Instruction

MI IDP25-F/IDP50-F
April 2010

I/A Series® Intelligent Pressure Transmitters

IDP25 and IDP50 Differential Pressure with FOUNDATION Fieldbus Communication

Installation, Operation, Calibration, Configuration, and Maintenance

invensys
Foxboro®

Contents

Figures ..... **v**

Tables ..... **vi**

1. Introduction **1**

General Description 1

Reference Documents 2

Transmitter Identification 3

Standard Specifications 5

Product Safety Specifications 9
- ATEX and IECEx Warnings 12
- ATEX Compliance Documents 12
- IECEx Compliance Documents 12

2. Installation **13**

Transmitter Mounting 13
- Process Mounting 13
- Manifold Mounted Transmitter 15
- Pipe or Surface Mounting 16

Venting and Draining 21
- Traditional Structure 21
- LP1 Low Profile Structure 21
- LP2 Low Profile Structure 22

Installation of Flow Measurement Piping 22

Filling System with Seal Liquid 25

Positioning the Housing 26

Positioning the Display 26

Setting the Write Protect Jumper 27

Cover Locks 27

Wiring 27
- Accessing Transmitter Field Terminals 28
- Wiring Notes 28
- Wiring the Transmitter 31

Putting a Differential Pressure Transmitter Into Operation 31

Taking a Differential Pressure Transmitter Out of Operation 32

Installing the Fieldbus Software 32

3. Operation Via Local Display **35**

Entering Numerical Values 36
Viewing the Database 37
Viewing the Pressure Range 37
Testing the Display 37

4. Calibration 39
Calibration Setup 39
Field Calibration Setup 39
Bench Calibration Setup 40
Calibration Using the Optional Local Display 41
Zero Adjustment Using External Zero Button 43
Calibration from a Fieldbus Host 44

5. Configuration 47
Configuration Using the Optional Local Display 47
Character Lists 54
Configuration From a Fieldbus Host 55
Configuration Procedure Using a Fieldbus Host 55
Application Specific Configurations 59
Changing the Primary Range Values
(Reranging) by Editing the Transducer Block Parameters 63
Disabling the Link Active Scheduler (LAS) 63

6. Maintenance 65
Troubleshooting 65
Simulation Mode 65
Restart 66
Switch Mode Checklist 67
Schedule Download Checklist 67
Block Errors 67
Interboard Communication Errors/Status 69
Parts Replacement 70
Replacing the Terminal Block Assembly 70
Replacing the Electronics Module Assembly 70
Removing and Reinstalling a Housing Assembly 72
Adding the Optional Display 73
Replacing the Sensor Assembly 73
Rotating Process Covers for Venting 75

Index 91

Figures

1	Transmitter Identification	3
2	Top Level Structure Diagram	4
3	Minimum Allowable Absolute Pressure vs. Process Temperature with Fluorinert Fill Fluid	7
4	Typical Mounting of an IDP Transmitter Supported by Process Piping	14
5	Typical Mounting of an IDP Transmitter Supported by a Bypass Manifold	15
6	Typical Mounting of IDP Transmitter on Coplanar Manifold	15
7	Pipe or Surface Mounted Transmitter Using a Standard Bracket	16
8	Examples of Mounting With a Standard Bracket	17
9	Details of a Universal Bracket	18
10	Mounting a Transmitter with Traditional Structure Using a Universal Bracket	19
11	Vertical Pipe Mounting a Transmitter with LP2 Structure Using a Universal Bracket	19
12	Horizontal Mounting a Transmitter with LP2 Structure Using a Universal Bracket	20
13	Vertical Mounting - Cavity Draining	21
14	Vertical Mounting - Cavity Venting	21
15	Horizontal Mounting - Cavity Venting	21
16	Vertical Mounting - Cavity Venting	22
17	Horizontal Mounting - Cavity Venting and Draining	22
18	Cavity Venting and Draining	22
19	Example of Horizontal Process Line Installation	24
20	Example of Vertical Process Line Installation	25
21	Housing Screw or Clip Location	26
22	Write Protection Jumper	27
23	Cover Lock Location	27
24	Accessing Field Terminals	28
25	Identification of Field Terminals	28
26	Wiring Diagram of Typical **Foundation** Fieldbus Transmitter Installation	30
27	Local Display Module	35
28	Top Level Structure Diagram	36
29	Display Test Segment Patterns	38
30	Field Calibration Setup	40
31	Bench Calibration Setup	41
32	Calibration Structure Diagram	42
33	Configuration Structure Diagram (1 of 3)	49
34	Configuration Structure Diagram (2 of 3)	50
35	Configuration Structure Diagram (3 of 3)	51
36	Simulation Jumper	65
37	Replacing the Electronics Module Assembly and Display	72
38	Replacing the Sensor Assembly	74
39	Replacing the Sensor Assembly (pvdf Inserts)	75
40	Sensor Cavity Venting and Draining	75

Tables

1	Reference Documents	2
2	Minimum Supply Voltage Requirements	9
3	Electrical Safety Specifications	11
4	Minimum Supply Voltage Requirements	29
5	Parameters Configurable from the Local Display	47
6	Alphanumeric Character List	54
7	Numeric Character List	54
8	Unit names and Unit Codes	56
9	Flow Applications	59
10	Pressure Applications	60
11	Open Tank or Dry Leg Level Applications	61
12	Wet Leg Level and Dual Seal Applications	62
13	Block Errors	67
14	Configuration Errors	68
15	Fieldbus Parameters	77

1. Introduction

General Description

The IDP25-F and IDP50-F 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 FOUNDATION fieldbus digital signal proportional to the differential pressure or to the square root of the 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 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-F 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 TI 037-096, available from Invensys.

The measurement signal is a FOUNDATION fieldbus digital signal for full communication with any FOUNDATION fieldbus host equipped with a FOUNDATION fieldbus Interface Module. The communication functionality permits you to reconfigure a transmitter from a remote fieldbus host personal computer, or I/A Series system equipped with a FOUNDATION fieldbus Interface Module.

FOUNDATION fieldbus is an all digital, serial, two-way communication system that runs at 31.25 kbps, interconnecting a fieldbus host and various field devices such as process sensors/transmitters, valves/actuators, and controllers — all connected in parallel to the same bus. Both ends of the bus must be terminated with standard characteristic impedance networks to minimize reflected signals. Power to all devices is supplied by a dc fieldbus power source connected anywhere on the bus.

— NOTE

The power supply must be a fieldbus-specific power supply.

The communication signals between a fieldbus host and all other bus-connected devices, which are superimposed on the dc power signal on the bus, are controlled according to a strict cycle schedule and protocol. During intervals when control and data signals are not being transmitted according to the schedule, the devices are free to communicate with each other for such functions as local PID control, trend recording/indicating, etc.

FOUNDATION fieldbus uses “Function Blocks” (standardized automation functions) to implement measurement and control strategies. These blocks may be distributed throughout the array of devices in whatever manner is most efficient. A major advantage of the concept is that devices from many manufacturers may be intermixed in a seamless and integrated manner. Since all devices in a system connect to the same wire pair, the system requires less wire than comparable systems, fewer intrinsic safety barriers and fewer interface cards, resulting in significant cost savings.

The Foxboro FOUNDATION fieldbus system implements the following blocks — Resource Block, Transducer Block, Analog Input (AI) Blocks, and Proportional Integral Derivative (PID) Block. The Resource Block contains all parameters needed to define the device description for the transmitter. The Transducer Block handles all configurable parameters that define the sensor, transmitter hardware, and manufacturer-specific data. The AI Blocks contain all configurable parameters needed to define the input data for use with the other function blocks. The PID Block contains parameters required for PID control.

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
Instructions	
MI 020-328	Instruction – Bubble Type Installation for Liquid Level
MI 020-329	Instruction – High Accuracy Flow Measurement
MI 020-360	Instruction, Wiring Guidelines for Foxboro FOUNDATION fieldbus Transmitters
MI 020-369	Instruction – Pressure Seals
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 sensor board 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.

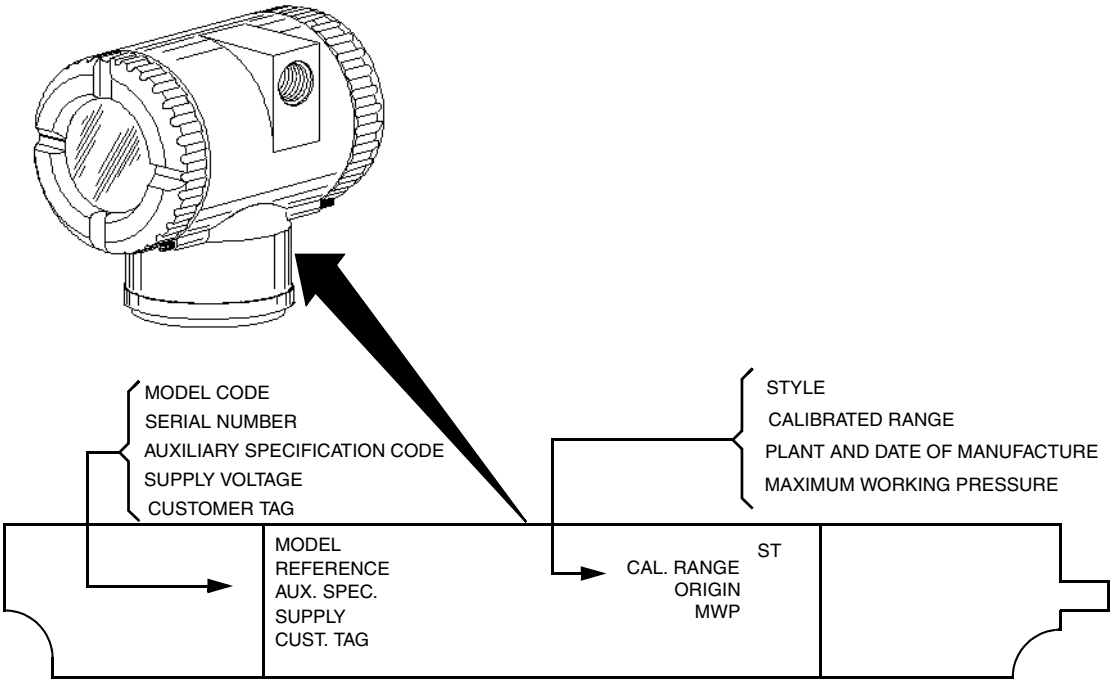


Figure 1. Transmitter Identification

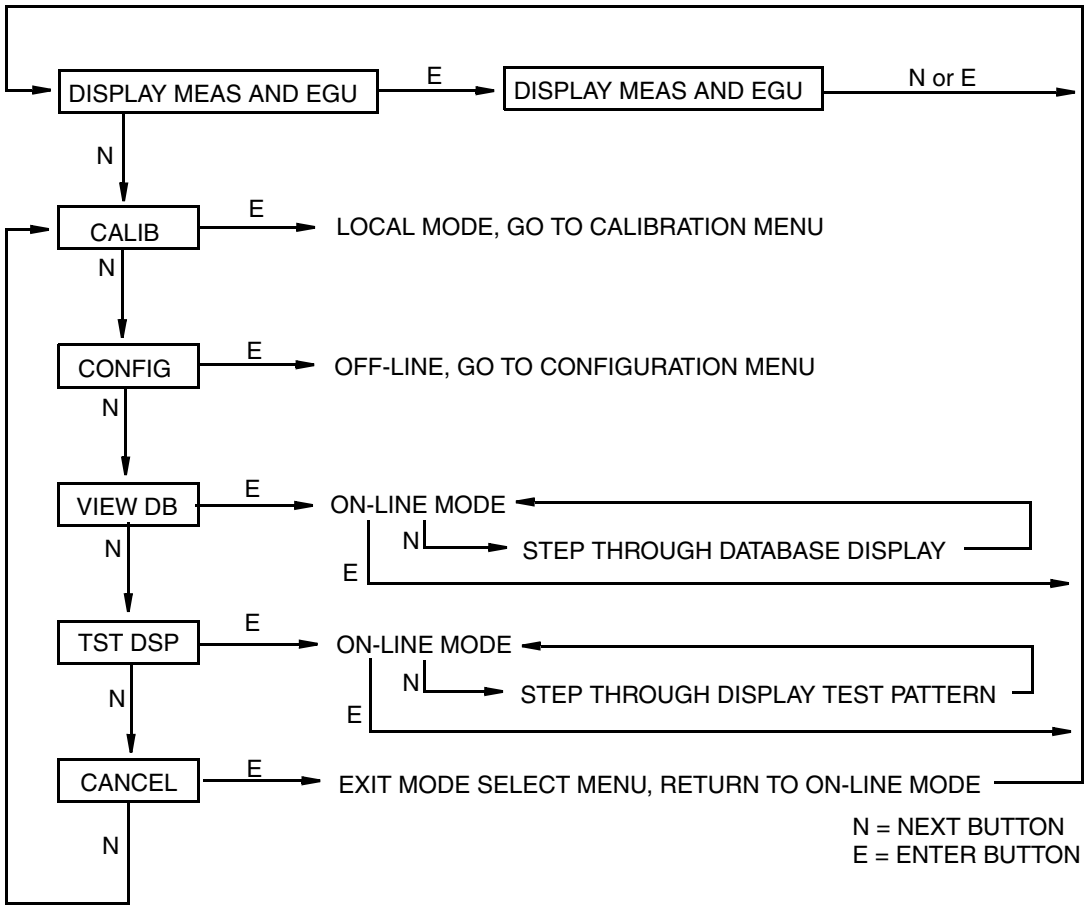
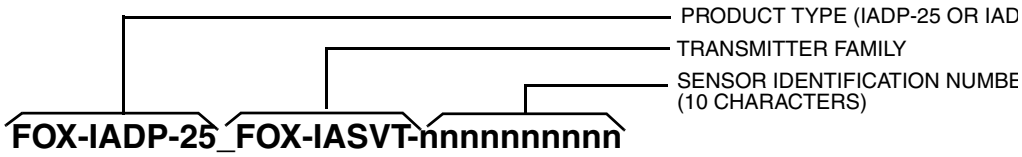
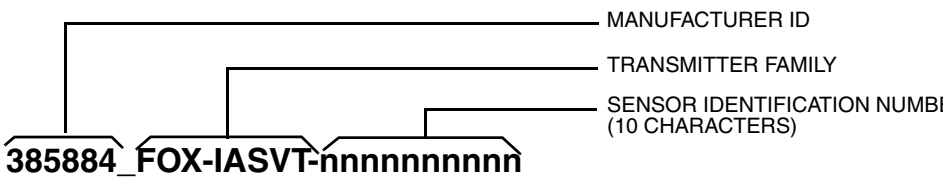


Figure 2. Top Level Structure Diagram

The initial PDTag of the device is:



The Device ID is:



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	9 to 32 V dc
Mounting Position	No Limit
Pollution Degree	2
Installation Category (Overvoltage Category)	II
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).

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.

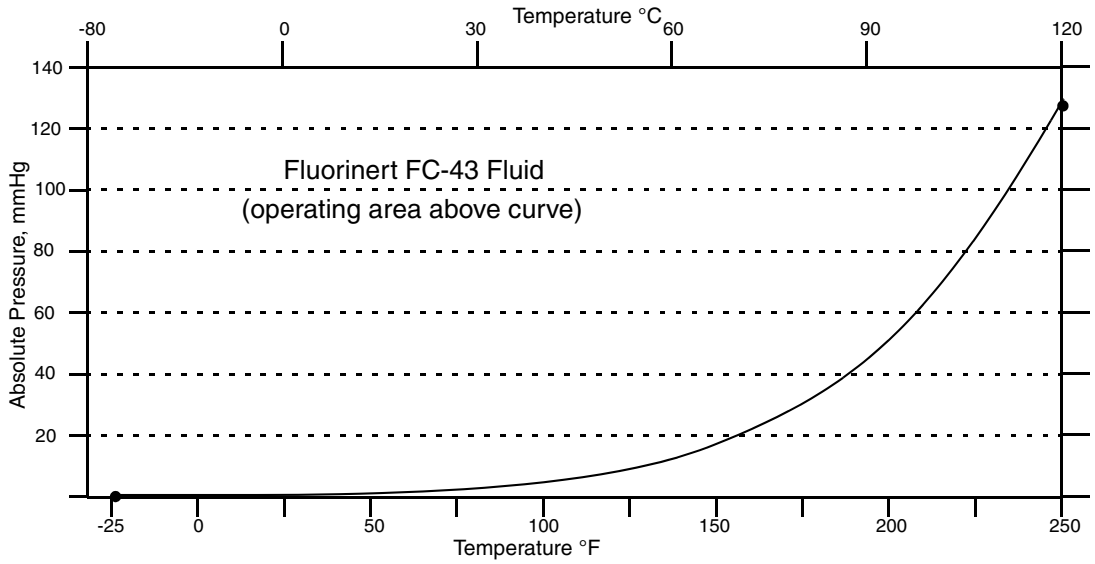


Figure 3. Minimum Allowable Absolute Pressure vs. Process Temperature with Fluorinert Fill Fluid

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 26. 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 26.

— 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.

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

FOUNDATION fieldbus linear or square root digital; software selectable and remotely configurable from a FOUNDATION fieldbus host such as a PC or I/A Series console equipped with a FOUNDATION fieldbus Interface Module. The output is also locally configurable with the pushbuttons on the display.

Zero and Span Adjustments

The zero and span is adjustable from the FOUNDATION fieldbus host computer or I/A Series console equipped with FOUNDATION fieldbus Interface Module. They are also adjustable at the transmitter using the display. An optional self-contained moisture sealed pushbutton assembly allows local resetting of the zero without removing the housing cover.

Shielding (Screening)

For best performance, fieldbus cables should be shielded. Use common multi-conductor (multi-core) “instrument” cable with one or more twisted pairs, an overall, metallized shield, and a shield wire. You can also use cable that has individually shielded pairs. For new installations, ask cable vendors for “fieldbus cable.”

Connect the shield on each spur to the trunk shield and connect the overall shield to ground **at one point only**. For most networks, the grounding point can be located anywhere.

In some instances, better high-frequency EMI shielding requires that the shield be connected to ground at multiple points. (See Mardiguian, M., and White, D.R.J., EMI Control Methodology and Procedures.) Fieldbus provides for this by allowing an rf ground at multiple points, consisting of a small capacitor from shield to ground.

Supply Voltage

Power supply (a FOUNDATION fieldbus Power Supply Module) must be capable of providing at least 14 mA for each transmitter connected.

A summary of the voltage requirements is listed in Table 2.

Table 2. Minimum Supply Voltage Requirements

Minimum Supply Voltage	9 V
Recommended Supply Voltage	24 V
Maximum Supply Voltage	32 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 terminal between the captive washer and loose washer on the external ground screw. Earth (ground) the shield at one place per segment **only**. Refer to MI 020-360 for wiring guidelines.

Remote Communications

Using the FOUNDATION fieldbus protocol, the transmitter communicates bidirectionally over the 2-wire field wiring to other FOUNDATION fieldbus devices (located anywhere in a Division 2 or nonhazardous area), or a FOUNDATION fieldbus host (anywhere in a nonhazardous area) and/or to an I/A Series system equipped with a FOUNDATION fieldbus Interface Module.

Communications Format

Communication is based upon the FOUNDATION fieldbus communication protocol. The signals are superimposed on the transmitter power/signal leads.

Digital Output

The transmitter can be configured to send its differential pressure measurement to the I/A Series system as a digital signal. Remote communications occur between the transmitter and other FOUNDATION fieldbus devices and hosts. The data transmission rate is 31.25 kbits/second. The maximum communication distance is 1900 m (6235 ft). This distance includes spur length. Maximum spur length is 120 m (395 ft). Minimum spur length is 1 m (3.3 ft). For intrinsically safe installations, maximum spur length is 30 m (98 ft).

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.
2. Wiring restrictions required to maintain electrical certification of the transmitter are provided in “Wiring” on page 27.

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 FISCO field device intrinsically safe: II 1 G EEx ia IIC, Zone 0.	SIRA 04ATEX2335X Temperature Class T4, Ta = -40 to +80°C	E
ATEX FNICO field device protection n for: II 3 G EEx nL IIC, Zone 2.	SIRA 04ATEX4019X Temperature Class T4, Ta = -40 to +80°C.	N
CSA FISCO field device 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.	Connect per MI 020-427. Temperature Class T4A at 40°C; T3C at 85°C maximum ambient.	C
CSA FNICO field device nonincendive for Class I, Division 2, Groups A, B, C, and D; Suitable for Class II, Division 2, Groups F and G; Class III Division 2.	Connect per MI 020-427. Temperature Class T4A at 40°C; T3C at 85°C maximum ambient.	
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 field device zone certified flameproof Ex d IIC. Also, all certifications of Code C above.	Maximum Ambient Temperature 85°C	B
FM FISCO field device 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; T4 at 85°C maximum ambient.	F
FM FNICO field device nonincendive for Class I, Division 2, Groups A, B, C, and D; Suitable for Class II, Division 2, Groups F and G; Class III Division 2.	Connect per MI 020-427. Temperature Class T4A at 40°C; T4 at 85°Cmaximum ambient.	
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; T5 at 85°C maximum ambient.	

Table 3. Electrical Safety Specifications (Continued)

Agency Certification, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
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
IECEx FISCO field device intrinsically safe: Ex ia IIC, Zone 0.	IECEx SIR 04.0036X Temperature Class T4, Ta = -40 to +80°C	T
IECEx FNICO field device protection n: Ex nL IIC, Zone 2.	IECEx SIR 04.0023X Temperature Class T4, Ta = -40 to +80°C	U
IECEx flameproof: Ex d IIC	IECEx FMG 06.0007X, Ex d IIC T6 Ta=80°C, T5 Ta=85°C Ambient Temperature -20 to +85°C	V

ATEX and IECEx Warnings

Do not open while circuits are alive.

ATEX Compliance Documents

EN 50014: 1997

EN 50018: 1994

EN 50020: 2002

EN 50284: 1999

EN 60079-15: 2003

IECEx Compliance Documents

IEC 60079-0 (Edition 4.0): 2004

IEC 60079-0 (Edition 3.1): 2000

IEC 60079-1 (Edition 5): 2003

IEC 60079-11 (Edition 4): 1999

IEC 60070-15 (Edition 2): 2001

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. 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. 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. If the transmitter is not installed in the vertical position, readjust the zero output to eliminate the position zero effect.
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.

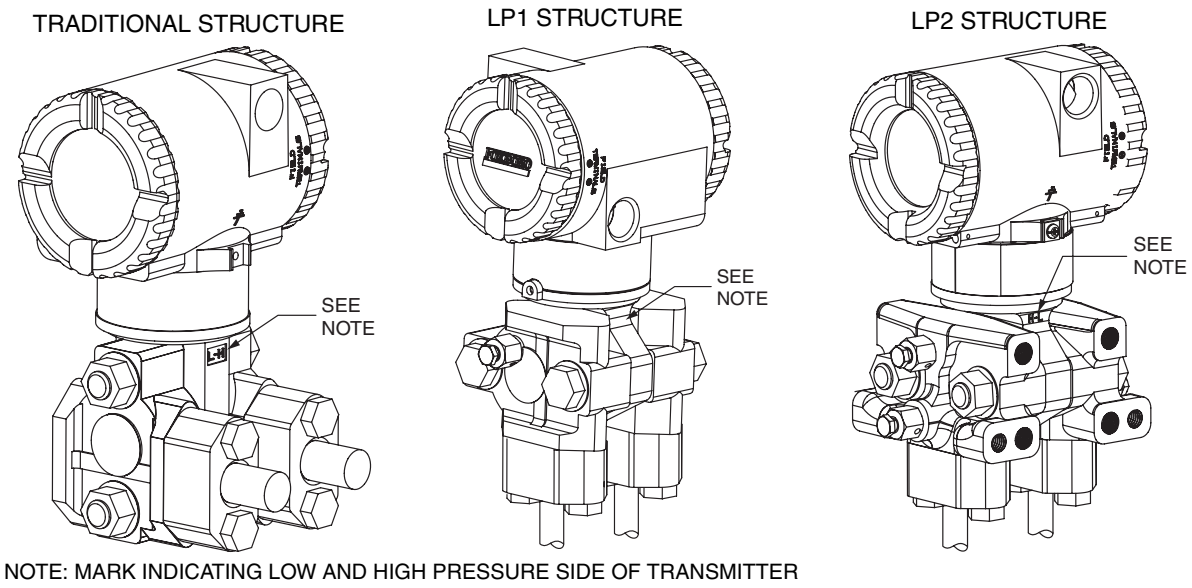


Figure 4. Typical Mounting of an IDP Transmitter Supported by Process Piping

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. See MI 022-138.

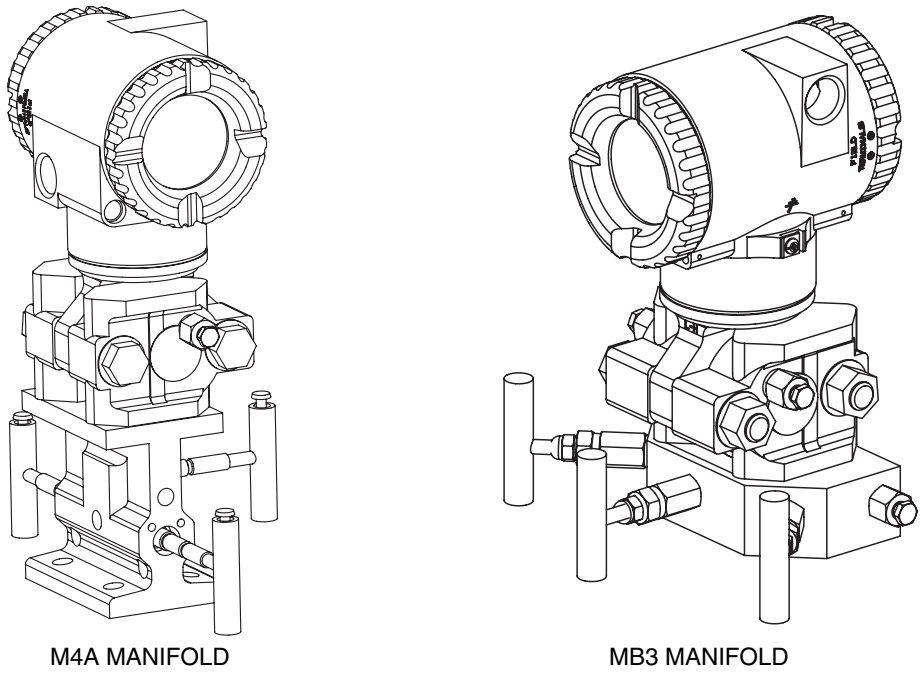


Figure 5. Typical Mounting of an IDP Transmitter Supported by a Bypass Manifold

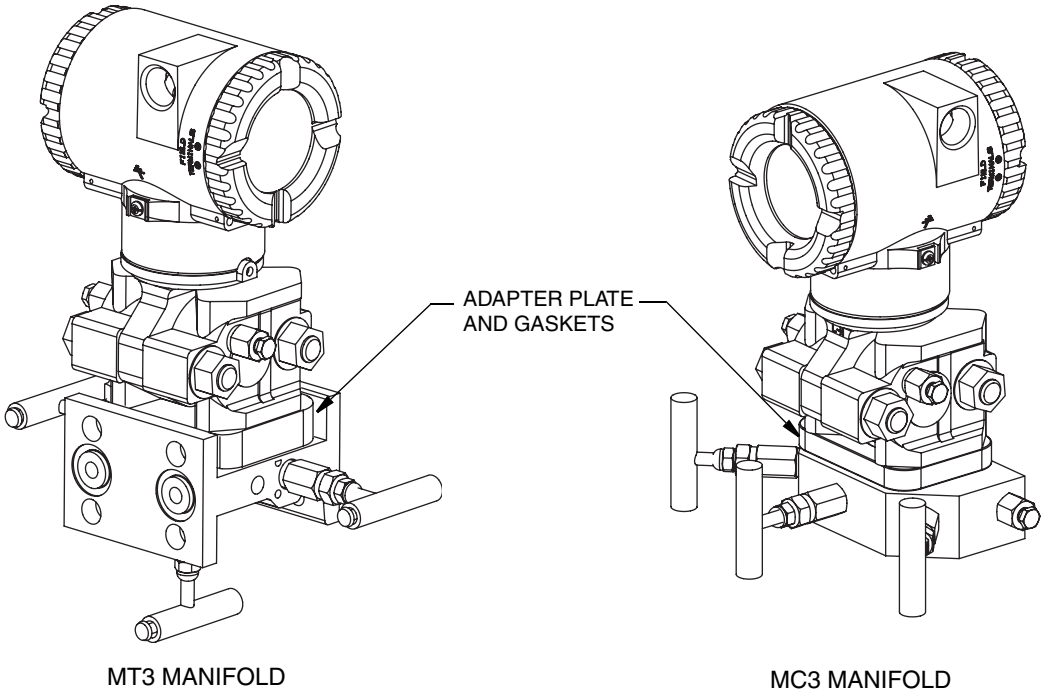


Figure 6. Typical Mounting of IDP Transmitter on Coplanar Manifold

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 the following figures 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.

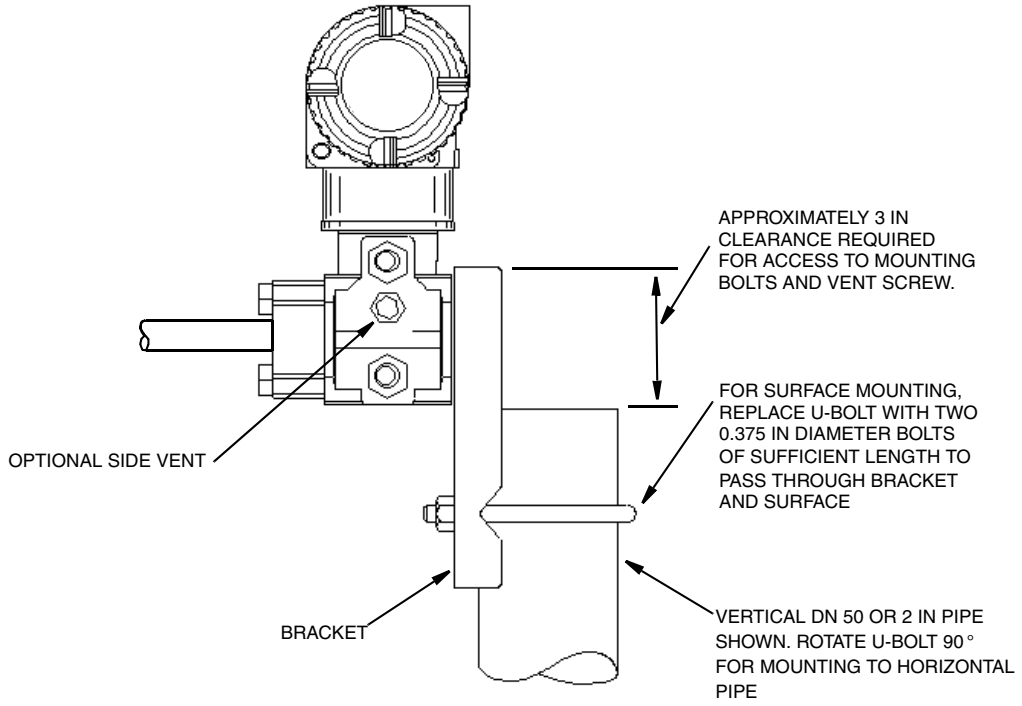


Figure 7. Pipe or Surface Mounted Transmitter Using a Standard Bracket

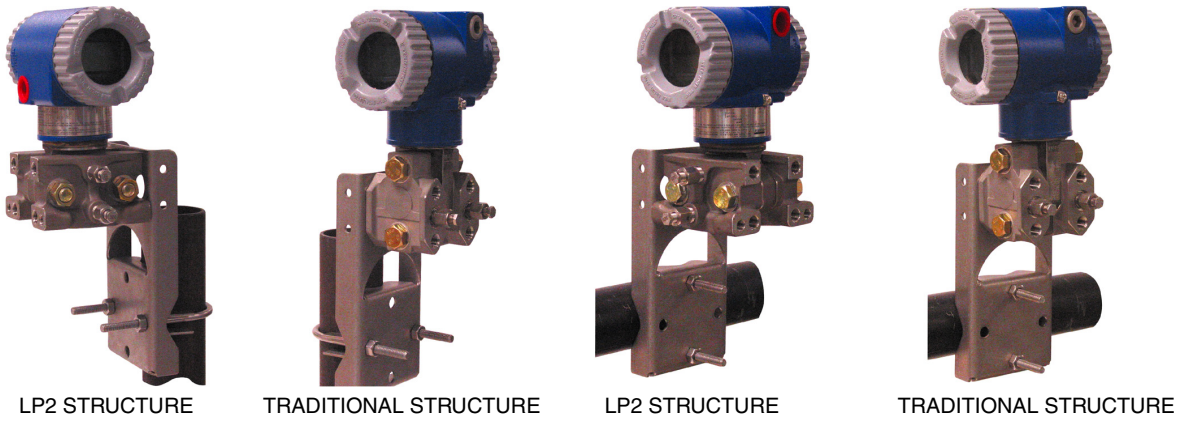


Figure 8. Examples of Mounting With a Standard Bracket

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.

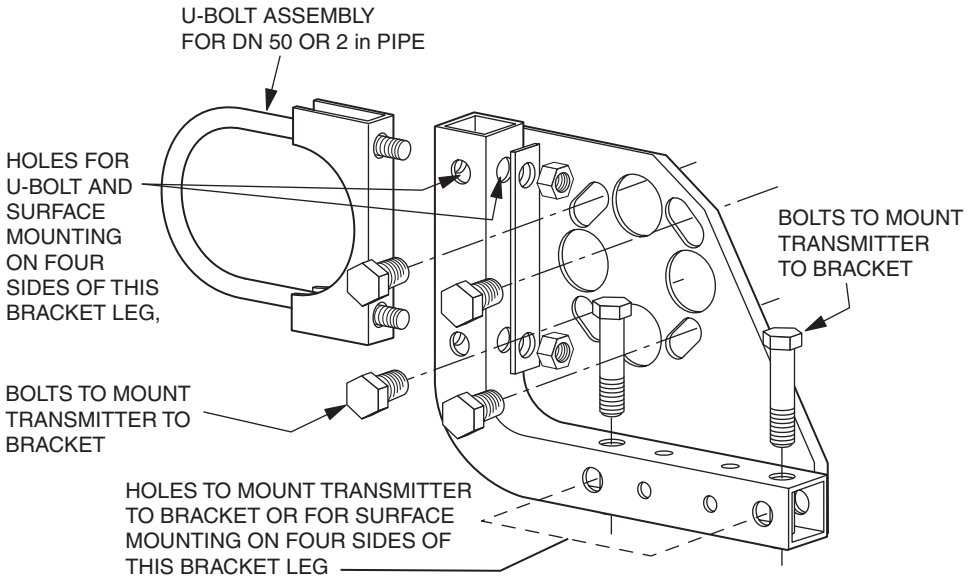


Figure 9. Details of a Universal Bracket

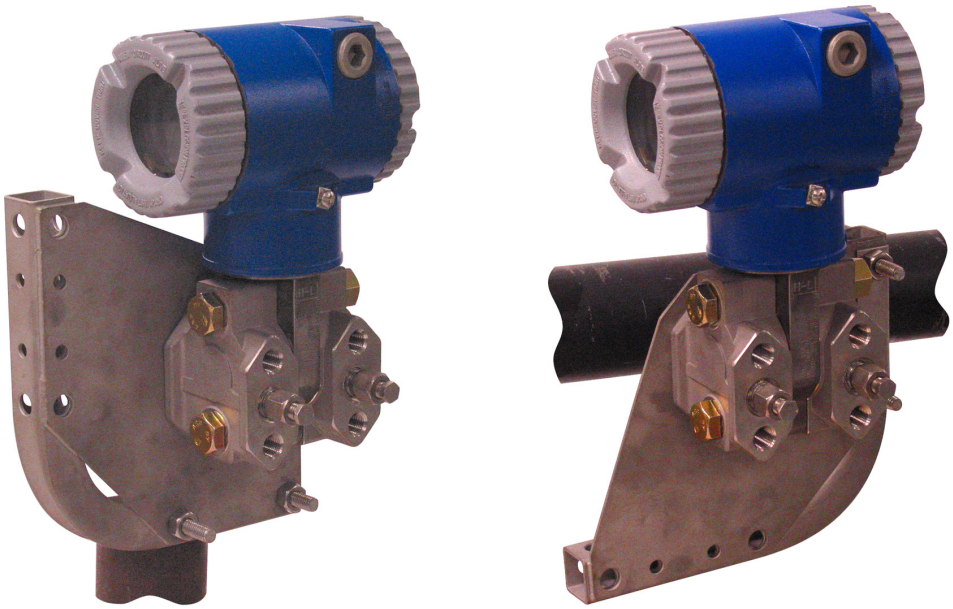


Figure 10. Mounting a Transmitter with Traditional Structure Using a Universal Bracket

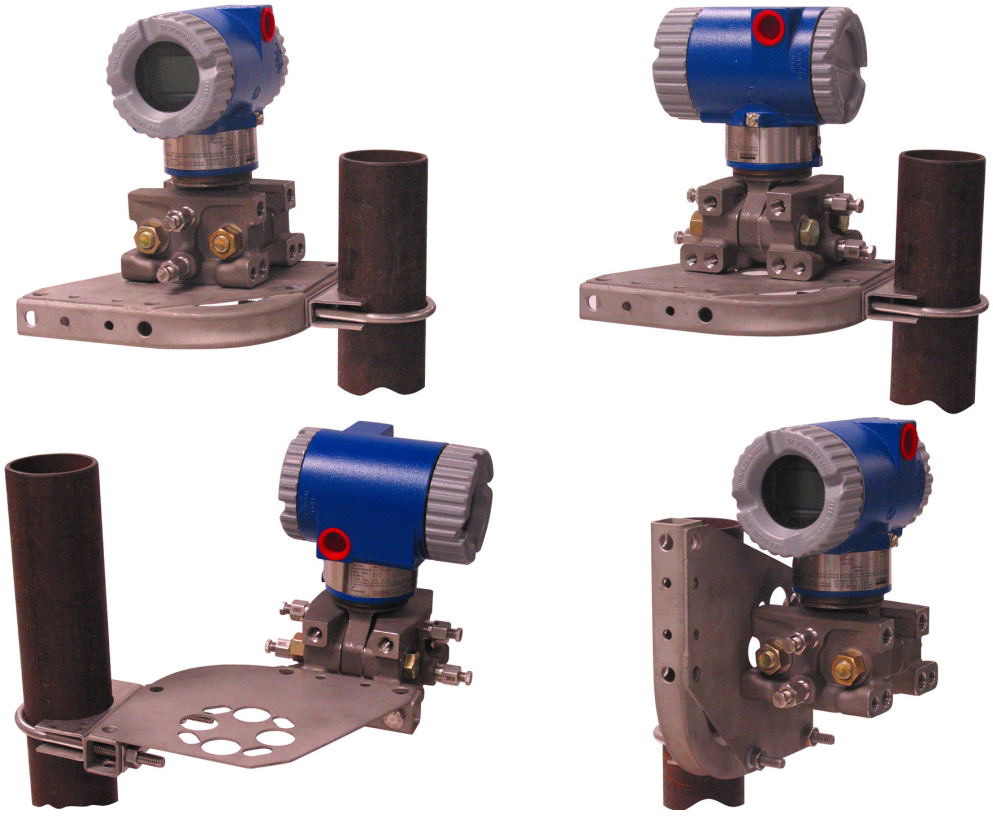


Figure 11. Vertical Pipe Mounting a Transmitter with LP2 Structure Using a Universal Bracket

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.

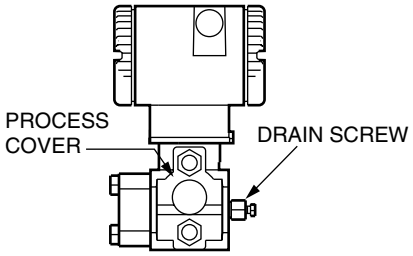


Figure 13. Vertical Mounting - Cavity Draining

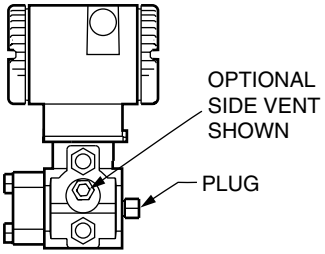


Figure 14. Vertical Mounting - Cavity Venting

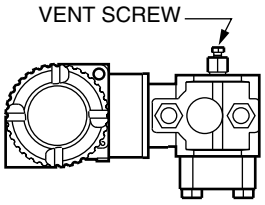


Figure 15. Horizontal Mounting - Cavity Venting

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.

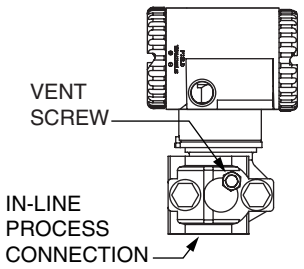


Figure 16. Vertical Mounting - Cavity Venting

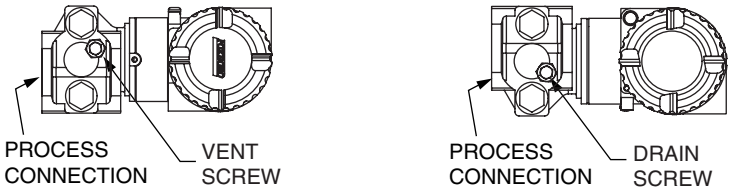


Figure 17. Horizontal Mounting - Cavity Venting and Draining

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.

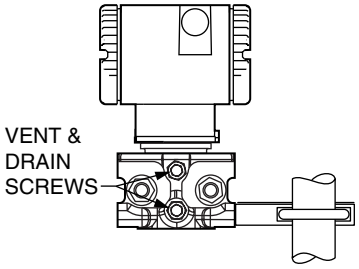


Figure 18. Cavity Venting and Draining

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

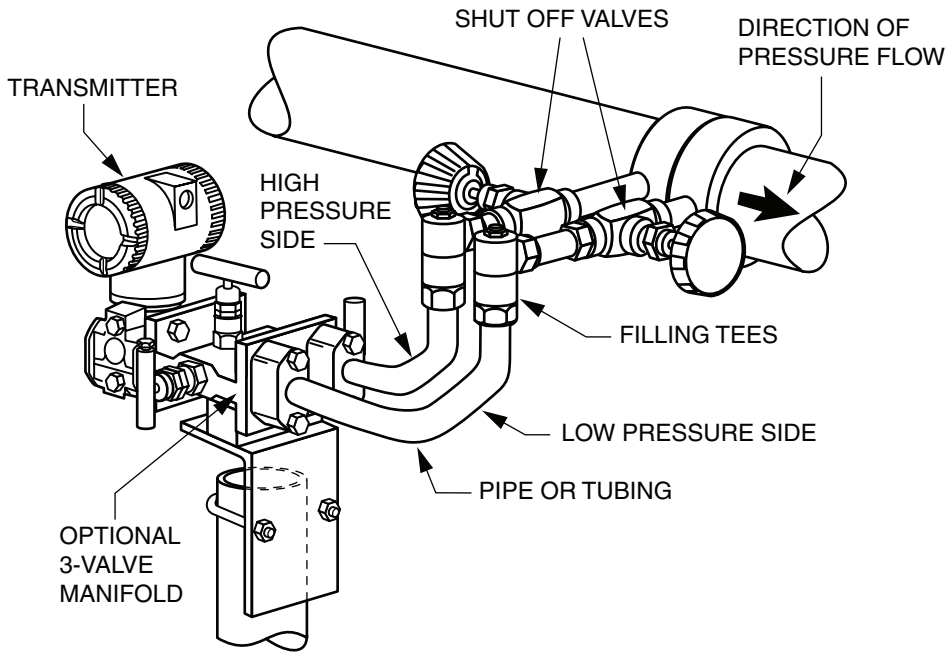


Figure 19. Example of Horizontal Process Line Installation

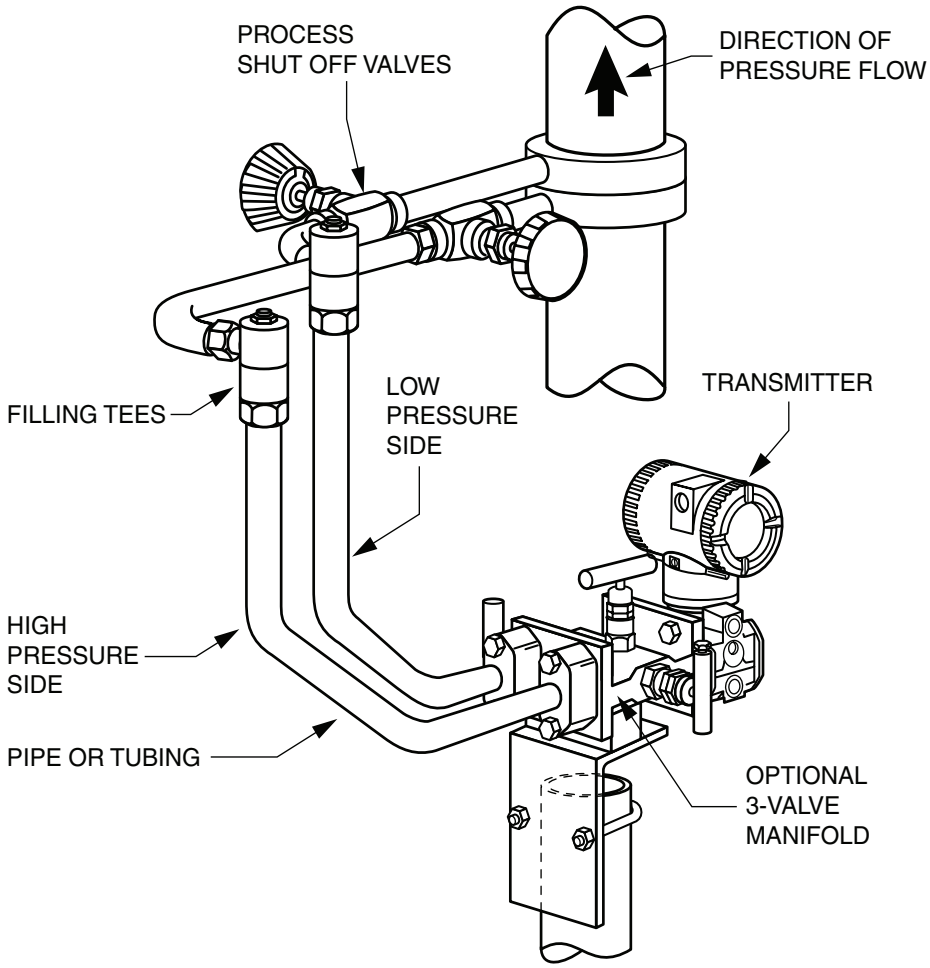


Figure 20. Example of Vertical Process Line Installation

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 32.
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 31.

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. Housings have either an anti-rotation screw or a retention clip that prevent the housing from being rotated beyond a safe depth of housing/sensor thread engagement.

WARNING

If the electronics housing is removed for maintenance, it must be hand tightened to the bottom of the threads, but not over-tightened upon reassembly. See "Removing and Reinstalling a Housing Assembly" on page 72.

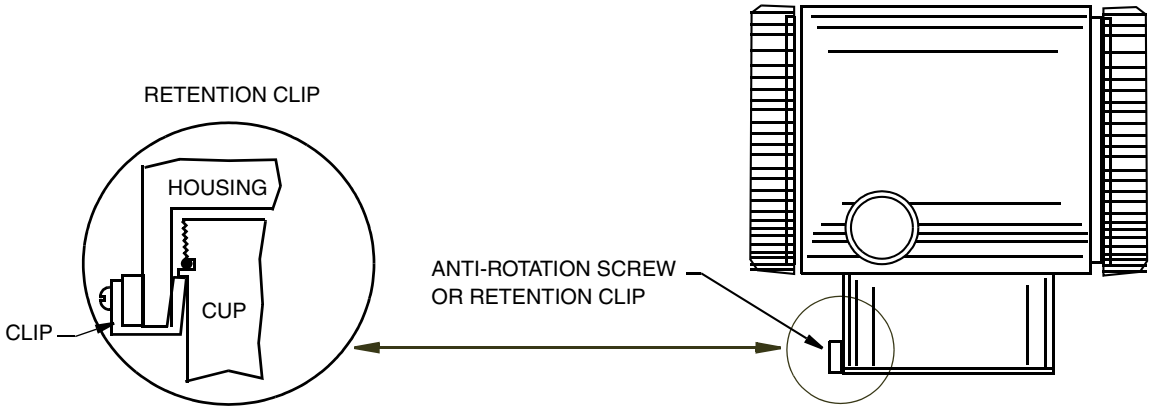


Figure 21. Housing Screw or Clip Location

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 making changes to the static or nonvolatile data base in the function block application of the resource. Write protection can be 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. See Figure 22. Replace the display. When configuring the transmitter, select the **Hard W Lock** option in the **FEATURE_SEL** parameter in the Resource Block. For more information on write protection in fieldbus devices, see MI 014-900.

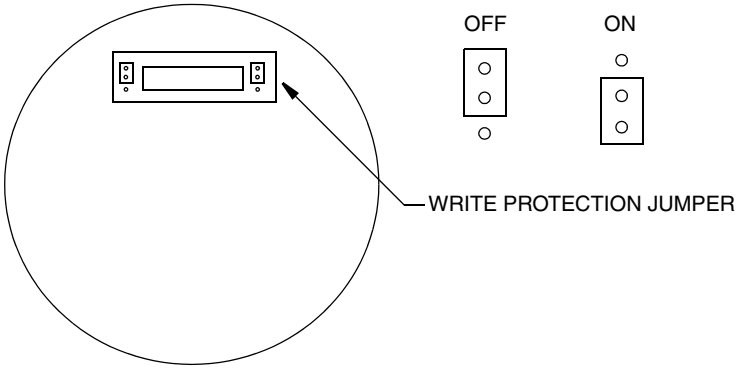


Figure 22. Write Protection Jumper

Cover Locks

Electronic housing cover locks, shown in the figure below, 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.

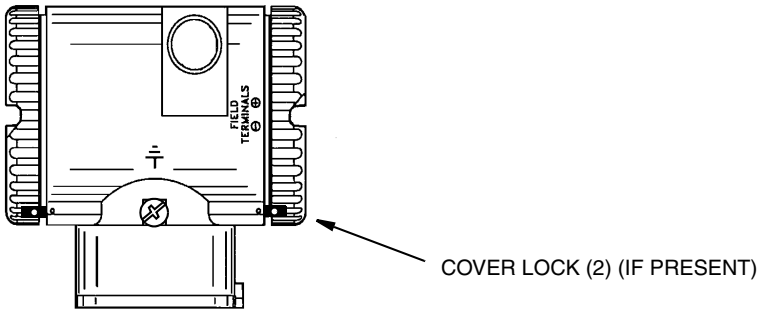


Figure 23. Cover Lock Location

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 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 the figure below. Note that the embossed letters **FIELD TERMINALS** identify the proper compartment.

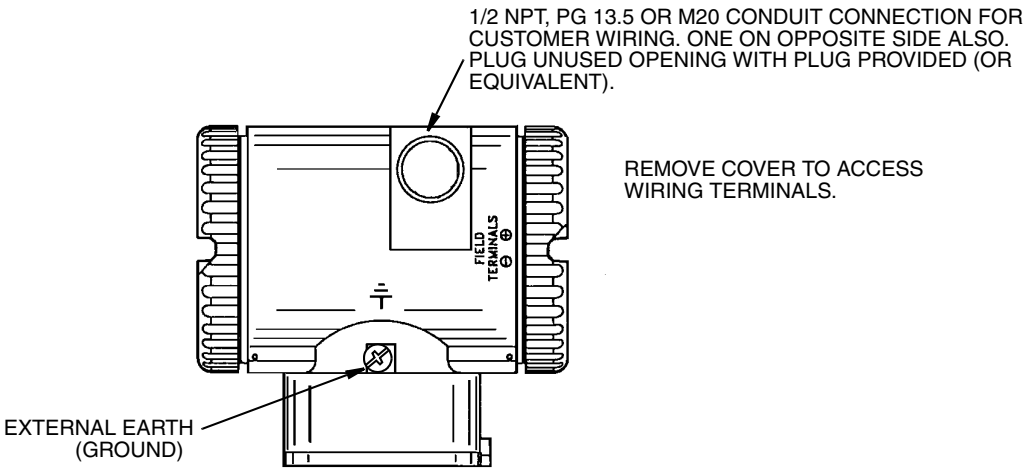


Figure 24. Accessing Field Terminals

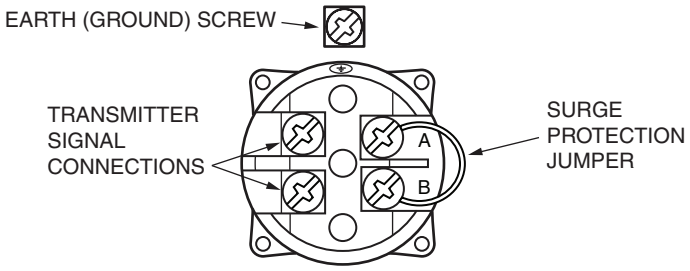


Figure 25. Identification of Field Terminals

Wiring Notes

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

Use FOUNDATION fieldbus approved cable (multi-core, shielded, twisted-pair cable) to protect remote communications from electrical noise. Refer to MI 020-360 or FOUNDATION fieldbus Application Guide AG-140, Rev 1.0 or later.

The transmitter is polarity independent and therefore cannot be wired incorrectly.

Power supply (a FOUNDATION fieldbus Power Supply Module) must be capable of providing at least 14 mA for each transmitter connected.

A summary of the voltage requirements is listed in Table 4:

Table 4. Minimum Supply Voltage Requirements

Minimum Supply Voltage	9 V
Recommended Supply Voltage	24 V
Maximum Supply Voltage	32 V

Review suggested wiring practices as described in MI 020-360 to ensure proper communications capability and to minimize the effects of RFI.

Refer to Figure 26 for a wiring diagram of a typical transmitter installation.

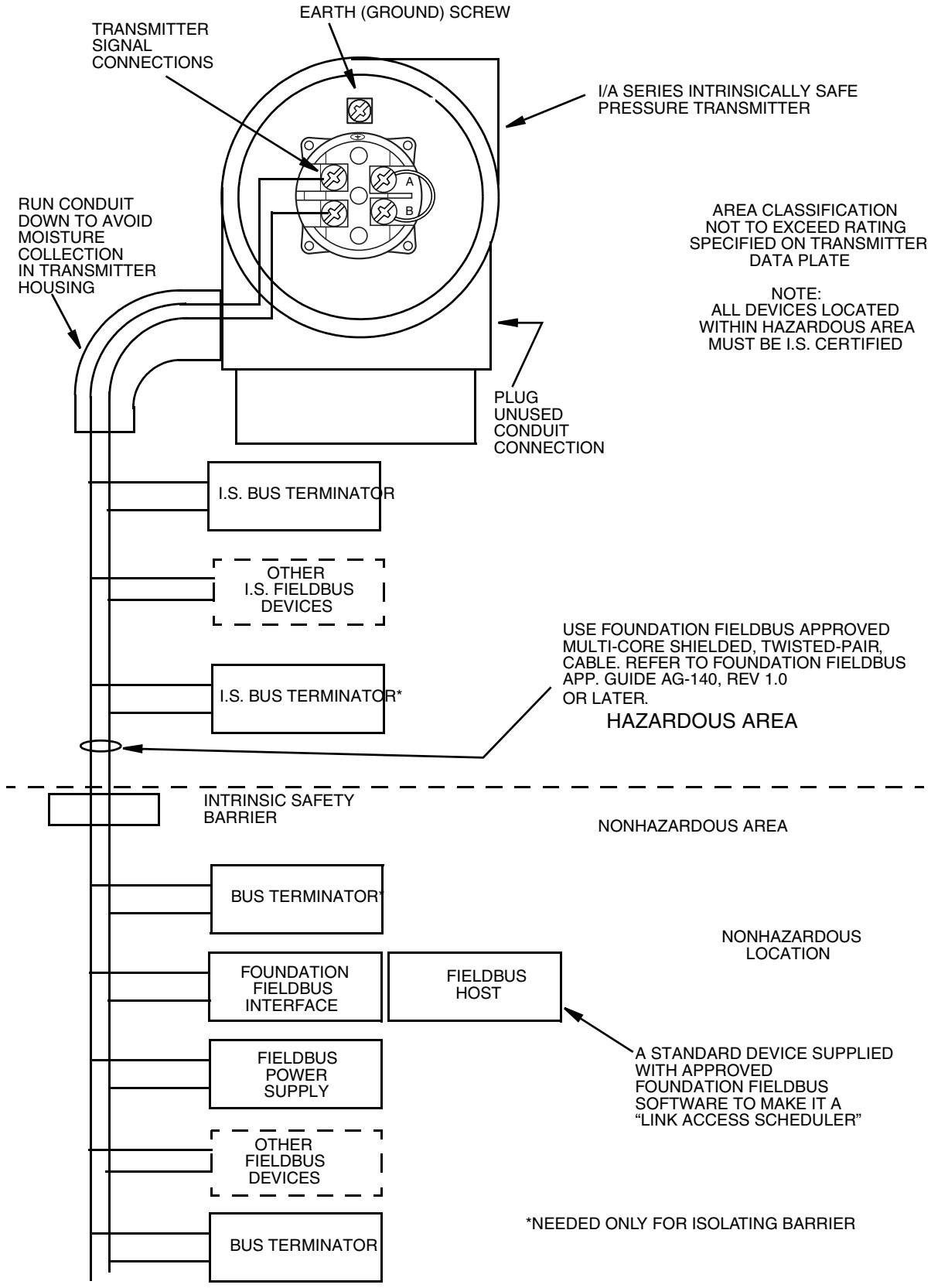


Figure 26. Wiring Diagram of Typical FOUNDATION Fieldbus Transmitter Installation

Wiring the Transmitter

Transmitters with a digital output signal connect to a FOUNDATION fieldbus host or an I/A Series system through the fieldbus. The maximum total resistance for each transmitter is 420 Ω. For example, if an intrinsically safe barrier with a resistance of 340 Ω is used, the maximum wire resistance is 80 Ω. Maximum recommended length for field wire is 1800 m (6000 ft). Transmitter power is supplied by a FOUNDATION fieldbus Power Supply Module. This procedure identifies wire terminations in the transmitter. For other system wiring details, refer to the installation instructions provided with the I/A Series system.

Use the following procedure to wire the transmitter:

1. Remove the cover from the transmitter field terminal compartment.
2. Run signal wires (0.50 mm^2 or 18 AWG, typical) through one of the transmitter conduit connections. Use shielded twisted-pair cable to protect the digital output and/or remote communications from electrical noise.

— NOTE

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

3. Plug the 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, the plug must engage a **minimum** of five full threads.
4. Connect an earth (ground) wire to the earth terminal in accordance with local practice.

— ! CAUTION

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

5. Connect the FOUNDATION fieldbus bus to the two terminals on the terminal block in the field terminal compartment.
6. 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 27.

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.

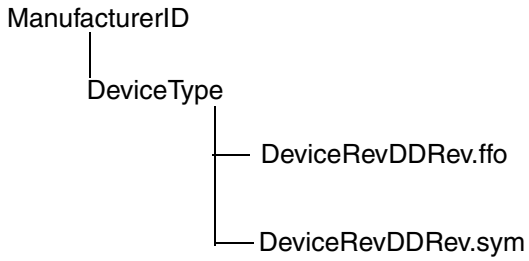
Installing the Fieldbus Software

Descriptor files used by a FOUNDATION fieldbus configurator (host) can be found on the Invensys or FOUNDATION fieldbus website. The files included are:

Filename	Description
readme.doc	A WORD file with DD installation instructions
reademe.txt	A text file with DD installation instructions (for users without MS-WORD).
xxyy.ffo where	DD binary file xx = Device Rev. (Parameter 12 in Resource Block) yy = DD Rev. (Parameter 13 in Resource Block)
xxyy.sym	DD symbol file
xxbbzz.cff[(a)]	Capability File (zz = cff rev)

(a) 'bb' may be the same as 'yy' or may be 'ff'.

Set up the following directory structure for the DD files of a device on the host computer. According to the FOUNDATION specification, the device description files must be present in the appropriate directories as described below.



where *.ffo is the DD binary file and *.sym is the symbol file.

The Manufacturer ID for Foxboro is 385884 and the Device Type for this pressure transmitter is BA30.

NOTE

Foxboro parameter values are depicted in this document in the hex format.

3. Operation Via Local Display

A local display, as shown in Figure 27, 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 display can be configured to meet your specific needs. If configured **Show 1**, M1 is displayed. If configured **Show 2**, M2 is displayed. To temporarily view the alternate measurement, press the **Enter** button. After showing this measurement for a brief period, the display reverts to the configured display.

If configured **Toggle**, the display toggles between M1 and M2. To view the alternate display, press the **Enter** button. After showing this measurement for a brief period, the display reverts to toggling between M1 and M2.

Whenever M2 is displayed, an M2 message blinks in the lower right of the 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 28.

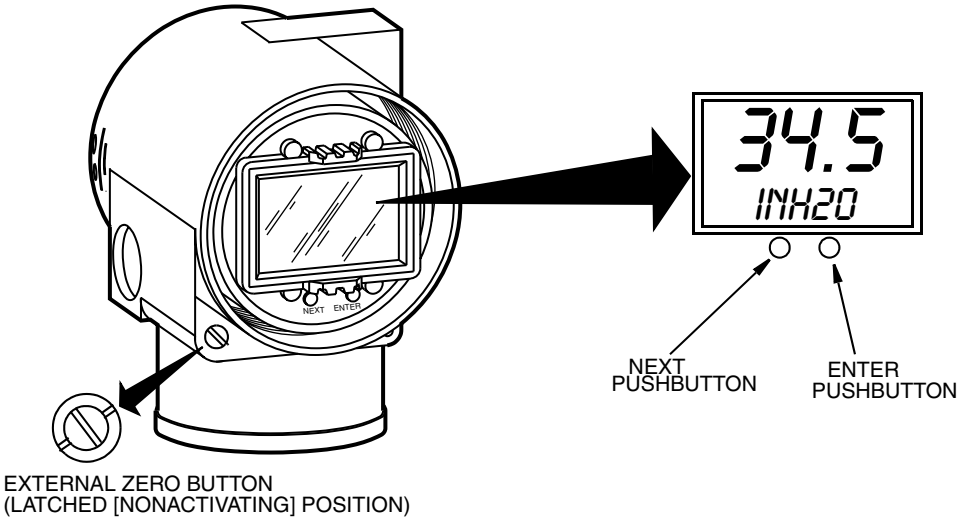


Figure 27. Local Display Module

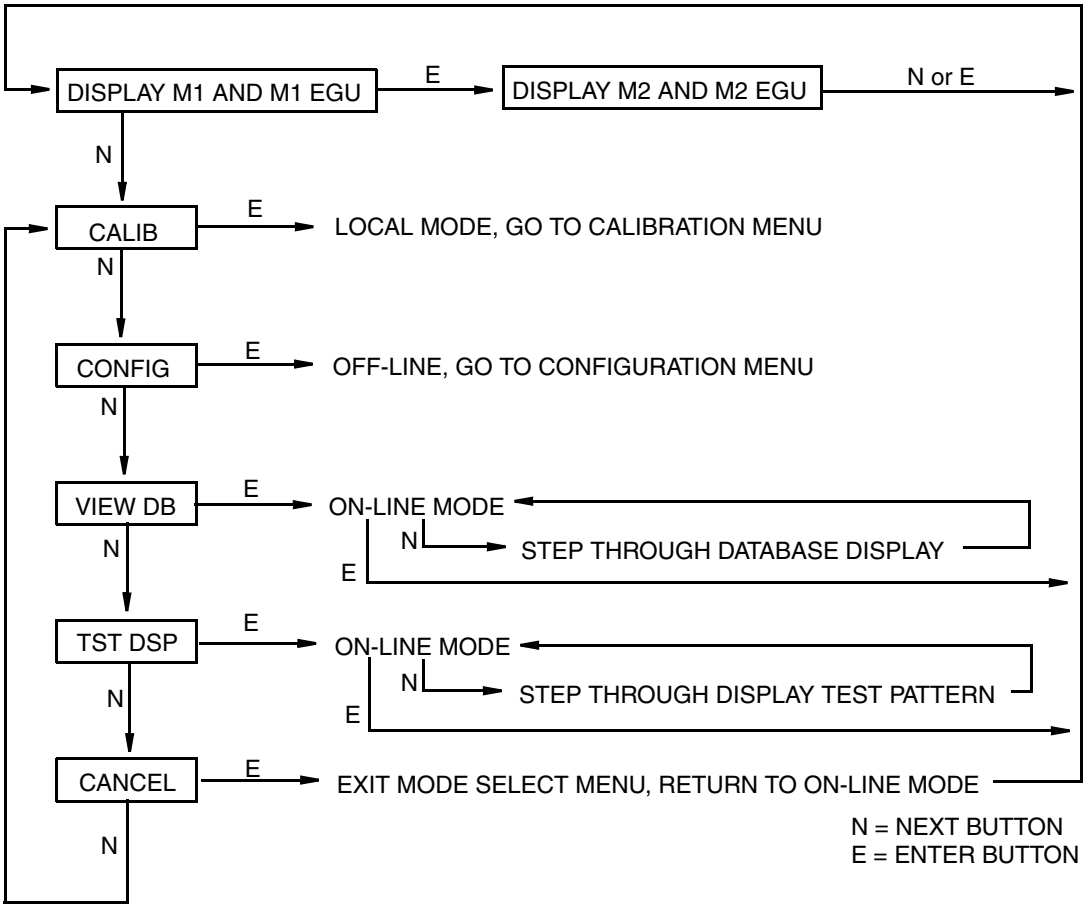


Figure 28. Top Level Structure Diagram

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 and Configuration 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 29.

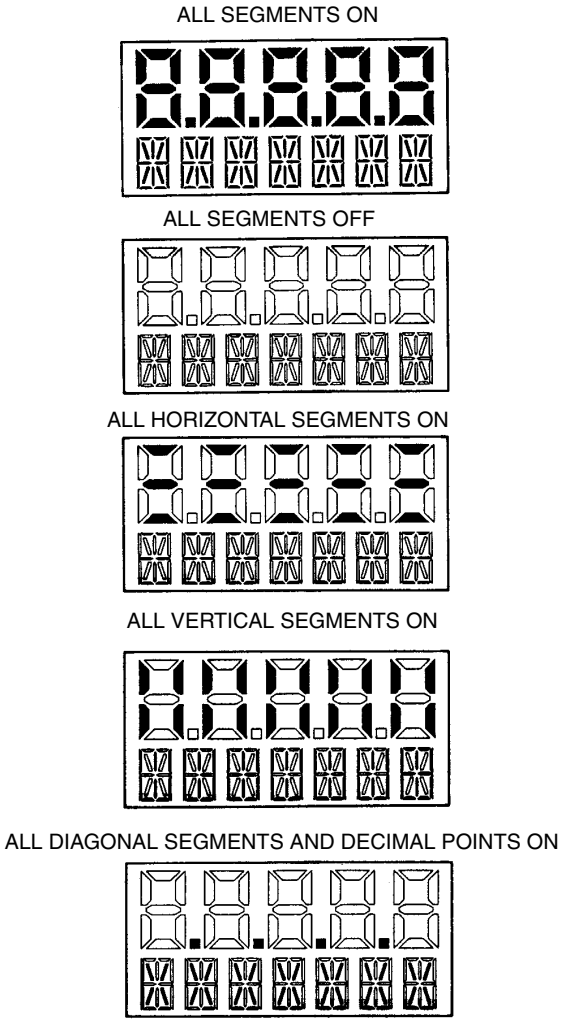


Figure 29. Display Test Segment Patterns

4. Calibration

NOTE

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

Calibration Setup

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.

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 "Bench Calibration Setup" on page 40.

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 as Foxboro Part Number F0101ES.

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

1. If the transmitter is in operation, follow the procedure in "Taking a Differential Pressure Transmitter Out of Operation" on page 32.

! 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 30.

— NOTE

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

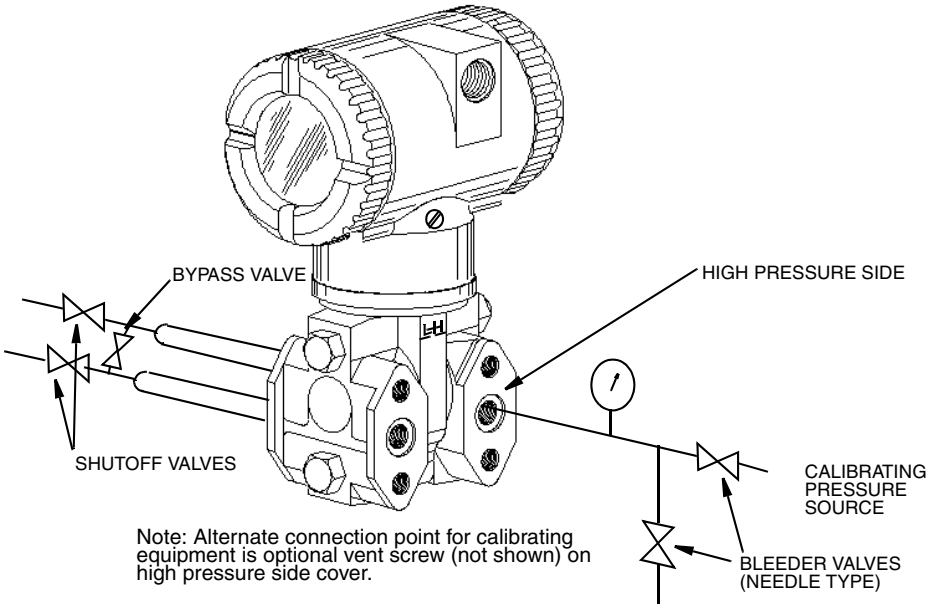


Figure 30. Field Calibration Setup

Bench Calibration Setup

The bench calibration setup requires disconnecting the process piping. For calibration setup without disconnecting the process piping, refer to "Field Calibration Setup" on page 39.

The input setup is shown in Figure 31. 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.

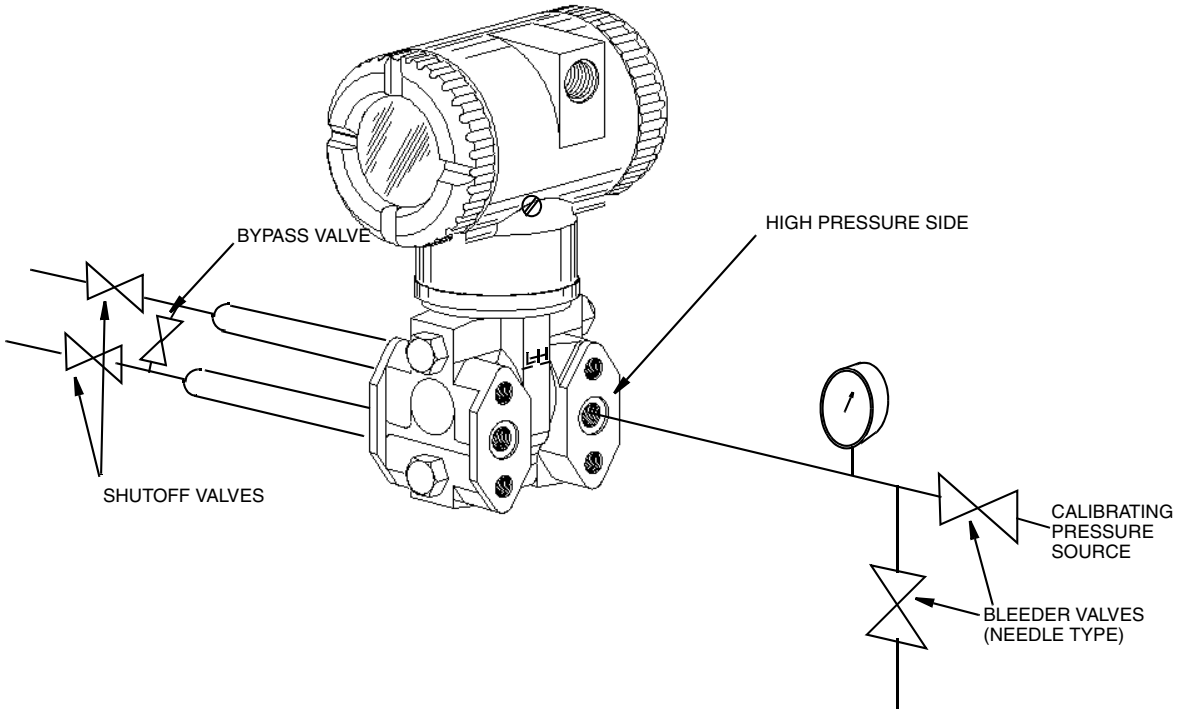


Figure 31. Bench Calibration Setup

Calibration Using the Optional Local Display

From the display, you can:

- Zero the transmitter at zero differential pressure
- Calibrate the lower range value (LRV or 0% range value)
- Calibrate the upper range value (URV or 100% range value)
- Rerange your transmitter by adjusting the 0% and 100% range values.

NOTE

1. 4 to 20 mA calibration is not available with FOUNDATION fieldbus transmitters.
2. If calibration has been configured as password protected, you are asked to enter the password before you can proceed.
3. If your transmitter is write protected, you cannot write your calibration to the electronics without disabling this feature.

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 shown in Figure 32.

Proceed to calibrate your transmitter by using the **Next** button to select your item and the **Enter** button to specify your selection per Figure 32. 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.

NOTE

Before doing a **CAL_ATO**, **CAL_LRV**, or **CAL_URV** calibration, check your **M1 LRV** and **M1 URV** values to make sure that they are the proper 0% and 100% range values for your application. If not, use the **Next** button to go to **RERANGE** to set the proper **M1 URV** and **M1 LRV**. Save these changes.

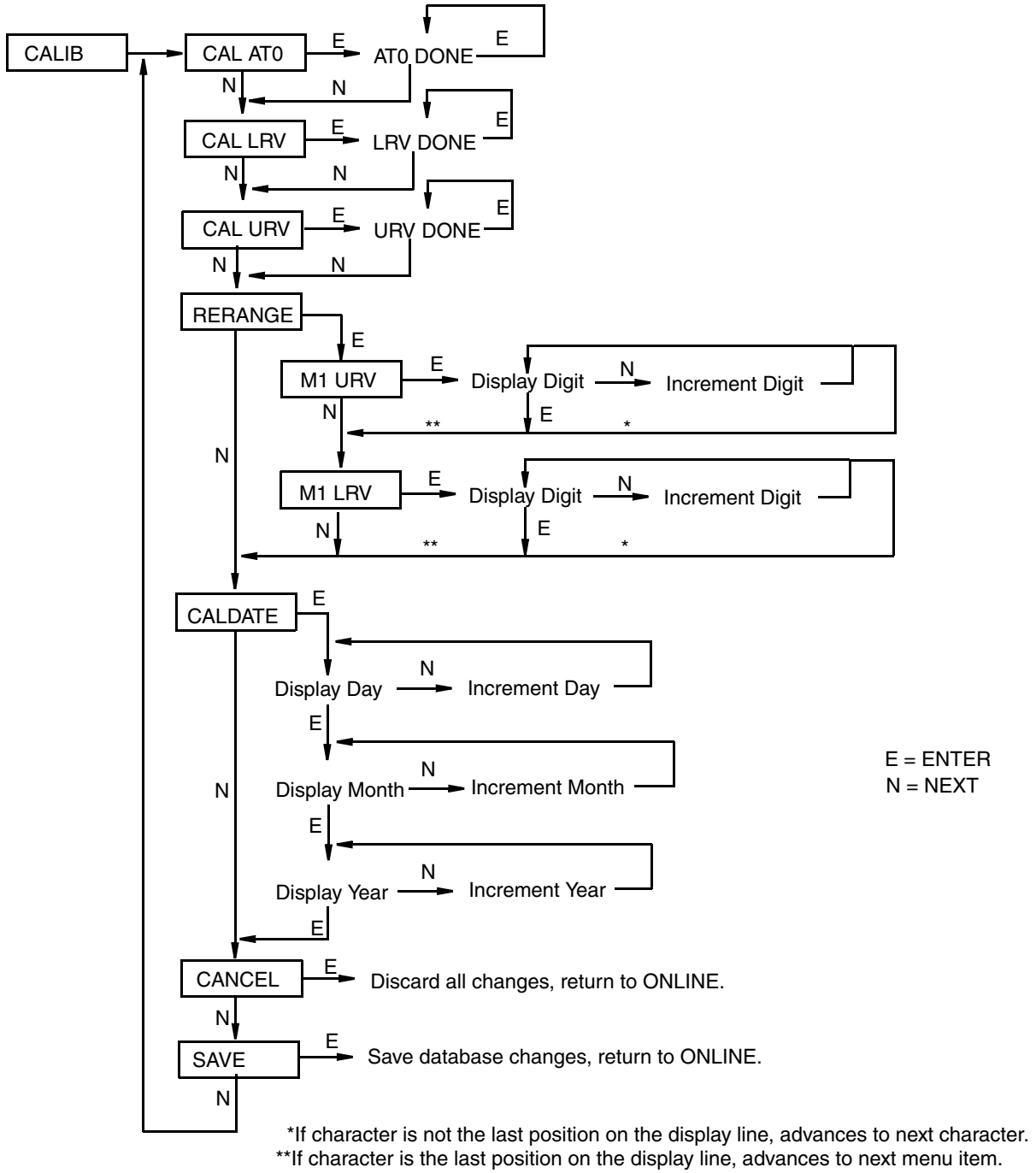


Figure 32. Calibration Structure Diagram

CAL_ATO:

To zero the transmitter at zero pressure, apply a zero differential pressure to the transmitter. Go to **CAL_ATO** using the **Next** button and press **Enter**. This can be done whether the LRV is zero or not. Completion is indicated by the display **ATO Done**.

— NOTE

This function cannot be done from a fieldbus host.

CAL_LRV:

To calibrate at 0% of range input, apply a differential pressure to the transmitter equal to the lower range value (**M1 LRV**) in the transmitter database. Go to **CAL_LRV** using the **Next** button and press **Enter**. Completion is indicated by the display **LRV Done**.

CAL_URV:

To calibrate at 100% of range input, apply a differential pressure to the transmitter equal to the upper range value (**M1 URV**) in the transmitter database. Go to **CAL_URV** using the **Next** button and press **Enter**. Completion is indicated by the display **URV Done**.

RERANGE:

To adjust 100% and 0% range values without application pressure, go to **RERANGE** using the **Next** button and press **Enter**. You can then adjust **M1 URV** and/or **M1 LRV** in the following two submenus.

M1 URV:

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

M1 LRV:

Similar to **M1 URV** immediately above.

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 calibration at zero differential pressure (the **CAL AT0** function) or at the lower range value differential pressure (the **CAL LRV** function) without removing the electronics compartment cover. The mechanism is magnetically activated through the housing wall to prevent moisture from entering the enclosure.

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. To set or reset the zero point at zero differential pressure, apply zero differential pressure to the transmitter or use a bypass valve to equalize pressure on both sides of the transmitter. Press the external zero button until the display reads **CAL AT0**. Release the button. The display reads **CAL WAIT** and then **RESET** (calibration is complete).

— NOTE

Do **not** use CAL AT0 if pressure seals are used that are at different elevations from the transmitter.

To set or reset the 0% of range input, apply the lower range value (LRV) differential pressure to the transmitter and press and hold the external zero button until the display reads **CAL LRV** (it reads **CAL AT0** first). Release the button. The display reads **CAL WAIT** and then **RESET** (calibration is complete).

— NOTE

If the optional display is not present, the same functions can be accomplished by depending on the length of time the external zero button is depressed. Press and hold the button for 1 to 3 seconds for **CAL AT0** or for 5 or more seconds for **CAL LRV**. Therefore, if your LRV is zero, just depress the button for a few seconds. However, if your LRV is not zero, use **caution** when using the external zero button without the optional display because you must rely strictly on the length of time the button is depressed to differentiate between **CAL AT0** and **CAL LRV**.

3. Another possible message is: **DISABLD** if **EX ZERO** is configured **EXZ DIS**.
4. If additional rezeroing is required after Steps 1 and 2 have been accomplished, repeat Step 2.
5. 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.

Calibration from a Fieldbus Host

— NOTE

Before doing a calibration, check your **PRIMARY_VALUE_RANGE • EU_at_100% and EU_at_0%** values to make sure that they are the proper values for your application. If not, adjust these values as necessary. Refer to “Changing the Primary Range Values (Reranging) by Editing the Transducer Block Parameters” on page 63.

1. Put the Transducer Block in the Out Of Service (OOS) mode and make sure the **MODE_BLK • ACTUAL** reads **OOS**.

— NOTE

It is important that you perform Steps 2 and 3 before Steps 4 and 5.

2. Apply the lower range value pressure to the transmitter.
3. Enter the value of the pressure applied to the transmitter into the **CAL_POINT_LO** parameter. Write the change to the transmitter.
4. Apply the upper range value pressure to the transmitter.
5. Enter the value of the pressure applied to the transmitter into the **CAL_POINT_HI** parameter. Write the change to the transmitter.

— NOTE

The difference between the lower range and upper range pressures must equal or exceed the **CAL_MIN_SPAN**.

6. Select the method from the **SENSOR_CAL_METHOD** parameter (normally set for **User Trim Standard Calibration**).
7. Type in the location in the **SENSOR_CAL_LOC** parameter
8. Type in the initials of the person performing the calibration in the **SENSOR_CAL_WHO** parameter
9. Adjust the **SENSOR_CAL_DATE** parameter.
10. Write the changes to the transmitter.
11. Put the Transducer Block in the Auto mode and make sure the **MODE_BLK • ACTUAL** reads **Auto**.

5. Configuration

Configuration Using the Optional Local Display

The transmitter can be configured from the optional local display or from a FOUNDATION fieldbus host. Some of the parameters can be configured from either the display and the host; others can be configured only from the display or the host.

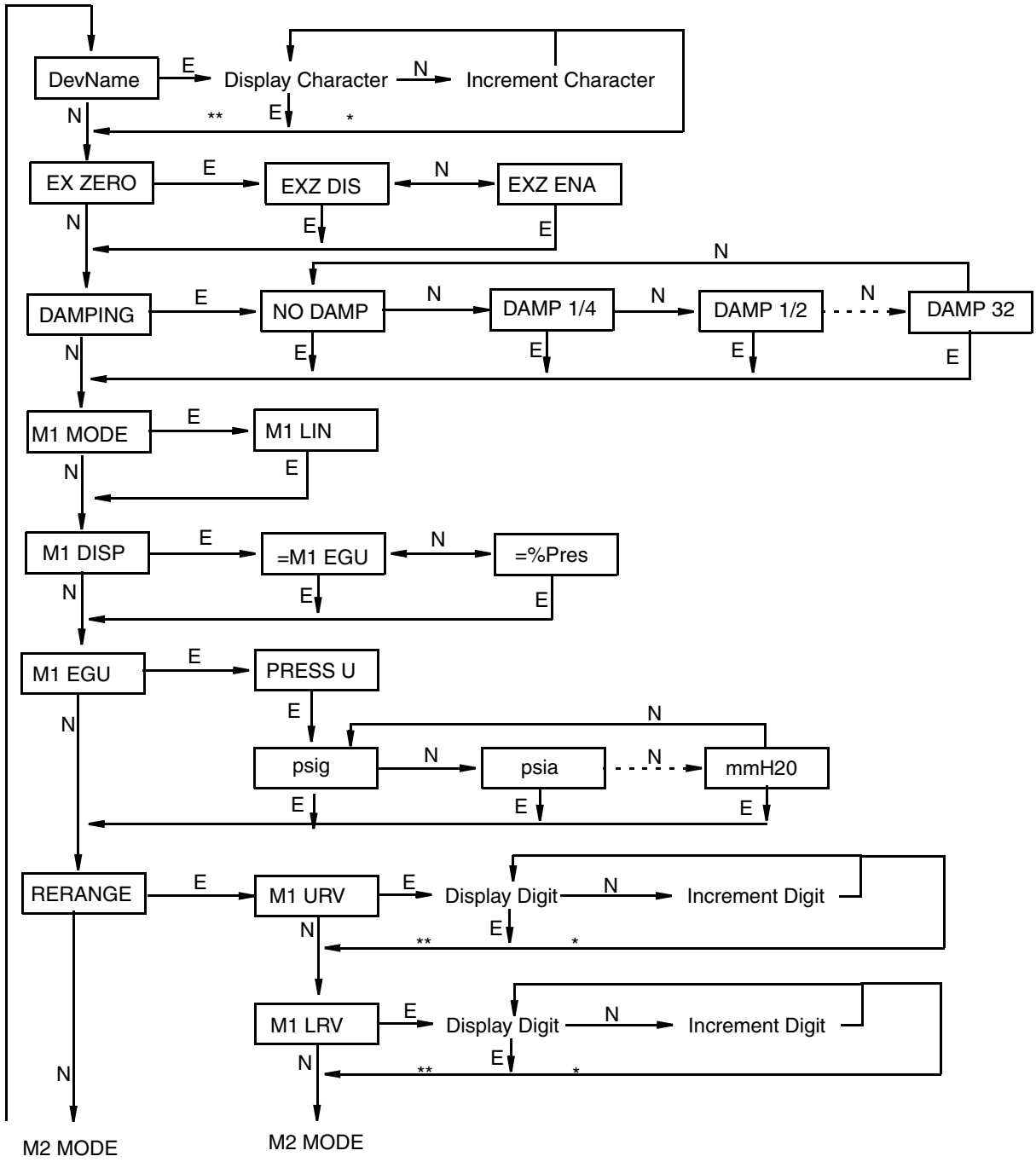
Table 5 lists all parameters that can be configured from the optional local display, the parameter values or options selected by the factory when the transmitter is shipped, and a list of comments and/or procedures to be followed when configuring the transmitter from a fieldbus host.

Table 5. Parameters Configurable from the Local Display

Parameter	Available Choices when Configuring from the Local Display	Local Display Initial Factory Settings	Procedure when Configuring from a FOUNDATION fieldbus Host
DevName	(up to six characters)	DevNam	N.A.
EXT_ZERO	Enable or Disable	Disable	N.A.
DAMPING	None, 1/4, /2, 1, 2, 4, 8, 16, or 32 seconds	None	Edit Transducer Block SENSOR_DAMPING parameter
M1_MODE	M1 LIN (Linear)	M1 LIN (Linear)	N.A.
M1_DISP	=M1 EGU or =% Pres	=M1 EGU	N/A
M1_EGU	User-selected engineering units	(Per Sales Order)	Edit Transducer Block PRIMARY_VALUE_RANGE •. UNITS_INDEX parameter
M1_LRV	User (configurable value)	- - -	Edit Transducer Block PRIMARY_VALUE_RANGE • EU_0 parameter.
M1_URV	User (configurable value)	- - -	Edit Transducer Block PRIMARY_VALUE_RANGE • EU_100 parameter.
M2_MODE	Linear or Type of Square Root	Linear	Edit Transducer Block THIRD_VALUE_TYPE
M2_DISP	=M2 EGU or =% Pres	=M2 EGU	N/A
M2_EGU	User-defined engineering units	%	Edit Transducer Block THIRD_VALUE_RANGE •. UNITS_INDEX parameter.
DISPLAY	Show 1, Show 2, or Toggle (between M1 and M2)	Show 1	N/A
CAL_DATE	Calibration Date	- - -	Edit Transducer Block SENSOR_CAL_DATE parameter.

Table 5. Parameters (Continued)Configurable from the Local Display

Parameter	Available Choices when Configuring from the Local Display	Local Display Initial Factory Settings	Procedure when Configuring from a FOUNDATION fieldbus Host
ENA_PWD	No Passwords, Configuration, or Config and Calibration	No Passwords	N.A.



*If character is not the last position on the display line, advances to next character.
**If character is the last position on the display line, advances to next menu item.

Figure 33. Configuration Structure Diagram (1 of 3)

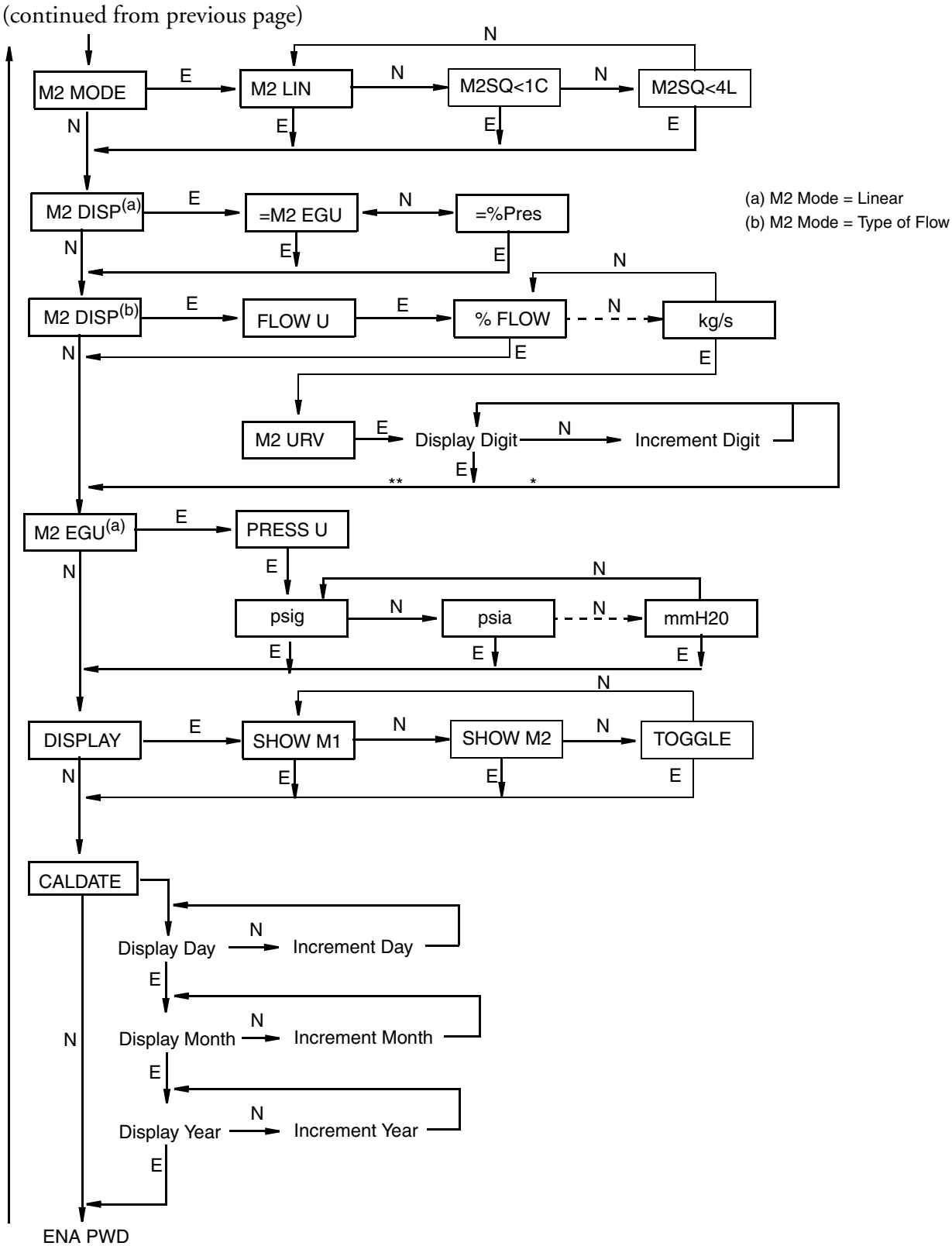
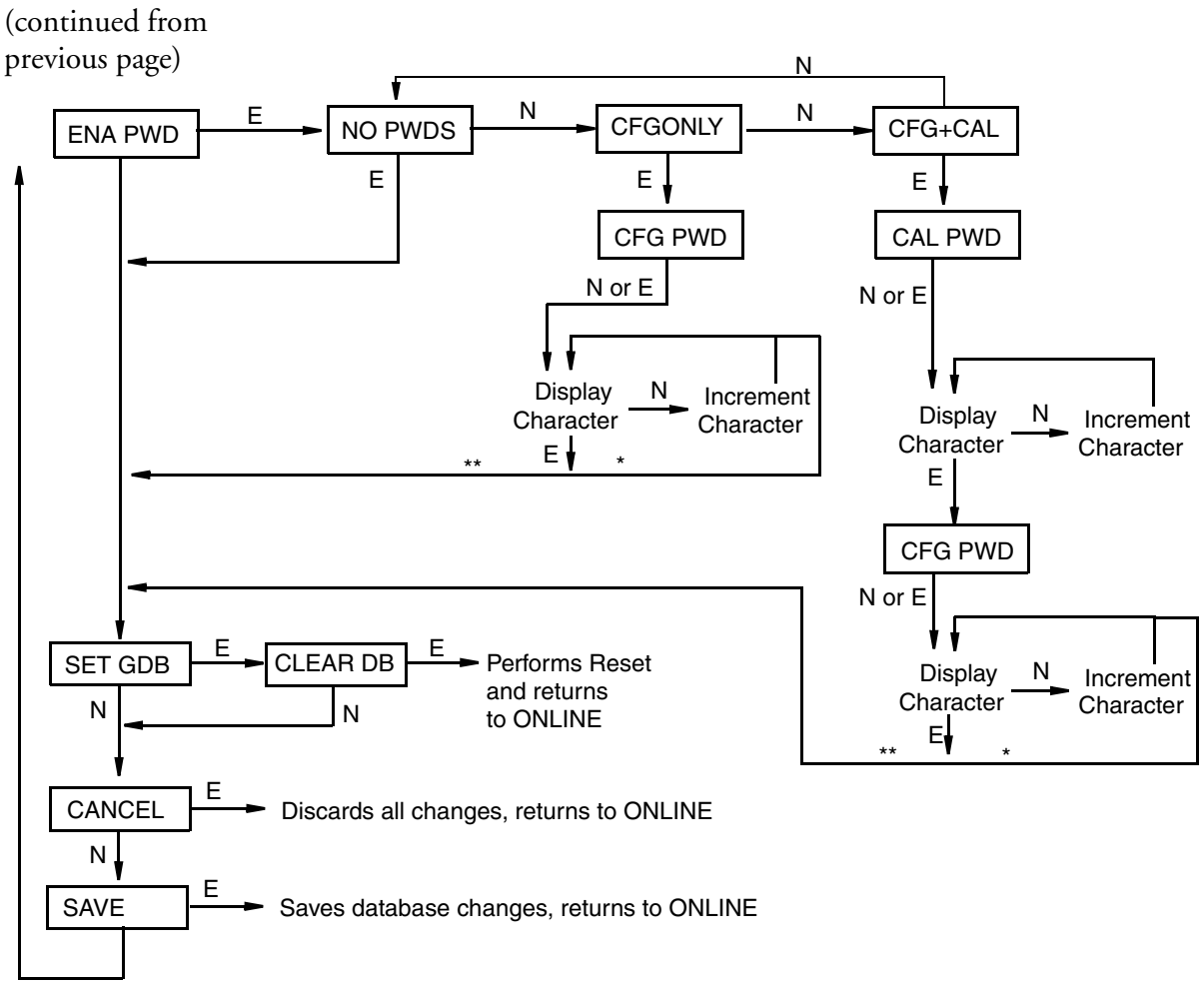


Figure 34. Configuration Structure Diagram (2 of 3)



*If character is not the last position on the display line, advances to next character.
**If character is the last position on the display line, advances to next menu item.

Figure 35. Configuration Structure Diagram (3 of 3)

Commentary on Configuration Structure Diagrams

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

DevName:

This parameter is not applicable for a FOUNDATION fieldbus transmitter.

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**.

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) and press **Enter**.

M1 DISPLAY:

To configure the display to show M1 in engineering units or percent pressure, go to **M1 DISP** with the **Next** button and press **Enter**. Use the **Next** button to select **M1EGU** or **%Pres** and press **Enter**.

M1 EGU:

To configure engineering units for your display and transmission, go to **M1 EGU** with the **Next** button and press **Enter**. Use the **Next** button to select **PRESS U** and press **Enter**.

You are then asked to specify one of the following labels: **psig**, **psia**, **inHg**, **ftH$_2$O**, **inH$_2$O**, **atm**, **bar**, **mbar**, **MPa**, **kPa**, **Pa**, **kg/cm^2**, **g/cm^2**, **dy/cm^2**, **cmHg**, **mmHg**, **torr**, **cmH$_2$O**, or **mmH$_2$O**.

RERANGE:

To adjust 100% and 0% range values without application pressure, 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.

M1 URV:

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

M1 LRV:

Similar to **M1URV** immediately above.

M2 MODE:

M2 is a secondary measurement that is read by the I/A Series system and can be displayed on the optional display. You might use this feature to display M1 in pressure units and M2 in other pressure units or percent of flow. 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), or **M2SQ<4L** (square root with linear below 4% of calibrated pressure range) and press **Enter**.

M2 DISPLAY (If M2 Mode was set to Linear):

To configure the display to show M2 in engineering units or percent pressure, go to **M2 DISP** with the **Next** button and press **Enter**. Use the **Next** button to select **M2EGU** or **%PRES** and press **Enter**.

M2 DISPLAY (If M2 Mode was set to a type of flow):

To configure the display to show M2 in engineering units or percent pressure, go to **M2 DISP** with the **Next** button and press **Enter**. Use the **Next** button to select **FLOW U** and

press **Enter**.
You are then asked to specify one of the following labels: **kg/s**, **kg/m**, **kg/h**, **kg/d**, **g/s**, **g/m**, **g/h**, **g/d**, **lb/s**, **lb/m**, **lb/h**, **lb/d**, **T/h**, **T/d**, **STon/h**, **STon/d**, **LTon/h**, **LTon/d**, **m3/s**, **m3/m**, **m3/h**, **m3/d**, **gal/s**, **gal/m**, **gal/h**, **gal/d**, **Mgal/h**, **Mgal/d**, **L/s**, **L/m**, **L/h**, **L/d**, **ML/h**, **ML/d**, **Ft3/s**, **Ft3/m**, **Ft3/h**, **Ft3/d**, **bbl3/s**, **bbl3/m**, **bbl3/h**, **bbl3/d**, **bbl4/s**, **bbl4/m**, **bbl4/h**, **bbl4/d**, **Sm3/s**, **Sm3/m**, **Sm3/h**, **Sm3/d**, **SF3/s**, **SF3/m**, **SF3/h**, **sF3/d**, **Sgal/s**, **Sgal/m**, **Sgal/h**, **Sgal/d**, **Sbl3/s**, **Sbl3/m**, **Sbl3/h**, **Sbl3/d**, **Sbl4/s**, **Sbl4/m**, **Sbl4/h**, **Sbl4/d**, **NL/s**, **NL/m**, **NL/h**, **NL/d**, **Nm3/s**, **Nm3/m**, **Nm3/h**, **Nm3/d**, **mcF/d** (thousand cubic feet per day), **mmcF/d** (million cubic feet per day), **mScF/d**, **mmScF/d**, or **% Flow**.

M2 URV:

To edit the upper range value, press **Enter** at the prompt **M2 URV**. Use the procedure "Entering Numerical Values" in Operation section to edit this parameter.

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 recordkeeping or plant maintenance purposes. To edit the calibration date, go to **CALDATE** with the **Next** button and press **Enter**. You then can change the day, month, and year. The display shows the last date with the day flashing. Use the **Next** button to step through the library of digits to select the desired day, then press **Enter**. Repeat this process for the month and year.

ENA PWD:

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

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

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

CAUTION

Record your new password before saving changes to the database.

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 6. Alphanumeric Character List

Characters
(space)
%
*
+
–
/
0 through 9
<
=
>
A through Z (uppercase)
[
\
]
Δ
- (underscore)
∇
a through z (lowercase)

Table 7. Numeric Character List

Characters
– (minus sign)
. (decimal point)
0 through 9

Configuration From a Fieldbus Host

The transmitter can be configured from the optional local display or from a FOUNDATION fieldbus host. Some of the parameters can be configured from the display and the host; others can be configured only from the display or the host.

— NOTE

After writing changes to your transmitter, wait at least 30 seconds before disconnecting your transmitter or otherwise removing power from it.

Configuration Procedure Using a Fieldbus Host

— NOTE

This procedure is for transmitters with a **DEV_REV** of 30 HEX (48 DEC) or higher.

A Foundation Fieldbus system is composed of two main parts: A Control Application Process (CAP) and a Device Application Process (DAP). The CAP contains the Resource Block, the Analog Input Blocks, and a PID Block if one is used. The contents of these blocks are defined by the Fieldbus FOUNDATION and are configured by the host, often using a template that has been developed. The DAP contains the Transducer Block. Its contents vary with the product and are usually configured by an operator using fieldbus configurator software.

Therefore, this configuration procedure will concentrate on setting the configurable parameters in the Transducer Block. It will also describe scaling parameters in the Analog Input Blocks that also must be set.

Configuring the Transducer Block

1. Open the Transducer Block. Put the block Out Of Service by setting **MODE_BLK • Target** to **OOS**.
2. Set the **PRIMARY_VALUE_RANGE • UNITS_INDEX** to a pressure engineering unit, such as inH2O, kg/cm2, and so forth. For unit codes, see Table 8.
3. Set the **THIRD_VALUE_TYPE** to Pressure Linear, Flow_comp_with zero_cutoff, or Flow_comp_with_linear_extrapolation.

— NOTE

THIRD_VALUE_TYPE cannot be written as one of the flow selections if **PRIMARY_RANGE_VALUE • EU_0** is not zero. Thus the order of configuring the parameters is important.

Example 1: To go from a 20 to 100 inH_2O pressure application to a 0 to 100 inH_2O flow application, set the **PRIMARY_RANGE_VALUE • EU_0** to zero and then set the **THIRD_VALUE_TYPE** to one of the flow selections.

Example 2: To go from a 0 to 100 inH_2O flow application to a 20 to 100 inH_2O pressure application, set the **THIRD_VALUE_TYPE** to pressure and then set the **PRIMARY_RANGE_VALUE • EU_0** to 20 inH_2O.

4. Set the **THIRD_VALUE_RANGE • UNITS_INDEX** to match the units in **XD_SCALE** for the AI Block connected to this channel. The available units are the same as **PRIMARY_VALUE_RANGE** except for the addition of % Flow.
5. The factory setting for **SENSOR_DAMPING** is **0**. If the process is noisy, increase the value in small increments, up to 32 seconds maximum. Select one of the following numbers: **0**, **0.25**, **0.50**, **1**, **2**, **4**, **8**, **16** or **32**.
6. Write the changes to the transmitter.

Table 8. Unit names and Unit Codes

Unit Name	Unit Code	Unit Name	Unit Code	Unit Name	Unit Code	Unit Name	Unit Code
Pa	1130	torr	1139	kgcm2	1145	mmHg0C	1158
MPa	1132	atm	1140	inH2O	1146	cmHg	31500
kPa	1133	psia	1142	mmH2O20C	1151	cmH2O	31502
bar	1137	psig	1143	ftH2O20C	1154	dycm2	31572
mbar	1138	gcm2	1144	inHg	1155		

Configuring the Scaling Parameters in the Analog Input Block

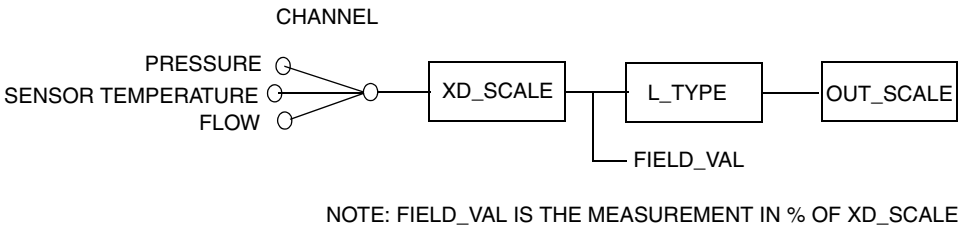
1. Open the Analog Input Block. Put the block Out Of Service by setting **MODE_BLK • Target** to **OOS**.
2. The **CHANNEL** parameter can be set to any of the following, depending upon what measurement you want to use:

CHANNEL Number	CHANNEL Parameter	Transducer Block Value Used By AI Block
1	Pressure	Primary Value
2	Sensor Temperature	Secondary Value (Transmitter Temperature)
3	Flow	Third Value

CAUTION

The S Temperature is the temperature inside the pressure sensor used for compensation purposes. It may not be equal to the ambient temperature. It definitely is not the process temperature, and therefore should not be used for control purposes.

3. Write the changes to the transmitter.
4. Set the XD_SCALE, L_TYPE, and OUT_SCALE parameters as follows:



If CHANNEL is set for Pressure

Set the XD_SCALE•UNITS_INDEX exactly the same as the PRIMARY_VALUE_RANGE•UNITS_INDEX.

Set the XD_SCALE range to the desired range. It doesn't have to match the PRIMARY_VALUE_RANGE values.

If L_TYPE is Direct, set the OUT_SCALE parameters to match those of the XD_SCALE.

If L_TYPE is Indirect, set the OUT_SCALE at the desired unit and values.

If L_TYPE is Indirect Sq Rt, set the OUT_SCALE to % (for % flow).

If CHANNEL is set for Sensor Temperature

Set the XD_SCALE•UNITS_INDEX to °C.

Set the XD_SCALE range to the desired range. Note that your transmitter can only read values within the range of (-50 to +105 °C).

If L_TYPE is Direct, set the OUT_SCALE parameters to match those of the XD_SCALE.

If L_TYPE is Indirect, set the OUT_SCALE at the desired unit and values. See example below.

L_TYPE Indirect Sq Rt is not applicable,

Example of Using Indirect L_TYPE

If you wanted to output sensor temperature from 0 to 100°C in degrees Fahrenheit:

Set the XD_SCALE•UNITS_INDEX to °C.

Set the XD_SCALE: EU_at 100% to 100, EU_at_0% to 0, and UNITS_INDEX to °C.

Set the L_TYPE as Indirect,

Set the OUT_SCALE: EU_at 100% to 212, EU_at_0% to 32, and UNITS_INDEX to °F. These are the equivalent values in °F of 0 100°C and 0°C respectively.

If CHANNEL is set for Flow and THIRD_VALUE_TYPE is Pressure Linear

Set the XD_SCALE •UNITS_INDEX exactly the same as the THIRD_VALUE_RANGE•UNITS_INDEX.

Set the XD_SCALE range to the desired range. It doesn't have to match the THIRD_VALUE_RANGE values.

If L_TYPE is Direct, set the OUT_SCALE parameters to match those of the XD_SCALE.

If L_TYPE is Indirect, set the OUT_SCALE at the desired unit and values.

If L_TYPE is Indirect Sq Rt, set the OUT_SCALE at the desired unit and values.

If CHANNEL is set for Flow and THIRD_VALUE_TYPE is Flow

Set the XD_SCALE •UNITS_INDEX exactly the same as the THIRD_VALUE_RANGE•UNITS_INDEX (%).

Set the XD_SCALE range to the desired range. It doesn't have to match the THIRD_VALUE_RANGE values.

If L_TYPE is Direct, set the OUT_SCALE parameters to match those of the XD_SCALE.

If L_TYPE is Indirect, set the OUT_SCALE at the desired unit and values.

L_TYPE Indirect Sq Rt is not applicable,

5. Write the changes to the transmitter.

Application Specific Configurations

Tables 9, 10, 11 and 12 show typical configuration parameters for various applications. Additional parameter configuration is required for various applications

Table 9. Flow Applications

Application Parameters		Application 1	Application 2	Application 3
Application		Flow	Flow	Flow
Square Root is done where?		In host controller	In transmitter	In Transmitter
Calibrated Range		0 to 50 inH2O	0 to 75 inH2O	0 to 200 inH2O
Transmitter output		0 to 50 inH2O	0 to 300 GPM	0 to 100%
Optional Indicator displays		0 to 50 inH2O (Note 1)	0 to 75 inH2O (Note 2)	0 to 200 inH2O
After pushing Enter key on indicator, the indicator displays		0 to 50 inH2O (Note 1)	0 to 100% (Note 3 & 4)	0 to 100% (Note 3 & 4)
Output of AI #1 to host system		0 to 50 inH2O (Note 1)	0 to 300 GPM (Note 3)	0 to 100% (Note 3)
Output of AI#2 to host system		-50 to +105 ºC	0 to 75 inH2O (Note 5)	-58 to +220 ºF
Block	**Parameter Name**	**Configuration**	**Configuration**	**Configuration**
TB	PRIMARY_VALUE_RANGE - EU_100	50	75	200
	PRIMARY _VALUE_RANGE - EU_0	0	0	0
	PRIMARY _VALUE_RANGE - UNITS_INDEX	inH2O	inH2O	inH2O
	THIRD_VALUE_RANGE - EU_100	- - -	100	100
	THIRD_VALUE_RANGE - EU_0	- - -	0	0
	THIRD_VALUE_RANGE - UNITS_INDEX	- - -	%	%
	THIRD_VALUE_TYPE	- - -	Flow (Note 6)	Flow (Note 6)
AI #1	CHANNEL	Pressure	Flow	Flow
	XD_SCALE - EU_100	50	100	100
	XD_SCALE - EU_0	0	0	0
	XD_SCALE - UNITS_INDEX	inH2O	%	%
	L_TYPE	Direct	Indirect	Direct
	OUT_SCALE - EU_100	50	300	100
	OUT_SCALE - EU_0	0	0	0
	OUT_SCALE - UNITS_INDEX	inH2O	GPM	%
AI #2	CHANNEL	S Temp	Pressure	S Temp
	XD_SCALE - EU_100	105	75	105
	XD_SCALE - EU_0	-50	0	-50
	XD_SCALE - UNITS_INDEX	ºC	inH2O	ºC
	L_TYPE	Direct	Direct	Indirect
	OUT_SCALE - EU_100	105	75	220
	OUT_SCALE - EU_0	-50	0	-58
	OUT_SCALE - UNITS_INDEX	ºC	inH2O	ºF

NOTES:

1. Linear with pressure because Square root extraction is done in the host controller, not in the transmitter.
2. CAUTION - The output being shown on the display is linear with pressure and not linear with flow rate.
3. The 0 to 100% values being shown on the indicator and the output of AI#1 to the host system is linear with the flow rate.
4. If the power to the transmitter is cycled, the indicator switches from 0 to 100% of flow rate to the pressure EGU's that are linear with pressure.

5. The output from AI#2 is linear with pressure, not flow rate.
6. Set for either flow_comp_with_zero_cutoff or flow_comp_with_linear_extrapolation.

Table 10. Pressure Applications

Application Parameters	Application 1	Application 2	Application 3
Application	Pressure	Pressure	Pressure
Calibrated Range	0 to 50 PSI	0 to 75 Kg/cm2	0 to 200 Bar
Transmitter output	0 to 50 PSI	0 to 75 Kg/cm2	0 to 100%
Indicator displays	0 to 50 PSI	0 to 75 Kg/cm2	0 to 200 Bar
After pushing Enter key on indicator, the indicator displays	0 to 50 PSI	0 to 75 Kg/cm2	0 to 200 Bar
Output of AI #1 to host system	0 to 50 PSI	0 to 75 Kg/cm2	0 to 100%
Output of AI #2 (internal temperature) to host system	ºF	ºC	ºF

Block	Parameter Name	Configuration	Configuration	Configuration
TB	PRIMARY_VALUE_RANGE - EU_100	50	75	200
	PRIMARY _VALUE_RANGE - EU_0	0	0	0
	PRIMARY _VALUE_RANGE - UNITS_INDEX	PSI	Kg/cm2	Bar
AI #1	CHANNEL	Pressure	Pressure	Pressure
	XD_SCALE - EU_100	50	75	200
	XD_SCALE - EU_0	0	0	0
	XD_SCALE - UNITS_INDEX	PSI	Kg/cm2	Bar
	L_TYPE	Direct	Direct	Indirect
	OUT_SCALE - EU_100	50	75	100
	OUT_SCALE - EU_0	0	0	0
	OUT_SCALE - UNITS_INDEX	PSI	Kg/cm2	%
AI #2	CHANNEL	S Temp	S Temp	S Temp
	XD_SCALE - EU_100	105	105	105
	XD_SCALE - EU_0	-50	-50	-50
	XD_SCALE - UNITS_INDEX	ºC	ºC	ºC
	L_TYPE	Indirect	Direct	Indirect
	OUT_SCALE - EU_100	220	105	220
	OUT_SCALE - EU_0	-58	-50	-58
	OUT_SCALE - UNITS_INDEX	ºF	ºC	ºF

Table 11. Open Tank or Dry Leg Level Applications

Application Parameters		Application 1	Application 2	Application 3
Application		Open Tank (see Note)	Dry Leg	Dry Leg
Calibrated Range		0 to 50 inH2O	0 to 75 kPa	20 to 200 mmH2O
Transmitter output		0 to 40 inches	0 to 75 kPa	0 to 100%
Indicator displays		0 to 50 inH2O	0 to 75 kPa	20 to 200 mmH2O
After pushing Enter key on indicator, the indicator displays		0 to 50 inH2O	0 to 75 kPa	20 to 200 mmH2O
Output of AI #1 to host system		0 to 40 inches	0 to 75 kPa	0 to 100%
Output of AI #2 (internal temperature) to host system		ºF	ºC	ºC
Block	**Parameter Name**	**Configuration**	**Configuration**	**Configuration**
TB	PRIMARY_VALUE_RANGE - EU_100	50	75	200
	PRIMARY _VALUE_RANGE - EU_0	0	0	20
	PRIMARY _VALUE_RANGE - UNITS_INDEX	inH2O	kPa	mmH2O
AI #1	CHANNEL	Pressure	Pressure	Pressure
	XD_SCALE - EU_100	50	75	200
	XD_SCALE - EU_0	0	0	20
	XD_SCALE - UNITS_INDEX	inH2O	kPa	mmH2O
	L_TYPE	Indirect	Direct	Indirect
	OUT_SCALE - EU_100	40 (see Note)	75	100
	OUT_SCALE - EU_0	0	0	0
	OUT_SCALE - UNITS_INDEX	in	kPa	%
AI #2	CHANNEL	S Temp	S Temp	S Temp
	XD_SCALE - EU_100	105	105	105
	XD_SCALE - EU_0	-50	-50	-50
	XD_SCALE - UNITS_INDEX	ºC	ºC	ºC
	L_TYPE	Indirect	Direct	Direct
	OUT_SCALE - EU_100	220	105	105
	OUT_SCALE - EU_0	-58	-50	-50
	OUT_SCALE - UNITS_INDEX	ºF	ºC	ºC

NOTE

In this example, the fluid level change is 40 inches, with a specific gravity of 1.25, which results in a range of 0 to 50 inH2O.

Table 12. Wet Leg Level and Dual Seal Applications

Application Parameters		Application 1	Application 2	Application 3
Application		Wet Leg Level	Dual Seal	Dual Seal (see Note)
Calibrated Range		-100 to 0 inH2O	-31 to -3 ft H2O	-190 to -30 mmH2O
Transmitter output		-100 to 0 inH2O	0 to 100%	0 to 200 mmH2O
Indicator displays		-100 to 0 inH2O	-31 to -3 ft H2O	-190 to -30 mmH2O
After pushing Enter key on indicator, the indicator displays		-100 to 0 inH2O	-31 to -3 ft H2O	-190 to -30 mmH2O
Output of AI #1 to host system		-100 to 0 inH2O	0 to 100%	0 to 200 mmH2O
Output of AI #2 (internal temperature) to host system		ºF	ºC	ºC
Block	**Parameter Name**	**Configuration**	**Configuration**	**Configuration**
TB	PRIMARY_VALUE_RANGE - EU_100	0	-3	-30
	PRIMARY _VALUE_RANGE - EU_0	-100	-31	-190
	PRIMARY _VALUE_RANGE - UNITS_INDEX	inH2O	ft H2O	mmH2O
AI #1	CHANNEL	Pressure	Pressure	Pressure
	XD_SCALE - EU_100	0	-3	-30
	XD_SCALE - EU_0	-100	-31	-190
	XD_SCALE - UNITS_INDEX	inH2O	ft H2O	mmH2O
	L_TYPE	Direct	Indirect	Indirect
	OUT_SCALE - EU_100	0	100	200
	OUT_SCALE - EU_0	-100	0	0
	OUT_SCALE - UNITS_INDEX	inH2O	%	mm
AI #2	CHANNEL	S Temp	S Temp	S Temp
	XD_SCALE - EU_100	105	105	105
	XD_SCALE - EU_0	-50	-50	-50
	XD_SCALE - UNITS_INDEX	ºC	ºC	ºC
	L_TYPE	Indirect	Direct	Direct
	OUT_SCALE - EU_100	220	105	105
	OUT_SCALE - EU_0	-58	-50	-50
	OUT_SCALE - UNITS_INDEX	ºF	ºC	ºC

— NOTE

For this example, the calibrated range (-190 to -30 mmH2O) is based upon a span of 200 mm of 0.8 SG fluid.

Changing the Primary Range Values (Reranging) by Editing the Transducer Block Parameters

1. Open the Transducer Block. Put the block Out Of Service by setting **MODE_BLK • Target** to **OOS**.
2. Set the **PRIMARY_VALUE_RANGE** sub-parameters as follows:

   EU_100 enter the 100% value of the calibrated range desired

   EU_0 enter the 0% value of the calibrated range desired

3. Write the changes to the transmitter.
4. Calibrate the transmitter. Refer to "Calibration" on page 39.
5. Set the Target Mode in the Transducer Block to **Auto**. Make sure that the **MODE_BLK • ACTUAL** value reads **Auto**. Once in the Auto mode, the **PRIMARY_VALUE** and **SECONDARY_VALUE** should display the appropriate values. If not, check the Maintenance section. If the block does not change to **Auto**, go to **BLOCK_ERR_DESC_1** to see what is wrong. Fix the problem and close the Transducer Block window.
6. Reconfigure the **CHANNEL**, **XD_SCALE**, **L_TYPE**, and **OUT_SCALE** parameters in the Analog Input Block as necessary. See "Configuring the Scaling Parameters in the Analog Input Block" on page 56.

Disabling the Link Active Scheduler (LAS)

To disable the LAS, right mouse click on **DEV_TAG** and set "Device Type = yes" to OK.

NOTE

If more than one device has the LAS feature configured on, the LAS is applied to the devices in the order of their Node Address. Therefore, take LAS into consideration when selecting the Node Address.

CAUTION

Do not modify the parameters in the Link Settings (Advanced) tab without good reason. If you must modify parameters for certain transmitters, Invensys will recommend settings. Modifying these parameters can have an adverse affect on device operation. If settings are incorrectly modified, some devices may disappear from the network.

NOTE

Invensys recommends, as a prudent measure, that multiple devices (two or more) on the bus be configured as link master devices.

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.

NOTE

After writing changes to your transmitter, wait at least 30 seconds before disconnecting your transmitter or otherwise removing power from it.

Troubleshooting

Simulation Mode

The transmitter has a simulation capability that can be used for debugging/troubleshooting the system when the process is not running. Once the simulation jumper is set, the user can select any value as the input to the AI Block for testing or debugging purposes. The procedure is as follows:

1. Place the appropriate AI Block in Out of Service (**OOS**) mode using the configurator software.
2. Remove the housing cover and the optional indicator.
3. To activate Simulation mode, move the simulation jumper to the lower position as shown in Figure 36.

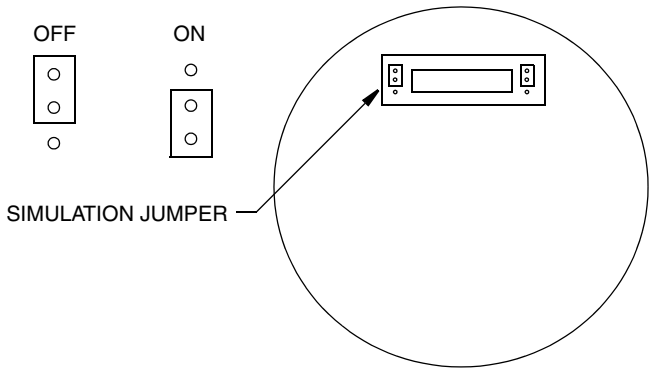


Figure 36. Simulation Jumper

4. Replace the indicator and housing cover, if desired.
5. Set the **SIMULATE_ENABLE • DISABLE** to **Active**

6. Set the **SIMULATE_STATUS_QUALITY** to **Good_NonCascade** (suggested setting) or other appropriate setting.
7. Type in the value you want as the output from the Transducer Block in the **Simulate_Value** parameter.
8. Click on the **Write Changes** button. If you try to send a simulated output without putting the jumper in the correct position (step #2), the software will not change anything (device did not accept this parameter value) and you will get an error response.
9. Set the AI Block to **AUTO** mode
10. Proceed with troubleshooting remembering that the output of the AI Block has been set by the value typed in step #7
11. After completion of troubleshooting, set the AI Block to Out of Service (OOS)
12. Set the **SIMULATE_ENABLE_DISABLE** to **Disabled**
13. Click on the **Write Changes** button.
14. Place the AI Block in **AUTO** mode using the configurator software. Make sure the **MODE_BLK • ACTUAL** reads **AUTO**.
15. Reset the jumper moved in Step 3.
16. Reassemble electronic module, indicator and housing cover.

Restart

The **RESTART** parameter in the Resource Block should only be used when the configuration in the transmitter is incorrect and you cannot fix the problem by using the troubleshooting information in this section. In all cases, try cycling the power to the transmitter first. Then go back to the block with the problem and try to write the changes to the transmitter. If that does not clear the problem, proceed with the RESTART procedure.

! CAUTION

When you do a "Defaults" RESTART command in the Resource Block, the configured parameters automatically default to the status and values predetermined by the Foundation. These are the same as the initial factory settings shown in Appendix A for the Resource, Analog Input, and PID Blocks but are different than those shown for the Transducer Block.

1. Open the Resource Block and put it in the OOS mode.
2. Open the RESTART box and select one of the following:
   - Uninitialized – do not use (may not appear on list)
   - Run – this is the default setting, the nominal state when not restarting
   - Defaults – Sets the parameters to the Foundation defaults, which may be different than the initial factory settings. This resets all configurable function block application objects. It also clears all configured Trend and Link Objects. A restart of the processor is also performed automatically after re-initialization has been completed.

- Processor – does a warm restart of CPU and has the same effect as cycling the power (OFF/ON) to the transmitter

3. Click on the **Write Changes** button.
4. Put the Resource Block back into AUTO mode (the RESTART selection automatically defaults to the Run position).
5. Reconfigure the appropriate function blocks.

Switch Mode Checklist

1. Verify that the block is scheduled. (Note that resource block and transducer block are always scheduled.)
2. Check the error messages in the **BLOCK_ERR_DESC_1** parameter.
3. Verify that resource block is in Auto Mode.
4. Verify that requested mode is permitted.

Schedule Download Checklist

1. Verify that all blocks in the network have different tags.
2. Verify that no two blocks from the same devices are scheduled to be executed at the same time.
3. Verify that there is enough time for block execution.

Block Errors

Table 13 lists all of the possible error codes in the various function blocks. Not all error codes are possible in all of the blocks. The condition number is shown in the **BLOCK_ERR** parameter for all blocks (and in the **XD_ERROR** in the Transducer Block).

Table 13. Block Errors

Bit Number	Name and Description
0	Other
1	Block Configuration Error: (See Table 14)
2	Link Configuration Error: A link used in one of the function blocks is improperly configured.
3	Simulate Active: The Simulation jumper is enabled. This is not an indication that the I/O blocks are using simulated data.
4	Local Override:
5	Device Fault State Set:
6	Device Needs Maintenance Soon:
7	Input Failure/Process Variable Has Bad Status: The hardware is bad, an input is not connected, or a status is being simulated.

Table 13. Block Errors (Continued)

Bit Number	Name and Description
8	Output Failure: The output is bad based primarily upon a bad input.
9	Memory Failure: A memory failure has occurred in Flash, RAM or EEPROM memory.
10	Lost Static Data: Static data stored in non-volatile memory has been lost.
11	Lost NV Data: Non-volatile data stored in non-volatile memory has been lost.
12	Readback Check Failed:
13	Device Needs Maintenance Now:
14	Power Up: The Device was just powered - wait
15	Out Of Service: The actual mode is OSS, change to AUTO

Table 14. Configuration Errors

Error	Description
Resource Block	
All Static Parameters are Reset	Device needs a complete download
Analog Input (AI) Block	
XD_SCALE.EU_0 ≥ XD_SCALE.EU_100	Low end of scale must be less than high end
OUT_SCALE.EU_0 ≥ OUT_SCALE.EU_100	Low end of scale must be less than high end
OUT_SCALE = XD_SCALE and L_TYPE = Direct	Scales must match if L_TYPE is Direct
XD_SCALE.UNITS_INDEX ≠ Pressure Channel Units	Units in Transducer Block and AI Block must match
XD_SCALE.UNITS_INDEX ≠ Temperature Channel Units	Units in Transducer Block and AI Block must match
XD_SCALE.UNITS_INDEX ≠ Flow Channel Units	Units in Transducer Block and AI Block must match
AI Block not scheduled	AI Block must be scheduled to run by a host
Invalid Channel	AI Block Channel must be 1, 2, or 3
Proportional Integral, Derivative (PID) Block	
SP not initialized	SP has never been written
BYPASS not initialized	BYPASS must be set to On or Off
SHED_OPT not initialized	SHED_OPT must be initialized for ROUT and RCAS modes
GAIN not initialized	GAIN must be greater than zero
OUT_SCALE.EU_0 ≥ OUT_SCALE.EU_100	Low end of scale must be less than high end
PV_SCALE.EU_0 ≥ PV_SCALE.EU_100	Low end of scale must be less than high end
FF_SCALE.EU_0 ≥ FF_SCALE.EU_100	Low end of scale must be less than high end

Table 14. Configuration Errors (Continued)

Error	Description
TRK_SCALE.EU_0 ≥ TRK_SCALE.EU_100	Low end of scale must be less than high end
PID Block not scheduled	PID Block must be scheduled to run by a host

Interboard Communication Errors/Status

The SENSOR_STATUS parameter in the Transducer Block reflects the state of the sensor board. If the state is normal, SENSOR_STATUS indicates the following:

SENSOR_STATUS
SENSOR_STATUS No Parameter Offset

If something occurs that affects the state of the sensor board, a status message is posted, for example:

SENSOR_STATUS Sensor Board is offline due to config
SENSOR_STATUS No Parameter Offset

which indicates the sensor interface is offline because someone is attempting to configure the transmitter via the local LCD display.

If a particular parameter is at fault it is displayed in the second portion of SENSOR_STATUS.

The following is a list of all the possible status messages:

1. No serial comm between Sensor and MAU
2. Sensor board is busy
3. Sensor board-Change to ONLINE failed after Re-Init
4. Sensor board is not in ONLINE mode
5. Sensor board M1_MODE is not LINEAR
6. Sensor board is not good for Pressure measurement
7. Sensor board M1EOFF or M2EOFF parameter is not ZERO
8. Sensor board M2 mode 'OFF' is selected
9. Sensor board M1DAMP parameter is not zero
10. EGU for M1 is not supported
11. EGU for M2 is not supported
12. Sensor board M2EGU should be '%flow
13. Transducer Block Initializing
14. EEPROM Error
15. Sensor Database is updating
16. Sensor Board is offline due to cal
17. Sensor Board is offline due to config
18. Sensor Board is Out Of Service

In general, any message that is permanently displayed or keeps returning for unknown reasons indicates a hardware failure of the sensor board and the board needs service.

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 27.
12. Turn on transmitter power source.

Replacing the Electronics Module Assembly

To replace the electronics module assembly, refer to Figure 37 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 27.
9. Turn on transmitter power source.

The module replacement procedure is now complete.

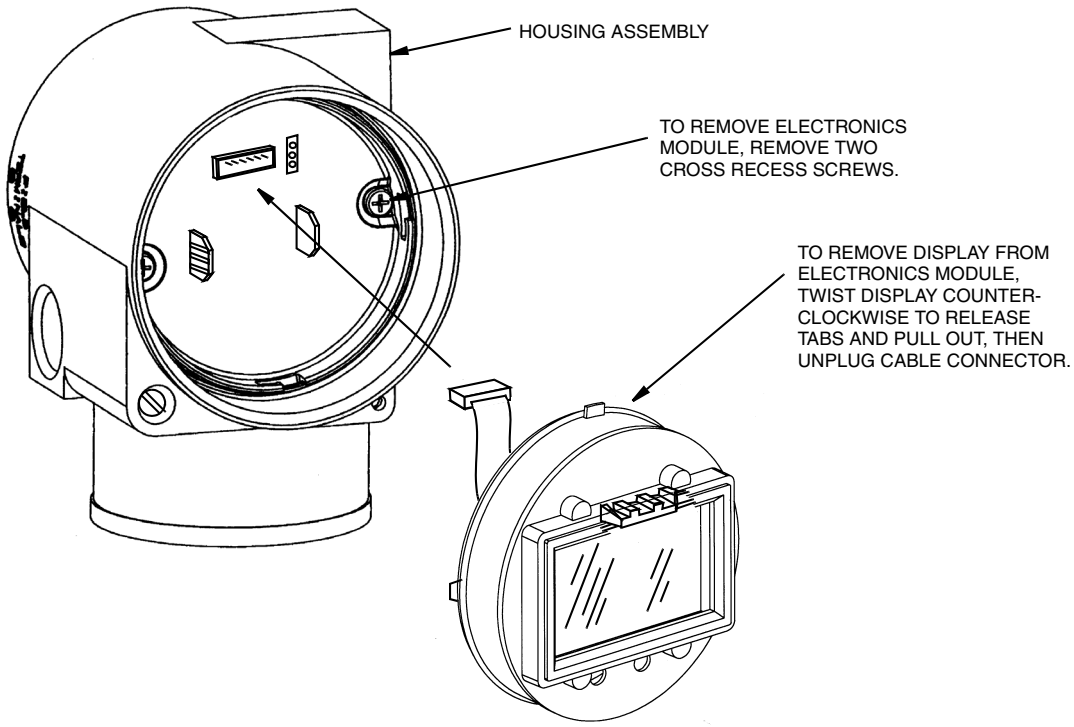


Figure 37. Replacing the Electronics Module Assembly and Display

Removing and Reinstalling a Housing Assembly

To remove and reinstall a housing assembly, refer to Figure 37 and proceed as follows:

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

WARNING

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

6. Feed the sensor cable through the housing neck into the electronics compartment.
7. Screw the housing onto the sensor neck until it bottoms. Do not over tighten. Be careful not to damage the sensor cable or dislodge the neck O-ring.

8. If your housing has an anti-rotation screw, engage the screw until it touches the sensor neck and back it off 1/8th turn. It is important that the screw is not touching the sensor. Fill the screw recess with red lacquer (Foxboro Part Number X0180GS or equivalent). the housing may then be rotated up to one full turn counterclockwise for optimum access.
9. If your housing has a retention clip, insert the clip over the boss in the housing neck so that the hole in the clip is aligned with the hole in the boss. Install the screw but do not tighten. Rotate the housing up to one full turn counterclockwise for optimum access. Tighten the retention clip screw and fill the screw recess with red lacquer (Foxboro Part Number X0180GS or equivalent). The housing can still be rotated for optimum access.
10. Reinstall the electronics module per Steps 6 through 9 in the previous procedure.

Adding the Optional Display

To add the optional display, refer to Figure 37 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 27.
6. Turn on transmitter power source.

Replacing the Sensor Assembly

To replace the sensor assembly, refer to Figures 38 and 39 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.

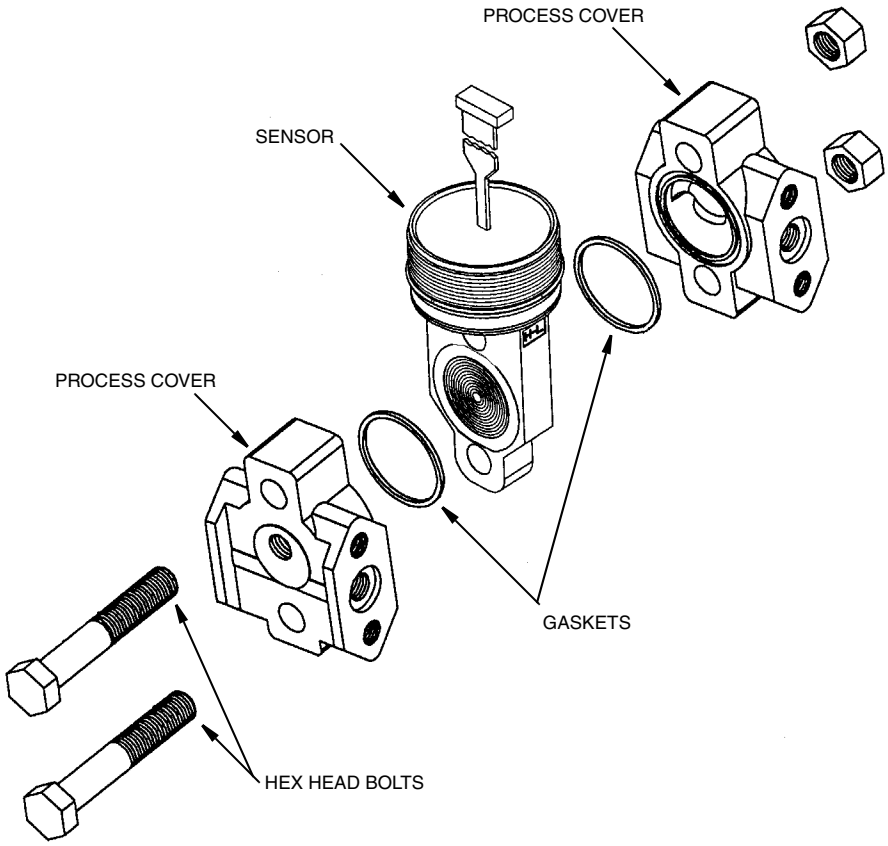


Figure 38. Replacing the Sensor Assembly

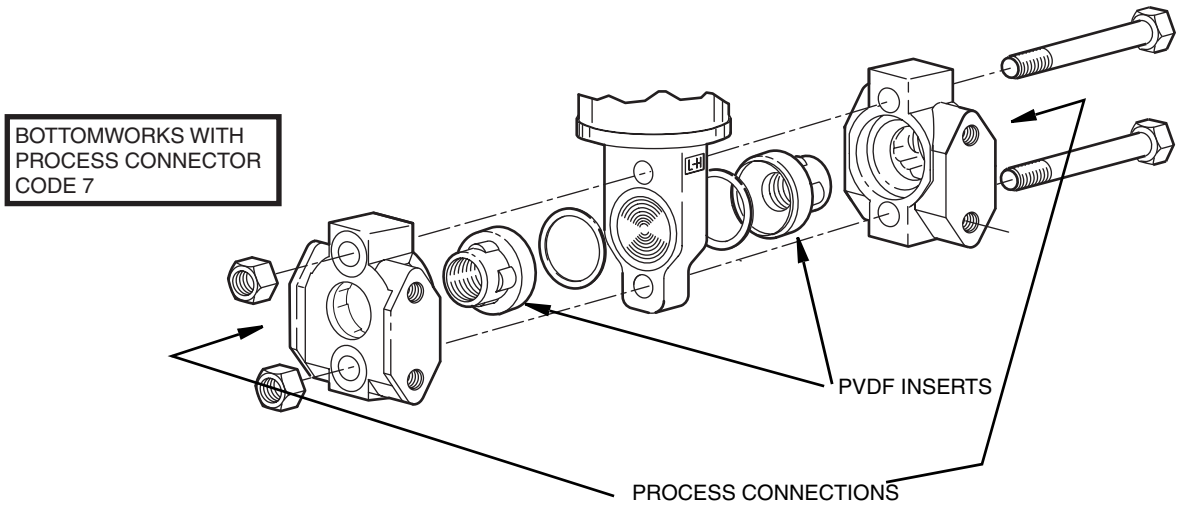


Figure 39. Replacing the Sensor Assembly (pvdf Inserts)

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 40.

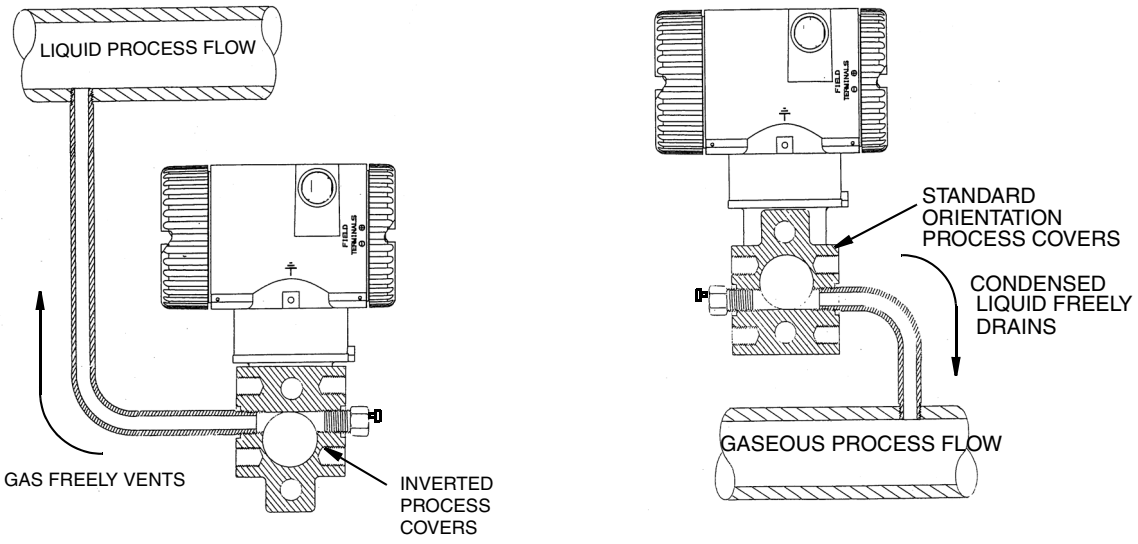


Figure 40. Sensor Cavity Venting and Draining

To rotate the process covers, refer to Figure 38 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.

Appendix A. List of Parameters

An explanation of common fieldbus parameter terms is located in MI 014-900.

Table 15. Fieldbus Parameters

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
	Network Configuration			
	PD_TAG	R/W	Unique Device ID	
	NODE_ADDRESS	R/W	Unique to a segment	
	Resource Block			
	BLOCK_TAG	R/W	RB(300)	Unique Block ID
1	ST_REV	RO	current rev	Static Data revision level
2	TAG_DESC	R/W	blank	User description of the block application
3	STRATEGY	R/W	0	To ID groups of blocks
4	ALERT_KEY	R/W	0	ID number of the plant unit
5	MODE_BLK			
	Target	R/W	OOS	Mode requested by operator
	Actual	RO	OOS	The current mode of the block
	Permitted	R/W	Auto, OOS	Modes allowed for this block
	Normal	R/W	Auto	Mode of block during normal operations
6	BLOCK_ERR	RO	OutOfService	Error status of the hardware or software
7	RS_STATE	RO	Standby	State of the function block application
8	TEST_RW	R/W		Test parameter used only for conformance testing.
9	DD_RESOURCE	RO		Tag of the resource identifying the DD
10	MANUFAC_ID	RO	Foxboro	Manufacturer ID number
11	DEV_TYPE	RO	BA30	Manufacturer Model number
12	DEV_REV	RO	current device rev	Device revision number
13	DD_REV	RO	01	Initial DD revision number
14	GRANT_DENY			Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters.
	Grant	R/W	0 (none selected)	
	Deny	R/W	0 (none selected	
15	HARD_TYPES	RO	Scalar Input	Type of hardware available to this resource
16	RESTART	R/W	Run	Defines the type of restart to be initiated
17	FEATURES	RO	Reports, Hard W Lock Chg Bypass in Auto	Shows supported Resource Block options

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
18	FEATURE_SEL	R/W	Hard W Lock	Used to select Resource Block options
19	CYCLE_TYPE	RO	Scheduled Block execution	Block execution methods available
20	CYCLE_SEL	R/W	0 (none selected)	Used to select Cycle Type
21	MIN_CYCLE_T	RO	6400 1/32 ms	Duration of the shortest cycle interval
22	MEMORY_SIZE	RO	0	Available config memory in the empty resource
23	NV_CYCLE_T	RO	480000 1/32 ms	Interval between writes to nonvolatile memory
24	FREE_SPACE	RO	0	% of memory available for further configuration
25	FREE_TIME	RO	0	% of block processing time available
26	SHED_RCAS	R/W	640000 1/32 ms	Timeout for write attempts to RCas locations
27	SHED_ROUT	R/W	640000 1/32 ms	Timeout for write attempts to ROut locations
28	FAULT_STATE	RO	Clear	When active, causes all output function flocks in the resource to go to the condition chosen by the fault state Type I/O option
29	SET_FSTATE	R/W	Off	Allows faultstate conditions to be manually set
30	CLR_FSTATE	R/W	Off	Allows faultstate conditions to be cleared
31	MAX_NOTIFY	RO	8	Maximum number of unconfirmed alert notify messages possible
32	LIM_NOTIFY	R/W	8	Maximum number of unconfirmed alert notify messages allowed
33	CONFIRM_TIME	R/W	640000 1/32 ms	Minimum time between retries of alert reports
34	WRITE_LOCK	R/W	Not Locked	Locked setting prevents writing changes if FEATURE_SEL is set to Hard W Lock and the write protection jumper is in the locked position.
35	UPDATE_EVT	RO		Generated by any change to static data of the block
36	BLOCK_ALM	RO		For all configuration, hardware, connection failure, or system problems

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
37	ALARM_SUM			The current alert status
	Current	RO	0	The active state of each alarm
	Unacknowledged	RO	0	The unacknowledged state of each alarm
	Unreported	RO	0	The unreported state of each alarm
	Disabled	R/W	no alarms disabled	The disabled state of each alarm
38	ACK_OPTION	R/W	no alarms auto ack'd	Selection of which alarms are automatically acknowledged
39	WRITE_PRI	R/W	0	Priority of alarm generated by clearing write lock
40	WRITE_ALM	RO		Alert generated if the write lock parameter is cleared
41	ITK_VER	RO	5	Revision to which the DD has been tested
42	BLOCK_ERR_DESC_1	RO	0	Details of a block error.

	Transducer Block			
	BLOCK_TAG	R/W	TR(550)	Unique Block ID
1	ST_REV	RO	current rev	Static data revision
2	TAG_DESC	R/W	blank	User description of the block application
3	STRATEGY	R/W	0	To ID groups of blocks
4	ALERT_KEY	R/W	0	ID number of plant unit
5	MODE_BLK			
	Target	R/W	Auto	Mode requested by operator
	Actual	RO	Auto	The current mode of the block
	Permitted	R/W	Auto, OOS	Modes allowed for this block
	Normal	R/W	Auto	Mode of block during normal operations
6	BLOCK_ERR	RO	OutOfService	Error status of the hardware or software
7	UPDATE_EVT	RO		Generated by any change to static data of the block
8	BLOCK_ALM	RO		For all configuration, hardware, connection failure, or system problems
9	TRANSDUCER _DIRECTORY	RO	0	Dir that specifies the number & start of data collection
10	TRANSDUCER_TYPE	RO	Std press w/calib	Identifies the transducer
11	XD_ERROR	RO	0	Transducer block alarm subcode
12	COLLECTION _DIRECTORY	RO	0	Directory that specifies the number & start of each transducer

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
13	PRIMARY_VALUE _TYPE	RO	Differential Pressure	Type of measurement of the primary value
14	PRIMARY_VALUE			
	Status	RO	GoodNonCascade, NonSpecific, NotLimited	Set by transmitter - status of measurement value
	Value	RO	0	Numerical quantity calculated by the transmitter
15	PRIMARY_VALUE _RANGE			The range, units, and precision of the primary value
	EU_at_100%	R/W	per sales order(1)	The engineering units value at 100% of range
	EU_at_0%	R/W	per sales order(1)	The engineering units value at 0% of range
	Units_Index	R/W	per sales order(1)	Engineering units for the primary value
	Decimal	R/W	5 (or per S.O.)	The number of digits to the right of the decimal point
16	CAL_POINT_HI	R/W	Same as PV Range	The highest calibrated value
17	CAL_POINT_LO	R/W	Same as PV Range	The lowest calibrated value
18	CAL_MIN_SPAN	RO	per device	The minimum calibration span
19	CAL_UNIT	R/W	Same as PV Range	Engineering units during last calibration
20	SENSOR_TYPE	R/W	Strain Gauge	The type of sensor
21	SENSOR_RANGE	RO	per device	The high and low range limits of the sensor, engineering units and digits to the right of the decimal point
22	SENSOR_SN	RO	per device	The sensor serial number
23	SENSOR_CAL _METHOD	R/W	0 (none selected)	The method of last sensor calibration
24	SENSOR_CAL_LOC	R/W	Foxboro MA	The last calibration location
25	SENSOR_CAL_DATE	R/W	mm/dd/yy; hh:mm:ss	The date of the last sensor calibration
26	SENSOR_CAL_WHO	R/W	Foxboro	The name of the person responsible for the last calibration
27	SENSOR_ISOLATOR _MTL	RO	0	The material of the isolating diaphragms
28	SENSOR_FILL _FLUID	RO	0	The type of sensor fill fluid

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
29	SECONDARY_VALUE			
	Status	RO	Bad, OutOfService, NotLimited	Set by transmitter - status of measurement value
	Value	RO	0	Numerical quantity calculated by the transmitter or entered by the user
30	SECONDARY_VALUE _UNIT	RO	°C (or per S.O.)	The engineering unit of the secondary value
31	THIRD_VALUE			Shows flow rate as a percentage of flow
	Status	RO	Bad, OutOfService, NotLimited	Set by transmitter - status of measurement value
	Value	RO	0	Numerical quantity calculated by the transmitter or entered by the user
32	THIRD_VALUE _RANGE			The range, units, and precision of the third value
	EU_at_100%	RO	100 (or per S.O.)	The engineering units value at 100% of range
	EU_at_0%	RO	0 (or per S.O.)	The engineering units value at 0% of range
	Units_Index	R/W	inH_20 (or per S.O.)	Engineering units for the third value
	Decimal	R/W	5 (or per S.O.)	The number of digits to the right of the decimal point
33	THIRD_VALUE_TYPE	R/W	Pressure Linear	Type of measurement of the third value
34	SENSOR_DAMPING	R/W	0	The value of the sensor board M1DAMP parameter
35	FACTORY_STATUS	RO	0	Diagnostic parameter reserved for Foxboro use.
36	SENSOR_STATUS	RO	0	Set by transmitter - status of the sensor.
37	TRANSDUCER _COMMAND	R/W	0	Diagnostic parameter reserved for Foxboro use.
38	TRANSDUCER _RESPONSE	RO	0	Diagnostic parameter reserved for Foxboro use.
39	MAU_SW_REVISION	RO	current rev	MAU firmware version
40	SB_SW_REVISION	RO	current rev	SB firmware version
41	BLOCK_ERR_DESC_1	RO	0	Details of a block error.
	Analog Input Blocks			
	BLOCK_TAG	R/W	AI1(350) or AI2(400)	Unique Block ID

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
1	ST_REV	RO	current rev	Static data revision
2	TAG_DESC	R/W	blank	User description of the block application
3	STRATEGY	R/W	0	To ID groups of blocks
4	ALERT_KEY	R/W	0	ID number of plant unit
5	MODE_BLK			
	Target	R/W	OOS	Mode requested by operator
	Actual	RO	OOS	The current mode of the block
	Permitted	R/W	Auto, OOS, Man	Modes allowed for this block
	Normal	R/W	Auto	Mode of block during normal operations
6	BLOCK_ERR	RO	OutOfService	Error status of the hardware or software
7	PV			
	Status	RO	Bad, NonSpecific, NotLimited	The status of this block
	Value	RO	0	The value of this block
8	OUT			
	Status	RO	Bad, OutOfService, NotLimited	The status of this block
	Value	Note 2	0	The primary analog value calculated by the transmitter or entered by the user in Manual mode
9	SIMULATE			Simulates the transducer input or output to this block
	Simulate Status			
	Quality	R/W	Bad	Quality of the measurement
	Substatus	R/W	NonSpecific	Substatus
	Limits	R/W	NotLimited	Limits
	Simulate Value	R/W	0	Used for the transducer value when simulation is enabled
	Transducer Status	RO	Bad, NonSpecific, NotLimited	Set by transmitter - status of the transducer
	Transducer Value	RO	0	Current value supplied by the transducer
	Enable/Disable	R/W	Disabled	Enable/disable simulation

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
10	XD_SCALE			The range, units, and precision of XD_SCALE
	EU_at_100%	R/W	100	The engineering units value at 100% of range
	EU_at_0%	R/W	0	The engineering units value at 0% of range
	Units_Index	R/W	inH2O	Engineering units for the transducer value
	Decimal	R/W	5	The number of digits to the right of the decimal point
11	OUT_SCALE			The range, units, and precision of OUT_SCALE
	EU_at_100%	R/W	100	The engineering units value at 100% of range
	EU_at_0%	R/W	0	The engineering units value at 0% of range
	Units_Index	R/W	%	Engineering units for the output value
	Decimal	R/W	5	The number of digits to the right of the decimal point
12	GRANT_DENY			Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters
	Grant	R/W	0 (none selected)	
	Deny	R/W	0 (none selected)	
13	IO_OPTS	R/W	0 (none selected)	Options to alter input and output block processing
14	STATUS_OPTS	R/W	0 (none selected)	Options for block processing of status
15	CHANNEL	R/W	AI1 = pressure AI2 = STemp	The logical channel connected to this block - Channel 1 is pressure, Channel 2 is sensor temperature, and Channel 3 is flow
16	L_TYPE	Note 2	Indirect	Determines if value is to be used directly or converted
17	LOW_CUT	R/W	0	Not Applicable. Only used in square root processing
18	PV_FTIME	R/W	0	Time constant of a single exponential filter for the PV, in seconds.
19	FIELD_VAL			
	Status	RO	Bad, NonSpecific, NotLimited	Status of transducer condition before signal characterization or filtering
	Value	RO	0	Raw value of the field device in % of PV range
20	UPDATE_EVT	RO		Generated by any change to static data of the block

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
21	BLOCK_ALM	RO		For all configuration, hardware, connection failure, or system problems
22	ALARM_SUM			The current alert status
	Current	RO	0	The active state of each alarm
	Unacknowledged	RO	0	The unacknowledged state of each alarm
	Unreported	RO	0	The unreported state of each alarm
	Disabled	R/W	no alarms disabled	The disabled state of each alarm
23	ACK_OPTION	R/W	no alarms auto ack'd	Selection of which alarms are automatically acknowledged
24	ALARM_HYS	R/W	0.5%	Amount the PV must return within alarm limits before the alarm condition clears
25	HI_HI_PRI	R/W	0	Priority of the High-High alarm
26	HI_HI_LIM	R/W	1.#INF	The setting for High-High alarm in engineering units
27	HI_PRI	R/W	0	Priority of the High alarm
28	HI_LIM	R/W	1.#INF	The setting for High alarm in engineering units
29	LO_PRI	R/W	0	Priority of the Low alarm
30	LO_LIM	R/W	-1.#INF	The setting for Low alarm in engineering units
31	LO_LO_PRI	R/W	0	Priority of the Low-Low alarm
32	LO_LO_LIM	R/W	-1.#INF	The setting for Low-Low alarm in engineering units
33	HI_HI_ALM	RO	0	The status of the High-High alarm
34	HI_ALM	RO	0	The status of the High alarm
35	LO_ALM	RO	0	The status of the Low alarm
36	LO_LO_ALM	RO	0	The status of the Low-Low alarm
37	BLOCK_ERR_DESC_1	RO	0	Details of a block error.

	PID Block			
	BLOCK_TAG	R/W	PID(450)	Unique Block ID
1	ST_REV	RO	current rev	Static data revision
2	TAG_DESC	R/W	blank	User description of the block application
3	STRATEGY	R/W	0	To ID groups of blocks
4	ALERT_KEY	R/W	0	ID number of plant unit

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
5	MODE_BLK			
	Target	R/W	OOS	Mode requested by operator
	Actual	RO	OOS	The current mode of the block
	Permitted	R/W	Auto, Man, OOS, ROut, RCas, Cas	Modes allowed for this block
	Normal	R/W	Auto	Mode of block during normal operations
6	BLOCK_ERR	RO	Out of Service	Error status of the hardware or software
7	PV			
	Status	RO	Bad; NonSpecific; NotLimited	The status of this parameter
	Value	RO	0	The value of this parameter
8	SP			The value and status for this parameter
	Status	RO	Bad; OutOfService; NotLimited	The setpoint status is determined by the transmitter
	Value	Note 3	0	The setpoint value must be written even if correctly shown
9	OUT			
	Status	RO	Bad; OutOfService; NotLimited	The status of the output of this block
	Value	Note 2	0	The primary analog value calculated by the transmitter or entered by the user in Manual mode
10	PV_SCALE			The range, units, and precision of the PV parameter
	EU_at_100%	R/W	100	The engineering units value at 100% of range
	EU_at_0%	R/W	0	The engineering units value at 0% of range
	Units_Index	R/W	%	Engineering units
	Decimal	R/W	5	The number of digits to the right of the decimal point

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
11	OUT_SCALE			The range, units, and precision of the OUT parameter
	EU_at_100%	R/W	100	The engineering units value at 100% of range
	EU_at_0%	R/W	0	The engineering units value at 0% of range
	Units_Index	R/W	%	Engineering units
	Decimal	R/W	5	The number of digits to the right of the decimal point
12	GRANT_DENY			Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters
	Grant	R/W	0 (none selected)	
	Deny	R/W	0 (none selected)	
13	CONTROL_OPTS	R/W	0 (none selected)	Options to alter calculations in the control block
14	STATUS_OPTS	R/W	0 (none selected)	Options for block processing of status
15	IN			
	Status	Note 4	Bad; NotConnected; NotLimited	The status of this block
	Value		0	The primary input value of this block
16	PV_FTIME	R/W	0	Time constant of a single exponential filter for the PV in seconds.
17	BYPASS	R/W	0 (none selected)	Enables the normal control algorithm to be bypassed
18	CAS_IN			The remote setpoint status and value
	Status	Note 4	Bad; NotConnected; NotLimited	The status of this block
	Value		0	The value of this block
19	SP_RATE_DN	R/W	+INF	Ramp rate at which downward setpoint changes are acted upon in Auto mode
20	SP_RATE_UP	R/W	+INF	Ramp rate at which upward setpoint changes are acted upon in Auto mode
21	SP_HI_LIM	R/W	100	Setpoint high limit
22	SP_LO_LIM	R/W	0	Setpoint low limit
23	GAIN	R/W	0	Value used by the block algorithm in calculating the block output
24	RESET	R/W	+INF	Integral time constant in seconds per repeat
25	BAL_TIME	R/W	0	Time for internal working value of bias or ratio to return to the operator set bias or ratio in seconds

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
26	RATE	R/W	0	Derivative time constant in seconds
27	BKCAL_IN			Value and status from a lower block's BKCAL_OUT
	Status	Note 4	Bad; NotConnected; NotLimited	The status of this block
	Value		0	The value of this block
28	OUT_HI_LIM	R/W	100	Limits the maximum output value
29	OUT_LO_LIM	R/W	0	Limits the minimum output value
30	BKCAL_HYS	R/W	0.5	Amount the output must change away from its output limit before the limit status is turned off (in % of span of the output)
31	BKCAL_OUT			Value and status from an upper block's BKCAL_IN
	Status	RO	Bad; NonSpecific; NotLimited	The status of this block
	Value	RO	0	The value of this block
32	RCAS_IN			Target setpoint and status provided by a supervisory host to an analog control or output block
	Status	R/W	Bad; OutOfService; NotLimited	The status of this block
	Value	R/W	0	The value of this block
33	ROUT_IN			Target setpoint and status provided by a host to the control block for use as the output
	Status	R/W	Bad; OutOfService; NotLimited	The status of this block
	Value	R/W	0	The value of this block
34	SHED_OPT	R/W	0 (uninitialized)	Action to be taken on remote control device timeout
35	RCAS_OUT			Block setpoint and status after ramping
	Status	RO	Bad; NonSpecific; NotLimited	The status of this block
	Value	RO	0	The value of this block
36	ROUT_OUT			Block output and status provided to a host
	Status	RO	Bad; NonSpecific; NotLimited	The status of this block
	Value	RO	0	The value of this block

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
37	TRK_SCALE			The range, units, and precision associated with TRK_VALr
	EU_at_100%	R/W	100	Engineering units value at 100% of scale
	EU_at_0%	R/W	0	Engineering units value at 0% of scale
	Units_Index	R/W	%	Engineering units
	Decimal	R/W	5	The number of digits to the right of the decimal point
38	TRK_IN_D			Used to initiate external tracking of the block output to the value specified in TRK_VAL
	Status	Note 4	Bad; NotConnected; NotLimited	The status of this block
	Value		0	The value of this block
39	TRK_VAL			Input used as the track value when external tracking is enabled by TRK_IN_D
	Status	Note 4	Bad; NotConnected; NotLimited	The status of this block
	Value		0	The value of this block
40	FF_VAL			The feed forward status and value
	Status	Note 4	Bad; NotConnected; NotLimited	The status of this block
	Value		0	The value of this block
41	FF_SCALE			The range, units and precision of the feed forward input
	EU_at_100%	R/W	100	Engineering units value at 100% of scale
	EU_at_0%	R/W	0	Engineering units value at 0% of scale
	Units_Index	R/W	%	Engineering units
	Decimal	R/W	5	The number of digits to the right of the decimal point
42	FF_GAIN	Note 2	0	Gain that the feedforward input is multiplied by before it is added to the calculated control output
43	UPDATE_EVT	RO		Generated by any change to static data of the block
44	BLOCK_ALM	RO		For all config, hardware, connection failures, and system problems
45	ALARM_SUM			
	Current	RO	0	The active state of each alarm
	Unacknowledged	RO	0	The unacknowledged state of each alarm
	Unreported	RO	0	The unreported state of each alarm
	Disabled	R/W	no alarms disabled	The disabled state of each alarm
46	ACK_OPTION	R/W	no alarms auto ack'd	Selection of which alarms will be automatically ack'd

Table 15. Fieldbus Parameters (Continued)

Rel Index	Parameter Name	RO or R/W	Initial Factory Settings	Comments
47	ALARM_HYS	R/W	0.5%	Amount the PV must return within alarm limits before the alarm condition clears
48	HI_HI_PRI	R/W	0	Priority of the High-High alarm (0-15)
49	HI_HI_LIM	R/W	+INF	Setting of High-High alarm in engineering units
50	HI_PRI	R/W	0	Priority of the High alarm (0-15)
51	HI_LIM	R/W	+INF	Setting of High alarm in engineering units
52	LO_PRI	R/W	0	Priority of the Low alarm (0-15)
53	LO_LIM	R/W	-INF	Setting for Low alarm in engineering units
54	LO_LO_PRI	R/W	0	Priority of the Low-Low alarm (0-15)
55	LO_L0_LIM	R/W	-INF	Setting of Low-Low alarm in engineering units
56	DV_HI_PRI	R/W	0	Priority for the high deviation alarm
57	DV_HI_LIM	R/W	+INF	Setting of high deviation alarm in engineering units
58	DV_LO_PRI	R/W	0	Priority for the low deviation alarm
59	DV_LO_LIM	R/W	-INF	Setting of low deviation alarm in engineering units
60	HI_HI_ALM	RO	0	Status and Value of the High-High alarm
61	HI_ALM	RO	0	Status and Value of the High alarm
62	LO_ALM	RO	0	Status and Value of the Low alarm
63	LO_LO_ALM	RO	0	Status and Value of the Low-Low alarm
64	DV_HI_ALM	RO	0	Status and Value of the High Deviation Alarm
65	DV_LO_ALM	RO	0	Status and Value of the Low Deviation Alarm
66	BLOCK_ERR_DESC_1	RO	0	Details of a block error.

(1)Transmitter parameters are configured as follows if calibrated range is not provided with the order: Span Code B: 0 to 200 inH_2O; Span Code C: 0 to 1000 inH_2O;.Span Code D: 0 and 2000 psi; Span Code M: 0 and 2000 psi

(2) R/W only in Manual or Out of Service mode.

(3) R/W only in Auto, ROut, or Out of Service

(4) R/W only when communication link not connected.

Index

B
Block Errors 67

C
Calibration 39
    From a Fieldbus Host 44
    Using the Local Display 41
Configuration
    From a Fieldbus Host 55
    Using the Local Display 47
Cover Locks 27

D
Display, Positioning the 26

F
Fieldbus Software, Installing 32

H
Housing, Positioning the 26

I
Identification
    Transmitter 3
Installation 13

L
Link Active Scheduler (LAS), Disabling the 63

M
Maintenance 65
Mounting 13

O
Operation Via Local Display 35

P
Parameters, List of 77

Parts Replacement 70
Piping, Installation of Flow Measurement 22

R
Reference Documents 2
Restart 66

S
Seal Liquid, Filling the System with 25
Simulation Mode 65
Specifications
Product Safety 9
Standard 5

T
Troubleshooting 65

V
Venting, Rotating Process Covers for 75

W
Wiring 27
Write Protect Jumper, Setting the 27

Z
Zero Adjustment Using External Zero Button 43

ISSUE DATES
DEC 2001
OCT 2003
APR 2004
FEB 2005
JUN 2005
SEP 2005
FEB 2006
MAY 2007
JUN 2007
AUG 2007
JUN 2008
APR 2010

Vertical lines to the right of text or illustrations indicate areas changed at last issue date.

Invensys Operations Management
5601 Granite Parkway Suite 1000
Plano, TX 75024
United States of America
http://www.iom.invensys.com

Global Customer Support
Inside U.S.: 1-866-746-6477
Outside U.S.:1-508-549-2424 or contact your local Invensys representative.
Email: support@invensys.com
Website: http://support.ips.invensys.com

Invensys, Foxboro, and I/A Series are trademarks of Invensys plc, its subsidiaries, and affiliates.
All other brand names may be trademarks of their respective owners.

Copyright 2001-2010 Invensys Systems, Inc.
All rights reserved