User's Guide

CE

Model PX2088 Pressure Transmitter

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PX2088
Pressure Transmitter

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SECTION
1

Introduction

OVERVIEW

This section contains general transmitter safety information, a brief description of each model covered in this manual, and a summary of each of each section.

SAFETY MESSAGES

Procedures and instructions in this manual may require special precautions to ensure the safety of the personnel performing the operations.

SAFETY NOTICE

⚠WARNING

The following performance limitations may inhibit efficient or safe operation. Critical applications should have appropriate diagnostic and backup systems in place.

Pressure transmitters contain an internal fill fluid. It is used to transmit the process pressure through the isolating diaphragms to the pressure sensing element. In rare cases, oil leak paths in oil-filled pressure transmitters can be created. Possible causes include: physical damage to the isolator diaphragms, process fluid freezing, isolator corrosion due to an incompatible process fluid, etc.

A transmitter with an oil fill fluid leak can continue to perform normally for a period of time. Sustained oil loss will eventually cause one or more of the operating parameters to exceed published specifications while a small drift in operating point output continues. Symptoms of advanced oil loss and other unrelated problems include:

- Sustained drift rate in true zero and span or operating point output or both
- Sluggish response to increasing or decreasing pressure or both
- Limited output rate or very nonlinear output or both
- Change in output process noise
- Noticeable drift in operating point output
- Abrupt increase in drift rate of true zero or span or both
- Unstable output
- Output saturated high or low

MODELS COVERED

Model PX2088 Smart and Analog Absolute or Gage Pressure Transmitter
measures absolute or gage pressure ranges from 0–1 to 0–4,000 psi (0–6.9 to 0–27579 kPa) using a patented piezoresistive silicon sensor. Mounts directly to the process pipe or to the optional mounting bracket.

USING THIS MANUAL

This manual provides information for the Omega Model PX2088 Pressure Transmitter. It is organized into the following sections:

Section 2 Commissioning the Smart Transmitter
This section provides information on commissioning and operating the Model PX2088 Smart Pressure Transmitter. Information is also included on software functions, configuration parameters, and on-line variables.

Section 3 Commissioning the Analog Transmitter
This section provides information on commissioning and operating the Model PX2088 Analog Pressure Transmitter.

Section 4 Installation
This section provides installation procedures, wiring diagrams, and information about transmitter load limitations and power supply requirements.

Section 5 Troubleshooting
This section provides basic troubleshooting suggestions to help solve the most common operating problems.

Section 6 Reference Data
This section provides reference data including ambient temperature effects, spare parts, and typical transmitter model structures.

Secton 7 LCD Meter
This section provides installation and operation information for the optional LCD Meter.

Appendix B HART Communicator
menu tree and fast key sequences for HART Communicator

SECTION 2

Commissioning the Smart Transmitter

OVERVIEW

This section contains information regarding commissioning the transmitter. Commissioning involves reviewing configuration data, setting the 4 and 20 mA points, configuring the transmitter to recognize accessories such as a LCD meter, and testing the transmitter output.

SAFETY MESSAGES

This section contains procedures that require connecting a communicator to the transmitter, or making connections in an explosive atmosphere. The following safety messages apply to all procedures throughout this section requiring cover removal and communicator connection to the transmitter terminal block. Keep the following safety messages in mind whenever you perform an operation requiring cover removal or the connection of a communicator to a measurement loop.

Warnings

⚠WARNING

Explosions could result in death or serious injury:

- Do not remove the transmitter covers in explosive atmospheres when the circuit is alive.
- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

⚠WARNING

High voltage that may be present on leads could cause electrical shock:

- Avoid contact with leads and terminals.

COMMISSION: ON THE BENCH OR IN THE LOOP

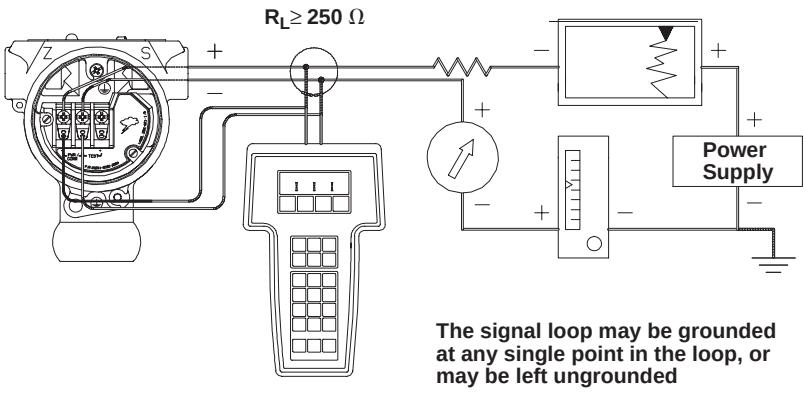
Commission the Model PX2088 Smart Transmitter before or after installation. It may be useful to commission the transmitter on the bench before installation to ensure proper operation, to familiarize yourself with transmitter functionality, and to avoid exposing the transmitter electronics to the plant environment. Commissioning consists of reviewing configuration data, setting output units, setting the 4 and 20 mA points, configuring the transmitter for any non-standard accessories or functions, and testing the transmitter output.

Set up the Transmitter and the Communicator

To configure the transmitter on the bench, connect the transmitter and the communicator as shown in Figure 2-1. To power the transmitter you will need a power supply capable of providing 10.5 to 36.0 V dc and a meter to measure output current. To enable communication, a resistance of at least 250 ohms must be present between the communicator loop connection and the power supply. You can connect the communicator leads at any termination point in the signal loop, but it is most convenient to connect them to the terminals labeled "COMM" on the terminal block.

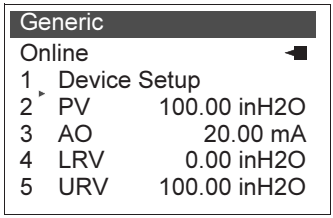
After you connect the bench equipment as shown in Figure 2-1, turn on the communicator by pressing the ON/OFF key. The communicator will search for a HART-compatible device and will indicate that the connection is made. If the connection is not made, the communicator will indicate that no device was found.

FIGURE 2-1. Connecting a Communicator to a Transmitter Loop



If the communicator lacks the device driver for the PX2088 Smart, the transmitter will be identified as "GENERIC" by the communicator. Basic configuration functions are still possible, but many advanced configuration functions are not possible when the communicator is in this mode. Contact Omega customers service for assistance in obtaining the PX2088 Smart device driver for the HART Communicator.

FIGURE 2-2. HART Communicator ScreenWithout Model PX2088 Smart Device Driver.



REVIEW CONFIGURATION DATA

Review all of the factory-set configuration data to ensure that is reflects the needs of your application before operating the transmitter in an actual installation.

Review

HART Fast Keys	1, 5

Review the transmitter configuration parameters set at the factory to ensure accuracy and compatibility with your particular application. After activating the review function, scroll through the data list to check each variable. Refer to “Basic Setup” in this section of the manual if a change to the transmitter configuration data is necessary.

CHECK OUTPUT

Before performing other transmitter on-line operations, review the digital output parameters to ensure that the transmitter is operating properly and is configured to the appropriate process variables.

Process Variables

HART Fast Keys	1, 1

The process variables for the Model PX2088 Smart provide the transmitter output, and are continuously updated. The Process Variable menu displays the following process variables:

- Pressure
- Percent Range
- Analog Output

BASIC SETUP

From the *Basic Setup* menu you can configure the transmitter for certain basic variables. In many cases, all of these variables are pre-configured at the factory. Configuration may be required if your transmitter is not configured or if the configuration variables need revision.

Tag

HART Fast Keys	1, 3, 1

The *Tag* variable is the easiest way to identify and distinguish between transmitters in multi-transmitter environments. Use this variable to label transmitters electronically according to the requirements of your application. The tag you define is automatically displayed when a HART-based communicator establishes contact with the transmitter at power-up. The tag may be up to eight characters long and has no impact on the primary variable readings of the transmitter.

Output Units

HART Fast Keys	1, 3, 3

The *Unit* command sets the desired primary variable units. Set the transmitter output to one of the following engineering units:

- inH_2O
- inHg
- ftH_2O
- mmH_2O
- psi
- bar
- mbar
- InH_2O @ °4 C
- g/cm^2
- kg/cm^2
- Pa
- kPa
- torr
- atm
- mmH_2O @ °4 C

NOTE

Output units is the only variable which must be sent separately from all other variable configurations. After changing units, press SEND (F2) so the microprocessor will recalculate the associated variables (4–20 mA points, for example). The Model PX2088 Smart recalculates all variables that depend on units. After the transmitter recalculates the variables, you may change any of the remaining parameters.

Rerange

HART Fast Keys	1, 3, 3

The *Range Values* command sets the 4 and 20 mA points (lower and upper range values). Setting the range values to the limits of expected readings maximizes transmitter performance; the transmitter is most accurate when operated within the expected pressure ranges for your application. In practice, you may reset the transmitter range values as often as necessary to reflect changing process conditions.

You may use one of three methods to rerange the transmitter. Each method is unique; examine all three closely before deciding which method to use.

NOTE

Regardless of the range points, the Model PX2088 Smart will measure and report all readings within the digital limits of the sensor. For example, if the 4 and 20 mA points are set to 0 and 10 inH_2O, and the transmitter detects a pressure of 25 inH2O, it digitally outputs the 25 in H_2O reading and a 250% percent of span reading. However, there may be up to ±5.0% error associated with output outside of the range points.

Method 1: Rerange Using the Communicator

Reranging using only the communicator is the easiest and most popular way to rerange the transmitter. This method changes the values of the analog 4 and 20 mA points independently without a pressure input.

To rerange using only the communicator enter the fast-key sequence above, select *1 Keypad input*, and follow the on-line instructions. Or enter the values directly from the HOME screen.

Method 2: Rerange Using the Communicator and a Pressure Source or Process Pressure

Reranging using the communicator and a pressure source or process pressure is a way of reranging the transmitter when specific 4 and 20 mA points are not known. This method changes the values of the analog 4 and 20 mA points. When you set the 4 mA point the span is maintained; when you set the 20 mA point the span changes.

To rerange using the communicator and a pressure source or process pressure enter the fast-key sequence above, select *2 Apply values*, and follow the on-line instructions.

Method 3: Rerange Using the Local Zero and Span Buttons and a Pressure Source or Process Pressure

Reranging using the local zero and span adjustments and a pressure source is a way of reranging the transmitter when specific 4 and 20 mA points are not known or a communicator is not available. When you set the 4 mA point the span is maintained; when you set the 20 mA point the span changes.

To rerange using the zero and span adjustments, refer to “Rerange Procedure” on page 4-13.

Damping

HART Fast Keys	1. 3. 6

The *Damping* command changes the response time of the transmitter to smooth variations in output readings caused by rapid changes in input. Determine the appropriate damping setting based on the necessary response time, signal stability, and other requirements of the loop dynamics of your system. The default damping value is 0.50 seconds and can be reset in fixed increments of 0.05, 0.10, 0.20, 0.40, 0.80, 1.60, 3.20, 6.40, 12.8, or 25.6 seconds.

DETAILED SETUP

Meter Setup

HART Fast Keys	1, 4, 3, 4

The *Meter Type* command allows you to configure the transmitter for use with an LCD meter. Transmitters shipped without meters are set to "NONE." Change the meter settings as often as necessary to reflect changing process or application conditions. To change the meter settings, and thereby configure the transmitter to recognize the LCD meter, perform the following procedure.

1. Select 1 *Device setup*, 4 *Detailed setup*, 3 *Output condition*, 4 *Meter options* to prepare to change the meter settings.
2. Select the appropriate variable configuration from the *Meter options* screen, and press enter.

NOTE
Selecting "None" from the meter type screen will disable the meter.

3. Select SEND to download the new meter configuration information to the transmitter.

For a more detailed description of the LCD meter features and diagnostic messages, refer to **Section 7 LCD Meter**.

Burst Mode

HART Fast Keys	1, 4, 3, 4, 3

Burst Mode sets the transmitter to maintain digital contact with a Digital Control System that has custom software to support burst mode. When the Model PX2088 Smart is configured for burst mode, it provides faster digital communication from the transmitter to the control system by eliminating the time required for the control system to request information from the transmitter.

Burst mode is compatible with use of the analog signal. Because HART® protocol features simultaneous digital and analog data transmission, the analog value can drive other equipment in the loop while the control system is receiving the digital information. Burst mode applies only to the transmission of dynamic data (pressure and temperature in engineering units, pressure in percent of range, and/or analog output in mA or V), and does not affect the way other transmitter data is accessed.

Access to information other than dynamic transmitter data is obtained through the normal poll/response method of HART communication. A HART-based communicator or the control system may request any of the information that is normally available while the transmitter is in burst mode. Between each message sent by the transmitter, a short pause allows the HART-based communicator or a control system to initiate a request. The transmitter will receive the request, process the response message, and then continue "bursting" the data approximately three times per second.

Save, Recall, or Clone Configuration Data

HART Fast Keys	left arrow, 3 (note)

Data that was entered off-line can be stored in the communicator memory and downloaded to other transmitters later. Data also can be copied from a transmitter in order to be sent to other transmitters in a process known as "cloning". This is especially useful if you work with a large number of transmitters that require the same configuration data.

Enable or Disable Local Span and Zero Buttons

HART Fast Keys	1, 4, 4, 1, 7

The *Local Keys* command allows you to enable or disable the local span and zero buttons. Disabling the local keys will prevent unauthorized reranging using the span and zero buttons, but will not prevent reranging using the communicator. To prevent all changes to the configuration data, use the transmitter security jumper (see "Transmitter Security" on page 4-12).

CALIBRATION

Calibrating the transmitter increases the precision of your measurement system. You may use one or more of a number of trim functions when calibrating.

To understand the trim functions, it is necessary to understand that smart transmitters operate differently from analog transmitters. An important difference is that smart transmitters are factory-characterized; they are shipped with a standard sensor curve stored in the transmitter firmware. In operation, the transmitter uses this information to produce a process variable output, in engineering units, dependent on the sensor input. The trim functions allow you to make corrections to the factory-stored characterization curve by digitally altering the transmitter's interpretation of the sensor input.

The trim functions should not be confused with the rerange functions. Although the rerange command matches a sensor input to a 4–20 mA output—as in conventional calibration—it does not affect the transmitter's interpretation of the input.

Calibration Overview

Complete calibration of the Model PX2088 Smart Pressure Transmitter involves one or more of the following tasks:

Configure the Analog Output Parameters

- Set Process Variable Units (Page 2-3)
- Rerange (Page 2-5)
- Set Output Type (Page 2-4)
- Set Damping (Page 2-6)

Calibrate the Sensor

- Full Trim (Page 2-10)
- Zero Trim (Page 2-10)

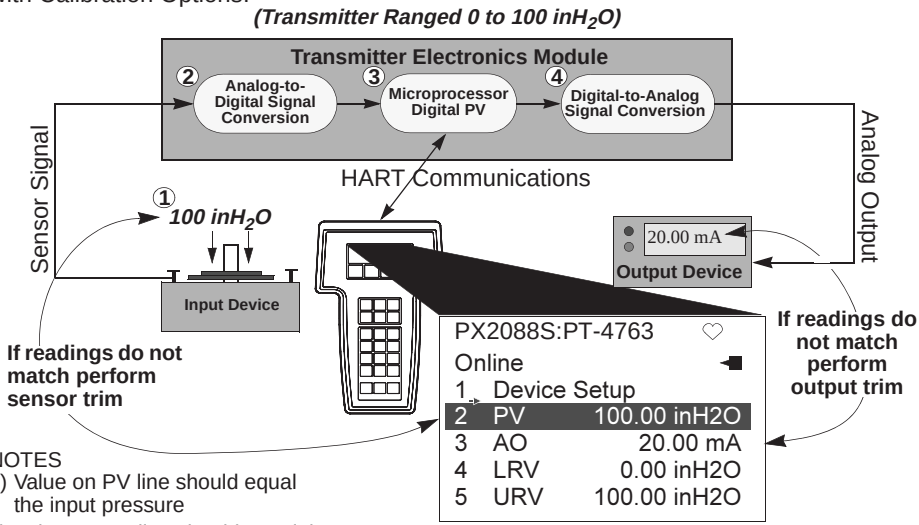
Calibrate the 4–20 mA Output

- Digital to Analog Trim (Page 2-11) or
- Scaled Digital to Analog Trim (Page 2-12)

Figure 2-3 illustrates the Model PX2088 Smart transmitter data flow. This data flow can be summarized in four major steps:

1. A change in pressure is measured by a change in the sensor output (Sensor Signal).
2. The sensor signal is converted to a digital format that can be understood by the microprocessor (Analog-to-Digital Signal Conversion).
3. Corrections are performed in the microprocessor to obtain a digital representation of the process input (Digital PV).
4. The Digital PV is converted to an analog value (Digital-to-Analog Signal Conversion).

FIGURE 2-3. Transmitter Data Flow with Calibration Options.



Deciding Which Trim Procedure to Use

To decide which trim procedure to use, you must first determine whether the analog-to-digital section or the digital-to-analog section of the transmitter electronics is in need of calibration. To do so, refer to Figure 2-3 and perform the following procedure:

1. Connect a pressure source, a HART communicator, and an output device to the transmitter.
2. Establish communication between the transmitter and the communicator.
3. Apply the desired 20mA point pressure (100 in H2O, for example).
4. Compare the applied pressure to the Process Variable (PV) line on the Communicator Online Menu. If the PV reading on the communicator does not match the applied pressure, and you are certain your test equipment is accurate, perform a sensor trim.
5. Compare the Analog Output (AO) line on the communicator online menu to the digital readout device. If the AO reading on the communicator does not match the digital readout device, and you are certain your test equipment is accurate, perform an output trim.

Sensor Trim

You can trim the sensor using either the full trim or the zero trim function. The trim functions vary in complexity, and their use is application-dependent. Both alter the transmitter's interpretation of the input signal.

A **zero trim** is a single-point adjustment. It is useful for compensating for mounting position effects, and can be performed with the transmitter installed or from the bench. Since this correction maintains the slope of the characterization curve, it should not be used in place of a full trim over the full sensor range.

A **full trim** is a two-point sensor calibration where two end-point pressures are applied, and all output is linearized between them. You should always adjust the low trim value first to establish the correct offset. Adjustment of the high trim value provides a slope correction to the characterization curve based on the low trim value. The factory-established characterization curve is not changed by this procedure. The trim values allow you to optimize performance over your specified measuring range at the calibration temperature.

Zero Trim

HART Fast Keys	1, 2, 3, 3, 1

To calibrate the sensor using the zero trim function, perform the following procedure.

1. Vent the transmitter and attach a communicator to the measurement loop.
2. From the communicator main menu select *1 Device setup*, *2 Diagnostics and service*, *3 Calibration*, *3 Sensor trim*, *1 Zero trim* to prepare to adjust the zero trim.

NOTE
The transmitter must be within 3% of true zero (zero based) in order to calibrate using the zero trim function.

3. Follow the commands provided by the communicator to complete the adjustment of the zero trim.

Full Trim

HART Fast Keys	1, 2, 3, 3

To calibrate the sensor using the full trim function, perform the following procedure.

1. Assemble and power the entire calibration system including a transmitter, communicator, power supply, pressure input source, and readout device.

NOTE
Use a pressure input source that is at least three times more accurate than the transmitter, and allow the input pressure to stabilize for 10 seconds before entering any values. If remote seals are used allow more time for the input pressure to stabilize.

2. From the communicator main menu select *1 Device setup*, *2 Diagnostics and service*, *3 Calibration*, *3 Sensor trim*, *2 Lower sensor trim* to prepare to adjust the lower trim point.

NOTE

Select pressure input values so that the low and high values are equal to or outside the 4 and 20 mA points. Do not attempt to obtain reverse output by reversing the high and low points. The transmitter allows approximately a 5% URL deviation from the characterized curve established at the factory.

3. Follow the commands provided by the communicator to complete the adjustment of the lower value.
4. Repeat the procedure for the upper value, replacing *2 Lower sensor* trim with *3 Upper sensor trim* in Step 2.

Output Trim

The output trim commands allow you to alter the transmitter's conversion of the input signal to a 4–20 mA output (see Figure 2-3 on page 2-9). Adjust the analog output signal at regular intervals to maintain measurement precision. Match the transmitter output to the output of the digital readout device (ammeter, DCS, etc.). You can trim the transmitter output using either the digital to analog trim or the scaled digital to analog trim function.

Digital to Analog Trim

HART Comm.	1, 2, 3, 2, 1
	1

To perform a digital-to-analog trim, perform the following procedure.

1. From the HOME screen, select *1 Device setup*, *2 Diag/Service*, *3 Calibration*, *4 D/A trim*. Select "OK" to after you set the control loop to manual.
2. Connect an accurate reference meter to the transmitter at the "Connect reference meter" prompt. To do so, connect the meter across the test terminals in the transmitter terminal compartment, or use the readout device within the loop.
3. Select "OK" after connecting the reference meter.
4. Select "OK" at the "Setting fld dev output to 4 mA" prompt. The transmitter outputs 4.00 mA.
5. Record the actual value from the reference meter, and enter it at the "Enter meter value" prompt.

The communicator prompts you to verify whether or not the output value equals the value on the reference meter.

6. Select *1 Yes* if the reference meter value equals the transmitter output value, or *2 No* if it does not.

If you select *1 Yes*, proceed to Step 7.

If you select *2 No*, repeat Step 5.

7. Select “OK” at the “Setting fld dev output to 20 mA” prompt, and repeat Steps 5 and 6 until the reference meter value equals the transmitter output value.

Select “OK” after you return the control loop to automatic control.

Scaled Digital to Analog Trim

HART Comm.	1, 2, 3, 2, 2

The *Scaled D/A Trim* command matches the 4 and 20 mA points to a user-selectable reference scale other than 4 and 20 mA (1 to 5 volts if measuring across a 250 ohm load, or 0 to 100 percent if measuring from a DCS, for example). To perform a scaled D/A trim, connect an accurate reference meter to the transmitter and trim the output signal to scale as outlined in the Output Trim procedure.

NOTE
Use a precision resistor for optimum accuracy. If you add a resistor to the loop, ensure that the power supply is sufficient to power the transmitter to a 20 mA output with the additional loop resistance.

DIAGNOSTICS AND SERVICE

Test Device

HART Fast Keys	1, 2, 1, 1

The *Test device* command initiates a more extensive diagnostic routine than that performed continuously by the transmitter. If the transmitter test detects a problem, the communicator displays messages to indicate the source of the problem.

Loop Test

HART Fast Keys	1, 2, 2

The *Loop Test* command verifies the output of the transmitter, the integrity of the loop, and the operations of any recorders or similar devices installed in the loop. To initiate a loop test, perform the following procedure:

1. From the HOME screen, Select *1 Device Setup*, *2 Diagnostics and Service*, *2 Loop Test*, to prepare to perform a loop test.
2. Select “OK” after you set the control loop to manual.

   The communicator displays the loop test menu.
3. Select a discreet milliamp level for the transmitter to output. At the “Choose analog output” prompt, select *1 4mA*, *2 20mA*, or select *3 other* to manually input a value between 4 and 20 milliamps.

4. Check the current meter installed in the test loop to verify that it reads the value you commanded the transmitter to output. If the readings do not match, the transmitter requires an output trim or the current meter is malfunctioning.

After completing the test procedure, the display returns to the loop test screen and allows you to choose another output value.

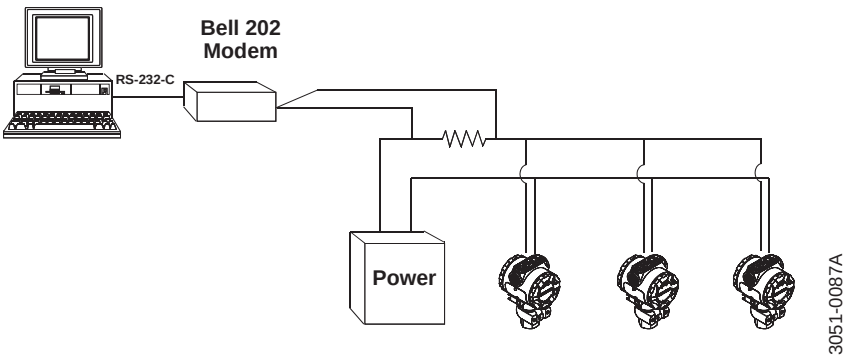
MULTIDROP COMMUNICATION

Multidropping transmitters refers to the connection of several transmitters to a single communications transmission line. Communication between the host and the transmitters takes place digitally with the analog output of the transmitters deactivated. Many of the SMART transmitters can be Multidropped. With the HART smart communications protocol, up to 15 transmitters can be connected on a single twisted pair of wires or over leased phone lines. Note that Burst Mode Operation is not compatible with multidrop communications.

The application of a multidrop installation requires consideration of the update rate necessary from each transmitter, the combination of transmitter models, and the length of the transmission line. Multidrop installations are not recommended where intrinsic safety is a requirement. Communication with the transmitters can be accomplished with commercially available Bell 202 modems and a host implementing the HART protocol. Each transmitter is identified by a unique address (1-15) and responds to the commands defined in the HART protocol.

Figure 2-4 shows a typical multidrop network. This figure is not intended as an installation diagram.

FIGURE 2-4. Typical Multidrop Network.



HART-based communicators can test, configure, and format a multidropped transmitter the same way as a transmitter in a standard point-to-point installation.

NOTE

The transmitter is set to address 0 at the factory, allowing it to operate in the standard point-to-point manner with a 4–20 mA output signal. To activate multidrop communication, you must change the transmitter address to a number from 1 to 15. This change deactivates the 4–20 mA analog output, locking it to 4 mA. It also disables the failure mode alarm signal, which is controlled by the upscale/downscale jumper position.

Changing a Transmitter Address

HART Fast Keys	1, 4, 3, 4, 1

To change the address of a multidropped transmitter, follow these fast key sequences. To activate multidrop communication, the transmitter address must be changed to a number from 1 to 15.

Polling a Multidropped Loop

HART Fast Keys	Left Arrow, 1, 1,

Polling a multidropped loop determines the model, address, and number of transmitters on the given loop.

NOTE

The Model HC275 HART Communicator requires you to use the Utility Menu to perform an auto poll. This menu is available from the Main Menu of the HART Communicator. Press the left arrow to move from the Online Menu to the Main Menu. Press 4 from the Main Menu to access the Utility Menu. The HART Communicator will only recognize transmitters with an address of “0” unless polling is initiated.

SECTION 3

Commissioning the Analog Transmitter

OVERVIEW

This section contains calibration information for the Models PX2088 Pressure Transmitter. The transmitter can be continuously adjusted to spans between maximum span and 1/10 of maximum span. Transmitter linearity information is programmed into the microprocessor at the factory; linearity adjustment is not necessary in the field.

SAFETY MESSAGES

This section contains procedures that require connecting the transmitter, or making connections in an explosive atmosphere. The following safety messages apply to all procedures throughout this section requiring cover removal and connection to the transmitter terminal block. Keep the following safety messages in mind whenever you perform an operation requiring cover removal or connection to a measurement loop.

⚠WARNING

Failure to follow safe commissioning guidelines can cause death or serious injury. Please review the following safety messages before commissioning a Model PX2088 Pressure Transmitter.

- To avoid explosions, do not remove the instrument cover or make electrical connections in explosive atmospheres when the circuit is alive. Make sure the instrument is installed in accordance with intrinsically safe or nonincendive field wiring practice.
- To meet explosion proof requirements, make sure that both transmitter covers are fully engaged.

⚠WARNING

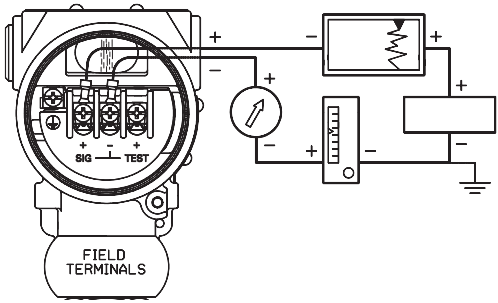
High voltage that may be present on leads could cause electrical shock:

- Avoid contact with leads and terminals.

COMMISSION: ON THE BENCH OR IN THE LOOP

Commission the Model PX2088 Analog transmitter before or after installation. It may be useful to commission the transmitter on the bench before installation to ensure proper operation and to avoid exposing the transmitter electronics to the plant environment. Commissioning consists of applying pressure and setting the zero and span to the desired values.

FIGURE 3-1. Transmitter Wiring.



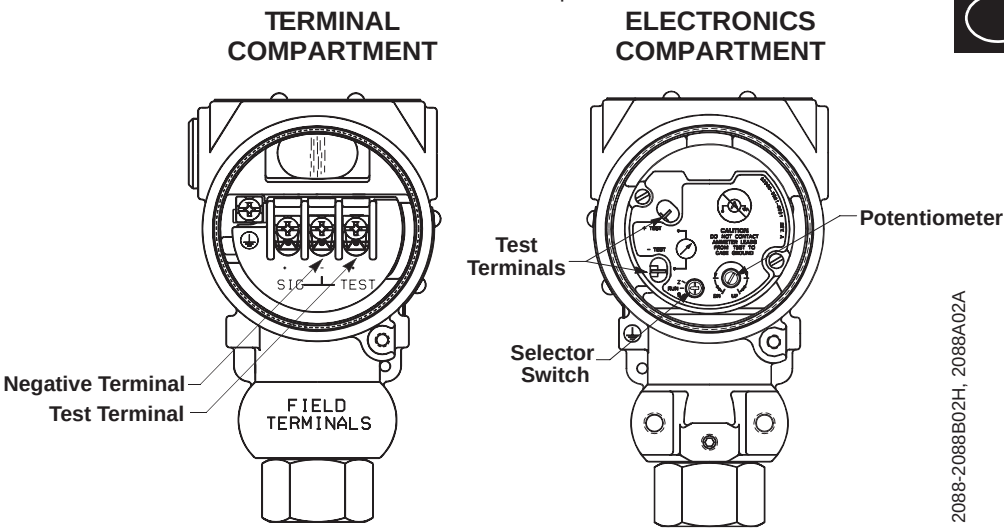
TEST TERMINALS

⚠CAUTION

Do not contact meter leads from either test terminal on the output board to case ground. This can result in the maximum current from the power supply flowing through the test meter and may blow the test meter fuse, or damage the test meter or transmitter.

Terminals for connecting an ammeter to the transmitter are provided in both the terminal and the electronics compartments. To connect an ammeter in the terminal compartment, connect the positive lead to the terminal marked "+TEST," and the negative lead to the terminal marked "–". To connect an ammeter in the electronics compartment, attach the positive lead to the terminal marked "+ TEST," and the negative lead to the terminal marked "– TEST" (see Figure 3-2).

FIGURE 3-2. Transmitter Terminal and Electronics Compartments.



ZERO AND SPAN ADJUSTMENTS

Adjustment controls for zero and span are located in the transmitter electronics compartment. Calibrate the transmitter with the three-position switch and the ¾-turn potentiometer (see Figure 3-2).

Selector Switch

The selector switch is labeled “Z” (Zero), “RUN,” and “S” (Span). The switch is set to the “RUN” position at the factory, and should remain there under normal operation.

⚠CAUTION

The selector switch must be returned to the “RUN” position after setting the proper calibration. Failure to return the switch to the “RUN” position will, after 20 minutes, cause the transmitter to return to the previously set 4–20 mA points. This will result in erroneous transmitter output.

Potentiometer Adjustment

The procedure for calibrating the Model PX2088 is different from that of any other pressure transmitters and takes some time to become accustomed to. However, this method of calibration is considerably faster than other calibration methods. In addition, there is no interaction between the zero and span adjustments.

An important feature of this design is that the potentiometer is an active part of the circuit only during calibration. The potentiometer is removed from the active circuit when the switch is placed in the "RUN" position. This unique design eliminates the temperature drift and stability shifts often associated with common potentiometers.

The potentiometer is marked "DN" (Down), "FINE," and "UP." The coarse adjustment regions are at each end, and a fine adjustment region is in the center. The output of the transmitter increases or decreases automatically when the potentiometer is placed in the coarse adjustment regions. The longer the potentiometer is held in the coarse adjustment region, the faster the rate of change in output.

⚠CAUTION

The potentiometer is a ¾-turn device and has a mechanical stop to prevent full rotation. Do not exert large twisting forces against the mechanical stop or damage will result.

NOTE

When the transmitter output is saturated below 4 mA or above 20 mA, the potentiometer may appear to have no effect on the transmitter calibration because the microprocessor is adjusting the calibration, but the current-limiting circuitry is maintaining the output at the saturation levels. Place the potentiometer in the coarse-adjust region and wait at least 15 seconds for the output to change.

Setting the Zero

Setting the zero point of the transmitter involves applying pressure and adjusting the potentiometer accordingly. To set the zero point of the transmitter, use the following procedure:

1. If the transmitter does not have a readout device, attach an ammeter using the test terminals in either compartment (see Figure 3-2 on Page 3-3).
2. Ensure that the selector switch is in the "RUN" position. Apply the pressure to which the zero point will be calibrated.
3. Set the selector switch to "Z."
4. Using the potentiometer, adjust the transmitter output until the readout device reads the 4 mA.
5. Return the selector switch to the "RUN" position.

⚠CAUTION

The selector switch should not be set to the “Z” position unless the potentiometer will be adjusted. Failure to adjust the potentiometer while in the “Z” position will result in erroneous transmitter output during an overpressure event, and a shift in calibration after the overpressure event. The transmitter can be returned to normal operation by performing either of the following procedures:

1.Remove power from the transmitter while the selector switch is in the “RUN” position, and re-apply power. This will reset the former zero calibration.

OR

2.Calibrate the zero point of the transmitter by following the instructions in the section entitled “Setting the Zero.”

Setting the Span

Setting the span of the transmitter involves applying pressure and adjusting the potentiometer accordingly. To set the span of the transmitter, use the following procedure:

1. If the transmitter does not have a readout device, attach an ammeter using the test terminals in either compartment (see Figure 3-2 on Page 3-3).
2. Ensure that the selector switch is in the “RUN” position. Expose the transmitter to full scale pressure.
3. Set the selector switch to “S.”
4. Using the potentiometer, adjust the transmitter output until the readout device reads the 20mA.
5. Return the switch to “RUN.”

SECTION
4

Installation

OVERVIEW

This section contains a flowchart (Figure 4-1 on Page 4-2), installation procedures, and a wiring diagram (Figure 4-8 on Page 4-10), to guide you to a successful Model PX2088 installation. Shielded cable should be used for best results in electrically noisy environments.

Safety Messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please read all warnings before proceding.

⚠WARNING

- Explosions could result in death or serious injury:
- Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.
- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.To avoid output shifts in critical applications, do not plug the low side with a solid plug.
- To avoid process leaks, install and tighten all four flange bolts before applying pressure, or process leakage may result. When properly installed, the flange bolts will protrude through the top of the module housing. Attempting to remove the flange bolts while the transmitter is in service may cause process fluid leaks.

⚠WARNING

Failure to follow these installation guidelines could result in death or serious injury:

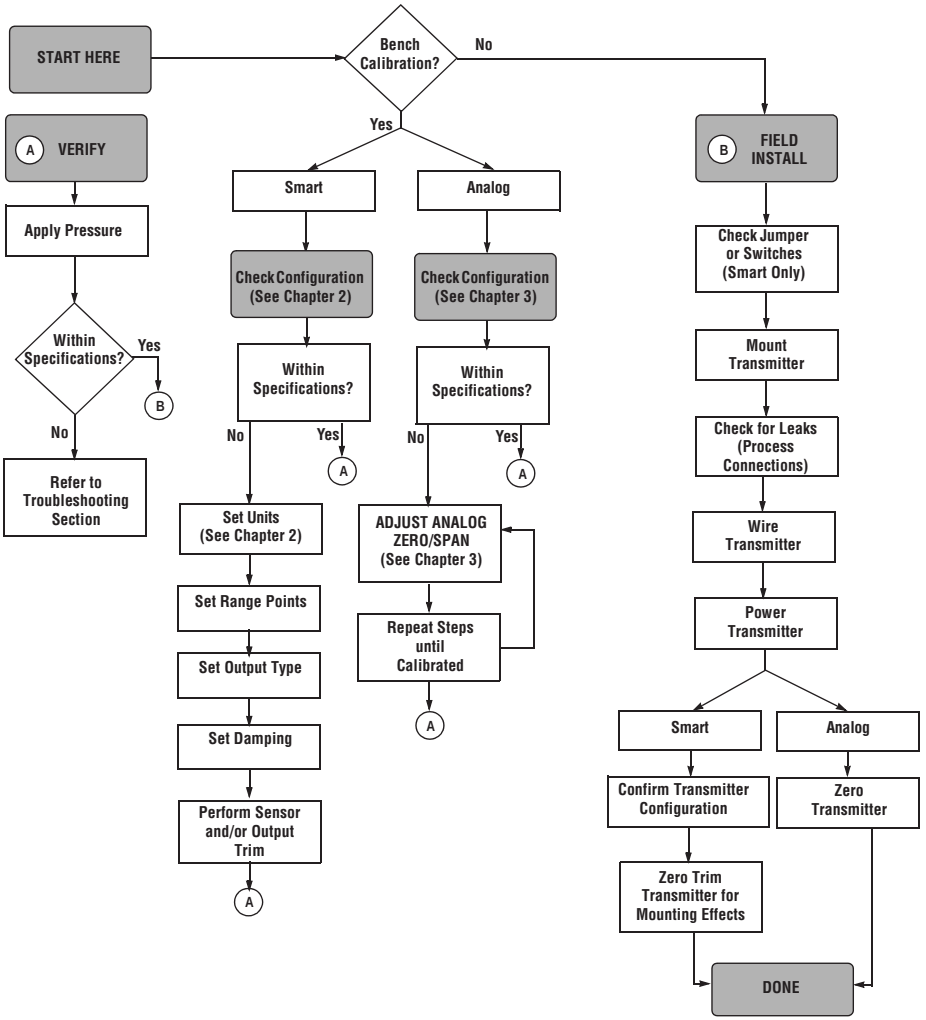
- Make sure only qualified personnel perform the installation.

⚠WARNING

High voltage that may be present on leads could cause electrical shock:

- Avoid contact with leads and terminals.

FIGURE 4-1. Installation Flowchart.



INSTALLATION

Installation consists of attaching the transmitter to the process piping and making electrical connections.

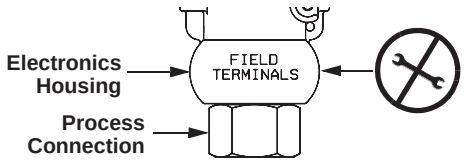
The Model PX2088 weighs approximately 2.0 pounds (0.9 kg). In many cases, its compact size and light weight makes it possible to mount the Model PX2088 directly t the impulse line without using an additional mounting bracket. When this is not desirable, mount directly to a wall, panel, or two-inch pipe using the optional mounting bracket (see Figure 4-3).

INSTALLATION PROCEDURES

Model PX2088

⚠CAUTION

Do not apply torque directly to the electronics housing. Rotation between the electronics housing and the process connection can damage the electronics. To avoid damage, apply torque only to the hex-shaped process connection.



Impulse Piping

Impulse piping configurations depend on specific measurement conditions. Use the following information and Figure 4-2 as a guideline when installing impulse piping.

Liquids: Make the line tap on the side of the pipe to prevent sediment deposits from plugging the impulse line or transmitter. Mount the transmitter level with or below the tap so gases vent into the process line.

Gases: Make the line tap on either the top or the side of the process line. Mount the transmitter level with or above the line tap so liquids drain into the process line.

Steam: Make the line tap in the side of the process line. Mount the transmitter below the line tap to ensure that the impulse line remains filled with condensate.

FIGURE 4-2. Model PX2088 Mounting Configurations for Liquids, Gases, and Steam.

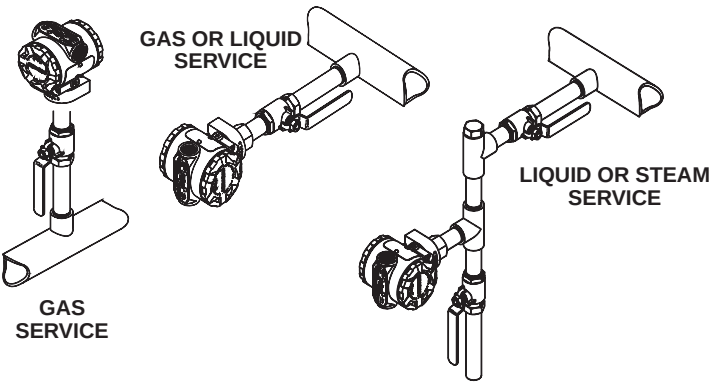
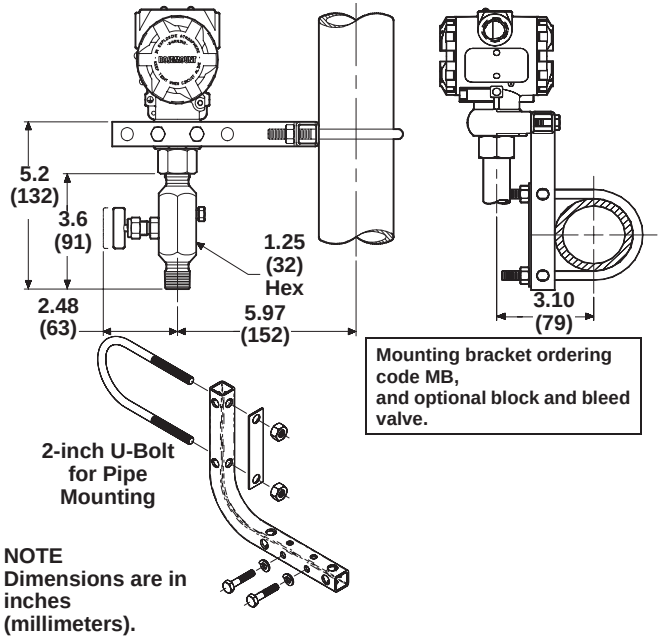


FIGURE 4-3. Model PX2088 Mounting Configurations with Optional Bracket.



⚠WARNING

- Explosions could result in death or serious injury:
- Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.
- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.To avoid output shifts in critical applications, do not plug the low side with a solid plug.

⚠WARNING

High voltage that may be present on leads could cause electrical shock:

- Avoid contact with leads and terminals.

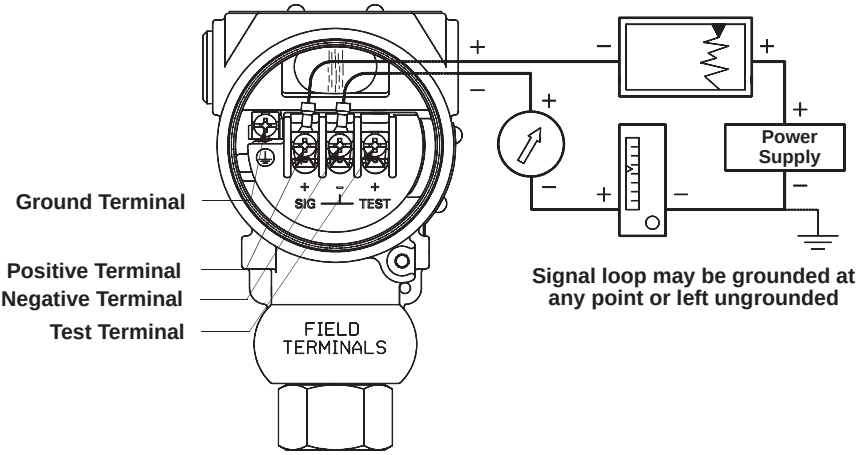
To power the transmitter, connect the positive power lead to the terminal marked "SIG +" and the negative power lead to the terminal marked "–" (see Figure 4-8 on Page 4-10). Tighten the terminal screws to ensure that adequate contact is made. No additional power wiring is required.

To connect test equipment for monitoring the output of the Model PX2088 during maintenance procedures, connect one lead to the terminal labeled "TEST+" and the other lead to the terminal labeled "–" (see Figure 4-8 on Page 4-10). Avoid contact with the leads and the terminals.

Signal wiring may be grounded at any one point on the measurement loop, or it may be left ungrounded. The negative side of the power supply is a recommended grounding point. The transmitter case may be grounded or left ungrounded.

Conduit connections at the transmitter should be sealed to prevent moisture accumulating in the field terminal side of the transmitter housing. Also, install wiring with a drip loop with the bottom of the drip loop lower than the conduit connection of the transmitter housing.

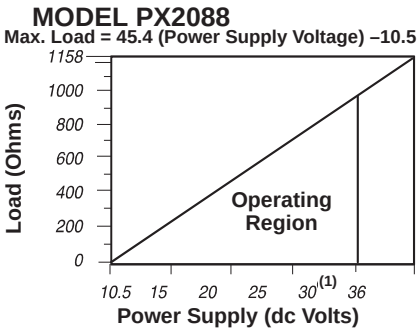
FIGURE 4-8. Transmitter Field Wiring.



Power Supply

The dc power supply should provide power to the transmitter with less than one percent ripple. The total loop resistance load is the sum of the resistance of the signal wires and the resistance load of the controller, indicator, and other pieces of equipment in the loop. Note that the resistance of intrinsic safety barriers, if used, must be included. Figure 4-9 shows the transmitter power supply load limitations.

FIGURE 4-9. Transmitter Load Limitations.



(1) For CENELEC EX ia approval, power supply must not exceed 30 volts.

NOTE
Minimum load impedance for Output Code M is 100 kilohms.

FAILURE MODE AND SECURITY JUMPERS

(Security Jumpers are Available with Smart Transmitters Only)

Failure Mode

As part of normal operation, the Model PX2088 Smart continuously monitors its own operation. This automatic diagnostic routine is a timed series of checks repeated continuously. If the diagnostic routine detects a failure in the transmitter, the transmitter drives its output either below or above specific values depending on the position of the failure mode jumper or switch.

Smart Transmitters

Whether the output is driven high or low when in failure mode is user-selectable by a jumper on the transmitter. The values to which 4–20 mA transmitters drive their output in failure mode depend on whether they are factory-configured to *standard* or *NAMUR-compliant* operation. The values for each are as follows:

Standard Operation

linear output: $3.9 \leq I \leq 20.8$ mA
fail low: 3.75 mA
fail high 21.75 mA

NAMUR-Compliant Operation (Option Code C4)

linear output: $3.8 \leq I \leq 20.8$ mA
fail low: 3.6 mA
fail high: 22.5

To determine the failure mode configuration of your transmitter, review the failure mode options using a Model HC275 HART Communicator.

NOTE

The failure mode configuration, whether standard or NAMUR-compliant, is configured at the factory and can not be changed in the field.

Failure Mode Jumper Locations

Without a meter installed

The failure mode alarm jumper is located on the front side of the electronics module just inside the electronics housing cover and is labeled ALARM (See Figure 4-10). Do not remove the instrument cover in explosive atmospheres when the circuit is alive. Both transmitter covers must be fully engaged to meet explosion proof requirements.

With a meter installed

The failure mode alarm jumper is located on the LCD faceplate in the electronics module side of the transmitter housing and is labeled ALARM (See Figure 4-10). Do not remove the instrument cover in explosive atmospheres when the circuit is alive. Both transmitter covers must be fully engaged to meet explosion proof requirements.

Analog Transmitters

If self diagnostics detect a sensor or microprocessor failure, the analog signal is driven low to alert the user ($I \leq 3.6$ mA or $V \leq 1$V for output Code M).

Transmitter Security

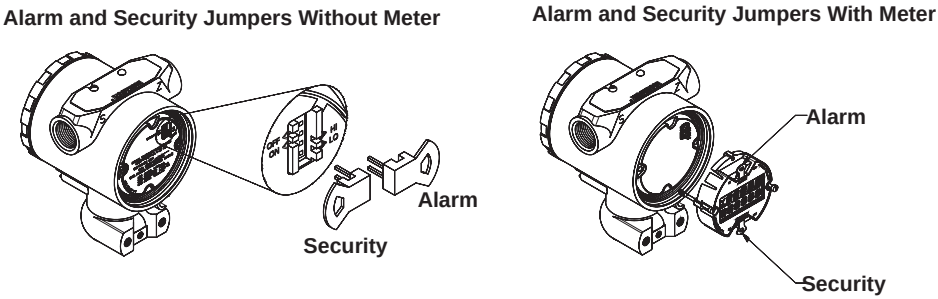
(Security Jumpers are Available with Smart Transmitters Only)

After commissioning the transmitter, you may wish to protect the configuration data from unwarranted changes. The transmitter is equipped with a security jumper that can be positioned to prevent changes to the configuration data. (see Figure 4-10). Remember that the circuit board is electrostatically sensitive. Be sure to observe handling precautions for static-sensitive components to avoid damage to the circuit board.

When the transmitter security jumper is in the "ON" position, the transmitter will not accept any "writes" to its memory. This means that configuration changes (such as digital trim and reranging) cannot take place when the transmitter security is on. The zero and span adjustment buttons are also disabled. To reposition the jumper, use the following procedure.

1. If the transmitter is installed, secure the loop, and remove power.
2. Remove the housing cover opposite the field terminal side. Do not remove the instrument cover in explosive atmospheres when the circuit is alive.
3. Reposition the jumper. Avoid contact with the leads and the terminals. Refer to Figure 4-10 for the location of the jumper and the ON and OFF positions.
4. Reattach the transmitter cover. The cover must be fully engaged to comply with explosion-proof requirements.

FIGURE 4-10. Transmitter Alarm and Security Jumper Locations.



NOTE

If either the alarm or security jumper is dislodged or removed from its position the transmitter reverts to default alarm or security settings of:
Alarm: output high
Security: off

ZERO AND SPAN ADJUSTMENTS

Smart

The Model PX2088 Smart is equipped with local zero and span adjustment buttons. The buttons are located on the top of the transmitter beneath the certifications label. Use the zero and span adjustments to set the 4 and 20 mA output points.

Rerange Procedure

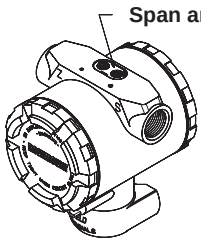
To rerange the transmitter using the span and zero buttons, perform the following procedure.

1. Loosen the screw holding the nameplate on top of the transmitter housing and rotate the nameplate to expose the zero and span buttons (see Figure 4-11).
2. Using a pressure source with an accuracy three to ten times the desired calibrated accuracy, apply a pressure equivalent to the lower range value.
3. To set the 4 mA point, press and hold the zero button for at least two seconds, then verify that the output is 4 mA. If a meter is installed, it will display ZERO PASS.
4. Apply a pressure equivalent to the upper range value.
5. To set the 20 mA point, press and hold the span button for at least two seconds, then verify that the output is 20 mA. If a meter is installed, it will display SPAN PASS.

NOTE

If the transmitter security jumper is in the "ON" position, or if the local zero and span adjustments are disabled through the software, you will not be able to make adjustments to the zero and span using the local buttons. Refer to Figure 4-10 on Page 4-12 for the proper placement of the transmitter security jumper.

FIGURE 4-11. Local Zero and Span Adjustments.



Disabling the Zero and Span Adjustments

After you rerange the transmitter using the span and zero adjustments, you may wish to disable the adjustments to prevent further reranging. To disable the span and zero adjustments, either activate the transmitter security jumper (see "Transmitter Security" on Page 4-12) or use the sofware to disable the zero and span adjustment buttons (HART fast key sequence 1,4,4,1,7).

NOTE

The transmitter security jumper prevents any changes to the transmitter configuration data. The software lockout sequence only disables the local span and zero adjustment buttons.

Analog

If it is necessary to make zero or span adjustments after installation of the transmitter, use the zero/span selector switch and the potentiometers to rerange the transmitter

SECTION
5

Troubleshooting

This section provides basic troubleshooting suggestions to help solve the most common operating problems.

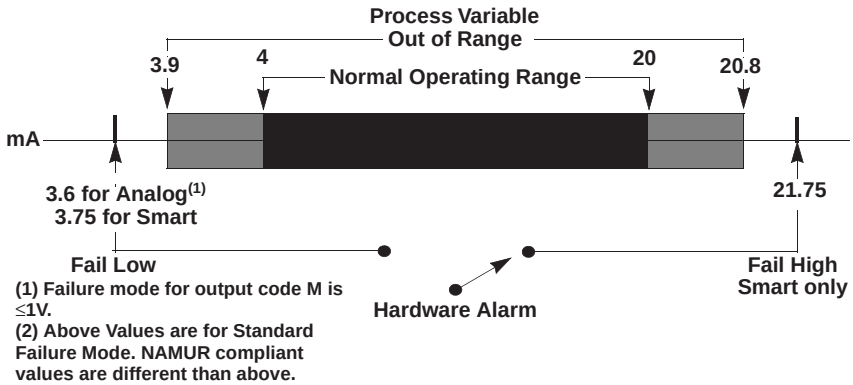
⚠WARNING

The following performance limitations may inhibit efficient or safe operation. Critical applications should have appropriate diagnostic and backup systems in place. Pressure transmitters contain an internal fill fluid. It is used to transmit the process pressure through the isolating diaphragms to the pressure sensing element. In rare cases, oil leak paths in oil-filled pressure transmitters can be created. Possible causes include: physical damage to the isolator diaphragms, process fluid freezing, isolator corrosion due to an incompatible process fluid, etc.

A transmitter with an oil fill fluid leak can continue to perform normally for a period of time. Sustained oil loss will eventually cause one or more of the operating parameters to exceed published specifications while a small drift in operating point output continues. Symptoms of advanced oil loss and other unrelated problems include:

- Sustained drift rate in true zero and span or operating point output or both.
- Sluggish response to increasing or decreasing pressure or both.
- Limited output rate or very nonlinear output or both.
- Change in output process noise.
- Noticeable drift in operating point output.
- Abrupt increase in drift rate of true zero or span or both.
- Unstable output.
- Output saturated high or low.

FIGURE 5-1. Range of Output.



TROUBLESHOOTING

TABLE 5-1. Smart Transmitter Troubleshooting and Corrective Actions.

Symptom	Potential Source	Corrective Action
High Output	Impulse Piping,	• Check for blockage in the impulse line. • Check to ensure that the blocking valve is fully open. • Check for trapped gas in a liquid line, or trapped liquid in a gas line. • Check to ensure that the density of the fluid in the impulse line is unchanged. • Check for sediment in the transmitter process connection. If you find sediment, flush the process connection clean with water or an appropriate solvent. **Do not attempt to scrape sediment free**; doing so could puncture the thin isolating diaphragm and destroy the transmitter. • Check for frozen process fluid in the process connector.
	Electronics	• Check test equipment. • Perform full sensor trim.
	Power Supply	• Check the output voltage of the power supply at the transmitter.(1)
	Other Components	• Replace the transmitter.
Erratic Output	Impulse Piping	• Check for leaks or blockage in the impulse line. • Check to ensure that the blocking valve is fully open. • Check for trapped gas in a liquid line, or trapped liquid in a gas line. • Check to ensure that the density of the fluid in the impulse line is unchanged. • Check for sediment in the transmitter process connection. If you find sediment, flush the process connection clean with water or an appropriate solvent. • Check for frozen process fluid in the process connector. • Check for trapped gas in a liquid line, or trapped liquid in a gas line.
	Loop Wiring	• Check for adequate voltage to the transmitter.(1) • Check for intermittent shorts, open circuits, and multiple grounds.
	Electronics	• Check for EMF interference. • Check damping. • Replace the output board and recalibrate the transmitter.
	Other Components	• Replace the transmitter.

TABLE 5-1. (continued).Smart Transmitter Troubleshooting and Corrective Actions.

Symptom	Potential Source	Corrective Action
Low Output or No Output	Impulse Piping	• Check for leaks or blockage in the impulse line. • Check to ensure that the blocking valve is fully open. • Check for trapped gas in a liquid line, or trapped liquid in a gas line. • Check to ensure that the density of the fluid in the impulse line is unchanged. • Check for sediment in the transmitter process connection. If you find sediment, flush the process connection clean with water or an appropriate solvent. **Do not attempt to scrape sediment free**; doing so could puncture the thin isolating diaphragm and destroy the transmitter. • Check for frozen process fluid in the process connector.
	Loop Wiring	• Check test equipment. • Check for adequate voltage to the transmitter. • Check the current rating of the power supply against the total current being drawn by all transmitters being powered. • Check for intermittent shorts, open circuits, and multiple grounds. • Check for proper polarity at the signal terminals. • Check the loop impedance.
	Electronics	• Replace the electronics board and recalibrate the transmitter.
	Other Components	• Replace the transmitter.

TABLE 5-2. Analog Transmitter Troubleshooting Symptoms and Corrective Actions.

Symptom	Potential Source	Corrective Action
High Output	Impulse Piping	• Check for blockage in the impulse line.. • Check to ensure that the blocking valve is fully open. • Check for trapped gas in a liquid line, or trapped liquid in a gas line. • Check to ensure that the density of the fluid in the impulse line is unchanged. • Check for sediment in the transmitter process connection. If you find sediment, flush the process connection clean with water or an appropriate solvent. **Do not attempt to scrape sediment free**; doing so could puncture the thin isolating diaphragm and destroy the transmitter. • Check for frozen process fluid in the process connector.
	Power Supply	• Check the output voltage of the power supply at the transmitter.(1)
	Output Electronics	• Replace the output board and recalibrate the transmitter.
	Other Components	• Replace the transmitter.

TABLE 5-2. (continued).Analog Transmitter Troubleshooting and Corrective Actions.

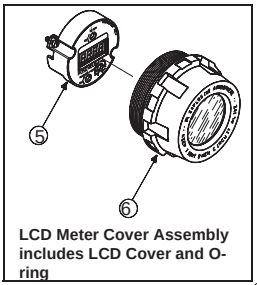
Symptom	Potential Source	Corrective Action
Erratic Output	Impulse Piping	• Check for leaks or blockage in the impulse line. • Check to ensure that the blocking valve is fully open. • Check for trapped gas in a liquid line, or trapped liquid in a gas line. • Check to ensure that the density of the fluid in the impulse line is unchanged. • Check for sediment in the transmitter process connection. If you find sediment, flush the process connection clean with water or an appropriate solvent. • Check for frozen process fluid in the process connector. • Check for trapped gas in a liquid line, or trapped liquid in a gas line.
	Loop Wiring	• Check for adequate voltage to the transmitter. • Check for intermittent shorts, open circuits, and multiple grounds.
	Output Electronics	• Replace the output board and recalibrate the transmitter.
	Other Components	• Replace the transmitter.
Low Output or No Output	Impulse Piping	• Check for leaks or blockage in the impulse line. • Check to ensure that the blocking valve is fully open. • Check for trapped gas in a liquid line, or trapped liquid in a gas line. • Check to ensure that the density of the fluid in the impulse line is unchanged. • Check for sediment in the transmitter process connection. If you find sediment, flush the process connection clean with water or an appropriate solvent. **Do not attempt to scrape sediment free**; doing so could puncture the thin isolating diaphragm and destroy the transmitter. • Check for frozen process fluid in the process connector.
	Loop Wiring	• Check for adequate voltage to the transmitter. • Check the current rating of the power supply against the total current being drawn by all transmitters being powered. • Check for intermittent shorts, open circuits, and multiple grounds. • Check for proper polarity at the signal terminals. • Check the loop impedance.
	Output Electronics	• Replace the output board and recalibrate the transmitter.
	Other Components	• Replace the transmitter.

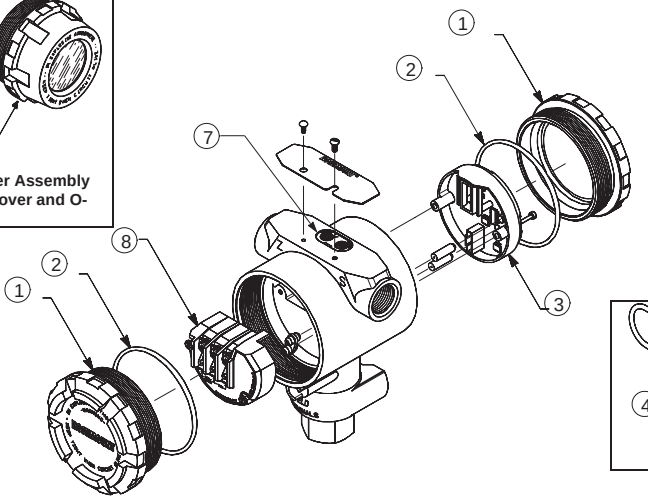
SECTION
6

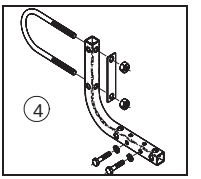
Spare Parts and Ordering

SPARE PARTS

FIGURE 6-1. Model PX2088 Smart Transmitter Exploded View.



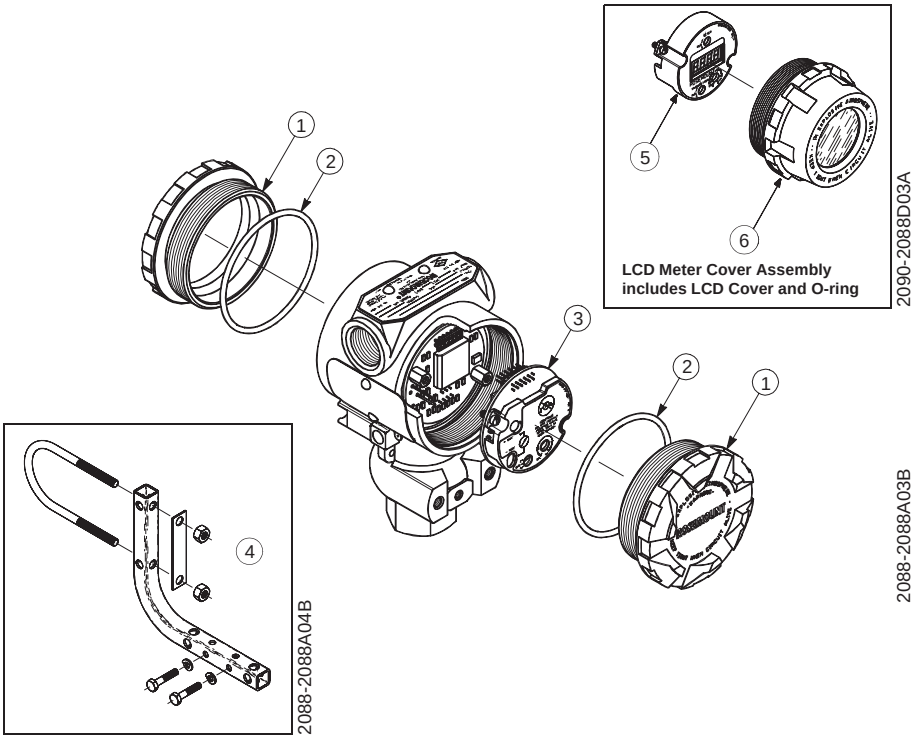




Part Description	Item No.	Part Number	Spares Category[1]
Smart Transmitters (Output Code S)			
Electronics Cover (with O-ring)	1, 2	03031-0292-0001	
LCD Meter Cover Assembly	6	03031-0193-0002	B
Cover O-rings	2	03031-0232-0001	B
Electronics Board Kits			
S Output (4–20 mA/Digital HART Protocol)	3	02088-0306-0002	A
S Output (NAMUR Compliant Operation)	3	02088-0306-0003	A
Optional Mounting Bracket (with 2-inch U-Bolt for Pipe Mounting)	4	02088-0071-0001	
LCD Meter Kit with Cover	5, 6	03031-0193-0101	
LCD Meter Kit without Cover	5	03031-0193-0103	A
Local Zero and Span Kit	7	3031-0293-0002	A
Standard Terminal Block	8	3031-0332-0003	B
Transient Protection BLock	8	3031-0332-0004	B

(1) One spare part is recommended for every 25 transmitters in category A, and one spare part for every 50 transmitters in category B.

FIGURE 6-2. Replacement Parts for the Model PX2088.



Part Description	Item No.	Part Number	Spares Category[1]
Analog Transmitters (Output Codes A and M)			
Electronics Cover	1	02088-0014-0002	
LCD Meter Cover Assembly	6	02088-0075-0003	B
Cover O-rings	2	02088-0073-0001	B
Electronics Board Kits[2]			
A Output (4–20 mA)	3	02088-0076-0001	A
M Output (1–5 V)	3	02088-0077-0001	A
Transient Protection			
A Output (4–20 mA)	--	02088-0214-0001	A
M Output (1–5 V)	--	02088-0216-0001	A
Optional Mounting Bracket (with 2-inch U-Bolt for Pipe Mounting)	4	02088-0071-0001	
LCD Meter Kit with Cover[3]	5, 6	02088-0075-0001	A
LCD Meter Kit without Cover[3]	5	02088-0075-0002	

(1) One spare part is recommended for every 25 transmitters in category A, and one spare part for every 50 transmitters in category B.
(2) Assembly hardware is included.
(3) Engineering Unit Label Provided.

SECTION 7

LCD Meter

LCD METER FOR SMART TRANSMITTERS

The LCD meter provides local indication of the output, and abbreviated diagnostic messages governing transmitter operation. The meter is located on the electronics module side of the transmitter, maintaining direct access to the signal terminals. An extended cover is required to accommodate the LCD Meter for Smart Transmitters. The LCD Meter can be ordered with the transmitter or added at a later time.

The new meter features a two-line display that accommodates five digits for reporting the process variable on the top line, and six characters for displaying engineering units on the bottom line. The meter uses both lines to display diagnostic messages. You can configure the meter to display the following information:

- Engineering Units
- Percent of Range
- User-Configurable LCD Scale
- Alternating between any two of the above

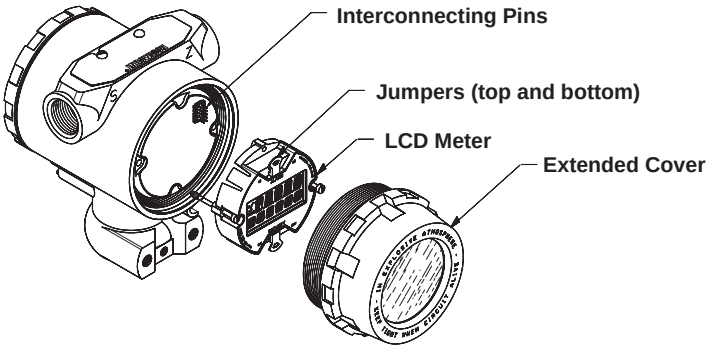
The user-configurable scale is a new feature that enables you to configure the LCD meter to a custom scale using a Model HC275 HART Communicator. With the user configurable scale feature, you can define the decimal point position, the upper range value, the lower range value, the engineering units, and the transfer function.

Use a HART-based communicator to change the engineering units displayed by the meter. Select from the following engineering units:

Engineering Unit	LCD Readout	Engineering Unit	LCD Readout
inH2O @20DegC	INH2O	g/Sqcm	G/CM2
mmH2O @20DegC	MMH20	kg/Sqcm	KG/CM2
ft H2O	FTH2O	Pa	PA
inHg	INHG	kPa	KPA
mmHg	MMHG	torr	TORR
psi	PSI	atm	ATM
bar	BAR	inH2O @4DegC	INH2O
mbar	MBAR	mmH2O @4DegC	MMH2O

Note the following LCD temperature limits:
Operating: –4 to 175 °F (–20 to 80 °C)
Storage: –40 to 185 °F (–40 to 85 °C)

FIGURE 7-1. Exploded View of the Transmitter with Optional LCD Meter.



Diagnostic Messages

In addition to the output, the LCD meter displays abbreviated operation, error, and warning messages for troubleshooting the transmitter. Messages appear according to their priority, with normal operating messages appearing last. To determine the cause of a message, use a Model HC275 HART Communicator to further interrogate the transmitter. A description of each LCD diagnostic message follows.

Error

Error messages appear on the LCD meter display to inform you of serious problems effecting the operation of the transmitter. The meter displays an error message until the error condition is corrected, and the analog output is driven to the specified alarm level. No other transmitter information is displayed during an alarm condition.

FAIL

The transmitter CPU board and the sensor module are incompatible.

FAIL MODULE

The sensor module is disconnected or is malfunctioning. Verify that the sensor module ribbon cable is connected to the back of the electronics board. If the ribbon cable is not disconnected, there is a problem within the sensor module. Possible sources of problems include:

- Pressure or temperature updates are not being received in the sensor module
- A non-volatile memory fault that will effect transmitter operation has been detected in the module by the memory verification routine–this condition is not repairable, the transmitter must be replaced

FAIL ELECT

The transmitter electronics module is malfunctioning. Possible causes include:

- Internal fault
- A non-volatile memory fault that will effect transmitter operation has been detected in the module by the memory verification routine

Neither problem is user-repairable; you must replace the electronics board.

FAIL CONFIG

A non-volatile memory fault has been detected in the transmitter memory by the memory verification routine. The memory fault is in a location that could effect transmitter operation, and is user-accessible. To correct this problem, use a Model HC275 HART Communicator to interrogate and reconfigure the appropriate portion of the transmitter memory.

Warnings

Warnings appear on the LCD meter display to alert you of user-repairable problems with the transmitter, or current transmitter operations. Warnings appear alternately with other transmitter information until the warning condition is corrected or the transmitter completes the operation that warrants the warning message.

PRESS LIMIT

The process variable read by the transmitter is outside of sensor range limits.

CURR FIXED

The transmitter is in multidrop mode. The analog output is not tracking pressure changes.

CURR SATURD

The pressure read by the module is outside of the specified range, and the analog output has been driven to saturation levels (“Failure Mode” on Page 4-11).

LOOP TEST

A loop test is in progress. During a loop test or 4–20 mA trim, the analog output is set to a fixed value. The meter display alternates between the current selected in milliamps and “LOOP TEST.”

XMTR INFO

A non-volatile memory fault has been detected in the transmitter memory by the memory verification routine. The memory fault is in a location containing transmitter information. To correct this problem, use a Model HC275 HART Communicator to interrogate and reconfigure the appropriate portion of the transmitter memory. This warning does not effect the transmitter operation.
Operation

Normal operation messages appear on the LCD meter to confirm actions or inform you of transmitter status. Operation messages are displayed with other transmitter information, and warrant no action to correct or alter the transmitter settings.

ZERO PASS

The zero value, set with the local zero adjustment button, has been accepted by the transmitter, and the output should change to 4 mA.

ZERO FAIL

The zero value, set with the local zero adjustment button, exceeds the maximum rangedown allowed for a particular range, or the pressure sensed by the transmitter exceeds the sensor limits.

SPAN PASS

The span value, set with the local span adjustment button, has been accepted by the transmitter, and the output should change to 20 mA.

SPAN FAIL

The span value, set with the local span adjustment button, exceeds the maximum rangedown allowed for a particular range, or the pressure sensed by the transmitter exceeds the sensor limits.

LOCAL DSBLD

This message appears during reranging with the integral zero and span buttons and indicates that the transmitter local zero and span adjustments have been disabled. The adjustments may have been disabled by the transmitter security jumper on the transmitter circuit board or through software commands from the Model HC275 refer to “Failure Mode and Security Jumpers” on Page 4-11 for information on the position of the security jumper, and for information on the software lockout.

WRITE PROTCT

The write protect (SECURITY) jumper is set to disable changes to the transmitter configuration data. Refer to “Failure Mode and Security Jumpers” on page 4-11 for more information on the security jumper.

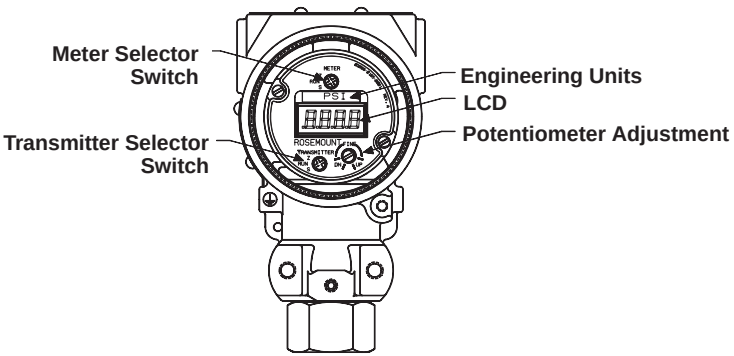
LCD METER FOR ANALOG TRANSMITTERS

The LCD meter displays a digital value that is proportional to the pressure measured by the transmitter. The zero point of the indicator may be set to any value between –999 and 1000. The full scale point may be set to any value between 1.000 and 9999. In addition, adhesive labels are provided with the LCD meter option so that you can scale the indication to display in engineering units of pressure or level (see Figure 7-2).

Note the following LCD temperature limits:
Operating: –4 to 175 °F (–20 to 80 °C).

Storage: –40 to 185 °F (–40 to 85 °C).

FIGURE 7-2. LCD Meter
on a Model PX2088 Analog.



DIAGNOSTIC MESSAGE DISPLAY

Model PX2088 Analog Transmitter conducts regular diagnostic routines and can identify several types of failure conditions. If the transmitter detects a failure, the indicator displays “FAIL”. In addition to detecting and displaying transmitter failures, the meter display will flash when other conditions exist. When the transmitter is under-ranged or –999 is exceeded, the display will flash “–999.” When the transmitter output is saturated or 9999 is exceeded, the display will flash “9999.”

INSTALLATION

Installing the LCD meter to the transmitter involves removing the plastic cover and the captive screws from the output board, and attaching the local indicator.

⚠WARNING

Explosions can result in death or serious injury. Do not remove the instrument cover in explosive environments while power is supplied to transmitter.

⚠CAUTION

Disconnect power to the transmitter before removing the output board. Failure to follow this procedure could result in permanent damage to the transmitter electronics.

⚠CAUTION

The circuit board is electrostatically sensitive. To prevent damage to the circuit board, be sure to observe handling precautions for static-sensitive components.

To install an LCD meter, perform the following procedure: Remove the cover from the electronics side of the transmitter.

1. Loosen the two captive screws holding the output board and plastic cover in place.
2. Remove the plastic cover and the two captive screws from the output board.

NOTE
If you are using a transmitter that has a white plastic electronics cover, perform the following procedure to replace it with a local indicator. If you are using a transmitter that has a black plastic electronics cover, proceed to Step 4

a. Gently remove the output board from the microprocessor board.
b. Completely remove the two captive screws from the white plastic cover and the output board. Carefully remove the plastic cover from the output board.
c. Carefully reattach the output board to the microprocessor board, taking care to correctly align the screw holes and all interconnecting pins.

Continue with Steps 4 through 6 to complete the installation.

3. Attach the local indicator to the output board, taking care to correctly align the selector switch and potentiometer with the appropriate holes on the local indicator. Also, make certain the interconnecting pins near the top of the output board mesh correctly with the rear of the local indicator.
4. Tighten the two captive screws and install the LCD meter cover.

CONFIGURATION

Before configuring the indicator, make sure the transmitter output is set to the desired calibration.

NOTE
The local indicator option does not allow access to the test terminals on the output circuit board. To measure the transmitter output during calibration, connect an ammeter to the test terminals in the terminal compartment of the electronics enclosure (Output Code A). For additional information, see “TEST TERMINALS” on Page 3-2. For Output Code M transmitters, connect a voltmeter between the “–” and “V out” terminals in the electronics compartment.

During transmitter calibration, the local indicator display becomes inactive. The display will indicate “ZERO” or “SPAN,” depending on the position of the transmitter selector switch. Refer to the ammeter reading for calibration of the transmitter output.

For transmitter calibration procedures, See “Zero and Span Adjustments” on Page 3-3.

Positioning the Decimal Point

The decimal point may be positioned in one of four locations, as shown in Figure 7-2 on Page 7-4. The decimal point will remain fixed in this position until it is repositioned.

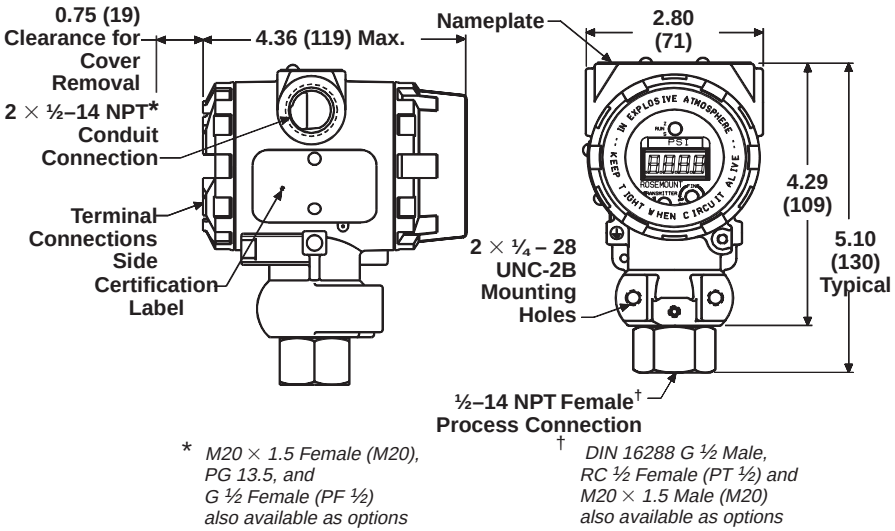
1. Place the meter selector switch in the “Z” (Zero) position.

NOTE

The meter selector switch must be placed in the “Z” position before placing the transmitter selector switch in the “Z” position. Failure to follow this sequence may accidently change the transmitter zero setting.

2. Place the transmitter selector switch in the “Z” position. The decimal point will begin to advance slowly through each location. To stop the decimal point from advancing, return the transmitter selector switch to the “RUN” position.
3. Return the meter selector switch to the “RUN” position.

FIGURE 7-3. Local Indicator Dimensional Drawings.



* *M20 × 1.5 Female (M20), PG 13.5, and G ½ Female (PF ½) also available as options*

† *DIN 16288 G ½ Male, RC ½ Female (PT ½) and M20 × 1.5 Male (M20) also available as options*

Scaling the Display

1. Apply pressure to the transmitter that represents the zero calibration.
2. Place the meter selector switch in the “Z” position.
3. Adjust the indicator to display the desired value using the potentiometer (“Potentiometer Adjustment” on Page 3-4). The potentiometer will adjust the display of the indicator without changing the calibration of the transmitter electronic output.

4. Return the meter selector switch to the “RUN” position. This action prompts the microprocessor to store the set value in memory and deactivates the potentiometer.
5. Apply pressure to the transmitter that represents the full-scale calibration.
6. Place the meter selector switch in the “S” (Span) position.
7. Adjust the potentiometer until the indicator displays the desired value (“Potentiometer Adjustment” on Page 3-4).
8. Return the meter selection switch to the RUN position.
9. Select the appropriate adhesive label and apply it to the indicator face directly above the LCD, as shown in Figure 7-2 on Page 7-4. The local indicator is supplied with adhesive labels of common engineering units for pressure and level. Several blank labels have also been provided to allow you to create individualized engineering units if desired.

SECTION
A

Model HC275 HART Communicator

OVERVIEW

This appendix provides basic communicator information on the Model HC275 HART Communicator when used with a Model PX2088S Smart Pressure Transmitter.

Included in this appendix is the PX2088S Smart menu tree and fast key table.

This brief appendix will familiarize you with the HART Communicator but is not meant to replace the HART Communicator product manual.

SAFETY MESSAGES

This section contains procedures that require connecting a communicator to the transmitter in an explosive atmosphere. The following safety messages apply to all procedures throughout this section requiring cover removal and communicator connection to the transmitter terminal block. Keep the following safety messages in mind whenever you perform an operation requiring cover removal or the connection of a communicator to a measurement loop.

Warnings

⚠WARNING

Explosions could result in death or serious injury:

- Do not make connections to the serial port or NiCad recharger jack in an explosive atmosphere.
- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

⚠WARNING

High voltage that may be present on leads could cause electrical shock:

- Avoid contact with leads and terminals.

FIGURE A-1. HART Communicator Menu Tree for the Model PX2088 Smart

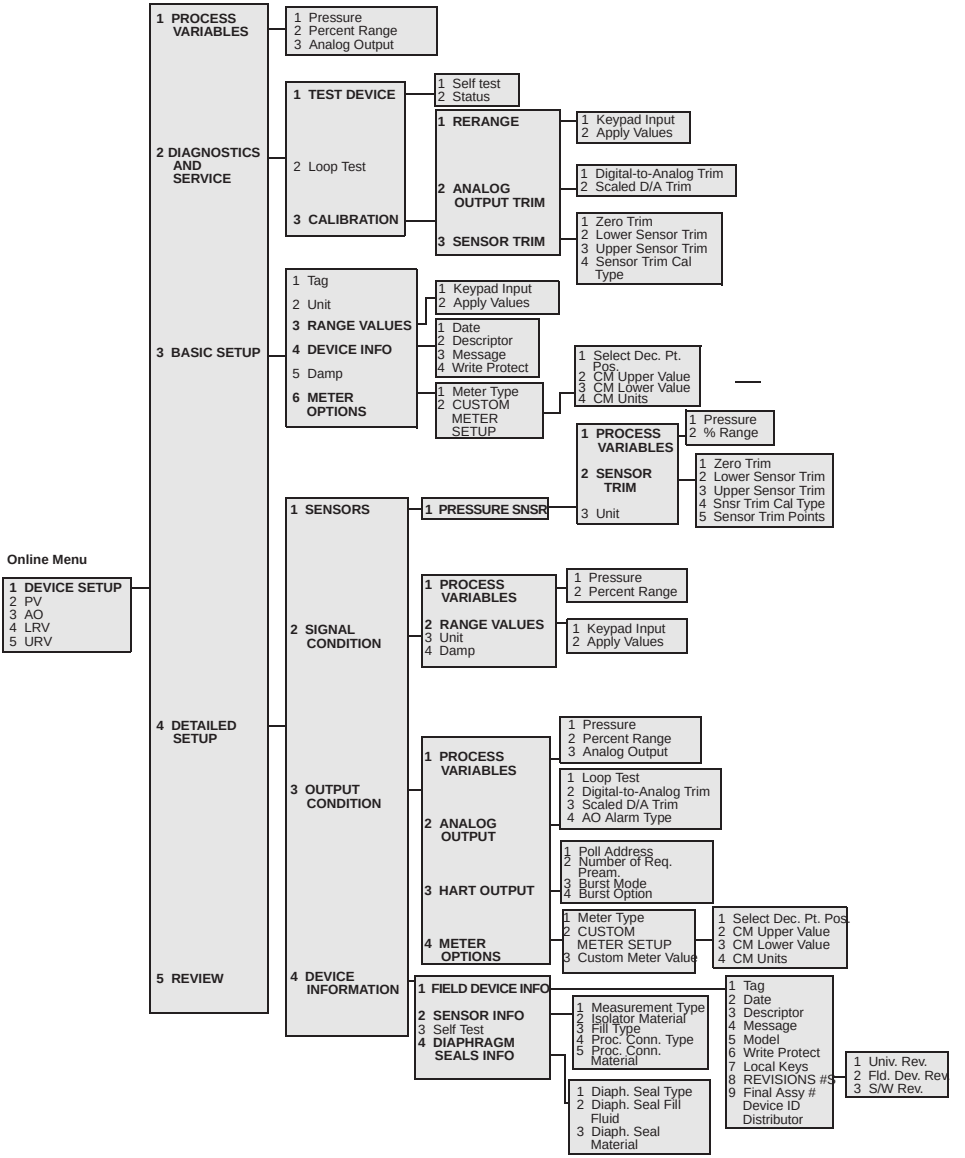


TABLE A-1. HART Fast Key Sequences for the Model PX2088S.

Function	HART Communicator Fast Key Sequences
Analog Output	3
Analog Output Alarm	1, 4, 3, 2, 4
Burst Mode Control	1, 4, 3, 3, 3
Burst Operation	1, 4, 3, 3, 4
Calibration	1, 2, 3
Damping	1, 3, 6
Date	1, 3, 4, 1
Descriptor	1, 3, 4, 2
Digital To Analog Trim (4–20 mA Output)	1, 2, 3, 2, 1
Disable Local Span/Zero Adjustment	1, 4, 4, 1, 7
Field Device Info	1, 4, 4, 1
Keypad Input	1, 2, 3, 1, 1
Loop Test	1, 2, 2
Lower Range Value	4, 1
Lower Sensor Trim	1, 2, 3, 3, 2
Message	1, 3, 4, 3
Meter Type	1, 3, 7, 1
Number of Requested Preambles	1, 4, 3, 3, 2
Output Trim	1, 2, 3, 2
Percent Range	1, 1, 2
Poll Address	Left Arrow, 5, 1
Pressure	2
Range Values	1, 3, 3
Rerange	1, 2, 3, 1
Scaled D/A Trim (4–20 mA Output)	1, 2, 3, 2, 2
Self Test (Transmitter)	1, 2, 1, 1
Sensor Info	1, 4, 4, 2
Sensor Trim (Full Trim)	1, 2, 3, 3
Sensor Trim Points	1, 2, 3, 3, 5
Status	1, 2, 1, 2
Tag	1, 3, 1
Transmitter Security (Write Protect)	1, 3, 4, 4
Units (Process Variable)	1, 3, 2
Upper Range Value	5
Upper Sensor Trim	1, 2, 3, 3, 3
Zero Trim	1, 2, 3, 3, 1

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of 13 months from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal one (1) year product warranty to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS,
please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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- √ Infrared Pyrometers

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- √ Heating Cable
- √ Cartridge & Strip Heaters
- √ Immersion & Band Heaters
- √ Flexible Heaters
- √ Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- √ Metering & Control Instrumentation
- √ Refractometers
- √ Pumps & Tubing
- √ Air, Soil & Water Monitors
- √ Industrial Water & Wastewater Treatment
- √ pH, Conductivity & Dissolved Oxygen Instruments

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