Reference Manual
00809-0100-4102, Rev AB
December 2023

Rosemount™ 2051 Wireless Pressure Transmitter

Pressure, Level, and Flow Solutions with *Wireless*HART® Protocol

ROSEMOUNT™

EMERSON™

Safety messages

⚠ WARNING

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

⚠ 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 Quick Start Guide for any restrictions associated with a safe installation.

Before connecting a HART®-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

⚠ WARNING

Process leaks could result in death or serious injury.

To avoid process leaks, only use the O-ring designed to seal with the corresponding flange adapter.

⚠ WARNING

Electrical shock could cause death or serious injury.

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

⚠ WARNING

Physical access

Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end users' equipment. This could be intentional or unintentional and needs to be protected against.

Physical security is an important part of any security program and fundamental in protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This is true for all systems used within the facility.

⚠ CAUTION

Using the transmitter in a manner other than what is specified by the manufacturer may impair the protection provided by the equipment.

NOTICE

This device complies with Part 15 of the Federal Communication Commission (FCC) Rules. Operation is subject to the following conditions:

This device must accept any interference received, including interference that may cause undesired operation.

This device must be installed to ensure a minimum antenna separation distance of 8 in. (20 cm) from all persons.

NOTICE

Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

The products described in this document are NOT designed for nuclear-qualified applications. This device may not cause harmful interference.

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

NOTICE

The Rosemount 2051 Wireless and all other wireless devices should be installed only after the Smart Wireless Gateway has been installed and is functioning properly. Wireless devices should also be powered up in order of proximity from the Smart Wireless Gateway, beginning with the closest. This will result in a simpler and faster network installation.

NOTICE

Shipping considerations for wireless products (lithium batteries: green power module, model number 701PGNKF):

Emerson shipped the device to you without the power module installed. Please remove the power module from the device prior to shipping.

Each power module contains one “D” size primary lithium-thionyl chloride battery. Primary lithium batteries are regulated in transportation by the US Department of Transportation, and are also covered by IATA (International Air Transport Association), ICAO (International Civil Aviation Organization), and ARD (European Ground Transportation of Dangerous Goods). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Please consult current regulations and requirements before shipping.

NOTICE

The power module with the wireless unit contains one “D” size primary lithium-thionyl chloride battery (Green Power Module, model number 701PGNKF). Each battery contains approximately 0.2 oz. (5.0 g) of lithium. Under normal conditions, the battery materials are self-contained and are not reactive as long as the battery and the pack integrity are maintained. Care should be taken to prevent thermal, electrical, or mechanical damage. Contacts should be protected to prevent premature discharge. Battery hazards remain when cells are discharged.

Store power modules in a clean and dry area.. For maximum battery life, storage temperature should not exceed 86 °F (30 °C).

You may replace the power module in a hazardous area. The power module has surface resistivity greater than one gigaohm and must be properly installed in the wireless device enclosure. Take care during transportation to and from the point of installation to prevent electrostatic charge build-up.

Contents

1 Introduction

1.1 Models covered

The following Rosemount 2051 Transmitters are covered by this manual:

- Rosemount 2051C Coplanar™ Pressure Transmitter
  - Measures differential and gauge pressure up to 2000 psi (137.9 bar).
  - Measures absolute pressure up to 4000 psi (275.8 bar).
- Rosemount 2051T In-Line Pressure Transmitter
  - Measures gauge/absolute pressure up to 10,000 psi (689.5 bar).
- Rosemount 2051L Level Transmitter
  - Measures level and specific gravity up to 300 psi (20.7 bar).
- Rosemount 2051CF Series Flow Meter
  - Measures flow in line sizes from ½-in. (15 mm) to 96 in. (2400 mm).

1.2 Transmitter overview

The Rosemount 2051C Coplanar™ design is offered for differential pressure (DP), gauge pressure (GP), and absolute pressure (AP) measurements.

The 2051C uses capacitance sensor technology for DP and GP measurements. The 2051T and 2051CA use piezo-resistive sensor technology for AP and GP measurements.

The major components of the 2051 Wireless Transmitter are the sensor module and the electronics housing. The sensor module contains the oil filled sensor system (isolating diaphragms, 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 antenna, and the battery. The basic block diagram of the 2051CD Wireless device is illustrated in Figure 1-2.

For the 2051, pressure is applied to the isolating diaphragm(s). 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 module. The microprocessor then takes the signals from the signal processing module and calculates the correct output of the transmitter. This signal is then sent via wireless communication to the Gateway.

An optional LCD display can be ordered that connects directly to the output electronics board, which maintains direct access to the signal terminals. The display indicates output and abbreviated diagnostic messages. A clear display cover is provided. For *Wireless*HART® output, the LCD display features a three-line display. The first line describes the process variable measured, the second line displays the measured value, and the third line displays engineering units. The LCD display can also display diagnostics messages.

Note
The LCD display uses a three-line, seven-digit character display and can display output and diagnostic messages. See Figure 1-1.

Figure 1-1: LCD display

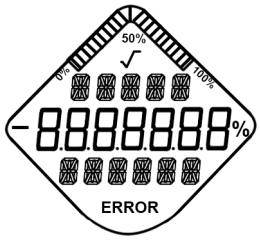
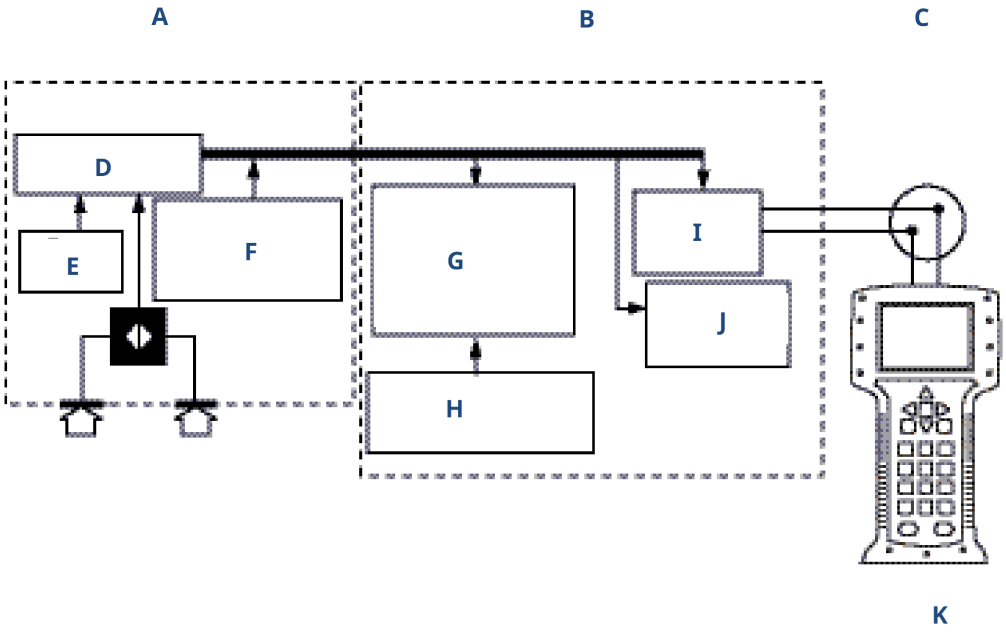


Figure 1-2: Block diagram of operation



A. Sensor module
B. Electronics board
C. WirelessHART signal to control system
D. Signal processing
E. Temperature sensor
F. Sensor module memory
G. Microprocessor
- *Sensor linearization*
- *Rerange*
- *Diagnostics*
- *Engineering units*
- *Communication*

H. Memory
- *Configuration*

I. Local HART handheld communicator
J. WirelessHART communication
K. Communication device

1.3 Product recycling/disposal

Consider recycling equipment and packaging and dispose of them in accordance with local and national legislation/regulations.

2 Configuration

2.1 Overview

This section contains information on commissioning and tasks that should be performed on the bench prior to installation.

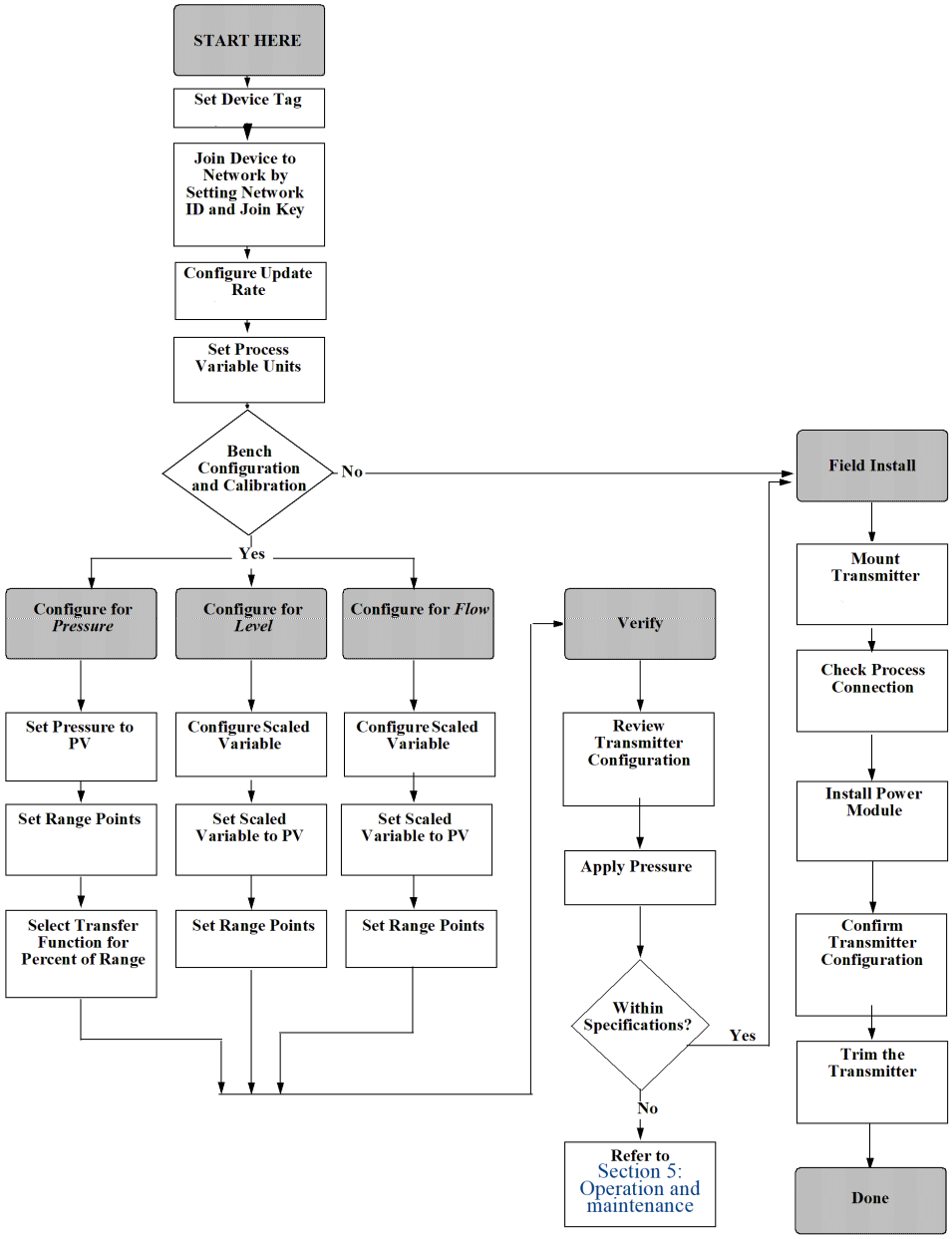
Communication device and AMS Device Manager instructions are given to perform configuration functions. For convenience, communication device fast key sequences are labeled “Fast Keys” for each software function below the appropriate headings.

Related information

Communication device menu trees

2.2 *Wireless*HART® installation flowchart

Figure 2-1: *Wireless*HART installation flowchart



2.3 Required bench top configuration

Bench top configuration requires a communication device or AMS.

Connect the communication device leads to the terminals labeled COMM on the power module. See Figure 2-2.

Bench top configuration consists of testing the transmitter and verifying transmitter configuration data. Rosemount 2051 Wireless Transmitters must be configured before installation. Configuring the transmitter on the bench before installation using a communication device or AMS ensures that all network settings are working correctly.

When using a communication device, use the **Send** key (**F2**) to send configuration changes to the transmitter. If using AMS, click the **Apply** button to send configuration changes to the transmitter.

AMS Wireless Configurator

AMS is capable of connecting to devices either directly, using a HART modem, or wirelessly via the Smart Wireless Gateway. When configuring the device, double click the device icon or right click and select **Configure**.

2.3.1 Connection diagrams

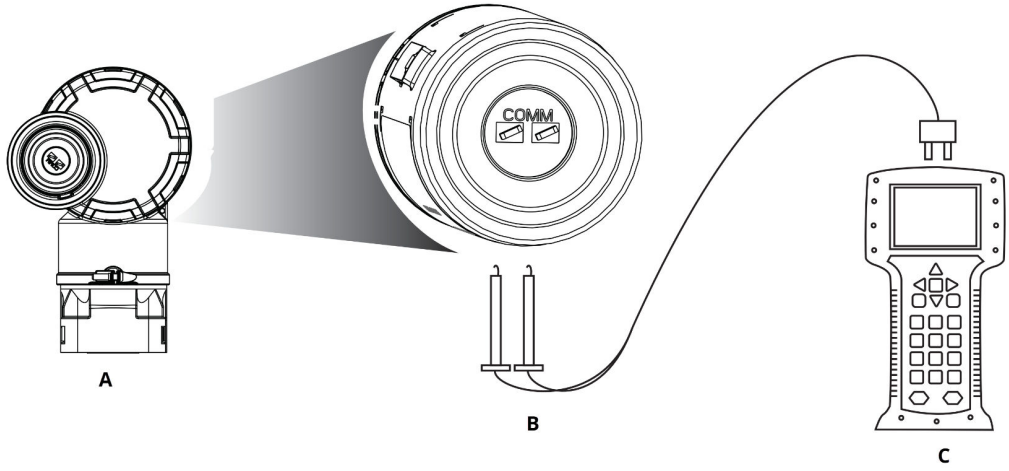
Bench hook-up

Connect the bench equipment as shown in Figure 2-2 and turn on the communication device by pressing the **ON/OFF** key or log into AMS. The communication device or AMS will search for a HART®-compatible device and indicate when the connection is made. If the communication device or AMS fail to connect, it indicates that no device was found. If this occurs, refer to Troubleshooting .

Field hook-up

Figure 2-2 illustrates the wiring for a field hook-up with a communication device or AMS. The communication device or AMS may be connected at COMM on the transmitter power module.

Figure 2-2: Communication device connection



A. Transmitter
B. HART communication terminal
C. Communication device

For HART communication, a Rosemount 2051 *Wireless*HART device driver (DD) is required.

2.4 Basic setup

2.4.1 Set tag

The tag is used to identify the device. You can use an 8 to 32-character tag.

Fast keys 2, 2, 9, 1, 1

Procedure

1. From the ***HOME*** screen, select **2: Configure**.
2. Select **2: Manual Setup**.
3. Select **9: Device Information**.
4. Select **1: Identification**.
5. Select **1: Tag**.

2.4.2 Join device to network

To communicate with the Smart Wireless Gateway, and ultimately the Host System, the transmitter must be configured to communicate over the wireless network.

Fast keys 2, 1, 3

Procedure

1. From the ***Home*** screen, select **2: Configure**.
2. Select **1: Guided Setup**.
3. Select **3: Join Device to Network**.
4. Using a communication device or AMS, enter the **Network ID** and **Join Key**.

NOTICE

If the **Network ID** and **Join Key** are not identical to those set in the Gateway, the transmitter will not communicate with the network.

When entering the Network ID and Join Key, use the same Network ID and Join Key as the Smart Wireless Gateway and other devices in the network. You can obtain the **Network ID** and **Join Key** from the Smart Wireless Gateway on the **Setup** → **Network** → **Settings** page on the web server.

2.4.3 Configure update rate

The **Update Rate** is the frequency at which a new measurement is taken and transmitted over the wireless network. By default, this is one minute. You can change this at commissioning or at any time via AMS Wireless Configurator. The **Update Rate** is user selectable from `1 second` to `60 minutes`.

Fast keys 2, 1, 4

Procedure

1. From the ***Home*** screen, select **2: Configure**.
2. Select **1: Guided Setup**.

3. Select **4: Configure Update Rate**.

2.4.4 Set process variable units

The **PV Unit** command sets the process variable units to allow you to monitor your process using the appropriate units of measure.

Fast keys 2, 2, 2, 3

To select a unit of measure for the PV:

Procedure

1. From the ***Home*** screen, select **2: Configure**.
2. Select **2: Manual Setup**.
3. Select **2: Pressure**.
4. Select **3: Unit** to select from the following engineering units:

- inH_2O at 4 °C
- inH_2O at 60 °F
- inH_2O at 68 °F
- ftH_2O at 4 °C
- ftH_2O at 60 °F
- ftH_2O at 68 °F
- mmH_2O at 4 °C
- mmH_2O at 68 °F
- cmH_2O at 4 °C
- mH_2O at 4 °C
- inHg at 0 °C
- mmHg at 0 °C
- cmHg at 0 °C
- mHg at 0 °C
- mmHg
- Psi
- Atm
- Torr
- Pascals
- hectoPascals
- Kilopascals
- Mpa
- Bar
- Mbar
- g/cm^2
- kg/cm^2
- kg/m^2

2.4.5 Remove power module

After configuring the sensor and network, remove the power module and replace the housing cover.

Only insert the power module when you are ready to commission the device.

NOTICE

The power module may be damaged if dropped from heights in excess of 20 ft. (6.1 m).

Use caution when handling the power module.

2.5 Configuring for pressure

2.5.1 Remapping device variables

The remapping function allows the transmitter primary, secondary, tertiary, and quaternary variables (PV, SV, TV, and QV) to be configured in one of two configurations.

You may select either the option of `Classic Mapping` or `Scaled Variable Mapping`. See Table 2-1 for what is mapped to each variable. You can remap all variables with a communication device or AMS Device Manager.

Table 2-1: Variable mapping

	Classic Mapping	Scaled Variable Mapping
PV	Pressure	Scaled Variable
SV	Sensor Temperature	Pressure
TV	Electronics Temperature	Sensor Temperature
QV	Supply Voltage	Supply Voltage

Note
The variable assigned to the primary variable drives the output. This value can be selected as Pressure or Scaled Variable.

Remap using a communication device

Procedure

From the ***HOME*** screen, enter the fast key sequence:

Fast keys 2, 2, 6, 1

Remap using AMS Device Manager

Procedure

1. Right click on the device and select **Configure**.
2. Select **Manual Setup** and click the ***HART*** tab.
3. Assign primary, secondary, tertiary, and quaternary variables under ***Variable Mapping***.
4. Click **Send**.
5. Carefully read the warning and click **Yes** if it is safe to apply the changes.

2.5.2 Set range points

The **Range Values** command sets the lower and upper range values used for the percent of range measurement.

From the ***HOME*** screen, enter the fast key sequence:

Fast keys 2, 1, 1, 5

Note
Rosemount ships transmitters fully calibrated per request or by the factory default of full scale (span = upper range limit).

Procedure

1. From the ***Home*** screen, select **2: Configure**.
2. Select **1: Guided Setup**.
3. Select **1: Basic Setup**.
4. Select **5: Range Values**.

2.5.3 Setting transmitter percent of range (transfer function)

The Rosemount 2051 Wireless Transmitter has two transfer functions for pressure applications: **Linear** and **Square Root**.

As shown in Figure 2-3, activating the **Square Root** option makes the transmitter analog output proportional to flow.

However, for differential pressure (DP) flow and DP level applications, Emerson recommends using **Scaled Variable**.

From 0 to 0.6 percent of the ranged pressure input, the slope of the curve is unit y (y = x). This allows accurate calibration near zero. Greater slopes would cause large changes in output (for small changes at input). From 0.6 percent to 0.8 percent, curve slope equals 42 (y = 42x) to achieve continuous transition from linear to square root at the transition point.

Set transmitter output using a communication device

Procedure

From the ***Home*** screen, enter the fast key sequence:

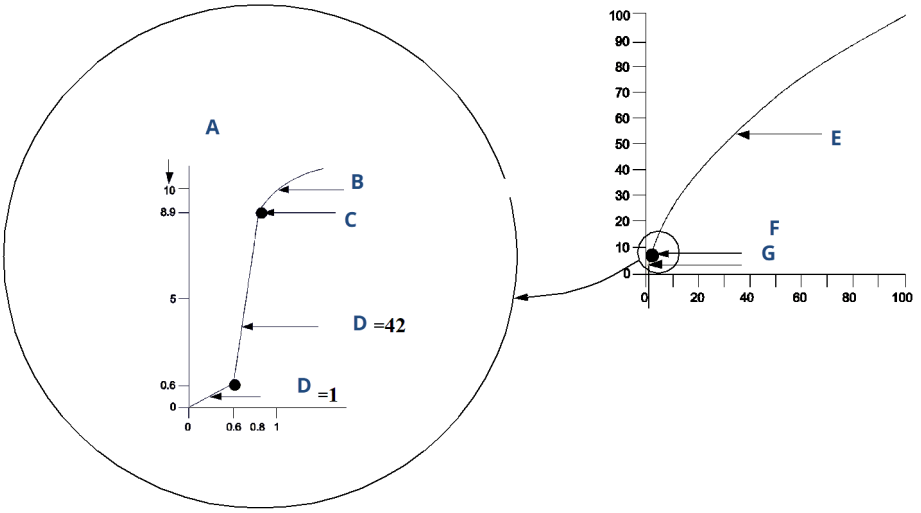
Fast keys 2, 2, 4, 2

Set transmitter output using AMS Device Manager

Procedure

1. Right click on the device and select **Configure**.
2. Click **Manual Setup**, select output type from **Transfer Function**, and click **Send**.
3. Carefully read the warning and click **Yes** if it is safe to apply the changes.

Figure 2-3: Square Root output transition point



A. Full scale flow (percent)
B. Square root curve
C. Transition point
D. Slope
E. Square root curve
F. Transition point
G. Linear section

2.6 Configuring for level and flow

2.6.1 Configuring Scaled Variable

The **Scaled Variable** configuration allows you to create a relationship/conversion between the pressure units and user-defined/custom units.

There are two use cases for **Scaled Variable**. The first is to allow custom units to be displayed on the transmitter's LCD display. The second is to allow custom units to drive the transmitter's primary variable PV output.

If you want custom units to drive the PV output, remap the **Scaled Variable** as the primary variable. Refer to Remapping device variables.

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: • Linear • Square Root
Pressure value position 1	Lower known value point with consideration of linear offset
Scaled Variable value position 1	Common 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 affecting the desired pressure reading
Low Flow Cutoff	Point at which output is driven to zero to prevent problems caused by process noise. Emerson highly recommends using the Low Flow Cutoff function in order to have a stable output and avoid problems due to process noise at a low flow or no flow condition. Enter a Low Flow Cutoff value that is practical for the flow element in the application.

Configure Scaled Variable using a communication device

From the ***Home*** screen, enter the fast key sequence:

Fast keys	2, 1, 7

Procedure

Follow the screen prompts to configure **Scaled Variable**.

- When configuring for level, select **Linear** under **Select Scaled data options**.
- When configuring for flow, select **Square Root** under **Select Scaled data options**.

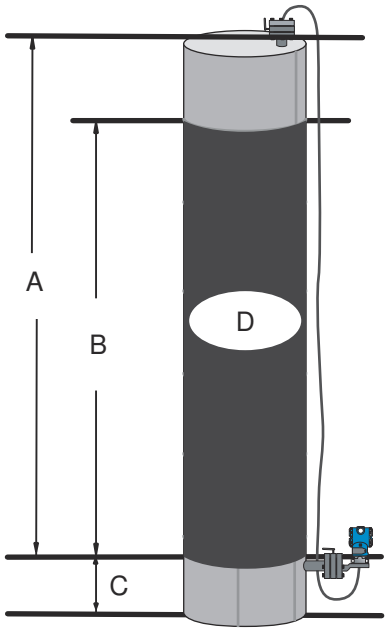
Configure Scaled Variable using AMS Device Manager

Procedure

1. Right click on the device and select **Configure**.
2. Select the ***Scaled Variable*** tab and click the **Scaled Variable** button.
3. Follow screen prompts to configure Scaled Variable.
   - When configuring for level applications, select **Linear** under **Select Scaled data options**.
   - When configuring for flow applications, select **Square Root** under Select **Scaled data options**.

DP level example

Figure 2-4: Example tank



A. 230 in. (5842 mm)
B. 200 in. (5080 mm)
C. 12 in. (305 mm)
D. 0.94 sg

A differential transmitter is used in a level application. Once the transmitter installed in an empty tank and taps are vented, the process variable reading is -209.4 inH_2O. The process variable reading is the head pressure created by fill fluid in the capillary. Based on Table 2-2, the Scaled Variable configuration would be as follows:

Table 2-2: Scaled Variable configuration for tank application

Scaled Variable units	inch
Scaled Data options	linear
Pressure value position 1	0 inH_2O
Scaled Variable position 1	12 in. (305 mm)
Pressure value position 2	188 inH_2O
Scaled Variable position 2	212 in. (5385 mm)
Linear offset	-209.4 inH_2O

DP flow example

A differential pressure transmitter is used in conjunction with an orifice plate in a flow application where the differential pressure at full scale flow is 125 inH_2O.

In this particular application, the flow rate at full scale flow is 20,000 gallons of water per hour. Emerson highly recommends using the **Low flow cutoff** function in order to have a

stable output and avoid problems due to process noise at a low flow or no flow condition. Enter a **Low flow cutoff** value that is practical for the flow element in the application. In this particular example, the **Low flow cutoff** value is 1000 gallons of water per hour. Based on this information, the scaled variable configuration would be as follows:

Table 2-3: Scaled variable configuration for flow application

Scaled variable units	gal/h
Scaled data options	square root
Pressure value position 2	125 inH_2O
Scaled variable position 2	20,000 gal/h
Low flow cutoff	1000 gal/h

Note
Pressure value position 1 and **Scaled Variable position 1** are always set to zero for a flow application. No configuration of these values is required.

2.6.2 Remapping device variables

The remapping function allows the transmitter primary, secondary, tertiary, and quaternary variables (PV, SV, TV, and QV) to be configured in one of two configurations.

You may select either the option of `Classic Mapping` or `Scaled Variable Mapping`. See Table 2-4 for what is mapped to each variable. All variables can be remapped with a communication device or AMS Device Manager.

Table 2-4: Variable mapping

Variable	Classic Mapping	Scaled Variable Mapping
PV	Pressure	Scaled Variable
SV	Sensor Temperature	Pressure
TV	Electronics Temperature	Sensor Temperature
QV	Supply Voltage	Supply Voltage

Note
The variable assigned to the primary variable drives the output. This value can be selected as `Pressure` or `Scaled Variable`.

Remap using a communication device

Procedure

From the ***HOME*** screen, enter the fast key sequence:

Fast keys 2, 2, 6, 1, 1

Remapping using AMS Device Manager

Right-click the device and select **Configure**.

Procedure

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

2. Assign Primary, secondary, tertiary and quaternary variables under *Variable Mapping*.
3. Click **Send**.
4. Carefully read the warning and click **Yes** if it is safe to apply the changes.

2.6.3 Set range points

From the ***HOME*** screen, enter the fast key sequence:

Fast keys 2, 1, 1, 5

The **Range Values** command sets the lower and upper range values used for the percent of range measurement.

Note
Rosemount ships transmitters fully calibrated per request or by the factory default of full scale (span = upper range limit).

Procedure

1. From the ***Home*** screen, select **2: Configure**.
2. Select **1: Guided Setup**.
3. Select **1: Basic Setup**.
4. Select **5: Range Values**.

2.7 Reviewing configuration data

The following is a list of factory default configurations that can be viewed by using the communication device or AMS.

Follow the steps below to review the transmitter configuration information.

Note
Information and procedures in this section that make use of communication device fast key sequences and AMS assume that the transmitter and communication equipment are connected, powered, and operating correctly.

2.7.1 View pressure information

Fast keys 2, 2, 2

Procedure

1. From the ***Home*** screen, select **2: Configure**.
2. Select **2: Manual Setup**.
3. Select **2: Pressure**.
4. Select from the corresponding number to view each field:

1	Pressure
2	Pressure Status
3	Units
4	Damping

2.7.2 View device information

Fast keys 2, 2, 9

Procedure

1. From the ***Home*** screen, select **2: Configure**.
2. Select **2: Manual Setup**.
3. Select **9: Device Information**.
4. Select from the corresponding number to view each field:

1	Identification
2	Revisions
3	Radio
4	Sensor Information
5	Flange Information
6	Remote Seal

2.7.3 View radio information

Fast keys 1, 7, 3

Procedure

1. From the ***Home*** screen, select **1: Overview**.
2. Select **7: Device Information**.
3. Select **3: Radio**.
4. Select from the corresponding number to view each field:

1	Manufacturer
2	Device Type
3	Device Revision
4	Software Revision
5	Hardware Revision
6	Transmit Power Level
7	Minimum Update Rate

2.7.4 View operating parameters

As long as the applied pressure is between the upper and lower range of the transmitter, the pressure output value in both engineering units and percent of range will reflect the applied pressure, even when the applied pressure is outside of the configured range.

Fast keys 3, 2

To view the ***Operating Parameters*** menu:

Example

For example, if a Range 2 Rosemount 2051T (lower range limit [LRL] = 0 psi, upper range limit [URL] = 150 psi) is ranged from 0 to 100 psi, an applied pressure of 150 psi will return a percent of range output of 150 percent and an engineering output of 150 psi.

Procedure

1. From the ***Home*** screen, select **3: Service Tools**.
2. Select **2: Variables**.

The ***Operating Parameters*** menu displays the following information pertaining to the device:

1. Process
   - Pressure
   - Percent of Range
   - Last Update Time
   - Scaled Variable
   - Enter Fast Update Mode
2. Device
   - Sensor Temperature
   - Supply Voltage

2.8 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
- Supply Voltage

You can also configure the LCD display to display configuration information during the device startup. Select **Review Parameters at Startup** to enable or disable this functionality.

Reference Figure 1-1 for image of LCD screen.

2.8.1 Configure LCD display using a communication device

Procedure

From the ***Home*** screen, enter the fast key sequence:

Fast keys 2, 2, 5

2.8.2 Configure LCD display with AMS Device Manager

Procedure

1. Right click on the device and select **Configure**.
2. Click **Manual Setup** and select the ***Display*** tab.
3. Select desired display options and click **Send**.

2.9 Detailed transmitter setup

2.9.1 Configure process alerts

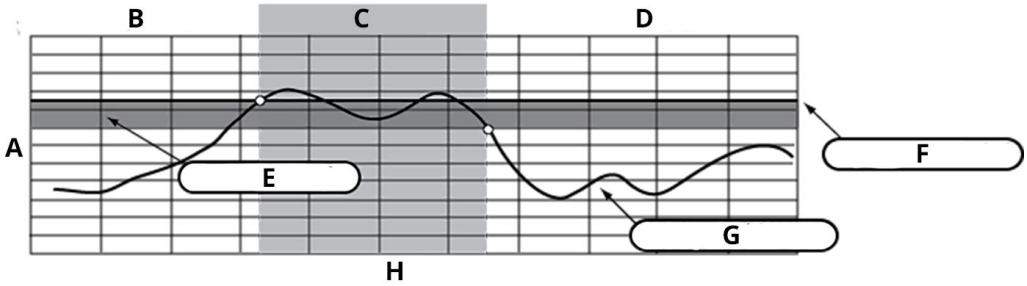
Process alerts allow the transmitter to indicate when the configured data point is exceeded.

Fast keys 2, 1, 6

Process alerts can be set for pressure, temperature, or both. An alert will be displayed on a communication device, AMS Device Manager status screen, or in the error section of the LCD display. The alert will reset once the value returns within range.

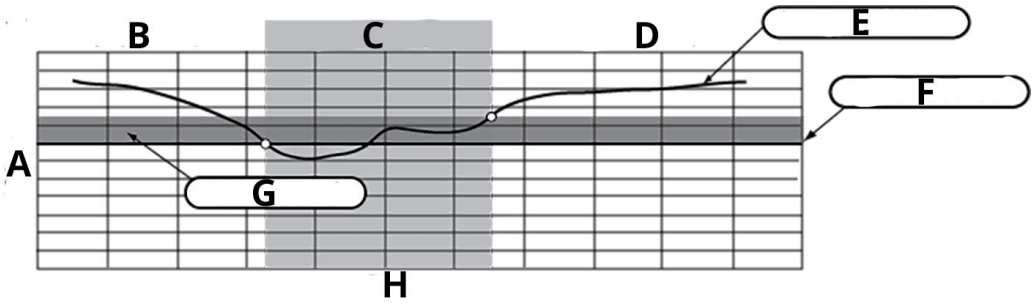
Note
HI alert value must be higher than the **LO** alert value. Both alert values must be within the pressure or temperature sensor limits.

Figure 2-5: Rising alert



A. Units of measurement
*B. Alert **OFF***
*C. Alert **ON***
*D. Alert **OFF***
E. Deadband
F. Alert set point
G. Assigned value
H. Time

Figure 2-6: Falling alert



A. Units of measurement
*B. Alert **OFF***
*C. Alert **ON***
*D. Alert **OFF***
E. Assigned value
F. Alert set point
G. Deadband
H. Time

To configure the process alerts:

Procedure

1. From the ***Home*** screen, select **2: Configure**.
2. Select **1: Guided Setup**.
3. Select **6: Configure Process Alerts** and follow the on-screen instructions to complete configure of process alarms.

2.9.2 Damping

The **Damping** command introduces a delay in processing which increases the response time of the transmitter, smoothing variations in output readings caused by rapid input changes.

In the Rosemount 2051 Wireless Pressure Transmitter, damping only takes effect when the device is placed in `high power refresh` mode and during calibration. In `normal power` mode, the effective damping is `0`. Note that when the device is in `high power refresh` mode, battery power will be depleted rapidly. Determine the appropriate damp setting based on the necessary response time, signal stability, and other requirements of the loop dynamics of your system. The damping value of your device is user selectable from 0 to 60 seconds.

Damping using a communication device

Procedure

1. From the ***HOME*** screen, enter the fast key sequence:

   Fast keys 2, 2, 2, 4

2. Enter desired **Damping** value and select **APPLY**.

Damping using AMS Device Manager

Procedure

1. Right click on 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.

2.9.3 Write protect

The Rosemount 2051 Wireless Pressure Transmitter has a software write protect security feature.

Enable write protect using a communication device

Procedure

1. From the ***Home*** screen, enter the fast key sequence:

   Fast keys 2, 2, 7, 1

2. Select **Write Protect** to enable.

Enable write protect using AMS Device Manager

Procedure

1. Right click on device and select **Configure**.
2. Select **Manual Setup**.
3. Select the tab labeled ***Device Information***.
4. Select **Write Protect** to enable this feature.

2.10 Diagnostics and service

Diagnostics and service functions listed in the following sections are primarily for use after field installation.

The **Transmitter Test** feature is designed to verify that the transmitter is operating properly, and you can perform this feature either on the bench or in the field.

2.10.1 Device Reset

The **Device Reset** function will reset the device electronics.

Perform a Device Reset using a communication device

From the ***HOME*** screen, enter the fast key sequence:

Fast keys 3, 5, 5

Procedure

1. From the ***HOME*** screen, select **3: Service Tools**.
2. Select **5: Maintenance**.

3. Select **5: Device Reset**.

2.10.2 Join Status

View Join Status using a communication device

From the ***Home*** screen, enter the fast key sequence:

Fast keys 3, 4, 1

Procedure

1. From the ***Home*** screen, select **3: Service Tools**.
2. Select **4: Communications**.
3. Select **1: Join Status**.

Wireless devices join the secure network through a four-step process:

Step 1	Network Found
Step 2	Network Security Clearance Granted
Step 3	Network Bandwidth Allocated
Step 4	Network Join Complete

2.10.3 Viewing number of available neighbors

In a self-organizing network, the more neighbors a device has, the more robust the network will be.

View number of available neighbors using a communication device

From the ***Home*** screen, enter the fast key sequence:

Fast keys 3, 4, 3

Procedure

1. From the ***Home*** screen, select **3: Service Tools**.
2. Select **4: Routine Maintenance**.
3. Select **3: Number of Available Neighbor**s.

2.11 Advanced functions for HART® protocol

2.11.1 Saving, recalling, and cloning configuration data

Use the **Cloning** feature of the communication device or the AMS **User Configuration** feature to configure several Rosemount 2051 Wireless Transmitters similarly.

Cloning involves configuring a transmitter, saving the configuration data, and then sending a copy of the data to a separate transmitter. Several possible procedures exist when saving, recalling, and cloning configuration data. For complete instructions refer to the *Field Communicator Manual* (publication no. 00809-0100-4276) or AMS Books Online. One method follows:

Cloning using a communication device

Fast keys left arrow, 1, 2

Procedure

1. Completely configure the first transmitter.
2. Save the configuration data:
   a) Select **F2 Save** from the communication device ***Home/Online*** screen.
   b) Ensure that the location to which the data will be saved is set to **Module**. If it is not, select **1: Location** to set the save location to **Module**.
   c) Select **2: Name**, to name the configuration data.
   The default is the transmitter tag number.
   d) Ensure that the data type is set to **standard**. If the data type is not **standard**, select **3: Data Type** to set the data type to **standard**.
   e) Select **F2 Save**.
3. Connect and power the receiving transmitter and communication device.
4. Select the **back** arrow from the ***Home/Online*** screen.
The communication device menu appears.
5. Select **1: Offline** → **2: Saved Configuration** → **1: Module Contents** to reach the ***Module Contents*** menu.
6. Use the **down arrow** to scroll through the list of configurations in the memory module, and use the **right arrow** to select and retrieve the required configuration.
7. Select **1: Edit**.
8. Select **1: Mark All**.
9. Select **F2 Save**.
10. Use the **down arrow** to scroll through the list of configurations in the memory module, and use the **right arrow** to select the configuration again.
11. Select **3: Send** to download the configuration to the transmitter.
12. Select **OK** after the control loop is set to **manual**.
13. After the configuration has been sent, select **OK**.

    When finished, the communication device informs you of the status. Repeat Step 3 through Step 13 to configure another transmitter.

Note
The transmitter receiving cloned data must have the same software version (or later) as the original transmitter.

Create a reusable copy using AMS

Procedure

1. Completely configure the first transmitter.
2. Select **View** → **User Configuration View** from the menu bar (or click the **Toolbar** button).
3. In the ***User Configuration*** window, right click and select **New** from the context menu.
4. In the ***New*** window, select a device from the list of templates shown and click **OK**.

The template is copied into the ***User Configurations*** window with the tag name highlighted.

5. Rename it as appropriate and press Enter.

Note
You can also copy a device icon by dragging and dropping a device template or any other device icon from AMS Explorer or Device Connection View into the ***User Configurations*** window.

The ***Compare Configurations*** window appears, showing the ***Current*** values of the copied device on one side and mostly blank fields on the other (***User Configuration***) side.

6. Transfer values from the ***Current*** configuration to the ***User Configuration*** as appropriate or enter values by typing them into the available fields.
7. Click **Apply** to apply the values or click **OK** to apply the values and close the window.

Apply a user configuration using AMS

You can create any amount of user configurations for the application.

You can also save them and apply them to connected devices or to devices in the ***Device List*** or ***Plant Database***.

To apply a user configuration perform the following procedure:

Procedure

1. Select the desired user configuration in the ***User Configurations*** window.
2. Drag the icon onto a similar device in ***AMS Explorer*** or ***Device Connection*** view.
   The ***Compare Configurations*** window opens, showing the parameters of the target device on one side and the parameters of the user configuration on the other.
3. Transfer parameters from the user configuration to the target device as desired.
   Click **OK** to apply the configuration and close the window.

3 Installation

3.1 Overview

Emerson ships a Quick Start Guide with every transmitter describing basic installation and startup procedures.

Note
For transmitter disassembly refer to Removing from service.

3.2 Considerations

3.2.1 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.

3.2.2 Wireless considerations

Power up sequence

Do not install the power module on any wireless device until the Smart Wireless Gateway is installed and functioning properly. This transmitter uses the green power module (order model number `701PGNKF`). Wireless devices should also be powered up in order of proximity from the Smart Wireless Gateway, beginning with the closest. This will result in a simpler and faster network installation. Enable `Active Advertising` on the Gateway to ensure that new devices join the network faster. For more information, see the Smart Wireless Gateway Manual.

Internal antenna position

The internal antenna is designed for multiple mounting orientations. Mount the transmitter according to measurement best practices for your pressure measurement application. The antenna should be approximately 3 ft. (1 m) from any large structure or building to allow clear communication to other devices.

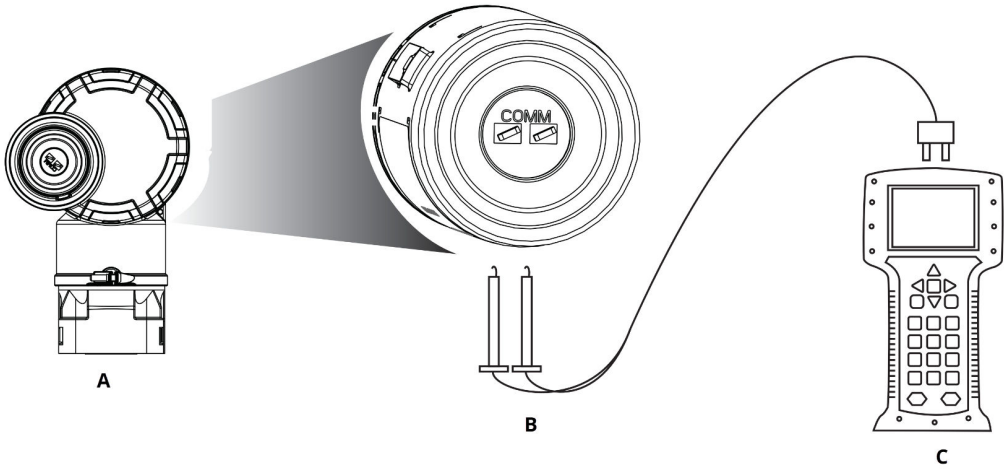
Network design best practices

When mounting the device, consider recommended best practices to achieve the best wireless performance. See Network design best practices for more information on recommended practices.

Communication device connections

In order for the communication device to interface with the Rosemount 2051 Wireless Transmitter, the power module must be connected. Refer to Figure 3-1 for a diagram on how to connect the communication device.

Figure 3-1: Communication device connections



A. Transmitter
B. HART® communication terminal
C. Communication device

3.2.3 Mechanical considerations

Location

When choosing an installation location and position, take into account access to the power module compartment for easy power module replacement.

Electronics cover

The electronics cover is tightened so that polymer contacts polymer. When removing the electronics cover, ensure there is no damage done to the O-ring. If it is damaged, replace the O-ring before reattaching cover, ensuring polymer contacts polymer (no O-ring visible).

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 3-16 for correct mounting orientation.

Side mounted

When the transmitter is mounted on its side, position the Coplanar flange to ensure proper venting or draining. Mount the flange as shown in Figure 3-16, keeping drain/vent connections on the bottom for gas service and on the top for liquid service.

3.2.4 Electrical considerations

Power module

The Rosemount 2051 Wireless Pressure Transmitter is self-powered. The power module contains a primary lithium-thionyl chloride battery (green power module, model number `701PGNKF`). Each battery contains approximately 0.2 oz. (5 g) of lithium. Under normal conditions, the battery materials are self-contained and are not reactive as long as the battery and the power module are maintained.

NOTICE

Take care to prevent thermal, electrical, or mechanical damage. Protect contacts to prevent premature discharge.

NOTICE

The power module may be damaged if dropped from heights in excess of 20 ft. (6.1 m).

Use caution when handling the power module.

3.2.5 Environmental considerations

Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

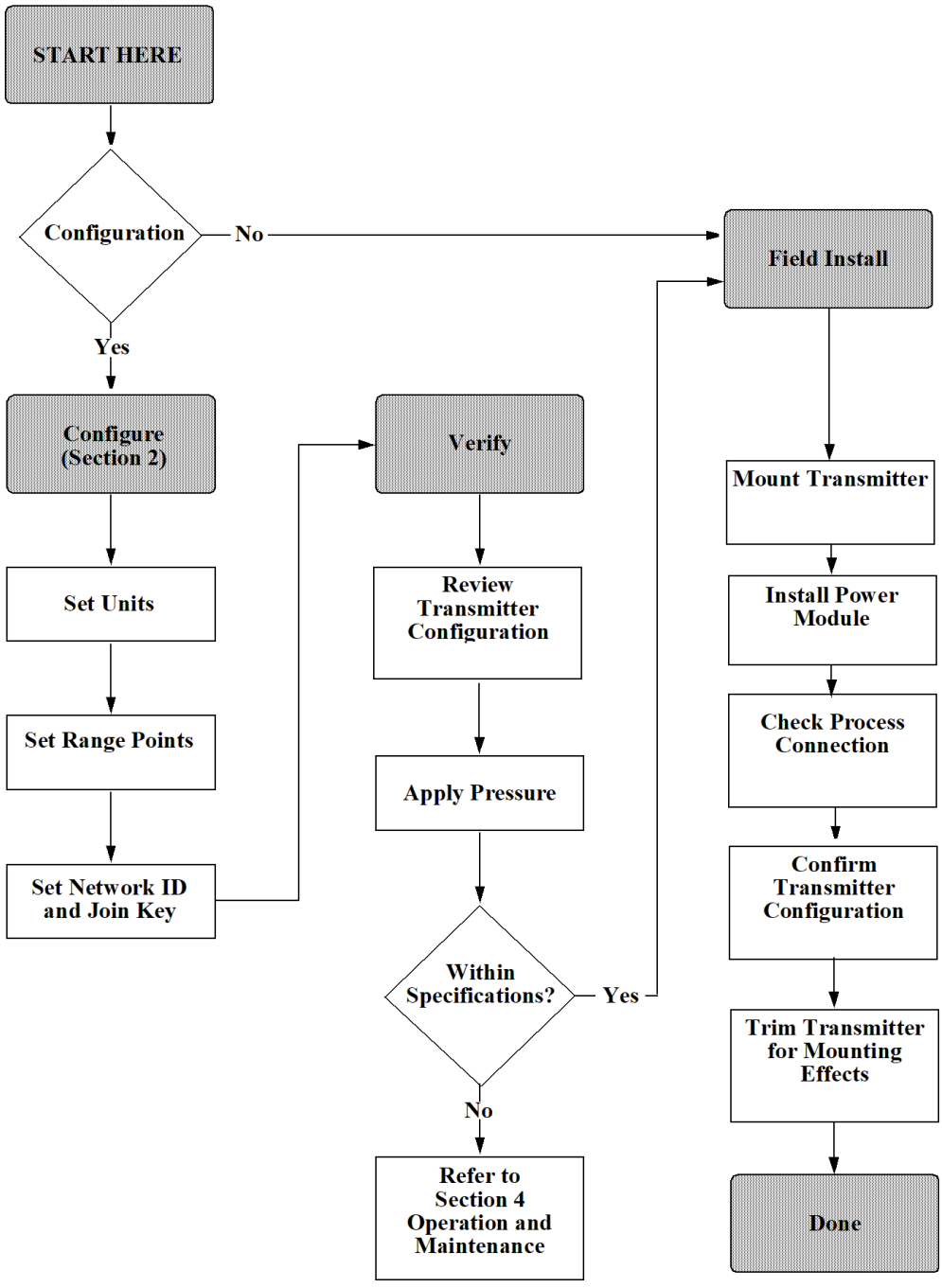
Mount the transmitter in an environment that has minimal ambient temperature change. The transmitter electronics temperature operating limits are –40 to +185 °F (–40 to +85 °C).

Heat from the process is transferred to the transmitter housing, If the process temperature is high, lower the ambient temperature to account for heat transferred to the transmitter housing. See the *Specifications* section of the Rosemount 2051 Pressure Transmitter Product Data Sheet for temperature ratings.

NOTICE

Mount the transmitter so that it is not susceptible to vibration and mechanical shock and does not have external contact with corrosive materials.

Figure 3-2: Installation flowchart



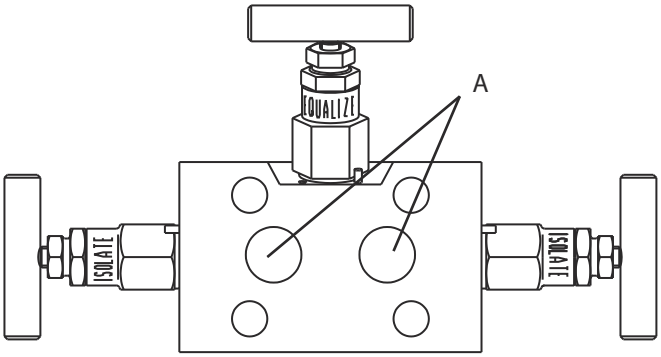
3.2.6 Draft range considerations

Installation

Mount the Rosemount 2051CD0 draft range pressure transmitter with the isolators parallel to the ground. See Figure 3-3 for a draft range installation example on a 304 manifold. Installing the transmitter in this way reduces oil head effect.

Tilting of the transmitter may cause a zero shift in the transmitter output, but can be eliminated by performing a trim procedure.

Figure 3-3: Draft range installation example



A. Isolators

Reducing process noise

2051CD0 draft transmitters are sensitive to small pressure changes. Increasing the damping will decrease output noise, but will further reduce response time. In gauge applications, it is important to minimize pressure fluctuations to the low side isolator.

Output damping

The **Damping** command introduces a delay in processing which increases the response time of the transmitter, smoothing variations in output readings caused by rapid input changes. In the 2051 Wireless Pressure Transmitter, damping only takes effect when the device is placed in `High Power Refresh` mode and during calibration. In `Normal Power` mode, the effective damping is `0`.

NOTICE

When the device is in `High Power Refresh` mode, battery power will be depleted rapidly.

Determine the appropriate damp setting based on the necessary response time, signal stability, and other requirements of the loop dynamics of your system. The damping value of your device is user selectable from 0 to 60 seconds.

Reference side filtering

In gauge applications it is important to minimize fluctuations in atmospheric pressure to which the low side isolator is exposed.

One method of reducing fluctuations in atmospheric pressure is to attach a length of tubing to the reference side of the transmitter to act as a pressure buffer.

Related information

Sensor Trim Overview

3.3 Installation procedures

3.3.1 Process flange orientation

Mount the process flanges with sufficient clearance for process connections.

⚠ CAUTION

For safety reasons, place the drain/vent valves so the process fluid is directed away from possible human contact when the vents are used.

In addition, consider the need for a testing or calibration input.

Note

Most transmitters are calibrated in the horizontal 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 Trim the pressure signal.

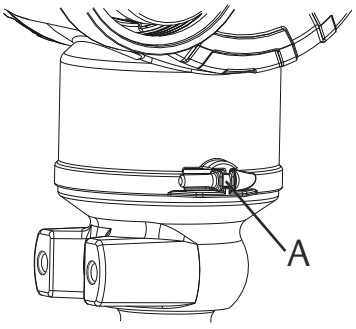
3.3.2 Rotate housing

You can rotate the electronics housing up to 180 degrees in either direction to improve field access to wiring or to better view the optional LCD display.

Procedure

1. Loosen the housing rotation set screw using a 5/64-inch hex wrench.
2. Rotate the housing clockwise to the desired location.
3. Retighten the housing rotation set screw.

Figure 3-4: Housing rotation



A. Housing rotation set screw (5/64-in.)

3.3.3 Power module side of electronics housing

Mount the transmitter so that the power module side is accessible.

Clearance of 3.5 in. (89 mm) is required for cover and power module removal.

3.3.4 Circuit side of electronics housing

Provide 1.75 in. (45 mm) of clearance for transmitters without an LCD display.

3 in. (76 mm) of clearance is required for cover removal if a meter is installed.

3.3.5 Environmental seal for housing

Always ensure a proper seal by installing the electronics housing cover(s) so that polymer contacts polymer (no O-ring visible).

Use Rosemount O-rings.

3.3.6 Mounting the transmitter

Mounting brackets

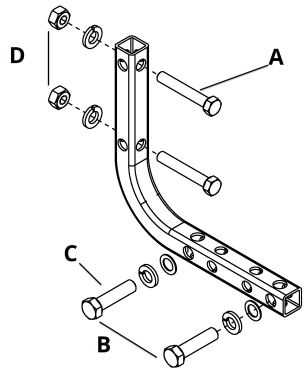
You may panel-mount of pipe-mount Rosemount 2051 Wireless Transmitters via an optional mounting bracket.

Refer to Table 3-1 for the complete offering and see Figure 3-5 for dimensional and mounting configuration information.

Table 3-1: Mounting brackets

Option code	Process connections			Mounting			Materials			
	Coplanar	In-line	Traditional	Pipe mount	Panel mount	Flat panel mount	Carbon steel (CS) bracket	Stainless steel (SST) bracket	CS bolts	SST bolts
B4	X	X		X	X	X		X		X
B1			X	X			X		X	
B2			X		X		X		X	
B3			X			X	X		X	
B7			X	X			X			X
B8			X		X		X			X
B9			X			X	X			X
BA			X	X				X		X
BC			X			X		X		X

Figure 3-5: Mounting bracket option code B4



A. 5/16 x 1½ bolts for panel mounting(not supplied)
B. 3.4 in. (85 mm)
C. ⅜-16 x 1¼ bolts for mounting to transmitter
D. 2.8 in. (71 mm)
E. 6.90 in. (175 mm)

Figure 3-6: Mounting bracket option code B4 U-bolt

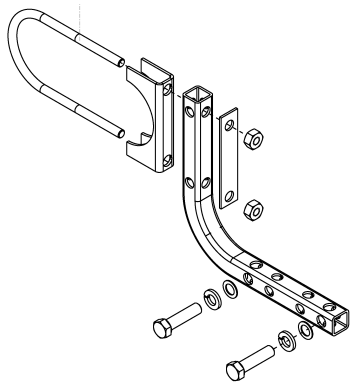
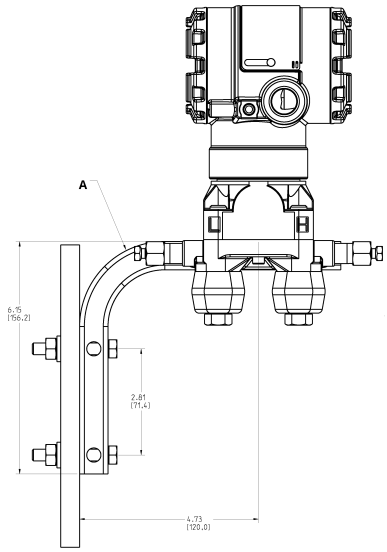


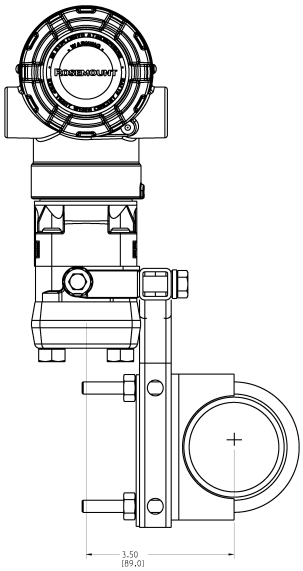
Figure 3-7: 2051C Coplanar Transmitter B4 mounting option



Dimensions are in inches [millimeters].

A. Drain/vent valve

Figure 3-8: 2051C Coplanar Transmitter process flange connection



Dimensions are in inches [millimeters].

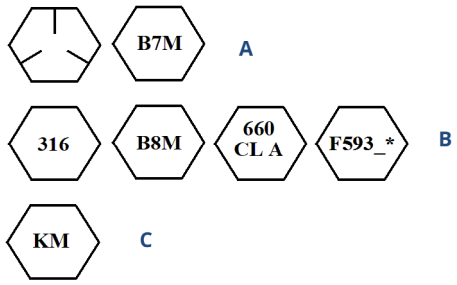
Flange bolts

Emerson can ship the Rosemount 2051 Wireless with a coplanar flange or a traditional flange installed with four 1.75-inch flange bolts.

Stainless steel bolts supplied by Emerson are coated with a lubricant to ease installation. Carbon steel bolts do not require lubrication. Do not apply any additional lubricant when

installing either type of bolt. Bolts supplied by Emerson are identified by their head markings.

Figure 3-9: Bolt head markings



A. Carbon steel (CS) head markings
B. Stainless steel (SST) head markings(1)
C. Alloy K-500 head marking

Install bolts

NOTICE

The use of non-approved bolts could reduce pressure.

Only use bolts supplied with the transmitter or sold by Emerson as spare parts.

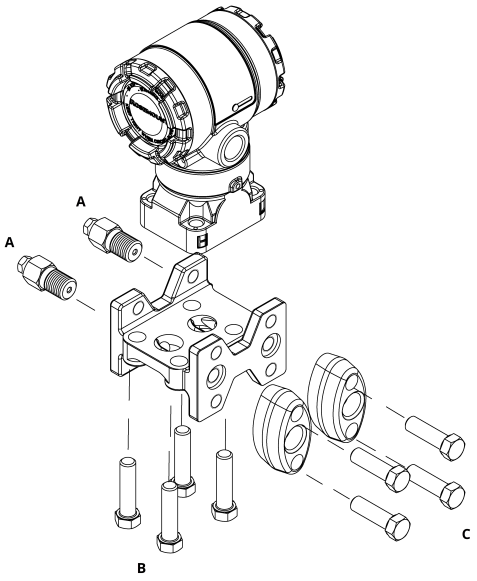
When installing the transmitter to one of the optional mounting brackets, torque the bolts to 125 in.-lb. (0.9 N-m).

Table 3-2: Bolt installation torque values

Bolt material	Initial torque value	Final torque value
Carbon steel (CS)-(ASTM-A445) standard	300 in.-lb. (34 N-m)	650 in.-lb. (73 N-m)
Austemitic 316 stainless steel (SST)—Option L4	150 in.-lb. (17 N-m)	300 in.-lb. (34 N-m)
ASTM A193 Grade B7M—Option L5	300 in.-lb. (34 N-m)	650 in.-lb. (73 N-m)
Alloy K-500 - Option L6	300 in.-lb. (34 N-m)	650 in.-lb. (73 N-m)
ASTM-A-453-660 - Option L7	150 in.-lb. (17 N-m)	300 in.-lb. (34 N-m)
ASTM A 193 Class 2, Grade B8M option L8	300 in.-lb (34 N-m)	650 in.-lb (73 N-m)

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

Figure 3-10: Rosemount 2051 Wireless differential transmitter

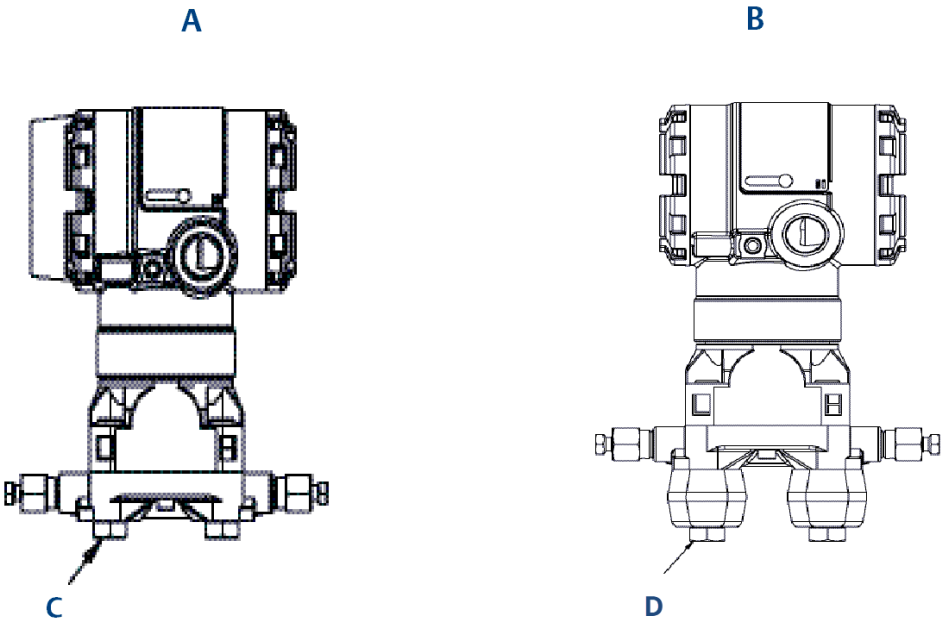


A. Drain/vent
B. 1.75 in. (44 mm) × 4
C. 1.50 in. (38 mm) × 4[(2)]

(2) For gauge and absolute transmitters: 150 (38) x 2

Figure 3-11: Mounting bolts and bolt configurations for coplanar flange

Dimensions are in inches (millimeters).



A. Transmitter with flange bolts
B. Transmitter with flange adapters and flange/adapter bolts
C. 1.75 in. (44 mm) × 4
D. 2.88 in. (73 mm) × 4

Table 3-3: Bolt configurations values

Description	Quantity	Size in. (mm)
Differential pressure		
Flange bolts	4	1.75 (44)
Flange/adapter bolts	4	2.88 (73)
Gauge/absolute pressure(1)		
Flange bolts	4	1.75 (44)
Flange/adapter bolts	2	2.88 (73)

(1) Rosemount 2051T Transmitters are direct mount and do not require bolts for process connection.

Figure 3-12: Mounting bracket option codes B1, B7, and BA

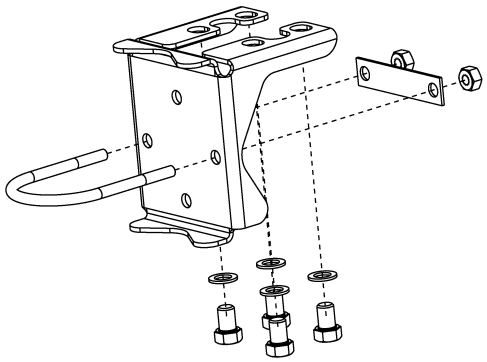
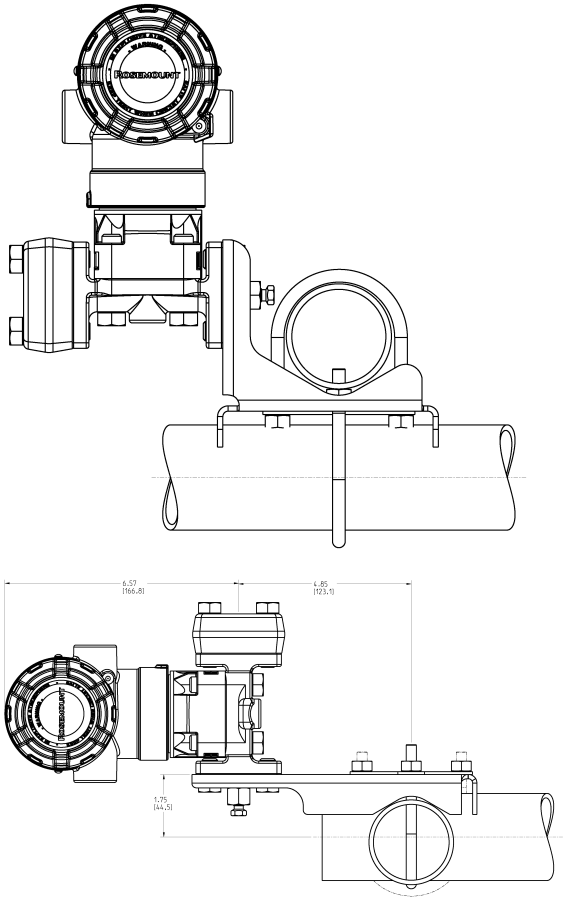
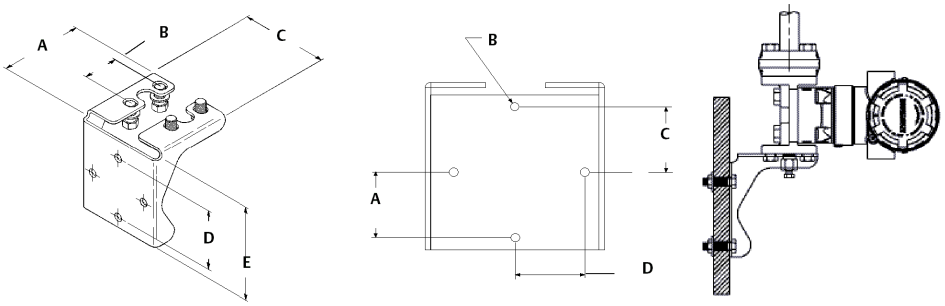


Figure 3-13: 2051C pipe mounted



Dimensions are in inches [millimeters].

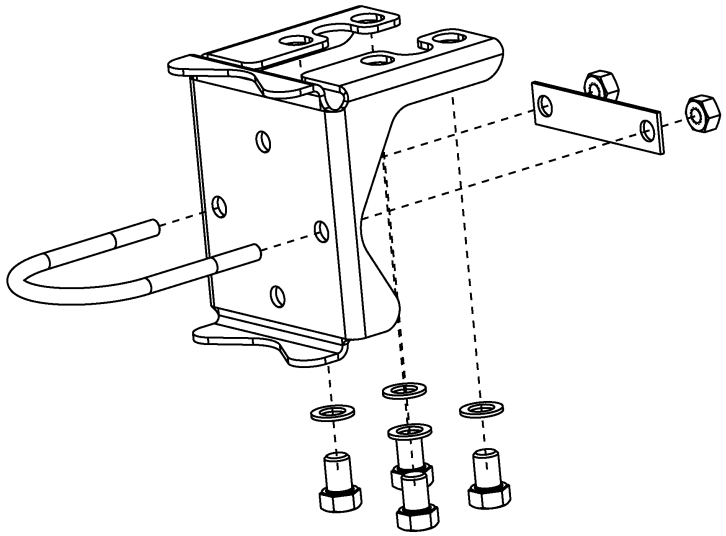
Figure 3-14: Panel mounting bracket option codes B2 and B8



A. 3.75 (95)
B. 1.63 (41)
C. 4.09 (104)
D. 2.81 (71)
E. 4.5 (114)

A. 1.40 (36)
B. Mounting holes 0.375 diameter (10)
C. 1.405 (35.7)
D. 1.405 (35.7)

Figure 3-15: Flat mounting bracket option codes B3 and BC



Procedure

1. Finger-tighten the bolts.
2. Torque the bolts to the initial torque value using a crossing pattern (see Table 3-2 for torque values).
3. Torque the bolts to the final torque value using the same crossing pattern.

3.3.7 Impulse piping

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:

- Leaks
- Friction loss (particularly if using purging)
- Trapped gas in a liquid line
- Liquid in a gas line
- Density variations between the legs

The best location for the transmitter in relation to the process pipe depends on the process itself. 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. per ft. (8 cm per m) upward from the transmitter toward the process connection.
- For gas service, slope the impulse piping at least 1 in. per ft. (8 cm per m) downward from the transmitter toward the process connection.
- Avoid high points in liquid lines and low points in gas lines.
- Make sure both impulse legs are the same temperature.
- Use impulse piping large enough to avoid friction effects and blockage.
- Vent all gas from liquid piping legs.
- When using a sealing fluid, fill both piping legs to the same level.
- 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.
- Keep the liquid head balanced on both legs of the impulse piping.
- Avoid conditions that might allow process fluid to freeze within the process flange.

Mounting requirements

Refer to Figure 3-16 for examples of the following mounting configurations:

Liquid flow measurement

- Place taps to the side of the line to prevent sediment deposits on the process isolators.
- Mount the transmitter beside or below the taps so gases vent into the process line.
- Mount drain/vent valve upward to allow gases to vent.

Gas flow measurement

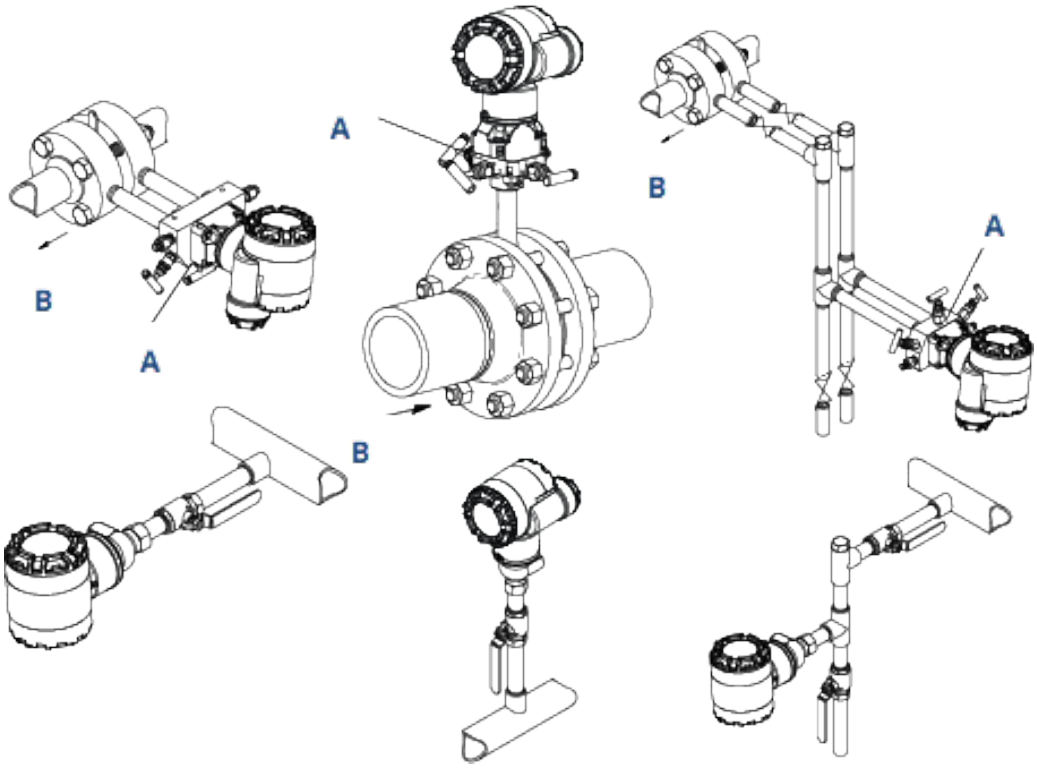
- Place taps in the top or side of the line.
- Mount the transmitter beside or above the taps so to drain liquid into the process line.

Steam flow measurement

- Place taps to the side of the line.
- Mount the transmitter below the taps to ensure that impulse piping will remain filled with condensate.
- Fill impulse lines 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 coplanar process flanges must not exceed 250 °F (121 °C) for transmitters with silicone fill, or 185 °F (85 °C) for inert fill. For vacuum service, these temperature limits are reduced to 220 °F (104 °C) for silicone fill and 160 °F (71 °C) for inert fill.

Figure 3-16: Installation examples



A. Drain/vent valves
B. Flow

3.3.8 Process connections

Coplanar or traditional process connection

NOTICE

Install and tighten all four flange bolts before applying pressure, or process leakage will result.

When properly installed, the flange bolts will protrude through the top of the sensor module housing.

Do not attempt to loosen or remove the flange bolts while the transmitter is in service.

Install flange adapters

Rosemount 2051 differential pressure (DP) and gauge pressure (GP) process connections on the transmitter flanges are ¼–18 NPT.

Flange adapters are available with standard ½–14 NPT Class 2 connections. The flange adapters allow you to disconnect from the process by removing the flange adapter bolts. Use plant-approved lubricant or sealant when making the process connections. This distance may be varied ±¼ in. (6 mm) by rotating one or both of the flange adapters.

Procedure

1. Remove the flange bolts.
2. Leaving the flange in place, move the adapters into position with the O-ring installed.
3. Clamp the adapters and the coplanar flange to the transmitter sensor module using the larger of the bolts supplied.
4. Tighten the bolts.

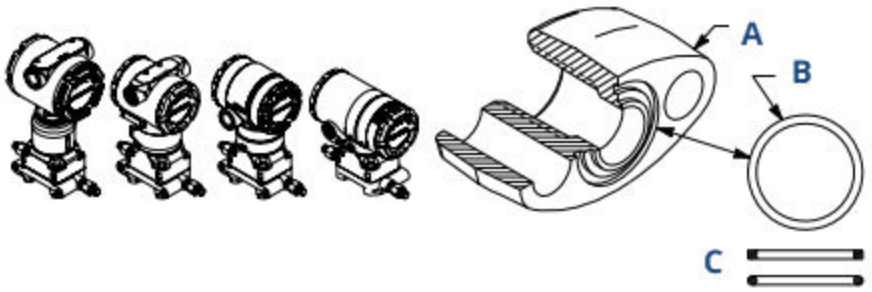
⚠ WARNING

Failure to install proper flange adapter O-rings may cause process leaks, which can result in death or serious injury.

The two flange adapters are distinguished by unique O-ring grooves. Only use the O-ring that is designed for its specific flange adapter, as shown in Figure 3-17

Replace PTFE O-rings if the flange adapter is removed.

Figure 3-17: Rosemount 2051S/2051/3001/3095



A. Flange adapter
B. O-ring
C. PTFE-based elastomer

When removing flanges or adapters, visually inspect the PTFE O-rings. Replace with O-rings designed for Rosemount transmitters if there are any signs of damage, such as nicks or cuts. You can reuse undamaged O-rings. If you replace the O-rings, re-torque the flange bolts after installation to compensate for cold flow.

NOTICE

Replace PTFE O-rings if you remove the flange adapter.

3.3.9 Inline process connection

Inline gauge transmitter orientation

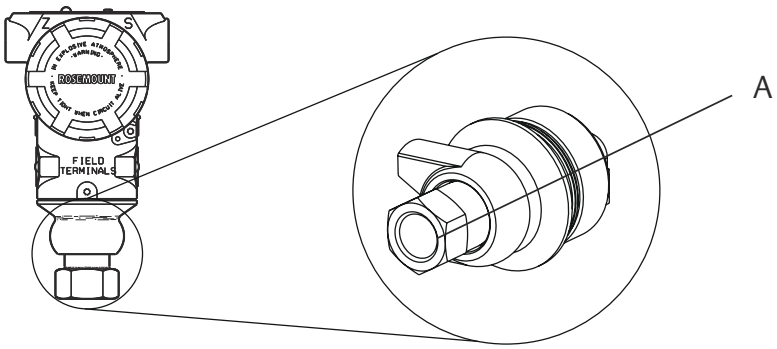
NOTICE

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

The low side pressure port on the inline gauge 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 3-18.

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 3-18: Inline gauge low side pressure port

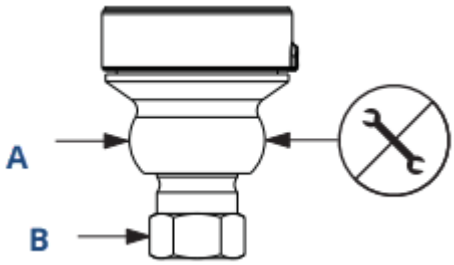


A. Low side pressure port (atmospheric reference)

NOTICE

Rotation between the sensor module and the process connection can damage the electronics.

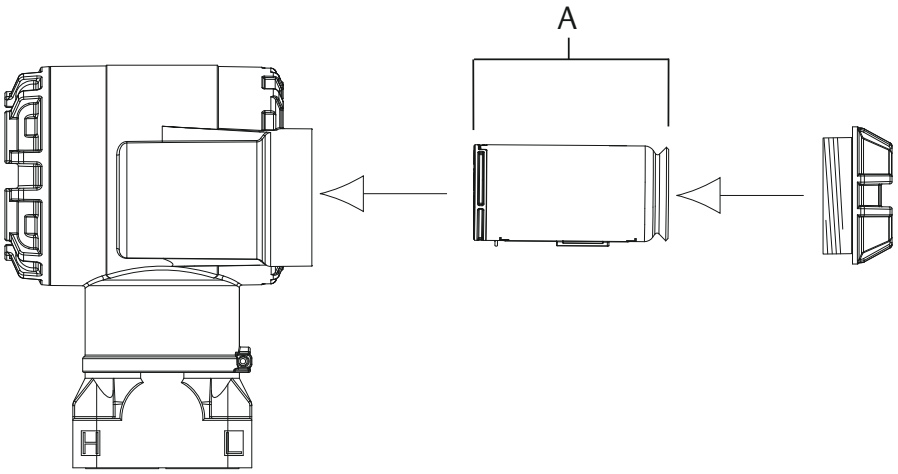
Do not apply torque directly to the sensor module.
To avoid damage, apply torque only to the hex-shaped process connection.



A. Sensor module
B. Process connection

3.3.10 Install power module

Figure 3-19: Power module



A. Power module (5/64-in. hex wrench required)

To make connections, perform the following procedure:

Procedure

1. Remove the housing cover on the power module compartment side.
   The power module supplies all power to the transmitter.
2. Connect power module `701PGNKF`.
3. Replace the power module cover and tighten to safety specification (polymer to polymer).

3.3.11 Install the LCD display

If you order a transmitter with an LCD display, Emerson will ship it with the display installed.

Note
Only use Rosemount Wireless LCD Display Part Number: 00753-9004-0002

NOTICE

An LCD display from a wired device will not function in a wireless device.

Like the housing, you can rotate the optional LCD display in 90-degree increments by squeezing the two tabs, pulling out, rotating and snapping back into place.

If LCD pins are inadvertently removed from the interface board, carefully re-insert the pins before snapping the LCD display back into place.

Procedure

1. Remove the back cover and power module.
2. Remove the transmitter cover opposite the field terminal side.

⚠ WARNING

Do not remove the instrument covers in explosive environments when the circuit is live.

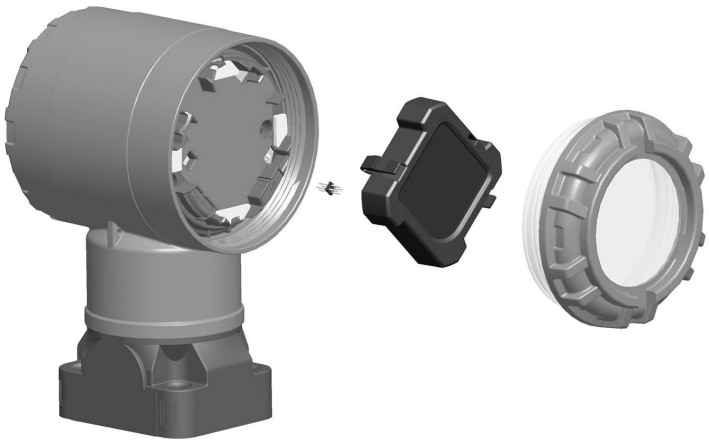
3. Engage the four-pin connector into the LCD display and snap into place.

   Note the following LCD temperature limits:

   Operating: –40 to 175 °F (–40 to 80 °C)

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

Figure 3-20: Optional LCD display

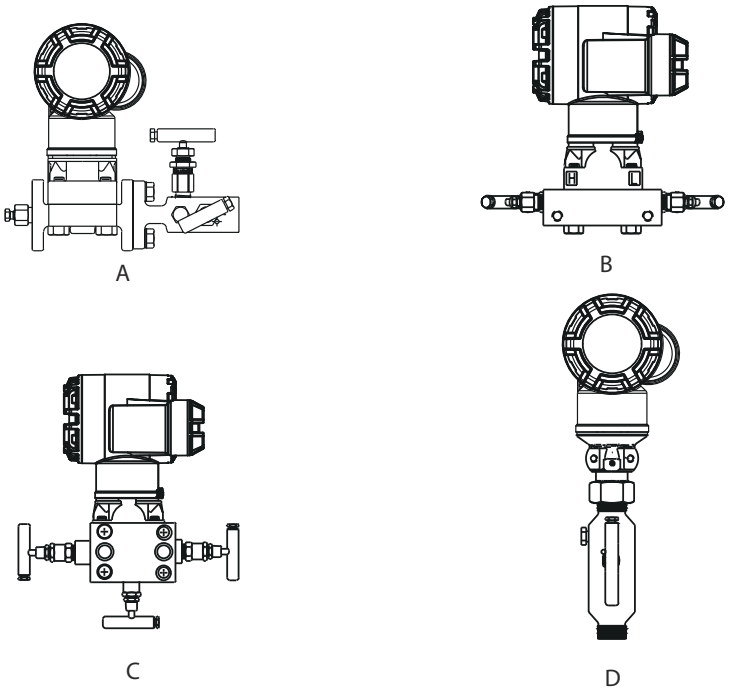


3.4 Rosemount 304, 305 and 306 Integral Manifolds

The 305 Integral Manifold mounts directly to the transmitter and is available in two designs: traditional and Coplanar™.

You can mount the traditional 305 Integral Manifold to most primary elements with mounting adapters in the market today. The 306 Integral Manifold is used with 2051T In-Line Transmitters to provide block-and-bleed valve capabilities of up to 10,000 psi (690 bar). The 304 comes in two basic styles: traditional (flange x flange and flange x pipe) and wafer. The 304 Traditional Manifold comes in two, three, and five-valve configurations. The 304 Wafer Manifold comes in three and five-valve configurations.

Figure 3-21: Integral Manifold designs



A. 2051C and 304 conventional
B. 2051C and 305 integral coplanar
C. 2051C and 305 integral traditional
D. 2051T and 306 in-line

3.4.1 Install Rosemount 305 Integral Manifold

To install a 305 Integral Manifold to a 2051 Wireless Transmitter:

Procedure

1. Inspect the PTFE sensor module O-rings. If the O-rings are undamaged, reusing them is recommended. If the O-rings are damaged (if they have nicks or cuts, for example), replace them with new O-rings.

   NOTICE

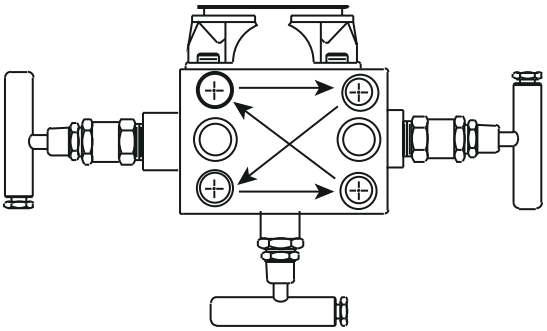
   If the O-rings are undamaged, Emerson recommends reusing them. If the O-rings are damaged (if they have nicks or cuts, for example), replace them with new O-rings.

   If replacing the O-rings, take care not to scratch or deface the O-ring grooves or the surface of the isolating diaphragm while you remove the damaged O-rings.

2. Install the Integral Manifold on the sensor module. Use the four 2.25-in. manifold bolts for alignment. Finger tighten the bolts; then tighten the bolts incrementally in a cross pattern as seen in Figure 3-22 to final torque value.

   See Flange bolts for complete bolt installation information and torque values. When fully tightened, the bolts should extend through the top of the module housing.

Figure 3-22: Bolt tightening pattern



3. If you have replaced the PTFE sensor module O-rings, re-tighten the flange bolts after installation to compensate for cold flow of the O-rings.
4. If applicable, install flange adapters on the process end of the manifold using the 1.75-inch flange bolts supplied with the transmitter.

NOTICE

Always perform a zero trim on the transmitter/manifold assembly after installation to eliminate mounting effects.

Related information

Operation and maintenance
Perform a Digital Zero Trim (option DZ)

3.4.2 Install Rosemount 306 Integral Manifold

The 306 Manifold is for use only with a 2051T Wireless In-Line Transmitter

NOTICE

Assemble the 306 Manifold to the 2051T Wireless In-Line Transmitter with a thread sealant.

Procedure

1. Place transmitter into holding fixture.
2. Apply appropriate thread paste or tape to threaded instrument end of the manifold.
3. Count total threads on the manifold before starting assembly.
4. Start turning the manifold by hand into the process connection on the transmitter.

Note
If using thread tape, be sure the thread tape does not strip when the manifold assembly is started.

5. Wrench tighten manifold into process connection.

Note
Minimum torque value is 425 in-lbs

6. Count how many threads are still showing.

Note
Minimum engagement is three revolutions

7. Subtract the number of threads showing (after tightening) from the total threads to calculate the revolutions engaged. Further tighten until a minimum of three rotations are achieved.
8. For block and bleed manifold, verify the bleed screw is installed and tightened. For two-valve manifold, verify the vent plug is installed and tightened.
9. Leak-check assembly to maximum pressure range of transmitter.

3.4.3 Install Rosemount 304 Conventional Manifold

Procedure

1. Align the Conventional Manifold with the transmitter flange. Use the four manifold bolts for alignment.
2. Finger tighten the bolts, then tighten the bolts incrementally in a cross pattern to final torque value.

   See Flange bolts for complete bolt installation information and torque values. When fully tightened, the bolts should extend through the top of the sensor module housing.
3. If applicable, install flange adapters on the process end of the manifold using the 1.75-inch flange bolts supplied with the transmitter.

3.4.4 Manifold operation

⚠ WARNING

Improper installation or operation of manifolds may result in process leaks, which may cause death or serious injury.

NOTICE

Always perform a zero trim on the transmitter/manifold assembly after installation to eliminate any shift due to mounting effects.

Related information

Perform a Digital Zero Trim (option DZ)

Operate three-valve manifold

⚠ WARNING

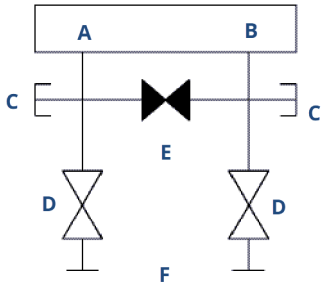
Improper installation or operation of manifolds may result in process leaks, which may cause death or serious injury.

Prerequisites

Always perform a zero trim on the transmitter/manifold assembly after installation to eliminate any shift due to mounting effects. See Operation and maintenance.

Three and five-valve configurations are shown:

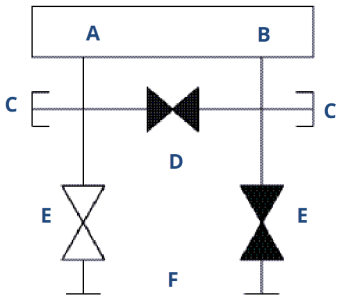
In normal operation, the two block valves between the process and instrument ports will be open, and the equalizing valve will be closed.



A. High
B. Low
C. Drain/vent valve
D. Isolate (open)
E. Equalize (closed)
F. Process

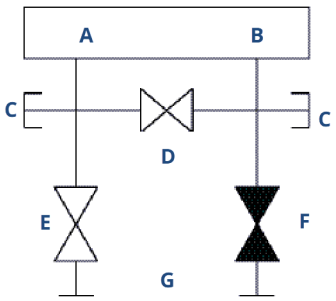
Procedure

1. To zero the transmitter, close the block valve to the low pressure (downstream) side of the transmitter first.



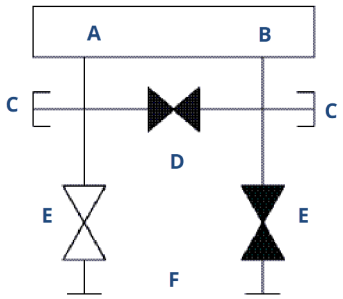
A. High
B. Low
C. Drain/vent valve
D. Equalize (closed)
E. Isolate (open)
F. Isolate (closed)
G. Process

2. Open the center (equalize) valve to equalize the pressure on both sides of the transmitter.
   The valves are now in the proper configuration for zeroing the transmitter.



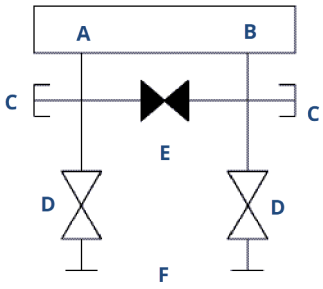
A. High
B. Low
C. Drain/vent valve
D. Equalize (open)
E. Isolate (open)
F. Isolate (closed)
G. Process

3. After zeroing the transmitter, close the equalizing valve.



A. High
B. Low
C. Drain/vent valve
D. Equalize (closed)
E. Isolate (open)
F. Isolate (closed)
G. Process

4. Open the block valve on the low pressure side of the transmitter to return the transmitter to service.



A. High
B. Low
C. Drain/vent valve
D. Isolate (open)
E. Equalize (closed)
F. Process

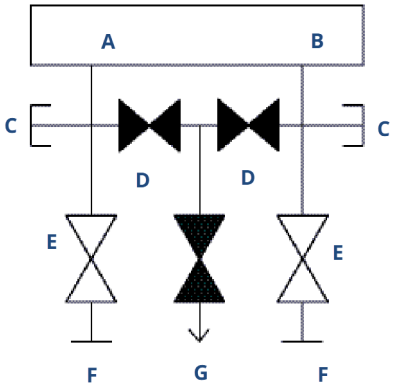
Related information

Perform a Digital Zero Trim (option DZ)

Operate five-valve manifold

Five-valve natural gas configurations are shown.

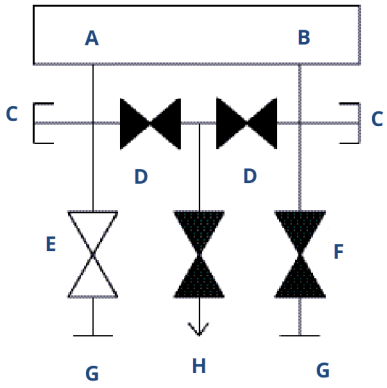
In normal operation, the two block valves between the process and instrument ports will be open, and the equalizing valves will be closed.



A. High
B. Low
C. Test (plugged)
D. Equalize (closed)
E. Isolate (open)
F. Process
G. Drain vent

Procedure

1. To zero the transmitter, first close the block valve on the low pressure (downstream) side of the transmitter.



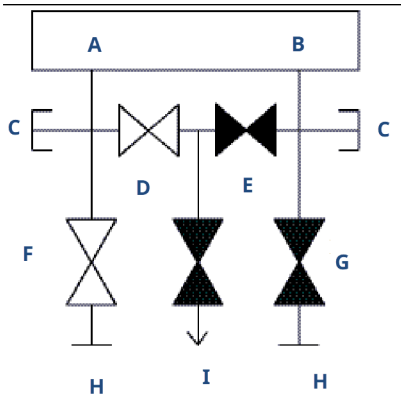
A. High
B. Low
C. Test (plugged)
D. Equalize (closed)
E. Isolate (open)
F. Isolate (closed)
G. Process
H. Drain vent

NOTICE

Opening the low side equalize valve before the high side equalize valve will overpressure the transmitter.

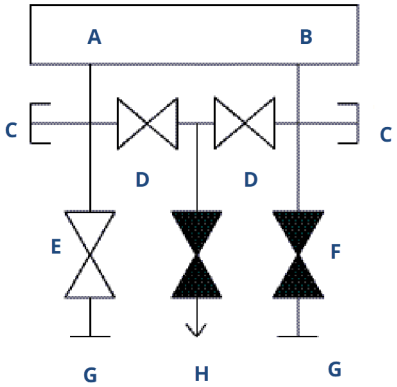
Do not open the low side equalize valve before the high side equalize valve.

2. Open the equalize valve on the high pressure (upstream) side of the transmitter.



A. High
B. Low
C. Test (plugged)
D. Equalize (open)
E. Equalize (closed)
F. Isolate (open)
G. Isolate (closed)
H. Process
I. Drain vent (closed)

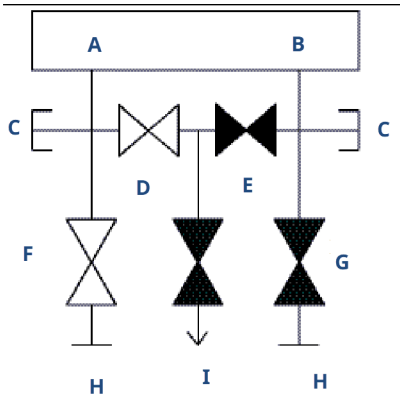
3. Open the equalize valve on the low pressure (downstream) side of the transmitter. The manifold is now in the proper configuration for zeroing the transmitter.



A. High
B. Low
C. Test (plugged)
D. Equalize (open)
E. Isolate (open)
F. Isolate (closed)
G. Process
H. Drain vent (closed)

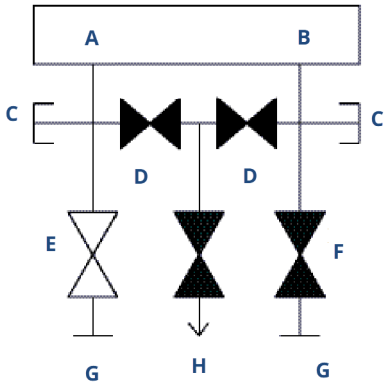
4. Zero the transmitter.

5. Close the equalize valve on the low pressure (downstream) side of the transmitter.



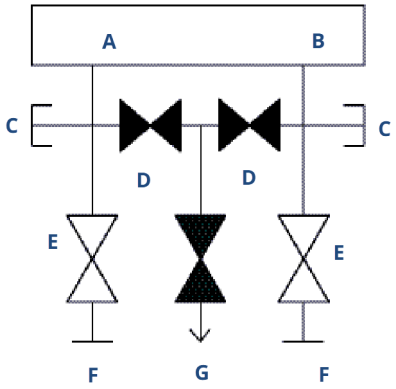
A. High
B. Low
C. Test (plugged)
D. Equalize (open)
E. Equalize (closed)
F. Isolate (open)
G. Isolate (closed)
H. Process
I. Drain vent (closed)

6. Close the equalize valve on the high pressure (upstream) side.



A. High
B. Low
C. Test (plugged)
D. Equalize (closed)
E. Isolate (open)
F. Isolate (closed)
G. Process
H. Drain vent

7. Finally, to return the transmitter to service, open the low side isolation valve.



A. High
B. Low
C. Test (plugged)
D. Equalize (closed)
E. Isolate (open)
F. Process
G. Drain vent

Related information

Perform a Digital Zero Trim (option DZ)

4 Commissioning

4.1 Overview

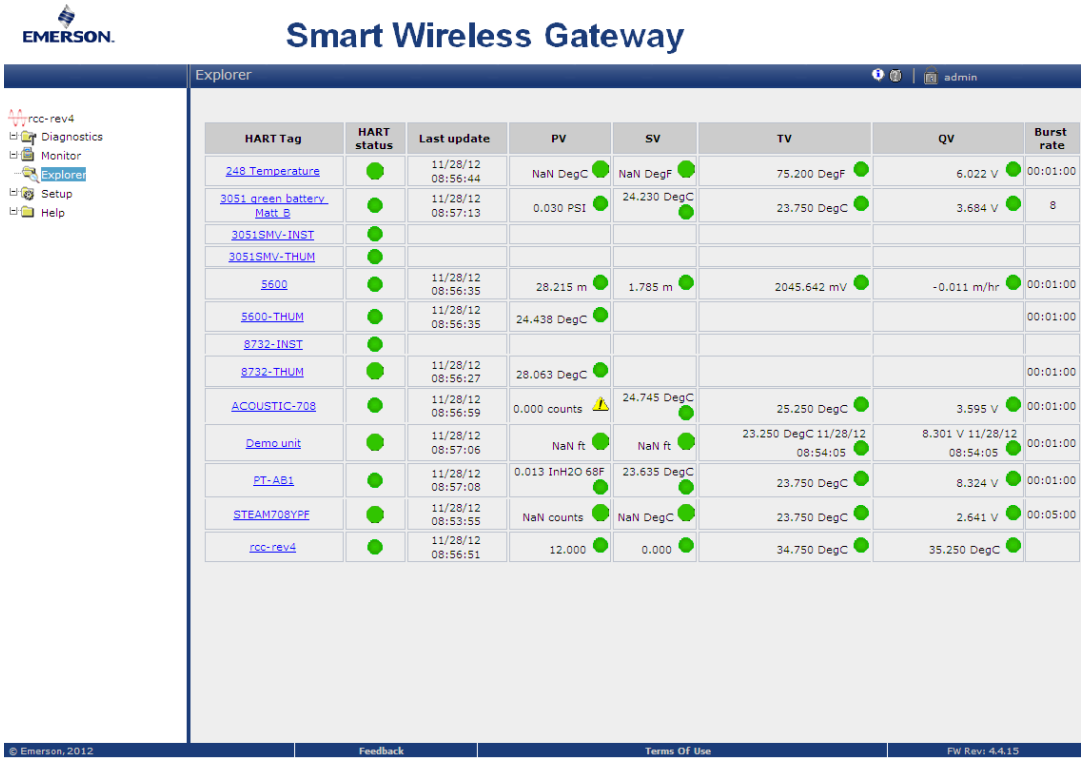
The information in this section covers installation considerations for the Rosemount 2051 Wireless Pressure Transmitter.

Note
For transmitter disassembly refer to Removing from service.

4.2 Viewing network status

If the Rosemount 2051 Wireless was configured with the Network ID and Join Key, and sufficient time for network polling has passed, connect the transmitter to the network.

To verify connectivity, open the Smart Wireless Gateway's integral web interface and navigate to the ***Explorer*** page.



This page will display the transmitter's HART Tag, primary variable (PV), secondary variable (SV), tertiary variable (TV), quaternary variable (QV), and Burst Rate. A green status indicator means that the device is working properly. A red indicator means that there is a problem with either the device or its communication path. For more detail on a specific device, click on the HART tag name.

4.3 Verifying operation

You can verify operation in four locations:

- Device local display
- Communication device
- Smart Wireless Gateway's integrated web interface
- AMS Suite Wireless Configurator
- AMS Device Manager

4.3.1 Verifying operation with the local display

The LCD display will display the primary variable (PV) value at the same rate as the configured update rate.

Press the **Diagnostic** button to display the ***Tag***, ***Device ID***, ***Network ID***, ***Network Join Status***, and ***Device Status*** screens.

For ***Device Status*** screens, see LCD Screen Messages.

Table 4-1: Diagnostic screen sequence

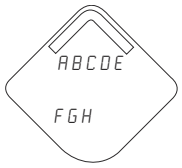
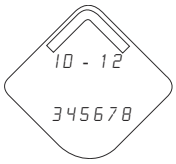
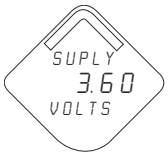
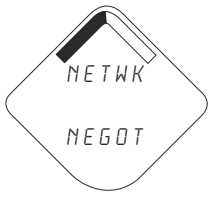
Tag	Device ID	Network ID	Network Join Status	Device Status
				

Table 4-2: Network Join Status screens

Searching for Network	Joining Network	Connected with Limited Bandwidth	Connected
			

4.3.2 Verifying operation with a communication device

For HART® wireless transmitter a communication, a Rosemount 2051 Wireless device descriptor (DD) is required.

To obtain the latest DD, visit Software & Drivers. Verify the communication status in the wireless device using the following fast key sequence:

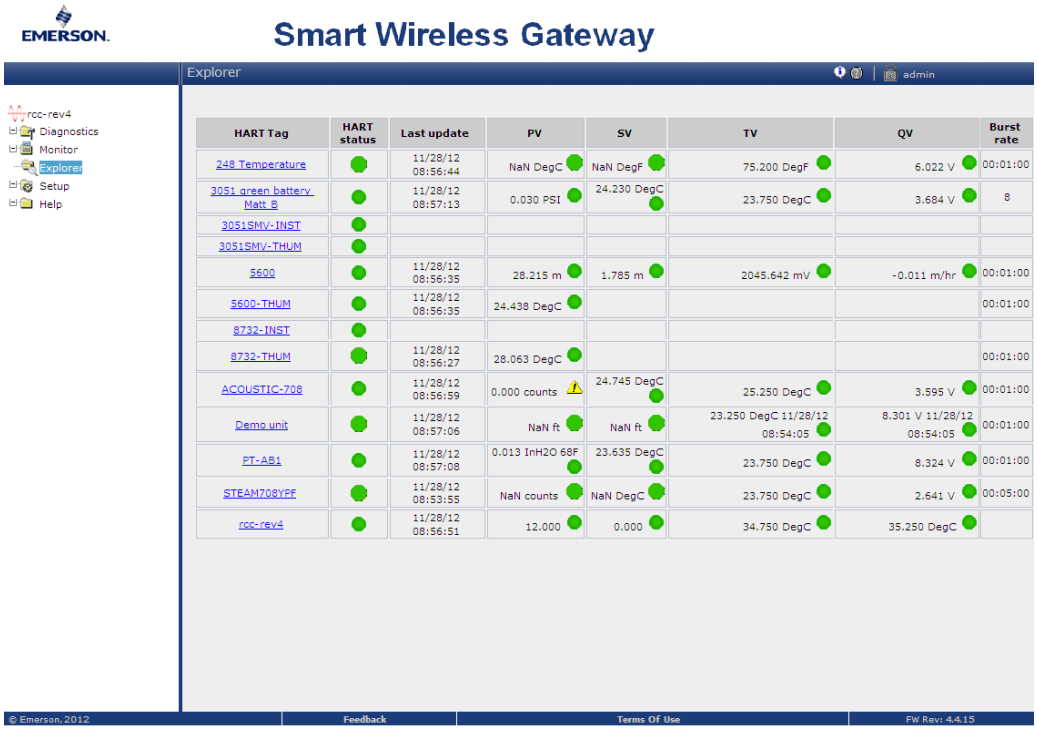
Function	Key sequence	Menu items
Communications	3, 4	• Join Status • Join Mode • Number of Available Neighbors • Number of Advertisements Heard • Number of Join Attempts

4.3.3 Verifying operation with Smart Wireless Gateway

Using the Gateway's web interface, navigate to the ***Explorer*** page as shown in Figure 4-1.

Locate the device in question and verify all status indicators are good (green).

Figure 4-1: Smart Wireless Gateway Explorer page

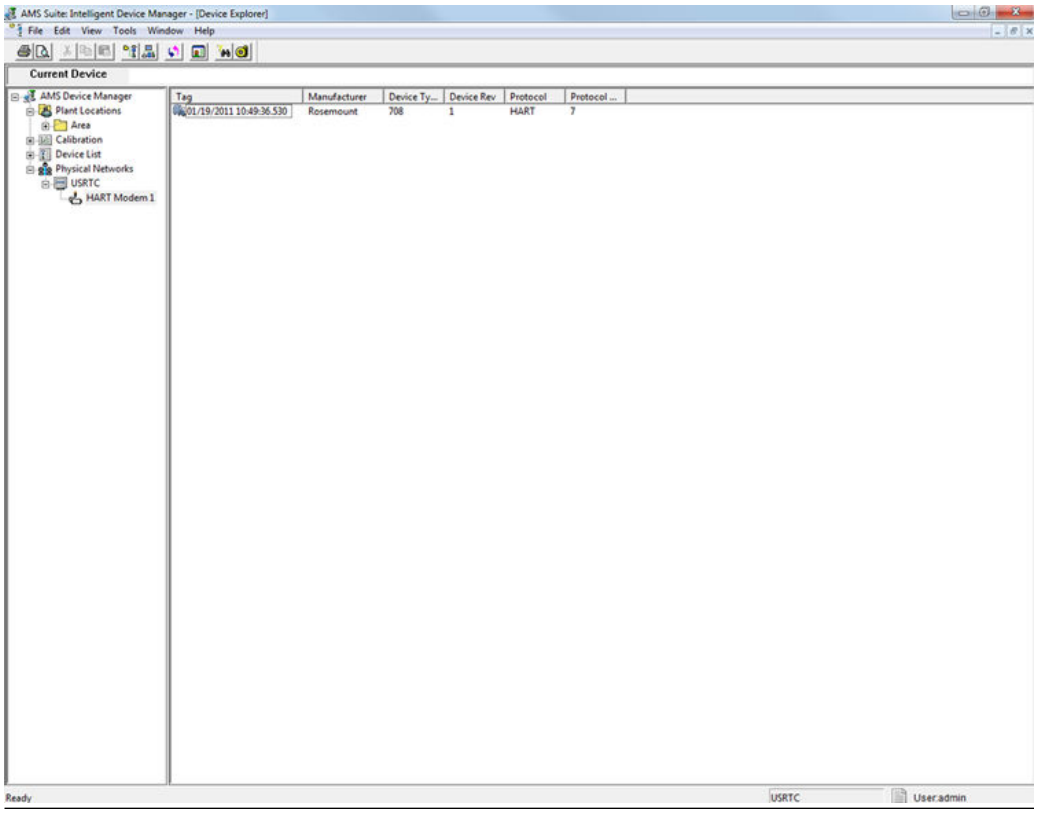


4.3.4 Verifying operation with AMS Suite Wireless Configurator

When the device has joined the network, it will appear in the AMS Suite Intelligent Device Manager as illustrated in Figure 4-2.

For HART® wireless transmitter communication, a Rosemount 2051 Wireless device descriptor (DD) is required. To obtain the latest DD, visit Software & Drivers.

Figure 4-2: AMS Suite Intelligent Device Manager



4.3.5 Troubleshooting operation verification

The device is not joined to the network after power-up.

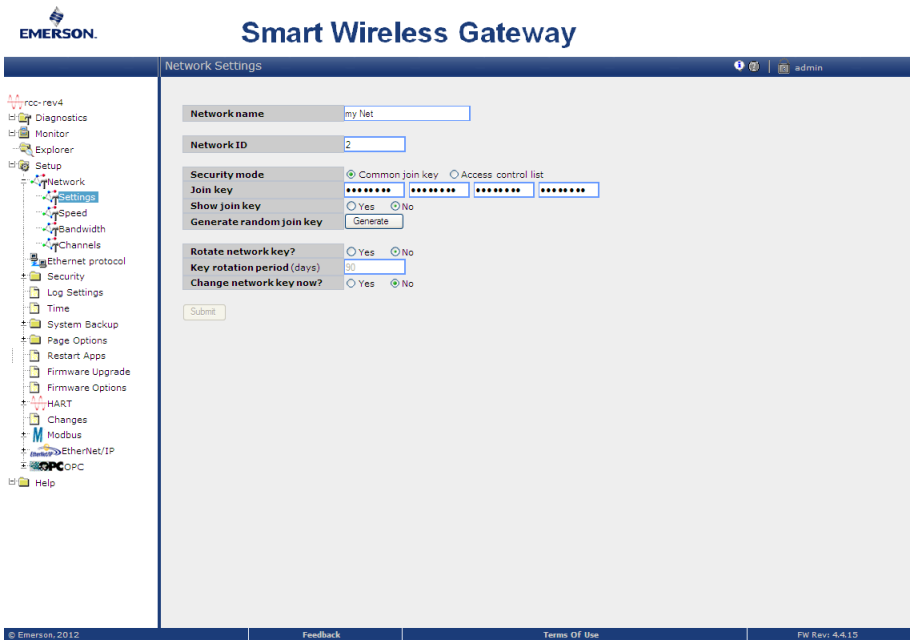
Recommended actions

1. Verify the correct configuration of the **Network ID** and **Join Key** and that **Active Advertising** has been enabled in the Gateway.

   The **Network ID** and **Join Key** in the device must match the **Network ID** and **Join Key** of the Gateway.

2. Obtain the **Network ID** and **Join Key** from the Gateway on the **Setup** → **Network Settings** page of the web server.

Figure 4-3: Smart Wireless Gateway Network Settings



3. To change the **Network ID** and **Join Key** in the wireless device, follow the fast key sequence shown below:

Function	Key sequence	Menu items
Join Device to Network	2, 1, 3	Network ID, Set Join Key

4.3.6 Using the communication device

Note
In order to communicate with a communication device, power the Rosemount 2051 Wireless Transmitter by connecting the power module. For more information on the power module, refer to the Power Module Product Data Sheet.

Table 4-3 includes fast key sequences frequently used to interrogate and configure the device.

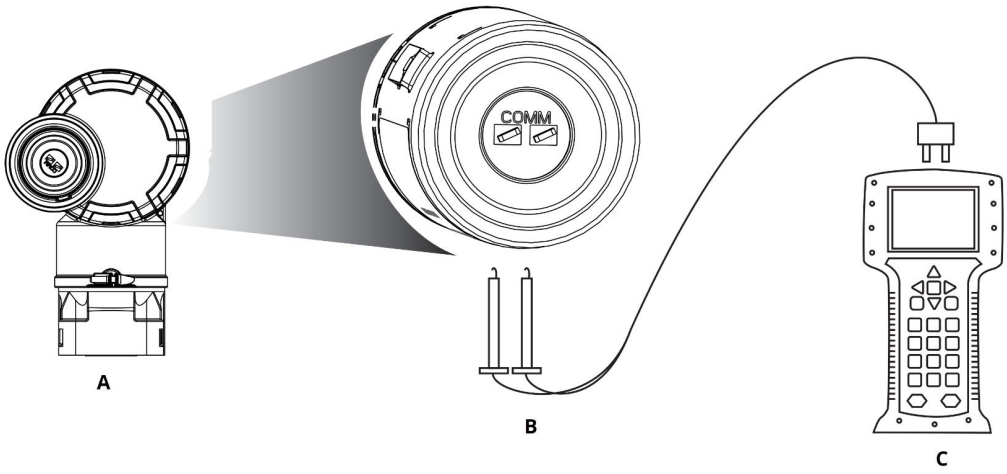
Table 4-3: 2051 Wireless fast key sequence

Function	Key sequence	Menu items
Device Information	2, 2, 9	• Identification • Model Numbers • Flange Information • Remote Seal Information • Serial Number

Table 4-3: 2051 Wireless fast key sequence *(continued)*

Function	Key sequence	Menu items
Guided Setup	2, 1	• Basic Setup • Join Device to Network • Configure Update Rates • Alert Setup
Manual Setup	2, 2	• Wireless • Sensor • HART • Security • Device Information • Power
Wireless	2, 2, 1	• Network ID • Join Device to Network • Broadcast Information

Figure 4-4: Communication device Connections



A. Transmitter
B. HART® communication terminal
C. Communication device

4.4 Configuring transmitter security

There are two security methods with the Rosemount 2051 Wireless Transmitter:

- HART Lock
- Configuration Button Lock

4.4.1 Configuring transmitter security using HART Lock

The HART Lock prevents changes to the transmitter configurations from all sources; the transmitter will reject all changes requested via HART® and local configuration buttons.

You can only set the HART Lock via HART communication. You can enable or disable the HART Lock with a communication device or AMS Device Manager.

Configure HART Lock using communication device

Procedure

From the ***Home*** screen, enter the fast key sequence:

Fast keys 2, 2, 7, 2

Configure HART Lock using AMS Device Manager

Procedure

1. Right click on the device and select **Configure**.
2. Under ***Manual Setup*** select the ***Security*** tab.
3. Select the **Lock/Unlock** button under ***HART Lock (Software)*** and follow the screen prompts.

4.4.2 Configuring transmitter security with Configuration Button Lock

The Configuration Button Lock disables all local button functionality.

The transmitter will reject changes to configuration from the local configuration buttons. You can only lock local external keys using HART® communication.

Configure Configuration Button Lock using a communication device

Procedure

From the ***HOME*** screen, enter the fast key sequence:

Fast keys 2, 2, 7, 4

Configure Configuration Button Lock using AMS device Manager

Procedure

1. Right click on the device and select **Configure**.
2. Under ***Manual Setup*** select the ***Security*** tab.
3. Within the ***Configuration Buttons*** drop-down menu select **Disabled** to lock external local keys.
4. Click **Send**.
5. Confirm service reason and click **Yes**.

5 Operation and maintenance

5.1 Overview

This section provides instructions to configure the transmitter using a communication device or AMS.

For convenience, communication device fast key sequences are labeled *Fast Keys* for each software function below the appropriate headings.

5.2 Calibration

Calibrating a Rosemount 2051 Wireless Transmitter may include:

Sensor Trim: Adjusts the position of the factory sensor characterization curve to optimize performance over a specified pressure range, or to adjust for mounting effects.

The 2051 Wireless sensor module contains information about the sensor's specific characteristics in response to pressure and temperature inputs. A smart transmitter compensates for these sensor variations. The process of generating the sensor performance profile is called factory sensor characterization.

Sensor trimming requires an accurate pressure input and adds additional compensation that adjusts the position of the factory sensor characterization curve to optimize performance over a specific pressure range.

NOTICE

Emerson calibrates absolute pressure transmitters (2051CA and 2051TA) 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.

NOTICE

For 2051CA, 2051TA range 0 and range 5 devices, an accurate absolute pressure source is required.

5.2.1 Recommended calibration tasks

Bench calibrate Rosemount 2051CD, 2051CG, 2051L, and 2051TG, Range 1-4

Procedure

1. Set output configuration parameters.
   a) Set the range points.
   b) Set the output units.
   c) Set the output type.
2. Optionally, perform a sensor trim.

An accurate pressure source is required for a sensor trim.

Related information

Sensor Trim Overview

Field calibrate Rosemount 2051CD, 2051CG, 2051L, and 2051TG, Range 1-4

Procedure

1. Reconfigure parameters if necessary.
2. Zero trim the transmitter to compensate for mounting effects or static pressure effects.

Related information

Perform a Digital Zero Trim (option DZ)

Bench calibrate Rosemount 2051CA, 2051TA, and 2051 TG, Range 5

Procedure

1. Set output configuration parameters.
   a) Set the range points.
   b) Set the output units.
   c) Set the output type.
2. Optionally, perform a sensor trim if equipment is available (accurate absolute pressure source required). Otherwise, perform the lower trim of Sensor Trim.

Field calibrate Rosemount 2051CA, 2051TA, and 2051TG, Range 5

Procedure

1. Reconfigure parameters if necessary.
2. Perform low trim value section of Sensor Trim to correct for mounting position effects.

5.2.2 Determine necessary sensor trims

Bench calibrations allow for calibrating the transmitter for its desired range of operation.

Straightforward 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 output value. Sensor Trim discusses how the trim operations change the calibration.

NOTICE

It is possible to degrade the performance of the transmitter if a trim is done improperly or with inaccurate equipment.

To set the transmitter back to factory settings, use the **Recall Factory Trim** command in Recall Factory Trim—Sensor Trim.

For transmitters that are field installed, the manifolds discussed in Rosemount 304, 305 and 306 Integral Manifolds allow the differential transmitter to be zeroed using the zero trim function. That section covers both 3-valve and 5-valve manifolds. This field calibration will eliminate any pressure offsets caused by mounting effects (head effect of the oil fill) and static pressure effects of the process.

To determine the necessary sensor trims:

Procedure

1. Apply pressure
2. Check digital pressure. If the digital pressure does not match the applied pressure, perform a digital zero trim.

   See Sensor Trim.

Related information

Perform a Digital Zero Trim (option DZ)

Trim using configuration buttons

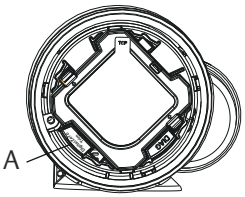
Local configuration buttons are located inside the transmitter housing.

Procedure

1. To access the buttons, remove the housing cover.
2. Perform a digital zero trim. See Recommended calibration tasks for trim instructions.

   Figure 5-1 shows the location of the **digital zero** button.

Figure 5-1: Digital zero button location



A. Digital zero button

Related information

Perform a Digital Zero Trim (option DZ)

5.2.3 Determine calibration frequency

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

Procedure

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.

Determine calibration frequency (example)

For a Rosemount 2051 Wireless (0.04 percent accuracy and five-year stability)

Procedure

1. Determine the performance required for your application.

Required performance	0.20 percent of span

2. Determine the operating conditions.

Transmitter	2051CD, range 2 (upper range limit [URL] = 250 inH_2O [623 mbar])
Calibrated span	150 inH_2O (374 mbar)
Ambient temperature change	±50 °F (28 °C)
Line pressure	500 psi (34.5 bar)

3. Calculate total probable error (TPE).

$$TPE = \sqrt{(ReferenceAccuracy)^2 + (TemperatureEffect)^2 + (StaticPressureEffect)^2}$$

Where:

Reference accuracy	±0.04 percent of span
Ambient temperature effect	$\left(\frac{(0.0125 \times URL)}{Span} + 0.0625\right)\%$ per 50 °F = ±0.0833% of span
Span static pressure effect	0.01 percent reading per 1000 psi (69 bar) - 0.05 percent of span at maximum span[3]

4. Calculate the stability per month.

$$Stability = \pm\left[\frac{(0.125 \times URL)}{Span}\right]\% \text{ of span for 5 years} = \pm 0.0021\% \text{ of URL for 1 month}$$

5. Calculate calibration frequency.

$$\text{Cal. Freq.} = \frac{(\text{Req. Performance} - TPE)}{\text{Stability per Month}} = \frac{(0.2\% - 0.105\%)}{0.0021\%} = 45 \text{ months}$$

Related information

Perform a Digital Zero Trim (option DZ)

(3) *Zero static pressure effect removed by zero trimming at line pressure.*

5.2.4 Compensating for span line pressure effects (Range 4 and Range 5)

Rosemount 2051 Wireless Range 4 and 5 pressure transmitters require a special calibration procedure when used in differential pressure applications.

The purpose of this procedure is to optimize transmitter performance by reducing the effect of static line pressure in these applications. The 2051 Wireless differential pressure transmitters (Ranges 0 through 3) do not require this procedure because optimization occurs at the sensor.

The systematic span shift caused by the application of static line pressure is -0.95% of reading per 1000 psi (69 bar) for Range 4 transmitters, and -1% of reading per 1000 psi (69 bar) for Range 5 transmitters. Using the following procedure, the span effect can be corrected to ±0.2% of reading per 1000 psi (69 bar) for line pressures from 0 to 3626 psi (0 to 250 bar).

Use the following example to compute correct input values.

Example

A Range 4 differential pressure HART® transmitter (2051CD4...) will be used in an application with a static line pressure of 1200 psi (83 bar). The transmitter output is ranged with the Lower Range Value at 500 inH20 (1, 2 bar) and the Upper Range Value at 1500 inH20 (3, 7 bar). To correct for systematic error caused by high static line pressure, first use the following formulas to determine the corrected values for the high trim value.

High trim value:

HT = (URV - (S/100 x P/1000 x LRV))

where:

HT	Corrected high trim value
URV	Upper range value
S	Span shift per specification (as a percent of reading)
P	Static line pressure in psi

In this example:

URV	1500 inH_2O (3.74 bar)
S	-0.95%
P	1200 psi
HT	1500 - (-0.95%/100 x 1200 psi/1000 psi x 1500 inH_2O)
HT	1517.1 in H_2O

Complete the Upper Sensor Trim procedure as described in Sensor Trim. In the example above, at step 4, apply the nominal pressure value of 1500 inH_20. However, enter the calculated correct upper Sensor Trim value of 1517.1 inH_20 with a communication device.

Note
The Range Values for the upper and lower range points should be at the nominal URV and LRV. In the example above, the values are 1500 inH_20 and 500 inH_20 respectively. Confirm the values on the HOME screen of the communication device. Modify, if needed, by following the steps in Set range points.

5.3 Trim the pressure signal

5.3.1 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, or the high and low side pressure are equal (for differential pressure transmitters).

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.

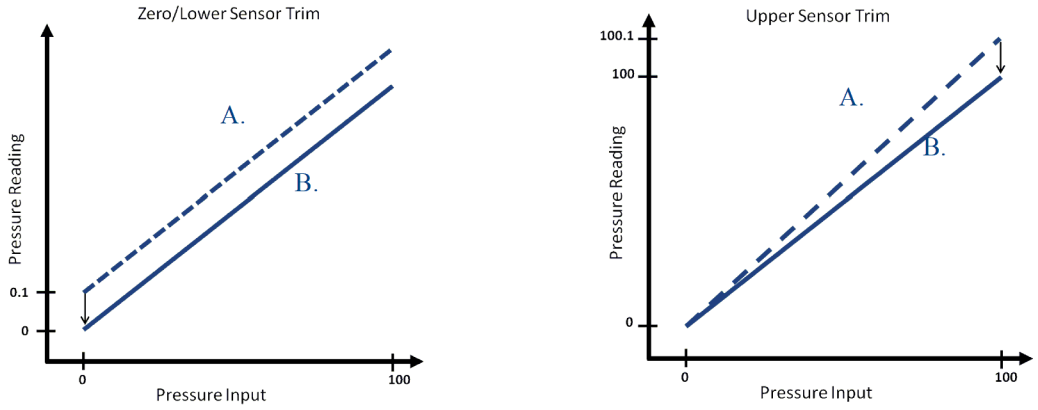
When performing a zero trim, ensure that the equalizing valve is open and all wet legs are filled to the correct levels. Line pressure should be applied to the transmitter during a zero trim to eliminate line pressure errors. Refer to Manifold operation.

Note
Do not perform a zero trim on 2051 Wireless absolute pressure transmitters. Zero trim is zero based, and absolute pressure transmitters reference absolute zero. To correct mounting position effects on a 2051 Wireless 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.

Sensor trim is a two-point sensor calibration where two end-point pressures are applied, and all output is linearized between them. 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 allow you to optimize performance over your specified measuring range at the calibration temperature.

During a trim operation, the 2051 Wireless is placed in high power refresh mode, which provides frequent pressure measurement updates and allows the configured damping to take effect. This behavior allows for more accurate calibration of the device. When the device is in high power refresh mode, the battery power supply will be depleted more rapidly.

Figure 5-2: Sensor Trim example



A	Before Trim
B	After Trim

Related information

Perform a Digital Zero Trim (option DZ)

5.3.2 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 trim.

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 ten seconds before entering any values.

Perform a Sensor Trim using a communication device

From the ***Home*** screen, enter the fast key sequence and follow the steps within the communication device to complete the Sensor Trim.

Fast keys 3, 5, 1

Procedure

1. Assemble and power the entire calibration system including the Rosemount 2051 Wireless, communication device, power supply, pressure input source, and readout device.
2. From the ***Home*** screen, select **3: Service Tools**.
3. Select **5: Maintenance**
4. Select **1: Pressure Calibration**.

   Note
   Select pressure points so that lower and upper values are equal to or outside the expected process operation range.

5. Follow the on-screen instructions to complete the adjustment of the lower value.

6. Repeat the procedure for the upper value. Select **1: Upper Sensor Trim** and follow the on-screen instructions to complete the adjustment of the upper value.

Perform a Sensor Trim using AMS Device Manager

Procedure

1. Right click on the device and go to **Method** → **Calibrate** → **Sensor Trim** → **Lower Sensor Trim**.
2. Follow the screen prompts to perform a Sensor Trim using AMS Device Manager.
3. If desired right click on the device and go to **Method** → **Calibrate** → **Sensor Trim** → **Upper Sensor Trim**.

Perform 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 **Digital Zero** 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 using configuration buttons located inside the housing of the transmitter, see Figure 5-1 for DZ button location.

Procedure

1. Remove the electronics housing cover.
2. Press and hold the **Digital Zero** button for at least two seconds then release to perform a Digital Zero Trim

5.3.3 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 AMS

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

Procedure

1. Click **Next** after setting the control loop to manual.
2. Select **Sensor Trim** under *Trim to recall* and click **Next**.
3. Follow the screen prompts to recall Sensor Trim.

5.3.4 Line pressure effect (Range 2 and Range 3)

The following specifications show the static pressure effect for the Rosemount 2051 Wireless Range 2 and Range 3 pressure transmitters used in differential pressure applications where line pressure exceeds 2000 psi (138 bar).

Zero effect

± 0.1% of the upper range limit plus an additional ± 0.1% of upper range limit error for each 1000 psi (69 bar) of line pressure above 2000 psi (138 bar).

Example: Line pressure is 3000 psi (207 bar) for Ultra performance transmitter. Zero effect error calculation:

± {0.05 + 0.1 x [3 kpsi - 2 kpsi]} = ± 0.15% of the upper range limit

Span effect

Refer to Line Pressure Effect per 1000 psi (6,9 MPa).

5.3.5 Compensating for line pressure (Range 4 and Range 5)

The Rosemount 2051 Wireless Range 4 and 5 pressure transmitters require a special calibration procedure when used in differential pressure applications.

The purpose of this procedure is to optimize transmitter performance by reducing the effect of static line pressure in these applications. The 2051 Wireless differential pressure transmitters (Ranges 1, 2, and 3) do not require this procedure because optimization occurs in the sensor.

Applying high static pressure to the 2051 Wireless Range 4 and Range 5 pressure transmitters causes a systematic shift in the output. This shift is linear with static pressure; correct it by performing the Sensor Trim procedure.

The following specifications show the static pressure effect for the 2051 Wireless Range 4 and Range 5 transmitters used in differential pressure applications:

Zero effect

± 0.1% of the upper range limit per 1000 psi (69 bar) for line pressures from 0 to 2000 psi (0 to 138 bar)

For line pressures above 2000 psi (138 bar), the zero effect error is ± 0.2% of the upper range limit plus an additional ± 0.2% of upper range limit error for each 1000 psi (69 bar) of line pressure above 2000 psi (138 bar).

Example: Line pressure is 3000 psi (3 kpsi). Zero effect error calculation:

± {0.2 + 0.2 x [3 kpsi - 2 kpsi]} = ± 0.4% of the upper range limit

Span effect

Correctable to ±0.2% of reading per 1000 psi (69 bar) for line pressures from 0 to 3626 psi (0 to 250 bar)

The systematic span shift caused by the application of static line pressure is -1.00% of reading per 1000 psi (69 bar) for Range 4 transmitters, and -1.25% of reading per 1000 psi (69 bar) for Range 5 transmitters.

Use the following example to compute corrected input values.

Example

A transmitter with model number 2051CD4 will be used in a differential pressure application where the static line pressure is 1200 psi (83 bar). The transmitter output is ranged with 4 mA at 500 inH_2O (1,2 bar) and 20 mA at 1500 inH_2O (3,7 bar).

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

LT = LRV + S x (LRV) x P

Where:

LT	Corrected low trim value
LRV	Lower range value

S	-(Span shift per specification)
P	Static line pressure

HT = URV + S x (URV) x P

Where:

HT	Corrected high trim value
URV	Upper range value
S	-(Span shift per specification)
P	Static line pressure

In this example:

URV	1500 inH_2O (3.75 bar)
LRV	500 inH_2O (1.25 bar)
P	1200 psi (82.74 bar)
S	±0.01/1000

To calculate the low trim (LT) value:

LT	500 + (0.01/1000)(500)(1200)
LT	506 inH_2O (1.25 bar)

To calculate the high trim (HT) value):

HT	1500 + (0.01/1000)(1500)(1200)
HT	1518 inH_2O (3.78 bar)

Complete a 2051 Wireless Sensor Trim and enter the corrected values for low trim (LT) and high trim (HT), refer to Sensor Trim.

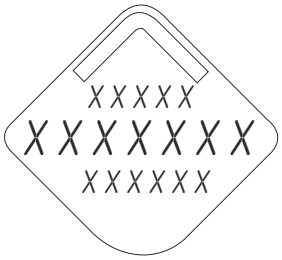
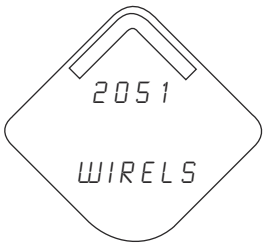
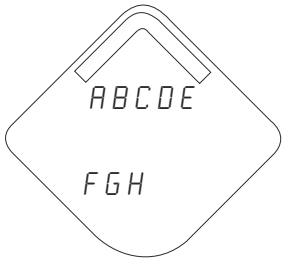
Enter the corrected input values for low trim and high trim through the communication device keypad after you apply the nominal value of pressure as the transmitter input.

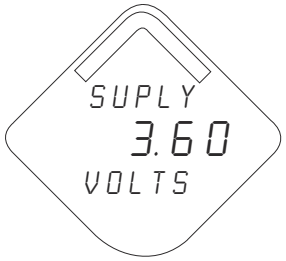
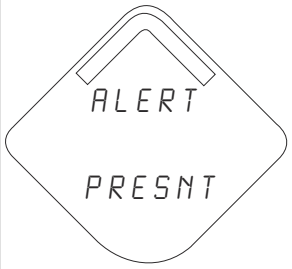
Note
After sensor trimming 2051 Wireless Range 4 and 5 transmitters for high differential pressure applications, verify that the lower and upper operating points are at nominal values using the communication device.

5.4 LCD Screen Messages

5.4.1 Startup Screen Sequence

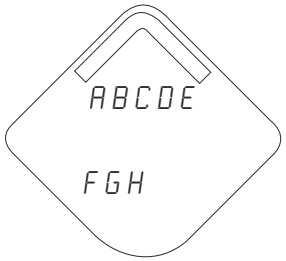
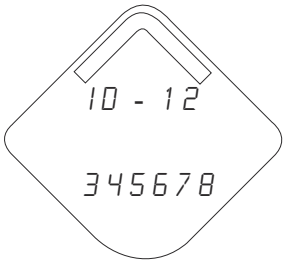
The following screens will display when the Power Module is first connected to the Rosemount 2051 Wireless.

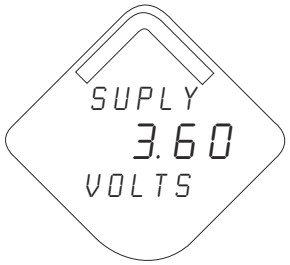
	All Segments On: used to visually determine if there are any bad segments on the LCD
	Device Identification: used to determine Device Type.
	Device Information - Tag: user entered tag which is eight characters long - will not display if all characters are blank
	PV Screen - process pressure
	SV Screen - sensor temperature value

	TV Screen - device temperature value
	QV Screen - voltage reading at the power supply terminals
	Percent Range Screen - percent range reading
	Alert Screen - at least one alert is present - this screen will not display if no alerts are present

5.4.2 Diagnostic Button Screen Sequence

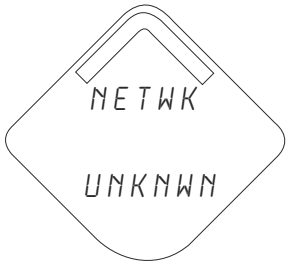
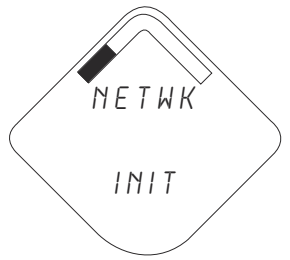
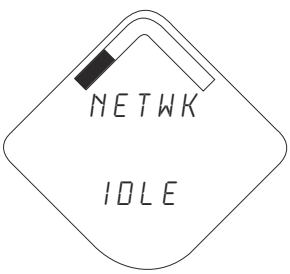
The following five screens will display when the device is operating properly and the Diagnostic Button has been pressed.

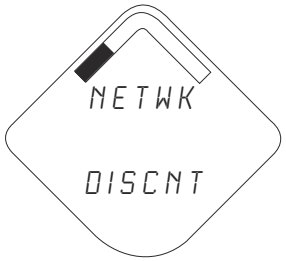
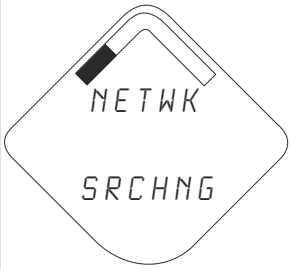
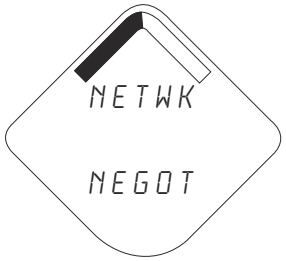
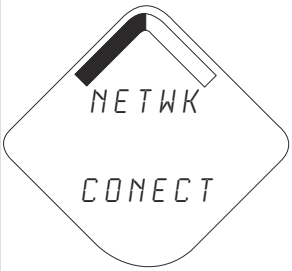
	Device Information - Tag: user entered tag which is eight characters long - will not display if all characters are blank
	Device Identification: used to determine Device ID
	Diagnostic Button Screen 3: assuming the device has the correct join key, this ID tells the user what network the device can connect with
	Diagnostic Button Screen 4: the device has joined a network and has been fully configured and has multiple parents

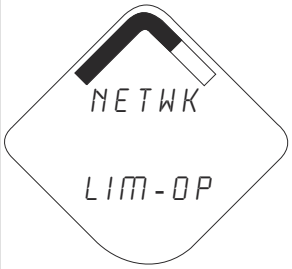
	Diagnostic Button Screen 5: voltage reading at the power supply terminals

5.4.3 Network Diagnostic Status Screens

These screens display the network status of the device. Only one will be shown during the startup sequence or diagnostic sequence.

	Diagnostic Button Screen 4.1: the device is attempting to start the radio
	Diagnostic Button Screen 4.2: the device has just restarted
	Diagnostic Button Screen 4.3: the device is starting to join the process

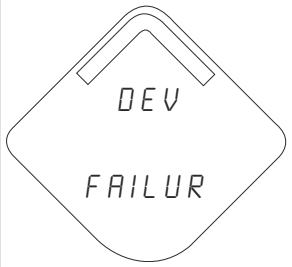
	Diagnostic Button Screen 4.4: the device is in a disconnected state and requires a “Force Join” command to join the network
	Diagnostic Button Screen 4.5: the device is searching for the Network
	Diagnostic Button Screen 4.6: the device is attempting to join a network
	Diagnostic Button Screen 4.7: the device is connected to the Network, but is in a “Quarantined” state

	Diagnostic Button Screen 4.8: the device is joined and operational, but is running with limited bandwidth for sending periodic data

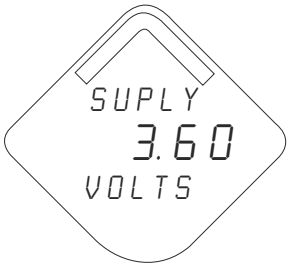
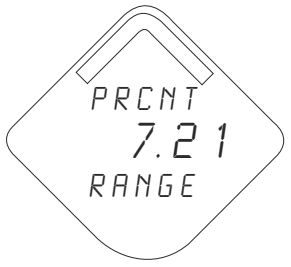
	Diagnostic Button Screen 4.9: the device has joined a network and has been fully configured and has multiple parents

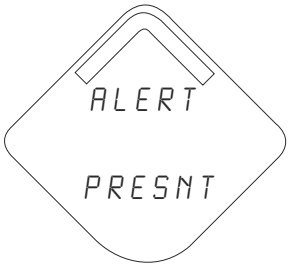
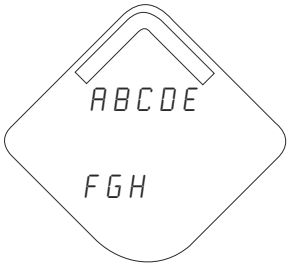
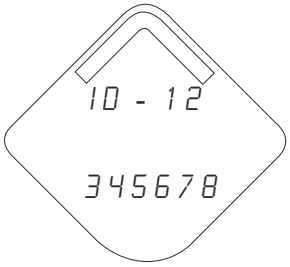
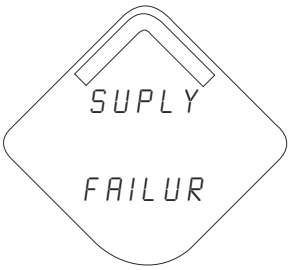
5.4.4 Device Diagnostic Screens

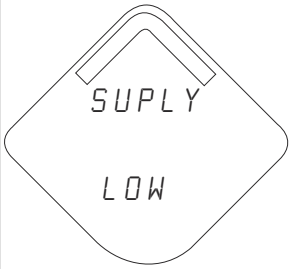
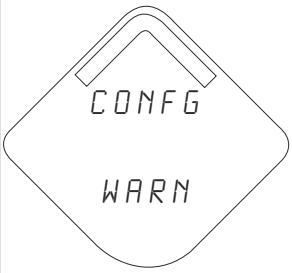
The following screens will show the device diagnostics depending on the state of the device.

	Device Information - Status: there is a critical error which may prevent the device from operating correctly. Check additional status screens for more information.

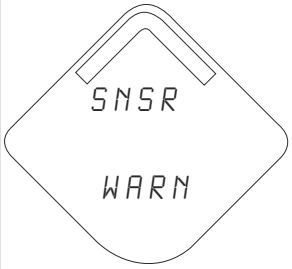
	PV Screen - process pressure value

	SV Screen - sensor temperature value
	TV Screen - device temperature value
	QV Screen - voltage reading at the power supply terminals
	Percent Range Screen - percent range reading

	Alert Screen - at least one alert is present - this screen will not display if no alerts are present
	Diagnostic Button Screen 1 - Tag: user entered tag which is eight characters long - will not display if all characters are blank
	Diagnostic Button Screen 2: the device's identifier that is used to make up the HART long address - the Smart Wireless Gateway may use this to help identify devices if no unique user tag is available
	Diagnostic Button Screen 7.1: the terminal voltage has dropped below level of operating limit. Replace the Power Module (Part Number: 701PGNKF)

	Diagnostic Button Screen 7.2: the terminal voltage is below the recommended operating range - the Power Module should be replaced
	Diagnostic Button Screen 8: the device may not be able to communicate with the radio or the radio has an internal error. In this state the device may still be operational and publishing HART data
	Diagnostic Button Screen 9.1: configuration of the transmitter is invalid such that critical operation of the device may be affected - check the extended configuration status to identify which configuration item(s) need to be corrected
	Diagnostic Button Screen 9.2: configuration of the transmitter is invalid such that non-critical operation of the device may be affected - check the extended configuration status to identify which configuration item(s) need to be corrected

	Diagnostic Button Screen 10.1: a sensor attached to the transmitter has failed, and valid readings from that sensor are no longer possible - check the sensor and sensor wiring connections - check additional status for more detailed information of the failure source

	Diagnostic Button Screen 10.2: a sensor attached to the transmitter is degraded, readings from that sensor may not be within accuracy specifications - check the process, and sensor wiring connections - check additional status for more detailed information of the warning source

Note
Use the Rosemount Wireless LCD Part Number: 00753-9004-0002.

6 Troubleshooting

6.1 Overview

Device Status warnings , Rosemount 2051 Wireless Transmitter troubleshooting, and Wireless network troubleshooting provide summarized maintenance and troubleshooting suggestions for the most common operating problems for the transmitter and the wireless network connection.

6.2 Device Status warnings

6.2.1 Electronics Failure

An electronics error that could impact the device measurement reading has occurred.

Recommended actions

1. Reset the device.
2. Reconfirm all configuration items in the device.
3. If the condition persists, replace the electronics.

6.2.2 Radio Failure

The wireless radio has detected a failure or stopped communicating.

Recommended actions

1. Reset the device.
2. If the condition persists, replace the electronics.

6.2.3 Supply Voltage Failure

The supply voltage is too low for the device to function properly.

Recommended action

Replace the power module.

6.2.4 Electronics Warning

The device has detected an electronics error that does not currently impact the device measurement reading.

Recommended actions

1. Reset the device.
2. Reconfirm all configuration items in the device.
3. If the condition persists, replace the electronics.

6.2.5 Pressure has Exceeded Limits

The sensor has exceeded the maximum measurement range.

Recommended actions

1. Check process for possible saturation condition.
2. Verify that the appropriate sensor was chosen for the application.
3. Reconfirm sensor configuration.
4. Reset the device.
5. Replace the sensor.

6.2.6 Electronics Temperature has Exceeded Limits

The electronics temperature has exceeded the transmitter's maximum range.

Recommended actions

1. Verify environmental temperature is within the transmitter's range.
2. Remote mount the transmitter away from process and environmental conditions.
3. Reset the device.
4. If the condition persists, replace the electronics.

6.2.7 Supply Voltage Low

The supply voltage is low and may soon affect broadcast updates.

Recommended action

Replace the power module.

6.2.8 Database Memory Warning

The device has failed to write to the database memory. Any data written during this time may have been lost.

If logging dynamic data is not needed, you may safely ignore this warning.

Recommended actions

1. Reset the device.
2. Reconfirm all configuration items in the device.
3. If the condition persists, replace the electronics.

6.2.9 Configuration Error

The device has detected a configuration error based on a change to the device.

Recommended actions

1. Click on details for more information.
2. Correct the parameter that has a configuration error.
3. Reset the device.
4. If the condition persists, replace the electronics.

6.2.10 HI HI Alarm

The primary variable has surpassed the user-defined limit.

Recommended actions

1. Verify that the process variable is within user-specified limits.
2. Reconfirm the user-defined alarm limit.
3. If not needed, disable this alert.

6.2.11 HI Alarm

The primary variable has surpassed the user-defined limit.

Recommended actions

1. Verify that the process variable is within user-specified limits.
2. Reconfirm the user-defined alarm limit.
3. If not needed, disable this alert.

6.2.12 LO Alarm

The primary variable has surpassed the user-defined limit.

Recommended actions

1. Verify that the process variable is within user-specified limits.
2. Reconfirm the user-defined alarm limit.
3. If not needed, disable this alert.

6.2.13 LO LO Alarm

The primary variable has surpassed the user-defined limit.

Recommended actions

1. Verify that the process variable is within user-specified limits.
2. Reconfirm the user-defined alarm limit.
3. If not needed, disable this alert.

6.2.14 Button Stuck

A button on the electronics board is detected as stuck in the active position.

Recommended actions

1. Check the button for obstructions.
2. Reset the device.
3. If the condition persists, replace the electronics.

6.2.15 Simulation Active

The device is in simulation mode and may not be reporting actual information.

Recommended actions

1. Verify that simulation is no longer required.
2. Disable `Simulation` mode in ***Service Tools***.
3. Reset the device.

6.3 Rosemount 2051 Wireless Transmitter troubleshooting

6.3.1 Transmitter will not respond to changes in applied pressure

Recommended actions

1. Check test equipment.
2. Check impulse piping or manifold for blockage.
3. Verify applied pressure is within sensor limits.

6.3.2 Digital pressure variable reading is low or high

Recommended actions

1. Check impulse piping for blockage or low fill in wet leg.
2. Verify transmitter is calibrated properly.
3. Check test equipment (verify accuracy).
4. Verify pressure calculations for application.

6.3.3 Digital pressure variable reading is erratic

Recommended actions

1. Check application for faulty equipment in pressure line.
2. Verify transmitter is not reacting directly to equipment turning on/off.

6.3.4 LCD display is not functioning

Recommended actions

1. Reseat the LCD display according to Install the LCD display.
2. Verify that the LCD display is a wireless LCD display meter.

   An LCD display from a wired device will not function in a wireless device. The required LCD display is Rosemount part number `00753-9004-0002`.
3. Verify that `LCD display mode` is not disabled.

6.4 Wireless network troubleshooting

6.4.1 Device not joining the network

Recommended actions

1. Verify network ID and join key.
2. Wait longer (up to 30 minutes).
3. Enable `High Speed Operation (Active Advertising)` on Smart Wireless Gateway.

4. Check power module.
5. Verify device is in range of at least one other device.
6. Verify network is in `Active Network Advertise`.
7. Power cycle device to try again.
8. Verify device is configured to join. Send the **Force Join** command to the device.
9. See troubleshooting section of the Smart Wireless Gateway Reference Manual for more information.

6.4.2 Short battery life

Recommended actions

1. Check that `Power Always On` mode is off.
2. Verify device is not installed in extreme temperatures.
3. Verify that device is not a network pinch point.
4. Check for excessive network rejoins due to poor connectivity.

6.4.3 Limited Bandwidth Error

Recommended actions

1. Reduce the **Update Rate** on transmitter.
2. Increase communication paths by adding more wireless points.
3. Check that the device has been online for at least an hour.
4. Check that the device is not routing through a `limited` routing mode.
5. Create a new network with an additional Smart Wireless Gateway.

6.5 Removing from service

Procedure

1. Follow all plant safety rules and procedures.
2. Isolate and vent the process from the transmitter before removing the transmitter from service.
3. Remove the transmitter from the process connection.
   a) The Rosemount 2051C Wireless transmitter is attached to the process connection by four bolts and two cap screws. Remove the bolts and screws and separate the transmitter from the process connection. Leave the process connection in place and ready for re-installation.

      Reference Figure 3-11 for coplanar flange.

   b) The Rosemount 2051T Wireless transmitter is attached to the process by a single hex nut process connection. Loosen the hex nut to separate the transmitter from the process.

NOTICE

Do not wrench on neck of transmitter. See warning in Inline process connection.

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

NOTICE

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

5. Whenever you remove the process flange or flange adapters, visually inspect the PTFE O-rings. Replace the O-rings if they show any signs of damage, such as nicks or cuts.

   You may reuse undamaged O-rings.

A Reference data

A.1 Ordering information, specifications, and drawings

To view current Rosemount 2051 Wireless ordering information, specifications, and drawings:

Procedure

1. Go to Emerson.com/en-us/catalog/rosemount-sku-2051-wireless-in-line-pressure-transmitter.
2. Scroll as needed to the green menu bar and click **DOCUMENTS & DRAWINGS.**
3. For ordering information, specifications, and dimensional drawings, click **Data Sheets & Bulletins** and select the appropriate Product Data Sheet.

A.2 Product certifications

Procedure

To view current Rosemount 2051 Wireless product certifications, see the Rosemount 2051 Wireless Quick Start Guide.

B Communication device Menu Trees and Fast Keys

B.1 Communication device menu trees

Figure B-1: Rosemount 2051 communication device menu tree: Overview

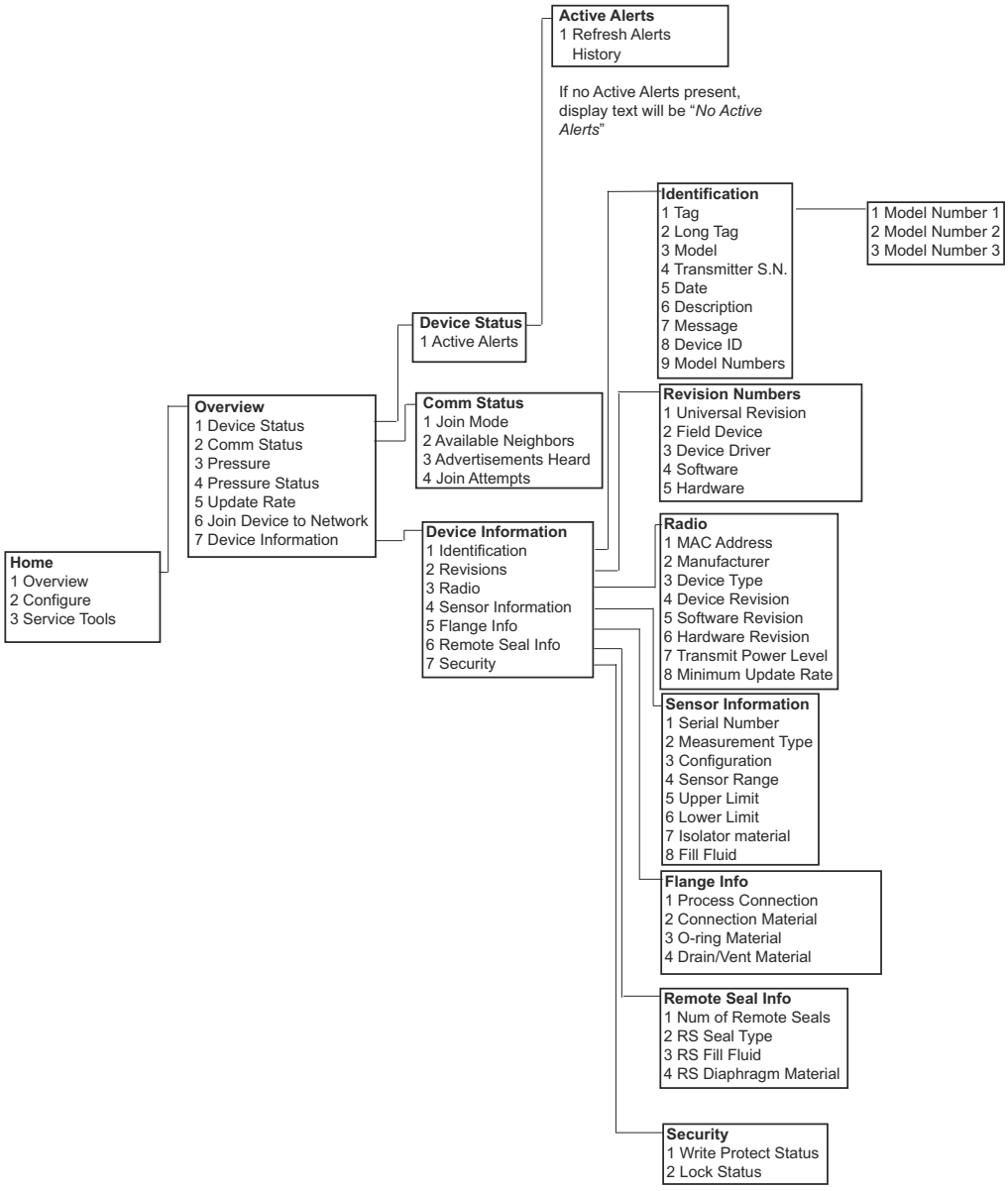


Figure B-2: 2051 communication device menu tree: Configure

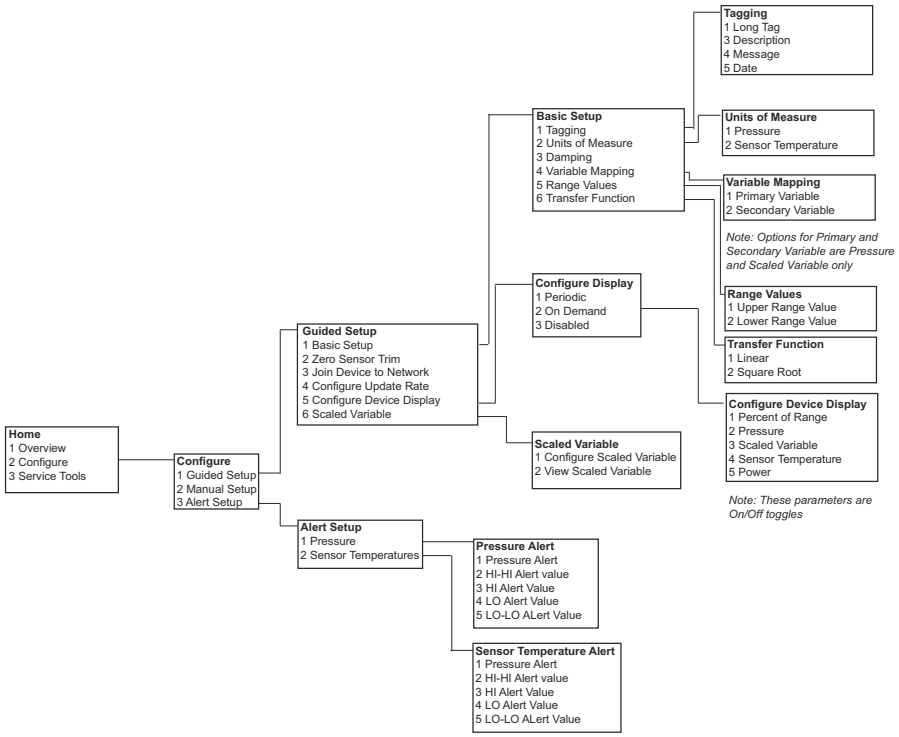


Figure B-3: Rosemount 2051 communication device menu tree: Manual Setup

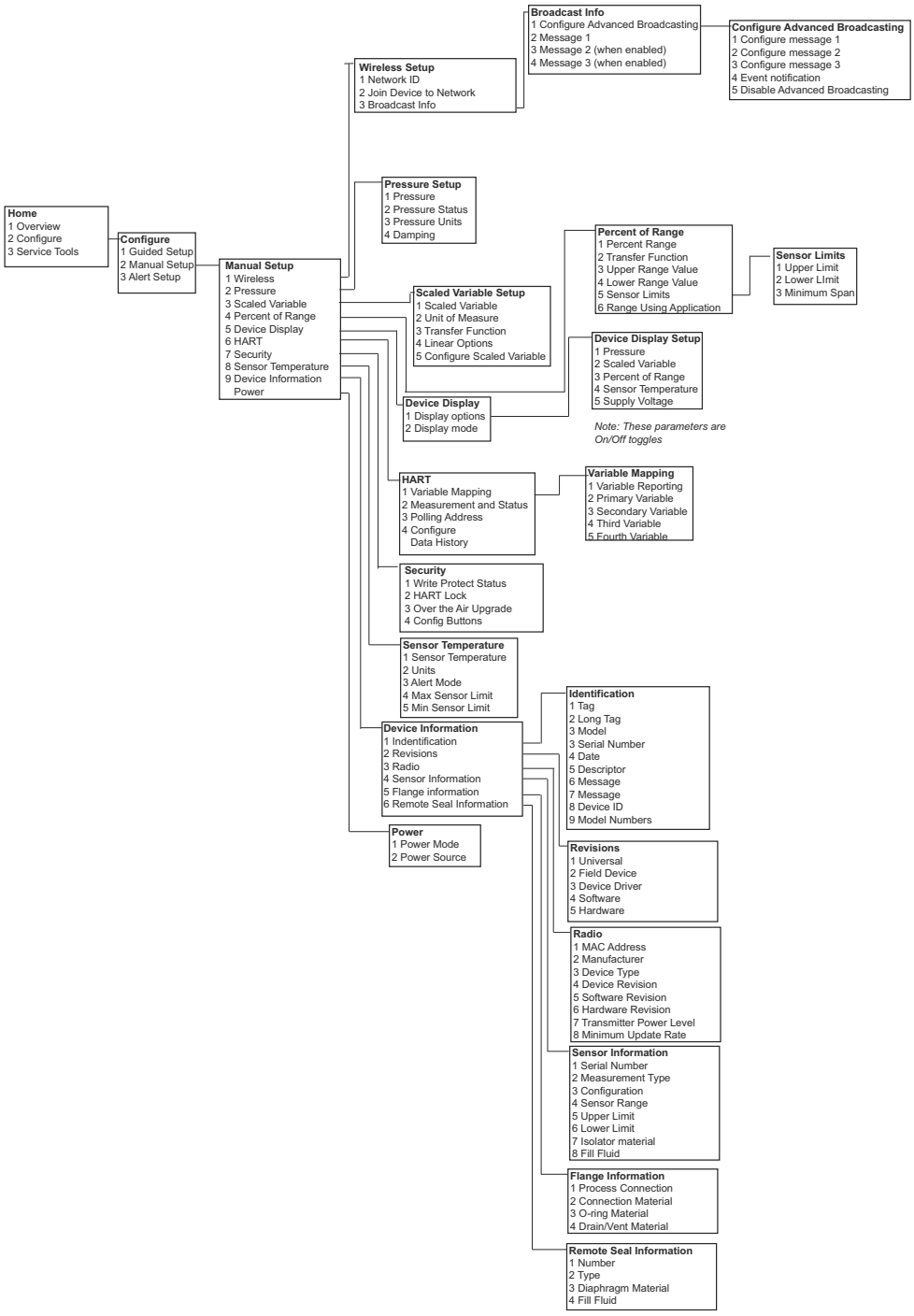
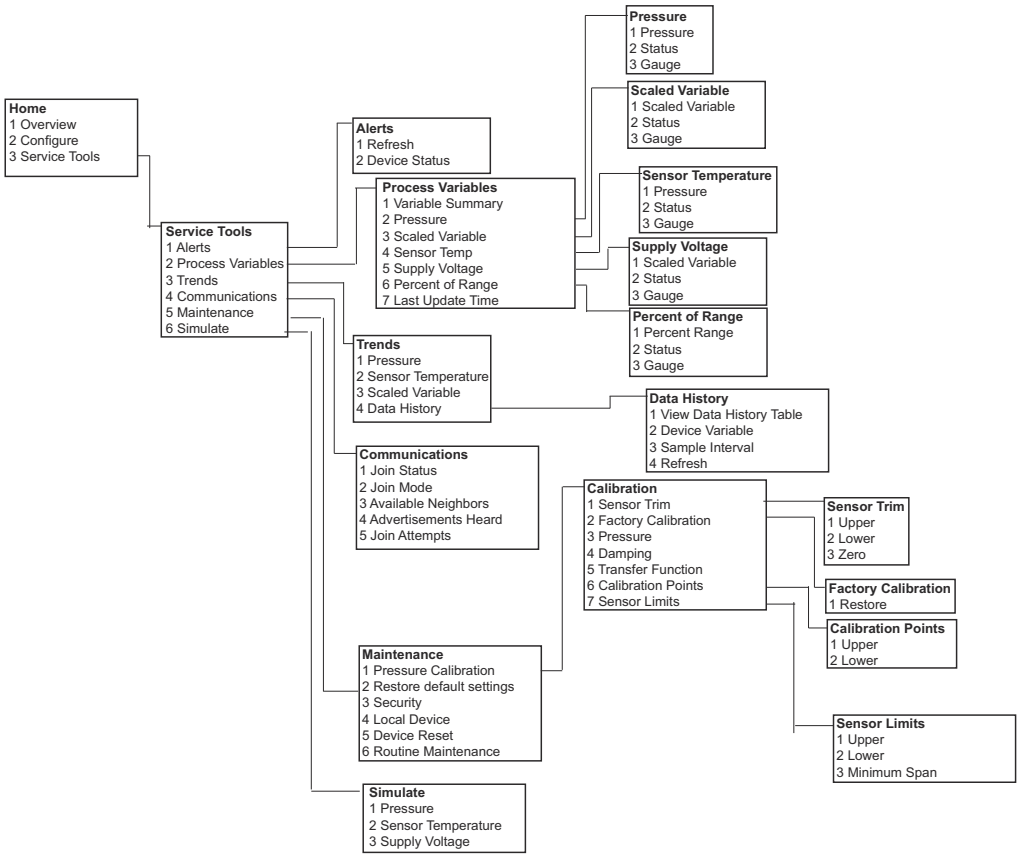


Figure B-4: Rosemount 2051 communication device menu tree: Manual Setup



C Network design best practices

All recommended practices should be followed to ensure highest data reliability. Deviation from these best practices may require device repeaters in the network to maintain 99% data reliability. The following are guidelines to achieve the best possible Smart Wireless Network.

1. Each wireless network field should be scoped to a single process unit.
2. Minimize the number of hops to the Gateway in order to reduce latency. A minimum of five wireless instruments should be within effective range of the Smart Wireless Gateway.
3. Each device in the network should have at minimum three devices with potential communication paths. A mesh network gets its reliability from multiple communication pathways. Ensuring each device has multiple neighbors within range will result in the most reliable network.
4. Have 25 percent of wireless instruments in the network within range of Smart Wireless Gateway. Other enhancing modifications include creating a higher percentage of devices within effective range of the gateway to 35 percent or more. This clusters more devices around the gateway and ensures fewer hops and more bandwidth available to *Wireless*HART devices with fast scan rates.
5. Effective range is determined by type of process unit and the density of the infrastructure that surrounds the network.

C.1 Effective range

Heavy Obstruction: 100 ft. (30 m). Typical heavy density plant environment. Cannot drive a truck or equipment through.

Medium Obstruction: 250 ft. (76 m). Typical light process areas, lots of space between equipment and infrastructure.

Light Obstruction: 500 ft. (152 m). Typical of tank farms. Despite tanks being big obstructions themselves, lots of space between and above makes for good RF propagation.

Line of Sight: 750 ft. (230 m). No obstructions between *Wireless*HART devices and devices mounted a minimum of 6 ft. (2 m) above ground or obstructions.

For examples and complete explanations, refer to the IEC62591 *Wireless*HART System Engineering Guidelines.

00809-0100-4102
Rev. AB
2023

For more information: **Emerson.com/global**

ROSEMOUNT™

EMERSON™