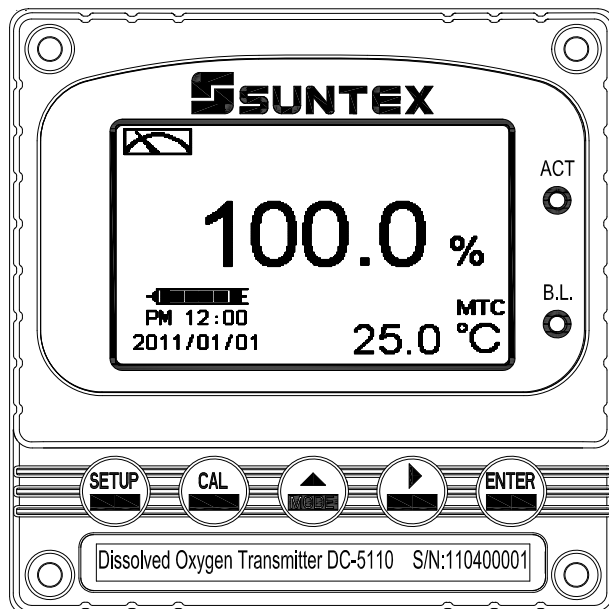


# DC-5110RS

## Intelligent Dissolved Oxygen Transmitter

Operation  
Manual



## CONTENTS

### Precautions for installation

<b>Brief Instruction</b> .....	1
<b>1. Specifications</b> .....	4
<b>2. Assembly and installation</b>	
2.1 Transmitter installation.....	5
2.2 Illustration of panel mounting.....	5
2.3 Illustration of Wall mounting and pipe mounting.....	6
<b>3. Overview of Intelligent D.O. transmitter DC-5110RS</b>	
3.1 Illustration of rear panel.....	7
3.2 Illustration of terminal function.....	7
3.3 Description of terminal function.....	8
3.4 Typical wirings.....	9
3.5 Illustration of electrical connection.....	10
<b>4. Configuration</b>	
4.1 Illustration of front panel.....	11
4.2 Keypad.....	11
4.3 LED indicators.....	11
<b>5. Operation</b>	
5.1 Measurement mode.....	12
5.2 Set-up menu.....	12
5.3 Calibration menu.....	12
5.4 Shortcuts.....	12
5.5 Reset	
5.5.1 Set-up reset.....	12
5.5.2 Calibration reset.....	12
<b>6. Measurement display mode</b>	
6.1 Normal mode(Text mode).....	13
6.2 Sensor slope status.....	13
6.3 Sensor diagnosis status.....	13
6.4 Real-Time Chart mode.....	14
6.5 Trace mode.....	15
6.6 Warning symbols and text.....	16
<b>7. Settings</b>	
Block diagram of settings.....	17
7.1 Entry of set-up menu.....	19
7.2 Security code of settings(Code).....	20

7.3	Language.....	21
7.4	Mode.....	22
7.5	Unit.....	23
7.6	Product adjustment.....	24
7.7	Temperature.....	25
7.8	Relay 1.....	26
7.9	Relay 2.....	27
7.10	Wash time(Clean).....	28
7.11	Analog output 1 (D.O.).....	29
7.12	Date/Time (Clock).....	30
7.13	RS-485 communication.....	31
7.14	Sample average of measurements (Digital filter).....	32
7.15	Backlight settings.....	33
7.16	Contrast settings.....	34
7.17	Logbook.....	35
7.18	Automatically back to measurement mode(Return).....	36
<b>8.</b>	<b>Calibration</b>	
	Block diagram of Calibration.....	37
8.1	Entry of calibration menu.....	38
8.2	Security password of calibration.....	39
8.3	Calibration.....	40
	8.3.1 Single point calibration(1-point).....	41
	8.3.2 Two points calibration(2-points).....	42
8.4	Automatically back to measurement mode(Return).....	44
<b>9.</b>	<b>Modbus protocol and instructions</b> .....	45
<b>10.</b>	<b>Error messages (Error code)</b> .....	49
<b>11.</b>	<b>Maintenance</b> .....	49
<b>12.</b>	<b>Appendix</b> .....	50




## Precautions for installation

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


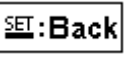

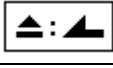
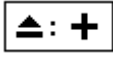


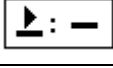


- To avoid potential danger, please do not send a current unless all wirings are finished and checked without any error.
- Please install this controller in an environment far away from high temperature, high humidity and corrosion, as well as from direct sunlight irradiation.
- The material of signal 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. (In case of electrical surge, it is recommended to separate the power supply and controlling device of the control; for example, separate from the power supply of the Dose feeder and mixing machine, so that the controller can use a specific power supply independently. Or you can eliminate the surge by installing a surge absorber at the electromagnetic switch or the loop of dynamic controlling device).
- **The output contact of this controller is used to connect device of alarming or controlling function. For security and protection, make sure to connect a relay able to endure adequate current, in order to ensure the use security of the instrument.** (see electrical wiring reference diagram 3.5)

## Brief Instruction






Description of set-up settings (see chapter 6 for details)













Press  and  simultaneously to see the overview of the set-up settings now. Then press  if you would like to modify set-up settings. Press keypad according to index of keypad on the screen.

### Index of keypad




keypad	Accordingly item	Description
		Back to upper layer
		Choose leftward of change to left page
		Increase digit
		Choose rightward of change to right page
		Decrease digit
		Confirm settings after modifications and then go through next step

### Selection of set-up items











keypad	Accordingly item	Description
Mode		Measurement mode, to select from polarographic or pre-amplifier sensor
Unit		Unit setting, select saturation %, of concentration ppm or mg/l (when select concentration unit, the salinity concentration need to be set)
Product Adj		Sample readings adjust settings--Users may make correction without removing the electrode out of installation site. Adjust the on-site measurements until the reading is as same as the reading from the lab measurement to eliminate the doubt of measurement error.
Temperature		Temperature measurement and compensation, including MTC, PTC, NTC (3 types total). MTC---Manual temperature compensation, PTC/NTC--- auto temperature compensation
Relay 1		First relay setting, to choose action off or Hi/Lo alarm

Relay 2		Second relay setting, to choose action off or Hi/Lo alarm
Clean		Automatic wash time setting, to choose electrode clean equipment's ON and OFF duration
Analog 1		Current output according to saturation or concentration setting range
RS-485		RS485 serial interface (Modbus protocol)
Clock		Clock setting ( <b>When out of power and reboot it, the instrument's time setting can maintain to the real time. If not, please replace the inner 3V CR2025 battery.</b> )
Digital Filter		Take every serial 1~60 measurements, average them continuously, and make it as the readings
Back-light		Backlight setting, to set Auto/ON/OFF backlight, brightness, and sensitivity
Contrast		Contrast of screen setting
Logbook		Event recorder logbook (50 data)
Return		Setting of returning to the measurement mode
Code		Security code of set-up mode. The set-up code is precedential to calibration code, thus it can pass a different security code of calibration. (Please refer to ch.6.2 for detail.)
Language		Available for English, Traditional Chinese, Simplified Chinese



## Description of calibration settings (see chapter 7 for details)

Press  and  simultaneously to see the last calibration information. Then press  if you would like to make a new calibration or modify setting of calibration. Press keypad according to index of keypad on the screen.

### Index of keypad:

keypad	Accordingly item	Description
		Back to upper layer
		Choose leftward of change to left page
		Increase digit
		Choose rightward of change to right page
		Decrease digit
		Confirm settings after modifications and then go through next step

### Selection of calibration items

keypad	Accordingly item	Description
Calibration	<b>Start Cal.</b>	Calibration mode
Return		Time interval setting of returning to the measurement mode
Code		Security code of calibration mode.
1-point	<b>1-point Calibration</b>	One point slope calibration
2-point	<b>2-point Calibration</b>	Dual points offset and slope calibration
Pressure	<b>bar</b>	According to pressure unit to set pressure value
Pressure	<b>mmHg</b>	According to pressure unit to set pressure value
Pressure	<b>psi</b>	According to pressure unit to set pressure value

Note: SUNTEX reserves the right to change the figure of icons and contents. The actual icons and contents please refer to the instruments.

## 1. Specifications

Model		DC-5110RS
Measuring mode		% / ppm / mg/L / TEMP.
Measuring Range	%	0~600 % (Depends on the sensor)
	mg/L	0~60.00 mg/L (Depends on the sensor)
	ppm	0~60.00 ppm (Depends on the sensor)
	Temp.	0~140°C(Depends on the sensor)
Resolution	%	0.1 %
	mg/L	0.01 mg/L / 0.001 mg/L
	ppm	0.01 ppm / 0.001 ppm
	Temp.	0.1°C
Accuracy	%	±0.5% of reading (±1 digit)
	mg/L	
	ppm	
	Temp.	±0.2°C (±1 digit) , Temperature error correction function
Temperature Compensation		NTC30K / NTC22K auto recognized Manual adjustment
Salinity compensation		00~45 ppt Manual compensation
Pressure compensation		Compensation range: 0.500~2.500bar or 7.25~36.25psi or 500~2500mmHg Manual adjustment
Calibration mode		One-point or two-point calibration
Ambient Temp.		0~50°C
Storage Temp.		-10~70°C
Display		Large LCM with auto-sense backlight sensor for contrast function. Trace mode/Real-time chart mode/Text mode
Analog output 1		Isolated DC 0/4~20mA corresponding to main measurement, max. load 500Ω
Serial interface		RS-485 (Modbus RTU or ASCII)
Logbook		50 events records
Settings	Contact	RELAY contact , 240VAC 0.5A Max.(recommend)
	Activate	Hi/Lo. Hi/Hi. Lo/Lo selectable two limited programmable, ON/OFF
Wash		ON 0~99min. 59sec. / OFF 0~999hr 59min.
Voltage output		DC±8V, Max. 0.5W
Protection		IP65
Power Supply		100V~240VAC±10% , 50/60Hz , 5W max.
Installation		Wall or Pipe or Panel Mounting
Dimensions		96m × 96mm × 132mm (H×W×D)
Cut off Dimensions		93 mm × 93 mm (H×W)
Weight		0.5 Kg

**Note: The specifications are subject to change without notice.**

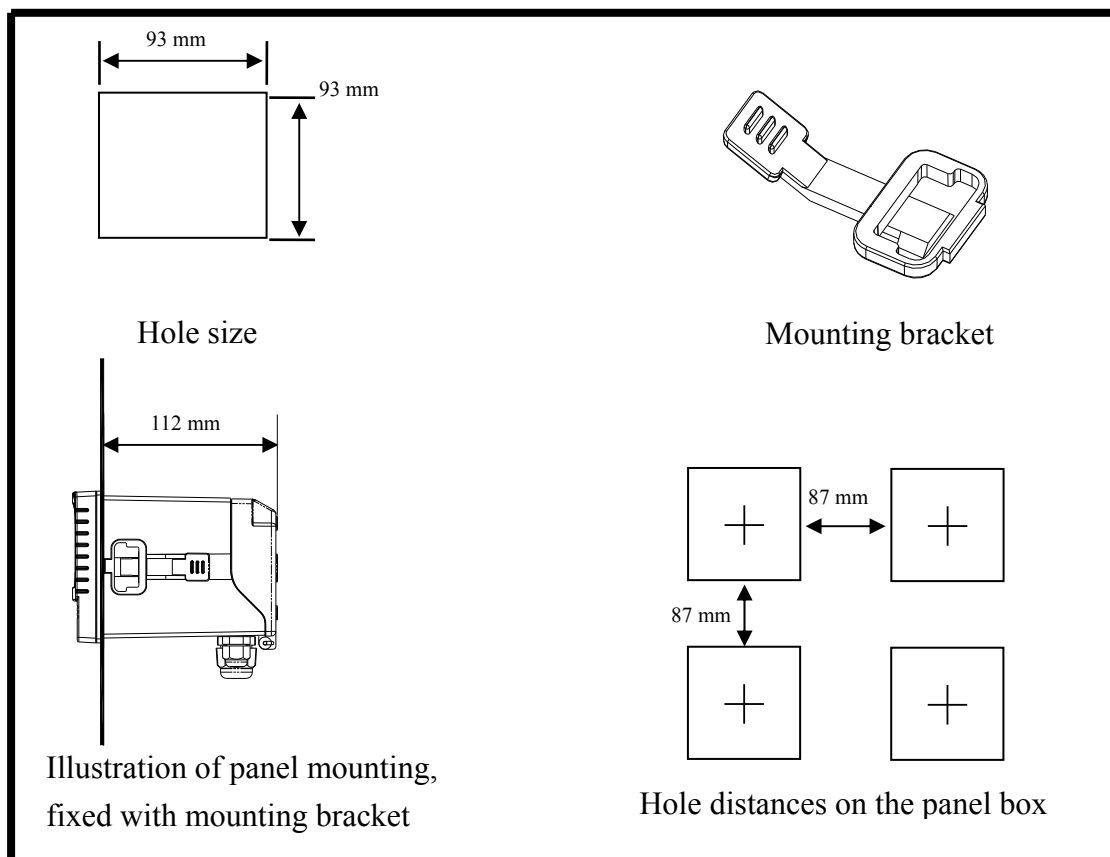


## 2. Assembly and installation

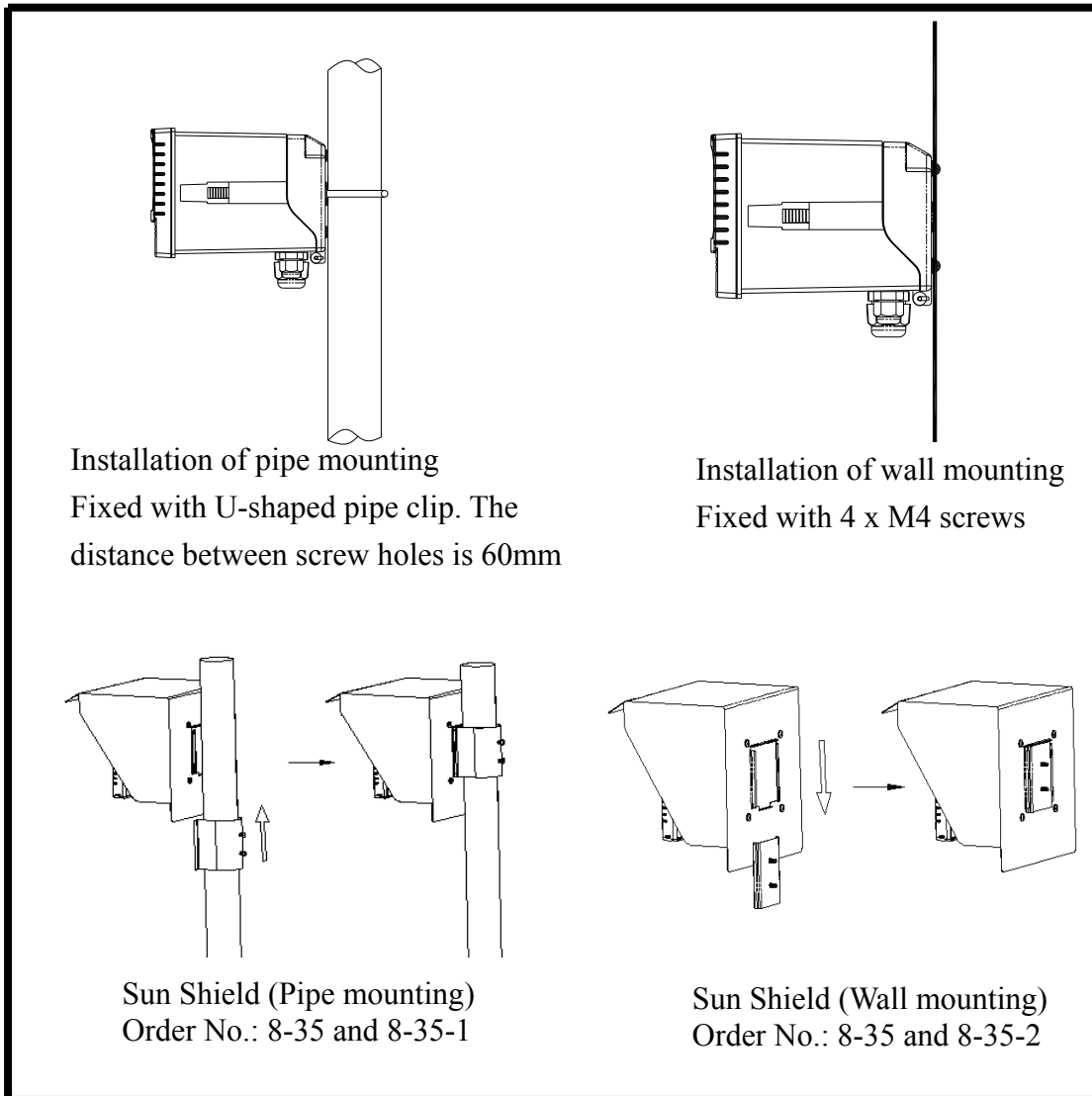
**2.1 Transmitter installation:** This Transmitter can be installed through panel mounting, wall mounting and pipe mounting.

**Installation of panel mounting:** First, prepare a square hole of 93 x 93mm on the panel box, and then insert the controller directly into the panel box. Insert the accessorial mounting bracket from the rear, and make it be fixed in to pickup groove.

### 2.2 Illustration of panel mounting



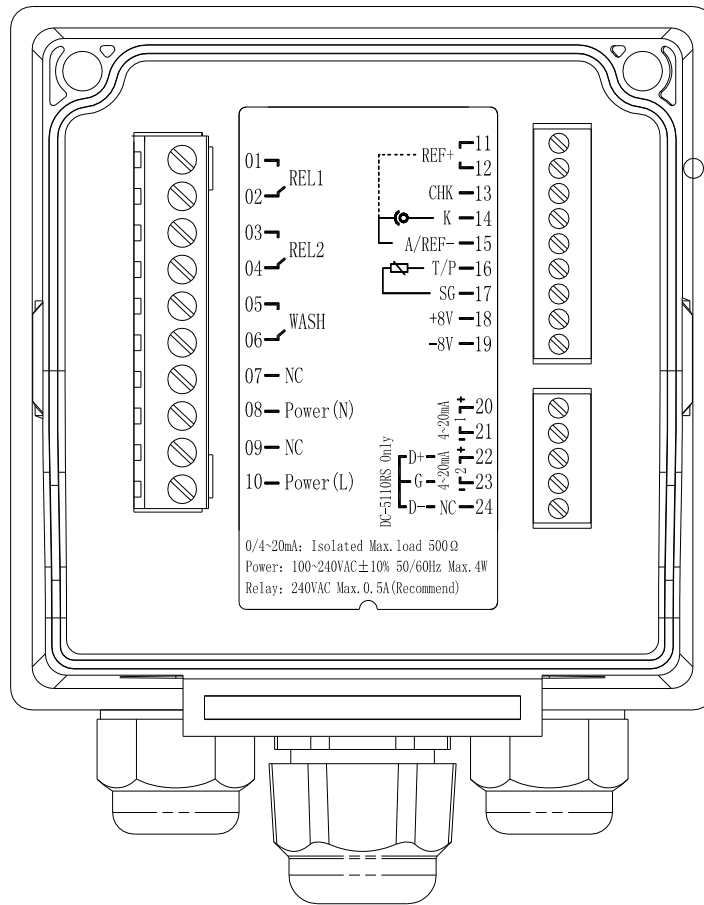
## 2.3 Illustration of Wall mounting and pipe mounting



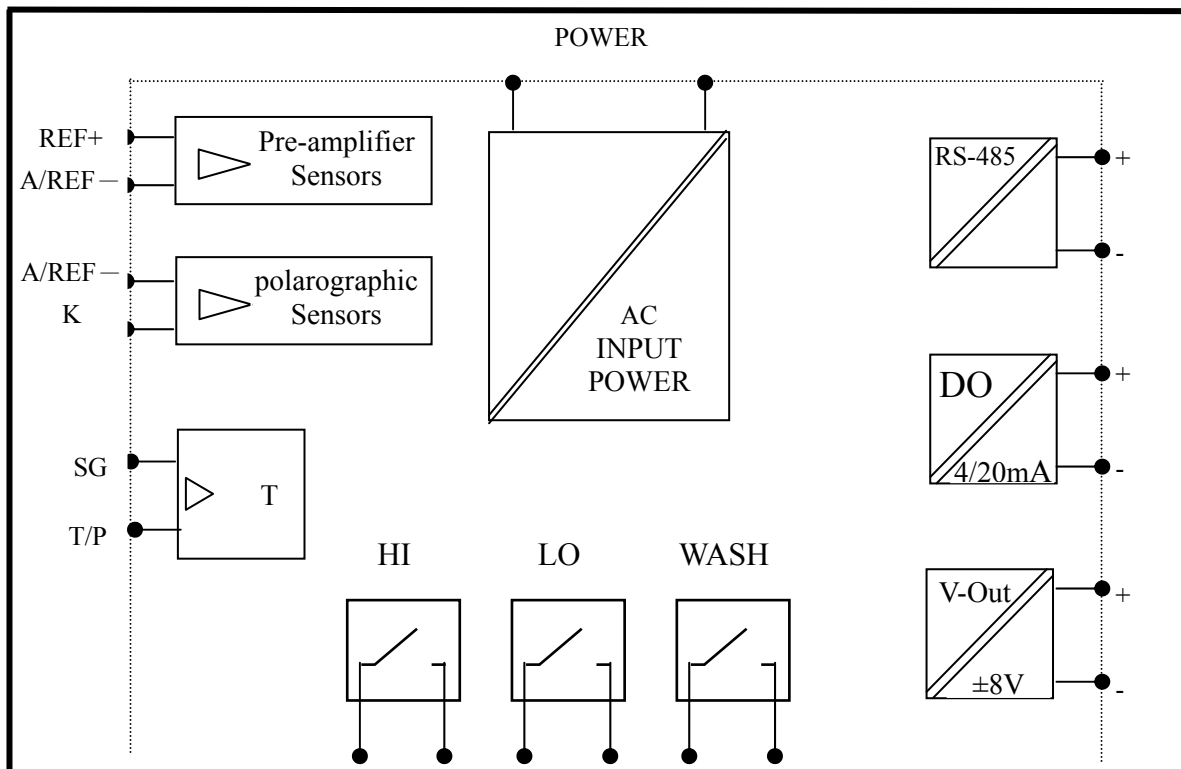
..

### 3. Overview of Dissolved Oxygen transmitter DC-5110RS

#### 3.1 Illustration of rear panel:



#### 3.2 Illustration of terminal function

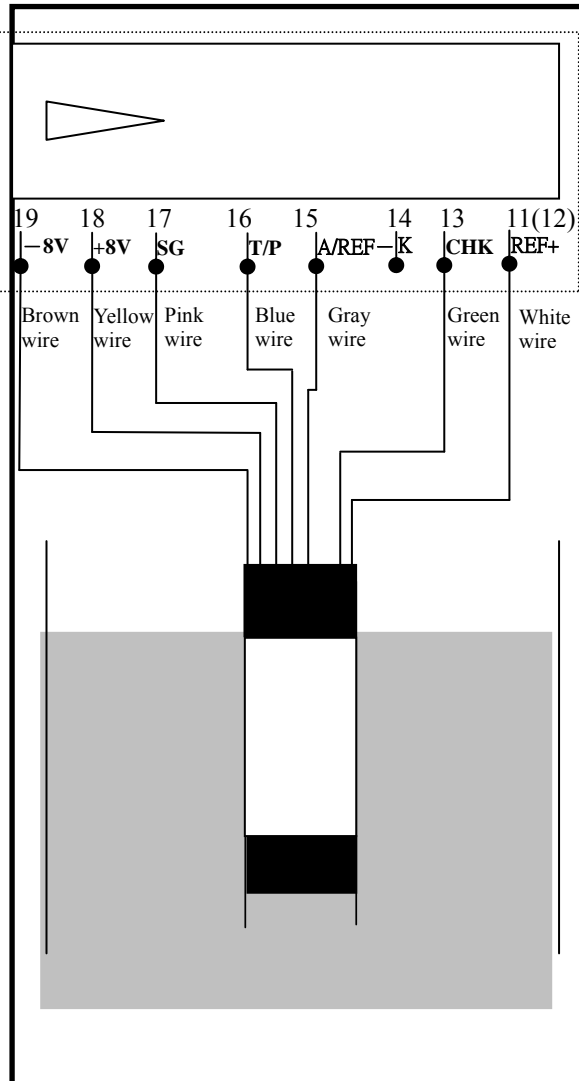


### 3.3 Description of terminal function:

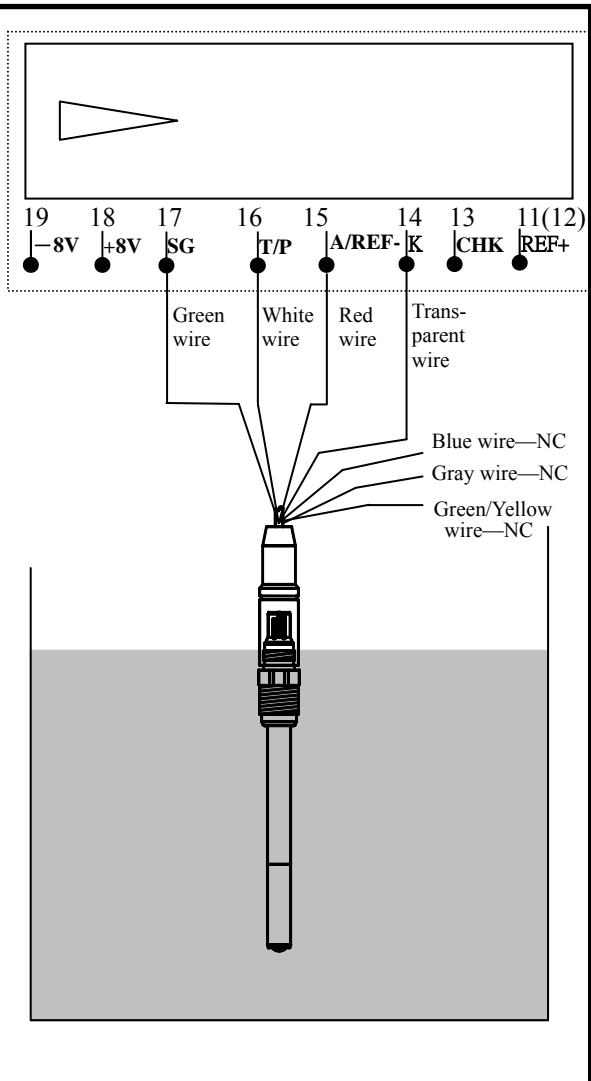
Terminal number	Wiring No.1-- Preamplifier voltage sensor	Wiring No.2 -- Polar-graphic current signal sensor
01-02 REL1	HI, External relay terminal high control	
03-04 REL2	LO, External relay terminal low control	
05-06 WASH	External wash relay terminal	
07 NC	NC	
08 Power(N)	100~240V Power supply terminal	
09 NC	NC	
10 Power(L)	100~240V Power supply terminal	
11-12 REF +	Sensor cable---White wire	NC
13 CHK	Sensor green wire (Only applied for WTW TriOxmatic 700 series sensor)	NC
14 K	NC	Sensor cable---Transparent wire ( Negative pole )
15 A/REF -	Sensor cable---Gray wire	Sensor cable---Red wire ( Positive pole )
16 T/P	Temperature cable---Blue(NTC30K)	Temperature cable---White wire(NTC22K)
17 SG	Temperature cable---Pink wire(NTC30K)	Temperature cable---Green wire(NTC22K)
18 DC+8V	Sensor power input---Yellow wire	NC
19 DC-8V	Sensor power input---Brown wire	NC
20 (1) 4~20mA +	D.O. measurement value current output terminal +, for external recorder or PLC control	
21 (1) 4~20mA -	D.O. measurement value current output terminal -, for external recorder or PLC control	
22 (2) 4~20mA+/D+	<b>RS-485 output---D+(B)</b>	
23 (2) 4~20mA-/G	<b>RS-485 output---GND</b>	
24 NC/D-	<b>RS-485 output---D-(A)</b>	

### 3.4 Typical wirings:

**Wiring No.1**  
Preamplifier voltage sensor

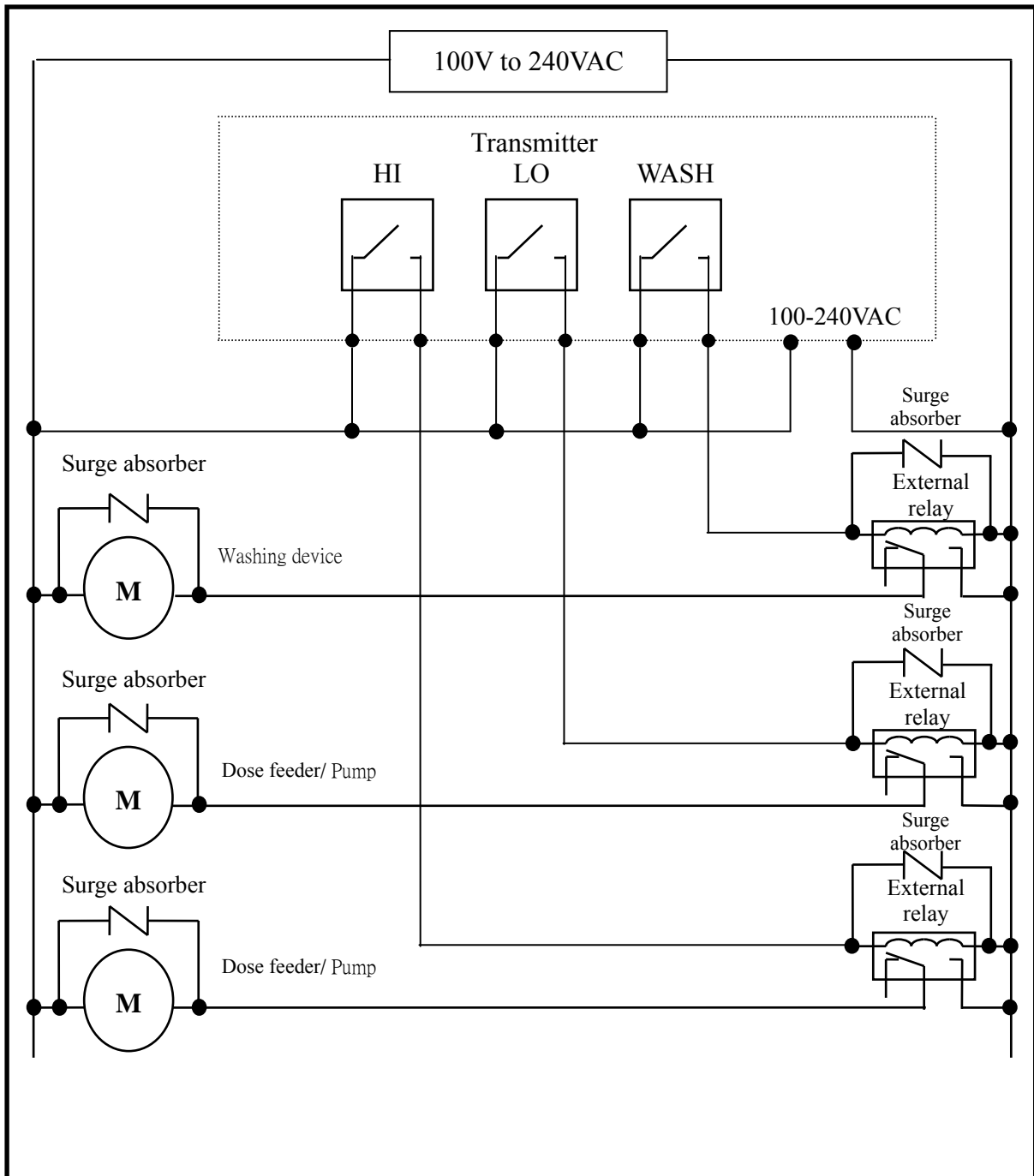


**Wiring No.2**  
Polar-graphic current signal sensor



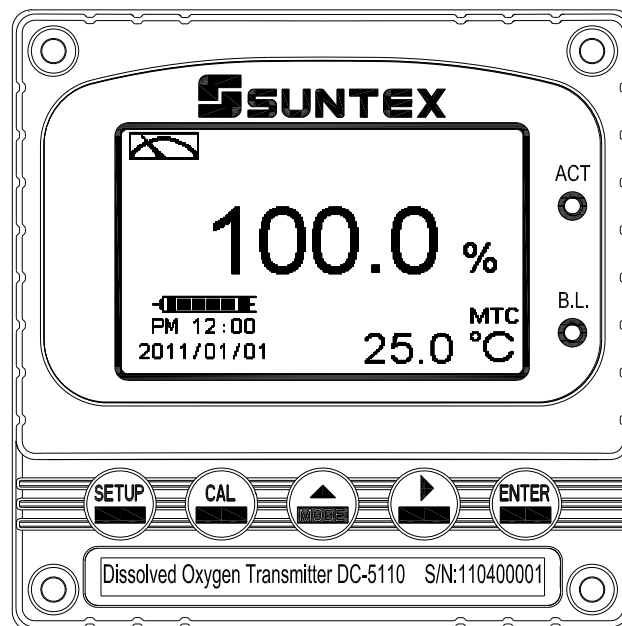
**Note:** Sensor green wire is only applied for WTW TriOxmatic 700 series sensor.

### 3.5 Illustration of electrical connection








## 4. Configuration

### 4.1 Illustration of front panel



### 4.2 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:

-  : 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.
-  :
  1. In the parameter set-up mode and Calibration mode, pressing this key to select leftward or change to another page.
  2. When adjusting value, press this key to increase the value
-  :
  1. In the parameter set-up mode and Calibration mode, pressing this key to select rightward or change to another page.
  2. When adjusting value, press this key to decrease the value.
-  : Key for confirmation; pressing this key is essential when modifying data value or selecting the parameter setting items in the window.

### 4.3 LED indicators:

**ACT** : Washing device operation indicator and controlling operation indicator (Relay 1, Relay 2)




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

## 5. Operation




### 5.1 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 enter measurement mode with the factory default settings or the last settings from user.






### 5.2 Set-up menu

Please refer to the set-up instructions in Chapter 6. Press  and  simultaneously to enter into set-up menu, and press  to go back to measurement mode.

### 5.3 Calibration menu

Please refer to the calibration instructions in Chapter 7. Press  and  simultaneously to enter into calibration menu, and press  to go back to measurement mode.

### 5.4 Shortcuts

1. In the measurement mode, if selecting MTC for temperature compensation mode, you may press  and  to adjust MTC temperature value.
2. Under measurement mode, press  continuously for 2 seconds to see the Logbook function directly. Press  key to back to measurement mode.
3. Under measurement mode, press  continuously for 2 seconds to switch the display mode from text mode, trace mode, and real-time display mode.

### 5.5 Reset

#### 5.5.1 Master reset

Measurement mode: Pre-amplifier  
Measurement unit: %  
Product adj : 0.0  
Temperature compensation: ATC, Adjust : 0.0°C  
Relay 1 : High point alarm: AUTO, SP1= 125.0%  
Relay 2 : Low point alarm: AUTO, SP2 =25.0 %  
Wash time: OFF  
Analog 1 current output (DO) : 4~20 mA , 0.0~100.0%  
RS-485: RTU, EVEN, 19200, ID:01  
Display backlit: OFF  
Contrast: 0  
Auto return: Auto  
Code: OFF  
Date & Time : 2011/1/1 00:00:00

#### 5.5.2 Calibration reset

Cal Time : 2011/01/01 , 00:00  
Cal Type : No Cal  
Cal Pressure : 1.013bar  
Cal Temp : none  
Relative Slope : none  
Saturation : none  
Return : Auto

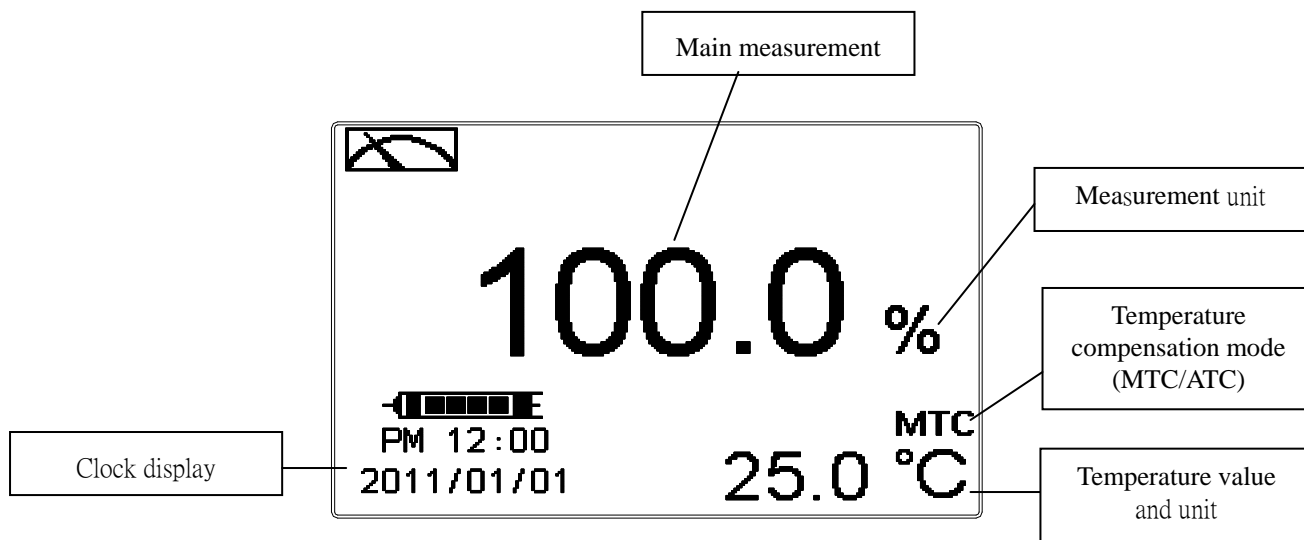
**Note:** The factory default of calibration presetting is “No Cal”, and the calibration value is “None”. It means that the user has not calibrated the sensor with the transmitter yet.



## 6. Measurement display mode

### 6.1 Normal mode(Text mode)

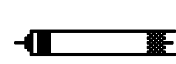
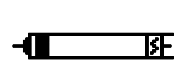
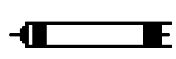
The normal mode is for digit display, the content is as the following illustration. It mainly includes main measurement value and unit, temperature measurement value and unit, temperature compensation mode, and clock display.



### 6.2 Sensor slope status

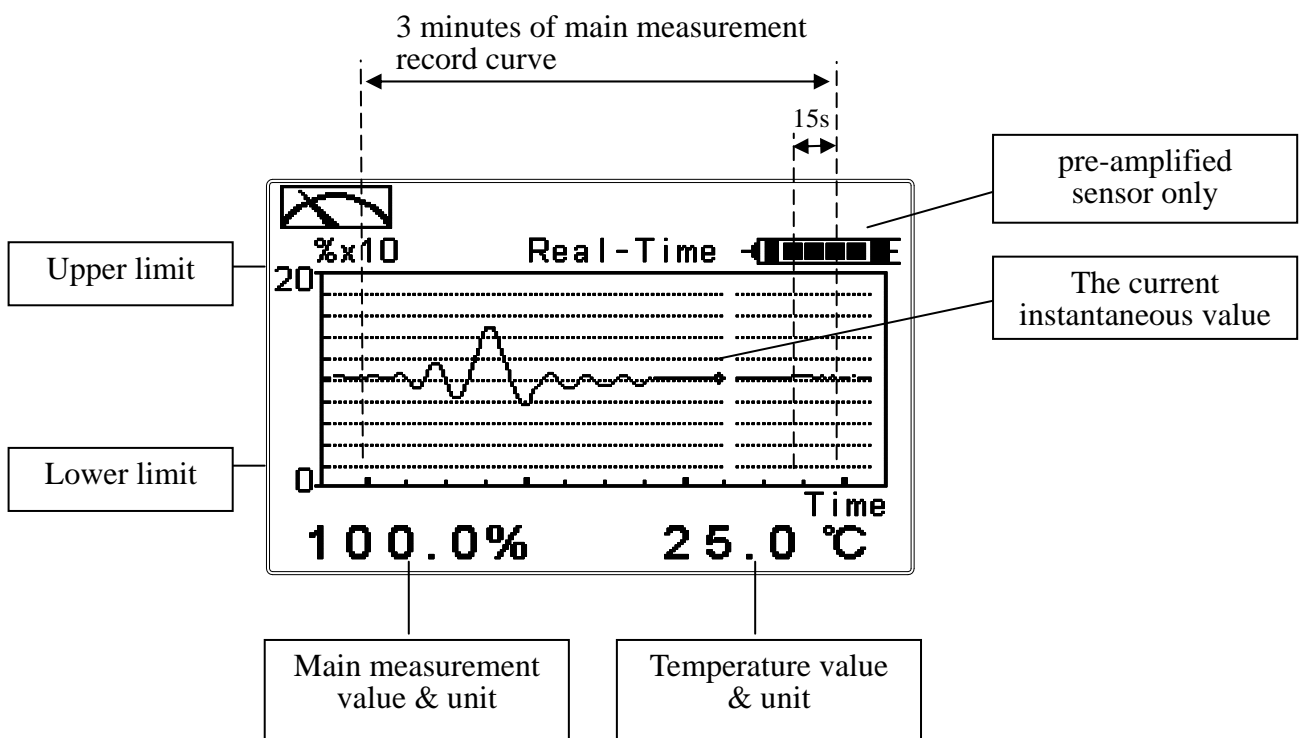
- : to represent the sensor of perfect condition
- : to represent the sensor of good condition
- : to represent the sensor of still acceptable condition
- : to represent the sensor status is of aging, in need of replacement a new sensor

### 6.3 Sensor diagnosis status : (Only applicable to WTW TriOxmatic 700 series sensors)

-  : Flashing said that the sensor is contaminated or aging, need to clean and replace the membrane and electrolyte.
-  : Said sensor membrane rupture, in need to replace the membrane and electrolyte.
-  : Said that the sensor is working properly.

### 6.4 Real-Time Chart mode

Real-time chart mode is for dynamic display of real-time graphics. The duration is about three minutes of the recent changes in measured values of the curve. Users can set the mode to its corresponding D.O. measuring range (see section 7.4). The smaller the range is set, the higher resolution of the display is. When entering setup or calibration mode and returning to measurement mode, the real-time graphic will be re-updated. When the measured value exceeds a set range of the upper and lower limit, the graphics will be presented in the upper and lower limits dotted line. Real-time chart mode display is shown as below. There are also real-time measurement value, & unit, and temperature value & unit which are displayed in the bottom of the screen. The timeline in real-time graphic is divided into 12 depict, which is describe the range of representatives of each of 1 / 4 minutes (15 seconds).

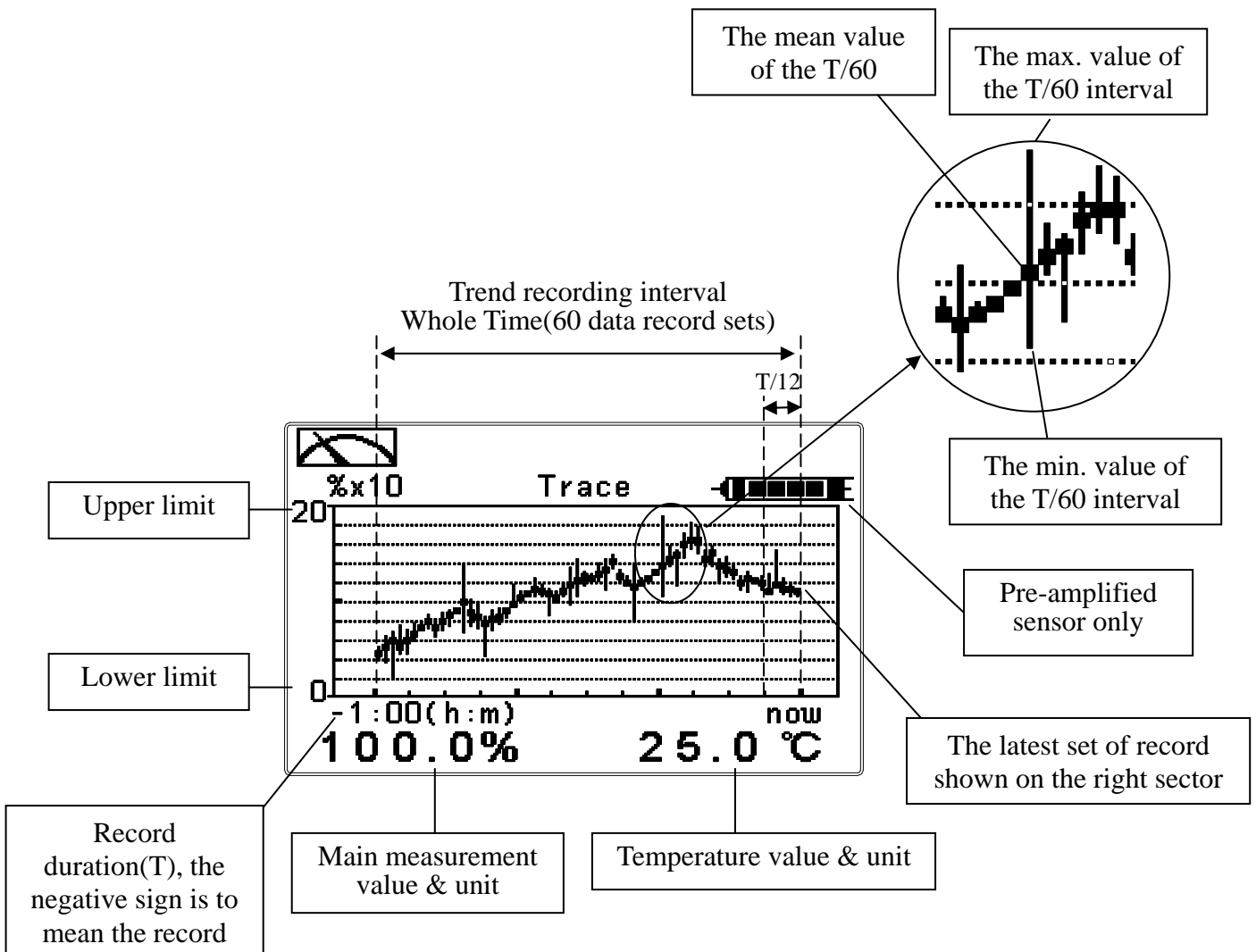


## 6.5 Trace mode

The feature of the trace mode is the record duration which can be set by the user (range from three minutes, up to four weeks). The trend graphic records the measurements in the past T time. The trend is recorded by the 60 group structure. Hence, each group of units is recorded in T/60 time interval. The trend line is constructed by all value data which is calculated to the average (Mean Value), maximum (Max Value) and minimum (Min Value) form. When the latest T/60 record shows in the rightmost of the trend graphic, all the previous record will be moved to the left side of the graphic. For example, T is set to 60 hours, then each set of records will be calculated to the average, the maximum, the minimum values after one hour( $T/60 = 1$ ), each time interval. Timeline of trends which is divided into 12 depictions showed on the horizontal axis of the display is on behalf of each characterization interval  $T/12$ . So, every depiction has 5 ( $T/60$ ) sets of records. Users can set the corresponding D.O.. measuring range in its set-up menu(see section 7.4). The smaller the range is set, the higher resolution of the display is. The trace mode is shown as below. There are also real-time measurement value, & unit, and temperature value & unit which are displayed in the bottom of the screen.

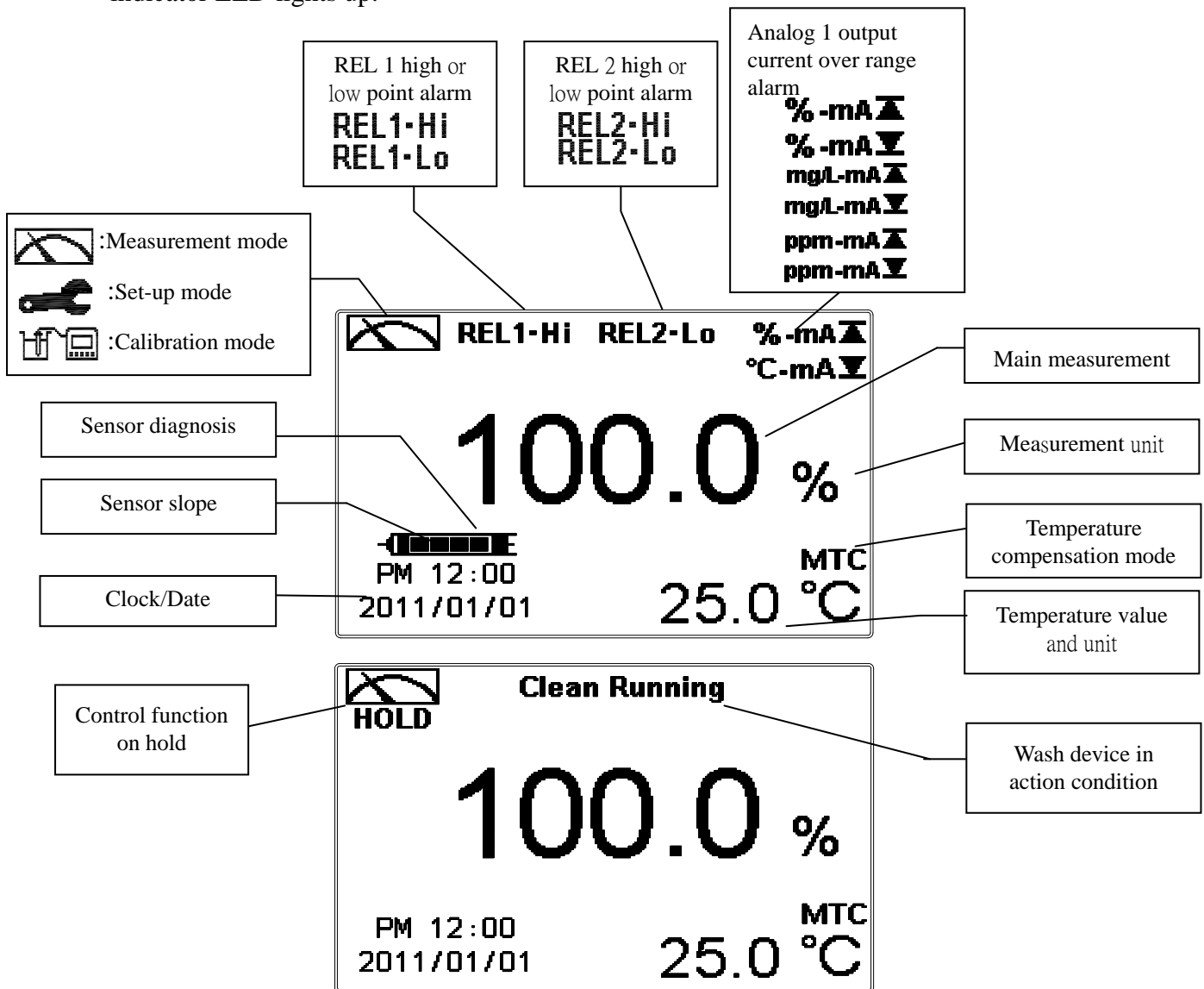
**Attention:** When the time interval has been reset, the trend in the data will not be retained, it will start a new trace record.

**Note:** The time display format (XX: XX) (hr: min), for example, appear as four weeks (672:00).



## 6.6 Warning symbols and text

1. When the wash device is turned on, the display shows and twinkles the description, “Clean Running”. At the same time, the ACT indicator LED lights up, and the transmitter automatically turns off Relay 1 and Relay 2 function. After finishing cleaning, the Relay 1 and Relay 2 will automatically back to normal status.
2. When Relay 1 which is set in high setting point is in action, the display shows and twinkles the description, “REL 1\_Hi”, and ACT indicator LED lights up. When Relay 1 which is set in low setting point is in action, the display shows and twinkles the description, “REL 1\_Lo”, and ACT indicator LED lights up.
3. When Relay 2 which is set in high setting point is in action, the display shows and twinkles the description, “REL 2\_Hi”, and ACT indicator LED lights up. When Relay 2 which is set in low setting point is in action, the display shows and twinkles the description, “REL 2\_Lo”, and ACT indicator LED lights up.

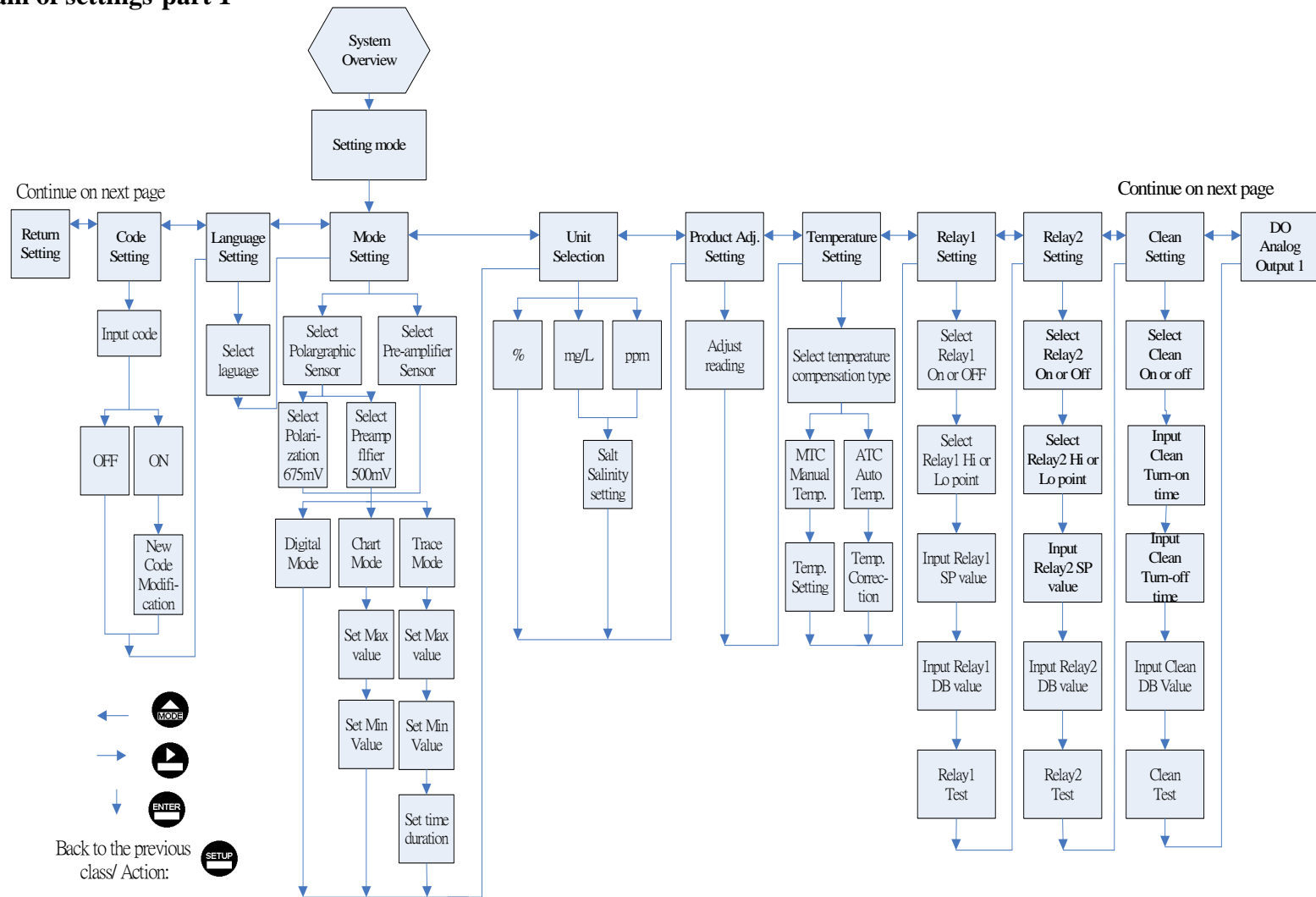


**Note: HOLD warning symbol appears in the cleaning status, set-up mode, and calibration mode. Under hold status, the relative display and output are as follows:**

1. Relay 1, 2 will cease from action. When it is form hold status of cleaning to enter into the set-up menu or calibration menu, the transmitter will cease the cleaning function.
2. The last signal output value of analog current output is kept in the reading before HOLD status.
3. The last signal output value of RS-485 interface is kept in the reading before HOLD status.

# 7. Settings

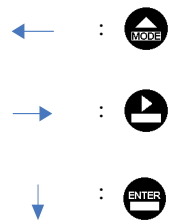
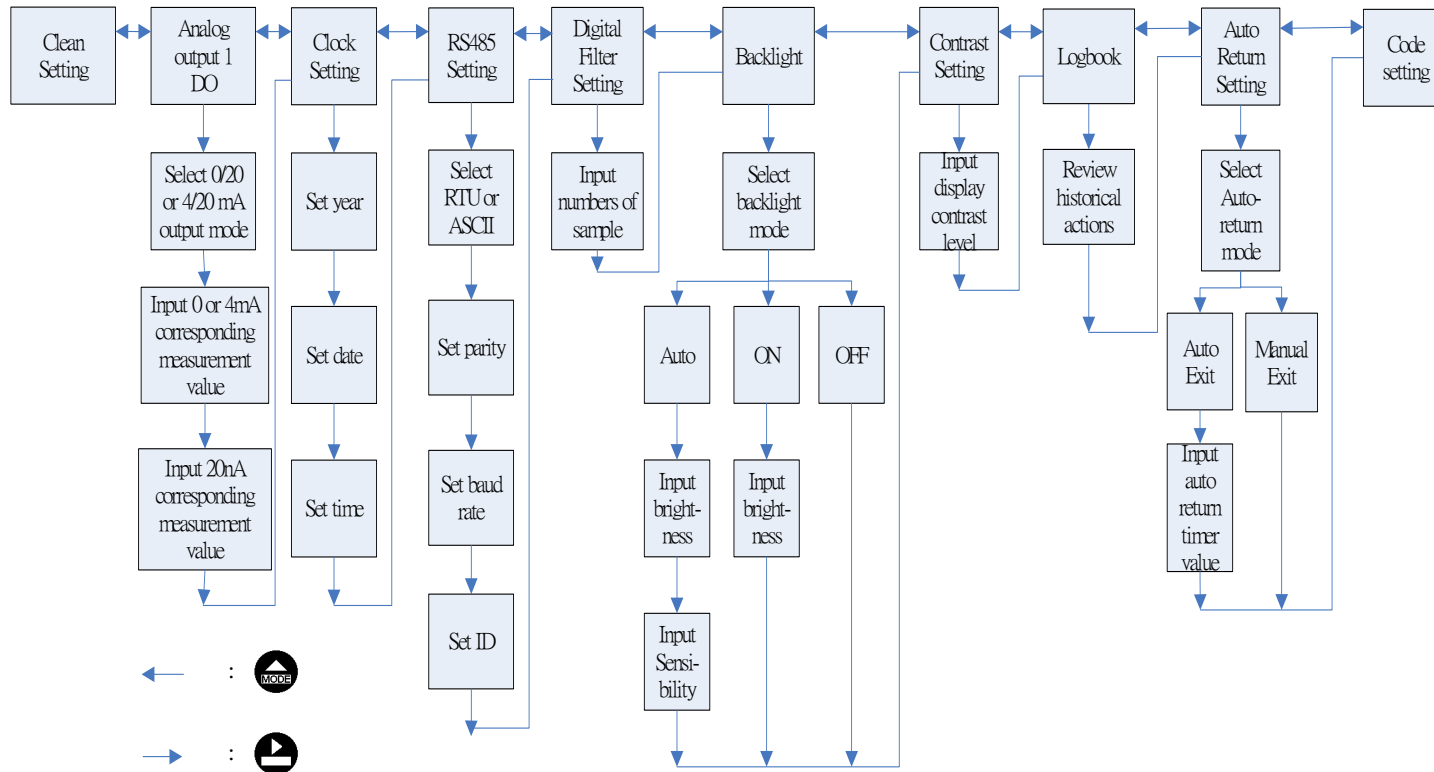
## Block diagram of settings-part 1



## Block diagram of settings-part 2




Connected with previous page

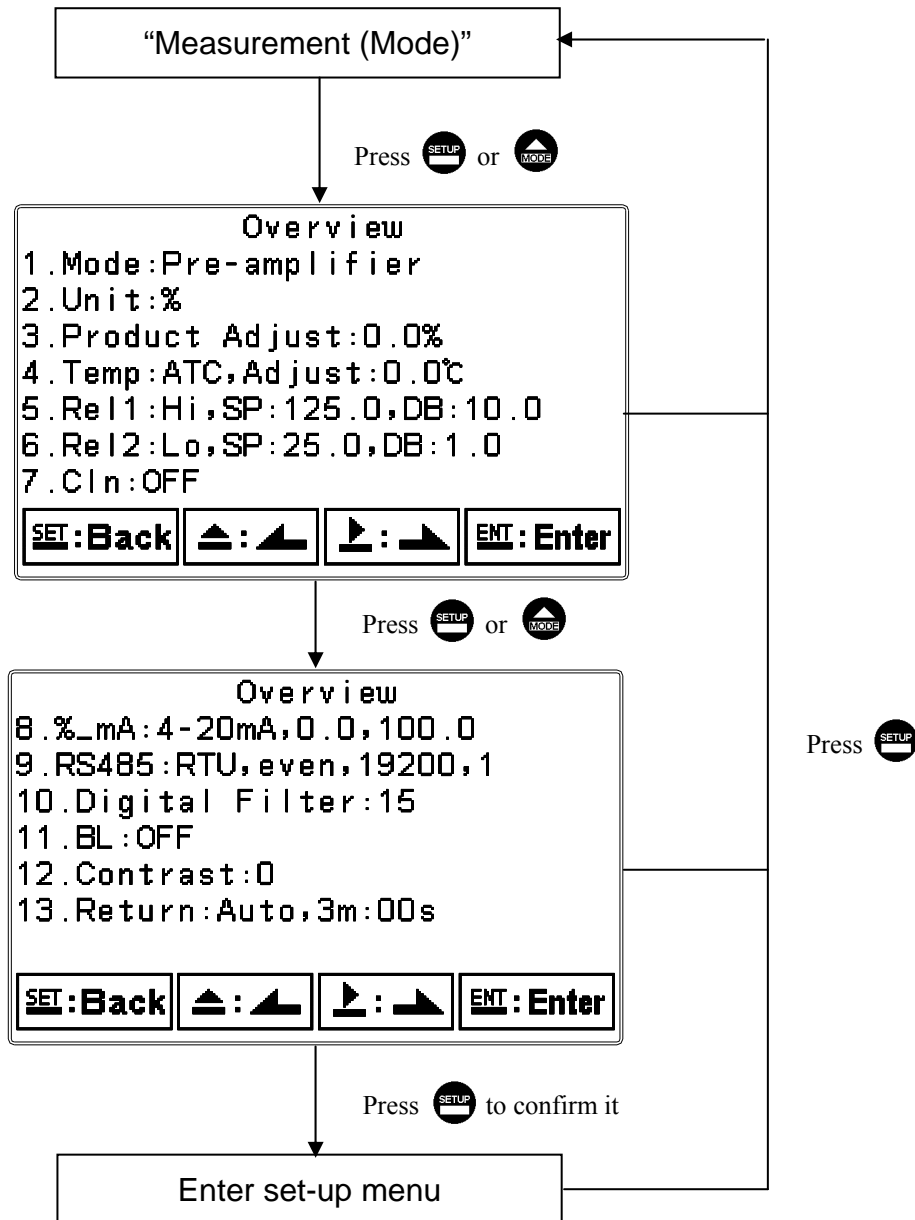
Connected with previous page




Back to previous class / action:

## 7.1 Entry of set-up menu

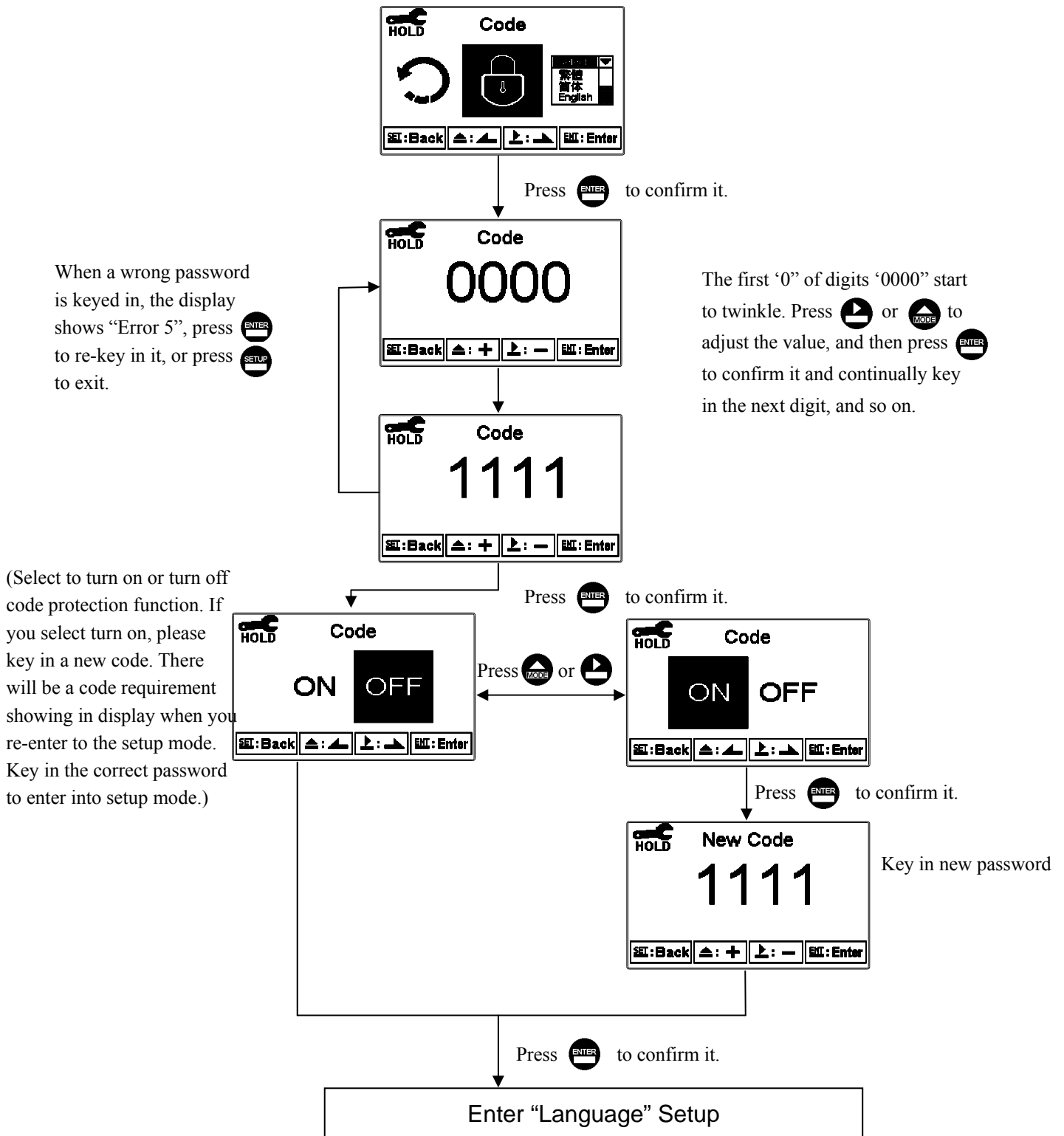
In the measurement mode, pressing the two keys  and  simultaneously allows you enter the overview of current setting, and press  to enter the set-up mode to modify the setting if necessary.



## 7.2 Security code of settings (Code)

After entering set-up mode, select “code” item, press  to enter into code procedure. The code pre-setting is 1111.

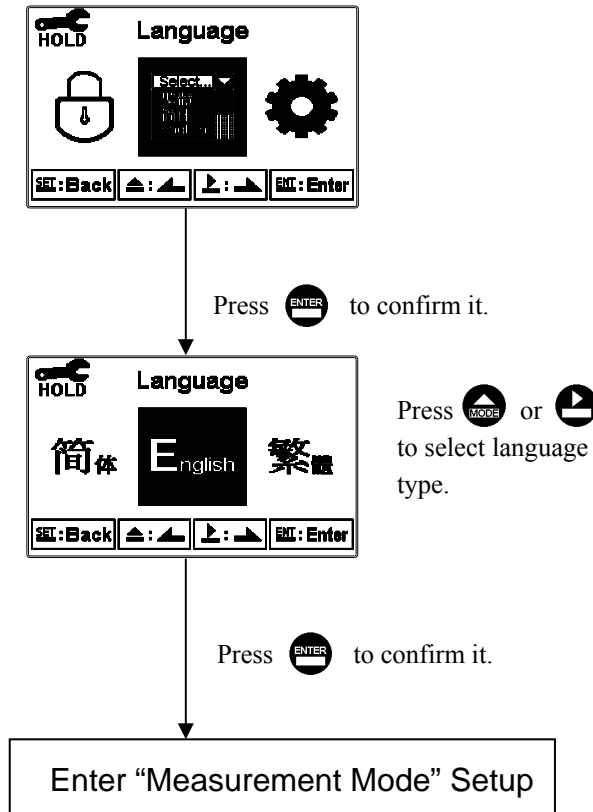
Note: The code of setting mode is prior to the code for calibration. That means that the code of setting mode can be used for the code of calibration mode.





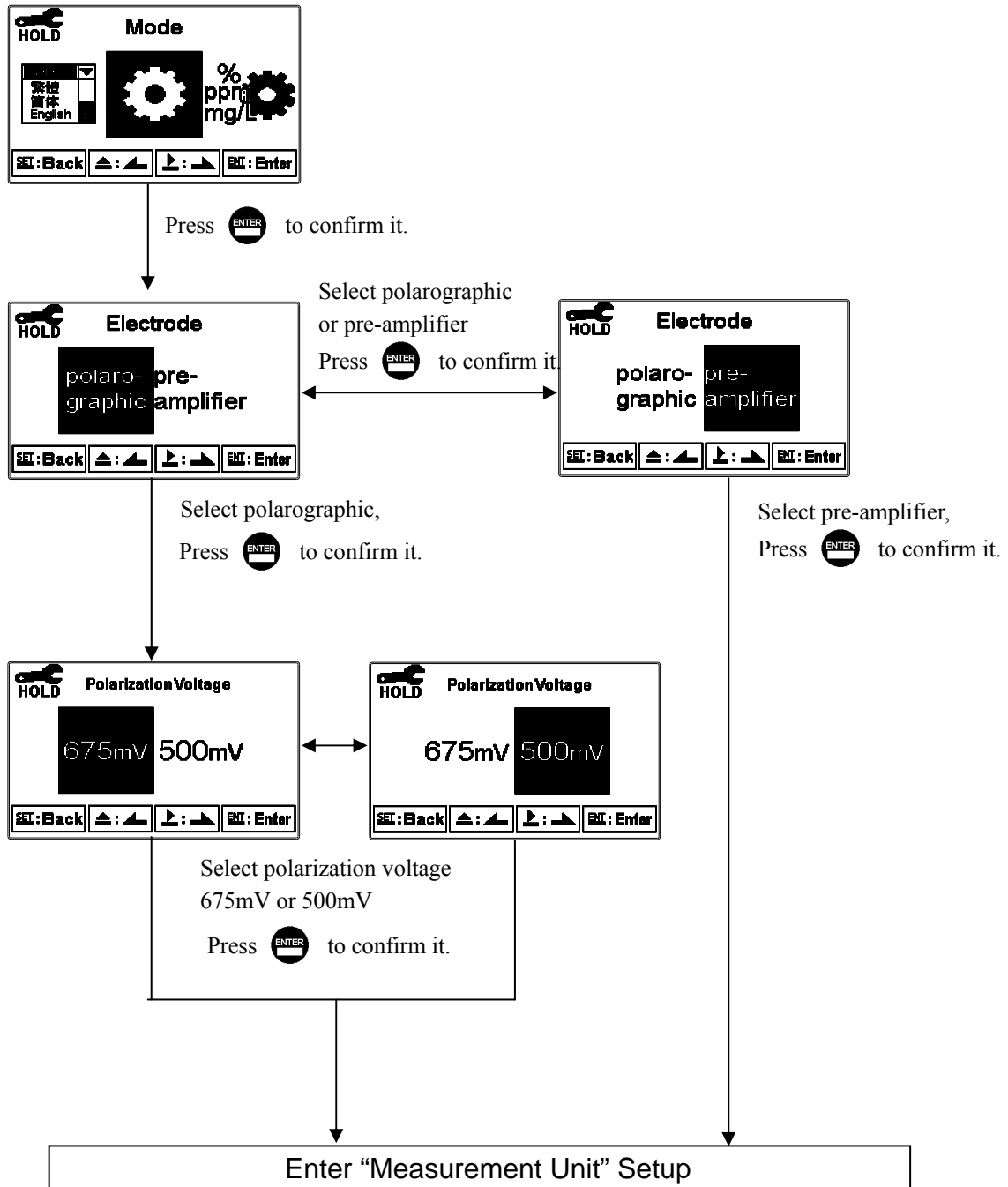
### 7.3 Language

Enter Language setup menu, select the system language from English, Traditional Chinese and Simplified Chinese.



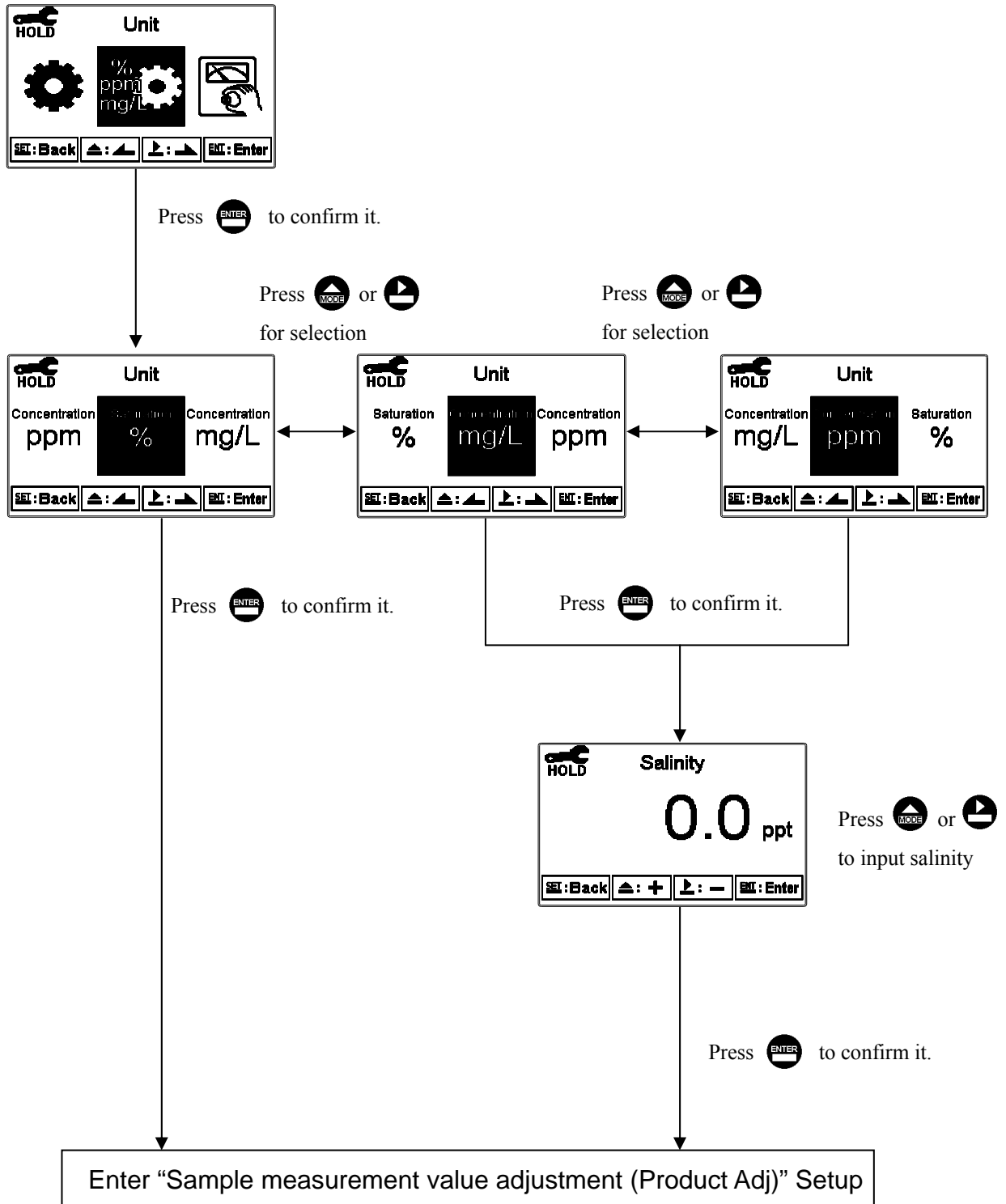
## 7.4 Mode

Enter setup of “Mode”. Select between “polarographic” or ”pre-amplifier(ex. WTW sensor) measurement mode. When select polarographic, select polarization voltage 675mV or 500mV according to measurement sensor.



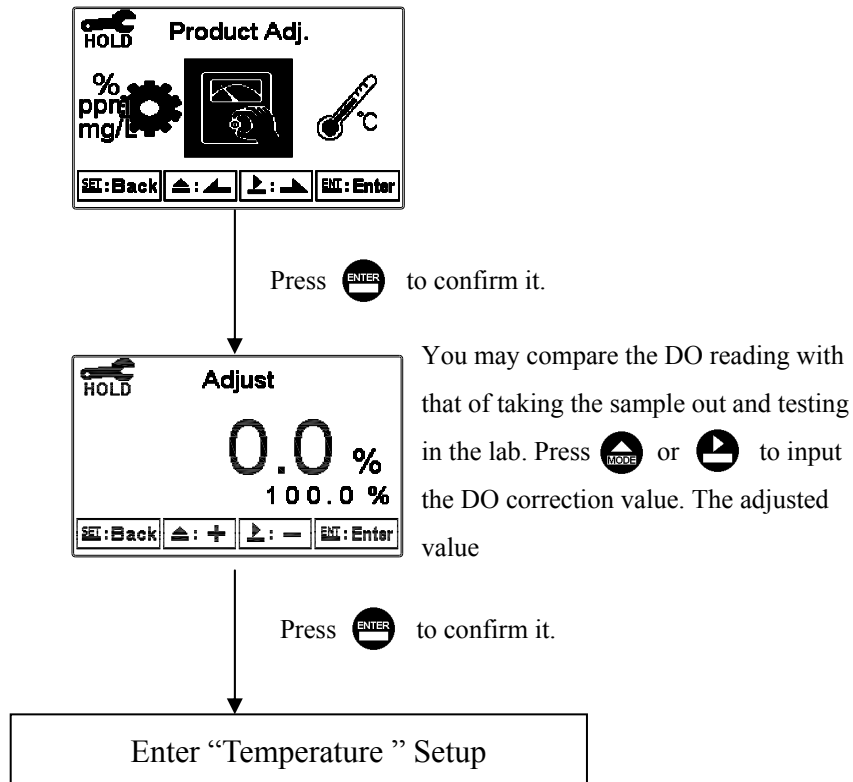
## 7.5 Unit

Enter unit setup, select saturation unit(%), or concentration unit(ppm, mg/l) according to your application requirement. When selecting concentration unit, input salinity value of sample solution for salinity compensation.







## 7.6 Product Adjustment)

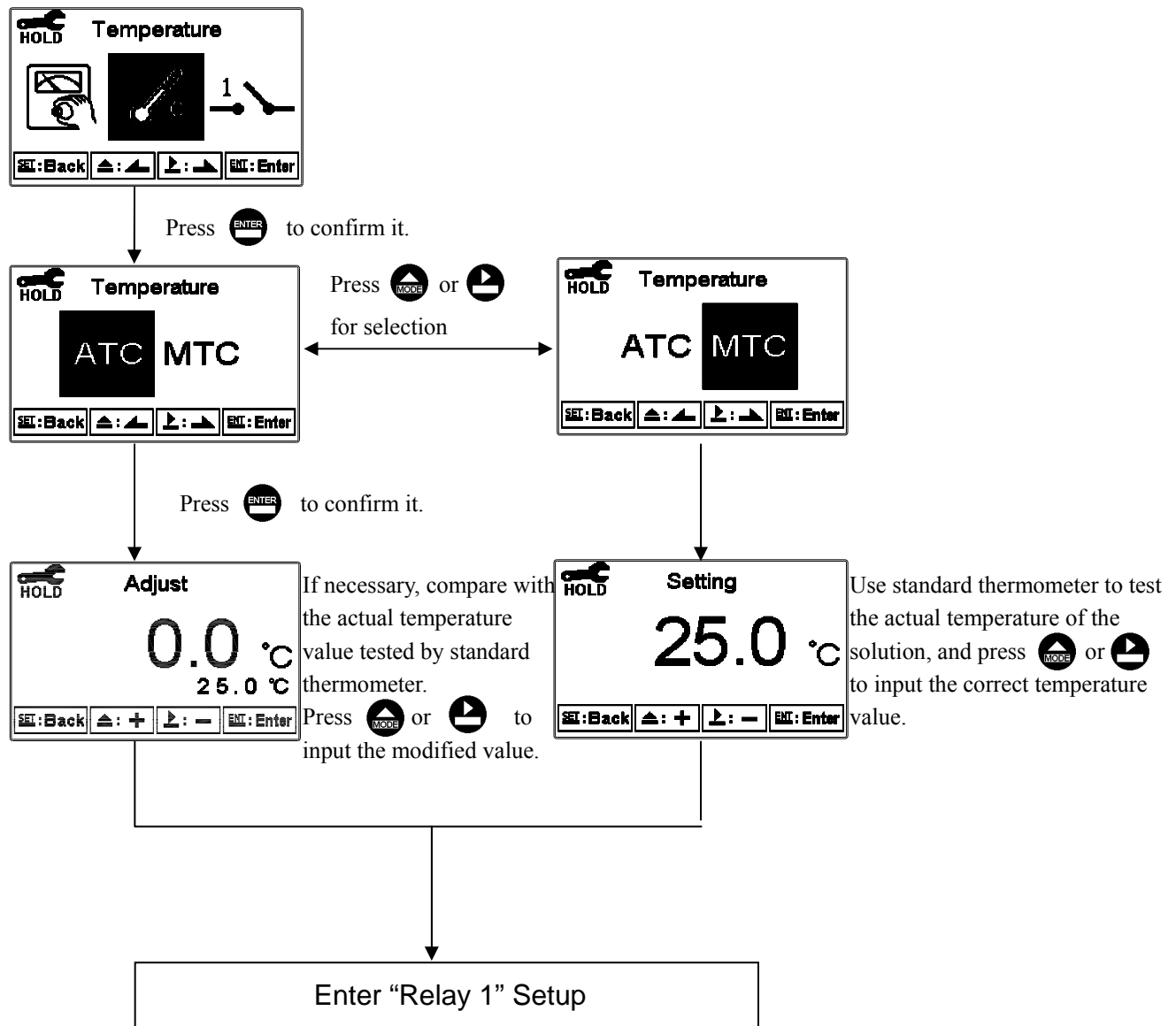
Enter setup of “Product Adj.”, make the sample reading modifications. Users are allowed to make sample reading adjustment without taking out the sensor and making calibration. Utilize the function to adjust the field measurement as same as the lab measurement to eliminate the doubt of measurement error.



## 7.7 Temperature

Enter Temperature setup menu, select ATC for auto temperature compensation or select MTC for manual temperature compensation. Under temperature setting menu, press  and  simultaneously to back to the default value. Under measurement mode, if the compensation is MTC mode, you may press  or  to adjust the MTC temperature value directly.

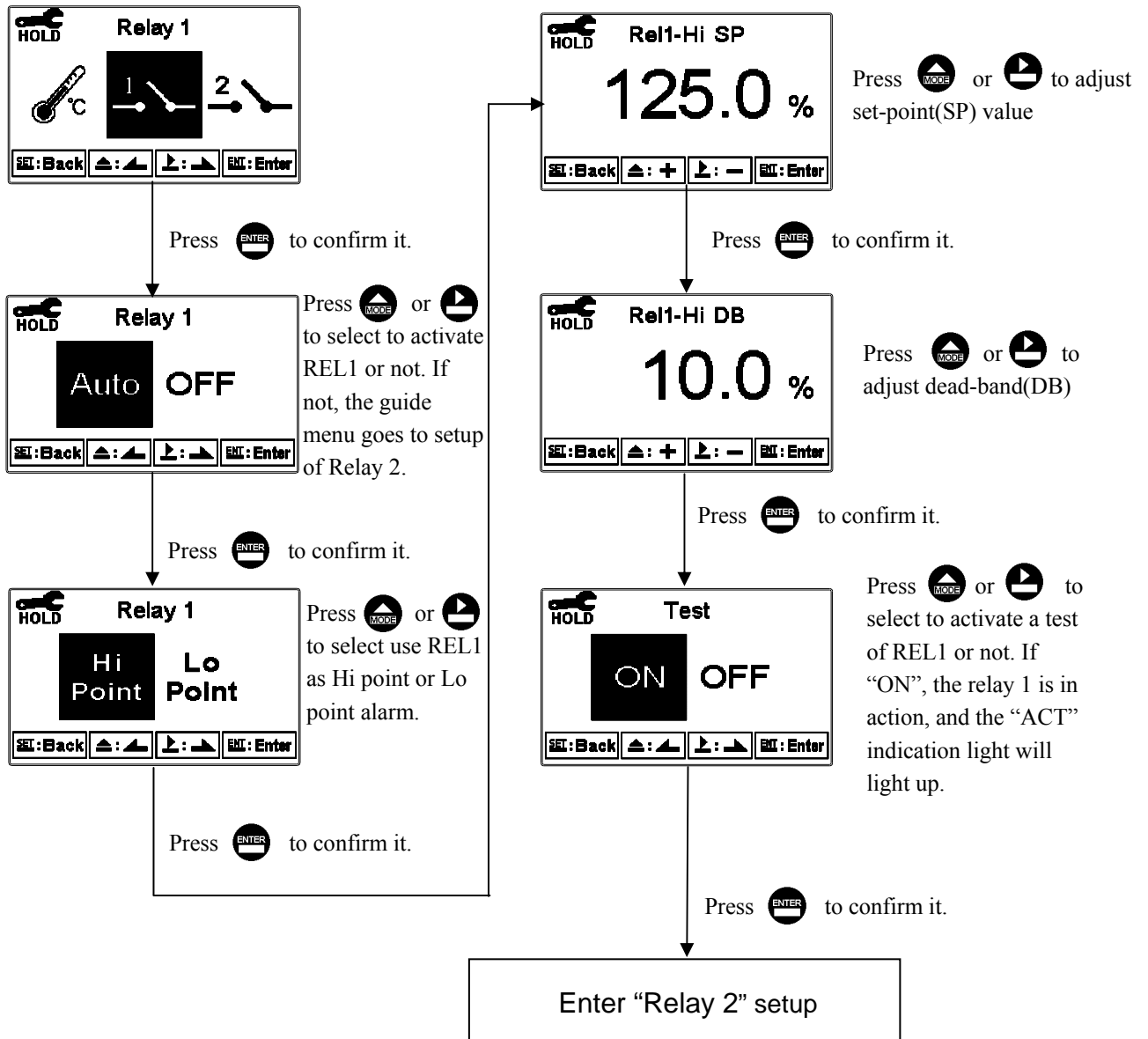
PS : If select polarographic measurement mode, the temperature compensation system automatically switches to NTC 22K. If select pre-amplifier measurement mode, the temperature compensation system automatically switches to NTC 30K.



## 7.8 Relay 1

Enter setup of Relay 1. Select the item to turn on or turn of the relay 1 function. If you select to turn on the relay 1, then select for using relay 1 as “Hi set-point” alarm or “Low set-point” alarm. Set the value of set-point (SP) and dead-band (DB).

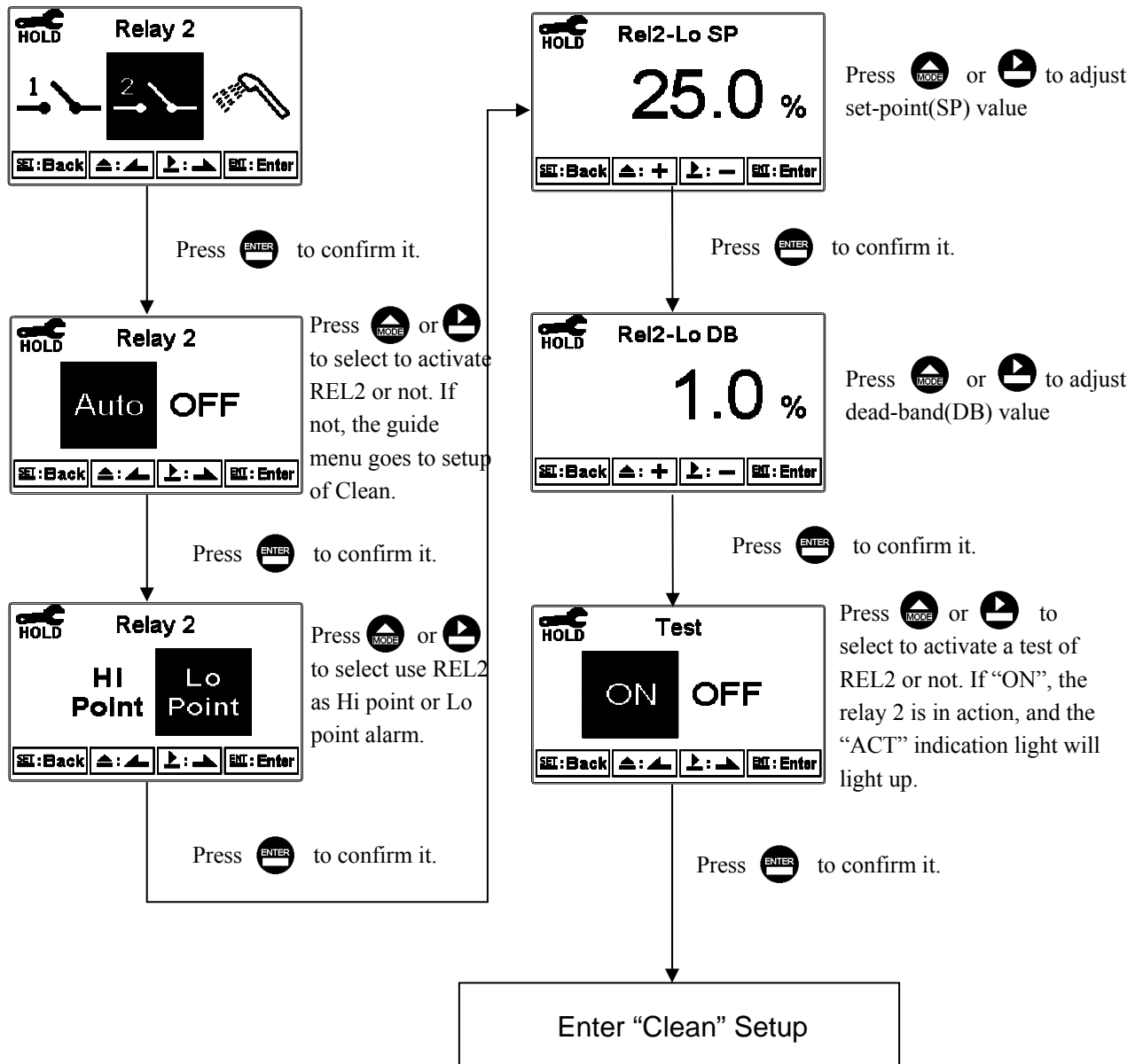
About the range for set-point please refer to the specification’s measurement range corresponding to different measurement unit.



## 7.9 Relay 2

Enter setup of Relay 2. Select the item to turn on or turn of the relay 2 function. If you select to turn on the relay 2, then select for using relay 2 as “Hi set-point” alarm or “Low set-point” alarm. Set the value of set-point (SP) and dead-band (DB).

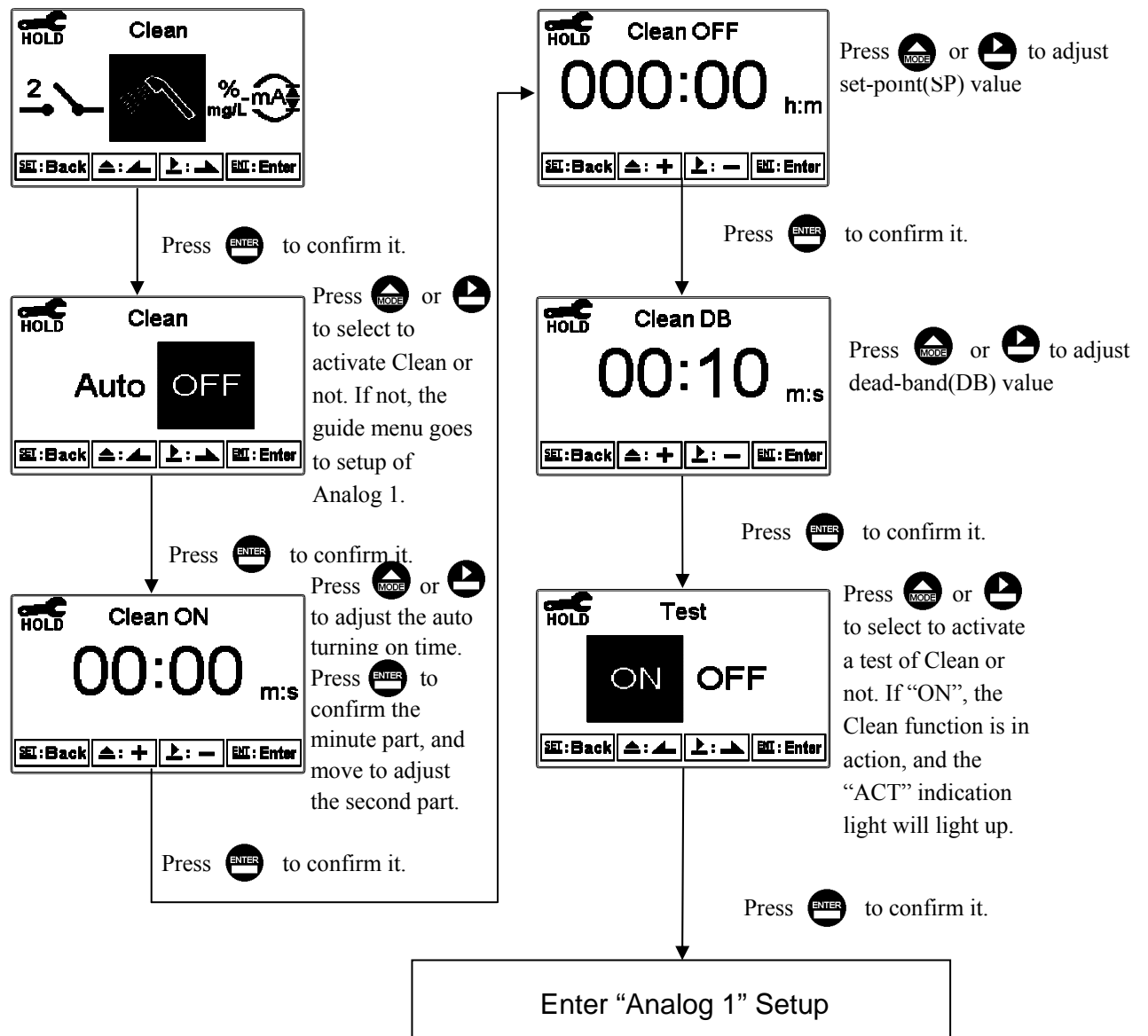
About the range for set-point please refer to the specification’s measurement range corresponding to different measurement unit.



## 7.10 Clean

Enter setup of “Clean” function. Select the icon to turn on or turn off the clean function. If you select “Auto” turning on, and set the timer of the clean function including automatically turning on time and turning off time, and set the bead-band value(DB).

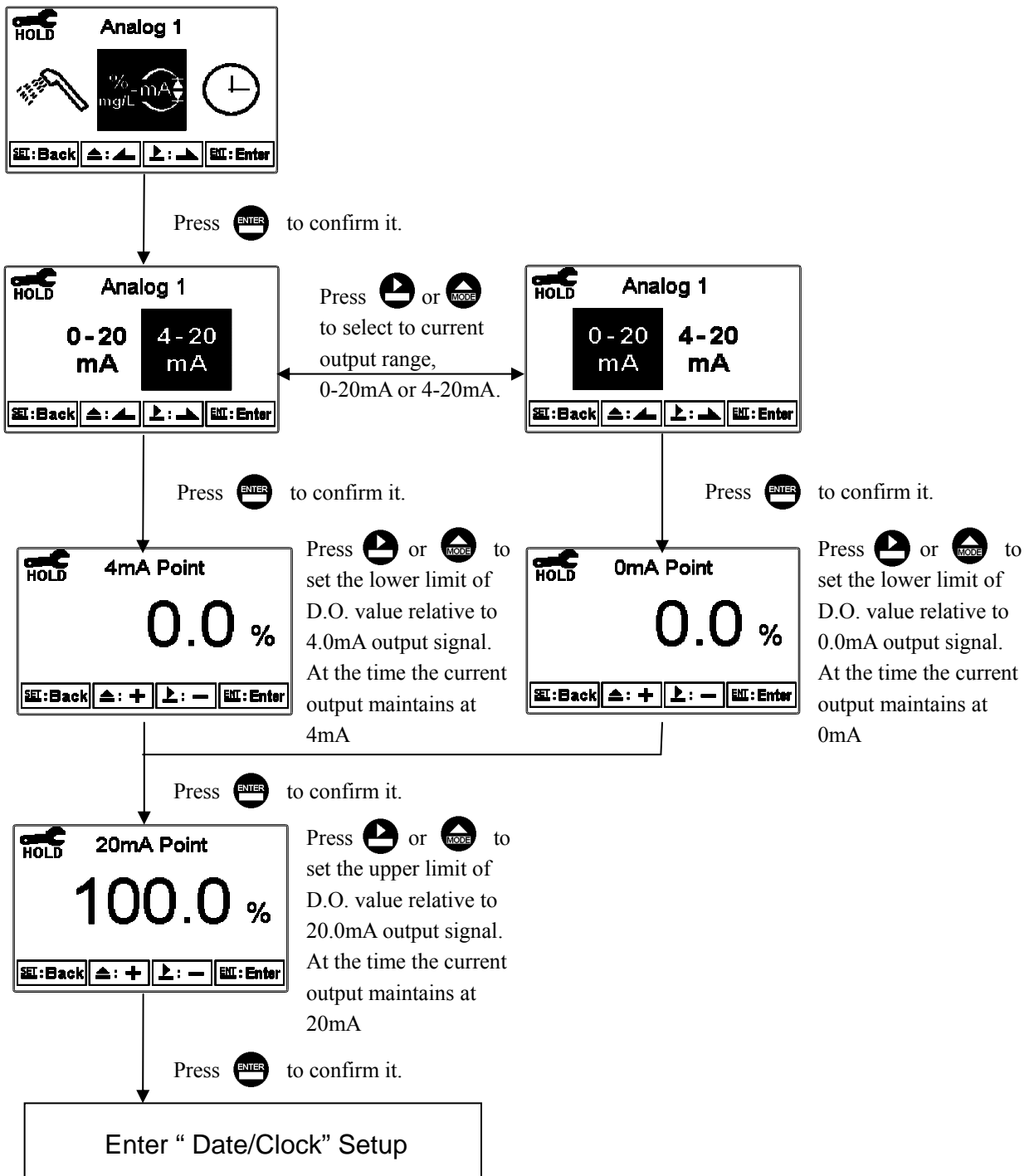
Note: When the clean function is turned on, if any value is set to be 0, the instrument will automatically turn off this function. And the measurement value will be hold as the last measurement value before wash status. If enter parameter setting mode or calibration setting mode under wash status, the instrument will stop wash status automatically.





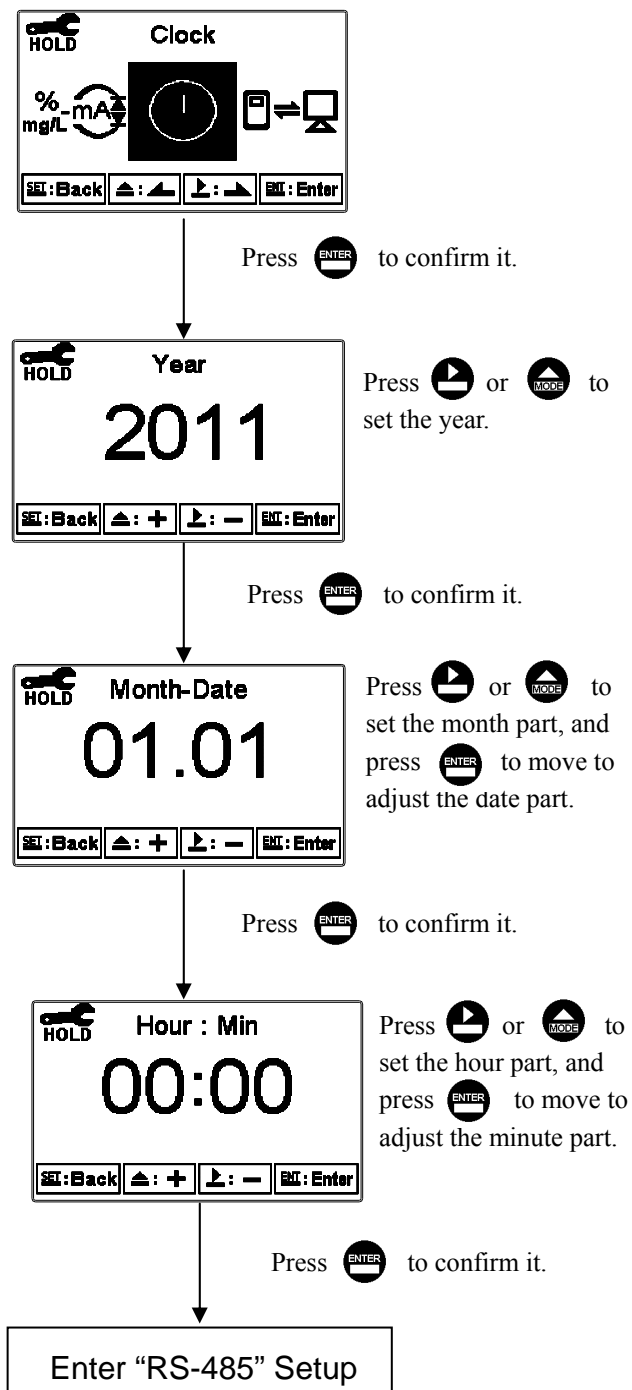
## 7.11 Analog output 1(D.O.)

Enter setup of Analog 1. Select 0~20mA or 4~20mA current output. Set the related value to the range of D.O. measurement. If the range of the D.O. measurement is to be set smaller, the resolution of current output is higher. When the measured value exceeds the higher range limit, the current will remain approximately 22mA output. When the measured value exceeds the lower range limit, under 0~20mA mode the current output will remain 0mA output; while under 4~20mA mode the current output will remain approximately 2mA output. The exceptional output value can be used as a basis for failure determination. Under HOLD(measurement) status, the current output maintain the last output value before HOLD status. However, in order for convenience of insuring the current setting of a external recorder or of a PLC controller, the current output will be 0/4mA or 20mA under the analog output 1 setup menu.



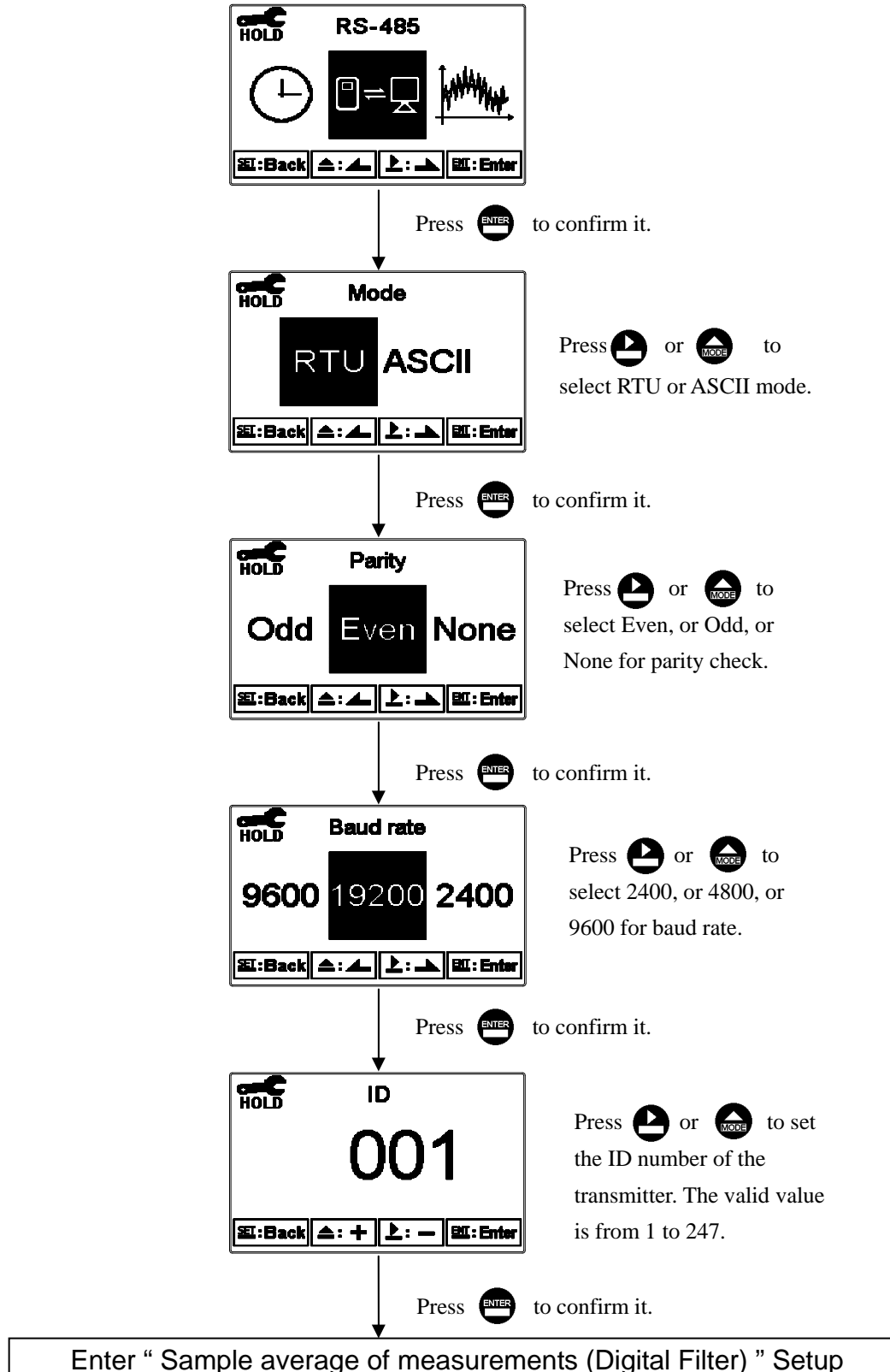
## 7.12 Date/Time(Clock)

Enter setup of Date/Time(Clock). Set the “Year”, “Month”, “Date”, “Hour”, and “Minute” time. Note: With the DC-5110RS model, the transmitter may keep the clock in operation even when encountering power failure. Only when the inner battery is out of power, the clock may stop operation. Then, please replace the 3V CR2025 Li batter inside the transmitter.



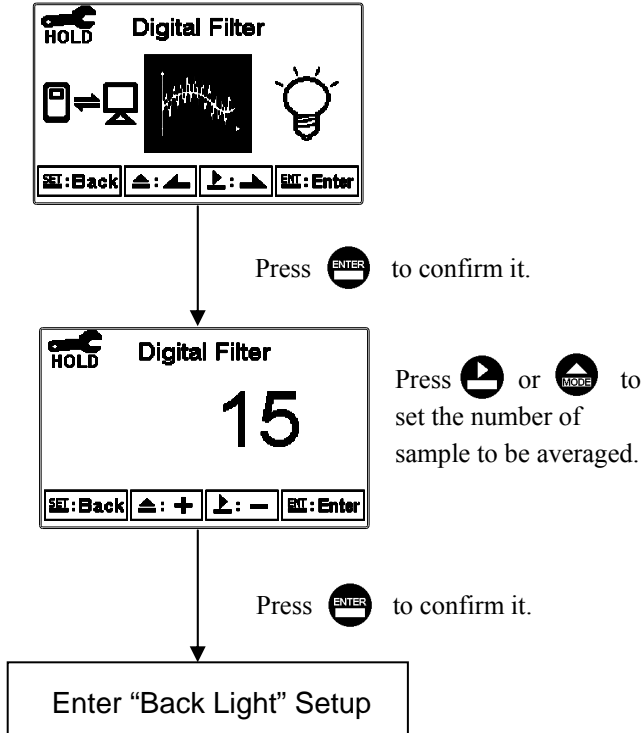
### 7.13 RS485 communication

Enter setup of RS485 communications. According to the Modbus protocol, set the transmitting mode, parity, baud rate, and ID number. About the detail of Modbus protocol, please refer to Ch9. If under hold status, the measurement signal output maintains the last output value before hold status.



### 7.14 Sample average of measurements (Digital Filter)

Enter the setup of Digital filter. 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.



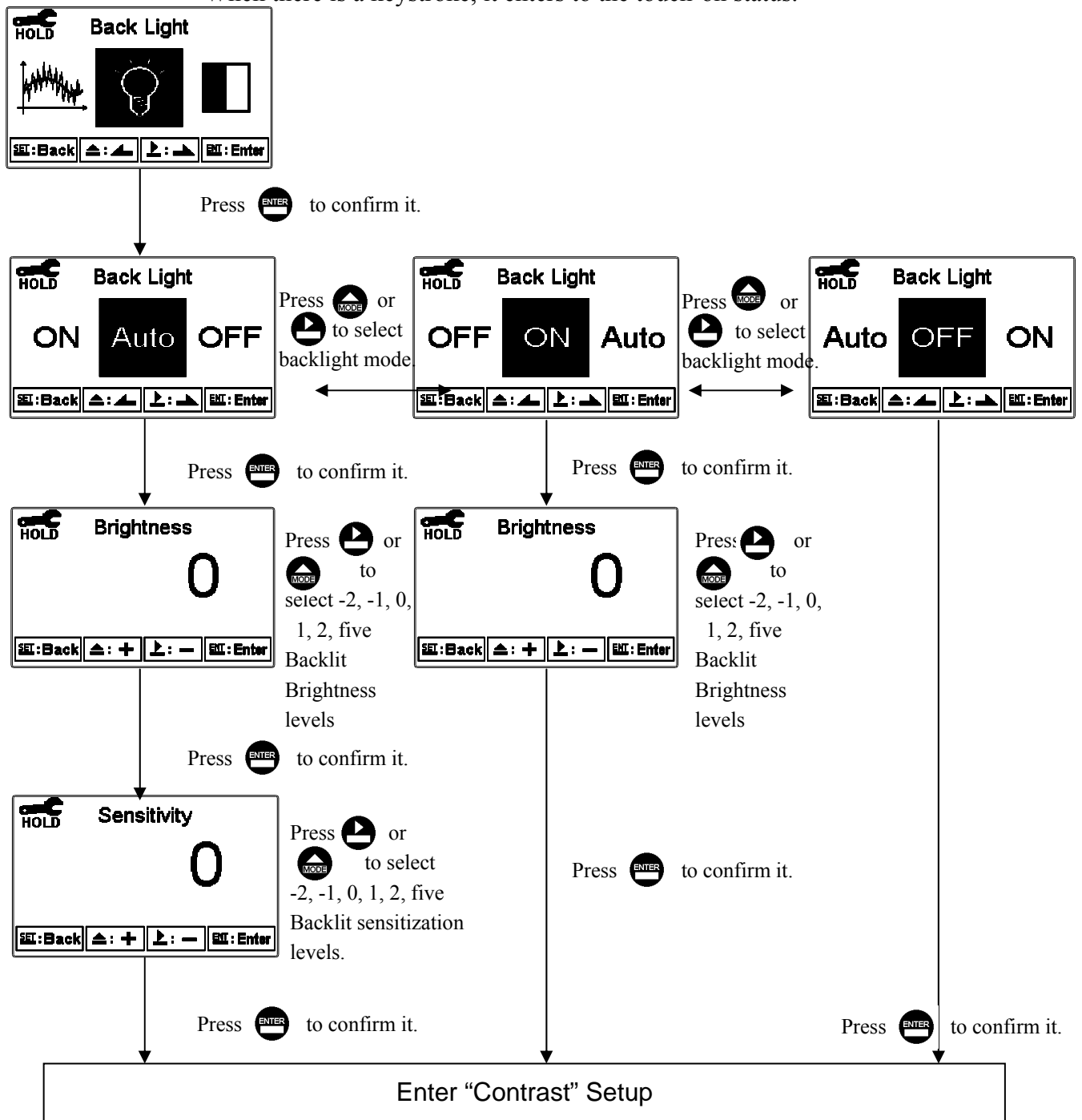
## 7.15 Backlight settings

Enter setup of backlight display. According to your need, you can set the brightness of display(-2~2, dark~bright) and sensitivity of the sensitization sensor(-2~2, insensitive~sensitive). Where there is a keystroke, then activate the touch-on backlight function. Regardless of what kind of backlight mode, the touch-on function will activate the backlight. If there is no keystroke for 5 seconds, the display will back to the original backlight setting status.

**ON setting:** The backlight is always on.

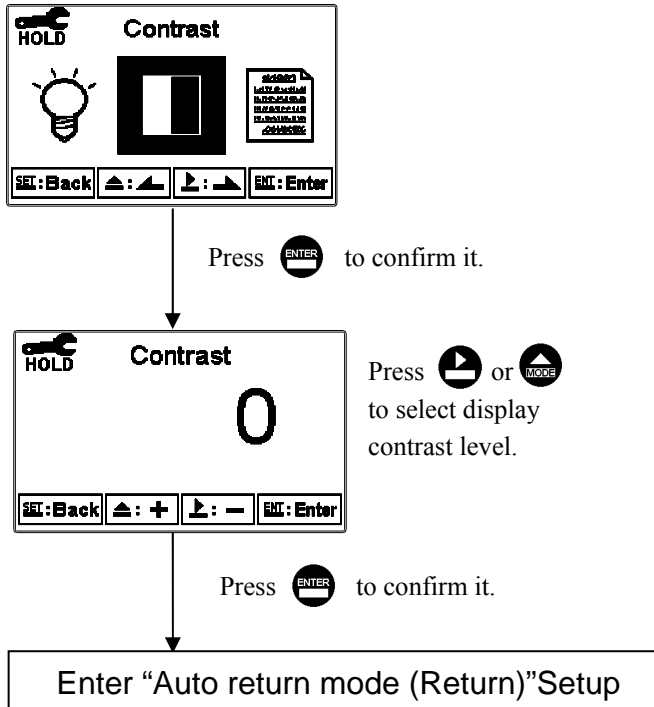
**OFF setting:** The backlight is off. When there is a keystroke, it enters to the touch-on status.

**Auto setting:** According to the ambient light, activate or deactivate the backlight. When there is a keystroke, it enters to the touch-on status.



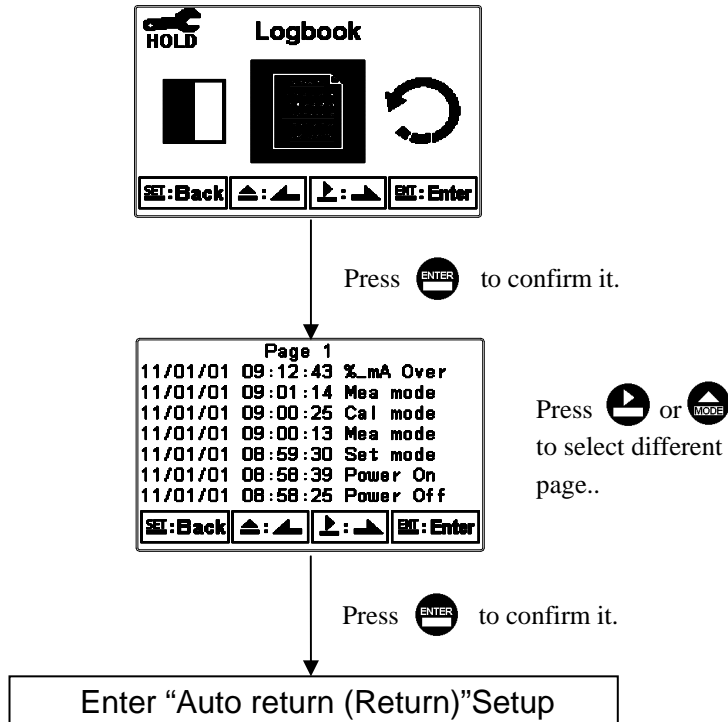
## 7.16 Contrast settings

Enter setup of display contrast. You can set the contrast of display according to your need. (-2, -1, 0, 1, 2, light to strong)



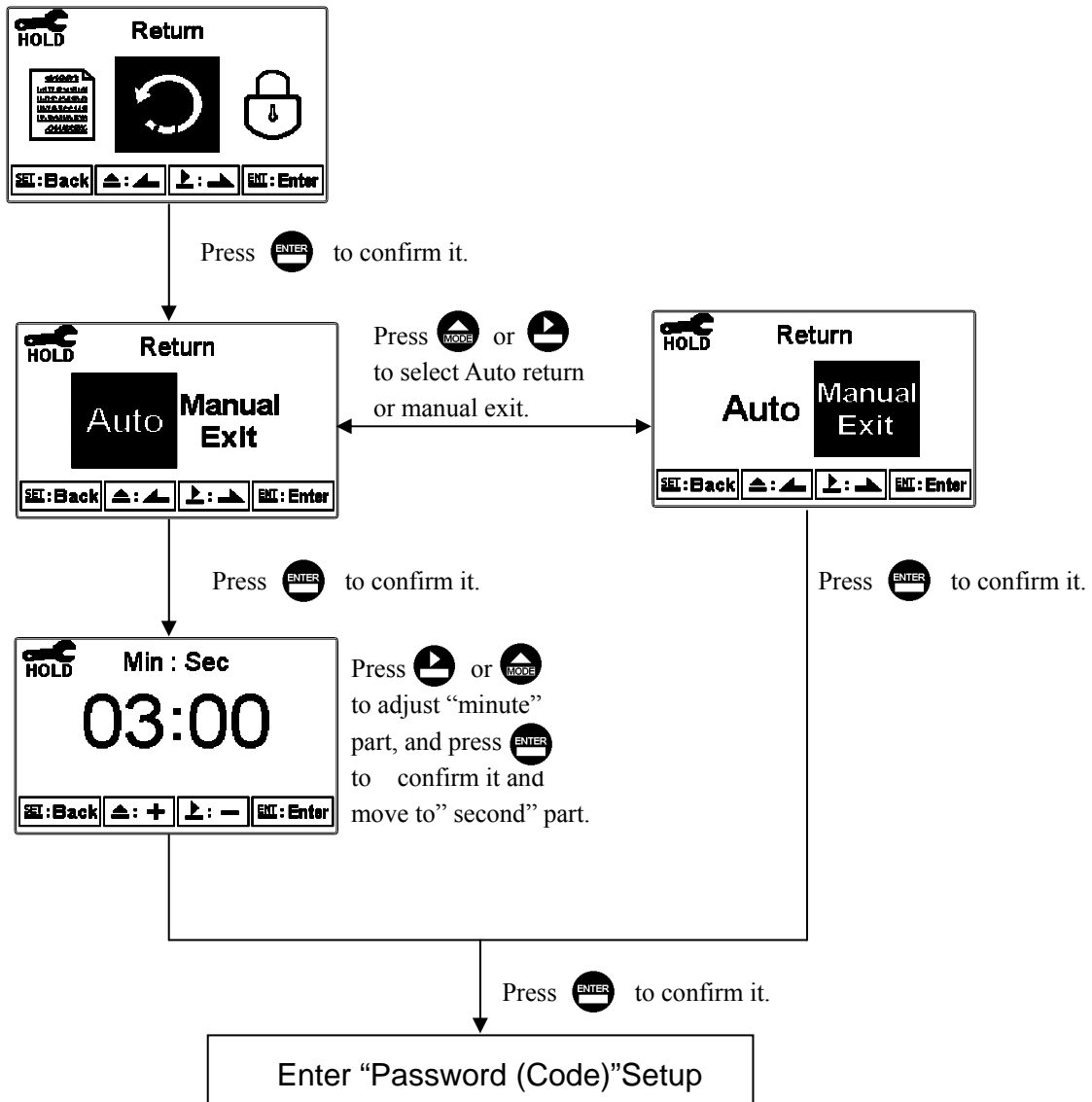
## 7.17 Logbook

Enter setup of Logbook. Users may look up the relative records of the transmitter. For example, Measurement mode (Mea mode), Setting mode (Set mode), Calibration mode (Cal mode), current output over setting range (%\_mA Over), power failure (Power On, Power Off), and other error message records (Error1, Error2...etc. The definition of error messages please refer to Ch10.)



## 7.18 Return

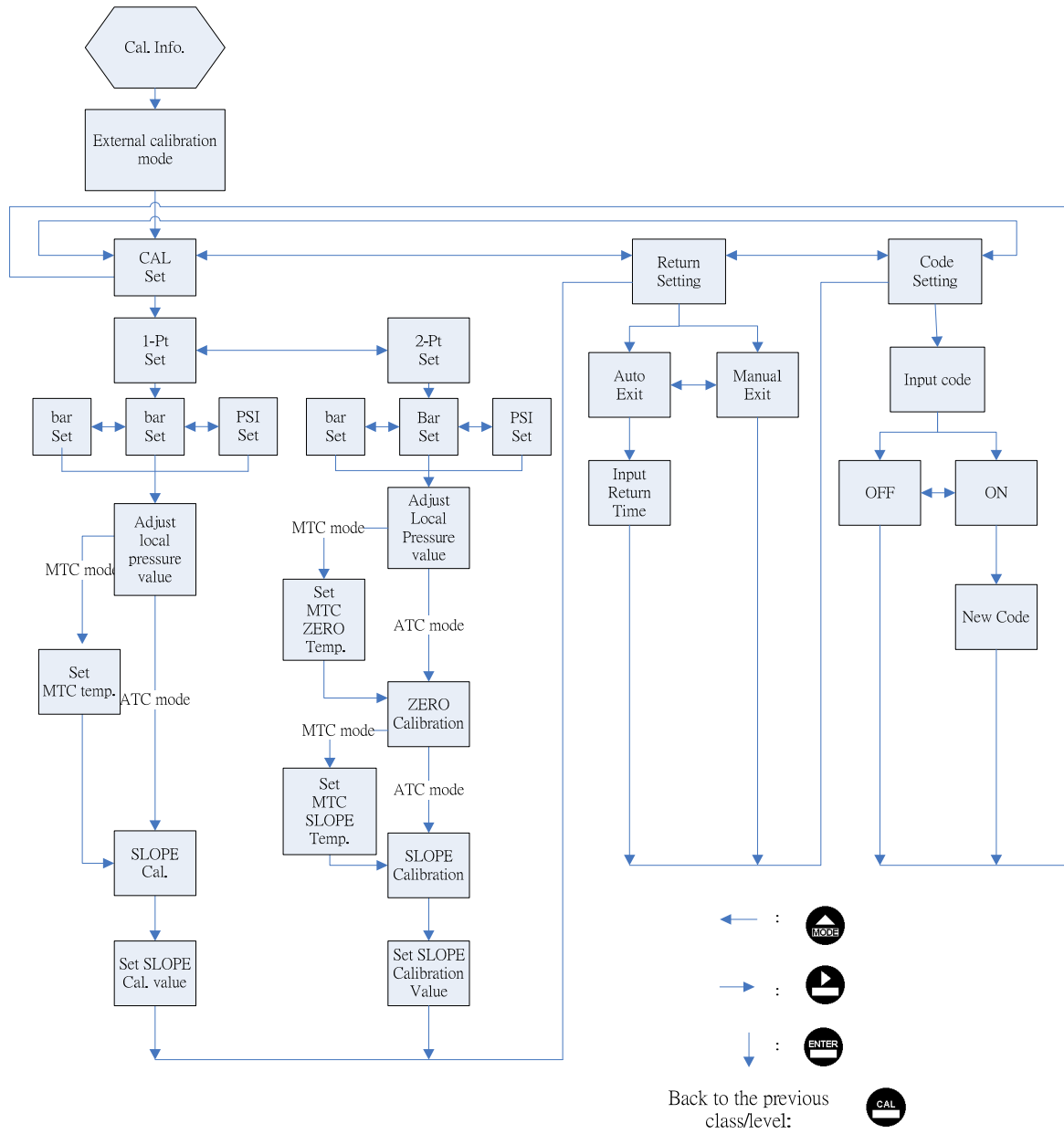
Enter setup of auto return mode (Return) to set the function that the instrument automatically exit the setup menu after a period of time without pressing any key. The “Manual Exit” means that it needs to exit setup menu manually, while “Auto” means that the display automatically exit the setup menu and back to measurement mode after a period of time without pressing any key.









## 8. Calibration

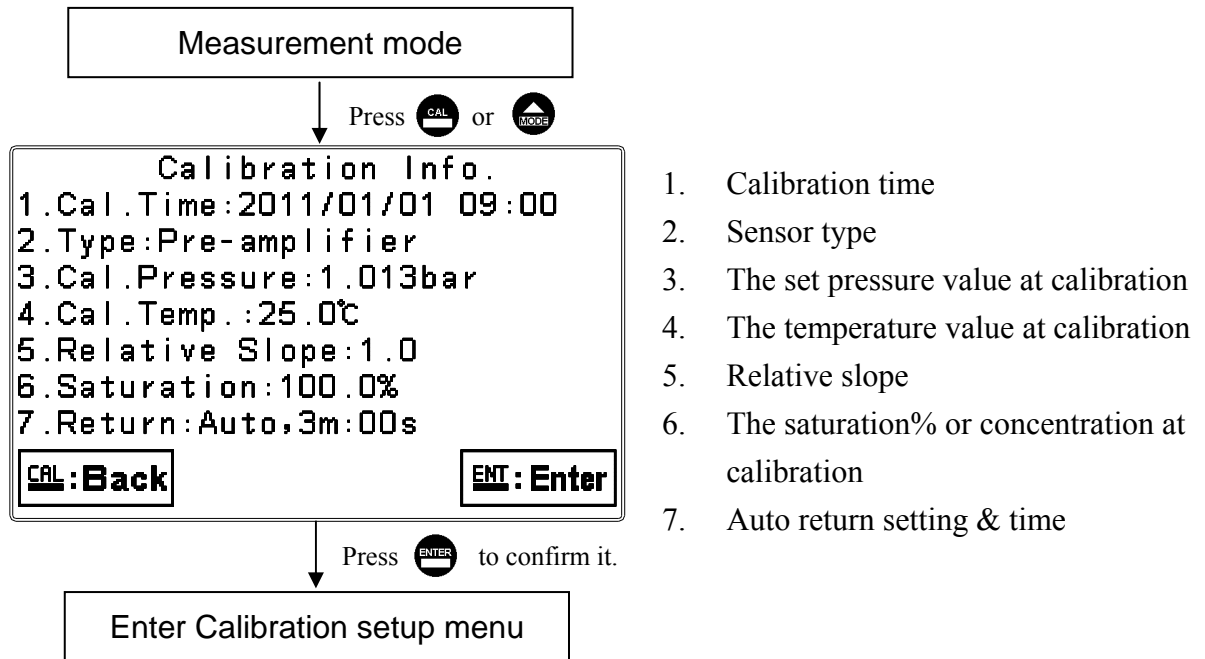
### Block diagram of calibration



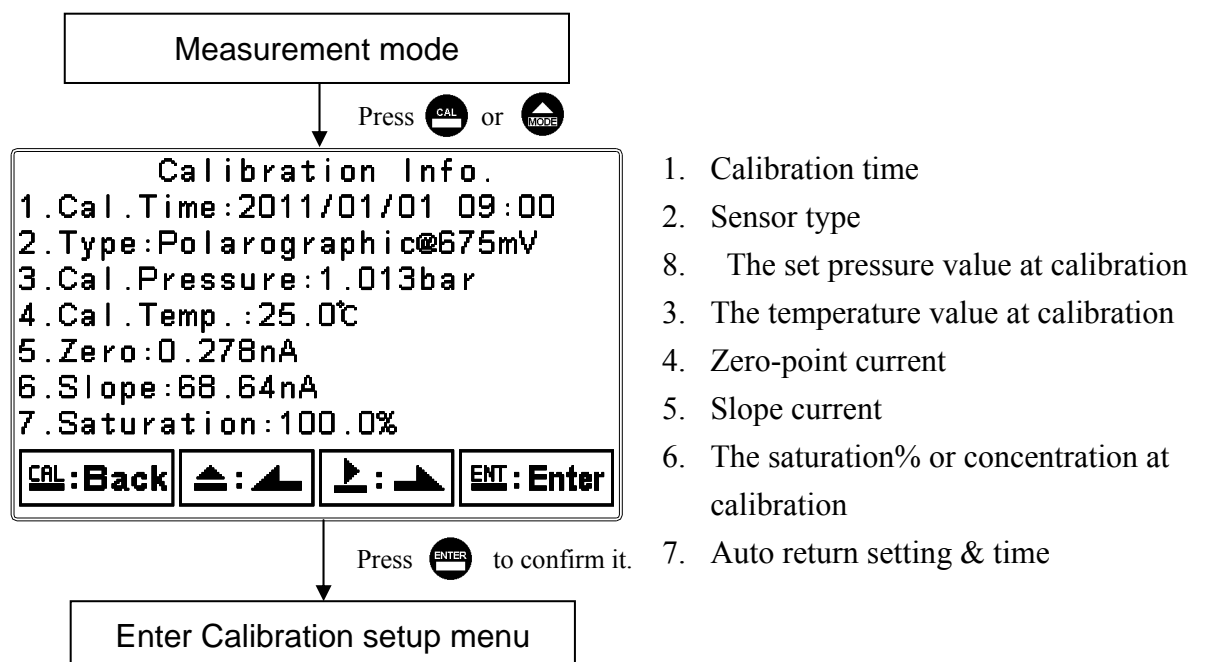
## 8.1 Enter calibration setup menu

In the measurement mode, pressing the two keys  and  simultaneously allows you enter the Calibration Information. If you do not need to re-calibrate the measurement system, press  to go back to measurement mode. If you need to re-calibrate the system, press  to enter to the calibration setup menu.

### Ex.1: Calibration information of applying Pre-amplifier type sensor

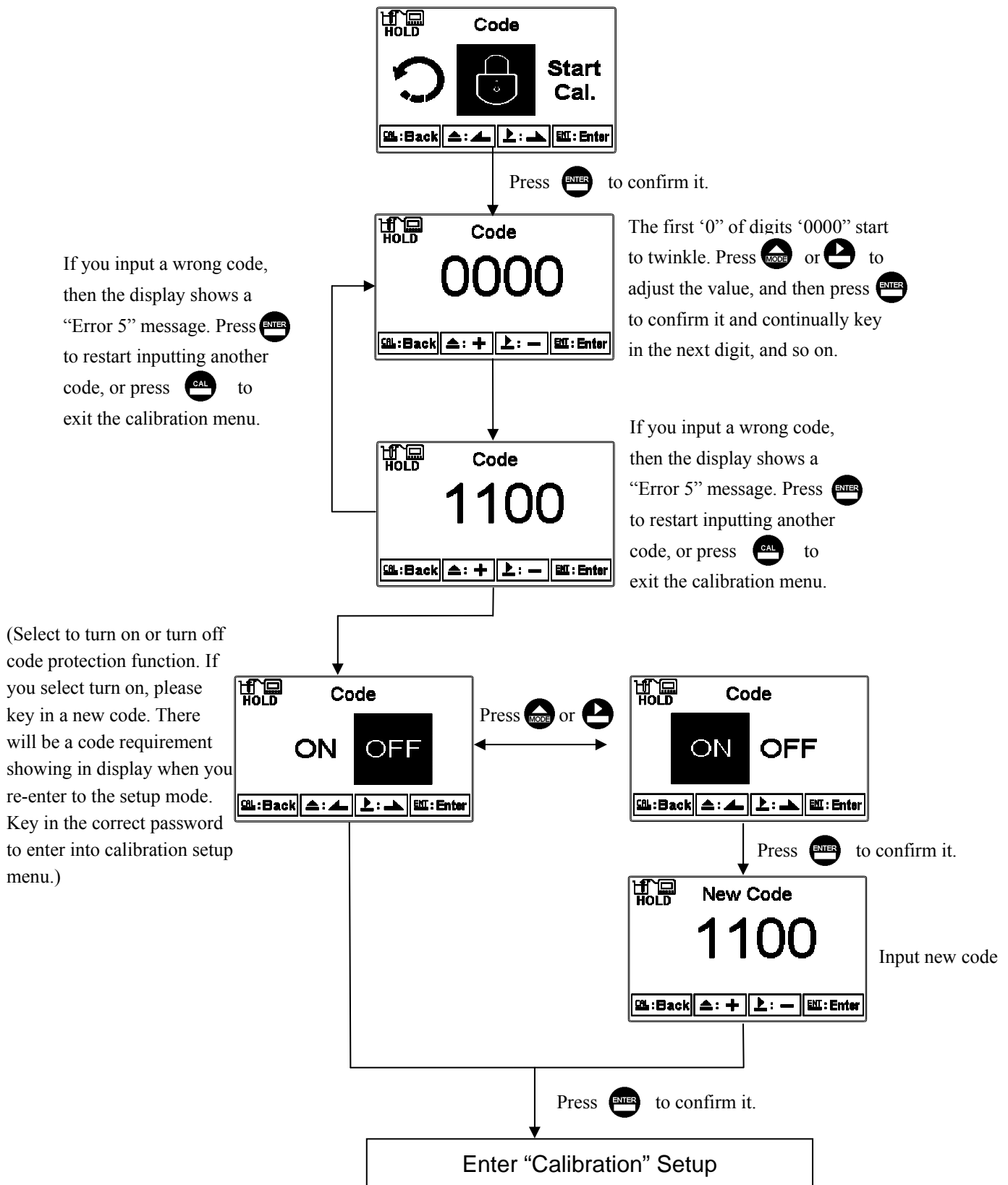


### Ex.2: Calibration information of applying Polarographic type sensor



## 8.2 Security password of calibration (Code)

Select the Code (password) icon after entering calibration setup mode. Select to activate code function or not. The default Calibration setting code is “1100”.



### 8.3 Calibration

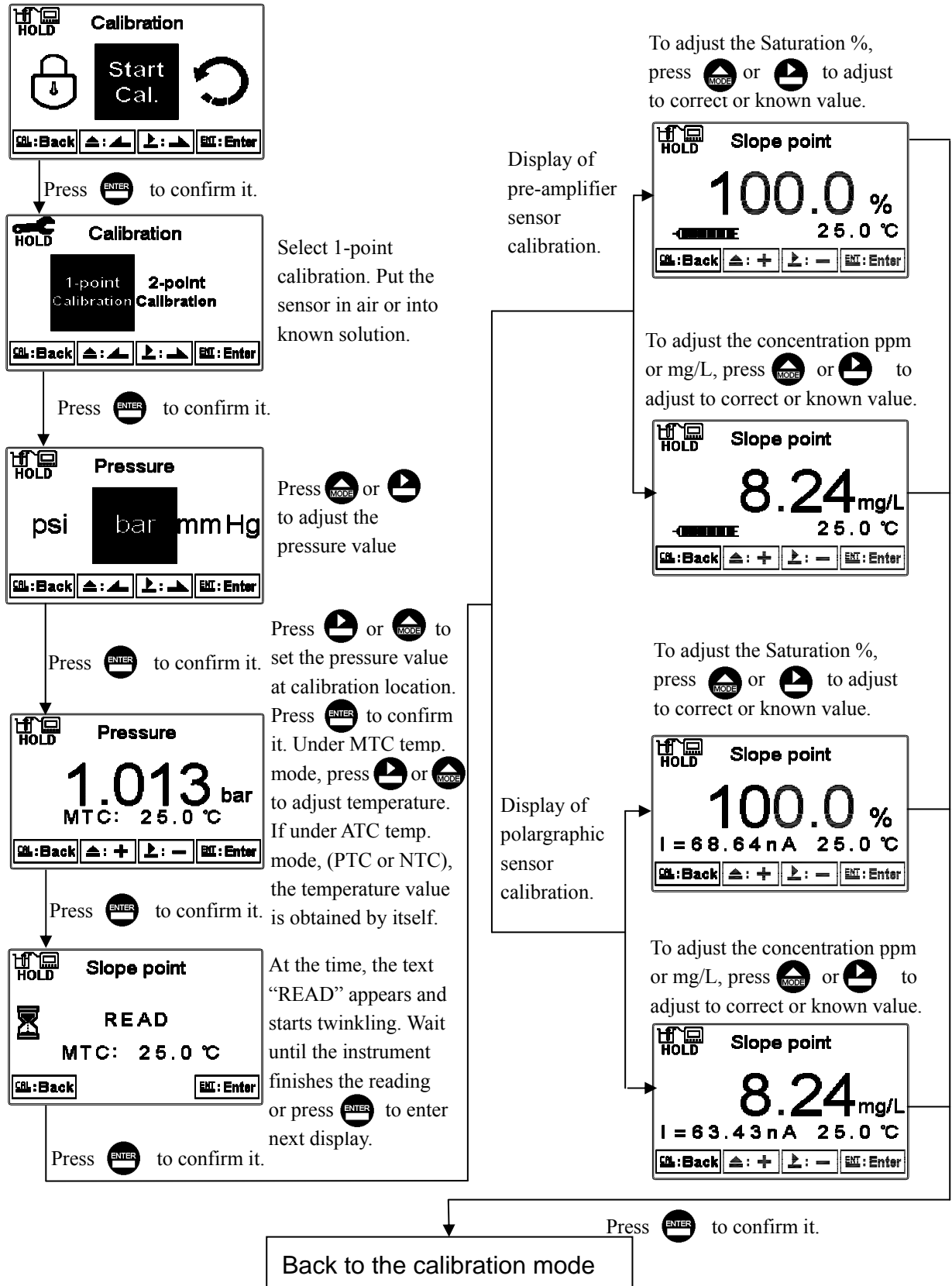
Each D.O. transmitter has not been calibrated with a sensor before out of factory because every sensor has different condition. Thus, the transmitter is necessary to be calibrated when connecting with a sensor or replace the electrolyte.

- According to set unit(% , mg/l, or ppm) under setup mode to start the calibration
- According to set polarographic sensor or pre-amplifier sensor to start the calibration
- The D.O. sensor is recommended for single point calibration(1-pt )100% in the air, not for 2 points calibration (2-pt).
- If it is necessary to make the zero point check(CHECK), please refer to the operation manual of the sensor.
- The two points calibration needs to make zero-points calibration at first, and then the slope calibration at last.

**Note: Before calibration, please refer to the operation manual of the sensor about the instruction of the polarization, zero point calibration, calibration in the air, etc.**

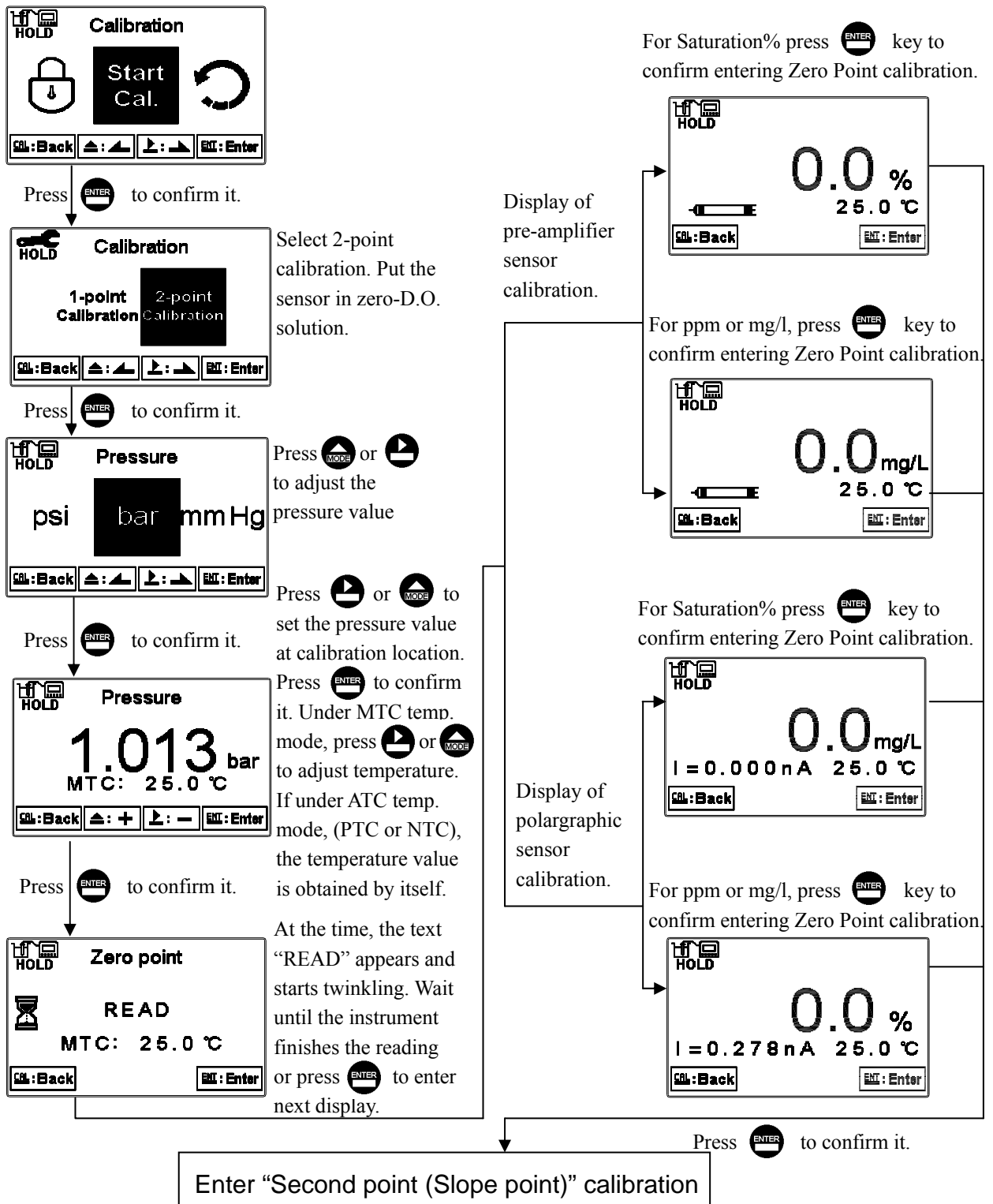
### 8.3.1 Single point calibration(1-Point.)

It is for the slope calibration of a sensor. Normally, the D.O. sensor is only necessary for 100% calibration in the air. The transmitter applies theoretical zero-point for the zero point base.



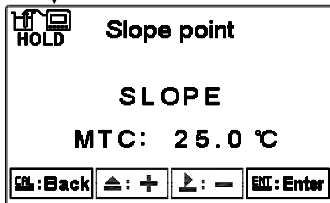
### 8.3.2 Two-Point Calibration (2-Point)

Normally, the D.O. sensor is not recommended for Two Point calibration. The first point of two-point calibration is to calibrate the ZERO point, and the second point is for slope calibration. Due to the extremely low current at zero point of a sensor, thus the zero point is only necessarily applied with very low D.O. measurement. For the two points calibration, please make sure the solution is indeed a zero-D.O. solution for zero point calibration. After finishing the zero point correction, the sensor is necessary to be steadily placed in the calibration medium for 10 ~ 30 minutes. Then, it is ready for the second point slope calibration. It is necessary the procedure of two point calibration to prevent the linear slope problem.



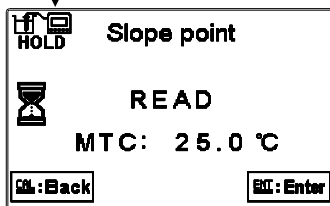
**Second point (Slope point)**

Put the sensor in the air or known solution and stay for 10~20 minutes.



Under MTC temp. mode, press or to adjust temperature. If under ATC temp. mode, (PTC or NTC), the temperature value is obtained by itself.

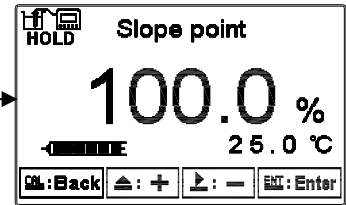
Press to confirm it.



At the time, the text "READ" appears and starts twinkling. Wait until the instrument finishes the reading or press to enter next display.

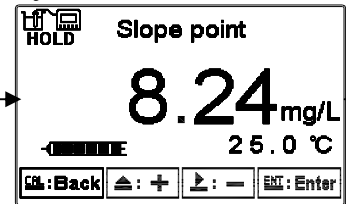
Press to confirm it.

Display of pre-amplifier sensor calibration.

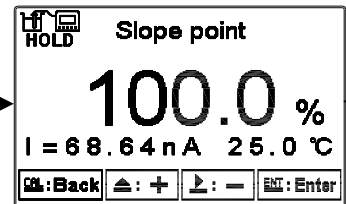


To adjust the Saturation %, press or to adjust to correct or known value.

To adjust the concentration ppm or mg/L, press or to adjust to correct or known value.

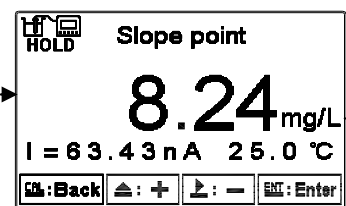


To adjust the Saturation %, press or to adjust to correct or known value.



Display of polarographic sensor calibration.

To adjust the concentration ppm or mg/L, press or to adjust to correct or known value.



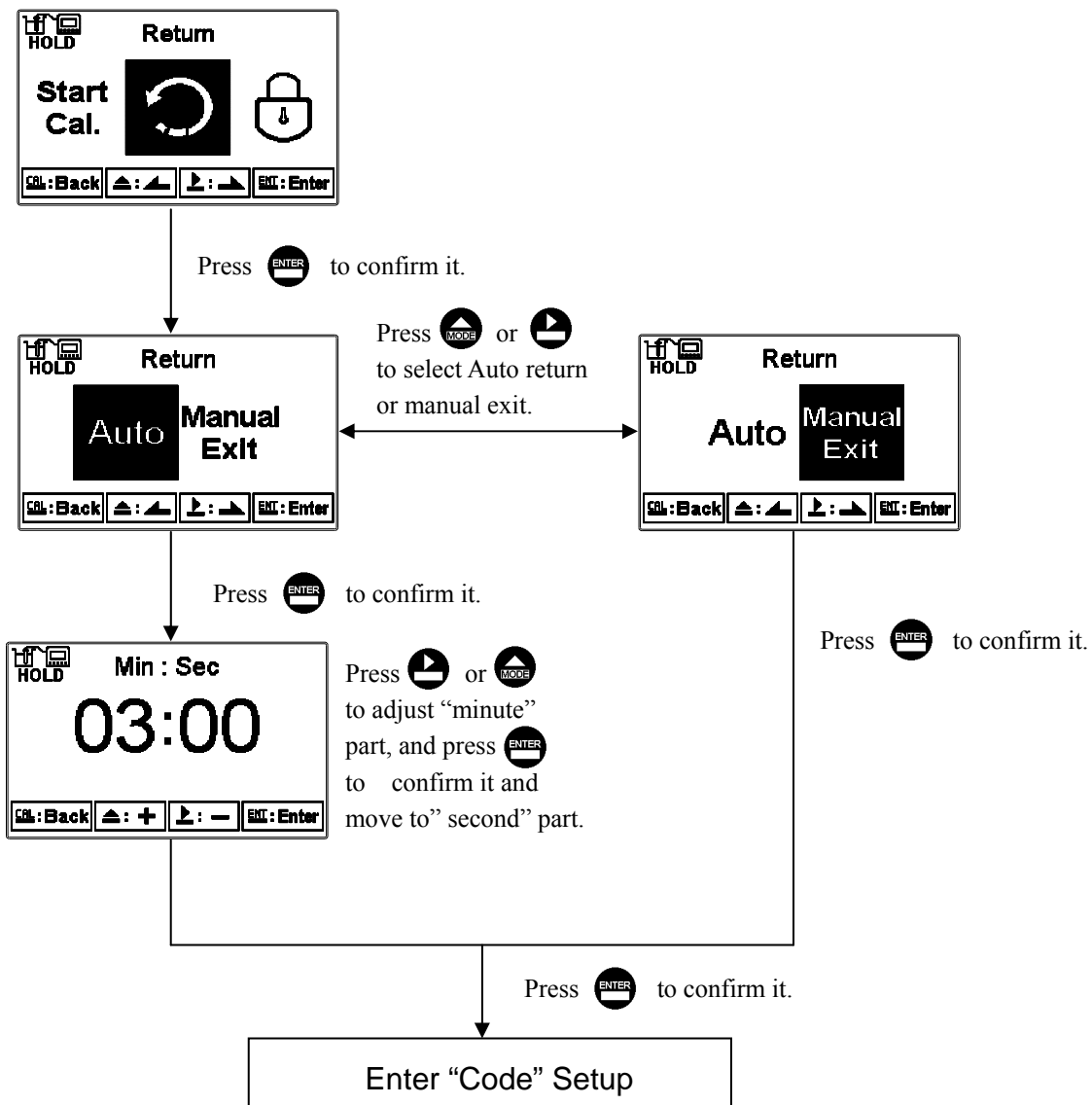
Press to confirm it.

**Back to the "Calibration" mode**

## 8.4 Return

Enter setup of auto return mode (Return) to set the function that the instrument automatically exit the setup menu after a period of time without pressing any key. The “Manual Exit” means that it needs to exit calibration setup menu manually, while “Auto” means that the display automatically exit the calibration setup menu and back to measurement mode after a period of time without pressing any key.

Note: the return function of setup menu and calibration setup menu are independent settings.

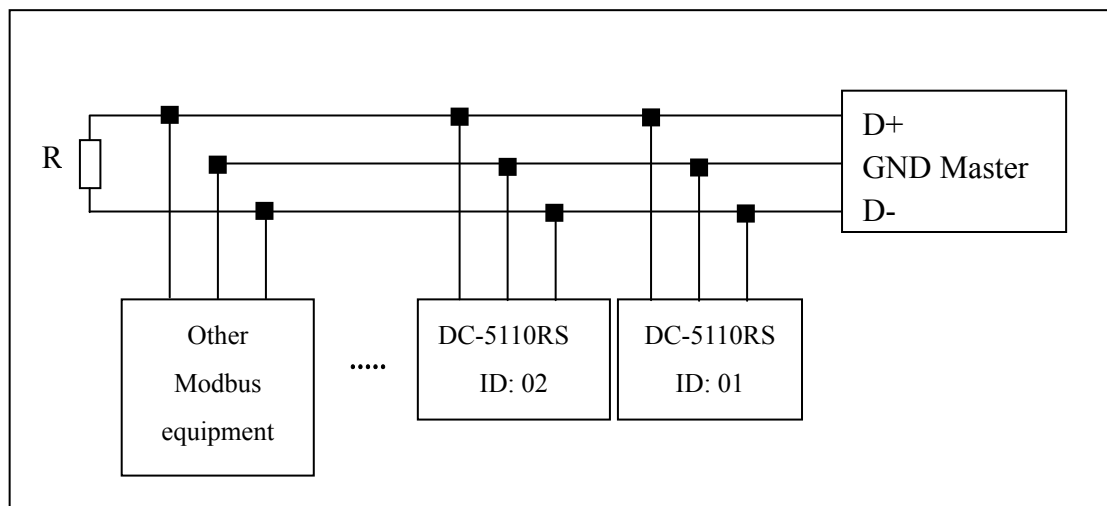




## 9. Modbus protocol and instructions

### 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 DC-5110RS 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	DC-5110		
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	2011-01-01, 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	0		
0017H	4		FLOAT	SP1	125.0%	Data affected by sign byte	
0019H	4		FLOAT	DB1	10.0%		

001BH	Relay 2 *	2	USHORT	0: OFF	1	Data affected by sign byte
				1: AUTO		
001CH		2	USHORT	Unused	1	
001DH		4	FLOAT	SP2	25.0%	
001FH		4	FLOAT	DB2	1.0%	

0021H	Backlight Brightness *	2	USHORT	0: AUTO	2	
				1: ON		
				2: OFF		
0022H	Backlight Brightness *	2	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	
			SHORT	1: High Sensitivity		
			SHORT	0: Standard		
			SHORT	-1: Low Sensitivity		
			SHORT	-2: Lowest Sensitivity		
0024H	Sample average of measurements (Digital Filter) *	2	USHORT	1-60	5	
0025H- 0030H	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	DC-5110RS 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	D.O. measurement	4	FLOAT	D.O. 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 (Contact off)	
0073H	MA too low	1	Current output over-range	0 (Contact off)	
0074H	Exceed temp. range	1	Temperature over-range	0 (Contact off)	
0075H	Exceed D.O. range	1	Measurement over-range	0 (Contact off)	
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.

## 10. Error messages (Error code)

Messages	Reason	Dispositions
<b>ERROR CODE</b>	Wrong password	Re-enter a password
<b>Error1</b>	SLOPE value exceeds the upper or lower limit	1. Replace the new membrane and electrolyte 2. Sensor failure, please replace a new sensor
<b>Error2</b>	The offset (zero-point) exceeds the upper or lower limit.	3. Replace the new membrane and electrolyte 1. Sensor failure, please replace a new sensor
<b>Error3</b>	The reading is unstable while calibration	Please maintain or replace the electrode, and make calibration again
<b>Error4</b>	The temperature is over the range 0~50°C while calibration.	Please adjust the standard solution to the proper temperature range.
<b>Error9</b>	Serious error that does not permit any further measuring	Please call service engineer.

## 11. Maintenance

Generally speaking, if normally operated, the controller produced by our company need no maintenance except 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. For the electrode cleaning time and methods, please refer to the Electrode Use Manual.

**Note: We reserve the right to modify displays and contents. The actual display of the transmitter is subject to change without notice.**

## 12. Appendix

### 12.1 Atmospheric pressure and relative height and % Air saturation table

At 100% relative humidity, % Air saturation and pressure, height table

<b>PSI</b>	<b>Bar</b>	<b>Relative height</b>	<b>CALIB VALUE</b>
14.84	1.023	84	101
14.69	1.013	0	100
14.54	1.003	85	99
14.49	0.999	170	98
14.25	0.983	256	97
14.11	0.973	343	96
13.96	0.963	431	95
13.81	0.952	519	94
13.66	0.942	608	93
13.52	0.932	698	92
13.37	0.922	789	91
13.23	0.912	880	90
13.08	0.902	972	89
12.94	0.892	1066	88
12.79	0.882	1160	87
12.63	0.871	1254	86
12.49	0.861	1350	85
12.34	0.851	1447	84
12.19	0.841	1544	83
12.05	0.831	1643	82
11.91	0.821	1743	81
11.76	0.811	1843	80
11.60	0.800	1945	79
11.46	0.790	2047	78
11.31	0.780	2151	77
11.17	0.770	2256	76
11.02	0.760	2362	75
10.88	0.750	2469	74
10.73	0.740	2577	73
10.59	0.730	2687	72
10.29	0.710	2797	71
10.28	0.709	2909	70
10.14	0.699	3023	69
9.99	0.689	3137	68
9.84	0.679	3253	67
9.70	0.669	3371	66

## 12.2 Temperature and salinity, dissolved oxygen saturation degree table

Under one atmospheric pressure (1.013Bar), exposed to the water saturated of air, the table of saturation degree of dissolved oxygen at different temperatures and different salinity.

Temp °C	Chlorinity	5.0	10.0	15.0	20.0	25.0
	Salinity	9.0	18.1	27.1	36.1	45.2
0	14.62	13.73	12.89	12.10	11.36	10.66
1	14.22	13.36	12.55	11.78	11.07	10.39
2	13.83	13.00	12.22	11.48	10.79	10.14
3	13.46	12.66	11.91	11.20	10.53	9.90
4	13.11	12.34	11.61	10.92	10.27	9.66
5	12.77	12.02	11.32	10.66	10.03	9.44
6	12.45	11.73	11.05	10.40	9.80	9.23
7	12.14	11.44	10.78	10.16	9.58	9.02
8	11.84	11.17	10.53	9.93	9.36	8.83
9	11.56	10.91	10.29	9.71	9.16	8.64
10	11.29	10.66	10.06	9.49	8.96	8.45
11	11.03	10.42	9.84	9.29	8.77	8.28
12	10.78	10.18	9.62	9.09	8.59	8.11
13	10.54	9.96	9.42	8.90	8.41	7.95
14	10.31	9.75	9.22	8.72	8.24	7.79
15	10.08	9.54	9.03	8.54	8.08	7.64
16	9.87	9.34	8.84	8.37	7.92	7.50
17	9.67	9.15	8.67	8.21	7.77	7.36
18	9.47	8.97	8.50	8.05	7.62	7.22
19	9.28	8.79	8.33	7.90	7.48	7.09
20	9.09	8.62	8.17	7.75	7.35	6.96
21	8.92	8.46	8.02	7.61	7.21	6.84
22	8.74	8.30	7.87	7.47	7.06	6.72
23	8.58	8.14	7.73	7.34	6.96	6.61
24	8.42	7.99	7.59	7.21	6.84	6.50
25	8.26	7.85	7.46	7.08	6.73	6.39
26	8.11	7.71	7.33	6.96	6.62	6.29
27	7.97	7.58	7.20	6.85	6.51	6.18
28	7.83	7.44	7.08	6.73	6.40	6.09
29	7.69	7.32	6.96	6.62	6.30	5.99
30	7.56	7.19	6.85	6.51	6.20	5.90
31	7.43	7.07	6.73	6.41	6.10	5.81
32	7.31	6.96	6.62	6.31	6.01	5.72

33	7.18	6.84	6.52	6.21	5.91	5.63
34	7.07	6.73	6.42	6.11	5.82	5.55
35	6.95	6.62	6.31	6.02	5.73	5.46
36	6.84	6.52	6.22	5.93	5.65	5.38
37	6.73	6.42	6.12	5.84	5.56	5.31
38	6.62	6.32	6.03	5.75	5.48	5.23
39	6.52	6.22	5.93	5.66	5.40	5.15
40	6.41	6.12	5.84	5.58	5.32	5.08
41	6.31	6.03	5.75	5.49	5.24	5.00
42	6.21	5.93	5.67	5.41	5.17	4.93
43	6.12	5.84	5.58	5.33	5.09	4.86
44	6.02	5.75	5.50	5.25	5.02	4.79
45	5.93	5.67	5.41	5.17	4.94	4.72
46	5.84	5.58	5.33	5.10	4.87	4.66
47	5.74	5.49	5.25	5.02	4.80	4.59
48	5.65	5.41	5.17	4.95	4.73	4.52
49	5.57	5.32	5.09	4.87	4.66	4.46
50	5.48	5.24	5.02	4.80	4.59	4.39





**SUNTEX INSTRUMENTS CO., LTD.**

13F, No. 31, Lane 169, Kangning St.,  
Xizhi Dist., New Taipei City, Taiwan (R.O.C.)  
Tel: 886-2-2695-9688  
Fax: 886-2-2695-9693  
e-mail: [suntex@ms1.hinet.net](mailto:suntex@ms1.hinet.net)

**[www.suntex.com.tw/en](http://www.suntex.com.tw/en)**