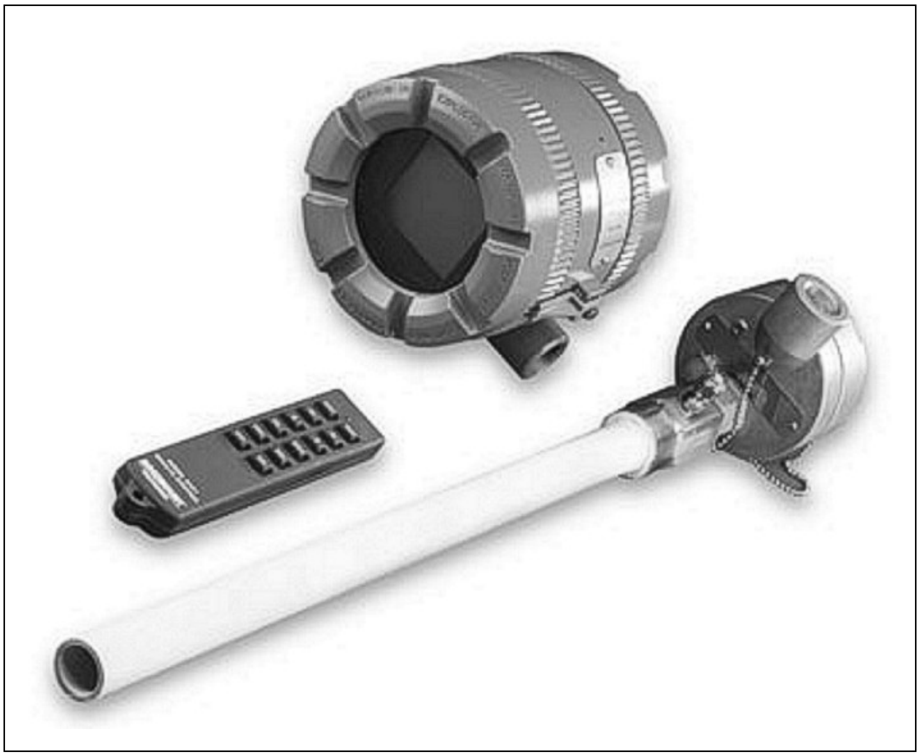
Instruction Manual
IB-106-3081 Rev. 1.5
September 2002

Model 3081FG

Two-Wire In Situ
Oxygen Analyzer
(550° to 1600°C)



ROSEMOUNT® Analytical

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ESSENTIAL INSTRUCTIONS
READ THIS PAGE BEFORE PROCEEDING!

Rosemount Analytical designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you **MUST properly install, use, and maintain them** to ensure they continue to operate within their normal specifications. The following instructions **MUST be adhered to** and integrated into your safety program when installing, using, and maintaining Rosemount Analytical products. Failure to follow the proper instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.

- **Read all instructions** prior to installing, operating, and servicing the product.
- If you do not understand any of the instructions, **contact your Rosemount Analytical representative** for clarification.
- **Follow all warnings, cautions, and instructions** marked on and supplied with the product.
- **Inform and educate your personnel in the proper installation, operation, and maintenance of the product**.
- **Install your equipment as specified in the Installation Instructions of the appropriate Instruction Manual and per applicable local and national codes**. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, **use qualified personnel** to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Rosemount. Unauthorized parts and procedures can affect the product's performance, place the safe operation of your process at risk, **and VOID YOUR WARRANTY**. Look-alike substitutions may result in fire, electrical hazards, or improper operation.
- **Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury**.

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

Emerson Process Management

Rosemount Analytical Inc.
Process Analytic Division
1201 N. Main St.
Orrville, OH 44667-0901
T (330) 682-9010
F (330) 684-4434
e-mail: gas.csc@EmersonProcess.com

http://www.processanalytic.com

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HIGHLIGHTS OF CHANGES

Effective June, 1998 Rev. 1.0

Page	Summary
Page 2-10	Corrected part numbers in Figure 2-9 for Flowmeter and Ref Air Set.
Page 3-4	Modified Figure 3-5 to reflect selection of additional faults.
Page 3-11	Modified paragraph 3-6a to select additional fault screens.
Page 4-4	Updated menus for O_2 value, SV, TV, and 4V values.
Page 8-1	Added in replacement part numbers for Model 3081 Transmitter.

Effective April, 1999 Rev. 1.1

Page	Summary
Cover	Added “Model 3081FG” to manual title.
Page 1-2	Deleted 48 in. probe and Mullite probe options from Product Matrix.
Page 1-7	Deleted 48 in. probe and Mullite probe references from specifications.
Page 2-1 through 2-6	Changed probe installation mounting and insertion procedures and requirements.
Page 5-1	Revised PC board stack replacement procedure.
Throughout	Changed all references to “power supply board” to read “analog board”. Reformatted document in accordance with the latest style guide.

Effective October, 2000 Rev. 1.2

Page	Summary
Throughout	Changed all references of 38 in. (965 mm) probe to 34.625 in. (880 mm).

Effective April, 2001 Rev. 1.3

Page	Summary
Page 2-9	Added 1st WARNING to paragraph 2-3.
Page 10-2	Added drawing 1400184.

Effective January, 2002 Rev. 1.4

Page	Summary
Page 8-1	Added part number for PC Board Stack Assembly.

Effective September, 2002 Rev. 1.5

Page	Summary
Page 1-7	Updated process temperature limits specification.

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PREFACE

The purpose of this manual is to provide information concerning the components, functions, installation and maintenance of the Model 3081FG Two-Wire In Situ Oxygen Analyzer (550° to 1600°C).

Some sections may describe equipment not used in your configuration. The user should become thoroughly familiar with the operation of this module before operating it. Read this instruction manual completely.

DEFINITIONS

The following definitions apply to WARNINGS, CAUTIONS, and NOTES found throughout this publication.

WARNING

Highlights an operation or maintenance procedure, practice, condition, statement, etc. If not strictly observed, could result in injury, death, or long-term health hazards of personnel.

CAUTION

Highlights an operation or maintenance procedure, practice, condition, statement, etc. If not strictly observed, could result in damage to or destruction of equipment, or loss of effectiveness.

NOTE

Highlights an essential operating procedure, condition, or statement.

⏚ : EARTH (GROUND) TERMINAL

⊜ : PROTECTIVE CONDUCTOR TERMINAL

⚠ : RISK OF ELECTRICAL SHOCK

⚠ : WARNING: REFER TO INSTRUCTION BULLETIN

NOTE TO USERS

The number in the lower right corner of each illustration in this publication is a manual illustration number. It is not a part number, and is not related to the illustration in any technical manner.

IMPORTANT

SAFETY INSTRUCTIONS FOR THE WIRING AND INSTALLATION OF THIS APPARATUS

The following safety instructions apply specifically to all EU member states. They should be strictly adhered to in order to assure compliance with the Low Voltage Directive. Non-EU states should also comply with the following unless superseded by local or National Standards.

1. Adequate earth connections should be made to all earthing points, internal and external, where provided.

2. After installation or troubleshooting, all safety covers and safety grounds must be replaced. The integrity of all earth terminals must be maintained at all times.

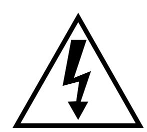
3. Mains supply cords should comply with the requirements of IEC227 or IEC245.

4. All wiring shall be suitable for use in an ambient temperature of greater than 75°C.

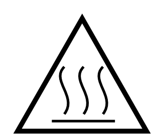
5. All cable glands used should be of such internal dimensions as to provide adequate cable anchorage.

6. To ensure safe operation of this equipment, connection to the mains supply should only be made through a circuit breaker which will disconnect all circuits carrying conductors during a fault situation. The circuit breaker may also include a mechanically operated isolating switch. If not, then another means of disconnecting the equipment from the supply must be provided and clearly marked as such. Circuit breakers or switches must comply with a recognized standard such as IEC947. All wiring must conform with any local standards.

7. Where equipment or covers are marked with the symbol to the right, hazardous voltages are likely to be present beneath. These covers should only be removed when power is removed from the equipment — and then only by trained service personnel.



8. Where equipment or covers are marked with the symbol to the right, there is a danger from hot surfaces beneath. These covers should only be removed by trained service personnel when power is removed from the equipment. Certain surfaces may remain hot to the touch.



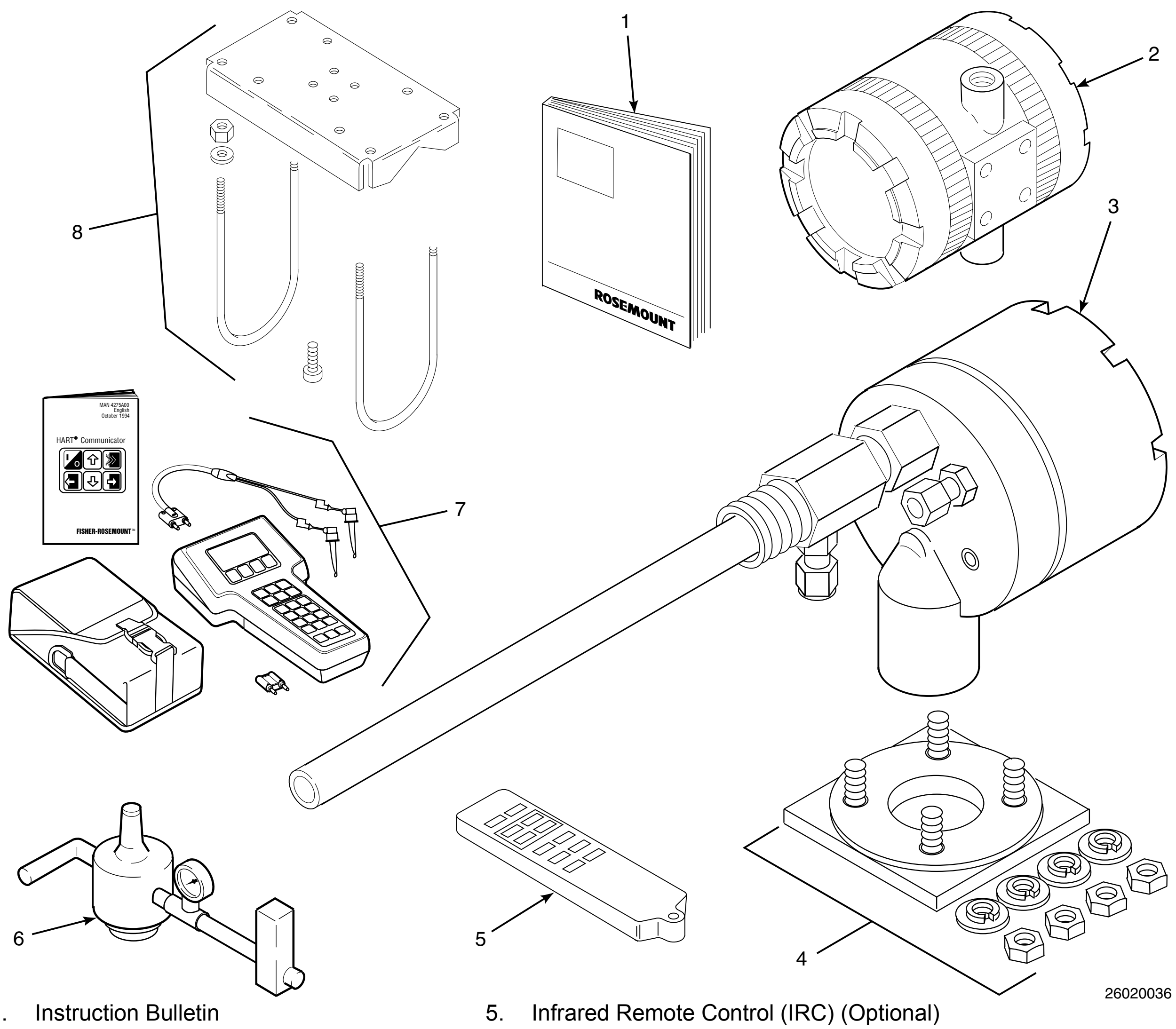
9. Where equipment or covers are marked with the symbol to the right, refer to the Operator Manual for instructions.

10. All graphical symbols used in this product are from one or more of the following standards: EN61010-1, IEC417, and ISO3864.

SECTION 1
DESCRIPTION AND SPECIFICATIONS

1-1 COMPONENT CHECKLIST OF TYPICAL SYSTEM (PACKAGE CONTENTS)

A typical Rosemount Two-Wire In Situ Oxygen Analyzer should contain the items shown in Figure 1-1. Record the part number, serial number, and order number for each component of your system in the table located on the first page of this manual. Also, use the product matrix in Table 1-1 to compare your order number against your unit. The first part of the matrix defines the model. The last part defines the various options and features of the analyzer. Ensure the features and options specified by your order number are on or included with the unit.



1. Instruction Bulletin
2. Model 3081 Transmitter
3. Oxygen Probe
4. Adapter Plate with mounting hardware and gasket (Optional)
5. Infrared Remote Control (IRC) (Optional)
6. Reference Air Set (Optional)
7. HART® Communicator Package (Optional)
8. Pipe Mounting Kit (Optional)

Figure 1-1. Typical System Package

Table 1-1. Product Matrix

3081FG	High Temperature Oxygen Flue Gas Analyzer

High Temperature Analyzer - Instruction Book

Code	Sensing Probe Length
1	20 in. (508 mm) probe, 1/4 in. tube fittings
2	26 in. (660 mm) probe, 1/4 in. tube fittings
3	34.625 in. (880 mm) probe, 1/4 in. tube fittings

Code	Probe Outer Tube Material - Maximum Operating Temperature
1	Alumina - 2912°F (1600°C) maximum - 1.25 NPT mounting
2	Inconel 600 - 1832°F (1000°C) maximum - 1.25 NPT mounting

Code	Mounting Adapter - Stack Side
0	No adapter plate required uses 1.25 NPT ("0" must also be chosen under "Mounting Adapter" below)
1	New flanged installation - Square weld plate with studs (matches "Mounting Adapter" below)
2	Model 450 mounting ("4" must also be chosen under "Mounting Adapter" below)
3	Competitor's Mount ("5" must also be chosen under "Mounting Adapter" below)

Code	Mounting Adapter - Probe Side
0	No adapter plate
1	ANSI 2 in. 150 lb flange to 1.25 NPT adapter (6 in. dia. flange, 4.75 in. BC with 4 x 0.75 in. dia. holes)
2	DIN to 1.25 NPT adapter (184 mm flange, 145 mm BC with 4 x 18 mm dia. holes)
3	JIS to 1.25 NPT adapter (155 mm flange, 130 mm BC with 4 x 13 mm dia. holes)
4	Model 450 to 1.25 NPT adapter
5	Competitor's mounting flange

Code	Electronics & Housing - Intrinsically Safe, NEMA 4X, IP65
1	3081 Electronics (Hart-compatible) - CENELEC EEx ia IIC T5
2	3081 Electronics (Hart-compatible) - CSA pending
3	3081 Electronics (Hart-compatible) - FM Class I, Div. I, Groups B,C,D

Code	Housing Mounting
0	Surface or wall mounting
1	1/2 to 2 in. pipe mounting

Code	Communications
0	No remote control
1	Infrared Remote Control (IRC) (LCD display through cover window)

Code	Calibration Accessories
1	No hardware
2	Calibration and reference air flowmeters and reference air pressure regulator

Code	Armored Cable Length
00	No cable
11	20 ft (6 m)
12	40 ft (12 m)
13	60 ft (18 m)
14	80 ft (24 m)
15	100 ft (30 m)
16	150 ft (45 m)
17	200 ft (61 m)
18	300 ft (91 m)
19	400 ft (122 m)
20	500 ft (152 m)

3081FG	2	1	0	0	1	1	1	2	11	Example

1-2 SYSTEM OVERVIEW

a. Scope

This Instruction Bulletin is designed to supply details needed to install, start up, operate, and maintain the Rosemount Two-Wire In Situ Oxygen Analyzer. The analyzer consists of an oxygen probe and Model 3081 Transmitter. The signal conditioning electronics of the Model 3081 Transmitter outputs a 4-20 mA signal representing an O_2 value. An infrared remote control (IRC) allows access to setup, calibration, and diagnostics. This same information, plus additional details, can be accessed with the HART Model 275 handheld communicator or Asset Management Solutions (AMS) software.

b. System Description

The Rosemount Two-Wire In Situ Oxygen Analyzer is designed to measure the net concentration of oxygen in an industrial process; i.e., the oxygen remaining after all fuels have been oxidized. The oxygen probe is permanently positioned within an exhaust duct or stack and performs its task without the use of a sampling system. The Model 3081 Transmitter is mounted remotely and conditions the oxygen probe outputs.

The equipment measures oxygen percentage by reading the voltage developed across an electrochemical cell, which consists of a small yttria-stabilized, zirconia disc. Both sides of the disc are coated with porous metal electrodes. The millivolt output voltage of the cell is given by the following Nernst equation:

$$EMF = KT \log10(P1/P2) + C$$

Where:

1. P_2 is the partial pressure of the oxygen in the measured gas on one side of the cell.
2. P_1 is the partial pressure of the oxygen in the reference air on the opposite side of the cell.
3. T is the absolute temperature.
4. C is the cell constant.
5. K is an arithmetic constant.

NOTE

For best results, use clean, dry, instrument air (20.95% oxygen) as the reference air.

NOTE

The probe uses a Type B thermocouple to measure the cell temperature.

When the cell is at 550°C to 1600°C (1022°F to 2912°F) and there are unequal oxygen concentrations across the cell, oxygen ions will travel from the high oxygen partial pressure side to the low oxygen partial pressure side of the cell. The resulting logarithmic output voltage is approximately 50 mV per decade.

The output is proportional to the inverse logarithm of the oxygen concentration. Therefore, the output signal increases as the oxygen concentration of the sample gas decreases. This characteristic enables the Rosemount Two-Wire In Situ Oxygen Analyzer to provide exceptional sensitivity and accuracy at low oxygen concentrations.

Oxygen analyzer equipment measures net oxygen concentration in the presence of all the products of combustion, including water vapor. Therefore, it may be considered an analysis on a "wet" basis. In comparison with older methods, such as the portable apparatus, which provides an analysis on a "dry" gas basis, the "wet" analysis will, in general, indicate a lower percentage of oxygen. The difference will be proportional to the water content of the sampled gas stream.

c. System Configuration

The equipment discussed in this manual consists of two major components: the oxygen probe and the Model 3081 Transmitter.

Oxygen probes are available in three length options, providing in situ penetration appropriate to the size of the stack or duct. The options on length are 20 in. (508 mm), 26 in. (660 mm), or 34.625 in. (880 mm).

The Model 3081 Transmitter is a two-wire transmitter providing an isolated output, 4-20 mA, that is proportional to the measured oxygen concentration. A customer-supplied 24 VDC power source is required to simultaneously provide power to the electronics and a 4-20 mA signal loop. The transmitter accepts millivolt signals generated by the probe and produces the outputs to be used by other remotely connected devices. The output is an isolated 4-20 mA linearized current.

d. System Features

1. The cell output voltage and sensitivity increase as the oxygen concentration decreases.

2. High process temperatures eliminate the need for external cell heating and increase cell accuracy.

3. HART communication is standard. To use the HART capability, you must have either:

   (a) HART Model 275 Communicator

   (b) Asset Management Solutions (AMS) software for the PC

4. Easy probe replacement due to the light-weight, compact probe design.

5. Remote location of the Model 3081 Transmitter removes the electronics from high temperature or corrosive environments.

6. Power is supplied to the electronics through the 4-20 mA line for intrinsic safety (IS) purposes.

7. Infrared remote control (IRC) allows interfacing without exposing the electronics.

8. An operator can operate and diagnostically troubleshoot the Two-Wire In Situ Oxygen Analyzer in one of two ways:

   (a) Infrared Remote Control. The IRC allows access to fault indication menus on the Model 3081 Transmitter LCD display. Calibration can be performed from the IRC keypad.

   (b) Optional HART Interface. The Two-Wire In Situ Oxygen Analyzer's 4-20 mA output line transmits an analog signal proportional to the oxygen level. The HART output is superimposed on the 4-20 mA output line. This information can be accessed through the following:

      1 Rosemount Model 275 Handheld Communicator - The handheld communicator requires Device Description (DD) software specific to the Two-Wire In Situ Oxygen Analyzer. The DD software will be supplied with many Model 275 units but can also be programmed into existing units at most Fisher-Rosemount service offices. See Section 4, HART/AMS, for additional HART information.

      2 Personal Computer (PC) - The use of a personal computer requires AMS software available from Fisher-Rosemount.

9. Selected Distributed Control Systems - The use of distributed control systems requires input/output (I/O) hardware and AMS Security codes are provided to (by infrared remote control) prevent unintended changes to analyzers adjacent to the one being accessed.

10. A calibration check procedure is provided to determine if the Rosemount Two-Wire In Situ Oxygen Analyzer is correctly measuring the net oxygen concentration in the industrial process.

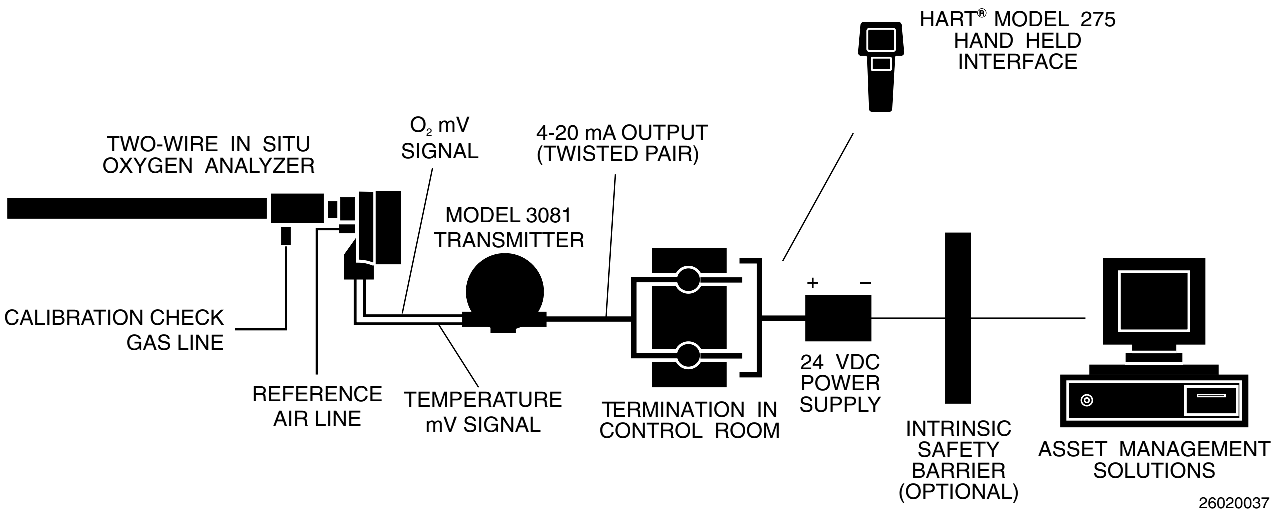


Figure 1-2. Two-Wire In Situ Oxygen Analyzer HART Connections and AMS Application

e. Handling the Analyzer

The probe was specially packaged to prevent breakage due to handling. Do not remove the padding material from the probe until immediately before installation.

> **CAUTION**
>
> **It is important that printed circuit boards and integrated circuits are handled only when adequate antistatic precautions have been taken to prevent possible equipment damage.**

> **CAUTION**
>
> **The oxygen probe is designed for industrial applications. Treat with care to avoid physical damage. The probe contains components made from ceramic, which are susceptible to shock when mishandled. THE WARRANTY DOES NOT COVER DAMAGE FROM MISHANDLING.**

f. System Considerations

Prior to installing your Rosemount Two-Wire In Situ Oxygen Analyzer, make sure you have all the components necessary to make the system installation. Ensure all the components are properly integrated to make the system functional.

After verifying that you have all the components, select mounting locations and determine how each component will be placed in terms of available line voltage, ambient temperatures, environmental considerations, convenience, and serviceability. Figure 1-2 shows a typical system wiring. A typical system installation is illustrated in Figure 1-3.

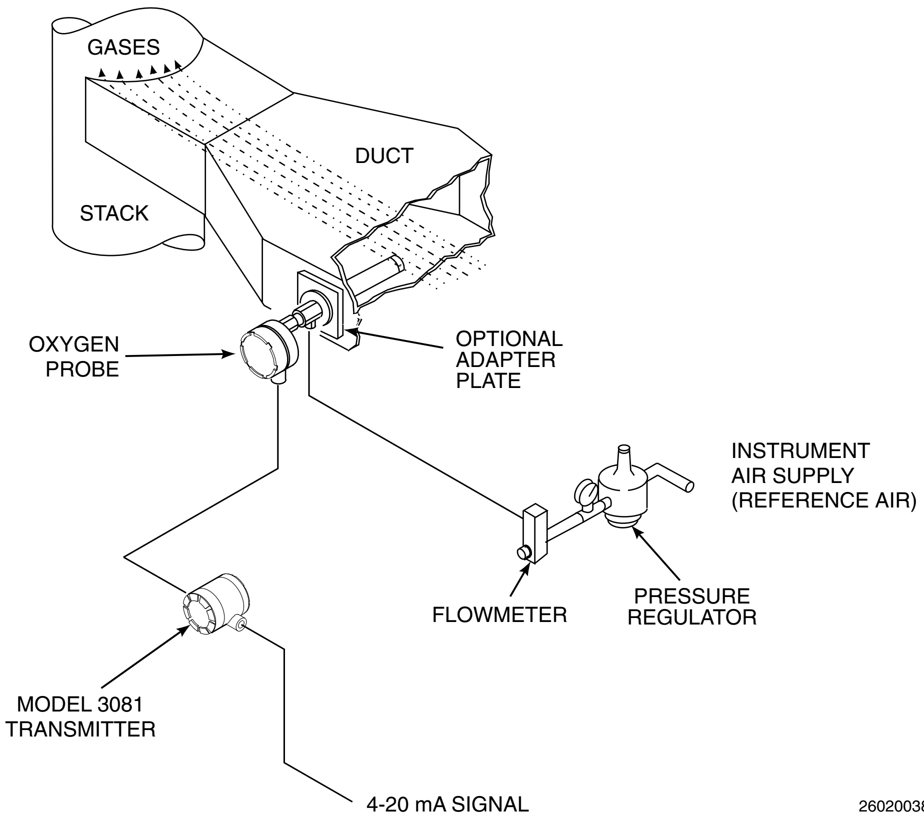


Figure 1-3. Typical System Installation

A source of instrument air is required at the oxygen probe for reference air use. Since the Two-Wire In Situ Oxygen Analyzer is equipped with an in-place calibration feature, provisions should be made for connecting calibration check gas tanks to the oxygen probe during calibration.

If the calibration check gas bottles are to be permanently connected, a check valve is required next to the calibration fittings on the integral electronics.

This check valve is to prevent breathing of calibration check gas line and subsequent flue gas condensation and corrosion. The check valve is in addition to the stop valve in the calibration check gas kit.

NOTE

The electronics of the Model 3081 Transmitter is rated NEMA 4X (IP65) and is capable of operating at temperatures up to 65°C (149°F).

Retain the packaging in which the Rosemount Two-Wire In Situ Oxygen Analyzer arrived from the factory in case any components are to be shipped to another site. This packaging has been designed to protect the product.

1-3 SPECIFICATIONS

Net O_2 Range	0 to 25% O_2
Fully Field Selectable via the HART Interface	
Lowest Limit	0.05% O_2
Highest Limit	25.00% O_2
Accuracy	±1.5% of reading or 0.05% O_2, whichever is greater
System Response to Calibration Check Gas	Initial response in less than 3 seconds T90 in less than 10 seconds
PROBE	
Lengths	20 in. (508 mm) 26 in. (660 mm) 34.625 in. (880 mm)
Temperature Limits	
Process Temperature Limits	550° to 1400°C (1022° to 2552°F) Operation to 1600°C (2912°F) with reduced cell life.
Ambient	-40° to 149°C (-40° to 300°F) Ambient
Mounting and Mounting Position	Vertical or Horizontal
Materials of Construction	
Process Wetted Parts	
Inner Probe	Zirconia
Outer Protection Tube	Alumina [1600°C (2912°F) limit] Inconel 600 [1000°C (1832°F) limit]
Probe Junction Box	Cast aluminum
Speed of Installation/Withdrawal	1 in. (25.4 mm) per minute
Hazardous Area Certification	Intrinsically safe per EN50 014 (1977), clause 1.3(1)
Reference Air Requirement	100 ml per minute (0.2 scfh) of clean, dry instrument air; 1/4 in. tube fittings
Calibration Check Gas Fittings	1/4 in. tube fittings
Cabling	Two twisted pairs, shielded

(1) Thermocouple and O_2 probe cell are both unpowered, developing a millivolt emf, and are considered a "simple apparatus" by certifying agencies.

ELECTRONICS	
Enclosure	IP65 (NEMA 4X), weatherproof, and corrosion-resistant
Materials of Construction	Low copper aluminum
Ambient Temperature Limits	-20° to 65°C (-4° to 149°F)
Relative Humidity	95% with covers sealed
Power Supply and Load Requirements	See Figure 1-4
Inputs (from O_2 Probe)	Two wires - O_2 signal Two wires - type B thermocouple
Output	One 4-20 mA signal with superimposed digital HART signal
Hazardous Area Certification	Cenelec EEx ia IIC T4 or T5(2) NEC Class I Div. I Group B,C,D CE Fisher-Rosemount has satisfied all obligations coming from the European legislation to harmonize the product requirements in Europe.
Power Transient Protection	IEC 801-4
Shipping Weight	10 lbs (4.5 kg)
INFRARED REMOTE CONTROL	
Power Requirements	Three AAA batteries
Hazardous Area Certification	Cenelec EEx ia IIC Class I, Div. I, Group A, B, C, D

[2]Dependent on ambient temperature limits.

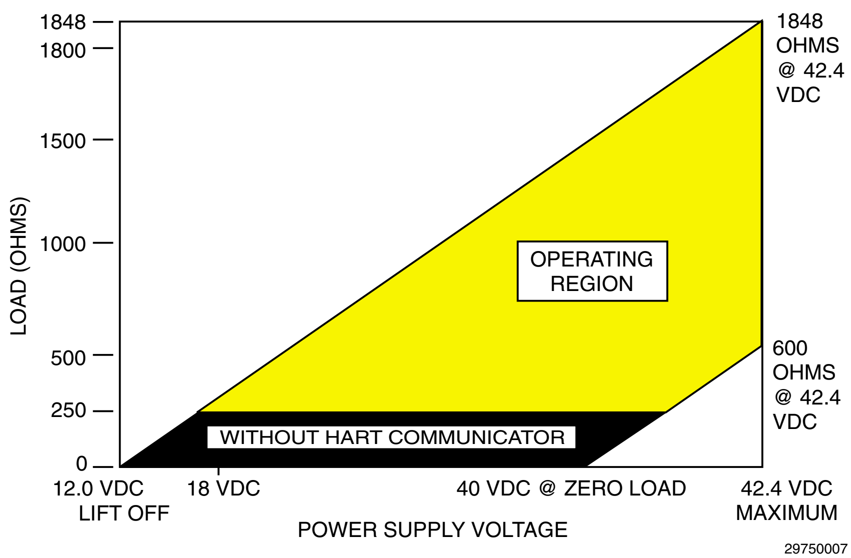


Figure 1-4. Power Supply and Load Requirements

2

SECTION 2 INSTALLATION

2-1 PRE-INSTALLATION

a. Inspect

Carefully inspect the shipping container for any evidence of damage. If the container is damaged, notify the carrier immediately.

b. Packing List

Confirm that all items shown on the packing list are present. Notify Rosemount Analytical immediately if items are missing.

WARNING

Before installing this equipment, read the "Safety instructions for the wiring and installation of this apparatus" at the front of this Instruction Bulletin. Failure to follow the safety instructions could result in serious injury or death.

2-2 MECHANICAL INSTALLATION

CAUTION

Avoid installation locations near steam soot blowers.

a. Locating Oxygen Probe

1. The location of the oxygen probe in the stack or flue is important for maximum accuracy in the oxygen analyzing process. The probe must be positioned so the gas it measures is representative of the process. Best results are normally obtained if the probe is positioned near the center of the duct (40-60% insertion). Longer ducts may require several analyzers since the O_2 can vary due to stratification. A point too near the wall of the duct, or the inside radius of a bend, may not provide a representative sample because of the very low flow conditions. The sensing point should be selected so the process gas temperature falls within a range of 550° to 1600°C (1022° to 2912°F). Figure 2-1 provides mechanical installation references.

2. Check the flue or stack for holes and air leakage. The presence of this condition will substantially affect the accuracy of the oxygen reading. Therefore, either make the necessary repairs or install the probe upstream of any leakage.

3. Ensure the area is clear of internal and external obstructions that will interfere with installation and maintenance access to the probe. Allow adequate clearance for probe removal (Figure 2-1).

b. Installing Oxygen Probe

CAUTION

The probe was specially packaged to prevent breakage due to handling. Do not remove the padding material from the probe until immediately before installation.

1. Ensure all components are available to install the probe.

NOTE

Leave the probe inner protective cover in place until installation. This is required to protect the ceramic cell during movement.

2. If using an optional adapter plate (Figure 2-2) or an optional mounting flange (Figure 2-3), weld or bolt the component onto the duct. The through hole in the stack or duct wall and refractory material must be 2 in. (50.8 mm) diameter, minimum.

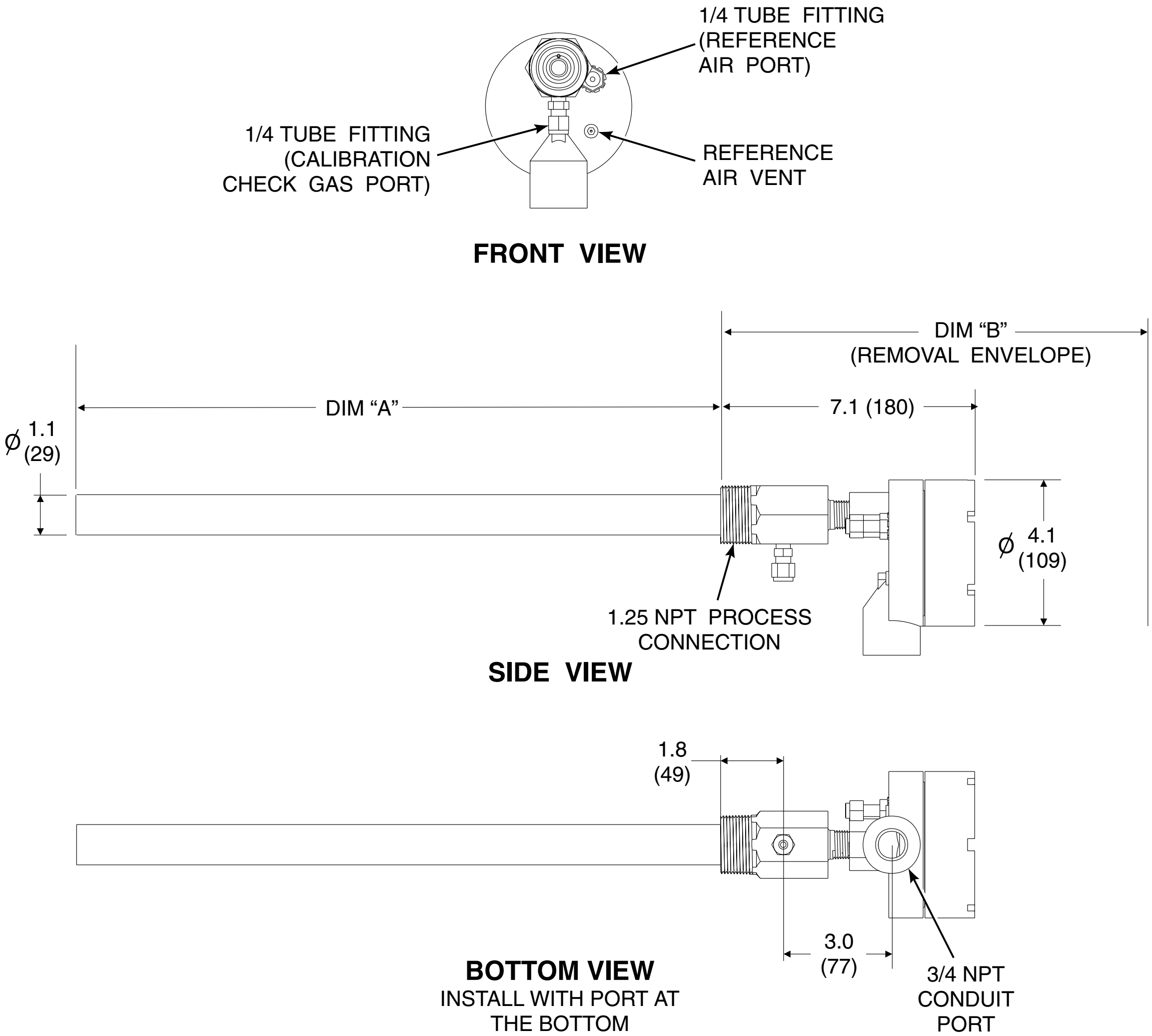


TABLE 1. INSTALLATION (REMOVAL)		
PROBE	DIM "A"	DIM "B"
20 IN.	20 (508)	31 (787)
26 IN.	26 (660)	37 (940)
34.625 IN.	34.625 (880)	46 (1170)

NOTE: DIMENSIONS ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.

29750001

Figure 2-1. Probe Installation Details

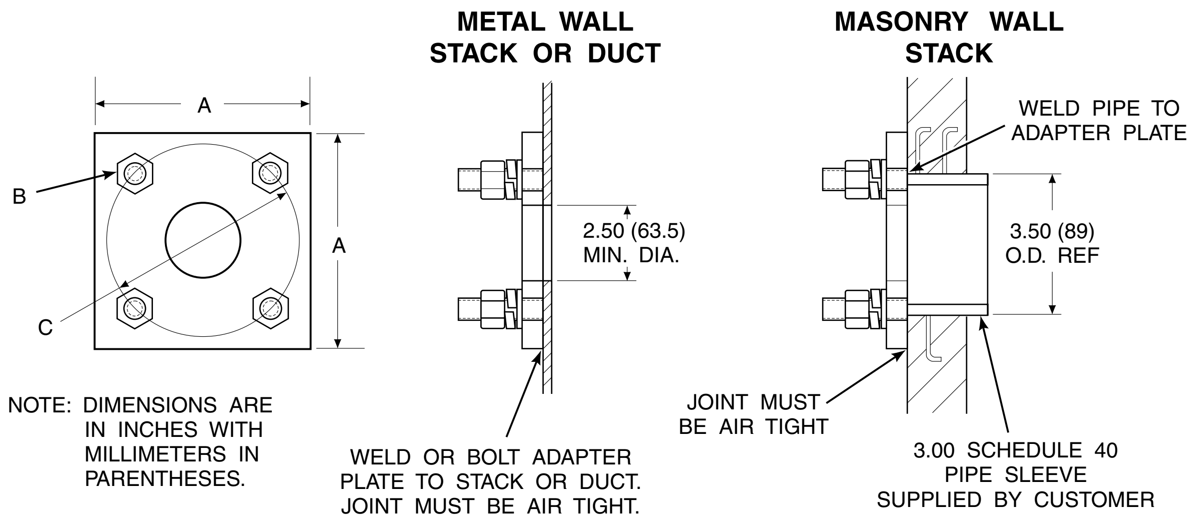
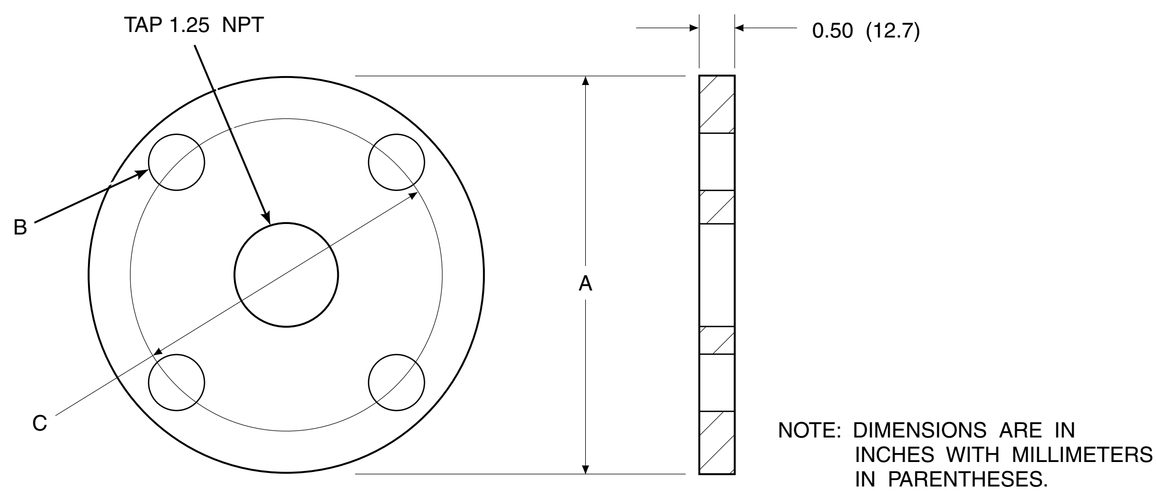


PLATE DIMENSIONS			
DIMENSION	ANSI 4512C34G01	DIN 4512C36G01	JIS 4512C35G01
"A"	6.00 (153)	7.5 (191)	6.50 (165)
"B" THREAD	0.625-11	M-16x2	M-12x1.75
"C" DIA.	4.75 (121)	5.71 (145)	5.12 (130)

29750002

Figure 2-2. Optional Adapter Plate



FLANGE DIMENSIONS				
DIMENSION	ANSI 5R10158H01	DIN 5R10158H02	JIS 5R10158H03	MODEL 450 5R10158H04
"A" DIA.	6.00 (153)	7.28 (185)	6.10 (155)	9.00 (229)
"B" DIA.	0.75 (20)	0.71 (18)	0.59 (15)	0.50 (13)
"C" DIA.	4.75 (121)	5.71 (145)	5.12 (130)	7.68 (195)

29750003

Figure 2-3. Optional Probe Mounting Flange

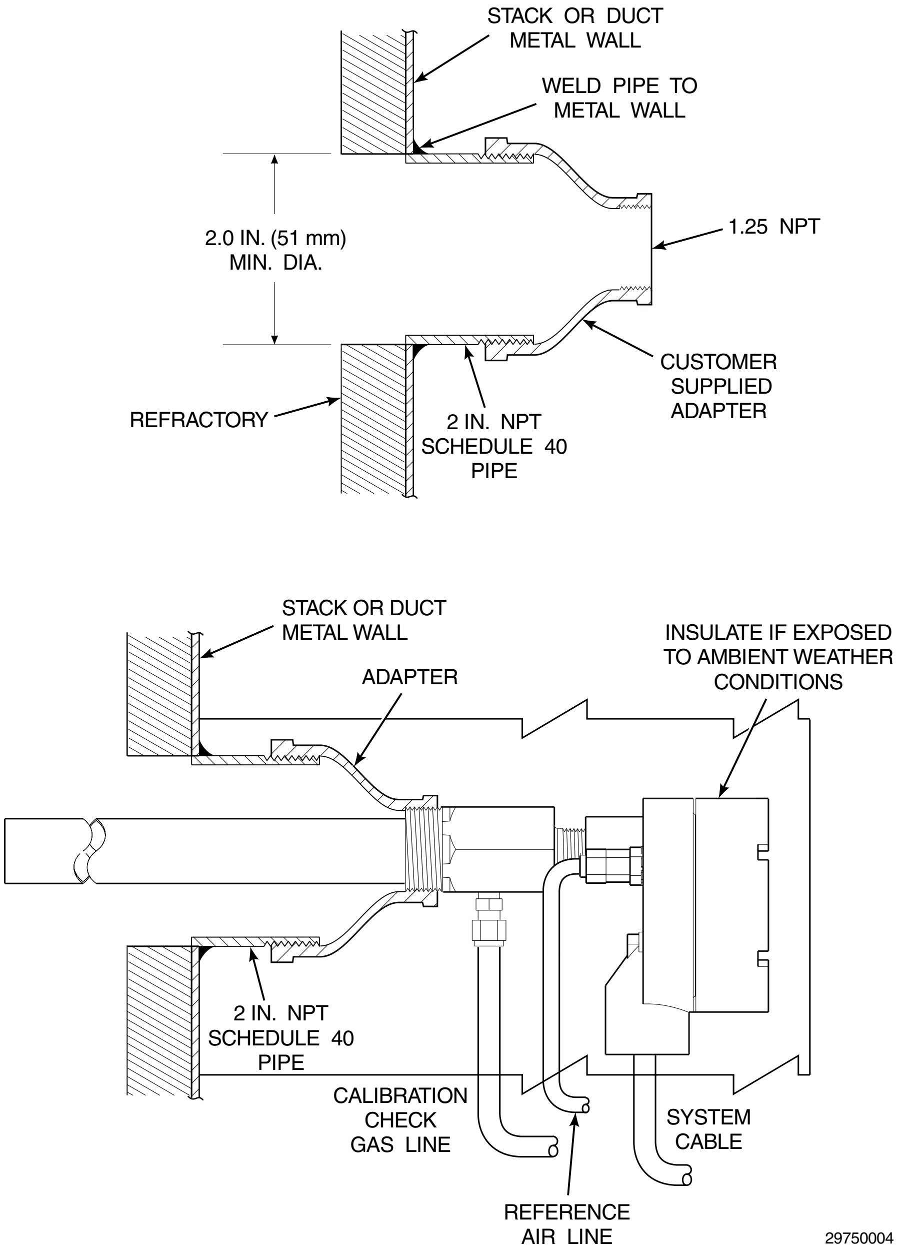


Figure 2-4. Horizontal Probe Installation

3. If the optional adapter plates are not used, a 2 in. NPT, schedule 40, pipe nipple (Figure 2-4) should be welded to the stack or duct wall.

   When a 2 in. NPT to 1.25 NPT adapter is threaded to the welded pipe nipple, the adapter provides the pipe threads needed for the probe's process fitting.

4. Where high particulate or slag is in the flue gas stream, it may be desirable to inset the probe in the refractory as shown in Figure 2-5. Use pipe couplings and nipples to adjust the probe insertion depth.

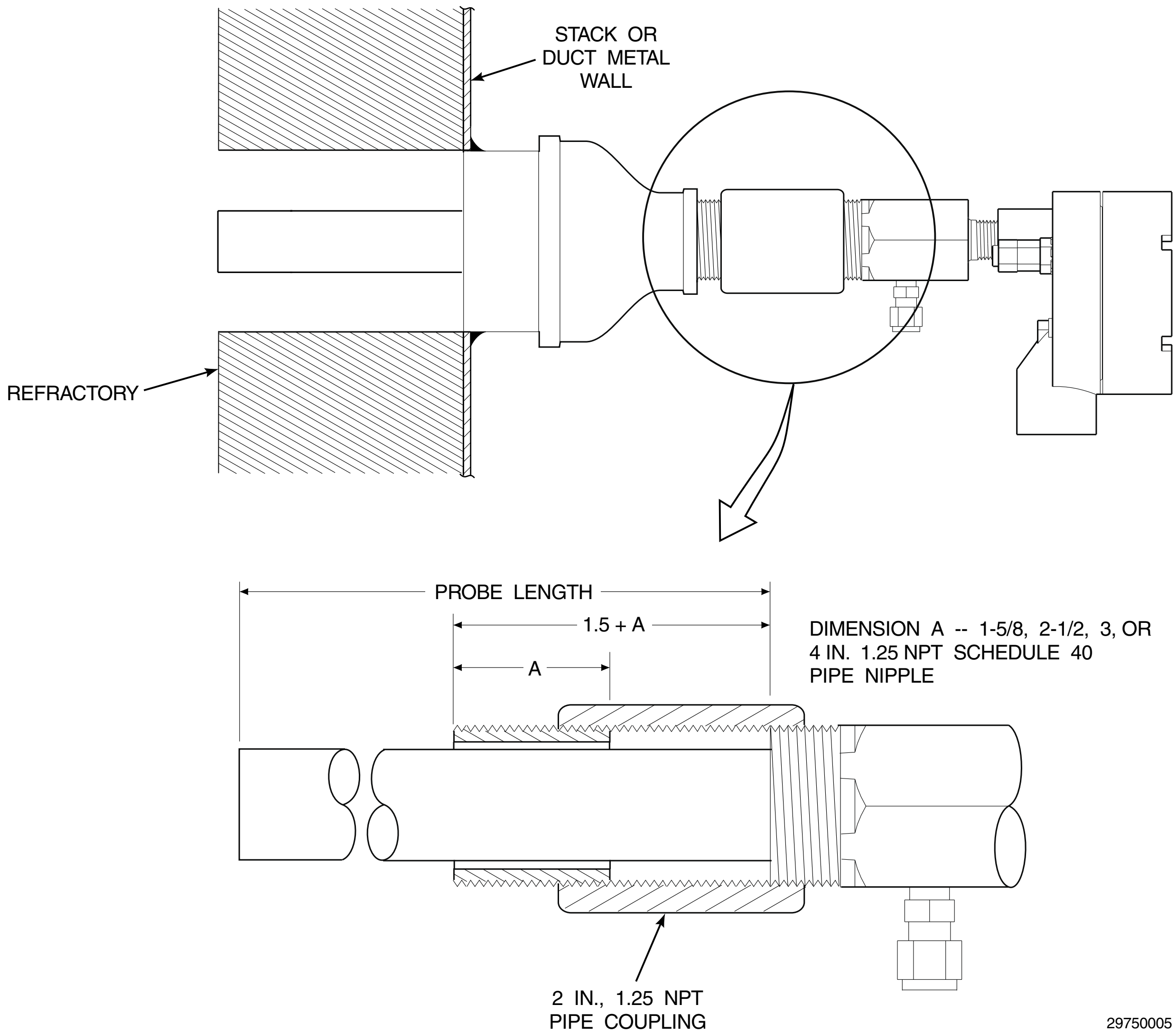


Figure 2-5. Adjusting Probe Insertion Depth

5. Use high temperature material (alumina wool) to seal around the probe during insertion. This prevents hot gases from escaping or cold air from entering the stack or duct.

6. Initially insert the probe to a depth of 3 in. (76.2 mm) or 1/2 the depth of the stack or duct refractory, whichever is greater.

CAUTION

After initial insertion, do not insert the probe at a rate exceeding 1 in. per minute (25.4 mm per minute) or damage to the probe may result due to thermal shock.

7. After initial insertion, insert the probe at a rate of 1 in. (25.4 mm) per minute until the probe is fully inserted.

8. Install anti-seize compound on the pipe threads and screw the probe into the process flange or adapter.

NOTE

Use anti-seize compound on threads to ease future removal of probe.

The electrical conduit port should be facing down for a horizontal probe installation. See Figure 2-4. In vertical probe installations, orient the probe so the system cable drops vertically from the probe. Ensure the electrical conduit is routed below the level of the terminal block housing. This drip loop minimizes the possibility that moisture will accumulate in the housing.

9. If insulation was removed to access the duct work for probe mounting, make sure the insulation is replaced afterward. See Figure 2-4.

CAUTION

If the ducts will be washed down during outage, MAKE SURE to power down the probes and remove them from the wash area.

c. Locating Model 3081 Transmitter

1. Ensure the Model 3081 Transmitter is easily accessible for maintenance and service and for using the infrared remote control (if applicable).

CAUTION

Do not allow the temperature of the Model 3081 Transmitter exceed 65°C (149°F) or damage to the unit may result.

2. The ambient temperature of the transmitter housing must not exceed 65°C (149°F). Locate the electronics in an area where temperature extremes, vibration, and electromagnetic and radio frequency interference are minimal.

3. Locate the Model 3081 Transmitter within 150 ft (45.7 m) of the oxygen probe due to wiring and signal considerations.

2

d. Installing Model 3081 Transmitter

1. Ensure all components are available to install the Model 3081 Transmitter.

2. Choose a method or location to mount the transmitter.

   (a) Flat Surface Mounting. The transmitter may be mounted on a flat surface using the threaded mounting holes located on the bottom of the transmitter housing. Refer to Figure 2-6 for installation references.

   (b) Pipe Mounting. An optional pipe mounting bracket is available for this type of installation. Refer to Figure 2-7 for installation references.

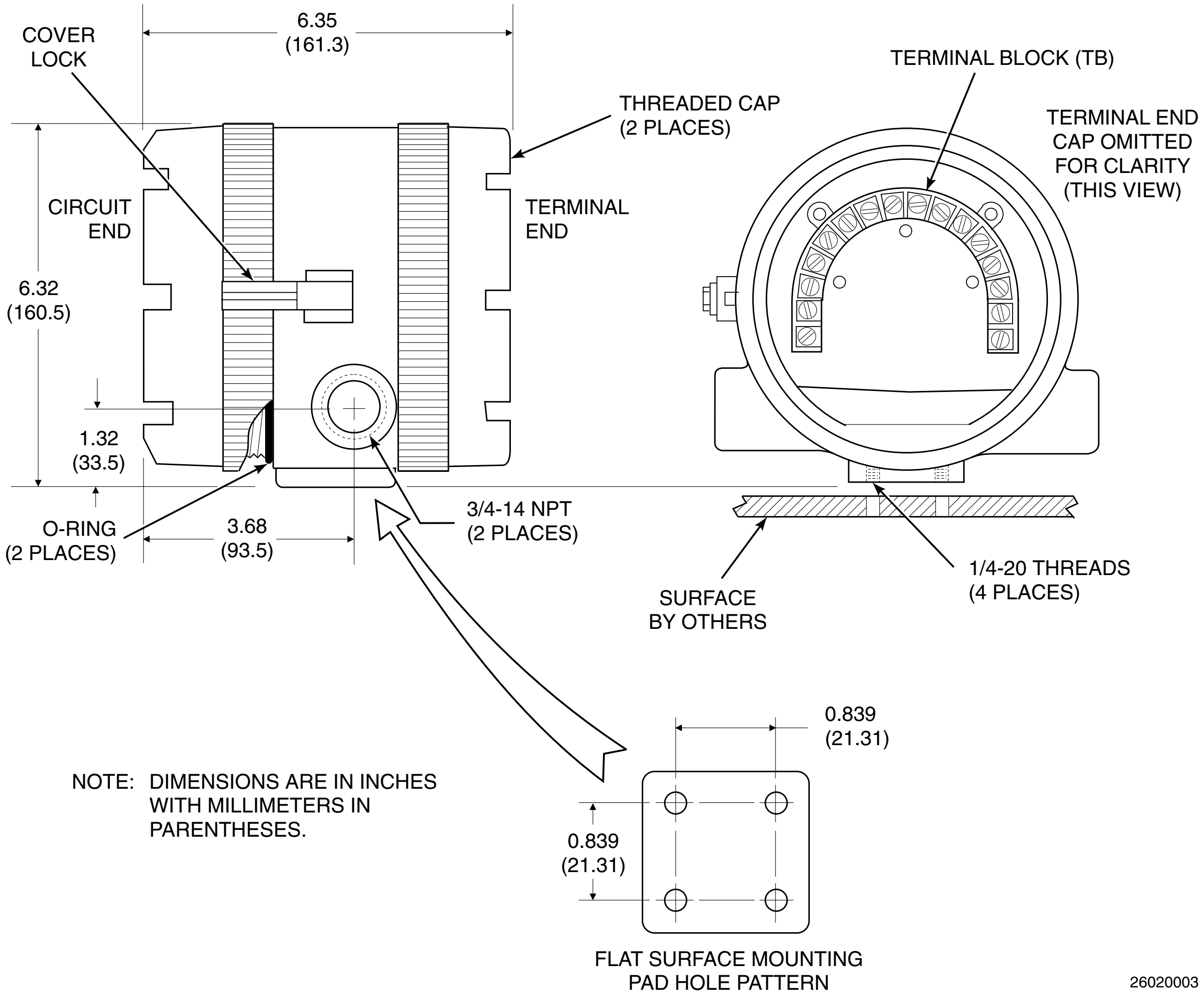


Figure 2-6. Flat Surface Mounting Dimensional Information

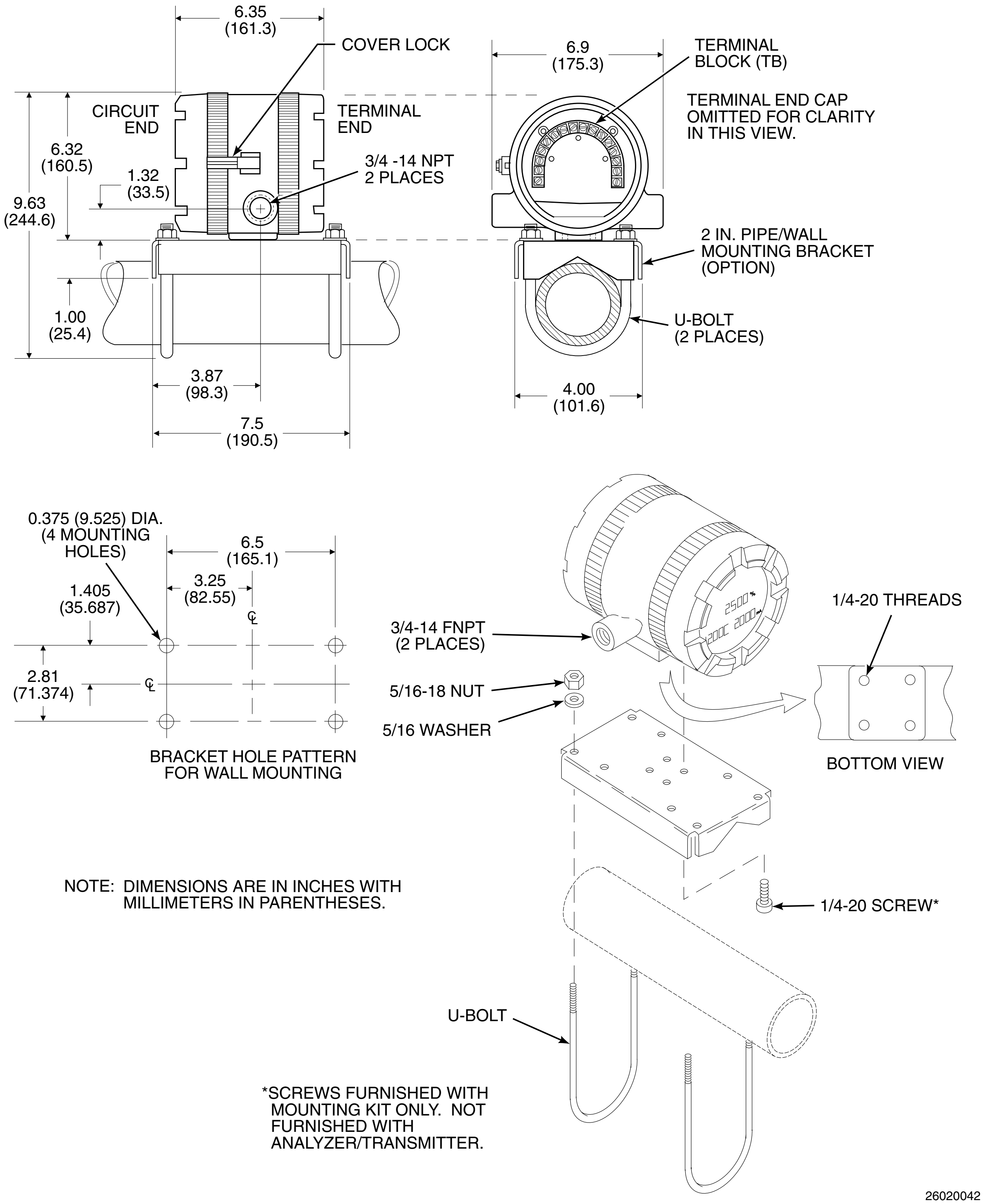


Figure 2-7. Pipe Mounting Dimensional Information

3. For correct viewing orientation, the display may be changed 90 degrees, using the following procedure:

   (a) Refer to Figure 2-8. Loosen the cover lock screw until the cover lock is disengaged from the knurled surface on the threaded circuit end cap.

   (b) Remove the circuit end cap.

   (c) Remove the three screws retaining the display board in place.

   (d) Lift and rotate the display board 90 degrees either way.

   (e) Reposition the display board on the standoffs. Install and tighten all three screws.

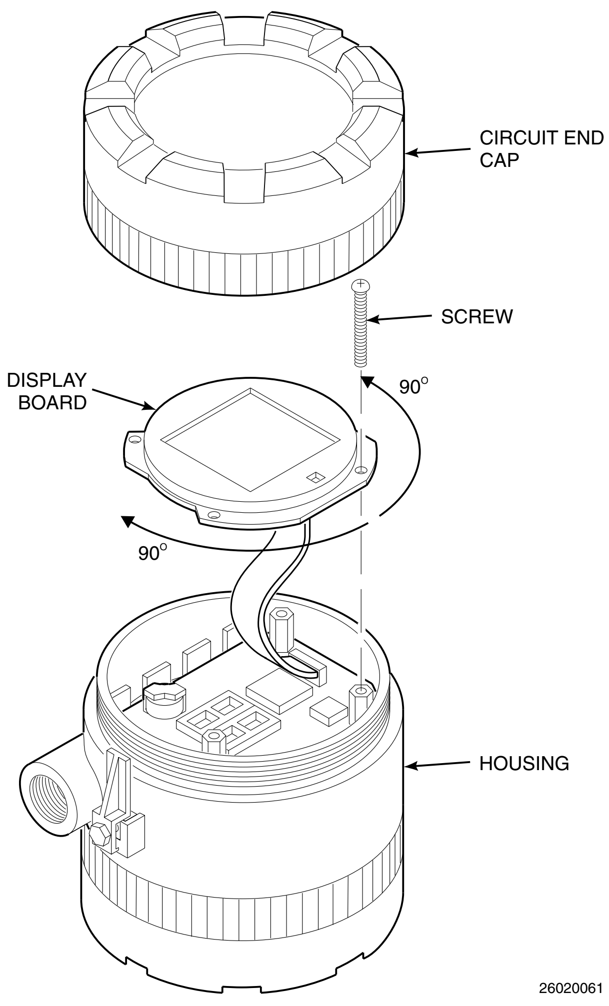


Figure 2-8. Display Positioning Assembly

   (f) Install the circuit end cap and tighten the cover lock screw to secure the cover lock in place.

2-3 ELECTRICAL INSTALLATION

All wiring must conform to local and national codes.

WARNING

For intrinsically safe applications, refer to drawing 1400184, page 10-2 of this Instruction Bulletin.

WARNING

Disconnect and lock out power before connecting the unit to the power supply.

WARNING

Install all protective equipment covers and safety ground leads after installation. Failure to install covers and ground leads could result in serious injury or death.

WARNING

To meet the Safety Requirements of IEC 1010 (EC requirement), and ensure safe operation of this equipment, connection to the main electrical power supply must be made through a circuit breaker (min 10 A) which will disconnect all current-carrying conductors during a fault situation. This circuit breaker should also include a mechanically operated isolating switch. If not, then another external means of disconnecting the supply from the equipment should be located close by. Circuit breakers or switches must comply with a recognized standard such as IEC 947.

a. General

The power supply and signal wiring should be shielded. Also, make sure the signal wiring is grounded at the Model 3081 Transmitter end only. Do not ground the signal loop at more than one point. Twisted pairs are recommended. Ground the transmitter housing to an earth ground to prevent unwanted electromagnetic interference (EMI) or radio frequency interference (RFI).

NOTE

For optimum EMI/RFI immunity, shield the 4-20 mA current loop cable and enclose in an earth grounded metal conduit.

NOTE

Never run signal or sensor wiring in the same conduit, or open tray, with power cables. Keep signal or sensor wiring at least 12 in. (0.3 m) away from other electrical equipment and 6.5 ft (2 m) from heavy electrical equipment.

It is necessary to prevent moisture from entering the Model 3081 Transmitter housing. The use of weather-tight cable glands is required. If conduit is used, plug and seal connections on the transmitter housing to prevent moisture accumulation in the terminal side of the housing.

CAUTION

Moisture accumulation in the transmitter housing can affect its performance and may void its warranty.

b. Oxygen Probe Signal Connections

1. Two signals represent the O_2 value and the cell temperature. The probe provides these values to the Model 3081 Transmitter for processing and signal conditioning.

2. Wiring connections for the probe are shown in Figure 2-9.

c. Model 3081 Transmitter 4-20 mA and Signal Connections

1. A 4-20 mA signal represents the O_2 value. Superimposed on the 4-20 mA signal is HART information that is accessible through a Model 275 Handheld Communicator or AMS software.

2. Two signals representing the O_2 value and the cell temperature are supplied to the Model 3081 Transmitter from the oxygen probe.

3. Wiring connections for the Model 3081 Transmitter are shown in Figure 2-10.

NOTE

The ground arrangement shown in Figure 2-10 limits the amount of noise introduced into the electronics.

4. Connect wire shields to terminal 1. Connect earth ground as shown.

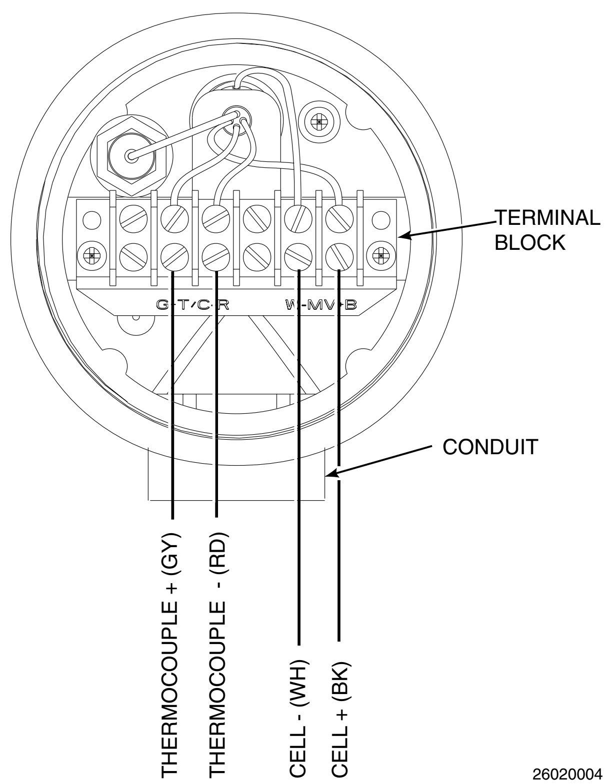


Figure 2-9. Oxygen Probe Terminal Block

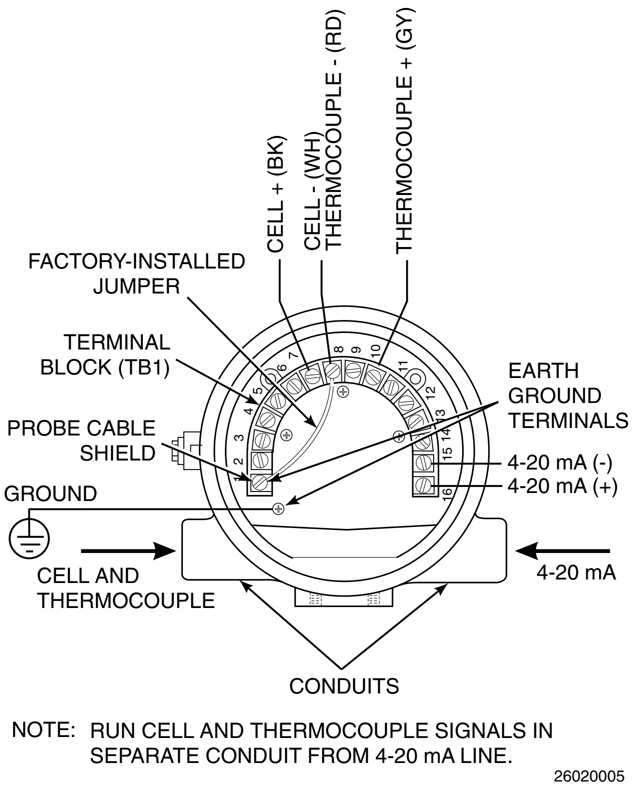


Figure 2-10. Model 3081 Transmitter Terminal Block

2-4 PNEUMATIC INSTALLATION

a. General

Reference air is required for O_2 calculation, and calibration check gas is required during a calibration check. Refer to Figure 2-11 for the gas connections on the oxygen probe.

b. Reference Air Package

After the oxygen probe is installed, connect the reference air set. Install the reference air set according to Figure 2-12.

c. Instrument Air (Reference Air)

Instrument air is required for reference. Use 10 psig (68.95 kPa gage) minimum, 225 psig (1551.38 kPa gage) at 0.2 scfh (100 ml/min.); less than 40 parts-per-million total hydrocarbons. Regulator outlet pressure should be set at 5 psi (35 kPa).

d. Calibration Check Gas

Two calibration check gas concentrations are used with the Two-Wire In Situ Oxygen Analyzer: Low Gas - 0.4% O_2 and High Gas - 8% O_2, each with the balance in nitrogen. Do not use 100% nitrogen. See Figure 2-11 for the probe connections. Set both calibration check gases at the same flow rate: 5 scfh (2.5 L/min).

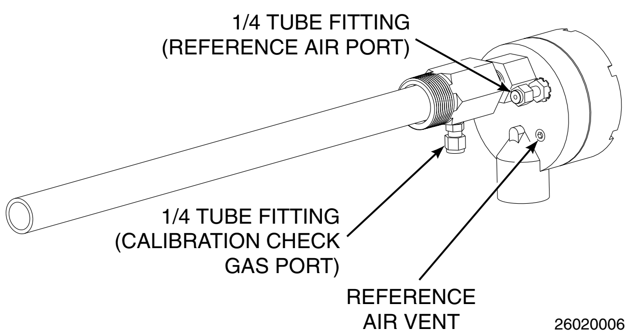
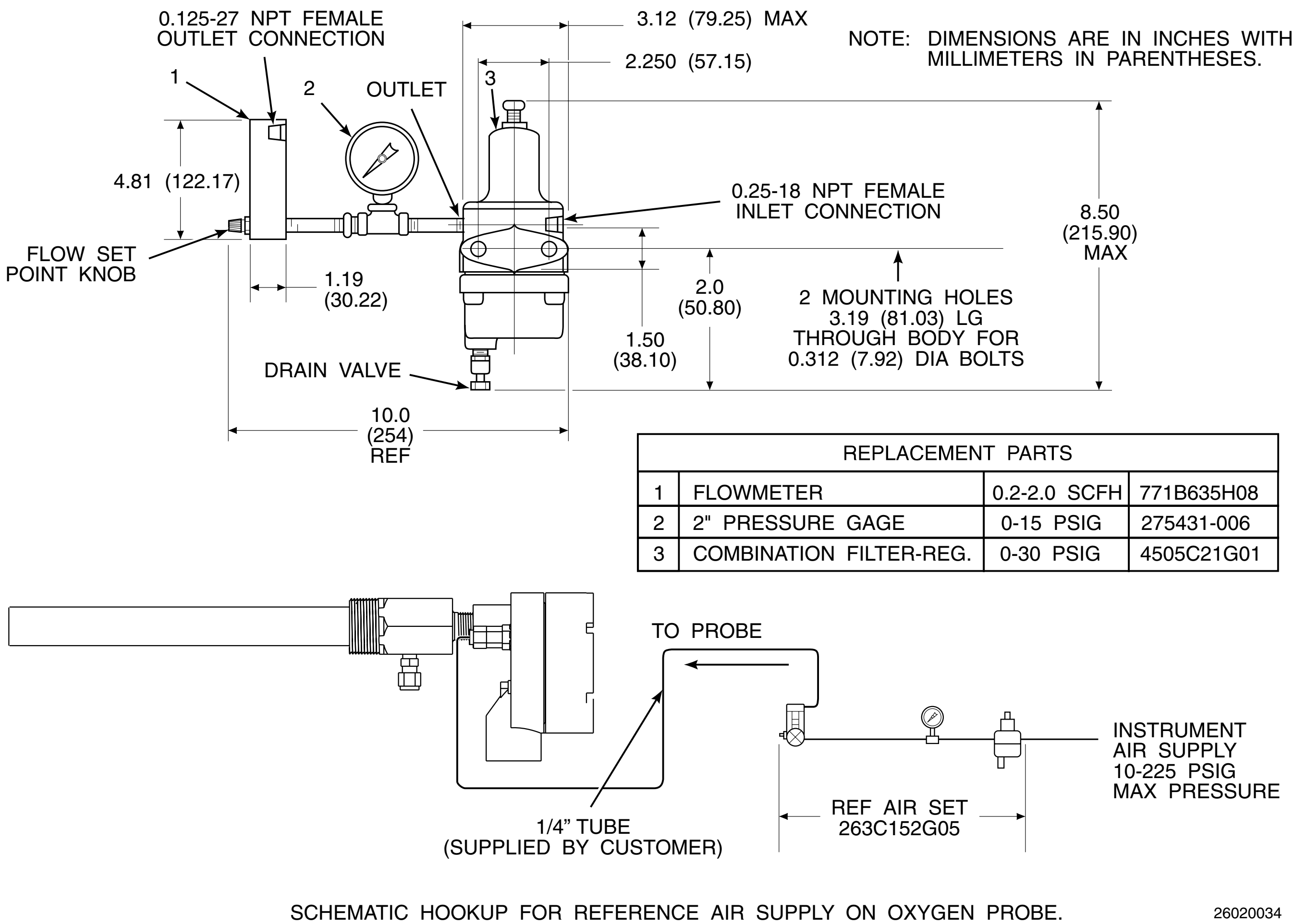


Figure 2-11. Oxygen Probe Gas Connections



REPLACEMENT PARTS			
1	FLOWMETER	0.2-2.0 SCFH	771B635H08
2	2" PRESSURE GAGE	0-15 PSIG	275431-006
3	COMBINATION FILTER-REG.	0-30 PSIG	4505C21G01

Figure 2-12. Air Set, Plant Air Connection

3

SECTION 3
STARTUP AND OPERATION

WARNING

Install all protective equipment covers and safety ground leads before equipment startup. Failure to install covers and ground leads could result in serious injury or death.

3-1 GENERAL

a. Verify Mechanical Installation

Ensure the Two-Wire In Situ Oxygen Analyzer is installed correctly. See paragraph 2-2 for mechanical installation information.

b. Verify Terminal Block Wiring

Ensure the wiring of both the oxygen probe terminal block and Model 3081 Transmitter terminal block is correct. Refer to paragraph 2-3 for electrical installation and wiring information.

3-2 POWER UP

a. General

The Two-Wire In Situ Oxygen Analyzer displays the current oxygen reading on the LCD face of the Model 3081 Transmitter. The O_2 concentration, cell temperature, and 4-20 mA output current are displayed as shown in Figure 3-1. This and other information may also be accessed using HART/AMS.

b. Startup Display

When the probe is first inserted into the stack, some time is required until minimum operating temperatures [550°C (1022°F)] are reached. Some time is also required for the electronics to reach an operating state. Therefore, when the unit is first powered up, a faulted operation display as shown in Figure 3-2 may be displayed by the transmitter until the probe operating temperatures are reached and the electronics are working properly (approximately 5 minutes).

c. Operating Display

After the probe has reached operating temperatures, the Model 3081 Transmitter display should look similar to Figure 3-1. The display will now track the O_2 concentration, cell temperature, and 4-20 mA output current.

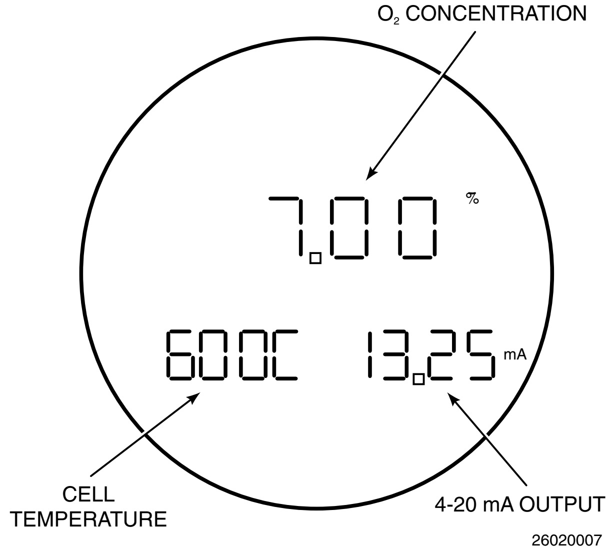


Figure 3-1. Normal Operation Display

Figure 3-2. Faulted Operation Display

3-3 REESTABLISHING PROPER CALIBRATION CHECK GAS FLOW RATE

The calibration check gas flow must be enough to ensure no combustion flue gases mix with the calibration check gases and only clean, good calibration check gas surrounds the cell without expending excess gas (Figure 3-3). Monitor the O_2 concentration using an IRC or HART Communicator. Set the calibration check gas flow rate as follows:

NOTE

Only set the calibration check gas flow rate at startup. It is not necessary to perform this procedure for each calibration check.

a. Adjust the calibration check gas flow to 5 scfh (2.5 L/min.) to ensure the cell is surrounded by calibration check gas. Due to the cooling effect of the gas, the cell temperature will decrease slightly, causing the O_2 concentration to drop. Once the electronics compensates for this effect, the O_2 concentration will stabilize.

b. Next, slowly reduce the calibration check gas flow until the O_2 concentration changes, which indicates that the calibration check and flue gases are mixing. Increase the flow rate until this effect is eliminated.

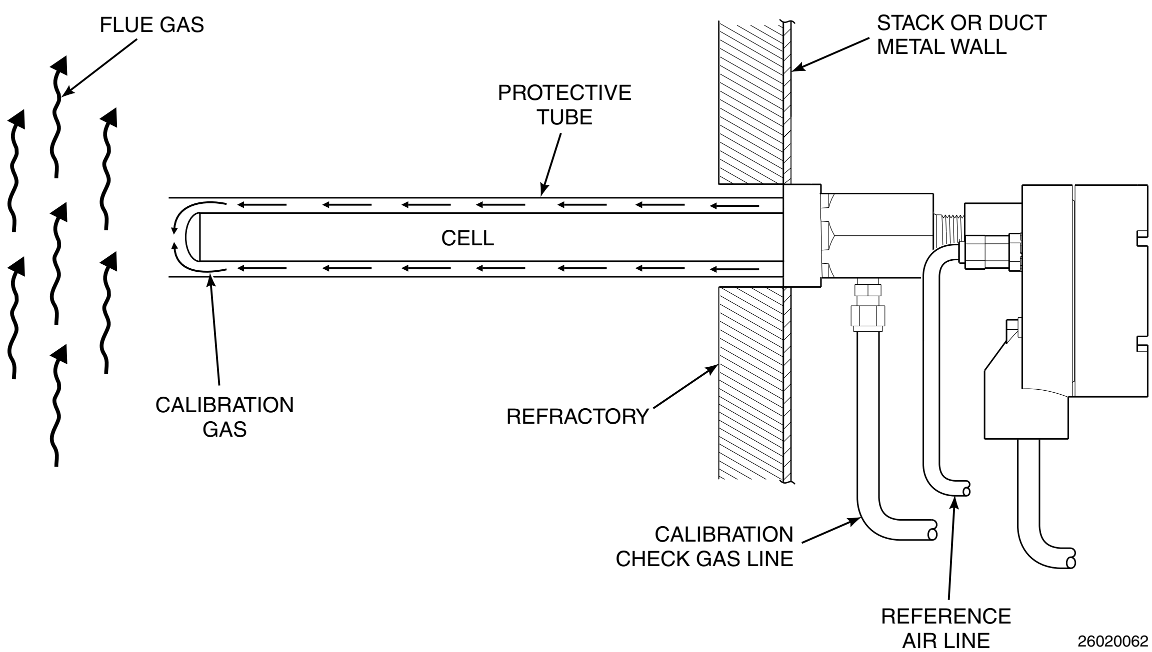


Figure 3-3. Proper Calibration Check Gas Flow Rate

3-4 OPERATION

a. Overview

This section explains the operator controls and displays of the Two-Wire In Situ Oxygen Analyzer. The use of the Infrared Remote Control (IRC) and the Model 3081 Transmitter Liquid Crystal Display (LCD) are described in detail. HART/AMS operation is not covered here but is discussed in Section 4, HART/AMS.

b. Display

The Model 3081 Transmitter LCD displays the O_2 concentration, cell temperature, and 4-20 mA output current during normal operation (see Figure 3-4). The LCD will also display fault conditions when they occur. To interact with the transmitter, use the IRC and navigate through a series of menus displayed on the LCD.

c. Menu Tree

The screens that can be displayed are shown in the menu tree of Figure 3-5. These screens are displayed on the LCD and are accessed using the IRC keypad.

3

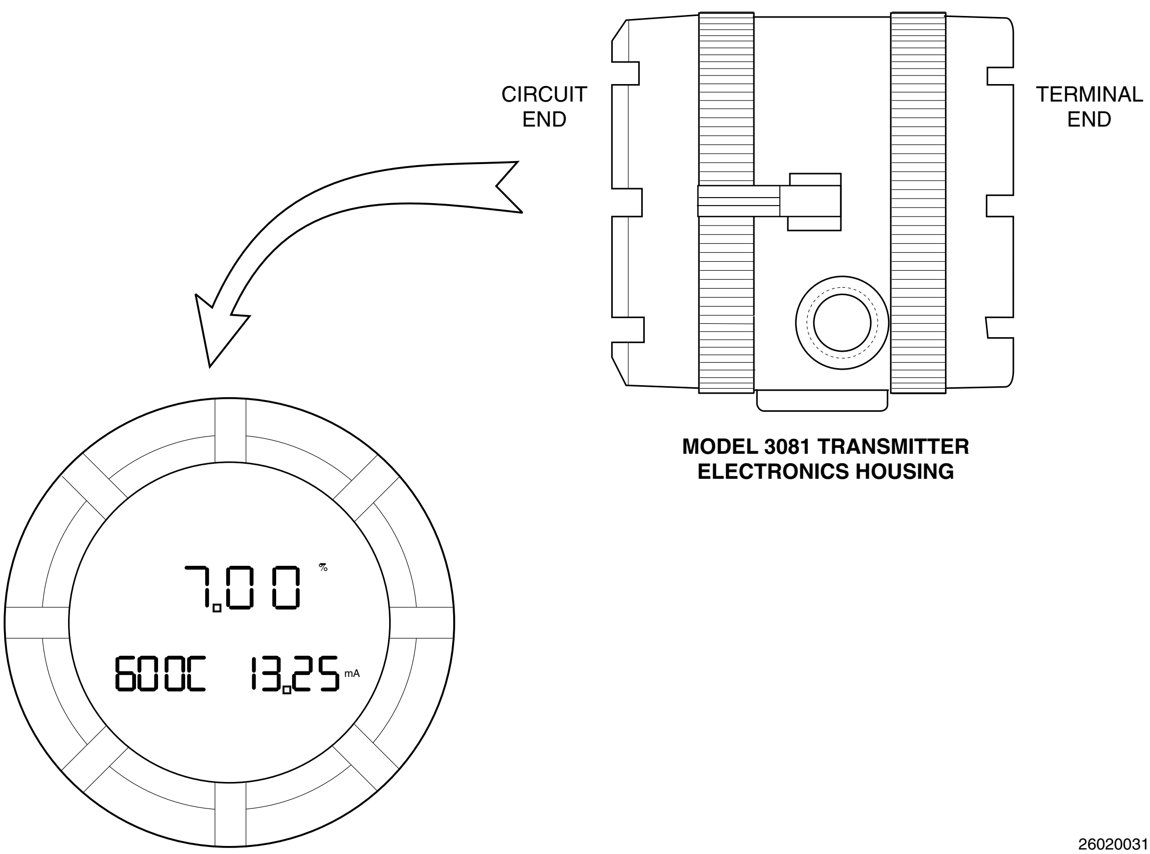


Figure 3-4. Normal Operation Display

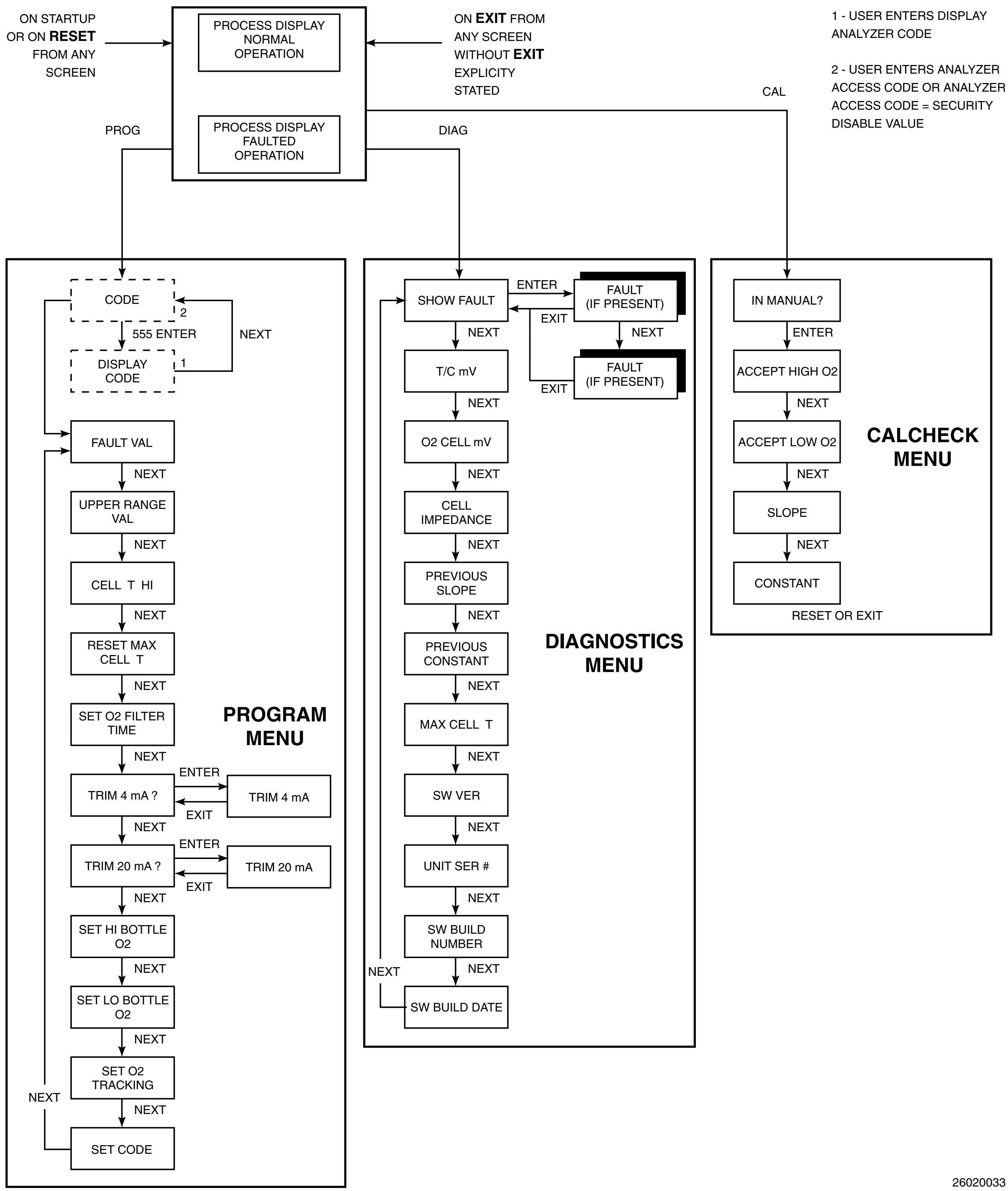


Figure 3-5. Model 3081 Transmitter Menu Tree

d. Navigation

The IRC in Figure 3-6 is used to interact with the Model 3081 Transmitter and navigate through the screens on the LCD.

1. Hold the IRC within 6 ft (1.8 m) of the Model 3081 Transmitter and within 15 degrees from the centerline of the transmitter LCD. The amount of ambient light may also affect IRC performance.

NOTE

The LCD may react slowly to IRC commands. Allow sufficient time between key presses to avoid undesired or repeated commands from accumulating in the command queue.

2. Use the keys on the IRC to navigate through the menu screens. Refer to Figure 3-6. General usage is as follows:

(a) RESET. Returns to the PROCESS DISPLAY screen at the top of the menu tree. Any non-entered number in the exited state will be ignored, and the previous data will be used.

(b) HOLD. Not used.

(c) Left/Right Arrow. Moves left and right among editable digits on the display.

(d) Up/Down Arrow. Increases or decreases the value of the currently selected digit on the display.

(e) CAL. Accesses the CALCHECK MENU branch of the menu tree. Only works from the PROCESS DISPLAY screen.

(f) PROG. Accesses the PROGRAM MENU branch of the menu tree. Only works from the PROCESS DISPLAY screen.

(g) DIAG. Accesses the DIAGNOSTICS MENU branch of the menu tree. Only works from the PROCESS DISPLAY screen.

(h) ENTER. Initiates the editing process and causes the most significant digit of the edited item to start flashing. Also processes the entry so the previous value updates to the new value entered using the arrow keys. Failure to press ENTER before exiting a screen will cancel the input value and revert to the previous value.

(i) NEXT. Accesses the next user screen as shown in the menu tree. Any non-entered number in the exited state will be ignored, and the previous data will be used.

(j) EXIT. Exits from sub-branches of the menu tree where an exit option is explicitly shown. Otherwise, returns to the PROCESS DISPLAY screen at the top of the menu tree. Any non-entered number in the exited state will be ignored, and the previous data will be used.

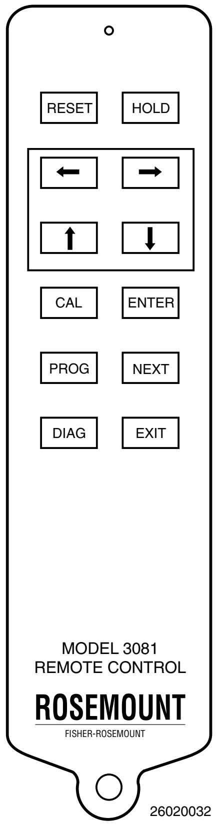


Figure 3-6. Infrared Remote Control (IRC)

3

3-5 PROGRAM MENU

The PROGRAM MENU branch of the menu tree allows you to program and edit some process parameters, faults, outputs, and security codes. To access this branch of the menu tree, press the PROG key on the IRC when in the PROCESS DISPLAY screen (Normal or Faulted). If security is enabled, you must enter the analyzer code to gain further access to the screens in this branch. Each screen in this branch is accessed sequentially using the NEXT key. Refer to Figure 3-5 during the following menu and screen descriptions.

NOTE

To edit a screen value, press ENTER to access the data field. Use the left and right arrow keys to move among the digits in the data field. Note that the editable position will be flashing. To change the value of a digit, use the up and down arrow keys to increase or decrease the value. When finished editing, press ENTER to accept the value. To go to the next screen in the menu, press NEXT.

a. CODE

Refer to Figure 3-7. After pressing the PROG key, this screen will display if security is enabled (see paragraph 3-5m). Use this screen to identify a specific analyzer in a process to prevent accessing an adjacent analyzer when using the IRC.

Press ENTER to begin editing. At this point, you can either specify the analyzer by its access code or view its code if it is unknown.

1. To gain further access to the screens in the PROGRAM MENU branch, enter the correct three-digit analyzer access code using the arrow keys and press ENTER. If security is disabled, this screen does not appear and the system displays the FAULT VAL screen.
2. If the analyzer access code is unknown, enter 555 and press ENTER to access the DISPLAY CODE screen. In that screen, you will be able to view the analyzer access code.

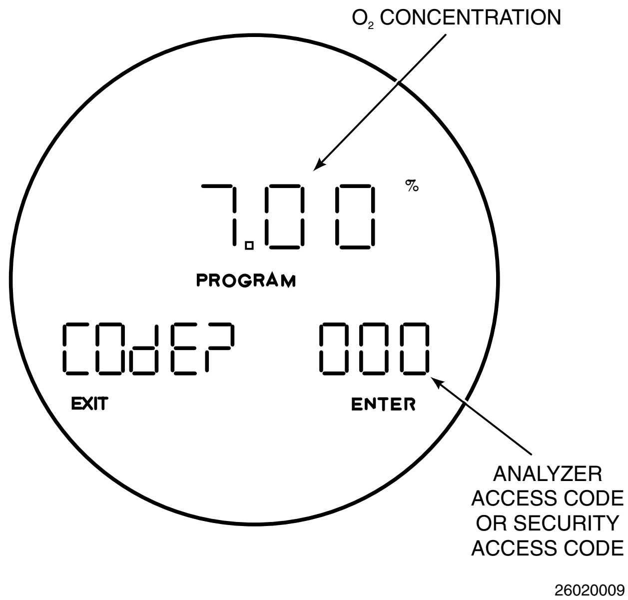


Figure 3-7. CODE

b. DISPLAY CODE

Refer to Figure 3-8. This screen is accessible from the CODE screen by entering 555 and pressing ENTER. The DISPLAY CODE screen identifies the analyzer access code so you can return to the CODE screen and enter the code as described in paragraph 3-5a. To return to the CODE screen, press NEXT.

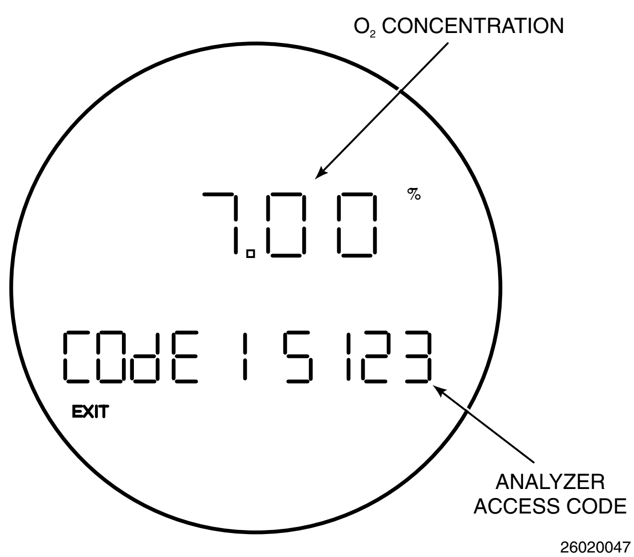


Figure 3-8. DISPLAY CODE

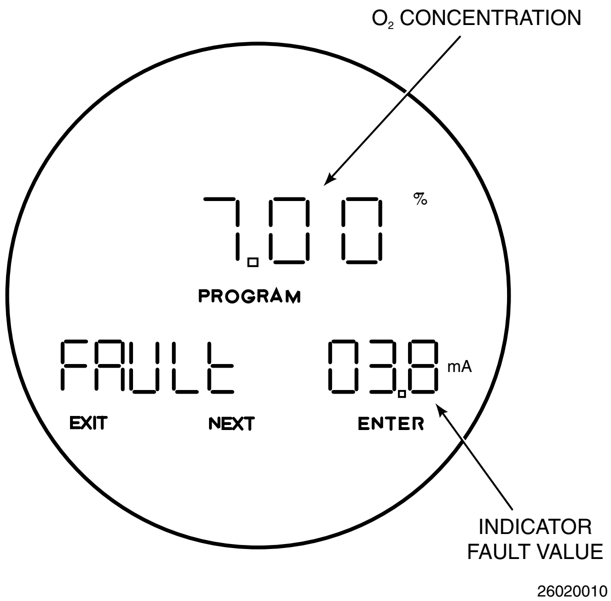


Figure 3-9. FAULT VAL

c. FAULT VAL

Refer to Figure 3-9. Use this screen to set the value that the 4-20 mA output will drive to and display during a fault condition. Press ENTER to begin editing. Use the arrow keys to enter a fault value. The fault value can be between 3.8 and 24 mA. Then, press ENTER to accept the value. Pressing NEXT displays the UPPER RANGE VAL screen.

Refer to Section 6, TROUBLESHOOTING, for the actual fault conditions.

d. UPPER RANGE VAL

Refer to Figure 3-10. Use this screen to set the value of the upper range limit. This value is the maximum limit of the O_2 concentration measurement and is used to scale the 4-20 mA output. Press ENTER to begin editing. Use the arrow keys to select and change the value. The upper range value can be between 0 and 25%. Then, press ENTER to accept the value. Pressing NEXT displays the CELL T HI screen.

e. CELL T HI

Refer to Figure 3-11. Use this screen to set the value of the upper cell temperature fault condition. This value is the maximum allowed cell temperature before a fault condition is indicated. Press ENTER to begin editing. Use the arrow keys to select and change the value. The value must be between 550° and 1600°C. Press ENTER to accept the value. Pressing NEXT displays the RESET MAX CELL T screen.

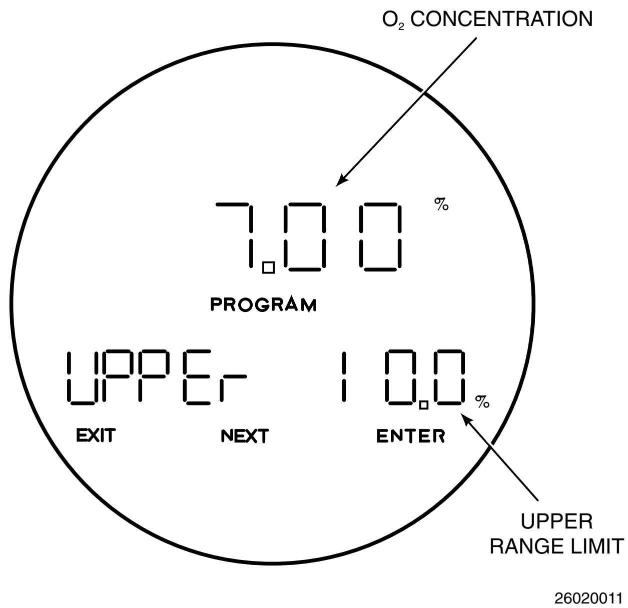


Figure 3-10. UPPER RANGE VAL

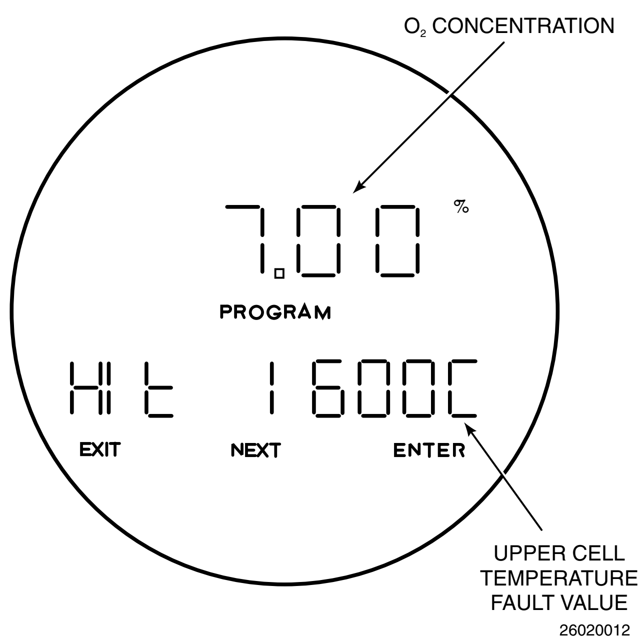


Figure 3-11. CELL T HI

3

f. RESET MAX CELL T

Refer to Figure 3-12. The transmitter tracks the maximum cell temperature obtained. Use this screen to reset the maximum cell temperature attained value to the current cell temperature. Press ENTER to begin editing. Use the arrow keys to select and change the value (Y/N). Then, press ENTER to accept the value. Pressing NEXT displays the SET O_2 FILTER TIME screen.

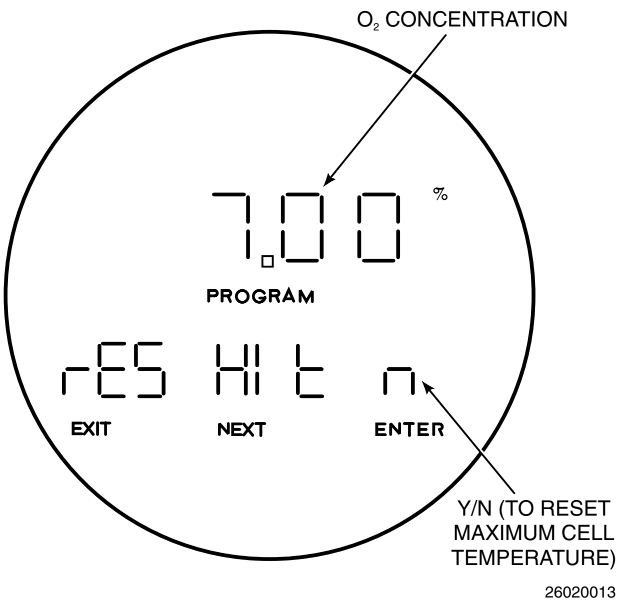


Figure 3-12. RESET MAX CELL T

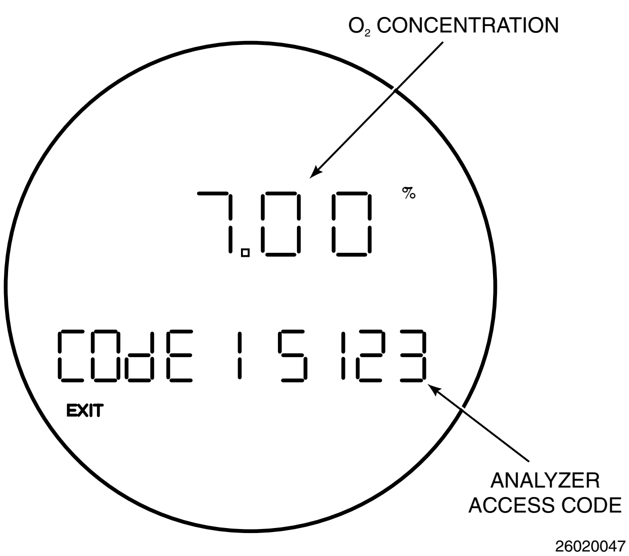


Figure 3-13. SET O_2 FILTER TIME

g. SET O_2 FILTER TIME

Refer to Figure 3-13. In some applications, it is beneficial to dampen the raw O_2 signal coming from the cell. Use this screen to enter the amount of time it will take the O_2 to reach 90% of the new reading. Press ENTER to begin editing. Use the arrow keys to select and change the screen value to the O_2 filter value (in seconds). Enter a value between 0 and 300 seconds and press ENTER to accept the value. Press NEXT to access the TRIM 4 mA? screen.

h. TRIM 4 mA?

Refer to Figure 3-14. Use this screen to trim the 4 mA value of the 4-20 mA output.

NOTE

Before trimming the 4 mA value, you must break the loop to add the ammeter. Power down the unit, connect the ammeter in series with Model 3081 Transmitter terminals 15(-) and 16(+), power up the unit, and return to the TRIM 4 mA? screen.

Press ENTER to begin editing. Use the arrow keys to select and change the screen value to the value displayed on the installed ammeter. Press ENTER to accept the value. After the value is entered, the unit calibrates itself to ensure it outputs 4 mA. Both the display and the ammeter will display 4 mA. Pressing EXIT returns to the initial TRIM 4 mA? screen, and pressing NEXT displays the TRIM 20 mA? screen.

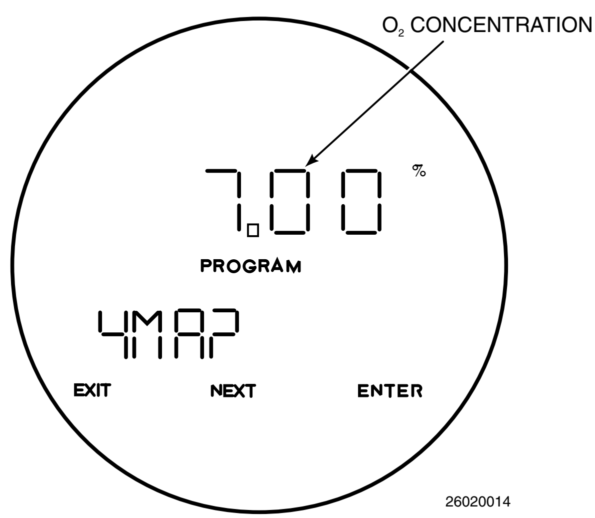


Figure 3-14. TRIM 4 mA?

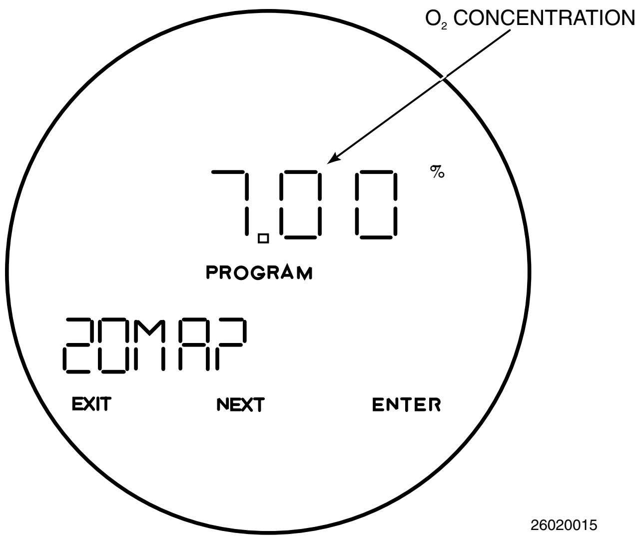


Figure 3-15. TRIM 20 mA?

i. **TRIM 20 mA?**

Refer to Figure 3-15. Use this screen to trim the 20 mA value of the 4-20 mA output.

NOTE

Before trimming the 20 mA value, you must break the loop to add the ammeter. Power down the unit, connect the ammeter in series with Model 3081 Transmitter terminals 15(-) and 16(+), power up the unit, and return to the TRIM 4 mA? screen.

Press ENTER to begin editing. Use the arrow keys to select and change the screen value to the value displayed on the installed ammeter. Press ENTER to accept the value. After the value is entered, the unit calibrates itself to ensure it outputs 20 mA. Both the display and the ammeter will update to 20 mA. Pressing EXIT returns to the initial TRIM 20 mA? screen, and pressing NEXT displays the SET HI BOTTLE O_2 screen.

j. **SET HI BOTTLE O_2**

Refer to Figure 3-16. Use this screen to identify, within the electronics, the percentage of O_2 used as the high calibration check gas. Press ENTER to begin editing. Use the arrow keys to select and change the screen value to the O_2 percentage of the high calibration check gas. Press EN TER to accept

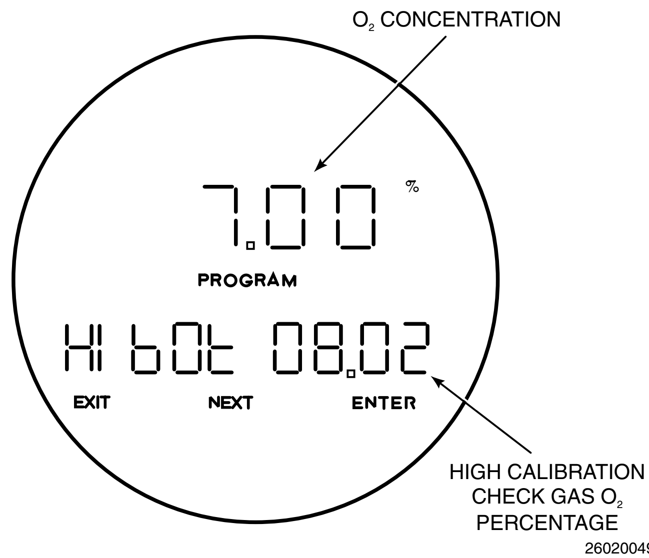


Figure 3-16. SET HI BOTTLE O_2

the value. Press NEXT to display the SET LO BOTTLE O_2 screen.

k. **SET LO BOTTLE O_2**

Refer to Figure 3-17. Use this screen to identify, within the electronics, the percentage of O_2 used as the low calibration check gas. Press ENTER to begin editing. Use the arrow keys to select and change the screen value to the O_2 percentage of the low calibration check gas. Press ENTER to accept the value. Press NEXT to display the SET O_2 TRACKING screen.

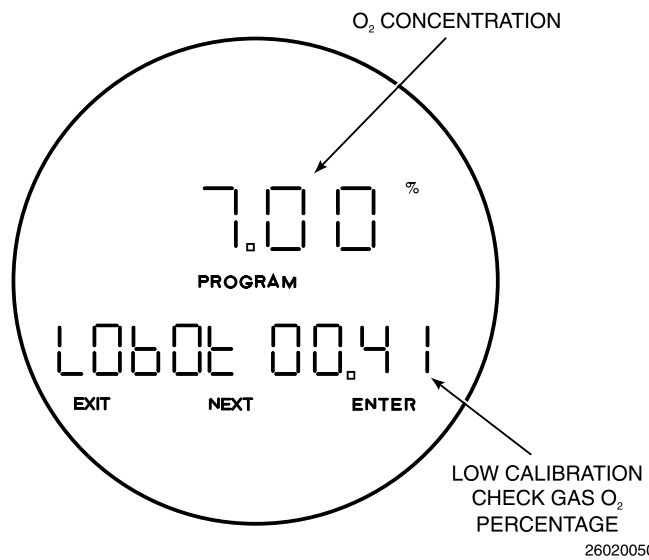


Figure 3-17. SET LO BOTTLE O_2

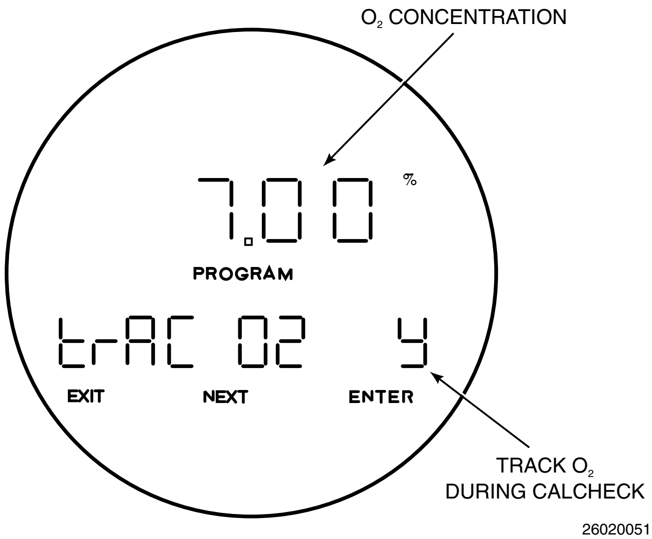


Figure 3-18. SET O_2 TRACKING

l. SET O_2 TRACKING

Refer to Figure 3-18. Use this screen to permit the 4-20 mA line to track the O_2 value during a calibration check. Press ENTER to begin editing. Use the arrow keys to select Y or N. Entering Y (yes) will allow the 4-20 mA line to track the O_2 value during the calibration check. Entering N (no) will hold the O_2 value steady during the calibration check. Press ENTER to accept the value. Press NEXT to display the SET CODE screen.

m. SET CODE

Refer to Figure 3-19. Use this screen to set the security code for the Model 3081 Transmitter. Press ENTER to begin editing. Use the arrow keys to select and change the value. Select any value between 000 and 999, excluding 000 and 555. Code 000 indicates that no code is set. Code 555 accesses the DISPLAY CODE screen. Press ENTER to accept the value. Pressing NEXT returns to the FAULT VAL screen at the beginning of the PROGRAM MENU.

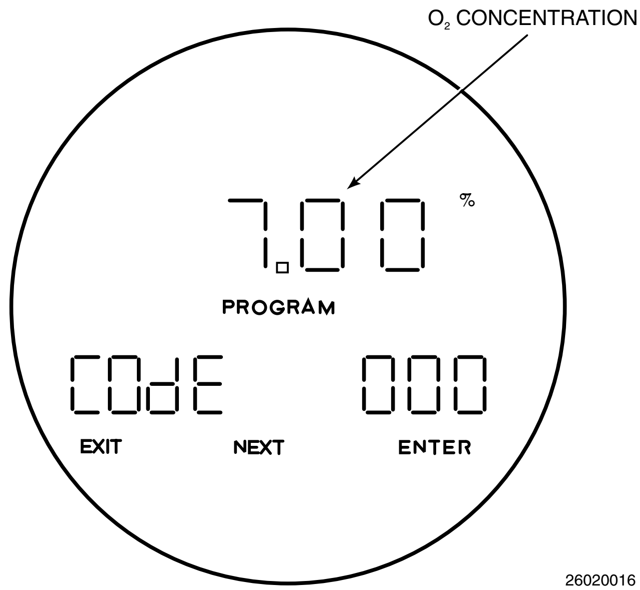


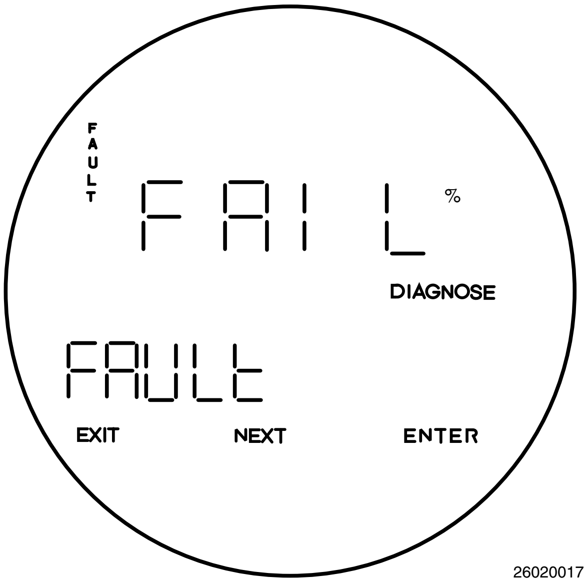
Figure 3-19. SET CODE

n. Model 3081 Transmitter Parameters

Table 3-1 lists the range and default value of operator-adjustable variables used by the Model 3081 Transmitter. These variables may all be changed from the PROGRAM MENU screens.

Table 3-1. Model 3081 Transmitter Parameters

Parameter	Range	Default
Indicator Fault Value	high value (24 mA) low value (3.8 mA)	low value (3.8 mA)
Upper Range Limit	2.0-25.0%	10.0%
Upper Cell Temp. Fault Value	650-1600°C	1600°C
Analyzer Access Code	000-999 (excluding 000 and 555)	000 (no code)



26020017

Figure 3-20. SHOW FAULT

3-6 DIAGNOSTICS MENU

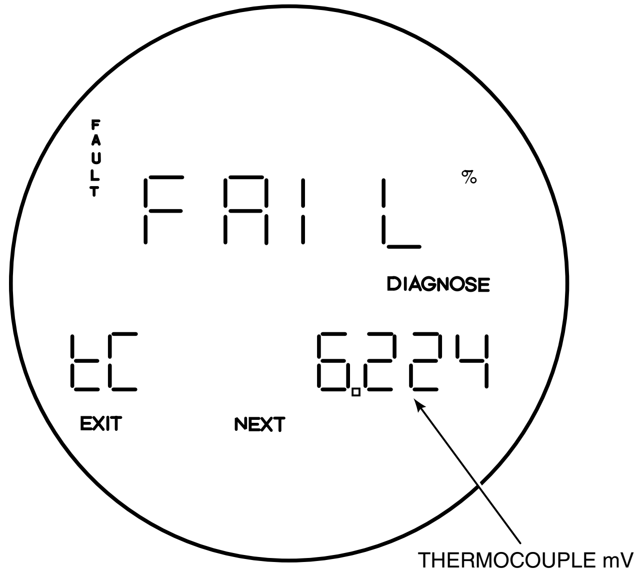
The DIAGNOSTICS MENU branch of the menu tree allows you to examine outputs, current faults, and unit information. None of the items in the DIAGNOSTICS MENU are editable. This branch of the menu tree may be accessed by pressing DIAG on the IRC when in the PROCESS DISPLAY screen (Normal or Faulted). Each screen in this branch is accessed sequentially by pressing NEXT. Refer to Figure 3-5 during the following menu and screen descriptions.

a. SHOW FAULT

Refer to Figure 3-20. After pressing DIAG, this screen displays. Pressing ENTER accesses a screen displaying the current fault (if any). If more than one fault exists, and you are in the FAULT screen, press NEXT to go to the next fault. Information on the fault screens can be found in Section 6, TROUBLESHOOTING. Press EXIT to return from this fault sub-menu and press NEXT to access the T/C mV screen.

b. T/C mV

Refer to Figure 3-21. Use this screen to examine the cell thermocouple mV output. Three decimal places are displayed. Pressing NEXT accesses the O_2 CELL mV screen.

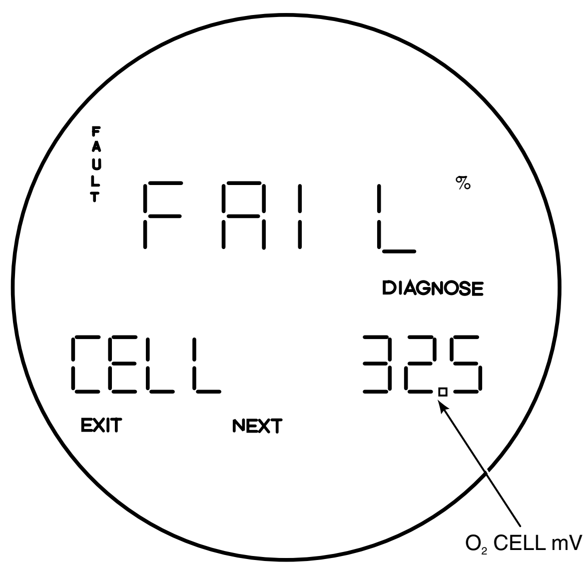


26020018

Figure 3-21. T/C mV

c. O_2 CELL mV

Refer to Figure 3-22. Use this screen to examine the O_2 cell mV output. Pressing NEXT accesses the CELL IMPEDANCE screen.



26020019

Figure 3-22. O_2 CELL mV

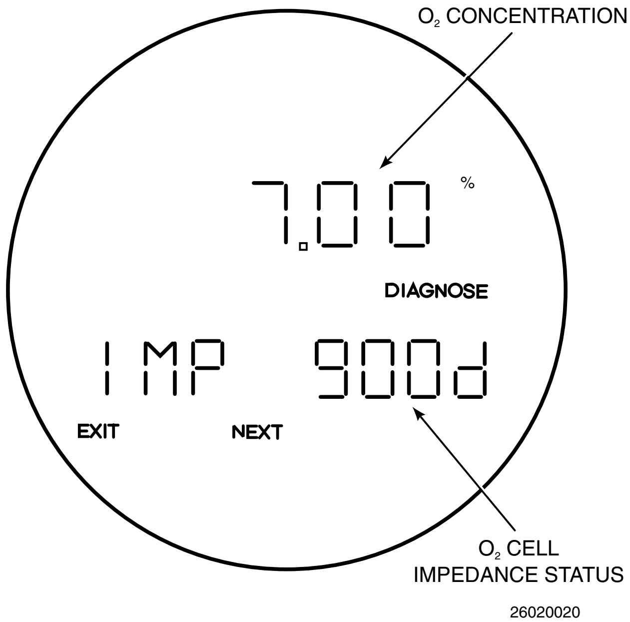


Figure 3-23. CELL IMPEDANCE

d. CELL IMPEDANCE

Refer to Figure 3-23. Use this screen to examine the O_2 cell impedance status. GOOD indicates the cell is operating normally. WARN indicates the cell has degraded but is still operational. HI indicates that the cell has degraded but is still operational; however, failure will occur soon. Pressing NEXT accesses the PREVIOUS SLOPE screen.

NOTE

Temperature influences cell impedance. Wait until the cell is at operating temperature before checking cell impedance. If checked before the cell reaches operating temperature [550°C (1022°F)], this screen displays a fail indication.

e. PREVIOUS SLOPE

Refer to Figure 3-24. Use this screen to examine the slope calculated from the most recent calibration check. The slope is the amount of cell voltage generated for a given O_2 value. For each calibration check, record the slope over the life of the probe. Tracking the slope will indicate if the probe is degrading. Press NEXT to access the PREVIOUS CONSTANT screen.

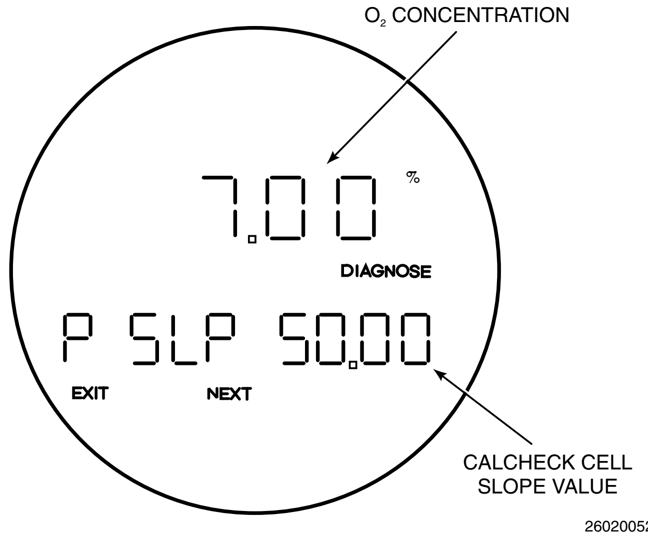


Figure 3-24. PREVIOUS SLOPE

f. PREVIOUS CONSTANT

Refer to Figure 3-25. Use this screen to examine the cell zero constant calculated from the most recent calibration check. The constant represents the voltage generated by the cell when no difference exists between the amount of O_2 on the reference and process sides of the cell. Press NEXT to access the MAX CELL T screen.

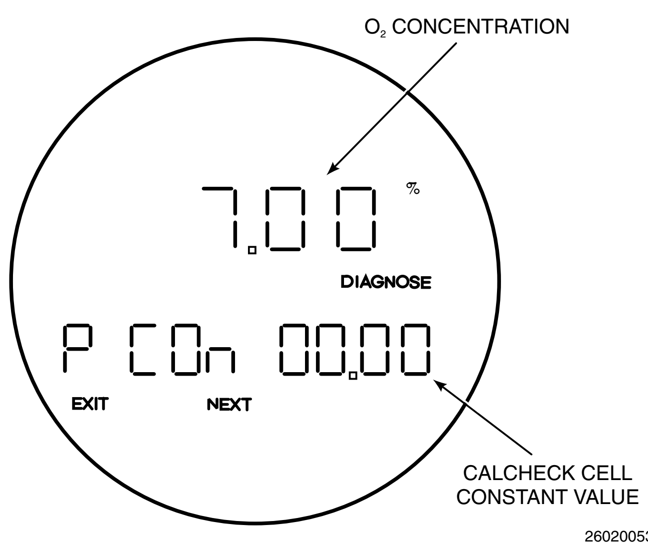


Figure 3-25. PREVIOUS CONSTANT

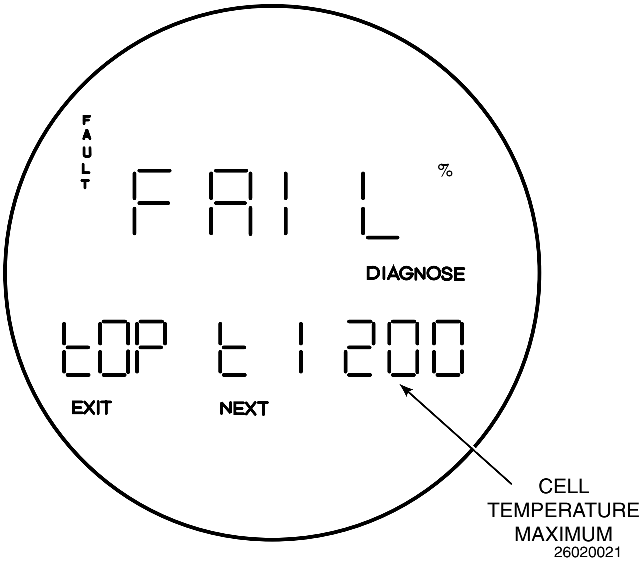


Figure 3-26. MAX CELL T

g. MAX CELL T

Refer to Figure 3-26. Use this screen to examine the maximum temperature attained by the O_2 cell. This value can be reset under the PROGRAM MENU. Pressing NEXT accesses the SW VER screen.

h. SW VER

Use this screen to see the software version number for the Model 3081 Transmitter. Pressing NEXT accesses the UNIT SER # screen.

i. UNIT SER #

Use this screen to see the unit serial number for the Model 3081 Transmitter. Pressing NEXT accesses the SW BUILD NUMBER screen.

j. SW BUILD NUMBER

Use this screen to see the software build number for the Model 3081 Transmitter. Pressing NEXT accesses the SW BUILD DATE screen.

k. SW BUILD DATE

Use this screen to see the software build date for the Model 3081 Transmitter. Pressing NEXT returns to the beginning of the DIAGNOSTICS MENU branch (the SHOW FAULT screen).

3-7 CALCHECK MENU

The CALCHECK MENU branch of the menu tree (Figure 3-5) allows you to perform a calibration check of the analyzer. Before performing a calibration check, ensure the high calibration check gas and low calibration check gas O_2 percentages are entered into the electronics via the PROGRAM MENU. To set these values, refer to paragraphs 3-5j and 3-5k.

Once these values are set, access the CALCHECK MENU branch by pressing CAL on the IRC when in the PROCESS DISPLAY screen (Normal or Faulted). Each screen in this branch identifies a process step in the calibration check procedure. The first screen in the sequence is the IN MANUAL? screen.

a. IN MANUAL?

Refer to Figure 3-27.

> **WARNING**
>
> **Failure to remove the analyzer from automatic control loops prior to performing this procedure may result in a dangerous operating condition.**

If the O_2 output value is used in any automatic process control loops, the loop must be placed in manual before beginning a calibration check.

Once the analyzer is removed from any automatic control loops, press ENTER to edit the screen. Use the arrow keys to select Y (yes) and press ENTER to process the selection and to display the ACCEPT HIGH O_2 screen.

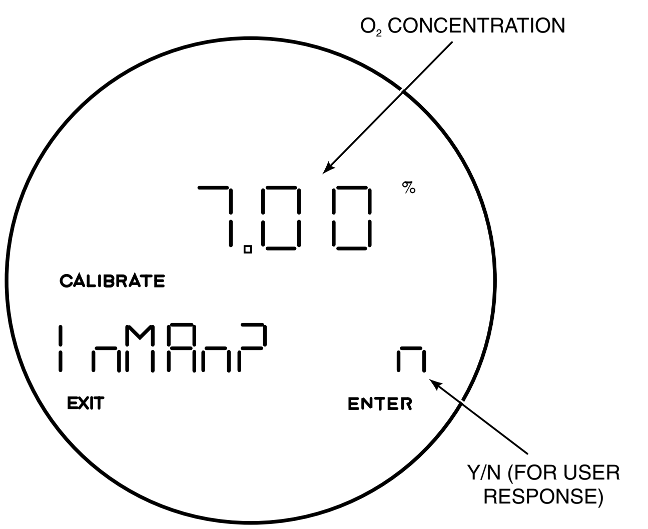


Figure 3-27. IN MANUAL?

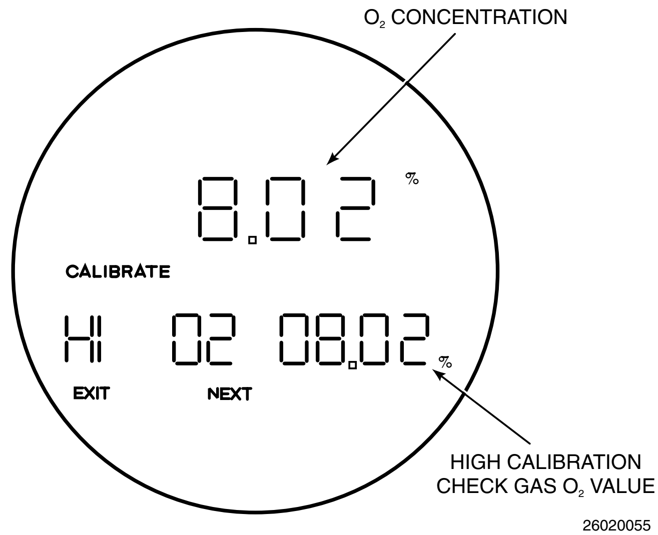


Figure 3-28. ACCEPT HIGH O_2

b. ACCEPT HIGH O_2

Refer to Figure 3-28. After pressing ENTER to begin the calibration check, the high calibration check gas starts to flow. After waiting approximately three minutes for the displayed O_2 value to settle, press NEXT to accept the high calibration check gas reading and apply the low calibration check gas. The next screen to display is the ACCEPT LOW O_2 screen.

c. ACCEPT LOW O_2

Refer to Figure 3-29. Once the low calibration check gas is applied, wait approximately three minutes for the displayed O_2 value to settle. Once the value settles, press NEXT to accept the reading and to display the SLOPE screen.

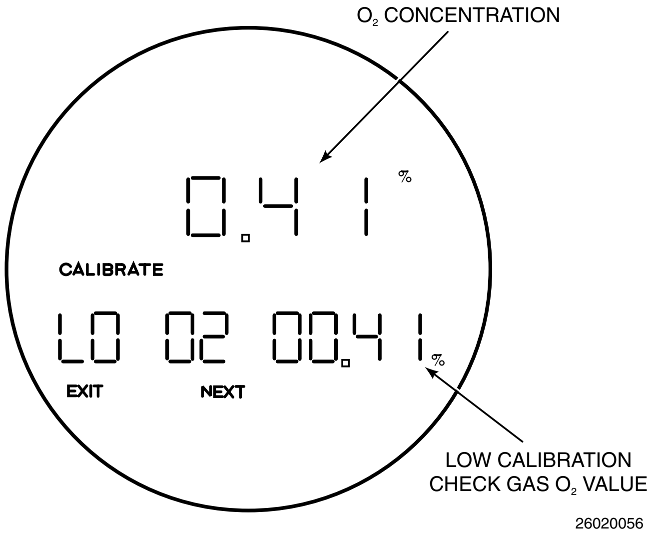


Figure 3-29. ACCEPT LOW O_2

d. SLOPE

Refer to Figure 3-30. Use this screen to examine the slope calculated from current calibration check. The slope is the amount of cell voltage generated for a given O_2 value. After each calibration check, record the slope over the life of the probe. Tracking the slope will indicate if the probe is degrading. Press NEXT to access the CONSTANT screen.

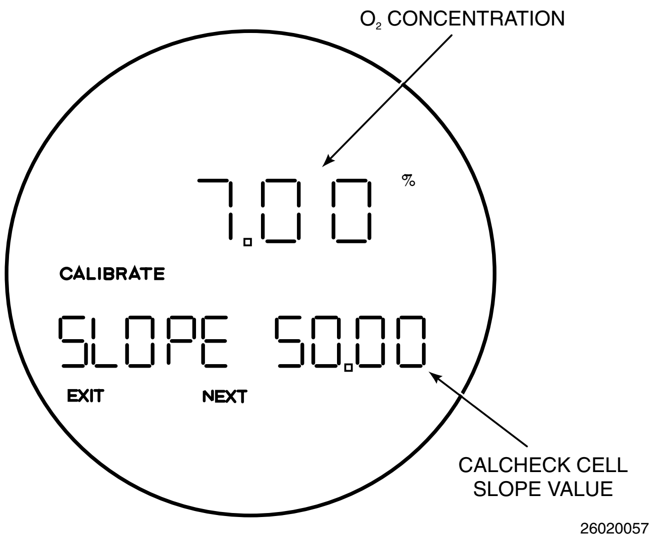


Figure 3-30. SLOPE

e. CONSTANT

Refer to Figure 3-31. Use this screen to examine the cell zero constant calculated from the current calibration check. The constant represents the voltage generated by the cell when no difference exists between the amount of O_2 on the reference and process sides of the cell. Note this value for comparison against future calibration checks. Press RESET or EXIT to return to the PROCESS DISPLAY screen.

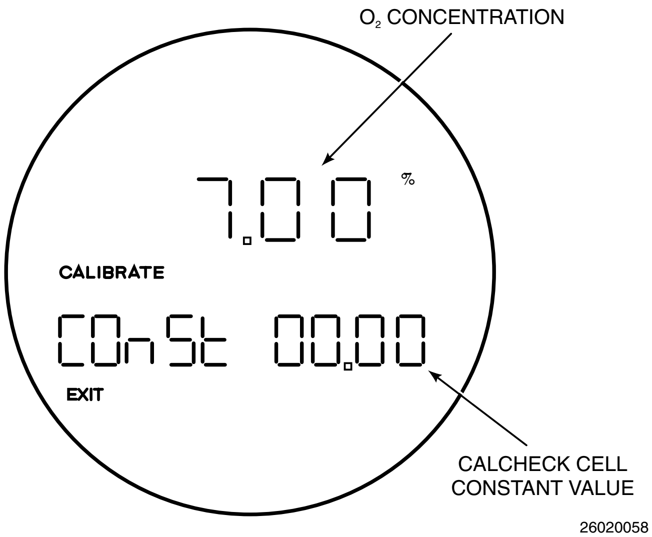


Figure 3-31. CONSTANT

3

SECTION 4
HART/AMS

4-1 OVERVIEW

The HART Communicator is a handheld communications interface device. It provides a common communications link to all microprocessor-based instruments that are HART compatible. The handheld communicator contains an 8 x 21 character liquid crystal display (LCD) and 25 keys. A pocket-sized manual, included with the HART Communicator, details the specific functions of all the keys.

To interface with the Two-Wire In Situ Oxygen Analyzer, the HART Communicator requires a termination point along the 4-20 mA current loop and a minimum load resistance of 250 ohms between the communicator and the power supply. The HART Communicator accomplishes its task using a frequency shift keying (FSK) technique. With the use of FSK, high-frequency digital communication signals are superimposed on the 4-20 mA transmitter current loop. The communicator does not disturb the 4-20 mA signal since no net energy is added to the loop.

The HART Communicator may be interfaced with a personal computer (PC) providing special software has been installed. To connect the HART Communicator to a PC, an interface adapter is required. Refer to the proper HART Communicator documentation regarding the PC interface option.

4-2 HART COMMUNICATOR SIGNAL LINE CONNECTIONS

The HART Communicator can connect to the Two-Wire In Situ Oxygen Analyzer analog output signal line at any wiring termination in the 4-20 mA current loop. There are two methods of connecting the HART Communicator to the signal line. For applications in which the signal line has a load resistance of 250 ohms or more, refer to method 1 and Figure 4-1. For applications in which the signal line load resistance is less than 250 ohms, refer to method 2 and Figure 4-2.

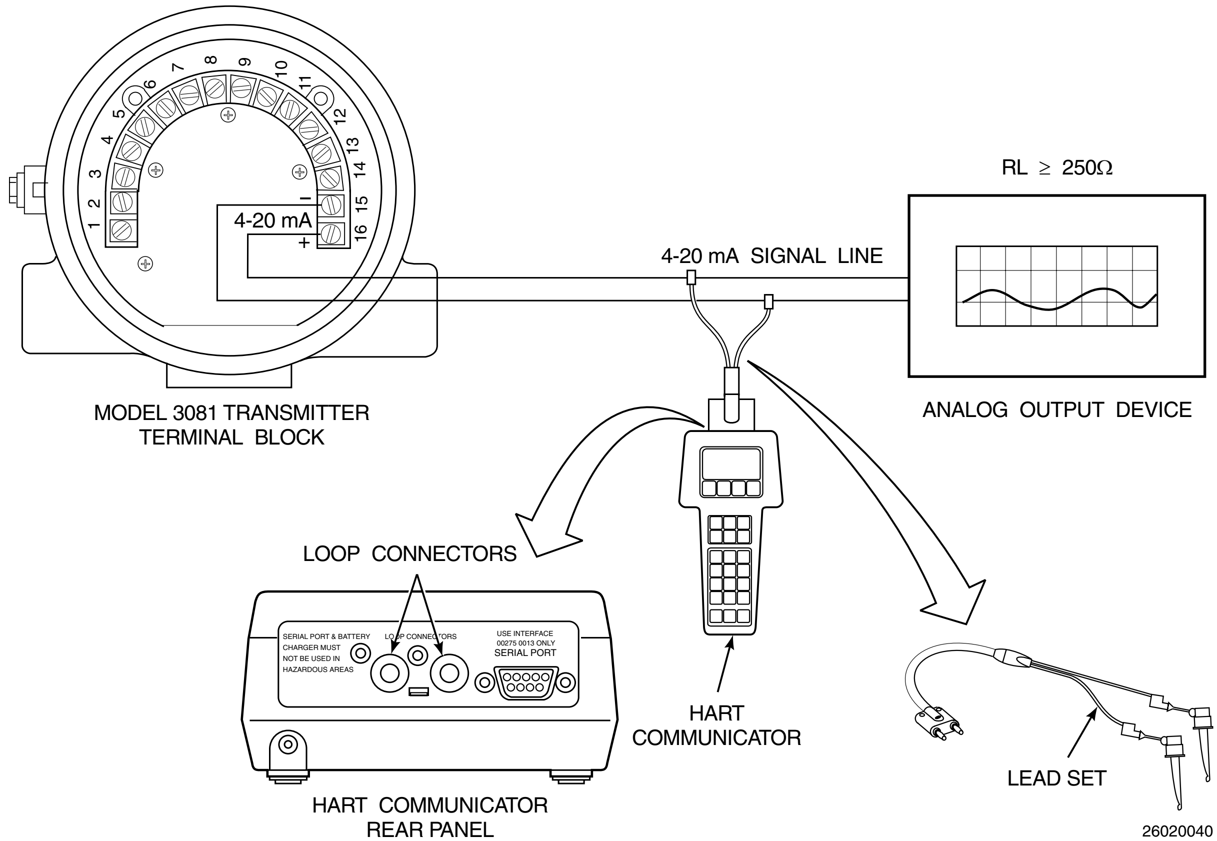


Figure 4-1. Signal Line Connections, ≥ 250 Ohms Lead Resistance

a. **Method 1, For Load Resistance ≥ 250 Ohms**

Refer to Figure 4-1 and the following instruction to connect the HART Communicator to a signal line with 250 ohms or more of load resistance.

WARNING

Explosions can result in death or serious injury. Do not make connections to the HART Communicator's serial port, 4-20 mV signal line, or NiCad recharger jack in an explosive atmosphere.

Using the supplied lead set, connect the HART Communicator in parallel to the Two-Wire In Situ Oxygen Analyzer. Use any wiring termination points in the analog output 4-20 mA signal line.

b. **Method 2, For Load Resistance < 250 Ohms**

Refer to Figure 4-2 and the following steps to connect the HART Communicator to a signal line with less than 250 ohms load resistance.

WARNING

Explosions can result in death or serious injury. Do not make connections to the HART Communicator's serial port, 4-20 mA signal line, or NiCad recharger jack in an explosive atmosphere.

1. At a convenient point, break the analog output 4-20 mA signal line and install the optional 250 ohm load resistor.

2. Plug the load resistor into the loop connectors (located on the rear panel of the HART Communicator).

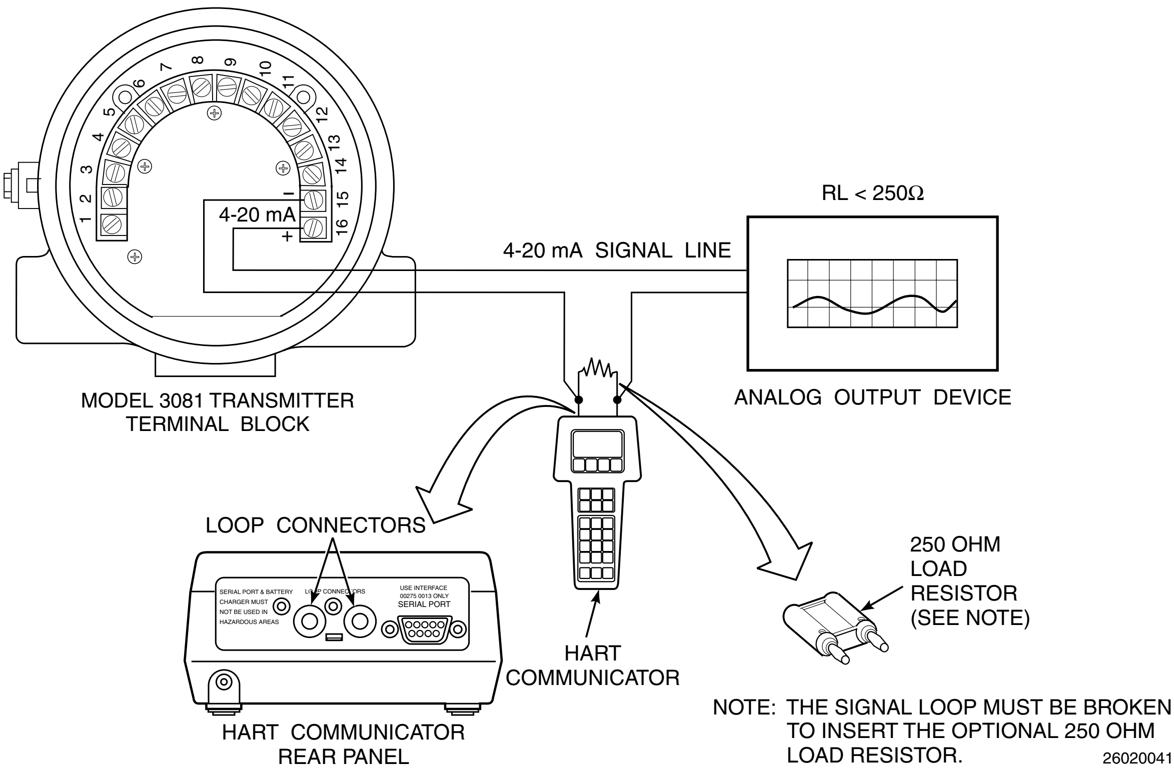


Figure 4-2. Signal Line Connections, < 250 Ohms Lead Resistance

4-3 HART COMMUNICATOR PC CONNECTIONS

There is an option to interface the HART Communicator with a personal computer. Load the designated AMS software into the PC. Link the HART Communicator to the PC using the interface PC adapter that connects to the serial port (on the communicator rear panel).

Refer to the proper HART Communicator documentation in regard to the PC interface option.

4-4 OFF-LINE AND ON-LINE OPERATIONS

The HART Communicator can be operated both off-line and on-line.

a. Off-line operations are those in which the communicator is not connected to the Two-Wire In Situ Oxygen Analyzer. Off-line operations can include interfacing the HART Communicator with a PC. (Refer to applicable HART documentation regarding HART/PC applications.)

b. In the on-line mode, the communicator is connected to the 4-20 mA analog output signal line. The communicator is connected in parallel to the Two-Wire In Situ Oxygen Analyzer or in parallel to the 250 ohm load resistor.

c. The opening menu displayed on the HART LCD is different for on-line and off-line operations. When powering up a disconnected (off-line) communicator, the HART LCD will display the Main Menu. When powering up a connected (on-line) communicator, the HART LCD will display the On-line Menu. Refer to the HART Communicator manual for detailed menu information.

4-5 MENU TREE FOR HART COMMUNICATOR/ TWO-WIRE IN SITU OXYGEN ANALYZER APPLICATIONS

This section consists of a menu tree for the HART Communicator (Figure 4-3). This menu is specific to Two-Wire In Situ Oxygen Analyzer applications.

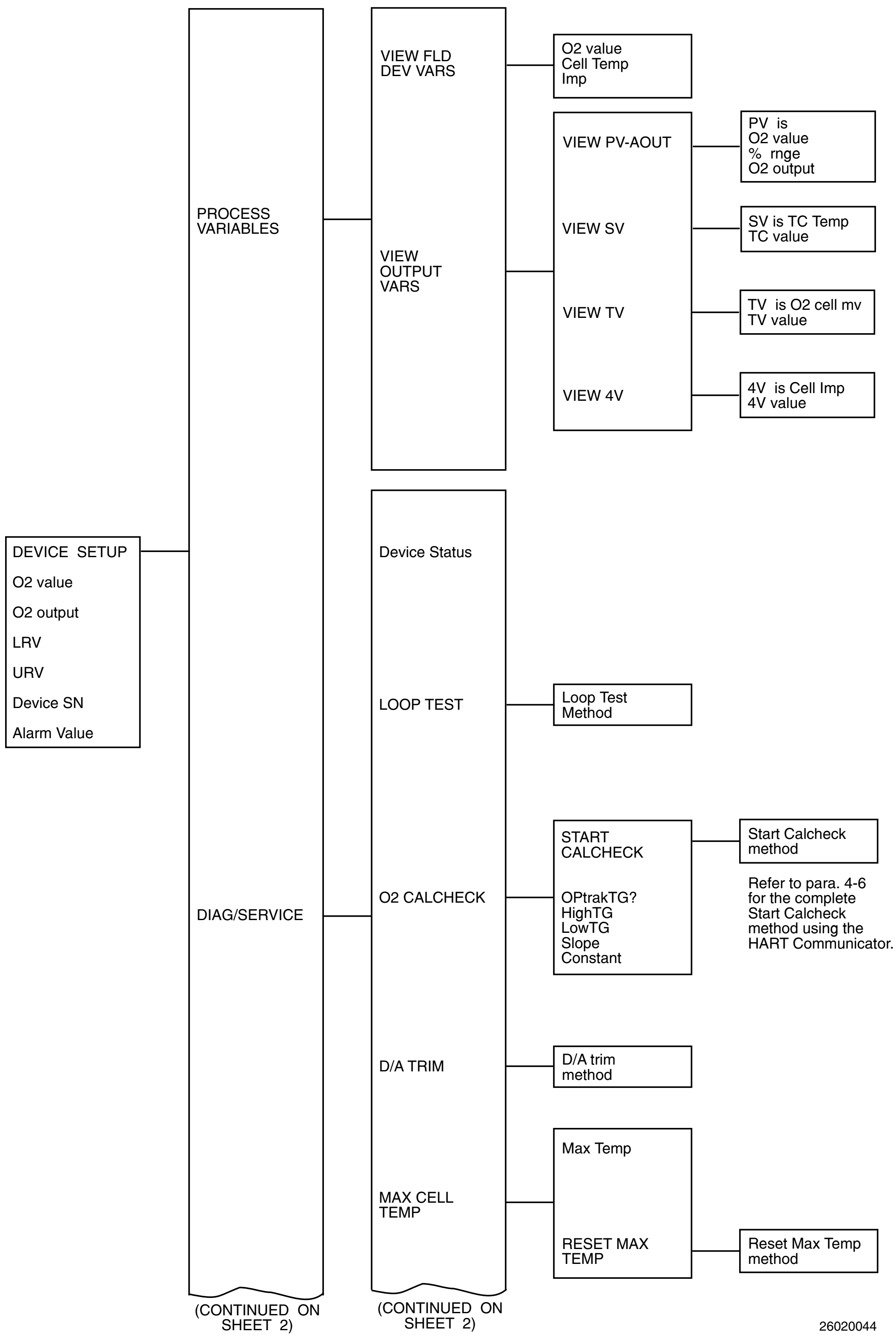


Figure 4-3. Menu Tree for HART/AMS on the Two-Wire In Situ Oxygen Analyzer (Sheet 1 of 3)

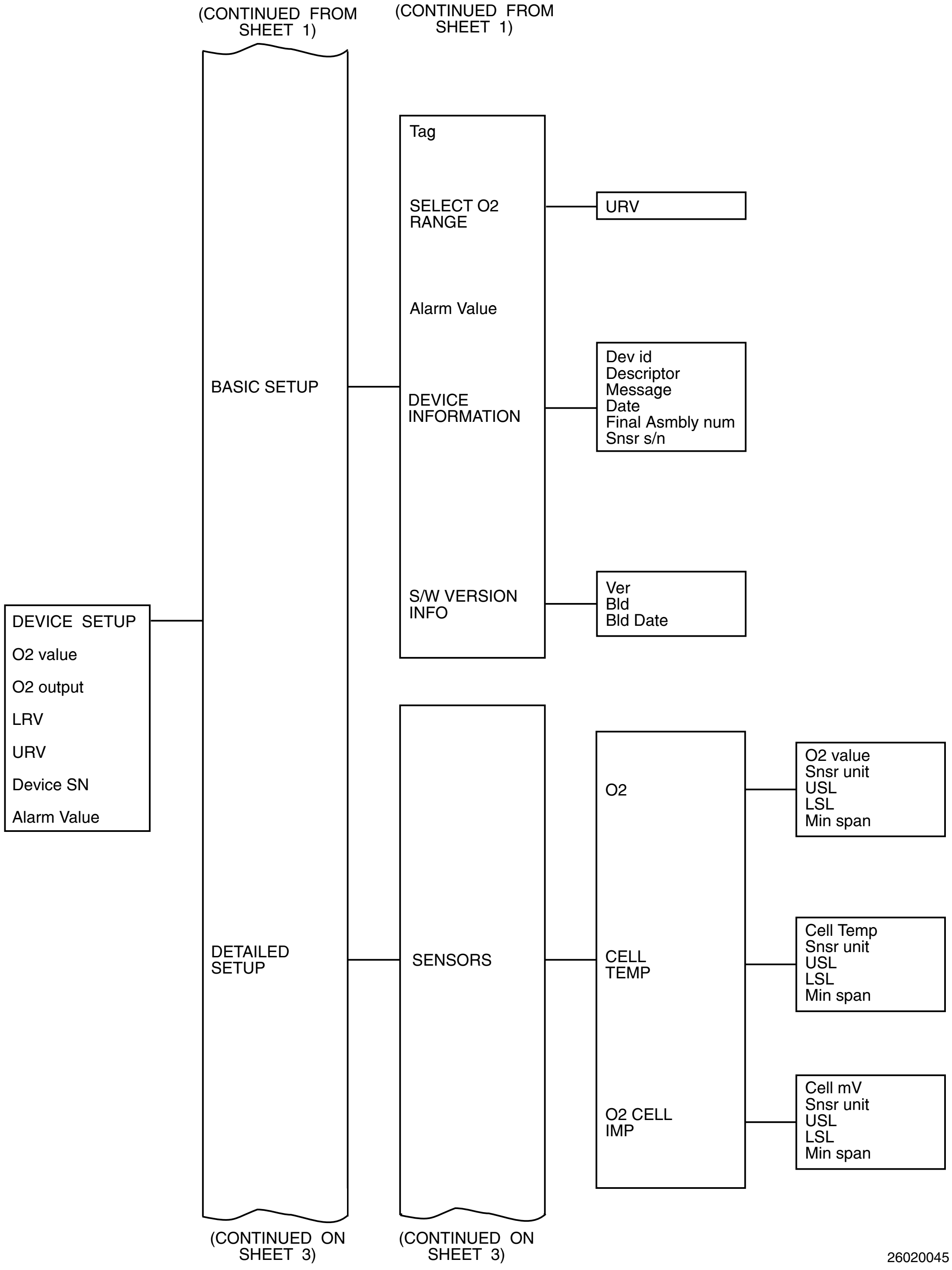


Figure 4-3. Menu Tree for HART/AMS on the Two-Wire In Situ Oxygen Analyzer (Sheet 2 of 3)

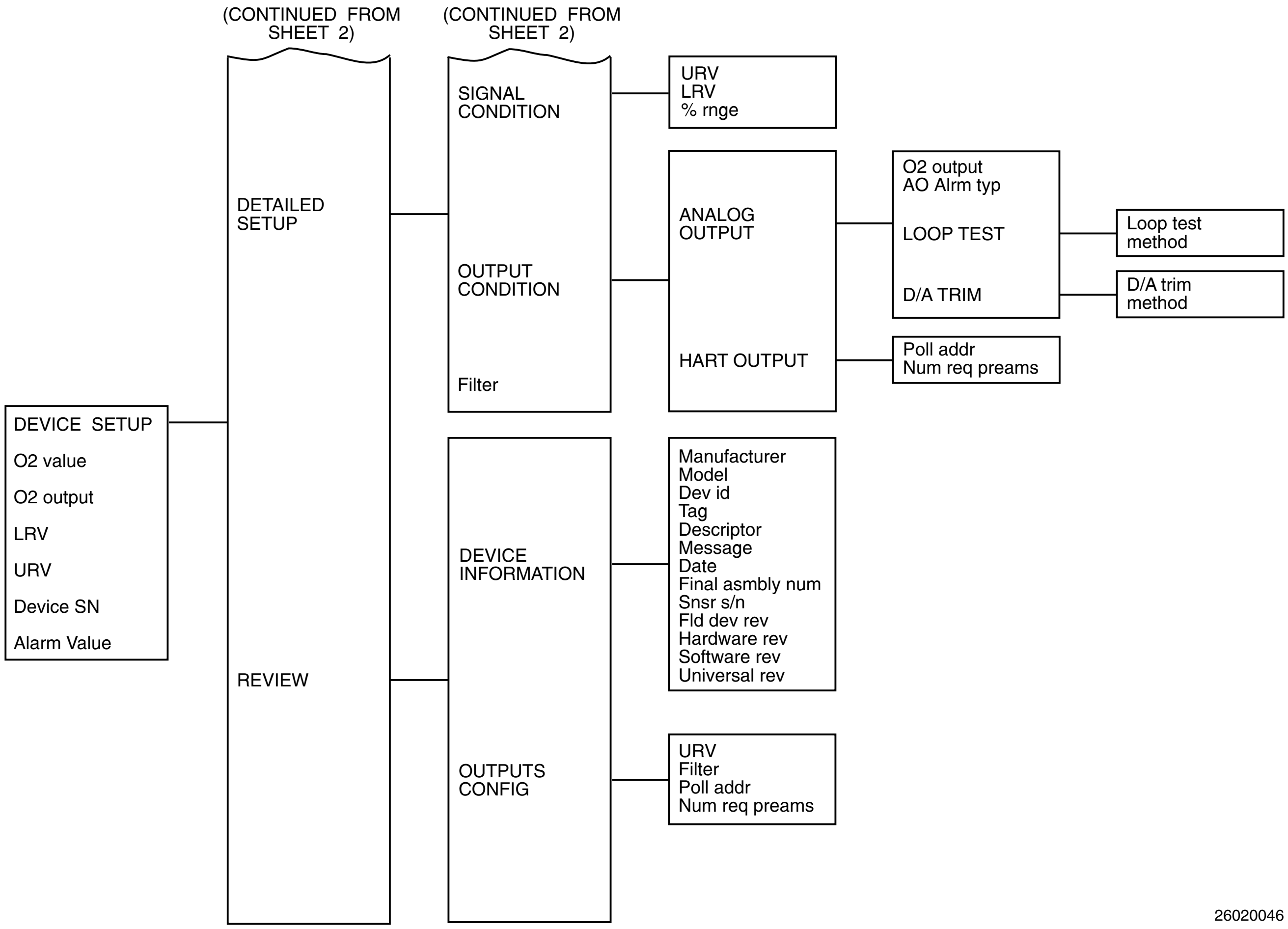


Figure 4-3. Menu Tree for HART/AMS on the Two-Wire In Situ Oxygen Analyzer (Sheet 3 of 3)

4-6 HART COMMUNICATOR START CAL-CHECK METHOD

To perform a calibration check on the Two-Wire In Situ Oxygen Analyzer with the HART Communicator, use the following procedure. If necessary, use the menu tree in Figure 4-3 (sheet 1 of 3) for reference.

NOTE

To select a menu item, either use the up and down arrow keys to scroll to the menu item and press the right arrow key or use the number keypad to select the menu item number.

To return to a preceding menu, press the left arrow key.

NOTE

Pressing ABORT at any time during this process will purge the calibration check gases and end the calibration check procedure.

a. From the DEVICE SETUP SCREEN, select DIAG/SERVICE.

b. From the DIAG/SERVICE screen, select O_2 CALCHECK.

c. Before starting the calibration check procedure, first set up the high calibration check gas, low calibration check gas, and tracking using HART/AMS.

d. From the O_2 CALCHECK screen, select menu item 1, START CALCHECK, to access the calibration check procedure.

WARNING

Failure to remove the analyzer from automatic control loops prior to performing this procedure may result in a dangerous operating condition.

e. In the first screen, a "Loop should be removed from automatic control" warning appears. Remove the analyzer from any automatic control loops to avoid undesirable equipment performance and press OK.

f. The next screen prompts you to apply the high calibration check gas. This message will only display for approximately three seconds. Press OK.

g. At this point, calibration check gas will flow for approximately three minutes until the gas reading is taken. Once the gas is measured, the message, "Hi gas reading taken," displays for three seconds.

h. Next, the screen prompts you to apply the low calibration check gas. Press OK.

i. The low calibration check gas will flow for approximately three minutes until the reading is taken. Once the gas is measured, the message, "Low gas reading taken," displays for three seconds.

j. Next, the screen prompts you to disconnect the calibration check gases. Press OK. Once the gases are disconnected, the system will purge the gases for approximately three minutes.

k. When the "Loop may be returned to automatic control" note appears, return the analyzer to the automatic control loops previously removed and press OK.

SECTION 5
MAINTENANCE AND SERVICE

> **WARNING**
>
> **Install all protective equipment covers and safety ground leads after equipment repair or service. Failure to install covers and ground leads could result in serious injury or death.**

> **WARNING**
>
> **Disconnect and lock out power before working on any electrical components.**

5-1 MODEL 3081 ELECTRONICS REPLACEMENT

Before replacing any electronic components, verify that the power to the Model 3081 Transmitter is removed. Refer to Table 8-1 for replacement part numbers.

a. Display Board Replacement

Use the following procedure to replace display board (11, Figure 5-1).

1. Loosen screw (14) until cover lock (15) disengages from the knurled surface of circuit end cap (13).
2. Remove circuit end cap (13).
3. Remove three screws (12) retaining the electronics in place.
4. Lift display board (11) and disconnect the ribbon cable connector between the display board and the CPU board of PC board stack (10).
5. Using a replacement display board, connect the ribbon cable connector between the display board and the CPU board of PC board stack (10). Ensure the cable connector is fully seated.
6. Reposition display board (11) on the standoffs. Rotate the display board 90 degrees either way as desired.
7. Install and tighten all three screws (12).
8. Install circuit end cap (13).
9. Tighten cover lock screw (14) until cover lock (15) engages knurled surface of circuit end cap (13).

b. PC Board Stack Replacement

PC board stack (10, Figure 5-1) is composed of the CPU board and the analog board. Use the following procedure to replace these boards as a set.

1. Loosen cover lock screw (14) until cover lock (15) disengages from the knurled surface of circuit end cap (13).
2. Remove circuit end cap (13). Remove three screws (12).
3. Lift display board (11) and disconnect the ribbon cable connector between the display board and the CPU board of PC board stack (10).
4. Lift the CPU board from housing (1) by the standoffs.
5. Remove two screws (4) and lockwashers (3). Lift terminal block (6) until the analog board is unplugged from the terminal board.
6. Reinstall terminal block (6), lockwashers (3), and screws (4).
7. Lift the analog board from housing (1) by the standoffs.
8. Install replacement PC board stack (10) into housing (1). Carefully seat the analog board onto housing pins. Press firmly on the CPU board standoffs to ensure good contact.

1. Housing
2. O-ring
3. Lockwasher
4. Screw
5. Terminal End Cap
6. Terminal Block
7. Ground Screw
8. Washer
9. O-ring
10. PC Board Stack (CPU and Analog Boards)
11. Display Board
12. Screw
13. Circuit End Cap
14. Screw
15. Cover Lock

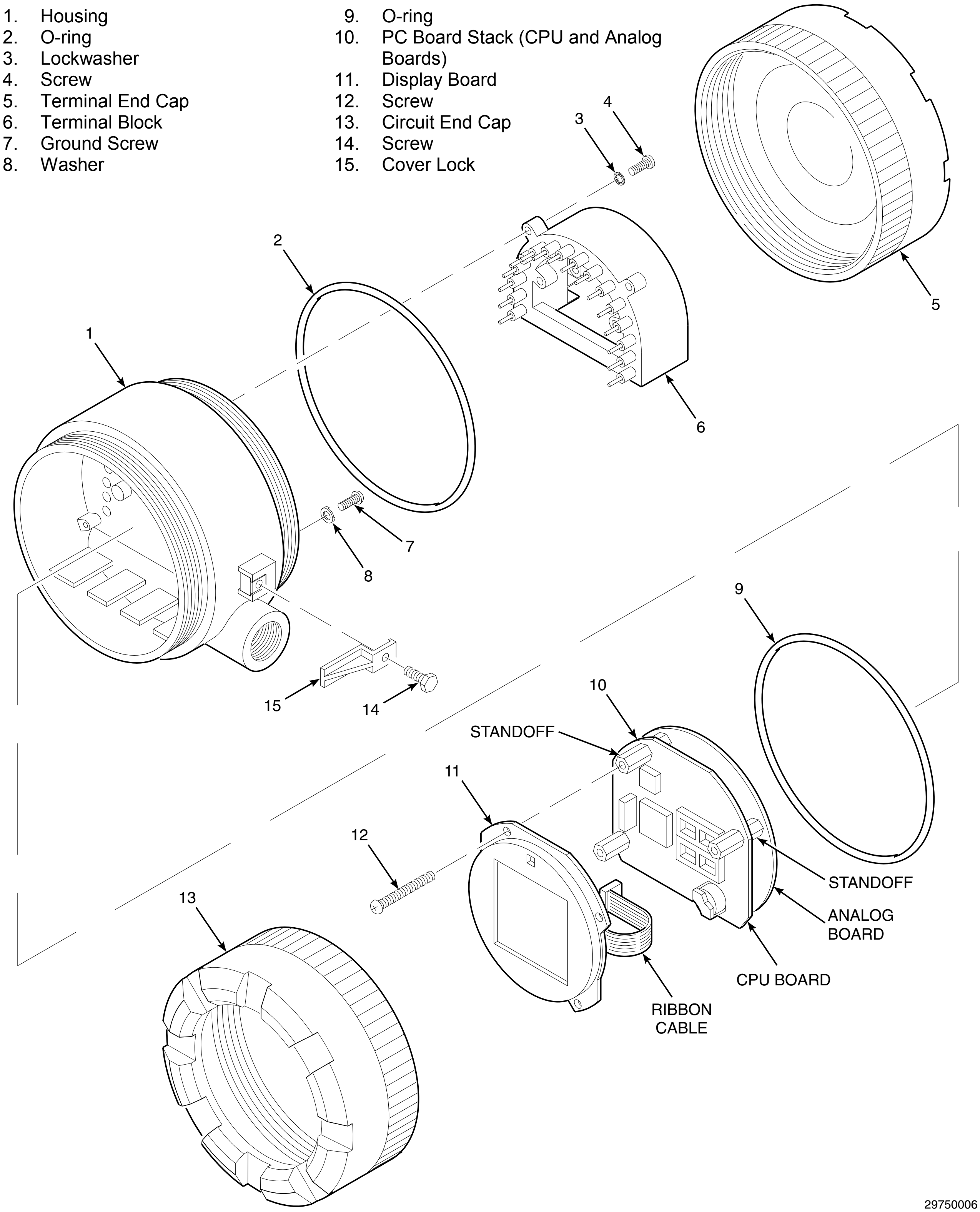


Figure 5-1. Two-Wire In Situ Oxygen Analyzer Exploded View

9. Connect the ribbon cable connector between display board (11) and the CPU board of PC board stack (10). Ensure the cable connector is fully seated.

10. Reposition display board (11) on the standoffs. Rotate the display board 90 degrees either way as desired.

11. Install and tighten all three screws (12) and circuit end cap (13).

12. Tighten cover lock screw (14) until cover lock (15) engages knurled surface of circuit end cap (13).

WARNING

Use heat resistant gloves and clothing when removing the probe. The probe can be as hot as 1600°C (2912°F). This can cause severe burns.

5-2 OXYGEN PROBE REPLACEMENT

The oxygen probe is designed with ceramic materials to provide maximum life at elevated temperatures and is not rebuildable. The condition of the sensing cell can be determined periodically by two methods:

- Note the cell impedance at the electronics. When the impedance displays a warning indication (WARN), increase the frequency of impedance readings. A cell with a sustained high impedance indication (HI) indicates a probe that is beyond its useful life.
- Conduct a calibration check. Follow the prompts provided by the electronics through the process of flowing two calibration check gases of known values. Record the generated slope and constant values.

Probe replacement may be conducted online as long as the process in which the probe is mounted is operating at a negative, or slightly positive, pressure. Refer to Section 6, TROUBLESHOOTING, for more information.

WARNING

Do not install or remove probes from a process where pressures are more than a few inches of H2O positive pressure. Hot gases may escape from the stack and cause severe personal injury.

CAUTION

Do not insert or withdraw a probe into or out of a hot process faster than 1 in. (25.4 mm) per minute or instrument damage from thermal shock may occur.

Also, ash, slag, or other materials can build up on the probe body in some applications. If this buildup is causing difficulty when withdrawing the probe, DO NOT FORCE. Rotate the probe back and forth to attempt to loosen the material on the probe body. Or, wait until the process cools down and access the buildup from inside the furnace.

Refer to Table 8-1 for replacement probe part numbers. Before replacing the probe, verify that the reference air and calibration check gas lines are turned off and disconnected from the probe.

a. Remove the end cap of the probe to expose the terminal block.

b. Refer to Figure 5-2. Disconnect the four wires (two oxygen signal wires and two thermocouple wires) from the terminal block.

c. Disconnect the reference air and the calibration check gas lines.

d. Unscrew the probe from the stack and remove.

e. Using a replacement probe, refer to paragraph 2-2c for mechanical installation instructions.

f. Refer to paragraph 2-3b for electrical installation instructions.

g. Refer to paragraph 2-4 for reference air and calibration check gas installation instructions.

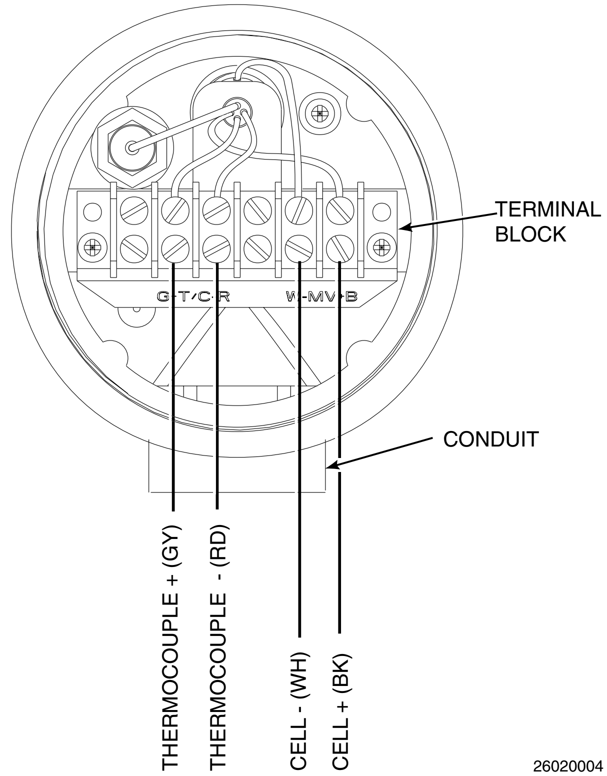


Figure 5-2. Oxygen Probe Terminal Block

SECTION 6
TROUBLESHOOTING

> **WARNING**
>
> **Install all protective equipment covers and safety ground leads after troubleshooting. Failure to install covers and ground leads could result in serious injury or death.**

6-1 GENERAL

This troubleshooting section describes how to identify and isolate faults that may develop in the Two-Wire In Situ Oxygen Analyzer.

6-2 PROBE LIFE

The zirconium oxide technology for measuring oxygen is very stable and should provide accurate service for several years.

Life of the probe is negatively impacted by:

- Continued operation at elevated temperatures above 1300°C (2372°F).
- Operation in processes that contain high levels of sulfur, SO_2, or other acidic compounds.

Operating conditions with simultaneously high levels of SO_2 and low levels of O_2 are particularly damaging.

The health and accuracy of a given cell is closely related to the resistance, or impedance, of the cell. Figure 6-1 illustrates that the amount of output from a cell for a given O_2 value (represented as slope) will remain very stable to the point where cell impedance increases to approximately 100 ohms.

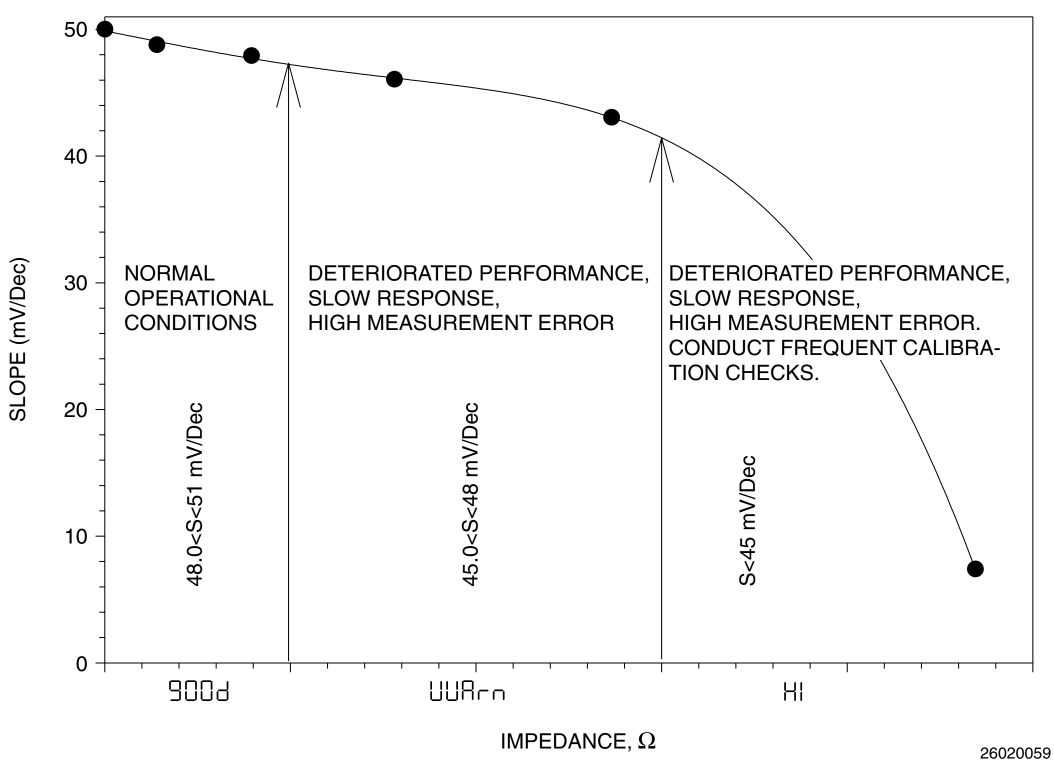


Figure 6-1. Slope vs. Impedance

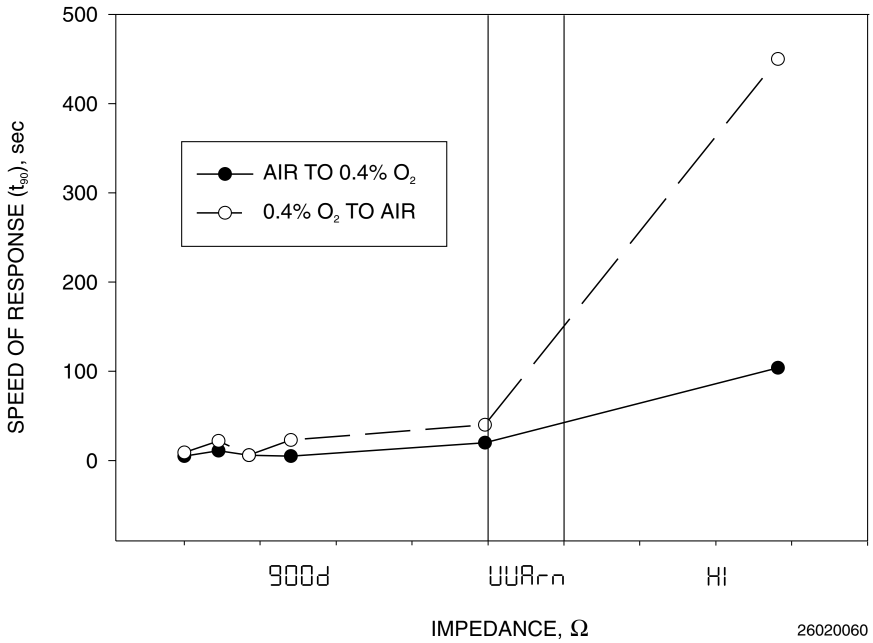


Figure 6-2. Speed of Response

Frequently conduct calibration checks to look for the following conditions:

- Continued degradation of cell slope.
- Sluggish response. (Note how long it takes the cell to respond to the application of calibration check gases.) See Figure 6-2.

The slope will be valid only for the process temperature at which the calibration check gases are flowed, so no adjustments to the electronics are made as a result of a calibration check.

Note that cells exposed to temperatures above 1300°C (2372°F) may lose the ability to measure accurately and respond quickly when returned to the lowest end of the operating temperature range [550°C (1022°F)].

Figure 6-3. Faulted Operation Display

6-3 FAULT INDICATIONS

The fault conditions for the Two-Wire In Situ Oxygen Analyzer will be indicated by the faulted operation display as shown in Figure 6-3. This screen displays when a fault that invalidates the O_2 reading is present. When the error is corrected, the screen will return to a normal operation display unless another error exists.

6-4 IDENTIFYING AND CORRECTING FAULT INDICATIONS

A fault in the operation of the Two-Wire In Situ Oxygen Analyzer is indicated by the faulted operation display. If no faults exist, the display will indicate NONE. Information on the current fault is found under the DIAGNOSTICS MENU as detailed in Section 3, STARTUP AND OPERATION.

The following paragraphs describe the faults, possible causes, and corrective actions. Refer to Figure 6-4 as needed for test points and wiring information.

NOTE

Allow adequate time for the oxygen probe to reach its operating temperature [approximately 500°C (932°F)] before investigating a fault. The SHOW FAULTS screen of the DIAGNOSTICS menu will indicate a fault until the unit reaches operating temperature.

NOTE

The probe uses a Type B thermocouple to measure the cell temperature. A Type B thermocouple output table may be useful for troubleshooting.

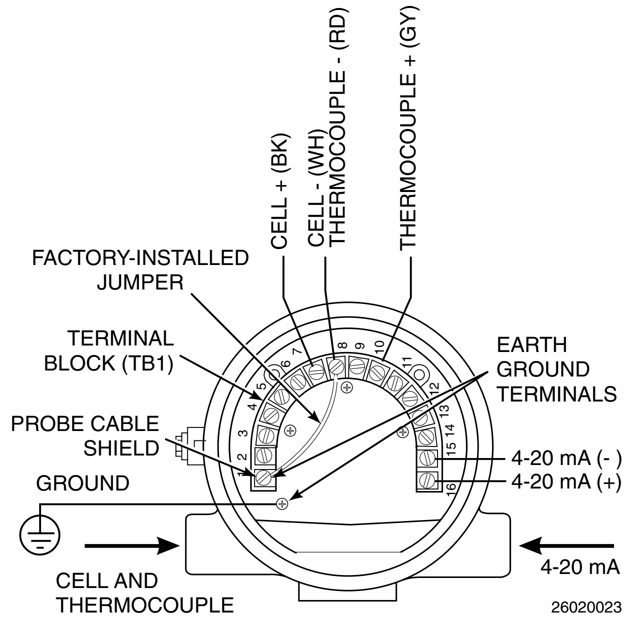


Figure 6-4. Model 3081 Transmitter Terminal Block

Figure 6-5. Fault 1, Open Thermocouple

a. Fault 1, Open Thermocouple

The thermocouple connection is open. The fault displays as shown in Figure 6-5.

1. Refer to Figure 6-4 and check the thermocouple wiring connections at terminals 8 and 10. Ensure the wires are properly connected.

2. Remove power. Disconnect the thermocouple wires (gray and red) from terminals 10 and 8. Measure the continuity across the gray and red thermocouple leads. The measurement should read approximately 1-2 ohms. Larger values indicate the thermocouple is open.

3. If the thermocouple is open, replace the oxygen probe per paragraph 5-2.

Figure 6-6. Fault 2, Reversed Thermocouple

b. Fault 2, Reversed Thermocouple Active

The thermocouple connections are reversed. The fault displays as shown in Figure 6-6.

1. Allow adequate time for the oxygen probe to reach operating temperatures. Probe temperatures below approximately 500°C (932°F) may result in this fault.

2. Refer to Figure 6-4. Check the gray (to terminal 10) and red (to terminal 8) wires for the proper placement.

3. Using a multimeter, measure between terminals 8(-) and 10(+). If the reading is negative, the thermocouple wiring is reversed. Rewire as necessary.

4. If the wiring is correct and the probe is at operating temperature, then the transmitter electronics are bad. Replace the PC board stack assembly per paragraph 5-1.

Figure 6-7. Fault 3, Shorted Thermocouple

c. Fault 3, Shorted Thermocouple

The thermocouple connections are shorted. The fault displays as shown in Figure 6-7.

1. Allow adequate time for the oxygen probe to reach operating temperatures. Probe temperatures below approximately 500°C (932°F) may result in this fault.

2. Refer to Figure 6-4. Using a multimeter, measure between terminals 8(-) and 10(+).

3. If the multimeter reading, in voltage mode, is between -0.5 and +0.5 mV, the thermocouple is shorted.

4. If the thermocouple is shorted, replace the oxygen probe per paragraph 5-2.

5. If the thermocouple is not shorted, then replace the PC board stack assembly per paragraph 5-1.

Figure 6-8. Fault 4, High Probe Temperature

d. Fault 4, High Probe Temperature

The probe's temperature has exceeded the maximum cell temperature setpoint. The fault displays as shown in Figure 6-8.

1. If the probe temperature exceeds the maximum cell temperature setpoint, the 4-20 mA signal output will become invalid and go to the default value.

2. Verify that the upper cell temperature setpoint is configured as desired under the PROGRAM MENU (see Section 3, STARTUP AND OPERATION).

Figure 6-9. Fault 5, O_2 Cell Open

Figure 6-10. Fault 6, Cell Impedance Too High

e. Fault 5, O_2 Cell Open

The O_2 cell connection is open. The fault displays as shown in Figure 6-9.

1. Allow adequate time for the oxygen probe to reach operating temperatures. Probe temperatures below approximately 500°C (932°F) may result in this fault.

2. Refer to Figure 6-4 and check the O_2 cell wiring connections at terminals 7 and 8. Ensure the wires are properly connected.

NOTE

Check the cell output voltage at the probe terminals -- not at the electronics.

3. Apply low calibration check gas (0.4% O_2). Measure the cell output from the O_2 cell wires at the probe terminal block. The cell output should be 100 ±20 mV. If no voltage can be measured, the cell is open.

4. If the O_2 cell is open, replace the oxygen probe per paragraph 5-2.

f. Fault 6, Cell Impedance Too High

The O_2 cell impedance has exceeded 100 ohms. The fault displays as shown in Figure 6-10.

1. This fault is usually indicated in conjunction with Fault 5, Cell Open. Correcting Fault 5 should correct Fault 6.

2. If Fault 6 appears independently, the cell has degraded beyond specification.

3. If the O_2 cell has become too old, replace the oxygen probe per paragraph 5-2.

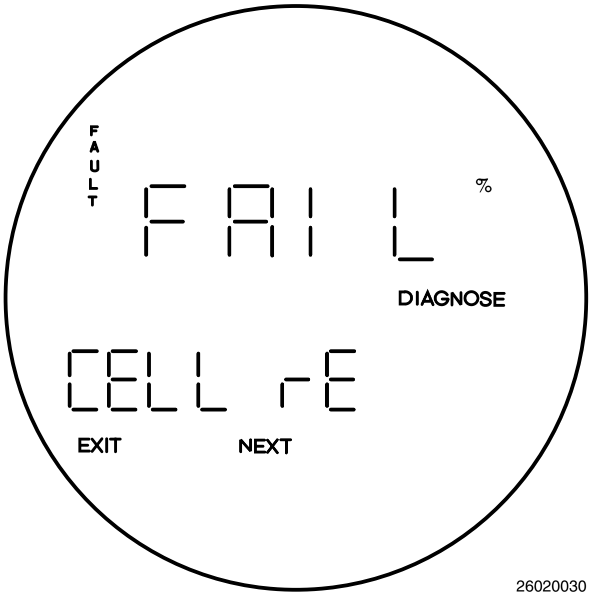


Figure 6-11. Fault 7, Reversed O_2 Cell

g. Fault 7, Reversed O_2 Cell

The O_2 cell connections are reversed. The fault displays as shown in Figure 6-11.

1. Refer to Figure 6-4. Check the black (to terminal 7) and white (to terminal 8) wires for the proper placement. Rewire if necessary.
2. Apply the low calibration check gas (0.4% O_2).
3. Using a multimeter, measure between terminals 7(+) and 8(-). If the cell output reading is negative, the O_2 cell wiring is reversed.
4. If the wiring is correct, check if the multimeter reading is the same as the reading shown on the O_2 CELL mV diagnostics screen (see Section 3, STARTUP AND OPERATION).
5. If the reading is different, the transmitter electronics are faulty. Replace the PC board stack assembly per paragraph 5-2.

SECTION 7
RETURN OF MATERIAL

7-1 If factory repair of defective equipment is required, proceed as follows:

a. Secure a return authorization number from a Rosemount Analytical Sales Office or representative before returning the equipment. Equipment must be returned with complete identification in accordance with Rosemount instructions or it will not be accepted.

In no event will Rosemount be responsible for equipment returned without proper authorization and identification.

b. Carefully pack defective unit in a sturdy box with sufficient shock absorbing material to ensure that no additional damage will occur during shipping.

c. In a cover letter, describe completely:

1. The symptoms from which it was determined that the equipment is faulty.
2. The environment in which the equipment has been operating (housing, weather, vibration, dust, etc.).
3. Site from which equipment was removed.
4. Whether warranty or nonwarranty service is requested.
5. Complete shipping instructions for return of equipment.
6. Reference the return authorization number.

d. Enclose a cover letter and purchase order and ship the defective equipment according to instructions provided in Rosemount Return Authorization, prepaid, to:

Rosemount Analytical Inc.
RMR Department
1201 N. Main Street
Orrville, Ohio 44667

If warranty service is requested, the defective unit will be carefully inspected and tested at the factory. If failure was due to conditions listed in the standard Rosemount warranty, the defective unit will be repaired or replaced at Rosemount's option, and an operating unit will be returned to the customer in accordance with shipping instructions furnished in the cover letter.

For equipment no longer under warranty, the equipment will be repaired at the factory and returned as directed by the purchase order and shipping instructions.

SECTION 8
REPLACEMENT PARTS

Table 8-1. Replacement Parts List

Figure and Index No.	Part Number	Description
1-1, 2	1A99138G01	Model 3081 Transmitter CENELEC
1-1, 2	1A99138G02	Model 3081 Transmitter CSA
1-1, 2	1A99138G03	Model 3081 Transmitter FM
1-1, 3	5R10092G01	20” Replacement Oxygen Probe, with Alumina Outer Protection Tube
1-1, 3	5R10092G02	26” Replacement Oxygen Probe, with Alumina Outer Protection Tube
1-1, 3	5R10092G03	34.625” Replacement Oxygen Probe, with Alumina Outer Protection Tube
1-1, 3	5R10092G09	20” Replacement Oxygen Probe, with Inconel 600 Outer Protection Tube
1-1, 3	5R10092G010	26” Replacement Oxygen Probe, with Inconel 600 Outer Protection Tube
1-1, 3	5R10092G011	34.625” Replacement Oxygen Probe, with Inconel 600 Outer Protection Tube
5-1, 10	23574-04	PC Board Stack Assembly (CPU and Analog Boards)
5-1, 11	23601-00	Display Board
5-1, 6	23581-00	Terminal Block
5-1, 13	23593-01	Circuit End Cap (with Glass)

SECTION 9
INDEX

This index is an alphabetized listing of parts, terms, and procedures having to do with the Hazardous Area Oxygen/Combustibles Transmitter. Every item listed in this index refers to a location in the manual by one or more page numbers.

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SECTION 10
DRAWINGS AND SCHEMATICS

D 1400184

LTR	ECO	REVISION DESCRIPTION	BY	DATE	CHK
C	7181	DELETED NOTES 3, 5 AND 9; RENUMBERED NOTES-NOTE 3 WAS 4, NOTE 4 WAS 6, NOTE 5 WAS 7 AND NOTE 6 WAS 8, DELETED NOTE 3 AND 5 CALL OUTS	BJ		

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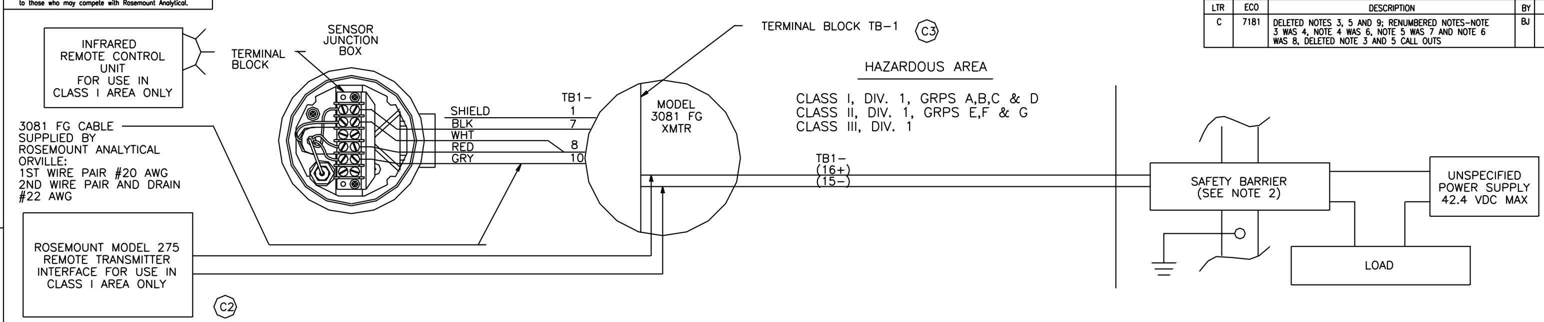

TABLE III

3081FG ENTITY PARAMETERS
SUPPLY / SIGNAL TERMINALS TB1- 15,16

MODEL NO.	Vmax (Vdc)	Imax (mA)	Pmax (W)	Ci (uF)	Li (mH)
3081 FG	30	300	0.9	0.008	0

ENTITY PARAMETERS: REMOTE TRANSMITTER INTERFACE

MODEL NO.	Vmax IN: Vdc	Imax IN:mA	Wamx IN: W	Ci (uF)	Li (mH)	Voc max OUT: Vdc	Isc max OUT:mA
275	30	300	1.0	.07	0.0	1.7	32

TABLE II

OUTPUT PARAMETERS	MODEL 3081FG TB1-1 THRU 12
Vt	13.0 Vdc
It	110 mA
Pmax	0.36 W
Cc	0.92 uF
Lc	2.9 mH

TABLE I

GROUP	Ca (uF)	La (mH)
A, B	1.2	2.9
C	3.6	11.6
D	9.6	23.0

6. SENSORS SHALL MEET THE REQUIREMENTS OF SIMPLE APPARATUS AS DEFINED IN ANSI/ISA RP12.6 AND THE NEC, ANSI/NFPA 70. THEY CAN NOT GENERATE NOR STORE MORE THAN 1.2V, 0.1A, 25mW, AND 20uJ.

5. UNSPECIFIED SAFE AREA APPARATUS MUST NOT BE SUPPLIED FROM OR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS A SOURCE OF POTENTIAL EXCEEDING 250 VOLTS rms OR 250 VOLTS dc.

4. THE INSTALLATION MUST CONFORM TO THE REQUIREMENTS IN ANSI/ISA RP12.6 AND THE NEC, ANSI/NFPA 70.

3. INTRINSICALLY SAFE APPARATUS (MODEL 3081 FG, AND MODEL 275) AND ASSOCIATED APPARATUS (SAFETY BARRIER) SHALL MEET THE FOLLOWING REQUIREMENTS: THE VOLTAGE (Vmax) AND CURRENT (Imax) OF THE INTRINSICALLY SAFE APPARATUS MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (Voc OR Vt) AND CURRENT (Isc OR It) WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS (SAFETY BARRIER). IN ADDITION, THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF THE INTRINSICALLY SAFE APPARATUS, INCLUDING INTERCONNECTING WIRING, MUST BE EQUAL OR LESS THAN THE CAPACITANCE (Ca) AND INDUCTANCE (La) WHICH CAN BE SAFELY CONNECTED TO THE APPARATUS. (REF. TABLES I, II & III). REFER TO MODEL 275 CONTROL DRAWING FOR INSTALLATION OF MODEL 275.

2. ANY SHUNT ZENER DIODE SAFETY BARRIER APPROVED BY FMRC HAVING THE FOLLOWING OUTPUT PARAMETERS:

SUPPLY/SIGNAL TERMINALS TB1- 15,16

Voc OR Vt NOT GREATER THAN 30 V
Isc OR It NOT GREATER THAN 300 mA
Pmax NOT GREATER THAN 0.9 W
Ci = .008uF
Li = 0

1. THE CAPACITANCE AND INDUCTANCE OF THE LOAD CONNECTED TO THE SENSOR TERMINALS MUST NOT EXCEED THE VALUES SPECIFIED IN TABLE I. (C1)

NOTES: UNLESS OTHERWISE SPECIFIED

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MAY 14, 1999	7038	C

UNLESS OTHERWISE SPECIFIED TOLERANCES .XX ± .030 .XXX ± .010 ANGLES ±1/2°
DIMENSIONS ARE IN INCHES
REMOVE BURRS & SHARP EDGES .020 MAX
MACHINED FILLET RADII .020 MAX
NOMINAL SURFACE FINISH 125
MATERIAL
FINISH

ITEM	PART NO.	DESCRIPTION	QTY
		BILL OF MATERIAL	

APPROVALS		DATE
DRAWN	B. JOHNSON	1/13/99
CHECKED	CAS	5/14/99
PROJECT ENGR APVD	DOC	5/14/99

Uniloc — Rosemount Analytical, Uniloc Division, 2400 Barranca Pkwy, Irvine, CA 92606

TITLE: SCHEMATIC, INSTALLATION 3081FG XMTR FMRC

THIS DWG PRODUCED ON MICROSTATION PC; FILENAME: 002508

SIZE D — DWG NO. 1400184 — REV C
SCALE NONE — TYPE — SHEET 1 OF 1

WARRANTY

Goods and part(s) (excluding consumables) manufactured by Seller are warranted to be free from defects in workmanship and material under normal use and service for a period of twelve (12) months from the date of shipment by Seller. Consumables, glass electrodes, membranes, liquid junctions, electrolyte, o-rings, etc., are warranted to be free from defects in workmanship and material under normal use and service for a period of ninety (90) days from date of shipment by Seller. Goods, part(s) and consumables proven by Seller to be defective in workmanship and/or material shall be replaced or repaired, free of charge, F.O.B. Seller's factory provided that the goods, part(s) or consumables are returned to Seller's designated factory, transportation charges prepaid, within the twelve (12) month period of warranty in the case of goods and part(s), and in the case of consumables, within the ninety (90) day period of warranty. This warranty shall be in effect for replacement or repaired goods, part(s) and the remaining portion of the ninety (90) day warranty in the case of consumables. A defect in goods, part(s) and consumables of the commercial unit shall not operate to condemn such commercial unit when such goods, part(s) and consumables are capable of being renewed, repaired or replaced.

The Seller shall not be liable to the Buyer, or to any other person, for the loss or damage directly or indirectly, arising from the use of the equipment or goods, from breach of any warranty, or from any other cause. All other warranties, expressed or implied are hereby excluded.

IN CONSIDERATION OF THE HEREIN STATED PURCHASE PRICE OF THE GOODS, SELLER GRANTS ONLY THE ABOVE STATED EXPRESS WARRANTY. NO OTHER WARRANTIES ARE GRANTED INCLUDING, BUT NOT LIMITED TO, EXPRESS AND IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Limitations of Remedy. SELLER SHALL NOT BE LIABLE FOR DAMAGES CAUSED BY DELAY IN PERFORMANCE. THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF WARRANTY SHALL BE LIMITED TO REPAIR OR REPLACEMENT UNDER THE STANDARD WARRANTY CLAUSE. IN NO CASE, REGARDLESS OF THE FORM OF THE CAUSE OF ACTION, SHALL SELLER'S LIABILITY EXCEED THE PRICE TO BUYER OF THE SPECIFIC GOODS MANUFACTURED BY SELLER GIVING RISE TO THE CAUSE OF ACTION. BUYER AGREES THAT IN NO EVENT SHALL SELLER'S LIABILITY EXTEND TO INCLUDE INCIDENTAL OR CONSEQUENTIAL DAMAGES. CONSEQUENTIAL DAMAGES SHALL INCLUDE, BUT ARE NOT LIMITED TO, LOSS OF ANTICIPATED PROFITS, LOSS OF USE, LOSS OF REVENUE, COST OF CAPITAL AND DAMAGE OR LOSS OF OTHER PROPERTY OR EQUIPMENT. IN NO EVENT SHALL SELLER BE OBLIGATED TO INDEMNIFY BUYER IN ANY MANNER NOR SHALL SELLER BE LIABLE FOR PROPERTY DAMAGE AND/OR THIRD PARTY CLAIMS COVERED BY UMBRELLA INSURANCE AND/OR INDEMNITY COVERAGE PROVIDED TO BUYER, ITS ASSIGNS, AND EACH SUCCESSOR INTEREST TO THE GOODS PROVIDED HEREUNDER.

Force Majeure. Seller shall not be liable for failure to perform due to labor strikes or acts beyond Seller's direct control.

CAUTION

The oxygen probe is designed for industrial applications. Treat with care to avoid physical damage. The probe contains components made from ceramic, which are susceptible to shock when mishandled. THE WARRANTY DOES NOT COVER DAMAGE FROM MISHANDLING. WARRANTY IS VOID IF OUTER PROTECTION TUBE IS BROKEN.

Instruction Manual
IB-106-3081 Rev. 1.5
September 2002

Model 3081FG

Two-Wire In Situ Oxygen Analyzer

Part no. ______________
Serial no. ______________
Order no. ______________

Emerson Process Management

Rosemount Analytical Inc.
Process Analytic Division
1201 N. Main St.
Orrville, OH 44667-0901
T (330) 682-9010
F (330) 684-4434
E gas.csc@emersonprocess.com

Fisher-Rosemount GmbH & Co.
Industriestrasse 1
63594 Hasselroth
Germany
T 49-6055-884 0
F 49-6055-884209

ASIA - PACIFIC
Fisher-Rosemount
Singapore Private Ltd.
1 Pandan Crescent
Singapore 128461
Republic of Singapore
T 65-777-8211
F 65-777-0947

EUROPE, MIDDLE EAST, AFRICA
Fisher-Rosemount Ltd.
Heath Place
Bognor Regis
West Sussex PO22 9SH
England
T 44-1243-863121
F 44-1243-845354

LATIN AMERICA
Fisher - Rosemount
Av. das Americas
3333 sala 1004
Rio de Janeiro, RJ
Brazil 22631-003
T 55-21-2431-1882

http://www.processanalytic.com

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