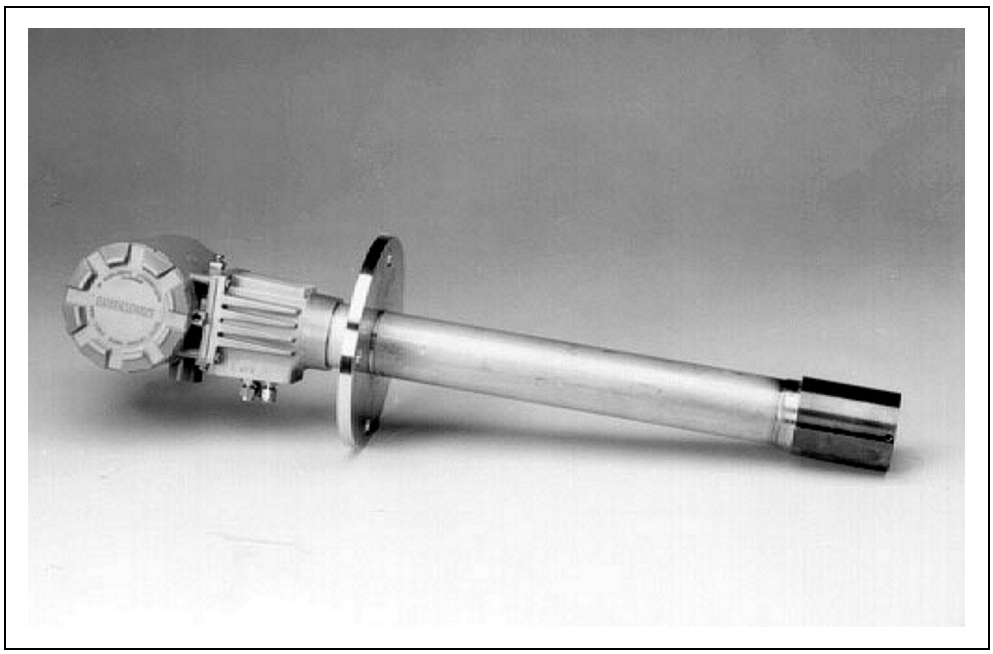
Instruction Manual
IB-106-340C Rev. 3.0
April 2001

OXYMITTER 4000

HAZARDOUS AREA
OXYGEN TRANSMITTER

Certified to: CENELEC EEx d IIB H_2 T2/T6
CSA NRTL/C Class I, Division 1, Groups B, C, D T2/T6



ROSEMOUNT® Analytical

EMERSON™ Process Management

http://www.processanalytic.com

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.

CAUTION

If a Model 275 Universal HART® Communicator is used with this unit, the software within the Model 275 may require modification. If a software modification is required, please contact your local Fisher-Rosemount Service Group or National Response Center at 1-800-433-6076 or 1-888-433-6829.

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HIGHLIGHTS OF CHANGES

Effective April, 2001 Rev. 3.0

Page	Summary
Throughout	Removed Warning “Consult Safety Data Sheet 1A99078…”.
Front Cover	Moved “Essential Instructions” page xxiii/xxiv forward to front cover. Changed National Response Center phone number to 1-800-433-6076 or 1-888-433-6829.
Page P-1	Changed “OCX 4400” to “OXT 4000” (2 places); deleted “Combustibles”.
Page P-10	Added new page “General Precautions for Handling and Storing High Pressure Gas Cylinders”.
Page 1-9	Changed Hazardous Area Certifications data. Changed Reference Air requirement. Deleted Electronic Noise requirement.
Page 2-9	Added Note to Figure 2-7. Changed Reference Air requirement in paragraph 2-3a.
Page 6-3	Table 6-1; changed Heater Fault 6 Self-Clearing column data to “NO” and Heater Fault 8 Self-Clearing column data to “YES”.
Page 6-7	Added factory assistance phone number to paragraph 6-4d1.
Back Cover	Added new Warranty statement.

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PREFACE

The purpose of this manual is to provide information concerning the components, functions, installation and maintenance of the Oxymitter 4000 Hazardous Area Oxygen Transmitter.

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.

CERAMIC FIBER PRODUCTS
MATERIAL SAFETY DATA SHEET
JULY 1, 1996

SECTION I. IDENTIFICATION

PRODUCT NAME

Ceramic Fiber Heaters, Molded Insulation Modules and Ceramic Fiber Radiant Heater Panels.

CHEMICAL FAMILY

Vitreous Aluminosilicate Fibers with Silicon Dioxide.

CHEMICAL NAME

N.A.

CHEMICAL FORMULA

N.A.

MANUFACTURER'S NAME AND ADDRESS

Watlow Columbia
2101 Pennsylvania Drive
Columbia, MO 65202

573-474-9402
573-814-1300, ext. 5170

HEALTH HAZARD SUMMARY
WARNING

- Possible cancer hazard based on tests with laboratory animals.
- May be irritating to skin, eyes and respiratory tract.
- May be harmful if inhaled.
- Cristobalite (crystalline silica) formed at high temperatures (above 1800ºF) can cause severe respiratory disease.

SECTION II. PHYSICAL DATA

APPEARANCE AND ODOR

Cream to white colored fiber shapes. With or without optional white to gray granular surface coating and/or optional black surface coating.

SPECIFIC WEIGHT: 12-25 lb./cubic foot ***BOILING POINT: N.A.***

VOLATILES (% BY WT.): N.A. ***WATER SOLUBILITY: N.A.***

SECTION III. HAZARDOUS INGREDIENTS

MATERIAL, QUANTITY, AND THRESHOLD/EXPOSURE LIMIT VALUES

Aluminosilicate (vitreous) 99+ %	1 fiber/cc TWA
CAS. No. 142844-00-06	10 fibers/cc CL
Zirconium Silicate	0-10% 5 mg/cubic meter (TLV)
Black Surface Coating**	0 - 1% 5 mg/cubic meter (TLV)
Armorphous Silica/Silicon Dioxide	0-10% 20 mppcf (6 mg/cubic meter) PEL (OSHA 1978) 3 gm cubic meter (Respirable dust): 10 mg/cubic meter, Intended TLV (ACGIH 1984-85)

**Composition is a trade secret.

SECTION IV. FIRE AND EXPLOSION DATA

FLASH POINT: None ***FLAMMABILITY LIMITS: N.A.***

EXTINGUISHING MEDIA

Use extinguishing agent suitable for type of surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS / SPECIAL FIRE FIGHTING PROCEDURES

N.A.

SECTION V. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

(See Section III)

EFFECTS OF OVER EXPOSURE

EYE

Avoid contact with eyes. Slightly to moderately irritating. Abrasive action may cause damage to outer surface of eye.

INHALATION

May cause respiratory tract irritation. Repeated or prolonged breathing of particles of respirable size may cause inflammation of the lung leading to chest pain, difficult breathing, coughing and possible fibrotic change in the lung (Pneumoconiosis). Pre-existing medical conditions may be aggravated by exposure: specifically, bronchial hyper-reactivity and chronic bronchial or lung disease.

INGESTION

May cause gastrointestinal disturbances. Symptoms may include irritation and nausea, vomiting and diarrhea.

SKIN

Slightly to moderate irritating. May cause irritation and inflammation due to mechanical reaction to sharp, broken ends of fibers.

EXPOSURE TO USED CERAMIC FIBER PRODUCT

Product which has been in service at elevated temperatures (greater than 1800ºF/982ºC) may undergo partial conversion to cristobalite, a form of crystalline silica which can cause severe respiratory disease (Pneumoconiosis). The amount of cristobalite present will depend on the temperature and length of time in service. (See Section IX for permissible exposure levels).

SPECIAL TOXIC EFFECTS

The existing toxicology and epidemiology data bases for RCF's are still preliminary. Information will be updated as studies are completed and reviewed. The following is a review of the results to date:

EPIDEMIOLOGY

At this time there are no known published reports demonstrating negative health outcomes of workers exposed to refractory ceramic fiber (RCF). Epidemiologic investigations of RCF production workers are ongoing.

1) There is no evidence of any fibrotic lung disease (interstitial fibrosis) whatsoever on x-ray.
2) There is no evidence of any lung disease among those employees exposed to RCF that had never smoked.
3) A statistical "trend" was observed in the exposed population between the duration of exposure to RCF and a decrease in some measures of pulmonary function. These observations are clinically insignificant. In other words, if these observations were made on an individual employee, the results would be interpreted as being within the normal range.
4) Pleural plaques (thickening along the chest wall) have been observed in a small number of employees who had a long duration of employment. There are several occupational and non-occupational causes for pleural plaque. It should be noted that plaques are not "pre-cancer" nor are they associated with any measurable effect on lung function.

TOXICOLOGY

A number of studies on the health effects of inhalation exposure of rats and hamsters are available. Rats were exposed to RCF in a series of life-time nose-only inhalation studies. The animals were exposed to 30, 16, 9, and 3 mg/m^3, which corresponds with approximately 200, 150, 75, and 25 fibers/cc.

Animals exposed to 30 and 16 mg/m^3 were observed to have developed a pleural and parenchymal fibroses; animals exposed to 9 mg/m^3 had developed a mild parenchymal fibrosis; animals exposed to the lowest dose were found to have the response typically observed any time a material is inhaled into the deep lung. While a statistically significant increase in lung tumors was observed following exposure to the highest dose, there was no excess lung cancers at the other doses. Two rats exposed to 30 mg/m^3 and one rat exposed to 9 mg/m^3 developed masotheliomas.

The International Agency for Research on Cancer (IARC) reviewed the carcinogenicity data on man-made vitreous fibers (including ceramic fiber, glasswool, rockwool, and slagwool) in 1987. IARC classified ceramic fiber, fibrous glasswool and mineral wool (rockwool and slagwool) as possible human carcinogens (Group 2B).

EMERGENCY FIRST AID PROCEDURES

EYE CONTACT

Flush eyes immediately with large amounts of water for approximately 15 minutes. Eye lids should be held away from the eyeball to insure thorough rinsing. Do not rub eyes. Get medical attention if irritation persists.

INHALATION

Remove person from source of exposure and move to fresh air. Some people may be sensitive to fiber induced irritation of the respiratory tract. If symptoms such as shortness of breath, coughing, wheezing or chest pain develop, seek medical attention. If person experiences continued breathing difficulties, administer oxygen until medical assistance can be rendered.

INGESTION

Do not induce vomiting. Get medical attention if irritation persists.

SKIN CONTACT

Do not rub or scratch exposed skin. Wash area of contact thoroughly with soap and water. Using a skin cream or lotion after washing may be helpful. Get medical attention if irritation persists.

SECTION VI. REACTIVITY DATA

STABILITY/CONDITIONS TO AVOID

Stable under normal conditions of use.

HAZARDOUS POLYMERIZATION/CONDITIONS TO AVOID

N.A.

INCOMPATIBILITY/MATERIALS TO AVOID

Incompatible with hydrofluoric acid and concentrated alkali.

HAZARDOUS DECOMPOSITION PRODUCTS

N.A.

SECTION VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

Where possible, use vacuum suction with HEPA filters to clean up spilled material. Use dust suppressant where sweeping if necessary. Avoid clean up procedure which may result in water pollution. (Observe Special Protection Information Section VIII.)

WASTE DISPOSAL METHODS

The transportation, treatment, and disposal of this waste material must be conducted in compliance with all applicable Federal, State, and Local regulations.

SECTION VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION

Use NIOSH or MSHA approved equipment when airborne exposure limits may be exceeded. NIOSH/MSHA approved breathing equipment may be required for non-routine and emergency use. (See Section IX for suitable equipment).

Pending the results of long term health effects studies, engineering control of airborne fibers to the lowest levels attainable is advised.

VENTILATION

Ventilation should be used whenever possible to control or reduce airborne concentrations of fiber and dust. Carbon monoxide, carbon dioxide, oxides of nitrogen, reactive hydrocarbons and a small amount of formaldehyde may accompany binder burn-off during first heat. Use adequate ventilation or other precautions to eliminate vapors resulting from binder burn-off. Exposure to burn-off fumes may cause respiratory tract irritation, bronchial hyper-reactivity and asthmatic response.

SKIN PROTECTION

Wear gloves, hats and full body clothing to prevent skin contact. Use separate lockers for work clothes to prevent fiber transfer to street clothes. Wash work clothes separately from other clothing and rinse washing machine thoroughly after use.

EYE PROTECTION

Wear safety glasses or chemical worker's goggles to prevent eye contact. Do not wear contact lenses when working with this substance. Have eye baths readily available where eye contact can occur.

SECTION IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

General cleanliness should be followed.

The Toxicology data indicate that ceramic fiber should be handled with caution. The handling practices described in this MSDS must be strictly followed. In particular, when handling refractory ceramic fiber in any application, special caution should be taken to avoid unnecessary cutting and tearing of the material to minimize generation of airborne dust.

It is recommended that full body clothing be worn to reduce the potential for skin irritation. Washable or disposable clothing may be used. Do not take unwashed work clothing home. Work clothes should be washed separately from other clothing. Rinse washing machine thoroughly after use. If clothing is to be laundered by someone else, inform launderer of proper procedure. Work clothes and street clothes should be kept separate to prevent contamination.

Product which has been in service at elevated temperatures (greater than 1800ºF/982ºC) may undergo partial conversion to cristobalite, a form of crystalline silica. This reaction occurs at the furnace lining hot face. As a consequence, this material becomes more friable; special caution must be taken to minimize generation of airborne dust. The amount of cristobalite present will depend on the temperature and length in service.

IARC has recently reviewed the animal, human, and other relevant experimental data on silica in order to critically evaluate and classify the cancer causing potential. Based on its review, IARC classified crystalline silica as a group 2A carcinogen (probable human carcinogen).

The OSHA permissible exposure limit (PEL for cristobalite is 0.05 mg/m^3 (respirable dust). The ACGIH threshold limit value (TLV) for cristobalite is 0.05 mg/m^3 (respirable dust) (ACGIH 1991-92). Use NIOSH or MSHA approved equipment when airborne exposure limits may be exceeded. The minimum respiratory protection recommended for given airborne fiber or cristobalite concentrations are:

CONCENTRATION

0-1 fiber/cc or 0-0.05 mg/m^3 cristobalite (the OSHA PEL)	Optional disposable dust respirator (e.g. 3M 9970 or equivalent).
Up to 5 fibers/cc or up to 10 times the OSHA PEL for cristobalite	Half face, air-purifying respirator equipped with high efficiency particulate air (HEPA) filter cartridges (e.g. 3M 6000 series with 2040 filter or equivalent).
Up to 25 fibers/cc or 50 times the OSHA PEL for cristobalite (2.5 mg/m^3)	Full face, air-purifying respirator with high efficiency particulate air (HEPA) filter cartridges (e.g. 3M 7800S with 7255 filters or equivalent) or powered air-purifying respirator (PARR) equipped with HEPA filter cartridges (e.g. 3M W3265S with W3267 filters or equivalent).
Greater than 25 fibers/cc or 50 times the OSHA PEL for cristobalite (2.5 mg/m^3)	Full face, positive pressure supplied air respirator (e.g. 3M 7800S with W9435 hose & W3196 low pressure regulator kit connected to clean air supply or equivalent).

If airborne fiber or cristobalite concentrations are not known, as minimum protection, use NIOSH/MSHA approved half face, air-purifying respirator with HEPA filter cartridges.

Insulation surface should be lightly sprayed with water before removal to suppress airborne dust. As water evaporates during removal, additional water should be sprayed on surfaces as needed. Only enough water should be sprayed to suppress dust so that water does not run onto the floor of the work area. To aid the wetting process, a surfactant can be used.

After RCF removal is completed, dust-suppressing cleaning methods, such as wet sweeping or vacuuming, should be used to clean the work area. If dry vacuuming is used, the vacuum must be equipped with HEPA filter. Air blowing or dry sweeping should not be used. Dust-suppressing components can be used to clean up light dust.

Product packaging may contain product residue. Do not reuse except to reship or return Ceramic Fiber products to the factory.

GENERAL PRECAUTIONS FOR HANDLING AND STORING HIGH PRESSURE GAS CYLINDERS

Edited from selected paragraphs of the Compressed Gas Association's "Handbook of Compressed Gases" published in 1981
Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, Virginia 22202
Used by Permission

1. Never drop cylinders or permit them to strike each other violently.

2. Cylinders may be stored in the open, but in such cases, should be protected against extremes of weather and, to prevent rusting, from the dampness of the ground. Cylinders should be stored in the shade when located in areas where extreme temperatures are prevalent.

3. The valve protection cap should be left on each cylinder until it has been secured against a wall or bench, or placed in a cylinder stand, and is ready to be used.

4. Avoid dragging, rolling, or sliding cylinders, even for short distance; they should be moved by using a suitable hand-truck.

5. Never tamper with safety devices in valves or cylinders.

6. Do not store full and empty cylinders together. Serious suckback can occur when an empty cylinder is attached to a pressurized system.

7. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). A flame should never be permitted to come in contact with any part of a compressed gas cylinder.

8. Do not place cylinders where they may become part of an electric circuit. When electric arc welding, precautions must be taken to prevent striking an arc against the cylinder.

SECTION 1
DESCRIPTION AND SPECIFICATIONS

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

A typical Rosemount Hazardous Area Oxymitter 4000 Oxygen Transmitter 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.

WARNING

The Oxymitter 4000 is offered in both hazardous and general purpose configurations. The hazardous area version has the "EX" and CSA symbols on the apparatus approval label. The general purpose version does not have an approval label. If you received the general purpose version, ensure you do not install it in a potentially explosive atmosphere.

Also, use the product matrix in Table 1-1 at the end of this section 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 Hazardous Area Oxymitter 4000. Ensure the features and options specified by your order number are on or included with the unit.

1-2 SYSTEM OVERVIEW

a. Scope

This Instruction Bulletin is designed to supply details needed to install, start up, operate, and maintain the Hazardous Area Oxymitter 4000. Integral signal conditioning electronics outputs a 4-20 mA signal representing an O_2 value and provides a membrane keypad for 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 Hazardous Area Oxymitter 4000 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 probe is permanently positioned within an exhaust duct or stack and performs its task without the use of a sampling system.

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

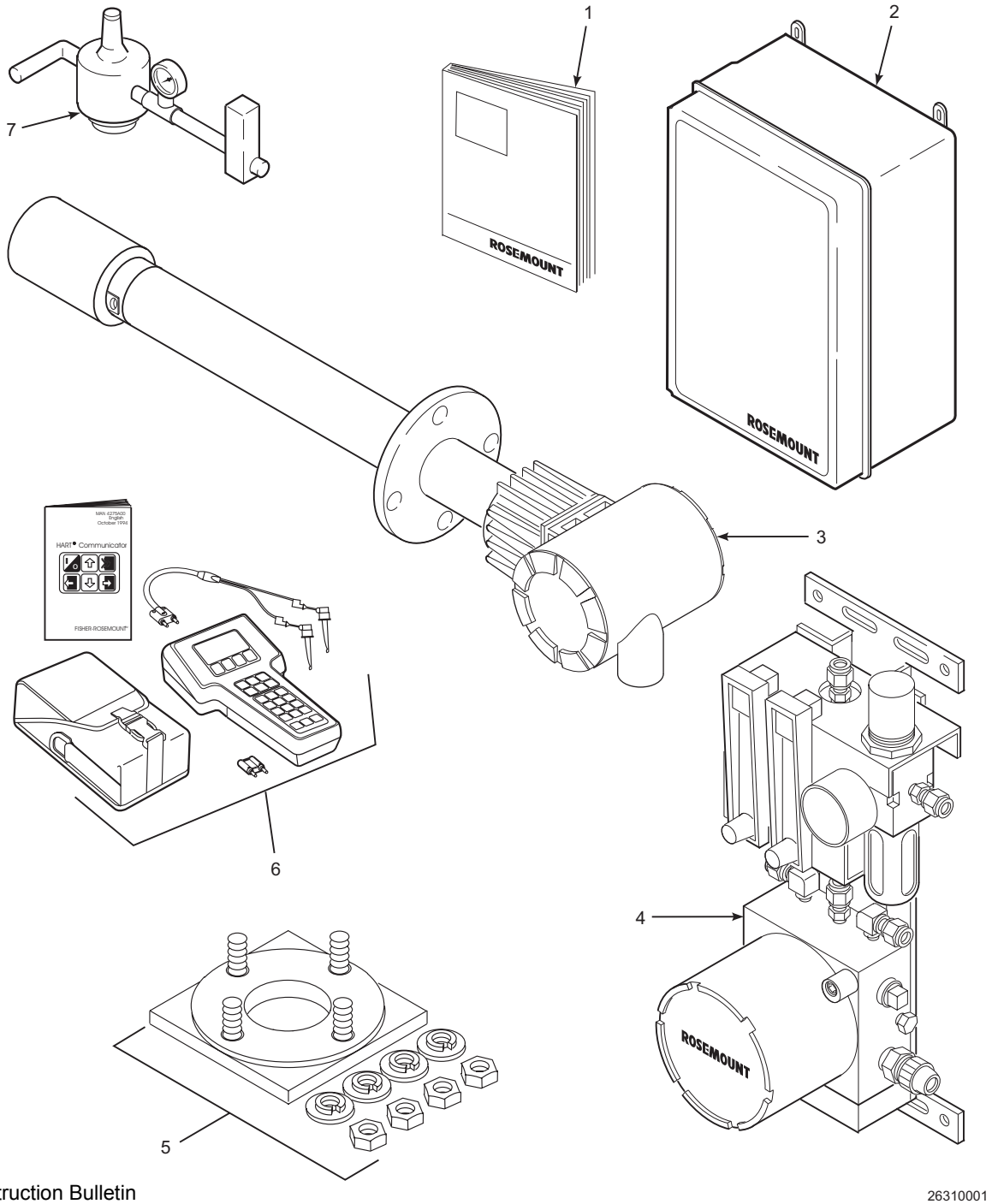
$$EMF = KT \log_{10}(P1/P2) + C$$

Where:

1. P2 is the partial pressure of the oxygen in the measured gas on one side of the cell.
2. P1 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.



1. Instruction Bulletin
2. IMPS 4000 Intelligent Multiprobe Test Gas Sequencer (Optional)
3. Hazardous Area Oxymitter 4000 with Integral Electronics
4. SPS 4000 Single Probe Autocalibration Sequencer (Optional) - (Shown with reference air option) (Safe area only)
5. Mounting Plate with Mounting Hardware and Gasket
6. HART® Communicator Package (Optional)
7. Reference Air Set (used if SPS 4000 without reference air option or IMPS 4000 not supplied)

Figure 1-1. Typical System Package

When the cell is at operating temperature 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 Hazardous Area Oxymitter 4000 to provide exceptional sensitivity at low oxygen concentrations.

The Hazardous Area Oxymitter 4000 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

Hazardous Area Oxymitter 4000 units are available in three length options, giving the user the flexibility to use an in situ penetration appropriate to the size of the stack or duct. The options on length are 457 mm (18 in.), 0.91 m (3 ft), and 1.83 m (6 ft).

The integral electronics controls probe temperature and provides an isolated output, 4-20 mA, that is proportional to the measured oxygen concentration. The power supply can accept voltages of 90-250 VAC and 50/60 Hz; therefore, no setup procedures are required. The oxygen sensing cell is maintained at a constant temperature by modulating the duty cycle of the probe heater portion of the integral electronics. The integral electronics accepts millivolt signals generated by the sensing cell and produces the outputs to be used by remotely connected devices. The output is an isolated 4-20 mA linearized current.

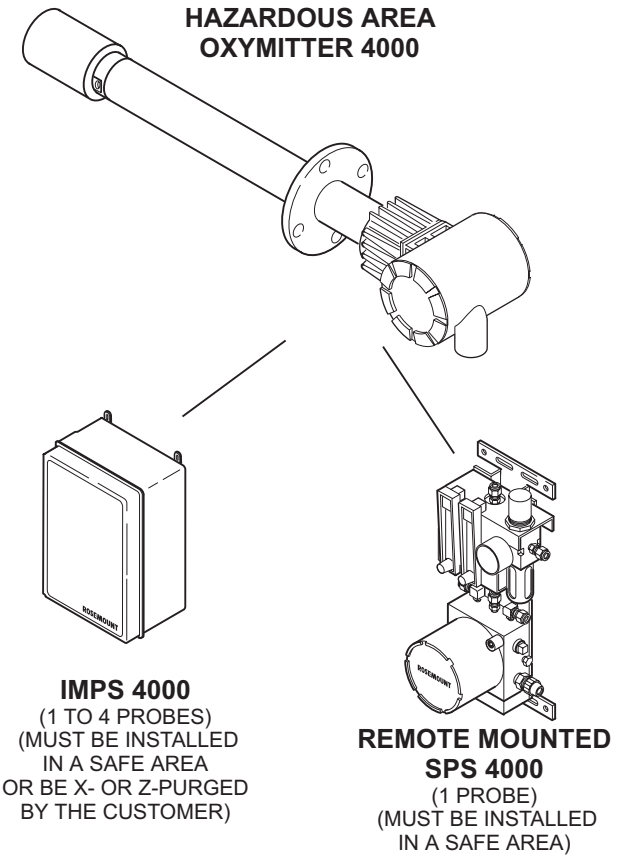


Figure 1-2. Hazardous Area Oxymitter 4000 Autocalibration System Options

Two calibration gas sequencers are available to the Hazardous Area Oxymitter 4000, but they must be installed in a non-hazardous, explosive-free environment: the IMPS 4000 and the SPS 4000 (Figure 1-2).

Systems with multiprobe applications may employ an optional IMPS 4000 Intelligent Multiprobe Test Gas Sequencer. The IMPS 4000 provides automatic calibration gas sequencing for up to four Hazardous Area Oxymitter 4000 units and accommodates autocalibrations based on the CALIBRATION RECOMMENDED signal from the Hazardous Area Oxymitter 4000, a timed interval set up in HART or the IMPS 4000, or whenever a calibration request is initiated.

For systems with one or two Hazardous Area Oxymitter 4000 units per combustion process, an optional remote mounted SPS 4000 Single Probe Autocalibration

Sequencer can be used with each Hazardous Area Oxymitter 4000 to provide automatic calibration gas sequencing. The sequencer performs autocalibrations based on the CALIBRATION RECOMMENDED signal from the Hazardous Area Oxymitter 4000, a timed interval set up in HART, or whenever a calibration request is initiated.

d. System Features

1. The CALIBRATION RECOMMENDED feature detects when the sensing cell is likely out of limits. This may eliminate the need to calibrate on a "time since last cal" basis.
2. The cell output voltage and sensitivity increase as the oxygen concentration decreases.

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

3. Membrane keypad and HART communication are 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. Field replaceable cell, heater, thermocouple, diffuser, and PC boards.
5. The Hazardous Area Oxymitter 4000 is constructed of rugged 316 L stainless steel for all wetted parts.
6. Integral electronics eliminates traditional wiring between probe and electronics.
7. The integral electronics is adaptable for line voltages from 90-250 VAC; therefore, no configuration is necessary.
8. The Hazardous Area Oxymitter 4000 membrane keypad is available in five languages:
   English
   French
   German
   Italian
   Spanish
9. An operator can calibrate and diagnostically troubleshoot the Hazardous Area Oxymitter 4000 in one of three ways:

CAUTION

Accessing the probe keypad requires opening the electronics housing. Opening the electronic housing will cause the loss of ALL hazardous permits. Opening the electronics housing in hazardous areas may cause an explosion resulting in loss of property, severe personal injury, or death. It may be required to get a hot work permit from your company safety officer before opening the electronic housing.

   (a) Membrane Keypad. The membrane keypad, housed within the right side of the electronics housing, provides fault indication by way of flashing LEDs. Calibration can be performed from the membrane keypad.

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

(b) Optional HART Interface. The Hazardous Area Oxymitter 4000'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 Hazardous Area Oxymitter 4000. 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 information.

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

3 Selected Distributed Control Systems - The use of distributed control systems requires input/output (I/O) hardware and AMS software which permit HART communications.

(c) Optional IMPS 4000. The Programmable Logic Controller (PLC) in the IMPS 4000 provides fault indications using flashing LEDs and LCD display messages. Refer to the IMPS 4000 Intelligent Multiprobe Test Gas Sequencer Instruction Bulletin for more information.

10. The optional Rosemount 751 remote-mounted LCD display panel is loop-driven by the 4-20 mA output signal representing the O_2 percentage.

e. Handling the Hazardous Area Oxymitter 4000

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.

The Hazardous Area Oxymitter 4000 is designed for industrial applications. Treat each component of the system with care to avoid physical damage. Some probe components are made from ceramics, which are susceptible to shock when mishandled.

f. System Considerations

Prior to installing your Hazardous Area Oxymitter 4000, 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 1-3 shows a typical system wiring. A typical system installation is illustrated in Figure 1-4.

A source of instrument air is optional at the Hazardous Area Oxymitter 4000 for reference air use. Since the unit can be equipped with an in-place calibration feature, provisions can be made to permanently connect calibration gas tanks to the Hazardous Area Oxymitter 4000.

If the calibration gas bottles will 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 the calibration gas line and subsequent flue gas condensation and corrosion.

The check valve is in addition to the stop valve in the calibration gas kit or the solenoid valves in the IMPS 4000 or SPS 4000.

NOTE

The integral electronics is rated NEMA 4X (IP66) and is capable of operation at temperatures up to 149°F (65°C).

Retain the packaging in which the Hazardous Area Oxymitter 4000 arrived from the factory in case any components are to be shipped to another site. This packaging has been designed to protect the product.

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

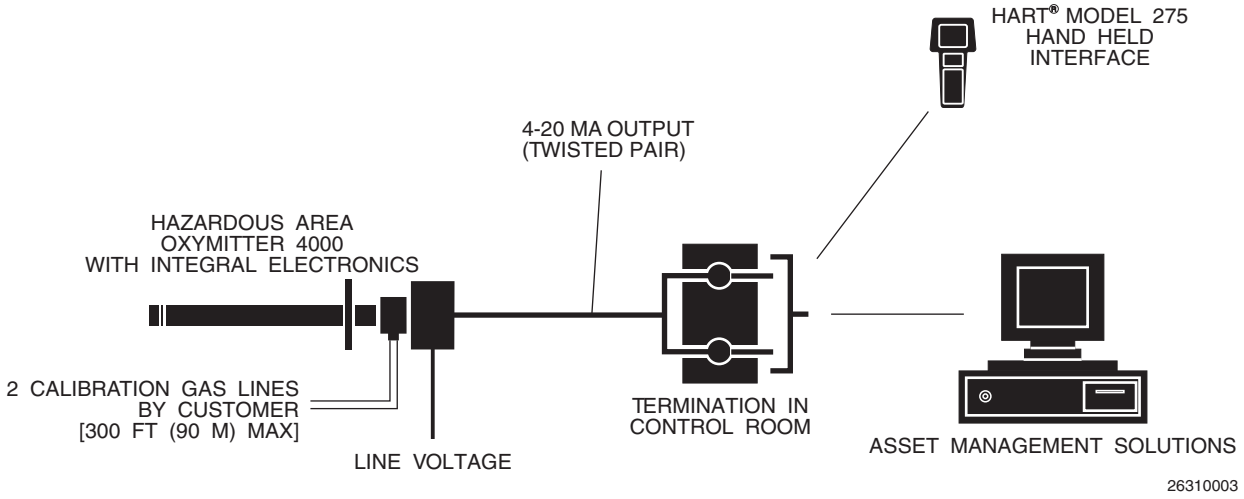


Figure 1-3. Hazardous Area Oxymitter 4000 HART Connections and AMS Application

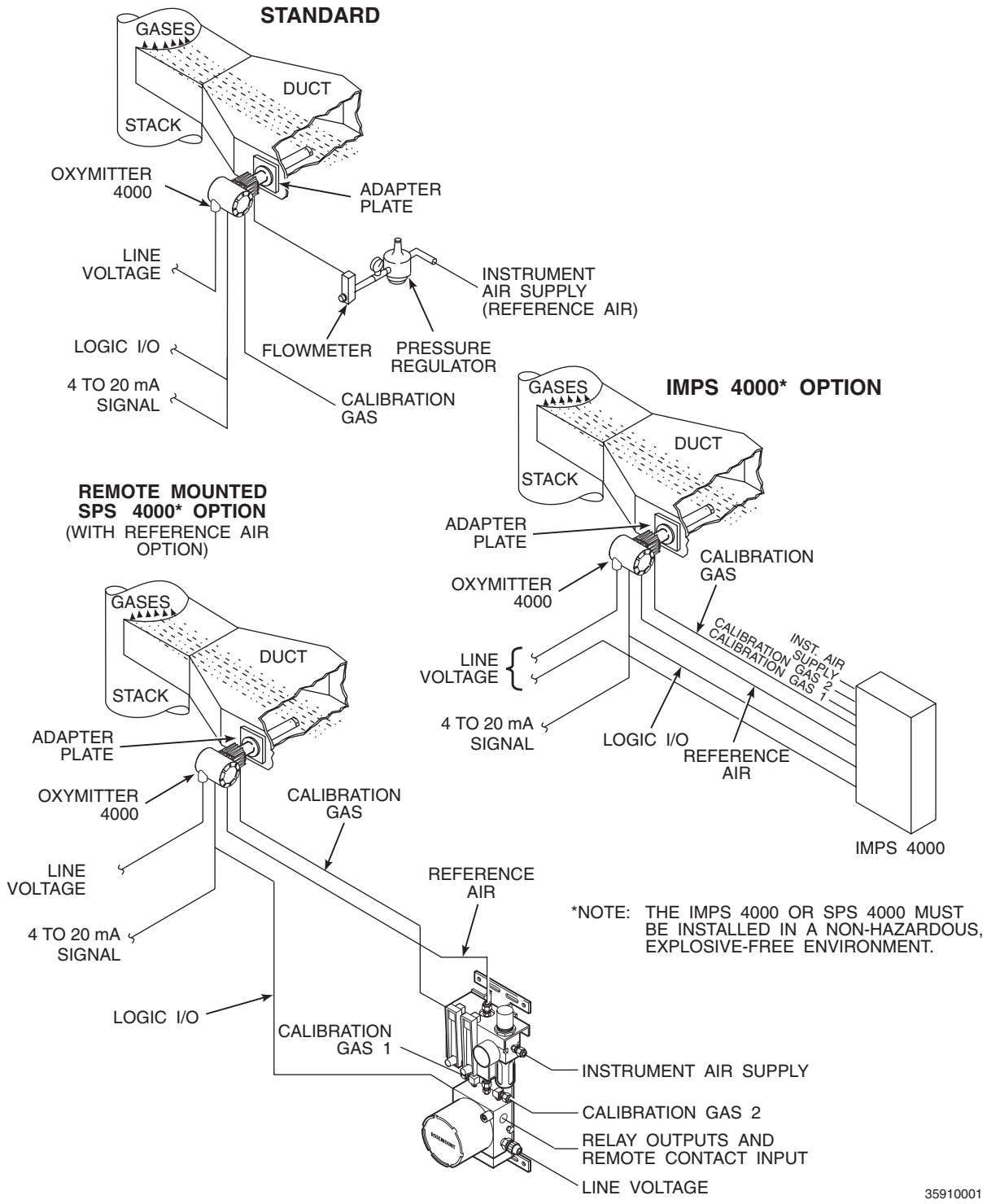


Figure 1-4. Typical System Installation

1-3 IMPS 4000 (OPTIONAL)

If using an IMPS 4000 with a Hazardous Area Oxymitter 4000, the sequencer must be installed in a non-hazardous, explosive-free environment. For further IMPS 4000 information, refer to the IMPS 4000 Intelligent Multiprobe Test Gas Sequencer Instruction Bulletin.

1-4 SPS 4000 (OPTIONAL)

If using an SPS 4000 with a Hazardous Area Oxymitter 4000, the sequencer must be installed in a non-hazardous, explosive-free environment. For further SPS 4000 information, refer to SPS 4000 Single Probe Autocalibration Sequencer Instruction Bulletin.

1-5 MODEL 751 REMOTE POWDERED LOOP LCD DISPLAY

The display provides a simple, economical means to obtain accurate, reliable, and remote indication of important process variables. This display operates on the 4-20 mA line from the Hazardous Area Oxymitter 4000. (See Figure 1-5).

Refer to Model 751 remote powered loop LCD manual for calibration and wiring.

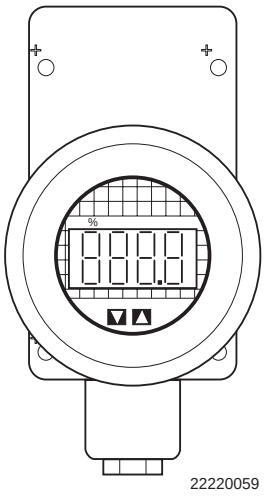


Figure 1-5. Model 751 Remote Powered Loop LCD Display

1-6 SPECIFICATIONS

Hazardous Area Oxymitter 4000

Hazardous Area Certifications	CENELEC EEx d IIB H_2 T2/T6 CSA NRTL/C Class I, Division 1, Groups B, C, D T2
O_2 Range:	
Standard	0 to 10% O_2 0 to 25% O_2 0 to 40% O_2 (via HART)
Accuracy	±0.75% of reading or 0.05% O_2, whichever is greater
System Response to Calibration Gas	Initial response in less than 3 seconds T90 in less than 8 seconds
Temperature Limits:	
Process	32° to 1300°F (0° to 704°C) up to 2400°F (1300°C) with optional accessories
Electronics	-40° to 185°F (-40° to 85°C) Operating temperature of electronics inside of instrument housing, as measured by a HART communicator, or Rosemount Asset Management Solutions software.
Probe Lengths	18 in. (457 mm) 3 ft (0.91 m) 6 ft (1.83 m)
Mounting and Mounting Position	Vertical or horizontal Spool pieces are available, P/N 3D39761G02, to offset transmitter housing from hot ductwork.
Materials:	
Probe	Wetted or welded parts - 316L stainless steel Non-wetted parts - 304 stainless steel, low-copper aluminum
Electronics Enclosure	Low-copper aluminum
Calibration	Manual, semi-automatic, or automatic
Calibration Gas Mixtures Recommended	0.4% O_2, Balance N_2 8% O_2, Balance N_2
Calibration Gas Flow	5 scfh (2.5 l/m)
Reference Air	0.5 scfh (0.25 l/hr), clean, dry, instrument-quality air (20.95% O_2), regulated to 5 psi (34 kPa)
Electronics	NEMA 4X, IP66 with fitting and pipe on reference exhaust port to clear dry atmosphere
Line Voltage	90-250 VAC, 50/60 Hz. No configuration necessary. 3/4 in.-14 NPT conduit port.
Signals:	
Analog Output/HART	4-20 mA isolated from power supply, 950 ohms maximum load
Logic I/O	Two-terminal logic contact configurable as either an alarm output or as a bi-directional calibration handshake signal to IMPS 4000 or SPS 4000. Self-powered (+5 V), in series with 340 ohms Conduit ports — 3/4 in.-14 NPT (one threaded hole for both analog output and logic I/O)
Power Requirements:	
Probe Heater	175 W nominal
Electronics	10 W nominal
Maximum	500 W

CE Fisher-Rosemount has satisfied all obligations coming from the European legislation to harmonize the product requirements in Europe.

Table 1-1. Product Matrix

OXT4C	OXYMITTER 4000 - EXPLOSION PROOF - IN SITU OXYGEN TRANSMITTER

Explosion Proof Oxygen Transmitter - Instruction Book

Code	Sensing Probe Type with Flame Arrester
1	Ceramic Diffusion Element Probe (ANSI 3 in. 150 lbs)
2	Snubber Diffusion Element (ANSI 3 in. 150 lbs)
3	Ceramic Diffusion Element Probe (DIN 2527) - 1/4 in. Tube Fittings
4	Snubber Diffusion Element (DIN 2527) - 1/4 in. Tube Fittings
5	Ceramic Diffusion Element Probe (JIS)
6	Snubber Diffusion Element (JIS)

Code	Probe Assembly
0	18 in. (457 mm) Probe
1	18 in. (457 mm) Probe with 3 ft (0.91 m) Bypass
2	18 in. (457 mm) Probe with Abrasive Shield(1)
3	3 ft (0.91 m) Probe
4	3 ft (0.91 m) Probe with Abrasive Shield(1)
5	6 ft (1.83 m) Probe
6	6 ft (1.83 m) Probe with Abrasive Shield(1)

Code	Mounting Adapter - Stack Side
0	No Adapter Plate (“0” must be chosen under “Mounting Adapter - Probe Side” below)
1	New Installation - Square weld plate with studs
2	Model 218 Mounting Plate (with Model 218 Shield Removed)
3	Competitor’s Mount(2)

Code	Mounting Adapter - Probe Side
0	No Adapter Plate
1	Probe Only (ANSI)
2	New Bypass or New Abrasive Shield (ANSI)
4	Probe Only (DIN)
5	New Bypass or New Abrasive Shield (DIN)
7	Probe Only (JIS)
8	New Bypass or New Abrasive Shield (JIS)

Code	Electronic Housing - NEMA 4X, IP66
11	Standard Filtered Termination
12	Transient Protected Filtered Termination

Code	Operator Interface(3)
1	Membrane Keypad - HART Capable

Code	Language
1	English
2	German
3	French
4	Spanish
5	Italian

OXT4C	3	3	1	1	10	1	1	Continued	Example

Table 1-1. Product Matrix (Continued)

Continued	Code	Termination Filtering
	00	No Option - Specified as part of Electronic Housing

Code	Calibration Accessories
00	No Hardware
01	Cal/Ref Flowmeters and Ref Pressure Regulator
02	IMPS 4000 (Safe Area Only)
03	SPS 4000 Remote Mounted (Safe Area Only)

Code	Hazardous Area Approval
10	CENELEC EEx d IIB + H2 T2/T6 (Electronics)
20	CSA - Class I, Div. 1, Groups B, C and D T2/T6 (Electronics)

Continued	10	03	10	Example

NOTES:

(1) Recommended usages: High velocity particulates in flue stream, installation within 11.5 ft (3.5 m) of soot blowers or heavy salt cake buildup. Applications: Pulverized coal, recovery boilers, lime kiln.

(2) Where possible, specify ANSI, DIN, or JIS designation; otherwise, provide details of the existing mounting plate as follows:

Plate with studs	Bolt circle diameter, number, and arrangement of studs; stud thread; and stud height above mounting plate.
Plate without studs	Bolt circle diameter, number, and arrangement of holes; thread; and depth of stud mounting plate with accessories.

(3) Startup, calibration, and operation can be implemented using the standard membrane keypad. Remote access and additional functionality available via HART Communications (Model 275 Handheld Communicator with Hazardous Area Oxymitter 4000 device descriptor (DD)) required.

Table 1-2. Calibration Components

PART NUMBER	DESCRIPTION
1A99119G01	Two disposable calibration gas bottles — 0.4% and 8% O_2, balance nitrogen — 550 liters each, includes bottle rack*
1A99119G02	Two pressure regulators for calibration gas bottles

*Calibration gas bottles cannot be shipped via airfreight.

When the bottles are used with “CALIBRATION RECOMMENDED” features, the bottles should provide 2 to 3 years of calibrations in normal service.

Table 1-3. Intelligent Multiprobe Test Gas Sequencer Versions

PART NUMBER	DESCRIPTION	NUMBER OF HAZARDOUS AREA OXYMITTER 4000 UNITS
3D39695G01	IMPS	1
3D39695G02	IMPS	2
3D39695G03	IMPS	3
3D39695G04	IMPS	4
3D39695G05	IMPS w/115 V Heater	1
3D39695G06	IMPS w/115 V Heater	2
3D39695G07	IMPS w/115 V Heater	3
3D39695G08	IMPS w/115 V Heater	4
3D39695G09	IMPS w/220 V Heater	1
3D39695G10	IMPS w/220 V Heater	2
3D39695G11	IMPS w/220 V Heater	3
3D39695G12	IMPS w/220 V Heater	4

SECTION 2
INSTALLATION

WARNING

The Hazardous Area Oxymitter 4000 and probe abrasive shield are heavy. Use proper lifting and carrying procedures to avoid personal injury.

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.

2-1 MECHANICAL INSTALLATION

a. Selecting Location

1. The location of the Hazardous Area Oxymitter 4000 in the stack or flue is most important for maximum accuracy in the oxygen analyzing process. The Hazardous Area Oxymitter 4000 must be positioned so the gas it measures is representative of the process. Best results are normally obtained if the Hazardous Area Oxymitter 4000 is positioned near the center of the duct (40 to 60% insertion). Longer ducts may require several Hazardous Area Oxymitter 4000 units 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 0° to 704°C (32° to 1300°F). Figure 2-1 through Figure 2-4 provide mechanical installation references.

   The ambient temperature of the integral electronics housing must not exceed 65°C (149°F).

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 Hazardous Area Oxymitter 4000 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 membrane keypad. Allow adequate clearance for removal of the Hazardous Area Oxymitter 4000 (Figure 2-1 or Figure 2-2).

CAUTION

Do not allow the temperature of the Hazardous Area Oxymitter 4000 integral electronics to exceed 65°C (149°F) or damage to the unit may result.

b. Installation

1. Ensure all components are available to install the Hazardous Area Oxymitter 4000. If equipped with the optional ceramic diffuser, ensure it is not damaged.

2. The Hazardous Area Oxymitter 4000 may be installed intact as it is received.

NOTE

An abrasive shield is recommended for high velocity particulates in the flue stream (such as those in coal-fired boilers, kilns, and recovery boilers).

3. Weld or bolt mounting plate (Figure 2-4) onto the duct.

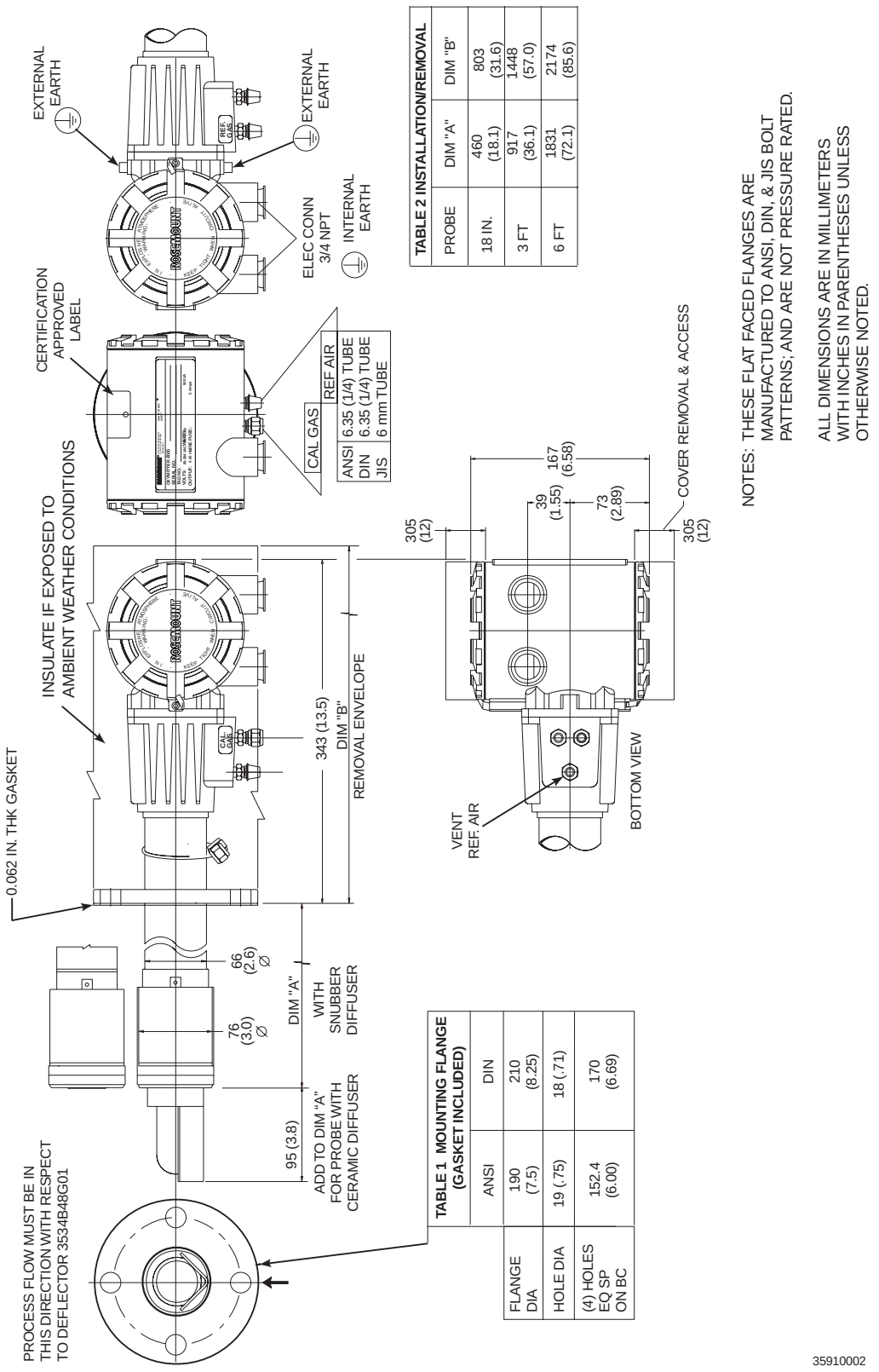


TABLE 2 INSTALLATION/REMOVAL

PROBE	DIM "A"	DIM "B"
18 IN.	460 (18.1)	803 (31.6)
3 FT	917 (36.1)	1448 (57.0)
6 FT	1831 (72.1)	2174 (85.6)

TABLE 1. MOUNTING FLANGE (GASKET INCLUDED)

	ANSI	DIN
FLANGE DIA	190 (7.5)	210 (8.25)
HOLE DIA	19 (.75)	18 (.71)
(4) HOLES EQ SP ON BC	152.4 (6.00)	170 (6.69)

Figure 2-1. Hazardous Area Oxymitter 4000 Installation

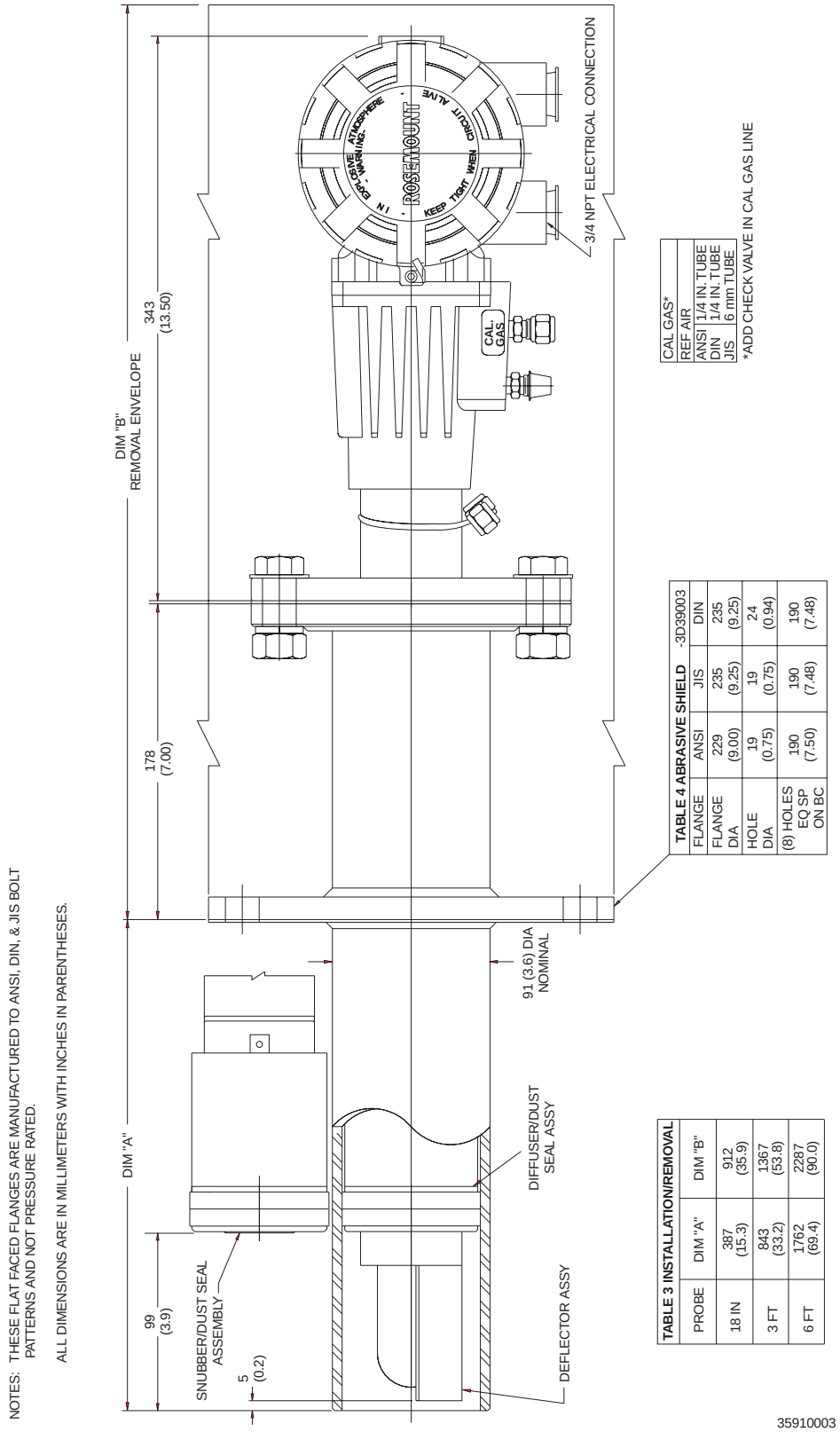


Figure 2-2. Hazardous Area Oxymitter 4000 with Abrasive Shield

MOUNTING PLATE OUTLINE

TABLE V. MOUNTING PLATE DIMENSIONS FOR HAZARDOUS AREA OXYMITTER 4000		
DIMENSIONS MM (in.)	ANSI	DIN
"A"	197 (7.75)	216 (8.50)
"B" STUD SIZE	0.625-11	M16 x 2
"C" DIA B.C.	152.4 (6.00)	170.0 (6.69)

TABLE VI. MOUNTING PLATE DIMENSIONS FOR HAZARDOUS AREA OXYMITTER 4000 WITH ABRASIVE SHIELD			
DIMENSIONS MM (in.)	ANSI	DIN	JIS
"A"	229 (9.00)	235 (9.25)	235 (9.25)
"B" DIA	121 (4.75)	100 (3.94)	125 (4.92)
"C" THREAD	0.625-11	M20 x 2.5	M16 x 2
"D" DIA B.C.	191 (7.50)	190 (7.48)	200 (7.89)

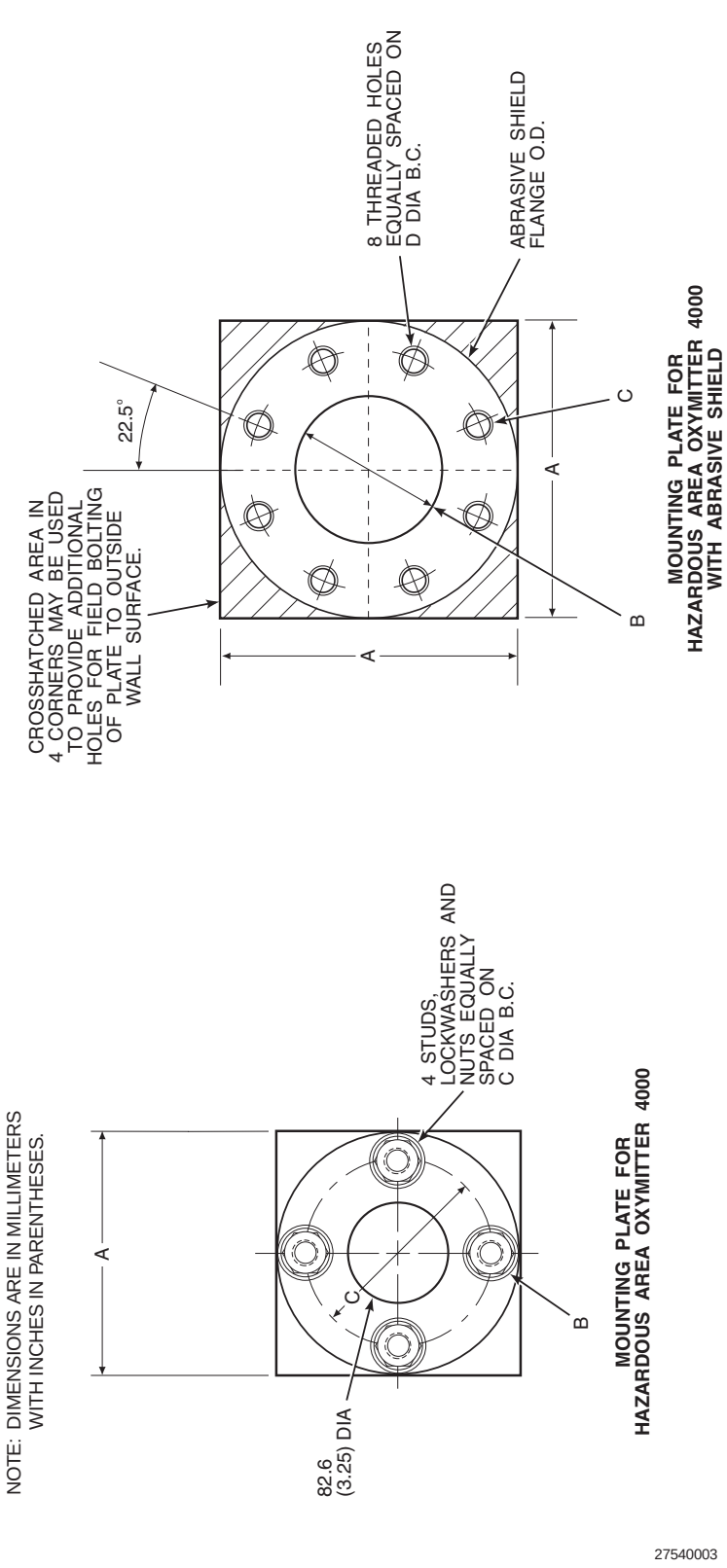
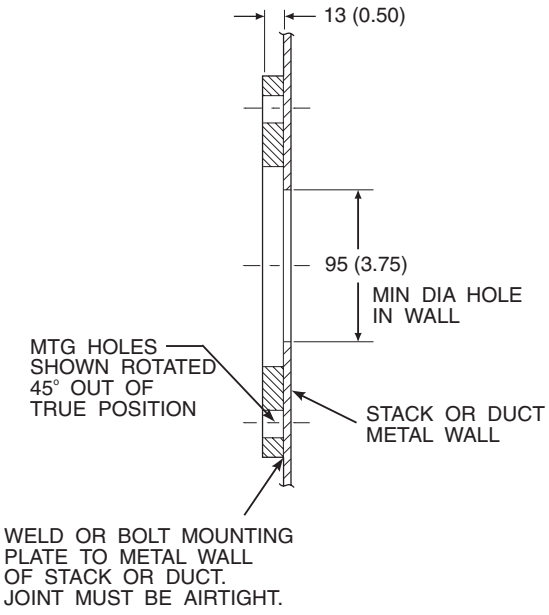


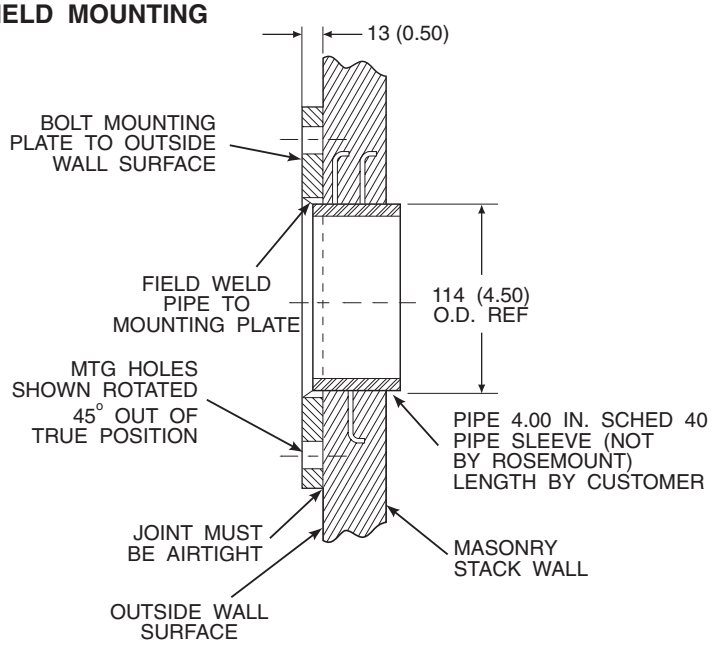
Figure 2-3. Hazardous Area Oxymitter 4000 Mounting Plate Dimensions

INSTALLATION FOR METAL WALL STACK OR DUCT CONSTRUCTION

INSTALLATION FOR MASONRY WALL STACK CONSTRUCTION

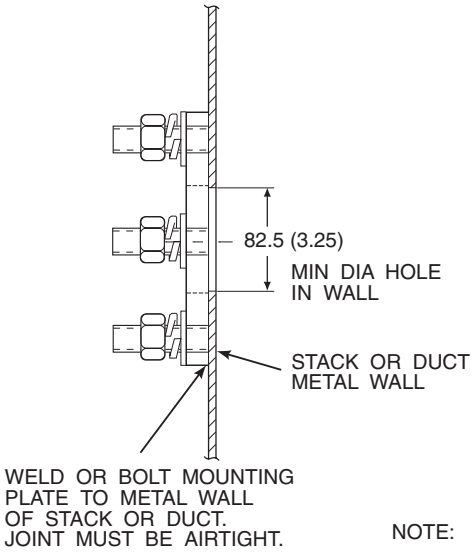
ABRASIVE SHIELD MOUNTING

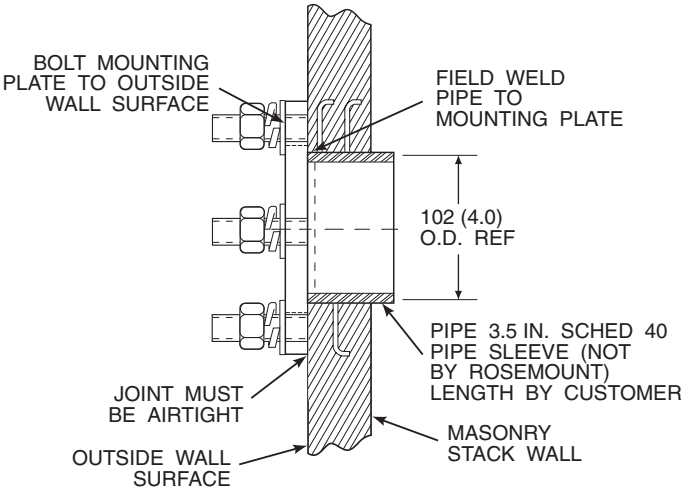




NOTE: ALL MASONRY STACK WORK AND JOINTS EXCEPT ADAPTOR PLATE NOT FURNISHED BY ROSEMOUNT.

PROBE MOUNTING





NOTE: DIMENSIONS IN MILLIMETERS WITH INCHES IN PARENTHESES.

27540004

Figure 2-4. Hazardous Area Oxymitter 4000 Mounting Plate Installation

4. If using the optional ceramic diffusion element, the vee deflector must be correctly oriented. Before inserting the Hazardous Area Oxymitter 4000, check the direction of flow of the gas in the duct. Orient the vee deflector so the apex points upstream toward the flow (Figure 2-5). This may be done by loosening the setscrews and rotating the vee deflector to the desired position. Retighten the setscrews.

5. In vertical installations, ensure the system cable drops vertically from the Hazardous Area Oxymitter 4000 and the conduit is routed below the level of the electronics housing. This drip loop minimizes the possibility that moisture will damage the electronics. See Figure 2-6.

6. If the system has an abrasive shield, check the dust seal gaskets. The joints in the two gaskets must be staggered 180 degrees. Make sure the gaskets are in the hub grooves as the Hazardous Area Oxymitter 4000 slides into the 15 degree forcing cone in the abrasive shield.

NOTE

If process temperatures will exceed 200°C (392°F), use anti-seize compound on the stud threads to ease future removal of the Hazardous Area Oxymitter 4000.

7. Insert probe through the opening in the mounting plate and bolt the unit to the plate.

NOTE

To maintain CE compliance, ensure a good connection exists between the mounting plate studs or earthing screws on electronics housing and earth.

8. Ensure the Hazardous Area Oxymitter 4000 is properly earthed by way of both internal and external points.

CAUTION

Uninsulated stacks or ducts may cause ambient temperatures around the electronics to exceed 149°F (65°C), which may cause overheating damage to the electronics.

9. If insulation is being removed to access the duct work for Hazardous Area Oxymitter 4000 mounting, make sure the insulation is replaced afterward. See Figure 2-6.

10. Ensure the installation does not obscure the messages on either housing cover.

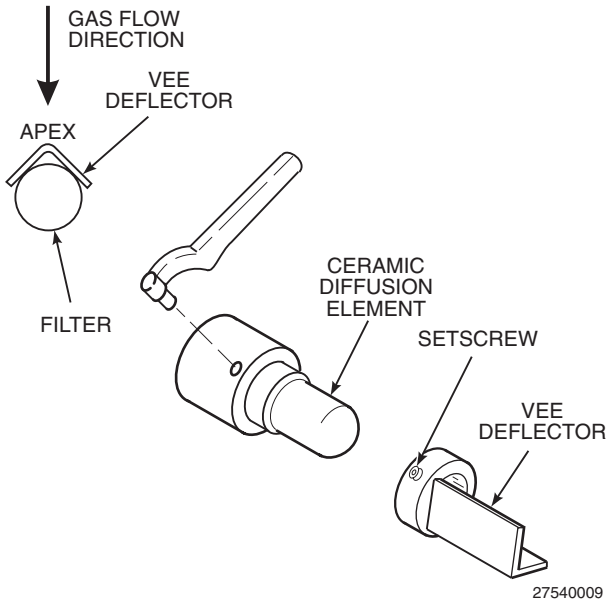


Figure 2-5. Orienting the Optional Vee Deflector

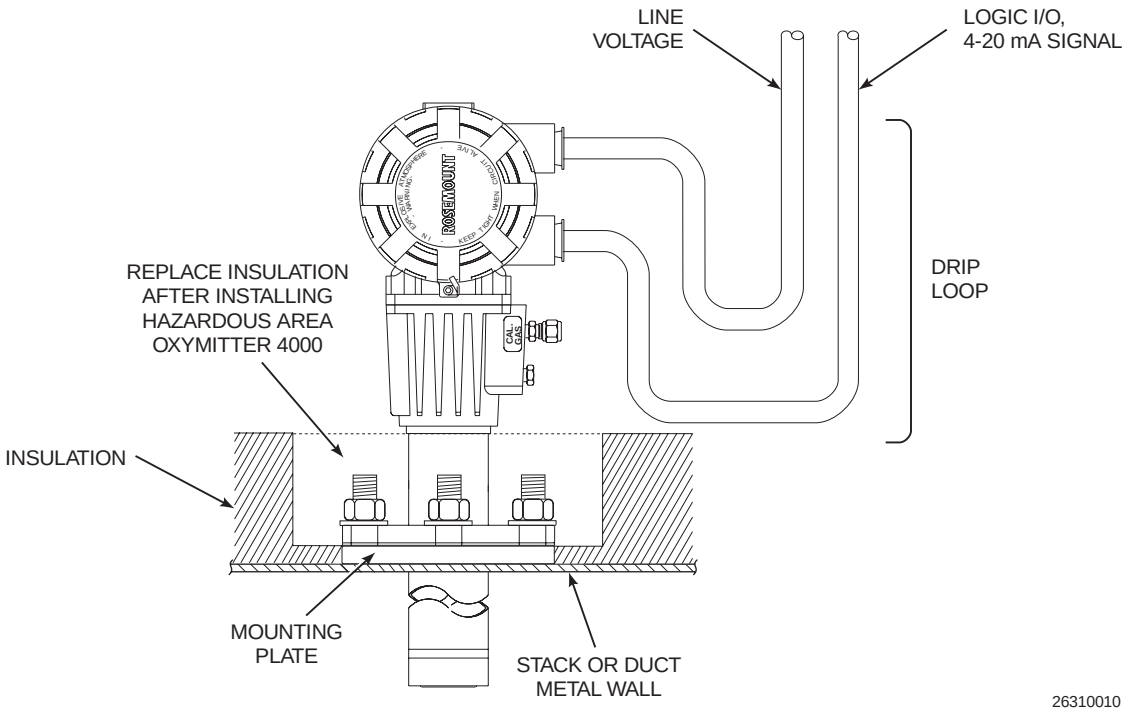


Figure 2-6. Installation with Drip Loop and Insulation Removal

2-2 ELECTRICAL INSTALLATION

All wiring must conform to local and national codes.

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.

WARNING

The probe and probe abrasive shield are heavy. Use proper lifting and carrying procedures to avoid personnel injury.

a. Remove screw (18, Figure 5-1), cover lock (19), and captive washer (20). Remove terminal block cover (17).

b. Connect Line Voltage. Connect the line, or L1, wire to the L1 terminal and the neutral, or L2 wire, to the N terminal. See Figure 2-7. The Hazardous Area Oxymitter 4000 automatically will configure itself for 90-250 VAC line voltage and 50/60 Hz. The power supply requires no setup.

c. Connect 4-20 mA Signal and Logic I/O/ Calibration Handshake Leads (Figure 2-7).

1. 4-20 mA Signal. The 4-20 mA signal represents the O_2 value and can also operate the Model 751 Remote Powered Loop LCD Display or any other loop powered display. Superimposed on the 4-20 mA signal is HART information that is accessible through a Model 275 Handheld Communicator or AMS software.

WARNING

If using an IMPS 4000 or SPS 4000, install it in a non-hazardous, explosive-free environment.

2. Logic I/O/Calibration Handshake. The output can either be an alarm or provide the handshaking to interface with an IMPS 4000 or SPS 4000.

3. If autocalibration is not utilized, a common bi-directional logic contact is provided for any of the diagnostic alarms listed in Table 6-1. The assignment of alarms which can actuate this contact be modified to one of seven additional groupings listed in Table 3-1.

   The logic contact is self-powered, +5 VDC, 340 ohm series resistance. An interposing relay will be required if this contact is to be utilized to annunciate a higher voltage device, such as a light or horn, and may also be required for certain DCS input cards. A Potter & Brumfield R10S-E1Y1-J1.0K 3.2 mA DC or an equal interposing relay will be mounted where the contact wires terminate in the control/relay room.

d. Install terminal block cover (17, Figure 5-1) and secure with captive washer (20), cover lock (19), and screw (18).

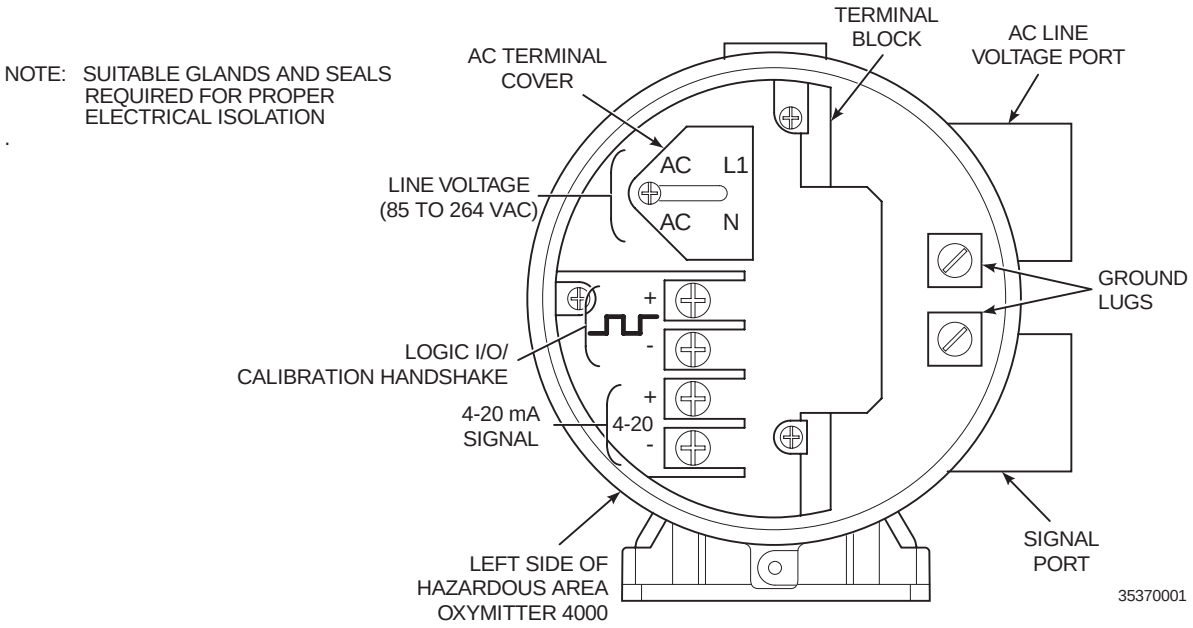


Figure 2-7. Terminal Block

2-3 PNEUMATIC INSTALLATION

a. Reference Air Package

After the Hazardous Area Oxymitter 4000 is installed, connect the reference air set to the Hazardous Area Oxymitter 4000. The reference air set should be installed in accordance with Figure 2-8.

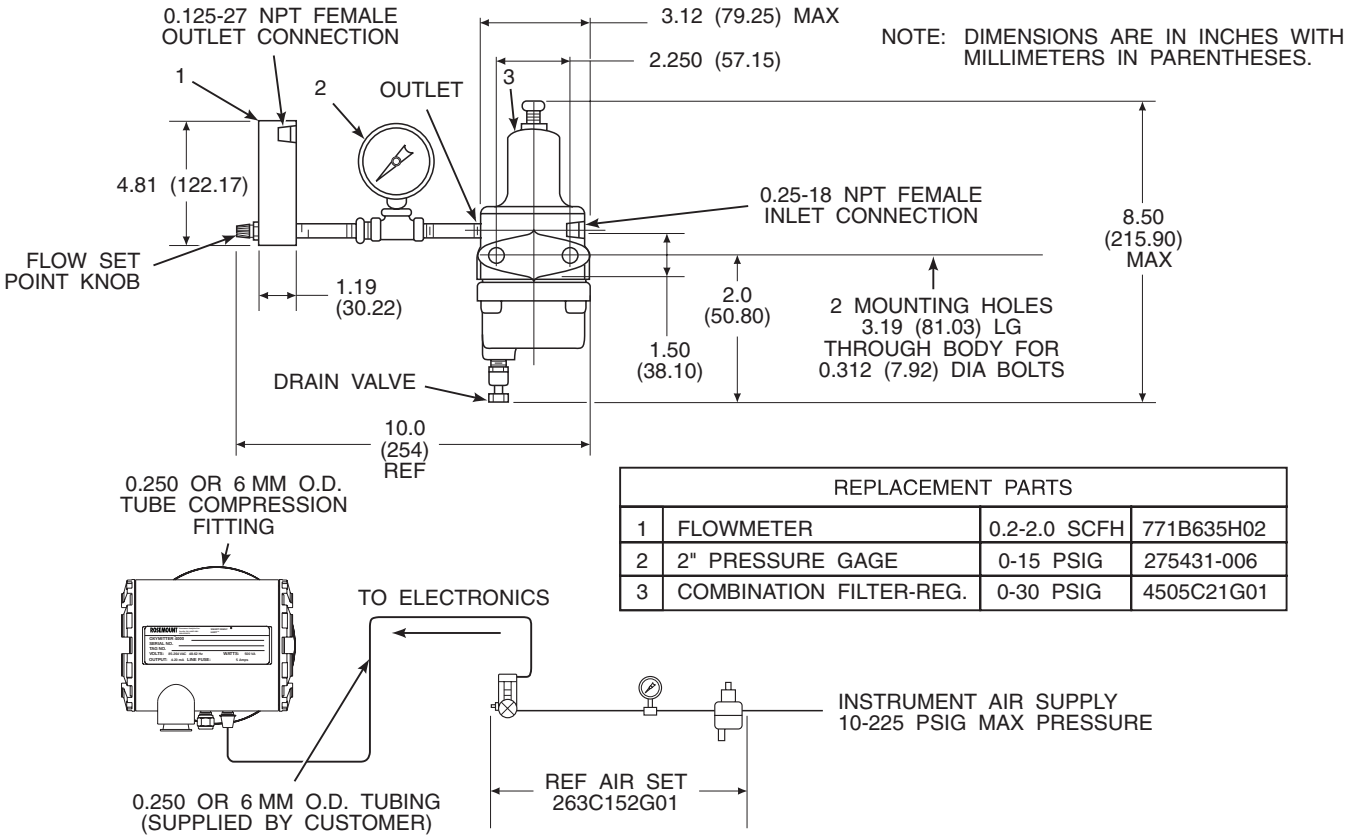
Instrument Air (Reference Air): 68.95 kPa gage (10 psig) minimum, 1551.38 kPa gage (225 psig) maximum at 0.5 scfm (0.25 l/hr) maximum; less than 40 parts-per-million total hydrocarbons. Regulator outlet pressure should be set at 35 kPa (5 psi).

WARNING

If using an IMPS 4000 or SPS 4000, install it in a non-hazardous, explosive-free environment.

If using an IMPS 4000, refer to the IMPS 4000 Intelligent Multiprobe Test Gas Sequencer Instruction Bulletin for the proper reference air connections.

If using an SPS 4000, refer to the SPS 4000 Single Probe Autocalibration Sequencer Instruction Bulletin for the proper reference air connections.



REPLACEMENT PARTS			
1	FLOWMETER	0.2-2.0 SCFH	771B635H02
2	2" PRESSURE GAGE	0-15 PSIG	275431-006
3	COMBINATION FILTER-REG.	0-30 PSIG	4505C21G01

SCHEMATIC HOOKUP FOR REFERENCE AIR SUPPLY ON OXYMITTER 4000 PROBE HEAD. 27540005

Figure 2-8. Air Set, Plant Air Connection

CAUTION

Do not use 100% nitrogen as a low gas (zero gas). It is suggested that gas for the low (zero) be between 0.4% and 2.0% O_2. Do not use gases with hydrocarbon concentrations of more than 40 parts per million. Failure to use proper gases will result in erroneous readings.

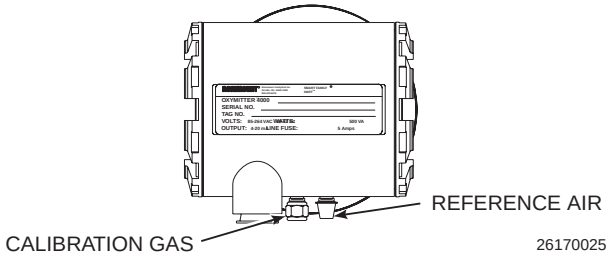


Figure 2-9. Hazardous Area Oxymitter 4000 Gas Connections

b. Calibration Gas

Two calibration gas concentrations are used with the Hazardous Area Oxymitter 4000, Low Gas - 0.4% O_2 and High Gas - 8% O_2. See Figure 2-9 for the Hazardous Area Oxymitter 4000 connections.

WARNING

If using an IMPS 4000 or SPS 4000, install it in a non-hazardous, explosive-free environment.

If using an IMPS 4000, refer to the IMPS 4000 Intelligent Multiprobe Test Gas Sequencer Instruction Bulletin for the proper calibration gas connections.

If using an SPS 4000, refer to the SPS 4000 Single Probe Autocalibration Sequencer Instruction Bulletin for the proper calibration gas connections.

NOTE

Upon completing installation, make sure that the Hazardous Area Oxymitter 4000 is turned on and operating prior to firing up the combustion process. Damage can result from having a cold Hazardous Area Oxymitter 4000 exposed to the process gases.

During outages, and if possible, leave all Hazardous Area Oxymitter 4000 units running to prevent condensation and premature aging from thermal cycling.

CAUTION

If the ducts will be washed down during outage, MAKE SURE to power down the Hazardous Area Oxymitter 4000 units and remove them from the wash area.

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 Hazardous Area Oxymitter 4000 is installed correctly. See Section 2, INSTALLATION.

b. Verify Terminal Block Wiring

1. Remove screw (18, Figure 5-1), cover lock (19), and captive washer (20) that secure the terminal block cover. Remove the cover to expose the terminal block (Figure 3-1).

2. Check the terminal block wiring. Be sure the power, 4-20 mA signal, and logic outputs are properly connected and secure.

3. Install the housing cover on the terminal block and secure with captive washer (20, Figure 5-1), cover lock (19), and screw (18).

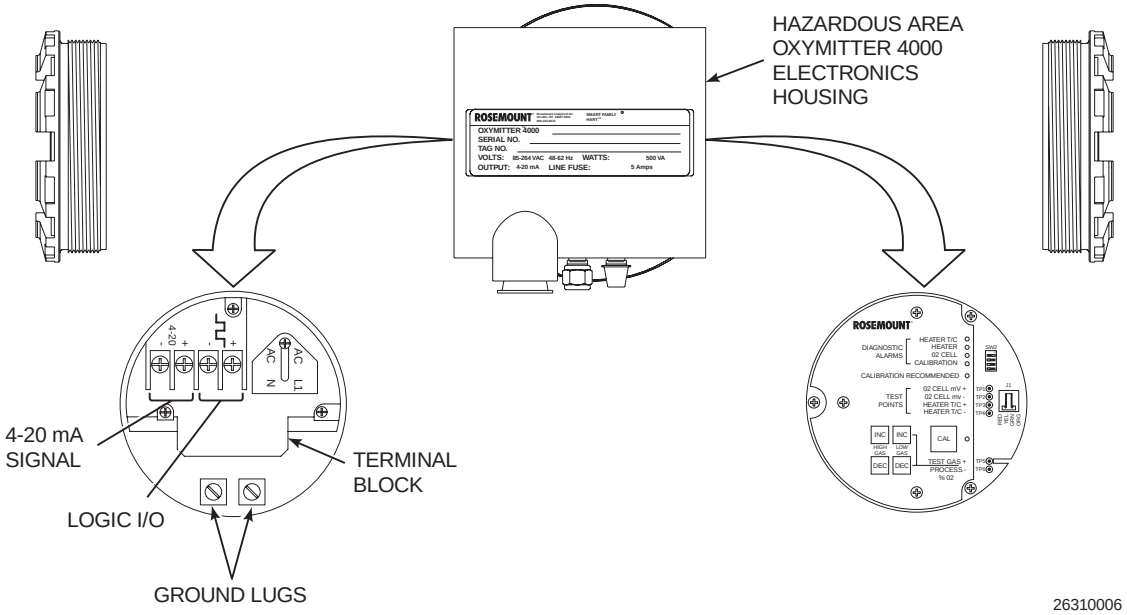


Figure 3-1. Integral Electronics

c. Verify Hazardous Area Oxymitter 4000 Configuration

Located on the microprocessor board, the top board, are two switches that configure outputs for the Hazardous Area Oxymitter 4000 (Figure 3-2). SW1 determines if the 4-20 mA signal is internally or externally powered. SW2 determines:

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

1. Hazardous Area Oxymitter 4000 status, HART or LOCAL.
2. Oxygen range, 0 to 10% O_2 or 0 to 25% O_2. (0 to 40% O_2 is also configurable only through HART/AMS.)
3. The 4-20 mA signal, at fault or power up, 3.5 mA or 21 mA.

CAUTION

Remove power from the Hazardous Area Oxymitter 4000 before changing defaults. If defaults are changed under power, damage to the electronics package may occur.

d. SW1

The two settings are internally or externally powering the 4-20 mA signal. The factory setting is for the 4-20 mA signal to be internally powered.

e. SW2

The factory sets this switch as follows:

1. Position 1 is HART/LOCAL. This switch controls the configuration of the Hazardous Area Oxymitter 4000. The defaults cannot be changed via HART/AMS unless the switch is in the HART position. Placing this switch in the LOCAL position forces the O_2 range to the setting of position 2. This switch must be placed in the LOCAL position or changes in position 2 will have no effect.
2. Position 2 determines the O_2 range. This can be set to either 0 to 10% O_2 or 0 to 25% O_2. The factory setting is 0 to 10% O_2.

WARNING

Typically, the probe's sensing cell, which is in direct contact with the process gases, is heated to approximately 1357°F (736°C), and the external temperature of the probe body may exceed 842°F (450°C). If operating conditions also contain high oxygen levels and combustible gases, the Hazardous Area Oxymitter 4000 may self-ignite.

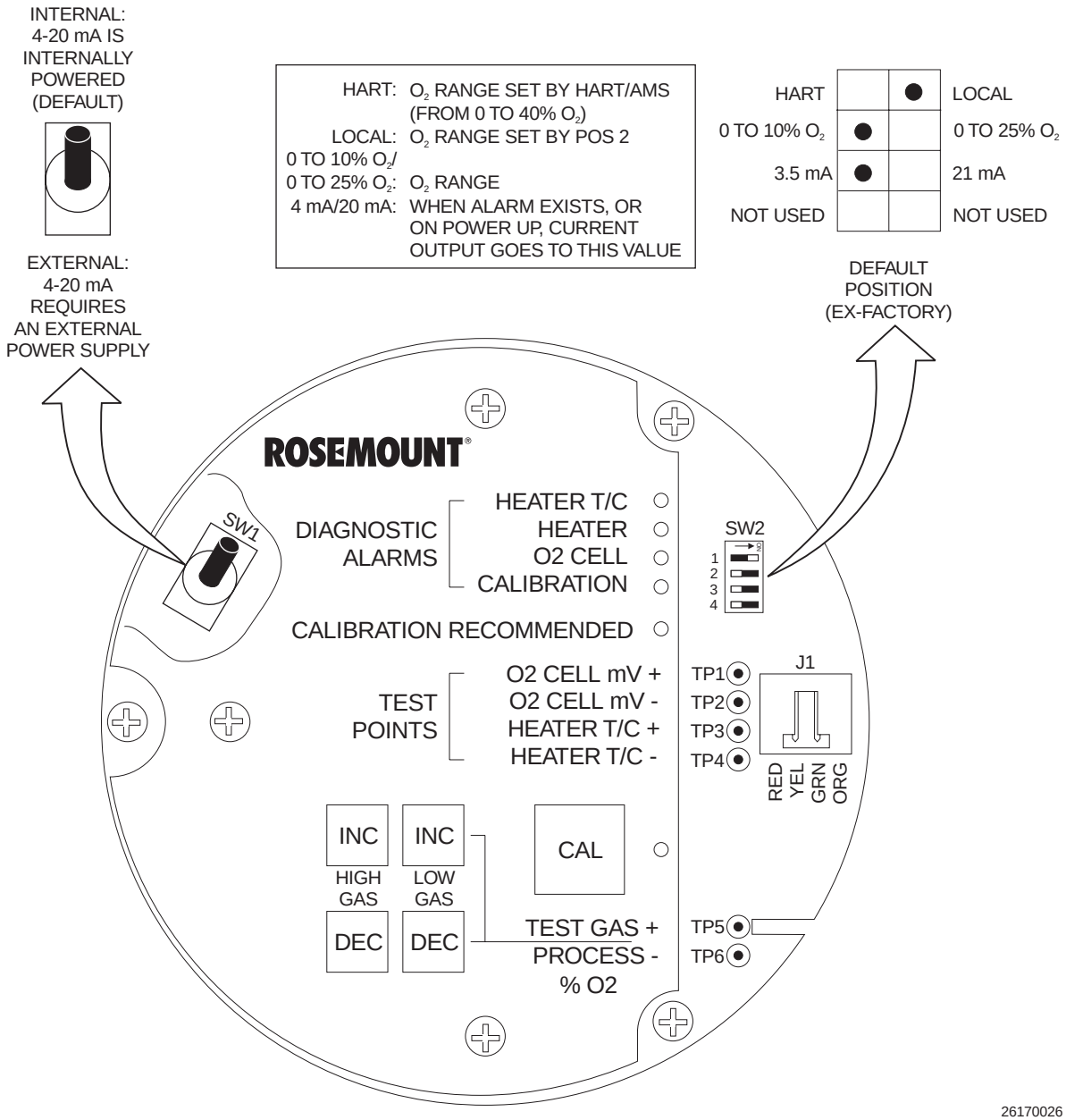
If necessary, the O_2 range can be configured from 0 to 40% O_2. To select values within this range, set position 1 of SW2 to HART and then enter the range via HART/AMS. Do not change position 1 of SW2 to LOCAL unless you want to operate in the range specified by position 2 of SW2.

3. Position 3 determines the output at startup or at an alarm. The settings are 3.5 mA or 21 mA. The factory setting is 3.5 mA. At startup, the current at the analog output is 3.5 mA or 21 mA.
4. Position 4 is not used.

f. Once the cell is up to operating temperature, the O_2 percentage can be read:

1. Access TP5 and TP6 next to the membrane keypad. Attach a multimeter across TP5 and TP6. The calibration and process gases can now be monitored. Pressing the INC or DEC once will cause the output to switch from the process gas to the calibration gas. Pressing INC or DEC a second time will increase or decrease the calibration gas parameter. If the keys have been inactive for one minute, the output reverts to the process gas. When a calibration has been initiated, the value at TP5 and TP6 is the % O_2 seen by the cell. Oxygen levels, as seen on the multimeter, are:

   8.0% O_2 = 8.0 VDC
   0.4% O_2 = 0.4 VDC
2. HART/AMS.
3. Model 751. The loop-driven LCD display.



26170026

Figure 3-2. Hazardous Area Oxymitter 4000 Defaults

CAUTION

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

3-2 LOGIC I/O

This two-terminal logic contact can be configured either as a solid-state relay-activated alarm or as a bi-directional calibration handshake signal to an IMPS 4000 or SPS 4000. The configuration of this signal depends on the setting of the LOGIC I/O PIN MODE via HART/AMS. The ten different modes available are explained in Table 3-1.

a. Alarm

When configured as an alarm, this signal alerts you to an out-of-spec condition. The output is 5 V in series with a 340 ohm resistor.

For optimum performance, Rosemount recommends connecting the output to a Potter & Bromfield 3.2 mA DC relay (P/N R10S-E1Y1-J1.0K).

Of the ten modes in Table 3-1, modes 0 through 7 are the alarm modes. The factory default is mode 5 for Hazardous Area Oxymitter 4000 units without an IMPS 4000 or SPS 4000. In this mode, the output will signal when a unit alarm or a CALIBRATION RECOMMENDED indication occurs.

b. Calibration Handshake Signal

If using an optional IMPS 4000 or SPS 4000, the logic I/O must be configured for calibration handshaking. Of the ten modes in Table 3-1, only modes 8 and 9 are configured for calibration handshaking. For an Hazardous Area Oxymitter 4000 with an IMPS 4000 or an SPS 4000, the factory sets the default to mode 8. In this mode, the logic I/O will be used to communicate between the Hazardous Area Oxymitter 4000 and sequencer and to signal the sequencer when a CALIBRATION RECOMMENDATION indication occurs.

Table 3-1. Logic I/O Configuration

Mode	Configuration
0	The unit is not configured for any alarm condition.
1	The unit is configured for a Unit Alarm.
2	The unit is configured for Low O_2.
3	The unit is configured for both a Unit Alarm and Low O_2.
4	The unit is configured for a High AC Impedance/CALIBRATION RECOMMENDED.
5*	The unit is configured for both a Unit Alarm and a High AC Impedance/CALIBRATION RECOMMENDED.
6	The unit is configured for both a Low O_2 and High AC Impedance/CALIBRATION RECOMMENDED.
7	The unit is configured for a Unit Alarm, a Low O_2, and a High AC Impedance/CALIBRATION RECOMMENDED.
8**	The unit is configured for a calibration handshake with IMPS 4000 or SPS 4000. CALIBRATION RECOMMENDED will initiate the calibration cycle.
9	The unit is configured for a calibration handshake. CALIBRATION RECOMMENDED will not initiate the calibration cycle with the IMPS 4000 or SPS 4000.

* The default condition for an Oxymitter 4000 without an IMPS 4000 or SPS 4000.
** The default condition for an Oxymitter 4000 with an IMPS 4000 or SPS 4000.

3-3 RECOMMENDED CONFIGURATION

a. 4-20 mA Signal Upon Critical Alarm

Rosemount recommends that the factory default be utilized. The 4-20 mA signal will go to the 3.5 mA level upon any critical alarm which will cause the O_2 reading to be unusable. Customer can also select 21 mA as the failure setting if normal operations cause O_2 readings to go below the zero % O_2 (3.5 mA) level.

If the O_2 measurement is being utilized as part of an automatic control loop, the loop should be placed into manual upon this failure event or other appropriate action should be taken.

b. Calibration

Rosemount recommends utilizing an autocalibration system, actuated by the "calibration recommended" diagnostic. New O_2 cells may operate for more than a year, but older cells may require recalibration every few weeks as they near the end of their life. This strategy ensures that the O_2 reading is always accurate, and eliminates many unnecessary calibrations based on calendar days or weeks since previous calibration. When utilizing the SPS 4000 or the IMPS 4000, consider wiring some or all associated alarm contacts.

1. CALIBRATION INITIATE. Contact from the control room to an SPS 4000 or IMPS 4000 (one per probe) provides the ability to manually initiate a calibration at any time from the control room. Note that calibrations can also be initiated from a HART handheld communicator, from Asset Management Solutions software, or from the keypad on the Oxymitter 4000.
2. IN CALIBRATION. One contact per probe provides notification to the control room that the "calibration recommended" diagnostic has initiated an automatic calibration through the SPS 4000 or IMPS 4000. If the O_2 signal is being utilized in an automatic control loop, this contact should be utilized to place the control loop into manual during calibration.
3. CALIBRATION FAILED. One contact per probe from an SPS 4000 or IMPS 4000 to the control room for notification that the calibration procedure failed. Grouped with this alarm is an output from a pressure switch which indicates when the calibration gas bottles are empty.
4. 4-20 mA SIGNAL DURING CALIBRATION. The 4-20 mA signal can be configured to respond normally during any calibration, or can be configured to hold the last O_2 value upon the initiation of calibration. Factory default is for the 4-20 mA signal to operate normally throughout calibration. Holding the last O_2 value may be useful if several probes are being averaged for the purpose of automatic control. Unless several probes are being averaged, always place any control loops using the O_2 signal into manual prior to calibrating.

3-4 POWER UP

a. Startup Display

When power is applied to the probe, the cell heater turns on. It takes approximately one half hour for the cell to heat to operating temperature. This condition is indicated by the top four LEDs (DIAGNOSTIC ALARMS) on the membrane keypad (Figure 3-3). Starting with the CALIBRATION LED, the LEDs light in ascending order until all four LEDs are on. At this point, all four turn off and the cycle starts again. This ramp cycle continues until the cell is up to operating temperature.

b. Operating Display

The ramp cycle turns into a cycle where the diagnostic LEDs light in sequence from the top to the bottom, one at a time. After the bottom LED turns on, the sequence starts again at the top with the HEATER T/C LED (Figure 3-3).

c. Error

If there is an error condition at startup, one of the diagnostics LEDs will be blinking. Refer to Section 6 TROUBLESHOOTING, to determine the cause of the error. Clear the error, cycle power, and the operating display should return.

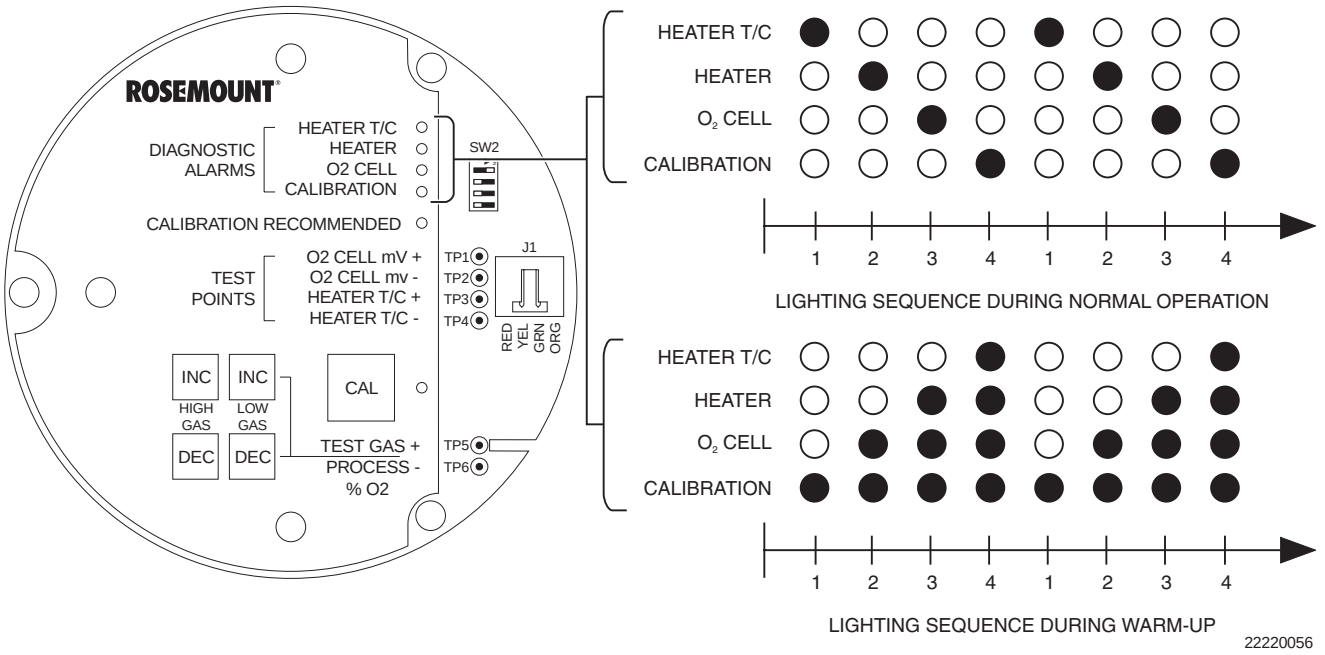


Figure 3-3. Startup and Normal Operation

d. Keypad

The five membrane keys on the membrane keypad are only used during calibration to adjust the high and low gas and to initiate the calibration sequence (Figure 3-4).

e. Reference Air

Ensure reference air, if used, is set to 56.6 l/hr (2 scfh).

3-5 START UP OXYMITTER 4000 CALIBRATION

Refer to Section 5, MAINTENANCE AND SERVICE, for calibration instructions.

3-6 IMPS 4000 CONNECTIONS

Ensure the IMPS 4000 is installed in a safe (non-hazardous, explosive-free) area and verify the wiring and pneumatic connections per the IMPS 4000 Intelligent Multi-probe Test Gas Sequencer Instruction Bulletin.

3-7 SPS 4000 CONNECTIONS

Ensure the SPS 4000 is installed in a safe (non-hazardous, explosive-free) area and verify the wiring and pneumatic connections per the SPS 4000 Single Probe Autocalibration Sequencer Instruction Bulletin.

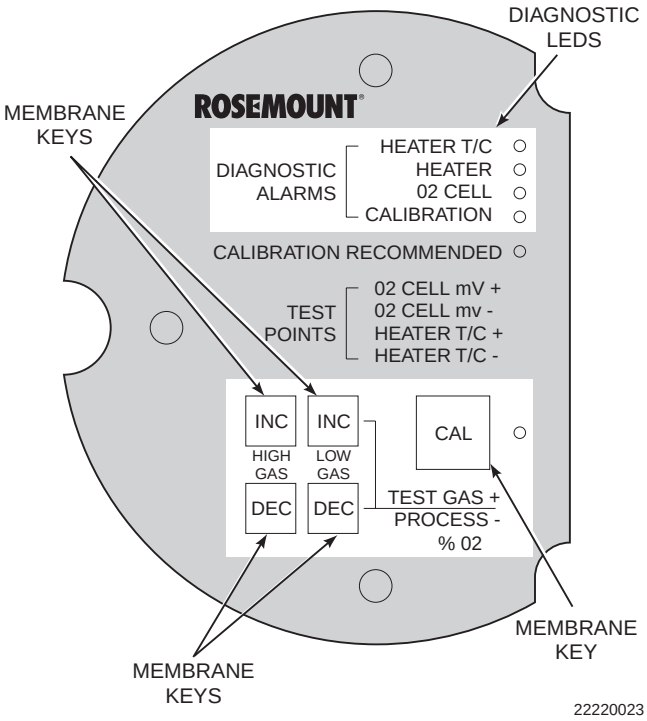


Figure 3-4. Calibration Keys

3-8 OPERATION

a. Overview

Ensure the Hazardous Area Oxymitter 4000 is at normal operation. The diagnostic LEDs will display the operating cycle. All other LEDs should be off (See Figure 3-5).

1. DIAGNOSTIC ALARM LEDS. If there is an error in the system, one of these LEDs will flash various blink codes (see Section 6, TROUBLESHOOTING). In the case of multiple errors, only one will be displayed based on a priority system. Correct the problem and cycle power. The operating display will return or the next error will be displayed. The alarms are:

   HEATER T/C
   HEATER
   O_2 CELL
   CALIBRATION

2. CALIBRATION RECOMMENDED LED. Turns on when the system determines a calibration is recommended.

3. TEST POINTS. Test points 1 through 6 will allow you to monitor with a multimeter: the heater thermocouple, O_2 cell millivolt, and the process O_2.

   (a) TP1 and TP2 monitor the oxygen cell millivolt output which equates to the percentage of oxygen present.

   (b) TP3 and TP4 monitor the heater thermocouple.

   (c) TP5 and TP6 monitor the process gas or the calibration gas parameter.

4. CAL LED. The CAL LED is on steady or flashing during calibration. Further information is available in Section 5, MAINTENANCE AND SERVICE.

5. Keys.

   (a) INC and DEC. The INC and DEC keys are used to set the values of the calibration gases. Attach a multimeter across TP5 and TP6. The calibration and process gases can now be monitored. Pressing the INC or DEC once will cause the output to switch from the process gas to the calibration gas. Pressing INC or DEC a second time will increase or decrease the calibration gas parameter. If the keys have been inactive for one minute, the output reverts to the process gas. When a calibration has been initiated, the value at TP5 and TP6 is the % O_2 seen by the cell. Oxygen levels, as seen on the multimeter, are:

   8.0% O_2 = 8.0 volts DC

   0.4% O_2 = 0.4 volts DC

   (b) CAL. The CAL key can:

   1 Initiate a calibration.

   2 Sequence through calibration.

   3 Abort the calibration.

b. Model 751 Remote Powered Loop LCD Display (Optional)

Refer to Remote Powered Loop LCD manual for calibration and operation.

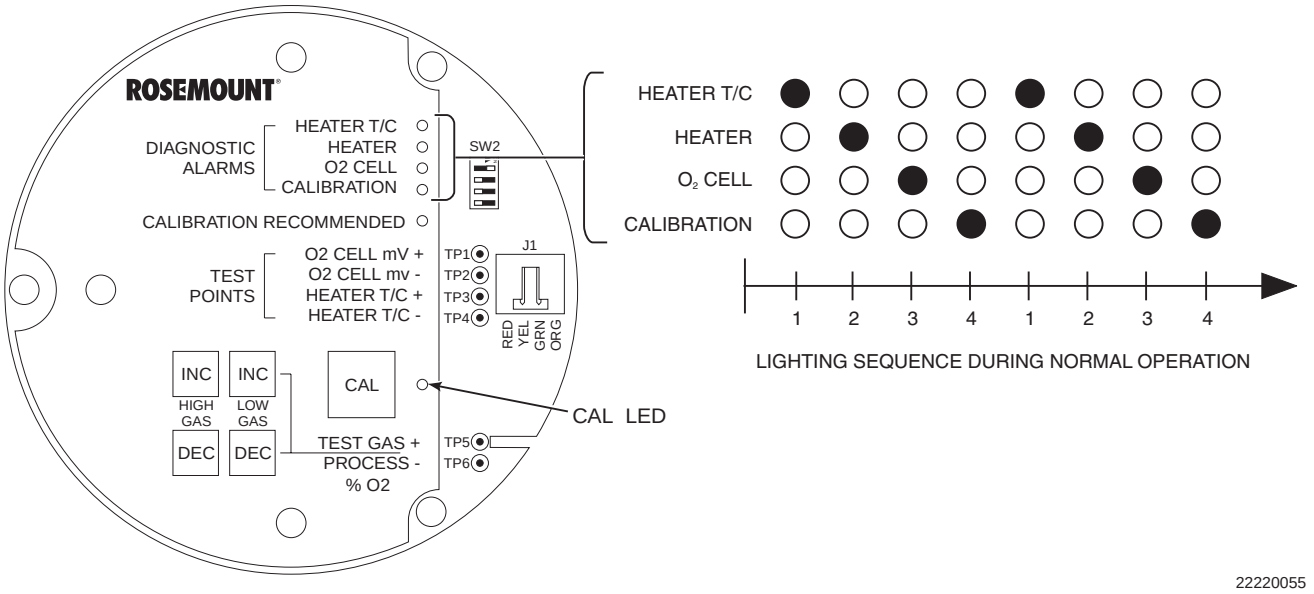


Figure 3-5. Normal Operation

SECTION 4
HART/AMS

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

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 Hazardous Area Oxymitter 4000, 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 Hazardous Area Oxymitter 4000's 4-20 mA 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 in regard to the PC interface option.

4-2 HART COMMUNICATOR SIGNAL LINE CONNECTIONS

The HART Communicator can connect to the Hazardous Area Oxymitter 4000's 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. For applications in which the signal line load resistance is less than 250 ohms, refer to method 2.

a. Method 1, For Load Resistance > 250 Ohms

Refer to Figure 4-1 and the following steps to connect the HART Communicator to a signal line 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 Hazardous Area Oxymitter 4000. 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).

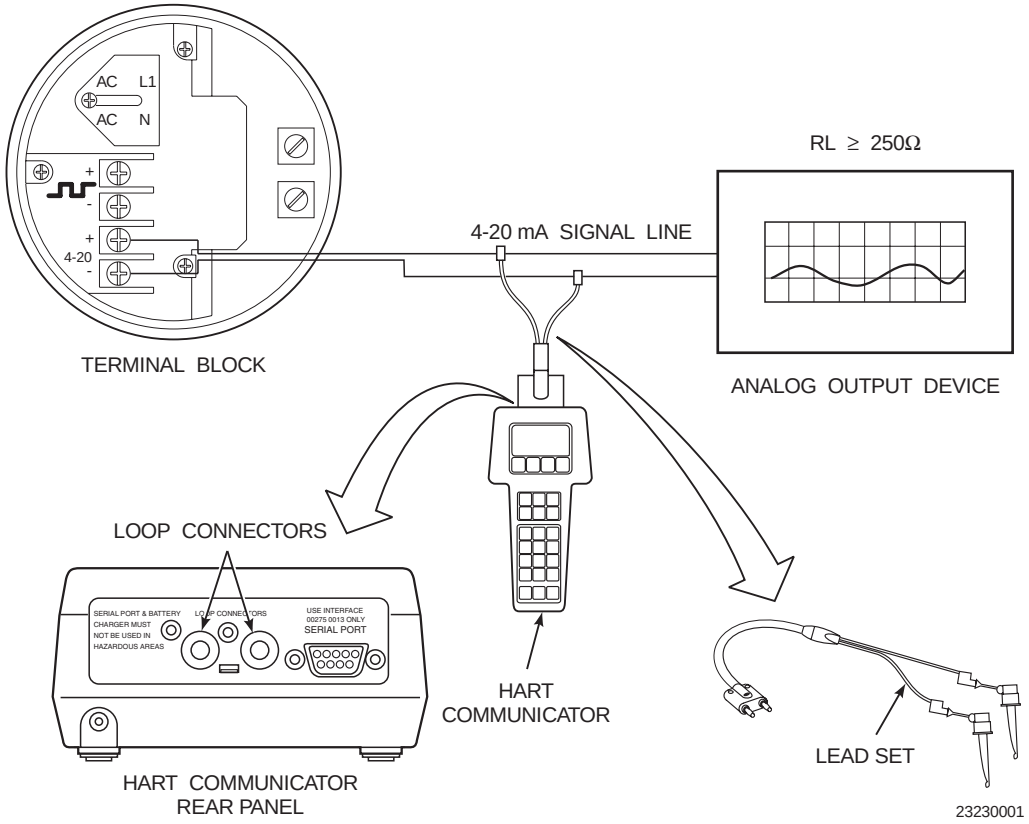


Figure 4-1. Signal Line Connections, > 250 Ohms Lead Resistance

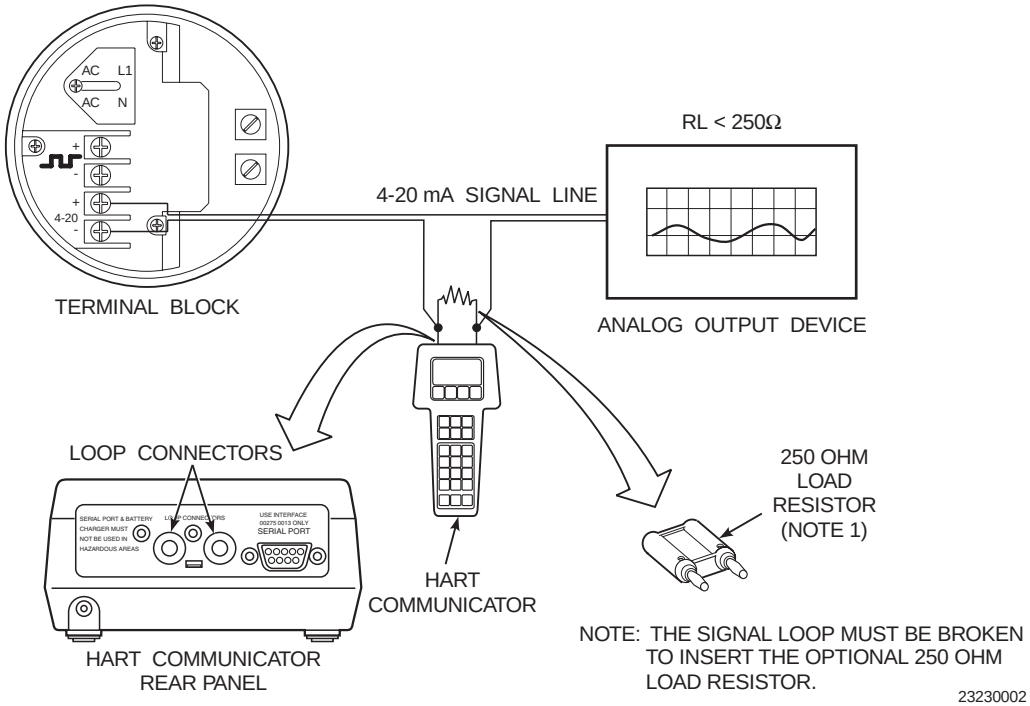


Figure 4-2. Signal Line Connections, < 250 Ohms Lead Resistance

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. Then 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 Hazardous Area Oxymitter 4000. 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 Hazardous Area Oxymitter 4000 or in parallel to the 250 ohm load resistor.

NOTE

If the HART Communicator is turned on while connected to the 4-20 mA analog output signal line, an undefined status indication appears while the communicator warms up. Wait until the warmup period ends to continue.

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

4-5 LOGIC I/O CONFIGURATIONS

The Hazardous Area Oxymitter 4000 logic I/O output can be configured for ten different modes through HART/AMS. The factory default condition is Mode 5. A list of possible configurations appear in Table 4-1.

The Unit Alarm configuration available for Modes 1, 3, 5, and 7 refers to the diagnostic alarm faults in Table 6-1.

4-6 HART/AMS MENU TREE FOR HAZARDOUS AREA OXYMITTER 4000 APPLICATIONS

This section consists of a menu tree for the HART Communicator. This menu is specific to Hazardous Area Oxymitter 4000 applications.

Table 4-1. Logic I/O Configuration

Mode	Configuration
0	The unit is not configured for any alarm condition.
1	The unit is configured for a Unit Alarm.
2	The unit is configured for Low O_2.
3	The unit is configured for both a Unit Alarm and Low O_2.
4	The unit is configured for a High AC Impedance/CALIBRATION RECOMMENDED.
5*	The unit is configured for both a Unit Alarm and a High AC Impedance/CALIBRATION RECOMMENDED.
6	The unit is configured for both a Low O_2 and High AC Impedance/CALIBRATION RECOMMENDED.
7	The unit is configured for a Unit Alarm, a Low O_2, and a High AC Impedance/CALIBRATION RECOMMENDED.
8**	The unit is configured for a calibration handshake with an IMPS 4000 or SPS 4000. CALIBRATION RECOMMENDED will initiate the calibration cycle.
9	The unit is configured for a calibration handshake. CALIBRATION RECOMMENDED will not initiate the calibration cycle with an IMPS 4000 or SPS 4000.

*The default condition for a Hazardous Area Oxymitter 4000 without an IMPS 4000 or SPS 4000.
**The default condition for a Hazardous Area Oxymitter 4000 with an IMPS 4000 or SPS 4000.

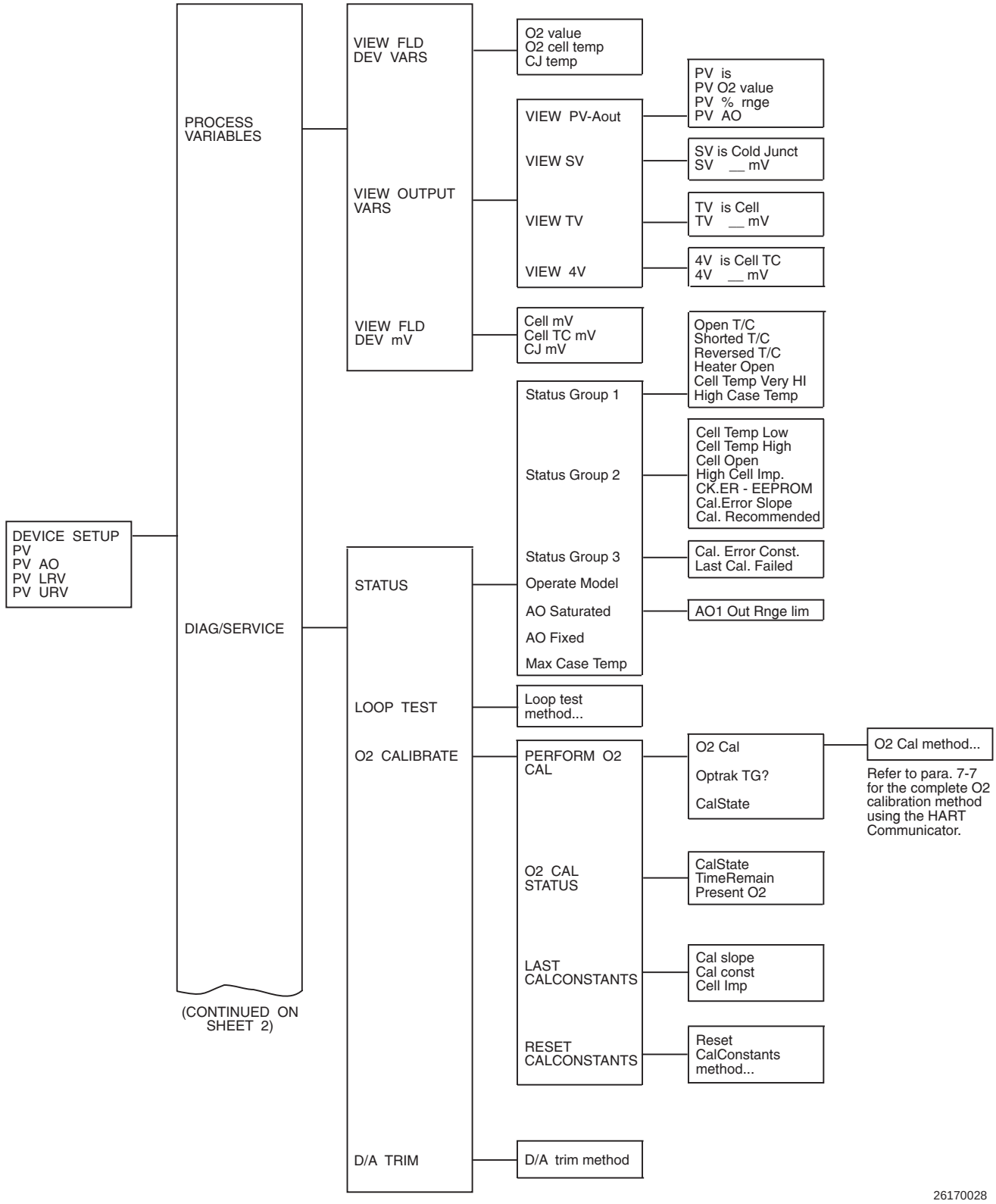


Figure 4-3. HART/AMS Menu Tree for the Hazardous Area Oxymitter 4000 (Sheet 1 of 3)

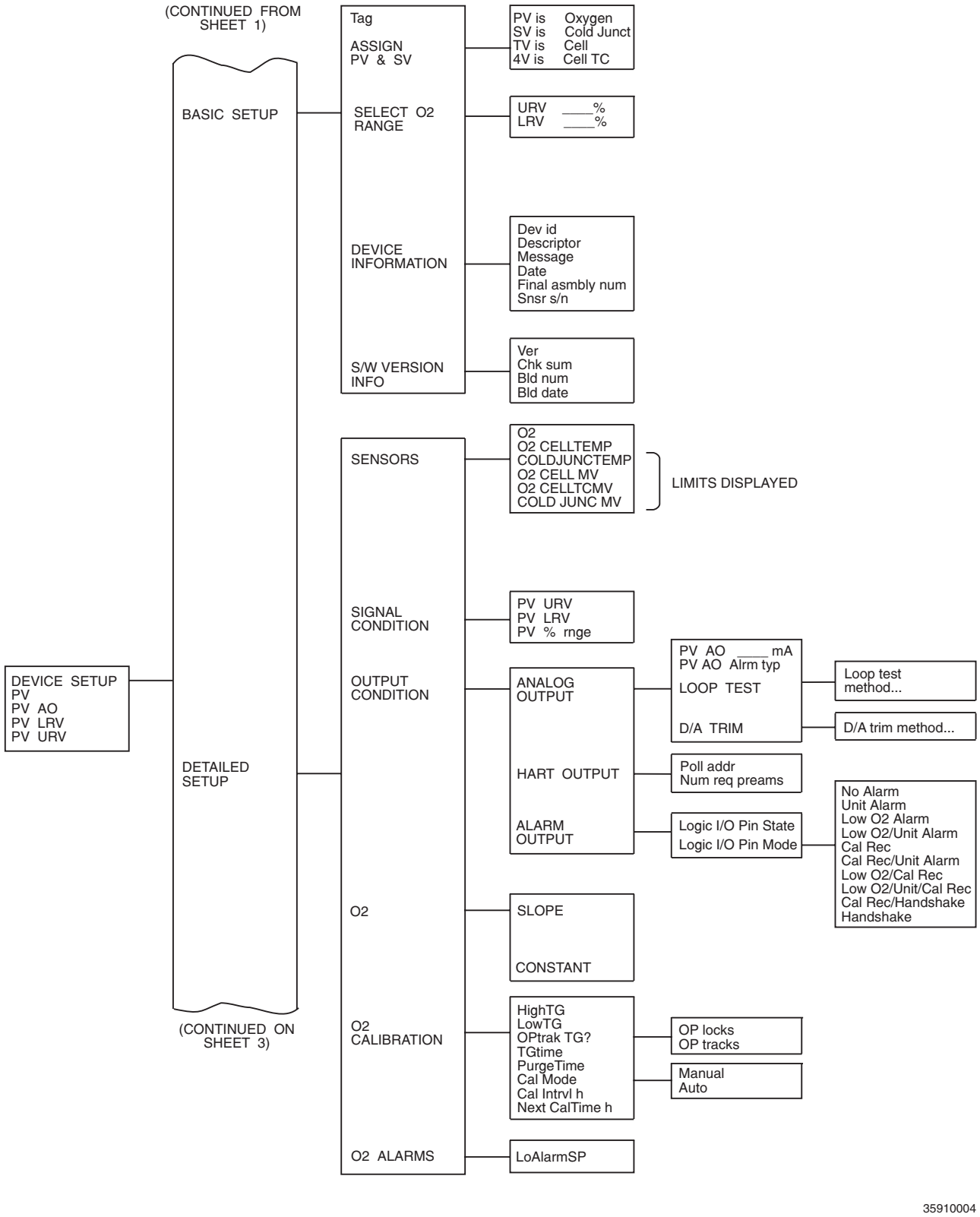


Figure 4-3. HART/AMS Menu Tree for the Hazardous Area Oxymitter 4000 (Sheet 2 of 3)

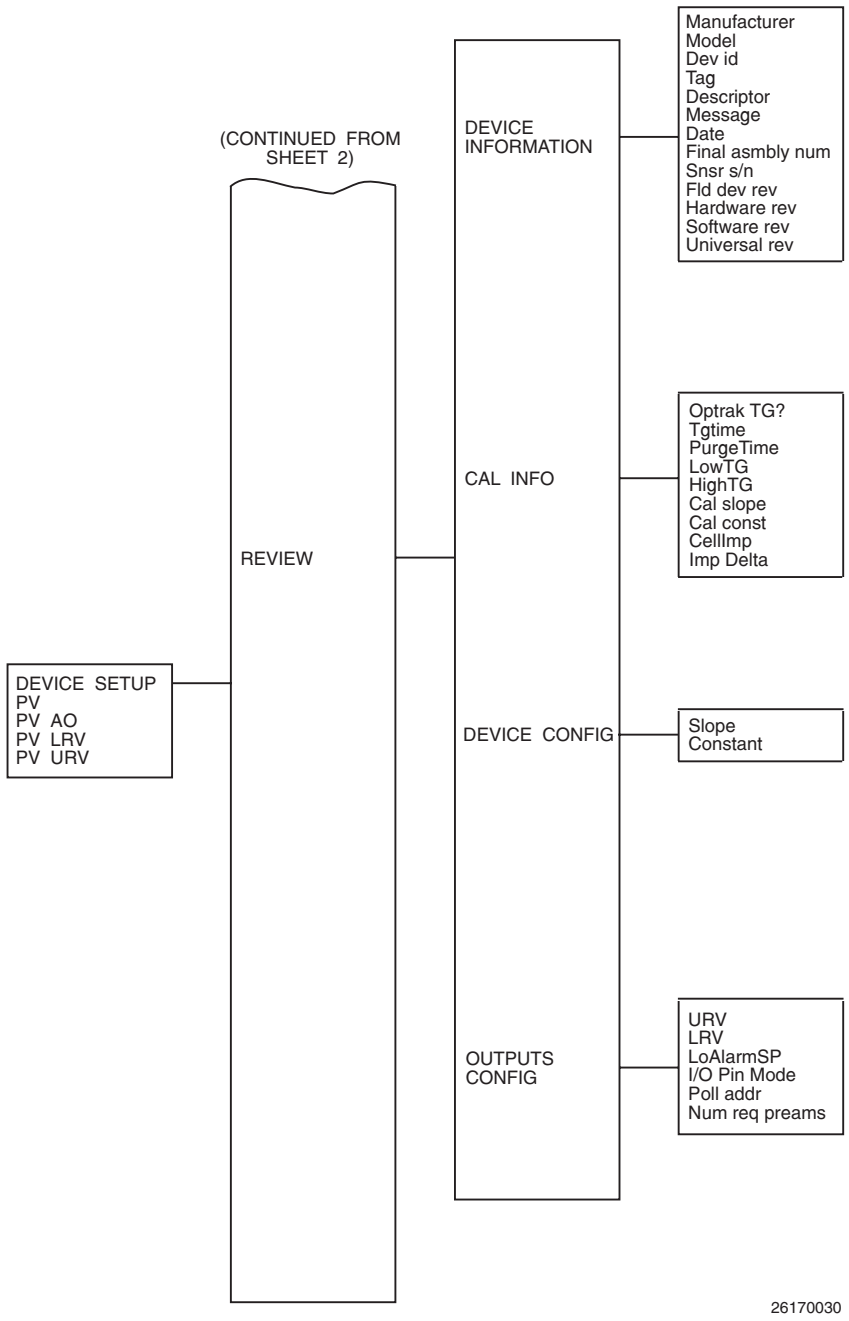


Figure 4-3. HART/AMS Menu Tree for the Hazardous Area Oxymitter 4000 (Sheet 3 of 3)

4-7 HART COMMUNICATOR O_2 CAL METHOD

To perform a calibration using 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.

a. From the PERFORM O_2 CAL screen, select menu item 1, O_2 CAL, to access the O_2 calibration procedure.

WARNING

Failure to remove the Hazardous Area Oxymitter 4000 from automatic control loops prior to performing this procedure may result in a dangerous operating condition.

b. In the first O_2 CAL screen, a "Loop should be removed from automatic control" warning appears. Remove the Hazardous Area Oxymitter 4000 from any automatic control loops to avoid a potentially dangerous operating condition and press OK.

c. The next several screens indicate the calibration status. At each of the following status prompts, select menu item 2, NEXT CAL STEP:

COMPLETE
CAL RECOMMENDED
APPLY GAS 1
GAS 1 FLOW

d. At this point, select menu item 4, EXIT, to leave the O_2 CAL procedure.

e. From the PERFORM O_2 CAL screen, view menu item 3, CALSTATE, to monitor the calibration status as it updates. Or, access the O_2 CALIBRATE screen and select menu item 2, O_2 CAL STATUS, to view menu item 1, CAL-STATE; menu item 2, TIMEREMAIN; and menu item 3, PRESENT O_2, as the calibration status updates.

f. When CALSTATE displays APPLY GAS 2, return to the O_2 CAL procedure.

g. When the "Loop should be removed from automatic control" warning appears, press OK.

h. At the APPLY GAS 2 status prompt, select menu item 2, NEXT CAL STEP. When the status displays GAS 2 FLOW, select menu item 4, EXIT, to leave the O_2 CAL procedure.

i. From the PERFORM O_2 CAL screen, view menu item 3, CALSTATE, to monitor the calibration status as it updates. Or, access the O_2 CALIBRATE screen and select menu item 2, O_2 CAL STATUS, to view menu item 1, CAL-STATE; menu item 2, TIMEREMAIN; and menu item 3, PRESENT O_2, as the calibration status updates.

j. When CALSTATE displays STOP GAS, return to the O_2 CAL procedure.

k. When the "Loop should be returned to automatic control" message appears, return the Hazardous Area Oxymitter 4000 to the automatic control loops previously removed and press OK.

l. At the STOP GAS status prompt, select menu item 2, NEXT CAL STEP. When the status displays PURGING, select menu item 4, EXIT, to leave the O_2 CAL procedure.

m. From the PERFORM O_2 CAL screen, view menu item 3, CALSTATE, to monitor the calibration status as it updates. Or, access the O_2 CALIBRATE screen and select menu item 2, O_2 CAL STATUS, to view menu item 1, CAL-STATE; menu item 2, TIMEREMAIN; and menu item 3, PRESENT O_2, as the calibration status updates.

n. When CALSTATE displays COMPLETE, the calibration is finished.

4-8 DEFINING A TIMED CALIBRATION VIA HART

Use the following procedure to specify a time interval (in hours) at which the Hazardous Area Oxymitter 4000 will be automatically calibrated.

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.

a. From the DEVICE SETUP screen, select DETAILED SETUP.

b. From the DETAILED SETUP screen, select O_2 CALIBRATION.

c. From the O_2 CALIBRATION screen, select menu item 6, CAL MODE. Set the CAL MODE to AUTO.

d. Return to the O_2 CALIBRATION screen and select menu item 7, CAL INTRVL.

e. At the prompt, input a time interval (in hours) at which an automatic calibration will occur and press ENTER.

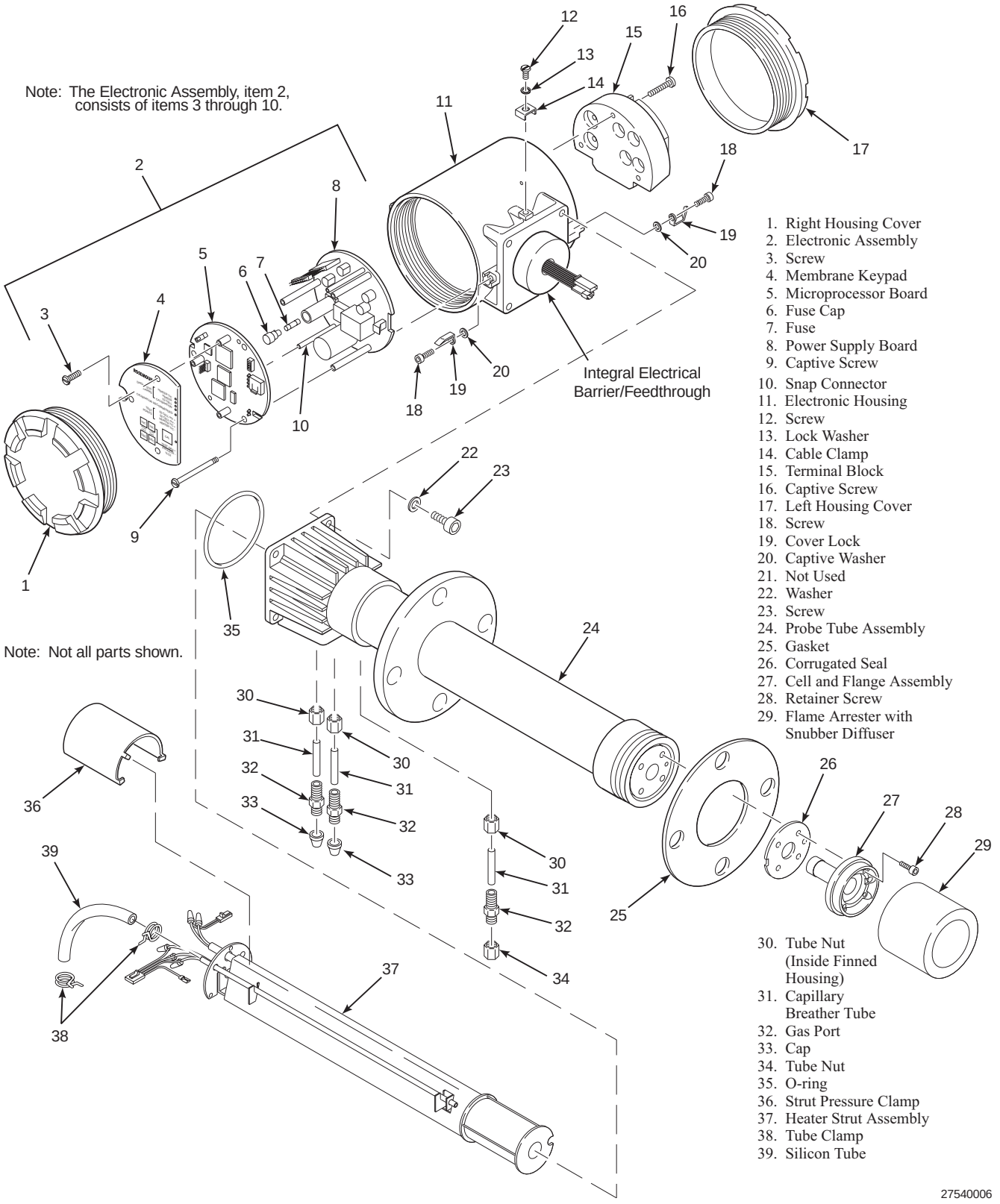


Figure 5-1. Hazardous Area Oxymitter 4000 Exploded View

SECTION 5
MAINTENANCE AND SERVICE

WARNING

When working on this equipment on the laboratory bench, be aware that the Hazardous Area Oxymitter 4000, probe tube, and flame arrester hub can be hot [up to 300°C (572°F)] in the region of the probe heater.

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.

5-1 OVERVIEW

This section identifies the calibration methods available and provides the procedures to maintain and service the Hazardous Area Oxymitter 4000.

5-2 CALIBRATION

a. During a calibration, two calibration gases with known O_2 concentrations are applied to the Hazardous Area Oxymitter 4000. Slope and constant values calculated from the two calibration gases determine if the Hazardous Area Oxymitter 4000 is correctly measuring the net concentration of O_2 in the industrial process.

Before calibrating the Hazardous Area Oxymitter 4000, verify that the calibration gas parameters are correct by setting the gas concentrations used when calibrating the unit (See paragraph 3-8a.5.) and by setting the calibration gas flowmeter.

The calibration gas flowmeter regulates the calibration gas flow and must be set to 5 scfh. However, only adjust the flowmeter to 5 scfh after placing a new diffuser on the end of the probe. Adjusting the flowmeter at any other time can pressurize the cell and bias the calibration.

In applications with a heavy dust loading, the O_2 probe diffusion element may become plugged over time, causing a slower speed of response. The best way to detect a plugged diffusion element is to note the time it takes the Hazardous Area Oxymitter 4000 to return to the normal process reading after the last calibration gas is removed and the calibration gas line is blocked off. A plugged diffusion element also can be indicated by a slightly lower reading on the flowmeter.

Change the diffusion element when the calibration gas flowmeter reads slightly lower during calibration or when the response time to the process flue gases becomes very slow. Each time the diffusion element is changed, reset the calibration gas flowmeter to 5 scfh and calibrate the Hazardous Area Oxymitter 4000. To change the diffusion element, refer to paragraph 5-9.

b. Three types of calibration methods are available: automatic, semi-automatic, and manual.

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

WARNING

Do not install an IMPS 4000 or SPS 4000 within the hazardous area. Installing the unit in a potentially explosive environment could cause serious injury or death and equipment damage. Ensure the sequencer is installed in a safe area.

NOTE

A calibration can be aborted any time during the process by pressing the CAL key (Figure 5-2) on the Hazardous Area Oxymitter 4000 keypad three times in a three second interval or via HART/AMS or an IMPS 4000. An aborted calibration will retain the values of the previous good calibration.

1. Automatic Calibration. Automatic calibrations require no operator action. However, the calibration gases must be permanently piped to the Hazardous Area Oxymitter 4000, an SPS 4000 or IMPS 4000 must be installed to sequence the gases, and the logic I/O must be set to mode 8 via HART/AMS so the sequencer and Hazardous Area Oxymitter 4000 can communicate.

   Depending on your system setup, an automatic calibration can be initiated by the following methods:

   (a) The Hazardous Area Oxymitter 4000's CALIBRATION RECOMMENDED alarm signals that a calibration is required.

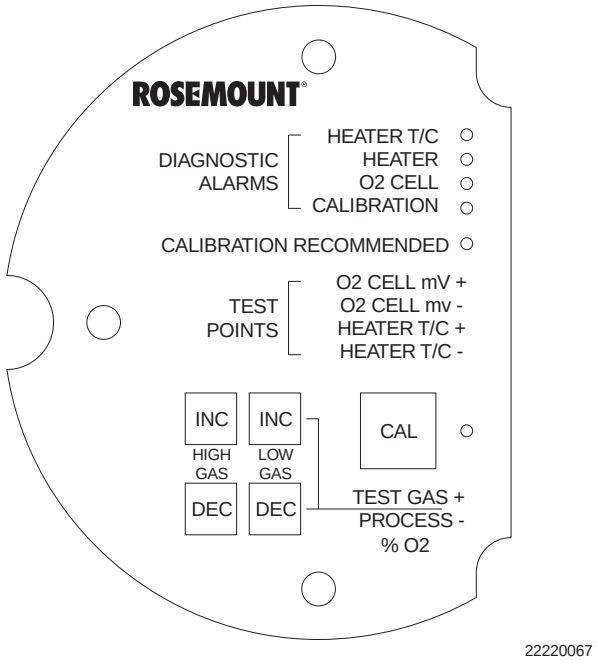


Figure 5-2. Membrane Keypad

   (b) Enter a "time since last cal" parameter (CAL INTRVL) via HART/AMS that will initiate an automatic calibration at a scheduled time interval (in hours). To configure the CAL INTRVL parameter, refer to paragraph 4-8.

   (c) If using an IMPS 4000, enter a time interval via the IMPS 4000 keypad that will initiate an automatic calibration at a scheduled time interval (in hours). To set the CalIntvX parameter of the CHANGE PRESETS display mode, refer to the IMPS 4000 Intelligent Multiprobe Test Gas Sequencer Instruction Bulletin for more information.

   Once an automatic calibration is initiated, by any of the methods previously described, the Hazardous Area Oxymitter 4000's CALIBRATION RECOMMENDED alarm signals an IMPS 4000 or SPS 4000 to initiate a calibration. The sequencer sends an "in cal" signal to the control room so that any automatic control loops can be placed in manual. Then, the sequencer begins to sequence the calibration gases.

2. Semi-Automatic Calibration. Semi-automatic calibrations only require operator initiation. However, the calibration gases must be permanently piped to the Hazardous Area Oxymitter 4000, an SPS 4000 or IMPS 4000 must be installed to sequence the gases, and the logic I/O must be set to mode 8 or 9 via HART/AMS so the sequencer and Hazardous Area Oxymitter 4000 can communicate.

3. Depending on your system setup, a semi-automatic calibration can be initiated by the following methods:

   (a) Hazardous Area Oxymitter 4000. Press the CAL key on the Hazardous Area Oxymitter 4000 keypad.

   (b) IMPS 4000. Use the IMPS 4000 keypad to change the InitCalX parameter of the CHANGE PRESETS display mode from 0000 to 0001. Refer to the IMPS 4000 Intelligent Multiprobe Test Gas Sequencer Instruction Bulletin for more information.

   (c) HART. Use the HART Communicator to access the O_2 CALIBRATE menu and perform the O_2 CAL method. Refer to paragraph 4-7 for the complete calibration procedure.

   (d) AMS. Refer to AMS documentation for more information.

   (e) Remote Contact. Initiate a calibration from a remote location via the remote contact input connection provided by an IMPS 4000 or SPS 4000.

   Refer to the documentation available for the control system in use for more information.

   Once a semi-automatic calibration is initiated by any of the methods previously described, the Hazardous Area Oxymitter 4000's CALIBRATION RECOMMENDED alarm signals an IMPS 4000 or SPS 4000 to initiate a calibration. The sequencer sends an "in cal" signal to the control room so that any automatic control loops can be placed in manual. Then, the sequencer begins to sequence the calibration gases.

4. Manual Calibration. Manual calibrations must be performed at the Hazardous Area Oxymitter 4000 site and require operator intervention throughout the process.

   Manual calibration instructions can also be found, in condensed form, on the inside of the right electronics housing cover. See Figure 5-3.

   Use the following procedure to perform a manual calibration:

   (a) Place control loop in manual.

   (b) Verify the calibration gas parameters are correct per paragraph 5-2a.

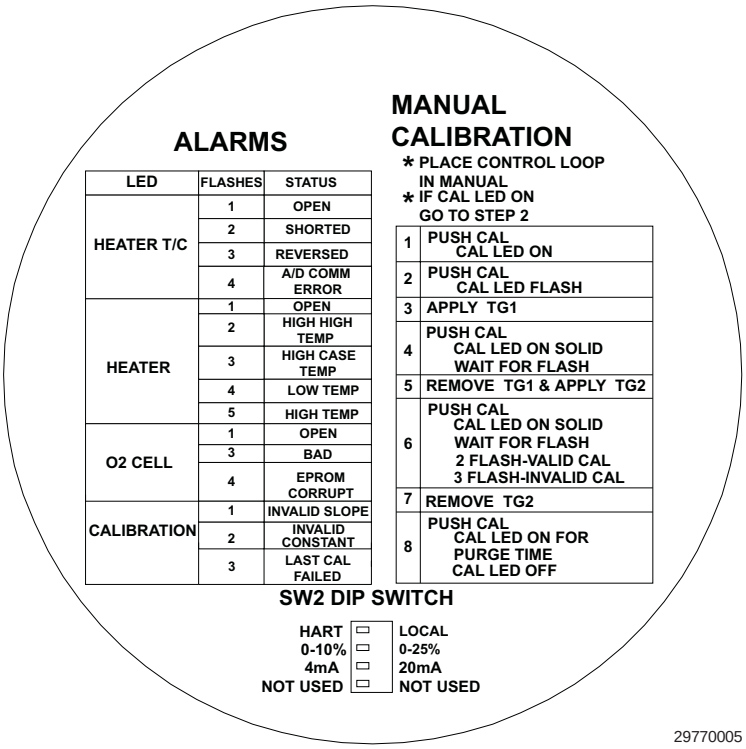


Figure 5-3. Inside Right Cover

(c) If performing a manual calibration with CALIBRATION RECOMMENDED LED off and the CAL LED off, start at step 1.

(d) If performing a manual calibration with CALIBRATION RECOMMENDED LED on and the CAL LED on, start at step 2.

1 Push the CAL key. The CALIBRATION RECOMMENDED LED will come on and the CAL LED will be on solid. If a multimeter is attached across TP5 and TP6, the reading will display the percentage of oxygen seen by the cell.

2 Push the CAL key. The CALIBRATION RECOMMENDED LED will turn off and the CAL LED will flash continuously. The Hazardous Area Oxymitter 4000 can be configured so that the 4-20 mA signal will hold the last value. The default condition is for the output to track. The flashing LED indicates that the Hazardous Area Oxymitter 4000 is ready to accept the first calibration gas.

3 Apply the first calibration gas. (Electronics will abort the calibration if step 4 is not done within 30 minutes).

4 Push the CAL key; the CAL LED will be on solid. A timer is activated to allow the calibration gas adequate time to flow (default time of five minutes). When the timer times out, the Hazardous Area Oxymitter 4000 has taken the readings using the first calibration gas and the CAL LED will flash continuously. The flashing indicates the Hazardous Area Oxymitter 4000 is ready to take readings using the second calibration gas.

5 Remove the first calibration gas and apply the second calibration gas. (Electronics will abort the calibration if step 6 is not done within 30 minutes).

6 Push the CAL key; the CAL LED will be on solid. The timer is activated for the second calibration gas flow. When the timer times out, the CAL LED will flash a 2 pattern flash or a 3 pattern flash (2 pattern flash equals a valid calibration, 3 pattern flash equals an invalid calibration).

If the slope or the constant is out of specification, a diagnostic alarm LED will be flashing. The diagnostic alarm will remain active until the purge cycle is over. If the three pattern flash occurs without a diagnostic alarm, the calibration gases could be the same or the calibration gas was not turned on.

The CAL LED flashing indicates the calibration is done. (See Section 6, TROUBLESHOOTING, for an explanation of the 2 pattern and 3 pattern flashes).

7 Remove the second calibration gas and cap off the calibration gas port.

8 Push the CAL key; the CAL LED will be on solid as the unit purges. (Default purge time is three minutes). When the purge is complete, the CAL LED will turn off and the Hazardous Area Oxymitter 4000 output unlocks from its held value and begins to read the process O_2.

If the calibration was valid, the DIAGNOSTIC ALARMS LEDs will indicate normal operation. If the new calibration values, slope or constant, is not within the parameters, the DIAGNOSTIC ALARMS LED will indicate an alarm. (See Section 6, TROUBLESHOOTING, for alarm codes). If the calibration was invalid, the Hazardous Area Oxymitter 4000 will return to normal operation, as it was before a calibration was initiated, and the parameters will not be updated.

(e) Place control loop in automatic.

5-3 LED STATUS INDICATORS

a. Diagnostic/Unit Alarms. Table 5-1 lists the types and status of alarms that will be encountered. (See Section 6, TROUBLESHOOTING, for a detailed description of each fault).

b. When the electronics determine a calibration is recommended, the CALIBRATION RECOMMENDED LED is on solid.

c. The CAL LED turns on when a calibration is recommended and is on during the calibration process. During calibration, the CAL LED can be flashing, which would indicate operator action is requested, or on solid, which indicates calculations and measurements are in progress.

Table 5-1. Diagnostic/Unit Alarms

LED	FLASHES	STATUS	FAULT
HEATER T/C	1	OPEN	1
	2	SHORTED	2
	3	REVERSED	3
	4	A/D COMM ERROR	4
HEATER	1	OPEN	5
	2	HIGH HIGH TEMP	6
	3	HIGH CASE TEMP	7
	4	LOW TEMP	8
	5	HIGH TEMP	9
O_2 CELL	1	HIGH mV	10
	3	BAD	11
	4	EEPROM CORRUPT	12
CALIBRATION	1	INVALID SLOPE	13
	2	INVALID CONSTANT	14
	3	LAST CALIBRATION FAILED	15

WARNING

It is recommended that the Hazardous Area Oxymitter 4000 be removed from the stack for all service activities. The unit should be allowed to cool and be taken to a clean work area. Failure to comply may cause severe burns.

WARNING

Disconnect and lock out power before working on any electrical components. There is voltage up to 115 VAC.

5-4 HAZARDOUS AREA OXYMITTER 4000 REMOVAL REPLACEMENT

a. Remove

1. Turn off power to the system.
2. Shut off the calibration gases at the cylinders and the instrument air.
3. Disconnect the calibration gas and instrument air lines from the Hazardous Area Oxymitter 4000.

4. While facing the Hazardous Area Oxymitter 4000 and looking at the Rosemount label, remove screw (18, Figure 5-1), cover lock (19), and captive washer (20) securing left housing cover (17). Remove the cover to expose the terminal block. See Figure 5-4.
5. Loosen the screw on the AC terminal cover and slide the cover back to access the neutral and line terminals. Loosen the AC line and neutral terminal screws and remove the leads. Loosen the ground lug screws and remove the leads. Slide the line power leads out of the AC line voltage port.
6. Loosen the logic I/O and the 4-20 mA signal terminal screws. Remove the leads from the terminals and slide the wires out of the signal port.
7. Remove insulation to access the mounting bolts. Unbolt the Hazardous Area Oxymitter 4000 from the stack and take it to a clean work area.
8. Allow the unit to cool to a comfortable working temperature.

b. Replace

1. Bolt the Hazardous Area Oxymitter 4000 to the stack and install insulation.
2. See Figure 5-4. Insert the logic I/O and 4-20 mA leads in the signal port and connect to the logic I/O and 4-20 mA screw terminals.
3. Insert the power leads in the AC line voltage port and connect to the AC line screw terminals. Connect the line, or L1, wire to the L1 terminal, and the neutral, or L2, wire to the N terminal. Slide the AC terminal cover over the terminal connection and tighten the cover screw.
4. Install left housing cover (17, Figure 5-1) and ensure it is tight. Secure the cover using captive washer (20), cover lock (19), and screw (18).
5. Connect the calibration gas and instrument air lines to the Hazardous Area Oxymitter 4000.
6. Turn on the calibration gases at the cylinders and turn on instrument air.

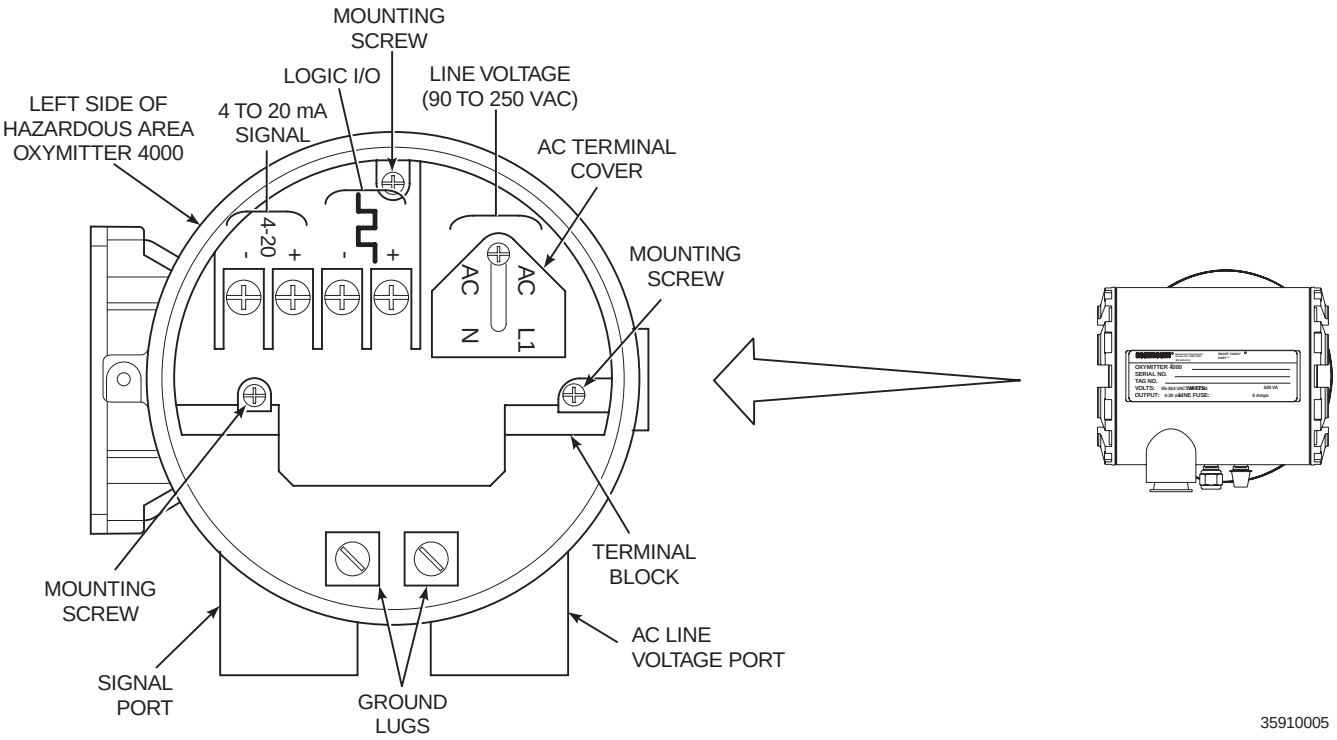


Figure 5-4. Terminal Block

7. Restore power to the system per paragraph 3-4 of Section 3, OPERATION. When the probe is at operating temperature, calibrate the probe per paragraph 5-2.

5-5 ELECTRONICS REPLACEMENT

Each of the following procedures details how to remove and replace a specific electronic component of the Hazardous Area Oxymitter 4000.

NOTE

Recalibration is required whenever electronic cards or sensing cell is replaced.

a. Entire Electronics Replacement (with Housing)

1. Follow the instructions in paragraph 5-4a to remove the Hazardous Area Oxymitter 4000 from the stack or duct.

CAUTION

Do not force the probe housing when installing or removing from the integral electrical barrier/feedthrough (Figure 6-1). Damage to the aluminum probe housing can occur.

2. Remove four screws (23, Figure 5-1) and washers (22) from the probe tube assembly. The probe and the electronic housing can now be separated.

NOTE

The integral electrical barrier/ feedthrough is thread-locked into the electrical housing and cannot be removed.

3. Make sure o-ring (35) is in good condition. Install new electronic housing and o-ring onto the probe tube assembly.

4. Make sure that the conduit port of the electronic housing is on the same side as the CAL and REF gas ports. Replace four washers (22) and screws (23) and tighten.

5. Follow the instructions in paragraph 5-4b to install the Hazardous Area Oxymitter 4000 into the stack or duct.

CAUTION

Opening the electronic housing will cause the loss of ALL hazardous permits. Opening the electronics housing in hazardous areas may cause an explosion resulting in loss of property, severe personal injury, or death. It may be required to get a hot work permit from your company safety officer before opening the electronic housing.

b. Electronic Assembly Replacement

See Figure 5-5.

1. Remove screw (18, Figure 5-1), cover lock (19), and captive washer (20) securing right housing cover (1). Remove the right housing cover to expose the electronic assembly. See Figure 5-5.

2. Depress and remove the J1 (cell and T/C) connector from the J1 socket. Loosen the three captive mounting screws on the microprocessor board (top board).

3. The J8 connector (heater leads) can be accessed by moving the J1 connector leads out of the slot on the microprocessor board and sliding the electronic assembly partially out of the housing. See Figure 5-6.

4. Squeeze the J8 connector on the sides and carefully remove. The electronic assembly can now be completely removed from the housing.

5. The J8 connector (heater leads) can be accessed by moving the J1 connector leads out of the slot on the microprocessor board and sliding the electronic assembly partially out of the housing. See Figure 5-6.

6. Squeeze the J8 connector on the sides and carefully remove. The electronic assembly can now be completely removed from the housing.

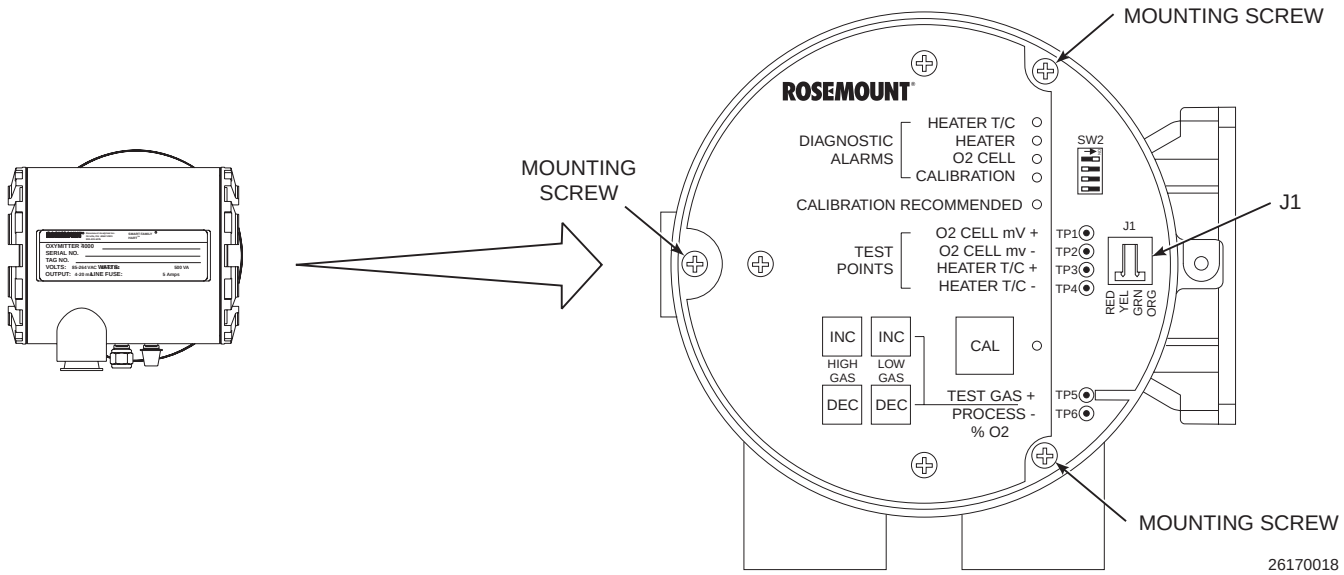


Figure 5-5. Electronic Assembly

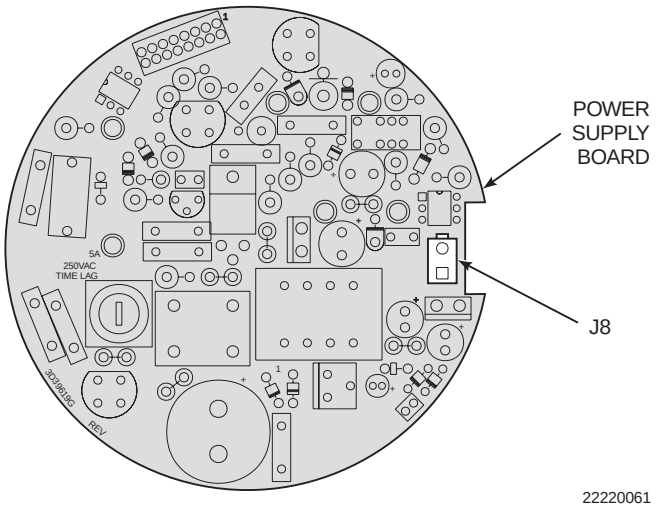


Figure 5-6. J8 Connector

7. Reconnect the J8 connector to the power supply board. Make sure the connector is secure.

8. Holding the J1 connector leads, slide the electronic assembly the rest of the way into the housing. Align the electronic assembly so that it fits flush on the pins. To ensure that it is flush, gently try to rotate the electronics. If the electronics rotates, repeat the alignment.

9. Reconnect the J1 connector to the microprocessor board (Figure 5-5). Ensure the connector is secure and tighten the three captive screws on the microprocessor board (top board).

10. Replace right housing cover (1, Figure 5-1) and ensure it is tight. Secure the cover using captive washer (20), cover lock (19), and screw (18).

CAUTION

Opening the electronic housing will cause the loss of ALL hazardous permits. Opening the electronics housing in hazardous areas may cause an explosion resulting in loss of property, severe personal injury, or death. It may be required to get a hot work permit from your company safety officer before opening the electronic housing.

c. Terminal Block Replacement

See Figure 5-4.

1. Loosen the mounting screws on the terminal block and carefully lift the block out of the housing.

2. Carefully align the new terminal block on the pins so that it sits flat in the housing. The round end of the terminal block should be on the opposite side of the housing conduit ports and should not be able to rotate.

3. Tighten the three mounting screws and ensure the terminal block is secure in the housing.

WARNING

Opening the electronic housing will cause the loss of ALL hazardous permits. Opening the electronics housing in hazardous areas may cause an explosion resulting in loss of property, severe personal injury, or death. It may be required to get a hot work permit from your company safety officer before opening the electronic housing.

d. Fuse Replacement

See Figure 5-5.

1. Remove screw (18, Figure 5-1), cover lock (19), and captive washer (20) securing right housing cover (1). Remove the right housing cover to expose the electronic assembly. See Figure 5-5.

2. Depress and remove the J1 (cell and T/C) connector from the J1 socket. Loosen the three captive mounting screws on the microprocessor board (top board).

3. The J8 connector (heater leads) can be accessed by moving the J1 connector leads out of the slot on the microprocessor board and sliding the electronic assembly partially out of the housing. See Figure 5-6.

4. Squeeze the J8 connector on the sides and carefully remove. The electronic assembly can now be completely removed from the housing.

5. Completely remove the three mounting screws on the microprocessor board.

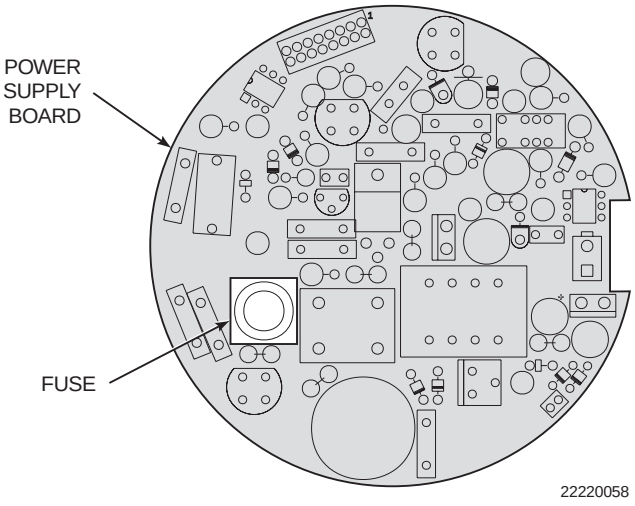


Figure 5-7. Fuse Location

6. Turn the electronic assembly over so that you are looking at the bottom of the power supply printed circuit board. Gently depress the two white posts one at a time. Carefully separate the power supply board from the microprocessor board.

7. Remove the fuse and replace it with a new one. See Figure 5-7.

8. Align the white posts with the post holes on the power supply board and the pin connector on the power supply board with the connector port on the back of the microprocessor board. Gently push the boards together until the white posts snap in place. Ensure the assembly is secure by gently trying to separate the boards.

9. Reconnect connector J8 to the power supply board. Make sure the connector is secure.

10. Holding the J1 connector leads, slide the electronic assembly the rest of the way into the housing. Align the electronic assembly so that it fits flush on the pins. To ensure that it is flush, gently try to rotate the electronics. If the electronics rotates, repeat the alignment.

11. Reconnect the J1 connector to the microprocessor board. Ensure the connector is secure and tighten the three captive screws on the microprocessor board (top board).
12. Replace right housing cover (1, Figure 5-1) and ensure it is tight. Secure the cover using captive washer (20), cover lock (19), and screw (18).

WARNING

When working on this equipment on the laboratory bench, be aware that the Hazardous Area Oxymitter 4000, probe tube, and flame arrester hub can be hot [up to 300°C (572°F)] in the region of the probe heater.

5-6 ENTIRE PROBE REPLACEMENT (EXCLUDING ELECTRONICS)

Do not attempt to replace the probe until all other possibilities for poor performance have been considered. If probe replacement is needed, see Table 8-1 for part numbers.

a. Follow the instructions in paragraph 5-4a to remove the Hazardous Area Oxymitter 4000 from the stack or duct.

b. Separate the probe and the electronics housing per paragraph 5-5a, step 2.

c. Reinstall electronics on the new probe per paragraph 5-5a, steps 3 through 4.

d. Follow the instructions in paragraph 5-4b to install the Hazardous Area Oxymitter 4000 into the stack or duct.

WARNING

When working on this equipment on the laboratory bench, be aware that the Hazardous Area Oxymitter 4000, probe tube, and flame arrester hub can be hot [up to 300°C (572°F)] in the region of the probe heater.

5-7 HEATER STRUT REPLACEMENT

This paragraph covers heater strut replacement. Do not attempt to replace the heater strut until all other possibilities for poor performance have been considered. If heater strut replacement is needed, order a replacement heater strut. See Table 8-1.

WARNING

Use heat resistant gloves and clothing when removing probe. Do not attempt to work on the probe until it has cooled to room temperature. The probe can be as hot as 300°C (572°F). This can cause severe burns.

a. Follow the instructions in paragraph 5-4a to remove the Hazardous Area Oxymitter 4000 from the stack or duct.

b. Remove oxygen sensing cell per paragraph 5-8, steps a through d.

c. Remove entire electronics per paragraph 5-5a, step 2.

d. Carefully remove the CAL and REF gas silicon tubes by pulling them off the CAL and REF gas ports.

e. Once the probe and electronic housing are separated, spring tension releases and the heater strut moves up. Remove strut pressure clamp (36, Figure 5-1).

f. Remove tube nuts (30) and capillary breather tubes (31) from the CAL, REF, and VENT ports.

g. Grasp the wire loop and carefully slide the strut out of the probe tube. See Figure 5-8.

h. When replacing the strut, align the slot on the heater plate with the calibration gas line in the probe tube. Slide the strut into the probe tube. It will turn to align the hole on the back plate of the strut with the calibration gas line. When the hole and the calibration gas line are aligned correctly, the strut will slide in the rest of the way.

i. Push down on the back plate of the strut to make sure you have spring tension and then install strut pressure clamp (36, Figure 5-1) on the back plate.

j. Install tube nuts (30) and capillary breather tubes (31) to the CAL, REF, and VENT ports.

k. Replace the CAL and REF gas silicon tubes.

l. Install the entire electronics per paragraph 5-5a, steps 3 through 4.

m. Follow the instructions in paragraph 5-4b to install the Hazardous Area Oxymitter 4000 into the stack or duct.

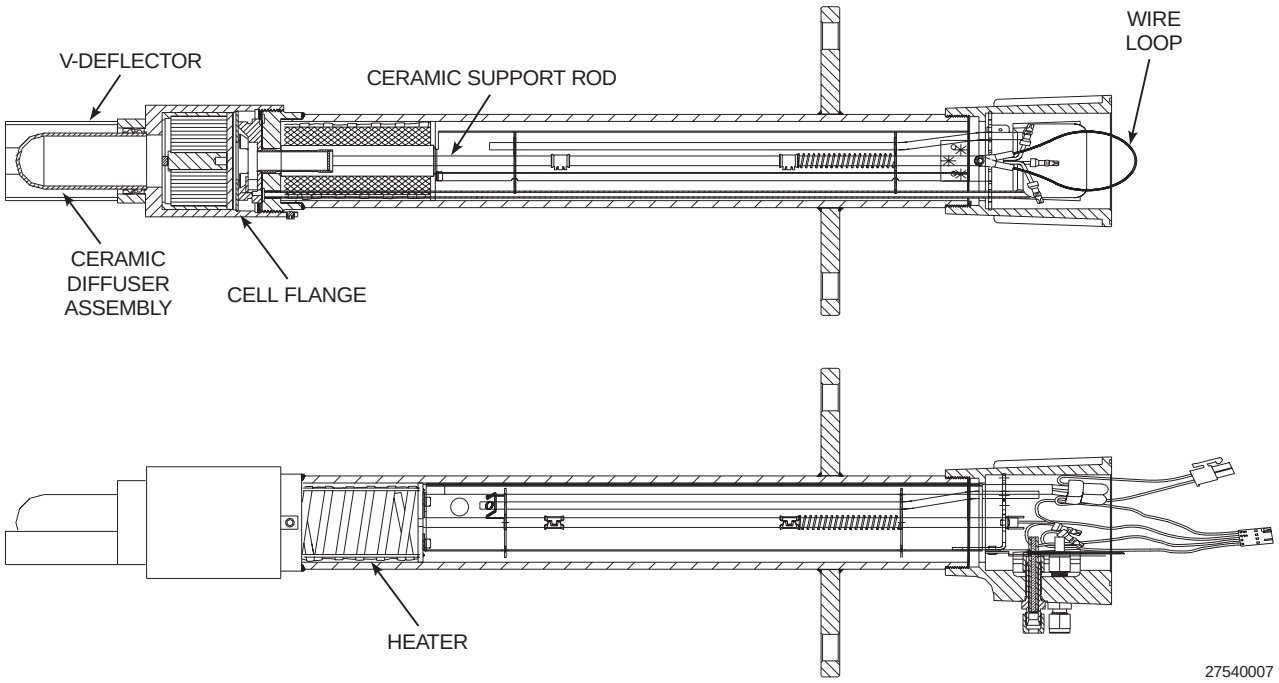


Figure 5-8. Heater Strut Assembly

WARNING

When working on this equipment on the laboratory bench, be aware that the Hazardous Area Oxymitter 4000, probe tube, and flame arrester hub can be hot [up to 300°C (572°F)] in the region of the probe heater.

5-8 CELL REPLACEMENT

This paragraph covers oxygen sensing cell replacement. Do not attempt to replace the cell until all other possibilities for poor performance have been considered. If cell replacement is needed, order the cell replacement kit. See Table 8-1.

The cell replacement kit (Figure 5-9) contains a cell and flange assembly, corrugated seal, setscrews, socket head cap screws, and anti-seize compound. The items are carefully packaged to preserve precise surface finishes. Do not remove items from the packaging until they are ready to be used. Spanner wrenches and hex wrenches needed for this procedure are part of an available special tools kit. See Table 8-1.

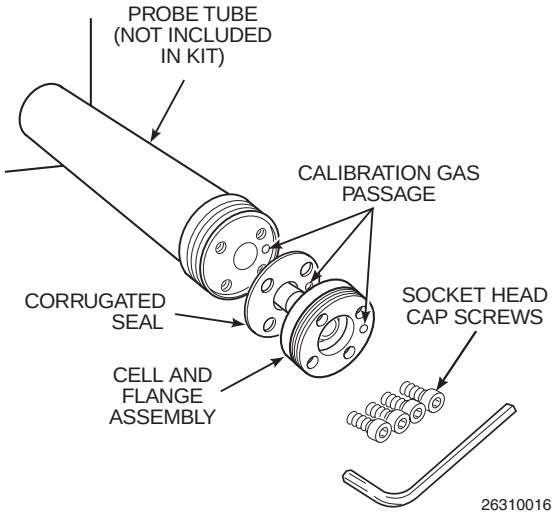


Figure 5-9. Cell Replacement Kit

WARNING

Use heat-resistant gloves and clothing when removing the probe. Do not attempt to work on these components until they have cooled to room temperature. Probe components can be as hot as 300°C (572°F). This can cause severe burns.

Disconnect and lock out power before working on any electrical components. There is voltage of up to 115 VAC.

CAUTION

Do not remove the cell unless certain it needs to be replaced. Removal may damage the cell and platinum pad. Go through the complete troubleshooting procedure to make sure the cell needs to be replaced before removing it.

a. Follow the instructions in paragraph 5-4a to remove the Hazardous Area Oxymitter 4000 from the stack or duct.

WARNING

The flame arrester and flame arrester hub are among the critical components of this type of protection. See Safety Data Sheet 1A99078.

b. If the probe uses a snubber diffuser, use a spanner wrench to remove the flame arrester/snubber diffuser assembly.

NOTE

To determine if the diffuser needs to be replaced, refer to paragraph 5-2.

c. Remove the locking set screw from the flame arrester. Use spanner wrenches from the probe disassembly kit (Table 8-1) to turn the flame arrester hub free from the probe flange. If equipped with the flame arrester with ceramic diffuser, remove and discard the setscrews and remove the vee deflector (Figure 5-10). Inspect the ceramic diffuser. If damaged, replace using paragraph 5-9.

d. Loosen the four socket head cap screws from the cell and flange assembly and remove the assembly and the corrugated seal. The cell flange has a notch that may be used to gently pry the flange away from the probe. Note that the contact pad inside of the probe will sometimes fuse to the oxygen sensing cell. If the cell is fused to the contact pad, push the cell assembly back into the probe (against spring pressure) and quickly twist the cell assembly. The cell and contact pad should separate. **If the contact pad stays fused to the cell**, a new contact/thermocouple assembly must be installed. Disconnect the orange cell wire at the probe electronics end of the strut by cutting the wire. Withdraw the cell with the wire still attached.

e. Remove entire electronics per paragraph 5-5a, step 2.

f. If the contact and thermocouple assembly is damaged, replace the assembly or the contact pad. Refer to paragraph 5-10 to replace the contact and thermocouple assembly. Instructions for replacing the contact pad are in the cell replacement kit.

g. Remove and discard the corrugated seal. Clean the mating faces of the probe tube and cell. Remove burrs and raised surfaces with a block of wood and crocus cloth. Clean the threads on the probe flange and flame arrester hub.

h. Rub a small amount of anti-seize compound on both sides of the new corrugated seal.

i. Assemble the cell and flange assembly and corrugated seal to the probe tube. Make sure the calibration tube lines up with the calibration gas passage in each component. Apply a small amount of anti-seize compound to the screw threads and use the screws to secure the assembly. Torque to 4 N·m (35 in-lbs).

j. Apply anti-seize compound to the probe threads, flame arrester hub, and setscrews. Reinstall the flame arrester on the probe. Using pin spanner wrenches, torque to 14 N·m (10 ft-lbs). Secure the flame arrester with the locking setscrew. Torque to 2.8 N·m (25 in-lbs). If applicable, reinstall the vee deflector, orienting apex toward gas

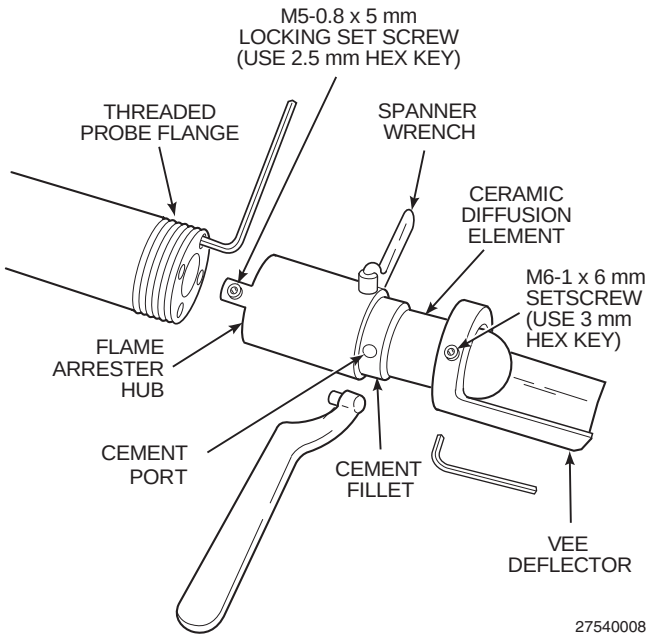


Figure 5-10. Ceramic Diffuser Element Replacement

flow. Secure with the setscrew and anti-seize compound. Torque to 2.8 N·m (25 in-lbs).

k. On systems equipped with an abrasive shield, install the dust seal gaskets, with joints 180° apart.

l. If previously removed, install the entire electronics per paragraph 5-5a, steps 3 through 4.

m. Follow the instructions in paragraph 5-4b to install the Hazardous Area Oxymitter 4000 into the stack or duct. If there is an abrasive shield in the stack, make sure the dust seal gaskets are in place as they enter the 15° reducing cone.

5-9 CERAMIC DIFFUSION ELEMENT REPLACEMENT

NOTE

This refers to ceramic diffuser element only.

a. General

The diffusion element protects the cell from particles in process gases. It does not normally need to be replaced because the vee deflector protects it from particulate erosion. In severe environments, the filter may be broken or subject to excessive erosion. Examine the ceramic diffusion element whenever removing the probe for any purpose. Replace if damaged.

Damage to the ceramic diffusion element may become apparent during calibration. Compare probe response with previous response. A broken diffusion element will cause a slower response to calibration gas.

Hex wrenches needed to remove setscrews and socket head screws in the following procedure are available as part of a Probe Disassembly Kit, Table 8-1.

b. Replacement Procedure

1. Follow the instructions in paragraph 5-4a to remove the Hazardous Area Oxymitter 4000 from the stack or duct.
2. Loosen setscrews, Figure 5-10, using hex wrench from Probe Disassembly Kit, Table 8-1 and remove vee deflector. Inspect setscrews. If damaged, replace with stainless setscrews coated with anti-seize compound.
3. On systems equipped with abrasive shield, remove dual dust seal gaskets.
4. Use spanner wrenches from Probe Disassembly Kit, Table 8-1, to turn hub free from retainer.
5. Put hub in vise. Break out old ceramic diffusion element with chisel along cement line and 9.5 mm (3/8 in.) pin punch through cement port.
6. Break out remaining ceramic diffusion element by tapping lightly around hub with hammer. Clean grooves with pointed tool if necessary.
7. Replace ceramic diffusion element using the ceramic diffusion element replacement kit in Table 8-1. This consists of a diffusion element, cement, setscrews, anti-seize compound and instructions.
8. Test fit replacement ceramic diffusion element to be sure seat is clean.

CAUTION

Do not get cement on ceramic diffusion element except where it touches the hub. Any cement on ceramic diffusion element blocks airflow through element. Wiping wet cement off of ceramic only forces cement into pores. Also do not get any cement onto the flame arrester element.

9. Thoroughly mix cement and insert tip of squeeze bottle into cement port. Tilt bottle and squeeze while simultaneously turning ceramic diffusion element into seat. Do not get any cement on upper part of ceramic diffusion element. Ensure complete penetration of cement around 3 grooves in hub. Cement should extrude from opposite hole. Wipe excess material back into holes and wipe top fillet of cement to form a uniform fillet. (A Q-Tip is useful for this.) Clean any excess cement from hub with water.
10. Allow filter to dry at room temperature overnight or 1 to 2 hours at 93°C (200°F).
11. Wipe a heavy layer of anti-seize compound onto the threads and mating surfaces of the flame arrester, diffusion hub, and probe tube.
12. Assemble flame arrester and diffusion hub with two pin spanner wrenches. Torque to 14 N·m (10 ft-lbs). Secure with hub retaining setscrew.
13. On systems equipped with abrasive shield, install dust seal gaskets with joints 180° apart.
14. Reinstall vee deflector, orienting apex toward gas flow. Apply anti-seize compound to setscrews and tighten with hex wrench.
15. Reinstall probe on stack flange.

5-10 CONTACT AND THERMOCOUPLE ASSEMBLY REPLACEMENT

See Figure 5-11.

a. Remove the cell per paragraph 5-8, steps a through e.

b. Remove the heater strut assembly per paragraph 5-7, steps c through g.

c. Use a pencil to mark locations of the spring clips on the ceramic rod of the contact and thermocouple assembly.

d. Squeeze the tabs on the spring clips and pull the contact and thermocouple assembly out of the heater strut assembly. Retain the spring clips and spring; replace if damaged.

e. While very carefully handling the new contact and thermocouple assembly, lay the old assembly next to the new one. Transfer the pencil marks to the new rod. Throw away the old contact and thermocouple assembly.

f. Carefully guide the new contact and thermocouple assembly through the spring, spring clips (held open by squeezing the tabs), tube supports, and heater support of the heater strut assembly until the spring clip reaches the pencil mark.

g. Install the cell per the instructions in paragraph 5-8, steps f through k.

h. Slide the heater strut assembly into the probe per the instructions in paragraph 5-7, steps h through l.

i. On systems equipped with an abrasive shield, install the dust seal gaskets, with joints 180° apart.

j. Follow the instructions in paragraph 5-4b to install the Hazardous Area Oxymitter 4000 into the stack or duct. If there is an abrasive shield in the stack, make sure the dust seal gaskets are in place as they enter the 15° reducing cone.

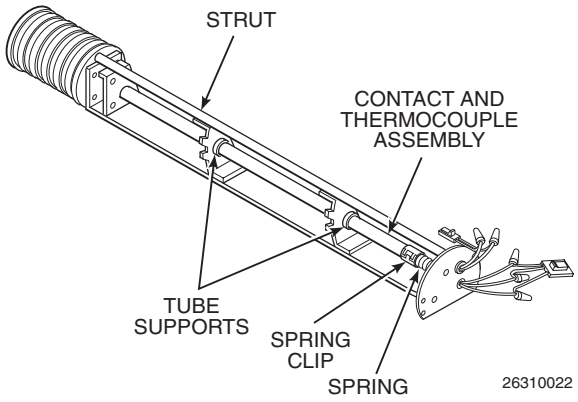


Figure 5-11. Contact and Thermocouple Assembly Replacement

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

The troubleshooting section describes how to identify and isolate faults that may develop in the Hazardous Area Oxymitter 4000. When troubleshooting, reference the following information.

a. Grounding

It is essential that adequate grounding precautions are taken when installing the system. Thoroughly check both the probe and electronics to ensure the grounding quality has not degraded during fault finding. The system provides facilities for 100% effective grounding and the total elimination of ground loops.

b. Electrical Noise

The Hazardous Area Oxymitter 4000 has been designed to operate in the type of environment normally found in a boiler room or control room. Noise suppression circuits are employed on all field terminations and main inputs. When fault finding, evaluate the electrical noise being generated in the immediate circuitry of a faulty system. Also, ensure all cable shields are connected to earth.

c. Loose Integrated Circuits

The Hazardous Area Oxymitter 4000 uses a microprocessor and supporting integrated circuits (IC). If the electronics are handled roughly during installation or located where subjected to severe vibration, the ICs could work loose. Before troubleshooting the system, ensure all ICs are fully seated.

d. Electrostatic Discharge

Electrostatic discharge can damage the ICs used in the electronics. Before removing or handling the processor board or the ICs, ensure you are at ground potential.

6-2 ALARM INDICATIONS

The majority of the fault conditions for the Hazardous Area Oxymitter 4000 will be indicated by one of the four LEDs referred to as diagnostic, or unit alarms on the operator's keypad. An LED will flash a code that will correspond to an error message.

Only one LED will blink at a time. An alarm code guide is provided inside the screw cover for the electronics. All alarm indications will be available via the HART Model 275 handheld communicator and Rosemount's Asset Management software. When the error is corrected and/or power is cycled, the diagnostic alarms will clear or the next error on the priority list will appear.

6-3 ALARM CONTACTS

a. If autocalibration is not utilized, a common bi-directional logic contact is provided for any of the diagnostic alarms listed in Table 6-1. The assignment of alarms which can actuate this contact can be modified to one of seven additional groupings listed in Table 4-1.

The logic contact is self-powered, +5 VDC, 340 ohm series resistance. An interposing relay will be required if this contact is to be utilized to annunciate a higher voltage device, such as a light or horn, and may also be required for certain DCS input cards. A Potter & Brumfield R10S-E1Y1-J1.0K 3.2 mA DC or an equal interposing relay will be mounted where the contact wires terminate in the control/relay room.

b. If autocalibration systems are utilized, the bidirectional logic contact is utilized as a "hand-shake" signal between the autocalibration system (SPS 4000 or IMPS 4000) and is unavailable for alarming purposes. The following additional contacts are provided through the autocalibration systems:

1. SPS 4000 and IMPS 4000, 1-4 probes.

   (a) One contact closure per probe from the control room to the SPS 4000 or IMPS 4000 for "calibration initiate".

   (b) One contact output per probe from the SPS 4000 or IMPS 4000 to the control room for "in calibration" notification.

   (c) One contact output per probe from the SPS 4000 or IMPS 4000 to the control room for "calibration failed" notification. (Includes output from pressure switch indicating "cal gas bottles empty").

2. Additional IMPS 4000 Alarm Contacts.

   (a) One contact per IMPS 4000 for "low calibration gas flowing".

   (b) One contact per IMPS 4000 for "high calibration gas flowing".

NOTE

The 4-20 mA signal can be configured to respond normally during any calibration, or can be configured to hold the last O_2 value upon the initiation of calibration. Factory default is for the 4-20 mA signal to operate normally throughout calibration. Holding the last O_2 value may be useful if several probes are being averaged for the purpose of automatic control.

Unless several probes are being averaged, always place any control loops using the O_2 signal into manual prior to calibrating.

6-4 IDENTIFYING AND CORRECTING ALARM INDICATIONS

Faults in the Hazardous Area Oxymitter 4000 are indicated using the four diagnostic, or unit, alarms. The pattern of repeating blinks will define the problem. A condensed table of the errors and the corresponding blink codes can be found on the inside right cover of the electronics housing. Table 6-1 also identifies the blink code and fault status of each LED as well as the output of the 4-20 mA signal line and a fault number that corresponds to the troubleshooting instructions provided in this section.

Table 6-1. Diagnostic/Unit Alarm Fault Definitions

LED	FLASHES	STATUS	4-20 mA LINE	FAULT	SELF-CLEARING
HEATER T/C	1	OPEN	Dependent on position 3 of SW2*	1	NO
	2	SHORTED	Dependent on position 3 of SW2*	2	NO
	3	REVERSED	Dependent on position 3 of SW2*	3	NO
	4	A/D COMM ERROR	Dependent on position 3 of SW2*	4	NO
HEATER	1	OPEN	Dependent on position 3 of SW2*	5	NO
	2	HIGH HIGH TEMP	Dependent on position 3 of SW2*	6	NO
	3	HIGH CASE TEMP	Dependent on position 3 of SW2*	7	YES
	4	LOW TEMP	Dependent on position 3 of SW2*	8	YES
	5	HIGH TEMP	Dependent on position 3 of SW2*	9	YES
O_2 CELL	1	HIGH mV	Dependent on position 3 of SW2*	10	YES
	3	BAD	Track O_2	11	YES
	4	EEPROM CORRUPT	Dependent on position 3 of SW2*	12	NO
CALIBRATION	1	INVALID SLOPE	Track O_2	13	YES
	2	INVALID CONSTANT	Track O_2	14	YES
	3	LAST CALIBRATION FAILED	Track O_2	15	YES
	**	CALIBRATION RECOMMENDED	Track O_2		YES

* Critical alarm conditions will render the O_2 measurement as unusable, and any of these events will cause the 4-20 mA signal to go to a user-selectable limit of 3.5 mA or 21 mA (position 3 of SW2). Factory default value is 3.5 mA. Alarms which are not “self-clearing” will require recycling of power to the electronics.

** The CALIBRATION RECOMMENDED alarm flashes the Calibration Recommended alarm LED on the operator’s keypad.

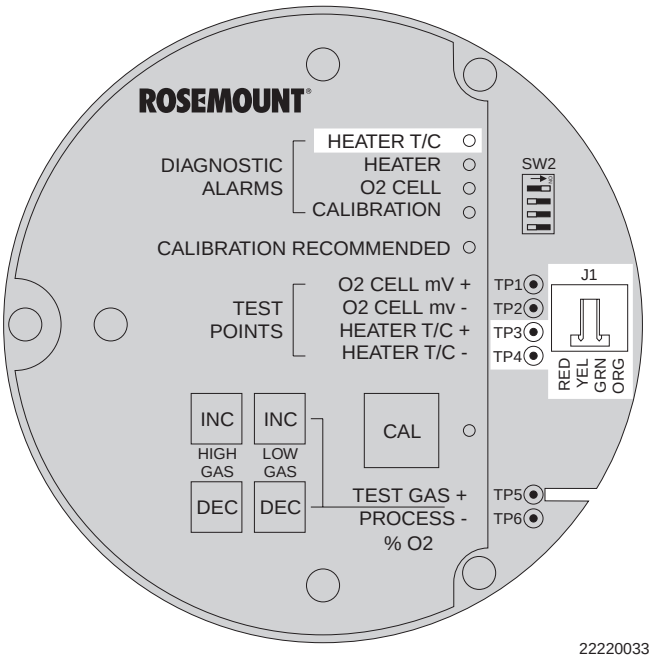


Figure 6-1. Fault 1, Open Thermocouple

a. Fault 1, Open Thermocouple

The HEATER T/C LED flashes once, pauses for three seconds, and repeats. See Figure 6-1.

1. Check connector J1. Ensure the connector is properly seated.
2. Using a multimeter, measure TP3+ to TP4-. If the reading is 1.2 VDC ±0.1 VDC, the thermocouple is open.
3. Remove power. Disconnect J1. Measure continuity across the red and yellow thermocouple leads.
4. The measurement should read approximately 1 ohm.
5. If the thermocouple is open, see paragraph 5-7, Heater Strut Replacement.

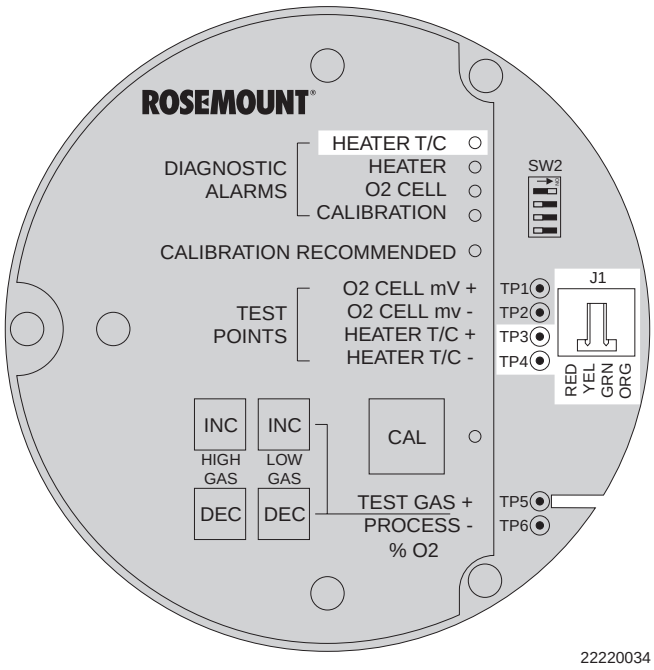


Figure 6-2. Fault 2, Shorted Thermocouple

b. Fault 2, Shorted Thermocouple

The HEATER T/C LED flashes twice, pauses for three seconds, and repeats. See Figure 6-2.

1. Using a multimeter, measure across TP3+ and TP4-.
2. If the reading is 0 ±0.5 mV, then a shorted thermocouple is likely.
3. Remove power and disconnect J1.
4. Measure from TP3+ to TP4-. The reading should be approximately 20 Kohms.
5. If so, the short is not on the PC board. See paragraph 5-7, Heater Strut Replacement.

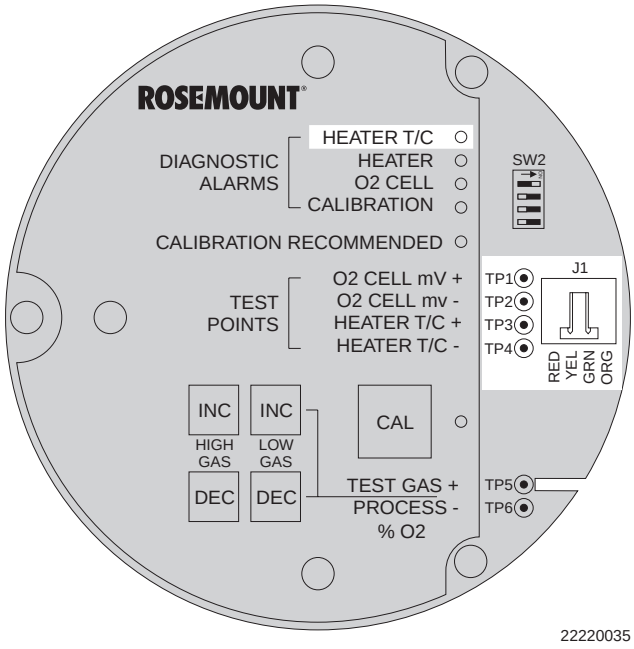


Figure 6-3. Fault 3, Reversed Thermocouple

c. Fault 3, Reversed Thermocouple

The HEATER T/C LED flashes three times, pauses for three seconds, and repeats. See Figure 6-3.

1. Using a multimeter, measure TP3+ to TP4-.
2. If the reading is negative, the thermocouple wiring is reversed.
3. Check red and yellow wires in the J1 connector for the proper placement.
4. If the wiring is correct, the fault is in the PC board. See paragraph 5-5b, Electronic Assembly Replacement.

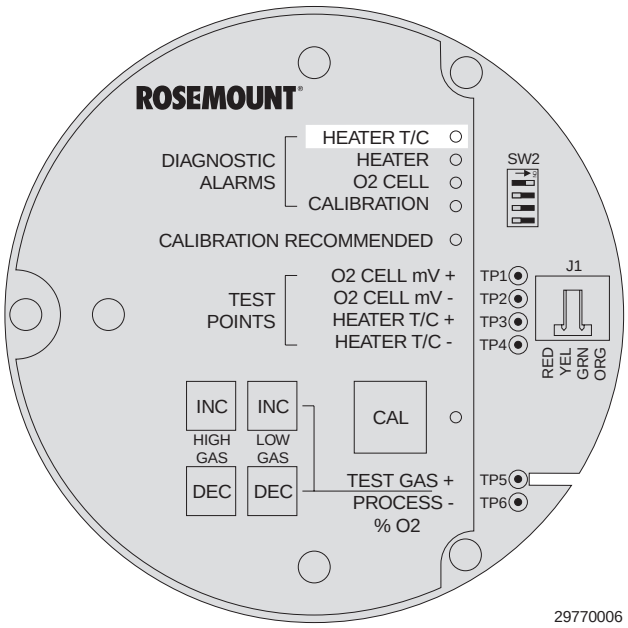


Figure 6-4. Fault 4, A/D Comm Error

d. Fault 4, A/D Comm Error

The HEATER T/C LED flashes four times, pauses for three seconds, and repeats (Figure 6-4).

1. Call the factory for assistance at 1-800-433-6076.

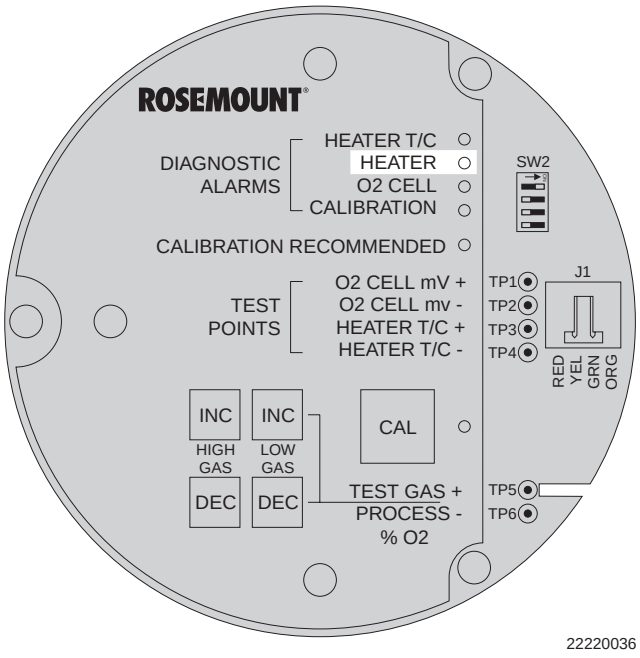


Figure 6-5. Fault 5, Open Heater

e. Fault 5, Open Heater

The HEATER LED flashes once, pauses for three seconds, and repeats. See Figure 6-5.

1. Remove power. Remove the electronic assembly per paragraph 5-5b, Electronic Assembly Replacement.

2. Using a multimeter, measure across the heater connector J8.

3. The measurement should be approximately 72 ohms. If the heater is open, see paragraph 5-7, Heater Strut Replacement.

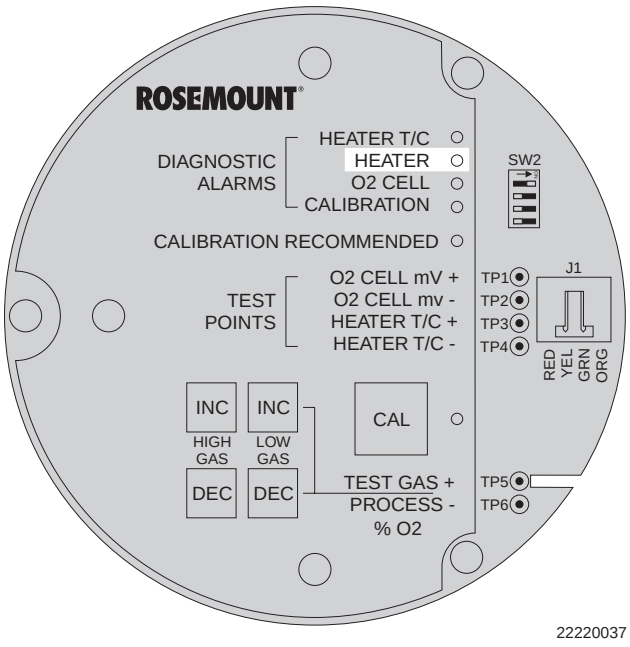


Figure 6-6. Fault 6, High High Heater Temp

f. Fault 6, High High Heater Temp

HEATER LED flashes twice, pauses for three seconds, and repeats. See Figure 6-6.

1. The high high heater temp alarm will activate when the thermocouple produces a voltage of 37.1 mV (900°C/1652°F).

2. The triac and the temperature control may be at fault.

3. Remove power. Allow Hazardous Area Oxymitter 4000 to cool for five minutes. Restore power.

4. If the condition repeats, replace the electronic assembly per paragraph 5-5b.1, Electronic Assembly Replacement.

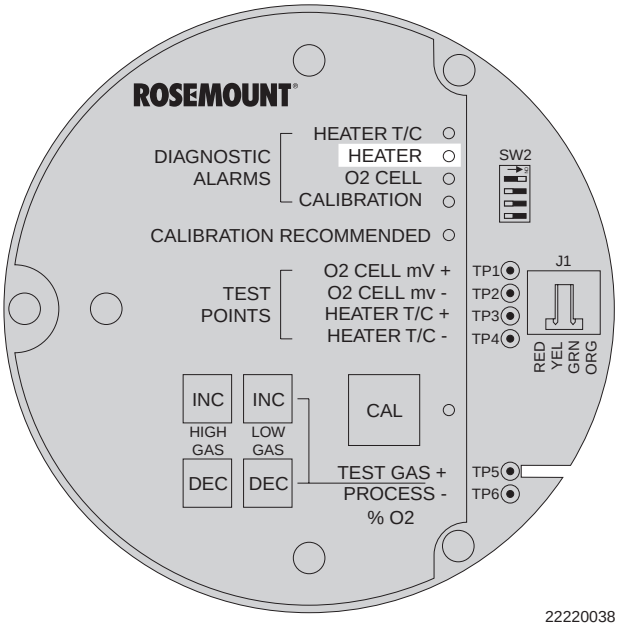


Figure 6-7. Fault 7, High Case Temp

g. Fault 7, High Case Temp

The HEATER LED flashes three times, pauses for three seconds, and repeats. See Figure 6-7.

1. If the case temperature exceeds 85°C (185°F), the temperature control will shut off and the 4-20 mA signal output will go to the default value.

2. This signifies that the environment where the Hazardous Area Oxymitter 4000 is installed exceeds the ambient temperature requirements or that heat due to convection is causing case temperature to rise above the limit.

3. Placing a spool piece between the stack flange and the Hazardous Area Oxymitter 4000 flange may eliminate this problem.

4. If a spool piece does not solve the problem, relocation is the only solution.

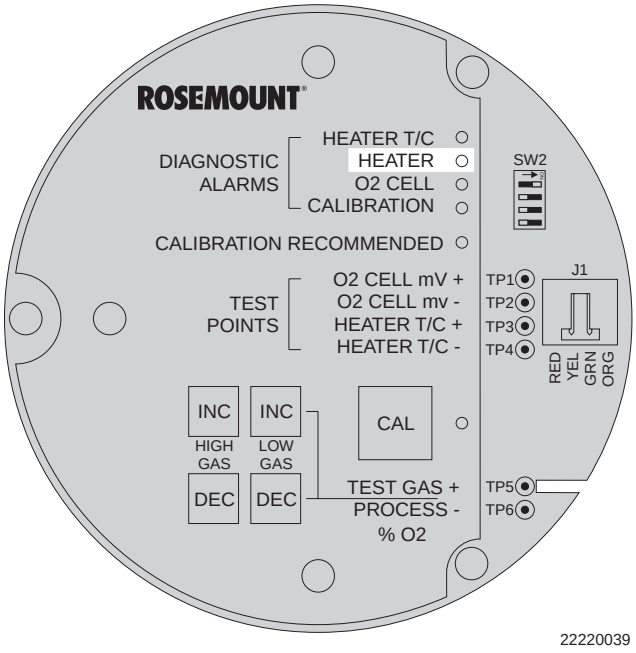


Figure 6-8. Fault 8, Low Heater Temp

h. Fault 8, Low Heater Temp

The HEATER LED flashes four times, pauses for three seconds, and repeats. See Figure 6-8.

1. The low heater temperature alarm is active when the thermocouple reading has dropped below 28.6 mV.

2. If the thermocouple reading continues to ramp downward for one minute and does not return to the temperature set point of approximately 29.3 mV, then an Open Heater fault will be displayed.

3. Power down the electronics. Remove the electronic assembly per paragraph 5-5b, Electronic Assembly Replacement. Using a multimeter, measure across the heater connector, J8.

4. If the heater is good, the reading will be approximately 70 ohms. If the heater is open, see paragraph 5-7, Heater Strut Replacement.

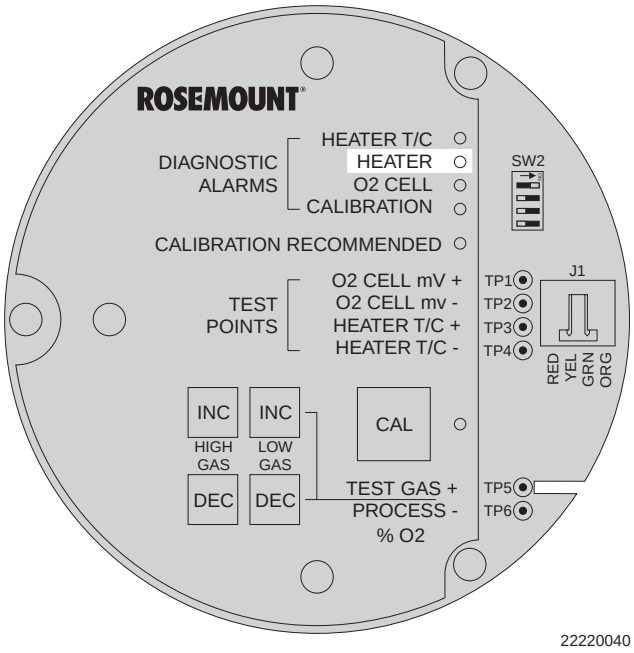


Figure 6-9. Fault 9, High Heater Temp

i. Fault 9, High Heater Temp

The HEATER LED flashes five times, pauses for three seconds, and repeats. See Figure 6-9.

1. If the thermocouple produces a voltage in excess of approximately 30.7 mV, the high heater temp alarm activates.
2. The 4-20 mA signal returns to the default value (4 or 20 mA).
3. This alarm is self-clearing. When temperature control is restored and the thermocouple voltage returns to the normal range, the alarm clears.
4. If the temperature continues to rise, the next alarm will be the high high heater temp alarm.

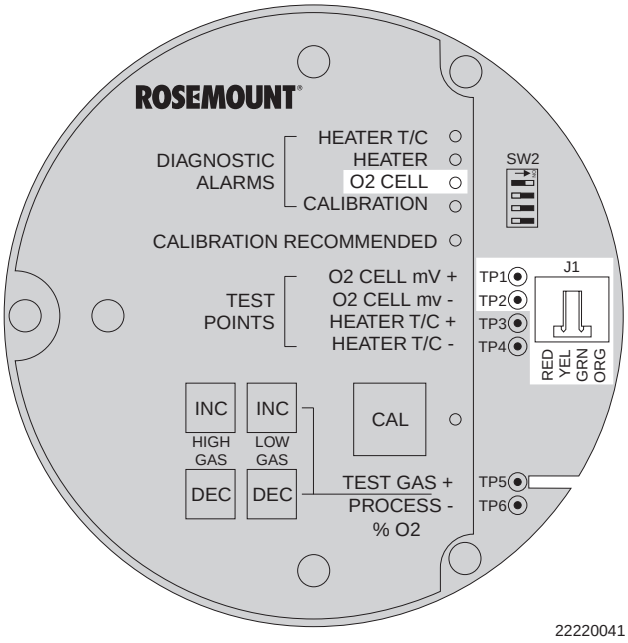


Figure 6-10. Fault 10, High Cell mV

j. Fault 10, High Cell mV

The O_2 CELL flashes once, pauses for three seconds, and repeats. See Figure 6-10.

1. Using a multimeter, measure across TP1+ to TP2-.

2. If you measure 204 mV to 1 volt DC the cell reading is due to high combustibles. This is a self-clearing alarm, once the combustible conditions go away.

3. If you measure 1.2 VDC, the cell wires, either orange or green, have become detached from the input.

4. One possible cause is connector J1. The orange or green wire has come loose from the crimped connection.

5. The platinum pad could also be at fault. The pad could have broken free from the back of the cell.

6. Replace heater strut per paragraph 5-7, Heater Strut Replacement. If necessary, replace the cell flange assembly per paragraph 5-8, Cell Replacement.

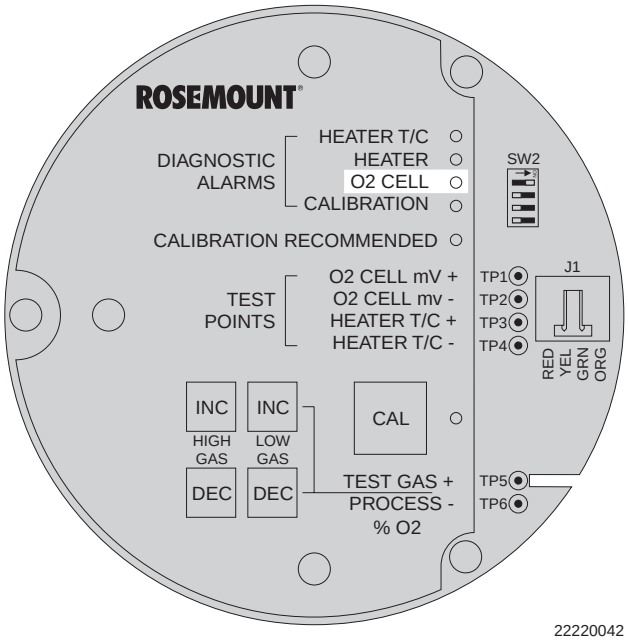


Figure 6-11. Fault 11, Bad Cell

k. Fault 11, Bad Cell

The O_2 CELL flashes three times, pauses for three seconds, and repeats. See Figure 6-11.

1. The bad cell alarm activates when the cell exceeds the maximum resistance value.

2. The cell should be replaced. See paragraph 5-8, Cell Replacement, for cell replacement instructions.

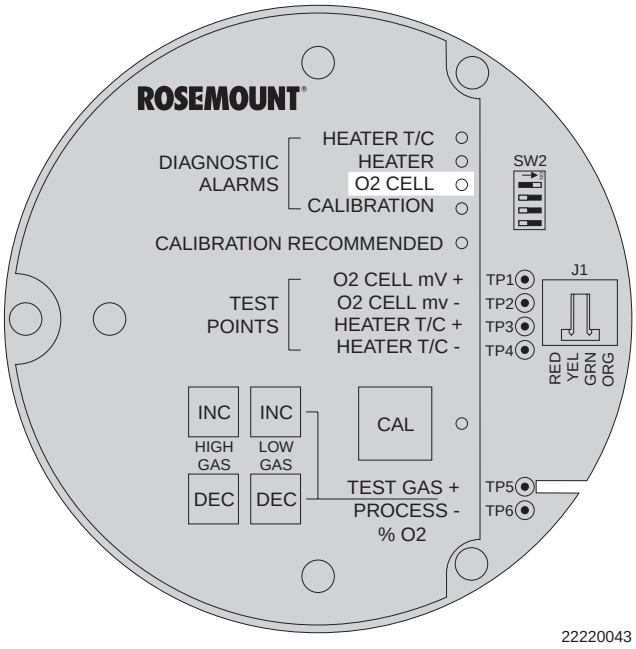


Figure 6-12. Fault 12, EEPROM Corrupt

I. Fault 12, EEPROM Corrupt

The O_2 CELL LED flashes four times, pauses for three seconds, and repeats. See Figure 6-12.

1. This alarm can occur if the EEPROM is changed for a later version. At power up, the EEPROM is not updated.
2. To correct this problem, power down and then restore power. The alarm should clear.
3. If the alarm occurs while the unit is running, there is a hardware problem on the microprocessor board.
4. If cycling the power does not clear the alarm, see paragraph 5-5b, Electronic Assembly Replacement.

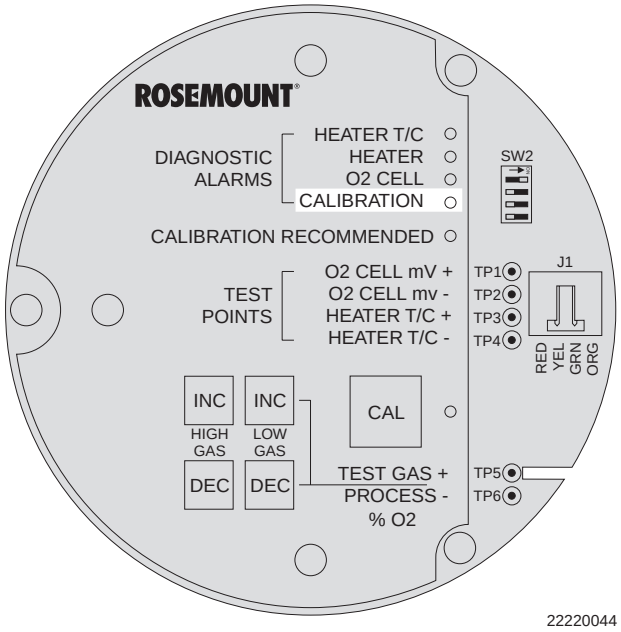


Figure 6-13. Fault 13, Invalid Slope

m. Fault 13, Invalid Slope

The CALIBRATION LED flashes once, pauses for three seconds, and repeats. See Figure 6-13.

1. During a calibration, the electronics calculates a slope value. If the value of the slope is less than 35 mV/deg or more than 52 mV/deg, the slope alarm will be active until the end of the purge cycle.

2. See paragraph 5-2, Calibration. Verify the calibration by carefully repeating it. Ensure the calibration gases match the calibration gas parameters. If you attach a multimeter to TP1+ and TP2-, sample gas measurements are:

   8% $O_2 \approx 23$ mV
   0.4% $O_2 \approx 85$ mV

3. Power down the Hazardous Area Oxymitter 4000 and remove it from the stack.

4. Replace the cell per paragraph 5-8, Cell Replacement.

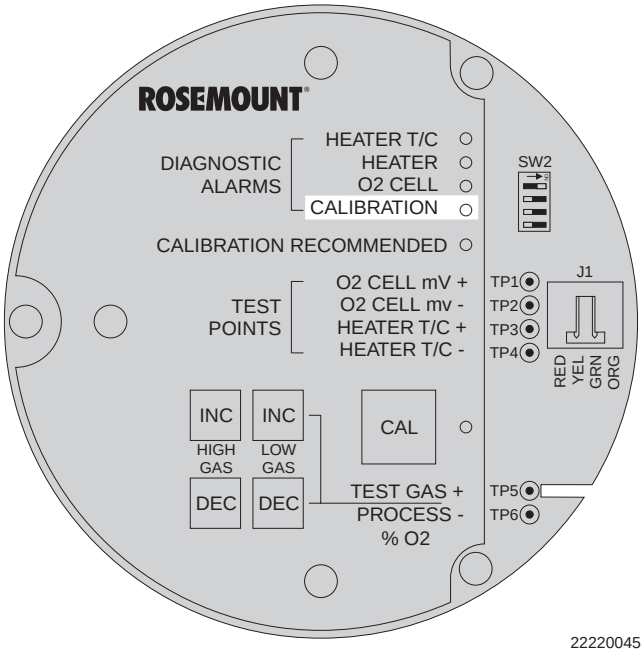


Figure 6-14. Fault 14, Invalid Constant

n. Fault 14, Invalid Constant

The CALIBRATION LED flashes twice, pauses for three seconds, and repeats. See Figure 6-14.

1. After a calibration has been performed, the electronics calculates a cell constant value.
2. If the cell constant value is outside of the range, -4 mV to 10 mV, the alarm will activate. See paragraph 5-2, Calibration, and verify the last calibration was performed correctly.
3. Power down the Hazardous Area Oxymitter 4000 and remove it from the stack.
4. Replace the cell per paragraph 5-8, Cell Replacement.

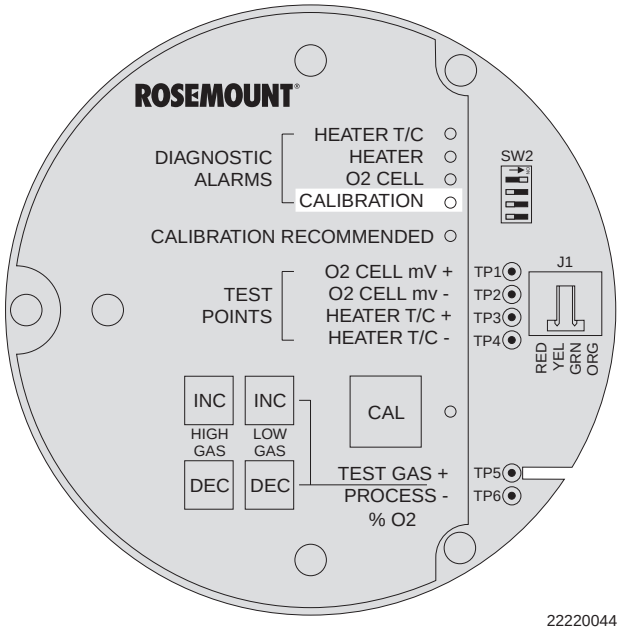


Figure 6-15. Fault 15, Last Calibration Failed

o. Fault 15, Last Calibration Failed

The CALIBRATION LED flashes three times, pauses for three seconds, and repeats. See Figure 6-15.

1. The last calibration failed alarm activates when the slope and constant values calculated are out of range and the unit reverts to using the previous calibration values.

2. The cell should be replaced. See paragraph 5-8, Cell Replacement, for cell replacement instructions.

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 for Probe

FIGURE and INDEX No.	PART NUMBER		DESCRIPTION
	(Dust Seal)	(No Dust Seal)	
5-1, 24	3D39746G01	3D39745G01	18” ANSI Flame Arrester with Ceramic Diffuser Probe
5-1, 24	3D39746G02	3D39745G02	3’ ANSI Flame Arrester with Ceramic Diffuser Probe
5-1, 24	3D39746G03	3D39745G03	6’ ANSI Flame Arrester with Ceramic Diffuser Probe
5-1, 24	3D39746G04	3D39745G04	18” JIS Flame Arrester with Ceramic Diffuser Probe
5-1, 24	3D39746G05	3D39745G05	3’ JIS Flame Arrester with Ceramic Diffuser Probe
5-1, 24	3D39746G06	3D39745G06	6’ JIS Flame Arrester with Ceramic Diffuser Probe
5-1, 24	3D39746G07	3D39745G07	18” DIN Flame Arrester with Ceramic Diffuser Probe
5-1, 24	3D39746G08	3D39745G08	3’ DIN Flame Arrester with Ceramic Diffuser Probe
5-1, 24	3D39746G09	3D39745G09	6’ DIN Flame Arrester with Ceramic Diffuser Probe
5-1, 24	3D39746G10	3D39745G10	18” ANSI Flame Arrester with Snubber Diffuser Probe
5-1, 24	3D39746G11	3D39745G11	3’ ANSI Flame Arrester with Snubber Diffuser Probe
5-1, 24	3D39746G12	3D39745G12	6’ ANSI Flame Arrester with Snubber Diffuser Probe
5-1, 24	3D39746G13	3D39745G13	18” JIS Flame Arrester with Snubber Diffuser Probe
5-1, 24	3D39746G14	3D39745G14	3’ JIS Flame Arrester with Snubber Diffuser Probe
5-1, 24	3D39746G15	3D39745G15	6’ JIS Flame Arrester with Snubber Diffuser Probe
5-1, 24	3D39746G16	3D39745G16	18” DIN Flame Arrester with Snubber Diffuser Probe
5-1, 24	3D39746G17	3D39745G17	3’ DIN Flame Arrester with Snubber Diffuser Probe
5-1, 24	3D39746G18	3D39745G18	6’ DIN Flame Arrester with Snubber Diffuser Probe

Table 8-2. Replacement Parts for Probe (Continued)

FIGURE and INDEX No.	PART NUMBER	DESCRIPTION
5-1, 37	3D39744G01	18” Heater Strut Assy.
5-1, 37	3D39744G02	3’ Heater Strut Assy.
5-1, 37	3D39744G03	6’ Heater Strut Assy.
8-1	4847B61G20	DIN 3’ Cell Replacement Kit*
8-1	4847B61G21	DIN 6’ Cell Replacement Kit*
8-1	4847B61G25	DIN 18” Cell Replacement Kit*
8-1	4847B61G26	ANSI 18” Cell Replacement Kit*
8-1	4847B61G27	ANSI 3’ Cell Replacement Kit*
8-1	4847B61G28	ANSI 6’ Cell Replacement Kit*
8-1	4847B61G29	JIS 18” Cell Replacement Kit*
8-1	4847B61G30	JIS 3’ Cell Replacement Kit*
8-1	4847B61G31	JIS 6’ Cell Replacement Kit*
2-2	3D39003G16	ANSI 18” Abrasive Shield Assy.
2-2	3D39003G17	ANSI 3’ Abrasive Shield Assy.
2-2	3D39003G18	ANSI 6’ Abrasive Shield Assy.
2-2	3D39003G19	DIN 18” Abrasive Shield Assy.
2-2	3D39003G20	DIN 3’ Abrasive Shield Assy.
2-2	3D39003G21	DIN 6’ Abrasive Shield Assy.
2-2	3D39003G22	JIS 18” Abrasive Shield Assy.
2-2	3D39003G23	JIS 3’ Abrasive Shield Assy.
2-2	3D39003G24	JIS 6’ Abrasive Shield Assy.

*Includes pad and wire.

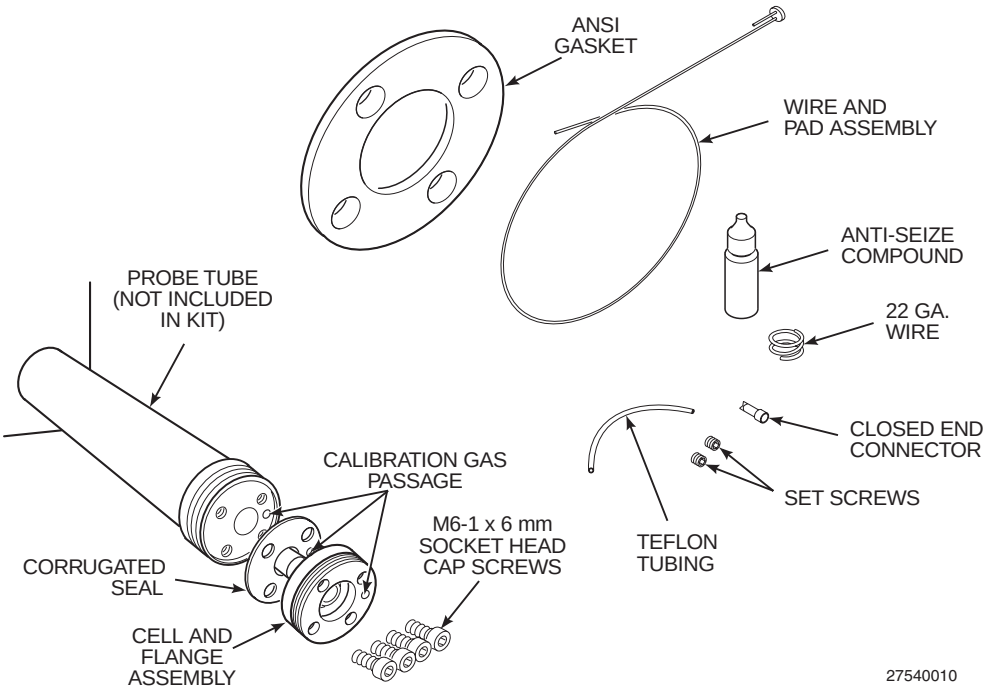


Figure 8-1. Cell Replacement Kit

Table 8-2. Replacement Parts for Probe (Continued)

FIGURE and INDEX No.	PART NUMBER	DESCRIPTION
	4507C26G07	Bypass Gas Pickup Tube (3 ft)
	4507C26G08	Bypass Gas Pickup Tube (6 ft)
	4507C26G09	Bypass Gas Pickup Tube (9 ft)
2-1	1U05677G01	Flame Arrester with Ceramic Diffuser
2-2	1U05677G02	Flame Arrester with Ceramic Diffuser and Dust Seal
2-2	1U05677G03	Flame Arrester with Ceramic Diffuser and Spare Dust Seal
2-1	1U05677G04	Flame Arrester with Snubber Diffuser
2-2	1U05677G05	Flame Arrester with Snubber Diffuser and Dust Seal
2-2	1U05677G06	Flame Arrester with Snubber Diffuser and Spare Dust Seal
5-10	1L03650H01	Flame Arrester Diffusion Hub Setscrew (M5-0.8 x 5 mm)
2-8	263C152G01	Reference Gas Air Set
	771B635H01	Calibration Gas Flowmeter
8-2	3535B42G03	Probe Disassembly Kit
5-1, 36	5R10130H01	Strut Pressure Clamp
5-10	6292A74G02	Ceramic Diffusion Element Replacement Kit

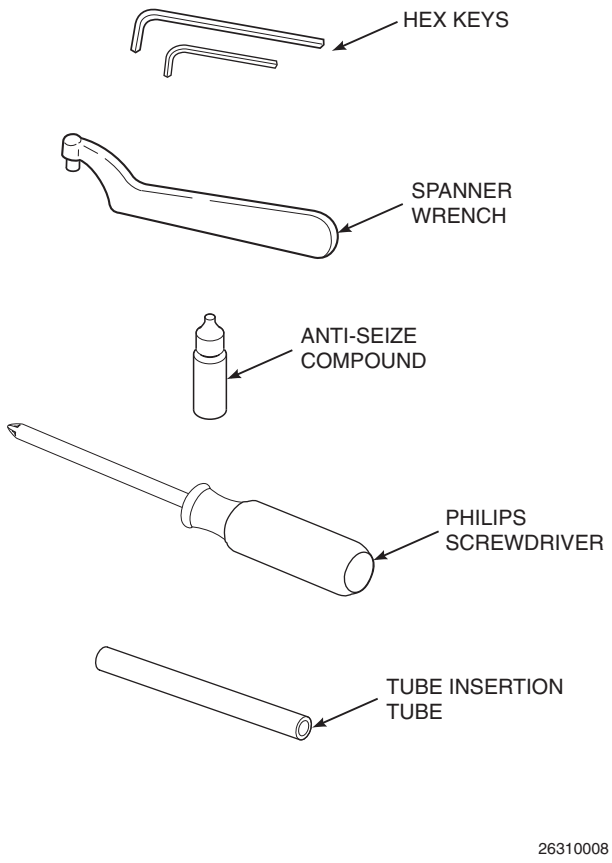


Figure 8-2. Probe Disassembly Kit

Table 8-2. Replacement Parts for Electronics

FIGURE and INDEX No.	PART NUMBER	DESCRIPTION
	4851B21G01	Electronics English-Standard
5-1, 11, 17	4850B86G01	Housing and Cover
5-1, 2	3D39777G02	Electronic Assembly and keypad English
5-1, 15	08732-0002-0001	Termination Block-Standard
5-1, 1	5R10145G01	Cover
	4851B21G02	Electronics German-Standard
5-1, 11, 17	4850B86G01	Housing and Cover
5-1, 2	3D39777G03	Electronic Assembly and keypad German
5-1, 15	08732-0002-0001	Termination Block-Standard
5-1, 1	5R10145G01	Cover
	4851B21G03	Electronics French-Standard
5-1, 11, 17	4850B86G01	Housing and Cover
5-1, 2	3D39777G04	Electronic Assembly and keypad French
5-1, 15	08732-0002-0001	Termination Block-Standard
5-1, 1	5R10145G01	Cover
	4851B21G04	Electronics Spanish-Standard
5-1, 11, 17	4850B86G01	Housing and Cover
5-1, 2	3D39777G05	Electronic Assembly and keypad Spanish
5-1, 15	08732-0002-0001	Termination Block-Standard
5-1, 1	5R10145G01	Cover
	4851B21G05	Electronics Italian-Standard
5-1, 11, 17	4850B86G01	Housing and Cover
5-1, 2	3D39777G06	Electronic Assembly and keypad Italian
5-1, 15	08732-0002-0001	Termination Block-Standard
5-1, 1	5R10145G01	Cover
	4851B21G06	Electronics English-Transient Protected
5-1, 11, 17	4850B86G01	Housing
5-1, 2	3D39777G02	Electronic Assembly and keypad English
5-1, 15	08732-0002-0002	Termination Block-Transient Protected
5-1, 1	5R10145G01	Cover
	4851B21G07	Electronics German-Transient Protected
5-1, 11, 17	4850B86G01	Housing
5-1, 2	3D39777G03	Electronic Assembly and keypad German
5-1, 15	08732-0002-0002	Termination Block-Transient Protected
5-1, 1	5R10145G01	Cover
	4851B21G08	Electronics French-Transient Protected
5-1, 11, 17	4850B86G01	Housing
5-1, 2	3D39777G04	Electronic Assembly and keypad French
5-1, 15	08732-0002-0002	Termination Block-Transient Protected
5-1, 1	5R10145G01	Cover

Table 8-2. Replacement Parts for Electronics (Continued)

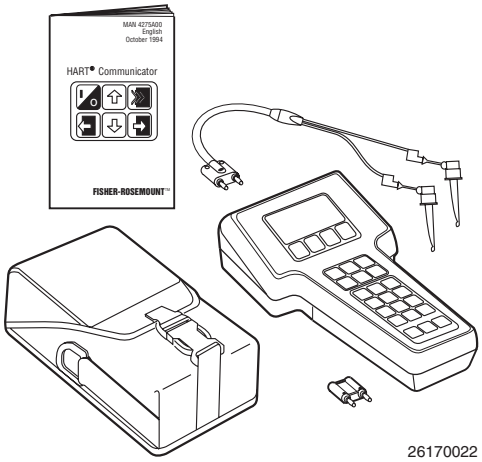
FIGURE and INDEX No.	PART NUMBER	DESCRIPTION
	4851B21G09	Electronics Spanish-Transient Protected
5-1, 11, 17	4850B86G01	Housing
5-1, 2	3D39777G05	Electronic Assembly and keypad Spanish
5-1, 15	08732-0002-0002	Termination Block-Transient Protected
5-1, 1	5R10145G01	Cover
	4851B21G10	Electronics Italian-Transient Protected
5-1, 11, 17	4850B86G01	Housing
5-1, 2	3D39777G06	Electronic Assembly and Keypad Italian
5-1, 15	08732-0002-0002	Termination Block-Transient Protected
5-1, 1	5R10145G01	Cover
5-1, 2	3D39777G01	Electronic Assembly
5-1, 4	4849B72H01	Membrane Keypad English
5-1, 4	4849B72H02	Membrane Keypad German
5-1, 4	4849B72H03	Membrane Keypad French
5-1, 4	4849B72H04	Membrane Keypad Spanish
5-1, 4	4849B72H05	Membrane Keypad Italian
5-1, 15	08732-0002-0001	Termination Block Standard
5-1, 15	08732-0002-0002	Termination Block Transient Protected

SECTION 9
OPTIONAL ACCESSORIES

HART HANDHELD 275 COMMUNICATOR

The HART Handheld 275 Communicator is an interface device that provides a common communication link to HART-compatible instruments, such as the Oxymitter 4000. HART Communications Protocol permits all the information available from the Oxymitter 4000's electronics to be transmitted over standard 4-20 mA signal wires. By attaching the HART handheld communicator at a termination point along the 4-20 mA signal line, a technician can diagnose problems and configure and calibrate the Oxymitter 4000 as if he or she were standing in front of the instrument.

For more information, call Rosemount Analytical at 1-800-433-6076.



26170022

ASSET MANAGEMENT SOLUTIONS (AMS)

Asset Management Solutions (AMS) software works in conjunction with the HART Communication Protocol and offers the capability to communicate with all HART plant devices from a single computer terminal.

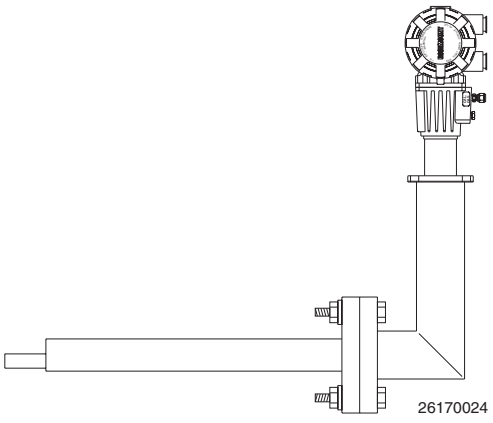
For more information, call Rosemount Analytical at 1-800-433-6076.

26170010

BY-PASS PACKAGES

The specially designed Rosemount Analytical By-Pass Package for oxygen analyzers has proven to withstand the high temperatures in process heaters while providing the same advantages offered by the in situ sensor. Inconel or Kanthal steel tubes provide effective resistance to corrosion, and the package uses no moving parts, air pumps, or other components common to other sampling systems.

For more information, call Rosemount Analytical at 1-800-433-6076.

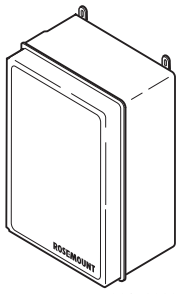

26170024

IMPS 4000 INTELLIGENT MULTIPROBE TEST GAS SEQUENCER

The IMPS 4000 Intelligent Multiprobe Test Gas Sequencer is housed within an IP56 (NEMA 4X) enclosure and has the intelligence to provide calibration gas sequencing of up to four Oxymitter 4000 units to accommodate automatic and semi-automatic calibration routines.

This sequencer works in conjunction with the Oxymitter 4000 CALIBRATION RECOMMENDED feature, eliminating out-of-calibration occurrences and the need to send a technician to the installation site. In addition, the SPS 4000 provides a remote contact input to initiate a calibration from a remote location and relay outputs to alert when a calibration is in progress, an Oxymitter 4000 is out of calibration, calibration gases are on, and calibration gas pressure is low.

For more information, call Rosemount Analytical at 1-800-433-6076.



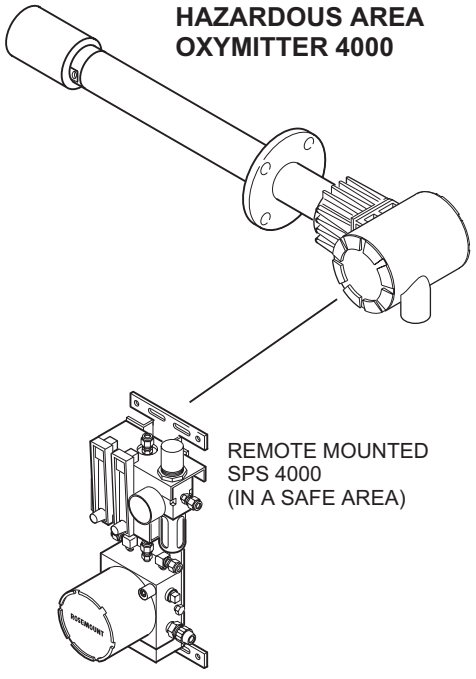
26170006

SPS 4000 SINGLE PROBE AUTOCALIBRATION SEQUENCER

Rosemount Analytical specifically designed the SPS 4000 Single Probe Autocalibration Sequencer to provide the capability to perform automatic or on-demand Oxymitter 4000 calibrations. The system can be installed either as an integral component to an Oxymitter 4000 or at a remote location if space is limited or corrosive conditions exist at the installation site.

The SPS 4000 works in conjunction with the Oxymitter 4000's CALIBRATION RECOMMENDED feature, eliminating out-of-calibration occurrences and the need to send a technician to the installation site. In addition, the SPS 4000 provides a remote contact input to initiate a calibration from a remote location and relay outputs to indicate when a calibration is in progress or the Oxymitter 4000 is out of calibration.

For more information, call Rosemount Analytical at 1-800-433-6076.

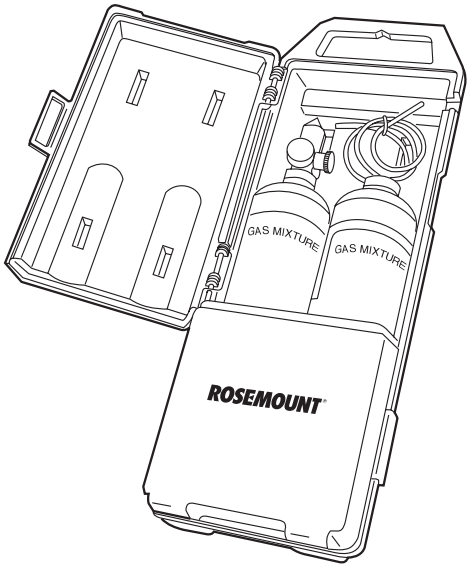


26310009

O_2 CALIBRATION GAS SEQUENCER

Rosemount Analytical's O_2 Calibration Gas and Service Kits have been carefully designed to provide a more convenient and fully portable means of testing, calibrating, and servicing
Rosemount Analytical's oxygen analyzers. These lightweight, disposable gas cylinders eliminate the need to rent gas bottles.

For more information, call Rosemount Analytical at 1-800-433-6076.



26170021

SECTION 10
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.

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.

Instruction Manual
IB-106-340C Rev. 3.0
April 2001

Oxymitter 4000

Hazardous Area
Oxymitter 4000

Part no. _____

Serial no._____

Order no._____

Emerson Process Management

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