Instruction Manual
IB-106-400IMPS Rev. 1.0
October 2000

IMPS 4000

Intelligent Multiprobe Test Gas Sequencer

ROSEMOUNT® Analytical

EMERSON™ Process Management

http://www.processanalytic.com

ESSENTIAL INSTRUCTIONS
READ THIS PAGE BEFORE PROCEEDING!

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

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

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

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HIGHLIGHTS OF CHANGES

Effective February, 1999 Rev. 1.0

Page	Summary
Page 1-1	Added note concerning the Oxymitter 5000.

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LIST OF TABLES

PREFACE

The purpose of this manual is to provide information concerning the components, functions, installation and maintenance of this particular test gas sequencer.

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

DEFINITIONS

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

WARNING

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

CAUTION

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

NOTE

Highlights an essential operating procedure, condition, or statement.

⏚ : EARTH (GROUND) TERMINAL

⏚ : PROTECTIVE CONDUCTOR TERMINAL

⚠ : RISK OF ELECTRICAL SHOCK

⚠ : WARNING: REFER TO INSTRUCTION BULLETIN

NOTE TO USERS

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

IMPORTANT

SAFETY INSTRUCTIONS FOR THE WIRING AND INSTALLATION OF THIS APPARATUS

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

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

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

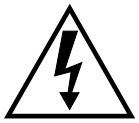
3. Mains supply cords should comply with the requirements of IEC227 or IEC245.

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

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

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

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



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

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

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

SECTION 1
DESCRIPTION AND SPECIFICATIONS

NOTE

The SPS 4000 Single Probe Autocalibration Sequencer operates exactly the same with either the Oxymitter 4000 Oxygen Transmitter or the Oxymitter 5000 Oxygen Transmitter with FOUNDATION fieldbus Communications. Any references to the Oxymitter 4000 throughout this instruction bulletin also include the Oxymitter 5000. When referred to an instruction bulletin for more information, reference IB-106-340 for the Oxymitter 4000 and IB-106-340-FB for the Oxymitter 5000.

1-1 INTRODUCTION

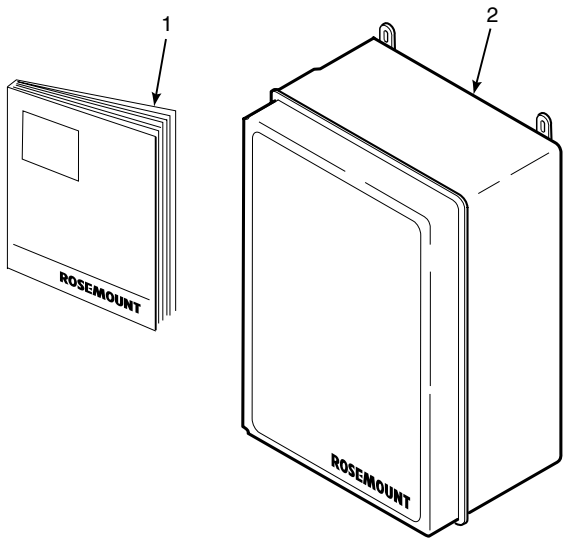
The Rosemount IMPS 4000 Intelligent Multiprobe Test Gas Sequencer is used with the Oxymitter 4000 Oxygen Transmitter. The IMPS 4000 has the intelligence to provide test gas sequencing of up to four Oxymitters to accommodate automatic and semi-automatic calibration routines. Table 1-1 lists the available IMPS 4000 versions.

Table 1-1. IMPS 4000 Versions

PART NUMBER	DESCRIPTION	NUMBER OF OXYMITTERS
3D39695G01	IMPS	1
3D39695G02	IMPS	2
3D39695G03	IMPS	3
3D39695G04	IMPS	4
3D39695G05	IMPS w/115 V Htr	1
3D39695G06	IMPS w/115 V Htr	2
3D39695G07	IMPS w/115 V Htr	3
3D39695G08	IMPS w/115 V Htr	4
3D39695G09	IMPS w/220 V Htr	1
3D39695G10	IMPS w/220 V Htr	2
3D39695G11	IMPS w/220 V Htr	3
3D39695G12	IMPS w/200 V Htr	4

1-2 COMPONENT CHECKLIST

A typical IMPS 4000 should contain the items shown in Figure 1-1. Record the part number, serial number, and order number for the IMPS 4000 on the first page of this manual.



1. Instruction Bulletin
2. IMPS 4000

Figure 1-1. Typical IMPS 4000 Package

1-3 PHYSICAL DESCRIPTION

The main components of the IMPS 4000 are housed in a NEMA 4X (IP56) non-hazardous enclosure.

The main internal components include the flow panel and the inner assembly.

a. Flow Panel (Figure 1-2)

The Programmable Logic Controller (PLC) operator interface and the reference and test gas flowmeters are mounted to the flow panel.

1. The PLC operator interface allows you to set up time-sequenced calibration routines for up to four Oxymitters. It also allows you to initiate a semi-automatic calibration.

2. A test gas and reference gas flowmeter set is mounted on the flow panel for each Oxymitter attached to the IMPS 4000. The test gas flowmeter indicates the amount of test gas sent to the Oxymitter. The reference gas flowmeter indicates the amount of reference air continuously flowing to the Oxymitter.

b. Inner Assembly

The inner assembly consists of the PLC, PC board, pressure regulator, gas solenoids, test gas pressure switches, and heater.

1. The PLC consists of a power supply, Central Processing Unit (CPU), and three I/O modules.

   (a) The power supply supplies the voltage and current needed to operate the IMPS 4000.

   (b) The CPU controls most system operations. It contains the program memory in which the information entered into the PLC operator interface is stored, and it processes the I/O signals received from the I/O modules.

   (c) The I/O modules are terminated on the PC board. They receive and send signals between the PLC and PC board for communication between the Oxymitter and the IMPS 4000.

2. The PC board contains all wiring connections for up to four Oxymitters.

3. The pressure regulator ensures the instrument air (reference gas) flowing to the Oxymitter is at a constant pressure [20 psi (138 kPa)]. The regulator also has a drain valve that drains excess moisture from the internal gas circuit.

4. The manifold can have up to six solenoids: test gas 1 solenoid, test gas 2 solenoid, and a gas solenoid for each Oxymitter connected to the IMPS 4000. The solenoids activate and deactivate to allow test gas to flow between the IMPS 4000 and an Oxymitter.

5. The pressure switches detect if the pressure of a test gas is low, which can be caused by an empty gas bottle, a disconnected gas line, etc. Calibration is prohibited when test gas pressure is low.

6. The heater keeps the components in the ambient temperature range to prevent electronic malfunction.

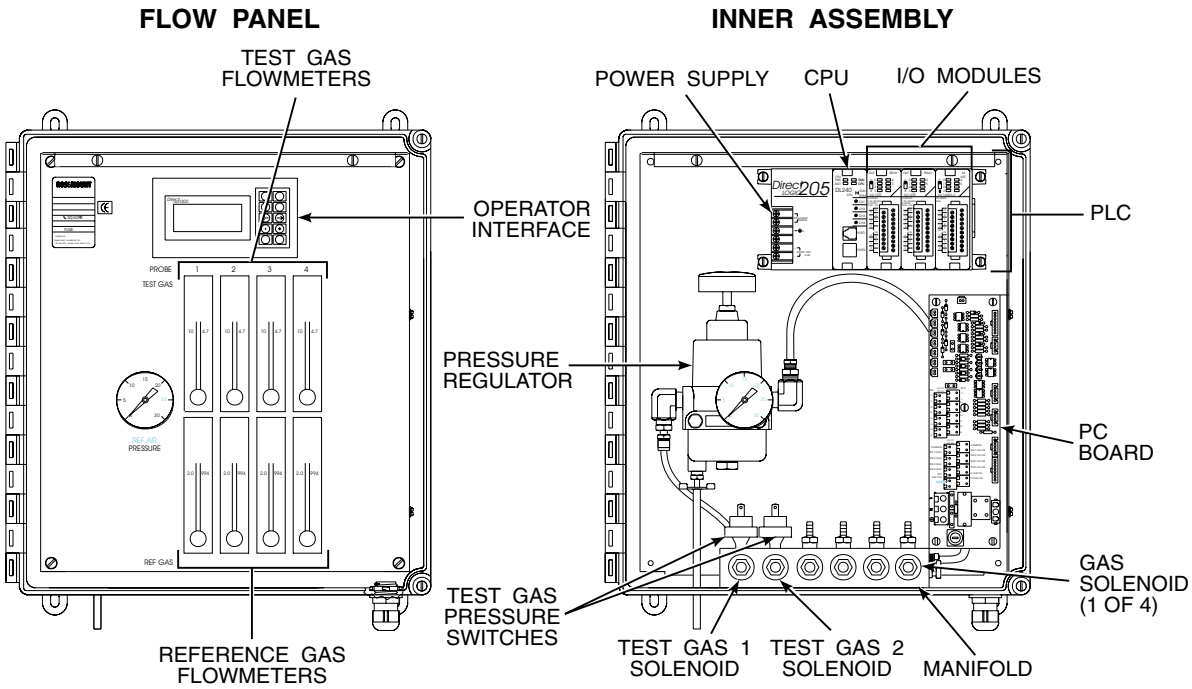


Figure 1-2. IMPS Components

1-4 SPECIFICATIONS

Table 1-2. IMPS 4000 Specifications

Electrical Classification	NEMA 4X (IP56)
Humidity Range	95% Relative Humidity
Ambient Temperature Range*	
w/o Heater Option	32° to 131°F (0° to 55°C)
w/ Heater Option	-35° to 131°F (-37° to 55°C)
Input Power*	
w/o Heater Option	90 to 250 V, 50/60 Hz, 50 VA
w/115 V Nominal Heater (Optional)	115 V Nominal, 50/60 Hz, 200 VA
w/220 V Nominal Heater (Optional)	230 V Nominal, 50/60 Hz, 200 VA
External Electrical Noise	Minimum Interference
Handshake Signal to/from Oxymitter (Self-Powered)	5 V (5 mA Maximum)
Cal Initiate Contact Input from Control Room (One per Probe)	24 VDC (Self-Powered)
Relay Outputs to Control Room (One "In-Cal" per Probe, "Low Gas Flowing," "High Gas Flowing, "One" Cal Failed" per Probe, "Gas Pressure Low")	5 to 30 VDC Form A (SPST), 1.5 A per point, 3 A total per common
Cabling Distance Between IMPS 4000 and Oxymitter	1000 ft (303 m) Maximum
Cabling Distance Between IMPS 4000 and Customer-Supplied Status Relay I/O in Control Room	1000 ft (303 m) Maximum
Piping Distance Between IMPS 4000 and Oxymitter	300 ft (91 m) Maximum
Approximate Shipping Weight	40 lbs. (18 kg)

*If using the heater option, the lower temperature value of the ambient temperature range may vary depending on the input voltage supply.

1-5 THEORY OF OPERATION (Figure 1-3)

When a calibration is initiated, via the IMPS, HART/AMS, Oxymitter, or remote location, the signal is sent to the IMPS 4000 PLC. The PLC first energizes the Oxymitter solenoid and then energizes the test gas 1 (high gas) solenoid.

Test gas 1 flows through the IMPS 4000 to the Oxymitter. The Oxymitter measures the oxygen content of test gas 1 and sends a signal to the IMPS 4000 indicating that it received test gas 1. When the IMPS 4000 receives the signal, the PLC deenergizes the test gas 1 solenoid.

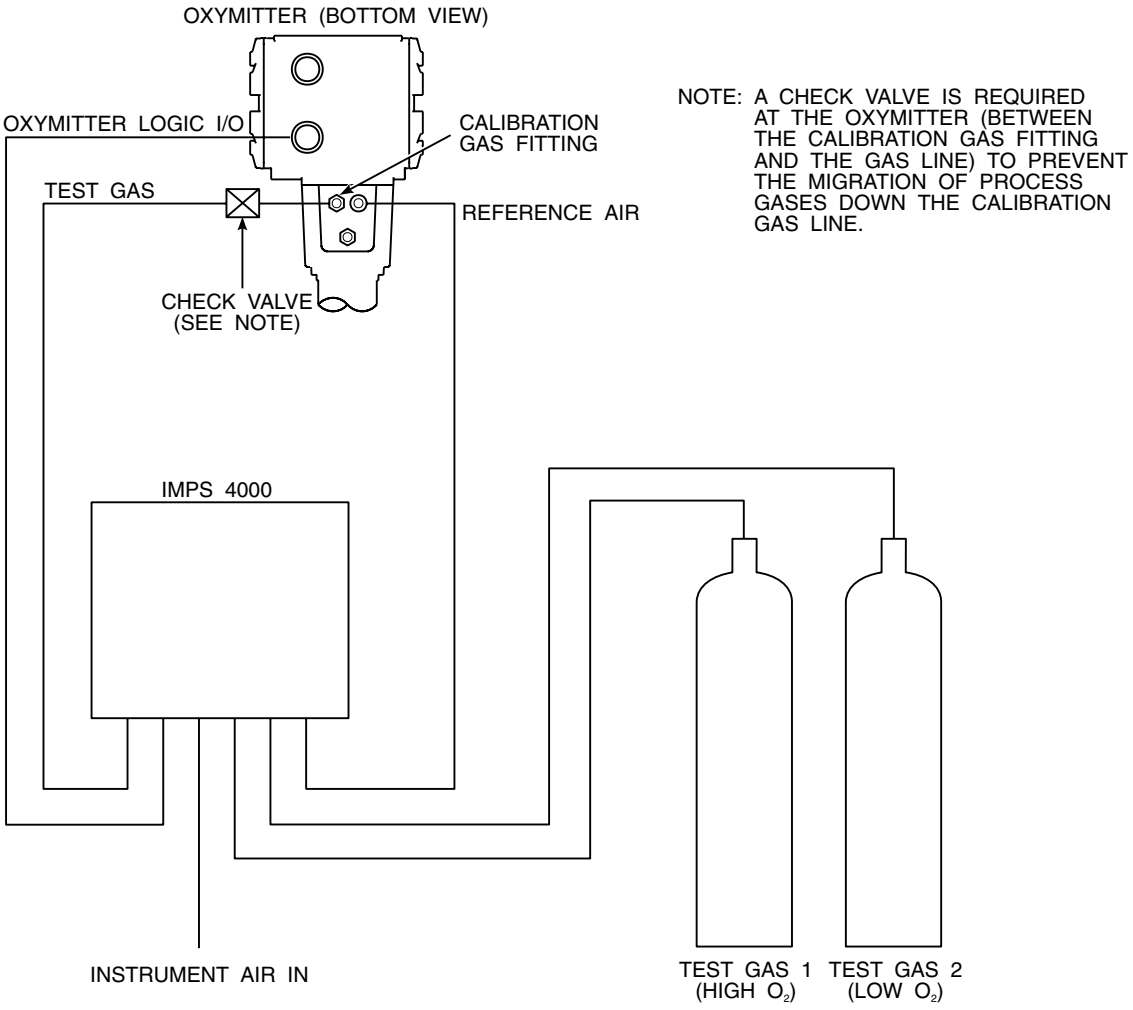


Figure 1-3. IMPS 4000 Calibration Setup

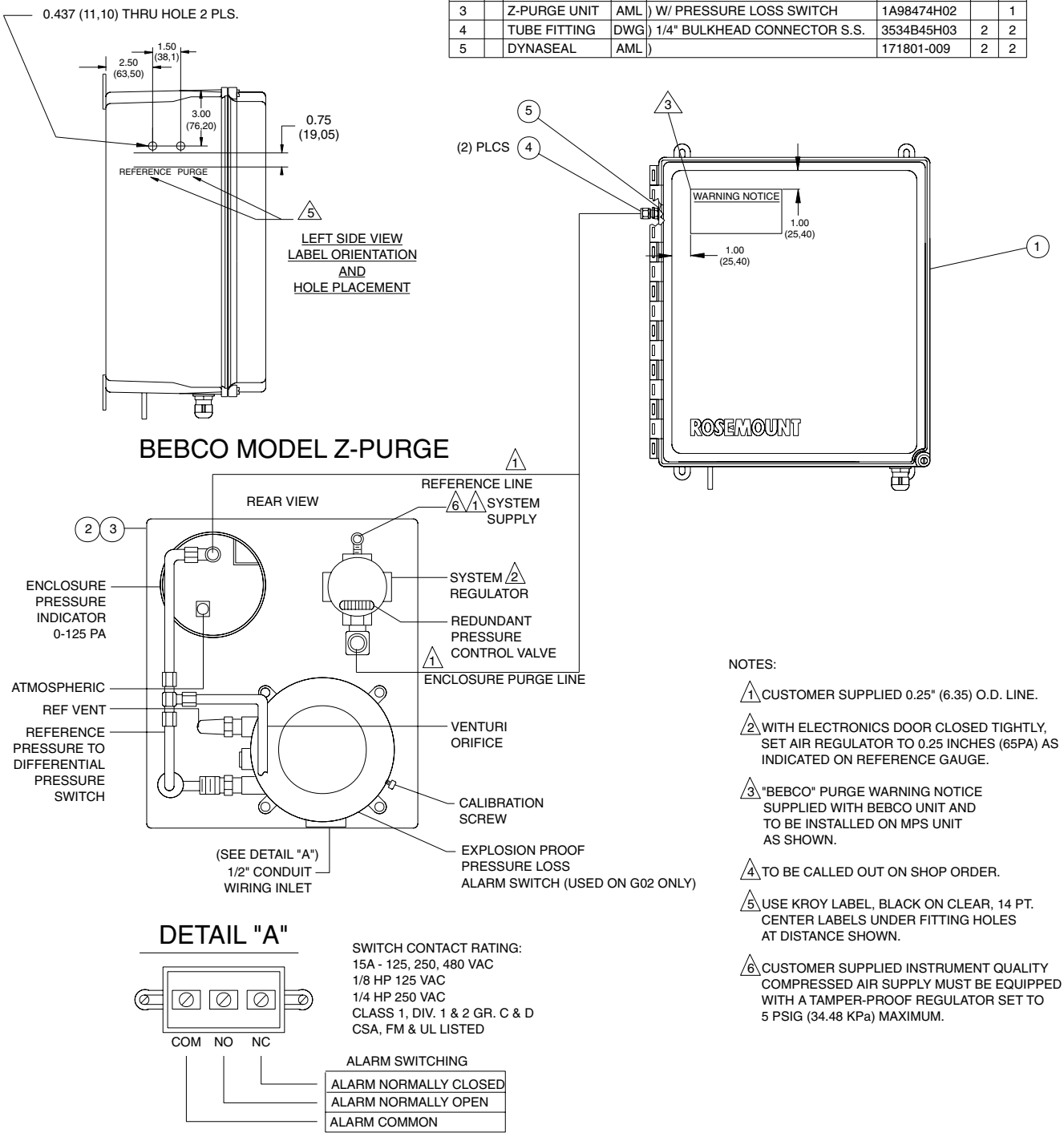
After a time delay that allows test gas 1 to clear the system, the PLC energizes the test gas 2 (low gas) solenoid. Test gas 2 flows through the IMPS 4000 to the Oxymitter. The Oxymitter measures the oxygen content of test gas 2 and sends a signal to the IMPS 4000 indicating that it received test gas 2. After measuring the two test gases, the Oxymitter automatically makes the internal calibration adjustment and sends the signal to the IMPS 4000. When the IMPS receives the signal, the PLC deenergizes the test gas 2 solenoid and the Oxymitter solenoid. Whether or not the calibration passes or fails displays on the PLC operator interface.

1-6 Z-PURGE OPTION

Some IMPS applications have area safety requirements (Class 1, Division 2). These requirements may be satisfied with the installation of an optional Z-purge. The Z-Purge provides positive pressure within the IMPS 4000 enclosure to keep out dust and other foreign matter. Figure 1-4 shows the Z-purge unit and how it connects to the IMPS 4000.

NOTE: DIMENSIONS IN INCHES WITH MILLIMETERS IN PARENTHESES.

PARTS LIST			PARTS LIST UNITS: INCHES		GROUP NOTE		
NOTE			DEFINER		MATL CODE PART NUMBER OR REF DWG	GROUP	
ITEM		PART NAME		SIZE - REFERENCE INFORMATION		G01	G02
1	4	IMPS ASSEMBLY	DWG	)	3D39695GXX	A/R	A/R
2		Z-PURGE UNIT	AML	) W/O PRESSURE LOSS SWITCH	1A98474H01	1	
3		Z-PURGE UNIT	AML	) W/ PRESSURE LOSS SWITCH	1A98474H02		1
4		TUBE FITTING	DWG	) 1/4" BULKHEAD CONNECTOR S.S.	3534B45H03	2	2
5		DYNASEAL	AML	)	171801-009	2	2



NOTES:

1. CUSTOMER SUPPLIED 0.25" (6.35) O.D. LINE.
2. WITH ELECTRONICS DOOR CLOSED TIGHTLY, SET AIR REGULATOR TO 0.25 INCHES (65PA) AS INDICATED ON REFERENCE GAUGE.
3. "BEBCO" PURGE WARNING NOTICE SUPPLIED WITH BEBCO UNIT AND TO BE INSTALLED ON MPS UNIT AS SHOWN.
4. TO BE CALLED OUT ON SHOP ORDER.
5. USE KROY LABEL, BLACK ON CLEAR, 14 PT. CENTER LABELS UNDER FITTING HOLES AT DISTANCE SHOWN.
6. CUSTOMER SUPPLIED INSTRUMENT QUALITY COMPRESSED AIR SUPPLY MUST BE EQUIPPED WITH A TAMPER-PROOF REGULATOR SET TO 5 PSIG (34.48 KPa) MAXIMUM.

Figure 1-4. IMPS 4000 with Z-Purge

SECTION 2
INSTALLATION

2-1 OVERVIEW

This section describes the installation of the IMPS 4000.

WARNING

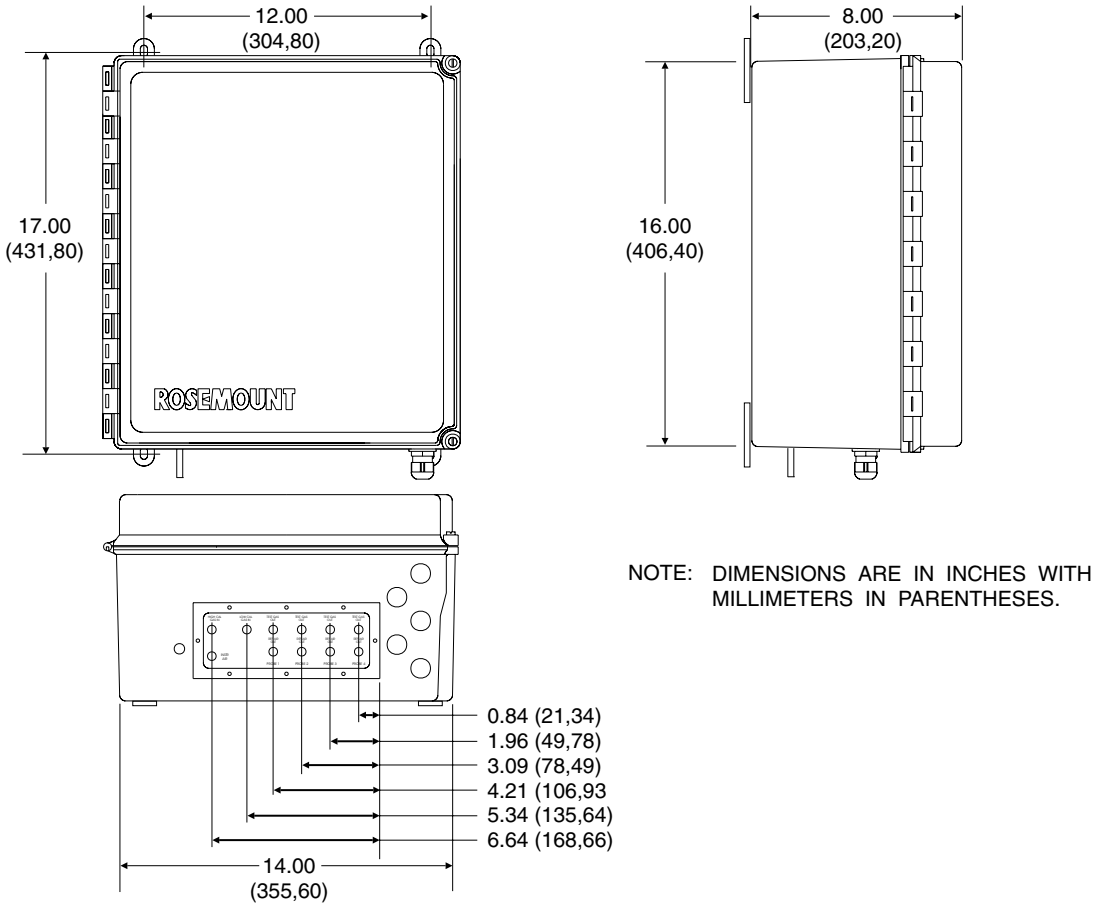
Before starting to install this equipment, read the "Safety Instructions for the Wiring and Installation of this Apparatus" at the front of this Instruction Bulletin. Failure to follow the safety instructions could result in injury or death.

WARNING

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

2-2 MECHANICAL INSTALLATION

The outline drawing in Figure 2-1 shows mounting centers and clearances of the IMPS 4000. The unit is designed to mount on a wall or bulkhead. Ensure the unit is installed according to the following specifications:



NOTE: DIMENSIONS ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.

Figure 2-1. Mechanical Installation

a. Install the module no further than 300 ft (91 m) from the probe and no further than 1000 ft (303 m) from a remote connection or from the status relay indicators.

b. Locate units without the optional heater where the ambient temperature is between 32° and 131°F (0° and 55°C). For units with the optional heater, install where the ambient temperature is between -35° and 131°F (-37° and 55°C).

2-3 GAS CONNECTIONS

Gas connections are located on the bottom of the IMPS 4000 and are 1/8-27 NPT fittings (Figure 2-2). Use the following procedure to connect the test gases:

a. Connect the reference air supply to INSTR AIR. The pressure regulator valve is set at the factory to 20 psi (138 kPa). If necessary, readjust by turning the knob on the top of the valve until the desired pressure is obtained.

b. Connect the O_2 test gas 1 to HIGH CAL GAS IN. The test gas pressure should be set at 20 psi (138 kPa).

CAUTION

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

c. Connect the O_2 test gas 1 to LOW CAL GAS IN. The test gas pressure should be set at 20 psi (138 kPa).

d. Connect the Oxymitter REF GAS to REF AIR OUT.

e. Connect the Oxymitter CAL GAS to TEST GAS OUT.

2-4 ELECTRICAL CONNECTIONS

All wiring must conform to local and national codes. Refer to Figure 2-3 and use the following procedure to connect the first Oxymitter. Repeat the procedure for each remaining Oxymitter.

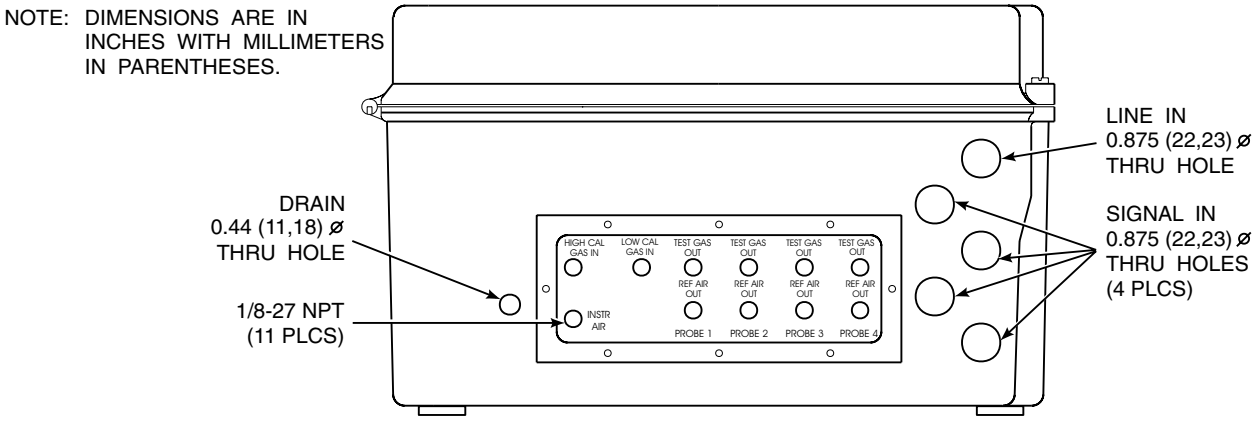


Figure 2-2. Gas Connections

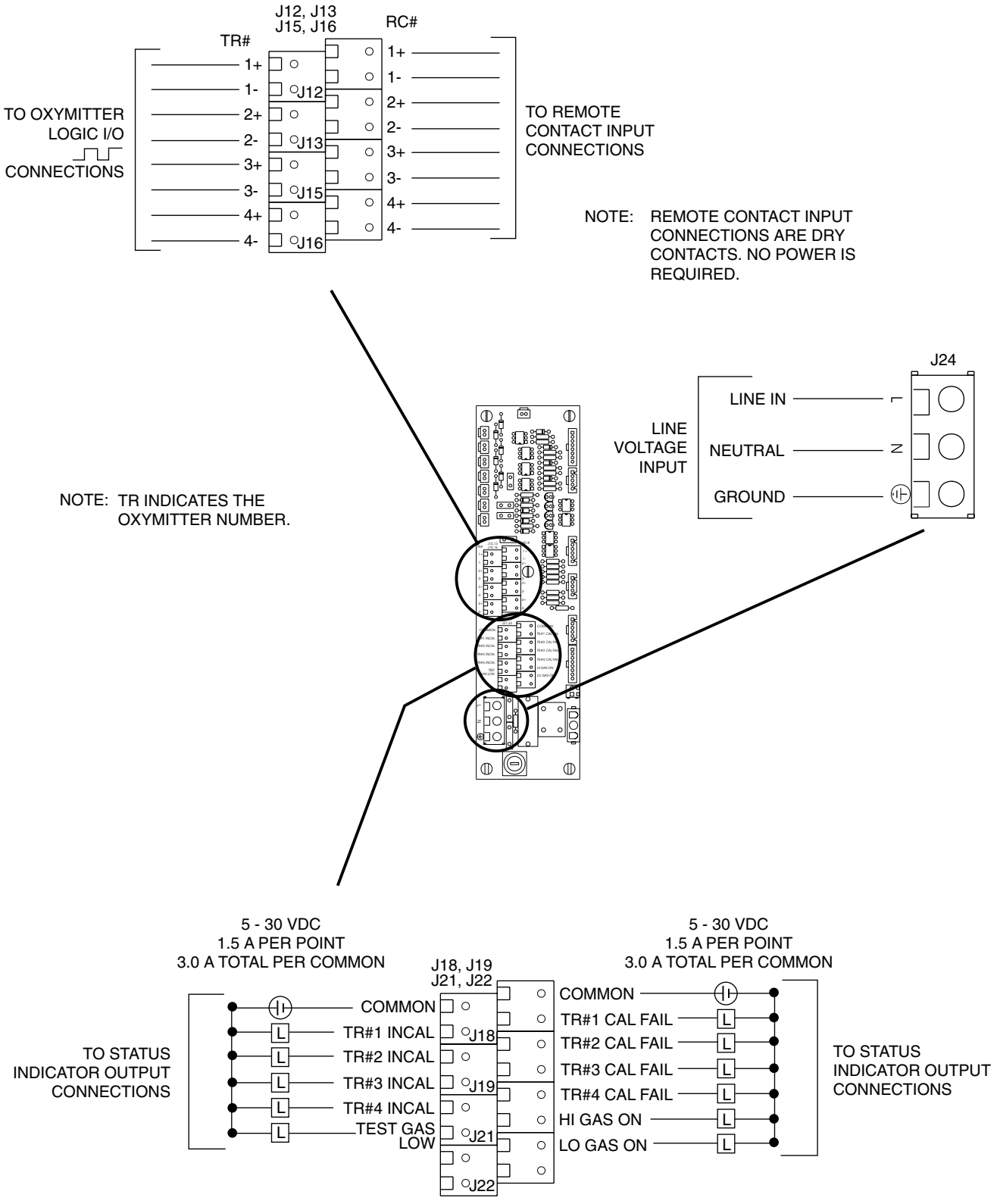


Figure 2-3. Electrical Connections

a. Run the line voltage through the bulkhead fitting on the bottom of the IMPS 4000 marked LINE IN. Connect the line voltage to the J24 terminal. The power supply automatically adjusts to the input voltage. Tighten the cord grips to provide strain relief.

b. Run the handshake logic I/O wires for each Oxymitter through a bulkhead fitting on the bottom of the IMPS 4000 marked SIGNAL IN. Dedicate one fitting for each Oxymitter. Connect the Oxymitter logic I/O wires as shown in Figure 2-3.

c. To set up the IMPS 4000 to initiate a calibration from a remote location, run the remote contact input wires through the SIGNAL IN bulkhead fitting. Connect the remote contact input wires as shown in Figure 2-3.

d. Status relay connections are available on the IMPS 4000 PC board to signal when the Oxymitter is in or out of calibration and to indicate calibration gas status. Status relays can be connected to either indicator lights or a computer interface. Relay contacts are capable of handling up to 5 to 30 V, 1.5 A per point, 3.0 A total per common maximum power source. Cabling requirement is 1000 ft (303 m) maximum. Make the status relay switch connections as shown in Figure 2-3.

SECTION 3
OPERATION

3-1 OVERVIEW

This section specifies the requirements to set up an Oxymitter calibration. It describes the PLC operator interface and explains how to set up time-sequenced calibration routines for up to four Oxymitters using the IMPS 4000. This section also explains the differences between automatic and semi-automatic calibrations and how to initiate them.

3-2 CALIBRATION REQUIREMENTS

a. Two tanks of precision calibration gas mixtures are required. Recommended calibration gases are nominally 0.4% and 8.0% oxygen in nitrogen.

CAUTION

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

Two sources of calibrated gas mixtures are:

LIQUID CARBONIC GAS CORP.
SPECIALTY GAS LABORATORIES

700 South Alameda Street
Los Angeles, California 90058
213/585-2154

767 Industrial Road
San Carlos, California 94070
415/592-7303

9950 Chemical Road
Pasadena, Texas 77507
713/474-4141

12054 S.W. Doty Avenue
Chicago, Illinois 60628
312/568-8840

603 Bergen Street
Harrison, New Jersey 07029
201/485-1995

255 Brimley Road
Scarborough, Ontario, Canada
416/266-3161

SCOTT ENVIRONMENTAL TECHNOLOGY, INC.
SCOTT SPECIALTY GASES

2600 Cajon Blvd.
San Bernardino, California 92411
714/887-2571
TWX: 910-390-1159

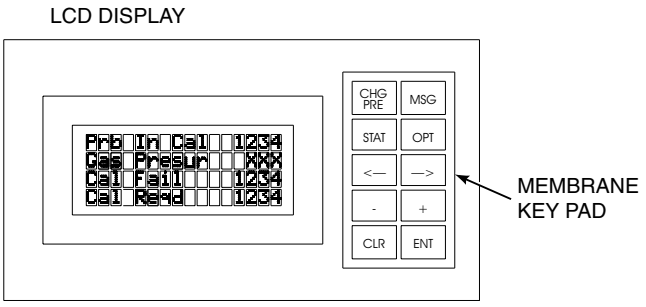
1290 Combermere Street
Troy, Michigan 48084
314/589-2950

Route 611
Plumsteadville, Pennsylvania 18949
215/766-8861
TWX: 510-665-9344

2616 South Loop West
Suite 100
Houston, Texas 77054
713/669-0469

b. A check valve is required at the Oxymitter (between the calibration fitting and the gas line) to prevent the migration of process gases down the calibration gas line.

A typical calibration setup is shown in Figure 1-3.



NOTE: THE LCD DISPLAY IN THIS ILLUSTRATION SHOWS THE MESSAGE DISPLAY MODE. THE CHANGE PRESETS DISPLAY MODE IS SHOWN IN FIGURE 3-2.

Figure 3-1. Operator Interface

3-3 OPERATOR INTERFACE DESCRIPTION

The operator interface consists of a membrane keypad and a 4-line, 16-character, backlit LCD display. The LCD display is divided into two areas. The left side is a descriptive field that identifies the calibration parameter. The right side shows the current value or status of the calibration parameter. See Figure 3-1.

a. Membrane Keypad.

The 10-key keypad, shown in Figure 3-1, allows you to toggle between the two available modes, scroll through the available descriptive fields, and change data field values. Table 3-1 describes the available membrane keys.

NOTE

Keypad response time is slow so the unit has time to process each keystroke. Please pause between keystrokes.

While viewing the display, note that the cursor appears only on the top line.

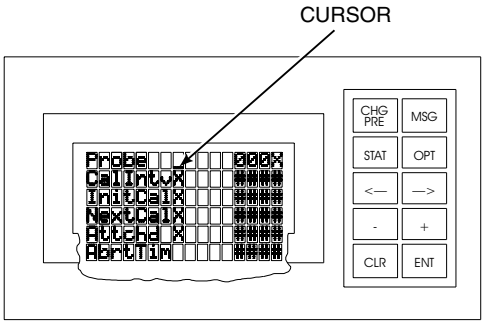
Table 3-1. Membrane Key Descriptions

NAME	DESCRIPTION
CHG PRE	Accesses the change presets display mode. The data fields in this mode can be changed using the keypad as required for system operation.
MSG	Accesses the message display mode. The message display mode provides IMPS status indications. The data fields indicate current status and are not changeable by the operator.
STAT	Not used.
OPT	Not used.
← and →	Moves the cursor left and right in the data field.
+ and **–**	Moves the text to the cursor when in a descriptive field or increases and decreases the data value highlighted by the cursor when in a data field.
CLR	Not used.
ENT	Toggles the cursor between the descriptive and data fields.

b. LCD Display

The two available display modes are the editable change presets display mode and the view-only message display mode.

1. The change presets display mode, shown in Figure 3-2, identifies the six parameters necessary to program time-sequenced, automatic calibration routines for up to four Oxymitters and to initiate a semi-automatic calibration. Table 3-2 explains the calibration parameters in the change presets display mode.



NOTE: ONLY FOUR LINES ARE VISIBLE AT A TIME ON THE ACTUAL DISPLAY.

Figure 3-2. Change Presets Display Mode

Table 3-2. Change Presets Display Mode Parameters

PARAMETER NAME	DATA DISPLAY	DESCRIPTION
NOTE **In the following parameters, X indicates the Oxymitter number (1 through 4).**		
Probe	0001 to 0004	This parameter sets/identifies the specific Oxymitter for setup/review. Only the least significant digit is editable.
CalIntvX	0001 to 9998, 9999	CalIntvX sets/indicates the number of hours between automatic calibrations. The range is 0001 to 9998 hours. Setting the parameter to 9999 intentionally does not establish a timed calibration interval.
InitCalX or **AbrtCalX**	0000 or 0001	When no calibration is taking place, InitCalX displays. Changing the 0000 parameter to 0001 initiates Oxymitter calibration. Only the least significant digit is editable. The display changes to AbrtCalX when the specified Oxymitter is undergoing calibration. Changing the 0001 parameter to 0000 aborts Oxymitter calibration. Only the least significant digit is editable.
NextCalX	0001 to 9997	NextCalX sets/indicates the number of hours until the next timed calibration. The maximum allowable value is the CalIntvX value specified for the Oxymitter.
Attchd X	0000 or 0001	Attchd X indicates whether or not the specified Oxymitter is connected to the IMPS 4000. A 0000 value indicates the Oxymitter is not connected. A 0001 value indicates the Oxymitter is connected. Only the least significant digit is editable. This parameter is also useful to reset the Oxymitter if the Oxymitter and the IMPS 4000 lose their communication link.
AbrtTim X	0001 to 9999	AbrtTim X indicates the time (in tenths of seconds) that the IMPS 4000 will wait for a step signal from the Oxymitter. This parameter limits the amount of time that gas will flow if communications between the IMPS 4000 and the Oxymitter are disrupted. The PLC operator interface holds only one value for the AbrtTim X. If the AbrtTim X is changed, it changes for all the Oxymitters connected to the IMPS 4000. This parameter value must be greater than the highest dwell time of all the Oxymitters connected to the IMPS 4000. Refer to the Oxymitter 4000 Oxygen Transmitter Instruction Bulletin for more information on dwell time. If no signal is received from the Oxymitter within the AbrtTim X specified, the calibration gas turns off and the sequence aborts.

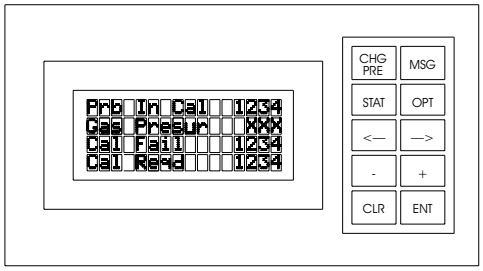


Figure 3-3. Message Display Mode

2. The message display mode, shown in Figure 3-3, only indicates IMPS 4000 status and is not changeable by the user. Table 3-3 explains the calibration statuses in this mode.

3-4 USING THE OPERATOR INTERFACE

a. Selecting a Parameter

The cursor only appears on the top line of the change presets display mode. To access a parameter, scroll the parameter to the top line of the display. Pressing the + key scrolls down the list. Pressing the – key scrolls up the list. The list of parameters will continuously scroll in either direction when at the top or bottom of the display.

NOTE

The PLC operator interface only uses the change presets display mode and the message display mode. If a screen displays that you do not recognize, press the CHG PRE or MSG key to exit the unfamiliar screen.

b. Changing a Typical Parameter

Once the parameter you want to change is at the top line, use the ENT key to move the cursor from the descriptive field to the data field. In the data field, use the ← or → key to move the cursor left or right in the data field. Next use the + or – key to increase or decrease the data value highlighted by the cursor.

3-5 TEST GAS FLOW SETUP

After setting up the parameters in Table 3-2, calibrate each Oxymitter to verify IMPS 4000 operation and the communication link between the sequencer and the Oxymitter.

a. Verify that both test gases are connected to the IMPS 4000 and the operator interface Gas Presur parameter in the message display mode indicates OK. Also verify that the pressure regulators on both test gas bottles are set to 20 psig (138 kPag).

Table 3-3. Message Display Mode Parameter

PARAMETER NAME	DATA DISPLAY	DESCRIPTION
Prb in Cal	none, 1, 2, 3, or 4	Prb in Cal indicates the Oxymitter currently undergoing calibration. If no Oxymitter is being calibrated, the parameter displays none.
Gas Presur	OK or LOW	Gas Presur indicates if the calibration gas pressure is high enough for calibration. OK indicates the pressure is high enough. LOW indicates the calibration gas pressure is too low and calibration will not occur.
Cal Fail	none, 1, 2, 3, or 4	If an Oxymitter fails calibration, Cal Fail displays the Oxymitter number. If the Oxymitter does not fail calibration, Cal Fail displays none.
Cal Reqd	none or 1, 2, 3, and/or 4	Cal Reqd displays the Oxymitter(s) waiting to be calibrated when another Oxymitter is in calibration. More than one Oxymitter can display at one time. If no Oxymitter is waiting to be calibrated, Cal Reqd displays none.

b. Initiate a semi-automatic calibration using one of the methods specified in paragraph 3-7.

NOTE

Only set the test gas flowmeter upon initial installation and after changing the diffusion element in the Oxymitter. Refer to the flowmeter adjustments in Section 4 for more information.

c. As the Oxymitter and IMPS 4000 apply the first test gas, set the test gas flowmeter to 5 scfh. During the application of the second test gas, verify that the flowmeter reads 5 scfh. If not, adjust the pressure regulator on the second test gas bottle so the 5 scfh flow is provided.

3-6 AUTOMATIC CALIBRATION

Automatic calibrations require no operator action. Automatic calibrations are performed through the time-sequenced calibrations programmed through the IMPS 4000 or through Oxymitter 4000 CAL RECOMMENDED feature.

a. IMPS 4000

The calibration routines programmed into the IMPS 4000 are automatic calibrations. After setting up the calibration routines using the PLC operator interface, the Oxymitters can calibrate on a time-sequenced schedule without any user intervention.

b. Oxymitter 4000

If the Oxymitter 4000 is configured for handshake mode with the IMPS 4000, the Oxymitter 4000 can initiate a calibration by sending a signal to the IMPS 4000 when the CAL RECOMMENDED LED activates. To enable handshake mode, the Oxymitter 4000 logic I/O must be set for mode 8. Handshake mode is configured at the factory or can be accessed using HART/AMS. Refer to the logic I/O information in the HART/AMS section of the Oxymitter 4000 Oxygen Transmitter Instruction Bulletin for more information.

3-7 SEMI-AUTOMATIC CALIBRATION

Semi-automatic calibrations require operator initiation. Semi-automatic calibrations can be performed using the IMPS 4000 keypad, the Oxymitter keypad, the HART handheld communicator/AMS software, or a remote contact.

a. IMPS 4000 Keypad

A semi-automatic calibration can be initiated using the InitCalX parameter in the change presets display mode. Change the InitCalX parameter from 0000 to 0001 for the Oxymitter to be calibrated. This semi-automatic calibration will not disturb the automatic, time-sequenced calibration programmed into the IMPS 4000.

b. Oxymitter Keypad

For information on initiating a semi-automatic calibration from the Oxymitter keypad, refer to the Oxymitter 4000 Oxygen Transmitter Instruction Bulletin.

c. HART Handheld Communicator/AMS Software

A semi-automatic calibration can be initiated by connecting the HART handheld communicator, or AMS software, to the Oxymitter signal line and initiating the calibration using the HART communicator keypad or computer keyboard. Refer to the Oxymitter 4000 Oxygen Transmitter Instruction Bulletin or the available HART documentation for more information.

d. Remote Contact

A semi-automatic calibration can be initiated using a remote contact such as a customer's control system. The remote contact processes the calibration command on the PC and sends a signal to the Oxymitter. For more information on remote-site calibrations, refer to the documentation for the system in use.

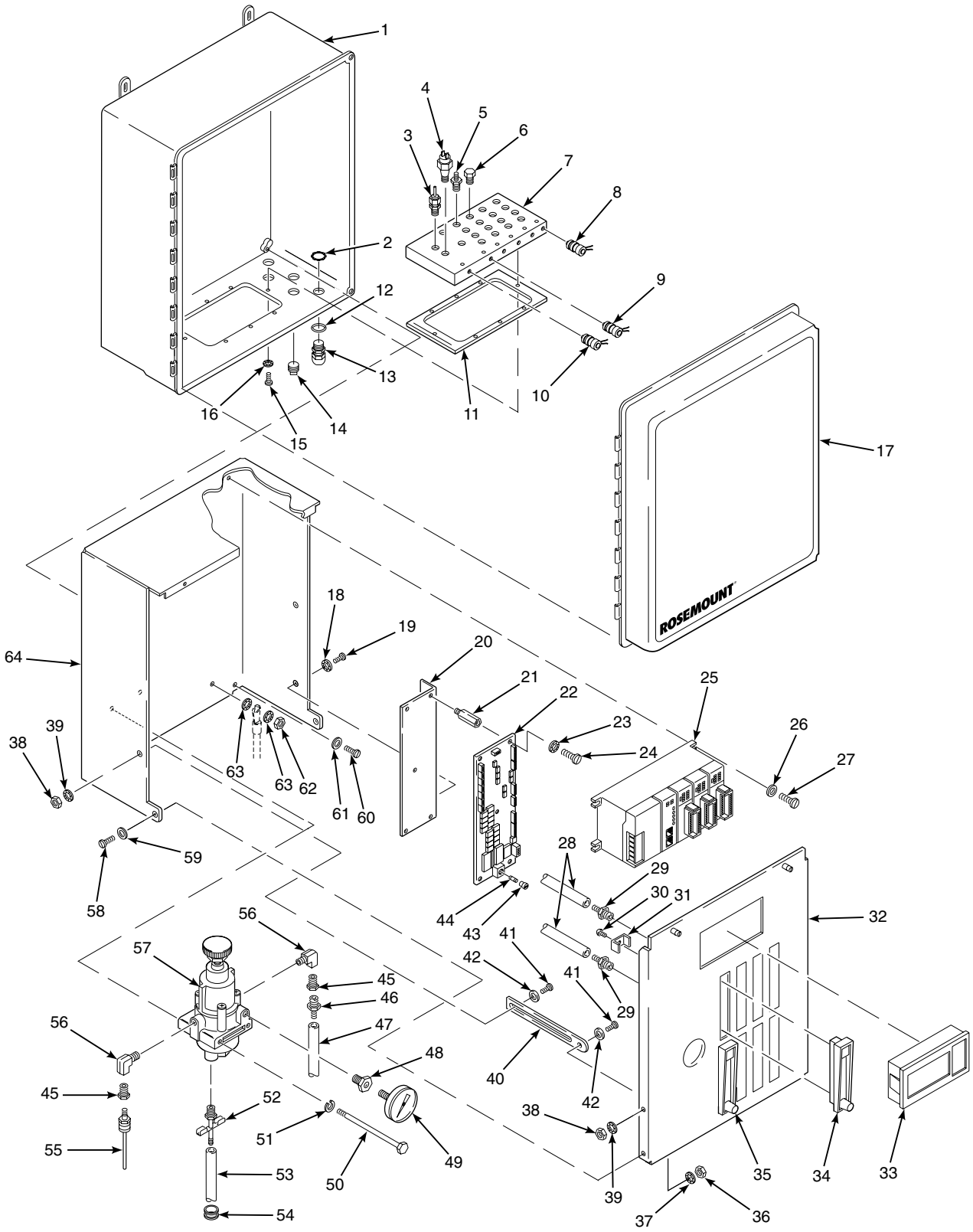


Figure 4-1. IMPS 4000, Exploded View

SECTION 4
MAINTENANCE AND SERVICE

4-1 OVERVIEW

This section describes service and routine maintenance of the IMPS 4000. Replacement parts referenced are available from Rosemount. Refer to Section 6 for part numbers and ordering information.

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.

4-2 FUSE REPLACEMENT

The IMPS 4000 has a fuse on the PC board. Refer to Table 7-1 for replacement fuse specifications. Perform the following procedure to check or replace the fuse.

WARNING

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

a. Turn off power to the system.

b. Open outer cover (17, Figure 4-1).

c. Loosen the two captive screws holding flow panel (32). Lower the flow panel.

d. Remove fuseholder (43) by pushing in the top and turning 1/4 turn counterclockwise. Remove fuse (44).

e. After checking or replacing fuse (44), install fuseholder (43) by pushing in the top and turning 1/4 turn clockwise.

f. Raise and secure flow panel (32) with two captive screws. Close outer cover (17).

4

LEGEND FOR FIGURE 4-1

1. Outer Enclosure
2. Conduit Locknut
3. Fitting
4. Pressure Switch
5. Hose Adapter
6. Plug
7. Manifold
8. Oxymitter Gas Solenoid
9. Test Gas 2 Solenoid
10. Test Gas 1 Solenoid
11. Gasket
12. Seal
13. Cable Grip
14. Plug
15. Screw
16. Washer
17. Outer Cover
18. Washer
19. Screw
20. Mounting Bracket
21. Standoff
22. PC Board
23. Washer
24. Screw
25. PLC
26. Washer
27. Screw
28. 1/8 in. Hose
29. Hose Adapter
30. Screw
31. Bracket
32. Flow Panel
33. Operator Interface
34. Test Gas Flowmeter, 10 scfh
35. Ref. Gas Flowmeter, 2 scfh
36. Nut
37. Washer
38. Nut
39. Washer
40. Slide
41. Screw
42. Washer
43. Fuseholder
44. Fuse
45. Bushing
46. Hose Adapter
47. 1/4 in. Tube
48. Bushing
49. Pressure Gauge
50. Bolt
51. Washer
52. Drain Valve
53. 1/8 in. Impolene Drain Tube
54. Grommet
55. Connector
56. Elbow
57. Pressure Regulator
58. Screw
59. Washer
60. Screw
61. Washer
62. Nut
63. Washer
64. Inner Enclosure

4-3 PLC REPLACEMENT

Perform the following procedure to replace a PLC.

WARNING

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

a. Turn off power to the system.

b. Open outer cover (17, Figure 4-1).

c. Loosen the two captive screws holding flow panel (32). Lower the flow panel.

d. Remove the plastic protective cover over the PLC power supply terminal block (Figure 4-2).

e. Tag and remove the wires shown in Figure 4-2 from the PLC power supply terminal block.

f. Remove the operator interface jack from PORT 2 on the CPU.

g. Tag the three connectors connected to the I/O modules. To remove each connector, squeeze together the top and bottom connector tabs and pull the connector from the I/O module.

h. Remove PLC (25, Figure 4-1) from inner enclosure (64) by removing four screws (27) and washers (26).

i. Mount new PLC (25) to inner enclosure (64) using four washers (26) and screws (27).

j. Refer to Figure 4-2. Carefully install the connectors in the I/O modules. While squeezing the top and bottom tabs together on the connector, align the connector to the I/O module edge connector. Firmly press the connector into place until it seats in the I/O module and the tabs click into place. Verify that you are installing the connectors in the same location as removed in step g.

k. Install the operator interface jack in PORT 2 on the CPU.

l. Install the wires to the PLC power supply terminal block.

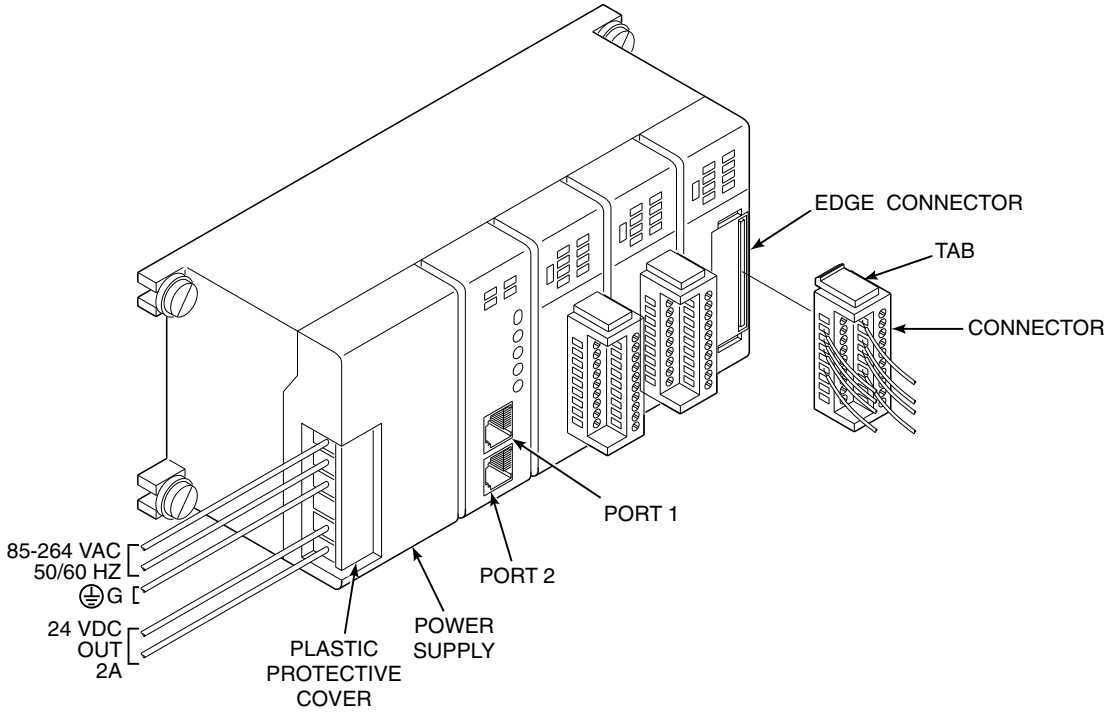


Figure 4-2. PLC Connections

WARNING

Install the plastic protective cover immediately after connecting the wires to the PLC power supply. Accidentally touching the wiring or wiring terminals with the power supply connected may cause severe injury or death due to electric shock.

m. Install the plastic protective cover in the grooves over the power supply terminals.

n. Raise and secure flow panel (32, Figure 4-1) with two captive screws. Close outer cover (17).

4-4 OPERATOR INTERFACE REPLACEMENT

Perform the following procedure to replace an operator interface.

WARNING

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

a. Turn off power to the system.

b. Open outer cover (17, Figure 4-1).

c. Loosen the two captive screws holding flow panel (32). Lower the flow panel.

d. Disconnect the operator interface jack from PORT 2 of the PLC. Refer to Figure 4-2.

e. From the inner side of flow panel (32, Figure 4-1), squeeze in the two tabs on either side of operator interface (33) and push the interface through the front of the flow panel.

f. Install new operator interface (33) by threading the cord through the interface mounting hole in flow panel (32).

g. Press operator interface (33) into flow panel (32) until the tabs click into place.

h. Plug the operator interface jack into PORT 2 of the PLC. Refer to Figure 4-2.

i. Raise and secure flow panel (32, Figure 4-1) with two captive screws. Close outer cover (17).

4-5 SOLENOID REPLACEMENT

The IMPS 4000 manifold has a HI GAS (test gas 1) solenoid (10, Figure 4-1), a LOW GAS (test gas 2) solenoid (9), and a solenoid (8) for each Oxymitter connected to the unit to manifold (7).

WARNING

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

a. Turn off power to the system.

b. Shut off the test gases at the cylinders.

c. Open outer cover (17, Figure 4-1).

d. d.Loosen the two captive screws holding flow panel (32). Lower the flow panel.

e. Disconnect the HI GAS (J2), LOW GAS (J4), or Oxymitter (J5, J7, J8, or J9) plug from its receptacle on PC board (22).

f. Loosen the retaining ring in the middle of the solenoid and remove the top part.

g. With a spanner wrench or padded pliers, remove the remaining part of the solenoid from manifold (7).

h. Separate the new solenoid and screw the smaller part into manifold (7).

i. Place the top part of the solenoid into position and tighten the retaining ring.

j. Connect the plug to the proper receptacle on PC board (22).

k. Raise and secure flow panel (32) with two captive screws. Close outer cover (17).

l. Turn on the test gases at the cylinders.

4-6 PRESSURE REGULATOR MAINTENANCE

a. Pressure Adjustments

Pressure regulator (57, Figure 4-1) is factory set to 20 psi (138 kPa). Adjust using the knob on top of the pressure regulator if necessary.

b. Condensation Drain

To drain excess moisture from the internal gas circuit of the IMPS 4000, periodically loosen drain valve (52) on the bottom of pressure regulator (57). The moisture will flow through drain tube (53) on the bottom of the pressure regulator and exit the bottom of outer enclosure (1).

4-7 FLOWMETER ADJUSTMENTS

a. Reference Gas Flowmeter

Reference gas flowmeter (35, Figure 4-1) regulates the reference gas and must be set to 2 scfh. Adjust the flow with the knob on the bottom of the respective reference gas flowmeter when necessary.

b. Test Gas Flowmeter

Test gas flowmeter (34) regulates the test gas flow and must be set to 5 scfh. However, only adjust the flowmeter to 5 scfh after placing a new diffusion element on the end of the Oxymitter. Adjusting the flowmeter at any other time can pressurize the cell and bias the calibration.

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

Change the diffusion element when the test gas flowmeter reads slightly lower during calibration or when the response time to the process flue gases becomes very slow. Each time the diffusion element is changed, reset the test gas flowmeter to 5 scfh and calibrate the Oxymitter. For more information on changing the diffusion element, refer to the Oxymitter 4000 Oxygen Transmitter Instruction Bulletin.

SECTION 5
TROUBLESHOOTING

5-1 OVERVIEW

This section describes troubleshooting for the IMPS 4000. Additional troubleshooting information can be found in the Instruction Bulletin for the Oxymitter.

WARNING

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

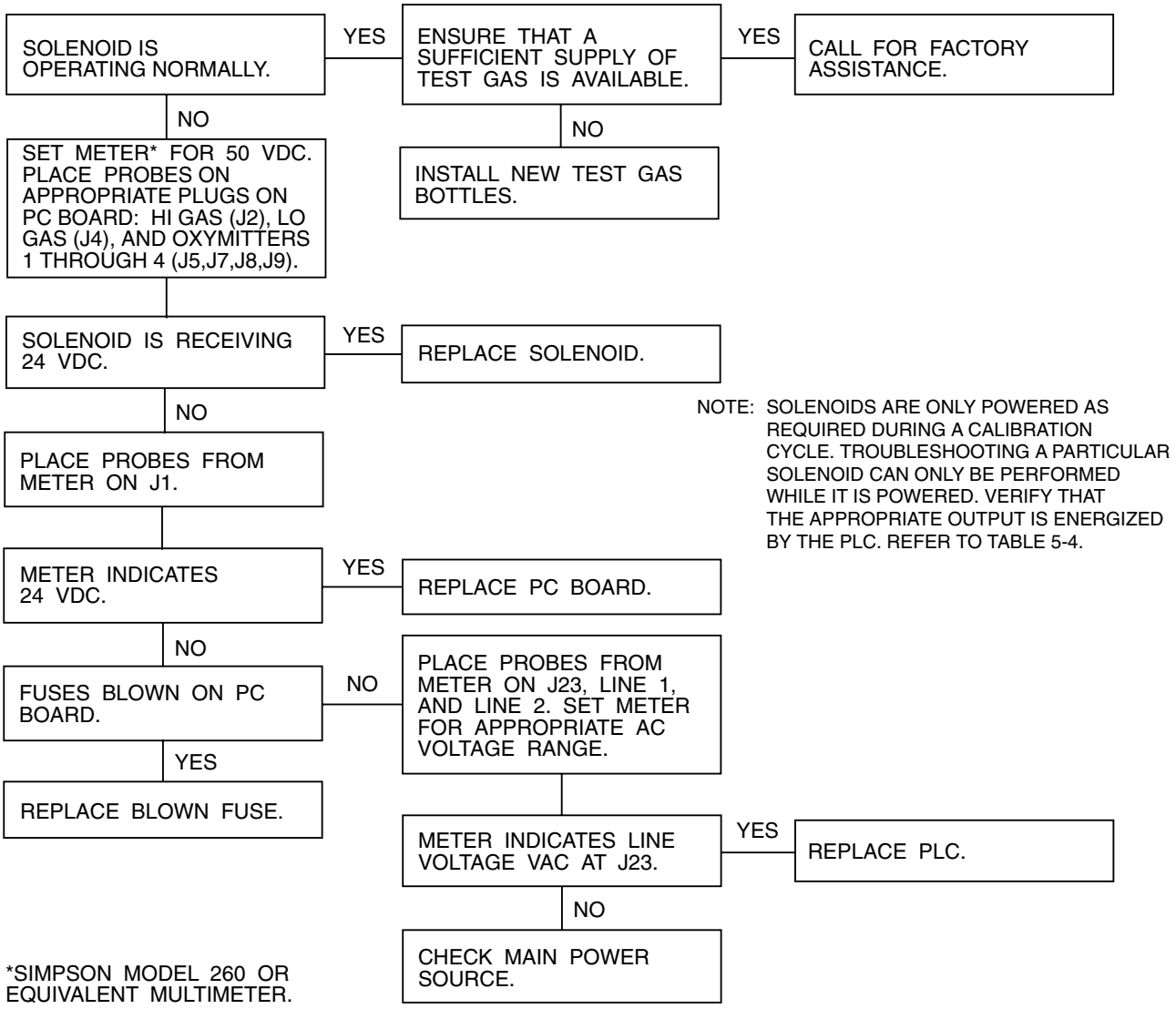
5-2 TROUBLESHOOTING

Table 5-1 provides a guide to fault finding failures within the IMPS. The flowchart in Figure 5-1 provides an alternate approach to fault finding IMPS related problems.

Table 5-1. Fault Finding

SYMPTOM	CHECK	FAULT	REMEDY
1. Power to solenoid, test gas not released to probe	Test gas	Insufficient test gas	Install new test gas tanks.
	Solenoid	Solenoid failure	Replace solenoid.
2. No power to solenoid	Power supply output	Power supply failure	Replace PLC
	Fuse on PC board	Fuse blown	Replace fuse
	Main power source	Main power off	Repair power outage

SYMPTOM



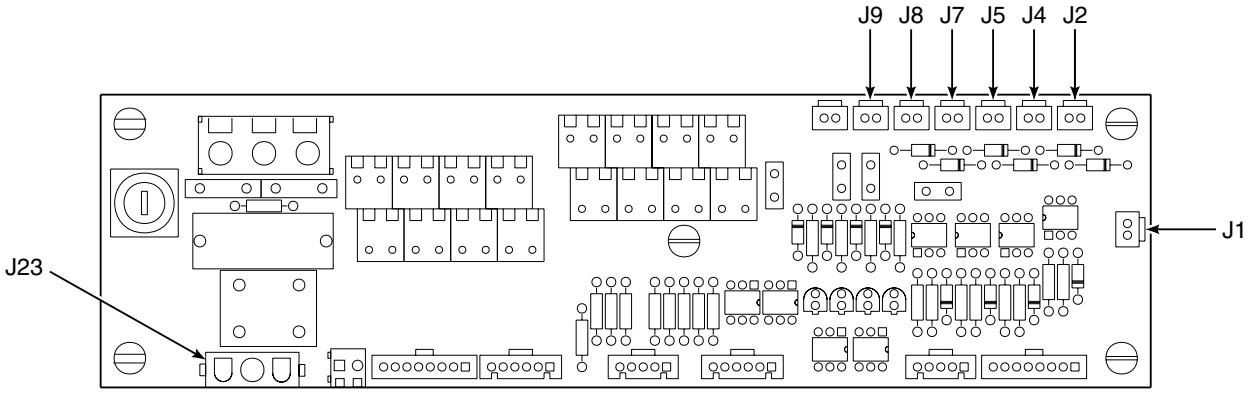


Figure 5-1. IMPS Troubleshooting Flowchart

5-3 CALIBRATION TROUBLESHOOTING

If the IMPS 4000 is unable to calibrate the Oxymitter, use Table 5-2 to determine and correct the problem.

Table 5-2. Cal Fail Fault Finding

SYMPTOM	CHECK	FAULT	REMEDY
1. Cal Fail indicated in MSG display mode	Test gas	Test gas pressure low	Check test gas line for obstruction or install new test gas bottle. When test gas pressure is OK, initiate a semi-calibration to clear the Cal Fail fault.
	Oxymitter	Oxymitter malfunction	Refer to Oxymitter 4000 Oxygen Transmitter Instruction Bulletin for further troubleshooting information.
2. Cal Reqd indicated in MSG display mode but IMPS 4000 cannot initiate calibration	Logic I/O handshake signal	Loss of synchronization between IMPS 4000 and Oxymitter.	1. Set AttchdX to 0000 in the CHG PRE display mode for that particular Oxymitter to clear the IMPS 4000 internal registers. 2. Ensure no alarm conditions are indicated on the Oxymitter and the green CAL LED is off. If the green CAL LED is on or flashing, press the CAL button three times within one second for the Oxymitter to abort the calibration routine. 3. When the Oxymitter green LED is off and no other alarms exist, reset the AttchdX parameter to 0001. **NOTE** **The CalIntvX for that particular Oxymitter resets to 9999 when the Oxymitter is detached from and reattached to the IMPS 4000. If a timed calibration is required for that Oxymitter, set this parameter to the appropriate time interval (in hours).** 4. After resetting the IMPS, initiate a calibration. Observe the Oxymitter status outputs. The INCAL contact will remain closed throughout the calibra tion cycle. The HI GAS ON contact will close for the test gas time set in the Oxymitter. Shortly after the high gas contact opens, the LO GAS ON con tact will close for the test gas time.
3. Cal Fail indicated in message display mode but IMPS 4000 cannot initiate a calibration	Logic I/O handshake signal	Loss of synchronization between IMPS 4000 and Oxymitter.	Refer to remedy for symptom 2.
4. Oxymitter indicates a calibration failure, but IMPS 4000 does not	Logic I/O handshake signal	Loss of synchronization between IMPS 4000 and Oxymitter.	Refer to remedy 1, 3, and 4 for symptom 2.

5-4 PLC I/O LED INDICATIONS

Observing the operation of the PLC inputs and outputs can be a valuable tool in troubleshooting the operation of the IMPS 4000.

Figure 5-2 displays the PLC I/O LEDs. On each input and output module are LEDs that correspond to a specific input or output. Each LED can have two different functions depending on the position of the A/B switch. On the input I/O module for example, if the switch is in the A position, LED 0 indicates input X0 operation. If the switch is in the B position, LED 0 indicates input X10 operation.

Tables 5-3 and Table 5-4 list each input and output of the I/O modules and its description. The tables also identify on which module the input or output resides, what position the A/B switch must be in to identify an I/O using an LED, the LED number, and notes. These notes explain typical I/O operation and corrective actions if the LED does not operate as specified.

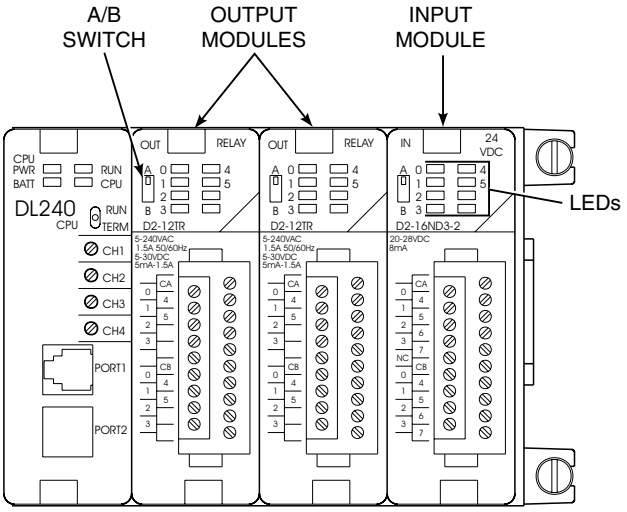


Figure 5-2. PLC I/O LEDs

Table 5-3. PLC Inputs

INPUT NO.	MODULE NO.	SWITCH	LED NO.	DESCRIPTION	NOTE
X0	3	A	0	OXT #1 INPUT	1
X1	3	A	1	OXT #2 INPUT	1
X2	3	A	2	OXT #3 INPUT	1
X3	3	A	3	OXT #4 INPUT	1
X5	3	A	5	GAS PRESSURE SWITCH2	2
X10	3	B	0	REMOTE INPUT #1	3
X11	3	B	1	REMOTE INPUT #2	3
X12	3	B	2	REMOTE INPUT #3	3
X13	3	B	3	REMOTE INPUT #4	3

NOTES

1. Energized by a digital output from the Oxymitter. If the LED is on steady, it indicates that the IMPS 4000 is not responding to an Oxymitter request for a calibration. To correct, perform the following procedure:
   a. Unattach the Oxymitter at the IMPS 4000 operator interface.
   b. Abort the calibration at the Oxymitter. Refer to the Oxymitter 4000 Oxygen Transmitter Instruction Bulletin.
   c. Reattach the Oxymitter at the IMPS 4000 operator interface.
2. Energized when test gas pressure is high enough for calibration. Deenergized indicates low gas pressure. If low test gas pressure is indicated by an unlit LED, verify that the test gas bottles are not empty. Check the piping from the test gas bottles to the IMPS 4000 for leaks or blockages.
3. Energized when a remote system is requesting calibration. This must be a momentary contact. If the LED is on steady, a malfunction is in the remote system or there is a short in interconnecting wiring. Locate and correct the problem.

Table 5-4. PLC Outputs

INPUT NO.	MODULE NO.	SWITCH	LED NO.	DESCRIPTION	NOTE
Y0	1	A	0	OXT #1 INPUT	1
Y1	1	A	1	OXT #2 INPUT	1
Y2	1	A	2	OXT #3 INPUT	1
Y3	1	A	3	OXT #4 INPUT	1
Y10	1	B	0	OXT #1 SOLENOID	2,8
Y11	1	B	1	OXT #2 SOLENOID	2,8
Y12	1	B	2	OXT #3 SOLENOID	2,8
Y13	1	B	3	OXT #4 SOLENOID	2,8
Y14	1	B	4	GAS 1 SOLENOID	3,9
Y15	1	B	5	GAS 2 SOLENOID	3,9
Y20	2	A	0	OXT #1 IN CAL	4,10
Y21	2	A	1	OXT #2 IN CAL	4,10
Y22	2	A	2	OXT #3 IN CAL	4,10
Y23	2	A	3	OXT #4 IN CAL	4,10
Y24	2	A	4	GAS PRESSURE ALARM	5,10
Y30	2	B	0	OXT #1 CAL FAIL	6,10
Y31	2	B	1	OXT #1 CAL FAIL	6,10
Y32	2	B	2	OXT #1 CAL FAIL	6,10
Y33	2	B	3	OXT #1 CAL FAIL	6,10
Y34	2	B	4	GAS 1 ON	7,10
Y35	2	B	5	GAS 2 ON	7,10

NOTES

1. Energized to reply to an Oxymitter. A pulse or a series of pulses will be observed, depending on what portion of the calibration cycle is being performed. If the LED is on steady, it may indicate a PLC failure. Before re placing the PLC, reset the PLC by powering down and powering up the IMPS 4000. Monitor the gas applica tion portion of the calibration cycle once again. If the LED is still on steady, replace the PLC.
2. Energized to select which Oxymitter will receive test gas during calibration. It is only energized during the gas application portion of the calibration cycle.
3. Energized to apply either test gas. It is only energized during the gas application portion of the calibration cycle.
4. Energized when an Oxymitter is in calibration.
5. Energized if gas pressure is low.
6. Energized if a calibration has failed.
7. Energized when a test gas is flowing.
8. If energized continuously, reset by unattaching and reattaching the Oxymitter at the IMPS 4000 operator interface.
9. If energized longer than the AbrtTim set at the operator interface, reset using the following procedure:
   a. Unattach the Oxymitter at the IMPS 4000 operator interface.
   b. Abort the calibration at the Oxymitter. Refer to the Oxymitter 4000 Oxygen Transmitter Instruction Bulletin.
   c. Reattach the Oxymitter at the IMPS 4000 operator interface.
10. If the output LED is illuminated but the remote indication is off, check the wiring from the IMPS 4000 to the remote device. Make sure the wiring is in accordance with Figure 2-3. Note that the status outputs from the IMPS 4000 have shared common connections and remote power is required.

SECTION 6
RETURN OF MATERIAL

6-1 If factory repair of defective equipment is required, proceed as follows:

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

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

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

c. In a cover letter, describe completely:

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

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

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

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

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

SECTION 7
REPLACEMENT PARTS

Table 7-1. Replacement Parts for the IMPS 4000

FIGURE and INDEX No.	PART NUMBER	DESCRIPTION
4-1, 8, 9, and 10	3D39435G01*	Solenoid
4-1, 44	1A97913H03	Fuse, 5A @ 250 Vac, Slow Blow
4-1, 34	771B635H01*	Flowmeter Assembly - Test Gas
4-1, 35	771B635H02*	Flowmeter Assembly - Reference Gas
	1A98631	Probe Adder Kit
4-1, 29	1A97953H01*	Hose Adapter
	4847B46H01*	Tubing Length
	4847B46H02*	Tubing Length
	4847B46H03*	Tubing Length
	4847B46H04*	Tubing Length
1-3	7307A56G02	Check Valve
4-1, 33	1A98972H01	Operator Interface
4-1, 25		PLC
	1A98969H01	PLC 4-Slot Base, 110/220 VDC Power Supply
1-2	1A98967H01	CPU
	1A98968H01	CPU Battery
5-2	1A98970H01	DC Input Module
5-2	1A98971H01	Relay Output Module
4-1, 22	3D39681G01	PC Board

*These items are included in the probe adder kit.

SECTION 8
INDEX

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

WARRANTY

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

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

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

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

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

Instruction Manual
IB-106-400IMPS Rev. 1.0
October 2000

IMPS 4000

IMPS 4000

Part no._____

Serial no._____

Order no._____

Emerson Process Management

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