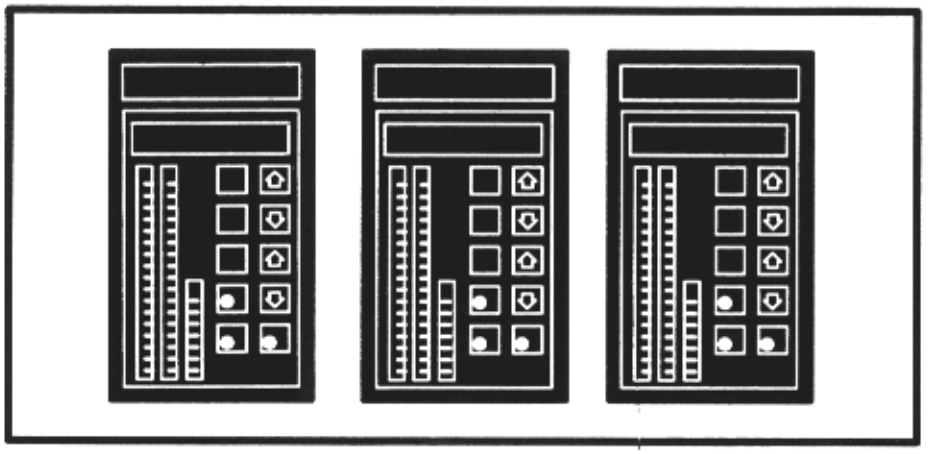
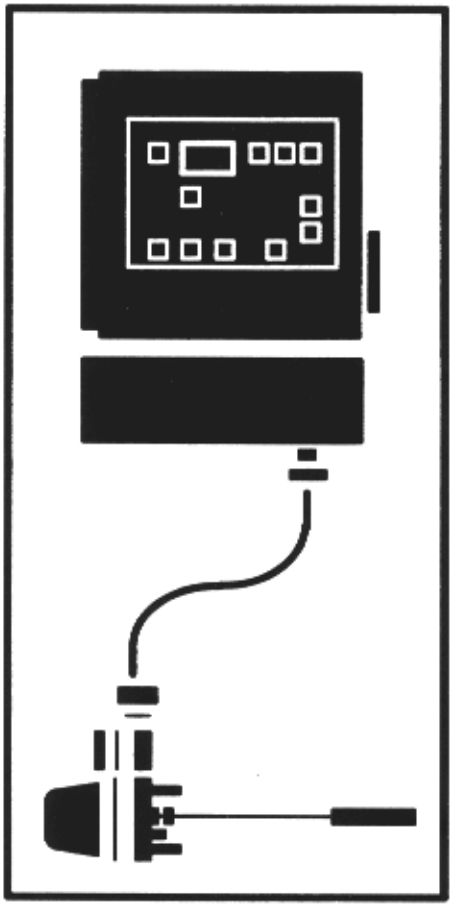
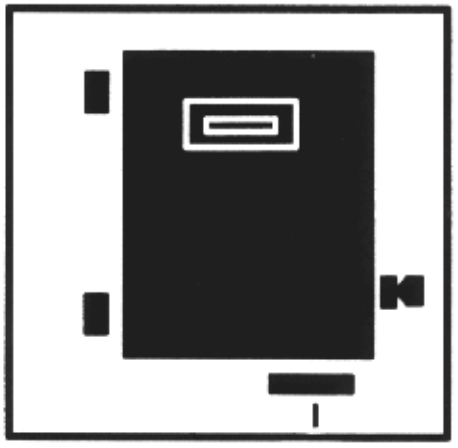
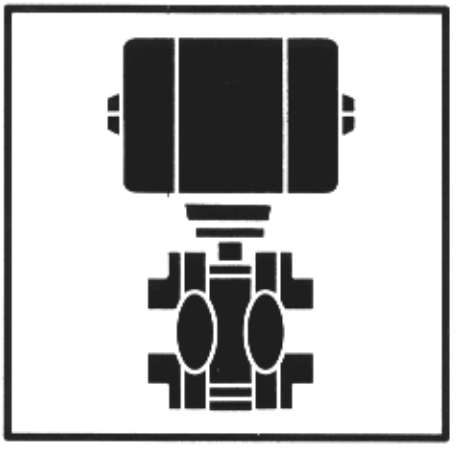
PRODUCT INSTRUCTION

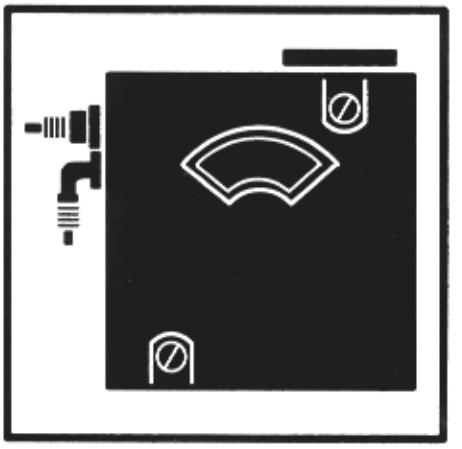
platinum standard ™ Series
Smart Pressure Transmitter
Type PTSD











ABB

Preface

This publication is for the use of technical personnel responsible for the installation, calibration, operation, maintenance, and repair of the Type PTSD Platinum Standard Smart Pressure Transmitter.

It is important for safety and operating reasons to read and understand this instruction. Until doing so, do not install or complete any tasks or procedures related to calibration, operation, maintenance, or repair.

List of Effective Pages

Total number of pages in this instruction is 120, consisting of the following:

Page No.	Change Date
Preface	Original
List of Effective Pages	Original
iii through ix	Original
1-1 through 1-18	Original
2-1 through 2-12	Original
3-1 through 3-17	Original
4-1 through 4-7	Original
5-1 through 5-8	Original
6-1 through 6-9	Original
7-1 through 7-5	Original
8-1 through 8-12	Original
9-1 through 9-18	Original
Index-1 through Index-5	Original

When an update is received, insert the latest changed pages and dispose of the superseded pages.

NOTE: On an update page, the changed text or table is indicated by a vertical bar in the outer margin of the page adjacent to the changed area. A changed figure is indicated by a vertical bar in the outer margin next to the figure caption. The date the update was prepared will appear beside the page number.

Table of Contents

Table of Contents (continued)

Table of Contents (continued)

List of Figures

List of Tables

List of Tables (continued)

Safety Summary

SPECIFIC WARNINGS	Consider the corrosive properties of the measured substance when selecting piping materials. Degradation of the piping can upset the process. Some process upsets can injure personnel and damage equipment. (p. 3-5) When pressurizing, avoid overloading and pressure hammer. Refer to the introduction section for the pressure limits of the cell. Exceeding this pressure could result in damage to the cell and cause serious injury to personnel. (p. 3-5) Explosionproof/dust-ignitionproof installations and intrinsically safe installations in Class II or Class III hazardous locations require that the assembly be kept tight while circuits are live unless the location is known to be nonhazardous at the time. (p. 4-1, 7-1, 8-1) The outputs of smart devices change to a fixed value during initialization and detected failure conditions. These values must be selected by the user to ensure safe operation. (p. 5-3) System maintenance must be performed only by qualified personnel and only after securing the equipment controlled by the circuit. Altering or removing components from an active circuit may upset the controlled process leading to personnel injury and equipment damage. (p. 7-1) Repairs must be performed only by qualified personnel and only after securing the equipment controlled by the circuit. Altering or removing components from an active circuit may upset the controlled process leading to personnel injury and equipment damage. (p. 8-1)

SPECIFIC CAUTIONS	If the cell with characterization board assembly has been cleaned for oxygen and chlorine service, do not compromise the integrity of this cleaning during these procedures. Impurities will react with oxygen and chlorine and damage the transmitter and the process. (p. 7-3, 8-1) Clean the diaphragms with a soft rag and appropriate solvent. The use of metal brushes, blades, or other tools will damage the diaphragms. (p. 7-3)

Trademarks and Registrations

Registrations and trademarks used in this document include:

™EZ CAL	Trademark of Elsag Bailey Process Automation.
™Platinum Standard	Trademark of Elsag Bailey Process Automation.
®Hastelloy	Registered trademark of Haynes International, Incorporated.
®HART	Registered trademark of HART Communication Foundation.
®INFI 90	Registered trademark of Elsag Bailey Process Automation.
®Viton	Registered trademark of DuPont Dow Elastomers L.L.C.
®Teflon	Registered trademark of E. I. DuPont de Nemours Company, Incorporated.
®Tape-Seal	Registered trademark of Friesland Plastics Company.

SECTION 1 - INTRODUCTION

OVERVIEW

The Type PTSD Platinum Standard Smart Pressure Transmitter accurately measures absolute, gage, or differential pressure, level, or flow rate of corrosive and noncorrosive liquids, vapors, and gases. The transmitter can be configured to provide a polled digital process variable signal (digital field bus mode) or a four to 20-milliampere process variable signal (analog mode).

It is important for safety and operating reasons to read and understand this instruction. Until doing so, do not install or complete any tasks or procedures related to installation, calibration, or operation.

INTENDED USER

The information in this publication is a guide for technical personnel responsible for the installation, calibration, operation, maintenance, and repair of the Type PTSD Platinum Standard Smart Pressure Transmitter.

EQUIPMENT DESCRIPTION

The Type PTSD pressure transmitter consists of a cell and characterization board assembly, and an electronics assembly. The electronics package uses the latest microprocessor technology, allowing calibration, operation, and troubleshooting from a local or remote location.

The Type STT Smart Transmitter Terminal communicates with the transmitter to configure, calibrate, check transmitter status, and perform other interactions with the transmitter. The EZ CAL™ option allows calibration validation without the Type STT terminal. An optional liquid crystal display (LCD) shows output in percent and user-defined secondary engineering units, input in primary engineering units, cell temperature, and the transmitter ID tag. An analog meter is also available for local output indication for those applications where the transmitter operates at temperature extremes (refer to Table 1-3 for the temperature limits).

FEATURES

Accurate, Stable, and Reproducible Measurements. Differential reluctance cell technology provides precise, stable, and reproducible pressure measurements.

Standard Hastelloy® C-276 Wetted Diaphragm. Corrosion resistant material is compatible with most substances. Reduces stock and minimizes purchase variations.

Easy Zero and Span Validation. Nonintrusive EZ CAL option does not violate transmitter case. Allows zero and span validation to previously defined pressure values without use of the Type STT terminal. The EZ CAL option may be supplied at delivery or added in the field, and can be used on any Type PTSD pressure transmitter (except those with stainless steel housings).

±0.08% Reference Accuracy for Precise Flow Measurements. Type PTSDDC pressure transmitter has upper range limit of 30 kilopascals (120 inches of water). Provides optimum performance for the most common flow measurement of 25 kilopascals (100 inches of water).

Turndown Ratios from 0.5:1 to 20:1. Turndown ratio range from 0.5:1, where the calibrated span is actually twice the upper range limit of the transmitter (from minus to plus the upper range limit), to 20:1.

Enhanced Remote Communications. Communicates with Type STT Smart Transmitter Terminal. Hand-held communication device uses high frequency AC signaling method known as FSK (frequency shift keying). Functions in the high noise environment found in many factories. The Type STT terminal communicates with the transmitter anywhere there is access to the signal wires within 1.6 kilometers (1.0 mile) of the transmitter. Parallel connection does not disrupt the isolated analog four to 20-milliampere process variable signal. The terminal is also available in French and Spanish language versions. Types STT04 terminals and later have the ability to communicate with HART® devices.

Low Range Differential Pressure Units. Type PTSDDA pressure transmitters offer a range down to 0.1 kilopascals (0.4 inches of water) full scale, providing increased accuracy at low pressures.

Optional Two-Line, Seven Character Liquid Crystal Display. Displays output in percent and user-defined secondary engineering units, input in primary engineering units, cell temperature, and transmitter ID tag. An analog meter is also available for those applications where the transmitter operates outside the temperature limits of the LCD. Both are easily installed for convenient local indication.

Advanced Electronics Insures Reliability. The amplifier assembly uses surface mount technology, designed to exceed 50 years MTBF (mean time between failure).

Dual Cover Housing. Immune to RFI (radio frequency interference).

Reduced Installation and Service Costs. Remote communications, modular plug-in electronics, and long-term stability reduce installation and service time.

Direct Replacement of Existing Analog Two-Wire Transmitters. Transmitters used in the analog mode replace most four to 20-milliampere output pressure transmitters that operate over a two-wire system.

Digital Field Bus Compatibility. When used as a high speed digital communicating device, analog signal processing does not occur. This results in an overall accuracy that is improved by more than three times compared to a traditional analog system. Such applications are INFI 90® OPEN supported.

Transmitter Diagnostics. The transmitter performs a series of self-checks, monitoring such areas as configuration integrity and input circuitry. Two user-defined cell temperature alarms are available. These diagnostics reduce troubleshooting and service time.

Agency Certifications. Designed to comply with FM (Factory Mutual) and CSA (Canadian Standards Association) certifications as intrinsically safe, explosionproof, and nonincendive. Selected transmitters may be supplied with CENELEC (European Committee for Electrotechnical Standardization) or SAA (Standards Association of Australia) certifications on special order. A NEMA 4X and IP67 housing makes the transmitter suitable for corrosive environments. The standard electronics housing is made of a low copper (less than one percent) Aluminum alloy. A polyurethane coating on the housing provides environmental protection.

EQUIPMENT APPLICATION

Uses for the transmitter include process control applications in the power generation, gas, water, petroleum, pulp and paper, and food industries.

INSTRUCTION CONTENT

This instruction is organized into nine sections.

Introduction — Describes this instruction and the transmitter. Includes reference documents, nomenclature, specifications, and options and accessories.

Description and Operation — Describes the functional operation of the transmitter and associated equipment. It also includes information about special applications such as the function generator.

Installation — Provides procedures for placing the transmitter into service.

Calibration — Identifies the calibration status of the transmitter and provides calibration check procedures. Calibration and validation procedures using both the Type STT terminal and EZ CAL option appear here.

Operating Procedures (Transmitter Configuration) — Addresses startup procedures, configuring, and monitoring of the transmitter (using the Type STT terminal), and the procedures that make the unit operational.

Troubleshooting — Provides steps that aid in solving operating difficulties that can occur, tables that list corrective action for error messages, and a troubleshooting flowchart.

Maintenance — Contains preventive maintenance schedules and procedures.

Repair and Replacement Procedures — Details procedures involved in replacing transmitter components.

Support Services — Provides spare parts lists and ordering information for replacement parts.

HOW TO USE THIS INSTRUCTION

Read this entire instruction through in sequence before attempting to install, calibrate, operate, troubleshoot, service, or repair the transmitter. After becoming completely familiar with the transmitter and this instruction, it may be used as a reference.

Throughout this instruction, the following text conventions generally apply.

Display Item — Any item displayed on a screen appears as italic text. Example:

Running

REFERENCE DOCUMENTS

Table 1-1 lists Bailey-Fischer & Porter documents referred to in this instruction.

Table 1-1. Reference Documents

Number	Description
B8113038	Board level wiring diagram
C-E21-50	Platinum Standard Series Smart Transmitters for Pressure, Flow and Level Measurements, Type PTS Specification
D3055060	Dimension drawing for Type PTSDD differential pressure transmitters
D3055061	Dimension drawing for Type PTSDA (absolute) and Type PTSDG (gage) pressure transmitters
D3055064	Dimension drawing for optional indicator
D3055065	User field connections
I-E96-302	Field Bus I/O Module (IMFBS01) Instruction
I-G18-1	Instrument Connecting Piping
I-G23-1	Installation of Orifices and Flow Nozzles
I-G23-2	Installation of Holding Ring Type Flow Nozzles
I-G23-4	Installation of Weld-In Type Flow Nozzles
P-E21-001	Installing a 4 to 20 mA Transmitter in a Hazardous Location
WBPEEUI110502A0	Type STT Smart Transmitter Terminal Instruction

NOMENCLATURE

The Type PTSD pressure transmitter has 15 nomenclature positions. Positions five through 15 have customer-selectable options. Use Table 1-2 to select or verify transmitter type.

Table 1-2. Nomenclature

Position	5	6	7	8	9	10	11	12	13	14	15	Platinum Standard Smart Pressure Transmitter — D Type Cell
P T S D	_	_	_	_	_	_	_	_	_	_	_	

Measurement application

A	_	_	_	_	_	_	_	_	_	_	_	Absolute pressure
D	_	_	_	_	_	_	_	_	_	_	_	Differential pressure
G	_	_	_	_	_	_	_	_	_	_	_	Gage pressure

Measurement range[1]

												Nominal Range		Minimum Range		Types
												kPa	in. H_2O/psi	kPa	in. H_2O/psi	
A	_	_	_	_	_	_	_	_	_	_	_	0 - 1.5	0 - 6 in. H_2O	0 - 0.1	0 - 0.4 in. H_2O	PTSDD
B	_	_	_	_	_	_	_	_	_	_	_	0 - 7.5	0 - 30 in. H_2O	0 - 0.4	0 - 1.5 in. H_2O	Not PTSDA
C	_	_	_	_	_	_	_	_	_	_	_	0 - 30	0 - 120 in. H_2O	0 - 1.5	0 - 6 in. H_2O	
D	_	_	_	_	_	_	_	_	_	_	_	0 - 90	0 - 360 in. H_2O	0 - 4.5	0 - 18 in. H_2O	All
F	_	_	_	_	_	_	_	_	_	_	_	0 - 500	0 - 75 psi	0 - 25	0 - 3.8 psi	
G	_	_	_	_	_	_	_	_	_	_	_	0 - 1,800	0 - 260 psi	0 - 90	0 - 13 psi	Not PTSDA
H	_	_	_	_	_	_	_	_	_	_	_	0 - 6,000	0 - 900 psi	0 - 400	0 - 60 psi	

Diaphragm material and fill fluid

												Diaphragm Material	Fill Fluid	Types
1	_	_	_	_	_	_	_	_	_	_	_	Hastelloy C-276	Silicone oil (ordered most)	All
2	_	_	_	_	_	_	_	_	_	_	_	Gold plated Hastelloy C-276	Silicone oil	Not PTSDA or PTSDDA
3	_	_	_	_	_	_	_	_	_	_	_	Tantalum		
A	_	_	_	_	_	_	_	_	_	_	_	Hastelloy C-276	Fluorinated oil	All
B	_	_	_	_	_	_	_	_	_	_	_	Gold plated Hastelloy C-276	Fluorinated oil	Not PTSDA or PTSDDA
C	_	_	_	_	_	_	_	_	_	_	_	Tantalum		
E	_	_	_	_	_	_	_	_	_	_	_	Hastelloy C-276	Fluorinated oil - cleaned for O_2 and Cl_2	All
F	_	_	_	_	_	_	_	_	_	_	_	Gold plated Hastelloy C-276	Fluorinated oil - cleaned for O_2 and Cl_2 service	Not PTSDA or PTSDDA
G	_	_	_	_	_	_	_	_	_	_	_	Tantalum		

High pressure side flange

												Material	Purge Valve	Style	Types
2	_	_	_	_	_	_	_	_	_	_	_	Stainless steel 316	Side	North American 7/16 (ordered most)	All
4	_	_	_	_	_	_	_	_	_	_	_	Stainless steel 316	Rear	North American 7/16 (special)	
B	_	_	_	_	_	_	_	_	_	_	_	Hastelloy C-276	Side	North American 7/16	
D	_	_	_	_	_	_	_	_	_	_	_	Hastelloy C-276	Rear	North American 7/16 (special)	
N	_	_	_	_	_	_	_	_	_	_	_	Stainless steel 304	Remote seal	North American 7/16	Not PTSDA or PTSDDA

Table 1-2. Nomenclature (continued)

Position 5 6 7 8 9 10 11 12 13 14 15	Platinum Standard Smart Pressure Transmitter — D Type Cell
P T S D _ _ _ _ _ _ _ _ _ _ _	

Low pressure side flange

	Material	Purge Valve	Style	Types
2	Stainless steel 316	Side	North American 7/16 (ordered most)	PTSDD
4	Stainless steel 316	Rear	North American 7/16 (special)	
B	Hastelloy C-276	Side	North American 7/16	
D	Hastelloy C-276	Rear	North American 7/16 (special)	
N	Stainless steel 304	Remote seal	North American 7/16	PTSDD, not PTSDDA

Bolting and O-rings[2]

	Bolt Material	Rating[3] kPa	Rating[3] psi	O-Ring Material	Types
1	Carbon steel (ordered most)	25,000	3,625	Viton®	Note 2
2	Stainless steel	20,000	2,900		
3	ASTM A193 B7M: NACE Class 2	20,000	2,900		
4	Carbon steel	41,000	6,000		
5	Stainless steel	41,000	6,000		
6	ASTM A193 B7M: NACE Class 2	41,000	6,000		
A	Carbon steel	25,000	3,625	Teflon® (PTFE)	Note 2
B	Stainless steel	20,000	2,900		
C	ASTM A193 B7M: NACE Class 2	20,000	2,900		
D	Carbon steel	41,000	6,000		
E	Stainless steel	41,000	6,000		
F	ASTM A193 B7M: NACE Class 2	41,000	6,000		
M	Carbon steel	25,000	3,625	Ethylene propylene	Note 2
N	Stainless steel	20,000	2,900		
P	ASTM A193 B7M: NACE Class 2	20,000	2,900		
Q	Carbon steel	41,000	6,000		
R	Stainless steel	41,000	6,000		
S	ASTM A193 B7M: NACE Class 2	41,000	6,000		
W	Carbon steel	25,000	3,625	Metal for vacuum service	PTSD___NN[2]
X	Stainless steel	20,000	2,900		
Y	ASTM A193 B7M: NACE Class 2	20,000	2,900		

Table 1-2. Nomenclature (continued)

Position 5 6 7 8 9 10 11 12 13 14 15	Platinum Standard Smart Pressure Transmitter — D Type Cell
P T S D _ _ _ _ _ _ _ _ _ _ _	

Adapters (two for PTSDD) and mounting bracket

	Adapters	Mounting Bracket	Types
0	None	None	All
1	None	Zinc plated chromate dipped C steel	
3	None	Stainless steel 316	
A	½ NPT stainless steel 316	None	
B	½ NPT stainless steel 316	Zinc plated chromate dipped C steel	
D	½ NPT stainless steel 316	Stainless steel 316	
M	½ NPT Hast C-276	None	
N	½ NPT Hast C-276	Zinc plated chromate dipped C steel	
Q	½ NPT Hast C-276	Stainless steel 316	

Certifications

0	NEMA 4X - Bailey-Fischer & Porter standard
1	NEMA 4X and CENELEC flameproof and intrinsically safe
2	NEMA 4X and FM and CSA explosionproof and intrinsically safe

Housing and electrical connection

	Housing	Electrical Connection	Types
1	Standard - low Cu light alloy Al	Two ½ NPT with 1 plug	All
A	Stainless steel 316	Two ½ NPT with 1 plug	All[3]

Indicator, lightning arrestor, and EZ CAL option

	Indicator	Lightning Arrestor	EZ CAL Option[3]	Types
0	Not included	Not included	Not included	All
1	Not included	Included	Not included	All
3	Not included	Not included	Included	All[3]
4	Not included	Included	Included	All[3]
A	LCD	Not included	Not included	All
B	LCD	Included	Not included	All
D	LCD	Not included	Included	All[3]
E	LCD	Included	Included	All[3]
M	Analog meter	Not included	Not included	All
N	Analog meter	Included	Not included	All
Q	Analog meter	Not included	Included	All[3]
R	Analog meter	Included	Included	All[3]

Table 1-2. Nomenclature (continued)

Position 5 6 7 8 9 10 11 12 13 14 15 P T S D _ _ _ _ _ _ _ _ _ _ _	Platinum Standard Smart Pressure Transmitter — D Type Cell

Configuration, tagging, and accessories[4]

	Configuration	Customer Tagging	Accessories[4]	Types
0	Standard	Not included	Not included	All
1	Standard	Riveted stainless steel	Not included	
2	Standard	Wired stainless steel	Not included	
3	Standard	Paper	Not included	
4	Standard	Not included	Included	
5	Standard	Riveted stainless steel	Included	
6	Standard	Wired stainless steel	Included	
7	Standard	Paper	Included	
A	Custom	Not included	Not included	All
B	Custom	Riveted stainless steel	Not included	
C	Custom	Wired stainless steel	Not included	
D	Custom	Paper	Not included	
E	Custom	Not included	Included	
F	Custom	Riveted stainless steel	Included	
G	Custom	Wired stainless steel	Included	
H	Custom	Paper	Included	

NOTES:

1. Units will be set to the nominal range. Specific customer calibrations are selected in nomenclature position 15. Refer to Table 1-8 for help.
2. Exceptions to the pressure ratings listed are: Type PTSDDA pressure transmitters are 2,000 kPa (300 psi); Types PTSDDH and PTSDGH pressure transmitters are 14,000 kPa (2,000 psi); all transmitters with tantalum diaphragms (3, C or G in nomenclature position 7) are 14,000 kPa (2,000 psi). High static pressure bolting and flanges (4, 5, 6, D, E, F, Q, R or S in nomenclature position 10) are only available for Types PTSDDB/C/D/F/G pressure transmitters, excluding those with tantalum diaphragms.
3. EZ CAL option cannot be used on transmitters with stainless steel housings (A in nomenclature position 13).
4. Typical accessories are mounted remote seals, manifolds, and integral orifice plates.

SPECIFICATIONS

The specifications are organized into separate tables. First is a list of specifications common to all Type PTSD pressure transmitters. This is followed by specifications unique to each of the three measurement applications (differential, gage, and absolute pressure).

Common Specifications

Tables 1-3 and 1-4 list the specifications common to all Type PTSD pressure transmitters.

Table 1-3. Common Specifications

Property	Characteristic/Value
Reference conditions	
Temperature	15.0° to 35.5°C (59.0° to 95.9°F)
Humidity	45% to 75%
Barometric pressure	86.0 to 106.0 kPa (12.5 to 15.4 psi)

Table 1-3. Common Specifications (continued)

<table>
<tr><th>Property</th><th>Characteristic/Value</th></tr>
<tr><td>Temperature limits for electronics, cell, and optional liquid crystal display</td><td>
<table>
<tr><th rowspan="2">Parameter</th><th colspan="2">Electronics[1]</th><th colspan="2">Cell[1,2]</th><th colspan="2">LCD[3]</th></tr>
<tr><th>°C</th><th>°F</th><th>°C</th><th>°F</th><th>°C</th><th>°F</th></tr>
<tr><td>Normal op</td><td>-40 to +85</td><td>-40 to +185</td><td>-40 to +85</td><td>-40 to +185</td><td>0 to +50</td><td>+32 to +122</td></tr>
<tr><td>Extreme op</td><td>-50 to +85</td><td>-58 to +185</td><td>-50 to +120</td><td>-58 to +248</td><td>0 to +50</td><td>+32 to +122</td></tr>
<tr><td>Storage/ transport</td><td>-55 to +85</td><td>-67 to +185</td><td>-55 to +85</td><td>-67 to +185</td><td>-20 to +70</td><td>-4 to +158</td></tr>
</table>
</td></tr>
<tr><td>Humidity limits</td><td>5% to 100% noncondensing continuous when the covers are properly installed and the conduit is sealed</td></tr>
<tr><td>Supply voltage[4]</td><td>12 to 53 VDC (12 to 42 VDC for certified applications). Installation category III.</td></tr>
<tr><td>Power supply effect</td><td>±0.005% of URL per volt</td></tr>
<tr><td>Output signal</td><td></td></tr>
<tr><td>Analog</td><td>4 to 20 mA</td></tr>
<tr><td>Digital</td><td>Bailey FSK communications</td></tr>
<tr><td>Output current limiting</td><td></td></tr>
<tr><td>Maximum</td><td>≥21.6 mA</td></tr>
<tr><td>Minimum</td><td>≤3.9 mA</td></tr>
<tr><td>Loop load limits</td><td>Refer to Figure 2-4</td></tr>
<tr><td>Damping/response time (one time constant - approximately 62% of final reading)</td><td>Analog and digital response to a step input change is adjustable from 0.0 to 32.0 secs and is entered during configuration. This value is in addition to:
Cell response time: dependent on cell and fill fluid
Electronics response time: approximately 0.25 secs</td></tr>
<tr><td>RFI/EMI effects</td><td>±0.1% of URL in fields from 4 to 1,000 MHz at 10 V/m</td></tr>
<tr><td>Surge tolerance</td><td>Complies with IEEE 472 test criteria. 2.5 kV, 1.5 MHz, 150-Ω source resistance.</td></tr>
<tr><td>Vibration effect</td><td>≤±0.1% of URL for 1 g from 1 to 2,000 Hz in any axis of the transmitter</td></tr>
<tr><td>Enclosure rating</td><td>NEMA 4X and IP67</td></tr>
<tr><td>FM and CSA certifications[5,6]</td><td></td></tr>
<tr><td>Explosionproof and dust-ignitionproof</td><td>Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G; Class III</td></tr>
<tr><td>Intrinsically safe</td><td>Classes I, II and III, Division 1; applicable groups when connected per drawing B222611</td></tr>
<tr><td>Nonincendive</td><td>Class I, Division 2, Groups A, B, C and D; Class II, Division 2, Groups E, F and G; Class III</td></tr>
</table>

NOTES:

1. The normal operating temperature range is that at which the transmitter meets all specifications. The extreme operating temperature range is that at which the transmitter remains powered without damage.
2. All transmitters with fluorinated oil filled cells can only be operated in temperatures from -10° to +80°C (+14° to +176°F).
3. The normal operating temperature range for the LCD is that at which the LCD remains functional. Exceeding those conditions may cause the LCD to go blank. The transmitter remains functional to its operating limits. When the temperature returns to the acceptable range, the display is restored; however, the life of the display may be reduced.
4. Add 0.4 VDC to all minimum supply voltage values if using the lightning arrestor option.
5. Refer to Table 1-4 for the ambient condition limits for certified applications.
6. The transmitters are only certified for those agencies and classes indicated on the certification label. Do not install the transmitters in locations for which they are not suited. Refer to nomenclature position 12.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Table 1-4. Ambient Condition Limits for Certified Applications

Agency	Category	T_{max}		T_{min}		P_{max}		P_{min}		O_{2max}
		°C	°F	°C	°F	kPa	psia	kPa	psia	%
FM	Explosionproof	80	176	-40	-40	108	15.7	86	12.5	21
	Dust-ignitionproof									
	Intrinsic safety	65 (T4)	149 (T4)							
	Nonincendive									
CSA	Explosionproof	60	140							
	Dust-ignitionproof									
	Intrinsic safety	40 (T3C) 60 (T3A)	104 (T3C) 140 (T3A)							
	Nonincendive	60 (T4A)	140 (T4A)							

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Type PTSDD Differential Pressure Transmitter Specifications

Table 1-5 lists the specifications unique to Type PTSDD differential pressure transmitters.

Table 1-5. Type PTSDD Differential Pressure Transmitter Specifications

Property	Characteristic/Value
Measurement range, turndown ratio, zero suppression, and zero elevation	Lower range value (zero) and upper range value (100%) can be calibrated at any value of pressure, provided that: 1. Their algebraic difference (the calibrated span) corresponds to an authorized TDR. 2. Both are within the following acceptable limits.

Type	International System Units							
	Range Limits (kPa)		Span and Turndown Ratio (TDR)					
	Upper	Lower	Nominal (kPa)		Maximum (kPa)		Minimum (kPa)	
PTSDDA	1.5	-1.5	1.5	1:1 TDR	3	0.5:1 TDR	0.1	15:1 TDR
PTSDDB	7.5	-7.5	7.5	1:1 TDR	15	0.5:1 TDR	0.4	20:1 TDR
PTSDDC	30	-30	30	1:1 TDR	60	0.5:1 TDR	1.5	20:1 TDR
PTSDDD	90	-90	90	1:1 TDR	180	0.5:1 TDR	4.5	20:1 TDR
PTSDDF	500	-500	500	1:1 TDR	1,000	0.5:1 TDR	25	20:1 TDR
PTSDDG	1,800	-1,800	1,800	1:1 TDR	3,600	0.5:1 TDR	90	20:1 TDR
PTSDDH	6,000	-6,000	6,000	1:1 TDR	12,000	0.5:1 TDR	400	15:1 TDR

Table 1-5. Type PTSDD Differential Pressure Transmitter Specifications (continued)

<table>
<tr><th>Property</th><th>Characteristic/Value</th></tr>
<tr><td>Measurement range, turndown ratio, zero suppression, and zero elevation (continued)</td><td>
<table>
<tr><th rowspan="3">Type</th><th colspan="8">American Units</th></tr>
<tr><th colspan="2">Range Limits (in. H_2O)</th><th colspan="6">Span and Turndown Ratio (TDR)</th></tr>
<tr><th>Upper</th><th>Lower</th><th colspan="2">Nominal (in. H_2O)</th><th colspan="2">Maximum (in. H_2O)</th><th colspan="2">Minimum (in. H_2O)</th></tr>
<tr><td>PTSDDA</td><td>6</td><td>-6</td><td>6</td><td>1:1 TDR</td><td>12</td><td>0.5:1 TDR</td><td>0.4</td><td>15:1 TDR</td></tr>
<tr><td>PTSDDB</td><td>30</td><td>-30</td><td>30</td><td>1:1 TDR</td><td>60</td><td>0.5:1 TDR</td><td>1.5</td><td>20:1 TDR</td></tr>
<tr><td>PTSDDC</td><td>120</td><td>-120</td><td>120</td><td>1:1 TDR</td><td>240</td><td>0.5:1 TDR</td><td>6</td><td>20:1 TDR</td></tr>
<tr><td>PTSDDD</td><td>360</td><td>-360</td><td>360</td><td>1:1 TDR</td><td>720</td><td>0.5:1 TDR</td><td>18</td><td>20:1 TDR</td></tr>
<tr><td>—</td><td colspan="8">(psi)</td></tr>
<tr><td>PTSDDF</td><td>75</td><td>-75</td><td>75</td><td>1:1 TDR</td><td>150</td><td>0.5:1 TDR</td><td>3.8</td><td>20:1 TDR</td></tr>
<tr><td>PTSDDG</td><td>260</td><td>-260</td><td>260</td><td>1:1 TDR</td><td>520</td><td>0.5:1 TDR</td><td>13</td><td>20:1 TDR</td></tr>
<tr><td>PTSDDH</td><td>900</td><td>-900</td><td>900</td><td>1:1 TDR</td><td>1,800</td><td>0.5:1 TDR</td><td>60</td><td>15:1 TDR</td></tr>
</table>
</td></tr>
<tr><td>Reference accuracy - per IEC 770 and SAMA PMC 31.1

All reference accuracy values are for transmitters with zero based spans, silicone oil fill, and Hastelloy C-276 isolating diaphragms at a reference temperature of 25°C (77°F).</td><td>
The reference accuracy includes the effects of linearity, hysteresis, repeatability, and deadband. The value listed may vary depending on the URL and calibrated span of the particular transmitter. To determine the accuracy of a transmitter:

RA or $\frac{CF \times URL}{Span}$ whichever is greater, where RA = reference accuracy at 1:1 TDR and CF = compensation factor due to TDR.
<table>
<tr><th rowspan="2">Type</th><th colspan="2">URL</th><th rowspan="2">RA (% of Span)</th><th rowspan="2">CF (% of Span)</th></tr>
<tr><th>(kPa)</th><th>(in. H_2O)</th></tr>
<tr><td>PTSDDA</td><td>1.5</td><td>6</td><td>±0.20</td><td>±0.032</td></tr>
<tr><td>PTSDDB</td><td>7.5</td><td>30</td><td>±0.10</td><td>±0.020</td></tr>
<tr><td>PTSDDC</td><td>30</td><td>120</td><td>±0.08</td><td>±0.012</td></tr>
<tr><td>PTSDDD</td><td>90</td><td>360</td><td>±0.08</td><td>±0.012</td></tr>
<tr><td>—</td><td>(kPa)</td><td>(psi)</td><td></td><td></td></tr>
<tr><td>PTSDDF</td><td>500</td><td>75</td><td>±0.10</td><td>±0.016</td></tr>
<tr><td>PTSDDG</td><td>1,800</td><td>260</td><td>±0.10</td><td>±0.016</td></tr>
<tr><td>PTSDDH</td><td>6,000</td><td>900</td><td>±0.20</td><td>±0.020</td></tr>
</table>
</td></tr>
<tr><td>Stability per 12-month period</td><td>±0.1% of URL (±0.2% of URL for Type PTSDDA pressure transmitter) at reference conditions</td></tr>
</table>

Table 1-5. Type PTSDD Differential Pressure Transmitter Specifications (continued)

<table>
<tr><th>Property</th><th>Characteristic/Value</th></tr>
<tr><td>Static pressure and overpressure limits

NOTE: The maximum static pressure and overpressure for transmitters with tantalum diaphragms (3, C, or G in nomenclature position 7) is 14,000 kPa (2,000 psi).</td><td>The minimum static pressure for all types is 3.4 kPa absolute (14.0 in. H_2O absolute or 0.5 psia). The maximum static pressure is listed in the following table.
<table>
<tr><th rowspan="3">Type</th><th colspan="2" rowspan="2">URL</th><th colspan="6">Pressure Rating/Bolting</th></tr>
<tr><th colspan="2">Carbon Steel</th><th colspan="2">Stainless Steel and NACE</th><th colspan="2">High Static Pressure</th></tr>
<tr><th>(kPa)</th><th>(in. H_2O)</th><th>(kPa)</th><th>(psi)</th><th>(kPa)</th><th>(psi)</th><th>(kPa)</th><th>(psi)</th></tr>
<tr><td>PTSDDA</td><td>1.5</td><td>6</td><td>2,000</td><td>300</td><td>2,000</td><td>300</td><td>N/A</td><td>N/A</td></tr>
<tr><td>PTSDDB</td><td>7.5</td><td>30</td><td>25,000</td><td>3,625</td><td>20,000</td><td>2,900</td><td>41,000</td><td>6,000</td></tr>
<tr><td>PTSDDC</td><td>30</td><td>120</td><td>25,000</td><td>3,625</td><td>20,000</td><td>2,900</td><td>41,000</td><td>6,000</td></tr>
<tr><td>PTSDDD</td><td>90</td><td>360</td><td>25,000</td><td>3,625</td><td>20,000</td><td>2,900</td><td>41,000</td><td>6,000</td></tr>
<tr><td>—</td><td>(kPa)</td><td>(psi)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>PTSDDF</td><td>500</td><td>75</td><td>25,000</td><td>3,625</td><td>20,000</td><td>2,900</td><td>41,000</td><td>6,000</td></tr>
<tr><td>PTSDDG</td><td>1,800</td><td>260</td><td>25,000</td><td>3,625</td><td>20,000</td><td>2,900</td><td>41,000</td><td>6,000</td></tr>
<tr><td>PTSDDH</td><td>6,000</td><td>900</td><td>14,000</td><td>2,000</td><td>14,000</td><td>2,000</td><td>N/A</td><td>N/A</td></tr>
</table></td></tr>
<tr><td>Static pressure effect on zero and span

These values are for transmitters with zero based spans, silicone oil fill, and Hastelloy C-276 isolating diaphragms at a reference temperature of 25°C (77°F).

NOTE: Zero effect can be calibrated out at line pressure.</td><td>The values listed for Type PTSDDA pressure transmitters are for a variation of 1,000 kPa (150 psi) for line pressures between 0 and 2,000 kPa (0 and 300 psi).

The values listed for all other types are for a variation of 7,000 kPa (1,000 psi) for line pressures between 0 and 14,000 kPa (0 and 2,000 psi).
<table>
<tr><th rowspan="2">Type</th><th colspan="2">URL</th><th rowspan="2">Zero Effect (% of URL)</th><th rowspan="2">Span Effect (% of Reading)</th></tr>
<tr><th>(kPa)</th><th>(in. H_2O)</th></tr>
<tr><td>PTSDDA</td><td>1.5</td><td>6</td><td>±0.20</td><td>±0.10</td></tr>
<tr><td>PTSDDB</td><td>7.5</td><td>30</td><td>±0.30</td><td>±0.25</td></tr>
<tr><td>PTSDDC</td><td>30</td><td>120</td><td>±0.20</td><td>±0.25</td></tr>
<tr><td>PTSDDD</td><td>90</td><td>360</td><td>±0.20</td><td>±0.25</td></tr>
<tr><td>—</td><td>(kPa)</td><td>(psi)</td><td></td><td></td></tr>
<tr><td>PTSDDF</td><td>500</td><td>75</td><td>±0.30</td><td>±0.75</td></tr>
<tr><td>PTSDDG</td><td>1,800</td><td>260</td><td>±0.30</td><td>±0.75</td></tr>
<tr><td>PTSDDH</td><td>6,000</td><td>900</td><td>±0.30</td><td>±0.50</td></tr>
</table></td></tr>
<tr><td>Ambient temperature effect on zero and span

These values are for transmitters with zero based spans, silicone oil fill, and Hastelloy C-276 isolating diaphragms.</td><td>The effects listed are for a variation of ±25°C (±45°F) from a calibration done at a temperature between -30° and +80°C (-22° and +176°F), as long as the variation does not take the transmitter out of the temperature specifications listed in Table 1-3.
<table>
<tr><th rowspan="2">Type</th><th colspan="2">URL</th><th rowspan="2">Total Effect</th></tr>
<tr><th>(kPa)</th><th>(in. H_2O)</th></tr>
<tr><td>PTSDDA</td><td>1.5</td><td>6</td><td>±(0.15% URL + 0.30% span)</td></tr>
<tr><td>PTSDDB</td><td>7.5</td><td>30</td><td>±(0.10% URL + 0.15% span)</td></tr>
<tr><td>PTSDDC</td><td>30</td><td>120</td><td>±(0.06% URL + 0.13% span)</td></tr>
<tr><td>PTSDDD</td><td>90</td><td>360</td><td>±(0.08% URL + 0.13% span)</td></tr>
<tr><td>—</td><td>(kPa)</td><td>(psi)</td><td></td></tr>
<tr><td>PTSDDF</td><td>500</td><td>75</td><td>±(0.10% URL + 0.15% span)</td></tr>
<tr><td>PTSDDG</td><td>1,800</td><td>260</td><td>±(0.10% URL + 0.15% span)</td></tr>
<tr><td>PTSDDH</td><td>6,000</td><td>900</td><td>±(0.15% URL + 0.25% span)</td></tr>
</table></td></tr>
<tr><td>Weight</td><td>4.3 kg (9.5 lbs) without options or accessories.</td></tr>
</table>

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Type PTSDG Gage Pressure Transmitter Specifications

Table 1-6 lists the specifications unique to Type PTSDG gage pressure transmitters.

Table 1-6. Type PTSDG Gage Pressure Transmitter Specifications

<table>
<tr><th>Property</th><th>Characteristic/Value</th></tr>
<tr><td>Measurement range, turndown ratio, zero suppression, and zero elevation</td><td>Lower range value (zero) and upper range value (100%) can be calibrated at any value of pressure, provided that:
1. Their algebraic difference (the calibrated span) corresponds to an authorized TDR.
2. Both are within the following acceptable limits.
<table>
<tr><th rowspan="3">Type</th><th colspan="6">International System Units</th></tr>
<tr><th colspan="2">Range Limits (kPa)</th><th colspan="4">Span and Turndown Ratio (TDR)</th></tr>
<tr><th>Upper</th><th>Lower</th><th colspan="2">Nominal (kPa)</th><th colspan="2">Minimum (kPa)</th></tr>
<tr><td>PTSDGB</td><td>7.5</td><td>-7.5</td><td>7.5</td><td>1:1 TDR</td><td>0.4</td><td>20:1 TDR</td></tr>
<tr><td>PTSDGC</td><td>30</td><td>-30</td><td>30</td><td>1:1 TDR</td><td>1.5</td><td>20:1 TDR</td></tr>
<tr><td>PTSDGD</td><td>90</td><td>-90</td><td>90</td><td>1:1 TDR</td><td>4.5</td><td>20:1 TDR</td></tr>
<tr><td>PTSDGF</td><td>500</td><td>-100</td><td>500</td><td>1:1 TDR</td><td>25</td><td>20:1 TDR</td></tr>
<tr><td>PTSDGG</td><td>1,800</td><td>-100</td><td>1,800</td><td>1:1 TDR</td><td>90</td><td>20:1 TDR</td></tr>
<tr><td>PTSDGH</td><td>6,000</td><td>-100</td><td>6,000</td><td>1:1 TDR</td><td>400</td><td>15:1 TDR</td></tr>
</table>
<table>
<tr><th rowspan="3">Type</th><th colspan="6">American Units</th></tr>
<tr><th colspan="2">Range Limits (in. H_2O)</th><th colspan="4">Span and Turndown Ratio (TDR)</th></tr>
<tr><th>Upper</th><th>Lower</th><th colspan="2">Nominal (in. H_2O)</th><th colspan="2">Minimum (in. H_2O)</th></tr>
<tr><td>PTSDGB</td><td>30</td><td>-30</td><td>30</td><td>1:1 TDR</td><td>1.5</td><td>20:1 TDR</td></tr>
<tr><td>PTSDGC</td><td>120</td><td>-120</td><td>120</td><td>1:1 TDR</td><td>6</td><td>20:1 TDR</td></tr>
<tr><td>PTSDGD</td><td>360</td><td>-360</td><td>360</td><td>1:1 TDR</td><td>18</td><td>20:1 TDR</td></tr>
<tr><td>—</td><td colspan="6">(psi)</td></tr>
<tr><td>PTSDGF</td><td>75</td><td>-14</td><td>75</td><td>1:1 TDR</td><td>3.8</td><td>20:1 TDR</td></tr>
<tr><td>PTSDGG</td><td>260</td><td>-14</td><td>260</td><td>1:1 TDR</td><td>13</td><td>20:1 TDR</td></tr>
<tr><td>PTSDGH</td><td>900</td><td>-14</td><td>900</td><td>1:1 TDR</td><td>60</td><td>15:1 TDR</td></tr>
</table>
</td></tr>
</table>

Table 1-6. Type PTSDG Gage Pressure Transmitter Specifications (continued)

<table>
<tr><th>Property</th><th>Characteristic/Value</th></tr>
<tr><td>Reference accuracy - per IEC 770 and SAMA PMC 31.1

All reference accuracy values are for transmitters with zero based spans, silicone oil fill, and Hastelloy C-276 isolating diaphragms at a reference temperature of 25°C (77°F).</td><td>The reference accuracy includes the effects of linearity, hysteresis, repeatability, and deadband. The value listed may vary depending on the URL and calibrated span of the particular transmitter. To determine the accuracy of a transmitter:

RA or $\frac{CF \times URL}{Span}$ whichever is greater, where RA = reference accuracy at 1:1 TDR and CF = compensation factor due to TDR.
<table>
<tr><th rowspan="2">Type</th><th colspan="2">URL</th><th rowspan="2">RA (% of Span)</th><th rowspan="2">CF (% of Span)</th></tr>
<tr><th>(kPa)</th><th>(in. H_2O)</th></tr>
<tr><td>PTSDGB</td><td>7.5</td><td>30</td><td>±0.10</td><td>±0.020</td></tr>
<tr><td>PTSDGC</td><td>30</td><td>120</td><td>±0.10</td><td>±0.012</td></tr>
<tr><td>PTSDGD</td><td>90</td><td>360</td><td>±0.10</td><td>±0.012</td></tr>
<tr><td>—</td><td>(kPa)</td><td>(psi)</td><td></td><td></td></tr>
<tr><td>PTSDGF</td><td>500</td><td>75</td><td>±0.10</td><td>±0.016</td></tr>
<tr><td>PTSDGG</td><td>1,800</td><td>260</td><td>±0.10</td><td>±0.016</td></tr>
<tr><td>PTSDGH</td><td>6,000</td><td>900</td><td>±0.20</td><td>±0.020</td></tr>
</table></td></tr>
<tr><td>Stability per 12-month period</td><td>±0.1% of URL at reference conditions.</td></tr>
<tr><td>Pressure limits

Carbon steel

Stainless steel and NACE</td><td>Minimum pressure for all types is 3.4 kPa absolute (14.0 in. H_2O absolute or 0.5 psia). The maximum overpressure depends on the type of bolting used to maintain the transmitter flanges.

NOTE: Maximum overpressure for transmitters with tantalum diaphragms (3, C, or G in nomenclature position 7) is 14,000 kPa (2,000 psi).

25,000 kPa (3,625 psi) for all but PTSDGH with a limit of 14,000 kPa (2,000 psi).

20,000 kPa (2,900 psi) for all but PTSDGH with a limit of 14,000 kPa (2,000 psi).</td></tr>
<tr><td>Ambient temperature effect on zero and span

These values are for transmitters with zero based spans, silicone oil fill, and Hastelloy C-276 isolating diaphragms.</td><td>The effects listed are for a variation of ±25°C (±45°F) from a calibration done at a temperature between -30° and +80°C (-22° and +176°F), as long as the variation does not take the transmitter out of the temperature specifications listed in Table 1-3.
<table>
<tr><th rowspan="2">Type</th><th colspan="2">URL</th><th rowspan="2">Total Effect</th></tr>
<tr><th>(kPa)</th><th>(in. H_2O)</th></tr>
<tr><td>PTSDGB</td><td>7.5</td><td>30</td><td>±(0.10% URL + 0.15% span)</td></tr>
<tr><td>PTSDGC</td><td>30</td><td>120</td><td>±(0.06% URL + 0.13% span)</td></tr>
<tr><td>PTSDGD</td><td>90</td><td>360</td><td>±(0.08% URL + 0.13% span)</td></tr>
<tr><td>—</td><td>(kPa)</td><td>(psi)</td><td></td></tr>
<tr><td>PTSDGF</td><td>500</td><td>75</td><td>±(0.10% URL + 0.15% span)</td></tr>
<tr><td>PTSDGG</td><td>1,800</td><td>260</td><td>±(0.10% URL + 0.15% span)</td></tr>
<tr><td>PTSDGH</td><td>6,000</td><td>900</td><td>±(0.15% URL + 0.25% span)</td></tr>
</table></td></tr>
<tr><td>Weight</td><td>4.3 kg (9.5 lbs) without options or accessories.</td></tr>
</table>

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Type PTSDA Absolute Pressure Transmitter Specifications

Table 1-7 lists the specifications unique to Type PTSDA absolute pressure transmitters.

Table 1-7. Type PTSDA Absolute Pressure Transmitter Specifications

<table>
<tr><th>Property</th><th>Characteristic/Value</th></tr>
<tr><td>Measurement range, turndown ratio, zero suppression, and zero elevation</td><td>Lower range value (zero) and upper range value (100%) can be calibrated at any value of pressure, provided that:
1. Their algebraic difference (the calibrated span) corresponds to an authorized TDR.
2. Both are within the following acceptable limits.
<table>
<tr><th rowspan="3">Type</th><th colspan="5">International System Units</th></tr>
<tr><th colspan="2">Range Limits (kPa)</th><th colspan="3">Span and Turndown Ratio (TDR)</th></tr>
<tr><th>Upper</th><th>Lower</th><th colspan="2">Nominal (kPa)</th><th colspan="2">Minimum (kPa)</th></tr>
<tr><td>PTSDAD</td><td>90</td><td>0</td><td>90</td><td>1:1 TDR</td><td>4.5</td><td>20:1 TDR</td></tr>
<tr><td>PTSDAF</td><td>500</td><td>0</td><td>500</td><td>1:1 TDR</td><td>25</td><td>20:1 TDR</td></tr>
</table>
<table>
<tr><th rowspan="3">Type</th><th colspan="6">American Units</th></tr>
<tr><th colspan="2">Range Limits (in. H_2O)</th><th colspan="4">Span and Turndown Ratio (TDR)</th></tr>
<tr><th>Upper</th><th>Lower</th><th colspan="2">Nominal (in. H_2O)</th><th colspan="2">Minimum (in. H_2O)</th></tr>
<tr><td>PTSDAD</td><td>360</td><td>0</td><td>360</td><td>1:1 TDR</td><td>18</td><td>20:1 TDR</td></tr>
<tr><td>—</td><td colspan="6">(psia)</td></tr>
<tr><td>PTSDAF</td><td>75</td><td>0</td><td>75</td><td>1:1 TDR</td><td>3.8</td><td>20:1 TDR</td></tr>
</table></td></tr>
<tr><td>Reference accuracy - per IEC 770 and SAMA PMC 31.1</td><td>This value is for transmitters with zero based spans, silicone oil fill, and Hastelloy C-276 isolating diaphragms at a reference temperature of 25°C (77°F). The reference accuracy includes the effects of linearity, hysteresis, repeatability, and deadband.

$\pm 0.20\%$ *of span or* $\pm \frac{0.016 \times URL}{Span}$ *(% of span),* whichever is greater.</td></tr>
<tr><td>Stability per 12-month period</td><td>±0.2% of URL at reference conditions.</td></tr>
<tr><td>Pressure limits

Carbon steel
Stainless steel and NACE</td><td>The minimum pressure for all types is 3.4 kPa absolute (14.0 in. H_2O absolute or 0.5 psia). The maximum overpressure depends on the type of bolting used to maintain the transmitter flanges.

25,000 kPa (3,625 psi)
20,000 kPa (2,900 psi)</td></tr>
<tr><td>Ambient temperature effect on zero and span</td><td>This value is for transmitters with zero based spans, silicone oil fill, and Hastelloy C-276 isolating diaphragms. The effects listed are for a variation of ±25°C (±45°F) from a calibration done at a temperature between -30° and +80°C (-22° and +176°F), as long as the variation does not take the transmitter out of the temperature specifications listed in Table 1-3.

±(0.10% URL + 0.15% span)</td></tr>
<tr><td>Weight</td><td>4.3 kg (9.5 lbs) without options or accessories</td></tr>
</table>

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

OPTIONS AND ACCESSORIES

Table 1-8 lists and describes the options and accessories available with the Type PTSD pressure transmitter.

Table 1-8. Options and Accessories

Item	Description
Type STT Smart Transmitter Terminal	Hand-held device for calibration, configuration, monitoring, and troubleshooting. Also communicates with HART devices.
EZ CAL option[1]	External nonintrusive device for zero and span validation. Add on kit no. 258562_1.
Liquid crystal display option[1]	Two-line, seven-character display for local output indication. Displays output in percent and user-defined secondary engineering units, input in primary engineering units, cell temperature, and transmitter ID tag. Mounts in four orientations for easy viewing. Refer to Table 1-3 for the temperature limitations. Add on kit no. 258550_1 (aluminum cover) or 258550_5 (stainless steel cover).
Analog meter option[1]	Provides local output indication for those applications where the transmitter operates outside the temperature limits of the LCD. Linear 0 to 100 and square root 0 to 10 graduations on same scale. Add on kit no. 258550_2 (aluminum cover) or 258550_6 (stainless steel cover).
Process adapter (football style)	½ NPT stainless steel 316 or Hastelloy C-276 (Type PTSD pressure transmitter only).
Mounting bracket option[1]	Universal support for mounting on panel or 1.5 in. to 2.0-in. pipe. Available in Zinc-plated, chromate-dipped carbon steel, or stainless steel 316.
Degreasing option[1]	For use in oxygen or chlorine service.
Gold plated Hastelloy C-276 diaphragm option[1]	For use in hydrogen service.
Tantalum diaphragm	For use with highly corrosive fluids.
Manifolds	Carbon steel or stainless steel 316 that attach directly to the transmitter in place of flange adapters. Manifolds are shipped assembled or unassembled to transmitter.
Remote diaphragm seals	For use with high temperature and corrosive fluids or where impulse line clogging may be a problem.
Lightning arrestor option[1]	Mounts internally to suppress lightning induced transients. Tested to suppress 10 successive 8 by 20 µsec pulses with a peak value of 20 kA (reference IEEE C62.41).
Antistatic kit	Contains static-dissipative work surface (mat), ground cord assembly, wrist bands, and alligator clip for personnel working on devices containing semiconductor components. Kit no. 1948385_1.
Available drawings	
B8113038	Board level wiring diagram.
D3055060	Dimension drawing for Type PTSD differential pressure transmitters.
D3055061	Dimension drawing for Type PTSDA (absolute) and Type PTSDG (gage) pressure transmitters
D3055064	Dimension drawing for optional indicator.
D3055065	User field connections.

Table 1-8. Options and Accessories (continued)

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Configuration option[1]
.
.</td><td>The transmitters are delivered with a standard configuration. Custom configurations can be ordered by selecting that option in nomenclature position 15. The factory programmed configuration is listed below, as well as a column to aid in ordering custom configurations.
<table>
<tr><th>Parameter</th><th>Standard Configuration</th><th>Custom Configuration</th></tr>
<tr><td>ID tag</td><td>PTS</td><td></td></tr>
<tr><td>Operating mode</td><td>Analog</td><td></td></tr>
<tr><td>Output function</td><td>Linear - normal acting</td><td></td></tr>
<tr><td>Damping</td><td>0.5 sec</td><td></td></tr>
<tr><td>Engineering units (EU)</td><td>in. H_2O/psi</td><td></td></tr>
<tr><td>Lower range value (LRV)</td><td>0.0</td><td></td></tr>
<tr><td>Upper range value (URV)</td><td>URL of transmitter</td><td></td></tr>
<tr><td>Initialize output</td><td>Low</td><td></td></tr>
<tr><td>Fail output</td><td>Low</td><td></td></tr>
<tr><td>Secondary EU</td><td>..MA</td><td></td></tr>
<tr><td>Secondary LRL</td><td>4.00</td><td></td></tr>
<tr><td>Secondary URL</td><td>20.00</td><td></td></tr>
<tr><td>Cell temp. low alarm</td><td>-40°C</td><td></td></tr>
<tr><td>Cell temp. high alarm</td><td>85°C</td><td></td></tr>
</table>
</td></tr>
</table>

NOTE:
1. These items are selected via nomenclature in Table 1-2.

SECTION 2 - DESCRIPTION AND OPERATION

INTRODUCTION

This section describes the Type PTSD Platinum Standard Smart Pressure Transmitter. It also includes information about special applications such as volume measurements and the function generator. Refer to Figure 2-1 for an illustration of the transmitter.

Type PTSD Platinum Standard Smart Pressure Transmitters measure absolute, gage, differential pressure, level, and flow of corrosive or noncorrosive liquids, vapors, and gases. The transmitter can be configured to provide a polled digital process variable signal (digital field bus mode) or a four to 20-milliampere process variable signal (analog mode). Uses for the transmitter include process control applications in the electric, gas, water, chemical, petroleum, pulp and paper, and food industries.

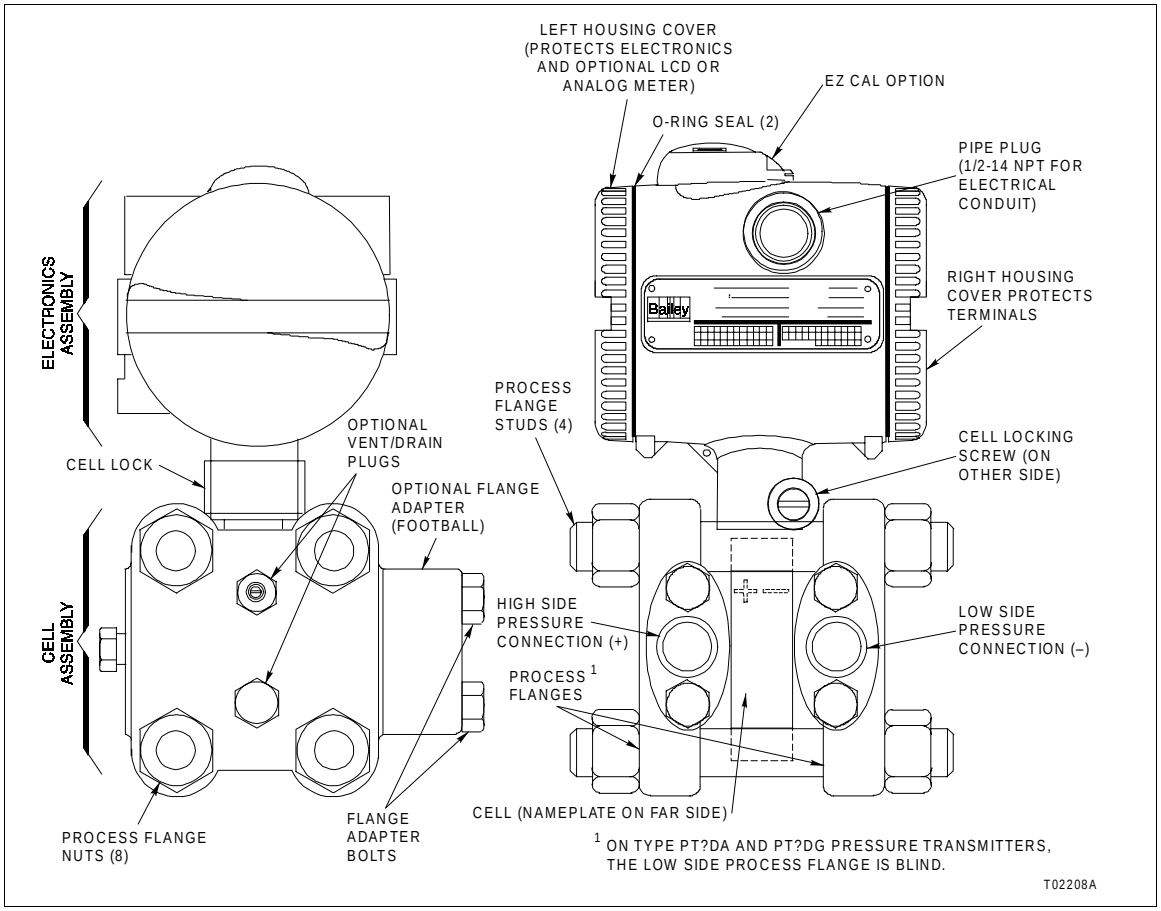


Figure 2-1. Type PTSD Pressure Transmitter

FUNCTIONAL OPERATION

The Type PTSD pressure transmitter has two major sections: a cell and characterization board assembly, and an electronics assembly. The Type STT Smart Transmitter Terminal communicates with the Type PTSD pressure transmitter. The EZ CAL option provides a way to validate the zero and span of the transmitter without using the Type STT terminal.

Cell and Characterization Board Assembly

Type PTSD pressure transmitters use an electrically isolated differential reluctance cell as the sensing device. The cell has two half-shells clasping a measuring diaphragm, centered and welded at the edges under stress. A core is welded to each side and at the center of the diaphragm. The diaphragm has spiral ridges for pressures ≤90 kilopascals (≤360 inches of water) or is flat and trimmed for pressures >90 kilopascals (>360 inches of water). These distinctive diaphragms provide symmetry, flexibility, and accuracy under static pressure (Fig. 2-2).

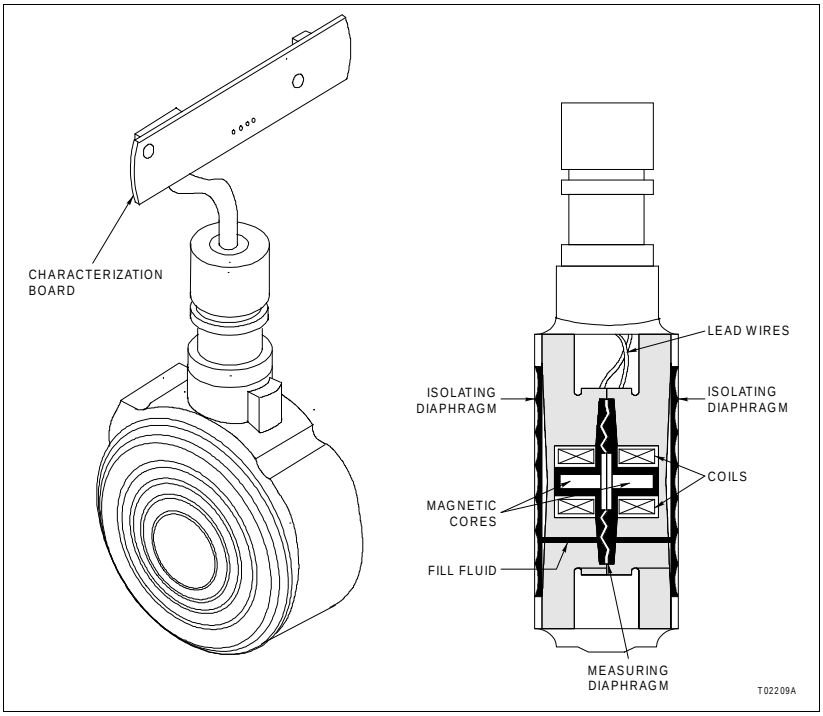


Figure 2-2. Cell and Characterization Board Assembly

Two inductive coils are at each side of the cores in the two half-shells. Two welded walls isolate them from the fill fluid. Two isolating diaphragms, welded to the edges, isolate the measuring diaphragm to protect against corrosion and overloads.

A welded housing protects the cell from the surroundings. The cell used for measuring absolute pressure has a vacuum sealed reference chamber.

The pressure, transmitted by the isolating diaphragms and fill fluid (silicone oil or fluorinated oil), moves the measuring diaphragm. An AC voltage excites the two series coils. The midpoint voltage of these coils varies as a function of the movement of the magnetic cores welded to the measuring diaphragm.

The cell and characterization board are a matched set and may not be separated. For more information on the characterization board, refer to ***Electronics Assembly***.

Electronics Assembly

Figure 2-3 shows the Type PTSD pressure transmitter electronics in block diagram form. All calibration, configuration, and compensation data are stored in both the main and characterization boards. The output of the cell goes into a custom analog to digital converter on the LSI smart chip via the characterization board. The microcontroller requests the digital outputs of the custom analog to digital converter. It uses these digital outputs and the memory stored on the characterization board to calculate an output for the transmitter. This output is then available as a four to 20-milliampere output or a polled digital process variable signal.

The transmitters include a lockout jumper that when activated, prevents any alterations to the calibration or configuration (Fig. 5-1).

EZ CAL Option

NOTE: The EZ CAL option is for zero and span validation only. Do ***not*** use it to change the calibrated span of the transmitter. The EZ CAL option provides no means to indicate if an error is made.

After mounting the EZ CAL option, one of two magnetically coupled components responds to the moving of a magnet in the EZ CAL option. When validating the zero, adjust the input pressure to the configured zero value and turn and hold the adjustment screw on the EZ CAL option in the zero direction for at least three seconds. This causes the electronics to automatically adjust the output to zero percent. To validate the span, set the input pressure to the configured span value, depress the span lock and turn and hold the adjustment screw on the EZ CAL option in the span direction for at least three seconds. This causes the electronics to automatically adjust the output to 100 percent. Span or zero or both may be adjusted.

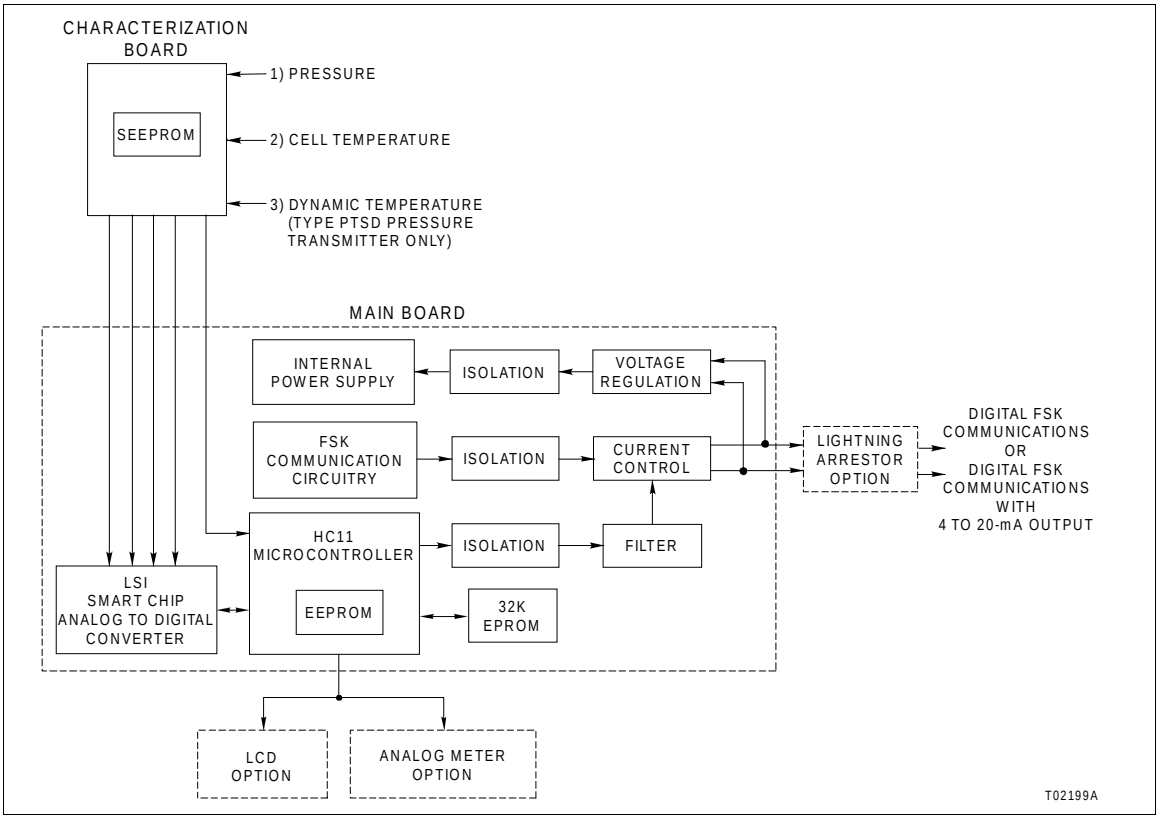


Figure 2-3. Electronics Block Diagram

Communications

A high frequency AC voltage signal imposed on the signal wires, known as FSK (frequency shift keying) allows communications between the Type PTSD pressure transmitter and the Type STT terminal. The location of the Type PTSD pressure transmitter may be up to 1.6 kilometers (1.0 mile) from the Type STT terminal. The FSK method provides excellent noise immunity for remote communications. A minimum of 250-ohms loop resistance is necessary to support communications (Fig. 2-4). This is true whether the transmitter is configured in the analog (four to 20 milliampere) point-to-point mode or the digital field bus mode. The Type STT terminal connects to the target transmitter anywhere there is access to the signal leads of the transmitter (for point-to-point wiring, the Type STT terminal must be connected between the device and the 250-ohm resistance). The clip leads connect across the signal leads independent of signal direction or polarity. Since the communication signal, a high frequency AC, has a zero DC average, it has no effect on the output. Two different frequency levels transmit a logic zero or a logic one.

Configuring the transmitter in the digital mode (Section 5) causes the microcontroller to set the output of the transmitter to less than four milliamperes for low power consumption. The

transmitter then provides a digital process variable signal. The transmitter reports its output (in percent) up to ten times per second for control purposes (Fig. 2-5).

NOTE: Refer to the ***Field Bus I/O Module (IMFBS01) Instruction*** for wire length and practices, and output update times.

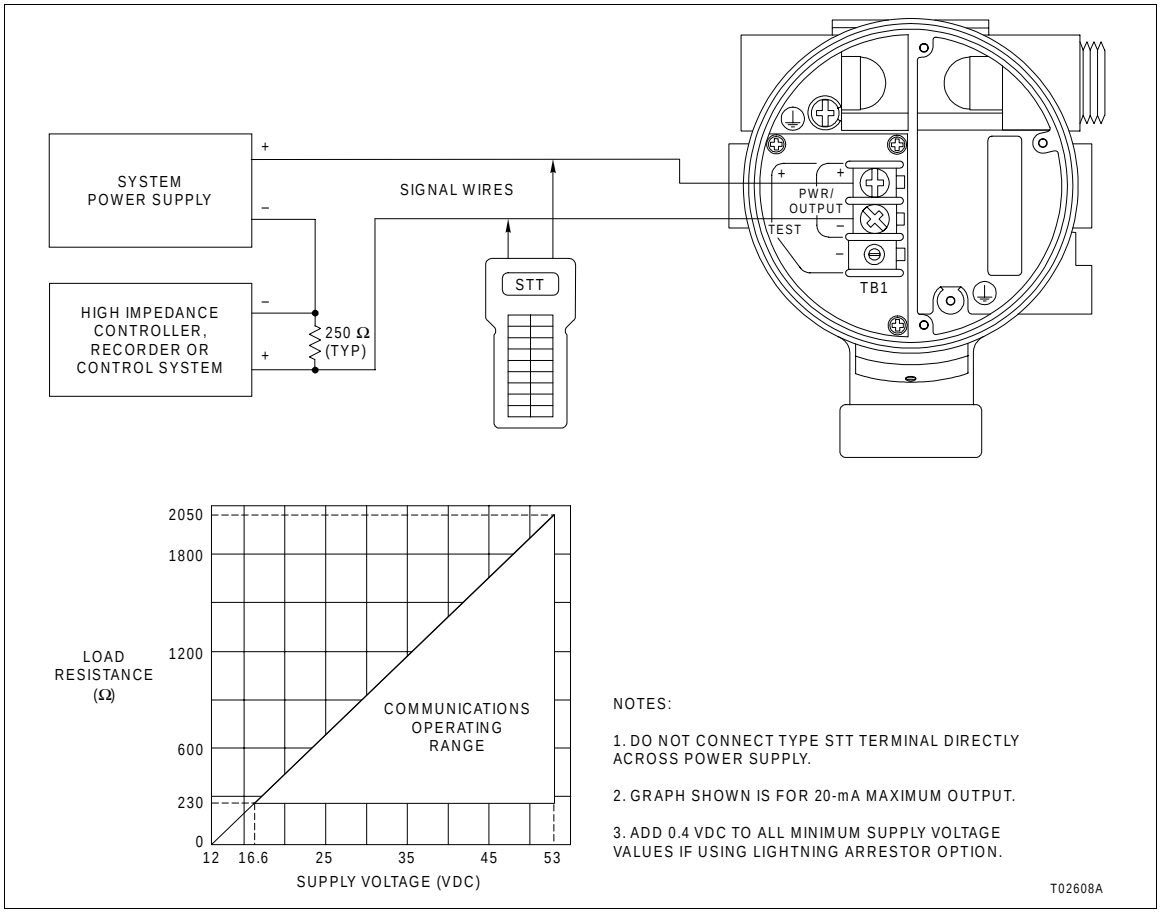


Figure 2-4. Analog Point-to-Point Wiring

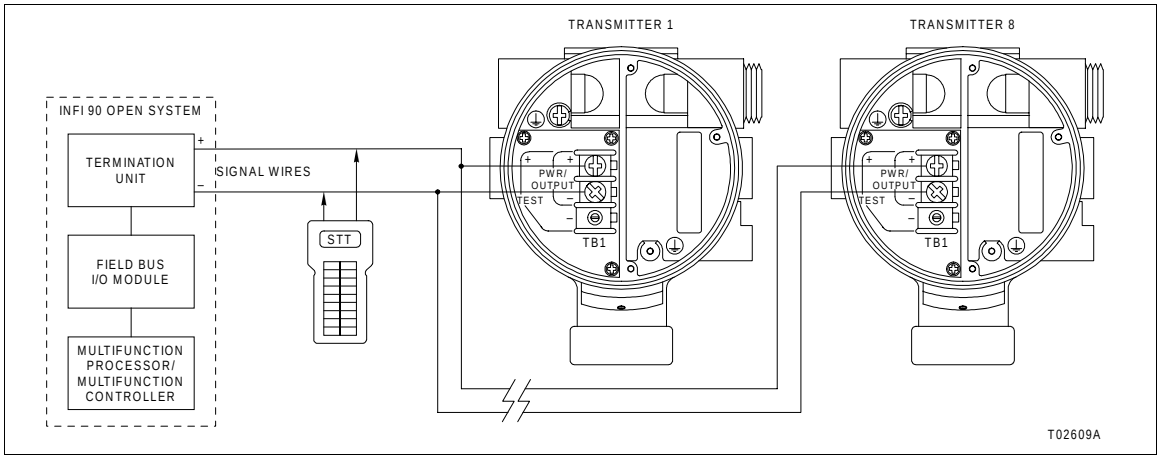


Figure 2-5. Digital Field Bus Wiring

The FSK communication technique makes it possible to communicate in the presence of electrical noise. Figure 2-6 shows how the ability to communicate varies with the amplitude and frequency of the noise. This graph represents a typical installation and applies only when one noise frequency is present. The graph indicates that the FSK communication technique tolerates up to two volts of noise amplitude at 60 hertz. This tolerance decreases as the noise frequency approaches the FSK communication frequencies of 19.0 kilohertz and 30.5 kilohertz.

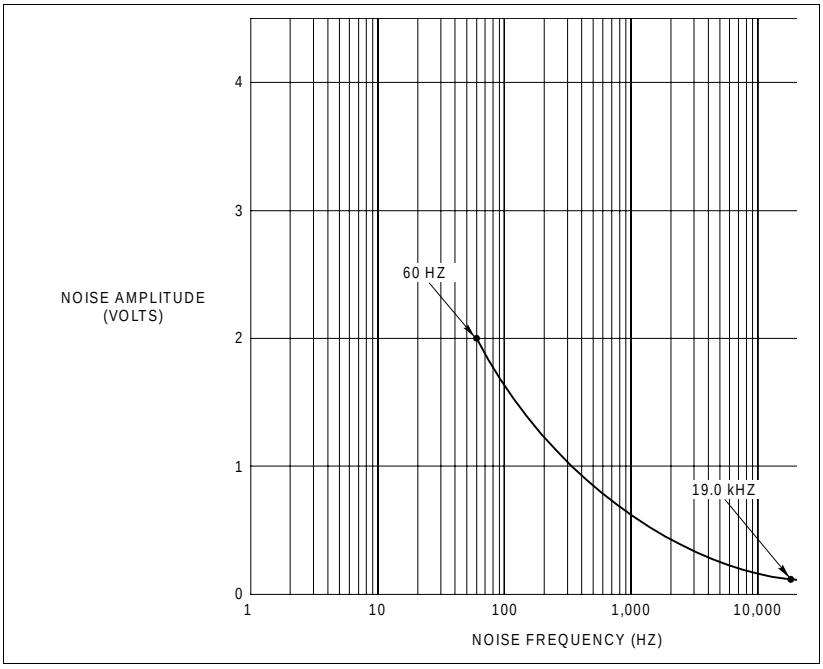


Figure 2-6. Communication Noise Rejection

Temperature Compensation

The transmitter electronics monitor the temperature of the cell assembly. This is accomplished by monitoring the resistance of the coils within the cell. This technique provides a true cell temperature measurement and the transmitter uses it to calculate an advanced correction for the cell output based on the programmed cell temperature characteristics. The transmitter also compensates the four to 20-milliampere output for temperature changes within the electronics housing. Type PTSD pressure transmitters monitor and compensate for the dynamic temperature difference between the high and low sides of the cell. The cell temperature can be monitored on the Type STT terminal.

Diagnostics

Continuous self-diagnostics are accessible on demand through the Type STT terminal. Areas monitored include: cell; cell temperature; electronics temperature; dynamic temperature; calibration; configured pressure limits; input circuits; analog to digital converter; microcontroller ROM, SEEPROM, and EEPROM; and reference voltages. Diagnostics identify the malfunctioning section of the transmitter. The diagnostics may indicate if a calibration error occurs.

Software Functions

Configuration and operational commands allow the input of an ID tag for the transmitter configuration, selection of engineering units (primary and secondary), and definition of the output. The output can be a linear, square root, ³⁄₂-power or ⁵⁄₂-power representation of the input.

³⁄₂-power and ⁵⁄₂-power apply to open channel measurements to find flow rates through flumes and weirs in processes such as water delivery and treatment. ³⁄₂-power is used for flumes, while ⁵⁄₂-power is used for weirs. Take the measurements in these situations using a bubbler system or a stilling chamber.

Other calculated outputs include volume of a spherical or horizontal flat end cylindrical tank or a function generator that follows a curve consisting of six straight line segments. The output can be set for normal or reverse acting and fixed to a specific value for plant startup and troubleshooting purposes. Other commands allow the output to be set to default values upon transmitter power up and failure. The Type STT terminal also supports configuration, input, output, and transmitter status monitoring. A damping adjustment command is also available.

SPHERICAL TANK VOLUME CALCULATION

Figure 2-7 shows a spherical tank setup. This is a common industrial tank. This procedure shows how to calculate the values entered into the transmitter (via the Type STT terminal) during configuration if *VOL./SPHERE* is chosen from the *OUTPUT TYPE* menu.

1. The empty tank pressure is the primary lower range value.

   a. If the location of the cell is at the bottom of the sphere, then the primary lower range value is 0.00 kilopascals (0.00 inches of water).

   b. If the location of the cell is below the bottom of the sphere, as shown in Figure 2-7, then offset the zero by setting the primary lower range value to the pressure

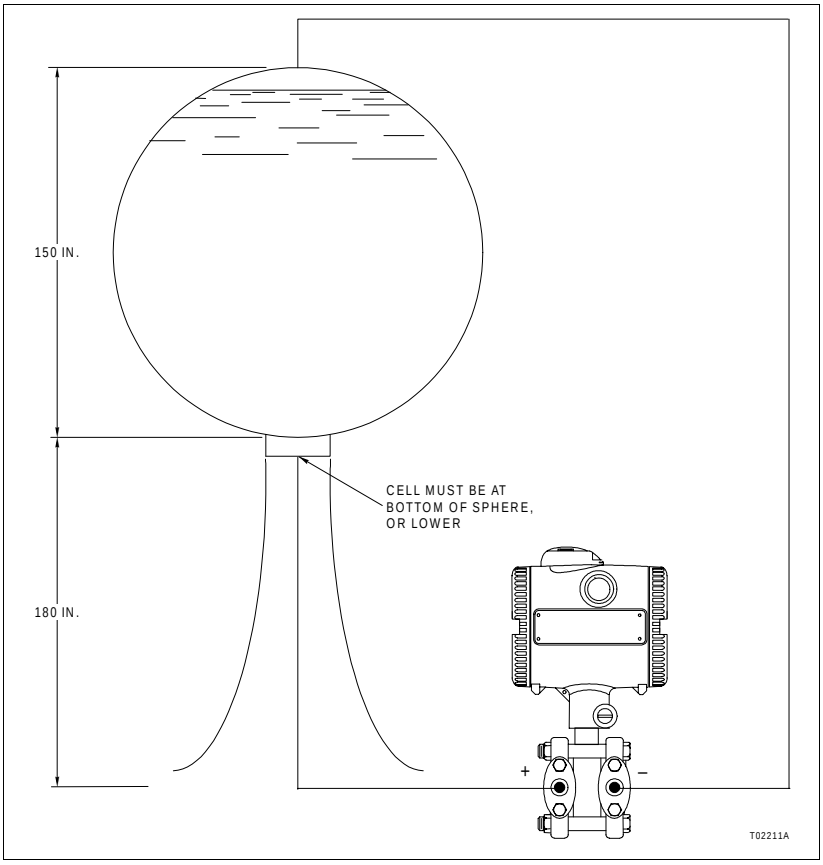


Figure 2-7. Spherical Tank Measurement

corresponding to the distance between the bottom of the sphere and the cell times the specific gravity (SG) of the liquid.

2. The full tank pressure is the primary upper range value.

   a. If the location of the cell is at the bottom of the sphere, then the primary upper range value is the height of the tank times the specific gravity of the liquid.

   b. If the location of the cell is below the bottom of the sphere, as shown in Figure 2-7, then the primary upper range value is the height of the tank times the specific gravity of the liquid plus the primary lower range value.

   NOTE: From Steps 1 and 2, it can be seen that whether the cell is at or below the bottom of the sphere, the span between the lower range value and the upper range value is the same.

3. The secondary lower range value is the empty volume of the tank (always zero).

4. The secondary upper range value is the full volume of the tank which depends on the tank and the process.

NOTE: The empty and full volumes do not include the tank base. The volume only includes the spherical portion of the tank.

Example: A Type PTSDDD pressure transmitter is installed as shown in Figure 2-7, and will be configured in the United States. The tank is filled with water (specific gravity = 1.0). The transmitter has an upper range limit of 360 inches of water. The cell is mounted 180 inches below the bottom of the sphere. The sphere itself is 150 inches in diameter. The empty volume is zero and the full volume is 7,650 gallons. The compensating leg shown in Figure 2-7 is a dry leg.

1. Calculate the empty tank pressure as the primary lower range value. Since the cell is below the bottom of the sphere by 180 in., the primary lower range value is equal to 180 in. H_2O.

2. Calculate the primary upper range value. The full pressure is equal to 150 in. H_2O, but since the zero offset of 180 in. H_2O was calculated as the primary lower range value, the primary upper range value must be equal to 150 plus 180, or 330 in. H_2O.

3. The secondary lower range value is the empty volume of the tank (always zero).

4.The full volume of the tank is calculated to be 7,650 gallons for the secondary upper range value.

$$volume\ of\ sphere = \frac{4\pi r^3}{3}\ in.^3\ and$$

$$volume\ at\ any\ height\ (h)\ in\ tank = \frac{1}{3}\pi h^2(3r - h)\ in.^3$$

$$in.^3 \times 0.004329 = gallons$$

FLAT END (CYLINDRICAL) TANK VOLUME CALCULATION

Figure 2-8 shows a flat end (cylindrical) tank setup. This is a general purpose tank. This procedure shows how to calculate the values entered into the transmitter (via the Type STT terminal) during configuration if *VOL./TANK* is chosen from the *OUTPUT TYPE* menu.

1. The empty tank pressure is the primary lower range value.

   a. If the location of the cell is at the bottom of the tank, then the primary lower range value is 0.00 kilopascals (0.00 inches of water).

   b. If the location of the cell is below the bottom of the tank, as shown in Figure 2-8, then offset the zero by setting the primary lower range value to the pressure corresponding to the distance between the bottom of the tank and the cell times the specific gravity of the liquid.

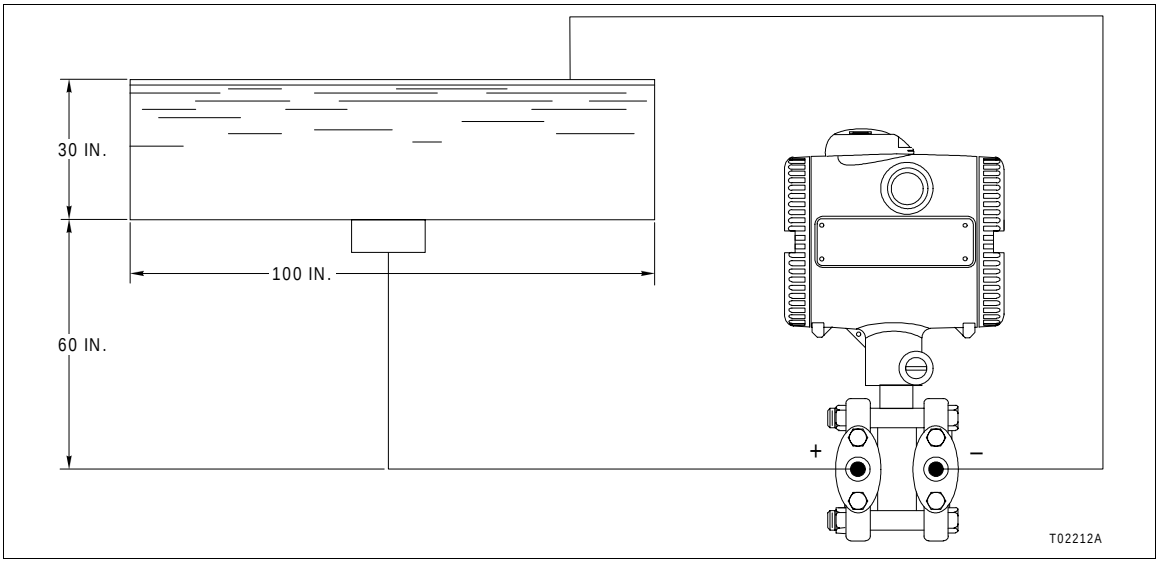


Figure 2-8. Flat End (Cylindrical) Tank Measurement

2. The full tank pressure is the primary upper range value.

   a. If the location of the cell is at the bottom of the tank, then the primary upper range value is the height of the tank times the specific gravity of the liquid.

   b. If the location of the cell is below the bottom of the tank, as shown in Figure 2-8, then the primary upper range value is the height of the tank times the specific gravity of the liquid plus the lower range value.

   NOTE: From Steps 1 and 2, it can be seen that whether the cell is at or below the bottom of the tank, the span between the lower range value and upper range value is the same.

3. The secondary lower range value is the empty volume of the tank (always zero).

4. The secondary upper range value is the full volume of the tank and depends on the tank and the process.

Example: A Type PTSDDC pressure transmitter is installed as in Figure 2-8, and will be configured in the United States. The tank is filled with water (specific gravity = 1.0). The transmitter has an upper range limit of 120 inches of water. The cell is mounted 60 inches below the bottom of the tank. The tank itself is 30-inches in diameter and 100-inches long. The empty volume is zero and the full volume is 306 gallons.

1. Calculate the empty tank pressure as the primary lower range value. Since the cell is below the bottom of the tank by 60 in., the primary lower range value is 60 in. H_2O.

2. Calculate the primary upper range value. The full pressure is 30 in. H_2O, but since the zero offset of 60 in. H_2O was

entered for the primary lower range value, the primary upper range value must be 30 plus 60, or 90 in. H_2O.

3. The secondary lower range value is the empty volume of the tank (always zero).

4. The full volume of the tank is calculated to be 306 gallons for the secondary upper range value.

$$volume\ of\ a\ cylinder\ =\ \pi r^2 l\ in.^3,\ and\ in.^3 \times 0.004329 =\ gallons$$

Function Generator

The function generator is a curve consisting of six straight line segments programmed into the transmitter via the Type STT terminal. This makes it possible to program the output to follow the input in a way that is specific to a certain application.

The first and last points of the curve (P0 and P6) are predefined at zero-percent input and output, and 100-percent input and output respectively. The other five points (P1, P2, P3, P4, and P5) are user defined. Refer to Section 5 of this instruction and the ***Type STT Smart Transmitter Terminal Instruction*** for more information on the function generator.

Figure 2-9 shows a function generator used to control the output of a Type PTSDDA pressure transmitter. This transmitter has a nominal range of zero to six-inches of water. In the example in Figure 2-9, the calibrated range is from -0.50 to +0.50 inches of water (calibrated span of 1.0 inch of water). The function generator is used to provide a full scale output (zero to 100 percent) for a -0.05 to +0.15 furnace pressure draft range. This is a common draft range for paint ovens used in the automobile or appliance industry, slab reheat furnaces in the steel industry, and glass tanks in the glass industry.

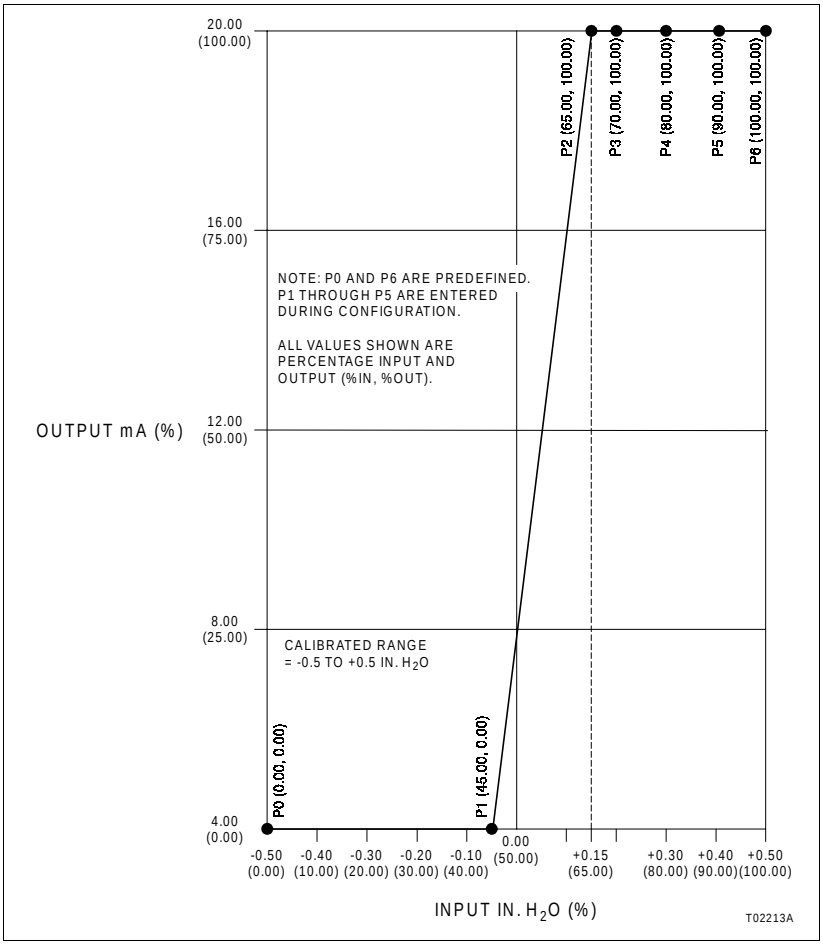


Figure 2-9. Function Generator Example

SECTION 3 - INSTALLATION

INTRODUCTION

This section aids in all levels of installation. The goal is to provide clear procedures for placing the transmitter into service.

> **NOTE:** Refer to ***Installing a 4 to 20 mA Transmitter in a Hazardous Location*** and ANSI/ISA RP12.6, ***Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations*** when applicable.

UNPACKING AND INSPECTION

1. Check for any obvious damage to the carton or its contents. If damage is evident, notify the carrier, and a sales representative.

2. Remove any loose packing from the carton.

3. Carefully remove the transmitter from the carton.

4. Inspect the nameplate to verify the unit received matches the desired function.

5. If the transmitter is to be stored prior to installation, pack it in the original container, if possible. Store in an area free from corrosive vapors and extremes in temperature and humidity. Install the covers and seal all wiring inlets.

> **NOTE:** Storage temperatures must not exceed the limits listed in Table 1-3.

LOCATION CONSIDERATIONS

Because of process and economic considerations, pressure transmitters must often be installed in harsh environments. The transmitter should, however, be located so as to minimize the effects of temperature gradients and fluctuations, and to avoid shock and vibration.

When mounting the transmitter, leave ample clearance to open the cover of the electronics housing (Fig. 3-1). Wire the transmitter with a twisted, shielded pair cable for best results. Avoid sources of RFI (radio frequency interference). Refer to Table 3-1 for the A, B, and C dimensions shown in Figure 3-1.

SETUP AND PHYSICAL INSTALLATION

The quality of the measurement depends on the correct installation of the transmitter. This includes the orientation, pipe

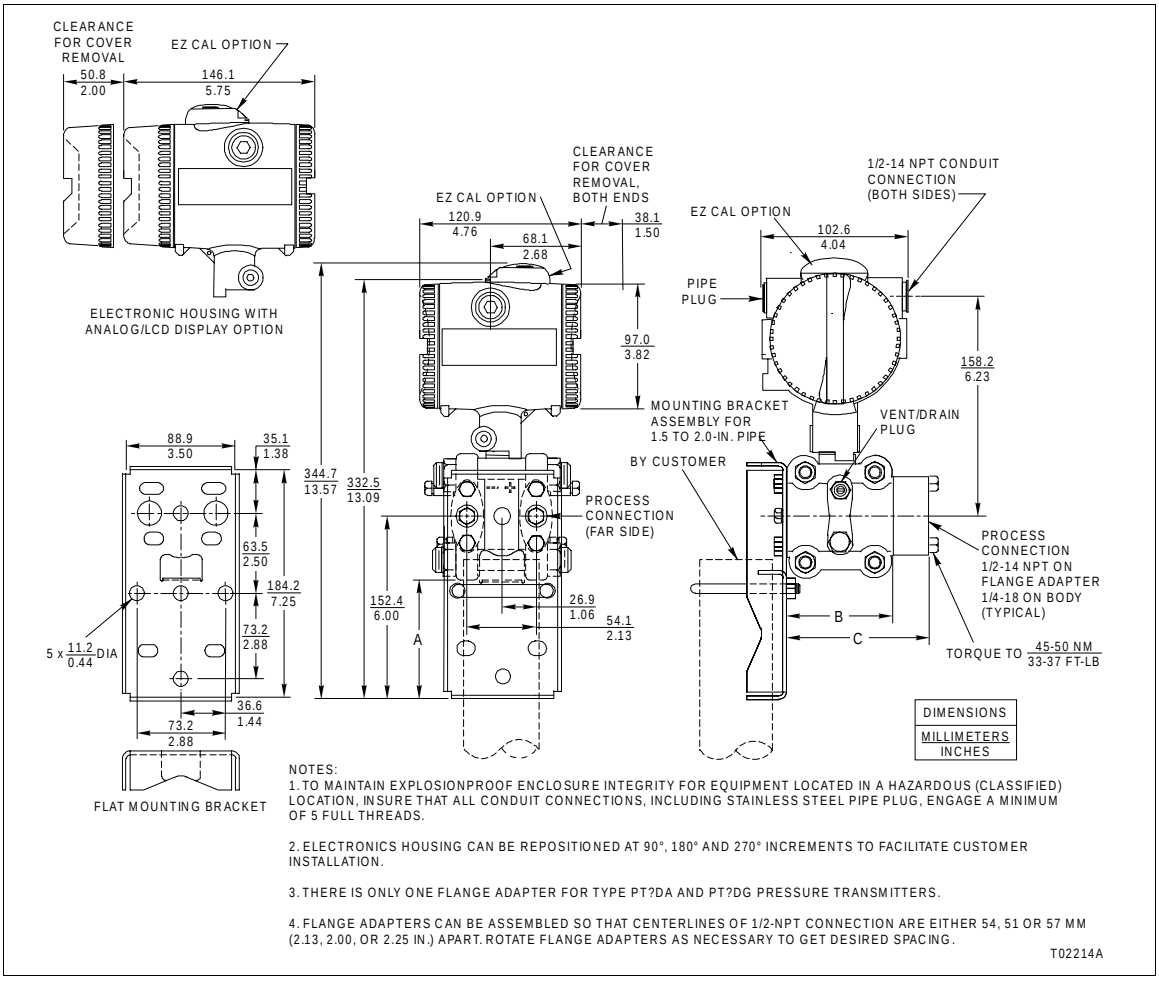


Figure 3-1. External and Mounting Dimensions

Table 3-1. Dimensions for Figure 3-1

Dimension	Standard Bolting, mm (in.)	High Static Pressure Bolting, mm (in.)
A	105.7 (4.16)	98.3 (3.87)
B	84.1 (3.31)	94.0 (3.70)
C	112.5 (4.43)	122.4 (4.82)

connections and wiring. Refer to ***Instrument Connecting Piping*** and ***ASME/ANSI Code for Pressure Piping*** (ANSI B31.1). For flow measurement, proper installation of the primary measuring element is also critical to the accuracy of the measurement. Refer to the ***Installation of Orifices and Flow Nozzles***, ***Installation of Holding Ring Type Flow Nozzles***, and ***Installation of Weld-In Type Flow Nozzles*** instructions when applicable.

Mounting

Refer to Figure 3-1 and Table 3-1 for the external and mounting dimensions of the transmitter.

FLANGE ADAPTERS

The process connections of the transmitter process flanges have ¼-18 NPT tapped holes. Optional ½-14 NPT process flange adapters (football flanges) are available. The process flange adapters allow the transmitter to be easily disconnected from the process by removing the process flange adapter bolts (Figs. 2-1 and 3-1). Refer to Tables 1-2 and 1-8 for more information on the process flange adapters.

If supplied, the process flange adapters come from the factory in a bag in the shipping carton. The process connection on each adapter is slightly off center, so it is possible to install the adapters so that the center-to-center distance of the process connections is 54 millimeters (2-⅛ inches), 51 millimeters (2 inches), or 57 millimeters (2-¼ inches). This is accomplished by rotating either one or both of the adapters 180 degrees. When installing the process flange adapters, tighten the process flange adapter bolts to a torque of 47, ±2 Nm (35, ±2 ft-lbs).

> **NOTE:** If the O-rings are PTFE, tighten to the same torque again after ***five days***. This is necessary due to the cold flow properties of PTFE. Tests have shown that a loss of torque of as much as 40 percent occurs over the five days. After a second tightening, no loss of torque is apparent.

MANIFOLDS

It is possible to mount Type PTSDD differential pressure transmitters by means of a three-way carbon steel or stainless steel manifold. The manifold connects directly to the cell in place of the process flange adapter. Refer to Table 1-8 for more information.

If mounting near the measuring point, the pressure pipes support the manifold and transmitter. If not, use the optional mounting bracket to mount the transmitter to a panel or 1.5 to 2.0-inch pipe. Refer to Tables 1-2 and 1-8 for more information on the mounting bracket.

VENT/DRAIN PLUGS

Refer to Figures 2-1 and 3-1 for identification of the optional vent/drain plugs. The purpose of the vent/drain feature is to release residual pressure during startup and servicing (as a bleeder valve) and to purge unwanted gas or liquid. This applies to discharging (in gas applications) and venting (in

liquid and vapor applications). During installation, make sure each vent/drain plug (if provided) is tight before proceeding with piping installation and calibration.

ELECTRONICS HOUSING ORIENTATION

Rotate the electronics housing as desired to aid in the installation process. There is a stop in the electronics housing to prevent it from being rotated more than 270 degrees. This stop prevents damage to the cell cable. Refer to Figure 2-1 for the location of the cell lock.

1. Use a four-mm Allen wrench to loosen the cell lock screw.

2. Back out the cell lock.

3. Rotate the electronics housing to the desired orientation.

4. Push the cell lock back in tight.

5. Tighten the cell lock screw.

INDICATOR ORIENTATION

The transmitter is shipped with the indicator in the upright (zero-degree) position. If desired, rotate the indicator 270 degrees in increments of 90 degrees.

1. Remove the left housing cover from the electronics housing (Fig. 2-1).

2. Remove the four screws that secure the indicator to the amplifier assembly (Fig. 8-1).

3. Gently pull on the indicator to unplug it from the amplifier assembly.

4. Align the connector on the back of the indicator with one of the four meter openings in the amplifier assembly (Fig. 8-1). The alignment of the connector depends on the desired viewing orientation. Gently press the indicator down to seat the mating connectors.

Install the four screws that secure the indicator to the amplifier assembly.

Coat the threads of the housing cover with a light coating of DRI-GLIDE graphite sealant (Man-Gill Chemical Corporation).

5. Replace the left housing cover.

EZ CAL OPTION

1. The transmitter is delivered with a logo nameplate in place of the EZ CAL option. Lift up on the logo nameplate to snap its tab out of the EZ CAL option mounting hole.

2. Position the EZ CAL option on the top of the transmitter as shown in Figure 3-1 and install the mounting screw.

Piping

WARNING	**Consider the corrosive properties of the measured substance when selecting piping materials. Degradation of the piping can upset the process. Some process upsets can injure personnel and damage equipment.**

Piping should be in accordance with ANSI Code B31.1 for pressure piping.

WARNING	**When pressurizing, avoid overloading and pressure hammer. Refer to the introduction section for the pressure limits of the cell. Exceeding this pressure could result in damage to the cell and cause serious injury to personnel.**

The piping shown in Figures 3-2 through 3-10 are typical piping arrangements only. They are intended as generalized guides, and may not necessarily reflect the exact configuration required for the particular service. As a general rule:

- If possible, mount the transmitter with the flanges vertical. Mounting the transmitter with the flanges other than vertical causes a zero offset due to the weight of the fill oil in the cell. If the transmitter must be mounted with the flanges other than vertical, refer to Section 4 to reset the zero.
- If using in corrosive processes, avoid splashes on the transmitter.
- Prevent obstruction of the pressure connections by solid matter of products coming from the piping.
- Be sure the wet legs in the pressure piping are full.
- Avoid sudden temperature variations.
- Wet legs (and possibly the transmitter) should be heated to prevent freezing.
- Make the impulse lines as short as possible.

- Locate the pressure inputs in accordance with standard practice for gas, liquid, and vapor flow rates.

- For liquid flow measurements, be sure there is no trapped air or gas in the pipes.

- For liquid flow measurement, mount the transmitter below the primary element. Avoid high points and slope all horizontal lines at least 83 millimeters per meter (one inch per foot) downward toward the transmitter.

- For liquid flow measurements, if the primary element is in a vertical pipe, provide drip pots at the low points.

- For gas flow measurements, mount the transmitter above the primary element to evacuate the condensates in the connecting pipes. Slope all horizontal lines at least 83 millimeters per meter (one inch per foot) upward toward the transmitter.

- For wet gas flow measurements, be sure the pipes are filled. Install drip pots at the low points.

- For flow measurements of condensable vapor, use condensate pots. Mount these pots on the pipe connections or on the flanges of the pressure connections so that the longitudinal axis of the pot is horizontal and its output toward the valve is directed vertically downward. Be sure the pots are at the same level.

- Provide drip pots (or condensation pots) along the entire course of the connecting pipes when impurities are present in the vapor or liquid in the pipes.

- The piping between the primary element and the transmitter must transfer the process pressure at the pipe or flange taps to the transmitter.

Possible sources of error in this pressure transfer are:

- Leaks.
- Friction loss, if continuous purging is used.
- Trapped gas in a liquid line.
- Trapped condensates in a gas line.

FLOW MEASUREMENTS

Refer to Figures 3-2, 3-3, and 3-4 for installation examples of transmitters used to measure liquid, gas, and vapor flow.

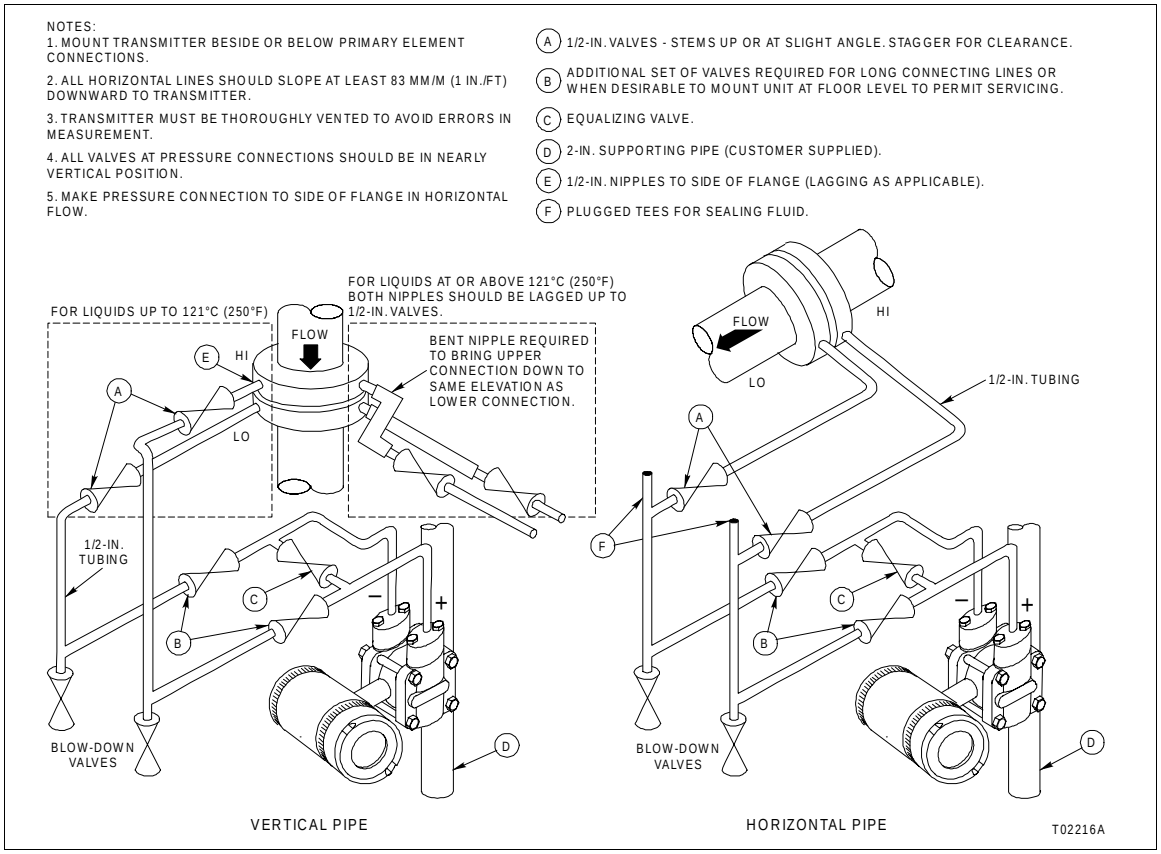


Figure 3-2. LIquid Flow

OPEN TANK LEVEL MEASUREMENT

In an open vessel, level can be measured by making a pressure measurement (P) at the bottom of the vessel (Figs. 3-5 and 3-6). The pressure at the transmitter + (high pressure) connection is equal to the product of the height (h_2) and the specific gravity (SG) of the liquid. Since SG is known, and P is the measured pressure, then:

$$h_2 = \frac{P}{SG}$$

1. Refer to Figure 3-6 for a typical piping arrangement for open tank level measurements.

2. Make the pressure connection to the + (high pressure) side of the transmitter.

3. Leave the - (low pressure) side of the transmitter open to the atmosphere.

NOTE: It is not unheard of for bees, wasps, spiders, and other unwanted insects to make a home of the open low pressure process connection. To prevent this, cover this connection with a fine screen or cheese cloth.

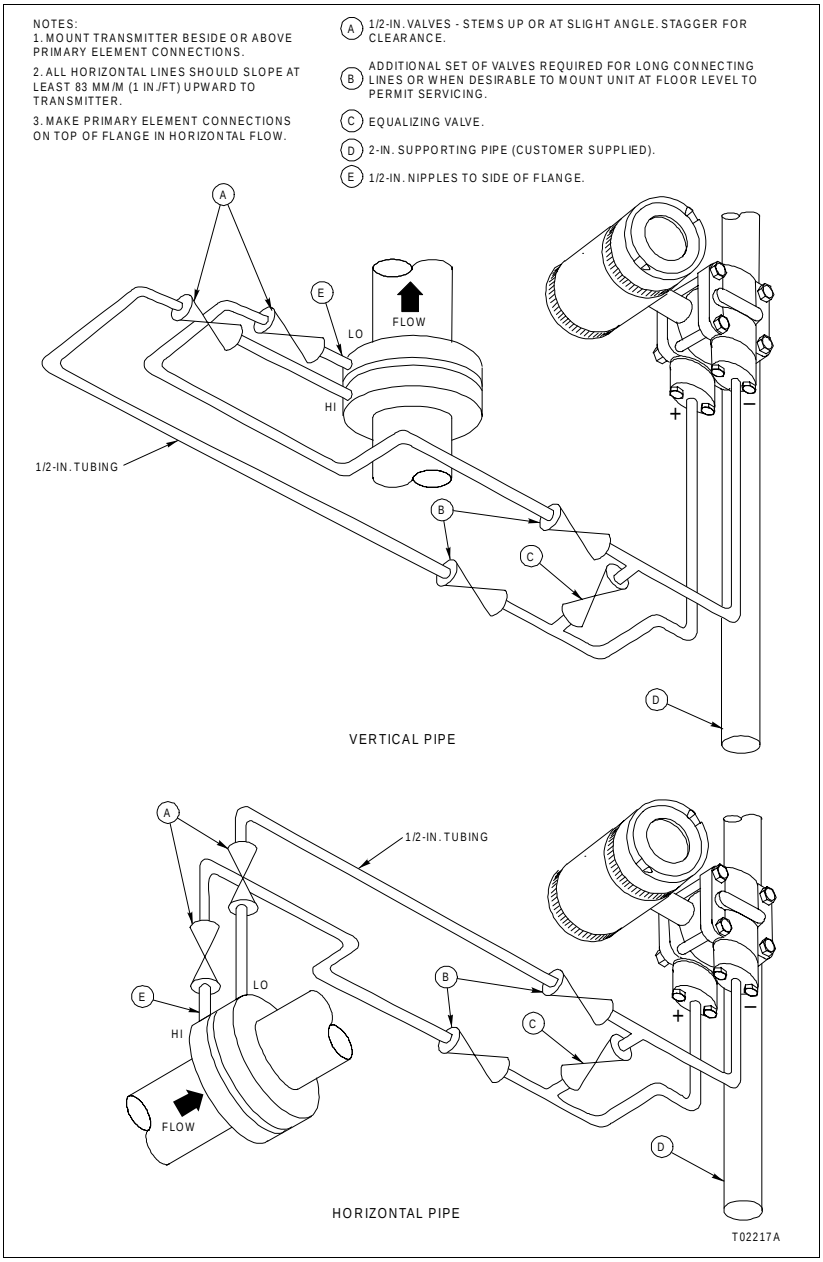


Figure 3-3. Gas Flow

4. Observe the conventions outlined in Figure 3-6.

5. The output of the transmitter is proportional to the level of the liquid above the cell times the specific gravity of the liquid. If the zero point of the desired level range is above the cell, the lower range value must be changed to reflect this. Refer to Section 4 and Section 5 for more information. Figure 3-5 includes a graphical representation of this application.

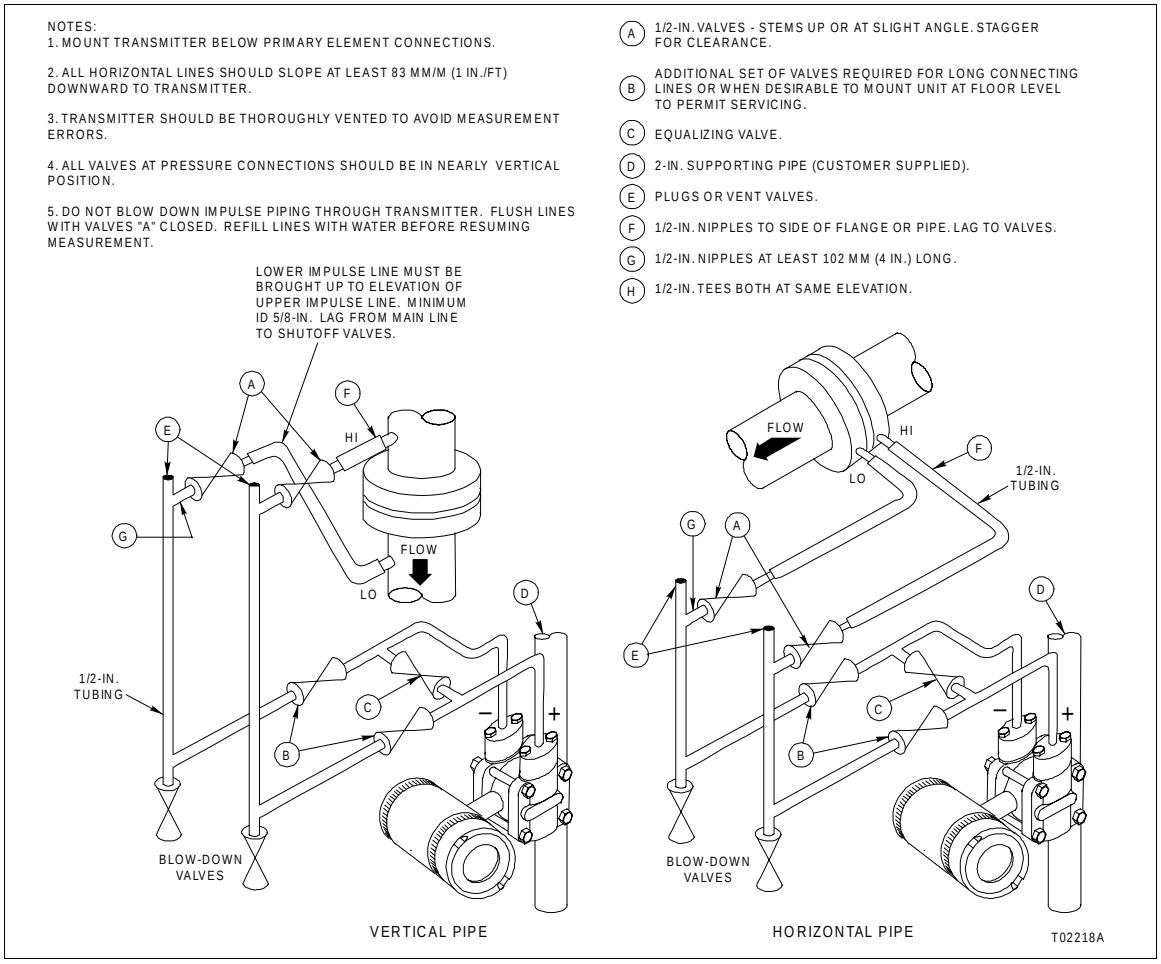


Figure 3-4. Vapor Flow

CLOSED TANK LEVEL MEASUREMENT

In a closed vessel, pressure above the liquid affects the pressure measured at the bottom of the vessel. It then becomes necessary to subtract the pressure above the liquid from the pressure at the bottom of the vessel. Instead of leaving the - (low pressure) connection open to the atmosphere (as in open tank level measurements), connect a pressure tap from the tank above the maximum level to be measured to the low pressure connection of the transmitter.

Closed Tank Level Measurement in Noncondensing Atmospheres

If the atmosphere above the liquid is noncondensing, the pressure line from the top connection to the low pressure connection of the cell is a dry leg. The transmitter responds only to the pressure of the fluid measured at the lower tap of the tank that connects to the + (high pressure) connection of the cell

(Fig. 3-7). The calculations are the same as those for an open tank level measurement.

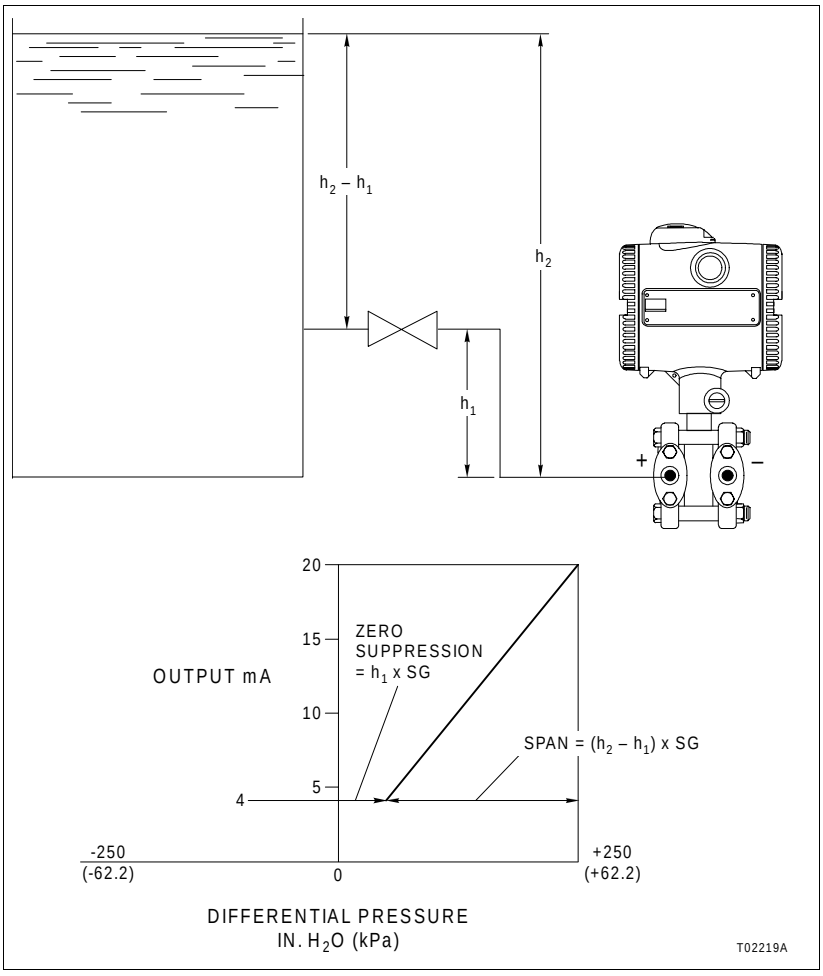


Figure 3-5. Open Tank Level Measurement

1. Refer to Figure 3-8 for a typical piping arrangement for closed tank level measurements in noncondensing atmospheres.

2. Make the connection from the lower tap of the tank to the + (high pressure) side of the transmitter.

3. Make the connection from the upper tap of the tank to the - (low pressure) side of the transmitter.

4. Observe the conventions outlined in Figure 3-8.

5. The output of the transmitter is proportional to the level of the liquid above the cell times the specific gravity of the liquid. If the zero point of the desired level range is above the cell, the lower range value must be changed to reflect this. Refer to

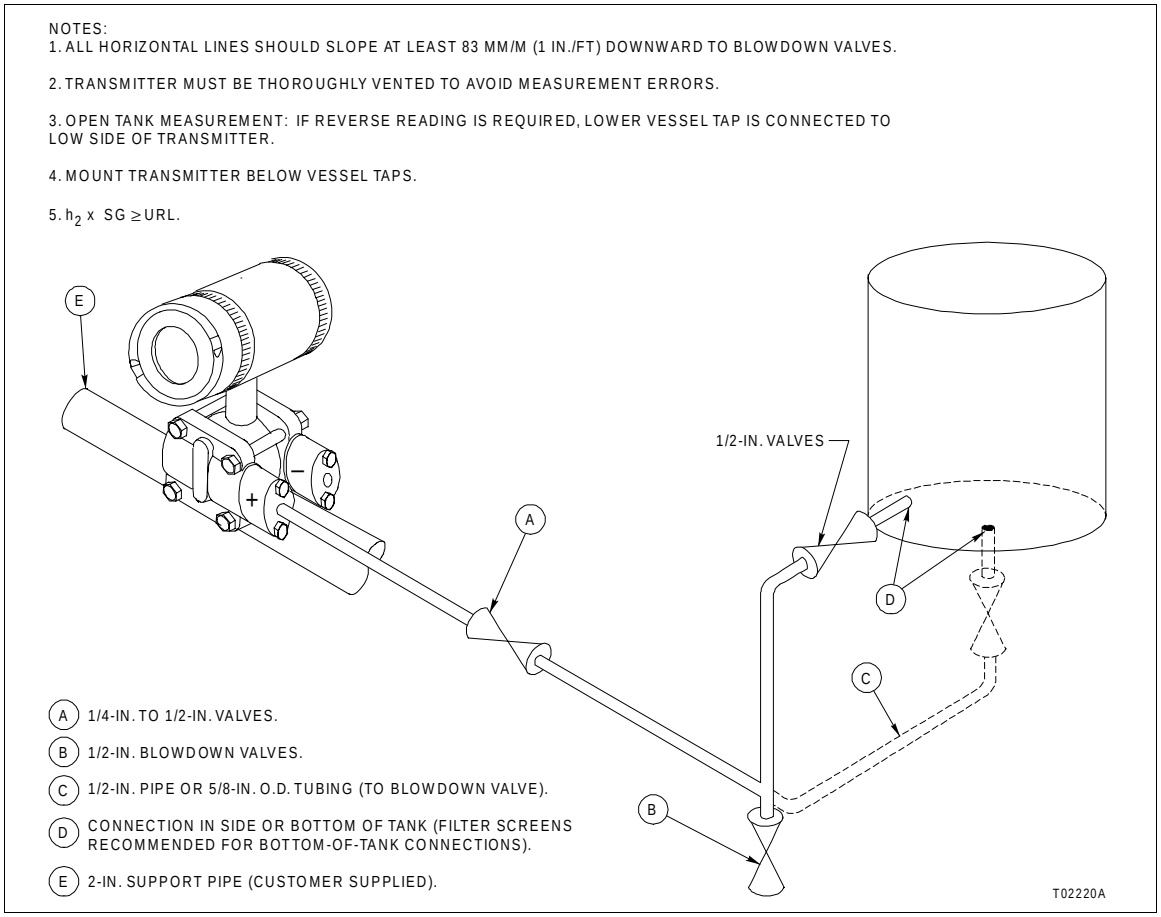


Figure 3-6. Connecting Piping for Open Tank Level Measurement

Section 4 and Section 5 for more information. Figure 3-7 includes a graphical representation of this application.

Closed Tank Level Measurements in Condensing Atmospheres

If the atmosphere (vapor state of the liquid) above the liquid is condensable (such as steam above boiler water), the pressure line from the upper tap of the tank to the - (low pressure) connection of the cell fills with condensate. This creates a wet leg or reference leg that exerts a pressure at the low pressure connection of the cell that is greater than that exerted by the variable level on the + (high pressure) connection of the cell.

In Figure 3-9, if h_3 is the level of the liquid at any point between minimum and maximum level range values, the transmitter senses the difference in pressure between the fixed head at h_2 and the variable head at h_3. As the level of h_3 increases, the difference between h_2 and h_3 decreases. The transmitter output decreases with increasing level and decreasing differential pressure. The effect is that of a negative differential pressure that decreases in numerical value as the level rises. This negative differential is simulated for calibra-

tion purposes by a positive pressure, increasing in value, imposed on the - (low pressure) connection of the cell.

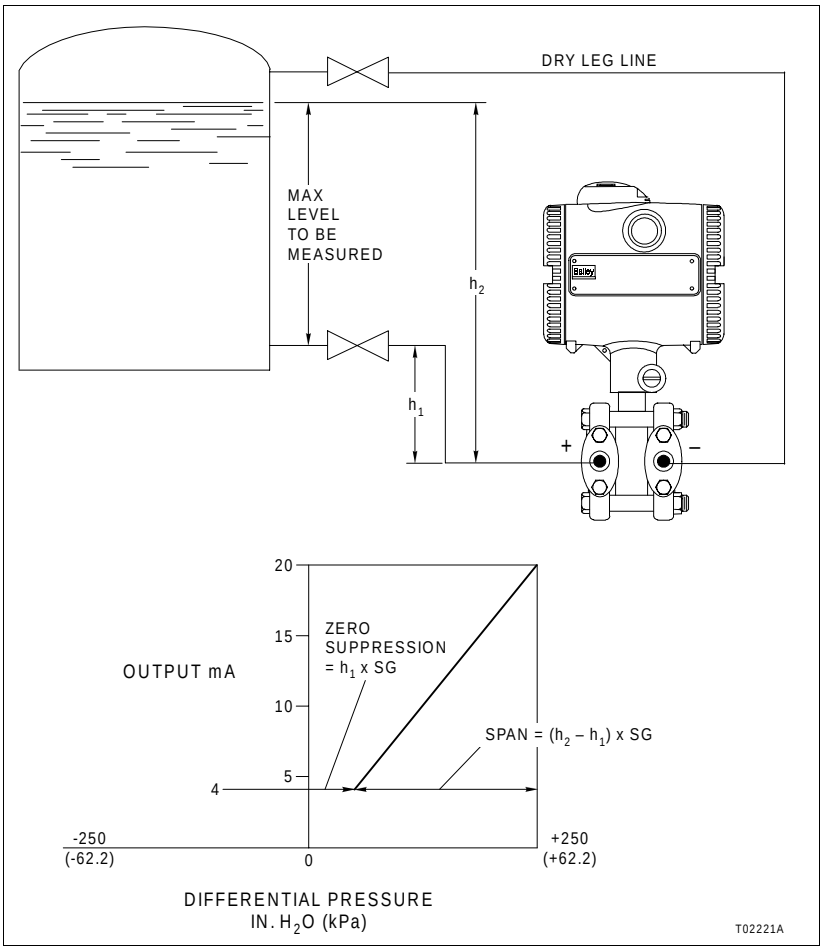


Figure 3-7. Closed Tank, Noncondensing Atmosphere Level Measurement

1. Refer to Figure 3-9 for a typical piping arrangement for closed tank level measurements in condensing atmospheres.

2. Make the connection from the lower tap of the tank to the + (high pressure) side of the transmitter.

3. Make the connection from the upper tap of the tank to the - (low pressure) side of the transmitter.

4. Observe the conventions outlined in Figure 3-10.

5. The output of the transmitter is proportional to the level of the liquid above the cell times the specific gravity of the liquid. If the zero point of the desired level range is above the cell, the lower range value must be changed to reflect this. Refer to Section 4 and Section 5 for more information. Figure 3-9 includes a graphical representation of this application.

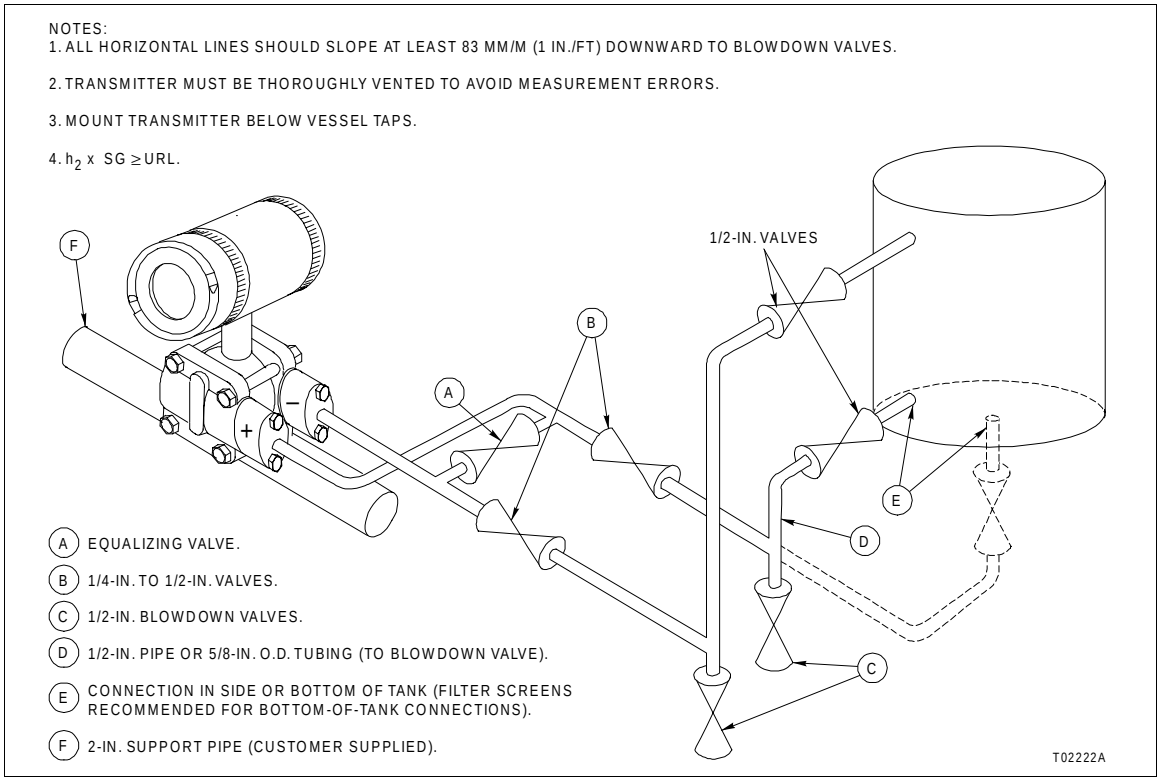


Figure 3-8. Connecting Piping for Closed Tank, Noncondensing Atmosphere Level Measurement

Wiring

There are two possible wiring configurations for the Type PTSD pressure transmitter.

NOTE: Never connect the loop wiring to the test terminals.

ANALOG MODE

In the analog mode of operation, the electrical connections are made in the typical two-wire, four to 20-milliampere configuration as shown in Figure 2-4. Both a + (positive) and - (negative) terminal are provided at the transmitter to identify the signal leads.

NOTE: Insure that the temperature rating of the wire is suitable for the environment.

The signal terminals located in the electronics housing accept wire sizes up to 14 AWG. The signal wiring supplies all power to the transmitter. The power supply limits are 12 to 53 VDC (12 to 42 VDC for certified application) across the transmitter inputs. Refer to Figure 2-4 for the load resistance limits, or use the equation:

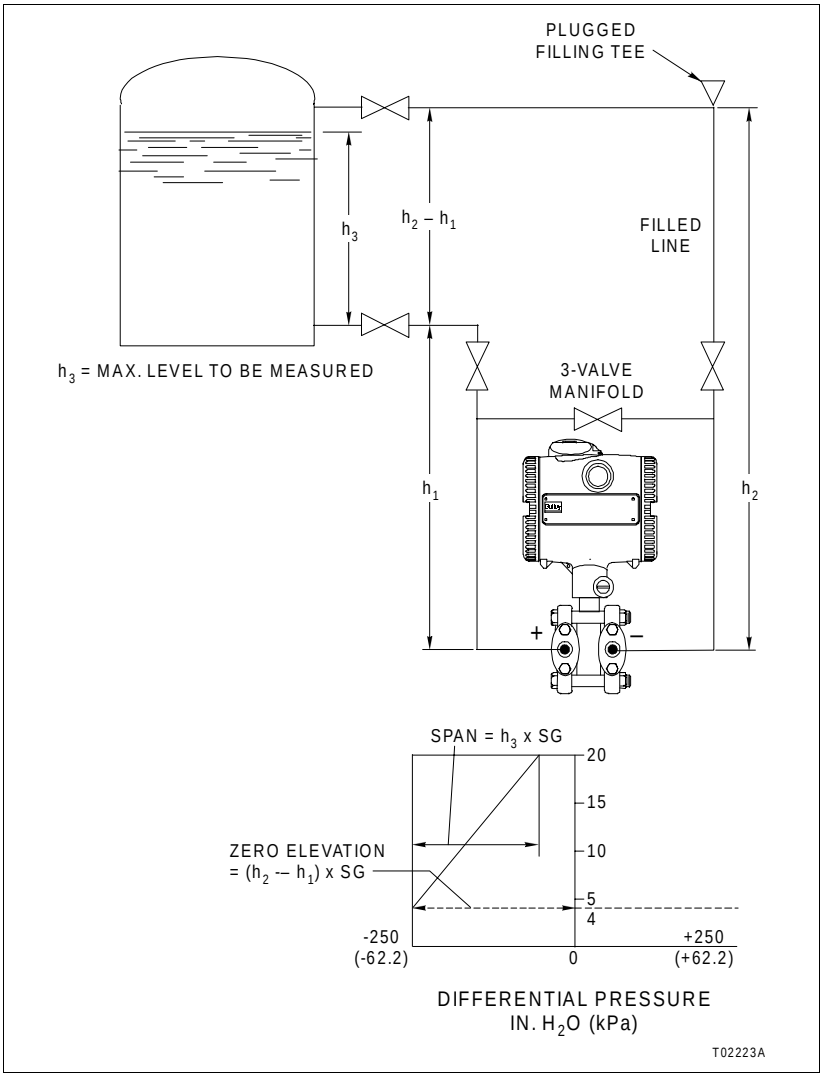


Figure 3-9. Closed Tank, Condensing Atmosphere Level Measurement

$$R_{max} = \frac{V - 12.00}{0.02}$$

NOTES:

1. The equation for load resistance is based on a maximum output of 20 milliamperes with the - (negative) TEST terminal jumper screw tightened. In some cases (initialize high, fail high, overpressure conditions, etc.) the output may be higher. If this value is known, it can be used in the denominator of the equation instead of 0.02.

2. If the - (negative) TEST terminal jumper screw is loosened ½-turn the minimum supply voltage is 12.7 VDC.

3. If using the optional lightning arrestor, add 0.4 VDC to all minimum supply voltage values.

The power supply and load resistance are variable over the entire operating region shown in Figure 2-4.

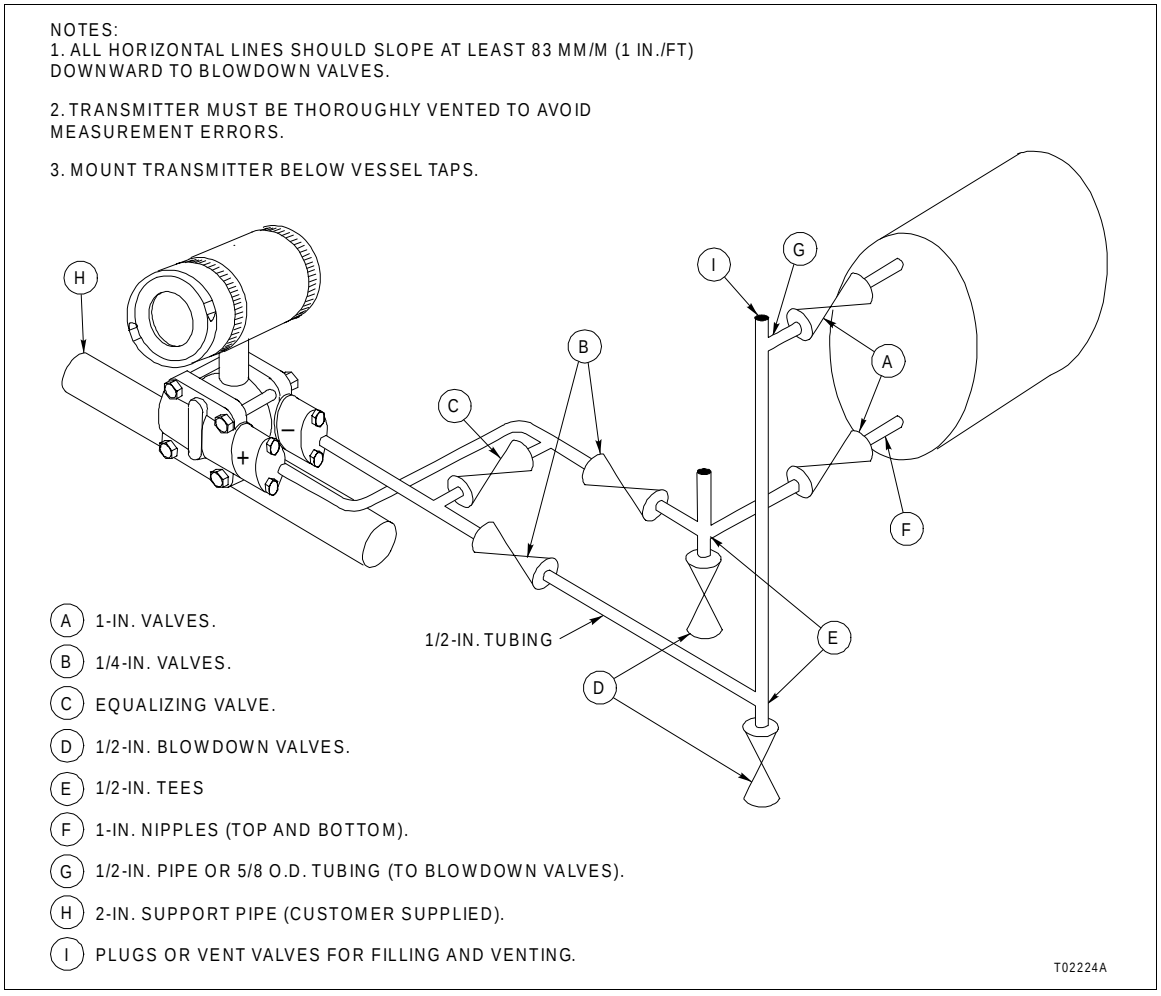


Figure 3-10. Connecting Piping for Closed Tank, Condensing Atmosphere Level Measurement

The TEST terminals have the same four to 20-milliampere signal as the PWR/OUTPUT terminals. Loosen the - (negative) TEST terminal jumper screw ½-turn for calibration or testing.

Signal wiring should be shielded. Use twisted pairs for best results. Connect the shield at the ground terminal inside the electronics housing (Fig. 2-4) or at the receiver.

NOTE: Connect the shield at one end only. Connecting the shield at both ends may result in a ground loop condition.

DIGITAL MODE

In the digital mode of operation there is no four to 20-milliampere signal. The transmitter draws less than four milliamperes to maintain operation (Fig. 2-5).

NOTE: Refer to the ***Field Bus I/O Module (IMFBS01) Instruction*** for wiring practices and output update times.

In the digital mode, the process variable signal of each transmitter is a digitally polled variable. The field bus module sequentially polls each transmitter output on the bus. Each transmitter on the bus has its own unique address that is assigned during configuration. Refer to ***Channel Number*** in Section 5 for information on configuring the transmitter address. The address allows the field bus module to distinguish between transmitters on the loop.

Each transmitter present on the bus is wired from the control system to the + (positive) and - (negative) terminals of the transmitter. Connect all transmitters on the bus in parallel.

The minimum power supply voltage required for the loop is determined by:

$$\textit{minumum supply voltage} = 12\ \textit{volts} + (0.004 \times \textit{no. of transmitters on bus} \times \textit{load resistance})$$

The load resistance must include the system input resistance and the resistance of the wire. No meters or measuring devices are to be included in the field bus loop since the transmitters are not delivering an analog process variable. Power supply regulation is not critical as long as the voltage remains above the minimum calculated value.

The Type STT terminal can be connected anywhere there is access to the signal leads. Since the Type STT terminal also has its own bus address, it can be connected to the bus while the control system is online. Only one Type STT terminal can be connected to the bus at any one time. While the field bus module is online, the Type STT terminal can monitor any transmitter on the bus.

In order to change any calibration or configuration parameters of transmitters using the Type STT terminal, the field bus module must be instructed to bring the desired transmitter offline.

Signal wiring should not be run in conduit or open trays with wiring used to power other devices and should not be run near heavy electrical equipment. Twisted shielded pairs are recommended for best results. Reverse polarity protection is built into the transmitter to protect it against accidental reversal of the field wiring connections.

GROUNDING

Signal wiring may be either ungrounded (floating) or grounded at any one point in the signal loop. If more than one transmitter is connected to a single power supply, grounding should be at the supply. The transmitter housing must also be grounded.

A ground terminal is provided inside the electronics housing (Figs. 2-4 and 2-5).

SELECTING DEFAULTS

The configuration of process control equipment within a particular system dictates the response to the controlled process of that system. Configuration may include such items as cross-limits, interlocks and alarms dealing with bad quality, and safety control equipment. Modern electronic process control equipment based on semiconductor technology is highly reliable and can be expected to provide long trouble-free service. However, component failures that disrupt process control are still possible. In addition, power line induced failures, failures caused by human error, static discharge, conducted and radiated EMI, acts of nature such as lightning strikes, and accidents can cause disruption of process control.

Refer to Section 5 to select defaults for failure conditions.

HAZARDOUS LOCATION INSTALLATIONS (FLAMMABLE ATMOSPHERES)

The Type PTSD Platinum Standard Smart Pressure Transmitter must not be located in a hazardous (classified) location unless factory marked as suitable for that location. This equipment must be installed and operated according to ***Installing a 4 to 20 mA Transmitter in a Hazardous Location***.

SECTION 4 - CALIBRATION

INTRODUCTION

WARNING	**Explosionproof/dust-ignitionproof installations and intrinsically safe installations in Class II or Class III hazardous locations require that the assembly be kept tight while circuits are live unless the location is known to be nonhazardous at the time.**

This section identifies the calibration status of the unit and provides the calibration check procedures. Calibration and validation procedures using both the Type STT terminal and the EZ CAL option appear here.

CALIBRATION PROCEDURES

If the standard configuration is ordered, the Type PTSD pressure transmitter will be set close to a zero based full scale span. A custom calibration can be factory supplied or implemented in the field.

The Type PTSD pressure transmitter operates in either the analog mode or the digital mode. Calibration procedures differ depending on the selected mode of operation.

The ***analog*** mode of operation allows both a complete bench calibration and a D/A adjustment. The D/A adjustment compensates for slight inaccuracies in the four to 20-milliampere current loop (or in receiving devices such as recorders). Use this procedure only when the system has first been installed or if something in the four to 20-milliampere current loop has changed. The ***digital*** mode of operation allows only a bench calibration.

> **NOTE:** This section is meant as a generalized guide and does not go through the step-by-step procedures required of the Type STT terminal. Although the menus that appear on the Type STT terminal display are easy to follow, consult the ***Type STT Smart Transmitter Terminal Instruction*** while performing these procedures.

Equipment Required for Calibration

- DC power supply, 24, ±1 VDC (recommended).
- Digital multimeter (DMM) — 4-½ digit display minimum with an accuracy at least four times greater than that of the transmitter (Tables 1-5, 1-6, and 1-7).
- 250-ohm (±0.01-percent) resistor, ½-watt minimum.

- Pressure source with an accuracy at least four times greater than that of the transmitter (Tables 1-5, 1-6, and 1-7).

- Type STT Smart Transmitter Terminal.

Analog Mode Calibration

Use these procedures for validation of transmitter calibration before installation, after an inadvertent overpressure condition, or after the replacement of components. If the checkout indicates an incorrect calibration, continue with the procedure to calibrate the transmitter.

BENCH CALIBRATION

1. Mount and connect the transmitter in a calibration setup such as the one shown in Figure 4-1.

NOTE: Turn the - (negative) test terminal jumper screw ½-turn counterclockwise.

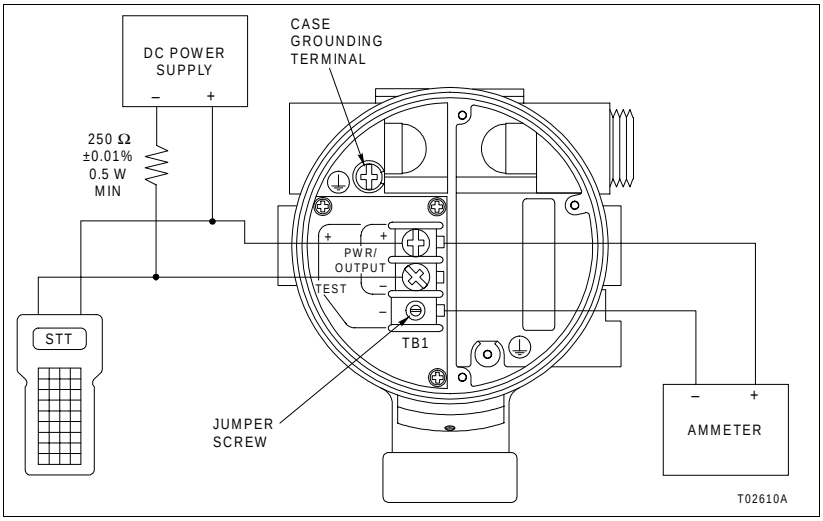


Figure 4-1. Calibration Setup (Typical)

2. Orient the transmitter in the same position as the final installation.

3. Allow the transmitter to stabilize for 15 minutes after power up.

4. Connect the pressure source to the + (high pressure) side of the cell.

5. Apply a pressure to the cell equal to the configured or desired lower range value.

6. The milliammeter should read 4.000 mA plus or minus the tolerance for the particular transmitter listed in Table 4-1.

7. Apply a pressure to the cell equal to the configured or desired upper range value.

8. The milliammeter should read 20.000 mA plus or minus the tolerance for the particular transmitter listed in Table 4-1.

9. If the output is not within the limits specified in Steps 6 and 8, calibrate the unit. To do so, press the CALIBRATE key on the Type STT terminal and follow the procedure in the ***Type STT Smart Transmitter Terminal Instruction***.

10. Turn the - (negative) test terminal jumper screw clockwise until tight.

Table 4-1. Analog Mode Calibration Tolerances

Type	Tolerance	
	mA	VDC (across precision resistor)
PTSDDC PTSDDD	±0.013	±0.003
PTSDDB PTSDDF PTSDDG PTSDGB PTSDGC PTSDGD PTSDGF PTSDGG	±0.016	±0.004
PTSDAD PTSDAF PTSDDA PTSDDH PTSDGH	±0.032	±0.008

D/A ADJUSTMENT (FINE TUNING THE ANALOG LOOP)

This procedure does not require removal of the covers from the electronics housing. Compensation for slight inaccuracies in the four to 20-milliampere current loop (or in receiving devices such as recorders) is accomplished by accessing the calibration menu on the Type STT terminal while it is connected to the target Type PTSD pressure transmitter. This procedure does not adjust the zero or span of the transmitter and only applies when first installing the system or if something in the

four to 20-milliampere current loop has changed. To adjust the zero of the transmitter, refer to ***REZERO PROCEDURE***.

Either connect the DMM, set to measure DC milliamperes, in series with the four to 20-milliampere current loop, or make a parallel connection across the precision 250-ohm resistor shown in Figure 2-4, with the DMM set to measure VDC. With the latter setup, the four to 20-milliampere output corresponds to one to five VDC.

NOTES:

1. These notes only apply when measuring VDC across the 250-ohm resistor shown in Figure 2-4.

2. The loop resistor must have a tolerance of 0.01 percent or better in order for this procedure to be valid.

3. If a resistor value other than a 250 ohms is used, the voltage output will be different according to Ohms law:

($V = I \times R$)

4. Throughout this procedure, the voltage values, based on a 250-ohm resistor, will be shown in parentheses following the milliampere values.

1. Press the CALIBRATE key on the Type STT terminal.

2. Use the up arrow and down arrow keys to scroll through the menu and select *D-A ADJUSTMENT*.

3. Press the ENTER key.

4. The instruction, *ADJUST TO 4 mA THEN HIT ENTER* appears on the display. Use the up arrow and down arrow keys to adjust the output to 4.000 mA (1.000 VDC) plus or minus the tolerance for the particular transmitter listed in Table 4-1. If using a receiving device (e.g. recorder), adjust for a zero-percent indication.

5. Press the ENTER key.

6. The message, *ADJUST TO 20 mA THEN HIT ENTER* appears on the display. Use the up arrow and down arrow keys to adjust the output to 20.000 mA (5.000 VDC) plus or minus the tolerance for the particular transmitter listed in Table 4-1. If using a receiving device, adjust for a 100-percent indication.

7. Press the ENTER key.

Digital Mode Calibration

1. Mount and connect the transmitter in a calibration setup such as the one shown in Figure 4-1.

NOTE: Turn the - (negative) test terminal jumper screw ½-turn counterclockwise.

2. Orient the transmitter in the same position as the final installation.

3. Connect the pressure source to the + (high pressure) side of the cell.

4. Apply a pressure to the cell equal to the configured or desired lower range value.

5. Since the transmitter configuration is for digital operation, the milliammeter should read below four milliamperes.

6. Press the OUTPUT key on the Type STT terminal, then select *MONITOR OUTPUT.*

7. The Type STT terminal should display 0.00% plus or minus the tolerance for the particular transmitter listed in Table 4-2.

Table 4-2. Digital Mode Calibration Tolerances

Type	Tolerance (%)
PTSDDC	±0.08
PTSDDD	
PTSDDB	±0.10
PTSDDF	
PTSDDG	
PTSDGB	
PTSDGC	
PTSDGD	
PTSDGF	
PTSDGG	
PTSDAD	±0.20
PTSDAF	
PTSDDA	
PTSDDH	
PTSDGH	

8. Apply a pressure to the cell equal to the configured or desired upper range value.

9. Since the transmitter is configured for digital operation, the milliammeter should read below four milliamperes.

> **NOTE:** If the four to 20-milliampere output changes with respect to pressure, then the unit is not in the digital mode. To enter this mode, press the CONFIGURE key on the Type STT terminal and follow the step-by-step procedures in the ***Type STT Smart Transmitter Terminal Instruction***. Use the SEND CONFIG key to download the new configuration to the transmitter (Section 5).

10. Press the OUTPUT key on the Type STT terminal and select *MONITOR OUTPUT*.

11. The Type STT terminal should display 100.00% (±0.15%).

12. If the digital output is not within the limits stated in Steps 7 and 11, calibrate the transmitter. To do so, press the CALIBRATE key on the Type STT terminal and follow the procedures in the ***Type STT Smart Transmitter Terminal Instruction***.

13. Turn the - (negative) test terminal jumper screw clockwise until tight.

RERANGING THE ANALOG OUTPUT

By pressing the RERANGE key on the Type STT terminal, the current (four to 20-milliampere) output can be quickly reranged to represent a different portion of the input span. This procedure bypasses the need to completely configure the Type PTSD pressure transmitter. Damping, engineering units, and the temperature alarms can also be adjusted during rerange.

> **NOTE:** The transmitter output is based on the values entered in this procedure. The terminal will not reject invalid ranges; therefore, it is imperative that the operator know the range limits specified for the transmitter. Refer to Table 1-2 for the proper ranges.

REZERO PROCEDURE

This procedure zeroes the transmitter only and does not compensate for slight inaccuracies in the four to 20-milliampere current loop. To adjust for these inaccuracies, refer to ***D/A ADJUSTMENT (FINE TUNING THE ANALOG LOOP)***.

By pressing the REZERO key on the Type STT terminal, the transmitter can be zeroed without performing a complete bench calibration. There is no effect on the span of the transmitter.

VERIFYING CALIBRATION WITH THE EZ CAL OPTION

NOTE: The EZ CAL option is for zero and span validation only. Do not use it to make large adjustments to the zero or span of the transmitter. The EZ CAL option provides no means to indicate if an error is made.

1. If not installed, refer to the Section 3 for installation procedures.

2. Open the dust cover on the EZ CAL option.

3. Connect the pressure source to the + (high pressure) side of the cell.

4. Apply a pressure to the cell equal to the configured lower range value.

5. Turn and hold the adjustment screw on the EZ CAL option in the zero direction (indicated on the EZ CAL option) for at least three seconds. The transmitter automatically adjusts the output to zero percent.

6. Apply a pressure to the cell equal to the configured upper range value.

7. Depress the span lock and turn and hold the adjustment screw on the EZ CAL option in the span direction (indicated on the EZ CAL option) for at least three seconds. The transmitter automatically adjusts the output to 100 percent.

SECTION 5 - OPERATING PROCEDURES

INTRODUCTION

This section addresses start-up procedures, configuration, and monitoring of the Type PTSD Platinum Standard Smart Pressure Transmitter and the procedures that make it operational.

OPERATOR INTERFACE

The Type PTSD pressure transmitter can be monitored and controlled using the Type STT terminal. Connect the Type STT terminal across the signal wires in a parallel connection (Figs. 2-4 and 2-5) wherever there is convenient access. (For point-to-point wiring, the Type STT terminal must be connected between the transmitter and the 250-ohm resistor.) Refer to the ***Type STT Smart Transmitter Terminal Instruction*** for detailed information and data entry procedures.

CONFIGURATION PROCEDURE

Configuration of the transmitter includes defining an identification tag, primary lower and upper range values, digital or analog mode of operation, primary engineering units, secondary engineering units and secondary lower and upper range values, output parameters, cell temperature alarm limits, and a damping constant. Use the CONFIGURE key and follow the step-by-step procedures in the ***Type STT Smart Transmitter Terminal Instruction***. Once a configuration has been saved in the Type STT terminal, download it to a connected transmitter using the SEND CONFIG key. The remainder of this section explains the configuration parameters.

ID Tag

The transmitter ID tag is a 14-character alphanumeric tag that can be programmed into the transmitter. It is different than the transmitter address. The ID tag is entered during configuration for identification purposes. To display the ID tag on the terminal screen, press the STATUS key.

Select Mode

Select either the analog mode or the digital mode. If the digital mode is selected, the transmitter does not output a four to 20-milliampere signal in proportion to the input. The output will be locked below four milliamperes. If the analog mode is specified instead, the transmitter will provide a four to 20-milliampere output signal.

Although there are no harmful effects to the transmitter or the loop, do not connect a transmitter configured for the analog mode to a field bus. The field bus will not support analog output devices.

Channel Number

The transmitter address (displayed as *CHANNEL #* on the Type STT terminal display) is used for field bus transmitters. Each transmitter on the field bus must have a separate address. The address range is one through 15.

Transmitter Type

This menu displays types of Bailey-Fischer & Porter smart transmitters. Choose the *PTS* selection by using the up arrow and down arrow keys and then pressing the ENTER key.

Output Type

The output of the transmitter must be specified as linear with respect to the input, as a square root of the input, as $^{3}/_{2}$-power output, or as $^{5}/_{2}$-power output. Also, the output can be specified as the volume of a spherical or flat ended horizontal tank, or as a function generator that follows a six-segment linear function. If a function generator is chosen, five input and output points must also be specified as a percent of input. Note that the first and the last point on the curve are assumed to be zero and 100 percent respectively. Program five other points between these two values (refer to ***Function Generator*** in Section 2).

Output Action

A transmitter in the normal-acting mode has an output that increases with increasing input to the + (high pressure) connection. The output of a transmitter in the reverse acting mode decreases with increasing input to the + (high pressure) connection.

Damping Adjustment

Damping adjustments have no effect on the calibration or accuracy of the transmitter; however, damping can be used to smooth out a fluctuating process signal. Damping is adjustable and provides single (1τ) time constant values from 0.00 to 32.00 seconds. A damping adjustment of 32.00 seconds would be used for a very noisy signal and a damping adjustment of 0.00 seconds would be used for an extremely quiet signal.

Primary Engineering Units

Primary engineering units are programmable. The selections appearing on the Type STT terminal display are:

- *iH20* — inches of water.
- *mmHG* — millimeters of mercury.
- *cmH20* — centimeters of water.
- *PSI* — pounds per square inch.
- *MPA* — megapascals.
- *kPA* — kilopascals.
- *BARS* — bars.
- *mBARS* — millibars.
- *Kgcm2* — kilograms per square centimeter.

Primary Upper and Lower Range Values

The range of the transmitter may be set electronically to any value within ±100 percent of the upper range limit to suit a specific application, provided the values are acceptable to the transmitter (refer to Table 1-2 for the nominal and minimum ranges of the transmitters).

Startup and Failure Conditions

WARNING	**The outputs of smart devices change to a fixed value during initialization and detected failure conditions. These values must be selected by the user to ensure safe operation.**

On power up, there is a four-second initialization period during which the output of the transmitter is in transition from nonpowered (no current output) and an output of either above 100 percent or below zero percent as defined during configuration.

If in the analog mode, *INITIALIZE LOW* sets the output to below zero percent (approximately 3.7 milliamperes) while *INITIALIZE HIGH* sets the output to above 100 percent (approximately 22 milliamperes).

If in the digital mode, *INITIALIZE LOW* sets the output to below zero percent (approximately 3.7 milliamperes) while *INITIALIZE HIGH* sets the output to above 100 percent. However, the current stays at approximately 3.7 milliamperes. The default initialization value is low (below zero percent). After initialization, the output ramps up or down to the correct value.

If during its continual diagnostics the microcomputer detects an error that is fatal to the transmitter or system, the transmitter output goes to a predetermined fail level. This level must be selected during configuration. The default value is low

(below zero percent). Table 6-1 shows what types of errors cause the transmitter to enter the fail mode.

NOTE: For a transmitter in the normal acting mode, output corresponding to zero-percent input would be four milliamperes and output corresponding to 100-percent input would be 20 milliamperes. For a transmitter in the reverse acting mode, output corresponding to zero-percent input would be 20 milliamperes and output corresponding to 100-percent input would be four milliamperes.

Secondary Engineering Units

Secondary engineering units are programmable. These units are in a free form format of seven characters. Program any seven characters into the transmitter, such as *MA* or *GAL/HR*. These units are used in conjunction with the secondary lower and upper range numeric values.

Use the up arrow and down arrow keys or the decimal number keys to select the secondary units.

NOTE: The secondary engineering units are left justified when displayed on the local LCD. If desired, enter dummy characters to center or right justify the display.

Secondary Lower and Upper Range Values

The secondary lower and upper range values of the transmitter can be set to any range within ±99999. These ranges can be monitored by the Type STT terminal or displayed on the optional LCD of the transmitter. The ranges are a function of the output of the device. Hence, if a nonlinear output is selected such as square root, the output to the Type STT terminal will be in units representing the nonlinear square root function. The output can be polled from the device or displayed on the optional LCD. These ranges have no effect on the calibration of the transmitter and are used to report the output of the transmitter in user-defined units.

Cell Temperature Alarm Limits

This sets the alarm limits for the cell temperature. The default values are -50.00-degrees Celsius and +120.00-degrees Celsius. Program the alarm limits anywhere between these two values.

Get Config Key

Once a Type PTSD pressure transmitter has been configured, the configuration that has been loaded into the transmitter memory may be reviewed by pressing the GET CONFIG key on the Type STT terminal (refer to the ***Type STT Smart Transmitter Terminal Instruction***). The configuration is not stored

in the Type STT terminal memory unless *YES* is chosen when *STORE THIS CONFIGURATION?* appears on the Type STT terminal display.

Send Config Key

The SEND CONFIG key allows selection of a configuration from the terminal memory to be sent to the transmitter (refer to the ***Type STT Smart Transmitter Terminal Instruction***).

View Config Key

Pressing the VIEW CONFIG key allows the parameters of the working configuration to be viewed, but not changed (refer to the ***Type STT Smart Transmitter Terminal Instruction***).

OPERATIONAL FUNCTIONS

Operational functions for the Type PTSD pressure transmitter are performed by using the SPECIAL FEATURE, OUTPUT, STATUS, and F1 keys on the Type STT terminal.

Special Feature Key

Press the SPECIAL FEATURE key on the Type STT terminal and follow the procedures in the ***Type STT Smart Transmitter Terminal Instruction***.

FIX OUTPUT/CANCEL FIX OUTPUT

For system troubleshooting purposes, the Type PTSD pressure transmitter output can be set to a constant, specified as a percent of the four to 20-milliampere signal. Press the SPECIAL FEATURE key and select *FIX OUTPUT* from the menu of the Type STT terminal (refer to the ***Type STT Smart Transmitter Terminal Instruction***). To cancel *FIX OUTPUT*, press the SPECIAL FEATURE key, then select *CANCEL FIX OUTPUT.*

LOCAL LCD SETUP

The local LCD can be programmed to display output in percent and user-defined secondary engineering units, input in primary engineering units, cell temperature, and transmitter ID tag.

STANDARD CONFIGURATION

This function allows the configuration of the transmitter to be changed back to the original configuration entered at the factory.

Output Key

Press the OUTPUT key on the Type STT terminal and follow the procedures in the ***Type STT Smart Transmitter Terminal Instruction***.

MONITOR OUTPUT

The Type PTSD pressure transmitter output can be monitored by pressing the OUTPUT key on the Type STT terminal, and choosing *MONITOR OUTPUT* from the display menu (refer to the ***Type STT Smart Transmitter Terminal Instruction***). The output displays as a percent, rather than in milliamperes, and updates once per second.

MONITOR INPUT

The input to the Type PTSD pressure transmitter can be monitored by using the OUTPUT key on the Type STT terminal and selecting *MONITOR INPUT* from the displayed menu (refer to the ***Type STT Smart Transmitter Terminal Instruction***). The input displays in engineering units and updates once per second.

MONITOR CELL TEMPERATURE

By pressing the OUTPUT key on the Type STT terminal and selecting *TEMPERATURE*, the Type STT terminal displays the ambient temperature of the cell in degrees Celsius.

MONITOR SECONDARY ENGINEERING UNITS

The secondary engineering units variable can be monitored by the Type STT terminal by pressing the OUTPUT key and selecting *SECONDARY UNITS*. The output reflects the output of the transmitter, but it is a percentage of the secondary lower and upper range values and displays in secondary engineering units.

Example: If the secondary lower range value is 10.0 gal/hr, the secondary upper range value is 100.0 gal/hr and the output of the transmitter is at 75 percent, the display reads 75-percent range or *77.5 GAL/HR*.

Status Key

The status of the transmitter, determined from results of the continuous self-diagnostics, can be checked using the STATUS key on the Type STT terminal. Refer to Section 6 for the corrective action necessary.

F1 Key

The Type STT terminal allows configurations to be copied to and from Type STC cartridges. Multiple configuration copies overwrite existing configurations on the terminal or cartridge, regardless of the amount of memory space available. Perform this function by pressing the F1 key on the Type STT terminal. Refer to the ***Type STT Smart Transmitter Terminal Instruction*** for more information.

CONFIGURATION LOCKOUT PROCEDURE

The Type PTSD pressure transmitter has a lockout feature. When engaged, configuration and calibration information is unalterable. This has no effect on the monitoring of transmitter functions. Refer to Figure 5-1 for the location of the jumper on the amplifier assembly.

1. Remove power from the transmitter.

2. Remove the left housing cover (Fig. 2-1) from the transmitter.

3. If there is an optional indicator, remove the four indicator screws (Fig. 8-1) and unplug it from the amplifier assembly. If there is no optional indicator, skip to Step 4.

4. Use needle nose pliers to change the jumper position. ***Position B*** locks the configuration and ***Position A*** enables configuration.

5. Reverse this procedure to put the transmitter back into service.

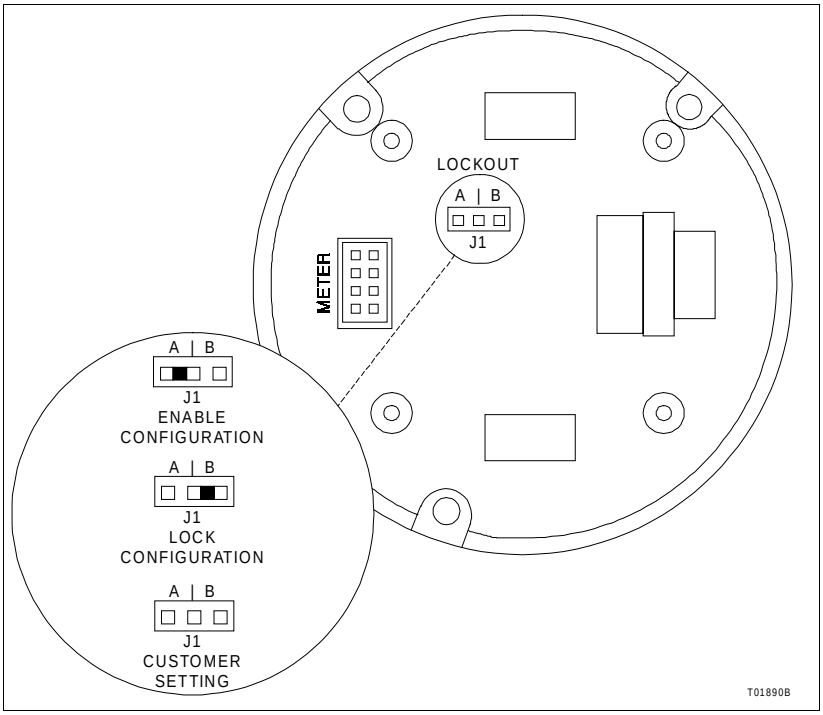


Figure 5-1. Lockout Jumper

SECTION 6 - TROUBLESHOOTING

INTRODUCTION

If the Type PTSD Platinum Standard Smart Pressure Transmitter cannot implement a command, the Type STT terminal is prompted. Pressing the STATUS key on the Type STT terminal causes it to display an error message relating to the existing problem. If an error occurs, but is corrected before the Type STT terminal is connected (such as a temporary overpressure condition), the error is stored and is indicated once the terminal is connected and the STATUS key is pressed. Table 6-1 shows these error messages, the probable cause of the malfunction and the recommended corrective action. Table 6-2 lists possible output problems and the recommended corrective action. A troubleshooting flowchart appears in Figures 6-1, 6-2, and 6-3.

> **NOTE:** More than one error can be present on one transmitter; however, only one error at a time can be displayed on the Type STT terminal. As such, error messages on the Type STT terminal are based on a priority structure. The error holding the most significance to the system will be displayed first and any others that follow will appear according to their rank in the priority structure.

ERROR MESSAGES AND CORRECTIVE ACTION

This section contains all of the possible error messages pertaining to the Type PTSD pressure transmitter that can display on the Type STT terminal. Table 6-1 lists the messages in alphabetical order and has four columns:

1. The ***Message*** column lists the errors (alphabetically) exactly as they appear on the smart terminal.

2. The ***Fail Mode*** column indicates if the error causes the Type PTSD pressure transmitter to enter the fail mode. Refer to ***Startup and Failure Conditions*** in Section 5 for more information.

3. The ***Probable Cause*** column provides a brief explanation of the cause of the error.

4. The ***Corrective Action*** column lists corrective actions to take for each error.

Table 6-1. Error Messages

Message	Fail Mode	Probable Cause	Corrective Action
Calibration required	No	Cell not calibrated with present amplifier board.	Calibrate transmitter.
Cannot save, configuration too large	No	Transmitter type not supported by Type STT terminal firmware revision level.	Consult Bailey Controls Company regarding latest Type STT terminal firmware revision.
Cell characterization board EEPROM failure	Yes	Damage to cell characterization board.	Turn Type STT terminal off and then on. If error still exists after reset, replace cell and characterization board assembly (Section 8).
Cell temperature over alarm	No	Cell temperature under/over alarm limit.	Correct temperature problem.
Cell temperature under alarm			Change alarm value. Refer to ***Type STT Smart Transmitter Terminal Instruction***.
Cell temperature over limit	No	Cell temperature input exceeds upper factory limit.	Remove source of temperature extreme.
Cell temperature under limit	No	Cell temperature input exceeds lower factory limit.	Remove source of temperature extreme.
Config “tagname” already exists	No	Attempted to copy configuration to cartridge or transmitter where it already exists.	Erase old configuration before copying new one. Refer to ***Type STT Smart Transmitter Terminal Instruction***.
Damaged cell or characterization board	Yes	Cell or characterization board disconnected.	Make sure cell, characterization board, and amplifier assembly are mounted properly.
		Cell or characterization board damaged.	Replace cell and characterization board assembly (Section 8).
Dynamic temperature measurement failure	No	Dynamic temperature input exceeded limits set at factory.	Output may no longer be accurate. Remove source of temperature shift.
Electronics temperature measurement failure	No	Hardware failure of on-board temperature sensor.	Replace amplifier assembly (Section 8).
Electronic temperature out of range	No	Temperature inside electronics housing exceeds limit set at factory.	Remove source of temperature extreme.
Error! Attempt to configure duplicate address	No	Attempt was made to assign analog mode transmitter address on FBM.	Be sure transmitter is in correct mode (analog or digital). Use VIEW key on Type STT terminal to verify mode. Refer to ***Type STT Smart Transmitter Terminal Instruction*** for details.
		Attempt was made to assign digital mode transmitter to occupied FBM address.	Assign transmitter to unoccupied address or channel number of FBM.

Table 6-1. Error Messages (continued)

Message	Fail Mode	Probable Cause	Corrective Action
Field device can't execute command: FBM on-line	No	The Type STT terminal cannot change any transmitter parameters while field bus is active.	Transmitter must be brought off-line. This can be done from the MFC/MFP module by tuning the function code. **NOTE:** To bring transmitter offline, the FBM can be unplugged from the rack. Be aware that by doing this, communication is lost for all other transmitters on the bus. When FMB is unplugged, there is a two minute time-out period until the Type STT terminal will be allowed to change parameters. After the two minute period, the transmitter allows the Type STT terminal access.
Field device can't execute command: Invalid command	No	Incorrect syntax.	Wrong transmitter type selected in configuration.
		Excessive line noise.	Check line noise. Use oscilloscope to determine if line noise is excessive.
		Type STT terminal failure.	Verify Type STT terminal operation. Verify by using another Type STT terminal known to be operational.
Field device can't execute command: Lockout engaged	No	Unable to configure or calibrate.	Hardware lock active. Refer to ***CONFIGURATION LOCKOUT PROCEDURE*** in Section 5.
Field device can't execute: Data out of range	Yes	Transmitter sent data that is out of acceptable range.	Press VIEW key on Type STT terminal to verify parameters of configuration and consult appropriate device instruction for correct parameters.
Field device configuration does not match STT's	No	Configuration of transmitter does not exactly match corresponding configuration in Type STT terminal.	Rerange was executed without updating Type STT terminal configuration. Perform GET CONFIG (Section 5).
Field device main electronics EEPROM failure	Yes	Memory problem.	Remove power from transmitter and reapply. If error still exists after reset, replace amplifier assembly (Section 8).
Field device input over range	No	Input exceeds cell specification.	Correct process input.
Field device input under range			

Table 6-1. Error Messages (continued)

Message	Fail Mode	Probable Cause	Corrective Action
Field device not responding	No	Type STT terminal not connected properly.	Check Type STT terminal wiring connections. Refer to Figure 2-4 or 2-5 for correct wiring arrangements.
		Short in communication wire.	Perform a continuity check to determine if a short exists.
		Transmitter does not have minimum of 17 VDC across inputs.	Correct power problem.
		Not using correct communication method.	Turn off Type STT terminal. Turn on and select *FSK/BUS* and press ENTER again. ID tags appear on screen. Select ID tag of transmitter, or select one appearing within brackets if unsure of ID tag. Press ENTER. Press STATUS key. If this error message is still present, go to next step.
		Transmitter or Type STT terminal defective.	If available, verify that Type STT terminal is functional by connecting to another transmitter. Replace Type STT terminal if not functional. If Type STT terminal is functional, replace amplifier assembly in transmitter (Section 8).
Field device not supported by cartridge or handheld	No	Field device type not supported by release of Type STT terminal firmware and cartridge.	Check to see if correct cartridge is inserted into Type STT terminal.
Field device output is fixed or in adj. mode	No	Type STT terminal turned off while 4 to 20-mA output was being calibrated.	Power down transmitter and power up transmitter.
		Transmitter cannot execute command because of fix output.	Take transmitter out of fix output. Refer to ***Type STT Smart Transmitter Terminal Instruction***.
Field device RAM failure	Yes	Memory problem.	Replace amplifier assembly (Section 8).
Input applied incorrectly, calibration failure	No	Calibrated input outside factory allowable limits.	Correct signal and calibrate (Section 4).
Span & zero key misoperation	No	Misoperation of EZ CAL option.	Try again.
		Damaged EZ CAL option.	Replace EZ CAL option (Section 8).
		Damaged amplifier assembly.	Replace amplifier assembly (Section 8).
Sorry, that routine not implemented in ROM D10	No	Cartridge not compatible.	Purchase latest Type STT terminal firmware. Refer to spare parts lists in ***Type STT Smart Transmitter Terminal Instruction***.
Unknown error	No	Transmitter reported error not understood by Type STT terminal.	Contact Bailey Technical Support.

Table 6-2. Output Troubleshooting

Fault	Probable Cause	Corrective Action
High output	Primary element	Check for restrictions at primary element.
	Pressure piping.	Check for leaks or blockage.
		Check that blocking valves are fully open.
		Check for entrapped gas in liquid lines and for liquid in dry lines.
		Check that the density of the fluid in the pressure lines is unchanged.
		Check for sediment in transmitter process flanges.
	Transmitter electronics connections.	Make sure all pins and receptacles are clean.
		Check cell connections.
	Transmitter electronics failure.	Press STATUS key and refer to Table 6-1 and Figure 6-1.
Erratic output	Cell.	Press STATUS key and refer to Table 6-1 and Figure 6-1.
	Loop wiring.	Check for intermittent shorts, open circuits, and multiple grounds.
	Process fluid pulsation.	Increase damping.
		Install dampers in pressure piping.
	Pressure piping.	Check for entrapped gas in liquid lines and for liquid in dry lines.
	Transmitter electronics connections.	Make sure pins and receptacles are clean.
		Check cell connections.
	Transmitter electronics failure.	Press STATUS key and refer to Table 6-1 and Figure 6-1.
Low output or no output	Power supply.	Check output of power supply.
	Loop wiring.	Check for shorts, open circuits, and multiple grounds.
		Check polarity of connections.
		Check loop impedance.
	Process connection.	Check installation and condition of process connection.
		Note any changes in process properties that may affect output.

Table 6-2. Output Troubleshooting (continued)

Fault	Probable Cause	Corrective Action
Low output or no output (continued)	Pressure piping.	Check that pressure connection is correct.
		Check for leaks or blockage.
		Check that blocking valves are fully open and bypass valves are tightly closed.
		Check for entrapped gas in liquid lines and for liquid in dry lines.
		Check that density of fluid in pressure piping is unchanged.
		Check for sediment at transmitter process connection.
	Device in digital mode.	If analog output is desired, configure the transmitter using CONFIGURE key, then press SEND CONFIG.
	Transmitter electronics connections.	Check for shorts in cell leads.
		Make sure pins and receptacles are clean.
		Check cell connections.
	Transmitter electronics failure.	Press STATUS key and refer to Table 6-1 and Figure 6-1.
	Cell.	Press STATUS key and refer to Table 6-1 and Figure 6-1.

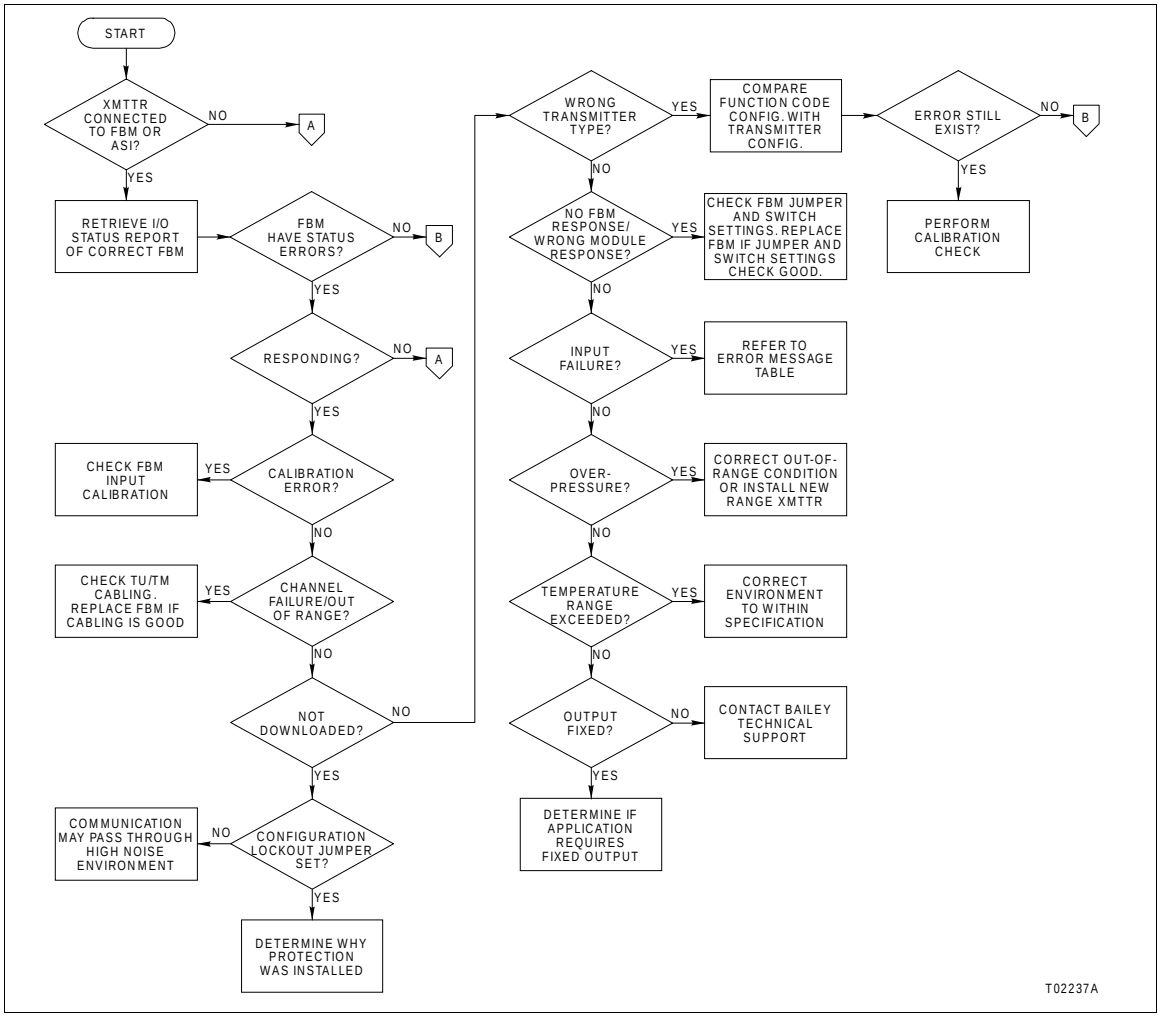


Figure 6-1. Troubleshooting Flowchart (Sheet 1 of 3)

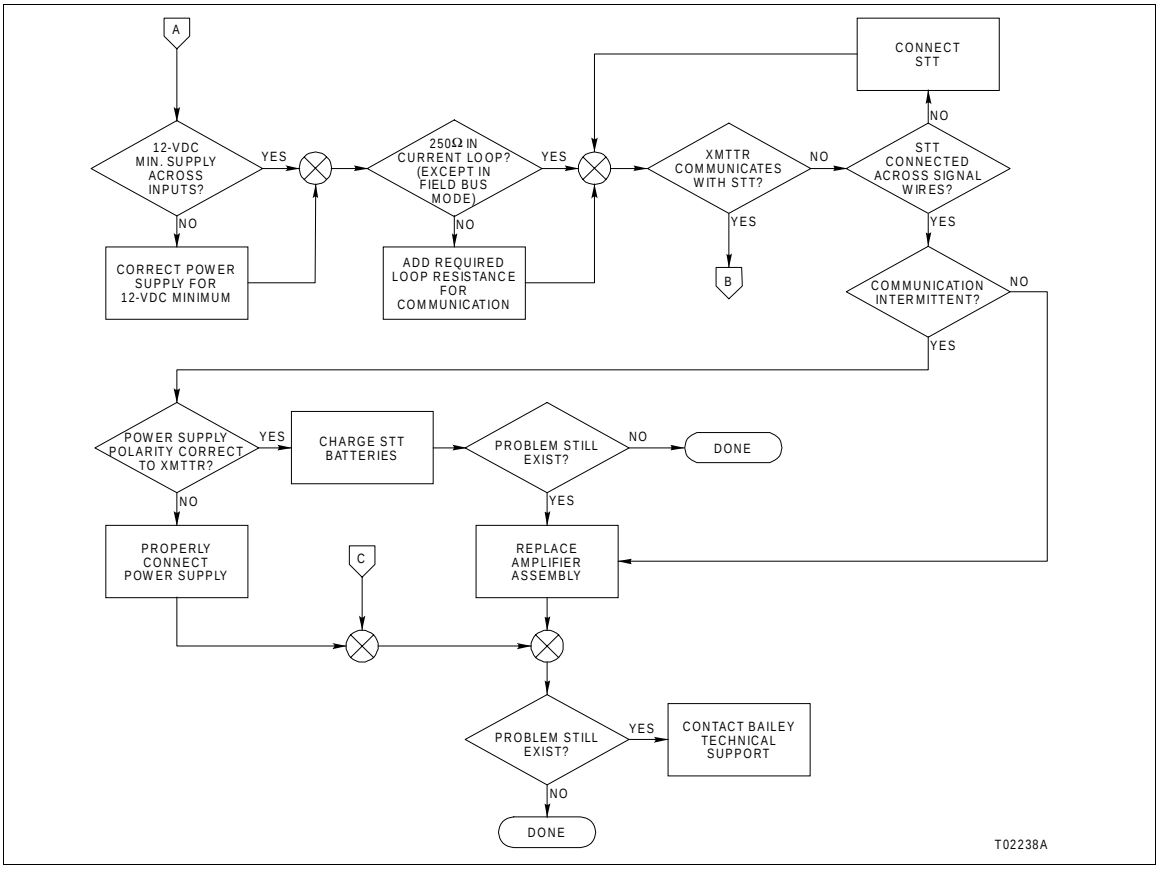


Figure 6-2. Troubleshooting Flowchart (Sheet 2 of 3)

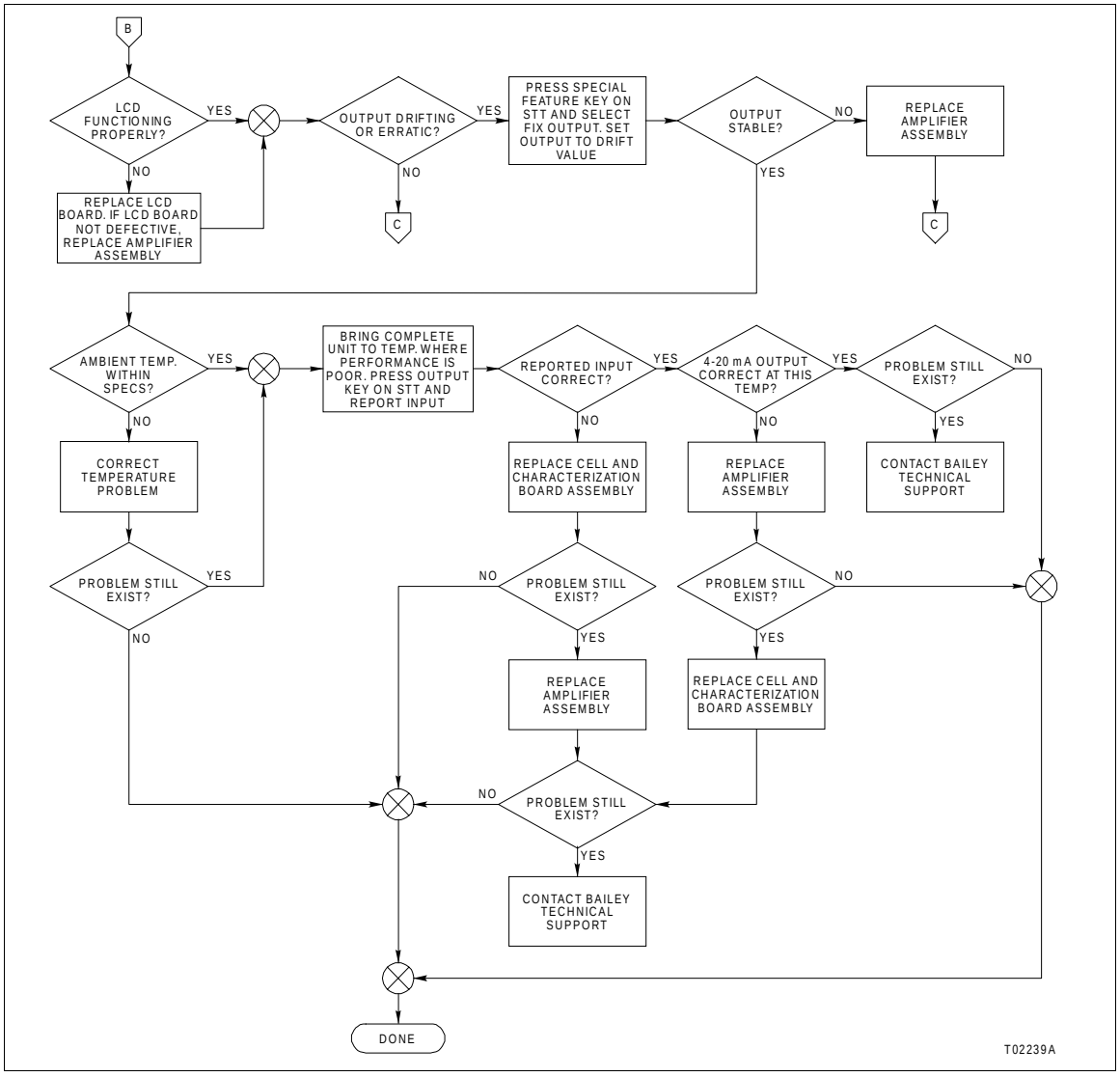


Figure 6-3. Troubleshooting Flowchart (Sheet 3 of 3)

SECTION 7 - MAINTENANCE

INTRODUCTION

WARNING

System maintenance must be performed only by qualified personnel and only after securing the equipment controlled by the circuit. Altering or removing components from an active circuit may upset the controlled process leading to personnel injury and equipment damage.

Explosionproof/dust-ignitionproof installations and intrinsically safe installations in Class II or Class III hazardous locations require that the assembly be kept tight while circuits are live unless the location is known to be nonhazardous at the time. Failure to follow this warning can lead to unsafe conditions that can injure personnel and damage equipment.

The reliability of any stand-alone product or control system is affected by the maintenance of the equipment. Bailey-Fischer & Porter recommends that all equipment users practice a preventive maintenance program that will keep the equipment operating at an optimum level.

NOTE: Refer to the ***Installing a 4 to 20 mA Transmitter in a Hazardous Location*** application guide when applicable.

Personnel performing preventive maintenance should meet the following qualifications:

- Be qualified electrical technicians or engineers that know the proper use of test equipment.
- Be familiar with the Type PTSD Platinum Standard Smart Pressure Transmitter and associated equipment and have experience working with process control systems.

PREVENTIVE MAINTENANCE SCHEDULE

The Type PTSD Transmitter has no moving parts and requires limited maintenance when operated under normal conditions.

Table 7-1 is the preventive maintenance schedule for the Type PTSD transmitter. The table lists the tasks in groups according to their specified maintenance interval. Some tasks in Table 7-1 are self-explanatory. Instructions for tasks that require further explanation are covered under ***PREVENTIVE MAINTENANCE PROCEDURES***.

If the transmitter is inoperative, or if operation is faulty, refer to Section 6.

Table 7-1. Preventive Maintenance Schedule[1]

Task	Frequency
Clean indicator window (if supplied). Refer to procedure.	3 months
Clean transmitter exterior. Refer to procedure.	
Check and tighten all wiring connections, including power and ground connections. Refer to procedure.	
Clean sediment and deposits from connecting piping (procedure depends on the installation and the process).	
Check and tighten piping connections (procedure depends on the installation and the process).	
Check and tighten all conduit connections (procedure depends on the installation and the process).	6 months
Calibrate the unit. Refer to Section 4.	12 months
Change O-rings. Refer to Section 8.	
Complete all applicable tasks in this table.	Shutdown[2]

NOTES:
1. Environmental conditions might warrant more frequent attention.
2. Shutdown is usually defined as an occurrence that happens on a frequency level of greater than one year.

PREVENTIVE MAINTENANCE PROCEDURES

This section covers tasks from Table 7-1 that require specific instructions or further explanation:

- Checking and tightening all wiring connections.
- Cleaning the indicator window (if supplied).
- Cleaning the exterior of the transmitter.

Checking Connections

The equipment needed to perform this procedure is a flat-blade screwdriver.

Check all signal wiring, power, and ground connections within the transmitter to verify their integrity. When checking connections, always turn the screw in the direction to tighten only. If the connection is loose, it will be tightened. If the connection is tight, the tightening action will verify that it is secure. There must not be any motion done to loosen the connection.

Indicator Window Cleaning

The equipment required to perform this procedure is:

- Window cleaning solution.
- Soft, lint-free cloth.

1. Spray the window cleaning solution on the soft, lint-free cloth. Do not spray directly on the indicator window.

2. Wipe the indicator window with the soft, lint-free cloth until all deposits are removed and the indicator can be easily viewed.

Transmitter Exterior Cleaning

The equipment needed to perform this procedure is dependent upon the standard cleaning procedures employed by the customer.

CAUTION

If the cell with characterization board assembly has been cleaned for oxygen and chlorine service, do not compromise the integrity of this cleaning during these procedures. Impurities will react with oxygen and chlorine and damage the transmitter and the process.

Clean the diaphragms with a soft rag and appropriate solvent. The use of metal brushes, blades, or other tools will damage the diaphragms.

In some processes, it is necessary to clean out the deposits of solid matter, crystals, and viscous condensates from the measuring chambers of the cell.

When cleaning the exterior of the transmitter, it is common to hose the unit down to free it of dust and process deposits. When this is done, the temperature of the medium (water, steam, or air) should not exceed the specifications of the transmitter and associated components (Table 1-3).

If possible, do not remove the process flanges from the cell after removing the transmitter from the process. If it is necessary to remove the process flanges, refer to the following procedure.

The equipment required to remove the process flanges and associated equipment is:

- Adjustable end wrench.
- Torque wrench:

  — 65 to 69 Nm (48 to 52 ft-lbs) for stainless steel and NACE process flange nuts.

  — 78 to 82 Nm (57 to 61 ft-lbs) for carbon steel process flange nuts.

  — 179 to 191 Nm (131 to 141 ft-lbs) for high static pressure process flange nuts.

  — 45 to 49 Nm (33 to 37 ft-lbs) for the flange adapter bolts.

- Dow Corning No. 4 compound.
- Tape-Seal® teflon tape.
- O-ring kits identified in Section 9 for the particular application.
- Nonmetallic tool to remove O-rings.

1. If supplied, use the adjustable end wrench to remove the vent/drain plugs, pipe plugs, and process flange adapters (Figs. 2-1, 8-2, and 8-3).

2. Use an adjustable end wrench to remove four of the process flange nuts on either side of the process flange and remove the process flange studs (Figs. 8-2 and 8-3).

3. Remove the process and flange adapter O-rings (Figs. 2-1, 8-2, and 8-3).

4. Use a liquid solvent compatible with the materials present (remaining O-rings, process flanges, and diaphragms).

5. Refer to Section 9 and identify the proper replacement O-rings for the application.

6. Coat the O-rings with a film of Dow Corning No. 4 compound and replace.

7. Mount the process flanges in the proper position and insert the process flange studs until the process flange nuts already installed come in contact with the process flange.

8. Starting with one of the other four process flange nuts, finger tighten it only until it comes in contact with the process flange.

9. Proceed in the same manner with the remainder of the process flange nuts, operating diagonally two by two.

10. Working diagonally two by two, tighten the process flange nuts in 25% increments until reaching a value of 65 to 69 Nm (48 to 52 ft-lbs) for stainless steel and NACE nuts, 78 to 82 Nm (57 to 61 ft-lbs) for carbon steel nuts, or 179 to 191 Nm (131 to 141 ft-lbs) for high static pressure nuts.

11. If supplied and removed, replace the flange adapters. Be sure to orient them in the same position as when they were removed to maintain the proper center-to-center distance for the application.

12. Torque the flange adapter bolts to 45 to 49 Nm (33 to 37 ft-lbs).

> **NOTE:** If the O-rings are PTFE, tighten to the same torque again after ***five days***. This is necessary due to the cold flow properties of PTFE. Tests have shown that a loss of torque of as much as 40 percent occurs over the five days. After a second tightening, no loss of torque is apparent.

13. If supplied and removed, wrap the threads of the vent/drain plugs and pipe plugs with one layer of Tape-Seal using a small overlap.

14. Press the tape into the thread slightly to hold it in place.

15. Install the vent/drain plugs and pipe plugs and tighten them with the adjustable end wrench.

16. Perform the procedures in Section 4 to verify that the calibration of the transmitter has not changed.

SECTION 8 - REPAIR AND REPLACEMENT PROCEDURES

INTRODUCTION

WARNING	**Explosionproof/dust-ignitionproof installations and intrinsically safe installations in Class II or Class III hazardous locations require that the assembly be kept tight while circuits are live unless the location is known to be nonhazardous at the time.** **Repairs must be performed only by qualified personnel and only after securing equipment controlled by the circuit. Altering or removing components from an active circuit may upset the process being controlled.**

This section contains procedures for replacement of transmitter components in the field.

The design of the Type PTSD pressure transmitter allows replacement of components in as little as five minutes. All calibration and configuration data are stored on both the amplifier assembly and characterization board.

Replacement of the amplifier assembly requires no configuration, as the characterization board automatically downloads this information into the amplifier assembly. Replacement cell and characterization board assemblies come with the standard factory configuration (Table 1-8) and that data transfers to the original amplifier assembly. If a configuration other than the standard is required, the transmitter must go through either a step-by-step configuration or must have a configuration downloaded from the Type STT terminal as described in Section 5. In either case, calibrate the transmitter according to the procedures in Section 4.

COMPONENT REMOVAL AND INSTALLATION PROCEDURES

CAUTION	**If the cell and characterization board assembly has been cleaned for oxygen and chlorine service, do not compromise the integrity of this cleaning during these procedures. Impurities will react with oxygen and chlorine and damage the transmitter and the process.**

Use Figures 8-1, 8-2, and 8-3 as visual aids when performing these procedures.

All procedures assume replacement of the O-rings whenever a component sealed by the O-ring is removed.

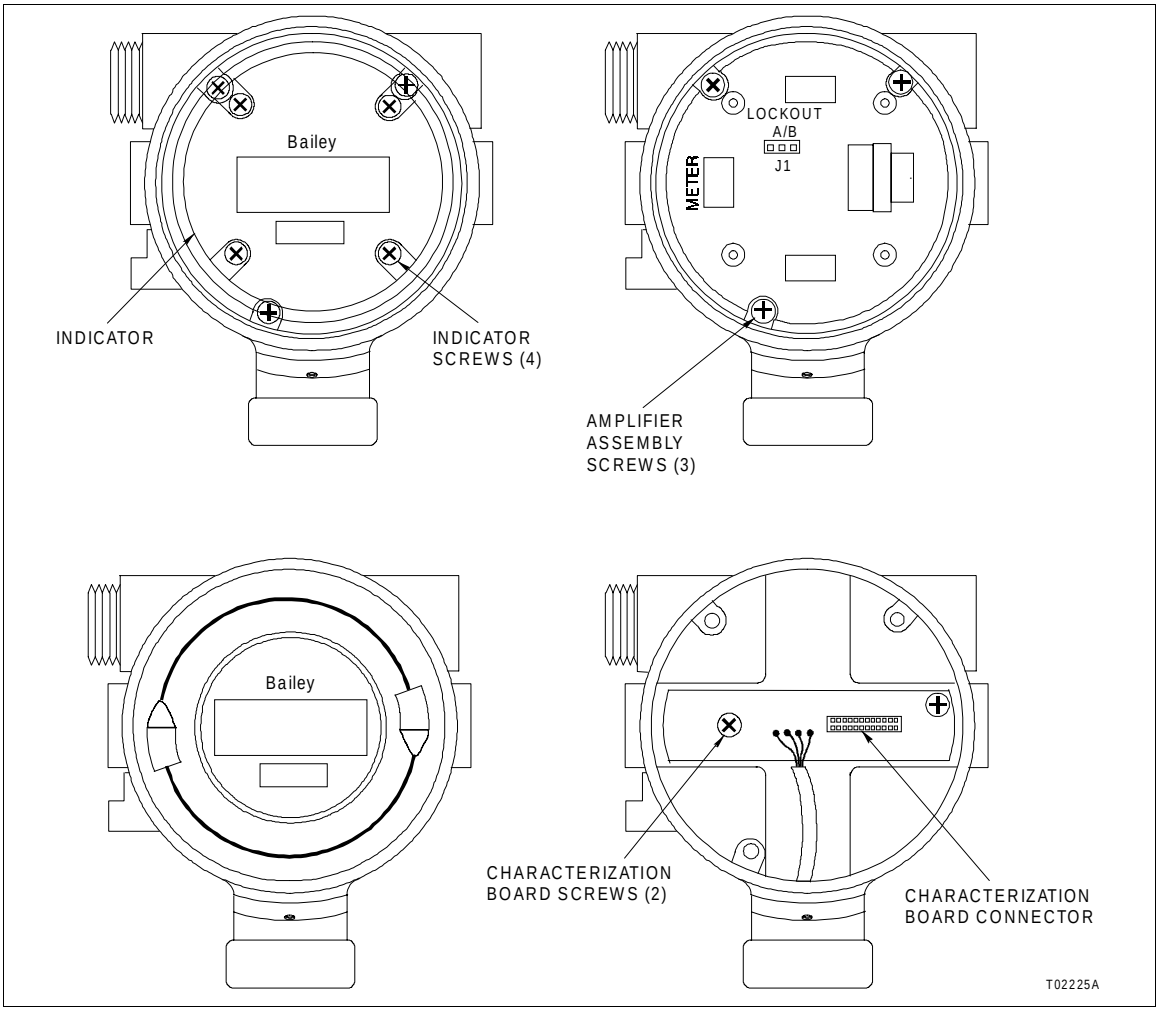


Figure 8-1. Internal Transmitter Components

The items needed to perform these procedures are:

- Spare parts kit identified in Section 9 for the particular component to be replaced.
- O-ring kits identified in Section 9 for the particular application.
- 4-mm Allen wrench.
- Phillips screwdriver.
- Flat-blade screwdriver.
- Adjustable end wrench.

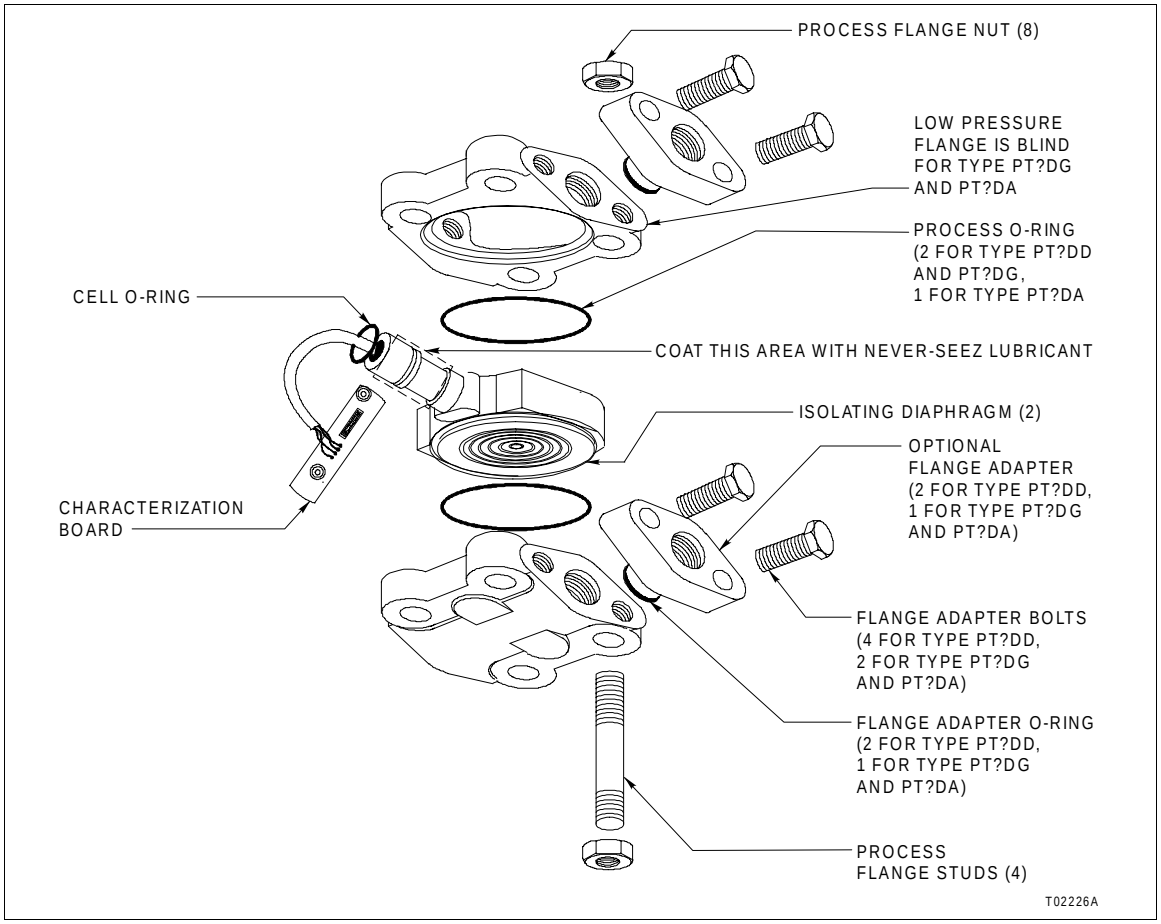


Figure 8-2. Exploded View of Cell for Type PTSDD Pressure Transmitter

- Torque wrench:

  — 65 to 69 Nm (48 to 52 ft-lbs) for stainless steel and NACE process flange nuts.

  — 78 to 82 Nm (57 to 61 ft-lbs) for carbon steel process flange nuts.

  — 179 to 191 Nm (131 to 141 ft-lbs) for high static pressure process flange nuts.

  — 45 to 49 Nm (33 to 37 ft-lbs) for the flange adapter bolts.

- DRI-GLIDE graphite sealant (Man-Gill Chemical Company) or equivalent.

- Dow Corning No. 4 compound.

- Tape-Seal teflon tape.

- Nonmetallic tool to remove O-rings.

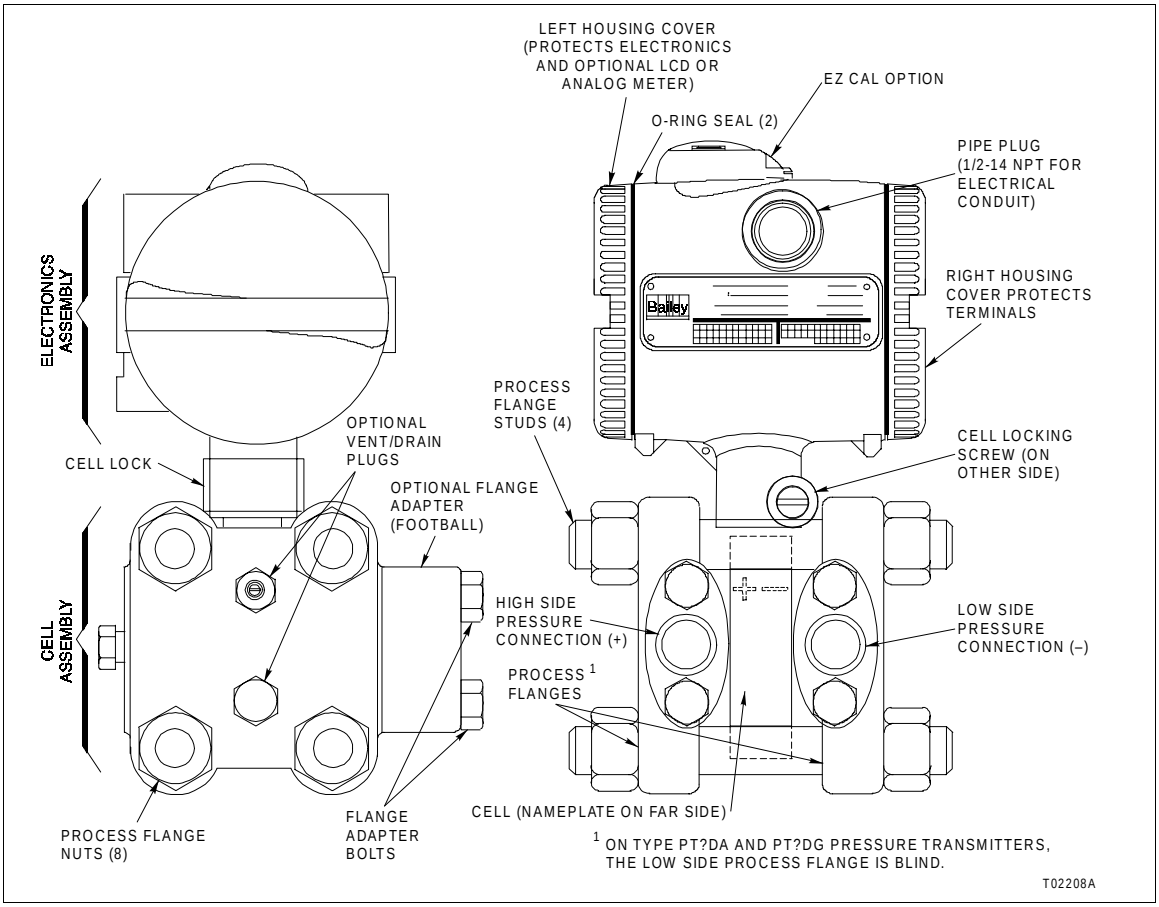


Figure 8-3. Type PTSD Pressure Transmitter

Cell and Characterization Board Assembly Removal

NOTE: The cell and characterization board are a matched set. If performing this procedure to remove and install the same cell (for instance, to change the O-rings or clean the cell), the characterization board does not need replacing. If performing this procedure to replace the cell with a new cell, replace the entire cell and characterization board assembly.

1. Remove the transmitter from the process.

2. Remove the left housing cover from the electronics housing (Fig. 8-3).

3. Use the Phillips screwdriver to remove the three screws that secure the amplifier assembly to the electronics housing (Fig. 8-1).

4. Gently pull the amplifier assembly out of the electronics housing to unplug it from the characterization board connector (Fig. 8-1).

5. Remove the two screws securing the characterization board to the electronics housing (Fig. 8-1).

6. Use the 4-mm Allen wrench to remove the cell locking screw (Fig. 8-3).

7. Remove the cell lock (Fig. 8-3).

8. Carefully remove the cell and process flange assembly, feeding the cell cable and characterization board through the opening left in the electronics housing by the cell.

9. Use the adjustable end wrench to remove all four of the process flange nuts on either side of the process flange (Fig. 8-2).

10. Separate the flanges from the cell, taking care not to damage the isolating diaphragms (Fig. 8-2).

11. Remove the cell, process, and cover O-rings (Figs. 8-2 and 8-3).

Cell and Characterization Board Assembly Installation

1. Refer to Section 9 and determine the proper replacement cell, process flange, and cover O-rings for the application.

2. Coat the O-rings with a film of Dow Corning No. 4 compound and install.

3. Mount the process flanges in the proper position and insert the process flange studs until the process flange nuts already installed come in contact with the process flange (Fig. 8-2).

4. Starting with one of the other four process flange nuts, finger tighten it only until it comes in contact with the process flange.

5. Proceed in the same manner with the remainder of the process flange nuts, operating diagonally two by two.

6. Working diagonally two by two, tighten the process flange nuts in 25% increments until reaching a value of 65 to 69 Nm (48 to 52 ft-lbs) for stainless steel and NACE nuts, 78 to 82 Nm (57 to 61 ft-lbs) for carbon steel nuts, or 179 to 191 Nm (131 to 141 ft-lbs) for high static pressure nuts.

> **NOTE:** If the O-rings are PTFE, tighten to the same torque again after ***five days***. This is necessary due to the cold flow properties of PTFE. Tests have shown that a loss of torque of as much as 40 percent occurs over the five days. After a second tightening, no loss of torque is apparent.

7. Coat the cylindrical part of the cell with a light coating of the DRI-GLIDE sealant (Fig. 8-2).

8. Feed the characterization board and cell cable through the opening in the bottom of the electronics housing, being careful not to damage the cell cable.

9. Mount the cell into the electronics housing in the desired orientation.

10. Install the cell lock and tighten the cell locking screw (Fig. 8-3).

11. Mount the characterization board to the electronics housing and install the two screws (Fig. 8-1).

12. Align the rectangular opening on the bottom of the amplifier assembly with the characterization board connector and install the amplifier assembly into the electronics housing. Gently press it down to seat the mating connectors.

13. Install the three screws to secure the amplifier assembly to the electronics housing.

14. Grease the threads of the housing cover with a light film of the DRI-GLIDE sealant.

15. Install the housing cover.

> **NOTE:** There will be a delay after initial power up when a new cell and characterization board assembly and amplifier assembly are mated.

16. If this is a new cell and characterization board assembly, and a configuration other than the standard factory configuration is desired (Table 1-8), perform the configuration procedures in Section 5.

17. Perform the calibration procedures in Section 4.

18. Install the transmitter on the process.

Amplifier Assembly Removal

Perform Steps 1 through 4 in the ***Cell and Characterization Board Assembly Removal*** section.

Amplifier Assembly Installation

1. Refer to Section 9 and determine the proper replacement cover O-rings.

2. Coat the O-rings with a film of Dow Corning No. 4 compound and install.

3. Perform Steps 12 through 15 in the ***Cell and Characterization Board Assembly Installation*** section.

4. Perform the calibration procedures in Section 4.

NOTE: This procedure assumes replacement of the amplifier assembly only. This means that the original configuration is still present in the characterization board memory and will be automatically downloaded to the amplifier assembly.

5. Install the transmitter on the process.

Electronics Housing and Housing Cover Replacement

Use this procedure if the electronics housing sustains damage, but the internal components and cell are unaffected.

1. Remove the transmitter from the process.

2. Remove the housing covers from the electronics housing (Fig. 8-3). If the housing covers ***do not*** require replacing, go to Step 3. If the housing covers ***do*** require replacing, go to Step 6.

3. Remove the housing cover O-rings (Fig. 8-3).

4. Refer to Section 9 and determine the proper cover O-rings.

5. Coat the cover O-rings with a film of Dow Corning No. 4 compound and install.

6. Perform Steps 3 through 8 in the ***Cell and Characterization Board Assembly Removal*** section.

7. Discard the old electronics housing and housing covers (if required).

8. Refer to Section 9 and determine the proper cell O-ring (Fig. 8-2).

9. Coat the cell O-ring with a film of Dow Corning No. 4 compound and install.

10. Perform Steps 7 through 15 in the ***Cell and Characterization Board Assembly Installation*** section.

11. Perform the calibration checks in Section 4 to verify the calibration has not changed.

12. Install the transmitter on the process.

Bolting Removal

1. Remove the transmitter from the process.

2. Using the adjustable end wrench, remove four of the process flange nuts from either side of the process flange (Fig. 8-2).

3. Remove the process flange studs (Fig. 8-2).

4. Remove the process O-rings.

Bolting Installation

1. Refer to Section 9 and determine the proper process O-rings (Fig. 8-2) for the application.

2. Coat the process O-rings with a film of Dow Corning No. 4 compound and install.

3. Using the new process flange studs and process flange nuts, finger tighten four of the process flange nuts on the sides of each of the four process flange studs with the least threads until the process flange nuts are at the bottom of the threads.

4. Insert the process flange studs into the flange and cell assembly until the process flange nuts already installed come in contact with the process flange.

5. Starting with one of the other four process flange nuts, finger tighten it only until it comes in contact with the process flange.

6. Proceed in the same manner with the remainder of the process flange nuts, operating diagonally two by two.

7. Working diagonally two by two, tighten the process flange nuts in 25% increments until reaching a value of 65 to 69 Nm (48 to 52 ft-lbs) for stainless steel and NACE nuts, 78 to 82 Nm (57 to 61 ft-lbs) for carbon steel nuts, or 179 to 191 Nm (131 to 141 ft-lbs) for high static pressure nuts.

> **NOTE:** If the O-rings are PTFE, tighten to the same torque again after ***five days***. This is necessary due to the cold flow properties of PTFE. Tests have shown that a loss of torque of as much as 40 percent occurs over the five days. After a second tightening, no loss of torque is apparent.

8. Perform the calibration checks in Section 4 to verify the calibration has not changed.

9. Install the transmitter on the process.

Process Flange Removal

1. Remove the transmitter from the process.

2. Using the adjustable end wrench, remove the flange adapters, vent/drain plugs, and pipe plugs from the process flanges (if supplied, refer to Figs. 8-2 and 8-3).

3. Using the adjustable end wrench, remove four of the process flange nuts from either side of the process flange (Fig. 8-2).

4. Remove the process flange studs (Fig. 8-2).

5. Separate the flanges from the cell, being careful not to damage the isolating diaphragms (Fig. 8-2).

6. Remove the process and flange adapter (if supplied) O-rings.

Process Flange Installation

1. Refer to Section 9 and determine the proper process and flange adapter (if supplied, see Fig. 8-2) O-rings for the application.

2. Coat the O-rings with a film of Dow Corning No. 4 compound and install.

3. Perform Steps 4 through 7 in the ***Bolting Installation*** section.

4. If supplied, install the flange adapters. Be sure to orient them in the same position as when they were removed to maintain the proper center-to-center distance for the application.

5. Torque the flange adapter bolts to 45 to 49 Nm (33 to 37 ft-lbs).

> **NOTE:** If the O-rings are PTFE, tighten to the same torque again after ***five days***. This is necessary due to the cold flow properties of PTFE. Tests have shown that a loss of torque of as much as 40 percent occurs over the five days. After a second tightening, no loss of torque is apparent.

6. If supplied, wrap the threads of the vent/drain plugs and pipe plugs with one layer of Tape-Seal using a small overlap.

7. Press the tape into the threads slightly to hold it in place.

8. Install the vent/drain plugs and pipe plugs and tighten them with the adjustable end wrench.

9. Perform the calibration checks in Section 4 to verify the calibration has not changed.

10. Install the transmitter on the process.

O-Ring Replacement

All O-ring replacement procedures are incorporated in the steps for the replacement of various transmitter components.

OPTIONAL EQUIPMENT REMOVAL AND INSTALLATION PROCEDURES

Use Figures 8-1, 8-2, and 8-3 as visual aids when performing these procedures.

Indicator Removal

1. Remove the transmitter from the process.

2. Remove the left housing cover from the electronics housing (Fig. 8-3).

3. Remove the four screws that secure the indicator to the amplifier assembly (Fig. 8-1).

4. Gently pull on the indicator to unplug it from the amplifier assembly.

5. Remove the housing cover O-ring.

Indicator Installation

1. Align the connector on the back of the indicator with one of the four meter openings in the amplifier assembly (Fig. 8-1). The alignment of the connector depends on the desired viewing orientation. Gently press the indicator down to seat the mating connectors.

2. Install the four screws that secure the indicator to the amplifier assembly.

3. Refer to Section 9 and identify the housing cover O-rings.

4. Coat the O-rings with a film of Dow Corning No. 4 compound and install.

5. Coat the threads of the housing cover with a light coating of DRI-GLIDE sealant.

6. Install the housing cover.

7. Install the transmitter on the process.

EZ CAL Option Removal

1. Use the flat-blade screwdriver to remove the mounting screw that secures the EZ CAL option to the electronics housing.

2. Remove the EZ CAL option.

EZ CAL Option Installation

1. Position the EZ CAL option on the electronics housing as shown in Figure 3-1.

2. Use the flat-blade screwdriver to install and tighten the mounting screw.

Flange Adapter Removal

1. Remove the transmitter from the process.

2. Using the adjustable end wrench, remove the flange adapter bolts.

3. Remove the flange adapter O-rings.

Flange Adapter Installation

1. Refer to Section 9 and determine the proper flange adapter O-rings for the application.

2. Coat the flange adapter O-rings with a film of Dow Corning No. 4 compound and install.

3. Install the flange adapters. Be sure to orient them in the same position as when they were removed to maintain the proper center-to-center distance for the application.

4. Torque the flange adapter bolts to 45 to 49 Nm (33 to 37 ft-lbs).

> **NOTE:** If the O-rings are PTFE, tighten to the same torque again after ***five days***. This is necessary due to the cold flow properties of PTFE. Tests have shown that a loss of torque of as much as 40 percent occurs over the five days. After a second tightening, no loss of torque is apparent.

5. Install the transmitter on the process.

Vent/Drain Plug and Pipe Plug Removal

1. Remove the transmitter from the process.

2. Using the adjustable end wrench, remove the vent/drain plugs and pipe plugs.

Vent/Drain Plug and Pipe Plug Installation

1. Wrap the threads of the vent/drain plugs and pipe plugs with one layer of Tape-Seal using a small overlap.

2. Press the tape into the thread slightly to hold it in place.

3. Install the vent/drain plugs and pipe plugs and tighten them with the adjustable end wrench.

4. Install the transmitter on the process.

Tagging Replacement (Wired Stainless Steel)

1. Remove the old tag from the transmitter.

2. Run the wire through the tagging hole in the electronics housing and twist the ends together.

SECTION 9 - SUPPORT SERVICES

INTRODUCTION

Bailey Controls Company can help in the use, application, and repair of its products. Contact the nearest sales office to make requests for sales, applications, installation, repair, overhaul and maintenance contract services.

REPLACEMENT PARTS

When making repairs, order replacement parts from an authorized Bailey Controls Company sales representative. Provide the following information:

1. Part description, part number, and quantity.

2. Nomenclature and serial numbers (if applicable).

3. Bailey Controls Company instruction number, page number, and reference figure that identifies the part.

When ordering standard parts from Bailey Controls Company, use the part numbers and descriptions from the spare parts lists. Order nonstandard parts from the nearest Bailey Controls Company sales office.

SPARE PARTS LISTS

Tables 9-1 through 9-14 list spare parts and kits. All kits are delivered with a copy of the kit drawing. This drawing lists the individual parts contained in the kit and their part numbers. To order compensated spare or replacement cell with characterization board assemblies, refer to ***Cell and Characterization Board Assembly Replacements***.

The ***Applicable Types*** column is included to indicate the nomenclature of the transmitter as originally supplied. Dashes in any of the 15 nomenclature positions indicate that any possible selection for that position can apply.

O-Ring Kits

Table 9-1. O-Rings, Cell and Cover

O-Ring[1]	Kit Number	Material	Applicable Types
Cell	258556_7	Buna-N	All
Cover	258556_8		

NOTE:
1. Each kit contains 10 O-rings.

Table 9-2. O-Ring, Process Flange

Kit Number[1]	Material	Applicable Types														
		Position														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258556_1	Viton	P	T	S	D	-	-	-	-	-	**1**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**2**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**3**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**4**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**5**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**6**	-	-	-	-	-
258556_2	Teflon	P	T	S	D	-	-	-	-	-	**A**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**B**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**C**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**D**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**E**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**F**	-	-	-	-	-
258556_3	Ethylene propylene	P	T	S	D	-	-	-	-	-	**M**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**N**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**P**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**Q**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**R**	-	-	-	-	-
		P	T	S	D	-	-	-	-	-	**S**	-	-	-	-	-

NOTE:
1. Each kit contains 10 O-rings.

Table 9-3. O-Ring, Flange Adapter

Kit Number[1]	Material	Applicable Types	Applicable Types
		Position	Position
		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
258556_4	Viton	P T S D - - - - - **1** **A** - - - -	P T S D - - - - - **4** **A** - - - -
		P T S D - - - - - **1** **B** - - - -	P T S D - - - - - **4** **B** - - - -
		P T S D - - - - - **1** **D** - - - -	P T S D - - - - - **4** **D** - - - -
		P T S D - - - - - **1** **M** - - - -	P T S D - - - - - **4** **M** - - - -
		P T S D - - - - - **1** **N** - - - -	P T S D - - - - - **4** **N** - - - -
		P T S D - - - - - **1** **Q** - - - -	P T S D - - - - - **4** **Q** - - - -
		P T S D - - - - - **2** **A** - - - -	P T S D - - - - - **5** **A** - - - -
		P T S D - - - - - **2** **B** - - - -	P T S D - - - - - **5** **B** - - - -
		P T S D - - - - - **2** **D** - - - -	P T S D - - - - - **5** **D** - - - -
		P T S D - - - - - **2** **M** - - - -	P T S D - - - - - **5** **M** - - - -
		P T S D - - - - - **2** **N** - - - -	P T S D - - - - - **5** **N** - - - -
		P T S D - - - - - **2** **Q** - - - -	P T S D - - - - - **5** **Q** - - - -
		P T S D - - - - - **3** **A** - - - -	P T S D - - - - - **6** **A** - - - -
		P T S D - - - - - **3** **B** - - - -	P T S D - - - - - **6** **B** - - - -
		P T S D - - - - - **3** **D** - - - -	P T S D - - - - - **6** **D** - - - -
		P T S D - - - - - **3** **M** - - - -	P T S D - - - - - **6** **M** - - - -
		P T S D - - - - - **3** **N** - - - -	P T S D - - - - - **6** **N** - - - -
		P T S D - - - - - **3** **Q** - - - -	P T S D - - - - - **6** **Q** - - - -
258556_5	Teflon	P T S D - - - - - **A** **A** - - - -	P T S D - - - - - **D** **A** - - - -
		P T S D - - - - - **A** **B** - - - -	P T S D - - - - - **D** **B** - - - -
		P T S D - - - - - **A** **D** - - - -	P T S D - - - - - **D** **D** - - - -
		P T S D - - - - - **A** **M** - - - -	P T S D - - - - - **D** **M** - - - -
		P T S D - - - - - **A** **N** - - - -	P T S D - - - - - **D** **N** - - - -
		P T S D - - - - - **A** **Q** - - - -	P T S D - - - - - **D** **Q** - - - -
		P T S D - - - - - **B** **A** - - - -	P T S D - - - - - **E** **A** - - - -
		P T S D - - - - - **B** **B** - - - -	P T S D - - - - - **E** **B** - - - -
		P T S D - - - - - **B** **D** - - - -	P T S D - - - - - **E** **D** - - - -
		P T S D - - - - - **B** **M** - - - -	P T S D - - - - - **E** **M** - - - -
		P T S D - - - - - **B** **N** - - - -	P T S D - - - - - **E** **N** - - - -
		P T S D - - - - - **B** **Q** - - - -	P T S D - - - - - **E** **Q** - - - -
		P T S D - - - - - **C** **A** - - - -	P T S D - - - - - **F** **A** - - - -
		P T S D - - - - - **C** **B** - - - -	P T S D - - - - - **F** **B** - - - -
		P T S D - - - - - **C** **D** - - - -	P T S D - - - - - **F** **D** - - - -
		P T S D - - - - - **C** **M** - - - -	P T S D - - - - - **F** **M** - - - -
		P T S D - - - - - **C** **N** - - - -	P T S D - - - - - **F** **N** - - - -
		P T S D - - - - - **C** **Q** - - - -	P T S D - - - - - **F** **Q** - - - -

Table 9-3. O-Ring, Flange Adapter (continued)

Kit Number[1]	Material	Applicable Types															Applicable Types													
		Position															Position													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258556_6	Ethylene propylene	P	T	S	D	-	-	-	-	-	M	A	-	-	-	-	P	T	S	D	-	-	-	-	-	Q	A	-	-	-	-
		P	T	S	D	-	-	-	-	-	M	B	-	-	-	-	P	T	S	D	-	-	-	-	-	Q	B	-	-	-	-
		P	T	S	D	-	-	-	-	-	M	D	-	-	-	-	P	T	S	D	-	-	-	-	-	Q	D	-	-	-	-
		P	T	S	D	-	-	-	-	-	M	M	-	-	-	-	P	T	S	D	-	-	-	-	-	Q	M	-	-	-	-
		P	T	S	D	-	-	-	-	-	M	N	-	-	-	-	P	T	S	D	-	-	-	-	-	Q	N	-	-	-	-
		P	T	S	D	-	-	-	-	-	M	Q	-	-	-	-	P	T	S	D	-	-	-	-	-	Q	Q	-	-	-	-
		P	T	S	D	-	-	-	-	-	N	A	-	-	-	-	P	T	S	D	-	-	-	-	-	R	A	-	-	-	-
		P	T	S	D	-	-	-	-	-	N	B	-	-	-	-	P	T	S	D	-	-	-	-	-	R	B	-	-	-	-
		P	T	S	D	-	-	-	-	-	N	D	-	-	-	-	P	T	S	D	-	-	-	-	-	R	D	-	-	-	-
		P	T	S	D	-	-	-	-	-	N	M	-	-	-	-	P	T	S	D	-	-	-	-	-	R	M	-	-	-	-
		P	T	S	D	-	-	-	-	-	N	N	-	-	-	-	P	T	S	D	-	-	-	-	-	R	N	-	-	-	-
		P	T	S	D	-	-	-	-	-	N	Q	-	-	-	-	P	T	S	D	-	-	-	-	-	R	Q	-	-	-	-
		P	T	S	D	-	-	-	-	-	P	A	-	-	-	-	P	T	S	D	-	-	-	-	-	S	A	-	-	-	-
		P	T	S	D	-	-	-	-	-	P	B	-	-	-	-	P	T	S	D	-	-	-	-	-	S	B	-	-	-	-
		P	T	S	D	-	-	-	-	-	P	D	-	-	-	-	P	T	S	D	-	-	-	-	-	S	D	-	-	-	-
		P	T	S	D	-	-	-	-	-	P	M	-	-	-	-	P	T	S	D	-	-	-	-	-	S	M	-	-	-	-
		P	T	S	D	-	-	-	-	-	P	N	-	-	-	-	P	T	S	D	-	-	-	-	-	S	N	-	-	-	-
		P	T	S	D	-	-	-	-	-	P	Q	-	-	-	-	P	T	S	D	-	-	-	-	-	S	Q	-	-	-	-

NOTE:
1. Each kit contains 10 O-rings.

Flange and Bolting Kits

Table 9-4. Bolting

Kit Number[1]	Application	Material	Stud Size	Pressure Rating[2]		Applicable Types														
				kPa	psi	Position														
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258551_1	General purpose	Carbon steel	M12	25,000	3,625	P	T	S	D	-	-	-	-	-	**1**	-	-	-	-	-
						P	T	S	D	-	-	-	-	-	**A**	-	-	-	-	-
						P	T	S	D	-	-	-	-	-	**M**	-	-	-	-	-
						P	T	S	D	-	-	-	-	-	**W**	-	-	-	-	-
258551_2	General purpose	Stainless steel	M12	20,000	2,900	P	T	S	D	-	-	-	-	-	**2**	-	-	-	-	-
						P	T	S	D	-	-	-	-	-	**B**	-	-	-	-	-
						P	T	S	D	-	-	-	-	-	**N**	-	-	-	-	-
						P	T	S	D	-	-	-	-	-	**X**	-	-	-	-	-
258551_3	NACE Class 2	4140 carbon steel	M12	20,000	2,900	P	T	S	D	-	-	-	-	-	**3**	-	-	-	-	-
						P	T	S	D	-	-	-	-	-	**C**	-	-	-	-	-
						P	T	S	D	-	-	-	-	-	**P**	-	-	-	-	-
						P	T	S	D	-	-	-	-	-	**Y**	-	-	-	-	-
258551_4	General purpose high static pressure	Carbon steel	M18	41,000	6,000	P	T	S	D	**D**	-	-	-	-	**4**	-	-	-	-	-
						P	T	S	D	**D**	-	-	-	-	**D**	-	-	-	-	-
						P	T	S	D	**D**	-	-	-	-	**Q**	-	-	-	-	-
258551_5	General purpose high static pressure	Stainless steel	M18	41,000	6,000	P	T	S	D	**D**	-	-	-	-	**5**	-	-	-	-	-
						P	T	S	D	**D**	-	-	-	-	**E**	-	-	-	-	-
						P	T	S	D	**D**	-	-	-	-	**R**	-	-	-	-	-
258551_6	NACE Class 2 high static pressure	4140 carbon steel	M18	41,000	6,000	P	T	S	D	**D**	-	-	-	-	**6**	-	-	-	-	-
						P	T	S	D	**D**	-	-	-	-	**F**	-	-	-	-	-
						P	T	S	D	**D**	-	-	-	-	**S**	-	-	-	-	-

NOTES:
1. Each kit contains four studs and eight nuts.
2. Exceptions to the pressure ratings listed are:
   The pressure rating for Type PTSDDA pressure transmitters is 2,000 kPa (300 psi).
   The pressure rating for Types PTSDDH and PTSDGH pressure transmitters is 14,000 kPa (2,000 psi).
   The pressure rating for all transmitters with tantalum diaphragms (3, C or G in nomenclature position 7) is 14,000 kPa (2,000 psi).
   High static pressure bolting and flanges are only available for Types PTSDDB, PTSDDC, PTSDDD, PTSDDF and PTSDDG pressure transmitters, excluding those with tantalum diaphragms.

Table 9-5. Process Flange, High Pressure Side

Kit Number[1]	Process Flange		Application	Vent/Drain Plug		Pipe Plug Qty	Applicable Types														
	Material	Qty		Mounting	Qty		Position														
							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258553_1	Stainless steel 316	1	Basic flange	Side	1	2	P	T	S	D	-	-	-	**2**	-	**1**	-	-	-	-	-
							P	T	S	D	-	-	-	**2**	-	**2**	-	-	-	-	-
							P	T	S	D	-	-	-	**2**	-	**3**	-	-	-	-	-

Table 9-5. Process Flange, High Pressure Side (continued)

Kit Number[1]	Process Flange		Application	Vent/Drain Plug		Pipe Plug Qty	Applicable Types
	Material	Qty		Mounting	Qty		Position 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
258553_1 *(cont)*	Stainless steel 316	1	Basic flange	Side	1	2	PTSD- - - **2- A** - - - - -
							PTSD- - - **2- B** - - - - -
							PTSD- - - **2- C** - - - - -
							PTSD- - - **2- M** - - - - -
							PTSD- - - **2- N** - - - - -
							PTSD- - - **2- P** - - - - -
258553_2	Stainless steel 316	1	Basic flange	Rear	1	0	PTSD- - - **4- 1** - - - - -
							PTSD- - - **4- 2** - - - - -
							PTSD- - - **4- 3** - - - - -
							PTSD- - - **4- A** - - - - -
							PTSD- - - **4- B** - - - - -
							PTSD- - - **4- C** - - - - -
							PTSD- - - **4- M** - - - - -
							PTSD- - - **4- N** - - - - -
							PTSD- - - **4- P** - - - - -
258553_3	Hastelloy C-276	1	Basic flange	Side	1	2	PTSD- - - **B- 1** - - - - -
							PTSD- - - **B- 2** - - - - -
							PTSD- - - **B- 3** - - - - -
							PTSD- - - **B- A** - - - - -
							PTSD- - - **B- B** - - - - -
							PTSD- - - **B- C** - - - - -
							PTSD- - - **B- M** - - - - -
							PTSD- - - **B- N** - - - - -
							PTSD- - - **B- P** - - - - -
258553_4	Hastelloy C-276	1	Basic flange	Rear	1	0	PTSD- - - **D- 1** - - - - -
							PTSD- - - **D- 2** - - - - -
							PTSD- - - **D- 3** - - - - -
							PTSD- - - **D- A** - - - - -
							PTSD- - - **D- B** - - - - -
							PTSD- - - **D- C** - - - - -
							PTSD- - - **D- M** - - - - -
							PTSD- - - **D- N** - - - - -
							PTSD- - - **D- P** - - - - -

Table 9-5. Process Flange, High Pressure Side (continued)

Kit Number[1]	Process Flange		Application	Vent/Drain Plug		Pipe Plug Qty	Applicable Types
	Material	Qty		Mounting	Qty		Position 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
258553_5	Stainless steel 316	1	High static pressure flange[2]	Side	1	2	PTSDD- - 2- 4 - - - - - PTSDD- - 2- 5 - - - - - PTSDD- - 2- 6 - - - - - PTSDD- - 2- D - - - - - PTSDD- - 2- E - - - - - PTSDD- - 2- F - - - - - PTSDD- - 2- Q - - - - - PTSDD- - 2- R - - - - - PTSDD- - 2- S - - - - -
258553_6	Stainless steel 316	1	High static pressure flange[2]	Rear	1	0	PTSDD- - 4- 4 - - - - - PTSDD- - 4- 5 - - - - - PTSDD- - 4- 6 - - - - - PTSDD- - 4- D - - - - - PTSDD- - 4- E - - - - - PTSDD- - 4- F - - - - - PTSDD- - 4- Q - - - - - PTSDD- - 4- R - - - - - PTSDD- - 4- S - - - - -
258553_7	Hastelloy C-276	1	High static pressure flange[2]	Side	1	2	PTSDD- - B- 4 - - - - - PTSDD- - B- 5 - - - - - PTSDD- - B- 6 - - - - - PTSDD- - B- D - - - - - PTSDD- - B- E - - - - - PTSDD- - B- F - - - - - PTSDD- - B- Q - - - - - PTSDD- - B- R - - - - - PTSDD- - B- S - - - - -

Table 9-5. Process Flange, High Pressure Side (continued)

Kit Number[1]	Process Flange		Application	Vent/Drain Plug		Pipe Plug Qty	Applicable Types					
	Material	Qty		Mounting	Qty		Position					
							1 2 3 4 5 6 7 8 9 10	11	12	13	14	15
258553_8	Hastel-loy C-276	1	High static pressure flange[2]	Rear	1	0	PTSDD- - D- 4	-	-	-	-	-
							PTSDD- - D- 5	-	-	-	-	-
							PTSDD- - D- 6	-	-	-	-	-
							PTSDD- - D- D	-	-	-	-	-
							PTSDD- - D- E	-	-	-	-	-
							PTSDD- - D- F	-	-	-	-	-
							PTSDD- - D- Q	-	-	-	-	-
							PTSDD- - D- R	-	-	-	-	-
							PTSDD- - D- S	-	-	-	-	-

NOTES:
1. Each kit contains one process flange with vent/drain plugs and pipe plugs installed as indicated in this table.
2. High static pressure bolting and flanges are only available for Types PTSDDB, PTSDDC, PTSDDD, PTSDDF and PTSDDG pressure transmitters, excluding those with tantalum diaphragms.

Table 9-6. Process Flange, Low Pressure Side

Kit Number[1]	Process Flange[2]		Application	Vent/Drain Plug		Pipe Plug Qty	Applicable Types					
	Material	Qty		Mounting	Qty		Position					
							1 2 3 4 5 6 7 8 9 10	11	12	13	14	15
258553_1	Stain-less steel 316	1	Basic flange	Side	1	2	PTSDD- - - 2 1	-	-	-	-	-
							PTSDD- - - 2 2	-	-	-	-	-
							PTSDD- - - 2 3	-	-	-	-	-
							PTSDD- - - 2 A	-	-	-	-	-
							PTSDD- - - 2 B	-	-	-	-	-
							PTSDD- - - 2 C	-	-	-	-	-
							PTSDD- - - 2 M	-	-	-	-	-
							PTSDD- - - 2 N	-	-	-	-	-
							PTSDD- - - 2 P	-	-	-	-	-
258553_2	Stain-less steel 316	1	Basic flange	Rear	1	0	PTSDD- - - 4 1	-	-	-	-	-
							PTSDD- - - 4 2	-	-	-	-	-
							PTSDD- - - 4 3	-	-	-	-	-
							PTSDD- - - 4 A	-	-	-	-	-
							PTSDD- - - 4 B	-	-	-	-	-
							PTSDD- - - 4 C	-	-	-	-	-
							PTSDD- - - 4 M	-	-	-	-	-
							PTSDD- - - 4 N	-	-	-	-	-
							PTSDD- - - 4 P	-	-	-	-	-

Table 9-6. Process Flange, Low Pressure Side (continued)

Kit Number[1]	Process Flange[2]		Application	Vent/Drain Plug		Pipe Plug Qty	Applicable Types										
	Material	Qty		Mounting	Qty		Position										
							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258553_3	Hastel-loy C-276	1	Basic flange	Side	1	2	P	T	S	D	D	-	-	-	B	1	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	2	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	3	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	A	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	B	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	C	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	M	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	N	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	P	-	-	-	-	-
258553_4	Hastel-loy C-276	1	Basic flange	Rear	1	0	P	T	S	D	D	-	-	-	D	1	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	2	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	3	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	A	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	B	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	C	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	M	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	N	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	P	-	-	-	-	-
258553_5	Stain-less steel 316	1	High static pressure flange[3]	Side	1	2	P	T	S	D	D	-	-	-	2	4	-	-	-	-	-
							P	T	S	D	D	-	-	-	2	5	-	-	-	-	-
							P	T	S	D	D	-	-	-	2	6	-	-	-	-	-
							P	T	S	D	D	-	-	-	2	D	-	-	-	-	-
							P	T	S	D	D	-	-	-	2	E	-	-	-	-	-
							P	T	S	D	D	-	-	-	2	F	-	-	-	-	-
							P	T	S	D	D	-	-	-	2	Q	-	-	-	-	-
							P	T	S	D	D	-	-	-	2	R	-	-	-	-	-
							P	T	S	D	D	-	-	-	2	S	-	-	-	-	-
258553_6	Stain-less steel 316	1	High static pressure flange[3]	Rear	1	0	P	T	S	D	D	-	-	-	4	4	-	-	-	-	-
							P	T	S	D	D	-	-	-	4	5	-	-	-	-	-
							P	T	S	D	D	-	-	-	4	6	-	-	-	-	-
							P	T	S	D	D	-	-	-	4	D	-	-	-	-	-
							P	T	S	D	D	-	-	-	4	E	-	-	-	-	-
							P	T	S	D	D	-	-	-	4	F	-	-	-	-	-
							P	T	S	D	D	-	-	-	4	Q	-	-	-	-	-
							P	T	S	D	D	-	-	-	4	R	-	-	-	-	-
							P	T	S	D	D	-	-	-	4	S	-	-	-	-	-

Table 9-6. Process Flange, Low Pressure Side (continued)

Kit Number[1]	Process Flange[2]		Application	Vent/Drain Plug		Pipe Plug Qty	Applicable Types													
	Material	Qty		Mounting	Qty		Position													
							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258553_7	Hastel-loy C-276	1	High static pressure flange[3]	Side	1	2	P	T	S	D	D	-	-	-	B	4	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	5	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	6	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	D	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	E	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	F	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	Q	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	R	-	-	-	-	-
							P	T	S	D	D	-	-	-	B	S	-	-	-	-	-
258553_8	Hastel-loy C-276	1	High static pressure flange[3]	Rear	1	0	P	T	S	D	D	-	-	-	D	4	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	5	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	6	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	D	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	E	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	F	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	Q	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	R	-	-	-	-	-
							P	T	S	D	D	-	-	-	D	S	-	-	-	-	-

NOTES:
1. Each kit contains one process flange with vent/drain plugs and pipe plugs installed as indicated in this table.
2. To order replacement low pressure side process flanges for Types PTSDA and PTSDG pressure transmitters, use part no. 6640211_10.
3. High static pressure bolting and flanges are only available for Types PTSDDB, PTSDDC, PTSDDD, PTSDDF and PTSDDG pressure transmitters, excluding those with tantalum diaphragms.

Table 9-7. Flange Adapter

Kit Number[1]	Adapter (1 pc)	Bolting (2 pcs)	Applicable Types														
			Position														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258558_1	Stainless steel 316	General purpose carbon steel	P	T	S	D	-	-	-	-	-	1	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	4	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	A	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	D	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	M	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	Q	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	W	A	-	-	-	-

Table 9-7. Flange Adapter (continued)

Kit Number[1]	Adapter (1 pc)	Bolting (2 pcs)	Applicable Types														
			Position														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258558_1 *(cont)*	Stainless steel 316	General purpose carbon steel	P	T	S	D	-	-	-	-	-	1	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	4	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	A	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	D	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	M	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	Q	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	W	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	1	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	4	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	A	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	D	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	M	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	Q	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	W	D	-	-	-	-
258558_2	Stainless steel 316	General purpose carbon steel	P	T	S	D	-	-	-	-	-	2	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	5	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	B	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	E	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	N	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	R	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	X	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	2	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	5	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	B	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	E	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	N	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	R	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	X	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	2	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	5	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	B	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	E	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	N	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	R	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	X	D	-	-	-	-

Table 9-7. Flange Adapter (continued)

Kit Number[1]	Adapter (1 pc)	Bolting (2 pcs)	Applicable Types														
			Position														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258558_3	Stainless steel 316	Carbon steel 4140 for NACE Class 2	P	T	S	D	-	-	-	-	-	3	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	6	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	C	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	F	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	P	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	S	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	Y	A	-	-	-	-
			P	T	S	D	-	-	-	-	-	3	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	6	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	C	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	F	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	P	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	S	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	Y	B	-	-	-	-
			P	T	S	D	-	-	-	-	-	3	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	6	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	C	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	F	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	P	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	S	D	-	-	-	-
			P	T	S	D	-	-	-	-	-	Y	D	-	-	-	-
258558_4	Hastelloy C-276	General purpose carbon steel	P	T	S	D	-	-	-	-	-	1	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	4	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	A	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	D	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	M	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	Q	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	W	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	1	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	4	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	A	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	D	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	M	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	Q	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	W	N	-	-	-	-

Table 9-7. Flange Adapter (continued)

Kit Number[1]	Adapter (1 pc)	Bolting (2 pcs)	Applicable Types														
			Position														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258558_4 *(cont)*	Hastelloy C-276	General purpose carbon steel	P	T	S	D	-	-	-	-	-	**1**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**4**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**A**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**D**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**M**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**Q**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**W**	**Q**	-	-	-	-
258558_5	Hastelloy C-276	General purpose carbon steel	P	T	S	D	-	-	-	-	-	**2**	**M**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**5**	**M**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**B**	**M**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**E**	**M**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**N**	**M**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**R**	**M**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**X**	**M**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**2**	**N**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**5**	**N**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**B**	**N**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**E**	**N**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**N**	**N**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**R**	**N**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**X**	**N**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**2**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**5**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**B**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**E**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**N**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**R**	**Q**	-	-	-	-
			P	T	S	D	-	-	-	-	-	**X**	**Q**	-	-	-	-

Table 9-7. Flange Adapter (continued)

Kit Number[1]	Adapter (1 pc)	Bolting (2 pcs)	Applicable Types													
			Position													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258558_6	Hastelloy C-276	Carbon steel 4140 for NACE Class 2	P	T	S	D	-	-	-	-	-	3	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	6	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	C	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	F	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	P	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	S	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	Y	M	-	-	-	-
			P	T	S	D	-	-	-	-	-	3	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	6	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	C	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	F	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	P	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	S	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	Y	N	-	-	-	-
			P	T	S	D	-	-	-	-	-	3	Q	-	-	-	-
			P	T	S	D	-	-	-	-	-	6	Q	-	-	-	-
			P	T	S	D	-	-	-	-	-	C	Q	-	-	-	-
			P	T	S	D	-	-	-	-	-	F	Q	-	-	-	-
			P	T	S	D	-	-	-	-	-	P	Q	-	-	-	-
			P	T	S	D	-	-	-	-	-	S	Q	-	-	-	-
			P	T	S	D	-	-	-	-	-	Y	Q	-	-	-	-

NOTE:
1. Each kit contains one flange adapter, two adapter bolts and one of each type of O-ring (Viton, Teflon and ethylene propylene). The O-rings are packaged in individual plastic bags and are identified by part number. Refer to the kit drawing for the part numbers.

Electronics Kits

Table 9-8. Amplifier Assembly (Compensated)

Kit Number[1]	Applicable Types
258546_1	All

NOTE:
1. Each kit contains one amplifier assembly.

Table 9-9. Indicator, Add-On

Kit Number[1]	Indicator Type	Cover Material	Applicable Types														
			Position														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258550_1	LCD	Aluminum	P	T	S	D	-	-	-	-	-	-	-	-	1	0	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	1	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	3	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	4	-
258550_2	Analog meter	Aluminum	P	T	S	D	-	-	-	-	-	-	-	-	1	0	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	1	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	3	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	4	-
258550_5	LCD	Stainless steel	P	T	S	D	-	-	-	-	-	-	-	-	A	0	-
			P	T	S	D	-	-	-	-	-	-	-	-	A	1	-
			P	T	S	D	-	-	-	-	-	-	-	-	A	3	-
			P	T	S	D	-	-	-	-	-	-	-	-	A	4	-
258550_6	Analog meter	Stainless steel	P	T	S	D	-	-	-	-	-	-	-	-	A	0	-
			P	T	S	D	-	-	-	-	-	-	-	-	A	1	-
			P	T	S	D	-	-	-	-	-	-	-	-	A	3	-
			P	T	S	D	-	-	-	-	-	-	-	-	A	4	-

NOTE:
1. Each kit contains one indicator, one cover with window and 0.25 oz. NEVER-SEEZ lubricant.

Table 9-10. Indicator, Spare

Kit Number[1]	Indicator Type	Applicable Types														
		Position														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258550_3	LCD	P	T	S	D	-	-	-	-	-	-	-	-	-	A	-
		P	T	S	D	-	-	-	-	-	-	-	-	-	B	-
		P	T	S	D	-	-	-	-	-	-	-	-	-	D	-
		P	T	S	D	-	-	-	-	-	-	-	-	-	E	-
258550_4	Analog meter	P	T	S	D	-	-	-	-	-	-	-	-	-	M	-
		P	T	S	D	-	-	-	-	-	-	-	-	-	N	-
		P	T	S	D	-	-	-	-	-	-	-	-	-	Q	-
		P	T	S	D	-	-	-	-	-	-	-	-	-	R	-

NOTE:
1. Each kit contains one indicator; one O-ring, cover; and 0.25 oz. of NEVER-SEEZ lubricant.

Table 9-11. EZ CAL Option

Kit Number[1]	Applicable Types														
	Position														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258562_1	P	T	S	D	-	-	-	-	-	-	-	-	1	3	-
	P	T	S	D	-	-	-	-	-	-	-	-	1	4	-
	P	T	S	D	-	-	-	-	-	-	-	-	1	D	-
	P	T	S	D	-	-	-	-	-	-	-	-	1	E	-
	P	T	S	D	-	-	-	-	-	-	-	-	1	Q	-
	P	T	S	D	-	-	-	-	-	-	-	-	1	R	-

NOTE:
1. Each kit contains one complete EZ CAL module.

Hardware Kits

Table 9-12. Tag, Stainless Steel, Wired

Kit Number[1]	Applicable Types														
	Position														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258557_1	P	T	S	D	-	-	-	-	-	-	-	-	-	-	2
	P	T	S	D	-	-	-	-	-	-	-	-	-	-	6
	P	T	S	D	-	-	-	-	-	-	-	-	-	-	C
	P	T	S	D	-	-	-	-	-	-	-	-	-	-	G

NOTE:
1. Each kit contains 10 stainless steel tags with 6-in. wires attached.

Table 9-13. Cover, Housing

Kit Number[1]	Cover Type	Cover Material	Applicable Types														
			Position														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258555_1	Standard	Aluminum	P	T	S	D	-	-	-	-	-	-	-	-	1	0	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	1	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	3	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	4	-
258555_2	Cover with window	Aluminum	P	T	S	D	-	-	-	-	-	-	-	-	1	A	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	B	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	D	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	E	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	M	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	N	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	Q	-
			P	T	S	D	-	-	-	-	-	-	-	-	1	R	-

Table 9-13. Cover, Housing (continued)

Kit Number[1]	Cover Type	Cover Material	Applicable Types													
			Position													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258555_3	Standard	Stainless steel	P	T	S	D	-	-	-	-	-	-	-	-	A	0	-
			P	T	S	D	-	-	-	-	-	-	-	-	A	1	-
258555_4	Cover with window	Stainless steel	P	T	S	D	-	-	-	-	-	-	-	-	A	A	-
			P	T	S	D	-	-	-	-	-	-	-	-	A	B	-
			P	T	S	D	-	-	-	-	-	-	-	-	A	M	-
			P	T	S	D	-	-	-	-	-	-	-	-	A	N	-

NOTE:
1. Each kit contains one housing cover with O-ring installed and 0.25 oz. NEVER-SEEZ lubricant.

Table 9-14. Electronics Housing

Kit Number[1]	Cover Type	Applicable Types														
		Position														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
258554_1	Aluminum housing with standard terminal block	P	T	S	D	-	-	-	-	-	-	-	-	1	0	-
		P	T	S	D	-	-	-	-	-	-	-	-	1	3	-
		P	T	S	D	-	-	-	-	-	-	-	-	1	A	-
		P	T	S	D	-	-	-	-	-	-	-	-	1	D	-
		P	T	S	D	-	-	-	-	-	-	-	-	1	M	-
		P	T	S	D	-	-	-	-	-	-	-	-	1	Q	-
258554_2	Stainless steel housing with standard terminal block	P	T	S	D	-	-	-	-	-	-	-	-	A	0	-
		P	T	S	D	-	-	-	-	-	-	-	-	A	A	-
		P	T	S	D	-	-	-	-	-	-	-	-	A	M	-
258554_3	Aluminum housing with terminal block/ lightning arrestor assembly	P	T	S	D	-	-	-	-	-	-	-	-	1	1	-
		P	T	S	D	-	-	-	-	-	-	-	-	1	4	-
		P	T	S	D	-	-	-	-	-	-	-	-	1	B	-
		P	T	S	D	-	-	-	-	-	-	-	-	1	E	-
		P	T	S	D	-	-	-	-	-	-	-	-	1	N	-
		P	T	S	D	-	-	-	-	-	-	-	-	1	R	-
258554_4	Stainless steel housing with terminal block/ lightning arrestor assembly	P	T	S	D	-	-	-	-	-	-	-	-	A	1	-
		P	T	S	D	-	-	-	-	-	-	-	-	A	B	-
		P	T	S	D	-	-	-	-	-	-	-	-	A	N	-

NOTE:
1. Each kit contains one electronics housing; two O-rings, cover; one O-ring, cell; and 0.25 oz. of NEVER-SEEZ lubricant. The electronics housing is supplied with all components installed, except cell with characterization board assembly, amplifier assembly and housing covers.

Cell and Characterization Board Assembly Replacements

To order compensated spare or replacement cell and characterization board assemblies:

1. Obtain the first seven characters of the transmitter nomenclature from the nameplate.

2. If position 5 contains a D or G, replace it with a 5. If position 5 contains an A, replace it with a 6.

3. Add an A1 to the end to complete the nine-position nomenclature.

Example 1: A replacement cell with characterization board assembly is required for a Type PTSDDC1221A11A2 pressure transmitter.

1. The first seven characters of the transmitter nomenclature are ***PTSDDC1***.

2. Since position 5 contains a D, it is replaced with a 5, yielding ***PTSD5C1***.

3. Adding an A1 to the end results in the nine-position nomenclature for the compensated spare or replacement cell with characterization board assembly ***PTSD5C1A1***.

Example 2: A replacement cell with characterization board assembly is required for a Type PTSDAFABB1B01RG pressure transmitter.

1. The first seven characters of the transmitter nomenclature are ***PTSDAFA***.

2. Since position 5 contains an A, it is replaced with a 6, yielding ***PTSD6FA***.

3. Adding an A1 to the end results in the nine-position nomenclature for the compensated spare or replacement cell with characterization board assembly ***PTSD6FAA1***.

TRAINING

Bailey Controls Company has a modern training facility available for training your personnel. On-site training is also available. Contact a Bailey Controls Company sales office for specific information and scheduling.

TECHNICAL DOCUMENTATION

Additional copies of this product instruction, or other Bailey Controls Company instructions, can be obtained from the nearest Bailey Controls Company sales office at a reasonable charge.

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