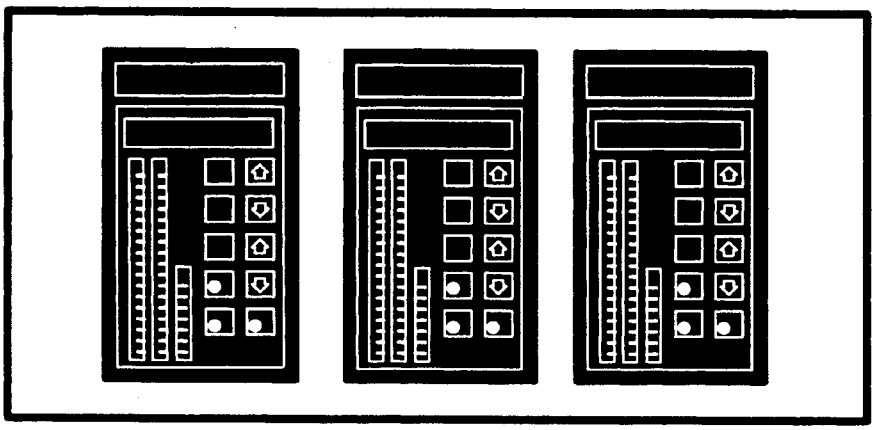
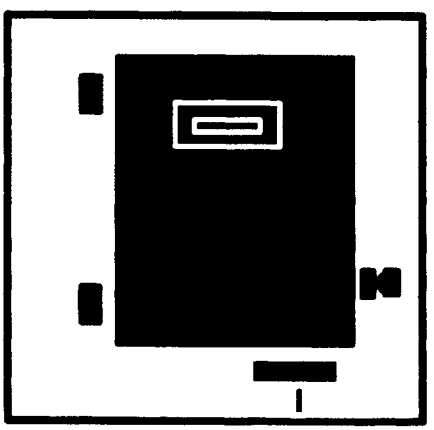
PRODUCT INSTRUCTION

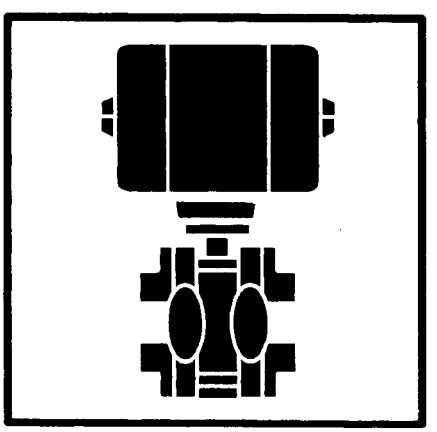
E51-80-001

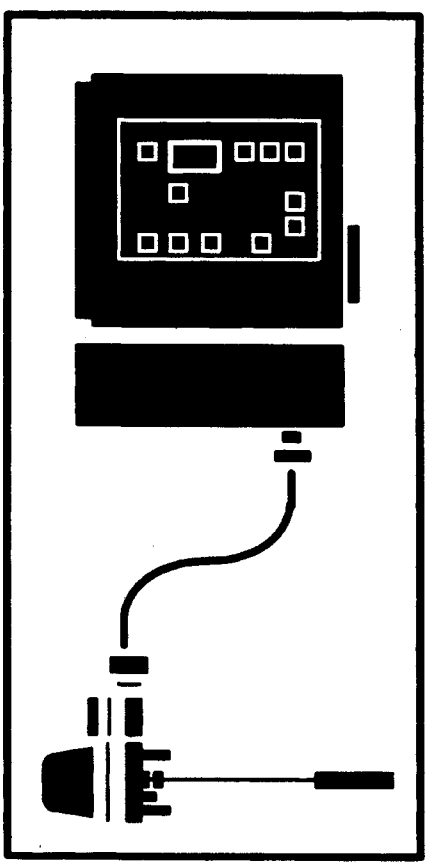
platinum standard™ Series Smart Temperature Transmitters

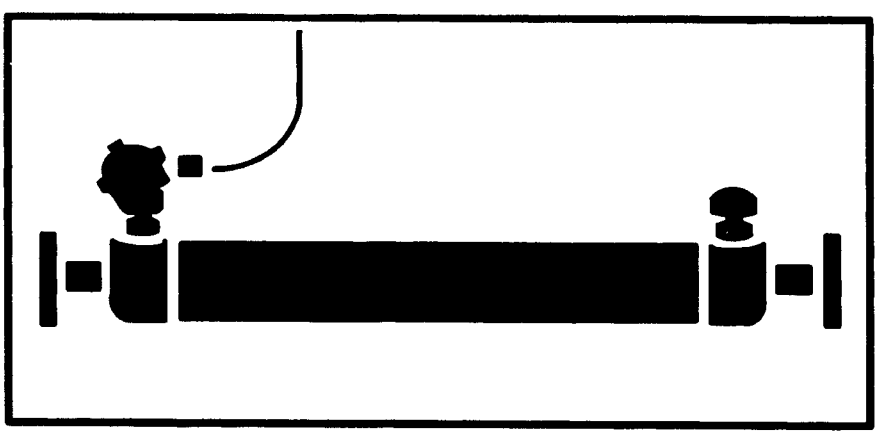
Type EQS

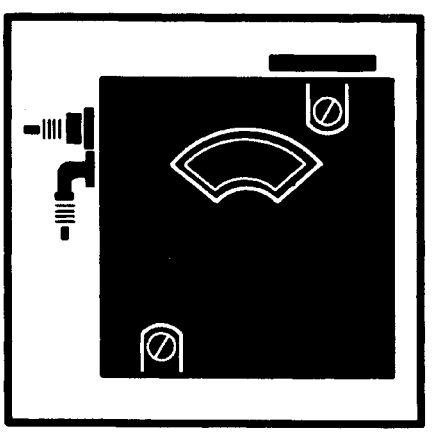












ABB

WARNING notices as used in this instruction apply to hazards or unsafe practices that could result in personal injury or death.

CAUTION notices apply to hazards or unsafe practices that could result in property damage.

NOTES highlight procedures and contain information that assists the operator in understanding the information contained in this instruction.

WARNING

INSTRUCTION MANUALS

DO NOT INSTALL, MAINTAIN, OR OPERATE THIS EQUIPMENT WITHOUT READING, UNDERSTANDING, AND FOLLOWING THE PROPER **Bailey-Fischer & Porter** INSTRUCTIONS AND MANUALS; OTHERWISE, INJURY OR DAMAGE MAY RESULT.

RADIO FREQUENCY INTERFERENCE

MOST ELECTRONIC EQUIPMENT IS INFLUENCED BY RADIO FREQUENCY INTERFERENCE (RFI). CAUTION SHOULD BE EXERCISED WITH REGARD TO THE USE OF PORTABLE COMMUNICATIONS EQUIPMENT IN THE AREA AROUND SUCH EQUIPMENT. PRUDENT PRACTICE DICTATES THAT SIGNS SHOULD BE POSTED IN THE VICINITY OF THE EQUIPMENT CAUTIONING AGAINST THE USE OF PORTABLE COMMUNICATIONS EQUIPMENT.

POSSIBLE PROCESS UPSETS

MAINTENANCE MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL AND ONLY AFTER SECURING EQUIPMENT CONTROLLED BY THIS PRODUCT. ADJUSTING OR REMOVING THIS PRODUCT WHILE IT IS IN THE SYSTEM MAY UPSET THE PROCESS BEING CONTROLLED. SOME PROCESS UPSETS MAY CAUSE INJURY OR DAMAGE.

AVERTISSEMENT

MANUELS D'OPÉRATION

NE PAS METTRE EN PLACE, RÉPARER OU FAIRE FONCTIONNER L'ÉQUIPEMENT SANS AVOIR LU, COMPRIS ET SUIVI LES INSTRUCTIONS RÉGLEMENTAIRES DE **Bailey-Fischer & Porter**. TOUTE NÉGLIGENCE À CET ÉGARD POURRAIT ÊTRE UNE CAUSE D'ACCIDENT OU DE DÉFAILLANCE DU MATÉRIEL.

PERTURBATIONS PAR FRÉQUENCE RADIO

LA PLUPART DES ÉQUIPEMENTS ÉLECTRONIQUES SONT SENSIBLES AUX PERTURBATIONS PAR FRÉQUENCE RADIO. DES PRÉCAUTIONS DEVRONT ÊTRE PRISES LORS DE L'UTILISATION DU MATÉRIEL DE COMMUNICATION PORTATIF. LA PRUDENCE EXIGE QUE LES PRÉCAUTIONS À PRENDRE DANS CE CAS SOIENT SIGNALÉES AUX ENDROITS VOULUS DANS VOTRE USINE.

PERTURBATIONS DU PROCÉDÉ

L'ENTRETIEN DOIT ÊTRE ASSURÉ PAR UNE PERSONNE QUALIFIÉE EN CONSIDÉRANT L'ASPECT SÉCURITAIRE DES ÉQUIPEMENTS CONTRÔLÉS PAR CE PRODUIT. L'AJUSTEMENT ET/OU L'EXTRACTION DE CE PRODUIT PEUT OCCASIONNER DES À-COUPS AU PROCÉDÉ CONTRÔLE LORSQU'IL EST INSÉRÉ DANS UNE SYSTÈME ACTIF. CES À-COUPS PEUVENT ÉGALEMENT OCCASIONNER DES BLESSURES OU DES DOMMAGES MATÉREILS.

NOTICE

The information contained in this document is subject to change without notice.

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Preface

This instruction is for use by technical personnel responsible for the installation, calibration, operation, maintenance, and repair of the Type EQS Platinum Standard Smart Temperature Transmitter.

Some sections of this instruction have been prepared in job sheet format. There is a job sheet sequence flowchart that follows the introduction to the section and any nonprocedural information. This flowchart directs personnel to the appropriate job sheet located in the back of this instruction. By treating each task as a separate entity, the job sheets provide an easy method for finding the information needed to perform each task. The job sheets can be removed and placed in separate folders or notebooks, or carried to the installation, calibration, or repair sites.

There are several communication devices available for use with the transmitter.

- The Type STT02E Smart Transmitter Terminal is a hand-held communication device for configuring, calibrating, monitoring, and troubleshooting. The Type STT02E terminal requires software revision level D11 or greater and a Type STC2BE Smart Terminal Cartridge for use with the transmitter.

- The Type SPC01 SMARTPC Interface Assembly provides a hardware and software link between the transmitter field wiring and a personal computer. It provides the speed and convenience of open platform remote communications. The Type SPC01 SMARTPC Interface Assembly requires software revision level B.

- SmartLink maintenance software provides real time diagnostic monitoring and configuration capabilities.

- The transmitter can also communicate with the INFI 90® system via the high speed field bus mode.

This instruction addresses only the Type STT02E Smart Transmitter Terminal. It is not meant to be a replacement or alternative to the ***Type STT02E Smart Transmitter Terminal Product Instruction***. If using any other communication device, refer to its instruction.

Do not install or complete any tasks or procedures related to calibration, operation, maintenance, or repair until reading and understanding this product instruction.

List of Effective Pages

Total number of pages in this instruction is 118, consisting of the following:

Page No.	Change Date
Preface	Original
List of Effective Pages	Original
iii through ix	Original
1-1 through 1-10	Original
2-1 through 2-4	Original
3-1 through 3-4	Original
4-1 through 4-2	Original
5-1 through 5-11	Original
6-1 through 6-7	Original
7-1 through 7-3	Original
8-1 through 8-3	Original
9-1 through 9-4	Original
I1-1 through I1-2	Original
I2-1 through I2-3	Original
I3-1 through I3-4	Original
I4-1 through I4-4	Original
I5-1 through I5-2	Original
I6-1 through I6-3	Original
I7-1 through I7-3	Original
I8-1 through I8-3	Original
C1-1 through C1-4	Original
C2-1 through C2-3	Original
C3-1 through C3-2	Original
R1-1 through R1-6	Original
R2-1 through R2-2	Original
R3-1 through R3-2	Original
R4-1 through R4-2	Original
R5-1	Original
R6-1 through R6-2	Original
R7-1	Original
R8-1	Original
R9-1 through R9-5	Original
R10-1	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

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Table of Contents (continued)

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List of Figures

List of Tables

Safety Summary

SPECIFIC WARNINGS

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. (p. 4-1, 7-1, 8-1, R1-1)

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. 5-4)

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, R1-1)

Disconnect power from the application in which the sensor is installed, or take precautions to insure that contact with energized parts is avoided when performing these procedures. Sensor wiring may be energized in certain applications. Failure to follow this warning constitutes an electrical shock hazard that can injure personnel and cause equipment damage. (p. 8-1, I8-1, R1-1)

Sommaire de Sécurité

AVERTISSEMENTS D'ORDRE SPÉCIFIQUE

En ce qui concerne l'installation anti-explosion et anti-ignition provoqué par la poussière dans des endroits se Classe II ou Classe III, il est indispensable que l'assemblage soit tenu étanche pendant que les circuits sont électrises, a moins que cet endroit ne présente aucun danger a ce moment-la. Toute négligence à cet égard peut entraîner des conditions dangereuses qui risquent de provoquer des blessures et des dommages matériels. (p. 4-1, 7-1, 8-1, R1-1)

Les signaux de sortie des transmetteurs intelligents prennent une valcur fixe au moment du initialisation, ainsi que lors de la détection d'une défectuosité. L'utilisateur doit affecter une valeur qui assurera un fonctionnement sécuritaire. (p. 5-4)

L'entretien du système ne doit être effectuée que par le personnel qualifié et seulement une fois que l'équipement contrôlé par le circuit est fixé en place. La modification ou le retrait des composants d'un circuit actif pourraient perturber le processus contrôlé et menter à des blessures au personnel et à l'endommagement de l'équipement. (p. 7-1)

Les réparations ne doit être effectuée que par le personnel qualifié et seulement une fois que l'équipement contrôlé par le circuit est fixé en place. La modification ou le retrait des composants d'un circuit actif pourraient perturber le processus contrôlé et menter à des blessures au personnel et à l'endommagement de l'équipement. (p. 8-1, R1-1)

Débrancher l'alimentation de la commande du procédé sur lequel le capteur est installé, ou prendre toutes les précautions pour s'assurer que tout contact avec les composantes sous tension est évité durant ces procédures. La fillerie du capteur peut être sous tension dans certaines applications. Un manquement à ces procédures constitue un risque de choc électrique qui peut causer des blessures au personnel et endommager l'équipement. (p. 8-1, I8-1, R1-1)

SECTION 1 - INTRODUCTION

OVERVIEW

The Type EQS Platinum Standard Smart Temperature Transmitter accurately measures resistance temperature detector (RTD), thermocouple (T/C), millivolt, and ohms inputs. Configuration options allow the transmitter to provide a polled digital process variable signal (field bus mode) or a four to 20 milliamp process variable signal (analog mode) as its output.

INTENDED USER

The information in this product instruction is a guide for technical personnel responsible for the installation, calibration, operation, maintenance, and repair of the Type EQS Platinum Standard Smart Temperature Transmitter.

EQUIPMENT DESCRIPTION

The Type EQS temperature transmitter consists of an electronics housing, a terminal board, and an amplifier assembly.

The amplifier assembly consists of the analog interface board and the main board. It is sealed and encased in a plastic shell, which in turn is shielded by a low copper (less than one percent) aluminum electronics housing. A polyurethane coating on the electronics housing provides environmental protection. An optional stainless steel electronics housing is also available.

The terminal board provides for the power/output connection and access to the test points.

The Type STT02E Smart Transmitter Terminal[1] communicates with the transmitter to perform various functions including configuration, calibration, troubleshooting, and status checks.

An optional liquid crystal display (LCD) shows output in percent and user-defined secondary engineering units, input in primary engineering units, reference junction temperature and ambient temperature inside the electronics housing (in degrees Celsius), and the transmitter ID tag.

An optional analog meter is also available. This is recommended if the transmitter will be installed in an environment

1. The Type STT02E Smart Transmitter Terminal requires software revision level D11 or later and a Type STC2BE Smart Terminal Cartridge for operation with the Type EQS temperature transmitter.

that takes it beyond the temperature specifications for the LCD (refer to Table 1-4).

FEATURES

User-configurable to accept RTD, T/C, mV, or ohms inputs. Temperature sensor may be two, three, or four-wire RTD, dual two-wire RTD (for differential temperature), thermocouple, millivolt, or ohms.

Precision measurement. No calibration after normal programming of range and sensor type, or before initial installation.

Enhanced remote communications. Type STT02E terminal performs all required communication functions.

Control room configuration, monitoring, and diagnostics. SmartLink maintenance software provides real time diagnostic monitoring and configuration capabilities.

Optional two-line, seven-character LCD. Displays user-selected transmitter parameters.

Direct replacement of existing analog two-wire transmitters. Replaces most four to 20 milliamp temperature transmitters that operate over a two-wire system.

Field bus mode capability. Can be used in the INFI 90 supported high speed field bus mode.

User-customized output feature. Output may be linear with respect to selected temperature span, or follow a user-programmed function generator.

Sophisticated electronics ensure reliability. Amplifier assembly exceeds 50 years mean time between failures (MTBF).

FM, CSA, and CENELEC certifications. FM and CSA certified as explosionproof, dust-ignitionproof[1], nonincendive, and intrinsically safe. CENELEC certified as flameproof and intrinsically safe.

1. To maintain the explosionproof and dust-ignitionproof certifications, the transmitter must be installed with an explosionproof and dust-ignitionproof sensor.

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 product instruction is organized into nine sections and three sets of job sheets. After becoming completely familiar with it and the transmitter, it may be used as a reference.

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

Description and Operation — Describes the functional operation of the transmitter and associated equipment.

Installation — Procedures for placing the transmitter into service. Provides an installation sequence flowchart that directs installation personnel to the appropriate Installation Job Sheet.

Calibration — Calibration checks and calibration procedures. Provides a calibration sequence flowchart that directs the calibration technician to the appropriate Calibration Job Sheet.

Operating Procedures — Addresses start-up, configuration, and monitoring.

Troubleshooting — Tables and a flowchart that aid in solving operating difficulties.

Maintenance — Preventive maintenance schedule and procedures.

Repair/Replacement Procedures — Procedures for replacing transmitter components. Provides a repair/replacement sequence flowchart that directs the repair technician to the appropriate Repair/Replacement Job Sheet.

Support Services — Spare parts lists and ordering information.

Installation Job Sheets I1 - I8 — Provide Installation Job Sheets for each installation task.

Calibration Job Sheets C1 - C3 — Provide Calibration Job Sheets for each calibration task.

Repair/replacement Job Sheets R1 - R10 — Provide Repair/Replacement Job Sheets for each repair/replacement task.

HOW TO USE THIS INSTRUCTION

Read this entire product instruction through in sequence before attempting to install, calibrate, operate, troubleshoot, service, or repair the transmitter.

Throughout this product instruction, the following text conventions generally apply.

Bold Text — **Bold** text applies to hardware terminal markings. References to the markings appear exactly as they do on the hardware.

Bold Italic Text — ***Bold italic*** text is used to refer to subsections throughout the product instruction. The case of the text appears as it does in the heading.

Display Item — *Display item* text is used to show displays as they appear on the Type STT02E terminal.

User Input — **User input** text is used to show fixed input that must be entered exactly as shown.

KEYCAPS — KEYCAPS are used to show actual keys that are pressed when using the Type STT02E terminal.

REFERENCE DOCUMENTS

Table 1-1 is a list of Bailey-Fischer & Porter documents referred to in this product instruction.

Table 1-1. Reference Documents

Number	Title
I-E21-28-1	Type STT02E Smart Transmitter Terminal Product Instruction
I-E21-53	Type SPC01 SMARTPC Interface Assembly Product Instruction
I-E96-302	Field Bus Module Product Instruction
P-E21-001	Installing a 4 to 20 mA Transmitter in a Hazardous Location
B222611	Intrinsically Safe Loops
C8113094	Wiring diagram (board level)
D3055071	Dimension drawing for installation (includes optional indicator and standard mounting bracket)
D3055180	Application drawing for installations using thermowells
D3055181	User field connections

NOMENCLATURE

The Type EQS temperature transmitter has eight nomenclature positions. Positions four through eight have customer

selectable options. Use Table 1-2 to select or verify transmitter type.

SPECIFICATIONS

Tables 1-3 and 1-4 list the specifications for the Type EQS Platinum Standard Smart Temperature Transmitter.

Sensor Specifications

Table 1-3 lists the accuracy, range, and span specifications for the transmitter when used with various sensor types.

Table 1-2. Nomenclature

Position	1	2	3	4	5	6	7	8
Type	E	Q	S	®	®	®	®	®

Platinum Standard Smart Temperature Transmitter

Thermowell and Mounting Bracket

	Thermowell	Mounting Bracket
1	Not Included	Carbon Steel
2	Not Included	Stainless Steel
4	Customer Mounted	Not Included

Certifications

0	NEMA 4X - Bailey-Fischer & Porter Standard
1	CENELEC Flameproof and Intrinsically Safe
2	NEMA 4X and FM and CSA Explosionproof and Intrinsically Safe
A	CENELEC Flameproof
B	NEMA 4X and FM and CSA Explosionproof

Housing and Electrical Connection

	Housing	Electrical Connection
4	Low Cu Light Alloy Al	Two ½ NPT Holes (most often ordered)
5	Low Cu Light Alloy Al	Two ¾ NPT Adapters
D	Stainless Steel 316	Two ½ NPT Holes
E	Stainless Steel 316	Two ¾ NPT Adapters

Local Indicator and Lightning Arrestor

	Local Indicator	Lightning Arrestor[1]
0	Not Included	Not Included
1	Not Included	Included
A	Liquid Crystal Display	Not Included
B	Liquid Crystal Display	Included
M	Analog Meter	Not Included
N	Analog Meter	Included

Configuration, Customer Tagging, and Accessories

	Configuration[2]	Customer Tagging	Accessories[3]
0	Standard	None	Not Included
1	Standard	Riveted Stainless Steel	Not Included
2	Standard	Wired Stainless Steel	Not Included
3	Standard	Paper	Not Included
4	Standard	None	Included
5	Standard	Riveted Stainless Steel	Included
6	Standard	Wired Stainless Steel	Included
7	Standard	Paper	Included
A	Special	None	Not Included
B	Special	Riveted Stainless Steel	Not Included
C	Special	Wired Stainless Steel	Not Included
D	Special	Paper	Not Included
E	Special	None	Included
F	Special	Riveted Stainless Steel	Included
G	Special	Wired Stainless Steel	Included
H	Special	Paper	Included

NOTES:
1. Consult Bailey-Fischer & Porter for availability of the lightning arrestor option.
2. Refer to Table 1-8 information on standard and special configurations.
3. Use the accessories selection when extra tags are desired.

Table 1-3. Sensor Type, Range, Span, and Accuracy

Input Type	Sensor Type	Range	Span		Digital Accuracy[1]
			Min	Max	
ITS 90 T/C (EMF)	B[2]	+200° to +1820°C (+392° to +3308°F)	200°C (360°F)	1620°C (2916°F)	Above 800°C (1472°F): Greater of ±0.70°C (±1.26°F) or ±0.075% of measurement
	C[2]	0° to +2300°C (+32° to +4172°F)	35°C (63°F)	2300°C (4140°F)	Greater of ±0.40°C (±0.72°F) or ±0.090% of measurement
	E[2]	-100° to +1000°C (-148° to +1832°F)	20°C (36°F)	1100°C (1980°F)	Greater of ±0.20°C (±0.36°F) or ±0.075% of measurement
	J[2]	-180° to +760°C (-292° to +1400°F)	20°C (36°F)	940°C (1692°F)	Greater of ±0.30°C (±0.54°F) or ±0.075% of measurement
	K[2]	-130° to +1370°C (-202° to +2498°F)	15°C (27°F)	1500°C (2700°F)	Greater of ±0.25°C (±0.45°F) or ±0.075% of measurement
	N[2]	0° to +1300°C (+32° to +2372°F)	20°C (36°F)	1300°C (2340°F)	Greater of ±0.25°C (±0.45°F) or ±0.075% of measurement
	R[2]	0° to +1700°C (+32° to +3092°F)	50°C (90°F)	1700°C (3060°F)	Above 800°C (1472°F): Greater of ±0.60°C (±1.08°F) or ±0.075% of measurement
	S[2]	0° to +1700°C (+32° to +3092°F)	50°C (90°F)	1700°C (3060°F)	Above 800°C (1472°F): Greater of ±0.65°C (±1.17°F) or ±0.075% of measurement
	T[2]	-200° to +400°C (-328° to +752°F)	15°C (27°F)	600°C (1080°F)	Above -100°C (-148°F): Greater of ±0.25°C (±0.45°F) or ±0.075% of measurement
Millivolt (EMF)	Millivolt	-10 to +100 mV	1 mV	110 mV	Greater of ±0.008 mV or 0.06% of measurement
100Ω Pt RTD (resistance)[3]	DIN 385 3, 4-wire (α=0.00385)	-200° to +650°C (-328° to +1202°F)	10°C (18°F)	850°C (1530°F)	Greater of ±0.20°C (±0.36°F) or 0.06% or measurement
	DIN 385 2-wire (α=0.00385)	-200° to +650°C (-328° to +1202°F)	10°C (18°F)	850°C (1530°F)	Greater of ±0.30°C (±0.54°F) or 0.06% of measurement
	DIN 385 Dual 2-wire (α=0.00385)	-200° to +650°C (-328° to +1202°F)	10°C (18°F)	850°C (1530°F)	Greater of ±0.40°C (±0.72°F) or 0.12% of measurement
	SAMA 392 3, 4-wire (α=0.00392)	-200° to +650°C (-328° to +1202°F)	10°C (18°F)	850°C (1530°F)	Greater of ±0.20°C (±0.36°F) or 0.06% of measurement
	SAMA 392 2-wire (α=0.00392)	-200° to +650°C (-328° to +1202°F)	10°C (18°F)	850°C (1530°F)	Greater of ±0.30°C (±0.54°F) or 0.06% of measurement
	SAMA 392 Dual 2-wire (α=0.00392)	-200° to +650°C (-328° to +1202°F)	10°C (18°F)	850°C (1530°F)	Greater of ±0.40°C (±0.72°F) or 0.12% of measurement
RTD Ohms (resistance)	3, 4-wire	0 to 550 Ω	2 Ω	550 Ω	Greater of ±0.050 Ω or 0.03% of measurement
	2-wire	0 to 550 Ω	2 Ω	550 Ω	Greater of ±0.075 Ω or 0.03% of measurement
	Dual 2-wire[4]	0 to 550 Ω	2 Ω	550 Ω	Greater of ±0.100 Ω or 0.06% of measurement

NOTES:

1. Analog accuracy = digital accuracy ±0.035% of span.
2. Thermocouple accuracies are in addition to the possible reference junction uncertainty of ±1.0°C (±1.8°F).
3. 98.129Ω at 0° C (32°F). Meets SAMA RC21-4-1966. For other curve requirements, consult Bailey-Fischer & Porter.
4. Maximum resistance for both RTDs is 550 ohms.

Transmitter Specifications

Table 1-4 lists the specifications for the Type EQS temperature transmitter that are independent of sensor type (except where indicated).

Table 1-4. Transmitter Specifications

Property	Characteristic/Value
Reference conditions	
Temperature	25°C (77°F)
Relative humidity	45% to 75%
Atmospheric pressure	86.0 to 106.0 kPa (12.5 to 15.4 psi)
Supply voltage[1]	
Non-CSA certified applications	12 to 53 VDC (Overvoltage Category III per ISA S82.01)
CSA certified applications	12 to 42 VDC
Intrinsic safety applications	Refer to Bailey-Fischer & Porter drawing ***B222611*** - ***Intrinsically Safe Loops***
Power supply effect	
Analog mode	±0.005% of calibrated span per volt.
Field bus mode	±0.003% of calibrated span per volt.
Power interruptions	Transmitter will not reset for DC power supply interruptions ≤ 5 msecs.
Burst 5/50 ns[2]	Transmitter recovers to within ±0.1% of previous analog output value when subjected to a 1 kV burst (per IEC 801-4, Class 2).
Sensor Input	
Common mode voltage (max)	300 VAC (Overvoltage Category I per ISA S82.01).
Common mode rejection ratio	120 dB minimum (up to 120 Hz).
Isolation	Galvanic isolation ≥ 300 VAC between the input and output circuitry (per IEC 348).
Stability per 12 month period (at reference conditions)	
RTD Mode	±0.3°C (±0.54°F)
RTD ohms mode	±0.12 Ω
Thermocouple mode	±2.0°C (±3.6°F)
Millivolt mode	±0.04 mV
FCC emissions	Class B as defined in January 1993.
Electrostatic discharge	Transmitter recovers to within ±0.1% of previous analog output value when subjected to electrostatic discharge of 8 kV (per IEC 801-2, Class 3).
Output signal (user selected)	
Analog mode	4 to 20 mA
Field bus mode	FSK communications
Output current limiting	
Maximum	≥ 21.6 mA
Minimum	≤ 3.7 mA
Loop load limits	Refer to Figure I6-1.

Table 1-4. Transmitter Specifications (continued)

<table>
<tr><th>Property</th><th>Characteristic/Value</th></tr>
<tr><td>Damping/response time</td><td>Analog and digital response (one time constant - approximately 62% of final reading) to a step input change is adjustable from 0.0 to 32.0 seconds and is entered during configuration. This value is in addition to:
Sensor response time: dependent on device.
Electronics response time: approximately 0.5 secs.</td></tr>
<tr><td>A/D sample rate</td><td>8 times per sec</td></tr>
<tr><td>Turn-on time</td><td>≤ 4 secs</td></tr>
<tr><td>Response to input failure</td><td>Upscale, downscale, or fixed upon open thermocouple, mV input, ohms input, or open leg of RTD.</td></tr>
<tr><td>Ambient temperature limits</td><td>
<table>
<tr><th rowspan="3">Parameter</th><th colspan="4">Ambient Temperature</th></tr>
<tr><th colspan="2">Electronics[3]</th><th colspan="2">LCD[4]</th></tr>
<tr><th>°C</th><th>°F</th><th>°C</th><th>°F</th></tr>
<tr><td>Normal Operating</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 Operating</td><td>-50 to +85</td><td>-58 to +185</td><td>0 to +50</td><td>+32 to +122</td></tr>
</table>
</td></tr>
<tr><td>Digital ambient temperature effect[5]
RTD mode
RTD ohms mode
Thermocouple mode
Millivolt mode</td><td>For a ±28°C (±50°F) change from reference conditions.
±0.15°C (±0.27°F)
±0.06 Ω
±1.0°C (±1.8°F)
±0.02 mV</td></tr>
<tr><td>Humidity limits</td><td>No effect for 0% to 100% noncondensing continuous when the conduit is sealed and the covers are properly installed (tested per IEC 68-2-3 at 93% noncondensing).</td></tr>
<tr><td>Enclosure classification</td><td>NEMA 4X and IP67</td></tr>
<tr><td>Vibration effect</td><td>±0.1% of URL for 1g from 2 to 500 Hz in any axis of the transmitter (per IEC 68-2-6).</td></tr>
<tr><td>Transport impact
Shock
Bump</td><td>
±0.1% of URL for acceleration of 30g half-sine during 18 msecs (per IEC 68-2-27).
±0.1% of URL for a peak acceleration of 10g, duration of 16 msecs, 1000 bumps in each axis of the transmitter (per IEC 68-2-29).</td></tr>
<tr><td>Weight</td><td>1.1 kg (2.3 lbs) without options or accessories.</td></tr>
</table>

NOTES:

1. Add 0.4 VDC to all minimum supply voltage values if using the lightning arrestor option (1, B, or N in nomenclature position 7).
2. Applies only to power and output terminals.
3. The normal operating temperature is that at which the transmitter meets all specifications. The extreme operating temperature is that at which the transmitter can be powered without damage.
4. The normal operating temperature for the LCD is that at which the LCD remains functional. Exceeding that condition 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 LCD may be reduced.
5. Analog ambient temperature effect = digital ambient temperature effect ± 0.025% of span.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

CERTIFICATIONS

Table 1-5 shows the FM and CSA certifications for the Type EQS temperature transmitter. Table 1-6 shows the ambient condition limits that apply when using the transmitter in certified applications. Table 1-7 shows the CENELEC Certifications.

Table 1-5. FM and CSA Certifications

Certification	Class	Division	Group
Explosionproof and Dust-ignitionproof[1]	I	1	B, C, D
	II	1	E, F, G
	III	1	N/A
Intrinsically safe	I	1	A, B, C, D
	II	1	E, F, G
	III	1	N/A
Nonincendive (FM) Division 2 (CSA)	I	2	A, B, C, D
	II	2	E[2], F, G
	III	2	N/A

NOTES:

1. To maintain the explosionproof and dust-ignitionproof certifications, the transmitter must be installed with an explosionproof and dust-ignitionproof sensor.
2. Nonincendive Class II, Division 2; Group E applies to CSA only.

Table 1-6. FM and CSA Ambient Condition Limits

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	-40	-40	108	15.7	86	12.5	21
	Dust-ignitionproof									
	Intrinsic safety	40 (T3C) 60 (T3A)	104 (T3C) 140 (T3A)							
	Division 2	60 (T4A)	140 (T4A)							

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Table 1-7. CENELEC Certifications

Certification	Type
Flameproof	EEx d IIC T6 or IIB + H_2 T6
Intrinsically safe	EEx ia IIC T6 or T5

OPTIONS AND ACCESSORIES

Table 1-8 lists the options and accessories available for use with the Type EQS temperature transmitter.

Table 1-8. Options and Accessories

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Type STT02E smart transmitter terminal</td><td>Hand-held communication device for calibrating, configuring, monitoring, and troubleshooting (firmware revision level D11 or later). Requires Type STC2BE Smart Terminal Cartridge.</td></tr>
<tr><td>Type SPC01 smartpc interface adapter (software revision B)</td><td>FSK to RS232 interface for calibrating, configuring, monitoring, and troubleshooting from a personal computer. Operates on a DOS platform (for use in analog mode only).</td></tr>
<tr><td>Liquid crystal display option[1]</td><td>Two-line seven-character display for local output indication. Displays output in percent and user-selected secondary engineering units, input in primary engineering units, reference junction temperature and ambient temperature inside the electronics housing (in °C), and the transmitter ID tag. Mounts in four orientations for easy viewing. Refer to Table 1-4 for temperature limitations. Add-on kit no. 258550_1 (aluminum cover) or 258550_5 (stainless steel cover).</td></tr>
<tr><td>Analog meter option[1]</td><td>Provides local output indication for those applications where the transmitter operates outside the temperature limits of the LCD. Add-on kit no. 258550_2 (aluminum cover) or 258550_6 (stainless steel cover).</td></tr>
<tr><td>Lightning arrestor option[1,2]</td><td>Mounts internally to suppress lightning induced transients on power and output signal lines. Tested to suppress 10 successive 8 by 20 µsec pulses with a peak value of 20 kA (reference ANSI/IEEE C62.41).</td></tr>
<tr><td>Remote mounting bracket option[1]</td><td>Mounting brackets available for pipe or wall mounting. Kit no. 6642086_1 (carbon steel) or 6642086_2 (stainless steel). Refer to Figure I3-1 for mounting dimensions.</td></tr>
<tr><td>Tag options[1]</td><td>Order by nomenclature (Table 1-2).</td></tr>
<tr><td>IMFBS01 fieldbus module (software revision A15)</td><td>Allows interface of smart instruments to INFI 90 Open control system through any one of the following modules: IMMFC03, rev. L.1; IMMFC04, rev. F.1; IMMFC05, rev. E.1; IMMFP01, IMMFP02, and IMMFP03, rev. D.2.</td></tr>
<tr><td>Configuration option[1]

The Type EQS temperature transmitters are delivered with a standard configuration. If a special configuration was ordered by selecting that option in nomenclature position 8, use the special configuration column to record that configuration.</td><td>
<table>
<tr><th>Parameter</th><th>Standard Configuration</th><th>Special Configuration</th></tr>
<tr><td>ID tag</td><td>EQS</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>Input mode</td><td>RTD SAMA 385, 100 Ω PT</td><td></td></tr>
<tr><td>Damping</td><td>0.0 sec</td><td></td></tr>
<tr><td>Number of wires</td><td>3</td><td></td></tr>
<tr><td>Number of elements</td><td>Single</td><td></td></tr>
<tr><td>Primary EU</td><td>℃</td><td></td></tr>
<tr><td>LRV</td><td>0</td><td></td></tr>
<tr><td>URV</td><td>100</td><td></td></tr>
<tr><td>Initialize output</td><td>Low</td><td></td></tr>
<tr><td>Input fail</td><td>High</td><td></td></tr>
<tr><td>Secondary EU</td><td>..MA</td><td></td></tr>
</table>
</td></tr>
</table>

NOTES:

1. These items are selected via nomenclature in Table 1-2.
2. Consult Bailey-Fischer & Porter for availability of lightning arrestor option.

SECTION 2 - DESCRIPTION AND OPERATION

INTRODUCTION

This section describes the Type EQS Platinum Standard Smart Temperature Transmitter. It also includes information about the Type STT02E Smart Transmitter Terminal and the function generator.

FUNCTIONAL OPERATION

The transmitter provides an output in response to thermocouple, RTD, ohms, and millivolt inputs. Thermocouple inputs follow International Temperature Scale of 1990 (ITS 90) calibrations, while RTD inputs follow either Deutsches Institut fur Normung e.V. Berlin (DIN) 385 calibrations or Scientific Apparatus Makers Association (SAMA) 392 calibrations. Millivolt and ohms inputs are linear. A user-defined curve can be configured for all input types. This curve is programmed via the function generator feature.

Refer to Figure 2-1 for a block diagram of the transmitter electronics. The amplifier assembly consists of the analog interface board and the main board. The main board stores all data. The output of the sensor feeds the analog to digital converter via the analog interface board. The microcontroller performs calculations on the analog to digital converter output. This signal is then represented as a four to 20-milliamp, or a polled digital process variable signal.

Communications

The transmitter communicates with the Type STT02E Smart Transmitter Terminal[1] via FSK communications. This communication method provides exceptional noise immunity in both the analog and field bus modes. Since the communication voltage is a high frequency AC waveform with a zero DC average, it has no effect on the transmitter output. The transmitter and the terminal can be as much as 1.6 kilometers (one mile) apart. Refer to Figures I6-1 and I7-1 for typical wiring diagrams for transmitters configured in the analog and field bus modes.

The Type STT02E Smart Transmitter Terminal is a battery powered, hand-held communication device. It configures, calibrates, modifies the parameters, troubleshoots, and verifies the operation of the transmitter while guiding the operator through step-by-step procedures.

1. The Type STT02E Smart Transmitter Terminal requires software revision level D11 or later and a Type STC2BE Smart Terminal Cartridge for operation with the Type EQS temperature transmitter.

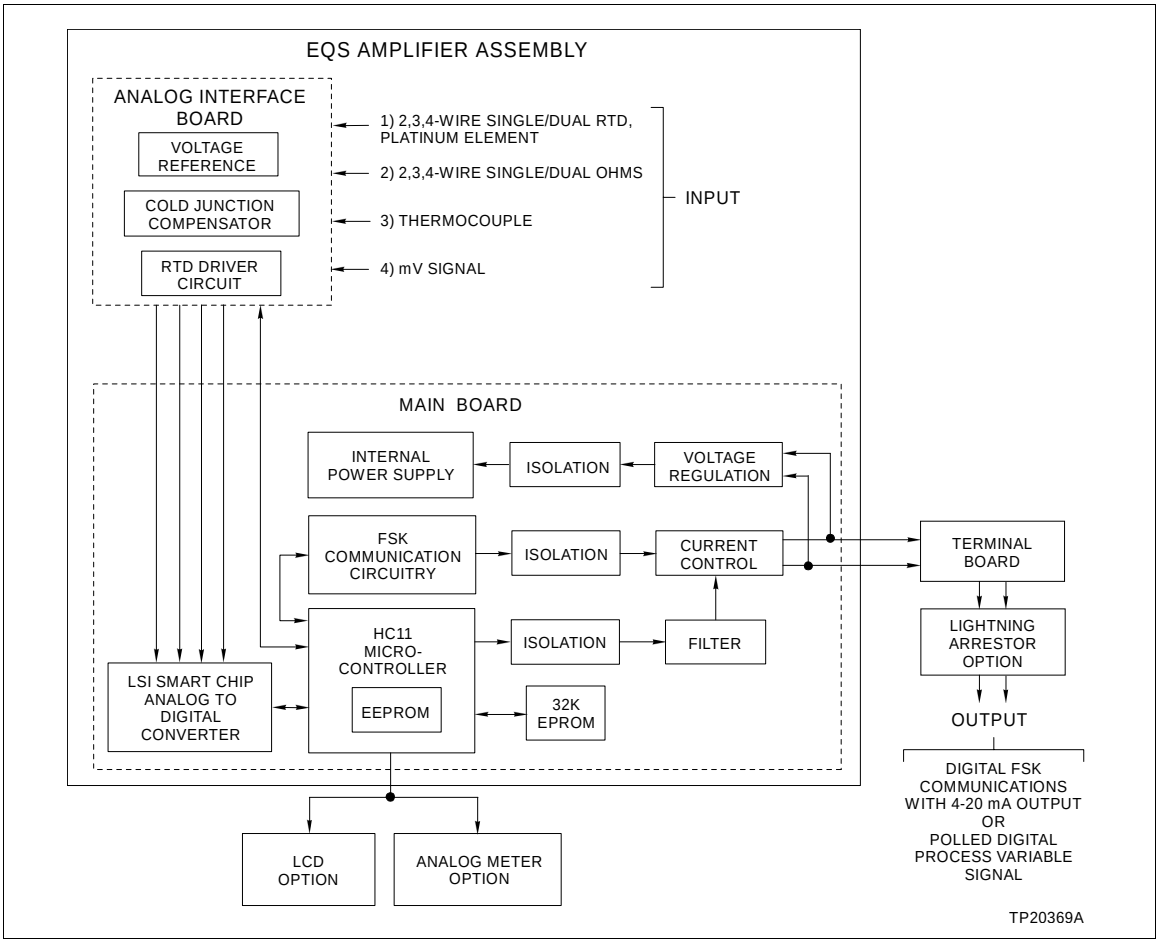

Figure 2-1. Electronics Block Diagram

The terminal is fully powered by six AA nickel cadmium (NiCd) batteries. It operates for approximately 24 hours continuous when fully charged. Information in the internal nonvolatile memory remains for approximately ten years.

Temperature Compensation

The output of a temperature sensor, located at the sensor input terminals, is monitored. Its output provides reference junction compensation on thermocouple inputs. It also provides a way to compensate for ambient temperature changes within the electronics housing. The transmitter temperature can be displayed on the LCD or monitored with the Type STT02E terminal.

Diagnostics

Continuous self-diagnostic results are available through the Type STT02E terminal. Areas monitored are configuration integrity, sensor status, transmitter temperature, and electronic circuitry. The diagnostics may indicate if a calibration error occurs.

Configuration and Operational Commands

Output commands permit definition of the output as linear with respect to the input, or as a function generator that follows a curve consisting of six straight line segments. The output can be set to normal or reverse acting, or fixed to a specific value for plant start-up or troubleshooting purposes. Other commands define default values for transmitter power up and failure. A damping adjustment command is also available.

The function generator curve is programmed into the transmitter via the Type STT02E 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 the ***OPERATING PROCEDURES*** section of this document and the ***Type STT02E Smart Transmitter Terminal Product Instruction*** for more information on programming the function generator.

Table 2-1 shows the configuration parameters for the example function generator shown in Figure 2-2. This example shows how the function generator can be used to curve fit a 25.5 ohm, three-wire, single element Platinum 392 RTD (alpha = 0.00392), from -20 to +100 degrees Celsius.

Table 2-1. Configuration Example

Parameter	Value
ID Tag	EQS
Operating Mode	Analog
Channel Number	N/A
Transmitter Type	EQS
Sensor Type	Ohms
RTD Type	N/A
Number of Elements	1
Number of Wires	3
Thermocouple Type	N/A
Primary EU	Ohms
Output Type	Function Generator
Point 1 In	16.91
Point 2 In	33.73
Point 3 In	50.45
Point 4 In	67.06
Point 5 In	83.58
Point 1 Out	16.67

Table 2-1. Configuration Example (continued)

Parameter	Value
Point 2 Out	33.33
Point 3 Out	50.00
Point 4 Out	66.67
Point 5 Out	83.33
Output Action	Normal
Damping	0.0 sec
Primary LRV	23.46
Primary URV	35.51
Initialize Output	Low
Input Fail	High
Secondary EU	°C
Secondary LRV	-20
Secondary URV	100
Low Temp Alarm	-50°C
High Temp Alarm	85°C

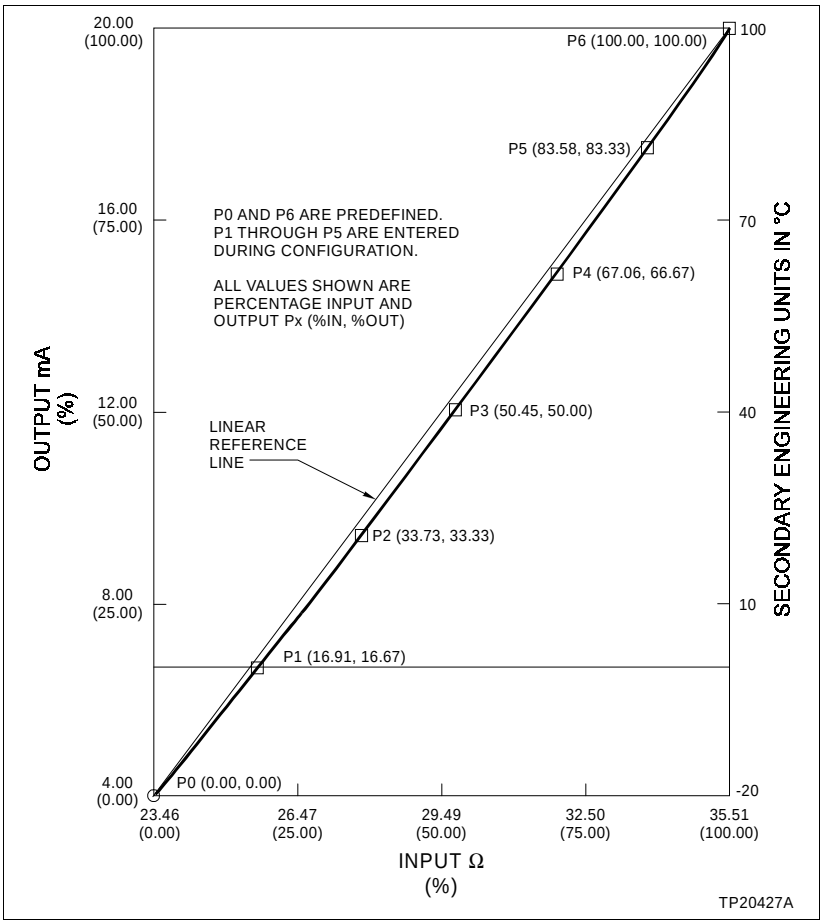

Figure 2-2. Function Generator Example

SECTION 3 - INSTALLATION

INTRODUCTION

This section aids in all levels of the installation process. It provides procedures for placing the transmitter into service. There is an installation sequence flowchart (Fig. 3-1) that directs the installation technician to the appropriate Installation Job Sheet.

> **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.

SPECIAL HANDLING

Semiconductor devices are subject to damage by static electricity. Therefore, observe these techniques during installation, servicing, troubleshooting, and repair.

> **NOTE:** An antistatic kit (Field Static Kit No. 1948385_1) is available for personnel working on equipment containing semiconductor devices. The kit contains a static-dissipative mat, a ground cord assembly, wrist bands, and alligator clips.

- Most assemblies with semiconductor devices come in a special antistatic bag. Keep the assembly in the bag as much as possible whenever the assembly is not installed.

- Assemblies containing semiconductor devices should be removed from their antistatic container only under certain conditions:

  - When at a static-free workstation or when the bag is grounded at a field test site.

  - Only after neutralizing the conductive area of the container.

  - Only after firm contact with an antistatic mat and/or firmly gripped by grounded personnel.

- Personnel handling assemblies with semiconductor devices should be neutralized to a static-free workstation by a grounding wrist strap connected to the station or to a good ground point at a field site.

- Do not allow clothing to contact semiconductor devices. Most clothing generates static electricity.

- Avoid touching connectors or components.
- Avoid partial connection of semiconductor devices. Most devices can be damaged by floating leads, especially the power supply connector. If an assembly must be placed in a live system, it should be done quickly. Do not cut leads or lift circuit paths when troubleshooting.
- Be sure to ground the test equipment.
- Avoid static charges during removal and replacement. Make sure the assembly is fully clean around its leads, but do not rub or clean with an insulating cloth.

UNPACKING AND INSPECTION

When the transmitter is received, it should be unpacked and inspected.

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

2. Remove any loose packing from the carton.

3. Carefully remove the transmitter from the carton.

4. Inspect the nameplate and 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 stated in Table 1-4.

SETUP AND PHYSICAL INSTALLATION

The quality of the measurement depends on the correct installation of the transmitter. This includes both mounting and wiring.

Because of process and economic considerations, temperature 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 unit, be sure to leave ample clearance to open the cover of the electronics (Fig. I3-1). Wire the transmitter **PWR/OUTPUT** connections with a twisted, shielded pair cable for best results. Avoid sources of EMI/RFI. The sensor

connections must be placed in metallic conduit, or shielded when remote mounting the transmitter.

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 years of troublefree service. However, component failures that disrupt process control are still possible. In addition, power line induced failures, static discharge, conducted and radiated EMI, acts of nature such as lightning strikes, failures caused by human error, and accidents can cause disruption of process control.

Refer to ***Initialization and Failure Conditions*** in Section 5 to select defaults for failure conditions.

HAZARDOUS LOCATION INSTALLATIONS (FLAMMABLE ATMOSPHERES)

The 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***.

INSTALLATION SEQUENCE

Refer to Figure 3-1 for the installation sequence for the Type EQS temperature transmitter. Each block of the flow represents a single task that must be completed before continuing with the sequence.

In some cases, more than one path can be taken during installation. For paths that are in parallel, either complete all of the tasks in all of the paths before continuing or complete all of the tasks in only those paths that apply before continuing. At least one path must be completed.

Some blocks contain alphanumeric codes. These codes identify the Installation (I) Job Sheet that describes the steps to complete an indicated task. Complete all of the steps given in an Installation Job Sheet before continuing to the next sheet.

By treating each task as a separate entity, the job sheets provide an easy method for finding the information needed to perform each task in the installation sequence. The job sheets are located in the back of this product instruction and can be easily removed and placed in separate folders or notebooks, or carried to the installation site.

can be easily removed and placed in separate folders or notebooks, or carried to the installation site.

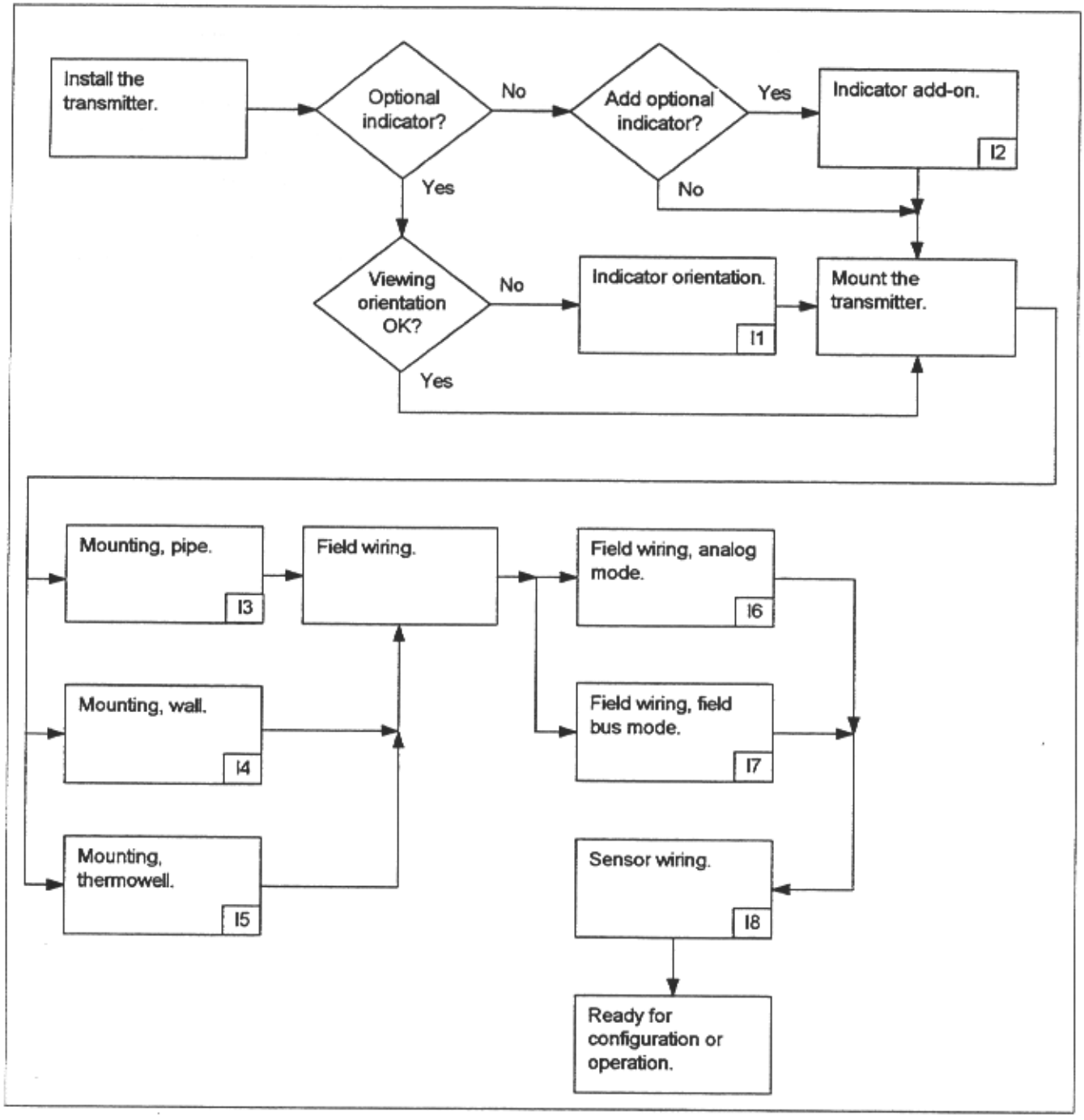

Figure 3-1. Installation Sequence Flowchart

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. Failure to follow this warning can lead to unsafe conditions that can injure personnel and damage equipment.**
AVERTISSEMENT	**En ce qui concerne l'installation anti-explosioin et anti-ignition provoqué par la poussière dans des endroits se Classe II ou Classe III, il est indispensable que l'assemblage soit tenu étanche pendant que les circuits sont électrises, a moins que cet endroit ne présente aucun danger a ce moment-la. Toute négligence à cet égard peut entraîner des conditions dangereuses qui risquent de provoquer des blessures et des dommages matériels.**

The Type EQS temperature transmitter is factory calibrated for all sensor types and ranges. If an additional bench input calibration is required, the transmitter will be calibrated for all sensor types and ranges upon completion of the calibration procedures. The transmitter does not require calibration before initial installation, although a calibration check may be desired.

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

CALIBRATION SEQUENCE

Refer to Figure 4-1 for the calibration sequence for the Type EQS temperature transmitter. Each block of the flow represents a single task that must be completed before continuing with the sequence.

In some cases, more than one path can be taken during calibration. For paths that are in parallel, either complete all of the tasks in all of the paths before continuing or complete all of the tasks in only those paths that apply before continuing. At least one path must be completed.

Some blocks contain alphanumeric codes. These codes identify the Calibration (C) Job Sheet that describes the steps to complete the indicated task. Complete all of the steps given in a Calibration Job Sheet before continuing to the next sheet.

By treating each task as a separate entity, the job sheets provide an easy method for finding the information needed to perform each task in the calibration sequence. The job sheets are located in the back of this product instruction and can be easily removed and placed in separate folders or notebooks, or carried to the calibration site.

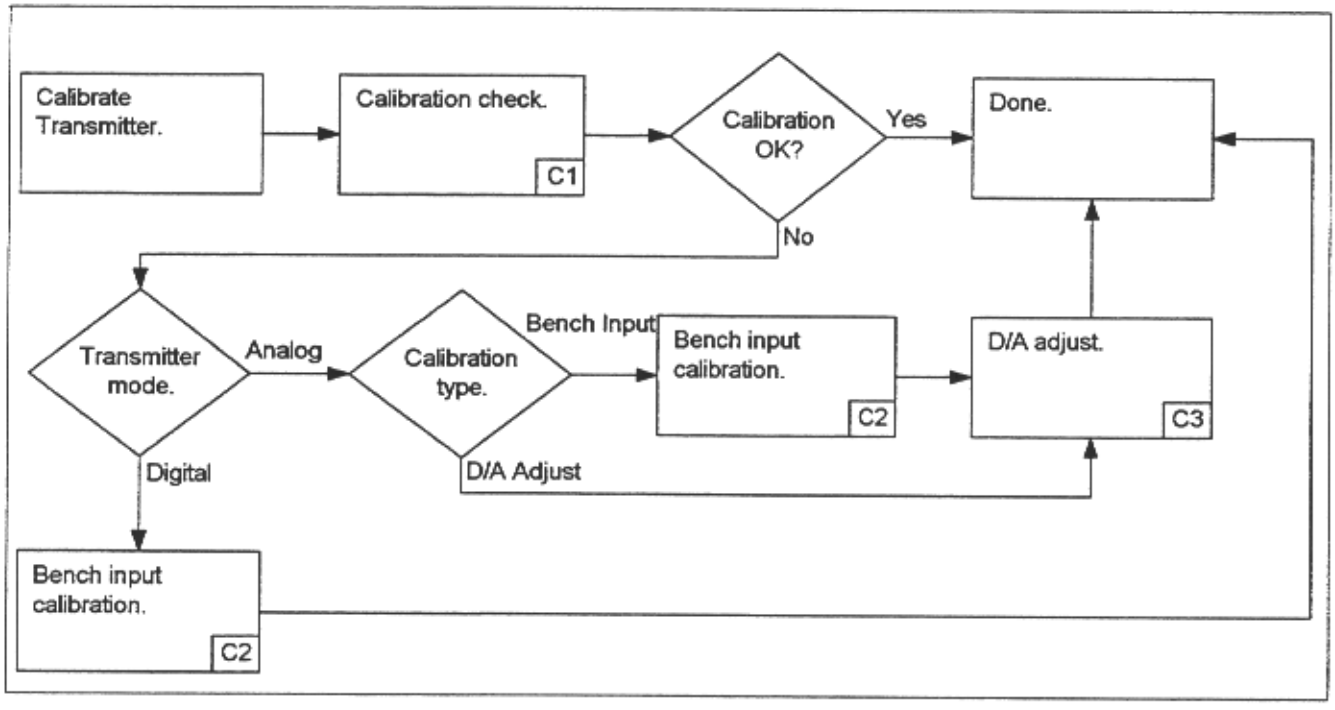

Figure 4-1. Calibration Sequence Flowchart

SECTION 5 - OPERATING PROCEDURES

INTRODUCTION

This section addresses start-up procedures, configuration and monitoring of the Type EQS Platinum Standard Smart Temperature Transmitter.

OPERATOR INTERFACE

The Type EQS temperature transmitter can be monitored and controlled using the Type STT02E Smart Transmitter Terminal. Connect the Type STT02E terminal wherever there is convenient access (Figs. I6-1 and I7-1). For analog mode wiring, the connection must be made between the resistance and the transmitter - it cannot be made directly across the power supply.

Refer to the ***Type STT02E Smart Transmitter Terminal Product Instruction*** for detailed information and data entry procedures.

CONFIGURATION PROCEDURE

> **NOTE:** This section only addresses configuration and operational parameters as they relate to the Type STT02E terminal. Refer to the appropriate product instruction for information on other communication devices.

Use **CONFIG** and follow the step-by-step procedures in the ***Type STT02E Smart Transmitter Terminal Product Instruction***. Once a configuration has been saved in the Type STT02E terminal, download it to a connected transmitter using **SEND CONFIG**.

The remainder of this section explains configuration parameters. In general, It does not contain step-by-step procedures for entering these parameters. Refer to the ***Type STT02E Smart Transmitter Terminal Product Instruction*** for detailed procedures.

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 **STATUS**.

Select Mode

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

Channel Number (Transmitter Address)

The transmitter address (displayed as *CHANNEL #* on the Type STT02E terminal) is used for field bus mode 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 instrumentation. Choose *EQS* by using ↑ and ↓ and then pressing ENTER.

Sensor Type

The sensor type choices are *THERMOCOUPLE, MILLIVOLT, RTD, or OHMS*. Use ↑ and ↓ until reaching the desired selection and then press ENTER.

RTD Type

The Type EQS temperature transmitter supports 100-ohm platinum 385 and 100-ohm platinum 392[1] RTD curves. Use ↑ and ↓ until reaching the desired selection for the installed RTD and then press ENTER.

Number of Elements

Select *SINGLE* when measuring temperature with one RTD element. Select *DUAL* when measuring temperature with two RTD elements. Use ↑ and ↓ until reaching the desired selection and then press ENTER.

Number of Wires

This parameter corresponds to the number of sensor leads on the RTD or ohms sensor. Use ↑ and ↓ until reaching the desired selection and then press ENTER.

1. 98.129 ohms at 0°C (32°F). Meets SAMA RC21-4-1966. For other curve requirements, consult Bailey-Fischer & Porter.

Thermocouple Type

The transmitter supports thermocouple Types B, C, E, J, K, N, R, S, and T. Use ←, →, ↑, and ↓ until reaching the desired selection for the installed thermocouple and then press ENTER.

Primary Engineering Units

Primary engineering units are programmable. Refer to Table 5-1 for the selections available, and to which modes they apply.

Use ↑ and ↓ until reaching the desired selection and then press ENTER.

Table 5-1. Primary Engineering Units[1] (STT02E)

Selections		Applicable Modes
Display	Translation	
degC	Degrees Celsius	T/C, RTD
degF	Degrees Fahrenheit	T/C, RTD
degK	Degrees Kelvin	T/C, RTD

NOTE:
1. If the sensor type selection was *MILLIVOLT* or *OHMS*, the primary engineering units will automatically be set to *mV* or *ohms* respectively.

Output Type

The output of the transmitter must be specified as linear with respect to the input, 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 last point on the curves are assumed to be zero and 100 percent respectively. Program five other points between these two values (refer to ***Configuration and Operational Commands*** in Section 2).

Use ↑ and ↓ to select *FUNC GENERATOR* if required and then press ENTER. Use 0 through 9, ±, and . to program each of the five curve points and press ENTER.

> **NOTE:** If an error is made while programming the values, press CLEAR before ENTER to start over.

Output Action

A transmitter in the normal acting mode has an output that increases with increasing input. The output of a transmitter in the reverse acting mode decreases with an increasing input. Use ↑ and ↓ until reaching the desired selection and then press ENTER.

Damping

Damping adjustments have no effect on the calibration or accuracy of the transmitter; however, response time increases with increased damping. 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 where a long response time can be tolerated. A damping adjustment of 0.00 seconds would be used for an extremely quiet signal where a fast response time is desired.

Use 0 through 9 and . to program the value and press ENTER.

NOTE: If an error is made while programming the value, press CLEAR before ENTER to start over.

Primary Upper and Lower Range Values

The range of the transmitter may be set electronically to any value to suit a specific application, provided the values are acceptable to the transmitter. Refer to Table 1-3 for the ranges of the transmitter for specific input types.

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 particular sensor. Refer to Table 1-3 for the proper ranges.

Use 0 through 9, ±, and . to program the primary lower range value and press ENTER. Repeat the process for the primary upper range value.

NOTE: If an error is made while programming the values, press CLEAR before ENTER to start over.

Initialization 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.**
AVERTISSEMENT	**Les signaux de sortie des transmetteurs intelligents prennent une valcur fixe au moment du initialisation, ainsi que lors de la détection d'une défectuosité. L'utilisateur doit affecter une valeur qui assurera un fonctionnement sécuritaire.**

INITIALIZE MODE

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.

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

In the field bus mode, *INITIALIZE LOW* sets the output to below zero percent (approximately 3.7 milliamps) while *INITIALIZE HIGH* sets the output to above 100 percent. However, the current stays at approximately 3.7 milliamps.

The default initialization value is low (below zero percent). After initialization, the output ramps up or down to the correct value.

Use [↑] and [↓] until reaching the desired selection and then press [ENTER].

FAIL MODE

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 in the ***TROUBLESHOOTING*** section 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 milliamps and output corresponding to 100 percent input would be 20 milliamps. For a transmitter in the reverse acting mode, output corresponding to zero percent input would be 20 milliamps and output corresponding to 100 percent input would be four milliamps.

Use [↑] and [↓] until reaching the desired selection and then press [ENTER].

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 milliamps (**MA**) or microvolts (**UV**). These units are used in conjunction with the secondary lower and upper range numeric values.

Use ↑ and ↓ or 0 through 9 to select the secondary units.

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

2. If an error is made while programming the values, press CLEAR before ENTER to start over.

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 STT02E terminal or displayed on the local LCD. The ranges are a function of the output of the device. 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.

Use 0 through 9, ±, and . to program the secondary lower range value and press ENTER. Repeat the process for the secondary upper range value.

NOTE: If an error is made while programming the values, press CLEAR before ENTER to start over.

Electronics Temperature Alarm Limits

This sets the alarm limits for the temperature inside the electronics housing. The default values are -50.00 and +85.00 degrees Celsius. Program the alarm limits anywhere between these two values.

Use 0 through 9, ±, and . to program the low temperature alarm limit and press ENTER. Repeat the process for the high temperature alarm limit.

NOTE: If an error is made while programming the values, press CLEAR before ENTER to start over.

Get Configuration

Once a Type EQS transmitter has been configured, the configuration that has been loaded into the transmitter memory may be retrieved by pressing GET CONFIG on the Type STT02E terminal (refer to the ***Type STT02E Smart Transmitter Terminal Product Instruction***).

Store Configuration

To store the configuration in the Type STT02E terminal memory, press GET CONFIG, and use ↓ to answer *YES* to the

STORE THIS CONFIGURATION? message on the display. Press ENTER.

Send Configuration

SEND CONFIG allows selection of a configuration from the terminal memory to be sent to the transmitter (refer to the ***Type STT02E Smart Transmitter Terminal Product Instruction***).

View Configuration

Pressing VIEW CONFIG allows the parameters of the working configuration to be viewed, but not changed (refer to the ***Type STT02E Smart Transmitter Terminal Product Instruction***).

OPERATIONAL FUNCTIONS

Operational functions for the Type EQS temperature transmitter are performed using the special keystrokes or keystroke sequence on the Type STT02E terminal. For step-by-step procedures, refer to the ***Type STT02E Smart Transmitter Terminal Product Instruction***.

Operational functions available from the Type STT02E terminal are performed using SPECIAL FEATURE, OUTPUT, STATUS, and F1.

Special Feature Key

Press SPECIAL FEATURE on the Type STT02E terminal to display the special features available.

FIX OUTPUT/CANCEL FIX OUTPUT

For system troubleshooting purposes, the Type EQS temperature transmitter output can be set to a constant, specified as a percent of the four to 20 milliamp signal. Press SPECIAL FEATURE and use the ↑ and ↓ keys to select *FIX OUTPUT* from the menu of the Type STT02E terminal. Press ENTER.

Use 0 through 9 and . to fix the output anywhere between zero and 100 percent and press ENTER.

> **NOTE:** If an error is made while programming the value, press CLEAR before ENTER to start over.

To cancel the fixed output, press SPECIAL FEATURE and use ↑ and ↓ to select *CANCEL FIX OUTPUT* from the menu of the Type STT02E terminal. Press ENTER.

LCD SETUP

The LCD can be programmed to display output in percent or user-defined secondary engineering units, input in primary engineering units, reference junction temperature and the ambient temperature inside the electronics housing (in degrees Celsius), and the ID tag. If the displayed variable is outside the range of ±9999, the LCD flashes lines across the display.

Press SPECIAL FEATURE and use ↑ and ↓ to select *LCD SETUP* from the menu of the Type STT02E terminal. Press ENTER.

Use ↑ and ↓ to make the desired display choice and press ENTER.

STANDARD CONFIGURATION

This function allows the configuration of the transmitter to be changed back to the standard factory configuration (refer to Table 1-8).

Press SPECIAL FEATURE and use ↑ and ↓ to select *STANDARD CONFIGURATION* from the menu of the Type STT02E terminal. Press ENTER. Use ↑ and ↓ to select *YES* and press ENTER.

Output Key

Press OUTPUT on the Type STT02E terminal to display the output features.

MONITOR OUTPUT

The output of the Type EQS temperature transmitter can be monitored by pressing OUTPUT on the Type STT02E terminal, using ↑ and ↓ to select *MONITOR OUTPUT* from the displayed menu, and pressing ENTER. The Type STT02E terminal displays the output in percent, rather than in milliamps, and updates once per second.

MONITOR INPUT

The input to the Type EQS temperature transmitter can be monitored by pressing OUTPUT on the Type STT02E terminal, using ↑ and ↓ to select *MONITOR INPUT* from the displayed menu, and pressing ENTER. The Type STT02E terminal displays the input in primary engineering units and updates once per second.

MONITOR SECONDARY ENGINEERING UNITS

The secondary engineering units variable can be monitored by pressing OUTPUT on the Type STT02E terminal, using ↑ and ↓ to select *SECONDARY UNITS* from the displayed menu, and pressing ENTER. The output reflects the output of the transmitter, but is a percentage of the secondary lower and upper range values. The Type STT02E terminal displays the output in secondary engineering units.

Example: If the secondary lower range value is 10°C and the secondary upper range value is 100°C and the output of the transmitter is at 75 percent, the display reads 75 percent range, or:

$$[0.75 \times (100.0 - 10.0)] + 10.0$$
$$= (0.75 \times 90.0) + 10.0 = 77.5°C.$$

MONITOR REFERENCE JUNCTION AND TRANSMITTER AMBIENT TEMPERATURE

The reference junction and ambient temperature inside the electronics housing can be monitored by pressing OUTPUT on the Type STT02E terminal, using ↑ and ↓ to select *TEMPERATURE* from the displayed menu, and pressing ENTER. The Type STT02E terminal displays the temperature in degrees Celsius.

Status Key

The status of the transmitter, determined from results of the continuous self-diagnostics, can be checked using STATUS on the Type STT02E terminal (refer to the ***Type STT02E Smart Transmitter Terminal Product Instruction***). Refer to the troubleshooting section for corrective action.

F1 Key

The Type STT02E terminal allows configurations to be copied to and from Type STC Smart Terminal 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 F1 on the Type STT02E terminal (refer to the ***Type STT02E Smart Transmitter Terminal Product Instruction*** for more information).

RERANGING THE ANALOG OUTPUT

Pressing RERANGE on the Type STT02E terminal allows the current (four to 20-milliamp) output to be quickly reranged to represent a different portion of the input span. This procedure bypasses the need to completely configure the transmitter. Damping, engineering units, and the temperature alarm can

also be adjusted during rerange. Refer to the ***Type STT02E Smart Transmitter Terminal Product Instruction***.

> **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 particular sensor. Refer to Table 1-3 for the proper ranges.

CONFIGURATION LOCKOUT PROCEDURE

The Type EQS temperature transmitter has a lockout feature. When locked, configuration and calibration information is unalterable. This has no effect on the monitoring of transmitter functions.

> **NOTE:** Refer to ***SPECIAL HANDLING*** in Section 3 when performing this procedure.

1. Remove power from the transmitter.

2. Remove the housing cover from the amplifier assembly side of the transmitter.

3. If there is an optional indicator, go to Step 4. If there is no optional indicator, go to Step 5.

4. Remove the four indicator screws (Fig. 5-1) and unplug the optional indicator from the amplifier assembly. Go to Step 5.

> **NOTE:** The main board connector in the amplifier assembly, which is accessible through the meter opening (Fig. 5-1), is female, as are the four connectors on the back of the LCD. Therefore, there is a male-to-male header strip between the two female connectors. Be sure the header strip stays in the main board connector in the amplifier assembly when the LCD is unplugged. If it comes out with the LCD, remove it from the LCD and replace it in the main board connector in the amplifier assembly before continuing with this procedure.

5. Use needle nose pliers to change the jumper position. **LOCKOUT A** enables the configuration and **LOCKOUT B** locks configuration (Fig. 5-2).

6. Reverse this procedure to put the transmitter into service.

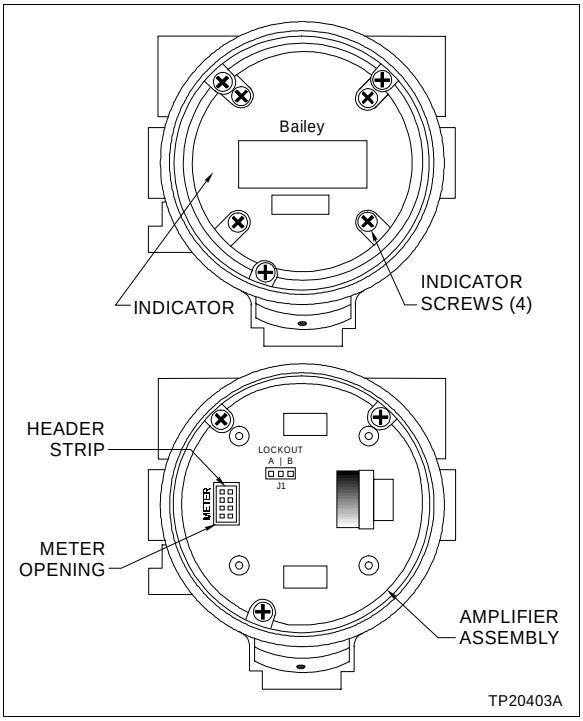

Figure 5-1. Lockout Jumper Access

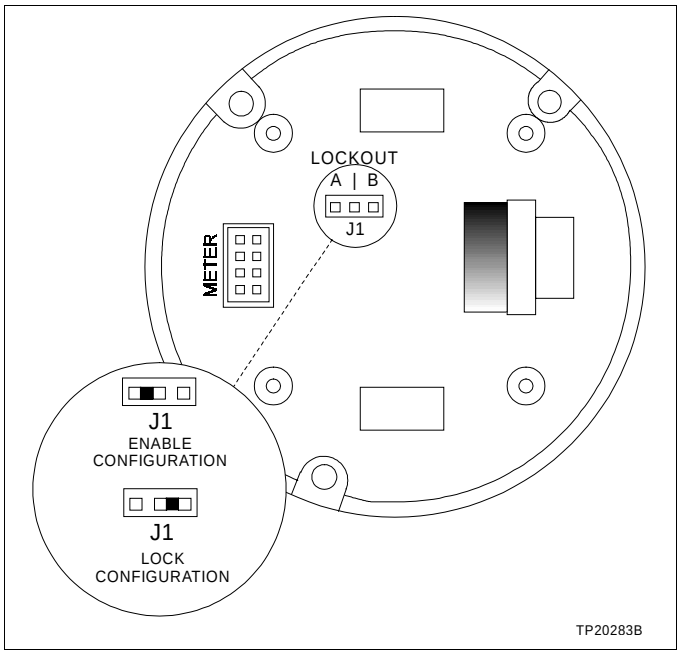

Figure 5-2. Lockout Jumper

SECTION 6 - TROUBLESHOOTING

INTRODUCTION

If the Type EQS Platinum Standard Smart Temperature Transmitter cannot implement a command, the Type STT02E Smart Transmitter Terminal is prompted.

To view the error message on the Type STT02E terminal, press **STATUS**.

If an error occurs, but is corrected before the terminal is connected, the message is stored and indicated when the terminal is connected. Table 6-1 shows the 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. Refer to Figure 6-1 for a troubleshooting flowchart.

> **NOTE:** More than one error can be present on one transmitter; however, only one error at a time can be displayed on the Type STT02E terminal. As such, error messages on the Type STT02E 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 on the priority structure, after the first error has been corrected.

ERROR MESSAGES AND CORRECTIVE ACTION

This section contains all of the possible error messages pertaining to the Type EQS temperature transmitter that can display on the Type STT02E terminal. Table 6-1 lists the messages in alphabetical order and has four columns.

Message Lists the errors (alphabetically) exactly as they appear.

Fail Mode Indicates if the error causes the Type EQS temperature transmitter to enter the fail mode. Refer to ***Initialization and Failure Conditions*** in Section 5 for more information.

Probable Cause Provides a brief explanation of the cause of the error.

Corrective Action Lists actions to take for each error.

Table 6-1. Type STT02E Terminal Error Messages

Message	Fail Mode	Probable Cause	Corrective Action
CANNOT SAVE, CONFIGURATION TOO LARGE	No	Transmitter type not supported by Type STT02E terminal firmware revision level.	Consult Bailey-Fischer & Porter regarding latest Type STT02E terminal firmware revision level.
CHECKSUM ERROR	Yes	The data the transmitter received did not pass a checksum test (data corrupted).	Extreme line noise could cause this code to randomly appear. Since the transmitter and communication devices do not check data for integrity, this is not a problem. If error code appears frequently, replace amplifier assembly (refer to the repair/replacement procedures section).
CONFIG "tagname" ALREADY EXISTS	No	Attempted to copy a configuration to a cartridge or transmitter or where it already exists.	Erase old configuration before copying new one. Refer to the ***Type STT02E Smart Transmitter Terminal Product Instruction***.
ELECTRONICS TEMPERATURE MEASUREMENT FAILURE	No	Hardware failure of on-board temperature sensor.	Replace amplifier assembly (refer to the repair/replacement procedures section).
ELECTRONICS TEMPERATURE OVER USER ALARM	No	Ambient temperature of transmitter is above user limit.	Change user limit. Relocate transmitter.
ELECTRONICS TEMPERATURE UNDER USER ALARM	No	Ambient temperature of transmitter is below user limit.	Change user limit. Relocate transmitter.
ERROR! ATTEMPT TO CONFIGURE DUPLICATE ADDRESS	No	Attempt was made to assign an analog mode transmitter an address on the field bus.	Be sure transmitter is in correct mode. Refer to ***Type STT02E Smart Transmitter Terminal Product Instruction*** for details.
		Attempt was made to assign a field bus mode transmitter an occupied field bus address.	Assign transmitter to an unoccupied address or channel number on FBS.
FIELD DEVICE CAN'T EXECUTE COMMAND: FBS ON-LINE	No	The Type STT02E terminal cannot change any parameters while the field bus is active.	Transmitter must be brought off-line. This can be done from the MFC/MFP module by tuning the function code. To bring the transmitter off-line, the I/O module can be unplugged from the rack. Be aware that by doing this, communication and the process value is lost for all other transmitters on the bus. When the I/O module is unplugged, there is a two-minute time-out period until the communication device will be allowed to change parameters. After the two-minute period, the transmitter allows the Type STT02E terminal access.
FIELD DEVICE CAN'T EXECUTE COMMAND: INVALID COMMAND	No	Incorrect syntax.	Wrong transmitter type selected during configuration.
		Excessive line noise.	Check line noise. Use an oscilloscope to determine if line noise is excessive.
		Type STT02E terminal failure.	Verify Type STT02E terminal operation. Verify by using another terminal that is known to be operational.

Table 6-1. Type STT02E Terminal Error Messages (continued)

Message	Fail Mode	Probable Cause	Corrective Action
FIELD DEVICE CAN'T EXECUTE COMMAND: LOCKOUT ENGAGED	No	Unable to configure or calibrate, because hardware lockout is engaged.	Hardware lock active. Refer to ***CONFIGU TION LOCKOUT PROCEDURE*** in Sectio
FIELD DEVICE CONFIG-URATION DOES NOT MATCH STTO2'S	No	Configuration of the transmitter does not exactly match the corre-sponding configuration in the Type STT02E terminal.	Rerange was executed without updating t Type STT02E terminal configuration. Refe ***Send Configuration*** in Section 5.
FIELD DEVICE INPUT OVER RANGE	No	Input exceeds sensor specification.	Correct the input to be within specificatior choose another sensor.
FIELD DEVICE INPUT UNDER RANGE			
FIELD DEVICE INTER-NAL REFERENCE FAIL-URE	Yes	Amplifier assembly damaged.	Replace amplifier assembly (refer to the r replacement procedures section).
FIELD DEVICE MAIN ELECTRONICS EEPROM FAILURE	Yes	Memory problem.	Remove power from transmitter and reap error still exists after reset, replace amplif assembly (refer to the repair/replacement dures section).
FIELD DEVICE MAIN INPUT FAILURE	No	Amplifier assembly failure.	Replace amplifier assembly (refer to the r replacement procedures section).
FIELD DEVICE NOT RESPONDING	No	Communication device not con-nected properly.	Check Type STT02E terminal wiring conn tions. Refer to Figure I6-1 or I7-1 for corre ing arrangements.
		Short in communication wire.	Perform a continuity check to determine if short exists.
		Transmitter does not have 17 VDC (17.4 VDC if using optional lightning arrestor) across inputs.	Correct power problem.
		Not using correct communication method.	Verify correct communication method is selected. Refer to ***Type STT02E Smart T mitter Terminal Product Instruction*** for c If error is still present, go to the next step.
		Transmitter or communication device is defective.	If available, verify that the Type STT02E te is functional by connecting it to another tra ter. Replace the Type STT02E terminal if i functional. If Type STT02E terminal is functional, rep the amplifier assembly in the transmitter (r the repair/replacement procedures sectio
FIELD DEVICE NOT SUPPORTED BY CAR-TRIDGE OR HANDHELD	No	Type EQS transmitter not sup-ported by the release of Type STT02E terminal firmware and cartridge.	Check to see if the proper cartridge is ins into the Type STT02E terminal.

Table 6-1. Type STT02E Terminal Error Messages (continued)

Message	Fail Mode	Probable Cause	Corrective Action
FIELD DEVICE OPEN SENSOR	No	Sensor failure.	Check connections. If this does not help, replace the sensor.
		Amplifier assembly failure.	Replace amplifier assembly (refer to the repair/ replacement procedures section).
FIELD DEVICE OUT-PUT IS FIXED OR IN ADJ. MODE	No	Type STT02E terminal turned off while the 4 to 20 mA output was being calibrated.	Power down the transmitter and power up the transmitter.
		Transmitter cannot execute com-mand because of fix output.	Take transmitter out of fix output. Refer to the operating procedures of this manual and the ***Type STT02E Smart Transmitter Terminal Product Instruction***.
FIELD DEVICE RAM FAILURE	Yes	Memory problem.	Replace amplifier assembly (refer to the repair/ replacement procedures section).
FIELD DEVICE TEM-PERATUER ABOVE LIMIT	No	Temperature inside electronics housing exceeds limit set at factory.	Remove the source of the temperature extreme.
FIELD DEVICE TEM-PERATURE BELOW LIMIT			
INPUT APPLIED INCOR-RECTLY, CALIBRATION FAILED	No	Calibrated input outside of factory allowable limits.	Correct the calibration signal and calibrate (refer to the calibration section).
SORRY, THAT ROU-TINE NOT IMPLE-MENTED IN D10	No	Cartridge not compatible.	Purchase latest Type STT02E terminal firmware. Refer to spare parts lists in ***Type STT02E Smart Transmitter Terminal Product Instruction***.
UNKNOWN ERROR	No	Transmitter reported an error that was not understood by Type STT02E terminal.	Contact Bailey-Fischer & Porter technical support.
VALUES OUT OF ACCEPTABLE RANGE FOR FIELD DEVICE	Yes	Transmitter sent data that is out of acceptable range.	Refer to the ***Type STT02E Smart Transmitter Terminal Product Instruction*** to view the con-figuration and verify the parameters.

OUTPUT TROUBLESHOOTING

Table 6-2 lists problems that can occur with the transmitter output that may or may not be indicated by error messages on the Type STT02E terminal. Table 6-2 has three columns.

Fault Lists the symptom as it appears at the transmitter output.

Probable CauseP Provides a brief explanation of the cause of the fault.

Corrective Action Lists actions to take for each fault.

Table 6-2. Output Troubleshooting

Fault	Probable Cause	Corrective Action
High Output	Transmitter electronics connections.	Make sure all pins and receptacles are clean.
		Check sensor connections.
	Transmitter electronics failure.	Refer to the appropriate communication device instruction to access error codes and refer to Table 6-1 and Figure 6-1.
	Transmitter requires calibration.	Refer to the calibration section and check the calibration of the transmitter.
Erratic Output	Loop wiring.	Check for intermittent shorts, open circuits, and multiple grounds.
	Transmitter electronics connections.	Make sure all pins and receptacles are clean.
		Check sensor connections.
	Transmitter electronics failure.	Refer to the appropriate communication device product instruction to access error codes 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.
	Sensor condition and connections.	Check installation and condition of sensor.
		Note any changes in process properties that may affect output.
	Device in field bus mode.	If analog output is desired, refer to the appropriate communication device product instruction and configure the transmitter in the analog mode.
	Transmitter electronics connections.	Make sure all pins and receptacles are clean.
		Check sensor connections.
	Transmitter electronics failure.	Refer to the appropriate communication device product instruction to access error codes and refer to Table 6-1 and Figure 6-1.
	Transmitter requires calibration.	Refer to the calibration section and check the calibration of the transmitter.

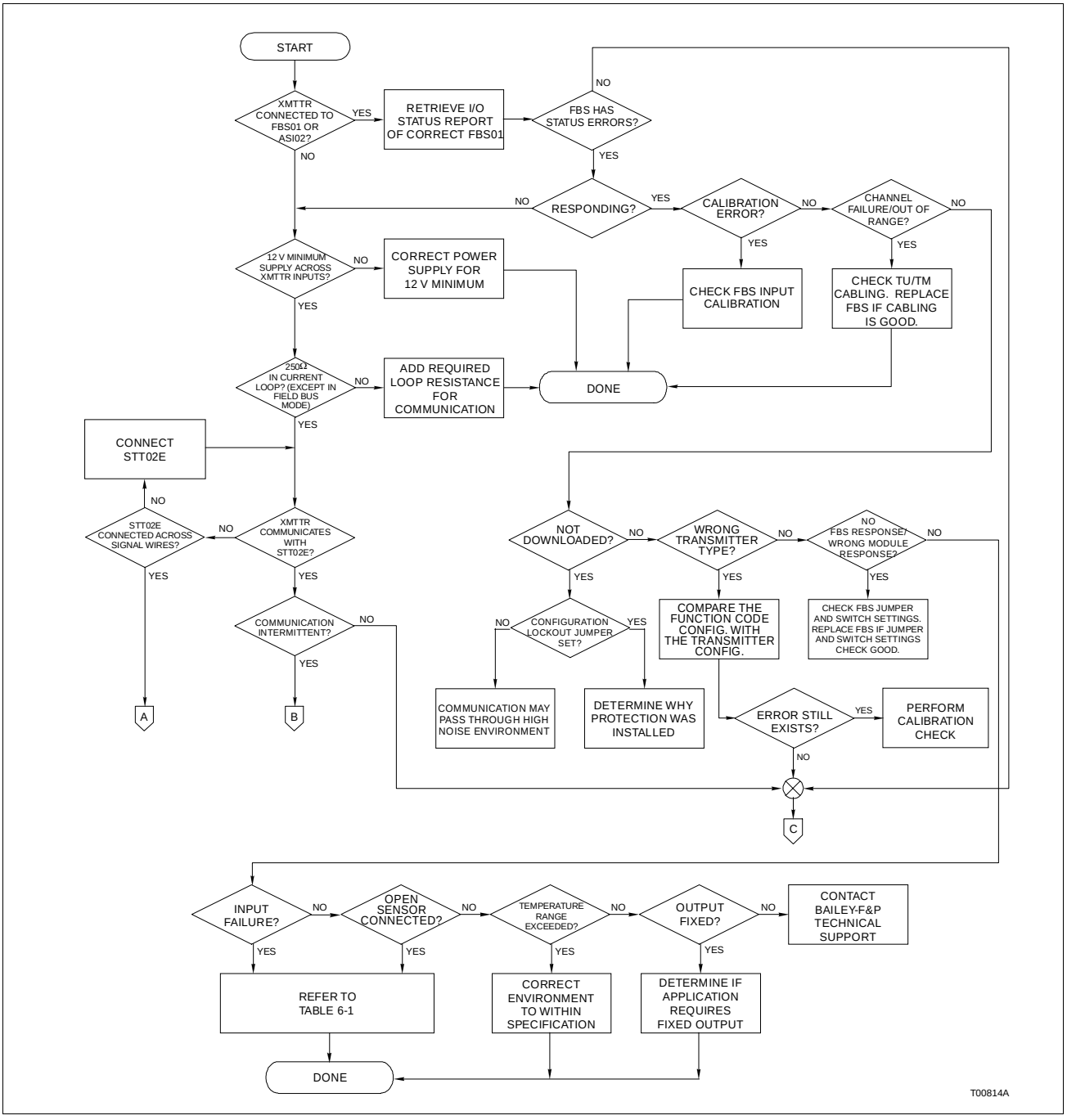

Figure 6-1. Troubleshooting Flowchart

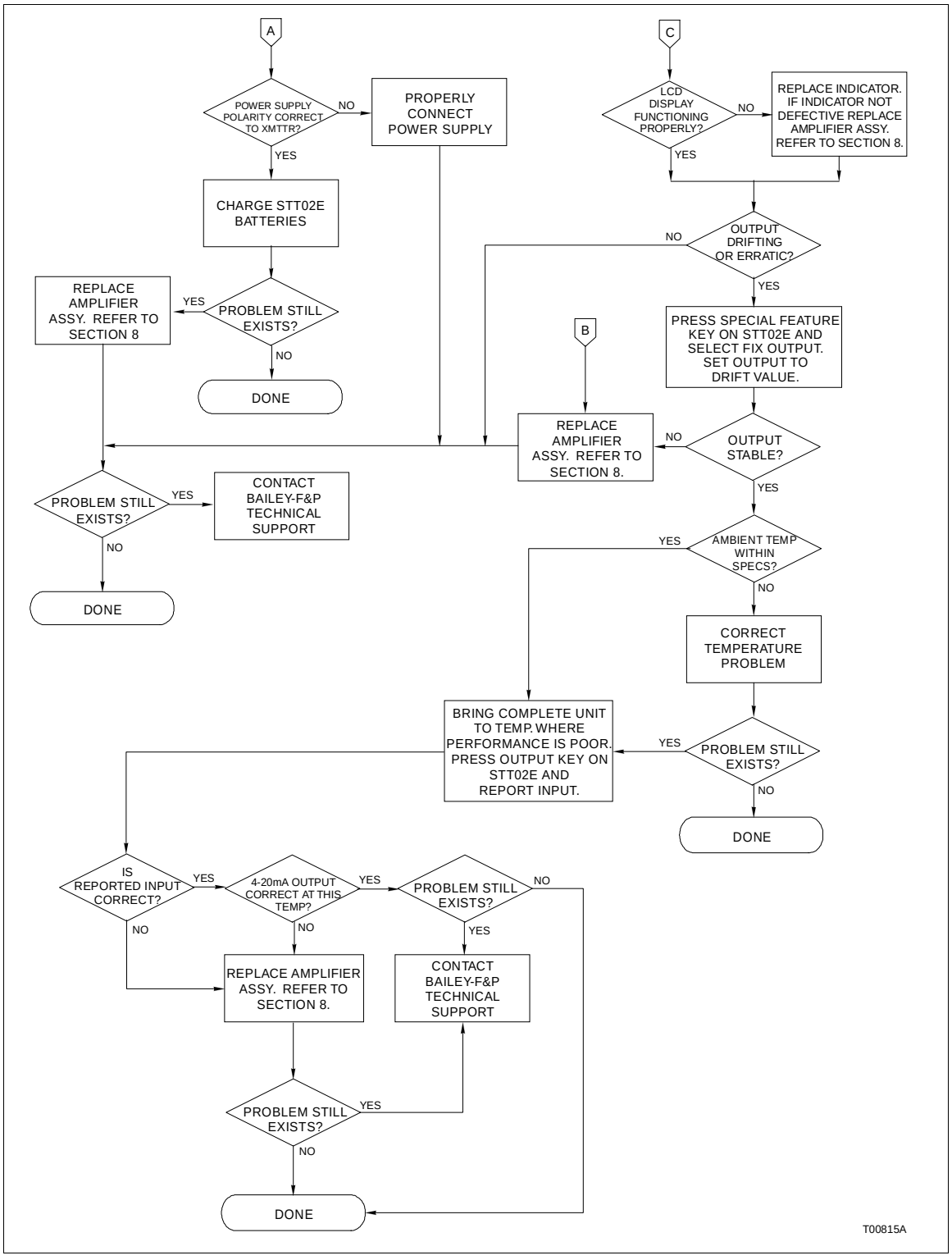

Figure 6-1. Troubleshooting Flowchart (continued)

SECTION 7 - MAINTENANCE

INTRODUCTION

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.

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.

AVERTISSEMENT

L'entretien du système ne doit être effectuée que par le personnel qualifié et seulement une fois que l'équipement contrôlé par le circuit est fixé en place. La modification ou le retrait des composants d'un circuit actif pourraient perturber le processus contrôlé et menter à des blessures au personnel et à l'endommagement de l'équipement.

En ce qui concerne l'installation anti-explosion et anti-ignition provoqué par la poussière dans des endroits se Classe II ou Classe III, il est indispensable que l'assemblage soit tenu étanche pendant que les circuits sont électrises, a moins que cet endroit ne présente aucun danger a ce moment-la. Toute négligence à cet égard peut entraîner des conditions dangereuses qui risquent de provoquer des blessures et des dommages matériels.

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

Personnel performing preventive maintenance should meet the following qualifications.

- Maintenance personnel should be qualified electrical technicians or engineers that know the proper use of test equipment.

- Maintenance personnel should be familiar with the Type EQS Platinum Standard Smart Temperature Transmitter and associated equipment and have experience working with process control systems.

PREVENTIVE MAINTENANCE SCHEDULE

The Type EQS Platinum Standard Smart Temperature Transmitter has no moving parts and requires limited maintenance when operated under normal conditions.

Table 7-1 is the preventive maintenance schedule for the 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***.

Table 7-1. Preventive Maintenance Schedule[1]

Task	Frequency
Clean indicator window (if supplied). See procedure.	3 months
Clean transmitter exterior. See procedure.	
Check and tighten all wiring connections, including power and ground connections. See procedure.	
Check and tighten all conduit connections (procedure depends on the installation and the process).	6 months
Check calibration of the unit. Refer to the calibration section.	12 months
Change O-rings. Refer to the repair/replacement procedures section.	
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.

If the transmitter is inoperative, or if operation is faulty, refer to the troubleshooting section.

PREVENTIVE MAINTENANCE PROCEDURES

This section covers tasks from Table 7-1 that require specific instructions or further explanation. The tasks and instructions covered are:

- Instructions for checking and tightening all wiring connections.
- Instructions for cleaning the indicator window (if supplied).
- Instructions for cleaning the exterior of the transmitter.

Checking Connections

The equipment needed to perform this procedure is:

- 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 as dependant upon the standard cleaning procedures employed by the customer.

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. Refer to Table 1-4 for temperature specifications.

SECTION 8 - REPAIR/REPLACEMENT PROCEDURES

INTRODUCTION

WARNING	**Disconnect power from the application in which the sensor is installed, or take precautions to insure that contact with energized parts is avoided when performing these procedures. Sensor wiring may be energized in certain applications. Failure to follow this warning constitutes an electrical shock hazard that can injure personnel and cause equipment damage.** **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.** **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.**

AVERTISSEMENT	**Débrancher l'alimentation de la commande du procédé sur lequel le capteur est installé, ou prendre toutes les précautions pour s'assurer que tout contact avec les composantes sous tension est évité durant ces procédures. La fillerie du capteur peut être sous tension dans certaines applications. Un manquement à ces procédures constitue un risque de choc électrique qui peut causer des blessures au personnel et endommager l'équipement.** **Les réparations ne doit être effectuée que par le personnel qualifié et seulement une fois que l'équipement contrôlé par le circuit est fixé en place. La modification ou le retrait des composants d'un circuit actif pourraient perturber le processus contrôlé et menter à des blessures au personnel et à l'endommagement de l'équipement.** **En ce qui concerne l'installation anti-explosion et anti-ignition provoqué par la poussière dans des endroits se Classe II ou Classe III, il est indispensable que l'assemblage soit tenu étanche pendant que les circuits sont électrises, a moins que cet endroit ne présente aucun danger a ce moment-la. Toute négligence à cet égard peut entraîner des conditions dangereuses qui risquent de provoquer des blessures et des dommages matériels.**

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

This section contains procedures for replacement of transmitter components in the field. There is a repair/replacement sequence flowchart (Fig. 8-1) that directs the repair technician to the appropriate Repair/Replacement Job Sheet.

The Type EQS temperature transmitter has been designed for a mean time to repair (MTTR) of five minutes. All calibration and configuration data are stored on the amplifier assembly. Replacement of the amplifier assembly requires no configuration as long as the standard factory configuration is desired (refer to Table 1-8). 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 STT02E terminal as described in the operating procedures section and the ***Type STT02E Smart Transmitter Terminal Product Instruction***. The amplifier assembly has been calibrated for all ranges and sensor types. If desired, a calibration check may be performed according to the procedures in the calibration section.

REPAIR/REPLACEMENT SEQUENCE

Refer to Figure 8-1 for the repair/replacement sequence for the Type EQS Temperature transmitter. The procedure for any component to be repaired/replaced assumes the transmitter will first be removed from service and a calibration check will be performed before returning the transmitter to service (except tagging replacement). Each block of the flow represents a single task that must be completed before continuing with the sequence.

In some cases, more than one path can be taken during repair/replacement of transmitter components. For paths that are in parallel, either complete all of the tasks in all of the paths before continuing or complete all of the tasks in only those paths that apply before continuing. At least one path must be completed.

Some blocks contain alphanumeric codes. These codes identify the Repair/Replacement (R) Job Sheet that describes the steps to complete an indicated task. Complete all of the steps given in a Repair/Replacement Job Sheet before continuing to the next sheet.

By treating each task as a separate entity, the job sheets provide an easy method for finding the information needed to perform each task in the repair/replacement sequence. The job sheets are located in the back of this product instruction and can be easily removed and placed in separate folders or notebooks, or carried to the installation and repair sites.

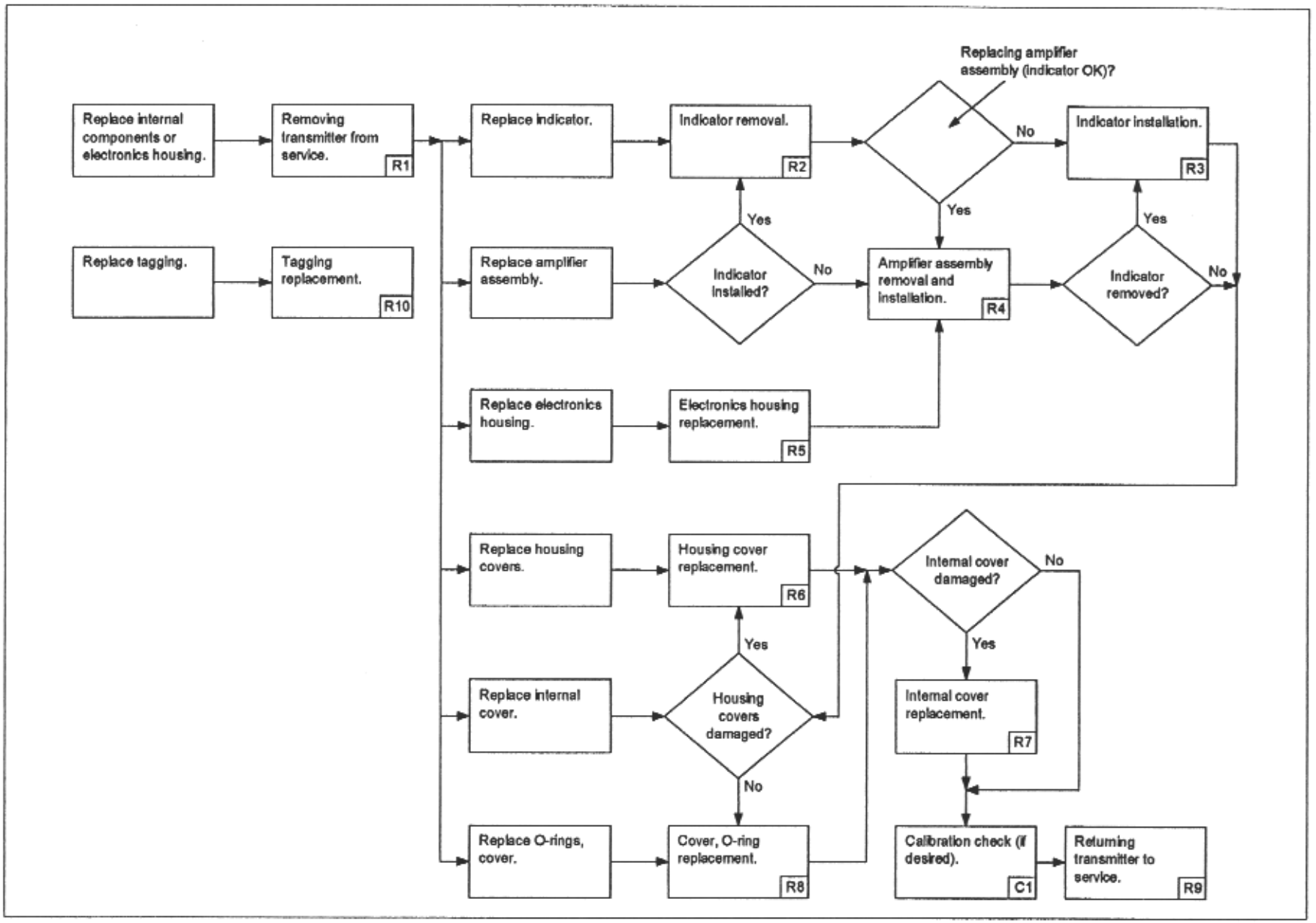

Figure 8-1. Repair/Replacement Sequence Flowchart

SECTION 9 - SUPPORT SERVICES

INTRODUCTION

Bailey-Fischer & Porter is ready to help in the use, application, and repair of its products. Contact your 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-Fischer & Porter sales representative. Provide the following information:

- Part description, part number, and quantity.
- Nomenclature and serial numbers (if applicable).
- Bailey-Fischer & Porter product instruction number, page number, and reference figure number that identifies the part.

When ordering standard parts from Bailey-Fischer & Porter, use the part numbers and descriptions from the spare parts lists. Order parts without commercial descriptions from the nearest Bailey-Fischer & Porter sales office.

SPARE PARTS LISTS

Tables 9-1 through 9-8 are lists of spare parts 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.

Electronics Kits

Table 9-1. Amplifier Assembly Spare Parts Kit[1]

Kit Number	Applicable Types
258546_2	All

NOTE:

1. Consists of amplifier assembly only.

Table 9-2. Indicator Add-On Kit[1]

Kit Number	Indicator Type	Cover Material	Applicable Types Position 1 2 3 4 5 6 7 8
258550_1	LCD	Aluminum	E Q S - - **4** - -
			E Q S - - **5** - -
258550_2	Analog meter	Aluminum	E Q S - - **4** - -
			E Q S - - **5** - -
258550_5	LCD	Stainless steel	E Q S - - **D** - -
			E Q S - - **E** - -
258550_6	Analog meter	Stainless steel	E Q S - - **D** - -
			E Q S - - **E** - -

NOTE:

1. Consists of indicator, cover with window, and 0.25 oz of NEVER-SEEZ® lubricant.

Table 9-3. Indicator Spare Parts Kit[1]

Kit Number	Indicator Type	Applicable Types Position 1 2 3 4 5 6 7 8
258550_3	LCD	E Q S - - - **A** -
		E Q S - - - **B** -
258550_4	Analog Meter	E Q S - - - **M** -
		E Q S - - - **N** -

NOTE:

1. Consists of indicator; O-ring, cover; and 0.25 oz of NEVER-SEEZ lubricant.

Hardware Kits

Table 9-4. Electronics Housing Spare Parts Kit[1]

Kit Number	Housing Material	Applicable Types Position 1 2 3 4 5 6 7 8
258583_1	Aluminum	E Q S - - **4** - -
		E Q S - - **5** - -
258583_2	Stainless steel	E Q S - - **D** - -
		E Q S - - **E** - -

NOTE:

1. Consists of housing with all components installed, except amplifier assembly and internal cover; two O-rings, cover; and 0.25 oz of NEVER-SEEZ lubricant.

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Table 9-5. Housing Cover Spare Parts Kit[1]

Kit Number	Cover Type	Cover Material	Applicable Types Position 1 2 3 4 5 6 7 8
258555_1	Standard	Aluminum	E Q S - - **4 0** -
			E Q S - - **4 1** -
			E Q S - - **5 0** -
			E Q S - - **5 1** -
258555_2	Cover with window	Aluminum	E Q S - - **4 A** -
			E Q S - - **4 B** -
			E Q S - - **4 M** -
			E Q S - - **4 N** -
			E Q S - - **5 A** -
			E Q S - - **5 B** -
			E Q S - - **5 M** -
			E Q S - - **5 N** -
258555_3	Standard	Stainless steel	E Q S - - **D 0** -
			E Q S - - **E 1** -
			E Q S - - **D 0** -
			E Q S - - **E 1** -
258555_4	Cover with window	Stainless steel	E Q S - - **D A** -
			E Q S - - **D B** -
			E Q S - - **D M** -
			E Q S - - **D N** -
			E Q S - - **E A** -
			E Q S - - **E B** -
			E Q S - - **E M** -
			E Q S - - **E N** -

NOTE:

1. Consists of housing cover; O-ring, cover (installed); and 0.25 oz of NEVER-SEEZ lubricant.

Table 9-6. O-Ring, Cover Spare Parts Kit[1]

Kit Number	Applicable Types
258556_8	All

NOTE:

1. Consists of ten Buna-N O-rings with each kit.

Table 9-7. Internal Cover Spare Parts Kit[1]

Kit Number	Applicable Types
258582_1	All

NOTE:

1. Consists of internal cover with gasket and captive screws installed.

Table 9-8. Wired Stainless Steel Tagging Spare Parts Kit

Kit Number	Applicable Types Position 1 2 3 4 5 6 7 8
258557_1	E Q S - - - - **2**
	E Q S - - - - **6**
	E Q S - - - - **C**
	E Q S - - - - **G**

NOTE:

1. Consists of ten stainless steel tags with six-inch stainless steel wires attached.

TRAINING

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

TECHNICAL DOCUMENTATION

Additional copies of this product instruction, or other Bailey-Fischer & Porter documentation, can be obtained from the nearest Bailey-Fischer & Porter sales office at a reasonable charge.

INSTALLATION I1 - INDICATOR ORIENTATION

PREPARATION

TOOLS:

- Phillips head screwdriver.
- NEVER-SEEZ lubricant.

REFERENCES: None.

PARTS: None.

ESTIMATED TIME: Five minutes.

PROCEDURE

NOTE: The analog meter cannot be rotated.

The transmitter is shipped with the indicator in the upright (zero degree) position. The LCD can be rotated 360 degrees in increments of 90 degrees.

NOTE: This procedure assumes the transmitter has not yet been mounted or put into service. It is begun from the unpowered state.

To rotate the LCD:

1. Remove the housing cover from the amplifier assembly side of the housing.
2. Remove the four indicator screws (Fig. I1-1).
3. Gently pull on the LCD to unplug it.

NOTE: The main board connector in the amplifier assembly, which is accessible through the meter opening (Fig. I1-1), is female, as are the four connectors on the back of the LCD. Therefore, there is a male-to-male header strip between the two female connectors. Be sure the header strip stays in the main board connector in the amplifier assembly when the LCD is unplugged. If it comes out with the LCD, remove it from the LCD and replace it in the main board connector in the amplifier assembly before continuing with this procedure.

4. Align one of the connectors on the back of the LCD with the meter opening in the amplifier assembly to get the desired viewing orientation (Fig. I1-1).
5. Press down on the LCD to seat the mating connectors.
6. Install the four indicator screws.

7. Coat the threads of the housing cover and the electronics housing with a light coating of NEVER-SEEZ lubricant.

8. Replace the housing cover.

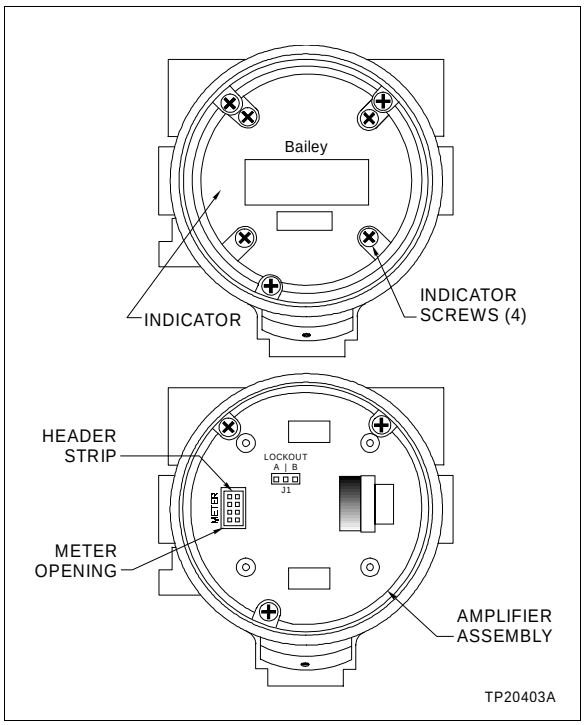

Figure I1-1. Orienting the Indicator

INSTALLATION I2 - INDICATOR ADD-ON

PREPARATION

TOOLS: Phillips head screwdriver.

REFERENCES: ***D3055071 - Dimension drawing for installation (includes optional indicator and standard mounting bracket).***

PARTS: Appropriate indicator add-on kit.

- Kit No. 258550_1. Consists of:

  LCD assembly with four captive screws and header strip (installed).

  Aluminum cover with window.

  O-ring, cover (installed).

  0.25 ounces of NEVER-SEEZ lubricant.

- Kit No. 258550_2. Consists of:

  Analog meter assembly with four captive screws and header strip (installed).

  Aluminum cover with window.

  O-ring, cover (installed).

  0.25 ounces of NEVER-SEEZ lubricant.

- Kit No. 258550_5. Consists of:

  LCD assembly with four captive screws and header strip (installed).

  Stainless steel cover with window.

  O-ring, cover (installed).

  0.25 ounces of NEVER-SEEZ lubricant.

- Kit No. 258550_6. Consists of:

  Analog meter assembly with four captive screws and header strip (installed).

  Stainless steel cover with window.

  O-ring, cover (installed).

  0.25 ounces of NEVER-SEEZ lubricant.

ESTIMATED TIME: Five minutes.

PROCEDURE

NOTE: This procedure assumes the transmitter has not yet been mounted or put into service. It is begun from the unpowered state.

To install the indicator:

1. Remove the housing cover from the amplifier assembly side of the housing.

2. Remove the header strip from the indicator and install it in the main board connector in the amplifier assembly, which is accessible through the meter opening (Fig. I2-1).

3. The LCD can be rotated 360 degrees in increments of 90 degrees. If adding the LCD, perform Steps 3a and 3b. The analog meter cannot be rotated and must be installed in the upright, zero degree position. If adding the analog meter, go to Step 4.

   a. Align one of the connectors on the back of the LCD with the meter opening in the amplifier assembly to get the desired viewing orientation (Fig. I2-1).

   b. Go to Step 5.

4. Mount the analog meter so that its four indicator screws align with the mounting bosses on the amplifier assembly. Go to Step 5.

5. Press down on the indicator to seat the mating connectors.

6. Use the phillips head screwdriver to tighten the four indicator screws.

7. Coat the threads of the housing cover and the electronics housing with a light coating of NEVER-SEEZ lubricant.

8. Replace the housing cover.

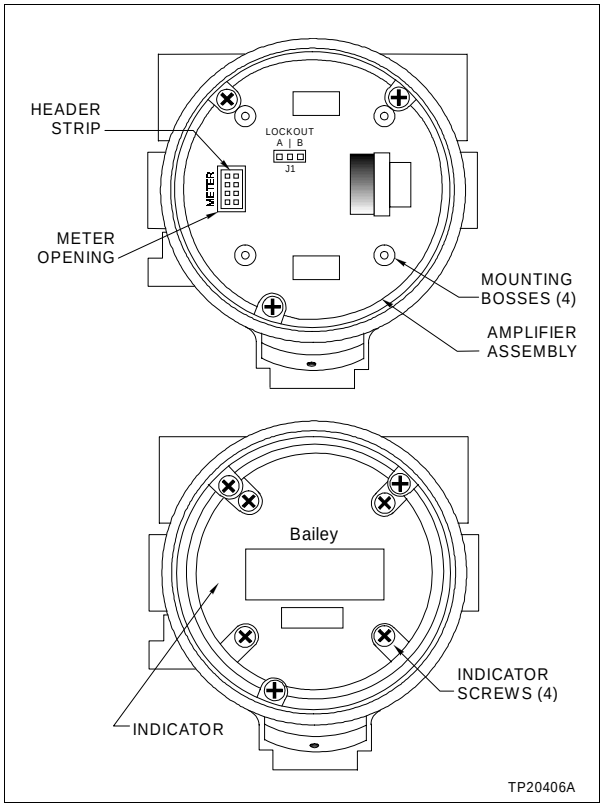

Figure I2-1. Adding the Indicator

INSTALLATION I3 - MOUNTING, PIPE

PREPARATION

TOOLS:

- Ratchet with 9/16-inch socket (for hex housing screw).
- Ratchet with 11/16-inch socket (for U-bolt nuts).

REFERENCES:

D3055071 - Dimension drawing for installation (includes optional indicator and standard mounting bracket).

P-E21-001 - Installing a 4 to 20 mA Transmitter in a Hazardous Location.

ANSI/ISA RP12.6 - Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations.

PARTS:

Appropriate mounting bracket kit (carbon steel or stainless steel).

- Kit No. 6642086_1 (carbon steel). Consists of:

  Carbon steel mounting bracket.

  One carbon steel 0.375-16 by 1.000-inch long hex head cap screw (hex housing screw).

  Carbon steel U-bolt.

  Three carbon steel 0.375 spring split lock washers (two for U-bolt, one for hex housing screw).

  Two carbon steel 0.375 plain washers (for U-bolt).

  Two carbon steel 0.375-16 hex nuts (for U-bolt).

  Two carbon steel 0.375-16 by 1.000-inch long hex head cap screws (for wall mounting - not used).

- Kit No. 6642086_2 (stainless steel). Consists of:

  Stainless steel mounting bracket.

  One stainless steel 0.375-16 by 1.000 inch-long hex head cap screw (hex housing screw).

  Stainless steel U-bolt.

  Three stainless steel 0.375 spring split lock washers (two for U-bolt, one for hex housing screw).

  Two stainless steel 0.375 plain washers (for U-bolt).

Two stainless steel 0.375-16 hex nuts (for U-bolt).

Two stainless steel 0.375-16 by 1.000-inch long hex head cap screws (for wall mounting - not used).

ESTIMATED TIME: 20 minutes.

PROCEDURE

The mounting bracket kit allows the transmitter to be mounted to a 1.5 to 2.0-inch pipe. Refer to Figures I3-1 and I3-2 as visual aids when performing this procedure.

1. Position the mounting bracket on the bottom of the electronics housing as shown in Figure I3-1.

2. Place a 0.375 lock washer over the hex housing screw.

3. Install the hex housing screw to secure the mounting bracket to the bottom of the electronics housing and use the ratchet with 9/16-inch socket to tighten the hex housing screw.

4. Place the transmitter, with mounting bracket attached, on the pipe to which it will be mounted (Fig. I3-2).

5. Place the U-bolt around the pipe and through the two mounting bracket holes (Fig. I3-2).

6. Place a 0.375 washer over each end of the U-bolt (Fig. I3-2).

7. Place a 0.375 lock washer over each end of the U-bolt (Fig. I3-2).

8. Install a nut on each end of the U-bolt and use the ratchet with 11/16-inch socket to tighten the nuts (Fig. I3-2).

NOTE: All sensor wiring must be run through metallic conduit.

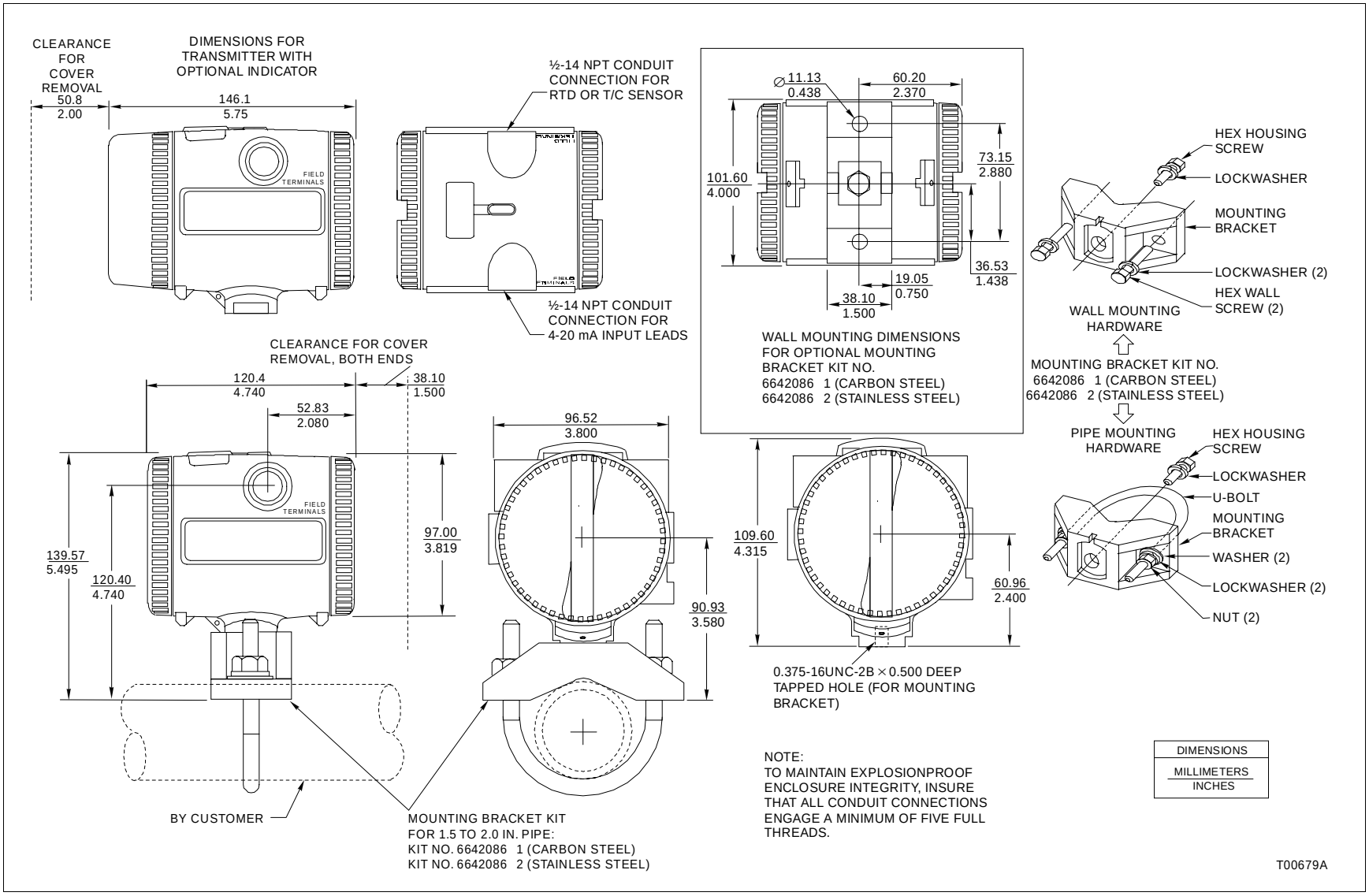

Figure I3-1. External and Mounting Dimensions

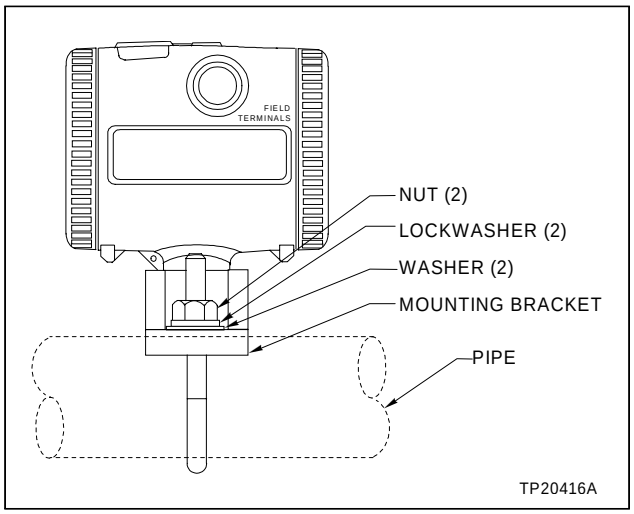

Figure I3-2. Pipe Mounting

INSTALLATION I4 - MOUNTING, WALL

PREPARATION

TOOLS:

- Ratchet with 9/16-inch socket.
- Method for anchoring hex wall screws in wall. Installations will vary, so it is not possible to list the specific tools needed for the particular installation.

REFERENCES:

D3055071 - Dimension drawing for installation (includes optional indicator and standard mounting bracket).

P-E21-001 - Installing a 4 to 20 mA Transmitter in a Hazardous Location.

ANSI/ISA RP12.6 - Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations.

PARTS:

Appropriate mounting bracket kit (carbon steel or stainless steel).

- Kit No. 6642086_1 (carbon steel) consists of:

  Carbon steel mounting bracket.

  One carbon steel 0.375-16 by 1.000-inch long hex head cap -screw (hex housing screw).

  Two carbon steel 0.375-16 by 1.000-inch long hex head cap screws (hex wall screws).

  Three carbon steel 0.375 spring split lock washers (two for hex wall screws, one for hex housing screw).

  Carbon steel U-bolt (for pipe mounting - not used).

  Two carbon steel 0.375-16 hex nuts (for pipe mounting - not used).

  Two carbon steel 0.375 plain washers (for pipe mounting - not used).

- Kit No. 6642086_2 (stainless steel) consists of:

  Stainless steel mounting bracket.

  One stainless steel 0.375-16 by 1.000-inch long hex head cap screw (hex housing screw).

  Two stainless steel 0.375-16 by 1.000-inch long hex head cap screws (hex wall screws).

Three stainless steel 0.375 spring split lock washers (two for hex wall screws, one for hex housing screw).

Stainless steel U-bolt (for pipe mounting - not used).

Two stainless steel 0.375-16 hex nuts (for pipe mounting - not used).

Two stainless steel 0.375 plain washers (for pipe mounting - not used).

ESTIMATED TIME: 20 minutes.

PROCEDURE

The mounting bracket kit allows the transmitter to be mounted to a wall. Refer to Figures I4-1 and I4-2 as visual aids when performing this procedure.

1. Position the mounting bracket on the bottom of the electronics housing as shown in Figure I4-1.

2. Place a 0.375 lock washer over the hex housing screw.

3. Install the hex housing screw to secure the mounting bracket to the bottom of the electronics housing and use the ratchet with 9/16-inch socket to tighten the hex housing screw.

4. Place the transmitter, with mounting bracket attached, so that the two mounting bracket holes align with the mounting holes in the wall (Fig. I4-2).

5. Place a 0.375 lock washer over each of the hex wall screws (Fig. I4-2).

6. Insert a hex wall screw through each of the mounting bracket holes and into the mounting holes in the wall and use the ratchet with 9/16-inch socket to tighten each of the hex wall screws (Fig. I4-2).

NOTE: All sensor wiring must be run through metallic conduit.

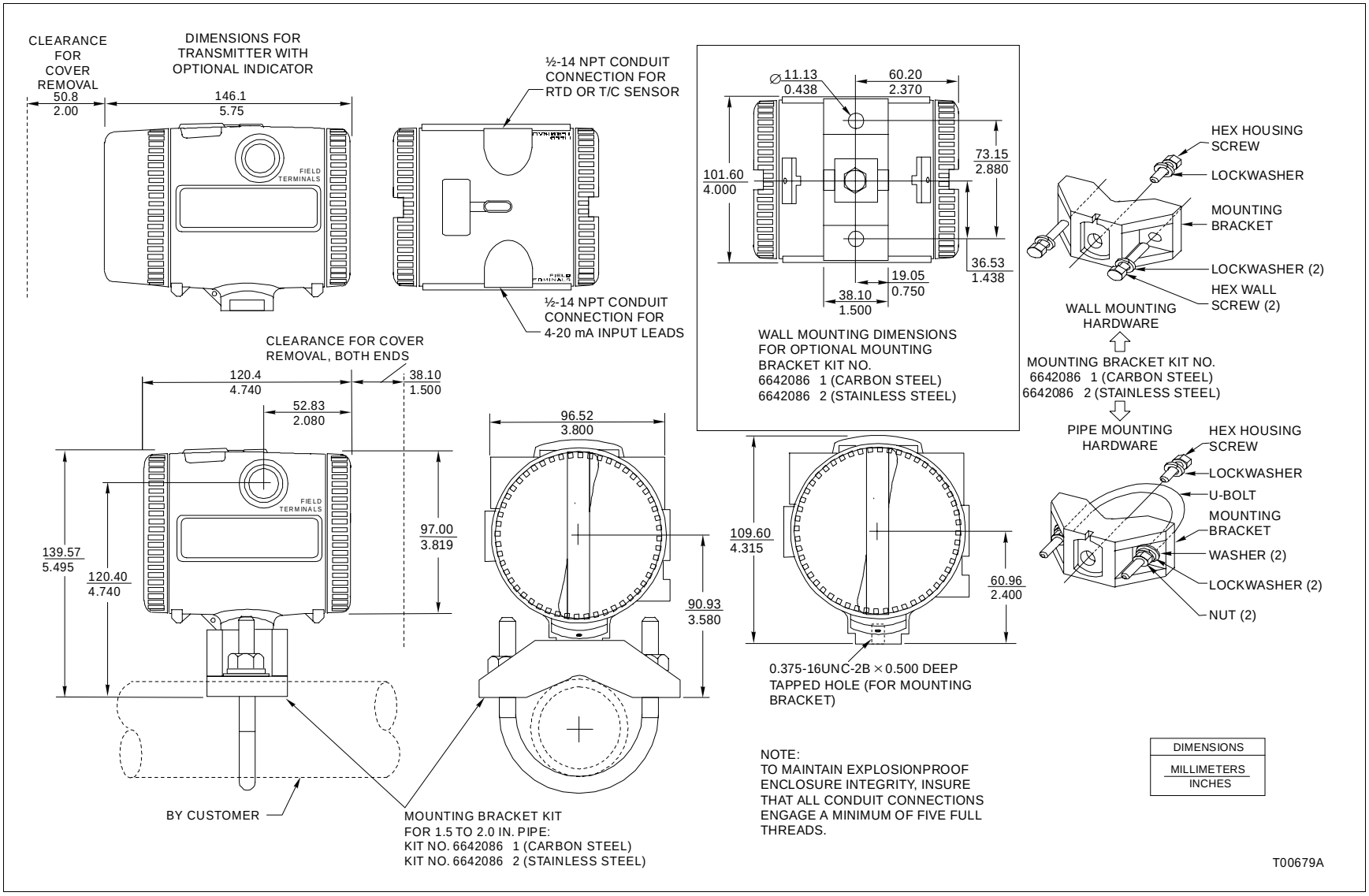

Figure I4-1. External and Mounting Dimensions

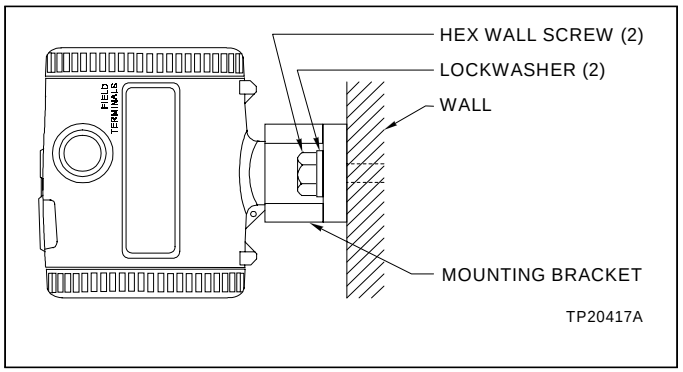

Figure I4-2. Wall Mounting

INSTALLATION I5 - MOUNTING, THERMOWELL

PREPARATION

TOOLS: The tools required are dependant on the installation and the process.

REFERENCES: ***D3055071 - Dimension drawing for installation (includes optional indicator and standard mounting bracket).***

D3055180 - Application drawing for installations using thermowells.

P-E21-001 - Installing a 4 to 20 mA Transmitter in a Hazardous Location.

ANSI/ISA RP12.6 - Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations.

PARTS: The parts required are dependant on the installation and the process.

ESTIMATED TIME: 20 minutes.

PROCEDURE

Refer to Figure I5-1 for two application examples for thermowell mounting. The procedure for installing thermowell mounted transmitters is dependant on the particular installation and the process and is beyond the scope of this instruction.

NOTES:

1. All sensor wiring must be run through metallic conduit.

2. When installing the transmitter in hazardous locations, in order to maintain the explosionproof and dust-ignitionproof certifications, the transmitter must be installed with an explosionproof and dust-ignitionproof sensor.

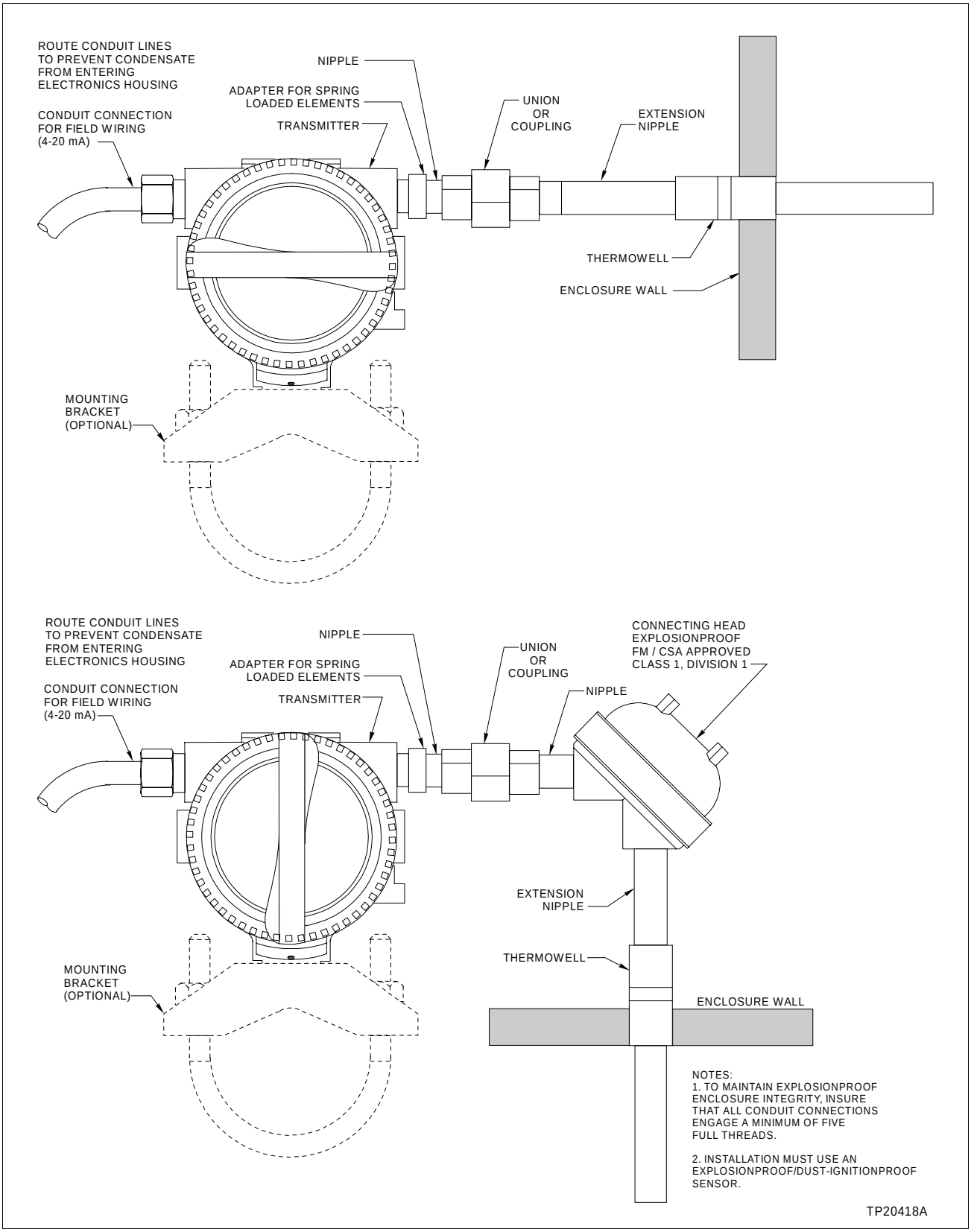

Figure I5-1. Application Drawing for Thermowell Mounting

INSTALLATION I6 - FIELD WIRING, ANALOG MODE

PREPARATION

TOOLS: Phillips head screwdriver.

REFERENCES: ***D3055181 - User field connections***.

P-E21-001 - Installing a 4 to 20 mA Transmitter in a Hazardous Location.

ANSI/ISA RP12.6 - Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations.

ESTIMATED TIME: Ten minutes.

WIRING

Field wiring should not be run in conduit or open trays with wiring used to power high current devices and should not be run near high power electrical equipment. A twisted shielded pair cable is recommended for best results. Reverse polarity protection guards against accidental reversal of the field wiring connections.

To prepare for the wiring connections after the transmitter is mounted, remove the housing cover from the field wiring side of the electronics housing (marked **FIELD TERMINALS** on the electronics housing).

In the analog mode of operation, the electrical connections are made in the typical two-wire, four to 20-milliamp configuration as shown in Figure I6-1. 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 across the transmitter inputs are 12 to 53 VDC and 12 to 42 VDC for CSA certified applications. Refer to Bailey-Fischer & Porter drawing ***B222611- Intrinsically Safe Loops*** for intrinsic safety applications. Refer to Figure I6-1 for the load resistance limits, or use the equation:

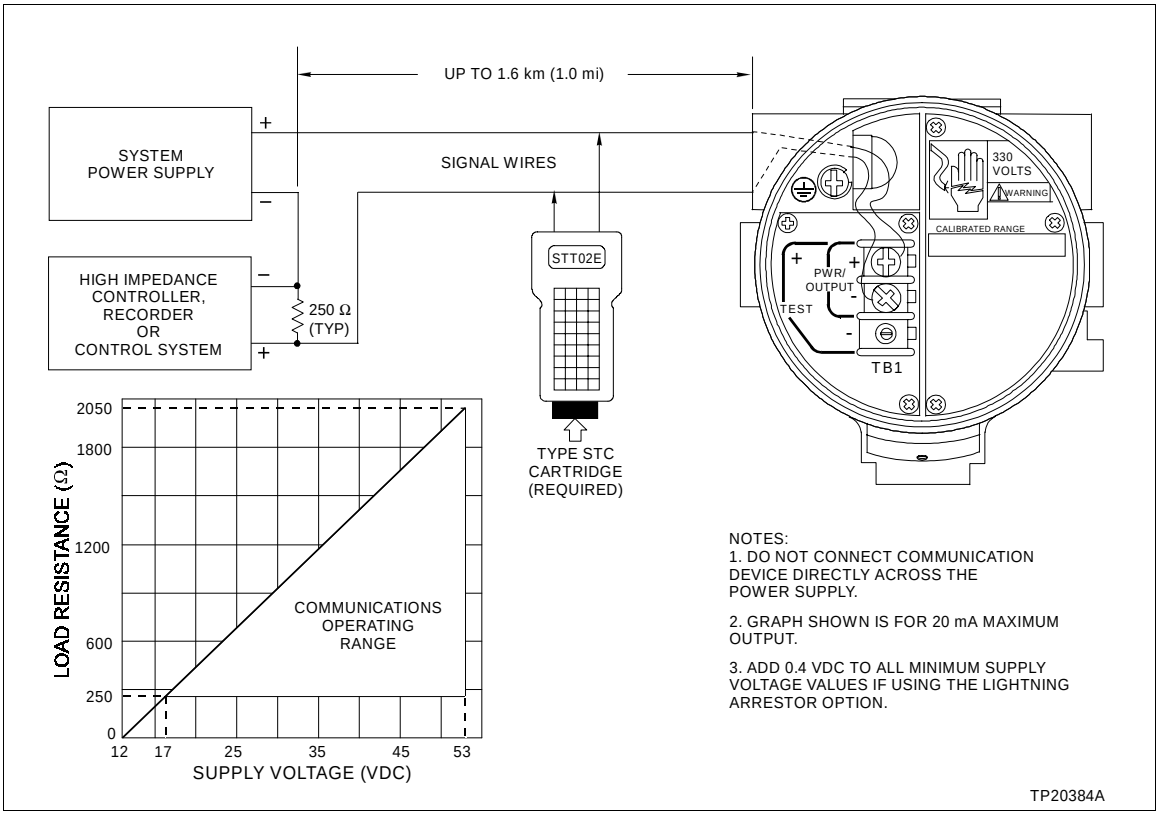

Figure I6-1. Wiring Diagram - Analog Mode

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

NOTES:

1. The equation for load resistance is based on a maximum output of 20 milliamps with the jumper screw tightened across the **TEST** terminals. In some cases (initialize high, fail high, 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 jumper screw is loosened from the **TEST** terminals, the minimum supply voltage is 12.7 VDC.

3. If using the lightning arrestor option (1, B, or N in nomenclature position 7) add 0.4 VDC to all minimum supply voltage values.

The power supply and load resistance are variable over the entire operating region as shown in Figure I6-1.

The **TEST** terminals have the same four to 20 milliamp signal as the **PWR/OUTPUT** terminals. Loosen the jumper screw ½-turn from the **TEST** terminals (Fig. I6-1) for calibration or testing.

NOTE: Do not connect permanent receiving devices (meters, recorders, etc.) to the **TEST** terminals.

Field wiring should be shielded. Use twisted pairs for best results. Connect the shield at the ground terminal inside the electronics housing (Fig. I6-1) 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.

GROUNDING

Field wiring must be 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 (Fig. I6-1).

INSTALLATION I7 - FIELD WIRING, FIELD BUS MODE

PREPARATION

TOOLS: Phillips head screwdriver.

REFERENCES: D3055181 - User field connections.

P-E21-001 - Installing a 4 to 20 mA Transmitter in a Hazardous Location.

Field Bus Module Product Instruction.

ANSI/ISA RP12.6 - Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations.

ESTIMATED TIME: Ten minutes.

WIRING

Field wiring should not be run in conduit or open trays with wiring used to power high current devices or near high power electrical equipment. A twisted shielded pair cable is recommended for best results. Reverse polarity protection guards against accidental reversal of the field wiring connections.

To prepare for the wiring connections after the transmitter is mounted, remove the housing cover from the field wiring side of the electronics housing (marked **FIELD TERMINALS** on the electronics housing).

In the field bus mode of operation there is no four to 20 milliamp signal. The transmitter draws less than four milliamps to maintain operation (Fig. I7-1).

NOTES:
1. Refer to the field bus module product instruction for wire length and practices and output update times.

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

In the field bus 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 (Transmitter Address)*** in the operating procedures section for information on configuring the transmitter address. The address allows the field bus module to distinguish between transmitters on the loop.

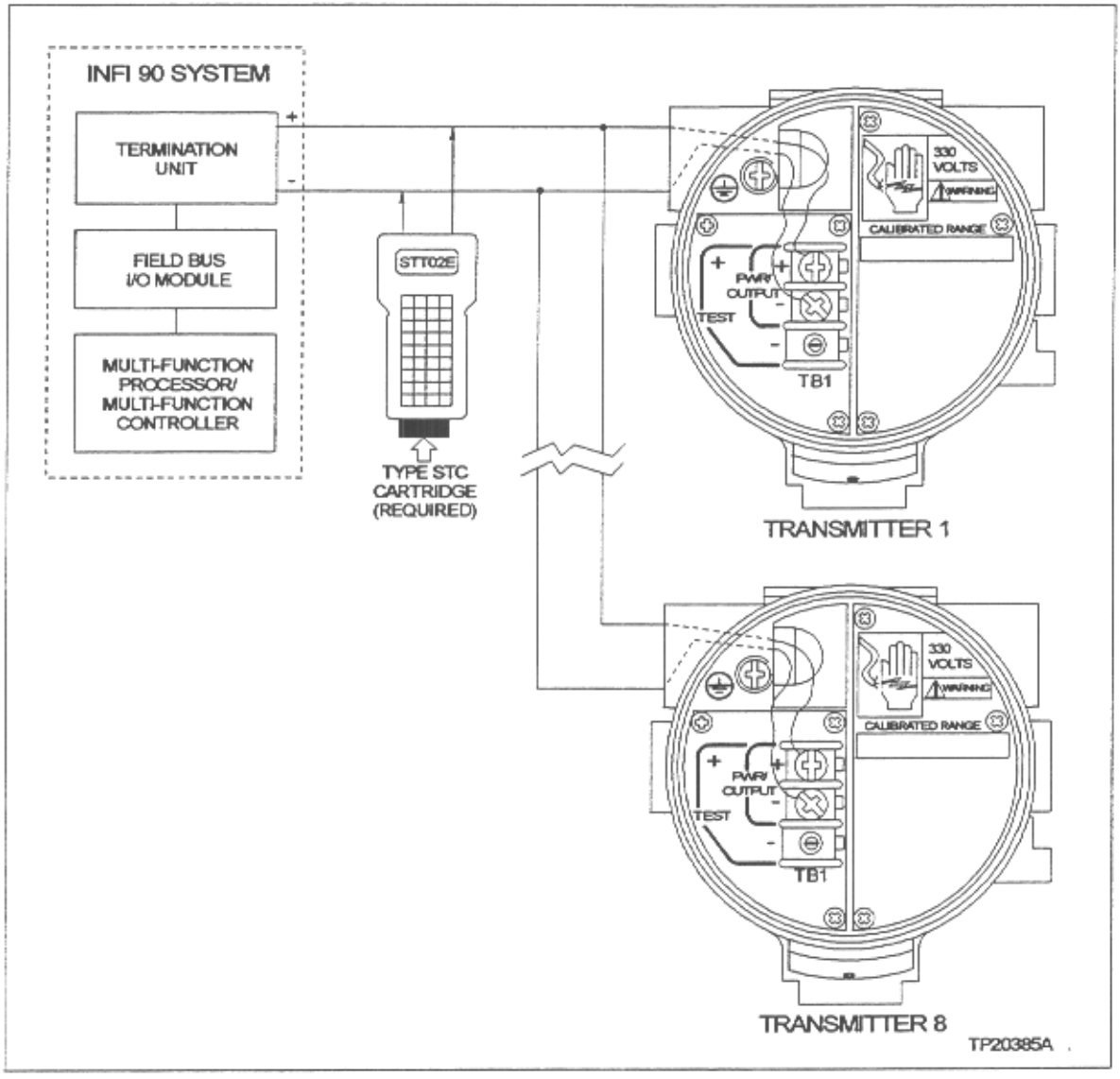

Figure I7-1. Wiring Diagram - Field Bus Mode

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:

minimum supply voltage =
12 volts + (0.004 × *number of transmitters on bus* × *load resistance*)

The load resistance must include the system input resistance and the resistance of the wire. No analog 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 STT02E terminal can be connected anywhere there is access to the signal leads. Since the terminal has its own bus address, it can be connected to the bus while the control system is on-line.

> **NOTE:** Only one Type STT02E terminal can be connected to the bus at any one time.

While the field bus module is on-line, the terminal can monitor any transmitter on the bus. In order to change any calibration or configuration parameters of transmitters using the terminal, the field bus module must be instructed to bring the desired transmitter off-line.

GROUNDING

Field 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 (Fig. I7-1).

INSTALLATION I8 - SENSOR WIRING

PREPARATION

TOOLS: Phillips head screwdriver.

Small flat-blade screwdriver.

Wire cutters/strippers.

REFERENCES: ***D3055181 - User field connections***.

P-E21-001 - Installing a 4 to 20 mA Transmitter in a Hazardous Location.

ANSI/ISA RP12.6 - Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations.

ESTIMATED TIME: Ten minutes.

SENSOR WIRING

WARNING

Disconnect power from the application in which the sensor is installed, or take precautions to insure that contact with energized parts is avoided when performing these procedures. Sensor wiring may be energized in certain applications. Failure to follow this warning constitutes an electrical shock hazard that can injure personnel and cause equipment damage.

AVERTISSEMENT

Débrancher l'alimentation de la commande du procédé sur lequel le capteur est installé, ou prendre toutes les précautions pour s'assurer que tout contact avec les composantes sous tension est évité durant ces procédures. La fillerie du capteur peut être sous tension dans certaines applications. Un manquement à ces procédures constitue un risque de choc électrique qui peut causer des blessures au personnel et endommager l'équipement.

To prepare for the wiring connections after the transmitter is mounted, remove the housing cover from the field wiring side of the electronics housing (marked **FIELD TERMINALS** on the electronics housing).

The sensor wiring terminal strip (**TB2**) is located on the field terminal side of the amplifier housing. The terminals are marked **1**, **2**, **3**, and **4**. The terminal strip is a lugless, spring

loaded lever type to ease installation. It accepts wire sizes from 26 to 14 AWG.

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

Refer to Figures I8-1 and I8-2 as visual aids when performing this procedure.

To connect the sensor wiring:

1. Use the phillips head screwdriver to remove the three internal cover screws (Fig. I8-1).

2. Remove the internal cover. This exposes the sensor wiring terminal strip **TB2** (Fig. I8-2).

3. Refer to Figure I8-2 and determine the proper sensor wiring configuration for the application.

4. Strip the sensor wiring insulation back approximately seven millimeters (¼-inch) to insure that there is enough bare wire for the jaws of the connector to contact, but not too much as to leave exposed wire beyond the connector.

5. Feed the sensor wiring through the ½ NPT (or ¾ NPT with adapter) conduit connection for sensor wiring (Fig. I8-2).

6. To insert the wires into the sensor terminals:

   a. Using a small, flat blade screwdriver, push firmly on the sensor wiring terminal strip lever associated with the desired connector. This opens the jaws of the connector for insertion of the stripped wire.

   b. After the wire is in place, release the lever.

   c. Continue in this manner for all connections.

   NOTE: When connecting a two-wire RTD or ohms sensor, a jumper must be placed between **TB2-3** and **TB2-4** (Fig. I8-2). The jumper should be of the same gage wire as the sensor leads.

7. Connect the sensor wire shield (if used) to the sensor ground terminal (Fig. I8-2).

8. Install the internal cover.

9. Coat the threads of the housing cover and the electronics housing with NEVER-SEEZ lubricant.

10. Install the housing cover.

    NOTE: Thermocouples may be grounded.

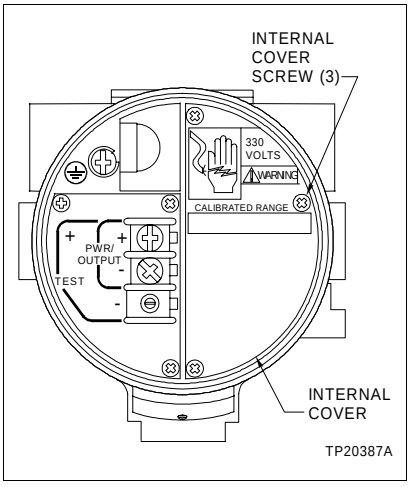

Figure I8-1. Internal Cover

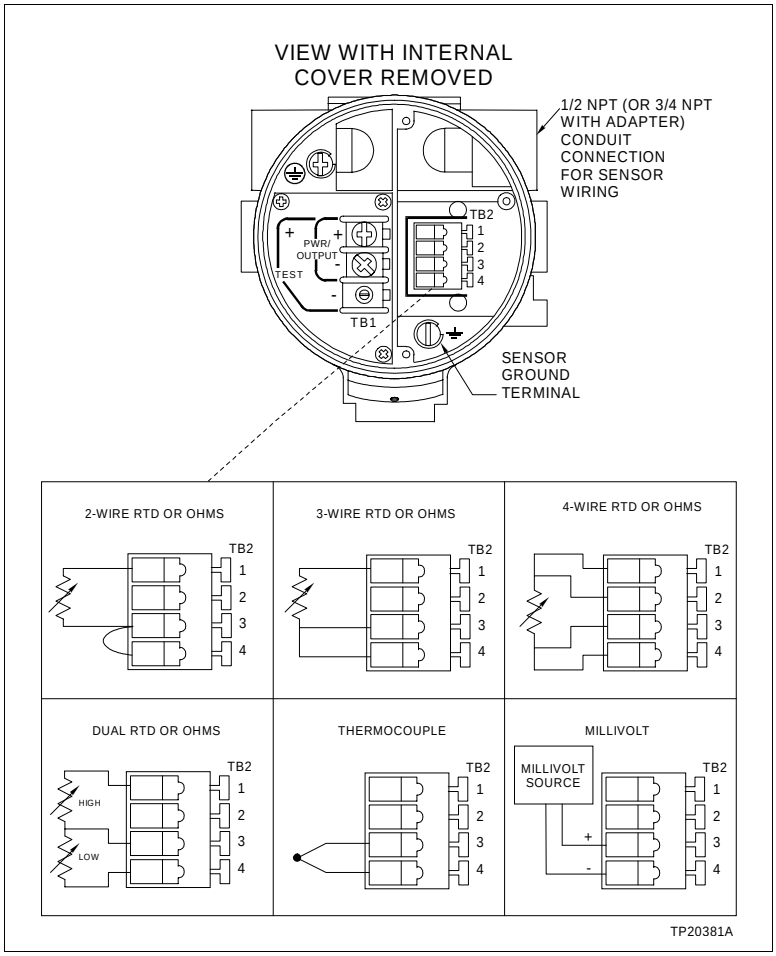

Figure I8-2. Sensor Wiring

CALIBRATION C1 - CALIBRATION CHECK

PREPARATION

TOOLS:

- DC power supply, 24, ±1 VDC (recommended).
- 250 ohm, ±0.01% resistor, ½-watt minimum.
- Digital multimeter (DMM): 4-½ digit display minimum with an accuracy at least four times greater than that of the transmitter (refer to Table 1-3).
- Sensor simulator with an accuracy at least four times greater than that of the transmitter (refer to Table 1-3).
- Type STT02E Smart Transmitter Terminal.
- Phillips head screwdriver.
- Small flat blade screwdriver.
- NEVER-SEEZ lubricant.
- Nonmetallic tool for removing O-rings, cover.
- Dow Corning® 4 compound.

REFERENCES: ***Type STT02E Smart Transmitter Terminal Product Instruction***.

PARTS: O-ring, cover spare parts kit.

- Kit No. 258556_7. Consists of ten Buna-N O-rings.

ESTIMATED TIME: Ten minutes, not including time to warm up test equipment.

NOTE: All test equipment should be warmed up and allowed to stabilize per the manufacturer's recommendations before performing this procedure. One warm up period is sufficient. Each Type EQS temperature transmitter connected to that equipment after the warm up period should be allowed one minute to stabilize before taking readings.

PROCEDURE

NOTE: This job sheet addresses the calibration check procedure only as it applies to the Type STT02E terminal. Refer to the appropriate product instruction for information on other communication devices.

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Use this procedure for checking transmitter calibration before installation or after replacement of components. If the check indicates an improper calibration, continue with the calibration sequence as shown in Figure 4-1. Refer to Figure C1-1 for a typical calibration setup and the sensor connections.

1. Remove the housing cover from the field terminal side of the housing.

2. Loosen the jumper screw ½-turn from the **TEST** terminals (Fig. C1-1).

3. Remove the three internal cover screws and remove the internal cover (Fig. C1-2).

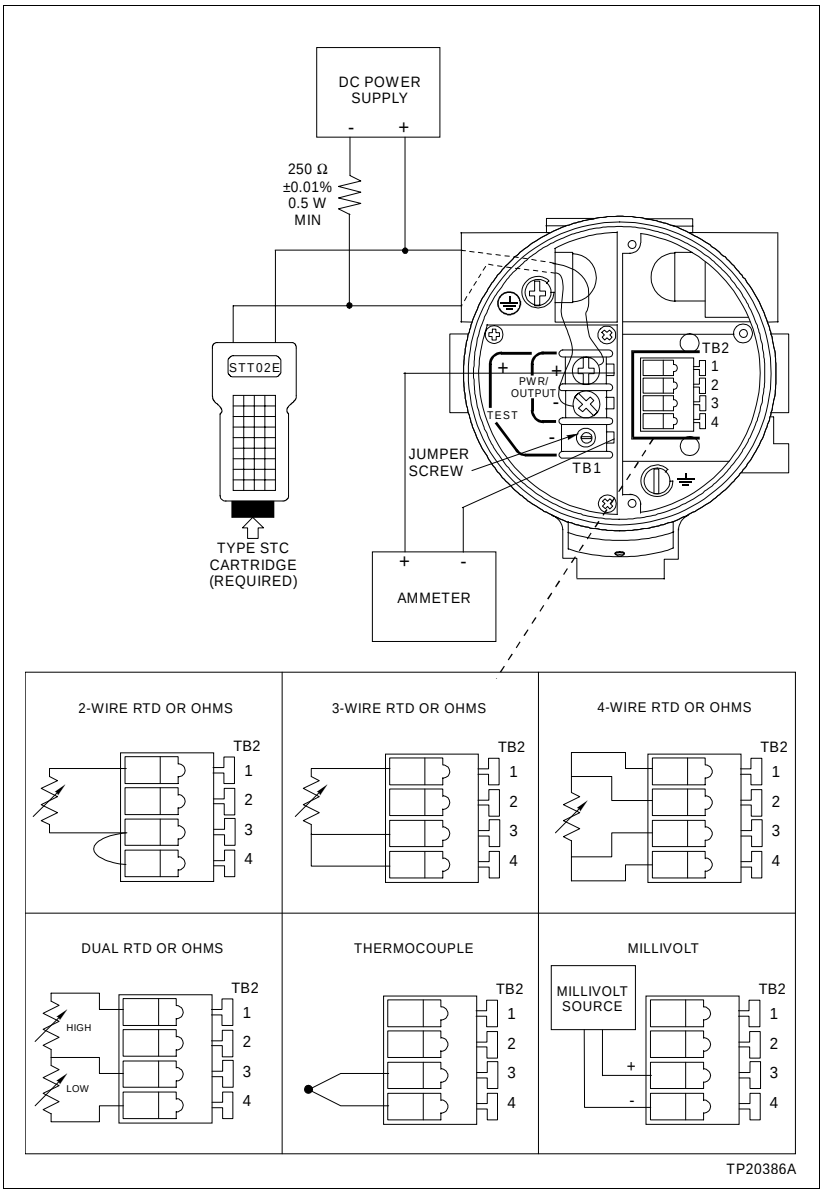


Figure C1-1. Calibration Setup (Typical)

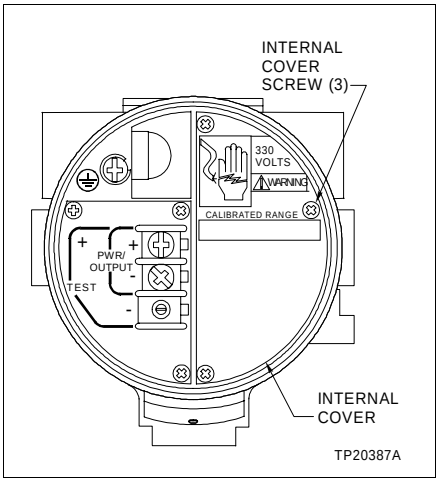


Figure C1-2. Internal Cover

4. Connect the field wiring terminals of the transmitter in a calibration setup as shown in Figure C1-1.

5. Connect the input for the desired sensor as shown in Figure C1-1. (Refer to Installation Job Sheet I8 to remove and install the sensor wires.)

6. Adjust the input to the configured lower range value.

7. The DMM (set for milliamps) should read:

Analog mode Four milliamps, plus or minus the tolerance listed for the particular sensor in Table 1-3. Go to Step 10.

Field bus mode Less than four milliamps (since the transmitter is configured for digital operation). Go to Step 8.

8. Press **OUTPUT** on the Type STT02E terminal.

9. Use ↑ and ↓ to select *MONITOR INPUT* and press **ENTER**. The Type STT02E terminal should display the lower range value, plus or minus the tolerance for the particular sensor listed in Table 1-3. Go to Step 10.

10. Record the output.

11. Adjust the input to the configured upper range value.

12. The DMM (set to milliamps) should read:

Analog mode 20 milliamps, plus or minus the tolerance listed for the particular sensor in Table 1-3. Go to Step 15.

Field bus mode

Less than four milliamps (since the transmitter is configured for digital operation) Go to Step 13.

> **NOTE:** If the four to 20-mA output changes with respect to the input, then the transmitter is not in the field bus mode. To enter this mode, refer to the operating procedures section in this product instruction and the ***Type STT02E Smart Transmitter Terminal Product Instruction***.

13. Press OUTPUT on the Type STT02E terminal.

14. Use ↑ and ↓ to select *MONITOR INPUT* and press ENTER. The Type STT02E terminal should display the upper range value, plus or minus the tolerance for the particular sensor listed in Table 1-3. Go to Step 15.

15. Record the output.

16. If the output is not within the limits specified in Steps 7 and 12 (analog mode) or Steps 9 and 14 (field bus mode), this indicates the calibration is not within tolerance. Leave the transmitter in the calibration setup and return to the calibration sequence flowchart (Fig. 4-1) to calibrate the transmitter. If the calibration is within the acceptable limits, the calibration is within tolerance. Continue with Step 17.

17. When completed, do not forget to tighten the jumper screw on the **TEST** terminals, install the sensor wires to the sensor terminal strip, and install the internal cover.

18. If this calibration procedure was performed after initially placing the transmitter into service, refer to Repair/Replacement Job Sheet R8 and replace the cover O-ring before installing the housing cover.

CALIBRATION C2 - BENCH INPUT CALIBRATION

PREPARATION

TOOLS:

- DC power supply, 24, ±1 VDC (recommended).
- Two 250-ohm, ±0.01% resistors, ½-watt minimum.
- Millivolt standard: ±0.001% at 100 millivolts (millivolt source).
- Wire jumper, less than 0.01 ohms.
- Type STT02E Smart Transmitter Terminal.
- Small, flat blade screwdriver.

REFERENCES: ***Type STT02E Smart Transmitter Terminal Product Instruction***.

PARTS: None.

ESTIMATED TIME: 15 minutes.

PROCEDURE

If the transmitter has failed the calibration check, it must go through a complete bench input calibration. The first part of this procedure involves indicating what standards are being used for the millivolt and ohms input calibration. The last part of the procedure involves connecting the actual values indicated to the sensor input terminals. When completed with this procedure, the transmitter will be calibrated for all input types and ranges.

> **NOTE:** During this procedure, each time ENTER is pressed on the Type STT02E terminal, the display automatically advances to the next parameter.

1. Press CALIBRATE on the Type STT02E terminal.
2. Use ↑ and ↓ to select *YES* and press ENTER.
3. Use ↑ and ↓ to select *BENCH CALIB.* and press ENTER.

> **NOTE:** When performing Steps 4 through 7, adjustments are only necessary when using calibration standards other than those specified.

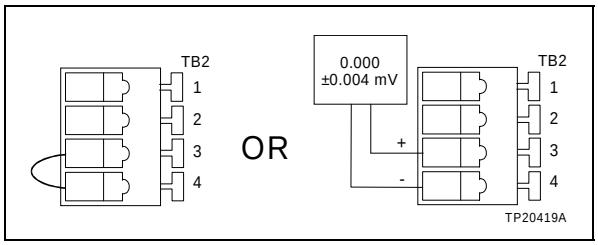
4. Use 0 through 9, ., and ± to adjust *LOW CALIB* (zero millivolt source) if necessary and press ENTER.

5. Repeat Step 4 for *HIGH CALIB* (100-millivolt source).

6. Repeat Step 4 for LOW CALIB RES (zero-ohm jumper) and press **ENTER**.

7. Repeat Step 4 for HIGH CALIB RES (250-ohm resistor) and press **ENTER**.

8. Connect a wire jumper or apply 0.000, ±0.004 mV between **TB2-3** (+) and **TB2-4** (-).

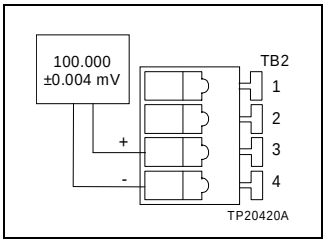


NOTE: The resistance of the wire jumper must be less than 0.01 ohms.

9. Wait 30 seconds and then press **ENTER** to calibrate the millivolt zero (lower range value).

10. When the Type STT02E terminal displays *APPLY 100 mV SOURCE*, remove the wire jumper or zero-millivolt source. The transmitter will take a ten-second average of the input before advancing.

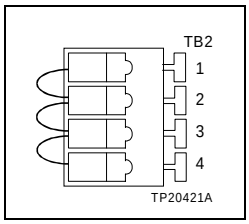
11. Apply 100.000, ±0.004 mV between **TB2-3** (+) and **TB2-4** (-).



12. Wait 30 seconds and press **ENTER** to calibrate the millivolt span (upper range value). The transmitter will take a ten-second average of the input before advancing.

13. When the Type STT02E terminal displays *APPLY THE 0 OHMS*, remove the 100-mV source.

14. Connect wire jumpers between **TB2-1** and **TB2-2**, **TB2-2** and **TB2-3**, and **TB2-3** and **TB2-4**.

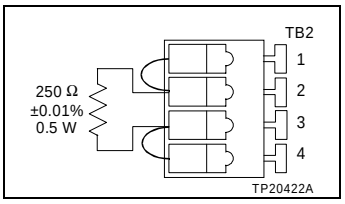


NOTE: The resistance of the wire jumper must be less than 0.01 ohms.

15. Wait 30 seconds and press **ENTER** to calibrate the ohms zero (lower range value). The transmitter will take a ten-second average of the input before advancing.

16. When the Type STT02E terminal displays *APPLY 250 OHMS*, remove the wire jumper from between **TB2-2** and **TB2-3**.

17. Replace the wire jumper removed in Step 16 with the 250-ohm, ±0.01% precision resistor.



18. Wait 30 seconds and press **ENTER** to calibrate the ohms span (upper range value). The transmitter will take a ten-second average of the input before advancing.

19. Use ↑ and ↓ to adjust the four-mA output until the DMM (set to read VDC) placed across the 250-ohm resistor reads 1.000, ±0.001 VDC and press **ENTER** to store the value.

20. Use ↑ and ↓ to adjust the 20-mA output until the DMM (set to read VDC) placed across the 250-ohm resistor reads 5.000, ±0.001 VDC and press **ENTER** to store the value.

21. Remove the 250-ohm resistor and the wire jumpers.

The transmitter is now calibrated for all input types and ranges.

CALIBRATION C3 - D/A ADJUSTMENT

PREPARATION

TOOLS:

- 250-ohm, ±0.01% resistor, ½-Watt minimum.
- Digital multimeter (DMM): 4-½ digit display minimum with an accuracy at least four times greater than that of the transmitter (refer to Table 1-3).
- Type STT02E Smart Transmitter Terminal.

REFERENCES: ***Type STT02E Smart Transmitter Terminal Product Instruction***.

PARTS: None.

ESTIMATED TIME: Three minutes.

PROCEDURE

NOTE: This procedure applies only to transmitters configured in the analog mode.

This procedure does not require removal of the covers from the electronics housing. Compensation for slight inaccuracies in the four to 20-milliamp current loop (or in receiving devices such as recorders) is accomplished by pressing **CALIBRATE** on the Type STT02E terminal while it is connected to the target transmitter. This procedure does not calibrate the sensor input. Use it when first installing the system, or if something in the four to 20-milliamp current loop has changed.

Either connect the DMM, set to measure DC milliamps, in series with the four to 20-milliamp current loop, or make a parallel connection across the precision 250-ohm resistor as shown in Figure C3-1, with the DMM set to measure DC volts. With the latter setup, the four to 20-milliamp output corresponds to one to five volts.

NOTES:

1. These notes only apply when measuring VDC across the 250-ohm resistor as shown in Figure C3-1.
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 250-ohms is used, the voltage output will be different according to Ohm's law ($V = I \times R$).
4. Throughout this procedure, voltage values, based on a 250-ohm resistor, are shown in parenthesis following milliamp values.

1. Press **CALIBRATE** on the Type STT02E terminal.

2. Use ↑ and ↓ to select *D-A ADJUSTMENT* and press **ENTER**.

3. The instruction, *ADJUST TO 4 mA THEN HIT ENTER* appears on the display. Use ↑ and ↓ to adjust the output to 4.000, ±0.004 mA (1.000, ±0.001 VDC). If using a receiving device, such as a recorder, adjust for a zero-percent indication.

4. Press **ENTER**.

5. The instruction, *ADJUST TO 20 mA THEN HIT ENTER* appears on the display. Use ↑ and ↓ to adjust the output to 20.000, ±0.004 mA (5.000, ±0.001 VDC). If using a receiving device, such as a recorder, adjust for a 100-percent indication.

6. Press **ENTER**.

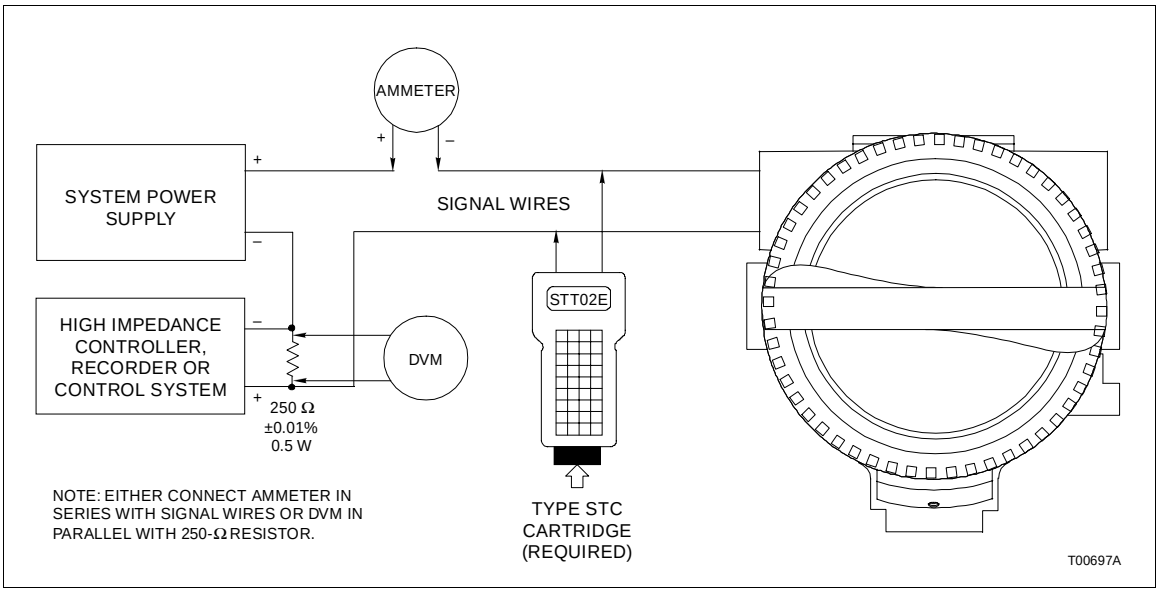


Figure C3-1. D/A Adjustment Setup

REPAIR/REPLACEMENT R1 - REMOVING TRANSMITTER FROM SERVICE

WARNING	**Disconnect power from the application in which the sensor is installed, or take precautions to insure that contact with energized parts is avoided when performing these procedures. Sensor wiring may be energized in certain applications. Failure to follow this warning constitutes an electrical shock hazard that can injure personnel and cause equipment damage.** **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.** **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.**

AVERTISSEMENT	**Débrancher l'alimentation de la commande du procédé sur lequel le capteur est installé, ou prendre toutes les précautions pour s'assurer que tout contact avec les composantes sous tension est évité durant ces procédures. La fillerie du capteur peut être sous tension dans certaines applications. Un manquement à ces procédures constitue un risque de choc électrique qui peut causer des blessures au personnel et endommager l'équipement.** **Les réparations ne doit être effectuée que par le personnel qualifié et seulement une fois que l'équipement contrôlé par le circuit est fixé en place. La modification ou le retrait des composants d'un circuit actif pourraient perturber le processus contrôlé et menter à des blessures au personnel et à l'endommagement de l'équipement.** **En ce qui concerne l'installation anti-explosion et anti-ignition provoqué par la poussière dans des endroits se Classe II ou Classe III, il est indispensable que l'assemblage soit tenu étanche pendant que les circuits sont électrises, a moins que cet endroit ne présente aucun danger a ce moment-la. Toute négligence à cet égard peut entraîner des conditions dangereuses qui risquent de provoquer des blessures et des dommages matériels.**

PREPARATION

TOOLS:

- Phillips head screwdriver.
- Small flat-blade screwdriver.
- Tape for labelling wires.
- Ratchet with 11/16-inch socket (for U-bolt nuts).
- Ratchet with 9/16-inch socket (for hex wall screws).

REFERENCES: None.

PARTS: None.

ESTIMATED TIME: Five minutes.

PROCEDURE

It is recommended that the transmitter be removed from service for the repair/replacement of any transmitter components, except tagging. This is for safety reasons and to allow for inspection of other transmitter components and a calibration check.

This procedure is the first task that must be completed when repairing/replacing any transmitter component, except tagging. The procedures for repairing/replacing transmitter components are contained in Repair/Replacement Job Sheets R2 through R10. The calibration check procedure is contained in Calibration Job Sheet C1. Refer to Figure 8-1 for the repair/replacement sequence that applies to the component to be repaired/replaced.

Refer to Figures R1-1 through R1-5 as visual aids when performing this procedure.

1. Secure the process being controlled.

2. Disconnect power from the application in which the sensor is installed, or take precautions to insure that contact with energized parts is avoided during this procedure.

3. Disconnect power from the transmitter.

4. Remove the transmitter from the process.

5. Remove the housing cover from the field terminal side of the electronics housing (marked **FIELD TERMINALS** on the electronics housing).

6. Use the phillips head screwdriver to remove the internal cover screws (Fig. R1-1).

7. Remove the internal cover. This exposes the sensor wiring terminal strip **TB2** (Fig. R1-2).

8. Using the small flat blade screwdriver, push firmly on a sensor wiring terminal strip lever associated with a connector that has a sensor wire installed.

9. Remove and label the sensor wire.

10. Repeat Steps 8 and 9 for each remaining sensor wire.

11. Use the phillips head screwdriver to loosen the sensor ground terminal screw (Fig. R1-2).

12. Remove the sensor shield.

13. Remove the sensor wiring from the electronics housing (the manner in which this is done depends on the installation).

14. Use the phillips head screwdriver to loosen the field wiring terminal screws from the **+** and **- PWR/OUTPUT** connections on **TB1** (Fig. R1-2).

15. Use the phillips head screwdriver to loosen the field wiring ground terminal screw (Fig. R1-2).

16. Remove the field wiring ground wire.

17. Remove the field wiring from the electronics housing (the manner in which this is done depends on the installation).

18. Remove the transmitter from its mounting.

Pipe Mounting

a. Use the ratchet with $^{1}/_{16}$-inch socket to remove the two nuts that secure the U-bolt around the pipe (Fig. R1-3).

b. Remove the two washers and lock washers (Fig. R1-3).

c. Remove the U-bolt to free the transmitter from the pipe.

Wall Mounting

Use the ratchet with $^{5}/_{16}$-inch socket to remove the two hex wall screws that secure the transmitter to the wall (Fig. R1-4).

Thermowell Mounting

The method for customer mounted thermowells varies depending on the installation. Figure R1-5 shows two application examples for thermowell installations.

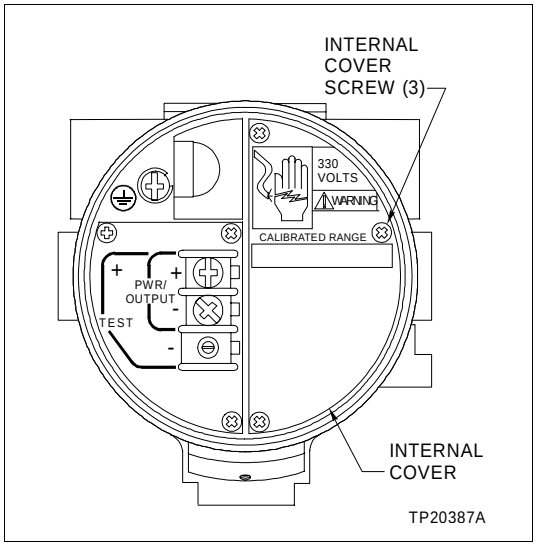


Figure R1-1. Internal Cover Installed

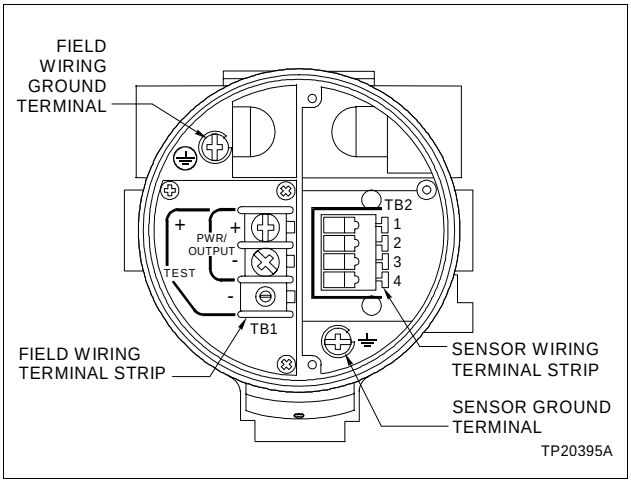


Figure R1-2. Internal Cover Removed

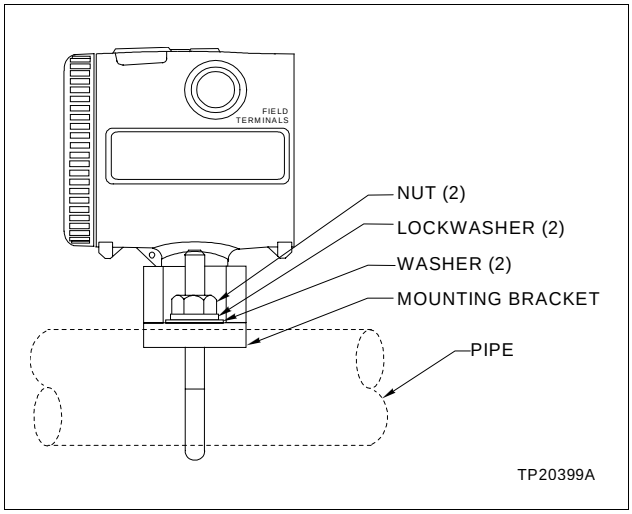


Figure R1-3. Pipe Mounted Transmitter

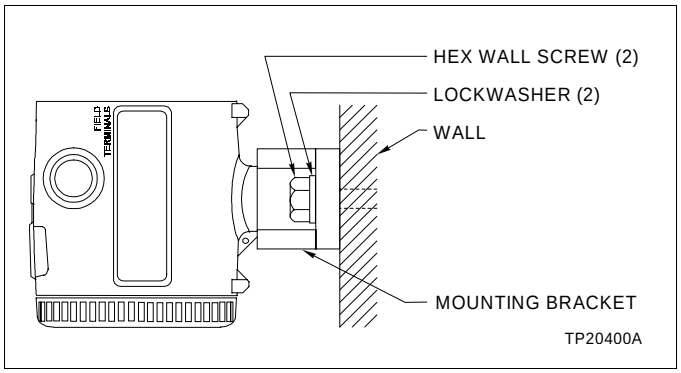


Figure R1-4. Wall Mounted Transmitter

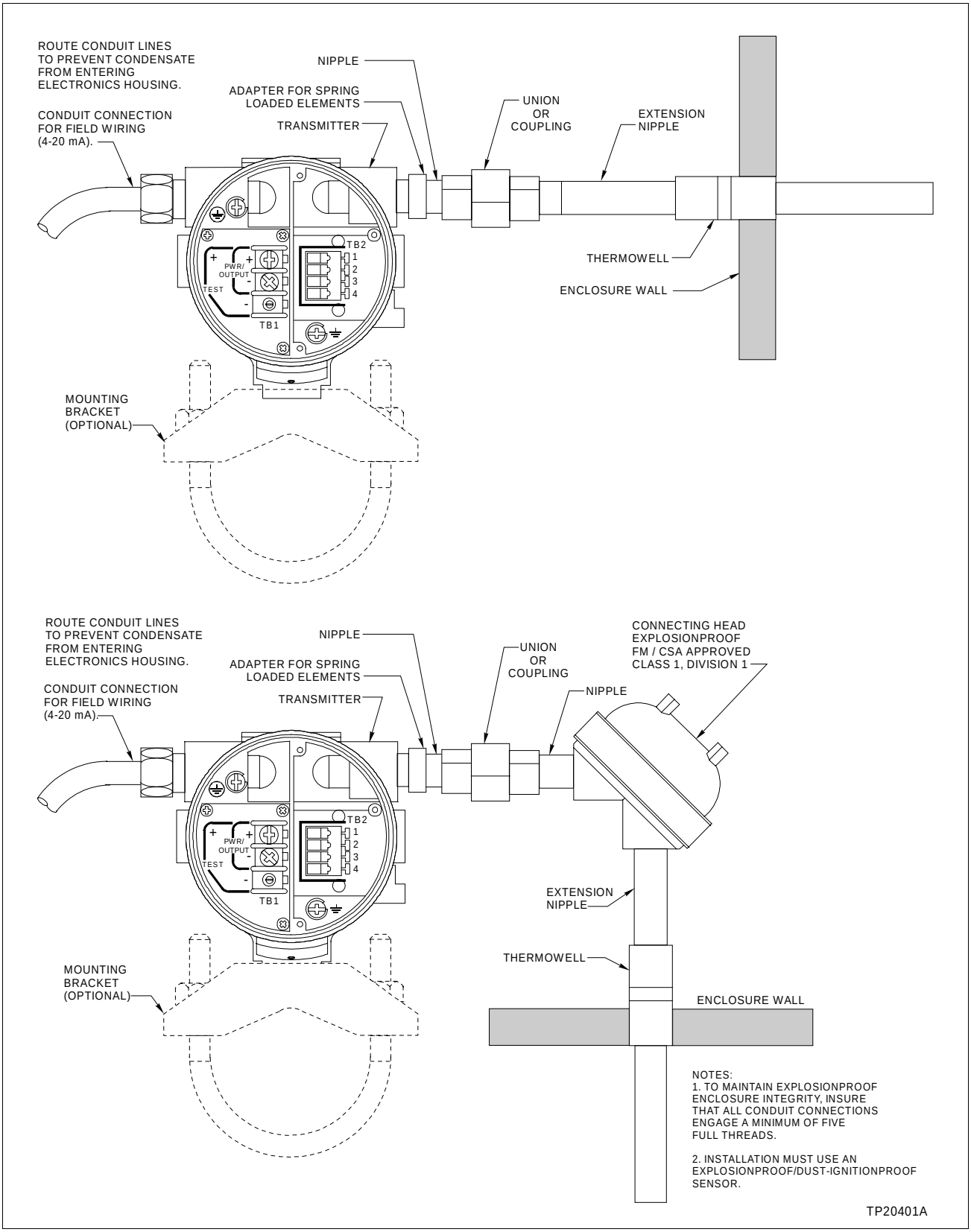


Figure R1-5. Application Examples of Thermowell Installations

REPAIR/REPLACEMENT R2 - INDICATOR REMOVAL

PREPARATION

TOOLS: Phillips head screwdriver.

REFERENCES: None.

PARTS: None.

ESTIMATED TIME: Two minutes.

PROCEDURE

Refer to Figure R2-1 as a visual aid when performing this procedure.

1. Remove the housing cover from the electronics assembly side of the electronics housing.

2. Use the phillips head screwdriver to remove the four indicator screws that secure the indicator to the amplifier assembly (Fig. R2-1).

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

> **NOTE:** The header strip that mates the amplifier assembly to the indicator is removable. Be sure to save it for installation of the indicator.

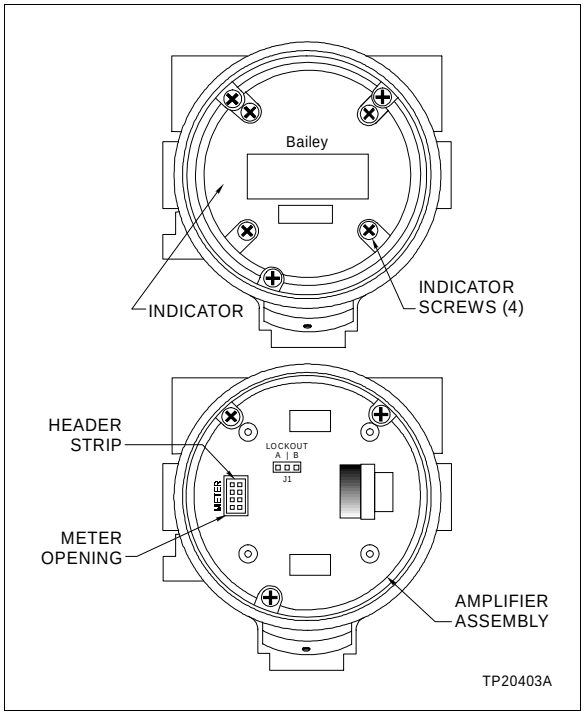


Figure R2-1. Indicator Removal

REPAIR/REPLACEMENT R3 - INDICATOR INSTALLATION

PREPARATION

TOOLS: Phillips head screwdriver.

REFERENCES: None.

PARTS: Appropriate indicator spare parts kit.

- Kit No. 258550_3 (LCD). Consists of:

  LCD assembly with four captive screws (installed).

  O-ring, cover.

  0.25 ounces of NEVER-SEEZ lubricant.

- Kit No. 258550_4. Consists of:

  Analog meter assembly with four captive screws (installed).

  O-ring, cover.

  0.25 ounces of NEVER-SEEZ lubricant.

- Header strip saved from indicator removal.

NOTE: The indicator spare parts kit is not required if using this job sheet as part of the amplifier assembly replacement procedure.

ESTIMATED TIME: Two minutes.

PROCEDURE

Refer to Figure R3-1 as a visual aid when performing this procedure.

NOTE: If using this procedure as part of the electronics assembly replacement, install the original indicator on the new electronics assembly. If using this procedure to replace the indicator, install the new indicator on the original electronics assembly.

1. Install the header strip in the meter opening in the electronics assembly (Fig. R3-1).

2. Align one of the connectors on the back of the indicator with the header strip installed in the meter opening in the amplifier assembly (Fig. R3-1). The alignment of the connector

depends on the desired viewing orientation. Gently press the indicator down to seat the mating connectors.

NOTE: The analog meter must be installed in the upright (zero degree) position. The analog meter cannot be rotated.

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

4. Save the cover O-ring and NEVER-SEEZ lubricant for use with Repair/Replacement Job Sheet R8.

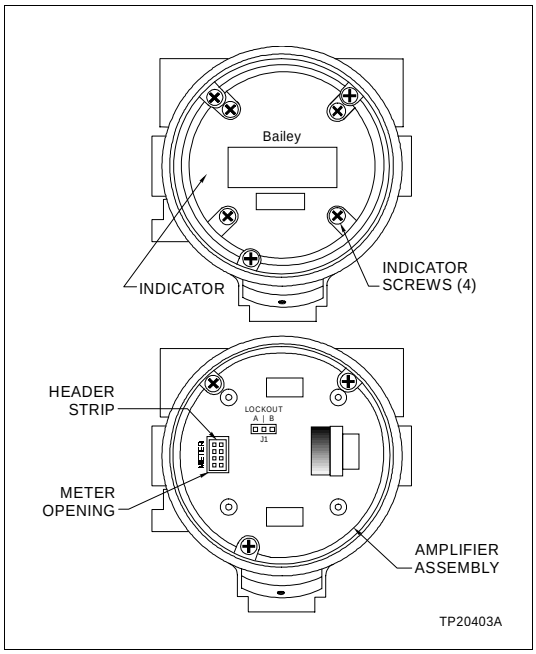


Figure R3-1. Indicator Installation

REPAIR/REPLACEMENT R4 - AMPLIFIER ASSEMBLY REMOVAL AND INSTALLATION

PREPARATION

TOOLS: Phillips head screwdriver.

REFERENCES: None.

PARTS: Appropriate amplifier assembly spare parts kit.

- Spare Parts Kit No. 258546_2. Consists of amplifier assembly only.

NOTE: The amplifier assembly spare parts kit is not needed if replacing electronics housing only.

ESTIMATED TIME: Two minutes.

PROCEDURE

Refer to Figure R4-1 as a visual aid when performing this procedure.

1. Remove the housing cover from the amplifier assembly side of the electronics housing.

2. Use the phillips head screwdriver to remove the three amplifier assembly screws (Fig. R4-1).

NOTE: Save the amplifier assembly screws for installing the amplifier assembly.

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

NOTE: If using this procedure as part of the electronics housing replacement, install the original amplifier assembly in the new electronics housing. If using this procedure to replace the electronics assembly, install the new electronics assembly in the original electronics housing.

4. Align the amplifier assembly with the mounting bosses in the electronics housing and install (Fig. R4-1).

5. Gently press down on the electronics assembly to seat the connector on the back of the amplifier assembly to the electronics housing connector (Fig. R4-1).

6. Use the phillips head screwdriver to install the three amplifier assembly screws.

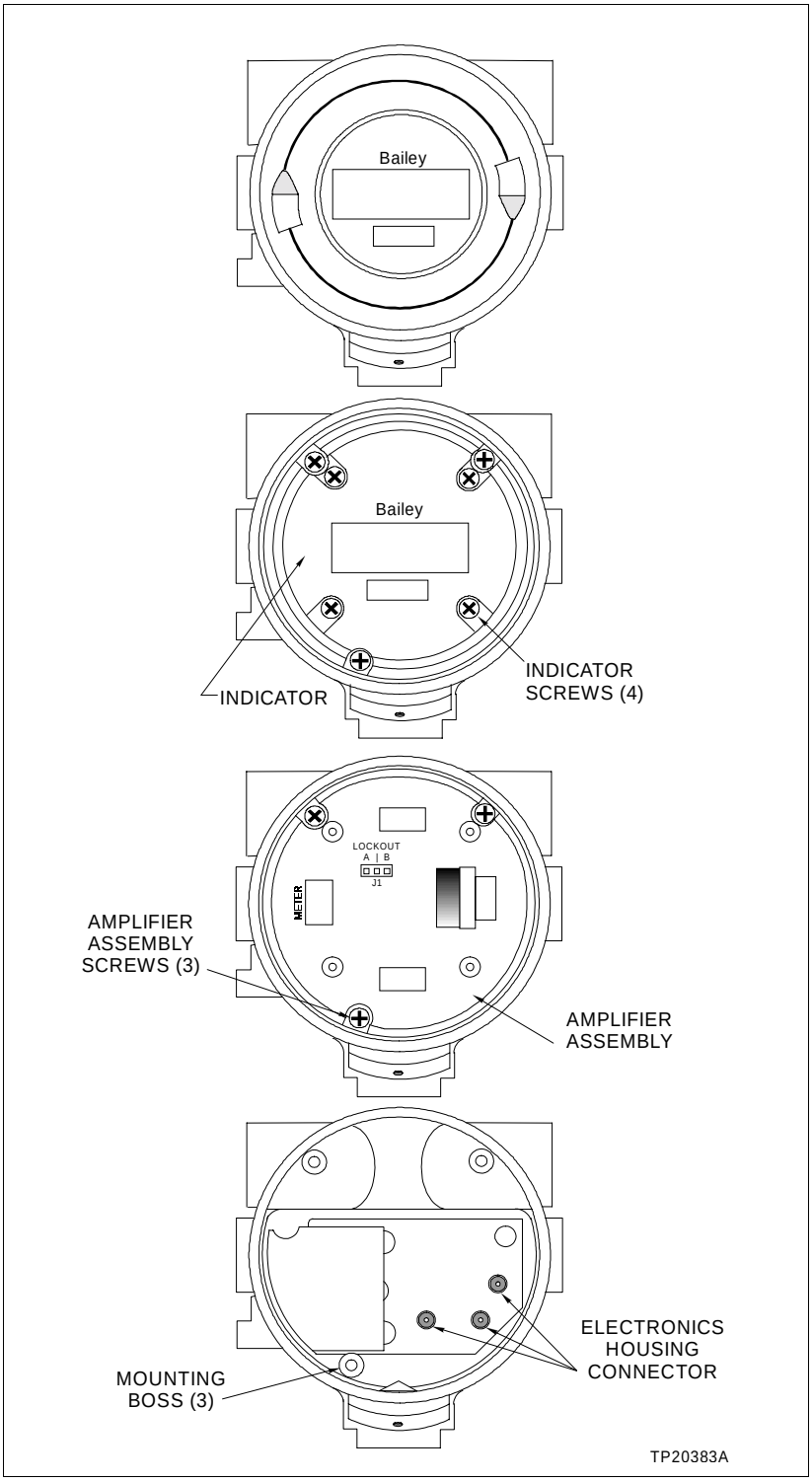


Figure R4-1. Amplifier Assembly

REPAIR/REPLACEMENT R5 - ELECTRONICS HOUSING REPLACEMENT

PREPARATION

TOOLS: None.

REFERENCES: None.

PARTS: Appropriate electronics housing spare parts kit.

- Kit No. 258583_1 (aluminum). Consists of:

  Aluminum housing with all components installed, except amplifier assembly and internal cover.

  Two O-rings, cover.

  0.25 ounces of NEVER-SEEZ lubricant.

- Kit No. 258583_2 (stainless steel). Consists of:

  Stainless steel housing with all components installed, except amplifier assembly and internal cover.

  Two O-rings, cover.

  0.25 ounces of NEVER-SEEZ lubricant.

ESTIMATED TIME: None.

PROCEDURE

This job sheet is for information only. The procedure for replacing the electronics housing is imbedded in Repair/ Replacement Job Sheets R3 through R9. Refer to Figure 8-1 for the proper sequence.

REPAIR/REPLACEMENT R6 - HOUSING COVER REPLACEMENT

PREPARATION

TOOLS: None.

REFERENCES: None.

PARTS: Appropriate housing cover spare parts kit.

- Kit No. 258555_1. Consists of:

  Aluminum cover without window.

  O-ring, cover (installed).

  0.25 ounces of NEVER-SEEZ lubricant.

- Kit No. 258555_2. Consists of:

  Aluminum cover with window.

  O-ring, cover (installed).

  0.25 ounces of NEVER-SEEZ lubricant.

- Kit No. 258555_3. Consists of:

  Stainless steel cover without window.

  O-ring, cover (installed).

  0.25 ounces of NEVER-SEEZ lubricant.

- Kit No. 258555-4. Consists of:

  Stainless steel cover with window.

  O-ring, cover (installed).

  0.25 ounces of NEVER-SEEZ lubricant.

The number of kits required depends on the number of covers to be replaced. Do not mix cover materials.

ESTIMATED TIME: One minute.

PROCEDURE

1. Remove the housing cover from the electronics assembly side of the electronics housing.

2. Discard the old housing covers.

3. Save the NEVER-SEEZ lubricant for use with Repair/ Replacement Job Sheet R9.

REPAIR/REPLACEMENT R7 - INTERNAL COVER REPLACEMENT

PREPARATION

TOOLS: None.

REFERENCES: None.

PARTS: Internal cover spare parts kit.

- Kit No. 258582_1. Consists of internal cover with gasket and captive screws installed.

ESTIMATED TIME: None.

PROCEDURE

This job sheet is for information only. The procedure for removing the internal cover is in Repair/Replacement Job Sheet R1. The procedure for installing the internal cover is in Repair/Replacement Job Sheet R9.

REPAIR/REPLACEMENT R8 - O-RING REPLACEMENT, COVER

PREPARATION

TOOLS:

- Nonmetallic tool to remove O-rings.
- Dow Corning 4 compound or equivalent.

REFERENCES: None.

PARTS: O-ring, cover spare parts kit.

- Kit No. 258556_7. Consists of ten Buna-N O-rings.

ESTIMATED TIME: One minute.

PROCEDURE

Refer to Figure R8-1 as a visual aid when performing this procedure.

1. Remove the housing cover from the amplifier assembly side of the electronics housing.

2. Use the nonmetallic tool to remove the O-rings.

3. Coat the new O-rings with a light film of Dow Corning 4 compound.

4. Install the new O-rings. They must go completely beyond the threads of the housing cover (Fig. R8-1). When installing the O-rings, be careful not to damage them on the threads of the housing cover.

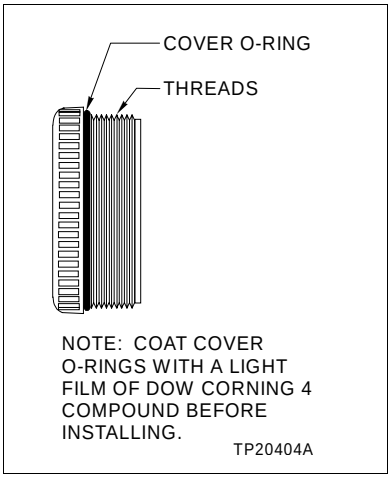


Figure R8-1. O-Ring, Cover Replacement

REPAIR/REPLACEMENT R9 - RETURNING THE TRANSMITTER TO SERVICE

PREPARATION

TOOLS:

- Phillips head screwdriver.
- Small flat-blade screwdriver.
- Ratchet with 1/16-inch socket (for U-bolt nuts).
- Ratchet with 9/16-inch socket (for hex wall screws).
- NEVER-SEEZ lubricant.

REFERENCES: None.

PARTS: Hardware removed when the transmitter was removed from service (depends on mounting method).

ESTIMATED TIME: Five minutes.

PROCEDURE

Refer to Figures R9-1 through R9-5 as visual aids when performing this procedure.

1. Grease the threads of the housing covers and the threads of the electronics housing with a light coating of NEVER-SEEZ lubricant.

2. If removed as part of another procedure, install the housing cover on the amplifier assembly side of the electronics housing.

3. Disconnect power from the application in which the sensor is installed, or take precautions to insure that contact with energized parts is avoided during this procedure.

4. Mount the transmitter.

Pipe Mounting

To pipe mount the transmitter:

a. Place the transmitter, with mounting bracket attached, on the pipe to which it will be mounted.

b. Place the U-bolt around the pipe and threw the two mounting bracket holes (Fig. R9-1).

c. Place a washer over each end of the U-bolt (Fig. R9-1).

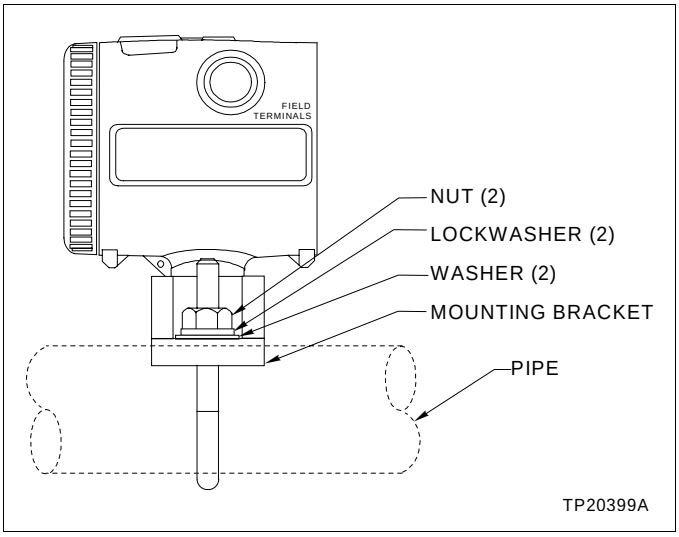


Figure R9-1. Pipe Mounting

d. Place a lock washer over each end of the U-bolt (Fig. R9-1).

e. Place a nut on each end of the U-bolt and hand tighten (Fig. R9-1).

f. Use the ratchet with 1/16-inch socket to tighten them.

Wall Mounting

To wall mount the transmitter:

a. Position the transmitter, with mounting bracket attached, so that the two mounting bracket holes align with the mounting holes in the wall.

b. Place a lock washer over each of the hex wall screws (Fig. R9-2).

c. Insert a hex wall screw through each of the mounting bracket holes and into the mounting holes in the wall (Fig. R9-2).

d. Use the ratchet with 9/16-inch socket to tighten each of the hex wall screws.

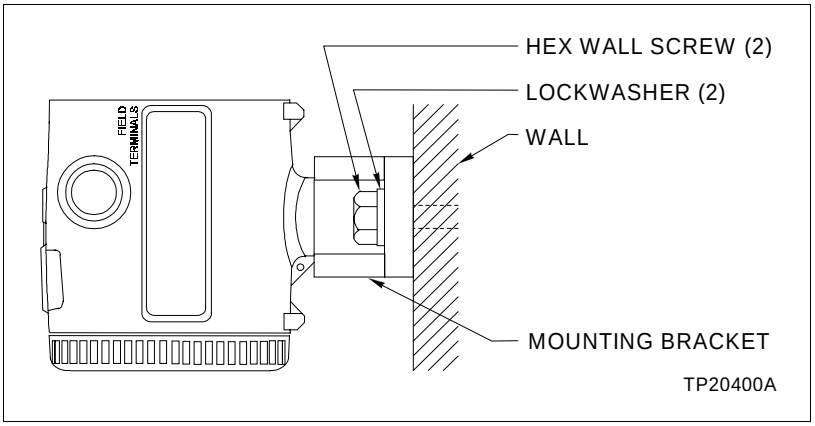


Figure R9-2. Wall Mounting

Thermowell Mounting

To thermowell mount the transmitter:

The method for customer mounted thermowells varies depending on the installation. Refer to Figure R9-3 for two application examples of thermowell installations.

5. Insert the field wiring into the electronics housing (the manner in which this is done depends on the installation).

6. Attach the field wiring to the **+** and **- PWR/OUTPUT** connections on **TB1** (Fig. R9-4).

7. Use the phillips head screwdriver to tighten the field wiring terminal screws.

8. Install the field wiring ground wire on the field wiring ground terminal (Fig. R9-4).

9. Use the phillips head screwdriver to tighten the field wiring ground terminal screw.

10. Using the small flat-blade screwdriver, push firmly on a sensor wiring terminal strip lever on **TB2** (Fig. R9-4) associated with a connector that will have a sensor wire installed.

11. Insert the proper sensor wire into the connector.

12. Repeat Steps 10 and 11 for each remaining sensor wire.

13. Install the sensor shield to the sensor ground terminal (Fig. R9-4).

14. Use the phillips head screwdriver to tighten the sensor ground terminal screw.

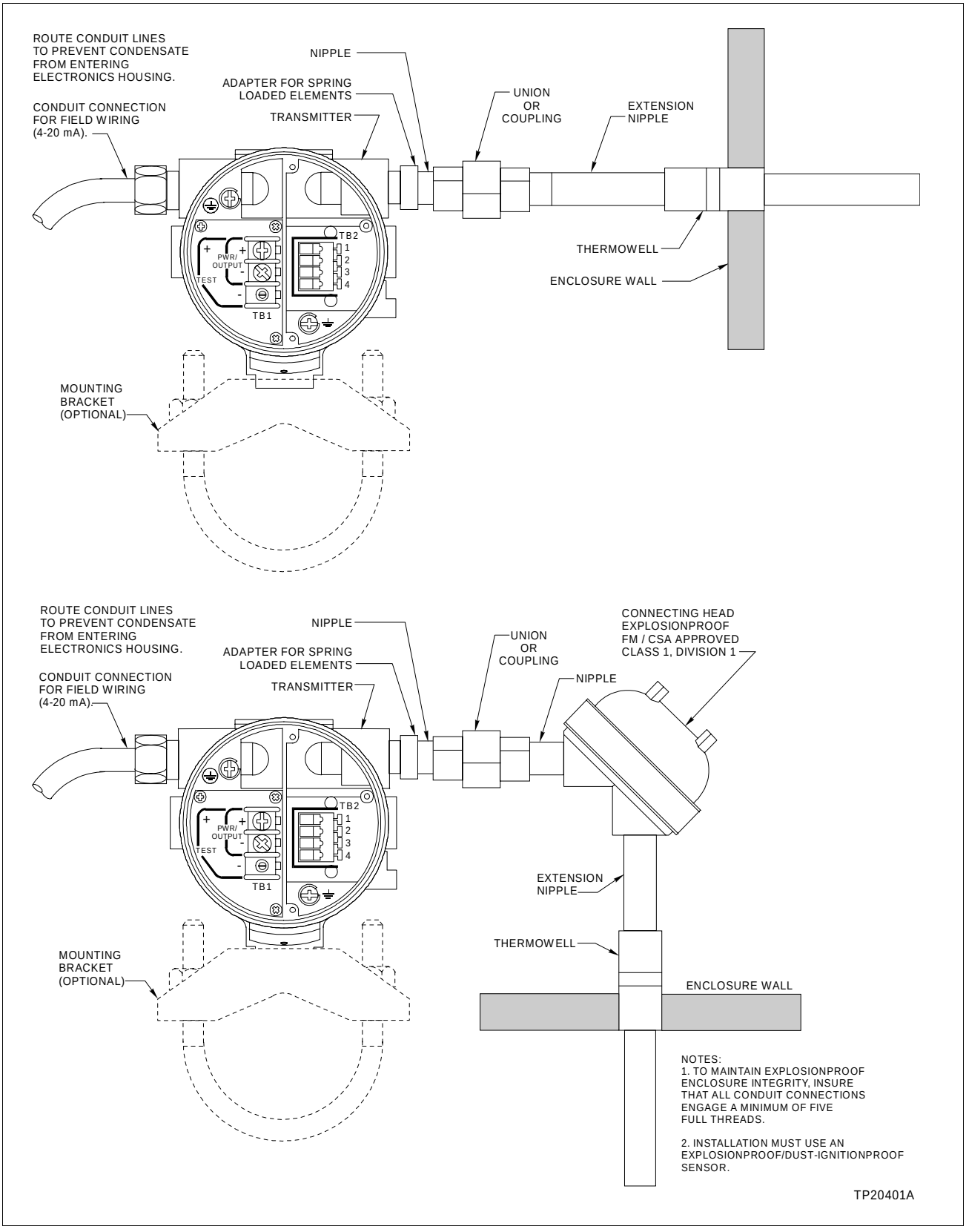


Figure R9-3. Thermowell Mounting

15. Position the internal cover over the three mounting holes in the electronics housing.

16. Use the phillips head screwdriver to tighten the three captive internal cover screws (Fig. R9-5).

17. Install the housing cover on the field terminal side of the electronics housing.

18. Apply power to the transmitter.

19. Return the transmitter to process.

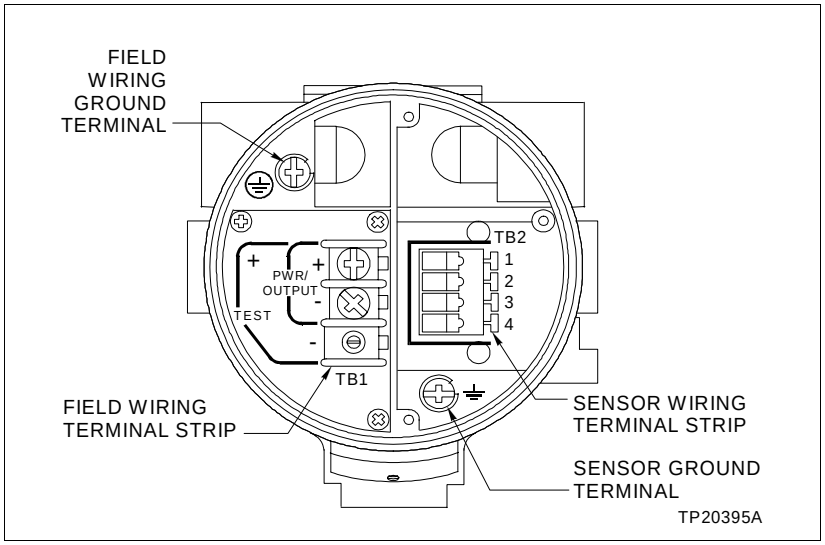


Figure R9-4. Wiring

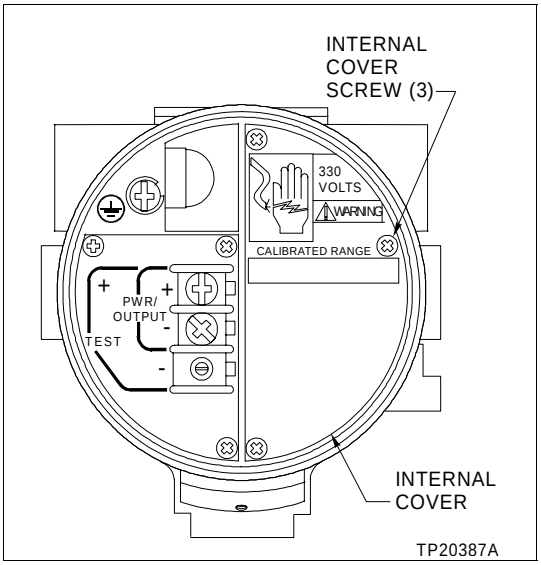


Figure R9-5. Internal Cover

REPAIR/REPLACEMENT R10 - TAGGING REPLACEMENT

PREPARATION

TOOLS:

- Wire cutters.
- Device for etching information on new tag.

REFERENCES: None.

PARTS: Stainless steel tagging spare parts kit.

- Kit No. 258557_1. Consists of ten blank stainless steel tags with six-inch wires attached.

ESTIMATED TIME: Ten minutes. Includes time for etching new tag.

PROCEDURE

Refer to Figure R10-1 when performing this procedure.

1. Use the etching device to etch the desired information on the new tag. Information that could be etched on this tag is the transmitter identification number, calibration date, or any other type of information useful to the particular process.

2. Use the wire cutters to cut the wire securing the old tag to the electronics housing.

3. Remove the tag.

4. Run the wire attached to the new tag through the tagging hole in the electronics housing and twist it together.

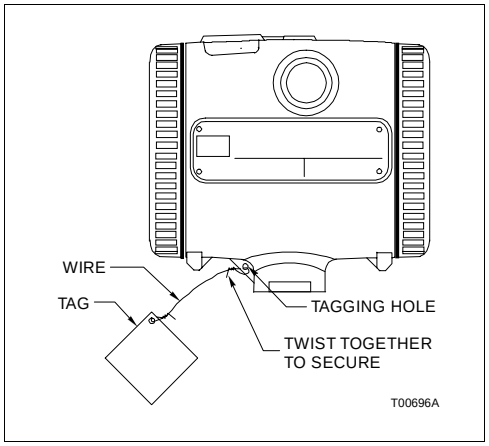


Figure R10-1. Tagging Replacement

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