TELEDYNE
ANALYTICAL INSTRUMENTS

Model LXT-230 Transmitter

Installation and Operating Manual
for
pH and ORP

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UNPACKING THE INSTRUMENT

Your Teledyne instrument has been carefully packaged to protect it from damage during shipment and dry storage. Upon receipt please follow the procedure outlined below.

1. Before unpacking, inspect the condition of the shipping container to verify proper handling by the carrier. If damage is noted, save the shipping container as proof of mishandling for the carrier.

2. Check the contents of the shipping container with the items and quantities shown on the packing list. Immediately report any discrepancies to TAI.

3. Save the original packing material until you are satisfied with the contents. In the event the transmitter must be returned to TAI, the packing material will allow you to properly ship it to TAI.

4. Familiarize yourself with the instrument before installation, and follow proper installation and wiring procedures.

1.0 GENERAL DESCRIPTION

Teledyne's Model LXT-230 is a microprocessor-based two-wire transmitter for process control of pH, ORP and Specific Ion. Incorporating microprocessor technology, the LXT-230 provides the following features:

1.1 Membrane Switches

Calibrations can be performed via membrane switches located on the front cover, removing the need to open the NEMA 4X enclosure and exposing components to the environment. No potentiometric adjustments are required.

1.2 Digital Display

A 32-character Supertwist alphanumeric liquid crystal display (LCD) is used to display data menus. The two rows of 16 characters can be adjusted to different contrast intensities for easy viewing.

1.3 Automatic Buffer Calibration

Allows buffer points to be defined upon initialization of the transmitter so that no adjustments are required for future buffer calibrations.

1.4 Back To Factory Calibration

Allows the transmitter to be returned to a predetermined factory calibration. The default parameters are zero electrode offset at 7.00pH or 0.00mV ORP and the ideal Nernstian slope for the appropriate measurement.

1.5 Current Output

A standard LXT-230 transmitter is provided with a 4-20 mA current output transmitted on the same 24-vdc power wiring. The current output may be expanded to any range within the transmitter's full operating range (see specifications). For customer controllers that are not capable of reverse acting control, the LXT-230 allows the current output to be reversed; for example, a 4-20 mA output for a range of 0-14 pH can be reversed to 14-0 pH.

1.6 Temperature Conversion

This standard feature allows the temperature displays to be presented in Celsius or

Fahrenheit. A toggle function in the Temperature Calibration Menu allows this selection to be performed in the field.

1.7 PID Output (Optional)

An optional PID output is available and provides a 4-20 mA, three-mode control signal to a transducer or a final control element. Proportional band is adjustable from 0.1 to 1,000%. Reset and Rate are adjustable from 0.00 to 100 repeats per minute and 0.00 to 1,000 minutes, respectively.

1.8 Dual Input (Optional)

An optional second input can be provided for pH, ORP, Dissolved Oxygen or Specific Ion. This input can be used as a second analysis or as specific compensation for the primary input. Temperature compensation for the secondary input (channel 2) is provided through the primary input (channel 1).

1.9 Dual Output (Optional)

The standard LXT-230 is provided with a single output; however, the dual output option provides a second output in either a 4-20 mA regenerated or a 4-20 mA PID format. Outputs can be defined in pH, ORP, Specific Ion, Dissolved Oxygen or Temperature. The second output is fully isolated from the inputs and the primary output and is "floating" so it can have either a positive or negative common.

1.10 Three Outputs (Optional)

Because temperature is an input on the primary channel, TAI has made it available as a third 4-20 mA output. The third output for the LXT-230 can only be a temperature output.

1.11 Optional Software

To enhance the capability of the LXT-230, other software options are available.

Among the options are:

1.11.1 Security Access

Allows only authorized personnel entry to calibration modes.

1.11.2 Differential Output

Provides an output expressed as the difference between two inputs.

1.11.3 Ratio Output

Provides an output expressed as the ratio of two inputs. This is applicable to percent rejection in some applications.

1.11.4 Averaged Outputs

1. Provides an output expressed as the average of two inputs.
2. Provides a field selectable time average (2 to 32 seconds).

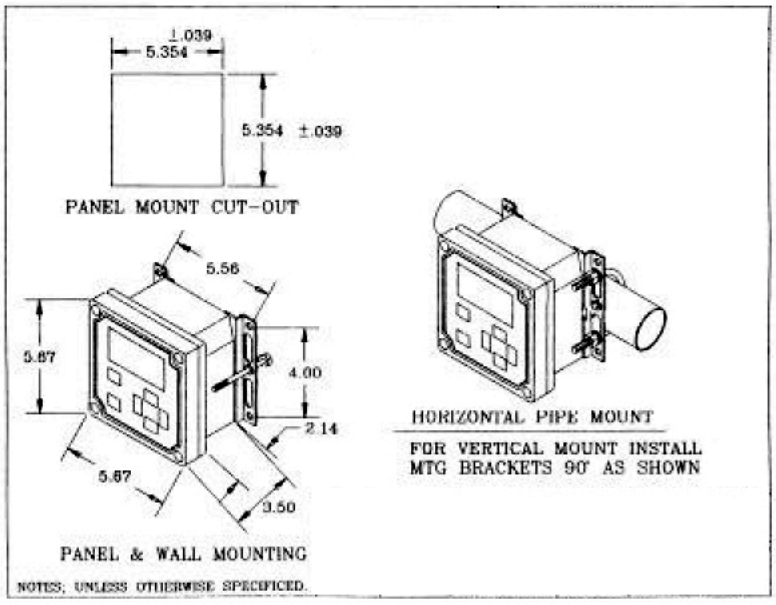
1.12 Identification

The full model number, as found on the packing slip, is a list of alphanumeric characters used to designate certain features of the transmitter. See section 10.0 (Table 1) for the list of designators used for the LXT-230.

2.0 INSTALLATION

2.1 Mounting

Three typical installation configurations are available for the LXT-230 transmitter: universal mounting, handrail mounting, and panel mounting configurations. The universal mounting configuration allows the LXT-230 to be mounted on a wall or a 2" pipe stand. U-bolts may be ordered separately for pipe stand mounting.



2.2 Power Wiring

The LXT-230 transmitter requires a nominal 24-vdc voltage source. With zero loop impedance, the minimum voltage requirement is 13.5 vdc. The maximum voltage limit is 50 vdc. Maximum loop impedance at 24 vdc is 525 ohms for the 4-20 mA compliance. Impedance levels higher than 525 ohms will require additional dc voltage.

When connecting the power wires, it is important to observe the polarity. Although no damage to the LXT-230 will result from polarity reversal, the LXT-230 will not function.

CAUTION
Do NOT apply 110 vac to the 24-vdc wiring terminals. Damage to the instrument will result!

Multiple channel transmitters can have each channel powered by separate power supplies, or they can be powered by one power supply.

2.3 Sensor Wiring

A conditioned input is required from the sensor or electrode to the LXT-230 transmitter for proper operation. In cases where S10 and S17 sensors are not used, a signal conditioning module is available and can be mounted inside the LXT-230 enclosure.

If preferred, the signal conditioner can be mounted remotely within a separate NEMA 4X enclosure. When used without an S10 or S17 sensor, signal conditioners for the LXT-230 do not provide temperature compensation. In these cases, a separate temperature sensing element is required for input to the temperature compensation circuitry.

3.0 FAMILIARIZATION

This section will provide an overview of the front panel key functions and the display menus for a single channel pH and ORP transmitter. Multiple channel transmitters will have the same menus.

3.1 Key Functions

Cursor positions or numeric adjustments are performed by pressing the appropriate keypad. The LXT-230 uses an "underline" cursor in each of the menus. Holding down the keypad will automatically scroll the cursor or numeric values. Please note that simultaneous pressure on both vertical keys or any combination of keys other than the two horizontal CALIBRATE keys is **not** recommended.

3.1.1 Menu Selection Keys

The MENU SELECTION keys are used to change the display menu and move the cursor vertically. Any menu can be accessed by the use of the appropriate up or down MENU SELECTION key, advancing the screen to the desired menu. These keys are also used to exit the calibration mode and save calibration data.

3.1.2 Calibrate Keys

The *horizontal* CALIBRATE keys are used to enter the calibrate mode and move the cursor horizontally. To enter the calibrate mode, both horizontal CALIBRATE keys must be pressed simultaneously. Once in the calibrate mode, the cursor can be positioned by pressing the individual right-hand or left-hand CALIBRATE keys.

The *vertical* CALIBRATE keys are used to perform numeric adjustments to displayed values. To use these keys, the LXT-230 must be in the calibrate mode. Pressing the upper CALIBRATE key will increase the value; pressing the lower CALIBRATE key will decrease the value.

To exit the calibrate mode, press either of the MENU SELECTION keys.

3.2 Display Menus and Screens

When the LXT-230 is first powered, the Copyright Display will appear for a few seconds, then the LXT-230 will display the Main Menu.

S/N 1234	V 2.01
(C) ECD	2002

The Copyright Display provides the software "version" number and the software serial number. TAI will require this information if software updates are to be performed. To access any of the menus listed below, press the desired MENU SELECTION key.

3.2.1 Contrast Menu

Display contrast can be adjusted to allow for variations of ambient lighting. The Contrast Menu is the same for all LXT-230 transmitters and is the uppermost screen. To access this menu from the Main Menu, press the upper MENU SELECTION key.

Contrast	20

3.2.2 Main Menu

This menu appears after the Copyright Display when power is first applied to the LXT-230. The Main Menu displays the measured process variable, temperature, and the current output in percent of full-scale. While in this menu, the current output can be adjusted and locked in a manual mode to provide an undisturbed output during buffer calibrations.

pH	7.00
_50.0%	25.0°C

ORP	-500.0 mV
_25.0%	25.0°C

3.2.3 Electrode Diagnostic Screen

As an informational screen only, this display provides diagnostic data pertaining to the electrode. The top line displays the real-time (active) absolute millivolt value (mVa) the electrode is generating, not compensated for temperature variations. The bottom line displays the electrode isopotential from the last calibration. The isopotential (electrode offset) is the value at which the electrode output is zero millivolts. A perfect pH electrode will indicate an isopotential of 7.00 pH. Replace the electrode if the isopotential is less than 6.00 pH or greater than 8.00 pH.

Input	.0 mVa
0 mVa	7.00

Input	-500.0 mVa
0 mVa	.0 mVa

A perfect ORP electrode will indicate an isopotential of 86 mV @ 25°C. Replace the electrode if the isopotential is less than 36 mV or greater than 136 mV @ 25°C.
This information is extremely helpful in determining the diagnostic status of a pH or ORP electrode. In conjunction with regular calibrations, the Electrode Diagnostic Screen provides valuable information to track electrode performance.

3.2.4 Electrode Standardization Menu

Provides the means with which to perform a one-point calibration (standardization) or the first point of a two-point calibration. For pH this point is typically 7.00 pH and ORP this point is typically 0.00 mV.

1 pH	7.00
Cal	.0 mV/pH

1 ORP	.0 mV
Cal	.0 mVa

Before entering the calibrate mode, the menu provides historical data from the last calibration. The top line displays the buffer, or calibration point, at which the last calibration was performed. The bottom line displays the temperature compensated mV value the electrode generated at the buffer point. Please note that temperature compensation is not performed for ORP. When in the calibrate mode, the bottom line displays the real-time, or active, millivolt value.

3.2.5 Electrode Span Menu

Provides the means to perform the span calibration, or the second point of a two-point calibration. Before entering the calibrate mode, the menu provides historical data from the last calibration.

2 pH	.00
Cal	-59.1 mV/pH

2 ORP	.0 mV
Cal	1.000 mV / ORP

The top line displays the buffer, or calibration point, at which the last calibration was performed. For pH transmitters, the bottom line displays the electrode slope, or efficiency, in millivolts per pH (mV/pH). ORP transmitters express efficiency in absolute millivolts per millivolt (mVa/mV). When in the calibrate mode, the bottom line displays the real-time, or active, millivolt slope value.

3.2.6 Output Calibration Menu

Current output ranges are adjusted in this menu. The top line defines the 4 mA point, while the bottom line defines the 20 mA point. Between these points, the output current is linear with respect to the sensor input. By reversing the signs, the European convention or the Thermodynamic (American) convention can be defined.

_4 mA	.00
20 mA	14.00

_4 mA -1000.0 mV
20 mA 1000.0 mV

3.2.7 Temperature Calibration Menu

This Menu has two calibrate functions. It is used to adjust or trim the temperature compensation for variations in the sensing element. This menu can also provide a manual temperature input for the process. The top line displays the temperature offset value. The bottom line displays the adjusted temperature value.

Trim °C	.0
Unit	24.3°C

Second, the menu is used to change the units of display to either Celsius or Fahrenheit. The change is performed as a toggle function and changes the displayed units on all screens or menus where temperature is displayed to the desired unit of measurement.

4.0 SENTINEL DIAGNOSTICS

The basic menu structure of the LXT-230 transmitter is architecturally the same as the LXT-230 pH, ORP and PION, with the only variable being the diagnostic information on the main and special diagnostic menus. The critical path to your process measurement is via the TAI sensor/electrode.

Under perfect conditions, the electro-chemical interface between the electrode's internal reference cell (the **measurement standard**) and the **liquid junction** (bridge between the internal electrolyte and the wet process) should be in balance (stable **potential** values). However, a dominant failure mechanism of an **Electro-Chemical** (pH, ORP, PION) **Reference Half Cell** is insidious process contamination impacting that balance (electrode internal chemistry).

Contamination from the wet process will eventually migrate through the electrode's inner structure eventually changing Electro-Chemical balances via oxidation/reduction of the metal/metal salts and gels.

4.1 Diagnostic set up and configuration menus

4.1.1 Main Menu

The degree to which the intrusive process chemicals degrades the "insitu" electrode is graphically depicted on the right side of the LXT-230 main process screen as a vertically expanding diagnostic bar, culminating in a flashing pre-pHault alert. This pre pHault Alert warns the user of a pending chemical alteration of the Electro-Chemical Reference Measurement Cell prior to the actual measurement error, hence the designation, "Pre-pHault."

pH	7.00
_50.0%	25.0°C

ORP		100.0 mV
25.0%	25.0°C	

4.1.2 SENTINEL DIAGNOSTIC SCREEN

The lower section of this (split screen – over under) menu will indicate default mV values as set by the factory; the default value will be 60mV in all cases. This value is Nurnstian in that it signifies one decade change in 4 molar reference gel. The transmitter has been designed so that the customer can input other mV values based on individual experience that may differ from the default mV number.

Ref	25.2 mV
Limit	30.0 mV

To change the "LIMIT" values, enter the CALIBRATE MODE by simultaneously pressing the two horizontal CALIBRATE keys; observe the cursor move to the right allowing LIMIT value change. Once in CAL MODE, the cursor can be moved to different digit placements, then, using the vertical key, the LIMIT value can be decreased or increased based on process demands.

NOTE:
This value responds to contamination of the secondary electrolyte chamber with a Nurnstian response (log 10 System)

To file the input, with the microprocessor, exit the calibrate mode by pressing either menu selection key. The upper half of the split screen menu displays absolute reference potential (±2 millivolts) directly from the electrode via the diagnostic signal co conditioner located in the sensor. This half of the menu is "read only" and cannot be accessed.

It is this half of the menu where you will observe the state of the electrode's performance in terms of process relates aging.

The mV LIMIT value, as set in by the user or TAI at time of shipment, may require adjustment from process to process due to major chemical changes that would introduce new electrolyte contaminants thereby impacting the rate of reference contamination in the electrode.

After the desired mV values are set into the DIAGNOSTIC CALIBRATION SCREEN, further electrode "INSITU" diagnostic information can be obtained by scrolling to the main process menu where VISUAL electrode diagnostic information is displayed as a cursor/growing black vertical bar. As process intrusion threatens the electrode's internal balance, the bar correspondingly grows in height (it will
eventually flash as a **final pre-pHault alert**).

The user can toggle between the main process screen and the dedicated diagnostic screen where specific, real time DIAGNOSTIC engineering data can be obtained. There is also an option (at time of purchase) to add a 4-20mA output card for the transmission of this "INSITU" diagnostic engineering data.

5.0 MAINTENANCE

If service of the internal components is required, always turn off the power to the instrument.

5.1 Cleaning

Cleaning the front panel can be performed with a detergent and water. DO NOT USE ACETONE, ACID OR CAUSTIC SOLUTIONS ON THE ENCLOSURE SURFACE. If the enclosure cover must be removed, it is wise to clean and inspect the gasket seal. If the seal is damaged, replace the gasket. Always keep the gasket lightly lubricated with a silicone grease.

5.2 Replacement of the Microprocessor

Contact factory.

6.0 CALIBRATION

6.1 Manual Output Mode

To perform calibrations without interfering with control or recorder functions, the LXT-230 incorporates a manual output mode. The current output is set to the desired level and saved until changed or released from the manual mode.

NOTE: Prior to any calibration the LXT-230 transmitter should be placed into the manual mode.

Procedure:

1. If not at the Main Menu, press the appropriate MENU SELECTION key to reach the Main Menu.
2. Press both horizontal CALIBRATE keys simultaneously to enter the calibrate mode and observe the "M" appear in front of the % current output value; The current output is now locked in the manual mode.
3. Using the horizontal CALIBRATE keys, position the cursor under the digit to be adjusted.
4. Increase or decrease the value by pressing the appropriate vertical CALIBRATE key.
5. When the desired value is reached, exit the calibrate mode by pressing either MENU SELECTION key. The current output will be held at the filed value.

pH	7.00
M24.3%	25.0°C

ORP	-500.0 mV
M 55.0%	25.0°C

To release manual output:

1. Return to the Main Menu by pressing the appropriate MENU SELECTION key.
2. Observe that the "M" appears in front of the % current output value. The "M" signifies that the output is being held at the displayed value.
3. Press the left-hand CALIBRATE key and observe the "M" disappear, releasing the LXT-230 from the manual output mode. The % output value will return to the real-time current output.

6.2 Contrast Adjustment

Procedure:

1. Press the upper MENU SELECTION key to reach the Contrast Menu (upper most menu).
2. Press both horizontal CALIBRATE keys simultaneously to enter the calibrate mode. Observe the cursor move to the last digit.
3. Using the horizontal CALIBRATE keys, position the cursor under the digit to be adjusted.
4. Increase or decrease the value by pressing the appropriate vertical CALIBRATE key.
5. To file the contrast value and exit the calibrate mode, press either MENU SELECTION key.

6.3 One-Point Buffer Calibration (Standardize)

Because all pH and ORP electrodes experience minor variations, buffer calibrations are necessary before installing the electrodes in service. Also, occasional calibrations are necessary to compensate for electrode degradation while in service. For measurement specifics, refer to the pH/ORP sensor manual.

Procedure:

1. Press the appropriate MENU SELECTION key to reach the Electrode Standardization Menu and locate the cursor under the "1" as illustrated in section 3.2.4.
2. For diagnostic reasons note the pH and mV values from the prior calibration.
3. Clean the electrode and insert the sensor into the desired buffer.
4. Press both horizontal CALIBRATE keys simultaneously to enter the calibrate mode. Observe the diagnostic value on the bottom line change from historical data to a real-time value and that the term "CAL" has disappeared.

1 pH 7.00 -3.2 mV@25	1 ORP .0 mV 85.9 mVa

5. To change the buffer point, position the cursor under the desired digit using the left-hand CALIBRATE key.
6. Increase or decrease the value by pressing the appropriate vertical CALIBRATE key.
7. Wait for the real-time mV value to stabilize.
8. To file the calibration and exit the calibrate mode, press either MENU SELECTION key.

6.4 Two-Point Buffer Calibration (Span)

When first installing an electrode, a two-point buffer calibration should be used to compensate for electrode slope variations or efficiency.

Procedure:

1. Perform a one-point calibration as outlined in section 5.3.
2. Press the appropriate MENU SELECTION key to reach the Electrode Span Menu and locate the cursor under the "2" as illustrated in section 3.2.5.
3. For diagnostic reasons note the pH and mV values from the prior calibration.
4. Press both horizontal CALIBRATE keys simultaneously to enter the calibrate mode. Observe the diagnostic value on the bottom line becomes a real-time value and that the term "CAL" has disappeared.

2 pH 4.00 -58.2 mV/pH	2 ORP 180.0 mV .980 mV/ORP

5. To change the buffer point, position the cursor under the desired digit using the left-hand CALIBRATE key.
6. Increase or decrease the value by pressing the appropriate vertical CALIBRATE key.
7. Wait for the real-time mV value to stabilize.
8. To file the calibration and exit the calibrate mode, press either MENU SELECTION key.

A perfect electrode slope (efficiency) is -59.1 mV/pH and ORP is 1mV/mV. If the value falls below -50.0 mV/pH or ORP .9 mV/mV, the electrode should be serviced or replaced.

IMPORTANT

If a flashing asterisk appears during or after calibration, the electrode may require service, or the buffer solution may be contaminated. Refer to section 5.6 for details.

NOTE:

Comparing the millivolt values before and after the calibration provides a valuable

diagnostic tool in determining the degradation of the electrode. Large differences between calibrations may indicate coating or damage to the measurement half-cell.

6.5 Calibration Using a Grab Sample as a Standard

The LXT-230 allows easy standardization to a grab sample value by placing the process value into the first calibration point.

Procedure:

1. Record the pH value of the process when the sample is extracted.
2. Record the pH value of the grab sample.
3. Calculate the difference between the two values as follows:
4. Immediately before making the calibration adjustment, note the current pH value on the display and add the pH differential to the current value. This "total adjusted" value is entered as the buffer value.

6.6 Calibration Error Detection & Electrode Operational Guidelines

If the slope calibration performed in section 5.4 is not within the predetermined limits of the instrument, a flashing asterisk (*) will appear. The presence of the asterisk indicates a potential calibration problem. In general, if the asterisk appears, the integrity of the electrode, the buffer solutions or the handling procedure should be questioned. See the pH/ORP sensor manual for specifics on the electrode.

6.7 Back-to-Factory Calibration

This feature allows the LXT-230 to be reset to "ideal electrode" (Nernst equation) for electrode potentials. According to the Nernst equation, an ideal pH electrode has a zero isopotential at 7.00 pH and a slope of -59.16 mV per pH unit, an ORP electrode has an ideal slope of 1 mV per ORP. This feature is useful in providing a reliable starting point if the LXT-230 has been mis-calibrated.

IMPORTANT: Ideal instrumentation calibration does not imply ideal system calibration.

The following procedure for returning the LXT-230 to factory calibration can be used for both standardize and span calibrations.

Procedure at the Standardization Menu:

1. Position the cursor under the "C" in "Cal."
2. Press both horizontal CALIBRATE keys simultaneously and observe the cursor briefly move to the right. The default setting is complete.
3. This procedure is required at BOTH of the calibration points.

2 pH .00 Cal -59.1 mV/ph	2 ORP .0 mV Cal 1.000 mV/ORP
1 pH 7.00 Cal 0 mV@25	1 ORP .0 mV Cal .0 mVa

6.8 Output Calibration

The Output Calibration Menu is used to define the 4-20 mA range for the measurement. To change or expand the 4-20 mA range, use the following procedure.

Procedure:

1. Press the appropriate MENU SELECTION key to reach the Output Calibration Menu.
2. Position the cursor on the top line to change the 4 mA point or the bottom line to change the 20 mA point.
3. Press both horizontal CALIBRATE keys simultaneously to enter the calibrate mode.
4. To change the value, position the cursor under the desired digit using the left-hand CALIBRATE key.
5. Increase or decrease the value by pressing the appropriate vertical CALIBRATE key.
6. When the desired value is reached, file the calibration and exit the calibrate mode by pressing either MENU SELECTION key.

6.9 Temperature Calibration - Trim Adjustment

When the process demands a tighter tolerance than ±3ºC the LXT-230 allows adjustment, or trim, of the temperature compensation element. This adjustment only compensates for deviations in the RTD input (as a sensor input standardize or zero adjustment).

Procedure for trim adjust:

1. Begin with the temperature sensing element (located in the sensor) in a solution of known temperature. If the temperature is not known, insert a precision thermometer in the same solution and allow it time to stabilize.
2. Press the appropriate MENU SELECTION key to reach the Temperature Calibration Menu.
3. Position the cursor on the top line.
4. Press both horizontal CALIBRATE keys simultaneously to enter the calibrate mode. Observe the cursor move under the last digit.
5. Position the cursor under the desired digit using the left-hand CALIBRATE key.
6. Dial in the difference between the displayed temperature and the actual temperature.

NOTE
Make temperature adjustments slowly to allow time for the bottom line of the display to update. This can take 5 to 7 seconds.

7. When the desired temperature value is reached, file the calibration and exit the calibrate mode by pressing either MENU SELECTION key. The value on the top line expresses the temperature error or deviation between the RTD and the precision thermometer. The value on the bottom line expresses the real-time process temperature.

6.10 Temperature Units Calibration - Celsius/Fahrenheit Conversion

The Temperature Calibration Menu is also used to change the units of display to either Celsius or Fahrenheit. The change is performed as a toggle function and changes the displayed units to the desired unit of measurement on all screens or menus where temperature is displayed.

The following procedure describes how to use this feature.

Procedure:

1. Press the appropriate MENU SELECTION key to reach the Temperature Calibration Menu.
2. Position the cursor on the bottom line under the "U" in Unit.
3. Press both horizontal CALIBRATE keys simultaneously. Observe the unit of measurement change.

4. To toggle back to the first unit of measurement, press the CALIBRATE keys again.

Trim °C	.0
Unit	25.0°C

Trim °F	.0
Unit	77.0°F

7.0 LXT-230 MODEL NUMBER DESIGNATORS

Channel 1 Input & Output

LXT-230-PH/MA	pH
LXT-230-OR/MA	ORP
LXT-230-PION/MA	Specific Ion *(see note 1)*

Note 1: For PION, the model number will reflect the ion being measured; for example, Ca for calcium, Fl for fluoride, etc.

Channel 2 Input

PH	pH
OR	ORP
PION	Specific Ion *(see note 1)*
DO	Dissolved Oxygen

Channel 2 Output

MA	4-20 mA, standard
PID	4-20 mA, 3-mode PID control
TMP1	4-20 mA, Temperature (adjustable -100° to +200°C)

Channel 3 Output

TMP1	Only output available on this channel.

Mounting Hardware

UM	Universal mounting plate
PM	Panel mounting hardware
HM	Handrail mounting plate (including 2” hardware)

Other Options

KSx	Keyboard Security Code (x = level of security. See Security Code Option)
F2	Output is the function of two inputs: ratio, differential, average.
SPH	Specific pH (TC for NH3 in condensate)
PA	Signal conditioner is mounted inside the transmitter enclosure
SC	Signal conditioner is mounted through the side of the enclosure
ZPR	Hazardous area Z-purge
AV	Field selectable time average (2 to 32 seconds)

Typical Example

LXT-230-OR/MA-PM - LXT-230 transmitter for use with an ORP sensor.

8.0 TROUBLESHOOTING GUIDE

Symptom	*Possible Causes*	*Suggested Actions*
The LCD does not display.	No power to the instrument.	Check power supply to be sure the correct voltage is being supplied to the transmitter. (13.5 to 50 VDC) Check polarity of transmitter wiring.
	Contrast level is set too low.	Set contrast level to a higher value. Because the contrast menu is always the top menu, it can be reached by pressing the upper MENU SELECTION key at least 12 times. Enter the calibrate mode and increase the value.
	Sensor or signal conditioner has a short that draws too much power from the transmitter.	Check the sensor for proper operation. To verify, disconnect all sensor wires and cycle power off, then on.
The pH fluctuates from minimum scale to full-scale, or the pH is locked at high or low scale.	The slope calibration is mis-calibrated. Typically the transmitter is calibrated with no slope (0 mV/pH).	Check buffers to make sure they are the correct values. Use the Back-to-Factory calibration feature on the Electrode Span Menu, then perform a buffer calibration. Check the electrode and sensor for proper operation.
	Wrong temperature correction has been calibrated in the temperature trim.	Examine the temperature and the Temperature Calibration Menu. Adjust trim as required.
The pH or ORP reading short spans.	The transmitter may have been mis-calibrated.	Check buffers to make sure they are the correct values. Use the Back-to-Factory calibration feature on the

		Electrode Span Menu, then perform a buffer calibration. Check the sensor and electrode for proper operation.
	Wrong temperature correction has been calibrated in the temperature trim.	Examine the temperature and the Temperature Calibration Menu. Adjust trim as required.
LCD turns black.	Power to the transmitter dropped below the minimum required voltage for a fraction of a second (gray-out). Typically caused by a voltage transient.	Cycle power off for approximately 10 seconds, and then on again.

APPENDIX A - SPECIFICATIONS

MEASUREMENT RANGE

pH: 0.00 to 14.00, fully expandable and reversible, standard. -2.00 to 14.00 pH, optional.

ORP: +1000 to -1000 mV, fully expandable and reversible, standard.

OUTPUT 4-20 mA or 20-4 mA, linear and expandable. Up to a maximum of 3 outputs.

POWER REQUIREMENTS
(with zero loop impedance)

Recommended	24 vdc
Maximum	50 vdc
Minimum	13.5 vdc

MAXIMUM LOOP IMPEDANCE
(@ 24 vdc)

525 ohms for 4-20 mA compliance on primary (channel 1) output; approximately 800 ohms on secondary outputs

OPERATING TEMPERATURE
-4°F to +158°F (-20°C to +70°C)

DISPLAY
Menu driven, 32 character alpha-numeric, Supertwist LCD. The main menu simultaneously displays (1) process identity (2) process value (and engineering units), (3) percent output, (4) temperature in °C or °F.

ENCLOSURE
NEMA 4X, weatherproof

SHIPPING WEIGHT
Standard LXT-230: 2 lbs (0.91 kgs)

ACCURACY
± 0.10% of full scale

LINEARITY
± 0.05% of full scale

SENSITIVITY
± 1.0 mV

STABILITY
± 0.2% per year @ 0°C to 70°C

RESPONSE TIME
1 second to reach 90% of the change.

REPEATABILITY
± 1.0 mV

TEMPERATURE COMPENSATION

pH: Automatic, -30°C to +140°C, RTD. Accuracy within ±0.1°C over a 0°C - 100°C span.

Specific pH compensation temperature correction) is available. Consult the factory.

ORP: Not used for compensation; however, temperature is displayed. Accuracy within ±0.1°C over a 0°C-100°C span.

50/60 Hz NOISE REJECTION
Greater than 70 db

INPUT/OUTPUT ISOLATION
Maximum 300 volts between process input and any 4-20 mA output (single and multiple channel outputs). No isolation between inputs on multiple channel units.

CALIBRATION

Auto Buffer Calibration

Allows the definition of two buffer points, saved in memory, during the initial start-up. This will allow subsequent standardize and span buffer calibrations with only 2 keystrokes.

Back-to-Factory Calibration (Factory Restart)

With 2 keystrokes, allows the technician to return the transmitter to a zero electrode offset (asymmetry potential) and to an ideal Nernstian slope (1.000 mV per ORP unit).

Temperature Trim

Allows for compensation for any differences in RTDs by programming the offset into the transmitter.

Temperature Display

Temperature can be field configured to display in OC or OF.

Display Contrast

Fully adjustable for ambient lighting conditions