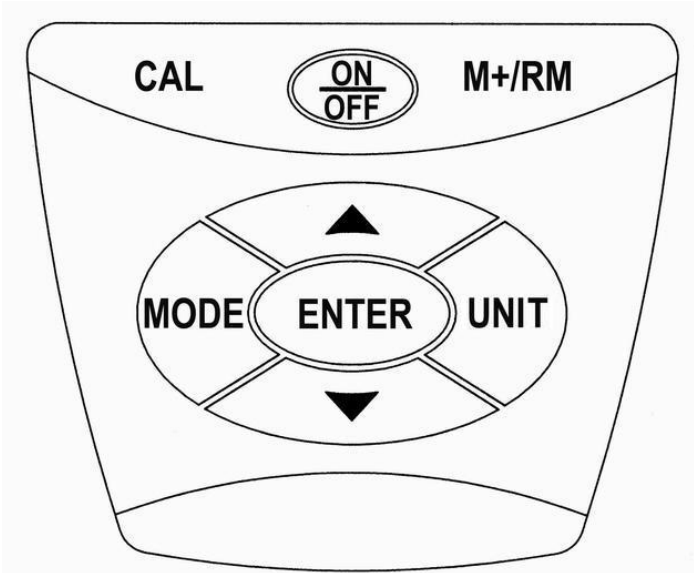
been connected with computer.

⑨ —— Timing measuring icon

⑩ —— Electrode calibration indication icon

⑪ —— Measuring value stable icon

3.2. Operation Keys:



The meter has 8 operation keys in all.

3.2.1. <ON/OFF> — Switch key

3.2.2. **< CAL >** — Calibration key, to make meter enters into calibration mode.

3.2.3. **< MODE >** — Function key

(a) Short-time press (time<1.5s) to switch the parameters, the meter will display **pH** and **mV** ;

(b) Depress (time >2s) to enter into the parameter setting mode P1, and again short-time press, will in turn display P2, P3…

3.2.4. **< UNIT >** —Unit and parameter mode key.

(a) When in **pH** mode, press the key to alter pH resolution: 0.01→0.1pH;

(b) When in **mV** mode, press this key to alter the parameter mode:

mV and **ORP**

(c) Press key to choose modified position of parameter when in the parameter setting state.

3.2.5. **< ENTER >** — Entrance key, when in the state of calibration or parameter setting, press the key to confirm. Then the meter enters into measuring state after pressing this key.

3.2.6. **< ▲ >** and **< ▼ >** — Increase and decrease key.

When in MTC state, press the key to increase or decrease the temperature value. Short-time press to alter 0.1℃ each time, while depress, the temperature will alter rapidly. When in the state of parameter setting, press the key to alter the number or ON/OFF state.

3.2.7. **< M+/RM >** — The compound key of memory and recall, short-time press (press time <1.5s) to save the measuring data, depress (press time > 2 s) to recall the saved measuring value.

3.3. The Storage, Recall and Elimination of the Measuring Information:

3.3.1. Store the measuring information:

(a) In the measuring mode, when the measuring value is stable and the "☺" appears, short press **< M+/RM >** key, LCD will display **"M+"** icon and storage serial number, and meanwhile memory all the measuring information including time, date, serial number, measuring data, measuring unit, temperature, temperature compensation state and so on. Meter can separately store 300 groups of measuring information in the mode of pH and mV, can total store 600 groups.

(b) When setting the timing measuring function, “  ” icon will appear on the LCD, and the meter will measure according to the time intervals set, and stores the measuring information at the same time;

3.3.2. Recall measuring information:

(a) Under the measuring mode, depress the **< M+/RM >** key, the meter will recall the last stored information, and the storage serial number and **“RM”** icon will appear in the lower right corner of the LCD, and the complete measuring information, measuring time and date will be displayed alternatively on the upper right corner. Again press **< ▼ >** or **< ▲ >** key, meter will recall all measuring information in turn, depress **< ▼ >** or **< ▲ >** key to rapidly check the measuring information under other serial number;

(b) In the recalling mode (there are **“RM”** icon and storage serial number in the lower right corner of the LCD), press **< ENTER >** key to return to the measuring mode.

3.3.3. Eliminate the stored measuring information:

In the recalling mode, depress the **< M+RM >** key for 5s, “  ” icon will display on the LCD for 2s. It means the internal storage has been eliminated, and then returns to measuring mode.

3.4. RS-232 Communication:

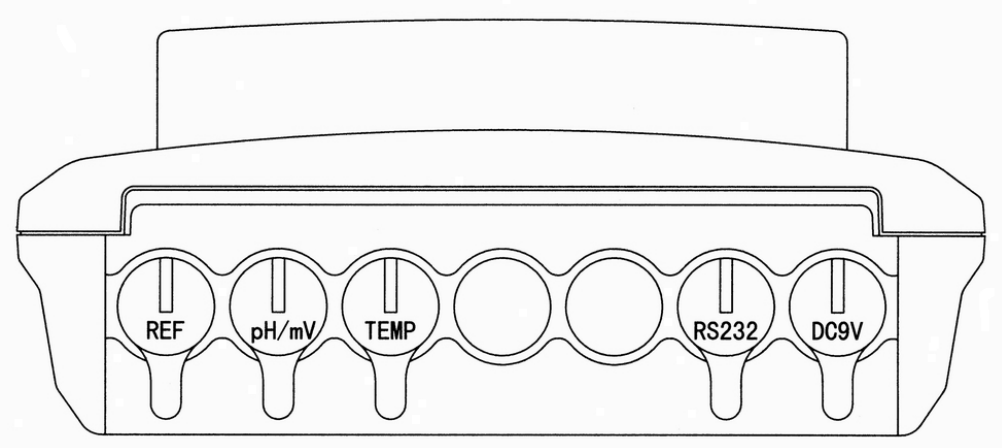
3.4.1. This meter adopts MP511 communication software which can achieve RS-232 communication function. The requirements for computer of this application software are: PC can stable operate the Windows XP operating system (Microsoft Excel 2000 or much higher version has been installed in

PC). According to different selection of resolution setting (1280 x 1024 or 1280 x 800) to install MP511 communication software by following the indications. Open the MP511 communication software and connect meter, the LCD will display "  " RS-232 communication icon. Meanwhile all the stored information including measuring value, measuring unit, temperature, temperature compensation state (ATC or MTC) and the last calibration information (calibration time, date and solution) will be transmitted to the computer.

3.4.2. Again press **< M+/RM >** key after meter being connected with computer, or timing measuring function has been set, all the measuring information will be transmitted to computer through RS-232 and won't be stored in meter. And there will also display a curve graph of measurement value changing with time on the interface of computer.

3.4.3. User can do operation such as analyzing, counting or printing etc. for all measuring information in "Microsoft Excel" file through the key **"Lead out"** in the interface of computer.

3.5. Sockets:



3.5.1. REF — Reference electrode socket

3.5.2. pH/mV — pH and ORP electrode socket (BNC socket)

3.5.3. TEMP — Temperature electrode socket (RCA microphone socket)

3.5.4. RS232 — RS232 communication connector socket

3.5.5. DC9V — DC9V power socket, Φ2.5, inner "+ "outer " - ".

4. pH Measurement:

4.1. Preparation Work:

4.1.1. Switch in power, press <ON/OFF> key to turn on.

4.1.2. Short-press **< MODE >** key to switch to **pH** mode.

4.1.3. Install electrode holder and debug.

4.1.4. Insert the 201T-M plastic pH/ATC three-in-one combination electrode into the meter's socket.

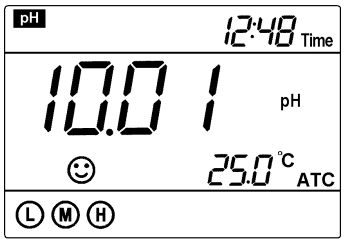
4.2. Electrode Calibration:

4.2.1. Press **< CAL >** to enter into calibration state, LCD display the twinkling "CAL 1" remind to enter into the first point calibration.

4.2.2. Wash the pH electrode in purified water and dry it, then immerge it into the pH7.00 buffer solution, rock the electrode holder and then still, waiting for a stable data and appear “ ☺ ”, then press key **< CAL >**, the LCD will appear a twinkling **“**7.00**”** pH, calibration finishes after several seconds and appear a stable pH value and a twinkling “ CAL2 ” icon, indicates the first point calibration has been finished and enters into the second point calibration.

4.2.3. Wash the pH electrode in purified water and dry it, then immerge it into the pH4.00 buffer solution, rock the electrode holder and then still, waiting for a stable data and appear “ ☺ ”, then press **< CAL >** key, the LCD will appear a twinkling **“**4.00**”** pH, calibration finishes after several seconds, LCD will appear a stable pH value and a twinkling “ CAL3 ” icon, indicates the second point calibration has been finished and enters into the third point calibration.

4.2.4. Wash the pH electrode in purified water and dry it, then immerge it into the pH 10.01 buffer solution, rock the electrode holder and still, waiting for the a stable data and “ ☺ ” appears, then press **< CAL >** key, LCD will appear a twinkling **“**10.01**”** pH, calibration finishes after several seconds, appear a stable pH and temperature value (the pH value displayed is related to the temperature, for example, it will display 10.01pH in 25℃, and 10.06pH in 20℃), and meanwhile display the three calibration icons “ Ⓛ Ⓜ Ⓗ ”, indicates the three-point calibration has been finished and enters into measuring mode. See picture (4-1).



Picture（4-1）

4.2.5. Note:

(a) This meter can adopt a random one-point, two-point or three-point automatic calibration, after the first point calibration (see 4.2.2.), press **< ENTER >** key to confirm and enter into measuring mode. The indication icon " Ⓜ " for one point calibration will appear in the lower left corner of the LCD. When the measuring accuracy is $\leqslant \pm 0.1$pH, the user just need to choose one kind buffer solution to take one-point calibration according to the measuring range.

(b) After finishing the second point calibration, (see item 4.2.3.), press **< ENTER >** key to confirm two-point calibration and enter into measuring mode. It will appear the indicate icon "Ⓛ Ⓗ" in the lower left corner of the LCD. User can choose pH4.00 and pH7.00 to calibrate if the measurement is just within the acidity range and choose pH7.00 and pH10.01 to calibrate if measurement just within the alkalinity range.

(c) It is better to choose three-point calibration so as to reach a more accurate measurement if the measuring range is wide or, if the electrode has been used for long or has ageing phenomenon. As to the new electrode, it must be calibrated to keep the unanimity of the meter slope adjustment with the pH electrode.

4.3. Sample Test:

Wash the pH electrode and dry it, then immerge it into the sample solution, rock the electrode holder and still, when the icon " ☺ " appears on the LCD, it is the pH value. Please pay attention that the closer the temperature of the sample solution and the calibration solution are, the more accurate the measuring value

is. This is called the pH equal temperature measurement theory.

4.4. Parameter Setting:

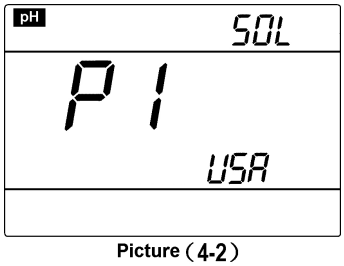
4.4.1. pH measuring parameter setting schedule (chart (4-1))

Chart (4-1)

Prompt Mark	Parameter Setting Items	Code	Parameters
P1	pH buffer solution series selection	SOL	USA(Europe & U.S.A series) NIS (NIST series) CH (China series)
P2	Time for timing measuring setting		0-99 min
P3	Temperature unit setting		℃ ℉
P4	Date setting	Date	Month / Day / Year
P5	Time setting	Time	Hour / Minute
P6	Restore to producer setting		OFF-On (shut-set)

4.4.2. pH buffer solution series selection (P1)

(a) Depress **< MODE >** key, meter enters into P1 mode, see picture (4-2).



Picture (4-2)

(b) Press **<** ▲ **>** or **<** ▼ **>** 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

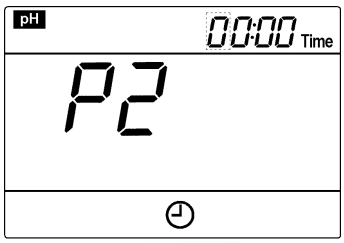
CH (China series) — 1.68, 4.00, 6.86, 9.18 and 12.46 pH

(c) Press **< MODE >** key to enter into next parameter setting or press **< ENTER >** key to conform and return to measuring mode.

(d) The producer setting is USA (Europe & U.S.A series).

4.4.3. Regular time interval measuring setting (P2)

(a) Short press **< MODE >** key in mode P2 to enter into mode P3. See picture (4-3).



Picture (4-3)

(b) Press **< UNIT >** key, the " 0 " will move rightward in turn and flash. Press **< ▲ >** or **< ▼ >** key to alter the number.

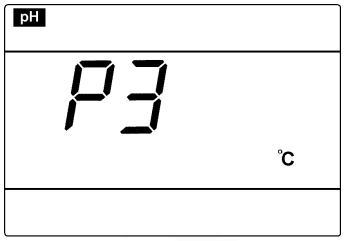
(c) Press **< MODE >** key to enter into next parameter setting or press **< ENTER >** key to conform and return to measuring mode.

(d) Producer setting is **0** second.

Note: in the form " 00:00 ", the number in the front of " :" is minute, and the maximum setting is 99; in the back of " : " is second, the maximum setting is 59. After setting the regular time interval measuring mode, LCD will display the " ◴ " icon.

4.4.4. Temperature unit ℃/℉ setting (P3)

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



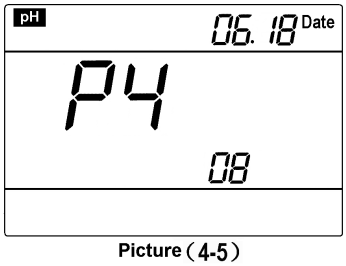
Picture (4-4)

(b) Press **< ▲ >** or **< ▼ >** key to choose temperature unit: ℃ or ℉.

(c) Press **< MODE >** key to enter into next parameter setting or press **< ENTER >** key to conform and return to measuring mode.

4.4.5. Date setting (P4)

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



Picture (4-5)

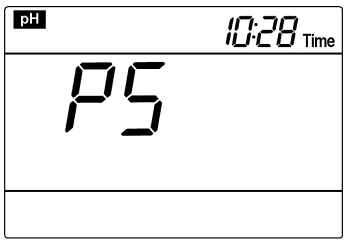
(b) Press **< UNIT >** key, the number will move

rightward and flash, press < ▲ > or < ▼ > key to alter the number. The upper right is month-day and the lower right is year.

(c) Press **< MODE >** key to enter into next parameter setting or press **< ENTER >** key to conform and return to measuring mode.

4.4.6.Time setting (P5)

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



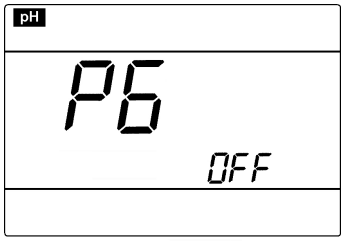
Picture (4-6)

(b) Press **< UNIT >** key, the number will move rightward and flash, press < ▲ > or < ▼ > key to alter the number.

(c) Press **< MODE >** key to enter into next parameter setting or press **< ENTER >** key to conform and return to measuring mode.

4.4.7. Restore to producer setting (P6)

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



Picture (4-7)

(b) Press < ▲ > key to choose " On ", means parameter setting has been restored to the producer setting mode, and will return to measuring mode after 2s.

4.5. Considerations:

4.5.1. In order to make electrode's response to be faster, should shake it several times and still then after immersing pH combination electrode into solution. Shaking should be more hard especially when using plastic pH combination electrode, because there is a small empty compartment between the electrode

protecting cap and pH bulb, it is easy to produce air bulb and make bulb can not touch well with solution, so it can eliminate the air bulb by hardly shaking. Also can take measurement by twisting the protecting cap off, but be attention to the damage of bulb.

4.5.2. Calibration times of meter rely on the sample, electrode performance and required accuracy. For high accurate measurement (≤±0.02pH), which should be calibrated immediately with high accurate standard buffer solution, for general accuracy measuring (≥±0.1pH), which can be used almost one week or long time once be calibrated.

4.5.3. The meter must be recalibrated in the following situations:

(a) New or unused electrode for a long time;

(b) After measuring acid (pH<2) or alkaline (pH>12) solution;

(c) After measuring solution which contains fluoride and concentrated organic solution;

(d) The solution's temperature is much different with calibration temperature.

4.5.4. If user do not want to use the temperature electrode, can press **< ▲ >** or **< ▼ >** key to adjust temperature and do manual temperature compensation.

4.5.5. The soaking solution in the protecting bottle of pH electrode is to keep the glass bulb and junction activating. Loose the capsule, pull out the electrode and wash it in purified water before measuring. Insert the electrode and screw tight the capsule after measuring to prevent the solution leaking. If the soaking solution is turbid or moldy, please clean and change new one at once.

4.5.6. The preparation of the soaking solution: take 25g analytic pure KCL,

dissolve with purified water and dilute to 100mL. Electrode must avoid soaking in purified water protein solution and acid fluoride solution for a long time as well avoid getting touching with organic silicon lipidic matters.

4.5.7. To calibrate the meter with the given value pH buffer solution, the pH value of the standard buffer solution must be reliable so as to improve the accuracy. Buffer solution should be changed in time after many times using.

4.5.8. Always keep the meter clean and dry, especially for the socket of meter and electrode, otherwise it may lead to an inaccurate measurement or invalidity. To clean and dry it with medical cotton and non-water alcohol if there are any dirty.

4.5.9. The sensitive glass bulb in the front of combination electrode should not touch with hard things, any broken and hair will make the electrode invalidity. Before and after measuring, the electrode should be washed with purified water, and dry electrode after washing, don't clean glass bulb with tissue for it will effect stability of electrode potential and enlarge response time. The electrode should be washed many times for removing the sample stuck on the electrode, after measuring sticky sample or wash with suitable solvent then clean the solvent with purified water.

4.5.10. An electrode be used for a long time, or measured solution which contains a polluting solute easily for the sensitive bulb, or a substance resulting in jam at the junction, the electrode will be getting passivated, its sensitivity grade will decrease and its response is getting slow, the reading are not correct. It could adopt the following method for various cases:

(a) The glass bulb is contaminated and aging: put the electrode into 0.1mol/L dilute hydrochloric acid (preparation: diluted 9mL hydrochloric acid to 1000mL with purified water) for 24h. Rinse it with purified water, then dipped it into the electrode dipping solution for 24h. If the passivation is serious, then user can also put the end of electrode into 4% HF (hydrofluoric acid) solution for 3 to 5 seconds, rinsing it with purified water, and dipped it in the electrode soaking solution for 24h to renew it.

(b) Clean for contaminated glass bulb and junction: (FYI)

Contamination	Abluent
Inorganic metal oxide	diluted acid less than 1mol/L
Organic lipidic matter	dilute washing (weak alkaline)
Resin macromolecule matter	dilute alcohol, acetone, ether
Proteinic haematocyte sediment	Acidic enzymatic solution (such as dried yeast)
Kinds of paint	dilute bleacher, peroxide

4.5.11. pH electrode using period is about 1 year, but its life will be shortened if using condition is poor or incorrect maintenance. So it should be replaced immediately after electrode become aging or invalid.

4.5.12. Please set P6 to be “On” to make meter restore to producer setting when meter’s calibration or display appears abnormal phenomenon, and do calibrate and test again.

4.5.13. Please don’t take power plug out when meter still working, user only can take out the plug after meter to be turned off.

4.6. The Self-diagnose Information:

When using, there might appear the following icons. This is the meter’s self-diagnose information, which can help to know some information about

the meter or the electrode when using:

4.6.1. The stable icon "-2.00" pH or the icon "19.99" pH — this is the icon appeared 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.

4.6.2. "Err 1" — Electrode zero potential to be exceeded (<-60mV or >60mV)

4.6.3. "Err2" — Electrode slope to be exceeded (< 85% or >105%)

When appear "Err 1" or "Err2", the meter will work abnormally, please take the following check:

(a) Check the electrode bulb if has air bulb, if has, please shake it hardly.

(b) Check the quality of pH buffer solution, if it goes bad or the value has biggish error.

(c) Restore the meter to producer setting mode (for details see P15 item 4.4.7.), then recalibrate it.

If it still can not recover to the normal state after the above checks, please replace a new pH electrode.

5. mV and ORP Measurement:

5.1. Sample Test:

5.1.1. Press < ON/OFF > to electrify meter, press **< MODE >** to switch to **mV**, then press **< UNIT >** key to choose **mV** or **ORP** ;

(a) **mV** — This is the measuring mode of electrode potential. mV value and the temperature will appear at the same time;

(b) **ORP** — This is the ORP electrode measuring mode. ORP measurement has no temperature compensation, so there is no temperature appeared in this mode;

Note: — ORP is the abbreviation of " Oxidation-Reduction Potential ", signify the Oxidation-Reduction Potential of the solution, ORP is the index about the ability the Oxidation-Reduction Potential of the aqueous solution, its unit is mV.

5.1.2. Connect ORP electrode or ion electrode, immerge it into the sample solution, slowly stir and then still. When there appear a "☺" and a stable reading, that is the ORP value or the potential of the ion electrode.

5.1.3. If it is a combination ORP or ion electrode, user just need to insert it into **" pH/mV "** socket, and if the electrode is other type, then user should also need to choose a proper reference electrode to connect it to the **" REF "** socket and to measure with both of the two electrodes at the same time.

5.2. Considerations:

5.2.1. The meter does not need to be calibrated when do ORP measurement. But if it is interrogative for the quality of ORP electrode or the measuring results, it's better to measure the mV value with the standard solution to identify the ORP electrode or to see if meter is accurate or not.

Our company can offer the following ORP standard solution: 222mV(25℃)± 15mV ORP standard solution (warranty 1 year), the inner solution of reference

electrode is 3.5mol/L KCl.

Chart（5-1）

℃	mV	℃	mV	℃	mV	℃	mV
10	242	20	227	30	215	38	205
15	235	25	222	35	209	40	201

5.2.2. The clean and activation of ORP electrode: the surface of the platinum will be polluted after the electrode being used for a long time, which will lead to inaccurate measurement and slow response. User can adopt the following methods for activation:

(a) For mineral pollution, immerge the electrode into 0.1mol/L dilute hydrochloric acid for 30 minutes, then wash with purified water, and then immerge it into the electrode soaking solution for 6 hours before using.

(b) For the organic oil stain pollution, wash the platinum surface with detergent, and then immerge it into the electrode soaking solution for 6 hours before using.

(c) For the seriously polluted platinum with oxidized membrane, polish the surface with toothpaste, then wash it in purified water, and then immerge it into the electrode soaking solution for 6 hours before using.

5.3. Parameter Setting:

5.3.1. mV and ORP measurement parameter setting schedule (chart (5-2))

Chart（5-2）

Prompt Mark	Parameter Setting Items	Code	Parameters
P1	Time for timing measuring setting		0 to 99min
P2	Restore to producer setting		OFF-On (shut-set)

5.3.2. Regular time interval measuring setting (P1):

Please see P13 items 4.4.3.

5.3.3. Restore to producer setting (P2):

Please see P15 items 4.4.7.

6. Meter's Complete Kit:

6.1. Model MP511 pH meter 1 unit

6.2. Model 602 flexible electrode holder 1 pc

6.3. 201T-M plastic pH/ATC three-in-one combination electrode 1 pc

6.4. pH standard buffer solution (pH 4.00,7.00,10.01/50mL) 1 bottle for each

6.5. 9V power adapter 1 pc

6.6. RS-232 communication cable 1 pc

6.7. MP511 communication software CD 1 pc

6.8. Operation manual 1 pc

6.9. Brief operation instruction 1 pc

7. Warranty:

7.1. We warrant this meter to be free of charge maintain, replace the parts or products under normal using circumstances, from purchased time within one

year caused by manufacturing bad and unable to work.

7.2. Attached pH electrode is not belong to this warrant range. But, if the newly purchased electrode went wrong without using, it's free of charge to repair or replace.

7.3. The above warranty is not apply to defects resulting from action of user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification.

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