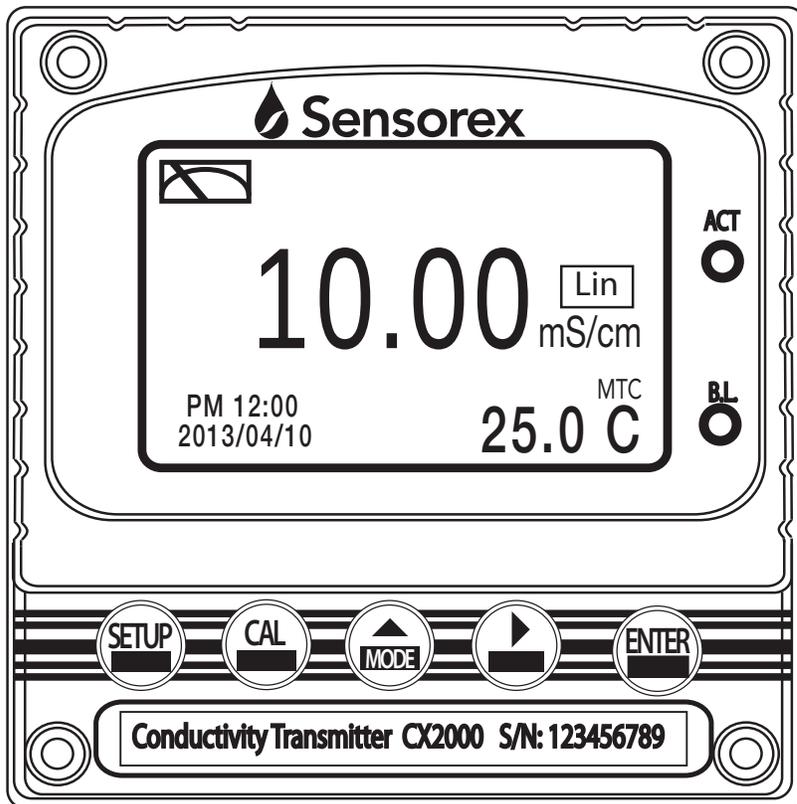


CX2000

Intelligent Conductivity Transmitter

Operation Manual



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ISO 9001:2008 Certificate No. 00036132-153

Precautions for installation

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

- Make sure to remove AC power from the controller before wiring input, output connections, and remove it before opening the controller housing.
- The installation site of the controller should be a well ventilated area and out of direct sunlight.
- The material of signal cable should be special coaxial cable. We strongly recommend using our coaxial cable.
- Avoid electrical surges when using power, especially when using three-phase power. Use ground wire correctly.
- The internal relay contact of the instruments is for alarm or control function. To ensure safety, please connect to external relay which can withstand enough amperage to allow safe operation of the instruments. (Please refer to chapter 3.6 “Illustration of electrical connection”)

CONTENTS

Precautions for installation

Brief Instruction	1
1. Specifications	4
2. Assembly and installation	
2.1 Transmitter installation.....	5
2.2 Illustration of panel mounting.....	5
2.3 Illustration of Wall mounting and pipe mounting.....	6
3. Overview of conductivity / resistivity transmitter CX2000	
3.1 Illustration of rear panel.....	7
3.2 Illustration of terminal function.....	7
3.3 Description of terminal function.....	8
3.4 Wiring of cable.....	9
3.5 Circuit of cable.....	9
3.6 Illustration of electrical connection.....	10
4. Configuration	
4.1 Illustration of front panel.....	11
4.2 Keypad.....	11
4.3 LED indicators.....	11
4.4 Display.....	12
5. Operation	
5.1 Measurement mode.....	13
5.2 Set-up menu.....	13
5.3 Calibration menu.....	13
5.4 Shortcuts.....	13
5.5 Reset.....	13
5.5.1 Set-up reset.....	13
5.5.2 Calibration reset.....	13
6. Settings	
Block diagram of settings.....	14
6.1 Entry of set-up menu.....	16
6.2 Security code of settings(Code).....	17
6.3 Language.....	18
6.4 Measurement parameters(Mode).....	19
6.5 Product Adjustment.....	20
6.6 Temperature.....	21
6.7 Compensation.....	22

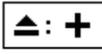
6.8 Relay 1.....	23
6.9 Relay 2.....	24
6.10 Wash time(Clean).....	25
6.11 Analog output 1 (Cond/Res).....	26
6.12 Analog output 2 (Temperature).....	27
6.13 Date/Time (Clock).....	28
6.14 Sample average of measurements (Digital filter).....	29
6.15 Backlight settings.....	30
6.16 Contrast settings.....	31
6.17 Power frequency (Freq.).....	32
6.18 Automatically back to measurement mode(Return).....	33
7. Calibration	
Block diagram of Calibration.....	34
7.1 Entry of calibration menu.....	35
7.2 Automatically back to measurement mode(Return).....	36
7.3 Security password of calibration.....	37
7.4 Cell constant calibration (CELL Const.).....	38
7.4.1 Resistivity (Res).....	38
7.4.2 Conductivity (Cond).....	39
7.5 Standard solution calibration (Std. Sol.).....	40
8. Error messages (Error code)	41
9. Installation of cells	
9.1 Correct installation.....	42
9.2 Incorrect installation.....	43

Brief Instruction

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

Press  and  simultaneously to see the overview of the set-up settings. Then press  if you would like to modify set-up settings.

Keypad Index

Keypad	Function	Description
		Back to upper level
		Choose change to left page
		Increase digit
		Choose change to right page
		Decrease digit
		Confirm settings after modifications and then go to next step

Selection of set-up items

Keypad	Function	Description
Mode		Measurement mode, to choose Resistivity (Res) or Conductivity (Cond) measurement
Temperature		Temperature measurement and compensation, including MTC, PTC, NTC MTC---Manual temperature compensation, PTC/NTC--- auto temperature compensation
Relay 1		First relay setting, to select OFF or Hi/Lo alarm
Relay 2		Second relay setting, to select OFF or Hi/Lo alarm
Clean		Automatic wash time setting, to choose electrode clean equipment's ON and OFF duration
Analog 1		Current output -Res or Cond
Analog 2		Current output -temperature

Clock		Clock setting (During loss of power the instrument's time will return to the factory setting)
Black-light		Backlight setting, to set Auto/ON/OFF backlight, brightness, and sensitivity
Contrast		Contrast of screen setting
Digital Filter		Takes every serial 1~60 measurements and averages them continuously and displays the average readings
Return		Setting of returning to the measurement mode
Code		Security code of set-up mode. The factory default is 1111, and a designated user can change the code.

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
		Change to left page
		Increase digit
		Change to right page
		Decrease digit
		Confirm settings after modifications and then go through next step

Selection of calibration items (up to three-point calibration)

keypad	Accordingly item	Description
Code		Security code of calibration mode. The factory default is 1100.
Return		Time interval setting of returning to the measurement mode
Cell Constant	CELL Const.	To adjust the instrument cell constant setting to match the value of the cell constant of the sensor
Solution	Std. Sol.	Use the appropriate standard solution to calibrate the system

Note

Sensorex reserves the right to change the figure of icons and contents. For the actual icons and contents please refer to the instruments.

1. Specifications

Model		CX2000
Measuring modes		Resistivity/Conductivity/Temp.
Ranges	Resistivity	0.00 MΩ·cm~20.00 MΩ·cm
	Conductivity	0.00 μS/cm~200.0 mS/cm manual or auto range selectable
	Temp.	-30.0~130.0 °C
Resolutions	Resistivity	0.01 MΩ·cm
	Conductivity	0.01 μS/cm
	Temp.	0.1 °C
Accuracy	Resistivity	±1% ± 1Digit
	Conductivity	±1% ± 1Digit
	Temp.	±0.2 °C ± 1Digit
Temperature Compensation		NTC30KΩ or PT1000 or Manual temperature compensation selectable
Calibration mode		(1)Cell constant adjustment (2)Standard solution calibration
Ambient Temp.		0~50 °C
Storage Temp.		-10~70 °C
Cell Constant		0.01, 0.05, 0.1, 0.5, 10.00 cm ⁻¹ fixed, freely selectable 0.008~19.99 cm ⁻¹
Temperature Coefficient		Linear temperature compensation from (0.00%~ 40.00%) and Non-Linear compensation
Display		Large LCD display with environment light sensor auto/manual illumination function
Analog output 1		Isolated DC 0/4~20mA corresponding to main measurement, max. load 500Ω
Analog output 2		Isolated DC 0/4~20mA corresponding to Temp., max. load 500Ω
Settings	Contact	RELAY contact , 240VAC 0.5A Max.(recommend)
	Activate	Two sets of individual HIGH or LOW programmable control
Wash		RELAY contact: ON 0~99min. 59sec. / OFF 0~999hr 59min.
Certification		IP65 (NEMA 4)
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		0.5Kg

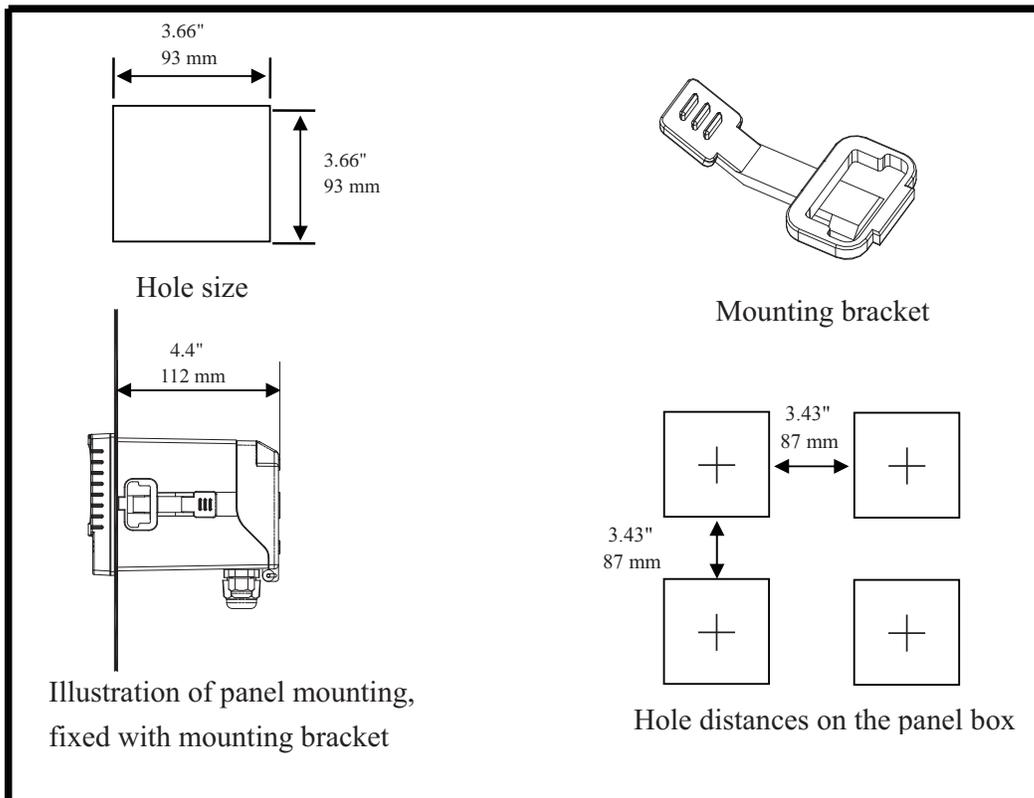
Note: The specifications are subject to change without notice.

2. Assembly and installation

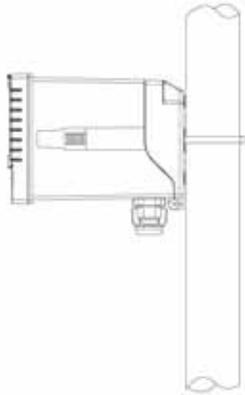
2.1 Transmitter installation: This Transmitter can be installed through panel mounting, wall mounting and pipe mounting.

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, until it is locked into pickup groove.

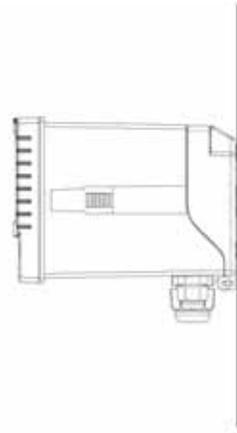
2.2 Illustration of panel mounting:



2.3 Illustration of Wall mounting and pipe mounting



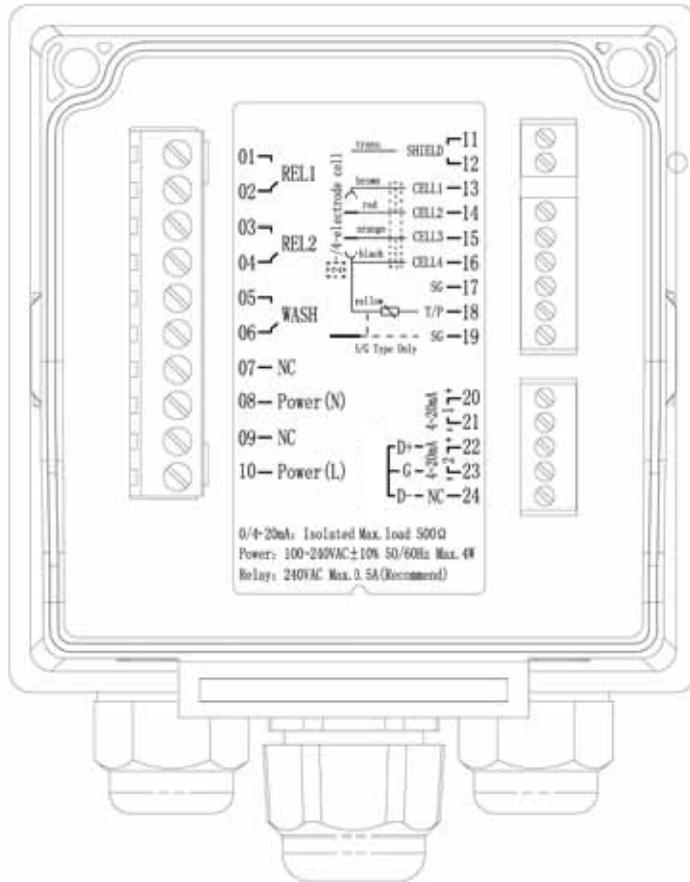
Installation of pipe mounting
Fixed with U-shaped pipe clip. The
distance between screw holes is 60mm



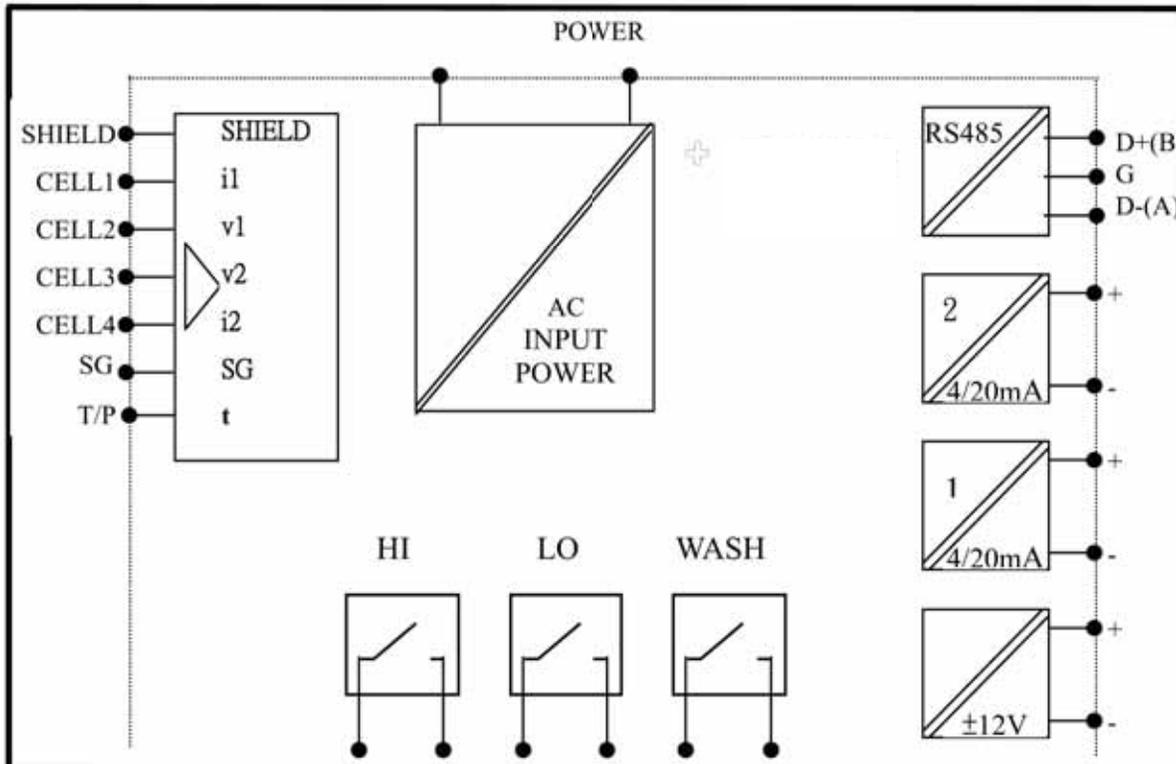
Installation of wall mounting
Fixed with 4 x M4 screws

3. Overview of Conductivity transmitter

3.1 Illustration of rear panel:

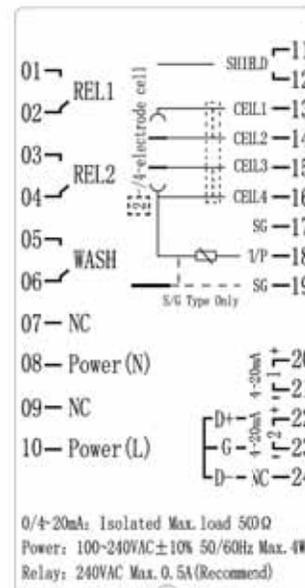


3.2 Illustration of terminal function:



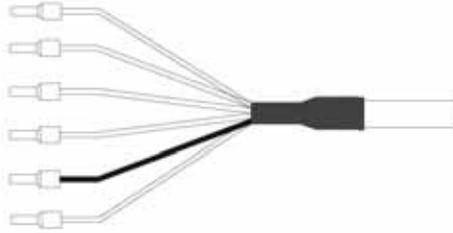
3.3 Description of terminal function:

01	┌───┐	—	REL1 : External relay terminal first control
02			
03	┌───┐	—	REL2 : External relay terminal second control
04			
05	┌───┐	—	WASH : External wash relay terminal
06			
07	—		NC : None contact
08	—		100~240AC : Power supply terminal
09	—		NC : None contact
10	—		100~240AC : Power supply terminal
11	┌───┐	—	SHIELD : The transparent cell connection line
12			
13	—		CELL1 : The cell connection line: Current electrode 1
14	—		CELL2 : The cell connection line: Voltage electrode 1
15	—		CELL3 : The cell connection line: Voltage electrode 2
16	—		CELL4 : The cell connection line: Current electrode 2 / Connect 1 side of ATC
17	—		SG : NC
18	—		TP : Connect 2nd side of ATC
19	—		SG : NC
20	—		4~20mA + terminal : Master measure current output terminal +, for external recorder or PLC control
21	—		4~20mA - terminal : Master measure current output terminal -, for external recorder or PLC control
22	—		4~20mA + terminal / D+(B) : Temperature current output terminal +, for external recorder or PLC control
23	—		4~20mA - terminal / G : Temperature current output terminal -, for external recorder or PLC control
24	—		NC / D- (A) : NC



3.4 Wiring of cable

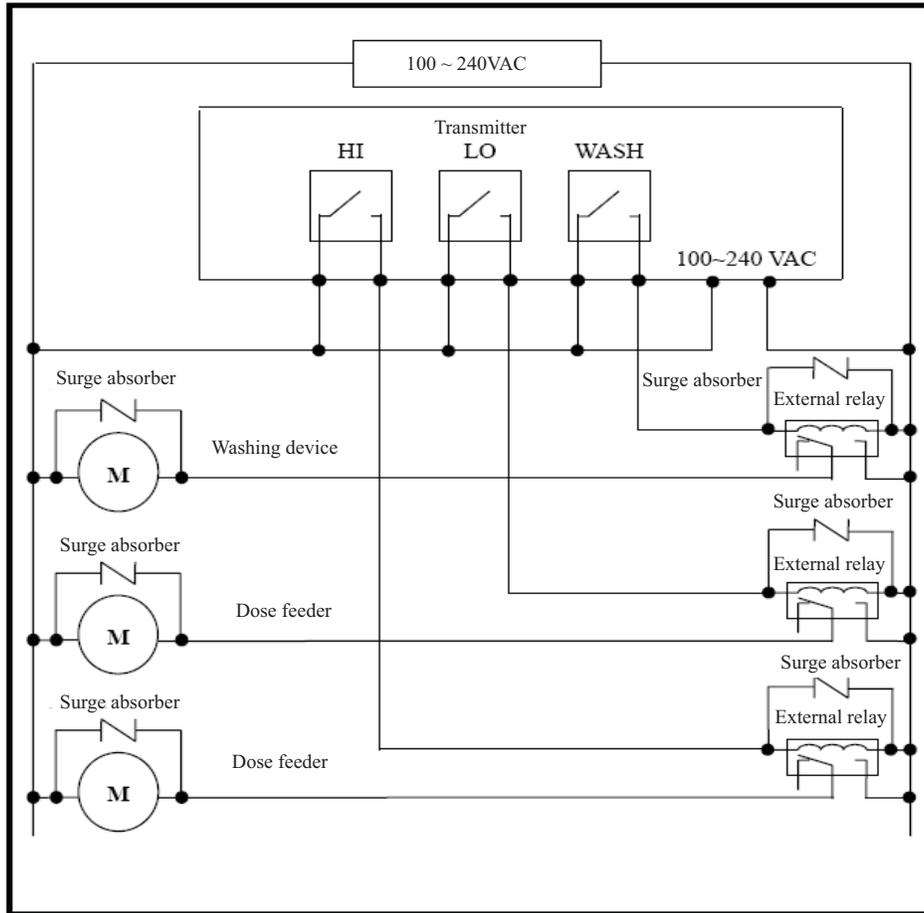
SHIELD
 CELL 1
 CELL 2
 CELL 3
 CELL 4
 T/P



3.5 Circuit of cable

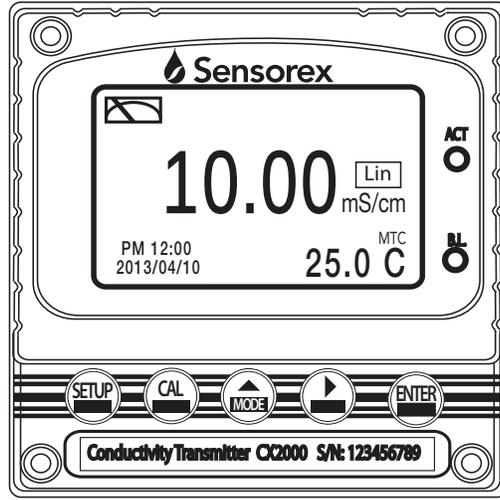
Terminal sign	Conductivity Cell			Others
	2 Electrode Cell 4-Electrode Cell	Fixed Cable Resistivity Cell	Fixed Cable Conductivity Cell	Please read the instruction of the cells
SHIELD				SHIELD
CELL 1				Current electrode 1
CELL 2				Voltage electrode 1
CELL 3				Voltage electrode 2
CELL 4				Current electrode2/ ATC
T/P				T/P 2nd side of ATC

3.6 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 multi-keys, and coding protection if necessary. Description of the key functions is in the following:



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



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



: 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.



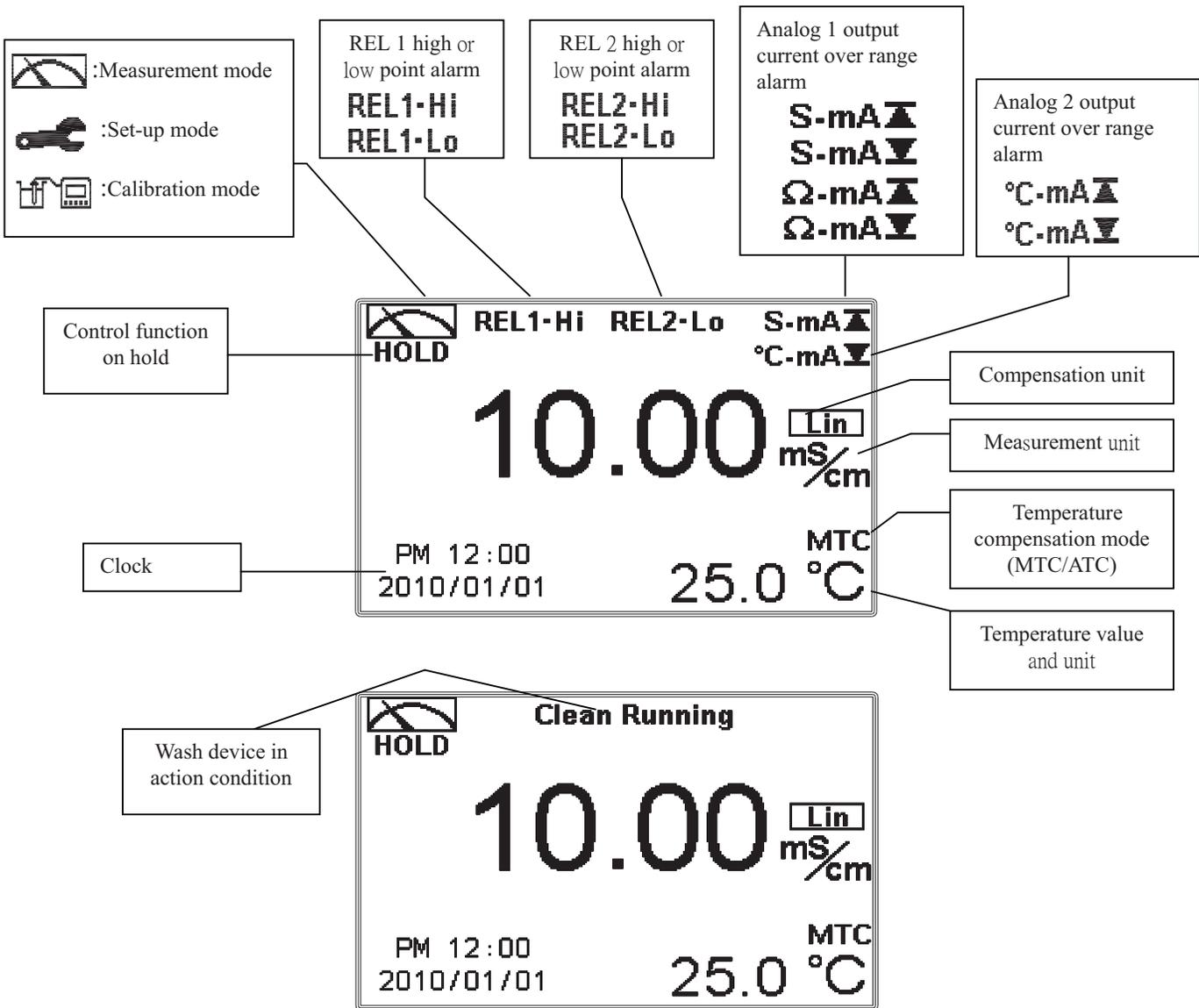
: Key for confirmation; pressing this key is essential when modifying data value or selecting the parameter setting items in the window.

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.

4.4 Display:



Note: 1. When the wash device is turned on, the display shows and flashes 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, relay 1 and Relay 2 will automatically return to normal status.

2. When Relay 1 which is set in high setting point is in action, the display shows and flashes 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 flashes 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 flashes 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 flashes the description, “REL 2_Lo”, and ACT indicator LED lights up.
4. When under measurement mode, if the temperature compensation mode is set in MTC (Manual adjustment), press  or  to adjust the MTC temperature manual.

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 press to 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: In the measurement mode, if selecting MTC for temperature compensation mode, you may press  and  to adjust MTC temperature value.

5.5 Reset:

5.5.1 Master Default:

Measurement mode: Conductivity, Auto-Range
Temperature compensation: MTC 25°C
Temperature Coefficient: Lin, 2.00%
Relay 1 : High point alarm: AUTO, SP1= 100.0mS , DB=10.0mS
Relay 2 : Low point alarm: AUTO, SP2 =10.0 mS , DB= 1.00 mS
Wash time: OFF
Analog 1 current output (Cond/Res) : 4~20 mA , 0.00~199.9mS
Analog 2 current output (Temp) : (Temp) : 4~20 mA , 0~100.0°C
Display backlit: OFF
Contrast: 0
Code: OFF
Date & Time : 2010/1/1 00:00:00
Auto back: Auto, 3 minutes

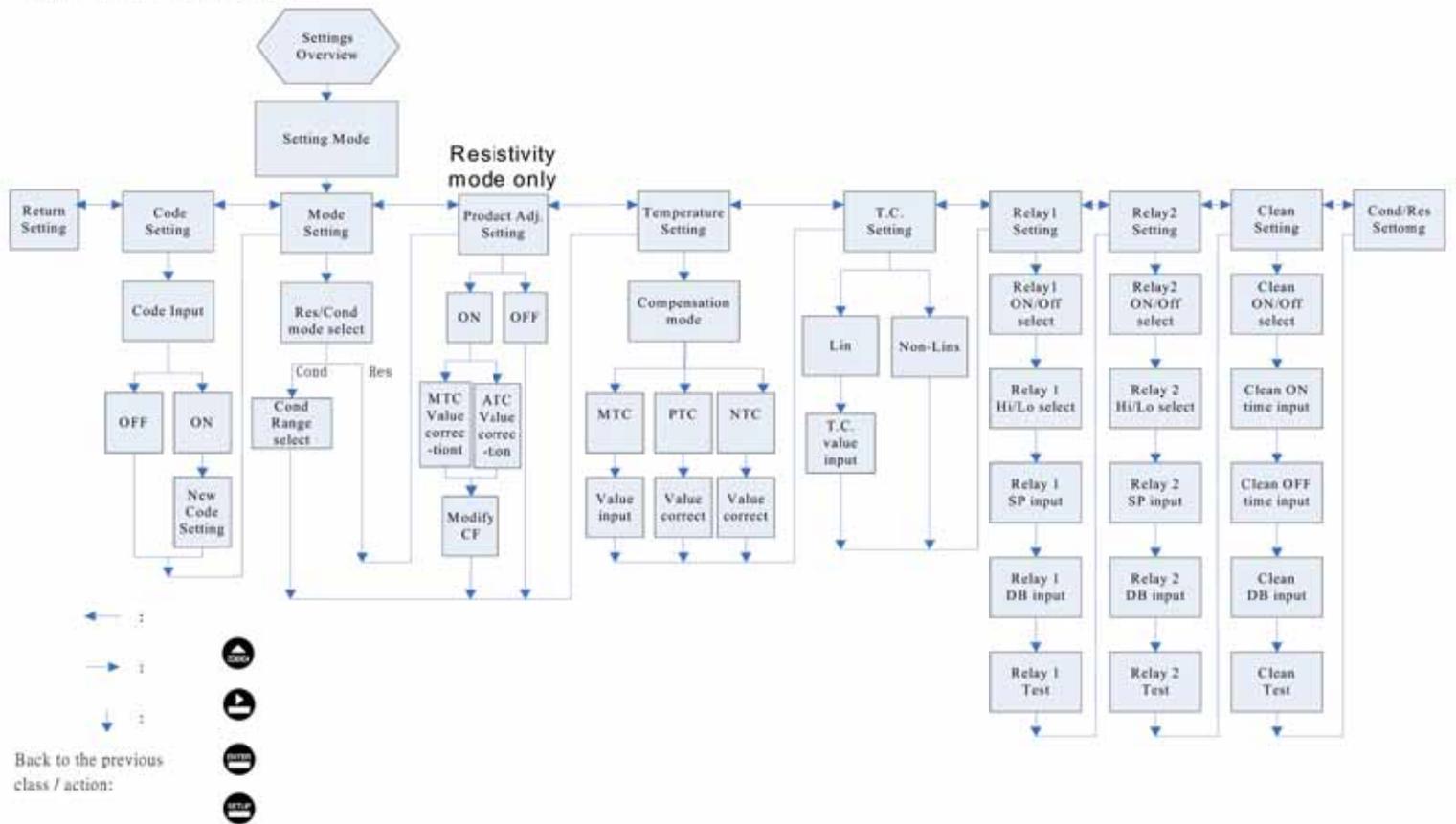
5.5.2 Calibration reset:

Cal Time : 2010/01/01
Cal Type : No Cal
Cell Constant : 0.5000
Cal Temp. : none
Auto back: Auto, 3 minutes

Note: The factory default of calibration presetting is “No Cal”, and the cell constant setting is “0.5000”. It means that the user has not calibrated the sensor with the transmitter yet. When selecting standard solution to finish calibration, the display shows cell constant of the cell and the value of the standard solution.

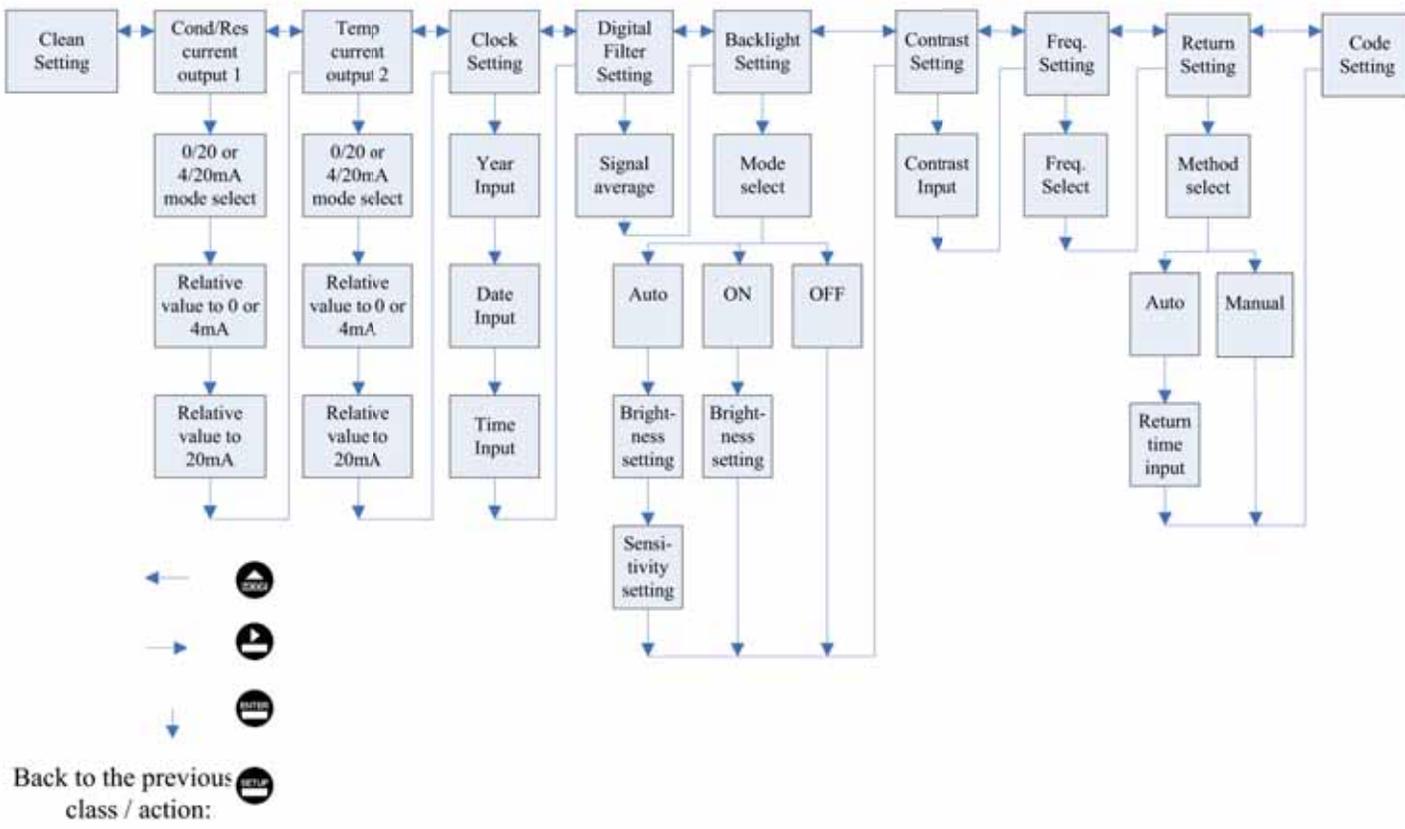
6. Settings

Block diagram of settings 1:



Continued on Next Page

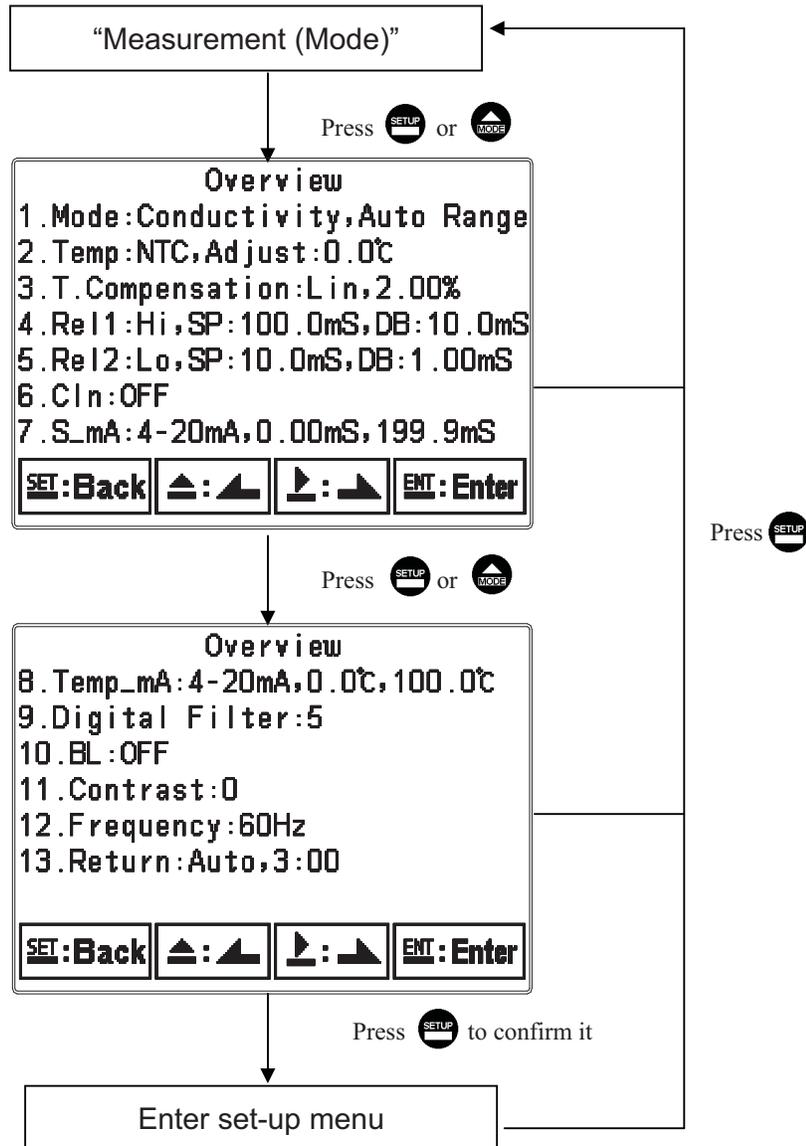
Block diagram of settings 2:



Connected with previous page

6.1 Entry of set-up menu

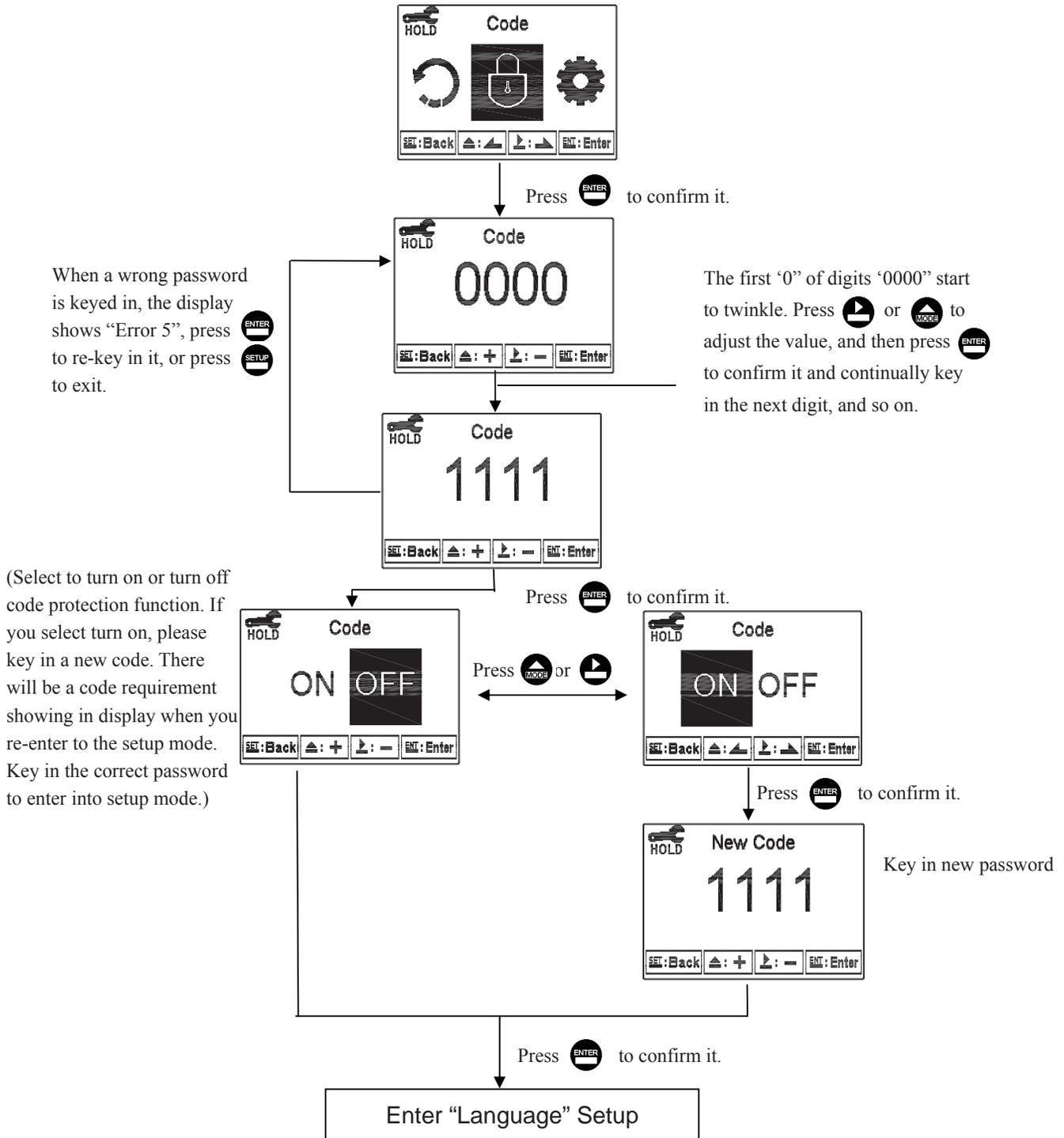
In the measurement mode, pressing the two keys  and  simultaneously allows you enter the overview of current setting, and press  to enter the set-up mode to modify the setting if necessary.



6.2 Security code of settings:

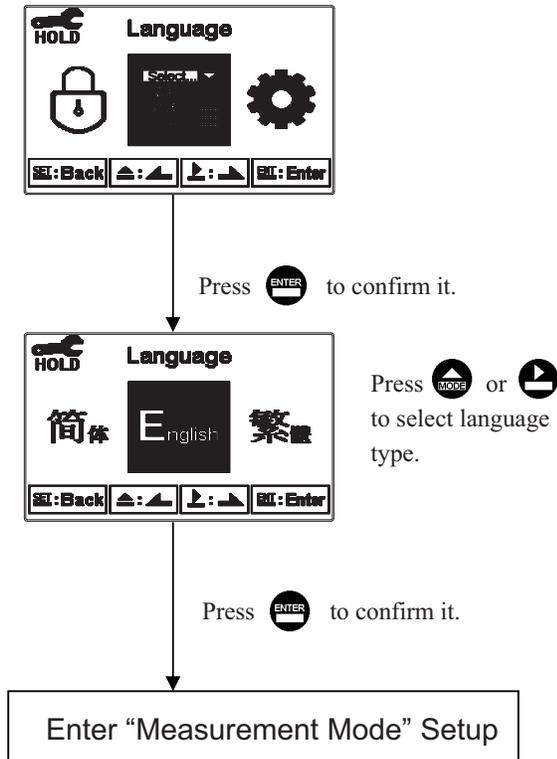
After entering set-up mode, select “code” item, press  enter into code procedure. The pre-set code is 1111.

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



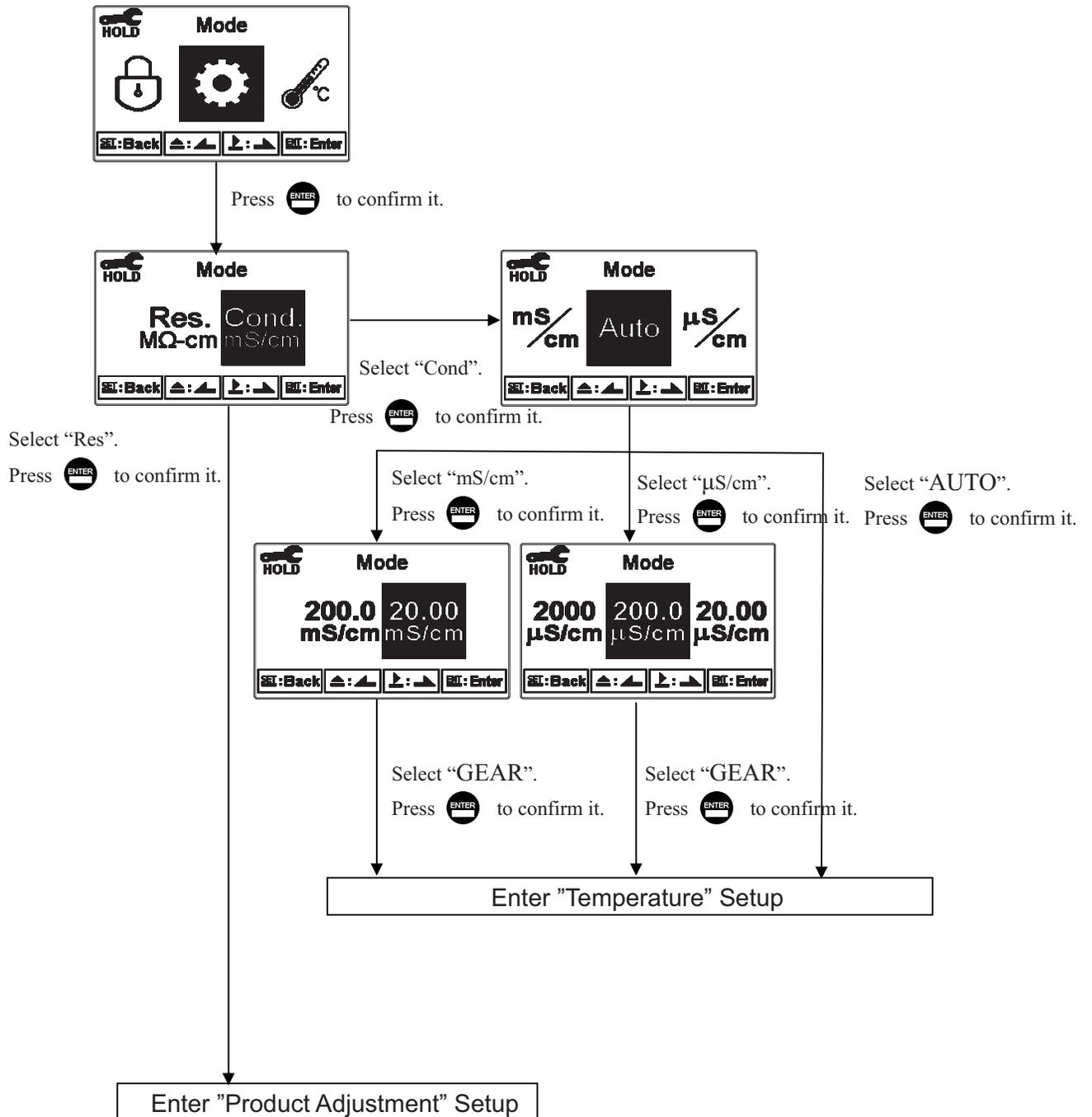
6.3 Language

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



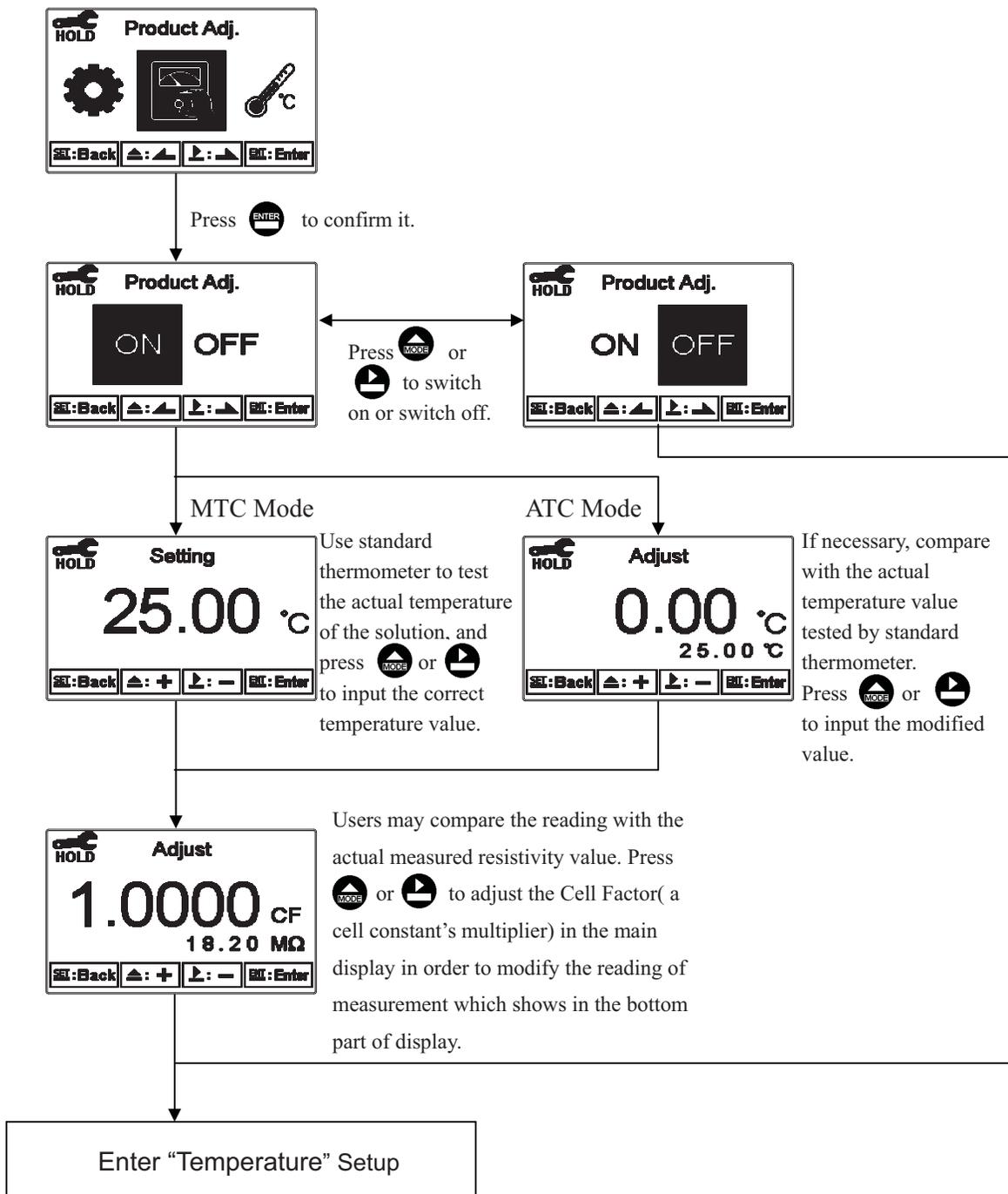
6.4 Mode

Enter setup of “Mode”. Select between “Conductivity (Cond)” or “Resistivity (Res)” measurement. If select “Conductivity”, then the range limit needs to be selected from AUTO, 20.00 μ S, 200.0 μ S, 2000 μ S, 20.00mS or 200.0mS.



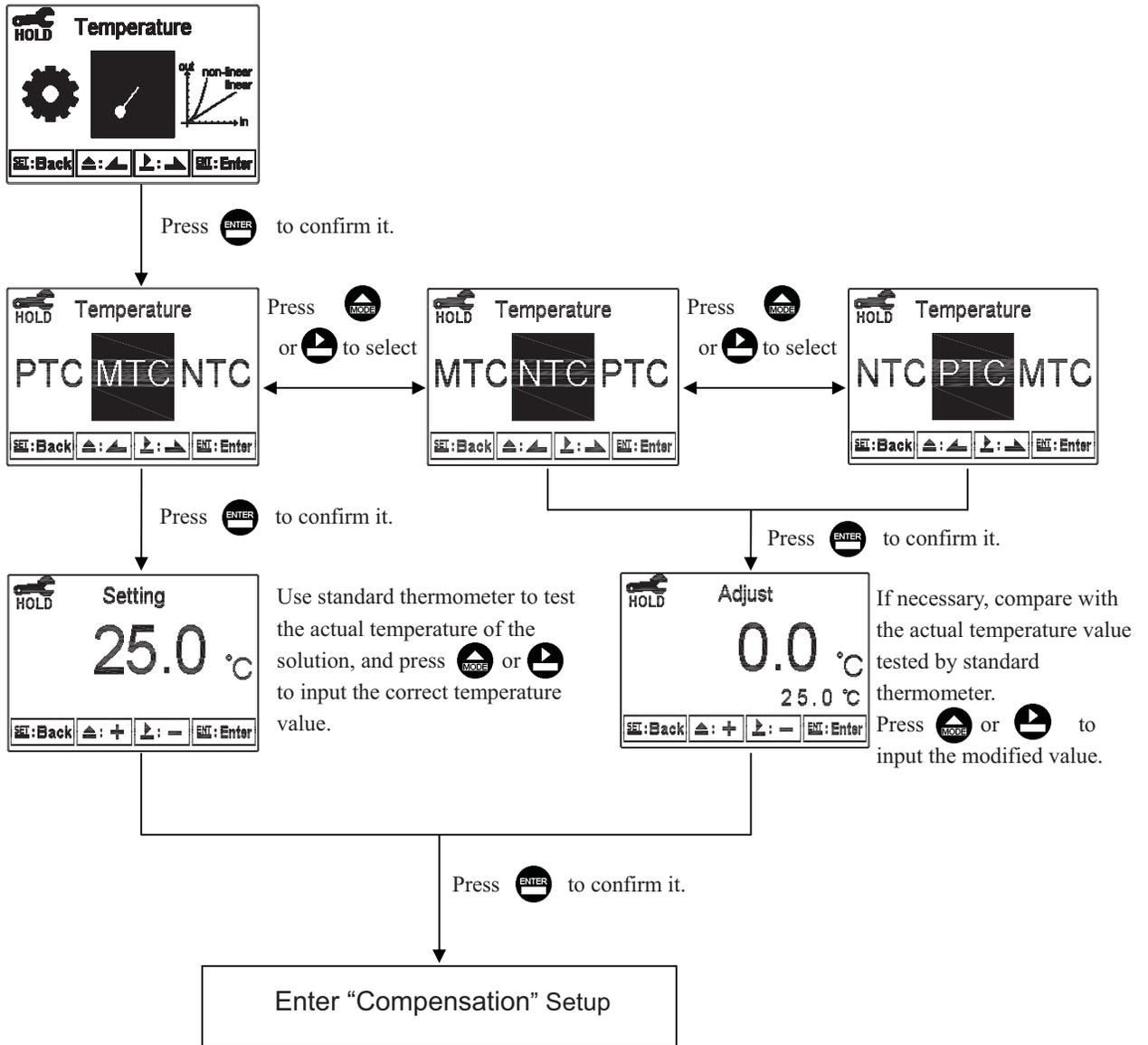
6.5 Product Adjustment (Resistivity mode only)

Enter setup of product Adjustment to make the fine adjustment of the measurement reading. For ultra-pure water application, the function can increase the resolution of cell constant, and it makes users to adjust the cell constant through a Cell Factor (CF) adjustable range: 0.7000~1.3000). It also allows two decimal of the temperature display which increases the sensitivity of cell constant and temperature change and achieves the fine adjustment of reading up to 0.01Meg ohm. It helps the users to see the small change of reading or trend in ultra-pure water application.



6.6 Temperature

Enter setup of “Temperature” to select temperature compensation mode. Select from NTC(NTC 30K), PTC(PT 1K) or MTC(Manual adjustment), or you may press  &  simultaneously to back to default setting. In the measurement mode, if selecting MTC for temperature compensation mode, you may press  or  to adjust MTC temperature value.



6.7 Compensation

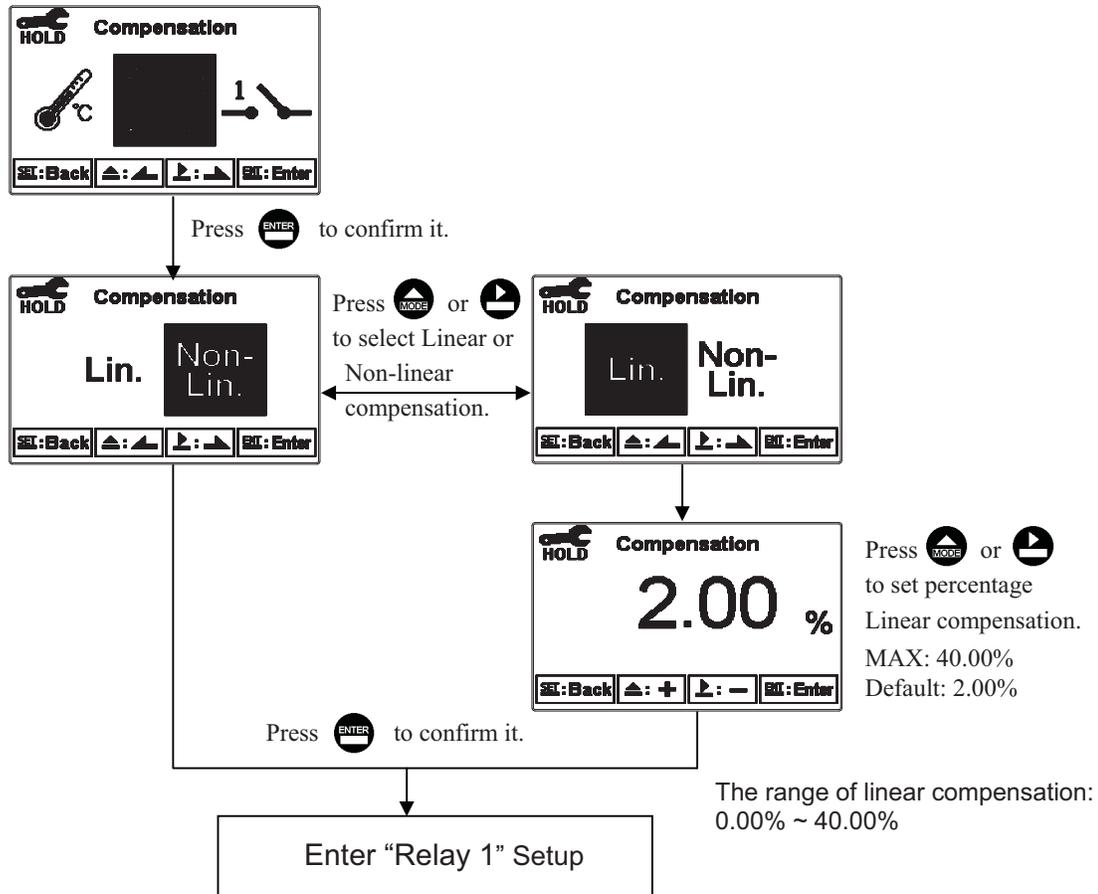
Enter setup of compensation mode, and select Linear Compensation or Non-linear compensation mode. According to your measurement need for temperature coefficient, you may select linear (Lin), non-linear (nLin), or non-compensated (Lin 0.00%).

Normally, select linear compensation for conductivity measurement(Cond)(Range: 0.00%~40.00%), and select non-linear compensation for Resistivity measurement.

Temperature coefficient (hereinafter referred to as TC): Conductivity of solution increases with temperature increase. The relationship is as follows:

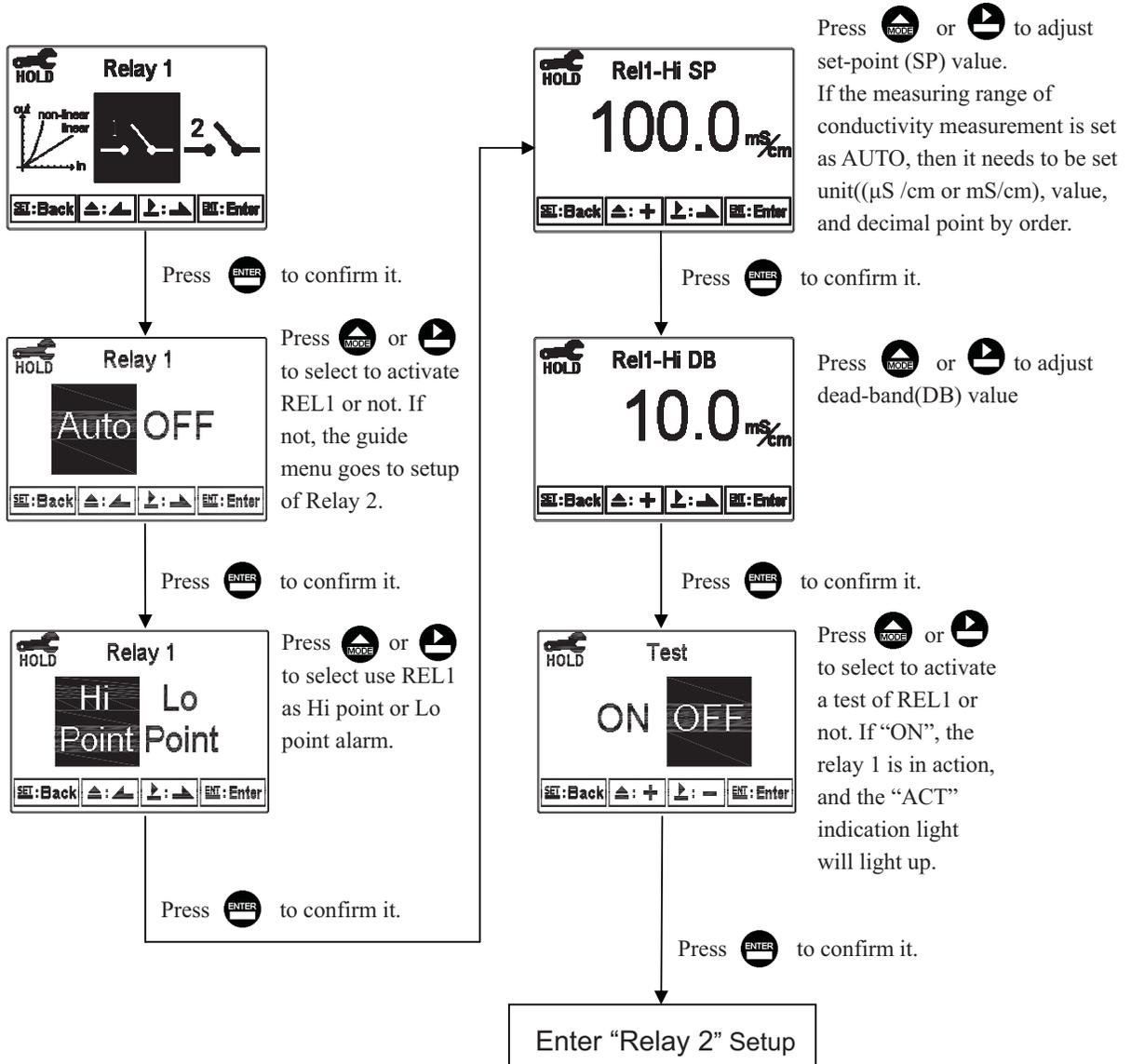
C ₂₅	Conductivity at 25°C	Formula 1 : $C_t = C_{25} \{ 1 + \alpha (T - 25) \}$
C _t	Conductivity at T°C	
T	Measured solution temperature	Formula 2 : $\alpha = (C_t - C_{25}) / \{ C_{25} (T - 25) \}$
α	Temperature compensation	

How to get TC of solution: For obtaining higher accuracy of measurement, you may calculate the TC value according to the formulas above and set an appropriate TC value for the instrument. Take an example for 0.01N KCl. Set the TC of the instrument to non-compensated (Lin, 0.00%), and control the temperature at 25°C and at 20°C. C₂₅ means the measurement value at 25°C(Such as C₂₅ = 1413μS). C_t means the measurement value at 20°C(Such as C₂₅ = 1278μS). According to the formulas above, α = 1.91%.



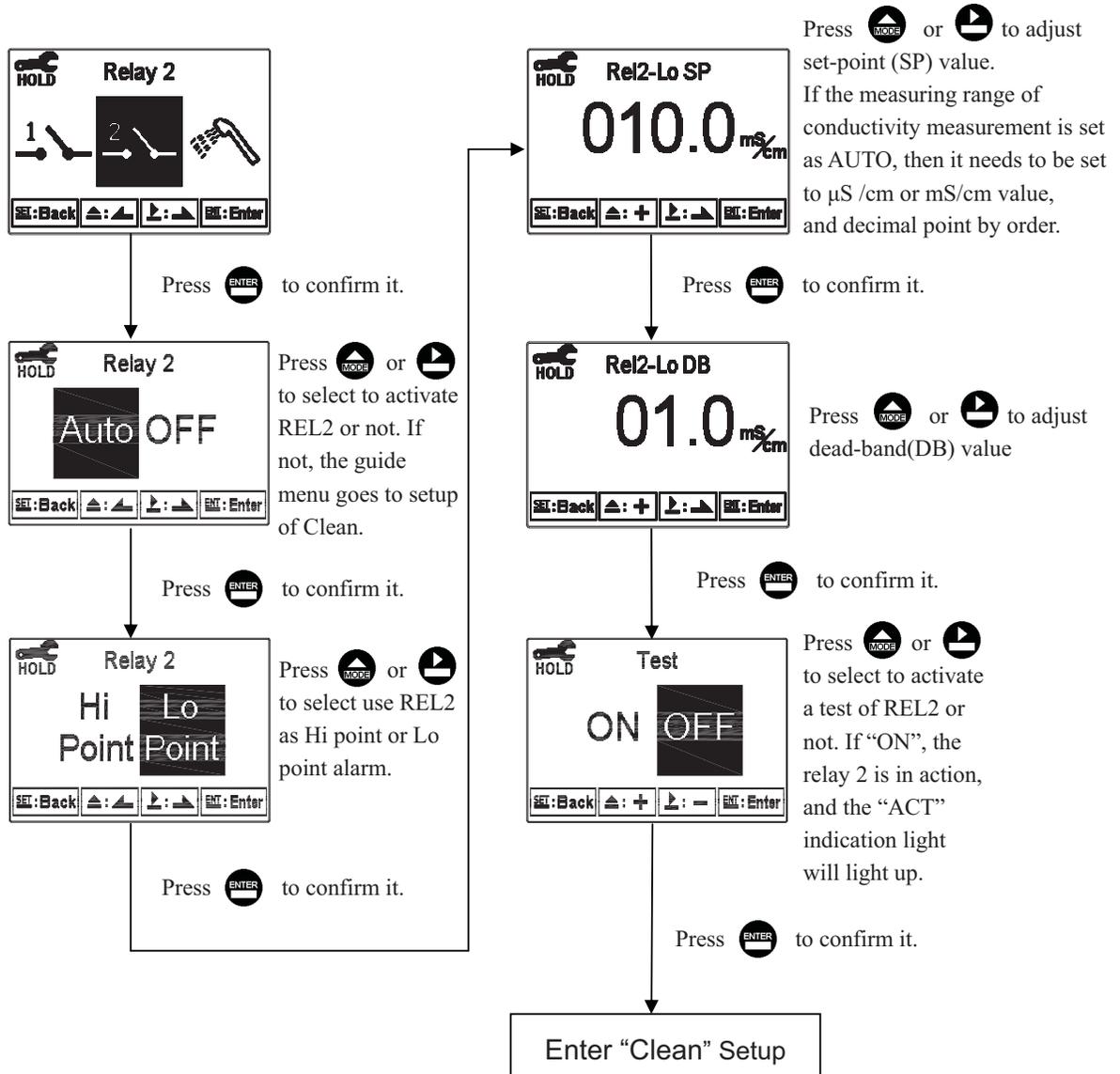
6.8 Relay 1

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). The range for set-point is 00.00MΩ~19.99 MΩ/00.00μs~1999mS; while the range for DB is 00.00MΩ~2.00 MΩ/00.00μs~19.99mS. (The measurement unit is depending on the use of measuring range)



6.9 Relay 2

Enter setup of Relay 2. Select the item to turn on or turn off the relay 2 function. If you select to turn on the relay 2, then select relay 2 as “Hi set-point” alarm or “Low set-point” alarm. Set the value of set-point (SP) and dead-band (DB). The range for set-point is 00.00MΩ~19.99 MΩ/00.00μs~1999mS; while the range for DB is 00.00MΩ~2.00 MΩ/00.00μs~19.99mS. (The measurement unit is depending on the use of measuring range)

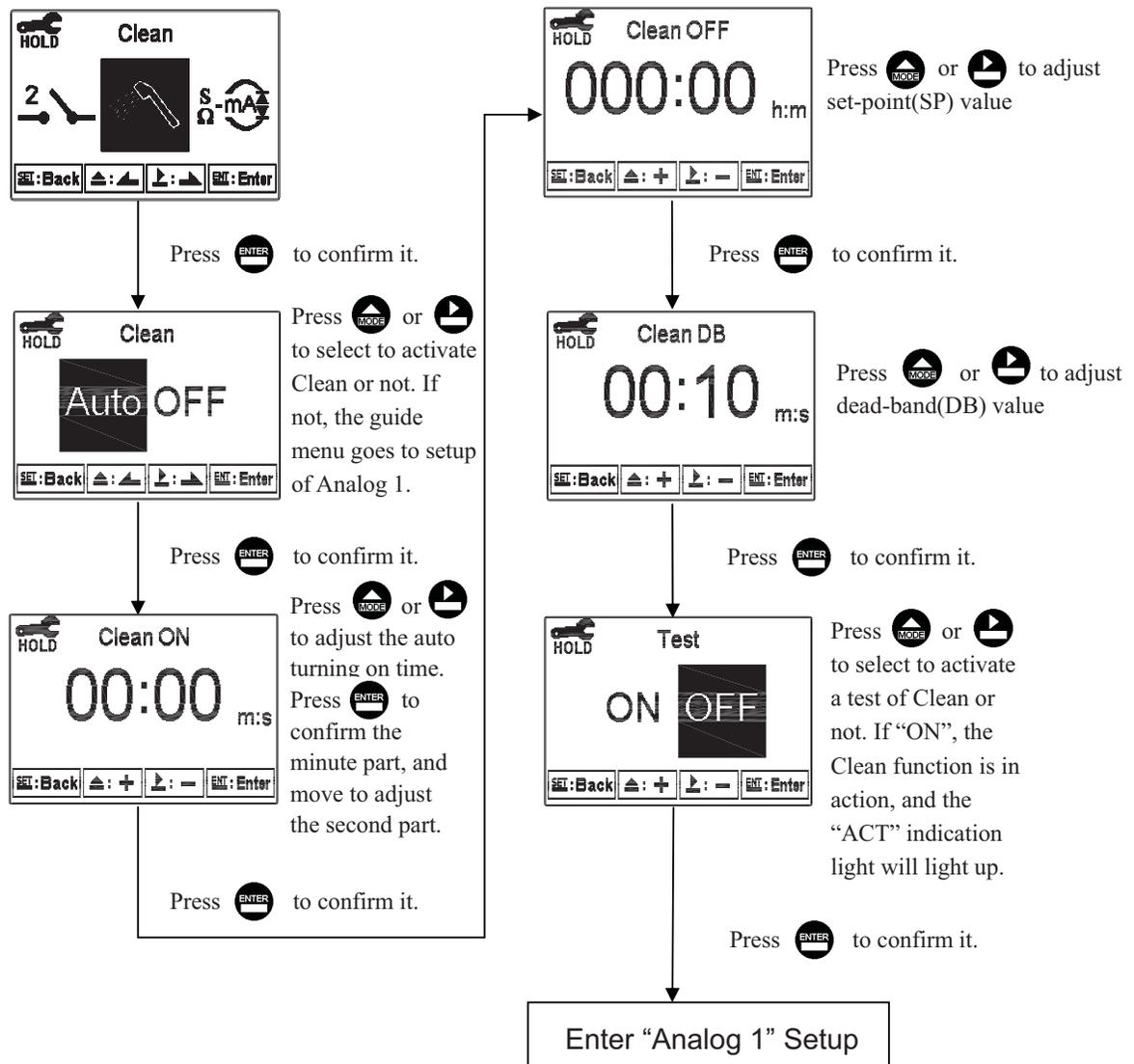


6.10 Clean

Enter setup of “Clean” function. Select the icon to turn on or turn off the clean function.

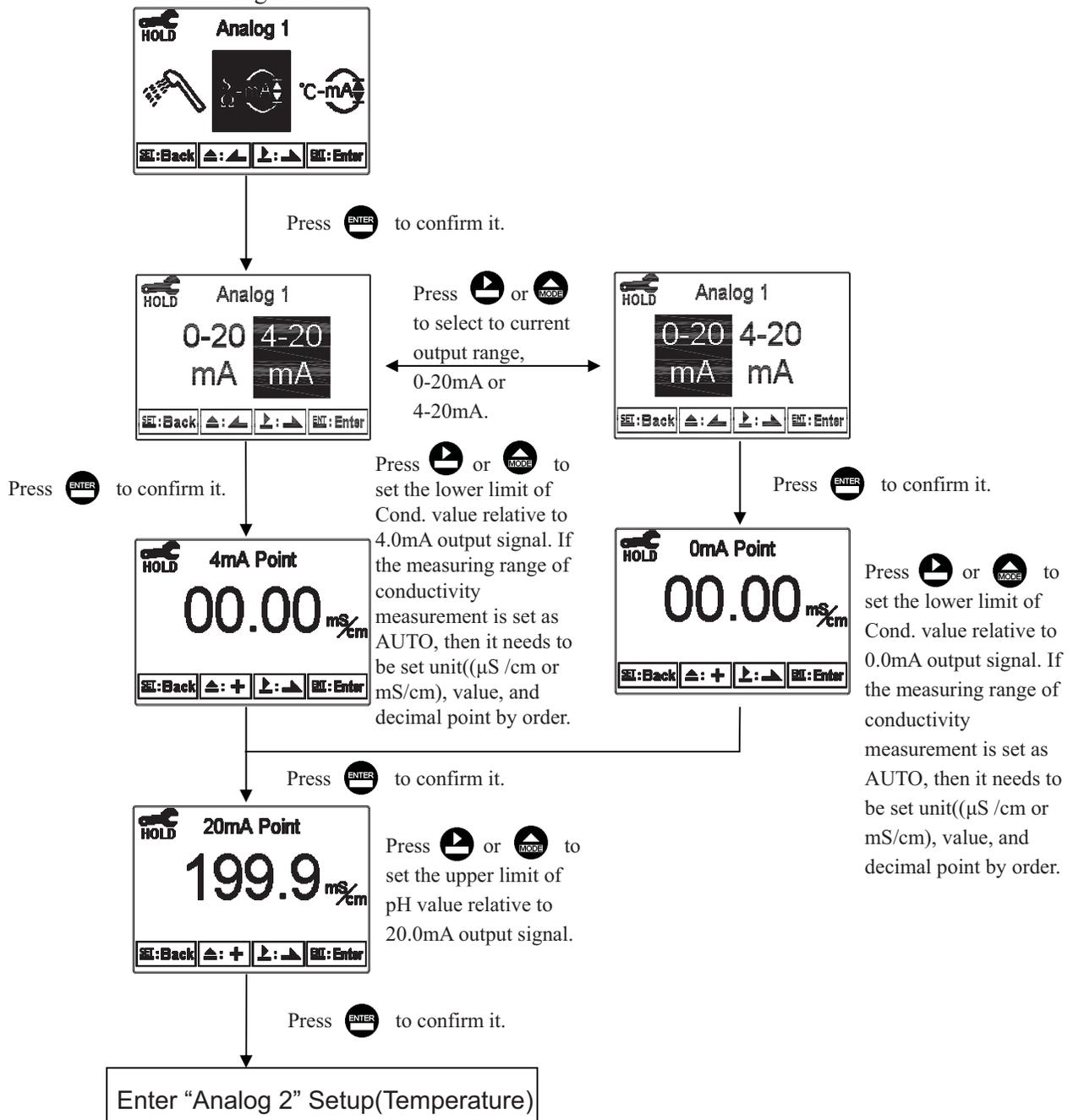
If you select “Auto” turning on, this sets the timer of the clean function including automatically turning on time and turning off time, and the bead-band value(DB).

Note: When the clean function is turned on, if any value is set to 0, the instrument will automatically turn off this function.



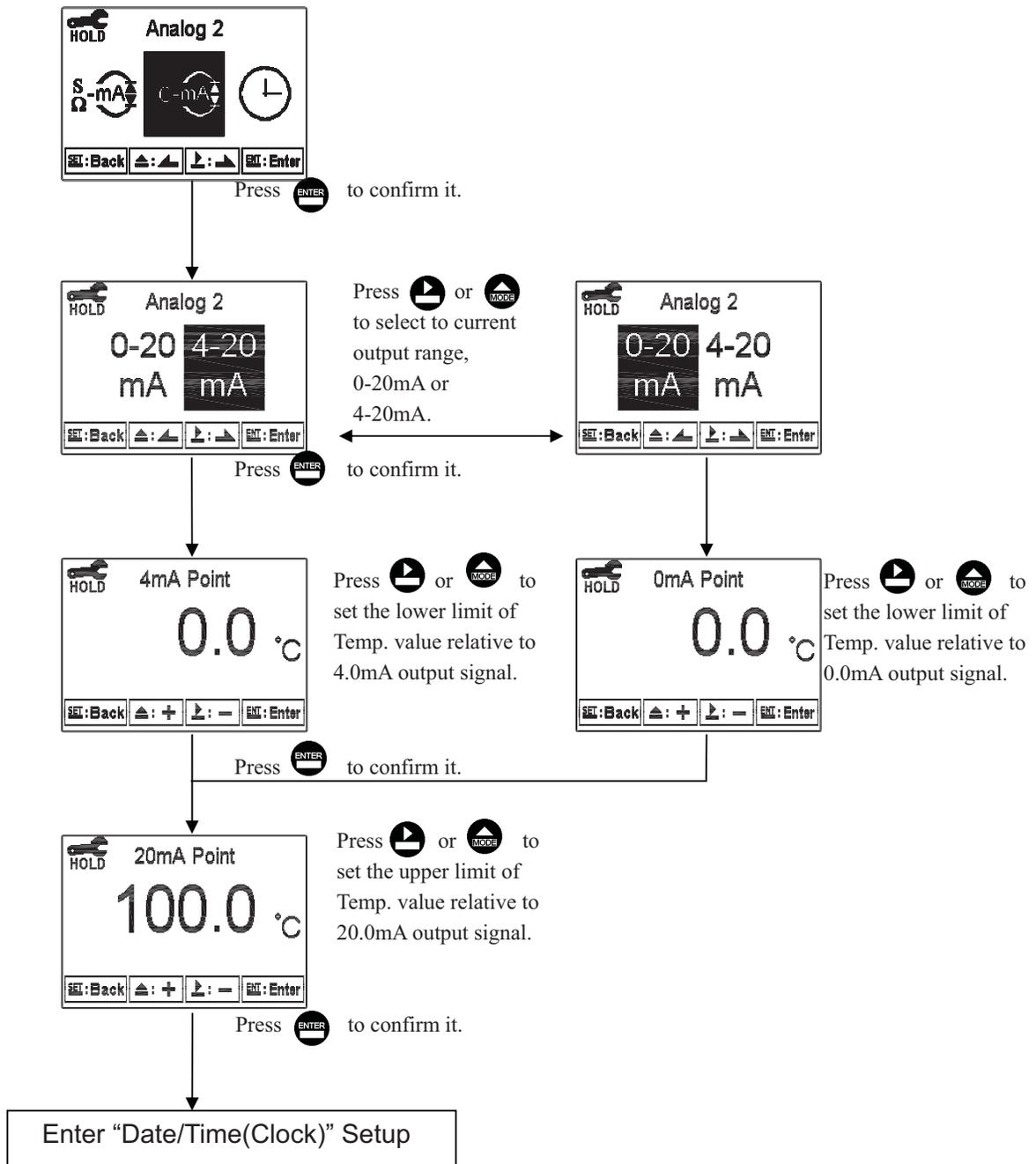
6.11 Analog output 1 (Cond/Res):

Enter setup of Analog 1. Select 0~20mA or 4~20mA current output. Set the related value to the range of Cond./Res. measurement. If the range of the Cond./Res. measurement is set smaller, the resolution of current output is higher. When the measurement value exceeds the upper limit of setting range, the current output remains at around 22mA. When the measurement value exceeds the lower limit of setting range, the current output remains at 0mA under 0~20mA mode, or the current output remains at around 2mA under 4~20mA mode. The phenomenon can be used as a judgment reference of abnormality. If under HOLD status, the current output will remain at last current output value before the HOLD status is activated. For the convenience of connecting external recorder or PLC controller, the current output will remain 0/4mA or 20mA while setting its relative measurement value.



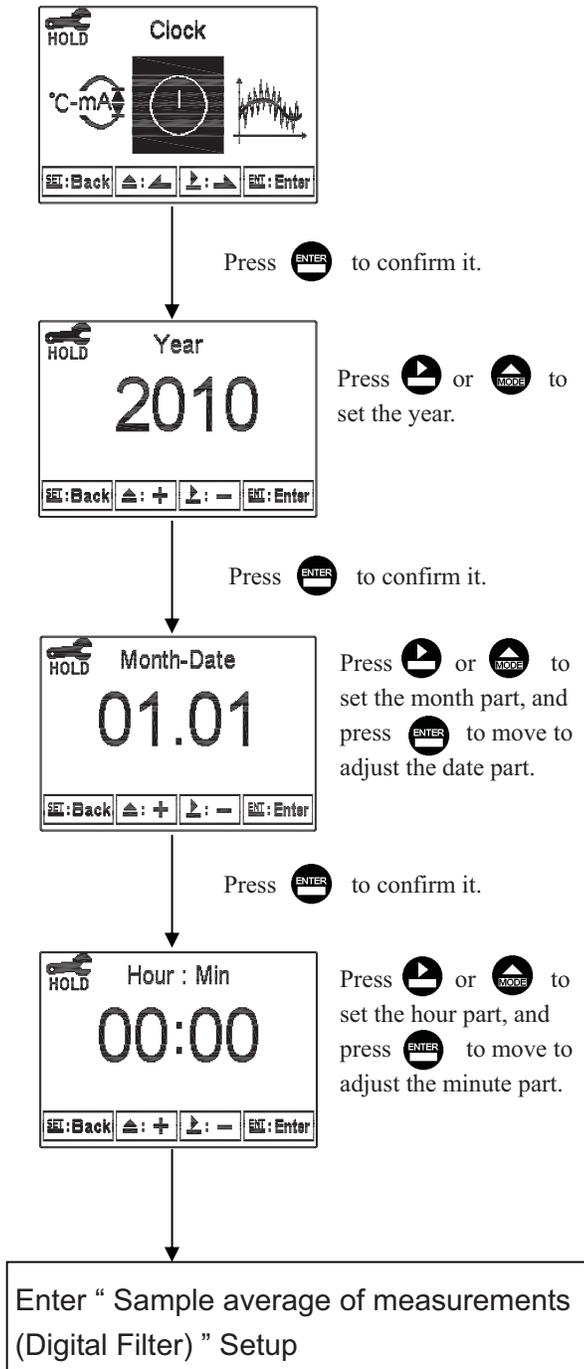
6.12 Analog output 2 (Temperature):

Enter setup of Analog 2. Select 0~20mA or 4~20mA current output. Set the related value to the range of temperature measurement. If the range or the temperature measurement is smaller, the resolution of current output is higher. When the measurement value exceeds the upper limit of setting range, the current output remains at around 22mA. When the measurement value exceeds the lower limit of setting range, the current output remains at 0mA under 0~20mA mode, or the current output remains at around 2mA under 4~20mA mode. If under HOLD status, the current output will remain at the last current output value before the HOLD status is activated.



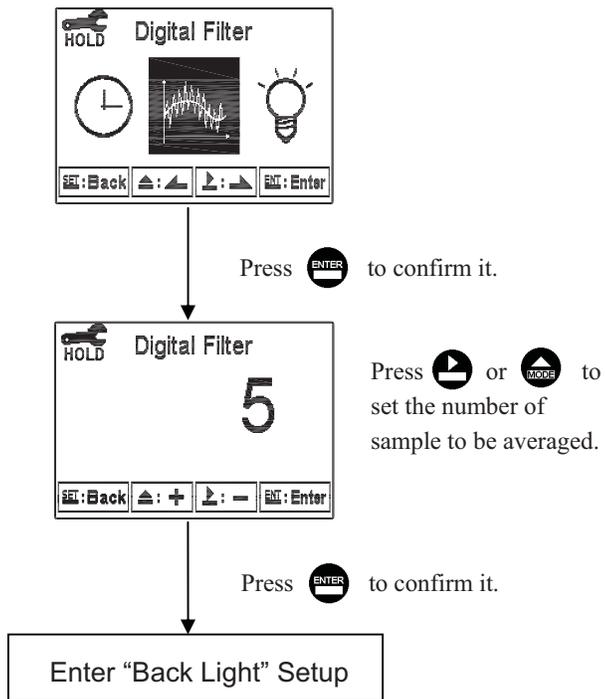
6.13 Date/Time(Clock)

Enter setup of Date/Time(Clock). Set the “Year”, “Month”, “Date”, “Hour”, and “Minute” time. **Note: The clock needs to be reset in the event of a power failure.**



6.14 Sample averaging of measurements (Digital Filter)

Enter the setup of Digital filter. You may select the number of samples to be averaged each time to increase the stability of measurement.



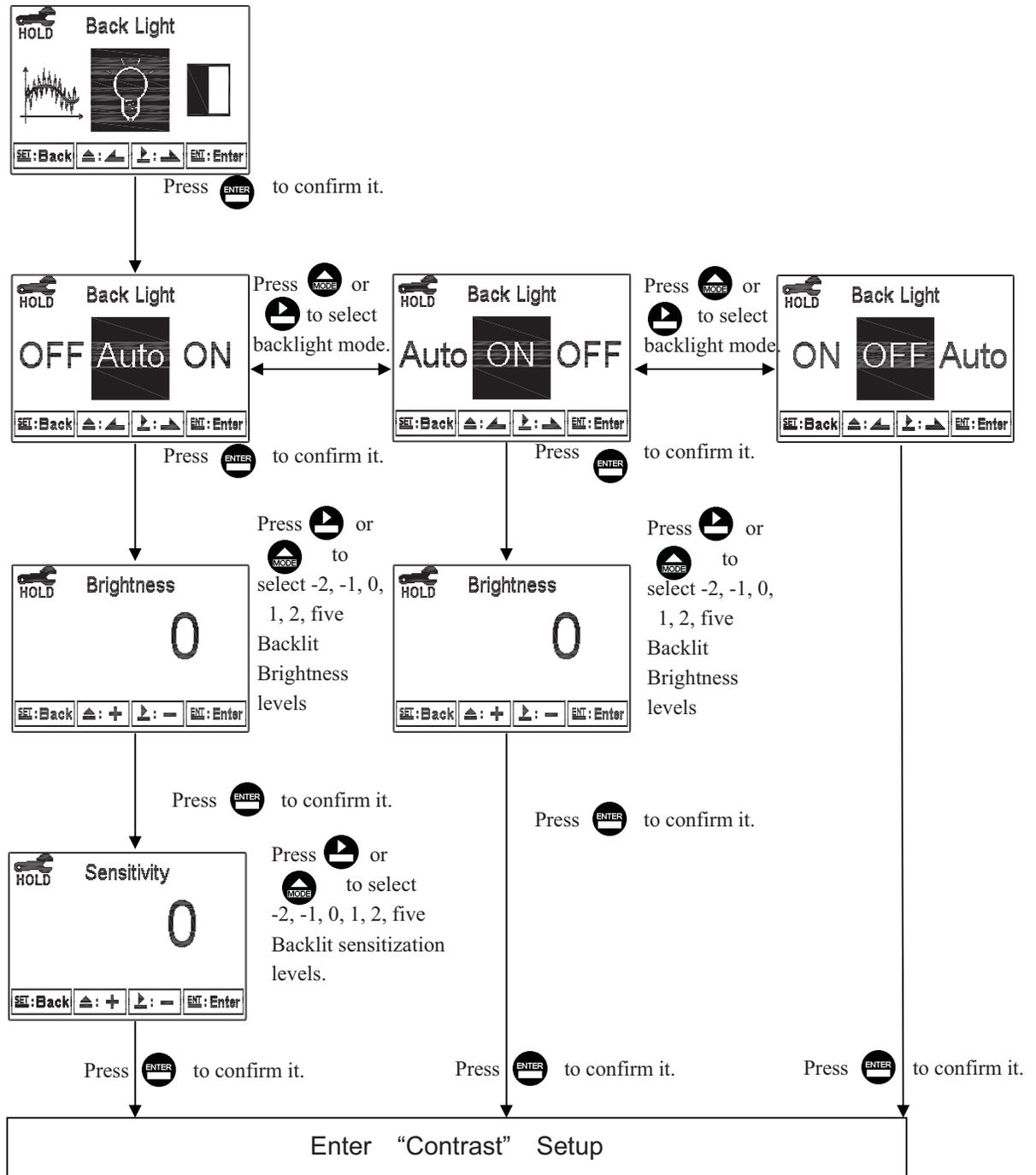
6.15 Backlight settings

Enter setup of backlight display. As needed, you can set the brightness of display(-2~2, dark~ bright) and sensitivity of the backlight sensor(-2~2, insensitive~ sensitive).

ON: Backlight light up

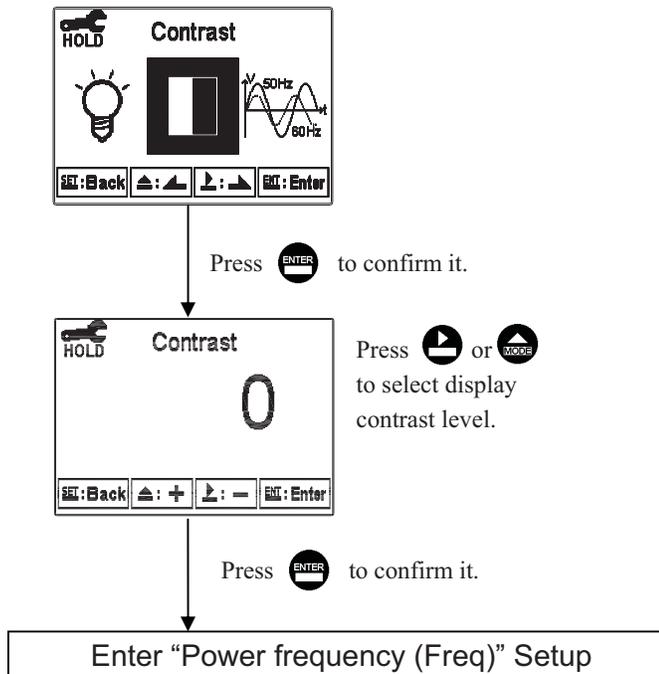
OFF: Backlight turns off & Touch-on mode

AUTO: According to ambient condition turn on & off automatically & Touch-on mode



6.16 Contrast settings

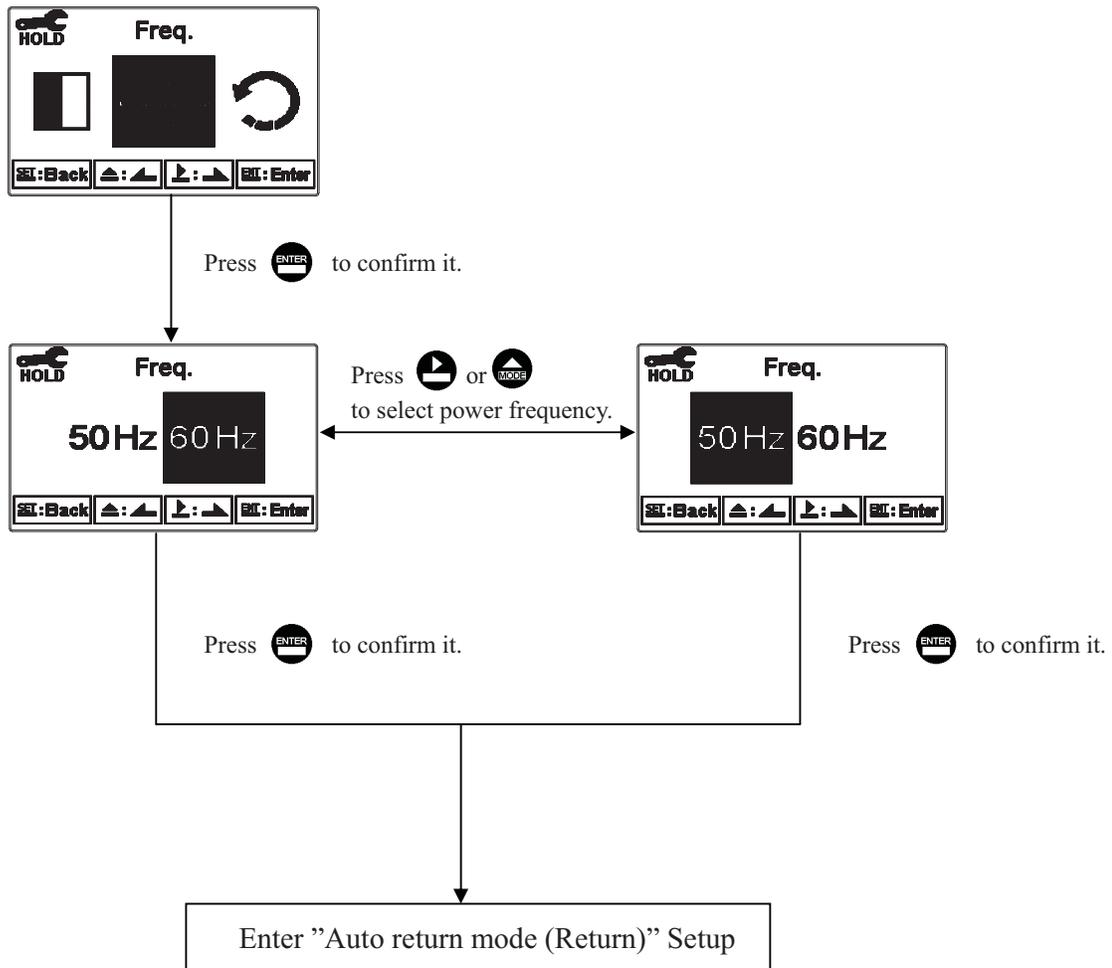
Enter setup of display contrast. You can set the contrast of display according to your need.



6.17 Power frequency (Freq.)

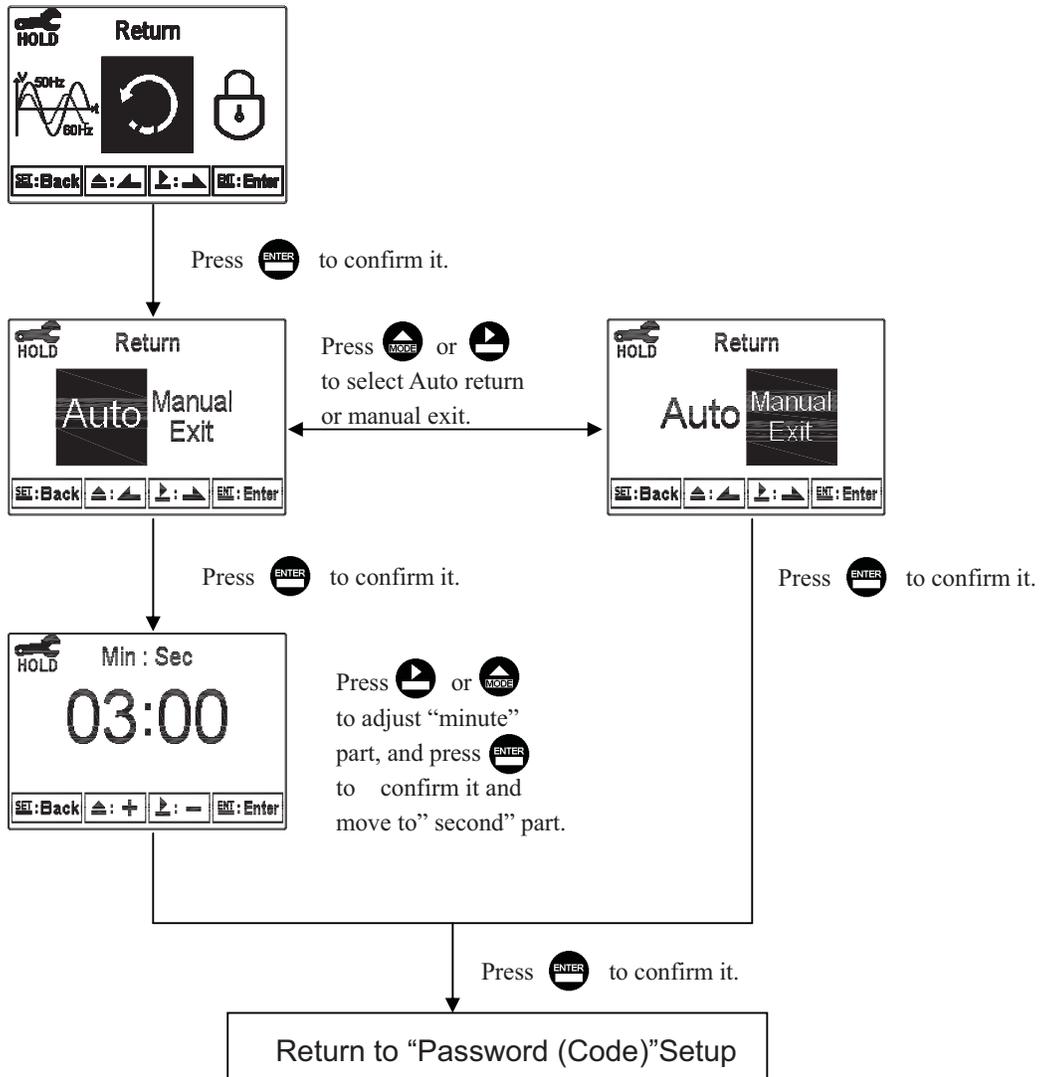
Enter setup of power frequency. You may select power frequency setting of the instrument 50Hz or 60Hz according to the local power frequency.

Note: This setting significantly affects the normal measurement of instrument, thus, be sure to make the setting correctly.



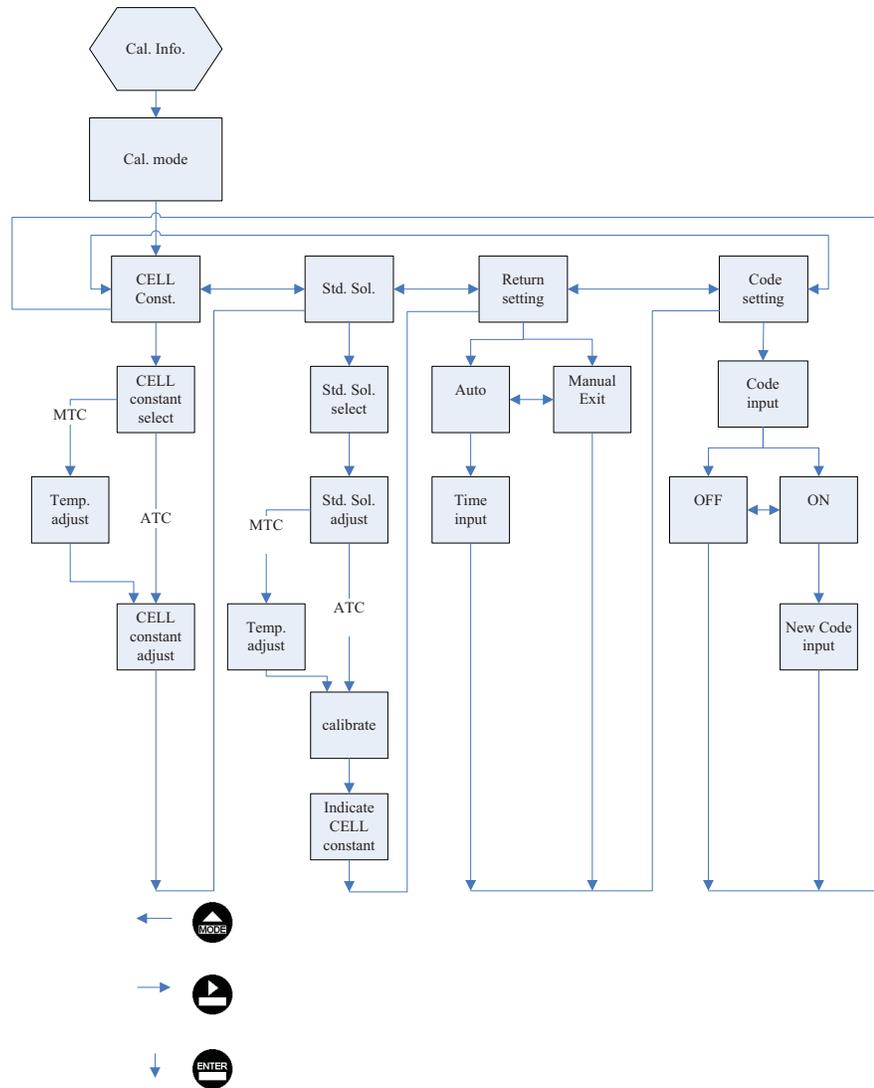
6.18 Return

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.



7. Calibration

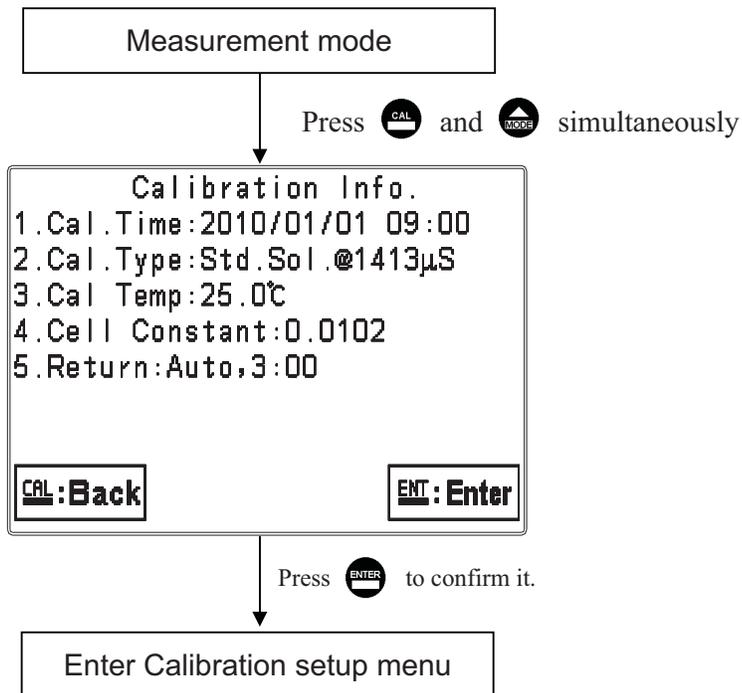
Block diagram of Calibration



Back to the previous class / action
or the end of the procedure: 

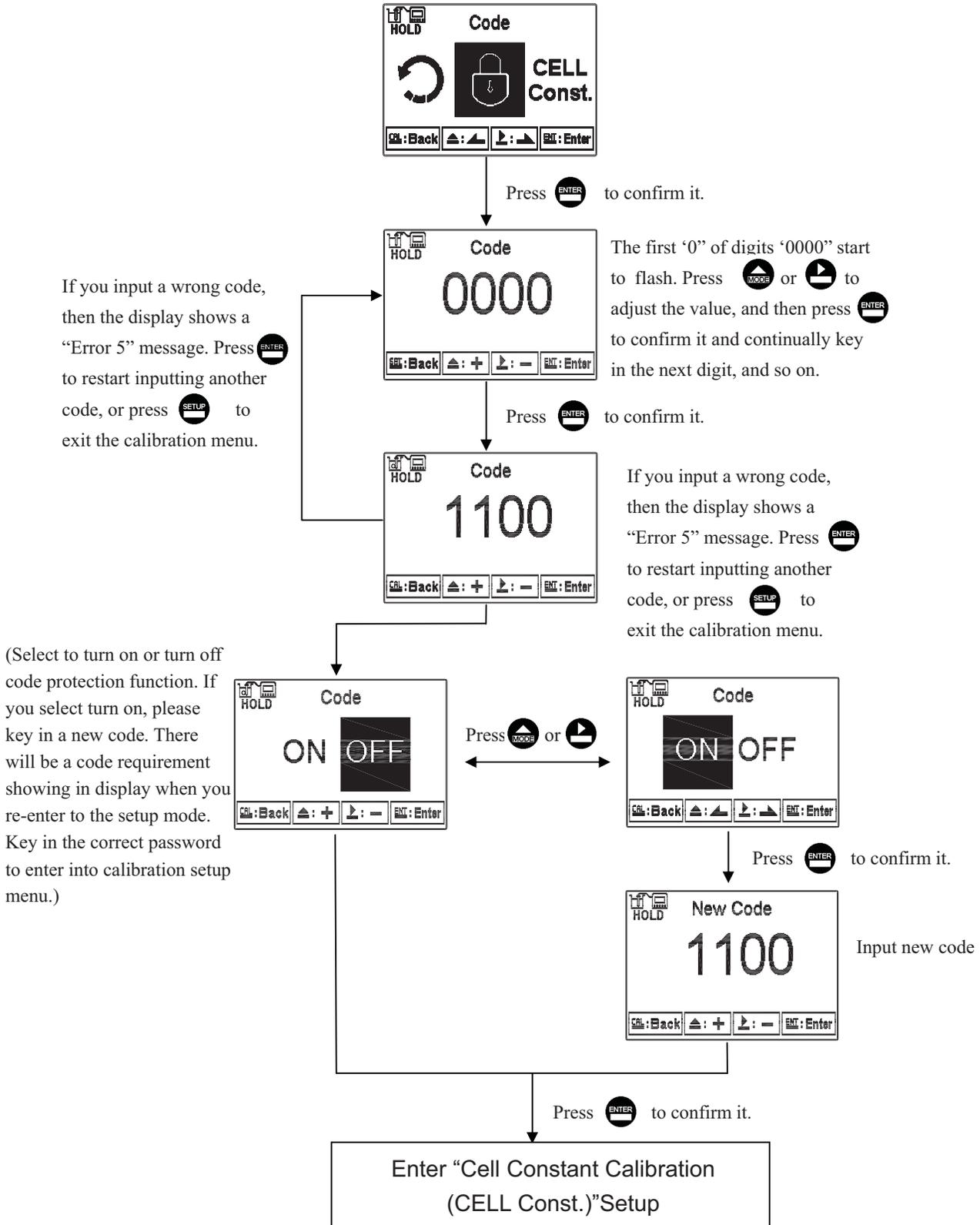
7.1 Entry of calibration menu

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.



7.3 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”.

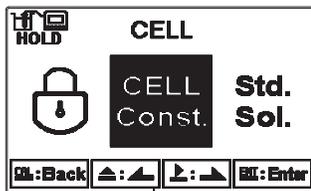


7.4 Cell constant calibration (CELL Const.)

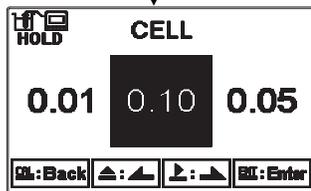
7.4.1 Resistivity (Res)

Enter setup of cell constant to directly set cell constant. Press or to select the preset value closest to your sensor's one. There are three sets of preset value (0.01, 0.05, 0.10). Select the most appropriate cell constant value and press to confirm it and enter to the next screen. At the time, the cell constant starts to flash. Press or to adjust the cell constant value. Correct the measurement value to known standard solution value by adjusting the cell constant, or setting the known cell constant directly. Press to confirm it.

Resistivity cell constant setting range:	
0.0100	Adjustable range: 0.0080 ~ 0.0120
0.0500	Adjustable range: 0.0400 ~ 0.0600
0.1000	Adjustable range: 0.0800 ~ 0.1200

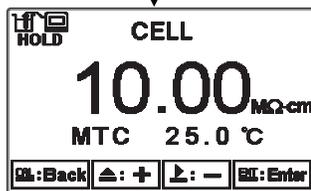


Press to confirm it.



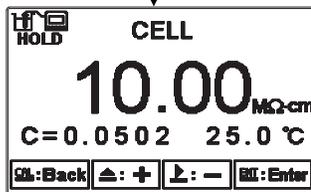
According to the cell constant of the resistivity sensor, press or to select the nearest preset value.

Press to confirm it.



Under MTC temperature mode, press or to adjust temperature value. If under ATC temperature mode (PTC or NTC), the temperature value is read automatically, and the instrument directly goes to next screen.

Press to confirm it.



According to labeled cell constant of the resistivity sensor, press or to adjust to the corresponding value. Press to confirm it.

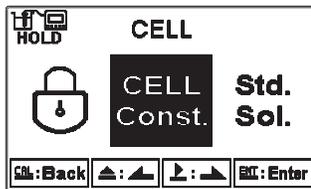
Press to confirm it.

Enter "Standard solution calibration" mode

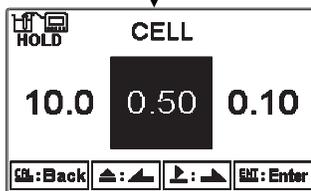
7.4.2 Conductivity (Cond)

Enter setup of cell constant to directly set cell constant. Press or to select the preset value to near an appropriate one. There are four sets of preset values (0.01, 0.10, 0.50, 10.00). Select the most appropriate cell constant value and press to confirm it and enter to the next screen. At this time, the cell constant starts to Flash . Press or to adjust the cell constant value. Correct the measurement value to known standard solution value by adjusting the cell constant, or set the known cell constant directly. Press to confirm it.

Conductivity cell constant setting range:	
0.0100	Adjustable range: 0.0080~0.1200
0.1000	Adjustable range: 0.0400~0.6000
0.500	Adjustable range: 0.0800~1.999
10.00	Adjustable range: 2.00~19.99

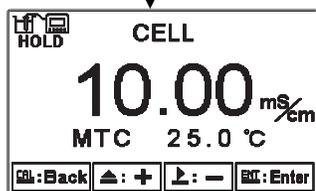


Press to confirm it.



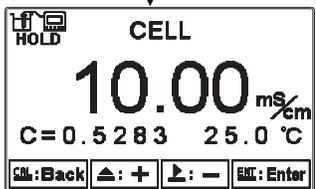
According to the cell constant of the resistivity sensor, press or to select the nearest preset value.

Press to confirm it.



Under MTC temperature mode, press or to adjust temperature value. If under ATC temperature mode (PTC or NTC), the temperature value is read automatically, and the instrument directly goes to next screen.

Press to confirm it.



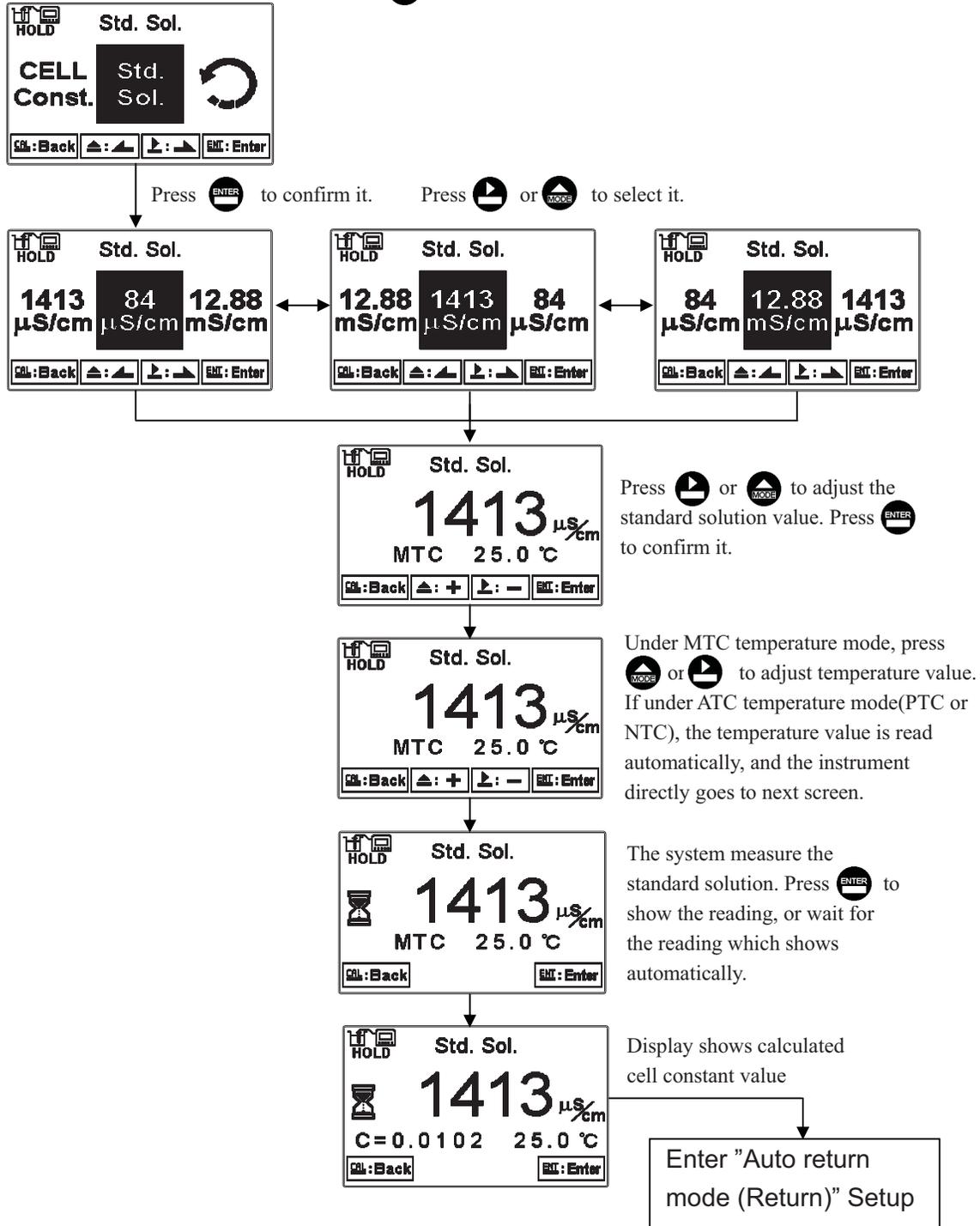
According to labeled cell constant of the conductivity sensor, press or to adjust to the corresponding value. Press to confirm it.

Press to confirm it.

Enter "Standard solution calibration" mode

7.5 Standard solution calibration (Std. Sol.)

Applying known standard solution for calibration is only suitable for conductivity measurement mode. Press or to select from preset standard solution value. There are three preset value from 84.0 μ S/cm, 1413 μ S/cm, to 12.88mS/cm. After selecting proper preset value, put the cleaned conductivity sensor into standard solution, and press to enter the calibration screen. At the time, the conductivity value can be adjusted according to standard solution value. Press to initiate the calibration. The display shows the sign , and it starts the auto calibration procedure. After finishing calibration, the display automatically shows the cell constant after calibration. Press to exit.

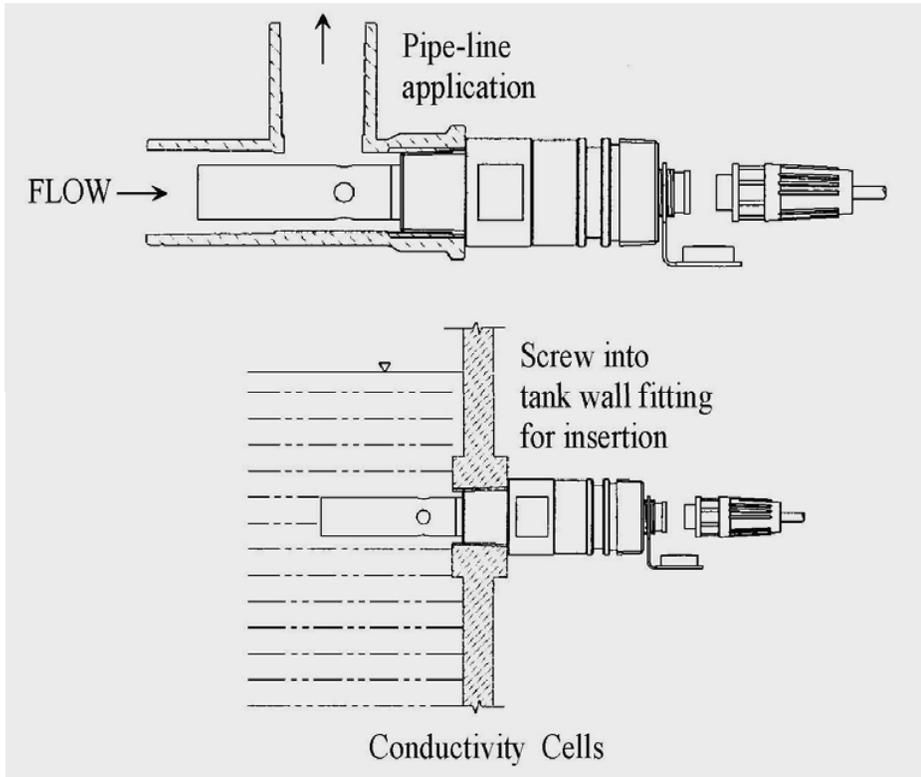


8. Error messages (Error code)

Messages	Reason	Dispositions
Error9	Serious error that does not permit any further measuring	Please call Customer service.
Error3	Wrong password	Re-enter a password
Error2	Cell constant of the electrode exceeds the upper or lower limit	<ol style="list-style-type: none">1. Replace with new standard solution2. Maintain the electrode or change to a new electrode, and make another calibration
Error1	The readout is unstable when calibration	<ol style="list-style-type: none">1. Replace with new standard solution2. Maintain the electrode or change to a new electrode, and make another calibration

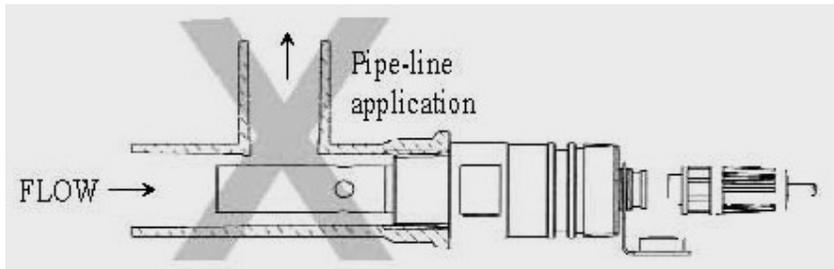
9. Installation of cells

9.1 Correct installation of cells

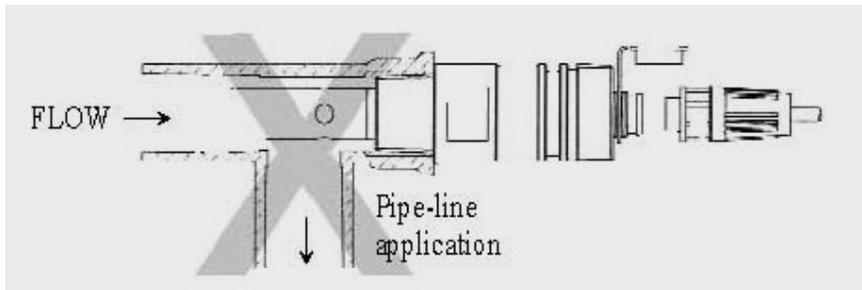


9.2 Incorrect installation

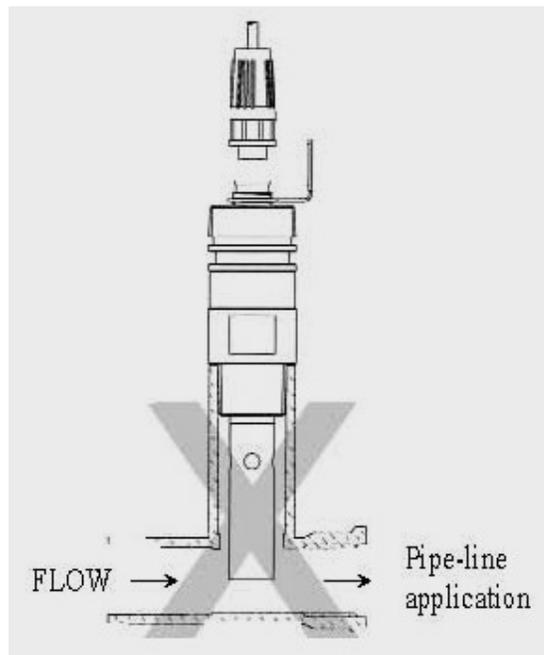
9.2.1 Insufficient immersion: This installation can result in stagnant water inside the cell and thus lead to measurement error.



9.2.2 Insufficient water flow: This installation is prone to error due to insufficient water flow.



9.2.3 Insufficient immersion: This installation can result in stagnant water inside the cell and thus lead to measurement error.





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ISO 9001-2008 Certificate No. C0036132-IS3