TX105 PH/ORP Transmitter

User Manual

REV B.15T

IMPORTANT SAFETY INFORMATION

Please read and observe the following:

- Remove line power before wiring transmitter connections.

- Wiring or repairs should only be performed by qualified personnel and only to an unpowered transmitter.

- Whenever it appears that Transmitter safety is questionable, disable the transmitter to ensure against any unintended operation. For example, an unsafe condition is likely when:

1） The transmitter appears visibly damaged.

2） The transmitter fails to operate properly or provide the intended measurements.

3） The transmitter has been stored for long periods at temperatures above 176°F (80°C).

- The transmitter must be installed by specially trained personnel in accordance with relevant local codes and instructions contained in this user manual. Observe the transmitter's specifications and relative parameter's ratings.

Table of Contents

1 Introduction

The TX105 pH/ORP transmitter is a 2-wire transmitter designed for industrial process monitoring, measurement, and control applications. This user's manual contains the information needed to install, set up, operate, and maintain the transmitter.

2 Dimension Drawings

2.1 Front and Side View

Front view

Side view
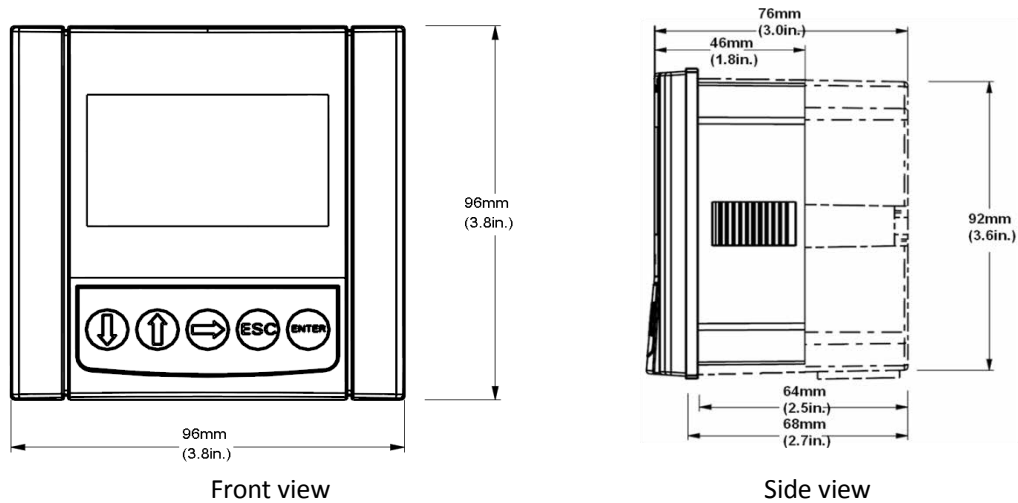
Panel Mount& Field Mount

2.2 Installation

TX105 pH/ORP transmitters are available in two installation styles: panel mount and field mount.

2.2.1 Panel Installation Instructions

1) The panel mount version is designed for installation using a 1/4 DIN Punch.
2) Recommended clearance on all sides between instruments is 1 inch.

3) Slide the gasket over the back of the instrument.
4) Place the instrument into the panel cut-out.
5) Attach the mounting bracket to the back of the instrument by pulling apart the quick clips and sliding it over the back of the instrument. Make sure that the quick clips are securely attached to the latches.
6) Inspect the instrument to make sure that the instrument and the gasket are secured to the panel appropriately.
7) To disassemble, press the clips of the mounting bracket against the panel and pull the instrument away from the front.

Diagrammatic sketch：
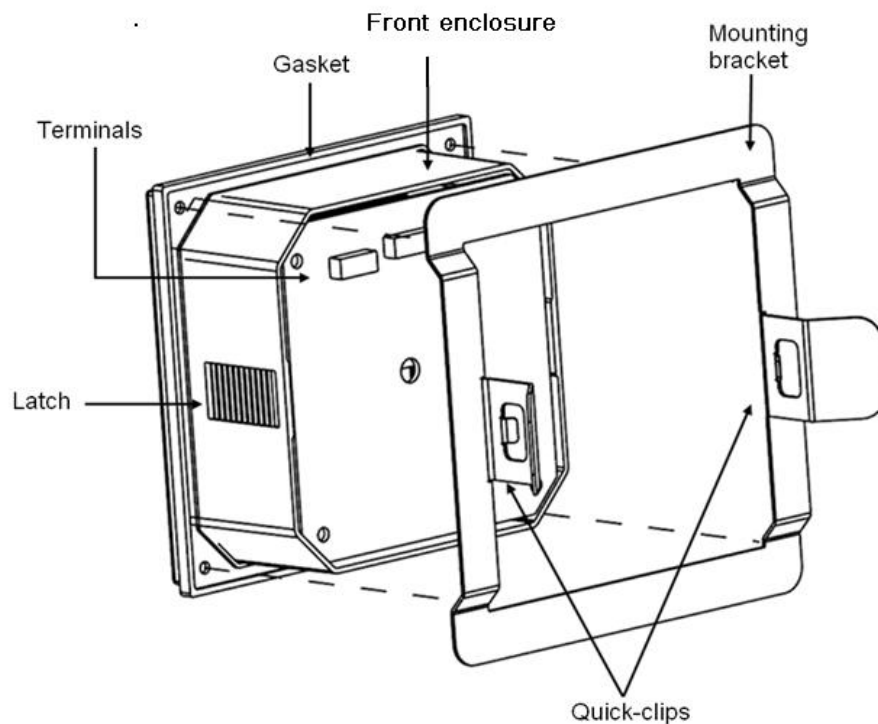
Panel mount installation detail schematic

2.2.1.1   Panel Cut-Out
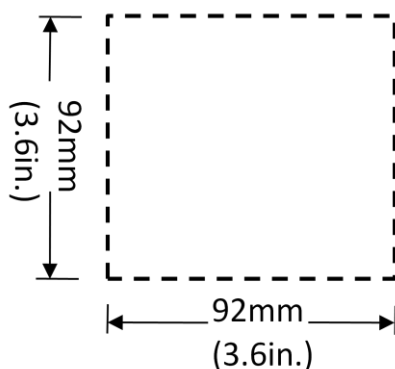
2.2.2 Field Mount Installation

The field mount version requires a wall mounting kit, which includes a plastic wall mounting rear cover with gasket as well as fixing screws. This makes it possible to install the transmitter on a variety of surfaces.

1) Place the gasket on the instrument.
2) Thread electrical cables through the connectors on the wall mounting rear cover.
3) Connect the power, sensor and OC output wires.
4) Secure the wall mounting rear cover to the front enclosure with screws.
5) Fix the wall mounting rear cover to the surface by using screws or cables.

   Diagrammatic sketch：
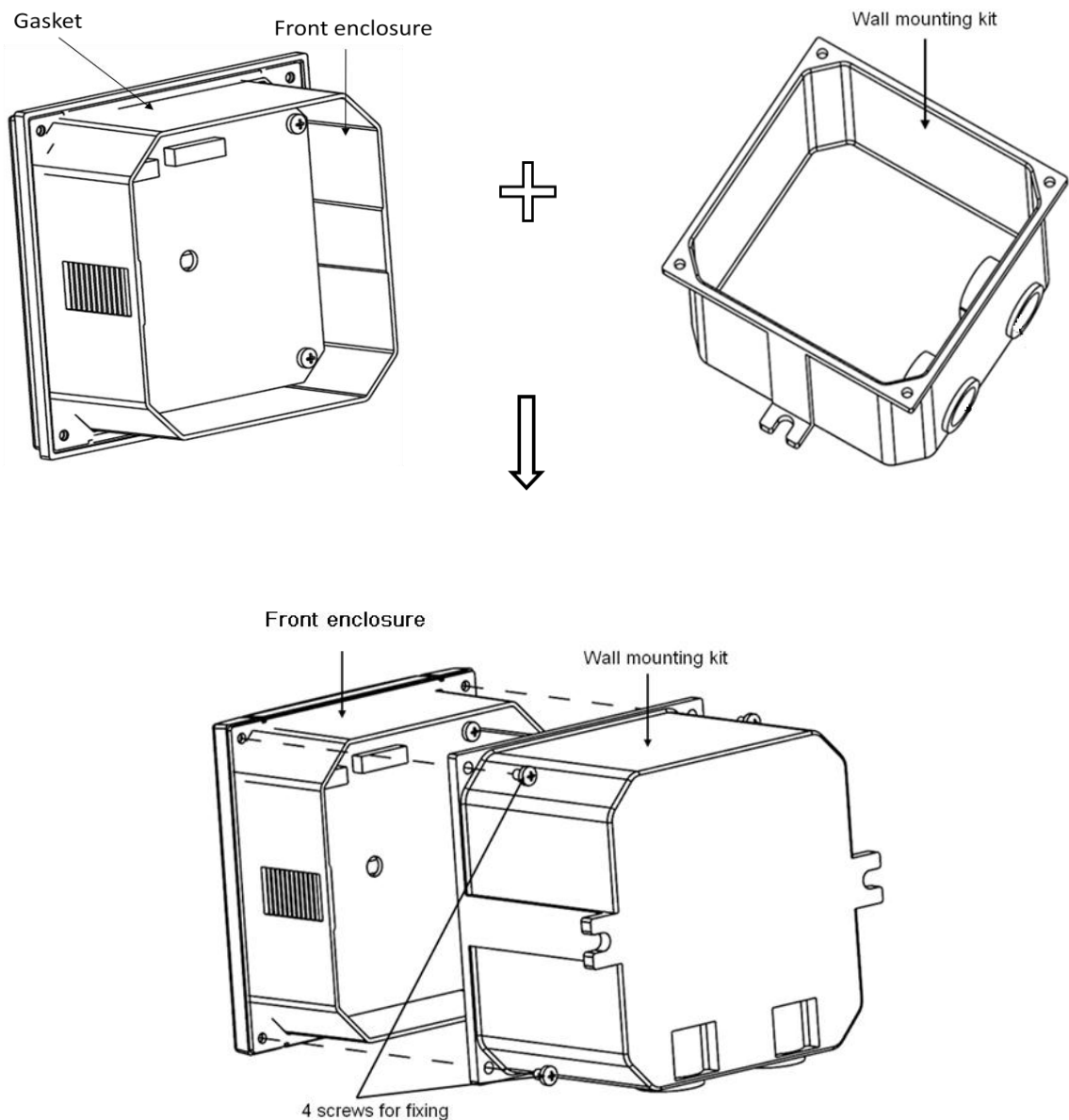
Field mount installation detail schematic

3 Specifications

Display:

- LCD: 128*65 dot matrix, figure or alphabet: 12x8, 28x15, 32x18, etc.

- Update rate: 1 second

- Contrast: User selected, 5 levels

Measurement:

- pH: 0.00 to 14.00 pH

- ORP: -2000mv~+2000mv

- Temperature: PT1000: 0 ~ 60 °C (32 ~ 140 °F)

- Accuracy: ± 0.5% of reading

- Repeatability*: ± 0.05% of span

- Temperature drift*: Zero and Span: ± 0.02% of span per℃

    *These performance specifications are typical at 25°C

Electrical:

- Power: 19 -48VDC, regulated, 30mA maximum

Current Output:

- Isolated 4-20 mA output with 0.004 mA (12-bit) resolution

- Update rate: 1 second

- Maximum loop impedance: 250Ω @24V; 600Ω @31V; 1500Ω @48V

Memory:

- Non-volatile: All user settings are retained indefinitely without battery backup

Open-Collector Output:

- Isolated, 50 mA sink, 40 VDC maximum pull-up voltage

    The OC output can be configured to be one of three modes below:

    - High mode

    - Low mode

    - Proportional pulses

Ambient Conditions:

- Operation: -10 °C to 70 °C (14 °F to 158 °F); 0-95% relative humidity, non-condensing

- Transport/storage: 15°C to 80°C (5°F to 176°F); 0-95% relative humidity, non-condensing

Standards and Approvals

- CE: Certified Compliant to European Community Standards.

4 Electrical Connections

4.1 System Power & Loop Connections

- Standalone application, loop current isn't used

Power Supply			Transmitter Terminals	
24VDC+	+		2	V+/Loop+
24VDC-	-		1	V-/Loop-

- Connection to a PLC with built-in power supply.

PLC Terminals			Transmitter Terminals	
24VDC+	+		2	V+/Loop+
24VDC-	-			
4-20mA Loop Input	-		1	V-/Loop-
4-20mA Loop Input	+			
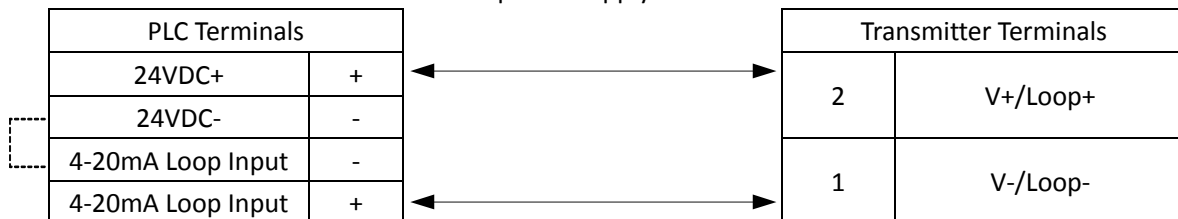
- Connection to a PLC with separate power supply

Option A

Power Supply			Transmitter Terminals	
24VDC+	+		2	V+/Loop+
24VDC-	-		1	V-/Loop-

PLC	
4-20mA Loop Input	-
4-20mA Loop Input	+

Option B

PLC			Transmitter Terminals	
4-20mA Loop Input	-		2	V+/Loop+
4-20mA Loop Input	+		1	V-/Loop-

Power Supply	
24VDC+	+
24VDC-	-
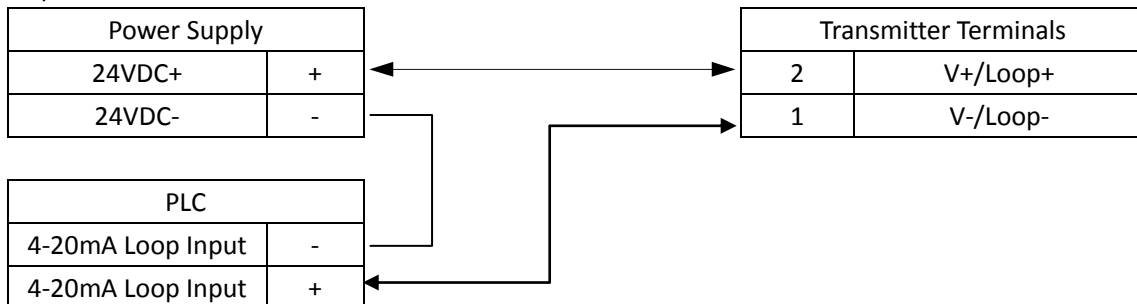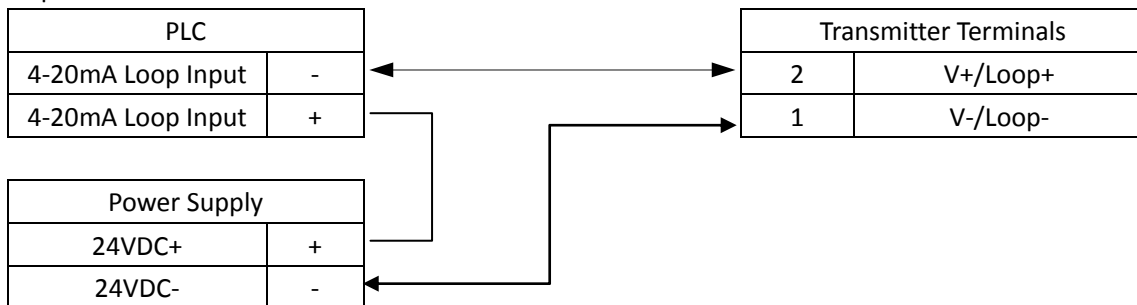
4.2 Sensor Input Connections

CAUTION:
• As electrical noise may interfere with electrode signal, please do not route the electrode cable in a conduit containing AC power wiring.

PH Sensor Input Connections： *Note: If sensor does not have ATC, short TC- to TC+*

Sensor Input			Transmitter Terminals	
TC-	Red	←→	9	Temp-
TC+	Black	←→	8	Temp+
REF	coax braid	←→	7	REF
PH	coax center	←→	6	PH/ORP Input

ORP Sensor Input Connections：

| Sensor Input			Transmitter Terminals	
10K Ohm Resistor	customer supplied	←→	9	10K Ohm Resistor
10K Ohm Resistor	customer supplied	←→	8	10K Ohm Resistor
REF	coax braid	←→	7	REF
ORP	coax center	←→	6	PH/ORP Input
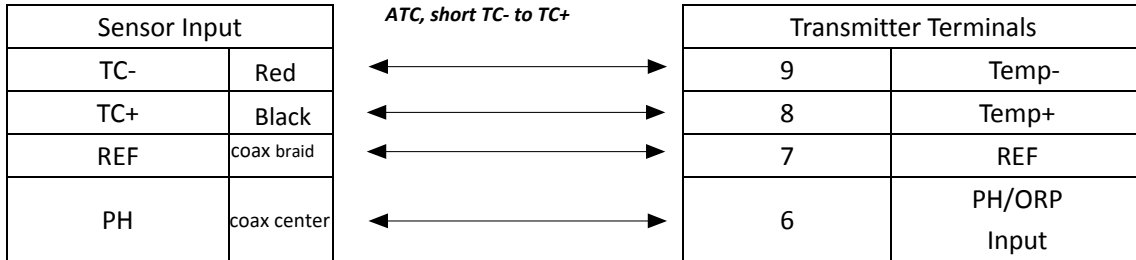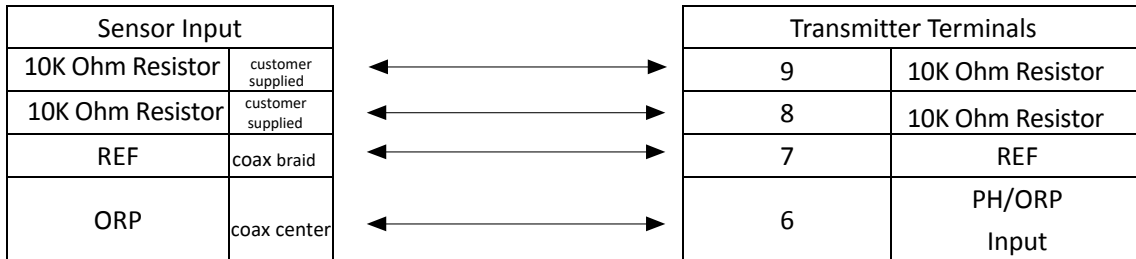
TX105

4.3 OC Output

4.3.1 Open Collector Output Connections

● Connection to a PLC with built-in power supply

PLC	
Power Supply+	+
Power Supply-	-
OC input+	+
OC input-	-

Transmitter Terminals	
4	O.C.+
3	O.C.-

100K
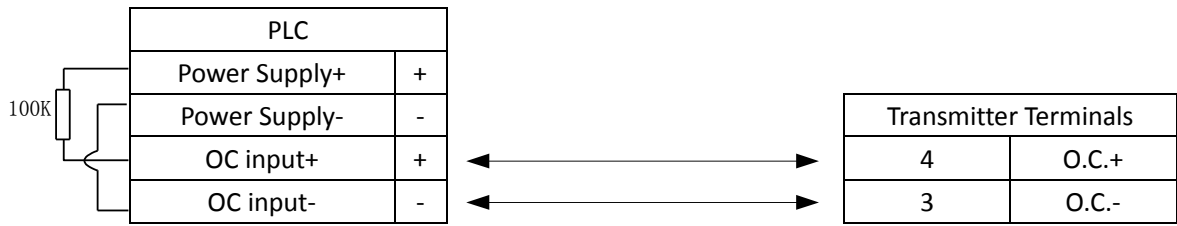
- Connection to a PLC, separate supply

Power Supply	
24VDC+	+
24VDC-	-

PLC	
OC input+	+
OC input-	-

Transmitter Terminals	
4	O.C.+
3	O.C.-

100K
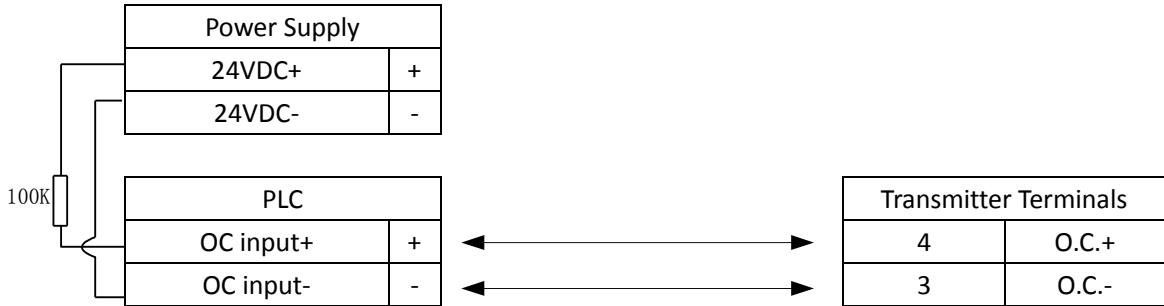
4.3.2 Open Collector Output Operation

The open collector output can be used as a switch or a warning that responds when the process value moves above or below a set point, or it can be used to generate a pulsing signal with a rate proportional to the process value. The output can be disabled if not used (select "OFF" in the OC OUTPUT menu). The "parameter" mentioned below could be any of the three: pH, ORP, or temperature.

- **Low Mode:**

In this mode, the OC output is only active when the parameter is less than a user set point. The output will be inactive when the parameter is larger than the set point plus the hysteresis value.

- **High Mode:**

In this mode, the OC output is only active when the parameter is larger than a user set point. The output will be inactive when the parameter is smaller than the set point minus the hysteresis value.

- **Proportional Pulsing**

In this mode, the OC output will generate a pulse sequence at the rate defined by the setting in the OC OUTPUT menu.

In the example below, the starting point is pH=0.00, the end point is pH=10.00 and the maximum frequency is 200 pulses/min:

• The output will be 0 pulses/min at pH values less than 0.0.

• The output will be 100 pulses/min at 5.00pH.

• The output will be 200 pulses/min at pH values above 10.00pH.
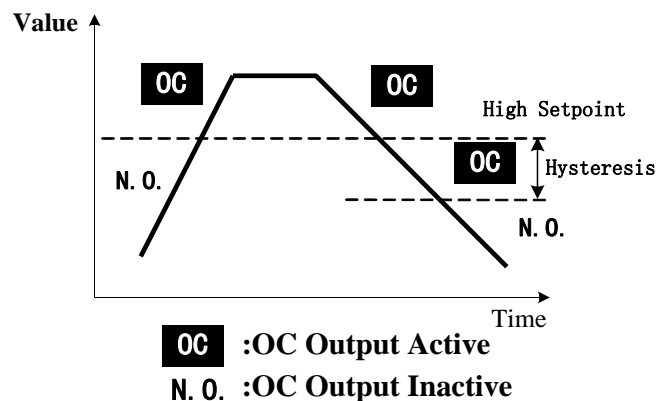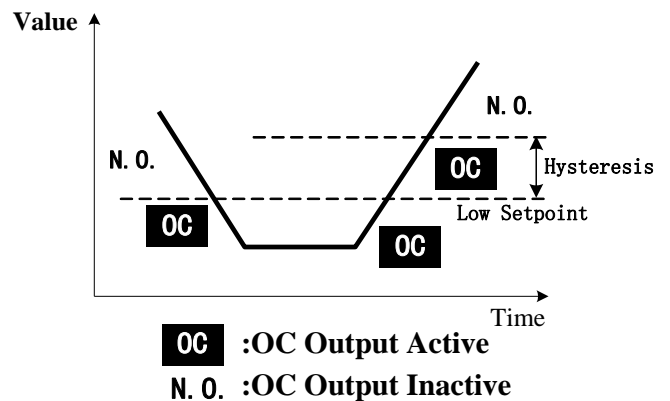
5 Menu

The menu consists of a view menu and an editable menu. The menu has several levels, with the view menu being at the topmost level. You can loop within the same level menu items by pressing the UP or DOWN arrow keys, move to a lower level menu by pressing the ENTER key, and move to an upper level menu by pressing the ESC key. At any time, the system will return to the view menu (default display) if no key is pressed for 10 minutes.

During normal operation, the view menu is displayed. Use the UP or DOWN arrow keys to select the information you want displayed. The items will scroll in a continuous sequence. System operations will not be interrupted during menu interaction.

5.1 View Menu for pH

Display	Description
Default display：	
3.90 PH 22.1 ℃	Monitors the pH and temperature input from the sensor.

All of the displays below are temporary. The system will return to the default display if no keys are pressed in 10 minutes.

Display	Description
Sensor Input **164 mV**	Monitors the millivolt input from the pH electrode.

Display	Description
4~20mA Output **8.44 mA**	Monitors the 4 to 20 mA loop output for the pH measurement.

Display	Description
EasyCal Press Enter To Start >	Easy calibrates the system for the pH measurement.

5.1.1 EasyCal Details

Display	Description
EASY CALIBRATE USE 4 7 10 > USE DIN19267>	Calibrates the system with standard 4.0, 7.0, and 10.0 pH buffers
EASY CALIBRATE USE 4 7 10> USE DIN19267>	Calibrates the system using pH =4.65, pH=6.79, and pH= 9.23 buffers, under DIN19267.

EasyCal procedures：

Only the 2 following buffers can be used by EasyCal：

1）Standard pH=4.00, pH=7.00, and pH=10.00

2）DIN 19267: pH =4.65, PH=6.79, and pH= 9.23

Set the sensor temperature before performing EasyCal for new electrode installations.

The procedure is the same for 1) and 2). Using 1) for an example:

EASYCAL 4 7 10:

Procedure	Display	Operation
Step 1	EASYCAL 4 7 10 Place Sensor in pH Buffer #1	Place the sensor in pH buffer 1, and wait 30 seconds for the sensor to stabilize.
	EASYCAL Buffer #1 4.10 PH 173 mV Please Select 4 7 10	Use the "RIGHT" key to navigate the pH value options and press the "ENTER" key to select.
	Buffer #1 is Accepted!	No operation is required.

Step 2	EASYCAL 4 7 10 Place Sensor in pH Buffer #2	Place the sensor in pH buffer 2, and wait 30 seconds for the sensor to stabilize.
	EASYCAL Buffer #2 7.10 PH 2 mV Please Select 4 7 10	Use the "RIGHT" key to navigate the pH value options and press the "ENTER" key to select.
	Buffer #2 is Accepted!	No operation is required.
	EASY CALIBRATE 4 7 10 Successfully!	No operation is required.

Theoretical mV values（25℃）

PH	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
mV	414	355	296	237	177	118	59	0	-59	-118	-177	-237	-296	-355	-414

5.2 View Menu for ORP

Display	Description

Default display：

Display	Description
ORP **366** mV	Monitors the ORP value.

All of the displays below are temporary. The system will return to the default display if no keys are pressed in 10 minutes.

Display	Description
Sensor Input **164 mV**	Monitors the millivolt input from the ORP electrode.

Display	Description
4~20mA Output **8.44 mA**	Monitors the 4 to 20 mA loop output for the ORP measurement.

5.3 Editable Menu

5.3.1 Editing Procedure

Step 1. Press and hold the ENTER key for 3 seconds to enter Main Menu:
- If a password is required, enter the correct key code. The key code is entered by pressing the RIGHT-DOWN-UP-DOWN keys in sequence.
- The system will return to the view menu if no key is pressed for 10 minutes.

Step 2. Navigate the menu with the UP and DOWN keys.

The selected menu is highlighted; press ENTER to edit the menu.
- Only the highlighted item can be edited.
- No parameters will be saved if the ESC key is pressed, and the display will return to the previous menu.
- The system will return to the view menu if no key is pressed for 10 minutes.

Tip:	CALIBRATION > is highlighted whereas CALIBRATION> is not highlighted.

Step 3. Press ENTER key to save the new settings and return to Step 2.

NOTE：

- **ESC can be pressed at any time, and the system will exit the current level without saving.**
- **The edited value is effective immediately after pressing the ENTER key.**
- **Repeat steps 2 and 3 as needed.**

5.3.2 Main Menu

CALIBRATION >
OUTPUT>
OPTIONS >

Press the UP or DOWN arrow keys to navigate the three items. Press the ENTER key to enter the CALIBRATION menu, the OUTPUT menu, or the OPTIONS menu. Press the ESC key to return to the view menu.

5.3.3 Calibration Menu for pH

Display		Description
Menu Item	Next Level Menu	
TEMPERATURE UNIT > ℃	Set Temp Unit ℃ ℉	Sets the temperature unit.
TEMPERATURE> +20℃	Set Temperature +20.0 ℃	Sets the temperature. This should be done before using EasyCal or standard/slope calibration.
STANDARD/SLOPE CALIBRATION>		Applies standard/slope calibration to the pH measurement.

5.3.3.1 Standard/slope Calibration Details

Display	Operation
Standard/Slope Place Sensor In pH Buffer #1	Place sensor In pH Buffer #1, and wait 30 seconds for the sensor to stabilize.
STANDARD/SLOPE Buffer#1 0mV 7.00PH Set Standard 00.00	Set the pH value for Buffer #1.
Buffer #1 is Accepted!	No operation is required.
Standard/Slope Place Sensor In pH Buffer #2	Place sensor In pH Buffer #2, and wait 30 seconds for the sensor to stabilize. The pH values of Buffer#2 and Buffer #1 shouldn't be too close.
STANDARD/SLOPE Buffer#2 177mV 4.01PH Set Slope 00.00	Set the pH value for Buffer #2.
Buffer #2 is Accepted!	No operation is required.
Standard/Slope Calibrate Successfully!	No operation is required.

5.3.4 Output Menu for pH

Display		Description
Menu Item	Next Level Menu	
Output 4~20mA>	4~20mA Source> PH	Sets either pH or temperature as the source for the 4~20mA current loop output.
	Set 4~20mA>	Sets the minimum and maximum pH/temperature values for the 4~20mA current loop output.

OC Output >	OC SOURCE> PH	Selects pH or temperature as the source for the open collector output.
	OC MODE> PULSE	See 4.3.2 Open Collector Output Operation; sets the OC mode and relative parameters.

The next two sections (5.3.4.1 and 5.3.4.2) use pH as an example, but all of the operations are the same for temperature.

5.3.4.1 Set 4~20mA Details for PH

Menu Item	Description

Set 4mA Output> 0.00 pH	Sets the pH value for 4mA current loop output.
Set 20mA Output> 14.00 pH	Sets the pH value for 20mA current loop output.

5.3.4.2 OC Output Details for PH

Display		Description
Menu Item	Next Level Menu	

MIN ALARM	MIN SETPIONT> 00.00 pH	As described in 4.3.2, sets the minimum point for low mode. The OC output is active when the pH value is less than the set value.
	HYSTERESIS> 00.10 pH	As described in 4.3.2, sets the hysteresis value for low mode. The OC output is inactive when the pH value is greater than the sum of the minimum point and the hysteresis value.

MAX ALARM	MAX SETPIONT> 10.00 pH	As described in 4.3.2, sets the maximum point for high mode. The OC output is active when the pH value is greater than the set value.
	HYSTERESIS> 00.50 pH	As described in 4.3.2, sets the hysteresis value for low mode. The OC output is inactive when the pH value is less than the maximum point minus the hysteresis value. **Note: the hysteresis value must be less than the maximum point.**

PULSE	RANGE > 00.00→14.00 pH	As described in 4.3.2, sets the range.
	PULSE RATE> 200 Pulse/min	As described in 4.3.2, sets the pulse rate.

5.3.5 Calibration Menu for ORP

Display		Description
Menu Item	Next Level Menu	

STANDARD > 000mv	One Point Cal 0000 mV	Applies a linear calibration to the ORP measurement.

5.3.6 Output Menu for ORP

Display		Description
Menu Item	Next Level Menu	

Output > 4~20mA	Set 4mA Output> -2000mV	Sets the minimum and maximum ORP values for the 4 to 20 mA current loop output.
	Set 20mA Output> 2000 mV	The valid value range is -2000~+2000 mV.

OC Output >	OC MODE> PULSE	See 4.3 Open Collector Output Operation, selects the OC mode and relative parameters.

The OC output details for ORP are the same as pH, see section 0.

5.3.7 Options Menu

The Options Menu is the same for both pH and ORP.

Display	Description
CONTRAST > Level 1	Adjusts the LCD contrast for optimal viewing. A setting of 1 is the lowest contrast, while a setting of 5 is the highest.

FILTER > 1S	Sets the time parameter for averaging input values, There are 8 Options: 1S, 2S, 5S, 8S, 10S, 20S, 40S, and 60S. **Note: Larger filter values mean more stable displays but longer response times. Please consider your system safety requirements.**

LOOP ADJUST 4mA > 3.75	Adjusts the minimum current output to match the external current measurement. Adjustable from 3.70 mA to 5.00 mA.

LOOP ADJUST 20mA > 21.00	Adjusts the maximum current output to match the external current measurement. Adjustable from 19.00 mA to 21.00 mA.

TEST 4~20mA OUTPUT	Press the UP and DOWN arrow keys to manually select any output current value from 3.7 mA to 21.00 mA to test the current loop output. The value changes 0.01mA each time the UP/DOWN key is pressed. If the UP/DOWN key is pressed and held for more than 5 seconds, The value will be adjusted by 0.1mA continuously.

TEST OC OUTPUT	Press the UP and DOWN arrow keys to manually select the state of the open collector output.

PASSWORD MENU OFF	Selects whether or not the password is needed to enter the Main Menu. **Note: the password is input by pressing the RIGHT-DOWN-UP-DOWN arrow keys in sequence and cannot be changed.**

RESTORE FACTORY SETTINGS>	Restores factory settings. In order to do so, you must enter the correct key code. The key code is input by pressing the RIGHT-DOWN-UP-DOWN arrow keys in sequence.

6 Troubleshooting

Display	Possible Cause	Suggestions
Please wait 30s for sensor stabilization!	During pH EasyCal or Standard/Slope calibration, when "Place Sensor in pH Buffer #1(or 2)" is prompted, the "Enter" key is pressed within 30 seconds.	Wait 30 seconds
Please Check Sensor!	1. During pH EasyCal, the detected sensor input is more than 2PH away from the selected pH value or the range of possible buffer values. 2. During pH Standard/Slope calibration, the detected sensor input is more than 2PH away from the entered pH value. 3. During ORP One Point calibration, the detected sensor input is more than 120mV away from the entered ORP value.	1. Check the sensor and restart the calibration procedure. 2. Press "Enter" to accept the value.
Please Maintain or Replace Sensor!	1. During pH EasyCal, the detected sensor input is more than 4PH away from the selected pH value or the range of possible buffer value. 2. During pH Standard/Slope calibration, the detected sensor input is more than 4PH away from the entered pH value. 3. During ORP One Point calibration, the detected sensor input is more than 240mV away from the entered ORP value.	1. Press "Enter" to interrupt the calibration. Replace the sensor and restart the calibration procedure. 2. Press "ESC" to reenter or reselect the pH or ORP value.

Buffer #2 is too close to Buffer #1	1. During pH EasyCal 4 7 10 or Standard/Slope calibration, buffer 2 is within 2PH of buffer 1. 2. During pH EasyCal DIN19267 calibration, buffer 2 is within 1PH of buffer 1.	Check buffers. 1. Replace Buffer #2 with a buffer of the appropriate pH value and continue the calibration. 2. Press "ESC" to interrupt the calibration when "Place Sensor in pH Buffer #2" is prompted again. Restart the calibration with appropriate buffers.
Value Must Be Larger Than -10°C(or 14°F)!	During temperature calibration, the entered value is smaller than -10°C(or 14°F).	Enter the appropriate value.
Value Must Be Smaller Than 70°C(or 158°F)!	During temperature calibration, the entered value is larger than 70°C(or 158°F).	Enter the appropriate value.
Value Too Large(or Small)!	During temperature calibration, the entered value is more than 25 degree away from the detected value.	1. Check the sensor and restart the calibration procedure. 2. Enter the appropriate value.
HYSTERESIS Too Large	The HYSTERESIS is greater than the MAX SETPOINT	Set HYSTERESIS to a smaller value than MAX SETPIONT.
Wrong Password	The password is wrong.	Enter correct password.