PC-3100/3100RS Microprocessor pH/ORP Controller

SUNTEX

7.00 pH

25.0 ℃ ATC

HI · B.L. · WASH · LO

Setup · Cal. · Mode · ▷ · Enter

pH/ORP TRANSMITTER PC-3100   S/N:0802001001

SUNTEX

CONTENTS

Brief Instruction

Settings of measurement parameters (see chapter 7)

Setup + Mode — 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.

CodE SEt — In the Code interface, entering original code or user's designated code allows you to reset the code or shut down this function.

ConF SEt — In the Configuration interface, please choose "pH" or "ORP" parameter to measure.
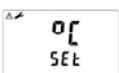
°C SEt — In the Temperature interface, please set temperature compensation type and temperature modification.

rLY1 SEt — In the Relay 1 interface, please choose Auto rLY1 or oFF rLY1 to activate it or not.

rLY2 SEt — In the Relay 2 interface, please choose Auto rLY1 or oFF rLY1 to activate it or not.

CLn SEt — In the Clean interface, please set wash time and stop duration.

PH SEt — In the pH interface, please set analog output 1 with 4-20 SEt or 0-20 SEt

tP SEt — In the tP interface, please set analog output 2 with 4-20 SEt or 0-20 SEt (PC-3100 only)

rtC SEt — In the Real-time clock interface, please set year, date, and time. (PC-3100RS only)

SErL SEt — In the Serl interface, please set ID code 031 id and speed baud 9600 bAUd (PC-3100RS only)
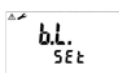
b.L. SEt — In the Back light interface, please set brightness of display and sensitivity of light-source sensor.

Settings of Calibration (see chapter 8)

Cal. + Mode — 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.

CodE SEt — In the Code interface, entering original code or user's designated code allows you to reset the code or shut down this function.

CA1 : Asymmetry Buffer

Ct1 : TECH. Buffer: pH2.00, 4.01, 7.00, 10.00, 12.00 (pH2.00 & pH12.00 for PC-3100RS only)

Cn1 : NIST Buffer: pH1.68, 4.01, 6.86, 9.18, 12.46 (pH1.68 & pH12.46 for PC-3100RS only)

Asymmetry Buffer Calibration (Single point and Dual points)

1. When entering CA1 calibration mode, clean the electrode with distill water before putting it in the buffer solution. Push ⬚ (Enter) 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, push ⬚ (Mode) or ⬚ to set the digit until it is equal to the buffer's standard. Then, push ⬚ (Enter) to ensure it.
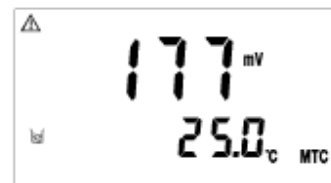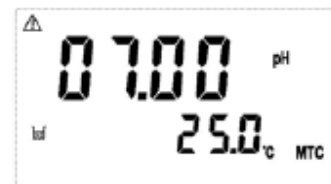
2. When the display shows "CA2", it means that you are now entering second point of calibration. Process same procedures as Step 1.
   Note 1: Push ⬚ (Mode) when showing CA2, you may choose to make single-point calibration only.
   Note 2: Single-point calibration means that you only modify zero point (OS value) and do not modify the slope (SLP value). The controller will automatically adapt to the SLP value that have been memorized the very last time.

3. 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)

4. The display will show OS value (zero-point) automatically. Push ⬚ (Enter) to show the SLP value of calibration. Push ⬚ (Cal.) to go back to measurement mode.

Display
⚠ 0 mV · 25.0 °C MTC
⚠ CA1 pH · rEdY
⚠ 07.00 pH · 25.0 °C MTC
⚠ CA2 pH · rEdY
⚠ 177 mV · 25.0 °C MTC
⚠ 04.01 pH · 25.0 °C MTC
⚠ PASS CAL
⚠ 0 mV · oS 1
⚠ 100.0 % · SLP 1

Note: This controller 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, push [Enter] bottom 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, push [Enter] bottom to start the second-point calibration.
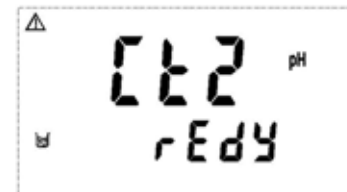
4. The display will show the mV value while being calibrated. After the value becomes stable, the display will show the second pH value of calibration automatically. Then, then it will enter the third-point calibration (Ct3).
   Note: Type PC-3100 does not supply with the function. For skipping the third-point calibration, please push [Mode] bottom to escape.
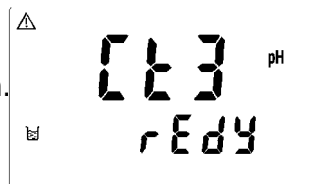
5. Clean the electrode completely, and put it into the third buffer solution. Then, push [Enter] bottom to start the third-point calibration. (Same steps as above)

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. Push [Enter] bottom to see SLP1 (slope) value. Then, push [Enter] to see oS2 (zero-point) value. Then, push [Enter] to see SLP2 (slope) value. Then, push [Enter] you may repeat calibration steps of 1 to 7.   Or push [Cal.] to go back to measurement mode.
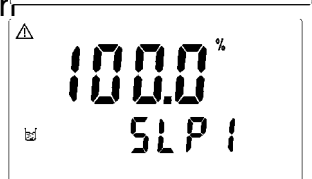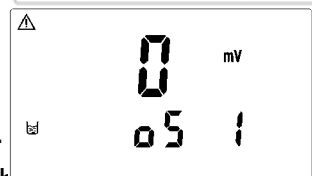
Note: (1) The dual-point and three-point calibration steps of pre-set buffer solutions (NIST) are the same procedure as the calibration of   TECH. buffer solutions.

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

Reset

Push [Setup] [Mode] for 5 seconds, then push [Enter] bottom. The display will show sign to (L)licate that Master Reset has been done.

Push [Cal.] [Mode] for 5 seconds, then push [Enter] bottom. The display will show sign to (L)licate that Calibration Reset has been done.

1. Specifications

Model		PC-3100	PC-3100RS
Measuring modes		PH/ORP/TEMP	
Ranges	pH	-2~16pH	
	ORP	-1999~1999mV	
	Temp.	-10.0~110.0°C	
Resolutions	pH	0.01pH	
	ORP	1mV	
	Temp.	0.1°C	
Accuracy	pH	±0.01±1Digit	
	ORP	±0.1%±1Digit	
	Temp.	±0.2°C±1Digit	
Temperature Compensation		NTC30KΩ or PT1000 auto recognized	
		Manual adjustment	
Ambient Temp.		0~50°C	
Storage Temp.		-10~70°C	
Input Impedance		$> 10^{12}\ \Omega$	
Display		LCD display with illumination function	
Analog output 1		Isolated DC 0/4~20mA corresponding to pH/ORP, max. load 600Ω	
Analog output 2		Isolated DC 0/4~20mA corresponding to Temp, max. load 600Ω	
Serial Interface			RS-485
Settings	Contact	240 VAC, 0.5A max.	
	Activate	Two sets Hi/Lo Programmable, ON/OFF	
Wash	Contact	240 VAC, 0.5A max.	
	Time	ON: 0~999 sec./ OFF: 0~999 hours	
Voltage Output		DC±12V	
Power Supply		Switching power 88V~265VAC 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		0.82 kg	
Certification		IP 65 (NEMX 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 controller before wiring input, output connections, and remove it before opening the controller housing.

● The installation site of the controller 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.

3. Assembly and installation

3.1 Controller installation: This controller 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 controller directly into the panel box. Insert the accessorial mounting bracket from the rear to be fixed in to pickup groove.

3.2 Illustration of panel mounting:

138mm

138mm

Hole size

Mounting bracket

42mm

42mm

Illustration of panel mounting, fixed with Mounting bracket

Figure 2

Hole distances on the panel box
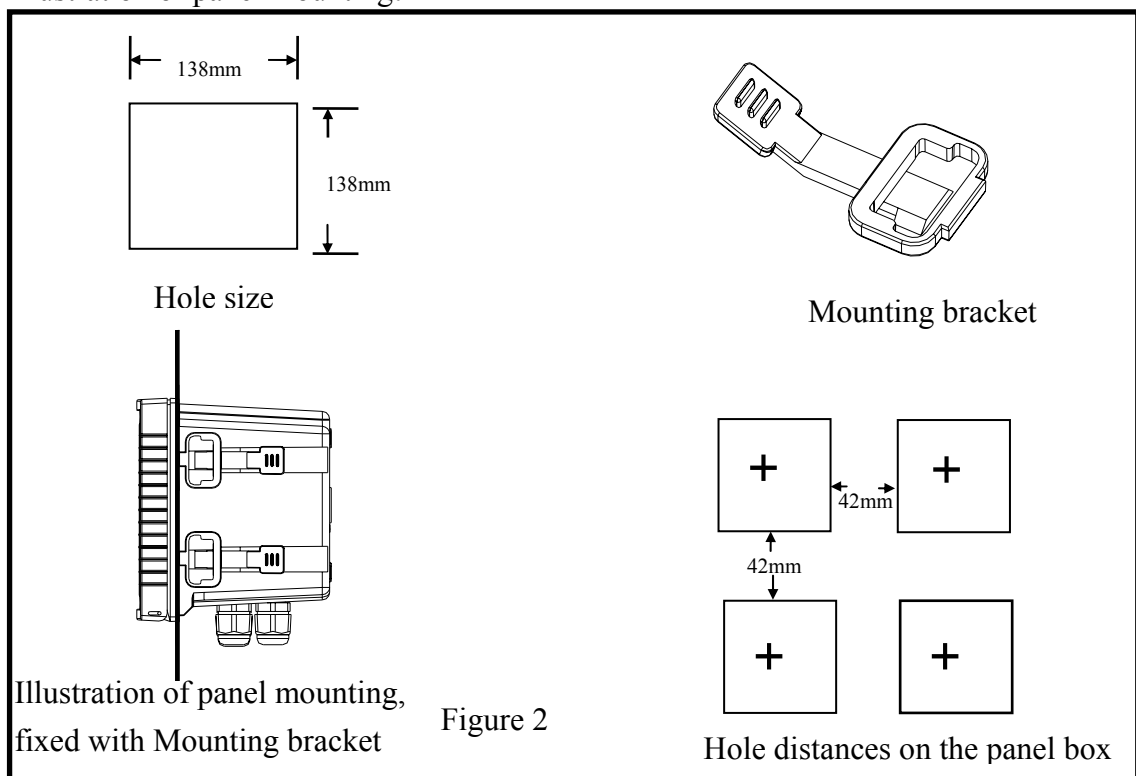
3.3 Illustration of Wall mounting and pipe mounting

Installation of pipe mounting
Fixed with U-shaped pipe clip
Order No.: 8-34

Installation of wall mounting
Fixed with 4 M5 screws

Rain covered
Order No.: 8-34 and 8-35

Figure 3

Rain covered
Order No.: 8-35
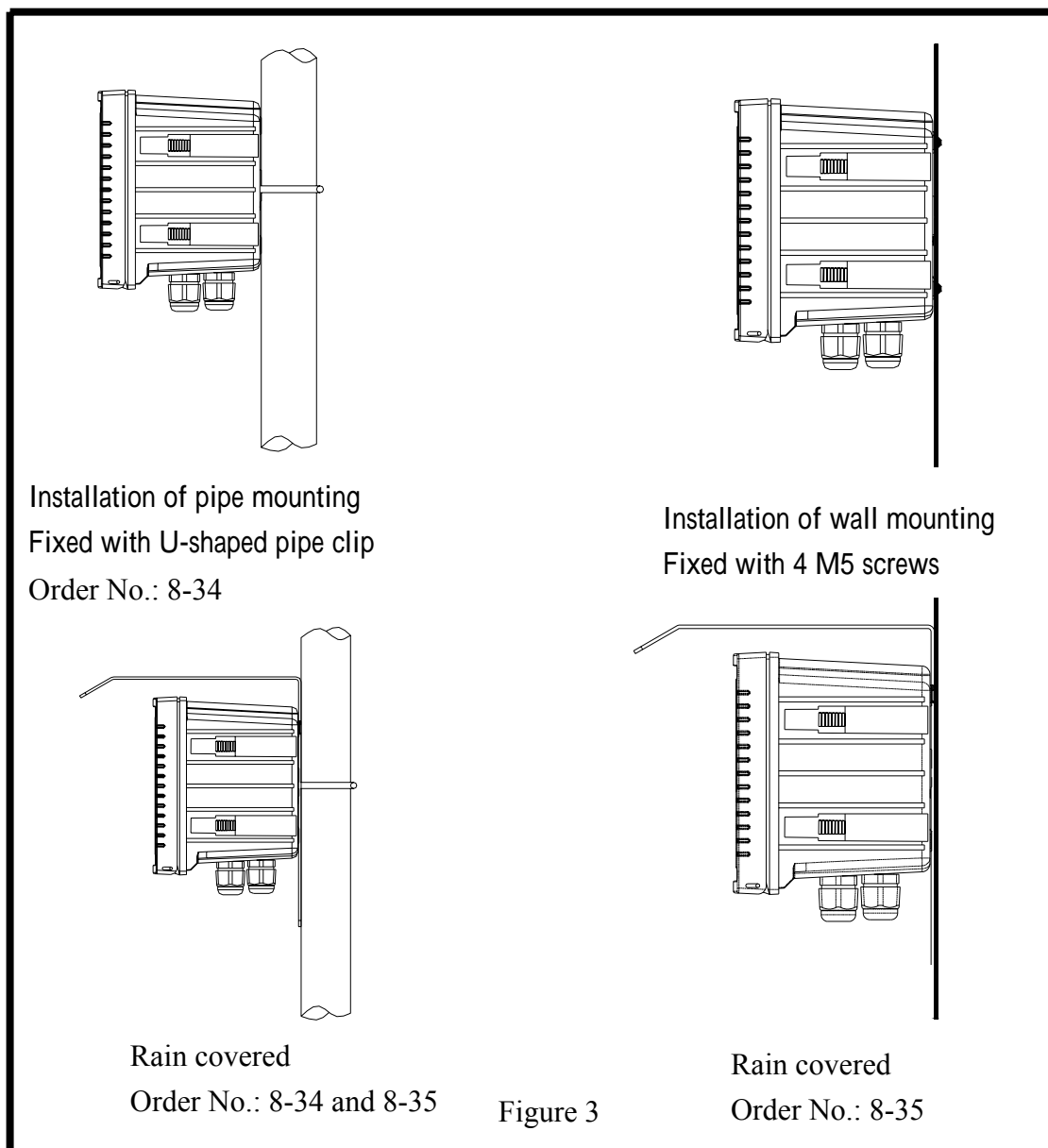
3.4 Assembly of electrode and housing

3.4.1 Cable set-up:
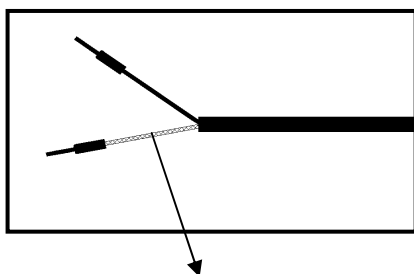
Set-up diagram of coaxial cable:
See the correct set-up method on the left:
Note: The black conductive rubber covering on the central spindle should be removed for use.

Remove the conductive rubber

a. Make sure to remove the conductive rubber or aluminum-foil paper between the electrode signal wire and the network cable.

b. Extend the cable to the controller without any joint except specific junction box. Connect

the central spindle directly to the Glass contact on the back of controller and connect network cable to Ref contact.

3.4. 2 Assembly of housing PP-100A

A------Upper cover of round joint box
B------O-Shaped ring
C------Cable fixing point MG16A
D------ Lower cover of round joint box
E------ Cable fixing point MG16A
F------ O-Shaped ring
G------PP Electrode Protective Housing
H------ Sensing electrode
I------- Rubber electrode holder
J------PP pipe protective cover
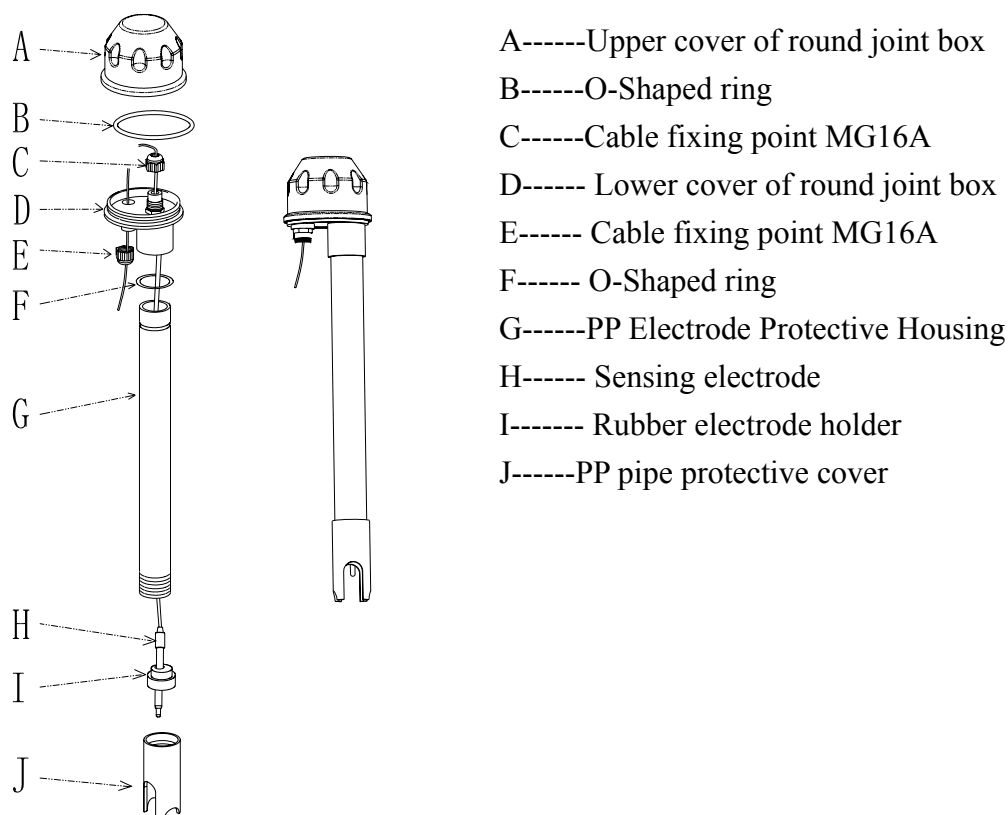
1. Insert **(H)** Sensing electrode through **(G)** PP Electrode Protective Housing
2. Lubricate **(H)** Sensing electrode properly, so that it can be easily pass through **(I)** Rubber electrode holder leaving about 5cm bellow.
3. Install the prepared **(I)** Rubber electrode holder into **(G)** PP Electrode Protective Housing and lock **(J)** PP pipe protective cover tightly.
4. Insert **(H)** Sensing 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 central spindle on terminal block 1 of round holder; Fix the terminal of electrode network cable 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 central spindle and electrode central spindle to connect them; extend the lead network cable to fix on the terminal block 3. Lock **(A)** Upper cover of round junction

box to finish the installation.

Mounting bracket:
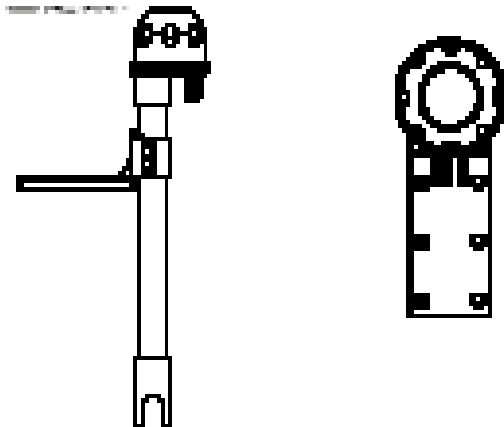
Our company use L-shaped mounting bracket as electrode mounting bracket. According to the site necessity, fix the bracket with steel nails or expansion bolts at proper locations by pool.

3.5 Illustration and description of junction box :(Two kinds of link distributing system)
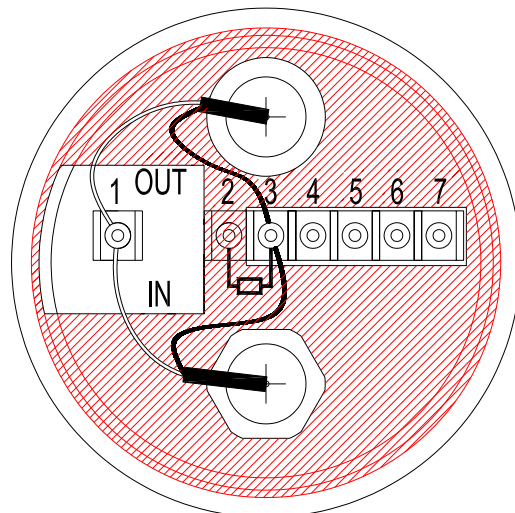
1

Two-wire distributing system			
IN terminals	Terminal No.	OUT terminals	Terminals on controller
Electrode central spindle	1	Central spindle extending wire for electrode	GLASS
Shield (forbidden)	2	Shield (forbidden)	------
Electrode network cable	3	Network cable extending wire for electrode	REF
Temperature probes red wire	4	Red wire extending wire for electrode	T/P
Temperature probes green wire	5	Green wire 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 material No. is 7202-RG-58.
2.) If temperature probe is used, the material 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 controller
Electrode central spindle	1	Central spindle extending wire for electrode	GLASS
Ground Rods	2	GND	GND
Electrode network cable	3	Green wire extending wire for electrode	REF
Temperature probes red wire	4	Red wire extending wire for electrode	T/P
Temperature probes green wire	5	Green wire 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 controller PC-3100

4.1 Illustration of rear panel:

100~240 WASH REL2 REL1 NC 4~20mA 4~20mA -12V +12V T/P GND REF NC GLASS
AC (PC-3100 Only)

-2 -1
+ +

D-(A) G D+(B)
RS-485
(PC-3100RS Only)

2 Wire only
3 Wire only

0/4~20mA:Isolated Max. load 600Ω
Power:100~240VAC±15% 50/60Hz
Relay:240VAC Max.0.5A(REL1/REL2/WASH)
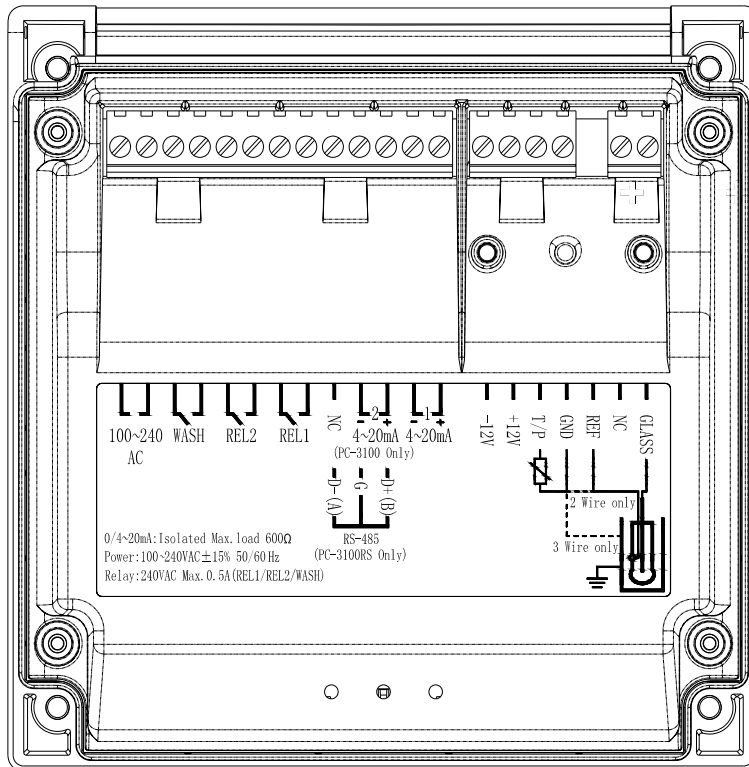
4.2 Illustration of terminal function:

POWER

GLASS
REF
PH/ORP

PC3100RS

RS485
D+(B
G
D-(A)

GND

AC
INPUT
POWER

PC3100 only

2
4/20mA
+
-

TP
TP
T

1
4/20mA
+
-

HI   LO   WASH

± 12V
+
-
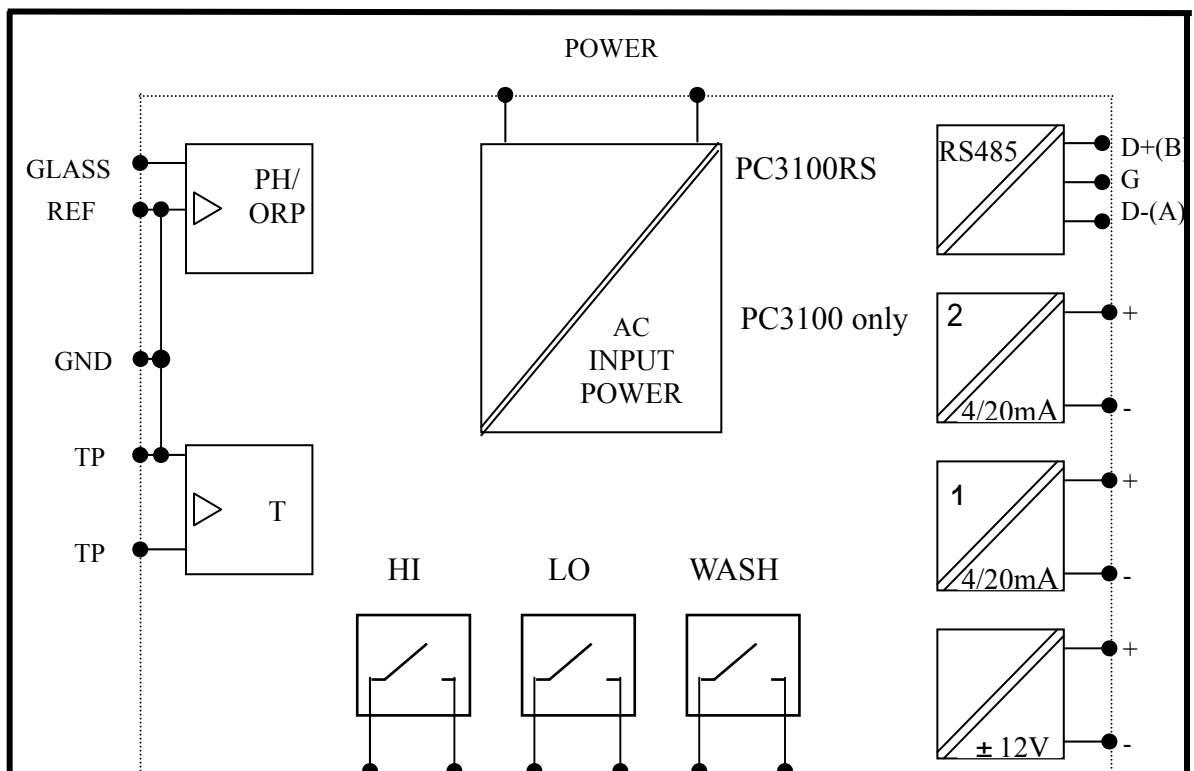
4.3 Description of terminal function:

GLASS	: Central spindle connecting pH/ORP electrode signal wire
NC	: **NC**
REF	: Network cable connecting pH/ORP electrode signal wire
GND	: The terminal connecting 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 going out the factory)**
T/P	: Connect the other end of temperature probe
DC±12V	: Output terminal of direct current voltage ±12V (**PH-300T only**)
(1) 4~20mA +terminal	: Master measure current output terminal +, for external recorder or PLC control
4~20mA - terminal	: Master measure current output terminal -, for external recorder or PLC control
(2) 4~20mA + terminal/ D+(B):	Temperature current output terminal +, for external recorder or PLC control (only applicable for PC-3100); or RS-485 output D+(B) (only applicable for PC-3100RS)
4~20mA - terminal, G	: Temperature current output terminal -, for external recorder or PLC control (only applicable for PC-3100); or RS-485 output GND (only applicable for PC-3100RS)
NC / D-(A)	: **NC** or RS-485 output D-(A) (only applicable for PC-3100RS)
REL1	: External relay terminal high control
REL2	: External relay terminal low control
WASH	: External wash relay terminal
100~240AC	: Power supply terminal

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 30 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.
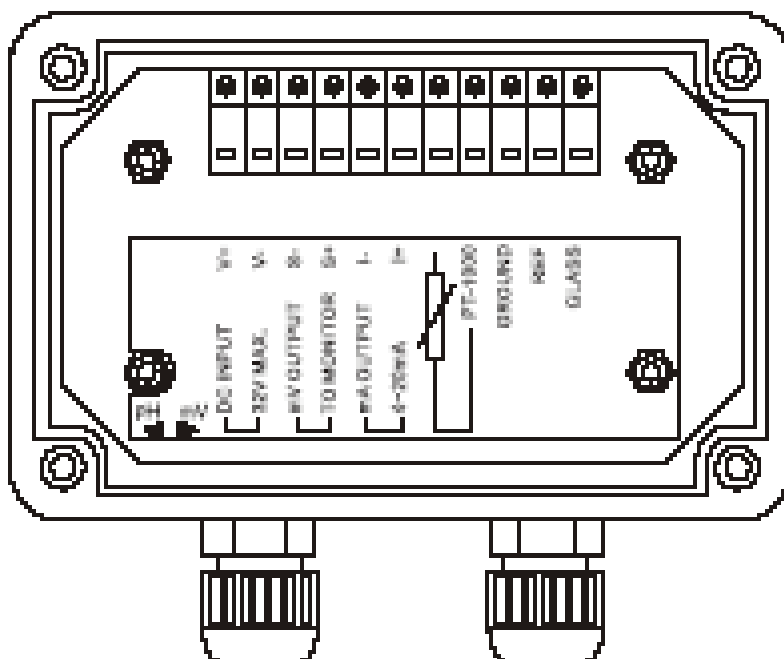
4.5 Connection of controller PC-3100 and transmitter PH-300T:

A. Connect the GLASS point of transmitter PH-300 terminal to the electrode central spindle. (Note: Remove the black conductive rubber); connect the REF point of transmitter PH-300 terminal to the electrode network cable.

B. See the two-wire distributing system and three-wire distributing system in the following page.

C. PT-1000 on transmitter PH-300 terminal is an automatic temperature compensation probe, or applies a fixed temperature compensation resistance.

D. The V+ and V- of transmitter PH-300 terminal respectively connect to DC12V+ and – of the controller.

E. The S+ and S- on transmitter PH-300 terminal respectively connect to GLASS and REF of the controller.

F. The I+ and I- on transmitter PH-300 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	5	10	15	20
R value	1000Ω	1019.25Ω	1038.5Ω	1057.75Ω	1077Ω
Temperature	25	30	35	40	45
R value	1096.25Ω	1115.5Ω	1134.75Ω	1154Ω	1173.25Ω
Temperature	50	55	60	65	70
R value	1192.5Ω	1211.75Ω	1231Ω	1250.25Ω	1269.5Ω
Temperature	75	80	85	90	100
R value	1288.75Ω	1308Ω	1327.25Ω	1346.5Ω	1385Ω

4.6 Typical wirings:

Two-wire distribution

pH/ ORP

GND   REF.   GLAS

Network cable   Central wire

Short circuit slice

Three-wire distribution

pH/ ORP

GND   REF.   GLAS

Black   Network   Central
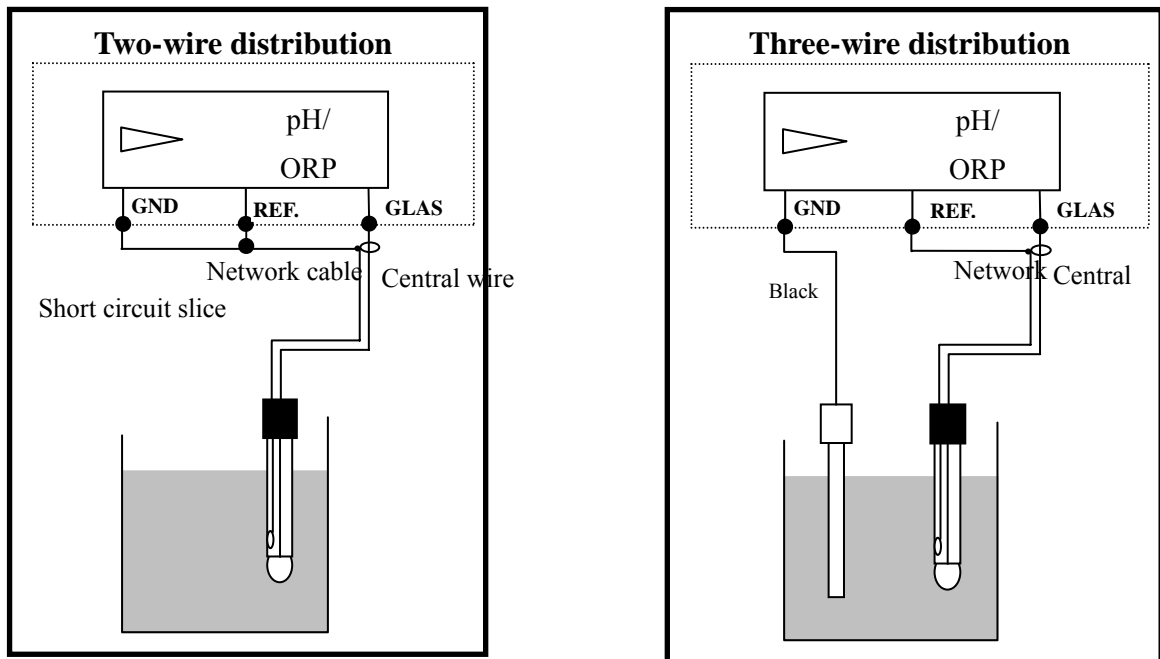
4.7 Illustration of electrical connection:

110 ~ 240VAC

Transmitter

HI   LO   WASH

100~240 VAC

Surge absorber

Washing device

Surge absorber

Dose feeder

Surge absorber

Dose feeder

Surge absorber   External relay

Surge absorber   External relay

Surge absorber   External relay

M   M   M
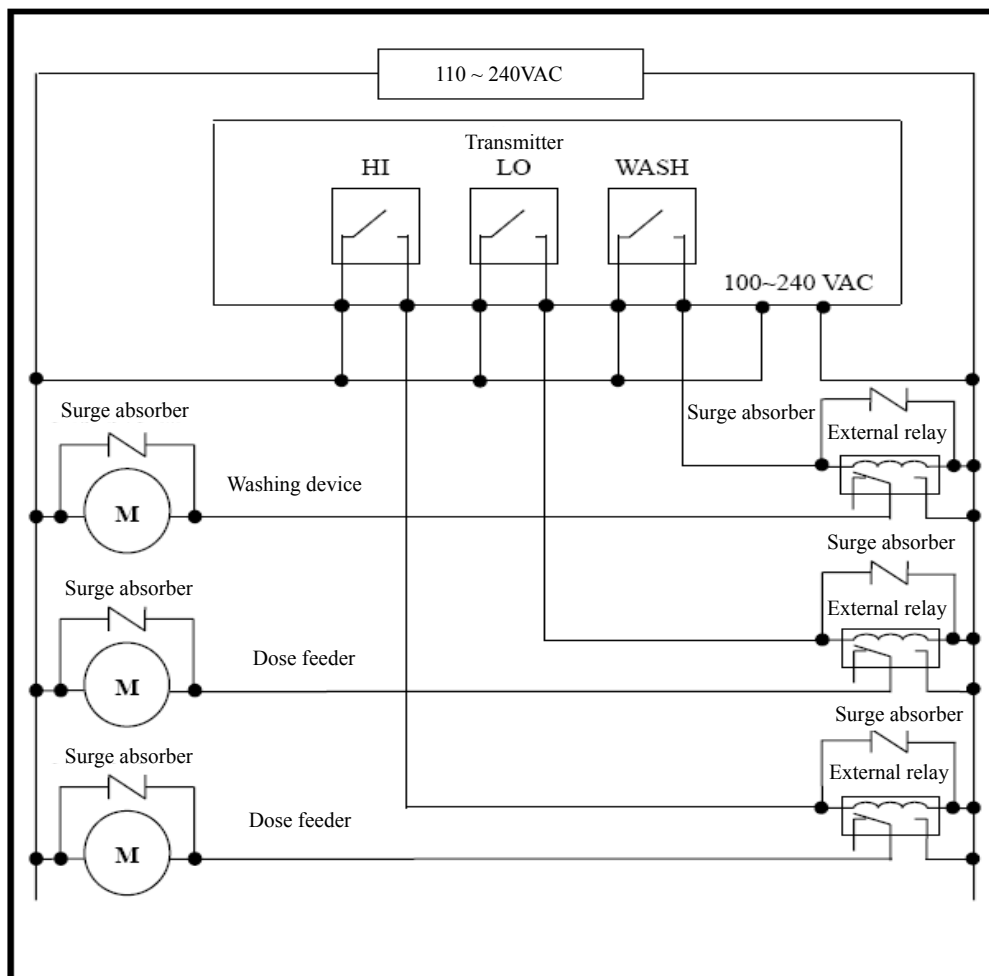
5. Configuration:

5.1 Illustration of front panel:
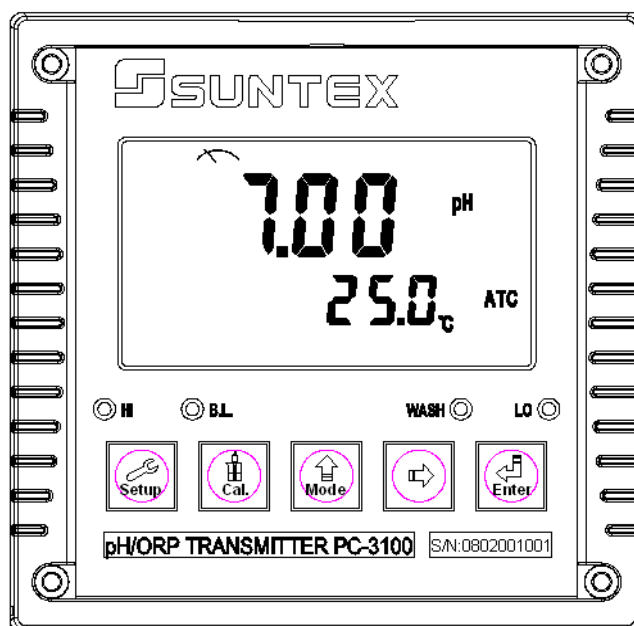
5.2 Keypad:

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

Setup	In the parameter set-up mode, pressing this key allows you exit parameter set-up mode and back to Measurement mode.
Cal.	In the Calibration mode, pressing this key allows you exit Calibration mode and back to Measurement mode.
⬆ **Cal.**	In the parameter set-up mode and Calibration mode, it is an optional function key and upward key.
⮕	In the parameter set-up mode and Calibration mode, it is an optional function key and rightward key.
Enter	Key for confirmation; pressing this key is essential when modifying data value or selecting the parameter setting items in the window.
Cal. **Mode**	: In the Measurement mode, pressing these two keys simultaneously allows you enter Calibration mode.
Setup **Mode**	: In the Measurement mode, pressing these two keys simultaneously allows you enter parameter set-up mode.

[Setup] [Mode] [Enter] : Restore factory default settings

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

[Cal.] [Mode] [Enter] : Restore factory default calibrations

In the Measurement mode, press the two keys [Cal.] [Mode] simultaneously for five seconds, and then press [Enter] until you see a clock signal appearing on the display; then loose all keys to restore factory default calibrations.
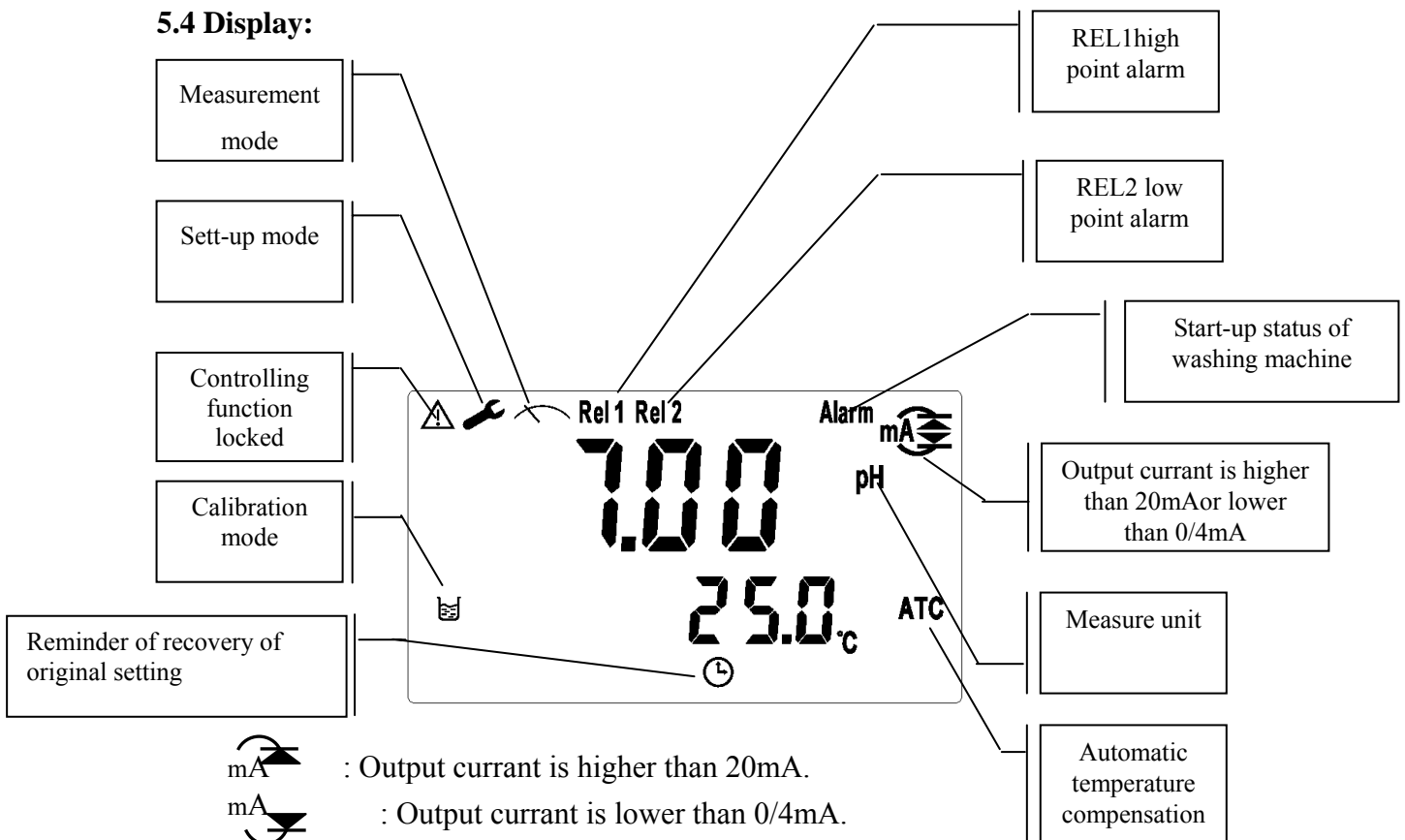
5.3 LED indicators:

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 value is started up, the REL1 indicator will light.

LO : Controlling operation indicator lamp; when the low setting value 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:

- Measurement mode
- Sett-up mode
- Controlling function locked
- Calibration mode
- Reminder of recovery of original setting
- REL1 high point alarm
- REL2 low point alarm
- Start-up status of washing machine
- Output currant is higher than 20mA or lower than 0/4mA
- Measure unit
- Automatic temperature compensation

mA : Output currant is higher than 20mA.

mA : Output currant is lower than 0/4mA.

6. Operation

6.1 Measurement mode:

After all electrical connections are finished and tested, connect the instrument to the power supply and start up it. Enter the Measurement mode of factory settings or final settings to begin the measurement and monitor.

6.2 Set-up mode:

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

6.3 Calibration mode:

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

6.4 Reset:

6.4.1 Master reset:

In the measurement mode and set-up mode, press two keys [Setup] [Mode] simultaneously for five seconds, and then press [Enter] 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: MTC25
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: ON =0000 s.   OFF =000.0 H   db= 0000 s.
pH/ORP current output: 4~20 mA   02.00~12.00pH
TP current output: 4~20 mA   000.0~100.0   (for PC-3100 only)
Display backlit: AUTO   b.L.= 0   SEnS =0
Code set-up: off
The followings are for PC-3100RS only:
Date and time: 2000-1-1 0Hr 0Minute 0sencond
RS-485 set-up: ID= 31   baud speed= 9600

6.4.2 Calibration reset:

In the Measurement mode, press the two keys [Cal.] [Mode] simultaneously for five seconds, and then press [Enter] 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 [Enter] to check the year, date, and time. You can shift among them sequentially by pressing the key [Enter] or enter the next page by waiting for 5 seconds.

After the checkup, it will back to measurement mode automatically.

17

7. Settings
Block diagram of settings:
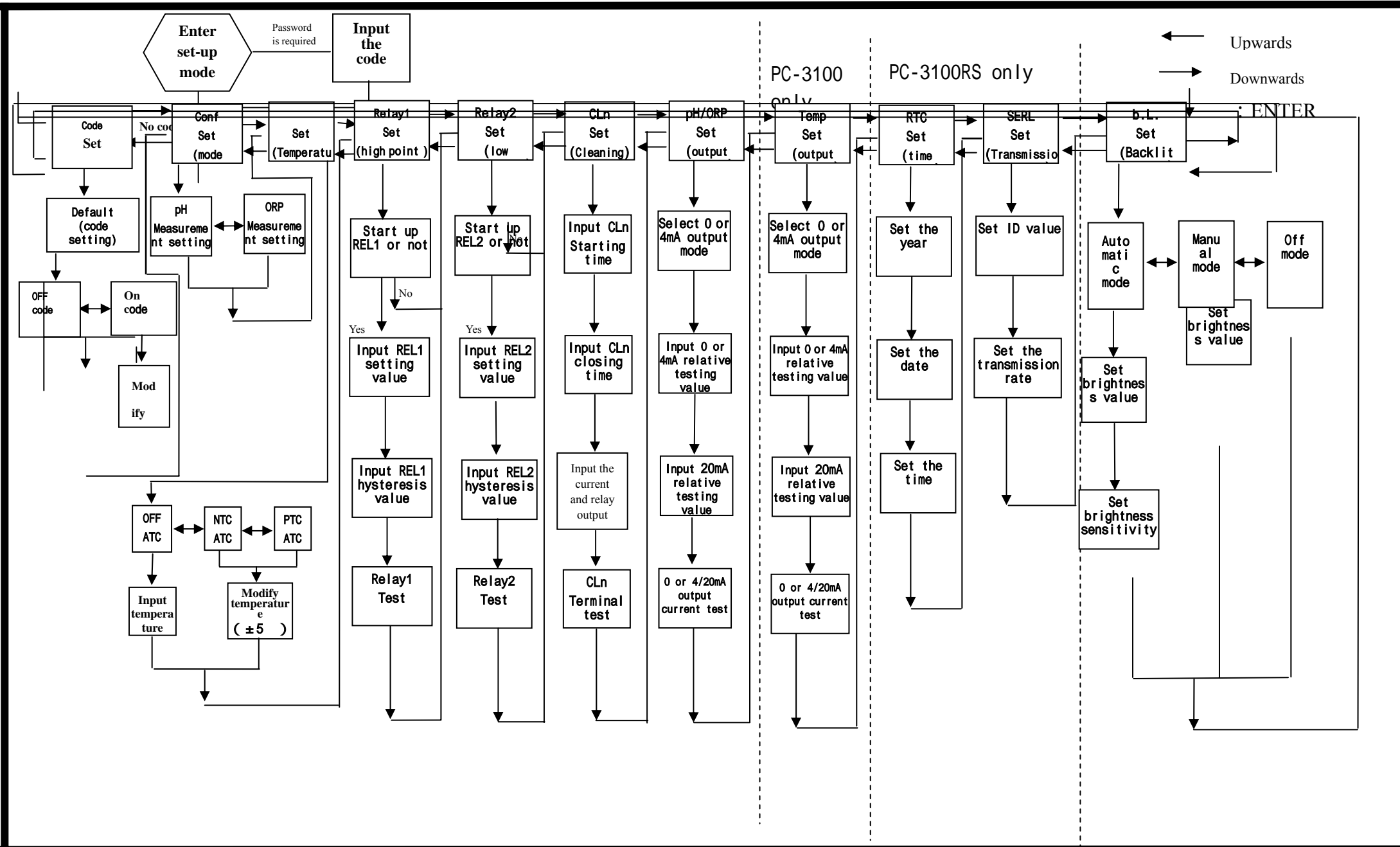
7.1 Entry of set-up mode

In the measurement mode, pressing the two keys [Setup] [Mode] simultaneously allows you enter the parameter set-up mode. You can back to the measurement mode at any time by pressing the key [Setup]. The original code is 1111.

7.2 Security code of settings:

In the set-up mode, you can set up the code by pressing the key [Mode], and confirm by pressing the key [Enter].

ConF SEt

Press [Mode]

CodE SEt

Press [Enter] for confirmation

0000 CodE

When the first "0" in the fields 0000 will shine, press upward key or rightward key to input the code, and press ENTER for confirmation. Then, continue inputting the second field, and by analogy.

If you input the wrong code, the CODE will shine 4 times and then the interface will back for another input.

1111 CodE

Press [Enter] for conformation

(If security code is cancelled, you can enter the set-up mode directly without inputting the password any more. You can reset the security code by pressing Model key by double pressing.)

oFF CodE   Press [Mode] or [→]   **on CodE**

Press [Enter] for confirmation

Modify the code   **2222 CodE**

Press [Enter] for

Enter Measurement parameter

19

7.3 Measurement parameters:

Enter the measurement parameter set-up

```
⚠🔧
  ConF
     SEt
```

Press [Enter] for

↓

```
⚠🔧
    PH
    SEt
```

Press [Mode] or [➡]

Select pH or ORP

↓

```
⚠🔧
  orP
    SEt
```

Press [Enter] for

↓

Enter temperature parameter setting
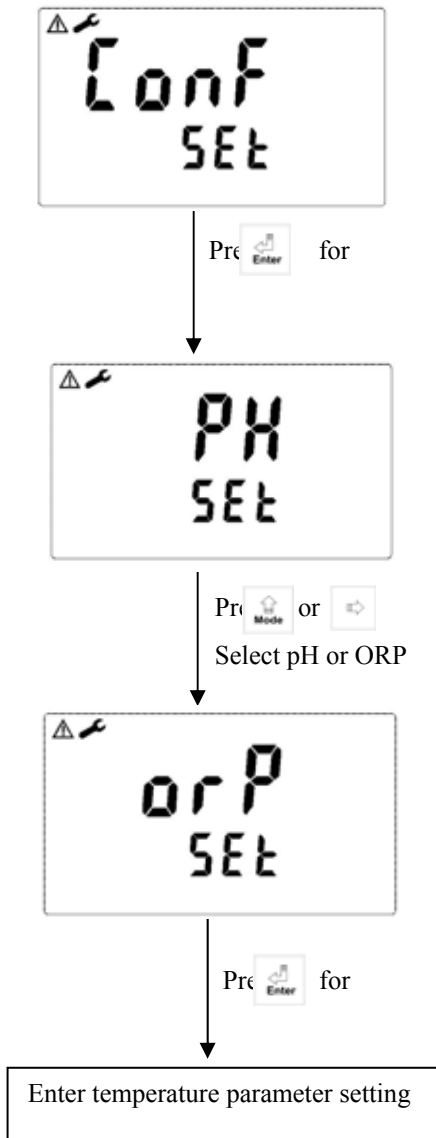
7.4 Temperature parameter

Enter temperature parameter set-up

```
°C
SEt
```

Press [Enter] for

```
oFF          ntC          PtC
AtC          AtC          AtC
```
press [Mode] or [→] for selection — press [Mode] or [→] for selection

```
025.0        00.0         00.0
SEt  ℃ MTC   25.0 ℃ ATC   25.0 ℃ ATC
```

Use standard thermometer to test the actual temperature of the solution, and press upward or rightward	If necessary, compare with the actual temperature value tested by standard thermometer. Press	If necessary, compare with the actual temperature value tested by standard thermometer. Press
Press [Enter] for	press [Enter] for	P [Enter] for

Enter High point alarm set-up mode

7.5 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 .00~2.00pH/0~200mv.

Press `Enter` for

Press `Mode` or `➡` to decide to start up REL1 or not.

Press `Enter` for

Press `Mode` or `➡` to set the required alarm

Press `Enter` for

Press `Mode` or `➡` to set an appropriate

Press `Enter` for

Press `Mode` or `➡` to make REL1 terminal or lamp test

Choose on, HI will light for a

Press `Enter` for

Press `Enter` for

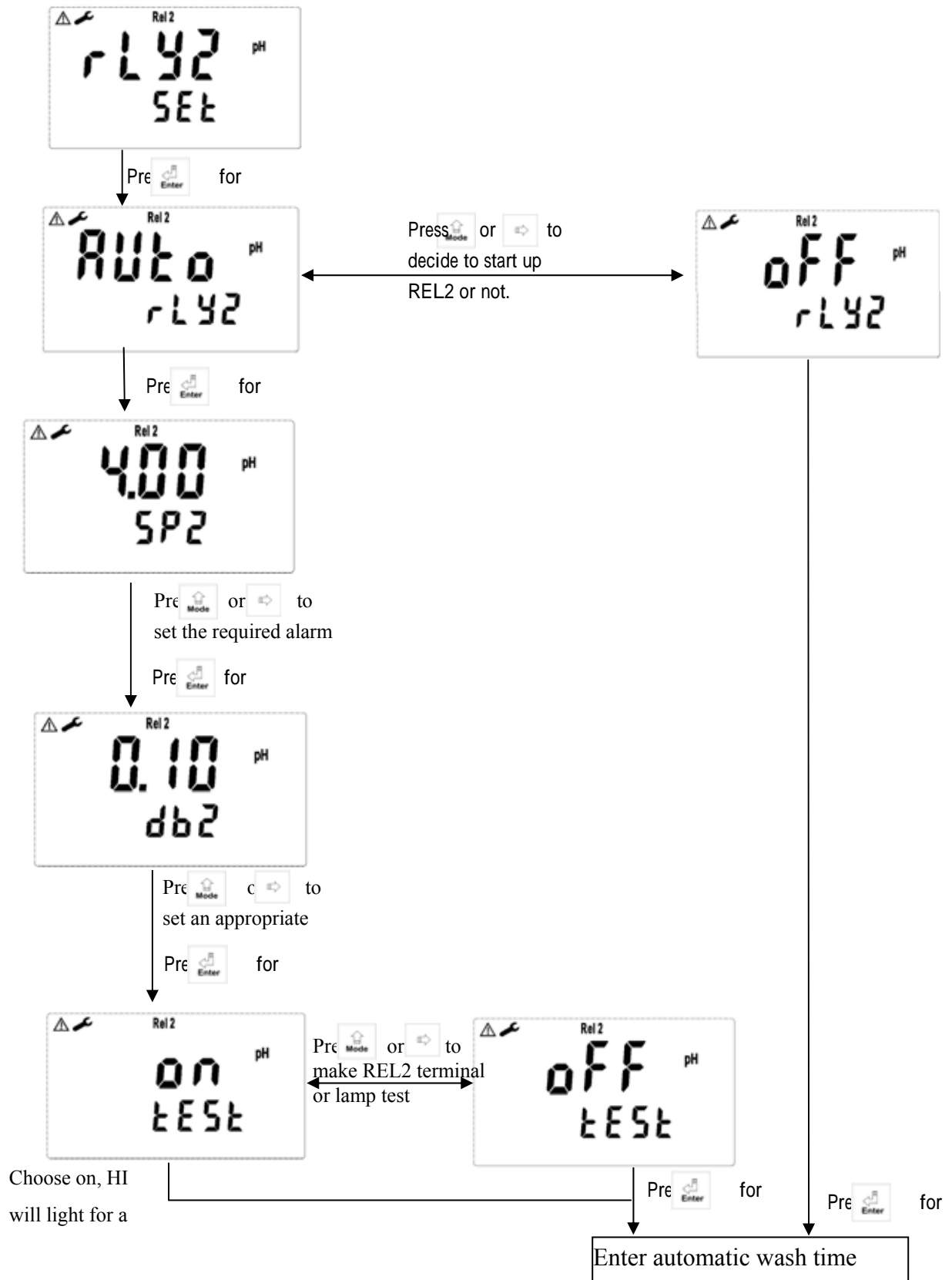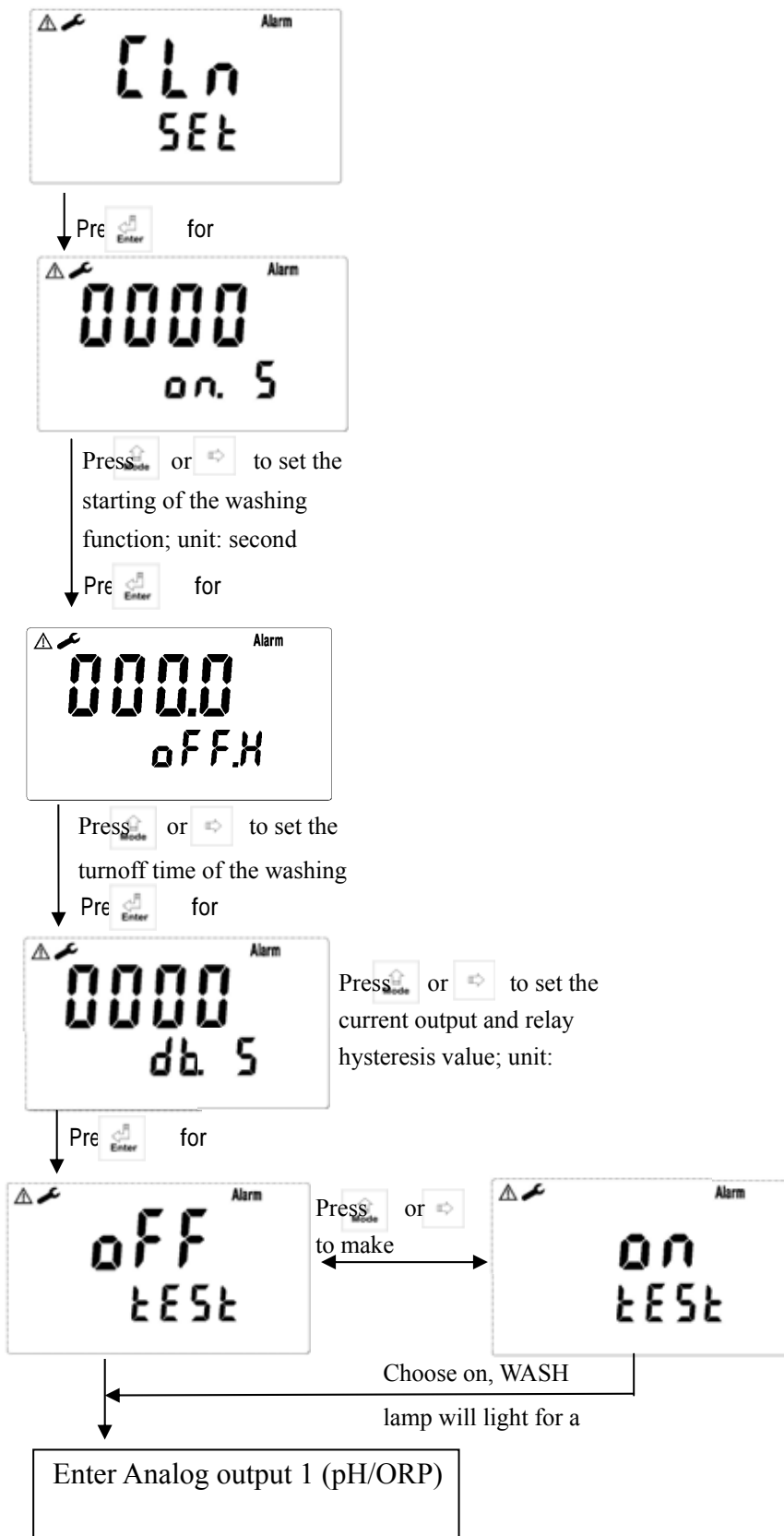Enter Low point alarm set-up mode

22
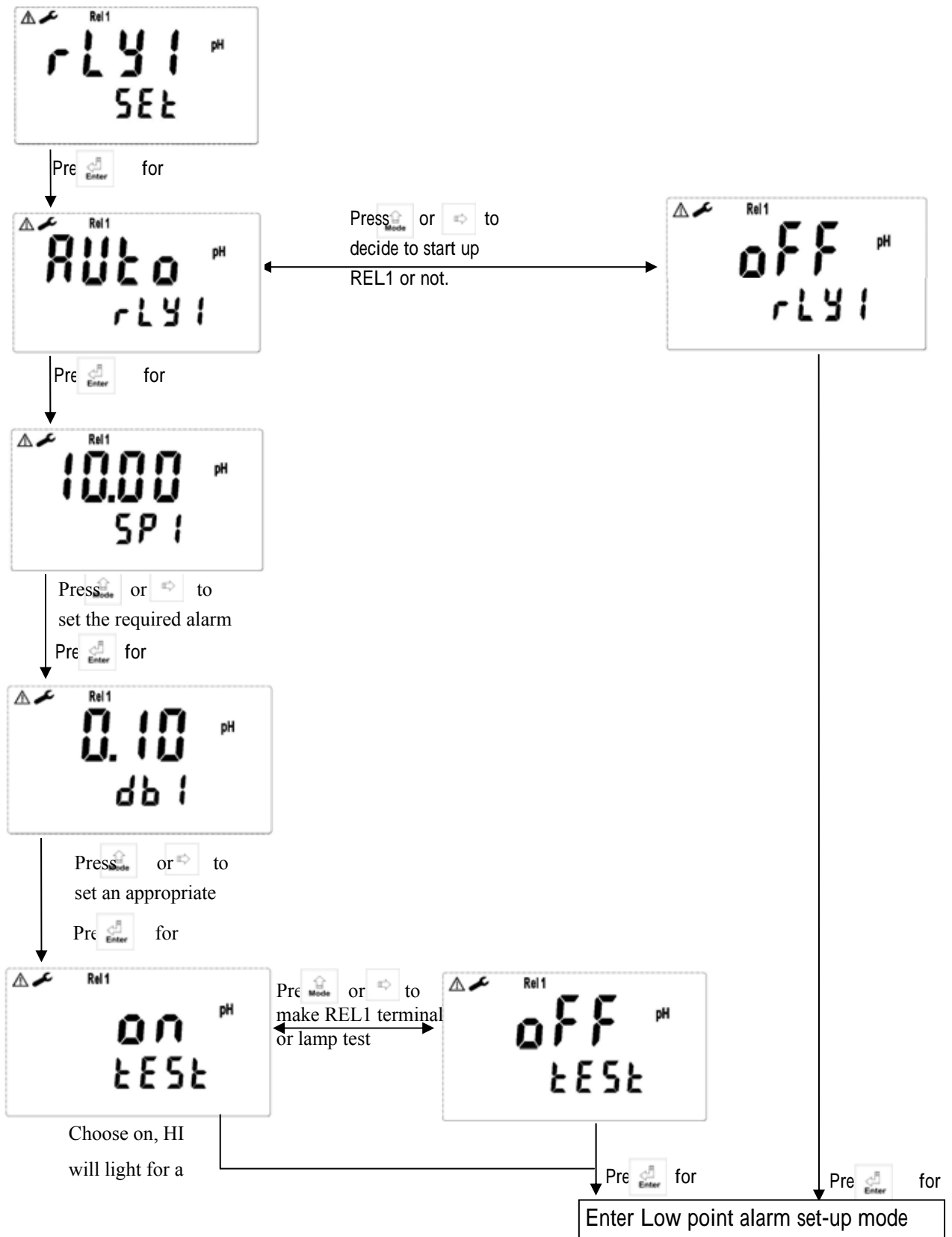
7.6 Lo point:

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 .00~2.00pH/0~200mv.

Press ⟲Enter for

Press 🏠Mode or ⇨ to decide to start up REL2 or not.

Press ⟲Enter for

Press 🏠Mode or ⇨ to set the required alarm

Press ⟲Enter for

Press 🏠Mode or ⇨ to set an appropriate

Press ⟲Enter for

Press 🏠Mode or ⇨ to make REL2 terminal or lamp test

Choose on, HI will light for a

Press ⟲Enter for

Press ⟲Enter for

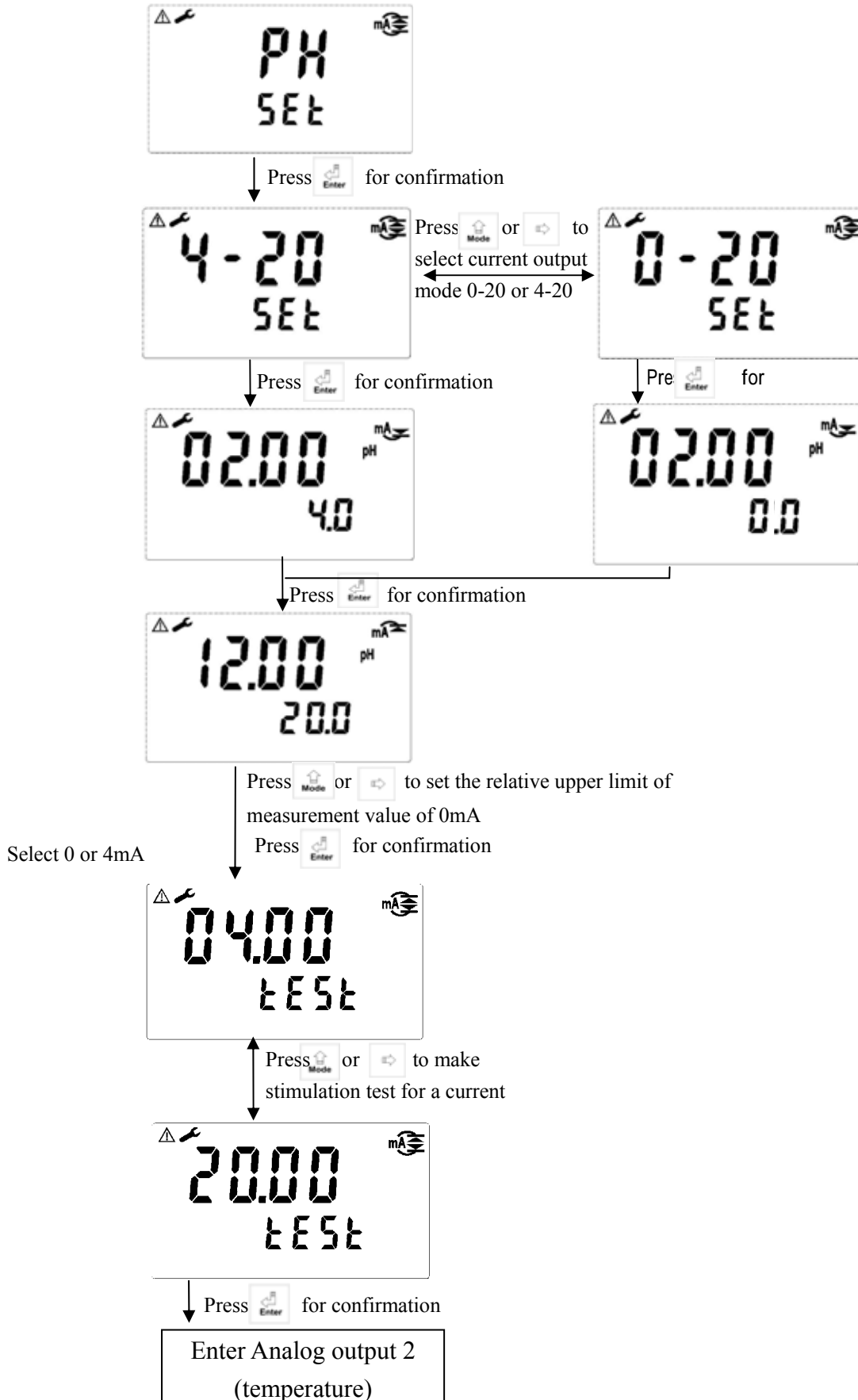Enter automatic wash time

7.7 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.

```
   ⚠ 🔧              Alarm
        [Ln
        5Et
```

Press Enter for

```
   ⚠ 🔧              Alarm
        0000
        on. 5
```

Press Mode or ⇨ to set the starting of the washing function; unit: second

Press Enter for

```
   ⚠ 🔧              Alarm
        000.0
        oFF.H
```

Press Mode or ⇨ to set the turnoff time of the washing

Press Enter for

```
   ⚠ 🔧              Alarm
        0000
        db. 5
```

Press Mode or ⇨ to set the current output and relay hysteresis value; unit:

Press Enter for

```
   ⚠ 🔧              Alarm
        oFF
        tESt
```

Press Mode or ⇨ to make

```
   ⚠ 🔧              Alarm
        on
        tESt
```

Choose on, WASH lamp will light for a

Enter Analog output 1 (pH/ORP)

24

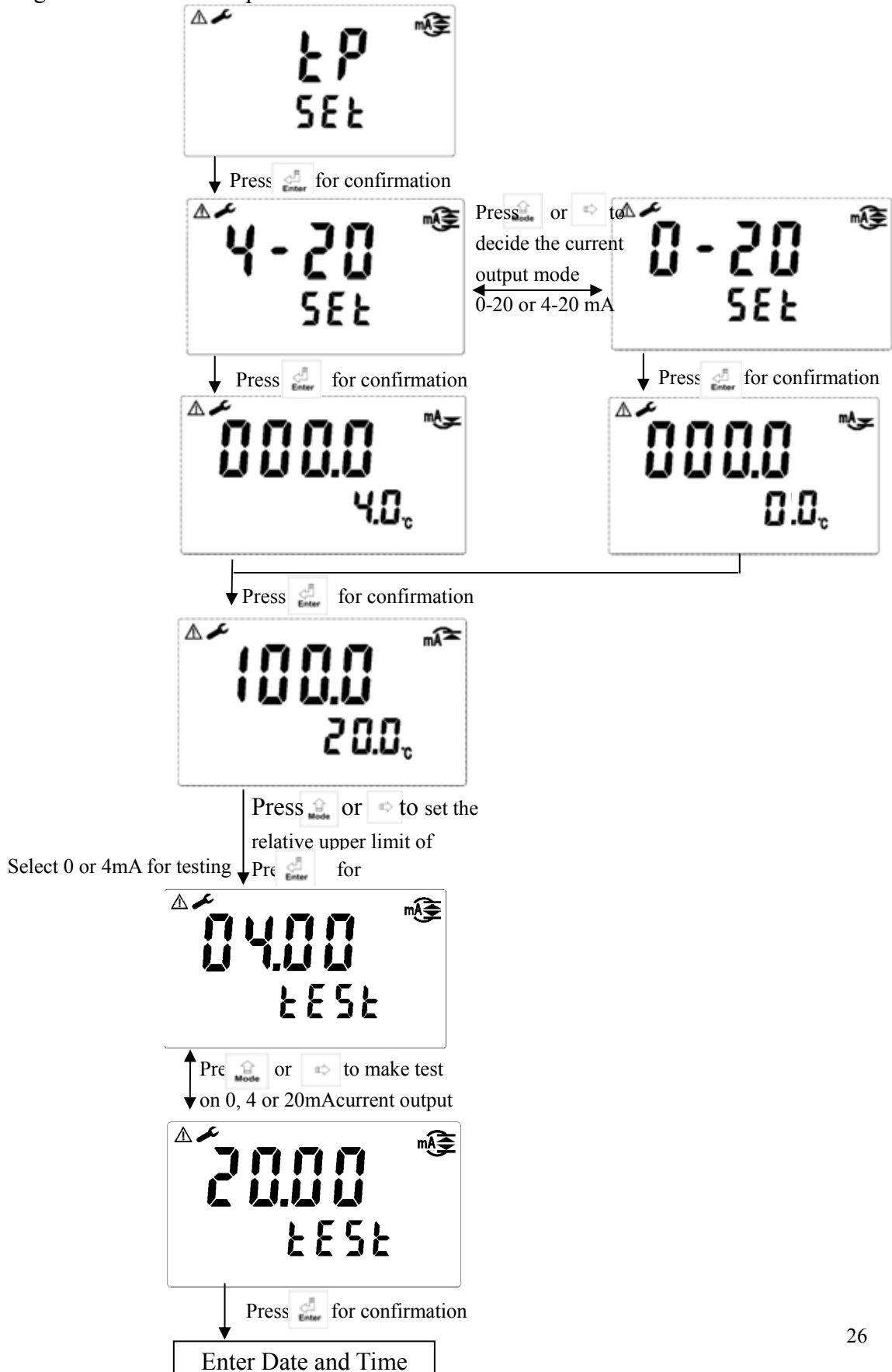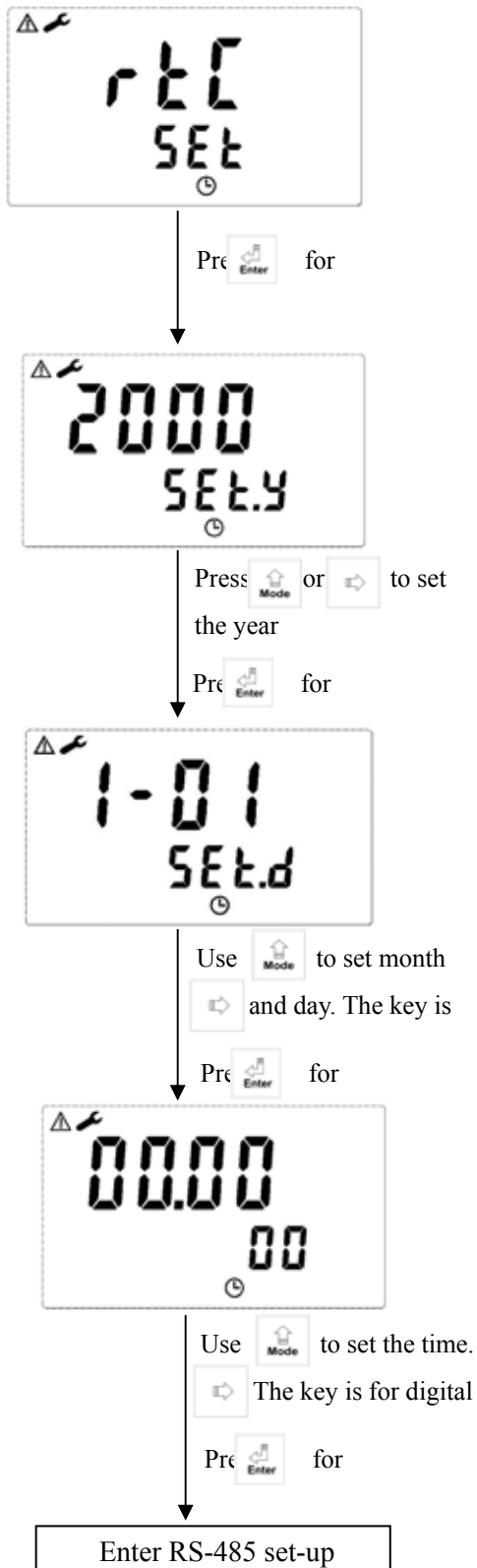## 7.8 Analog output 1 (pH/ORP):

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.
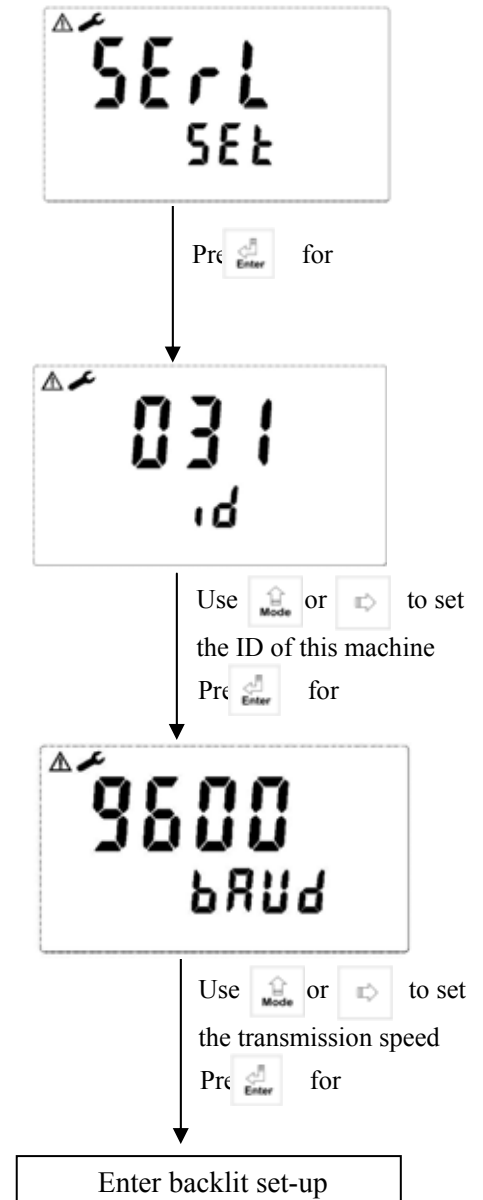
PH
SEt

↓ Press [Enter] for confirmation

4-20 SEt   Press [Mode] or [⇨] to select current output mode 0-20 or 4-20   0-20 SEt

↓ Press [Enter] for confirmation   ↓ Press [Enter] for

02.00 pH
4.0

02.00 pH
0.0

↓ Press [Enter] for confirmation

12.00 pH
20.0

↓ Press [Mode] or [⇨] to set the relative upper limit of measurement value of 0mA

Select 0 or 4mA   Press [Enter] for confirmation

04.00
tESt

↕ Press [Mode] or [⇨] to make stimulation test for a current

20.00
tESt

↓ Press [Enter] for confirmation

Enter Analog output 2
(temperature)

25

Note: The setting in 7.9is for PC-3100 only.

7.9 Analog output 2 (temperature) (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.

⚠️🔧 **tP**
     SEt   mA≋

↓ Press 🔲 for confirmation

⚠️🔧 **4-20**   mA≋
    SEt

Press 🔲 or ➡ to decide the current output mode 0-20 or 4-20 mA

⚠️🔧 **0-20**   mA≋
    SEt

↓ Press 🔲 for confirmation   ↓ Press 🔲 for confirmation

⚠️🔧 **000.0** mA≋
      4.0℃

⚠️🔧 **000.0** mA≋
      0.0℃

↓ Press 🔲 for confirmation

⚠️🔧 **100.0** mA≋
      20.0℃

Press 🔲 or ➡ to set the relative upper limit of

Select 0 or 4mA for testing ↓ Press 🔲 for

⚠️🔧 **04.00** mA≋
    tESt

↑ Press 🔲 or ➡ to make test ↓ on 0, 4 or 20mAcurrent output

⚠️🔧 **20.00** mA≋
    tESt

↓ Press 🔲 for confirmation

Enter Date and Time

Note: The setting in 7.10 and 7.11 is for model PC-3100RS only.

7.10 Date and Time setting

```
  ⚠ ⚙
    r t C
    SEt
      ⊕
```

Press Enter for

```
  ⚠ ⚙
   2000
    SEt.Y
      ⊕
```

Press Mode or ⇨ to set the year

Press Enter for

```
  ⚠ ⚙
   1-01
    SEt.d
      ⊕
```

Use Mode to set month ⇨ and day. The key is

Press Enter for

```
  ⚠ ⚙
   00.00
        00
      ⊕
```

Use Mode to set the time. ⇨ The key is for digital

Press Enter for

Enter RS-485 set-up

7.11 RS-485 set-up (PC-3100RS only)

The user can set, as necessry, the ID and transmission speed of the series output interface.

```
  ⚠ ⚙
   SErL
    SEt
```

Press Enter for

```
  ⚠ ⚙
    031
    id
```

Use Mode or ⇨ to set the ID of this machine

Press Enter for

```
  ⚠ ⚙
   9600
    bAUd
```

Use Mode or ⇨ to set the transmission speed

Press Enter for

Enter backlit set-up

7.12　Backlit LCD

```
⚠️🔧
b.L.
SEt
```

Press [Enter] for confirmation　　Use [Mode] or [▷] to select automatic, manual or off.

Use [Mode] or [▷] to select automatic, manual or off.

```
⚠️🔧
Auto
b.L.
```
◄──────►
```
⚠️🔧
on
b.L.
```
◄──────►
```
⚠️🔧
oFF
b.L.
```

Press [Enter] for confirmation　　　　Press [Enter] for confirmation

```
⚠️
0
b.L.
```

```
⚠️
0
b.L.
```

Use [Mode] or [▷] to select -2, -1　0　1　2 five backlit brightness levels
Press [Enter] for

Use [Mode] or [▷] to select -2, -1　0　1　2 five backlit brightness levels
Press [Enter] for

```
⚠️🔧
0
SEnS
```

Press [Enter] for confirmation

Use [Mode] or [▷] to select -2　-1　0　1　2 five levels of sensitivity of
Press [Enter] for confirmation

Back to Measurement Mode

8. Calibration

Block diagram of Calibration

Enter external calibration mode

Password is → Input the code

OS value of last calibration

Slope value of last calibration

Code Set

Default (Code Set)
11111

OFF code ↔ On code

Modify

Ct1 rEdy (Manual)

Identify the standard electrical potential

Ct2 rEdy (Automatic)

Identify the standard electrical potential

On1 rEdy (Automatic)

Identify the standard electrical potential

On2 rEdy (Automatic)

Identify the standard electrical potential

CA1 rEdy (Manual)

Show the calibrated electrical potential

Set pH value of standard solution

MODE

CA2 rEdy (Manual)

Show the calibrated electrical potential

Set pH value of standard solution

PASS

CAL

← Upwards

→ Downwards

↓ ENTER

Note: In any step of this process, pressing CAL will allow backing the measurement mode.

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8.1 Security code of calibration**:**

8.1.1Code authorization: The code authorization of parameter set-up is prior to the code authorization of calibration mode. Therefore, in order to enter the calibration model, you can input the parameter set-up model or the code of calibration mode.

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

⚠ **CodE**
SEt

Press [Enter] for

⚠ **0000**
CodE

If you input the wrong code, the CODE will shine 4 times and then the interface will back for another input.

When the first "0" in the fields 0000 will shine, press upward key or rightward key to input the code, and press ENTER for confirmation. Then, continue inputting the second field, and by analogy.

⚠ **1111**
CodE

Press [Enter] for

(If security code is cancelled, you can enter the set-up mode directly without inputting the password any more. You can reset the security code by pressing Model key by double pressing.)

⚠ **oFF**
CodE

Press [Mode] or [▷]

⚠ **on**
CodE

Press [Enter] for

Modify the code

⚠ **2222**
CodE

Press [Enter] for

Back to Calibration Mode

8.2 Entry of calibration mode

8.2.1 Pressing [Cal.] [Mode] simultaneously allows entering calibration mode, and pressing [Cal.] at any time allows backing to the measurement mode.

8.2.2 In entering the calibration mode, the display shows the previous calibration OS (null-point potential) value. Pressing [Enter] allow entering the next page.

```
         0      mV

      o5 1
```
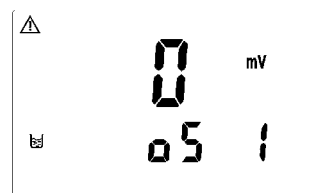
8.2.3 The display shows the previous calibration SLP (Slope) value. Press [Enter] allow entering the calibration menu.

```
    100.0   %

      SLP1
```
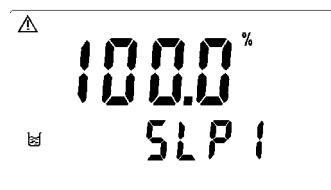
8.2.4 Use [Mode] or [⇨] to select **CA1, Ct1 or Cn1**, and press [Enter] for confirmation. The preset is Ct1 Buffer calibration.

```
     CA1    pH

      rEdY
```

Note:

1. **Ct1:   Refer to TECH. Buffer: pH2.00, pH4.01, pH7.00, pH10.00, and pH12.00 (pH2.00 and pH12.00 are for PC-3100RS only.)**

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 Asymmetry Buffer, for dual-point or three-point calibration only.**

4. **Ct1 and Cn1 of PC-3100RS can apply three-point calibration, but must in sequence from high to low, or from low to high.**

8.3 Asymmetry Buffer calibration

8.3.1 Single-point calibration:

In single-point calibration, it is only necessary to calibrate OS value and the unmodified SLP value. The instrument will apply the factory defaults or the SLP value of last calibration.

1. When entering CA1 calibration mode, clean the electrode with distill water before putting it in the buffer solution. Press [Enter] to start the calibration. Then display will show the mV value of the buffer and [icon] begin to twinkle. After showing a similar number of pH value to the buffer solution, push [Mode] or [➡] to set the digit until it is equal to the buffer's standard. Then, push [Enter] to ensure it.

2. When the display shows "CA2", push [Mode] and the display will show OS value. Push [Cal.] to back to the measurement mode.
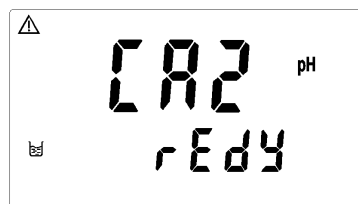
8.3.2 Dual-point Calibration

1. When entering CA1 calibration mode, clean the electrode with distill water before putting it in the buffer solution. Press [Enter] to start the calibration. Then display will show the mV value of the buffer and [icon] begin to twinkle. After showing a similar number of pH value to the buffer solution, push [Mode] or [➡] to set the digit until it is equal to the buffer's standard. Then, push [Enter] to ensure it.

2.   When entering CA2 calibration mode, clean the electrode with distill 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, push ⬚ or ⬚ to set the digit until it is equal to the buffer's standard. Then, push ⬚ to ensure it.
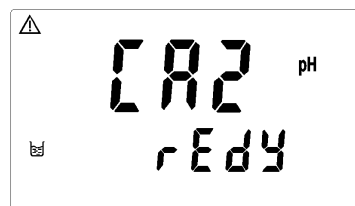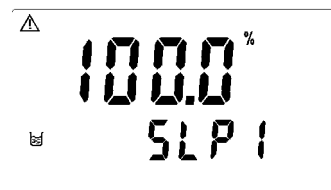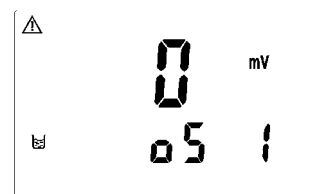
3. When being calibrated successfully, it will show "CAL PASS". If the calibration is unsuccessful, it will show "CAL Err". (See chapter 10 for Error messages and solutions).

4. The display will automatically show the oS1 (zero-point mV) Value. Push ⬚ bottom to see SLP1 (slope) value. Push ⬚ again to back to measurement mode.

8.4 Calibration of Pre-set buffer (TECH.)
8.4.1 Dual-point Calibration:
1. Enter Ct1 calibration mode. Clean the electrode completely. Put it into the first buffer solution. Then, push ⬚ bottom 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, push ⬚ bottom to start the second-point calibration.
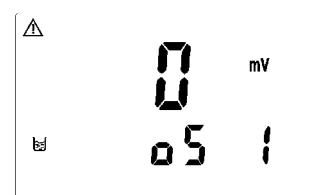
4. The display will show mV value while being calibrated. After the value becomes stable, the display will show the second pH value of calibration. Then, it will enter the calibration mode.

5. 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).

6. The display will automatically show the oS1 (zero-point mV) Value. Push ⏚Enter bottom to see SLP1 (slope) value. Push ⏚Enter again to repeat the calibration steps as shown in 8.4.1 or push ⏚Cal. to back to the measurement mode.

Note: The dual-point and three-point calibration steps of NTST Buffer are the same procedure as the calibration of TECH Buffer except the buffer's standard.
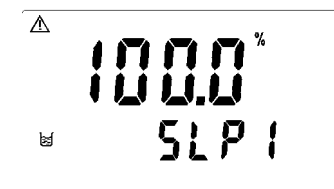
8.4.2Three-point calibration (for PC-3100RS only):

1. Enter Ct1 calibration mode. Clean the elect ⏚Enter completely. Put it into the first buffer solution. Then, push ⏚ bottom 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, push ⏚Enter bottom to start the second-point calibration.

4. The display will show mV value while being calibrated. After the value becomes stable, the display will show the second pH value of calibration. Then, it will enter the third calibration (Ct3).
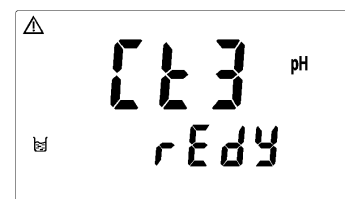
```
⚠  Ct3  pH
☒  rEdY
```

5. Clean the electrode completely, and put it into the second buffer solution. Then, push [Enter] bottom to start the third-point calibration.

```
⚠  10.00  pH
☒        25.0°C  MTC
```

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).

```
⚠  PASS
☒  CAL
```

7. The display will show OS1 value (zero-point) automatically. Push [Enter] to show the SLP1 value of calibration; Push [Enter] again to show OS2 value (zero-point); Push [Enter] again to show SLP2 value; Push [Enter] again to repeat the calibration steps as shown in 8.4.2 or push [Cal] to go back to measurement mode.
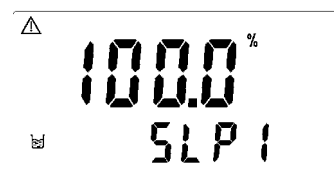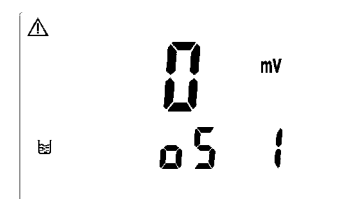
```
⚠  0  mV
☒  oS 1
```

```
⚠  100.0 %
☒  SLP1
```

Note: 1. The dual-point and three-point calibration steps of NTST Buffer are the same procedure as the calibration of TECH Buffer except the buffer's standard.

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

```
⚠  0  mV
☒  oS 2
```

```
⚠  99.9 %
☒  SLP2
```
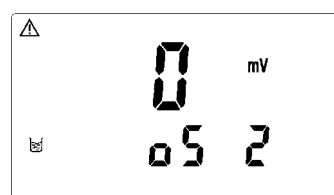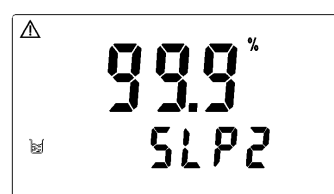
8.5 ORP calibration:

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. Push [Cal.] [Mode] for the adjustment of ORP zero-point electrical potential.

1. Clean the electrode completely, and put it into the buffer solution. Check the difference between the readout and buffer solution. Push [Mode] or [▷] to set the digit until it is equal to the buffer's standard. Then, push [Enter] to ensure it and push [Cal.] to back to the measurement mode.

9. Instruction set for RS-485 (PC-3100RS only)

RS-485 should apply MASTER+ SLAVE structure, which means that MASTER (computer) sends out orders and SLAVE (controller) is responsible to respond to the order. A standard RS-485 network totally contains 32 points of MASTER and SLAVE. Usually, MASTER=0 and SLAVE=1~31. Every RS-485 equipment has a specific ID which helps to identify whom the order is sent to, so please set up the ID in the set-up mode.

Factory default:
ID=031
Baud Speed=9600

9.1 Illustration of connection for RS-485 <Important!>

No matter how many controllers are used for RS-485 transmission, the last one should be connected to a terminal resistance (so does single controller), so it is necessary to connect a terminal resistance of 100Ω between D+(B) and D-(A) of PC-3100RS.
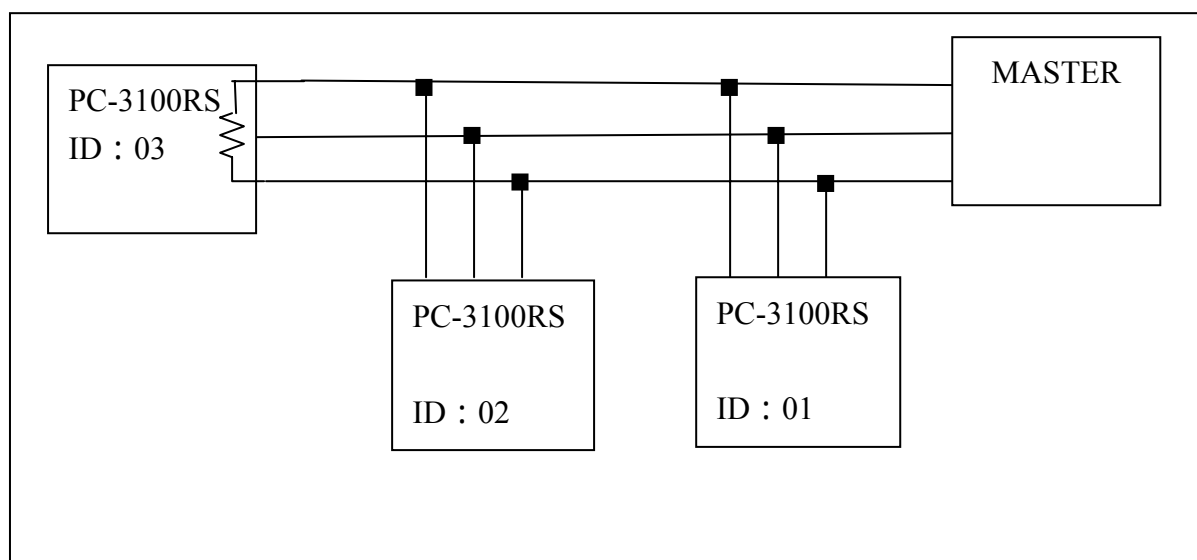
The following data feedbacks are the communication content between the controller and Windows HyperTerminal. The related settings of HyperTerminal are shown as follows:

1. Click start on the lower left; select program set   Accessorial applications   Communication   Hyper Terminal , and the display will show a window of "Hyper Terminal".

2. Set icon and online name for Hyper Terminal before entering the "ONLINE" window.

3. Select communication terminal (for example, select   connect COM1) in   Use online (N):   in "ONLINE" window, and then enter the window "COM1 content".

4. In   transmission bit per second (B): in "COM1 content", select baud rate=9600 (It should be consistent with controller settings), data bit (D)=8, parity check(P)=none, stop bit (S)= 1, flow control (E) =none.

5. Click   intermit online

6. Click   file   content   , and enter the window "XXX content".

7. Click   setting value   ASCII setting   to enter "ASCII setting" window.

8. In "ASCII setting" window, select   newline at the end of each line (S)   ,

Respond to the input characters (E) ,   Add LF at the end of each input line
(A)   and   newline if exceeding the width of terminal (W) , and then leave
"ASCII setting" window by pushing   confirm .

9. Push   confirm   to leave   "XXX content" window.
10. Push   call   to link the communication.

9.2 RS-485 Instruction set of measurement mode:

Instruction format: ABBCC[(XXXX)]

A   : Instruction leader character

BB   : RS-485 ID

CC   : Instruction

[]   : Omission if there is no parameter

(XXXX): Parameter input

Readout in the measurement mode and the instruction examples in set-up mode <0011 refers to ID01 machine>

Items	Instruction function	Syntactic instruction	Output format	Data feedback instances
1	Read the date	$01LT	$$0011LLTT	>00 2006/09/01 13:47:59
2	Read measurement value	$01LV	$$0011LLVV	>00 1.97pH M 25.0C
3	Identify Relay status	$01LR	$$0011LLRR	>00 RLY1 OFF, RLY2 OFF, WASH OFF
4	Read measurement value and status	$01LA	$$0011LLAA	>00 2006/09/01 13:48:36 1.97pH M 25.0C RLY1 OFF, RLY2 OFF, WASH OFF
5	Read the final calibration data	$01LC	$$0011LLCC	>00 CAL pH 0MV 100.0% 2004/01/01 00:00:00
6	Enter set-up mode	!01SI(2695)	!!0011SSII(22669955)	>00 OK

9.3 RS-485 Instruction set of set-up mode:

Instruction format: ABBCC[(XXXX)] [(XXXX)] [(XXXX)]

A : Instruction leader character

BB : RS-485 ID

CC : Instruction

[] : Omission if there is no parameter

(XXXX): Parameter input

Readout of parameter settings in set-up mode

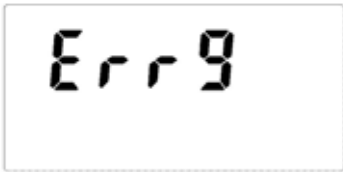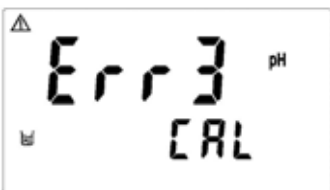| Items	Instruction function	Syntactic instruction	Output format	Data feedback instances
1	Read ID	#01ID	##0011IIDD	>00 01
2	Read setting speed	#01BR	##0011BBRR	>00 9600
3	Read current output Relative PH/ORP setting value	#01RS	##0011RRSS	>00 4-20MA
4	Read current output Relative temperature setting value	#01TS	##0011TTSS	>00 4-20MA
5	Read current output Relative PH/ORP setting value	#01RA	##0011RRAA	>00 2.00pH 12.00pH
6	Read current output Relative temperature setting value	#01TA	##0011TTAA	>00 M 0.0C M 100.0C
7	Read cleaning setting value	#01WT	##0011WWTT	>00 0 0
8	Read high point alarm controlling way	#01HM	##0011HHMM	>00 AUTO
9	Read low point alarm controlling way	#01LM	##0011LLMM	>00 AUTO
10	Read high point alarm setting value	#01HP	##0011HHPP	>00 10.00pH 0.10pH
11	Read low point alarm setting value	#01LP	##0011LLPP	>00 4.00pH 0.10pH
12	Read measurement mode	#01MM	##0011MMMM	>00 pH
13	Read present temperature compensation way	#01TM	##0011TTMM	>00 MANUAL
14	Read present manual temperature setting value or automatic temperature correction value	#01TV	##0011TTVV	>00 M 25.0C

Input of parameter settings in set-up mode

Items	Instruction function	Instruction language	Set the parameter range
1	Input the date	&01SD(xxxx)(yy)(zz)	xxxx: 2000~2099 year yy : 1~12 month zz : 1~31 day
2	Input the time	&01ST(xx)(yy)(zz)	xx: 0~23 hour yy: 0~59 minute zz: 0-59 second
3	Relay1 terminal test	&01SH(x)	x: ON or OFF
4	Relay2 terminal test	&01SL(x)	x: ON or OFF
5	WASH terminal test	&01SW(x)	x: ON or OFF
6	Set current pH/ORP way	&01RS(x)	x: 0 or 4 mA
7	Set current temperature way	&01TS(x)	x: 0 or 4 mA
8	Set current pH/ORP value	&01RA(xxxx)(yyyy)	Refer Note1
9	Set current temperature value	&01TA(xxxx)(yyyy)	Refer Note2
10	WASH time setting	&01WT(xxxx)(yyyy)	xxxx: 0-9999 sec./ON yyyy: 0-9999 H./Off
11	High point control setting	&01HM(x)	x: AUTO or OFF
12	Low point control setting	&01LM(x)	x: AUTO or OFF
13	Input PH/ORP high point alarm value	&01HP(xxxx)(yyy)	Refer Note3
14	Input PH/ORP low point alarm value	&01LP(xxxx)(yyy)	Refer Note4
15	Setting of measurement way	&01MM(x)	x: pH or ORP
16	Setting of temperature compensation way	&01TM(x)	x: AUTO/P AUTO/N or OFF
17	Setting of manual temperature compensation value Setting of automatic temperature compensation value	&01TV(xxxx)	Refer Note 5
18	Restore original factory parameter settings	&01DS(ON)	
19	Leave the set-up mode	&01SO	

Note:
1. (xxxx) stands for low current output setting value; (yyyy) stands for high current output setting value.
   pH mode: setting range -2.00~16.00 pH; for example, 5.00 pH is set as (500)
   ORP mode: setting range -1999~1999 mV; for example, -250 mV is set as (-250)

2. (xxxx) stands for low current output setting value; (yyyy) stands for high current output setting value.
   Temperature setting range -30.0~130.0 ℃; for example, 25.0 ℃ is set as (250)

3. (xxxx) stands for high point alarm setting value; (yyy) stands for high point hysteresis setting value.
   Alarm setting range:
   pH mode: -2.00~16.00 pH; for example, 5.00 pH is set as (500)
   ORP mode: -1999~1999 mV; for example, -250 mV is set as (-250)
   Hysteresis setting range:
   pH mode: 0.00~2.00 pH; for example, 0.20 pH is set as (20)
   ORP mode: 0~200 mV; for example, 50 mV is set as (50)

4. (xxxx) stands for high point alarm setting value; (yyy) stands for high point hysteresis setting value.
   Alarm setting range:
   pH mode: -2.00~16.00 pH; for example, 5.00 pH is set as (500)
   ORP mode: -1999~1999 mV; for example, -250 mV is set as (-250)
   Hysteresis setting value:
   pH mode: 0.00~2.00 pH; for example, 0.20 pH is set as (20)
   ORP mode: 0~200 mV; for example, 50 mV is set as (50)

5. (xxxx) stands for the manual temperature setting value when the temperature compensation is OFF; the temperature difference correction when the temperature compensation way is AUTO/P; or no function when the temperature compensation way is AUTO/N.
   Manual temperature setting range: -30.0~130.0 ℃; for example, 45.0 ℃ is set as (450)
   Temperature difference correction range: 0.0~5.0 ℃; for example, 2.1 ℃ is set as (21)

10. Error messages (Error code)

Phenomenon	Possible cause	Dispositions
Err 9	equipment failure	Please inform the maintainers for disposition
⚠ Err 4 pH CAL	1. During the calibration, the buffer is over 5~50 2. The buffer can not be identified.	1. Please adjust the buffer temperature to the appropriate temperature range and make another calibration. 2. Please change the buffer or maintain and update the electrode to make another calibration.
⚠ Err 3 pH CAL	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.
⚠ Err 6 pH CAL	The calibration sequence is incorrect. (Three-point calibration)	Please calibrate in correct sequence **(from lowest pH value to highest one, or vice versa.)** .
⚠ Err 2 pH CAL	SLOPE value exceeds the upper or lower limit	Maintain the electrode or change a new electrode, and make another calibration.
⚠ Err 1 pH CAL	OFFSET(zero-point electric potential) value 60mv	Maintain the electrode or change a new electrode, and make another calibration.

11. Maintenance

Generally speaking, if normally operate, the controller produced by our company need no maintenance expect regular cleaning and calibration of the electrode, in order to ensure accurate and stable measurement value and normal system operation.

The cleaning cycle for the electrode depends on the pollution degree of the tested water sample. Generally speaking, it is recommended to make weekly cleaning. The following chart gives introductions of different cleaning methods in light of difference pollutions, in order to provide the operators with reference for cleaning and maintenance.

Pollution types	Cleaning methods
In the testing solution, there is protein that can pollute the electrode film.	Soak the electrode in Pepsin/HCL solution for several hours, such as METTLER-TOLEDO 9891 electrode cleaning solution.
Sulfide pollution (electrode film becomes black)	Soak the electrode in Thiourea/HCL solution until the electrode film turns white, such as METTLER-TOLEDO 9891 electrode cleaning solution.
Pollution by grease or organic substance.	Use acetone or ethanol to clean the electrode temporarily for a few seconds.
Common pollution	Use 0.1moL/1NaOH or 0.1mol/1HCL to clean the electrode for a few minutes.
After using the above methods to clean the electrode, please wash it cleanly with fresh water, and soak the electrode in 3MKCL solution for about 15 minutes. After that, make calibration for electrode again.	
During the electrode cleaning process, please do not rub the electrode glass sensor or clean the electrode with mechanical way; otherwise, there will be statics that influence the electrode reaction.	
For the cleaning of platinum electrode, wipe the platinum ring with watered cloth.	

The electrode cleaning cycle depends on the pollution degree of the water sample. Generally speaking, weekly cleaning and calibration is suggested, or clean it according to the electrode operation manual or as suggested by the original factory.