

MP511 pH/mV Benchtop Meter

Instruction Manual



APER A INSTRUMENTS, LLC

www.aperainst.com

Contents

1	Brief Introduction	- 3 -
2	Technical Specifications.....	- 4 -
2.1	Technical Parameters	- 4 -
2.2	Other Technical Parameters.....	- 4 -
3	The Meter	- 5 -
3.1	LCD Display	- 5 -
3.2	Keypad	- 6 -
3.2	Store, recall and clear readings.....	- 7 -
3.3	Sockets:	- 8 -
	pH Measurement	- 8 -
3.4	Preparation	- 8 -
3.5	Electrode Calibration.....	- 8 -
3.6	Sample Test.....	- 10 -
3.7	Parameter Setting	- 10 -
3.8	Notes:	- 12 -
3.9	Self-diagnostic Information	- 14 -
4	mV and ORP Measurement.....	- 15 -
4.1	Sample Test.....	- 15 -
4.2	Notes	- 15 -
4.3	Parameter Setting	- 16 -
5	RS232 Communication	- 16 -
5.1	System requirements	- 16 -
5.2	Software interface.....	- 17 -
5.3	Load software	- 17 -
5.4	Port Connection	- 18 -
5.5	Run Software	- 18 -
6	Complete Kit.....	- 19 -
7	Warranty	- 19 -


1 Brief Introduction

Thanks for purchasing and using APERA INSTRUMENTS MP511 pH/mV Benchtop Meter (referred to “meter” as below).

Before using this meter, please read this instruction manual carefully in order to use and maintain it correctly. On the basis of improving instrument of 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 an outstanding combination of advanced electronic technology, sensor technology and software design. It is suitable for laboratory use to measure pH and ORP value of the aqueous solution. It also can be used to measure the electrode potential of all kinds of ion selective electrodes.

With its built-in microprocessor chip, elegant designs and user-friendliness, this meter has the following features:

- Meet international GLP standards, with intelligent functions such as automatic calibration, automatic temperature compensation, data storage, timing measurement, RS232 output, clock display, functions setting and self-diagnosis etc.
- With digital processing technology, the response speed and accuracy are greatly improved.  appears when readings are stable.
- Automatic pH buffer solution recognition. Buffer solution selectable: Europe & USA series, NIST series and China series.
- The meter meets IP54 protection level. The sockets are seal protected by the silica gel caps.

2 Technical Specifications

2.1 Technical Parameters

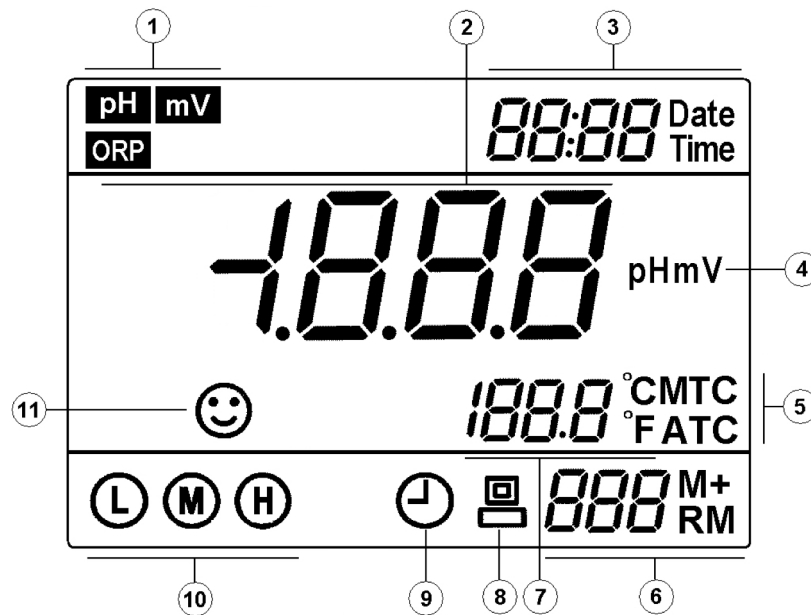
pH	Range	(-2.00 ~ 19.99) pH
	Resolution	0.1/0.01 pH
	Accuracy	±0.01pH±1digit
	Input Current	≤2×10 ⁻¹² A
	Input Impedance	≥1×10 ¹² Ω
	Stability	±0.01 pH±1digit/3h
	Temp. Compensation Range	(0 ~ 100) °C (Automatic or Manual)
mV (ORP)	Range	-1999mV ~ 0 ~ 1999mV
	Resolution	1mV
	Accuracy	±0.1% FS
Temp.	Range	-10°C~ 110°C
	Resolution	0.1°C
	Accuracy	5~ 60°C : ±0.5°C±1digit Other : ±1°C

2.2 Other Technical Parameters

Data storage	600 groups
Storage content	serial number, date, time, measurement value, temperature value, ATC or MTC state
Communication connector	RS232
Power	2.2.1 <u>DC9V/0.5A</u>
IP rated	IP 54 dustproof and splash-proof
Size and weight	160 × 190 × 70mm/880g
2.2.2 <u>Quality and safety</u>	ISO9001:2008 and CE

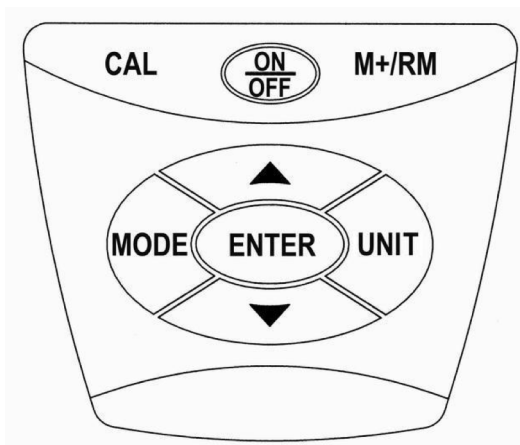
3 The Meter

3.1 LCD Display



1. — Measurement mode icon
2. — Measurement value
3. — Time and date
4. — Units of measurement
- ⑤— Temperature compensation icon:
 - ATC — automatic temperature compensation;
 - MTC — manual temperature compensation
- ⑥— Serial number and icon of data storage and recall
 - M+ — icon for measurement storage;
 - RM — icon for reading recalls; Numbers on the left is serial number.
- ⑦— Temperature measurement and unit
- ⑧—RS232 communication icon When this icon appears, the meter has been connected with computer.
- ⑨— Timing measuring icon
- ⑩— Electrode calibration indication icon
- ⑪ — Stability icon of readings


3.2. Keypad



Keypad operations: Momentary press— <1.5 seconds; Long press — >2seconds.


Keypad operations and descriptions


Keypad	Operations	Descriptions
ON OFF	Momentary press	<ul style="list-style-type: none"> ● Turn on/off the power. <p>Attention: Only under measuring mode can the meter be turned off. If under calibration or parameter setting mode, the operation will be invalid. You need to press <ENTER> and go back to measuring mode. Then press <$\frac{ON}{OFF}$> to turn off.</p>
CAL	Momentary press	<ul style="list-style-type: none"> ● Press the button, the meter will be in calibration mode and press again to start calibration.
MODE	Momentary press	<ul style="list-style-type: none"> ● To select the parameters: pH → mV
	Long Press	<ul style="list-style-type: none"> ● Enter into parameter setting mode P1, then momentary press to enter P2, P3.....
UNIT	Momentary press	<ul style="list-style-type: none"> ● In pH measuring mode: press the button to change the resolution repeatedly: 0.01→0.1pH ● In mV measuring mode : press the button to change parameter mode: mV → ORP ● In parameter setting mode: press the button to move the number position.
ENTER	Momentary press	<ul style="list-style-type: none"> ● In calibration mode: press the button to confirm 1 point or 2 points calibration and then return to measuring mode. ● In parameter setting mode: press the button to confirm parameter setting and then return to measuring mode. ● In (RM) mode: press button to return to measuring mode.

	Momentary press Long press	<ul style="list-style-type: none"> ● In MTC mode: press the button to increase or decrease the temperature. The temperature will be fast altered with long press. ● In parameter setting mode: press the button to changer numbers or ON/OFF state. ● In (RM) mode: press the button to alter the storage serial number. Long press to alter rapidly.
M+/RM	Momentary press Long Press	<ul style="list-style-type: none"> ● Momentary press to store measurements while long press to recall.

3.2 Store, recall and clear readings

3.2.1 Store

(a) In measuring mode, when the measuring value is stable and the  appears, Momentary press < **M+/RM** > key, LCD will display “M+” icon and storage serial number and meanwhile all the measurements will be stored in memory. The meter can totally store 600 groups of measurement values with 300 groups in each of the pH measuring mode and mV measuring mode.

(b) When in timing measuring mode,  icon will appear on the LCD and the meter will conduct measuring according to the time set and stores the measuring information at the same time;

3.2.2 Recall measuring information:

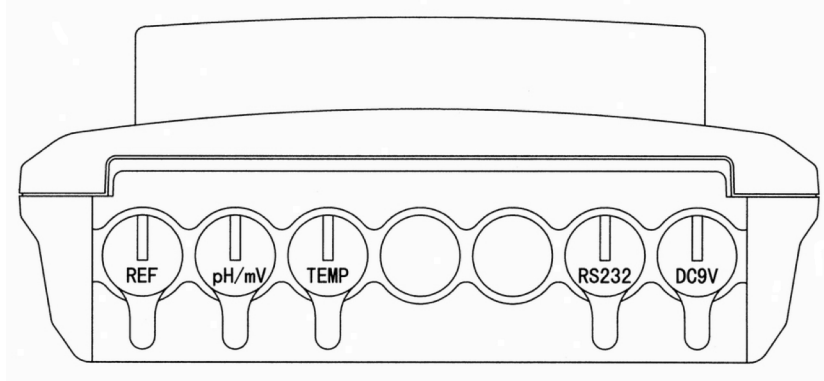
(a) In measuring mode, long press < **M+/RM** > key, the meter will recall the previous stored information. The storage serial number, **RM** icon and the complete measuring information will appear on the lower right corner of the LCD; measuring time and date will be displayed alternatively on the upper right corner. Then press < **▼** > or < **▲** > key, the measuring information will be recalled accordingly. Long press < **▼** > or < **▲** > key to rapidly check the measuring information under other serial number;

(b) In the recalling mode, press < **ENTER** > key to return to the measuring mode.

3.2.3 Clear stored value

In the recalling mode, long press < **M+RM** > key for 5s, **CLR** icon will appear on the LCD for 2s. It means the internal storage has been cleared up and then returns to measuring mode.

3.3 Sockets:



REF — Reference electrode socket

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

TEMP — Temperature electrode socket (RCA socket)

RS232 — RS232 communication connector socket

DC9V — DC9V power socket, $\Phi 2.5$, inner “+” outer “-”

pH Measurement

3.4 Preparation:


4.1.1. Switch in power, press < **1.1.1.1** > key to turn on.


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



4.1.3. Insert the pH/ATC three-in-one combination electrode into the meter's socket.

3.5 Electrode Calibration:

4.2.1. Press < **CAL** > to enter into calibration state, LCD flashes **CAL 1**, indicating to make the 1st point calibration.


4.2.2. Rinse  electrode in pure water, allow it to dry and submerge it in pH7.00 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until reading is stable and **CAL2** icon displays, then press **< CAL >**, LCD flashes 7.00 pH, calibration finishes after several seconds and then flashes, indicating the 1st point calibration has been finished and the 2nd point calibration begins.


4.2.3. Take out pH electrode, rinse it in pure water, allow it to dry and submerge it in pH4.00 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until reading is stable and  icon displays, then press **< CAL >**, LCD flashes 4.00pH, calibration finishes after several seconds and then **CAL3** flashes, indicating the 2nd point calibration has been finished and the 3rd point calibration begins.

4.2.4. Take out pH electrode, rinse it in pure water, allow it to dry and submerge it in pH 10.01 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until reading is stable and  icon displays, then press **< CAL >**, LCD flashes 10.01pH, calibration finishes after several seconds and displays a stable pH and temperature value, meanwhile  icon appears on the screen, indicating 3 points calibration has been finished and enters into measuring mode. See picture (4-1).

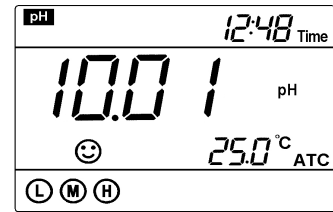
4.2.5. Notes:

(a) The meter can perform 1 point, 2 points and 3 points automatic calibration. When the 1st point calibration finished, press **< ENTER >** key to confirm and enter into measuring mode.

 icon for one-point calibration will appear on the lower left corner of the LCD. When the measuring accuracy is $\leq \pm 0.1$ pH, choose one kind of buffer solution according to the measuring range and then proceed with one-point calibration.


(b) When the 2nd calibration finishes, press **< ENTER >** key to confirm 2 points calibration and enter into measuring mode. Icon  for 2 points calibration will appear on the lower left corner of the LCD. If measurement is within acid range, you can choose pH4.00 and pH7.00 for calibration. If the measurement is within alkalinity range, you can choose pH7.00 and pH10.01 for calibration.

(c) For high accuracy measurement, it is better to choose 3 points calibration if the measuring range is wide or the electrode is ageing or used for long time. For a new electrode, 3 points calibration must be performed to make the slope of meter consistent with the pH electrode.



Picture (4-1)



3.6 Sample Test

Rinse pH electrode in pure water, allow it to dry, and submerge it in sample solution. Stir the solution briefly and allow it to stay in the sample solution until the stable value and  icon appears on LCD, get the reading which is pH value of sample solution. Please note that the closer the temperature of the sample solution to the calibration solution is, the more accurate readings will appear.

3.7 Parameter Setting

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


Chart (4-1)

Mode	Parameter Settings	Code	Parameters
P1	pH buffer solution series selection		USA (Europe & U.S.A series) NIS (NIST series) CH (China series)
P2	Time setting for timing measuring		0-99 min
P3	Unit of temperature		°C/°F
P4	Date setting	Date	Month / Day / Year
P5	Time setting	Time	Hour / Minute
P6	Restore factory setting		OFF-On

4.4.2. Select pH buffer solution standard (P1) with

(a) Long press < **MODE** > key to enter into P1 mode, see picture (4-2).

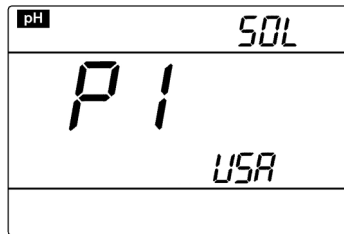
(b) Press < ▲ > or < ▼ > key to choose buffer solution series:

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

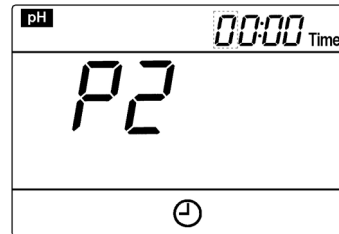
n 15 (NIST series) — 1.68, 4.01, 6.86, 9.18 and 12.45 pH

CH (Chinese 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.



Picture (4-2)



Picture (4-3)


4.4.3. Time setting for timing measurement (P2)

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

(b) Press **< UNIT >** key, the “**n**” will move to the right and flash. Press **<▲>** or **<▼>** key to change when the number is flashing.

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

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

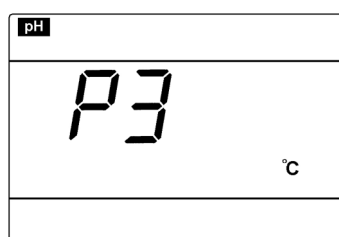
Note: in the form of “**00:00**”, on the left side of “**:**” is minute, and its maximum setting is 99; on the right side of “**:**” is second, its maximum setting is 59. After set timing measuring mode,  icon will appear on the LCD screen.

4.4.4. Temperature unit $^{\circ}\text{C}/^{\circ}\text{F}$ setting (P3)

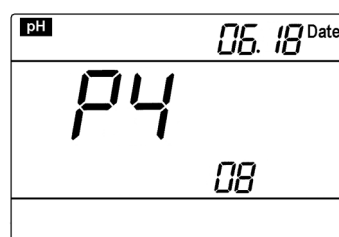
(a) Momentary press **<MODE>** key in mode P2 to enter into mode P3, see picture (4-4)

(b) Press **<▲>** or **<▼>** key to choose temperature unit: $^{\circ}\text{C}$ or $^{\circ}\text{F}$.

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



Picture (4-4)



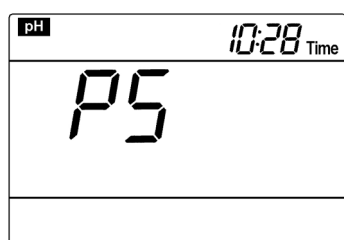
Picture (4-5)

4.4.5. Date setting (P4)

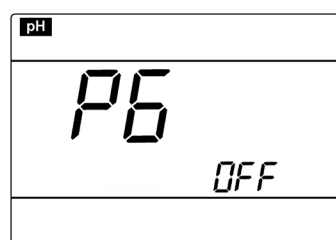
- (a) Momentary press **<MODE>** key in mode P3 to enter into mode P4, see picture (4-5)
- (b) Press **<UNIT >** key, the number will move rightward and flash , press **<▲ >** or **<▼ >** key to alter the number. The upper right is month-day and the lower right is year.
- (c) Press **<MODE >** key to enter into next parameter setting or press **<ENTER >** key to conform and return to measuring mode.

4.4.6. Time setting (P5)

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



Picture (4-6)



Picture (4-7)

4.4.7. Restore to factory setting (P6)

- (a) Momentary press **<MODE>** key in mode P5 to enter into mode P6, see picture (4-7)
- (b) Press **<▲ >** key to choose “**On**”, indicating parameter setting has been restored to the factory setting state and will return to measuring mode after 2s.

3.8 Notes:

4.5.1. After immersing the pH combination electrode into the solution, please stir the solution briefly in order to avoid bubble disturbance and obtain a faster response and stable measurement value.

4.5.2. Calibration frequency depends on the solution sample, electrode performance and required accuracy. For high accuracy measurement ($\leq \pm 0.02 \text{pH}$), timely calibration performed with high accurate buffer solution is required. For general accuracy measuring

($\geq \pm 0.1$ pH), one-time calibration can be used continuously for one week or longer time.

4.5.3. The meter should be recalibrated in such cases:

- (a) New electrode or long time idle electrode;
- (b) After measuring strong acid (pH<2) or strong alkaline (pH>12) solution;
- (c) After measuring fluoride containing solution or strong organic solution;
- (d) The temperature of the tested solution is much different with the calibration temperature.

4.5.4. If without temperature electrode, users can press < ▲ > or < ▼ > key to do manual temperature compensation.

4.5.5. In front of the pH electrode, there is a protection bottle, which contains the soaking solution. The tip of the electrode should be immersed in the solution to keep the glass bulb junction's activation. Unscrew the cap, pull out the electrode and wash it in pure water before measuring. Put in the electrode and screw tight the cap after measuring to prevent the solution leaking. If the soaking solution is turbid or moldy, please clean and change it at once.

4.5.6. The preparation of the soaking solution: add 30g pure KCL and 0.5g potassium acid phthalate into 100mL /60 °C pure water and stir it to fully dissolve. Electrode should avoid long time immersing into pure water, protein solution and acid fluoride solution and should prevent from contacting with organic silicon lipidic stuffs.

4.5.7. In order to improve the accuracy, the pH value of the buffer solution should be known and reliable. Buffer solution should be changed in time after repeated using.

4.5.8. Keep the meter, especially the electrode and the socket of the electrode clean and dry, otherwise it may lead to an inaccurate measurement or invalidity. Clean the stains with medical cotton and absolute alcohol and blow dry afterward.

4.5.9. The sensitive glass bulb in the front of the combination electrode should not come in contact with hard surfaces. Scratches or cracks on the electrode will cause inaccurate readings. Before and after each measurement, wash the electrode with pure water and then throw off the excess water on the electrode. Do not clean the glass bulb with a tissue for it

will affect the stability of the electrode potential and increase the response time. The electrode should be thoroughly cleaned if a sample sticks to the electrode. Use a solvent if the solution does not appear clean after washing.

4.5.10. The life span of pH electrode is about 1 year. This will be shortened if used in extreme condition or improper maintained. The ageing and invalid electrode should be replaced in time.

4.5.11. If the calibration or display of the meter occurs abnormal, please set P6 to be “On” to restore to factory setting and calibrated again.

4.5.12. Please don't plug out the power when meter is still working; plug out after turning off the meter.

3.9 Self-diagnostic Information

In the process of using, some icons might appear. This is the self-diagnosis for the meter, which will help to understand the problems of the meter or electrode during using:

4.6.1. The stationary “ - 2.00 pH ” or “ 19.99 pH ” icon — this means the measurements has exceeded the measuring range. If the meter is not proper connected with the electrode or the electrode doesn't immerse into the solution, such icons will also appear and that is normal.

4.6.2. “ **Err1** ” — Electrode zero potential is exceeded (<-60mV or >60mV)

4.6.3. “ **Err2** ” — Electrode slope is exceeded (< 85% or >105%)

4.6.4. When “ **Err1** ” or “ **Err2** ” appears on the upper right corner, the meter will not work normally, please check as following:





(a) Check the electrode bulb and see if there is an air bubble, if exists, please throw it out hardly.


(b) Check the pH buffer solution and see if it goes bad or has bigger error.


(c) Restore the meter to factory setting mode (for details see item 4.4.7), then recalibrate it. If it doesn't work after the above checks, please replace a new pH electrode.

4 mV and ORP Measurement


4.1 Sample Test

5.1.1. Press  to turn on the meter, press **< MODE >** to switch to  then press **< UNIT >** key to choose  or  ;

(a)  – This is the electrode potential measuring mode. mV value and the temperature will be displayed at the same time;

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

Note: — ORP is the abbreviation of “Oxidation-Reduction Potential”, representing the Oxidation-Reduction Potential of the solution, ORP is the measuring parameter for the oxidation reduction potential of the aqueous solution. Use mV as its unit.

5.1.2. Connect ORP electrode or ion electrode, immerge it into the sample solution, stir briefly and then set it still. When  icon appears, the reading is the ORP value or the potential value of the ion electrode.

4.2 Notes

5.2.1. ORP measurement does not require calibration. When the user is not sure about ORP electrode quality or measuring value, use ORP standard solution to test mV value and see whether ORP electrode or meter works properly.

5.2.2. Clean and activate ORP electrode: After the electrode has been used over a long period of time, the platinum surface will get polluted which causes inaccurate measurement and slow response. Please refer to the following methods to clean and activate ORP

electrode:

(a) For inorganic pollutant, submerge the electrode in 0.1mol/L dilute hydrochloric acid for 30 minutes, then wash it in pure water, then submerge it in the soaking solution for 6 hours.


(b) For organic or lipid pollutant, clean the platinum surface with detergent, then wash it in pure water, then submerge it in the soaking solution for 6 hours.

(c) For heavily polluted platinum surface on which there is oxidation film, polish the platinum surface with toothpaste, then wash it in pure water, then submerge it in the soaking solution for 6 hours.

4.3 Parameter Setting

5.3.1. mV and ORP measurement parameter setting (chart (5-1))

Chart (5-1)

Mode	Contents	Code	Parameters
P1	Time set for timing measuring		0 to 99min
P2	Restore to factory setting		OFF-On

5.3.2. Time set for timing measuring (P1):

Please refer to 4.4.3.

5.3.3. Restore to factory setting (P2):

Please refer to P15 items 4.4.7

5 RS232 Communication

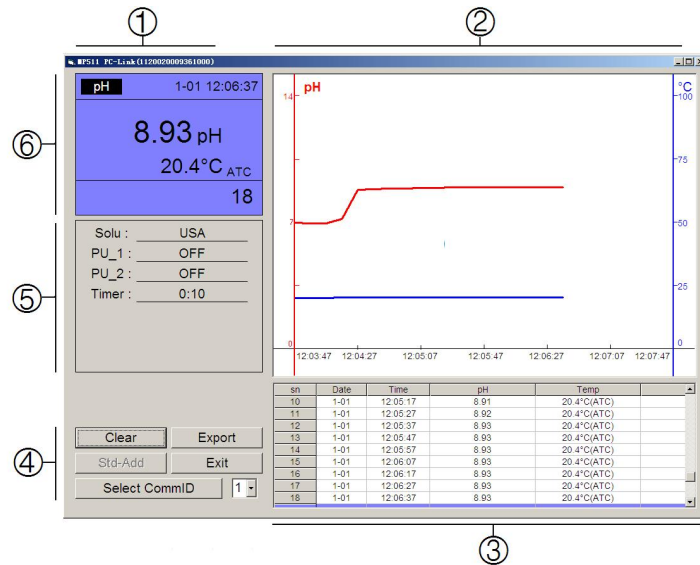
5.1 System requirements

This meter uses “MP500 PC-Link” communication software for RS232 communication. This software requires the computer to meet such requirement: Personal computer (Microsoft Excel 2000 or the version of higher rank) which can operate Windows XP operation system,

PC-IBM compatible with XT and CD-ROM driver, RS232 communication port.

5.2 Software interface

Software interface: refer to Picture (6-1).



Picture (6-1)

① — Meter Serial number

② — Measurements and time curve

③ — Stored value display area

④ — Keys

Clear — Press the key to clear data

Export — Press this key to export the stored value to Microsoft Excel file

Exit — Press this key, PC-Link program exits from the computer interface

Select CommlD — Press the key to download the data from the meter and upload it to PC

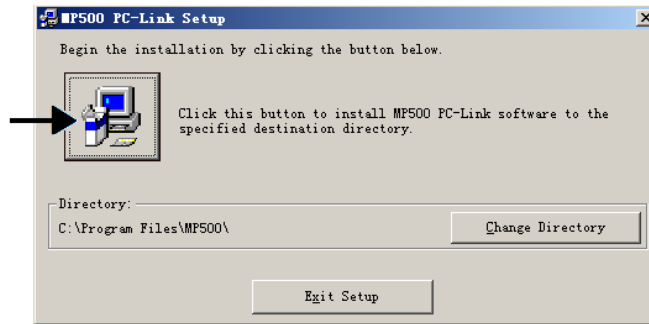
⑤ — Parameters setting : Standard of the buffer solution, time setting etc.

⑥ — Measurements display screen

5.3 Load software


Put the software disk into the computer and install the software as per the following procedures:

Open "PC-Link" file → Double click "Setup" program → Click "OK" → Click the icon (refer to Picture (6-2)) → Click "Continue" → Click "Enter".




Picture(6-2)

5.4 Port Connection

Connect the meter and PC with RS232 cable and open the MP 500 PC Link Program, the PC will enter into program interface and then click" Select CommID". The default port of the PC is port#1, Icon  will appear on the lower left corner of the LCD screen.

5.5 Run Software

6.5.1. Upload the stored value

When the meter is connected with PC and icon  appears on the LCD screen, the data stored in the meter will be automatically uploaded to the PC. This program will sort the pH and mV measurement and show the data in category.

6.5.2. Storage during operation

When the program is running, press **<M+/RM>** key to store data. All the measurement value will be uploaded to the PC through RS 232 and will not be stored in the meter. Storage data during operation will be the same with which displays on the meter. If timing measuring mode is set, the time curve will be showed on the interface as well as the measurements.

6.5.3. Data processing

Press "Export" key to export the stored value to Microsoft Excel file and then analyze or print the stored data.

6 Complete Kit

7.1. P300 pH/mV/T Meter	1 unit
7.2. pH/ATC three-in-one combination electrode	1 pc
7.3. 9V multi- adapter (with four kinds of plug)	1 pc
7.4. RS232 communication cable (optional)	1 pc
7.5. P300 communication software CD (optional)	1 pc
7.6. Operation manual	1 pc
7.7. Brief operation instruction	1 pc

7 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 probes). 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, and 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.

APERA INSTRUMENTS, LLC

Address: 977 Old Henderson Rd, Columbus Ohio 43220

Tel: 1-614-285-3080

Email: info@aperainst.com

Website: www.aperainst.com