

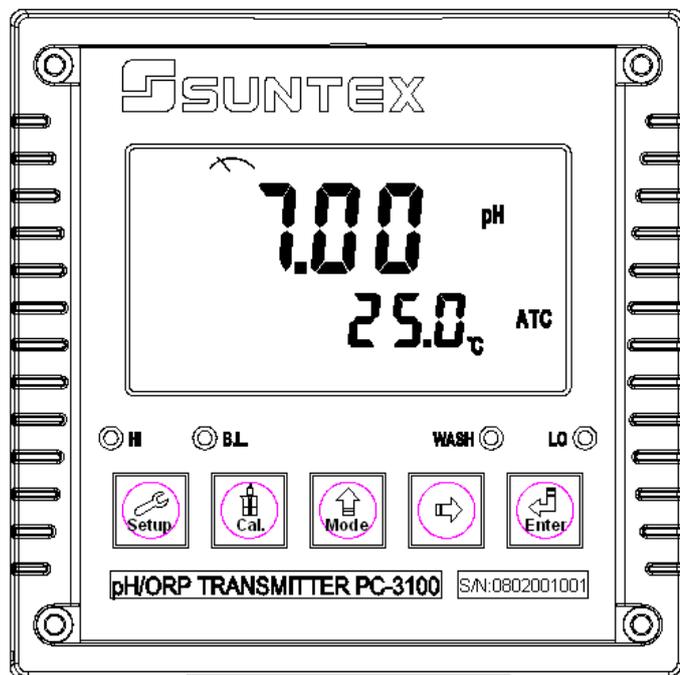
PC-3100/3100RS

Microprocessor

pH/ORP

Transmitter

Operation
Manual



CONTENTS

Brief Instruction

1. Specifications	1
2. Precautions for installation	2
3. Assembly and installation	
3.1 Transmitter installation	2
3.2 Illustration of panel mounting	2
3.3 Illustration of Wall mounting and pipe mounting	3
3.4 Assembly of electrode and housing	3
3.4.1 Cable set-up	3
3.4.2 Assembly of housing PP-100A	4
3.5 Illustration and description of junction box	5
4. Overview of pH/ORP transmitter PC-3100	
4.1 Illustration of rear panel	7
4.2 Illustration of terminal function	7
4.3 Description of terminal function	8
4.4 Installation of transmitter PH-300T	8
4.5 Connection of transmitter PC-3100 and transmitter PH-300T	9
4.6 Typical wirings	10
4.7 Illustration of electrical connection	10
5. Configuration	
5.1 Illustration of front panel	11
5.2 Keypad	11
5.3 LED indicators	12
5.4 Display	12
6. Operation	
6.1 Measurement mode	13
6.2 Set-up mode	13
6.3 Calibration mode	13
6.4 Reset	
6.4.1 Master reset	13
6.4.2 Calibration reset	13
6.5 Time and date mode (PC-3100RS only)	13
7. Settings	
7.1 Entry of set-up mode	14
7.2 Security code of settings	14
7.3 Measurement parameters	15
7.4 Temperature	16
7.5 Stand by	17

7.6 Hi point.....	18
7.7 Lo point.....	19
7.8 Wash time.....	20
7.9 Analog output 1 (pH/ORP).....	21
7.10 Analog output 2 (temperature) (PC-3100 only)	22
7.11 Sample average of measurements (Digital Filter).....	23
7.12 Time and date setting (PC-3100RS only).....	23
7.13 RS-485 (PC-3100RS only).....	24
7.14 Backlit LCD	25
8. Calibration	
8.1 Security code of calibration.....	26
8.2 Entry of calibration mode.....	27
8.3 Any Buffer calibration.....	28
8.4 Calibration of pre-set TECH. buffer (Ct1).....	29
8.5 Calibration of pre-set NIST. buffer (Cn1).....	31
8.6 ORP calibration.....	31
9. Modbus protocol and instructions(PC-3100RS only)	32
10. Error messages (Error code)	37
11. Maintenance	38

Brief Instruction

Settings of measurement parameters (see chapter 7)



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In measurement mode, pressing “Setup” and “Mode” simultaneously allows you to access Set-up mode.

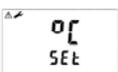
If you like to use security code of settings, the original code is e1111.



In the Code function, entering original code or user’s designated code allows you to reset the code or shut down this function.



In the Configuration function, please select “pH” or “ORP” parameter to measure.



In the Temperature function, please set temperature compensation type and temperature modification.



In the Relay 1 function, please select  or  to activate it or not.



In the Relay 2 function, please select  or  to activate it or not.



In the Clean function, please set wash time and stop duration.



In the pH function, please set analog output 1 with  or 



In the tP function, please set analog output 2 with (temperature)  or  (PC-3100 only)



In the Real-time clock function, please set year, date, and time. (PC-3100RS only)



In the SerL function, please set ID code  and baud speed  (PC-3100RS only)



In the Back light function, please set brightness of display and sensitivity of light-source sensor.

Settings of Calibration (see chapter 8)



+



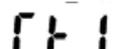
In measurement mode, pressing “Cal.” and “Mode” simultaneously allows you to access Calibration mode.

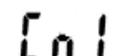
If you like to use security code of calibration, the original code is 1111.



In the Code function, entering original code or user’s designated code allows you to reset the code or shut down this function.

 : Any Buffer

 : TECH. Buffer: pH2.00, 4.01, 7.00, 10.00, 12.00 (pH2.00 & pH12.00 for PC-3100RS only)

 : NIST Buffer: pH1.68, 4.01, 6.86, 9.18, 12.46 (pH1.68 & pH12.46 for PC-3100RS only)

Any Buffer Calibration (Single point and Dual points)

- When entering CA1 calibration mode, clean the electrode with distilled water before putting it in the buffer solution. Press  to start the calibration. Then display will show the mV value of the buffer and  begin to twinkle. After showing a similar number of pH value to the buffer solution, press  or  to set the digit until it is equal to the buffer's standard. Then, press  to ensure it.



- When the display shows "CA2", it means that you are now entering second point of calibration. Process same procedures as Step 1.

Note 1: Press  when showing CA2, you may choose to make single-point calibration only.

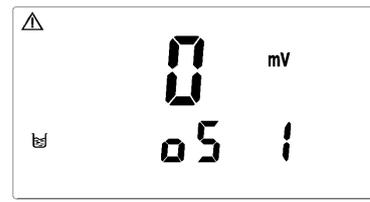
Note 2: Single-point calibration means that you only modify zero point (OS value) and do not modify the slope (SLP value). The transmitter will automatically adapt to the SLP value that have been memorized the very last time.



- The display will show "CAL PASS" when you successfully finish calibration. In the other hand, it will show "CAL Err" when failing calibration. (See chapter 10 for error messages)



- The display will show OS value (zero-point) automatically. Press  to show the SLP value of calibration. Press  to go back to measurement mode.



Standard Buffer Calibration (TECH) --- Two points and Three points

Note: This transmitter can recognize buffer solutions automatically. Three-point calibration is for PC-3100RS only.

1. Enter Ct1 calibration mode. Clean the electrode completely. Put it into the first buffer solution. Then, press  to start the first-point calibration.



2. The display will show mV value while being calibrated. After the value becomes stable, the display will show the first pH value of calibration. Then, it will enter the second calibration (Ct2).



3. Clean the electrode completely, and put it into the second buffer solution. Then, press  to start the second-point calibration.



4. The display will show the mV value while being calibrated. After the value becomes stable, the display will show the second pH value of calibration automatically. Then, then it will enter the third-point calibration (Ct3).

Note: Only PC-3100RS supply with the "Ct3" function.

For skipping the third-point calibration, please press  to escape.



5. Clean the electrode completely, and put it into the third buffer solution. Then, press  to start the third-point calibration. (Same steps as above)



6. When being calibrated successfully, it will show “CAL PASS”. If the calibration is unsuccessful, it will show “CAL Err”. (See chapter 10 for Error messages and solutions)



7. The display will automatically show the oS1 (zero-point mV) Value. Press  to see SLP1 (slope) value.



PC-3100RS only →

- Then, press  to see oS2 (zero-point) value. Then, press  to see SLP2 (slope) value. Then, press  you may repeat calibration steps of 1 to 7. Or, press



 to go back to measurement mode.



Note: (1) The two-point and three-point calibration steps of pre-set buffer solutions (NIST) are the same procedure as the calibration of TECH. buffer solutions.

(2)When doing Three-point calibration, be aware of calibrating it from lowest pH value to highest one, or vice versa.



Reset

Press  +  for 5 seconds, then press . The display will show  to indicate that the “Master Reset” has been done.

Press  +  for 5 seconds, then press . The display will show  to indicate that the “Calibration Reset” has been done.

1. Specifications

Model		PC-3100	PC-3100RS
Measuring modes		pH/ORP/TEMP	
Ranges	pH	-2.00~16.00pH	
	ORP	-1999~1999mV	
	Temp.	-30.0~130.0°C	
Resolutions	pH	0.01pH	
	ORP	1mV	
	Temp.	0.1°C	
Accuracy	pH	±0.01± 1Digit	
	ORP	±1mV ± 1Digit	
	Temp.	±0.2°C± 1Digit	
Temperature Compensation		NTC30KΩ or PT1000 auto recognized Manual adjustment	
Ambient Temp.		0~50°C	
Storage Temp.		-20~70°C	
Input Impedance		> 10 ¹² Ω	
Display		Large LCD display with environment light sensor auto/manual illumination function	
Analog output 1		Isolated DC 0/4~20mA corresponding to pH/ORP, max. load 500Ω	
Analog output 2		Isolated DC 0/4~20mA corresponding to Temp, max. load 500Ω	—
Serial Interface		—	RS-485 (MODBUS RTU or ASCII)
Calibration mode		Any , Tech & NIST buffer, up to Two points	Any , Tech & NIST buffer , up to three points
Settings	Contact	Relay contact, 240 VAC, 0.5A max.	
	Activate	Two sets Hi/Lo Programmable, ON/OFF	
Wash	Contact	Relay contact, 240 VAC, 0.5A max.	
	Time	ON: 0~9999 sec./ OFF: 0~999.9 hours	
Voltage Output		DC±12V	
Power Supply		100~240VAC, 50/60Hz	
Installation		Wall or Pipe or Panel Mounting	
Dimensions		144 mm × 144 mm × 115 mm (H×W×D)	
Cut off Dimensions		138 mm × 138 mm (H×W)	
Weight		0.8 kg	
Certification		IP 65 (NEMA 4X), CE	

2. Precautions for installation

Wrong wiring will lead to breakdown or electrical shock of the instrument, please read this operation manual clearly before installation.

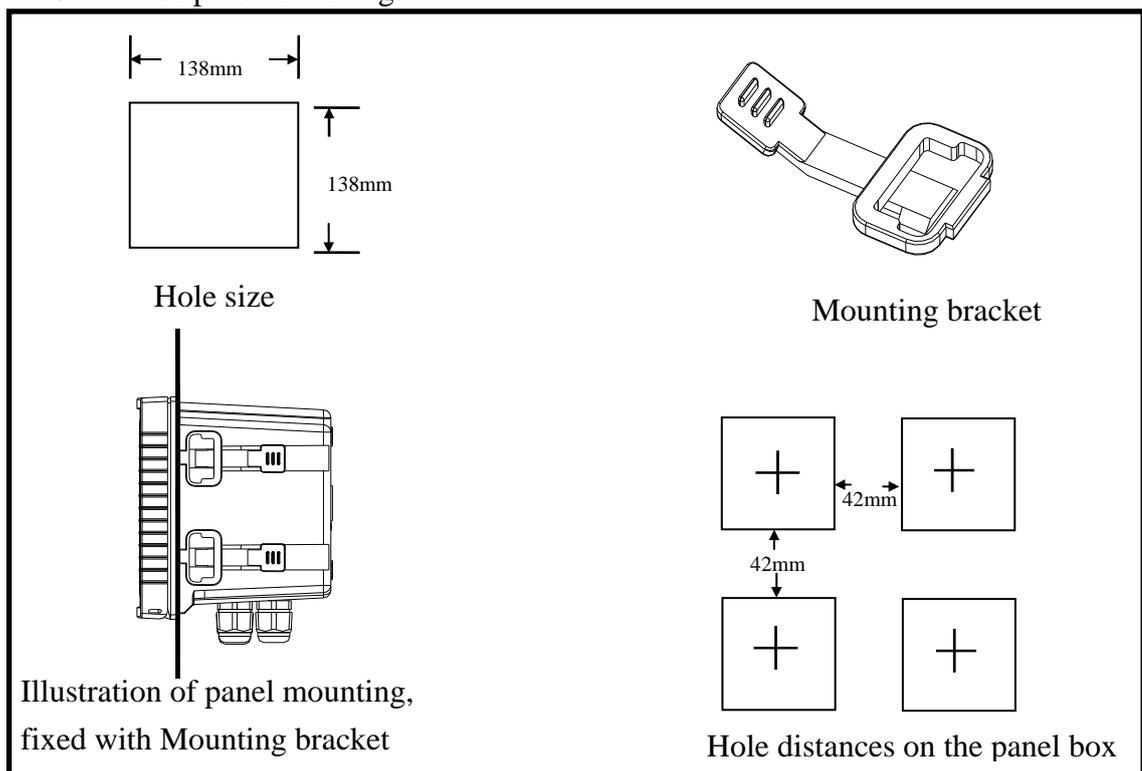
- Make sure to remove AC power from the transmitter before wiring input, output connections, and remove it before opening the transmitter housing.
- The installation site of the transmitter should be good in ventilation and avoid direct sunshine.
- The material of signal cable should be special coaxial cable. Strongly recommend using our coaxial cable. Do not use normal wires instead.
- Avoid electrical surge when using power. Especially when using three-phase power, use ground wire correctly.
- The internal relay contact of the instruments is for alarm or control function. Due to safety, please must connect to external relay which can stand enough ampere to make sure the safety operation of the instruments. (Please refer to chapter 4.7 “Illustration of electrical connection”)

3. Assembly and installation

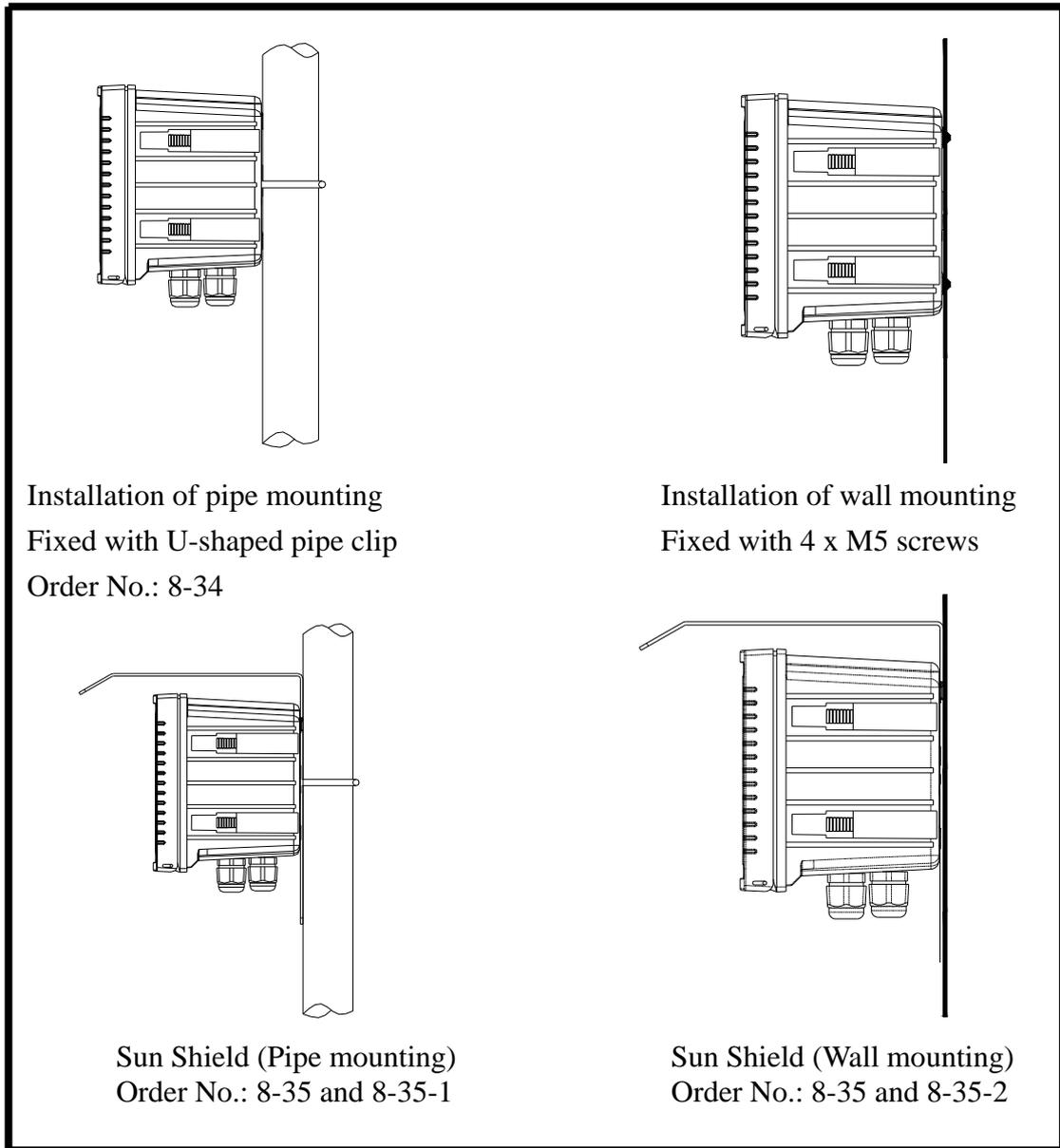
3.1 Transmitter installation: This transmitter can be installed through panel mounting, wall mounting and pipe mounting.

Installation of panel mounting: First, prepare a square hole of 138 x 138mm on the panel box, and then insert the transmitter directly into the panel box. Insert the accessorial mounting bracket from the rear, and make it be fixed in to pickup groove.

3.2 Illustration of panel mounting:

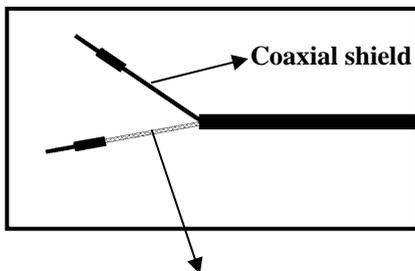


3.3 Illustration of Wall mounting and pipe mounting



3.4 Assembly of electrode and housing

3.4.1 Cable set-up:



Remove the conductive rubber from the coaxial inner

Set-up diagram of coaxial cable:

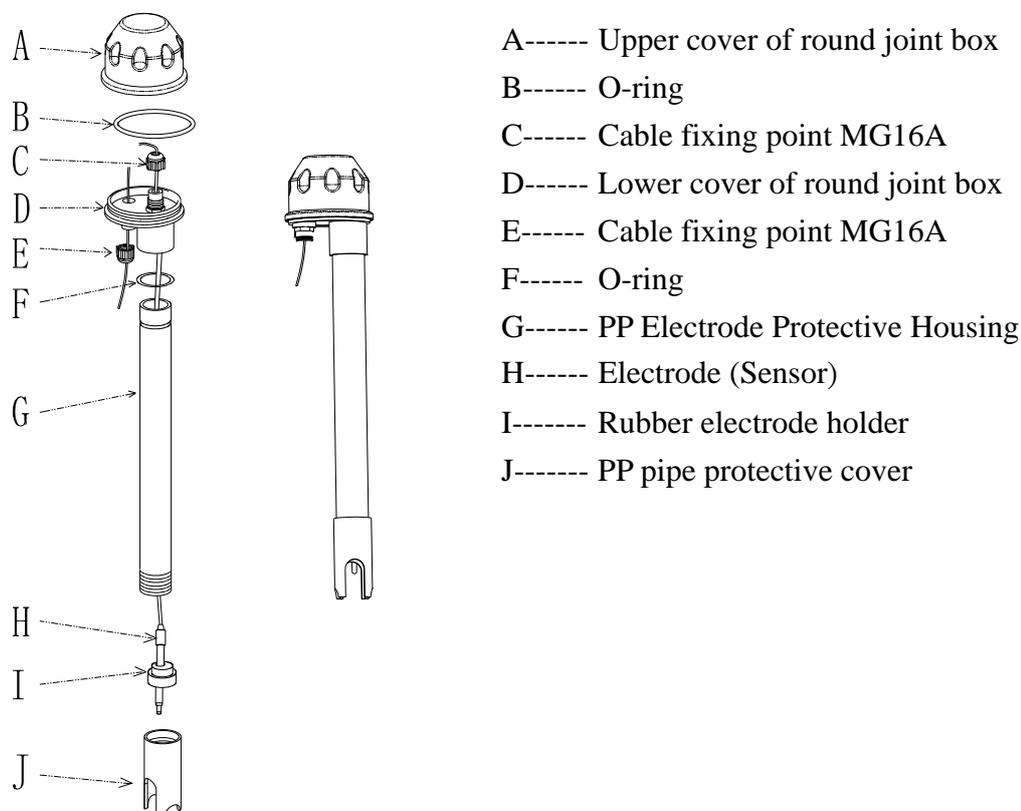
See the correct set-up method on the left:

Note: The black conductive rubber covering on the coaxial inner should be removed for use.

- Make sure to remove the conductive rubber or aluminum-foil paper between the electrode signal wire and the coaxial shield.
- Extend the cable to the transmitter without any joint except specific junction box. Connect

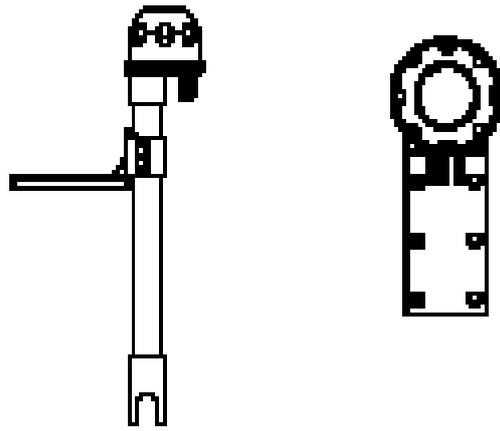
the coaxial inner directly to the Glass contact on the back of transmitter and connect coaxial shield to Ref. contact.

3.4. 2 Assembly of housing PP-100A



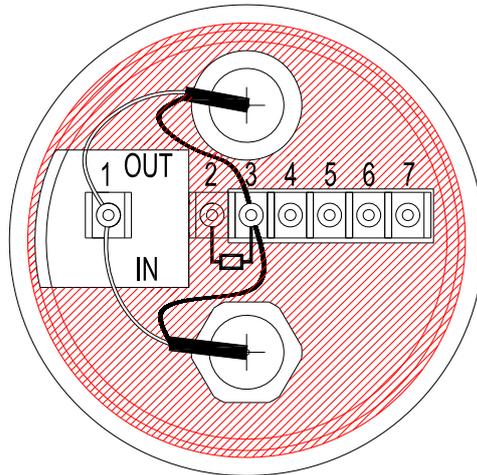
1. Insert **(H)** Electrode through **(G)** PP Electrode Protective Housing
2. Rinse **(H)** Electrode properly, so that it can be easily pass through **(I)** Rubber electrode holder, leave about 5cm bellow.
3. Install the prepared **(I)** Rubber electrode holder into **(G)** PP Electrode Protective Housing and lock **(J)** PP pipe protective cover tightly.
4. Insert **(H)** Electrode cable through **(D)** Lower cover of round junction box and **(C)** Cable fixing point, and use **(D)** Lower cover of round junction box to lock **(G)** PP Electrode Protective Housing tightly.
5. Prepare 15cm cable in the PP pipe, and then lock **(C)** Cable fixing point MG16A tightly. Leave **(H)** Sensing electrode cable for about 12-14cm, and split it carefully.
6. Fix the terminal of electrode coaxial inner on terminal block 1 of round holder; Fix the terminal of electrode coaxial shield on terminal block 3. (See the instruction of junction box)
7. Extend the cable to pass through **(E)** Cable fixing point on **(D)** Lower cover of round junction box, and lock **(E)** Cable fixing point MG16A tightly, leaving 12-14cm in the box for split.
8. Extend the lead coaxial inner and electrode coaxial inner to connect them; extend the lead coaxial shield to fix on the terminal block 3. Lock **(A)** Upper cover of round junction box to finish the installation.

Mounting bracket:



Suntex applies L-shaped mounting bracket as electrode mounting bracket. According to the site necessity, fix the bracket with steel nails or expansion bolts at proper locations by pool.

3.5 Illustration and description of junction box :(Two kinds of link distributing system)



〔 1 〕 Two-wire distributing system			
INPUT terminals	Terminal No.	OUTPUT terminals	Terminals on transmitter
Coaxial inner	1	Coaxial inner's extending wire for electrode	GLASS
Shield (forbidden)	2	Shield (forbidden)	-----
Coaxial shield	3	Coaxial shield's extending wire for electrode	REF
Temperature probes red wire	4	Red wire's extending wire for electrode	T/P
Temperature probes green wire	5	Green wire's extending wire for electrode	GND
Alternative	6、 7	Alternative	-----

Note: 1. Our company's extending wire for electrode material No. is 7202-F94009-BK and 7202-RG-58

1.) If temperature probe is not used, the Order No. is 7202-RG-58.

2.) If temperature probe is used, the Order No. is 7202-F94009-BK.

2. If temperatures probe 8-26-3(NTC30K) or 8-26-8(PT1000) is used for two-wire distribution, the black wire terminal should be forbidden.

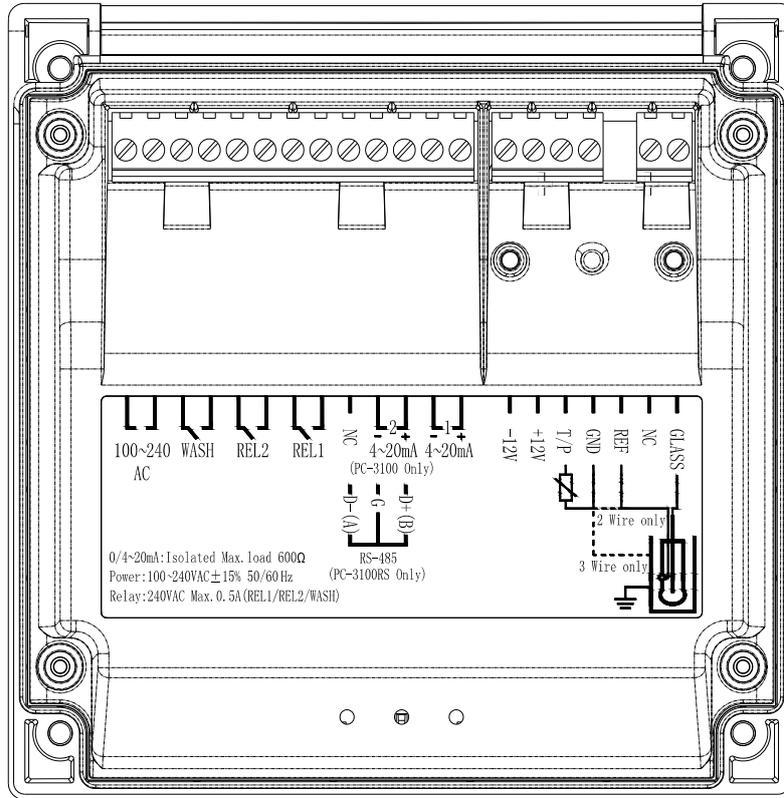
(2) Three-wire distributing system			
IN terminals	Terminal No.	OUT terminals	Terminals on transmitter
Coaxial inner	1	Coaxial inner's extending wire for electrode	GLASS
Ground Rods	2	GND	GND
Coaxial Shield	3	Coaxial Shield's extending wire for electrode	REF
Temperature probes red wire	4	Red wire's extending wire for electrode	T/P
Temperature probes green wire	5	Green wire's extending wire for electrode	GND
Alternative	6, 7	Alternative	----

Note: 1. The black wire on the temperature probes of 8-26-3(NTC30K) or 8-26-8(PT1000) is used as special wire for Ground Rods to be connected at terminal 2.

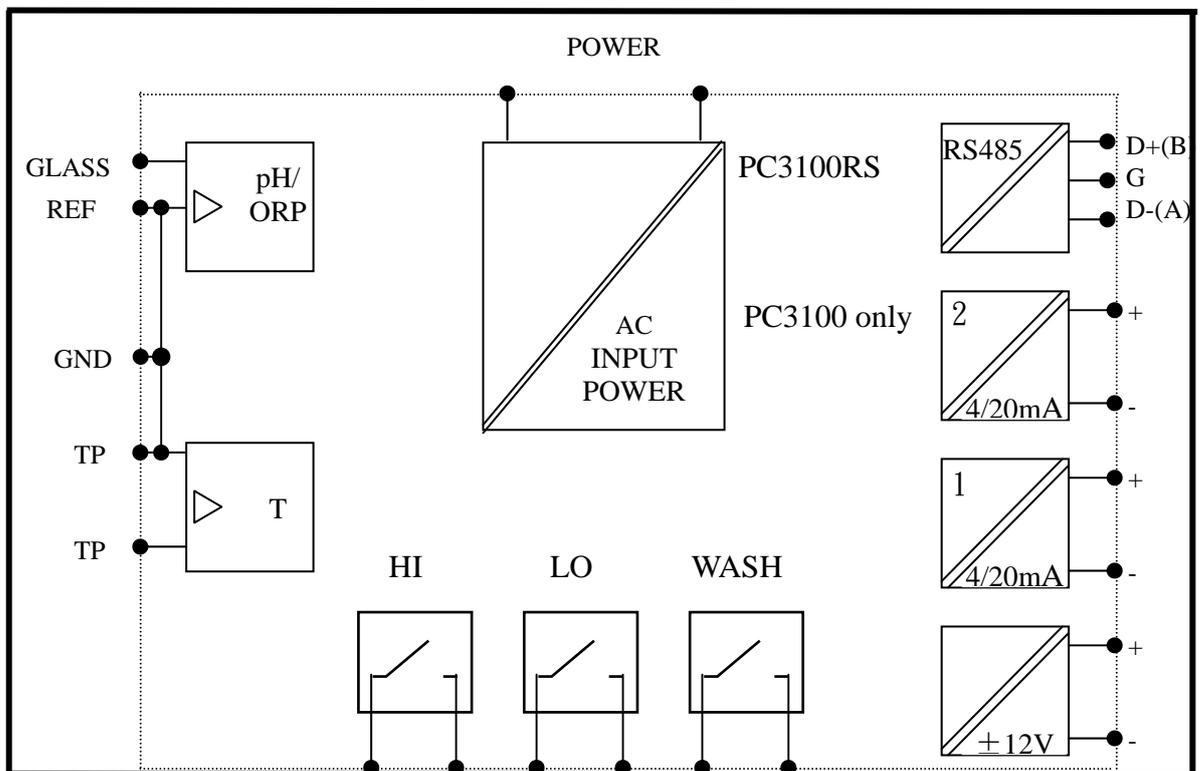
2. The extending wire for electrode that has a temperature probe or ground rod is marked with material number 7202-F94009-BK.

4. Overview of pH transmitter PC-3100

4.1 Illustration of rear panel:



4.2 Illustration of terminal function:

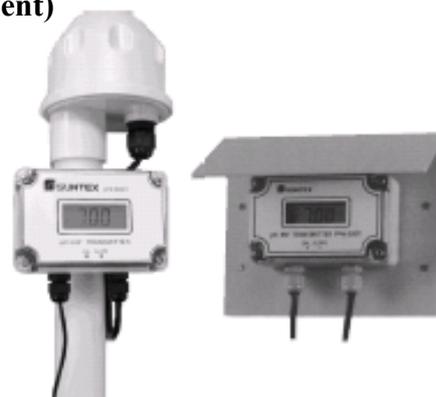


4.3 Description of terminal function:

- “1”   **100~240AC:** Power supply terminal
- “3”   **WASH:** External wash relay terminal
- “5”   **REL2:** L0, External relay terminal low control
- “7”   **REL1:** HI , External relay terminal high control
- “9”  **NC / D-(A):**
PC-3100: NC
PC-3100RS: RS-485 output D-(A)
- “10”  **4~20mA – terminal /G:**
 PC-3100: Temperature current output terminal -
 PC-3100RS: RS-485 output GND
- “11”  **4~20mA – terminal / D+(B):**
 PC-3100: Temperature current output terminal +
 PC-3100RS: RS-485 output D+(B)
- “12”  **4~20mA - terminal:** Master measurement current output terminal -
- “13”  **4~20mA + terminal:** Master measurement current output terminal +
- “14”   **DC±12V:** Output terminal of direct current voltage ±12V (**for PH-300T only**)
- “16”  **T/P:** Connect the end of temperature probe
- “17”  **SG :** Connect the other end of temperature probe, or used as ±12V ground potential. **In two-wire distributing system, there should be a short circuit between this terminal and REF (a short circuit slice is attached when out of factory)**
- “18”  **REF:** Coaxial shield connecting pH/ORP electrode signal wire
- “19”  **NC:** NC
- “20”  **GLASS:** Coaxial inner connecting pH/ORP electrode signal wire

4.4 Installation of transmitter PH-300T: (alternative equipment)

PH-300T transmitter is mainly installed on the electrode protective pipe, but also can apply wall mounting and pipe mounting. For long distance transmission (100m), if PC-3100 is more than 30m far away from the electrode, PH-300T transmitter is recommended to avoid the attenuation of electrode signal, and for the convenience of onsite observation, measurement, and calibration.

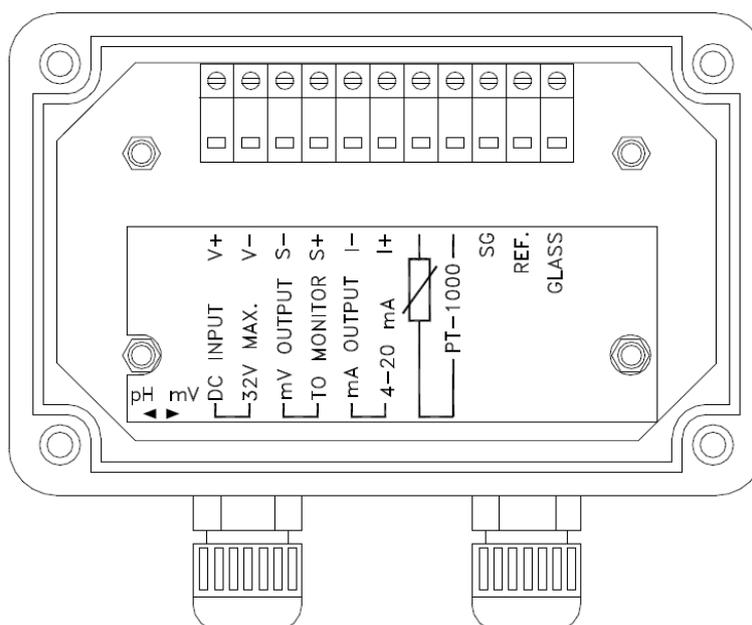


4.5 Connection of transmitter PC-3100 and transmitter PH-300T:

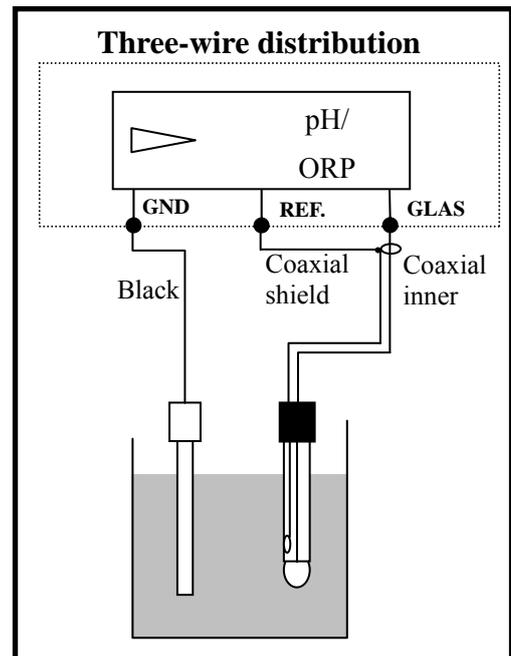
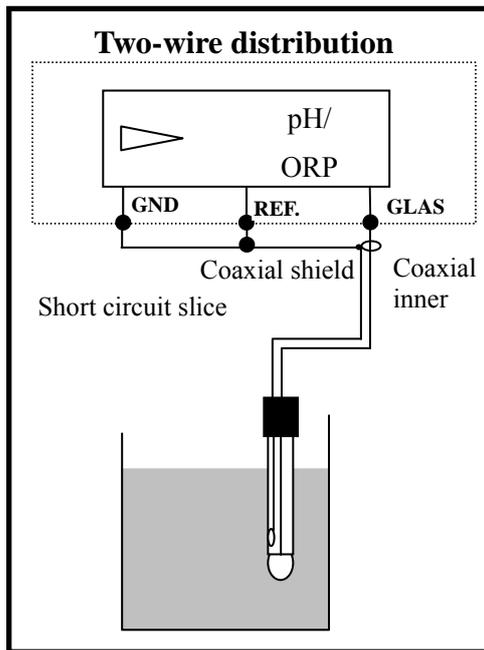
- A. Connect the GLASS point of transmitter PH-300T's terminal to the electrode coaxial inner. (Note: Remove the black conductive rubber); connect the REF point of transmitter PH-300T's terminal to the electrode coaxial shield.
- B. See the two-wire distributing system and three-wire distributing system in the following page.
- C. Sign "PT-1000" on transmitter PH-300T's terminal is the connector for automatic temperature compensation probe, PT-1000, or applies a fixed temperature compensation resistance.
- D. The V+ and V- of transmitter PH-300T's terminal respectively connect to DC12V+ and – of the transmitter.
- E. The S+ and S- on transmitter PH-300T's terminal respectively connect to GLASS and REF of the transmitter.
- F. The I+ and I- on transmitter PH-300T's terminal are output (4-20mA), which can connect to devices that receive current signals. **(Note: The current output signal of this transmitter is not insulating, so use it with much care!)**

Note: Refer to the following table for proper fixed temperature compensation resistance

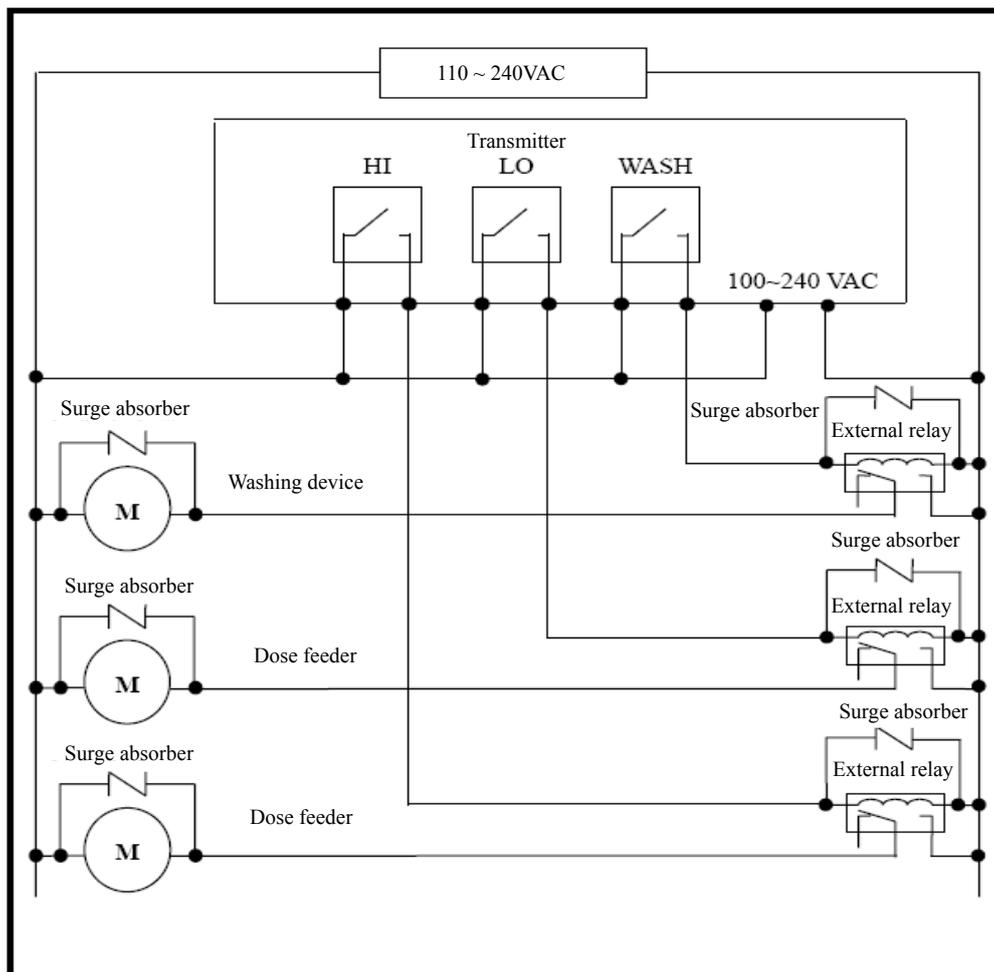
Temperature	0°C	5°C	10°C	15°C	20°C
R value	1000Ω	1019.25Ω	1038.5Ω	1057.75Ω	1077Ω
Temperature	25°C	30°C	35°C	40°C	45°C
R value	1096.25Ω	1115.5Ω	1134.75Ω	1154Ω	1173.25Ω
Temperature	50°C	55°C	60°C	65°C	70°C
R value	1192.5Ω	1211.75Ω	1231Ω	1250.25Ω	1269.5Ω
Temperature	75°C	80°C	85°C	90°C	100°C
R value	1288.75Ω	1308Ω	1327.25Ω	1346.5Ω	1385Ω



4.6 Typical wirings:

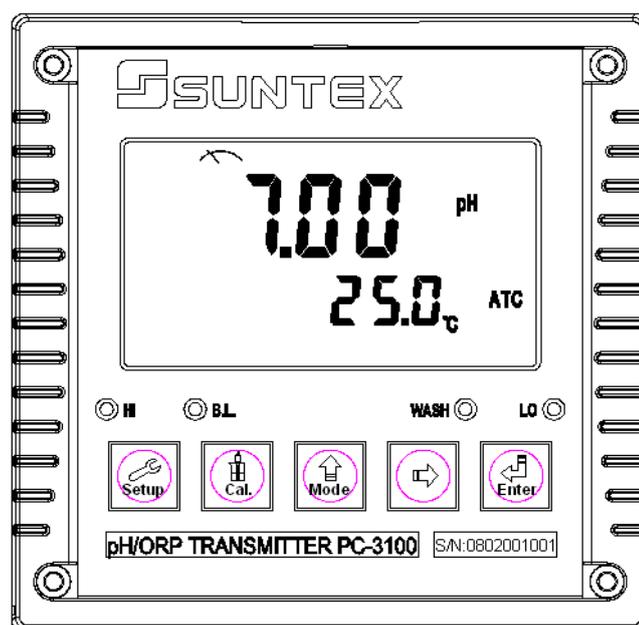


4.7 Illustration of electrical connection:



5. Configuration:

5.1 Illustration of front panel:



5.2 Keypad:

In order to prevent inappropriate operation by others, before the parameter setting and calibration, the operation applies multi-keys, and coding protection if necessary. Description of the key functions is in the following:



In the parameter set-up mode, pressing this key allows you exit parameter set-up mode and back to Measurement mode.



In the Calibration mode, pressing this key allows you exit Calibration mode and back to Measurement mode.



In the parameter set-up mode and Calibration mode, pressing this key to increase the value or to scroll to other function.



In the parameter set-up mode and Calibration mode, pressing this key to decrease the value or to scroll to other function.



Key for confirmation; pressing this key is essential when modifying data value or selecting the parameter setting items in the window.



+



: In the Measurement mode, pressing these two keys simultaneously allows you enter Calibration mode.



+



: In the Measurement mode, pressing these two keys simultaneously allows you enter parameter set-up mode.

(Master Reset)Restore factory default parameter's settings

In the Measurement mode, press the two keys  +  simultaneously for five seconds, and then press  until you see a clock signal appearing on the display; then loose all keys to restore factory default settings.

(Calibration Reset)Restore factory default calibration's settings

In the Measurement mode, press the two keys  +  simultaneously for five seconds, and then press  until you see a clock signal appearing on the display; then loose all keys to restore factory default calibrations.

5.3 LED indicators:

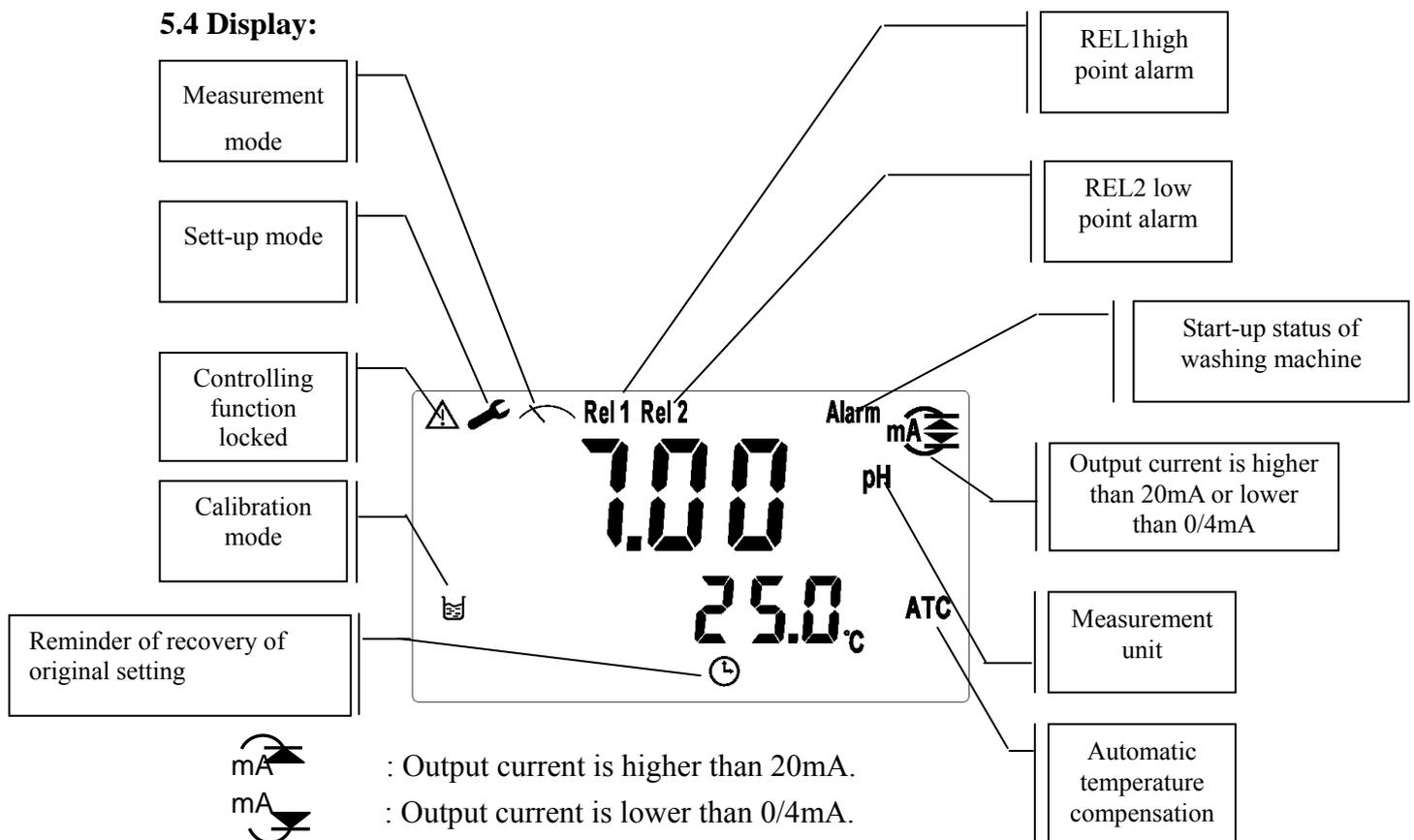
WASH: Washing device operation indicator lamp; when the washing device is started up, the Alarm indicator will light.

HI : Controlling operation indicator lamp; when the high setting point is reached, the REL1 indicator will light.

LO : Controlling operation indicator lamp; when the low setting point is started up, the REL2 indicator will light.

B.L. : Light sensor; in the automatic display backlit mode, the lamp will light or go out as the change of environmental brightness.

5.4 Display:



6. Operation

6.1 Measurement mode:

After all electrical connections are finished and tested, connect the instrument to the power supply and turn it on. The transmitter will automatically entering measurement mode with the factory default settings or the last settings from user.

6.2 Set-up mode:

Please refer to the set-up instructions in Chapter 7, and press  to back to measurement mode.

6.3 Calibration mode:

Please refer to the calibration instruction in chapter 8, and press  to back to measurement mode.

6.4 Reset:

6.4.1 Master reset:

In the measurement mode, press two keys  +  simultaneously for five seconds, and then press  until you see a clock signal appearing on the display; then loose all keys to restore factory defaults.

Factory defaults:

Measurement mode: pH

Temperature compensation: MTC 25°C

High point alarm: AUTO, SP1= 10.00 pH, db1= 0.10 pH

Low point alarm: AUTO, SP2 =04.00 pH, db2= 0.10 pH

Wash time: OFF

pH/ORP current output: 4~20 mA, 02.00~12.00pH

TP current output: 4~20 mA, 000.0~100.0°C (for PC-3100 only)

Display backlit: OFF

Code set-up: OFF

The followings are for PC-3100RS only:

Date and time: 2010-1-1 0 Hr 0 Minute 0 second

MODBUS set-up: RTU, even-parity, ID= 001, baud speed= 19200

6.4.2 Calibration reset:

In the Measurement mode, press the two keys  +  simultaneously for five seconds, and then press  until you see a clock signal appearing on the display; then loose all keys to restore factory default calibrations.

Factory defaults:

OS value: 0 mV

SLOPE value: 100.0 %

Calibration mode: Two-Point Calibration: Ct1

Three-Point Calibration: Ct1 (PC-3100RS only)

6.5 Time and date mode (PC-3100RS only)

In the measurement mode, press the key  to check the year, date, and time. You can shift among them sequentially by pressing the key  or enter the next page by waiting for 5 seconds. After the checkup, it will back to measurement mode automatically.

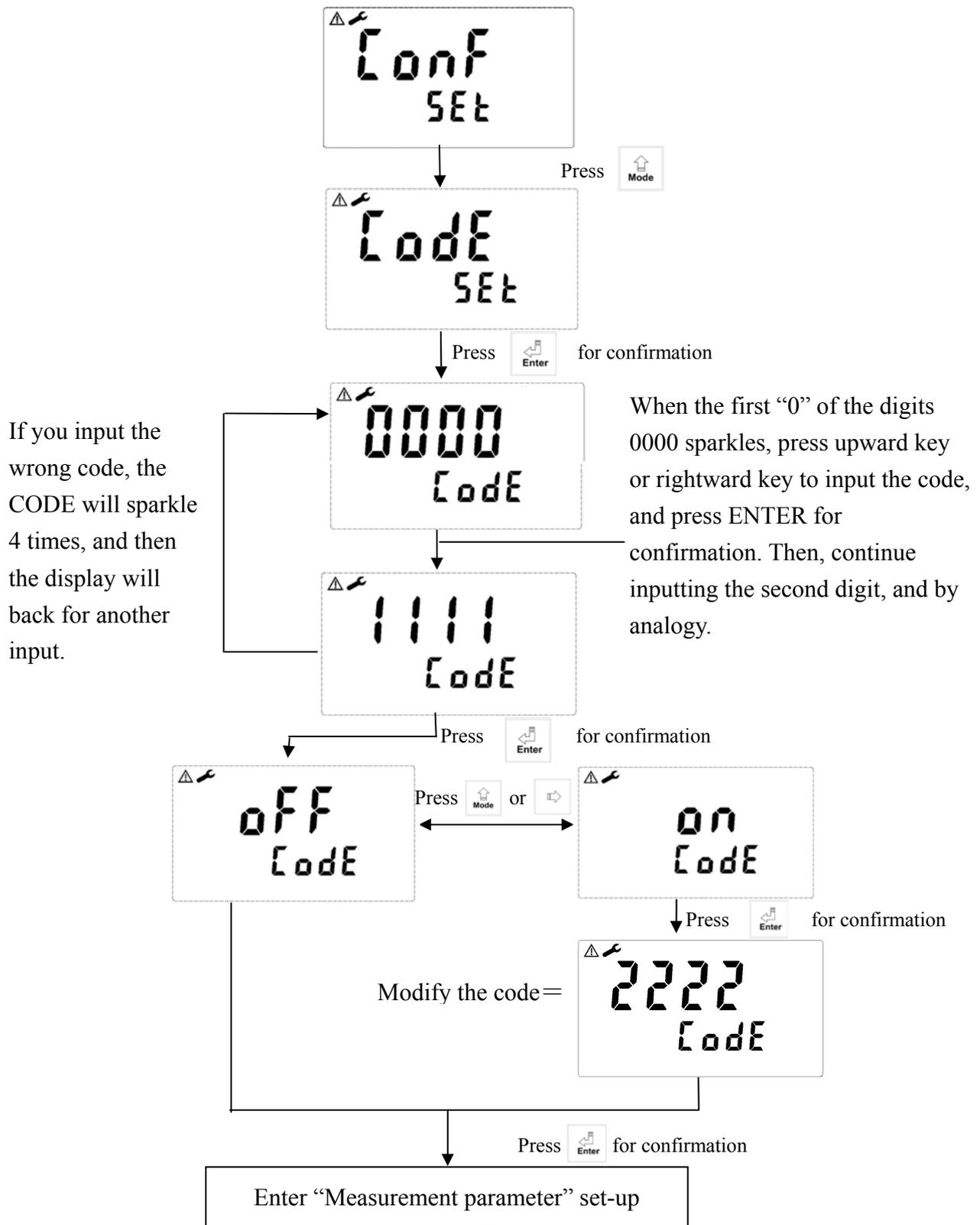
7. Setting

7.1 Entry of set-up mode

In the measurement mode, pressing the two keys  +  simultaneously allows you enter the parameter set-up mode. You can back to the measurement mode at any time by pressing the key .

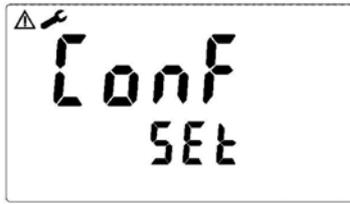
7.2 Security code of settings:

In the set-up mode, you can set up the code by pressing the key , and confirm by pressing the key . The original code is 1111.



7.3 Measurement parameters:

Enter the measurement parameter set-up



Press  for confirmation



Press  or 
Select pH or ORP

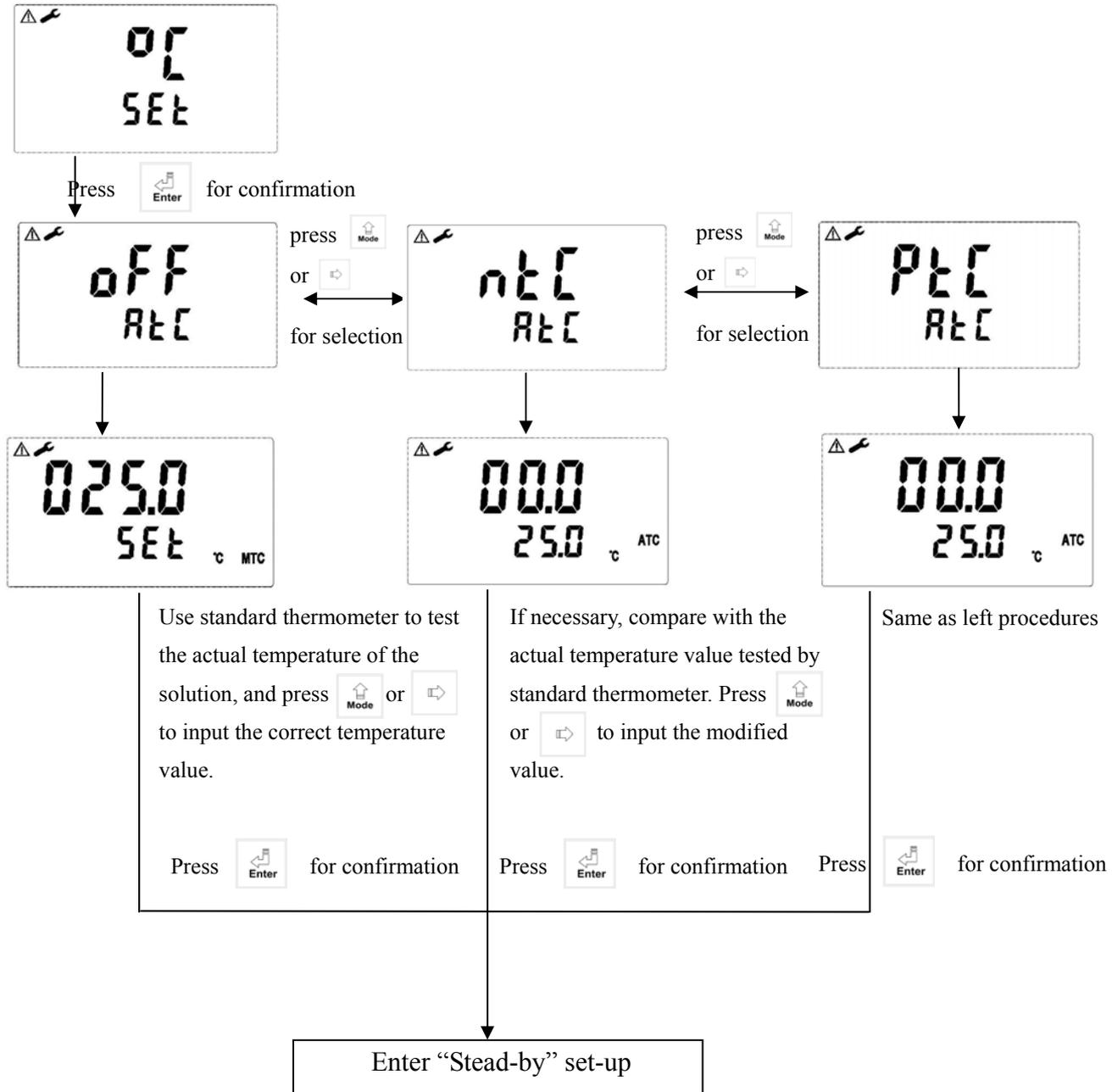


Press  for confirmation

Enter "Temperature parameter" setting

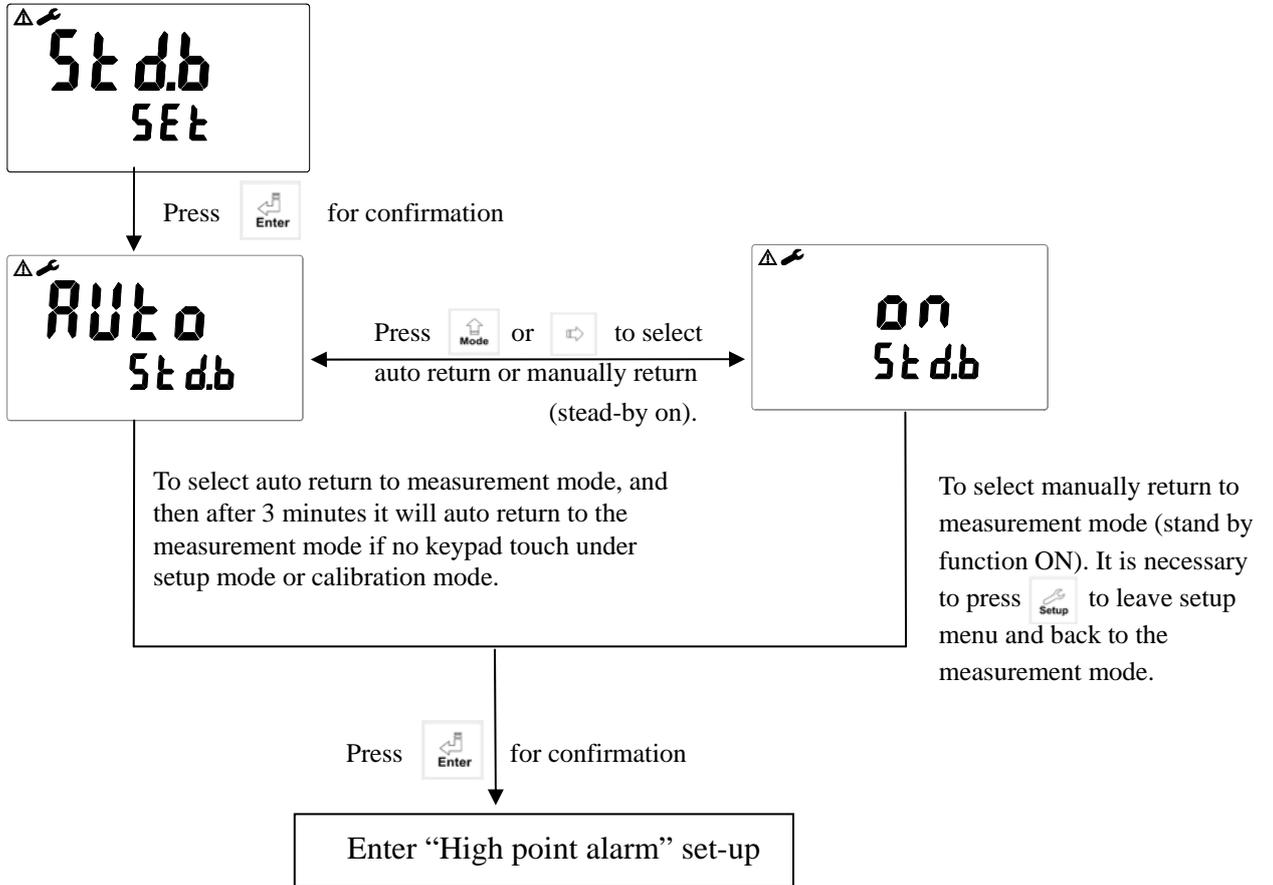
7.4 Temperature parameter

Enter temperature parameter set-up



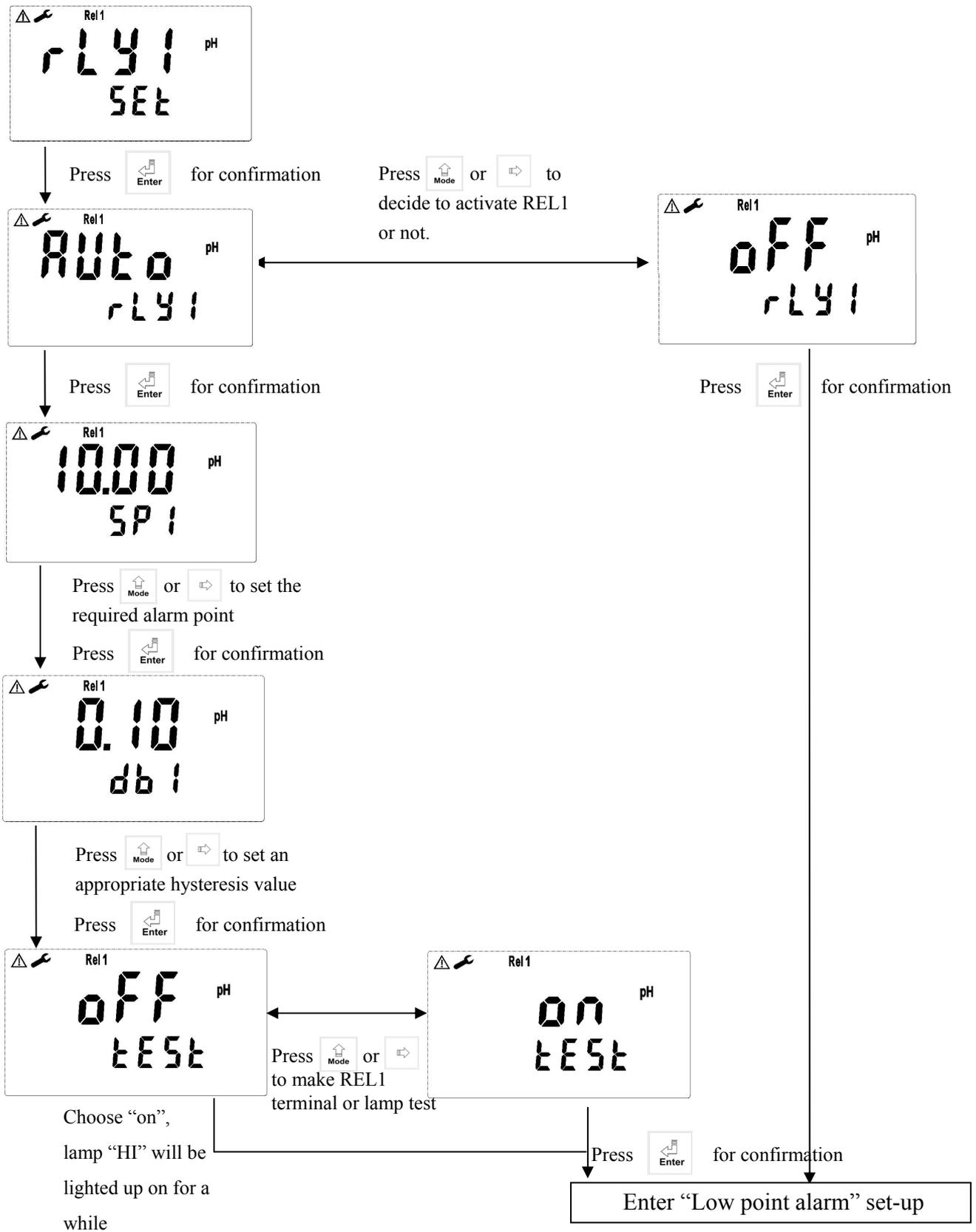
7.5 Stand by

To select manual operation for going back to measurement mode or to select auto return to measurement mode.



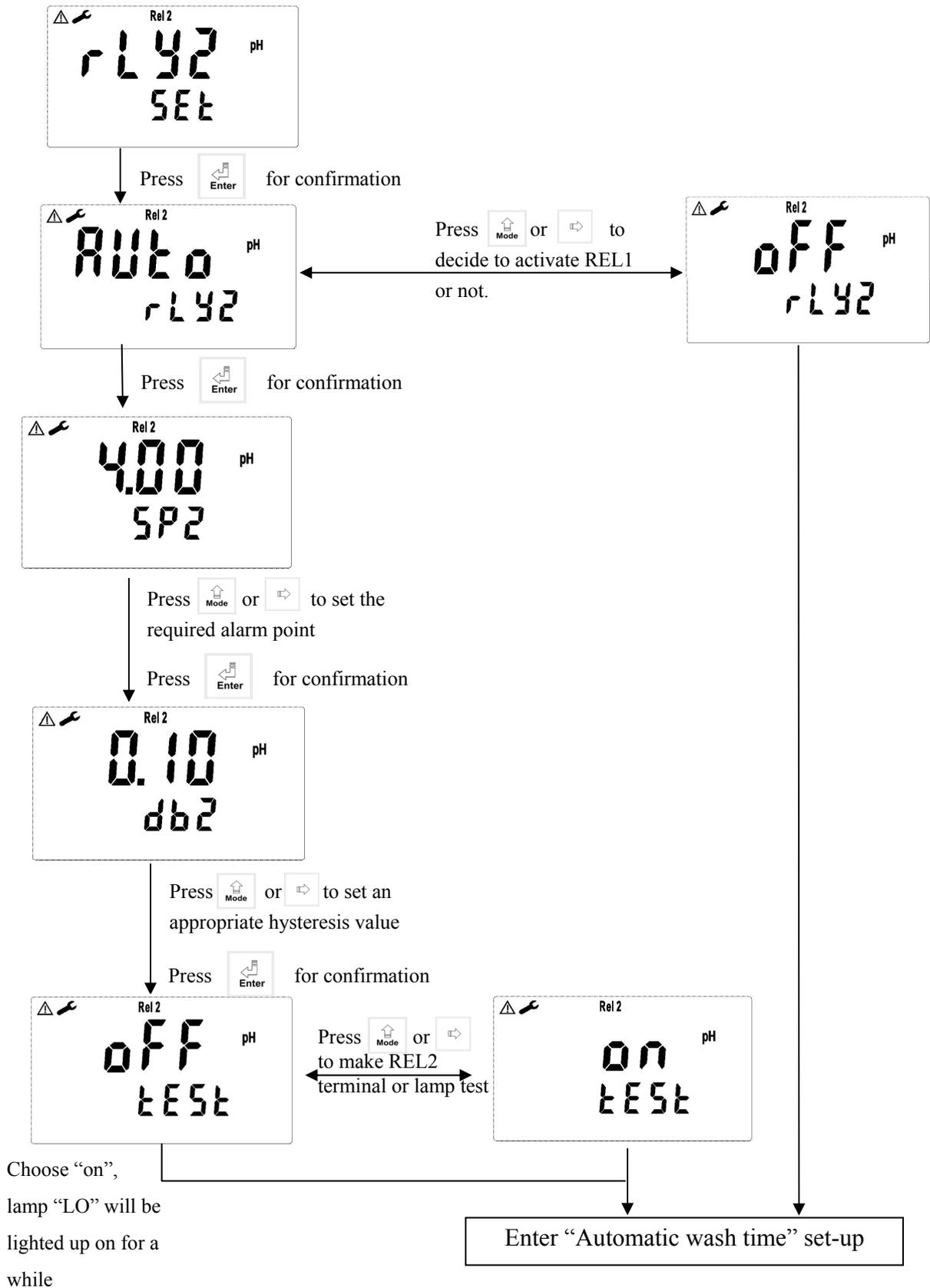
7.6 Hi point:

Set the TH (THRESHOLD) and DB (DEADBAND) of Hi (REL1). The range for TH is -2.00~16.00pH/-1999~1999mv; while the range for DB is 0.00~2.00pH /0~200mv.



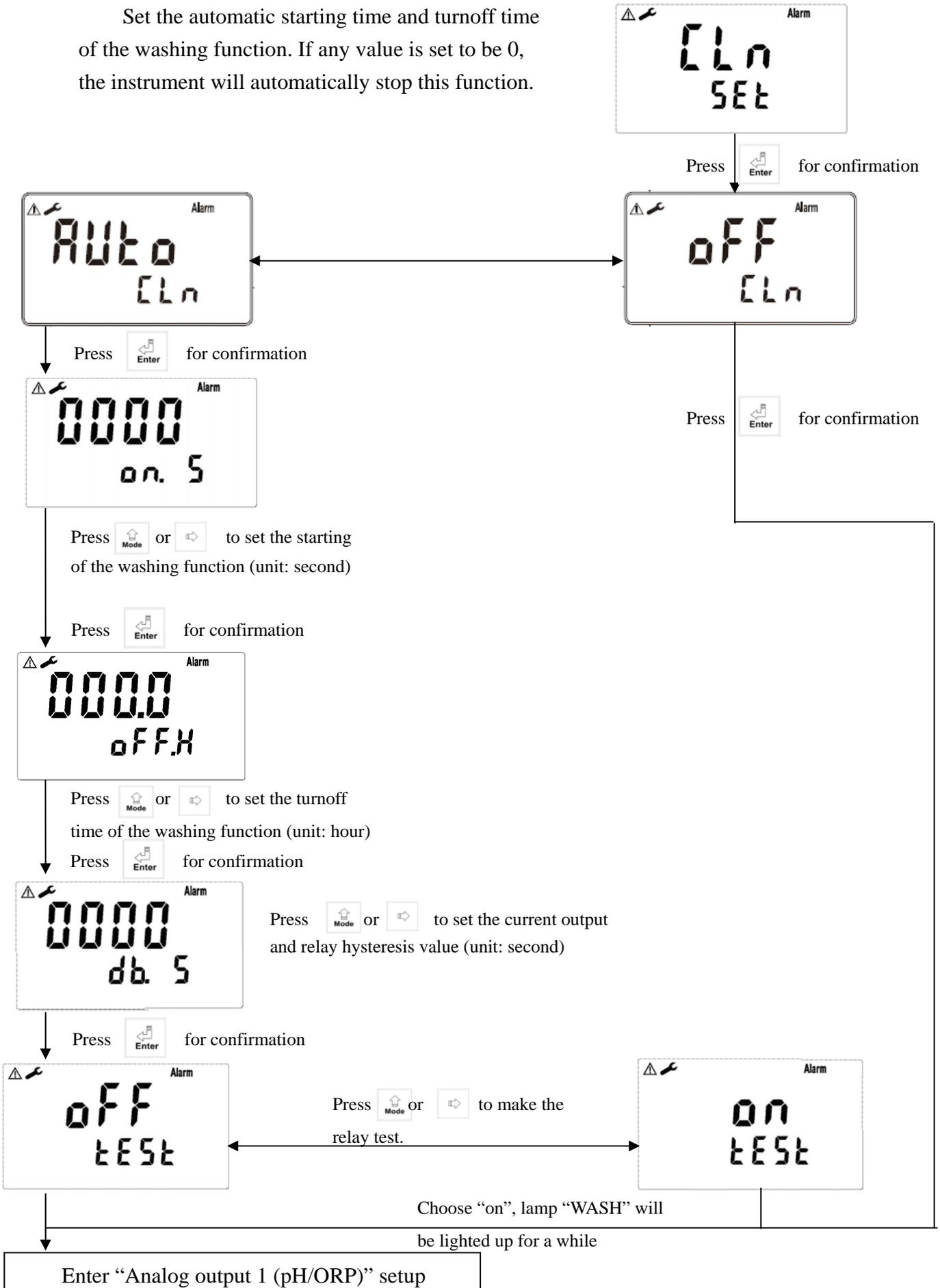
7.7 Lo point:

Set the TH (THRESHOLD) and DB (DEADBAND) of Lo (REL2). The range for TH is -2.00~16.00pH/-1999~1999mv; while the range for DB is 0.00~2.00pH/ 0~200mv.



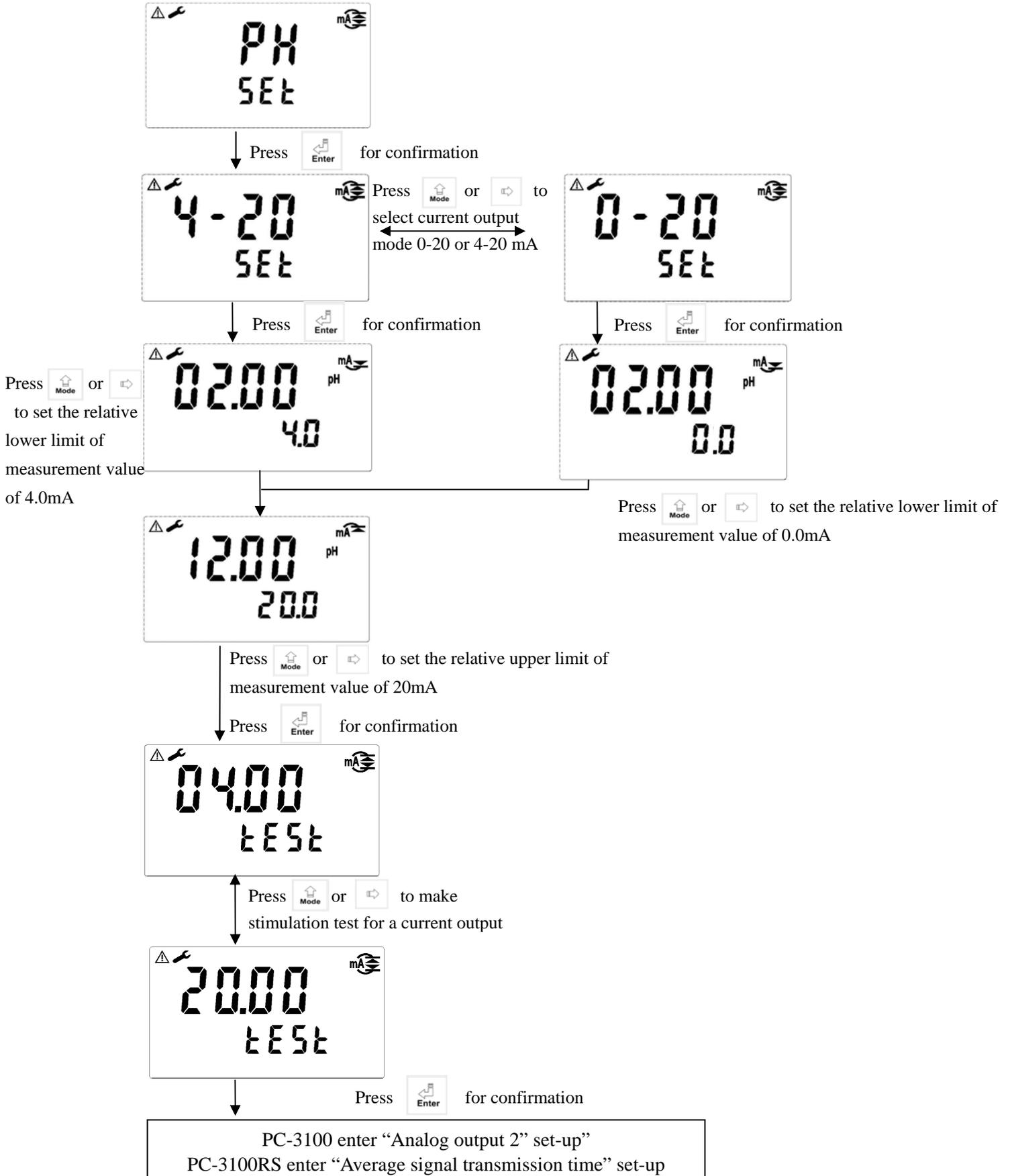
7.8 Wash time:

Set the automatic starting time and turnoff time of the washing function. If any value is set to be 0, the instrument will automatically stop this function.



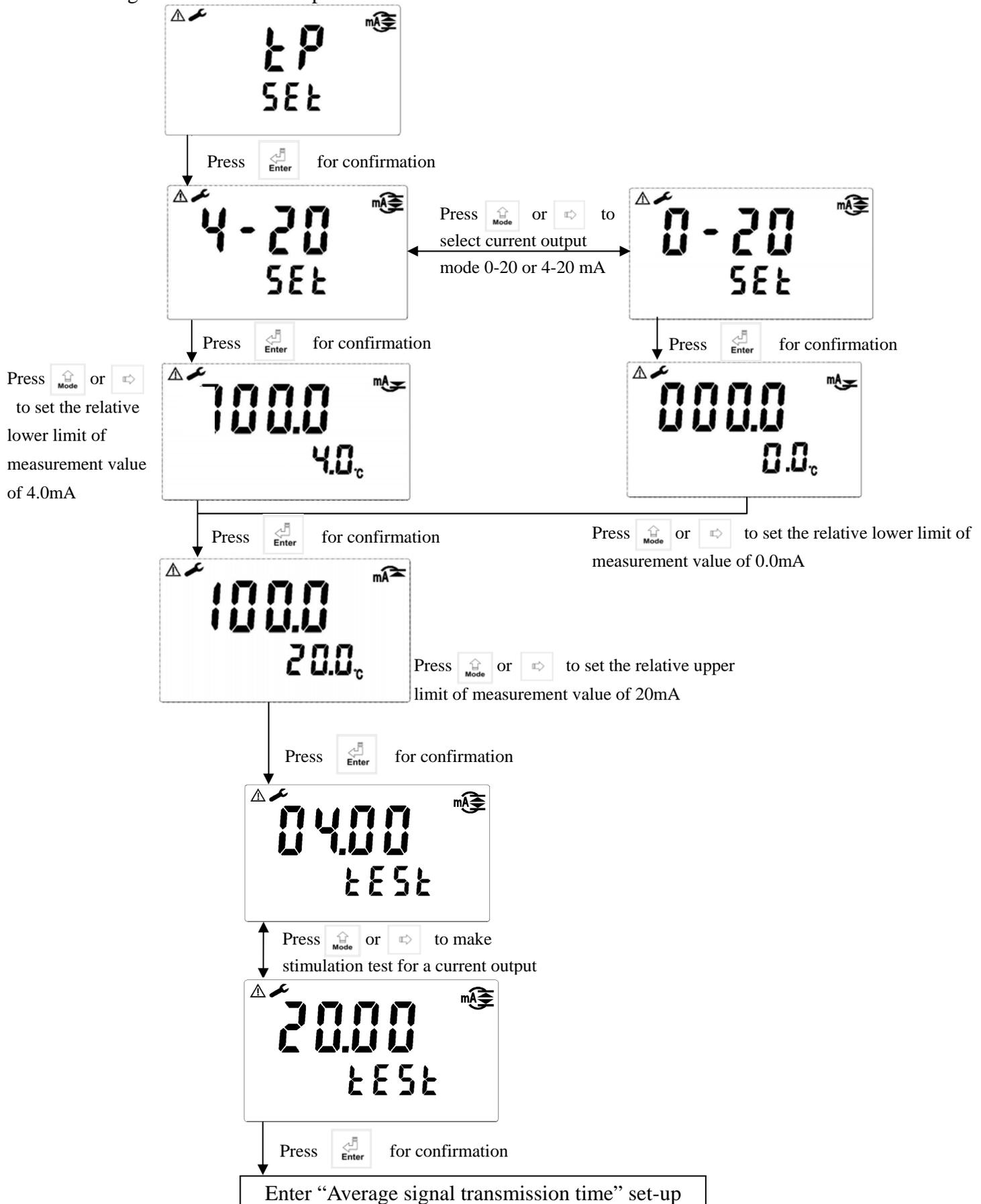
7.9 Analog output 1 (pH/ORP):

The user can adjust the relative relationship between the pH /ORP measurement range and the output current according to actual situation, in order to improve the recognition of current output.



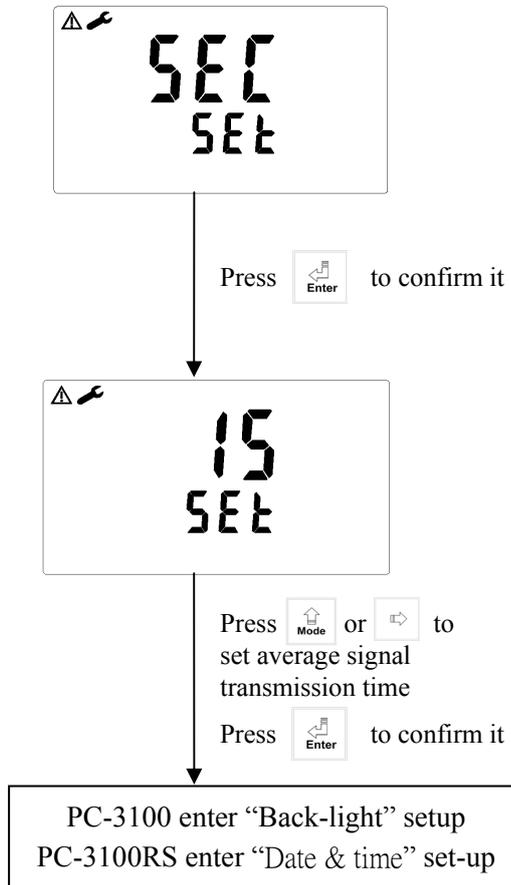
7.10 Analog output 2 (temperature) *Note: for PC-3100 only*

The user can adjust the relative relationship between the TEMP measurement range and the output current according to actual situation, in order to improve the recognition of current output.

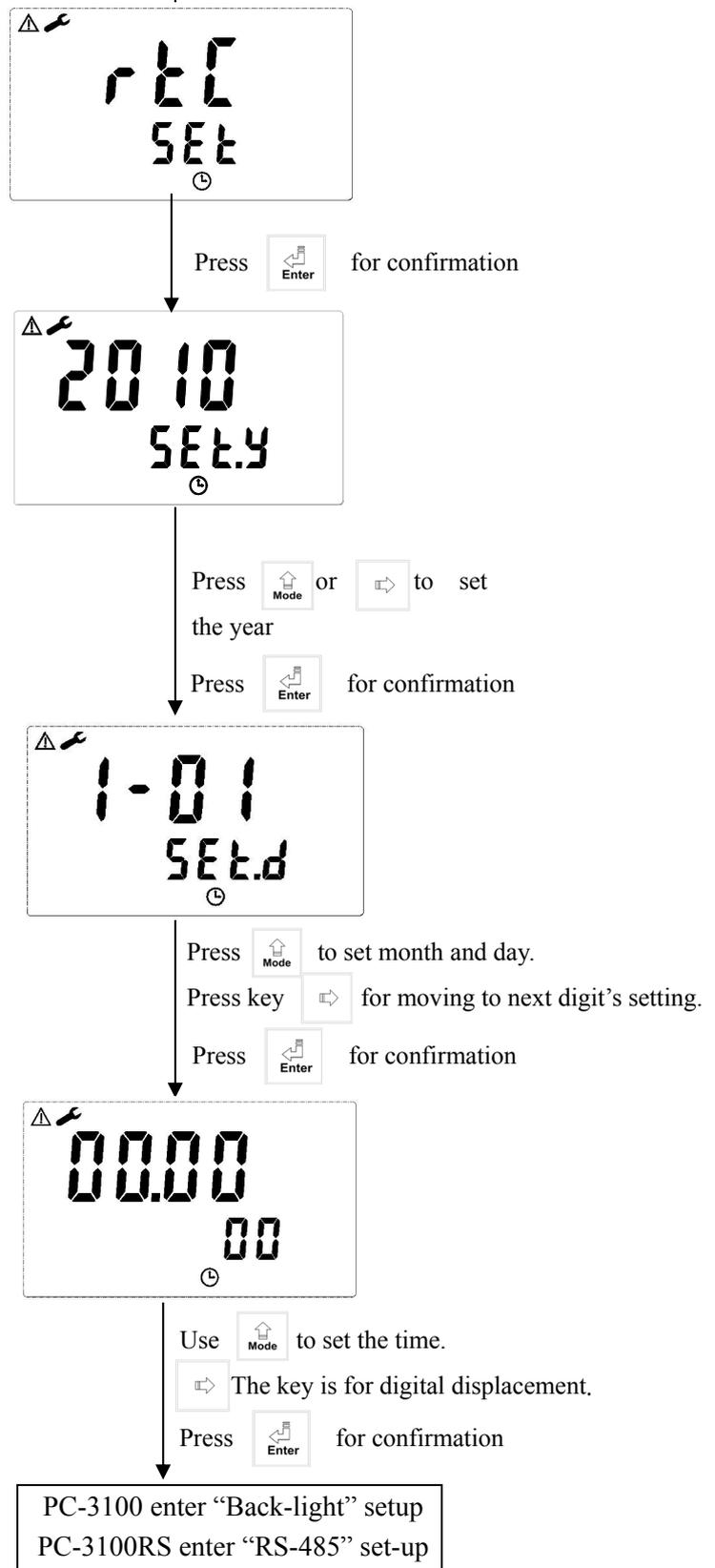


7.11 Sample average of measurements

Enter the setup of Sample average of measurements. You may select the number of sample to be averaged each time to become a reading which is gradually counted in order to increase the stability of measurement.



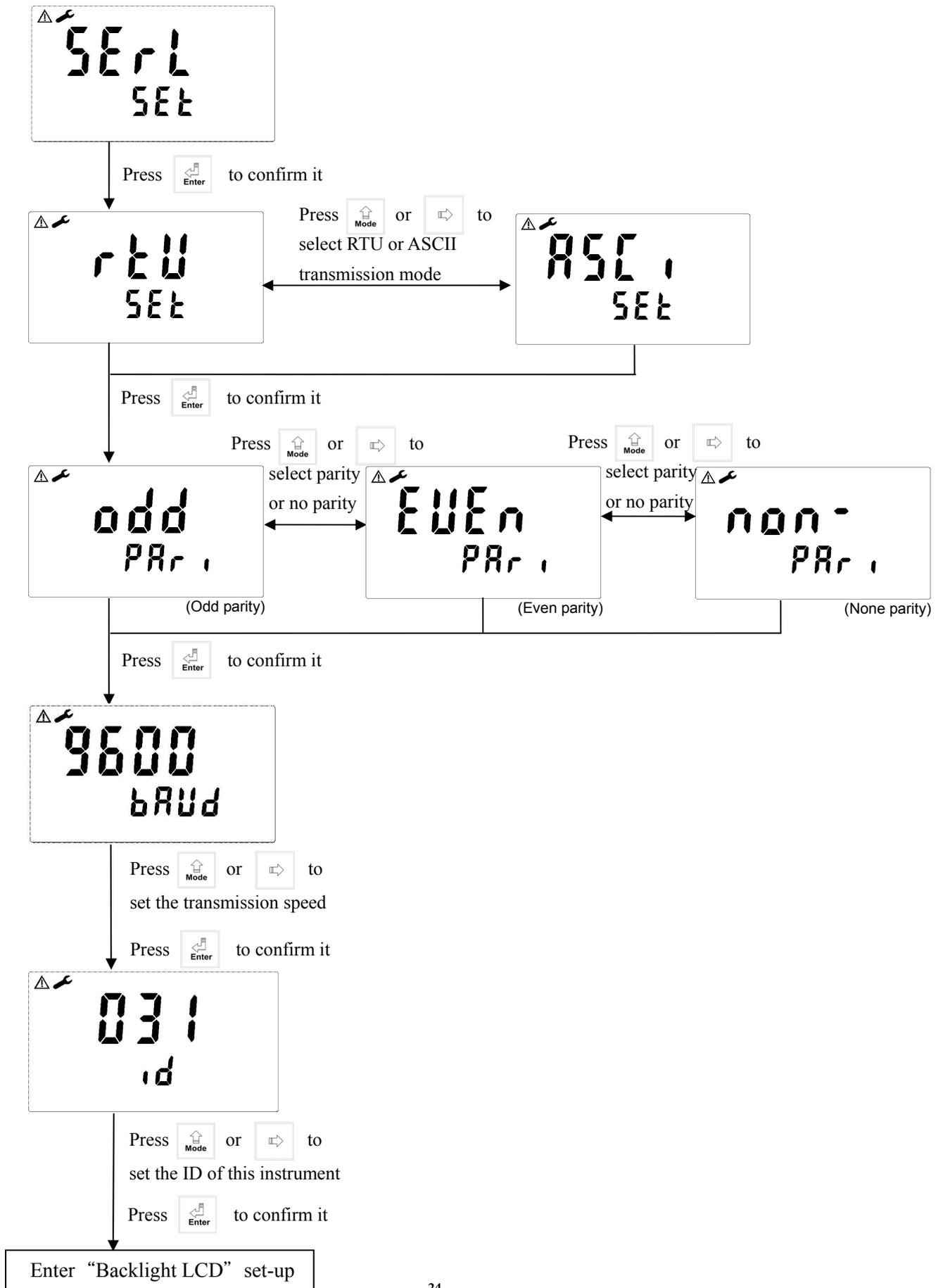
7.12 Date/time set-up



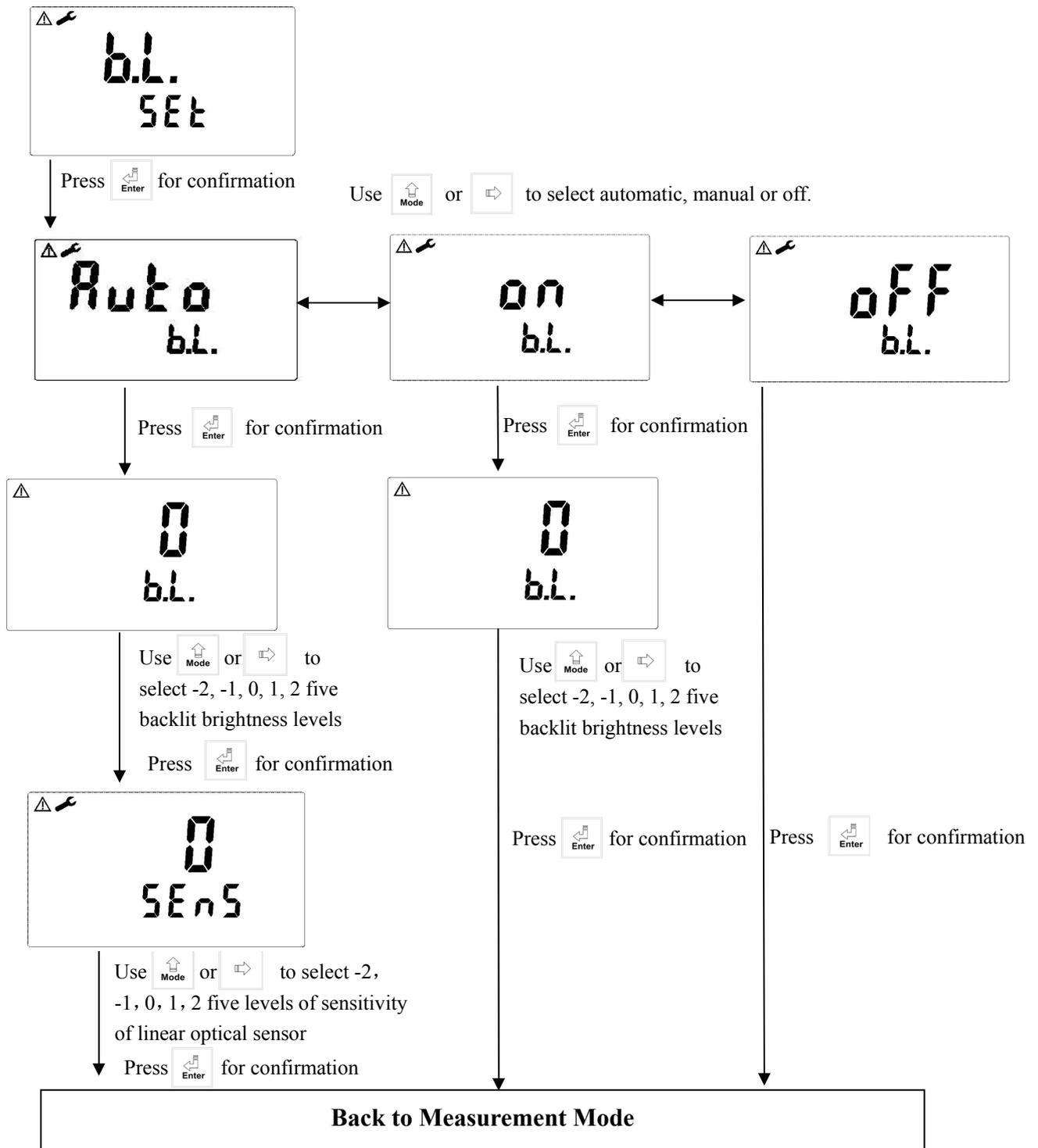
Note: The setting 7.12 is for model PC-3100RS only.

7.13 RS-485 set-up *Note: for PC-3100RS only*

If necessary, the user can set the ID and transmission speed of the series output interface.



7.14 Backlit LCD

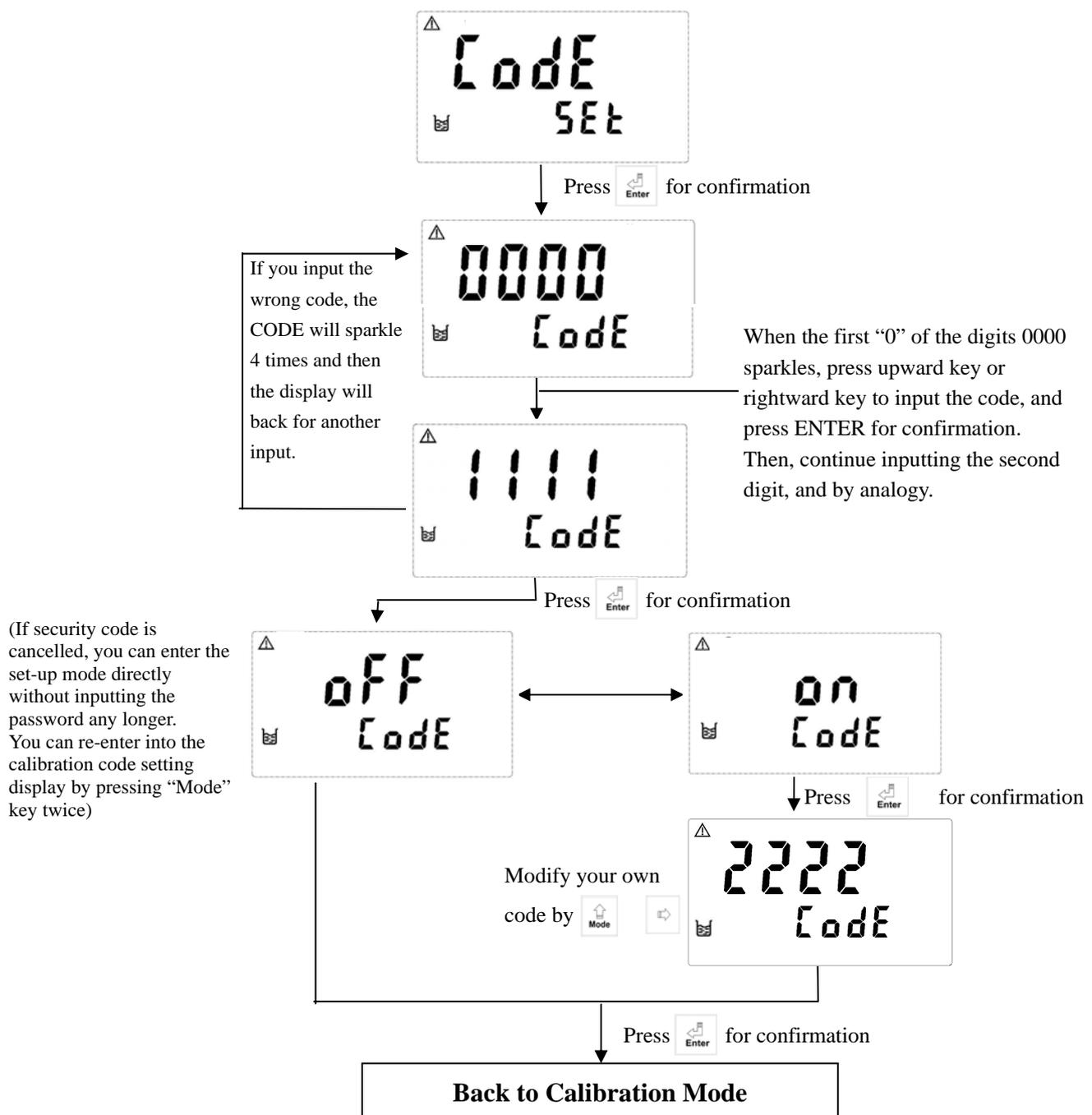


8. Calibration

8.1 Security code of calibration:

8.1.1 Code authorization: There is a two level password protection design. The code authorization of parameter setting is prior to the code authorization of calibration setting. Therefore, you can unlock the calibration with your “parameter set-up” password, or directly with your calibration set-up password.

8.1.2 Code set: In the pH measurement mode, press  +  simultaneously to access the OS value (by pressing ) and slope value (by pressing ) of previous calibration, and then use  or  to enter the code set page.



8.2 Entry of calibration mode

8.2.1 Pressing  +  simultaneously allows entering calibration mode, and pressing  at any time allows you back to the measurement mode.

8.2.2 In entering the calibration mode, the display shows the previous calibration OS (null-point potential) value. Pressing  allows you enter into the next page.



8.2.3 The display shows the previous calibration SLP (Slope) value. Pressing  allows you enter into the calibration menu.



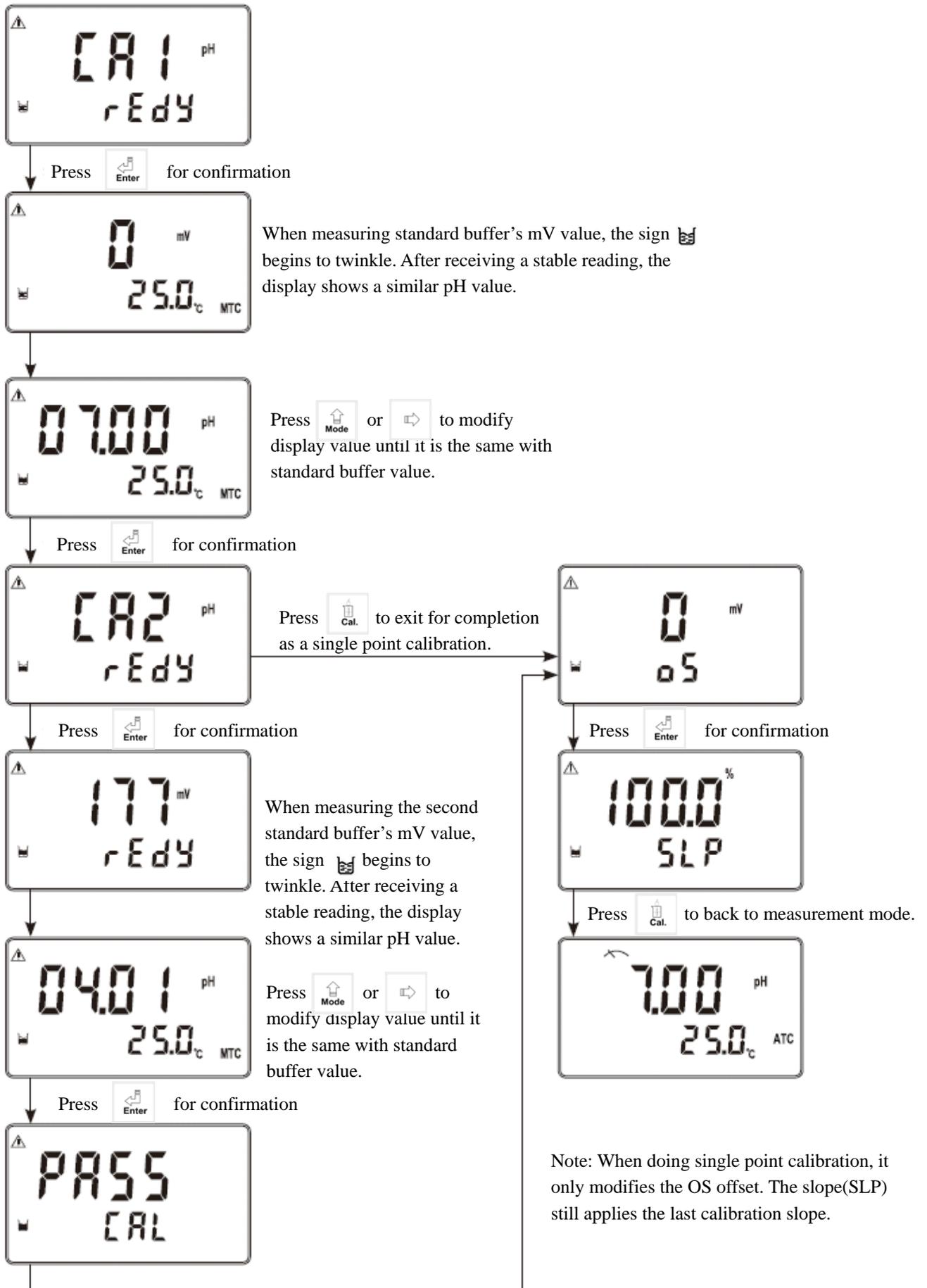
8.2.4 Use  or  to select CA1, Ct1 or Cn1, and press  for confirmation. The preset is Ct1 Buffer calibration.



Note:

1. Ct1: Refer to TECH. Buffer: pH4.01, pH7.00, pH10.00
2. Cn1: Refer to NIST. Buffer: pH1.68, pH4.01, pH6.86, pH9.18, and pH12.46 (pH1.68 and pH12.46 are for PC-3100RS only.)
3. CA1: Refer to Any Buffer, for dual-point (or three-point calibration for PC-3100RS only)
4. PC-3100RS can apply three-point calibration of Ct1 and Cn1.

8.3 Any Buffer calibration



8.4 Calibration of Pre-set TECH.buffer (ct1)



Press  for confirmation



When measuring standard buffer's mV value, the sign  begins to twinkle. After receiving a stable reading, the display shows the first point of pH value.



Go to the second point automatically.



Press  to exit for completion as a single point calibration.

Press  for confirmation



When measuring the second standard buffer's mV value, the sign  begins to twinkle. After receiving a stable reading, the display shows the second point of pH value.

Continue with next page

Continue with next page

Continue with previous page

Continue with previous page

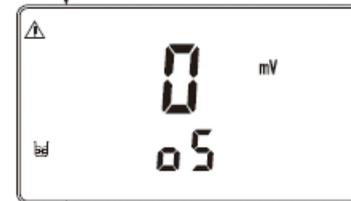


PC-3100 to finish the Tech buffer two point calibration.
Or for PC-3100RS, press  to exit for completion as a two point calibration.

PC-3100RS Go to the third point automatically.



When measuring the second standard buffer's mV value, the sign  begins to twinkle. After receiving a stable reading, the display shows the third point of pH value.



Press  for confirmation



Press  to back to measurement mode.



8.5 Calibration of Pre-set NIST buffer (Cn1)

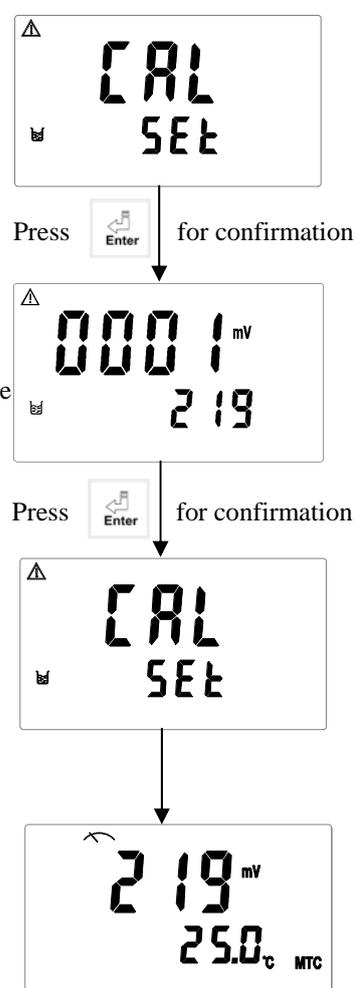
Except different standard buffer set, the calibration procedure is the same with Ct1.
(See chapter 8.4)

8.6 ORP calibration:

It is unnecessary to make regular calibration for ORP electrode as pH electrode, and it is only necessary to use ORP Buffer to check the electrode or adjust the deviation of electrical potential. Press  +  simultaneously for the adjustment of ORP zero-point electrical potential.

- Clean the electrode completely, and put it into the buffer solution. Check the difference between the readout and buffer solution. Press  or  to set the digit until it is equal to the buffer's standard. Then, press  to ensure it and press  to back to the measurement mode.

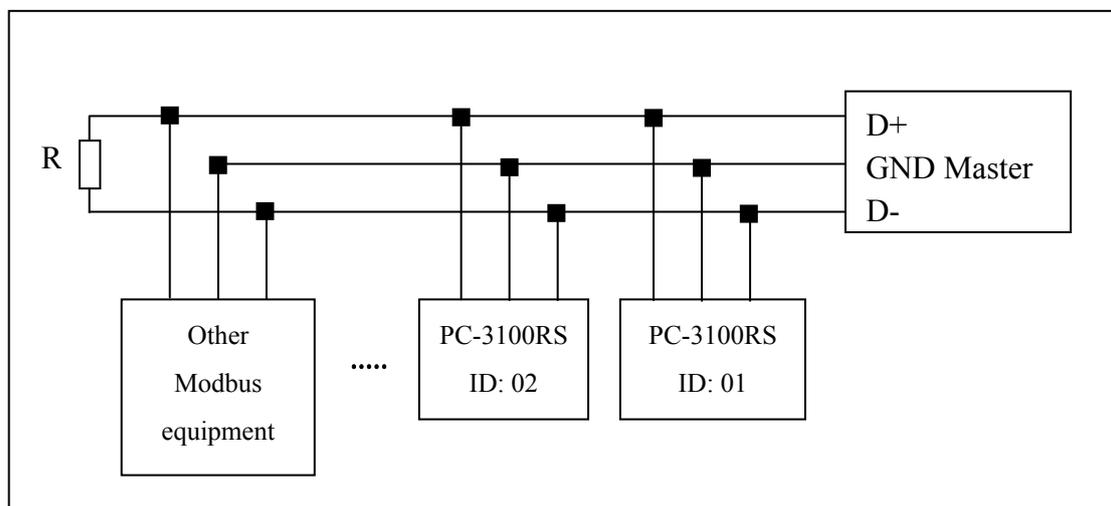
Press  or  to adjust the ORP value until it is the same as the standard solution value.



9. Modbus protocol and instructions for PC-3100RS

9.1 Communication connection

The RS-485 communication port of the transmitter features with electrical isolation protection, lightning protection, and to provide internal independent ground solution. It is allowed to use normal twisted-pair (segregation double-stranded twisted pair cable) cable connections. All devices are in contact with a double-stranded, and then all together, and another line will be connected with all the negative contacts, and the isolated shield wire must be connected to GND. When we talk about communication in the laboratory, the stand-alone master-slave communication is relatively simple. Hence, it is allowed to consider using the normal cable instead. However, there should be strictly in accordance with the requirements of industrial engineering construction. Wiring diagram is as follows:



Note:

1. The RS-485 interface of PC-3100RS transmitter has a protective earth terminal. When communicate with the RS-485, there should use with solution ground to eliminate risk of safety.
2. It is allowed to use a 120 ohm impedance matching resistors at terminal equipment in the transmission lines (D +, D-) ends across to effectively reduce or eliminate signal reflection.
3. Without repeaters, the RS-485 network can not exceed a maximum of 32 nodes. The maximum communication transmission distance of RS-485 is up to 1200 meters.
4. When communication, all the equipments of the network should be maintained in the same transfer mode, baud rate, parity consistent. And each of the device address can not be the same, so as not to conflict resulted in the normal network communications.
5. The Modbus command of the transmitter can only access 50 registers. If it exceeds the length, then it returns abnormal message.

9.2 MODBUS name and address table

Function Code : 03H, 06, 10H Modbus response (setup parameter)

Logic address	Item	Number of Byte	Information type	Description of data transmission	Default value	Note
0001H	Equipment's ID	2	USHORT	1-247	1	
0002H	Transmitter model	6	USHORT	ASCII Code	PC3100	
0005H	Communication protocol	2	USHORT	0: RTU	0	
				1: ASCII		
0006H	Serial transmission speed (Baud rate)	2	USHORT	0: 2400	3	
				1: 4800		
				2: 9600		
				3: 19200		
0007H	Parity	2	USHORT	0: None	1	
				1: Even		
				2: Odd		
0008H	Real-time clock*	12	USHORT	Second	2009-1-01, 00:00:00	
0009H			USHORT	Minute		
000AH			USHORT	Hour		
000BH			USHORT	Day		
000CH			USHORT	Month		
000DH			USHORT	Year		
000EH	Code setting*	2	USHORT	Code setting	1111	
000FH	Temperature mode*	2	USHORT	0: MTC	0	
				1: PTC		
				2: NTC		
0010H	WASH relay*	2	USHORT	0: OFF	0	
			USHORT	1: AUTO		
0011H		2	USHORT	ON.S: 0-9999	0	Second
0012H		4	USHORT	OFF.H: 0-999.9	0	Hour
0014H		2	USHORT	DB.S: 0-9999	0	Second
0015H		Relay 1 *	2	USHORT	0: OFF	1
1: AUTO						
0016H	2		USHORT	Unused		Unused
0017H	4		FLOAT	SP1	10.00PH/1000MV	Data affected by sign byte
0019H	4	FLOAT	DB1	0.1PH/10MV		

001BH	Relay 2 *	2	USHORT	0: OFF	1	
001CH				1: AUTO		
001DH		2	USHORT	Unused	1	Unused
001FH		4	FLOAT	SP2	4.00PH/-1000MV	Data affected by sign byte

0021H	Backlight Brightness *	2	USHORT	0: AUTO	2	
0022H				1: ON		
				2: OFF		
	SHORT	2: Highest bright	0			
	SHORT	1: high bright				
	SHORT	0: Standard				
SHORT	-1: Low bright					
SHORT	-2: Lowest bright					
0023H	Backlight Sensitivity*	2	SHORT	2: Highest Sensitivity	0	
0024H				1: High Sensitivity		
				0: Standard		
				-1: Low Sensitivity		
				-2: Lowest Sensitivity		
0025H-0030H	Sample average of measurements (Digital Filter) *		USHORT	1-60	5	
Factory reserved						

Note : The actions without * sign only support for function code 03H. The actions with * sign support function code 03H, 06H, 10H. USHORT data range from 0 to 65535, SHORT data range from -32768 to 32767. FLOAT is a 4 data bits IEEE 754 format float. The data range follows is the same.

Function code: 03H Modbus response (measurement parameter)

Logic address	Item	Number of Byte	Information type	Description of data transmission	Default value	Note
0031H	Number of measurement channels	2	USHORT	PC-3100RS only has one channel	1	
0032H	Sign byte	6	CHAR	pH		ASCII code
				ORP(mV)		
				uS/cm		
				mS/cm		
				MΩ-cm		
				ppt		
				ppm		
				mg/l		
				%		
				mA		
				°C		
				NTU		
FNU						
FTU						
0035H	pH/ORP measurement	4	FLOAT	pH/ORP measurement		Data affected by sign byte
0037H	Temperature measurement	4	FLOAT	Temperature measurement		
0039H-0050H	Factory reserved					

Function code: 01H,05H,0FH Modbus response (dispersion parameter)

Logic address	Item	BIT	Description	Default value	Note
0070H	LO Alarm	1	Contact on	0 (Contact off)	
0071H	Hi Alarm	1	Contact on	0 (Contact off)	
0072H	MA too high	1	Current output over-range	0 (Within 0/4~20mA)	
0073H	MA too low	1	Current output over-range	0 (Within 0/4~20mA)	
0074H	Exceed temp. range	1	Temperature over-range	0	
0075H	Exceed pH/ORP range	1	Measurement over-range	0	
0076H	RLY1 Action *	1	Contact on	0 (Contact off)	
0077H	RLY2 Action*	1	Contact on	0 (Contact off)	
0078H	WASH Action*	1	Contact on	0 (Contact off)	
0079H-0090H	Factory reserved				

Note: The actions without * sign only support for function code 01H.

The actions with * sign support function code 01H, 05H, 0FH.

Function code: 08H Correlated diagnostic function

Sub function code	Name of Counter	Note
0AH	Clear all the counters	Clear Counters and Diagnostic Register
0BH	Return Bus Message Count	The response data field returns the quantity of message that the slave has detected on the communications system since its last restart or last clear counters operation, or being powered-up. It counts whether the address comes from the remote equipment or not,.
0CH	Return Bus Communication Error Count	The response data field returns the quantity of CRC errors encountered by the slave since its last restart, clear counters operation, or power-up. It counts whether the address comes from the remote equipment or not,.
0DH	Return Bus Exception Error Count	The response data field returns the quantity of Modbus exception responses returned by the slave since its last restart, clear counters operation, or power-up. It only counts when the address comes from the remote equipment.
0EH	Return Slave Message Count	The response data field returns the quantity of messages addressed to the slave, or broadcast, that the slave has processed since its last restart, clear counters operation, or power-up. It only counts when the address comes from that remote equipment.
0FH	Return Slave No Response Count	The response data field returns the quantity of message addressed to the slave for which it returned no response (neither a normal responses nor an exception response), since its last restart, clear counters operation, or power-up. It is said that the counter will calculate the quantity of none-error broadcast messages.
10H	Return Slave NAK Count	The response data field returns the quantity of message addressed to the slave for which it returned a Negative Acknowledge (NAK) exception response since its last restart, clear counters operation, or power-up.
11H	Return Slave Busy Count	The response data field returns the quantity of message addressed to the slave for it returned a Slave Device Busy exception response, since its last restart, clear counters operation, or power-up.
12H	Return Bus Character overrun Count	The response data field returns the quantity of messages addressed to the slave that it could not handle due to a character overrun condition ,since its last restart, clear counters operation, or power-up.

10. Error messages (Error code)

Messages	Reason	Dispositions
	Serious error that does not permit any further measuring	Please call service engineer.
	<ol style="list-style-type: none"> 1. During calibration, the buffer solution temperature exceeds a range of 5~50°C 2. The buffer can not be identified. 	<ol style="list-style-type: none"> 3. Please adjust the buffer solution temperature to the appropriate temperature range and make another calibration. 4. Please replace the buffer, or maintain or replace the electrode and make another calibration.
	The readout is unstable	Please check whether there is bubble or air in the glass end of the electrode; maintain the electrode or change a new electrode, and make another calibration.
	SLOPE value exceeds the upper or lower limit	Maintain the electrode or change a new electrode, and make another calibration.
	OFFSET(zero-point electric potential) value \geq 60mv	Maintain the electrode or replace the electrode, and make another calibration.

11. Maintenance

Generally speaking, under normal operation, the transmitter produced by our company need no maintenance expect regular cleaning and calibration of the electrode to ensure accurate and stable measurement and system operation.

The cleaning cycle for the electrode depends on the pollution degree of the measurement sample. Generally speaking, it is recommended to make weekly cleaning. The following chart gives introductions of different cleaning methods according to different type of contaminations to provide the operators with reference for cleaning and maintenance.

Type of Contaminations	Cleaning methods
Measuring solutions containing proteins. (Contamination of the junction)	The electrode should be soaked in Pepsin/HCl for several hours. METTLER-TOLEDO 9891 Electrode Cleaner is recommended.
Measuring solution containing sulfides. (The junction becomes black)	The junction should be soaked in Thiourea/HCl solution until being bleached. METTLER-TOLEDO 9892 Electrode Cleaner is recommended.
Contamination by grease or organic substance	Short rinsing of the electrode with acetone and ethanol.
Acid and alkaline soluble contaminations	Rinsing the electrode with 0.1mol/l NaOH or 0.1mol/l HCl for a few minutes.
Apply clean water to flash the electrode after above cleaning steps and immerse the electrode in 3M KCl solution for 15 minutes at least, and then calibrate the electrode.	
The electrode should only be rinsed and never rubbed or otherwise mechanically cleaned, since this would lead to electrostatic charges. This could cause an increase in the response time.	
In cleaning the platinum electrode, the platinum ring of the electrode can be rubbed gently with a wet soft piece of cloth.	

※ **The frequency of electrode cleaning depends on the type and degree of contamination. However it is recommended that the electrode be cleaned once a week.**



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