Rosemount™ 2088, 2090P, and 2090F Pressure Transmitters

with HART® and 1-5Vdc Low Power Protocol

CE HART COMMUNICATION PROTOCOL

EMERSON™

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Rosemount™ 2088, 2090P, and 2090F Pressure Transmitters

⚠ WARNING

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

For technical assistance, contacts are listed below:

Customer Central
Technical support, quoting, and order-related questions.

United States - 1-800-999-9307 (7:00 am to 7:00 pm CST)

Asia Pacific- 65 777 8211

Europe Middle East Africa - 49 (8153) 9390

North American Response Center
Equipment service needs.

1-800-654-7768 (24 hours—includes Canada)

Outside of these areas, contact your local Emerson™ representative.

⚠ CAUTION

The products described in this document are NOT designed for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Emerson Sales Representative.

⚠ WARNING

Explosions could result in death or serious injury.

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Review the approvals section of the Rosemount 2088, 2090F, 2090P reference manual for any restrictions associated with a safe installation.

- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- In an explosion-proof/flameproof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks may cause harm or result in death.

- Install and tighten process connectors before applying pressure.

Electrical shock can result in death or serious injury.

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

Section 1   Introduction

1.1   Using this manual

The sections in this manual provide information on installing, operating, and maintaining the Rosemount™ 2088, 2090F, and 2090P. The sections are organized as follows:

Section 2: Configuration provides instruction on commissioning and operating Rosemount 2088 Transmitters. Information on software functions, configuration parameters, and online variables is also included.

Section 3: Hardware installation contains mechanical installation instructions, and field upgrade options.

Section 4: Electrical installation contains electrical installation instructions, and field upgrade options.

Section 5: Operation and maintenance provides detailed information on calibrating and changing HART® Revisions.

Section 6: Troubleshooting provides troubleshooting techniques for the most common operating problems.

Appendix A: Reference data supplies reference and specification data, as well as ordering information.

Appendix B: Field Communicator menu trees and Fast Keys provides full menu trees and abbreviated Fast Key sequences for commissioning tasks.

Appendix C: Local Operator Interface provides detailed Local Operating Interface (LOI) menu trees.

1.2 Models covered

The following Rosemount Pressure Transmitters are covered by this manual:

1.2.1 Rosemount 2088G Gage Pressure Transmitter

- Measures gage pressure up to 4000 psi (275,8 bar)

1.2.2 Rosemount 2088A Absolute Pressure Transmitter

- Measures absolute pressure up to 4000 psi (275,8 bar)

1.2.3 Rosemount 2090F Hygienic Pressure Transmitter

Rosemount 2090FG - Gage Pressure Transmitter

- Measures gage pressure up to 300 psi (20,7 bar)

Rosemount 2090FA - Absolute Pressure Transmitter

- Measures absolute pressure up to 300 psi (20,7 bar)

1.2.4 Rosemount 2090P Pulp and Paper Pressure Transmitter

Rosemount 2090PG - Gage Pressure Transmitter

- Measures gage pressure up to 300 psi (20,7 bar)

Rosemount 2090PA - Absolute Pressure Transmitter

- Measures gage pressure up to 300 psi (20,7 bar)

1.3 Product recycling/disposal

Recycling of equipment and packaging should be taken into consideration and disposed of in accordance with local and national legislation/regulations.

Section 2   Configuration

2.1   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.

2.2   System readiness

- If using HART based control or asset management systems, confirm the HART capability of such systems prior to commissioning and installation. Not all systems are capable of communicating with HART revision 7 devices.

- For instructions on how to change the HART revision of your transmitter, see "Switching HART revision" on page 63.

2.2.1   Confirm correct device driver

Verify the latest Device Driver (DD/DTM™) is loaded on your systems to ensure proper communications.

1. Download the latest DD at Emerson.com or FieldCommGroup.org.

2. In the *Browse by Member* dropdown menu, select Rosemount business unit of Emerson™.

3. Select desired product.
   a. Within Table 2-1, use the HART Universal Revision and Device Revision numbers to find the correct DD

Table 2-1. Rosemount 2088 and 2090 with 4–20 mA HART Protocol Device Revisions and Files

Release date	Device identification			Device driver identification		Review instructions	Review functionality
	NAMUR hardware revision [1]	NAMUR software revision [1]	HART software revision [2]	HART universal revision	Device revision [3]	Manual document number	Change description
Aug-16	1.1.xx	1.0.xx	3	7	10	00809-0100-4108 (2088) 00809-0100-4690 (2090)	[4]
				5	9		[5]
Jan-13	N/A	1.0.xx	1	7	10		N/A
				5	9		
Jan-98	N/A	N/A	178	5	3		

1. NAMUR revision is located on the hardware tag of the device. Differences in level 3 changes, signified above by xx, represent minor product changes as defined per NE53. Compatibility and functionality are preserved and product can be used interchangeability.
2. HART software revision can be read using a HART capable configuration tool. Value shown is minimum revision that could correspond to NAMUR revisions.
3. Device driver file names use Device and DD revision, e.g. 10_01. HAR protocol is designed to enable legacy device driver revisions to continue to communicate with new HART devices. To access new functionality, the new DD must be downloaded. It is recommended to download new DD files to ensure full functionality.
4. Updated electronics hardware design. Intrinsic Safety temperature classification change.
5. HART revision 5 and 7 selectable, LOI, configurable alarms, expanded engineering units.

Table 2-2. Rosemount 2088 with 1–5 Vdc Low Power HART Protocol Device Revisions and Files

Release date	Device identification			Device driver identification		Review instructions	Review functionality
	NAMUR hardware revision [1]	NAMUR software revision [1]	HART software revision [2]	HART universal revision	Device revision [3]	Manual document number	Change description
Jan-13	N/A	1.0.2	3	7	10	00809-0100-4108 (2088) 00809-0100-4690 (2090)	[4]
				5	9		
Jan-98	N/A	N/A	178	5	3		N/A

1. NAMUR revision is located on the hardware tag of the device. Differences in level 3 changes, signified above by xx, represent minor product changes as defined per NE53. Compatibility and functionality are preserved and product can be used interchangeability.
2. HART software revision can be read using a HART capable configuration tool. Value shown is minimum revision that could correspond to NAMUR revisions.
3. Device driver file names use Device and DD revision, e.g. 10_01. HART protocol is designed to enable legacy device driver revisions to continue to communicate with new HART devices. To access new functionality, the new DD must be downloaded. It is recommended to download new DDfiles to ensure full functionality.
4. HART revision 5 and 7 selectable, LOI, configurable alarms, expanded engineering units.

2.3 HART installation flowchart

Figure 2-1. HART® Installation Flowchart

```
                    ┌──────────────┐
                    │  START HERE  │
                    └──────────────┘
                           │
                           ▼
                      ◇ Bench
                      Calibration? ◇ ──── No ──────────────────────►  ┌──────────────┐
                                                                       │ Field Install │
                           │                                           └──────────────┘
                          Yes                                                 │
                           │                                                  ▼
                    ┌──────────────┐          ┌──────────────┐         ┌──────────────────┐
                    │ Configure for│          │    Verify    │         │    Configure     │
                    │   Pressure   │          └──────────────┘         │  Security and    │
                    └──────────────┘                 │                 │     Alarm        │
                           │                          ▼                 │   (page 43)      │
                    ┌──────────────┐          ┌──────────────┐         └──────────────────┘
                    │  Set Units   │          │Review Transmitter│             │
                    │  (page 13)   │          │ Configuration │               ▼
                    └──────────────┘          │   (page 9)   │         ┌──────────────────┐
                           │                  └──────────────┘         │Mount Transmitter │
                    ┌──────────────┐                 │                 │   (page 31)      │
                    │Set Range Points│               ▼                 └──────────────────┘
                    │  (page 13)   │          ┌──────────────┐                 │
                    └──────────────┘          │Apply Pressure│                 ▼
                           │                  └──────────────┘         ┌──────────────────┐
                    ┌──────────────┐                 │                 │  Check Process   │
                    │Select Linear │                 ▼                 │   Connection     │
                    │   Output     │              ◇ Within             │   (page 46)      │
                    │  (page 13)   │            Specifications? ◇ ── Yes└──────────────────┘
                    └──────────────┘                 │                        │
                           │                         No                        ▼
                    ┌──────────────┐                 │                 ┌──────────────────┐
                    │ Set Damping  │                 ▼                 │ Wire Transmitter │
                    │  (page 16)   │          ┌──────────────┐         │   (page 47)      │
                    └──────────────┘          │  Refer to    │         └──────────────────┘
                                              │Section 5: Operation│           │
                                              │and maintenance│               ▼
                                              └──────────────┘         ┌──────────────────┐
                                                                       │Power Transmitter │
                                                                       │   (page 46)      │
                                                                       └──────────────────┘
                                                                              │
                                                                              ▼
                                                                       ┌──────────────────┐
                                                                       │Confirm Transmitter│
                                                                       │ Configuration    │
                                                                       │   (page 11)      │
                                                                       └──────────────────┘
                                                                              │
                                                                              ▼
                                                                       ┌──────────────────┐
                                                                       │   Trim the       │
                                                                       │  Transmitter     │
                                                                       │   (page 56)      │
                                                                       └──────────────────┘
                                                                              │
                                                                              ▼
                                                                       ┌──────────────┐
                                                                       │     Done     │
                                                                       └──────────────┘
```

2.4   Transmitter overview

The Rosemount™ 2088, 2090F, and 2090P are offered for Gage Pressure (GP) and Absolute Pressure (AP) measurements. The Rosemount 2088 utilizes piezoresistive sensor technology for AP and GP measurements.

The major components of the Rosemount 2088, 2090F, and 2090P are the sensor module and the electronics housing. The sensor module contains the oil filled sensor system (isolating diaphragm, oil fill system, and sensor) and the sensor electronics. The sensor electronics are installed within the sensor module and include a temperature sensor, a memory module, and the analog to digital signal converter (A/D converter). The electrical signals from the sensor module are transmitted to the output electronics in the electronics housing. The electronics housing contains the output electronics board, the optional external configuration buttons, and the terminal block. The basic block diagram of the transmitter is illustrated in Figure 2-3 on page 7.

When pressure is applied to the isolating diaphragm, the oil deflects the sensor which then changes its capacitance or voltage signal. This signal is then changed to a digital signal by the Signal Processing. The microprocessor then takes the signals from the Signal Processing and calculates the correct output of the transmitter. This signal is then sent to the D/A converter, which converts the signal back to the analog signal, then superimposes the HART signal on the 4–20 mA (1–5 Vdc) output.

An optional LCD display can be ordered that connects directly to the interface board which maintains direct access to the signal terminals. The display indicates output and abbreviated diagnostic messages. A glass display cover is provided. For 4-20 mA HART output, the LCD display features a two-line display. The first line displays the actual measured value, the second line of six characters displays the engineering units. The LCD display can also display diagnostic messages.

Note
LCD display utilizes a 5 × 6 character display and can display output and diagnostic messages. The LOI display uses an 8 × 6 character display and can display output, diagnostic messages, and LOI menu screens. The LOI display comes with two buttons mounted on the front of the display board. See Figure 2-2.

Figure 2-2. LCD/LOI display

LCD display   **LOI display**
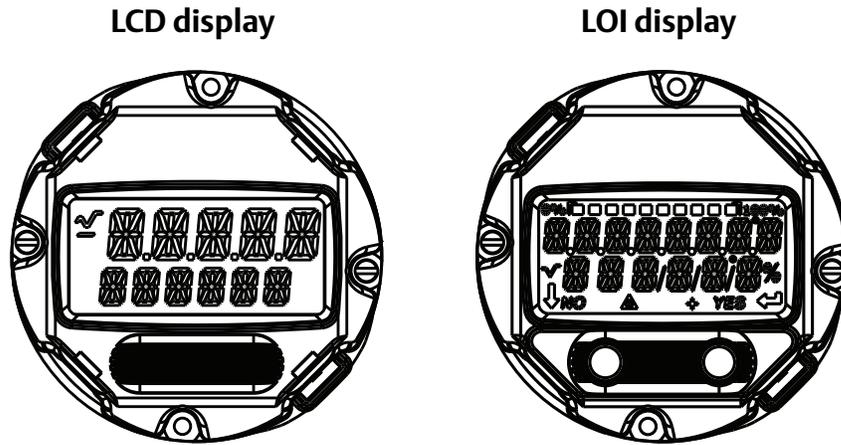
Figure 2-3. Block Diagram Of Operation

A   B   C

Signal Processing

Temp. Sensor

Sensor Module Memory

Pressure Sensor

Microprocessor
■ Sensor linearization
■ Rerange
■ Damping
■ Diagnostics
■ Engineering units
■ Communication

Memory
■ Configuration

Digital-to-Analog Signal Conversion

Digital Communication

D
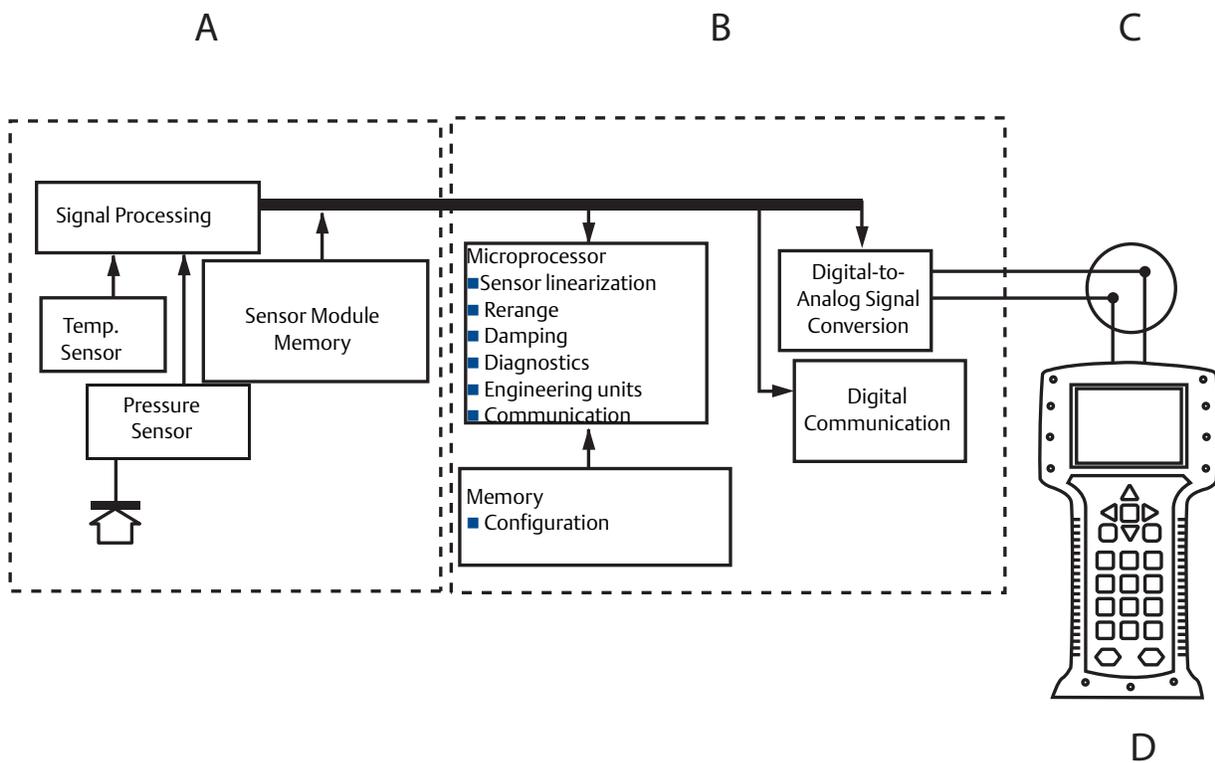
A. Sensor Module
B. Electronics Board
C. 4-20 mA Signal to Control System
D. Field Communicator

2.5   Configuration overview

This section contains information on commissioning and tasks that should be performed on the bench prior to installation, as well as tasks performed after installation as described in "Performing transmitter tests" on page 23.

Field Communicator, AMS Device Manager, and Local Operator Interface (LOI) instructions are given to perform configuration functions. For convenience, Field Communicator Fast Key sequences are labeled "Fast Keys," and abbreviated LOI menus are provided for each function below.

Full Field Communicator menu trees and Fast Key sequences are available in Appendix C: Field Communicator menu trees and Fast Keys. LOI menu trees are available in Appendix D: Local Operator Interface.

2.6   Configuration basics

> **⚠ CAUTION**

Set all transmitter hardware adjustments during commissioning to avoid exposing the transmitter electronics to the plant environment after installation.

The Rosemount 2088, 2090F, and 2090P can be configured either before or after installation. Configuring the transmitter on the bench using either a Field Communicator, AMS Device Manager, or LOI ensures all transmitter components are in working order prior to installation. Verify that the security switch is set in the unlock position (🔓) in order to proceed with configuration. See Figure 4-2 on page 43 for switch location.

Note
LOI is available with the Rosemount 2088 (option M4) but is not available with the Rosemount 2090F or 2090P.

2.6.1   Configuring on the bench

To configure on the bench, required equipment includes a power supply, and a Field Communicator, AMS Device Manager, or an LOI (option M4). Wire equipment as shown in Figure 2-4 below. To ensure successful HART communication, a resistance of at least 250 Ωs must be present between the transmitter and the power supply, see "Power supply" on page 46 for details. Connect the Field Communicator leads to the terminals labeled "COMM" on the terminal block or 1–5 V configuration, wire as shown in Figure 2-4 on page 9. The Field Communicator is connected to the terminals labeled VOUT/COMM.

Figure 2-4. Wiring the Transmitter (4–20 mA HART)
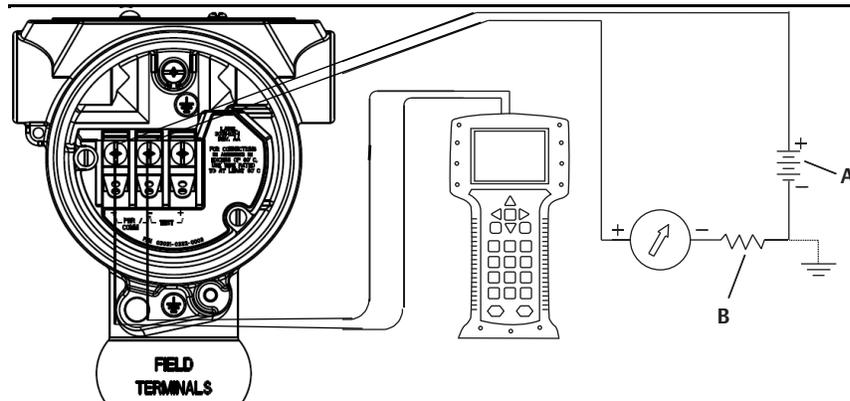
A. Vdc supply
B. R $_L$ ≥ 250 (necessary for HART communication only)

2.6.2   Configuration tools

Figure 2-5. Wiring the Transmitter (1–5 Vdc Low Power)
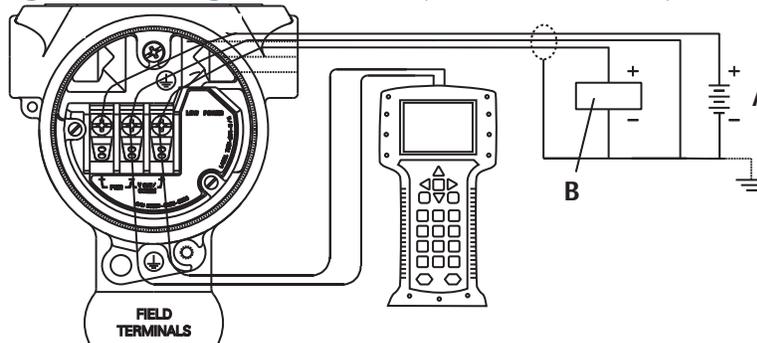
A. DC power supply
B. Voltmeter

Configuring with a Field Communicator

There are two interfaces available with the Field Communicator: Traditional and Dashboard interfaces. All steps using a Field Communicator will be described using Dashboard interfaces. HART shows the Device Dashboard interface. As stated in System readiness , it is critical that the latest DD's are loaded into the Field Communicator. Visit Emerson.com or FieldCommGroup.org to download latest DD library.

Field Communicator menu trees and Fast Keys are available in Appendix C: Field Communicator menu trees and Fast Keys.

Figure 2-6. Device Dashboard
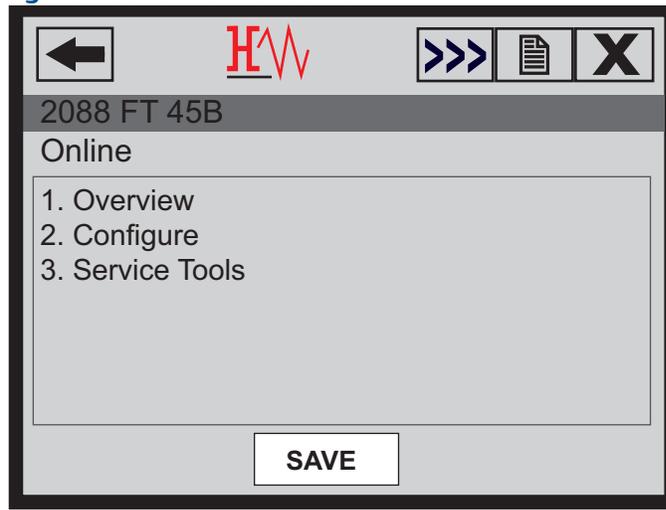
Configuring with AMS Device Manager

Full configuration capability with AMS Device Manager requires loading the most current Device Descriptor (DD) for this device. Download the latest DD at Emerson.com or FieldCommGroup.org.

Note
All steps using AMS Device Manager will be described using version 11.5.

Configuring with a local operator interface

The LOI requires option code M4 to be ordered. To activate the LOI push either configuration button. Configuration buttons are located on the LCD display (must remove housing cover to access), or underneath the top tag of the transmitter. See Table 2-3 for configuration button functionality and Figure 2-7 for configuration button location. When using the LOI for configuration, several features require multiple screens for a successful configuration. Data entered will be saved on a screen-by-screen basis; the LOI will indicate this by flashing "SAVED" on the LCD display each time.

LOI menu trees are available in Appendix D: Local Operator Interface.

Figure 2-7. LOI Configuration Buttons
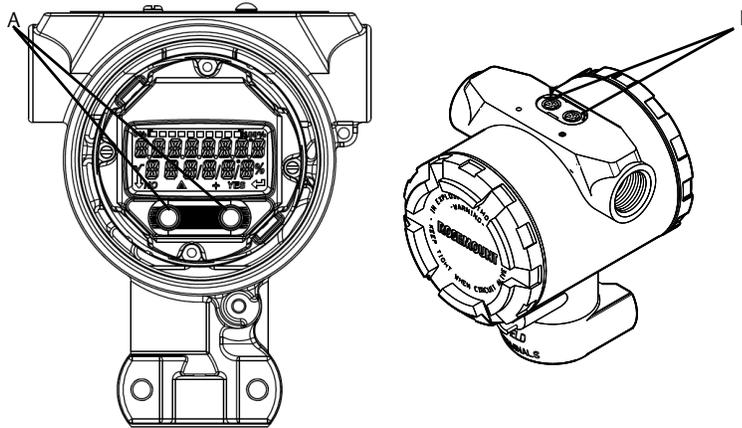
A. Internal configuration buttons
B. External configuration buttons

Table 2-3. LOI Button Operation

Button	EXIT MENU? NO YES	EXIT MENU ↓ ↵
Left	No	SCROLL
Right	Yes	ENTER

2.6.3   Setting the loop to manual

⚠ Whenever sending or requesting data that would disrupt the loop or change the output of the transmitter, set the process application loop to manual control. The Field Communicator, AMS Device Manager, or the LOI will prompt you to set the loop to manual when necessary. The prompt is only a reminder; acknowledging this prompt does not set the loop to manual. It is necessary to set the loop to manual control as a separate operation.

2.7   Verify configuration

It is recommended that various configuration parameters are verified prior to installation into the process. The various parameters are detailed out for each configuration tool. Depending on what configuration tool(s) are available follow the steps listed relevant to each tool.

2.7.1   Verifying configuration with Field Communicator

Configuration parameters listed in Table 2-4 are to be reviewed prior to transmitter installation. A Full list of configuration parameters that can be reviewed and configured using a Field Communicator are located in Appendix C: Field Communicator menu trees and Fast Keys.

Fast key sequences for the latest DD are shown in Table 2-4. For Fast Key sequences for legacy DD's contact your local Emerson Representative.

Table 2-4. Rosemount 2088 and 2090F/P device dashboard Fast Key sequence

From the *HOME* screen, enter the Fast Key sequences listed

Function	Fast Key sequence	
	HART 7	**HART 5**
Alarm and Saturation Levels	2, 2, 2, 5	2, 2, 2, 5
Damping	2, 2, 1, 1, 5	2, 2, 1, 1, 5
Primary Variable	2, 1, 1, 4, 1	2, 1, 1, 4, 1
Range Values	2, 1, 1, 4	2, 1, 1, 4
Tag	2, 2, 7, 1, 1	2, 2, 7, 1, 1
Transfer Function	2, 2, 1, 1, 6	2, 2, 1, 1, 6
Units	2, 2, 1, 1, 4	2, 2, 1, 1, 4

2.7.2 Verifying configuration with AMS Device Manager

Right select on the device and select **Configuration Properties** from the menu. Navigate the tabs to review the transmitter configuration data.

2.7.3 Verifying configuration with local operator interface

Press any configuration button to activate the LOI. Select **VIEW CONFIG** to review the below parameters. Use the configuration buttons to navigate through the menu. The parameters to be reviewed prior to installation include:

- Tag
- Units
- Transfer Function
- Alarm and Saturation Levels

- Primary Variable
- Range Values
- Damping

2.7.4 Verifying process variables configuration

This section describes how to verify that the correct process variables are selected.

Verifying process variables with a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

Device Dashboard Fast Keys	3, 2, 1

Verifying process variables with AMS Device Manager

1. Right select the device and select **Overview** from the menu.

2. Select the **All Variables** button to display the primary, secondary, tertiary and quaternary variables.

2.8 Basic setup of the transmitter

This section goes through the necessary steps for basic setup of a pressure transmitter.

2.8.1   Setting pressure units

⚠ The pressure unit command sets the unit of measure for the reported pressure.

Setting pressure units with a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

Device Dashboard Fast Keys	2, 2, 1, 1, 4

Setting pressure units with AMS Device Manager

1. Right select the device and select **Configure**.

2. Select **Manual Setup** and select desired units from *Pressure Units* dropdown menu.

3. Select **Send** when complete.

Setting pressure units with a local operator interface

Follow Figure 2-8 on page 13 to select desired pressure and temperature units. Use the **SCROLL** and **ENTER** buttons to select desired unit. Save by selecting **SAVE** as indicated on the LCD display screen.

Figure 2-8. Selecting Units with LOI
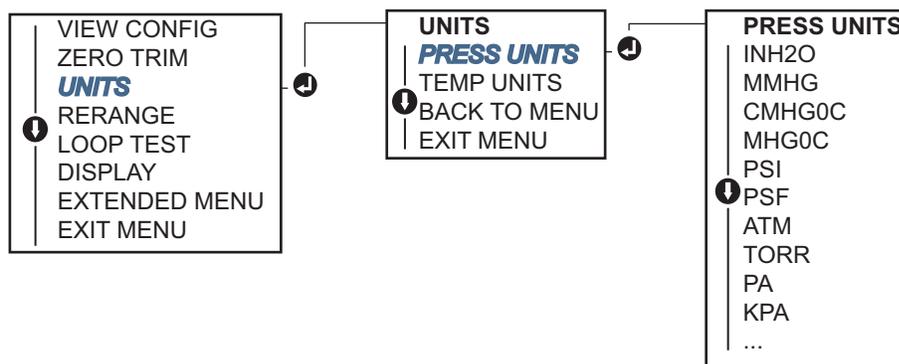
2.8.2   Rerange the transmitter

⚠ The range values command sets each of the lower and upper range analog values (4 and 20 mA/1–5 Vdc points) to a pressure. The lower range point represents 0% of range and the upper range point represents 100% of range. In practice, the transmitter range values may be changed as often as necessary to reflect changing process requirements. For a complete listing of Range & Sensor limits, refer to "Functional specifications" on page 74.

Select from one of the methods below to rerange the transmitter. Each method is unique; examine all options closely before deciding which method works best for your process.

■ Rerange by manually setting range points with a Field Communicator, AMS Device Manager, or LOI.

■ Rerange with a pressure input source and a Field Communicator, AMS Device Manager, LOI, or local zero and span buttons.

Manually rerange the transmitter by entering range points

Entering range points with a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

Device Dashboard Fast Keys	2, 2, 2, 1

### Entering range points with AMS Device Manager

1. Right select the device and select **Configure**.

2. Select **Manual Setup** and select **Analog Output**.

3. Enter upper and lower range values in the *Range Limits* box and click **Send.**

4. Carefully read the warning and click **Yes** if it is safe to apply the changes.

Entering range points with a LOI

Reference Figure 2-9 on page 14 to rerange the transmitter using the LOI. Enter values using **SCROLL** and **ENTER** buttons.

Figure 2-9. Rerange with LOI
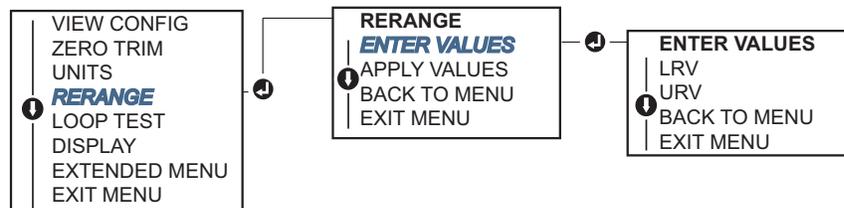
Rerange the transmitter with applied pressure source

Reranging using an applied pressure source is a way of reranging the transmitter without entering specific 4 and 20 mA (1–5 Vdc) points.

Rerange with an applied pressure source using a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

Device Dashboard Fast Keys	2, 2, 2, 2

Rerange with an applied pressure source using AMS Device Manager

1. Right select the device, select **Configure**.

2. Select the **Analog Output** tab.

3. Select **Range by Applying Pressure** button and follow the screen prompts range the transmitter.

Rerange with an applied pressure source using a Field Communicator

Use Figure 2-10 to manually rerange the device using an applied pressure source with an LOI.

Figure 2-10. Rerange with Applied Pressure Using LOI

```
 ┌─────────────────┐          ┌─────────────────┐
 │  VIEW CONFIG    │          │    RERANGE      │          ┌─────────────────┐
 │  ZERO TRIM      │          │  ENTER VALUES   │          │  APPLY VALUES   │
 │  UNITS          │      ↵   │ ❶ APPLY VALUES  │   ↵      │  LRV            │
 │ ❶ RERANGE       │          │  BACK TO MENU   │          │ ❶ URV           │
 │  LOOP TEST      │          │  EXIT MENU      │          │  BACK TO MENU   │
 │  DISPLAY        │          └─────────────────┘          │  EXIT MENU      │
 │  EXTENDED MENU  │                                       └─────────────────┘
 │  EXIT MENU      │
 └─────────────────┘
```
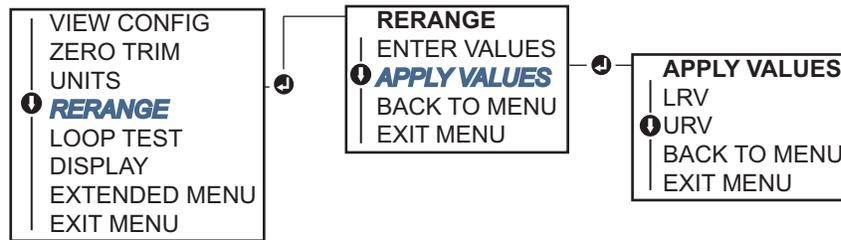
Rerange with an applied pressure source using local zero and span buttons

If ordered, local zero and span buttons (option code D4) can be used to rerange the transmitter with an applied pressure. Refer to Figure 2-11 on page 16 for analog zero and span button location.

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

1. Loosen the screw holding the top tag of the transmitter housing. Rotate the label to expose the zero and span buttons.

2. Confirm device has local zero and span buttons by verifying blue retainer under the tag.

3. Apply transmitter pressure.

4. Rerange the transmitter.

    a. To change the zero (4 mA/1 V point) while maintaining the span: press and hold zero button for at least two seconds then release.

    b. To change the span (20 mA/5 V point) while maintaining the zero point: press and hold the span button for at least two seconds and then release.

Note
4 mA and 20 mA points must maintain the minimum span defined in Appendix A: Specifications and reference data.

Figure 2-11. Analog Zero and Span Buttons
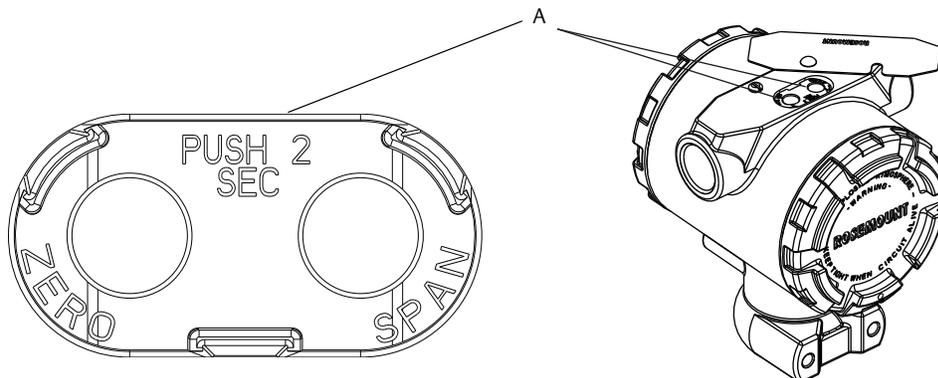
A. Zero and span buttons

Note

- If the transmitter security is on, adjustments to the zero and span will not be able to be made. Refer to "Configuring transmitter security" on page 43 for security information.

- The span is maintained when the 4 mA/1 V point is set. The span changes when the 20mA 5 V point is set. If the lower range point is set 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.

- Regardless of the range points, the transmitter measure and report all readings within the digital limits of the sensor. For example, if the 4 and 20 mA(1–5 Vdc) points are set to 0 and 10 inH$_2$O, and the transmitter detects a pressure of 25 inH$_2$O, it digitally outputs the 25 inH$_2$O reading and a 250% of range reading.

2.8.3 Damping

⚠ The damping command changes the response time of the transmitter; higher values can smooth variations in output readings caused by rapid input changes. Determine the appropriate damping setting based on the necessary response time, signal stability, and other requirements of the loop dynamics within your system. The damping command utilizes floating point configuration allowing the user to input any damping value within 0.0–60.0 seconds.

Damping with a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

| **Device Dashboard Fast Keys**	2, 2, 1, 1, 5

Enter desired Damping Value and select **APPLY**.

Damping with AMS Device Manager

1. Right select the device and select **Configure**.

2. Select **Manual Setup**.

3. Within the *Pressure Setup* box, enter desired damping value and click **Send**.

4. Carefully read the warning and click **Yes** if it is safe to apply the changes.

Damping with a LOI

Reference Figure 2-12 to enter damping values using an LOI.

Figure 2-12. Damping with LOI

```
VIEW CONFIG          EXTENDED MENU
ZERO TRIM            CALIBRAT
UNITS                DAMPING
RERANGE              TRANSFER FUNCT
LOOP TEST            SCALED VARIAB
DISPLAY              ASSIGN PV
EXTENDED MENU        TAG
EXIT MENU            ALARM SAT VALUES
                     PASSWORD
                     SIMLATE
                     HART REV
                     BACK TO MENU
                     EXIT MENU
```
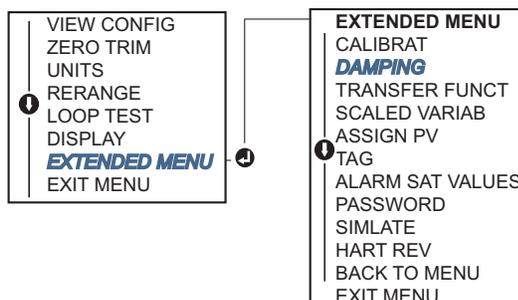
2.9   Configuring the LCD display

The LCD display configuration command allows customization of the LCD display to suit application requirements. The LCD display will alternate between the selected items.

- Pressure Units
- % of Range
- Scaled Variable
- Sensor Temperature
- mA/Vdc Output

In the following instructions, the LCD display can also be configured to display configuration information during the device startup. Select **Review Parameters at Startup** to enable or disable this functionality.

Reference Figure 2-2 on page 7 LCD display with LOI for image of LCD display screen.

Configuring LCD display with a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

| **Device Dashboard Fast Keys** | 2, 2, 4 |

Configuring LCD display with AMS Device Manager

1. Right select on the device and select **Configure**.

2. Select **Manual Setup**, select the **Display tab**.

3. Select desired display options and click **Send.**

Configuring LCD display with a local operator interface

Refer to Figure 2-13 for LCD display configuration using a LOI.

Figure 2-13. Display with LOI

```
┌─────────────────────┐
│  VIEW CONFIG        │
│  ZERO TRIM          │              ┌──────────────────────┐
│  UNITS              │              │ DISPLAY              │
│  RERANGE            │              │ PRESS (on/off)       │
│  LOOP TEST          │              │ SCALED (on/off)      │
│ ⬇  DISPLAY          │────┐      ⬇  │ TEMP (on/off)        │
│  EXTENDED MENU      │    └──🕐───   │ %RANGE (on/off)      │
│  EXIT MENU          │              │ ANALOG (on/off)      │
└─────────────────────┘              │ STRTUP (on/off)      │
                                     │ BACK TO MENU         │
                                     │ EXIT MENU            │
                                     └──────────────────────┘
```
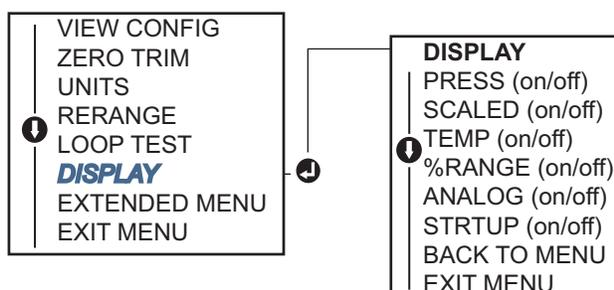
2.10   Detailed transmitter setup

2.10.1   Configuring alarm and saturation levels

In normal operation, the transmitter will drive the output in response to pressure from the lower to upper saturation points. If the pressure goes outside the sensor limits, or if the output would be beyond the saturation points, the output will be limited to the associated saturation point.

The transmitter automatically and continuously performs self-diagnostic routines. If the self-diagnostic routines detect a failure, the transmitter drives the output to configured alarm and value based on the position of the alarm switch. See "Setting transmitter alarm" on page 45.

Table 2-5. Rosemount Alarm and Saturation Values

Level	4–20 mA (1–5 Vdc) saturation	4–20 mA (1–5 Vdc alarm
Low	3.90 mA (0.97 V)	≤ 3.75 mA (0.95 V)
High	20.80 mA (5.20 V)	≥ 21.75 mA (5.40 V)

Table 2-6. NAMUR-Compliant Alarm and Saturation Values

Level	4–20 mA (1–5 Vdc) saturation	4–20 mA (1–5 Vdc) alarm
Low	3.80 mA (0.95 V)	≤ 3.60 mA (0.90 V) (.90 –.95 V)
High	20.50 mA (5.13 V)	≥22.50 mA (5.63 V) (5.05 –5.75 V)

Table 2-7. Custom Alarm and Saturation Values

Level	4–20 mA (1–5 Vdc) saturation	4–20 mA (1–5 Vdc) alarm
Low	3.70 mA– 3.90 mA (.90 –.95 V)	3.60–3.80 mA (.90 –.95 V)
High	20.10 mA –22.90 mA (5.025 –5.725 V)	20.20 mA – 23.00 mA (5.05 –5.75 V)

Failure mode alarm and saturation levels can be configured using a Field Communicator, AMS Device Manager, and the LOI. The following limitations exist for custom levels:

- Low alarm level must be less than the low saturation level
- High alarm level must be higher than the high saturation level
- Alarm and saturation levels must be separated by at least 0.1 mA (0.025 Vdc)

The configuration tool will provide an error message if the configuration rule is violated.

Note
Transmitters set to HART multidrop mode send all saturation and alarm information digitally; saturation and alarm conditions will not affect the analog output. See also "Establishing multidrop communication" on page 25.

Configuring alarm and saturation levels using a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

| **Device Dashboard Fast Keys**	2, 2, 2, 5

Configuring alarm and saturation levels with AMS Device Manager

1. Right select on the device, and select **Configure**.

2. Select **Configure Alarm and Saturation Levels** button.

3. Follow screen prompts to configure Alarm and Saturation Levels.

Configuring alarm and saturation levels using LOI

Refer to Figure 2-14 for instructions to configure alarm and saturation levels.

Figure 2-14. Configuring Alarm and Saturation with LOI
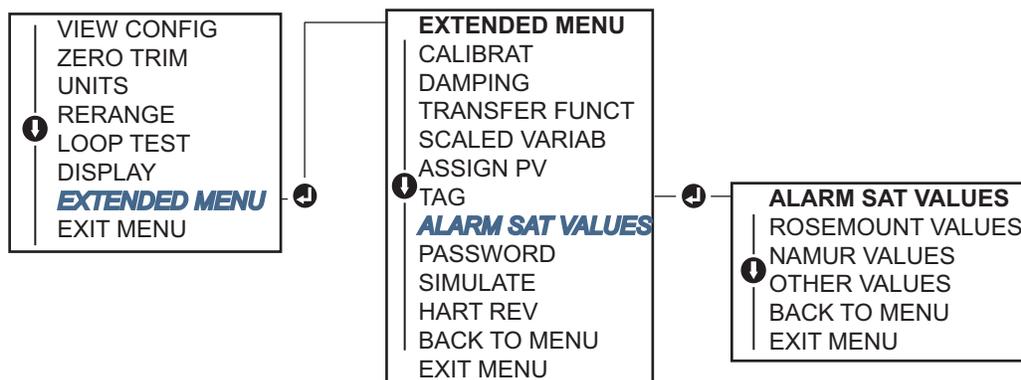
2.10.2   Configuring scaled variable

The Scaled Variable configuration allows the user to create a relationship/conversion between the pressure units and user-defined/custom units. There are two use cases for Scaled Variable. The first use case is to allow custom units to be displayed on the transmitter's LCD/LOI Display. The second use case is to allow custom units to drive the transmitter's 4–20 mA (1–5 Vdc) output.

If the user desires custom units to drive the 4–20 mA (1–5 Vdc) output, Scaled Variable must be re-mapped as the primary variable. Refer to "Re-mapping device variables" on page 21.

The Scaled Variable configuration defines the following items:

- Scaled Variable units - Custom units to be displayed.
- Scaled data options - Defines the transfer function for the application
- Pressure value position 1 - Lower known value point with consideration of linear offset.
- Scaled Variable value position 1 - Custom unit equivalent to the lower known value point.
- Pressure value position 2 - Upper known value point
- Scaled Variable value position 2 - Custom unit equivalent to the upper known value point
- Linear offset - The value required to zero out pressures effecting the desired pressure reading.

Configuring scaled variable using a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

Device Dashboard Fast Keys	2, 1, 4, 7

1. Follow the screen prompts to configure Scaled Variable.
   a. Select **Linear** under *Select Scaled data options*.

Configuring scaled variable using AMS Device Manager

1. Right select on the device and, select **Configure**.

2. Select the **Scaled Variable** tab and select the **Scaled Variable** button.

3. Follow screen prompts to configure Scaled Variable
    a. Select **Linear** under *Select Scaled data options*.

Configuring scaled variable using a LOI

Refer to Figure 2-15 on page 21 for instructions to configure Scaled Variable using a LOI.

Figure 2-15. Configuring Scaled Variable Using a LOI


```
VIEW CONFIG          EXTENDED MENU         SCALED VARIAB
ZERO TRIM              CALIBRAT              VIEW SCALED
UNITS                 DAMPING               CONFIG SCALED
RERANGE               TRANSFER FUNCT        BACK TO MENU
LOOP TEST             SCALED VARIAB         EXIT MENU
DISPLAY               ASSIGN PV
EXTENDED MENU         TAG
EXIT MENU             ALARM SAT VALUES
                      PASSWORD
                      SIMLATE
                      HART REV
                      BACK TO MENU
                      EXIT MENU
```
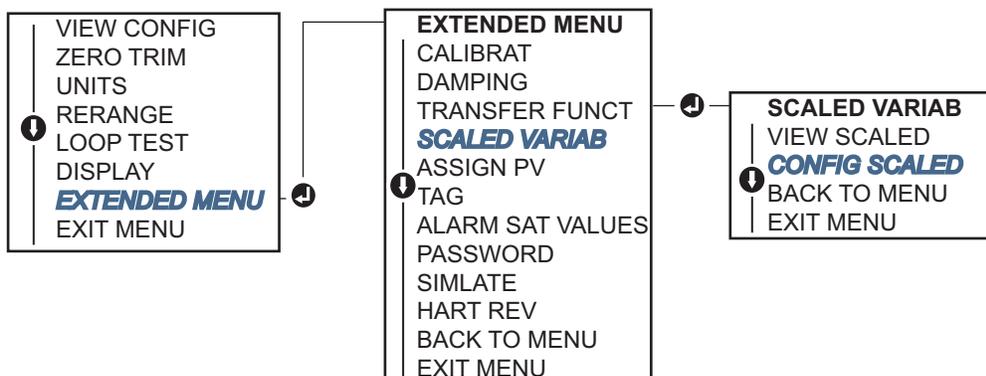
2.10.3   Re-mapping device variables

⚠ The re-mapping function allows the transmitter primary, secondary, tertiary, and quaternary variables (PV, 2V, 3V, and 4V) to be configured as desired. The PV can be remapped with a Field Communicator, AMS Device Manager, or a LOI. Variables (2V, 3V, and 4V) can only be re-mapped via Field Communicator or AMS Device Manager.

Note
The variable assigned to the primary variable drives the 4–20 mA (1–5 Vdc) output. This value can be selected as Pressure or Scaled Variable. The 2, 3, and 4 variables only apply if HART burst mode is being used.

Re-mapping using a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

| **Fast Keys**	2, 1, 1, 3

Re-mapping using AMS Device Manager

1. Right select the device and select **Configure**.

2. Select **Manual Setup** and click on the **HART** tab.

3. Assign Primary, secondary, tertiary, and quaternary variables under *Variable Mapping*.

4. Select **Send**.

5. Carefully read the warning and select **Yes** if it is safe to apply the changes.

Re-mapping using LOI

Refer to Figure 2-16 for instructions to remap the primary variable using a LOI.

Figure 2-16. Re-mapping with local operator interface
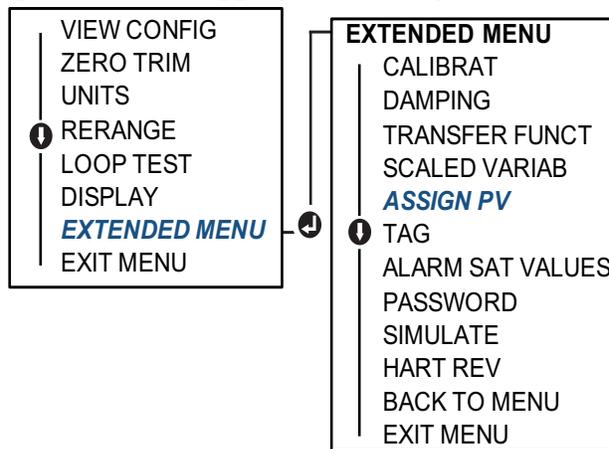
2.11 Performing transmitter tests

2.11.1 Verifying alarm level

If the transmitter is repaired or replaced, verify the transmitter alarm level before returning the transmitter to service. This is useful in testing the reaction of the control system to a transmitter in an alarm state. Thus ensuring the control system recognizes the alarm when activated. To verify the transmitter alarm values, perform a loop test and set the transmitter output to the alarm value (see Table 2-5, 2-6, and 2-7 on page 18).

Note
Before returning transmitter to service, verify security switch is set to the correct position. Refer to "Verify configuration" on page 11.

2.11.2 Performing an analog loop test

⚠ The analog 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. It is recommended that the 4–20 mA (1–5 Vdc) points in addition to alarm levels when installing, repairing, or replacing a transmitter.

The host system may provide a current measurement for the 4–20 mA (1–5 Vdc) HART output. If not, connect a reference meter to the transmitter by either connecting the meter to the test terminals on the terminal block, or shunting transmitter power through the meter at some point in the loop. For 1–5 V output, voltage measurement is directly measured from Vout to (–) terminals.

Performing an analog loop test using a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

Device Dashboard Fast Keys	3, 5, 1

#### Performing an analog loop test using AMS Device Manager

1. Right select on the device and, within the *Methods* drop down menu, move cursor over *Diagnostics and Test*. In the *Diagnostics and Test* drop down menu select **Loop Test**.

2. Select **Next** after setting the control loop to manual.

3. Follow Screen prompts to perform a Loop Test.

4. Select **Finish** to acknowledge the method is complete.

Performing analog loop test using a LOI

To perform an analog loop test using the LOI, the 4 mA (1 V), 20 mA (5 V), and custom mA point may be set manually. Reference Figure 2-17 for instructions on how to perform a transmitter loop test using an LOI.

Figure 2-17. Performing an Analog Loop Test Using an LOI

```
┌──────────────────────┐        ┌───────────────────────────┐
│ │ VIEW CONFIG          │        │ │ LOOP TEST               │
│ │ ZERO TRIM            │        │ │ SET 4MA(1V)             │
│ │ UNITS                │        │ │ SET 20MA(5V)            │
│ │ RERANGE              │   ◄┘   │ ↕ SET CUSTOM             │
│ ↕ LOOP TEST            │        │ │ END LOOP TEST           │
│ │ DISPLAY              │        │ │ BACK TO MENU            │
│ │ EXTENDED MENU        │        │ │ EXIT MENU               │
│ │ EXIT MENU            │        └───────────────────────────┘
└──────────────────────┘
```
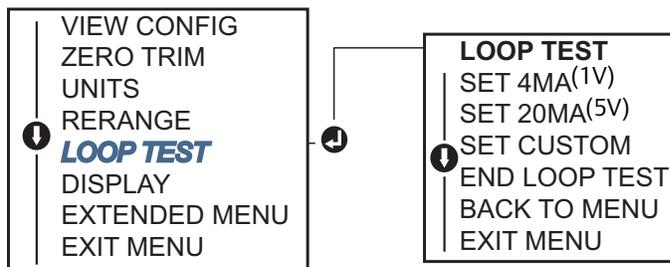
2.11.3   Simulate device variables

It is possible to temporarily set the Pressure, Sensor Temperature, or Scaled Variable to a user-defined fixed value for testing purposes. Once the simulated variable method is left, the process variable will be automatically returned to a live measurement. Simulate device variables is only available in HART Revision 7 mode.

Simulate digital signal with a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

Device Dashboard Fast Keys	3, 5

Simulate digital signal with AMS Device Manager

1. Right select on the device and select **Service Tools**.

2. Select **Simulate.**

3. Under *Device Variables* select a digital value to simulate.

    a. Pressure

    b. Sensor Temperature

    c. Scaled Variable

4. Follow the screen prompts to simulate selected digital value.

2.12   Configuring burst mode

Burst mode is compatible with the analog signal. Because the 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, Scaled Variable, and/or analog output), and does not affect the way other transmitter data is accessed. However, when activated, bust mode can slow down communication of non-dynamic data to the host by 50 percent.

Access to information other than dynamic transmitter data is obtained through the normal poll/response method of HART communication. A Field Communicator, AMS Device Manager, 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 Field Communicator, AMS Device Manager, or a control system to initiate a request.

Choosing burst mode options in HART 5

Message content options:

- PV only
- Percent of Range
- PV, 2V, 3V, 4V
- Process Variables
- Device Status

Choosing burst mode options in HART 7

Message content options:

- PV only
- Percent of Range
- PV, 2V, 3V, 4V
- Process Variables and Status
- Process Variables
- Device Status

Choosing a HART 7 trigger mode

When in HART 7 mode, the following trigger modes can be selected.

- Continuous (same as HART5 burst mode)
- Rising
- Falling
- Windowed
- On Change

Note
Consult your host system manufacturer for burst mode requirements.

Configuring burst mode using a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

Device Dashboard Fast Keys	2, 2, 5, 3

Configuring burst mode using AMS Device Manager

1. Right select on the device and select **Configure**.

2. Select the **HART** tab.

3. Enter the configuration in Burst Mode Configuration fields.

2.13   Establishing 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.

Multidrop installation requires consideration of the update rate necessary from each transmitter, the combination of transmitter models, and the length of the transmission line. Communication with transmitters can be accomplished with HART modems and a host implementing HART protocol. Each transmitter is identified by a unique address and responds to the commands defined in the HART protocol. Field Communicators and AMS Device Manager can test, configure, and format a multidropped transmitter the same way as a transmitter in a standard point-to-point installation.

Figure 2-18 shows a typical multidrop network. This figure is not intended as an installation diagram.

Figure 2-18. Typical Multidrop Network (4–20 mA only)
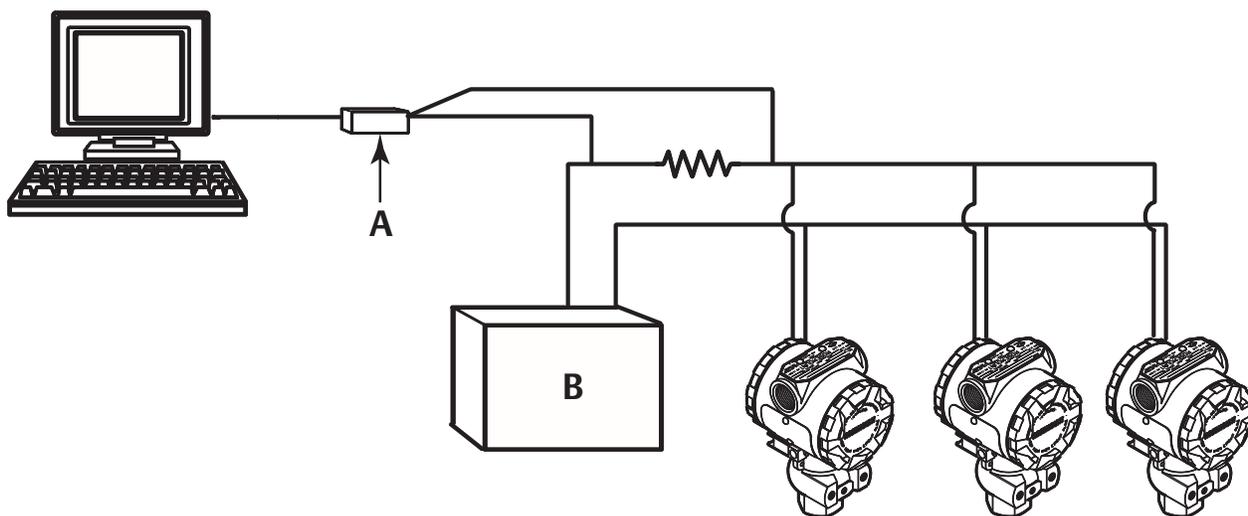
A. HART modem
B. Power supply

The Rosemount 2088, 2090F, 2090P is set to address zero (0) at the factory, which allows operation in the standard point-to-point manner with a 4–20 mA (1–5 Vdc) output signal. To activate multidrop communication, the transmitter address must be changed to a number from 1 to 15 for HART Revision 5, or 1–63 for HART Revision 7. This change deactivates the 4–20 mA (1–5 Vdc) analog output, sending it to 4 mA (1 Vdc). It also disables the failure mode alarm signal, which is controlled by the upscale/downscale switch position. Failure signals in multidropped transmitters are communicated through HART messages.

2.13.1   Changing a transmitter address

To activate multidrop communication, the transmitter poll address must be assigned a number from 1 to 15 for HART Revision 5, and 1–63 for HART Revision 7. Each transmitter in a multidropped loop must have a unique poll address.

Changing transmitter address using a Field Communicator

From the *HOME* screen, enter the Fast Key sequence	**HART Revision 5**	**HART Revision 7**
Device Dashboard Fast Keys	2, 2, 5, 2, 1	2, 2, 5, 2, 2

Changing transmitter address using AMS Device Manager

1. Right select on the device and select **Configure**.

2. In HART Revision 5 mode:
    a. Select **Manual Setup**, select the **HART** tab.
    b. In the Communication Settings box enter polling address in the **Polling Address** box, select **Send**.

3. In HART Revision 7 mode:
    a. Select **Manual Setup**, select the **HART** tab and select the **Change Polling Address** button.

4. Carefully read the warning and click **Yes** if it is safe to apply the changes.

2.13.2   Communicating with a multidropped transmitter

To communicate with a multidrop transmitter, the Field Communicator or AMS Device Manager has to be set up for Polling.

Communicating with a multidropped transmitter using a Field Communicator

1. Select **Utility** and **Configure HART Application**.

2. Select **Polling Addresses.**

3. Enter **0–63.**

Communicating with a multidropped transmitter using AMS Device Manager

1. Select on the *HART modem icon* and select **Scan All Devices**.

Section 3   Hardware installation

3.1   Overview

The information in this section covers installation considerations for the Rosemount™ 2088, 2090F, and 2090P, 2090F, and 2090P with HART® protocols. A Quick Start Guide is shipped with every transmitter to describe recommended pipe-fitting and wiring procedures for initial installation. Dimensional drawings for each transmitter variation and mounting configuration are included on page 31.

Note
For transmitter disassembly and reassembly refer to "Disassembly procedures" on page 70, and "Reassembly procedures" on page 72.

3.2   Safety messages

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

⚠ **WARNING**

Explosions could result in death or serious injury.

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Review the approvals section of the Rosemount 2088, 2090F, 2090P reference manual for any restrictions associated with a safe installation.

- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- In an explosion-proof/flameproof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks may cause harm or result in death.

- Install and tighten process connectors before applying pressure.

Electrical shock can result in death or serious injury.

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

- Avoid contact with the leads and terminals.

Process leaks could result in death or serious injury.

- Install and tighten all four flange bolts before applying pressure.
- Do not attempt to loosen or remove flange bolts while the transmitter is in service.

Replacement equipment or spare parts not approved by Emerson™ for use as spare parts could reduce the pressure retaining capabilities of the transmitter and may render the instrument dangerous.

- Use only bolts supplied or sold by Emerson as spare parts.

Improper assembly of manifolds to traditional flange can damage sensor module.

- For safe assembly of manifold to traditional flange, bolts must break back plane of flange web (i.e., bolt hole) but must not contact sensor module housing.

3.3   Considerations

3.3.1   Installation considerations

Measurement accuracy depends upon proper installation of the transmitter and impulse piping. Mount the transmitter close to the process and use a minimum of piping to achieve best accuracy. Keep in mind the need for easy access, personnel safety, practical field calibration, and a suitable transmitter environment. Install the transmitter to minimize vibration, shock, and temperature fluctuation.

Important
Install the enclosed pipe plug (found in the box) in unused housing conduit opening with a minimum of five threads of engagement to comply with explosion-proof requirements.

3.3.2   Environmental considerations

Best practice is to mount the transmitter in an environment that has minimal ambient temperature change. The transmitter electronics temperature operating limits are –40 to 185 °F (–40 to 85 °C). Refer to Appendix A: Reference data that lists the sensing element operating limits. Mount the transmitter so that it is not susceptible to vibration and mechanical shock and does not have external contact with corrosive materials.

3.3.3   Mechanical considerations

Steam service

For steam service or for applications with process temperatures greater than the limits of the transmitter, do not blow down impulse piping through the transmitter. Flush lines with the blocking valves closed and refill lines with water before resuming measurement. Refer to Figure 3-4 on page 35 through Figure 3-6 on page 36 for correct mounting orientation.

3.4   Installation procedures

3.4.1   Mount the transmitter

The following are approximate weights of each transmitter:
- Rosemount 2088 2.44 lb (1,11 kg)
- Rosemount 2090F 2.74 lb (1.24 kg)
- Rosemount 2090P 2.96 lb (1.34 kg).

In many cases its compact size and light weight makes it possible to mount directly to the respective apparatus 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 3-1 on page 32).

For dimensional drawing information refer to Appendix A: Reference data.

Note
Most transmitters are calibrated in the upright position. Mounting the transmitter in any other position will shift the zero point to the equivalent amount of liquid head pressure caused by the varied mounting position. To reset zero point, refer to "Sensor trim overview" on page 56.

Electronics housing clearance

Mount the transmitter so the terminal side is accessible. Clearance of 0.75-in. (19 mm) is required for cover removal. Use a conduit plug in the unused conduit opening. Three inches of clearance is required for cover removal if a meter is installed.

Environmental seal for housing

Thread sealing (PTFE) tape or paste on male threads of conduit is required to provide a water/dust tight conduit seal and meets requirements of NEMA® Type 4X, IP66, and IP68. Consult factory if other Ingress Protection ratings are required.

For M20 threads, install conduit plugs to full thread engagement or until mechanical resistance is met.

Mounting brackets

Rosemount 2088, 2090F, or 2090P transmitters may be panel-mounted or pipe-mounted via an optional mounting bracket (option code B4). See Figure 3-1 on page 32 and for dimensional and mounting configuration information.

**Figure 3-1. Mounting Bracket Option Code B4**
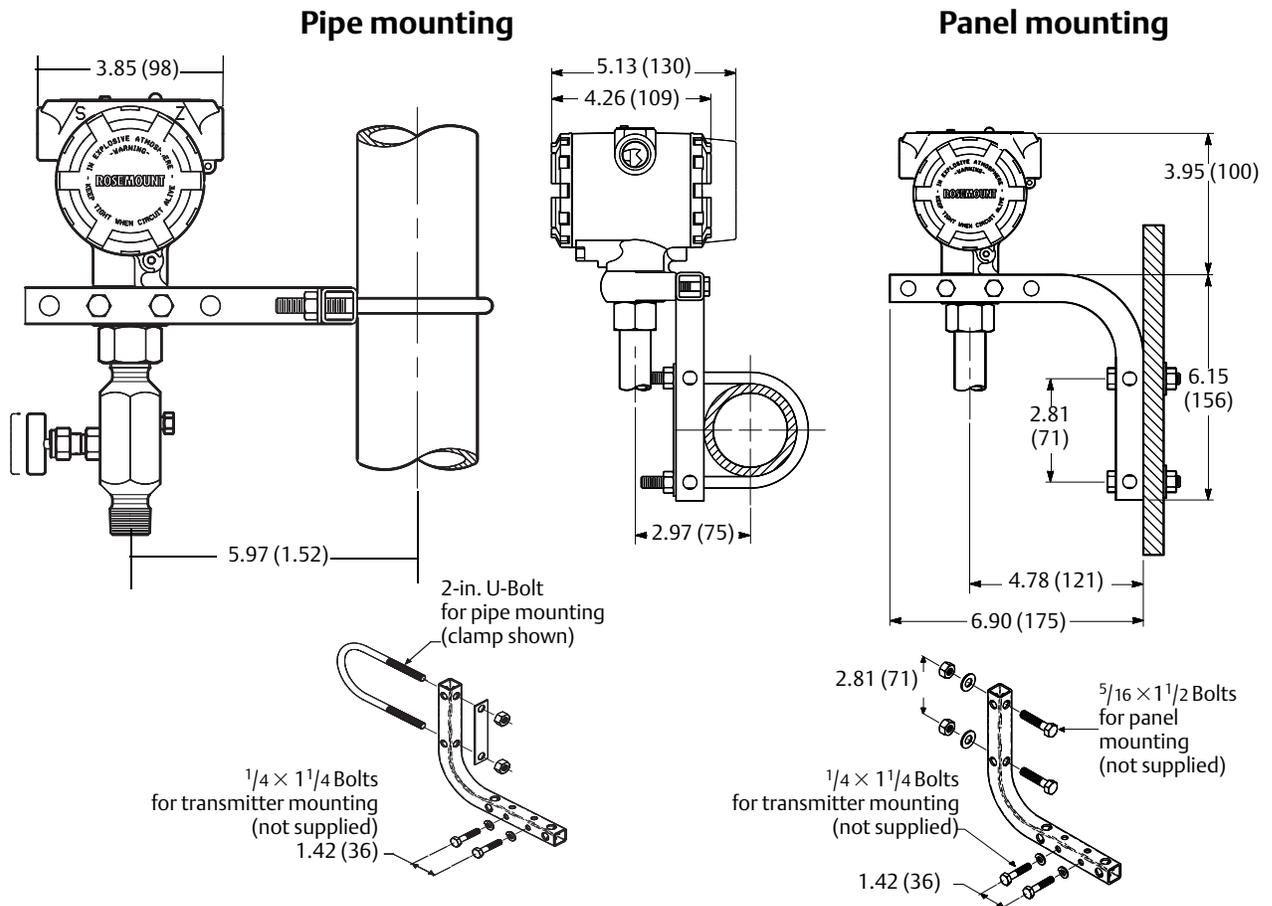
Dimensions are in inches (millimeters).

Figure 3-2. Mounting Bracket Option Code B4

Pipe mounting

Panel mounting

2-in. U-Bolt
for pipe mounting
(clamp shown)

¼ × 1¼ Bolt
for transmitter mounting
(not supplies) 1.42 (36)

5.97 (152)

2.97
(75)

2.810
71.4

8.090
(205.5)

4.78
(121)

5⁄16 × 1½ Bolt
for panel mounting
(not supplies)

¼ × 1¼ Bolt
for transmitter mounting
(not supplies) 1.42 (36)
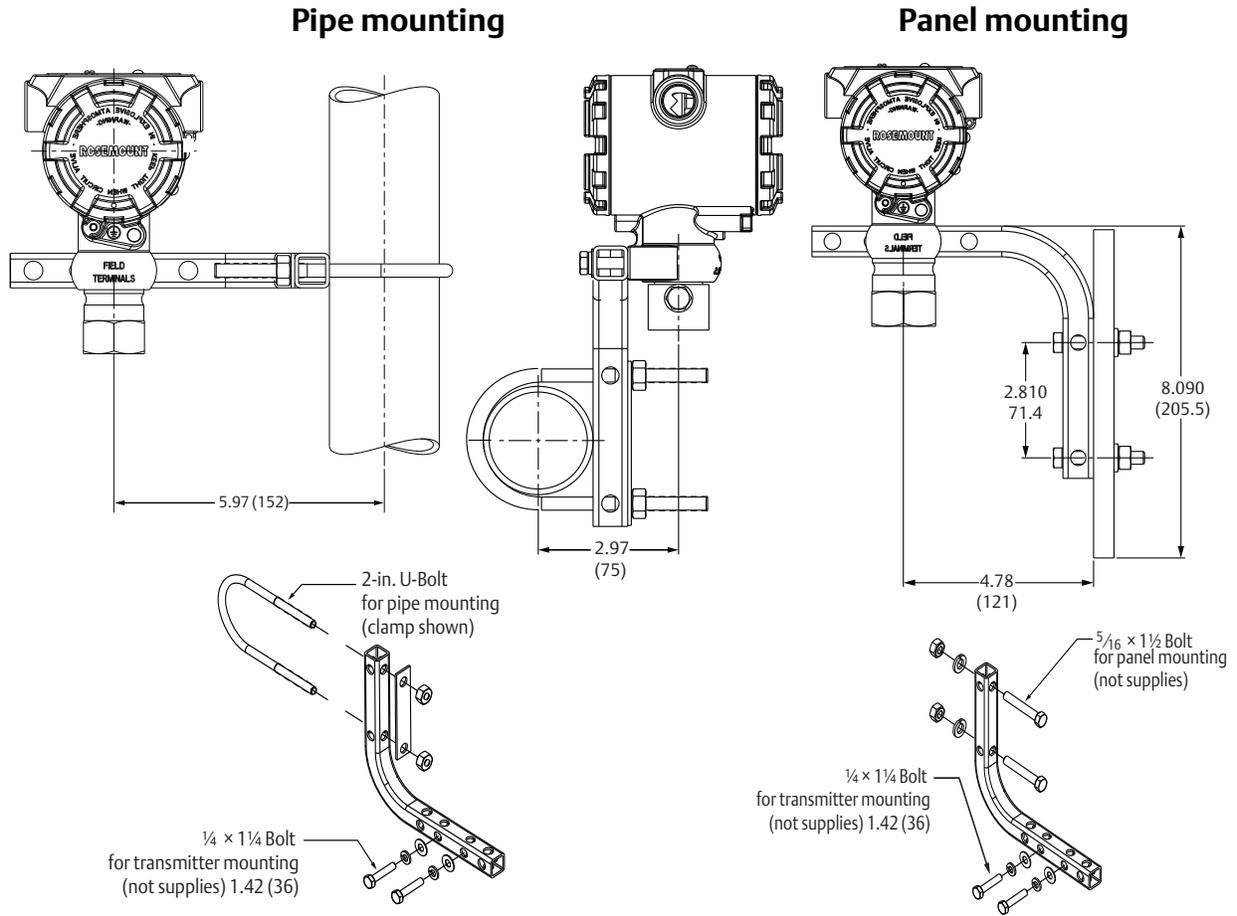
Dimensions are in inches (millimeters).

Figure 3-3. Mounting Bracket Option Code B4

Pipe mounting

Panel mounting

5.97 (152)

2.97 (75)

4.78 (121)

2-in. U-Bolt for pipe mounting (clamp shown)

$\frac{5}{16}$ × 1½ Bolt for panel mounting (not supplies)

¼ × 1¼ Bolt for transmitter mounting (not supplies) 1.42 (36)

¼ × 1¼ Bolt for transmitter mounting (not supplies) 1.42 (36)

Dimensions are in inches (millimeters).

B7M   Carbon Steel (CS) Head Markings

Stainless steel (SST) head markings

316   B8M   660 CL A   F593_*   *The last digit in the F593_ head marking may be any letter between A and M.

KM   Alloy K-500 head marking

3.4.2   Impulse piping

Mounting requirements

Impulse piping configurations depend on specific measurement conditions. Refer to through for examples of the following mounting configurations:

Liquid measurement

- Place taps to the side of the line to prevent sediment deposits on the transmitter's process isolator.
- 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 measurement

- Place tap in the top or side of the line.
- Mount the transmitter beside or above the tap so liquid will drain into the process line.

Steam measurement

- Place tap to the side of the line.
- Mount the transmitter below the taps to ensure that the impulse piping will stay filled with condensate.
- In steam service above 250 °F (121 °C), fill impulse line with water to prevent steam from contacting the transmitter directly and to ensure accurate measurement start-up.

Note
For steam or other elevated temperature services, it is important that temperatures at the process connection do not exceed the transmitter's process temperature limits.

Figure 3-4. Liquid Applications Installation Example
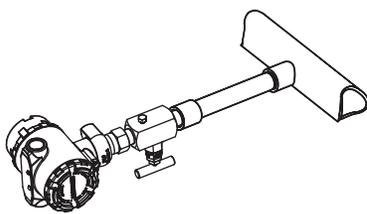
**Figure 3-5. Gas Applications Installation Example**
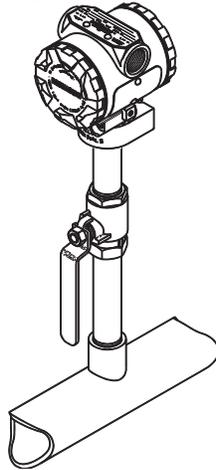
Figure 3-6. Steam Applications Installation Example
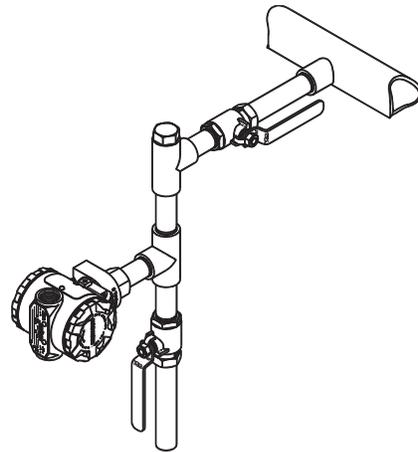
Best practices

The piping between the process and the transmitter must accurately transfer the pressure to obtain accurate measurements. There are five possible sources of error: pressure transfer, leaks, friction loss (particularly if purging is used), trapped gas in a liquid line, liquid in a gas line, and density variations between the legs.

The best location for the transmitter in relation to the process pipe is dependent on the process. Use the following guidelines to determine transmitter location and placement of impulse piping:

- Keep impulse piping as short as possible.
- For liquid service, slope the impulse piping at least 1 in./ft (8 cm/m) upward from the transmitter toward the process connection.
- For gas service, slope the impulse piping at least 1 in./ft (8 cm/m) downward from the transmitter toward the process connection.
- Avoid high points in liquid lines and low points in gas lines.
- Use impulse piping large enough to avoid friction effects and blockage.
- Vent all gas from liquid piping legs.
- When purging, make the purge connection close to the process taps and purge through equal lengths of the same size pipe. Avoid purging through the transmitter.
- Keep corrosive or hot [above 250 °F (121 °C)] process material out of direct contact with the sensor module and flanges.
- Prevent sediment deposits in the impulse piping.
- Avoid conditions that might allow process fluid to freeze within the process flange.

3.4.3   Inline process connection

Inline gage transmitter orientation

⚠ **CAUTION**

Interfering or blocking the atmospheric reference port will cause the transmitter to output erroneous pressure values.

The low side pressure port on the inline gage transmitter is located in the neck of the transmitter, behind the housing. The vent path is 360 degrees around the transmitter between the housing and sensor (See Figure 3-7).

Keep the vent path free of any obstruction, such as paint, dust, and lubrication by mounting the transmitter so that the process can drain away.

Figure 3-7. Inline gage low side pressure port
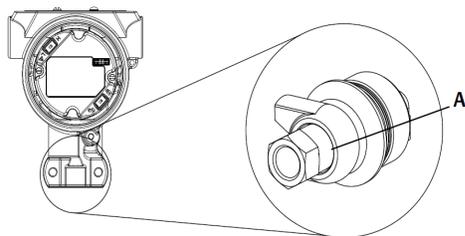
A. Low side pressure port (atmospheric reference)

⚠ **WARNING**

Do not apply torque directly to the sensor module. Rotation between the sensor module and the process connection can damage the electronics. To avoid damage, apply torque only to the hex-shaped process connection.
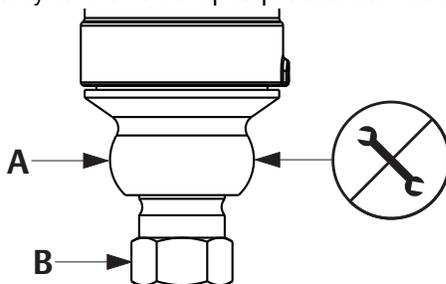
A. Sensor module
B. Process connection

3.5 Process connections

3.5.1 Rosemount 2090P

Installing the Rosemount 2090P transmitter involves attaching a weld spud to the tapped process vessel, attaching the transmitter to the weld spud, and making electrical connections. If you intend to use an existing weld spud, proceed to the transmitter section of this installation procedure.

Note
The Rosemount 2090P isolating diaphragm can be mounted flush with the inside diameter of any vessel larger than three inches in diameter.

⚠ **CAUTION**

Installation of the weld spud should be performed by a skilled welder using a TIG welder. Improper installation may result in weld spud distortion.

3.5.2   Weld spud

1. Using the appropriate size hole saw, cut a hole in the process vessel to accept the weld spud. The diameter for a weld spud with heat isolator groove is 2.37-in. (60 mm); when compatible with 1-in. PMC® process connection style spud, diameter is 1.32 in. (33,4 mm). The hole should produce a tight, uniform fit when coupled with the weld spud.

2. Bevel the edge of the vessel hole to accept filler material.

3. Remove the weld spud from the transmitter and remove the PTFE gasket from the weld spud.

⚠ **CAUTION**

Excessive heat will distort the weld spud. Weld in sections, as shown in Figure 2-5, cooling each section with a wet cloth. Allow adequate cooling between passes.
To reduce the chances of distorting the weld spud (for 1.5-in. connection), use a he sink—Rosemount Part Number 02088-0196-0005.

4. Position the weld spud in the vessel hole, place heat sink and tack spud in place using the welding sequence shown in Figure 2-8. Cool each section with a wet cloth before proceeding to the next section.

5. Weld the spud in place using 0.030 to 0.045-in. (0,762 to 1,143 mm) stainless steel rod as filler in the bevelled area. Using between 100 and 125 amps., adjust the amperage for 0.080-in. (2,032 mm) penetration.

3.5.3   Transmitter

1. After the weld spud has cooled, remove the heat sink and install the PTFE gasket into the weld spud. Ensure that the gasket is properly positioned within the weld spud; improper placement could cause a process leak.

2. Position the transmitter into the spud and begin to engage the threads. Rotate the transmitter prior to seating the threads completely to enable access to the housing compartments, the conduit entry, and the LCD display.

3. Hand tighten the transmitter using the knurled retaining ring, then snug an additional $1/8$ turn with adjustable pliers.

Important
Do not over-tighten the retaining ring. A spanner wrench hole is located on the knurled portion of the retaining ring to assist in transmitter removal if it is over-tightened.

Figure 3-8. PTFE Installing the Weld Spud

308L SST


2.37 (60)

Code "C" in Model Structure or
P/N 02088-0195-0005
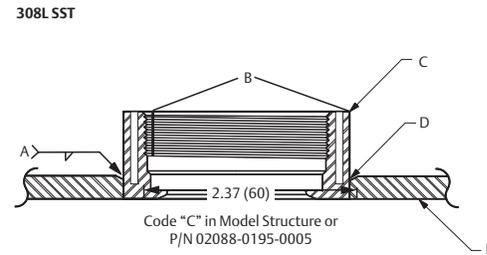
A. 100–125 Amps recommended
B. Heat isolation grooves
C. Weld spud
D. Bevelled edge
E. Process

3.6 Rosemount 306 Manifold

The Rosemount 306 Integral Manifold is used with the Rosemount 2088 in-line transmitters to provide block-and-bleed valve capabilities of up to 10000 psi (690 bar).

Figure 3-9. Rosemount 2088 and 306 In-line Manifold
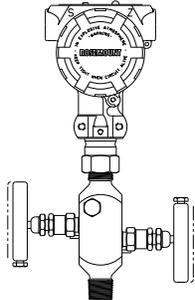
3.6.1 Rosemount 306 Integral Manifold installation procedure

⚠ Assemble the Rosemount 306 Manifold to the Rosemount 2088 In-line transmitter with a thread sealant.

Section 4   Electrical installation

4.1   Overview

The information in this section covers installation considerations for the Rosemount™ 2088, 2090F, and 2090P. A Quick Start Guide is shipped with every transmitter to describe pipe-fitting, wiring procedures, and basic configuration for initial installation.

Note
For transmitter disassembly and reassembly refer to sections "Disassembly procedures" on page 70, and "Reassembly procedures" on page 72.

4.2   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.

> **⚠ WARNING**
>
> **Explosions could result in death or serious injury.**
>
> Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Review the approvals section of the Rosemount 2088, 2090F, and 2090P reference manual for any restrictions associated with a safe installation.
>
> - In an Explosion-Proof/Flameproof installation, do not remove the transmitter covers when power is applied to the unit.
>
> **Process leaks may cause harm or result in death.**
>
> - Install and tighten process connectors before applying pressure.
>
> **Electrical shock can result in death or serious injury.**
>
> - Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

4.3   Local Operating Interface (LOI)/LCD display

Transmitters ordered with the LCD display option (M5) or LOI option (M4) are shipped with the display installed. Installing the display on an existing transmitter requires a small instrument screwdriver. Carefully align the desired display connector with the electronics board connector. If connectors don't align, the display and electronics board are not compatible.

Figure 4-1. LOI display assembly
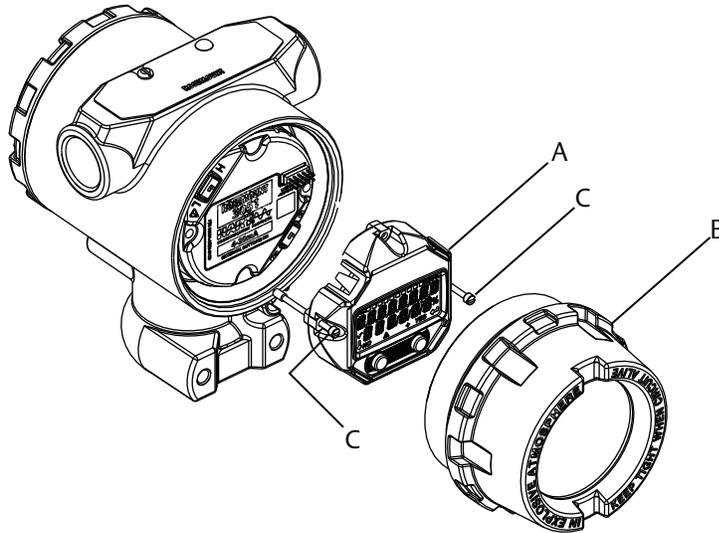
A. LCD/LOI display
B. Extended cover
C. Captive screws

4.3.1   Rotating LCD/LOI display

⚠ 1. Secure the loop to manual control and remove power to transmitter.

2. Remove transmitter housing cover.

3. Remove screws form the LCD/LOI display and rotate to desired orientation.

   a. Insert 10 pin connector into the display board for the correct orientation. Carefully align pins for insertion into the output board.

4. Re-insert screws.

5. Reattach transmitter housing cover; cover must be fully engaged to comply with explosion proof requirements.

6. Re-attach power and return loop to automatic control.

4.4 Configuring transmitter security

There are four security methods with the Rosemount 2088, 2090F, and 2090P transmitters.

■ Security switch

■ HART® Lock

■ Configuration Buttons lock

■ LOI password

Figure 4-2. 4–20 mA electronics board

Without LCD display meter   **With LCD display /LOI display**
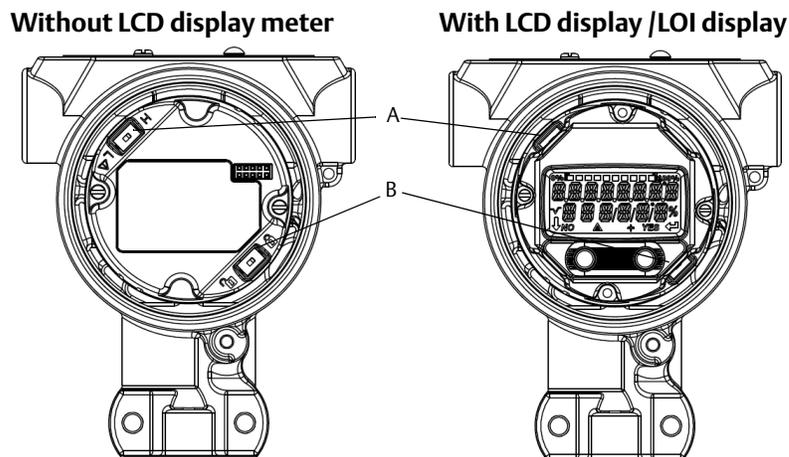
A. Alarm
B. Security

Note
1–5 Vdc Alarm and Security switches are located in the same location as 4–20 mA output boards.

4.4.1 Setting security switch

The security switch is used to prevent changes to the transmitter configuration data. If the security switch is set to the locked location (🔒), any transmitter configuration requests sent via HART, LOI, or local configuration buttons will be rejected by the transmitter and the transmitter configuration data will not be modified. Reference Figure 4-2 for the location of the security switch. Follow the steps below to enable the security switch.

⚠ 1. Set loop to manual and remove power.

2. Remove transmitter housing cover.

3. Use a small screwdriver to slide the switch to the lock (🔒) position.

4. Replace transmitter housing cover; cover must be fully engaged to comply with explosion proof requirements.

4.4.2   HART lock

The HART Lock prevents changes to the transmitter configuration from all sources; all changes requested via HART, LOI, and local configuration buttons will be rejected. The HART Lock can only be set via HART communication, and is only available in HART Revision 7 mode. The HART Lock can be enabled or disabled with a Field Communicator or AMS Device Manager.

Configuring HART lock using Field Communicator

From the *HOME* screen, enter the Fast Key sequence

Device Dashboard Fast Keys	2, 2, 6, 4

Configuring HART lock using AMS Device Manager

1. Right select the device and select **Configure.**

2. Under *Manual Setup* select the **Security** tab.

3. Select **Lock/Unlock** button under *HART Lock (Software)* and follow the screen prompts.

4.4.3   Configuration button lock

The configuration button lock disables all local button functionality. Changes to the transmitter configuration from the LOI and local buttons will be rejected. Local external keys can be locked via HART communication only.

Configuring configuration button lock using a Field Communicator

From the *HOME* screen, enter the Fast Key sequence

Device Dashboard Fast Keys	2, 2, 6, 3

Configuring configuration button lock using AMS Device Manager

1. Right select the device and select **Configure.**

2. Under *Manual Setup* select the **Security** tab.

3. Within the *Configuration Buttons* dropdown menu select **Disabled** to lock external local keys.

4. Select **Send**.

5. Confirm service reason and click **Yes**.

4.4.4   LOI password

A Local Operator Interface Password can be entered and enabled to prevent review and modification of device configuration via the LOI. This does not prevent configuration from HART or external keys (analog zero and span; Digital zero trim). The LOI password is a four digit code that is to be set by the user. If the password is lost or forgotten the master password is "9307".

The LOI password can be configured and enabled/disabled by HART communication via a Field Communicator, AMS Device Manager, or the LOI.

Configuring password with Field Communicator

From the *HOME* screen, enter the Fast Key sequence

Device Dashboard Fast Keys	2, 2, 6, 5, 2

Configuring password with AMS Device Manager

1. Right select the device and select **Configure.**

2. Under *Manual Setup* select the **Security** tab.

3. Within the *LOI* select the **Configure Password** button and follow the screen prompts.

Configuring LOI password using LOI

Figure 4-3. LOI Password
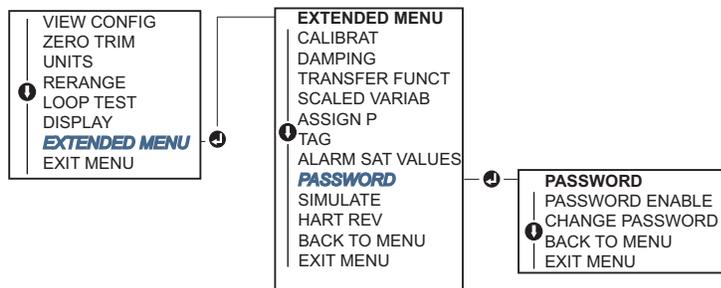
4.5 Setting transmitter alarm

On the electronics board is an alarm switch, reference Figure 4-2 on page 43 for switch location. Follow the steps below to change the alarm switch location:

1. Set loop to manual and remove power.

2. Remove transmitter housing cover.

3. Use a small screwdriver to slide switch to desired position.

4. Replace transmitter cover; cover must be fully engaged to comply with explosion proof requirements.

4.6   Electrical considerations

Note
Make sure all electrical installation is in accordance with national and local code requirements.

⚠ CAUTION

Do not run signal wiring in conduit or open trays with power wiring or near heavy electrical equipment.

4.6.1   Conduit installation

⚠ CAUTION

If all connections are not sealed, excess moisture accumulation can damage the transmitter. Make sure to mount the transmitter with the electrical housing positioned downward for drainage. To avoid moisture accumulation in the housing, install wiring with a drip loop, and ensure the bottom of the drip loop is mounted lower than the conduit connections of the transmitter housing.

Recommended conduit connections are shown in Figure 4-4.

Figure 4-4. Conduit Installation Diagrams
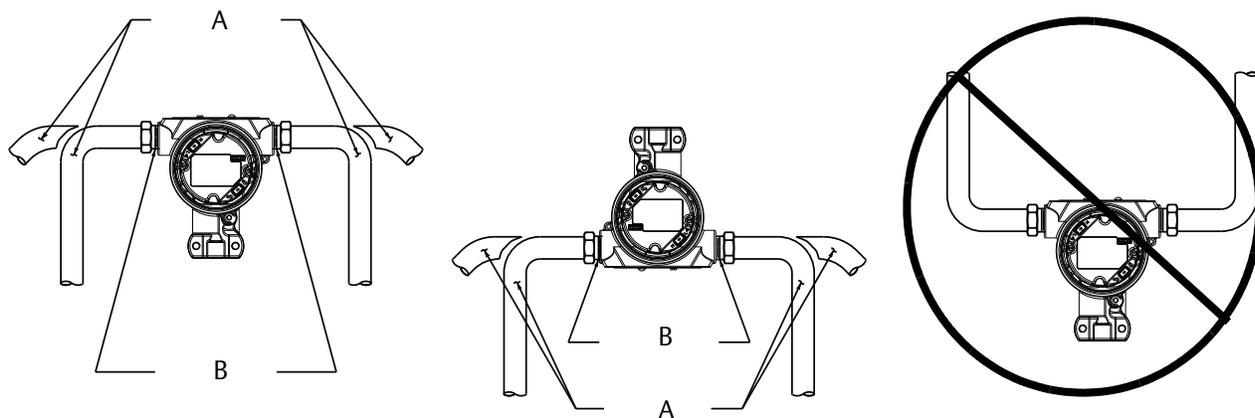
A. Possible conduit line positions
B. Sealing compound

### 4.6.2   Power supply

4–20 mA HART (option code S)

Transmitter operates on 10.5–42.4 Vdc at the terminal of the transmitter. The dc power supply should provide power with less than two percent ripple. A minimum of 16.6V is required for loops with a 250 Ω resistance.

Note
A minimum loop resistance of 250 Ωs is required to communicate with a Field Communicator. If a single power supply is used to power more than one transmitter, the power supply used, and circuitry common to the transmitters, should not have more that 20 Ωs of impedance at 1200 Hz.

Figure 4-5. Load limitation

Maximum loop resistance = 43.5 × (Power supply voltage – 10.5)
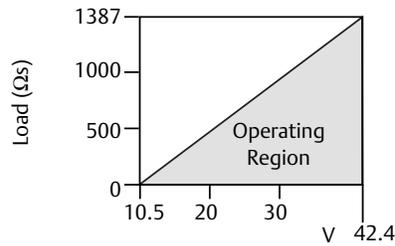
The Field Communicator requires a minimum loop resistance of 250 Ω for communication.

The total resistance load is the sum of the resistance of the signal leads and the load resistance of the controller, indicator, I.S. Barriers, and related pieces. If intrinsic safety barriers are used, the resistance and voltage drop must be included.

1–5 Vdc low power HART (output code N)

Low Power transmitters operate on 5.8 Vdc. The dc power supply should provide power with less than 2 percent ripple. The V_{out} load should be 100 kΩ or greater.

4.6.3   Wiring the transmitter

⚠ CAUTION

Do not connect the power signal wiring to the test terminals. Incorrect wiring can damage test circuit.

Note
Use shielded twisted pairs to yield best results. To ensure proper communication, use 24 AWG or larger wire and do not exceed 5000 ft. (1500 m). For 1–5 V 500 ft. (150 m) maximum are recommended. Unpaired three conductor or two twisted pairs is recommended.

Figure 4-6. Wiring the Transmitter (4–20 mA HART)
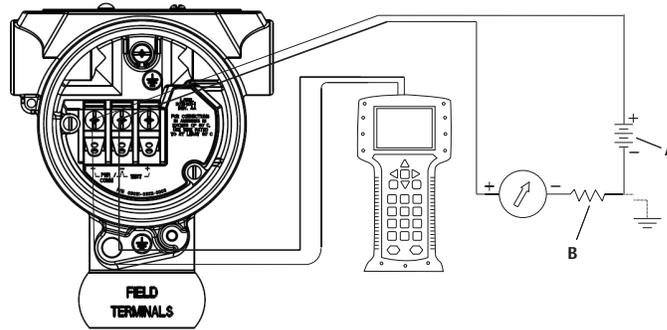
A. DC power supply
B. R $_L \geq$ 250 (necessary for HART communication only)

Figure 4-7. Wiring the Transmitter (1–5 Vdc Low Power)
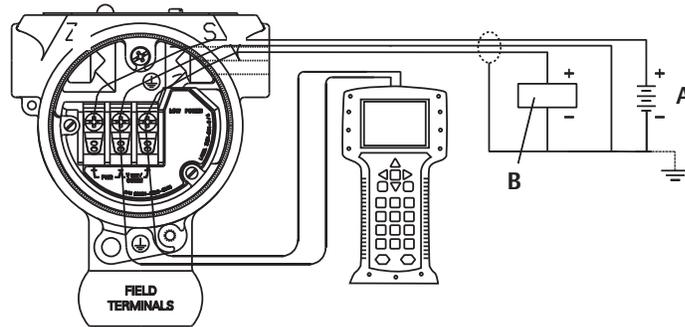
A. DC power supply
B. Voltmeter

Perform the following procedure to make wiring connections:

1. Remove the housing cover on terminal compartment side. Do not remove the cover in explosive atmospheres when the circuit is live. Signal wiring supplies all power to the transmitter.

2. For 4–20 mA HART output, connect the positive lead to the terminal marked (pwr/comm+) and the negative lead to the terminal marked (pwr/comm–). Do not connect the powered signal wiring to the test terminals. Power could damage the test diode.

    a. For 1–5 Vdc HART Output, connect the positive lead to (PWR +) and the negative to the (PWR–). Do not connect the powered signal wiring to the test terminals. Power could damage the test diode.

3. Ensure full contact with Terminal Block screw and washer. When using a direct wiring method, wrap wire clockwise to ensure it is in place when tightening the terminal block screw.

Note
The use of a pin or ferrule wire terminal is not recommended as the connection may be more susceptible to loosening over time or under vibration.

4. Plug and seal unused conduit connection on the transmitter housing to avoid moisture accumulation in the terminal side.

4.6.4   Grounding the transmitter

Signal cable shield grounding

Signal cable shield grounding is summarized in Figure 4-8 on page 49. The signal cable shield and unused shield drain wire must be trimmed and insulated, ensuring that the signal cable shield and drain wire do not come in contact with the transmitter case. See "Transmitter case grounding" on page 50 for instructions on grounding the transmitter case. Follow the steps below to correctly ground the signal cable shield:

1. Remove the field terminals housing cover.

2. Connect the signal wire pair at the field terminals as indicated in Figure 4-6.

3. At the field terminals, the cable shield and shield drain wire should be trimmed close and insulated from transmitter housing.

4. Reattach the field terminals housing cover; cover must be fully engaged to comply with explosion proof requirements.

5. At terminations outside the transmitter housing, the cable shield drain wire should be continuously connected.

   a. Prior to the termination point, any exposed shield drain wire should be insulated as shown in Figure 4-8 (B).

6. Properly terminate the signal cable shield drain wire to an earth ground at or near the power supply.

Figure 4-8. Wiring Pair and Ground
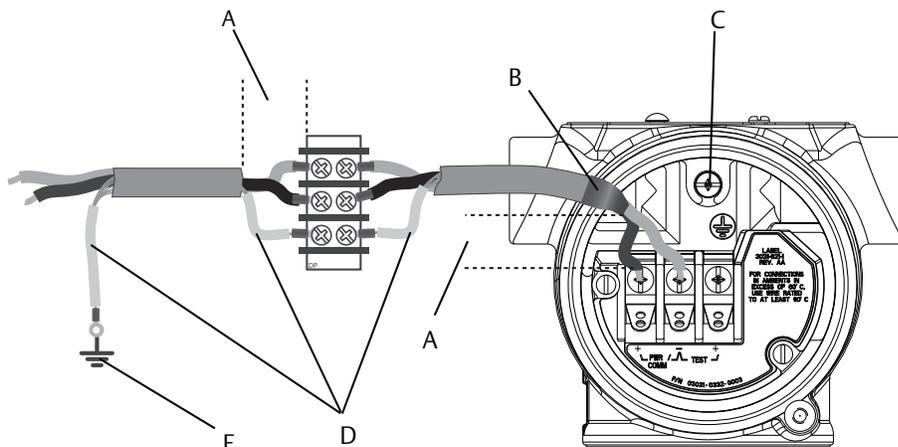
A. Minimize distance
B. Trim shield and insulate
C. Protective grounding terminal
D. Insulate shield
E. Connect shield back to the power supply

Transmitter case grounding

Always ground the transmitter case in accordance with national and local electrical codes. The most effective transmitter case grounding method is a direct connection to earth ground with minimal impedance. Methods for grounding the transmitter case include:

- Internal ground connection: the internal ground connection screw is inside the FIELD TERMINALS side of the electronics housing. This screw is identified by a ground symbol (⏚). The ground connection screw is standard on all Rosemount 2088, 2090F, 2090P transmitters. Refer to Figure 4-9 on page 50.

- External ground connection: The external ground connection is located on the exterior of the transmitter housing. Refer to Figure 4-9 on page 50. This connection is only available with option T1.

Figure 4-9. Internal Ground Connection
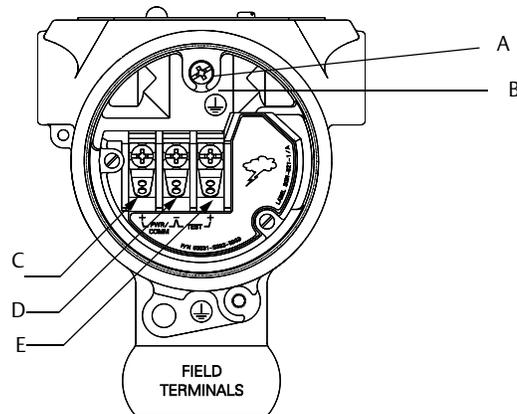
A. Internal ground location
B. External ground location
C. Positive
D. Negative
E. Test

Note
Grounding the transmitter case via threaded conduit connection may not provide sufficient ground continuity.

Transient protection terminal block grounding

The transmitter can withstand electrical transients of the energy level usually encountered in static discharges or induced switching transients. However, high-energy transients, such as those induced in wiring from nearby lightning strikes, can damage the transmitter.

The transient protection terminal block can be ordered as an installed option (Option Code T1) or as a spare part to retrofit existing Rosemount 2088, 2090F, and 2090P transmitters in the field. See "Ordering Information, Specifications, and Drawings" on page 31 for part numbers. The lightning bolt symbol shown in Figure 4-10 on page 51 identifies the transient protection terminal block.

Figure 4-10. Transient protection terminal block
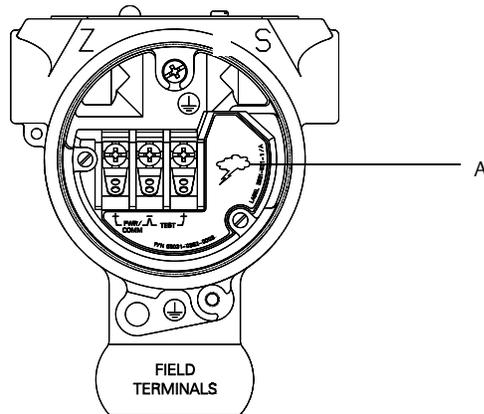
A. Lightning bolt location

Note
The transient protection terminal block does not provide transient protection unless the transmitter case is properly grounded. Use the guidelines to ground the transmitter case. Refer to Figure 4-9 on page 50.

Section 5 Operation and maintenance

5.1 Overview

This section contains information on calibrating Rosemount™ 2088 Pressure Transmitters.

Field Communicator, AMS Device Manager and Local Operator Interface (LOI) instructions are given to perform configuration functions.

5.2 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.

> **⚠ WARNING**
>
> **Explosions could result in death or serious injury.**
>
> Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Review the approvals section of the reference manual for any restrictions associated with a safe installation.
>
> - Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
>
> - In an Explosion-Proof/Flameproof installation, do not remove the transmitter covers when power is applied to the unit.
>
> **Process leaks may cause harm or result in death.**
>
> - Install and tighten process connectors before applying pressure.
> **Electrical shock can result in death or serious injury.**
>
> - Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

5.3 Recommended calibration tasks

⚠CAUTION

Absolute pressure transmitters are calibrated at the factory. Trimming adjusts the position of the factory characterization curve. It is possible to degrade performance of the transmitter if any trim is done improperly or with inaccurate equipment.

5.3.1 Field installation tasks

1. Perform sensor zero/lower trim: Compensate for mounting pressure effects

   a. Refer to Section 3.6: Rosemount 306 Manifold for manifold operation instructions to properly drain/vent valves

2. Set/check basic configuration parameters

   a. Output units
   b. Range points
   c. Output type
   d. Damping Value

5.3.2 Bench calibration tasks

1. Perform optional 4–20 mA 1–5 Vdc output trim

2. Perform a sensor trim

   a. Zero/lower trim Table 6-1 on page 66 using line pressure effect correction.Refer to Section 3: Rosemount 306 Manifold for manifold drain/vent valve operation instructions.
   b. Optional full scale trim. Sets the span of the device and requires accurate calibration equipment.
   c. Set/check basic configuration parameters.

5.4 Calibration overview

The Pressure Transmitter is an accurate instrument that is fully calibrated in the factory. Field calibration is provided to the user to meet plant requirements or industry standards. Complete calibration of the transmitter can be split into two halves: Sensor Calibration and Analog Output Calibration.

Sensor calibration allows the user to adjust the pressure (digital value) reported by the transmitter to be equal to a pressure standard. The sensor calibration can adjust the pressure offset to correct for mounting conditions or line pressure effects. This correction is recommended. The calibration of the pressure range (pressure span or gain correction) requires accurate pressure standards (sources) to provide a full calibration.

Like the Sensor calibration, the analog output can be calibrated to match the user measurement system. The Analog Output Trim (4–20 mA/ 1–5 V output trim) will calibrate the loop at the 4 mA (1 V) and 20 mA (5 V) points.

The Sensor calibration and the analog output calibration combine to match the transmitter's measurement system to the plant standard.

Calibrate the sensor

- Sensor trim (page 57)
- Zero trim (page 59)

Calibrate the 4–20 mA output

- 4–20 mA/ 1–5V Output trim (page 60)
- 4–20 mA/ 1–5V Output trim using other scale (page 61)

5.4.1   Determining necessary sensor trims

Bench calibrations allow for calibrating the instrument for its desired range of operation. Straight forward connections to pressure source allow for a full calibration at the planned operating points. Exercising the Transmitter over the desired pressure range allows for verification of the analog output. "Trim the pressure signal" on page 56 discusses how the trim operations change the calibration. It is possible to degrade the performance of the transmitter if a trim is done improperly or with inaccurate equipment. The transmitter can be set back to factory settings using the "Recall factory trim—sensor trim" on page 59.

Determine the necessary trims with the following steps.

1. Apply pressure.

2. Check digital pressure, if the digital pressure does not match the applied pressure, perform a digital trim. See "Perform a sensor trim" on page 57.

3. Check reported analog output against the live analog output. If they do not match, perform an analog output trim. See "Performing digital-to-analog trim (4–20mA/ 1–5 V output trim)" on page 60.

Trimming with configuration buttons

Local configuration buttons are external buttons located underneath the top tag of the transmitter. There are two possible sets of local configuration buttons that can be ordered with the Rosemount 2088 and used to perform trim operations: Digital zero trim and LOI. To access the buttons, loosen screw and rotate top tag until buttons are visible.

- **LOI (M4):** Can perform both digital Sensor Trim and the 4–20mA Output Trim (analog output trim). Follow the same procedures listed in trimming with Field Communicator or AMS Device Manager listed below.

- **Digital zero trim (DZ):** Used for performing a sensor zero trim. See "Determining calibration frequency" on page 56 for trim instructions.

All configuration changes should be monitored by a display or by measuring the loop output. Figure 5-1 shows the physical differences between the two sets of buttons.

Figure 5-1. Local Configuration Button Options

A
B
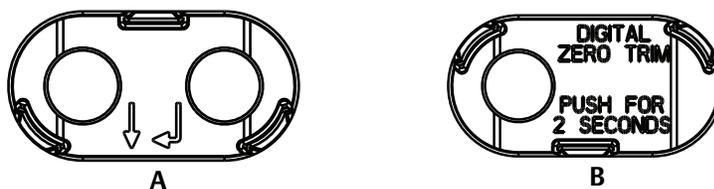
A. LOI - green retainer
B. Digital zero trim- blue retainer

5.4.2   Determining calibration frequency

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

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.

Sample calculation for Rosemount 2088

Step 1: Determine the performance required for your application.

Required Performance:	0.50% of span

Step 2: Determine the operating conditions.

Transmitter:	Rosemount 2088G, Range 1 [URL = 30 psi (2,1 bar)]
Calibrated Span:	30 psi (2,1 bar)
Ambient Temperature Change:	± 50 °F (28 °C)

Step 3: Calculate total probable error (TPE).

$$TPE = \sqrt{(ReferenceAccuracy)^2 + (TemperatureEffect)^2 + (StaticPressureEffect)^2} = 0.309\% \text{ of span}$$

Where:

Reference Accuracy =	± 0.075% of span
Ambient Temperature Effect =	± (0.15% URL + 0.15% of span) per 50 °F = ± 0.3% of span
Static Pressure Effect =	0% (does not apply to in-line products)

Step 4: Calculate the stability per month.

$$Stability = \pm \left[\frac{(0.100 \times URL)}{Span} \right] \% \text{ of span for 3 years} = \pm 0.0028\% \text{ of URL for 1 month}$$

Step 5: Calculate calibration frequency.

$$Cal. Freq. = \frac{(Req. Performance - TPE)}{Stability \text{ per Month}} = \frac{(0.5\% - 0.309\%)}{0.0028\%} = 68 \text{ months}$$

5.5   Trim the pressure signal

5.5.1   Sensor trim overview

A sensor trim corrects the pressure offset and pressure range to match a pressure standard. The upper sensor trim corrects the pressure range and the lower Sensor trim (zero trim) corrects the pressure offset. An accurate pressure standard is required for full calibration. A zero trim can be performed if the process is vented.

Zero trim is a single-point offset adjustment. It is useful for compensating for mounting position effects and is most effective when performed with the transmitter installed in its final mounting position. Since this correction maintains the slope of the characterization curve, it should not be used in place of a Sensor Trim over the full sensor range.

Note
Do not perform a zero trim on Rosemount 2088A, 2090FA, 2090PA Absolute Pressure Transmitters. Zero trim is zero based, and absolute pressure transmitters reference absolute zero. To correct mounting position effects on an Absolute Pressure Transmitter, perform a low trim within the sensor trim function. The low trim function provides an offset correction similar to the zero trim function, but it does not require zero-based input.

Upper and lower sensor trim is a two-point sensor calibration where two end-point pressures are applied, all output is linearized between them, and requires an accurate pressure source. 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 trim values help optimize performance over a specific measurement range.

Figure 5-2. Sensor trim example

A. Before trim
B. After trim
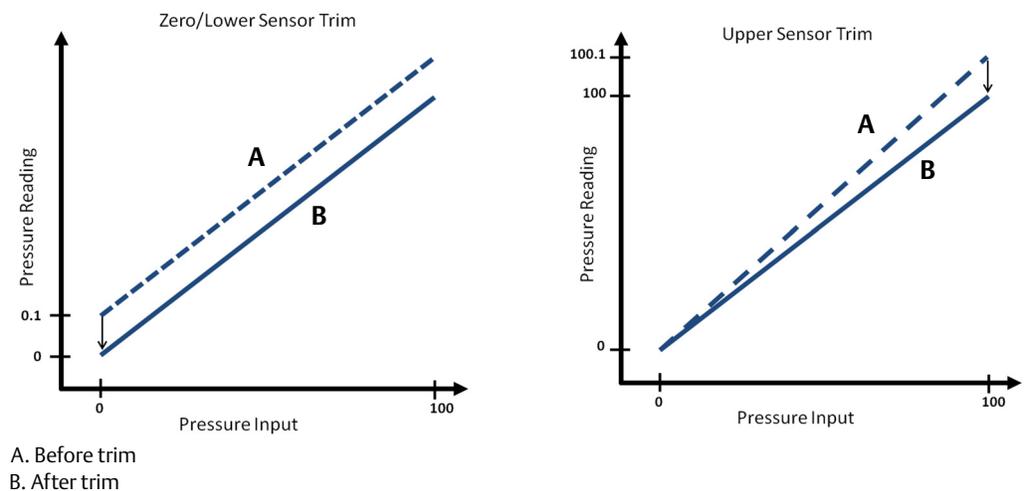
5.5.2   Perform a sensor trim

When performing a sensor trim, both the upper and lower limits can be trimmed. If both upper and lower trims are to be performed, the lower trim must be done prior to the upper time.

Note
Use a pressure input source that is at least four times more accurate than the transmitter, and allow the input pressure to stabilize for 10 seconds before entering any values.

Performing a sensor trim with a Field Communicator

From the *HOME* screen, enter the Fast Key sequence and follow the steps within the Field Communicator to complete the sensor trim.

| Device Dashboard Fast Keys | 3, 4, 1 |

To calibrate the sensor with a Field Communicator using the sensor trim function, perform the following procedure:

1. Select **2: Lower Sensor Trim**.

Note
Select pressure points so that lower and upper values are equal to or outside the expected process operation range. This can be done by going to "Rerange the transmitter" on page 13 of Section 2.

2. Follow the commands provided by the Field Communicator to complete the adjustment of the lower value.

3. Select **3: Upper Sensor Trim**.

4. Follow the commands provided by the Field Communicator to complete the adjustment of the upper value.

Performing a sensor trim with AMS Device Manager

Right select the device and, under the *Method* drop down menu, move cursor over *Calibrate* and, under *Sensor Trim*, select **Lower Sensor Trim**.

1. Follow the screen prompts to perform a Sensor Trim using AMS Device Manager.

2. If desired, right select the device and under the *Method* drop down menu, move cursor over *Calibrate* and under *Sensor Trim* and select **Upper Sensor Trim**

Performing a sensor trim using local operator interface

Perform an upper and lower Sensor trim by referencing Figure 5-3.

Figure 5-3. Sensor trim with LOI
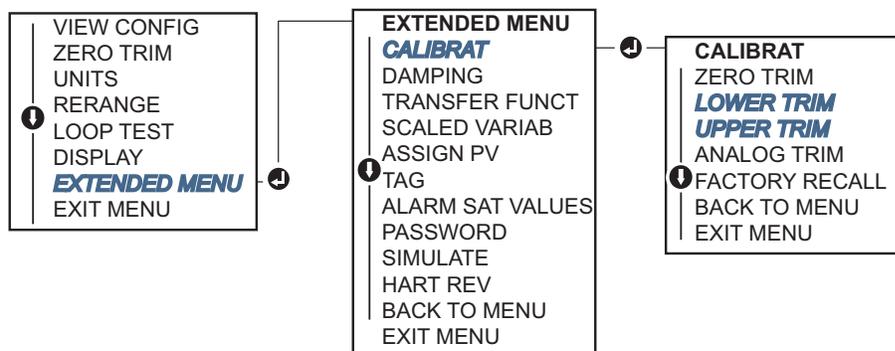
Performing a digital zero trim (option DZ)

A digital zero trim (option DZ) provides the same function as a zero/lower sensor trim, but can be completed in hazardous areas at any given time by simply pushing the zero trim button when the transmitter is at zero pressure. If the transmitter is not close enough to zero when the button is pushed, the command may fail due to excess correction. If ordered, a digital zero trim can be performed by utilizing external configuration buttons located underneath the top tag of the transmitter, see Figure 5-1 on page 55 for DZ button location.

1. Loosen the top tag of the transmitter to expose buttons.

2. Press and hold the digital zero button for at least two seconds, then release to perform a digital zero trim.

5.5.3   Recall factory trim—sensor trim

The recall factory trim-sensor trim command allows the restoration of the as-shipped factory settings of the sensor trim. This command can be useful for recovering from an inadvertent zero trim of an absolute pressure unit or inaccurate pressure source.

Recalling factory trim with a Field Communicator

From the *HOME* screen, enter the Fast Key sequence and follow the steps within the Field Communicator to complete the sensor trim.

Device Dashboard Fast Keys	3, 4, 3

Recalling factory trim with AMS Device Manager

1. Right select on the device and, under the *Method* drop down menu, move cursor over *Calibrate* and select **Restore Factory Calibration**.

2. Set the control loop to manual.

3. Select **Next**.

4. Select **Sensor Trim** under *Trim to recall* and click **Next**.

5. Follow the screen prompts to recall sensor trim.

Recalling factory trim - sensor trim using local operator interface

Refer to Figure 5-4 to recall factory sensor trim.

Figure 5-4. Recall Factory Trim - Sensor Trim With Local Operator Interface

VIEW CONFIG
ZERO TRIM
UNITS
RERANGE
LOOP TEST
DISPLAY
EXTENDED MENU
EXIT MENU

EXTENDED MENU
CALIBRAT
DAMPING
TRANSFER FUNCT
SCALED VARIAB
ASSIGN PV
TAG
ALARM SAT VALUES
PASSWORD
SIMULATE
HART REV
BACK TO MENU
EXIT MENU

CALIBRAT
ZERO TRIM
LOWER TRIM
UPPER TRIM
ANALOG TRIM
FACTORY RECALL
BACK TO MENU
EXIT MENU

FACTORY RECALL
SENSOR RECALL
ANALOG RECALL
BACK TO MENU
EXIT MENU

5.6 Trim the analog output

The Analog Output Trim commands allow you to adjust the transmitter's current output at the 4 and 20 mA (1 – 5 Vdc) points to match the plant standards. This trim is performed after the digital to analog conversion so only the 4–20 mA analog (1– 5 Vdc) signal will be affected. Figure 5-5 graphically shows the two ways the characterization curve is affected when an analog output trim is performed.

Figure 5-5. Analog Output Trim Example

4-20mA Output Trim – Zero/Lower Trim

4-20mA Output Trim – Upper Trim

A. Before trim
B. After Trim
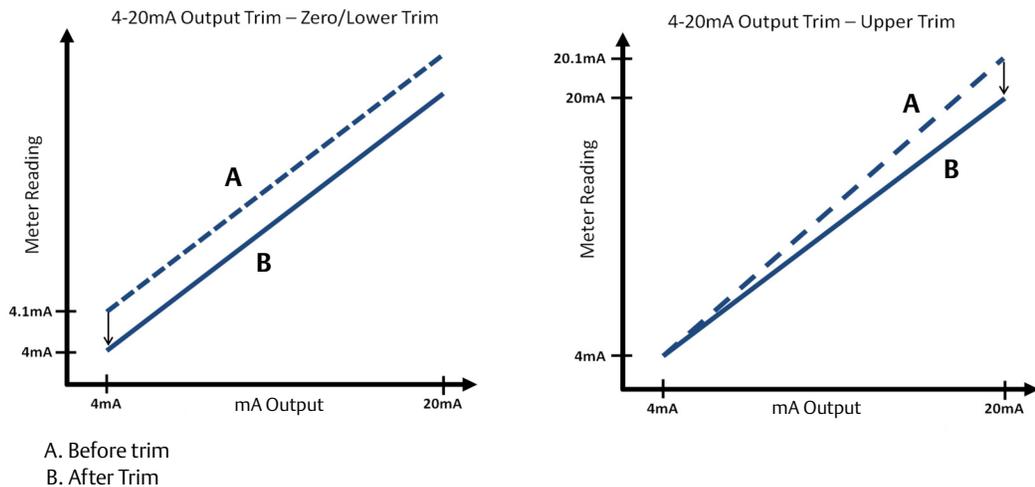
5.6.1 Performing digital-to-analog trim (4–20mA/ 1–5 V output trim)

Note
If a resistor is added to the loop, ensure that the power supply is sufficient to power the transmitter to a 20 mA output with additional loop resistance. Refer to "Power supply" on page 46.

Performing a 4–20 mA/ 1–5 V output trim with a Field Communicator

From the *HOME* screen, enter the Fast Key sequence and follow the steps within the Field Communicator to complete the 4–20 mA output trim.

| **Device Dashboard Fast Keys**	3, 4, 2, 1

⚠ Performing a 4–20 mA/ 1–5 V output trim with AMS Device Manager

Right select the device and, under the *Method* drop down menu, move cursor over *Calibrate* and select **Analog Calibration**.

1. Select **Digital to Analog Trim.**

2. Follow the screen prompts to perform a 4–20 mA output trim.

Performing 4–20 mA/ 1–5 V output trim using local operator interface

Figure 5-6. 4–20mA output trim using local operator interface
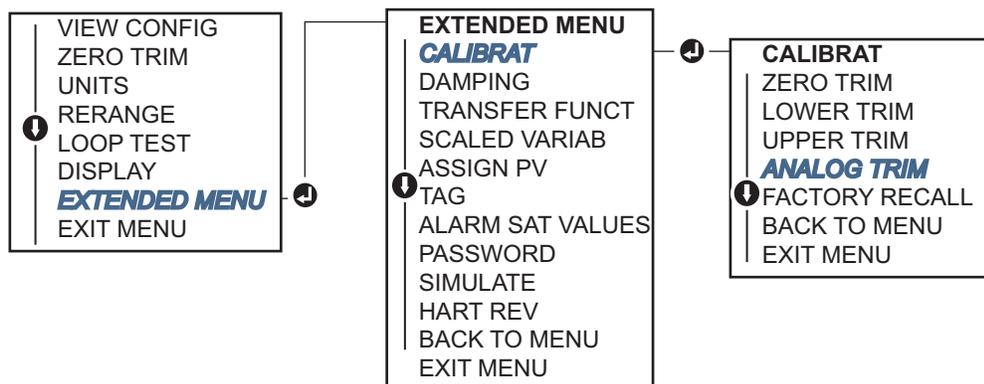
5.6.2   Performing digital-to-analog trim (4–20mA/ 1–5 V output trim) using other scale

The scaled 4–20 mA output Trim command matches the 4 and 20 mA points to a user selectable reference scale other than 4 and 20 mA [for example, 2 to 10 volts if measuring across a 500 Ω load, or 0 to 100 percent if measuring from a Distributed Control System (DCS)]. To perform a scaled 4–20 mA output trim, connect an accurate reference meter to the transmitter and trim the output signal to scale, as outlined in the output trim procedure.

Performing a 4–20/ 1–5 V mA output trim using other scale with a Field Communicator

From the *HOME* screen, enter the Fast Key sequence and follow the steps within the Field Communicator to complete the 4–20 mA output trim using other scale.

Device Dashboard Fast Keys	3, 4, 2, 2

⚠ Performing a 4–20 mA/ 1–5 V output trim using other scale with AMS Device Manager

1. Right select the device and under the *Method* drop down menu, move cursor over *Calibrate* and select **Analog Calibration**.

2. Select **Scaled Digital to Analog Trim**.

3. Follow screen prompts to perform a 4–20mA/ 1–5 V output trim.

5.6.3   Recalling factory trim—analog output

⚠ The Recall Factory Trim—Analog Output command allows the restoration of the as-shipped factory settings of the analog output trim. This command can be useful for recovering from an inadvertent trim, incorrect Plant Standard or faulty meter.

Recalling factory trim - analog output with a Field Communicator

From the *HOME* screen, enter the Fast Key sequence and follow the steps within the Field Communicator to complete the digital to analog trim using other scale.

Device Dashboard Fast Keys	3, 4, 3

Recalling factory trim - analog output with AMS Device Manager

1. Right select the device and, under the *Method* drop down menu, move cursor over *Calibrate* and select **Restore Factory Calibration**.

2. Select **Next** to set the control loop to manual.

3. Select **Analog Output Trim** under *Select trim to recall* and click **Next**.

4. Follow screen prompts to recall analog output trim.

Recalling factory trim - analog output with LOI

Reference Figure 5-7 for LOI instructions.

Figure 5-7. Recall factory Trim – Analog Output with LOI
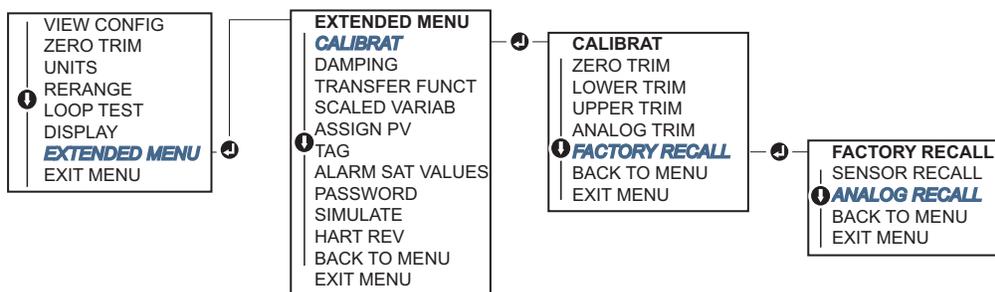
5.7 Switching HART revision

Some systems are not capable of communicating with HART® Revision 7 devices. The following procedures list how to change HART revisions between HART Revision 7 and HART Revision 5.

5.7.1 Switching HART revision with generic menu

If the HART configuration tool is not capable of communicating with a HART Revision 7 device, it should load a generic menu with limited capability. The following procedures allow for switching between HART Revision 7 and HART Revision 5 from a generic menu.

1. Locate "Message" field.
    a. To change to HART Revision 5, Enter: **HART5** in the message field.
    b. To change to HART Revision 7, Enter: **HART7** in the message field.

5.7.2 Switching HART revision with Field Communicator

From the HOME screen, enter the Fast Key sequence and follow steps within the Field Communicator to complete the HART revision change.

From the *HOME* screen, enter the Fast Key sequence	HART5	HART7
Device Dashboard Fast Keys	2, 2, 5, 2, 4	2, 2, 5, 2, 3

5.7.3 Switching HART revision with AMS Device Manager

1. Select **Manual Setup** and select **HART.**

2. Select **Change HART Revision,** then follow the on screen prompts.

Note
AMS Device Manager versions 10.5 or greater are compatible with HART Revision 7.

5.7.4   Switching HART revision with LOI

Navigate to *HART REV* within the extended menu and select either *HART REV 5* or *HART REV 7*.
Use Figure 5-8 below to change HART Revision:

Figure 5-8. Change HART Revision with LOI
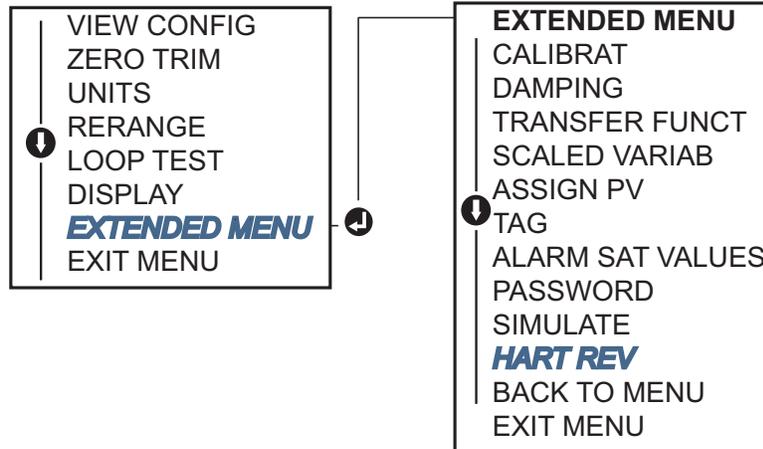
Section 6 Troubleshooting

6.1 Overview

Table 6-1 provides summarized maintenance and troubleshooting suggestions for the most common operating problems.

If you suspect malfunction despite the absence of any diagnostic messages on the Field Communicator display, consider using Section 6.3: Diagnostic messages on page 68 to identify any potential problem.

6.2 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.

⚠ WARNING

Explosions could result in death or serious injury.

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Review the approvals section of the Rosemount™ 2088, 2090F, and 2090P reference manual for any restrictions associated with a safe installation.

- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

- In an Explosion-Proof/Flameproof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks may cause harm or result in death.

- Install and tighten process connectors before applying pressure.

Electrical shock can result in death or serious injury.

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

Table 6-1. Rosemount 2088 2090F, 2090P troubleshooting table for 4–20 mA output

Symptom	Corrective actions
Transmitter milliamp reading is zero	Verify terminal voltage is 10.5 to 42.4 Vdc at signal terminals
	Check power wires for reversed polarity
	Check that power wires are connected to signal terminals
	Check for open diode across test terminal
Transmitter not communicating with Field Communicator	Verify terminal voltage is 10.5 to 42.4 Vdc
	Check loop resistance, 250 Ω minimum (PS voltage -transmitter voltage/loop current)
	Check that power wires are connected to signal terminals and not test terminals
	Verify clean DC Power to transmitter (Max AC noise 0.2 volts peak to peak)
	Verify the output is between 4 and 20 mA or saturation levels
	Have Field Communicator poll for all addresses
Transmitter milliamps reading is low or high	Verify applied pressure
	Verify 4 and 20 mA range points
	Verify output is not in alarm condition
	Perform analog trim
	Check that power wires are connected to the correct signal terminals (positive to positive, negative to negative) and not the test terminal
Transmitter will not respond to changes in applied pressure	Check impulse piping or manifold for blockage
	Verify applied pressure is between the 4 and 20 mA points
	Verify the output is not in alarm condition
	Verify transmitter is not in loop test mode
	Verify transmitter is not in multidrop mode
	Check test equipment
Digital pressure variable reading is low or high	Check impulse piping for blockage or low fill in wet leg
	Verify transmitter is calibrated properly
	Check test equipment (verify accuracy)
	Verify pressure calculations for application
Digital pressure variable reading is erratic	Check application for faulty equipment in pressure line
	Verify transmitter is not reacting directly to equipment turning on/off
	Verify damping is set properly for application
Milliamps reading is erratic	Verify power source to transmitter has adequate voltage and current
	Check for external electrical interference
	Verify transmitter is properly grounded
	Verify shield for twisted pair is only grounded at one end

Table 6-2. Rosemount 2088 troubleshooting for 1–5 Vdc output

Symptom	Corrective actions
Transmitter voltage reading is zero	Verify terminal voltage is 5.8 to 28.0 Vdc at signal terminals
	Check power wires for reversed polarity
	Check that power wires are connected to signal terminals
	Check for open diode across test terminal
Transmitter not communicating with Field Communicator	Verify terminal voltage is 5.8 to 28.0 Vdc
	Check loop resistance, 250 Ù minimum (PS voltage -transmitter voltage/loop current)
	Check that power wires are connected to signal terminals and not test terminals
	Verify clean DC Power to transmitter (Max AC noise 0.2 volts peak to peak)
	Verify the output is between 1–5 Vdc or saturation levels
	Have Field Communicator poll for all addresses
Transmitter voltage reading is low or high	Verify applied pressure
	Verify 1–5 Vdc range points
	Verify output is not in alarm condition
	Perform analog trim
	Check that power wires are connected to the correct signal terminals (positive to positive, negative to negative) and not the test terminal
Transmitter will not respond to changes in applied pressure	Check impulse piping or manifold for blockage
	Verify applied pressure is between the 1–5 Vdc points
	Verify the output is not in alarm condition
	Verify transmitter is not in loop test mode
	Verify transmitter is not in multidrop mode
	Check test equipment
Digital pressure variable reading is low or high	Check impulse piping for blockage or low fill in wet leg
	Verify transmitter is calibrated properly
	Check test equipment (verify accuracy)
	Verify pressure calculations for application
Digital pressure variable reading is erratic	Check application for faulty equipment in pressure line
	Verify transmitter is not reacting directly to equipment turning on/off
	Verify damping is set properly for application
Voltage reading is erratic	Verify power source to transmitter has adequate voltage and current
	Check for external electrical interference
	Verify transmitter is properly grounded
	Verify shield for twisted pair is only grounded at one end

6.3   Diagnostic messages

Listed in the below sections are detailed table of the possible messages that will appear on either the LCD/LOI display, a Field Communicator, or an AMS Device Manager system. Use the tables below to diagnose particular status messages.

- Good
- Failed – fix now
- Maintenance – fix soon
- Advisory

Table 6-3. Status: Failed – Fix Now

Alert name	LCD display screen	LOI screen	Problem	Recommended action
No Pressure Updates	NO P UPDATE	NO PRESS UPDATE	There are no pressure updates from the sensor to the electronics	1. Ensure the sensor cable connection to the electronics is tight. 2. Replace the transmitter.
Electronics Board Failure	FAIL BOARD	FAIL BOARD	A failure has been detected in the electronics circuit board	1. Replace the pressure transmitter.
Critical Sensor Data Error	MEMRY ERROR	MEMORY ERROR	A user written parameter does not match the expected value	1. Confirm and correct all parameters listed in Device Information. 2. Perform a Device Reset. 3. Replace Pressure Transmitter.
Critical Electronics Data Error			A user written parameter does not match the expected value	1. Confirm and correct all parameters listed in Device Information. 2. Perform a Device Reset. 3. Replace pressure transmitter.
Sensor Failure	FAIL SENSOR	FAIL SENSOR	A failure has been detected in the pressure sensor	1. Replace pressure transmitter.
Incompatible Electronics and Sensor	XMTR MSMTCH	XMTR MSMTCH	The pressure sensor is incompatible with the attached electronics	1. Replace the pressure transmitter.

Table 6-4. Status: Maintenance – Fix Soon

Alert name	LCD display screen	LOI screen	Problem	Recommended action
No Temperature Updates	NO T UPDATE	NO TEMP UPDATE	There are no temperature updates from the sensor to the electronics	1. Ensure the sensor cable connection to the electronics is tight. 2. Replace the pressure transmitter.
Pressure Out of Limits	PRES LIMITS	PRES OUT LIMITS	The pressure is either above or below the sensor limits	1. Check the transmitter pressure connection to ensure it is not plugged or the isolating diaphragms are not damaged. 2. Replace the pressure transmitter.

Alert name	LCD display screen	LOI screen	Problem	Recommended action
Sensor Temperature Beyond Limits	TEMP LIMITS	TEMP OUT LIMITS	The sensor temperature has exceeded its safe operating range	1. Check the process and ambient conditions are within −85 to 194 °F (−65 to 90 °C). 2. Replace the pressure transmitter.
Electronics Temperature Beyond Limits			The temperature of the electronics has exceeded its safe operating range.	1. Confirm electronics temperature is within limits of −85 to 194 °F (−65 to 90 °C). 2. Replace the pressure transmitter.
Electronics Board Parameter Error	MEMRY WARN (also in advisory)	MEMORY WARN (also in advisory)	A device parameter does not match the expected value. The error does not affect transmitter operation or analog output.	1. Replace the pressure transmitter.
Configuration Buttons Operator Error	STUCK BUTTON	STUCK BUTTON	Device is not responding to button presses.	1. Check configuration buttons are not stuck. 2. Replace the pressure transmitter.

Table 6-5. Status: Advisory

Alert name	LCD display screen	LOI screen	Problem	Recommended action
Non-Critical User Data Warning	MEMRY WARN	MEMORY WARN	A user written parameter does not match expected value.	1. Confirm and correct all parameters listed in Device Information. 2. Perform a Device Reset. 3. Replace the pressure transmitter.
Sensor Parameter Warning			A user written parameter does not match expected value.	1. Confirm and correct all parameters listed in Device Information. 2. Perform a Device Reset. 3. Replace pressure transmitter.
LCD Display Update Failure	[If display is not updating]	[If display is not updating]	The LCD display is not receiving updates from the pressure sensor.	1. Check the connection between the LCD display and the circuit board. 2. Replace the LCD display. 3. Replace the pressure transmitter.
Configuration Changed	[none]	[none]	A recent change has been made the device by a secondary HART® master such as a handheld device.	1. Verify that the configuration change of the device was intended and expected. 2. Clear this alert by selecting Clear Configuration Changed Status. 3. Connect a HART master such as AMS Device Manager or similar which will automatically clear it.

Alert name	LCD display screen	LOI screen	Problem	Recommended action
Analog Output Fixed	ANLOG FIXED	ANALOG FIXED	The analog output is fixed and does not represent the process measurement. This may be caused by other conditions in the device, or because the device has been set to loop test or multidrop mode.	1. Take action on any other notifications from the device. 2. If the device is in loop test, and should no longer be, disable or momentarily remove power. 3. If the device is in multidrop mode and should not be, re-enable loop current by setting the polling address to 0.
Simulation Active	[none]	[none]	The device is in simulation mode and may not be reporting actual information.	1. Verify that simulation is no longer required. 2. Disable simulation mode in service tools. 3. Perform a Device Reset.
Analog Output Saturated	ANLOG SAT	ANALOG SAT	The analog output is saturated either high or low due to the pressure either above or below the range values.	1. Check the pressure applied to ensure it is between the 4–20mA points. 2. Check the transmitter pressure connection to make sure it is not plugged or isolating diaphragms are not damaged. 3. Replace the pressure transmitter.

6.4 Disassembly procedures

⚠ Do not remove the instrument cover in explosive atmospheres when the circuit is live.

6.4.1 Removing from service

1. Follow all plant safety rules and procedures.

2. Power down device.

3. Isolate and vent the process from the transmitter before removing the transmitter from service.

4. Remove all electrical leads and disconnect conduit.

5. Remove the transmitter from the process connection.

   a. The Rosemount 2088 Transmitter is attached to the process by a single hex nut process connection. Loosen the hex nut to separate the transmitter from the process.

   b. The Rosemount 2090F Transmitter is attached to the process with a Tri Clamp or similar attachment. Remove the Tri Clamp or attachment to separate the transmitter from the process.

Note
Do not wrench on neck of transmitter. See warning in "Inline process connection" on page 37.

6. Do not scratch, puncture, or depress the isolating diaphragms.

7. Clean isolating diaphragms with a soft rag and a mild cleaning solution, and rinse with clear water.

6.4.2   Removing terminal block

Electrical connections are located on the terminal block in the compartment labeled "FIELD TERMINALS."

1. Remove the housing cover from the field terminal side.

2. Loosen the two small screws located on the assembly in the 9 and 5 o'clock positions relative to the top of the transmitter.

3. Pull the entire terminal block out to remove it.

6.4.3   Removing the LOI or LCD display

Rosemount 2088 with M4 or M5 option codes have and LOI or LCD display. The transmitter LOI/LCD display are located in the compartment opposite the terminal side. To remove and/or replace the LOI/LCD display, perform the following procedures:

1. Remove the housing cover opposite the field terminal side.

2. Loosen the two captive screws that are visible (See Figure 4-2 on page 43 for screw locations). The two screws anchor the LOI/LCD display to the electronics board and the electronics board to the housing.

    ⚠ See "Safety messages" on page 65 for complete warning

3. After the screws are loosened, pull the LOI/LCD display off of the electronics board and out of the housing. Make sure to pull directly backwards so to not bend or damage the connection pins on the electronics board.

Note
Do not attempt to pull out the electronics board from the housing as this could permanently damage the transmitter.

6.5 Reassembly procedures

6.5.1 Installing LOI/LCD Display

1. While aligning the captive screws with the respective holes on the electronics board, connect the LCD/LOI display to the electronics board by pressing down firmly.

2. Ensure that the connecting pins on the back of the LCD fully connect to the front of the electronics board.

3. Fully tighten down the captive screws

4. Replace the housing cover. The transmitter must be fully engaged to meet Explosion-Proof requirementsInstalling terminal block.

6.6 Service support

Within the United States, call the Emerson™ Instrument and Valve Response Center using the 1-800-654-RSMT (7768) toll-free number. This center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number. The center will also ask for the process material to which the product was last exposed.

For inquiries outside of the United States, contact the nearest Emerson representative for RMA instructions.

To expedite the return process outside of the United States, contact the nearest Emerson representative.

⚠ CAUTION

Individuals who handle products exposed to a hazardous substance can avoid injury if they are informed of and understand the hazard. The product being returned will require a copy of the required Safety Data Sheet (SDS) for each substance must be included with the returned goods.

5. Emerson Instrument and Valve Response Center representatives will explain the additional information and procedures necessary to return goods exposed to hazardous substances.

Appendix A   Reference data

A.1 Rosemount™ 2088 Product Certifications

To view current Rosemount 2088 Product Certifications, follow these steps:

1. Go to Emerson.com/Rosemount/2088.

2. Scroll as needed to the green menu bar and click **Documents & Drawings**.

3. Click **Manuals & Guides**.

4. Select the appropriate Quick Start Guide.

A.2 Rosemount 2090P Product Certifications

To view current Rosemount 2090P Product Certifications, follow these steps:

1. Go to Emerson.com/Rosemount/2090P.

2. Scroll as needed to the green menu bar and click **Documents & Drawings**.

3. Click **Manuals & Guides**.

4. Select the appropriate Quick Start Guide.

A.3 Rosemount 2090F Product Certifications

To view current Rosemount 2090F Product Certifications, follow these steps:

1. Go to Emerson.com/Rosemount/2090F.

2. Scroll as needed to the green menu bar and click **Documents & Drawings**.

3. Click **Manuals & Guides**.

4. Select the appropriate Quick Start Guide.

A.4 Ordering Information, Specifications, and Drawings

To view current Rosemount 2088 Product Certifications, follow these steps:

1. Go to Emerson.com/Rosemount/2088.

2. Scroll as needed to the green menu bar and click **Documents & Drawings**.

3. For installation drawings, click **Drawings & Schematics** and select the appropriate document.

4. For ordering information, specifications, and dimensional drawings, click **Data Sheets & Bulletins** and select the appropriate Product Data Sheet.

A.5 Ordering Information, Specifications, and Drawings

To view current Rosemount 2090P Product Certifications, follow these steps:

1. Go to Emerson.com/Rosemount/2090P.

2. Scroll as needed to the green menu bar and click **Documents & Drawings**.

3. For installation drawings, click **Drawings & Schematics** and select the appropriate document.

4. For ordering information, specifications, and dimensional drawings, click **Data Sheets & Bulletins** and select the appropriate Product Data Sheet.

A.6 Ordering Information, Specifications, and Drawings

To view current Rosemount 2090F Product Certifications, follow these steps:

1. Go to Emerson.com/Rosemount/2090F.

2. Scroll as needed to the green menu bar and click **Documents & Drawings**.

3. For installation drawings, click **Drawings & Schematics** and select the appropriate document.

4. For ordering information, specifications, and dimensional drawings, click **Data Sheets & Bulletins** and select the appropriate Product Data Sheet.

Appendix B   Field Communicator menu trees and Fast Keys

B.1   Field Communicator menu trees

Figure B-1. Field Communicator menu tree: overview

Note
Selections with black circle are only available in HART® Revision 7 mode. Selection will not appear in HART Revision 5 DD.

Figure B-2. Field Communicator menu tree: configure - guided setup

Device Tagging
1 Tag
2 Long Tag ●
3 Description
4 Message
5 Date

Basic Setup
1 Device Tagging
2 Units of Measure/Damping
3 Variable Mapping
4 Analog Output
5 Alarm/Saturation Values

Units of Measure/Damping
1 Units of Measure
2 Damping

Units of Measure
1 Pressure
2 Sensor Temp Units

Variable Mapping
1 Primary Variable
2 Second Variable
3 Third Variable
4 Fourth Variable

Configure Display
1 Pressure
2 Scaled Variable
3 Sensor Temperature
4 Percent of Range
5 Analog Output
6 Review Parameters at Start-up

Analog Output
1 Primary Variable
2 Upper Range Value
3 Lower Range Value

Alarm/Saturation Values
1 Alarm Direction
2 High Alarm
3 High Saturation
4 Low Saturation
5 Low Alarm
6 Config Alarm/Sat Values

Guided Setup
1 Basic Setup
2 Zero Trim
3 Configure Display
4 Scaled Variable
5 Configure Burst Mode

Scaled Variable
1 SV Data Points
2 SV Units
3 SV Transfer Function
4 SV Linear Offset
5 SV Cutoff mode
6 SV Low Cutoff
7 Scaled Variable

Home
1 Overview
2 Configure
3 Service Tools

Configure
1 Guided Setup
2 Manual Setup
3 Alert Setup

Message 1 Variables
1 First and Trigger Variable
2 Second Variable
3 Third Variable
4 Fourth Variable

Configure Burst Mode
1 Burst Message 1
2 Message 1 Content
3 Message 1 Variables

Note
Selections with black circle are only available in HART Revision 7 mode. Selection will not appear in HART Revision 5 DD.

Figure B-3. Field Communicator menu tree: configure - manual setup

Home
1 Overview
2 Configure
3 Service Tools

Configure
1 Guided Setup
2 Manual Setup
3 Alert Setup

Manual Setup
1 Process Variables
2 Analog Output
3 Scaled Variable
4 Display
5 HART
6 Security
7 Device Information

Process Variables
1 Pressure Setup
2 Sensor Temperature Setup

Pressure Setup
1 Pressure
2 Upper Range Value
3 Lower Range Value
4 Pressure Units
5 Damping
6 AO Transfer Function

Sensor Temperature Setup
1 Sensor Temperature
2 Sensor Temp Units

Analog Output
1 Set Range Points
2 Range by Applying Pressure
3 Sensor Limits
4 Readings
5 Alarm/Saturation Levels

Set Range Points
1 Primary Variable
2 Upper Range Value
3 Lower Range Value

Sensor Limits
1 PV Upper Limit
2 PV Lower Limit
3 PV Minimum Span

Readings
1 Analog Output
2 Percent of Range

Alarm/Saturation Levels
1 Alarm Direction
2 High Alarm
3 High Saturation
4 Low Saturation
5 Low Alarm
6 Config Alarm/Set Levels

Scaled Variable
1 SV Data Points
2 SV Units
3 SV Transfer Function
4 SV Linear Offset
5 SV Cutoff mode
6 SV Low Cutoff
7 Scaled Variable

Variable Mapping
1 Primary Variable
2 Second Variable
3 Third Variable
4 Fourth Variable

Communication Settings
1 Polling Address
2 Change Polling Address ●
3 Universal Revision
4 Change HART Revision

Display
1 Pressure
2 Scaled Variable
3 Sensor Temperature
4 Percent of Range
5 Analog Output
6 Review Parameters at Start-up

Burst Mode Configuration
1 Burst Message 1
2 Message 1 Content
3 Message 1 Variable
4 Configure Additional Messages ●

Message 1 Variable
1 First and Trigger Variable
2 Second Variable
3 Third Variable
4 Fourth Variable

HART
1 Variable Mapping
2 Communication Settings
3 Burst Mode Configuration

HART Lock
1 Lock Status
2 Lock/Unlock

LOI Password
1 Password Protection
2 Configure Password

Security
1 Security Switch Status
2 External Buttons
3 Configuration Buttons
4 HART Lock ●
5 LOI Password Protection

Identification
1 Tag
2 Long Tag ●
3 Model
4 Serial Number
5 Date
6 Description
7 Message
8 Model Numbers
9 Manufacturer

Model Numbers
1 Model Number 1
2 Model Number 2
3 Model Number 3

Device Information
1 Indentification
2 Revision Numbers
3 Sensor Module Info
4 Flange Info
5 Remote Seal Info

Revision Numbers
1 Universal Revision
2 Device Revision
3 Software Revision
4 Hardware Revision
5 Device Driver Revision

Sensor Module Info
1 Configuration
2 Measurement Type
3 Sensor Range
4 Upper Limit
5 Lower Limit
6 Isolator Material
7 Fill Fluid

Flange Info
1 Process Connection
2 Process Connection Material
3 O-ring Material
4 Drain/Vent Material

Remote Seal Info
1 Num of Remote Seals
2 Seal Type
3 Fill Fluid
4 Diaphragm Material

Note
Selections with black circle are only available in HART Revision 7 mode. Selection will not appear in HART Revision 5 DD.

Figure B-4. Field Communicator menu tree: configure - alert setup

```
┌─────────────────┐
│ Home            │
│ 1 Overview      │──┐
│ 2 Configure     │  │   ┌─────────────────┐
│ 3 Service Tools │  └───│ Configure       │
└─────────────────┘      │ 1 Guided Setup  │
                         │ 2 Manual Setup  │
                         │ 3 Alert Setup   │──┐
                         └─────────────────┘  │
                                              │
       ┌──────────────────────────────────────┘
       │
       │  ┌─────────────────────────┐
       └──│ Alert Setup             │
          │ Alarm/Saturation Levels │──┐
          │                         │  │
          │                         │  │
          └─────────────────────────┘  │
                                       │
                ┌───────────────────────┘
                │
                │  ┌──────────────────────────┐
                └──│ Alarm/Saturation Levels  │
                   │ 1 Alarm Direction        │
                   │ 2 High Alarm             │
                   │ 3 High Saturation        │
                   │ 4 Low Saturation         │
                   │ 5 Low Alarm              │
                   │ 6 Config Alarm/Sat Levels│
                   └──────────────────────────┘
```

Figure B-5. Field Communicator menu tree - service tools

Note
Selections with black circle are only available in HART Revision 7 mode. Selection will not appear in HART Revision 5 DD.

B.2 Field communicator Fast Keys

- A (✓) indicates the basic configuration parameters. At minimum these parameters should be verified as a part of configuration and startup.
- A (7) indicates availability only in HART revision 7 mode.

Table B-1. Device revision 9 and 10 (HART 7), DD revision 1 Fast Key sequence

	Function	Fast Key sequence	
		HART 7	HART 5
✓	Alarm and Saturation Levels	2, 2, 2, 5	2, 2, 2, 5
✓	Damping	2, 2, 1, 1, 5	2, 2, 1, 1, 5
✓	Primary Variable	2, 2, 5, 1, 1	2, 2, 5, 1, 1

Table B-1. Device revision 9 and 10 (HART 7), DD revision 1 Fast Key sequence

	Function	Fast Key sequence	
		HART 7	HART 5
✓	Range Values	2, 2, 2, 1	2, 2, 2, 1
✓	Tag	2, 2, 7, 1, 1	2, 2, 7, 1, 1
✓	Transfer Function	2, 2, 1, 1, 6	2, 2, 1, 1, 6
✓	Pressure Units	2, 2, 1, 1, 4	2, 2, 1, 1, 4
	Date	2, 2, 7, 1, 5	2, 2, 7, 1, 4
	Descriptor	2, 2, 7, 1, 6	2, 2, 7, 1, 5
	Digital to Analog Trim (4 - 20 mA / 1-5 V Output)	3, 4, 2, 1	3, 4, 2, 1
	Digital Zero Trim	3, 4, 1, 3	3, 4, 1, 3
	Display Configuration	2, 2, 4	2, 2, 4
	LOI Password Protection	2, 2, 6, 5	2, 2, 6, 4
	Loop Test	3, 5, 1	3, 5, 1
	Lower Sensor Trim	3, 4, 1, 2	3, 4, 1, 2
	Message	2, 2, 7, 1, 7	2, 2, 7, 1, 6
	Pressure Trend	3, 3, 1	3, 3, 1
	Rerange with Keypad	2, 2, 2, 1	2, 2, 2, 1
	Scaled D/A Trim (4 - 20 mA / 1-5 V) Output)	3, 4, 2, 2	3, 4, 2, 2
	Scaled Variable	2, 2, 3	2, 2, 3
	Sensor Temperature Trend	3, 3, 3	3, 3, 3
	Switch HART Revision	2, 2, 5, 2, 4	2, 2, 5, 2, 3
	Upper Sensor Trim	3, 4, 1, 1	3, 4, 1, 1
7	Long Tag	2, 2, 7, 1, 2	
7	Locate Device	3, 4, 5	
7	Simulate Digital Signal	3, 5	

Appendix C   Local Operator Interface

C.1   LOI menu tree

```
LOI MENU
  VIEW CONFIG
  ZERO TRIM
  UNITS
  RERANGE
  LOOP TEST
  DISPLAY
  EXTENDED MENU
  EXIT MENU

UNITS
  PRESSURE UNITS
  TEMP UNITS
  BACK TO MENU
  EXIT MENU

RERANGE
  ENTER VALUES
  APPLY VALUES
  BACK TO MENU
  EXIT MENU

LOOP TEST
  SET 4MA
  SET 20MA
  SET CUSTOM
  END LOOP TEST
  BACK TO MENU
  EXIT MENU

DISPLAY
  PRESS (on/off)
  SCALED (on/off)
  TEMP (on/off)
  RANGE % (on/off)
  STARTUP (on/off)
  BACK TO MENU
  EXIT MENU

EXTENDED MENU
  CALIBRAT
  DAMPING
  TRANSFER FUNCT
  SCALED VARIAB
  ASSIGN PV
  TAG
  ALARM SAT VALUES
  PASSWORD
  SIMULATE
  HART REV
  BACK TO MENU
  EXIT MENU

VIEW CONFIG
  TAG
  PV
  PRESS UNITS
  TEMP UNITS
  URV
  LRV
  TRANSFER FUNCTION
  DAMPING
  HIALARM
  LOALARM
  HISAT
  LOSAT
  ALARM
  SECURITY
  BACK TO MENU
  EXIT MENU

ENTER VALUES
  LRV
  URV
  BACK TO MENU
  EXIT MENU

APPLY VALUES
  LRV
  URV
  BACK TO MENU
  EXIT MENU
```

C.2   LOI menu tree - extended menu

CALIBRAT
| ZERO TRIM
| LOWER TRIM
| UPPER TRIM
| ANALOG TRIM
⬇ FACTORY RECALL
| BACK TO MENU
| EXIT MENU

FACTORY RECALL
| SENSOR RECALL
⬇ ANALOG RECALL
| BACK TO MENU
| EXIT MENU

EXTENDED MENU
| CALIBRAT
| DAMPING
| TRANSFER FUNCT
| SCALED VARIAB
| ASSIGN PV
⬇ TAG
| ALARM SAT VALUES
| PASSWORD
| SIMULATE
| HART REV
| BACK TO MENU
| EXIT MENU

TRANSFER FUNCT
| LINEAR TRANSFER FUNCTION
| SQR ROOT TRANSFER FUNCTION
⬇ BACK TO MENU
| EXIT MENU

SCALED VARIAB
| VIEW SCALED
⬇ CONFIG SCALED
| BACK TO MENU
| EXIT MENU

ASSIGN PV
| PRESSURE SET PV
| SCALED SET PV
⬇ BACK TO MENU
| EXIT MENU

ALARM SAT VALUES
| ROSEMOUNT VALUES
| NAMUR VALUES
⬇ OTHER VALUES
| BACK TO MENU
| EXIT MENU

OTHER VALUES
| HIGH ALARM
| LOW ALARM
⬇ HIGH SATURATION
| LOW SATURATION
| BACK TO MENU
| EXIT MENU

PASSWORD
| ENABLE PASSWORD
| CHANGE PASSWORD
⬇ BACK TO MENU
| EXIT MENU

SIMULATE
| SIMULATE PRESS
| SIMULATE TEMP
⬇ SIMULATE SCALED
| END SIMUL
| BACK TO MENU
| EXIT MENU

HART REV
| HART7 REV
| HART5 REV
⬇ BACK TO MENU
| EXIT MENU

C.3   Number entry

Floating-point numbers can be entered with the LOI. All eight number locations on the top line can be used for number entry. Refer to Table 2-3 on page 11 for LOI button operation. Below is a floating-point number entry example for changing a value of "-0000022" to "000011.2".

Step	Instruction	Current position (indicated by underline)
1	When the number entry begins, the left most position is the selected position. In this example, the negative symbol, "-", will be flashing on the screen.	<u>-</u>0000022
2	Press the scroll button until the "0" is blinking on the screen in the selected position.	<u>0</u>0000022
3	Press the enter button to select the "0" as an entry. The second digit from the left will be blinking.	0<u>0</u>000022
4	Press the enter button to select "0" for second digit. The third digit from the left will be blinking.	00<u>0</u>00022
5	Press the enter button to select "0" for the third digit. The fourth digit from the left will now be blinking.	000<u>0</u>0022
6	Press the enter button to select "0" for the fourth digit. The fifth digit from the left will now be blinking.	0000<u>0</u>022
7	Press scroll to navigate through the numbers until the "1" is on the screen.	00001<u>0</u>22
8	Press the enter button to select the "1" for the fifth digit. The sixth digit from the left will now be blinking.	00001<u>0</u>22
9	Press scroll to navigate through the numbers until the "1", is on the screen.	00001<u>1</u>22
10	Press the enter button to select the "1" for the sixth digit. The seventh digit from the left will now be blinking.	000011<u>2</u>2
11	Press scroll to navigate through the numbers until the decimal, ".", is on the screen.	000011<u>.</u>2
12	Press the enter button to select the decimal, ".", for the seventh digit. After pressing enter, all digits to the right of the decimal will now be zero. The eighth digit from the left will now be blinking.	000011.<u>0</u>
13	Press the scroll button to navigate through the numbers until the "2", is on the screen.	000011.<u>2</u>
14	Press the enter button to select the "2" for the eighth digit. The number entry will be complete and a "SAVE" screen will be shown.	000011.2

Usage notes:

- It is possible to move backwards in the number by scrolling to the left arrow symbol and pressing enter.
- The negative symbol is only allowed in the left most position.
- Numbers can be entered in scientific notation by placing an "E" in the 7th position.

C.4   Text entry

1. Text can be entered with the LOI. Depending on the edited item, up to eight locations on the top line can be used for text entry. Text entry follows the same rules as the number entry rules in "LOI menu tree" on page 119, except the following characters are available in all locations: A-Z, 0-9, -, /, space.

Usage note:

If the current text contains a character the LOI cannot display, it will be shown as an asterisk "*".

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