

**I/A Series® Intelligent
Electronic Multivariable Transmitters
with Modbus Communication (Model IMV25-M)
and
PCMM Field Device Configurator**

**Installation, Calibration, Configuration, and Maintenance
Style A**

i n v e n s i s

Foxboro®

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1. Introduction

General Description

The IMV25-M Multivariable Transmitter is a single transmitter designed for multiple measuring applications. It measures absolute and differential pressure, sensor and electronic temperature, and process temperature from an RTD. It also provides transmission of all the measured values.

Communication with remote terminal units (RTUs) is via a Modbus communication protocol over an RS-485 twisted shielded pair multidrop serial connection. The communication function permits you to reconfigure or rerange a transmitter from a remote Modbus Host personal computer using the PCMM Field Device Configurator.

The PCMM Field Device Configurator is a Windows-based software package for use with the IMV25-M Multivariable Transmitter using Modbus communication protocol. It displays measurements and has full configuration and calibration capability. An RS-232 to RS-485 converter or a USB Port to RS-485 converter is required for communication with the transmitter.

The PCMM Configurator is designed to run from a PC with the following minimum system requirements.

- ◆ **Operating System:** Windows 98, Windows ME, Windows NT 4.0, Windows 2000, or Windows XP.
- ◆ **CPU:** Pentium 130 MHz or better; must meet the minimum requirements of the operating system installed.
- ◆ **Video:** 800 by 600 resolution minimum; 1024 by 768 resolution recommended.
- ◆ **Free RAM:** 32 MB minimum; 64 MB recommended; must meet the minimum requirements of the operating system installed.
- ◆ **Free Hard Drive Space:** 5 MB

Reference Documents

This document (MI 020-384) contains instructions for transmitter installation, configuration, calibration, and maintenance details. It also contains Modbus database information. For further information relating to the use of this transmitter, refer to Table 1.

Table 1. Reference Documents

Document	Description
DP 020-432	Dimensional Print – IMV25, IMV30, and IMV31 Multivariable Transmitters
PL 009-019	Parts List – IMV25 Multivariable Transmitter
TI 37-75b	Technical Information – Transmitter Material Selection Guide

Transmitter Identification

See Figure 1 for transmitter data plate contents. For a complete explanation of the Model Number code, see PL 009-019. The firmware version is identified under **FMW REV** when **VIEW DB** (View Database) is selected in the top level structure (see Figure 32 on page 35).

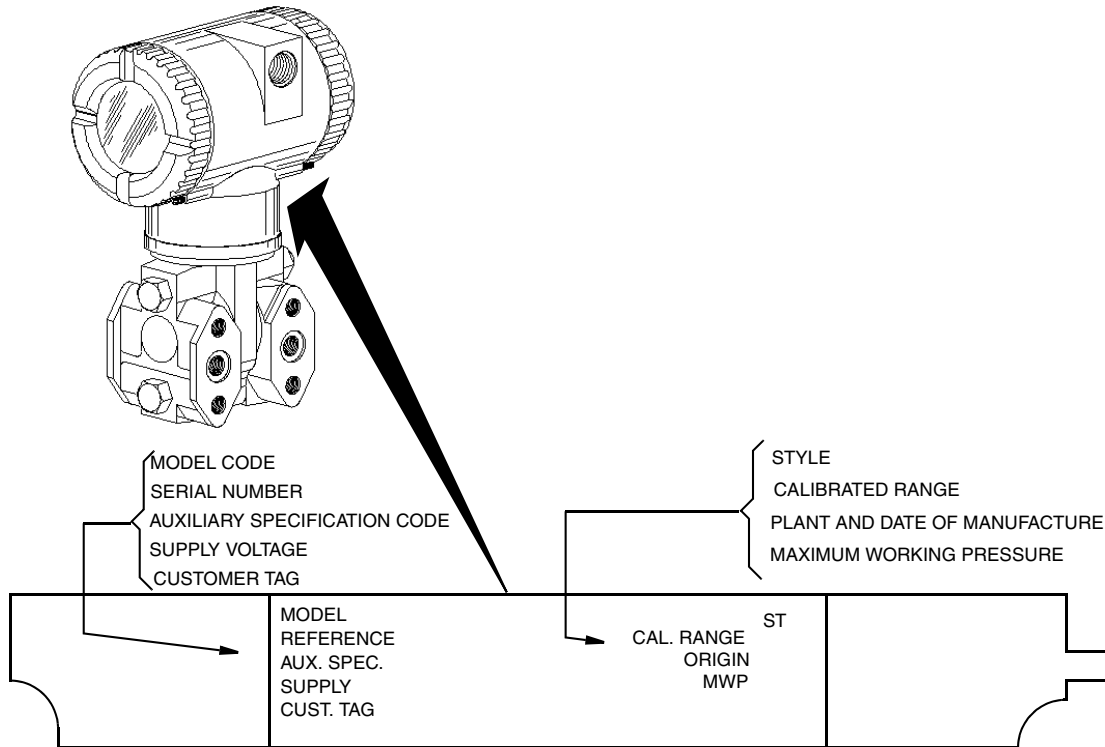


Figure 1. Transmitter Identification

Standard Specifications

Span and Range Limits for Differential Pressure Measurement

Span Limit Code	Span Limits ΔP	Range Limits $\Delta P^{(a)}$
L	0.12 and 2.5 kPa (0.5 and 10 inH ₂ O)	-2.5 and +2.5 kPa (-10 and +10 inH ₂ O)
A	0.75 and 75 kPa (3 and 30 inH ₂ O)	-7.5 and +7.5 kPa (-30 and +30 inH ₂ O)
B	0.5 and 50 kPa (2 and 200 inH ₂ O)	-50 and +50 kPa (-200 and +200 inH ₂ O)
G	0.5 and 100 kPa (2 and 400 inH ₂ O)	-100 and +100 kPa (-400 and +400 inH ₂ O)
C	2.5 and 210 kPa (10 and 840 inH ₂ O)	-210 and +210 kPa (-840 and +840 inH ₂ O)

(a) Negative values of differential pressure indicate a higher pressure on the **low side** of the sensor. Positive values indicate a higher pressure on the **high side** of the sensor.

Span and Range Limits for Absolute Pressure Measurement

Span Limit Code	Span Limits	Range Limits
D	0.02 and 2.1 MPa (3 and 300 psia)	0 and 2.1 MPa (0 and 300 psia)
G	0.07 and 3.5 MPa (10 and 500 psia)	0 and 3.5 MPa (0 and +500 psia)
E	0.21 and 10 MPa (30 and 1500 psia)	0 and 10 MPa (0 and 1500 psia)
H	0.42 and 20.7 MPa (60 and 3000 psia)	0 and 20.7 MPa (0 and 3000 psia)
F	3.45 and 36.5 MPa (500 and 5300 psia)	0 and 36.5 MPa (0 and 5300 psia)

Maximum Static, Working, and Overrange Pressure

Span Code ^(a)	Sensor URL		Maximum Static		Max Working (MWP)		Maximum Overrange	
	Differential Pressure	Absolute Pressure	MPa	psi	MPa	psi	MPa	psi
A G	30 inH ₂ O	500 psia	3.5	500	3.5	500	5.2	750
B D	200 inH ₂ O	300 psia	2.1	300	2.1	300	3.1	450
B E	200 inH ₂ O	1500 psia	10	1500	10	1500	15.0	2250
B H	200 inH ₂ O	3000 psi	20.7	3000	20.7	3000	31.0	4500
B F	200 inH ₂ O	5300 psia	36.5	5300	36.5	5300	51.2	7420
C D	840 inH ₂ O	300 psia	2.1	300	2.1	300	3.1	450
C E	840 inH ₂ O	1500 psia	10	1500	10	1500	15	2250
C H	840 inH ₂ O	3000 psia	20.7	3000	20.7	3000	31.0	4500

Span Code ^(a)	Sensor URL		Maximum Static		Max Working (MWP)		Maximum Overrange	
	Differential Pressure	Absolute Pressure	MPa	psi	MPa	psi	MPa	psi
C F	840 inH ₂ O	5300 psia	36.5	5300	36.5	5300	51.2	7420
GG	400 inH ₂ O	500 psia	3.5	500	3.5	500	5.2	750
GE	400 inH ₂ O	1500 psia	10	1500	10	1500	15	2250
GH	400 inH ₂ O	3000 psia	20.7	3000	20.7	3000	31.0	4500
G F	400 inH ₂ O	5300 psia	36.5	5300	36.5	5300	51.2	7420
LG	10 inH ₂ O	500 psia	3.5	500	3.5	500	5.2	750

(a) Available combinations of DP and AP sensors.

— NOTE —

Static pressure zero shift for all calibrated spans can be minimized by readjusting the zero output at nominal operating static pressure.

— ! CAUTION —

Exceeding the maximum overrange pressure can cause damage to the transmitter degrading its performance.

Process Temperature Measurement

Measurement Element: 2-, 3-, or 4-wire, 100 ohm platinum RTD

DIN 43760; IEC 751, mean temperature coefficient (alpha) of 0.00385 ohms/ohm/°C

Range Limits: -200 and +850°C (-328 and +1562°F)

Elevated Zero and Suppressed Zero

For applications requiring an elevated or suppressed zero, the maximum span and the upper and lower range limits of the transmitter can not be exceeded.

Zero and Span Adjustments (DP and AP)

The zero and span is remotely adjustable from the PC-Based Configurator. They are also adjustable at the transmitter using the optional display.

Mounting Position

The transmitter can be mounted in any orientation. Differential pressure position effect zero shift for all calibrated spans can be eliminated by readjusting zero output after installation.

Adjustable Damping (DP and AP)

The transmitter response time is normally 1.0 second or the electronically adjustable setting of 0.00 (none), 0.25, 0.50, 1, 2, 4, 8, 16, or 32 seconds, whichever is greater, for a 90% recovery from an 80% input step as defined in ANSI/ISA S51.1.

Operative Limits

Influence	Normal Operating Condition Limits	Operative Limits
Sensor Body Temperature	-29 and +82°C (-20 and +180°F)	-46 and +121°C (-50 and +250°F)
Silicone Fill Fluid	-29 and +82°C (-20 and +180°F)	-29 and +121°C (-20 and +250°F)
Fluorinert Fill Fluid	-29 and +82°C (-20 and +180°F)	-29 and +121°C (-20 and +250°F)
Electronics Temperature	-29 and +82°C (-20 and +180°F)	-40 and +85°C (-40 and +185°F)
With LCD Display	-20 and +82°C (-4 and +180°F)*	-29 and +85°C (-20 and +185°F)*
Relative Humidity	5 and 95%	0 and 100%
Supply Voltage	9 and 30 V dc	9 and 30 V dc
Mounting Position	Upright or horizontal	No Limit

*Display updates are slowed and readability decreased at temperatures below -20°C (-4°F).

Sensor Fill Fluid

Silicone Oil (DC 200) or Fluorinert (FC-43)

Minimum Allowable Absolute Pressure vs. Sensor Temperature

With Silicone Fill Fluid: At full vacuum: Up to 121°C (250°F)
 With Fluorinert Fill Fluid: Refer to Figure 2.

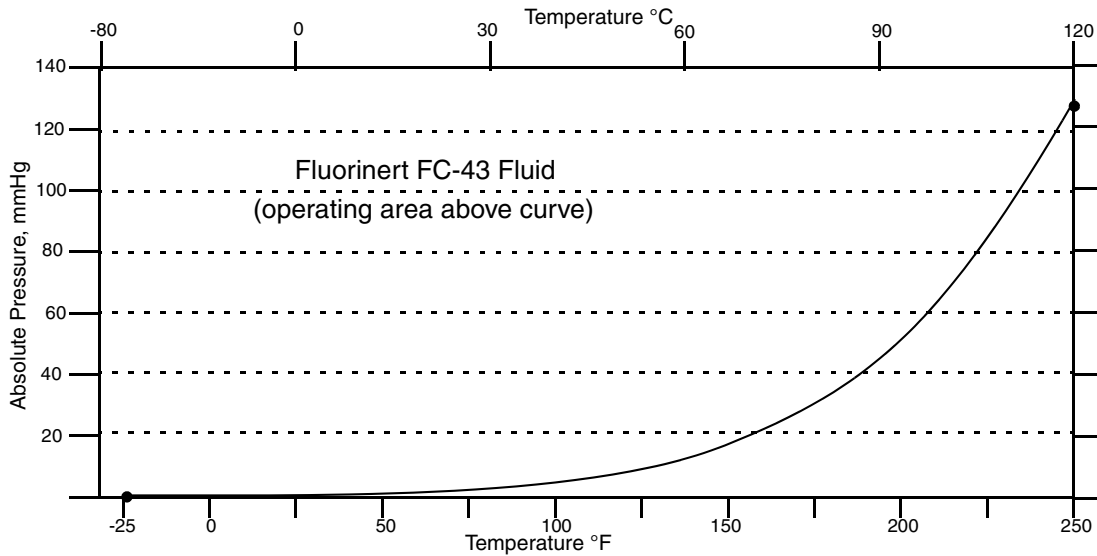


Figure 2. Minimum Allowable Absolute Pressure vs. Sensor Temperature with Fluorinert Fill Fluid

Electrical Connections

Field wires enter through M20, PG 13.5 or 1/2 NPT threaded entrances on either side of the electronics housing. Leads terminate under screw terminals and washers on the terminal block in the field terminal compartment. Unused conduit connection must be

plugged with metal plug provided to maintain RFI/EMI, environmental, and explosionproof ratings.

Process Connections

The transmitters are connected to the process via a 1/4 NPT thread or any one of a number of optional process connectors.

Electrical Ground Connections

The transmitter is equipped with an internal ground connection within the field wiring compartment and an external ground connection at the base of the electronics housing. To minimize galvanic corrosion, place the wire lead or terminal between the captive washer and loose washer on the internal or external ground screw. Earth (ground) the shield at the field enclosure **only**. Do **not** ground the shield at the transmitter.

Approximate Mass

Without Process Connectors	3.5 kg (7.8 lb)
With Process Connectors	4.2 kg (9.2 lb)
With Optional 316 ss Housing	Add 1.1 kg (2.4 lb)

Process Wetted Materials

Sensor: 316L ss or Hastelloy C

Covers and Process Connections: 316 ss or Hastelloy C

Remote Communications

The transmitter communicates over an RS-485 twisted shielded pair multidrop serial connection.

The information that can be continuously displayed is:

- ◆ Differential Pressure
- ◆ Pressure
- ◆ Process Temperature (from external RTD)
- ◆ Sensor Temperature
- ◆ Electronics Temperature

RS-485 Communications Format

Communication is based upon the Modbus communication protocol.

The default protocol parameters are:

- ◆ Modbus RTU
- ◆ Station Address 1

The default communication parameters are:

- ◆ 9600 baud
- ◆ 8 data bits

- ◆ 1 stop bit
- ◆ No parity.

Product Safety Specifications

— DANGER

To prevent possible explosions and to maintain flameproof, explosionproof, and dust-ignitionproof protection, observe applicable wiring practices. Plug unused conduit opening with the provided metal pipe plug. Both plug and conduit must engage a minimum of five full threads for 1/2 NPT connections; seven full threads for M20 and PG 13.5 connections.

— WARNING

To maintain IEC IP66 and NEMA Type 4X protection, the unused conduit opening must be plugged with the metal plug provided. Use a suitable thread sealant on both conduit connections. In addition, the threaded housing covers must be installed. Turn covers to seat the O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal.

— NOTE

1. These transmitters have been designed to meet the electrical safety description listed in Table 2. For detailed information or status of testing laboratory approvals/certifications, contact Invensys.
 2. Wiring restrictions required to maintain electrical certification of the transmitter are provided in the “Transmitter Wiring” section of this document on page 22.
-

Table 2. Electrical Safety Specifications

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
ATEX flameproof; II 2 GD EEx d IIC, Zone 1.	KEMA 00ATEX2019X Temperature Class T6 T85°C Ta = -40 to +80°C	D
CSA explosionproof for Class I, Division 1, Groups B, C, and D; and dust-ignitionproof apparatus for Class II, Division 1, Groups E, F, and G; and Class III, Division 1.	Maximum Ambient Temperature 85°C (185°F).	C
CSA field device zone certified flameproof Ex d IIC. Also, all certifications of Code C above.	Maximum Ambient Temperature 85°C (185°F).	B

Table 2. Electrical Safety Specifications

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
FM explosionproof for Class I, Division 1, Groups B, C, and D; and dust-ignitionproof apparatus for Class II, Division 1, Groups E, F, and G; and Class III, Division 1.	Temperature Class T6 at 80°C (176°F) and T5 at 85°C (185°F) maximum ambient.	F
FM field device zone certified flameproof AEx d IIC. Also, all certifications of Code F above.	Temperature Class T6 at 80°C (176°F) and T5 at 85°C (185°F) maximum ambient.	G
IECEX flameproof: Ex d IIC	IECEX FMG 06.0007X, Ex d IIC T6 Ta=80°C, T5 Ta=85°C Ambient Temperature -20 to +85°C	V

ATEX and IECEX Warnings

Do not open while circuits are alive.

ATEX Compliance Documents

EN 50014: 1997

EN 50018: 1994

IECEX Compliance Documents

IEC 60079-0 (Edition 4.0): 2004

IEC 60079-1 (Edition 5): 2003

2. Installation

The following material provides information and procedures for installing the transmitter. For dimensional information, refer to DP 020-432.

— **! CAUTION** —

To avoid damage to the transmitter sensor, do not use any impact devices, such as an impact wrench or stamping device, on the transmitter.

— **NOTE** —

Use a suitable thread sealant on all connections.

Transmitter Mounting

The transmitter can be supported by the process piping (Figure 3), on a bypass manifold (Figures 4 through 5), or mounted to a vertical or horizontal pipe or surface using an optional mounting bracket (Figures 6 through 11). For dimensional information, refer to DP 020-432.

— **NOTE** —

1. If the transmitter is not installed in the vertical position, readjust zero output to eliminate the position zero effect.
2. The transmitter should be mounted so that any moisture condensing or draining into the field wiring compartment can exit through one of the two threaded conduit connections.

Process-Mounted Transmitter

Figure 3 shows the transmitter mounted to and supported by the process piping.

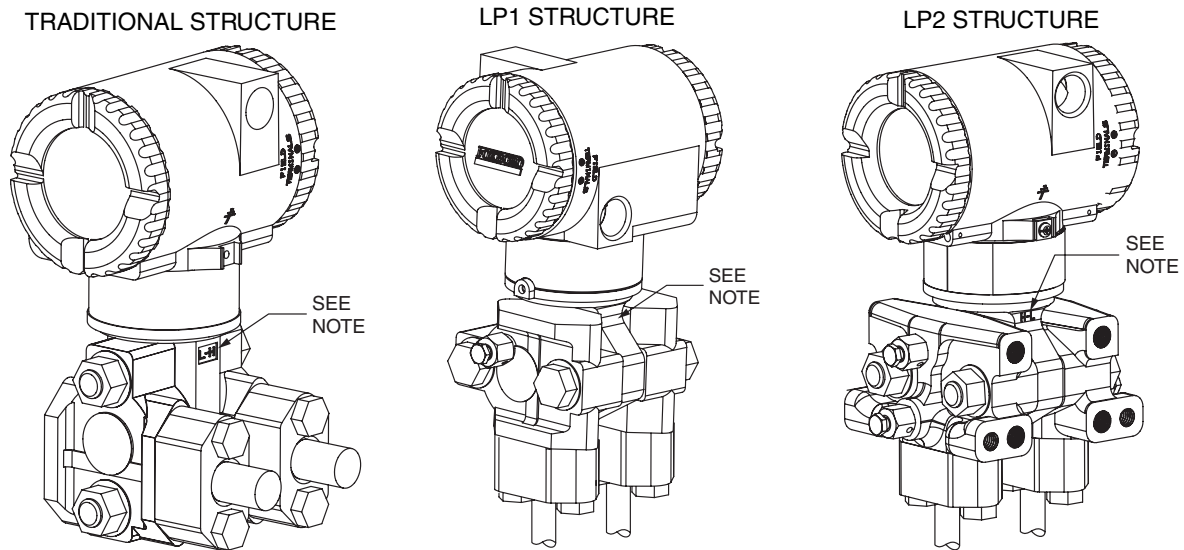


Figure 3. Typical Mounting of an IMV25 Transmitter Supported by Process Piping

Manifold Mounted Transmitter

Figures 4 and 5 show the transmitter mounted to and supported by a bypass manifold.

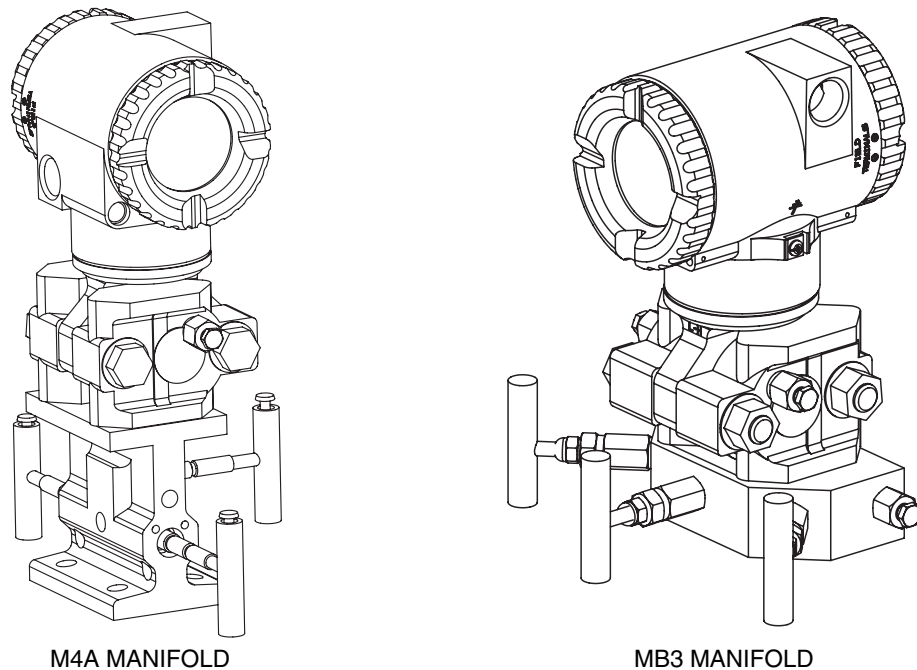


Figure 4. Typical Mounting of an IMV25 Transmitter Supported by a Bypass Manifold

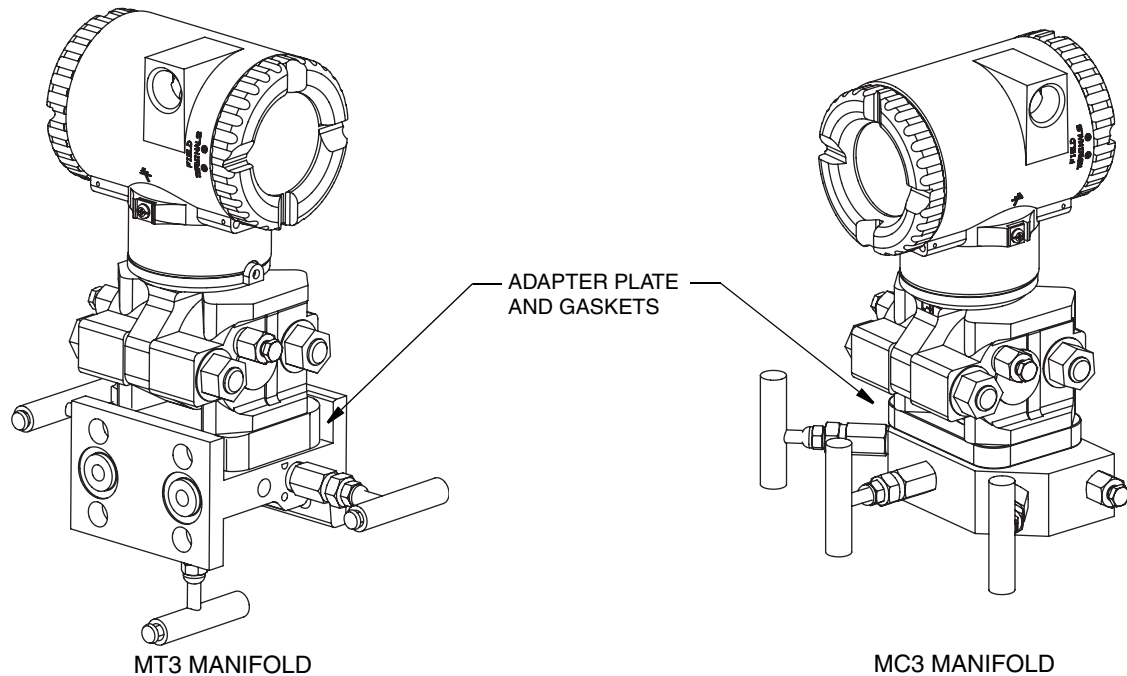


Figure 5. Typical Mounting of IMV25 Transmitter on Coplanar™ Manifold

Pipe- or Surface-Mounted Transmitter

To mount the transmitter to a pipe or surface, use the Standard Mounting Bracket Set (Model Code Option -M1 or -M2) or Universal Bracket Mounting Set (Model Code Option -M3).

Standard Mounting Bracket

The transmitter (with either traditional or LP2 low-profile structures) can be mounted to a vertical or horizontal, DN 50 or 2-in pipe using a standard bracket. See Figure 6 for details and Figure 7 for examples of different situations. Secure the mounting bracket to the transmitter using the four screws provided. Mount the bracket to the pipe. To mount to a horizontal pipe, turn the U-bolt 90° from the position shown in Figure 6. The mounting bracket can also be used for wall mounting by securing the bracket to a wall using the U-bolt mounting holes.

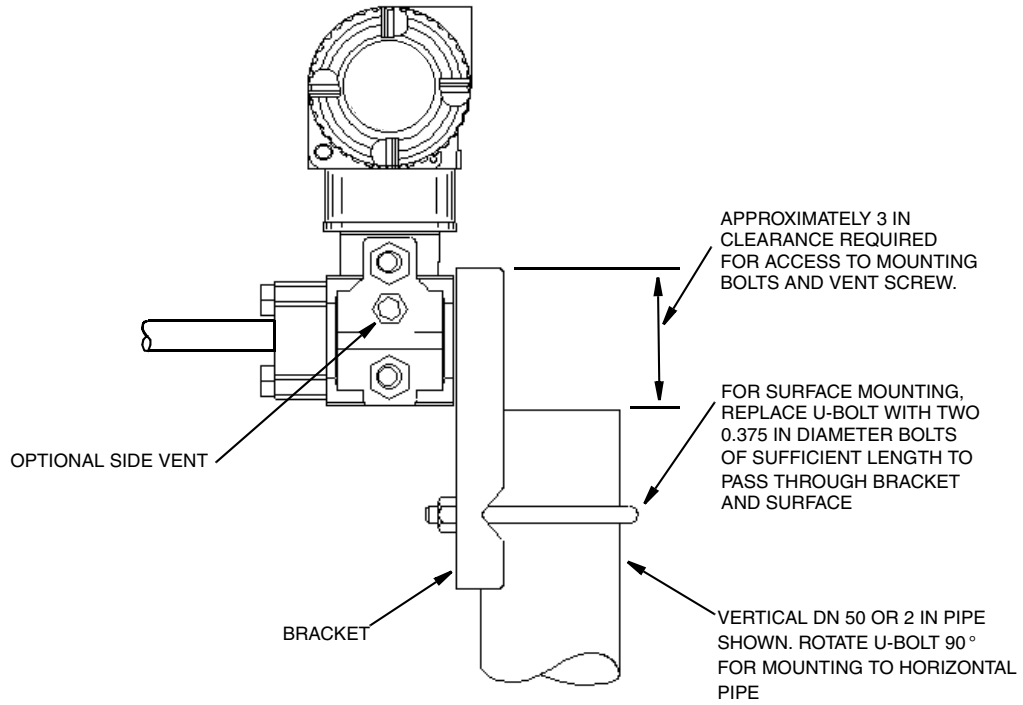


Figure 6. Pipe or Surface Mounted Transmitter Using a Standard Bracket

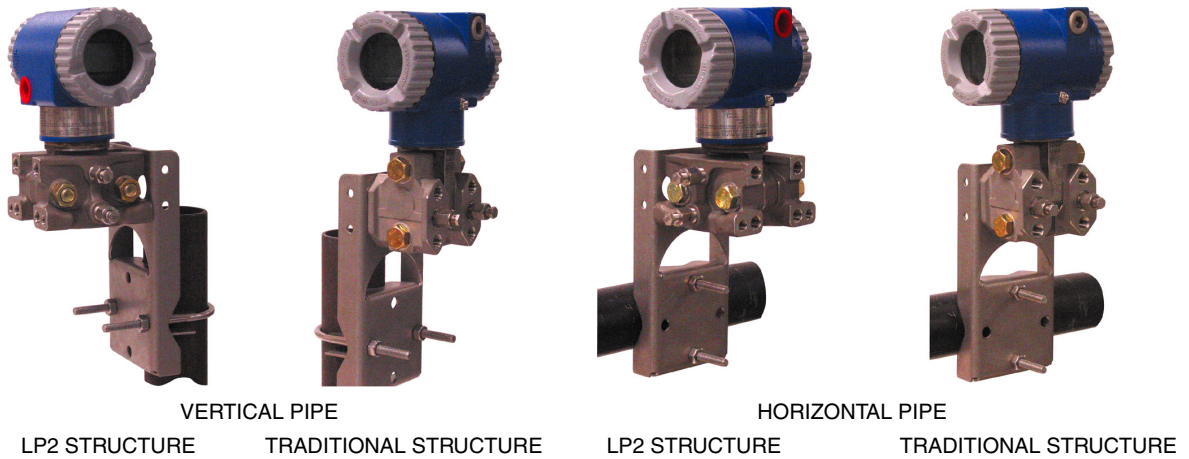


Figure 7. Examples of Mounting with a Standard Bracket

Universal Mounting Bracket

The transmitter (with either traditional or LP2 low-profile structure) can be mounted in a myriad of positions to a vertical or horizontal, DN 50 or 2-in pipe using a universal bracket. See Figure 8 for details of a universal bracket and Figure 9 through Figure 11 for examples of different mounting situations. Secure the mounting bracket to the transmitter using the two long or four short screws provided. Mount the bracket to the pipe. The mounting bracket can also be used for wall mounting by securing the bracket to a wall using the U-bolt mounting holes.

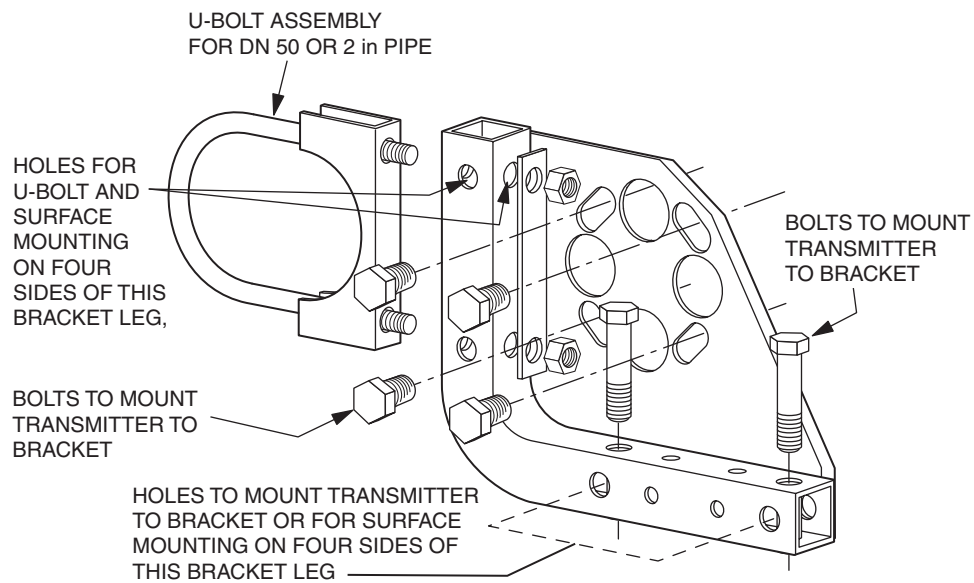


Figure 8. Details of a Universal Bracket

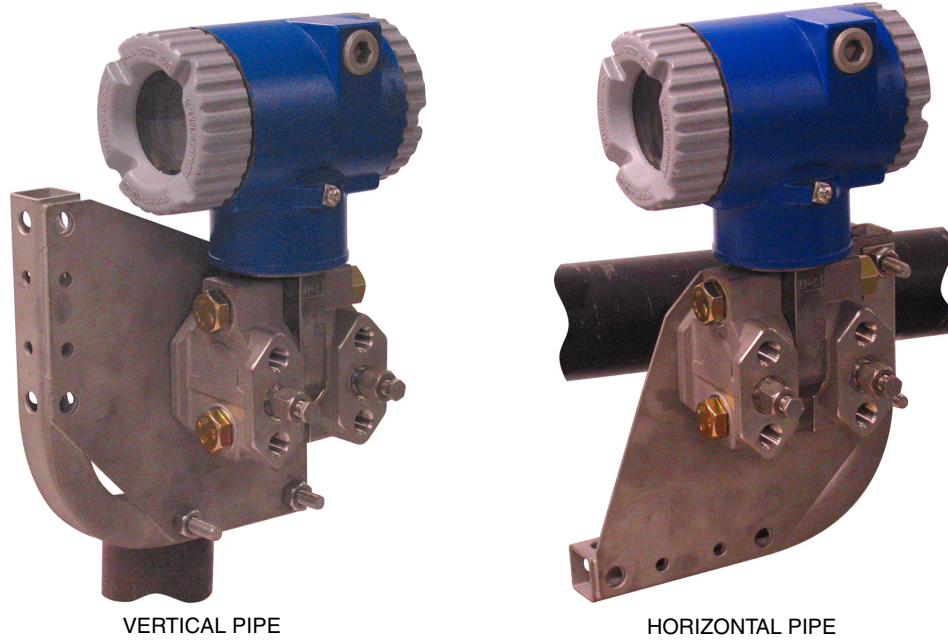


Figure 9. Mounting a Transmitter with Traditional Structure Using a Universal Bracket

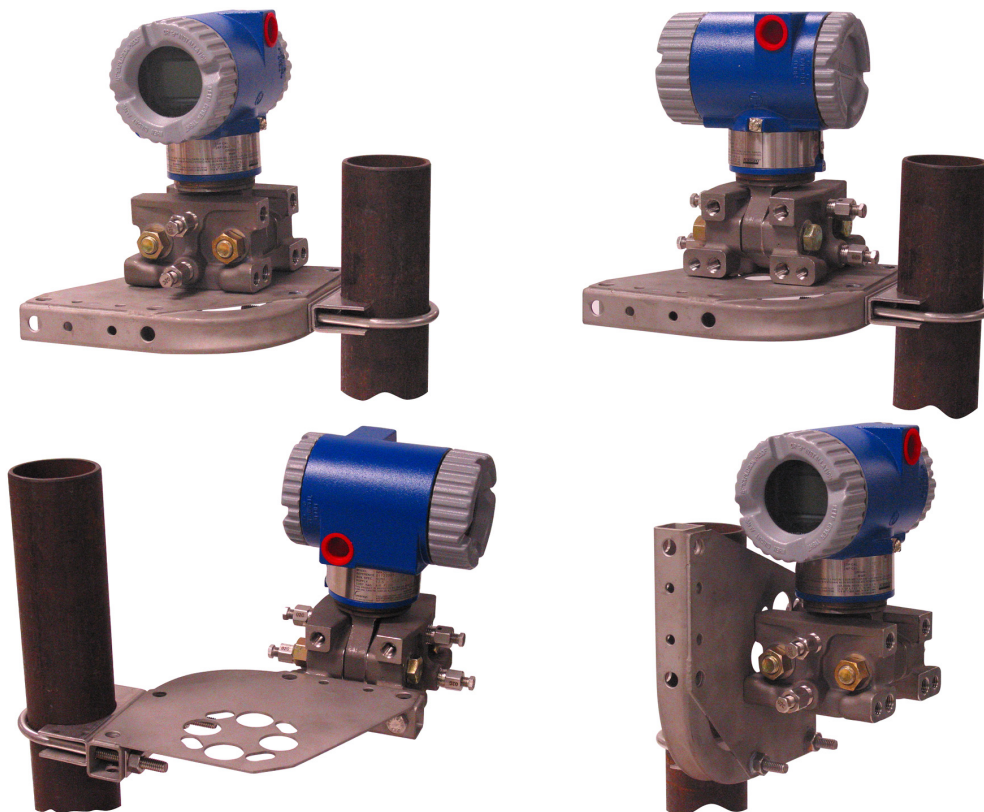


Figure 10. Vertical Pipe Mounting a Transmitter with LP2 Structure Using a Universal Bracket



Figure 11. Horizontal Mounting a Transmitter with LP2 Structure Using a Universal Bracket

Venting and Draining

Traditional Structure

Sensor cavity venting and draining is provided for both vertical and horizontal mounting. For vertical mounted units, draining is via a drain screw shown in Figure 12 and venting is possible with side vents (Option Code -V) shown in Figure 13. For horizontal mounted units, the unit is self draining and venting is via a vent screw shown in Figure 14.

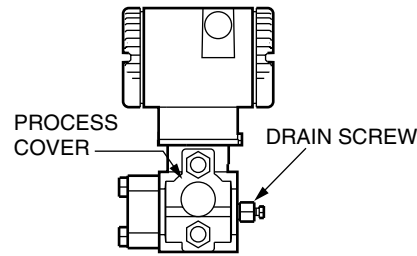


Figure 12. Vertical Mounting - Cavity Draining

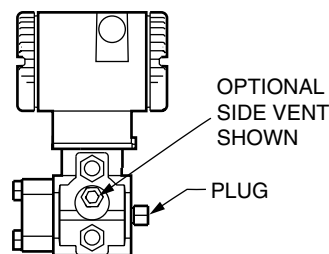


Figure 13. Vertical Mounting - Cavity Venting

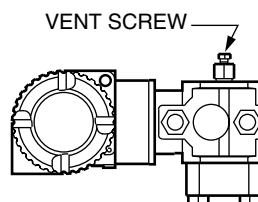


Figure 14. Horizontal Mounting - Cavity Venting

LP1 Low Profile Structure

Sensor cavity venting and draining is provided for both vertical and horizontal mounting. For vertical mounted units, the transmitter is self draining and venting is via a vent screw shown in Figure 15. For horizontal mounted units, the transmitter can simply be 'turned over' (rotated 180 degrees) as shown in Figure 16 to orient the high and low pressure sides in the preferred

locations. There is no need to unbolt the process covers. If the transmitter is connected with a length of impulse piping, such piping should slope up to the transmitter for gas applications and down for liquid applications.

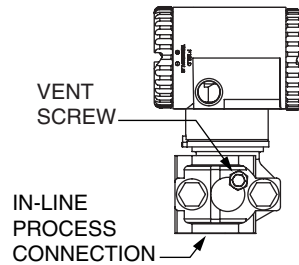


Figure 15. Vertical Mounting - Cavity Venting



Figure 16. Horizontal Mounting - Cavity Venting and Draining

LP2 Low Profile Structure

The transmitter with LP2 low profile structure had a full-featured vent and drain design with separate vent and drain screws positioned in each cover for complete venting and draining from the sensor cavity. See Figure 17.

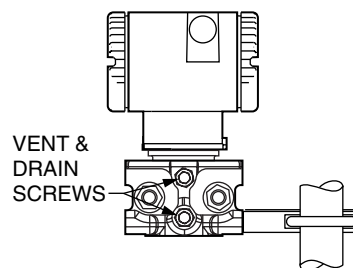


Figure 17. Cavity Venting and Draining

Installation of Flow Measurement Piping

Figure 18 and Figure 19 show typical installations with horizontal and vertical process pipes.

The transmitters are shown below the level of the pressure connections at the pipe (usual arrangement, except for gas flow without a seal liquid), and with filling tees in the lines to the transmitter (for a seal liquid).

If the process fluid being measured must not come in contact with the transmitter, the transmitter lines must be filled with a suitable seal liquid (see procedure in next section). In such a case, the transmitter must be mounted below the level of the pressure connections at the pipe. With steam flow, the lines are filled with water to protect the transmitter from the hot steam. The seal liquid (or water) is added to the lines through the filling tees. To prevent unequal heads on the transmitter, the tees must be at the same elevation (as shown in Figure 18) and the transmitter must be mounted vertically (as shown). If a seal liquid is not required, elbows can be used in place of the tees.

Tighten drain plugs and optional vent screws to 20 N·m (15 lb·ft). Tighten the four process connector bolts to a torque of 61 N·m (45 lb·ft).

Note that the low and high pressure sides of the transmitter are identified by an L-H marking on the side of the sensor above the warning label as shown in Figure 3.

With medium-viscosity seal liquids and/or long transmitter lines, larger valve sizes should be used.

— NOTE

1. With a **horizontal** line, pressure connections at the pipe should be at the side of the line. However, with gas flow without a seal liquid, connections should be at top of line.
 2. With a **vertical** line, flow should be upwards.
 3. For **liquid** or **steam** flow, the transmitter should be mounted **lower** than the pressure connections at the pipe.
 4. For **gas** flow **without** a seal liquid, the transmitter should be mounted **above** the pressure connections at the pipe; for **gas** flow **with** a seal liquid, the transmitter should be mounted **below** the pressure connections.
 5. Invensys recommends the use of snubbers in installations prone to high levels of fluid pulsations.
-

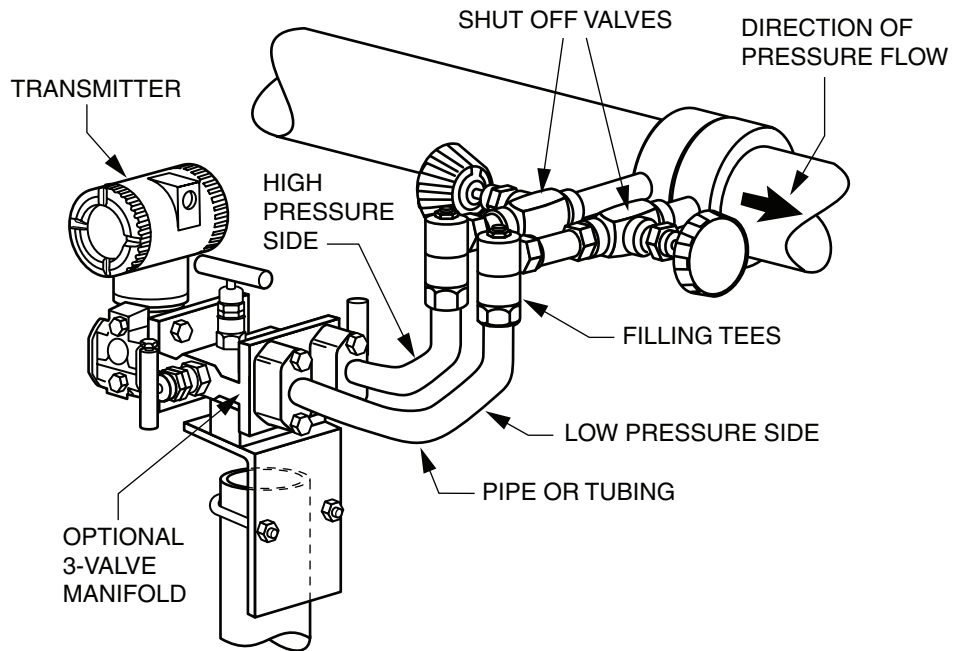


Figure 18. Example of Horizontal Process Line Installation

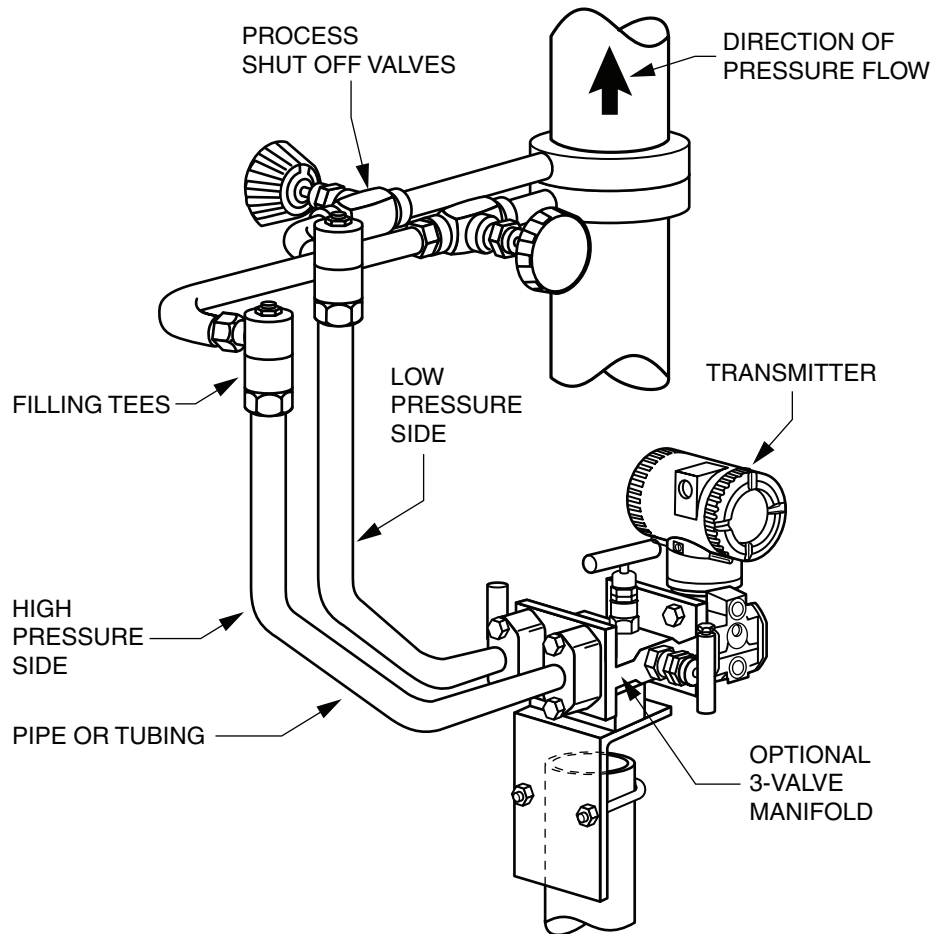


Figure 19. Example of Vertical Process Line Installation

Filling System with Seal Liquid

If the process fluid being measured must not come in contact with the transmitter, the transmitter lines must be filled with a suitable seal liquid. The procedure to do this is as follows:

1. If the transmitter is in service, follow the procedure for “Taking Transmitter out of Operation” on page 27.
2. Close both process shutoff valves.
3. Open all three valves on the 3-valve manifold.
4. Partially open the vent screws on the transmitter until all air has been forced out of the transmitter body and lines. Close the vent screws.
5. Refill the tee connections. Replace the plugs and close the bypass valve. Check for leaks.
6. Follow the procedure for “Putting Transmitter into Operation” on page 26.

! CAUTION

To prevent loss of seal liquid and contamination of process fluid, never open both the process shutoff valves and the manifold shutoff valves if the bypass valve is open.

Positioning Housing

The transmitter housing (topworks) can be rotated up to one full turn in the counterclockwise direction when viewed from above for optimum access to adjustments, display, or conduit connections. Housings have either an anti-rotation screw or a retention clip that prevent the housing from being rotated beyond a safe depth of housing/sensor thread engagement.

! WARNING

If the electronics housing is removed for maintenance, it must be hand tightened to the bottom of the threads, but not over-tightened upon reassembly. See “Removing and Reinstalling a Housing Assembly” on page 69.

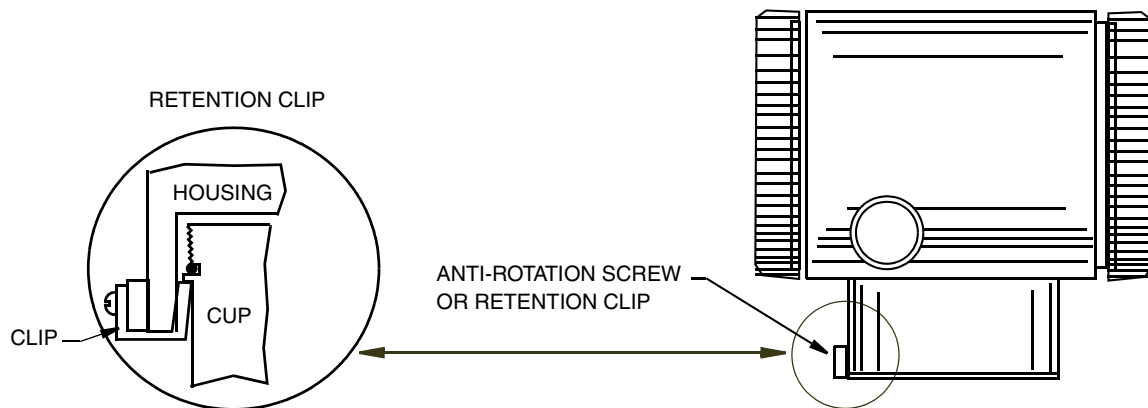


Figure 20. Housing Screw or Clip Location

Positioning Optional Display

The optional display can be rotated within the housing to any of four positions at 90° increments. To do this, grasp the two tabs on the display and rotate it about 10° in a counterclockwise direction. Pull out the display. Ensure that the O-ring is fully seated in its groove in the display housing. Turn the display to the desired position, reinsert it in the electronics module, aligning the tabs on the sides of the assembly, and twist it in the clockwise direction.

! CAUTION

Do not turn the display more than 180° in any direction. Doing so could damage its connecting cable.

Setting the Write Protect Jumper

Your transmitter has write protection capability for use in safety shutdown systems. This means that the local display and remote communications can be prevented from writing to the electronics. Write protection is set by moving a jumper that is located in the electronics compartment behind the optional display (see Figure 55 on page 69). To activate write protection, remove the display as described in the previous section, then remove the jumper or move it to the lower position as shown on the exposed label. Replace the display.

Cover Locks

Electronic housing cover locks, shown in Figure 21, are provided as standard with certain agency certifications and as part of the Custody Transfer Lock and Seal option. To lock the covers, unscrew the locking pin until approximately 6 mm (0.25 in) shows, lining up the hole in the pin with the hole in the housing. Insert the seal wire through the two holes, slide the seal onto the wire ends and crimp the seal.

Transmitter Wiring

The installation and wiring of your transmitter must conform to local code requirements.

— **NOTE** —

The transmitter includes transient surge protection as standard. However, Invensys recommends the use of additional transient/surge protection in installations prone to unusually high levels of electrical transients and surges.

Accessing Transmitter Field Terminals

For access to the field terminals, thread the cover lock (if present) into the housing to clear the threaded cover and remove the cover from the field terminals compartment as shown in Figure 21. Note that the embossed letters **FIELD TERMINALS** identify the proper compartment. Identification of terminals is shown in Figure 22.

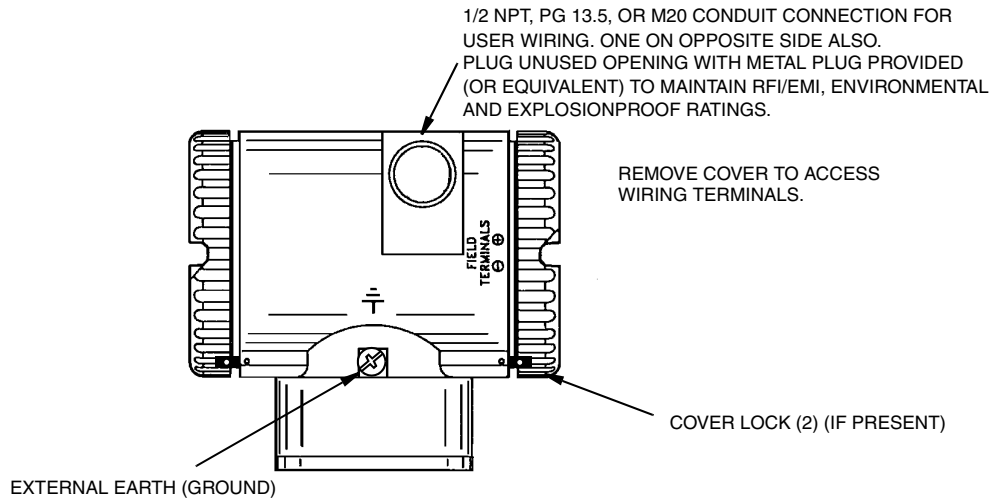


Figure 21. Accessing Field Terminals

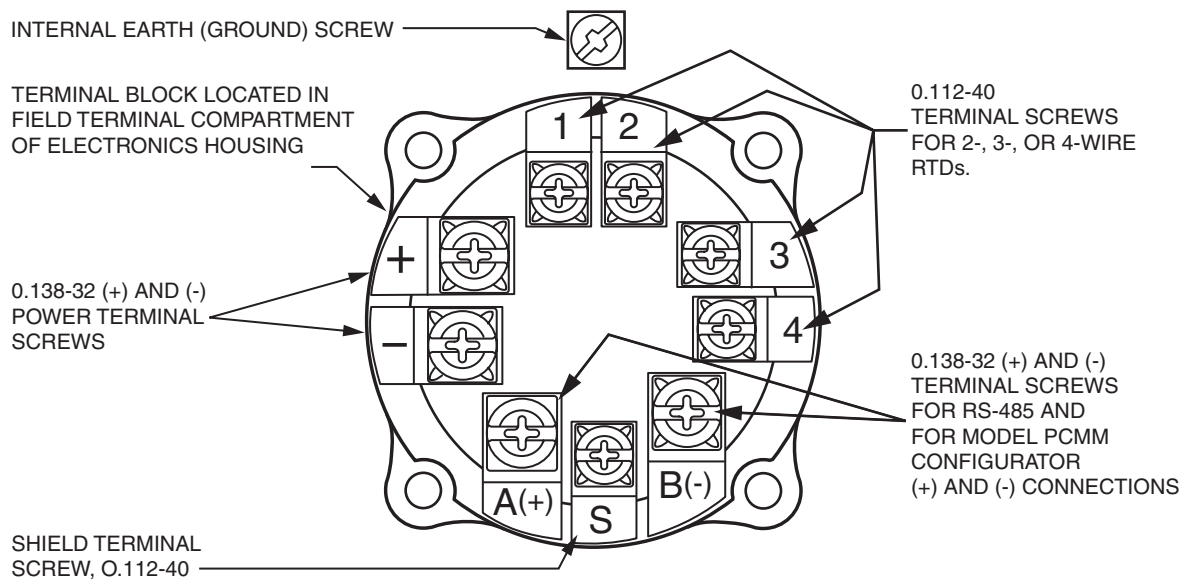


Figure 22. Identification of Field Terminals

Electrical Ground Connections

The transmitter is equipped with an internal ground connection within the field wiring compartment and an external ground connection at the base of the electronics housing. To minimize galvanic corrosion, place the wire lead or terminal between the captive washer and loose washer on the external ground screw. If shielded cable is used, earth (ground) the shield at the field enclosure **only**. Do **not** ground the shield at the transmitter.

Wiring Notes

1. Plug unused conduit connection with the M20, PG 13.5 or 1/2 NPT metal plug provided (or equivalent). To maintain specified explosionproof and dust-ignitionproof protection, plug must engage a **minimum** of five full threads for 1/2 NPT connections; seven full threads for M20 and PG 13.5 connections.
2. Connect an earth (ground) wire to the earth terminal in accordance with local practice.

— CAUTION

If the signal circuit must be earthed (grounded), it is preferable to do so at the negative terminal of the dc power supply. To avoid errors resulting from earth loops or the possibility of short-circuiting groups of instruments in a loop, there should be only one earth in a loop.

3. Install the cover onto the transmitter.

Connecting the Transmitter to an I/A Series System

The transmitter can also send its measurement to the I/A Series system as a digital signal via an FBM224. The following procedure identifies wire terminations in the transmitter. For other system wiring details, refer to the Installation Instructions provided with the I/A Series system.

1. Remove the cover from the transmitter field terminal compartment.
2. Run signal wires (0.50 mm² or 20 AWG, typical) through one of the transmitter conduit connections as shown in Figure 23. Use twisted pair to protect the digital output and/or remote communications from electrical noise. Screened (shielded) cable may be required in some locations.

— NOTE

Do **not** run transmitter wires in the same conduit as mains (ac power) wires.

3. If shielded cable is used, earth (ground) the shield at the field enclosure **only**. Do not ground the shield at the transmitter.
4. Plug unused conduit connection with the 1/2 NPT, PG 13.5, or M20 metal plug provided (or equivalent). To maintain specified explosionproof and dust-ignitionproof protection, plug must engage a **minimum** of five full threads for 1/2 NPT connections; seven full threads for M20 and PG 13.5 connections.

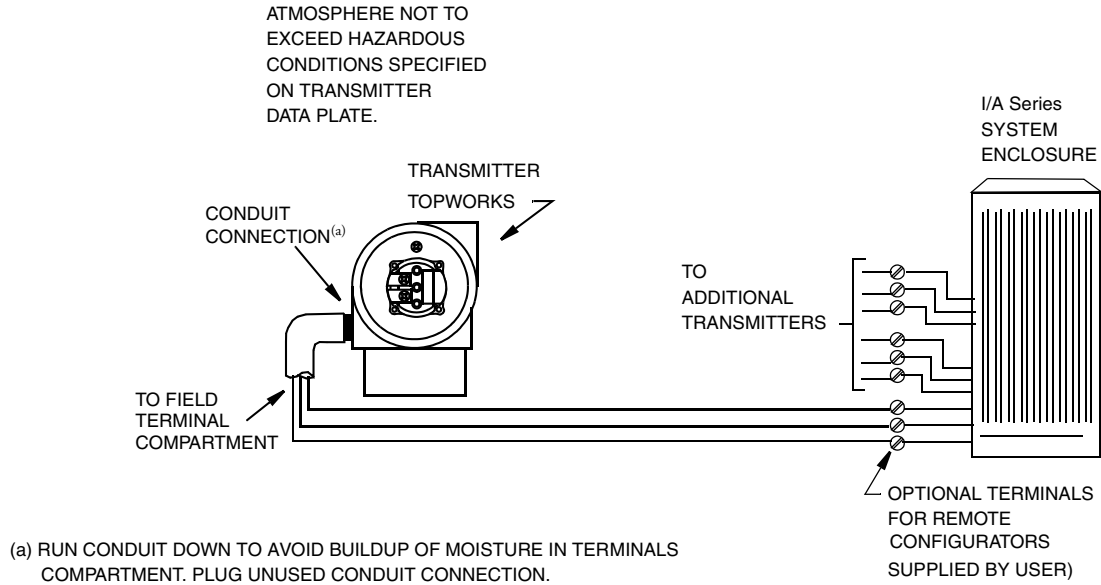


Figure 23. Typical Transmitter Wiring to an I/A Series System

5. Connect an earth (ground) wire to the earth terminal in accordance with local practice. Ground terminal is shown in Figure 22.

— **! CAUTION** —

To avoid errors resulting from earth loops or the possibility of short-circuiting groups of instruments in a loop, use only one earth in a loop.

6. Connect the signal wires to the transmitter “+” and “-” terminal connections shown in Figure 22.
7. The PCMM Configurator can be connected via the A and B terminals on the terminal block in the field terminal compartment as shown in Figure 22 to any convenient location in the loop (subject to hazardous location restrictions).
8. Reinstall the cover on the transmitter. Turn the cover to seat the O-Ring into the housing and continue to hand tighten until the cover contacts the housing metal-to-metal. If cover locks are present, lock the cover per the procedure described in “Cover Locks” on page 22.

Connecting the RTD

— **! WARNING** —

For CE compliance, metallic conduit is required between the transmitter and the RTD. Invensys recommends the use of metallic conduit for all installations.

Connect your RTD to terminals 1, 2, 3 and 4. Locations are shown in Figure 22. Wire per Figure 24.

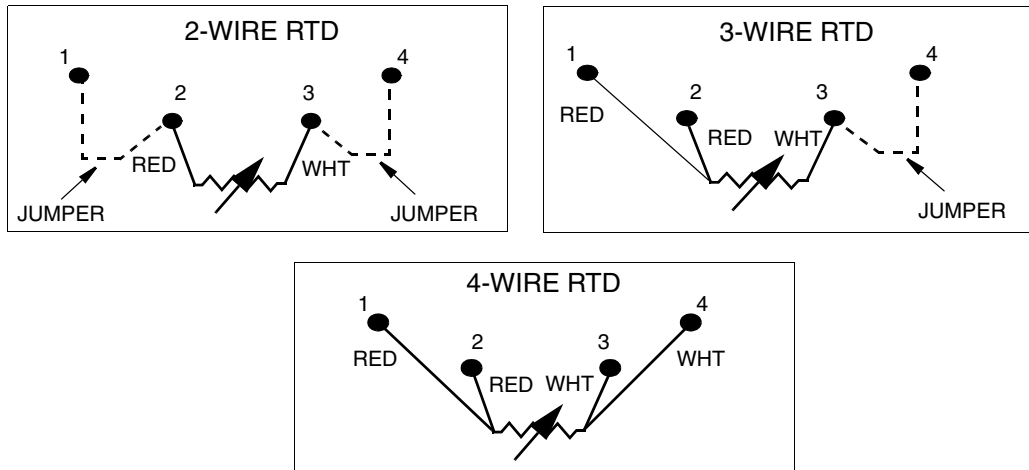


Figure 24. RTD Wiring

— **NOTE** —

Only a 4-wire RTD is compensated for by the transmitter and thus yields the most accurate measurement.

Putting Transmitter into Operation

The following procedure explains how to sequence the valves in your flow measurement piping or optional bypass manifold to ensure that your transmitter is not overranged and that seal liquid is not lost. Refer to Figure 18 or Figure 19.

— **NOTE** —

This procedure assumes that process shutoff valves are open.

1. Make sure that both upstream and downstream manifold valves are closed.
2. Make sure that the bypass valve is open.
3. Slowly open the upstream manifold valve.
4. Close the bypass valve.
5. Slowly open the downstream manifold valve.

Taking Transmitter out of Operation

The following procedure explains how to sequence the valves in your flow measurement piping or optional bypass manifold to ensure that your transmitter is not overranged and that seal liquid is not lost. Refer to Figure 18 or Figure 19.

— NOTE —

This procedure assumes that Process shutoff valves are open.

1. Close the downstream manifold valve.
2. Close the upstream manifold valve.
3. Open the bypass valve.
4. Carefully open the vent screw to release any residual pressure before disconnecting lines.

— ! WARNING —

When venting pressure from the transmitter, wear suitable protective equipment to prevent possible injury from process material, temperature, or pressure.

Installing PCMM Configurator Software

Insert the CD into the CD drive on your personal computer. The software has an autostart feature so that if you wait a short while, it automatically starts. Follow the on-screen instructions. If it does not automatically start, use Windows Explorer and double click on the Setup icon. Proceed with the installation of the PCMM software.

Installing PCMM Configurator Hardware

Connecting a PCMM-AE2 Configurator to a Transmitter

Connect the RS232 to RS485 converter for serial port to the transmitter per Figure 27 or 28.

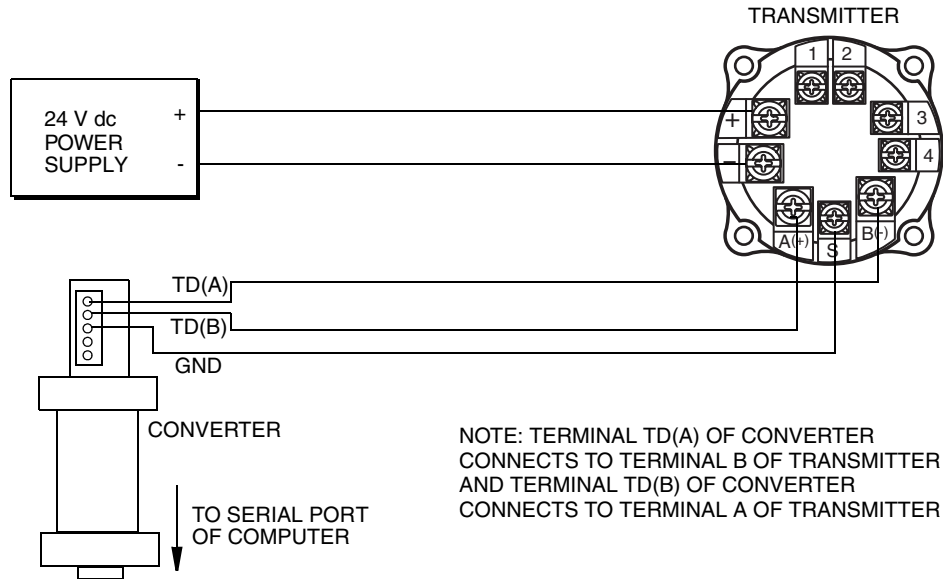


Figure 25. Transmitter with Remote Power Supply

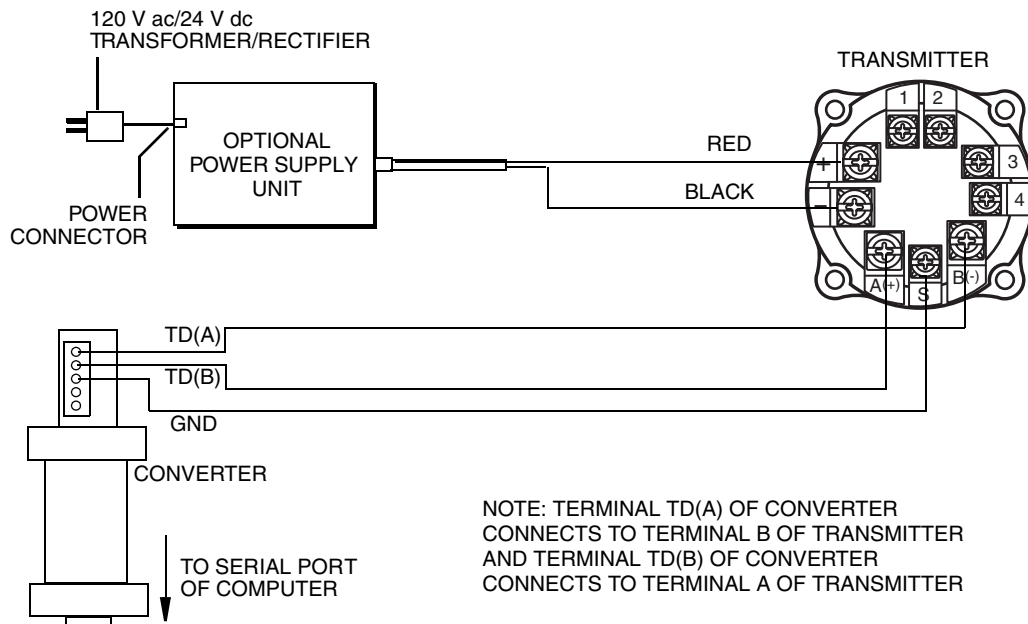
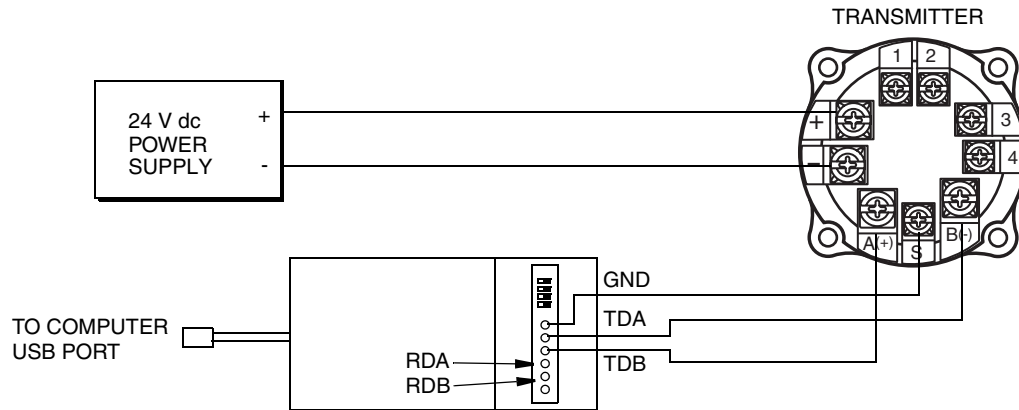


Figure 26. Transmitter with Optional Power Supply

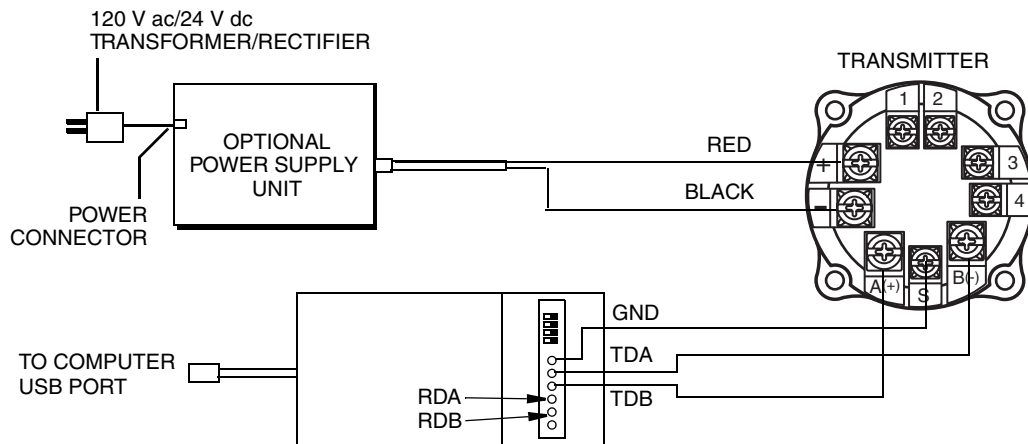
Connecting a PCMM-AE3 Configurator to a Transmitter

Connect the USB to RS485 converter to the transmitter per Figure 27 or 28. Make sure that all micro switches are positioned to the right. Also load the USB to serial driver disk data into your computer.

**NOTES**

1. NOTE: TERMINAL TD(A) OF CONVERTER CONNECTS TO TERMINAL B OF TRANSMITTER AND TERMINAL TD(B) OF CONVERTER CONNECTS TO TERMINAL A OF TRANSMITTER
2. JUMPER TDA TO RDA AND TDB TO RDB.

Figure 27. Transmitter with Remote Power Supply

**NOTES**

1. NOTE: TERMINAL TD(A) OF CONVERTER CONNECTS TO TERMINAL B OF TRANSMITTER AND TERMINAL TD(B) OF CONVERTER CONNECTS TO TERMINAL A OF TRANSMITTER
2. JUMPER TDA TO RDA AND TDB TO RDB.

Figure 28. Transmitter with Optional Power Supply

Attaching the Converter to the Serial Port

Attach your converter to your computer serial port (COM1 or COM2). If the computer serial port has a 25-pin connector, use a 25-to-9-pin adapter.

3. Calibration and Configuration

— **NOTE** —

1. For best results in applications where high accuracy is required, rezero the transmitter output once it has stabilized at the final operating temperature.
 2. Zero shifts resulting from position effects and/or static pressure effects can be eliminated by rezeroing the transmitter output.
-

Calibration Setup

This section shows setups for field or bench calibration. Use test equipment that is at least three times as accurate as the desired accuracy of the transmitter.

— **NOTE** —

It is not necessary to set up calibration equipment to rerange the transmitter to a different range. The transmitter can be accurately reranged by simply changing the Lower Range Value and the Upper Range Value, which are stored in the transmitter database.

Field calibration is performed without disconnecting the process piping. In order to do this, you must have a bypass and shutoff valves between the process and the transmitter and one of the following:

- ◆ Access to the process connections on the nonprocess side of the transmitter or
- ◆ The optional vent screw in the side of the process covers.

An adjustable air supply and a pressure measuring device are required. For example, a dead weight tester or an adjustable clean air supply and pressure gauge can be used. The pressure source can be connected to the transmitter process connection with pipe fittings or it can be connected to the vent screw assembly using a calibration screw. The calibration screw has a Polyflo fitting and can be used for pressures up to 700 kPa (100 psi). It is available as Foxboro Part Number F0101ES.

To set up the equipment, refer to Figure 29 or Figure 30 and use the following procedure.

1. If the transmitter is in operation, follow the procedure on “Taking Transmitter out of Operation” on page 27.

—  **CAUTION** —

With liquid service, drain both sides of transmitter to avoid calibration errors.

2. If a calibration screw is being used, remove the vent screw and replace it with the calibration screw. Connect the pressure source to the calibration screw using 6 x 1 mm or 0.250 inch tubing.
If a calibration screw is **not** being used, remove the entire vent screw assembly or drain plug (as applicable) from the high pressure side of the transmitter. Connect calibration tubing using a suitable thread sealant.
3. Close the bypass valve opened in Step 1.

4. Complete the setup shown in Figure 29 for differential pressure calibration and Figure 30 for absolute pressure calibration.

— **NOTE** —

For vacuum applications, connect the calibrating pressure source to the low pressure side of the transmitter.

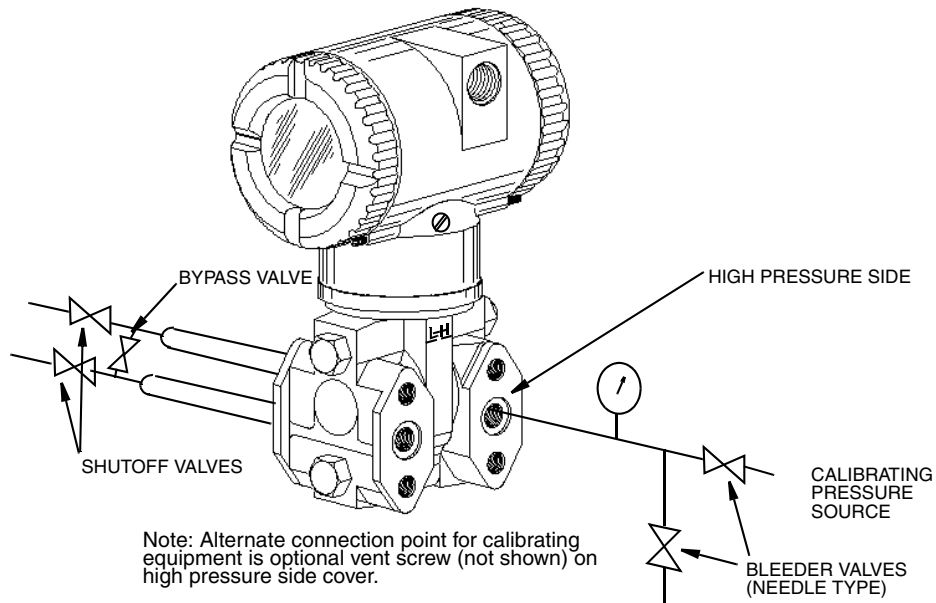


Figure 29. Setup for Differential Pressure Calibration

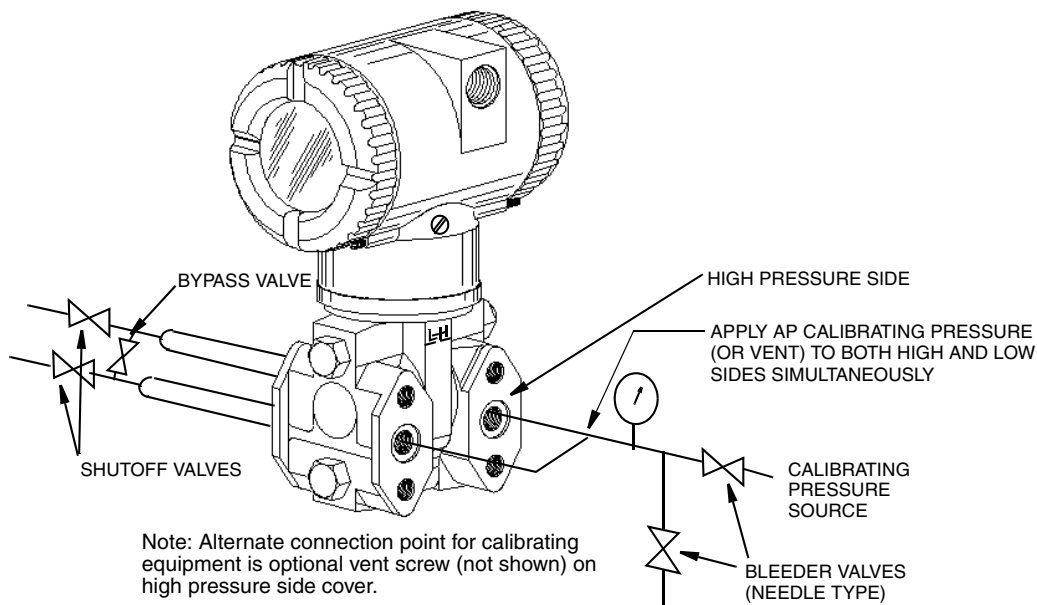


Figure 30. Setup for Absolute Pressure Calibration

Configurable Parameters

Table 3 lists all of the configurable parameters and the factory default for the IMV25-M Transmitter. The table also shows which parameters are configurable with the integral indicator and with a remote configurator.

Table 3. Configurable Parameters

Parameter	Capability	Factory Default	Configurable with	
			Integral Indicator	Remote Config.
IT Mode	Digital	Digital	No	No
Descriptors				
Tag			No	Yes
Description			No	Yes
Message			No	Yes
Device Name	6 Characters maximum	DevNam	Yes	Yes
D/P				
Mode	Linear	Linear	No	No
Units	Pressure units	inH ₂ O	Yes	Yes
D/P LRV	Within D/P range	0	Yes	Yes
D/P URV	Within D/P range	URL	Yes	Yes
Damping	0 to 32 seconds	None	Yes	Yes
A/P				
Mode	Display AP or GP	AP	Yes	Yes
Units	Pressure units	psia	Yes	Yes
A/P LRV	Within A/P range	0	Yes	Yes
A/P URV	Within A/P range	URL	Yes	Yes
ATM REF	Pressure value	14.7	Yes	Yes
Damping	0 to 32 seconds	None	Yes	Yes
RTD				
Mode	On or Off	On	Yes	Yes
Units	Temperature Units	deg C	Yes	Yes
RTD LRV	Within RTD range	-200	Yes	Yes
RTD URV	Within RTD range	+850	Yes	Yes
RTD Default Value		26	Yes	No
Other				
Calibration Date	ddmmmyy		Yes	No
Enable Passwords for local display pushbuttons	No password, Configuration only locked, or Calibration and Configuration locked	No Password	Yes	No
Reset Database	Keep or Clear	Keep	Yes	No

Calibration and Configuration Using the Optional Local Display

A local display, as shown in Figure 31, has two lines of information. The upper line is a 5-digit numeric display (4-digit when a minus sign is needed); the lower line is an 7-digit alphanumeric display. The display provides local indication of measurement information. The primary measurement is normally displayed. To view the secondary measurement, press the **Enter** button while in normal operating mode. To view the tertiary measurement, press the **Enter** button again. Press the **Next** or **Enter** button to return to the primary measurement. If power to the transmitter is interrupted, the display reverts to the primary display.

The display also provides a means for performing calibration and configuration, viewing the database, and testing the display via the 2-button keypad. You can access these operations by means of a multi-level menu system. Entry to the Mode Select menu is made (from normal operating mode) by pressing the **Next** button. You can exit this menu, restore your prior calibration or configuration, and return to the normal operating mode at any time by going to **Cancel** and pressing the **Enter** button.

— NOTE —

During calibration or configuration, a single change could affect several parameters. For this reason, if an entry is entered in error, re-examine the entire database or use the **Cancel** feature to restore the transmitter to its starting configuration and begin again.

The following items can be selected from this menu: Calibration (**CALIB**); Configuration (**CONFIG**); Viewing the database (**VIEW DB**); and Testing the display (**TST DSP**). The top level structure diagram is shown in Figure 32.

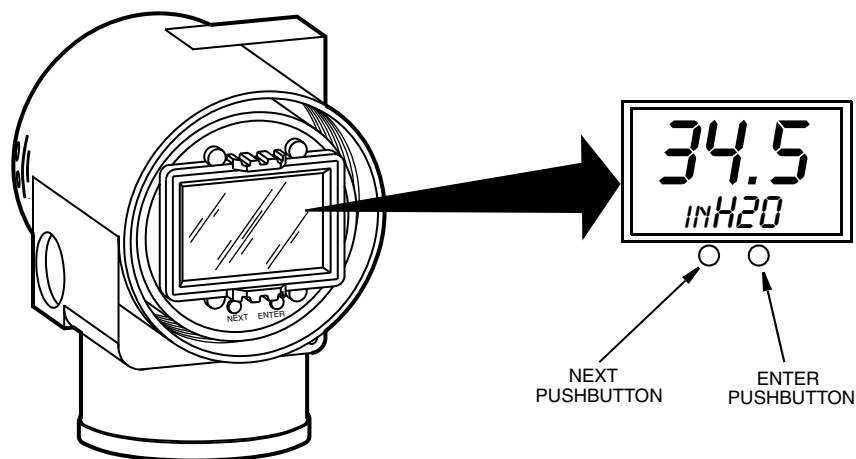


Figure 31. Local Display Module

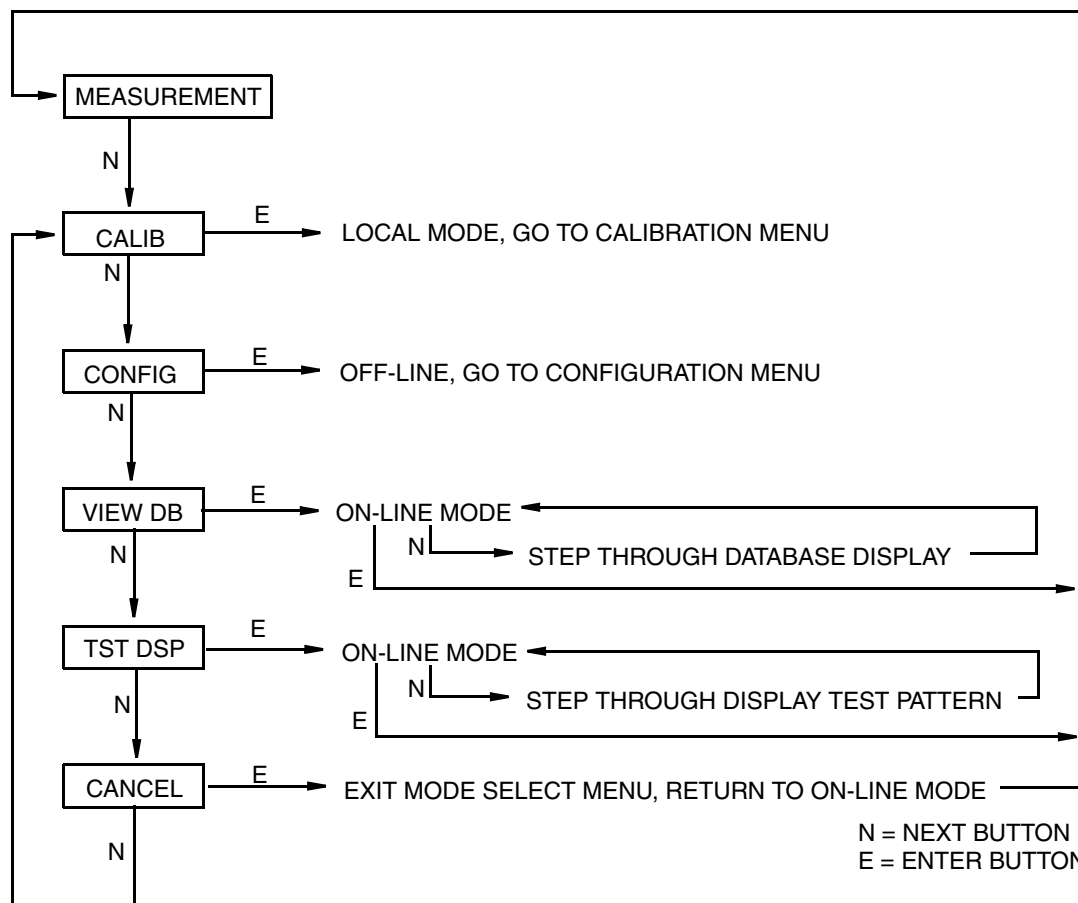


Figure 32. Top Level Structure Diagram

Entering Numerical Values

The general procedure for entering numerical values in Calibration and Configuration is as follows:

1. At the appropriate prompt, press the **Enter** button. The display shows the last (or default) value with the first digit flashing.
2. Use the **Next** button to select the desired first digit, then press the **Enter** button. Your selection is entered and the second digit flashes.
3. Repeat Step 2 until you have created your new value. If the number has less than five characters, use leading or trailing zeros for the remaining spaces. When you have configured the fifth space, the display prompts you to place the decimal point.
4. Move the decimal point with the **Next** button until it is where you want it and press the **Enter** button.

— NOTE —

1. The decimal point can not be placed directly after the first digit. For example, you can not enter a value as 1.2300; you must enter it as 01.230.

2. The decimal position is identified by flashing except at the position after the fifth digit. At that position (representing a whole number), the decimal point is assumed.
-
5. The display advances to the next menu item.

Calibration

To access the Calibration mode (from the normal operating mode), press the **Next** button. The display reads **CALIB**, the first item on the menu. Acknowledge your choice of this selection by pressing the **Enter** button. The display shows the first item in the Calibration menu. You can then calibrate the items shown in Table 4.

— NOTE

1. If calibration has been configured as password protected, you are asked to enter the password before you can proceed.
 2. If your transmitter is write protected, you cannot write your calibration to the electronics. To disable this feature, see “Setting the Write Protect Jumper” on page 22.
-

Table 4. Calibration Menu

Item	Description
CAL PWD	Enter password if required.
CAL DP	Calibrate differential pressure.
CAL AP	Calibrate absolute pressure.
CAL RTD	Calibrate the RTD.
CALDATE	Enter the calibration date.
CAL DP causes the following three submenus:	
CALDP 0	Calibrate at zero differential pressure.
CALDPLR	Calibrate with differential pressure at 0% of transmitter range. (LRV)
CALDPUR	Calibrate with differential pressure at 100% of transmitter range. (URV)
CAL AP causes the following three submenus:	
CALAPAT	Calibrate at atmospheric pressure.
CALAPLR	Calibrate with pressure at 0% of transmitter range. (LRV)
CALAPUR	Calibrate with pressure at 100% of transmitter range. (URV)
CAL RTD causes the following submenu:	
ADJTEMP	Edit current RTD temperature.

Proceed to calibrate your transmitter by using the **Next** button to select your item and the **Enter** button to specify your selection per Figure 33. At any point in the calibration, you can **Cancel**, restore your prior calibration and return to the online mode or **Save** your new calibration. Calibration error messages are listed in Table 5.

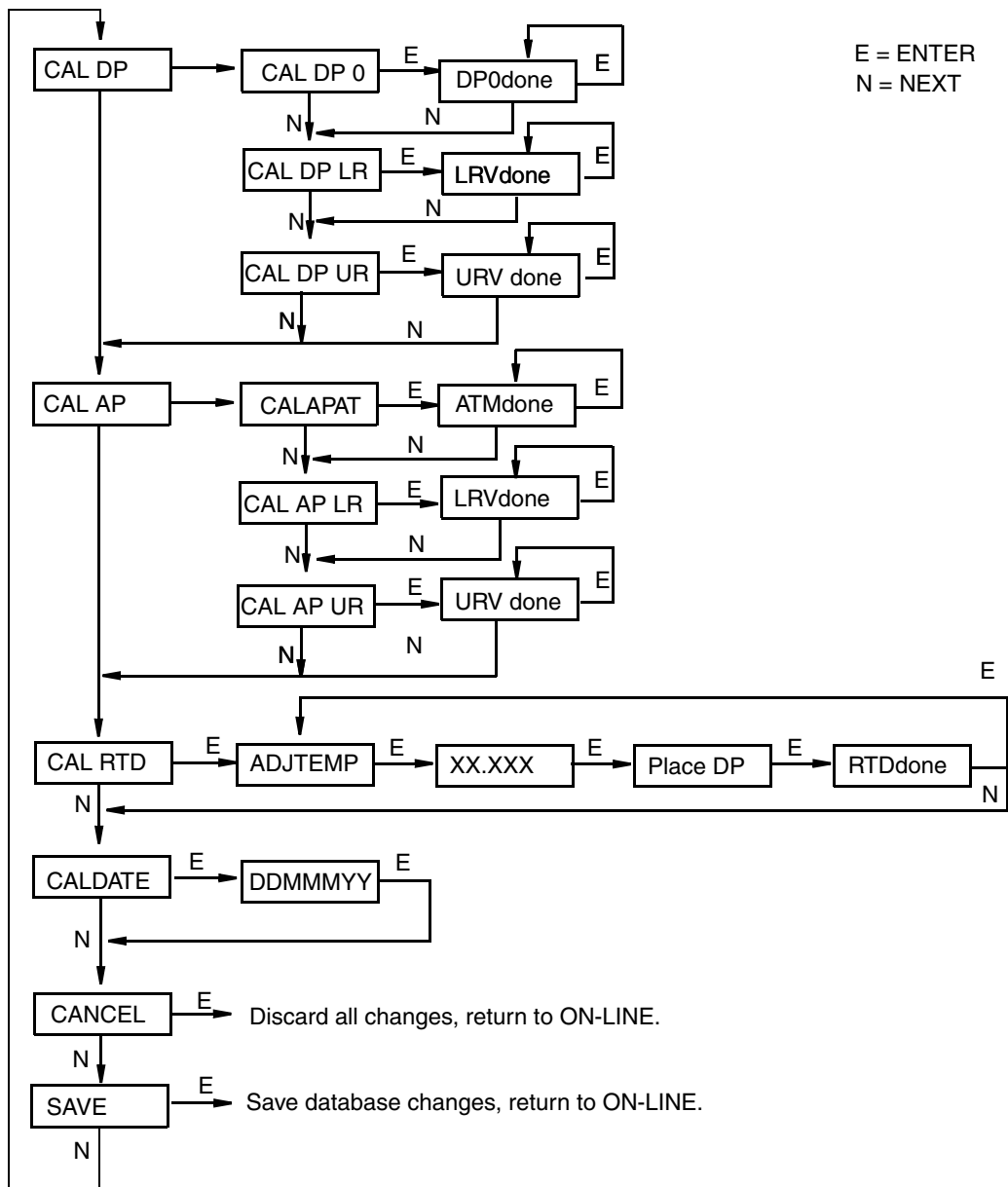


Figure 33. Calibration Structure Diagram

Commentary on Figure 33

CAL DP

To calibrate the differential pressure measurement, press **Enter** at the display of **CAL DP**. Then, using the **Next** button, select **CAL DP 0**, **CAL DP LR**, or **CAL DP UR**.

To set or reset the zero point at zero pressure, apply zero differential pressure to the transmitter and, at display of **CAL DP 0**, press **Enter**. This can be done whether LRV is zero or not. Completion is indicated by the display **DP0done**. Press **Enter** to repeat or **Next** to move to **CAL DP LR**.

To set or reset 0% of range input, apply differential pressure to the transmitter equal to the Lower Range Value (LRV) in the transmitter data base and, at display of **CAL DP LR**, press **Enter**. Completion is indicated by the display **LRVdone**. Press **Enter** to repeat or **Next** to move to **CAL DP UR**.

To set or reset 100% of range input, apply differential pressure to the transmitter equal to the Upper Range Value (URV) in the transmitter database and, at display of **CAL DP UR**, press **Enter**. Completion is indicated by the display **URVdone**. Press **Enter** to repeat or **Next** to move to **CAL AP**.

CAL AP

To calibrate the pressure measurement, press **Enter** at the display of **CAL AP**. Then, using the **Next** button, select **CALAPAT**, **CAL DP LR**, or **CAL DP UR**.

To set or reset the zero point at atmospheric pressure, vent both the high and low side process connections of the transmitter to atmosphere and, at the display of **CALAPAT**, press **Enter**. Completion is indicated by the display **ATMdone**. Press **Enter** to repeat or **Next** to move to **CAL AP LR**.

To set or reset 0% of range input, apply pressure to both the high and low side process connections of the transmitter equal to the Lower Range Value (LRV) in the transmitter database and, at display of **CAL AP LR**, press **Enter**. Completion is indicated by the display **LRVdone**. Press **Enter** to repeat or **Next** to move to **CAL DP UR**.

To set or reset 100% of range input, apply pressure to both the high and low side process connections of the transmitter equal to the Upper Range Value (URV) in the transmitter database and, at display of **CAL DP UR**, press **Enter**. Completion is indicated by the display **URVdone**. Press **Enter** to repeat or **Next** to move to **CAL RTD**.

CAL RTD

To edit the current RTD temperature, at the display **CAL RTD**, press **Enter**. At the display **ADJTEMP**, press **Enter** again. Enter the temperature you desire and press **Enter**. Completion is indicated by the display **RTDdone**. Press **Enter** to repeat or **Next** to move to **CAL mA**.

CALDATE

This is not a required entry but can be used for recordkeeping or plant maintenance purposes. To edit the calibration date, go to **CALDATE** with the **Next** button and press **Enter**. You then can change the day, month, and year. The display shows the last date with the day flashing. Use the **Next** button to step through the menu of digits to select the desired day, then press **Enter**. Repeat this process for the month and year.

Configuration

You can access the Configuration mode by the same multi-level menu system that was used to enter Calibration mode. Entry to the Mode Select menu is made (from normal operating mode) by pressing the **Next** button. The display reads **CALIB**, the first item on the menu. Press the **Next** button again to get to the second item on the menu, **CONFIG**. Acknowledge your choice of this selection by pressing the **Enter** button. The display shows the first item in the Configuration menu. You can then configure items shown in Table 3. The standard factory default configuration is also given in this table.

— **NOTE** —

1. If configuration has been password protected, you are asked to enter the password before you can proceed.
2. If your transmitter is write protected, you cannot write your configuration to the electronics. To disable this feature, see “Setting the Write Protect Jumper” on page 22.

Proceed to configure your transmitter by using the **Next** button to select your item and the **Enter** button to specify your selection per Figure 34. At any point in the configuration you can **Cancel** your changes and return to the on-line mode, or **Save** your changes.

Configuration error messages are listed in Table 6.

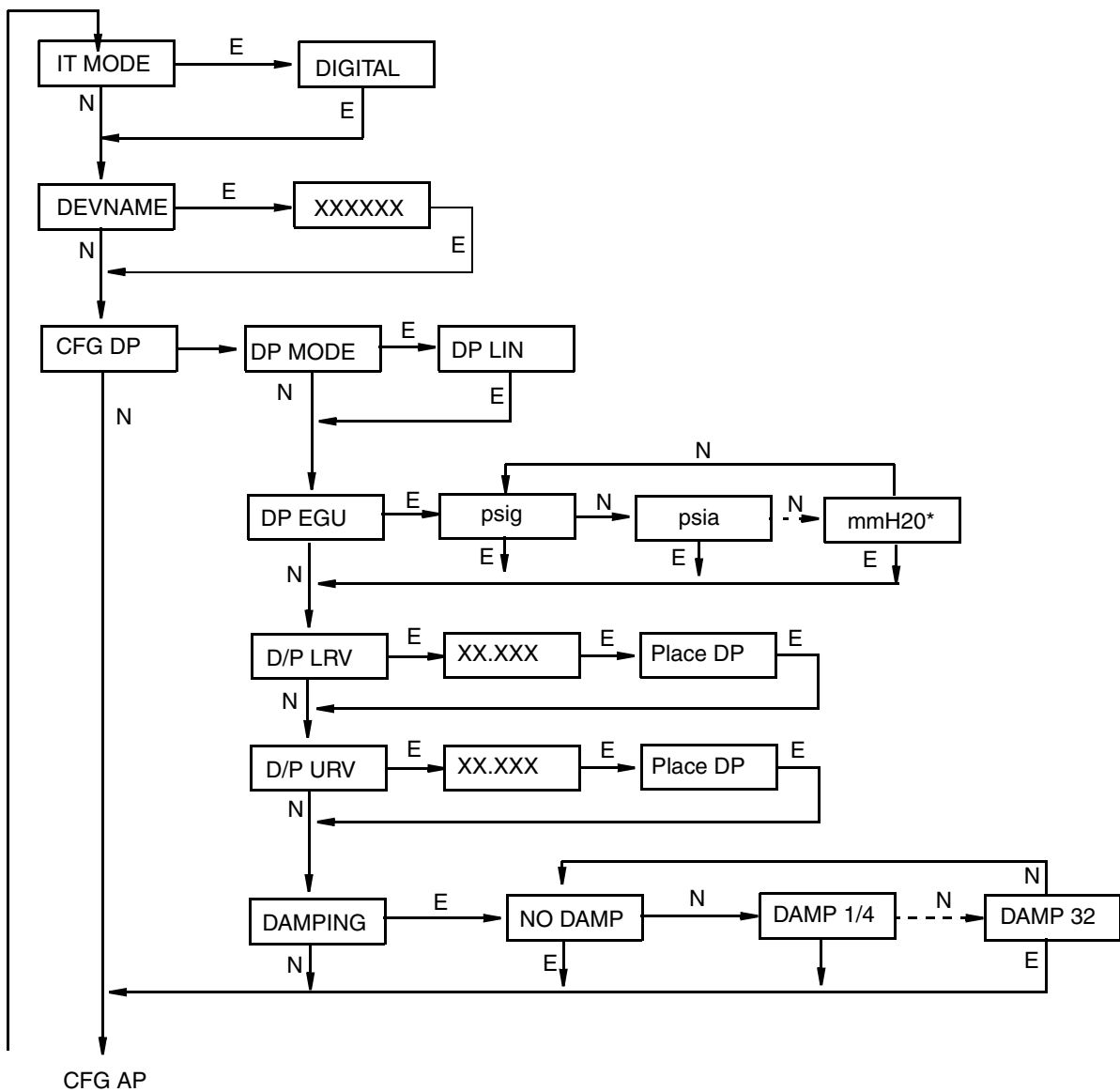
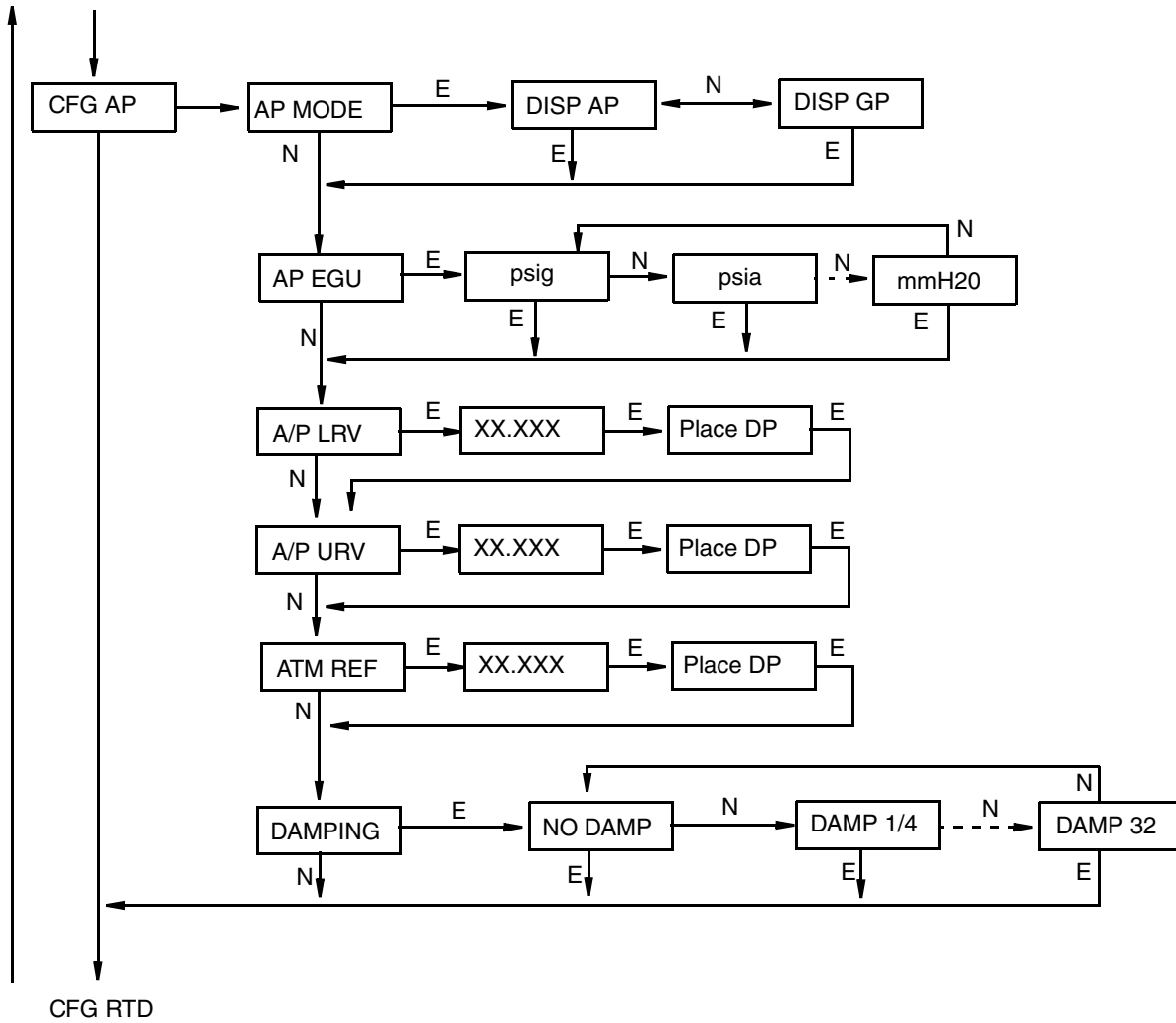
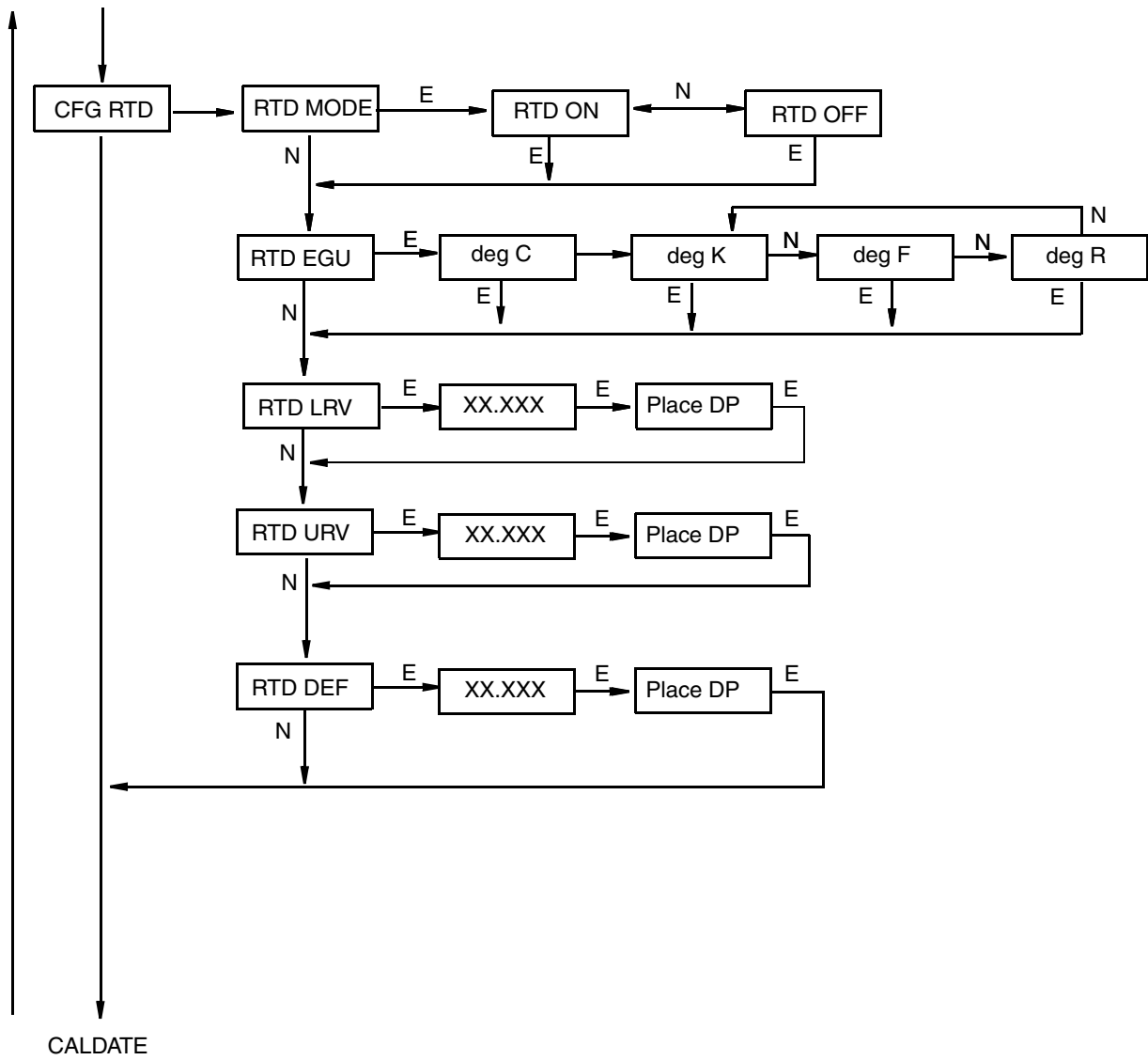


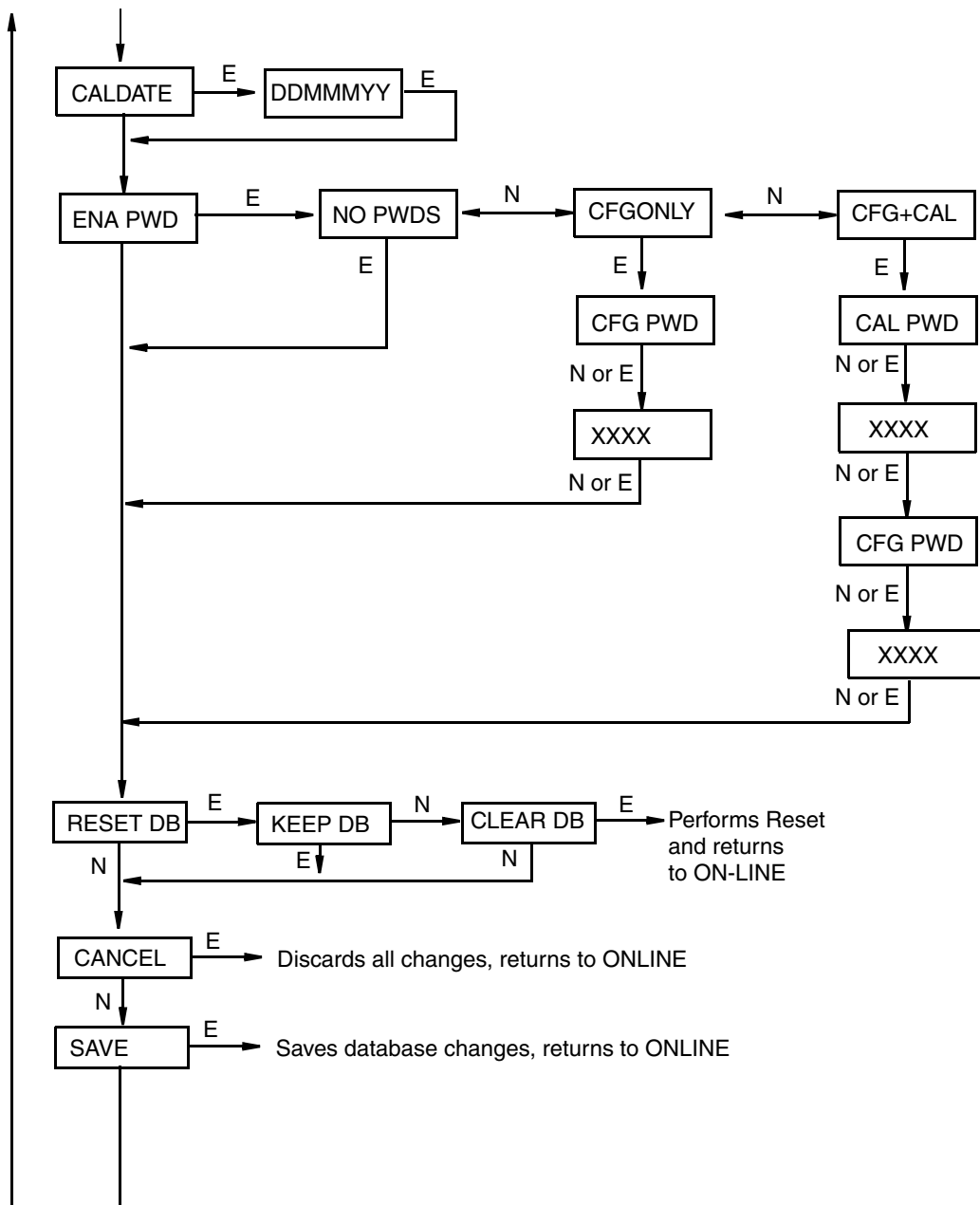
Figure 34. Configuration Structure Diagram



Configuration Structure Diagram (Continued)



Configuration Structure Diagram (Continued)



Configuration Structure Diagram (Continued)

Commentary on Figure 34

In general, use the **Next** button to select your item and the **Enter** button to specify your selection.

IT MODE

The only selection is **Digital**. Press **Enter**.

DEVNAME

The main purpose of this parameter is to identify the transmitter for its communications with an I/A Series system. In this situation, the **DEVNAME** must match the letterbug used for that channel in the I/A Series system. The **DEVNAME**, however, can be used for other purposes.

CFG DP

To configure the differential pressure measurement, go to **CFG DP** with the **Next** button and press **Enter**. **DP MODE** is displayed.

To configure engineering units for your display and transmission (if in digital mode), press **Next** to go to **DP EGU** and press **Enter**.

Next, you are asked to specify one of the following units: **psi, inHg, FtH2O, inH2O, atm, bar, mbar, MPa, kPa, Pa, kg/cm2, g/cm2, cmHg, mmHg, torr, mH2O, cmH2O, or mmH2O**. Then, set the **D/P URV** (upper range value) and the **DP LRV** (lower range value).

To configure additional damping, go to **DAMPING** with the **Next** button and press **Enter**. Use the **NEXT** button to select **NO DAMP, DAMP 1/4, DAMP 1/2, DAMP 1, DAMP 2, DAMP 4, DAMP 8, DAMP 16, or DAMP 32** and press **Enter**.

CFG AP

To configure the pressure measurement, go to **CFG AP** with the **Next** button and press **Enter**. The first parameter, **AP MODE**, is displayed.

To configure the absolute pressure mode, press **Enter**. Then use the **Next** button to select **DISP AP** (absolute pressure) or **DISP GP** (gauge pressure) and press **Enter**.

To configure engineering units for your display and transmission (if in digital mode), go to **AP EGU** and press **Enter**.

You are asked to specify one of the following labels: **psi, inHg, FtH2O, inH2O, atm, bar, mbar, MPa, kPa, Pa, kg/cm2, g/cm2, cmHg, mmHg, torr, mH2O, cmH2O, or mmH2O**. Then, set the **A/P URV** (upper range value) and **DP LRV** (lower range value).

If **AP MODE** is configured **DISPGP**, you must configure the atmospheric reference. To do this, go to **ATM REF** and press **Enter**. Enter the desired value and press **Enter**.

CFG RTD

To configure the RTD measurement, go to **CFG RTD** with the **Next** button and press **Enter**. The first parameter, **RTD MODE**, is displayed.

To configure the RTD mode, press **Enter**. Then use the **Next** button to select **RTD ON**, or **RTD OFF** and press **Enter**.

To configure engineering units for your display and transmission if in digital mode, go to **RTD EGU** and press **Enter**.

You are asked to specify one of the following labels: **deg C, deg K, deg F, or deg R**. Then, set the **RTD URV** (upper range value) and **RTD LRV** (lower range value).

To configure a default temperature value for flow and density calculations in the event of an RTD failure, go to **RTD DEF** with the **Next** button and Press **Enter**. Then set the default value.

To configure additional damping, go to **DAMPING** with the **Next** button and press **Enter**. Use the **NEXT** button to select **NO DAMP**, **DAMP 1/4**, **DAMP 1/2**, **DAMP 1**, **DAMP 2**, **DAMP 4**, **DAMP 8**, **DAMP 16**, or **DAMP 32** and press **Enter**.

CALDATE

This is not a required entry but can be used for recordkeeping or plant maintenance purposes. To edit the calibration date, go to **CALDATE** with the **Next** button and press **Enter**. You then can change the day, month, and year. The display shows the last date with the day flashing. Use the **Next** button to step through the library of digits to select the desired day, then press **Enter**. Repeat this process for the month and year.

ENA PWD

To enable or disable the password feature, go to **ENA PWD** with the **Next** button and press **Enter**. Use the **Next** button to select **NO PWDS** (password feature disabled), **CFGONLY** (password required to configure only), or **CFG+CAL** (password required to both configure and calibrate) and press **Enter**.

If you selected **CFG ONLY**, the display changes to **CFG PWD**. Press either the **Next** or **Enter** button. Use the **Next** button to step through the library of characters to select the desired first character, then press **Enter**. Your selection is entered and the second character flashes. Repeat this procedure until you have created your password. If the password has less than six characters, use blanks for the remaining spaces. When you have configured the sixth space, the display advances to the next menu item.

If you selected **CFG+CAL**, the display changes to **CAL PWD**. To create the Calibration password, press either the **Next** or **Enter** button. Use the **Next** button to step through the library of characters to select the desired first character, then press **Enter**. Your selection is entered and the second character flashes. Repeat this procedure until you have created your password. If the password has less than six characters, use blanks for the remaining spaces. When you have configured the sixth space, the display advances to **CFG PWD**. Use the same procedure to create the configuration password.

— CAUTION —

Record your new password before saving changes to the database.

RESET DB

If your transmitter database becomes corrupted and you receive an **INITERR** message upon startup, this function enables you to rewrite all calibration and configuration values with default values. Therefore, it should be **configured Keep DB** if your transmitter is functioning normally.

— CAUTION —

Changing the database from the local display changes the default address to 99. Changing it to the default address of 1 or to another address between 1 and 247, must be done via a PCMM configurator.

Viewing the Database

You can access the View Database mode by the same multi-level menu system that was used to enter Calibration and Configuration mode. Access to **View DB** is made (from normal operating mode) by pressing the **Next** button three times. Acknowledge your choice of this selection by pressing the **Enter** button. The first item on the view database menu is the firmware version, **FMW REV**. Pressing the **Next** button repeatedly steps you through the database. You can abort this procedure at any time by pressing the **Enter** button.

Testing the Display

You can access the Test Display mode by the same multi-level menu system that was used to enter Calibration, Configuration, and View Database mode. Entry to the Mode Select menu is made (from normal operating mode) by pressing the **Next** button. The display reads **CALIB**, the first item on the menu. Press the **Next** button three times to get to the fourth item on the menu, **TST DSP**. Acknowledge your choice of this selection by pressing the **Enter** button. The display shows the first test segment pattern. You can step through the five patterns by repeated use of the **Next** button. You can abort the test at any time by pressing the **Enter** button.

Error Messages

Table 5. Calibration Error Messages

Parameter	Condition Tested	Error Message	User Action
Password Protection	Password	BAD PWD	Bad password entered, use another.
Write Protection	Write protection enabled	REJECT	Displays when you attempt an action that is write protected.
CAL DP or CAL AP ZERO	Calculated offset too large	BADZERO	Check applied pressure and configured LRV.
	Completion of data collection	CALWAIT	Displayed while data is collected for calibration.
	Measurement Status Error	BADSTAT	If AP, check that calibrating pressure (or vent) is applied to both high and low pressure sides simultaneously.
CAL RTD ADJTEMP	Calculated offset too large	BADOFST	Check RTD connections. Adjustment limited to 0.05% of range.
	Completion of data collection	CALWAIT	Displayed while data is collected for calibration.
	Measurement Status Error	BADSTAT	If AP, check that calibrating pressure (or vent) is applied to both high and low pressure sides simultaneously.
	RTD Mode	MEASOFF	Calibration attempt fails when RTD is configured Off.
CAL DP	DP Cal Point	CALnot0	User entered calibration point must be 0 for a 1-point calibration using an external device with DP in Square Root mode.
CAL DP or CAL AP SPAN	Calculated slope too large or too small	BADSPAN	Check applied pressure and configured LRV.
	Completion of data collection	CALWAIT	Displayed while data is collected for calibration.
	Measurement Status Error	BADSTAT	If AP, check that calibrating pressure (or vent) is applied to both high and low pressure sides simultaneously.
RERANGE (entering URV)	M1URV > max pressure in EGU	URV>FMX	Entered pressure is greater than maximum rated pressure of transmitter. Check entry. Verify EGUs.
	M1URV < min pressure in EGU	URV<FMN	Entered pressure is less than minimum rated pressure of transmitter. Check entry. Verify EGUs.
	Entered URV value = LRV value	LRV=URV	Cannot set span to 0. Check entry. Check LRV. Verify EGU.
	Calculated turndown exceeds limit	BADTDWN	Span too small. Check entry. Check LRV. Verify EGU.

Table 5. Calibration Error Messages (Continued)

Parameter	Condition Tested	Error Message	User Action
RERANGE (entering LRV)	M1LRV > max pressure in EGU	LRV>FMX	Entered pressure is greater than maximum rated pressure of transmitter. Check entry. Verify EGUs.
	M1LRV < min pressure in EGU	LRV<FMN	Entered pressure is less than minimum rated pressure of transmitter. Check entry. Verify EGUs.
	M1 URV = M1 LRV	LRV=URV	Cannot set span to 0. Check entry. Check URV. Verify EGU.
	Calculated turndown exceeds limit	BADTDWN	Span too small. Check entry. Check URV. Verify EGU.

Table 6. Configuration Error Messages

Parameter	Condition Tested	Error Message	User Action
Any Configuration Action	Calculation Delay	WAIT	Displayed temporarily during calculation of updated values that result from a configuration change. No user action is necessary.
Password Protection	Password	BAD PWD	Bad password entered, use another.
Write Protection	Write Protection Enabled	REJECT	Displays when user attempts an action that is write protected.
AP MODE (changing DISP GP or DISP AP)	Adjusted LRV is too large to display	LRV>DSP	EGU must be changed if you want to edit LRV value on display.
	Adjusted URV is too large to display	URV>DSP	EGU must be changed if you want to edit URV value on display.
ATM REF (in CFG AP)	ATM REF too high	ATM>20	ATM REF must be set below 20 psia.
	ATM REF too low	ATM<10	ATM REF must be set above 10 psia.
RTD DEF	Default too high	DEF>FMX	Set default value lower
	Default too low	DEF>FMN	Set default value higher.

Table 6. Configuration Error Messages (Continued)

Parameter	Condition Tested	Error Message	User Action
CFG any (entering URV)	M1URV > max pressure in EGU	URV>FMX	Entered pressure is greater than maximum rated pressure of transmitter. Check entry. Verify EGUs.
	M1URV < min pressure in EGU	URV<FMN	Entered pressure is less than minimum rated pressure of transmitter. Check entry. Verify EGUs.
	Entered URV value = LRV value	LRV=URV	Cannot set span to 0. Check entry. Check LRV. Verify EGU.
	Calculated turndown exceeds limit	BADTDWN	Span too small. Check entry. Check LRV. Verify EGU.
CFG any (entering LRV)	LRV > max pressure in EGU	LRV>FMX	Entered pressure is greater than maximum rated pressure of transmitter. Check entry. Verify EGUs.
	LRV < min pressure in EGU	LRV<FMN	Entered pressure is less than minimum rated pressure of transmitter. Check entry. Verify EGUs.
	URV = LRV	LRV=URV	Cannot set span to 0. Check entry. Check URV. Verify EGU.
	Calculated turn- down exceeds limit	BADTDWN	Span too small. Check entry. Check URV. Verify EGU.
CFG any (changing EGU)	LRV in new EGU is too large to display	LRV>DSP	EGU must be changed if you want to edit LRV value on display.
	URV in new EGU is too large to display	URV>DSP	EGU must be changed if you want to edit URV value on display.

Table 7. Operation Error Messages

Parameter	Condition Tested	Error Message	User Action
Normal Operation	Write protection enabled	WR PROT	Displays periodically to notify user that unit is in Write Protect.
	Any non-on-line Condition	OFFLINE	Notifies user of a non-on-line condition.
	Raw input error	S# ERR	Check connections.
	Measurement error	M# ERR	Temperature and pressures must be within configured limits.
Startup	Measurement is being overridden	OVERRIDE	Displays periodically to notify the user that an external PC or HART Communicator calibration or loop test operation is controlling one or more measurements. To return to normal operation, complete the external operation or cycle power to the transmitter.
	Database OK or corrupted	INITERR	Perform RESET DB procedure.
	Bad MAU identification	UNK MAU	Contact our Global Client Support Center at 1-866-746-6477.
	RTD Mode configured Off	M5=OFF	Configure ON if desired.

Operation From a PCMM Configurator

The PCMM Configurator allows you to set up and maintain IMV25-M Transmitters. The configurator enables you to:

- ◆ Find IMV25-M Transmitters connected in your system
- ◆ Configure communication parameters
- ◆ View and configure sensor parameters
- ◆ Calibrate sensors
- ◆ View status and other information

Starting the Configurator Program

To start the program, double click the configurator icon or access the program from the Start menu. The PCMM Configurator main window appears.

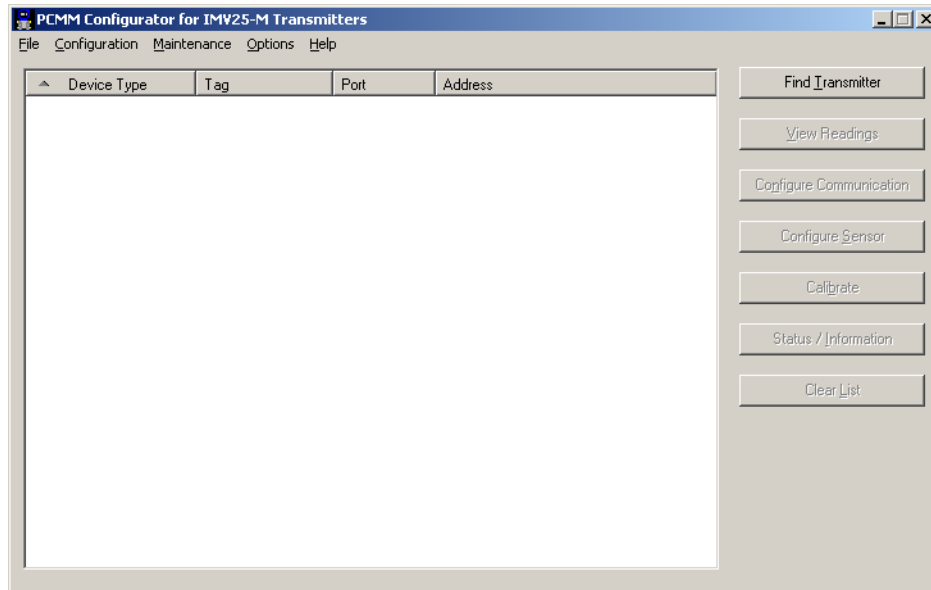


Figure 35. PCMM Configurator Main Window

Finding a Transmitter

To make a connection to an IMV25-M transmitter, connect the PC running the Configurator to the transmitter or the RS-485 network to which the transmitter is connected. See Figure “Installing PCMM Configurator Hardware” on page 27.

1. Click the **Find Transmitter** button. This will open the Find Transmitter dialog.
2. Select the serial port your PC is using in the **Find One Transmitter on Port** drop down list.
3. Select **Automatic Connection** if connecting to only one transmitter or **Manual Connection** for multidrop serial connection.
4. If you selected **Manual Connection**, select the baud rate of the RS-485 network. Valid values are 1200, 2400, 4800, 9600, 19200 and 38400. The default value is 9600.
5. If you selected **Manual Connection**, enter the address of the transmitter you are searching for or enter a range of addresses to be searched. Valid addresses are 1 to 247. The default value is 1.
6. Click the **Search Serial** button to start the search for the transmitter(s).
7. Once the transmitter is found, click the **Close** button to close the Find Transmitter dialog.
8. If the transmitter is not found, check that the serial connection is wired correctly and that the correct serial port is selected for your PC in the **Find One Transmitter on Port** drop down list.

Configuring Transmitter Communication Parameters

When the transmitters have been found they are displayed in the PCMM Configurator main window. The device type, tag (if configured, blank if not), port, and address are shown for each found transmitter. The control buttons at the right of the dialog are now active.

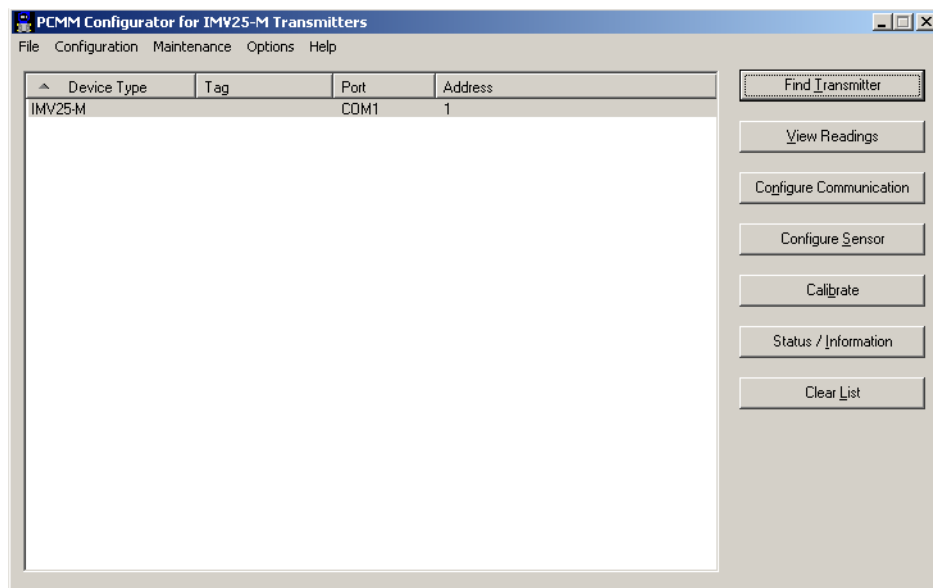


Figure 36. PCMM Configurator Main Window

1. To configure the communication parameters for a transmitter click on the transmitter in the list to highlight it.
2. Click the **Configure Communication** button to read the communication parameters from the selected transmitter and to open the Transmitter Communication Settings dialog.
3. The Transmitter Communication Settings dialog has two tabs. Click on the applicable tab to display and configure the Serial or Protocol communication parameters. The **Serial** tab is displayed by default.

Configuring Serial Communication Parameters

When the **Serial** tab is selected, the COM1 serial port parameters currently set in the transmitter are displayed. If the transmitter has not been configured, the default settings are used.

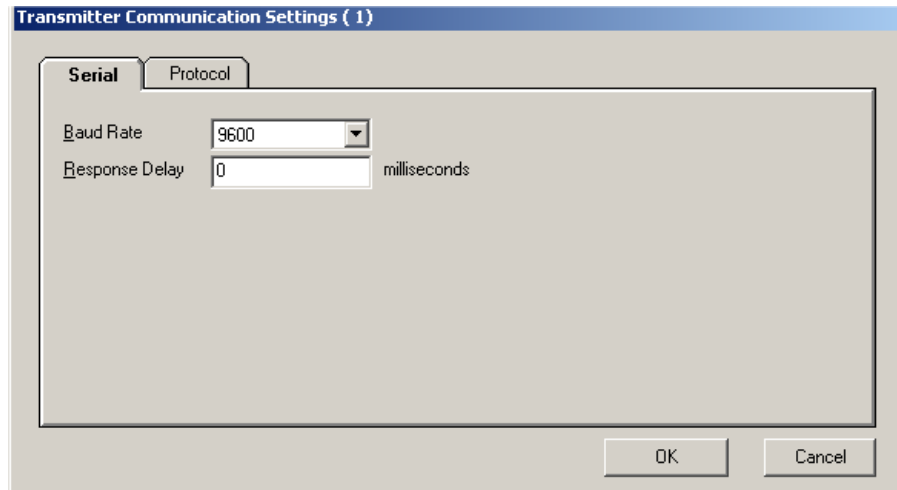


Figure 37. Transmitter Communication Settings - Serial Tab

1. In the **Baud Rate** drop down box select the baud rate for the transmitter. Choices are 1200, 2400, 4800, 9600, 19200, and 38400. The default value is 9600.
2. In the **Response Delay** entry box enter the value for the response delay. The response delay is the time the transmitter waits before transmitting a response on the serial port. Valid values are 0 to 65535 milliseconds. The default value is 0 milliseconds.
3. Click the **OK** button to write the new settings to the transmitter and close the dialog. Click the **Cancel** button to close the dialog and not write new settings to the transmitter.

Configuring Protocol Parameters

When the **Protocol** tab is selected, the address setting currently set in the transmitter is displayed.

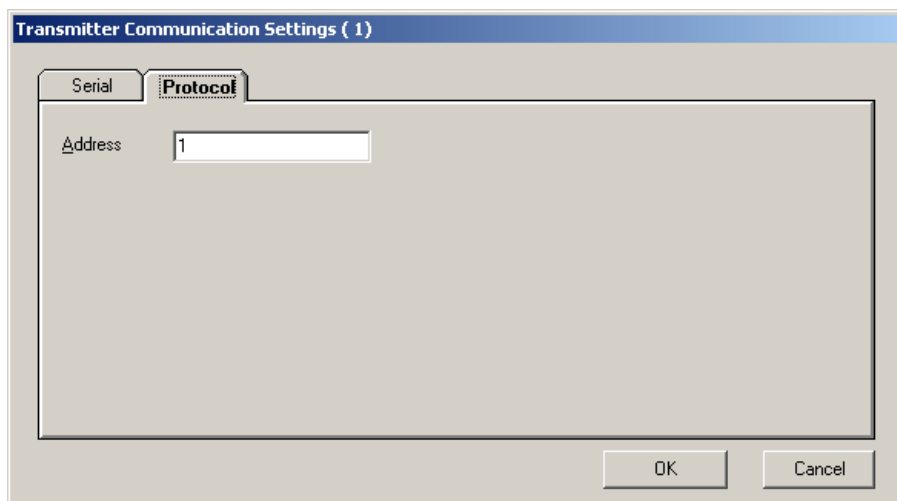


Figure 38. Transmitter Communication Settings - Protocol Tab

1. In the **Address** entry box, enter the Modbus Address for the transmitter. Valid values are 1 to 247. The default value is 1.
2. Click the **OK** button to write the new settings to the transmitter and close the dialog. Click the **Cancel** button to close the dialog and not write new settings to the transmitter.

Viewing and Configuring Sensor Parameters

1. To configure the sensor parameters click on the transmitter in the PCMM Configurator main window listing to highlight it. See Figure 36.
2. Click the **View/Configure Sensor** button to read the sensor parameters from the selected transmitter and open the Sensor Settings dialog.
3. The Sensor Settings dialog has four tabs. Click on the applicable tab to display and configure the Differential Pressure (DP), Static Pressure (SP), Temperature, or Display parameters. The **DP** tab is displayed by default.

Configuring the Differential Pressure Parameters

When the **DP** tab is selected, the display shows the live differential pressure reading and the current DP parameters in the transmitter.

The screenshot shows a dialog box titled "Sensor Settings (1)" with four tabs: DP, SP, RTD, and Display. The DP tab is selected. The DP tab contains the following fields and values:

Differential Pressure	0.5454478	inches H2O
Units	inches H2O	
Upper Operating Limit	400	
Lower Operating Limit	0	
Damping	0.0	seconds
Upper Range Limit	400.0001	
Lower Range Limit	-400.0001	

At the bottom right of the dialog are two buttons: "OK" and "Cancel".

Figure 39. Sensor Settings - DP Tab

1. The **Differential Pressure** window displays the current differential pressure.
2. In the **Units** drop down box select the units for the DP measurement.
3. In the **Upper Operating Limit** entry window enter the upper operating limit for the DP sensor. This value must be less than the upper range limit.
4. In the **Lower Operating Limit** entry window enter the lower operating limit for the DP sensor. This value must be greater than the lower range limit.

5. In the **Damping** drop down box select a damping time for the measured value.
6. The **Upper Range Limit** and the **Lower Range Limit** are factory set and cannot be changed.
7. Click the **OK** button to write the new settings to the transmitter and close the dialog. Click the **Cancel** button to close the dialog and not write new settings to the transmitter.

Configuring the Static Pressure Parameters

When the **SP** tab is selected, the display shows the live static pressure reading and the current SP parameters in the transmitter.

The screenshot shows a dialog box titled "Sensor Settings (1)" with four tabs: DP, SP, RTD, and Display. The SP tab is selected. The dialog contains the following fields and controls:

Static Pressure	15.14903	psi
Units	psi	▼
Upper Operating Limit	1500	
Lower Operating Limit	0	
Damping	0.0	seconds ▼
Type	absolute	▼
Atmospheric Pressure	14.7	
Upper Range Limit	1500	
Lower Range Limit	0	

At the bottom right of the dialog are two buttons: "OK" and "Cancel".

Figure 40. Sensor Settings - SP Tab

1. The **Static Pressure** window displays the current differential pressure.
2. In the **Units** drop down box select the units for the SP measurement.
3. In the **Upper Operating Limit** entry window enter the upper operating limit for the SP sensor. This value must be less than the upper range limit.
4. In the **Lower Operating Limit** entry window enter the lower operating limit for the SP sensor. This value must be greater than the lower range limit.
5. In the **Damping** drop down box select a damping time for the measured value.
6. In the **Type** drop down box select **absolute** or **gage**. Because the sensor is an absolute sensor, **gage** is equal to the measured absolute pressure minus the value entered in **Atmospheric Pressure** below. It is not referenced to varying atmospheric pressure.
7. In the **Atmospheric Pressure** entry window enter the atmospheric pressure. This entry is only allowed if the transmitter type is set to **gage**.

8. The **Upper Range Limit** and the **Lower Range Limit** are factory set and cannot be changed.
9. Click the **OK** button to write the new settings to the transmitter and close the dialog. Click the **Cancel** button to close the dialog and not write new settings to the transmitter.

Configuring the RTD Parameters

When the **RTD** tab is selected, the display shows the live temperature reading and the current temperature parameters in the transmitter.

The screenshot shows a dialog box titled "Sensor Settings (1)". It has four tabs: "DP", "SP", "RTD" (which is selected and highlighted with a dotted border), and "Display". The "RTD" tab contains the following fields:

Temperature	78.35301	°F
Units	*F	▼
Upper Operating Limit	1562	
Lower Operating Limit	-328	
Upper Range Limit	1562	
Lower Range Limit	-328	

At the bottom right of the dialog are two buttons: "OK" and "Cancel".

Figure 41. Sensor Settings - Temperature Tab

1. The **Temperature** window displays the current temperature.
2. In the **Units** drop down box select the units for the temperature measurement.
3. In the **Upper Operating Limit** entry window enter the upper operating limit for the temperature sensor. This value must be less than the upper range limit.
4. In the **Lower Operating Limit** entry window enter the lower operating limit for the temperature sensor. This value must be greater than the lower range limit.
5. The **Upper Range Limit** and the **Lower Range Limit** are factory set and cannot be changed.
6. Click the **OK** button to write the new settings to the transmitter and close the dialog. Click the **Cancel** button to close the dialog and not write new settings to the transmitter.

Configuring the Display Parameters

When the **Display** tab is selected, the screen shows the currently selected parameters for the optional display.

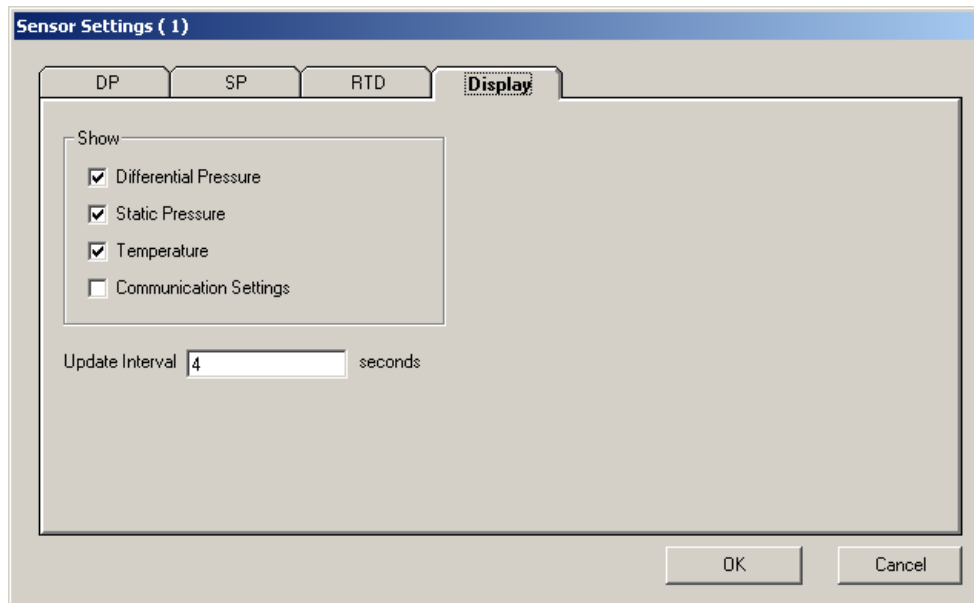


Figure 42. Sensor Settings - Display Tab

1. Click the box beside **Differential Pressure** to select and unselect Differential Pressure for display.
2. Click the box beside **Static Pressure** to select and unselect Static Pressure for display.
3. Click the box beside **Temperature** to select and unselect Temperature for display.
4. Click the box beside **Communication Settings** to select and unselect Communication Settings for display.
5. In the **Update Interval** entry window enter a display update interval. The update interval is the length of time that each reading remains on the display.
6. Click the **OK** button to write the new settings to the transmitter and close the dialog. Click the **Cancel** button to close the dialog and not write new settings to the transmitter.

Calibration

Your transmitter will normally only require a Differential Pressure Re-Zero when installed to correct for mounting position effects. See the **Re-Zero DP** section for the procedure to do this.

— NOTE —

The calibration of the Differential Pressure and Static Pressure **span** is **not** recommended unless accurate laboratory equipment is available.

! CAUTION

Before beginning any calibration, the transmitter must be removed from any process control. All automatic control loops **must** be put into manual mode before beginning a calibration.

1. To configure the sensor parameters click on the transmitter in the PCMM Configurator main window listing to highlight it. See Figure 36.
2. Click the **Calibrate** button to open the calibration dialog.

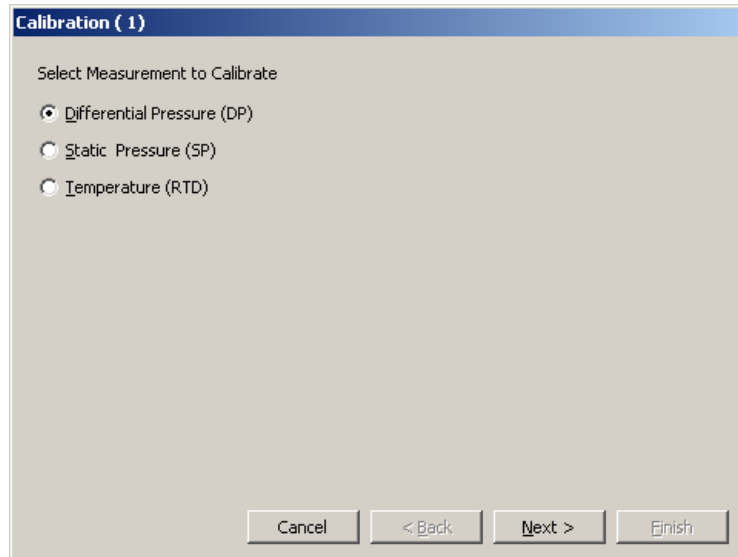


Figure 43. Calibration Dialog

3. Select the measurement to calibrate.
4. Click the **Next** button to start the selected calibration.

Calibrating Differential Pressure (DP)

When **Differential Pressure (DP)** is selected for calibration the Select DP Calibration Type dialog is displayed.

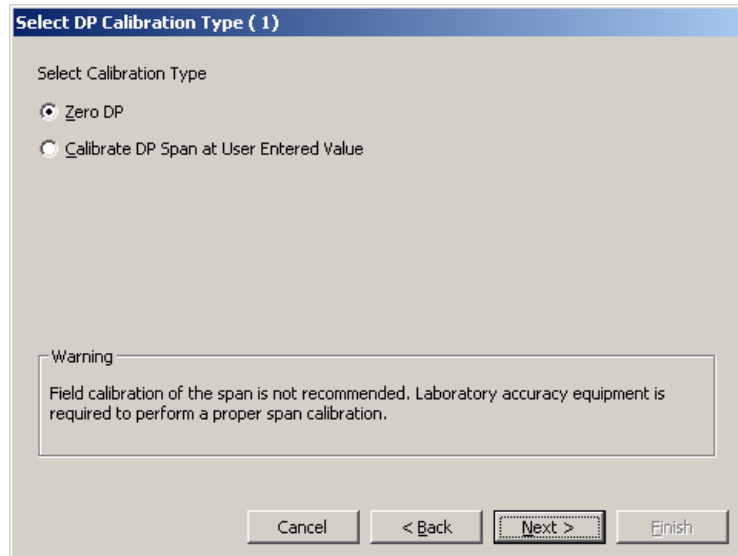


Figure 44. DP Calibration Type Dialog

1. Select **Zero DP** to rezero the DP measurement or **Calibrate DP Span at User Entered Value** to calibrate the transmitter at a value at the high end of the range.
2. Click the **Next** button to start the selected calibration type.

Zero DP

When **Zero DP** is selected, the Zero DP dialog is displayed. Follow the procedure in the **Instructions** section of the dialog. Then click the **Next** button to complete the zero calibration.

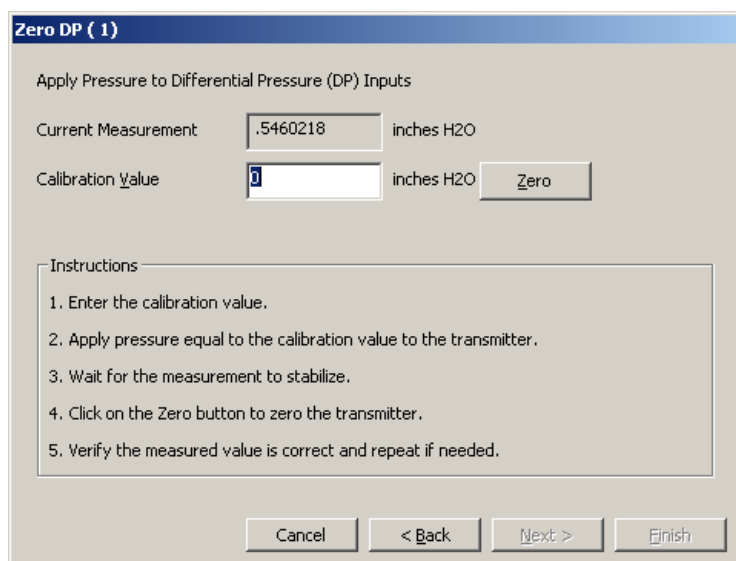


Figure 45. Zero DP Dialog

The Calibration Complete dialog is displayed. You can then select to calibrate another measurement or not.

- ◆ If you select **Yes, calibrate another measurement** and then click the **Next** button, the Calibration dialog is displayed (see Figure 43).
- ◆ If you select **No** and then click the **Next** button, the End Calibration dialog is displayed. Reconnect all process inputs to the transmitter and click on **Finish**. The transmitter is returned to the online mode.

Calibrate DP Span at User Entered Value

— **NOTE** —

DP Span calibration is **not** recommended unless accurate laboratory equipment is available.

When **Calibrate DP Span at User Entered Value** is selected, the Calibrate DP dialog is displayed. Follow the procedure in the **Instructions** section of the dialog. Then click the **Next** button to complete the calibration.

Figure 46. Calibrate DP Dialog

The Calibration Complete dialog is displayed. You can then select to calibrate another measurement or not.

- ◆ If you select **Yes, calibrate another measurement** and then click the **Next** button, the Calibration dialog is displayed (see Figure 43).
- ◆ If you select **No** and then click the **Next** button, the End Calibration dialog is displayed. Reconnect all process inputs to the transmitter and click on **Finish**. The transmitter is returned to the online mode.

Calibrating Static Pressure (SP)

When **Static Pressure (SP)** is selected for calibration the Select SP Calibration Type dialog is displayed.

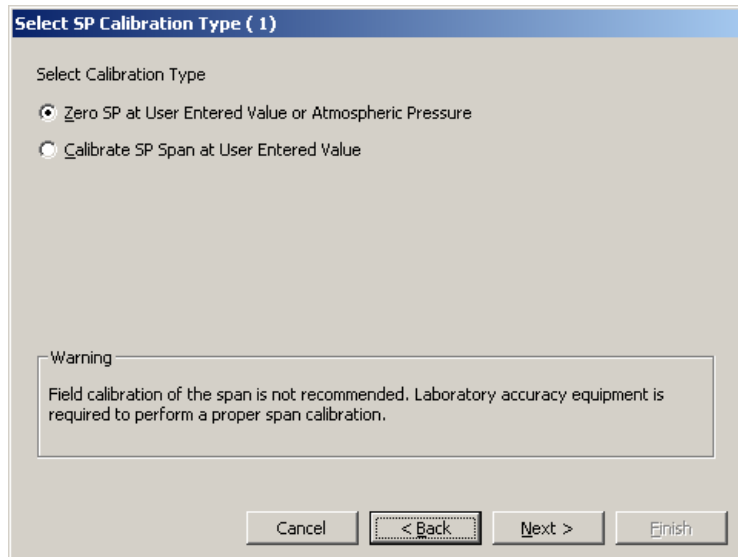


Figure 47. SP Calibration Type Dialog

1. Select **Zero SP at User Entered Value or Atmospheric Pressure** to rezero the SP measurement or **Calibrate SP Span at User Entered Value** to calibrate the transmitter at a value at the high end of the range.
2. Click the **Next** button to start the selected calibration type.

Zero SP at User Entered Value or Atmospheric Pressure

When **Zero SP at User Entered Value or Atmospheric Pressure** is selected, the Zero SP dialog is displayed. Follow the procedure in the **Instructions** section of the dialog. Then click the **Next** button to complete the zero calibration.

Figure 48. Zero SP Dialog

The Calibration Complete dialog is displayed. You can then select to calibrate another measurement or not.

- ◆ If you select **Yes, calibrate another measurement** and then click the **Next** button, the Calibration dialog is displayed (see Figure 43).
- ◆ If you select **No** and then click the **Next** button, the End Calibration dialog is displayed. Reconnect all process inputs to the transmitter and click on **Finish**. The transmitter is returned to the online mode.

Calibrate SP Span at User Entered Value

— **NOTE** —

SP Span calibration is **not** recommended unless accurate laboratory equipment is available.

When **Calibrate SP Span at User Entered Value** is selected, the Calibrate SP dialog is displayed. Follow the procedure in the **Instructions** section of the dialog. Then click the **Next** button to complete the calibration.

Figure 49. Calibrate SP Dialog

The Calibration Complete dialog is displayed. You can then select to calibrate another measurement or not.

- ◆ If you select **Yes, calibrate another measurement** and then click the **Next** button, the Calibration dialog is displayed (see Figure 43).
- ◆ If you select **No** and then click the **Next** button, the End Calibration dialog is displayed. Reconnect all process inputs to the transmitter and click on **Finish**. The transmitter is returned to the online mode.

Calibrating Temperature (RTD)

When **Temperature (RTD)** is selected for calibration the Select RTD Calibration Type dialog is displayed.

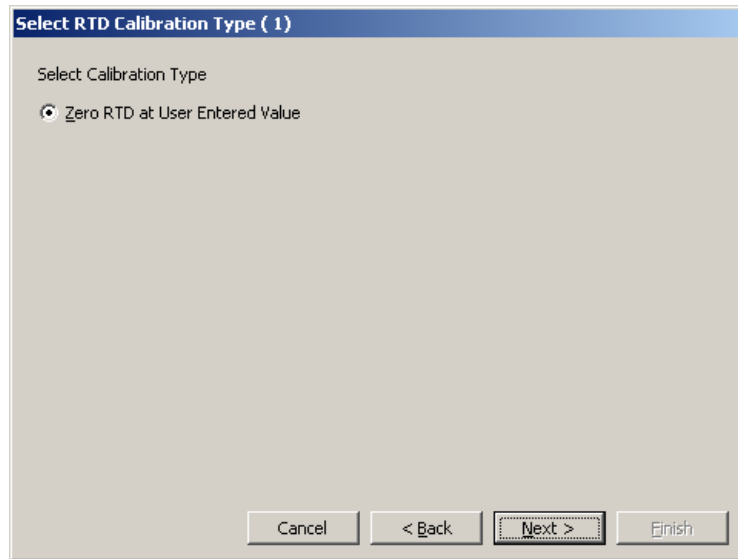


Figure 50. RTD Calibration Type Dialog

1. Select **Zero RTD at User Entered Value** to rezero the Temperature measurement.
2. Click the **Next** button to start the calibration. The Zero RTD dialog is displayed.
3. Follow the procedure in the **Instructions** section of the dialog. Then click the **Next** button to complete the zero calibration.

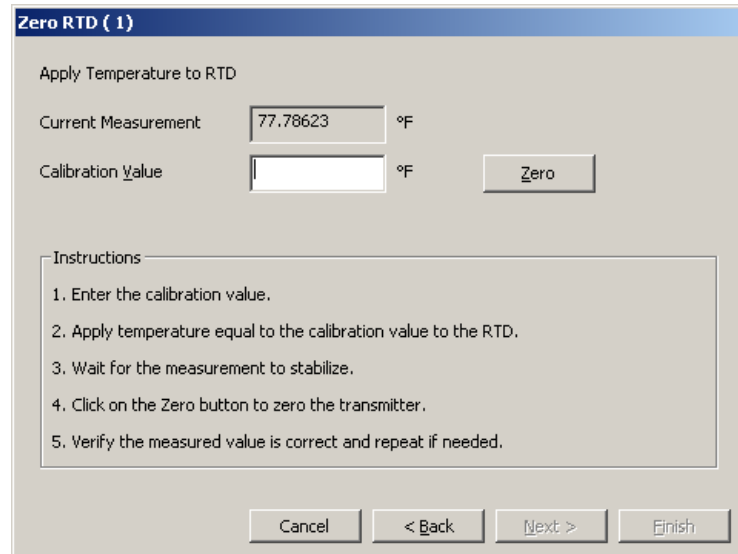


Figure 51. Zero RTD Dialog

The Calibration Complete dialog is displayed. You can then select to calibrate another measurement or not.

- ◆ If you select **Yes, calibrate another measurement** and then click the **Next** button, the Calibration dialog is displayed (see Figure 43).

- ◆ If you select **No** and then click the **Next** button, the End Calibration dialog is displayed. Reconnect all process inputs to the transmitter and click on **Finish**. The transmitter is returned to the online mode.

Viewing Status and Other Information

1. To view status and other information on your transmitter, click on the transmitter in the PCMM Configurator main window listing to highlight it. See Figure 36.
2. Click the **Status / Information** button to access this information.
3. The Transmitter Status dialog has three tabs. Click on the applicable tab to display Communication, Diagnostic, or other Information.

Communication Status

When the **Communication Status** tab is selected, information on the serial port and sensor is displayed.

— **NOTE**

During configuration, a small number of errors for the communication ports are normal.

The screenshot shows a dialog box titled "Transmitter Status (1)" with three tabs: "Information", "Diagnostics", and "Communication Status". The "Communication Status" tab is selected. The dialog is divided into two sections: "Sensor" and "com1 Serial Port". Each section contains a table of error counts and command/response statistics.

Sensor	
Framing Errors	0
Parity Errors	0
Overrun Errors	0
Checksum Errors	0
Commands Sent	8179
Responses Received	8171

com1 Serial Port	
Framing Errors	0
Parity Errors	0
Overrun Errors	0
Checksum Errors	0
Commands Received	5085
Responses Sent	5084

At the bottom right of the dialog are "OK" and "Cancel" buttons.

Figure 52. Transmitter Status - Communications

Framing Errors is the number of serial character framing errors. Framing errors indicate garbled communication or mismatched serial communication parameters.

Parity Errors is the number of serial parity errors. Parity errors indicate garbled communication.

Overrun Errors is the number of serial character overrun errors. Overrun errors indicate garbled communication.

Checksum Errors is the number of Modbus checksum errors. Checksum errors indicate garbled communication.

Commands Received is the number of Modbus commands received.

Responses Sent is the number of Modbus responses sent. Normally this is roughly equal to the number of commands received.

Commands Sent is the number of commands sent to the sensor.

Responses Received is the number of responses received from the sensor. Normally this is roughly equal to the number of commands sent. A difference that is changing indicates communication problems with the sensor.

Diagnostic Status

When the **Diagnostic** tab is selected, sensor diagnostic messages are displayed if the corresponding diagnostic bit indicates an error. Normal conditions are not shown. The values are updated continuously from the transmitter.

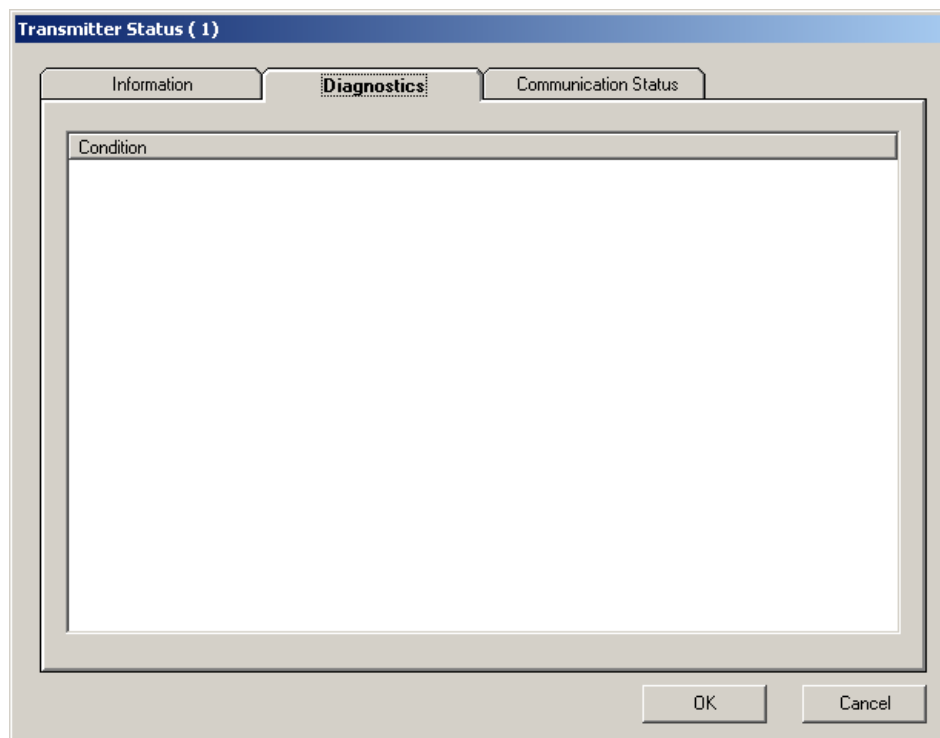


Figure 53. Transmitter Status - Diagnostics

Information

When the **Information** tab is selected, information on the sensor is displayed. The Tag, Description and Message can also be entered from this display.

Field	Value
Tag	
Description	
Message	
Manufacture Code	4000
Type Code	4025
Software Version	1.10 build 05
Sensor Software Version	1.22
Hardware Version	3
Modbus Version	1
Sensor Date	2004/1/8
Sensor Core Number	905

Figure 54. Transmitter Status - Information

Tag is the user-entered tag for the transmitter. The tag is 8 characters long. Valid values are any ASCII character. The default value is blank.

Description is the user-entered description for the transmitter. The description is 16 characters long. Valid values are any ASCII character. The default value is blank.

Message is the user-entered message for the transmitter. The message is 32 characters long. Valid values are any ASCII character. The default value is blank.

Manufacturer Code identifies the maker of the transmitter.

Type Code identifies the type of the transmitter.

Software Version identifies the transmitter firmware version.

Sensor Software Version identifies the sensor firmware version.

Hardware Version identifies the hardware version.

Modbus Version identifies the Modbus protocol firmware version.

Sensor Date is the manufacture date of the sensor electronics.

Sensor Code Number identifies the sensor.

4. Maintenance

— DANGER

For nonintrinsically safe installations, to prevent a potential explosion in a Division 1 hazardous area, de-energize transmitters before you remove threaded housing covers. Failure to comply with this warning could result in an explosion resulting in severe injury or death.

Fault Analysis

Infrequently, the optional display may display the message **FAULT** or **RESET**. Individual, temporary display of **FAULT** or **RESET** does not indicate a problem with the transmitter. If the cycle of **FAULT** followed by **RESET** persists, contact our Global Client Support Center at 1-866-746-6477.

In rare cases, the transmitter database can become corrupted and the transmitter does not go online when powered. This can potentially occur if power to the transmitter is interrupted during a **Save** operation. The optional display continually shows an alternating display of **INITERR** and **RESET**.

To restore the transmitter from this condition, use the **RESET DB** function shown on page 44. Because the **RESET DB** function sets a default database and overwrites all calibration and configuration data, the transmitter needs to be reconfigured and recalibrated.

Parts Replacement

Parts replacement is generally limited to the electronics module assembly, housing assembly, sensor assembly, terminal block assembly, cover O-rings, and optional display. For part numbers relating to the transmitter and its options, see PL 009-019.

Replacing the Electronics Module

— CAUTION

The electronics module is **highly susceptible to damage from electrostatic discharge**. Therefore, the person performing this procedure should be earthed (grounded) via a conductive wrist strap (between 100 Ω minimum and 1 M Ω maximum).

To replace the electronics module assembly, refer to Figure 55 and proceed as follows:

1. Turn off the transmitter power source.
2. Remove the electronics compartment cover by rotating it counterclockwise. Screw in the cover lock if applicable.
3. Remove the digital display (if applicable) as follows: grasp the two tabs on the display and rotate it about 10° in a counterclockwise direction. Pull out the display and disconnect its cable.

4. Remove the electronics module from the housing by loosening the two captive screws that secure it to the housing. Then pull the module out of the housing far enough to gain access to the cable connectors on the rear of the module.

— **! CAUTION** —

Do **not** exceed the slack available in connecting cables when removing the module.

5. Unplug all cable connectors from the rear of the electronics module and place the module on a clean surface.
6. Predetermine connector orientation, then insert the cable connectors into the replacement module. Replace the module in the housing using care not to pinch the cables between the module and the housing.

— **NOTE** —

This can be done by turning the module 180° in the clockwise direction before trying to seat the module.

7. Tighten the two screws that secure the module to the housing.
 8. Connect the cable from the digital display to the electronics module. Ensure that the O-ring is fully seated in the display housing. Then, holding the digital display by the tabs at the sides of the display, insert it into the housing. Secure the display to the housing by aligning the tabs on the sides of the assembly and rotating it about 10° in a clockwise direction.
 9. Reinstall the cover onto the housing by rotating it clockwise to seat the O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal. If cover locks are present, lock the cover per the procedure described in “Cover Locks” on page 22.
 10. Turn on transmitter power source.
- The module replacement procedure is now complete.

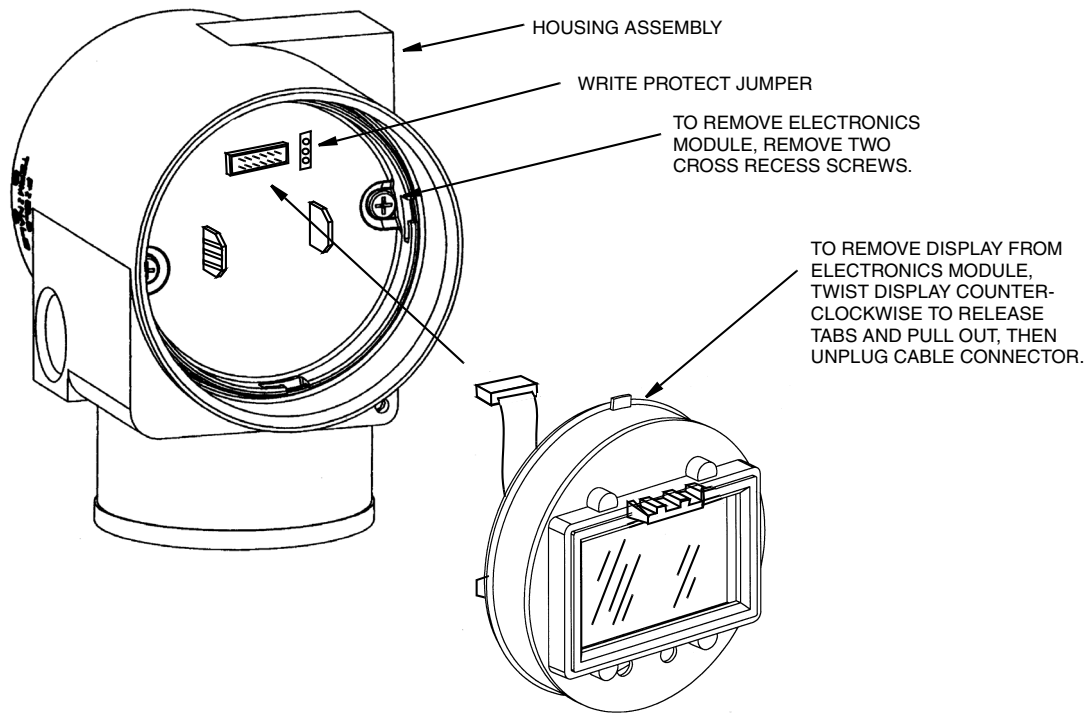


Figure 55. Replacing the Electronics Module Assembly and Display

Removing and Reinstalling a Housing Assembly

To remove and reinstall a housing assembly, refer to Figure 55 and proceed as follows:

1. Remove the electronics module per Steps 1 through 5 in “Replacing the Electronics Module” on page 67.
2. If your housing has an anti-rotation screw, remove the red lacquer from the screw recess. Turn the screw three full turns counterclockwise.
3. If your housing has a retention clip, remove the red lacquer from the screw recess. Remove the screw completely, and slide the clip off the housing. Save the clip and screw for future use,
4. Remove the housing by rotating it counterclockwise (when viewed from the top). Use caution to avoid damaging the sensor cable.
5. Inspect the sensor O-ring for damage. If the O-ring is damaged, replace it with the appropriate O-ring. (See parts list for your transmitter). Lubricate the O-ring with silicone lubricant (Foxboro Part Number 0048130 or equivalent). Verify that the O-ring is situated in the groove of the neck.

! WARNING

Failure to reuse or install the proper O-ring for a CSA labeled product violates ANSI / ISA 12.27.01.

6. Feed the sensor cable through the housing neck into the electronics compartment.

7. Screw the housing onto the sensor neck until it bottoms. Do not over tighten. Be careful not to damage the sensor cable or dislodge the neck O-ring.
8. If your housing has an anti-rotation screw, engage the screw until it touches the sensor neck and back it off 1/8th turn. It is important that the screw is not touching the sensor. Fill the screw recess with red lacquer (Foxboro Part Number X0180GS or equivalent). The housing can then be rotated up to one full turn counterclockwise for optimum access.
9. If your housing has a retention clip, insert the clip over the boss in the housing neck so that the hole in the clip is aligned with the hole in the boss. Install the screw but do not tighten. Rotate the housing up to one full turn counterclockwise for optimum access. Tighten the retention clip screw and fill the screw recess with red lacquer (Foxboro Part Number X0180GS or equivalent). The housing can still be rotated for optimum access.
10. Reinstall the electronics module per Steps 6 through 9 in “Replacing the Electronics Module” on page 67.

Replacing the Sensor Assembly

— CAUTION

The electronics module and sensor are **highly susceptible to damage from electrostatic discharge**. Therefore, the person performing this procedure should be earthed (grounded) via a conductive wrist strap (between 100 Ω minimum and 1 M Ω maximum).

To replace the sensor assembly, refer to Figure 56 and proceed as follows:

1. Remove the electronics module as described above.
2. Remove the housing as described above.
3. Remove the process covers from sensor by removing two hex head bolts.
4. Replace gaskets in process covers.
5. Install process covers and housing on new sensor. Torque cover bolts to 100 N·m (75 lb·ft) in several even increments. Torque values are 68 N·m (50 lb·ft) when 316 ss bolts are specified; 75 N·m (55 lb·ft) when B7M bolts are specified.
6. Reinstall the electronics module.
7. Pressure test the sensor and process cover assembly by applying a hydrostatic pressure of 150% of the maximum static and overrange pressure rating (see page 3) to both sides of the process cover/sensor assembly simultaneously through the process connections. Hold pressure for one minute. There should be no leakage of the test fluid through the gaskets. If leakage occurs, retighten the cover bolts per Step 5 (or replace the gaskets) and retest.

— CAUTION

Perform hydrostatic test with a liquid and follow proper hydrostatic test procedures.

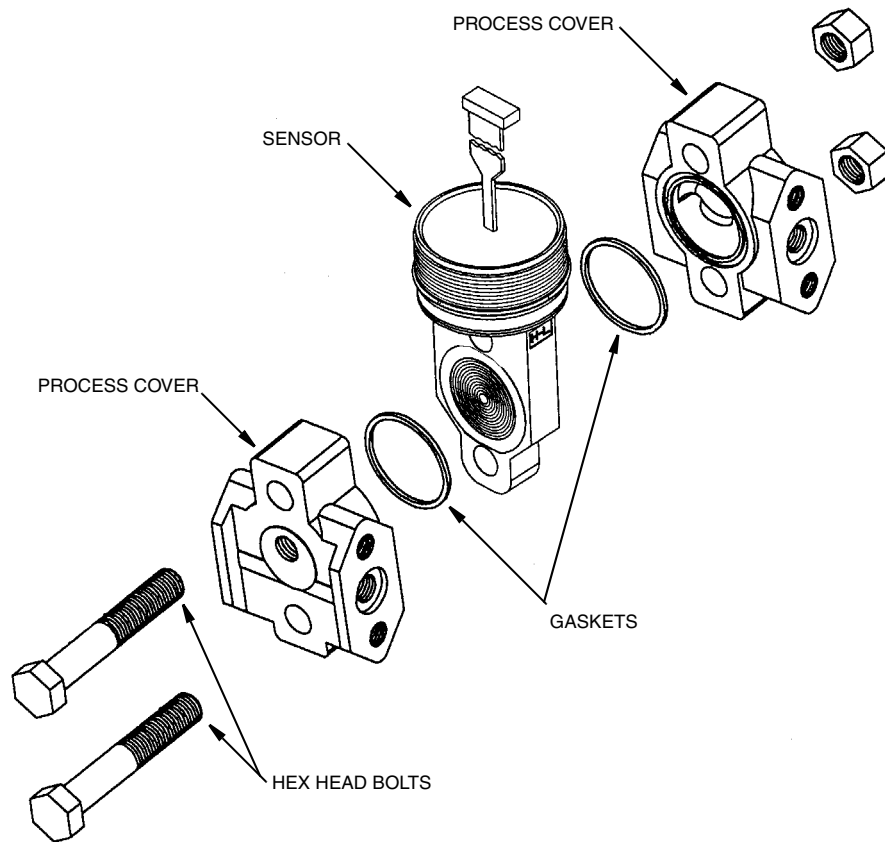


Figure 56. Replacing the Sensor Assembly

Replacing the Terminal Block Assembly

— NOTE

This procedure also requires replacing the power cable.

1. Perform Steps 1 through 4 in “Replacing the Electronics Module” on page 67.
2. Remove the Field Terminals compartment cover by rotating it counterclockwise. Screw in the cover lock if applicable.
3. Disconnect all exposed wires from the terminal block.
4. Remove the four socket head screws securing the terminal block.
5. Disconnect the power and RTD cables at the electronic module end.
6. Carefully remove the terminal block and attached cables. Also remove the terminal block gasket
7. Disconnect the RTD cable from the old terminal block and connect it to the new terminal block. Also connect the new power cable to the new terminal block.
8. Feed the power and RTD cables (which are connected to the new terminal block) through the housing and connect them to the electronics module.

9. Install the new terminal block gasket and terminal block with the four screws removed in Step 4. Tighten the screws to 0.67 N·m (6 in·lb) in several even increments.
10. Connect the wires disconnected in Step 3.
11. Reinstall the electronics module in the housing using care not to pinch the cables between the module and the housing.

— **NOTE** —

This can be done by turning the module 180° in the clockwise direction before trying to seat the module.

12. Tighten the two screws that secure the module to the housing.
13. Reinstall the digital display (if applicable) as follows: Connect the cable from the digital display to the electronics module. Ensure that the O-ring is fully seated in the display housing. Then, holding the digital display by the tabs at the sides of the display, insert it into the housing. Secure the display to the housing by aligning the tabs on the sides of the assembly and rotating it about 10° in a clockwise direction.
14. Reinstall the covers onto the housing by rotating them clockwise to seat the O-ring into the housing and then continue to hand tighten until the covers contacts the housing metal-to-metal. If cover locks are present, lock the covers per the procedure described in “Cover Locks” on page 22.
15. Turn on transmitter power source.

Adding the Optional Display

To add the optional display, refer to Figure 55 and proceed as follows:

1. Turn off the transmitter power source.
2. Remove the electronics compartment cover by rotating it counterclockwise. Screw in the cover lock if applicable.
3. Plug the display into the receptacle at the top of the electronics assembly.
4. Ensure that the O-ring is seated in its groove in the display housing. Then insert the display into the electronics compartment by grasping the two tabs on the display and rotating it about 10° in a clockwise direction.
5. Install the new cover (with a window) onto the housing by rotating it clockwise until the O-ring contacts the housing; then continue to hand tighten until the cover contacts the housing metal-to-metal. If cover locks are present, lock the cover per the procedure described in “Cover Locks” on page 22.
6. Turn on the transmitter power source.

Rotating Process Covers for Venting

As received, the IDP10 Transmitter provides sensor cavity draining without the need for side drain connections, regardless of whether the transmitter is mounted vertically or horizontally. Sensor cavity venting is provided by mounting horizontally or with the optional vent screw (-V).

However, if you did not specify this option, you can still achieve venting (instead of draining) with vertical mounting by rotating the process covers. See Figure 57.

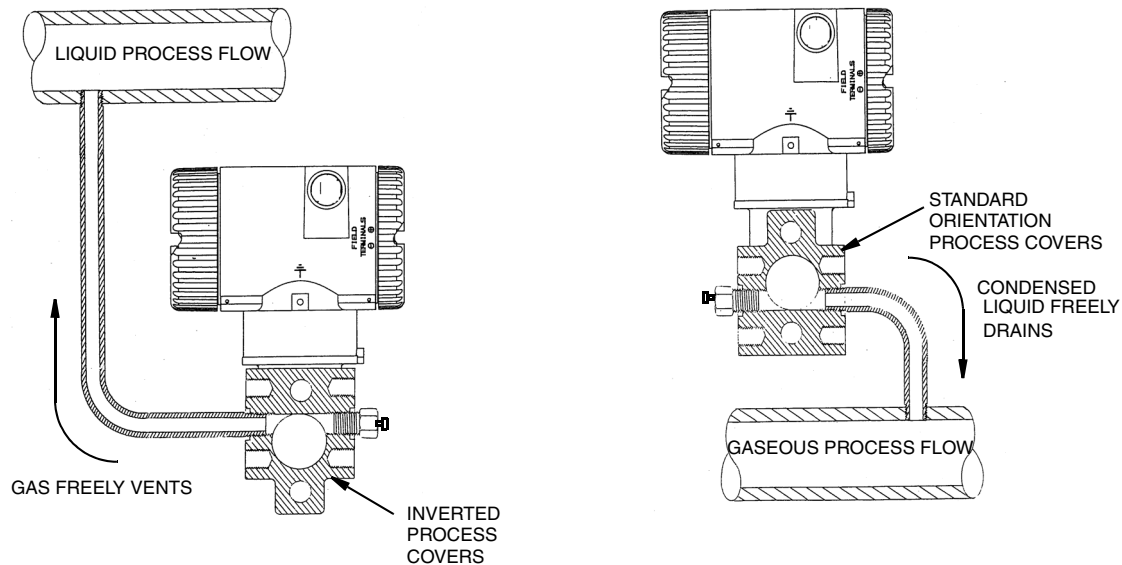


Figure 57. Sensor Cavity Venting and Draining

To rotate the process covers, refer to Figure 56 and proceed as follows:

1. Remove the process covers from the sensor by removing two hex head bolts.
2. Replace the gaskets in the process covers.
3. Rotate the process covers so that the longer tab is at the bottom.
4. Reinstall the process covers and bolts. Torque the cover bolts to 100 N·m (75 lb·ft) in several even increments. Torque values are 68 N·m (50 lb·ft) when 316 ss bolts are specified; 75 N·m (55 lb·ft) when B7M bolts are specified.
5. Pressure test the sensor and process cover assembly by applying a hydrostatic pressure of 150% of the maximum static and overrange pressure (see page 3) to both sides of the process cover/sensor assembly simultaneously through the process connections. Hold pressure for one minute. There should be no leakage of the test fluid through the gaskets. If leakage occurs, retighten the cover bolts per Step 4 or replace the gaskets and retest.

! CAUTION

Perform hydrostatic test with a liquid and follow proper hydrostatic test procedures.

Appendix A. Modbus Database

This appendix describes Modbus protocols used to communicate with the IMV25-M transmitter and the parameters that are assigned to Modbus registers.

The Modbus registers used are listed and described in two sections. First the Modbus registers are described in groups of related transmitter data, such as Process Variables or Transmitter and Sensor data, and secondly a complete sequential listing of all registers used is given.

Modbus Communication Overview

The implementation of Modbus in the IMV25-M Series transmitter is based on the document number PI-MBUS-300 Rev B, Gould Modbus Protocol Reference Guide.

Modbus Protocols

Modbus RTU is a serial protocol that can be used in point to point or multidrop serial networks.

Modbus/TCP is an extension of serial Modbus, which defines how Modbus messages are encoded within and transported over TCP/IP-based networks. The Modbus/TCP protocol uses a custom Modbus protocol layer on top of the TCP protocol. Its request and response messages are prefixed by six bytes. These six bytes consist of three fields: transaction ID field, protocol ID field and length field. The encapsulated Modbus message has exactly the same layout and meaning, from the function code to the end of the data portion, as other Modbus messages. The Modbus 'CRC-16' or 'LRC' check fields are not used in Modbus/TCP. The TCP/IP and link layer (e.g. Ethernet) checksum mechanisms instead are used to verify accurate delivery of the packet.

Modbus/UDP communication mode is similar to Modbus/TCP communication mode. It has the same message format as the Modbus/TCP. The only difference between them is one uses TCP protocol and another uses UDP protocol.

Modbus RTU in TCP message format is exactly same as that of the Modbus RTU protocol. The main difference is that Modbus RTU in TCP protocol communicates with a controller through the Internet. The Modbus RTU in TCP protocol does not include a six-byte header prefix, as with the Modbus/TCP, but does include the Modbus 'CRC-16' or 'LRC' check fields. The Modbus RTU in TCP message format supports Modbus RTU message format.

Modbus RTU in UDP communication mode is similar to Modbus RTU in TCP communication mode. It has the same message format as the RTU in TCP message. The only difference between them is one uses TCP protocol and another uses UDP protocol.

Modbus Function Codes

The following table lists the Modbus function codes or commands, supported by the IMV25-M transmitter.

Function Code	Description	Comments
03	Read Holding Registers	Read the contents of a register in 4xxxx register address range (Holding Registers).
04	Read Input Registers	Read the contents of a register in 3xxxx register address range (Input Registers).
06	Preset Single Holding Register	Writes data to a single register in the 4xxxx register address range.
16	Preset Multiple Registers	Writes data to several holding registers. The registers must be in a block continuous 4xxxx register addresses.

Modbus Station Addressing

The IMV25-M transmitters support standard or extended Modbus addressing.

- ◆ Standard addressing allows 247 stations and is compatible with standard Modbus devices.
- ◆ Extended addressing allows 65534 stations, with stations 1 to 254 compatible with standard Modbus devices.

— NOTE

Per Modbus standard, a maximum of 32 drops are allowed per physical layer segment.

Data Formats

The following table describes the data formats used for Modbus registers in the IMV25-M transmitter.

Data Type	Registers Required	Description
Integer	1	Unsigned integer in the range 0 to 65535.
Float	2	All floating-point numbers are in the IEEE 754 format. Numbers are made up of one sign bit (S), eight exponent bits (E), and twenty-three mantissa bits (M). A number consists of 4 bytes as shown below. Byte A Byte B Byte C Byte D SEEE EEEE EMMM MMMM MMMM MMMM MMMM MMMM Floating-point values are stored in two consecutive registers. Both registers must be read or written in the same Modbus command. Failure to do so may result in indeterminate values.

Data Type	Registers Required	Description
ASCII	1	Two characters are stored in each register. Valid values are any ASCII character. The first character is in the low order byte, the second in the high order byte. The string is terminated with a NULL (= 0) character if it is less than 8 characters. Set the first register to 0 to indicate a NULL (empty) string.

Write Protecting the Modbus Database

Write Protect Jumper

The transmitter can be write protected by installing the write-protect jumper. See *Figure 5* for the location of the write protection jumper.

- ◆ When the write-protect jumper is installed, registers 40001 to 40499 are read only.
- ◆ When the write-protect jumper is not installed, the read/write ability corresponds to the **Modbus Register Database** table.

Register Write Protection

The Flow Computer must log all changes to measurement parameters. When the flow computer is running the software write-protect is enabled. This prevents Modbus protocol commands and logic applications from writing the transmitter registers. When the software write-protect is enabled, registers 40001 to 40499 are read only via Modbus commands, Ladder Logic register access, and ISaGRAF register access. C programs can write to the registers in the normal fashion.

The software write-protect is disabled by default at reset.

Modbus Registers

This section of the manual describes some of the IMV25-M transmitter parameters that are assigned to Modbus registers. The registers described are divided into categories for ease of reference. See the *Modbus Register Database (40001 – 40500)* section for a complete listing of IMV25-M transmitter Modbus registers.

The registers defined may be read only or read and write registers. The Read/Write column in the tables indicates the register type.

- ◆ **Read Only** indicates the register is read only.
- ◆ **Read/Write** indicates the register may be read or written to.

Process Variables

Primary Variable Value

Register(s) 40401 – 40402 Read Only

These registers hold the primary variable (Differential Pressure [DP]) as a floating-point number in the specified floating-point format.

Secondary Variable Value

Register(s) 40403 - 40404 Read Only

These registers hold the secondary variable (Static Pressure [SP]) as a floating-point number in the specified floating-point format. The diagnostic bits indicate the validity of this register.

Tertiary Variable Value

Register(s) 40405 - 40406 Read Only

These registers hold the tertiary variable (Process Temperature [RTD]) as a floating-point number in the specified floating-point format.

Primary Variable Units

Register(s) 40060 Read/Write

This register holds a value representing the engineering units for the primary variable. The primary variable is differential pressure. The units may only be changed if the transmitter is in off-line mode. Refer to register 40206 for the transmitter mode state.

Value = Units		
2 = Pa	8 = atm	14 = torr
3 = kPa	9 = bar	15 = mH ₂ O
4 = MPa	10 = kg/cm ²	16 = cmH ₂ O
5 =psi	11 = g/cm ²	17 = mmH ₂ O
6 = inH ₂ O at 68 F	12 = cmHg	18 = inHg
7 = ftH ₂ O	13 = mmHg	19 = mbar

Secondary Variable Units

Register(s) 40061 Read/Write

This register holds a value representing the engineering units for the static pressure. Valid values are shown in the table. The units may only be changed if the transmitter is in off-line mode. Refer to register 40206 for the transmitter mode state.

Value = Units

2 = Pa	8 = atm	14 = torr
3 = kPa	9 = bar	15 = mH ₂ O
4 = MPa	10 = kg/cm ²	16 = cmH ₂ O
5 = psi	11 = g/cm ²	17 = mmH ₂ O
6 = inH ₂ O at 68 F	12 = cmHg	18 = inHg
7 = ftH ₂ O	13 = mmHg	19 = mbar

*Tertiary Variable Units***Register(s) 40062 Read/Write**

This register holds a value representing the engineering units for the process temperature. Valid values are shown in the table. The units may only be changed if the transmitter is in off-line mode. Refer to register 40206 for the transmitter mode state.

- 20 = degrees Celsius (°C)
- 21 = degrees Fahrenheit (°F)
- 22 = degrees Kelvin (K)
- 23 = degrees Rankine (R)

Transmitter and Sensor

*Manufacturer's Code***Register(s) 40001 Read Only**

This register holds a constant value of 4000.

*Type Code***Register(s) 40002 Read Only**

This register holds a value, type code, which indicates the model of the transmitter (IMV25-M).

*Software Revision Level***Register(s) 40003 Read Only**

This register holds the revision number of the 4000 Series transmitter firmware.

*Sensor Software Revision Level***Register(s) 40004 Read Only**

This register holds the revision number of the sensor firmware. This is read from the sensor.

Transmitter Manufacture Date

Register(s) 40007 Read Only

Register 40007 holds the manufacture date as bits in the format.

YYYYYYMMMMDDDDDD,

YYYYYY is the number of years since 1986. Add this number to 1986 to obtain the year of manufacture.

MMMM is the month of manufacture.

DDDDDD is the day of manufacture

Transmitter Core Number

Register(s) 40008 Read Only

Register 40008 holds the core number. This is a number set when the sensor core is manufactured.

Sensor Firmware Version

Register(s) 40009 Read Only

This register holds the sensor firmware version sensor in the format

MAJOR_VERSION * 100 + MINOR_VERSION. For example 1.19 would be displayed as 119 in register 40009.

Modbus Revision

Register(s) 40010 Read Only

This register holds the Modbus mapping and protocol revision. It is fixed at 1.

Sensor Type

Register(s) 40011 Read/Write

This register selects if the Static Pressure measures gage or absolute pressure.

A value of 1 means gage pressure. The gage pressure is calculated by measuring the absolute pressure and adding the contents of register 40399. The user must set the value in register 40399 for the gage pressure to be accurate.

A value of 0 means absolute pressure.

Tag Name (8 characters)

Register(s) 40032 – 40035 Read/Write

These registers hold the transmitter tag name. The tag name can be up to 8 characters. Two characters are stored in each register. Valid values are any ASCII character. See the table in the *Display Module ASCII Characters* section for useable ASCII characters.

Description (16 characters)

Register(s) 40036 – 40043 Read/Write

These registers hold the transmitter description. The description can be up to 16 characters. Two characters are stored in each register. Valid values are any ASCII character. See the table in the *Display Module ASCII Characters* section for useable ASCII characters.

Message (32 characters)

Register(s) 40044 – 40059 Read/Write

These registers hold the transmitter message. The message can be up to 32 characters. Two characters are stored in each register. Valid values are any ASCII character. See the table in the *Display Module ASCII Characters* section for useable ASCII characters.

Communications

Baud Rate

Register(s) 40015 Read/Write

This register holds the serial port baud rate for the IMV25-M transmitter. When this register changes it will update the serial port settings. The valid values are shown below.

Value = Units

5 = 1200

6 = 2400

7 = 4800

8 = 9600 (default)

9 = 19200

10 = 38400

Transmitter Address

Register(s) 40016 Read/Write

This register holds the transmitter Modbus address for the serial port.

Response Delay Time

Register(s) 40131 Read/Write

This register sets serial port response delay. The register specifies the delay from the normal response time. Valid values are 0 to 65535 milliseconds. The default value is 0 milliseconds.

Com1 Framing Errors

Register(s) 40145 Read Only

This register holds the number of framing errors on COM1. This register is cleared when the controller is reset.

Com1 Parity Errors

Register(s) 40146 Read Only

This register holds the number of parity errors on com1. This register is cleared when the controller is reset.

Com1 Overrun Errors

Register(s) 40147 Read Only

This register holds the number of character-overrun errors on COM1. This register is cleared when the controller is reset.

Com1 Modbus Checksum Errors

Register(s) 40148 Read Only

This register holds the number of Modbus checksum errors on COM1. This register is cleared when the controller is reset.

Com1 Modbus Commands Received

Register(s) 40149 Read Only

This register holds the number of Modbus commands received on COM1. This register is cleared when the controller is reset.

COM1 Modbus Responses Sent

Register(s) 40150 Read Only

This register holds the number of Modbus responses sent on COM1. This register is cleared when the controller is reset.

Sensor Framing Errors

Register(s) 40157 Read Only

This register holds the number of framing errors on Sensor communication with the sensor electronics. This register is cleared when the controller is reset.

Sensor Parity Errors

Register(s) 40158 Read Only

This register holds the number of parity errors on Sensor communication with the sensor electronics. This register is cleared when the controller is reset.

Sensor Overrun Errors

Register(s) 40159 Read Only

This register holds the number of character-overrun errors on Sensor communication with the sensor electronics. This register is cleared when the controller is reset.

Sensor Checksum Errors

Register(s) 40160 Read Only

This register holds the number of checksum errors on Sensor communication with the sensor electronics. This register is cleared when the controller is reset.

Sensor Commands Sent

Register(s) 40161 Read Only

This register holds the number of Sensor commands sent to the sensor electronics. This register is cleared when the controller is reset.

Sensor Responses Received

Register(s) 40162 Read Only

This register holds the number of Sensor responses received from the sensor electronics. This register is cleared when the controller is reset.

LCD Display

Display Scan Interval

Register(s) 40126 Read/Write

This register controls the display scan interval. It will hold the value in seconds that each reading selected in the Display Control will remain on the display. Valid values will be integers between 2000 and 60000 ms.

! WARNING

Do not write to this register continuously. Excessively writing to this register will wear out the EEPROM and then the display will not function properly.

Display Control

Register(s) 40128 Read/Write

This register controls which items are displayed on the display. This register is a bit-mapped field. The following shows the effects of individual bits. When a bit is turned on the floating point value and associated text will be cycled through on the display.

Bit 00 = Display DP in transmitter units

Bit 01 = Display SP in transmitter units

Bit 02 = Display PT in transmitter units

Bit 03 = Display Communication settings (baud rate and station number)

Bit 04 = Display 1st user defined data set

Bit 05 = Display 2nd user defined data set

Bit 06 = Display 3rd user defined data set

Bit 07 = Display 4th user defined data set

Bit 08 = Display 5th user defined data set

Bit 09 = Display 6th user defined data set
 Bit 10 = Display 7th user defined data set
 Bit 11 = Display 8th user defined data set
 Bit 12 = Display 9th user defined data set
 Bit 13 = Display 10th user defined data set
 Bit 14 = Display 11th user defined data set
 Bit 15 = Display 12th user defined data set

! WARNING

Do not write to this register continuously. Excessively writing to this register will wear out the EEPROM and then the display will not function properly.

1st User Defined Display Value

Register(s) 40207 – 40208 Read/Write

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 1st user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.

1st User Defined Display Text

Register(s) 40209 – 40215 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 1st user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

2nd User Defined Display Value

Register(s) 40216 – 40217 Read/Write

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 2nd user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.

2nd User Defined Display Text

Register(s) 40218 – 40224 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 2nd user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

3rd User Defined Display Value

Register(s) 40225 – 40226 Read/Write

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 3rd user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ---- (5 dashes) on the display. By default the display will show 5 dashes.

3rd User Defined Display Text

Register(s) 40227 – 40233 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 3rd user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

4th User Defined Display Value

Register(s) 40234 – 40235 Read/Write

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 4th user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ---- (5 dashes) on the display. By default the display will show 5 dashes.

4th User Defined Display Text

Register(s) 40236 – 40242 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 4th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

5th User Defined Display Value

Register(s) 40243 – 40244 Read/Write

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 5th user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ---- (5 dashes) on the display. By default the display will show 5 dashes.

5th User Defined Display Text

Register(s) 40245 – 40251 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 5th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

6th User Defined Display Value

Register(s) 40252 – 40253 Read/Write

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 6th user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.

6th User Defined Display Text

Register(s) 40254 – 40260 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 6th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

7th User Defined Display Value

Register(s) 40261 – 40262 Read/Write

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 7th user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.

7th User Defined Display Text

Register(s) 40263 – 40269 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 7th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

8th User Defined Display Value

Register(s) 40270 – 40271 Read/Write.....

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 8th user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ---- (5 dashes) on the display. By default the display will show 5 dashes.

8th User Defined Display Text

Register(s) 40272 – 40278 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 8th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

9th User Defined Display Value

Register(s) 40279 – 40280 Read/Write

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 9th user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ---- (5 dashes) on the display. By default the display will show 5 dashes.

9th User Defined Display Text

Register(s) 40281 – 40287 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 9th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

10th User Defined Display Value

Register(s) 40288 – 40289 Read/Write

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 10th user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ---- (5 dashes) on the display. By default the display will show 5 dashes.

10th User Defined Display Text

Register(s) 40290 – 40296 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 10th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

11th User Defined Display Value

Register(s) 40297 – 40298 Read/Write

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 11th user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.

11th User Defined Display Text

Register(s) 40299 – 40305 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 11th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

12th User Defined Display Value

Register(s) 40306 – 40307 Read/Write

These registers hold the floating-point value that will be included in the display cycle if the bit to display the 12th user defined data set is turned on in the Display Control register. Only values between –9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.

12th User Defined Display Text

Register(s) 40308 – 40314 Read/Write

These registers hold the text that will be included in the display cycle if the bit to display the 12th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The **Display Module ASCII Characters** table below lists the displayable characters.

On a power cycle these registers are reset to be all spaces.

Display Valid Time

Register(s) 40315 Read/Write

This register holds the number of minutes that display data will be valid for. Once this limit has been exceeded instead of displaying the normal user defined text line 1 will appear as dashes and line 2 will read READING UNAVAIL.

The range of valid values is 0 to 65535. A value of 0 means the user-defined text will always be displayed. Writing to the user defined display registers resets this timeout.

Diagnostics

Diagnostic Bits – Operating Limits

Register(s) 40407 Read Only

This register holds a bit-mapped value. The individual bits correspond to these conditions.

- Bit 15 = Calibration flag (see register 40206)
- Bit 14 = N/A
- Bit 13 = Input(s) out of range or operating limits
- Bit 12 = Primary signal above Upper Range Limit (URL) +10%
- Bit 11 = Primary signal above Upper Range Limit (URL)
- Bit 10 = Primary signal above Upper Operating Limit (URV)
- Bit 09 = Primary signal below Lower Operating Limit (LRV)
- Bit 08 = Primary signal below Lower Range Limit (LRL)
- Bit 07 = Primary signal below Lower Range Limit (LRL) – 10%
- Bit 06 = Secondary signal above Upper Range Limit (URL) +10%
- Bit 05 = Secondary signal above Upper Range Limit (URL)
- Bit 04 = Secondary signal above Upper Operating Limit (URV)
- Bit 03 = Secondary signal below Lower Operating Limit (LRV)
- Bit 02 = Secondary signal below Lower Range Limit (LRL)
- Bit 01 = Secondary signal below Lower Range Limit (LRL) – 10%
- Bit 00 = N/A

Diagnostic Bits – Range Limits

Register(s) 40408 Read Only

This register holds a bit-mapped value. The individual bits correspond to these conditions.

- Bit 15 = N/A
- Bit 14 = Tertiary signal above Upper Range Limit (URL) +10%
- Bit 13 = Tertiary signal above Upper Range Limit (URL)
- Bit 12 = Tertiary signal above Upper Operating Limit (URV)
- Bit 11 = Tertiary signal below Lower Operating Limit (LRV)
- Bit 10 = Tertiary signal below Lower Range Limit (LRL)
- Bit 09 = Tertiary signal below Lower Range Limit (LRL) – 10%
- Bit 08 = N/A
- Bit 07 = Primary variable is bad
- Bit 06 = Secondary variable is bad

Bit 05 = Tertiary variable is bad
 Bit 04 = Reserved
 Bit 03 = Reserved
 Bit 02 = Reserved
 Bit 01 = Reserved
 Bit 00 = Off-line Flag (see register 40206)

Diagnostic Bits – Sensor and Hardware Protect

Register(s) 40409 Read Only

This register holds a bit-mapped value. The individual bits correspond to these conditions.

Bit 15 = Sensor module is not updating
 Bit 14 = reserved
 Bit 13 = Sensor microprocessor is not responding
 Bit 12 = reserved
 Bit 11 = reserved
 Bit 10 = reserved
 Bit 09 = reserved
 Bit 08 = reserved
 Bit 07 = reserved
 Bit 06 = reserved
 Bit 05 = reserved
 Bit 04 = reserved
 Bit 03 = reserved
 Bit 02 = reserved
 Bit 01 = Hardware write protect status
 Bit 00 = reserved

Modbus Register Database (40001 – 40500)

The table of Modbus registers in this section of the manual describes the 4000 Series transmitter parameters that are assigned to Modbus registers. The registers defined may be read only or read and write registers. The Read/Write column in the tables indicates the register type.

- ◆ **Read** indicates the register is read only.
- ◆ **Read/Write** indicates the register may be read or written to.

The Type column describes the format of the Modbus register.

- ◆ **Integer** is an unsigned integer in the range 0 to 65535.
- ◆ **Float** is a floating-point number in the IEEE 754 format. Numbers are made up of one sign bit (S), eight exponent bits (E), and twenty-three mantissa bits (M). A number consists of 4 bytes as shown below.

Byte A	Byte B	Byte C	Byte D
SEEE	EEEE	EMMM	MMMM

Floating-point values are stored in two consecutive registers. Both registers must be read or written in the same Modbus command. Failure to do so may result in indeterminate values.

ASCII is two characters are stored in each register. Valid values are any ASCII character. The first character is in the low order byte, the second in the high order byte.

The string is terminated with a NULL (= 0) character if it is less than 8 characters. Set the first register to 0 to indicate a NULL (empty) string.

Primary Register	Read/Write	Read Only Register	Type	Parameter
40001	Read		Integer	Manufacturer's Code This register holds a constant value of 02035. This indicates the transmitter is manufactured by Foxboro.
40002	Read		Integer	Type Code This register holds a value, type code, which indicates the model of the transmitter. Type Code 25 = Model IMT25-M
40003	Read		Integer	Software Revision Level This register holds the revision number of the 4000 Series transmitter firmware.
40004	Read		Integer	Sensor Software Revision Level This register holds the revision number of the sensor firmware. This is read from the sensor.
40005 - 40006				Reserved
40007	Read		Integer	Transmitter Manufacture Date Register 40007 holds the manufacture date as bits in the format: YYYYYYY MMMM DDDDD YYYYYYY is the number of years since 1986. Add this number to 1986 to obtain the year of manufacture. MMMM is the month of manufacture. DDDDD is the day of manufacture.
40008	Read		Integer	Transmitter Core Number This is a number set when the sensor core is manufactured.

Primary Register	Read/Write	Read Only Register	Type	Parameter
40009	Read		Integer	Sensor Firmware Version This register holds the sensor firmware version sensor in the format MAJOR_VERSION * 100 + MINOR_VERSION. For example 1.19 would be displayed as 119 in register 40009.
40010	Read		Integer	Modbus Revision This register holds the Modbus mapping and protocol revision. It is fixed at 1.
40011	Read/Write		Integer	Sensor Type This register selects if the Static Pressure measures gage or absolute pressure. The sensor type may only be changed if the transmitter is in off-line mode. Refer to register 40206 for the transmitter mode state. <ul style="list-style-type: none"> • A value of 1 means gage pressure. The gage pressure is calculated by measuring the absolute pressure and adding the contents of register 40399. The user must set the value in register 40399 for the gage pressure to be accurate. • A value of 0 means absolute pressure.
40012 - 40014				Reserved
40015	Read/Write		Integer	Baud rate This register holds the serial port baud rate for the transmitter. When this register changes it will update the serial port settings. The valid values are shown below. 5 = 1200 6 = 2400 7 = 4800 8 = 9600 (default) 9 = 19200 10 = 38400
40016	Read/Write		Integer	Transmitter Address This register holds the transmitter Modbus address for the serial port.
40018 - 40031				Reserved

Primary Register	Read/Write	Read Only Register	Type	Parameter
40032 - 40035	Read/Write		ASCII	Tag Name (8 characters) These registers hold the transmitter tag name. The tag name can be up to 8 characters. Two characters are stored in each register. Valid values are any ASCII character.
40036 - 40043	Read/Write		ASCII	Description (16 characters) These registers hold the transmitter description. The description can be up to 16 characters. Two characters are stored in each register. Valid values are any ASCII character.
40044 - 40059	Read/Write		ASCII	Message (32 characters) These registers hold the transmitter message. The message can be up to 32 characters. Two characters are stored in each register. Valid values are any ASCII character.
40060	Read/Write		Integer	Primary Variable Units This register holds a value representing the engineering units for the primary variable. The primary variable is differential pressure. The units may only be changed if the transmitter is in off-line mode. Refer to register 40206 for the transmitter mode state. 2 = Pascals (Pa) 3 = kiloPascal (kPa) 4 = megaPascals (MPa) 5 = pounds per square inch (psi) 6 = inches of water at 68 F 7 = ftH ₂ O 8 = atm 9 = bar 10 = kg/cm ² 11 = g/cm ² 12 = cmHg 13 = mmHg 14 = torr 15 = mH ₂ O 16 = cmH ₂ O 17 = mmH ₂ O 18 = inHg 19 = mbar

Primary Register	Read/Write	Read Only Register	Type	Parameter
40061	Read/Write		Integer	<p>Secondary Variable Units This register holds a value representing the engineering units for the static pressure. Valid values are shown in the table. The units may only be changed if the transmitter is in off-line mode. Refer to register 40206 for the transmitter mode state.</p> <p>Value Units 2 = Pascal (Pa) 3 = kiloPascal (kPa) 4 = megaPascal (MPa) 5 = pounds per square inch (psi) 6 = inches of water at 68 F 7 = ftH2O 8 = atm 9 = bar 10 = kg/cm2 11 = g/cm2 12 = cmHg 13 = mmHg 14 = torr 15 = mH2O 16 = cmH2O 17 = mmH2O 18 = inHg 19 = mbar</p>
40062	Read/Write		Integer	<p>Tertiary Variable Units This register holds a value representing the engineering units for the process temperature. Valid values are shown in the table. The units may only be changed if the transmitter is in off-line mode. Refer to register 40206 for the transmitter mode state.</p> <p>20 = degrees Celsius (°C) 21 = degrees Fahrenheit (°F) 22 = degrees Kelvin (K) 23 = degrees Rankine (R)</p>
40063 – 40125				Reserved

Primary Register	Read/Write	Read Only Register	Type	Parameter
40126	Read/Write		Integer	<p>Display Scan Interval This register controls the display scan interval. It will hold the value in seconds that each reading selected in the Display Control will remain on the display. Valid values will be integers between 2000 and 60000 ms.</p> <p>Warning: Do not write to this register continuously. Excessively writing to this register will wear out the EEPROM and then the display will not function properly.</p>
40127				Reserved
40128	Read/Write		Bit field	<p>Display Control This register controls which items are displayed on the display. This register is a bit-mapped field. The following shows the effects of individual bits. When a bit is turned on the floating point value and associated text will be cycled through on the display.</p> <p>Bit 00 = Display DP in transmitter units Bit 01 = Display SP in transmitter units Bit 02 = Display PT in transmitter units Bit 03 = Display Communication settings (baud rate and station number) Bit 04 = Display 1st user defined data set Bit 05 = Display 2nd user defined data set Bit 06 = Display 3rd user defined data set Bit 07 = Display 4th user defined data set Bit 08 = Display 5th user defined data set Bit 09 = Display 6th user defined data set Bit 10 = Display 7th user defined data set Bit 11 = Display 8th user defined data set Bit 12 = Display 9th user defined data set Bit 13 = Display 10th user defined data set Bit 14 = Display 11th user defined data set Bit 15 = Display 12th user defined data set</p> <p>Warning Do not write to this register continuously. Excessively writing to this register will wear out the EEPROM and then the display will not function properly.</p>
40129 – 40130				Reserved

Primary Register	Read/Write	Read Only Register	Type	Parameter
40131	Read/Write	30131	Integer	Response Delay Time This register sets serial port response delay. The register specifies the delay from the normal response time. Valid values are 0 to 65535 milliseconds. The default value is 0 milliseconds.
40132	Read/Write		Integer	Floating Point Format This register is included for 3095FB compatibility only. The floating-point format is fixed. This register specifies the byte order of floating-point registers. All floating-point numbers are in the IEEE 754 format. Numbers are made up of one sign bit (S), eight exponent bits (E), and twenty-three mantissa bits (M). A number consists of 4 bytes as shown below. <div style="text-align: center;"> Byte A Byte B Byte C Byte D SEEE EEEE EMMM MMMM MMMM MMMM MMMM MMMM The only valid value is 0. The register will always return 0 when read. 0 = A B C D (default, RealFLO format) 1 = C D A B (not available) 2 = D C B A (not available) 3 = B A D C (not available) </div>
40133 - 40144				Reserved
40145	Read		Integer	Com1 Framing Errors This register holds the number of framing errors on com1. This register is cleared when the controller is reset.
40146	Read		Integer	Com1 Parity Errors This register holds the number of parity errors on com1. This register is cleared when the controller is reset.
40147	Read		Integer	Com1 Overrun Errors This register holds the number of character-overrun errors on com1. This register is cleared when the controller is reset.
40148	Read		Integer	Com1 Modbus Checksum Errors This register holds the number of Modbus checksum errors on com1. This register is cleared when the controller is reset.
40149	Read		Integer	Com1 Modbus Commands Received This register holds the number of Modbus commands received on com1. This register is cleared when the controller is reset.

Primary Register	Read/Write	Read Only Register	Type	Parameter
40150	Read		Integer	Com1 Modbus Responses Sent This register holds the number of Modbus responses sent on com1. This register is cleared when the controller is reset.
40151				Reserved
40152				Reserved
40153				Reserved
40157	Read		Integer	Sensor Framing Errors This register holds the number of framing errors on Sensor communication with the sensor electronics. This register is cleared when the controller is reset.
40158	Read		Integer	Sensor Parity Errors This register holds the number of parity errors on Sensor communication with the sensor electronics. This register is cleared when the controller is reset.
40159	Read		Integer	Sensor Overrun Errors This register holds the number of character-overrun errors on Sensor communication with the sensor electronics. This register is cleared when the controller is reset.
40160	Read		Integer	Sensor Checksum Errors This register holds the number of checksum errors on Sensor communication with the sensor electronics. This register is cleared when the controller is reset.
40161	Read		Integer	Sensor Commands Sent This register holds the number of Sensor commands sent to the sensor electronics. This register is cleared when the controller is reset.
40162	Read		Integer	Sensor Responses Received This register holds the number of Sensor responses received from the sensor electronics. This register is cleared when the controller is reset.
40164 – 40203				Reserved
40204	Read		Integer	Scaled Integer Method This register is included only for 3095 compatibility. Scaled integers are not supported. The only valid value is 0. The register will always return 0 when read.

Primary Register	Read/Write	Read Only Register	Type	Parameter
40205	Read/Write		Integer	<p>Reset to Default Parameters Writing to this register resets the transmitter to default parameters.</p> <p>Note: The transmitter calibration is reset to full scale with an offset of zero. The transmitter should be re-zeroed after this action. A sequence of three numbers must be written to the register to cause a reset. This protects accidental modification of the register from resetting the parameters. Use the following procedure to reset the parameters.</p> <ul style="list-style-type: none"> • Write the value 493 to the register. • Write the value 27254 to the register. • Write the value 6003 to the register. <p>To abort the sequence once it is started write any value other than the next value in the sequence. See the <i>IMT25-M Transmitter</i> Default Parameters table for default values. This register is set to 0 on every power cycle.</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40206	Read/Write		Integer	<p>Sensor Operating Mode</p> <p>This register controls the operating mode of the transmitter: online mode, offline mode, or calibrate mode.</p> <p>Note: Process values are updated only in the online mode. Ensure the system is in a safe state before switching to offline or calibrate mode.</p> <p>This register must be set to offline mode before changing engineering units or re-ranging the transmitter</p> <p>This register must be set to calibration mode before changing the span or the zero</p> <p>Changes are not applied until the unit is placed online. Valid values shown below. The default value is 0 (online).</p> <p>0 = online mode, normal operation 63 = offline mode, change engineering units or re-range transmitter 247 = calibrate mode, change zero or span</p> <p>The display will indicate OFFLINE when the transmitter is in the offline or calibrate modes. The display will operate normally in the online mode.</p> <p>Note: This register is cleared when the power is lost to the transmitter. The transmitter always starts in online mode.</p> <p>If power is lost while in either calibration or offline mode the transmitter may report incorrect measurement values. Should this occur put the transmitter in offline mode and write a valid DP Damping value. The transmitter will now need to be returned to online mode to complete the recovery.</p>
40207 – 40208	Read/Write		Float	<p>1st User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 1st user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40209 – 40215	Read/Write		ASCII	<p>1st User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 1st user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40216 – 40217	Read/Write		Float	<p>2nd User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 2nd user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>
40218 – 40224	Read/Write		ASCII	<p>2nd User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 2nd user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40225 – 40226	Read/Write		Float	<p>3rd User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 3rd user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40227 – 40233	Read/Write		ASCII	<p>3rd User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 3rd user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40234 – 40235	Read/Write		Float	<p>4th User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 4th user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>
40236 – 40242	Read/Write		ASCII	<p>4th User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 4th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40243 – 40244	Read/Write		Float	<p>5th User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 5th user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40245 – 40251	Read/Write		ASCII	<p>5th User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 5th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40252 – 40253	Read/Write		Float	<p>6th User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 6th user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>
40254 – 40260	Read/Write		ASCII	<p>6th User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 6th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40261 – 40262	Read/Write		Float	<p>7th User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 7th user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40263 – 40269	Read/Write		ASCII	<p>7th User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 7th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40270 – 40271	Read/Write		Float	<p>8th User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 8th user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>
40272 – 40278	Read/Write		ASCII	<p>8th User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 8th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40279 – 40280	Read/Write		Float	<p>9th User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 9th user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40281 – 40287	Read/Write		ASCII	<p>9th User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 9th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40288 – 40289	Read/Write		Float	<p>10th User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 10th user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>
40290 – 40296	Read/Write		ASCII	<p>10th User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 10th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40297 – 40298	Read/Write		Float	<p>11th User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 11th user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40299 – 40305	Read/Write		ASCII	<p>11th User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 11th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40306 – 40307	Read/Write		Float	<p>12th User Defined Display Value</p> <p>These registers hold the floating-point value that will be included in the display cycle if the bit to display the 12th user defined data set is turned on in the Display Control register. Only values between -9999 and 99999 can be displayed. Any value outside of that range will be replaced by ----- (5 dashes) on the display. By default the display will show 5 dashes.</p>
40308 – 40314	Read/Write		ASCII	<p>12th User Defined Display Text</p> <p>These registers hold the text that will be included in the display cycle if the bit to display the 12th user defined data set is turned on in the Display Control register. Each register holds 2 ASCII characters. The first 7 ASCII characters will be displayed on line 2 of the display, followed by the second 7 ASCII characters. The Display Module ASCII Characters table below lists the displayable characters. On a power cycle these registers are reset to be all spaces.</p>
40315	Read/Write		Integer	<p>Display Valid Time</p> <p>This register holds the number of minutes that display data will be valid for. Once this limit has been exceeded instead of displaying the normal user defined text line 1 will appear as dashes and line 2 will read READING UNAVAIL. The range of valid values is 0 to 65535. A value of 0 means the user-defined text will always be displayed. Writing to the user defined display registers resets this timeout.</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40316	Read/Write		Integer	Lockout Register This register can be used to prevent writing to other database registers. When a non-zero value is entered in this register all other registers become read-only. When a value of 0 is entered in this register all registers revert to their normal read/write status. There is also a hardware write protect jumper. Refer to the Write Protect Jumper section for more details. This register is set to 0 (disabled) at power-up.
40317 – 40396				Reserved
40397	Read		Integer	Input Voltage This register holds the input voltage in mV. This register is read-only.
40399 - 40400	Read/Write		Float	Atmospheric Pressure These registers hold the user-specified atmospheric pressure as a floating-point number in the specified floating-point format. This value is used when the sensor type is set to gage using register 40011. This value is ignored if the sensor type is set to absolute. The value in this register must be in the same units as the static pressure. The transmitter must be in the offline mode to change this register. No change will be made if the transmitter mode is not correct. The transmitter must be returned to online mode after the atmospheric pressure reference is changed.
40401 - 40402	Read		Float	Primary Variable Value These registers hold the primary variable as a floating-point number in the specified floating-point format.
40403 - 40404	Read		Float	Secondary Variable Value These registers hold the secondary variable as a floating-point number in the specified floating-point format. The diagnostic bits indicate the validity of this register.
40405 - 40406	Read		Float	Tertiary Variable Value These registers hold the tertiary variable as a floating-point number in the specified floating-point format.

Primary Register	Read/Write	Read Only Register	Type	Parameter
40407	Read	30119 30407	Integer	<p>Diagnostic Bits</p> <p>This register holds a bit-mapped value. The individual bits correspond to these conditions.</p> <p>Bit 15 = Calibration flag (see register 40206)</p> <p>Bit 14 = The Process Variables may not be valid.</p> <p>Bit 13 = Input(s) out of range or operating limits</p> <p>Bit 12 = Primary signal above Upper Range Limit (URL) +10%</p> <p>Bit 11 = Primary signal above Upper Range Limit (URL)</p> <p>Bit 10 = Primary signal above Upper Operating Limit (URV)</p> <p>Bit 09 = Primary signal below Lower Operating Limit (LRV)</p> <p>Bit 08 = Primary signal below Lower Range Limit (LRL)</p> <p>Bit 07 = Primary signal below Lower Range Limit (LRL) -10%</p> <p>Bit 06 = Secondary signal above Upper Range Limit (URL) +10%</p> <p>Bit 05 = Secondary signal above Upper Range Limit (URL)</p> <p>Bit 04 = Secondary signal above Upper Operating Limit (URV)</p> <p>Bit 03 = Secondary signal below Lower Operating Limit (LRV)</p> <p>Bit 02 = Secondary signal below Lower Range Limit (LRL)</p> <p>Bit 01 = Secondary signal below Lower Range Limit (LRL) -10%</p> <p>Bit 00 = N/A</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40408	Read	30120 30408	Integer	<p>Diagnostic Bits This register holds a bit-mapped value. The individual bits correspond to these conditions.</p> <ul style="list-style-type: none"> Bit 15 = N/A Bit 14 = Tertiary signal above Upper Range Limit (URL) +10% Bit 13 = Tertiary signal above Upper Range Limit (URL) Bit 12 = Tertiary signal above Upper Operating Limit (URV) Bit 11 = Tertiary signal below Lower Operating Limit (LRV) Bit 10 = Tertiary signal below Lower Range Limit (LRL) Bit 09 = Tertiary signal below Lower Range Limit (LRL) -10% Bit 08 = N/A Bit 07 = Primary variable is bad. Bit 06 = Secondary variable is bad Bit 05 = Tertiary variable is bad Bit 04 = Reserved Bit 03 = Reserved Bit 02 = Reserved Bit 01 = Reserved Bit 00 = Off-line Flag (see register 40206)
40409	Read	30121 30409	Integer	<p>Diagnostic Bits This register holds a bit-mapped value. The individual bits correspond to these conditions.</p> <ul style="list-style-type: none"> Bit 15 = Sensor module is not updating Bit 14 = reserved Bit 13 = Sensor microprocessor is not responding Bit 12 = reserved Bit 11 = reserved Bit 10 = reserved Bit 09 = reserved Bit 08 = reserved Bit 07 = reserved Bit 06 = reserved Bit 05 = reserved Bit 04 = reserved Bit 03 = reserved Bit 02 = reserved Bit 01 = Hardware write protect status Bit 00 = reserved

Primary Register	Read/Write	Read Only Register	Type	Parameter
40410	Read	30122 30410	Integer	Diagnostic Bits This register is reserved for future diagnostic bits. This register always contains 0.
40411	Read	30123 30411	Integer	Diagnostic Bits This register is reserved for future diagnostic bits. This register always contains 0.
40412	Read	30124 30412	Integer	Diagnostic Bits This register is reserved for future diagnostic bits. This register always contains 0.
40413 - 40414	Read		Float	Primary Variable Upper Range Limit These registers hold the primary variable upper Range Limit as a floating-point number in the specified floating-point format.
40415 - 40416	Read		Float	Primary Variable Lower Range Limit These registers hold the primary variable lower Range Limit as a floating-point number in the specified floating-point format.
40417 - 40418	Read/ Write	30417 - 30418	Float	Primary Variable Upper Operating Limit These registers hold the primary variable upper operating limit as a floating-point number in the specified floating-point format. The transmitter must be in the offline mode to change this register. No change will be made if the transmitter mode is not correct. The transmitter must be returned to online mode after the change has been made. The upper operating limit must be less than the upper range limit and greater than the lower operating limit.
40419 - 40420	Read/ Write	30419 - 30420	Float	Primary Variable Lower Operating Limit These registers hold the primary variable lower operating limit as a floating-point number in the specified floating-point format. The transmitter must be in the offline mode to change this register. No change will be made if the transmitter mode is not correct. The transmitter must be returned to online mode after the change has been made. The upper operating limit must be less than the upper range limit and greater than the lower operating limit.
40421 - 40422	Read		Float	Secondary Variable Upper Range Limit These registers hold the secondary variable upper Range Limit as a floating-point number in the specified floating-point format.

Primary Register	Read/Write	Read Only Register	Type	Parameter
40423 - 40424	Read		Float	Secondary Variable Lower Range Limit These registers hold the secondary variable lower Range Limit as a floating-point number in the specified floating-point format.
40425 - 40426	Read/Write	30425 - 30426	Float	Secondary Variable Upper Operating Limit These registers hold the secondary variable upper operating limit as a floating-point number in the specified floating-point format. The transmitter must be in the offline mode to change this register. No change will be made if the transmitter mode is not correct. The transmitter must be returned to online mode after the change has been made. The upper operating limit must be less than the upper range limit and greater than the lower operating limit.
40427 - 40428	Read/Write	30427 - 30428	Float	Secondary Variable Lower Operating Limit These registers hold the secondary variable lower operating limit as a floating-point number in the specified floating-point format. The transmitter must be in the offline mode to change this register. No change will be made if the transmitter mode is not correct. The transmitter must be returned to online mode after the change has been made. The upper operating limit must be less than the upper range limit and greater than the lower operating limit.
40429 - 40430	Read		Float	Tertiary Value Upper Range Limit These registers hold the tertiary value upper range limit as a floating-point number in the specified floating-point format.
40431 - 40432	Read		Float	Tertiary Value Lower Range Limit These registers hold the tertiary value upper range limit as a floating-point number in the specified floating-point format.

Primary Register	Read/Write	Read Only Register	Type	Parameter
40433 - 40434	Read/Write	30433 - 30434	Float	<p>Tertiary Value Upper Operating Limit</p> <p>These registers hold the tertiary value upper operating limit as a floating-point number in the specified floating-point format.</p> <p>The transmitter must be in the offline mode to change this register. No change will be made if the transmitter mode is not correct. The transmitter must be returned to online mode after the change has been made. The upper operating limit must be less than the upper range limit and greater than the lower operating limit.</p>
40435 - 40436	Read/Write	30435 - 30436	Float	<p>Tertiary Value Lower Operating Limit</p> <p>These registers hold the tertiary value lower operating limit as a floating-point number in the specified floating-point format.</p> <p>The transmitter must be in the offline mode to change this register. No change will be made if the transmitter mode is not correct. The transmitter must be returned to online mode after the change has been made. The upper operating limit must be less than the upper range limit and greater than the lower operating limit.</p>
40437 - 40438	Read/Write	30437 - 30438	Float	<p>Primary Variable Zero Calibration</p> <p>These registers are used to change the primary variable zero. The value is a floating-point number in the specified floating-point format.</p> <p>The transmitter must be in the calibrate mode to change this register. No change will be made if the transmitter mode is not correct. The transmitter must be returned to online mode when the change is complete.</p> <p>When this register is read, it returns the last value used for the zero calibration. The value in these registers do not change if the zero calibration fails.</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40439 - 40440	Read/Write	30439 - 30440	Float	<p>Primary Variable Span Calibration</p> <p>These registers are used to change the primary variable span. The value is a floating-point number in the specified floating-point format.</p> <p>The transmitter must be in the calibrate mode to change this register. No change will be made if the transmitter mode is not correct. The transmitter must be returned to online mode when the change is complete.</p> <p>When this register is read, it returns the last value used for the span calibration. The value in these registers do not change if the span calibration fails.</p>
40441 - 40442	Read/Write	30441- 30442	Float	<p>Primary Variable Damping</p> <p>These registers hold the primary variable damping as a floating-point number in the specified floating-point format.</p> <p>Valid values are 0.0 (damping off), 0.5, 1.0, 2.0, 4.0, 8.0, 16.0, and 32.0 seconds. The default value is 0 (damping off).</p> <p>The transmitter must be in the offline or calibrate mode to change this register. No change will be made if the transmitter mode is not correct.</p> <p>The transmitter must be returned to online mode when the change is complete.</p>
40443 - 40444	Read/Write	30443 - 30444	Float	<p>Secondary Variable Zero Calibration</p> <p>These registers are used to change the secondary variable zero. The value is a floating-point number in the specified floating-point format.</p> <p>The transmitter must be in the calibrate mode to change this register. No change will be made if the transmitter mode is not correct. The transmitter must be returned to online mode when the change is complete.</p> <p>When this register is read, it returns the last value used for the zero calibration. The value in these registers do not change if the zero calibration fails.</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40445 - 40446	Read/Write	30445 - 30446	Float	<p>Secondary Variable Span Calibration</p> <p>These registers are used to change the secondary variable span. The value is a floating-point number in the specified floating-point format.</p> <p>The transmitter must be in the calibrate mode to change this register. No change will be made if the transmitter mode is not correct. The transmitter must be returned to online mode when the change is complete.</p> <p>When this register is read, it returns the last value used for the span calibration. The value in these registers do not change if the span calibration fails.</p>
40447 - 40448	Read/Write	30447 - 30448	Float	<p>Secondary Variable Damping</p> <p>These registers hold the SP damping as a floating-point number in the specified floating-point format. Valid values are 0.0 (damping off), 0.5, 1.0, 2.0, 4.0, 8.0, 16.0, and 32.0 seconds. The default value is 0 (damping off).</p> <p>The transmitter must be in the offline or calibrate mode to change this register. No change will be made if the transmitter mode is not correct.</p> <p>The transmitter must be returned to online mode when the change is complete.</p>
40449 - 40450	Read/Write	30449 - 30450	Float	<p>Tertiary Variable Zero Calibration</p> <p>These registers are used to change the tertiary variable zero. The value is a floating-point number in the specified floating-point format.</p> <p>The transmitter must be in the calibrate mode to change this register. No change will be made if the transmitter mode is not correct.</p> <p>The transmitter must be returned to online mode when the change is complete.</p>
40451 - 40452	Read/Write	30451 - 30452	Float	<p>Tertiary Variable Span Calibration.</p> <p>These floating point registers are implemented for compatibility with other devices and do not actually provide a means to perform a span calibration of the tertiary variable.</p> <p>These registers accept any value written to them and return the same value when read.</p>

Primary Register	Read/Write	Read Only Register	Type	Parameter
40453 - 40454	Read/Write	30453 - 30454	Float	Tertiary Variable Damping. These floating point registers are implemented for compatibility with other devices and do not actually provide a means to change the tertiary damping value. These registers accept any value written to them and return the same value when read.
40473 - 40500			Float	Reserved

Transmitter Default Parameters

The IMT25-M transmitter is reset to default values when the correct sequence is written to register 40205. The following table shows the registers that are reset and their default values.

Register	Type	Value	Parameter
40060	Integer	psi (5)	Primary Variable Units.
40061	Integer	psia (5)	Static Pressure Units.
40062	Integer	degrees C (20)	Process Temperature Units.
40407	Integer	current conditions	Diagnostic Bits
40408	Integer	current conditions	Diagnostic Bits
40409	Integer	current conditions	Diagnostic Bits
40410	Integer	0	Diagnostic Bits
40411	Integer	0	Diagnostic Bits
40412	Integer	0	Diagnostic Bits
40417 - 40418	Float	factory maximum sensor limit	DP Upper Operating Limit
40419 - 40420	Float	0.0	DP Lower Operating Limit
40425 - 40426	Float	factory maximum sensor limit	SP Upper Operating Limit
40427 - 40428	Float	0.0	SP Lower Operating Limit
40433 - 40434	Float	factory maximum sensor limit	PT Upper Operating Limit
40435 - 40436	Float	factory minimum sensor limit	PT Lower Operating Limit
40437 - 40438	Float	0.0	DP Zero Calibration
40439 - 40440	Float	1.0	DP Span Calibration (factory default)
40441 - 40442	Float	0.0	DP Damping
40443 - 40444	Float	0.0	SP Zero Calibration
40445 - 40446	Float	1.0	SP Span Calibration (factory default)

Register	Type	Value	Parameter
40447 - 40448	Float	0.0	SP Damping
40449 - 40450	Float	0.0	PT Zero Calibration

Display Module ASCII Characters

The table below lists the useable ASCII characters for the Display Module. The User Defined Display Text registers use these characters.

Hex Value	Character	Hex Value	Character	Hex Value	Character
0x20	Space	0x48	H	0x62	b
0x25	%	0x49	I	0x63	c
0x2A	*	0x4A	J	0x64	d
0x2B	+	0x4B	K	0x65	e
0x2D	-	0x4C	L	0x66	f
0x2F	/	0x4D	M	0x67	g
0x30	0	0x4E	N	0x68	h
0x31	1	0x4F	O	0x69	i
0x32	2	0x50	P	0x6A	j
0x33	3	0x51	Q	0x6B	k
0x34	4	0x52	R	0x6C	l
0x35	5	0x53	S	0x6D	m
0x36	6	0x54	T	0x6F	n
0x37	7	0x55	U	0x70	o
0x38	8	0x56	V	0x71	p
0x39	9	0x57	W	0x72	q
0x3C	<	0x58	X	0x73	r
0x3D	=	0x59	Y	0x74	s
0x3E	>	0x5A	Z	0x75	t
0x41	A	0x5B	[0x76	u
0x42	B	0x5C	\	0x77	v
0x43	C	0x5D]	0x78	w
0x44	D	0x5E	^	0x79	x
0x45	E	0x5F	_	0x7A	y
0x46	F	0x60	'	0x70	z
0x47	G	0x61	a		

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