

## Instruction Manual

IB-106-5081, Rev. 1.0

May 2005

# Model 5081FG

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



**ROSEMOUNT**<sup>®</sup>  
Analytical

<http://www.raihome.com>

  
**EMERSON**<sup>™</sup>  
Process Management

# ESSENTIAL INSTRUCTIONS

## READ THIS PAGE BEFORE PROCEEDING!

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

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

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

### Emerson Process Management

Rosemount Analytical Inc.  
Process Analytic Division  
6565P Davis Industrial Parkway  
Solon, OH 44139  
T (440) 914 1261  
F (440) 914 1271  
E [gas.csc@emersonprocess.com](mailto:gas.csc@emersonprocess.com)

<http://www.raihome.com>



# HIGHLIGHTS OF CHANGES

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<b>Page</b>	<b>Summary</b>
Throughout	Changed IB revision number and release date.
Cover	Changed E-mail address.
Inside Cover	Changed mailing and E-mail addresses.
Page 7-1	Changed repair facility address.
Page 8-1	Changed Figure 5-1, item 10 part number in Table 8-1.

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## PREFACE

The purpose of this manual is to provide information concerning the components, functions, installation and maintenance of the Model 5081FG Two-Wire In Situ Oxygen Analyzer (550° to 1600°C).

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

## DEFINITIONS

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

### **WARNING**

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

### **CAUTION**

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

### **NOTE**

Highlights an essential operating procedure, condition, or statement.

⊕ : EARTH (GROUND) TERMINAL

⊕ : PROTECTIVE CONDUCTOR TERMINAL

⚠ : RISK OF ELECTRICAL SHOCK

⚠ : WARNING: REFER TO INSTRUCTION BULLETIN

## NOTE TO USERS

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

**IMPORTANT**  
**SAFETY INSTRUCTIONS**  
**FOR THE WIRING AND INSTALLATION**  
**OF THIS APPARATUS**

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




1. Adequate earth connections should be made to all earthing points, internal and external, where provided.
2. After installation or troubleshooting, all safety covers and safety grounds must be replaced. The integrity of all earth terminals must be maintained at all times.
3. Mains supply cords should comply with the requirements of IEC227 or IEC245.
4. All wiring shall be suitable for use in an ambient temperature of greater than 75°C.
5. All cable glands used should be of such internal dimensions as to provide adequate cable anchorage.
6. To ensure safe operation of this equipment, connection to the mains supply should only be made through a circuit breaker which will disconnect all circuits carrying conductors during a fault situation. The circuit breaker may also include a mechanically operated isolating switch. If not, then another means of disconnecting the equipment from the supply must be provided and clearly marked as such. Circuit breakers or switches must comply with a recognized standard such as IEC947. All wiring must conform with any local standards.
7. Where equipment or covers are marked with the symbol to the right, hazardous voltages are likely to be present beneath. These covers should only be removed when power is removed from the equipment — and then only by trained service personnel.
8. Where equipment or covers are marked with the symbol to the right, there is a danger from hot surfaces beneath. These covers should only be removed by trained service personnel when power is removed from the equipment. Certain surfaces may remain hot to the touch.
9. Where equipment or covers are marked with the symbol to the right, refer to the Operator Manual for instructions.
10. All graphical symbols used in this product are from one or more of the following standards: EN61010-1, IEC417, and ISO3864.



### **BELANGRIJK**

#### **Veiligheidsvoorschriften voor de aansluiting en installatie van dit toestel.**




**De hierna volgende veiligheidsvoorschriften zijn vooral bedoeld voor de EU lidstaten. Hier moet aan gehouden worden om de onderworpenheid aan de Laag Spannings Richtlijn (Low Voltage Directive) te verzekeren. Niet EU staten zouden deze richtlijnen moeten volgen tenzij zij reeds achterhaald zouden zijn door plaatselijke of nationale voorschriften.**

1. Degelijke aardingsaansluitingen moeten gemaakt worden naar alle voorziene aardpunten, intern en extern.
2. Na installatie of controle moeten alle veiligheidsdeksels en -aarding terug geplaatst worden. Ten alle tijde moet de betrouwbaarheid van de aarding behouden blijven.
3. Voedingskabels moeten onderworpen zijn aan de IEC227 of de IEC245 voorschriften.
4. Alle bekabeling moet geschikt zijn voor het gebruik in omgevingstemperaturen, hoger dan 75°C.
5. Alle wartels moeten zo gedimensioneerd zijn dat een degelijke kabel bevestiging verzekerd is.
6. Om de veilige werking van dit toestel te verzekeren, moet de voeding door een stroomonderbreker gevoerd worden (min 10A) welke alle draden van de voeding moet onderbreken. De stroomonderbreker mag een mechanische schakelaar bevatten. Zoniet moet een andere mogelijkheid bestaan om de voedingsspanning van het toestel te halen en ook duidelijk zo zijn aangegeven. Stroomonderbrekers of schakelaars moeten onderworpen zijn aan een erkende standaard zoals IEC947.
7. Waar toestellen of deksels aangegeven staan met het symbool is er meestal hoogspanning aanwezig. Deze deksels mogen enkel verwijderd worden nadat de voedingsspanning werd afgelegd en enkel door getraind onderhoudspersoneel.
8. Waar toestellen of deksels aangegeven staan met het symbool is er gevaar voor hete oppervlakken. Deze deksels mogen enkel verwijderd worden door getraind onderhoudspersoneel nadat de voedingsspanning verwijderd werd. Sommige oppervlakken kunnen 45 minuten later nog steeds heet aanvoelen.
9. Waar toestellen of deksels aangegeven staan met het symbool gelieve het handboek te raadplegen.
10. Alle grafische symbolen gebruikt in dit produkt, zijn afkomstig uit een of meer van devolgende standaards: EN61010-1, IEC417 en ISO3864.

## **VIGTIGT**

### **Sikkerhedsinstruktion for tilslutning og installering af dette udstyr.**




**Følgende sikkerhedsinstruktioner gælder specifikt i alle EU-medlemslande. Instruktionerne skal nøje følges for overholdelse af Lavspændingsdirektivet og bør også følges i ikke EU-lande medmindre andet er specificeret af lokale eller nationale standarder.**

1. Passende jordforbindelser skal tilsluttes alle jordklemmer, interne og eksterne, hvor disse forefindes.
2. Efter installation eller fejlfinding skal alle sikkerhedsdæksler og jordforbindelser reetableres.
3. Forsyningskabler skal opfylde krav specificeret i IEC227 eller IEC245.
4. Alle ledningstilslutninger skal være konstrueret til omgivelsestemperatur højere end 75° C.
5. Alle benyttede kabelforskruninger skal have en intern dimension, så passende kabelaflastning kan etableres.
6. For opnåelse af sikker drift og betjening skal der skabes beskyttelse mod indirekte berøring gennem afbryder (min. 10A), som vil afbryde alle kredsløb med elektriske ledere i fejlsituation. Afbryderen skal indholde en mekanisk betjent kontakt. Hvis ikke skal anden form for afbryder mellem forsyning og udstyr benyttes og mærkes som sådan. Afbrydere eller kontakter skal overholde en kendt standard som IEC947.
7. Hvor udstyr eller dæksler er mærket med dette symbol, er farlige spændinger normalt forekommende bagved. Disse dæksler bør kun afmonteres, når forsyningsspændingen er frakoblet - og da kun af instrueret servicepersonale. 
8. Hvor udstyr eller dæksler er mærket med dette symbol, forefindes meget varme overflader bagved. Disse dæksler bør kun afmonteres af instrueret servicepersonale, når forsyningsspænding er frakoblet. Visse overflader vil stadig være for varme at berøre i op til 45 minutter efter frakobling. 
9. Hvor udstyr eller dæksler er mærket med dette symbol, se da i betjeningsmanual for instruktion. 
10. Alle benyttede grafiske symboler i dette udstyr findes i én eller flere af følgende standarder:- EN61010-1, IEC417 & ISO3864.

### **BELANGRIJK**

#### **Veiligheidsinstructies voor de bedrading en installatie van dit apparaat.**




**Voor alle EU lidstaten zijn de volgende veiligheidsinstructies van toepassing. Om aan de geldende richtlijnen voor laagspanning te voldoen dient men zich hieraan strikt te houden. Ook niet EU lidstaten dienen zich aan het volgende te houden, tenzij de lokale wetgeving anders voorschrijft.**

1. Alle voorziene interne- en externe aardaansluitingen dienen op adequate wijze aangesloten te worden.
2. Na installatie, onderhouds- of reparatie werkzaamheden dienen alle beschermdeksels /kappen en aardingen om reden van veiligheid weer aangebracht te worden.
3. Voedingskabels dienen te voldoen aan de vereisten van de normen IEC 227 of IEC 245.
4. Alle bedrading dient geschikt te zijn voor gebruik bij een omgevings temperatuur boven 75°C.
5. Alle gebruikte kabelwartels dienen dusdanige inwendige afmetingen te hebben dat een adequate verankering van de kabel wordt verkregen.
6. Om een veilige werking van de apparatuur te waarborgen dient de voeding uitsluitend plaats te vinden via een meerpolige automatische zekering (min. 10A) die **alle** spanningvoerende geleiders verbreekt indien een foutconditie optreedt. Deze automatische zekering mag ook voorzien zijn van een mechanisch bediende schakelaar. Bij het ontbreken van deze voorziening dient een andere als zodanig duidelijk aangegeven mogelijkheid aanwezig te zijn om de spanning van de apparatuur af te schakelen. Zekeringen en schakelaars dienen te voldoen aan een erkende standaard zoals IEC 947.
7. Waar de apparatuur of de beschermdeksels/kappen gemarkeerd zijn met het volgende symbool, kunnen zich hieronder spanning voerende delen bevinden die gevaar op kunnen leveren. Deze beschermdeksels/kappen mogen uitsluitend verwijderd worden door getraind personeel als de spanning is afgeschakeld.  

8. Waar de apparatuur of de beschermdeksels/kappen gemarkeerd zijn met het volgende symbool, kunnen zich hieronder hete oppervlakken of onderdelen bevinden. Bepaalde delen kunnen mogelijk na 45 min. nog te heet zijn om aan te raken.  

9. Waar de apparatuur of de beschermdeksels/kappen gemarkeerd zijn met het volgende symbool, dient men de bedieningshandleiding te raadplegen.  

10. Alle grafische symbolen gebruikt bij dit produkt zijn volgens een of meer van de volgende standaarden: EN 61010-1, IEC 417 & ISO 3864.

## **TÄRKEÄÄ**

**Turvallisuusohje, jota on noudatettava tämän laitteen asentamisessa ja kaapeloinnissa.**




**Seuraavat ohjeet pätevät erityisesti EU:n jäsenvaltioissa. Niitä täytyy ehdottomasti noudattaa jotta täytettäisiin EU:n matalajännitedirektiivin (Low Voltage Directive) yhteensopivuus. Myös EU:hun kuulumattomien valtioiden tulee noudattaa tätä ohjetta, elleivät kansalliset standardit estä sitä.**

1. Riittävät maadoituskytkennät on tehtävä kaikkiin maadoituspisteisiin, sisäisiin ja ulkoisiin.
2. Asennuksen ja vianetsinnän jälkeen on kaikki suojat ja suojavaat asennettava takaisin paikoilleen. Maadoitusliittimen kunnollinen toiminta täytyy aina ylläpitää.
3. Jännitesyöttöjohtimien täytyy täyttää IEC227 ja IEC245 vaatimukset.
4. Kaikkien johdotuksien tulee toimia >75°C lämpötiloissa.
5. Kaikkien läpivientiholkkien sisähalkaisijan täytyy olla sellainen että kaapeli lukkiutuu kun-nolla kiinni.
6. Turvallisen toiminnan varmistamiseksi täytyy jännitesyöttö varustaa turvakatkimella (min 10A), joka kytkee irti kaikki jännitesyöttöjohtimet vikatilanteessa. Suojaan täytyy myös sisältyä mekaaninen erotuskytkin. Jos ei, niin jännitesyöttö on pystyttävä katkaisemaan muilla keinoilla ja merkittävä siten että se tunnistetaan sellaiseksi. Turvakatkimien tai katkaisimien täytyy täyttää IEC947 standardin vaatimukset näkyvyydestä.
7. Mikäli laite tai kosketussuoja on merkitty tällä merkillä on merkinnän takana tai alla hengenvaarallisen suuruinen jännite. Suojaa ei saa poistaa jänniteen ollessa kytkettynä laitteeseen ja poistamisen saa suorittaa vain alan asiantuntija. 
8. Mikäli laite tai kosketussuoja on merkitty tällä merkillä on merkinnän takana tai alla kuuma pinta. Suojaa saa poistaa vain alan asiantuntija kun jännite-syöttö on katkaistu. Tällainen pinta voi säilyä kosketuskuumana jopa 45 minuuttia. 
9. Mikäli laite tai kosketussuoja on merkitty tällä merkillä katso lisäohjeita käyttöohjekirjasta 
10. Kaikki tässä tuotteessa käytetyt graafiset symbolit ovat yhdestä tai useammasta seuraavista standardeista: EN61010-1, IEC417 & ISO3864.

## **IMPORTANT**

### **Consignes de sécurité concernant le raccordement et l'installation de cet appareil.**




**Les consignes de sécurité ci-dessous s'adressent particulièrement à tous les états membres de la communauté européenne. Elles doivent être strictement appliquées afin de satisfaire aux directives concernant la basse tension. Les états non membres de la communauté européenne doivent également appliquer ces consignes sauf si elles sont en contradiction avec les standards locaux ou nationaux.**

1. Un raccordement adéquat à la terre doit être effectuée à chaque borne de mise à la terre, interne et externe.
2. Après installation ou dépannage, tous les capots de protection et toutes les prises de terre doivent être remis en place, toutes les prises de terre doivent être respectées en permanence.
3. Les câbles d'alimentation électrique doivent être conformes aux normes IEC227 ou IEC245
4. Tous les raccordements doivent pouvoir supporter une température ambiante supérieure à 75°C.
5. Tous les presse-étoupes utilisés doivent avoir un diamètre interne en rapport avec les câbles afin d'assurer un serrage correct sur ces derniers.
6. Afin de garantir la sécurité du fonctionnement de cet appareil, le raccordement à l'alimentation électrique doit être réalisé exclusivement au travers d'un disjoncteur (minimum 10A.) isolant tous les conducteurs en cas d'anomalie. Ce disjoncteur doit également pouvoir être actionné manuellement, de façon mécanique. Dans le cas contraire, un autre système doit être mis en place afin de pouvoir isoler l'appareil et doit être signalisé comme tel. Disjoncteurs et interrupteurs doivent être conformes à une norme reconnue telle IEC947.
7. Lorsque les équipements ou les capots affichent le symbole suivant, cela signifie que des tensions dangereuses sont présentes. Ces capots ne doivent être démontés que lorsque l'alimentation est coupée, et uniquement par un personnel compétent.  

8. Lorsque les équipements ou les capots affichent le symbole suivant, cela signifie que des surfaces dangereusement chaudes sont présentes. Ces capots ne doivent être démontés que lorsque l'alimentation est coupée, et uniquement par un personnel compétent. Certaines surfaces peuvent rester chaudes jusqu'à 45 mn.  

9. Lorsque les équipements ou les capots affichent le symbole suivant, se reporter au manuel d'instructions.  

10. Tous les symboles graphiques utilisés dans ce produit sont conformes à un ou plusieurs des standards suivants: EN61010-1, IEC417 & ISO3864.

## Wichtig

### **Sicherheitshinweise für den Anschluß und die Installation dieser Geräte.**

**Die folgenden Sicherheitshinweise sind in allen Mitgliederstaaten der europäischen Gemeinschaft gültig. Sie müssen strikt eingehalten werden, um der Niederspannungsrichtlinie zu genügen. Nichtmitgliedstaaten der europäischen Gemeinschaft sollten die national gültigen Normen und Richtlinien einhalten.**




1. Alle intern und extern vorgesehenen Erdungen der Geräte müssen ausgeführt werden.
2. Nach Installation, Reparatur oder sonstigen Eingriffen in das Gerät müssen alle Sicherheitsabdeckungen und Erdungen wieder installiert werden. Die Funktion aller Erdverbindungen darf zu keinem Zeitpunkt gestört sein.
3. Die Netzspannungsversorgung muß den Anforderungen der IEC227 oder IEC245 genügen.
4. Alle Verdrahtungen sollten mindestens bis 75 °C ihre Funktion dauerhaft erfüllen.
5. Alle Kabeldurchführungen und Kabelverschraubungen sollten in Ihrer Dimensionierung so gewählt werden, daß diese eine sichere Verkabelung des Gerätes ermöglichen.
6. Um eine sichere Funktion des Gerätes zu gewährleisten, muß die Spannungsversorgung über mindestens 10 A abgesichert sein. Im Fehlerfall muß dadurch gewährleistet sein, daß die Spannungsversorgung zum Gerät bzw. zu den Geräten unterbrochen wird. Ein mechanischer Schutzschalter kann in dieses System integriert werden. Falls eine derartige Vorrichtung nicht vorhanden ist, muß eine andere Möglichkeit zur Unterbrechung der Spannungszufuhr gewährleistet werden mit Hinweisen deutlich gekennzeichnet werden. Ein solcher Mechanismus zur Spannungsunterbrechung muß mit den Normen und Richtlinien für die allgemeine Installation von Elektrogeräten, wie zum Beispiel der IEC947, übereinstimmen.
7. Mit dem Symbol sind Geräte oder Abdeckungen gekennzeichnet, die eine gefährliche (Netzspannung) Spannung führen. Die Abdeckungen dürfen nur entfernt werden, wenn die Versorgungsspannung unterbrochen wurde. Nur geschultes Personal darf an diesen Geräten Arbeiten ausführen. 
8. Mit dem Symbol sind Geräte oder Abdeckungen gekennzeichnet, in bzw. unter denen heiße Teile vorhanden sind. Die Abdeckungen dürfen nur entfernt werden, wenn die Versorgungsspannung unterbrochen wurde. Nur geschultes Personal darf an diesen Geräten Arbeiten ausführen. Bis 45 Minuten nach dem Unterbrechen der Netzzufuhr können derartig Teile noch über eine erhöhte Temperatur verfügen. 
9. Mit dem Symbol sind Geräte oder Abdeckungen gekennzeichnet, bei denen vor dem Eingriff die entsprechenden Kapitel im Handbuch sorgfältig durchgelesen werden müssen. 
10. Alle in diesem Gerät verwendeten graphischen Symbole entspringen einem oder mehreren der nachfolgend aufgeführten Standards: EN61010-1, IEC417 & ISO3864.



## **IMPORTANTE**

### **Norme di sicurezza per il cablaggio e l'installazione dello strumento.**




**Le seguenti norme di sicurezza si applicano specificatamente agli stati membri dell'Unione Europea, la cui stretta osservanza è richiesta per garantire conformità alla Direttiva del Basso Voltaggio. Esse si applicano anche agli stati non appartenenti all'Unione Europea, salvo quanto disposto dalle vigenti normative locali o nazionali.**

1. Collegamenti di terra idonei devono essere eseguiti per tutti i punti di messa a terra interni ed esterni, dove previsti.
2. Dopo l'installazione o la localizzazione dei guasti, assicurarsi che tutti i coperchi di protezione siano stati collocati e le messa a terra siano collegate. L'integrità di ciascun morsetto di terra deve essere costantemente garantita.
3. I cavi di alimentazione della rete devono essere secondo disposizioni IEC227 o IEC245.
4. L'intero impianto elettrico deve essere adatto per uso in ambiente con temperature superiore a 75°C.
5. Le dimensioni di tutti i connettori dei cavi utilizzati devono essere tali da consentire un adeguato ancoraggio al cavo.
6. Per garantire un sicuro funzionamento dello strumento il collegamento alla rete di alimentazione principale dovrà essere eseguita tramite interruttore automatico (min.10A), in grado di disattivare tutti i conduttori di circuito in caso di guasto. Tale interruttore dovrà inoltre prevedere un sezionatore manuale o altro dispositivo di interruzione dell'alimentazione, chiaramente identificabile. Gli interruttori dovranno essere conformi agli standard riconosciuti, quali IEC947.
7. Il simbolo riportato sullo strumento o sui coperchi di protezione indica probabile presenza di elevati voltaggi. Tali coperchi di protezione devono essere rimossi esclusivamente da personale qualificato, dopo aver tolto alimentazione allo strumento. 
8. Il simbolo riportato sullo strumento o sui coperchi di protezione indica rischio di contatto con superfici ad alta temperatura. Tali coperchi di protezione devono essere rimossi esclusivamente da personale qualificato, dopo aver tolto alimentazione allo strumento. Alcune superfici possono mantenere temperature elevate per oltre 45 minuti. 
9. Se lo strumento o il coperchio di protezione riportano il simbolo, fare riferimento alle istruzioni del manuale Operatore. 
10. Tutti i simboli grafici utilizzati in questo prodotto sono previsti da uno o più dei seguenti standard: EN61010-1, IEC417 e ISO3864.

## **VIKTIG**

### **Sikkerhetsinstruks for tilkobling og installasjon av dette utstyret.**




**Følgende sikkerhetsinstruksjoner gjelder spesifikt alle EU medlemsland og land med i EØS-avtalen. Instruksjonene skal følges nøye slik at installasjonen blir i henhold til lavspenningsdirektivet. Den bør også følges i andre land, med mindre annet er spesifisert av lokale- eller nasjonale standarder.**

1. Passende jordforbindelser må tilkobles alle jordingspunkter, interne og eksterne hvor disse forefinnes.
2. Etter installasjon eller feilsøking skal alle sikkerhetsdeksler og jordforbindelser reetableres. Jordingsforbindelsene må alltid holdes i god stand.
3. Kabler fra spenningsforsyning skal oppfylle kravene spesifisert i IEC227 eller IEC245.
4. Alle ledningsforbindelser skal være konstruert for en omgivelsestemperatur høyere en 750C.
5. Alle kabelforskruvninger som benyttes skal ha en indre dimensjon slik at tilstrekkelig avlastning oppnåes.
6. For å oppnå sikker drift og betjening skal forbindelsen til spenningsforsyningen bare skje gjennom en strømbryter (minimum 10A) som vil bryte spenningsforsyningen til alle elektriske kretser ved en feilsituasjon. Strømbryteren kan også inneholde en mekanisk operert bryter for å isolere instrumentet fra spenningsforsyningen. Dersom det ikke er en mekanisk operert bryter installert, må det være en annen måte å isolere utstyret fra spenningsforsyningen, og denne måten må være tydelig merket. Kretsbytere eller kontakter skal oppfylle kravene i en annerkjent standard av typen IEC947 eller tilsvarende.
7. Der hvor utstyr eller deksler er merket med symbol for farlig spenning, er det sannsynlig at disse er tilstede bak dekslet. Disse dekslene må bare fjernes når spenningsforsyning er frakoblet utstyret, og da bare av trenet servicepersonell. 
8. Der hvor utstyr eller deksler er merket med symbol for meget varm overflate, er det sannsynlig at disse er tilstede bak dekslet. Disse dekslene må bare fjernes når spenningsforsyning er frakoblet utstyret, og da bare av trenet servicepersonell. Noen overflater kan være for varme til å berøres i opp til 45 minutter etter spenningsforsyning frakoblet. 
9. Der hvor utstyret eller deksler er merket med symbol, vennligst referer til instruksjonsmanualen for instruksjer. 
10. Alle grafiske symboler brukt i dette produktet er fra en eller flere av følgende standarder: EN61010-1, IEC417 & ISO3864.

## **IMPORTANTE**

### **Instruções de segurança para ligação e instalação deste aparelho.**




**As seguintes instruções de segurança aplicam-se especificamente a todos os estados membros da UE. Devem ser observadas rigidamente por forma a garantir o cumprimento da Directiva sobre Baixa Tensão. Relativamente aos estados que não pertençam à UE, deverão cumprir igualmente a referida directiva, exceptuando os casos em que a legislação local a tiver substituído.**

1. Devem ser feitas ligações de terra apropriadas a todos os pontos de terra, internos ou externos.
2. Após a instalação ou eventual reparação, devem ser recolocadas todas as tampas de segurança e terras de protecção. Deve manter-se sempre a integridade de todos os terminais de terra.
3. Os cabos de alimentação eléctrica devem obedecer às exigências das normas IEC227 ou IEC245.
4. Os cabos e fios utilizados nas ligações eléctricas devem ser adequados para utilização a uma temperatura ambiente até 75° C.
5. As dimensões internas dos buçins dos cabos devem ser adequadas a uma boa fixação dos cabos.
6. Para assegurar um funcionamento seguro deste equipamento, a ligação ao cabo de alimentação eléctrica deve ser feita através de um disjuntor (min. 10A) que desligará todos os condutores de circuitos durante uma avaria. O disjuntor poderá também conter um interruptor de isolamento accionado manualmente. Caso contrário, deverá ser instalado qualquer outro meio para desligar o equipamento da energia eléctrica, devendo ser assinalado convenientemente. Os disjuntores ou interruptores devem obedecer a uma norma reconhecida, tipo IEC947.
7. Sempre que o equipamento ou as tampas contiverem o símbolo, é provável a existência de tensões perigosas. Estas tampas só devem ser retiradas quando a energia eléctrica tiver sido desligada e por Pessoal da Assistência devidamente treinado. 
8. Sempre que o equipamento ou as tampas contiverem o símbolo, há perigo de existência de superfícies quentes. Estas tampas só devem ser retiradas por Pessoal da Assistência devidamente treinado e depois de a energia eléctrica ter sido desligada. Algumas superfícies permanecem quentes até 45 minutos depois. 
9. Sempre que o equipamento ou as tampas contiverem o símbolo, o Manual de Funcionamento deve ser consultado para obtenção das necessárias instruções. 
10. Todos os símbolos gráficos utilizados neste produto baseiam-se em uma ou mais das seguintes normas: EN61010-1, IEC417 e ISO3864.

**IMPORTANTE**

**Instrucciones de seguridad para el montaje y cableado de este aparato.**




**Las siguientes instrucciones de seguridad , son de aplicacion especifica a todos los miembros de la UE y se adjuntaran para cumplir la normativa europea de baja tension.**

1. Se deben preveer conexiones a tierra del equipo, tanto externa como internamente, en aquellos terminales previstos al efecto.
2. Una vez finalizada las operaciones de mantenimiento del equipo, se deben volver a colocar las cubiertas de seguridad aasi como los terminales de tierra. Se debe comprobar la integridad de cada terminal.
3. Los cables de alimentacion electrica cumpliran con las normas IEC 227 o IEC 245.
4. Todo el cableado sera adecuado para una temperatura ambiental de 75°C.
5. Todos los prensaestopas seran adecuados para una fijacion adecuada de los cables.
6. Para un manejo seguro del equipo, la alimentacion electrica se realizara a traves de un interruptor magnetotermico ( min 10 A ), el cual desconectara la alimentacion electrica al equipo en todas sus fases durante un fallo. Los interruptores estaran de acuerdo a la norma IEC 947 u otra de reconocido prestigio.
7. Cuando las tapas o el equipo lleve impreso el simbolo de tension electrica peligrosa, dicho alojamiento solamente se abra una vez que se haya interrumpido la alimentacion electrica al equipo asimismo la intervencion sera llevada a cabo por personal entrenado para estas labores. 
8. Cuando las tapas o el equipo lleve impreso el simbolo, hay superficies con alta temperatura, por tanto se abra una vez que se haya interrumpido la alimentacion electrica al equipo por personal entrenado para estas labores, y al menos se esperara unos 45 minutos para enfriar las superficies calientes. 
9. Cuando el equipo o la tapa lleve impreso el simbolo, se consultara el manual de instrucciones. 
10. Todos los simbolos graficos usados en esta hoja, estan de acuerdo a las siguientes normas EN61010-1, IEC417 & ISO 3864.

### VIKTIGT

#### Säkerhetsföreskrifter för kablage och installation av denna apparat.




Följande säkerhetsföreskrifter är tillämpliga för samtliga EU-medlemsländer. De skall följas i varje avseende för att överensstämma med Lågspännings direktivet. Icke EU medlemsländer skall också följa nedanstående punkter, såvida de inte övergrips av lokala eller nationella föreskrifter.

1. Tillämplig jordkontakt skall utföras till alla jordade punkter, såväl internt som externt där så erfordras.
2. Efter installation eller felsökning skall samtliga säkerhetshöljen och säkerhetsjord återplaceras. Samtliga jordterminaler måste hållas obrutna hela tiden.
3. Matningsspänningens kabel måste överensstämma med föreskrifterna i IEC227 eller IEC245.
4. Allt kablage skall vara lämpligt för användning i en omgivningstemperatur högre än 75°C.
5. Alla kabelförskruvningar som används skall ha inre dimensioner som motsvarar adekvat kabelförankring.
6. För att säkerställa säker drift av denna utrustning skall anslutning till huvudströmmen endast göras genom en säkring (min 10A) som skall fränkoppla alla strömförande kretsar när något fel uppstår. Säkringen kan även ha en mekanisk frånskiljare. Om så inte är fallet, måste ett annat förfarande för att frånskilja utrustningen från strömförsörjning tillhandahållas och klart framgå genom markering. Säkring eller omkopplare måste överensstämma med en gällande standard såsom t ex IEC947.
7. Där utrustning eller hölje är markerad med vidstående symbol föreligger risk för livsfarlig spänning i närheten. Dessa höljen får endast avlägsnas när strömmen ej är ansluten till utrustningen - och då endast av utbildad servicepersonal.
 
8. När utrustning eller hölje är markerad med vidstående symbol föreligger risk för brännskada vid kontakt med uppvärmd yta. Dessa höljen får endast avlägsnas av utbildad servicepersonal, när strömmen kopplats från utrustningen. Vissa ytor kan vara mycket varma att vidröra även upp till 45 minuter efter avstängning av strömmen.
 
9. När utrustning eller hölje markerats med vidstående symbol bör instruktionsmanualen studeras för information.
 
10. Samtliga grafiska symboler som förekommer i denna produkt finns angivna i en eller flera av följande föreskrifter:- EN61010-1, IEC417 & ISO3864.

## ΠΡΟΣΟΧΗ

### **Οδηγίες ασφαλείας για την καλωδίωση και εγκατάσταση της συσκευής.**

**Οι ακόλουθες οδηγίες ασφαλείας εφαρμόζονται ειδικά σε όλες τις χώρες μέλη της Ευρωπαϊκής Κοινότητας. Θα πρέπει να ακολουθούνται αυστηρά ώστε να εξασφαλιστεί η συμβατότητα με τις οδηγίες για τη Χαμηλή Τάση. Χώρες που δεν είναι μέλη της Ευρωπαϊκής Κοινότητας θα πρέπει επίσης να ακολουθούν τις οδηγίες εκτός εάν αντικαθίστανται από τα Τοπικά ή Εθνικά Πρότυπα.**

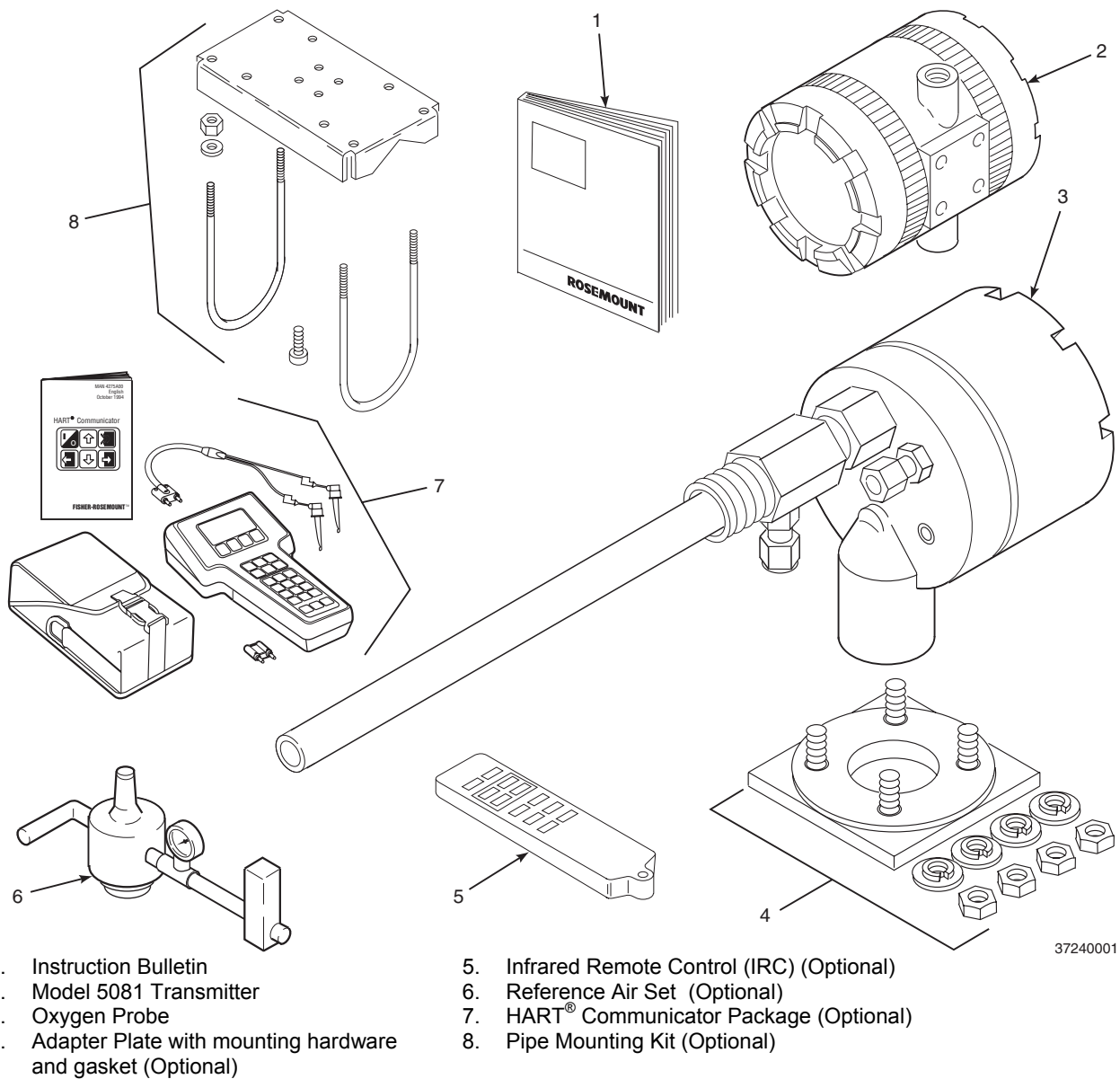
1. Επαρκείς συνδέσεις γείωσης θα πρέπει να γίνονται σε όλα τα σημεία γείωσης, εσωτερικά και εξωτερικά όπου υπάρχουν.
2. Μετά την εγκατάσταση ή την εκσφαλμάτωση όλα τα καλύματα ασφαλείας και οι γειώσεις ασφαλείας πρέπει να επανεγκαθίστανται. Η καλή κατάσταση όλων των ακροδεκτών γείωσης πρέπει να ελέγχεται και να συντηρείται διαρκώς.
3. Τα καλώδια τροφοδοσίας πρέπει να πληρούν τις απαιτήσεις των IEC227 ή IEC245.
4. Όλες οι καλωδιώσεις θα πρέπει είναι κατάλληλες για χρήση σε ατμοσφαιρική θερμοκρασία χώρου υψηλότερη από 75°C.
5. Όλοι οι στυπιοθλίπτες θα πρέπει να είναι τέτοιων εσωτερικών διαστάσεων ώστε να παρέχουν επαρκή στερέωση των καλωδίων.
6. Για τη διασφάλιση ασφαλούς λειτουργίας της σύνδεσης τροφοδοσίας αυτής της συσκευής θα πρέπει να γίνεται μόνο μέσω ασφαλειοδιακόπτη (ελάχιστο 10A) ο οποίος θα αποσυνδέει όλους του ηλεκτροφόρους αγωγούς στη διάρκεια κατάστασης σφάλματος.  
Ο ασφαλειοδιακόπτης μπορεί επίσης να περιλαμβάνει μηχανικό διακόπτη απομόνωσης. Εάν δεν περιλαμβάνει, τότε άλλα μέσα αποσύνδεσης της συσκευής από την τροφοδοσία πρέπει να παροχρηθούν και σαφώς να σημειθούν σαν τέτοια. Οι ασφαλειοδιακόπτες ή διακόπτες πρέπει να συμφωνούν με αναγνωρισμένα πρότυπα όπως το IEC947.
7. Όπου συσκευές ή καλύματα είναι σημασμένα με το σύμβολο επικίνδυνες τάσεις ενυπάρχουν κάτω από αυτά.  
Αυτά τα καλύματα θα πρέπει να αφαιρούνται μόνο όταν έχει αφαιρεθεί η τροφοδοσία από τη συσκευή και τότε μόνο από ειδικευμένο τεχνικό προσωπικό. 
8. Όπου συσκευές ή καλύματα είναι σημασμένα με το σύμβολο υπάρχει κίνδυνος από καυτές επιφάνειες κάτω από αυτά.  
Αυτά τα καλύματα θα πρέπει να αφαιρούνται μόνο από ειδικευμένο τεχνικό προσωπικό, όταν η τροφοδοσία έχει αφαιρεθεί από τη συσκευή. Τέτοιες επιφάνειες μπορούν να παραμείνουν ζεστές στην αφή έως και 45 λεπτά αργότερα. 
9. Όπου συσκευές ή καλύματα είναι σημασμένα με το σύμβολο αναφερθείται στις οδηγίες χρήσης της συσκευής. 
10. Όλα τα γραφικά σύμβολα που χρησιμοποιούνται σε αυτό το προϊόν είναι από ένα ή περισσότερα από τα έξης πρότυπα: EN61010-1, IEC417 και ISO3864.

## SECTION 1 DESCRIPTION AND SPECIFICATIONS

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

A typical Rosemount Analytical Two-Wire In Situ Oxygen Analyzer should contain the items shown in Figure 1-1. Record the part number, serial number, and order number for each component of your system in the table located on the first

page of this manual. Also, use the product matrix in Table 1-1 to compare your order number against your unit. The first part of the matrix defines the model. The last part defines the various options and features of the analyzer. Ensure the features and options specified by your order number are on or included with the unit.



- |                                                                                                                                                                                                              |                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>1. Instruction Bulletin</li> <li>2. Model 5081 Transmitter</li> <li>3. Oxygen Probe</li> <li>4. Adapter Plate with mounting hardware and gasket (Optional)</li> </ul> | <ul style="list-style-type: none"> <li>5. Infrared Remote Control (IRC) (Optional)</li> <li>6. Reference Air Set (Optional)</li> <li>7. HART® Communicator Package (Optional)</li> <li>8. Pipe Mounting Kit (Optional)</li> </ul> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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**Figure 1-1. Typical System Package**

**Table 1-1. Product Matrix**

<b>5081FG</b>	<b>High Temperature Oxygen Flue Gas Analyzer</b>										
<b>High Temperature Analyzer - Instruction Book</b>											
<b>Code</b>	<b>Sensing Probe Length</b>										
1	20 in. (508 mm) probe, 1/4 in. tube fittings										
2	26 in. (660 mm) probe, 1/4 in. tube fittings										
3	34.625 in. (880 mm) probe, 1/4 in. tube fittings										
<b>Code</b>	<b>Probe Outer Tube Material - Maximum Operating Temperature</b>										
1	Alumina - 2912°F (1600°C) maximum - 1.25 NPT mounting										
2	Inconel Alloy - 1832°F (1000°C) maximum - 1.25 NPT mounting										
<b>Code</b>	<b>Mounting Adapter - Stack Side</b>										
0	No adapter plate required uses 1.25 NPT ("0" must also be chosen under "Mounting Adapter" below)										
1	New flanged installation - Square weld plate with studs (matches "Mounting Adapter" below)										
2	Model 450 mounting ("4" must also be chosen under "Mounting Adapter" below)										
3	Competitor's Mount ("5" must also be chosen under "Mounting Adapter" below)										
<b>Code</b>	<b>Mounting Adapter - Probe Side</b>										
0	No adapter plate										
1	ANSI 2 in. 150 lb flange to 1.25 NPT adapter (6 in. dia. flange, 4.75 in. BC with 4 x 0.75 in. dia. holes)										
2	DIN to 1.25 NPT adapter (184 mm flange, 145 mm BC with 4 x 18 mm dia. holes)										
3	JIS to 1.25 NPT adapter (155 mm flange, 130 mm BC with 4 x 13 mm dia. holes)										
4	Model 450 to 1.25 NPT adapter										
5	Competitor's mounting flange										
<b>Code</b>	<b>Electronics &amp; Housing - Intrinsically Safe, NEMA 4X, IP65</b>										
1	5081 Electronics (Hart-compatible) - ATEX EEx ia IIC T5										
2	5081 Electronics (Hart-compatible) - CSA pending										
3	5081 Electronics (Hart-compatible) - FM Class I, Div. I, Groups B,C,D										
<b>Code</b>	<b>Housing Mounting</b>										
0	Surface or wall mounting										
1	1/2 to 2 in. pipe mounting										
<b>Code</b>	<b>Communications</b>										
0	No remote control										
1	Infrared Remote Control (IRC) (LCD display through cover window)										
<b>Code</b>	<b>Calibration Accessories</b>										
1	No hardware										
2	Calibration and reference air flowmeters and reference air pressure regulator										
<b>Code</b>	<b>Armored Cable Length</b>										
00	No cable										
11	20 ft (6 m)										
12	40 ft (12 m)										
13	60 ft (18 m)										
14	80 ft (24 m)										
15	100 ft (30 m)										
16	150 ft (45 m)										
17	200 ft (61 m)										
18	300 ft (91 m)										
19	400 ft (122 m)										
20	500 ft (152 m)										
<b>5081FG</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>11</b>	<b>Example</b>	



## 1-2 SYSTEM OVERVIEW

### a. Scope

This Instruction Bulletin is designed to supply details needed to install, start up, operate, and maintain the Rosemount Analytical Two-Wire In Situ Oxygen Analyzer. The analyzer consists of an oxygen probe and Model 5081 Transmitter. The signal conditioning electronics of the Model 5081 Transmitter outputs a 4-20 mA signal representing an O<sub>2</sub> value. An infrared remote control (IRC) allows access to setup, calibration, and diagnostics. This same information, plus additional details, can be accessed with the HART Model 275/375 handheld communicator or Asset Management Solutions (AMS) software.

### b. System Description

The Rosemount Analytical Two-Wire In Situ Oxygen Analyzer is designed to measure the net concentration of oxygen in an industrial process; i.e., the oxygen remaining after all fuels have been oxidized. The oxygen probe is permanently positioned within an exhaust duct or stack and performs its task without the use of a sampling system. The Model 5081 Transmitter is mounted remotely and conditions the oxygen probe outputs.

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

$$EMF = KT \log_{10}(P_1/P_2) + C$$

Where:

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

### NOTE

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

### NOTE

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

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

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

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

### c. System Configuration

The equipment discussed in this manual consists of two major components: the oxygen probe and the Model 5081 Transmitter.

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

The Model 5081 Transmitter is a two-wire transmitter providing an isolated output, 4-20 mA, that is proportional to the measured oxygen concentration. A customer-supplied 24 VDC power source is required to simultaneously provide power to the electronics and a 4-20 mA signal loop. The transmitter accepts millivolt signals generated by the probe and produces the outputs to be used by other remotely connected devices. The output is an isolated 4-20 mA linearized current.

**d. System Features**

1. The cell output voltage and sensitivity increase as the oxygen concentration decreases.
2. High process temperatures eliminate the need for external cell heating and increase cell accuracy.
3. HART communication is standard. To use the HART capability, you must have either:
  - (a) HART Model 275/375 Communicator
  - (b) Asset Management Solutions (AMS) software for the PC
4. Easy probe replacement due to the light-weight, compact probe design.
5. Remote location of the Model 5081 Transmitter removes the electronics from high temperature or corrosive environments.
6. Power is supplied to the electronics through the 4-20 mA line for intrinsic safety (IS) purposes.
7. Infrared remote control (IRC) allows interfacing without exposing the electronics.
8. An operator can operate and diagnostically troubleshoot the Two-Wire In Situ Oxygen Analyzer in one of two ways:
  - (a) Infrared Remote Control. The IRC allows access to fault indication menus on the Model 5081 Transmitter LCD display. Calibration can be performed from the IRC keypad.
  - (b) Optional HART Interface. The Two-Wire In Situ Oxygen Analyzer's 4-20 mA output line transmits an analog signal proportional to the oxygen level. The HART output is superimposed on the 4-20 mA output line. This information can be accessed through the following:
    - 1 Rosemount Analytical Model 275/375 Handheld Communicator - The handheld communicator requires Device Description (DD) software specific to the Two-Wire In Situ Oxygen Analyzer. The DD software will be supplied with many Model 275/375 units but can also be programmed into existing units at most Fisher-Rosemount Analytical service offices. See Section 4, HART/AMS, for additional HART information.
    - 2 Personal Computer (PC) - The use of a personal computer requires AMS software available from Fisher-Rosemount.
9. Selected Distributed Control Systems - The use of distributed control systems requires input/output (I/O) hardware and AMS Security codes are provided to (by infrared remote control) prevent unintended changes to analyzers adjacent to the one being accessed.
10. A calibration check procedure is provided to determine if the Rosemount Analytical Two-Wire In Situ Oxygen Analyzer is correctly measuring the net oxygen concentration in the industrial process.

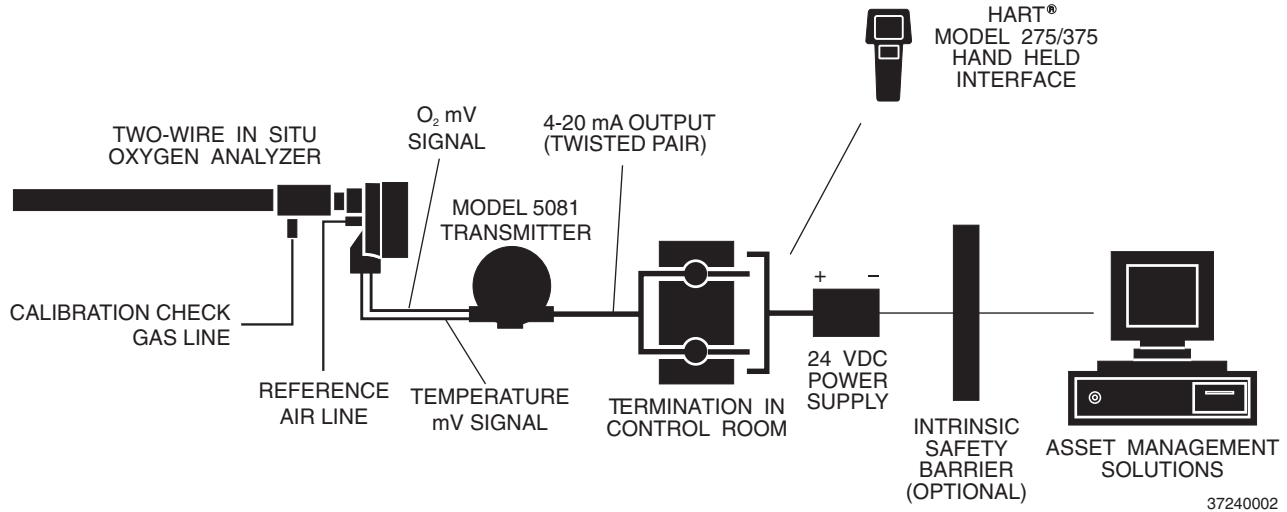


Figure 1-2. Two-Wire In Situ Oxygen Analyzer HART Connections and AMS Application

e. Handling the Analyzer

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

**CAUTION**

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

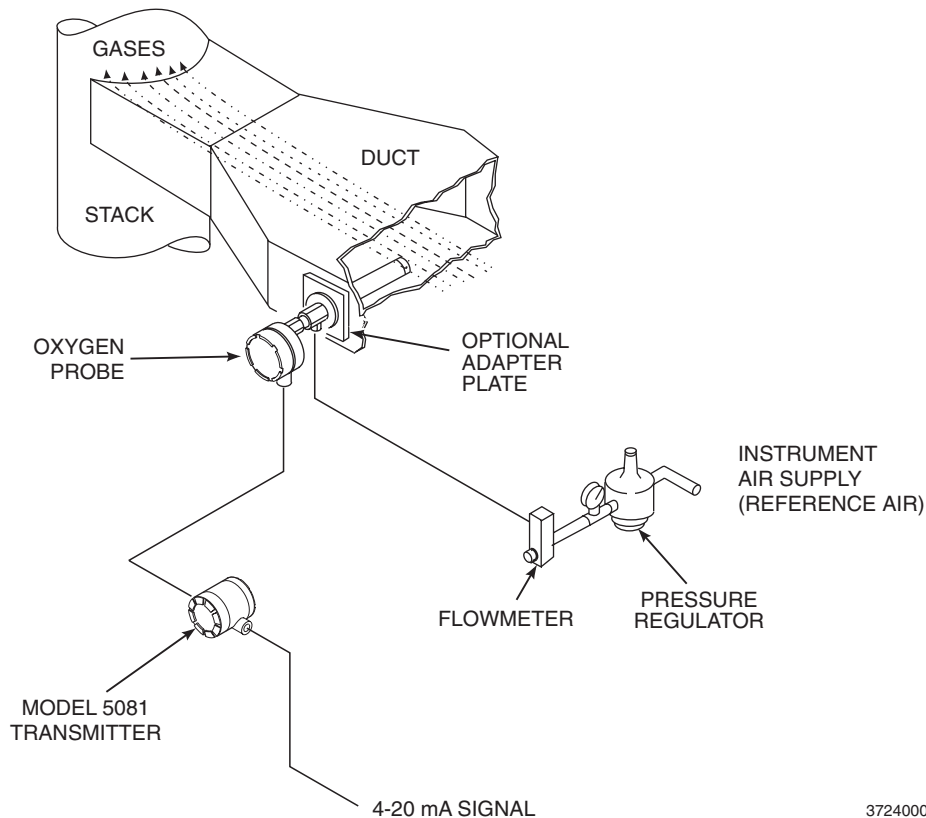
**CAUTION**

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

f. System Considerations

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

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



**Figure 1-3. Typical System Installation**

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

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

This check valve is to prevent breathing of calibration check gas line and subsequent flue gas condensation and corrosion. The

check valve is in addition to the stop valve in the calibration check gas kit.

**NOTE**

**The electronics of the Model 5081 Transmitter is rated NEMA 4X (IP65) and is capable of operating at temperatures up to 65°C (149°F).**

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

# Model 5081FG

## 1-3 SPECIFICATIONS

Net O <sub>2</sub> Range.....	0 to 25% O <sub>2</sub>
Fully Field Selectable via the HART Interface	
Lowest Limit.....	0.05% O <sub>2</sub>
Highest Limit.....	25.00% O <sub>2</sub>
Accuracy .....	±1.5% of reading or 0.05% O <sub>2</sub> , whichever is greater
System Response to Calibration Check Gas .....	Initial response in less than 3 seconds T90 in less than 10 seconds
<b>PROBE</b>	
Lengths .....	20 in. (508 mm) 26 in. (660 mm) 34.625 in. (880 mm)
<b>Temperature Limits</b>	
Process Temperature Limits.....	550° to 1400°C (1022° to 2552°F) Operation to 1600°C (2912°F) with reduced cell life.
Ambient.....	-40° to 149°C (-40° to 300°F) Ambient
Mounting and Mounting Position .....	Vertical or Horizontal
<b>Materials of Construction</b>	
Process Wetted Parts	
Inner Probe .....	Zirconia
Outer Protection Tube .....	Alumina [1600°C (2912°F) limit] Inconel 600 [1000°C (1832°F) limit]
Probe Junction Box .....	Cast aluminum
Speed of Installation/Withdrawal .....	1 in. (25.4 mm) per minute
Hazardous Area Certification.....	Intrinsically safe per EN50 014 (1977), clause 1.3(1)
Reference Air Requirement .....	100 ml per minute (0.2 scfh) of clean, dry instrument air; 1/4 in. tube fittings
Calibration Check Gas Fittings .....	1/4 in. tube fittings
Cabling.....	Two twisted pairs, shielded

<sup>(1)</sup>Thermocouple and O<sub>2</sub> probe cell are both unpowered, developing a millivolt emf, and are considered a “simple apparatus” by certifying agencies.

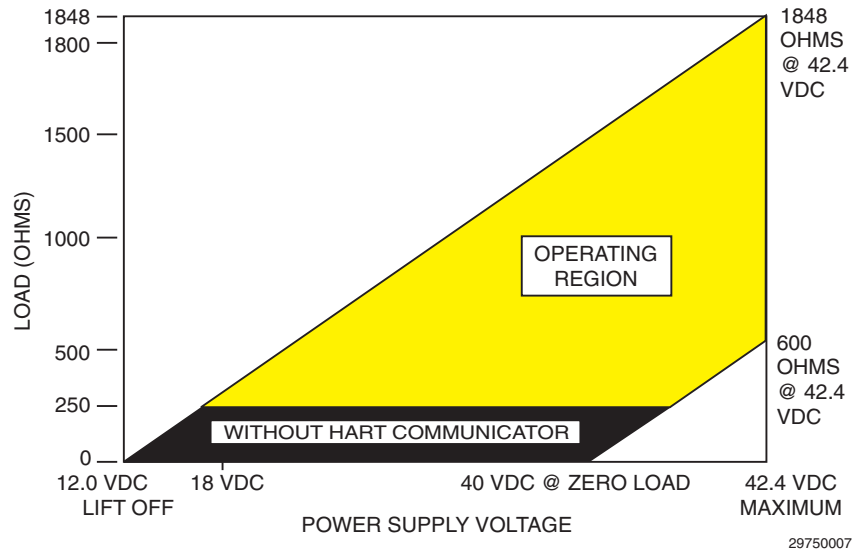
**ELECTRONICS**

Enclosure .....	IP65 (NEMA 4X), weatherproof, and corrosion-resistant
Materials of Construction .....	Low copper aluminum
Ambient Temperature Limits .....	-20° to 65°C (-4° to 149°F)
Relative Humidity .....	95% with covers sealed
Power Supply and Load Requirements .....	See Figure 1-4
Inputs (from O <sub>2</sub> Probe).....	Two wires - O <sub>2</sub> signal
	Two wires - type B thermocouple
Output .....	One 4-20 mA signal with superimposed digital HART signal
Hazardous Area Certification.....	ATEX EEx ia IIC T4 or T5(2) NEC Class I Zone I Group B,C,D

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

Power Transient Protection .....	IEC 801-4
Shipping Weight.....	10 lbs (4.5 kg)
<b>INFRARED REMOTE CONTROL</b>	
Power Requirements .....	Three AAA batteries
Hazardous Area Certification.....	ATEX EEx ia IIC Class I, Zone I, Group A, B, C, D

<sup>(2)</sup>Dependent on ambient temperature limits.



**Figure 1-4. Power Supply and Load Requirements**

## SECTION 2 INSTALLATION

### 2-1 PRE-INSTALLATION

#### a. Inspect

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

#### b. Packing List

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

#### **WARNING**

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

### 2-2 MECHANICAL INSTALLATION

#### **CAUTION**

**Avoid installation locations near steam soot blowers.**

#### a. Locating Oxygen Probe

1. The location of the oxygen probe in the stack or flue is important for maximum accuracy in the oxygen analyzing process. The probe must be positioned so the gas it measures is representative of the process. Best results are normally obtained if the probe is positioned near the center of the duct (40-60% insertion). Longer ducts may require several analyzers since the O<sub>2</sub> can vary due to stratification. A point too near the wall of the duct, or the inside radius of a bend, may not provide a representative sample because of the very low flow conditions. The

sensing point should be selected so the process gas temperature falls within a range of 550° to 1600°C (1022° to 2912°F). Figure 2-1 provides mechanical installation references.

2. Check the flue or stack for holes and air leakage. The presence of this condition will substantially affect the accuracy of the oxygen reading. Therefore, either make the necessary repairs or install the probe upstream of any leakage.
3. Ensure the area is clear of internal and external obstructions that will interfere with installation and maintenance access to the probe. Allow adequate clearance for probe removal (Figure 2-1).

#### b. Installing Oxygen Probe

#### **CAUTION**

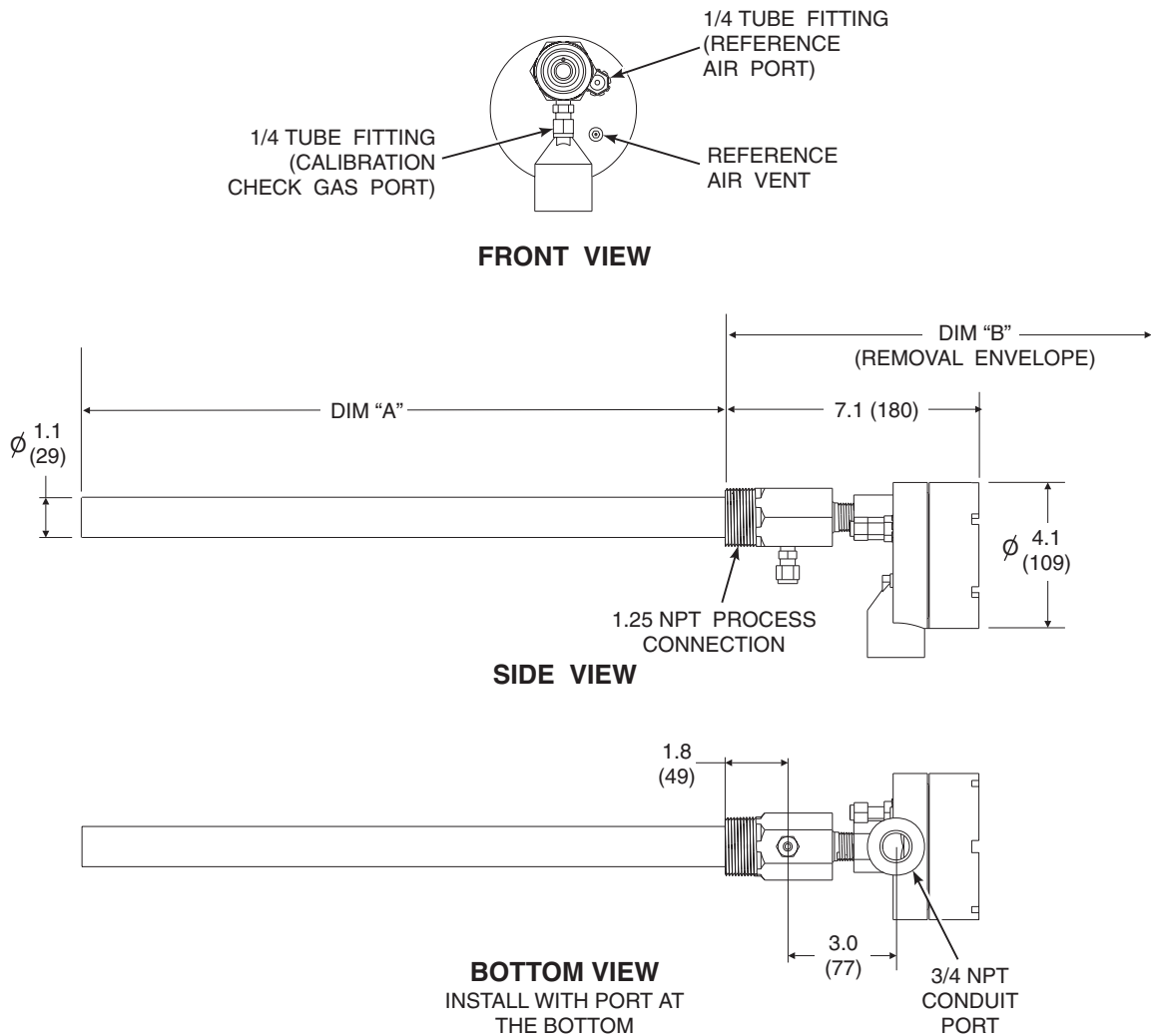
**The probe was specially packaged to prevent breakage due to handling. Do not remove the padding material from the probe until immediately before installation.**

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

#### **NOTE**

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

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



**TABLE 1. INSTALLATION (REMOVAL)**

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

NOTE: DIMENSIONS ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.

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**Figure 2-1. Probe Installation Details**



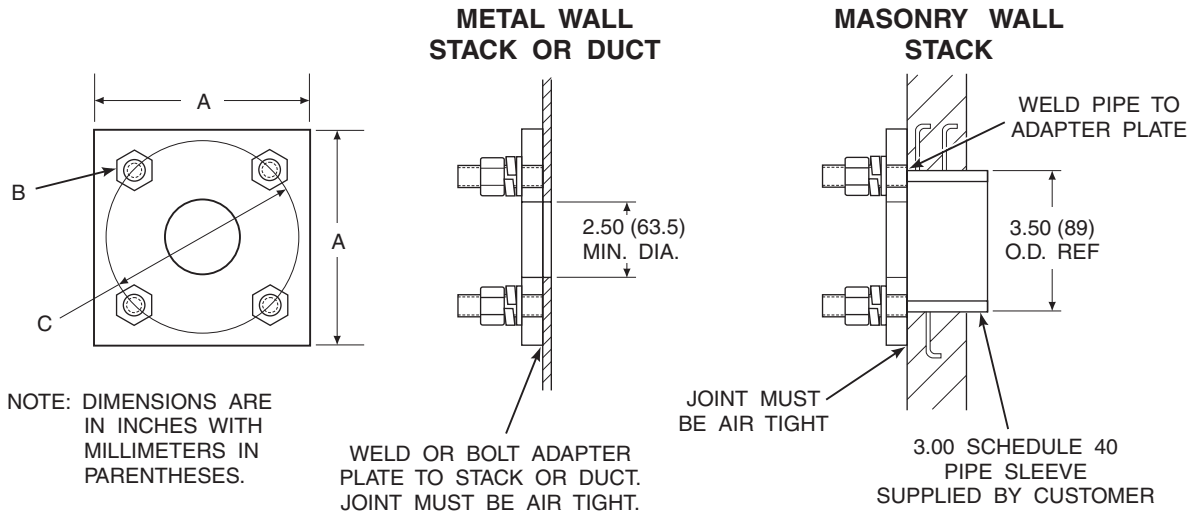
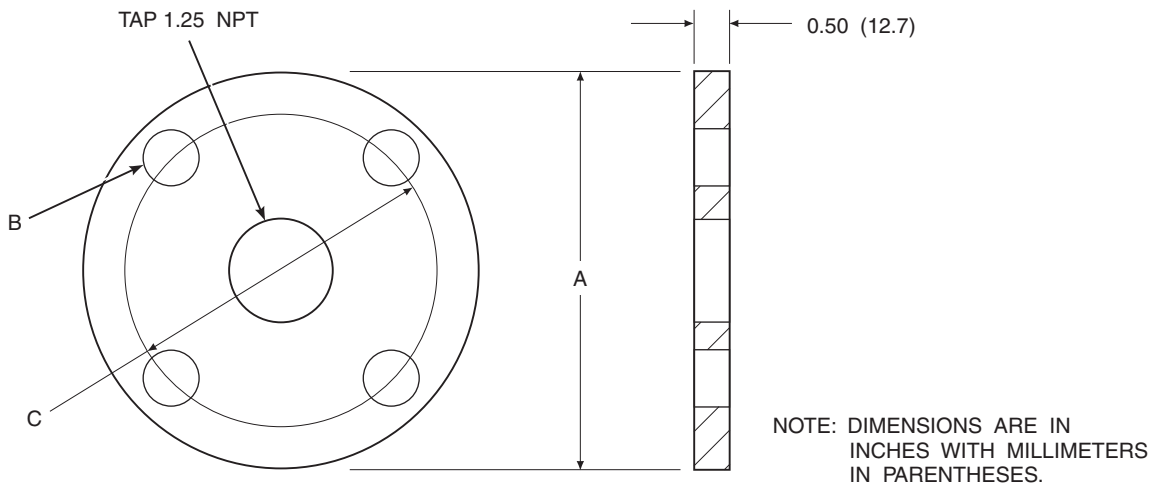


PLATE DIMENSIONS			
DIMENSION	ANSI 4512C34G01	DIN 4512C36G01	JIS 4512C35G01
"A"	6.00 (153)	7.5 (191)	6.50 (165)
"B" THREAD	0.625-11	M-16x2	M-12x1.75
"C" DIA.	4.75 (121)	5.71 (145)	5.12 (130)

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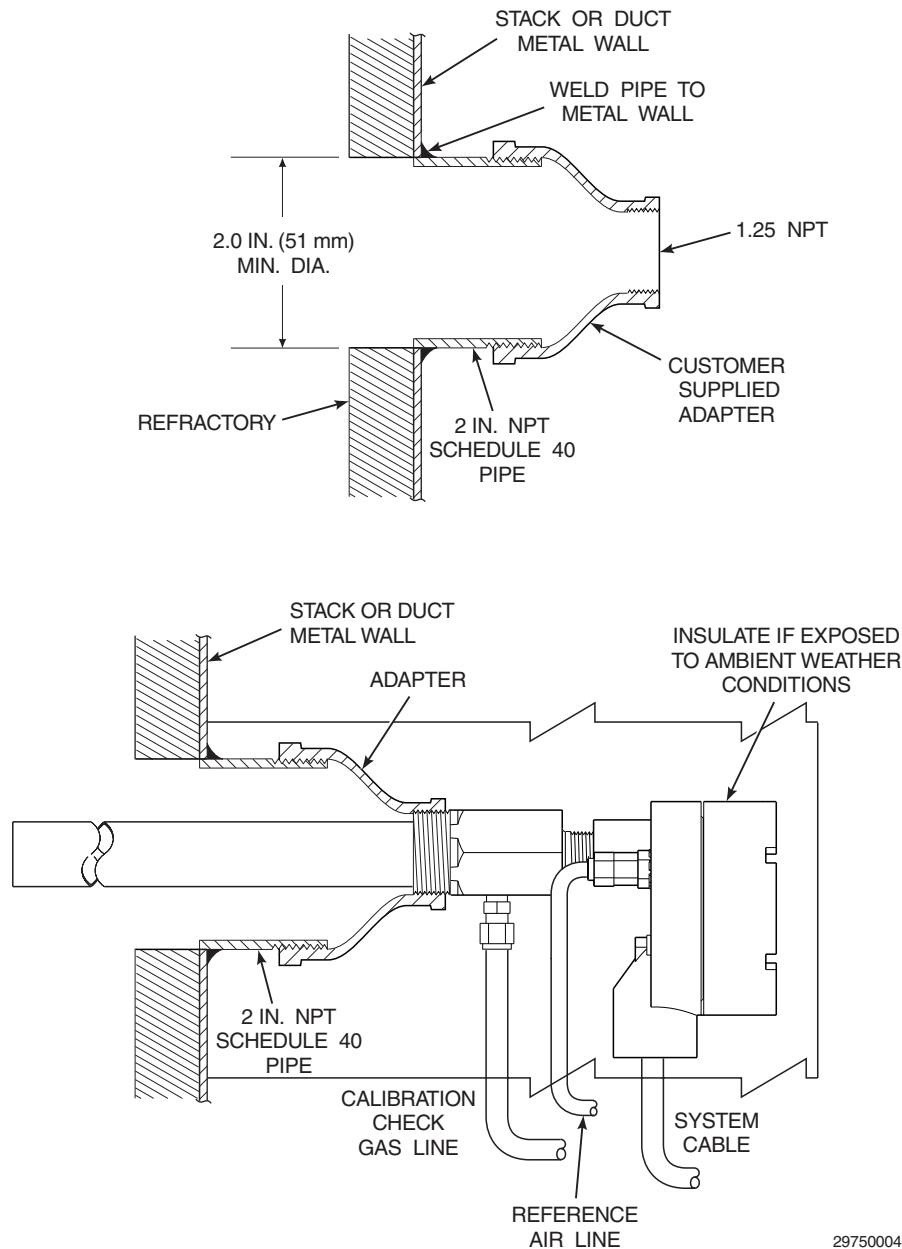
Figure 2-2. Optional Adapter Plate



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

29750003

Figure 2-3. Optional Probe Mounting Flange



**Figure 2-4. Horizontal Probe Installation**

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

When a 2 in. NPT to 1.25 NPT adapter is threaded to the welded pipe nipple,

the adapter provides the pipe threads needed for the probe's process fitting.

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

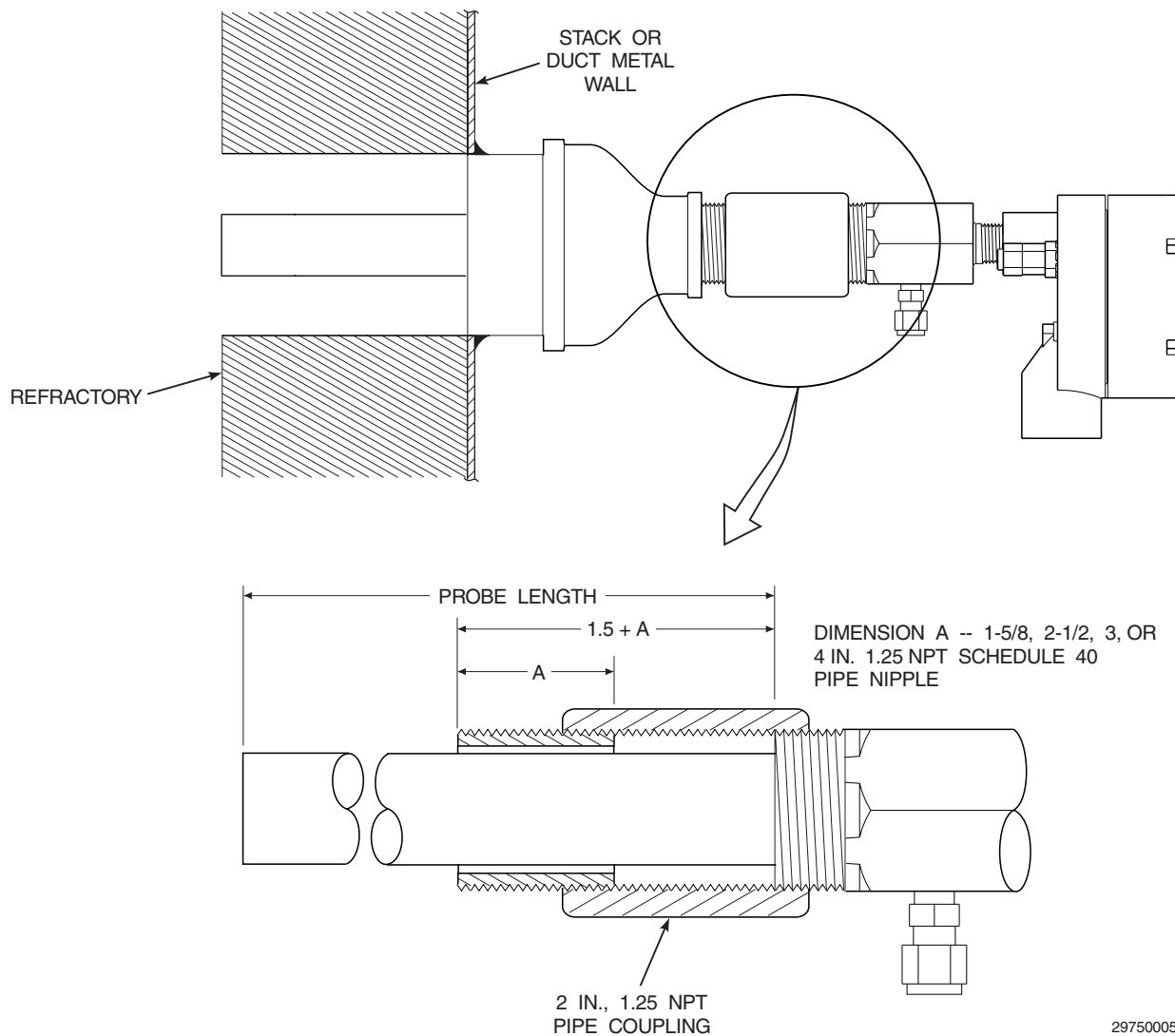


Figure 2-5. Adjusting Probe Insertion Depth

5. Use high temperature material (alumina wool) to seal around the probe during insertion. This prevents hot gases from escaping or cold air from entering the stack or duct.
6. Initially insert the probe to a depth of 3 in. (76.2 mm) or 1/2 the depth of the stack or duct refractory, whichever is greater.

**CAUTION**

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

7. After initial insertion, insert the probe at a rate of 1 in. (25.4 mm) per minute until the probe is fully inserted.
8. Install anti-seize compound on the pipe threads and screw the probe into the process flange or adapter.

**NOTE**

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

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

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

**CAUTION**

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

**c. Locating Model 5081 Transmitter**

1. Ensure the Model 5081 Transmitter is easily accessible for maintenance and service and for using the infrared remote control (if applicable).

**CAUTION**

**Do not allow the temperature of the Model 5081 Transmitter exceed 65°C (149°F) or damage to the unit may result.**

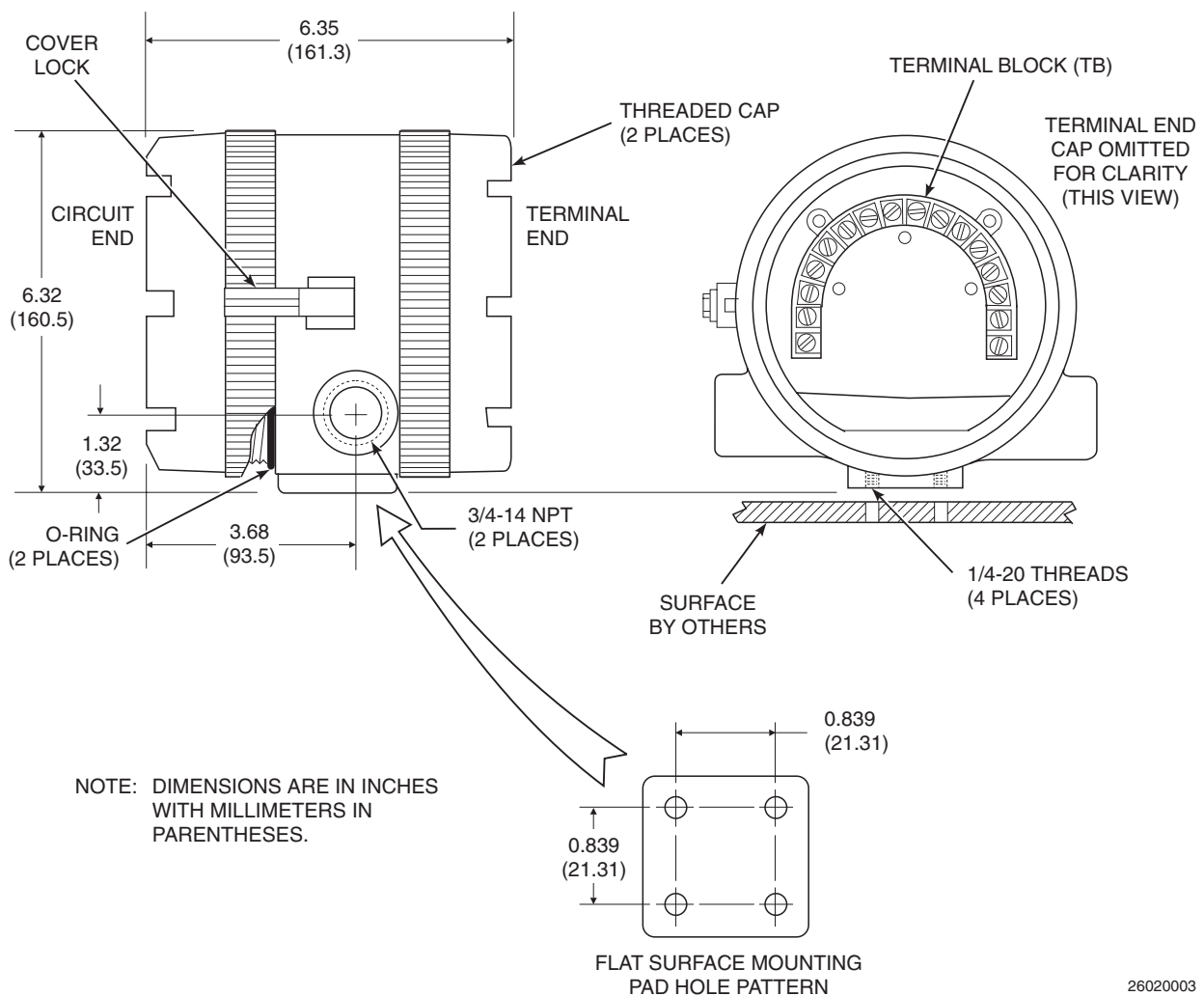
2. The ambient temperature of the transmitter housing must not exceed 65°C (149°F). Locate the electronics in an area where temperature extremes, vibration, and electromagnetic and radio frequency interference are minimal.
3. Locate the Model 5081 Transmitter within 150 ft (45.7 m) of the oxygen probe due to wiring and signal considerations.

### d. Installing Model 5081 Transmitter

1. Ensure all components are available to install the Model 5081 Transmitter.
2. Choose a method or location to mount the transmitter.
  - (a) Flat Surface Mounting. The transmitter may be mounted on a flat

surface using the threaded mounting holes located on the bottom of the transmitter housing. Refer to Figure 2-6 for installation references.

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



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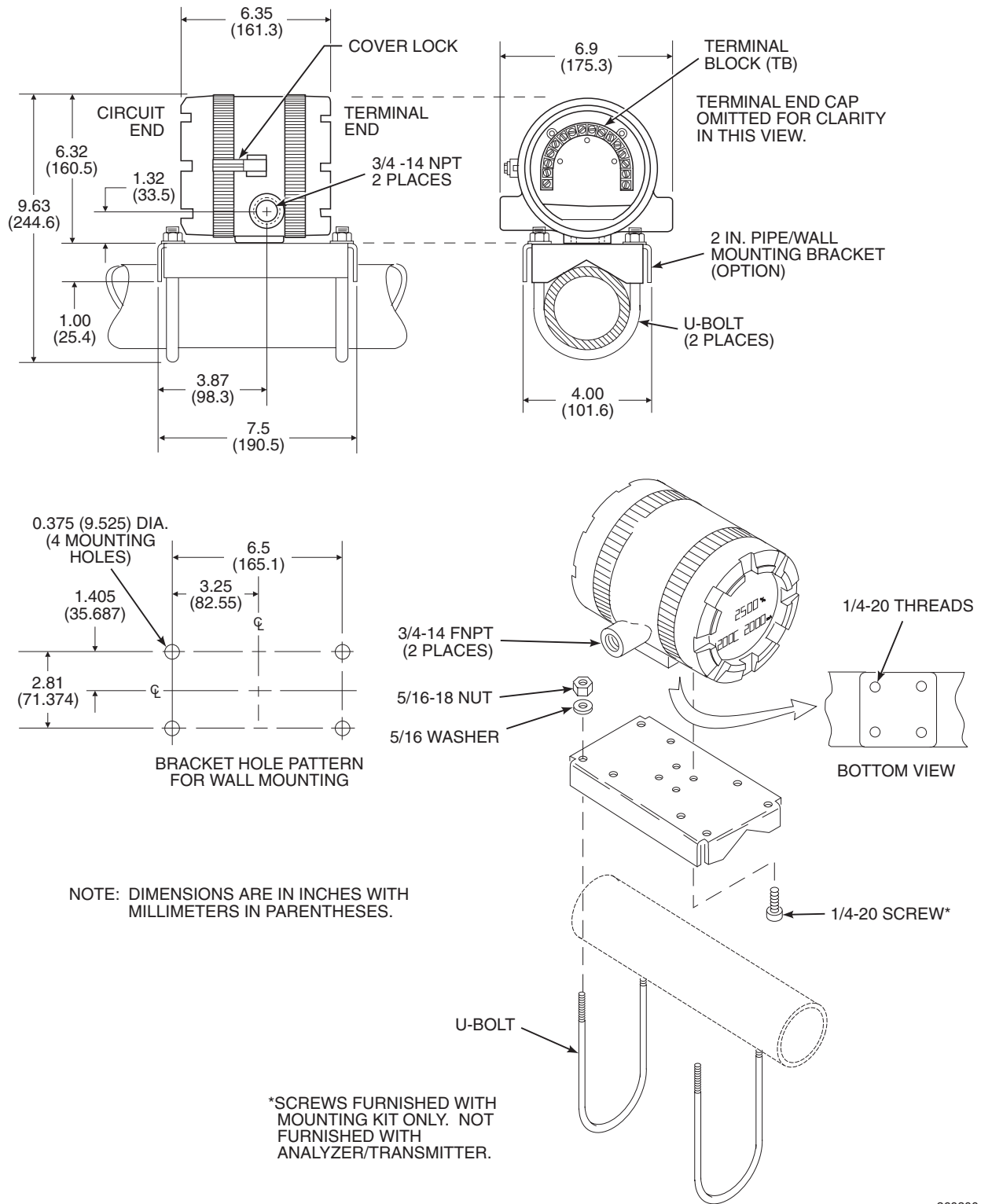
**Figure 2-6. Flat Surface Mounting Dimensional Information**

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**Figure 2-7. Pipe Mounting Dimensional Information**

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3. For correct viewing orientation, the display may be changed 90 degrees, using the following procedure:
  - (a) Refer to Figure 2-8. Loosen the cover lock screw until the cover lock is disengaged from the knurled surface on the threaded circuit end cap.
  - (b) Remove the circuit end cap.
  - (c) Remove the three screws retaining the display board in place.
  - (d) Lift and rotate the display board 90 degrees either way.
  - (e) Reposition the display board on the standoffs. Install and tighten all three screws.

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

### 2-3 ELECTRICAL INSTALLATION

All wiring must conform to local and national codes.

#### **WARNING**

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

#### **WARNING**

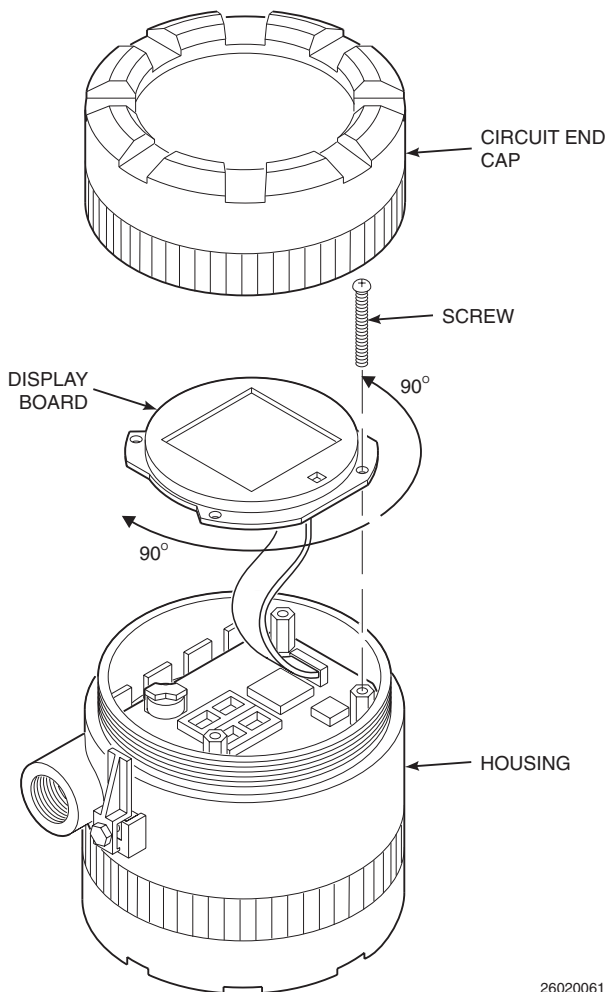
Disconnect and lock out power before connecting the unit to the power supply.

#### **WARNING**

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

#### **WARNING**

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



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**Figure 2-8. Display Positioning Assembly**

#### a. General

The power supply and signal wiring should be shielded. Also, make sure the signal wiring is grounded at the Model 5081 Transmitter end only. Do not ground the signal loop at more than one point. Twisted

pairs are recommended. Ground the transmitter housing to an earth ground to prevent unwanted electromagnetic interference (EMI) or radio frequency interference (RFI).

**NOTE**

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

**NOTE**

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

It is necessary to prevent moisture from entering the Model 5081 Transmitter housing. The use of weather-tight cable glands is required. If conduit is used, plug and seal connections on the transmitter housing to prevent moisture accumulation in the terminal side of the housing.

**CAUTION**

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

**b. Oxygen Probe Signal Connections**

1. Two signals represent the O<sub>2</sub> value and the cell temperature. The probe provides these values to the Model 5081 Transmitter for processing and signal conditioning.
2. Wiring connections for the probe are shown in Figure 2-9.

**c. Model 5081 Transmitter 4-20 mA and Signal Connections**

1. A 4-20 mA signal represents the O<sub>2</sub> value. Superimposed on the 4-20 mA

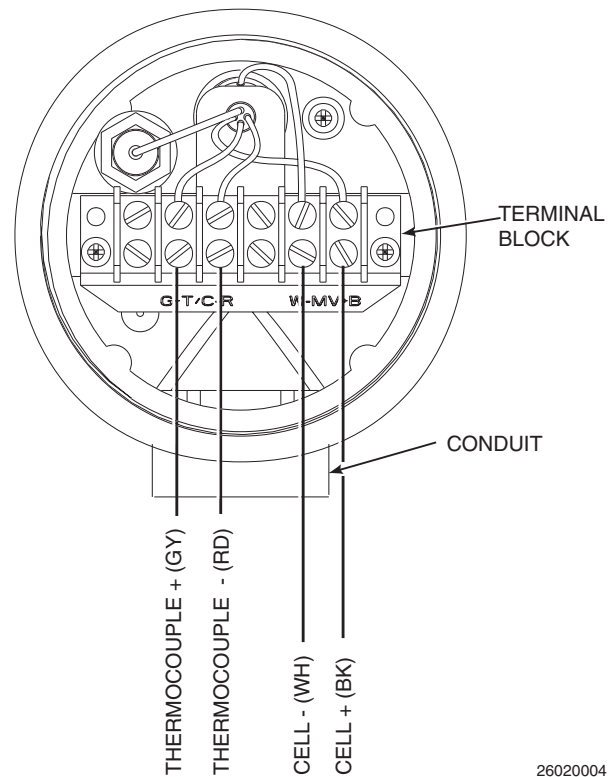
signal is HART information that is accessible through a Model 275/375 Handheld Communicator or AMS software.

2. Two signals representing the O<sub>2</sub> value and the cell temperature are supplied to the Model 5081 Transmitter from the oxygen probe.
3. Wiring connections for the Model 5081 Transmitter are shown in Figure 2-10.

**NOTE**

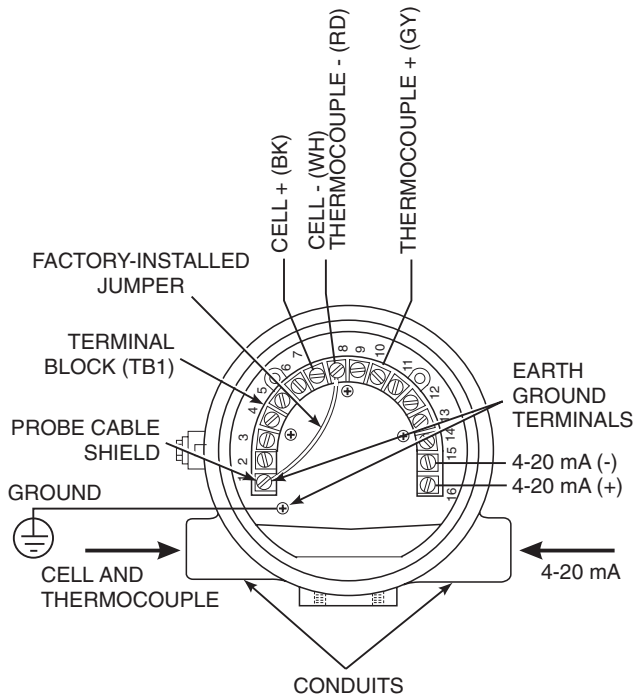
**The ground arrangement shown in Figure 2-10 limits the amount of noise introduced into the electronics.**

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



**Figure 2-9. Oxygen Probe Terminal Block**





NOTE: RUN CELL AND THERMOCOUPLE SIGNALS IN SEPARATE CONDUIT FROM 4-20 mA LINE.

26020005

**Figure 2-10. Model 5081 Transmitter Terminal Block**

## 2-4 PNEUMATIC INSTALLATION

### a. General

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

### b. Reference Air Package

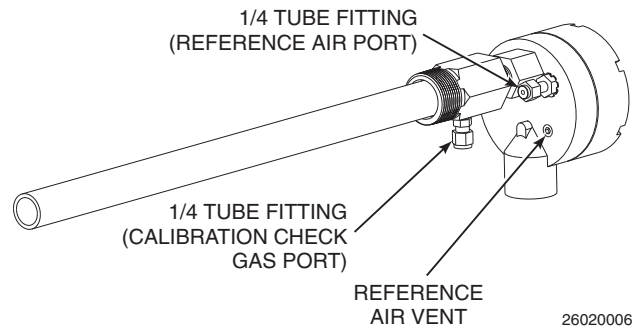
After the oxygen probe is installed, connect the reference air set. Install the reference air set according to Figure 2-12.

### c. Instrument Air (Reference Air)

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

### d. Calibration Check Gas

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



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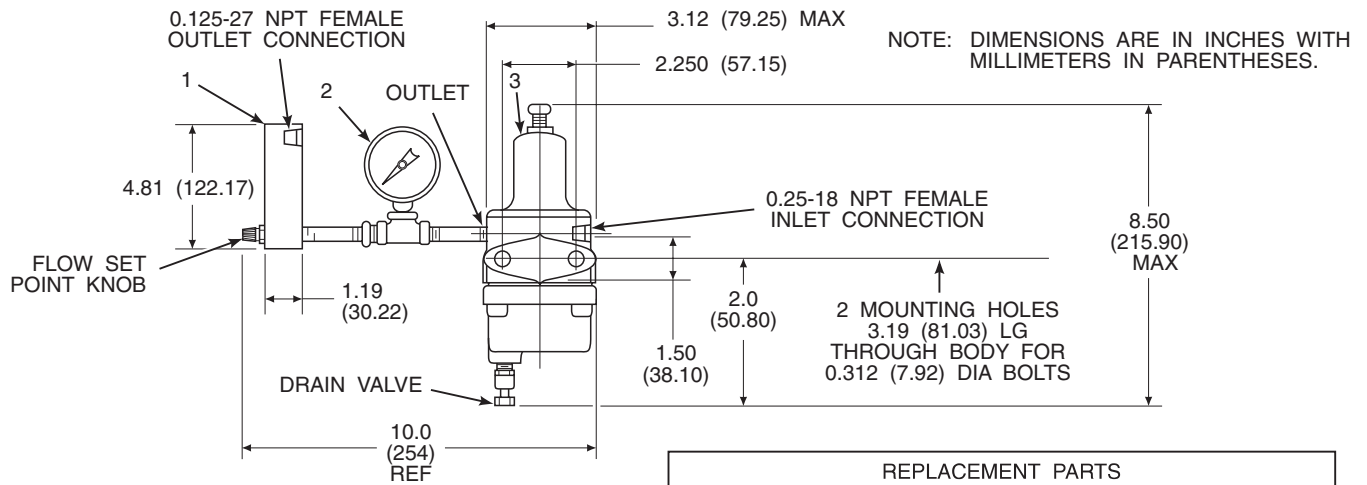
**Figure 2-11. Oxygen Probe Gas Connections**

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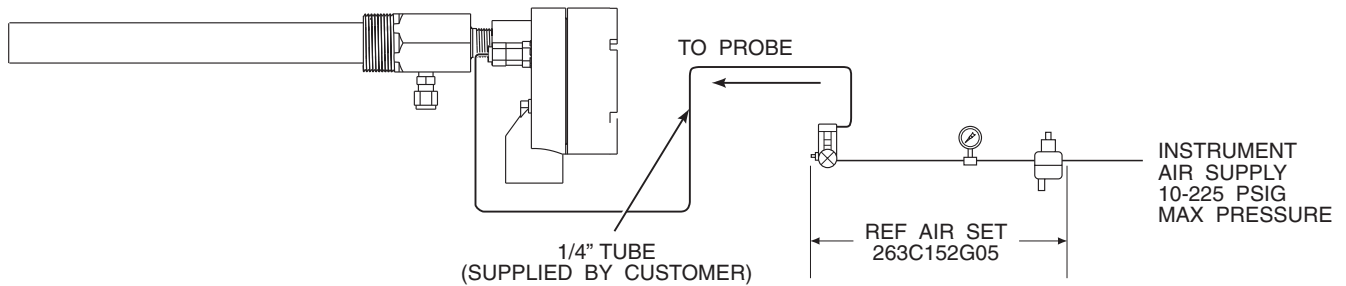
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REPLACEMENT PARTS			
1	FLOWMETER	0.2-2.0 SCFH	771B635H08
2	2" PRESSURE GAGE	0-15 PSIG	275431-006
3	COMBINATION FILTER-REG.	0-30 PSIG	4505C21G01



SCHEMATIC HOOKUP FOR REFERENCE AIR SUPPLY ON OXYGEN PROBE.

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**Figure 2-12. Air Set, Plant Air Connection**

## SECTION 3 STARTUP AND OPERATION

**WARNING**

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

### 3-1 GENERAL

#### a. Verify Mechanical Installation

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

#### b. Verify Terminal Block Wiring

Ensure the wiring of both the oxygen probe terminal block and Model 5081 Transmitter terminal block is correct. Refer to paragraph 2-3 for electrical installation and wiring information.

### 3-2 POWER UP

#### a. General

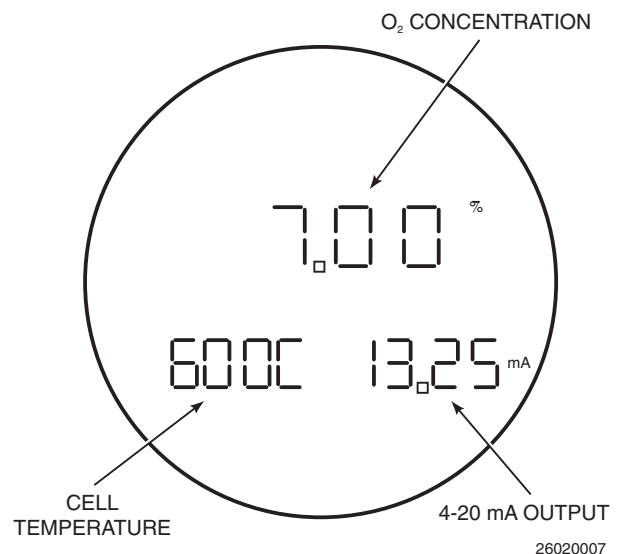
The Two-Wire In Situ Oxygen Analyzer displays the current oxygen reading on the LCD face of the Model 5081 Transmitter. The O<sub>2</sub> concentration, cell temperature, and 4-20 mA output current are displayed as shown in Figure 3-1. This and other information may also be accessed using HART/AMS.

#### b. Startup Display

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

#### c. Operating Display

After the probe has reached operating temperatures, the Model 5081 Transmitter display should look similar to Figure 3-1. The display will now track the O<sub>2</sub> concentration, cell temperature, and 4-20 mA output current.



**Figure 3-1. Normal Operation Display**



**Figure 3-2. Faulted Operation Display**

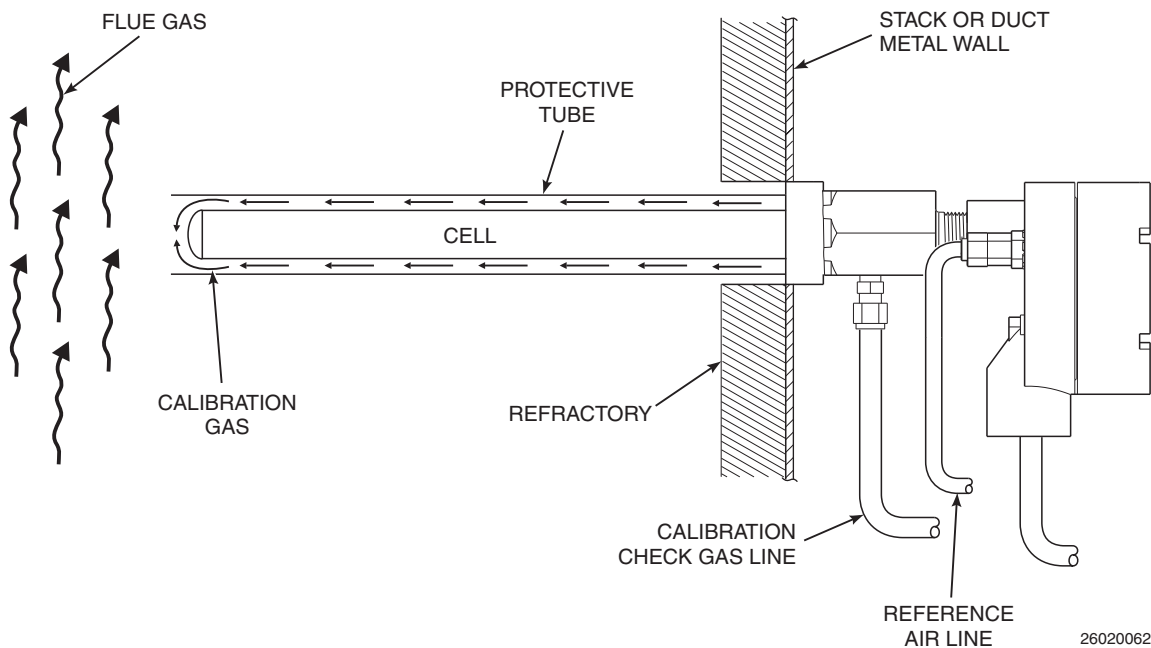
**3-3 REESTABLISHING PROPER CALIBRATION CHECK GAS FLOW RATE**

The calibration check gas flow must be enough to ensure no combustion flue gases mix with the calibration check gases and only clean, good calibration check gas surrounds the cell without expending excess gas (Figure 3-3). Monitor the O<sub>2</sub> concentration using an IRC or HART Communicator. Set the calibration check gas flow rate as follows:

**NOTE**

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

- a. Adjust the calibration check gas flow to 5 scfh (2.5 L/min.) to ensure the cell is surrounded by calibration check gas. Due to the cooling effect of the gas, the cell temperature will decrease slightly, causing the O<sub>2</sub> concentration to drop. Once the electronics compensates for this effect, the O<sub>2</sub> concentration will stabilize.
- b. Next, slowly reduce the calibration check gas flow until the O<sub>2</sub> concentration changes, which indicates that the calibration check and flue gases are mixing. Increase the flow rate until this effect is eliminated.



**Figure 3-3. Proper Calibration Check Gas Flow Rate**

# Model 5081FG

## 3-4 OPERATION

### a. Overview

This section explains the operator controls and displays of the Two-Wire In Situ Oxygen Analyzer. The use of the Infrared Remote Control (IRC) and the Model 5081 Transmitter Liquid Crystal Display (LCD) are described in detail. HART/AMS operation is not covered here but is discussed in Section 4, HART/AMS.

### b. Display

The Model 5081 Transmitter LCD displays the O<sub>2</sub> concentration, cell temperature, and

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

### c. Menu Tree

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

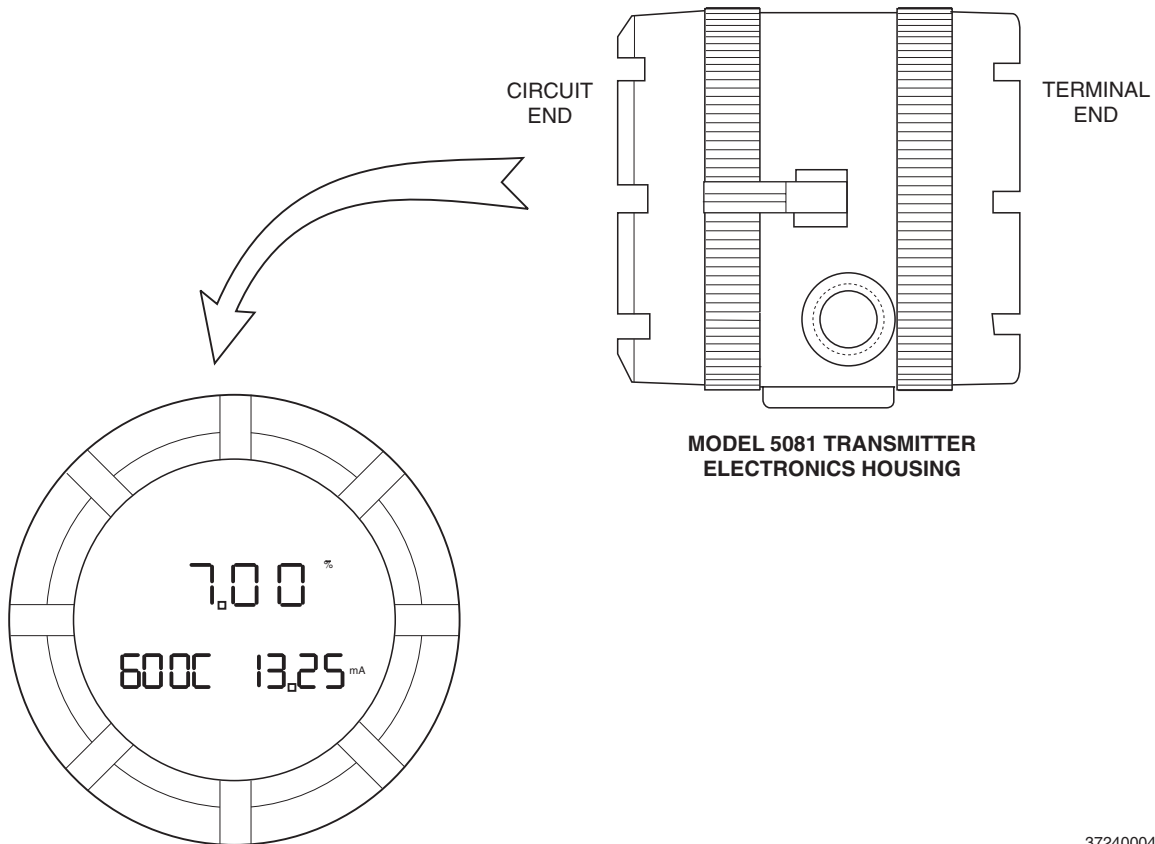
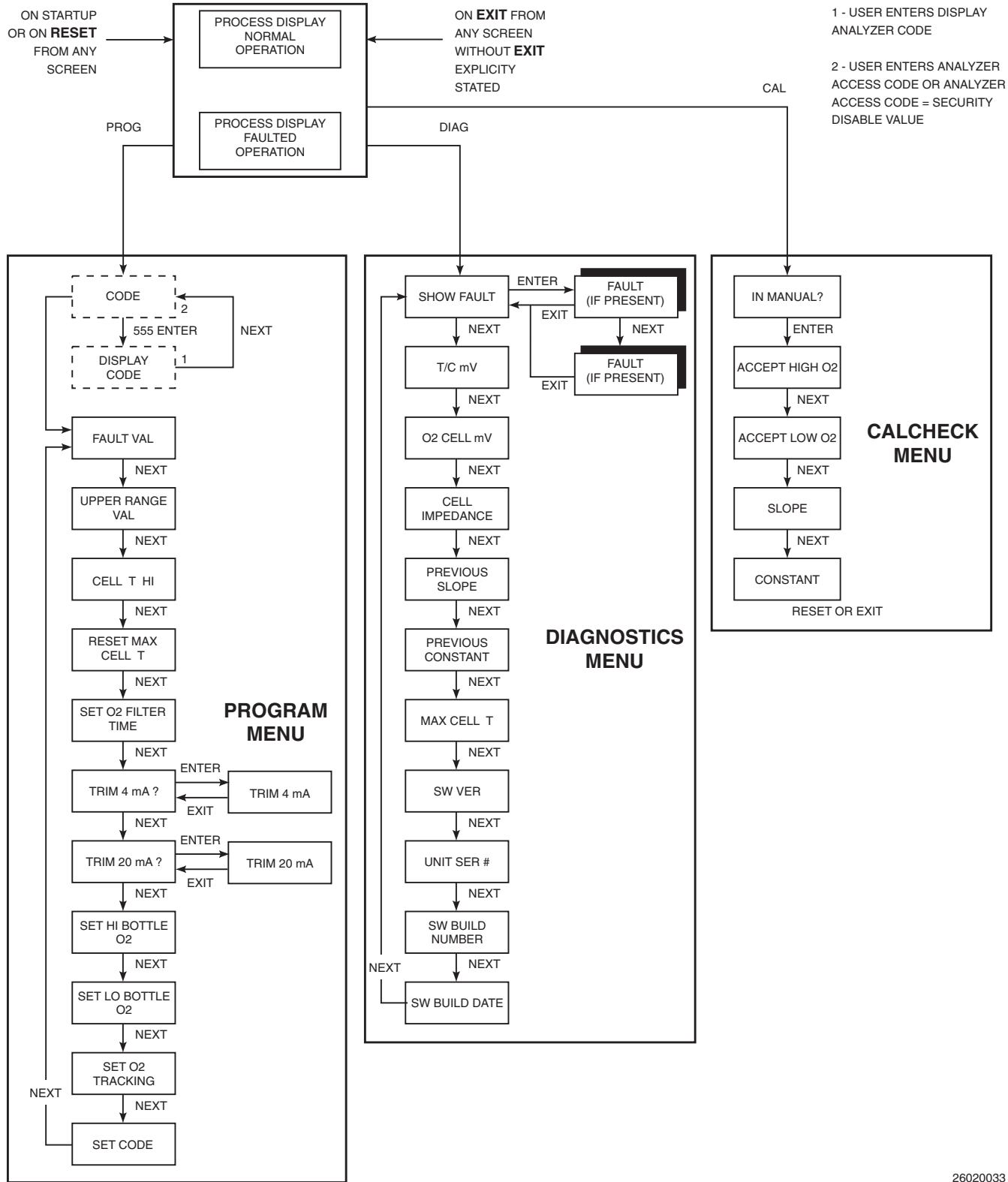


Figure 3-4. Normal Operation Display

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**Figure 3-5. Model 5081 Transmitter Menu Tree**

### d. Navigation

The IRC in Figure 3-6 is used to interact with the Model 5081 Transmitter and navigate through the screens on the LCD.

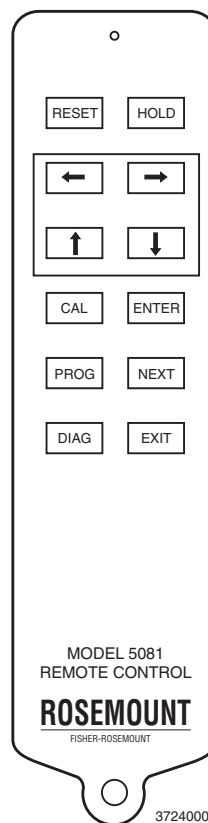
1. Hold the IRC within 6 ft (1.8 m) of the Model 5081 Transmitter and within 15 degrees from the centerline of the transmitter LCD. The amount of ambient light may also affect IRC performance.

#### NOTE

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

2. Use the keys on the IRC to navigate through the menu screens. Refer to Figure 3-6. General usage is as follows:
  - (a) RESET. Returns to the PROCESS DISPLAY screen at the top of the menu tree. Any non-entered number in the exited state will be ignored, and the previous data will be used.
  - (b) HOLD. Not used.
  - (c) Left/Right Arrow. Moves left and right among editable digits on the display.
  - (d) Up/Down Arrow. Increases or decreases the value of the currently selected digit on the display.
  - (e) CAL. Accesses the CALCHECK MENU branch of the menu tree. Only works from the PROCESS DISPLAY screen.
  - (f) PROG. Accesses the PROGRAM MENU branch of the menu tree. Only works from the PROCESS DISPLAY screen.
  - (g) DIAG. Accesses the DIAGNOSTICS MENU branch of the menu tree. Only works from the PROCESS DISPLAY screen.

- (h) ENTER. Initiates the editing process and causes the most significant digit of the edited item to start flashing. Also processes the entry so the previous value updates to the new value entered using the arrow keys. Failure to press ENTER before exiting a screen will cancel the input value and revert to the previous value.
- (i) NEXT. Accesses the next user screen as shown in the menu tree. Any non-entered number in the exited state will be ignored, and the previous data will be used.
- (j) EXIT. Exits from sub-branches of the menu tree where an exit option is explicitly shown. Otherwise, returns to the PROCESS DISPLAY screen at the top of the menu tree. Any non-entered number in the exited state will be ignored, and the previous data will be used.



**Figure 3-6. Infrared Remote Control (IRC)**

**3-5 PROGRAM MENU**

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

**NOTE**

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

**a. CODE**

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

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

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

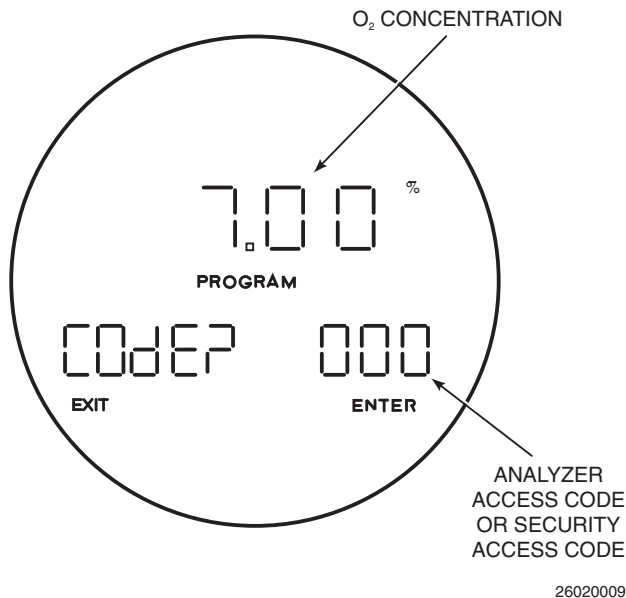


Figure 3-7. CODE

**b. DISPLAY CODE**

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

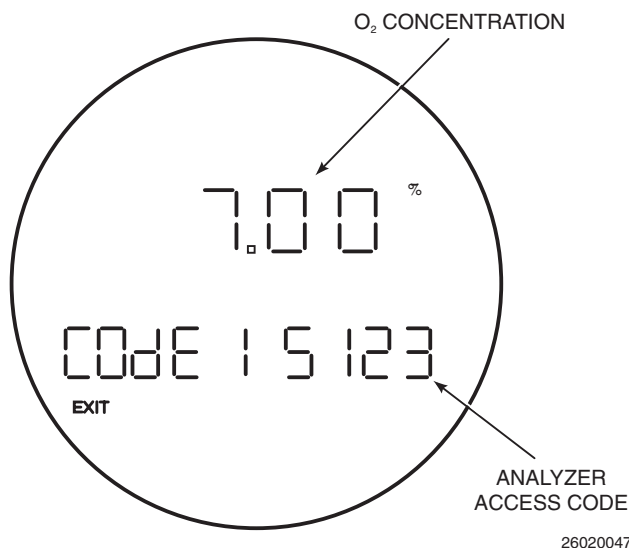


Figure 3-8. DISPLAY CODE



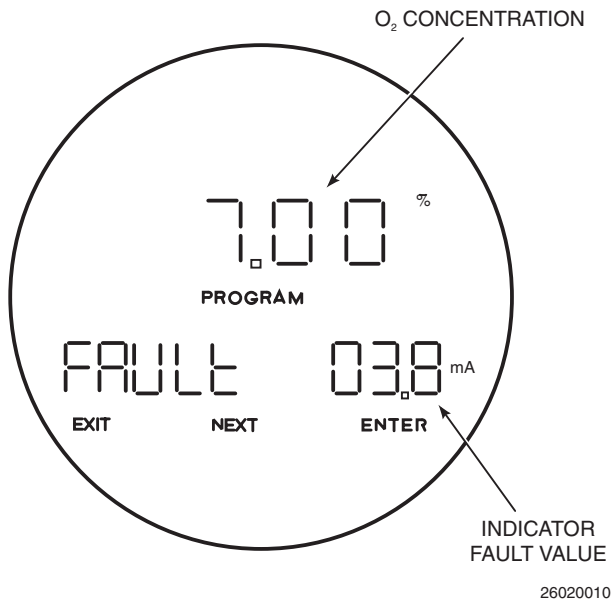


Figure 3-9. FAULT VAL

c. FAULT VAL

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

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

d. UPPER RANGE VAL

Refer to Figure 3-10. Use this screen to set the value of the upper range limit. This value is the maximum limit of the O<sub>2</sub> concentration measurement and is used to scale the 4-20 mA output. Press ENTER to begin editing. Use the arrow keys to select and change the value. The upper range value can be between 0 and 25%. Then, press ENTER to accept the value. Pressing NEXT displays the CELL T HI screen.

e. CELL T HI

Refer to Figure 3-11. Use this screen to set the value of the upper cell temperature fault condition. This value is the maximum al-

lowed cell temperature before a fault condition is indicated. Press ENTER to begin editing. Use the arrow keys to select and change the value. The value must be between 550° and 1600°C. Press ENTER to accept the value. Pressing NEXT displays the RESET MAX CELL T screen.

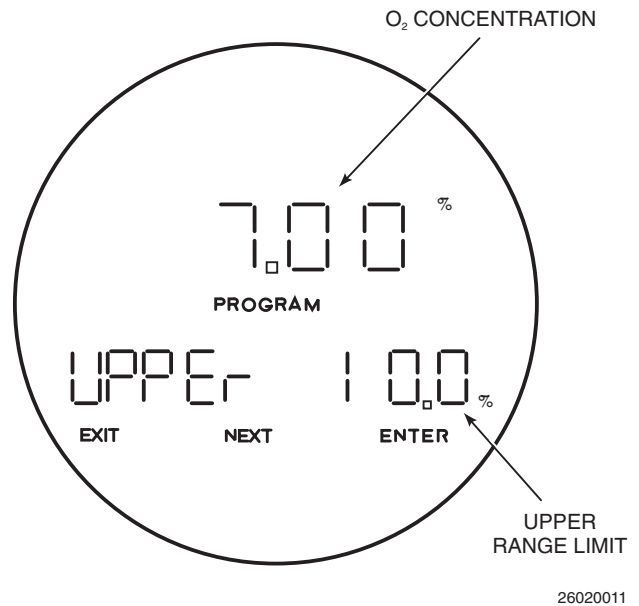


Figure 3-10. UPPER RANGE VAL

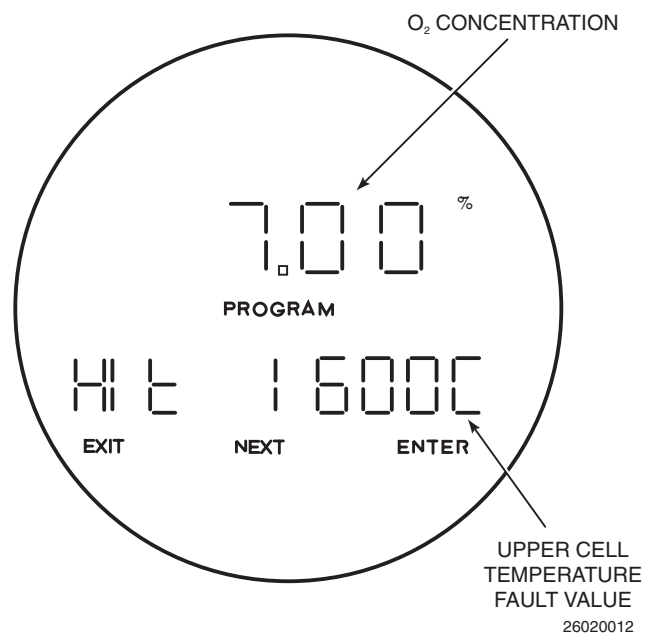
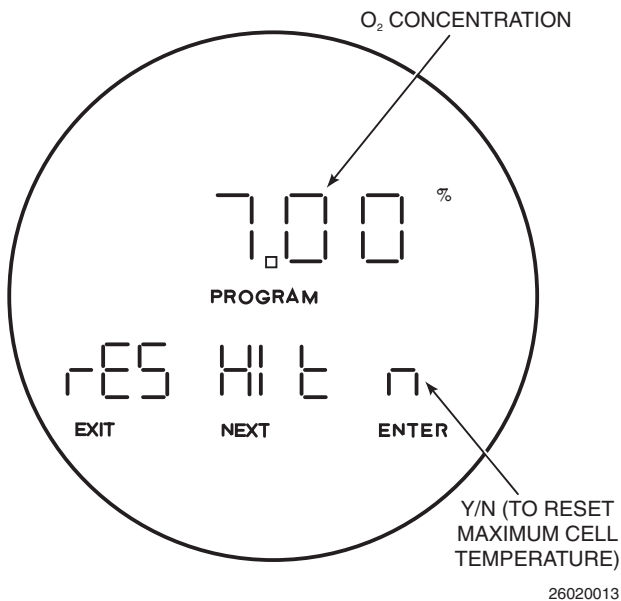


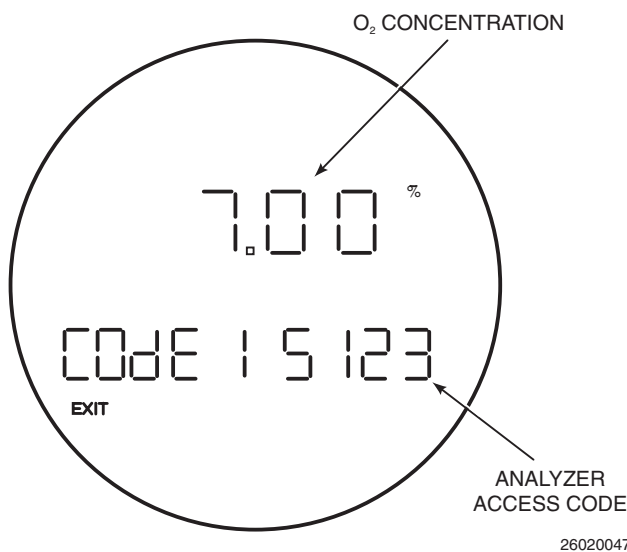
Figure 3-11. CELL T HI

**f. RESET MAX CELL T**

Refer to Figure 3-12. The transmitter tracks the maximum cell temperature obtained. Use this screen to reset the maximum cell temperature attained value to the current cell temperature. Press ENTER to begin editing. Use the arrow keys to select and change the value (Y/N). Then, press ENTER to accept the value. Pressing NEXT displays the SET O<sub>2</sub> FILTER TIME screen.



**Figure 3-12. RESET MAX CELL T**



**Figure 3-13. SET O<sub>2</sub> FILTER TIME**

**g. SET O<sub>2</sub> FILTER TIME**

Refer to Figure 3-13. In some applications, it is beneficial to dampen the raw O<sub>2</sub> signal coming from the cell. Use this screen to enter the amount of time it will take the O<sub>2</sub> to reach 90% of the new reading. Press ENTER to begin editing. Use the arrow keys to select and change the screen value to the O<sub>2</sub> filter value (in seconds). Enter a value between 0 and 300 seconds and press ENTER to accept the value. Press NEXT to access the TRIM 4 mA? screen.

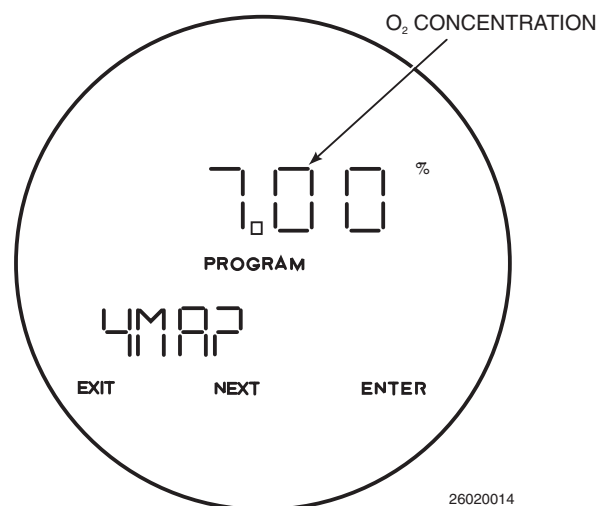
**h. TRIM 4 mA?**

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

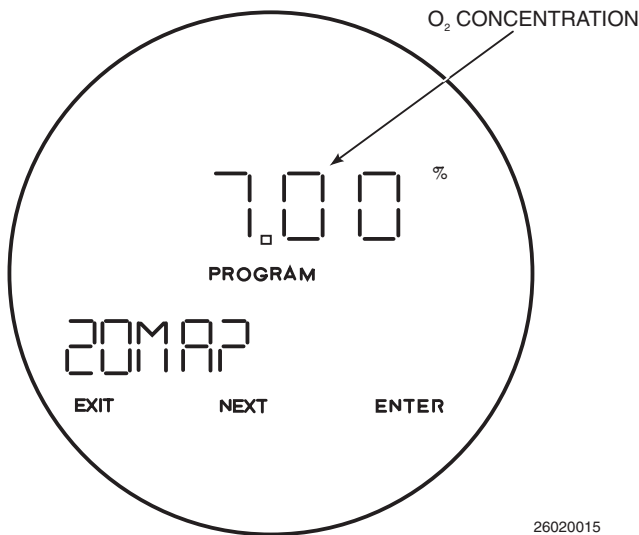
**NOTE**

**Before trimming the 4 mA value, you must break the loop to add the ammeter. Power down the unit, connect the ammeter in series with Model 5081 Transmitter terminals 15(-) and 16(+), power up the unit, and return to the TRIM 4 mA? screen.**

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



**Figure 3-14. TRIM 4 mA?**



26020015

Figure 3-15. TRIM 20 mA?

i. TRIM 20 mA?

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

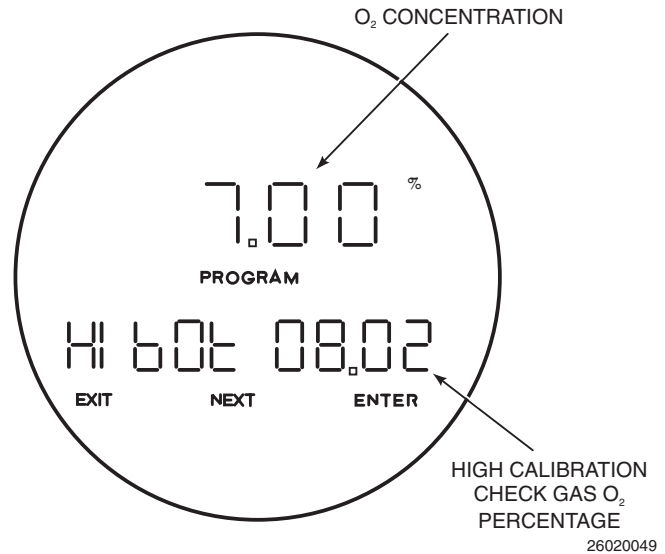
NOTE

**Before trimming the 20 mA value, you must break the loop to add the ammeter. Power down the unit, connect the ammeter in series with Model 5081 Transmitter terminals 15(-) and 16(+), power up the unit, and return to the TRIM 4 mA? screen.**

Press ENTER to begin editing. Use the arrow keys to select and change the screen value to the value displayed on the installed ammeter. Press ENTER to accept the value. After the value is entered, the unit calibrates itself to ensure it outputs 20 mA. Both the display and the ammeter will update to 20 mA. Pressing EXIT returns to the initial TRIM 20 mA? screen, and pressing NEXT displays the SET HI BOTTLE O<sub>2</sub> screen.

j. SET HI BOTTLE O<sub>2</sub>

Refer to Figure 3-16. Use this screen to identify, within the electronics, the percentage of O<sub>2</sub> used as the high calibration check gas. Press ENTER to begin editing. Use the arrow keys to select and change the screen value to the O<sub>2</sub> percentage of the high calibration check gas. Press ENTER to accept



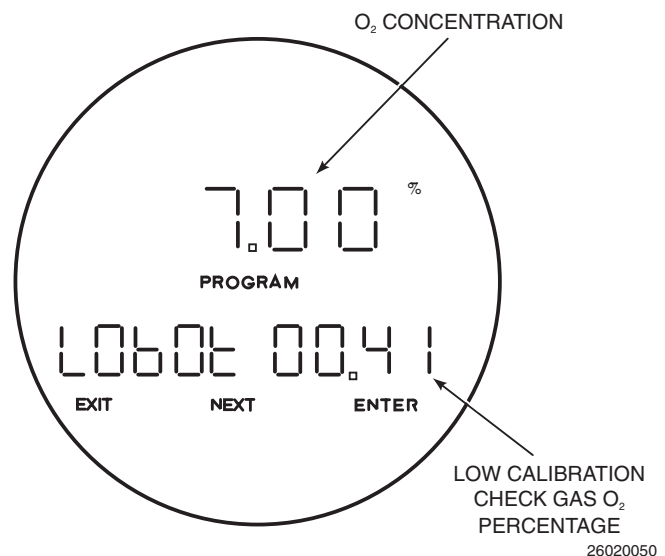
26020049

Figure 3-16. SET HI BOTTLE O<sub>2</sub>

the value. Press NEXT to display the SET LO BOTTLE O<sub>2</sub> screen.

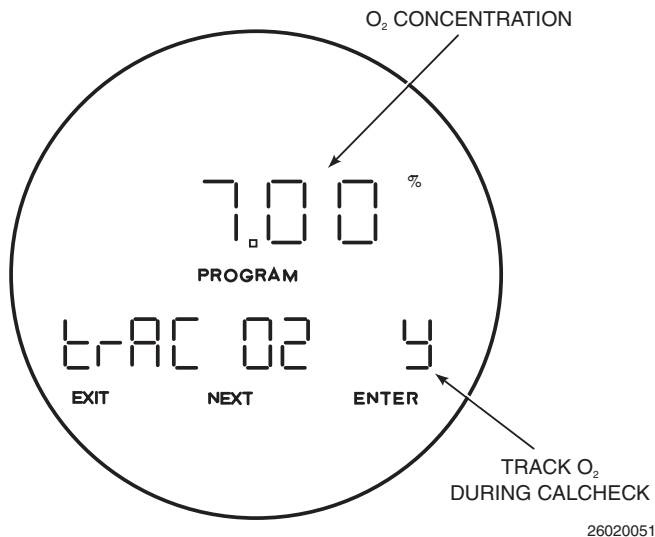
k. SET LO BOTTLE O<sub>2</sub>

Refer to Figure 3-17. Use this screen to identify, within the electronics, the percentage of O<sub>2</sub> used as the low calibration check gas. Press ENTER to begin editing. Use the arrow keys to select and change the screen value to the O<sub>2</sub> percentage of the low calibration check gas. Press ENTER to accept the value. Press NEXT to display the SET O<sub>2</sub> TRACKING screen.



26020050

Figure 3-17. SET LO BOTTLE O<sub>2</sub>



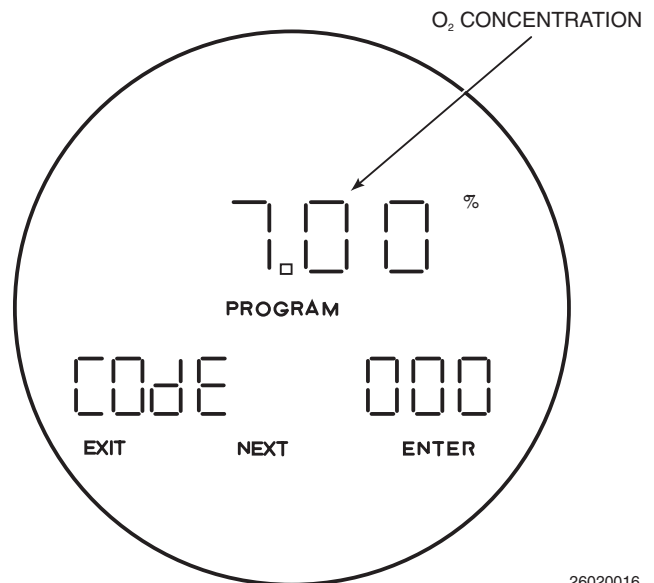
**Figure 3-18. SET O<sub>2</sub> TRACKING**

**I. SET O<sub>2</sub> TRACKING**

Refer to Figure 3-18. Use this screen to permit the 4-20 mA line to track the O<sub>2</sub> value during a calibration check. Press ENTER to begin editing. Use the arrow keys to select Y or N. Entering Y (yes) will allow the 4-20 mA line to track the O<sub>2</sub> value during the calibration check. Entering N (no) will hold the O<sub>2</sub> value steady during the calibration check. Press ENTER to accept the value. Press NEXT to display the SET CODE screen.

**m. SET CODE**

Refer to Figure 3-19. Use this screen to set the security code for the Model 5081 Transmitter. Press ENTER to begin editing. Use the arrow keys to select and change the value. Select any value between 000 and 999, excluding 000 and 555. Code 000 indicates that no code is set. Code 555 accesses the DISPLAY CODE screen. Press ENTER to accept the value. Pressing NEXT



**Figure 3-19. SET CODE**

returns to the FAULT VAL screen at the beginning of the PROGRAM MENU.

**n. Model 5081 Transmitter Parameters**

Table 3-1 lists the range and default value of operator-adjustable variables used by the Model 5081 Transmitter. These variables may all be changed from the PROGRAM MENU screens.

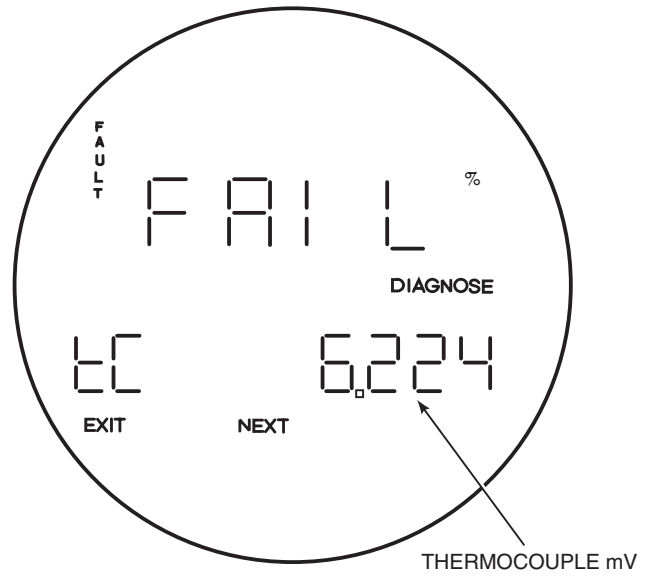
**Table 3-1. Model 5081 Transmitter Parameters**

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



26020017

Figure 3-20. SHOW FAULT



26020018

Figure 3-21. T/C mV

**3-6 DIAGNOSTICS MENU**

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

**a. SHOW FAULT**

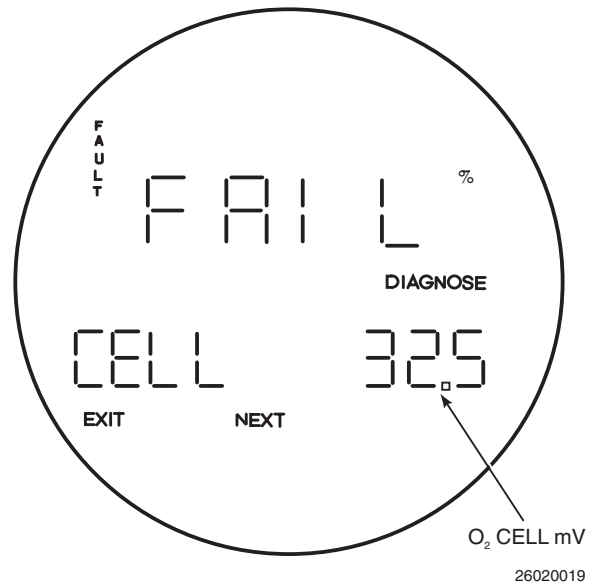
Refer to Figure 3-20. After pressing DIAG, this screen displays. Pressing ENTER accesses a screen displaying the current fault (if any). If more than one fault exists, and you are in the FAULT screen, press NEXT to go to the next fault. Information on the fault screens can be found in Section 6, TROUBLESHOOTING.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

**b. T/C mV**

Refer to Figure 3-21. Use this screen to examine the cell thermocouple mV output. Three decimal places are displayed. Pressing NEXT accesses the O<sub>2</sub> CELL mV screen.

**c. O<sub>2</sub> CELL mV**

Refer to Figure 3-22. Use this screen to examine the O<sub>2</sub> cell mV output. Pressing NEXT accesses the CELL IMPEDANCE screen.



26020019

Figure 3-22. O<sub>2</sub> CELL mV

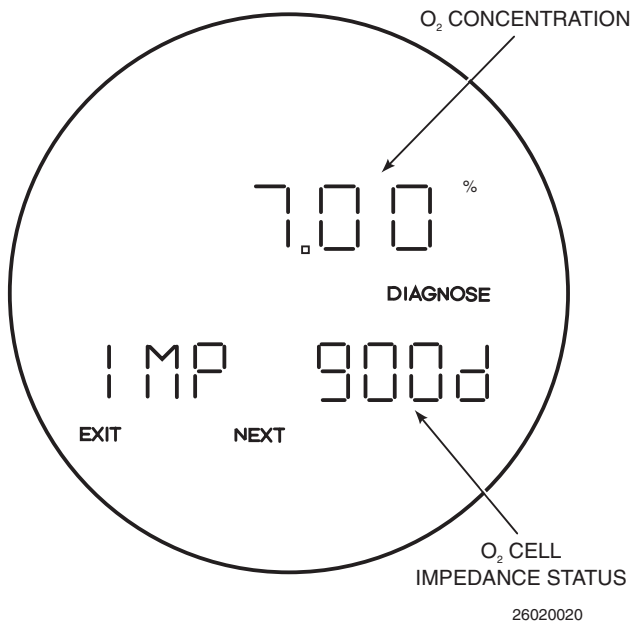


Figure 3-23. CELL IMPEDANCE

d. CELL IMPEDANCE

Refer to Figure 3-23. Use this screen to examine the O<sub>2</sub> cell impedance status. GOOD indicates the cell is operating normally. WARN indicates the cell has degraded but is still operational. HI indicates that the cell has degraded but is still operational; however, failure will occur soon. Pressing NEXT accesses the PREVIOUS SLOPE screen.

NOTE

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

e. PREVIOUS SLOPE

Refer to Figure 3-24. Use this screen to examine the slope calculated from the most recent calibration check. The slope is the amount of cell voltage generated for a given O<sub>2</sub> value. For each calibration check, record the slope over the life of the probe. Tracking the slope will indicate if the probe is degrading. Press NEXT to access the PREVIOUS CONSTANT screen.

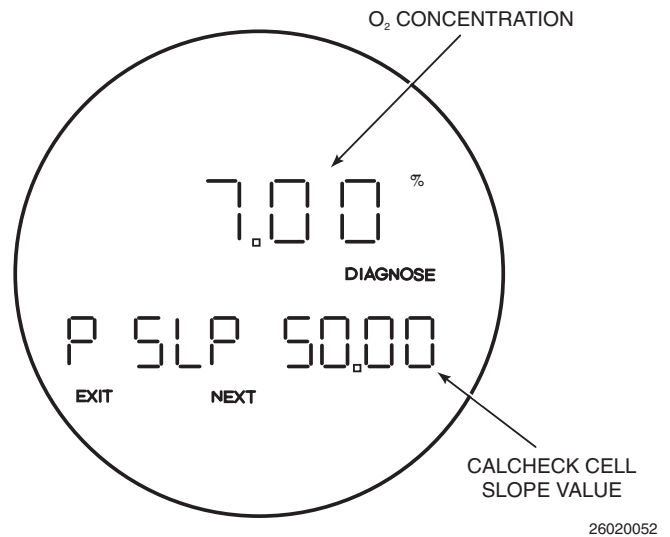


Figure 3-24. PREVIOUS SLOPE

f. PREVIOUS CONSTANT

Refer to Figure 3-25. Use this screen to examine the cell zero constant calculated from the most recent calibration check. The constant represents the voltage generated by the cell when no difference exists between the amount of O<sub>2</sub> on the reference and process sides of the cell. Press NEXT to access the MAX CELL T screen.

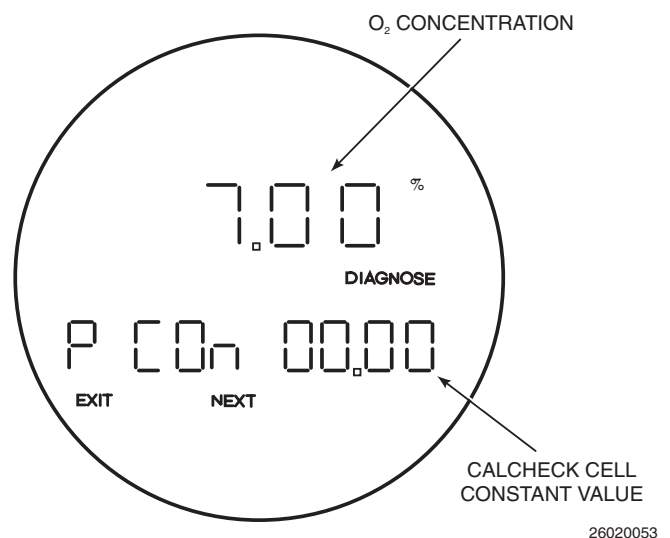


Figure 3-25. PREVIOUS CONSTANT

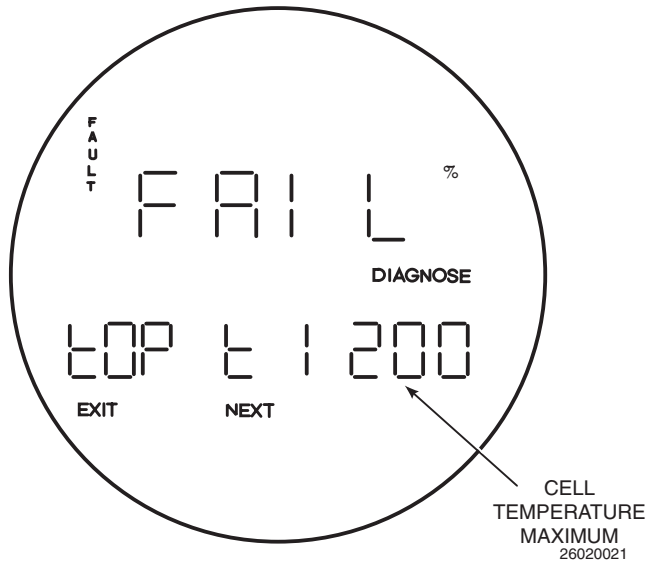


Figure 3-26. MAX CELL T

**g. MAX CELL T**

Refer to Figure 3-26. Use this screen to examine the maximum temperature attained by the O<sub>2</sub> cell. This value can be reset under the PROGRAM MENU. Pressing NEXT accesses the SW VER screen.

**h. SW VER**

Use this screen to see the software version number for the Model 5081 Transmitter. Pressing NEXT accesses the UNIT SER # screen.

**i. UNIT SER #**

Use this screen to see the unit serial number for the Model 5081 Transmitter. Pressing NEXT accesses the SW BUILD NUMBER screen.

**j. SW BUILD NUMBER**

Use this screen to see the software build number for the Model 5081 Transmitter. Pressing NEXT accesses the SW BUILD DATE screen.

**k. SW BUILD DATE**

Use this screen to see the software build date for the Model 5081 Transmitter. Pressing NEXT returns to the beginning of the DIAGNOSTICS MENU branch (the SHOW FAULT screen).

**3-7 CALCHECK MENU**

The CALCHECK MENU branch of the menu tree (Figure 3-5) allows you to perform a calibration check of the analyzer. Before performing a calibration check, ensure the high calibration check gas and low calibration check gas O<sub>2</sub> percentages are entered into the electronics via the PROGRAM MENU. To set these values, refer to paragraphs 3-5j and 3-5k.

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

**a. IN MANUAL?**

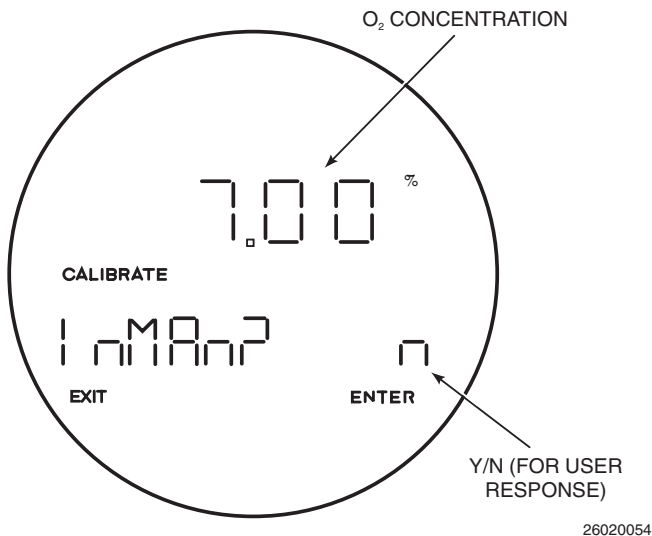
Refer to Figure 3-27.

**WARNING**

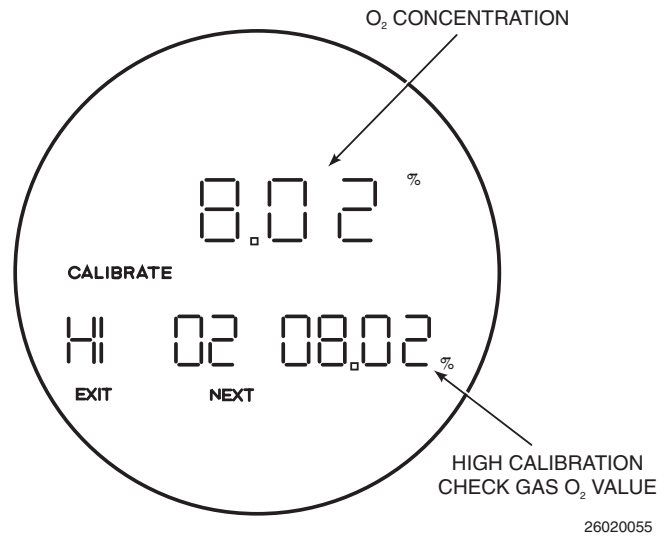
**Failure to remove the analyzer from automatic control loops prior to performing this procedure may result in a dangerous operating condition.**

If the O<sub>2</sub> output value is used in any automatic process control loops, the loop must be placed in manual before beginning a calibration check.

Once the analyzer is removed from any automatic control loops, press ENTER to edit the screen. Use the arrow keys to select Y (yes) and press ENTER to process the selection and to display the ACCEPT HIGH O<sub>2</sub> screen.



**Figure 3-27. IN MANUAL?**



**Figure 3-28. ACCEPT HIGH O<sub>2</sub>**

**b. ACCEPT HIGH O<sub>2</sub>**

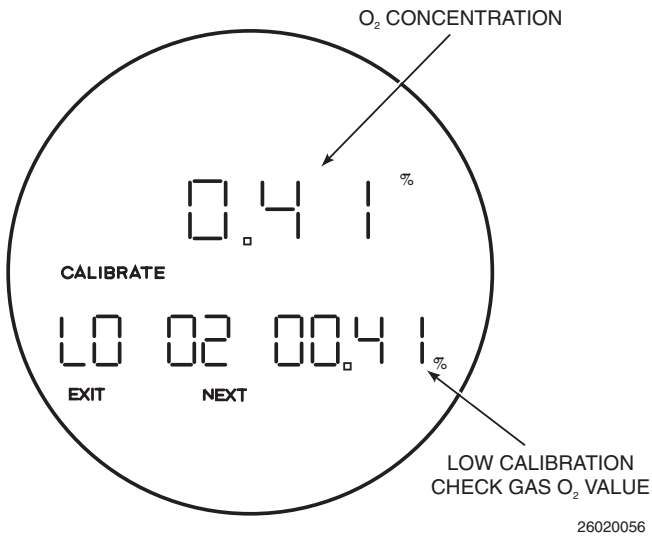
Refer to Figure 3-28. After pressing ENTER to begin the calibration check, the high calibration check gas starts to flow. After waiting approximately three minutes for the displayed O<sub>2</sub> value to settle, press NEXT to accept the high calibration check gas reading and apply the low calibration check gas. The next screen to display is the ACCEPT LOW O<sub>2</sub> screen.

**c. ACCEPT LOW O<sub>2</sub>**

Refer to Figure 3-29. Once the low calibration check gas is applied, wait approximately three minutes for the displayed O<sub>2</sub> value to settle. Once the value settles, press NEXT to accept the reading and to display the SLOPE screen.



# Model 5081FG



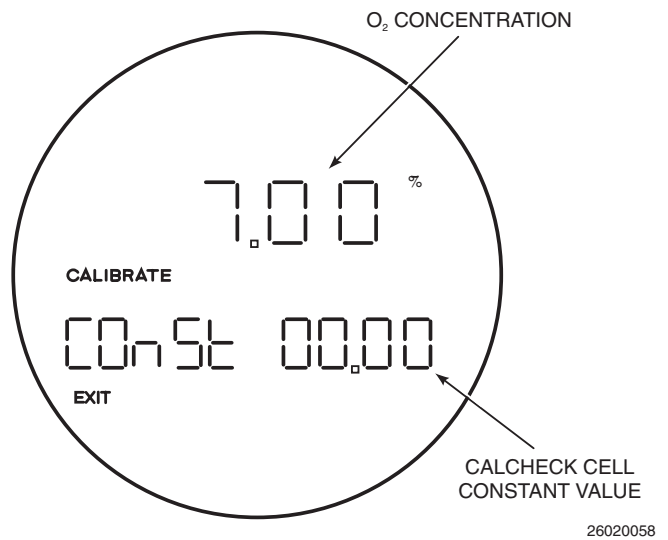
**Figure 3-29. ACCEPT LOW O<sub>2</sub>**

**d. SLOPE**

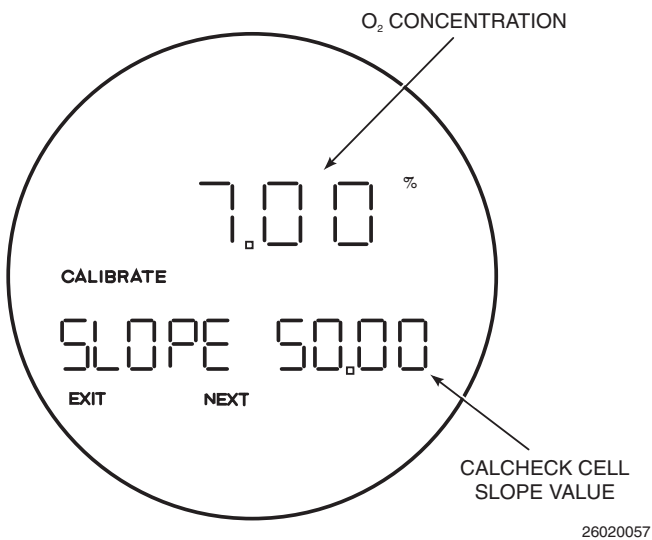
Refer to Figure 3-30. Use this screen to examine the slope calculated from current calibration check. The slope is the amount of cell voltage generated for a given O<sub>2</sub> value. After each calibration check, record the slope over the life of the probe. Tracking the slope will indicate if the probe is degrading. Press NEXT to access the CONSTANT screen.

**e. CONSTANT**

Refer to Figure 3-31. Use this screen to examine the cell zero constant calculated from the current calibration check. The constant represents the voltage generated by the cell when no difference exists between the amount of O<sub>2</sub> on the reference and process sides of the cell. Note this value for comparison against future calibration checks. Press RESET or EXIT to return to the PROCESS DISPLAY screen.



**Figure 3-31. CONSTANT**



**Figure 3-30. SLOPE**

**Instruction Manual**

IB-106-5081, Rev. 1.0

May 2005

Model 5081FG

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## SECTION 4 HART/AMS

### 4-1 OVERVIEW

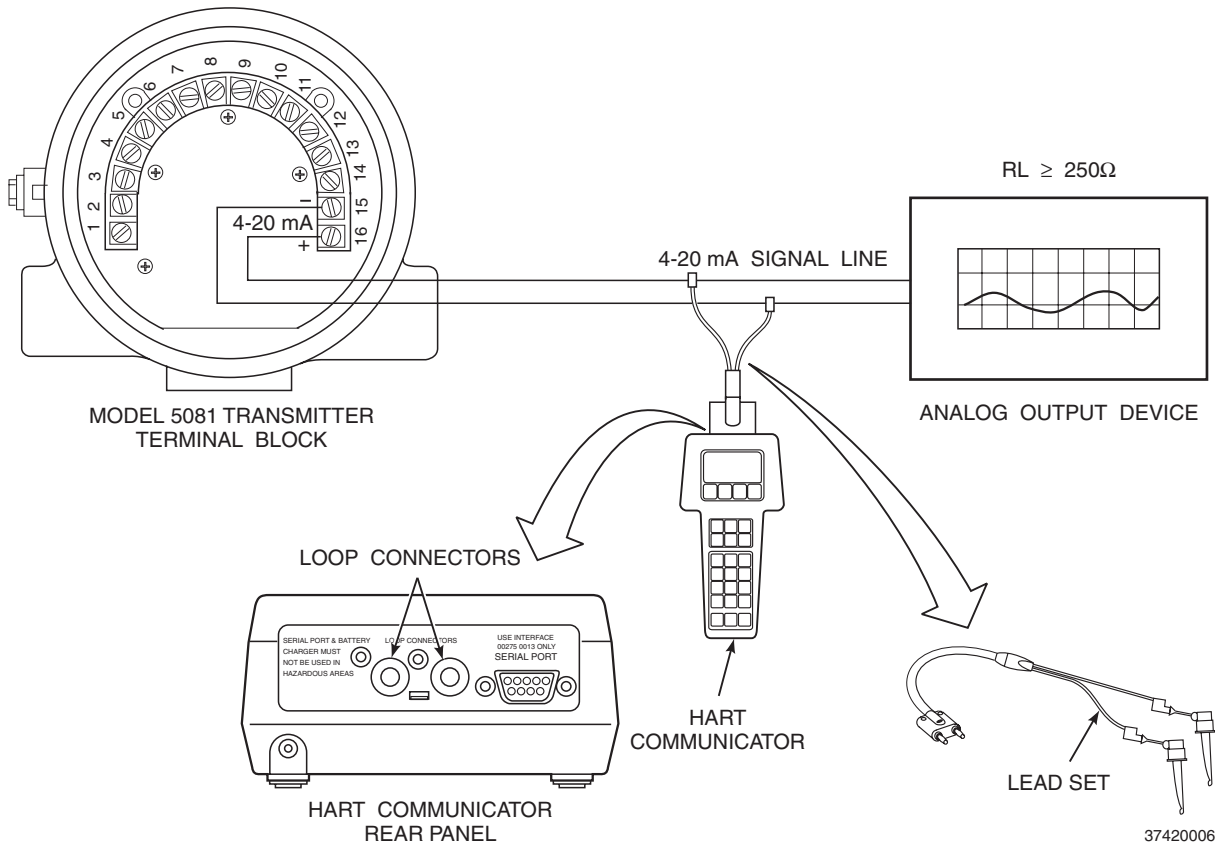
The HART Communicator is a handheld communications interface device. It provides a common communications link to all microprocessor-based instruments that are HART compatible. The handheld communicator contains an 8 x 21 character liquid crystal display (LCD) and 25 keys. A pocket-sized manual, included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

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

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

### 4-2 HART COMMUNICATOR SIGNAL LINE CONNECTIONS

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



**Figure 4-1. Signal Line Connections,  $\geq 250$  Ohms Lead Resistance**

**a. Method 1, For Load Resistance  $\geq 250$  Ohms**

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

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

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

**WARNING**

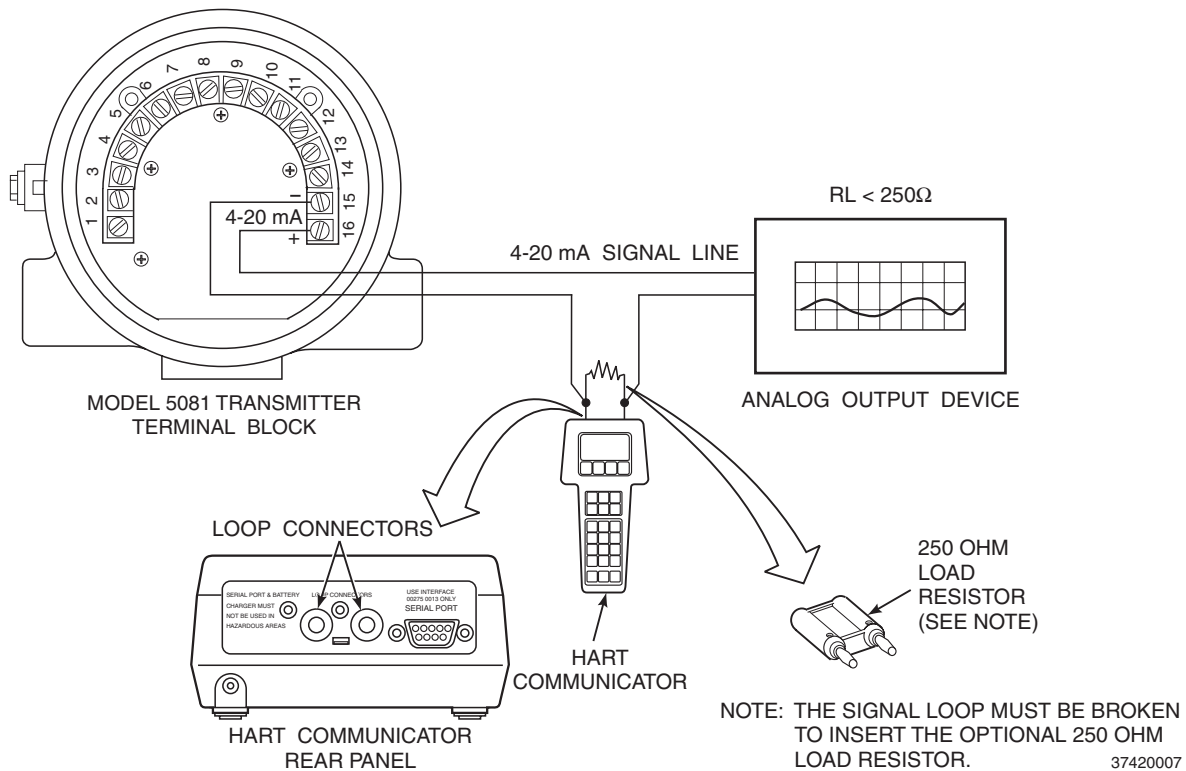
Explosions can result in death or serious injury. Do not make connections to the HART Communicator's serial port, 4-20 mA signal line, or NiCad recharger jack in an explosive atmosphere.

**WARNING**

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

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

1. At a convenient point, break the analog output 4-20 mA signal line and install the optional 250 ohm load resistor.
2. Plug the load resistor into the loop connectors (located on the rear panel of the HART Communicator).



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

### 4-3 HART COMMUNICATOR PC CONNECTIONS

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

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

### 4-4 OFF-LINE AND ON-LINE OPERATIONS

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

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

- b. In the on-line mode, the communicator is connected to the 4-20 mA analog output signal line. The communicator is connected in parallel to the Two-Wire In Situ Oxygen Analyzer or in parallel to the 250 ohm load resistor.
- c. The opening menu displayed on the HART LCD is different for on-line and off-line operations. When powering up a disconnected (off-line) communicator, the HART LCD will display the Main Menu. When powering up a connected (on-line) communicator, the HART LCD will display the On-line Menu. Refer to the HART Communicator manual for detailed menu information.

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

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

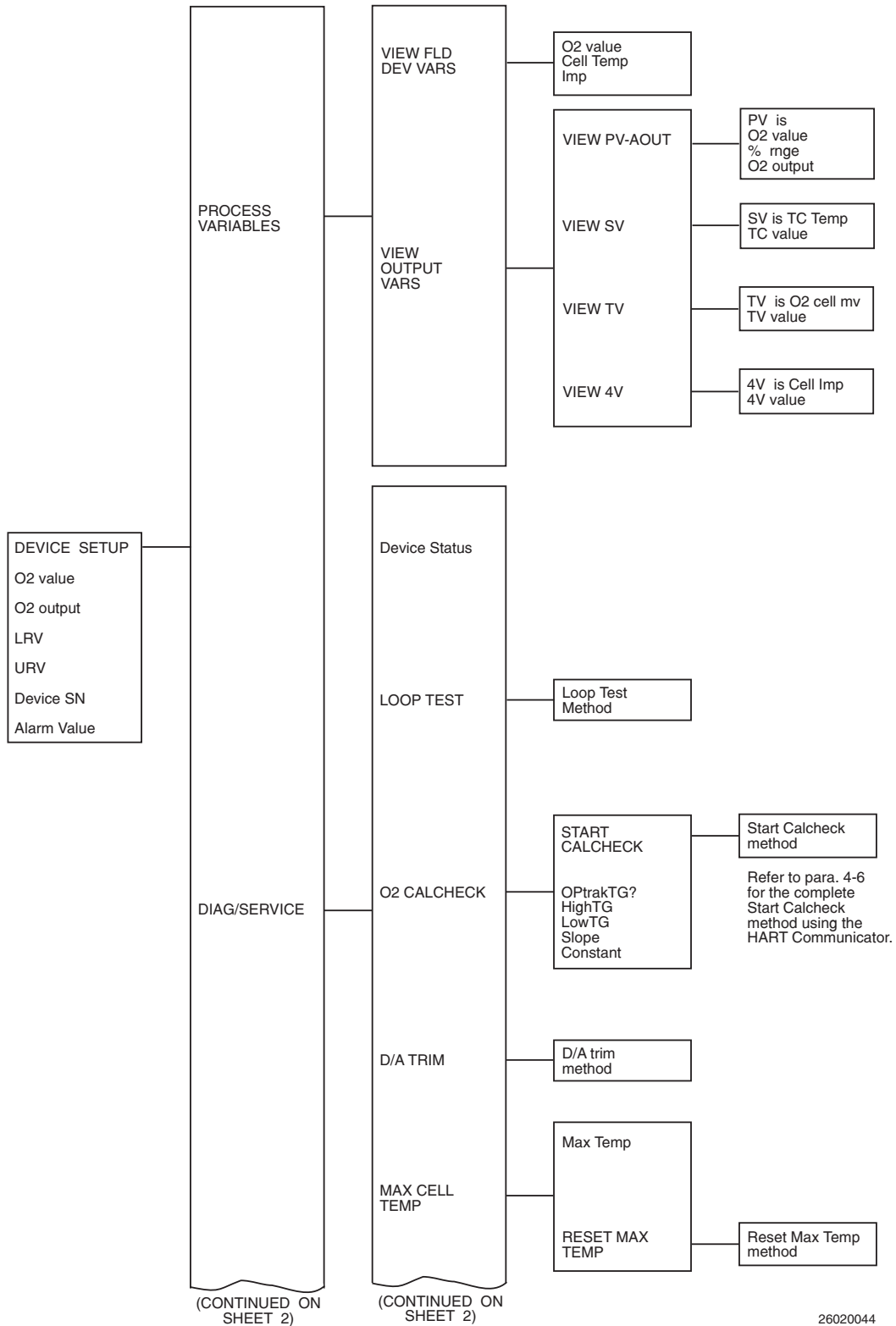
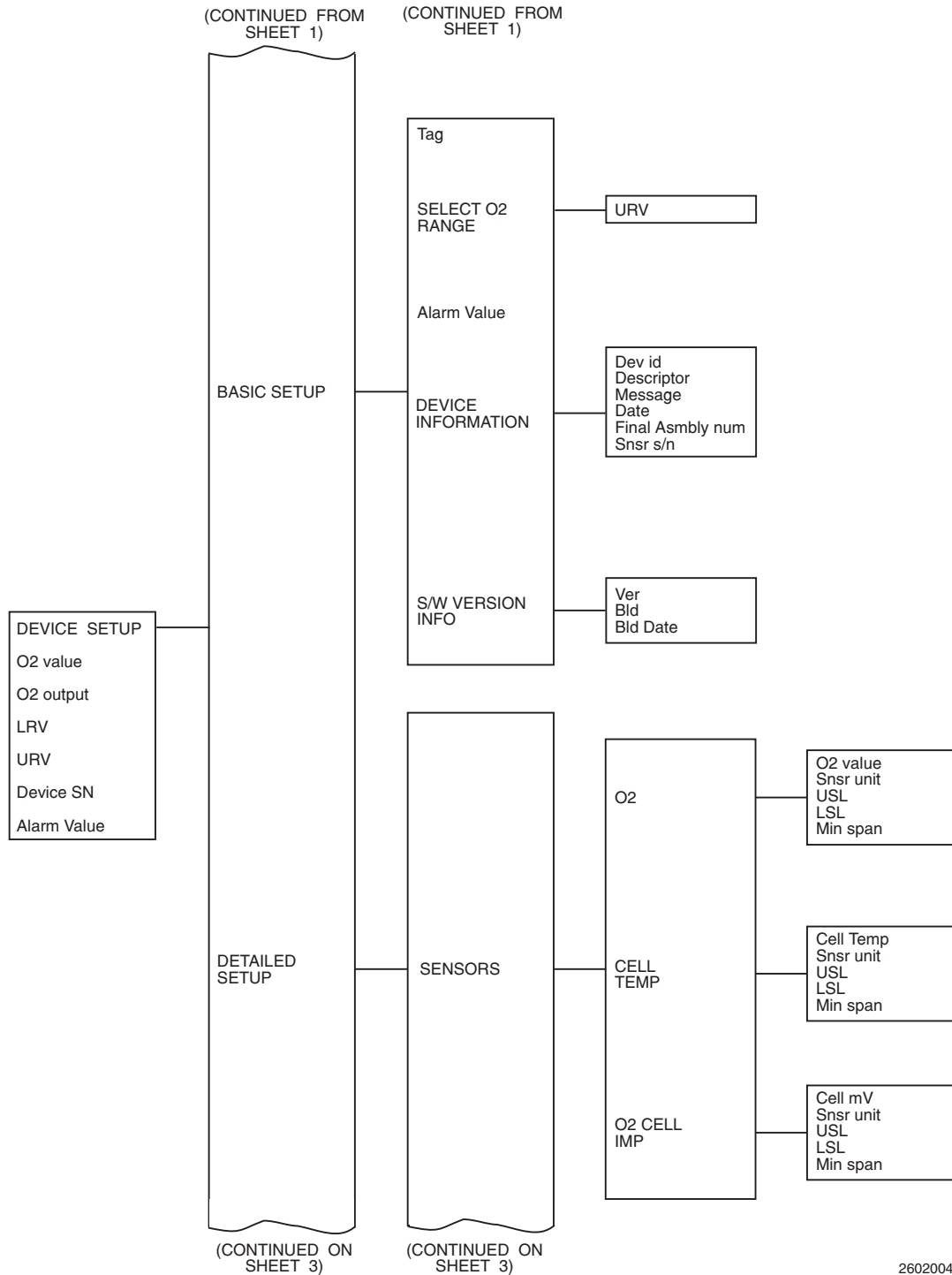
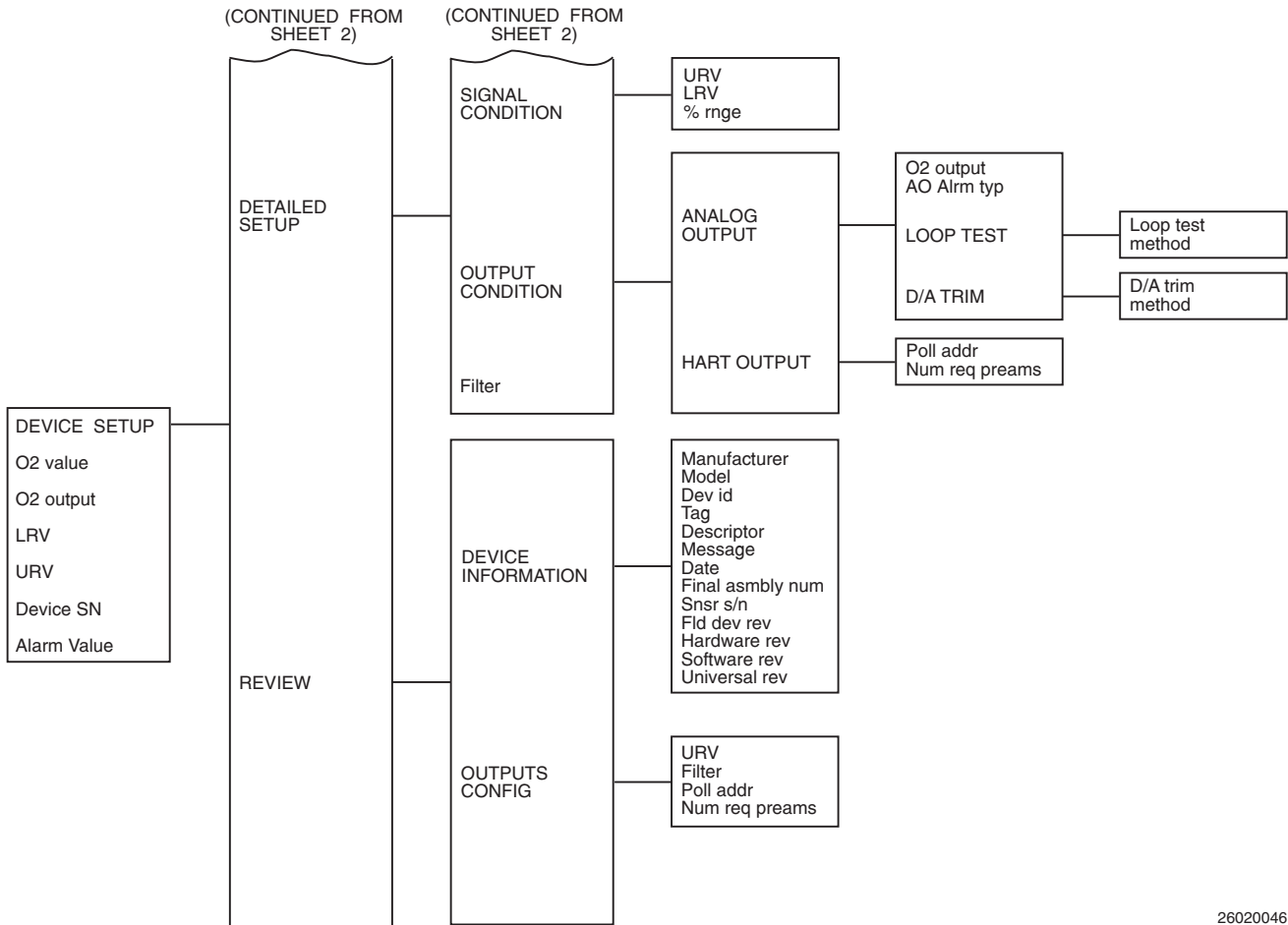


Figure 4-3. Menu Tree for HART/AMS on the Two-Wire In Situ Oxygen Analyzer (Sheet 1 of 3)



26020045

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



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



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## 4-6 HART COMMUNICATOR START CAL-CHECK METHOD

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

### NOTE

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

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

### NOTE

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

- a. From the DEVICE SETUP SCREEN, select DIAG/SERVICE.
- b. From the DIAG/SERVICE screen, select O<sub>2</sub> CALCHECK.
- c. Before starting the calibration check procedure, first set up the high calibration check gas, low calibration check gas, and tracking using HART/AMS.
- d. From the O<sub>2</sub> CALCHECK screen, select menu item 1, START CALCHECK, to access the calibration check procedure.

### **WARNING**

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

- e. In the first screen, a "Loop should be removed from automatic control" warning appears. Remove the analyzer from any automatic control loops to avoid undesirable equipment performance and press OK.
- f. The next screen prompts you to apply the high calibration check gas. This message will only display for approximately three seconds. Press OK.
- g. At this point, calibration check gas will flow for approximately three minutes until the gas reading is taken. Once the gas is measured, the message, "Hi gas reading taken," displays for three seconds.
- h. Next, the screen prompts you to apply the low calibration check gas. Press OK.
- i. The low calibration check gas will flow for approximately three minutes until the reading is taken. Once the gas is measured, the message, "Low gas reading taken," displays for three seconds.
- j. Next, the screen prompts you to disconnect the calibration check gases. Press OK. Once the gases are disconnected, the system will purge the gases for approximately three minutes.
- k. When the "Loop may be returned to automatic control" note appears, return the analyzer to the automatic control loops previously removed and press OK.

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## SECTION 5 MAINTENANCE AND SERVICE

### **WARNING**

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

### **WARNING**

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

#### 5-1 MODEL 5081 ELECTRONICS REPLACEMENT

Before replacing any electronic components, verify that the power to the Model 5081 Transmitter is removed. Refer to Table 8-1 for replacement part numbers.

##### a. Display Board Replacement

Use the following procedure to replace display board (12, Figure 5-1).

1. Loosen screw (15) until cover lock (16) disengages from the knurled surface of circuit end cap (14).
2. Remove circuit end cap (14).
3. Remove three screws (13) retaining the electronics in place.
4. Lift display board (12) and disconnect the ribbon cable connector between the display board and the CPU board (11).
5. Using a replacement display board, connect the ribbon cable connector between the display board and the CPU board (11). Ensure the cable connector is fully seated.
6. Reposition display board (12) on the standoffs. Rotate the display board 90 degrees either way as desired.
7. Install and tighten all three screws (13).
8. Install circuit end cap (14).
9. Tighten cover lock screw (15) until cover lock (16) engages knurled surface of circuit end cap (14).

##### b. Spare Board Stack Replacement

The spare board stack is composed of the analog board (10, Figure 5-1) and the CPU board (11). Use the following procedure to replace either of these boards.

1. Loosen cover lock screw (15) until cover lock (16) disengages from the knurled surface of circuit end cap (14).
2. Remove circuit end cap (14). Remove three screws (13).
3. Lift display board (12) and disconnect the ribbon cable connector between display board and CPU board (11).
4. Remove two screws (4) and lockwashers (3). Lift terminal block (6) until the analog board (10) is unplugged from the terminal board.
5. Lift spare board stack from housing (1) by the standoffs. Reinstall terminal block (6), lockwashers (3), and screws (4).
6. Remove standoffs from the spare board stack. Replace faulty analog board (10) or CPU board (11). Reinstall standoffs.
7. Install repaired spare board stack into housing (1). Carefully seat the analog board onto housing pins. Press firmly on the CPU board standoffs to ensure good contact.

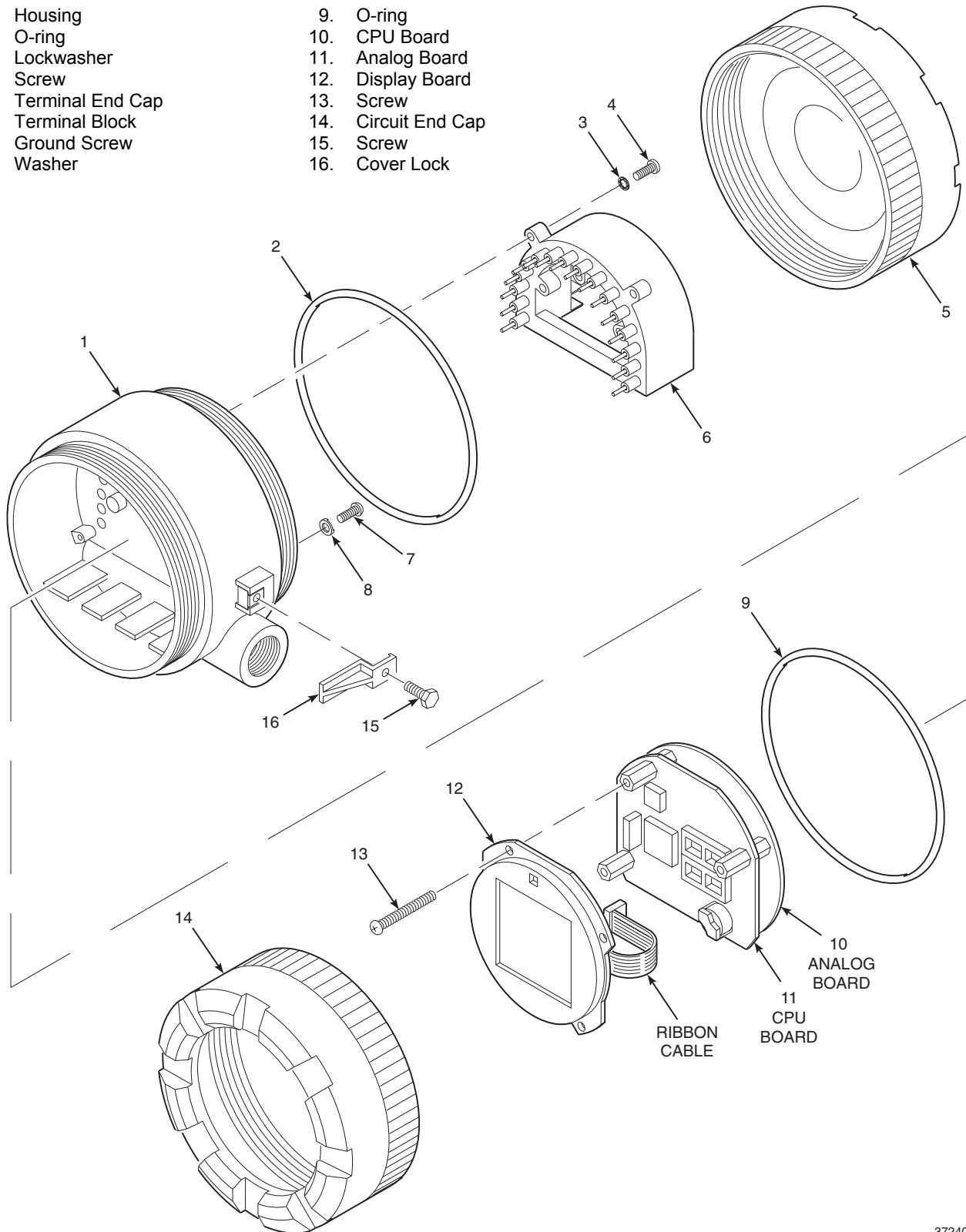
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- |                     |                     |
|---------------------|---------------------|
| 1. Housing          | 9. O-ring           |
| 2. O-ring           | 10. CPU Board       |
| 3. Lockwasher       | 11. Analog Board    |
| 4. Screw            | 12. Display Board   |
| 5. Terminal End Cap | 13. Screw           |
| 6. Terminal Block   | 14. Circuit End Cap |
| 7. Ground Screw     | 15. Screw           |
| 8. Washer           | 16. Cover Lock      |



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

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8. Connect the ribbon cable connector between display board (12) and the CPU board (11). Ensure the cable connector is fully seated.
9. Reposition display board (12) on the standoffs. Rotate the display board 90 degrees either way as desired.
10. Install and tighten all three screws (13) and circuit end cap (14).
11. Tighten cover lock screw (15) until cover lock (16) engages knurled surface of circuit end cap (14).

### **WARNING**

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

## 5-2 OXYGEN PROBE REPLACEMENT

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

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

gases of known values. Record the generated slope and constant values.

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

### **WARNING**

Do not install or remove probes from a process where pressures are more than a few inches of H<sub>2</sub>O positive pressure. Hot gases may escape from the stack and cause severe personal injury.

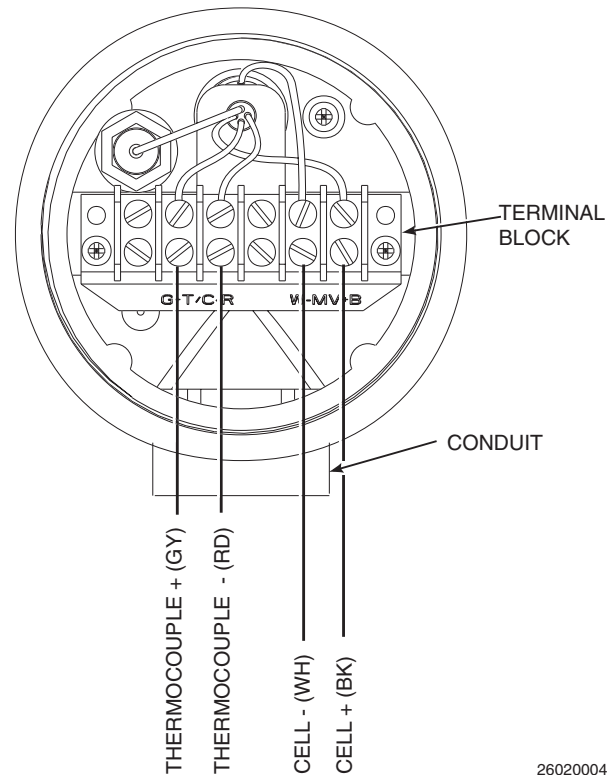
### **CAUTION**

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

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

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

- a. Remove the end cap of the probe to expose the terminal block.
- b. Refer to Figure 5-2. Disconnect the four wires (two oxygen signal wires and two thermocouple wires) from the terminal block.
- c. Disconnect the reference air and the calibration check gas lines.
- d. Unscrew the probe from the stack and remove.
- e. Using a replacement probe, refer to paragraph 2-2c for mechanical installation instructions.
- f. Refer to paragraph 2-3b for electrical installation instructions.
- g. Refer to paragraph 2-4 for reference air and calibration check gas installation instructions.



**Figure 5-2. Oxygen Probe Terminal Block**

## SECTION 6 TROUBLESHOOTING

**WARNING**

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

Life of the probe is negatively impacted by:

- Continued operation at elevated temperatures above 1300°C (2372°F).
- Operation in processes that contain high levels of sulfur, SO<sub>2</sub>, or other acidic compounds.

### 6-1 GENERAL

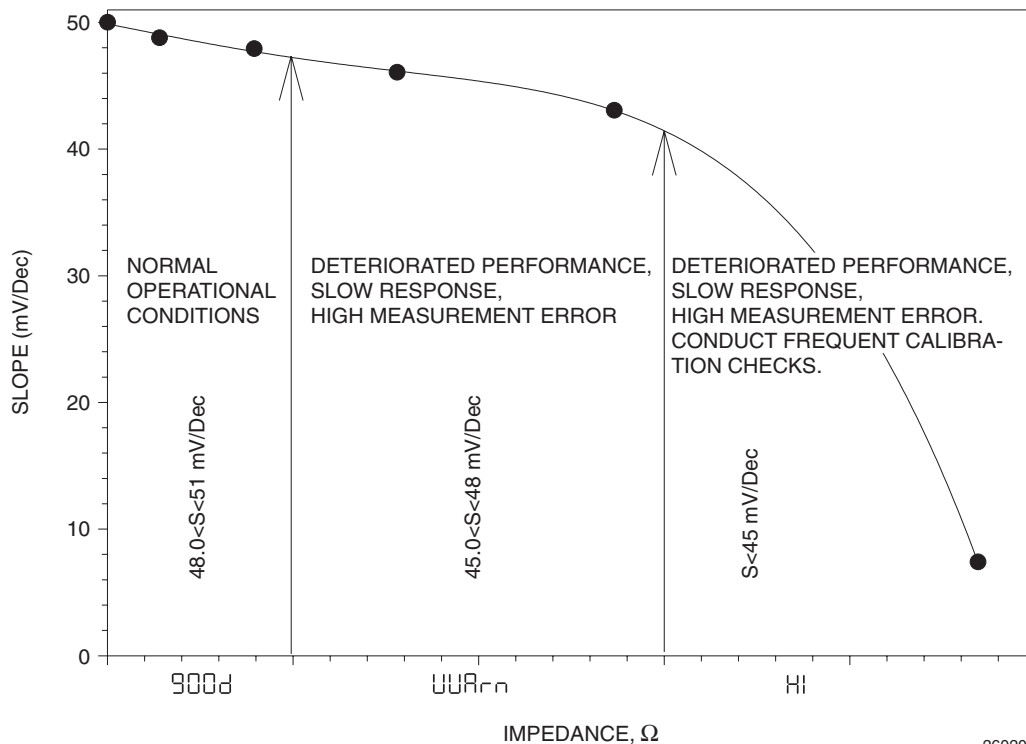
This troubleshooting section describes how to identify and isolate faults that may develop in the Two-Wire In Situ Oxygen Analyzer.

### 6-2 PROBE LIFE

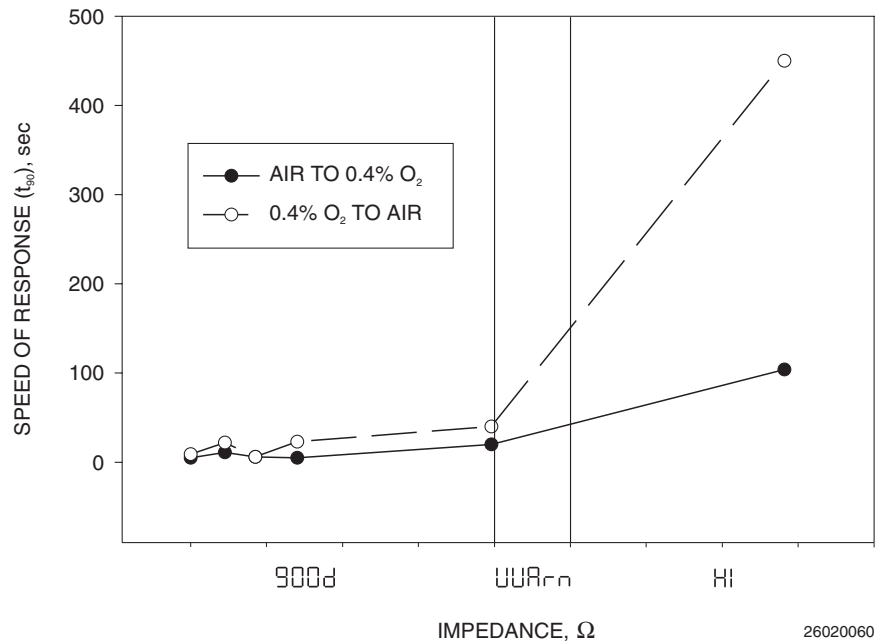
The zirconium oxide technology for measuring oxygen is very stable and should provide accurate service for several years.

Operating conditions with simultaneously high levels of SO<sub>2</sub> and low levels of O<sub>2</sub> are particularly damaging.

The health and accuracy of a given cell is closely related to the resistance, or impedance, of the cell. Figure 6-1 illustrates that the amount of output from a cell for a given O<sub>2</sub> value (represented as slope) will remain very stable to the point where cell impedance increases to approximately 100 ohms.



**Figure 6-1. Slope vs. Impedance**



**Figure 6-2. Speed of Response**

Frequently conduct calibration checks to look for the following conditions:

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

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

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

**6-3 FAULT INDICATIONS**

The fault conditions for the Two-Wire In Situ Oxygen Analyzer will be indicated by the faulted operation display as shown in Figure 6-3. This screen displays when a fault that invalidates the O<sub>2</sub> reading is present. When the error is corrected, the screen will return to a normal operation display unless another error exists.



**Figure 6-3. Faulted Operation Display**



## 6-4 IDENTIFYING AND CORRECTING FAULT INDICATIONS

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

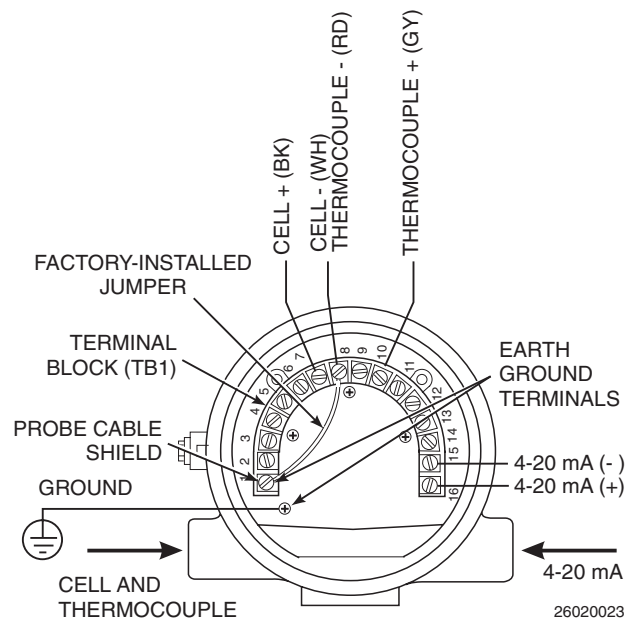
The following paragraphs describe the faults, possible causes, and corrective actions. Refer to Figure 6-4 as needed for test points and wiring information.

### NOTE

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

### NOTE

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



**Figure 6-4. Model 5081 Transmitter Terminal Block**



26020024

**Figure 6-5. Fault 1, Open Thermocouple**

**a. Fault 1, Open Thermocouple**

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

1. Refer to Figure 6-4 and check the thermocouple wiring connections at terminals 8 and 10. Ensure the wires are properly connected.
2. Remove power. Disconnect the thermocouple wires (gray and red) from terminals 10 and 8. Measure the continuity across the gray and red thermocouple leads. The measurement should read approximately 1-2 ohms. Larger values indicate the thermocouple is open.
3. If the thermocouple is open, replace the oxygen probe per paragraph 5-2.



26020025

**Figure 6-6. Fault 2, Reversed Thermocouple**

**b. Fault 2, Reversed Thermocouple Active**

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

1. Allow adequate time for the oxygen probe to reach operating temperatures. Probe temperatures below approximately 500°C (932°F) may result in this fault.
2. Refer to Figure 6-4. Check the gray (to terminal 10) and red (to terminal 8) wires for the proper placement.
3. Using a multimeter, measure between terminals 8(-) and 10(+). If the reading is negative, the thermocouple wiring is reversed. Rewire as necessary.
4. If the wiring is correct and the probe is at operating temperature, then the transmitter electronics are bad. Replace the faulty analog or CPU board per paragraph 5-1.



26020026

**Figure 6-7. Fault 3, Shorted Thermocouple**

**c. Fault 3, Shorted Thermocouple**

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

1. Allow adequate time for the oxygen probe to reach operating temperatures. Probe temperatures below approximately 500°C (932°F) may result in this fault.
2. Refer to Figure 6-4. Using a multimeter, measure between terminals 8(-) and 10(+).
3. If the multimeter reading, in voltage mode, is between -0.5 and +0.5 mV, the thermocouple is shorted.
4. If the thermocouple is shorted, replace the oxygen probe per paragraph 5-2.
5. If the thermocouple is not shorted, then replace the faulty analog or CPU board per paragraph 5-1.



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**Figure 6-8. Fault 4, High Probe Temperature**

**d. Fault 4, High Probe Temperature**

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

1. If the probe temperature exceeds the maximum cell temperature setpoint, the 4-20 mA signal output will become invalid and go to the default value.
2. Verify that the upper cell temperature setpoint is configured as desired under the PROGRAM MENU (see Section 3, STARTUP AND OPERATION).



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**Figure 6-9. Fault 5, O<sub>2</sub> Cell Open**

**e. Fault 5, O<sub>2</sub> Cell Open**

The O<sub>2</sub> cell connection is open. The fault displays as shown in Figure 6-9.

1. Allow adequate time for the oxygen probe to reach operating temperatures. Probe temperatures below approximately 500°C (932°F) may result in this fault.
2. Refer to Figure 6-4 and check the O<sub>2</sub> cell wiring connections at terminals 7 and 8. Ensure the wires are properly connected.

**NOTE**

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

3. Apply low calibration check gas (0.4% O<sub>2</sub>). Measure the cell output from the O<sub>2</sub> cell wires at the probe terminal block. The cell output should be 100 ±20 mV. If no voltage can be measured, the cell is open.
4. If the O<sub>2</sub> cell is open, replace the oxygen probe per paragraph 5-2.



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

**f. Fault 6, Cell Impedance Too High**

The O<sub>2</sub> cell impedance has exceeded 100 ohms. The fault displays as shown in Figure 6-10.

1. This fault is usually indicated in conjunction with Fault 5, Cell Open. Correcting Fault 5 should correct Fault 6.
2. If Fault 6 appears independently, the cell has degraded beyond specification.
3. If the O<sub>2</sub> cell has become too old, replace the oxygen probe per paragraph 5-2.



**Figure 6-11. Fault 7, Reversed O<sub>2</sub> Cell**

### g. Fault 7, Reversed O<sub>2</sub> Cell

The O<sub>2</sub> cell connections are reversed. The fault displays as shown in Figure 6-11.

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

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## SECTION 7 RETURN OF MATERIAL

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

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

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

- b.** Carefully pack defective unit in a sturdy box with sufficient shock absorbing material to ensure that no additional damage will occur during shipping.
- c.** In a cover letter, describe completely:
  1. The symptoms from which it was determined that the equipment is faulty.
  2. The environment in which the equipment has been operating (housing, weather, vibration, dust, etc.).
  3. Site from which equipment was removed.
  4. Whether warranty or nonwarranty service is requested.

5. Complete shipping instructions for return of equipment.

6. Reference the return authorization number.

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

PAD Repair Depot Dock C  
c/o Emerson Process Management  
11100 Brittmoore Park Drive  
Houston, TX 77041

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

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

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## SECTION 8 REPLACEMENT PARTS

**Table 8-1. Replacement Parts List**

Figure and Index No.	Part Number	Description
1-1, 2	1A99138G01	Model 5081 Transmitter ATEX
1-1, 2	1A99138G02	Model 5081 Transmitter CSA
1-1, 2	1A99138G03	Model 5081 Transmitter FM
1-1, 3	5R10092G01	20" Replacement Oxygen Probe, with Alumina Outer Protection Tube
1-1, 3	5R10092G02	26" Replacement Oxygen Probe, with Alumina Outer Protection Tube
1-1, 3	5R10092G03	34.625" Replacement Oxygen Probe, with Alumina Outer Protection Tube
1-1, 3	5R10092G09	20" Replacement Oxygen Probe, with Inconel 600 Outer Protection Tube
1-1, 3	5R10092G010	26" Replacement Oxygen Probe, with Inconel 600 Outer Protection Tube
1-1, 3	5R10092G011	34.625" Replacement Oxygen Probe, with Inconel 600 Outer Protection Tube
5-1, 6	23581-00	Terminal Block
5-1, 10 and 11	1A99777H02	Spare Board Stack, HART Compatible
5-1, 12	23652-01	Display Board Assembly
5-1, 14	23593-01	Circuit End Cap (with Glass)

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## SECTION 9 INDEX

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

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# WARRANTY

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

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

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

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

## **CAUTION**

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

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# Model 5081FG

<b>Two-Wire In Situ Oxygen Analyzer</b>	
Part no.	_____
Serial no.	_____
Order no.	_____

#### WORLD HEADQUARTERS

**Emerson Process Management  
Rosemount Analytical Inc.  
Process Analytic Division**  
6565P Davis Industrial Parkway  
Solon, OH 44139  
T 440 914 1261  
T 800 433 6076  
gas.csc@emersonprocess.com

#### GAS CHROMATOGRAPHY CENTER AND LATIN AMERICA

**Emerson Process Management  
Rosemount Analytical**  
9753 Pinelake Drive  
Houston, TX 77055  
T 713 467 6000  
F 713 827 3329

#### EUROPEAN TECHNOLOGY CENTER

**Emerson Process Management  
Fisher-Rosemount MFG GmbH & Co.**  
Industriestrasse 1  
63594 Hasselroth  
Germany  
T 49 6055 884 0  
F 49 6055 884 209

#### ASIA – PACIFIC

**Emerson Process Management  
Asia Pacific Private Limited**  
1 Pandan Crescent  
Singapore 128461  
Republic of Singapore  
T 65 6 777-8211  
F 65 6 777-0947

#### EUROPE, MIDDLE EAST AND AFRICA

**Emerson Process Management  
Shared Services Limited**  
Heath Place  
Bognor Regis  
West Sussex PO22 9SH  
England  
T 44 1243 863121  
F 44 1243 845354

<http://www.raihome.com>