# User's Guide

Model PX751 Pressure Transmitter

http://www.omega.com
e-mail: info@omega.com

PX751
Pressure Transmitter

| | |
|---|---|
| OMEGAnet® On-Line Service | Internet e-mail |
| http://www.omega.com | info@omega.com |

## Servicing North America:

USA: One Omega Drive, Box 4047
ISO 9001 Certified Stamford, CT 06907-0047
Tel: (203) 359-1660 FAX: (203) 359-7700
e-mail: info@omega.com

Canada: 976 Bergar
Laval (Quebec) H7L 5A1
Tel: (514) 856-6928 FAX: (514) 856-6886
e-mail: info@omega.ca

## For immediate technical or application assistance:

USA and Canada: Sales Service: 1-800-826-6342 / 1-800-TC-OMEGASM
Customer Service: 1-800-622-2378 / 1-800-622-BESTSM
Engineering Service: 1-800-872-9436 / 1-800-USA-WHENSM
TELEX: 996404 EASYLINK: 62968934 CABLE: OMEGA

Mexico and Latin America: Tel: (95) 800-826-6342 FAX: (95) 203-359-7807
En Espan˜ol: (95) 203-359-7803 e-mail: espanol@omega.com

## Servicing Europe:

Benelux: Postbus 8034, 1180 LA Amstelveen, The Netherlands
Tel: (31) 20 6418405 FAX: (31) 20 6434643
Toll Free in Benelux: 0800 0993344
e-mail: nl@omega.com

Czech Republic: ul. Rude armady 1868, 733 01 Karvina-Hranice
Tel: 420 (69) 6311899 FAX: 420 (69) 6311114
Toll Free: 0800-1-66342 e-mail: czech@omega.com

France: 9, rue Denis Papin, 78190 Trappes
Tel: (33) 130-621-400 FAX: (33) 130-699-120
Toll Free in France: 0800-4-06342
e-mail: france@omega.com

Germany/Austria: Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
Tel: 49 (07056) 3017 FAX: 49 (07056) 8540
Toll Free in Germany: 0130 11 21 66
e-mail: info@omega.de

United Kingdom: One Omega Drive, River Bend Technology Centre
ISO 9002 Certified Northbank, Irlam, Manchester
M44 5EX, England
Tel: 44 (161) 777-6611 FAX: 44 (161) 777-6622
Toll Free in the United Kingdom: 0800-488-488
e-mail: info@omega.co.uk

EN

# Table of Contents

## SECTION 1 Introduction



## SECTION 2 Commissioning

EN

## SECTION 3 Installation



## SECTION 4 Troubleshooting



## SECTION 5 Reference Data



## APPENDIX A HART® Communicator

SECTION 1

# Introduction

EN

## OVERVIEW

This section outlines the models covered and the organization of this manual.

**⚠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

EN

This manual provides basic installation, commissioning, and troubleshooting information for the following Omega® Model PX751 Pressure Transmitters:

**Model PX751CD — Differential Pressure Transmitter**

measures differential pressure from 0.5 in$H_2O$ to 2,000 psi (0.12–13800 kPa) with superior performance including 0.075% accuracy and 100:1 rangeability.

**Model PX751CG — Gage Pressure Transmitter**

measures gage pressure from 2.5 in$H_2O$ to 2,000 psig (0.62–13800 kPa) using proven capacitance cell technology.

**Model PX751CA — Absolute Pressure Transmitter**

measures absolute pressure from 0.167 to 4,000 psia (8.6 mmHga to 27580 kPa) using patented piezoresistive silicon sensor.

**Model PX751H — High Process Temperature Pressure Transmitter**

provides high process temperature capability to 375 °F (191°C), without the use of remote diaphragm seals or capillaries. These transmitters are available for differential and gage configurations (PX751HD and PX751HG).

**Model PX751P — *Reference Class* Pressure Transmitter**

provides 0.05% accuracy. The Model PX751P is the most accurate pressure transmitter available and is ideal for fiscal and allocation metering. Eliminates the need to stack multiple transmitters.

**Model PX751T – Gage and Absolute Pressure Transmitter**

measures absolute and gage pressures from 2,000 to 10,000 psi (13800 to 68900 kPa). The Model PX751T uses a single isolator design and microprocessor-based electronics.

## USING THIS MANUAL

This manual is designed to assist in basic installation and operation of Model PX751 Family of Smart Pressure Transmitters. For more detailed information, contact an Omega product specialist.

EN

**Section 2 Commissioning**

provides a description of common commissioning tasks.

**Section 3 Installation**

provides a flowchart outlining installation procedures and installation wiring diagrams.

**Section 4 Troubleshooting**

provides basic troubleshooting techniques for common diagnostic messages associated with the transmitter and the communicator.

**Section 5 Reference Data**

provides range tables, a typical model structure, and bolt torque specifications for Model PX751 Transmitters.

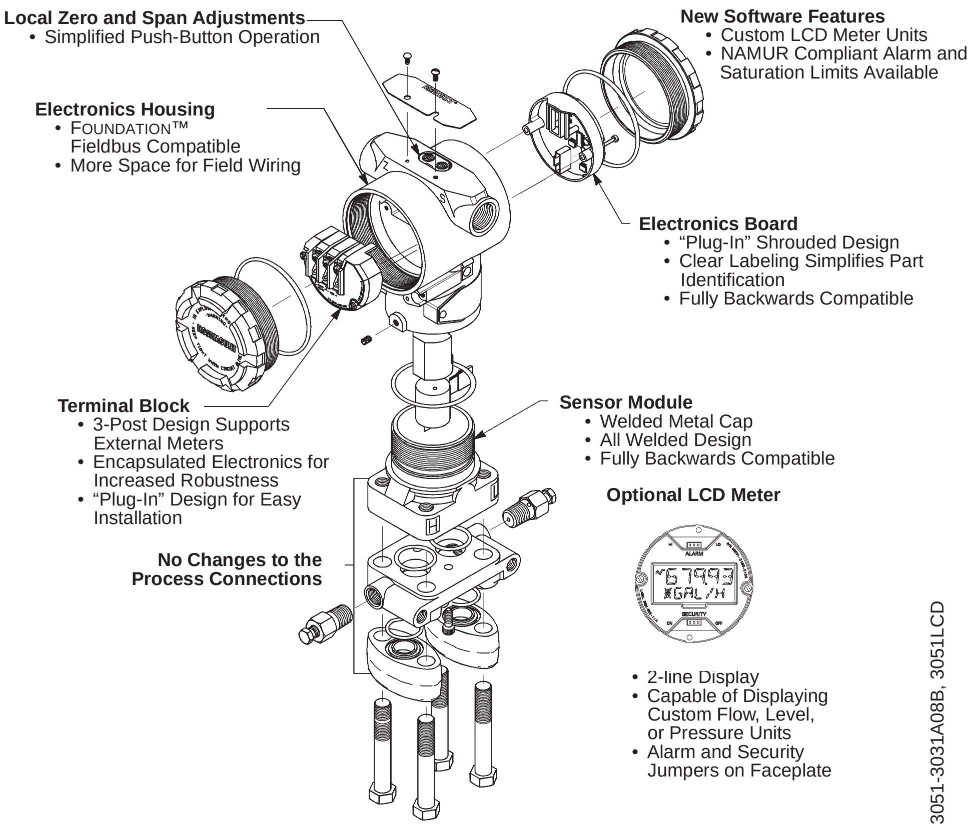
**Appendices**

contain menu trees and fast key sequences for the HART Communicator.

## NEW FEATURES

EN

The latest line of Omega Model PX751 pressure transmitters feature physical and software enhancements for additional functionality and increased ease of use.



SECTION 2

EN

# Commissioning

## OVERVIEW

This section summarizes Model PX751 Transmitter commissioning procedures.

## SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

### Warnings (⚠)

**⚠WARNING**

**Explosions can result in death or serious injury.**

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

**⚠WARNING**

**Electrical shock can result in death or serious injury.**

- Avoid contact with the leads and the terminals. High voltage that may be present on leads can cause electrical shock.

EN

## SETTING THE LOOP TO MANUAL

Whenever you are preparing to send or request data that would disrupt the loop or change the output of the transmitter, you will have to set your process application loop to manual. The HART Communicator Model HC275
will prompt you to set the loop to manual when necessary. Keep in mind that acknowledging this prompter does not set the loop to manual. It's only a reminder; you have to set the loop to manual yourself, as a separate operation.

## FAST KEY SEQUENCES

For your convenience, fast key sequences are listed for common transmitter functions. Complete tables of fast key sequences are located in Appendix A/
If you are unfamiliar with the communicator or how to follow fast key sequences, please refer to Appendix A for communicator operations.

The fast key boxes in this section contain codes for the HART Communicator Model HC275. From the Online menu (HART Communicator)
press these key sequences to access the desired transmitter function.

## CONFIGURE THE ANALOG OUTPUT PARAMETERS

**NOTE**
The position of the transmitter security jumper may prevent configuration changes. Refer to Section 5 for the proper placement of the transmitter security jumper.

### Set the Process Variable Units

| HART Comm. | 1, 3, 2 |
|---|---|
| | |

The Model PX751 allows any of the following output units: inH$^2$O, inHg, ftH$^2$O, mmH$^2$O, mmHg, psi, bar, mbar, g/cm$^2$, kg/cm$^2$, Pa, kPa, torr, and atm.

## Set the Output Type

EN

| HART Comm. | 1, 3, 5 |
|---|---|
| | |

You can set the transmitter output to either linear or square root. Activate the transmitter square root output mode to make the analog output proportional to flow. While in square root output mode, the Model PX751 switches to linear output at 0.8% of ranged pressure input, or 9% of full scale flow output to avoid the extremely high gain that results as the input approaches zero. The transition from linear to square root output is smooth, with no step change or discontinuity in output.

## Rerange

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.

**NOTE**
Regardless of the range points, the Model PX751 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 in$H_20$, and the transmitter detects a pressure of 25 in$H_20$, it digitally outputs the 25 in $H_20$ 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.

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.

EN

### Rerange with a Communicator Only

| HART Comm. | 4 -or- 5 |
|---|---|
| | |

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.

**NOTE**
Changing the lower or upper range point results in similar changes to the span.

**NOTE**
If the transmitter security jumper is in the "ON" position, you will not be able to make adjustments to the zero and span. Refer to Figure 3-12 on Page 3-11 for the appropriate placement of the transmitter security jumper.

### Rerange with a Pressure Input Source and a Communicator

| HART Comm. | 1, 2, 3, 1, 2 |
|---|---|
| | |

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.

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.

**NOTE**
If the transmitter security jumper is in the "ON" position, you will not be able to make adjustments to the zero and span. Refer to Figure 3-12 on Page 3-11 for the appropriate placement of the transmitter security jumper.

### Rerange with a Pressure Input Source and the Local Zero and Span Buttons

Reranging using the local zero and span adjustments (see Figure 2-1), and a pressure source is a way of reranging the transmitter when specific 4 and 20 mA points are not known and a communicator is not available.

---

**NOTE**

When you set the 4 mA point the span is maintained; when you set the 20 mA point the span changes. If you set the lower range point to a value that causes the upper range point to exceed the sensor limit, the upper range point is automatically set to the sensor limit, and the span is adjusted accordingly.

---

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

1. Loosen the screw holding the certifications label on top of the transmitter housing, and rotate the label to expose the zero and span buttons (see Figure 2-1 on page 2-5).
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 to the high side of the transmitter.
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 to the high side of the transmitter.
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.

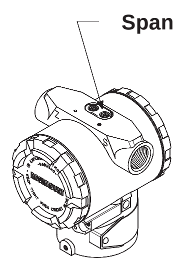
---

**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 3-12 on Page 3-11 for the proper placement of the transmitter security jumper. Or refer to "Local Span and Zero Control" on page 2-6 for instructions on how to enable the span and zero buttons.

---

FIGURE 2-1. Local Zero and Span Adjustments.



EN

### Local Span and Zero Control

| HART Comm. | 1, 4, 4, 1, 7 |
|---|---|
| | |

The *Local keys* command allows software control over the use of the local span and zero adjustments. To enable or disable the span and zero adjustment buttons on your transmitter, perform the fast key sequence above.

**NOTE**
Disabling the local keys only disables transmitter configuration changes using the zero and span buttons. With the local keys disabled, you can still make changes to the transmitter configuration using a Hart Communicator.

## Set the Damping

| HART Comm. | 1, 3, 6 |
|---|---|
| | |

The Model PX751 electronic damping feature 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.

## LCD Meter Options

| HART Comm. | 1, 4, 3, 4 |
|---|---|
| | |

The *Meter Options* command allows you to customize the LCD meter for use in your application. You can configure the meter to display the following information:

- Engineering Units
- Percent of Range
- User-Configurable LCD Scale(1)
- Alternating between any two of the above

The user-configurable scale (*2 CM Setup*) is a new feature that enables you to configure the LCD meter to a custom scale using a Model HC275 HART communicator. With this feature you can define the decimal point position, the upper range value, the lower range value, the engineering units, and the transfer function. For more detailed LCD meter information, contact an Omega product specialist.
.

*(1) The user-configurable LCD scale is a feature specific to the new 4–20 mA output transmitters. It is not available with Low Power transmitters.*

## DIAGNOSTICS AND SERVICE

EN

The diagnostics and service functions are primarily for use after you install the transmitter in the field. The *transmitter test* feature is designed to verify that the transmitter is operating properly, and can be performed either on the bench or in the field. The *loop test* feature is designed to verify proper loop wiring and transmitter output, and should only be performed after you install the transmitter.

### Transmitter Test

| HART Comm. | 1, 2, 1, 1 |
|---|---|
| | |

The transmitter test command initiates a more extensive diagnostics routine than that performed continuously by the transmitter. The transmitter test routine can quickly identify potential electronics problems. If the transmitter test detects a problem, messages to indicate the source of the problem are displayed on the communicator screen.

### Loop Test

| HART Comm. | 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. Connect a reference meter to the transmitter. To do so, either connect the meter to the test terminals on the transmitter terminal block, or shunt the power to the transmitter through the meter at some point in the loop.
2. From the HOME screen, Select *1 Device Setup*, *2 Diagnostics and Service*, *2 Loop Test*, to prepare to perform a loop test.
3. Select “OK” after you set the control loop to manual (see “Setting the Loop to Manual” on page 2-2).

   The communicator displays the loop test menu.

EN

4. 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.

   If you are performing a loop test to verify the output of a transmitter, enter a value between 4 and 20 mA. If you are performing a loop test to verify the transmitter alarm levels, enter the milliamp value at which the transmitter should enter an alarm state (see Table 3-1 on page 3-12).
5. Check the electrical current meter installed in the test loop to verify that it reads the value you commanded the transmitter to output. If the readings match, the transmitter and the loop are configured and functioning properly. If the readings do not match, there may be a fault in the wiring, the transmitter may require an output trim, or the electrical current meter may be malfunctioning.

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

## CALIBRATION

Calibrating a smart transmitter is different from calibrating an analog transmitter. The one-step calibration process of an analog transmitter is done in three steps with a smart transmitter:

- Rerange – sets the 4 and 20 mA points at the desired pressures;
- Sensor Trim – Adjusts the factory characterization curve to optimize the transmitter performance over a specified pressure range or to adjust for mounting effects;
- Analog Output Trim – Adjusts the analog output to match the plant standard or the control loop.

TABLE 2-1. Recommended Calibration Tasks.

EN

| Transmitter | Bench Calibration Tasks | Field Calibration Tasks |
|---|---|---|
| PX751CD<br>PX751CG<br><br>PX751HD<br>PX751HG | 1. Set output configuration parameters:<br>a) Set the range points.<br>b) Set the Output Units.<br>c) Set the Output Type.<br>d) Set the Damping Value.<br>2. *Optional:* Perform a Full Sensor Trim (Accurate pressure source required)<br>3. *Optional:* Perform an Analog Output Trim (Accurate multimeter required) | 1. Reconfigure parameters if necessary.<br>2. Zero Trim the transmitter to compensate for mounting position or static pressure effects. |
| PX751CA<br>PX751TA<br>PX751TG | 1. Set output configuration parameters:<br>a) Set the range points.<br>b) Set the Output Units.<br>c) Set the Output Type.<br>d) Set the Damping Value.<br>2. *Optional:* Perform a Full Sensor Trim if equipment is available (accurate absolute pressure source required), otherwise perform the Low Trim Value section of Full Sensor Trim procedure.<br>3. *Optional:* Perform an Analog Output Trim (Multimeter required) | 1. Reconfigure parameters if necessary.<br>2. Perform Low Trim Value section of Full Sensor Trim procedure to correct for mounting position effects. |

## Calibration Overview

EN

Complete calibration of the Model PX751 Pressure Transmitter involves the following tasks:

### Configure the Analog Output Parameters

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

### Calibrate the Sensor

- Full Trim (Page 2-14)
- Zero Trim (Page 2-13)

### Calibrate the 4–20 mA Output

- 4–20 mA Output Trim (Page 2-14) or
- 4–20 mA Output Trim Using Other Scale (Page 2-16) or

### 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, perform the following procedure:

1. Connect a pressure source, a HART communicator, and a digital readout device to the transmitter.
2. Establish communication between the transmitter and the communicator.
3. Apply pressure equal to the upper range point pressure (100 in $H_20$, 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 confident that 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 confident that your test equipment is accurate, perform an output trim.

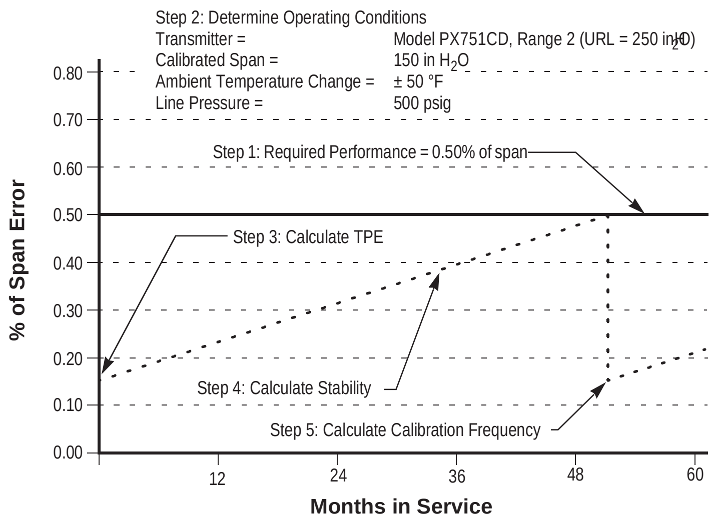
## Determining Calibration Frequency

Calibration frequency can vary greatly depending on the application, performance requirements, and process conditions. Use the following procedure to determine the calibration frequency that meets the needs of your application.

EN

1. Determine the performance required for your application.
2. Determine the operating conditions.
3. Calculate the Total Probable Error (TPE).
4. Calculate the stability per month.
5. Calculate the calibration frequency.

FIGURE 2-2. Calculating Calibration Frequency.



EN

## SAMPLE CALCULATION

### Step 1: Determine the Performance Required for your Application

| | |
|---|---|
| Required Performance: | 0.50% of span |

### Step 2: Determine the Operating Conditions

| | |
|---|---|
| Transmitter: | Model PX751CD, Range 2 (URL = 250 in$H_2O$) |
| Calibrated Span: | 150 in$H_2O$ |
| Ambient Temperature Change: | ± 50 °F |
| Line Pressure: | 500 psig |

### Step 3: Calculate the Total Probable Error (TPE)

$$TPE = \sqrt{(\text{Reference Accuracy})^2 + (\text{Temperature Effect})^2 + (\text{Static Pressure Effect})^2} = \mathbf{0.150\%\ of\ span}$$

Where:

Reference Accuracy = ± 0.075% of span

Ambient Temperature Effect = $\pm\left[\frac{0.0125 \times URL}{Span} + 0.06125\right]$ per 50 °F = ±0.0833% of span

Span Static Pressure Effect = 0.2% of reading per 1000 psi = ±0.1% of span at maximum span

*(NOTE: There is no zero static pressure effect. The zero static pressure effect can be calibrated out at line pressure.)*

### Step 4: Calculate the Stability per Month

Stability = $\pm\left[\frac{(0.25\% \times URL)}{span}\right]$ % of span for 5 years = 0.417% of span for 5 years

= **± 0.007% of span per month**

### Step 5: Calculate Calibration Frequency

Calibration Frequency = $\frac{(\text{Required Perfromance} - \text{TPE})}{\text{Stability per Month}} = \frac{(0.5\% - 0.150\%)}{0.007\%}$ = **50 months**

## Sensor Trim

EN

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 trim functions alter the transmitter's interpretation of the input signal.

---

**NOTE**

Trimming the sensor adjusts the position of the factory characterization curve. It is possible to degrade the performance of the transmitter if the sensor trim is done improperly or with equipment that does not meet the accuracy requirements.

---

### Zero Trim

| HART Comm. | 1, 2, 3, 3, 1 |
|---|---|
| | |

To calibrate the sensor with a HART Communicator 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.

EN

### Full Trim

| HART Comm. | 1, 2, 3, 3 |
| --- | --- |
| | |

To calibrate the sensor with a HART communicator using the full trim function, perform the following procedure.

1. Assemble and power the entire calibration system including a transmitter, HART 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.

---

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.

## Analog Output Trim

The Analog Output Trim commands allow you to adjust the transmitter's current output at the 4 and 20 mA points to match the plant standards. This command adjusts the digital to analog signal conversion.

## Digital to Analog Trim

| HART Comm. | 1, 2, 3, 2, 1 |
|---|---|
| | |

EN

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

1. From the HOME screen, select *1 Device setup*, *2 Diag/Service*, *3 Calibration*, *4 D/A trim*. Select "OK" after you set the control loop to manual (see "Setting the Loop to Manual" on page 2-2).
2. Connect an accurate reference ammeter to the transmitter at the "Connect reference meter" prompt. To do so, connect the positive lead to the positive terminal and the negative lead to the test terminal in the transmitter terminal compartment, or shunt the transmitter power through the reference meter at some point.
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.
8. Select "OK" after you return the control loop to automatic control.

EN

### Digital to Analog Trim Using Other Scale

| 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.

---

## Compensating Model PX751 Range 4 and 5 Differential Pressure Transmitters for Line Pressure

Model PX751 Range 4 and Range 5 pressure transmitters require a special calibration procedure when used in differential pressure applications. The purpose of this procedure is to optimize transmitter performance by reducing the effect of static line pressure in these applications. Model PX751 differential pressure transmitters (Ranges 1, 2, and 3) do not require this procedure because the optimization occurs in the sensor.

Applying high static pressure to Model PX751 Range 4 and Range 5 pressure transmitters causes a systematic shift in the output. This shift is linear with static pressure; correct it by performing the Full Trim procedure on page 2-14.

The following specifications show the static pressure effect for Model PX751 Range 4 and Range 5 transmitters used in differential pressure applications:

**Zero Effect:** ±0.1% of the upper range limit per 1,000 psi (6.9 MPa) for line pressures from 0 to 2,000 psi (0 to 13.8 MPa).
±0.2% of the upper range limit per 1,000 psi (6.9 MPa) for line pressures above 2,000 psi (13.8 MPa).

**Span Effect:** Correctable to ±0.2% of reading per 1,000 psi for line pressures from 0 to 3,626 psi.

The systematic span shift caused by the application of static line pressure is –1.00% of reading per 1,000 psi for PX751C Range 4 transmitters,
and –1.25% of reading per 1,000 psi for Range 5 transmitters.

Use the following example to compute corrected input values.

EN

### Example

A transmitter with model number PX751CD-4 will be used in a differential pressure application where the static line pressure is 1,200 psi. The transmitter is ranged so that the output is 4 mA at 500 in$H_2O$ and 20 mA at 1,500 in$H_2O$.

To correct for systematic error caused by high static line pressure, first use the following formulas to determine corrected values for the low trim and high trim.

**LT = LRV + S (LRV) P**

*Where:* LT = Corrected Low Trim Value

LRV = Lower Range Value

S = –(Span shift per specification)

P = Static Line Pressure

**HT = URV + S (URV) P**

*Where:* HT = Corrected High Trim Value

URV = Upper Range Value

S = –(Span shift per specification)

P = Static Line Pressure

*In this example:*

URV = 1,500 in$H_2O$

LRV = 500 in$H_2O$

P = 1,200 psi

S = +0.01/1000

*To calculate the low trim (LT) value:*

LT = 500 + (0.01/1000)(500)(1200)
LT = 506 in$H_2O$

*To calculate the high trim (HT) value:*

HT= 1500 + (0.01/1000)(1500)(1200)

HT= 1,518 in$H_2O$

To complete a Model PX751 full trim and enter the corrected values for low trim (LT) and high trim (HT) (see “Full Trim” on page 2-14).

Enter the corrected input values for low trim and high trim through the communicator keypad after you apply the nominal value of pressure as the transmitter input.

---

**NOTE**

After calibrating Model PX751 Range 4 and Range 5 transmitters for high differential pressure applications, rerange the 4 and 20 mA points using the communicator to maintain the systematic static line pressure correction. You may re-zero the 4 mA point after installation using the local zero button without affecting the completed calibration.

---

EN

SECTION 3

# Installation

EN

## OVERVIEW

This section contains safety messages, an installation flowchart (see Figure 3-1 on Page 3-2), and basic mechanical and electrical considerations to guide you through a successful Model PX751 installation. For more detailed information, contact Omega.

## SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

### Warnings (⚠)

**⚠WARNING**

**Explosions can result in death or serious injury.**

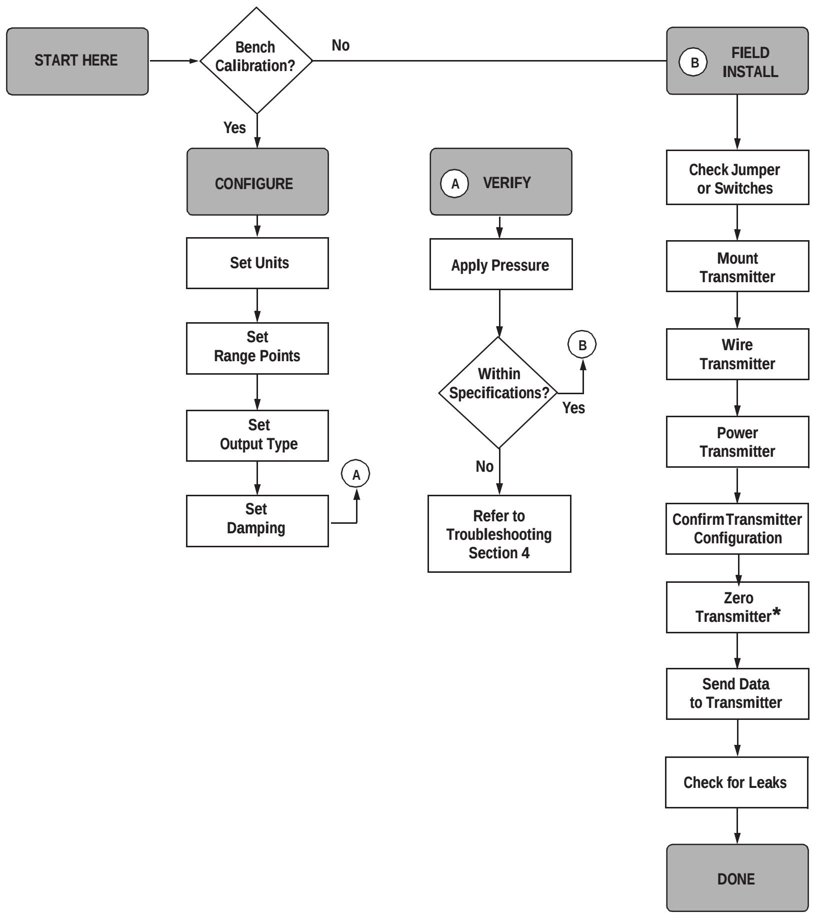
- Do not remove the transmitter covers in explosive environments when the circuit is alive.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.
- Before connecting a communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance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

**⚠WARNING**

**Electrical shock can result in death or serious injury.**

- Avoid contact with the leads and the terminals. High voltage that may be present on leads can cause electrical shock.

EN FIGURE 3-1. Installation Flowchart.




*** Not applicable with the Model PX751CA and Model PX751TA Pressure Transmitters.**

## MECHANICAL CONSIDERATIONS

EN

### Mounting Brackets

The Model PX751C Transmitter weighs 5.5 pounds (2.5 kg) without additional options. Optional mounting brackets allow you to mount the transmitter to a panel, a wall, or a 2-inch pipe. The B4 bracket option is for use with the Coplanar flange, and the Model PX751T (see Figure 3-2).
Bracket option B6 is for use with the Model PX751H(see Figure 3-5 on Page 3-5).

FIGURE 3-2. Mounting Configurations Using the Optional B4 Mounting Bracket.

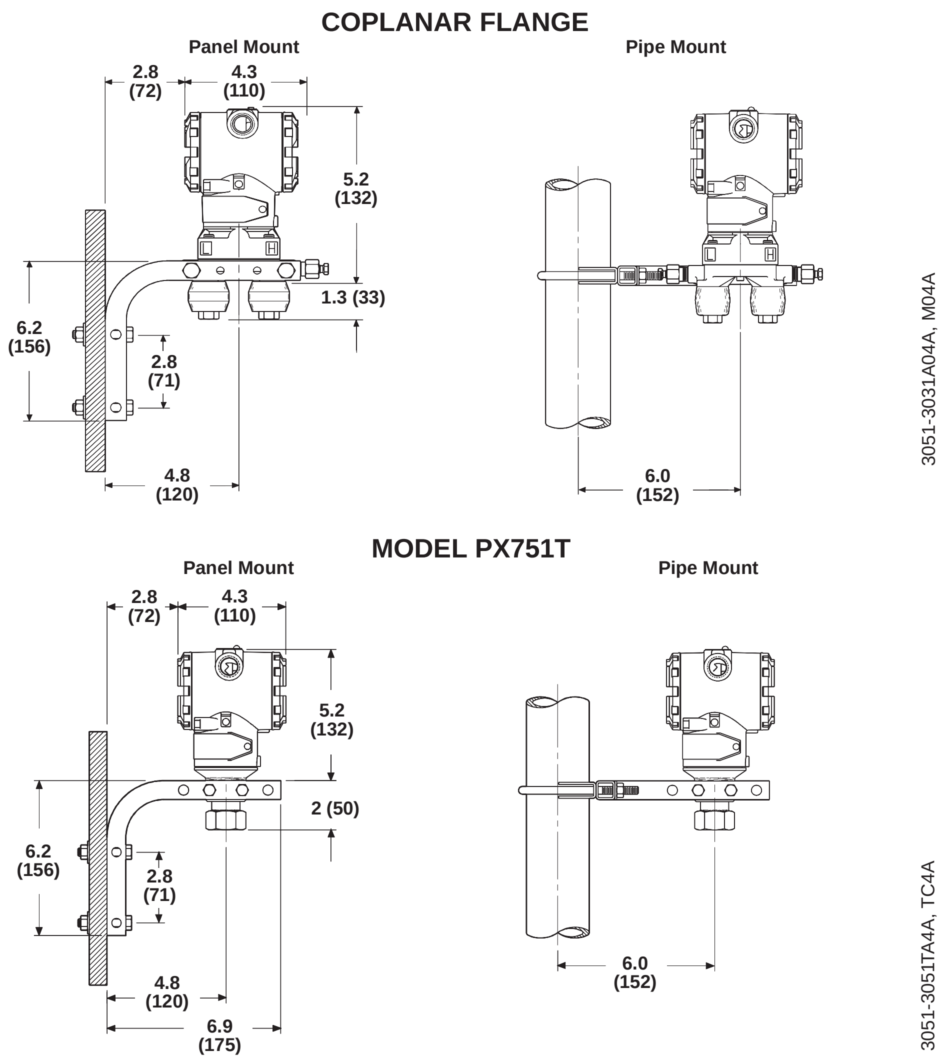
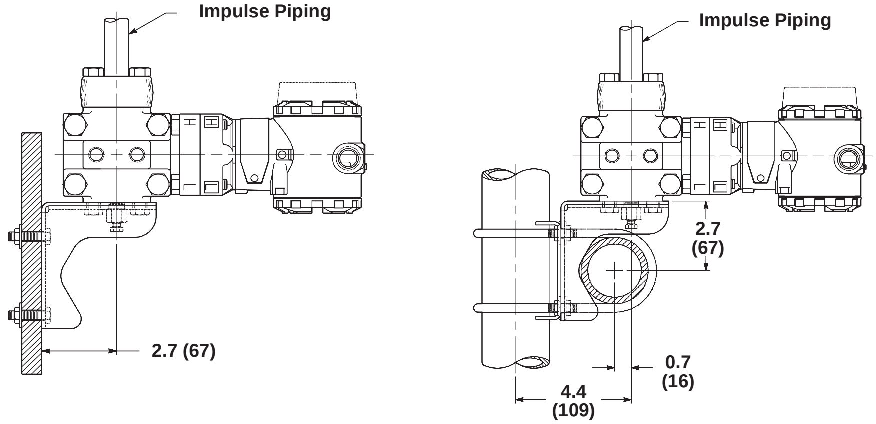


FIGURE 3-5. Mounting Configurations Using the Optional B6 Mounting Bracket.

EN




## Housing Rotation

You can rotate the electronics housing up to 180 degrees (left or right) to improve field access to the two compartments or to better view the optional LCD meter. To rotate the housing, release the housing rotation set screw and turn the housing not more than 180 degrees from the orientation shown in Figure 3-6. **Do not rotate the housing more than 180 degrees in either direction. Over-rotation will sever the electrical connection between the sensor module and the electronics module, and will void the warranty**.

FIGURE 3-6. Model PX751 Standard Housing Orientation.

3051-036AB

## Mounting Requirements

EN

Refer to Figure 3-7 for examples of the following mounting configurations:

### Liquid Flow Measurement

- place taps to the side of the line to prevent sediment deposits on the transmitter's process isolators,
- mount the transmitter beside or below the taps so gases can vent into the process line,
- mount drain/vent valve upward to allow gases to vent.

### Gas Flow Measurement

- place taps in the top or side of the line,
- mount the transmitter beside or above the taps so liquid will drain into the process line.

### Steam Flow Measurement

- place taps to the side of the line,
- mount the transmitter below the taps to ensure that the impulse piping will stay filled with condensate,
- fill impulse lines with water to prevent the steam from contacting the transmitter directly and to ensure accurate measurement start-up.

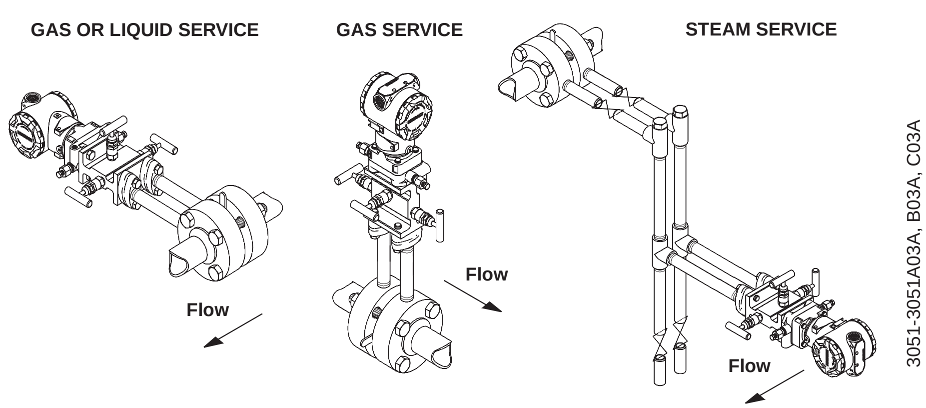
---

**NOTE**

In steam or other elevated temperature services, it is important that temperatures at the coplanar process flanges not exceed 250 °F (121 °C) for transmitters with silicone fill or 185 °F (85 °C) for inert fill. In vacuum service, these temperature limits are reduced to 220 °F (104 °C) for silicone fill and 160 °F (71 °C) for inert fill. Model PX751H, and the traditional flange allow higher temperatures.

---

FIGURE 3-7. Transmitter Installation Examples.



## ELECTRICAL CONSIDERATIONS



### Power Supply

#### 4–20 mA Transmitters

The dc power supply should provide power with less than 2 percent ripple. The total resistance load is the sum of the resistance and signal leads and the load resistance of the controller, indicator, and related pieces. Note that the resistance of intrinsic safety barriers, if used, must be included. Refer to Figure 3-8 for power supply load limitations.

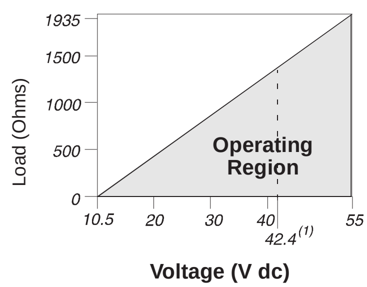
**NOTE**
If a single power supply is used to power more than one Model PX751 Transmitter, the power supply used and the circuitry common to the transmitters should not have more than 20 ohms of impedance at 1200 Hz.

**NOTE**
A resistance of at least 250 ohms must exist between the communicator and the power supply for communications.

FIGURE 3-8. Power Supply Requirements.

**Max. Loop Resistance = 43.5 × (Power Supply Voltage – 10.5)**

**Communication requires a minimum loop resistance of 250 ohms. Minimum terminal voltage for transmitter is 10.5 V with no load.**




*(1) For CSA approval, power supply must not exceed 42.4 V.*

#### Low Power Transmitters

Low power transmitters require a 6–12 V dc external power supply.

## Wiring

To make electrical connections, remove the housing cover on the side marked FIELD TERMINALS. Do not remove the instrument covers in explosive atmospheres when the circuit is alive. All power to the transmitter is supplied over the signal wiring. Connect the lead that originates at the positive side of the power supply to the terminal marked “+” and the lead that originates at the negative side of the power supply to the terminal marked “–” (see Figure 3-9). Avoid contact with the leads and the terminals. Do not connect the powered signal wiring to the test terminals. Power could damage the test diode in the test connection.

Plug and seal unused conduit connections on the transmitter housing to avoid moisture accumulation in the terminal side of the housing. If you do not seal the unused connections, mount the transmitter with the electrical housing positioned downward for drainage. Install wiring with a drip loop. Arrange the drip loop so the bottom is lower than the conduit connections and the transmitter housing.

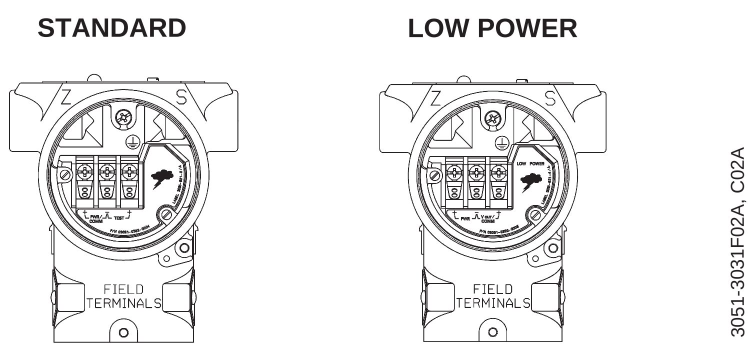
---

**NOTE**

Signal wiring need not be shielded, but use twisted pairs for best results. In order to ensure proper communication, use 24 AWG or larger wire, and do not exceed 5,000 feet (1500 meters).

---

FIGURE 3-9. Model PX751 Transmitter Terminal Block.



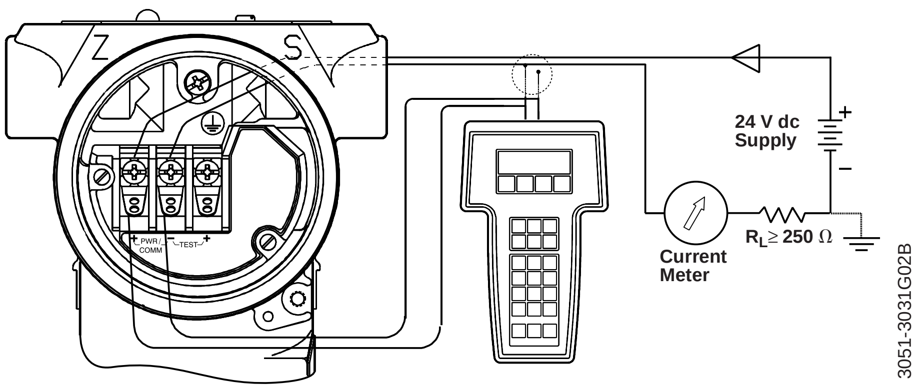
### Wiring Diagrams

The following diagrams show the wiring connections necessary to power a Model PX751 Transmitter and enable communications with a hand-held communicator. For 4–20 mA transmitters, refer to Figure 3-10. For Low Power transmitters, refer to Figure 3-11 on Page 3-10. Do not remove the transmitter covers in explosive environments when the circuit is alive.

EN

FIGURE 3-10. 4–20 mA Transmitter Wiring Diagrams.

WIRING ON THE BENCH




WIRING IN THE FIELD

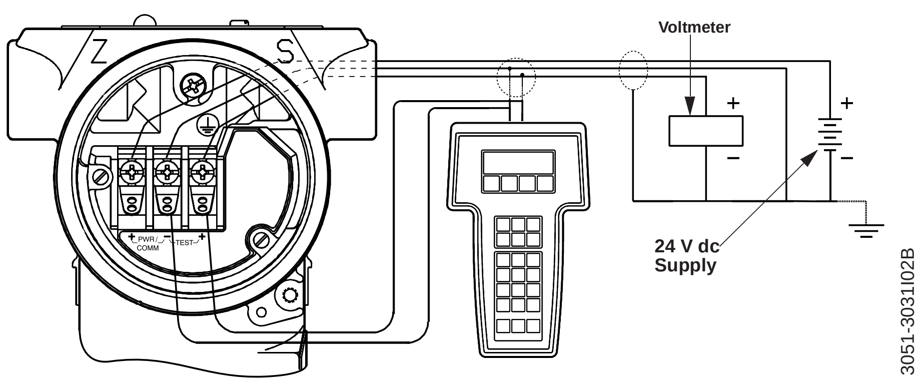
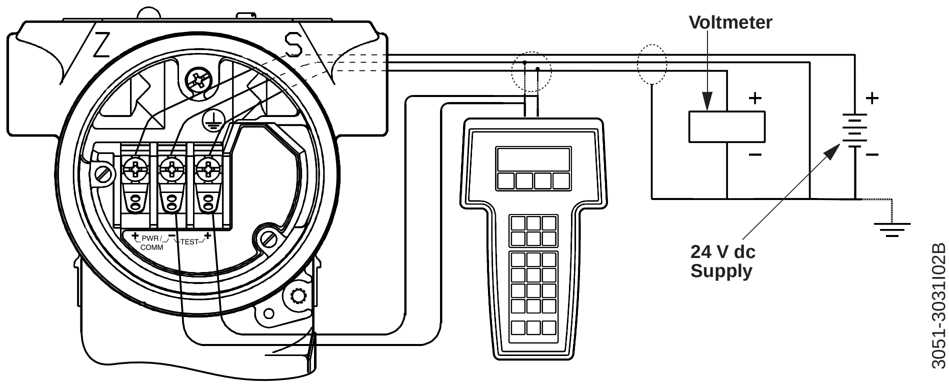


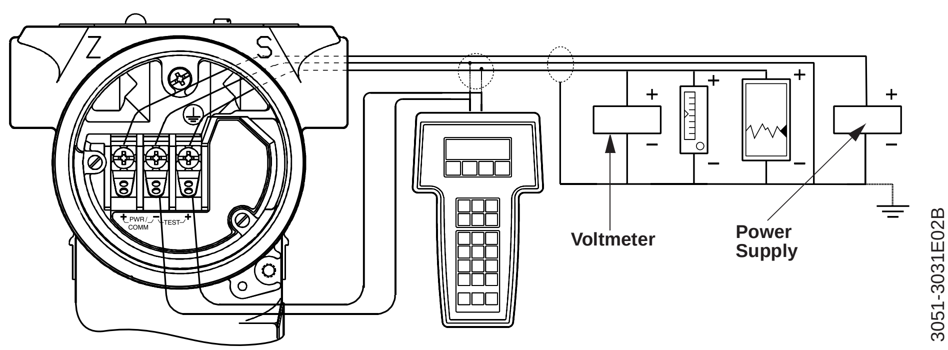
FIGURE 3-11. Low Power Transmitter Wiring Diagrams.

EN

## WIRING ON THE BENCH




## WIRING IN THE FIELD



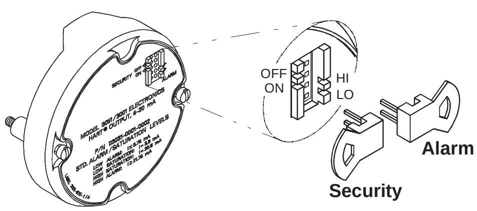
## FAILURE MODE ALARM

As part of normal operation, the Model PX751 continuously monitors its own operation. This automatic diagnostic routine is a timed series of checks repeated continuously. If the diagnostic routine detects a failure, the transmitter drives its output either below or above specific values depending on the position of the failure mode jumper.

- For 4–20 mA transmitters factory-configured for standard operation, the transmitter drives its output either below 3.75 mA or above 21.75 mA.
- For 4–20 mA transmitters factory-configured for NAMUR-compliant operation, the transmitter drives its output either below 3.6 mA or above 22.5 mA.
- For low-power transmitters configured for 1–5 Volts, the transmitter drives its output either below 0.95 V or above 5.4 V.
- For low-power transmitters configured for 0.8–3.2 Volts, the transmitter drives its output either below 0.75 V or above 4.2 V.

The failure mode alarm jumper is located on the front of the electronics board inside of the electronics housing cover. The position of this jumper determines whether the output is driven high or low when a failure is detected (see Figure 3-12). If the alarm jumper is not installed, the transmitter will operate normally and the default alarm condition will be high.

FIGURE 3-12. Transmitter Electronics Board.




3051-3051A, 3031A05C

EN

## Failure Mode Alarm vs. Saturation Output Values

The failure mode alarm output levels differ from the output values that occur when applied pressure is outside of the range points. When pressure is outside of the range points, the analog output continues to track the input pressure until reaching the saturation value listed below; the output does not exceed the listed saturation value regardless of the applied pressure. For example, with standard alarm and saturation levels and pressures outside of the 4–20 range points, the output saturates at 3.9 mA or 20.8 mA. When the transmitter diagnostics detect a failure, the analog output is set to a specific alarm value that differs from the saturation value to allow for proper troubleshooting.

TABLE 3-1. 4–20 mA Transmitter Alarm Values vs. Saturation Values.

| Level | STANDARD | | NAMUR COMPLIANT | |
|---|---|---|---|---|
| | Saturation | Alarm | Saturation | Alarm |
| Low | 3.9 mA | ≤ 3.75 mA | 3.8 mA | ≤ 3.6 mA |
| High | 20.8 mA | ≥ 21.75 mA | 20.5 mA | ≥ 22.5 mA |

TABLE 3-2. Low Power Transmitter Alarm Values vs. Saturation Values.

| Level | 1 – 5 V | | 0.8 – 3.2 V | |
|---|---|---|---|---|
| | Saturation | Alarm | Saturation | Alarm |
| Low | 0.97 mA | ≤ 0.95 mA | 0.78 mA | ≤ 0.75 mA |
| High | 5.20 mA | ≥ 5.4 mA | 4.04 mA | ≥ 4.2 mA |

SECTION 4

# Troubleshooting

EN

## OVERVIEW

Table 4-1 provides summarized troubleshooting suggestions for the most common operating problems.

**⚠WARNING**

Failure to follow safe operating practices can cause death or serious injury. Please review the following safety messages before troubleshooting the Model PX751 Pressure Transmitter.

- Using improper procedures or parts can affect product performance and the output signal used to control a process. To ensure safe transmitter performance, use only new parts and follow Omega documented procedures. Questions regarding these procedures or parts should be directed to Omega's customer service dept.
- Isolate a failed transmitter from its pressure source as soon as possible. Pressure that may be present could cause death or serious injury to personnel if the transmitter is disassembled or ruptures under pressure.
- 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.
- To avoid process leaks, use only the O-ring designed to seal with the corresponding flange adapter. Omega supplies two unique styles of O-rings for Omega flange adapters: one for Model PX751 flange adapters and another for Model PX750 flange adapters. Each flange adapter is distinguished by its unique groove. Refer to the Spare Parts List PPL 4001 for the numbers of the flange adapters and O-rings designed for the Model PX751 Pressure Transmitter.

TABLE 4-1. Model PX751 Troubleshooting Chart.

| Symptom | Corrective Actions |
| --- | --- |
| Milliamp Reading is Zero | • Check if Power Polarity is Reversed<br>• Verify Voltage Across Terminals (should be 10 to 55 V dc)<br>• Check for Bad Diode in Terminal Block<br>• Replace Transmitter Terminal Block |
| Transmitter is not Communicating with Communicator | • Check Power Supply Voltage at Transmitter (Minimum 10.5 V)<br>• Check Load Resistance (250 Ω minimum)<br>• Check if Unit is Addressed Properly<br>• Replace Electronics Board |
| Milliamp Reading is Low or High | • Check Pressure Variable Reading for Saturation<br>• Check if Output is in Alarm Condition<br>• Perform 4–20 mA Output Trim<br>• Replace Electronics Board |
| No Response to Changes in Applied Pressure | • Check Test Equipment<br>• Check Impulse Piping for Blockage<br>• Check for Disabled Span Adjustment<br>• Check Transmitter Security Jumper<br>• Verify Calibration Settings (4 and 20 mA Points)<br>• Replace Sensor Module |
| Pressure Variable Reading is Low or Hig | • Check Impulse Piping for Blockage<br>• Check Test Equipment<br>• Perform Full Sensor Trim<br>• Replace Sensor Module |
| Pressure Variable Reading is Erratic | • Check Impulse Piping for Blockage<br>• Check Damping<br>• Check for EMF Interference<br>• Replace Sensor Module |

SECTION
5

# Reference Data

EN

## OVERVIEW

This section contains the following reference data for the Model PX751 family of pressure transmitters:

- Transmitter Range and Sensor Limits
- Bolt Installation
- Ordering Information

## TRANSMITTER RANGE AND SENSOR LIMITS

TABLE 5-1. Model PX751CD, PX751CG, PX751P, and PX751H Range and Sensor Limits.

| Range | Minimum Span | | Range and Sensor Limits | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Lower (LRL) | | | | | |
| | Model PX751 CD CG, L, H | Model PX751P | Upper (URL) | PX751C/P Differential | PX751C/P Gage | | | PX751H Differential | PX751H Gage |
| 1 | 0.5 in$H_2O$ (0.12 kPa) | NA | 25 in$H_2O$ (6.22 kPa) | –25 in$H_2O$ (1) (–6.22 kPa) | NA | | | NA | NA |
| 2 | 2.5 in$H_2O$ (0.62 kPa) | 25 in$H_2O$ (6.22 kPa) | 250 in$H_2O$ (62.2 kPa) | –250 in$H_2O$ (–62.2 kPa) | –250 in$H_2O$ (–62.2 kPa) | | | –250 in$H_2O$ (–62.2 kPa) | –250 in$H_2O$ (–62.2 kPa) |
| 3 | 10 in$H_2O$ (2.48 kPa) | 100 in$H_2O$ (24.8 kPa) | 1,000 in$H_2O$ (248 kPa) | –1,000 in$H_2O$ (–248 kPa) | 0.5 psia (3.5 kPa abs) | | | –1,000 in$H_2O$ (–248 kPa) | 0.5 psia (3.5 kPa abs) |
| 4 | 3 psi (20.7 kPa) | 30 psi (207 kPa) | 300 psi (2070 kPa) | –300 psi (1) (–2070 kPa) | 0.5 psia (3.5 kPa abs) | | | –300 psi (–2070 kPa) | 0.5 psia (3.5 kPa abs) |
| 5 | 20 psi (138 kPa) | 200 psi (1380 kPa) | 2,000 psi (13800 kPa) | – 2,000 psi (1) (–13800 kPa) | 0.5 psia (3.5 kPa abs) | | | – 2,000 psi (–13800 kPa) | 0.5 psia (3.5 kPa abs) |

*(1) This range not available for Model PX751P Reference Class Transmitters.*

TABLE 5-2. Model PX751CA Range and Sensor Limits.

| Range | Minimum Span | Range and Sensor Limits | |
|---|---|---|---|
| | | Upper (URL) | Lower (LRL) |
| 0 | 0.167 psia (8.6 mmHga) | 5 psia (260 mmHga) | 0 psia (0 mmHga) |
| 1 | 0.3 psia (2.07 kPa) | 30 psia (206.8 kPa) | 0 psia (0 kPa) |
| 2 | 1.5 psia (10.34 kPa) | 150 psia (1034.2 kPa) | 0 psia (0 kPa) |
| 3 | 8 psia (55.16 kPa) | 800 psia (5515.8 kPa) | 0 psia (0 kPa) |
| 4 | 40 psia (275.8 kPa) | 4,000 psia (27580 kPa) | 0 psia (0 kPa) |

TABLE 5-3. Model PX751T Gage and Absolute Range and Sensor Limits.[1]

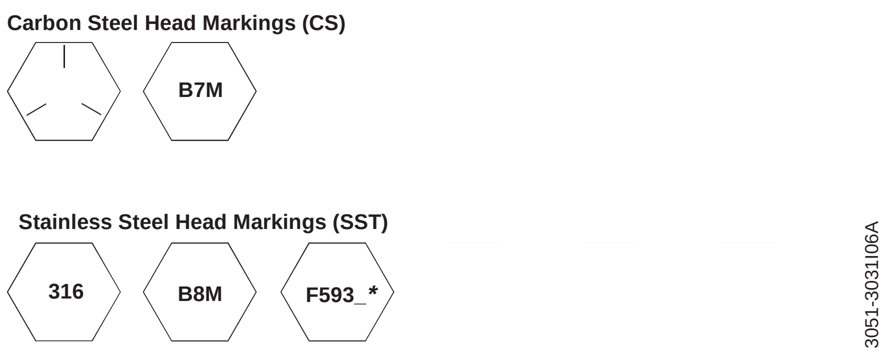
| Range | Minimum Span | Range and Sensor Limits Upper (URL) | Lower (LRL) |
|---|---|---|---|
| 1 | 0.3 psi (2 kPa) | 30 psi (207 kPa) | 0 psi (0 kPa) |
| 2 | 1.5 psi (10 kPa) | 150 psi 1034 kPa) | 0 psi (0 kPa) |
| 3 | 8 psi (55 kPa) | 800 psi (5516 kPa) | 0 psi (0 kPa) |
| 4 | 40 psi (276 kPa) | 4,000 psi (27579 kPa) | 0 psi (0 kPa) |
| 5 | 2,000 psi (13800 kPa) | 10,000 psi (68948 kPa) | 0 psia (0 kPa) |

*(1) For absolute limits, substitute psia for units.*

## BOLT IDENTIFICATION AND INSTALLATION

Bolts supplied by Omega can be identified by their head markings. Refer to Figure 5-1 to verify that you are using the proper types of bolts.

FIGURE 5-1. Omega Bolt Identification Markings.




* The last digit in the F593_ head marking may be any letter between A and M.

TABLE 5-4. Bolt Installation Torque Values.

| Bolt Material | Initial Torque Value | Final Torque Value |
|---|---|---|
| Carbon Steel (CS) | 300 in-lb (34 N-m) | 650 in-lb (73 N-m) |
| Stainless Steel (SST) | 150 in-lb (17 N-m) | 300 in-lb (34 N-m) |

APPENDIX

A

# HART® Communicator

EN

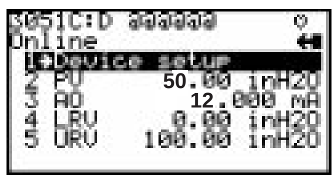
## OVERVIEW

The HART Communicator provides communication capabilities for Model PX751 Smart Pressure Transmitters. The HART Communicator menu tree provides a schematic overview of configuration functions, and the fast key sequences provide direct access to software functions.

### Online Menu

The Online menu appears automatically if the HART Communicator is connected to an active loop with an operating transmitter. From the Online menu, press the appropriate key sequence to access the desired function. Follow the on-screen instructions to complete the function.

FIGURE 1-1. HART Communicator Online Menu.




### HART Fast Key Feature

The fast key sequences for the HART Communicator use the following convention for their identification:

**1 through 9**–Refer to the keys located in the alphanumeric keypad located below the dedicated keypad.

---

**NOTE**

HART fast key sequences are operational only from the Online menu. To access the Online menu from any other menu, select the **HOME** (F3) key.

---

### HART Fast Key Example

Fast key sequences are made up of the series of numbers corresponding to the individual options in each step of the menu structure. For example, from the Online menu you can change the date. Following the menu structure, press 1 to reach **Device Setup**, press 3 for **Basic Setup**, press 4 for **Device Info**, press 1 for **Date**. The corresponding HART fast key sequence is 1, 3, 3, 1.

FIGURE 1-2. HART Communicator Menu Tree for Model PX751

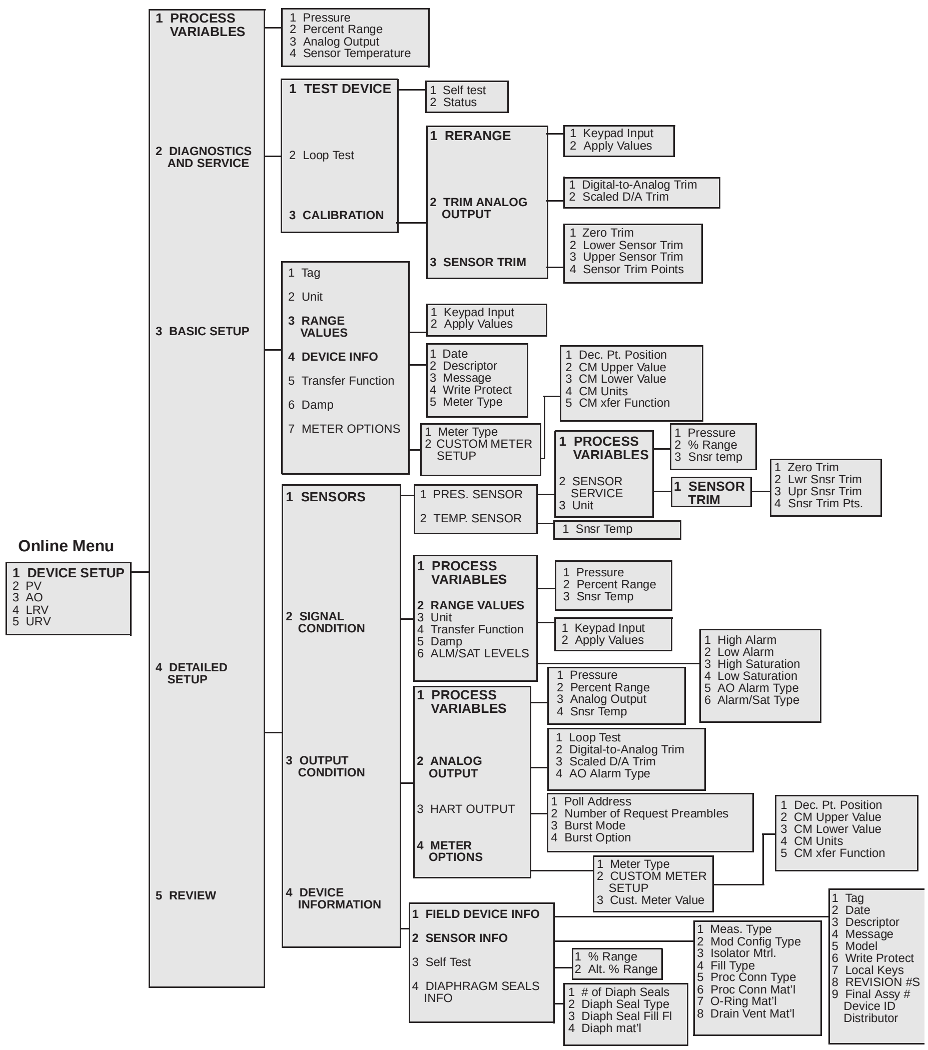



TABLE A-1. HART Communicator Fast Key Sequences for Model PX751 Transmitters.

| Function | HART Communicator Fast Keys |
|---|---|
| Alarm and Saturation Levels | 1, 4, 2, 7 |
| Analog Output | 3 |
| Analog Output Alarm Type | 1, 4, 3, 2, 4 |
| Burst Mode Control | 1, 4, 3, 3, 3 |
| Burst Operation | 1, 4, 3, 3, 3 |

| Function | HART Communicator Fast Keys |
|---|---|
| Calibration | 1, 2, 3 |
| Clone Data | |
| Custom Meter Configuration | 1, 3, 7, 2 |
| Custom Meter Value | 1, 4, 3, 4, 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 |
| Full Trim | 1, 2, 3, 3 |
| Keypad Input – Rerange | 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 Options | 1, 4, 3, 4 |
| Number Of Requested Preambles | 1, 4, 3, 3, 2 |
| Percent Range | 1, 1, 2 |
| Poll Address | 1, 4, 3, 3, 1 |
| Poll a Multidropped Transmitter | Left Arrow, 4, 1, 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 Temperature | 1, 1, 4 |
| Sensor Temperature Units | 1, 4, 1, 2, 2 |
| Sensor Trim Points | 1, 2, 3, 3, 5 |
| Status | 1, 2, 1, 2 |
| Tag | 1, 3, 1 |
| Transfer Function (Setting Output Type) | 1, 3, 5 |
| Transmitter Security (Write Protect) | 1, 3, 4, 4 |
| Trim Analog Output | 1, 2, 3, 2 |
| Units (Process Variable) | 1, 3, 2 |
| Upper Range Value | 5, 2 |
| 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.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY / DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

## RETURN REQUESTS / INQUIRIES

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.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible.
This affords our customers the latest in technology and engineering.

# Where Do I Find Everything I Need for Process Measurement and Control? OMEGA…Of Course!

## TEMPERATURE

- √ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- √ Wire: Thermocouple, RTD & Thermistor
- √ Calibrators & Ice Point References
- √ Recorders, Controllers & Process Monitors
- √ Infrared Pyrometers

## PRESSURE, STRAIN AND FORCE

- √ Transducers & Strain Gauges
- √ Load Cells & Pressure Gauges
- √ Displacement Transducers
- √ Instrumentation & Accessories

## FLOW/LEVEL

- √ Rotameters, Gas Mass Flowmeters & Flow Computers
- √ Air Velocity Indicators
- √ Turbine/Paddlewheel Systems
- √ Totalizers & Batch Controllers

## pH/CONDUCTIVITY

- √ pH Electrodes, Testers & Accessories
- √ Benchtop/Laboratory Meters
- √ Controllers, Calibrators, Simulators & Pumps
- √ Industrial pH & Conductivity Equipment

## DATA ACQUISITION

- √ Data Acquisition & Engineering Software
- √ Communications-Based Acquisition Systems
- √ Plug-in Cards for Apple, IBM & Compatibles
- √ Datalogging Systems
- √ Recorders, Printers & Plotters

## HEATERS

- √ 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

M-3266 / 0799