

Rosemount™ 6888A

O₂ Combustion Flue Gas Transmitter



Essential instructions

Read this page before proceeding!

Emerson™ 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 Emerson 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 Emerson 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 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 Emerson. 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 people, to prevent electrical shock and personal injury.

NOTICE

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

NOTICE





The Field Communicator must be upgraded to System Software 2.0 with graphic license for operation with the Rosemount™ 6888A O₂ Transmitter. The AMS software must be upgraded to AMS 8.0 or above. Contact Emerson's Global Service Center (GSC) at +1-800-833-8314 to upgrade the Field Communicator software to System Software 2.0 with graphic license.

Preface

The purpose of this manual is to provide information concerning components, functions, installation, and maintenance of the Rosemount 6888A O₂ Transmitter.

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

Symbols

	Earth (ground) terminal
	Protective conductor terminal
	Risk of electrical shock
	Refer to reference manual.

The following definitions apply to Warnings, Cautions, and Notices found throughout this publication.

WARNING!

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

NOTICE

Highlights an essential operating procedure, condition, or statement.

Overview

The 6888A is Rosemount's latest in-situ probe offering intended for combustion flue gas service. Similar to our previous World Class and Oxymitter probes, there is no sampling system. The sensing cell is mounted to the end of a probe (18 in., 3 ft, 6 ft, 9 ft, or 12 ft long) that is directly inserted into the flue gas stream.

The sensing cell is of similar design to the World Class and Oxymitter cells, using the zirconium oxide sensing principle. The cell is heated and maintained at 736 °C (1357 °F) setpoint and generates a logarithmic MV signal proportional to the partial pressure difference of oxygen between the reference side of the cell (usually instrument air at 20.95% O₂) and the process side of the cell (usually combustion flue gases). For more information on sensing cell operation, see [Chapter 4](#).

Technical support hotline

For assistance with technical problems, please call the Customer Support Center (CSC).

Phone: 1-800-433-6076 1-440-914-1261

In addition to the CSC, you may also contact Field Watch. Field Watch coordinates Emerson's field service throughout the US and abroad.

Phone: 1-800-654-RSMT (1-800-654-7768)

Email: Gas.CSC@emerson.com

Web: www.Emerson.com/RosemountGasAnalysis

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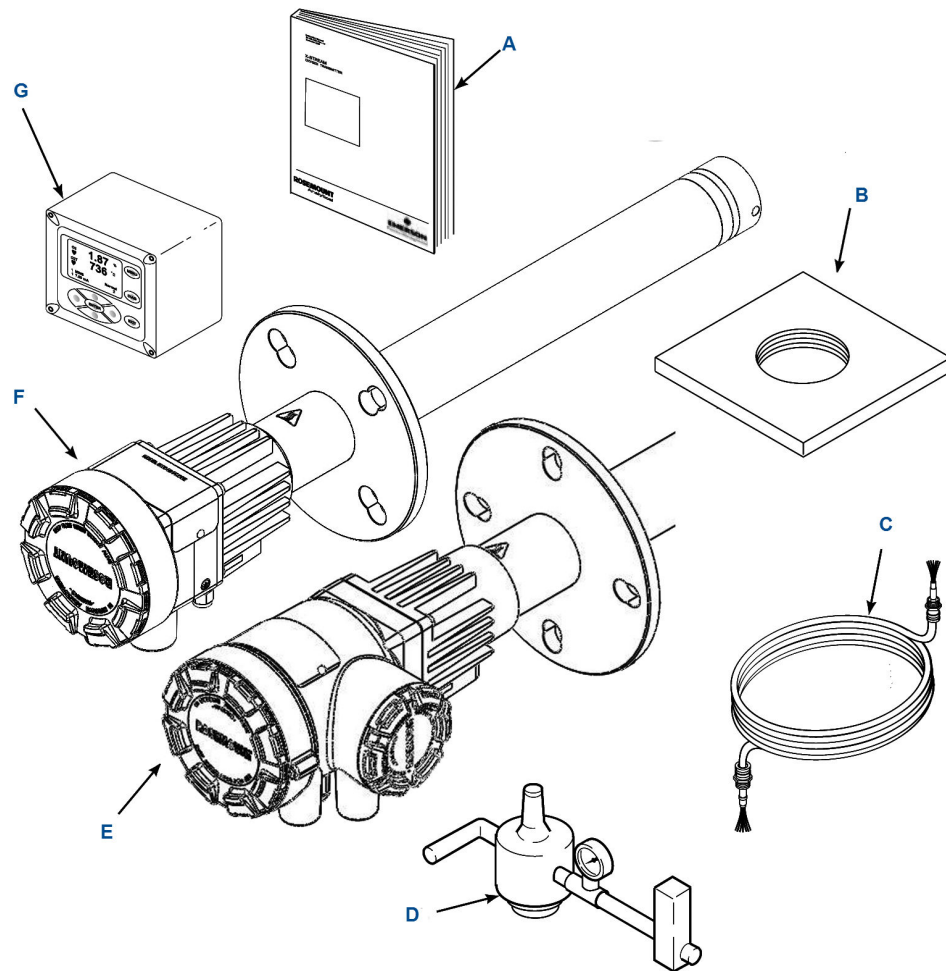
1 Description and specifications

1.1 Component checklist

A typical Rosemount™ 6888A O₂ Combustion Flue Gas Transmitter should contain the items shown in [Figure 1-1](#). A complete Oxygen Analyzer system includes some or all of the equipment shown. However, this manual describes the Rosemount 6888A Transmitter only.

Also, use the product matrix ([Section 1.6](#)) 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 Rosemount 6888A. Ensure the features and options specified by your order number are on or included with the unit.

Figure 1-1: Typical System Package



- A. Quick start guide
- B. Optional mounting or adapter plate
- C. Optional traditional architecture cable
- D. Optional reference and calibration gas accessories
- E. 6888A integral autocal housing
- F. 6888A probe with standard terminations/electronics housing
- G. Optional 6888Xi Advanced Electronics

1.2 Technical support hotline

For assistance with technical problems, please call the Customer Support Center (CSC).

- 1-RAI-AND-U (1-855-724 2638)
- 1-440-914-1261

In addition to the CSC, you may also contact Field Watch. Field Watch coordinates Emerson's field service throughout the US and abroad.

- 1-800-654-RSMT (1-800-654-7768)

Emerson may also be reached via the Internet through email and the World Wide Web.

- Email: Gas.CSC@Emerson.com
- World Wide Web: www.Emerson.com/RosemountGasAnalysis

1.3 System overview

The 6888 is Rosemount's latest combustion flue gas oxygen analyzer. This product is intended for measuring the flue gases resulting from any combustion process. It uses the same heated sensing technology as the O₂ sensors found in most automobiles. Contact Rosemount's technical support group at 800-433-6076 for any applications other than measuring combustion flue (exhaust) gases.

This product uses an *in-situ* sensor, i.e., the sensor is placed at the end of a probe, and the probe extends directly into the flue gas duct or stack at a given length. The sensor is like a thermocouple, generating its own millivolt signal based on the differences between a reference gas (ambient or instrument air - always 20.95% O₂) and the flue gases being measured. There are several different arrangements of probes, electronics, and features that are explained below and in the wiring diagrams.

An optional Rosemount 6888Xi with HART[®] communication provides a convenient operator interface for setup, calibration, and diagnostics. HART communication is still present when using the Rosemount 6888Xi.

1.4 System configurations

1.4.1 Transmitter probe, only

The Rosemount 6888 probe has the electronics in the blue housing that controls the heater temperature and also amplifies the raw O₂ millivolt signal to a linear 4-20 mA. The 4-20 mA signal lines can be run directly to the control room and also power the transmitter electronics. As with most other Rosemount transmitters, measuring pressure, temperature, and flow setup is conducted through HART communications via a 475 handheld communicator or via Asset Management Solutions (AMS).

1.4.2 Standard housing transmitter probe plus Rosemount 6888Xi Electronics

The Rosemount 6888Xi Electronics serve as a local operator interface unit with a back-lit display and keypad. It is capable of two channels, serving two Rosemount 6888 probes. The Rosemount 6888Xi also carries these optional advanced features:

- Fully automatic calibration. Requires Xi O₂ Cal Autocalibration system

- Loss of flame contact for powering down the heater in the event of a flame-out condition in a furnace.
- Heaterless operation at process temperatures above 550 °C (1022 °F). This feature will also permit operation above the heater setpoint of 736 °C (1357 °F). Sensing cell life will be shortened by operation above 800 °C (1472 °F), however.
- Plugged diffuser diagnostic operates by measuring the return-to-process rate after calibration gas has been stopped. This feature also includes auto gas switching when the reading settles out versus waiting for configured gas flow time to expire.
- Stoichiometer - If a furnace goes into a reducing condition (zero % O₂), this feature will determine how far.
- Programmable reference - Permits more accurate readings at near-ambient O₂ levels (20.95% O₂).
- *A cal check* capability. New calibration values are not automatically stored after a calibration. An accept/reject calibration feature can be enabled or disabled so that the technician or operator can decide to accept or reject a potentially large change in calibration values.
- Tolerance check that will alarm if the wrong test gases are being used or if a bottle runs out in the middle of a calibration. Take care to ensure gas 1 and gas 2 calibration gases are properly configured if the tolerance check feature is enabled.

1.4.3 Transmitter probe and Rosemount 6888Xi with flame safety interlock

A flame safety interlock by Emerson is available for heater power disconnect whenever there is a loss of the process flame or a heater runaway condition (heater over-temperature) in the O₂ probe. This input is internally powered by the Rosemount 6888Xi and is actuated via a dry contact output from your flame scanner. A closed contact indicates a flame is present. An open contact indicates a loss of flame. This feature is also available with the integral autocal housing.

1.4.4 Transmitter probe with integral autocal, Rosemount 6888Xi, and HART[®] communications

This probe contains gas-switching solenoids so that the Rosemount 6888Xi electronics can control the introduction of calibration gases. Calibrations can be initiated via a calibration recommended diagnostic, time since last calibration, manually via external dry contact, HART communications, or from the Rosemount 6888Xi local operator interface keypad. The integral autocal feature can only be implemented when the probe is used with a Rosemount 6888Xi.

1.4.5 Transmitter probe with integral autocal and FOUNDATION[™] Fieldbus (FF) communications

This probe contains gas-switching solenoids that can control the introduction of calibration gases for calibration. Calibrations can be initiated automatically via a calibration recommended diagnostic, time since last calibration, manually via the optional

Rosemount 6888Xi keypad, FF communications via the 475 communicator, or AMS console. Unlike the HART transmitter electronics, the FF version can execute automatic calibrations either with or without the optional Rosemount 6888Xi electronics. Likewise, advanced features can be implemented either with or without the optional Rosemount 6888Xi.

1.4.6 Direct replacement (DR) probe with traditional architecture Rosemount 6888Xi electronics

Here there are no electronics inside the probe head, so the raw sensor signals for the heater thermocouple and zirconium oxide O₂ sensor are sent to a remote Rosemount 6888Xi Electronics. The Rosemount 6888 traditional architecture electronics will also directly apply power to the probe heater in order to maintain the correct sensor temperature. This arrangement calls for a 7-conductor cable to carry this power and the sensor signals. Maximum length for the cable is 200 feet. This probe will also operate on previous Westinghouse/Rosemount electronics (World Class and Oxymitter), as well as many competitive electronics.

1.4.7 Wireless capability

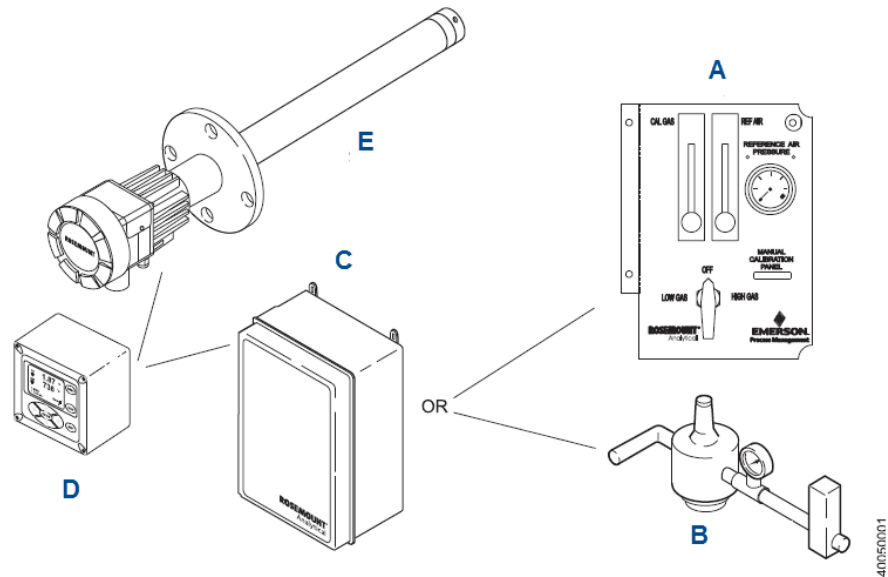
Both the transmitter electronics in the head of the probe and the Rosemount 6888Xi Electronics communicate over HART communications and can implement wireless communications via Emerson Wireless 775 THUM™ Adapter.

1.4.8 Automatic calibration

Calibrations consist of introducing bottled gases of known value into the probe so that the electronics can make automatic adjustments to the O₂ readings to match the bottled gas value.

Emerson recommends 0.4% O₂ and 8% O₂ (balance nitrogen) gases. Never use nitrogen or instrument air as calibration gases. Flowmeters (for calibration gases) and regulators and flowmeters (for reference air) are available as loose components, mounted into an optional manual calibration switching panel or a fully automatic calibration system (*Figure 1-2*) where calibration solenoids are switched from the Rosemount 6888Xi Advanced Electronics. See the *Rosemount SPS 4001B Single Probe Autocalibration Sequencer* or *Rosemount IMPS 4000 Intelligent Multiprobe Test Gas Sequencer* manuals for additional details.

Figure 1-2: Rosemount 6888A with Rosemount 6888Xi Advanced Electronics and Autocalibration Sequencer



- A. Manual calibration switching panel
- B. Reference air set
- C. Rosemount SPS 4001B or Rosemount IMPS 4000
- D. Rosemount 6888Xi Advanced Electronics
- E. Rosemount 6888A O₂ Transmitter

1.4.9 Communication options

A customer-supplied 375/475 Field Communicator and/or the optional Rosemount 6888Xi Advanced Electronics accomplish Rosemount 6888A communications. Graphic displays are available via the optional Rosemount OxyBalance Display and Averaging System.

Data communications

You can configure and diagnostically troubleshoot the Rosemount 6888A in one of two ways:

1. Using the optional Rosemount 6888Xi Advanced Electronics allows local communication with the electronics. The Rosemount 6888Xi also offers the following optional advanced features:
 - Fully automatic calibration.
 - Optional flame safety interface (single probe version only).
 - High temperature operation [above 700 °C (1292 °F) standard temperature].
 - Stoichiometer feature provides the ability to indicate O₂ efficiency when the combustion process goes into reducing conditions (0% O₂).
 - Programmable reference provides enhanced accuracy when measuring at or near O₂ level (20.95% O₂).

- Plugged diffuser diagnostic to detect fouled diffuser.
2. Using the HART interface, the Rosemount's 6888A'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:
 - Rosemount 375/475 Field Communicator: The handheld communicator requires device description (DD) software specific to the Rosemount 6888A. The DD software is supplied with many 375/475 units, but can also be programmed into existing units at most Emerson service offices. See [Chapter 3](#) for additional information.
 - Personal computer (PC): The use of a personal communicator requires AMS software available from Emerson.
 - Delta V and Ovation Distributed Control System (DCS) with AMS-inside capability.
 3. The Rosemount 6888A can also transmit HART information wirelessly via a wireless THUM Adapter. The THUM Adapter threads into the Rosemount 6888A conduit port and converts the 4-20 mA signal to a wireless protocol. All other HART information is also transmitted.

In addition to the wireless THUM Adapter, a hard wire connection of the 4-20 mA signal to the DCS may be used at the same time. More detailed information regarding the application of the THUM Adapter is available in Product Data Sheet *00813-0100-4075*.

Note

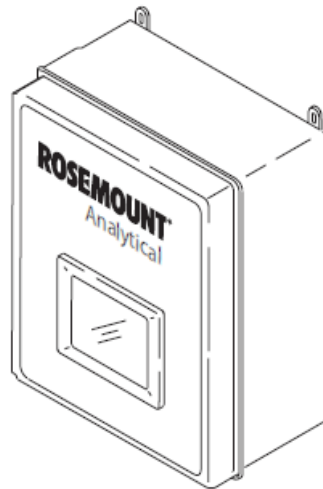
The 375 field communicator must be upgraded to System Software 2.0 with Graphic License for operation with the Rosemount 6888A O₂ transmitter. The AMS software must be upgraded to AMS 8.0 or above.

Contact Emerson's Global Service Center (GSC) at 1-800-833-8314 to upgrade the 375 field communicator software to System Software 2.0 with Graphic License.

Optional Rosemount OxyBalance Display and Averaging System

The optional Rosemount OxyBalance Display and Averaging System receives up to eight 4-20 mA signals from individual probes, trends individual outputs, and calculates four programmable averages as additional 4-20 mA outputs. For more information, call Rosemount at 1-800-433-6076.

Figure 1-3: Rosemount OxyBalance System



1.5 Probe options

1.5.1 Diffusion elements

The Rosemount 6888A is available with one of three diffusion elements fitted to the process end. The basic diffusers provide for a constant outer probe tube diameter the full length of the probe. When the Rosemount 6888A is used with an abrasive shield, the diffuser body has a larger diameter with grooves to accept packing material to seal out fly ash. The snubber and ceramic diffusers may also be fitted with a flash arrestor to reduce the possibility of the probe igniting from flammable gases within the process.

⚠ WARNING!

FLAME AND EXPLOSION

The diffusers fitted with flash arrestors have been tested to provide a measure of protection in preventing ignition of flammable gases. They are not intended to provide flame proof or explosion proof protection for the Rosemount 6888A.

Snubber diffusion assembly

The standard snubber diffusion assembly (*Figure 1-4*) is satisfactory for most applications; however, the snubber diffuser should not be used in flue gas temperatures above 400 °C (752 °F).

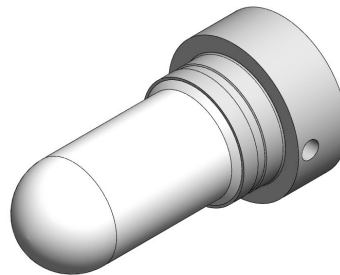
Figure 1-4: Snubber Diffusion Assembly



Ceramic diffusion assembly

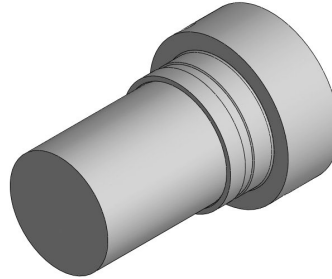
The ceramic diffusion assembly (*Figure 1-5*) is the traditional design for the probe. Used for over 25 years, the ceramic diffusion assembly provides a greater filter surface area.

Figure 1-5: Ceramic Diffusion Assembly



Cup-type diffusion assembly

The cup-type diffusion assembly (*Figure 1-6*) is typically used in high temperature applications where frequent diffusion element plugging is a problem. The cup-type diffusion assembly is available with a 40 micron, sintered, Hastelloy element.

Figure 1-6: Hastelloy Cup-Type Diffusion Assembly

1.6 Rosemount 6888A product matrix

Table 1-1: Calibration Glass

Part number	Description
1A9919G01	Two disposable calibration gas bottles - 0.4% and 8% O ₂ , balance nitrogen - 550 liters each. ⁽¹⁾
1A9919G02	Two flow regulators for calibration gas bottles
1A9919G03	Bottle rack

⁽¹⁾ Calibration gas bottles cannot be shipped via air freight.

Compare the configuration matrix below to the model number on the probe tag to confirm the features present in this specific probe

Table 1-2: Rosemount 6888A Product Matrix

Model	Description
6888A	O ₂ Transmitter
Measurement	
1OXY	Oxygen, standard sensing cell
2OXY	Oxygen, acid resistant stoichiometric sensing cell
Probe length ⁽¹⁾	
1	18 in. probe, standard probe tube
2	18 in. probe, standard probe tube with abrasive shield
3	18 in. probe, abrasion resistant probe tube
4	3 ft probe, standard probe tube
5	3 ft probe, standard probe tube with abrasive shield
6	3 ft probe, abrasion resistant probe tube

Table 1-2: Rosemount 6888A Product Matrix (continued)

7	6 ft probe, standard probe tube
8	6 ft probe, standard probe tube with abrasive shield
9	6 ft probe, abrasion resistant probe tube
A	9 ft probe, abrasion resistant probe tube
AA	9 ft probe, abrasion resistant probe tube with abrasive shield
B	12 ft probe, abrasion resistant probe tube
BA	12 ft probe, abrasion resistant probe tube with abrasive shield
Diffuser	
1	Snubber 400 °C (752 °F)
1A	Snubber with dust shield 400 °C (752 °F) (used with abrasive shield)
1F	Snubber with flashback arrestor 400 °C (752 °F)
2	Ceramic 825 °C (1517 °F)
2A	Ceramic with dust shield 825 °C (1517 °F) (used with abrasive shield)
2F	Ceramic (825 °C) with flashback arrestor 825 °C (1517 °F)
3	Hastelloy 40 µm 705 °C (1292 °F)
3A	Hastelloy with dust seal 40 µm 705 °C (1292 °F) *used with abrasive shield
Housing and electronics	
1HT	Standard housing, transmitter electronics, HART communications
2HT	Integral autocal, transmitter electronics, HART communications
4FF	Integral autocal, transmitter electronics, Fieldbus communications
5DR	Standard housing, direct replacement, no electronics
6DRY	Standard housing, direct replacement, YEW electronics
Mounting plate	
00	None
04	New installation - square weld plate with ANSI 2 in. - 150# studs & flange (2.5 in. process hole required)
05	New installation - square weld plate with DIN studs and flange (2.5 in. process hole required)
06	New installation - variable insertion mount; abrasion resistant probe only
07	New installation - variable insertion mount; mounted to existing OXT/WC abrasive shield mounts; abrasion resistant probe only
08	Adapter to existing ANSI 3 in. 150# flange
09	Adapter to existing ANSI 4 in. 150# flange
10	Adapter to existing ANSI 6 in. 150# flange
11	Adapter to existing ANSI 3 in. 300# flange
12	Adapter to existing ANSI 4 in. 300# flange

Table 1-2: Rosemount 6888A Product Matrix (continued)

99	Special adapter - provide existing flange dimensions, including thru-hole diameter
Manual calibration accessories	
00	None
01	Calibration and reference gas flowmeters and reference regulator/filter diffuser
02	Calibration/reference panel
Stoichiometer function -FOUNDATION Fieldbus only (For HART versions, order this feature with Rosemount 6888Xi Electronics)	
0	No
1	Yes
Programmable reference function - FOUNDATION Fieldbus only (For HART versions, order this feature with Rosemount 6888Xi Electronics)	
0	No
1	Yes
Extended temperature reference function - FOUNDATION Fieldbus only (For HART versions, order this feature with Rosemount 6888Xi Electronics)	
0	No
1	Yes
Diffuser warning function - FOUNDATION Fieldbus only (For HART versions, order this feature with Rosemount 6888Xi Electronics)	
0	No
1	Yes

(1) Probes supplied with flanges with dual ANSI/DIN hole pattern.

1.7 Rosemount 6888Xi product matrix

Compare the configuration matrix below to the model number on the probe tag to confirm the features present in this specific probe.

Model	Product description
6888Xi	Advanced Electronics
Remote type	
1OXY	Single channel O ₂
2OXY	Single channel O ₂ with flame safety interlock for heater
3OXY	Dual channel O ₂
4OXY	Single channel O ₂ with traditional architecture for 120 V probes ⁽¹⁾

Mounting	
00	No Hardware
01	Panel mount kit with gasket
02	2 in. pipe/wall mount kit
Cable	
00	No cable
10	6 m (20 ft) cable, use with traditional architecture probe only
11	12 m (40 ft) cable, use with traditional architecture probe only
12	18 m (60 ft) cable, use with traditional architecture probe only
13	24 m (80 ft) cable, use with traditional architecture probe only
14	30 m (100 ft) cable, use with traditional architecture probe only
15	45 m (150 ft) cable, use with traditional architecture probe only
16	60 m (200 ft) cable, use with traditional architecture probe only
Stoichiometer function for O₂	
00	No
01	Single channel
02	Dual channel
Programmable reference function for O₂	
00	None
01	Single channel
02	Dual channel
Extended Temperature Function for O₂	
00	None
01	Single channel
02	Dual channel
Plugged diffuser diagnostics	
00	None
01	Single channel
02	Dual channel

(1) The Rosemount 6888Xi does not support World Class 44v probes.

The X-STREAM Xi will support World Class 44v probes.

1.8 Transmitter/DR probe specifications



Table 1-3: Measurement Specifications

Net O ₂ range	Variable 0 - 10% to 0 - 50% (Xi electronics off 0 - 50% O ₂ range)
Accuracy in oxidizing condition	±0.75% of reading or 0.05% O ₂ , whichever is greater
Lowest detectable limit	0.02% O ₂
Process temperature effect	Less than 0.05% O ₂ from 100 to 700 °C (212 to 1292 °F)
System speed of response to calibration gas	Initial response in less than 3 seconds, T _∞ in less than 8 seconds. Response to process gas changes vary depending on velocity and particulate loading of the diffuser.
Calibration validity	Presentation of calibration gases matches the bottle value to within ±0.02% O ₂ .
Accuracy in reducing conditions (requires stoichiometer feature)	±10% of reading or 0.1% O ₂ , whichever is greater
System response in reducing conditions (requires stoichiometer feature)	Going from oxidizing to reducing -T90 in 120 seconds Going from reducing to oxidizing -T90 in 30 seconds

Table 1-4: Environmental specifications

Transmitter probe	Process-wetted materials are 316L or 304 stainless.
Process temperature limits	0 to 705 °C (32 to 1300 °F) 550 to 825 °C (1022 to 1517 °F) with Xi <i>heaterless operation</i> feature ⁽¹⁾
Transmitter electronics housing	Low copper aluminum Type 4X/IP66 with reference air exhaust port piped to clean, dry area Ambient temperature limits -40 to 70 °C (-40 to 158 °F), transmitter -40 to 85 °C (-40 to 185 °F) as measured by electronics -40 to 90 °C (-40 to 194 °F), DR probe
Probe electronics ambient temperature limits	-40 to 70 °C (-40 to 158 °F)
Temperature limit as measured inside probe electronics	-40 to 85 °C (-40 to 185 °F)
DR probe, no electronics inside, ambient temperature limits	-40 to 90 °C (-40 to 194 °F)
Optional Xi electronics	
Materials	NEMA 4X, polycarbonate material

Table 1-4: Environmental specifications (continued)

General purpose certifications	 
Xi ambient temperature limits	-20 to 50 °C (-4 to 122 °F)
Xi temperature limits as measured inside the electronics housing	-20 to 70 °C (-4 to 158 °F)

(1) Reduced cell life can be expected if operated continuously at temperatures above 705 °C (1300 °F). Optional bypass and jacket accessories permit operation to 1050 °C (1922 °F).

Table 1-5: Installation specifications - probe

Probe mounting flange	<p>Vertical or horizontal - 2 in. 150# (121 m (4.75 in.) bolt circle)</p> <hr/> <p>Note Flanges are flat-faced and for mounting only. Flanges are not pressure-rated. A 2.5-in. diameter hole in the process is required.</p> <hr/> <p>Spool piece PN 3D39761G02 is available to offset probe electronics housing from hot duct work. Many adapter flanges are available to mate to existing flanges.</p>
Probe lengths and approximate shipping weights	
457 mm (18 in.) package	7.3 kg (16 lb)
0.91 m (3 ft) package	9.5 kg (21 lb)
1.83 m (6 ft) package	12.2 kg (27 lb)
2.74 m (9 ft) package	15.0 kg (33 lb)
3.66 m (12 ft) package	17.7 kg (39 lb)
Reference air (optional)	2 scfh (1 L/min), clean, dry, instrument-quality air (20.95% O ₂), regulated to 5 psi (34 kPa)
Calibration	Semi-automatic or automatic
Calibration gases	0.4% O ₂ and 8% O ₂ , balance N ₂ recommended. Instrument air may be used as a high cal gas but is not recommended. 100% nitrogen cannot be used as the low cal gas.
Calibration gas line	91 m (300 ft) maximum length
Calibration gas flow	5 scfh (2.5 L/min)
Heater electrical power	120/140 Vac ± 10%, 50/60 Hz, 260/1020 VA max, 1/2-in. - 14 NPT conduit ports
Traditional architecture cable	61 m (200 ft) maximum length
Power consumption of probe heater	776 VA maximum during warm-up

Table 1-5: Installation specifications - probe (continued)

4-20 mA/HART loop power	12-30 Vdc (loop power from control room or Rosemount 6888Xi)
-------------------------	--------------------------------------------------------------

Table 1-6: Installation Specifications: Rosemount 6888Xi with Transmitter Probe

Electrical power of optional Xi electronics	120/240 V \pm 10%, 50/60 Hz
Power consumption of Xi	10 watts maximum
Xi alarm relays	2 provided - 2 amps, 30 Vdc
Xi optional loss of flame contact	Removes heater power
Electrical noise	Meets EN 61326, Class A
Traditional architecture cable	61 m (200 ft) maximum length
Transmitter electrical 4-20 mA power	12 - 42 Vdc (loop-powered from the control room or from the Xi box)

Table 1-7: Installation Specifications for Traditional Architecture Rosemount 6888Xi for use with DR or other Probe

Electrical power for Xi	120/240 V \pm 10%, 50/60 Hz
Power consumption of Xi	12 VA maximum or 1020 VA maximum with traditional architecture, 120 V probes 450 VA maximum with traditional architecture 44 V probes
Alarm relay outputs	Two provided - 2 amperes, 30 Vdc, Form-C
Optional loss of flame input	Internally powered input to remove heater power actuated via dry contact output from probe of flame device.

Emerson has satisfied all obligations coming from the European legislation to harmonize the product requirements in Europe. 

2 Install

⚠ WARNING!

Before installing this equipment, read the Essential Instructions at the front of this Reference Manual. Failure to follow safety instructions could result in serious injury or death.

⚠ WARNING!

ELECTRIC SHOCK

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!

HAZARDOUS AREAS

The Rosemount™ 6888A O₂ Transmitter can be installed in general purpose areas only. Do not install the transmitter in hazardous areas or in the vicinity of flammable liquids.

⚠ CAUTION!

EQUIPMENT DAMAGE

If external loop power is used, the power supply must be a safety extra low voltage (SELV) type.

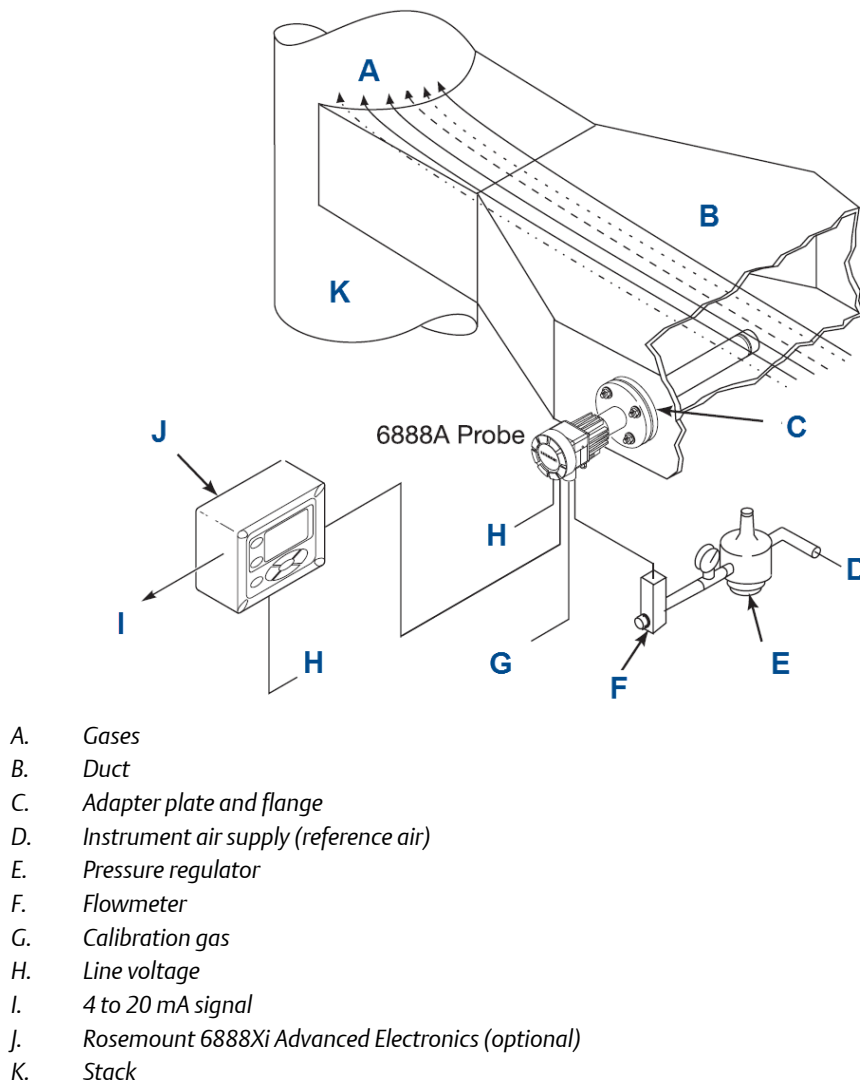
2.1 System considerations

NOTICE

Plug all unused ports on the Rosemount 6888A probe housing with suitable fittings.

A typical system installation for a Rosemount 6888A with integral electronics is shown in [Figure 2-1](#).

Figure 2-1: Typical system installation



A source of instrument air is required at the transmitter for reference air flow [2.0 scfh (1.0 L/min)]. Since the unit is equipped with an in place calibration feature, you can make provisions to permanently connect calibration gas bottles to the transmitter.

If the calibration gas bottles will be permanently connected, install a check valve next to the calibration fittings on the probe. 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 on the calibration gas bottles or the solenoid valves in the Rosemount SPS 40001B or Rosemount IMPS 4000.

If the Rosemount 6888Xi Advanced Electronics option is not used, the 4 to 20 mA signal from the probe will be loop-powered from the DCS. A 375/475 Field Communicator or AMS is required to set up and operate the probe.

The optional Rosemount 6888Xi enhanced interface communicates with the probe transmitter electronics via HART[®] communications riding on to the 4 to 20 mA signal coming from the transmitter. If using the 375/475 Field Communicator, connect it to the 4 to 20 mA signal loop between the Rosemount 6888Xi and the control room or data acquisition system. Connecting the 375/475 Field Communicator between the transmitter and Rosemount 6888Xi will cause communication errors and affect system operation.

NOTICE

The transmitter electronics is rated Type 4X and IP66 and is capable of operation at temperatures from -40 to 85 °C (-40 to 185 °F). Retain the packaging in which the Rosemount 6888A arrived from the factory in case any components are to be shipped to another site. This packaging has been designed to protect the product.

2.2 Mechanical installation

Most combustion processes run only slightly negative or positive in pressure, so that the probe flange is for mechanical mounting only. The probe is not rated for high pressures. If this is a new installation, a *weld plate* for welding to the flue gas duct can be supplied.

⚠ WARNING!

ELECTRIC SHOCK

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. The Rosemount 6888A O₂ transmitter can be installed in general purpose areas only. Do not install the transmitter or the Rosemount 6888Xi in hazardous areas or in the vicinity of flammable liquids.

2.2.1 Install probe

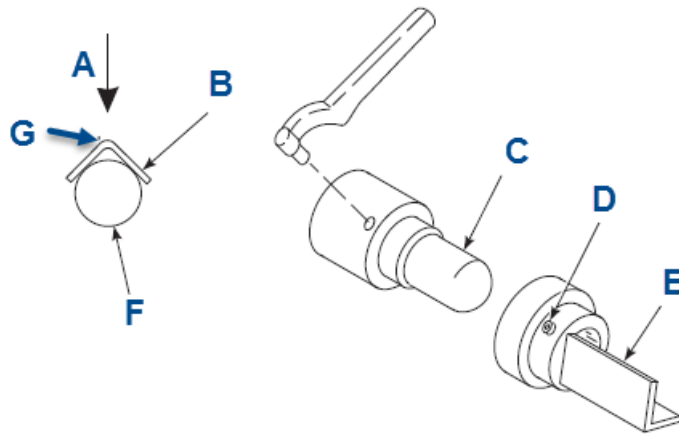
Complete the following steps to install the Rosemount 6888A O₂ probe.

1. Ensure all components are available to install the Rosemount 6888A O₂ probe.

Refer to the probe installation details in [Figure 2-1](#). If using the optional ceramic or Hastelloy diffusion element, the vee deflector must be correctly oriented.

2. Before inserting the Rosemount 6888A probe, check the direction of gas flow in the duct. Orient the vee deflector so the apex points upstream toward the flow. See [Figure 2-2](#).

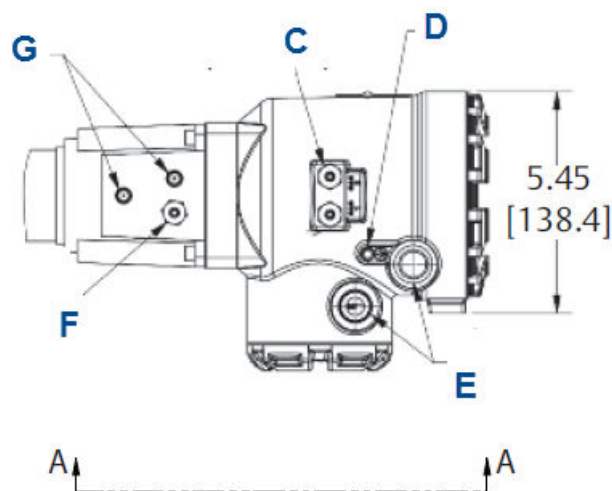
Figure 2-2: Orienting the Optional Vee Deflector



- A. Gas flow direction
- B. Vee deflector
- C. Diffusion element
- D. Setscrew
- E. Vee deflector
- F. Filter
- G. Apex

3. If using the standard square weld plate or an optional flange mounting plate, weld or bolt the plate onto the duct.

Figure 2-5: Rosemount 6888A Integral Autocal Housing Close-up



- A. Dimension
- B. Dimension
- C. Calibration gas 1/4 tube fittings 5.0 SCFH (2.4 L/min) 20 PSI (138 kPa)
- D. #10 socket head cap screw (external ground)
- E. 1/2 NPT conduit connection (power, signal)
- F. Reference gas 1/4 tube fitting 2.0 SCFH (1.0 L/min) 20 PSI (138 kPa)
- G. Reference air vents

Note

All dimensions are in inches with millimeters in parentheses.

Table 2-1: Removal/Installation

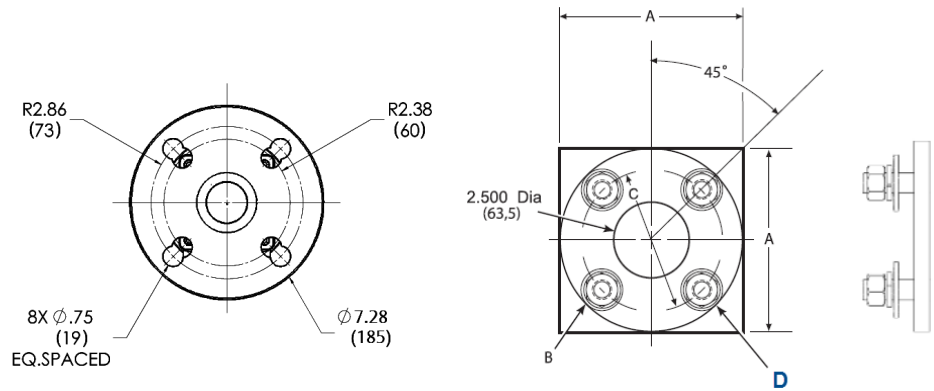
Probe length ⁽¹⁾	Dim A insertion depth	Dim B removal envelope standard housing	Dim B removal envelope accessory housing
457 mm (18 in.) probe	409 mm (16.1 in.)	401 mm (15.77 in.)	490 mm (19.26 in.)
0.91 m (3 ft) probe	826 mm (33.52 in.)	1182 mm (46.6 in.)	1271 mm (50.1 in.)
1.83 m (6 ft) probe	1740 mm (68.52 in.)	2097 mm (82.6 in.)	2186 mm (86.1 in.)
2.74 m (9 ft) probe	2655 mm (104.52 in.)	3011 mm (118.6 in.)	3100 mm (122.1 in.)
3.66 m (12 ft) probe	3569 mm (140.52 in.)	3926 mm (154.6 in.)	4015 mm (158.1 in.)

(1) Add 96 mm (3.8 in.) to Dim A and Dim B for probe with ceramic or Hastelloy diffuser.

The through hole diameter in the stack or duct wall and refractory material must be at least 63.5 mm (2-1/2 in.)

4. Insert probe through the opening in the mounting flange and bolt the unit to the flange.

Figure 2-6: Probe Installation



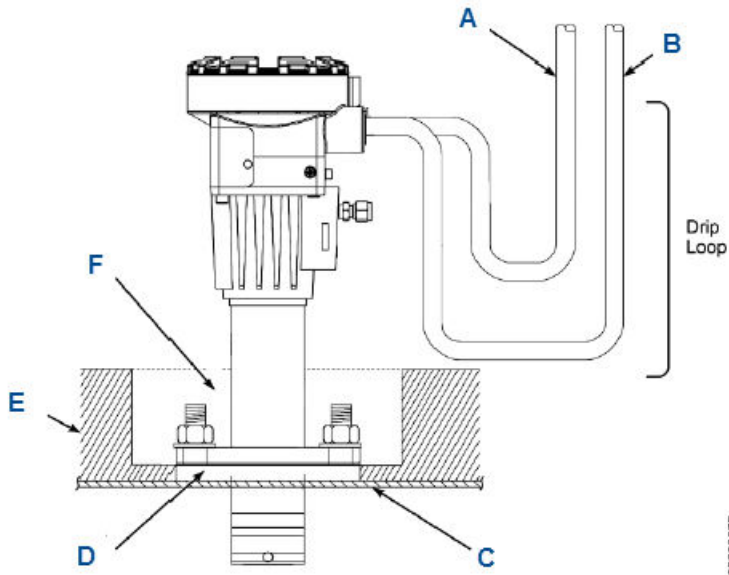
- A. Dimension
- B. Dimension
- C. Dimension
- D. Four studs, lockwashers, and nuts equally spaced on C dia. B C

Table 2-2: Mounting flange

	ANSI	DIN
Flange diameter	7.28 (185)	
Hole diameter	.75 (20)	
(4) holes eq sp on BC	4.75 (121)	5.71 (145)

Table 2-3: Installation Weld Plate Outline

Dimension	ANSI	DIN
A	6.0 m (152 in.)	7.5 m (191 in.)
B thread	.625 m (11 in.)	M16x2
C diameter	4.75 m (121 in.)	5.708 m (145 in.)

Figure 2-7: Drip Loop and Insulation Removal

- A. Line voltage
- B. Logic I/O, 4-20 mA signal
- C. Stack or duct metal wall
- D. Adapter plate
- E. Insulation
- F. **Note**

Replace insulation after installing Rosemount 6888A

2.2.2 Variable insertion

The ideal placement of O₂ probes is often difficult to determine, and the variable insertion option is intended to assist in optimizing the ideal probe location.

Variable insertion option

The variable insertion option permits a probe to be slid into and out of a flue gas duct at infinitely variable depths. This has several advantages over traditional mountings that fix the probe length with a flange at the time of installation:

- One length of probe can be stocked for any length requirement.
- The flue gas duct where the probe is mounted can be profiled with a single long probe while the flue gas levels are trended within the control system. This information can be used to determine the installation *sweet spot* that is most representative of a particular burner column (in the case of wall-fired furnaces), furnace corner (in the case of tangential-fired furnaces), or firing zone (in the case of a fired process heater).

- Process upsets can be diagnosed by again profiling the duct stratification on-line by sliding probe in and out and recording the O₂ levels at different insertion depths. This provides a good diagnostic for balancing burners and tracking down upset conditions caused by sticking burner sleeve dampers, roping in coal pipes, classifier problems, etc.
- A probe can be slid to the most convenient location for a technician to access for the purposes of conducting a calibration or diagnosing a probe problem.

The variable insertion mount consists of a slip-tube that is mounted to the furnace via a flange or pipe thread. Slide the O₂ probe through this mounting and seal the probe outside diameter to the slip-tube ID via valve packing material. A stop-collar is provided for safety to ensure that a probe in a vertical installation does not creep through the packing material due to gravity after installation. The stop collar has separate holes where screws can be inserted to jack the probe out of the slip mount if debris builds up on the probe over time. The packing material can be withdrawn with the probe in situations where the buildup on the probe is heavy and cannot pass through the packing material.

Installation

An installation permitting variable insertion requires some special considerations:

- Removal envelope: There must be enough room for the probe to slide in and out.
- Utilities: Since the probe will be operating continually as its position is adjusted, the electrical wires and pneumatic tubing must be able to travel with the probe.
- Duct pressure: Balanced draft and natural draft furnaces typically run at a slightly negative pressure, so any small leaks in the packing material will draw air into the furnace. When the probe is removed for service, a flow of fresh air into the furnace also results. A positive pressure duct, however, releases hot flue gases when the probe is removed.
- Be mindful that the slip-support holding the end of the probe inside the furnace will likely be attached to the internal structure that may grow thermally more than the furnace wall where the probe flange is mounted. A probe that is perfectly aligned with the slip-support(s) during initial installation (with the furnace off) may be out of alignment once the furnace heats up.

The variable insertion arrangement is set up for Rosemount 6888A probes with heavy-wall abrasion-resistant probe bodies only. For probe lengths of 9 feet and longer, an outboard slip support must be mounted inside the flue gas duct. The support structure may include angle iron or tube bundles that will be at elevated temperatures during use. Plan for thermal expansion when installing the outboard slip support.

WARNING!

GAS LEAKS

Some flue gas ducts operate under positive pressure. While the packing material will prevent most flue gases from escaping into the ambient environment, some leakage can be expected. Once the probe is fully extracted from the slip-tube, hot flue gases will freely exit the hole in the slip tube until a replacement probe or core plug is inserted. Observe safety precautions when removing or inserting a probe into a furnace operating at positive pressure.

⚠ CAUTION!

This variable insertion mount is intended for use in negative pressure ducts and positive pressure ducts where the flue gas pressure is no more than 1 psi. Emerson offers other systems with isolation valve and pressure balancing for applications where the pressure is up to 50 psi.

2.3 Electrical installation

All wiring must conform to local and national codes. Multiple wiring diagrams are shown in this section. Always refer to the diagrams that apply to your transmitter configuration and disregard all other wiring diagrams.

⚠ WARNING!**ELECTRIC SHOCK**

Disconnect and lock out power before connecting the power supply.

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

To meet the safety requirements of IEC 61010-1 (EC requirement) and ensure safe operation of this equipment, connect the main electrical power supply 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, keep another external means of disconnecting the supply from the equipment located close by. Circuit breakers or switches must comply with a recognized standard such as IEC 947.

NOTICE

To maintain proper earth grounding, ensure a positive connection exists between the transmitter housing and earth. The connecting ground wire must be 14 AWG minimum.

NOTICE

Line voltage, signal, and relay wiring should be rated for at least 105 °C (221 °F).

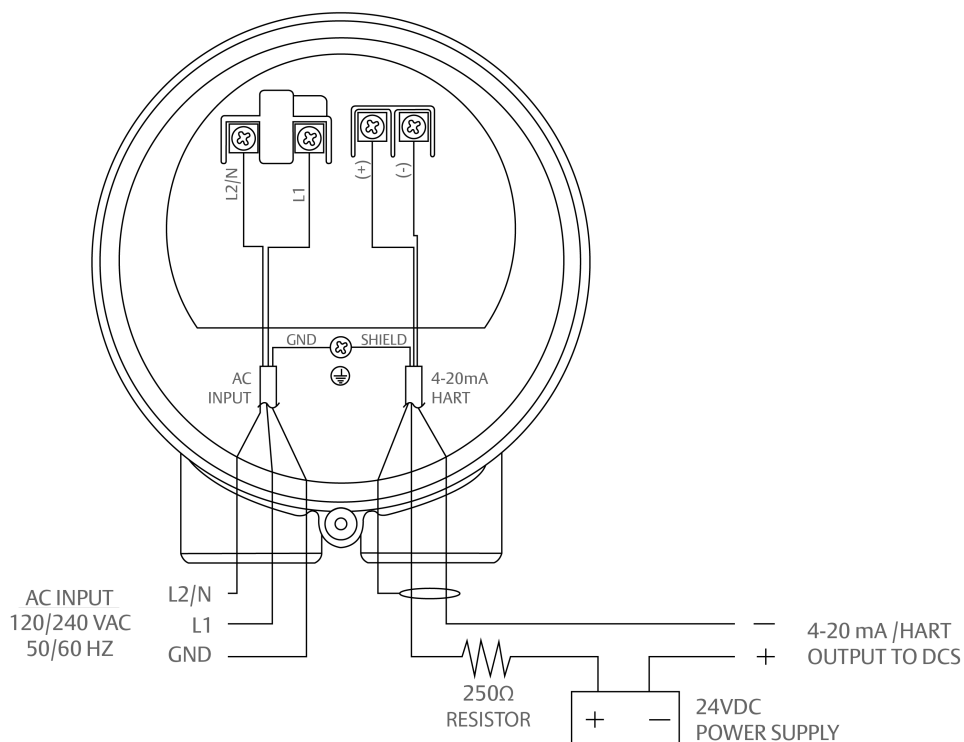
2.3.1 Wiring for Rosemount 6888 Transmitter probe only (no Rosemount 6888Xi Electronics)

The Rosemount 6888 transmitter probe has electronics in the blue housing that controls the heater temperature and also amplifies the raw O₂ millivolt signal to a linear 4-20 mA. The 4-20 mA signal lines can be run directly to the control room and also power the transmitter electronics. There is no O₂ display or keypad on the probe, so you must set up through HART[®] communications via a 475 handheld communicator or via Asset Management Solutions (AMS).

1. Remove the cover from the probe.
2. Connect the line (L1 wire) to the L1 terminal, the neutral (L2 wire) to the L2/N terminal, and the ground wire to the ground lug.

The transmitter accepts 120/240 Vac \pm 10% line voltage and 50/60 Hz. No setup is required.

Figure 2-8: Rosemount 6888A Standard Probe Housing



3. Connect the 4-20 mA signal wires at the transmitter. Use a shielded twisted wire pair.

Do not allow bare shield wires to contact the circuit boards. Insulate the shield wires prior to termination. The transmitter electronics are loop-powered, i.e., the 4-20 mA signal wires supply 24 Vdc from the DCS or an external power supply.

4. Terminate the shield only at the transmitter electronics housing unless using a Rosemount 6888Xi. When using the Rosemount 6888Xi Advanced Electronics, terminate the shield at both ends.

NOTICE

The 4-20 mA signal represents the O₂ value and also powers the probe-mounted electronics. Superimposed on the 4-20 mA signal is HART information accessible through a Field Communicator or AMS software.

5. Reinstall cover on transmitter.
6. Follow the remaining electrical instructions only if the Rosemount 6888Xi is included with your system configuration.

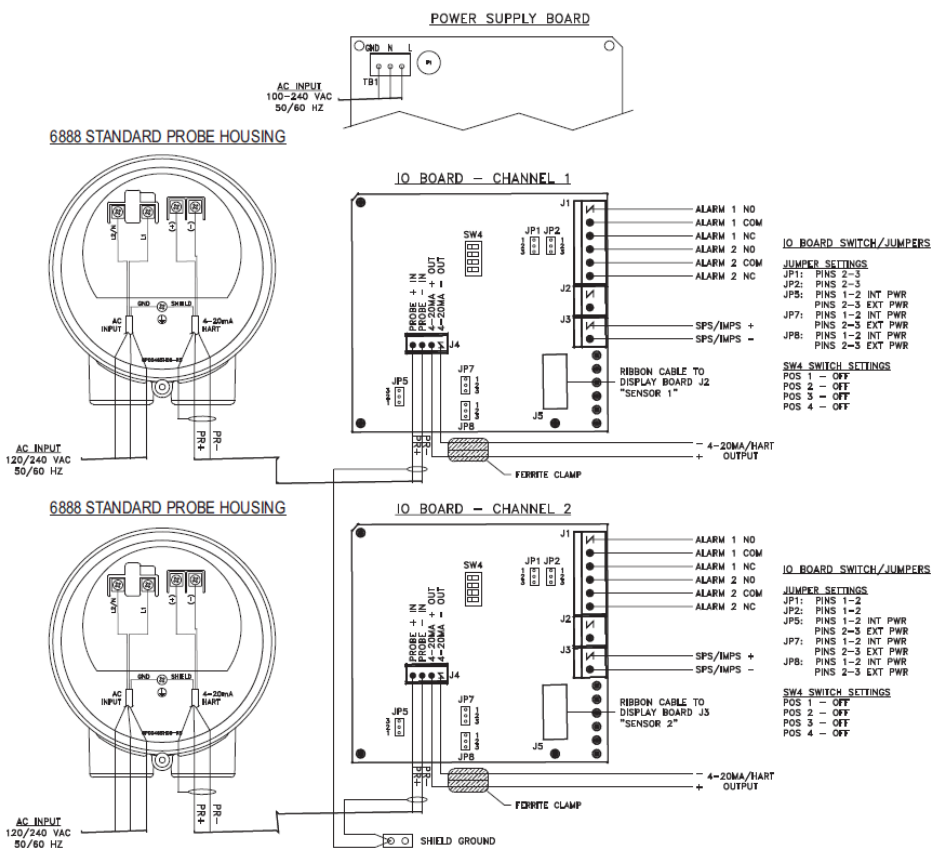
2.3.2 Standard housing transmitter probe plus Rosemount 6888Xi Electronics

The Rosemount 6888Xi Electronics serve as an operator interface unit with a back-lit display and keypad. It is capable of two channels, serving two Rosemount 6888 probes.

1. Remove cover screws from the front cover of the Rosemount 6888Xi. Swing down the front cover of the interface box.
2. Pull out the I/O board on the right side of the card rack inside the Rosemount 6888Xi.

If your system is configured to operate two transmitter probes, there are two I/O interface boards. See [Figure 2-9](#).

Figure 2-9: Wiring Diagrams - Single/Dual Channel Wiring Diagram



Note

- A. Except for JP5, JP2, and JP8 on IO board, jumper and switch settings are factory set and are shown for reference only.
- B. IO board 4-20 mA/HART loop power settings:

JP5: Pins 1-2 internal power Rosemount 6888Xi to Rosemount 6888 transmitter, pins 2-3 external power Rosemount 6888Xi to Rosemount 6888 transmitter (requires 2500 resistor across J4, PR+ to PR-)

JP7/JP8: Pins 1-2 internal power Rosemount 6888Xi to DCS, pins 2-3 external power Rosemount 6888Xi to DCS.

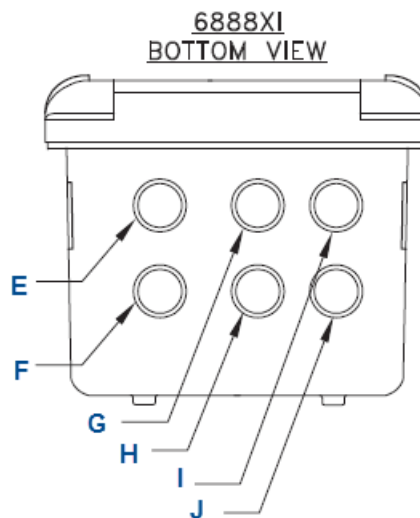
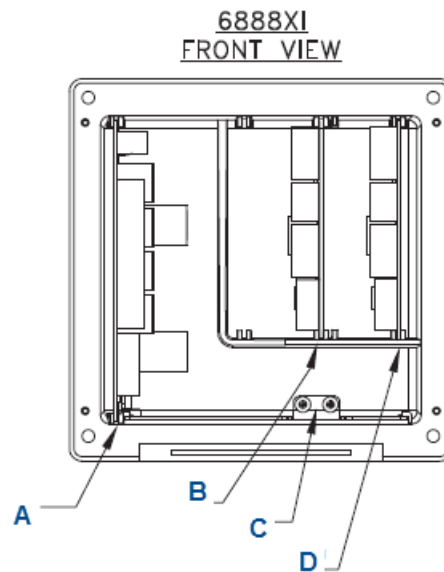
Compare the configuration matrix below to the model number on the probe tag to confirm the features present in this specific probe.

Table 2-4: Remote Type

10XY	Single channel O ₂
20XY	Single channel O ₂ with flame safety interlocking heater
30XY	Dual channel O ₂

Table 2-4: Remote Type *(continued)*

4OXY	Single channel O ₂ traditional architecture for 120 V probes
------	-------------------------------------------------------------------------

Figure 2-10: Rosemount 6888Xi Front and Bottom View


- A. Power supply board
 - B. Channel #2 IO board
 - C. Shield ground
 - D. Channel #1 IO board
 - E. AC input to P/S
 - F. Plug
 - G. Channel #2 alarm relay, SPS/IMPS
 - H. Channel #2 4-20 mA/HART output
 - I. Channel #1 alarm relay SPS/IMPS
 - J. Channel #1 4-20 mA/HART output
-

3. Connect the 4-20 mA signal wires at J4 of the I/O board. Attach the supplied ferrite clamp over the 4-20 mA out wires that extend past the shield.

NOTICE

Installation of the ferrite clamp over the 4-20 mA out wires is required for the compliance with the European EMC directive.

4. Terminate the shield of the 4-20 mA signal wires at the designated ground terminal of the Rosemount 6888Xi. Do not allow bare shield wires to contact the circuit boards. Insulate the shield wires prior to termination.
5. Connect the signal wires from the Rosemount SPS or Rosemount IMPS (if used) to the applicable terminals of J3. Refer to the [Rosemount SPS 4001B](#) or [Rosemount IMPS 4000](#) instruction manual for wiring details.
6. Reinstall the I/O board in the card rack of the Rosemount 6888Xi.
7. If your system is configured for two channel operation, repeat steps 2 through 7 to connect the other probe's signal wires.
8. Remove the probe's connector from the power supply board located on the left side of the card rack inside the Rosemount 6888Xi.
9. Connect the line, or L1, wire to the L1 terminal and the neutral, or L2, wire to the N terminal.
10. Reinstall the power supply connector in the power supply board.

2.3.3 Transmitter probe with single-channel Xi and flame safety interlock

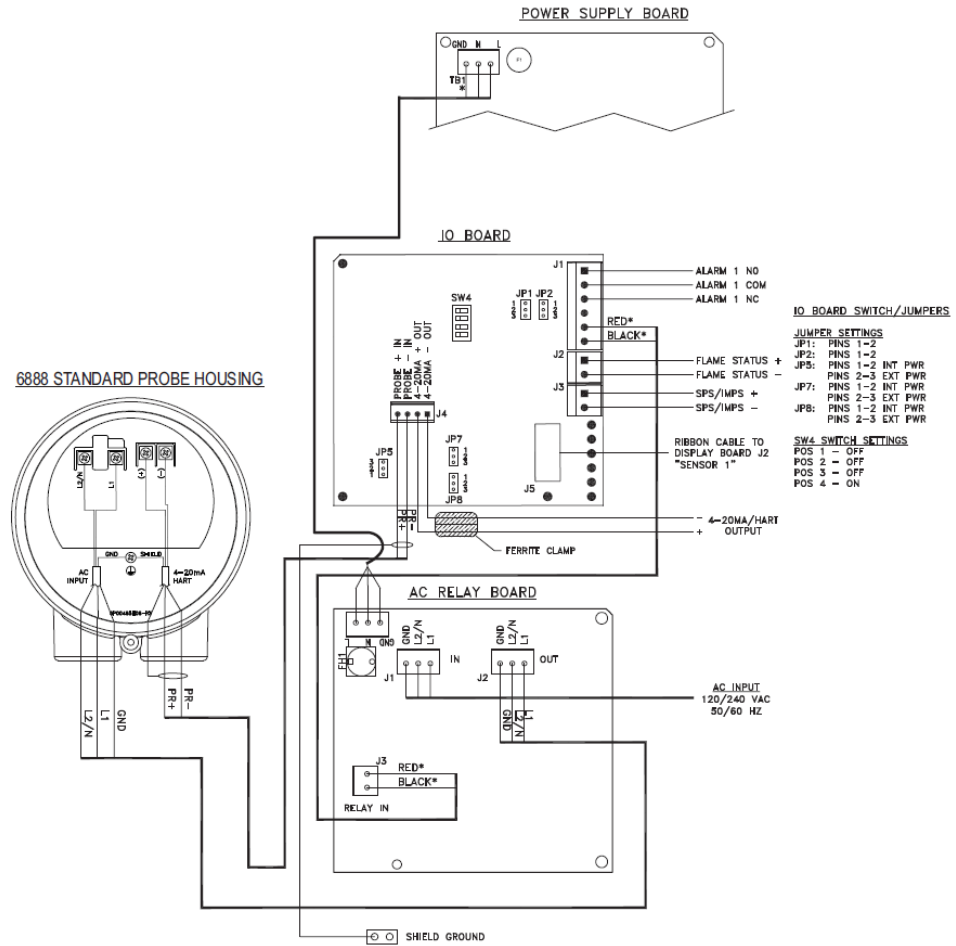
A flame safety interlock by Emerson is available for heater power disconnect whenever there is a loss of the process flame or a heater runaway condition (heater over-temperature) in the O₂ probe. This input is internally powered by the Rosemount 6888Xi and is actuated via a dry contact output from your flame scanner. A closed contact indicates a flame is present. An open contact indicates a loss of flame.

Procedure

1. Refer to [Figure 2-11](#). Connect the signal wires from the burner management system flame status output to the flame status input terminals of J2.

The flame status sensing device is supplied by the customer. Refer to the applicable OEM documents for signal wiring details.
2. Remove the J1 and J2 connectors from the AC relay board.
3. Connect the AC line input to the J1 connector.
4. Connect the AC power to the probe to the J2 connector.
5. Reinstall connector J1 and J2 to the AC relay board.

Figure 2-11: Single channel with flame safety wiring diagram

**Note**

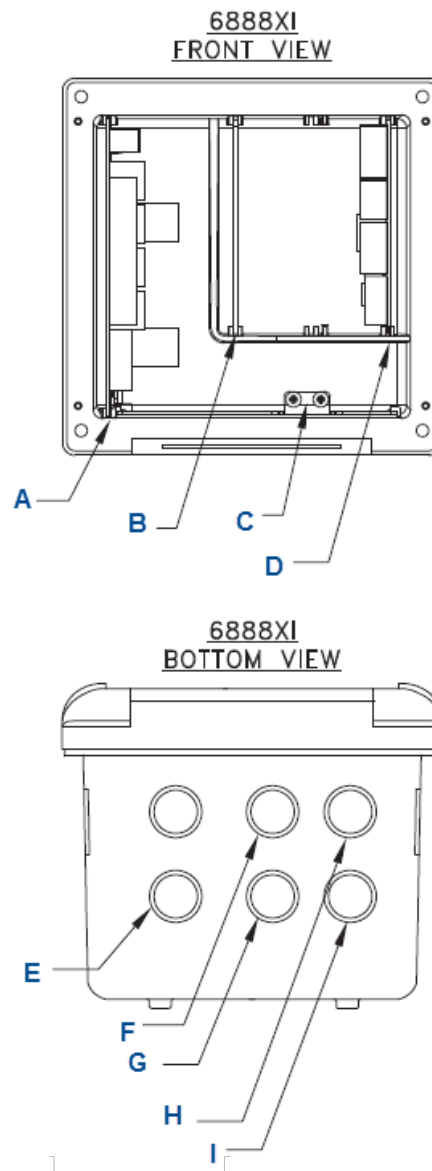
- See [Rosemount 6888Xi Instruction Manual](#) for additional installation and operating instructions.
- All wiring marked with an asterisk (*) is factory wiring inside the Rosemount 6888Xi.
- Except for JP5, JP7, and JP8 on IO board, jumper and switch settings are factory set and are shown for reference only.
- IO board 4-20 mA/HART loop power settings

JP5: Pins 1-2 internal power Rosemount 6888Xi to Rosemount 6888 Transmitter, pins 2-3 external power Rosemount 6888Xi to Rosemount 6888 Transmitter (requires 250 Ω resistor across J4, PR+ to PR-)

JP7/JP8: Pins 1-2 internal power Rosemount 6888Xi to DCS, pins 2-3 external power Rosemount 6888Xi to DCS

See [Table 2-4](#) for the Rosemount 6888Xi configuration matrix.

Figure 2-12: Rosemount 6888Xi Front and Bottom View



- A. Power supply board
- B. AC relay board
- C. Shield ground
- D. IO board
- E. Plug
- F. AC input
- G. Loss of flame output to burner management system
- H. Alarm relay, SPS/IMPS
- I. 4-20 mA/HART output

2.3.4 Transmitter probe with integral autocal and HART communications

This probe contains gas-switching solenoids so that the Rosemount 6888Xi Electronics can control the introduction of calibration gases. Calibrations can be initiated via a calibration recommended diagnostic, time since last calibration, manually via external dry contact, HART communications, or from the Rosemount 6888Xi local operator interface keypad. The integral autocal feature can only be implemented when the probe is used with a Rosemount 6888Xi.

1. Remove the two covers from the transmitter.
2. Connect the line (L1 wire) to the L1 terminal, the neutral (L2) wire to the L2/N terminal, and the ground wire to the ground lug.

The Rosemount 6888A accepts 120/240 Vac \pm 10%, 50/60 Hz. No setup is required.

3. Connect the 4-20 mA signal wires from the Rosemount 6888Xi to the connections in the side chamber of the transmitter.

Do not connect the signal wires to the terminals in the main chamber where the AC input wires are connected. Use a shielded twisted wire pair. Do not allow bare shield wires to contact the circuit boards. Insulate the shield wires prior to termination. The 24 Vdc loop power is sourced from the Rosemount 6888Xi.

4. Terminate the shield at both the probe and the Rosemount 6888Xi Advanced Electronics.

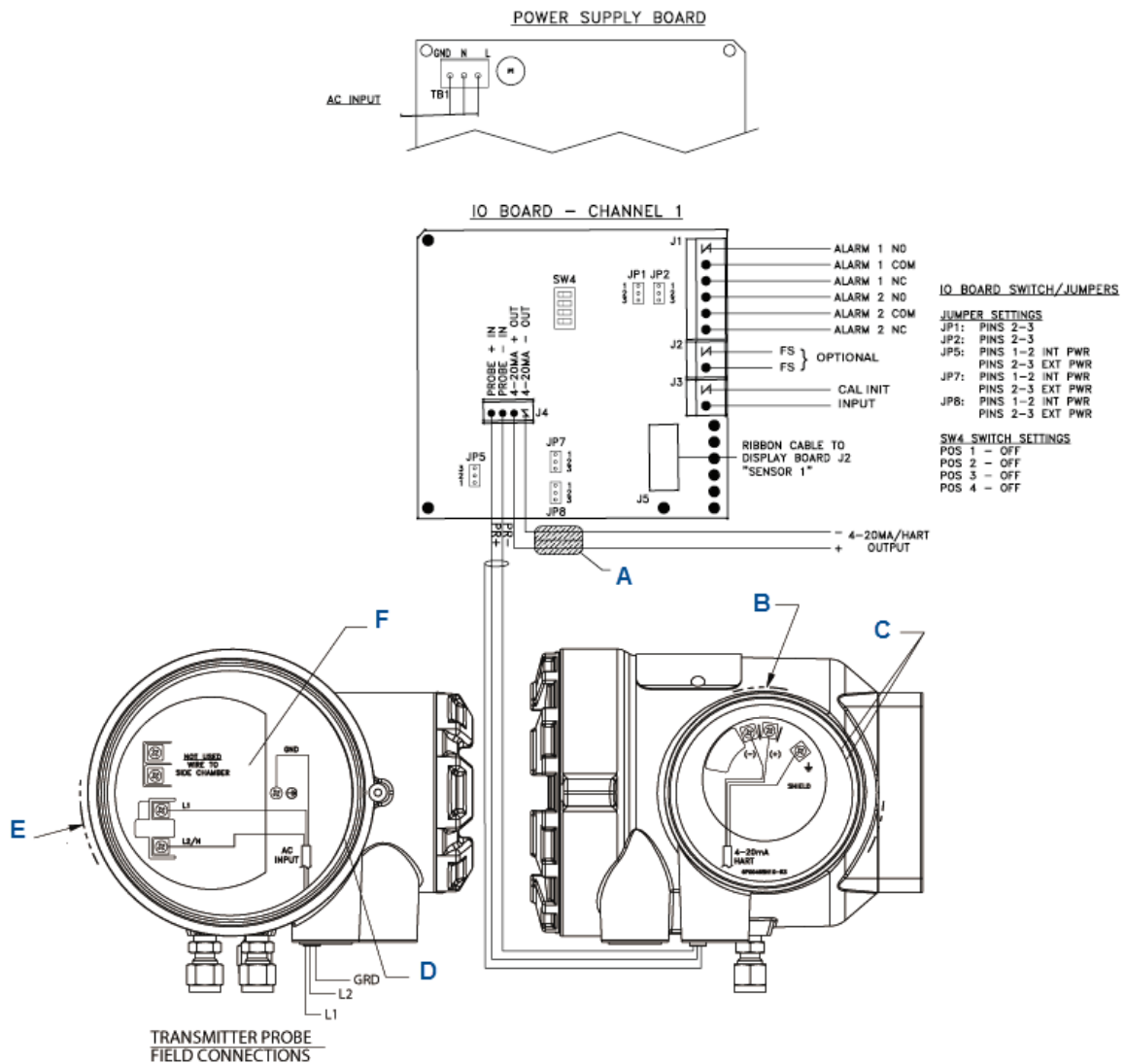
NOTICE

The 4-20 mA signal represents the O₂ value and also powers the probe-mounted electronics. Superimposed on the 4-20 mA signal is HART information accessible through a field communicator or AMS software.

5. Reinstall both covers on transmitter.
6. Follow the remaining electrical installation instructions for the Rosemount 6888Xi included with your system configuration.

See [Table 2-4](#) for the Rosemount 6888Xi product matrix.

Figure 2-13: Integral Autocal and HART Communications



- A. Ferrite clamp
- B. Signal
- C. Test points
- D. #8 pan htd scr (internal ground)
- E. Power
- F. Test point group

NOTICE

A. Except for JP5, JP7, and JP8 on IO board, jumper and switch settings are factory set and are shown for reference only.

B. IO board: 4-20 mA/HART loop power settings

- JP5
 - Pins 1-2: internal power Rosemount 6888 Xi to Rosemount 6888 transmitter
 - Pins 2-5: external power Rosemount 6888 Xi to Rosemount 6888 transmitter (requires 2,500 resistor across J4, PR+ to PR-)
- JP7/JP8
 - Pins 1-2: internal power to DCS
 - Pins 2-3: external power Rosemount 6888 Xi to DCS

NOTICE

I/O board - Channel 2 is a duplicate of Channel 1.

See [Figure 2-10](#) for the front and bottom view of the Rosemount 6888Xi.

2.3.5 Wire the Rosemount 6888A Transmitter probe with integral autocal and FOUNDATION™ Fieldbus communications

This probe contains gas-switching solenoids so that the Rosemount 6888Xi electronics can control the introduction of calibration gases. Calibrations can be initiated manually via a calibration recommended diagnostic, time since last calibration, manually via external dry contact, HART communications, or from the Rosemount 6888Xi local operator interface keypad. The integral autocal feature can only be implemented when the probe is used with a Rosemount 6888Xi.

1. Remove the two covers from the transmitter.
2. Connect the line (L1) wire to the L1 terminal, the neutral (L2) wire to the L2/N terminal, and the ground wire to the ground lug.

The Rosemount 6888A accepts 120/240 Vac \pm 10% line voltage and 50/60 Hz. No setup is required.

3. Connect the FOUNDATION Fieldbus wires from the Rosemount 6888 side housing to the FF segment.

The Rosemount 6888 probe is not rated as intrinsically safe and will render any IS or FISCO segment it is wired to as non-IS. Use a shielded twisted wire pair. Do not allow bare shield wires to contact the circuit boards.

4. Terminate the shield at both the probe and the Rosemount 6888Xi advanced electronics.

NOTICE

The FOUNDATION Fieldbus signal represents the O₂ value and also powers the probe-mounted electronics.

5. Reinstall both covers on transmitter.
6. Follow the remaining electrical installation instructions for the Rosemount 6888Xi included with your system configuration.

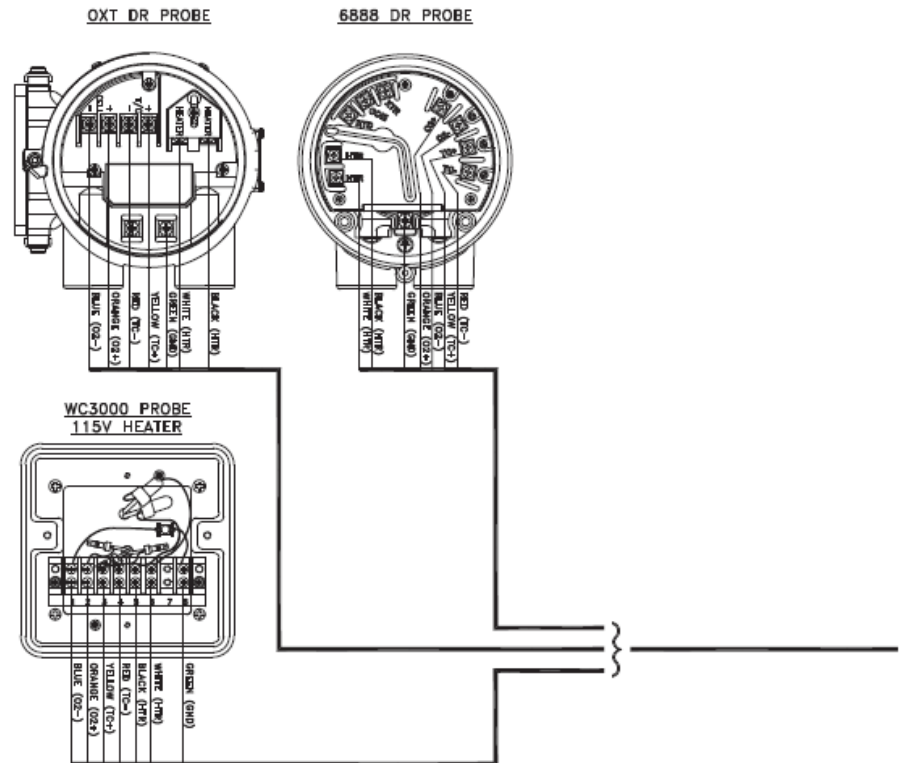
2.3.6 Wire the traditional architecture system with direct replacement probe (no electronics inside)

Here there are no electronics inside the probe head, so the raw sensor signals for the heater thermocouple and zirconium oxide (O₂) sensor are sent to a remote Rosemount 6888Xi electronics. The Rosemount 6888Xi electronics also directly applies power to the probe heater in order to maintain the correct sensor temperature. This arrangement calls for a 7-conductor cable to carry this power and the sensor signals. Maximum length for this cable is 200 feet.

1. Remove cover from probe.
2. Feed all DR probe wiring through line power conduit of probe.
3. Connect DR probe heater power leads to DR probe connectors, [Figure 2-14](#).

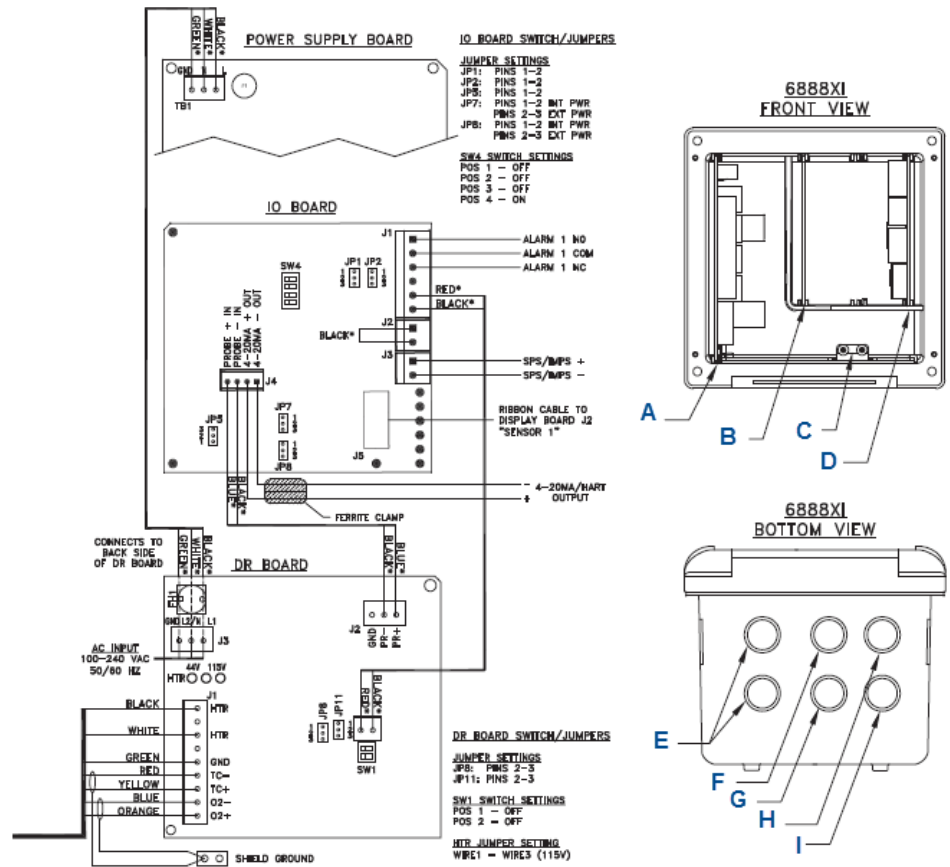
See [Table 2-4](#) for the Rosemount 6888Xi product matrix.

Figure 2-14: Wiring Diagrams - Traditional Architecture with Direct Replacement Probe (no Electronics Inside)



Note

- See [Rosemount 6888Xi Instruction Manual](#) for additional installation and operating instructions.
- All wiring marked with an asterisk (*) is factory wiring inside the Rosemount 6888Xi.
- Except for JP7 and JP8 on IO board, jumper and switch settings are factory set and are shown for reference only.



- A. Power supply board
- B. DR board
- C. Shield ground
- D. IO board
- E. Plug
- F. Probe cable
- G. AC input
- H. Alarm relay SPS/IMPS
- I. 4-20 mA/HART output

4. Connect O₂ signal and thermocouple wires to DR probe connectors.

2.3.7 Wire the traditional architecture cable connections

A traditional architecture configuration is used to provide for remote location of the transmitter electronics. All electronics are housed inside the Rosemount 6888Xi. A multi-conductor power/signal cable connects between the probe and the Rosemount 6888Xi. Use the following procedure to connect the traditional architecture probe to the Rosemount 6888Xi.

NOTICE

The traditional architecture cable is provided at the specified length and is ready for installation. The cable glands must be properly terminated to maintain EMC/EMI noise protection.

Procedure

1. Run the 7-conductor cable between the traditional architecture probe and the installation site for the Rosemount 6888Xi. Use new cable conduit or trough as needed.
2. Install the cable and lead wires to the probe per manufacturer's instructions.
3. Install the cable at the probe housing and at the Rosemount 6888Xi enclosure according to the following procedure:
 - a. Unscrew the locking nut from the gland assembly and slide the locking nut back along the cable.
 - b. Pull the gland body away from the plastic insert.
Use care not to damage the cable shield braid.
 - c. Insert the cable wires into the proper entry port in either the probe housing or the Rosemount 6888Xi enclosure.
 - d. At the probe housing, apply Teflon[®] tape or similar sealing compound to the tapered pipe threads. Thread the gland body into the probe housing until properly seated.
 - e. At the Rosemount 6888Xi enclosure, insert the gland body into the left front cable port from the inside of the enclosure. Use the rubber O-ring provided to seal the cable port.
 - f. Ensure the cable shield braid is evenly formed over the gray insert.
When properly formed, the braid should be evenly spaced around the circumference of the insert and not extend beyond the narrow diameter portion.
 - g. Carefully press the gray insert into the gland body. The grooves on the insert should align with similar grooves inside the gland body. Press the insert in until it bottoms out in the gland body.
 - h. Slide the locking nut up and thread it onto the gland body. Tighten the locking nut so the rubber grommet inside the plastic insert compresses against the cable wall to provide an environmental seal.
4. At the Rosemount 6888Xi, connect the cable leads to the connectors on the transmitter I/O board.

2.4 Pneumatic installation

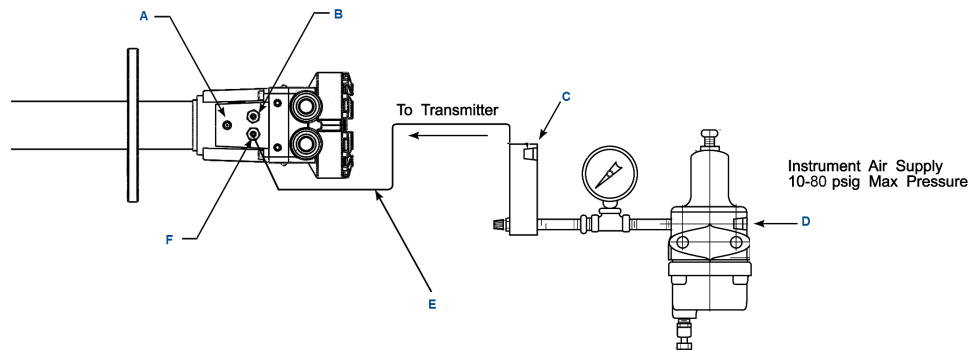
2.4.1 Reference air package

After the Rosemount 6888A is installed, connect the reference air set to the Rosemount 6888A unit.

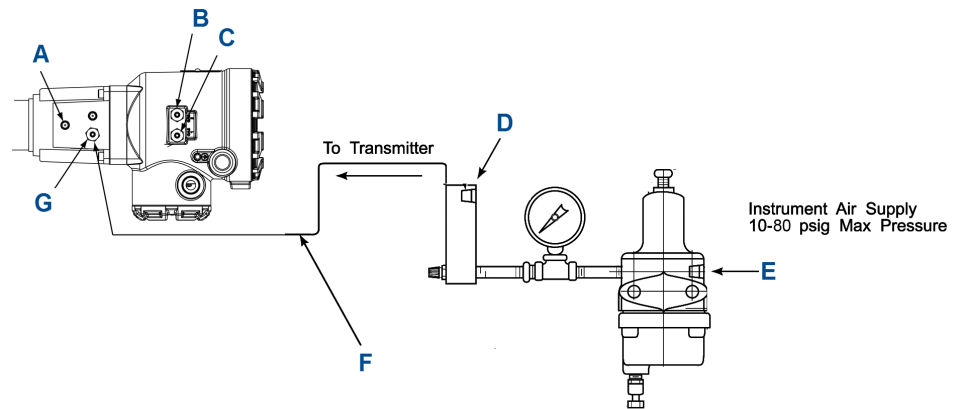
Refer to the schematic diagram in [Figure 2-15](#) for a locally assembled reference air supply.

Instrument air (reference air): 5 psi (34 kPa) minimum, 8 psi (54 kPa) maximum at 2.0 scfh (1.01 L/min) maximum; less than 40 parts per million total hydrocarbons. Regulator outlet pressure should be set at 5 psi (34 kPa). Reference air can be supplied by the reference air set or the optional Rosemount SPS 4001B or Rosemount IMPS 4000.

Figure 2-15: Plant Schematic Diagram, Standard Housing

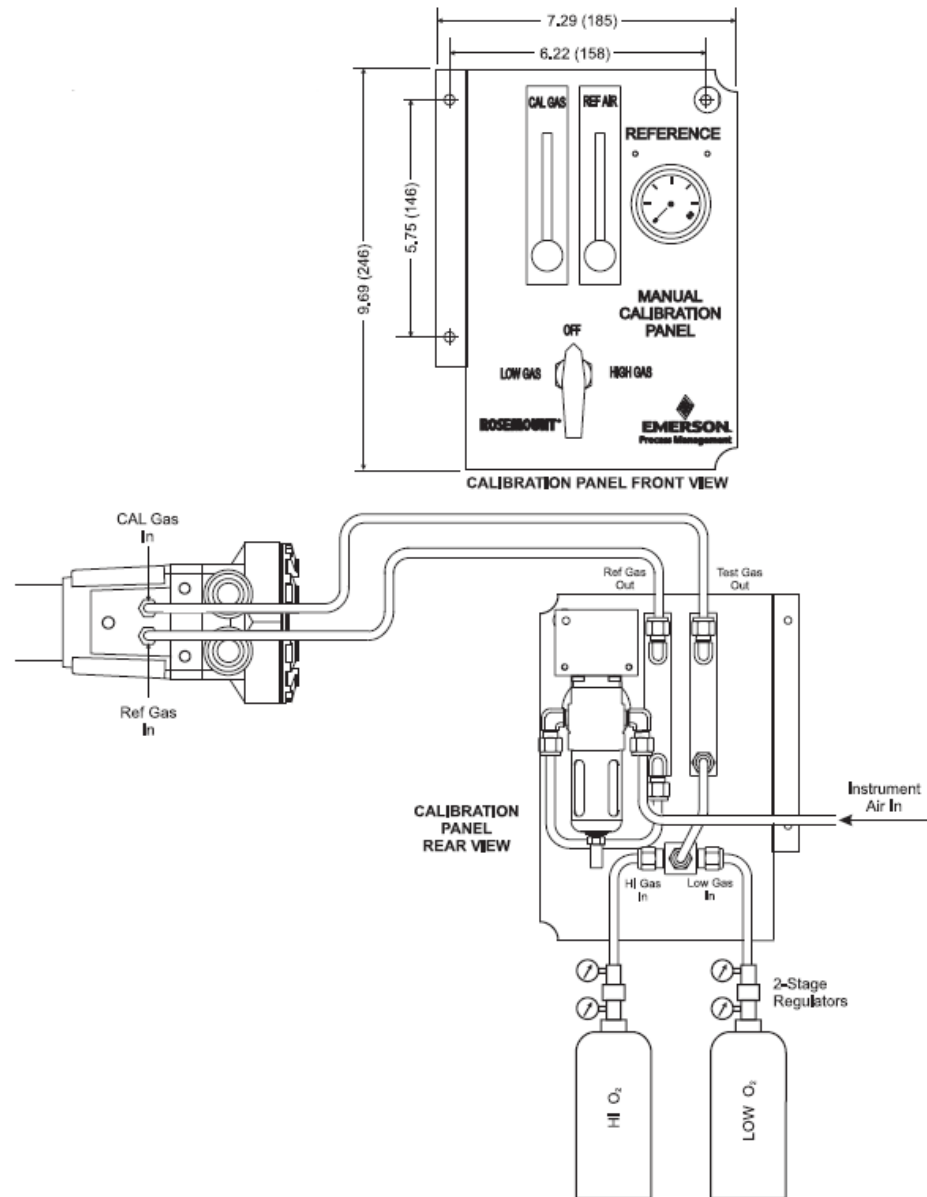


- A. Vent
- B. Calibration gas: 1/4 in. tube
- C. Reference air flowmeter
- D. 0.25-18 NPT female inlet connection
- E. 0.25 or 6 mm O.D. tubing (supplied by customer)
- F. Reference gas: 1/4 in. tube

Figure 2-16: Plant Air Schematic Diagram, Accessory Housing

- A. Vent
- B. Calibration gas 1: 1/4 in. tube
- C. Calibration gas 2: 1/4 in. tube
- D. Reference air flowmeter
- E. 0.25-18 NPT female inlet connection
- F. 0.25 or 6 mm O.D. tubing (supplied by customer)
- G. Reference gas: 1/4 in. tube

Figure 2-17: Manual Calibration Panel

**Note**

Dimensions are in inches with millimeters in parentheses.

Reference air components are included in the optional manual calibration panel (Figure 2-17), the Rosemount SPS 4001 Single Probe Autocalibration Sequencer, and the Rosemount IMPS 4000 Intelligent Multiprobe Test Gas Sequencer.

NOTICE

The optional Rosemount SPS 4001B or Rosemount IMPS 4000 Sequencer can only be used when the Rosemount 6888Xi advanced electronics option is selected. The Rosemount 6888Xi must be properly configured for autocalibration. See [Chapter 3](#).

See the [SPS 4001B Single Probe Autocalibration Sequencer Instruction Manual](#) or the [IMPS 4000 Intelligent Multiprobe Test Gas Sequencer Instruction Manual](#) for wiring and pneumatic connections.

2.4.2 Calibration gas

Two calibration gas concentrations are used with this transmitter, low gas - 0.4% O₂, balance N₂, and high gas - 8% O₂, balance N₂.

⚠ CAUTION!**CALIBRATION READING ERRORS**

Do not use 100% nitrogen as a low gas (zero gas). Emerson suggests that gas for the low (zero) be between 0.4% and 2.0% O₂. Do not use gases with hydrocarbon concentrations of more than 40 parts per million. Failure to use proper gases will result in erroneous readings.

⚠ CAUTION!**EQUIPMENT DAMAGE**

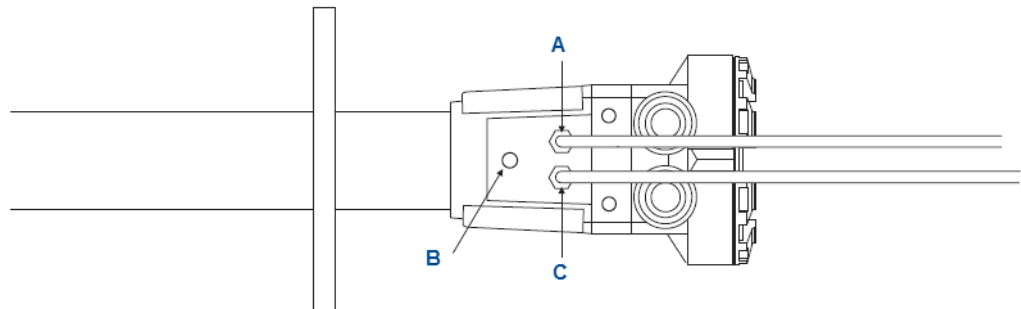
If the ducts will be washed down during outage, **MAKE SURE** to power down the Rosemount 6888A units and remove them from the wash areas.

NOTICE

Upon completing installation, make sure that the transmitter is turned on and operating prior to firing up the combustion process. Damage can result from having a cold unit exposed to the process gases. During outages, if possible, leave all units running to prevent condensation and premature aging from thermal cycling.

An optional manual calibration panel is shown in [Figure 2-17](#). See [Figure 2-18](#) for the Rosemount 6888A probe calibration gas connection ports.

Figure 2-18: Rosemount 6888A Calibration Gas Connections



- A. *Cal gas in*
- B. *Ref air vent*
- C. *Ref air in*

Figure 2-19: Traditional Architecture Cable Gland Assembly



3 Configuration, startup, and operation

⚠ WARNING!

ELECTRIC SHOCK

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.

⚠ CAUTION!

EQUIPMENT DAMAGE

If external loop power is used, the power supply must be a safety extra low voltage (SELV) type.

3.1 Power up Rosemount 6888 Transmitter without Rosemount 6888Xi

Complete the following steps to apply power to the Rosemount 6888 Transmitter without connecting it to the Rosemount 6888Xi.

1. Apply AC line power to the transmitter.
2. Apply 24 Vdc loop power to the transmitter.
3. Using either the DCS control or a Field Communicator, verify communications to the transmitter.

The transmitter probe takes approximately 45 minutes to warm up to the 736 °C (1357 °F) heater setpoint. The 4-20 mA signal remains at a default value of 3.5 mA, and the O₂ reading remains at 0% through this warm-up period. After warm-up, the probe begins reading oxygen, and the 4-20 mA output is based on the default range of 0-10% O₂.

If there is an error condition at startup, an alarm message is displayed.

3.2 Power up the Rosemount 6888 Transmitter with single/dual channel or single channel and flame safety interlock Rosemount 6888Xi

Complete the following steps to power up the Rosemount 6888 Transmitter with single/dual channel or single channel and flame safety interlock Rosemount 6888Xi.

1. Apply AC line power to the transmitter.
2. Apply AC line power to the Rosemount 6888Xi. Run the Rosemount 6888Xi Quick Start Wizard ([Section 3.4](#)). At the Auto Cal Device screen, select the calibration method based on the Rosemount 6888 Transmitter as follows:
 - a. Standard probe housing configuration - Select None, SPS, or IMPS as appropriate. Do not select Integral or calibration will not be possible.
 - b. Integral autocal probe housing - Select Integral only. If Integral is not selected, calibration will not be possible.
3. Verify communications between the transmitter and the Rosemount 6888Xi.

The Rosemount 6888Xi display is preconfigured to display O₂ and cell temperature for single channel configurations and both O₂ readings for dual channel configurations.

The transmitter probe takes approximately 45 minutes to warm up to the 736 °C (1357 °F) heater setpoint. The 4-20 mA signal remains at a default value of 3.5 mA, and the O₂ reading remains at 0% through this warm-up period. After warm up, the probe begins reading oxygen, and the 4-20 mA output is based on the default range of 0-10% O₂.

If there is an error condition at startup, an alarm message is displayed on the Rosemount 6888Xi.

3.3 Power up the Rosemount 6888 direct replacement probe (no electronics inside) with traditional architecture Rosemount 6888Xi

Complete the following steps to power up the Rosemount 6888 direct replacement probe with the Rosemount 6888Xi Electronics.

1. Apply AC line power to the Rosemount 6888Xi.
2. Run the Quick Start Wizard as described in [Section 3.4](#).
3. At the Auto Cal Device screen, select None, SPS, or IMPS as appropriate.

Do not select Integral or calibration will not be possible.

The transmitter probe takes approximately 45 minutes to warm up to the 736 °C (1357 °F) heater setpoint. The 4-20 mA signal remains at a default value of 3.5 mA, and the O₂ reading remains at 0% through this warm-up period. After warm up, the probe begins reading oxygen, and the 4-20 mA output is based on the default range of 0-10% O₂.

If there is an error condition at startup, an alarm message is displayed on the Rosemount 6888Xi.

3.4 Rosemount 6888Xi Quick Start Wizard

When the Rosemount 6888Xi is first powered, a short wizard program guides you through the basic setup. Once configured, the Rosemount 6888Xi retains the setup, and the wizard will not repeat.

1. Apply power to the Rosemount 6888Xi.

Once boot-up is complete, the Quick Start Wizard screen appears. With a dual channel Rosemount 6888Xi, the wizard runs for both channels in succession.

2. Press **Enter** to continue.

3. At the Sensor Type screen, use the **Up** and **Down** keys to select O₂.

Do not select CO as this option is reserved for future use.

4. Press **Enter** to continue.

5. At the Device Type screen use the **Up** and **Down** keys to select HART® or FF (FOUNDATION™ Fieldbus), whichever applies.

6. At the Auto Cal Device screen, use the **Up** and **Down** keys to select the calibration method to be used. The methods are defined as follows:

- None - Manual calibration with the standard probe housing configuration
- SPS - Automatic calibration with the standard probe housing configuration using the Rosemount SPS 4001B
- IMPS - Automatic calibration with the standard probe housing configuration using the Rosemount IMPS
- Integral - Automatic calibration with the integral autocal probe housing configuration

7. Press **Enter** to continue.

NOTICE

If SPS, IMPS, or Integral is selected, you must still configure automatic calibration as On. Other parameters, such as test gas values and gas times, should be verified as well. Refer to the [Rosemount 6888Xi Reference Manual](#) for calibration setup details.

8. When prompted by Setup Correct?, use the **Up** and **Down** keys to select Yes.

If you select No, the wizard restarts.

9. Press **Enter** to continue.

The Rosemount 6888Xi displays several screens while saving the configuration, resets itself, and then returns to the main screen.

3.5 Re-initiating Rosemount 6888Xi wizard

To re-initiate the wizard setup, you must reset the I/O board to default factory conditions.

1. Apply power to the Rosemount 6888Xi.
2. When the main screen appears, press **Menu** several times until the System menu appears. Use the **Up** and **Down** keys to select Configure IOB. Press **Enter** to continue.
3. When the Configure IOB screen appears, use the **Up** and **Down** keys to select I/O Board 1. With a dual channel Rosemount 6888Xi, you can reset and reconfigure either or both I/O boards. Press **Enter** to continue.
4. When the I/O board 1 menu appears, use the **Up** and **Down** keys to select Reset I/O Board. Press **Enter** to continue.
5. When the Reset menu appears, use the **Up** and **Down** keys to select Factory Defaults. Press **Enter** to continue.
6. When prompted, use the **Up** and **Down** keys to select Yes. Press **Enter** to continue.

The Rosemount 6888Xi displays several screens while saving the configuration, resets itself, and then displays the Wizard screen.

3.6 Calibration

The Rosemount 6888 O₂ analyzer system can be calibrated in the installed condition without removing the instrument from the process duct and also while the combustion process is on-line. A stainless steel tube runs the length of the probe and delivers the calibration gases into the cell area. Factory calibration is usually satisfactory for initial startup and operation, but the most accurate measurement is gained by executing a calibration under normal operating conditions.

Emerson recommends using 0.4% O₂ and 8% O₂ as calibration gases, with a balance of nitrogen in the gas bottles, but other values can be used as long as the electronics are configured identically. Do not use instrument air or pure nitrogen as calibration gas values. Use a two-stage pressure regulator to establish a pressure of 20 psi from the bottles and set the flowmeter to 5 scfh flow rate.

3.6.1 Manual/semi-automatic calibration

The Rosemount 6888 probe with the standard housing can be calibrated in a semi-automatic fashion with a technician following prompts via the display of the Rosemount 6888Xi Electronics or via HART communications to a Field Communicator or AMS console. The technician needs to manually switch the gases based upon these prompts. Emerson recommends using 0.4% O₂ and 8% O₂, balance nitrogen as calibration gases. Always use a two-stage pressure regulator set to 20 psi. Set the calibration gas flowmeter for a maximum of 5 scfh with the cal gas fitting removed from the probe. A diffuser/filter that is plugged over time may cause the flowmeter to deliver less flow to the sensing cell, but never readjust the flow rate until a new diffuser is installed. Readjusting the flowmeter back up to the 5 scfh level could pressurize the cell during calibration and cause the O₂ reading to shift downwards.

The electronics determine if the calibration was successful and calculate new calibration values. New calibration values are not automatically loaded into the electronics after a successful calibration, however. The technician has the opportunity to accept or reject the new values. (A significant calibration change may cause a bump in the O₂ readings at the DCS console, causing operator concern). Record the calibration data on a log (cell slope, constant, and impedance, as well as the speed of response data). If the electronics is used, it stores calibration data for the past 10 successful calibrations.

⚠ CAUTION!

READING ERRORS

Make sure the calibration gas cap is replaced tightly after calibration is complete. A loose or missing cap can permit fresh air to bias the O₂ readings high in processes that run at negative pressure.

3.6.2 Fully automatic calibration

For fully automatic calibration, the Rosemount 6888Xi Electronics must manage the actuation of solenoids to introduce gases into the probe.

Rosemount 6888 probes with standard electronics housing

In addition to the Rosemount 6888Xi, this arrangement requires a separate single probe sequencer (SPS), which is a solenoid box for switching calibration gases, or a larger intelligent multiprobe sequencer (IMPS), which can handle the autocal for up to four probes in one box.

The automatic calibration can be initiated in several ways:

- Via a *calibration recommended* diagnostic that is periodically checking cell impedance
- Via push button on the Rosemount 6888Xi electronics
- Via HART communications from a 475 handheld communicator or AMS
- Via an external contact closure
- Via time since the last successful calibration

If the O₂ measurement is being used for automatic control, always place the O₂ control loop into manual prior to calibrating. Always inform the operator prior to calibrating. The Rosemount 6888Xi Electronics provides an *in cal* contact closure for this purpose. An *initiate cal* contact is also provided.

The Rosemount 6888Xi Electronics sequences the calibration gases in turn into the sensing cell. A 300 second flow time is the factory default for both gases and also for the purge cycle, which lets the probe signal come back to the normal flue gas readings. The 4-20 mA signal representing O₂ can be held during the calibration cycle or permitted to vary with the bottled gases, in which case a record of the calibration can be trended at the DCS.

Calibration setup is found under the detailed setup menu.

Rosemount 6888 probe with integral autocal housing

This probe contains the autocal solenoids within the blue electronics housing, eliminating the need and cost for an SPS or IMPS solenoid enclosure. Both calibration gases are permanently piped into two ports on the probe. It's important to confirm that there are no piping leaks or the calibration bottles will leak down prematurely.

Note

The calibration sequence from the Rosemount 6888Xi electronics will be identical to that for manual/semiautomatic calibration, but with the integral auto cal version of this probe it is not possible to conduct a manual calibration. The factory offers a probe rebuild capacity if solenoid or other failures occur.

Note

Calibration gas bottles are piped and under pressure at all times, so be sure to leak-check all fittings, tubings, and connections. Always use dual-stage pressure regulators.

3.6.3 Other features associated with calibration

1. Cal check capability: You can choose to look at new calibration values prior to having them load in and become active. If this feature is selected, a `calibration changed` alarm comes up after the calibration is complete. Push the **Diagnostics** button on the Rosemount 6888Xi to require an Accept Cal step so that the technician or operator can decide if they are ready to accept a potentially large change in calibration values.
2. Plugged diffuser diagnostic: This feature measures the return-to-process rate after calibration gases are removed and will alarm when this time exceeds 75% of the purge time configured. A `purge time too short` alarm indicates that the diagnostic could not work because of a short purge time and is another indication that the diffuser is plugged. Increase purge time in this case.

Another feature that comes with the plugged diffuser diagnostic is auto gas switching. This feature switches cal gases and also ends the purge sequence when the readings settle out, vs. waiting for a configured flow time. This saves time and gas.

3. Tolerance check: Alarms if the cell MV signal is significantly different from the expected signal of the bottles noted in the setup. This indicates if the wrong bottles are being used or if a bottle runs out in the middle of a calibration.

Calibration setup is under the Detailed Setup menu.

Calibration setup can be found in the Rosemount 6888Xi menu.

For the factory default menu, see [Figure 3-1](#).

Figure 3-1: Calibration Defaults

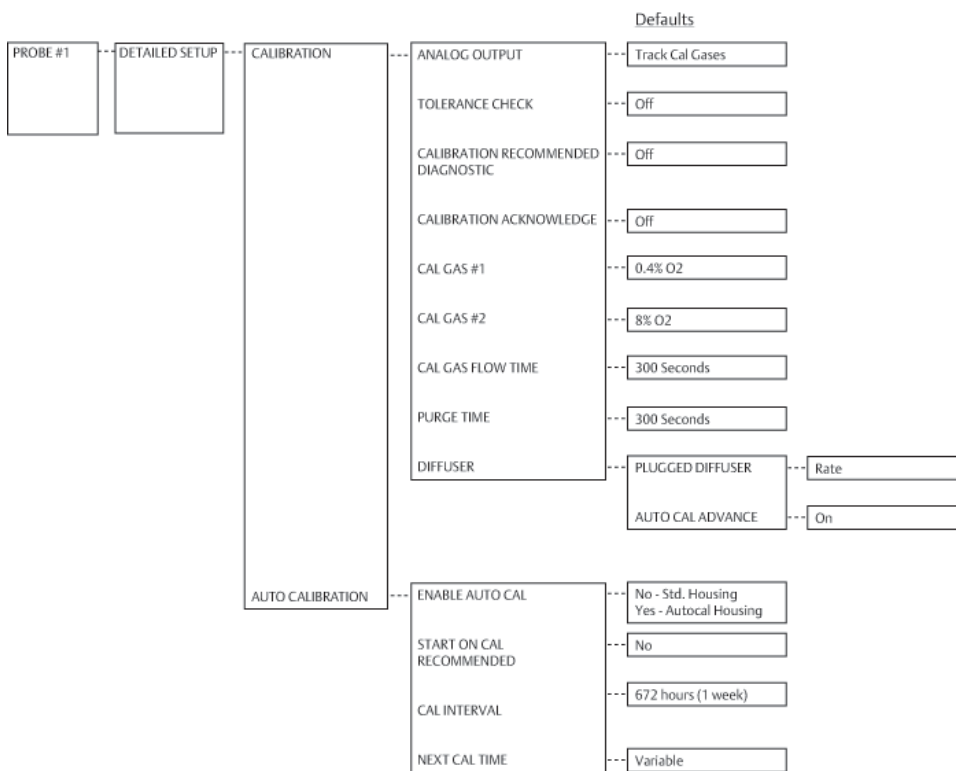
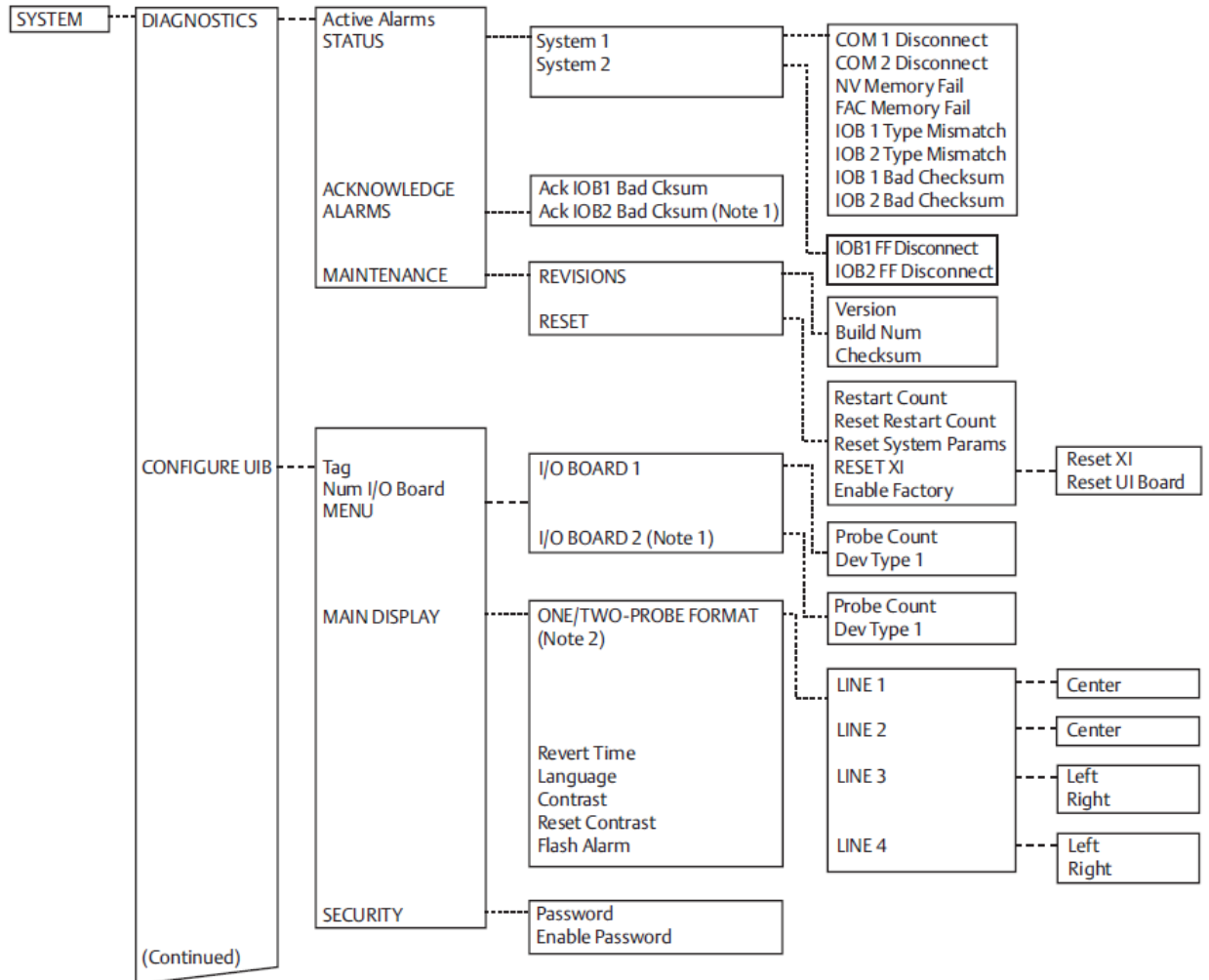
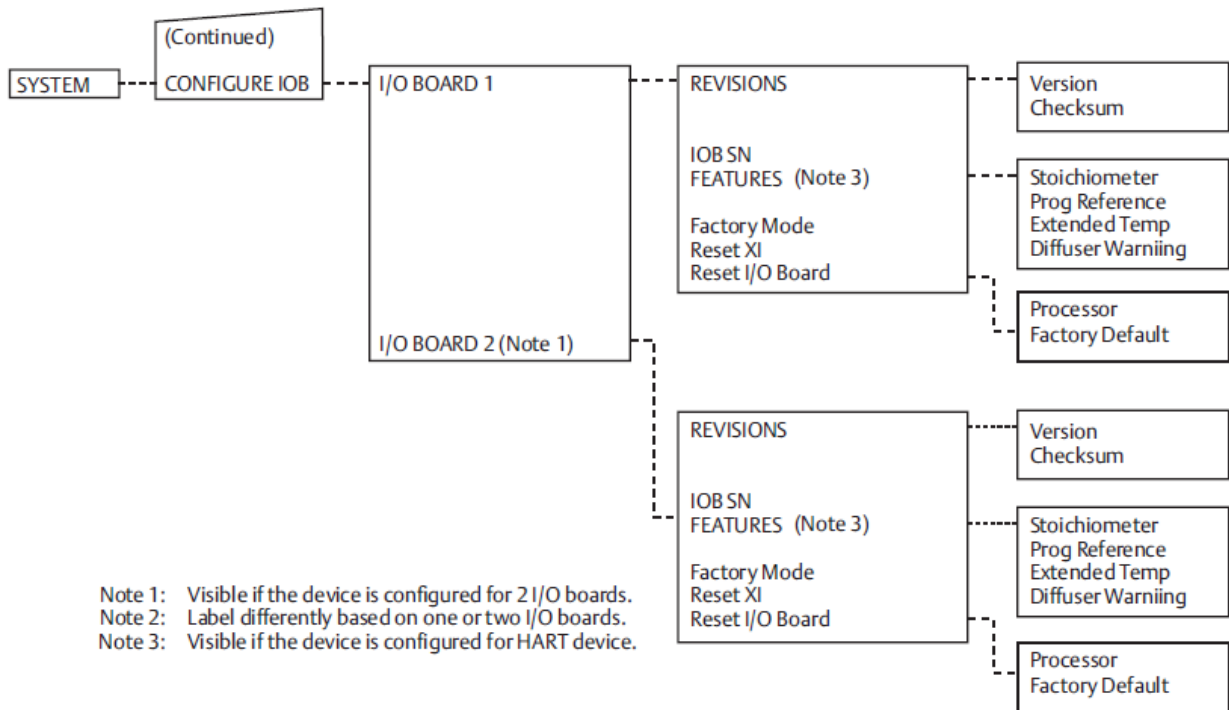
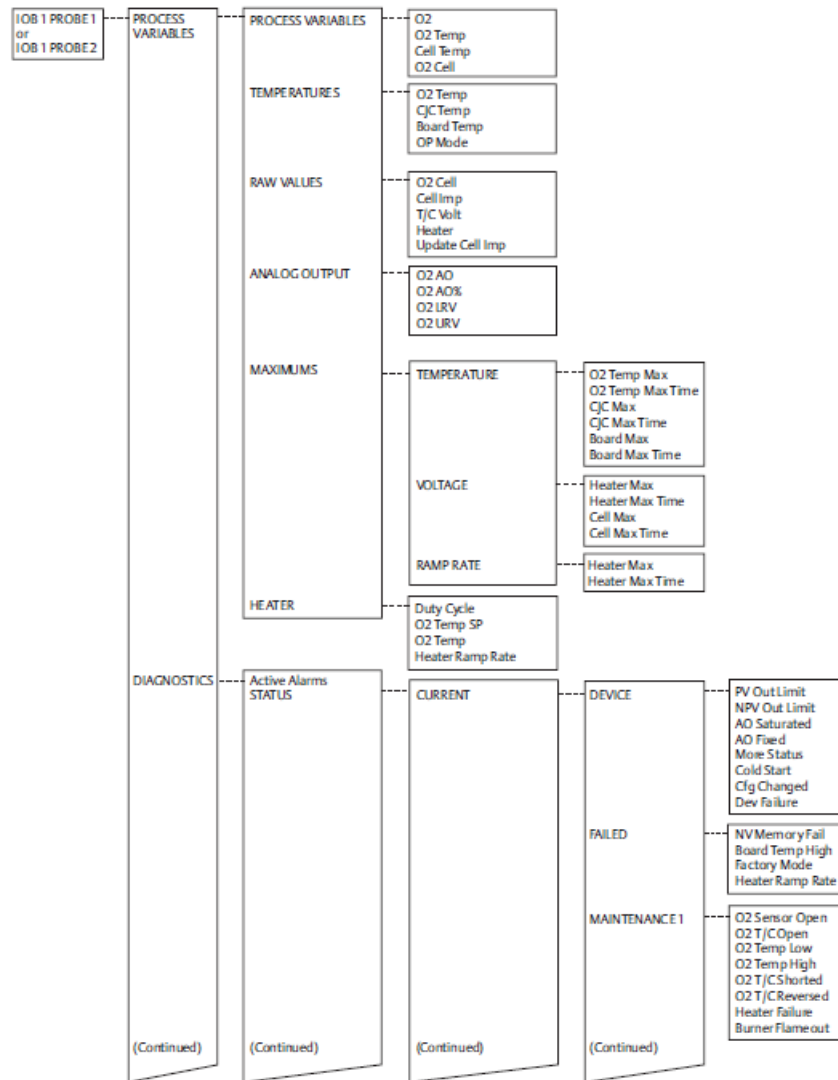
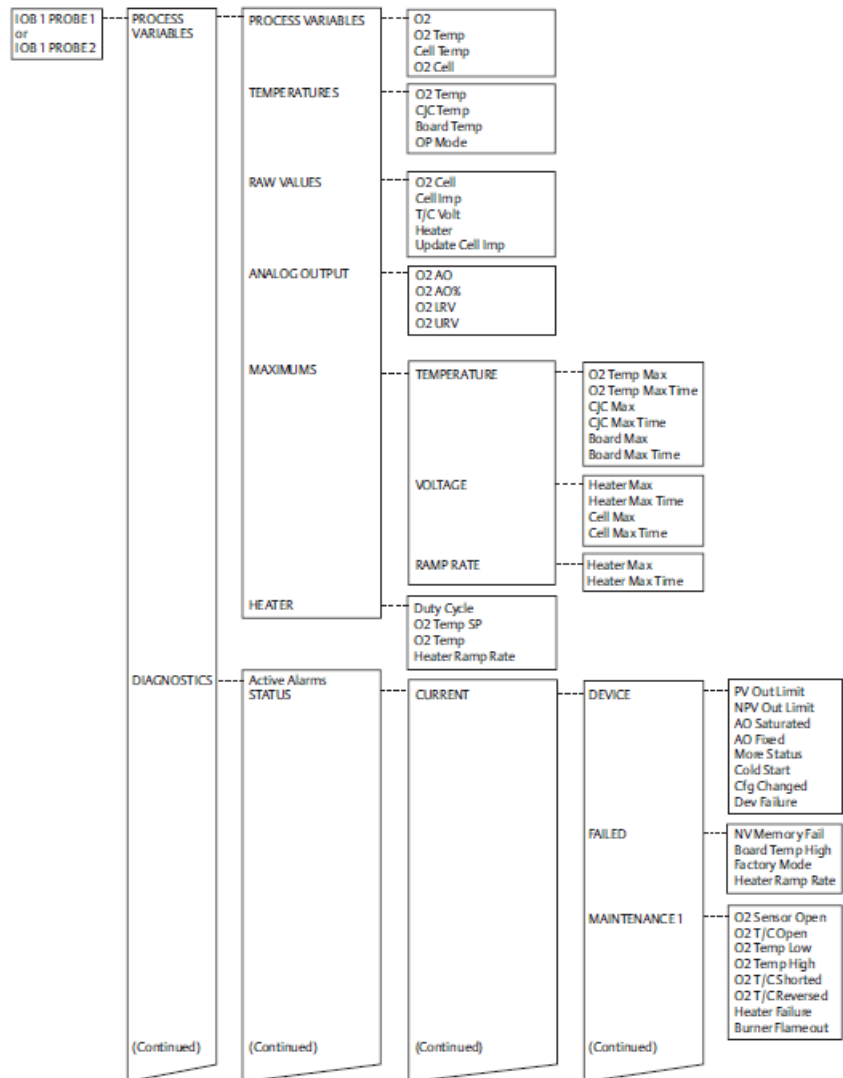


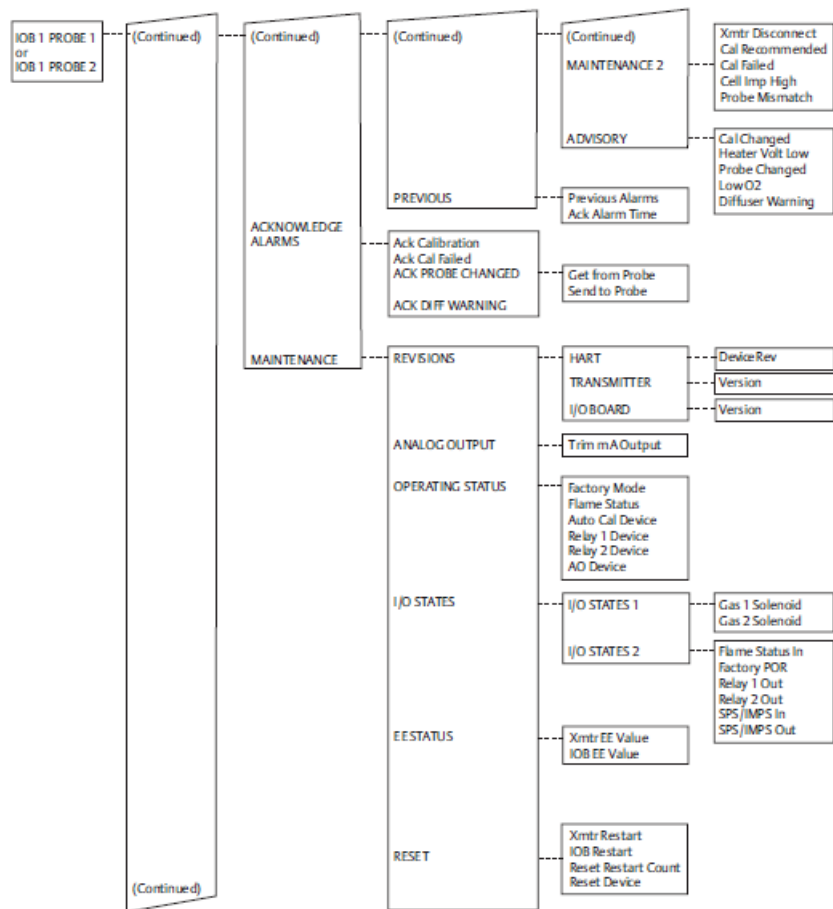
Figure 3-2: HART Menu Trees - Rosemount 6888Xi

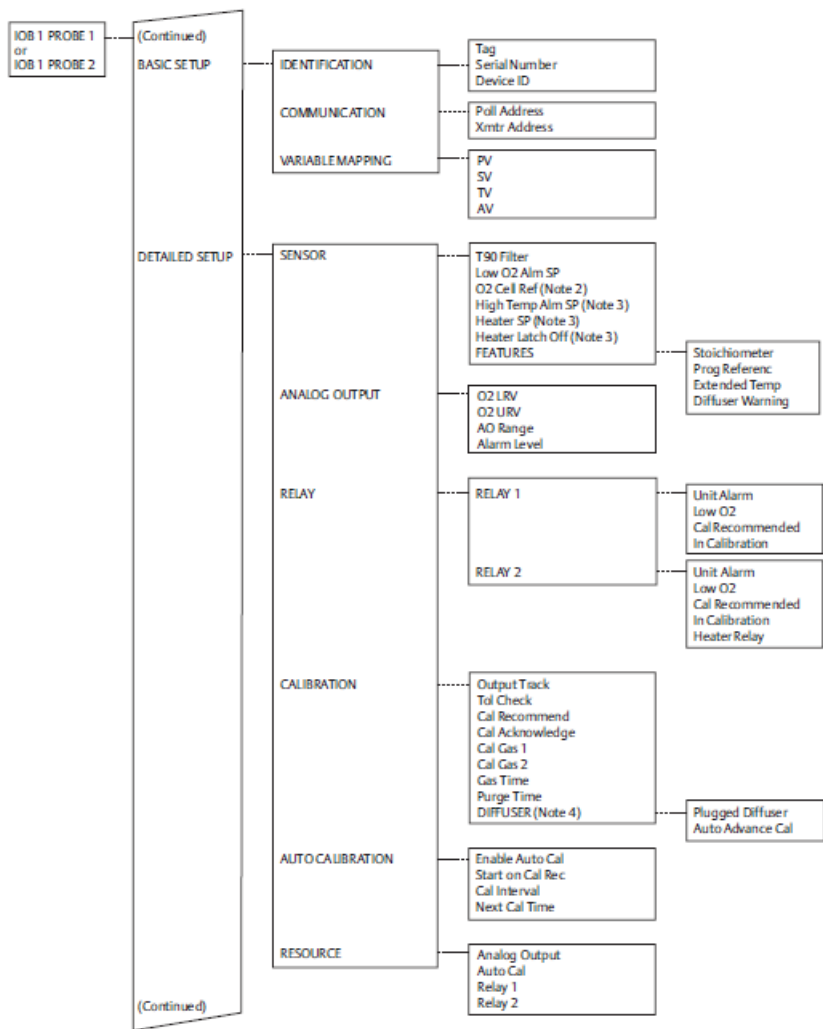


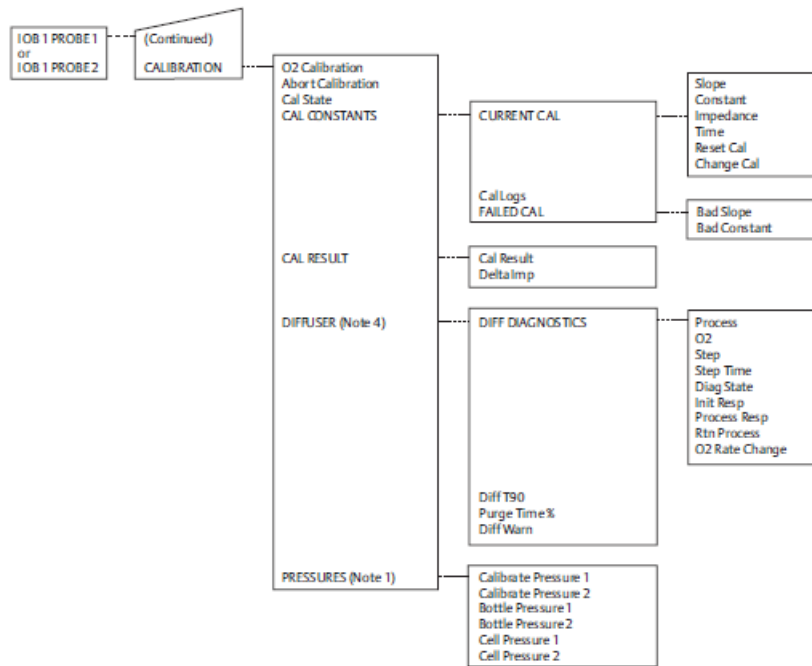












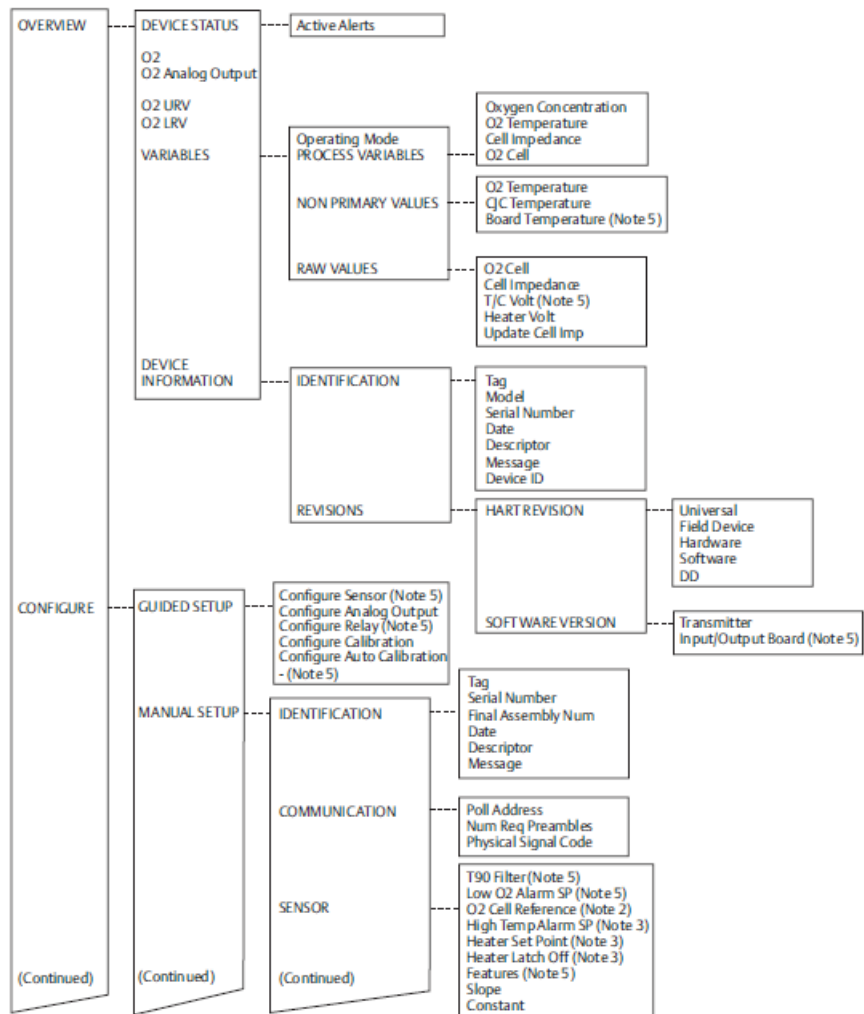
Note 1: Visible if the device is configured for HSPS Autocal.

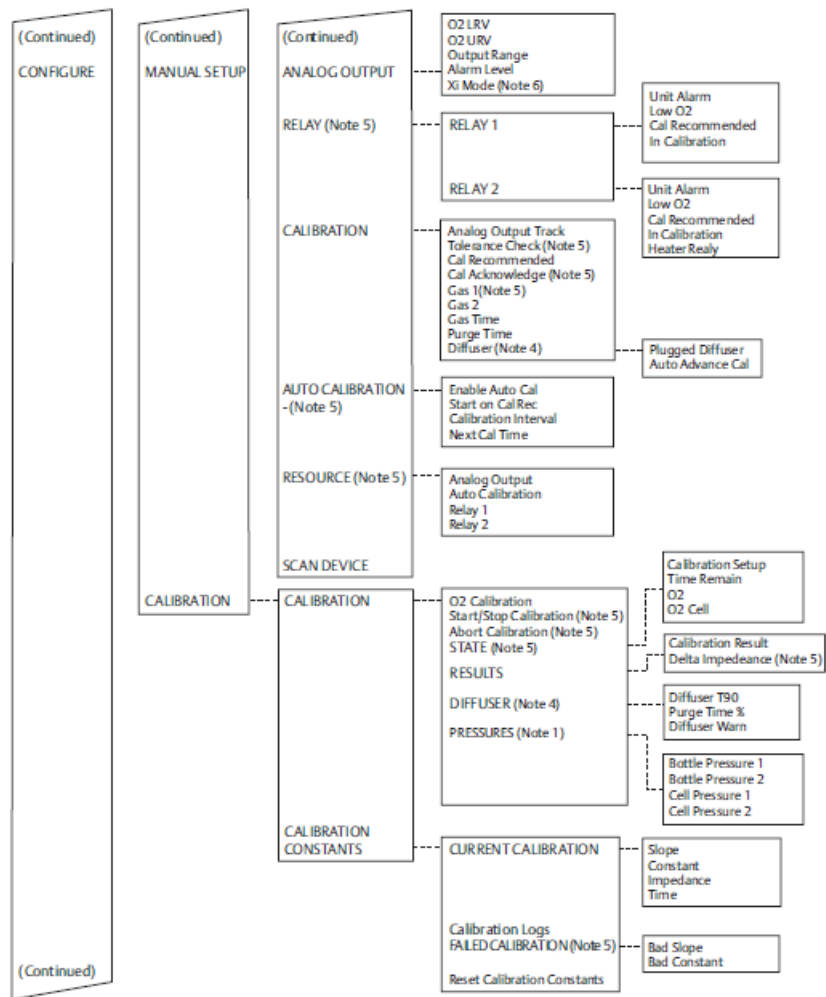
Note 2: Visible if the Programmable References software feature is enabled.

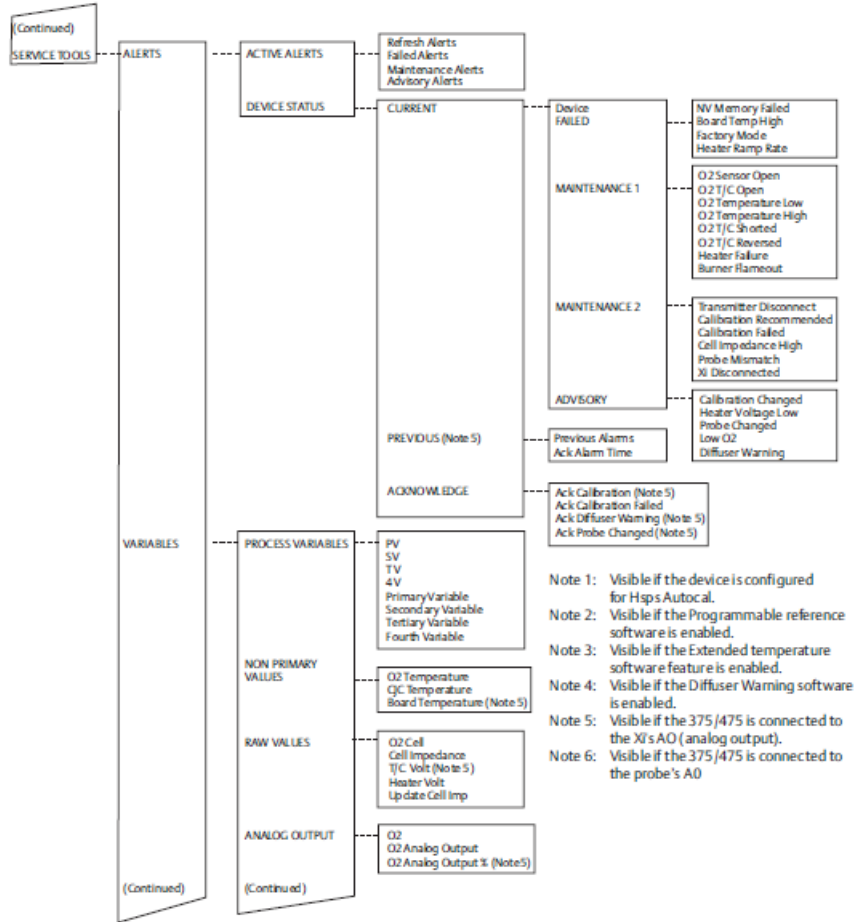
Note 3: Visible if the Extended Temperature software feature is enabled.

Note 4: Visible if the Diffuser Warning software feature is enabled.

Figure 3-3: HART Menu Trees - 375/475 Field Communicator







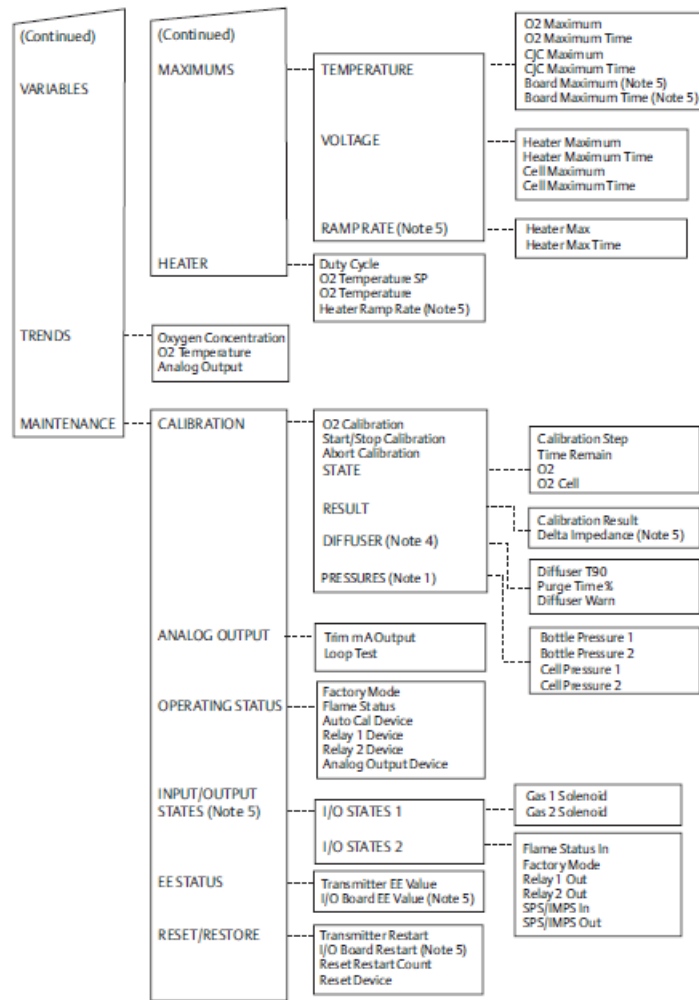
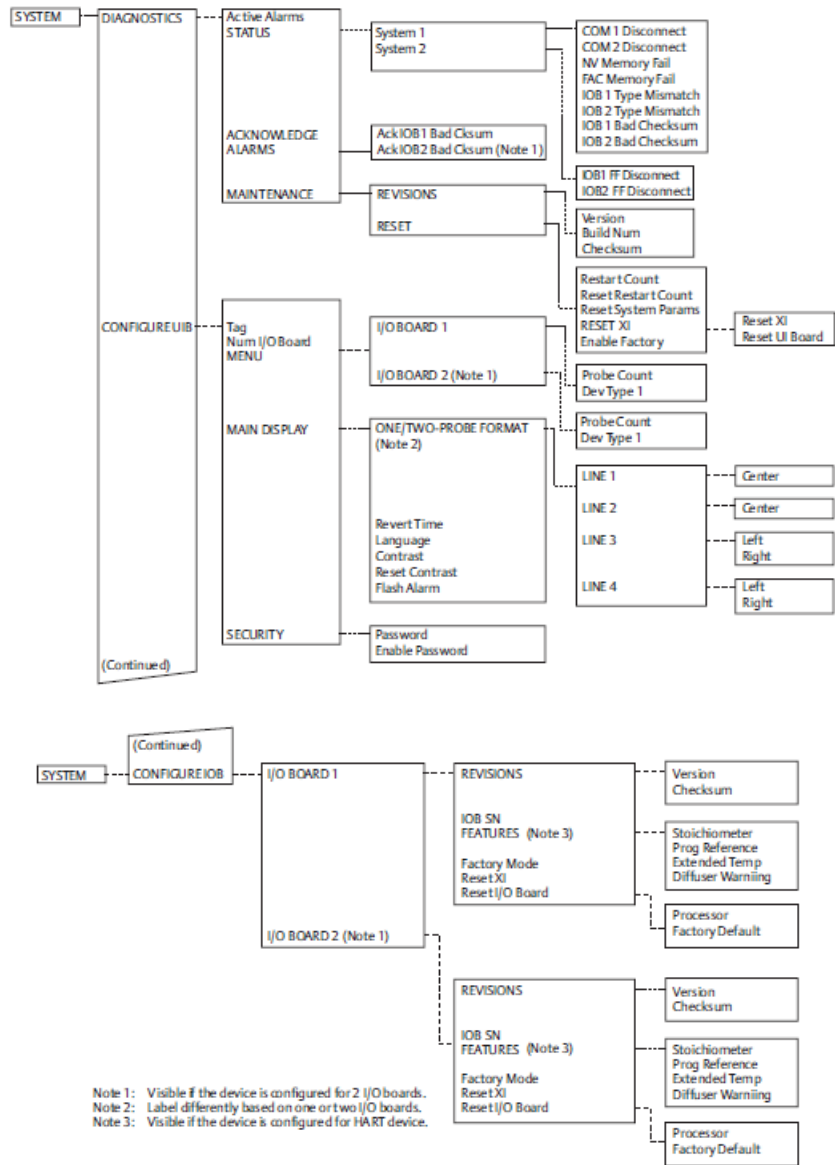
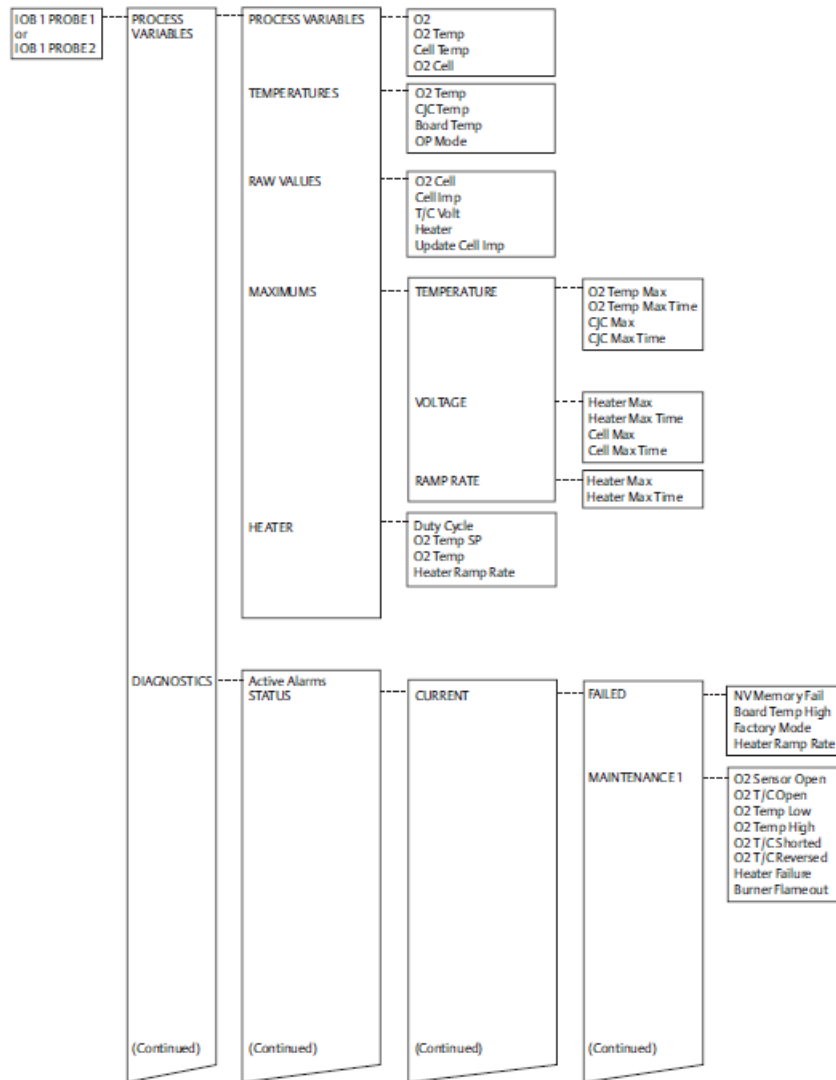
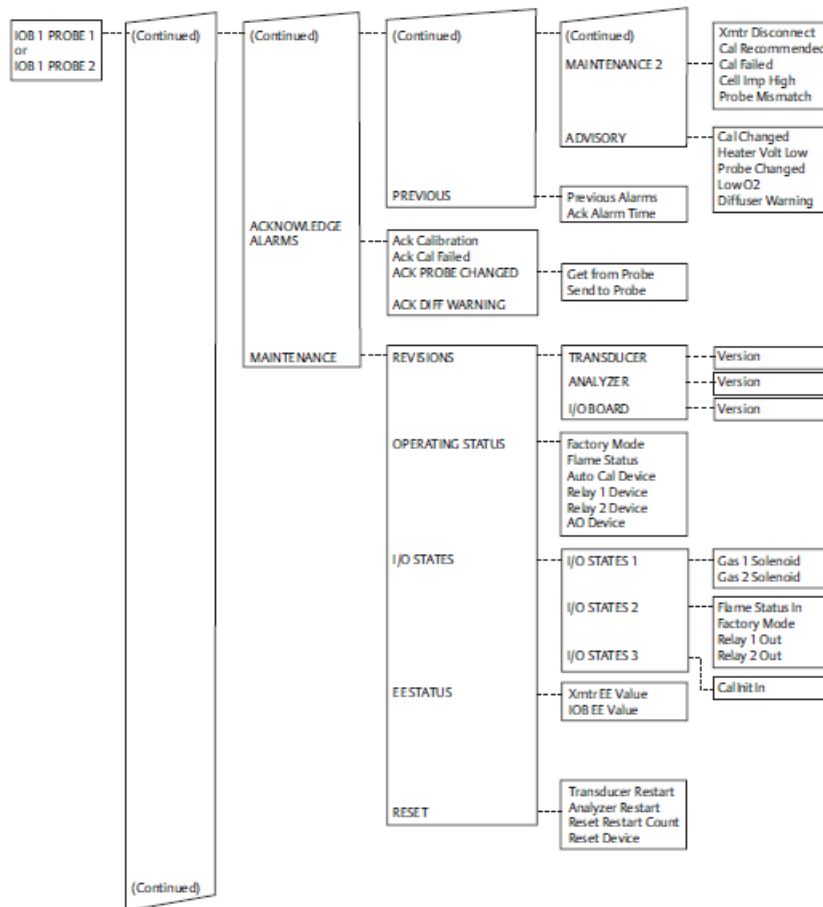
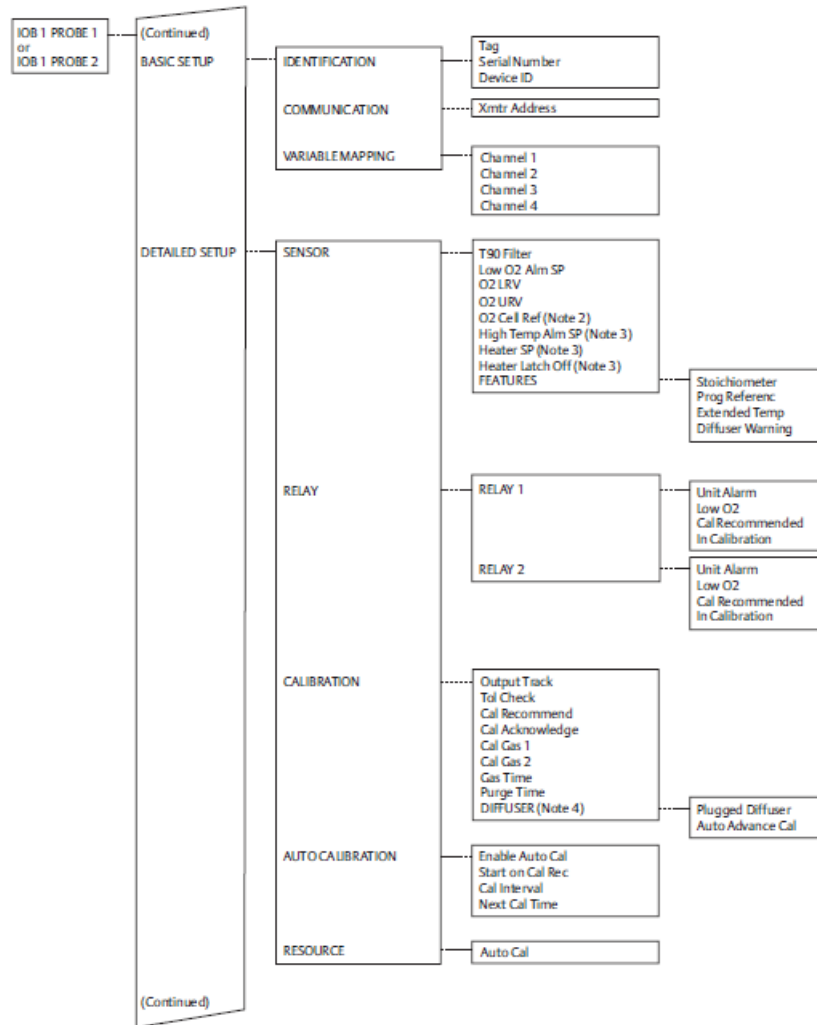


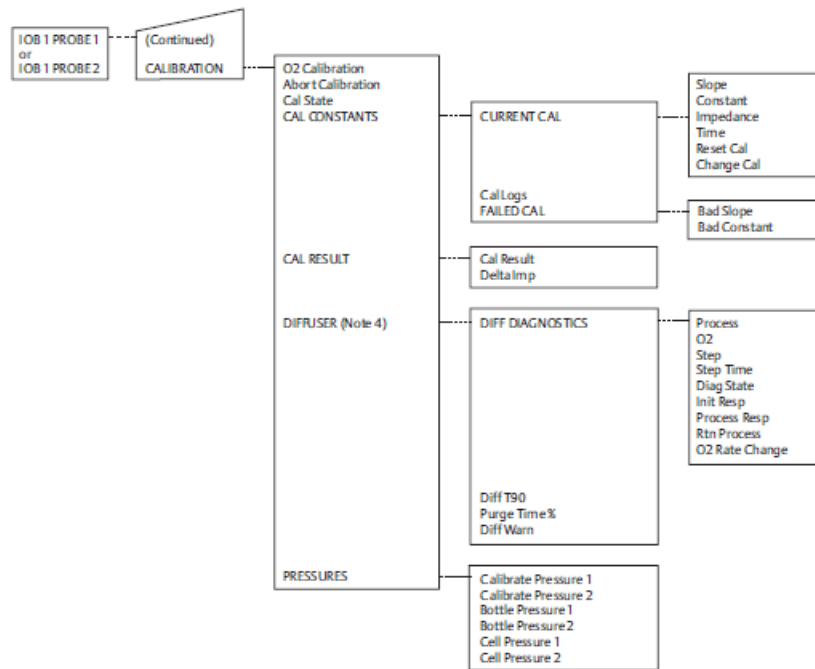
Figure 3-4: FOUNDATION Fieldbus Menu Trees - Rosemount 6888Xi











Note 1: N/A

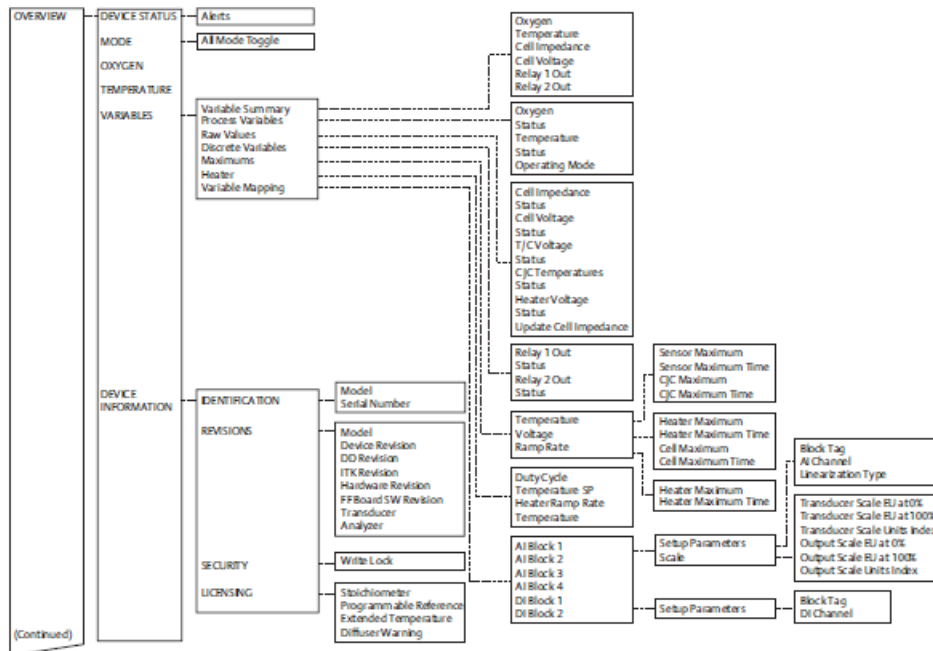
Note 2: Visible if the Programmable References software feature is enabled.

Note 3: Visible if the Extended Temperature software feature is enabled.

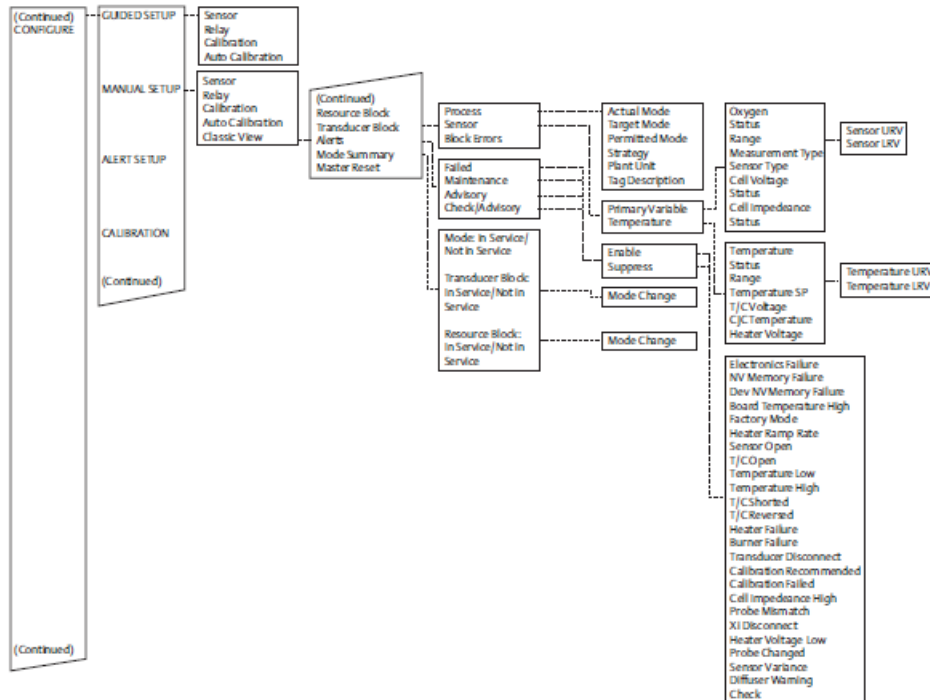
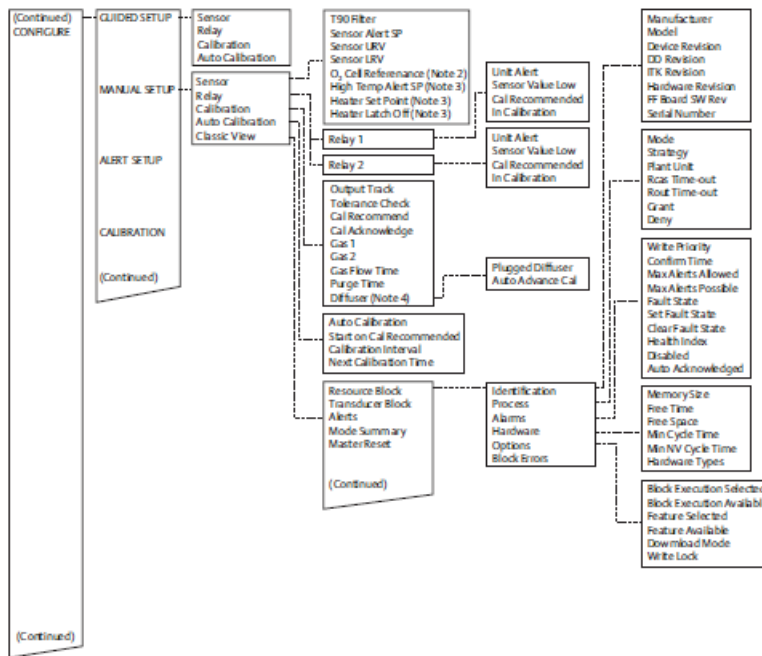
Note 4: Visible if the Diffuser Warning software feature is enabled.

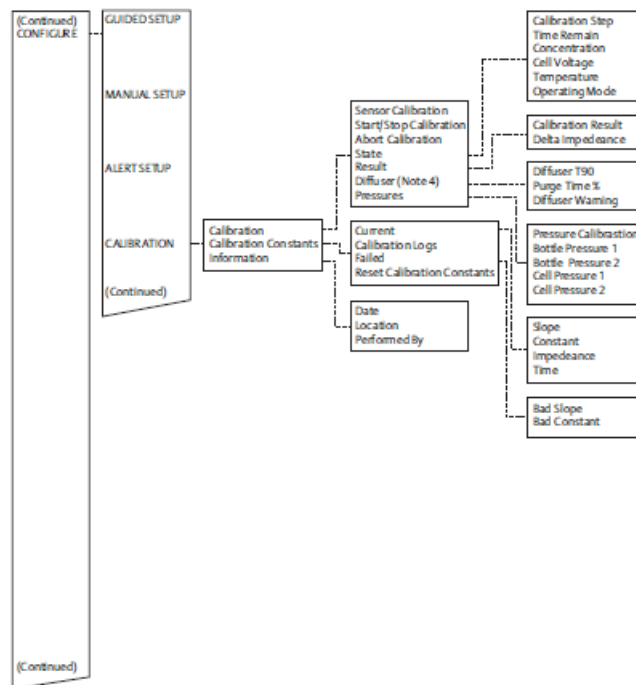
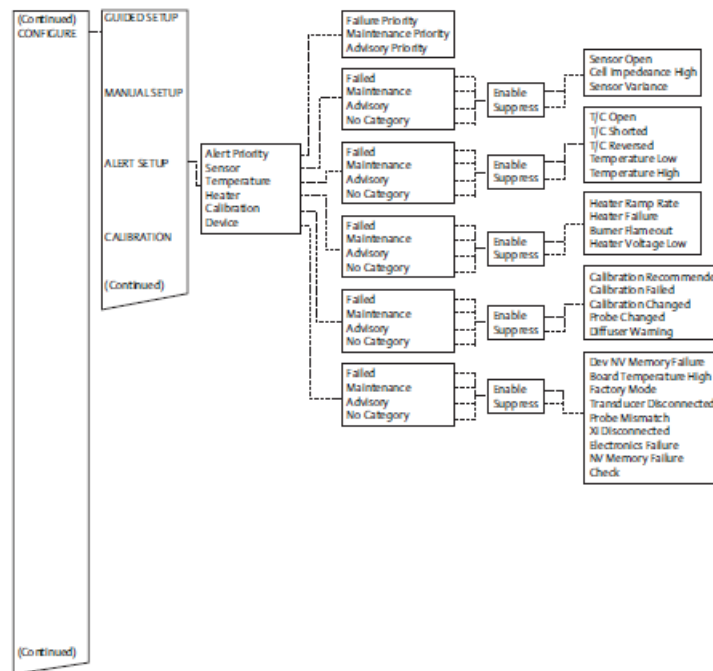
Note 5: Visible if the Factory Mode switch is on.

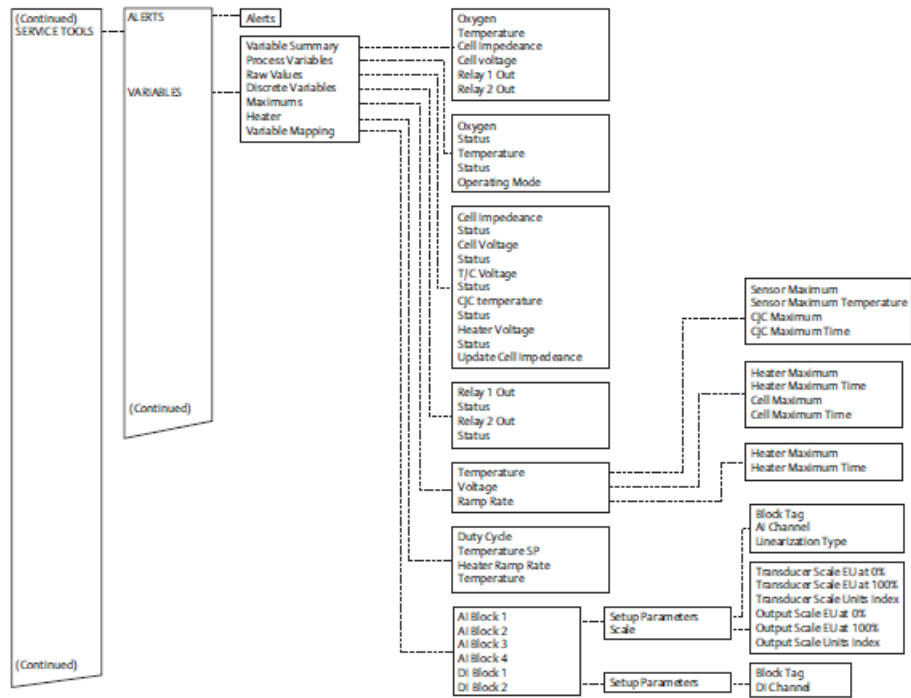
Figure 3-5: FOUNDATION Fieldbus Menu Trees - 375/475 Field Communicator

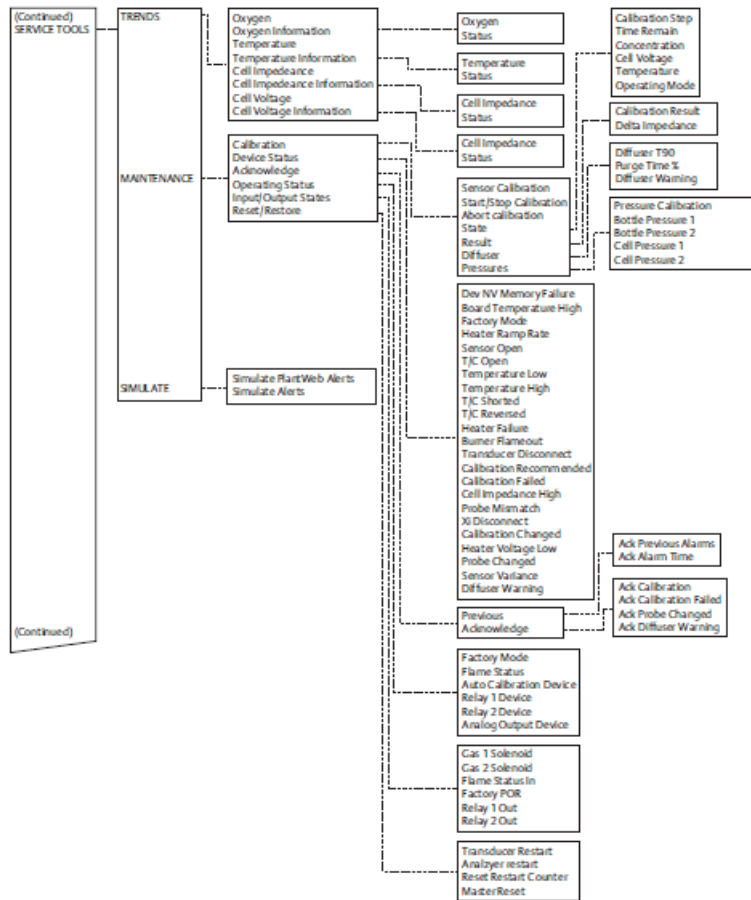


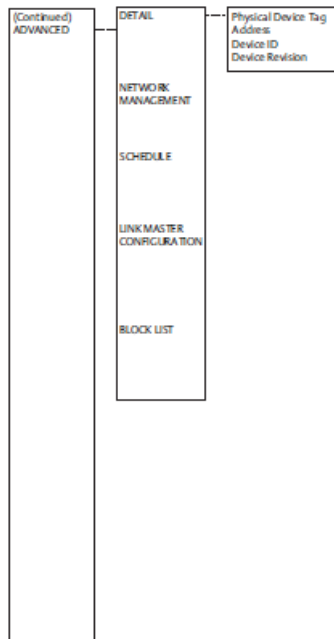
- Note 1: N/A
- Note 2: Visible if the Programmable Reference software feature is enabled.
- Note 3: Visible if the Extended Temperature software is enabled.
- Note 4: Visible if the Diffuser Warning software feature is enabled.











3.7 Startup

The transmitter begins operation when the signal wiring is connected and heater power is supplied to the transmitter. First power the AC line voltage to the heater and then power the 24 Vdc power/signal loop for the transmitter electronics.

The O₂ probe takes approximately 45 minutes to warm up to the 736 °C (1357 °F) heater setpoint. The 4-20 mA signal remains at a default value of 3.5 mA through this warmup period. Once warm, the O₂ reads oxygen, and the 4-20 mA signal's reading is based on the default range of 0-10% O₂.

3.7.1 Error conditions

If there is an error condition at startup, an alarm message is displayed. Refer to [Chapter 4](#) to determine the cause of the error. Clear the error and cycle power. The %O₂ and temperature display should return without the alarm message.

3.8 System parameter descriptions

Among the parameters available through the 375/475 Communicator menus are a number of *system parameters*. The system parameters define variables that configure a specific probe in the transmitter system. System parameters are described in the following table.

Table 3-1: System Parameters

Parameter name	Unit	Description
O ₂	%	Current oxygen concentration value (O ₂ %). The value should reflect the last good O ₂ value if it is in the <i>Lock</i> state during calibration.
O ₂ Temp	°C	Current O ₂ sensor temperature.
CJC Temp	°C	Current cold junction temperature.
O ₂ Cell	mV	Raw mV value for O ₂ sensor.
Cell Imp	ohm	Cell impedance/sensor resistance measured.
Heater	V	Heater voltage.
O ₂ AO	mA	Analog output value represents the O ₂ concentration measurement.
O ₂ Temp Max	°C	This is the highest O ₂ sensor temperature reached since last reset.
O ₂ Temp Max Time	Days ago	Time stamp of the highest O ₂ sensor temperature reached since last reset.
Temperature CJC Max	°C	This is the highest temperature reached at the cold junction since last reset.
Temperature CJC Max Time	Days ago	Time stamp of the highest temperature reached at the cold junction since last reset.
Voltage Heater Max	°C	This is the highest heater voltage reached since last reset.
Voltage Heater Max Time	Days ago	Time stamp of the highest heater voltage reached since last reset.
Voltage Cell Max	°C	This is the highest cell voltage reached since last reset.
Voltage Cell Max Time	Days ago	Time stamp of the highest cell voltage reached since last reset.
OP Mode	--	Device operating mode: <i>PO</i> = Power up <i>WU</i> = Warm up (analog output is railed) <i>NM</i> = Normal operation <i>CA</i> = Calibrating (analog output can be tracking or locked at last good value based on <i>AO Tracks</i> configuration) <i>AL</i> = Alarm detected (recoverable) <i>SF</i> = Alarm detected (non-recoverable)
Active alarms	--	Current alarms (see Chapter 4)

Table 3-1: System Parameters (continued)

Parameter name	Unit	Description
Device	--	Alarm state
Failed	--	Alarm state: On/Off NV Memory Fail, Board Temp High, Factory Mode, Heater Ramp Rate
Maintenance 1	--	Alarm state: On/Off O ₂ Sensor Open, O ₂ T/C Open, O ₂ Temp Low, O ₂ Temp High, O ₂ T/C Shorted, O ₂ T/C Reversed, Heater Failure, Burner Flameout
Maintenance 2	--	Alarm state: On/Off Xmtr Disconnect, Cal Recommended, Cal Failed, Cell Imp High, Probe Mismatch
Advisory	--	Alarm state: Xmtr Disconnect, Cal Recommended, Cal Failed, Cell Imp High, Probe Mismatch
Duty Cycle	--	O ₂ heater duty cycle. Value between 0 and 1.
O ₂ Temp SP	°C	PID temperature set point.
Heater Ramp Rate	°C/sec	Heater ramp rate calculated in °C per second.
Operating Status	--	Device configuration: On/Off Factory Mode, Flame Status (IO Board DIP Switch setting), Auto Cal Device, Relay 1 Device, Relay 2 Device, AO Device
Xmtr EE Val	--	Transmitter board nonvolatile memory diagnostic.
Xmtr Restart	--	Software restart count for the transmitter.
HART Device Rev	--	HART device revision number.
Transmitter Version	--	Software version number for the transmitter.
Tag	--	Device tag: Up to 8 characters long.
Serial Number	--	Probe serial number.
Device ID	--	Unique device ID number. (HART)
PV	--	Primary variable assignment: O ₂ (HART).
SV	--	Secondary variable assignment: Cell imp (HART).
TV	--	Third variable assignment: Cell imp (HART).
4V	--	Fourth variable assignment: O ₂ cell (HART).
Xmtr Address	--	Transmitter board polling address.
O ₂ LRV	%	Primary variable (O ₂ %) lower range value.
O ₂ URV	%	Primary variable (O ₂ %) upper range value.

Table 3-1: System Parameters (continued)

Parameter name	Unit	Description
Alarm Level	--	O ₂ alarm level 0 = 3.5 mA 1 = 21.1 mA
Cal Gas 1	%	Test gas 1 value. This is the actual value of the gas being applied during the Test Gas 1 phase of a calibration.
Cal Gas 2	%	Test gas 2 value. This is the actual value of the gas being applied during the Test Gas 2 phase of a calibration.
Gas Time	sec	Test gas application time. This is the length of time test gases are applied to the O ₂ probe during low or high test gas phase of a calibration.
Purge Time	sec	Test gas purge time. This is the length of time before the output will be returned to the process reading after a calibration.
Slope	mV/Dec	Current calibration slope. This is the slope value that was calculated as a result of the last successful calibration.
Constant	mV	Current calibration constant. This is the constant value that was calculated as a result of the last successful calibration.
Impedance	ohm	Cell impedance. This is the sensor resistance that was calculated as a result of the last successful calibration.
Time	Days ago	Time stamp of the last successful calibration.
Cal Logs Slope	mV/Dec	Previous calibration slope. There are ten calibration results. 1 is the most recent, and 10 is the least recent calibration slope.
Cal Logs Constant	mV	Previous calibration constant. There are ten calibration results. 1 is the most recent, and 10 is the least recent calibration constant.
Cal Logs Impedance	ohm	Previous cell impedance. This is the sensor resistance that was calculated as a result of a previous successful calibration. There are ten calibration results. Index 1 is the most recent, and Index 10 is the least recent sensor resistance measured.
Cal Logs Time	Days ago	Time stamp of the previous successful calibration. There are ten calibration time stamps. Index 1 is the most recent, and Index 10 is the least recent time stamp.

Table 3-1: System Parameters (continued)

Parameter name	Unit	Description
Cal Result	--	Calibration result: 0 = None 1 = Success 2 = Failed constant 3 = Failed slope 4 = Failed temperature 5 = Gas 1 tolerance error 6 = Gas 2 tolerance error 7-10 (future) 11 = AutoCal no resp 12 = AutoCal out of sync 13 = AutoCal abort 14 = No solenoid 15 = Warmup abort 16 = Alarm abort

3.9 Parameter setup

3.9.1 Test gas values

Use a Field Communicator to set test gas values for calibration. A Rosemount 6888A shipped from the factory has test gas values for low and high set to 0.4% and 8.0% respectively. Perform this same process any time a transmitter board is replaced.

1. Use the 375/475 Field Communicator to access the main HART menu.
2. From the main menu, select **CONFIGURE**.
3. From the **CONFIGURE** menu, select **MANUAL SETUP**.
4. From the **MANUAL SETUP** menu, select **CALIBRATION**.
5. From the **CALIBRATION** menu, select **GAS 1**.
6. Press the **Right** key to edit the gas value.
7. Use the stylus to enter the new gas value. Then press **ENTER** when finished.
8. Use the stylus to select **SEND** to update the Rosemount 6888A.
9. Repeat steps 5 through 8 for Gas 2.

3.9.2 Set test gas times

Use a Field Communicator to set test gas flow time and purge time for calibration.

A Rosemount 6888A shipped from the factory has test gas flow time and purge time set to 300 seconds. You must complete the same process any time a transmitter board is replaced.

Procedure

1. Use the 375/475 Field Communicator to access the main HART menu.
2. From the main menu, select CONFIGURE.
3. From the **CONFIGURE** menu, select MANUAL SETUP.
4. From the **MANUAL SETUP** menu, select CALIBRATION.
5. From the **CALIBRATION** menu, select GAS TIME.
6. Press the **Right** key to edit the gas value.
7. Use the stylus to enter the new gas value; then press **ENTER** when finished.
8. Use the stylus to select SEND to update the Rosemount 6888A.
9. From the **GAS TIME** menu, select PURGE TIME.
10. Press the **Right** key to edit the gas value.
11. Use the stylus to enter the new gas value; then press **ENTER** when finished.
12. Use the stylus to select SEND to update the Rosemount 6888A.

3.9.3 Track output during calibration

Use a Field Communicator to set how the analog output value will function during calibration.

A Rosemount 6888A shipped from the factory has output tracking set to No, i.e., the analog output holds the last value during the calibration cycle. You must perform this same process any time a transmitter board is replaced.

Procedure

1. Use the 375/475 Field Communicator to access the main HART menu.
2. From the main menu, select CONFIGURE.
3. From the **CONFIGURE** menu, select MANUAL SETUP.
4. From the **MANUAL SETUP** menu, select CALIBRATION.
5. From the **CALIBRATION** menu, select ANALOG OUTPUT TRACK.
6. Press the **Right** key to edit, then the **Up** and **Down** keys to select YES or NO.
 - No - The analog output holds the last value during calibration.
 - Yes - The analog output tracks the actual measurement during calibration.
7. Use the stylus to press ENTER when finished.
8. Use the stylus to select SEND to update the Rosemount 6888A.

3.9.4 Configure analog output

The analog output signal from the Rosemount 6888A can be configured for the 4-20 mA range and fault condition. A separate configuration is set up when the Rosemount 6888A is used with the optional Rosemount 6888Xi Advanced Electronics. When the Rosemount 6888A is used without the Rosemount 6888Xi, this parameter must be set to NO. If it is set to YES and a Rosemount 6888Xi is not connected, the Rosemount 6888A triggers an alarm and forces the analog output to the fault level. If the Rosemount 6888A is used later with a Rosemount 6888Xi, the Rosemount 6888Xi automatically sets this parameter to YES.

An Rosemount 6888A shipped from the output has the analog outputs set to 4 to 20 mA range with a 3.5 mA alarm level. You must complete the same process any time transmitter board is replaced.

1. Use the 375/475 Field Communicator to access the main HART menu.
2. From the main menu, select CONFIGURE.
3. From the **CONFIGURE** menu, select MANUAL SETUP.
4. From the **MANUAL SETUP** menu, select ANALOG OUTPUT.
5. From the **ANALOG OUTPUT** menu, select from the following parameters; then press **ENTER**.
 - O₂ LRV: O₂ value at lower analog output value (0% at 4 mA, non-configurable)
 - O₂ URV: O₂ value at upper analog output value (50% max at 20 mA)
 - Output Range: Range of analog output (4-20 mA, non-configurable)
 - Alarm level: O₂ alarm level (3.5 mA or 21.1 mA)
 - Xi Mode: Selects whether or not the Rosemount 6888A is used with a Rosemount 6888Xi (should always be set to NO for a stand-alone Rosemount 6888A)
6. Use the stylus to enter the value; then press ENTER when finished.
7. Use the stylus to select SEND to update the Rosemount 6888A.

3.10 Calibrate

New O₂ cells may operate for more than a year without requiring calibration, but older cells may require calibration every few weeks as they near the end of their life.

A **CALIBRATION RECOMMENDED** alarm provides notice of when a calibration is required. This strategy ensures that the O₂ reading is always accurate and eliminates many unnecessary calibrations based on calendar days or weeks since previous calibration.

You can calibrate the Rosemount 6888A transmitter manually through the handheld 375/475 Field Communicator or the optional Rosemount 6888Xi. Fully automatic calibration can be performed using the optional Rosemount 6888Xi advanced electronics and the Rosemount SPS4001B Single Probe Autocalibration Sequencer or the Rosemount IMPS 4000 Intelligent Multiprobe Sequencer.

3.10.1 Calibration procedure

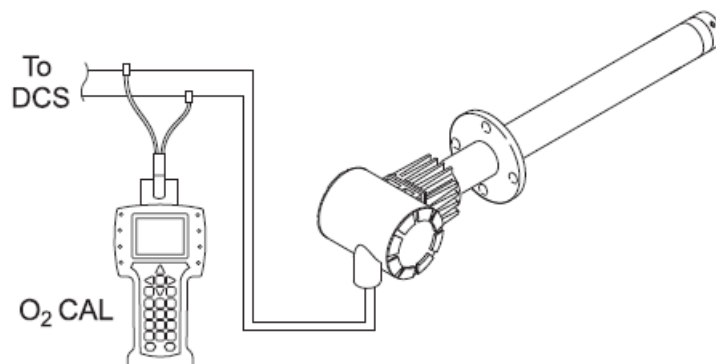
This section covers manual calibration. For automatic calibration details, see the instruction manual for the Rosemount SPS 4001B Single Probe Autocalibration Sequencer or the Rosemount IMPS 4000 Intelligent Multiprobe Test Gas Sequencer.

1. Use the 375/475 Field Communicator to access the main HART menu.
2. From the main menu, select CONFIGURE.
3. From the **CONFIGURE** menu, select CALIBRATION.
4. From the **CALIBRATION** menu, again select CALIBRATION.
5. From the **CALIBRATION** menu, select O₂ CALIBRATION.

⚠ WARNING!

Failure to remove the Rosemount 6888A from automatic control loops prior to performing this procedure may result in a dangerous operating condition.

Figure 3-6: Calibration Method - Simplified



6. In the first screen, a Loop should be removed from automatic control warning occurs. Remove the Rosemount 6888A from any automatic loop controls to avoid a potentially dangerous operating condition. Press **OK** when ready.
7. At the next screen, when the step shows **APPLY GAS 1**, press **OK** to continue.
8. When Flow Gas 1 and Read Gas 1 are complete and the step shows **APPLY GAS 2**, press **OK** to continue.
9. When Flow Gas 2 and Read Gas 2 are complete and the step shows **STOP GAS**, press **OK** to continue the calibration with purge.
10. When the screen shows Loop may be returned to automatic control, press **OK** to return to the CALIBRATION screen.
11. At the CALIBRATION menu, select **RESULT**.

At the **RESULT** menu, the results of the calibration are displayed. In the event the calibration cycle fails, the reason is displayed here as well. The calibration results are described as follows:

- Success: Calibration completed successfully.
 - Failed Constant: The calculated calibration constant is outside the range of ± 20.00 .
 - Failed Slope: The calculated calibration slope is outside the range of 34.5 to 57.5.
 - WarmUp Abort: Attempted to perform a calibration during warmup.
 - Alarm Abort: Another alarm occurred and caused the calibration cycle to abort.
12. In the event of a calibration failure, do the following:
- a. From the RESULT menu, press HOME to return to the main menu.
 - b. From the main menu, select SERVICE TOOLS.
 - c. From the OVERVIEW menu, select ALERTS.
 - d. From the ALERTS menu, select ACTIVE ALERTS.

The ACTIVE ALERTS menu should contain an A: CALIBRATION FAILED alarm.

- e. Press the **Left** key to return to the ALERTS menu.
- f. From the ALERTS menu, select DEVICE STATUS.
- g. From the DEVICE STATUS menu, select ACKNOWLEDGE.
- h. From the ACKNOWLEDGE menu, select ACK CALIBRATION FAILED.

When the process is complete, the system returns to the ACKNOWLEDGE menu.

3.10.2 Calibration log

The Rosemount 6888A stores the current and 10 previous calibrations. The stored data includes the slope, constant, cell impedance, and time (in days) since that calibration. The log can be accessed as follows:

Using the Field Communicator: Configure > Calibration > Calibration Constants > Calibration Logs.

When first entering the log, the screen displays `Calibration 1`. This is the most recent previous calibration, not the current calibration. `Calibration 0` displays the current calibration. Use the keypad or communicator keys to navigate through the logs. The factory default for log entries is a slope of 50.00 mV/Dec and a constant of 0.00 mV. Any log entries with these values means there have not been at least 10 calibrations performed to fill the entire log.

3.10.3 Reset calibration

The Rosemount 6888A can reset the current calibration and replace it with the previous calibration. You may reset the calibration in cases where the calibration was known to contain invalid values. Resetting a calibration transfers the slope and constant from calibration 1 in the log into the calibration 0 position. The cell impedance and days since calibration remain unchanged.

Reset the calibration as follows:

⚠ WARNING!

Failure to remove the Rosemount 6888A from automatic control loops prior to performing this procedure may result in a dangerous operating condition.

Using the Field Communicator: Configure > Calibration > Calibration Constants > Reset Calibration Constants.

Follow the instructions on the screen to complete the reset function.

3.11 D/A trim

The D/A trim procedure is used to calibrate the 4-20 mA output signal to a precision mA measurement device. Only the signal to the DCS needs to be trimmed.

1. Use the 375/475 Field Communicator to access the main HART menu.
2. From the main menu, select SERVICE TOOLS.
3. From the SERVICE TOOLS menu, select MAINTENANCE.
4. From the MAINTENANCE menu, select ANALOG OUTPUT.
5. From the ANALOG OUTPUT menu, select TRIM mA OUTPUT.

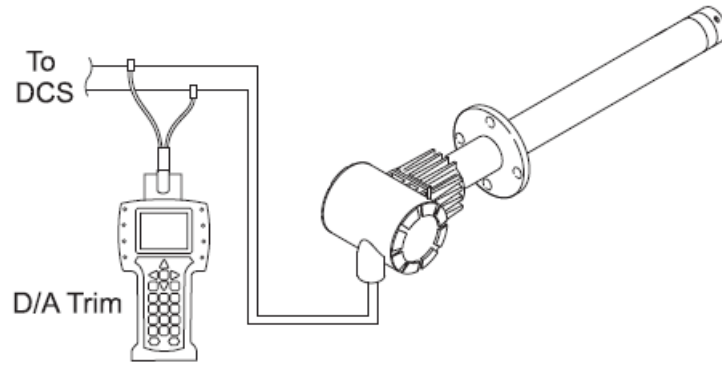
In the first screen, a Loop should be removed from automatic control warning occurs.

⚠ WARNING!

Failure to remove the Rosemount 6888A from automatic control loops prior to performing this procedure may result in a dangerous operating condition.

6. Remove the Rosemount 6888A from any automatic control loops to avoid a potentially dangerous operating condition. Press **OK** when ready.
7. Follow the prompts on the 375/475 to perform the trim.
8. Use the stylus to enter the new measured analog output value; then press **ENTER** to accept.
9. When trim is complete, press **OK** to return to the ANALOG OUTPUT menu.

Figure 3-7: D/A Trim Method - Simplified



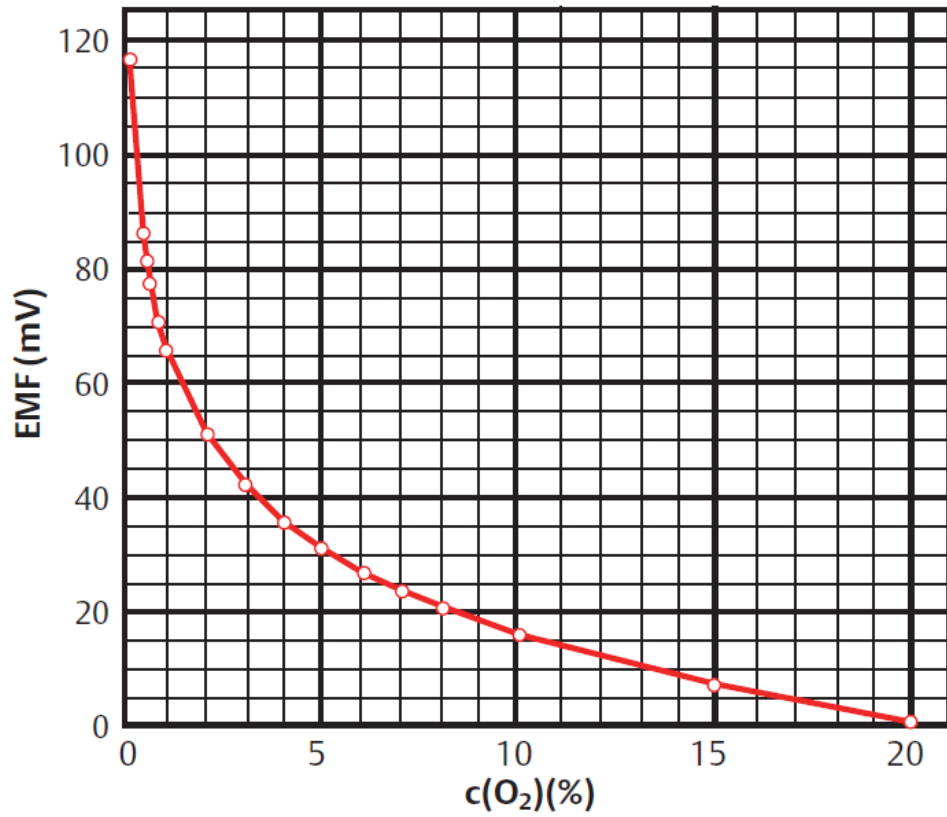
4 Troubleshooting

4.1 Overview

When the zirconium oxide sensing cell is heated to its setpoint [736 °C (1357 °F)], the cell generates a voltage that represents the difference between the process O₂ % and the reference O₂ % inside the probe (20.95% O₂ instrument or ambient air).

When flowing calibration gases, the raw cell millivolt value should represent the levels on the chart in [Figure 4-1](#). Note that the raw cell millivolt value increases logarithmically as the O₂ concentration decreases.

Figure 4-1: O₂ Sensor mV Reading vs %O₂ at 736 °C (1357 °F) (Reference Air, 20.95% O₂)



O ₂ %	EMF (mV)
100	-34
20	1.0
15	7.25
10	16.1
9	18.4
8	21.1
7	23.8
6	27.2
5	31.2
4	36.0
3	42.3
2	51.1
1	66.1
0.8	71.0
0.6	77.5

O ₂ %	EMF (mV)
0.5	81.5
0.4	86.3
0.2	101.4
0.1	116.6
0.01	166.8

4.2 General

⚠ WARNING!

ELECTRIC SHOCK

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

Consider the following equipment conditions, features, and requirements when troubleshooting a problem.

4.2.1 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 total elimination of ground loops.

4.2.2 Electrical noise

The transmitter 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. Ensure all cable shields are connected to earth.

4.2.3 Electrostatic discharge

Electrostatic discharge can damage ICs in the electronics.

Before removing or handling the processor board or the ICs, ensure you are at ground potential.

4.3 Alarm indications

The first indication of a problem at the O₂ measuring system usually comes from the operators running the process. Critical alarms that render the O₂ measurement unusable will force the 4-20 mA analog output signal representing O₂ to go to a default condition, as follows:

4-20 mA signal alarm level	Transmitter condition
0 mA	Transmitter unpowered or completely failed
3.5 mA	Critical alarm - transmitter reading unusable (factory default)
3.8 mA	Reading under range (Example - you set range to 2-10%. Current reading is 1.9%.)
4 to 20 mA	Normal operation
20.5 mA	Reading over range (Example - range is 0-10%. Current reading is 12%.)
>21 mA	Critical alarm - transmitter reading is unusable (you can choose this alarm level instead of the factory default level of 3.5 to 3.6 mA).

NOTICE

To ensure correct operation, you should make sure that the Digital Control System is configured to interpret these signal levels correctly.

Once an alarm condition is identified, the Rosemount 6888A offers a number of diagnostics to interpret the specific alarm.

Alarm indications are available via the optional Rosemount 6888Xi or the 375/475 Field 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.

4.4 Identifying and correcting fault indications

There are two types of alarms: recoverable and non-recoverable. If an existing alarm is recoverable, the alarm-active indication disappears when the alarm condition no longer exists. If an alarm is not recoverable, the alarm indication continues to be displayed after the cause of the alarm condition is corrected. AC power to the transmitter must be cycled to clear a non-recoverable alarm.

Alarm messages are displayed on the optional Rosemount 6888Xi or the 475 Field Communicator. A listing of the alarm/fault messages and the related fault status descriptions are shown in [Table 4-1](#).

Fault conditions that give no fault indication and that allow the probe to pass calibration are listed and discussed after [Table 4-1](#).

Table 4-1: Diagnostic/Unit Alarm Fault Definitions

Message	Status	Alert	Self clearing	Rail A out
NV Memory Fail	A checksum error was detected in the nonvolatile memory configuration data when the unit was turned on. Default values have been loaded. Check to see that your configurations have not been changed. Cycle the power to clear alarm.	Failed	No	Yes
Board Temp High	The electronics board reading is above the threshold. The board may not function correctly. The predefined temperature threshold is 86 °C (187 °F) for IO board or 126 °C (259 °F) for transmitter board.	Failed	No	Yes
O2 Sensor Open	The cell impedance is reading less than -1.0 Vdc, indicating the O ₂ sensor wires may be disconnected or the O ₂ sensor junction may be open. Check wiring.	Maint	Yes	Yes
O2 TC Open	The O ₂ sensor heater thermocouple voltage is reading more than 0.065 volt, indicating the thermocouple wires may be disconnected or the thermocouple junction may be open. Check wiring.	Maint	Yes	Yes
O2 Temp Low	The sensor heater temperature is below the low temperature threshold. If extended temperature feature is not enabled, the pre-defined low temperature threshold is 726 °C (1339 °F). If extended temperature feature is enabled, the pre-defined low temperature threshold is 726 °C (1339 °F) if the Heater SP is set to Normal or 540 °C (1030 °F) if it is set to Low.	Maint	Yes	Yes

Table 4-1: Diagnostic/Unit Alarm Fault Definitions (continued)

Message	Status	Alert	Self clearing	Rail A out
O2 Temp High	The heater temperature is above the defined temperature threshold. If extended temperature feature is not enabled, the pre-defined high temperature threshold is 750 °C (1382 °F). If extended temperature feature is enabled, the high temperature threshold is defined by the High Temp Alm SP parameter.	Maint	Yes	Yes No
O2 T/C Shorted	This diagnostic is only intended to detect a copper short of the thermocouple connections at the electronic connector. The cell heater T/C voltage is reading close to zero, indicating the thermocouple wires may be shorted.	Maint	Yes	Yes
O2 T/C Reversed	The O ₂ sensor heater temperature thermocouple voltage is reading a negative voltage, indicating the thermocouple wire connections may be reversed. Check wiring.	Maint	Yes	Yes
Cal Failed	A calibration error occurred during the last calibration. Check the cal result for more details. Acknowledge calibration failed or recalibrate to clear alarm.	Maint	Yes	No
Cell Imp High	The O ₂ sensor impedance/cell resistance value measurement is greater than 2000 Ohms, indicating the cell may be beyond its useful life.	Maint	Yes	No
Xi Disconnect	It indicates using transmitter's AO when connected to Rosemount 6888Xi and Rosemount 6888Xi is disconnected.	Maint	Yes	Yes
Htr Voltage Low	The heater voltage for the O ₂ heater is below 30 volts. Check heater power.	Adv	Yes	No

4.5 Calibration passes, but still reads incorrectly

There are a few fault conditions where no alarm indication is present and the probe passes calibration, but the O₂ reading may still be incorrect.

An incorrect flow rate of calibration gases can cause a shifted calibration. If the flow rate of calibration gases is too low, process gases can mix in with the calibration gases, causing a mixture at the cell that is different from what is noted on the calibration gas bottles. Always set the calibration flow rate when a new diffuser is installed and never readjust this flow rate until another new diffuser is installed. For applications with heavy particulate loading, see [Section 4.5.2](#).

If reference air is not supplied or is improperly supplied, the calibration may read incorrectly.

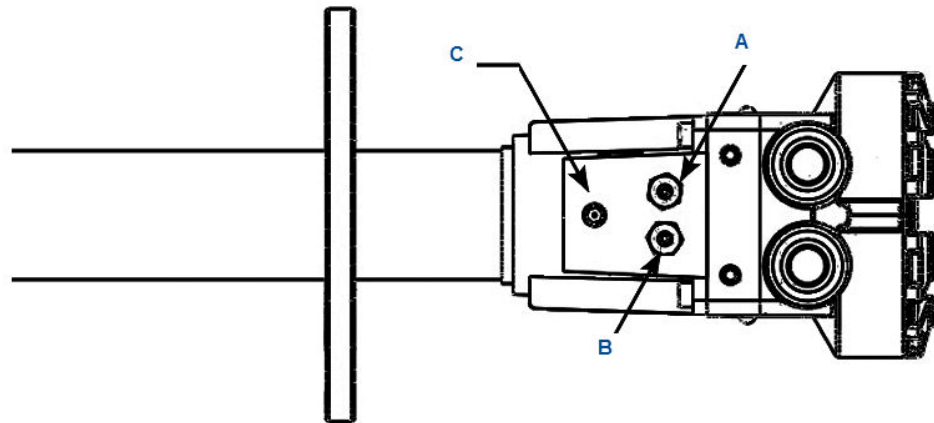
4.5.1 Probe passes calibration, O₂ still reads high

External reference air leak

There may be a leak that is permitting ambient air to mix with the process gases. Since many combustion processes are slightly negative in pressure, ambient air can be drawn into the cell area, biasing the O₂ reading upward.

1. Make sure that the calibration gas is capped tightly between calibrations.
2. If autocal is used, make sure the check valve is sealing properly.

Figure 4-2: Probe Leakage Paths



- A. Cal gas 1/4 in. tube
- B. Ref gas 1/4 in. tube
- C. Vent

3. If an abrasive shield is used, a small leak at the probe flange can migrate down the annular space between the probe OD and shield ID to the sensing cell, causing a false high O₂ reading.

Internal reference air leak

See [Figure 4-2](#). There may be a leak inside the O₂ probe itself, permitting the reference air (20.95% O₂) to mix with the process gases at the cell. To confirm this leak condition, pressurize the inside (reference side) of the probe by plugging the reference air exhaust port with your finger for one minute. (The conduit ports where the signal and power wires pass may also need to be sealed.) The O₂ reading should decrease slightly. If the O₂ reading increases during this test, there is a leak inside the probe.

1. Acid condensation inside the probe can degrade the hose that carries the cal gas to the cell. Inspect this hose. Dislodging or improper installation of the cal gas or reference air hose can cause a leakage path.
2. The sensing cell is fastened to the end of the probe tube and uses a corrugated washer to separate the process gases from the ambient reference air. The corrugated washer may be damaged by corrosion. Discard used washer.

NOTICE

Always install a new corrugated washer whenever you remove the sensing cell from the probe.

Bad reference side cell electrode

A bad reference side cell electrode can cause an elevated O₂ reading. This fault is usually indicated by a frequent *Calibration Recommended* alarm and increasing cell impedance readings. A high cell impedance can be calibrated out, but if the impedance continues to increase rapidly, the sensing cell must be replaced.

4.5.2 Probe passes calibration, O₂ still reads low

The diffusion element at the end of the probe is a passive filter. It plugs very slowly, because there is no active flow being drawn across it. In applications that have a heavy particulate loading (coal or wood fired boilers, cement and lime kilns, catalyst regeneration, recovery boilers, etc.) this diffusion element will eventually plug.

NOTICE

It is important not to pressurize the sensing cell during calibrations by flowing excessive cal gas against a plugged diffuser. Always use a two-stage regulator for setting calibration gas pressure. Calibration flow rates should be set only when a new diffuser is installed. As the diffuser plugs, do not adjust the flow rates upward.

4.5.3 How do I detect a plugged diffuser?

The O₂ cell's speed of response will degrade. The O₂ trend in the control room will become smoother.

When calibrating, the calibration gas flow rate will be noted to be lower. Never readjust this flow upwards to correct for a plugged diffuser. Adjust this flow only when a new diffuser is installed.

Always note the time it takes for the cell to recover to the normal process value after the cal gas is removed. As the diffuser plugs, this recovery time will get longer and longer. Use a calibration record to record and track calibration response times.

The Rosemount 6888Xi Advanced Electronics is available with an enhanced software feature to automatically characterize the rate of diffuser pluggage during a calibration cycle.

4.5.4 Can I calibrate a badly plugged diffuser?

It may not be possible to immediately replace a plugged diffuser while the process is on-line.

You can calibrate the probe without pressurizing the cell by adjusting the calibration gas flow rate downward before calibration. For instance, say the process is at 3%, and the first calibration gas is 8%. Adjust the flow of cal gas downward until the reading begins to migrate from 8% to lower values, indicating that the process gases are now mixing with the calibration gases.

Adjust the flow rate back up until this mixing is just eliminated. Calibrate at this flow rate. Replace the diffuser at the first opportunity.

⚠ WARNING!

ELECTRIC SHOCK

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.

5 Maintenance and service

5.1 Overview

This section identifies the calibration methods available and provides the procedures to maintain and service the Rosemount 6888A O₂ transmitter.

WARNING!

ELECTRIC SHOCK

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.

5.2 Maintenance intervals

The maintenance interval required is variable, depending on the ambient and process conditions the analyzer is exposed to. The zirconium oxide sensing cell is non-depleting and has no specific shelf life or a defined life in flue gas operation. The sensitivity of a sensing cell that is mounted inside a boiler that is burning natural gas may shift slightly over several years. Acidic compounds are the main aggressors to the sensing cell, typically SO₂, resulting from sulfur contained in coal and heavy oil fuels, and also HCl from the combustion of plastics in municipal incinerators and in industrial thermal oxidizers. Sensing cells may experience significant degradation and signal shift in this type of service, particularly if the operating levels of O₂ are very low (below 1% O₂).

A calibration check is generally recommended on a quarterly basis (every three months) by flowing bottled gas to the probe. (Make sure the operations personnel are notified when doing this and also make sure that the O₂ control loop is placed in manual mode). If the probe readings vary significantly from the bottle values, conduct a formal calibration as noted in [Chapter 3](#).

The optional Rosemount 6888Xi offers a `calibration recommended` diagnostic that indicates when the probe needs to be calibrated.

Combustion processes that have a high level of ash or other particulate content will cause the diffusion element on the end of the probe to plug off. A significantly plugged diffuser causes a slower speed of response to changing O₂ levels in the process. This can usually be seen on the recorded trends in the control room.

When performing a calibration check or actual calibration, the calibration flow meter may read lower if the diffuser is significantly plugged. Never increase the flow rate back-up, however, as this can cause a shifted calibration. Adjust the calibration flow rate only when a new diffuser is installed. Always record the response time back to the process after the calibration gases are removed. Diffuser plugging can be tracked through the calibration record.

Visually inspect the probe during plant outages, paying particular attention to condensed components. Condensation can be reduced or eliminated by insulating the probe installation, including the probe mount, flange, and blue housing.

5.3 Calibrate

The Rosemount 6888A O₂ transmitter can be calibrated manually through the handheld 375/475 Field Communicator or automatically through the Rosemount SPS4001 Single Probe Autocalibration Sequencer or the Rosemount IMPS 4000 Intelligent Multiprobe Test Gas Sequencer and the Rosemount 6888Xi Advanced Electronics.

5.3.1 Manual calibration

Refer to [Section 3.6.1](#) to perform a manual calibration.

5.3.2 Automatic calibration

Contact from the Rosemount 6888Xi Advanced Electronics to a Rosemount SPS4001B (one per probe) or Rosemount IMPS4000 (up to four probes) provides the ability to manually initiate a calibration at any time from the control room. The Rosemount 6888Xi interface must be used with the Rosemount SPS4001B or Rosemount IMPS4000 in order to perform an auto/semi-auto calibration. Refer to the [Rosemount SPS4001B](#) or [Rosemount IMPS4000](#) instruction manual for further details on how to configure and perform an automatic calibration.

5.4 Repair

Each of the following procedures details how to remove and replace a specific component of the Rosemount 6888A.

WARNING!

BURNS

Remove the transmitter from the stack for all service activities. Allow the unit to cool and take it to a clean work area. Failure to comply may cause severe burns.

WARNING!

ELECTRIC SHOCK

Disconnect and lock out power before working on any electrical components. There is voltage up to 240 Vac.

5.4.1 Remove and replace probe

Remove probe

Complete the following steps to remove the probe from the stack.

1. Turn off power to the system.
2. Shut off the calibration gases at the cylinder and the instrument air.
3. Disconnect the calibration gas and instrument air lines from the transmitter.
4. Remove housing cover.
5. Remove all signal and power wiring to the probe.
6. Remove insulation to access the mounting probe.
7. Unbolt the transmitter from the stack and take it to a clean work area.
8. Allow the unit to cool to a comfortable working temperature.

Replace probe

Complete the following steps to replace the probe in the stack.

1. Bolt the transmitter to the stack and install the insulation.
2. Connect all signal and power leads at the probe.

Refer to [Chapter 2](#) for detailed wiring instructions.

3. Connect the calibration gas and instrument air lines to the probe.
4. Install the housing cover.
5. Turn on instrument air.
6. Restore power to the system.

Refer to [Chapter 3](#).

NOTICE

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

5.4.2 Replace transmitter board

The transmitter board is not repairable and must be replaced if any component fails. See [Figure 5-1](#) for item number references. The transmitter board is available as a standalone kit or with the plastic cover and mounting plate.

⚠ WARNING!

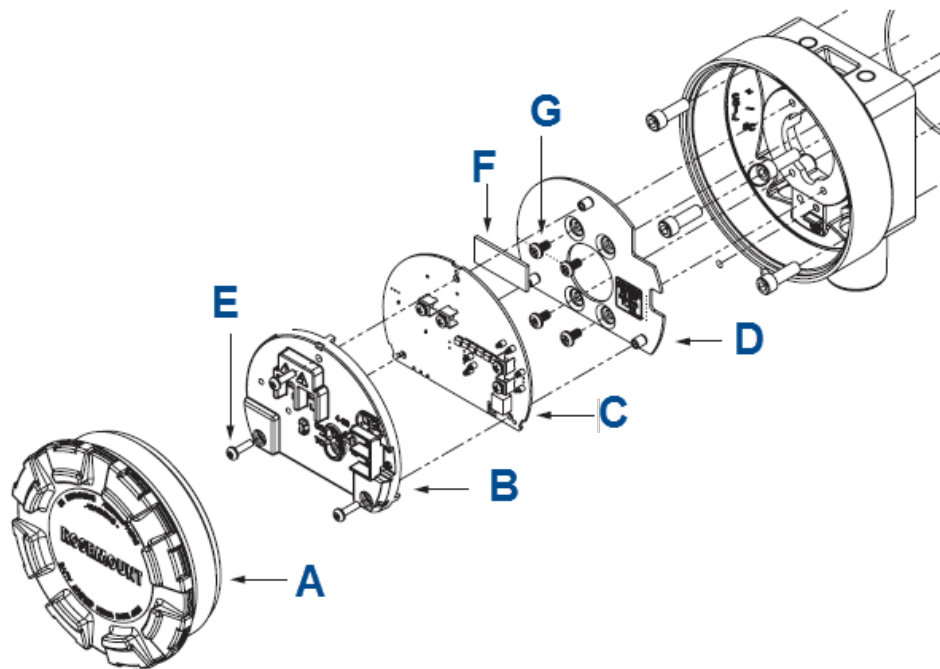
ELECTRIC SHOCK

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

⚠ CAUTION!**MEASUREMENT ERRORS**

Failure to resynchronize the calibration parameters with a Rosemount 6888Xi after replacing the transmitter board or recalibrating the instrument may cause an inaccurate O₂ measurement. When the transmitter board is replaced and the calibration parameters are not synchronized with the Rosemount 6888Xi, the parameters in the Rosemount 6888Xi will be used as default to calculate the O₂ measurement.

Figure 5-1: Transmitter board mounting



- A. Cover
- B. Plastic cover
- C. Transmitter board
- D. Mounting plate
- E. Screws
- F. Thermal pad
- G. Screws

Procedure

1. Remove cover (A) from the transmitter housing.
2. Disconnect the power and signals from the transmitter board (C).
3. Remove the three screws (E) securing the plastic cover (B) and transmitter board (C) to mounting plate (D).
4. The plastic cover snaps onto the transmitter board with three tabs. Pull the cover and board away from the mounting plate.

The thermal pad (F) will most likely remain attached to the mounting plate.

5. Disconnect the two wire harness connectors from the back of the transmitter board and remove the plastic cover and transmitter board.

Replacement transmitter boards come in two configurations:

- a. Transmitter board with thermal pad and mounting screws
- b. Transmitter board, thermal pad, plastic cover, mounting plate, and mounting screws

6. If only the transmitter board is being replaced, carefully unsnap the plastic cover from the old transmitter board and then snap it onto the new board.

The cover goes in one way only with the screw terminals for the power and signal wiring fitting into the openings in the cover.

If the transmitter board, plastic cover, and mounting plate are being replaced, the plastic cover should already be snapped onto the transmitter board.

7. Remove the old thermal pad from the mounting plate. Attach the new thermal pad to the mounting plate 1 in. up from the flat edge of the pad.

Do not reassemble without the thermal pad in place. If the transmitter board, plastic cover, and mounting plate are being replaced, the thermal pad should already be in place on the mounting plate.

8. If the mounting pad is being replaced, remove the four screws (H) securing the plate to the housing. Install the new mounting plate using four screws.

Replacement screws are provided if any become lost or damaged.

9. Reconnect the two wire harness connectors to the back of the transmitter board.

The connectors are different and individually keyed to prevent misconnection.

10. Carefully push the wire harnesses through the hole in the mounting plate and align the transmitter board with plastic cover over the three standoffs on the mounting plate.

11. Install the three screws to secure the board to the mounting plate.

Replacement screws are provided if any become lost or damaged.

12. Reconnect the power and signal wires to the transmitter board.
13. Reinstall the cover to the transmitter housing.
14. Reapply power to the transmitter. Prior to using the transmitter for measurement purposes, perform one of the following:

- Transmitter without Rosemount 6888Xi: Recalibrate the transmitter. See [Chapter 3](#).
- Transmitter with Rosemount 6888Xi: When initialization is complete, the transmitter begins to heat up, but an alarm condition is shown on the Rosemount 6888Xi. Synchronize the calibration parameters via the Rosemount 6888Xi as follows:
 - a. Press **DIAG** once to view the alarms. A `Probe Changed` alarm appears.
 - b. Press **EXIT** once to enter the **Diagnostic** menu.

- c. Use the **Up** and **Down** keys to select 3-Acknowledge Alarms. Press **ENTER**.
- d. Use the **Up** and **Down** keys to select 3-Ack Probe Changed. Press **ENTER**.
- e. Use the **Up** and **Down** keys to select 1-Send To Probe. Press **ENTER**.
- f. When transfer is complete, press **EXIT** twice to return to the main menu.

5.4.3 Replace DR terminal board

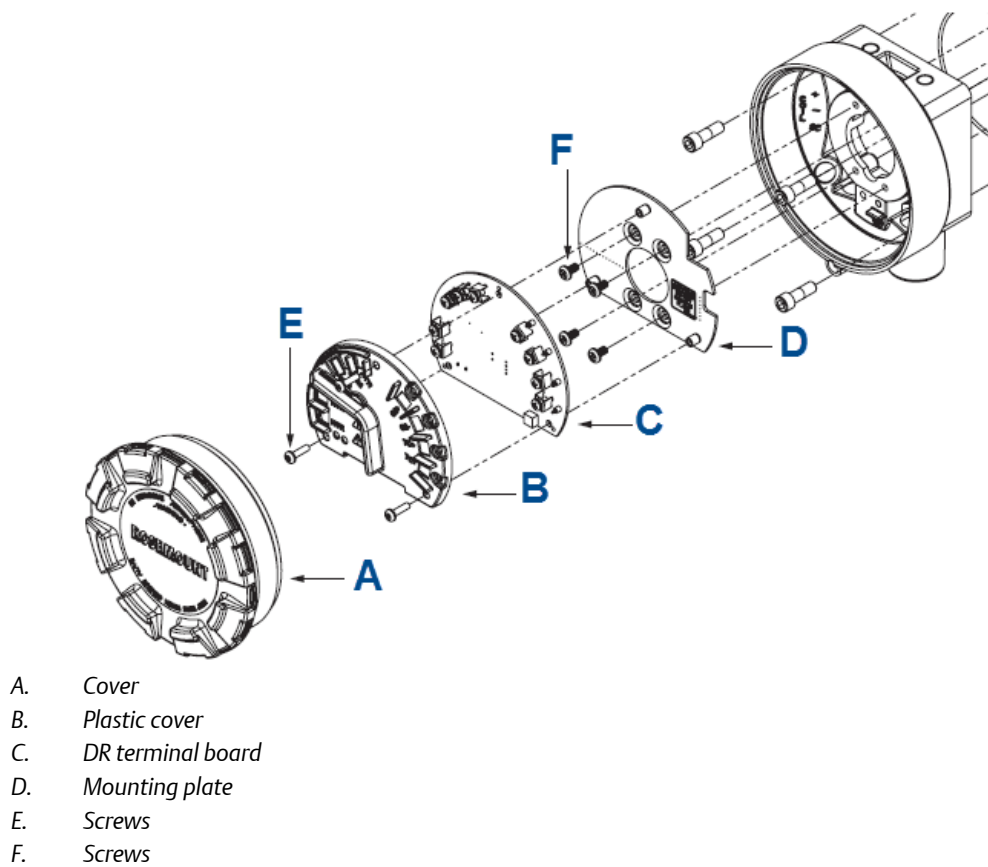
This section covers replacement of the DR board. The board is not repairable and must be replaced if any component fails. See [Figure 5-2](#) for letter references. The DR board is available as a standalone kit or with the plastic cover and mounting plate.

⚠ WARNING!

ELECTRIC SHOCK

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

Figure 5-2: DR terminal board mounting



Procedure

1. Remove cover (A) from the DR probe housing.
2. Disconnect the power and signal wires from the DR terminal board (C).
3. Remove the three screws (E) securing the plastic cover (B) and DR terminal board (C) to mounting plate (D).
4. Disconnect the two wire harness connectors from the back of the transmitter board.

Replacement DR terminal boards come in two configurations:

- a. DR terminal board with thermal pad and mounting screws
 - b. DR terminal board, thermal pad, plastic cover, mounting plate, and mounting screws
5. If the mounting pad is being replaced, remove the four screws (F) securing the plate to the housing. Install the new mounting plate using four screws.

Replacement screws are provided if any become lost or damaged.

6. Reconnect the two wire harness connectors to the back of the DR terminal board.

The connectors are different and individually keyed to prevent misconnection.

7. Carefully push the wire harnesses through the hole in the mounting plate and align the DR terminal board with plastic cover over the three standoffs on the mounting plate.
 8. Install the three screws to secure the board to the mounting plate.
- Replacement screws are provided if any become lost or damaged.
9. Reconnect the power and signal wires to the transmitter board.
 10. Reinstall the cover to the DR probe housing.
 11. Reapply power to the DR probe.

5.4.4 Heater strut replacement

This section covers heater strut replacement. Do not attempt to replace the heater strut until all other possibilities for poor performance have been considered.

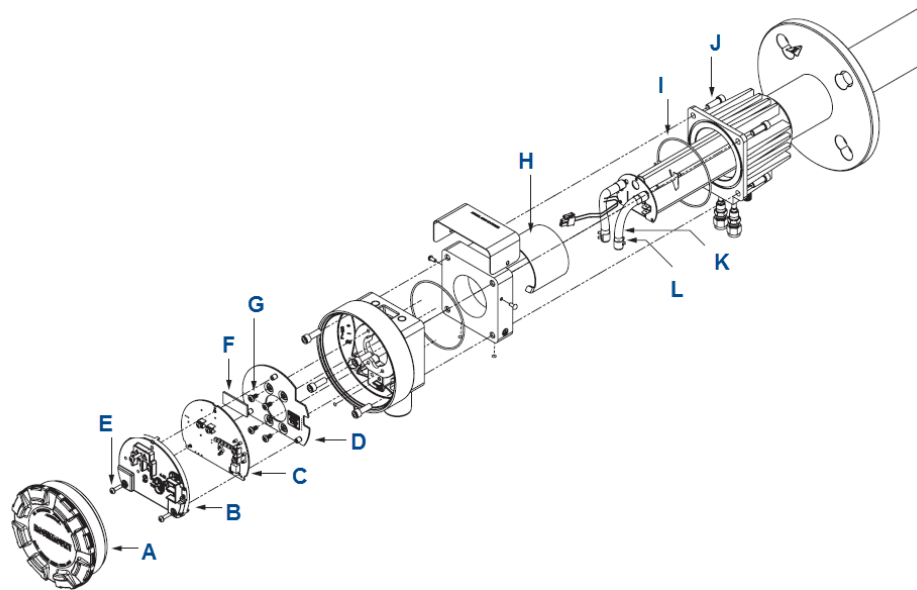
If heater strut replacement is needed, order a replacement heater strut kit ([Table 6-1](#)).

Refer to [Figure 5-3](#) for item letter references.

WARNING!

BURNS

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 427 °C (800 °F). This can cause severe burns.

Figure 5-3: Housing/Strut Exploded View

- A. Cover
- B. Plastic cover
- C. Transmitter board
- D. Mounting plate
- E. Screws
- F. Thermal pad
- G. Screws
- H. Strut clamp
- I. O-ring
- J. Screws
- K. Viton tube
- L. Tube clamp

Procedure

1. Follow the instructions in [Section 5.4.1](#) to remove the transmitter from the stack or duct.
2. Follow the instructions in [Section 5.4.2](#) or [Section 5.4.3](#) to remove the electronics from the housing.
3. Remove four screws (E). Remove housing from probe using care not to damage the strut wire harnesses or O-ring (I).
4. Remove the strut clamp (H) from inside the finned housing on the probe.
5. Remove tube clamps (L) and Viton tubes (K) from the CAL and REF gas ports and the CAL and REF gas lines. Leave the clamps in place on the hoses for later reassembly.
6. Grasp the wire loop and carefully slide the heater strut assembly out of the probe tube.

7. When replacing the strut, orient the probe so that the small calibration gas tube is at the 6 o'clock position of the probe tube. Align the slot on the heater plate with the calibration gas line in the probe tube. Slide the strut into the probe tube.

It turns to align the hole on the back plate of the strut with the calibration gas line. When the hole and calibration gas line are aligned correctly, the strut slides in the rest of the way.
8. As the strut insertion nears completion, install the guide rod into the calibration gas tube to assist in guiding the calibration gas tube through the hole in the end of the strut.
9. Replace the CAL and REF gas Viton tubes (K).
10. Insert the strut clamp (H) back into the finned housing on the probe.

The opening should be down to allow for clearance for the gas tubes.
11. Carefully install the O-ring (I) back into the groove between the two housings.

A small amount of silicone grease may be used to hold the O-ring in place. Do not use petroleum based grease.
12. Insert the strut wire harnesses into the housing.
13. Turn the conduit ports of the housing to the CAL and REF gas ports side of the probe and position the housing on the probe.
14. Install and tighten the four screws (J).
15. Follow the instructions in [Section 5.4.2](#) to install the electronics into the housing.
16. Follow the instructions in [Section 5.4.1](#) to install the transmitter into the stack or duct.

5.4.5 Cell replacement

This section 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 ([Table 6-1](#)).

The cell replacement kit ([Figure 5-4](#)) 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 ([Table 6-1](#)).

WARNING!

BURNS

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.

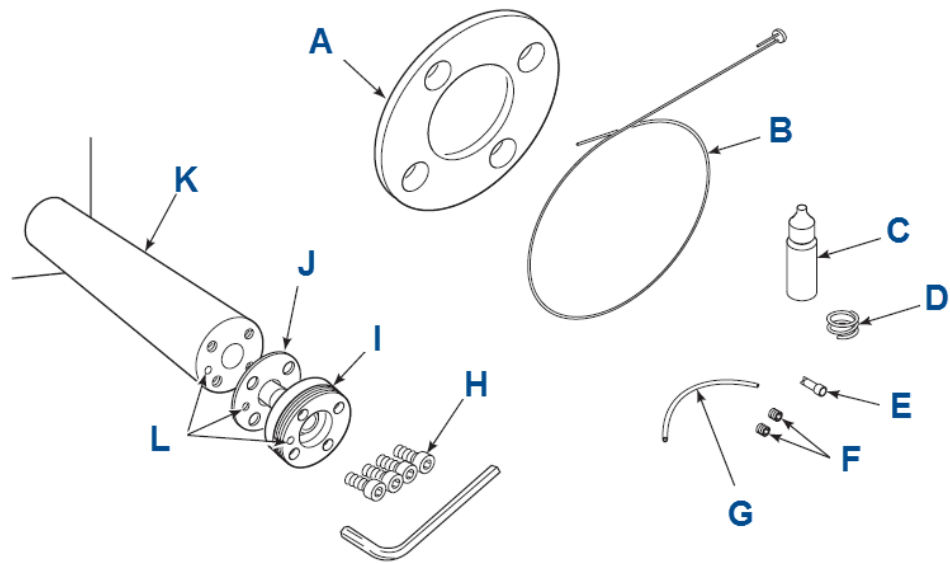
Disconnect and lock out power before working on any electrical components. There is voltage up to 240 Vac.

⚠ CAUTION!

EQUIPMENT DAMAGE

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

Figure 5-4: Cell Replacement Kit



- A. ANSI gasket
- B. Wire and pad assembly
- C. Anti-seize compound
- D. 22 gauge wire
- E. Closed end connector
- F. Set screws
- G. Teflon tubing
- H. Socket head cap screws
- I. Cell and flange assembly
- J. Corrugated seal
- K. Probe (not included in kit)
- L. Calibration gas passage

Procedure

1. Follow the instructions in [Section 5.4.1](#) to remove the transmitter from the stack or duct.
2. If the probe uses the standard diffusion element, use a wrench to remove the diffuser assembly.
3. If equipped with the optional ceramic diffusion assembly, remove and discard the setscrews and remove the vee deflector. Use spanner wrenches from the probe disassembly kit ([Table 6-1](#)) to turn the hub free from the retainer. Inspect the diffusion element. If damaged, replace the element.
4. 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. The contact pad inside of the probe sometimes fuses 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 cell and the thermocouple wires at the crimp connections and withdraw the cell with the wires still attached.

5. If the contact assembly is damaged, replace the strut or contact pad. Follow the instructions in [Section 5.4.4](#), steps 2 through 4, to remove the electronics housing and then follow the instructions for replacing the contact pad provided in the cell replacement kit.
6. Remove and discard the corrugated seal. Clean the mating faces of the probe tube and retainer. Remove burrs and raised surfaces with a block of wood and crocus cloth. Clean the threads on the retainer and hub.
7. Rub a small amount of anti-seize compound on both sides of the new corrugated seal.
8. Assemble the cell and flange assembly, corrugated seal, and 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 assembly. Torque to 60 in.-lb (6.8 N m).
9. Follow the instructions in [Section 5.4.4](#), steps 9 through 15, to reassemble the electronics housing.
10. Apply anti-seize compound to the threads of the cell assembly, hub, and setscrews. Reinstall the hub on the cell assembly. Using pin spanner wrenches, torque to 10 ft-lb (14 N m). If applicable, reinstall the vee deflector, orienting apex toward gas flow. Secure with setscrews and anti-seize compound. Torque to 25 in.-lb (2.8 N m).
11. On systems equipped with an abrasive shield, install the dust gaskets with joints 180° apart.
12. Follow the instructions in [Section 5.4.1](#) to install the transmitter to the stack or duct.
13. Turn on power and monitor thermocouple output.

It should stabilize at 29.3 ± 0.2 mV. Set reference air flow at 1 l/min (2 scfh). After the transmitter stabilizes, calibrate the probe. If new components have been installed, repeat calibration after 24 hours of operation.

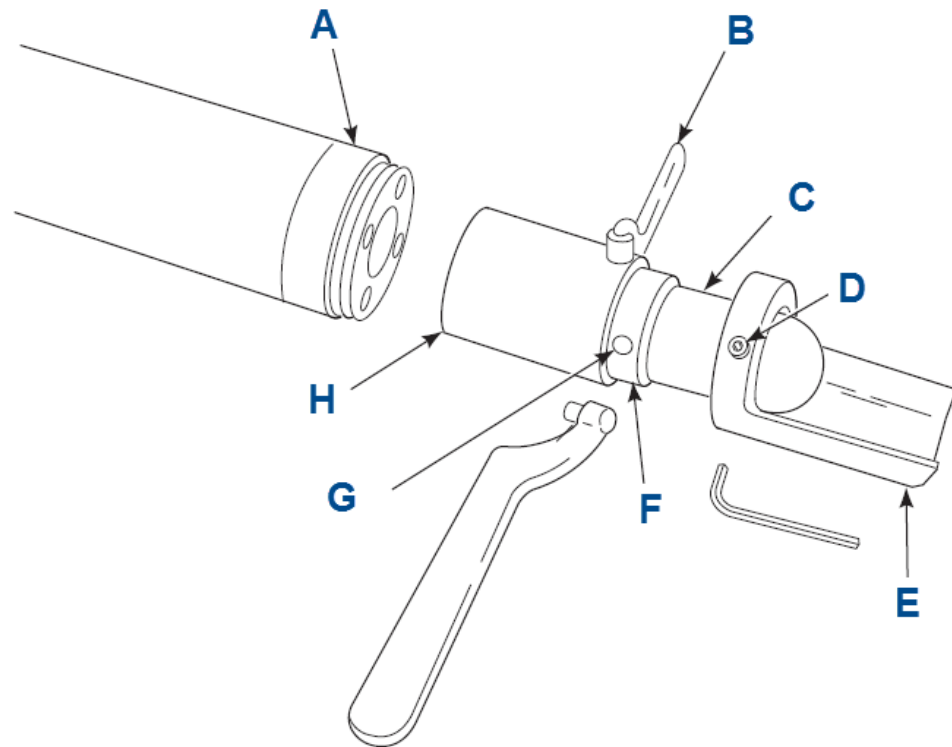
5.4.6 Diffusion element replacement

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

Damage to the diffusion element may become apparent during calibration. Compare probe response with previous response. A broken diffusion element will cause an inadequate 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 6-1](#).

NOTICE

This refers to the ceramic diffusion element only.

Figure 5-5: Ceramic diffuser element replacement

- A. Retainer
- B. Spanner wrench
- C. Optional ceramic diffusion element
- D. Set screw
- E. Vee deflector
- F. Cement fillet
- G. Cement port
- H. Hub

Procedure

1. Follow the instructions in [Section 5.4.1](#) to remove the probe from the stack or duct.
2. Loosen set screws (D) using the hex wrench from the probe disassembly kit and remove the vee deflector (E). Inspect sets crews. If damaged, replace with stainless sets crews coated with anti-seize compound.
3. Follow the instructions in [Section 5.4.1](#) to install the probe into the stack or duct.

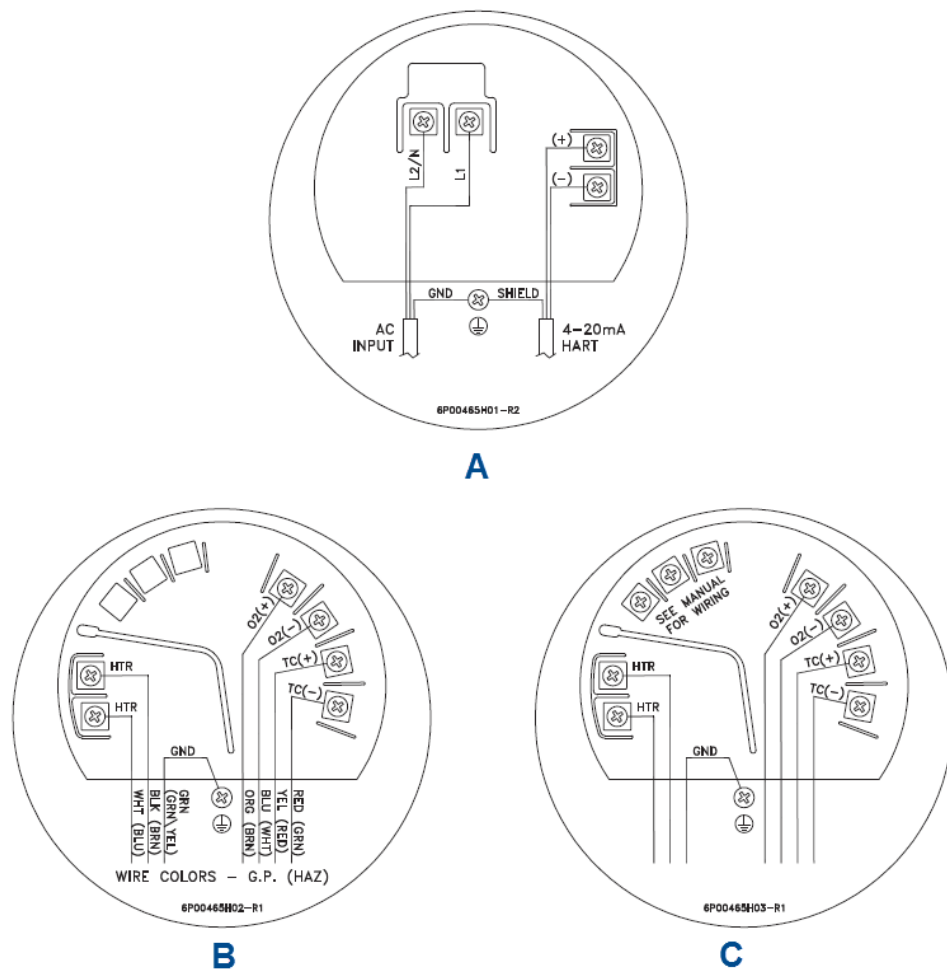
5.4.7 Blind cover replacement

This section covers the replacement of the main housing cover and the application of the correct field wiring label.

NOTICE

Field wiring labels are supplied for each product configuration. Ensure the correct label is applied to the inside of the cover that matches your configuration.

Figure 5-6: Field wiring labels



- A. Label for full transmitter
- B. Label for DR probe
- C. Label for DR/YEW probe

Procedure

1. Remove existing cover from the transmitter housing.
2. Select the new field wiring label that matches the existing label on the inside of the old cover.

A graphic of each label and its application is shown in [Figure 5-6](#).

3. Peel off the backing and attach the new label to the inside of the new cover.
4. Install the new cover onto the housing.

6 Replacement parts

Table 6-1: Replacement Part Kits for O₂ Transmitter

Part Number	Description
6A00448G01	Kit, transmitter board
6A00448G02	Kit, transmitter board with mounting plate and cover
6A00449G01	Kit, DR terminal board
6A00449G02	Kit, DR terminal board with mounting plate and cover
6A00449G10	Kit, DR terminal board, YEW
6A00449G11	Kit, DR terminal board, YEW with mounting plate and cover
6A00452G01	Kit, blind cover, standard, and autocal housing
6A00450G01	Kit, Cell gaskets (pack of five)
6A00451G01	Kit, cover O-rings, standard housing (pack of five)
6A00453G01	Kit, snubber diffuser
6A00453G02	Kit, snubber diffuser with dust seal
6A00453G03	Kit, ceramic diffuser with V-deflector
6A00453G04	Kit, ceramic diffuser with dust seal with V-deflector
6A00453G05	Kit, Hastelloy diffuser with V-deflector
6A00453G06	Kit, Hastelloy diffuser with dust seal with V-deflector
6A00454G01	Kit, strut, 18 inch
6A00454G02	Kit, strut, 3 foot
6A00454G03	Kit, strut, 6 foot
6A00454G04	Kit, strut, 9 foot
6A00454G05	Kit, strut, 12 foot
6A00455G01	Kit, cell replacement, 18 inch, standard cell
6A00455G02	Kit, cell replacement, 3 foot, standard cell
6A00455G03	Kit, cell replacement, 6 foot, standard cell
6A00455G04	Kit, cell replacement, 9 foot, standard cell
6A00455G05	Kit, cell replacement, 12 foot, standard cell
6A00455G11	Kit, cell replacement, 18 inch, acid resistant cell
6A00455G12	Kit, cell replacement, 3 foot, acid resistant cell
6A00455G13	Kit, cell replacement, 6 foot, acid resistant cell
6A00455G14	Kit, cell replacement, 9 foot, acid resistant cell
6A00455G15	Kit, cell replacement, 12 foot, acid resistant cell
6A00456G01	Flange gasket kit, ANSI, general purpose, (pack of five)
6A00456G03	Flange gasket kit, DIN, general purpose (pack of five)

Table 6-1: Replacement Part Kits for O₂ Transmitter (continued)

6A00457G01	Spare transmitter board cover
6A00457G02	Spare DR term board cover
6A00475G01	Tool kit - 6888
1A99119G01	Calibration gas bottles - 0.4% and 8% O ₂ , balance nitrogen - 550 liters each ⁽¹⁾
1A99119G02	Two flow regulators (for calibration gas bottles)
1A99119G03	Bottle rack

(1) Calibration gas bottles cannot be shipped via air freight.

7 Optional accessories

7.1 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.

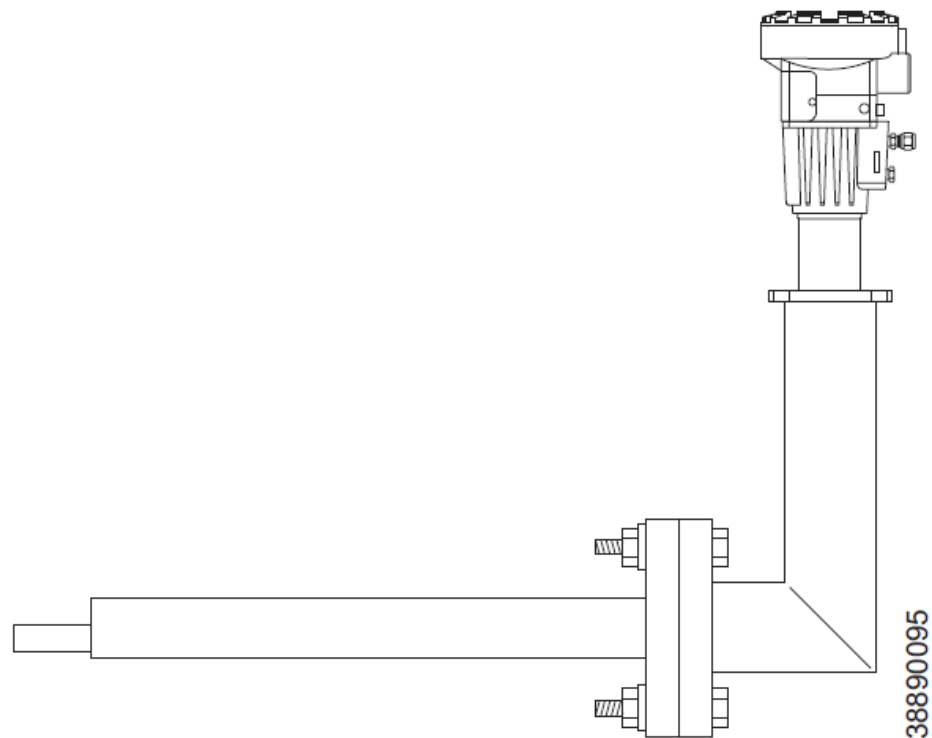
For more information, call Rosemount at 1-800-433-6076.

7.2 By-Pass Packages

The specially designed Rosemount 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 steel tubes provide effective resistance to corrosion, and the package uses no moving parts, air pumps, or other components common to other sampling systems.

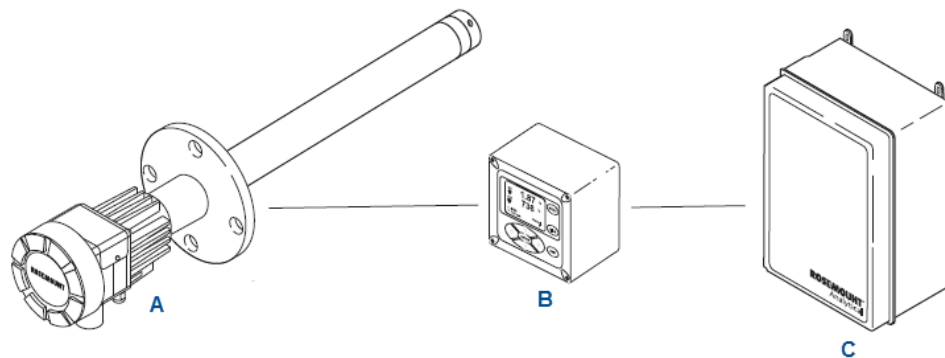
For more information, call Rosemount at 1-800-433-6076.

Figure 7-1: By-Pass Packages



7.3 Rosemount SPS 4001B Single Probe Autocalibration Sequencer

Figure 7-2: Rosemount SPS 4001B



- A. *Rosemount 6888A O₂ Transmitter*
- B. *Rosemount 6888Xi Advanced Electronics*
- C. *Rosemount SPS 4001B*

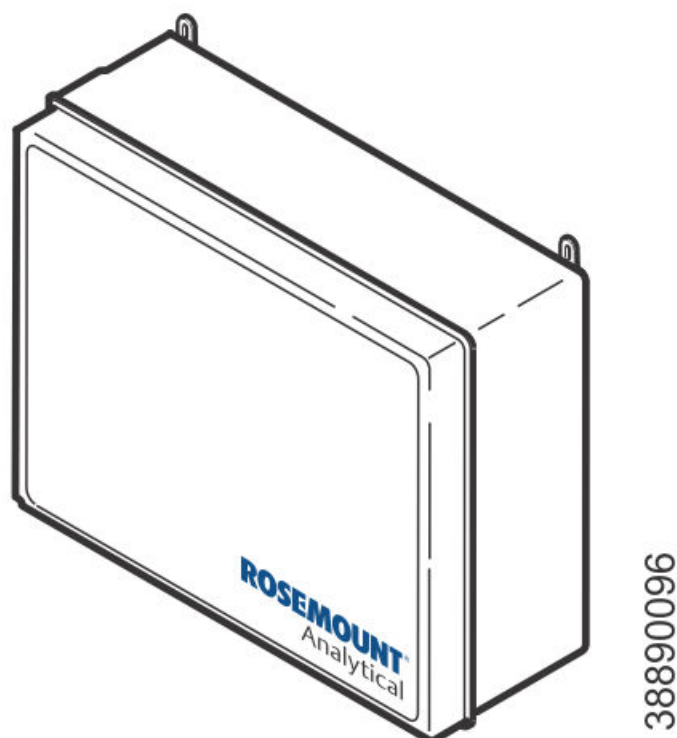
Rosemount specifically designed the SPS 4001B Single Probe Autocalibration Sequencer to provide the ability to perform automatic or on-demand calculations. The Rosemount SPS 4001B is fully enclosed in a NEMA cabinet suitable for wall-mounting. This cabinet provides added protection against dust and minor impacts.

The Rosemount SPS 4001B works in conjunction with the Rosemount 6888Xi, eliminating out-of-calibration occurrences and the need to send a technician to the installation site.

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

7.4 Rosemount IMPS 4000 Intelligent Multiprobe Test Gas Sequencer

Figure 7-3: Rosemount IMPS 4000



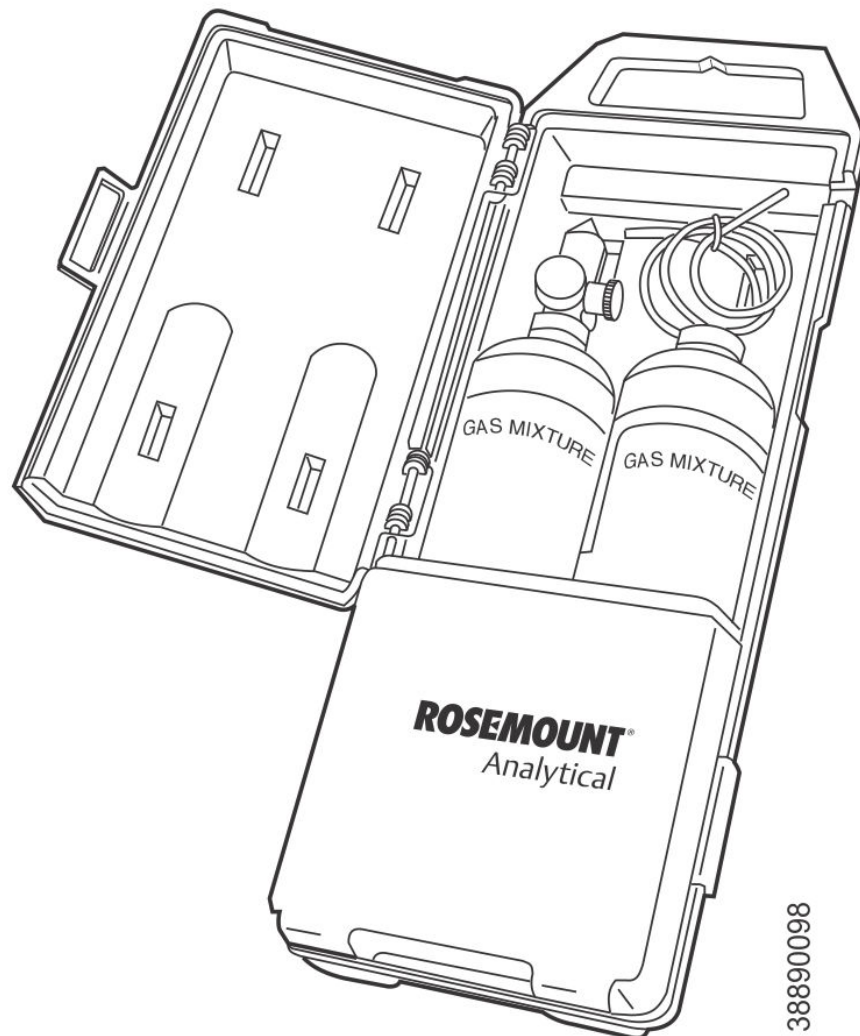
The Rosemount IMPS 4000 Intelligent Multiprobe Test Gas Sequencer is housed within an IP56 (NEMA 4X) enclosure and has the intelligence to provide calibration gas sequencing of up to four Rosemount 6888Xis to accommodate automatic and semi-automatic calibration routines.

The sequencer works in conjunction with the CALIBRATION RECOMMENDED feature, eliminating out-of-calibration occurrences and the need to send a technician to the installation site. In addition, the Rosemount IMPS 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 O₂ probe is out of calibration, calibration gases are on, and calibration pressure is low.

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

7.5 O₂ calibration gas

Figure 7-4: Calibration Gas Bottles



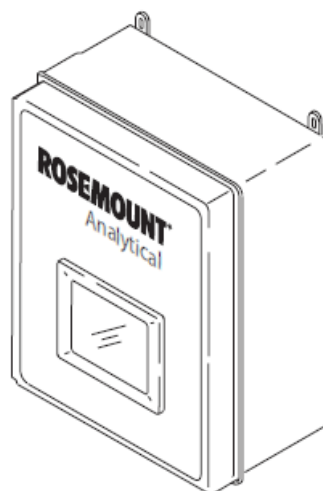
Rosemount's O₂ calibration gas and service kits have been carefully designed to provide a more convenient and fully portable means of testing, calibrating, and servicing Rosemount's oxygen analyzers. These lightweight, disposable gas cylinders eliminate the need to rent gas bottles.

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

7.6 Optional Rosemount OxyBalance Display and Averaging System

The optional Rosemount OxyBalance Display and Averaging System receives up to eight 4-20 mA signals from individual probes, trends individual outputs, and calculates four programmable averages as additional 4-20 mA outputs. For more information, call Rosemount at 1-800-433-6076.

Figure 7-5: Rosemount OxyBalance System



Appendix A

Rosemount™ 6888 product certifications

A.1 European Directive information

A copy of the EC Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EC Declaration of Conformity can be found at Emerson.com/Rosemount.

A.2 Ordinary location certification


As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

A.3 Installing equipment in North America

The US National Electrical Code (NEC) and the Canadian Electrical Code (CEC) permit the use of Division marked equipment in Zones and Zone marked equipment in Divisions. The marking must be suitable for the area classification, gas, and temperature class. This information is clearly defined in the respective codes.

A.4 Rosemount™ 6888A In-Situ Oxygen Transmitter for General Purpose Locations

A.4.1 USA

FM Certificate	FM17NUS0009X
Standards	FM 3810:2005, ANSI/IEC-250:2003, ANSI/EC 60529:2004
Markings	 Type 4X, IP66

Special conditions for use

1. Type 4X and IP66 applies to the transmitter portion that is mounted externally to the flue duct.

A.4.2 Canada

CSA Certificate 1913435

Standards CAN/CSA C22.2 No. 61010-1-04, UL 61010-1:2004 (2nd Edition), UL 50 (11th Ed.), IEC 60529 (Edition 2.1-2001-02), NEMA 250-2003

Markings  Type 4X, IP66

A.4.3 Europe

TUV Rheinland QAL1 Certificate 0000038506

Standards EN15267-1:2009, EN15627-2:2009, EN15627-3:2007, EN14181:2004

MCERTS Certificate Sira MC140270/00

Standards EN15267-1:2009, EN15627-2:2009, EN15627-3:2007, EN14181:2004

A.5 Rosemount™ 6888Xi Digital Transmitter for General Purpose Locations

A.5.1 USA

FM Certificate FM17NUS0009X

Standards FM 3810: 2005, ANSI/IEC: 2003, ANSI/EC 60529: 2004

Markings  Type 4X

Special conditions for use

1. Mounting option 01 was not certified to provide Type 4X ingress protection through the panel cut-out opening. The panel mount gasket has not been tested for Type 4X installation.

A.5.2 Canada

CSA Certificate 1913435

Standards CAN//CSA C22.2 No. 61010-1-04, UL 61010-1:2004 (2nd Edition), CAN/CSA-C22.2 No.94-M91 (R2001), UL 50 (11th Ed.)

Markings  Type 4X IP66

A.6 Rosemount™ SPS4001B and IMPS4000 Autocalibration Devices for General Purpose Locations

A.6.1 USA/Canada

CSA certificate 1640823

Standards CAN/CSA C22.2 No. 61010-1-04; ANSI/UL 61010-1:2004, (2nd Edition); CSA C22.2 No. 94.1-07; ANSI/UL 50 (12th Edition); CSA C22.2 No. 94.2 (1st Edition); ANSI/UL 50 E First Edition; CSA C22.2 No. 60529:05 (R2010); ANSI/IEC 60529-2004 (R2011)

Markings  Type 4X, IP66


Appendix B

Safety data


B.1 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 (167 °F).
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 it does 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 following symbol, 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 following symbol, 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 following symbol, refer to the

Reference 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.
11. Where equipment or labels are marked "Do Not Open While Energized" or similar, there is a danger of ignition in areas where an explosive atmosphere is present. This equipment should only be opened when the power is removed and adequate time as specified in the label or in the instruction manual has been allowed for the equipment to cool down - and then only by trained service personnel.

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