Instruction Manual
PN 51-1181PB/rev.A
April 2003

Model 1181 PB

Dissolved Oxygen Two-Wire Transmitter

ROSEMOUNT® Analytical

EMERSON™ 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 this Instruction Manual is not the correct manual, telephone 1-800-654-7768 and the requested manual will be provided. Save this Instruction Manual for future reference.
- If you do not understand any of the instructions, contact your Rosemount representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install your equipment as specified in the Installation Instructions of the appropriate Instruction Manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Rosemount. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. 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.

DANGER
HAZARDOUS AREA INSTALLATION

INTRINSICALLY SAFE INSTALLATION

Installations in hazardous area locations must be carefully evaluated by qualified on site safety personnel. Transmitter and Sensor alone are not Intrinsically safe. To secure and maintain an intrinsically safe installation, a certified safety barrier must be used and the installation must comply with the governing approval agency (FM, CSA or BASEEFA/CENELEC) installation drawing requirements (see Section 2.0 - Installation).

EXPLOSION-PROOF INSTALLATION

Caution: Sensors are not explosion-proof. If the sensor must be installed in a hazardous location an intrinsically safe system must be implemented.

To maintain the explosion-proof rating of the transmitter, the following conditions must be met:

- Discontinue power supply before removing enclosure covers.
- Transmitter covers must be properly installed during power on operation.
- Explosion proof "Y" fittings must be properly installed with sealing compound prior to applying power to the transmitter.
- Serial tag cover over the external Zero and Span adjustments must be in place.
- See Installation Section for details.

Proper installation, operation and servicing of this instrument in a Hazardous Area Installation is entirely the responsibility of the user.

Emerson Process Management

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EMERSON Process Management

MODEL 1181 PB
TWO-WIRE TRANSMITTER

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SECTION 1.0
DESCRIPTION AND SPECIFICATIONS

- TWO-WIRE FIELD MOUNTED TRANSMITTERS. Ideal for multiple loop installations where central data processing and control are required. Field mounting near the sensor for ease in routine calibration.
- NEMA 4X WEATHERPROOF, CORROSION-RESISTANT, DUAL COMPARTMENT HOUSING provides maximum circuit protection for increased reliability in industrial environments.
- HAZARDOUS AREA INSTALLATION. Certified NEMA 7B explosion-proof and intrinsically safe when used with an approved sensor and safety barrier.
- COMMONALITY OF PARTS reduces inventory required to support different field measurements.
- SWITCH SELECTABLE RANGES further reduces inventory by permitting calibration of one Model to virtually any Tag Number requiring the same measurement.
- EXTERNAL ZERO AND SPAN, 20-turn potentiometers provide for fine calibration of the isolated 4-20 mA output signal.

1.1 FEATURES AND APPLICATIONS

The Rosemount Analytical Two-Wire PB Dissolved Oxygen Transmitter, with the Model 120012 Dissolved Oxygen Sensor Assembly, is used to accurately and continuously measure dissolved oxygen at parts per billion levels in applications such as boiler feed water, food and beverage applications, deaerated sea water for desalinization and deoxygenated brine for oil well injection.

The Model 1181PB includes all the circuitry necessary for the measurement and transmission of an isolated 4-20 mA signal. This current output signal is compatible with, and provides a reliable front end measurement for, virtually any process monitoring and control scheme.

The transmitter is housed in a NEMA 4 weatherproof, NEMA 7 explosion-proof enclosure and is designed for intrinsically safe operation. Features include external 20-turn ZERO and SPAN controls, and a dual compartment housing with a moisture barrier that totally isolates the electronic circuitry from the field wiring and calibration terminals.

The electronic circuitry is mounted on printed circuit boards (PCB's) which plug directly into the moisture barrier. The printed circuit boards are removed as a unit and may be replaced individually or as a unit to expedite maintenance.

The Model 1181PB is available with an analog meter, a 3¼ digit LCD display, or as a blind version if local indication is not required. The measurement range is field selectable and does not require removal of the electronic circuitry. The range switch provides a full scale span of 0-50, 0-100 or 0-200 PB, plus an air calibrate position. A matrix is provided for convenient indication of the proper switch position for a desired measurement range.

The 3¼ digit LCD display can be calibrated for the desired range using the "Display" zero and span pots found on the LCD display board (these are not the same as the "external" ZERO and SPAN controls), and the decimal positioning switch, also located on the display PCB. The display is directly proportional to the 4-20 mA isolated current output. To facilitate installation, an optional two-inch pipe/wall mounting bracket (Code 07) is available.

The Model 120012 is a patented polarographic dissolved oxygen sensor designed for long-life, high accuracy and rugged use in industrial environments. Constructed of Polypropylene and Teflon, the sensor provides three to six months of continuous operation before recharging, which simply involves adding a new supply of liquid electrolyte and a new Teflon membrane. To further reduce maintenance costs and down time, the Teflon membrane is recessed for protection. Should it become damaged, non-technical personnel can easily replace it in a matter of minutes without concern for variable tension, membrane stretching or folding.

The Model 120012 sensor comes with a Flow Chamber Assembly, available only in PVC, that allows the sensor to be mounted "inline". The nozzle directs the sample flow onto the cathode of the sensor. The direct impingement of sample reduces sample flow requirements. It also improves the response to changes in dissolved oxygen while providing a cleaning action to the sensor membrane.

1.2 PHYSICAL SPECIFICATIONS – GENERAL

Enclosure: NEMA 4X, weatherproof and corrosion-resistant, NEMA 7B, explosion proof

Hazardous Area Classification - Explosion Proof:
FM: Class I, Groups B, C, & D, Div. 1
Class II, Groups E, F, & G, Div. 1
Class III
CSA: Class I, Groups C, & D
Class II, Groups E, F, & G
Class III, Encl 4
Class I, Groups A, B, C & D. Div. 2
Encl 4, Factory Sealed

Hazardous Area Classification - Intrinsic Safety:
FM: Class I, II & III, Div. 1
CSA: Class I, Groups A, B, C, & D
Encl 4, Temperature Code T4

Display:
Analog: plug in, 90 degree, 2.5 inch diameter triple scale, 0-5, 0-10, 0-20 ppb X10
Digital: 3.5 digit, LCD, adjustable range in engineering units

Recommended Cable: Transmitter to Power Supply
Two Wire, 18 AWG, shielded, Belden 8760 or equal (Rosemount Analytical P/N 9200001)

Weight/Shipping Weight:
Blind: 1.44 kg/1.89 kg (3.18 lbs/4.18 lbs)
Analog/Digital: 2.15 kg/2.6 kg (4.74 lbs/5.75 lbs)

1.3 PERFORMANCE SPECIFICATIONS – GENERAL

Power Supply Requirements: (See Load/Supply Chart)

Lift Off Voltage:
Blind & Analog: 10 VDC
Digital: 12.5 VDC

Maximum Operating Power: 40 milliwatts

Output:
Blind & Analog: Isolated 4-20 mA into 700 ohms at 24 VDC
Digital: Isolated 4-20 mA into 575 ohms at 24 VDC

Input/Output Isolation: 600 Volts

Ambient Temperature: –30° to 70°C

Relative Humidity: 0-99%

Digital Display Accuracy: 0.1% reading ±1.0 count

Analog Display Accuracy: ±2.0%

External Zero: ±7.0% full scale (25% for 1181T)

External Span: ±7.0% full scale (50% for 1181T)

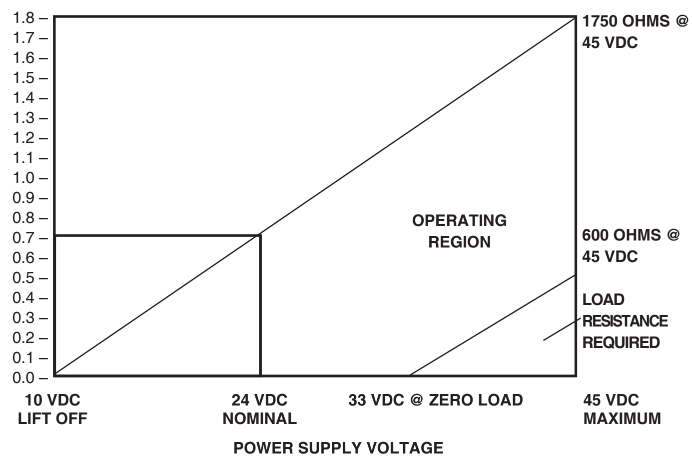
Shock: 10G maximum for 10 milliseconds

Vibration: 0.025 inches double amplitude
5 to 50 Hz for 2 hours

EMI/RFI:
EN61326 CE

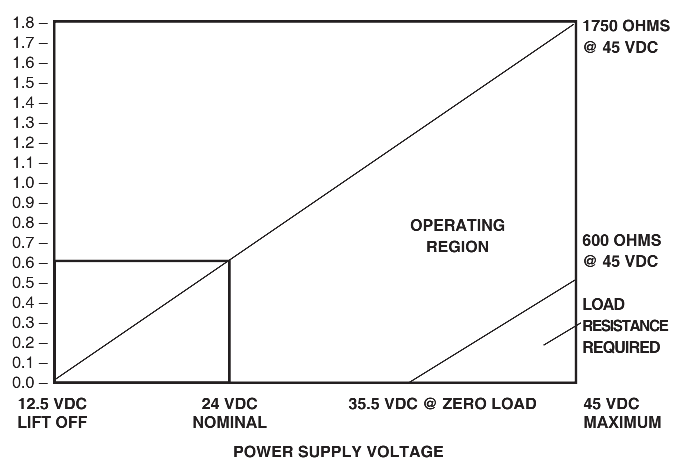
BLIND & ANALOG DISPLAY
LOAD/POWER SUPPLY REQUIREMENTS

+45 VDC @ 600 OHMS MIN. 1750 OHMS MAX.



DIGITAL DISPLAY
LOAD/POWER SUPPLY REQUIREMENTS

+45 VDC @ 600 OHMS MIN. 1750 OHMS MAX.



The **Model 1181PB** Transmitter measures dissolved oxygen in parts per billion. Switch selectable ranges are 0-50, 0-100, and 0-200 ppb with air calibrate.

RECOMMENDED SENSORS:

Rosemount Analytical, La Habra, CA :
Model 120012 (P/N 639900) Rechargeable

1.4 PERFORMANCE SPECIFICATIONS @ 25°C

Measurement Range: 0-50, 0-100, & 0-200 ppb
Accuracy: ±1.0% full scale
Stability: ±1.0% full scale/month, non-cumulative
Repeatability: ±1.0 full scale
Temperature Coefficient: ±0.05 %/°C
Automatic Temperature Compensation: 0-44°C

1.5 ORDERING INFORMATION

Model 1181 ppb DO Two Wire Transmitter is housed in a NEMA 7B explosion-proof, 4X weatherproof, corrosion-resistant enclosure and includes all the circuitry necessary for measurement and transmission of an isolated 4-20 mA signal. The transmitter may be selected with or without an analog or digital display.

MODEL	
1181	TWO-WIRE TRANSMITTER

CODE	INPUT (Required Selection)
PB	Dissolved Oxygen ppb

CODE	DISPLAY (Required Selection)
01	Analog display
02	Blind, without indication
06	Digital display

CODE	OPTIONS
07	Two-inch pipe/wall mounting bracket
11	Stainless steel nameplate (specify marking)

CODE	AGENCY APPROVALS
67	FM Explosion proof and Intrinsically Safe
69	CSA Explosion Proof and Intrinsically Safe
79	CE Construction (not available with Code 67 or 69)

1181	PB	01	07-11	67	EXAMPLE

NOTES:

Recommended cable from +24 volt DC power supply to Model 1181PB is Belden 8760, available from Irvine as P/N 920000; Specify length.

Model 1181PB is designed for use with Rosemount Analytical, La Habra, CA Sensor Model 120012 Rechargeable (P/N 639900) DO Sensor.

SECTION 2.0
INSTALLATION

2.1 UNPACKING AND INSPECTION. Before opening the shipping carton, inspect the outside of the carton for any damage. If damage is detected, contact the carrier immediately. If there is no apparent damage, open the carton and inspect the instrument and hardware. Make sure all the items in the packing list are present and in good condition. Notify the factory if any part is missing. If the instrument appears to be in satisfactory condition, proceed to the transmitter installation.

NOTE

Save the original packing cartons and materials as most carriers require proof of damage due to mishandling, etc., also, if it is necessary to return the instrument to the factory, you must pack the instrument in the same manner as it was received. (refer to Section 10.0 for return of materials instructions).

2.2 MECHANICAL INSTALLATION.

IMPORTANT

Do not attempt to install and operate the Model 1181PB without first reading this manual.

2.2.1 General. The transmitter may be installed in harsh environments. However, it should be installed in an area where sources of extreme temperature fluctuation, vibration and shock are at a minimum or non-existent. Select an installation site that (1) is easily accessed by operating and maintenance personnel; (2) is at least 12 inches (300 mm) from sources of high voltage.

2.2.2 Mounting. The transmitter may be mounted on a flat surface using the two threaded mounting holes located on the bottom of the transmitter or through the use of an optional 2-inch pipe/wall mounting bracket, Code 07 (see Figure 2-1).

2.3 HAZARDOUS LOCATIONS-EXPLOSION PROOF INSTALLATION. In order to maintain the explosion proof rating for the installed transmitter, the following conditions must be met:

1. The transmitter enclosure covers must be on hand tight and the threads must not be damaged.

   NOTE

   These covers seat on o-rings which serve to provide a dust proof enclosure for Class II and Class III installations.

2. Explosion proof "Y" fittings must be properly installed and plugged with a sealing compound to prevent explosive gases from entering the transmitter. CSA has determined that the transmitter housing is "Factory Sealed". Installation of "Y" fittings and the use of sealing compound is not required for CSA approved Explosion Proof installations.

   NOTE

   Do not install sealing compound until all field wiring is complete.

   CAUTION

   Sealing compound must be installed prior to applying power to the transmitter.

3. If one of the conduit connections on the housing is not used, it must be closed with a threaded metal plug with at least five threads engaged.

4. The serial tag cover on the external ZERO and SPAN adjustments must be in place.

5. FM approved Explosion proof installation must be in accordance with drawing number 1400155 (see Figure 2-2).

6. Due to the nature of the measurement, sensors cannot be designed to meet explosion proof certification. If the sensors must be installed in hazardous area locations, Rosemount Analytical Inc. recommends that an intrinsically safe system be installed.

2.4 WIRING-GENERAL. The transmitter is equipped with two (2) ¼ -inch conduit openings, one on each side of the housing. One is for the power supply/signal wiring and the other is for the sensor wiring.

The use of waterproof cable glands or conduit is recommended to prevent moisture from entering the housing. If conduit is used, it should be positioned to prevent condensation from draining into the housing.

It is recommended that the power cable/signal wiring be shielded, twisted pairs that are earth grounded. The transmitter case shall be grounded.

Signal or sensor wiring should never be run in the same conduit or open tray with AC power or relay actuated signal cables. Keep signal or sensor wiring at least 12 inches from heavy electrical equipment.

NOTE

For best EMI/RFI protection the power supply/signal cable should be shielded and enclosed in an earth grounded, rigid metal conduit. Connect the cable's outer shield to the transmitter's earth ground terminal near TB1, Fig. 2-3.

The sensor cable should also be shielded. The cable's outer shield shall be connected to the transmitter's earth ground per the instructions above. If the sensor's outer shield is braided, an appropriate metal cable gland fitting may be used to connect the braid to earth ground via the instrument case.

A new addition to the suite of tests done to ensure CE compliance is IEC 1000-4-5. This is a surge immunity test that simulates overvoltages due to switching and lightning transients.

In order to meet the requirements of this test, additional protection must be added to the instrument in the form of a Transient Protector such as the Rosemount Model 470D. This is a 3½-inch tube with ½-inch MNPT threads on both ends. Inside the tube are gas discharge and zener diode devices to limit surges to the transmitter from the current loop. No additional protection is needed on the sensor connections.

2.4.1 Sensor Wiring. The Sensor wiring terminals are located on the side of the housing designated TERM SIDE on the serial label. Remove the housing cover from the TERM SIDE to gain access to the terminals designated TB2. Remove the optional Analog or Digital display. The plug in analog display is held in by a spring clip and the digital display is held in by a locking screw. Connect the sensor wiring to TB2 terminals 1 through 4 as shown in Figure 2-3.

The Model 120012 dissolved oxygen sensor is connected to the 1181 transmitter via a six (6) conductor cable (PN 70000-04) as shown in Figure 2-3.

Prepare the unfinished (transmitter) end of the sensor cable, as shown in Figure 2-3, then wire the sensor to the transmitter per the following Steps:

1. Connect the connector end of the cable to the PB sensor.
2. Ensure that the transmitter end of the cable has been properly prepared with the green and yellow wires removed and spade lugs attached. Insert the cable through the conduit opening opposite the external zero and span screws. This side MUST be used due to the large size of the cable.

2.4.2 Power and Signal Wiring. The power and signal wiring terminals are located directly above the Sensor wiring terminals and are designated TB1 (see Figure 2-3). TB1 also provides for plugging in the optional Analog display or wiring of the optional digital display.

2.5 HAZARDOUS LOCATIONS-INTRINSICALLY SAFE INSTALLATION. To secure and maintain intrinsically safe installation for the appropriate approval agency, the following conditions must be met:

1. Code 67 must be specified when ordering F.M. units. Approved "Entity" installation must be in accordance with Drawing Number 1400153 (see Figure 2-4).
2. Code 69 must be specified when ordering CSA (Canadian Standards Association) units. Installation must be performed in accordance with Drawing Number 1400157 (see Figure 2-5).

2.6 DISSOLVED OXYGEN SENSOR. The sensor should be installed in San environment where the temperature remains between 0 and 44°C (32-110°F). It is used in combination with the 627866 flow chamber and should be mounted as described in the following sections.

2.6.1 Installation Procedure. The sensor is shipped assembled and charged, ready for use. Occasionally, however, a new sensor may perform unsatisfactorily upon initial start-up, because of previous long storage or other unusual circumstances. If this occurs, the sensor must be recharged as explained in Section 8.3. During subsequent routine operation, the sensor will require periodic recharging, typically about once every three months. Outline and mounting dimensions of the flow chamber are given in Figure 2-6.

2.6.2 Monitoring Boiler Feedwater or Other High-Purity Water. The flow chamber may be mounted behind the panel of a water quality system, or in the plant, near the sample point.

1. Mount the flow chamber horizontally, with the outlet port facing upward. Thus, upon start-up, any gas bubbles will be rapidly purged. Mounting the flow chamber horizontally also prevents entrapment of gas bubbles on the surface of the sensor membrane.
2. A siphon-breaker vent should be installed in the outlet line so that the flow chamber will remain full of water during boiler shutdowns (see Figure 2-7).
3. The sensor is installed in the flow chamber with adaptor (P/N 193523) and safety clamp (see Figure 2-6).
4. Sample Temperature and Flow Requirements. Preferably, the flow chamber should receive sample that has been temperature-conditioned to 25°C ±1°C. If this is not possible, use water-cooled sample with the temperature held constant to ±5°C.

2.6.3 Monitoring Deaerated Sea Water. In the multi-stage flash vaporization process for desalinization of sea water, feedwater is deaerated prior to entry into the evaporators. Because of the highly corrosive effect of oxygenated sea water, the deaeration efficiency should be monitored continuously. Installation of the flow chamber is essentially the same as for monitoring boiler feedwater, as described in Section 2.6.2.

2.6.4 Monitoring Deoxygenated Brine for Oil Well Flooding. In oil well flooding, large volumes of brine are pumped underground to replace oil and brine removed during the oil production operation.

To prevent excessive corrosion of equipment, the brine is deoxygenated prior to pumping underground. Use of the Model 1181PB DO is essentially the same as the boiler feedwater and desalinization applications previously described. However, the brine may contain metallic sulfides which may form a coating on the oxygen sensor, thus requiring more frequent sensor maintenance than in the other applications.

A typical sampling system is shown in Figure 2-7. Sample for the flow chamber is obtained via a tap in the piping on the discharge side of the flooding pump. A needle valve is used to regulate sample flow. Installation of a flowmeter in the sample line is usually impractical because of the coating problem. Instead, flow is measured by allowing the discharge from the chamber to flow into a graduated cylinder for a timed interval. Recommended flow rate is approximately 500 milliliters per minute.

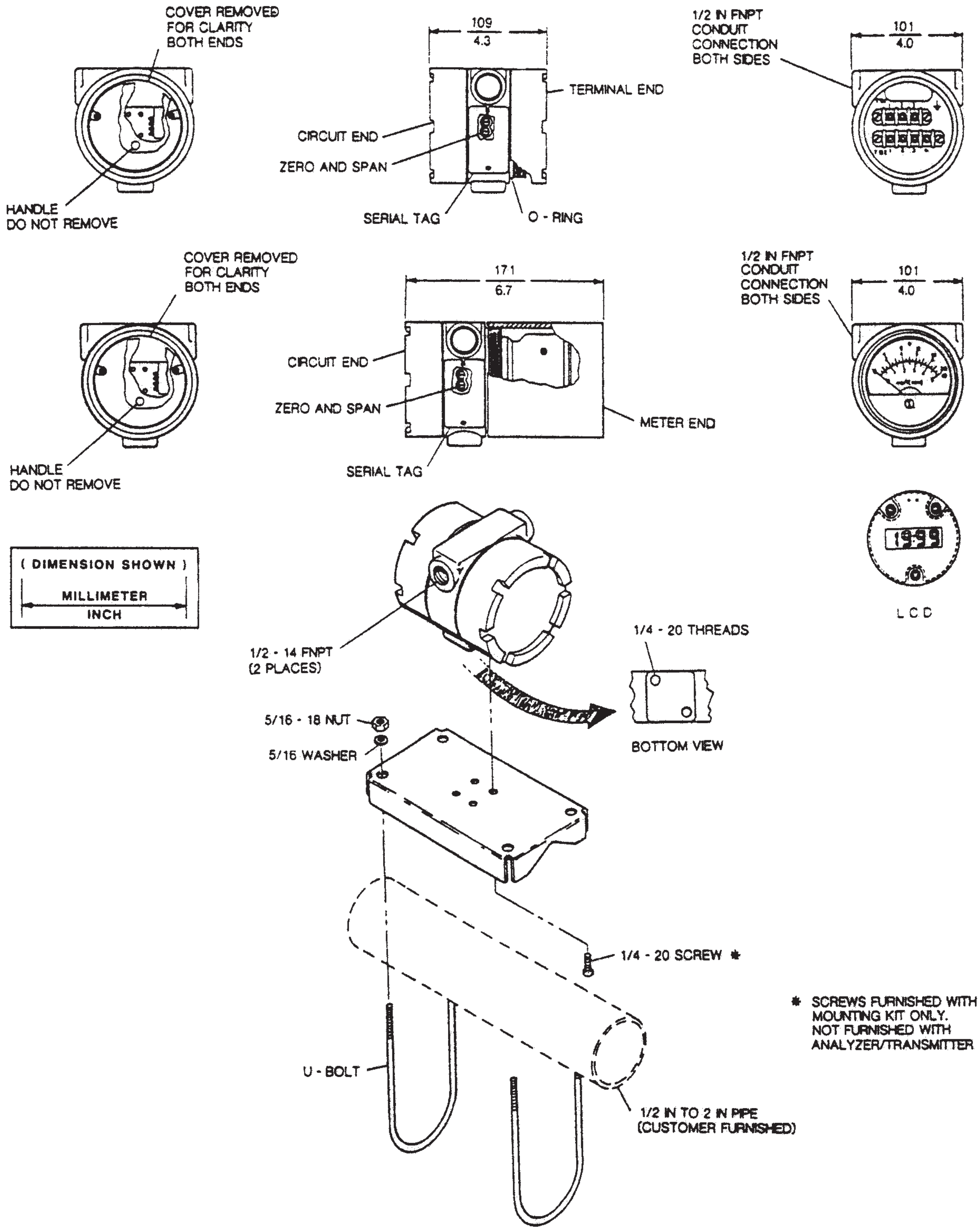


FIGURE 2-1 Mounting and Dimensional Drawing

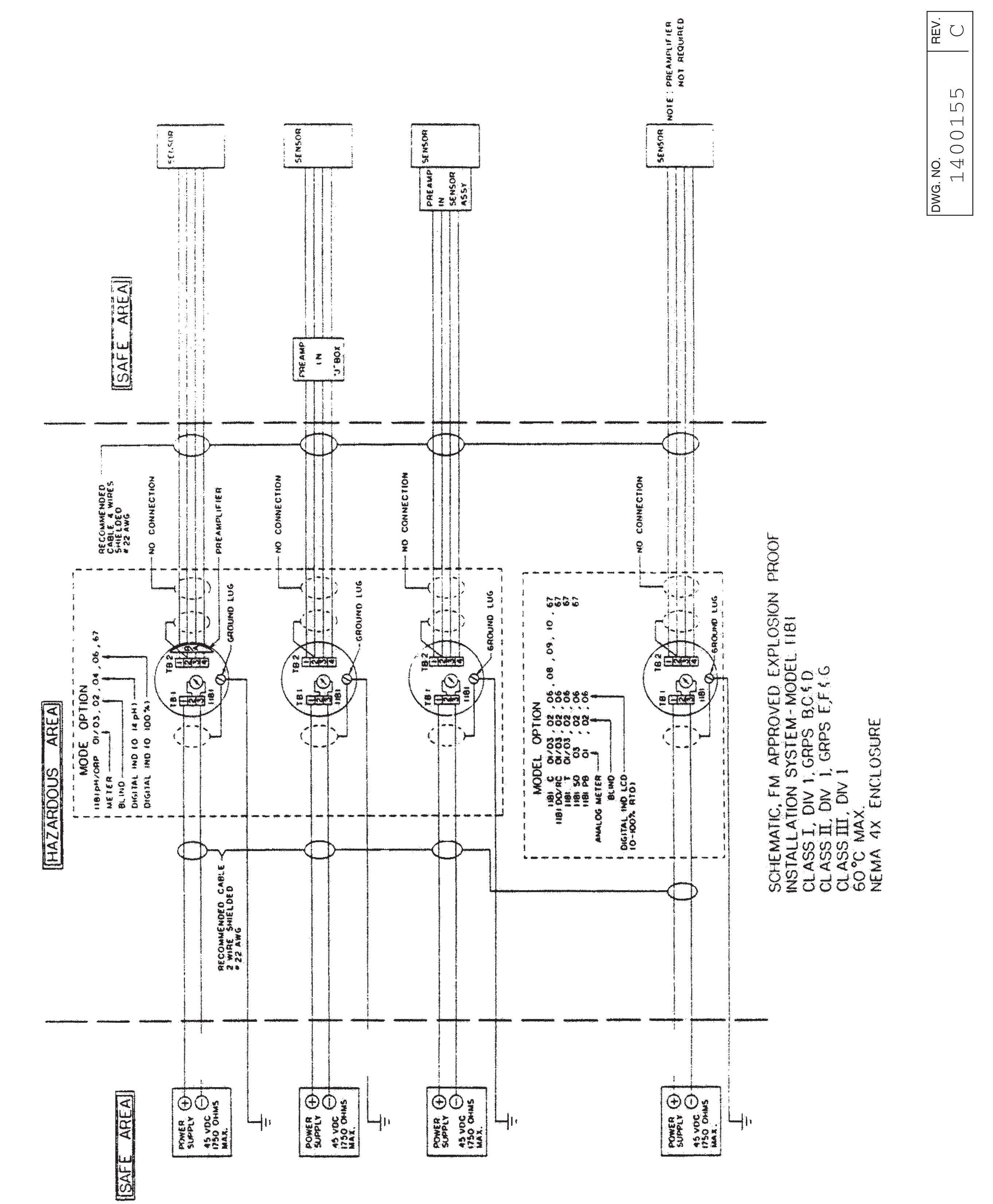


FIGURE 2-2. Schematic System, F.M. Explosion Proof Approved

Power Wiring (TB1)
TB1-1, Loop Signal [Power Supply (+)VDC]*
TB1-2, Meter (+) Red
TB1-3, Loop Signal [Power Supply (-) VDC]* /Meter (-)
* 4-20 mADC

Sensor Wiring (TB2)
TB2-1 TC Element (Brown)
TB2-2 Shield
TB2-3, Gold Cathode (Black) and T. C. Element (Blue)
TB2-4, Silver Anode (Red)

Note: The white and green wires of the sensor cable are not used and should be cut back away from the terminal connections of the 1181.

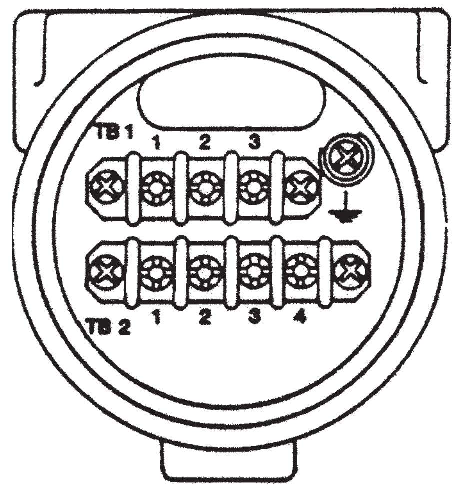
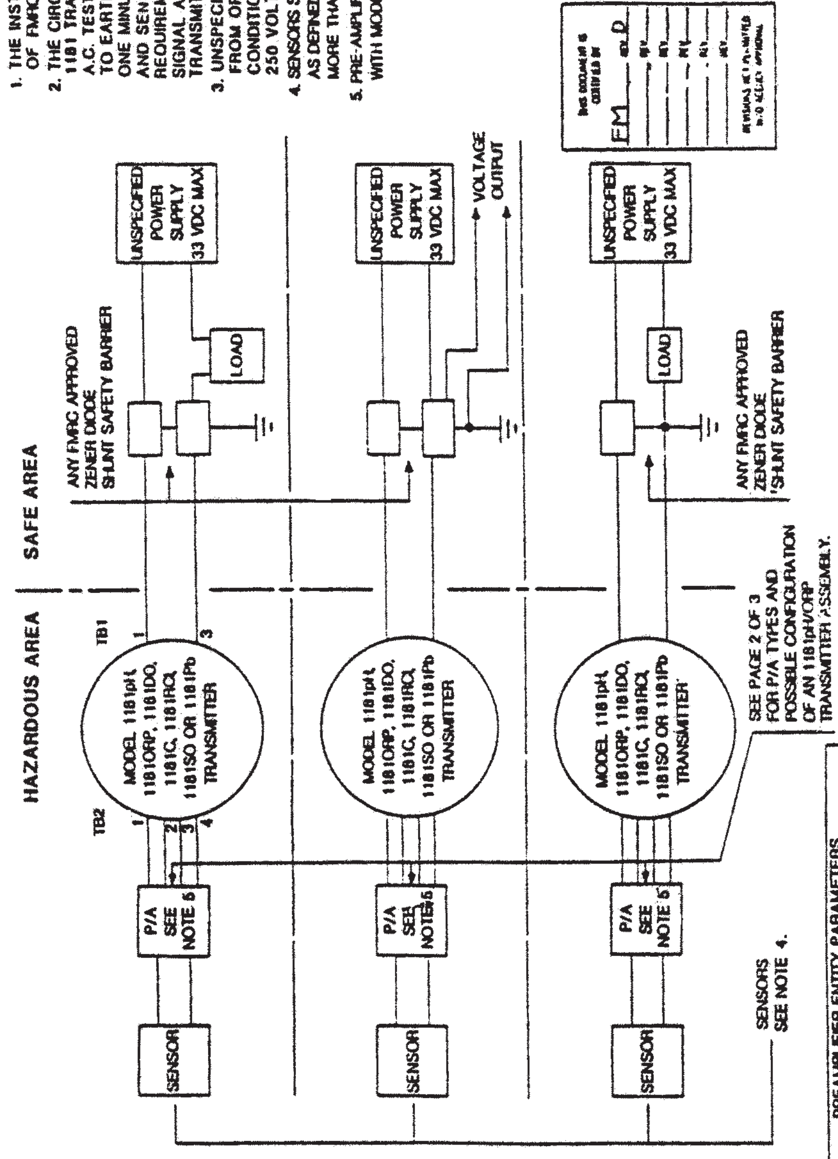


FIGURE 2-3. Transmitter Wiring

1181 ENTITY PARAMETERS SUPPLY/SIGNAL TERMINALS 1 & 3				
MODEL NO.	V max (vdc)	I max (mA)	Ci (uf)	Li (mH)
1181pH/ORP	33	230	0.08	0.15
1181C	33	230	0.08	0.15
1181DO/RCl	33	230	0.08	0.15
1181SO/Pb	33	230	0.08	0.15

1181 ENTITY PARAMETERS - SENSOR TERMINALS 1, 2, 3 & 4 GROUPS A & B				
MODEL NO.	Voc max (vdc)	Isc max (mA)	Ca max (uf)	La max (mH)
1181pH/ORP	11.8	12.5	1.0	200.0
1181C	11.8	20.5	1.0	80.0
1181DO/RC	11.8	6.9	1.0	600.0
1181SO/Pb	11.8	6.6	1.0	700.0



PREAMPLIFIER ENTITY PARAMETERS				
PART NUMBER	V max (vdc)	I max (mA)	Ci (uf)	Li (mH)
22698-02	16	16	0.6	0
22941-00	16	16	0.6	0
22729-01	16	16	0.6	0

1. THE INSTALLATION MUST CONFORM TO THE REQUIREMENTS OF FMRC.
2. THE CIRCUIT AT THE SUPPLY TERMINALS (TB1) OF THE MODEL 1181 TRANSMITTER MUST BE CAPABLE OF WITHSTANDING AN A.C. TEST VOLTAGE OF 500 VOLTS rms WITH RESPECT TO EARTH OR FRAME OF THE APPARATUS FOR A PERIOD OF ONE MINUTE WITHOUT BREAKDOWN. THE PRE-AMPLIFIERS AND SENSORS NEED NOT MEET THE 500 VOLT INSULATION REQUIREMENT DUE TO THE ELECTRICAL ISOLATION BETWEEN SIGNAL AND SUPPLY TERMINALS (TB2), (TB1) OF THE TRANSMITTER.
3. UNSPECIFIED SAFE AREA APPARATUS MUST NOT BE SUPPLIED FROM OR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS A SOURCE OF POTENTIAL EXCEEDING 250 VOLTS rms OR 250 VOLTS dc.
4. SENSORS SHALL MEET THE REQUIREMENTS OF SIMPLE APPARATUS AS DEFINED BY FMRC. THEY CAN NOT GENERATE NOR STORE MORE THAN 1.2V 0.1A, 25mW or 20uJ.
5. PRE-AMPLIFIERS ARE ONLY REQUIRED WHEN USED IN CONJUNCTION WITH MODELS 1181pH & 1181ORP TRANSMITTER.

FIGURE 2-4. Schematic System, F.M. I.S. Approved-Entity (1 of 3)

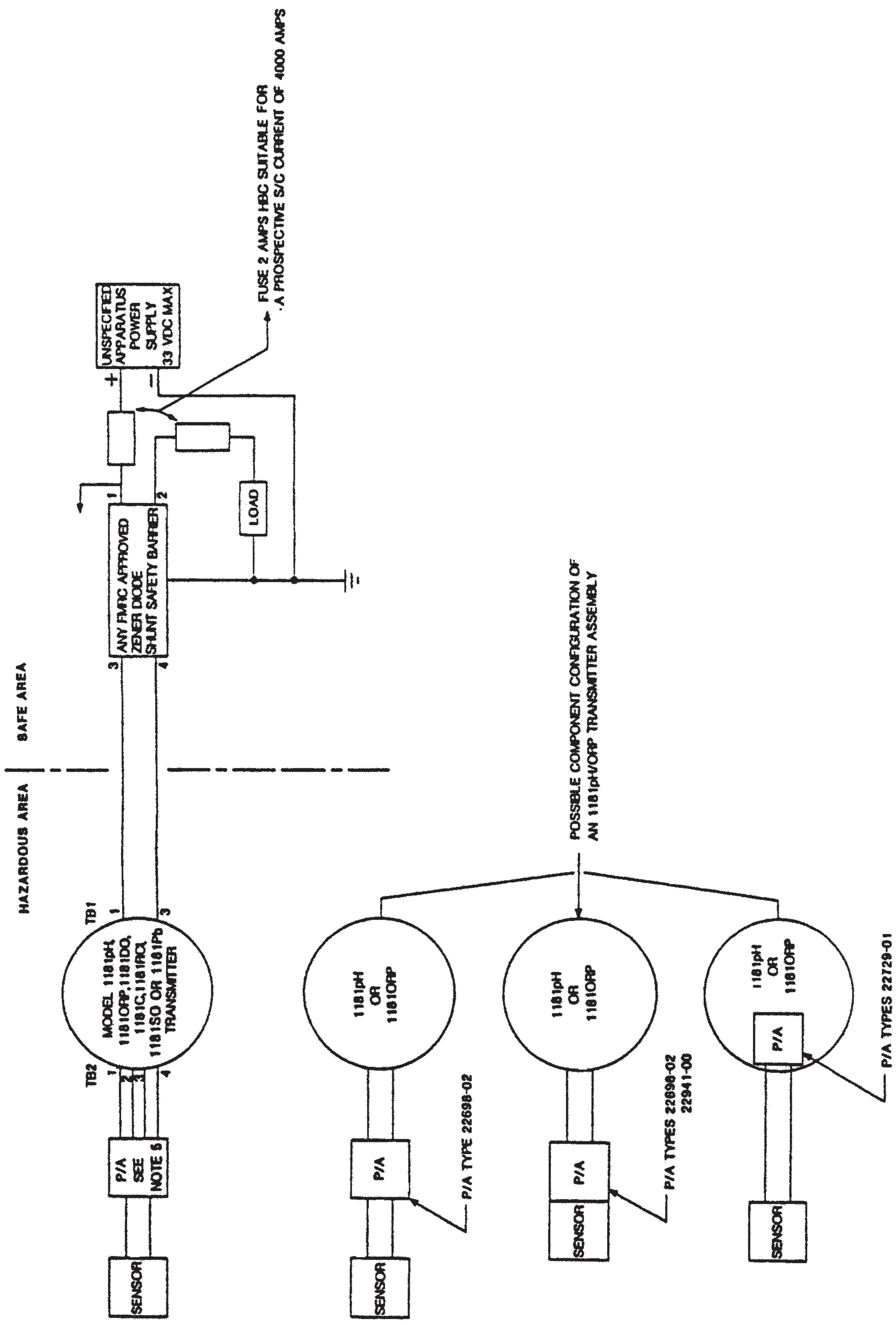


FIGURE 2-4. Schematic System, F.M. I.S. Approved-Entity (2 of 3)

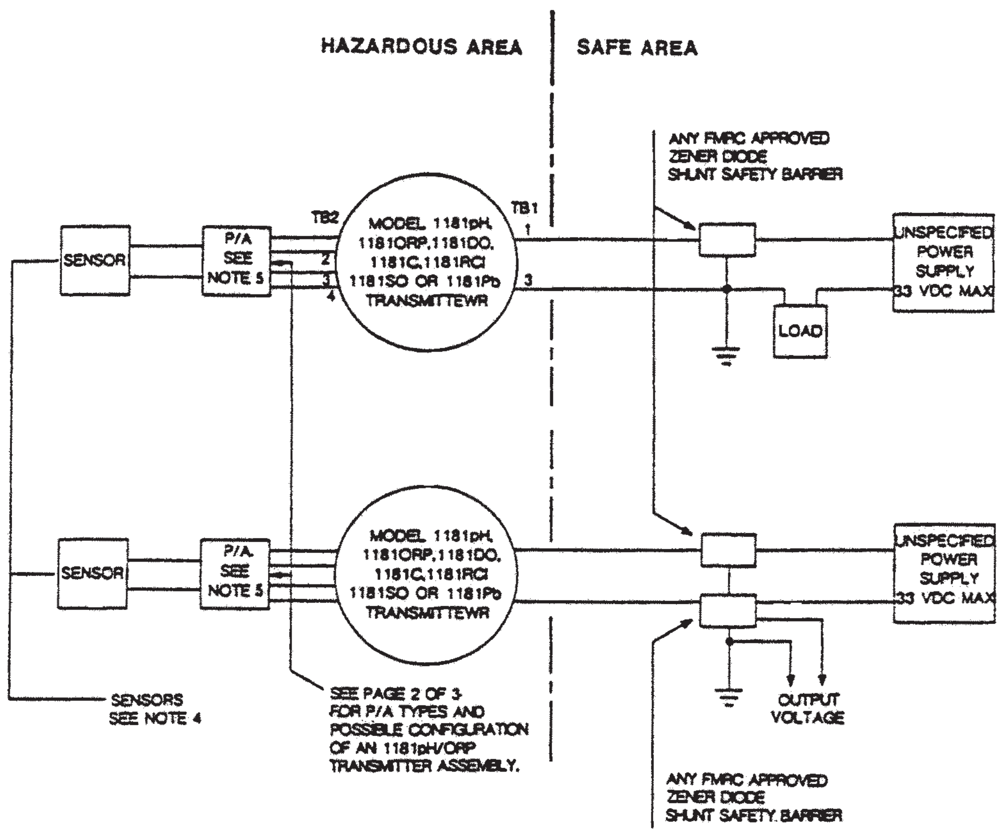
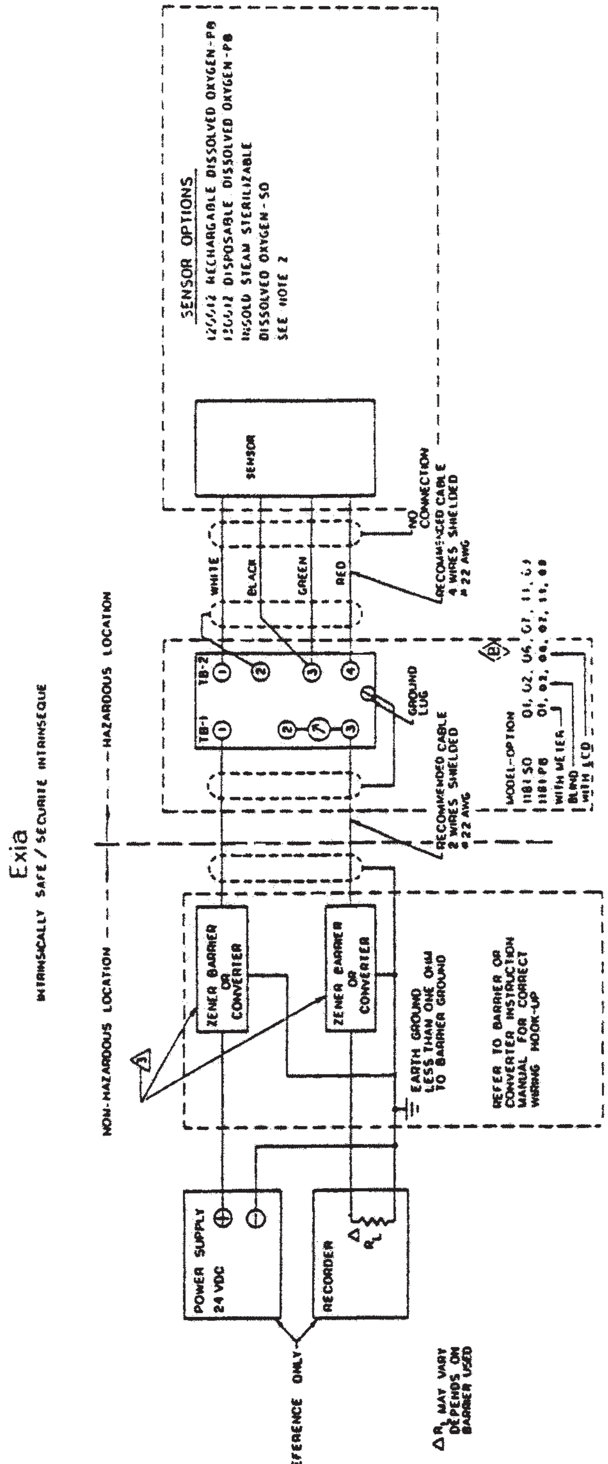


FIGURE 2-4. Schematic System, F.M. I.S. Approved-Entity (3 of 3)



NOTES: UNLESS OTHERWISE SPECIFIED

1. ANY CHANGE TO THIS DRAWING MAY AFFECT CSA APPROVAL

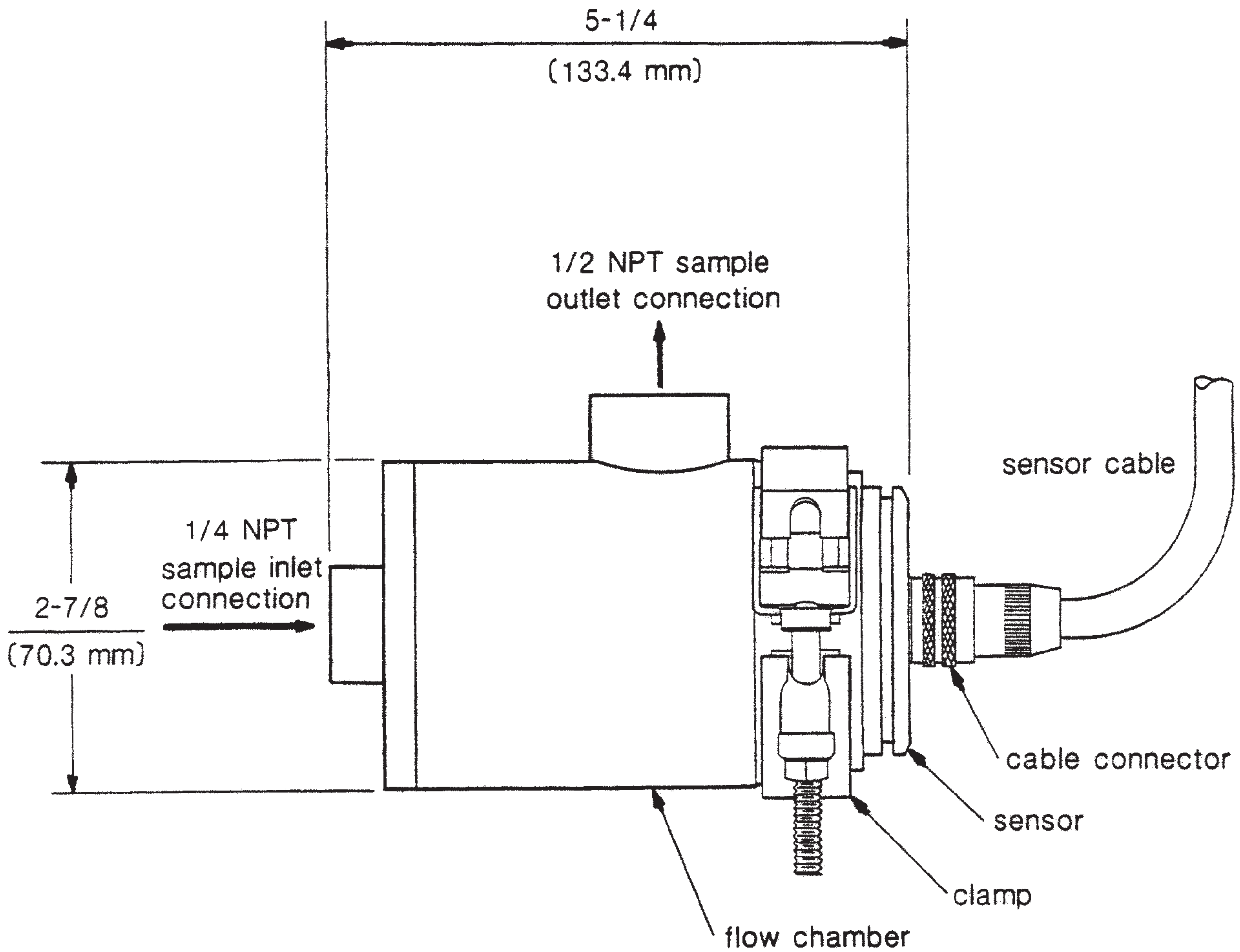
2. SENSOR ASSEMBLIES IN THIS SYSTEM ARE LOW ENERGY NON INCENTIVE DEVICES WHICH DO NOT CONTAIN MAKE/BREAK CONTACTS OR COMPONENTS WHICH PRODUCE OR STORE MORE THAN 1.2V, 0.1A, 25mW OR 20 μJ.

3. APPROVED FOR CLASS 1, DIVISION 1, GROUPS C & D WHEN USED IN CIRCUIT WITH TWO CSA CERTIFIED SINGLE CHANNEL SAFETY BARRIERS (OF LIKE POLARITY), ONE WITH APPROVED SAFETY PARAMETERS OF 30 VOLTS OR LESS AND 150 OHMS OR MORE IN PLUS POWER LINE, AND ONE WITH APPROVED SAFETY PARAMETERS OF 10 VOLTS OR LESS AND 47 OHMS OR MORE IN PLUS OUTPUT LINE.

   APPROVED FOR CLASS 1, DIVISION 1, GROUPS A, B, C, D WHEN NOT USED IN CIRCUIT WITH TWO CSA CERTIFIED SINGLE CHANNEL SAFETY BARRIERS (OF LIKE POLARITY) ONE WITH APPROVED SAFETY PARAMETERS OF 28 VOLTS OR LESS AND 300 OHMS OR MORE IN PLUS POWER LINE, AND ONE WITH APPROVED SAFETY PARAMETERS OF 10 VOLTS OR LESS AND 47 OHMS OR MORE IN PLUS OUTPUT LINE.

DWG. NO.	REV.
1400157	B

FIGURE 2-5. Schematic System, CSA I.S. Approved-Loop



NOTES:

1. Weight: approximately 3 pounds (1.36 kg).
2. Allow 6 inches (152.4 mm) minimum clearance for sensor removal.
3. All dimensions are in inches ±1/16 and millimeters ± 2
4. Allow 2 inches (50.4 mm) for safety clamp removal.

FIGURE 2-6. Flow Chamber with Sensor Dimensions

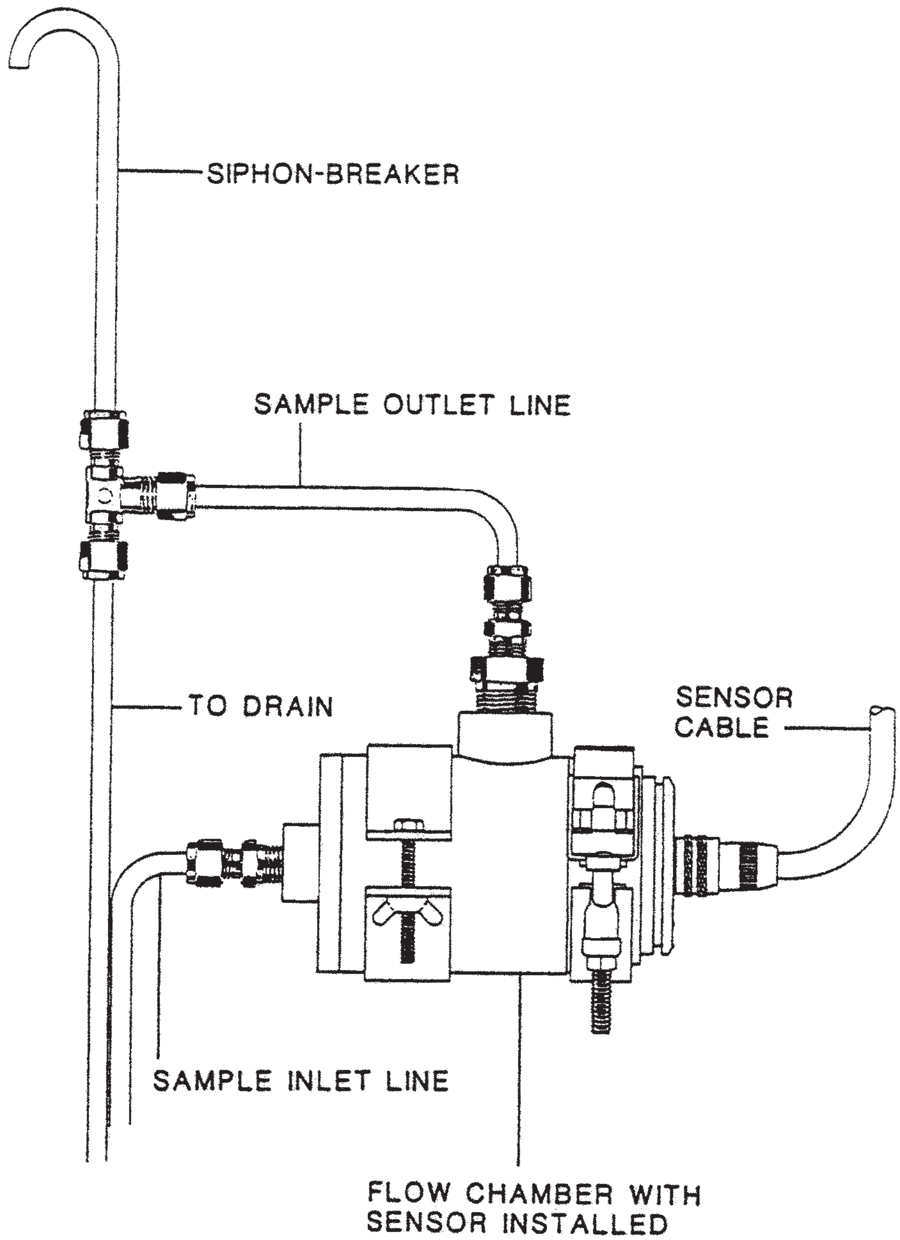


FIGURE 2-7
. Typical Installation with Siphon Breaker

SECTION 3.0
DESCRIPTION OF CONTROLS

3.1 DESCRIPTION OF CONTROLS.

3.1.1 Range Selector Switch. A set of five (5) dip switches used for selecting the 1181PB measurement ranges (0-50, 0-100, 0-200PB). The Air Calibrate position is used during Start Up, Periodic Maintenance or Troubleshooting (see Figure 3-1).

3.1.2 Coarse Span Adjust. A 280° printed circuit board mounted potentiometer used for coarse adjustment of the operating range for the 1181 transmitter (see Figure 3-1).

3.1.3 Analog/LCD Operation Jumper located on the transmitter display PCB. When the jumper is in the W5 position (• □□) position, the 1181PB will operate only with an analog meter or as a blind unit. But when the jumper is in the opposite position (□□ •) or is removed, the 1181PB will operate only with an LCD (see Figure 3-2).

3.1.4 External Zero Adjust. A 20-turn potentiometer for fine tuning the low end current output value with respect to the low end of the measurement range selected by the Range Selector Switches (see Figure 3-3).

3.1.5 External Span Adjust. A 20-turn potentiometer for fine tuning the full scale current output value with respect to the full scale value of the measurement range selected by the Range Selector Switches (see Figure 3-3).

3.1.6 LCD Zero and Span. Printed circuit board mounted potentiometers for adjustment of the LCD display. The display can be adjusted for any value from 0 to 1999 (see Figure 3-4).

3.1.7 LCD Decimal Point Switch. Switch for selection of the decimal point location on the LCD display (see Figure 3-4).

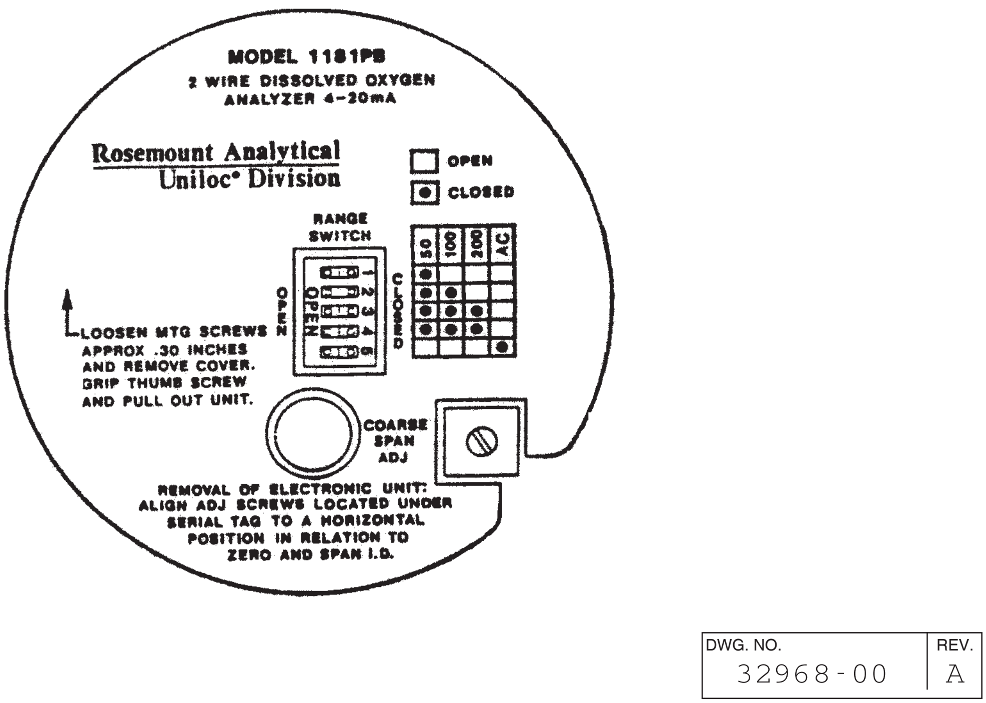


FIGURE 3-1. Range Selector Switch and Course Span Adjust

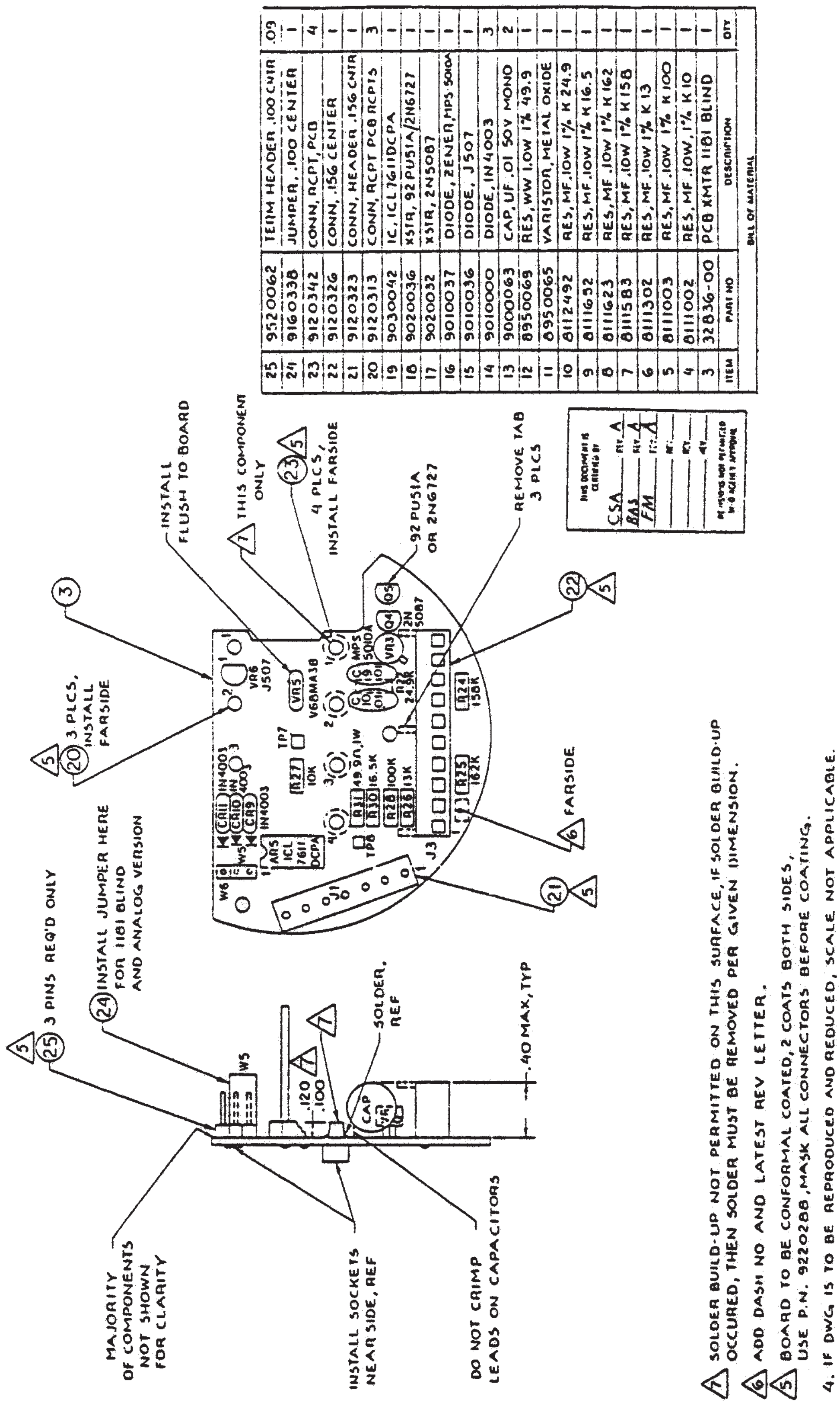


FIGURE 3-2. Display PCB

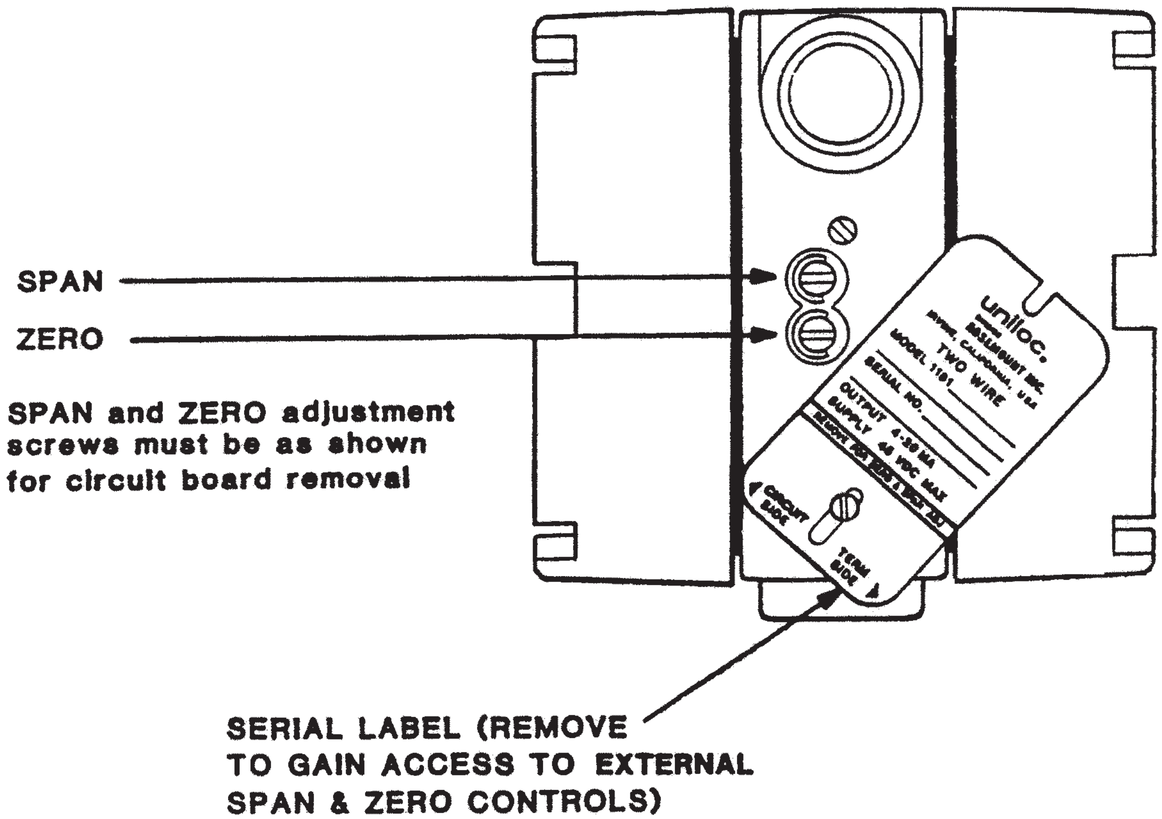


FIGURE 3-3. External Zero and Span Adjust

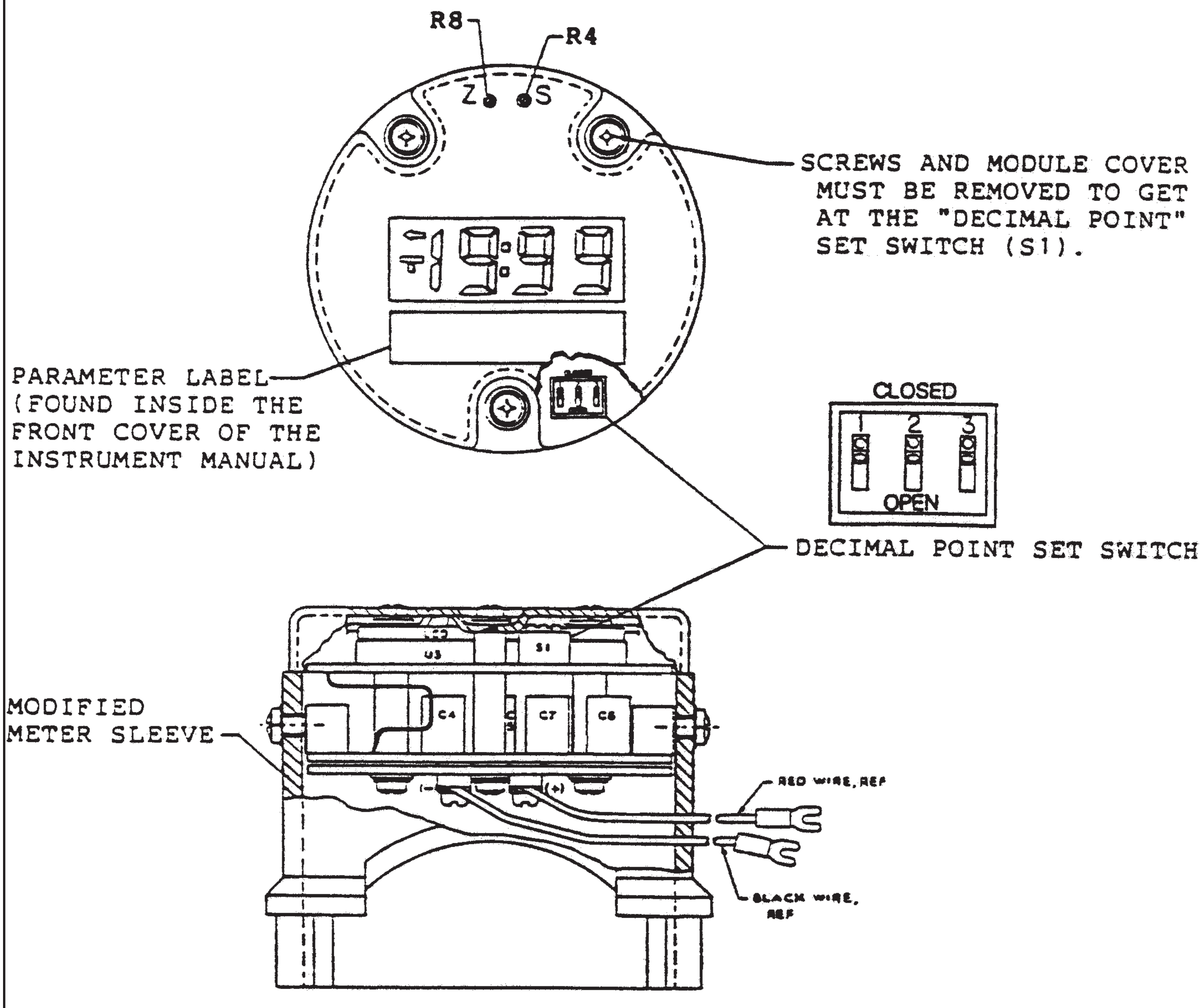


FIGURE 3-4. Digital Display

SECTION 4.0
CONFIGURATION

4.1 GENERAL The Model 1181PB is factory calibrated to measure 0-200 ppb dissolved oxygen corresponding to a 4-20 mA. The optional LCD display is calibrated to 0-100% corresponding to 4-20 mA.

NOTE

Do not attempt to adjust any sealed adjustment pots.

4.2 RANGE SELECTION. The sequence for changing the full scale measurement of the Model 1181PB is shown on a range matrix opposite the range switch block (see Figure 3-1). The matrix is accessed by removing the housing cover on the circuit side of the transmitter.

The first three columns of the range matrix identifies each range switch position (on or off) to accommodate the desired full scale measurement range or for air calibration. For example, if a 0-50 ppb full scale measurement range is desired, reading vertically on the range matrix, switches 1 thru 5 should be closed and switch 1 should be open.

4.3 COARSE SPAN ADJUSTMENT. The course span adjustment 1 turn potentiometer should be set at mid range before start-up procedures (see Figure 3-1).

4.4 EXTERNAL ZERO AND SPAN ADJUSTMENT. These 20-turn potentiometers should be set at mid range before commencing start-up proceedures (see Figure 3-3).

4.5 DIGITAL DISPLAY. The digital display is factory calibrated to indicate 0-100% corresponding to 4-20mA and is provided with independent zero and span potentiometers.

The LCD is a three and a half digit display and may be calibrated in engineering units (ppb DO) to indicate from 000 to 1999.

A decimal point switch is provided and may be accessed by removing three cover screws and the cover. The decimal point switch is located below and to the right of the LCD display. The dip switches are designated s1, s2, and s3. The decimal point adjustment is as follows:

Decimal Point Position	s1	s2	s3
1999	open	open	open
199.9	open	open	closed
19.99	open	closed	open
1.999	closed	open	open

To calibrate the LCD display, adjust the zero potentiometer for 000 at 4.0 mA output and the span potentiometer for the full scale (ppb DO) range at 20.0 mA output.

SECTION 5.0
START UP AND CALIBRATION

5.1 GENERAL. This section provides the start-up and calibration procedure for the Model 1181PB two-wire transmitter. The Transmitter is used in conjunction with the PB sensor assembly.

5.2 TRANSMITTER ZERO. This procedure is required to electronically zero the transmitter/sensor loop. In order to eliminate any residual current in the sensor it must be placed in a zero DO solution and remain there for a minimum of 12 to 24 hours before adjusting the transmitter zero. 2% sodium bislfite ($NaHSO_3$), nitrogen gas, or fresh water sparged with nitrogen gas should be used for zeroing.

1. Make sure the transmitter and sensor are installed and wired as specified in Sections 2.0 and 3.0 and that the sensor is completely dry, then apply power to the transmitter.
2. Remove the covers from the transmitter housing.
3. Place the RANGE SWITCH in the 50 ppb range position (see Figure 5-1).
4. Place sensor in zero DO solution and allow it to remain there for 12 to 24 hours before proceeding.

5.2.1 Zero Adjustment for Transmitters with Analog Meter (Code 01). Adjust the external zero control of the Transmitter to obtain a 4.0 mA output and a zero meter indication of zero.

5.2.2 Zero Adjustment for Transmitters with LCD Digital Display.

1. Adjust the external zero control of the Transmitter to obtain a 4.0 mA output.
2. Adjust the zero adjustment on the Digital LCD Display to indicate zero.

5.3 AIR CALIBRATION. To initially calibrate the Transmitter/Sensor loop for response oxygen partial pressure, use the following procedure:

1. Expose the sensor to ambient air. The membrane must be clean and dry. Inspect the membrane for splits, tears, wrinkles or any obvious damage. Make sure there is no oil or solvent coating on the membrane.
2. Remove the cover from the circuit side of the transmitter housing.
3. Set RANGE SWITCH to the AC (Air Calibrate) position (see Figure 5-1).
4. Allow sufficient time (up to 60 minutes) for the sensor to reach temperature equilibrium with the air.
5. Once the reading is stable, adjust the EXTERNAL SPAN control to the minimum reading.

5.3.1 Air Calibration Adjustment for Transmitters with Analog Meters (Code 01).

1. Adjust the COURSE SPAN ADJUST pot (see Figure 5-1) to a reading on the 0-100 ppb scale on the Analog Meter, which equals $^1/_{10}$ of the local barometric pressure in millimeters of Mercury (mmHg).

NOTE
1 inch Hg = 25.4 mmHg
1 mmHg = 0.133 kPa

EXAMPLE: If the barometric pressure reading, obtained from your local weather station or airport, equals 30.16 in Hg then:

$$(30.16 \text{ in Hg}) \text{ X } (25.4 \tfrac{\text{mmHg}}{\text{in H2}}) = 766 \text{ mmHg}$$

The reading on the Analog Meter's 0-100 ppb scale would then adjusted to $^1/_{10}$ of 766 or 76.6.

2. If required, adjust the External SPAN control to obtain the exact Analog METER indication.
3. Set Range Switch to the desired a range.
4. Install Sensor into the flow chamber and allow the system to purge 12 to 24 hours.

5.3.2 Air Calibration Adjustment for Transmitters with LCD Digital Display (Code 06).

1. Adjust the COURSE SPAN ADJUST POT (see Figure 5-1) to obtain a transmitter output calculated from the local barometric pressure as follows (see note in Section 5.3.1 on converting barometric pressure in inches of mercury (inHg) to millimeters of Mercury (mmHg):

$$\text{Output(mA)} = \frac{\text{Barometric Pressure (mmHg)}}{62.5} + 4.0$$

2. If required, adjust the EXTERNAL SPAN control to obtain the exact milliamp output.
3. Adjust the LCD DIGITAL DISPLAY by adjusting the SPAN ADJUST on the DIGITAL DISPLAY to indicate the following ppb concentration, based on the desired operating range in ppb:

Desired Operating Range	Adjust LCD Digital Display Span to Read:
0-50 ppb	$\text{ppb} = \frac{\text{Barometric Pressure (mmHg)}}{20}$
0-100 ppb	$\text{ppb} = \frac{\text{Barometric Pressure (mmHg)}}{10}$
0-200 ppb	$\text{ppb} = \frac{\text{Barometric Pressure (mmHg)}}{5}$

The digital LCD display is now calibrated.

4. Set the RANGE SWITCH to the desired operating range.
5. Install the sensor into the flow chamber and allow the system to purge 12 to 24 hours.

5.4 CALIBRATION FOR MEASURING PPB OXYGEN

The final calibration adjustment takes into account the actual solubility of oxygen in the process. Adjustment is made based on chemical analysis of a process grab sample. Sampling procedures and the method of analysis will depend upon the current procedure used for a particular application, such indigo carmen analysis for boiler feed, or US Department of the Interior methods for deaerated sea water, etc.

In any case, final calibration should be performed only when the process is in a steady state conditions, and not during upsets or when oxygen concentrations are rapidly fluctuating.

1. Note the reading on the Analog Meter or LCD Digital Display at the time the grab sample is taken.
2. If the reading on the Analog Meter or Digital Display has not changed after the analysis has been completed, adjust the External span adjust pot to match the analysis. The transmitter/sensor loop is now calibrated.
3. If the reading on the Analog Meter or Digital Display has changed since the grab sample was taken, adjust the external span adjust pot to obtain a ppb reading as calculated below:

Adjust Reading to:

$$\text{ppb} = \frac{\text{Concentration by lab analysis}}{\text{Reading at time of sampling}} \times \text{Present Reading}$$

The Transmitter/Sensor loop is now calibrated.

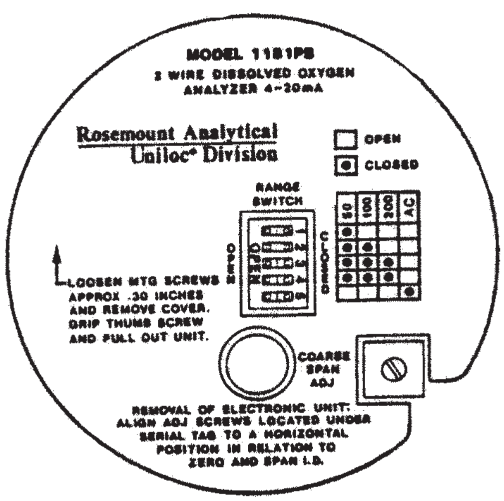


FIGURE 5-1. Matrix Cover-Range Selection

SECTION 6.0
THEORY OF OPERATION

6.1 MODEL 1181PB. The Model 1181PB Two-Wire Transmitter automatically and continuously measures low-level concentrations of dissolved oxygen in water or aqueous solutions. The determination is based on the measurement of the electrical current developed by the dissolved oxygen measurement sensor in contact with the sample. This theory of operation is illustrated below (see Figure 6-1 Simplified Block Diagram).

6.1.1 Liftoff Voltage. The transmitter lifts off approximately 10 volts from the loop current to power the electronics. The voltage dropped across VR1 provides for the system voltage. Upon start-up, a voltage potential must be established across VR1 to power the power supply (P.S.) module. To establish this voltage, a starting current is generated by current diode CR1 (Q1 and Q2 are off during start-up). Once the power supply module is started, power is provided for AR1 and then 1 and 2 are switched on to regulate the current loop current.

6.1.2 Power Supply Module. The power supply module on the loop-side switches at 10K Hz to provide ±5 volts power for the sensor-side power supply module, and ±5 volts power for the loop-side module. The power supply mode also provides modulator and demodulator chopping signals. On the sensor-side a polar voltage is generated for the sensor electrodes and the resultant current is scaled.

6.1.3 Temperature Compensation Circuit. The dissolved oxygen measurement of a solution varies with temperature change. Change in temperature is sensed at the sensor and is automatically corrected to a reference temperature of 25°C.

6.1.4 Output Signal. After the signal is corrected for the temperature, it is then modulated across the isolation transformer and receiver by amplifier AR1, where it is generated as a current proportional to the modulated signal plus four milliamps. Diode CR2 protects against reverse current flow, and CR3 and CR4 are meter diodes.

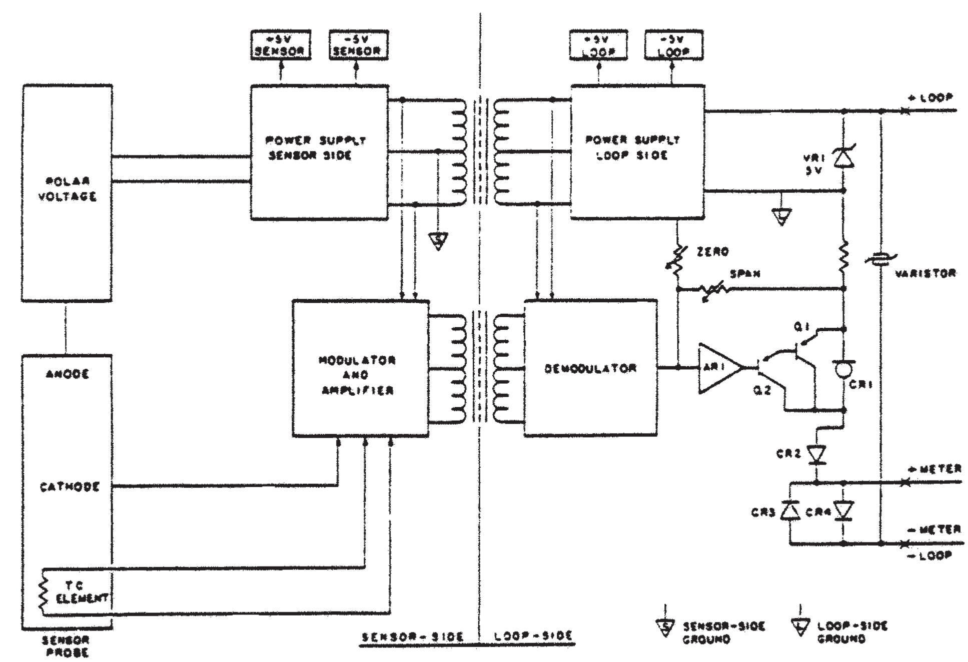


FIGURE 6-1. Simplified Block Diagram

6.2 DISSOLVED OXYGEN MEASUREMENT SENSOR

Rosemount Analytical utilizes the amperometric membrane technique for the measurement and control of dissolved oxygen. The success of membrane electrodes stems from the isolation of the electrodes (cathode and anode) and electrolyte from the sample by means of a semi-permeable membrane. This membrane protects the electrodes from contamination by restricting the flow of sample to gases only, and oxygen in particular.

Within the body of the sensor is a gold cathode and a silver anode, electrically connected by potassium chloride (KCL) electrolyte solution and separated from the process stream by a gas permeable membrane. The transmitter lifts off at approximately 10 VDC from the loop current to power the electronics and, in turn, supplies a constant 750mV DC polarizing voltage which is impressed across the two electrodes.

Oxygen from the sample diffuses through the membrane and is reduced at the gold cathode. The resultant electrical current flow between anode and cathode is proportional to the partial pressure of oxygen in the sample. The chemical reactions which accompany this process are as follows

Gold cathode: $O_2 + 2H_2O + 4e^- \quad 4OH^-$

Silver anode: $4Ag + 4C1^- \quad 4AgC1 + 4e^-$

The reaction that takes place at the anode is the oxidation of silver to form silver chloride. This reaction is offset at the gold cathode by the reduction of oxygen molecules to hydroxide ions. The resulting current is directly proportional to the dissolved oxygen content of the sample stream.

A 30K thermistor incorporated in the sensor, is used by the 1181PB transmitter to; (1) compensate for temperature-dependent variations in the permeability of the membrane to oxygen and (2) to compensate for temperature-dependent variations in the solubility of oxygen in water.

During installation, the sensor is mounted in the flow chamber. Within the chamber, the sample passes through a nozzle and impinges directly onto the membrane area of the sensor. This arrangement permits fast response with comparatively low sample flow.

6.2.1 Measurement Variables. Variables that influence the dissolved oxygen measurement include barometric pressure, relative humidity, sample temperature, interfering gases and composition of the liquid medium.

6.2.2 Barometric Pressure and Relative Humidity. Rate of oxygen diffusion through the sensor membrane, and therefore the sensor response, is linear with respect to oxygen partial pressure (assuming constant sample temperature).

At the normal sea-level barometric pressure of 760 mm Hg (101.3 kPa), the oxygen partial pressure of dry air is 160 mm Hg (21.2 kPa). As atmospheric pressure deviates from the standard value, the oxygen partial pressure varies proportionally. Accordingly, the solubility of oxygen in water varies in proportion to the change in the partial pressure of oxygen in air. Barometric pressure is therefore a significant factor instrument calibration.

6.2.3 Relative Humidity. In calibration for dissolved oxygen measurement, one method is to expose the sensor to a gaseous sample, typically dry air, of accurately known oxygen content. The known gaseous oxygen concentration value is the related to a corresponding dissolved oxygen value.

Since dry air contains 20.95 oxygen by volume, regardless of the barometric pressure, the partial pressure of oxygen can be shown to be directly proportional to the total barometric pressure, according to Dalton's law of partial pressures. Thus for dry air, if the total barometric pressure is known, the partial pressure of oxygen can be computed. However, this procedure is valid only for dry air conditions. Humid air has the effect of reducing the partial pressure of oxygen and the other gases in the air without affecting the total barometric pressure. Another way of expressing this relationship is by the following equation:

where	P(atm)	= P(gas) + P(oxygen + P(water)
	P(atm)	= Total barometric pressure
	P(gas)	= Partial pressure of all gases other than oxygen and water vapor
	P(oxygen)	= Partial pressure of oxygen
	P(water)	= Partial pressure of water vapor

Thus, for constant barometric pressure, if the humidity in the air is other than zero, the partial pressure of oxygen is less than the value for dry air. For most measurements taken below 80°F (26.7°C), the effect of water vapor may be ignored.

To determine the partial pressure of oxygen in air at various levels of humidity and barometric pressure, the partial pressure of water is subtracted from the total barometric pressure and the difference is multiplied by 20.95%.

EXAMPLE:

Barometric pressure	= 740	mm Hg (98.5 kPa)
Partial pressure H_2O	= 20	mm Hg (2.7 kPa)
Partial pressure O_2	=70-20] x 0.2095 mm Hg	
	= 150	mm Hg (19.95 kPa)

6.2.4 Sample Temperature. The temperature of the sample affects sensor response in two ways:

1. **Oxygen Diffusion Rate --** The rate of oxygen diffusion through the sensor membrane varies with temperature at a coefficient of about +3% per degree Celsius, causing a corresponding change in sensor current.

2. **Oxygen Solubility --** In an **oxygen-saturated** liquid, partial pressure of dissolved oxygen is equal to the partial pressure of oxygen in the atmosphere above liquid. This relationship holds true regardless of the oxygen concentration in parts per billion by weight. As sample temperature increases, oxygen partial pressure remains unchanged (except as influenced by Vapor pressure of the liquid); however, the dissolved oxygen concentration in parts per billion by weight is reduced.

To compensate for both temperature affects the Model 1181PB uses the 30K thermistor incorporated in the measurement sensor. As the sample temperature changes, the thermistor resistance also changes affecting the signal gain of the transmitter. The result is a temperature corrected dissolved oxygen reading in parts per billion within the range of 32°F to 110°F (0°C to 44°C) .

6.2.5 Interfering Gases. Gases that are reduced or oxidized at about 0.75 Vdc, and thus contribute to sensor current, may cause a readout error. Only a few gases have this characteristic. Common gases that should be avoided include $S0_2$, $C1_2$ and oxides of nitrogen. Low-level concentrations of hydrogen-sulfide tend to contaminate the sensor, but do not seriously affect dissolved oxygen measurement. If contaminated, the sensor must be rejuvenated by procedures described in Section 8.3.2.

6.2.6 Composition of the Liquid Medium. A significant change in the composition of the solution may change the solubility of oxygen. If the solvent is water, the addition of any water soluble components, such as sodium chloride, may change the dissolved oxygen concentration.

If the water contains chlorides for example, the reading will be corrected to take into account the effect of the chlorides by the final grab sample calibration (see Section 5.4).

SECTION 7.0
DISASSEMBLY/REASSEMBLY PROCEDURE

7.1 DISASSEMBLY PROCEDURE. Disconnect the power to the transmitter prior to disassembly. (see Figure 9-1 for item numbers also see Figure 3-3).

1. Remove covers (1) and (14) or meter housing cover (11) from housing (3). Save O-rings (2); discard if damaged.
2. Loosen screws retaining the serial label, and then rotate to gain access to the Span and Zero pots.
3. Align the Span and Zero adjusting screws (4), so the slots are horizontal, pointing end cap to end cap.
4. In circuit side of housing (3) remove the circuit board retaining screws, washers and matrix cover (10). The matrix cover is secured to screws by nylon split washers. Remove the screws in equal increments, so the matrix cover is not damaged.
5. Pull straight out on the signal conditioning board assembly (9) to remove circuit boards from housing (3).
6. To separate the individual boards, remove the retaining screw located on the terminal side of the transmitter board (6).
7. Remove each printed circuit board assembly by pulling straight out from their respective connectors.

7.2 REASSEMBLY PROCEDURE.

1. Assemble the circuit board assemblies (6,7,8,9) by first aligning the connectors with the respective pins, and then pushing straight in. Install screw which holds circuit board assemblies together.
2. Align the Zero and Span adjusting screws (4) on the housing (3) to the horizontal position, slots pointing end cap to end cap (see Figure 3-3).
3. Align the Zero and Span potentiometers (R29 & R23) located on the driver circuit board (7) to the horizontal position, with blades perpendicular to PCB's (6) and (7) (see Figure 9-1).
4. Place the circuit board assemblies (6, 7, 8, 9) into housing by first aligning the connector pins with the terminal receptacles in the base of the housing (3) and then pushing straight in on the signal conditioning board (9).
5. Install the matrix cover (10) and secure with screws and washers. The matrix cover is secured to the screws with nylon split washers, so install the screws in equal increments, so the matrix cover is not damaged.
6. Inspect the thread connections on housing (3) to make sure five undamaged threads will fully engage.
7. Replace O-rings (2) on housing (3). Use new O-rings if the old ones were damaged.
8. Install covers (1,14) or meter housing (11) on transmitter housing (3).
9. Apply power to the transmitter and perform the appropriate calibration procedure if necessary.

SECTION 8.0
TROUBLESHOOTING/MAINTENANCE

8.1 GENERAL. This section covers the troubleshooting and maintenance instructions for the Model 1181PB Transmitter and PB DO Sensor. The transmitter has no moving parts and requires minimum maintenance. Procedures for calibrating the Model 1181PB is given in Section 5.0 and generally the only operation type "maintenance" required to keep the units in good operating condition.

NOTE

If downtime is of critical concern, a full complement of spare parts is recommended. (See Section 9.0, spare parts).

8.2 TROUBLESHOOTING. Table 8-1 provides a general reference table for commonly encountered problems and suggested actions to be taken to correct those problems.

TABLE 8-1. Troubleshooting Guide

SYMPTOM	PROBLEM	ACTION
1. Abnormally high O_2 readings (inability to calibrate)	a. Hole in membrane	Replace membrane
	b. Gold cathode loose	Replace sensor
	c. Open thermistor	Replace sensor
2. Abnormally low O_2 readings (inability to calibrate)	a. High internal cell resistance	Rejuvenate and recharge cell
	b. Membrane too loose	Tighten cap or replace membrane
	c. Contaminated electrolyte*	Clean sensor and recharge
	d. Shorted thermistor	Replace sensor
3. Sensor noisy (motion sensitive)	a. Membrane loose	Replace sensor
	b. Low electrolyte level	Fill properly
	c. Cathode contaminated*	Rejuvenate and recharge
4. Upscale readings with known oxygen-free sample	a. Gold cathode loose	Replace sensor
5. Slow response (sluggish)	a. Contaminated electrolyte*	Rejuvenate and recharge

* Contamination” may be the normal accumulation from long-term operation, indicating standard rejuvenation is required.

8.3 MAINTENANCE. Most routine maintenance involves the sensor. Sensor maintenance consists of periodic recharging and-cleaning, or rejuvenating the sensor cathode. The usual indication that the sensor requires rejuvenation and recharging is that, during calibration, the correct upscale reading is unobtainable by adjustment of the EXTERNAL SPAN CONTROL. Normally, the inability to calibrate is preceded by a gradual, day-to-day reduction in sensor output, with a resultant lower instrument indication. The rate of reduction increases with the increase in internal resistance of the sensor.

NOTE

If the sensor is disassembled for inspection, it must be recharged, utilizing a new membrane.

Normally, the sensor requires recharging with fresh electrolyte once every three months. Cleaning the sensor and rejuvenating the electrodes may be extended to longer intervals, depending on the application in which the sensor is used. In general, correcting a low output may be accomplished by first recharging with fresh electrolyte, as described in Section 8.3.1.

8.3.1 Recharging The Sensor. The sensor must be removed from the process installation for recharging. A recharge kit, Figure 8-1, provides the necessary materials for recharging. Fresh electrolyte, a new Teflon membrane, and a pressure-compensating rubber diaphragm must be placed in the sensor. The following steps describe how to recharge the sensor.

1. Unscrew the knurled cap from end of sensor body. Remove membrane assembly, consisting of Teflon membrane fixed between holder and retainer (see Figure 8-2). Empty all the electrolyte from sensor and flush with distilled or deionized water to remove all particulate matter.
2. Unscrew the fill-port plug. Remove the Teflon washer and pressure-compensating diaphragm from the fill port .
3. Examine the gold cathode for the following:

   a. Staining or uneven coloration indicates that the cathode should be rejuvenated as described in Section 8.3.2.

   b. Any deposited material (typically white to gray) present in or around the grooves of the cathode must be removed to ensure optimum operation. Most of these deposits are water-soluble and may be removed by a water jet from a squeeze bottle. Any insoluble deposits in the annular and channel grooves may be removed with a toothpick, taking care to avoid deforming the grooves.

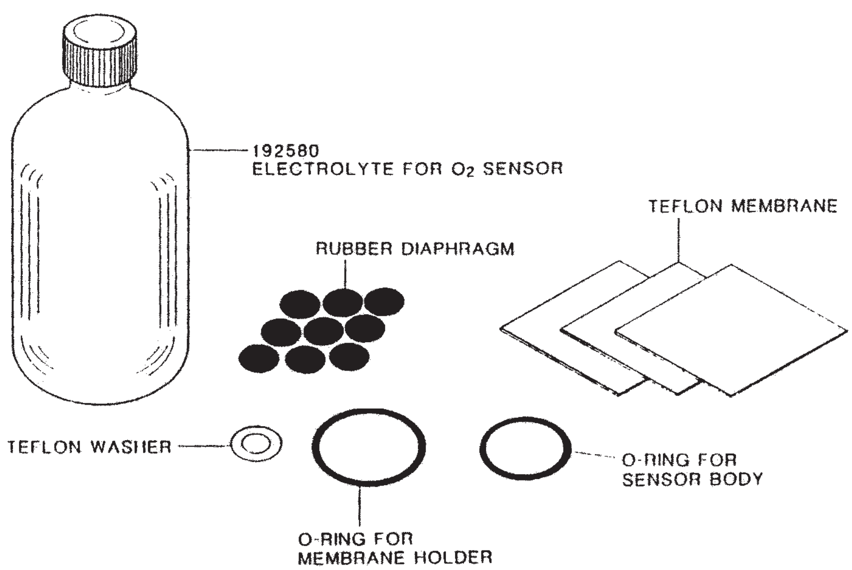


Figure 8-1. Recharge Kit

4. The membrane assembly consists of a Teflon membrane and three associated parts: a holder, a retainer, and an O-ring. Remove the retainer from the holder by placing a finger into center hole of holder and pressing the fingernail against the inner edge of retainer .
5. Verify that the O-ring is properly positioned in the associated groove in the holder (see Figure 8-2).
6. Holding a single Teflon membrane, by the edges only, place it across the membrane holder; then, snap the retainer into the membrane holder (see Figure 8-2). The membrane is now fixed in the proper position, between the holder and retainer.

CAUTION

Never touch the center area of the membrane with your fingers. Membranes are easily contaminated with foreign substances. Contaminated membranes cause drifting or erratic readings.

7. Using a sharp razor blade, carefully trim away excess membrane around the edge of the membrane assembly. Take care that the razor blade does not cut into the edges of the membrane assembly.
8. Disconnect the sensor body from the cable and set on flat surface, with the gold cathode facing upward. Verify that the O-ring is in the groove at the end of sensor body is properly positioned around gold cathode (see Figure 8-2).
9. Taking care not to disturb central orientation of the membrane assembly, carefully place the cap on the sensor body and screw it down until snug. The membrane is now stretched taut across the gold cathode.
10. Turn the sensor on its side, with the fill port facing up. Pour electrolyte into the fill port until the sensor is filled completely. Seal the port with your thumb and rotate the sensor back and forth, with the port facing up, to release any entrapped air through the fill port. Add more electrolyte until it just covers the silver anode and is slightly over-filled. Use an eye-dropper or clean paper tissue to draw off or absorb the excess.
11. Insert the rubber diaphragm into the port. Place the washer over the diaphragm, and secure tightly with the plug. Do not over-tighten the plug.
12. Inspect the sensor for possible leaks and damage to the Teflon membrane.
13. The sensor is now ready for operation. Connect the cable. If the sensor does not operate properly, refer to Section 8.3.2.

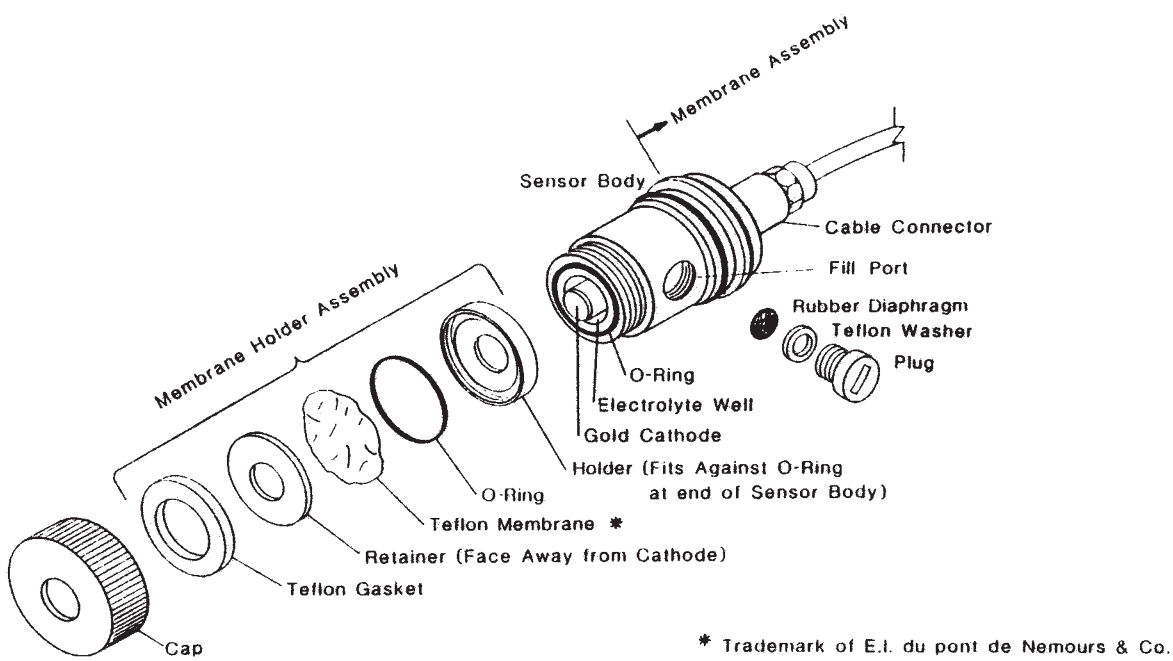


Figure 8-2. Exploded View of Sensor/Membrane Assembly

8.3.2 Rejuvenating The Gold Cathode. Typically, the gold cathode is rejuvenated during the recharging procedure described in Section 8.3.1. In the event that simple recharging does not correct symptoms of low output on the readout meter, clean and/or rejuvenate the cathode as follows:

1. Disassemble the sensor. Remove the cap and membrane assembly. Discard the used electrolyte. Flush the sensor with distilled or deionized water to remove all particulate material.
2. Over a sink, use a cotton swab to treat the gold cathode with concentrated Reagent Grade nitric acid, obtainable from laboratory supply house sources. The end of the swab should be dipped under the surface of the nitric acid until it is saturated. Excess acid should be drained from the swab by exerting pressure against the container wall. The cathode area should be swabbed lightly for a five-minute period with the nitric acid saturated swab.

   Care should be taken to confine the nitric acid to the gold button area. Only a thin film of nitric acid should be present on the surface of the gold cathode during the cleaning operation. Excessive application may result in the destruction of the epoxy annulus surrounding the gold and result in sensor failure.
3. Rinse the gold button and sensor cavity thoroughly with distilled or deionized water. Then rinse the sensor with electrolyte by pouring it over the gold cathode into the sensor cavity until it is filled. Discard this electrolyte.
4. Proceed to recharge the sensor in the normal fashion.

WARNING

CONCENTRATED NITRIC ACID IS HIGHLY CORROSIVE. PROPER PRECAUTIONS SHOULD BE TAKEN TO AVOID CONTACT WITH SKIN, EYES, CLOTHING, AND PRECISION INSTRUMENT PARTS.

If normal operation is not obtained with the specified rejuvenation procedure, the sensor is depleted and must be replaced.

SECTION 9.0
SPARE PARTS

9.1 SPARE PARTS. (Refer to Figure 9-1 for the following spare parts list for the Model 1181PB.

TABLE 9-1. Model 1181PB Two-Wire Transmitter Spare Parts

Item No.	Part Number	Description	Qty.
1	3002425	Cover (for Blind Model)	2
1	3002425	Cover (for Meter Model)	1
2	2002604	O-ring Kit	1
	Consists of:		
	99550136	O-ring	12
3	2002528	Housing	1
3A	23563-00	Housing for code -79	1
4	2002598	Adjustment Screw Kit	1
	Consists of:		
	9160299	Retaining Ring	4
	9550137	O-ring	2
	3002422	Screw, Adjustment	2
5	2002605	O-ring Kit	1
	Consists of:		
	9550137	O-ring	12
6	22795-02 / 22795-03	Transmitter PCB (Analog and Blind / LCD)	1
7	23160-00	Power PCB	1
8	23044-00	Transducer PCB	1
9	22709-03	Matrix Cover Kit	1
	Consists of:		
	32968-00	Cover, Matrix	1
	9620620	Screw, Short	1
	9620628	Screw, Long	1
	9910404	Washer, Nylon (Split)	2
	9910600	Washer, Flat	2
	9910610	Washer, Lock	2
10	2002518	Meter Cover Kit	1
	Consists of:		
	3002429	Housing	1
	9550135	O-ring	12
	3002421	Window	1
	32491-00	Ring, Retainer	1
11	2002603	O-Ring Kit	1
	Consists of:		
	9550135	O-Ring	12
12	2002600	Window Kit	1
	Consists of:		
	9550135	O-Ring	1
	3002421	Window	1
13	9170164 / 23123-00	Indicators (Meter / LCD)	1
14	2002599	Meter Sleeve Kit	1
	Consists of:		
	3002433	Sleeve Meter	1
	9731004	Set Screw, Short	4
	9730816	Set Screw, Long	1
	9560185	Nut, Hex	1

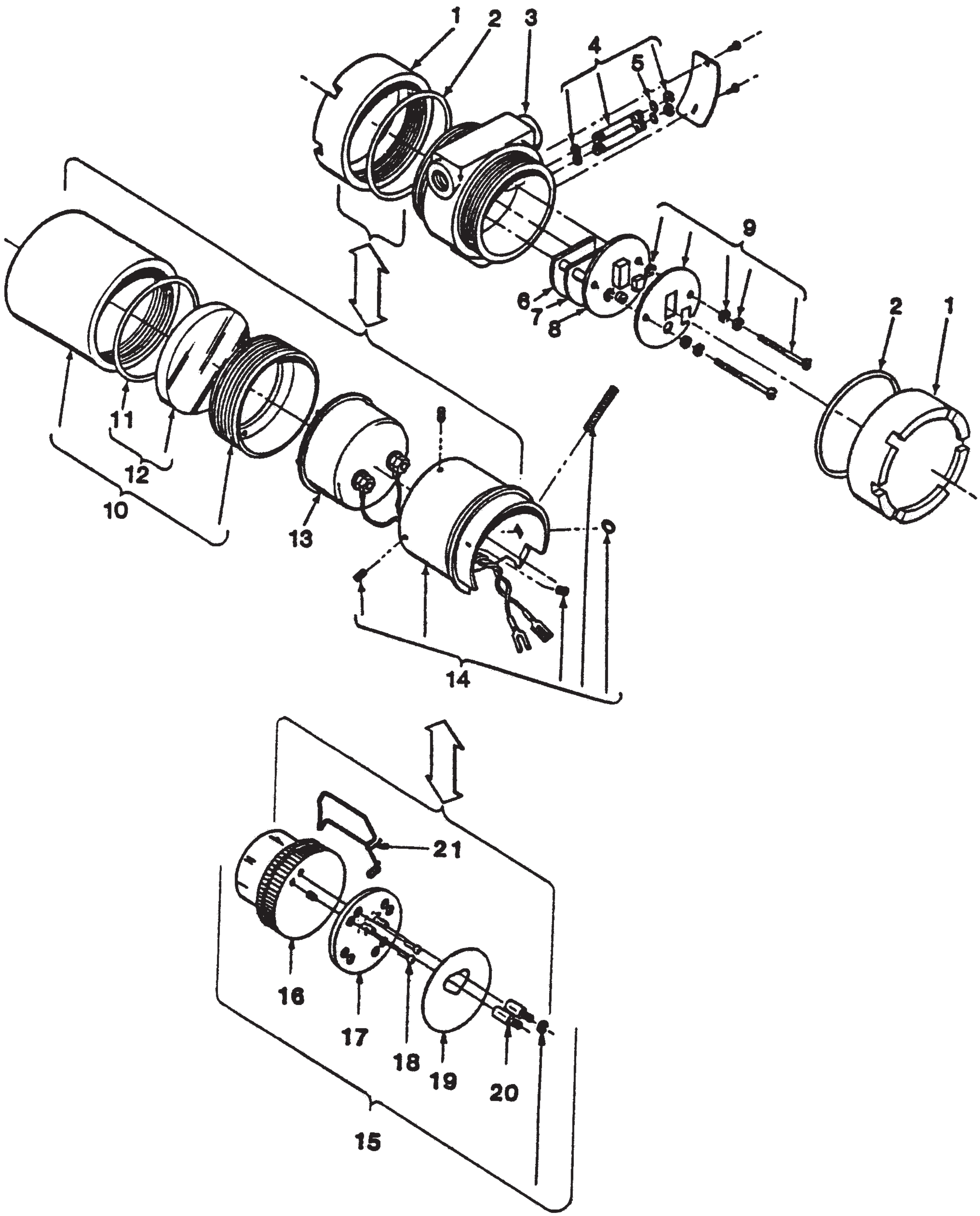


FIGURE 9-1. Model 1181PB Two-Wire Transmitter Parts

SECTION 10.0
RETURN OF MATERIAL

10.1 GENERAL. To expedite the repair and return of instruments, proper communication between the customer and the factory is important. The “Return of Materials Request” form is provided for you to copy and use in case the situation arises. The accuracy and completeness of this form will affect the processing time of your materials.

10.2 WARRANTY REPAIR. The following is the procedure for returning instruments still under warranty.

1. Contact the factory for authorization.
2. Complete a copy of the “Return of Materials Request” form as completely and accurately as possible.
3. To verify warranty, supply the factory sales order number or the original purchase order number. In the case of individual parts or sub-assemblies, the serial number of the transmitter must be supplied.
4. Carefully package the instrument and enclose your “Letter of Transmittal” and the completed copy of the “Return of Materials Request” form. If possible, pack the in the instruments in the same manner as it was received.
5. Send the package prepaid to:

   Rosemount Analytical Inc.
   2400 Barranca Parkway
   Irvine, CA 92606
   Attn: Factory Repair

   Mark the package: Returned for Repair
   Model No._____

10.3 NON WARRANTY REPAIR.

1. Fill out a copy of the “Return of Materials Request” form as completely and accurately as possible.
2. Include a purchase order number and make sure to include the name and telephone number of the right individual to be contacted should additional information be needed.
3. Follow Steps 4 and 5 of Section 10.2.

NOTE

Consult the factory for additional information regarding service or repair.

IMPORTANT

Please see second section of “Return of Materials Request Form”. Compliance to the OSHA requirements is mandatory for the safety of all personnel. MSDS forms and a certification that the instruments have been disinfected or detoxified are required.

RETURN OF MATERIALS REQUEST

•IMPORTANT!
This form must be completed to ensure expedient factory service.

CUSTOMER

FROM:	RETURN	BILL TO:
______________________	______________________	______________________
______________________	______________________	______________________
______________________	______________________	______________________

NOTICE TO SENDER

CUSTOMER/USER MUST SUBMIT MATERIAL SAFETY SHEET (MSDS) OR COMPLETE STREAM COMPOSITION, AND/OR LETTER CERTIFYING THE MATERIALS HAVE BEEN DISINFECTED AND/OR DETOXIFIED WHEN RETURNING ANY PRODUCT, SAMPLE OR MATERIAL THAT HAVE BEEN EXPOSED TO OR USED IN AN ENVIRONMENT OR PROCESS THAT CONTAINS A HAZARDOUS MATERIAL **ANY OF THE ABOVE THAT IS SUBMITTED TO ROSEMOUNT ANALYTICAL WITHOUT THE MSDS WILL BE RETURNED TO SENDER C.O.D.** FOR THE SAFETY AND HEALTH OF OUR EMPLOYEES. WE THANK YOU IN ADVANCE FOR COMPLIANCE TO THIS SUBJECT.

SENSOR OR CIRCUIT BOARD ONLY:
(Please reference where from in MODEL / SER. NO. Column)

1. PART NO. ______________ 1. MODEL ______________ 1. SER. NO. __________
2. PART NO. ______________ 2. MODEL ______________ 2. SER. NO. __________
3. PART NO. ______________ 3. MODEL ______________ 3. SER. NO. __________
4. PART NO. ______________ 4. MODEL ______________ 4. SER. NO. __________

REASON FOR RETURN

PLEASE CHECK ONE:

☐ REPAIR AND CALIBRATE ☐ DEMO EQUIPMENT NO. ______________
☐ EVALUATION ☐ OTHER (EXPLAIN) ______________
☐ REPLACEMENT REQUIRED? ☐ YES ☐ NO ______________

DESCRIPTION OF MALFUNCTION:
____
____
____

REPAIR STATUS

WARRANTY REPAIR REQUESTED:

☐ YES-REFERENCE ORIGINAL ROSEMOUNT ANALYTICAL ORDER NO. ______________
CUSTOMER PURCHASE ORDER NO. ______________
☐ NO-PROCEED WITH REPAIRS-INVOICE AGAINST P.O. NO. ______________
☐ NO-CONTACT WITH ESTIMATE OF REPAIR CHARGES: LETTER ☐ ______________
PHONE ☐ ______________

NAME ______________________ PHONE ______________
ADDRESS ______________________________________
______________________________________ ZIP ______________

RETURN AUTHORITY FOR CREDIT ADJUSTMENT [Please check appropriate box(s)]

☐ WRONG PART RECEIVED ☐ REPLACEMENT RECEIVED
☐ DUPLICATE SHIPMENT REFERENCE ROSEMOUNT ANALYTICAL SALES ORDER NO. __________
☐ RETURN FOR CREDIT **RETURN AUTHORIZED BY:** ______________
WARRANTY DEFECT ______________________________________
____

Emerson Process Management

Rosemount Analytical Inc.
2400 Barranca Parkway
Irvine, CA 92606 USA
Tel: (949) 757-8500
Fax: (949) 474-7250

http://www.RAuniloc.com

EMERSON™
Process Management

WARRANTY

Seller warrants that the firmware will execute the programming instructions provided by Seller, and that the Goods manufactured or Services provided by Seller will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller, whichever period expires first. **Consumables, such as glass electrodes, membranes, liquid junctions, electrolyte, o-rings, catalytic beads, etc., and Services are warranted for a period of 90 days from the date of shipment or provision.**

Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Seller has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products.

If Buyer discovers any warranty defects and notifies Seller thereof in writing during the applicable warranty period, Seller shall, at its option, promptly correct any errors that are found by Seller in the firmware or Services, or repair or replace F.O.B. point of manufacture that portion of the Goods or firmware found by Seller to be defective, or refund the purchase price of the defective portion of the Goods/Services.

All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources, unsuitable environmental conditions, accident, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense. Seller shall not be obligated to pay any costs or charges incurred by Buyer or any other party except as may be agreed upon in writing in advance by an authorized Seller representative. All costs of dismantling, reinstallation and freight and the time and expenses of Seller's personnel for site travel and diagnosis under this warranty clause shall be borne by Buyer unless accepted in writing by Seller.

Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller. Except as otherwise expressly provided in the Agreement, THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICES.

RETURN OF MATERIAL

Material returned for repair, whether in or out of warranty, should be shipped prepaid to:

Emerson Process Management
Liquid Division
2400 Barranca Parkway
Irvine, CA 92606

The shipping container should be marked:

Return for Repair
Model ________________________________

The returned material should be accompanied by a letter of transmittal which should include the following information (make a copy of the "Return of Materials Request" found on the last page of the Manual and provide the following thereon):

1. Location type of service, and length of time of service of the device.
2. Description of the faulty operation of the device and the circumstances of the failure.
3. Name and telephone number of the person to contact if there are questions about the returned material.
4. Statement as to whether warranty or non-warranty service is requested.
5. Complete shipping instructions for return of the material.

Adherence to these procedures will expedite handling of the returned material and will prevent unnecessary additional charges for inspection and testing to determine the problem with the device.

If the material is returned for out-of-warranty repairs, a purchase order for repairs should be enclosed.

The right people,
the right answers,
right now.

ROSEMOUNT ANALYTICAL
CUSTOMER SUPPORT CENTER
1-800-854-8257

ON-LINE ORDERING NOW AVAILABLE ON OUR WEB SITE
http://www.raihome.com

PlantWeb

CERTIFIED QUALITY MANAGEMENT SYSTEM ISO 9001:2000 DNV

Credit Cards for U.S. Purchases Only.

VISA MasterCard AMERICAN EXPRESS Cards

Emerson Process Management

Liquid Division
2400 Barranca Parkway
Irvine, CA 92606 USA
Tel: (949) 757-8500
Fax: (949) 474-7250

http://www.raihome.com

EMERSON Process Management