I/A Series® Intelligent Pressure Transmitters

IDP25 and IDP50 Differential Pressure with HART Communication

Installation, Operation, Calibration, Configuration, and Maintenance

FOXBORO

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1. Introduction

General Description

The IDP25-T and IDP50-T intelligent differential pressure transmitters measure the difference between two pressures applied to opposite sides of a silicon strain gauge microsensor within the sensor assembly. This microsensor converts differential pressure to a change in resistance. The resistance change is then converted to a 4 to 20 mA or digital signal proportional to differential pressure or to the square root of differential pressure. This measurement signal is transmitted to remote receivers over the same two wires that supply power to the transmitter electronics. These wires also carry two-way data signals between the transmitter and remote communication devices.

The transmitter allows direct analog connection to common receivers while still providing full Intelligent Transmitter Digital Communications using a HART Communicator.

The transmitter is often used for measuring fluid flow rates across a primary device such as an orifice plate, but can also be used for other types of differential pressure measurements such as liquid level, interface level, or density measurements. The IDP25-T can also be supplied with direct connected or remote pressure seals to isolate the measuring element from corrosive or viscous fluids.

For more detailed information on the principle of operation of the transmitter, refer to document TI 037-096, available from Invensys Process Systems.

Reference Documents

Table 1. Reference Documents

Document	Description
Dimensional Prints	
DP 020-342	Dimensional Print – PSFLT Pressure Seals
DP 020-343	Dimensional Print – PSFPS and PSFES Pressure Seals
DP 020-345	Dimensional Print – PSFAR Pressure Seals
DP 020-347	Dimensional Print – PSTAR Pressure Seals
DP 020-349	Dimensional Print – PSISR Pressure Seals
DP 020-351	Dimensional Print – PSSCR Pressure Seals
DP 020-353	Dimensional Print – PSSSR Pressure Seals
DP 020-354	Dimensional Print – PSSST Pressure Seals
DP 020-355	Dimensional Print – PSSCT Pressure Seals
DP 020-446	Dimensional Print – IDP10, IDP25, and IDP50 Differential Pressure Transmitters
Parts Lists	
PL 009-013	Parts List – IDP25 Differential Pressure Transmitter
PL 009-014	Parts List – IDP50 Differential Pressure Transmitter

Table 1. Reference Documents (Continued)

Document	Description
Instructions	
MI 020-328	Instruction – Bubble Type Installation for Liquid Level
MI 020-329	Instruction – High Accuracy Flow Measurement
MI 020-366	Instruction – I/A Series Intelligent Pressure Transmitters Operation, Configuration, and Calibration Using a HART Communicator
MI 020-369	Instruction – Pressure Seals
MI 020-427	Instruction – Intrinsic Safety Connection Diagrams and Nonincendive Circuits
MI 020-501	Instruction – PC50 Intelligent Field Device Tool (Installation and Parts List)
MI 020-520	Instruction – PC50 Intelligent Field Device Tool with Advanced DTM Library (Operation Using HART Protocol)
MI 022-138	Instruction – Bypass Manifolds - Installation and Maintenance
Technical Information	
TI 1-50a	Technical Information – Liquid Density Measurement
TI 001-051	Technical Information – Liquid Interface Measurement
TI 001-052	Technical Information – Liquid Level Measurement
TI 37-75b	Technical Information – Transmitter Material Selection Guide
TI 037-097	Technical Information – Process Sealing of I/A Series Pressure Transmitters for use in Class 1, Zone 0, 1, and 2 Hazardous Locations

Transmitter Identification

See Figure 1 for transmitter data plate contents. For a complete explanation of the Model Number code, see the parts list. The firmware version is identified on the top line of the display when **VIEW DB** (View Database) is selected in the top level structure. See Figure 2.

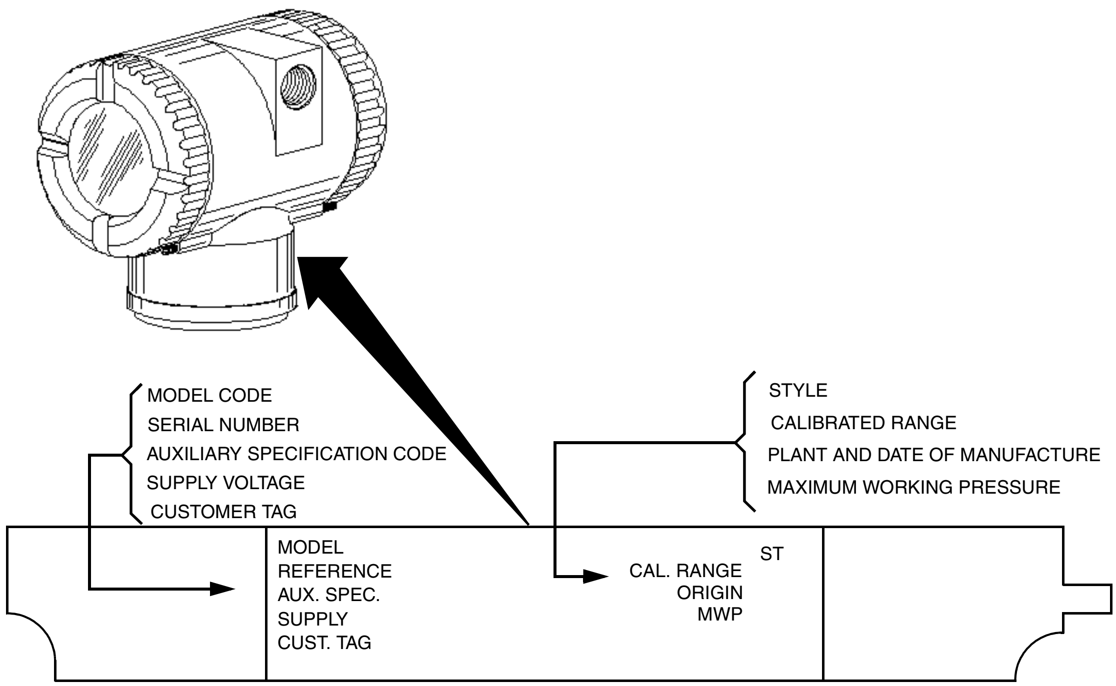


Figure 1. Transmitter Identification

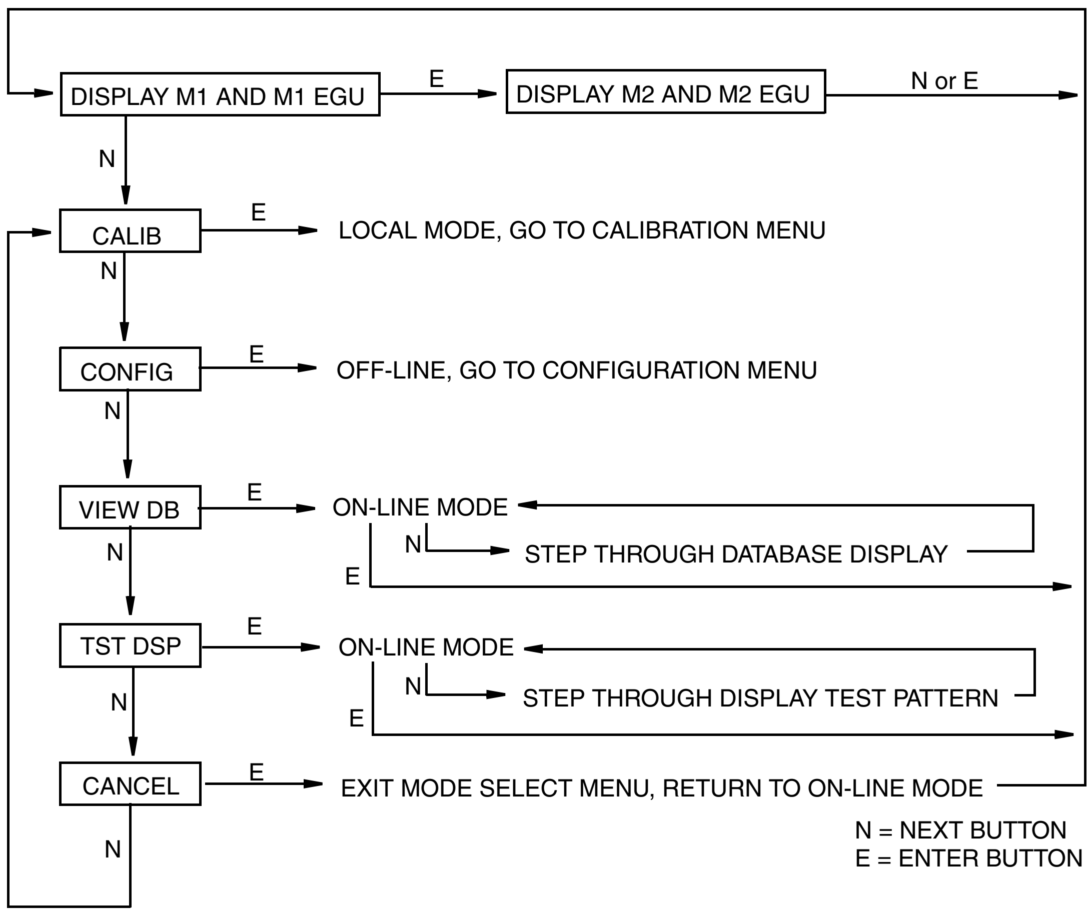


Figure 2. Top Level Structure Diagram

Standard Specifications

Operative Limits

Influence	Operative Limits
Sensor Body Temperature[(a)] Silicone Fill Fluid Fluorinert Fill Fluid pvdf Inserts	 -46 and +121°C (-50 and +250°F) -29 and +121°C (-20 and +250°F) -7 and +82°C (20 and 180°F)
Electronics Temperature With LCD Display	-40 and +85°C (-40 and +185°F) -40 and +85°C (-40 and +185°F)[(b)]
Relative Humidity	0 and 100%
Supply Voltage	11.5 and 42 V dc
Output Load[(c)]	0 and 1450 ohms
Mounting Position	No Limit
Vibration	6.3 mm (0.25 in) double amplitude from 5 to 15 Hz with aluminum housing and from 5 to 9 Hz with 316 ss housing. 0 to 30 m/s (0 to 3 “g”) from 15 to 500 Hz with aluminum housing and 0 to 10 m/s (0 to 1 “g”) from 9 to 500 Hz with 316 ss housing.

(a) Refer to MI 020-369 for temperature limits with pressure seals.

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

(c) 250 Ω minimum load is required for communication with a HART Communicator.

Span and Range Limits

Model	Span Limit Code	Span Limits ΔP	Range Limits[(a,b)] ΔP
IDP25	B	0.12 and 50 kPa (0.5 and 200 inH_20)	-50 and +50 kPa (-200 and +200 inH_20)
	C	0.625 and 250 kPa (2.5 and 1000 inH_20)	-250 and +250 kPa (-1000 and +1000 inH_20)
IDP50	B	0.63 and 50 kPa (2.5 and 200 inH_20)	-50 and +50 kPa (-200 and +200 inH_20)
	C	3.1 and 250 kPa (12.5 and 1000 inH_20)	-250 and +250 kPa (-1000 and +1000 inH_20)
	D[(c)]	0.17 and 14 MPa (25 and 2000 psi)	-0.21 and +14 MPa (-30 and +2000 psi)
	M[(d)]	0.017 and 1.4 MPa (25 and 2000 psi)	-0.21 and +1.4 MPa (-30 and +200 psi)

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

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

(c) Also applies to Option G2.

(d) Only applies to Option G2.

Maximum Static, Overrange, and Proof Pressure

Transmitter Configuration (Bolting Material)[c]	Maximum Static and Overrange Pressure Rating[a,e,f]		Proof Pressure Rating[b]	
	MPa	Psi	MPa	Psi
Standard (B7 steel), Option "-B2" (17-4 PH ss), Option "-D3" or "-D7"	25	3625	100	14500
Option "B1" (316 ss) or Option "-D5"	15	2175	60	8700
Option "B3" (B7M)	20	2900	70	11150
Option "-D1"	16	2320	64	9280
Option "-D2", "-D4", "-D6", or "-D8"[d]	10	1500	40	6000
Option "-D9" (17-4 PH ss)	40	5800	100	14500

(a) Either side can be at higher pressure during overrange.

(b) Meets ANSI/ISA Standard S82.03-1988.

(c) -D1 = DIN Single ended process cover with M10 bolting.
-D2 = DIN Double ended process cover with M10 bolting
-D3 = DIN Single ended process cover with 7/16 in bolting.
-D4 = DIN Double ended process cover with 7/16 in bolting.
-D5 = DIN Single ended process cover with 7/16 in 316 ss bolting.
-D6 = DIN Double ended process cover with 7/16 in 316 ss bolting.
-D7 = DIN Single ended process cover with 7/16 in 17-4 ss bolting.
-D8 = DIN Double ended process cover with 7/16 in 17-4 ss bolting
-D9 = DIN Single ended process cover with 7/16 in 17-4 ss bolting.

(d) Limited to operating temperatures ranging from 0 to 60 °C (32 to 140°F).

(e) When Structure Codes 78/79 are used (pvdf inserts in the Hi and Lo side process covers), the maximum overrange is 2.1 MPa (300 psi) and temperature limits are -7 and +82°C (20 and 180°F).

(f) Static pressure rating of 40 MPa (5800 psi) with Option Code -Y.

— NOTE

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

— ! CAUTION

1. Exceeding the maximum overrange pressure can cause damage to the transmitter degrading its performance.
2. The transmitter could be nonfunctional after application of the proof pressure.

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.

Sensor Fill Fluid

IDP25: Silicone Oil (DC 200) or Fluorinert (FC-43)

IDP50: Silicone Oil (DC 200)

Minimum Allowable Absolute Pressure vs. Process Temperature

With Silicone Fill Fluid:	At full vacuum: Up to 121°C (250°F)
With Fluorinert Fill Fluid:	Refer to Figure 3.

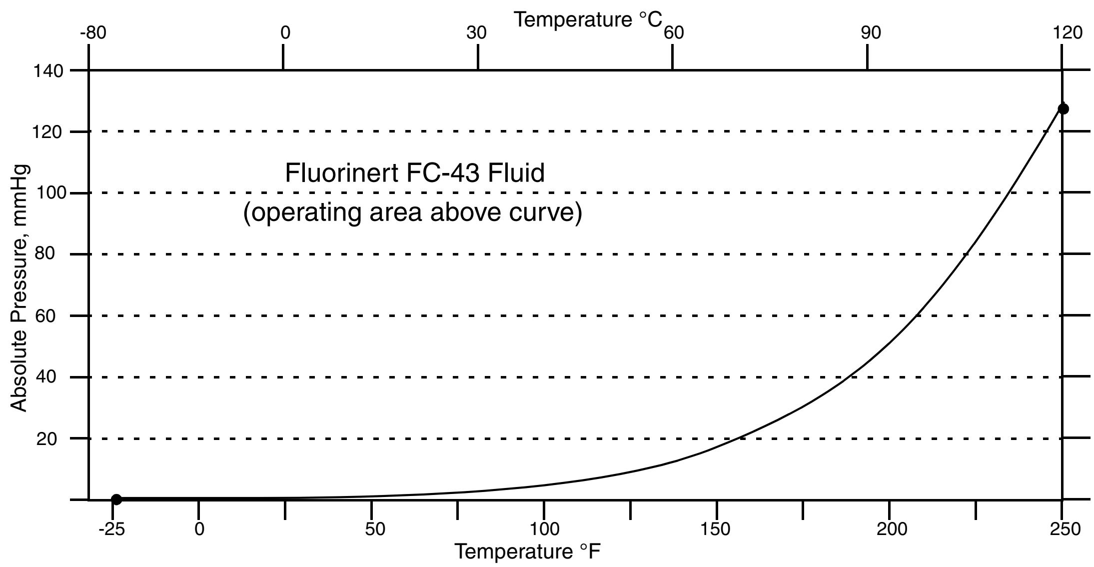


Figure 3. Minimum Allowable Absolute Pressure vs. Process Temperature with Fluorinert Fill Fluid

Mounting Position

The transmitter can be mounted in any orientation. It can be supported by the process piping. It can also be mounted directly to a vertical or horizontal pipe or surface mounted using an optional mounting bracket. The housing can be rotated up to one full turn to any desired position for access to adjustments, display, or conduit connections. See "Positioning the Housing" on page 27. The display (if present) can also be rotated in the housing to any of four different positions at 90° increments. See "Positioning the Display" on page 27.

— NOTE
Position effect zero shift for all calibrated spans can be eliminated by readjusting zero output after installation.

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 Connections

IDP25 and IDP50 transmitters are connected to the process via a 1/4 NPT thread or any one of a number of optional process connectors.

Process Wetted Materials

Diaphragm: 316L ss and Hastelloy C
Covers and Process Connections: 316 ss and Hastelloy C

Electrical Connections

Field wires enter through 1/2 NPT, PG 13.5, or M20 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. To maintain RFI/EMI, environmental, and explosionproof ratings, unused conduit connection must be plugged with metal plug (provided), inserted to five full turns.

Field Wiring Reversal

Accidental reversal of field wiring will not damage the transmitter, provided the current is limited to 1 A or less by active current limiting or loop resistance. Sustained currents of 1 A will not damage the electronics module or sensor but could damage the terminal block assembly and external instruments in the loop.

Adjustable Damping

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.

Output Signal

4 to 20 mA dc linear or 4 to 20 mA dc square root; software selectable. The output is remotely configurable from the HART Communicator and locally configurable with the pushbuttons on the display.

— NOTE

Only 4 to 20 mA linear output on absolute pressure, gauge pressure, and flange level transmitters.

Zero and Span Adjustments

Zero and span are adjustable from the HART Communicator. They are also adjustable at the transmitter using the display. An optional external self-contained moisture sealed pushbutton assembly allows local resetting of zero without removing the housing cover.

Power-up Time

Less than 2.0 seconds for output to reach the first valid measurement, then at the electronic damping rate to reach the final measured variable value.

Supply Voltage

Power supply must be capable of providing 22 mA when the transmitter is configured for 4 to 20 mA output. Ripple of up to 2 V pp (50/60/100/120 Hz) is tolerable, but instantaneous voltage must remain within specified range.

The supply voltage and loop load must be within specified limits. This is explained in detail in “Wiring” on page 28. A summary of the minimum requirements is listed in Table 2.

Table 2. Minimum Loop Load and Supply Voltage Requirements

	HART Communication	No HART Communication
Minimum Resistance	250 Ω	0
Minimum Supply Voltage	17 V	11.5 V

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 contact 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.

HART Communicator Connection Points

The HART Communicator can be connected in the loop as shown in “Wiring” on page 28. It can also be connected directly to the transmitter at the two upper banana plug receptacles.

Test Points

The two lower banana plug receptacles (designated **CAL**) can be used to check transmitter output when configured for 4 to 20 mA. Measurements should be 100-500 mV dc for 0-100% transmitter output.

Remote Communications

The transmitter communicates bidirectionally over the 2-wire field wiring to a HART Communicator. The information that can be continuously displayed is:

- Process Measurement (expressed in one or two types of units)
- Transmitter Temperature (sensor and electronics)
- mA Output (equivalent)

The information that can be remotely displayed and reconfigured includes:

- Output in Percent Flow (square root) or Pressure Units (linear). Percent Display in Linear mode on local display is also supported.
- Zero and Span, including reranging
- Zero Elevation or Suppression
- Linear Output or Square Root Output (in some models)
- Pressure or Flow Units (from list provided)
- Temperature Sensor Failure Strategy
- Electronic Damping

- Poll Address (Multidrop mode)
- External Zero (Enable or Disable)
- Failsafe Direction
- Tag, Description, and Message
- Date of Last Calibration

Communications Format

Communication is based upon the FSK (Frequency Shift Keying) technique. The frequencies are superimposed on the transmitter power/signal leads.

4 to 20 mA Output

The transmitter sends its differential pressure measurement to the loop as a continuous 4 to 20 mA dc signal. It also communicates digitally with the HART Communicator at distances up to 3000 m (10 000 ft). Communication between the remote configurator and the transmitter does not disturb the 4 to 20 mA output signal. Other specifications are:

Data Transmission Rate:	1200 Baud
4 - 20 mA Update Rate:	30 times/second
Output when Fail Low:	3.60 mA
Output when Fail High:	21.00 mA
Output when Underrange	3.80 mA
Output when Overrange	20.50 mA
Output when Offline:	User configurable between 4 and 20 mA

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 3. For detailed information or status of testing laboratory approvals/certifications, contact Invensys Process Systems.
2. Wiring restrictions required to maintain electrical certification of the transmitter are provided in “Wiring” on page 28.

Table 3. Electrical Safety Specifications

Agency Certification, 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
ATEX intrinsically safe: II 1 GD EEx ia IIC, Zone 0 or II 1/2 GD EEx ib IIC, Zone 0 and 1.	KEMA 00ATEX1009X Temperature Class T4 at 80°C, T5 at 40°C, and T6 at 40°C maximum ambient.	E
ATEX protection n: II 3 GD EEx nL IIC, Zone 2.	KEMA 00ATEX1060X Temperature Class T4 at 80°C, T5 at 70°C, and T6 at 40°C maximum ambient.	N
ATEX multiple certifications, ia & ib and n. Refer to Codes E and N for details.	Applies to Codes D, E, and N.[a]	M
CSA intrinsically safe for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1. Also, Zone certified intrinsically safe Ex ia IIC and energy limited Ex nA II.	Connect per MI 020-427. Temperature Class T4A at 40°C and T3C at 85°C maximum ambient. Temperature Class T4 at 40°C and T3 at 85°C maximum ambient.	C
CSA explosionproof for Class I, Division 1, Groups B, C, and D; dust-ignitionproof for Class II, Division 1, Groups E, F, and G; Class III, Division 1.	Maximum Ambient Temperature 85°C.	
CSA for Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; Class III, Division 2.	Temperature Class T4A at 40°C and T3C at 85°C maximum ambient.	
CSA field device zone certified flameproof Ex d IIC. Also, all certifications of Code C above.	Maximum Ambient Temperature 85°C.	B

Table 3. Electrical Safety Specifications (Continued)

Agency Certification, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
FM intrinsically safe for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1. Also, Zone certified intrinsically safe AEx ia IIC.	Connect per MI 020-427. Temperature Class T4A at 40°C and T4 at 85°C maximum ambient. Temperature Class T4 at 85°C maximum ambient.	F
FM explosionproof for Class I, Division 1, Groups B, C, and D; dust-ignitionproof for Class II, Division 1, Groups E, F, and G; Class III, Division 1.	Temperature Class T6 at 80°C and T5 at 85°C maximum ambient.	
FM nonincendive for Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; Class III, Division 2.	Temperature Class T4A at 40°C and T4 at 85°C maximum ambient.	
FM field device zone certified flameproof AEx d IIC. Also, all certifications of Code F above.	Temperature Class T6 at 75°C maximum ambient.	G
SAA Ex ia IIC, intrinsically safe, Gas Group IIC, Zone 0.	Temperature Calss T4 at 85°C maximum ambient.	H
SAA Ex n IIC, nonincendive, Gas Group IIC, Zone 2.	Temperature Class T6.	K
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

(a) User must permanently mark (check off in rectangular block on data plate) one type of protection only (ia and ib, d, or n). This mark cannot be changed once it is applied.

ATEX and IECEx Warnings

Do not open while circuits are alive.

ATEX Compliance Documents

EN 50014: 1997
EN 50018: 1994
EN 50020: 1994
EN 50284: 1999
EN 50021: 1999

IECEx Compliance Documents

IEC 60079-0 (Edition 4.0): 2004
IEC 60079-1 (Edition 5): 2003

2. Installation

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

1. 1. 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.
2. 2. Use a suitable thread sealant on all connections.

Transmitter Mounting

The IDP Series differential pressure transmitter can be supported by the process piping or mounted to a vertical or horizontal pipe or surface using the optional mounting bracket. See figures below. For dimensional information, refer to DP 020-446.

NOTE

1. 1. If the transmitter is not installed in the vertical position, readjust the zero output to eliminate the position zero effect.
2. 2. When structure codes 78/79 are used (pvdf inserts) with the IDP10 transmitters, the process connection must be made directly to the pvdf inserts in the high and low side process covers.

Process Mounting

With process mounting, the transmitter mounted to and supported by the process piping.

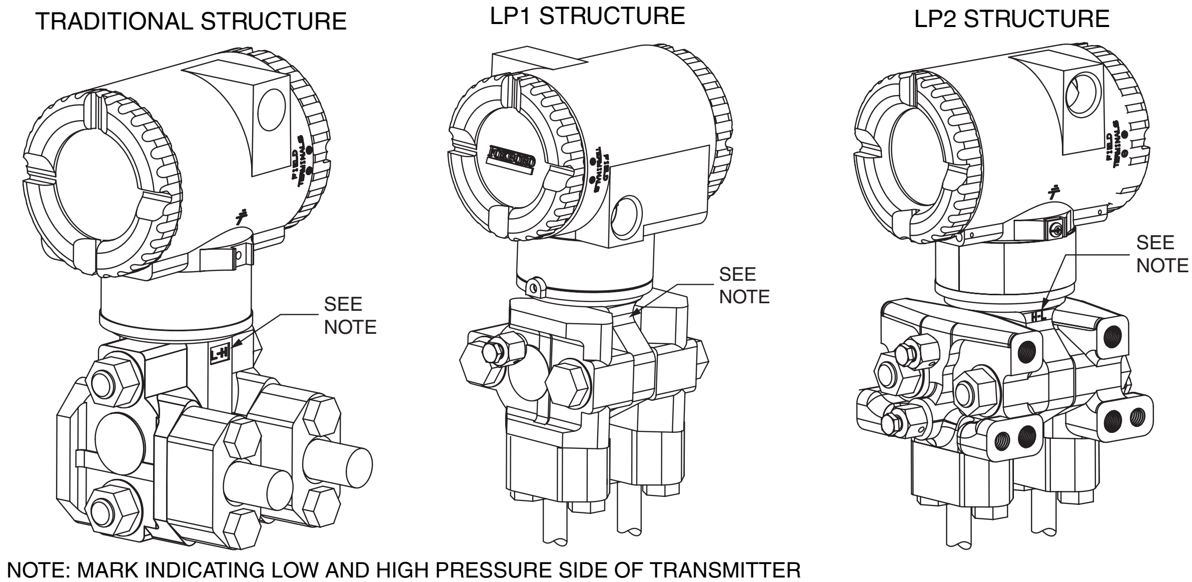


Figure 4. Typical Mounting of an IDP Transmitter Supported by Process Piping

Manifold Mounted Transmitter

With manifold mounting, the transmitter is mounted to and supported by a bypass manifold. The bypass manifold can be mounted to a DN50 or 2 inch pipe with an optional mounting bracket.

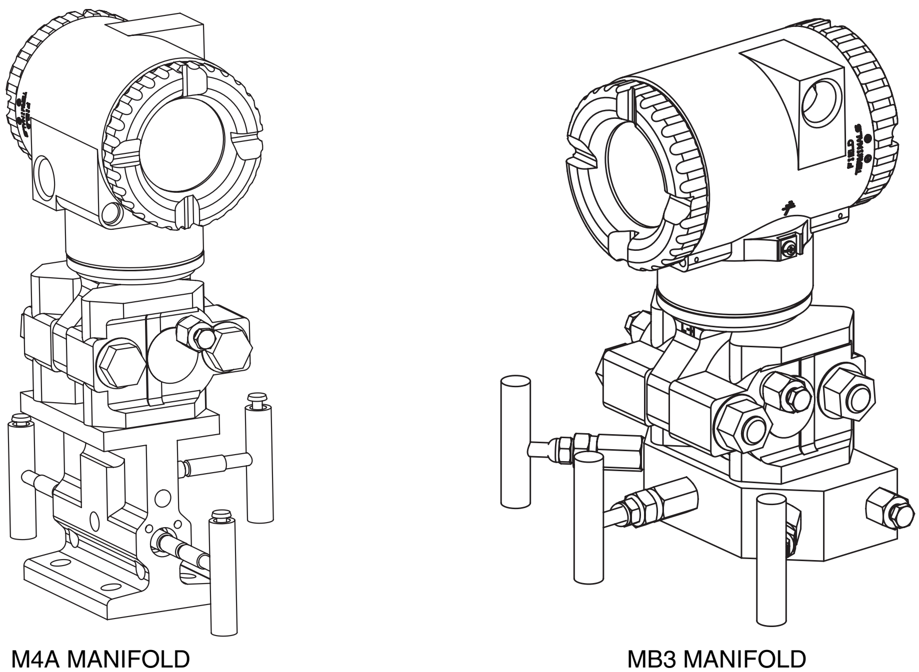


Figure 5. Typical Mounting of an IDP Transmitter Supported by a Bypass Manifold

Transmitter Mounted on a Coplanar™ Manifold

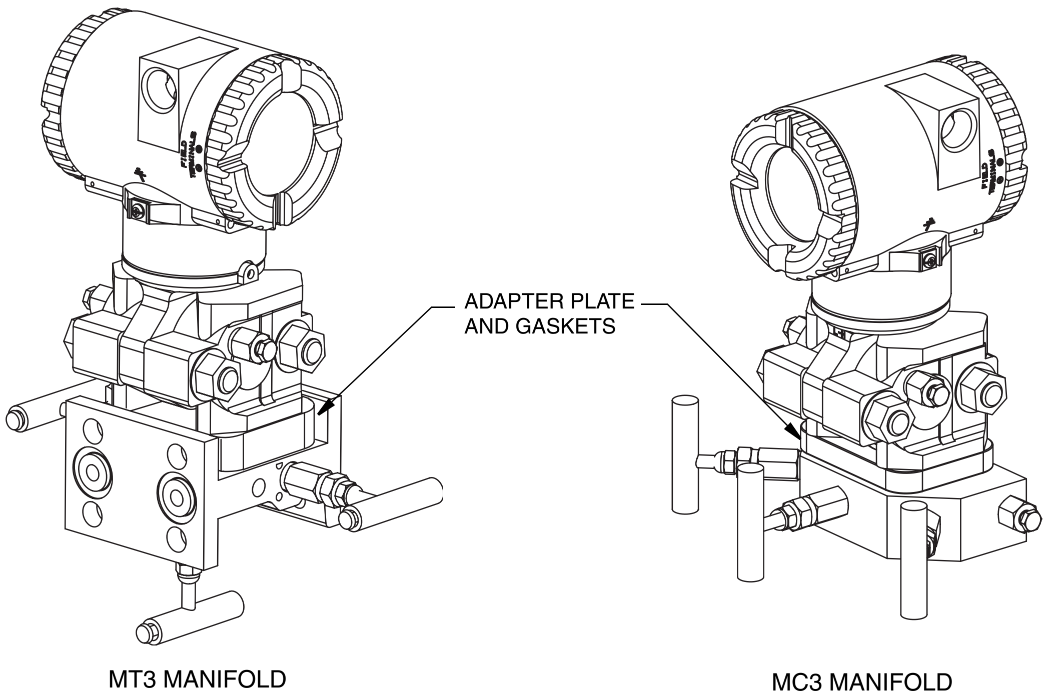


Figure 6. Typical Mounting of IDP Transmitter on Coplanar Manifold

Pipe or Surface Mounting

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 Figures 7 and 8 for details of a standard bracket and examples of different mounting 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. The mounting bracket can also be used for wall mounting by securing the bracket to a wall using the U-bolt mounting holes.

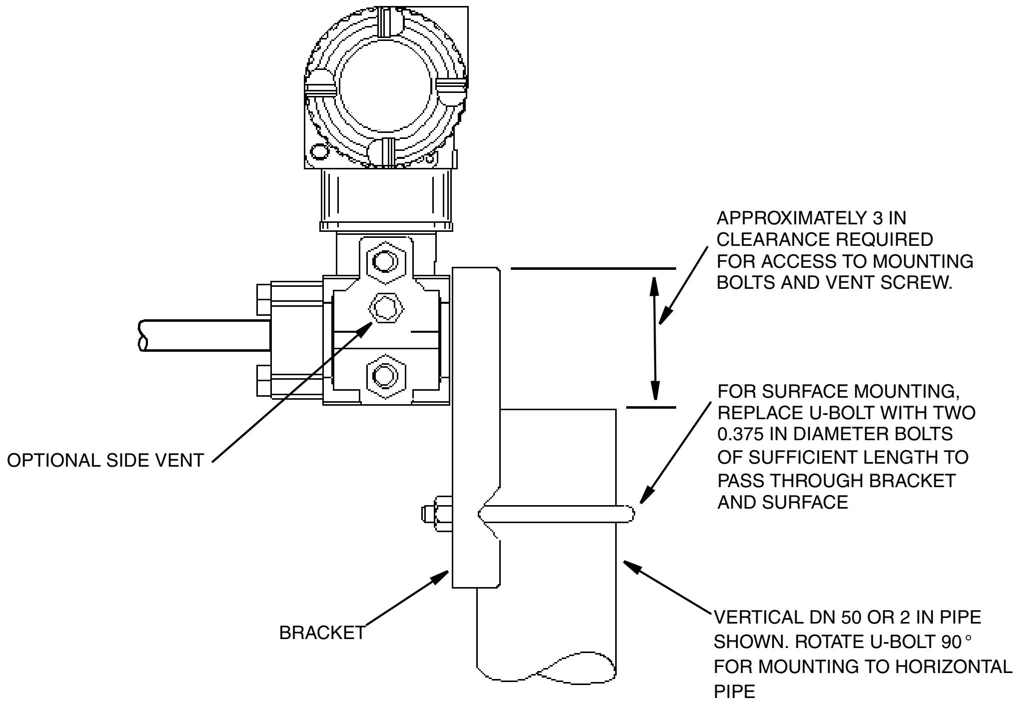


Figure 7. Pipe or Surface Mounted Transmitter Using a Standard Bracket

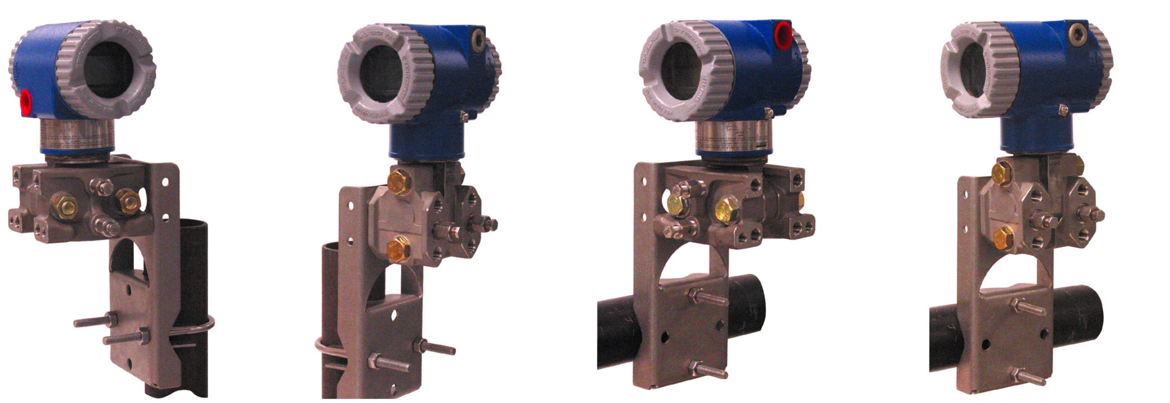


Figure 8. Examples of Mounting With a Standard Bracket

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 the following figures for details of a universal bracket and 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.

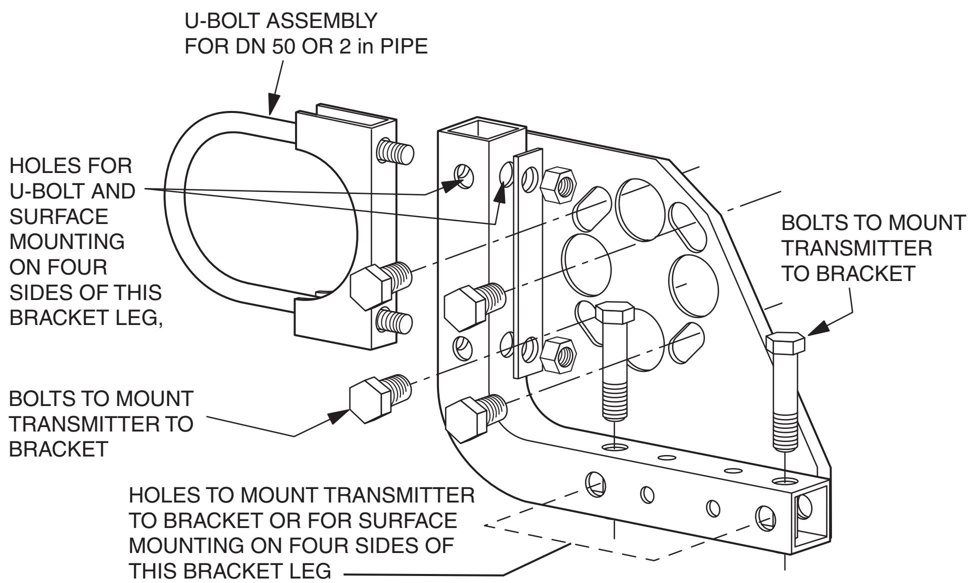


Figure 9. Details of a Universal Bracket

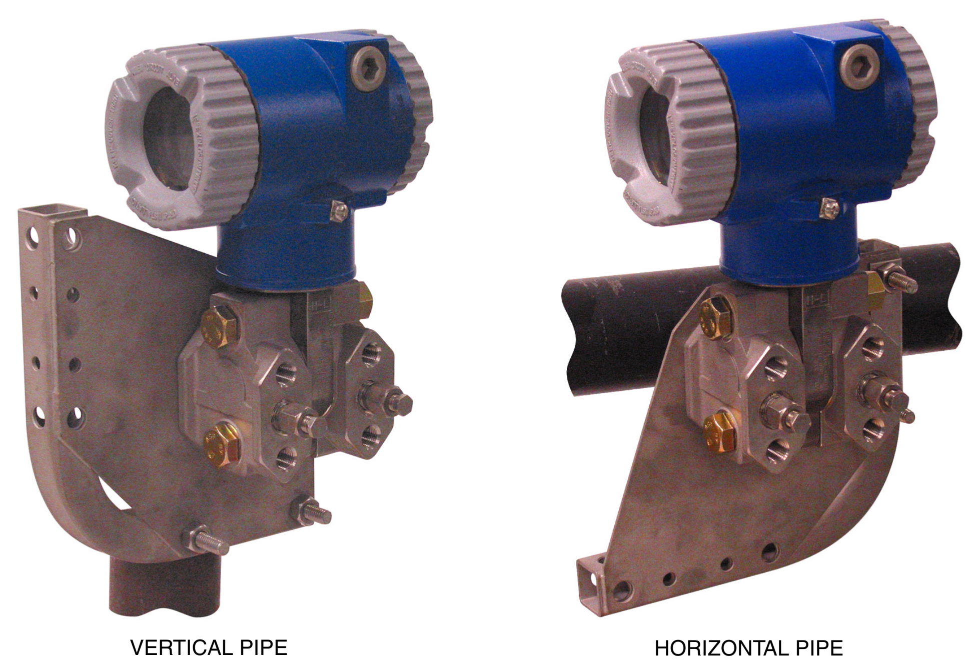


Figure 10. Mounting a Transmitter with Traditional Structure Using a Universal Bracket

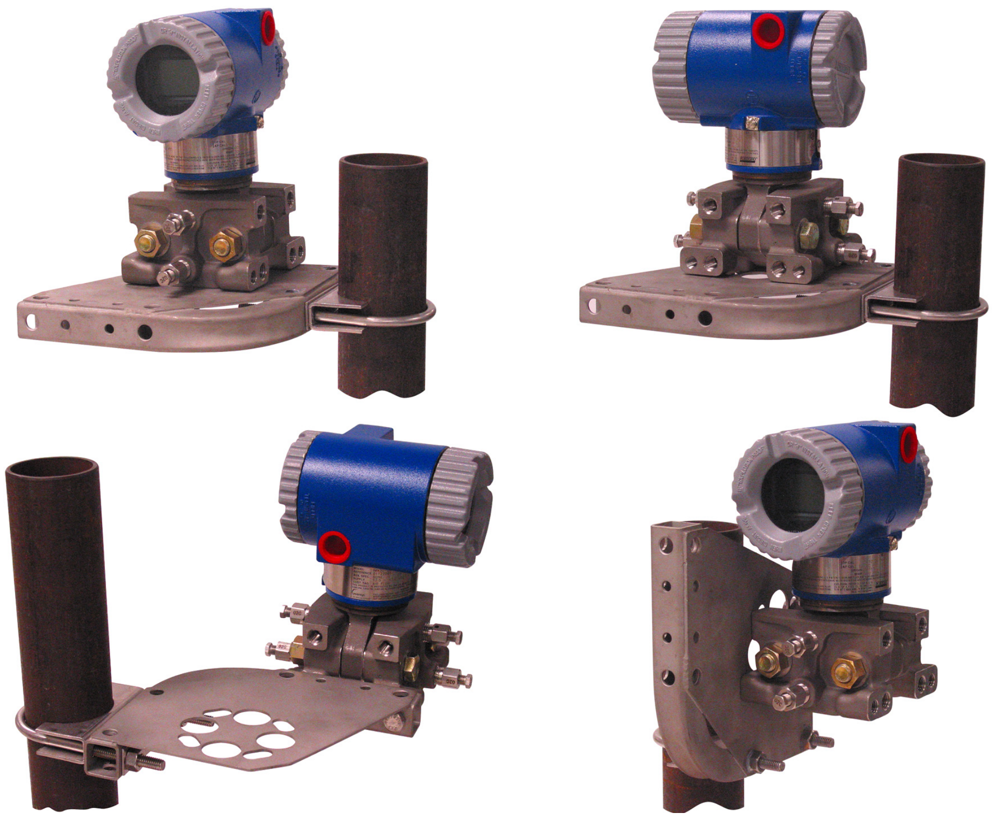


Figure 11. Vertical Pipe Mounting a Transmitter with LP2 Structure Using a Universal Bracket

Figure 12. 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 and venting is possible with side vents (Option Code -V). For horizontal mounted units, the unit is self draining and venting is via a vent screw.

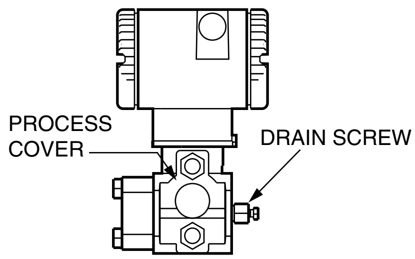


Figure 13. Vertical Mounting - Cavity Draining

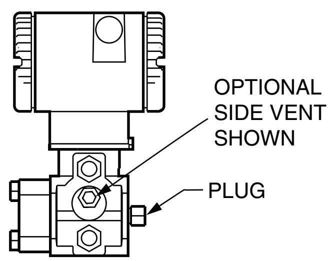


Figure 14. Vertical Mounting - Cavity Venting

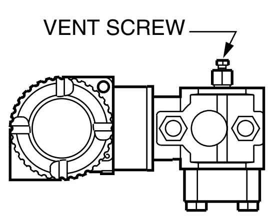


Figure 15. Horizontal Mounting - Cavity Venting

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. For horizontal mounted units, the transmitter can simply be 'turned over' (rotated 180 degrees) 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.

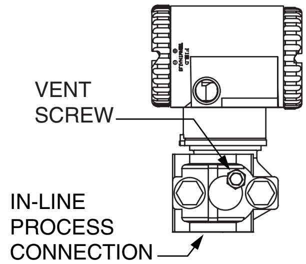


Figure 16. Vertical Mounting - Cavity Venting

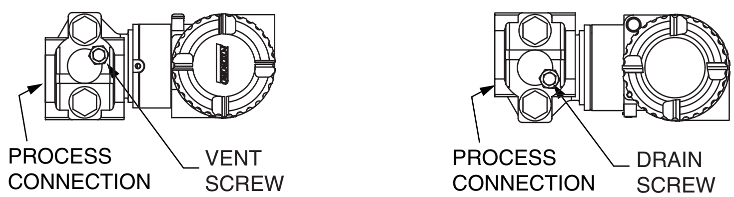


Figure 17. Horizontal Mounting - Cavity Venting and Draining

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.

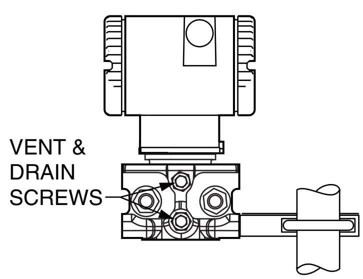


Figure 18. Cavity Venting and Draining

Installation of Flow Measurement Piping

Figures 19 and 20 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 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.

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

— NOTE

1. 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. 2. With a **vertical** line, flow should be upwards.
3. 3. For **liquid** or **steam** flow, the transmitter should be mounted **lower** than the pressure connections at the pipe.
4. 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. 5. Invensys Process Systems recommends the use of snubbers in installations prone to high levels of fluid pulsations.

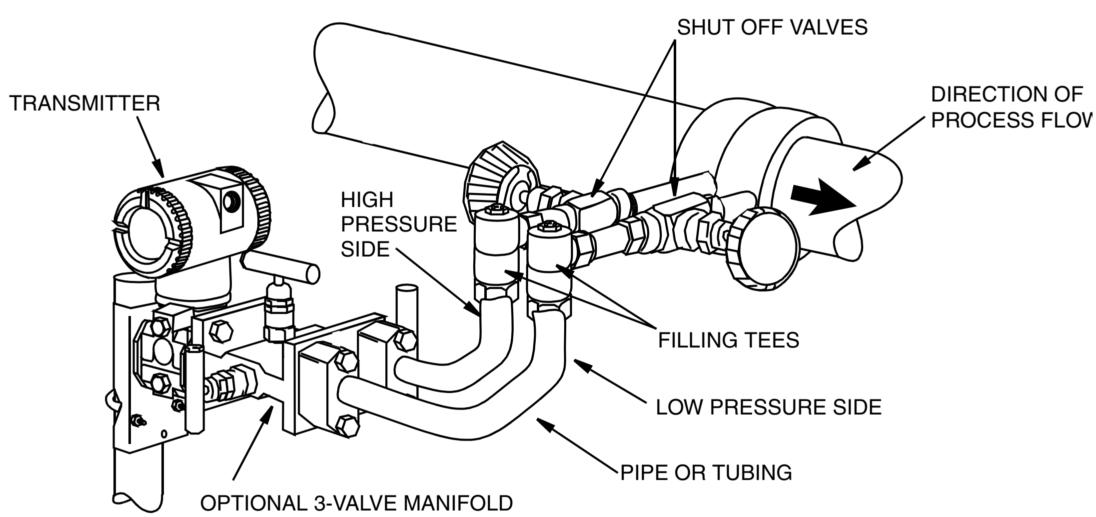


Figure 19. Example of Horizontal Process Line Installation

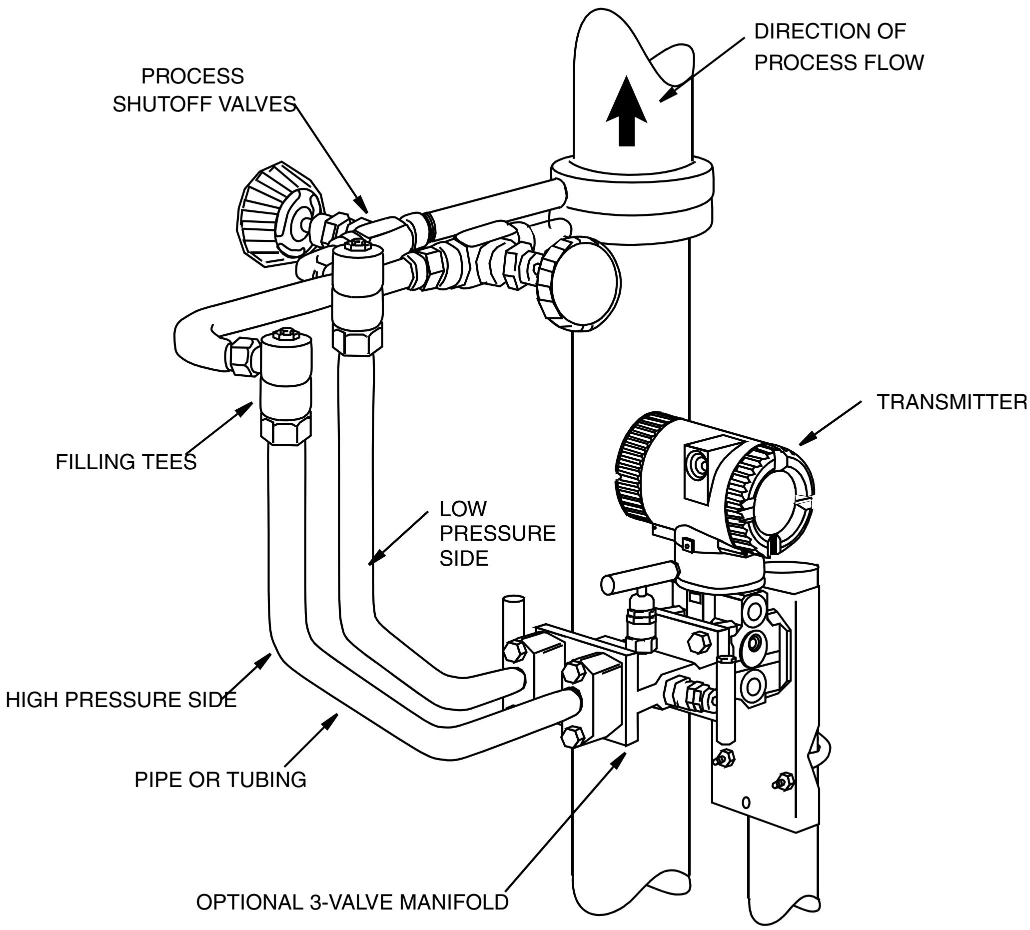


Figure 20. Example of Vertical Process Line Installation

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 a Differential Pressure Transmitter Out of Operation" on page 34.
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 a Differential Pressure Transmitter Into Operation" on page 33.

CAUTION

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

Positioning the 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.

WARNING

If the electronics housing is removed for any reason, it must be hand tightened fully. Then engage the set screw until it bottoms out and back it off 1/8th turn. Fill the set screw recess with red lacquer (Foxboro Part number X0180GS or equivalent). The housing then may be rotated up to one full turn in a counterclockwise direction for optimum access to adjustments.

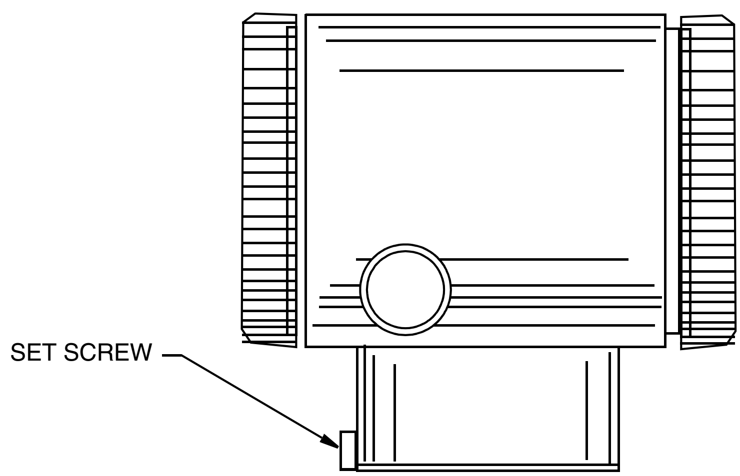


Figure 21. Housing Set Screw Location

Positioning the Display

The display (optional in some models) 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. This means that the external zero, 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. 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 22, 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.

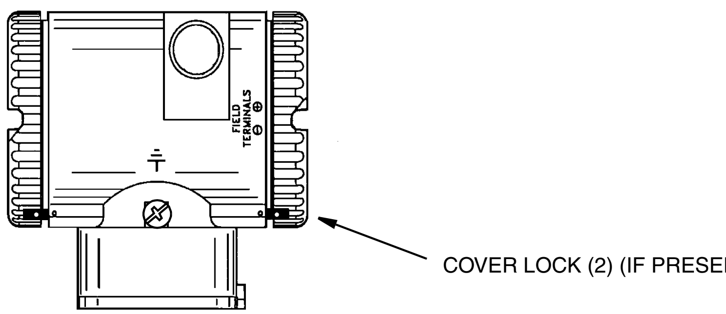


Figure 22. Cover Lock Location

Wiring

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

WARNING

ATEX requires that when the equipment is intended to be used in an explosive atmosphere caused by the presence of combustible dust, cable entry devices and blanking elements shall provide a degree of ingress protection of at least IP6X. They shall be suitable for the conditions of use and correctly installed.

NOTE

Invensys Process Systems recommends the use of transient/surge protection in installations prone to 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 23. Note that the embossed letters **FIELD TERMINALS** identify the proper compartment.

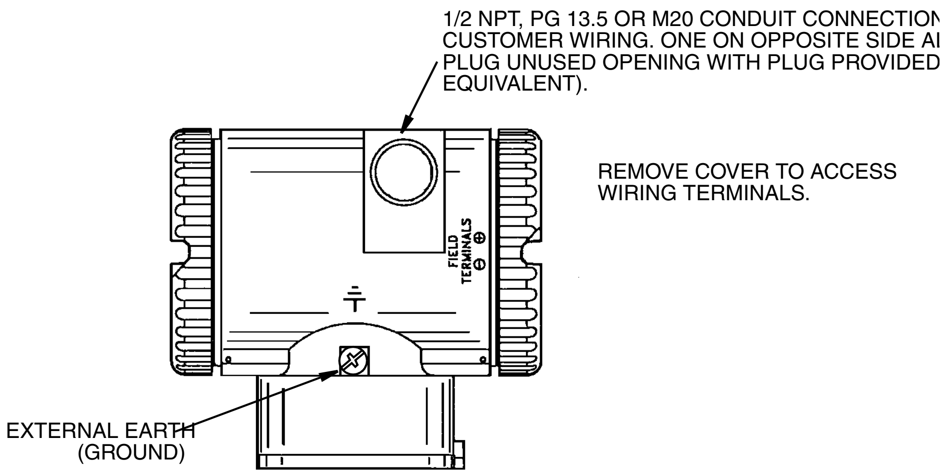


Figure 23. Accessing Field Terminals

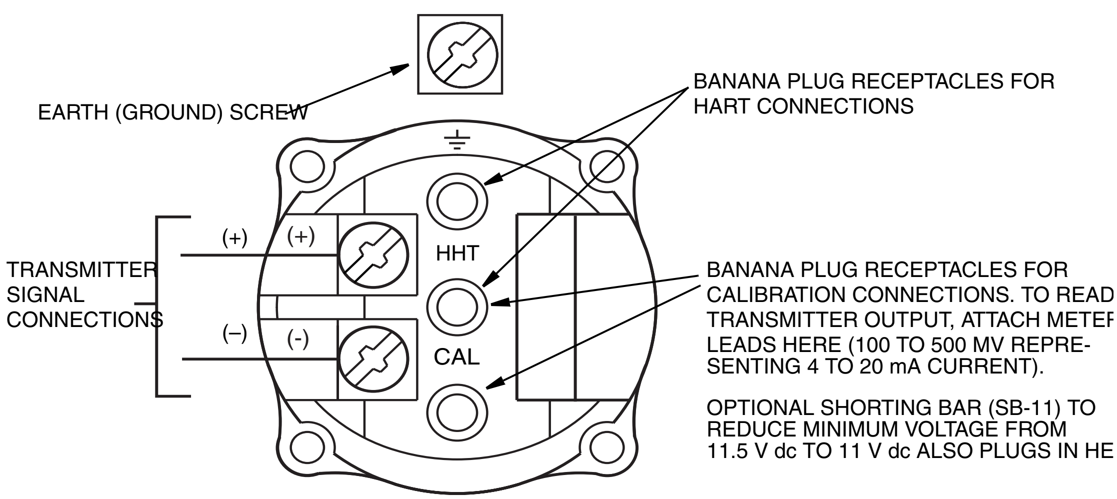


Figure 24. Identification of Field Terminals

Wiring the Transmitter to a Control Loop

When wiring the transmitter, the supply voltage and loop load must be within specified limits. The supply output load vs. voltage relationship is:

R_{MAX} = 47.5 (V - 11.5) and is shown in Figure 25.

— NOTE

The relationship when the optional shorting bar is used is:

R_{MAX} = 46.8 (V - 11).

Any combination of supply voltage and loop load resistance in the shaded area can be used. To determine the loop load resistance (transmitter output load), add the series resistance of each component in the loop, excluding the transmitter. The power supply must be capable of supplying 22 mA of loop current.

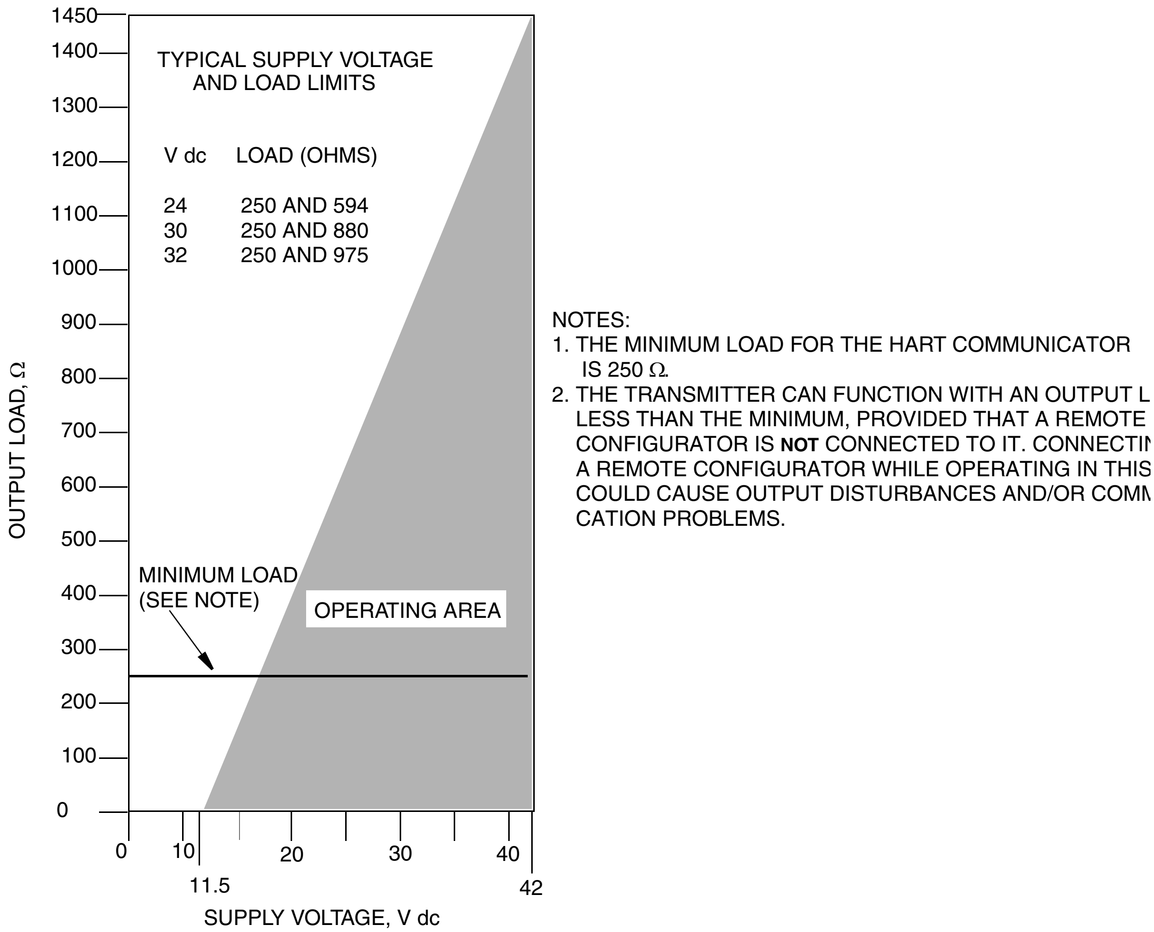


Figure 25. Supply Voltage and Loop Load

Examples:

1. For a loop load resistance of 880 Ω, the supply voltage can be any value from 30 to 42 V dc.
2. For a supply voltage of 24 V dc, the loop load resistance can be any value from 250 to 594 Ω (zero to 594 Ω without a HART Communicator connected to the transmitter).

To wire one or more transmitters to a power supply, proceed with the following steps.

1. Remove the cover from the transmitter field terminals compartment.

2. Run signal wires (0.50 mm^2 or 20 AWG, typical) through one of the transmitter conduit connections. Use twisted single pair to protect the 4 to 20 mA output and/or remote communications from electrical noise. Maximum recommended length for signal wires is:

- 3050 m (10,000 ft) **using single pair cable** and adhering to requirements of HART physical layer implementation defined in HART Document HCF_SPEC-53. Use CN=1 when calculating max. lengths.
- 1525 m (5000 ft) in a multidrop (15 devices maximum) mode.
  Screened (shielded) cable could be required in some locations.

— NOTE

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

3. If shielded cable is used, earth (ground) the shield at the power supply **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.
5. 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.

6. Connect the power supply and receiver loop wires to the "+" and "–" terminal connections.
7. Connect receivers (such as controllers, recorders, indicators) in series with power supply and transmitter as shown in Figure 26.
8. 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 28.
9. If wiring additional transmitters to the same power supply, repeat Steps 1 through 8 for each additional transmitter. The setup with multiple transmitters connected to a single power supply is shown in Figure 27.
10. The HART Communicator or PC-Based Configurator can be connected in the loop between the transmitter and the power supply as shown in Figures 26 and 27. Note that a minimum of 250 Ω must separate the power supply from the HART Communicator or
    PC-Based Configurator.

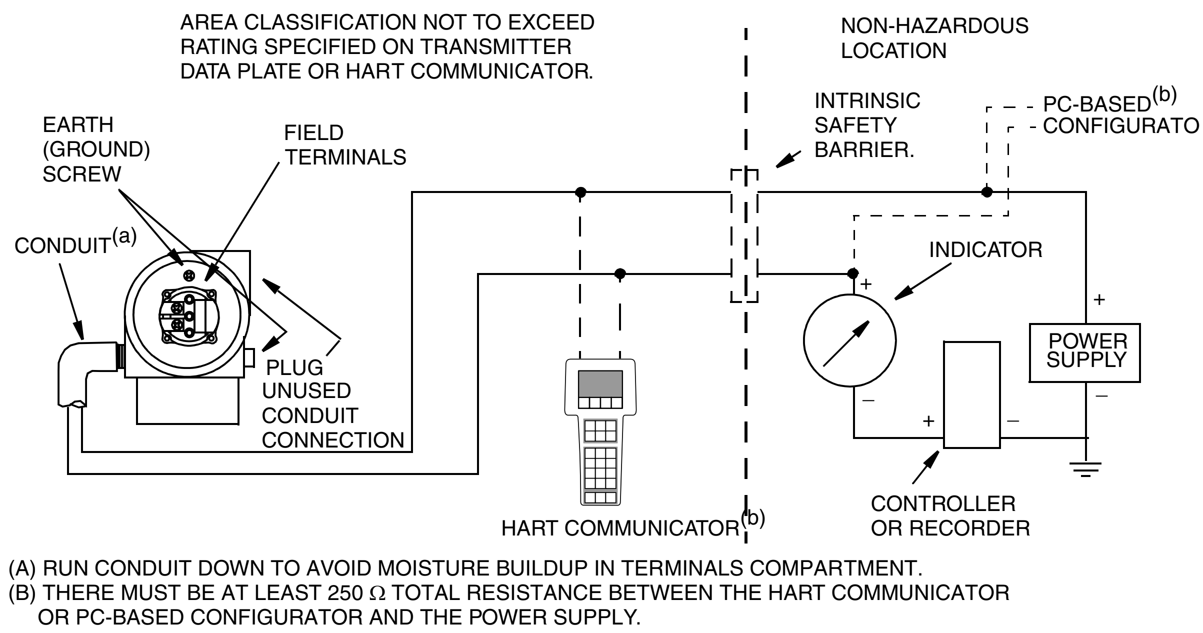


Figure 26. Loop Wiring Transmitters

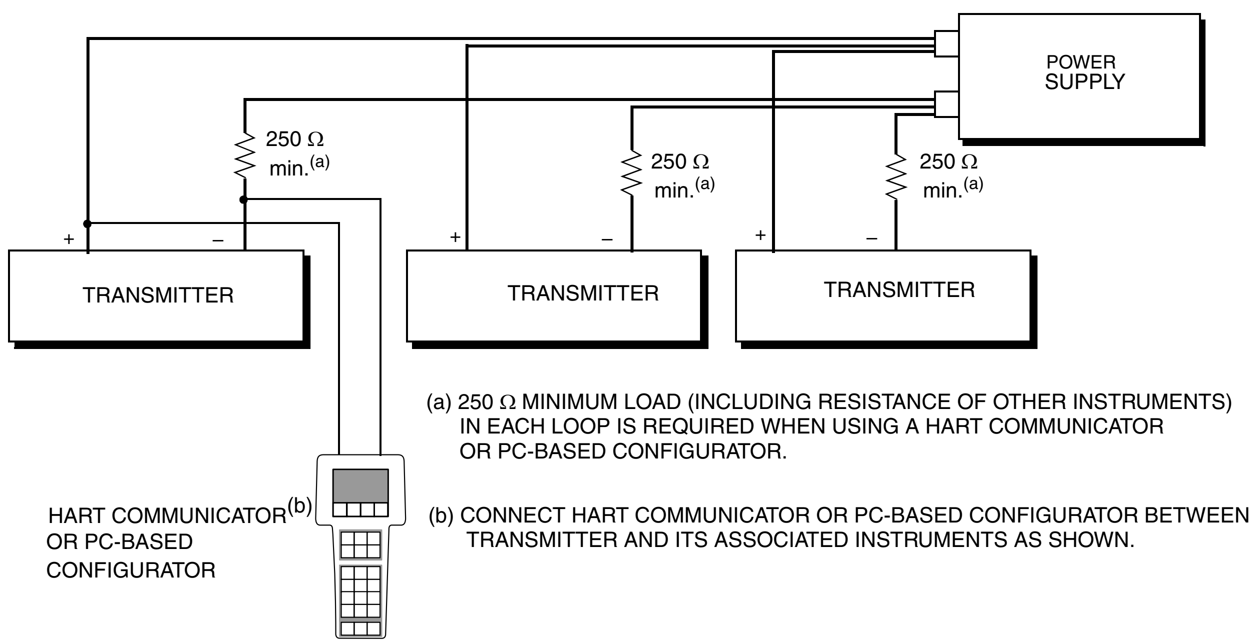


Figure 27. Wiring Several Transmitters to a Common Power Supply

Multidrop Communication

"Multidropping" refers to the connection of several transmitters to a single communications transmission line. Communications between the host computer and the transmitters takes place digitally with the analog output of the transmitter deactivated. With the HART communications protocol, up to 15 transmitters can be connected on a single twisted pair of wires or over leased telephone lines.

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

Figure 28 shows a typical multidrop network. Do not use this figure as an installation diagram. Contact the HART Communications Foundation, (512) 794-0369, with specific requirements for multidrop applications.

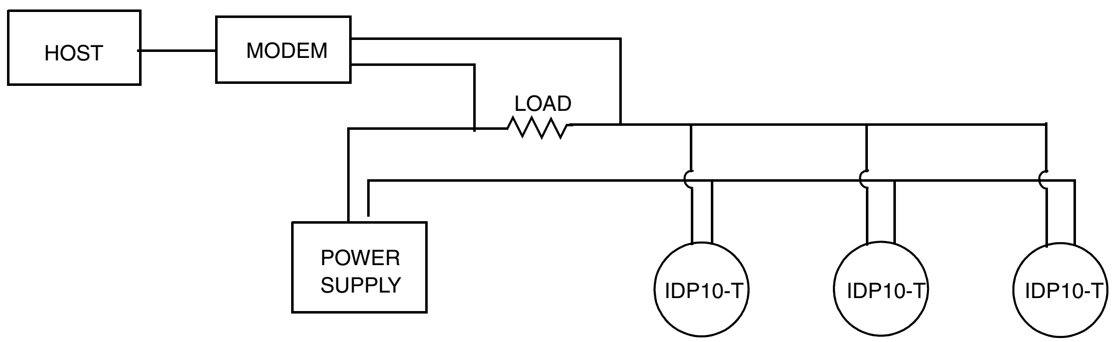


Figure 28. Typical Multidrop Network

The HART Communicator can operate, configure, and calibrate IASPT transmitters with HART communication protocol in the same way as it can in a standard point-to-point installation.

— NOTE

IASPT transmitters with HART communication protocol are set to poll address 0 (**POLLADR 0**) at the factory, allowing them to operate in the standard point-to-point manner with a 4 to 20 mA output signal. To activate multidrop communication, the transmitter address must be changed to a number from 1 to 15. Each transmitter must be assigned a unique number on each multidrop network. This change deactivates the 4 to 20 mA analog output.

Connecting the Transmitter to an I/A Series System

The transmitter can also send its measurement to an I/A Series system as a digital signal via an FBM214/215. Wiring terminations at the transmitter are the same as described above. For other system wiring details, refer to the installation instructions provided with the I/A Series system.

Putting a Differential Pressure 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 Figures 19 and 20.

— NOTE
This procedure assumes that the 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 a Differential Pressure 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 Figures 19 and 20.

— NOTE
This procedure assumes that the 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.

3. Operation Via Local Display

A local display, as shown in Figure 29, 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 a 7-digit alphanumeric display. The display provides local indication of measurement information. The primary (M1) measurement is normally displayed. To view the secondary (M2) measurement, press the **Enter** button while in normal operating mode. Press the **Next** or **Enter** button to return to the primary measurement. If left in M2 display, an M2 message blinks in the lower right of the display. If power to the transmitter is interrupted, the display reverts to the M1 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.

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 30.

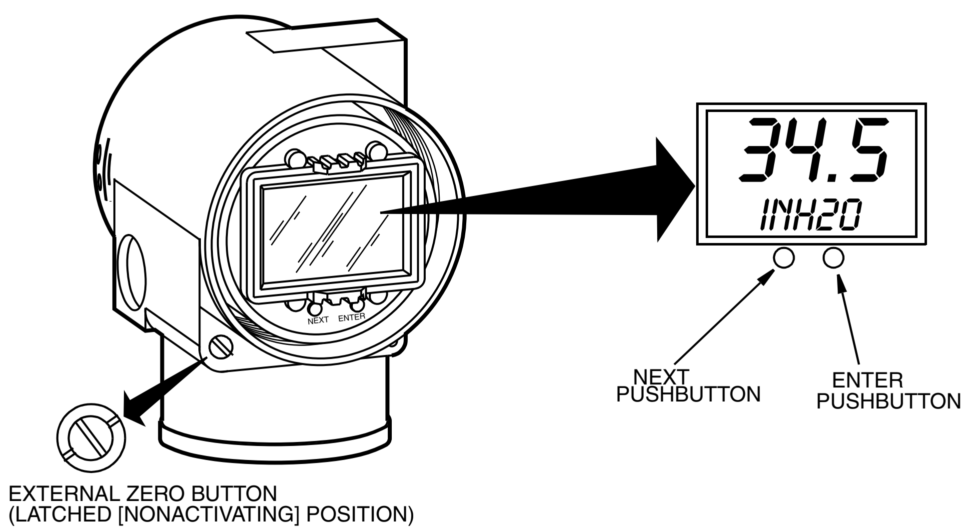


Figure 29. Local Display Module

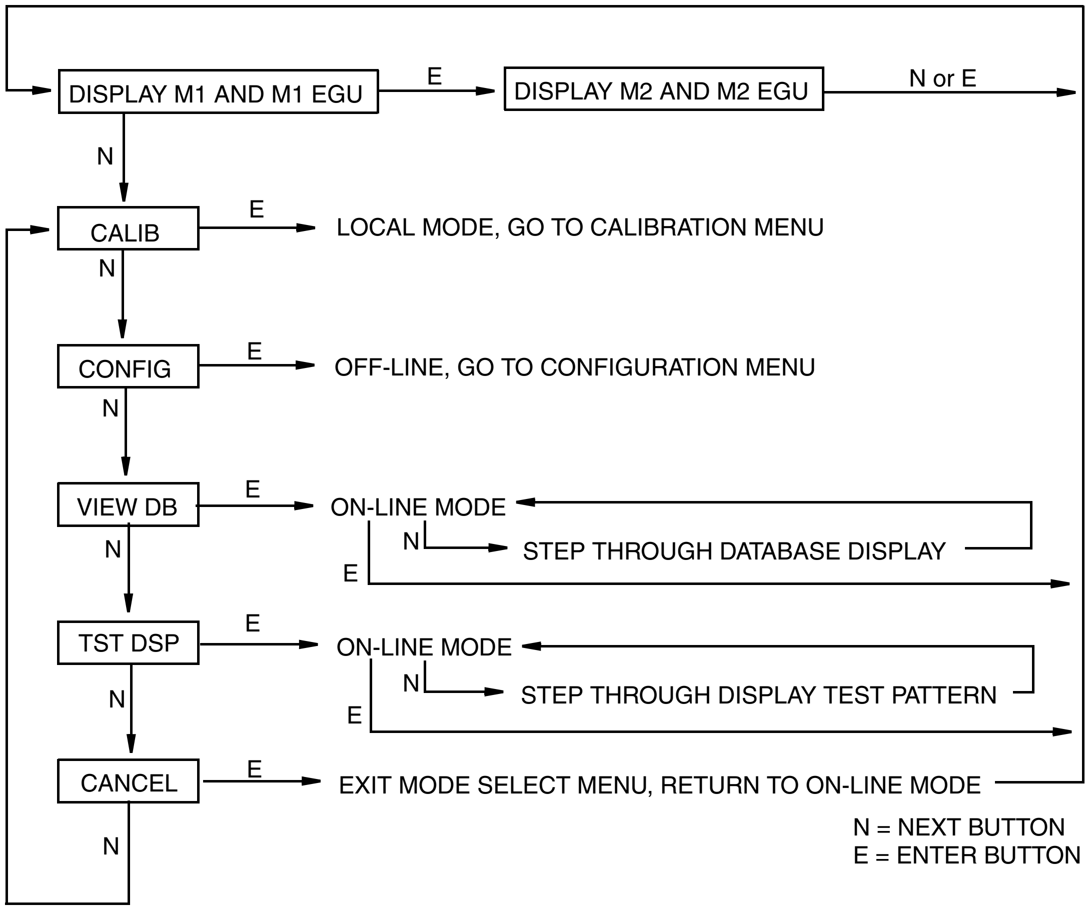


Figure 30. Top Level Structure Diagram

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 may 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.

Viewing the Database

You can access the View Database mode by the multi-level menu system described above. 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 twice to get to the third item on the menu, **VIEW DB**. Acknowledge your choice of this selection by pressing the **Enter** button. The display shows the first item in the database. You can step through the database display by repeated use of the **Next** button. You can abort this procedure at any time by pressing the **Enter** button.

Viewing the Pressure Range

The values of **M1LRV** and **M1 URV** can be viewed in **VIEW DB** as described above. They can also be viewed in the **RERANGE** function in Calibration mode.

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. The five patterns are shown in Figure 31.

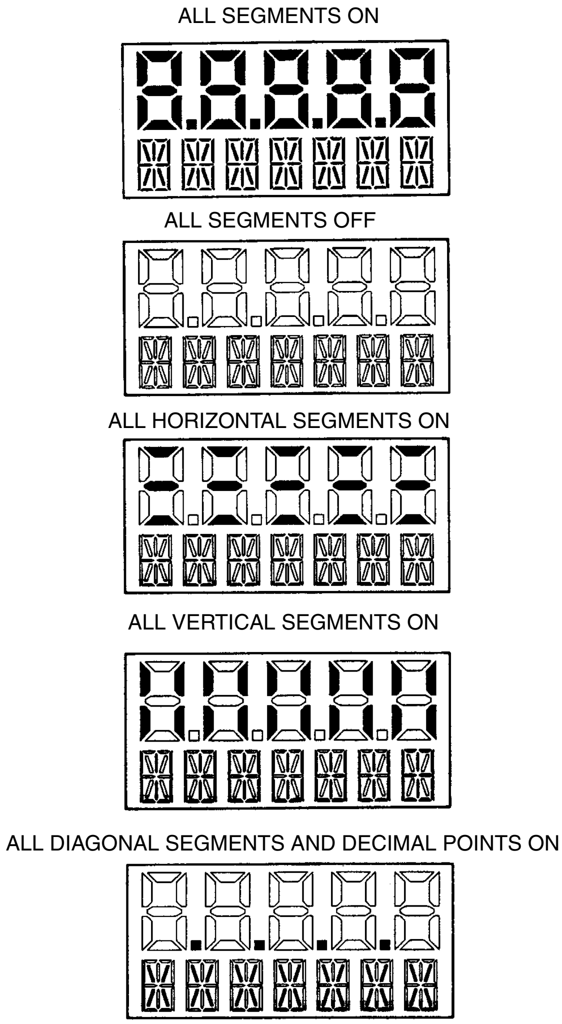


Figure 31. Display Test Segment Patterns

Error Messages

Table 4. Operation Error Messages

Parameter	Condition Tested	Error Message	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.
Startup	Database OK or corrupted	INITERR	User should perform SET GDB procedure. See “SET GDB:” on page 60.

4. Calibration

NOTE

1. 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. 2. Zero shifts resulting from position effects and/or static pressure effects can be eliminated by rezeroing the transmitter output.
3. 3. When checking the zero reading of a transmitter operating in the square root mode, return the output to the linear mode. This eliminates an apparent instability in the output signal. Return the transmitter output to the square root mode after the zero check is complete.
4. 4. After calibrating transmitters operating with a 4 to 20 mA (or 1 to 5 V dc) output signal, check the underrange and overrange output values to ensure that they extend beyond 4 and 20 mA (or 1 and 5 V dc) respectively.

General Calibration Notes

1. Each transmitter is factory characterized over its full rated pressure range. One benefit of this process is that every transmitter can measure any applied differential pressure within its range limits regardless of the calibrated range. The applied differential pressure is measured and converted into an internal digital value of differential pressure. This digital value of differential pressure is always available whether the transmitter is calibrated or not. Calibration assures that the transmitter rated accuracy is achieved over the calibrated range.
2. The internal digital value of differential pressure can be displayed on the optional local display, transmitted digitally, and converted to a 4 to 20 mA analog output signal.
3. Each transmitter is factory calibrated to either a specified or a default calibrated range. This calibration optimizes the accuracy of the internal digital value of differential pressure over that range. If no range is specified, the default range is zero to the sensor upper range limit (URL).
4. The transmitter database has configurable values for both Lower Range Value (LRV) and upper range value (URV). These values are used for two functions.
   a. Defining the Calibrated Range When Using Local Pushbuttons for Calibration:
      - When either **CAL LRV** or **CAL URV** is initiated from the local pushbuttons, the transmitter expects that the differential pressure applied at the time the button is pressed is equal to the LRV or URV value respectively.
      - This function trims the internal digital value of differential pressure; that is, it performs a calibration based on the application of accurate differential pressures equal to the values entered for LRV and URV in the transmitter database.
      - This function also sets the 4 and 20 mA output points; that is, the 4 and 20 mA points correspond to the values of LRV and URV in the database.

- The value of LRV can be larger than the value of URV.

b. Reranging Without the Application of Pressure:

- Since the transmitter continually determines an internal digital value of the measured differential pressure from the lower range limit (LRL) to the upper range limit (URL), the 4 and 20 mA output points can be assigned to any differential pressure values (within the span and range limits) without application of pressure.
- The reranging function is accomplished by entering new database values for LRV and URV.
- Reranging does not affect the calibration of the transmitter; that is, it does not affect the optimization of the internal digital value of differential pressure over a specific calibrated range.
- If the reranged LRV and URV are not within the calibrated range, the measured values may not be as accurate as when they are within the calibrated range.

If the transmitter is in square root mode for flow rate measurement, the URV in the database is displayed as the flow rate URV when the view database (**VIEW DB**) function is used. However, the LRV and URV in pressure units can be displayed by selecting the reranging (**RERANGE**) function. LRV is always zero when the transmitter is configured for square root mode.

5. When the optional local display is used, the internal digital value of differential pressure is sent directly to the indicator.
   - The display can show any measured differential pressure in selected units regardless of the calibrated range and the values of LRV and URV (within the limits of the transmitter and display).
   - If the measured differential pressure is outside the range established by the LRV and URV values in the database, the display shows the measurement but also continually blinks to indicate that the measurement is out of range. The mA current signal is saturated at either the low or high overrange limit respectively but the display continually shows the pressure.
6. When configured for 4 to 20 mA output, the internal digital value of differential pressure is converted to an analog current signal.
   - The transmitter sets the output at 4 mA for the LRV and 20 mA for the URV.
   - There is an independent trim on the digital-to-analog conversion stage. This trim allows for slight adjustment of the 4 and 20 mA outputs. This compensates for any slight difference that exists between the transmitter mA output and an external reference device which is measuring the current.
   - The mA trim does not affect the calibration or the reranging of the transmitter and does not affect the internal digital value of differential pressure or the transmission or display of measured pressure.
   - The mA trim can be done with or without pressure applied to the transmitter.
7. Zeroing from the local display does not affect the span.

When the transmitter is zeroed to compensate for installed position effect, the transmitter can have either LRV differential pressure applied (**CAL LRV**) or zero differential pressure applied (**CAL AT0**). If using a zero-based range, either method produces the same result. However, if the range is not zero-based, it is advantageous to have both methods available.

For example, consider a differential pressure transmitter having a range of 50 to 100 psig. If it is not feasible to vent the transmitter to atmosphere for zeroing (or to bypass the high and low sides for zeroing), it can be zeroed while the LRV differential pressure of 50 psi is applied by using the **CAL LRV** function. On the other hand, if the transmitter has been installed but there is no pressure in the process line yet (or the high and low sides can be connected by a bypass valve), it can be zeroed while open to atmosphere (or bypassed) by using the **CAL AT0** function.

a. Zeroing with LRV Pressure Applied (**CAL LRV**):

- ♦ Before using this zeroing function, apply a differential pressure to the transmitter equal to the value of LRV stored in the transmitter database.
- ♦ When you zero the transmitter, the internal digital value of differential pressure is trimmed to be equal to the value of LRV stored in the database and the mA output set to 4 mA.
- ♦ If zeroing is done when the applied differential pressure is different from the LRV value in the database, the internal digital value of differential pressure is biased by the difference in the values but the output is still set at 4 mA.
- ♦ The **CAL LRV** and **CAL URV** function should be used when calibrating a transmitter for a specific range with known input differential pressures applied for the LRV and URV.

b. Zeroing with Zero Pressure Applied (**CAL AT0**):

- ♦ Make sure that the applied differential pressure is at zero. This means venting the transmitter to atmosphere or opening a bypass valve to connect high and low sides.

♦ When you zero the transmitter, the internal digital value of the differential pressure is trimmed to be equal to zero and the mA output set to an appropriate value such that the mA output is a nominal 4 mA when the LRV pressure is applied later.

Calibration Setup

The following sections show 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.

Setup of Electronic Equipment

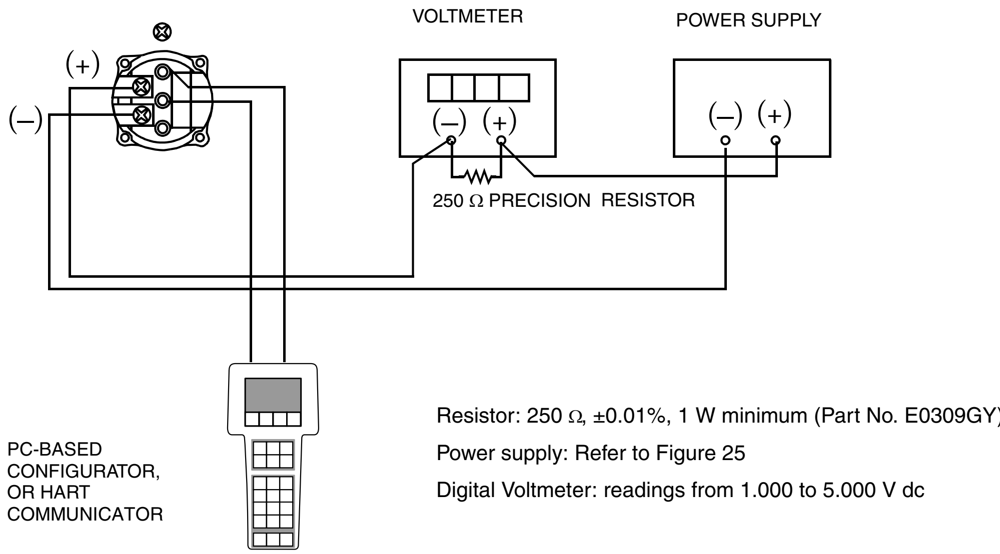


Figure 32. 4 to 20 mA Output Calibration Setup of Electronic Equipment

Field Calibration Setup

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
- The optional vent screw in the side of the process covers.

If the transmitter is to be removed from the process for calibration, refer to the "Bench Calibration" procedure.

For field calibration, 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 from Invensys Process Systems as Part Number F0101ES.

To set up the equipment, refer to Figure 32 and use the following procedure.

1. If the transmitter is in operation, follow the "Taking a Differential Pressure Transmitter Out of Operation"procedure on page 34.

⚠ 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 33.

— NOTE

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

5. If calibrating the output signal, also connect equipment as shown in Figure 32

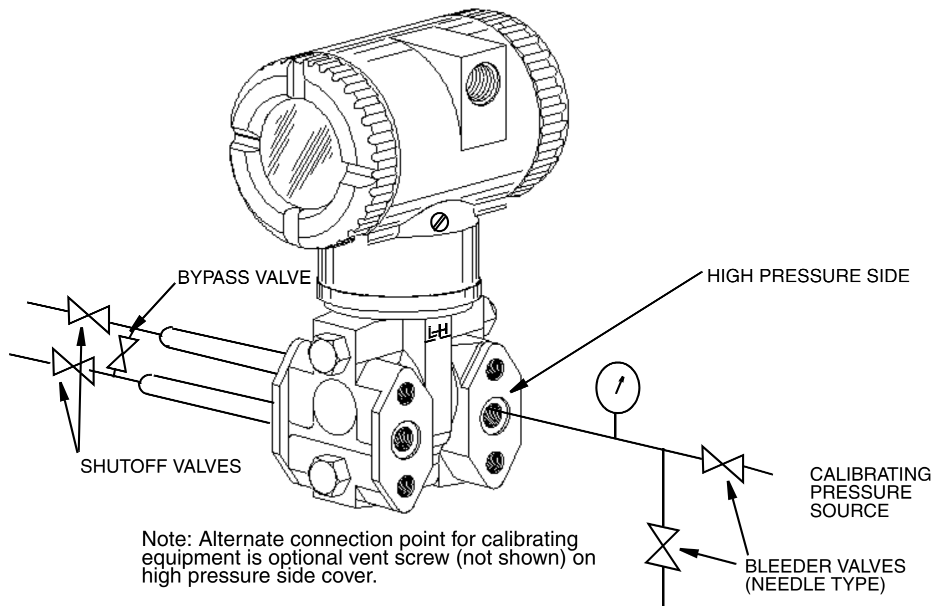


Figure 33. Field Calibration Setup

Bench Calibration Setup

The bench calibration setup requires disconnecting the process piping. For calibration setup without disconnecting the process piping, refer to the "Field Calibration" procedure.

The bench calibration setup is shown in Figure 34. Connect the input piping to the high pressure side of the transmitter as shown. Vent the low pressure side of the transmitter.

— NOTE

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

If calibrating the output signal, also connect equipment as shown in Figure 32.

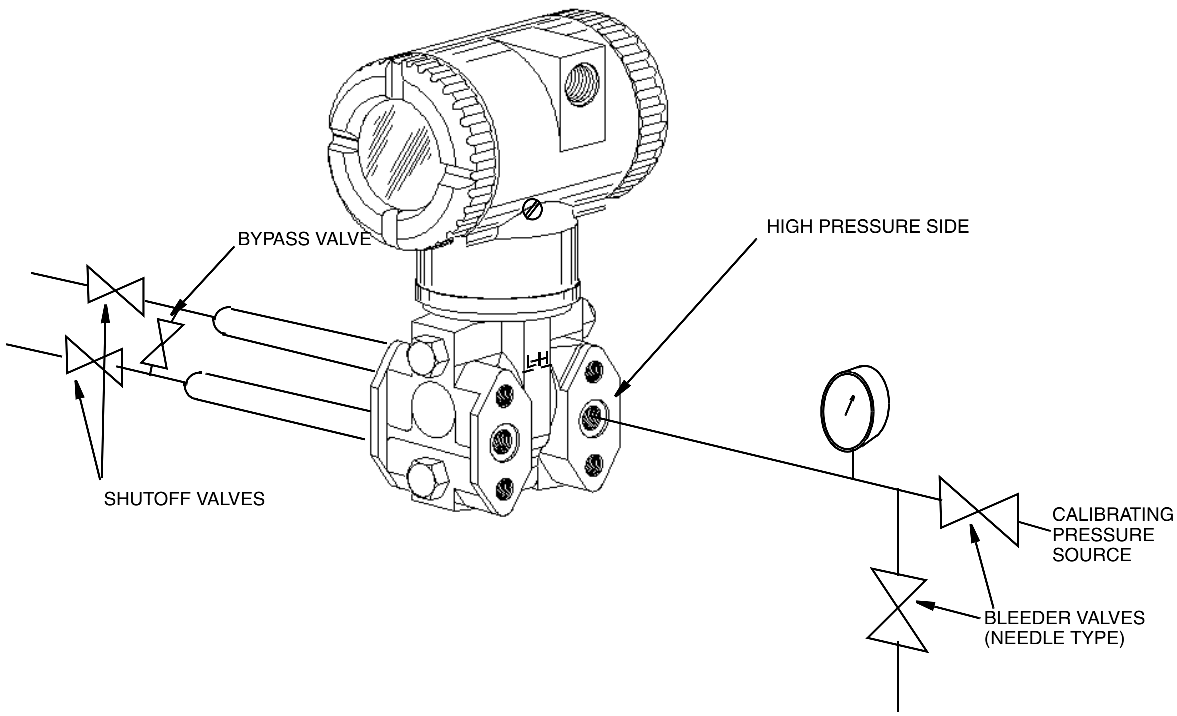


Figure 34. Bench Calibration Setup

Calibration Using a PC50

To calibrate the transmitter using a PC50 Configurator, follow the procedure in MI 020-501 and MI 020-520.

Calibration Using a HART Communicator

To calibrate the transmitter using a HART Communicator, follow the procedure in MI 020-366.

Calibration Using the Optional Local Display

To access the Calibration mode (from 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.

— NOTE

1. 1. During calibration, 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.
2. 2. During adjustment of 4 and 20 mA in the Calibration menu, the milliampere output does not reflect live measurement values.

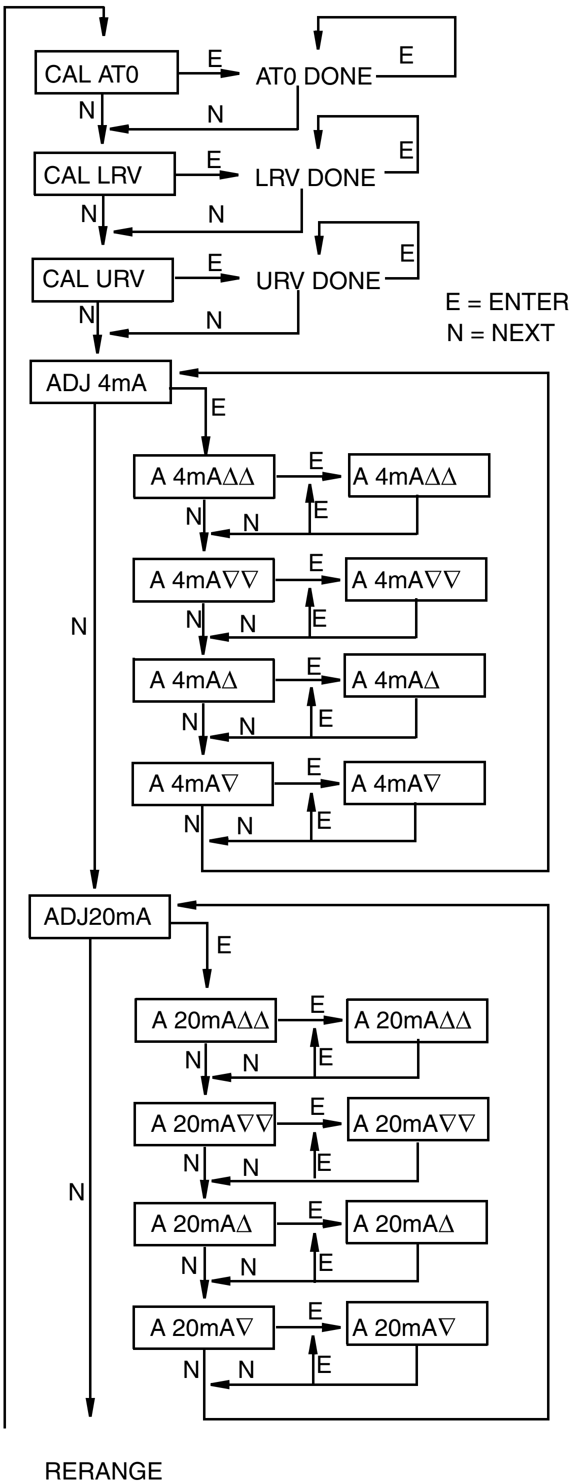
Table 5. Calibration Menu

Item	Description
CAL AT0	Calibrate at zero pressure.
CAL LRV	Calibrate with pressure at 0% of transmitter range (LRV).
CAL URV	Calibrate with pressure at 100% of transmitter range (URV).
ADJ 4mA	Adjust nominal 4 mA output.
ADJ20mA	Adjust nominal 20 mA output.
RERANGE	Adjust primary upper and lower range values.
CALDATE	Enter the calibration date.
ADJ 4mA causes the following four submenus.	
A 4mA∆∆	Increase 4 mA output by large step.
A 4mA∇∇	Decrease 4 mA output by large step.
A 4mA∆	Increase 4 mA output by small step.
A 4mA∇	Decrease 4 mA output by small step.
ADJ 20mA causes the following four submenus.	
A 20mA∆∆	Increase 20 mA output by large step.
A 20mA∇∇	Decrease 20 mA output by large step.
A 20mA∆	Increase 20 mA output by small step.
A 20mA∇	Decrease 20 mA output by small step.
RERANGE causes the following two submenus.	
M1 URV	Adjust upper range value.
M1 LRV	Adjust lower range value.

— NOTE

It is not necessary to use the **ADJ4mA** or **ADJ20mA** menu selections unless there is a plant requirement to make the 4 and 20 mA output values exactly match readings on certain plant calibration equipment and the **ZERO** and **SPAN** operations done result in a small but unacceptable difference between the transmitter mA output and the test equipment mA readout values.

Proceed to calibrate your transmitter by using the **Next** key to select your item and the **Enter** key to specify your selection per Figures 35 and 36. At any point in the calibration you can **Cancel**, restore your prior calibration and return to the on-line mode or **Save** your new calibration.



(continued on next

Figure 35. Calibration Structure Diagram

CAL AT0: To set or reset the zero point at zero pressure, apply zero differential pressure to the transmitter and, at display of **CAL AT0**, press **Enter**. This can be done whether LRV is zero or not. Completion is indicated by the display **AT0 Done**.

CAL LRV: To set or reset 0% of range input, apply differential pressure to the transmitter equal to the lower range value (LRV) in the transmitter database and, at display of **CAL LRV**, press **Enter**. Completion is indicated by the display **LRV Done**.

CAL URV: 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 URV**, press **Enter**. Completion is indicated by the display **URV Done**.

ADJ4mA: If you configured your transmitter operating mode as 4 to 20 mA, you can adjust the 4 mA output by going to **ADJ4mA** using the **Next** button and press **Enter**. This menu item is bypassed if you configured your transmitter operating mode as digital.

To increase the 4 mA output by a large (0.025 mA) step, press **Enter** at the display **A 4mA**ΔΔ. To decrease it by a large step, go to the display **A 4mA**∇∇ by pressing the **Next**

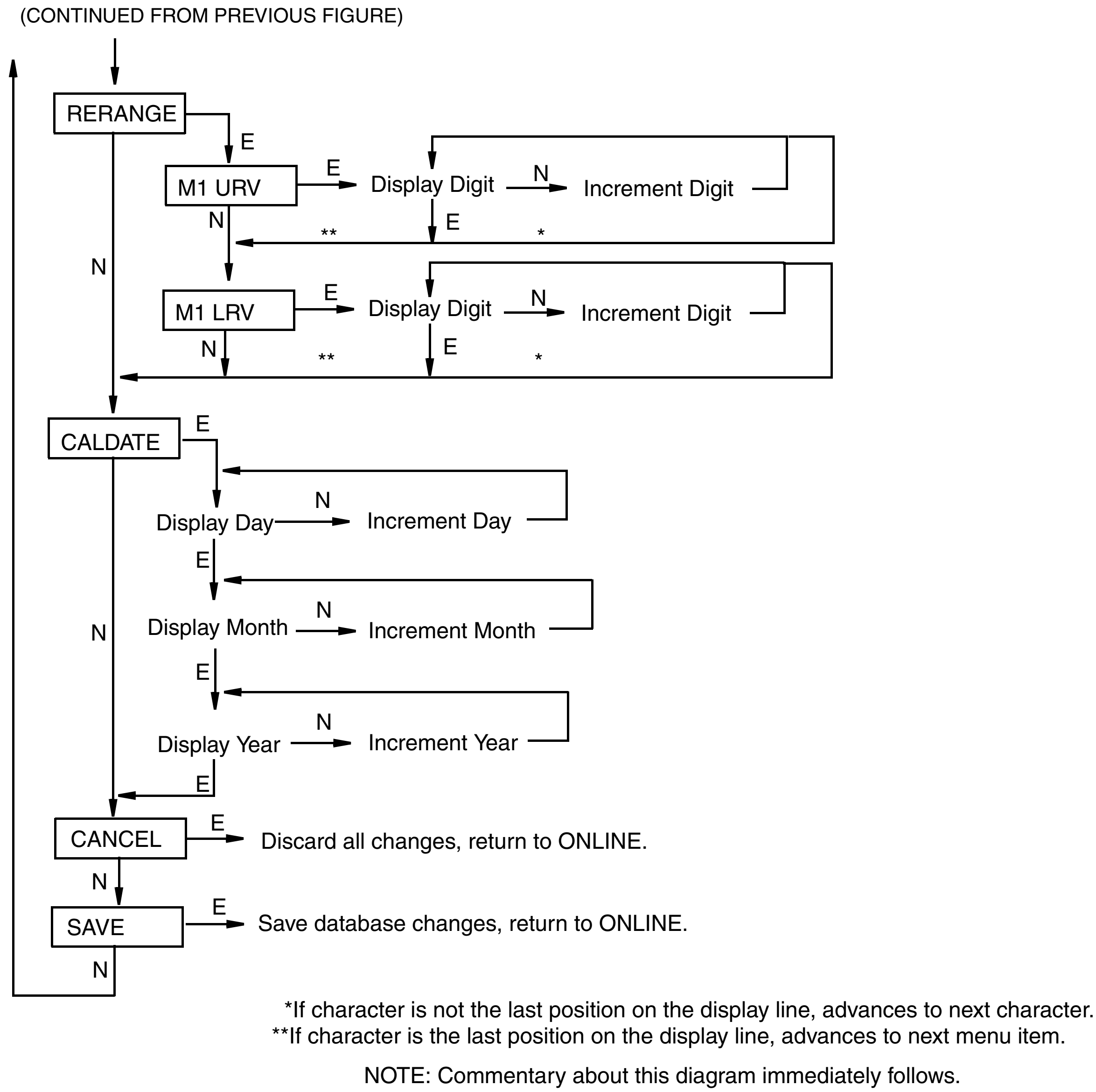


Figure 36. Calibration Structure Diagram (Continued)

Commentary on Figure 36

RERANGE:

To adjust 100% and 0% range values, go to **Rerange** with the **Next** button and press **Enter**. You can then adjust **M1 URV** and/or **M1 LRV** in the following two submenus.

— **NOTE**

If M1 is in square root mode, regardless of engineering units selected, **RERANGE** must be done in “default” pressure units. The “default” pressure units are:
• In **inH2O**, if M2 is a type of square root.
• In **M2 EGU** units, if M2 is linear.
The bottom line of the display indicates “default" units during **RERANGE**. Following **RERANGE**, the display automatically switches back to the configured engineering units.

M1 URV:

To edit the upper range value, press **Enter** at the prompt **M1 URV**.

M1 LRV:

Similar to M1URV immediately above.

— **NOTE**

M1 LRV is bypassed if **M1 MODE** is configured as square root since **M1 LRV** must be zero.

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.

Zero Adjustment Using External Zero Button

An external zero adjustment mechanism in the electronics housing allows local rezeroing of the transmitter output without removing the electronics compartment cover. The mechanism is magnetically activated through the housing wall to prevent moisture from entering the enclosure. Zeroing is accomplished when the external zero button is depressed.

To use this feature:

1. Unlatch the external zero button by turning it 90° in a counterclockwise direction so that the screwdriver slot lines up with the two holes in the face of the adjacent part. Do **not** push the button in with the screwdriver while doing this.
2. With the applied process differential pressure (LRV) at the desired value, press the button. The zero output of 4 mA is set at this pressure. If the transmitter contains the optional display, the display indicates **ZEROED**. Other possible messages are: **DISABLD** if **EX ZERO** is configured **EXZ DIS**, **WAIT20S** if the transmitter has just been powered or a rezeroing has just been accomplished, and **IGNORED** if the transmitter is not in the on-line mode.

— **NOTE**

For the optional display and the digitally transmitted measurement to be correct, the applied pressure must be equal to the value stored in the database for LRV. See “General Calibration Notes” on page 39

3. If additional rezeroing is required after Steps 1 and 2 have been accomplished, wait 20 seconds and repeat Step 2.
4. Relatch the external zero button by turning it 90° in a clockwise direction to prevent accidental pressing of the button. Do **not** push the button in with the screwdriver while doing this.

Error Messages

Table 6. 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 user attempts an action that is write protected.
ZERO	Internal offset too large	BADZERO	Check applied pressure, configured **M1 LRV** and configured **M1 EOFF**.
SPAN	Slope too large or too small	BADSPAN	Check applied pressure, configured **M1 LRV** and configured **M1 EFAC**.
M1 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.
	M1 URV = M1 LRV	LRV=URV	Cannot set span to 0. Check entry. Check **M1 LRV**.
	M1 turndown exceeds limit	BADTDWN	Check entry. Check **M1 LRV**.
	URV < 0 with M1 or M2 SqRt	URV<LRV	Square root mode with nonzero LRV is not valid. Change LRV to 0.
M1 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 **M1 URV**.
	M1 turndown exceeds limit	BADTDWN	Check entry. Check **M1 URV**.

5. Configuration

Configurable Parameters

Table 7 lists all the configurable parameters and the factory default for the IDP25-T and IDP50-T Transmitters. The factory default values have been customized if the transmitter was ordered with optional feature -C2. The table also shows which parameters are configurable with the integral vs. remote configurators.

Table 7. Configurable Parameters

Parameter	Capability	Factory Default	Configurable with		Application Requirement
			Integ. Indic.	Remote Config.	
Descriptors					
Tag Number	8 characters max	Tag Number	No	Yes	
Descriptor	16 characters max	Tag Name	No	Yes	
Message	32 characters max	Inst Location	No	Yes	
Input					
Calibrated Range	LRV to URV in units listed in (a) below	See (b) below when not specified per S.O.	Yes	Yes	
Output					
Measurement #1 Output (PV)	4 to 20 mA or Fixed Current. Specify Poll Address (1-15) for Fixed Current.	4 to 20 mA	Yes	Yes	
Measurement #1 Mode	Linear or type of square root in (d) below	Linear	Yes	Yes	
Measurement #1 EGUs	If linear, select from units listed in (a) below; If Sq.Rt., select from units listed in (c) below	Units of Calibrated Range	Yes	Yes	
Measurement #2 Mode (SV)	Linear or type of square root in (d) below	Linear	Yes	Yes	
Measurement #2 EGUs	If linear, select from units listed in (a) below; If Sq.Rt., select from units listed in (c) below	Units of Calibrated Range	Yes	Yes	
Temp. Sensor Fail Strategy	Normal oper. or failsafe	Fail-safe	Yes		
Fail-safe	High or Low	High	Yes	Yes	
External Zero	Enabled or Disabled	Enabled	Yes	Yes	

Table 7. Configurable Parameters (Continued)

Parameter	Capability	Factory Default	Configurable with		Application Requirement
			Integ. Indic.	Remote Config.	
Damping	0 to 32 seconds.	None	Yes	Yes	
Poll Address	0 - 15	0	Yes	Yes	
LCD Indicator (e)	Meas #1 EGU or % Lin	Meas #1 EGU	Yes	No	

(a) psi, inHg, ftH_2O, inH_2O, atm, bar, mbar, MPa, kPa, Pa, kg/cm^2, g/cm^2, mmHg, torr, mmH_2O.

(b) ISpan Code B: 0 to 200 inH_2O; Span Code C: 0 to 1000 inH_2O

(c) gal/s, gal/m, gal/h, gal/d, Mgal/d, ft^3/s, ft^3/m, ft^3/h, ft^3/d, Igal/s, Igal/m, Igal/h, Igal/d, l/s, l/m, l/h, Ml/d, m^3/s, m^3/m, m^3/h, m^3/d, bbl/s, bbl/m, bbl/h, bbl/d, %flow.

(d) Square root with cutoff below 1% of calibrated pressure range or with linear below 4% of calibrated pressure range.

(e) Measurement #2 can be displayed at any time by pressing the **Enter** button regardless of the local display configuration. This reverts to Measurement #1 or % Lin (as configured) when power is cycled off and on.

Configuration Using a PC50

To configure the transmitter using a PC50 Configurator, follow the procedure in MI 020-501 and MI 020-520.

Configuration Using a HART Communicator

To configure the transmitter using a HART Communicator, follow the procedure in MI 020-366.

Configuration Using the Optional Local Display

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 8. The standard factory default configuration is also given in this table.

The standard factory default configuration is not used if custom configuration option -C2 has been specified. Option -C2 is a full factory configuration of all parameters to the user's specifications.

— NOTE

1. 1. You can configure most parameters using the local display. However, for more complete configuration capability, use a HART Communicator or PC-Based configurator.

2. 2. During configuration, a single change can 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.

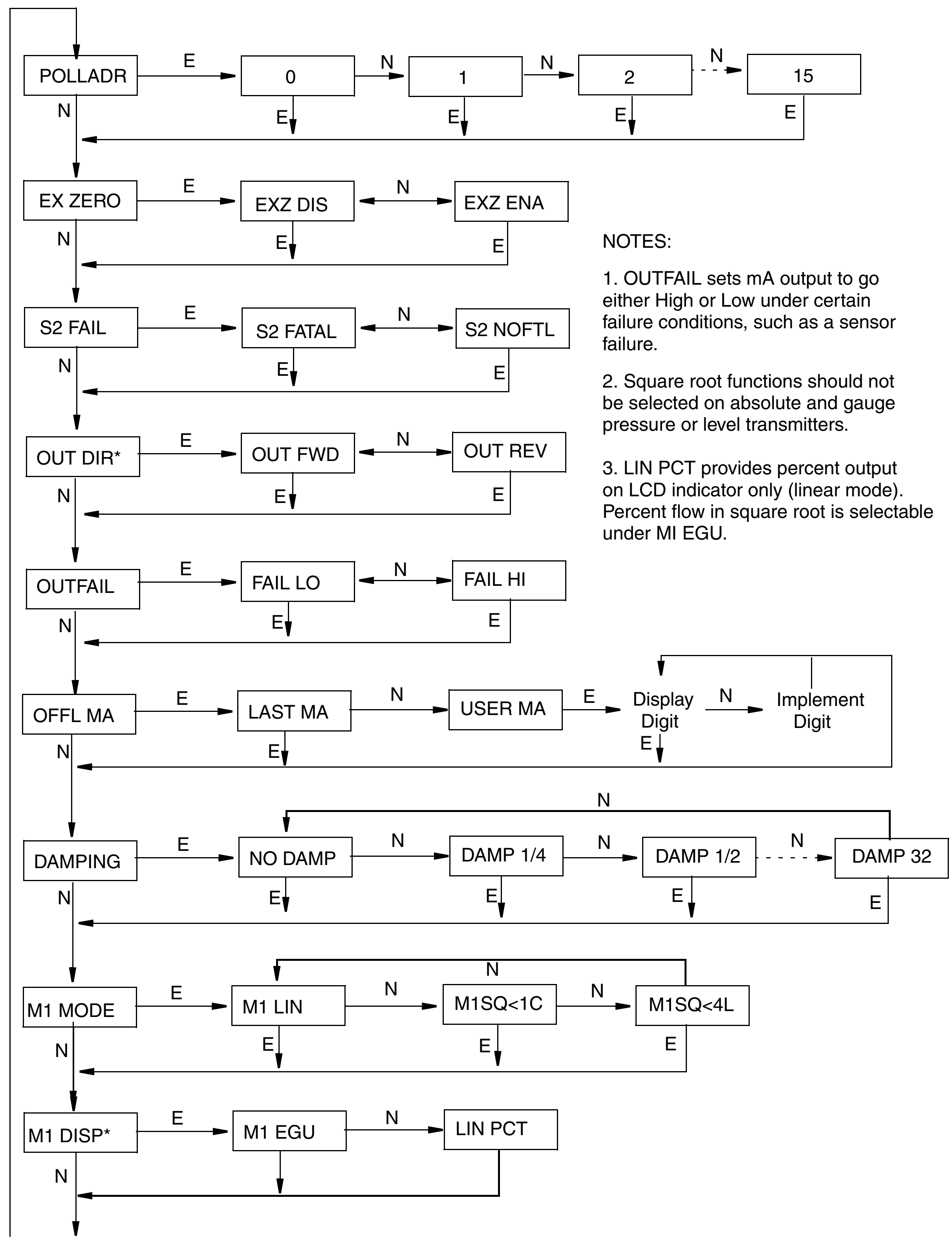
Table 8. Configuration Menu

Item	Description	Initial Factory Configuration
POLLADR	Poll Address: 0 - 15	0
EX ZERO[a]	External Zero: enable or disable	Enable
S2 FAIL	Temperature Sensor Failure Strategy: S2FATAL or S2NOFTL	S2FATAL
OUT DIR	4 to 20 mA Output: forward or reverse	Forward
OUTFAIL	4 to 20 mA Output: fail mode output - low or high	High
OFFL MA	4 to 20 mA Output in offline mode - last or user set	USER MA
DAMPING	Damping: none, 1/4, 1/2, 1, 2, 4, 8, 16, or 32 seconds	None
M1 MODE	Output: linear or type of square root[b]	Linear
M1DISP	Local Indicator Display in linear mode: in percent or engineering units	M1EGU
M1 EGU	User-Defined Engineering Units	inH_2O or psi
RERANGE	Adjustment of 100% and 0% range limits	- - -
M1 URV	Primary Upper Range Value	URL
M1 LRV	Primary Lower Range Value	0
M2 MODE	Output: linear or type of square root	Linear
M2 EGU	User-Defined Engineering Units	Same as M1 EGU
DISPLAY	**Show 1, Show 2, or Toggle (between M1 and M2)**	Show 1
CALDATE	Calibration Date	- - -
ENA PWD	Enable password; no password, configuration only, or configuration and calibration	NO PWD
CFG PWD	User set configuration password (six characters)	- - -
CAL PWD	User set calibration password (six characters)	- - -
SET GDB	Rewrite all calibration and configuration values with default values	- - -

(a) Applies only if transmitter contains External Zero option.

(b) Square root is not applicable to absolute pressure, gauge pressure, and flange level measurement.

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



NOTES:

1. OUTFAIL sets mA output to go either High or Low under certain failure conditions, such as a sensor failure.

2. Square root functions should not be selected on absolute and gauge pressure or level transmitters.

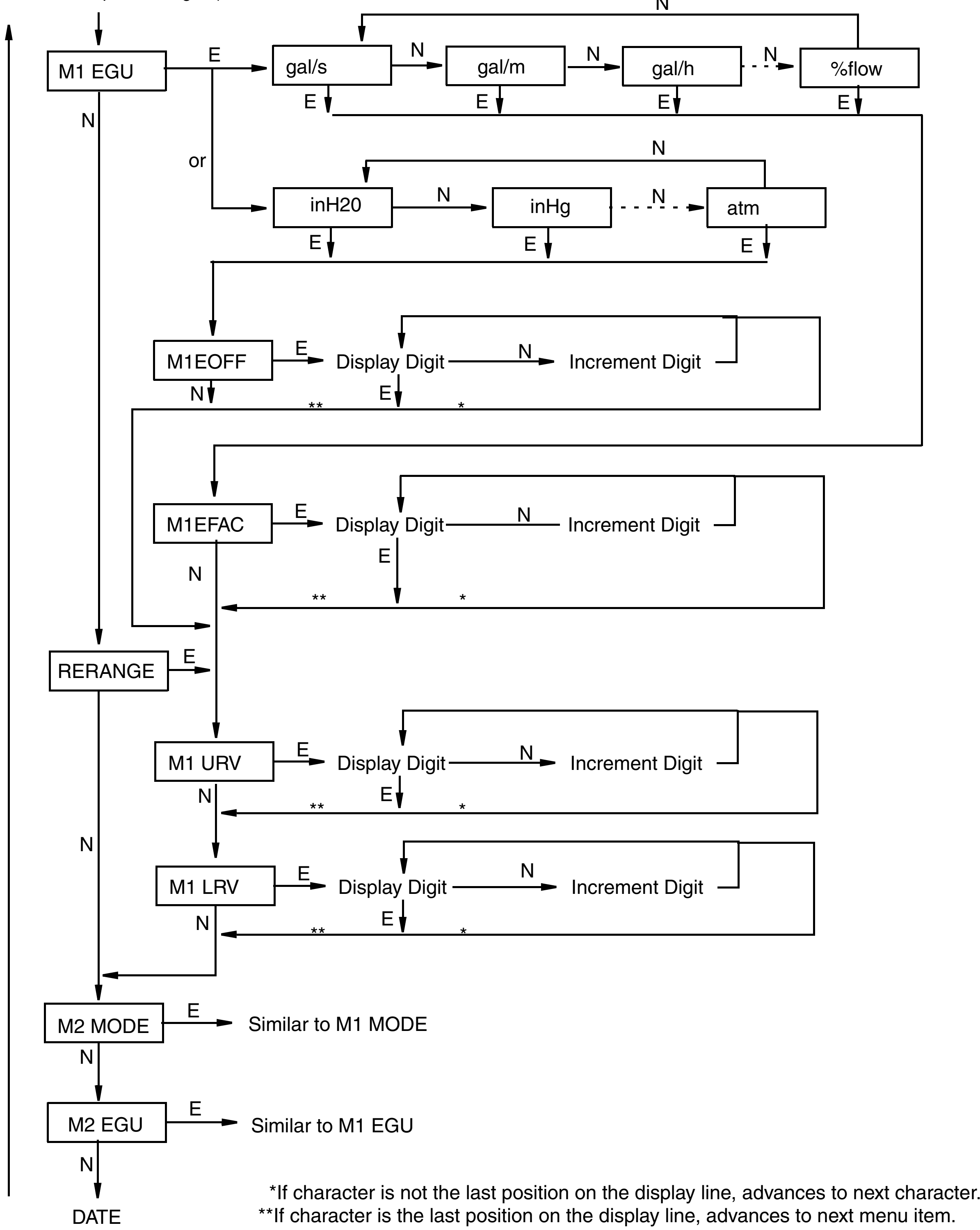
3. LIN PCT provides percent output on LCD indicator only (linear mode). Percent flow in square root is selectable under MI EGU.

(continued on next figure)

*Linear Mode only.

Figure 37. Configuration Structure Diagram

(continued from previous figure)



(continued on next figure)

Figure 38. Configuration Structure Diagram (Continued)

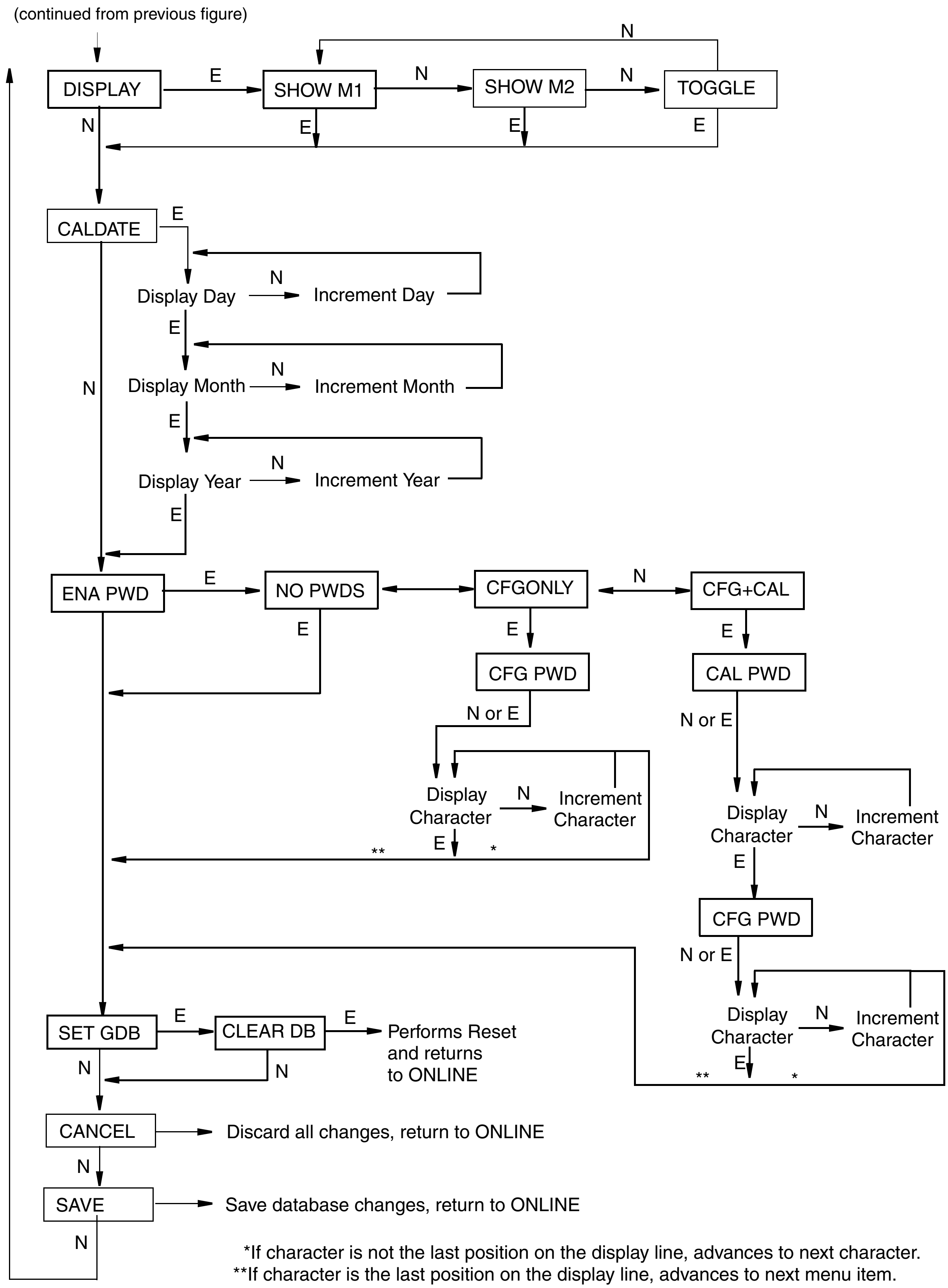


Figure 39. Configuration Structure Diagram (Continued)

Commentary on Configuration Structure Diagram

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

POLLADR:

To configure the transmitter poll address, press **Enter**. Use the **Next** button to select an address of **0** through **15**, then press **Enter**.

EX ZERO:

The External Zero feature allows the optional external zero pushbutton to be disabled for additional security. To configure this feature, go to **EX ZERO** with the **Next** button and press **Enter**. Use the **Next** button to select **EXZ DIS** or **EXZ ENA** and press **Enter**.

S2 FAIL:

To configure the temperature sensor failure strategy, go to **S2 FAIL** with the **Next** button and press **Enter**. Use the **Next** button to select **S2 FATAL** (to have the output go to that configured in **OUTFAIL**) or **S2 NOFTL** (to continue operation with a temperature sensor failure).This parameter has no effect if **POLLADR** is configured any number from **1** through **15** and is bypassed if **M1 MODE** or **M2 MODE** is configured as square root.

OUT DIR:

To configure the Output Direction, go to **OUT DIR** with the **Next** button and press **Enter**. Use the **Next** button to select **OUT FWD** (4 - 20 mA) or **OUT REV** (20 - 4 mA) and press **Enter**. This parameter has no effect if **POLLADR** is configured any number from **1** through **15** and is bypassed if **M1 MODE** or **M2 MODE** is configured as square root.

OUTFAIL:

The Outfail feature provides high or low output with certain malfunctions. To configure the fail mode output, go to **OUTFAIL** with the **Next** button and press **Enter**. Use the **Next** button to select **FAIL LO** or **FAIL HI** and press **Enter**. This parameter has no effect if **POLLADR** is configured any number from **1** through **15**.

OFFL MA:

The Off-line mA feature enables you to set the output to a specified value or to the last value if the transmitter goes off-line. To configure the off-line output, go to **OFFL MA** with the **Next** button and press **Enter**. Use the **Next** button to select **LAST MA** or **USER MA** and press **Enter**. If you selected **USER MA**, press **Enter** again at the display of digits. Then use the **Next** button to step through the library of digits to select the desired first digit, then press **Enter**. Your selection is entered and the second character flashes. Repeat this procedure until you have entered the last digit. Then use the **Next** button to move the decimal point to its desired location and press **Enter**. The display advances to the next menu item.

DAMPING:

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**.

M1 MODE:

To configure the mode of the primary output, go to **M1 MODE** with the **Next** button and press **Enter**. Use the **Next** button to select **M1 LIN** (linear), **M1SQ<1C** (square root with cutoff below 1% of calibrated pressure range), or **M1SQ<4L** (square root with linear below 4% of calibrated pressure range) and press **Enter**. You cannot configure this parameter as square root if **OUT DIR** was configured as **OUT REV**.

M1 DISP:

To configure the optional local indicator for percent in linear mode, go to **M1 DISP** with the **Next** button and press **Enter**. Use the **Next** button to select **M1 EGU** or **LIN PCT** and press **Enter**. **LIN PCT** only provides percent readings on the local display. **M1EGU** is used for remote communication of Measurement #1, even if **LIN PCT** is selected. This parameter has no effect if **POLLADR** is configured any number from **1** through **15**.

M1 EGU:

To configure pressure or flow engineering units for your display and transmission, go to **M1 EGU** with the **Next** button and press **Enter**. If **M1 MODE** is configured as **M1 LIN**, you are asked to specify one of the following pressure labels: **inH$_2$O**, **inHg**, **ftH$_2$O**, **mmH$_2$O**, **mmHg, psi**, **bar**, **mbar**, **g/cm^2**, **kg/cm^2**, **Pa**, **kPa**, **MPa**, **torr**, **atm**, **hW60** (inH$_2$O at 60°F), or **mH2O**. Your transmitter then automatically adjusts **M1EFAC** (engineering factor), **M1 URV** (upper range value), and **M1 LRV** (lower range value). **M1EOFF** is set to zero.

If **M1 MODE** is configured as **M1 SQ<1C** or **M1SQ<4L**, you are asked to specify one of the following flow labels: **%flow, gal/s**, **gal/m**, **gal/h**, **gal/d**, **Mgal/d**, **ft^3/s**, **ft^3/m**, **ft^3/h**, **ft^3/d**, **Igal/s**, **Igal/m**, **Igal/h**, **Igal/d**, **l/s**, **l/m**, **l/h**, **Ml/d**, **m^3/s**, **m^3/m**, **m^3/h**, **m^3/d**, **bbl/s**, **bbl/m**, **bbl/h**, **bbl/d**, **t/h**, **lb/h**, **kg/h**, **Nm^3/h** (normal m^3/h) **Sm^3/h** (standard m^3/h), **Am^3/h** (actual m^3/h) or **MMSCFD** (million scfd). If you have configured flow units before, your transmitter then automatically adjusts **M1EFAC** (engineering factor). If you have not, you must manually adjust **M1EFAC** as follows:

M1EFAC:

This parameter is used to input the numerical relationship between the measured span in pressure units and the displayed (and transmitted) span in flow units. It is the displayed URV in flow units (which is also the span in flow units since flow ranges must be zero-based).

Example:

For a 200 inH$_2$O transmitter with a measured range of 0 to 100 inH$_2$O and displayed range of 0 to 500 gal/m, **M1EFAC** = 500.

To edit the span in your configured flow units, press **Enter** at the prompt **M1EFAC**. Use the procedure “Entering Numerical Values” on page 36 to edit this parameter.

RERANGE:

To adjust 100% and 0% range limits, go to **RERANGE** with the **Next** button and press **Enter**. You can then adjust **M1 URV** and/or **M1 LRV** in the following two submenus.

— NOTE

If **M1 MODE** is in a square root mode, regardless of engineering units selected, **RERANGE** is automatically done in the following "default" pressure units:

- **inH2O**, if **M2 MODE** is a type of square root.
- **M2 EGU** units, if **M2 MODE** is linear.

The bottom line of the display indicates "default units" during **RERANGE**. Following **RERANGE**, the display automatically switches back to the configured engineering units.

M1 URV:

To edit the upper range value, press **Enter** at the prompt **M1 URV**. Use the procedure "Entering Numerical Values" on page 36 to edit this parameter.

M1 LRV:

Similar to M1URV immediately above.

M1 LRV is bypassed if **M1 MODE** is configured as square root since **M1 LRV** must be zero.

M2 MODE:

M2 is a secondary measurement that is read by the HART Communicator and can be displayed on the optional display. You might use this feature to display M1 in flow units and M2 in comparable pressure units. To configure this parameter, go to **M2 MODE** with the **Next** button and press **Enter**. Use the next button to select **M2 LIN** (linear), **M2SQ<1C** (square root with cutoff below 1% of calibrated pressure range), **M2SQ<4L** (square root with linear below 4% of calibrated pressure range), and press **Enter**.

M2 EGU:

Similar to M1 EGU.

DISPLAY:

To display M1, M2, or to toggle between M1 and M2, go to **DISPLAY** with the **Next** button and press **Enter**. Use the **Next** button to select **SHOW M1**, **SHOW M2**, or **TOGGLE** and press **Enter**.

CALDATE:

This is not a required entry but can be used for record-keeping 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 not required for either calibration or configuration), **CFGONLY** (password required to configure but not to calibrate), or **CFG+CAL** (passwords 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.

— NOTE

In normal operation, the CAL PWD allows access to only calibration mode. The CFG PWD allows access to both configuration and calibration.

—⚠ CAUTION

Record your new password before saving changes to the database.

SET GDB:

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.

—⚠ CAUTION

Any calibration and configuration values that you have entered will be lost. Therefore, **SET GDB** should **not** be selected if your transmitter is functioning normally.

Character Lists

Table 9. Alphanumeric Character List

Character List*	
@	‘
, (comma)	(
A-Z (uppercase)	)
[	*
\	+
]	-
^	.
_ (underscore)	/
space	0-9
!	:
“	;
#	<
$	>
%	=
&	?

*List only applies to HART Communicator not to optional local display.

Table 10. Numeric Character List

Character List
–
. (decimal point)
0 through 9

Error Messages

Table 11. Configuration 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 user attempts an action that is write protected.
M1 MODE (being changed to square root)	M1 LRV ≠ 0	LRVnot0	Square root mode with nonzero LRV is not valid. Change **M1 LRV** to 0.
	M1 URV < 0	URV<LRV	Square root mode with negative URV is not valid. Change **M1 URV** to positive value.
	OUT DIR is OUT REV	URV<LRV	Square root mode with URV < LRV is not valid. Change **M1 LRV** to 0 and **M1 URV** to positive value.
	M1EFAC < 0	-M1EFAC	Negative **M1 EFAC** is not valid. Change **M1 EFAC** to positive value.
	M2EFAC < 0	-M2EFAC	Negative **M2 EFAC** is not valid. Change **M2 EFAC** to positive value.
	M1EFAC = 0	0M1EFAC	**M1 EFAC** = 0 is not valid. Change **M1 EFAC** to positive value.
	M2EFAC = 0	0M2EFAC	**M2 EFAC** = 0 is not valid. Change **M2 EFAC** to positive value.
	M1EOFF ≠ 0 or M2EOFF ≠ 0	BADEOFF	Square root mode with nonzero **M1 EOFF** and **M2 EOFF** is not valid. Change **M1 EOFF** and **M2 EOFF** to 0.
M1EFAC	M1EFAC < 0	-M1EFAC	Negative **M1 EFAC** is not valid. Change **M1 EFAC** to positive value.
	M1EFAC = 0	0M1EFAC	**M1 EFAC** = 0 is not valid. Change **M1 EFAC** to positive value.
M1 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.
	M1 URV = M1 LRV	LRV=URV	Cannot set span to 0. Check entry. Check **M1 LRV**.
	M1 turndown exceeds limit	BADTDWN	Check entry. Check **M1 LRV**.
	URV <0 with M1 or M2 SqRt	URV<LRV	Square root mode with nonzero LRV is not valid. Change **M1 LRV** to 0.

Table 11. Configuration Error Messages (Continued)

Parameter	Condition Tested	Error Message	User Action
M1 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 **M1 URV**.
	M1 turndown exceeds limit	BADTDWN	Check entry. Check **M1 URV**.
M2 MODE (being changed to square root)	M1 LRV ≠ 0	LRVnot0	Square root mode with nonzero LRV is not valid. Change **M1 LRV** to 0.
	M1 URV < 0	URV<LRV	Square root mode with negative URV is not valid. Change **M1 URV** to positive value.
	OUT DIR is OUT REV	URV<LRV	Square root mode with URV < LRV is not valid. Change **M1 LRV** to 0 and **M1 URV** to positive value.
	M1EFAC < 0	-M1EFAC	Negative **M1 EFAC** is not valid. Change **M1 EFAC** to positive value.
	M2EFAC < 0	-M2EFAC	Negative **M2 EFAC** is not valid. Change **M2 EFAC** to positive value.
	M1EFAC = 0	0M1EFAC	**M1 EFAC** = 0 is not valid. Change **M1 EFAC** to positive value.
	M2EFAC = 0	0M2EFAC	**M2 EFAC** = 0 is not valid. Change **M2 EFAC** to positive value.
	M1EOFF ≠ 0 or M2EOFF ≠ 0	BADEOFF	Square root mode with nonzero **M1 EOFF** and **M2 EOFF** is not valid. Change **M1 EOFF** and **M2 EOFF** to 0.
M2EFAC	M2EFAC < 0	-M2EFAC	Negative **M2 EFAC** is not valid. Change **M2 EFAC** to positive value.
	M2EFAC = 0	0M2EFAC	**M2 EFAC** = 0 is not valid. Change **M2 EFAC** to positive value.

6. 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.

Error Messages

For error messages displayed on the HART Communicator refer to MI 020-366.

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 the following parts lists:

IDP25 Differential Pressure Transmitter: PL 009-013

IDP50 Differential Pressure Transmitter: PL 009-014

Replacing the Terminal Block Assembly

1. Turn off transmitter power source.
2. Remove the Field Terminals and the Electronics compartment covers by rotating them counterclockwise. Screw in 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.
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.
5. Remove the four socket head screws securing the terminal block.
6. Disconnect the terminal block cable connector from the electronics module.
7. Remove the terminal block and the gasket under it.
8. Connect the new terminal block cable connector to the electronics module.
9. Install the new terminal block and new gasket and reinstall the four screws to 0.67 N·m (6 in·lb) in several even increments.
10. Reinstall the electronics module (and digital display if applicable).
11. 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 each cover contacts the

housing metal-to-metal. If cover locks are present, lock the cover per the procedure described in “Cover Locks” on page 28.

12. Turn on transmitter power source.

Replacing the Electronics Module Assembly

To replace the electronics module assembly, refer to Figure 40 and proceed as follows:

1. Turn off transmitter power source.
2. Remove the electronics compartment cover by rotating it counterclockwise. Screw in 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

The electronics module is “one assembly” at this point and is electrically and mechanically connected to topworks with a flexible ribbon signal cable, a 2-wire power cable, and in some cases, a cable for an external zero pushbutton. Do **not** exceed the slack available in these cables when removing the assembled 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. Tighten the two screws that secure the module to the housing.
7. 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.
8. 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 28.
9. Turn on transmitter power source.

The module replacement procedure is now complete.

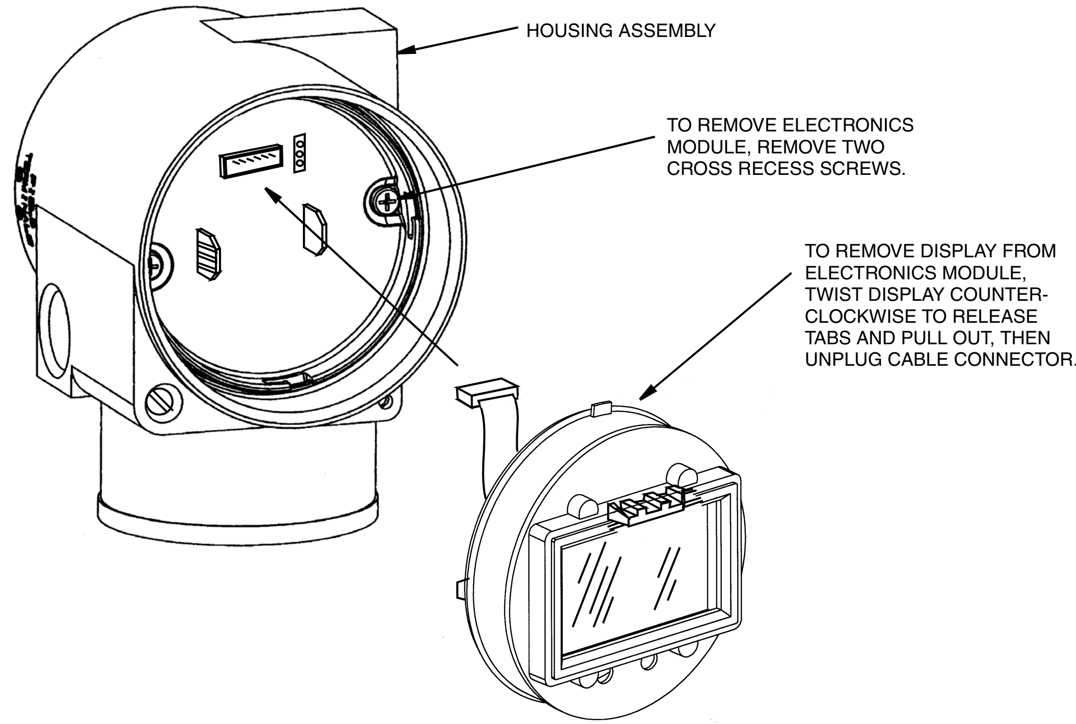


Figure 40. Replacing the Electronics Module Assembly and Display

Removing and Reinstalling a Housing Assembly

To remove and reinstall a housing assembly, refer to Figure 40 and proceed as follows:

1. Remove the electronics module per Steps 1 through 5 in the previous procedure.
2. Remove the housing by rotating it counterclockwise (when viewed from the top) using caution to avoid damaging the ribbon cables.
3. Inspect the sensor O-ring and lubricate if necessary with silicone lubricant (Part Number 0048130 or equivalent).
4. Reinstall the housing by reversing Step 2.
5. Reinstall the electronics module per Steps 6 through 9 in the previous procedure.

Adding the Optional Display

To add the optional display, refer to Figure 40 and proceed as follows:

1. Turn off transmitter power source.
2. Remove the electronics compartment cover by rotating it counterclockwise. Screw in 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 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 28.
6. Turn on transmitter power source.

Replacing the Sensor Assembly

To replace the sensor assembly, refer to Figures 41 and 42 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 the gaskets in the process covers.
5. Install the process covers and housing on the 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 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 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.

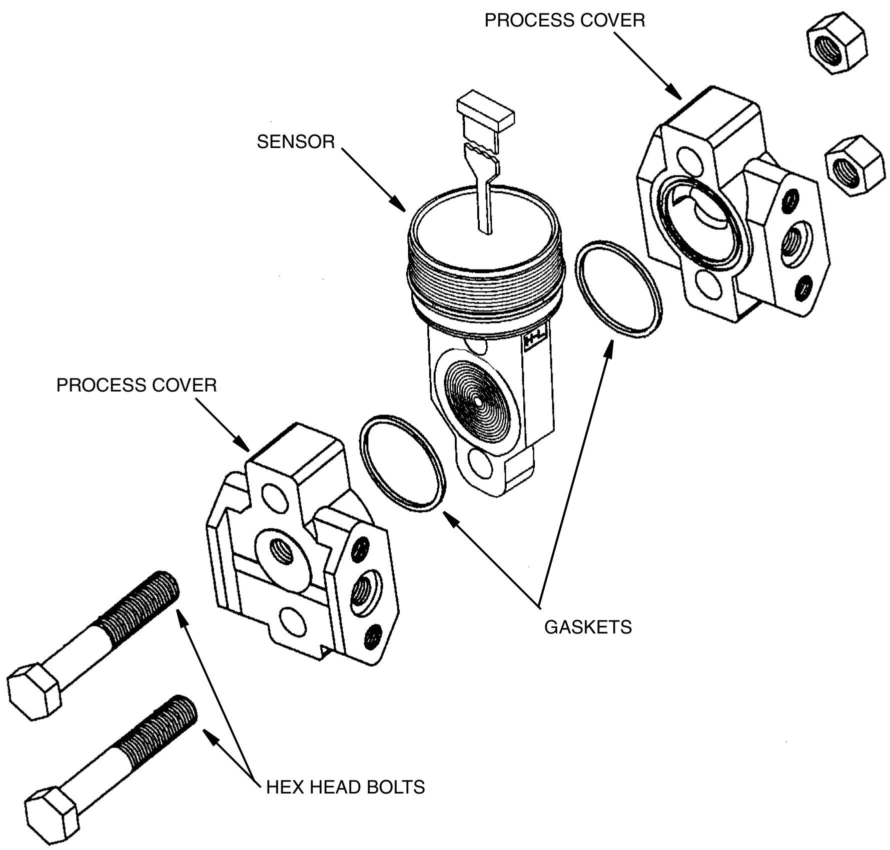


Figure 41. Replacing the Sensor Assembly

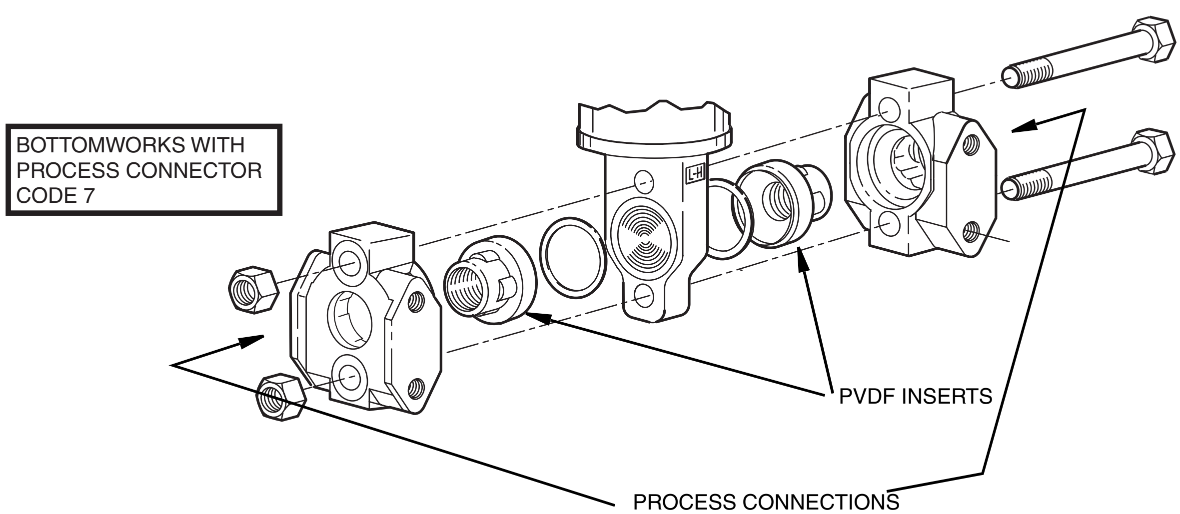


Figure 42. Replacing the Sensor Assembly (pvdf Inserts)

Rotating Process Covers for Venting

As received, your IASPT 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 the transmitter 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 43.

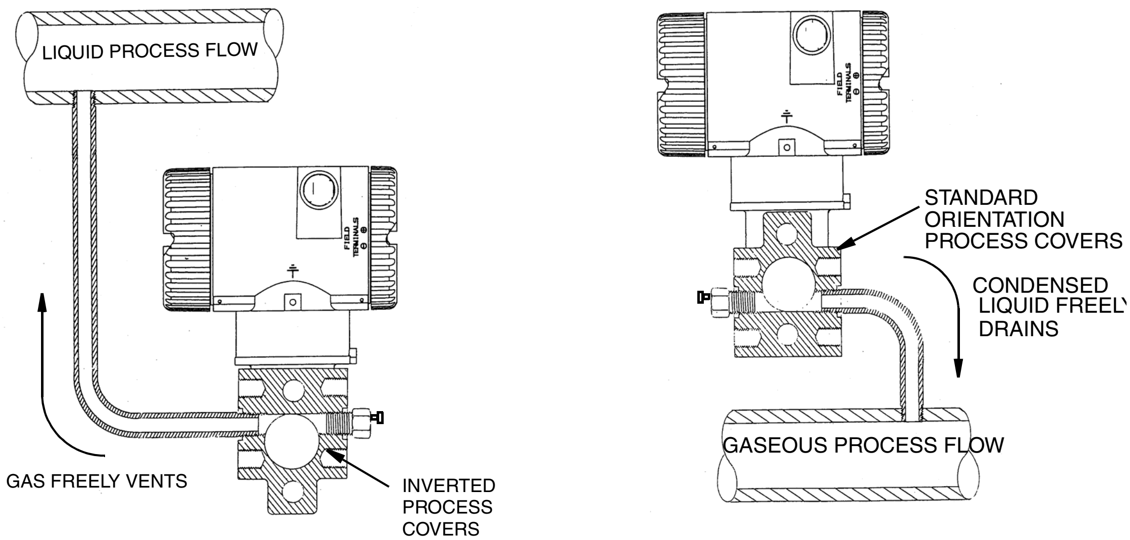


Figure 43. Sensor Cavity Venting and Draining

To rotate the process covers, refer to Figure 41 and proceed as follows:

1. Turn off the transmitter power source and remove the transmitter from the process.
2. Remove the process covers from sensor by removing two hex head bolts.
3. Replace gaskets in process covers.
4. Rotate the process covers so that the longer tab is at the bottom.
5. Reinstall process covers and bolts. 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. Pressure test the sensor and process cover assembly by applying a hydrostatic pressure of 150% of the maximum static and overrange pressure (see "Standard Specifications" on page 5) 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.

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