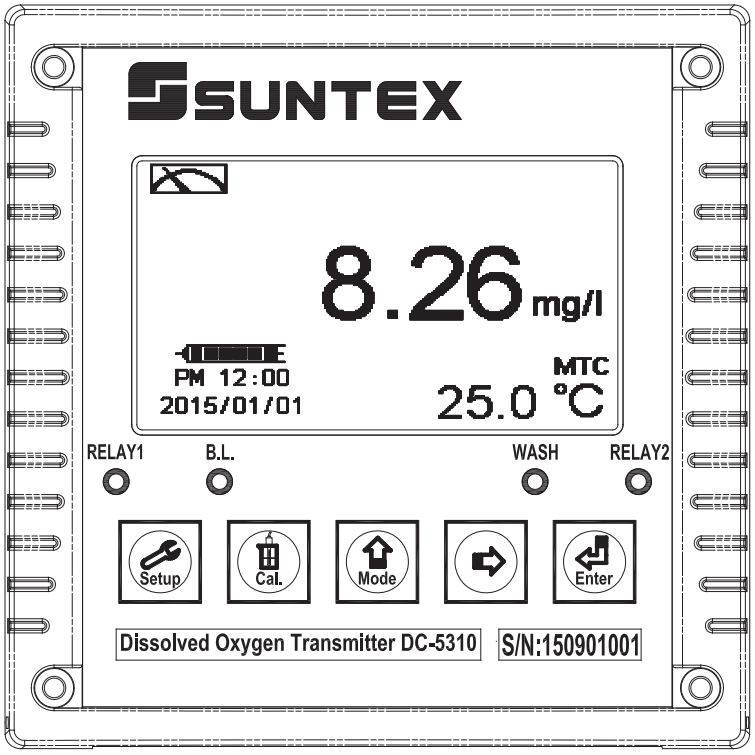
DC-5310
Microprocessor Dissolved Oxygen Transmitter

Operation Manual



SUNTEX

CONTENTS

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Precautions for installation

Wrong wiring will lead to breakdown or electrical shock of the instrument. Please read the operation manual carefully before installation.

- Make sure to remove AC power from the transmitter before wiring input, output connections, and remove it before opening the transmitter's housing.
- The installation site of the transmitter should be good in ventilation and avoid direct sunshine.
- The material of signal cable should be special coaxial cable. It is strongly recommended our coaxial cable be used instead of normal wires.
- Avoid electrical surge when using power. Especially when using three-phase power, use ground wire correctly. If the power surges interference occurs, separate the power supply of transmitter from the control device such as dosing machines, mixers, to make individual power supply for the transmitter; set surge absorber to reduce the power surges at all electromagnetic switches and power control device coils.
- **The internal relay contact of the instruments is for alarm or control function. Due to safety, please connect to external relay which can stand enough current to make sure the safety operation of the instruments.（Please refer to chapter 3.6 "Illustration of electrical connection"）**
- It shows SUNTEX logo on display of transmitter at any time, so it will not be seen on the graphic menu of function descriptions in the operation manual.

Brief Instruction

Description of parameter settings (see chapter 6 in detail)

Press [Setup] and [Mode] simultaneously to see the overview of the parameter settings. Then press [Enter] to enter setting mode for further parameter setup. Press keypad according to index of keypad on the screen.

Index of keypad

keypad	Icon	Description
Setup	SET:Back	Back to upper layer.
Mode	◢:	Switch to left item or page.
	◢: +	Increase digit.
⇨	◣:	Switch to right item or page.
	◣: —	Decrease digit.
Enter	ENT: Enter	Confirmation.

Selection of set-up items

keypad	Icon	Description
Mode		Measurement mode 1. Select sensor type from polargraphic or preamplifier 2. Measuring unit selection ● Polargraphic: Sat%, O_2%, ppm, mg/l, ppb or µg/l ● Preamplifier: Sat%, ppm or mg/l Note: Salinity compensation is required if measuring unit is set in concentration.
Product Adj.		Product adjustment; it is available for users to make correction to on-site measurement directly without taking the electrode out for calibration.
Temperature		Temperature measurement and compensation, inclusive of ATC & MTC. ATC: Automatic Temperature Compensation; MTC: Manual Temperature Compensation.

Relay 1		First alarm contact setup (ON/OFF).
Relay 2		Second alarm contact setup (ON/OFF).
Clean		Automatic cleaning duration setup; set the time to turn electrode cleaning devices (optional) ON/ OFF.
Analog 1		Analog current output matched to DO (Sat%, O_2% or concentration) range setup.
Analog 2		Analog current output matched to temperature range setup.
Clock		Date / time setup. **(If the power supply is cut, the clock will resume default settings.)**
Digital Filter		Signal-averaged setup.
Back Light		Backlight setup; to set backlight, brightness and sensitivity.
Contrast		Contrast setup.
Return		Automatic return to measurement mode.
Code		Setting security code setup; setting code takes a higher priority to calibration code.
Language		Available for English, Traditional Chinese or Simplified Chinese

Description of calibration settings (see chapter 7 in detail)

Press [Cal.] and [Mode] simultaneously to see the last calibration information. Then press [Enter] 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	Icon	Description
Cal.	CAL:Back	Back to upper layer.
Mode	▲: ◢	Switch to left item or page.
	▲: +	Increase digit.
⇨	▶: ◢	Switch to right item or page.
	▶: −	Decrease digit.
Enter	ENT: Enter	Confirmation.

Selection of calibration items

keypad	Icon	Description
Calibration	Start Cal.	Calibration mode.
1-point	1-point Calibration	Single point for slope calibration.
2-point	2-point Calibration	2-point calibration; zero point & slope calibration.
Pressure	bar	Pressure unit.
Pressure	mmHg	Pressure unit.
Pressure	psi	Pressure unit.
Return	↺	Automatic return duration setup.
Code	🔒	Calibration security code.

1. Specifications

1.1 Specifications

Model		DC-5310
Measuring modes		%Sat / $\%O_2$ / ppm / mg/l / ppb / µg/l / Temp
Ranges	% Sat	0~600 % (Depends on the sensor)
	$\%O_2$	0~120 % (Depends on the sensor)
	mg/l, ppm	0~60.00 mg/l (ppm) (Depends on the sensor)
	µg/l, ppb	0~9999.9 µg/l (ppb) (Depends on the sensor)
	Temp	0~140°C (Depends on the sensor)
Resolutions	% Sat	0.1%
	$\%O_2$	0.01%
	mg/l, ppm	0.01mg/l / 0.001mg/l (0.01ppm / 0.001ppm)
	µg/l, ppb	0.1µg/l (ppb)
	Temp	0.1℃
Accuracy	% Sat	±0.5% of reading (± 1 Digit)
	$\%O_2$	
	mg/l, ppm	
	µg/l, ppb	
	Temp	±0.2°C(± 1 Digit) with temperature error correction function
Temperature compensation		NTC30K/ NTC22K Auto Temperature Compensation
		Manual Temperature Compensation
Salinity compensation		0.0~45ppt, Manual Compensation
Pressure compensation		0.500~2.500bar or 7.25~36.25psi or 500~2500mmHg Manual Compensation
Calibration mode		Single point or 2-point calibration
Ambient temp.		0~50°C
Storage temp.		-20~70°C
Display		Large LCM with auto-sense backlight & contrast function.
Languages		Available with English, Traditional Chinese and Simplified Chinese
Analog output 1		Isolated DC 0/4~20mA matched to DO measurement, with Max. load of 500Ω
Analog output 2		Isolated DC 0/4~20mA corresponding to Temp., with Max. load of 500Ω
Control	Contact	RELAY ON/OFF contact, 240VAC 0.5A Max. (Recommended)
	Activation	Hi/Lo, Hi/Hi, Lo/Lo, two individual limited programmable (ON/OFF)
Wash		Contact output: ON 0~99min. 59sec. / OFF 0~999hr 59min.
Voltage output		DC±8V, 0.5W Max.
Protection level		IP65

Power supply	100V~240VAC±10%, 8W max., 50/60Hz
Installation	Wall or Pipe or Panel Mounting
Dimensions	144mm × 144mm × 115mm (H×W×D)
Cut off dimensions	138mm × 138mm (H×W)
Weight	0.8Kg

Note: The specifications are subject to change without notice.

1.2 Accessory

1.2.1 Standard accessories

1. 4 panel mounting clips
2. Plastic L-shaped electrode holder support base

1.2.2 Optional accessories

1. 690 D.O. sensor, with 7m cable
2. 8-09-5 + DO-100, Protective Sensor Holder for D.O. sensor, 1M Incl. Junction box
3. 8-SF01, Protection holder float for measurement in variable water levels or in lakes, etc.
4. 8-CH-20, D.O. sensor head auto clean kit
5. F94008-G, Extension cable for 690 D.O. sensor (per meter)
6. 8-35 + 8-35-1, Sun shield for 1/2 DIN transmitter with Pipe mounting kit
7. 8-35 + 8-35-2, Sun shield for 1/2 DIN transmitter with Wall mounting kit

Note: Please refer to “ch3.5 Typical Wiring” for sensor wiring.

2. Assembly and installation

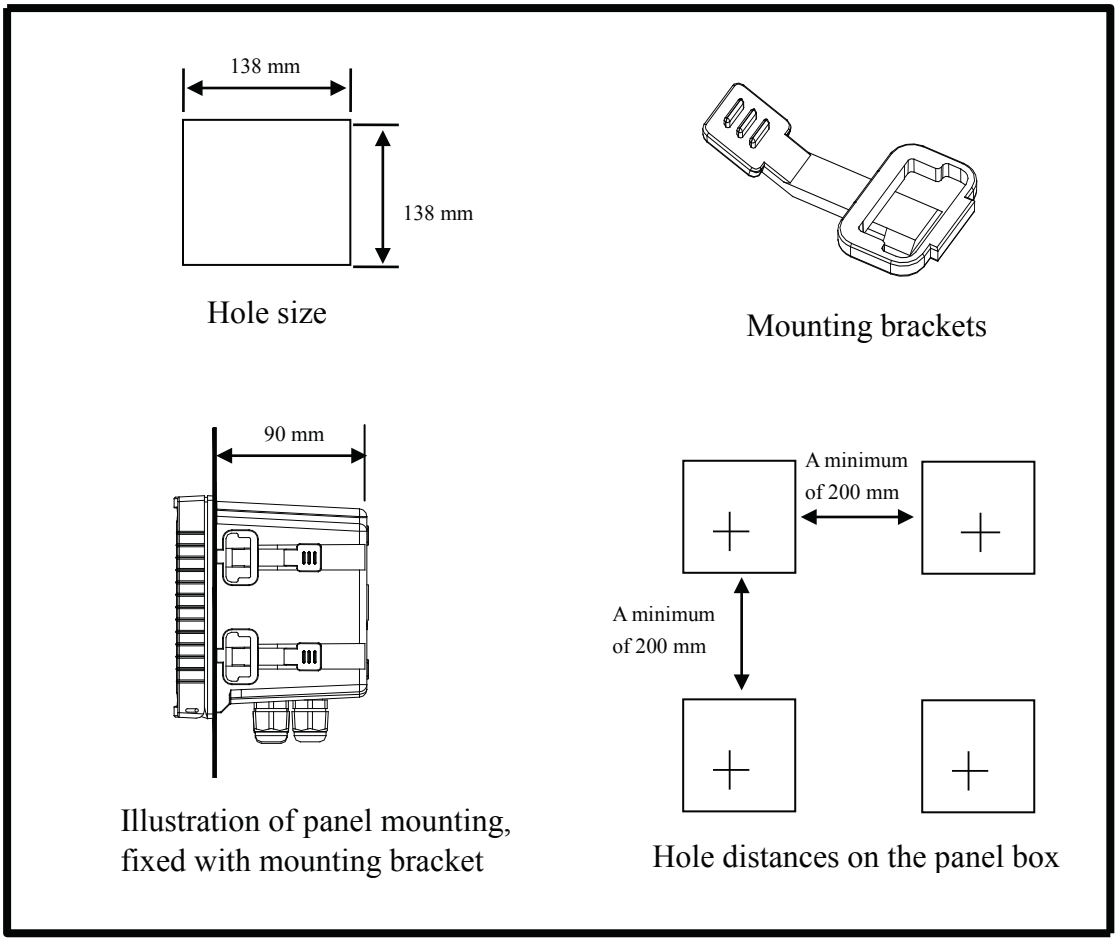
2.1 Transmitter installation:

The unit can be installed through panel mounting, wall mounting and 2” pipe mounting.

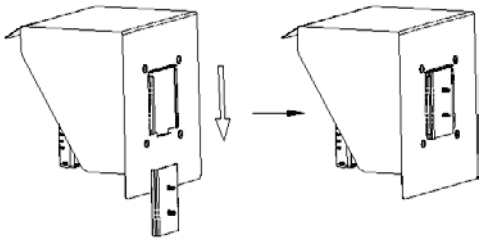
Installation of panel mounting:

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

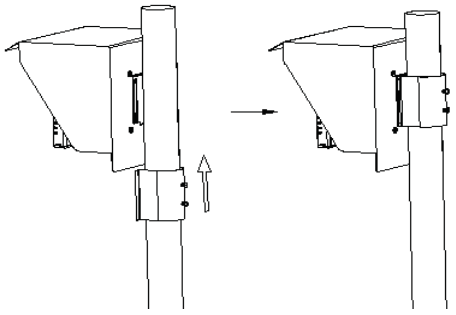
2.2 Illustration of panel mounting



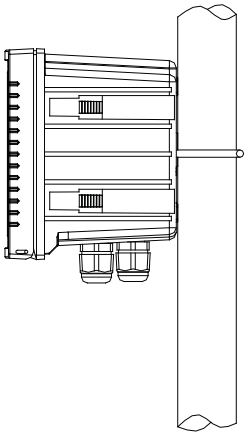
2.3 Illustration of wall mounting and pipe mounting



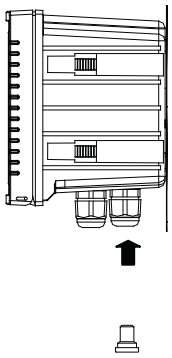
Sun Shield (Wall mounting, Optional)
(Order No.: 8-35 + 8-35-2)



Sun Shield (Pipe mounting, Optional)
(Order No.: 8-35 + 8-35-1)



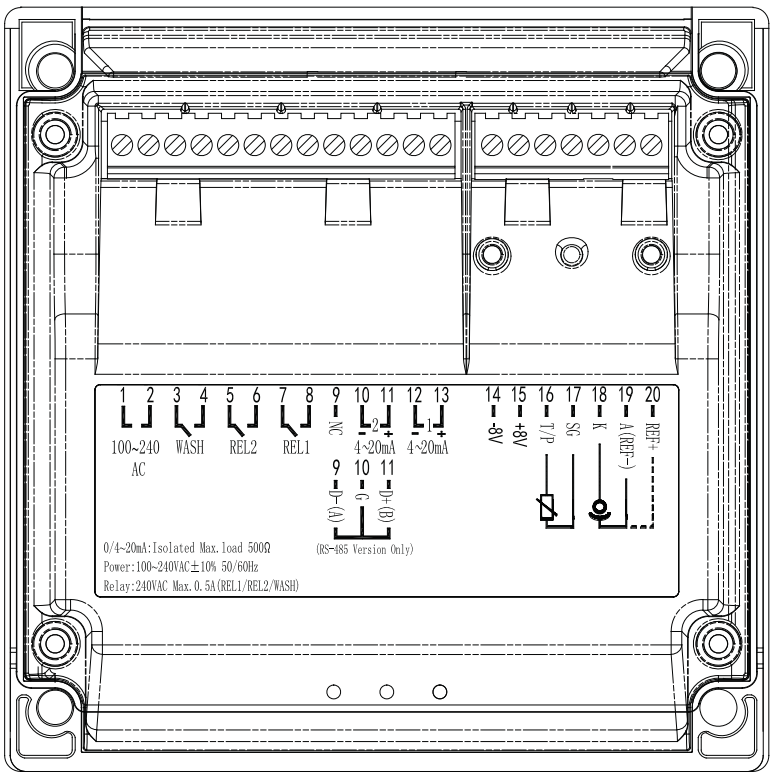
Installation of pipe mounting, fixed with an U-shaped pipe clamp (optional)
(Order No.: 8-34)



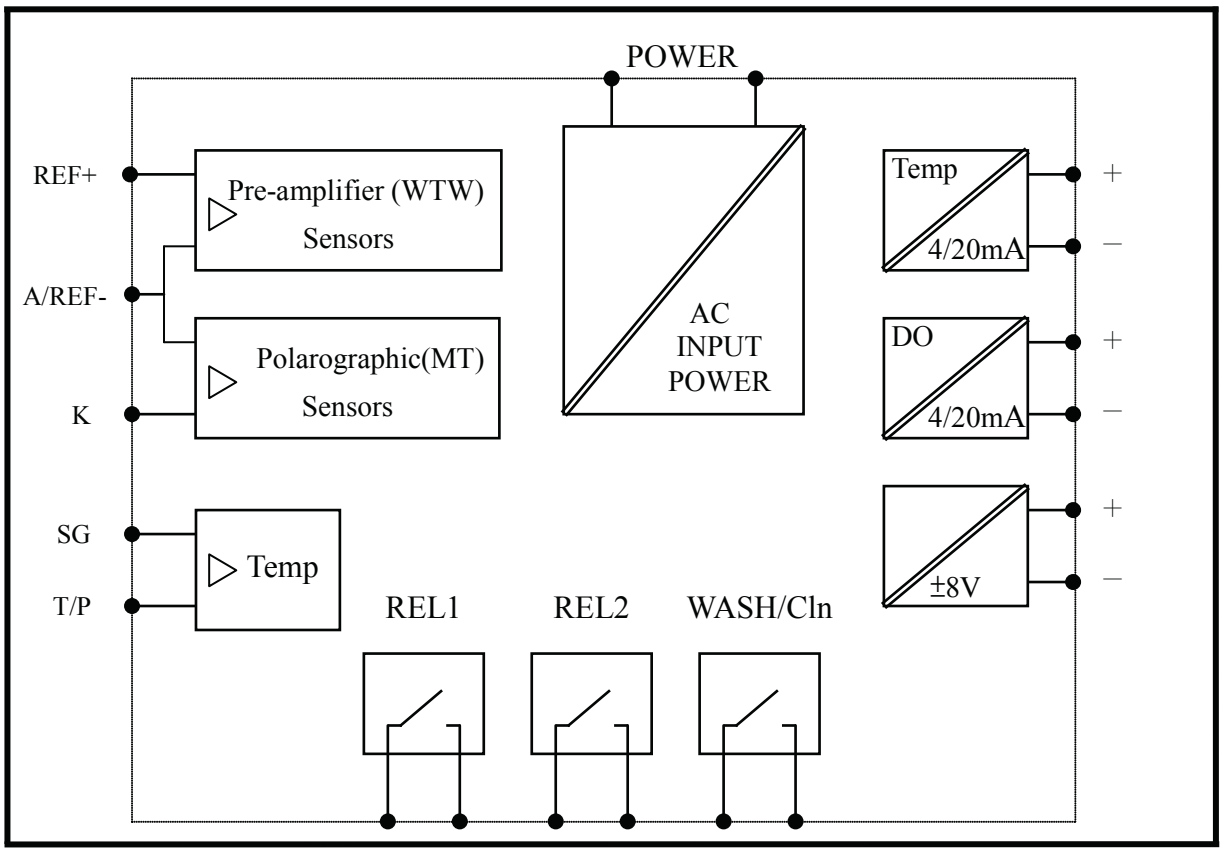
Insert the rubber plug into the unused cable gland, and tighten up the cable gland to prevent water vapor from penetration.

3. Overview of Intelligent Dissolved Oxygen Transmitter DC-5310

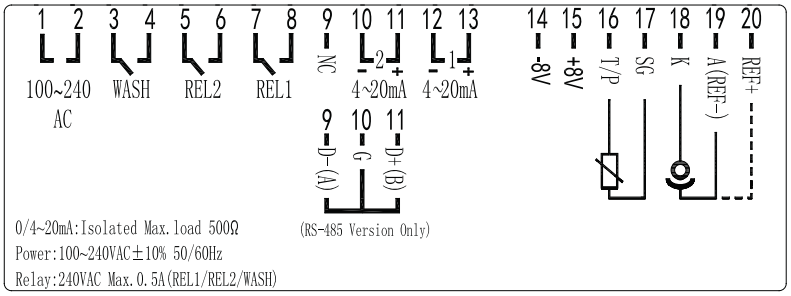
3.1 Illustration of rear panel



3.2 Illustration of terminal function



3.3 Description of terminal function



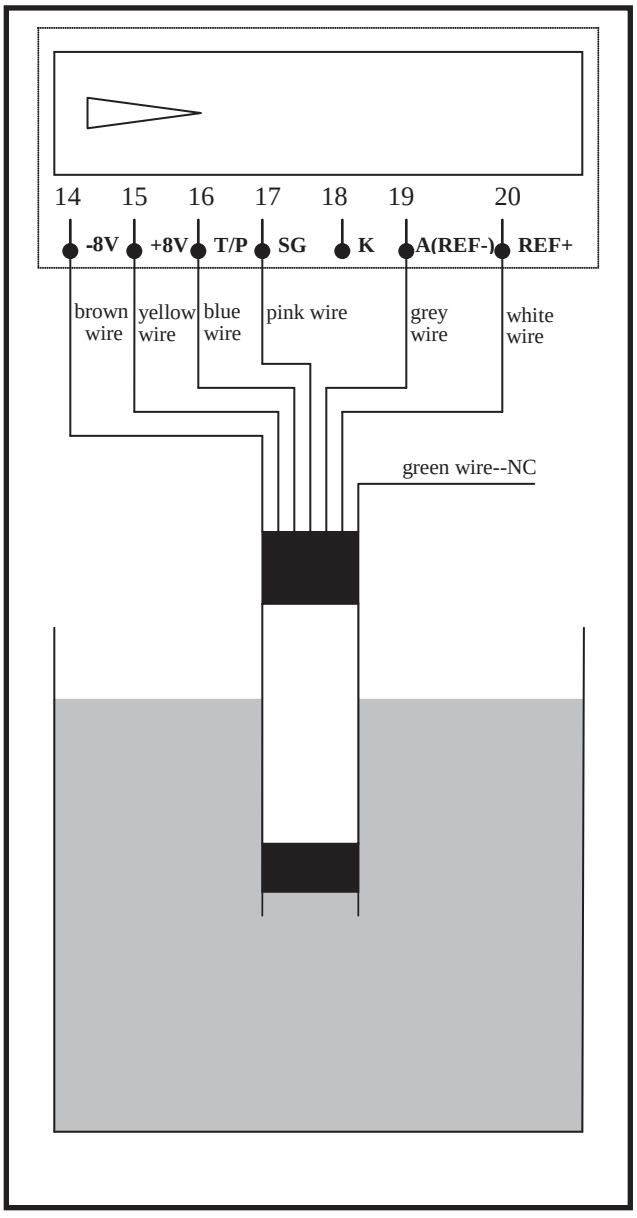
Terminal number		Wiring type 1 Preamplifier voltage sensor	Wiring type 2 Polar-graphic current signal sensor
01 02	**100~240 AC**	100~240AC power supply terminal	
03 04	**WASH**	External washing devices relay terminal	
05 06	**REL2**	The second alarm control; external relay terminal	
07 08	**REL1**	The first alarm control; external relay terminal	
09	**NC / D-(A)**	NC	
10	**4~20mA - / G**	Temperature value current output terminal-, for external recorders or PLC devices	
11	**4~20mA + / D+(B)**	Temperature value current output terminal+, for external recorders or PLC devices	
12	**4~20mA -**	DO measurement value current output terminal-, for external recorders or PLC devices	
13	**4~20mA +**	DO measurement value current output terminal+, for external recorders or PLC devices	
14	**-8V**	Sensor cable---Brown wire	NC
15	**+8V**	Sensor cable---Yellow wire	NC
16	**T/P**	Temperature cable---Blue (NTC30K)	Temperature cable---White (NTC22K)
17	**SG**	Temperature cable---Pink (NTC30K)	Temperature cable---Green (NTC22K)
18	**K**	NC	Sensor cable---transparent wire (Cathode)
19	**A(REF-)**	Sensor cable---Gray wire	Sensor cable---Red wire (Anode)
20	**REF+**	Sensor cable---white wire	NC
	ESD SHIELD	NC	Green/ yellow wire
	------	Green wire---NC	Blue/ grey wire---NC

3.4 Category of electrodes and selection of polarization voltage

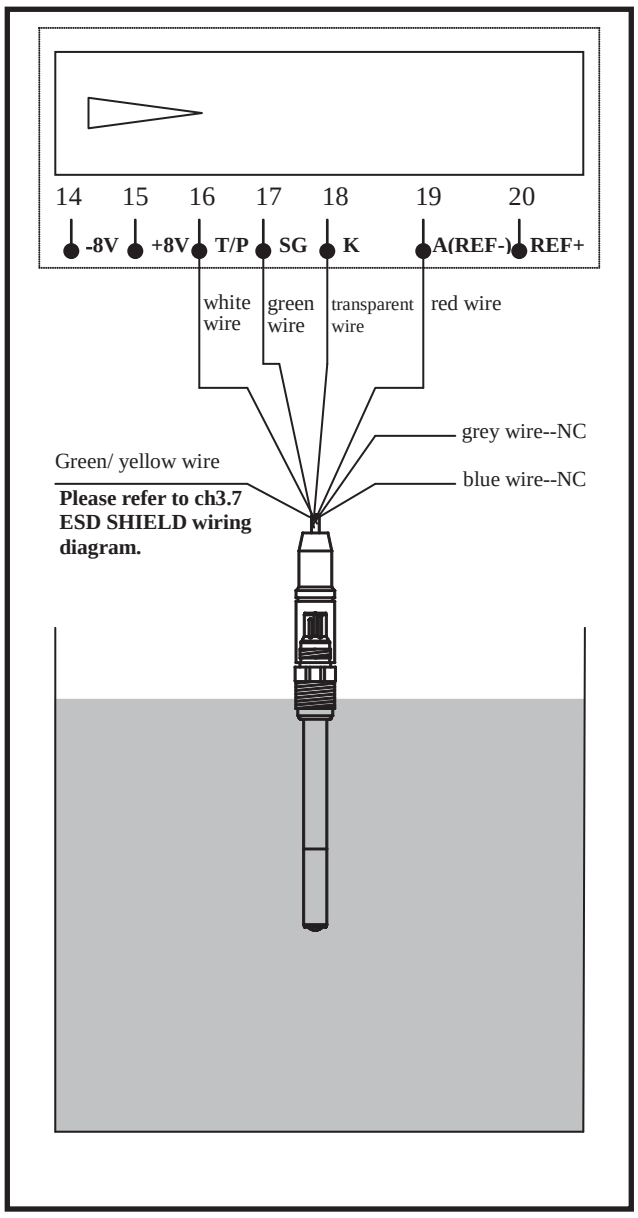
Pre-amplifier WTW Preamplifier voltage sensor	Polarographic MT Polar-graphic current signal sensor	
TriOximatic 690	InPro 6800 series	-675mV
TriOximatic 700 series	InPro 6900 seires	-500mV
	InPro 6050	-675mV

3.5 Typical wirings

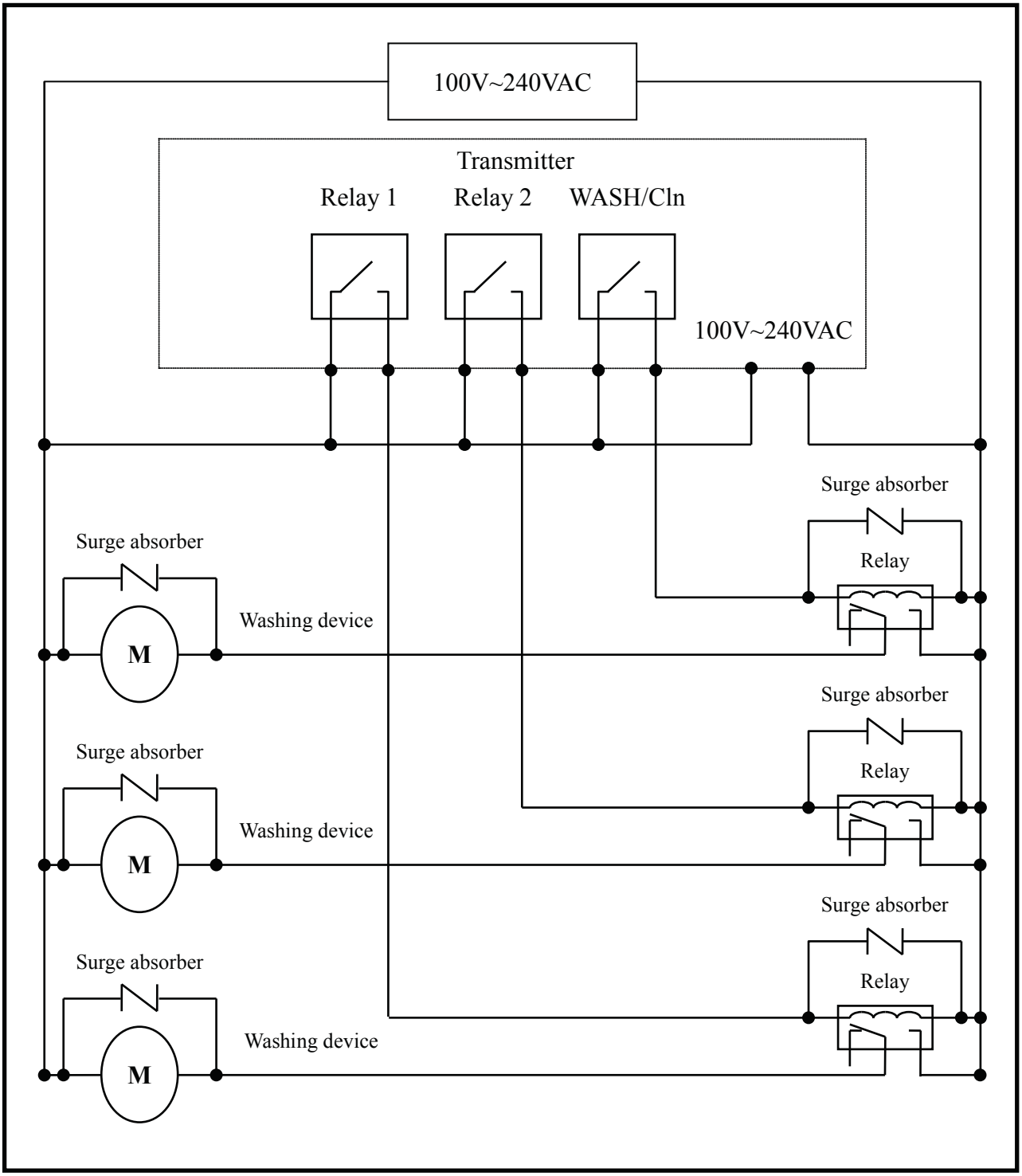
Preamplifier voltage sensor



Polar-graphic current signal sensor



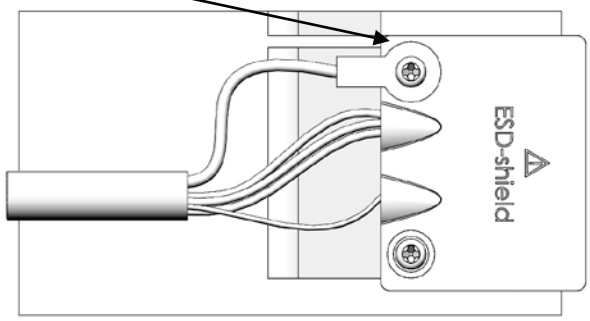
3.6 Illustration of electrical connection



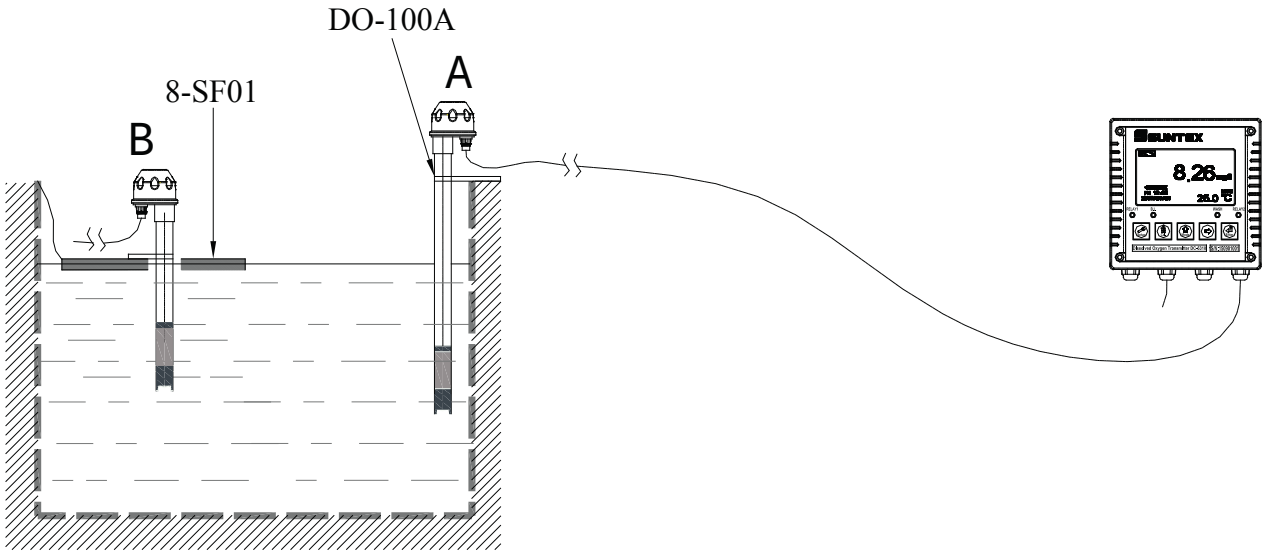
Note: Repair and replacement of the built-in miniature relay of the transmitter require professional technicians. It is recommended that an external relay (Power Relay) should be used to activate the external equipments.

3.7 ESD wiring diagram

Add an O-ring terminal to the end of the green/ yellow wire of MT sensor and screw it on the ESD shield.



3.8 Illustration of online DO pipe system (optional)

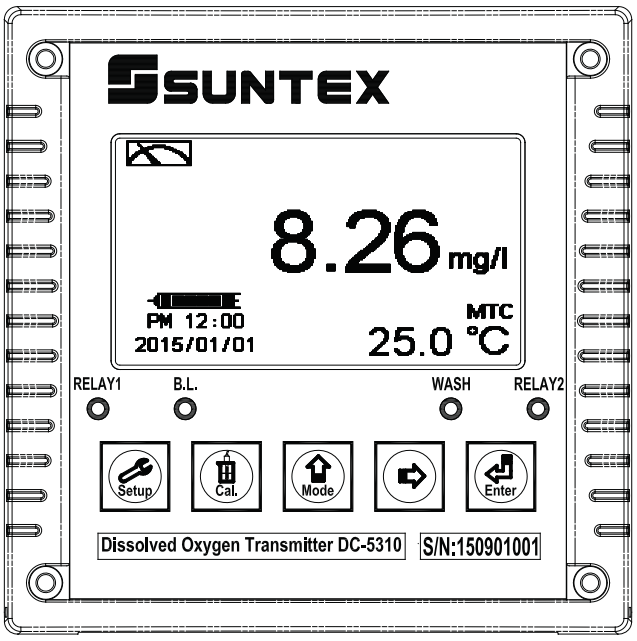


A: Immersive type

B: Float type

4. Configuration

4.1 Illustration of front panel



4.2 Keypad

In order to prevent inappropriate operation by others, before entering parameter setting and calibration, the operation applies composite keys and coding protection if necessary. Descriptions of key functions are as follows:

Setup : In the parameter set-up mode, pressing this key allows you to exit from parameter set-up mode to Measurement mode.

Cal. : In the Calibration mode, pressing this key allows you to exit from Calibration mode to Measurement mode.

Mode :
1. In the parameter set-up mode and Calibration mode, press this key to select leftward or change to another page.
2. When adjusting values, press this key to increase the value

:
1. In the parameter set-up mode and Calibration mode, press this key to select rightward or change to another page.
2. When adjusting value, press this key to decrease the value.

Enter : Press this to confirm it and enter the next step.

4.3 LED indicators

WASH : Washing device relay (WASH/Cln) indicator

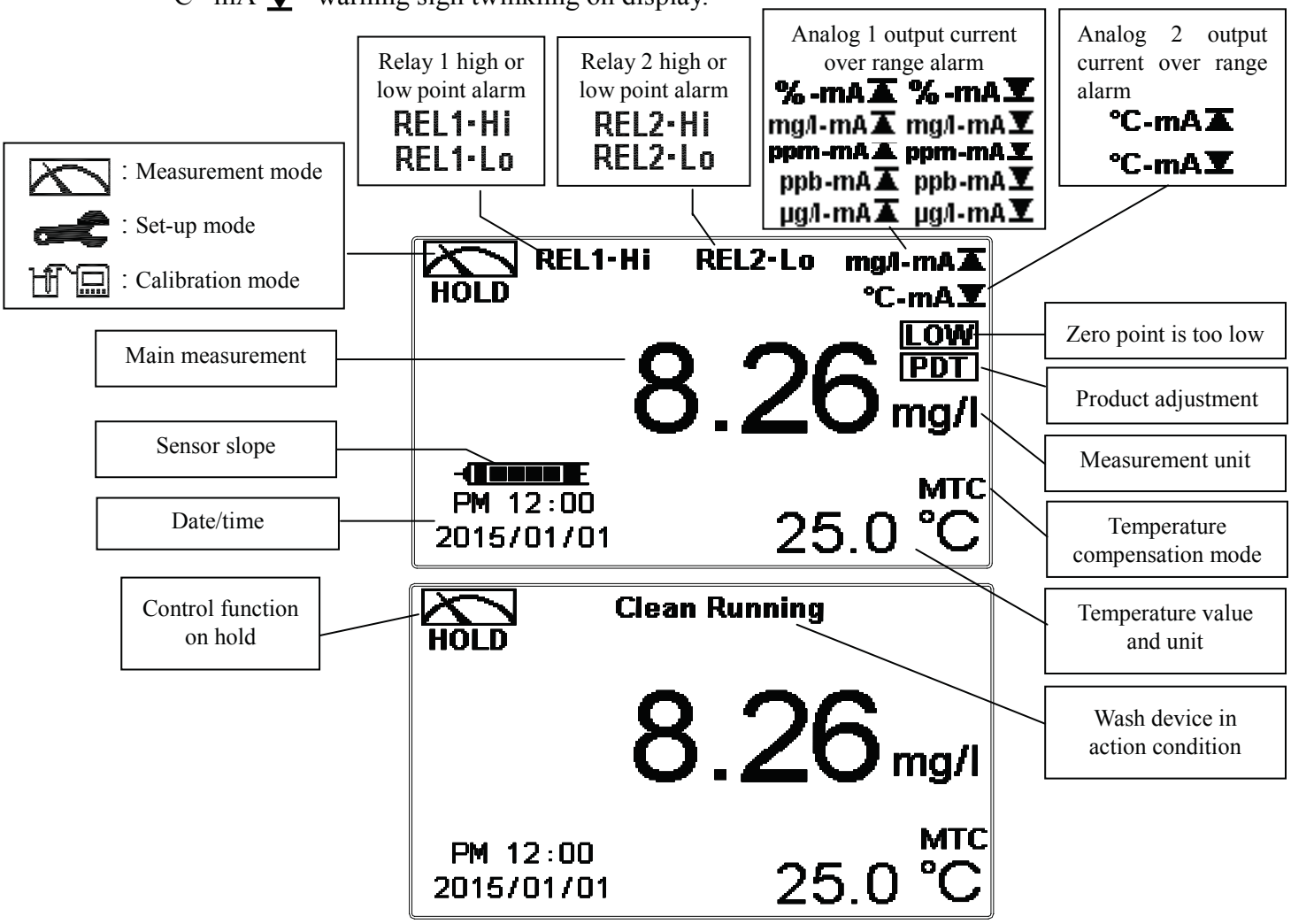
RELAY1 : Dosing device relay (Relay 1) indicator

RELAY2 : Dosing device relay (Relay 2) indicator

B.L. : Ambient Light Sensor; it will turn ON or OFF backlight automatically according to lights from the surroundings under Automatic Backlight Mode.

4.4 Display

1. When washing device is activated, it will show “HOLD” sign on display and the description “Clean Running” will be twinkling. At the same time, the WASH indicator LED will light up, and the transmitter will automatically turn off Relay 1 and Relay 2 function. After cleaning is complete, both Relay 1 and Relay 2 will automatically resume working.
2. When Relay 1/ Relay 2 which is set in high setting point is in action, the description “REL 1_Hi / REL 2_Hi” will show and twinkle on display and RELAY1/RELAY2 will light up. When Relay 1 / Relay 2 which is set in low setting point is in action, the description “REL 1_Lo / REL 2_Lo” will show and twinkle on display and RELAY1/ RELAY2 indicator LED lights up.
3. When the Analog 1 output current exceeds the upper / lower range, it will show “%-mA ▲ / %-mA▼”, “mg/l-mA▲/ mg/l-mA▼”, “ppm-mA▲/ ppm-mA▼”, “ppb-mA ▲ /ppb-mA▼” or “µg/l -mA ▲ /µg/l -mA▼” warning sign twinkling on display.
4. When the Analog 2 output current exceeds the upper / lower range, it will show “°C-mA▲ / ˚C –mA ▼” warning sign twinkling on display.



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.

4.5 Sensor slope status (applied to Preamplifier sensors only)

There are 4 types of slope status  as follows.

 : the sensor is in a perfect condition.

 : the sensor is in a good condition.

 : the sensor is still in an acceptable condition.

 : the sensor has been aged and requires being replaced.

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 [Setup] and [Mode] simultaneously to enter set-up menu, and press [Setup] to go back to measurement mode.

5.3 Calibration menu:

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

5.4 Default value:

5.4.1 Master reset:

Measurement mode: Preamplifier
Measurement unit: mg/l
Product Adjustment: 0.00 mg/l
Temperature compensation: ATC
Relay 1: High point alarm (Hi), AUTO, SP1= 10.00 mg/l, Hys.= 0.10 mg/l
Relay 2: Low point alarm(Lo), AUTO, SP2 = 5.00 mg/l, Hys.= 0.10 mg/l
Wash time: OFF
Analog 1 current output (DO): 4~20 mA, 0.0~10.00 mg/l
Analog 2 current output (Temp): 4~20 mA, 0.0~50.0 ℃
Date & Time: 2015/1/1 00:00:00
Digital filter: 15
Backlight setting: OFF
Contrast: 0
Auto back: Auto, 3 minutes
Code set-up: OFF

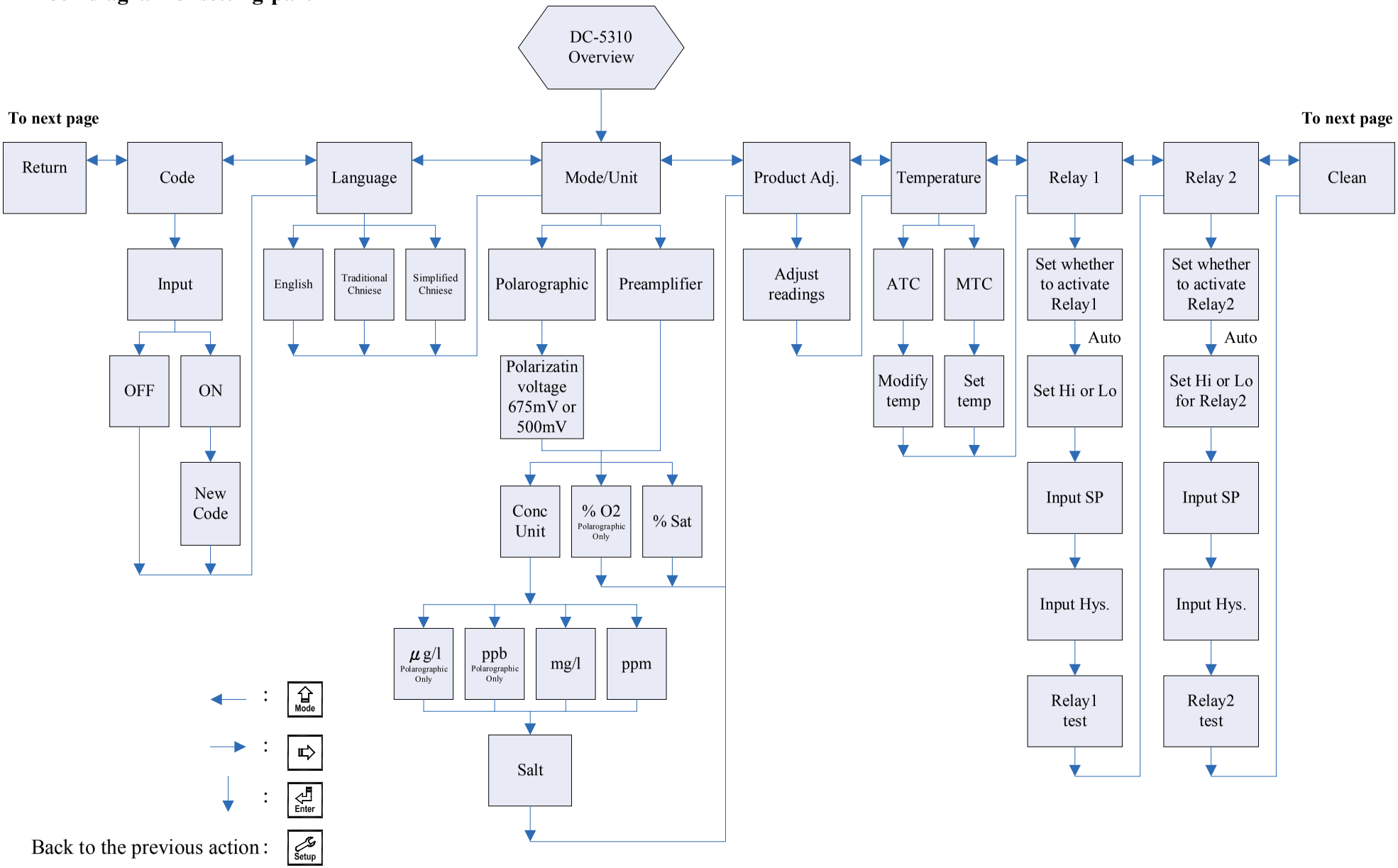
5.4.2 Calibration default value:

Cal Type: No Cal
Cal Pressure: 1.013 bar
Cal Temp: None
Relative Slope: None
Saturation: None
Auto back: Auto, 3 minutes
Code set-up: OFF

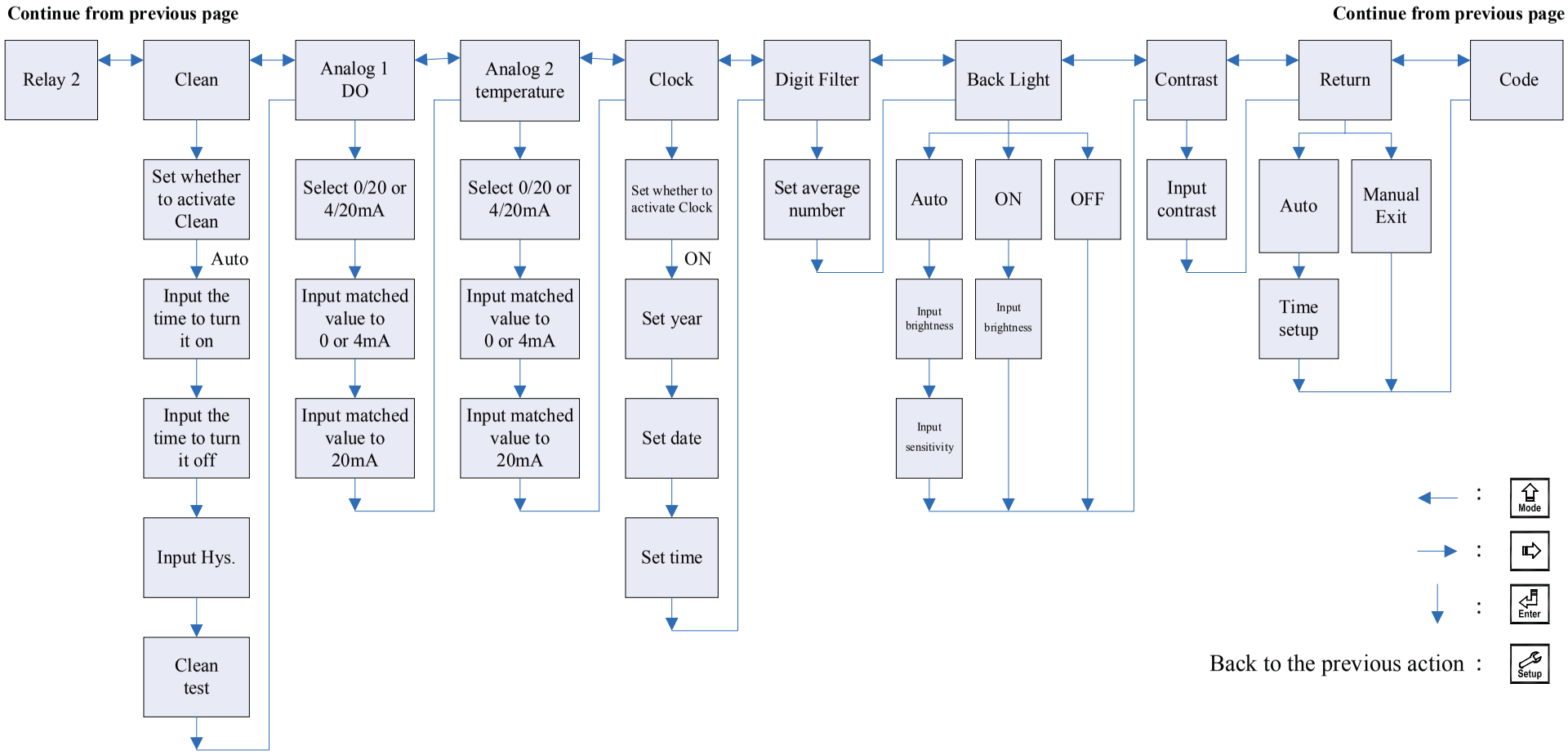
Note: The calibration default is “No Cal” and thus “None” means there is no calibration data available, which means that the user has not calibrated the sensor with the transmitter yet.

6. Settings

Block diagram of setting-part 1

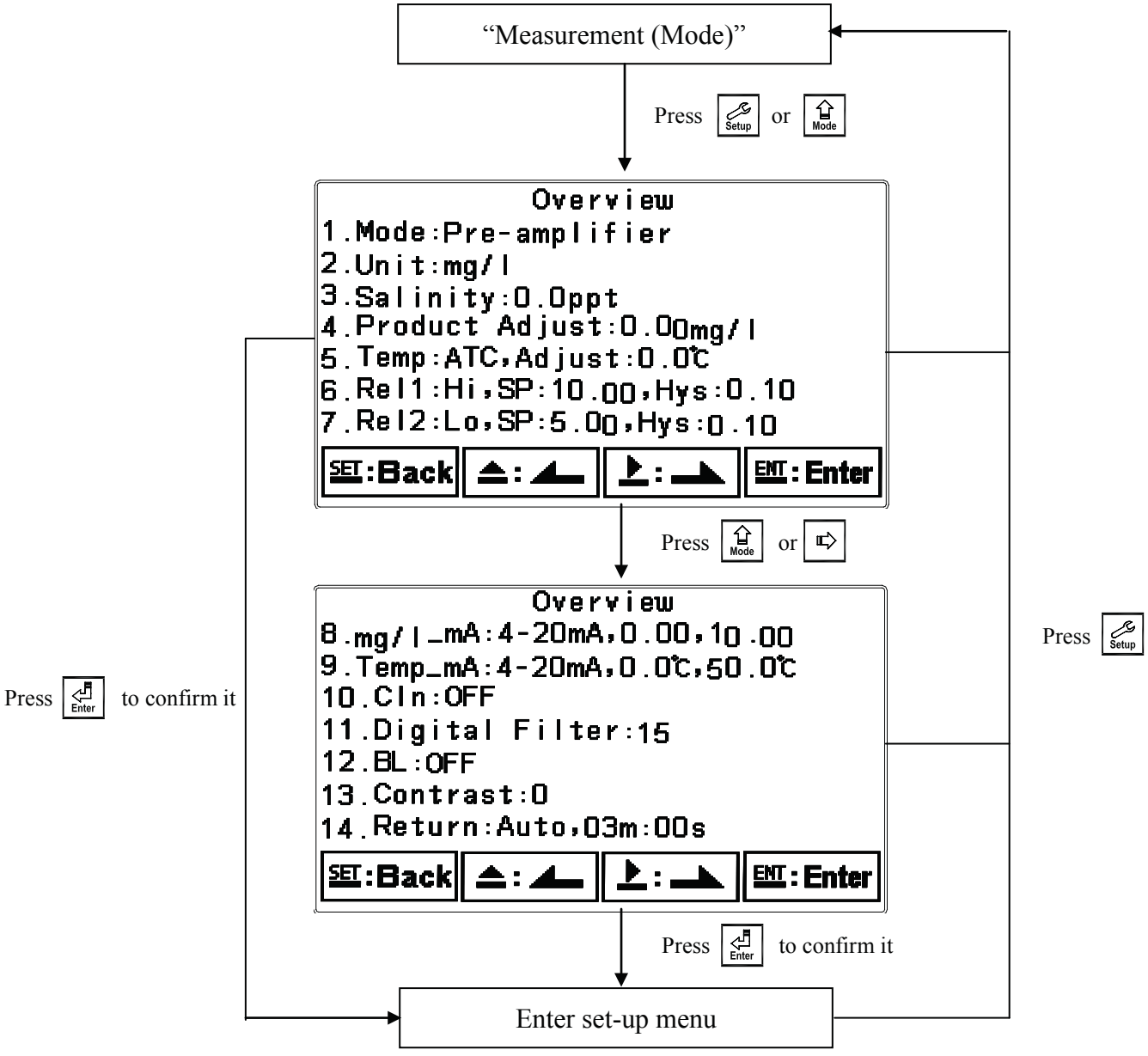


Block diagram of setting-part 2



6.1 Entry of set-up menu

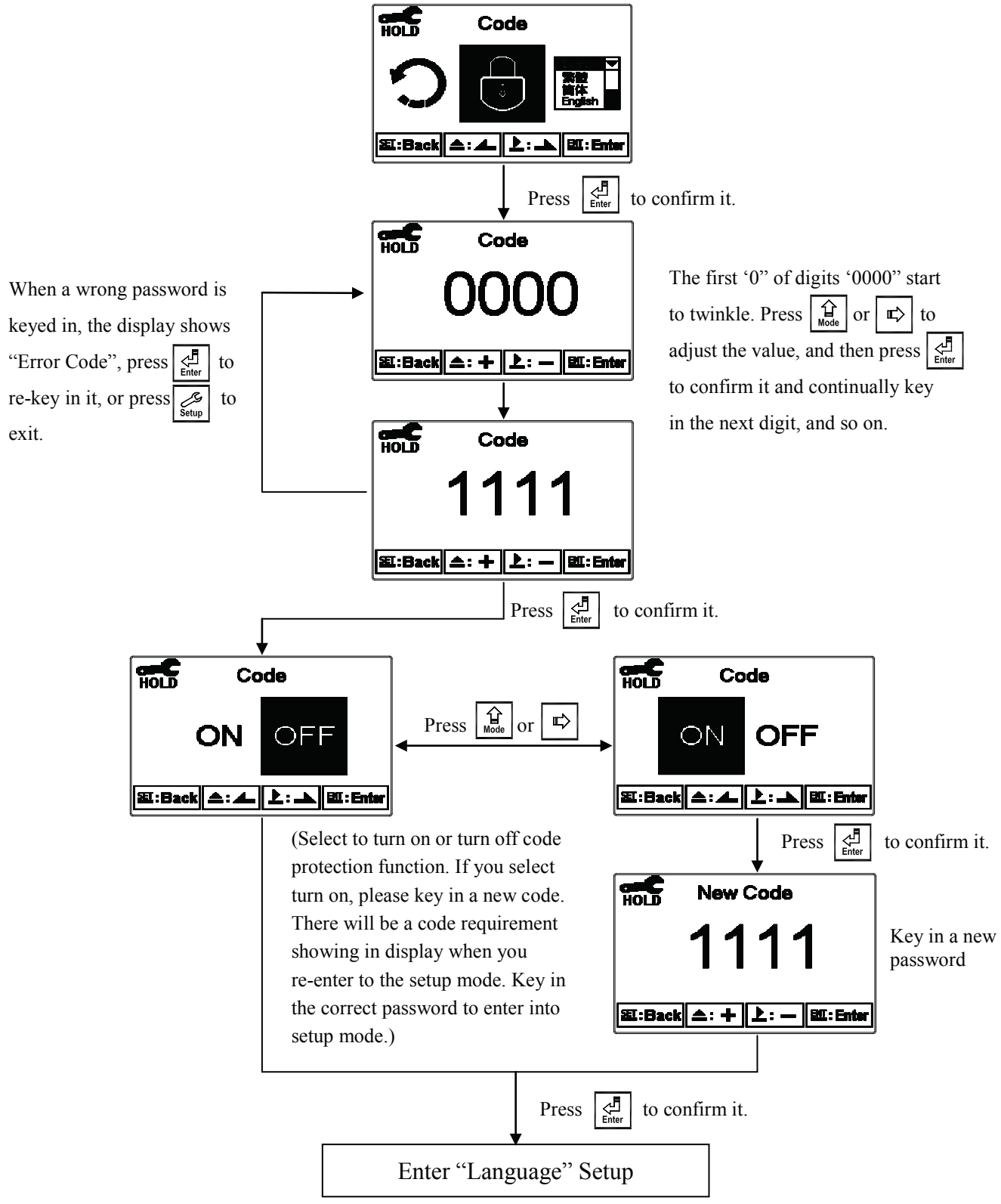
In the measurement mode, pressing the two keys Setup and Mode simultaneously allows you to enter and see an Overview for current setting; if there is no need to modify parameter, press Setup to go back to measurement mode. Press Enter to enter the set-up mode on Overview display.



6.2 Security code of settings

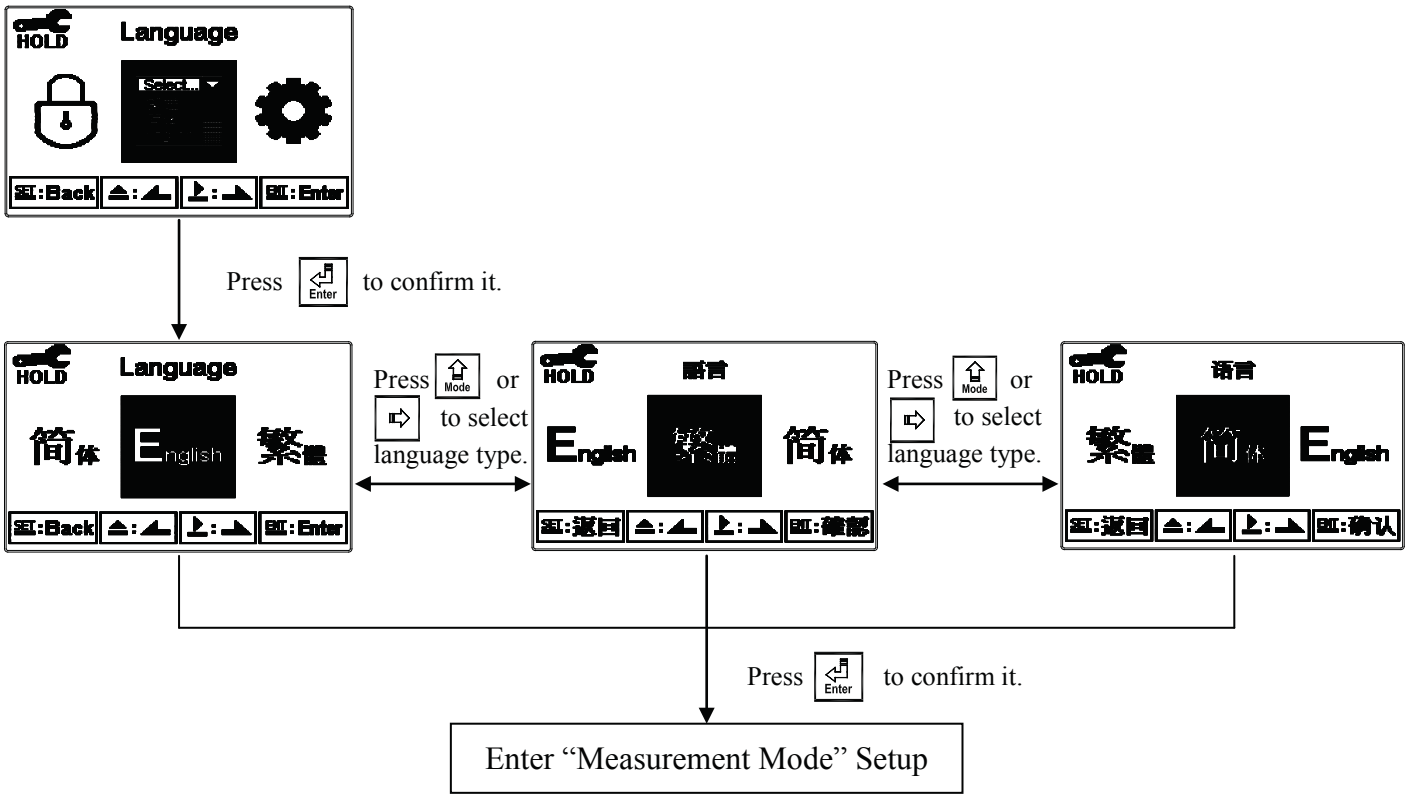
After entering set-up mode, select "code" item, press [Enter] to enter into code procedure. **The code pre-setting is 1111.**

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.



6.3 Language

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

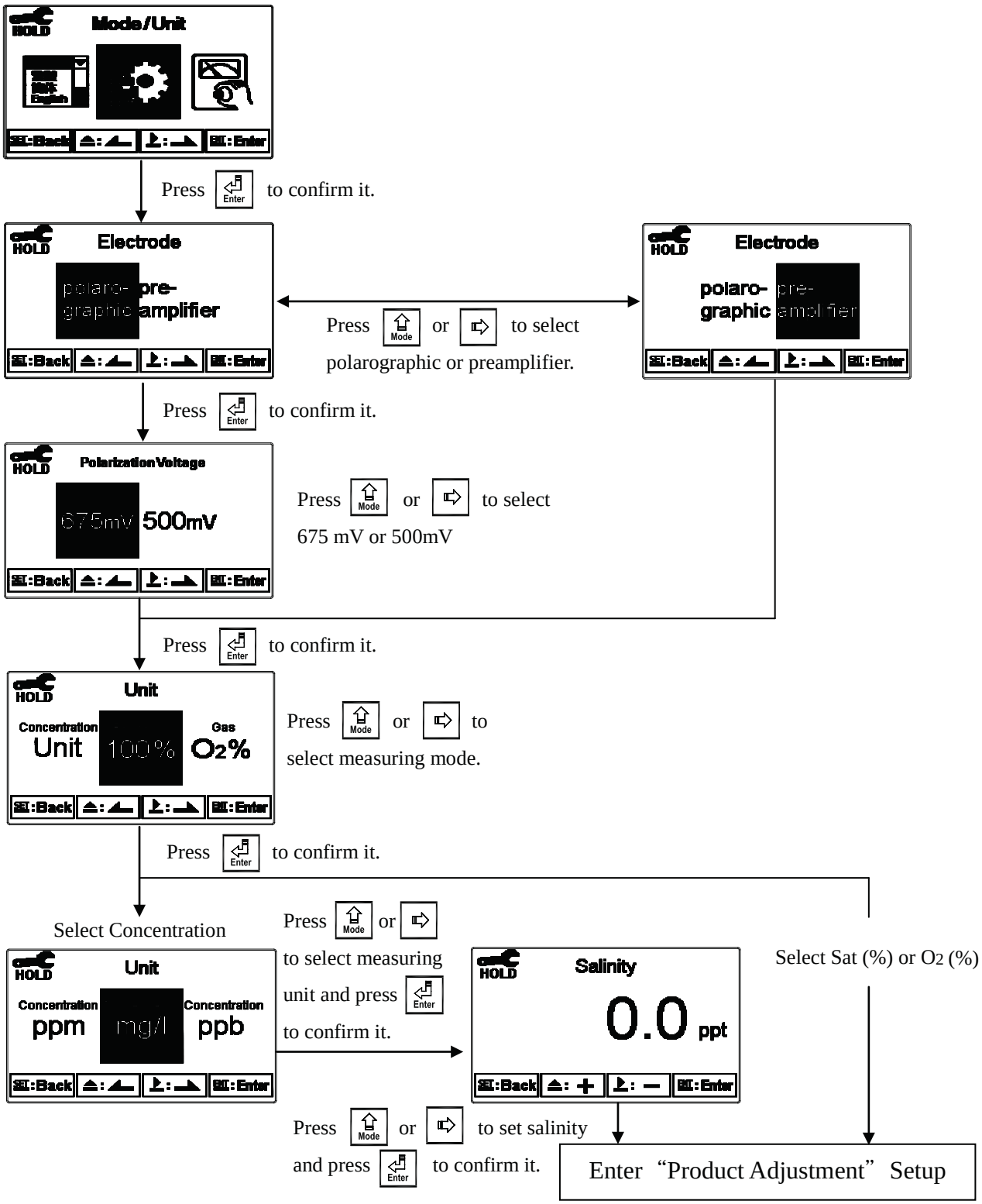


6.4 Mode/Unit

Enter Mode/Unit setup to select polarographic or preamplifier first, then measuring unit. When the unit is selected and shown in concentration, salinity compensation setup will be needed after that.

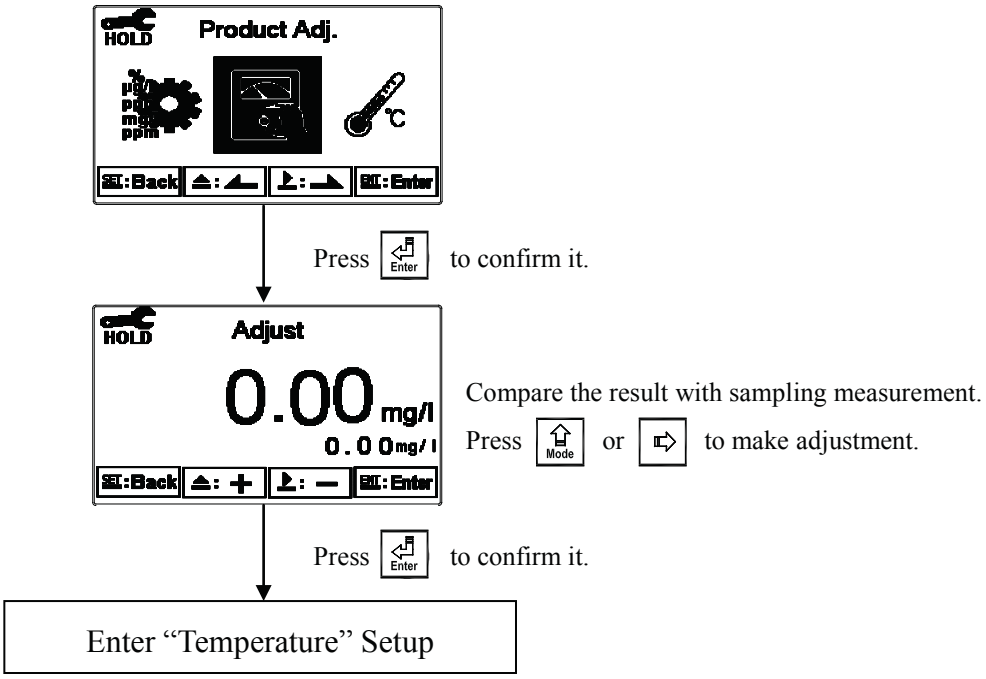
Polarographic: select polarization voltage from 675mV or 500mV based on used sensor and select measuring unit from Sat(100.0%), O_2 (20.95%) or concentration (ppm, mg/l, μg/l, ppb) based on required applications.

Preamplifier: select measuring unit from Sat (100.0%) or concentration (ppm, mg/l) based on required applications.



6.5 Product Adjustment

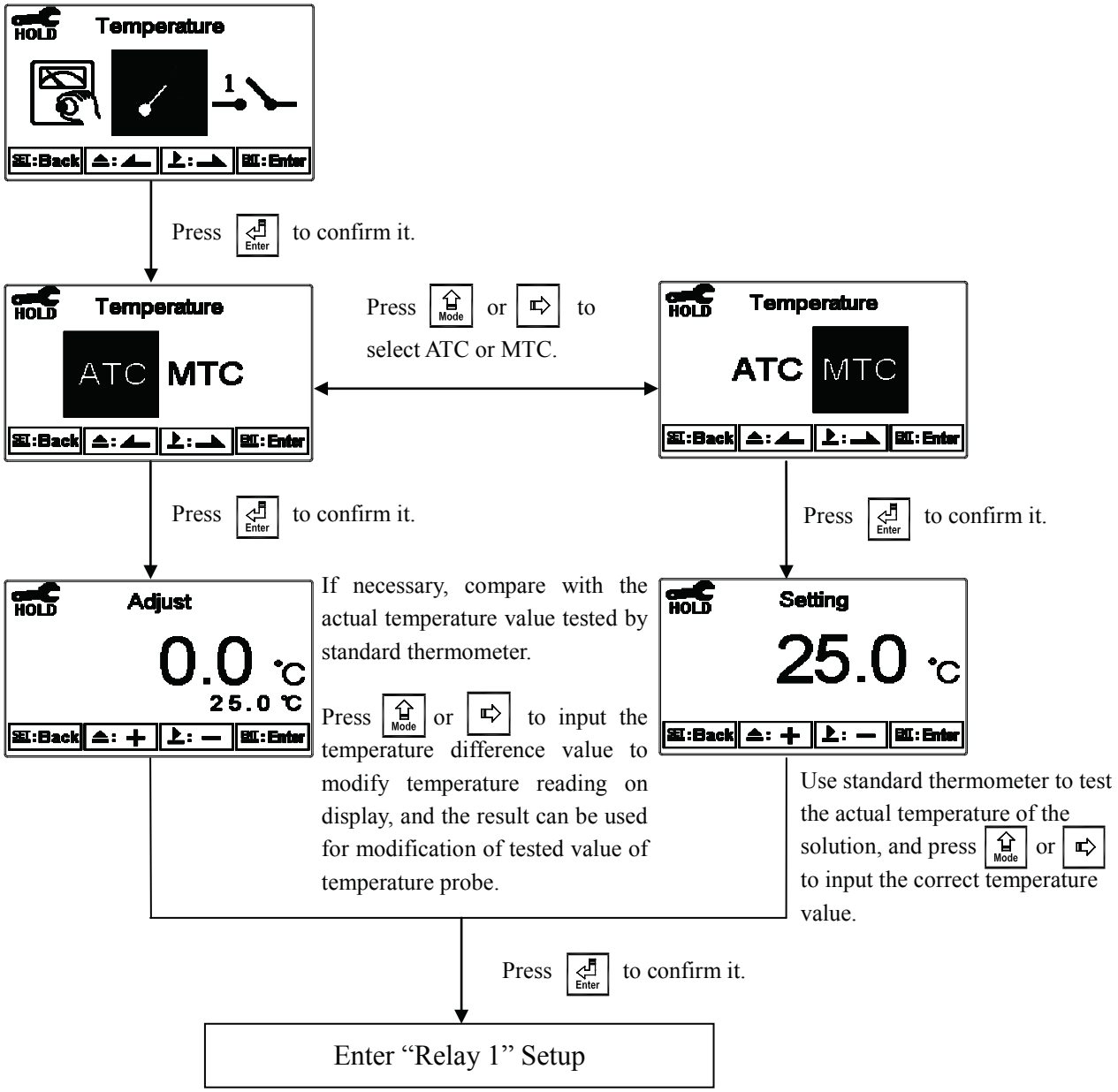
Enter Product Adjustment to make sample reading modifications. Users are allowed to make sample reading modifications without taking the sensor out for calibration. Adjust the field measurement and make it same as the result by sampling measurement. It will show PFT sign on display if there is any adjustment. (Please refer to ch4.4 Display.)



6.6 Temperature

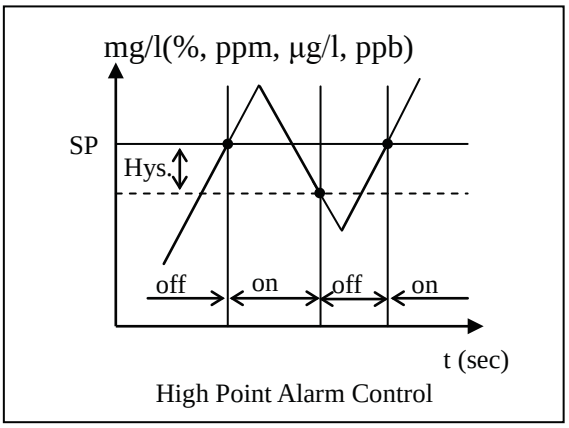
Enter setup of "Temperature" to set temperature compensation mode. Select ATC (Auto Temperature Compensation) or MTC (Manual Temperature Compensation).

Note: Under polarographic mode: NTC22K; under preamplifier mode: NTC30K.

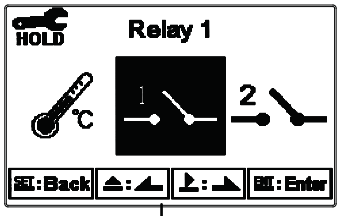


6.7 Relay 1

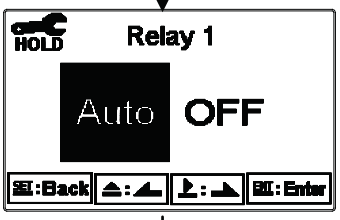
Enter setup of Relay 1. Select whether to turn on or turn off the relay 1 function. If you select to turn it on, then select for using relay 1 as “Hi point” alarm or “Lo point” alarm. Set the value of Setting Point (SP) and Hysteresis (Hys.). The relationship among each parameter can refer to an explanatory diagram of the box (High Point Alarm Control).



High Point Alarm Control

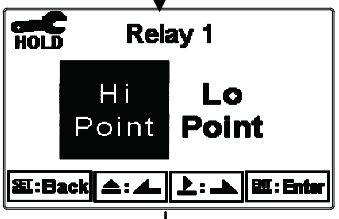


Press Enter to confirm it.



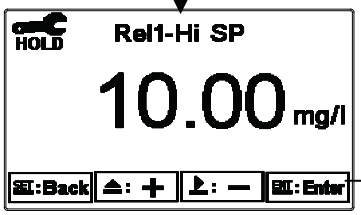
Press Mode or to select whether to turn on REL1 or not. If OFF is selected, the guide menu will go to setup of Relay 2.

Press Enter to confirm it.



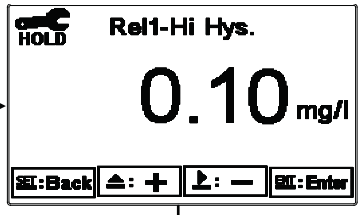
Press Mode or to select Hi point or Lo point alarm of REL1.

Press Enter to confirm it.



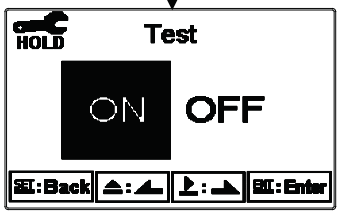
Press Mode or to adjust Setting Point (SP) value.

Press Enter to confirm it.



Press Mode or to adjust Hysteresis (Hys.) value

Press Enter to confirm it.



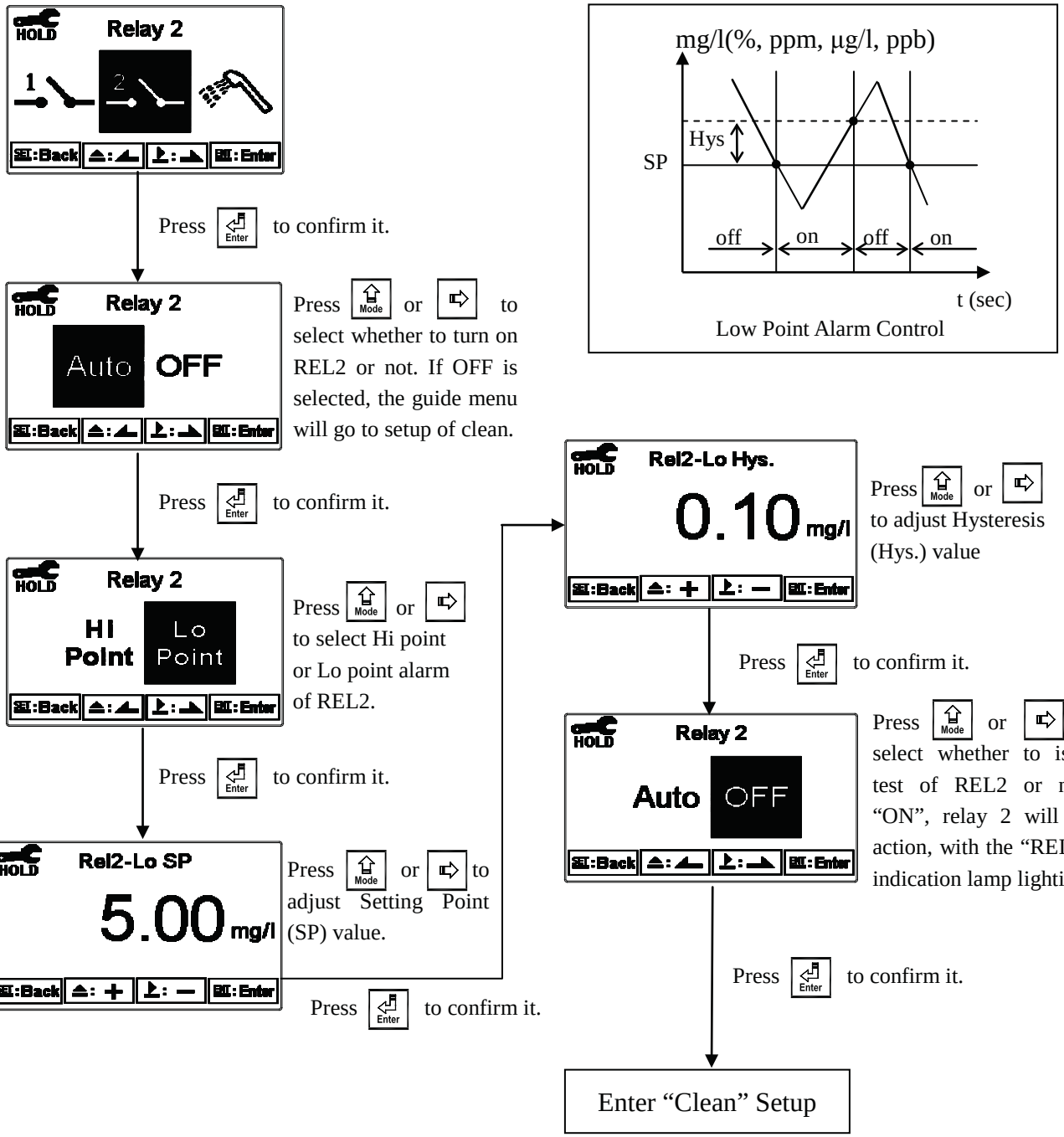
Press Mode or to select whether to issue a test of REL1 or not. If “ON”, relay 1 will be in action, with “RELAY1” indication lamp lighting up.

Press Enter to confirm it.

Enter “Relay 2” setup

6.8 Relay 2

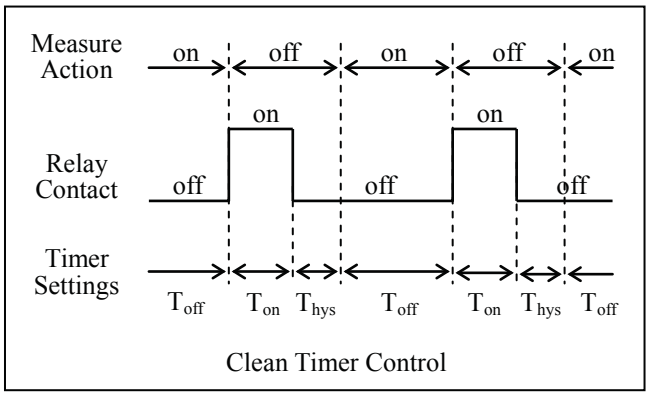
Enter setup of Relay 2. Select whether to turn on or turn off the relay 2 function. If you select to turn on the relay 2, then select for using relay 2 as “Hi point” alarm or “Lo point” alarm. Set the value of Setting Point (SP) and Hysteresis (Hys.). The relationship among each parameter can refer to an explanatory diagram of the box (Low Point Alarm Control).



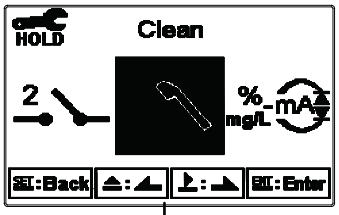
6.9 Clean

Enter setup of "Clean" function. Select whether to turn on or turn off the clean function. If "Auto" is selected, set the timer that decides to turn on and off the cleaning under "Clean ON" and "Clean OFF" respectively and then set the Hysteresis value (Hys.). The relationship among each parameter can refer to an explanatory diagram of the box (Clean Timer Control).

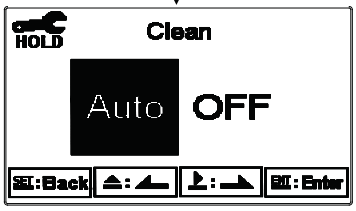
Note: When the clean function is activated, if any value is set to be 0, the instrument will automatically shut down this function. If the clean function is activated under measurement mode, there will show a message "Clean Running" on top of the display. And the displayed reading will be kept what it was before cleaning started. The unit will cease cleaning procedure if entering setting menu or calibration menu under clean status.



Clean Timer Control

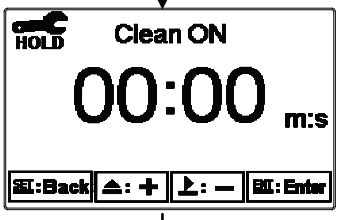


Press Enter to confirm it.



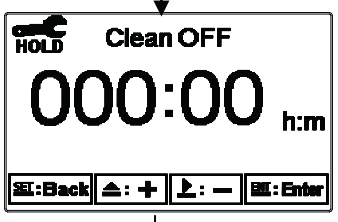
Press Mode or ⇨ to select whether to turn on Clean or not. If not, the guide menu will go to setup of Analog 1.

Press Enter to confirm it.



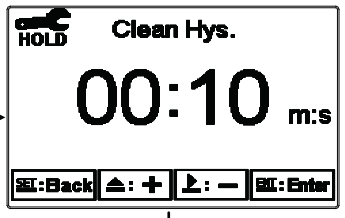
Press Mode or ⇨ to adjust the action time.
Press Enter to confirm the minute part, and then adjust the second part.

Press Enter to confirm it.



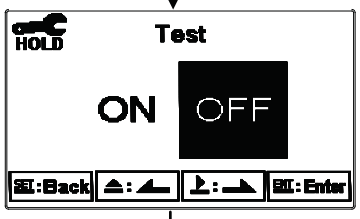
Press Mode or ⇨ to adjust the action time.
Press Enter to confirm the hour part, and then adjust the minute part.

Press Enter to confirm it.



Press Mode or ⇨ to adjust Hysteresis (Hys.) value

Press Enter to confirm it.



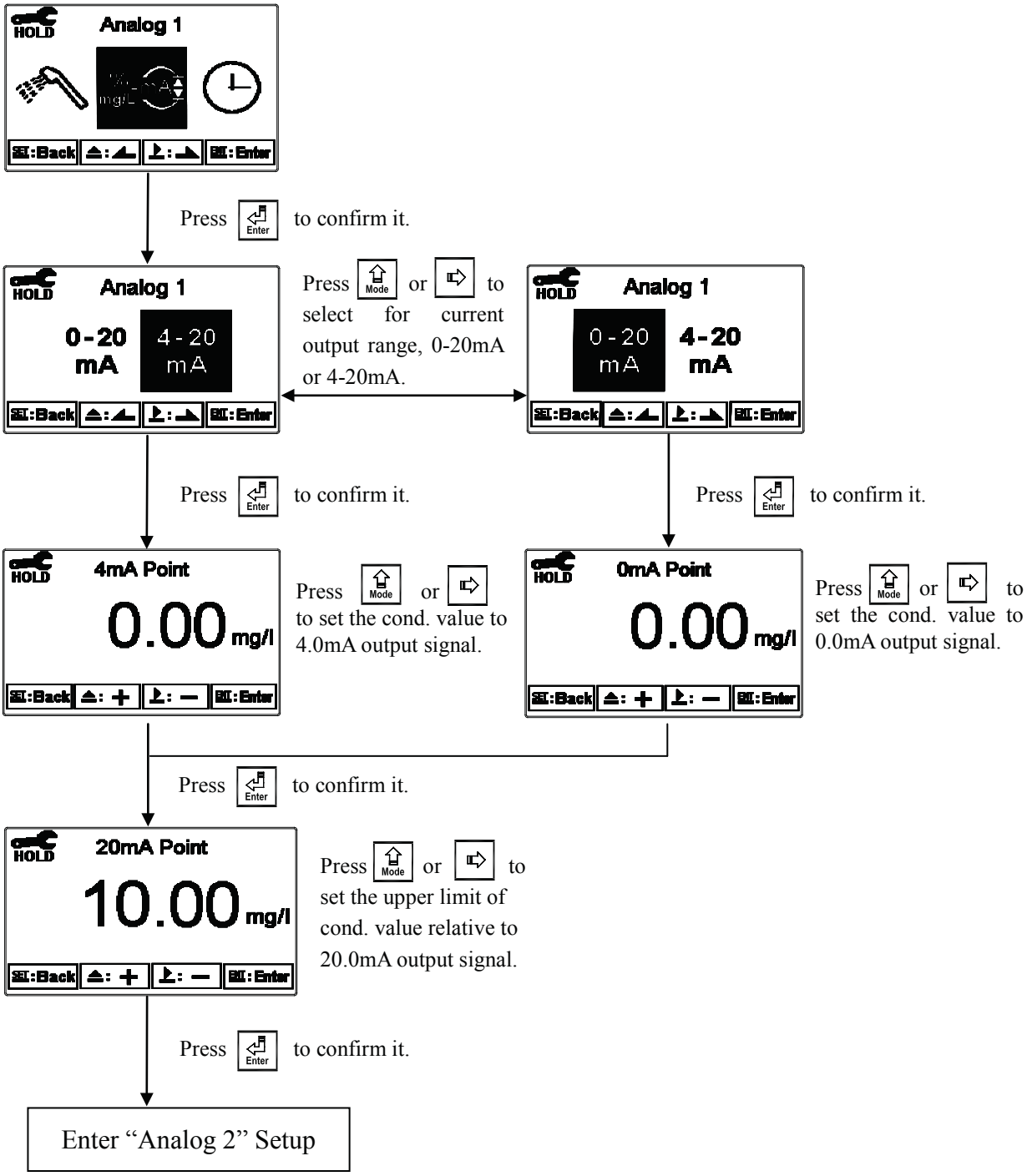
Press Mode or ⇨ to select whether to issue a test of Clean or not. If "ON", the Clean function will be in action, with the "WASH" indication lamp lighting up.

Press Enter to confirm it.

Enter "Analog 1" Setup

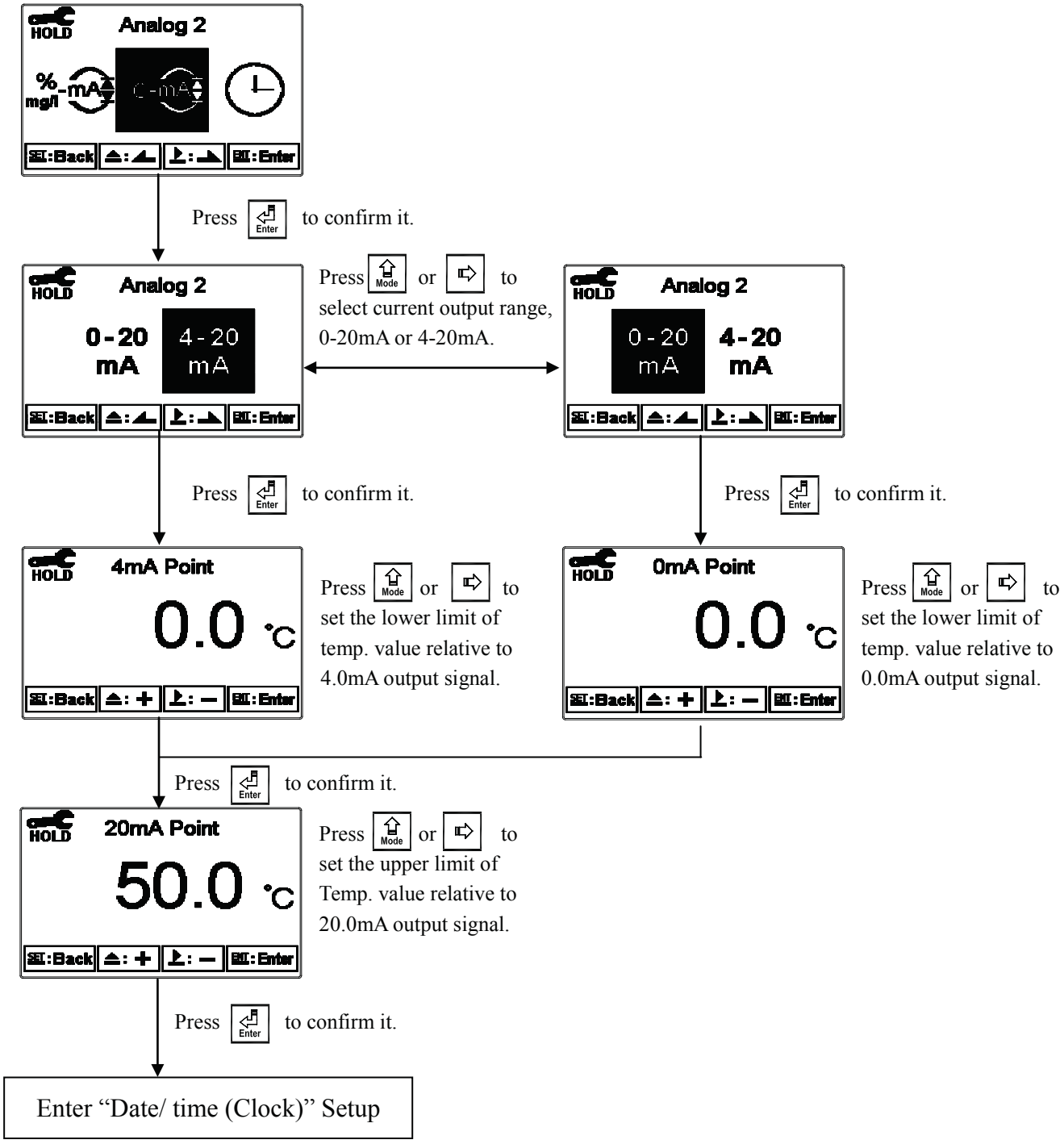
6.10 Analog output 1 (D.O.)

Enter setup of Analog 1. Select 0~20mA or 4~20mA as output current and set its corresponding measuring range. The smaller a corresponding measuring range is set, the higher accuracy the output current will be. When the measured value outweighs the upper limit of set range, the output current will remain approximately 22mA. In comparison, when the measured value exceeds the lower limit of set range, the output current will keep 0mA under 0~20mA mode, approximately 2mA under 4~20mA mode, which can be used as a basis for failure determination. Under HOLD (measurement) status, the current output maintains the last output value before HOLD status. However, in order to be convenient for the current set-up of an external recorder or a PLC controller, the output current will remain 0/4mA or 20mA under the analog output setup menu.



6.11 Analog output 2(Temperature)

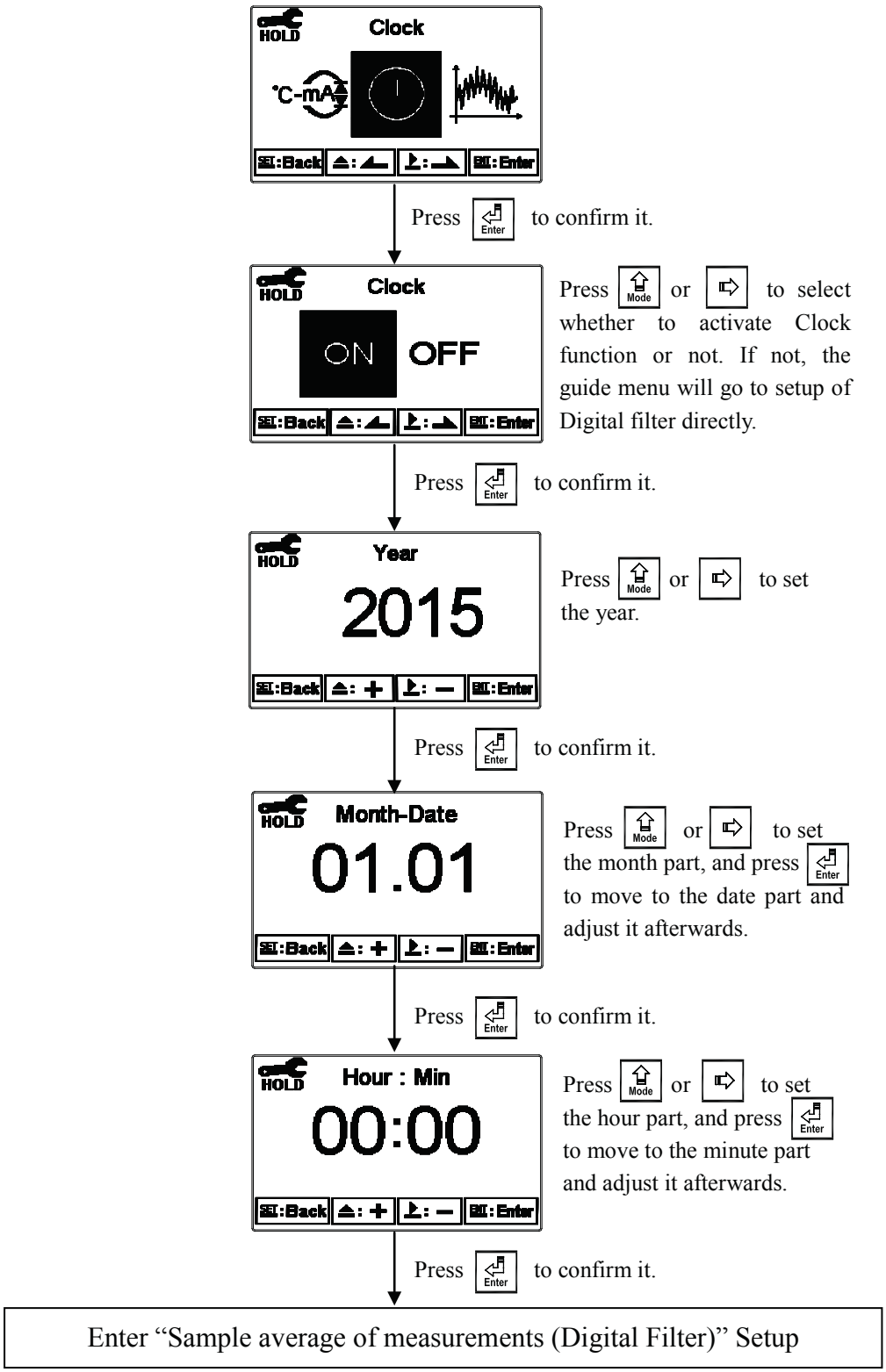
Enter setup of Analog 2. Select 0~20mA or 4~20mA as output current and set its corresponding measuring range (temperature). The smaller a corresponding measuring range is set, the higher accuracy the output current will be. When the measured value outweighs the upper limit of set range, the output current will remain approximately 22mA. In comparison, when the measured value exceeds the lower limit of set range, the output current will keep 0mA under 0~20mA mode, approximately 2mA under 4~20mA mode, which can be used as a basis for failure determination. Under HOLD (measurement) status, the current output maintains the last output value before HOLD status. However, in order to be convenient for the current set-up of an external recorder or a PLC controller, the output current will remain 0/4mA or 20mA under the analog output setup menu.



6.12 Date/Time (Clock)

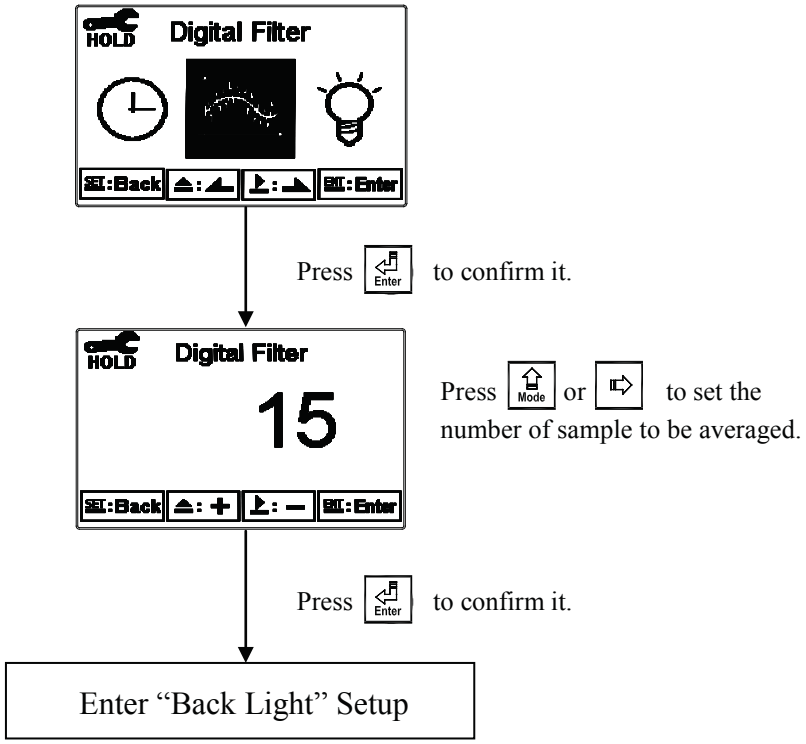
Enter setup of Date/Time (Clock). Set the “Year”, “Month”, “Date”, “Hour”, and “Minute” time. If you select to turn off the clock function, clock will not be displayed under measurement mode. Also, the calibration time of calibration record will show “OFF” sign under calibration overview display.

Note: The clock needs to be reset once encountering power failure.



6.13 Sample average of measurements (Digital Filter)

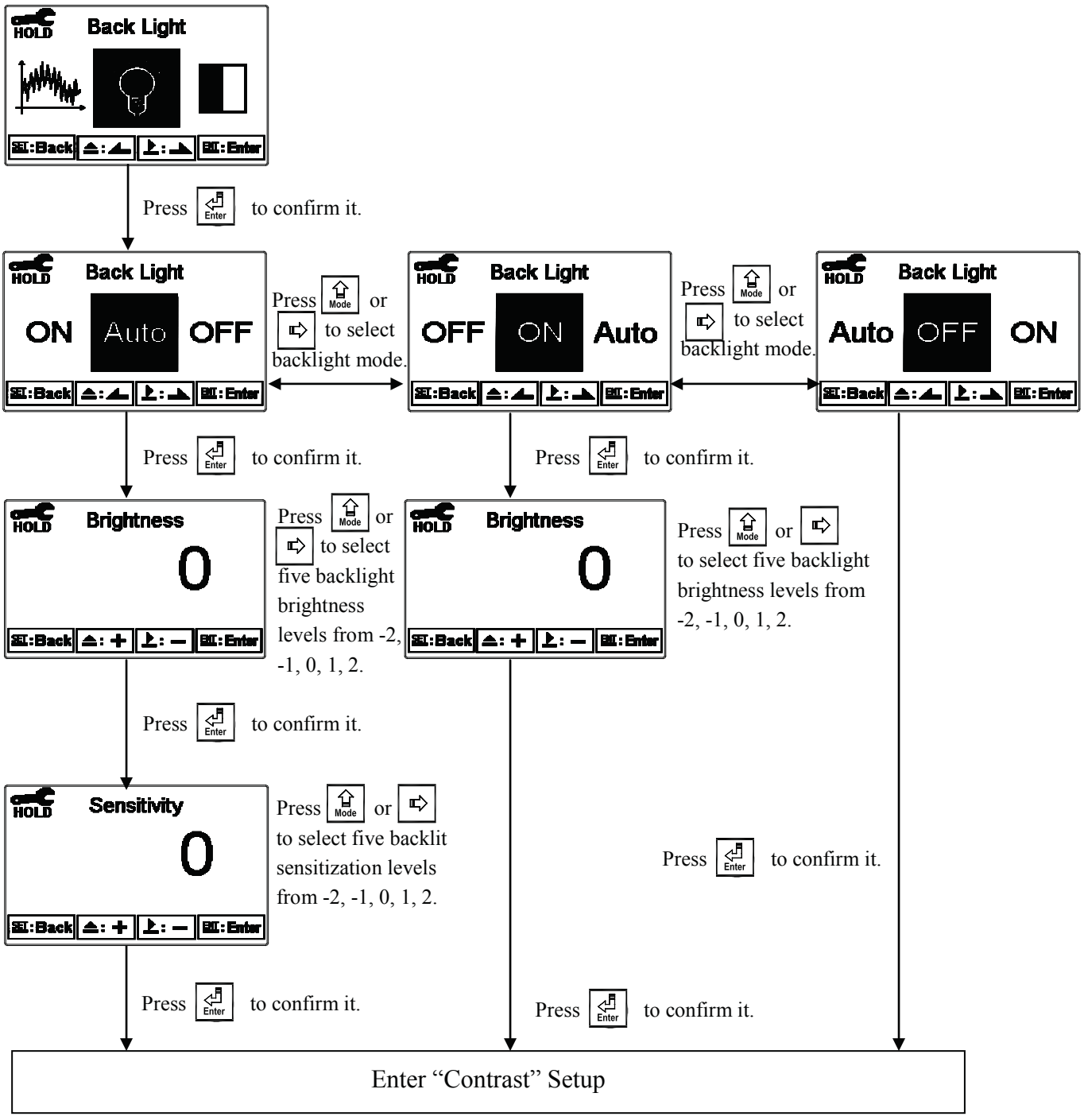
Enter the setup of Digital filter. You may select the number of sample to be averaged each time to become a reading which is gradually counted in order to increase the stability of measurement.



6.14 Backlight settings

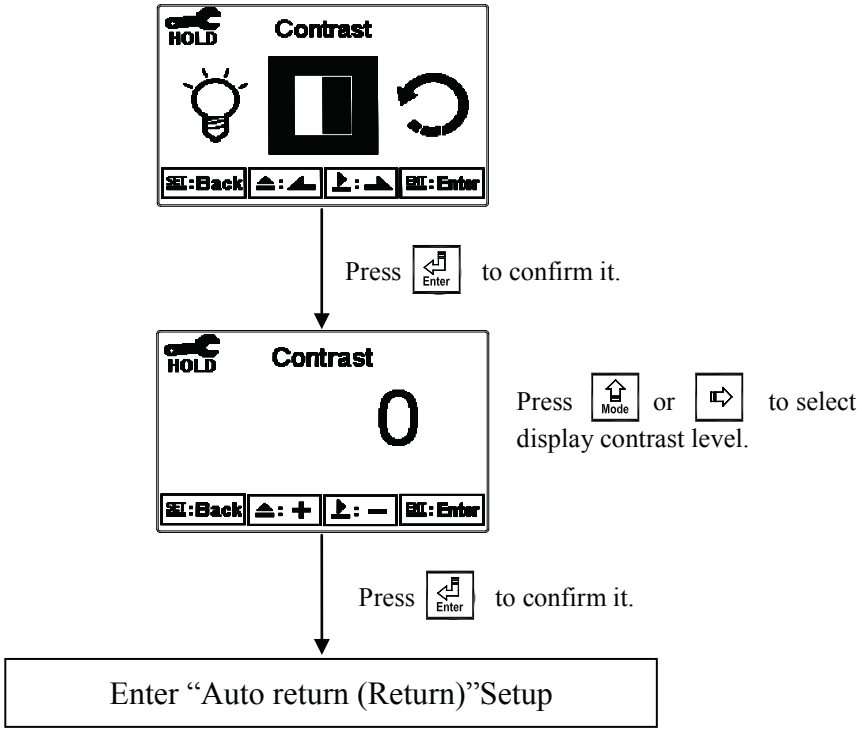
Enter setup of backlight display. According to your need, you can adjust the brightness of display (-2~2, dark ~ bright) and sensitivity of the sensitization sensor (-2~2, insensitive ~ sensitive). Under OFF or AUTO mode, the unit will activate the touch-on status as there is a keystroke. However, it will turn off the backlight if there is no keystroke for 5 seconds.

ON setting: The backlight is always on.
OFF setting: The backlight is off. When there is a keystroke, it enters the touch-on status.
Auto setting: It turns on the backlight depending on ambient light and it will enter the touch-on status if there is a keystroke.



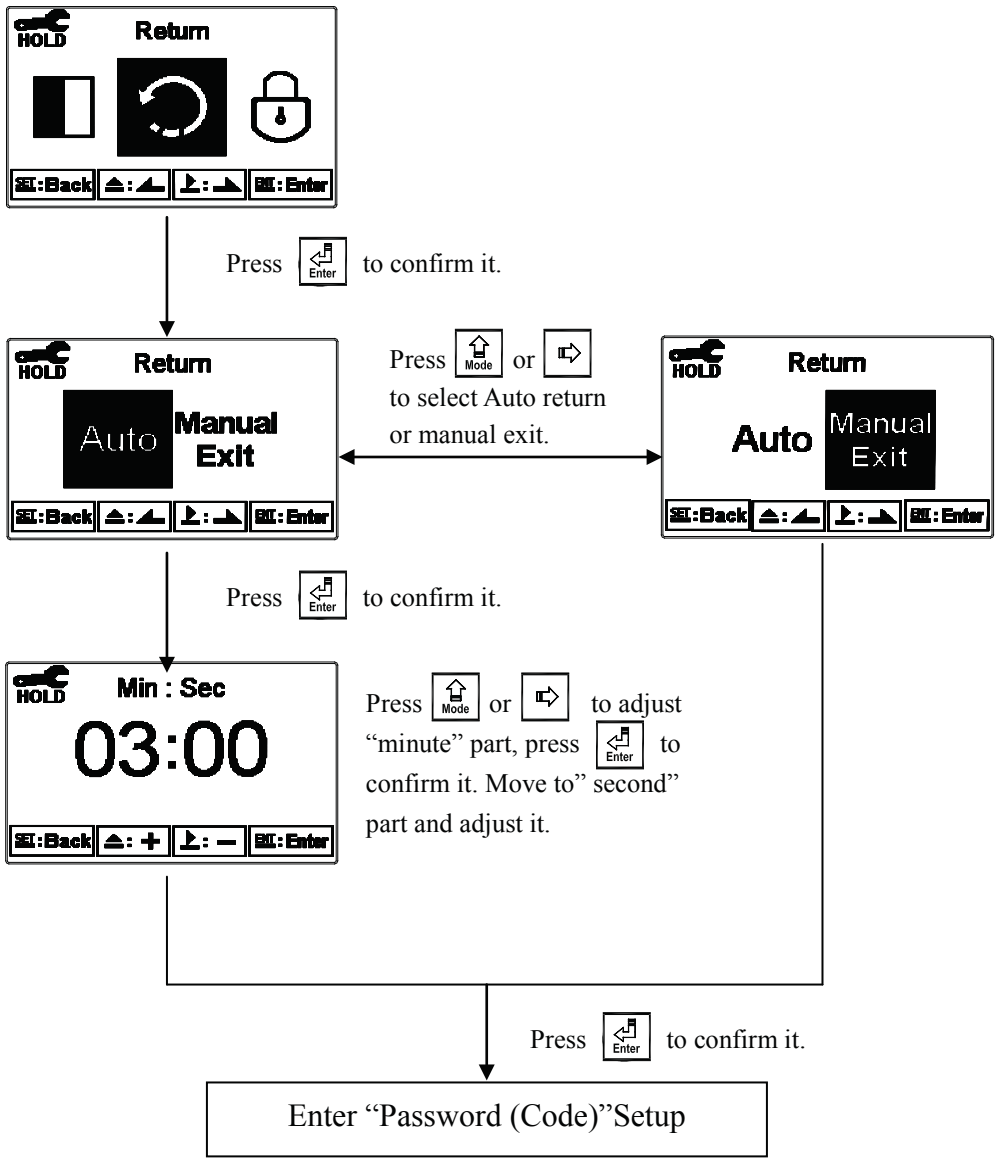
6.15 Contrast settings

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



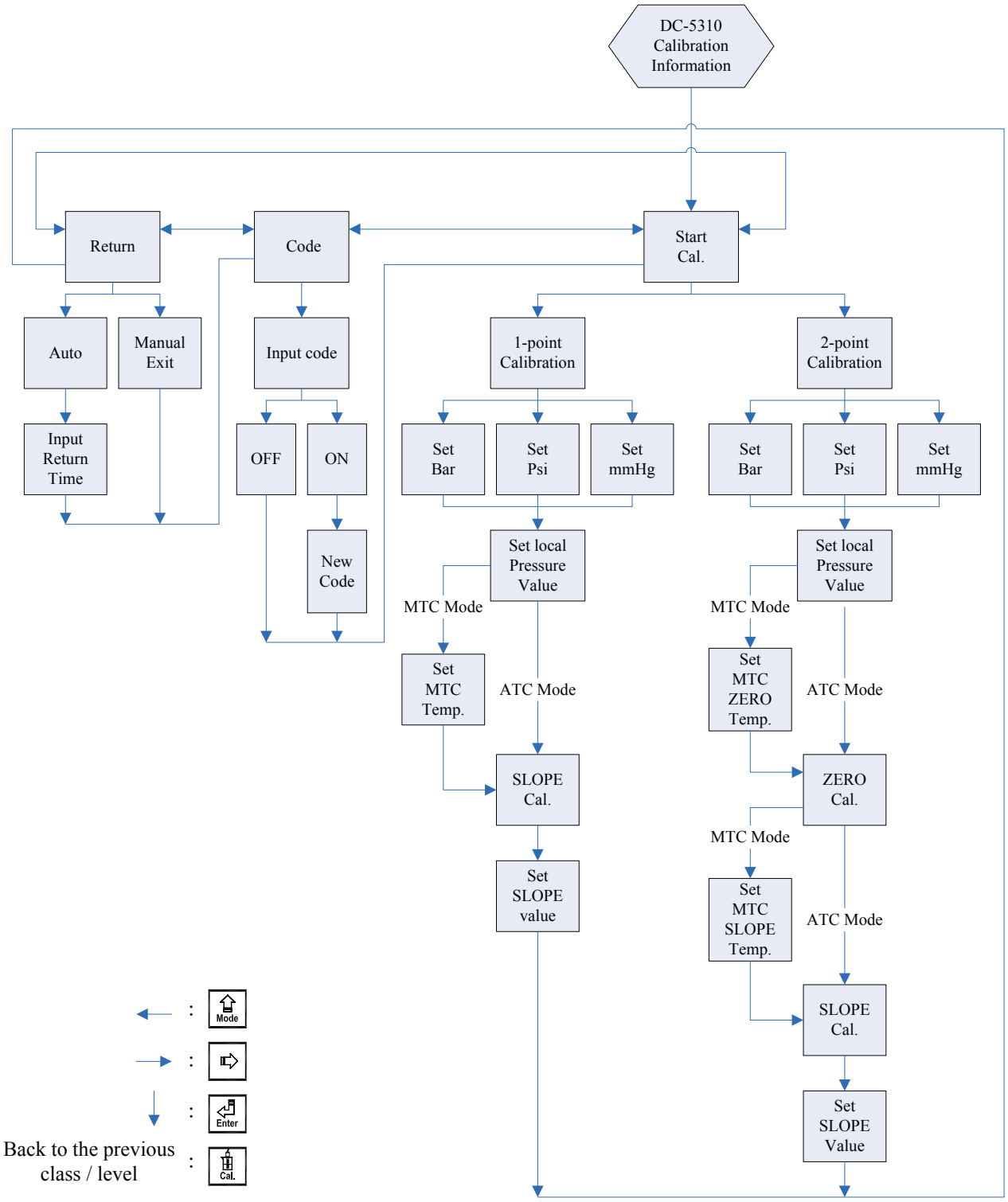
6.16 Return

Enter setup of auto return mode (Return). Set the function that the unit will automatically exit the setup menu after a period of time without pressing any key. The “Manual Exit” means that to exit setup menu is operated manually, while “Auto” means that the display automatically exits the setup menu, goes back to measurement mode after a period of time without pressing any key.



7. Calibration

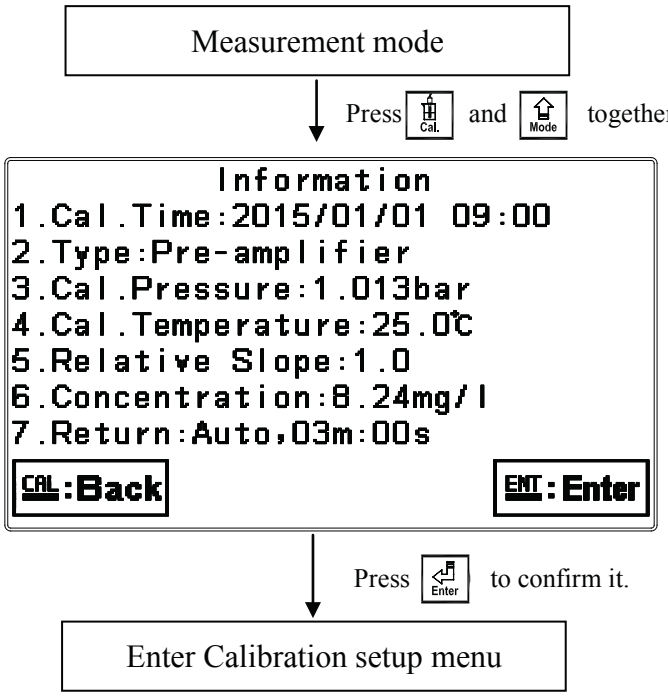
Block diagram of calibration



7.1 Enter calibration setup menu

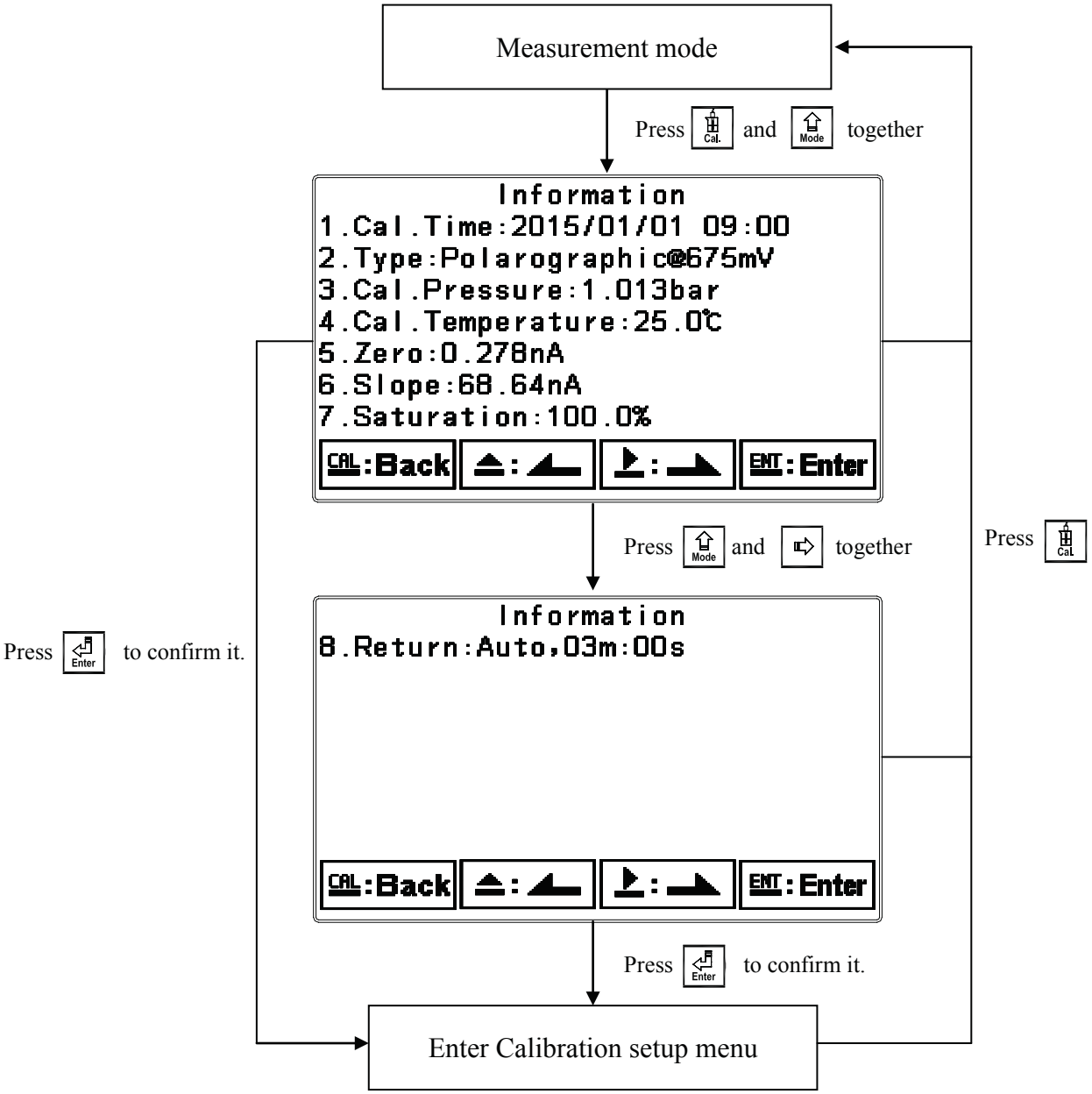
Under the measurement mode, pressing the two keys [CAL] and [Mode] simultaneously allows you to enter the Calibration Information. If you do not need to re-calibrate the measurement system, press to [Cal.] go back to measurement mode. If you need to re-calibrate the system, press [Enter] to enter the calibration setup menu. (If the calibration time shows "OFF", it represents that the clock function has been turned off.)

Calibration information of applying Pre-amplifier sensor



1. Calibration time
2. Sensor type
3. The set pressure value at calibration
4. The temperature value at calibration
5. Relative slope
6. The saturation%, O_2% or concentration at calibration
7. Auto return duration setup

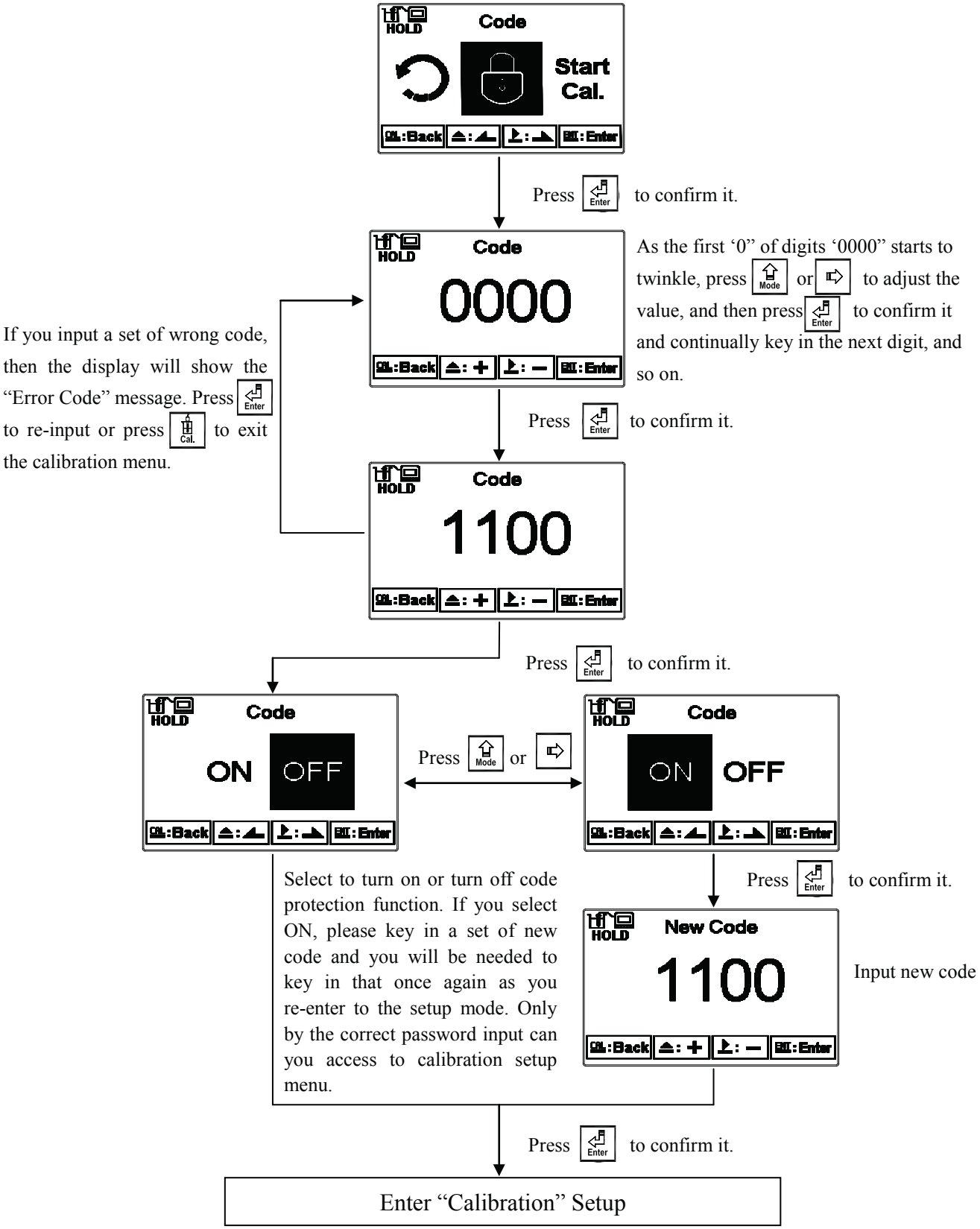
Calibration information of applying Polarographic sensor



1. Calibration time
2. Sensor type
3. The set pressure value at calibration
4. The temperature value at calibration
5. Zero point current
6. Slope current
7. The saturation%, O_2% or concentration at calibration
8. Auto return setting & time

7.2 Security password of calibration (Code)

Select the Code (password) icon after entering calibration setup mode and select whether to activate code function or not. **The default Calibration Code is "1100".**



7.3 Calibration

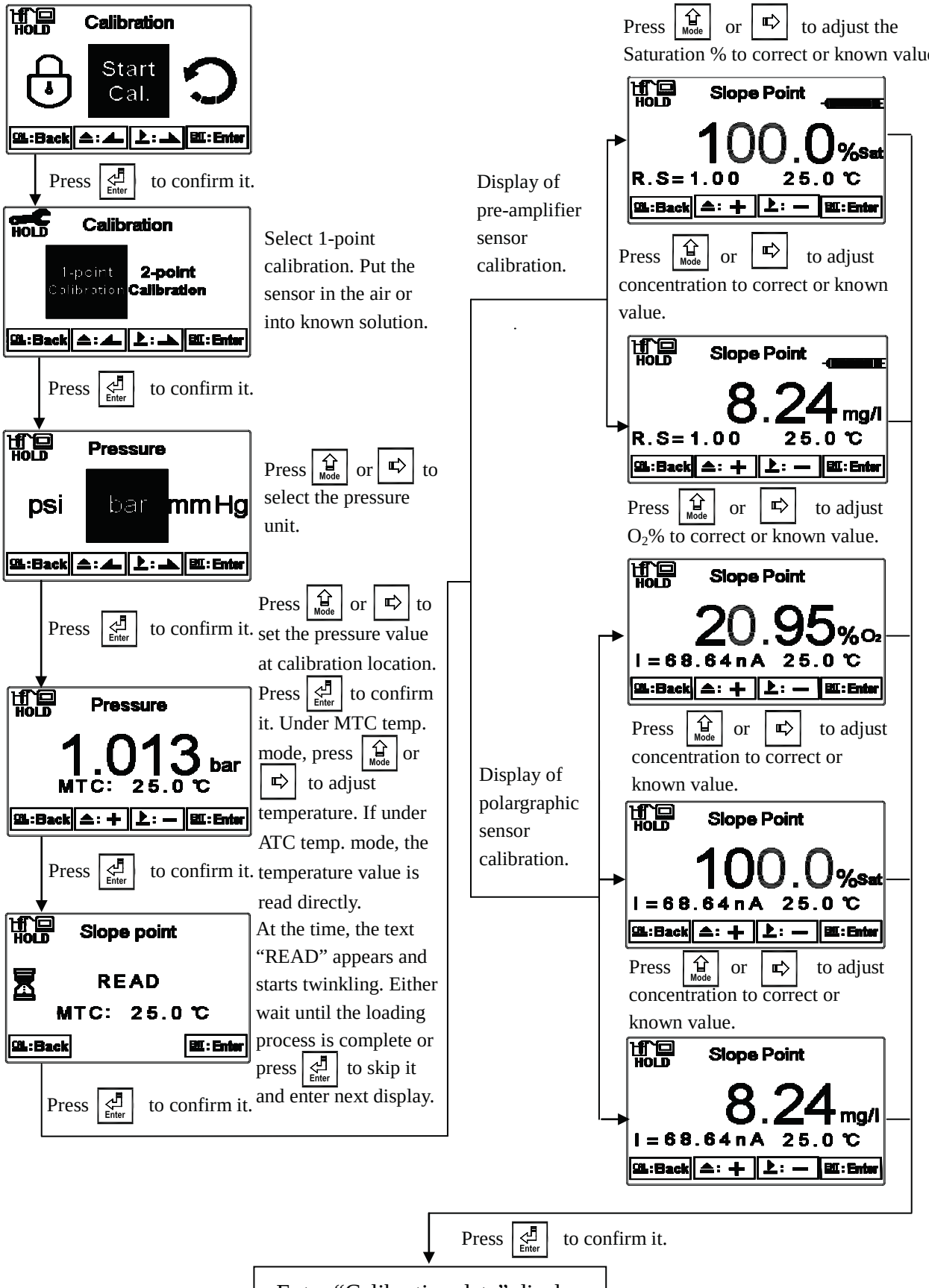
Each D.O. transmitter has not been calibrated with a sensor before out of factory because every sensor has a different condition. Thus, the transmitter is necessary to be calibrated when connecting with a sensor or replacing the electrolyte.

- According to set unit (Sat%, O_2%, μg/l, ppb, mg/l or ppm) under setup mode to start calibration
- According to set polarographic sensor or pre-amplifier sensor to start the calibration
- The D.O. sensor is recommended for single point calibratioin(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 calibratioin 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 to the polarization, zero point calibration, calibration in the air, etc.

7.3.1 Single point calibration (1-Point)

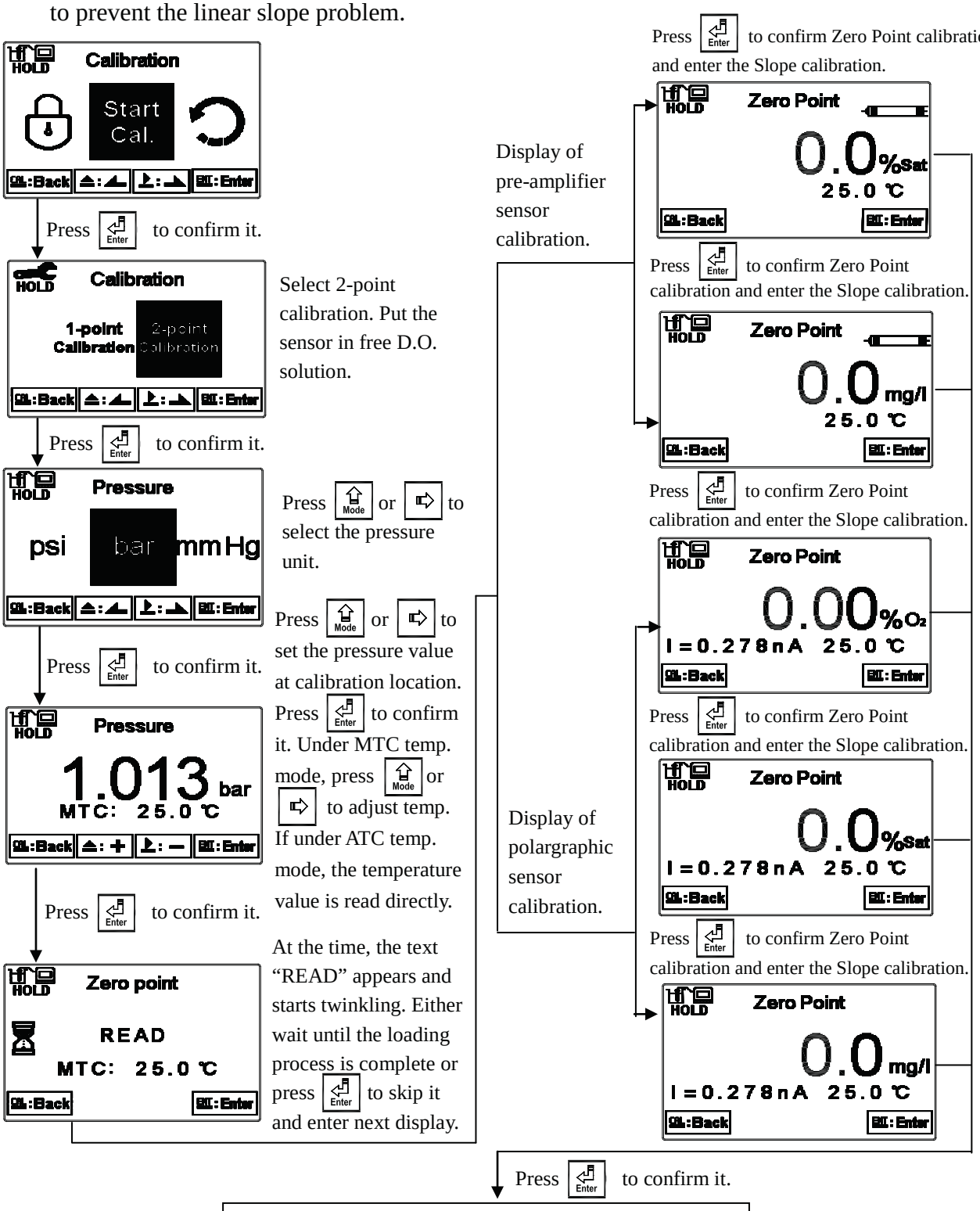
It is for sensor slope calibration. Normally, the D.O. sensor is only necessary for Sat 100.0% or O_2 20.95% calibration in the air. The transmitter applies theoretical zero-point as basis.



7.3.2 Two-Point Calibration (2-Point)

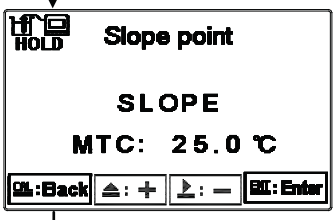
Normally, the D.O. sensor is not recommended for 2-Point calibration.

The first point of 2-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, the zero point is required only when low D.O. measurement occurs. For the 2-point calibration, please make sure that there is a free oxygen environment for zero point calibration. After that, it is necessary to put and the sensor in the calibration medium and remain still for 10 ~ 30 minutes. Then, move on the second point for slope calibration. It is necessary to complete the procedure of 2-point calibration to prevent the linear slope problem.

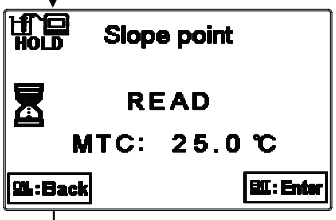


Second point (Slope point)

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



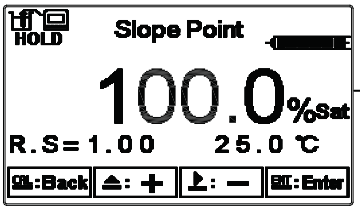
Under MTC temp. mode, press Mode or ⇨ to adjust temperature. If under ATC temp. mode, the temperature value is read directly.



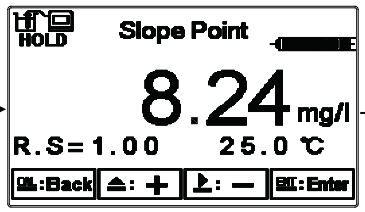
At the time, the text "READ" appears and starts twinkling. Either wait until the loading process is complete or press Enter to skip it and enter next display.

Display of pre-amplifier sensor calibration.

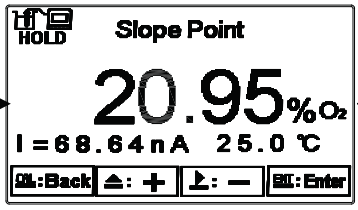
Display of polargraphic sensor calibration.



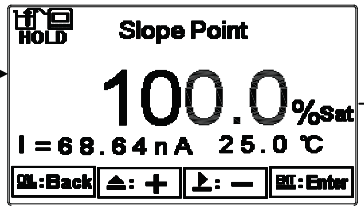
Press Mode or ⇨ to adjust the Saturation % to correct or known value.



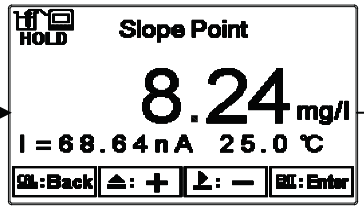
Press Mode or ⇨ to adjust concentration to correct or known value.



Press Mode or ⇨ to adjust O_2% to correct or known value.



Press Mode or ⇨ to adjust Sat% to correct or known value.



Press Mode or ⇨ to adjust concentration to correct or known value.

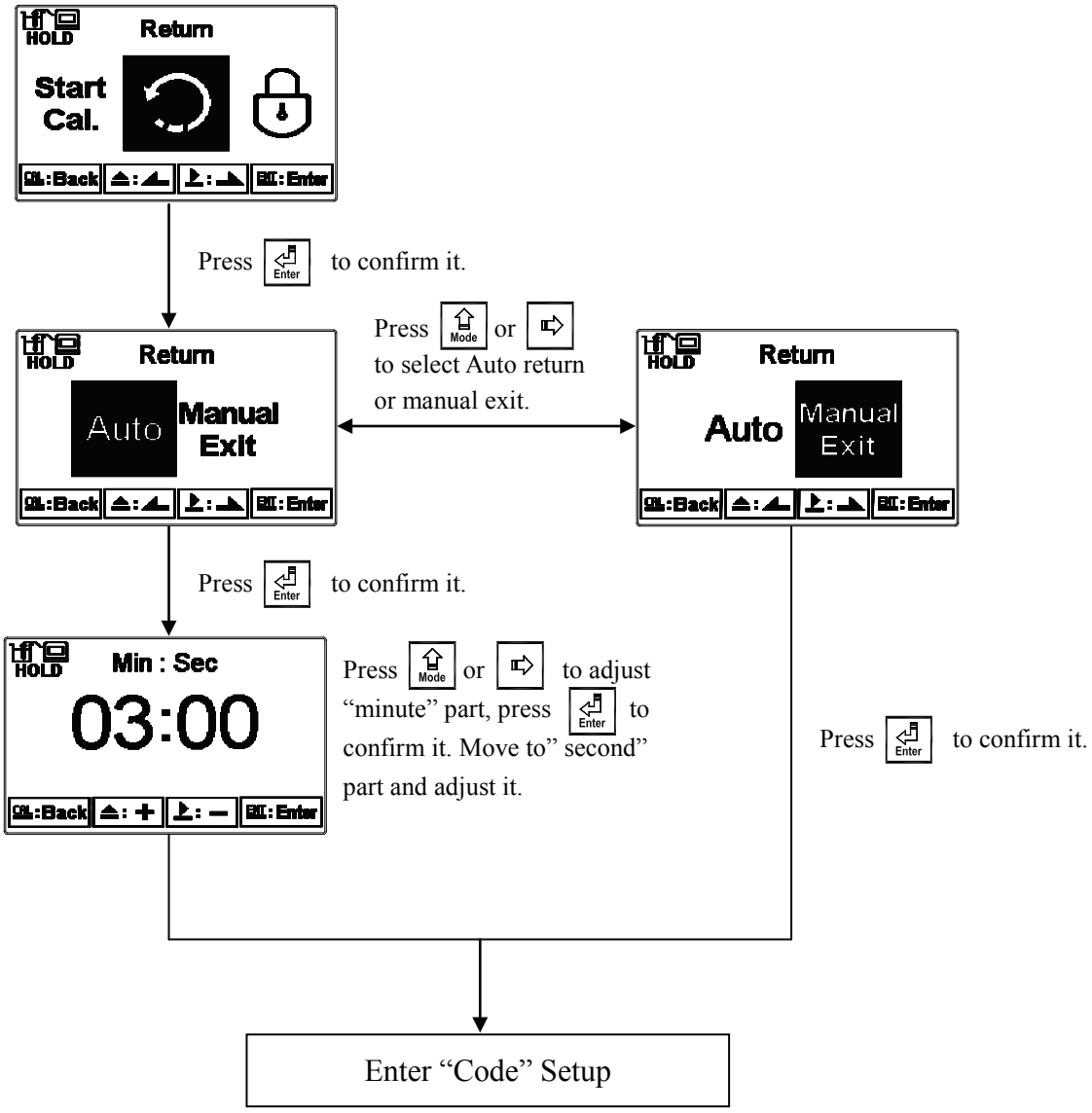
Press Enter to confirm it.

Enter "Calibration data" display

7.4 Return

Enter setup of auto return mode (Return). Set the function that the unit will automatically exit the setup menu after a period of time without pressing any key. The “Manual Exit” means that to exit setup menu is operated manually, while “Auto” means that the display automatically exits the setup menu, goes 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.



8. Error messages (Error code)

Messages	Reasons	Dispositions
Error1	SLOPE value exceeds the upper or lower limit.	1. Replace the membrane and electrolyte. 2. Sensor failure; please replace a sensor.
Error2	The offset (zero-point) exceeds the upper or lower limit.	1. Replace the membrane and electrolyte. 2. Sensor failure; please replace a sensor.
Error3	The reading is unstable while calibration.	Please maintain or replace the electrode, and make calibration again.
Error4	The temperature is over range of 0~50℃ while calibration.	Please adjust the temperature of standard solution to a proper range.
Error5	Wrong password **ERROR CODE.**	Re-enter a password.
Error9	Serious error that does not permit any further measuring.	Please contact service engineer.

Note:

1. When polarographic method is applied, the current range allowance is within 0-500nA.
   Example: As calibrating the ZERO point, if the current exceeds 20nA, it will display **Error 2**; if the calibration Slope is lower than 30nA or higher than 500nA, it will display **Error 1**.
2. When pre-amplifier method is applied, the relative slope is 1.00.
   ***Example*:** As calibrating ZERO point, if the value exceeds 0.2, it will display **Error 2**; if the calibration slope is lower than 0.35 or higher than 6.00, it will display **Error 1**.

9. Maintenance

Generally speaking, if normally operated, the controller produced by our company needs 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.

10. Appendix

10.1 Atmosphere pressure and relative height and% Air saturation table

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

PSI	Bar	Relative height	CALIB VALUE
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

10.2 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 0.0 Salinity 0.0	5.0 9.0	10.0 18.1	15.0 27.1	20.0 36.1	25.0 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

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