

Foxboro IDP10-F22C11F-M1L1W

## Differential Pressure Transmitter



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## I/A Series® Pressure Transmitters

**IDP10 Differential Pressure  
with FOUNDATION™ Fieldbus Communication  
Installation, Operation, Calibration, Configuration, and Maintenance**

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**Foxboro**®  
**by Schneider** Electric



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# 1. Introduction

## General Description

The IDP10-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 IDP10 can also be supplied with direct connected or remote pressure seals to isolate the measuring element from corrosive or viscous fluids.

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.

The 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.

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### — NOTE —

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

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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.

The 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 Invensys 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                                                                                                                          |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>Dimensional Prints</b>    |                                                                                                                                      |
| 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 – PSSCT Pressure Seals                                                                                             |
| DP 020-354                   | Dimensional Print – PSSSR Pressure Seals                                                                                             |
| DP 020-355                   | Dimensional Print – PSSST Pressure Seals                                                                                             |
| DP 020-446                   | Dimensional Print – IDP10, IDP25, and IDP50 Differential Pressure Transmitters                                                       |
| DP 022-335                   | Dimensional Print – Model CO Compact Orifice                                                                                         |
| <b>Parts Lists</b>           |                                                                                                                                      |
| PL 006-172                   | Parts List – Model CO Compact Orifice                                                                                                |
| PL 009-005                   | Parts List – IDP10 Differential Pressure Transmitter                                                                                 |
| <b>Instructions</b>          |                                                                                                                                      |
| MI 014-900                   | Instruction – Fieldbus Overview                                                                                                      |
| 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 020-427                   | Instruction – Intrinsic Safety Connection Diagrams and Nonincendive Circuits                                                         |
| MI 022-138                   | Instruction – Bypass Manifolds - Installation and Maintenance                                                                        |
| MI 022-335                   | Instruction – Model CO Compact Orifice                                                                                               |
| <b>Technical Information</b> |                                                                                                                                      |
| 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*

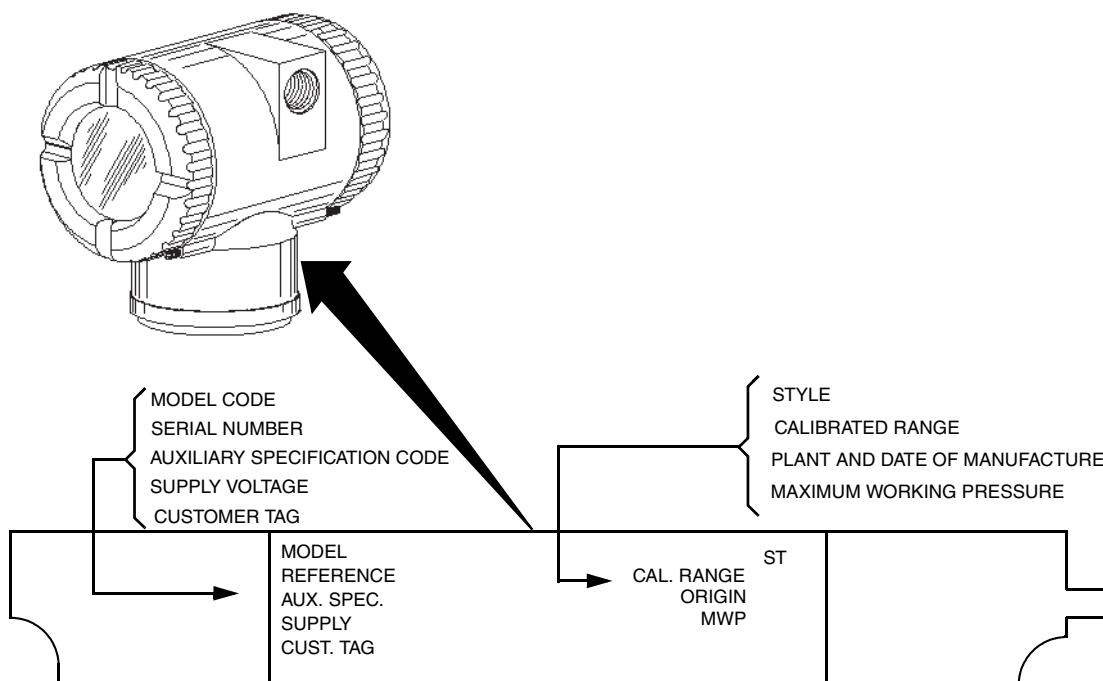
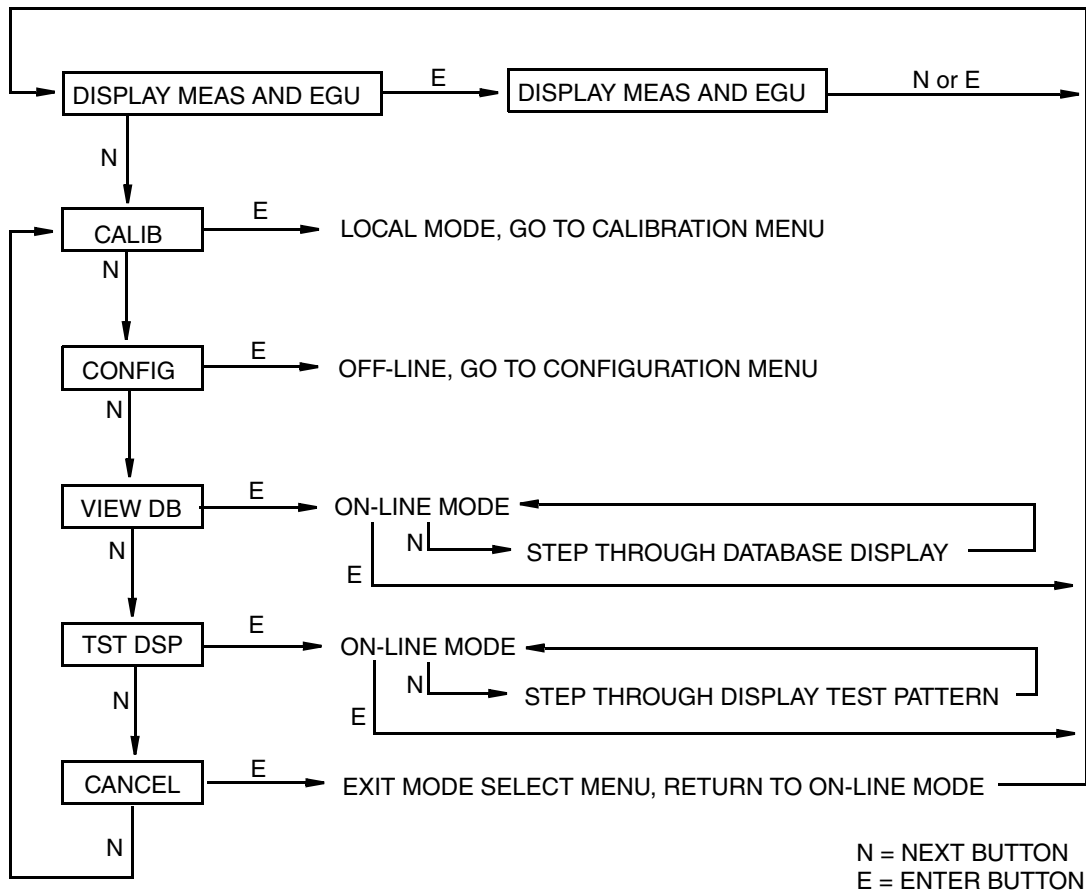
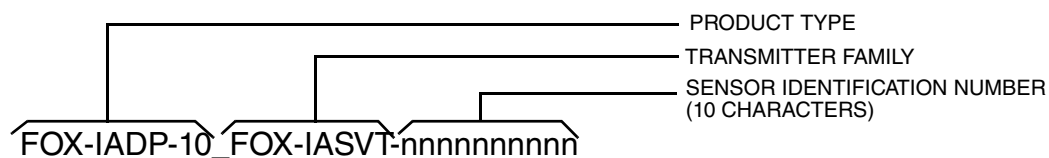


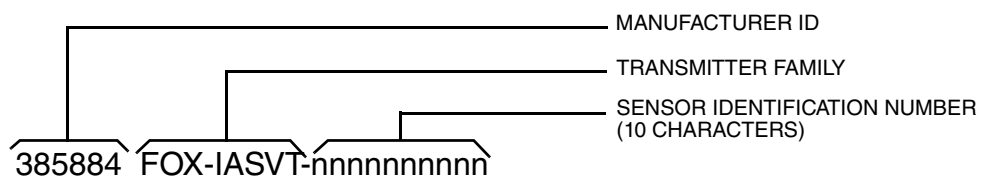
Figure 2. Top Level Structure Diagram



The initial PDTag of the device is:



The Device ID is:



# Standard Specifications

## Operative Limits

| Influence                                                                                   | Operative Limits                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sensor Body Temperature (a)<br>Silicone Fill Fluid<br>Fluorinert Fill Fluid<br>pvdf Inserts | -46 and +121°C (-50 and +250°F)<br>-29 and +121°C (-20 and +250°F)<br>-7 and +82°C (20 and 180°F)                                                                                                                                                         |
| Electronics Temperature<br>With LCD Display                                                 | -40 and +85°C (-40 and +185°F)<br>-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<br>(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.<br>0 to 30 m/s (0 to 3 "g") from 15 to 500 Hz with aluminum housing and<br>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

| Span Limit Code | Span Limits<br>$\Delta P$                                                           | Range Limits<br>$\Delta P$ (a)                                                            |
|-----------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| A (b)           | 0.12 and 7.5 kPa<br>0.5 and 30 inH <sub>2</sub> O<br>12 and 750 mmH <sub>2</sub> O  | -7.5 and +7.5 kPa<br>-30 and +30 inH <sub>2</sub> O<br>-750 and +750 mmH <sub>2</sub> O   |
| B               | 0.87 and 50 kPa<br>3.5 and 200 inH <sub>2</sub> O<br>87 and 5000 mmH <sub>2</sub> O | -50 and +50 kPa<br>-200 and +200 inH <sub>2</sub> O<br>-5000 and +5000 mmH <sub>2</sub> O |
| C               | 7.0 and 210 kPa<br>28 and 840 inH <sub>2</sub> O<br>2.3 and 69 ftH <sub>2</sub> O   | -210 and +210 kPa<br>-840 and +840 inH <sub>2</sub> O<br>-69 and +69 ftH <sub>2</sub> O   |
| D               | 0.07 and 2.1 MPa<br>10 and 300 psi<br>23 and 690 ftH <sub>2</sub> O                 | -0.21 and +2.1 MPa<br>-30 and +300 psi<br>-69 and +690 ftH <sub>2</sub> O                 |
| E               | 0.7 and 21 MPa<br>100 and 3000 psi                                                  | -0.21 and +21 MPa<br>-30 and +3000 psi                                                    |

- a. Negative values of differential pressure indicate a higher pressure on the **low side** of the sensor.  
Positive values indicate a higher pressure on the **high side** of the sensor.  
b. Span Limit Code "A" not available with pressure seals.

## Maximum Static, Overrange, and Proof Pressure

| Transmitter Configuration<br>(Bolting Material) (a)                   | Maximum Static and Overrange<br>Pressure Rating (b), (c), (d) |      | Proof Pressure Rating (e) |       |
|-----------------------------------------------------------------------|---------------------------------------------------------------|------|---------------------------|-------|
|                                                                       | MPa                                                           | psi  | MPa                       | psi   |
| Standard (B7 steel),<br>Option -B2 (17-4 PH ss),<br>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 (f)                                      | 10                                                            | 1500 | 40                        | 6000  |
| Option -D9 (17-4 PH ss)                                               | 40                                                            | 5800 | 100                       | 14500 |

- a. -D1 = DIN Single ended process cover with M10 B7 bolting.  
 -D2 = DIN Double ended process cover with M10 B7 bolting.  
 -D3 = DIN Single ended process cover with 7/16 in B7 bolting.  
 -D4 = DIN Double ended process cover with 7/16 in B7 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.
- b. Either side can be at higher pressure during overrange.
- c. 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).
- d. Static pressure rating of 40 MPa (5800 psi) with Option Code -Y.
- e. Meets ANSI/ISA Standard S82.03-1988.
- f. Limited to operating temperatures ranging from 0 to 60°C (32 to 140°F).

### 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 and degrade 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.

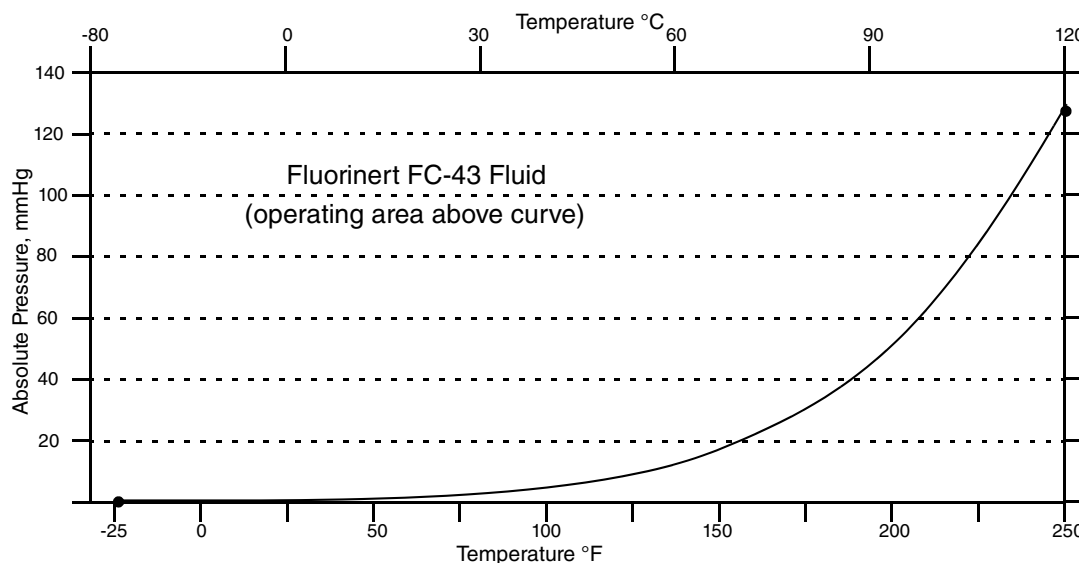
## Sensor Fill Fluid

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

## 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 34. 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 35.

### 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)   |
| With Pressure Seals          | Varies with seal used |

## Process Connections

IDP10 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, Co-Ni-Cr, Hastelloy C, Monel, gold plated 316L ss, or tantalum  
Covers and Process Connections: 316 ss, carbon steel, Hastelloy C, Monel, or pvdf inserts  
Pressure Seals: Refer to MI 020-369

## Process Pressure and Temperature Limits for Pressure Seals

Refer to MI 020-369

## 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 for 1/2 NPT connections; seven full turns for M20 and PG 13.5 connections.

## Adjustable Damping

The transmitter response time is normally less than 1.0 second for a 90% recovery from an 80% input step as defined in ANSI/ISA S51.1. Additional damping can be set from 0.00 (default), 0.25, 0.50, 1, 2, 4, 8, 16, or 32 seconds.

## 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 36.

*Table 3. Electrical Safety Specifications*

| Agency Certification,<br>Types of Protection,<br>and Area Classification         | Application Conditions                                                | Electrical Safety<br>Design Code |
|----------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------|
| <b>ATEX</b> flameproof: II 2 GD EEx d IIC, Zone 1.                               | KEMA 00ATEX2019X<br>Temperature Class T6, T85°C<br>Ta = -40 to +80°C. | D                                |
| <b>ATEX</b> FISCO field device intrinsically safe:<br>II 1 G EEx ia IIC, Zone 0. | SIRA 04ATEX2335X<br>Temperature Class T4, Ta = -40 to +80°C           | E                                |
| <b>ATEX</b> FNICO field device protection n for:<br>II 3 G EEx nL IIC, Zone 2.   | SIRA 04ATEX4019X<br>Temperature Class T4, Ta = -40 to +80°C.          | N                                |

*Table 3. Electrical Safety Specifications (Continued)*

| Agency Certification,<br>Types of Protection,<br>and Area Classification                                                                                                                                                                                          | Application Conditions                                                                                                                                                                  | Electrical Safety<br>Design Code |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>CSA</b> FISCO field device intrinsically safe for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, G; Class III Division 1.<br><br>Also zone certified intrinsically safe Ex ia IIC, Zone 0 and energy limited Ex nA II, Zone 2. | Connect per MI 020-427. Temperature Class T6 at 40°C (104°F), and T4A at 85°C (185°F) maximum ambient.<br><br>Temperature Class T4 at 40°C (104°F), and T3 at 85°C (185°F) max.ambient. | C                                |
| <b>CSA</b> 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 (185°F).                                                                                                                                               |                                  |
| <b>CSA</b> FNICO field device for Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; Class III, Division 2.                                                                                                                        | Temperature Class T6 at 40°C (104°F) and T4A at 85°C (185°F) maximum ambient.                                                                                                           |                                  |
| <b>CSA</b> field device zone certified flameproof Ex d IIC. Also, all certifications of Code C above.                                                                                                                                                             | Maximum Ambient Temperature 85°C (185°F).                                                                                                                                               | B                                |
| <b>FM</b> FISCO field device intrinsically safe for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, G; Class III Division 1.<br><br>Also zone certified intrinsically safe AEx ia IIC.                                             | Connect per MI 020-427. Temperature Class T4A at 40°C (104°F) and T4 at 85°C (185°F) maximum ambient.<br><br>Temperature Class T4 at 85°C (185°F) maximum ambient.                      | F                                |
| <b>FM</b> 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 (176°F) and T5 at 85°C (185°F) maximum ambient.                                                                                                            |                                  |
| <b>FM</b> FNICO field device nonincendive for Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; Class III, Division 2.                                                                                                            | Temperature Class T4A at 40°C (104°F) and T4 at 85°C (185°F) maximum ambient.                                                                                                           |                                  |
| <b>FM</b> field device zone certified flameproof AEx d IIC. Also, all certifications of Code F above.                                                                                                                                                             | Temperature Class T6 at 75°C (167°F) maximum ambient.                                                                                                                                   | G                                |
| <b>IECEX</b> FISCO field device intrinsically safe: Ex ia IIC, Zone 0.                                                                                                                                                                                            | IECEX SIR 04.0036X<br>Temperature Class T4, Ta = -40 to +80°C                                                                                                                           | T                                |
| <b>IECEX</b> FNICO field device protection n: Ex nL IIC, Zone 2.                                                                                                                                                                                                  | IECEX SIR 04.0023X<br>Temperature Class T4, Ta = -40 to +80°C                                                                                                                           | U                                |
| <b>IECEX</b> flameproof: Ex d IIC                                                                                                                                                                                                                                 | IECEX FMG 06.0007X, Ex d IIC<br>T6 Ta=80°C, T5 Ta=85°C<br>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**

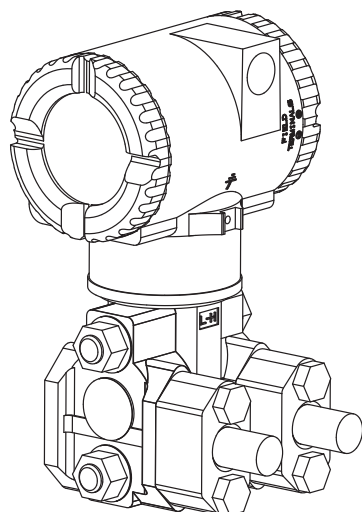
1. If the transmitter is not installed in the vertical position, readjust the zero output to eliminate the position zero effect.
  2. When structure codes 78/79 are used (pvdf inserts) with the IDP10 transmitters, the process connection must be made directly to the pvdf inserts in the high and low side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

### Process Mounting

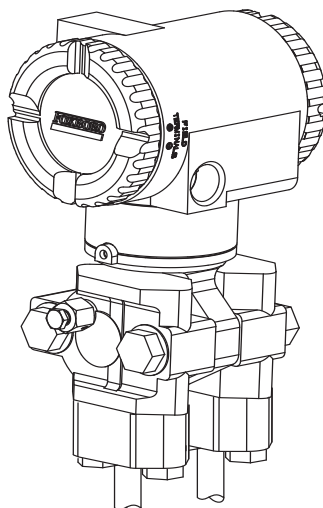
With process mounting, the transmitter mounted to and supported by the process piping.

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

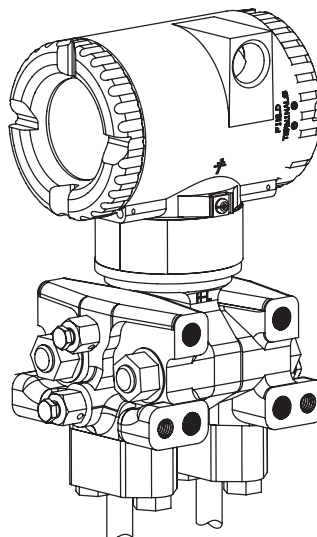
TRADITIONAL STRUCTURE



LP1 STRUCTURE



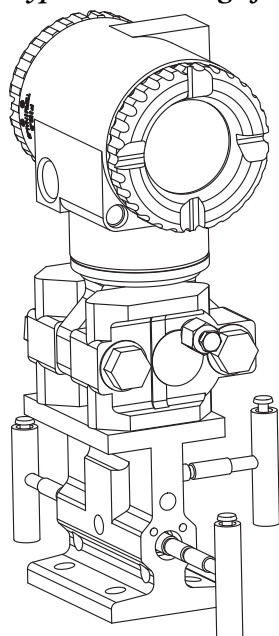
LP2 STRUCTURE



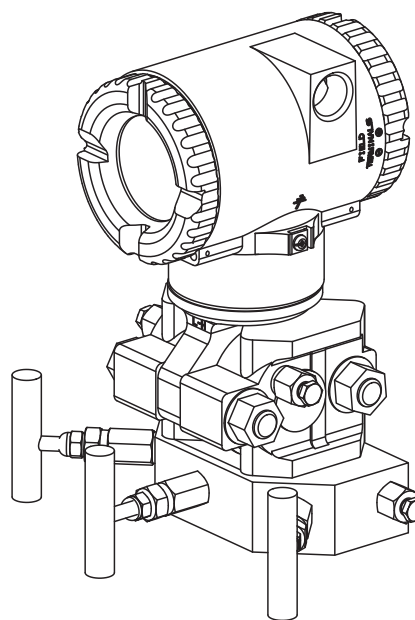
NOTE: MARK INDICATING LOW AND HIGH PRESSURE SIDE OF TRANSMITTER

## 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.

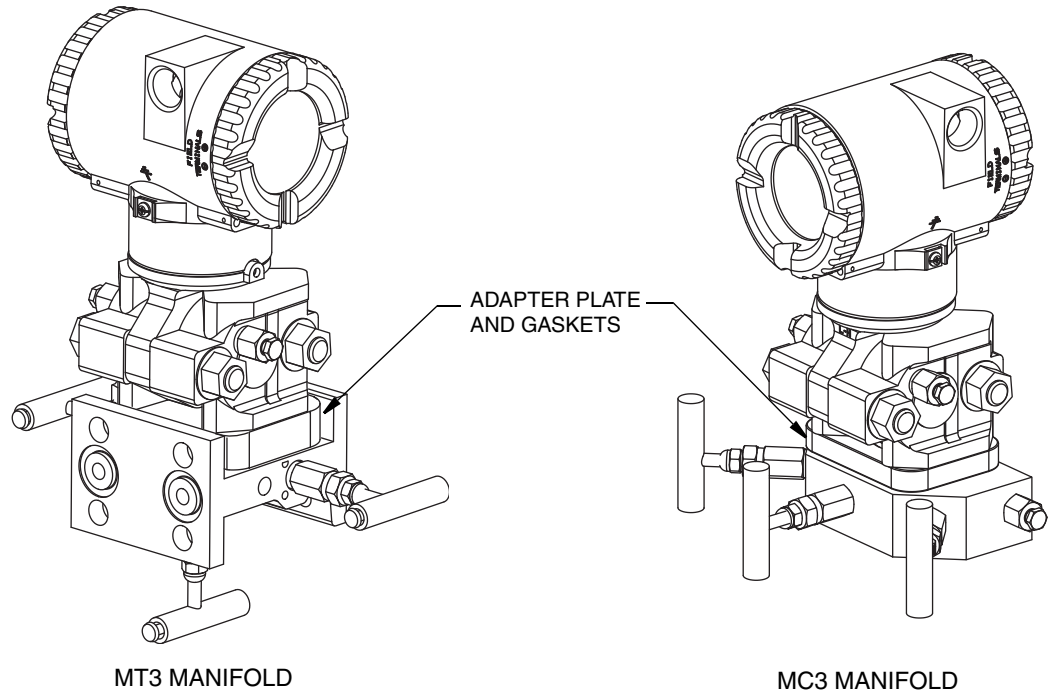
*Figure 5. Typical Mounting of an IDP Transmitter Supported by a Bypass Manifold*

M4A MANIFOLD



MB3 MANIFOLD

*Figure 6. Typical Mounting of IDP Transmitter on Coplanar™ Manifold*

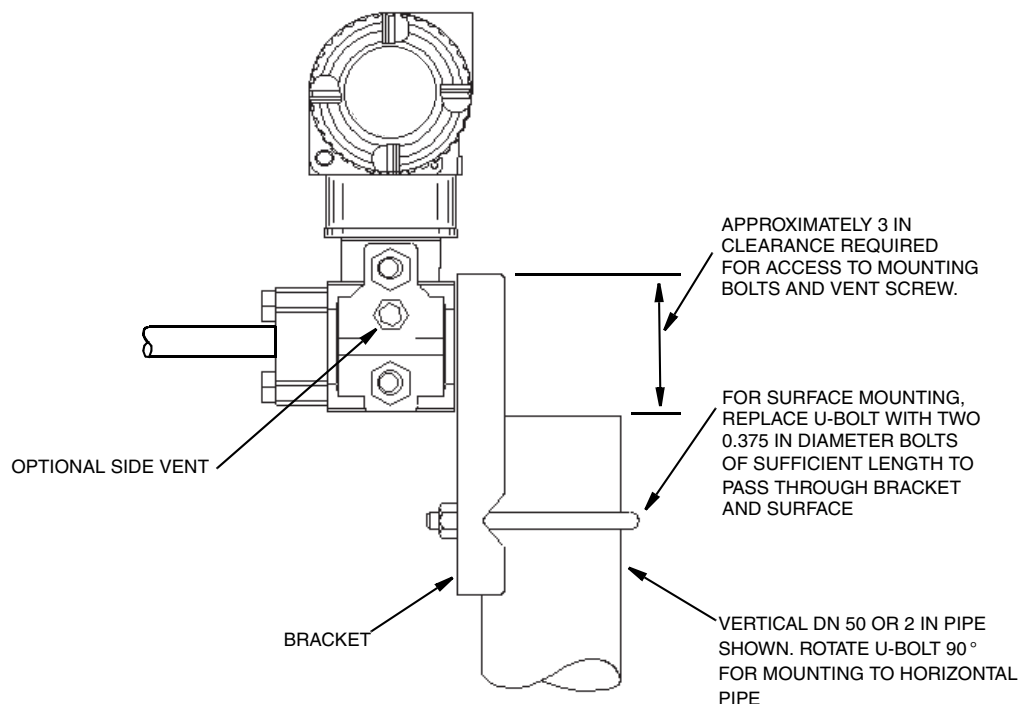
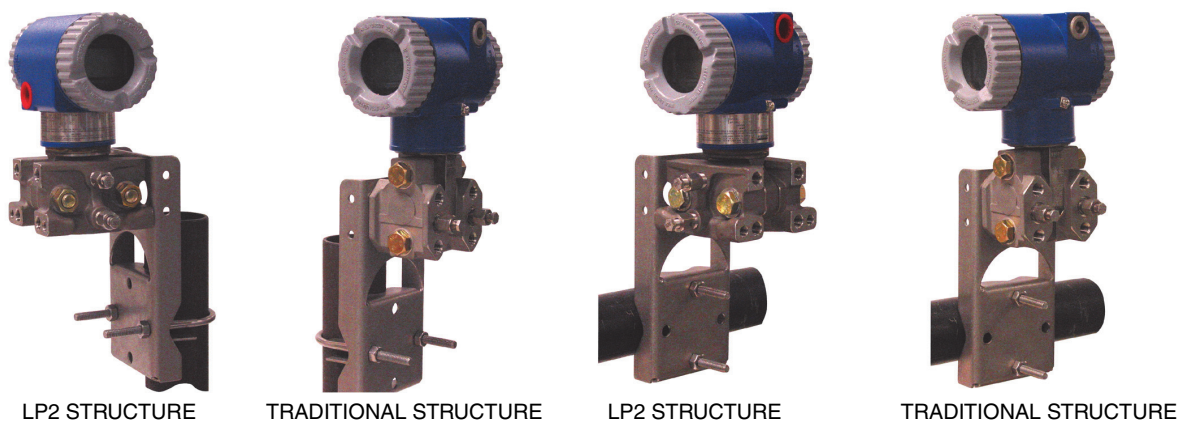


## Pipe or Surface Mounting

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

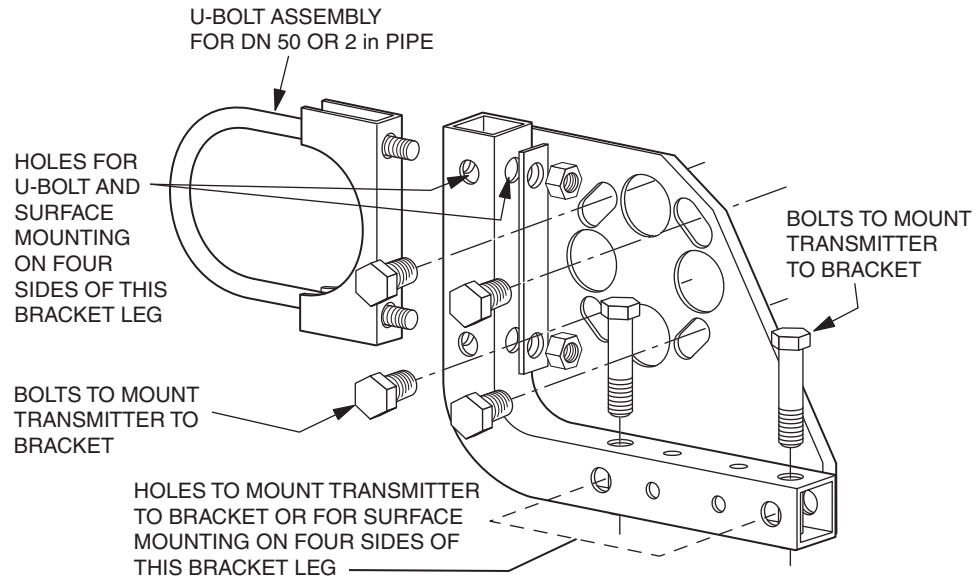
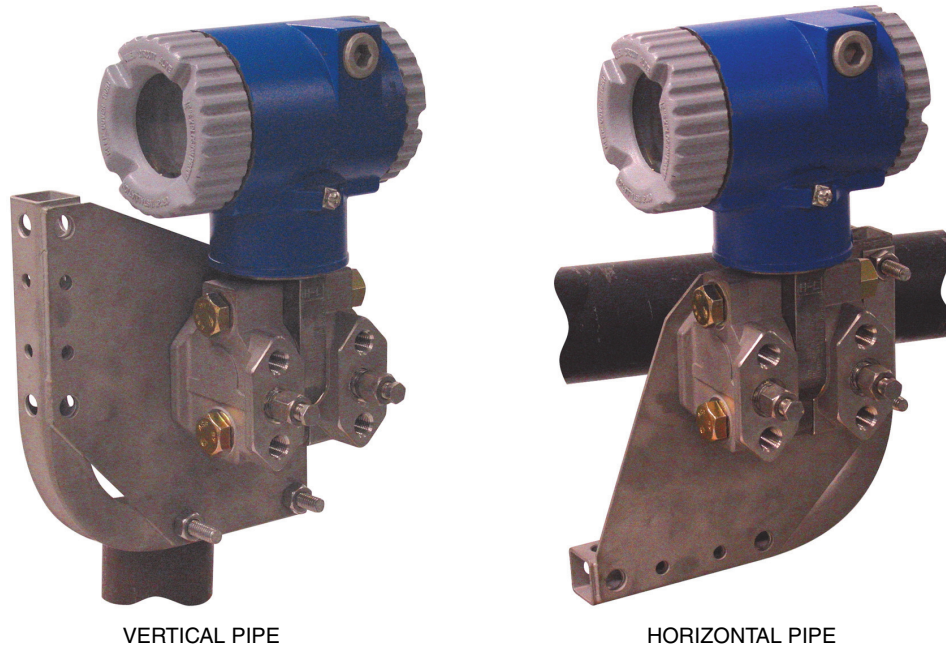
### Standard Mounting Bracket

The transmitter (with either traditional or LP2 low-profile structures) can be mounted to a vertical or horizontal, DN 50 or 2-in pipe using a standard bracket. See Figures 7 and 8 for details of a standard bracket and examples of different mounting situations. Secure the mounting bracket to the transmitter using the four screws provided. Mount the bracket to the pipe. To mount to a horizontal pipe, turn the U-bolt 90° from the position shown. The mounting bracket can also be used for wall mounting by securing the bracket to a wall using the U-bolt mounting holes.

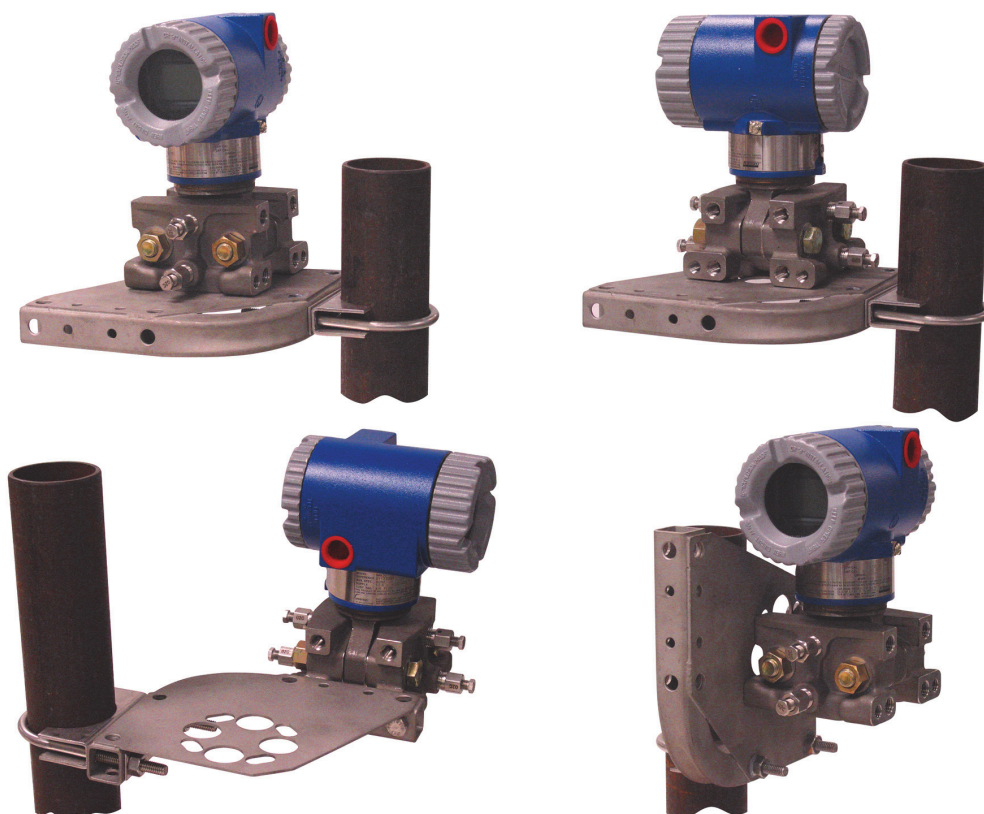
*Figure 7. Pipe or Surface Mounted Transmitter Using a Standard Bracket**Figure 8. Examples of Mounting With a Standard Bracket*

### *Universal Mounting Bracket*

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

*Figure 9. Details of a Universal Bracket**Figure 10. Mounting a Transmitter with Traditional Structure Using a Universal Bracket*

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



*Figure 12. Horizontal Mounting a Transmitter with LP2 Structure Using a Universal Bracket*

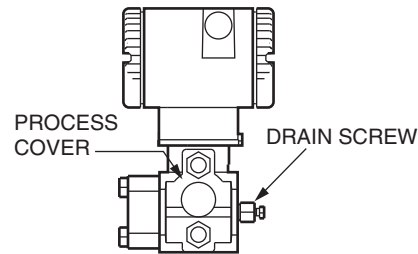


# Venting and Draining

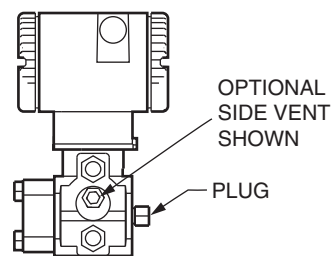
## Traditional Structure

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

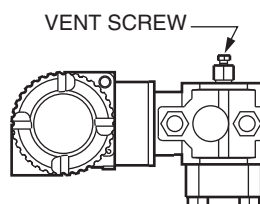
*Figure 13. Vertical Mounting - Cavity Draining*



*Figure 14. Vertical Mounting - Cavity Venting*



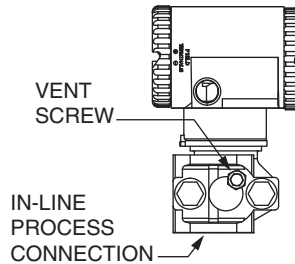
*Figure 15. Horizontal Mounting - Cavity Venting*



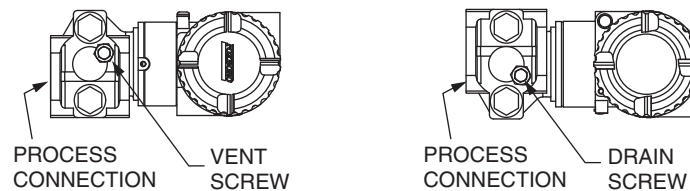
## LP1 Low Profile Structure

Sensor cavity venting and draining is provided for both vertical and horizontal mounting. For vertical mounted units, the transmitter is self draining and venting is via a vent screw. For horizontal mounted units, the transmitter can simply be 'turned over' (rotated 180 degrees) to orient the high and low pressure sides in the preferred locations. There is no need to unbolt the process covers. If the transmitter is connected with a length of impulse piping, such piping should slope up to the transmitter for gas applications and down for liquid applications.

*Figure 16. Vertical Mounting - Cavity Venting*



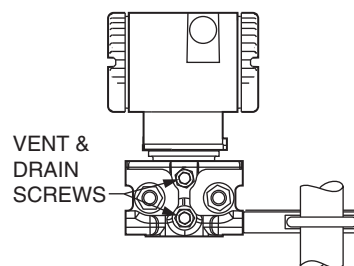
*Figure 17. Horizontal Mounting - Cavity Venting and Draining*



## LP2 Low Profile Structure

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

*Figure 18. Cavity Venting and Draining*



# Installation of Flow Measurement Piping

Figures 19 and 20 show typical installations with horizontal and vertical process pipes.

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

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

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

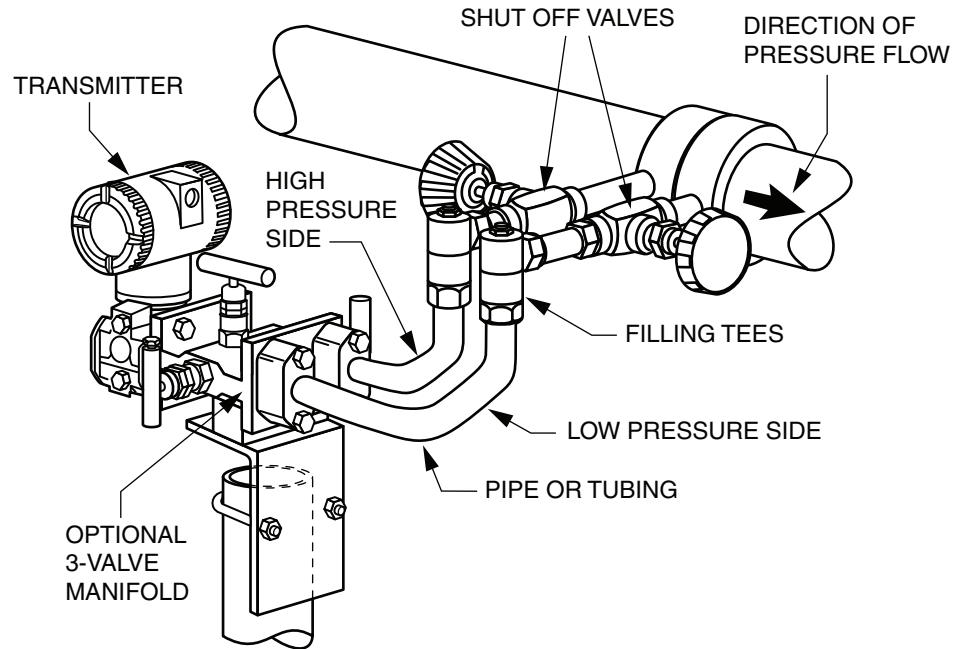
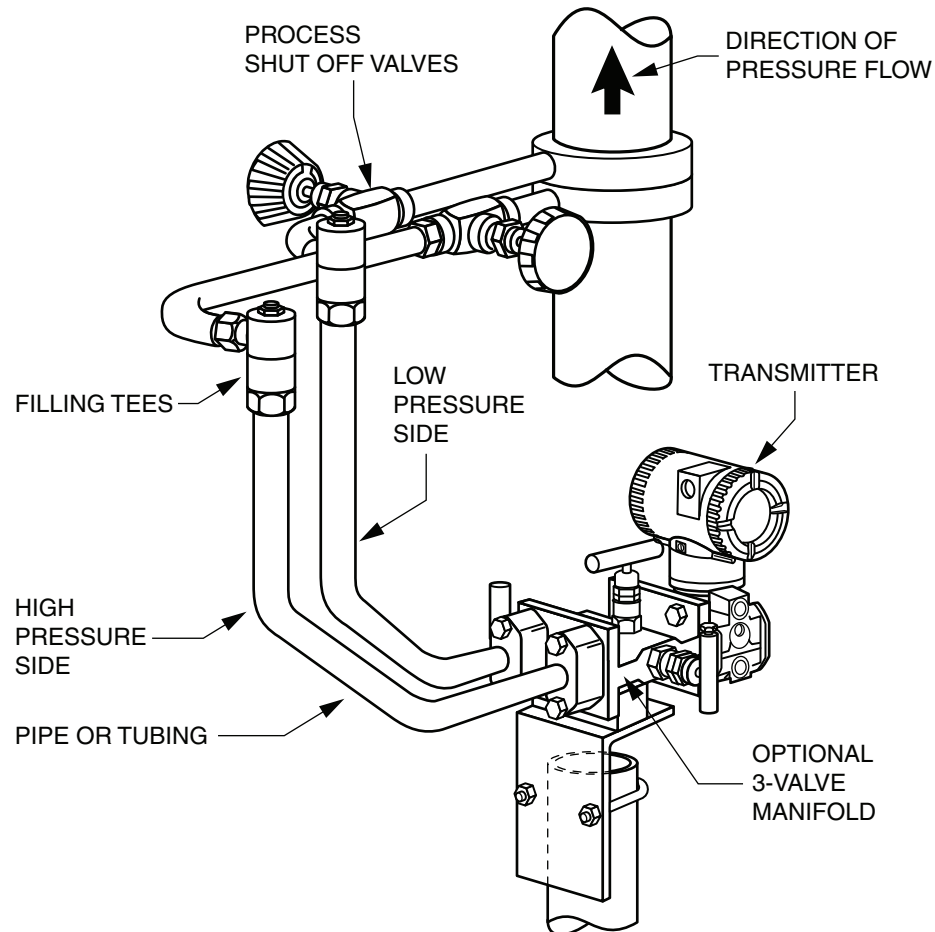
Note that the low and high pressure sides of the transmitter are identified by an L-H marking on the side of the sensor above the warning label.

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

---

**NOTE**

1. 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. It is recommended that you use 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 42.
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 41.

---

 **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

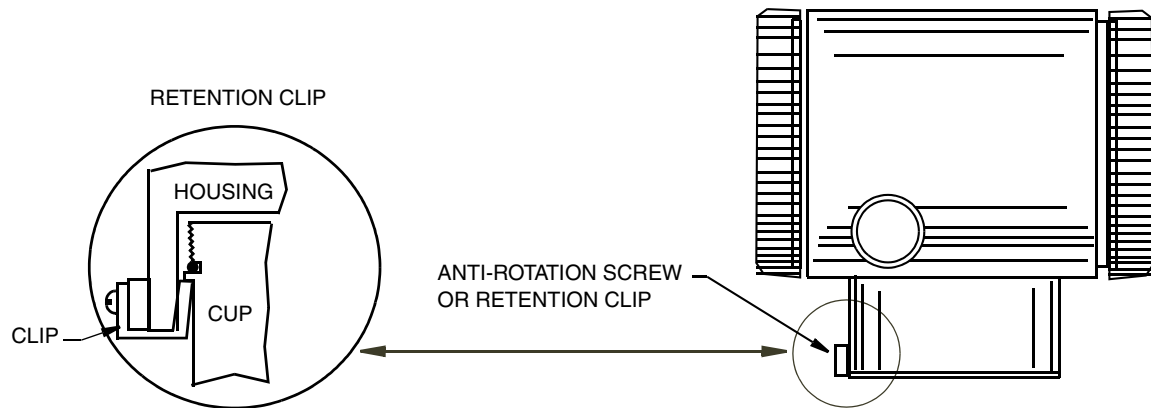
The transmitter housing (topworks) can be rotated up to one full turn in the counterclockwise direction when viewed from above for optimum access to adjustments, display, or conduit connections. Housings have either an anti-rotation screw or a retention clip that prevent the housing from being rotated 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 81.

---

*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

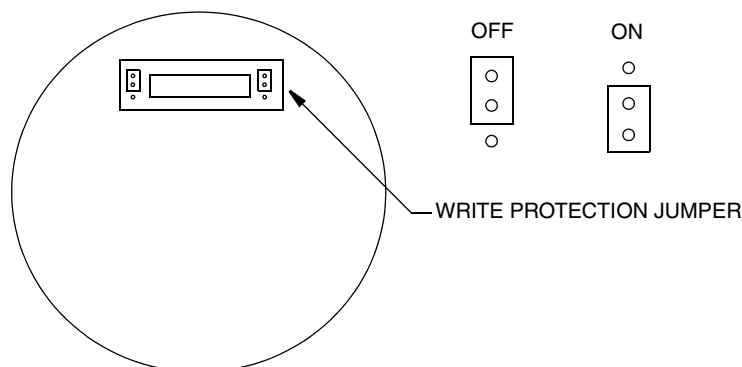
---

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

---

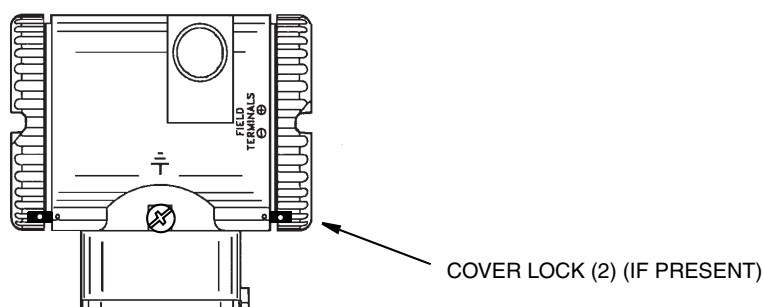
## Setting the Write Protect Jumper

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 Figure 23, 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**

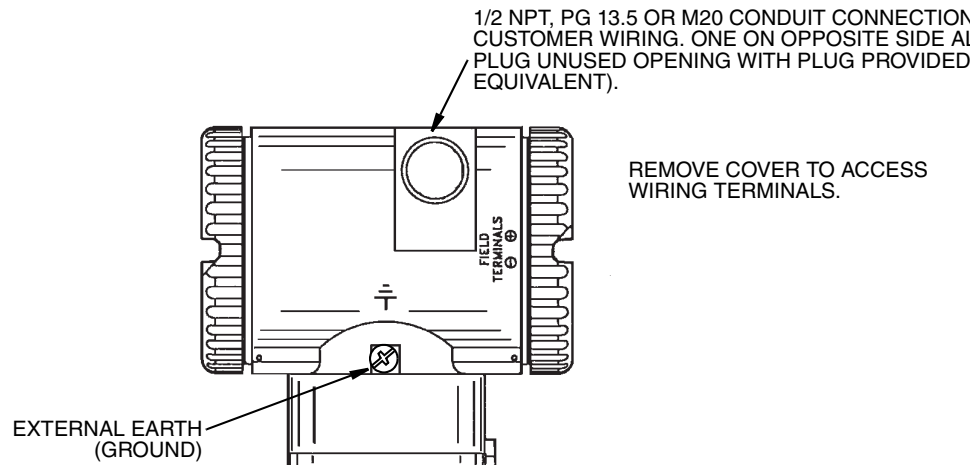
It is recommended that you use transient/surge protection in installations prone to high levels of electrical transients and surges.

---

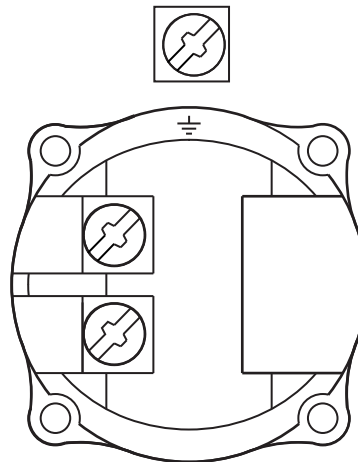
## Accessing Transmitter Field Terminals

For access to the field terminals, thread the cover lock (if present) into the housing to clear the threaded cover and remove the cover from the field terminals compartment as shown in Figure 24. 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.

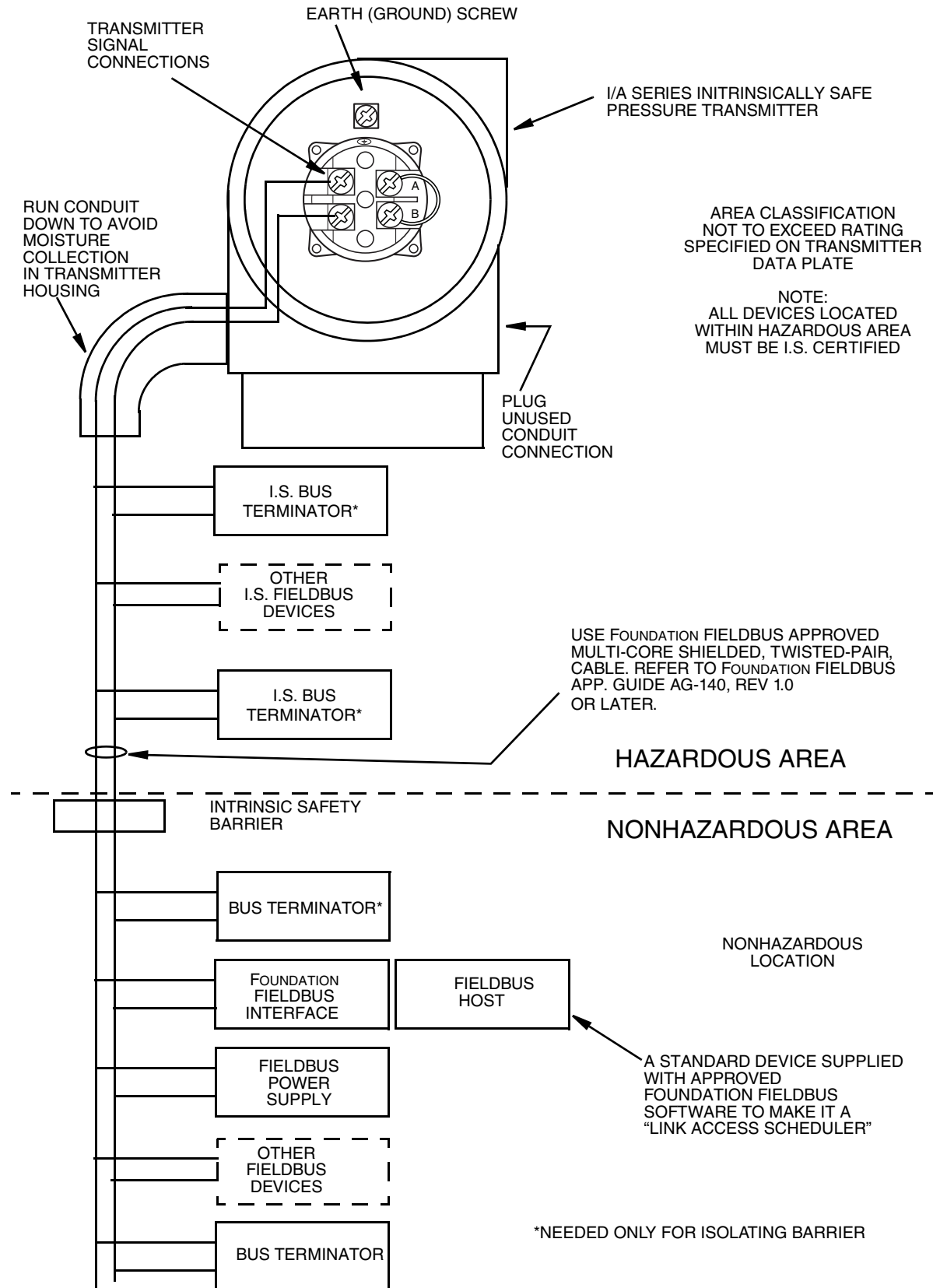
A summary of the voltage requirements is listed in Table 4:

*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. 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<sup>2</sup> 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 for 1/2 NPT connections; seven full threads for M20 and PG 13.5 connections.
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 36.

## Installing the Fieldbus Software

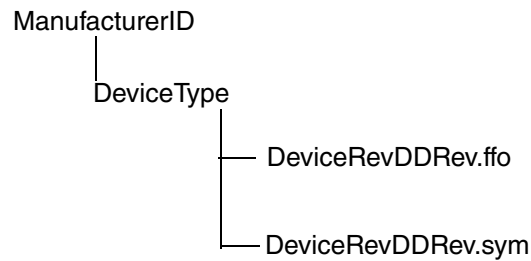
Descriptor files used by a FOUNDATION fieldbus configurator (host) can be found on the Invensys or FOUNDATION fieldbus website. The files included are:

| Filename             | Description     |
|----------------------|-----------------|
| <xyy>.ffo (a)        | DD binary file  |
| <xyy>.sym (a)        | DD symbol file  |
| <xxbbzz>.cff (a) (b) | Capability file |

a. xx = Device revision (Parameter 12 in Resource Block);  
yy = DD revision (Parameter 13 in Resource Block)

b. 'bb' may be the same as 'yy' or may be 'ff'; zz = cff rev

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 Invensys is 385884 and the Device Type for this pressure transmitter is BA30.

---

**NOTE**

1. The applicable DD and capability files are also available at [www.fieldbus.org](http://www.fieldbus.org).
  2. Foxboro parameter values are depicted in this document in the hexadecimal format.
- 

## Putting a Differential Pressure Transmitter Into Operation

The following procedure explains how to sequence the valves in your flow measurement piping or optional bypass manifold to ensure that your transmitter is not overranged and that seal liquid is not lost. Refer to Figures 19 and 20.

---

**NOTE**

This procedure assumes that the process shutoff valves are open.

---

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

# Taking a Differential Pressure Transmitter Out of Operation

The following procedure explains how to sequence the valves in your flow measurement piping or optional bypass manifold to ensure that your transmitter is not overranged and that seal liquid is not lost. Refer to Figures 19 and 20.

---

**NOTE**

This procedure assumes that the process shutoff valves are open.

---

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

---

**! WARNING**

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

---

### 3. Operation Via Local Display

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

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

The following items can be selected from this menu: Calibration (CALIB), Configuration (CONFIG), Viewing the database (VIEW DB), and Testing the display (TST DSP). The top level structure diagram is shown in Figure 28.

*Figure 27. Local Display Module*

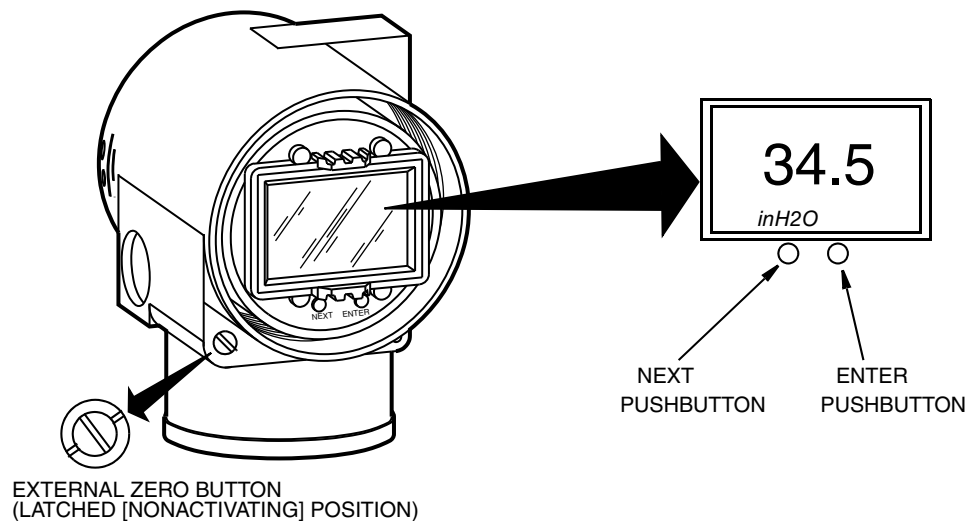
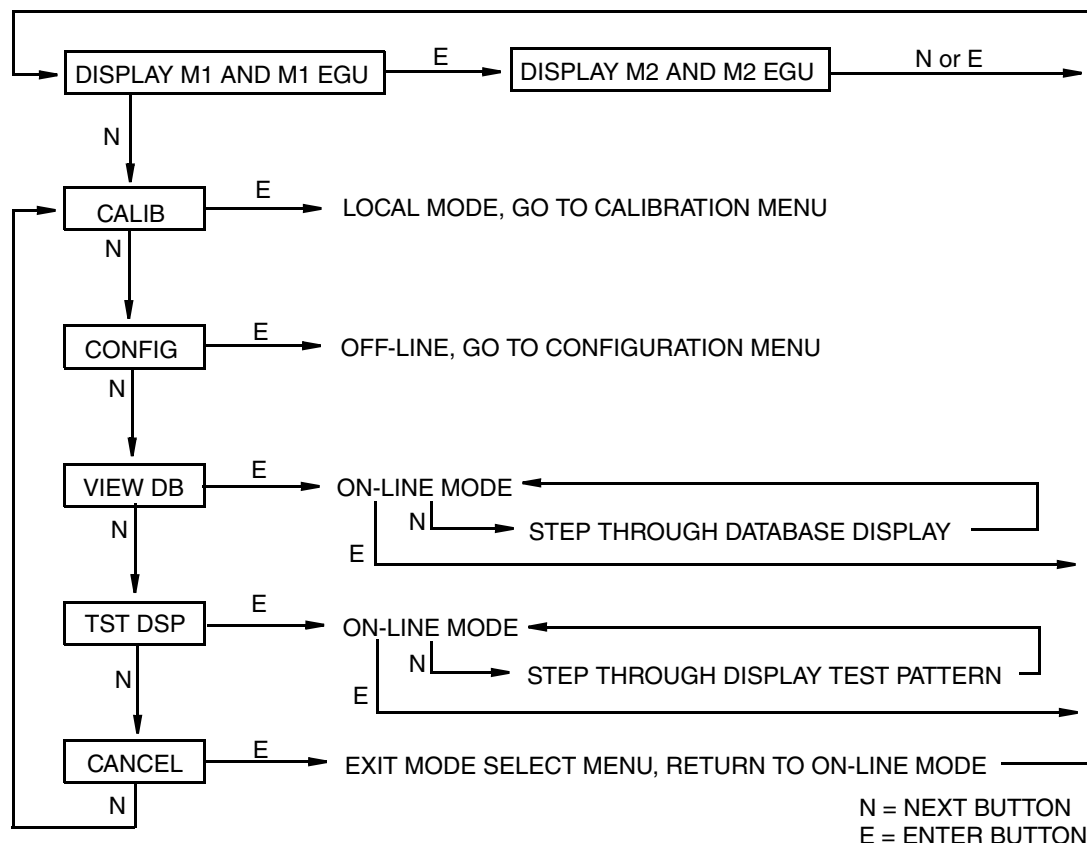


Figure 28. Top Level Structure Diagram



## 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.
  3. 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

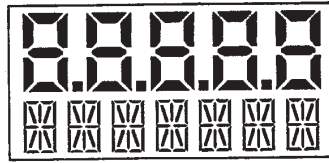
The values of **M1\_LRV** and **M1\_URV** can be viewed in **VIEW DB** as described above. They can also be viewed in the **RERANGE** function in Calibration mode and Configuration mode.

## Testing the Display

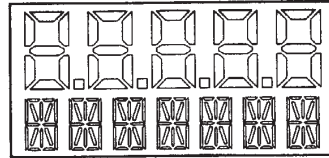
You can access the Test Display mode by the same multi-level menu system that was used to enter Calibration, Configuration, and View Database mode. Entry to the Mode Select menu is made (from normal operating mode) by pressing the **Next** button. The display reads **CALIB**, the first item on the menu. 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*

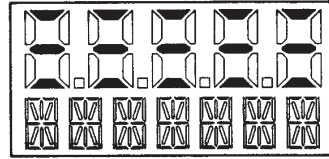
ALL SEGMENTS ON



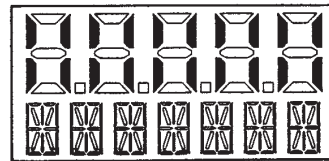
ALL SEGMENTS OFF



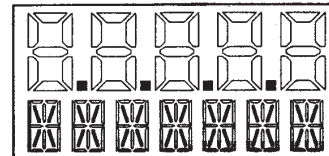
ALL HORIZONTAL SEGMENTS ON



ALL VERTICAL SEGMENTS ON



ALL DIAGONAL SEGMENTS AND DECIMAL POINTS ON



# 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 48.

For field calibration, an adjustable air supply and a pressure measuring device are required. For example, a dead weight tester or an adjustable clean air supply and pressure gauge can be used. The pressure source can be connected to the transmitter process connection with pipe fittings or it can be connected to the vent screw assembly using a calibration screw. The calibration screw has a Polyflo fitting and can be used for pressures up to 700 kPa (100 psi). It is available from Invensys as 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 42.

---

 **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.

---

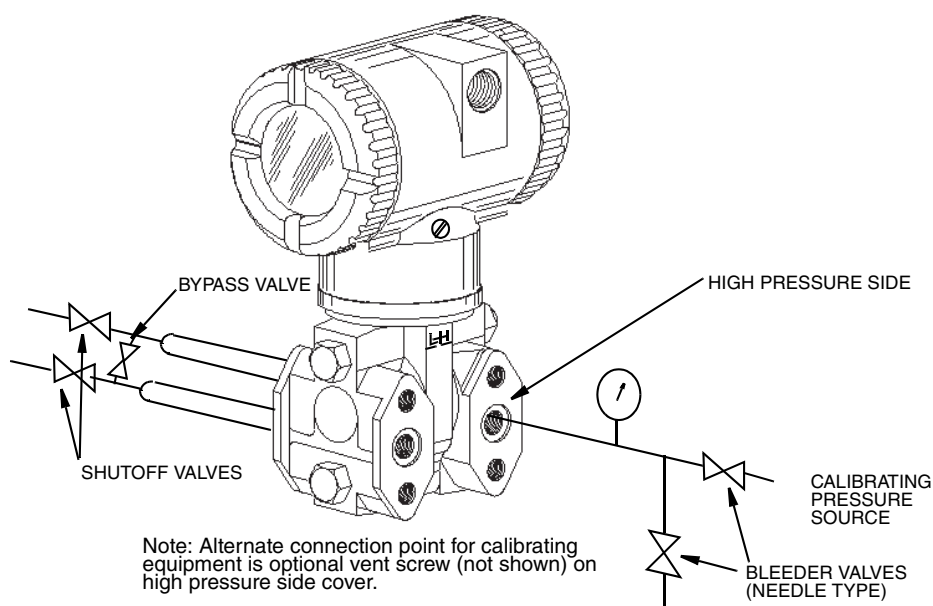
**NOTE**


---

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 47.

The 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.

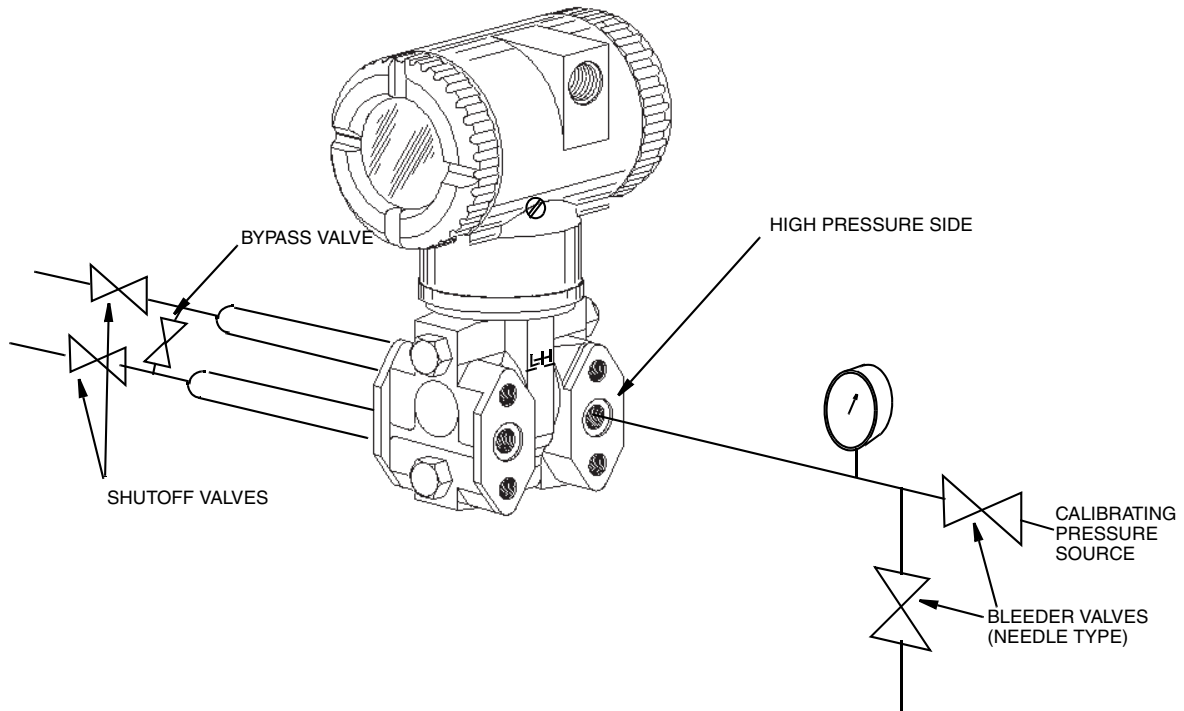
---

**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.
- 

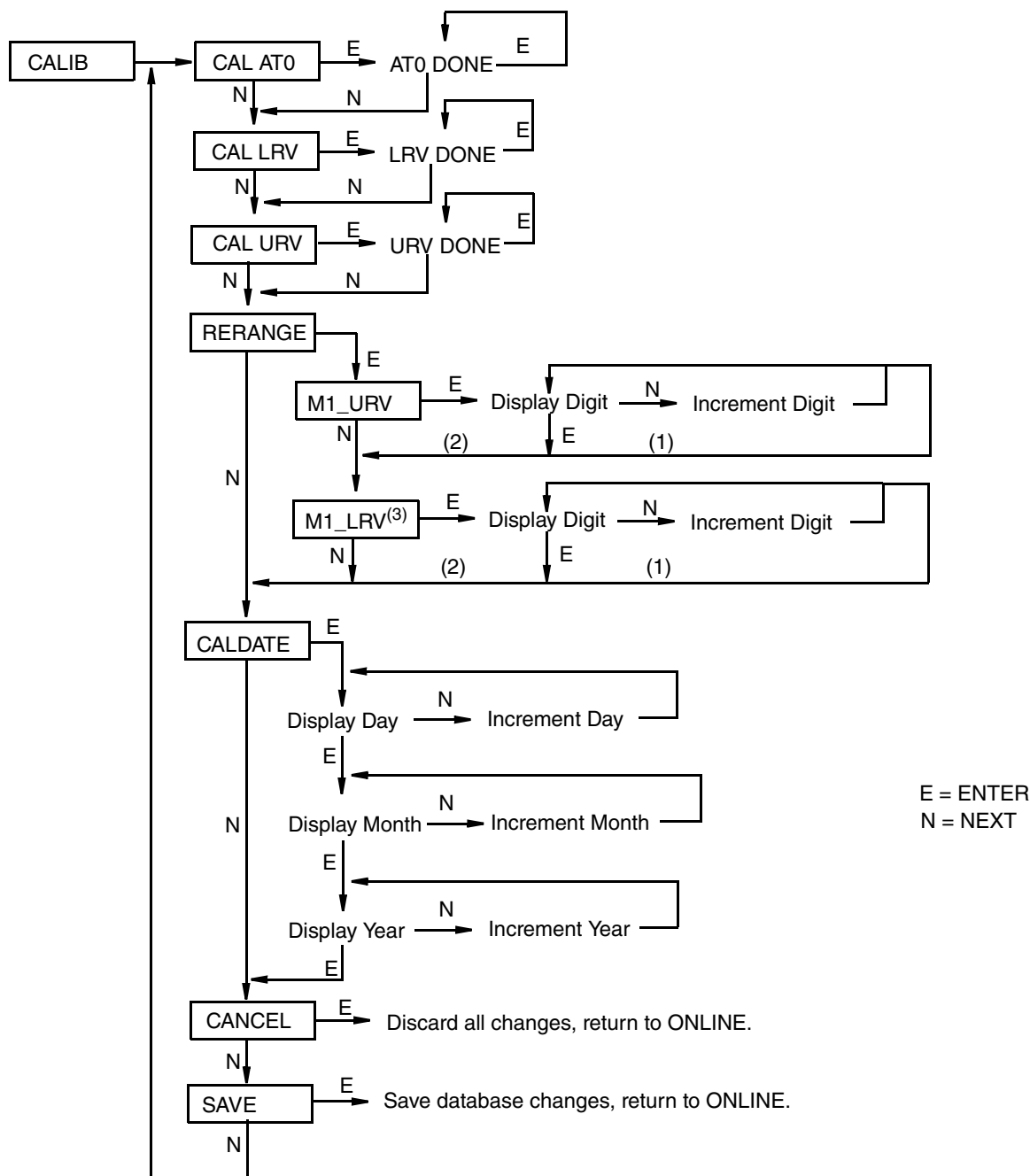
To access the Calibration mode (from normal operating mode), press the **Next** button. The display reads **CALIB**, the first item on the menu. Acknowledge your choice of this selection by pressing the **Enter** button. The display shows the first item in the Calibration menu shown below.

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 AT0, 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*

**NOTES:**

1. If character is not the last position on the display line, advances to next character.
2. If character is the last position on the display line, advances to next menu item.
3. If M2 MODE is configured as a type of flow (M2SQ<1C, M2SQ<4L, or M2SQ\_0), M1\_LRV does not appear in the menu. In this case, the lower range value should be 0. Refer to "M2 MODE:" on page 61.

**CAL AT0:**

To zero the transmitter at zero pressure, apply a zero differential pressure to the transmitter. Go to **CAL AT0** using the **Next** button and press **Enter**. This can be done whether the LRV is zero or not. Completion is indicated by the display **AT0 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 from “Entering Numerical Values” on page 44 to edit this parameter.

**M1 LRV:**

To edit the lower range value, press **Enter** at the prompt **M1 LRV**. Use the procedure from “Entering Numerical Values” on page 44 to edit this parameter.

**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 FOUNDATION 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 72.

---

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*

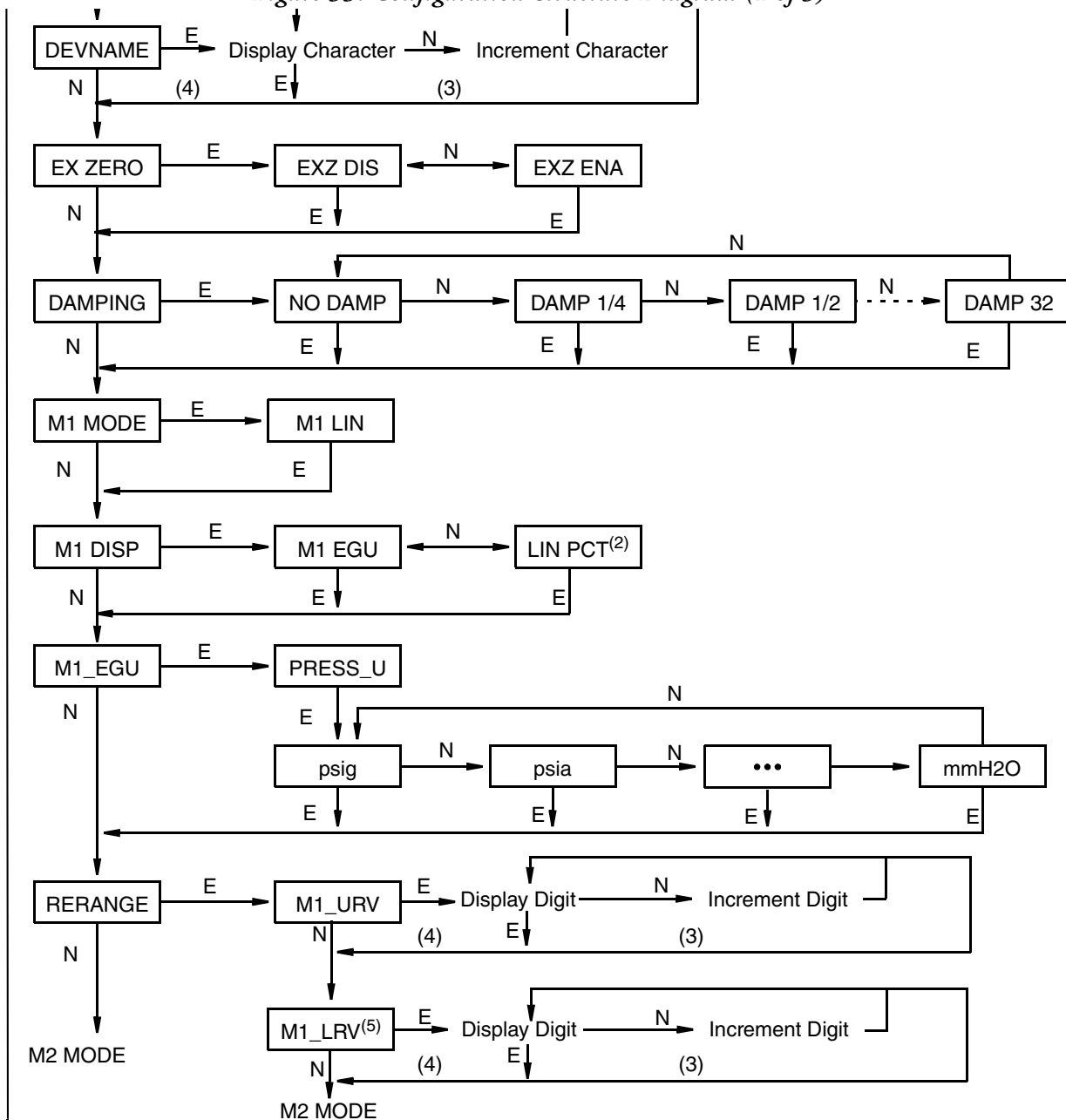
| Parameter   | Available Choices when Configuring from the Local Display                                                                                                                                                                    | Local Display Initial Factory Settings | Procedure when Configuring from a FOUNDATION fieldbus Host                                                                                                                 |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IT MODE     | Digital only                                                                                                                                                                                                                 | Digital                                | N/A                                                                                                                                                                        |
| DEVNAME     | (up to six characters)                                                                                                                                                                                                       | DevNam                                 | N/A                                                                                                                                                                        |
| EX ZERO     | Enable (EXZ ENA) or disable (EXZ DIS)                                                                                                                                                                                        | Disable                                | N/A                                                                                                                                                                        |
| DAMPING     | 0, 0.25, 0.5, 1, 2, 4, 8, 16, or 32 seconds                                                                                                                                                                                  | None (NO DAMP)                         | Edit Transducer Block SENSOR_DAMPING parameter                                                                                                                             |
| M1 MODE     | Linear Only                                                                                                                                                                                                                  | Linear                                 | N/A                                                                                                                                                                        |
| M1 DISP     | M1 EGU or LIN PCT (a)                                                                                                                                                                                                        | M1 EGU                                 | N/A<br>(The M1 DISP setting only affects the value shown on the optional local display module. It does not affect the values transmitted to the FOUNDATION fieldbus host.) |
| M1_EGU      | User-selected pressure engineering units                                                                                                                                                                                     | (Per Sales Order)                      | Edit Transducer Block PRIMARY_VALUE_RANGE • UNITS_INDEX parameter                                                                                                          |
| M1_LRV (b)  | 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 (Pressure) or Type of Square Root (Flow)                                                                                                                                                                              | Linear                                 | Edit Transducer Block THIRD_VALUE_TYPE                                                                                                                                     |
| M2 DISP (c) | If M2 Mode is linear, M2 DISP can only be set to =M2_EGU (pressure units).<br><br>If M2 Mode is a type of flow (square root), M2 DISP can be set to either a % of flow (=M2_EGU) or to a user-defined flow engineering unit. | =M2_EGU                                | N/A<br>(The M2 DISP setting only affects the value shown on the optional local display module. It does not affect the values transmitted to the FOUNDATION fieldbus host.) |
| M2_EGU      | User-defined (pressure) engineering units                                                                                                                                                                                    | Same as M1_EGU                         | Edit Transducer Block THIRD_VALUE_RANGE • UNITS_INDEX parameter                                                                                                            |

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

| Parameter   | Available Choices when Configuring from the Local Display | Local Display Initial Factory Settings | Procedure when Configuring from a FOUNDATION fieldbus Host |
|-------------|-----------------------------------------------------------|----------------------------------------|------------------------------------------------------------|
| DISPLAY (c) | Show M1, Show M2, or Toggle                               | Show M1                                | N/A                                                        |
| CALDATE     | Calibration Date                                          | - - -                                  | Edit Transducer Block SENSOR_CAL_DATE parameter.           |
| ENA_PWD     | No Passwords, Configuration, or Config and Calibration    | No Passwords                           | N/A                                                        |

- a. The M1 DISP menu selections are limited for specific firmware versions. M1 DISP cannot be set to LIN PCT with firmware versions 4.04 and earlier or with firmware version 5.00.
- b. M1\_LRV is only available if M2 MODE is linear.
- c. The M2 DISP and DISPLAY menus are not available with firmware versions 4.04 and earlier or with firmware version 5.00.

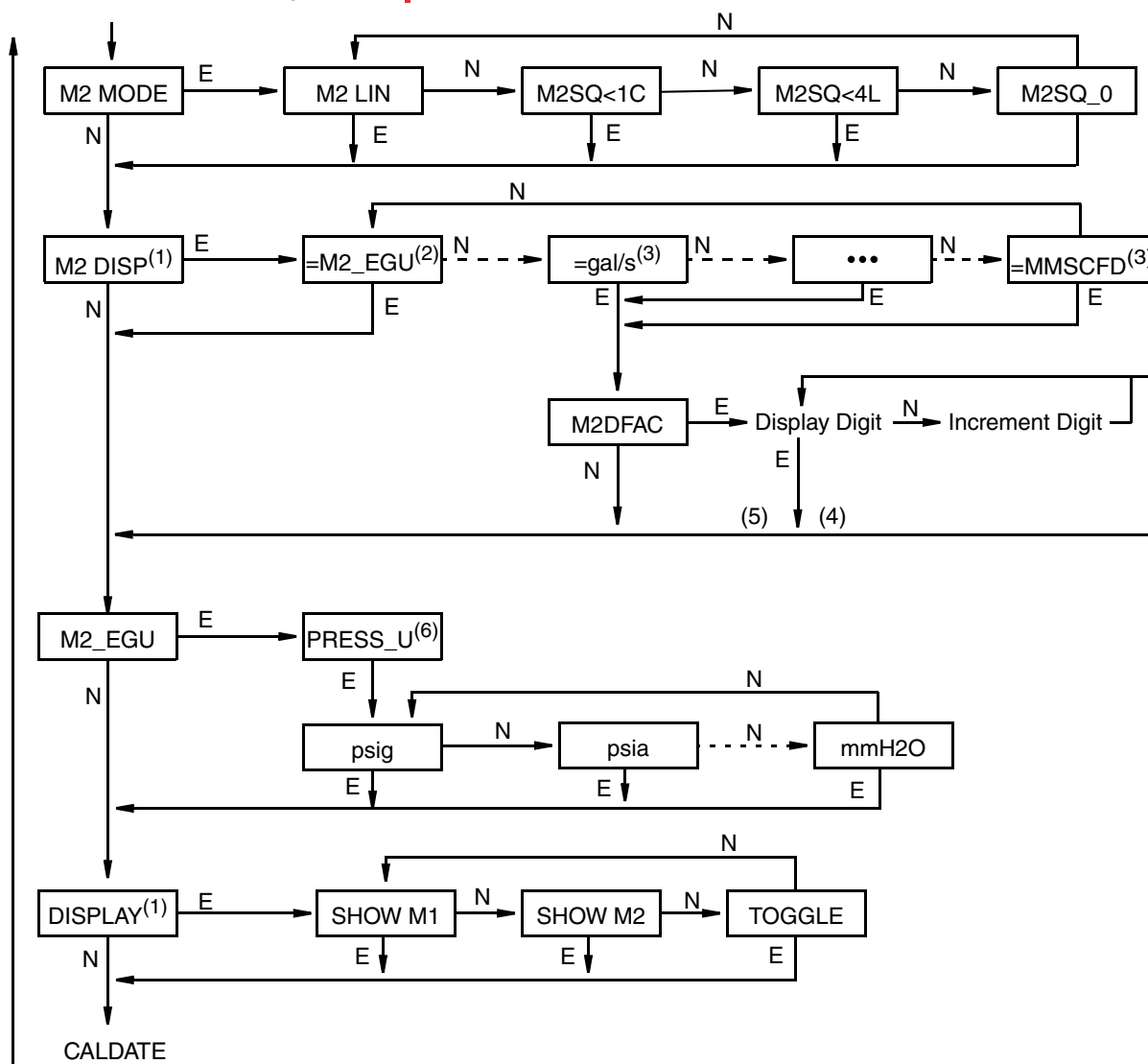
Figure 33. Configuration Structure Diagram (1 of 3)

**NOTE**

1. 4-20 mA is not a valid menu selection for Foundation fieldbus transmitters.
2. LIN PCT provides percent output on LCD indicator only, and is not available with firmware versions 4.04 and earlier or with firmware version 5.00.
3. If character is not the last position on the display line, advances to next character.
4. If character is the last position on the display line, advances to next menu item.
5. If M2 MODE is configured as a type of flow (M2SQ<1C, M2SQ<4L, or M2SQ\_0), M1\_LRV does not appear in the menu.
6. In this case, the lower range value should be 0. Refer to "M2 MODE:" on page 61.

Figure 34. Configuration Structure Diagram (2 of 3)

(continued from previous page)

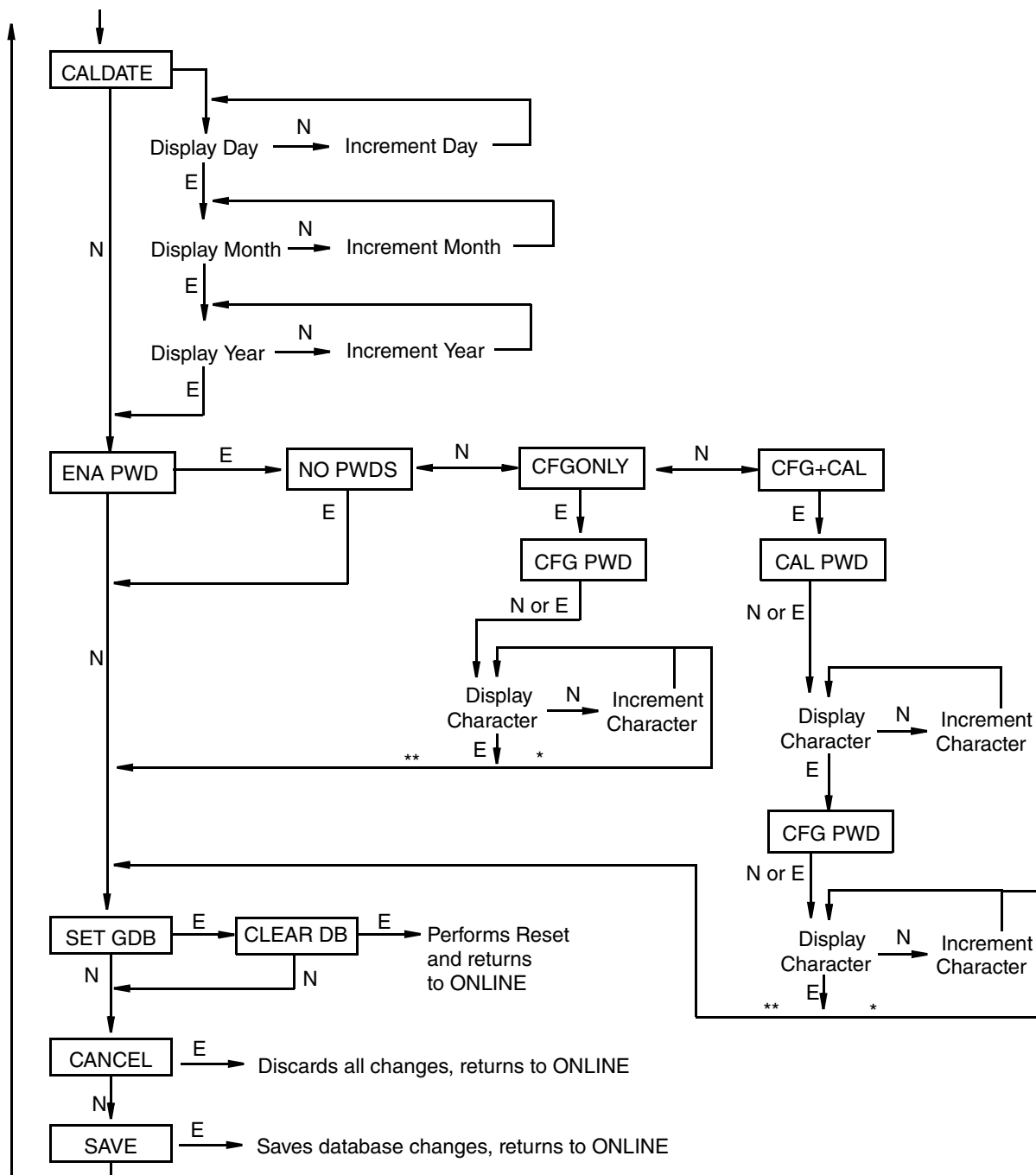
**NOTE**

1. The M2 DISP and DISPLAY menus are not available with firmware versions 4.04 and earlier or with firmware version 5.00.
2. When M2 MODE is linear (M2 LIN), =M2\_EGU is the only available selection in the M2 DISP menu.  
M2 will appear on the local display with pressure engineering units selected in M2\_EGU.
3. When M2 MODE is a type of flow (M2SQ<1C, M2SQ<4L, or M2SQ\_0), select =M2\_EGU to display a % flow on the local display, or select any of the available flow engineering units for M2
4. If character is not the last position on the display line, advances to next character.
5. If character is the last position on the display line, advances to next menu item.

6. If you configured M2 to appear on the local display in flow engineering units or as a percent of flow (any of the square root functions), INVALID temporarily appears on the local display if you press Enter at this menu selection.

*Figure 35. Configuration Structure Diagram (3 of 3)*

(continued from previous page)



\*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.

## Commentary on Configuration Structure Diagrams

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

### IT MODE:

To configure the transmitter operating mode, press **Enter**. Use the **Next** button to select **DIGITAL** and press **Enter**.

---

#### — NOTE

The **IT MODE** should remain **DIGITAL** for **FOUNDATION** fieldbus operation.

---

### 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 DISP:

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 **M1 EGU** or **LIN PCT** and press **Enter**.

---

#### — NOTE

**LIN PCT** is not available with firmware versions 4.04 and earlier or with firmware version 5.00.

---

Selecting **LIN PCT** causes percent readings to appear with a % **lin** label on the local display only. The **M1** pressure engineering unit is used for remote communication of Measurement #1, even if **LIN PCT** is selected.

**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<sub>2</sub>O**, **inH<sub>2</sub>O**, **atm**, **bar**, **mbar**, **MPa**, **kPa**, **Pa**, **kg/cm<sup>2</sup>**, **g/cm<sup>2</sup>**, **dy/cm<sup>2</sup>**, **cmHg**, **mmHg**, **torr**, **cmH<sub>2</sub>O**, or **mmH<sub>2</sub>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” on page 44 to edit this parameter.

**M1\_LRV:**

To edit the lower range value, press **Enter** at the prompt **M1\_LRV**. Use the procedure “Entering Numerical Values” on page 44 to edit this parameter.

**— NOTE**


---

**M1\_LRV** is only available when **M2 MODE** is linear.

---

**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 different pressure units, flow 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 flow calculation with cutoff below 1% of calibrated pressure range), **M2SQ<4L** (square root flow calculation with linear extrapolation below 4% of calibrated pressure range), or **M2SQ\_0** (square root flow calculation down to 0% of calibrated pressure range), and press **Enter**.

- ◆ If you select **M2 LIN**, the **M2** reading appears on the local display with the pressure engineering units selected in **M2\_EGU**.
- ◆ If you select a square root option, the **M2** reading appears on the local display with configurable flow units or as a percent of flow (% flow). These options are configured in **M2 DISP**.

**— NOTE**


---

Because this is not a multivariable flowmeter, the **M2** square root modes do not reflect compensated flow measurements.

---

## M2 DISP

The **M2 DISP** menu allows you to configure how the M2 reading appears on the local display. This menu is not available with firmware versions 4.04 and earlier or with firmware version 5.00.

When **M2 MODE** is linear (**M2 LIN**):

**M2 DISP** allows you to show the M2 reading in pressure engineering units. To configure the display to show M2 in pressure engineering units go to **M2 DISP** with the **Next** button and press **Enter**. Use the **Next** button to select **=M2\_EGU**, which is the only menu selection for a linear **M2 MODE**, and press **Enter**.

When **M2 MODE** is a type of flow (**M2SQ<1C**, **M2SQ<4L**, or **M2SQ\_0**):

**M2 MODE** defines whether the flow calculation should cut off below 1% of calibrated pressure range, be linearly extrapolated below 4% of calibrated pressure range, or be calculated down to 0% of calibrated pressure range.

**M2 DISP** allows you to show the M2 reading on the local display in flow engineering units or as a percent of flow (**% flow**).

To configure the display to show M2 as a percent of flow:

1. Go to **M2 DISP** with the **Next** button and press **Enter**. Use the **Next** button to select **=M2\_EGU**.

To configure the display to show M2 in flow engineering units:

1. Go to **M2 DISP** with the **Next** button and press **Enter**.
2. Use the **Next** button to select any of the flow engineering units available: **gal/s**, **gal/m**, **gal/h**, **gal/d**, **Mgal/d**, **Ft3/s**, **Ft3/m**, **Ft3/h**, **Ft3/d**, **Igal/s**, **Igal/m**, **Igal/h**, **Igal/d**, **L/s**, **L/m**, **L/h**, **ML/d**, **m3/s**, **m3/m**, **m3/h**, **m3/d**, **bb1/s**, **bb1/m**, **bb1/h**, **bb1/d**, **T/h**, **lb/h**, **kg/h**, **Nm3/h**, **Sm3/h**, **Am3/h**, **mmScF/d**.
3. Press **Enter**.
4. You are then asked to configure a display factor, **M2DFAC**, which is used to configure the numerical relationship between the measured span in pressure units and the and the displayed span in custom units. Calculate **M2DFAC** using the following formula:

$$M2DFAC = \frac{\text{Flow Span}}{100}$$

Example:

For a transmitter where the desired display range is 0 to 75 gallons per minute:

$$M2DFAC = \frac{75}{100} = 0.75$$

5. To edit the span in your configured engineering units, press **Enter** at the prompt **M2DFAC**. Use the procedure “Entering Numerical Values” on page 44 to edit this parameter.

**M2\_EGU:**

To configure pressure engineering units for your display and transmission, go to **M2\_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<sub>2</sub>O**, **inH<sub>2</sub>O**, **atm**, **bar**, **mbar**, **MPa**, **kPa**, **Pa**, **kg/cm<sup>2</sup>**, **g/cm<sup>2</sup>**, **dy/cm<sup>2</sup>**, **cmHg**, **mmHg**, **torr**, **cmH<sub>2</sub>O**, or **mmH<sub>2</sub>O**.

**— NOTE**

If you configured M2 to appear on the local display in flow engineering units or as a percent of flow, **INVALID** temporarily appears on the local display if you press **Enter** at this menu selection.

**DISPLAY:**

This parameter allows you to configure whether the optional local indicator display shows M1, M2, or toggles between M1 and M2. This menu is not available with firmware versions 4.04 and earlier or with firmware version 5.00.

To configure the display value, navigate to the **DISPLAY** menu selection 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 Using a FOUNDATION 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 either 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.

---



---

### — 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 00S.
2. Set the **PRIMARY\_VALUE\_RANGE • UNITS\_INDEX** to a pressure engineering unit, such as inH<sub>2</sub>O, kg/cm<sup>2</sup>, 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<sub>2</sub>O pressure application to a 0 to 100 inH<sub>2</sub>O 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<sub>2</sub>O flow application to a 20 to 100 inH<sub>2</sub>O pressure application, set the **THIRD\_VALUE\_TYPE** to pressure and then set the **PRIMARY\_RANGE\_VALUE • EU\_0** to 20 inH<sub>2</sub>O.

---

4. Set the **THIRD\_VALUE\_RANGE • UNITS\_INDEX** to match the units in **XD\_SCALE** for the AI Block connected to this channel. The units available are the same as **PRIMARY\_VALUE\_RANGE** except for the addition of % Flow.

- 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.
- Write the changes to the transmitter.

Table 8. Unit Names and Unit Codes

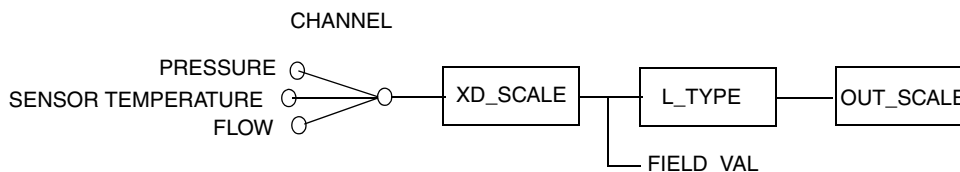
| Unit Name | Unit Code | Unit Name | Unit Code | Unit Name | Unit Code | Unit Name | Unit Code |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Pa        | 1130      | torr      | 1139      | kgcm2     | 1145      | mmHg0C    | 1158      |
| MPa       | 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

- Open the Analog Input Block. Put the block Out Of Service by setting MODE\_BLK • Target to 00S.
- 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                               |

- 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.
- Write the changes to the transmitter.
- Set the XD\_SCALE, L\_TYPE, and OUT\_SCALE parameters as follows:



NOTE: FIELD\_VAL IS THE MEASUREMENT IN % OF XD\_SCALE

**a. 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 does not need 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).

**b. 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 XD\_SCALE • UNITS\_INDEX to °C
- ▶ Set XD\_SCALE • EU\_at\_100% to 100
- ▶ Set XD\_SCALE • EU\_at\_0% to 0
- ▶ Set L\_TYPE to Indirect
- ▶ Set OUT\_SCALE • EU\_at\_100% to 212 (equivalent to 100°C)
- ▶ Set OUT\_SCALE • EU\_at\_0% to 32 (equivalent to 0°C)
- ▶ Set OUT\_SCALE • UNITS\_INDEX to °F

**c. 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 does not need 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 parameters to the desired unit and values.
- ◆ If L\_TYPE is Indirect Sq Rt, set the OUT\_SCALE parameters to the desired unit and values.

- d. 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 does not need to match the THIRD\_VALUE\_RANGE values.
  - ◆ If L\_TYPE is Direct, set the OUT\_SCALE parameters to match those of the XD\_SCALE parameters.
  - ◆ If L\_TYPE is Indirect, set the OUT\_SCALE parameters to the desired unit and values.
  - ◆ L\_TYPE Indirect Sq Rt is not applicable.
6. 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 (a)  | 0 to 75 inH2O (b)  | 0 to 200 inH2O     |
| After pushing Enter key on indicator, the indicator displays |                                   | 0 to 50 inH2O (a)  | 0 to 100% (c), (d) | 0 to 100% (c), (d) |
| Output of AI #1 to host system                               |                                   | 0 to 50 inH2O (a)  | 0 to 300 GPM (c)   | 0 to 100% (c)      |
| Output of AI #2 to host system                               |                                   | -50 to +105°C      | 0 to 75 inH2O (e)  | -58 to +220°F      |
| 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 (f)           | Flow (f)           |
| 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            | °C                 | inH2O              | °C                 |
|                                                              | L_TYPE                            | Direct             | Direct             | Indirect           |
|                                                              | OUT_SCALE • EU_100                | 105                | 75                 | 220                |
|                                                              | OUT_SCALE • EU_0                  | -50                | 0                  | -58                |
|                                                              | OUT_SCALE • UNITS_INDEX           | °C                 | inH2O              | °F                 |

- Linear with pressure because Square root extraction is done in the host controller, not in the transmitter.
- CAUTION:** The output being shown on the display is linear with pressure and not linear with flow rate.
- 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.
- If the power to the transmitter is cycled, the indicator switches from 0 to 100% of flow rate to the pressure EGUs that are linear with pressure.
- The output from AI#2 is linear with pressure, not flow rate.
- 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 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    |                                   | °F            | °C             | °F            |
| 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            | °C            | °C             | °C            |
|                                                          | L_TYPE                            | Indirect      | Direct         | Indirect      |
|                                                          | OUT_SCALE • EU_100                | 220           | 105            | 220           |
|                                                          | OUT_SCALE • EU_0                  | -58           | -50            | -58           |
|                                                          | OUT_SCALE • UNITS_INDEX           | °F            | °C             | °F            |

*Table 11. Open Tank or Dry Leg Level Applications*

| Application Parameters                                   |                                   | Application 1  | Application 2 | Application 3   |
|----------------------------------------------------------|-----------------------------------|----------------|---------------|-----------------|
| Application                                              |                                   | Open Tank (a)  | 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 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    |                                   | °F             | °C            | °C              |
| 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            | °C             | °C            | °C              |
|                                                          | L_TYPE                            | Indirect       | Direct        | Direct          |
|                                                          | OUT_SCALE • EU_100                | 220            | 105           | 105             |
|                                                          | OUT_SCALE • EU_0                  | -58            | -50           | -50             |
|                                                          | OUT_SCALE • UNITS_INDEX           | °F             | °C            | °C              |

a. 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 (a)     |
| 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 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    |                                   | °F              | °C               | °C                |
| 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           | ftH2O            | 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 (b)            |
| 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            | °C              | °C               | °C                |
|                                                          | L_TYPE                            | Indirect        | Direct           | Direct            |
|                                                          | OUT_SCALE • EU_100                | 220             | 105              | 105               |
|                                                          | OUT_SCALE • EU_0                  | -58             | -50              | -50               |
|                                                          | OUT_SCALE • UNITS_INDEX           | °F              | °C               | °C                |

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

b. Output configured in units of length. EGUs available with DEV\_REV 15 or later.

## 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 00S.
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 47.

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 66.

## Disabling the Link Active Scheduler (LAS)

To disable the LAS, right mouse click on **DEV\_TAG** and set “Device Type = yes” to OK.

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### — 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.

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### — 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 data throughput rates. If settings are incorrectly modified, some devices may disappear from the network.

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### — NOTE —

As a prudent measure, it is recommended that multiple devices (two or more) on the bus be configured as link master devices.

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## 6. Maintenance

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### ! DANGER

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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.

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### NOTE

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

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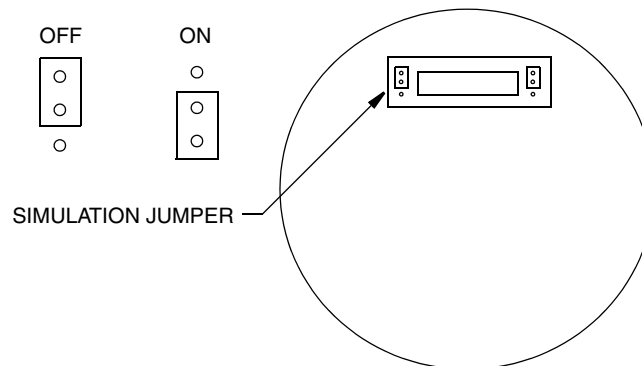
## Troubleshooting

### 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 3), 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 **Write Changes**.
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 will automatically default to the status and values predetermined by the Fieldbus Foundation. These are the same as the initial factory settings shown in Appendix A, “List of Parameters” 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 Fieldbus Foundation defaults, which may be different than the initial factory settings. This will reset all configurable function block application objects. It will also clear all configured Trend and Link Objects. A restart of the processor will also be 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 **Write Changes**.
4. Put the Resource Block back into AUTO mode (the RESTART selection will automatically default 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          | No Error                                                                                                                       |
| 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. |
| 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                                          |
|-----------------------------------------------------------------|------------------------------------------------------|
| <b>Resource Block</b>                                           |                                                      |
| All Static Parameters are Reset                                 | Device needs a complete download                     |
| <b>Analog Input (AI) Block</b>                                  |                                                      |
| $XD\_SCALE \bullet EU\_0 \geq XD\_SCALE \bullet EU\_100$        | Low end of scale must be less than high end          |
| $OUT\_SCALE \bullet EU\_0 \geq OUT\_SCALE \bullet EU\_100$      | 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             |
| $XD\_SCALE \bullet UNITS\_INDEX \neq$ Pressure Channel Units    | Units in Transducer Block and AI Block must match    |
| $XD\_SCALE \bullet UNITS\_INDEX \neq$ Temperature Channel Units | Units in Transducer Block and AI Block must match    |
| $XD\_SCALE \bullet UNITS\_INDEX \neq$ 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                  |
| <b>Proportional Integral, Derivative (PID) Block</b>            |                                                      |
| 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                       |
| $OUT\_SCALE \bullet EU\_0 \geq OUT\_SCALE \bullet EU\_100$      | Low end of scale must be less than high end          |
| $PV\_SCALE \bullet EU\_0 \geq PV\_SCALE \bullet EU\_100$        | Low end of scale must be less than high end          |
| $FF\_SCALE \bullet EU\_0 \geq FF\_SCALE \bullet EU\_100$        | Low end of scale must be less than high end          |
| $TRK\_SCALE \bullet EU\_0 \geq TRK\_SCALE \bullet EU\_100$      | 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 will be 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 PL 009-005.

## 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 36.
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

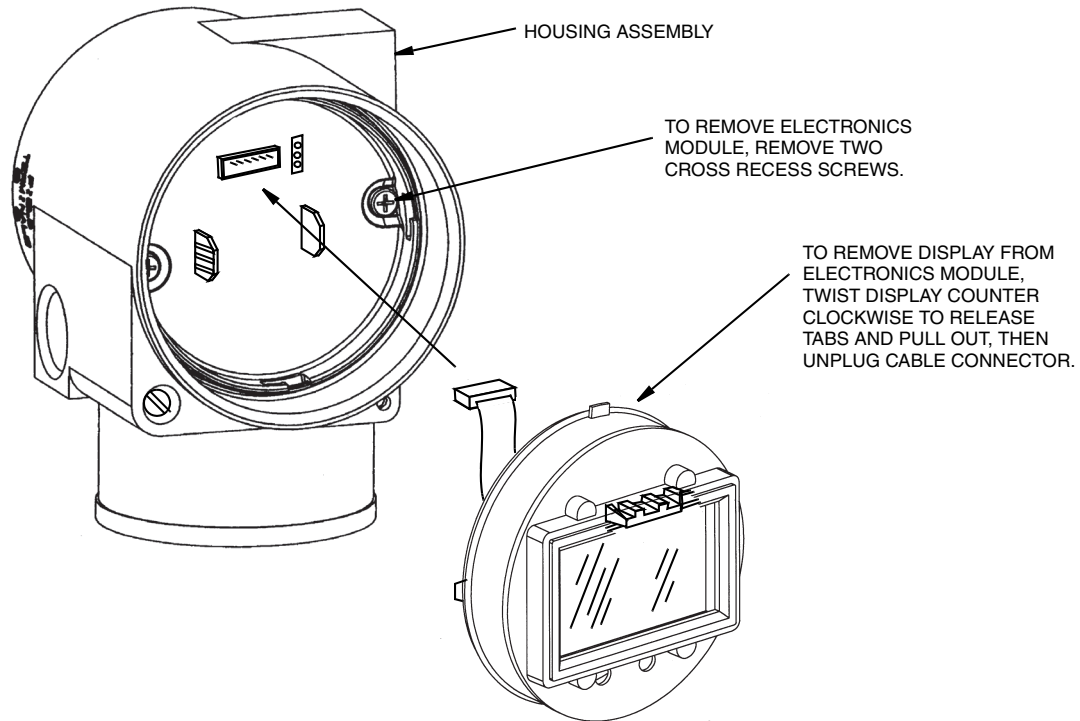
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The electronics module is “one assembly” at this point and is electrically and mechanically connected to topworks with a flexible ribbon signal cable, a 2-wire power cable, and in some cases, a cable for an external zero pushbutton. Do **not** exceed 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 36.
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 (Part Number 0048130 or equivalent). Verify that the O-ring is situated in the groove of the neck.
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 (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 (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 36.
6. Turn on transmitter power source.

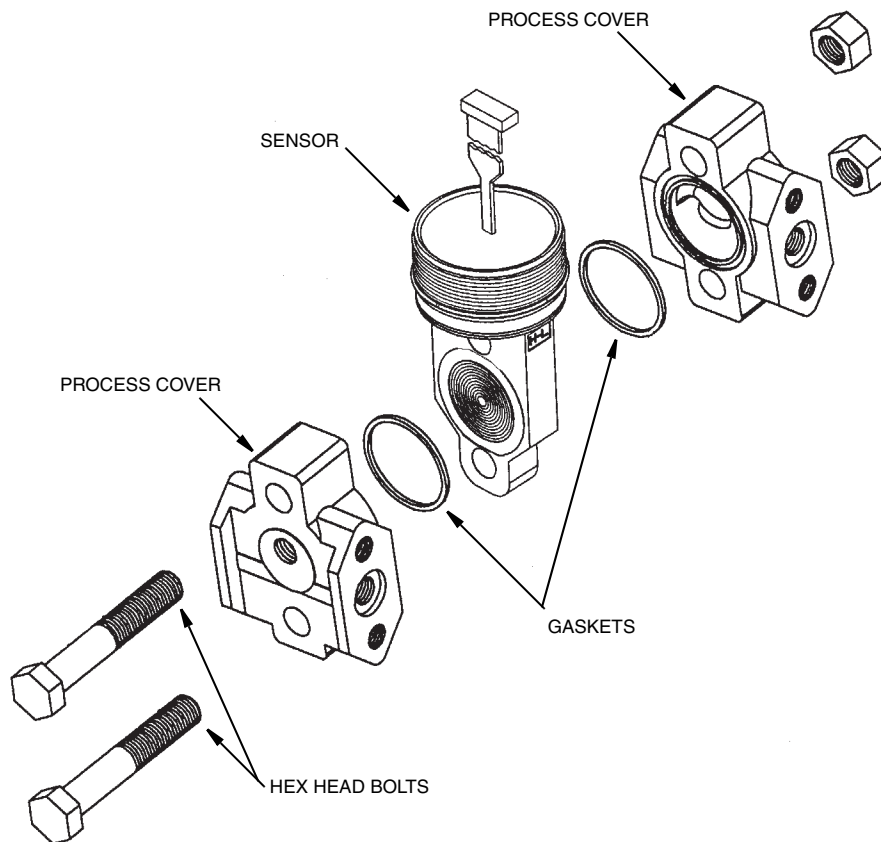
## Replacing the Sensor Assembly

To replace the sensor assembly, refer to Figures 38 and 39 and proceed as follows:

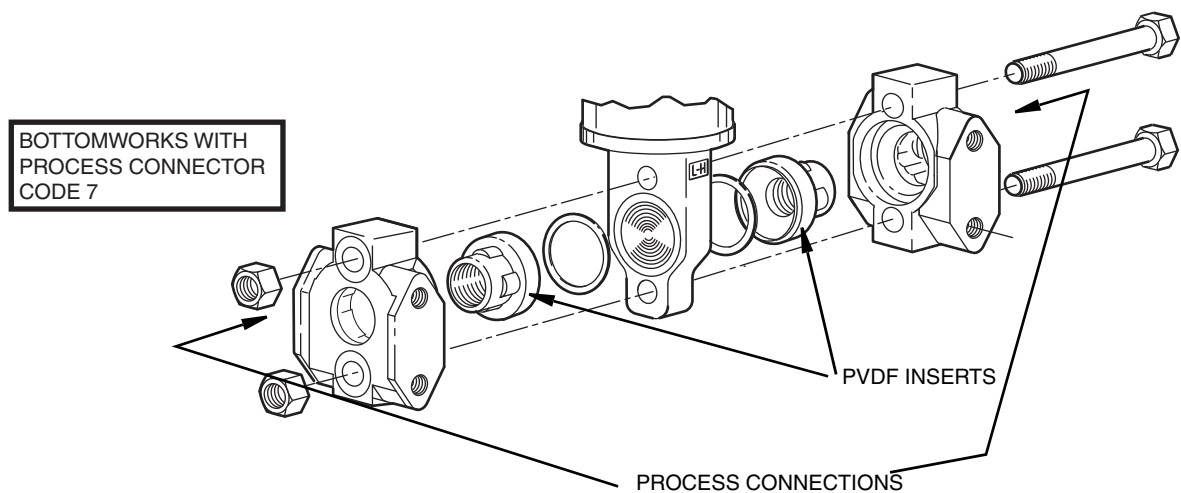
1. Remove the electronics module as described above.
2. Remove the housing as described above.
3. Remove the process covers from sensor by removing two hex head bolts.
4. Replace the gaskets in the process covers.
5. Install the process covers and housing on the new sensor. Torque cover bolts to 100 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*



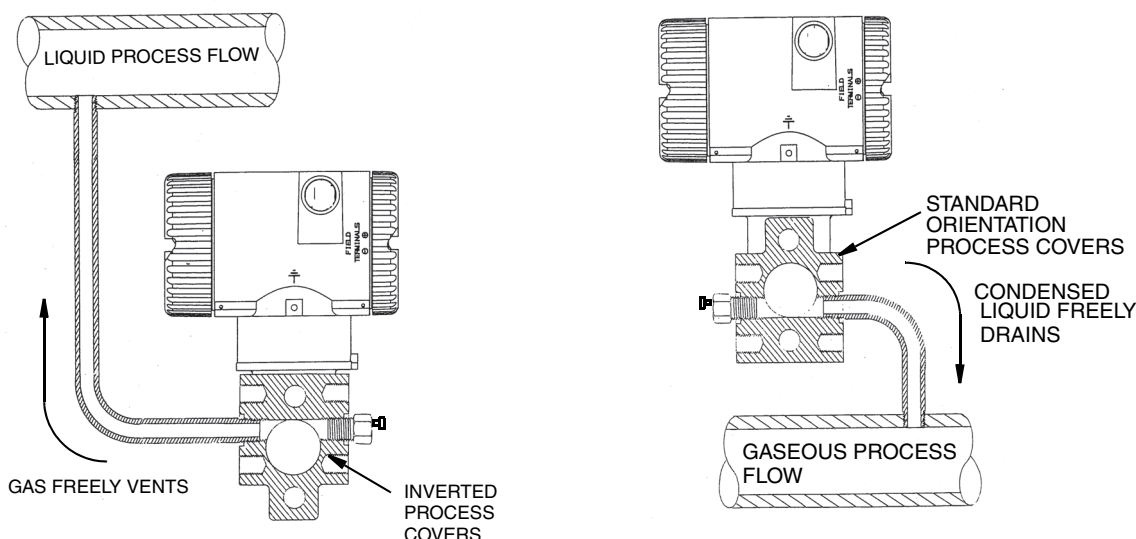
*Figure 39. Replacing the Sensor Assembly (PVDF Inserts)*



## 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 15) to both sides of the process cover/sensor assembly simultaneously through the process connections. Hold pressure for one minute. There should be no leakage of the test fluid through the gaskets. If leakage occurs, retighten the cover bolts per Step 4 or replace the gaskets and retest.

---

**! CAUTION**

---

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

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# Appendix A. List of Parameters

Table 15. Fieldbus Parameters

| Rel Index                    | Parameter Name | RO or R/W | Initial Factory Settings                      | Comments                                                                                                              |
|------------------------------|----------------|-----------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Network Configuration</b> |                |           |                                               |                                                                                                                       |
|                              | PD_TAG         | R/W       | Unique Device ID                              |                                                                                                                       |
|                              | NODE_ADDRESS   | R/W       | Unique to a segment                           |                                                                                                                       |
| <b>Resource Block</b>        |                |           |                                               |                                                                                                                       |
|                              | 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,<br>Hard W Lock<br>Chg Bypass in Auto | Shows supported Resource Block options                                                                                |
| 18                           | FEATURE_SEL    | R/W       | Hard W Lock                                   | Used to select Resource Block options                                                                                 |
| 19                           | CYCLE_TYPE     | RO        | Scheduled<br>Block execution                  | Block execution methods available                                                                                     |
| 20                           | CYCLE_SEL      | R/W       | 0 (none selected)                             | Used to select Cycle Type                                                                                             |
| 21                           | MIN_CYCLE_T    | RO        | 1900 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                                                                          |

Table 15. Fieldbus Parameters (Continued)

| Rel Index               | Parameter Name       | RO or R/W | Initial Factory Settings | Comments                                                                                                                                |
|-------------------------|----------------------|-----------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 28                      | FAULT_STATE          | RO        | Clear                    | When active, causes all output function blocks 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                                                                 |
| 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                                                                                                                |
| <b>Transducer Block</b> |                      |           |                          |                                                                                                                                         |
|                         | 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                                                                          |
| 13                      | PRIMARY_VALUE_TYPE   | RO        | Differential Pressure    | Type of measurement of the primary value                                                                                                |

Table 15. Fieldbus Parameters (Continued)

| Rel Index | Parameter Name       | RO or R/W | Initial Factory Settings                | Comments                                                                                                    |
|-----------|----------------------|-----------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 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 (a)                     | The engineering units value at 100% of range                                                                |
|           | EU_at_0%             | R/W       | per sales order (a)                     | The engineering units value at 0% of range                                                                  |
|           | Units_Index          | R/W       | per sales order (a)                     | Engineering units for the primary value                                                                     |
|           | Decimal              | R/W       | 5 (or per sales order)                  | 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                                                                               |
| 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          |           |                                         |                                                                                                             |
|           | 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 <sub>2</sub> O (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 factory use.                                                              |
| 36        | SENSOR_STATUS        | RO        | 0                                       | Set by transmitter - status of the sensor                                                                   |
| 37        | TRANSDUCER_COMMAND   | R/W       | 0                                       | Diagnostic parameter reserved for factory use                                                               |
| 38        | TRANSDUCER_RESPONSE  | RO        | 0                                       | Diagnostic parameter reserved for factory 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                                                                                    |

Table 15. Fieldbus Parameters (Continued)

| Rel Index                  | Parameter Name    | RO or R/W        | Initial Factory Settings      | Comments                                                                                                             |
|----------------------------|-------------------|------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>Analog Input Blocks</b> |                   |                  |                               |                                                                                                                      |
|                            | BLOCK_TAG         | R/W              | AI1(350) or AI2(400)          | 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              | 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             | See footnote (b) | 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                                                                                            |
| 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                                                                               |

Table 15. Fieldbus Parameters (Continued)

| Rel Index        | Parameter Name   | RO or R/W        | Initial Factory Settings         | Comments                                                                                                                    |
|------------------|------------------|------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 15               | CHANNEL          | R/W              | AI1 = pressure<br>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           | See footnote (b) | Indirect                         | Determines if value is to be used directly or converted                                                                     |
| 17               | LOW_CUT          | R/W              | 0                                | Low limit used in square root processing. This feature is used to eliminate noise from a sensor near zero.                  |
| 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                                                                         |
| 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.                                                                                                   |
| <b>PID Block</b> |                  |                  |                                  |                                                                                                                             |
|                  | 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                                                                                                     |
| 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, ROOut, RCas, Cas | Modes allowed for this block                                                                                                |
|                  | Normal           | R/W              | Auto                             | Mode of block during normal operations                                                                                      |

Table 15. Fieldbus Parameters (Continued)

| Rel Index | Parameter Name | RO or R/W        | Initial Factory Settings      | Comments                                                                                                             |
|-----------|----------------|------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------|
| 6         | BLOCK_ERR      | RO               | Out of Service                | Error status of the hardware or software                                                                             |
| 7         | PV             |                  |                               | The value and status for this parameter                                                                              |
|           | 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          | See footnote (c) | 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          | See footnote (b) | 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                                                               |
| 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         | See footnote (d) | 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         | See footnote (d) | 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                                                                         |

Table 15. Fieldbus Parameters (Continued)

| Rel Index | Parameter Name | RO or R/W        | Initial Factory Settings      | Comments                                                                                                                    |
|-----------|----------------|------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 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                     |
| 26        | RATE           | R/W              | 0                             | Derivative time constant in seconds                                                                                         |
| 27        | BKCAL_IN       |                  |                               | Value and status from a lower block's BKCAL_OUT                                                                             |
|           | Status         | See footnote (d) | 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                                                                                                     |
| 37        | TRK_SCALE      |                  |                               | The range, units, and precision associated with TRK_VAL                                                                     |
|           | 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         | See footnote (d) | 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         | See footnote (d) | Bad; NotConnected; NotLimited | The status of this block                                                                                                    |
|           | Value          |                  | 0                             | The value of this block                                                                                                     |

Table 15. Fieldbus Parameters (Continued)

| Rel Index | Parameter Name   | RO or R/W        | Initial Factory Settings      | Comments                                                                                             |
|-----------|------------------|------------------|-------------------------------|------------------------------------------------------------------------------------------------------|
| 40        | FF_VAL           |                  |                               | The feed forward status and value                                                                    |
|           | Status           | See footnote (d) | 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          | See footnote (b) | 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                                                |
| 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_LO_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.                                                                            |

a. Transmitter parameters are configured as follows if calibrated range is not provided with the order:

Span Code A: 0 to 30 inH<sub>2</sub>O; Span Code B: 0 to 200 inH<sub>2</sub>O; Span Code C: 0 to 840 inH<sub>2</sub>O;

Span Code D: 0 to 300 psi; Span Code E: 0 to 3000 psi.

b. R/W only in Manual or Out of Service mode.

c. R/W only in Auto, ROut, or Out of Service mode

d. R/W only when communication link is not connected.



**ISSUE DATES**

|          |          |          |
|----------|----------|----------|
| DEC 2001 | SEP 2005 | MAY 2010 |
| OCT 2003 | FEB 2006 | NOV 2013 |
| APR 2004 | OCT 2007 | MAR 2014 |
| FEB 2005 | MAY 2008 | JUL 2014 |

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