

## Instruction Manual

760007-A

July 2003

# Model NGA2000 PMD

Paramagnetic Detector Analyzer Module



# 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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## TABLE OF CONTENTS

<b>PREFACE</b> .....	<b>P-1</b>
Intended Use Statement.....	P-1
Definitions.....	P-1
Safety Summary.....	P-2
General Precautions For Handling And Storing High Pressure Gas Cylinders.....	P-4
Documentation.....	P-5
Compliances.....	P-5
Glossary Of Terms.....	P-6
<b>1-0 DESCRIPTION AND SPECIFICATIONS</b> .....	<b>1-1</b>
1-1 Overview.....	1-1
1-2 Typical Applications.....	1-1
1-3 Theory Of Technology.....	1-1
1-4 Features.....	1-2
1-5 Specifications.....	1-3
a. General.....	1-3
b. Sample.....	1-3
c. Physical.....	1-3
<b>2-0 INSTALLATION</b> .....	<b>2-1</b>
2-1 Unpacking.....	2-1
2-2 Assembly.....	2-1
2-3 Location.....	2-2
2-4 Gases.....	2-2
a. Requirements.....	2-2
b. Connections.....	2-3
c. Leak Test.....	2-3
2-5 Electrical Connections.....	2-6
<b>3-0 OPERATION</b> .....	<b>3-1</b>
3-1 Overview.....	3-1
3-2 Displays.....	3-1
a. Run Mode Display.....	3-1
b. Menu Displays.....	3-1
c. Help Displays.....	3-1
3-3 Startup Procedure.....	3-5
3-4 Binding.....	3-5
3-5 Calibration.....	3-5
3-6 Background Gas Compensation.....	3-8
3-7 Barometric Pressure Compensation.....	3-11
<b>4-0 MAINTENANCE AND SERVICE</b> .....	<b>4-1</b>
4-1 Overview.....	4-1
4-2 Printed Circuit Board Replacement.....	4-1
4-3 Module Fan Replacement.....	4-2
4-4 Thermal Fuse Replacement.....	4-3
4-5 Flow Sensor Replacement.....	4-4
4-6 Power Fuse Replacement.....	4-4

<b>5-0</b>	<b>REPLACEMENT PARTS</b> .....	<b>5-1</b>
5-1	Matrix.....	5-1
5-2	Replacement Parts.....	5-2
<b>6-0</b>	<b>RETURN OF MATERIAL</b> .....	<b>6-1</b>
6-1	Return Of Material.....	6-1
6-2	Customer Service.....	6-1
6-3	Training.....	6-1
<b>7-0</b>	<b>APPENDIX A. MENU DISPLAYS</b> .....	<b>7-1</b>

## **LIST OF ILLUSTRATIONS**

Figure 1-1.	Spherical Body in Non-Uniform Magnetic Field.....	1-1
Figure 1-2.	Trace Oxygen Detector Coulometric Principle.....	1-2
Figure 2-1.	Analyzer Module Installation Into Instrument Platform.....	2-1
Figure 2-2.	PMD Front Panel Connections.....	2-4
Figure 2-3.	PMD Back Panel Connections.....	2-4
Figure 2-4.	Interconnection of Typical Gas Manifold to PMD Analyzer Module.....	2-5
Figure 2-5.	PMD Wiring Diagram.....	2-6
Figure 2-6.	PMD Outline and Mounting Dimensions.....	2-7
Figure 3-1.	Run Mode Display.....	3-3
Figure 3-2.	Main Menu Display.....	3-3
Figure 3-3.	Basic Controls Menu.....	3-3
Figure 3-4.	Expert Controls and Setup Menu.....	3-4
Figure 3-5.	Technical Level Configuration Menu.....	3-4
Figure 3-6.	Typical Help Screen.....	3-4
Figure 4-1.	PMD Module – Major Components.....	4-1
Figure 4-2.	Module Fan Assembly.....	4-2
Figure 4-3.	Detector Assembly.....	4-3

## **LIST OF TABLES**

Table 3-1.	PMD Analyzer Module Alarms.....	3-2
Table 3-2.	Calibration Range for Various Zero Based Operating Ranges.....	3-6
Table 3-3.	Calibration Range for Various Suppressed Range Operations.....	3-6
Table 3-4.	Oxygen Equivalents of Common Gases.....	3-10

## PREFACE

### INTENDED USE STATEMENT

The purpose of this manual is to provide information concerning the components, functions, installation and maintenance of the Model NGA2000 PMD and the System Accessories of the NGA2000 System.

### DEFINITIONS

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

#### **DANGER .**

Highlights the presence of a hazard which will cause severe personal injury, death, or substantial property damage if the warning is ignored.

#### **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.

## SAFETY SUMMARY

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.

### **DANGER**

#### **ELECTRICAL SHOCK HAZARD**

Do not operate without covers secure. Servicing requires access to live parts which can cause death or serious injury. Refer servicing to qualified personnel.

For safety and proper performance this instrument must be connected to a properly grounded three-wire source of power.

### **DANGER**

#### **POSSIBLE EXPLOSION HAZARD**

This equipment is not designed and should not be used in the analysis of flammable samples. Use of this equipment in this way could result in explosion and death.

### **NOTE**

Apply leak test liquid to cell or detectors only as a last resort.

### **WARNING**

#### **POSSIBLE EXPLOSION HAZARD**

Verify that all gas connections are made as labeled and are leak free. Improper gas connections could result in explosion or death. See Section 2-4c on page 2-3 for Leak test procedure.

### **WARNING**

#### **HIGH PRESSURE GAS CYLINDERS**

This analyzer requires use of pressurized gas. See General Precautions for Handling and Storing High Pressure Cylinders, page P-4.

### **WARNING**

#### **PARTS INTEGRITY**

Tampering or unauthorized substitution of components may adversely affect safety of this product. Use only factory documented components for repair.

### **WARNING**

#### **OVER-VOLTAGE SPIKING**

If this Analyzer Module is used with a non-Rosemount Analytical power supply, adding Rosemount Analytical PN 90331 Current Protector in series with the 24 V positive line will prevent over-voltage spiking and resultant fuse flowing when powering up the instrument.

### **CAUTION**

#### **HAND INJURY HAZARD**

Do not place hands or fingers in Platform front handles when the front panel is open. Dropping front panel while hand or fingers are inside either handle can cause serious injury.

### **CAUTION**

#### **OVERBALANCE HAZARD**

This Analyzer Module may tip instrument over if it is pulled out too far and the Platform is not properly supported.

### **NOTICE**

Software compatibility is necessary for all NGA2000 components in your system to work together. The version of your Platform's software must be equal to or greater than the version of any other module(s) for successful compatibility. If it is not, contact Rosemount Analytical at 800-433-6076 to order software upgrade kit PN 657150 for the Platform.

You can locate the version of each NGA2000 component as follows:

**Platform Controller Board**  
Turn power ON.

The display will show "Control Module V2. ...". This is the software version.

**Analyzer Module**  
Located on the right side of the Analyzer Module case.

**I/O Module**  
Located on the backplane connector of the module. If no label is present, the module is Version 2.0.

## **GENERAL PRECAUTIONS FOR HANDLING AND STORING HIGH PRESSURE GAS CYLINDERS**

**Edited from selected paragraphs of the Compressed Gas Association's "Handbook of Compressed Gases" published in 1981**

**Compressed Gas Association  
1235 Jefferson Davis Highway  
Arlington, Virginia 22202**

### **Used by Permission**

1. Never drop cylinders or permit them to strike each other violently.
2. Cylinders may be stored in the open, but in such cases, should be protected against extremes of weather and, to prevent rusting, from the dampness of the ground. Cylinders should be stored in the shade when located in areas where extreme temperatures are prevalent.
3. The valve protection cap should be left on each cylinder until it has been secured against a wall or bench, or placed in a cylinder stand, and is ready to be used.
4. Avoid dragging, rolling, or sliding cylinders, even for a short distance; they should be moved by using a suitable hand-truck.
5. Never tamper with safety devices in valves or cylinders.
6. Do not store full and empty cylinders together. Serious suckback can occur when an empty cylinder is attached to a pressurized system.
7. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). A flame should never be permitted to come in contact with any part of a compressed gas cylinder.
8. Do not place cylinders where they may become part of an electric circuit. When electric arc welding, precautions must be taken to prevent striking an arc against the cylinder.



## DOCUMENTATION

The following NGA2000 PMD instruction materials are available. Contact Customer Service Center or the local representative to order.

760007 Instruction Manual (this document)

## COMPLIANCES

This product may carry approvals from several certifying agencies, including Factory Mutual and the Canadian Standards Association (which is also an OSHA accredited, Nationally Recognized Testing Laboratory), for use in non-hazardous, indoor locations.



Rosemount Analytical Inc. has satisfied all obligations from the European Legislation to harmonize the product requirements in Europe.



These products comply with the standard level of NAMUR EMC. Recommendation (May 1993).

**NAMUR**

This product satisfies all obligations of all relevant standards of the EMC framework in Australia and New Zealand.



## **GLOSSARY OF TERMS**

### **Analyzer Module**

The module that contains all sensor/detector components for development of a Primary Variable signal; includes all signal conditioning and temperature control circuitry.

### **Backplane**

The interconnect circuit board which the Controller Board, Power Supply, Analyzer Module power and network cables, I/O Modules and Expansion Modules plug into.

### **Control Module**

The Operator Interface plus the Controller Board.

### **Controller Board**

The computer board that serves as the Network Manager and operates the Display and Keypad.

### **Distribution Assembly**

The Backplane and the card cages that hold I/O and Expansion Modules.

### **Expansion Module**

A circuit board that plugs into the Backplane from the front of the Platform and performs special features not related to I/O functions.

### **I/O Module**

A circuit board that plugs into the Backplane from the rear of the Platform. Has a connector terminal for communication with external data acquisition devices and provides an input/output function.

### **Operator Interface**

The Display and Keyboard.

### **Platform**

Any workable collection of the following: Controller Board, Power Supply, Distribution Assembly, Enclosure and Operator Interface.

### **Power Supply**

Any of a variety of components that provides conditioned power to other NGA2000 components, from the Power Supply Board that plugs into the front of the Backplane in a stand-alone instrument to several larger ones that can power larger collections of modules and components.

### **Primary Variable**

The measured species concentration value from an Analyzer Module.

### **Secondary Variable**

Data placed on the network by a module regarding current status, e.g., sample flow, source voltage and other diagnostic information.

# Model NGA2000 PMD

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**Softkeys**

The five function softkeys located below the front panel display; they assume the function displayed directly above each on the display, a function dictated by software.

**System**

Any collection of Analyzer Module(s), Platform(s), I/O Module(s) and Expansion Module(s).



## SECTION 1 DESCRIPTION AND SPECIFICATIONS

### 1-1 OVERVIEW

This manual describes the Paramagnetic Detector (PMD) Analyzer Module of Rosemount Analytical's NGA2000 Series of gas analysis components.

The PMD Analyzer Module is designed to continuously determine the concentration of oxygen in a flowing gaseous mixture. The concentration is expressed in ppm or percent volume O<sub>2</sub>.

The entire Analyzer Module is designed as a slide-in module (if configured in stand-alone instrument fashion), removable from the front of the Platform, with gas connections made from the rear. All electronics relative to sample detection and conditioning are included in this module.

### 1-2 TYPICAL APPLICATIONS

PMD Analyzer Module applications include:

- process control
- continuous emissions monitoring systems (CEMS)
- industrial gas production
- fermentation process monitoring

### 1-3 THEORY OF TECHNOLOGY

Oxygen is strongly paramagnetic (i.e., capable of becoming a temporary magnet when placed in a magnetic field) while most other common gases are weakly diamagnetic (i.e., tend to be non-magnetic). See Figure 1-1 below.

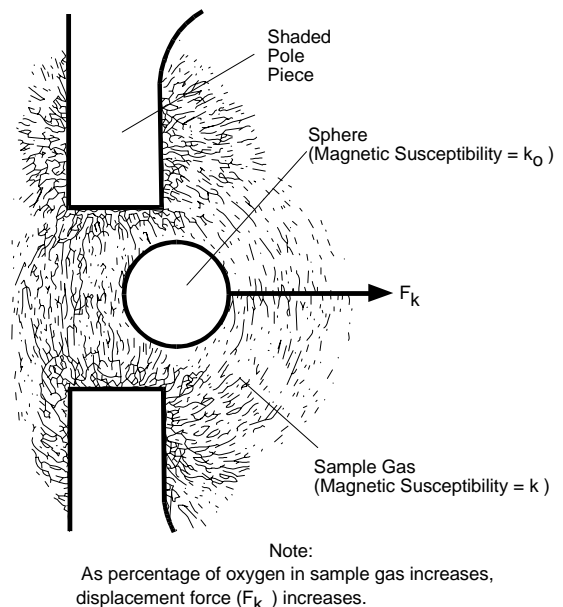
The Magnetic susceptibility of the flowing gas sample is sensed in the detector/magnet assembly. As shown in Figure 1-2 on page 1-2, a dumbbell shaped, nitrogen-filled, hollow gas test body is suspended on a platinum/nickel alloy ribbon in a non-uniform magnetic field.

Because of a "magnetic buoyancy" effect, the spheres of the test body are subjected to displacement forces, resulting in a displacement torque proportional to the magnetic susceptibility of the gas surrounding the test body.

Measurement is accomplished by a null-balance system, whereby the displacement torque is opposed by an equal and opposite restorative torque. The restoring current is automatically maintained at the correct level by an electro-optical feedback system. A beam of light from the source LED is reflected off the square mirror attached to the test body onto a bi-cell (dual photodiode).

The current required to keep the test body to the null position is a linear function of the total magnetic susceptibility of the sample gas.

See Figure 4-1 on page 4-1, Figure 4-2 on page 4-2, and Figure 4-3 on page 4-3 for component configuration.

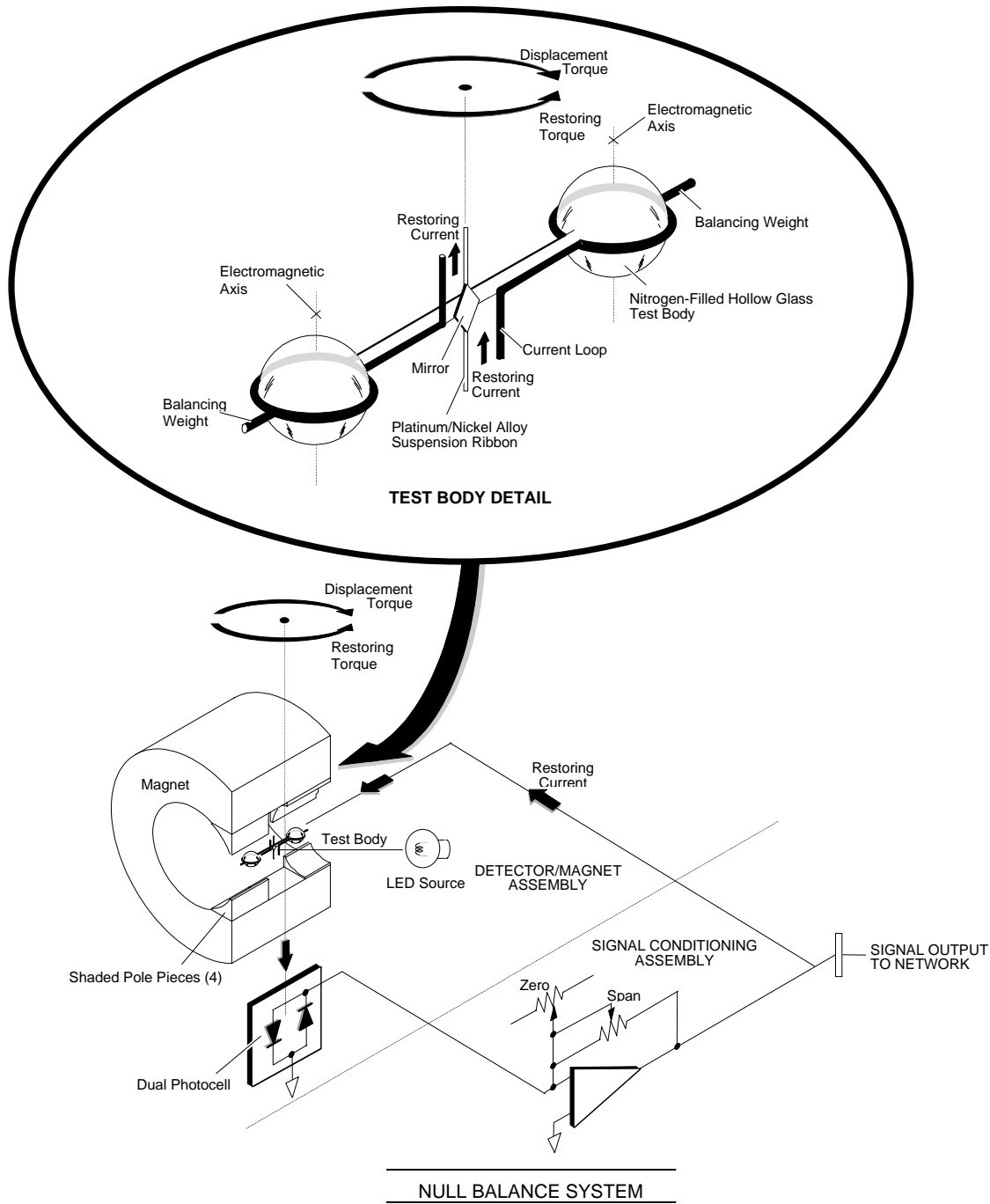


**Figure 1-1. Spherical Body in Non-Uniform Magnetic Field**

**1-4 FEATURES**

Among the features incorporated into the PMD Analyzer Module is a flow splitter ( $\approx 2:1$ ) that allows for greater sample flow, decreased lag time and faster analyzer response.

The "Time Alignment" feature can be used to delay sending the Primary Variable from the PMD Analyzer Module for up to 30 seconds in 0.1 second intervals. This feature allows Primary Variables from more than one PMD Analyzer Module to be "time aligned" if necessary.



**Figure 1-2. Trace Oxygen Detector Coulometric Principle**

# Model NGA2000 PMD

## 1-5 SPECIFICATIONS<sup>1</sup>

### a. General

Measurement Species.....	Oxygen
Ranges .....	0 to 100% oxygen; four fullscale selections, including suppressed zero ranges in 1% increments
Repeatability.....	±1% of fullscale (at constant temperature)
Minimum Detectable Level.....	0.01% oxygen
Noise .....	<1% of fullscale, peak-to-peak; <±1% for suppressed ranges
Linearity .....	±1% of fullscale
Response Time .....	0 to 90% of fullscale in 20 seconds (±2 seconds)
Drift (Zero and Span).....	<±1% of fullscale/24 hours, <±2% of fullscale/week at constant temperature; <±2% of fullscale/24 hours, <±4% of fullscale/week of range for 99 to 100% (at constant temperature)
Effect of Temperature.....	<±1% of fullscale over any 10°C interval for rate of change no greater than 10°C per hour
Environment .....	Location - Class B controlled, indoor, non-hazardous
Ambient Temperature.....	0 to 45°C (32 to 113°F)
Effect of Flow.....	<±1% of range when sample flow rate is changed by 20 ml/min.
Power Requirements.....	24 VDC ±5%, 50 W max.; ripple and noise: <100 mV peak-to-peak; line and load regulations: <±1%

### b. Sample

Temperature .....	Non-flammable;: 10 to 66°C (50 to 150°F)
Flow Rate .....	800 to 1400 ml/min.
Exhaust Pressure .....	-345 to 690 hPa-gauge (-5 to 10 psig)
Particles.....	filtered to <2 microns
Dewpoint.....	below 43°C (110°F), no entrained liquid
Materials in Contact with Sample..	Glass, 316 stainless steel, titanium, Paliney No. 7, epoxy resin, Viton A, platinum, nickel, rhodium and MgF <sub>2</sub>
Sample Humidity .....	non-condensing at ambient temperatures

### c. Physical

Case Classification.....	General purpose for installation in weather-protected areas
Dimensions.....	See Outline and Mounting Dimensions, Figure 2-6 on page 2-7
Weight .....	8 kg (17.6 lbs.)
Mounting.....	Inside a Platform or custom-installed in a panel
Maximum Length of LON Cable....	1600 m (1 mile) between Analyzer Module and Platform

<sup>1</sup> See the Platform manual for specifications regarding Platform related components.





## SECTION 2 INSTALLATION

### 2-1 UNPACKING

If the Paramagnetic Analyzer Module is received as a separate unit, carefully examine the shipping carton and contents for signs of damage. Immediately notify the shipping carrier if the carton or contents is damaged. Retain the carton and packing material until all components associated with the Analyzer Module are operational.

### 2-2 ASSEMBLY

If the Analyzer Module requires assembly with other components (e.g., the Platform and associated I/O Modules), do so at this time. Following the guides on the bottom left and bottom center of the Platform, carefully slide the Analyzer Module halfway into place.

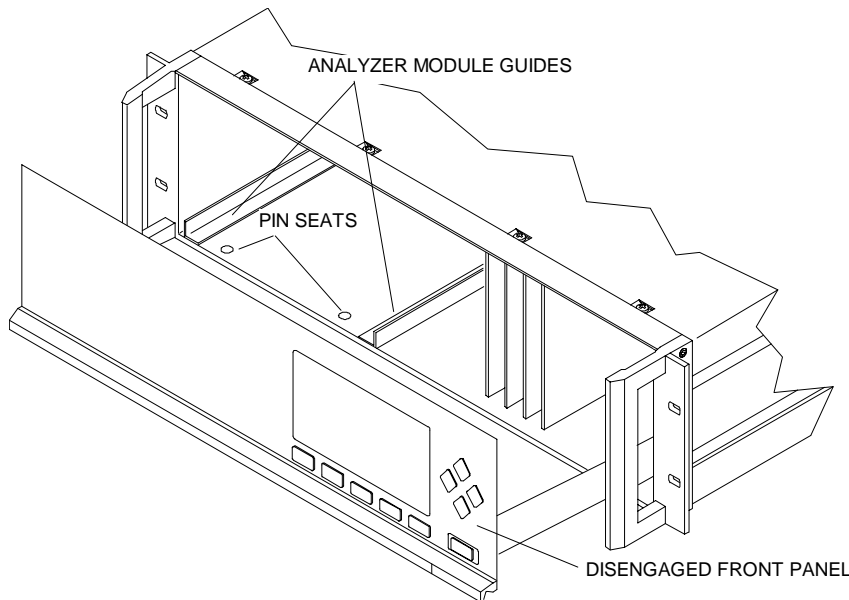
**WARNING**

**HAND INJURY HAZARD**

**Do not place hands or fingers in the Platform front handles when front panel is open. Dropping the front panel of the Platform while hand or fingers are inside either handle can cause serious injury.**

Lift the spring-loaded pins on the front of the Analyzer Module, and carefully slide it the rest of the distance. Secure the module in position by releasing the pins, which seat in the available holes in the bottom of the case (see Figure 2-1 below). If the module and Platform are difficult to assemble, remove the module, ensure the top cover of the module is firmly seated on the hold-down screws, and repeat the assembly procedure.

Install I/O Module(s) according to guidelines in the I/O manual. After startup and calibration have been performed, secure the front panel with the six screws provided.



**Figure 2-1. Analyzer Module Installation Into Instrument Platform**

## **2-3 LOCATION**

Install the Analyzer Module in a clean, non-hazardous, weather protected, vibration free location free from extreme temperature variations. For best results, either install the module near the sample stream to minimize sample transport time or supply a flow greater than necessary and route only the appropriate amount through the Analyzer Module.

Observing these requirements are critical. Note the following:

- Excessive vibration can cause a noisy readout. To minimize vibration effects, the detector/magnet assembly is enveloped in a shock-mounted compartment.
- The user should ensure, when making any internal electrical connections, that no cables are placed in contact with the detector assembly or associated internal sample inlet and outlet tubing.
- Magnetic susceptibilities and partial pressures of gases vary with temperature. Permissible ambient temperature range is 32°F to 113°F (0°C to 45°C).
- The interior of the Detector Assembly is maintained at approximately 144°F (62°C) by an electronically controlled heater. Prior to entering the detector assembly, the sample is heated in a coiled tubing to match the detector's temperature.

## **2-4 GASES**

### **a. Requirements**

#### ***Calibration Gases***

Analyzer Module calibration requires the establishment of zero and span calibration points. This requires a zero standard gas to set the zero point span gas to establish a calibration point at or near the upper range limit.

An oxygen-free gas, typically nitrogen, is required for use as the zero standard gas. Recommendations for span calibration gases, bases on various operating ranges, are tabulated in Table 3-4 on page 3-10. Air (20.93% oxygen) can be used as span gas regardless of the ranges used for sampling, although very low ranges may lose accuracy.

#### ***Sample Gas***

Sample gas should be non-flammable.

#### ***Temperature***

Sample temperature at the inlet should be from 50°F to 150°F (10°C to 66°C). A maximum entry temperature of 110°F (43°C) is recommended to prevent cooling of the sample and possible internal condensation. Such condensation could damage some components of the Analyzer Module. This recommendation can be ignored if a thoroughly dry sample is examined.

#### ***Pressure***

Sample exhaust pressure limits are -5 to 10 psig (-345 to 690 hPa-gauge). Normal operation is in the positive range, between 0 and 10 psig (0 and 690 hPa-gauge). Negative gauge pressures are not normally recommended, but may be used in certain special applications.

To prevent over-pressurization, insert a pressure relief valve into the sample inlet line. A check valve should also be placed in the outlet line if the Analyzer Module is connected to a manifold associated with a flare or other apparatus that does not operate at atmospheric pressure.

The outlet port is commonly vented to the atmosphere. Any change in barometric pressure has a directly proportional effect on the indicated percent of oxygen, and should be neutralized through manual or computer correction of data. Note the following example:

Range = 0% to 5% oxygen

Barometric pressure change after calibration = 1%

Analyzer Module measurement = 5% oxygen

Measurement error =  $0.01 \times 5\%$  oxygen

Fullscale span = 5% oxygen

0.05% oxygen error = 1% of fullscale

The error is more significant for suppressed range 99% to 100%.

An optional barometric pressure compensation board is available to automatically perform this correction.

A general rule regarding calibration gas pressure is that it should be the same as the expected sample gas pressure during routine operation.

The above requirement increases the difficulty of operation at negative gauge pressure. A suction pump can be connected to the outlet port for drawing sample through the Analyzer Module. Such operation necessitates special precautions to ensure accurate readout, including the following:

The need for equilibrium between sample and gas calibration pressures.

Any leakage in the sample handling system will decrease readout accuracy.

### **Flow Rate**

Recommended sample flow rate is 800 to 1400 ml/min.,  $\pm 40$  ml/min. Optimum flow rate is 1100 ml/min.

If flow is held to within tolerance and operating pressure remains constant, zero and span drift will meet specified limits.

### **b. Connections**

(See Figure 2-3 on page 2-4) Connect inlet and outlet lines for sample gas to appropriately labeled fittings on the rear panel. Both connections are 1/4 inch ferrule-type compression fittings.

Zero and span gases use the same inlet and outlet as the sample. Figure 2-4 on page 2-5 shows a typical external sample handling manifold for gas selection. Particulates must be filtered down to two microns, gases generally require pressurization, and flow measurement metering **MUST** be present.

### **c. Leak Test**

The Analyzer Module is thoroughly tested at the factory for gas leakage. The user is responsible for testing for leakage only at the inlet and outlet fittings on the rear panel. The user is also responsible for internal leak testing periodically and if any internal pneumatic components are adjusted or replaced (with a test procedure selected by the user).

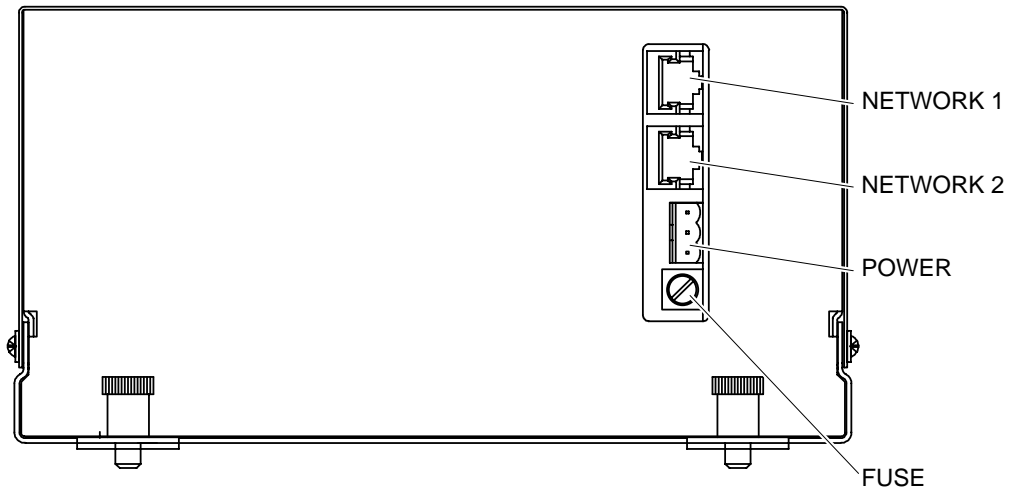
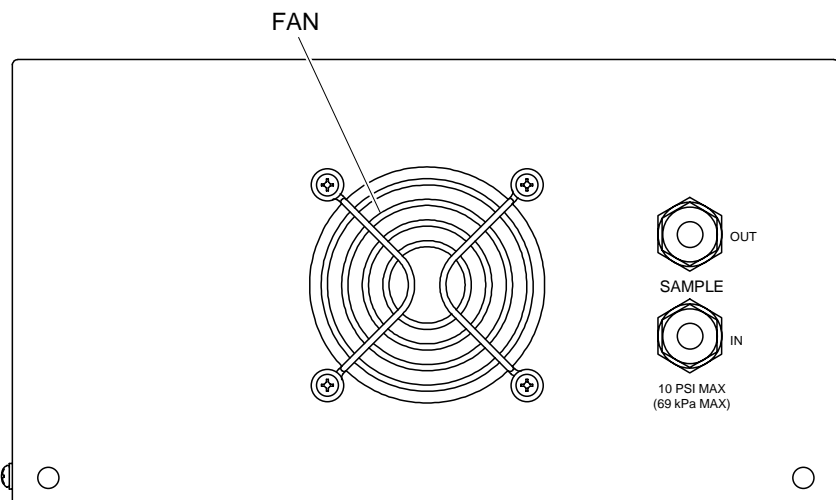
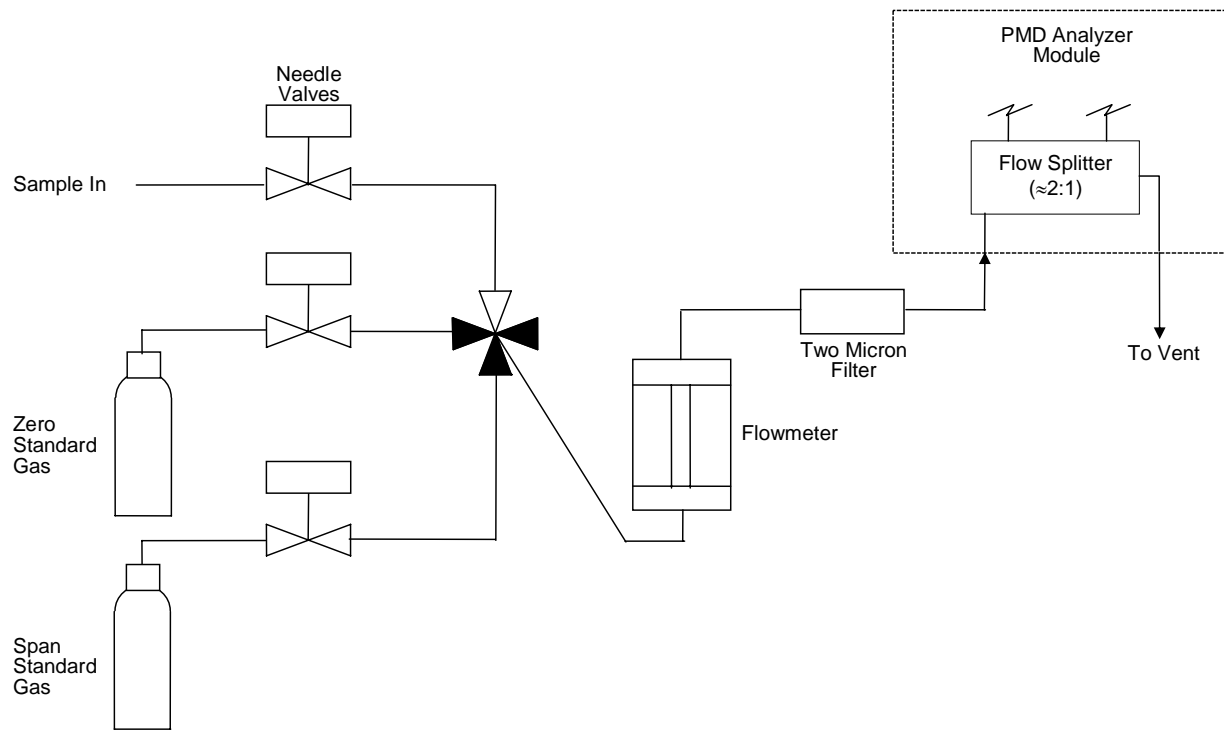


Figure 2-2. PMD Front Panel Connections



Note: Reference and purge gas connections are applicable only to certain applications.

Figure 2-3. PMD Back Panel Connections



**Figure 2-4. Interconnection of Typical Gas Manifold to PMD Analyzer Module**

**2-5 ELECTRICAL CONNECTIONS**

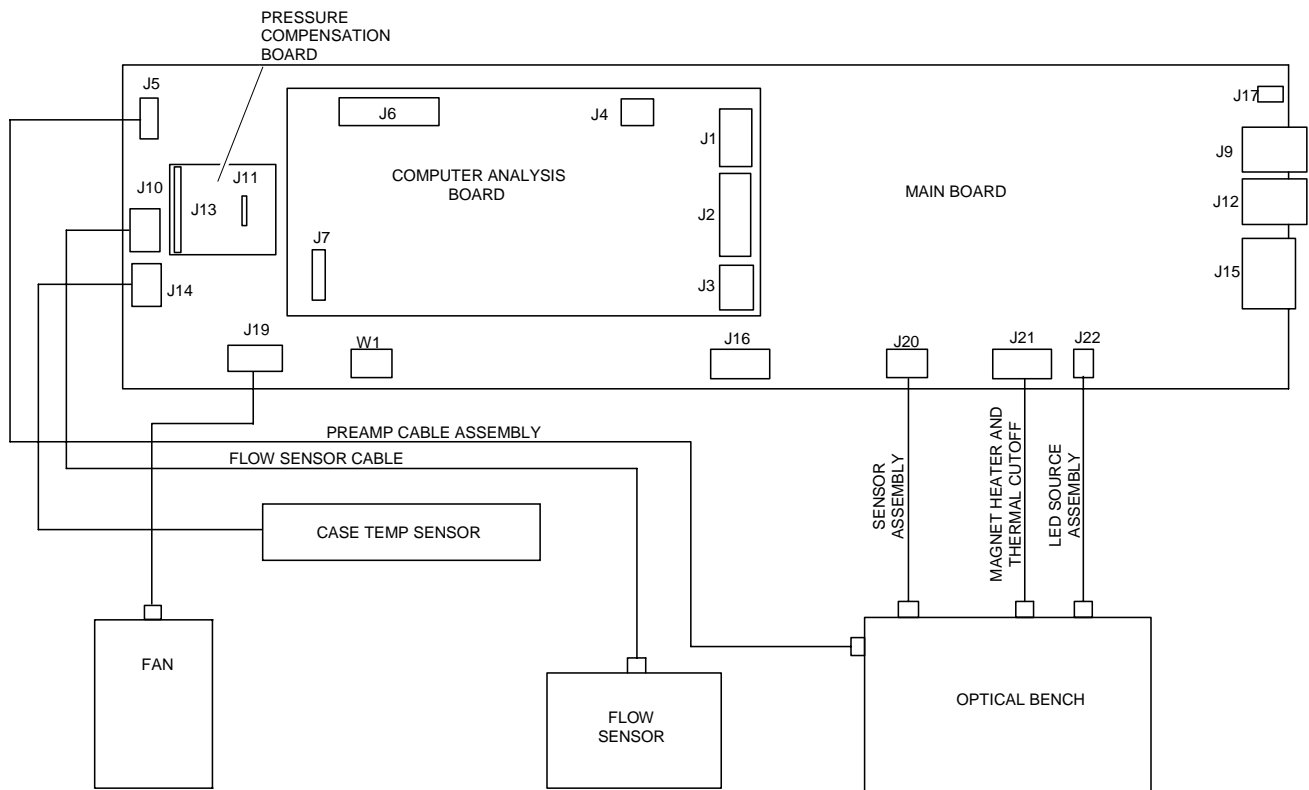
**NOTE**

**Electrical connections must be in compliance with National Electrical Code (ANSI/NFPA 70) and/or any applicable national or electrical codes.**

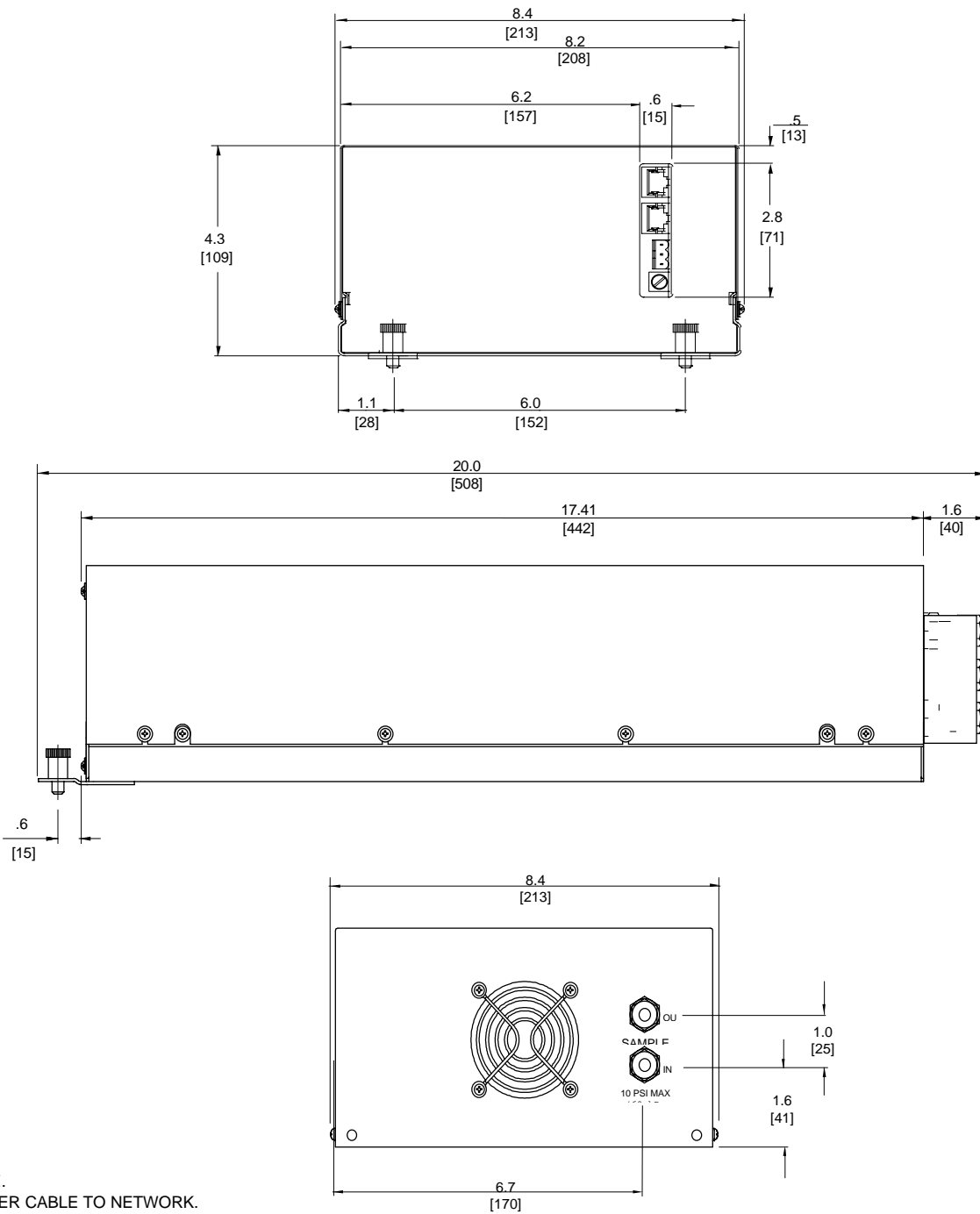
Two electrical connections are required on the Analyzer Module; POWER and NETWORK.

See Figure 2-2 on page 2-4. On the Analyzer Module, two NETWORK connections are available, either of which is appropriate for : 1) interconnection with Backplane of the Platform (see Platform instruction manual) or 2) "daisy chaining" with other NGA2000 components.

Connect Analyzer Module POWER 24 VDC power source, either the Platform or external power source.



**Figure 2-5. PMD Wiring Diagram**



- E. FUSE.
- D. POWER CABLE TO NETWORK.
- C. NETWORK CABLE CONNECTIONS TO PLATFORM.
- B. SAMPLE OUT: 1/4" O.D. TUBE FITTING.
- A. SAMPLE IN: 1/4" O.D. TUBE FITTING.

- 5. MODULE TO BE INSTALLED WITHIN  $\pm 15^\circ$  OF HORIZONTAL.
- 4. POWER REQUIREMENTS: 24 VDC 3.5 A.
- 3. ELECTRICAL INSTALLATION MUST BE IN COMPLIANCE WITH NATIONAL ELECTRICAL CODE (ANSI/NFPA 70) AND/OR ANY APPLICABLE NATIONAL OR LOCAL CODES.
- 2. MODULE IS NOT WEATHERPROOF.
- 1. APPROXIMATE WEIGHT: 15 LB (6.8 kg).

<p><b>DIMENSIONS</b></p> <p>INCH [mm]</p>
---

**Figure 2-6. PMD Outline and Mounting Dimensions**





## SECTION 3 OPERATION

### 3-1 OVERVIEW

Prior to initial startup, the user should perform the leak test procedure outlined in Section 2-4c on page 2-3.

For the remainder of this section Analyzer Module interconnection with a Platform or some interfacing component will be assumed. Display and keypad information shall refer to that which the user can expect to see and do with regard to the front panel of the Platform.

For a complete description of the Platform front panel controls and indicators, see the Platform instruction manual, Displays & Operating Keys.

### 3-2 DISPLAYS

Three kinds of Display screens are available to the user:

- Run Mode
- Menu
- Help

#### a. Run Mode Display

The Run Mode is the normal mode of operation. In this mode, the Display (see Figure 3-1 on page 3-3) will show current gas measurement, the component of interest, the current operations of the softkeys, and a graphic bar representing the displayed concentration as ppm or as a percent of oxygen.

If more than one Analyzer Module is connected to the system, the Run Mode display will show as many as four gas measurements on screen. Alarm messages may also appear on the display (See Table 3-1 on page 3-2).

#### b. Menu Displays

The menu structure enables the user to access data and functions, and put information onto the network.

The Main Menu (Figure 3-2 on page 3-3) is subdivided into three levels of control based generally on which personnel is likely to use it: Basic Controls, Expert Controls and Setup, and Technical Level Configuration. See Figure 3-3 on page 3-3, Figure 3-4 on page 3-4, and Figure 3-5 on page 3-4. Many layers of the menu structure are described at appropriate places throughout this manual.

From the Run Mode display, press the MENU softkey to enter the Main Menu (Figure 3-2 on page 3-3).

#### c. Help Displays

The Help structure is intended to be an on-line "tutorial," context sensitive and topic-interconnected, so that the user can practically operate NGA2000 without need of an instruction manual (Figure 3-6 on page 3-4).

<b>MESSAGE DISPLAY</b>	<b>DESCRIPTION</b>	<b>TYPE</b>
barometer	System Barometer	warning
case temp	Case Temperature	warning
crude noise	Calculated Noise	warning
currentrnghi	Current, High Range	warning
currentrnglo	Current, Low Range	warning
det tem	Detector Temperature	warning
fan fet	Fan Current	warning
heater fet	Heater Current	warning
led current	LED Current	warning
lin error	Linearizer Error	warning
loop current	PMD Loop Current	warning
n15 volts	Power Supply, -15V	warning
p15 volts	Power Supply, +15V	warning
p24 volts	Power Supply, +24V	warning
P5 volts	Power Supply, +5v	warning
raw signal	Raw Signal	warning
Samp Pres	Sample Pressure	warning
svflow	Sample Bypass Flow	warning
bicella	PMD Photo Sensor	failure
bicellb	PMD Photo Sensor	failure
sw error	Software Error	failure

**Table 3-1. PMD Analyzer Module Alarms**

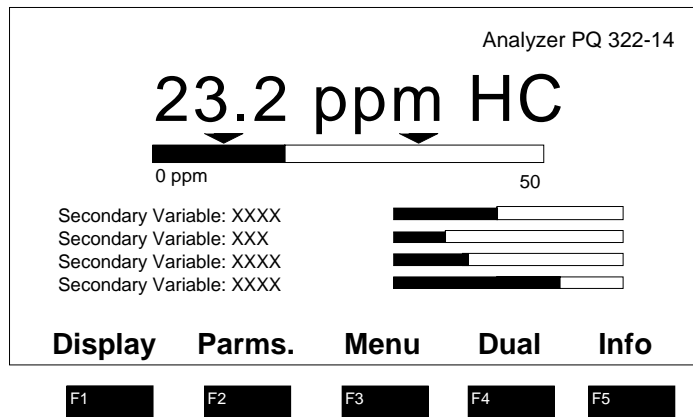


Figure 3-1. Run Mode Display

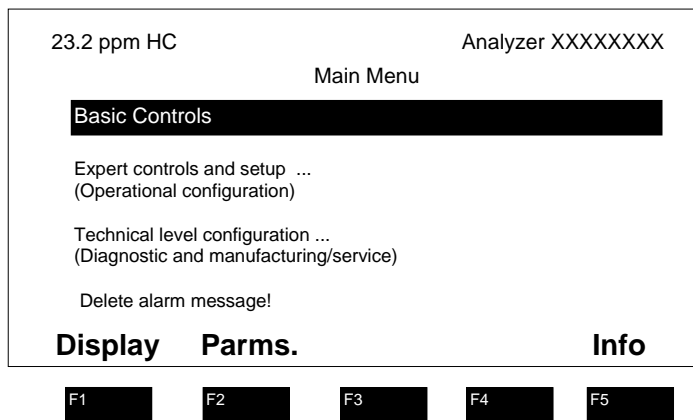


Figure 3-2. Main Menu Display

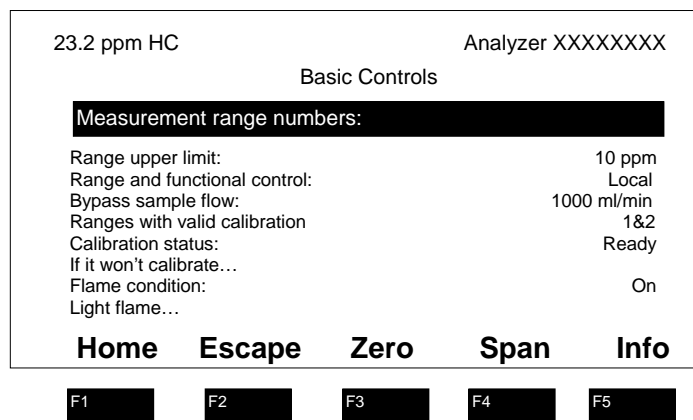


Figure 3-3. Basic Controls Menu

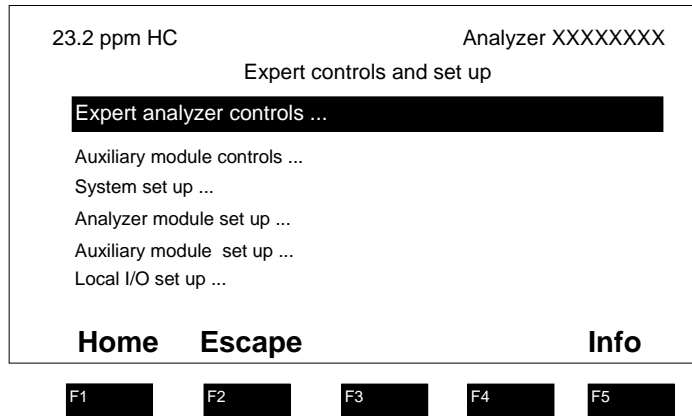


Figure 3-4. Expert Controls and Setup Menu

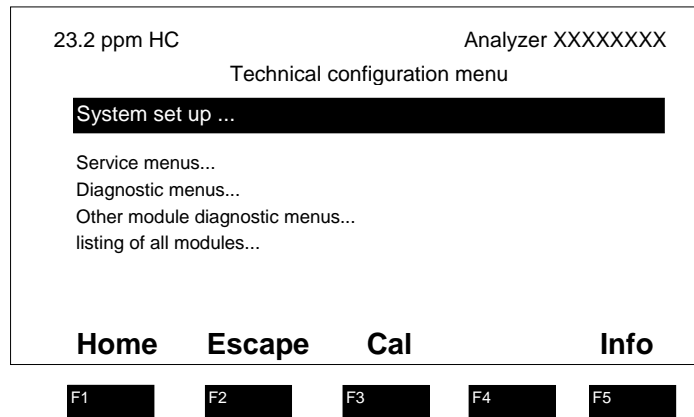


Figure 3-5. Technical Level Configuration Menu

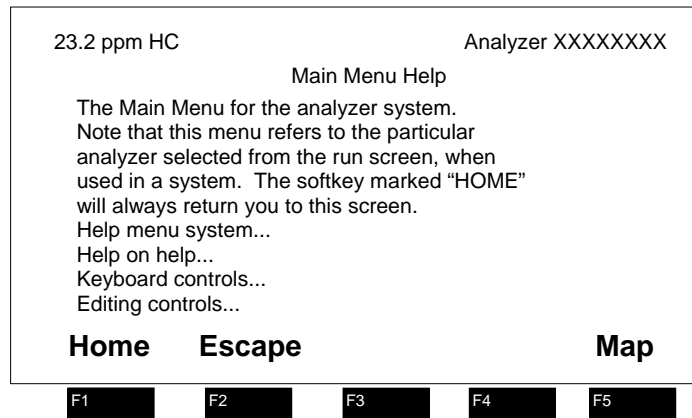


Figure 3-6. Typical Help Screen

# Model NGA2000 PMD

## 3-3 STARTUP PROCEDURE

Introduce a suitable on-scale gas (NOT actual sample) into sample inlet.

Apply power to the PMD Analyzer Module. If it is associated with a Platform, do this by plugging in the Platform to a power source. The Platform has no ON/OFF power switch. Once power is supplied to the Platform, the PMD Analyzer Module will be energized.

If the user's system contains only one Analyzer Module, all system components, the Controller Board and the network "self-install" (bind together) during initial startup. If the system contains more than one Analyzer Module, the startup sequence will interrogate the network to locate and identify all components on the network. The user will have to bind appropriate combinations of components after the startup sequence.

After the warm-up period, approximately one hour for PMD Module, all modules are completely functional.

Enter appropriate data in the Calibration Gas List (by making the following display selections: Main Menu, Expert Controls and Setup [enter security code, if necessary], Analyzer Module setup, Calibration Gas List). Also, enter appropriate values in the Calibration Parameters menu (by making the following display selections: Main Menu, Expert Controls and Setup [enter security code, if necessary], Analyzer Module Setup, Calibration Parameters), particularly data related to which ranges are to be zeroed together and how the Analyzer Module is expected to calibrate ranges (separately or otherwise).

The Analyzer Module will not allow the user to increase the upper limit of a range beyond the "maximum range" software setting. To change the "maximum range" value, select the following from the Main Menu: Technical Configuration Menu, Service Menu, Manufacturing Data, Analyzer Module Data. Select Maximum Range, and use the arrow keys to scroll the indicated value. The same applies for "minimum range" settings.

## 3-4 BINDING

To achieve full coordination between Analyzer Modules and associated I/O Modules, the user must bind those components together in the System Setup portion of the Technical Configuration Menu in software.

## 3-5 CALIBRATION

Calibration consists of establishing zero and span calibration points. Generally, zero and span calibration should be performed on the range that will be used during sample analysis.

To calibrate the PMD Analyzer Module, introduce zero gas into the SAMPLE INLET, and do the following:

1. If the *Multi-Analyzer Module*, split *Run Mode* display is shown, press the *DISPLAY* softkey until the desired Analyzer's *Run Mode* display is acquired.
2. Press the *MENUS* softkey to enter the *Main Menu*.
3. Press the *ENTER* key to enter the *Basic Controls menu*.
4. Press the *ZERO* softkey to enter the *Analyzer Zero menu*.
5. Press the *ZERO* softkey and wait.
6. Introduce span gas (Table 3-2 on page 3-6) into the SAMPLE INLET.
7. Press the *SPAN* softkey to enter the *Analyzer Span menu*, press *SPAN* again and wait.
8. Press the *HOME* softkey to re-enter the *Main Menu*.
9. Press the *DISPLAY* softkey for the *Run Mode* display.

For users of analyzers with suppressed indicating ranges, it may be desirable to calibrate the analyzer zero and span points within the suppressed range with gases in the sup-

pressed range. Table 3-3 below shows recommended zero and span standard gases for

suppressed range oxygen indication in an Argon background.

RANGE % OXYGEN	RECOMMENDED ZERO STANDARD GAS	RECOMMENDED SPAN STANDARD GAS
0 to 1	Nitrogen	0.9% O2, balance N2
0 to 2.5	Nitrogen	2.3% O2, balance N2
0 to 5	Nitrogen	4.5% O2, balance N2
0 to 10	Nitrogen	9% O2, balance N2
0 to 25	Nitrogen	Air (20.93% O2)
0 to 50	Nitrogen	45% O2, balance N2
0 to 100	Nitrogen	100% O2

**Table 3-2. Calibration Range for Various Zero Based Operating Ranges**

RANGE % OXYGEN	RECOMMENDED ZERO STANDARD GAS	RECOMMENDED SPAN STANDARD GAS
50 to 100	50 - 50.5% O2 Balance AR	100% O2
70 – 100%	70 – 70.5% O2 Balance AR	100% O2
98 – 100%	98 – 98.5% O2 Balance AR	100% O2
99 – 100%	99 – 99.5% O2 Balance AR	100% O2

**Table 3-3. Calibration Range for Various Suppressed Range Operations**

If the user is unable to calibrate the Analyzer Module (i.e., when ZERO or SPAN is initiated, nothing happens), a possible solution relates to the use of an incorrect gas for zeroing or spanning (e.g., using a high concentration gas to zero or a zero gas to span the Analyzer Module). Recalibrating with the appropriate gas(es) WILL NOT correct the problem because the ZERO OFFSET or SPAN FACTOR has been set to an extreme value in the process.

To remedy the problem, do the following:

1. Select the following from the Main Menu: Expert Controls and Setup (enter security

code if necessary), Analyzer Module Setup, and Calibration Parameters.

2. Using the down arrow, select Zero Ranges, press ENTER and, using the up/down arrows, toggle to SEPARATE. Do the same for the Span Ranges selection. Do not press ESCAPE at any time unless retention of prior settings is desired.
3. Return to the Main Menu (HOME) and make the following selections: Expert Controls and Setup (enter security code if necessary), Expert Analyzer Controls, CAL softkey, FACTORS softkey, and

# Model NGA2000 PMD

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Range 1 (2, 3, 4) Factors. (Do steps 4 and 5 for each range.)

4. Select Zero Offset, press ENTER, adjust the value to 525000 with the up/down arrow keys, and press ENTER. Do not press ESCAPE at any time unless retention of prior settings is desired.
5. Select Span Factor, press ENTER, adjust the value to 0.000015 with the up/down arrow keys, and press ENTER. Do not

press ESCAPE unless retention of prior settings is desired.

6. Attempt to recalibrate the Analyzer Module according to the procedure outlined at the beginning of Section 3-5 on page 3-5. If re-calibration fails, return to the Range Factors menu, readjust factors, and attempt calibration again.

### 3-6 BACKGROUND GAS COMPENSATION

Any gas having a composition other than 100% oxygen contains background gas, that is, non-oxygen components. Sometimes, the PMD Module response to background gas is significant, depending largely on the span and range used.

If the operator uses zero and span gases that contain the same background gas as the sample, calibration procedures automatically compensate. No adjustments are necessary.

If the background gas in the sample is different from that in the zero and/or span gases, the operator must take into consideration background effects to ensure correct readout. During entry of zero and span gas values in the Calibration Gas List, the instrument is not set to indicate the true oxygen content of the zero and span standard gases. It is set to indicate a slightly different value, relative to background gas, calculated to provide correct readout during subsequent analysis of sample gas.

#### ***Oxygen Equivalent Values of Gases***

For computation of background corrections, the analyzer's response to each component of the sample must be known. Table 3-4 on page 3-10 lists the percentage oxygen equivalent values for many common gases. For a more comprehensive list of oxygen equivalent values, refer to a resource text such as the Handbook of Chemistry and Physics for tables of magnetic susceptibility of substances. The percentage oxygen equivalent of a gas can be determined by the following equation, assuming both gases are supplied at the same pressure:

$$\%O_2 \text{ Equivalent of Gas} = \frac{\text{Analyzer Response to Gas}}{\text{Analyzer Response to O}_2} \times 100\%$$

For example, if the analyzer's response to oxygen is +100%, the response to xenon would be -1.34%.

The oxygen equivalent of a gas mixture is the sum of the contribution of the individual gas components.

#### **Example: Zero Based Range**

At lower range limit (i.e., 0% O<sub>2</sub>), composition of sample is: 80% CO<sub>2</sub>, 20% N<sub>2</sub>.

From Table 3-4 on page 3-10, the percent oxygen equivalents are: CO<sub>2</sub> -0.623%, N<sub>2</sub> -0.358%.

The percent oxygen equivalent of the mixture = 0.8(-0.623) + 0.2(-0.358) = (-0.4984) + (-0.0716) = 0.570% O<sub>2</sub>.



# Model NGA2000 PMD

## Computing Adjusted Values for Calibration Gas List

Before calibrating the Analyzer Module, values in the Calibration Gas List must be adjusted to correct for magnetic susceptibility of background gas. In the equation that follows, the quantities are defined as follows:

- **BGGst** = oxygen equivalent of background gas in standard gas (Table 3-4 on page 3-10).
- **BGGs** = oxygen equivalent of background gas in sample (Table 3-4 on page 3-10).
- **OP** = operating pressure. Unless special pressure corrections are to be made, the zero standard, span standard and sample gases must all be admitted at the same pressure.

Use the following equation to compute the adjusted settings for the Calibration Gas List:

$$\text{Adjusted percent oxygen for standard gas} = \frac{(A)[100 + (B-C)] - 100[B-C]}{100}$$

Where:

A = true percent oxygen of standard gas

B = BGGs

C = BGGst

Example:

Background gas in sample is CO<sub>2</sub>, oxygen equivalent = -0.623%.

Zero gas is 100% N<sub>2</sub>.

Span standard gas is air: 21% O<sub>2</sub>, 79% N<sub>2</sub>.

Background gas in zero and span standard gases is N<sub>2</sub>, oxygen equivalent = 0.358%.

With N<sub>2</sub> zero standard gas flowing, zero gas value in the Calibration Gas List would be 0.265% O<sub>2</sub> (as determined by the following):

$$\frac{0[100+(-0.623-(-0.358))] - 100\{-0.623-(-0.358)\}}{100} = 0.265\% \text{ O}_2$$

With air flowing, span gas value in the Calibration Gas List would be 21.21% oxygen (as determined by the following):

$$\frac{21(100 - 0.265) - 100 (-0.265)}{100} = 21.209\% \text{ O}_2 \cong 21.21 \text{ O}_2$$

In two limiting cases, the general equation is reduced to simpler forms.

1. If the span standard gas is 100% oxygen, the adjusted oxygen value is the same as the true value (i.e., 100% O<sub>2</sub>).
2. If the zero standard is an oxygen-free zero gas, the adjusted value for setting the ZERO Control = BGGst-BGGs. (If the oxygen-free zero gas is more diamagnetic than the background gas in the sample, this difference is negative. The negative value may be entered in the Calibration Gas List.)

Alternately, the user can avoid these compensation calculations by using zero and span gases which have been specially prepared to contain the expected amounts of background gas. Calibration of the analyzer module will then factor in background gas effects in the same proportions as normal run mode measurement.

GAS	EQUIV. % AS O <sub>2</sub>
Acetylene, C <sub>2</sub> H <sub>2</sub>	-0.612
Allene, C <sub>3</sub> H <sub>4</sub>	-0.744
Ammonia, NH <sub>3</sub>	-0.479
Argon, A	-0.569
Bromine, Br <sub>2</sub>	-0.83
1,2-Butadiene, C <sub>4</sub> H <sub>6</sub>	-1.047
1,3-Butadiene, C <sub>4</sub> H <sub>6</sub>	-0.944
n-Butane, C <sub>4</sub> H <sub>10</sub>	-1.481
iso-Butane, C <sub>4</sub> H <sub>10</sub>	-1.485
Butene-1, C <sub>4</sub> H <sub>8</sub>	-1.205
cis Butene-2, C <sub>4</sub> H <sub>8</sub>	-1.201
iso-Butene, C <sub>4</sub> H <sub>8</sub>	-1.274
trans Butene-2, C <sub>4</sub> H <sub>8</sub>	-1.274
Carbon Dioxide, CO <sub>2</sub>	-0.623
Carbon Monoxide, CO	-0.354
Ethane, C <sub>2</sub> H <sub>6</sub>	-0.789
Ethylene, C <sub>2</sub> H <sub>4</sub>	-0.553
Helium, He	-0.059
n-Heptane, C <sub>7</sub> H <sub>16</sub>	-2.508
n-Hexane, C <sub>6</sub> H <sub>14</sub>	-2.175
cyclo-Hexane, C <sub>6</sub> H <sub>12</sub>	-1.915
Hydrogen, H <sub>2</sub>	-0.117

GAS	EQUIV. % AS O <sub>2</sub>
Hydrogen Bromide, Hbr	-0.968
Hydrogen Chloride, HC1	-0.650
Hydrogen Fluoride, HF	-0.253
Hydrogen Iodide, HI	-1.403
Hydrogen Sulhide, H <sub>2</sub> S	-0.751
Krypton, Kr	-0.853
Methane, CH <sub>4</sub>	-0.512
Neon, Ne	-0.205
Nitric Oxide, NO	+44.2
Nitrogen, N <sub>2</sub>	-0.358
Nitrogen Dioxide, NO <sub>2</sub>	+28.7
Nitrous Oxide, N <sub>2</sub> O	-0.560
n-Octane, C <sub>8</sub> H <sub>18</sub>	-2.840
Oxygen, O <sub>2</sub>	+100.0
n-Pentane, C <sub>5</sub> H <sub>12</sub>	-1.810
iso-Pentane, C <sub>5</sub> H <sub>12</sub>	-1.853
neo-Pentane, C <sub>5</sub> H <sub>12</sub>	-1.853
Propane, C <sub>3</sub> H <sub>8</sub>	-1.135
Propylene, C <sub>3</sub> H <sub>6</sub>	-0.903
Water, H <sub>2</sub> O	-0.381
Xenon, Xe	-0.340

Table 3-4. Oxygen Equivalents of Common Gases

# Model NGA2000 PMD

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## 3-7 BAROMETRIC PRESSURE COMPENSATION

Although normally calibrated for readout in percent oxygen, the PMD Analyzer Module actually responds to oxygen partial pressure. The partial pressure of the oxygen component in a gas mixture is proportional to the total pressure of the mixture. Thus readout is affected by pressure variations.

For instance, assume that an instrument is calibrated for correct readout with a standard gas containing 5% oxygen, admitted at the normal sea level atmospheric pressure of 14.7 psia (1013 hPa). If the operating pressure

now drops to one-half of the original value (i.e., to 7.35 psia/506 hPa and the calibration controls are left at the previously established settings, the display reading for the standard gas will drop to 2.5%.

It is therefore necessary to calibrate the instrument at the same pressure that will be used during subsequent operation, and to maintain this pressure during operation.

Alternatively, an optional Barometric Pressure Compensation Board, typically used for suppressed range applications, can perform signal corrections automatically.



## SECTION 4 MAINTENANCE AND SERVICE

**WARNING**

**QUALIFIED PERSONNEL**

**This equipment should not be adjusted or repaired by anyone except properly qualified service personnel.**

The LED bi-cell assembly source required adjustment (rotation) anytime the Detector is disassembled. Refer to Figure 4-3 on page 4-3 for locations of these components.

### 4-1 OVERVIEW

PMD Analyzer components that may require replacement include:

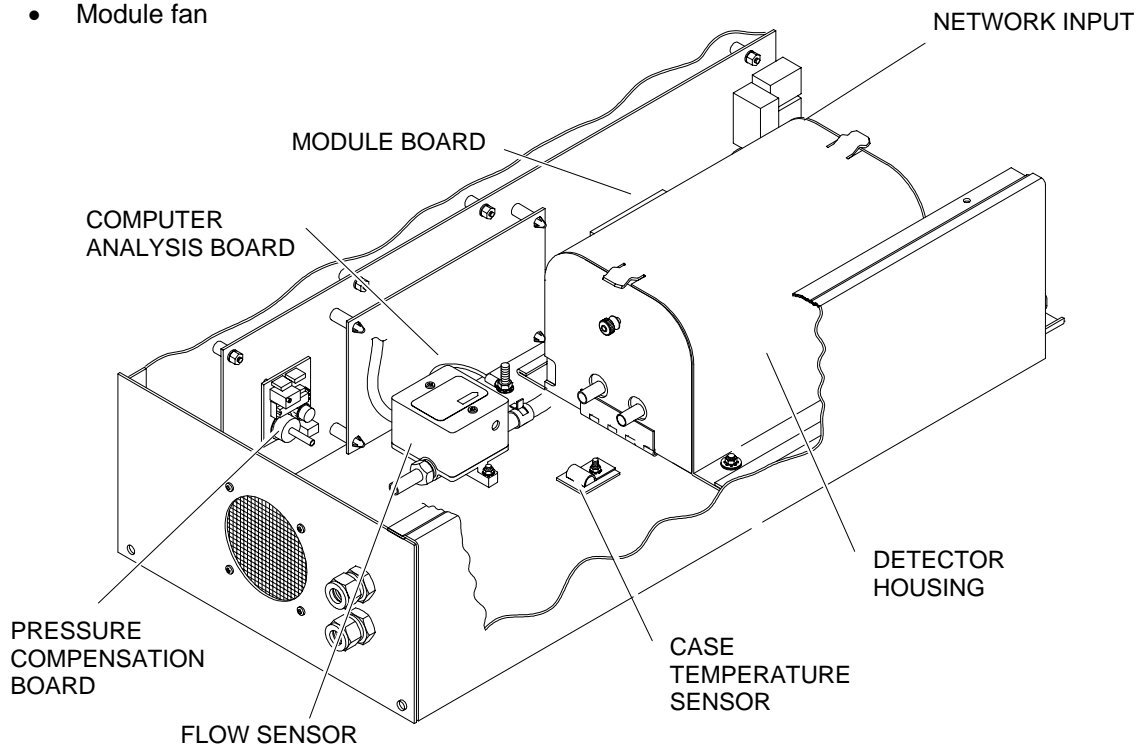
- All printed circuit board
- Thermal fuse inside Detector
- Case temperature sensor
- Flow sensor
- Power fuse
- Detector
- Module fan

### 4-2 PRINTED CIRCUIT BOARD REPLACEMENT

Refer to Figure 4-1 below for locations of the Signal, Microprocessor, Power Supply and (optional) Pressure Compensation Boards.

All boards are secured to a side of the analyzer module that folds out while interconnection wiring is still in place. Remove the securing screws and fold out the entire panel.

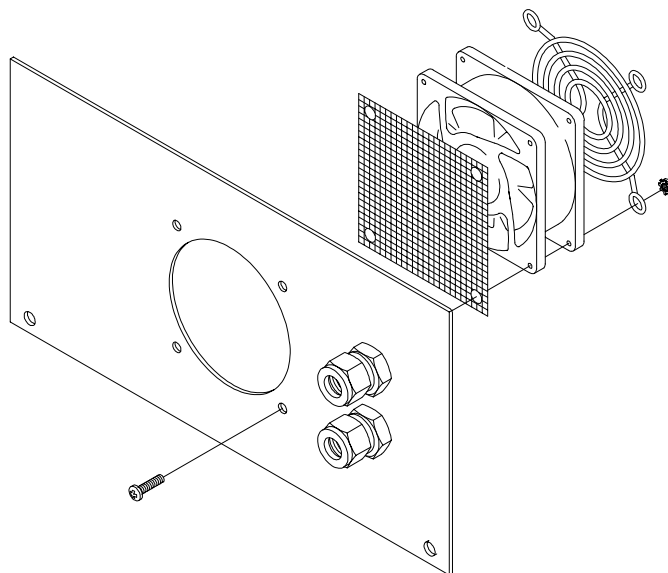
To remove individual boards on the fold-out panel, label and unplug all interconnection wiring, and remove securing hardware. Reverse this procedure for installation.



**Figure 4-1. PMD Module – Major Components**

**4-3 MODULE FAN REPLACEMENT**

The Analyzer Module fan assembly is disassembled as shown in Figure 4-2 below.



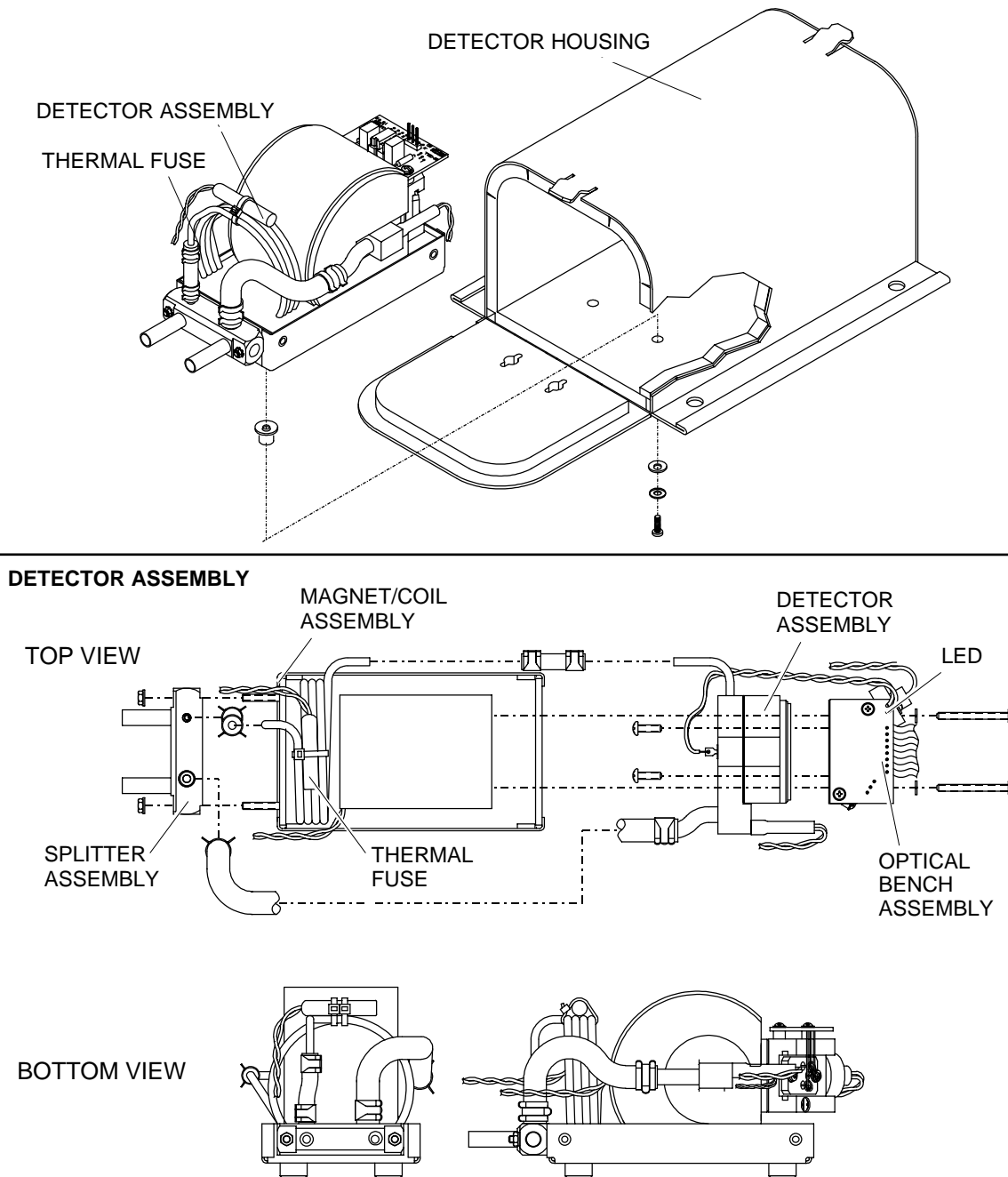
**Figure 4-2. Module Fan Assembly**

## 4-4 THERMAL FUSE REPLACEMENT

See Figure 4-3 below for location of the Detector Thermal Fuse.

Remove the Detector Assembly from the detector housing, replace the thermal fuse.

Reassemble in reverse order.



**Figure 4-3. Detector Assembly**

**4-5 FLOW SENSOR REPLACEMENT**

See Figure 4-1 on page 4-1 for location of Flow Sensor. To replace the sensor, remove connections to sample gas line and disconnect securing hardware. Reassemble in reverse order.

**4-6 POWER FUSE REPLACEMENT**

The power fuse is located in the Network Input Module and is accessible through the front panel of the PMD Analyzer. To remove the fuse, push and turn the fuse-holder cap 1/4 turn counterclockwise. Verify that the replacement fuse is the same type and rating.



## SECTION 5 REPLACEMENT PARTS

**WARNING**

**PARTS INTEGRITY**

**Tampering with or unauthorized substitution of components may adversely affect safety of this product. Use only factory-approved components for repair.**

### 5-1 MATRIX

Each analyzer is configured per the customer sales order. Below is the PMD sales matrix which lists the various configurations available.

To identify the configuration of an analyzer, locate the analyzer name-rating plate. The sales matrix identifier number appears on the analyzer name-rating plate.

PMD2	NGA2000 PARAMAGNETIC DETECTOR																
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Code</th> <th>Software Version</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>Current Version</td> </tr> <tr> <td>02</td> <td>2.2.1 version</td> </tr> <tr> <td>03</td> <td>3X version – specify version</td> </tr> </tbody> </table>					Code	Software Version	01	Current Version	02	2.2.1 version	03	3X version – specify version				
Code	Software Version																
01	Current Version																
02	2.2.1 version																
03	3X version – specify version																
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Code</th> <th>Configuration Identifier</th> </tr> </thead> <tbody> <tr> <td>A1</td> <td>Calibrated Standard Ranges: 0-5, 0-10, 0-25, 0-100%</td> </tr> <tr> <td>A2</td> <td>Calibrated Standard Ranges: 0-1, 0-5, 0-10, 0-25%</td> </tr> <tr> <td>H1</td> <td>Calibrated Standard Suppressed Ranges/Barometric Pressure Compensation: 90-100, 95-100, 98-100, 99-100%</td> </tr> <tr> <td>H2</td> <td>Calibrated Standard Suppressed Ranges/Barometric Pressure Compensation: 50-100, 70-100, 80-100, 90-100%</td> </tr> <tr> <td>99</td> <td>Special Calibration Ranges</td> </tr> </tbody> </table>				Code	Configuration Identifier	A1	Calibrated Standard Ranges: 0-5, 0-10, 0-25, 0-100%	A2	Calibrated Standard Ranges: 0-1, 0-5, 0-10, 0-25%	H1	Calibrated Standard Suppressed Ranges/Barometric Pressure Compensation: 90-100, 95-100, 98-100, 99-100%	H2	Calibrated Standard Suppressed Ranges/Barometric Pressure Compensation: 50-100, 70-100, 80-100, 90-100%	99	Special Calibration Ranges
Code	Configuration Identifier																
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A2	Calibrated Standard Ranges: 0-1, 0-5, 0-10, 0-25%																
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99	Special Calibration Ranges																
			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Code</th> <th>Barometric Pressure Compensation</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>None</td> </tr> <tr> <td>S1</td> <td>Standard Elevations</td> </tr> <tr> <td>E1</td> <td>High Elevations</td> </tr> </tbody> </table>			Code	Barometric Pressure Compensation	00	None	S1	Standard Elevations	E1	High Elevations				
Code	Barometric Pressure Compensation																
00	None																
S1	Standard Elevations																
E1	High Elevations																
				<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Code</th> <th>Detector Type</th> </tr> </thead> <tbody> <tr> <td>R1</td> <td>Rhodium Plated Current Loop</td> </tr> <tr> <td>T1</td> <td>Titanium Current Loop (Standard)</td> </tr> </tbody> </table>		Code	Detector Type	R1	Rhodium Plated Current Loop	T1	Titanium Current Loop (Standard)						
Code	Detector Type																
R1	Rhodium Plated Current Loop																
T1	Titanium Current Loop (Standard)																
PMD2	01	A1	S1	T1	Example												

**5-2 REPLACEMENT PARTS**

902931	Sensor, Gas Flow
655856	Source/Holder Assembly
902922	Bi-Cell, Optical
655670	Pressure Compensation Board
903347	Fuse, Time-Delay 6A 250 VAC
657860	Module Board
622917	Sensor RTD
656576	Case Temperature Sensor
655893	Fan
898733	Detector Thermal Fuse
655838	Optical Bench Assembly
658083	Detector, Corrosion Resistant (Option)

## SECTION 6 RETURN OF MATERIAL

### 6-1 RETURN OF MATERIAL

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

1. Secure a return authorization from a Rosemount Analytical Inc. 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.

Rosemount CSC will provide the shipping address for your instrument.

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

2. Carefully pack the defective unit in a sturdy box with sufficient shock absorbing material to ensure no additional damage occurs during shipping.
3. In a cover letter, describe completely:
  - The symptoms that determined the equipment is faulty.
  - The environment in which the equipment was operating (housing, weather, vibration, dust, etc.).
  - Site from where the equipment was removed.
  - Whether warranty or non-warranty service is expected.
  - Complete shipping instructions for the return of the equipment.
4. Enclose a cover letter and purchase order and ship the defective equipment according to instructions provided in the Rosemount Return Authorization, prepaid, to the address provided by Rosemount CSC.

**Rosemount Analytical Inc.  
Process Analytical Division  
Customer Service Center  
1-800-433-6076**

If warranty service is expected, the defective unit will be carefully inspected and tested at the factory. If the failure was due to the 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 the 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.

### 6-2 CUSTOMER SERVICE

For order administration, replacement Parts, application assistance, on-site or factory repair, service or maintenance contract information, contact:

**Rosemount Analytical Inc.  
Process Analytical Division  
Customer Service Center  
1-800-433-6076**

### 6-3 TRAINING

A comprehensive Factory Training Program of operator and service classes is available. For a copy of the *Current Operator and Service Training Schedule* contact the Technical Services Department at:

**Rosemount Analytical Inc.  
Customer Service Center  
1-800-433-6076**



## SECTION 7 APPENDIX A. MENU DISPLAYS

Menu: 0 ANALOP

Expert controls	
Measurement range number:	000.0
Range lower limit:	000.0
Range upper limit:	000.0
Linearizer:	000.0
Range and functional control:	000.0
Zero/Span calibration...	
Ranges with valid calibration:	000.0

HOME
ESCAPE
CAL
CAL DATA
INFO

Menu: 1 ANALSET

Analyzer module set up	
Calibration gas list...	
Calibration Parameters...	
Concentration alarms...	
Gas measurement parameters...	
Analyzer parameter list...	
Physical measurement parameters...	
Displayed parameters...	

HOME
ESCAPE
INFO

Menu: 2 FLOCHEK

Secondary Measurements	
Sample flow:	000.0
Flow lower limit:	000.0
Flow upper limit:	000.0
Sample pressure:	000.0
Case temperature:	000.0

HOME
ESCAPE
INFO

Menu: 3 ZERO11

**Zero/Span Calibration help**

This allow manual control of the zero and span. Flow zero gas, and make sure the gas value is correct: press the zero key to make the analyzer zero itself. Or select Edit measurement using zero offset, then scroll the reading with the up and down keys. In this way you can make the analyzer read what you want. Then do the same with span gas. If the zero was not a real zero, the span action will change the zero reading; the last zero reading shows you what it would have been on the zero gas with the current span.

**HOME    ESCAPE    MORE    INFO**

Menu: 4 SPAN11

**Span Calibration help**

Use this screen to perform a span Calibration. Either directly adjust the reading with the up and down arrow keys, or press the SPAN softkey to force a span calibration to the span gas concentration.

You should do a zero calibration before

**HOME    ESCAPE    MORE    BACK    INFO**

Menu: 5 FLOCHEK11

**Secondary Measurements help**

This screen shows the auxiliary measurements made by the analyzer module the limits may be set by the user as warning alarms.

These readings are updated only when they change.

**HOME    ESCAPE    INFO**

# Model NGA2000 PMD

## Menu: 6 ANALOP11

**Basic controls help**

This screen selects immediately available functions. Lines that are not editable refer to variables set up elsewhere.

To zero or span the analyzer, flow the correct gas and press the zero or span button.

Remote control does not disable local control.

This screen does not control an autocal module.

Calibration info...

**HOME**
**ESCAPE**
**INFO**

## Menu: 7 ACALSET

**Calibration Parameters**

Calibration adjustment limits:	000.0
Calibration averaging time:	000.0
Calibration failure alarm:	000.0
Cal failure error allowed:	000.0
Calibration time out:	000.0
Zero ranges:	000.0
Span ranges:	000.0

**HOME**
**ESCAPE**
**INFO**

## Menu: 8 LINSET

**Gas measurement parameters**

Linearization parameters...

Response time/delay parameters...

Range setting...

Automatic range change parameters...

Units...

Linearization functions...

**HOME**
**ESCAPE**
**INFO**

Menu: 9 APARLST

Analyzer Parameter List	
Analyzer tag:	000.0
First line's parameter:	000.0
Second line's parameter:	000.0
Third line's parameter:	000.0
Fourth line's parameter:	000.0

HOME    ESCAPE    NEXT    LAST    INFO

Menu: 10 ANALSET1

Measurement Parameters
This lists the operational parameters that can be set up by the user. More detailed information can be seen in the diagnostic menus.

HOME    ESCAPE    INFO

Menu: 11 CALLIST

Calibration Gas List	
Zero gas – range 1:	000.0
Span gas – range 1:	000.0
Zero gas – range 2:	000.0
Span gas – range 2:	000.0
Zero gas – range 3:	000.0
Span gas – range 3:	000.0
Zero gas – range 4:	000.0
Span gas – range 4:	000.0

HOME    ESCAPE    INFO



# Model NGA2000 PMD

Menu: 12 CALLIST1

**Calibration Gas List**

Zero and span gases for each range are shown. Edit these to correspond to the contents of the appropriate calibration gas bottles.

Enter the values of concentration on the bottles of gas used for calibration.

**HOME**
**ESCAPE**
**INFO**

Menu: 13 ACALSET1

**Calibration Parameter help**

Factors that control how the calibration works.  
 Calibration mode allows calibration to be initiated through this screen (local), through an IO module or gateway (remote), or automatically by an auto-calibration module (auto).  
 Calibration averaging time set the time used by the analyzer to average its reading. A longer time will give a

**HOME**
**ESCAPE**
**MORE**
**INFO**

Menu: 14 APARLST1

**Analyzer Parameter List**

This is a listing of all the user editable parameters in the current parameter set.

**HOME**
**ESCAPE**
**INFO**

Menu: 15 AMMAN

Analyzer manufacturing data	
More...	
Bench configuration code:	000.0
Minimum range:	000.0
Maximum range:	000.0
Measured gas:	000.0

HOME   ESCAPE   RESET   STORE   INFO

Menu: 16 AMMAN1

Analyzer manufacturing data	
Shows manufacturing data. Edit at your own risk! The tag is the tag of this analyzer module, and may be modified as desired by user. This appears at the top of this screen, but it won't be updated until you re-enter the menus from the display screen.	
RESET erases ALL EEPROM data! Re-initialize the system after RESET!	

HOME   ESCAPE   INFO

Menu: 17 AMSVC

Analyzer module service history	
Manufacturing date:	000.0
In service date:	000.0
Last zero calibration date:	000.0
Last span calibration date:	000.0
Last service date:	000.0
List notes...	

HOME   ESCAPE   ManData   INFO

# Model NGA2000 PMD

Menu: 18 AMSVC11

**Analyzer module service notes**

Add notes as desired. See the control module service screen into for a list of the service note abbreviations.

**HOME**
**ESCAPE**
**INFO**

Menu: 19 ADIAG

**Analyzer Diagnostics**

Power supply voltages...  
 Primary variable parameters...  
 Physical Measurements...  
 Temperature control parameters...  
 Miscellaneous control parameters...  
 Trend display control...  
 Barometric pressure parameters...  
 Software diagnostics...

**HOME**
**ESCAPE**
**REBOOT**
**INIT**
**INFO**

Menu: 20 AMPWR

**Analyzer diagnostics**

<b>Power supply voltages</b>	
+15V analog is:	000.0
+15V analog was:	000.0
-15V analog is:	000.0
-15V analog was:	000.0
+5V digital is:	000.0
+5V digital was:	000.0
+24V power is:	000.0
+24V power was:	000.0

**HOME**
**ESCAPE**
**INFO**

Menu: 21 AM1V

Primary variable parameters	
Raw measurement signal:	000.0
Bicell #1 signal:	000.0
Bicell #2 signal:	000.0
Pk-pk noise:	000.0
Loop current:	000.0
Calibration factors...	
<b>HOME</b>	<b>ESCAPE</b>
<b>INFO</b>	

Menu: 22 AMTEMP

Temperature control	
Fan lower set point:	000.0
Fan upper set point:	000.0
Minimum fan duty cycle:	000.0
Case temperature:	000.0
Detector set point:	000.0
Detector P gain:	000.0
Detector I gain:	000.0
Detector bias:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>INFO</b>	

Menu: 23 AMMISC

Miscellaneous control parameters	
Fan current:	000.0
Fan duty cycle:	000.0
Source LED current:	000.0
Heated current:	000.0
Heater duty cycle:	000.0
Alarm messages valid for:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>INFO</b>	

# Model NGA2000 PMD

Menu: 24 AMTREND

Trend display control	
First displayed variable:	000.0
Second displayed variable:	000.0
Timebase:	000.0
Drop out to measuring mode:	000.0
<b>HOME</b>	<b>ESCAPE</b>
	<b>INFO</b>

Menu: 25 ADIAG1

Analyzer Diagnostics	
Select the area of diagnostics to examine.	
Press INIT to re-initialize the EEPROM data. Press REBOOT to restart the analyzer.	
<b>HOME</b>	<b>ESCAPE</b>
	<b>INFO</b>

Menu: 26 RANGESETAM

Range Settings	
Minimum range:	000.0
Maximum range:	000.0
Range 1 lower limit:	000.0
Range 1 upper limit:	000.0
Range 2 lower limit:	000.0
Range 2 upper limit:	000.0
Range 3 lower limit:	000.0
Range 3 upper limit:	000.0
Range 4 lower limit:	000.0
Range 4 upper limit:	000.0
<b>HOME</b>	<b>ESCAPE</b>
	<b>INFO</b>

Menu: 27 RANGESSET1

**Range Settings**

Set the upper and lower limits of the reportable ranges. These values are copied into the output module and used for calculating the analog output. The analyzer uses them to select the closest linearizer polynomial to use if any.

**HOME      ESCAPE      INFO**

Menu: 28 SPAN12

**Span Calibration help**

The calibration is performed on the range selected by the range  
If the calibration set up selected the ranges to be calibrated together, all the ranges will be calibrated at once by the first calibration. Otherwise they must be calibrated individually.  
The line showing what the last zero gas would read shows the effect of the most

**HOME      ESCAPE      BACK      INFO**

Menu: 29 ACALSET12

**Calibration Parameter help**

Calibration alarms will only work if warning alarms are enabled.

Calibration info...

**HOME      ESCAPE      BACK      INFO**

Menu: 30 ZEROI2

**Zero Calibration help**

Make sure the zero gas is flowing through the analyzer. When the reading has stabilized, either adjust the reading to the zero gas concentration, or, if the zero gas concentration shown is correct, select the automatic zero function.  
Then if desired, do a span calibration.

<b>HOME</b>	<b>ESCAPE</b>	<b>MORE</b>	<b>BACK</b>	<b>INFO</b>
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Menu: 31 LINRANGE1

**Linearity coefficients**

Curve 1

A0 coefficient:	000.0
A1 coefficient:	000.0
A2 coefficient:	000.0
A3 coefficient:	000.0
A4 coefficient:	000.0
Curve upper limit:	000.0
Curve over-range:	000.0
Curve under-range:	000.0

<b>HOME</b>	<b>ESCAPE</b>	<b>NEXT</b>	<b>LAST</b>	<b>INFO</b>
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Menu: 32 LINRANGE2

**Linearity coefficients**

Curve 2

A0 coefficient:	000.0
A1 coefficient:	000.0
A2 coefficient:	000.0
A3 coefficient:	000.0
A4 coefficient:	000.0
Curve upper limit:	000.0
Curve over-range:	000.0
Curve under-range:	000.0

<b>HOME</b>	<b>ESCAPE</b>	<b>NEXT</b>	<b>LAST</b>	<b>INFO</b>
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Menu: 33 LINRANGE3

Linearity coefficients	
Curve 3	
A0 coefficient:	000.0
A1 coefficient:	000.0
A2 coefficient:	000.0
A3 coefficient:	000.0
A4 coefficient:	000.0
Curve upper limit:	000.0
Curve over-range:	000.0
Curve under-range:	000.0

HOME   ESCAPE   NEXT   LAST   INFO

Menu: 34 LINRANGE4

Linearity coefficients	
Curve 4	
A0 coefficient:	000.0
A1 coefficient:	000.0
A2 coefficient:	000.0
A3 coefficient:	000.0
A4 coefficient:	000.0
Curve upper limit:	000.0
Curve over-range:	000.0
Curve under-range:	000.0

HOME   ESCAPE   FIRST   LAST   INFO

Menu: 35 LINRANGE0

Linearization parameters	
Range 1 linearizer:	000.0
If enabled, uses curve no.:	000.0
Range 2 linearizer:	000.0
If enabled, uses curve no.:	000.0
Range 3 linearizer:	000.0
If enabled, uses curve no.:	000.0
Range 4 linearizer:	000.0
If enabled, uses curve no.:	000.0

HOME   ESCAPE   INFO



# Model NGA2000 PMD

Menu: 36 AMPWR11

**Analyzer diagnostics**

Power supply voltages  
The  
the power supplies as described. The

Unit was manufactured. Changes of more  
than a few percent should be noted.  
The 24V supply may differ substantially  
if the unit is used on anything but a  
Rosemount power supply.

HOME ESCAPE INFO

Menu: 37 FLOCHEK111

**Physical Measurements**

These are the measurements made by the  
analyzer module to make sure that it is  
working correctly, and the sample and  
support gases if any are flowing.

The various temperatures are controlled  
to values set up in the diagnostic menus.

HOME ESCAPE INFO

Menu: 38 FILTER

**Response time/delay parameters**

Range 1 t90 time:	000.0
Range 2 t90 time:	000.0
Range 3 t90 time:	000.0
Range 4 t90 time:	000.0
LON update rate:	000.0
Output delay time:	000.0

HOME ESCAPE INFO

Menu: 39 AM1VI1

**Primary variable parameters**

Shows the parameters used to calculate the primary reading.  
The bicell readings are the individual outputs of the two photocells. The instrument responds to the difference between them, but each signal should be as large as possible without saturating.  
The pk-pk noise is a measure of the standard deviation of the signal.

**HOME**   **ESCAPE**   **INFO**

Menu: 40 AMTEMP11

**Temperature control**

These are the variables used to define the operation of the PID algorithms used for temperature control.  
Adjust them at your own risk!

This analyzer controls its detector temperature, while keeping its case temperature within rather wide limits.

**HOME**   **ESCAPE**   **INFO**

Menu: 41 AM2VA

**Physical Measurements**

Sample flow:	000.0
Sample pressure:	000.0
Case temperature:	000.0
Detector temperature:	000.0
Flow limits...	
Pressure limits...	

**HOME**   **ESCAPE**   **INFO**

# Model NGA2000 PMD

Menu: 42 PLIMITSA

Pressure Limits				
Sample pressure upper limit:	000.0			
Sample pressure lower limit:	000.0			
<table border="0" style="width: 100%;"> <tr> <td style="width: 33%; text-align: center;"><b>HOME</b></td> <td style="width: 33%; text-align: center;"><b>ESCAPE</b></td> <td style="width: 33%; text-align: center;"><b>INFO</b></td> </tr> </table>		<b>HOME</b>	<b>ESCAPE</b>	<b>INFO</b>
<b>HOME</b>	<b>ESCAPE</b>	<b>INFO</b>		

Menu: 43 TLIMITSA

Temperature limits				
Case upper limit:	000.0			
Case lower limit:	000.0			
<table border="0" style="width: 100%;"> <tr> <td style="width: 33%; text-align: center;"><b>HOME</b></td> <td style="width: 33%; text-align: center;"><b>ESCAPE</b></td> <td style="width: 33%; text-align: center;"><b>INFO</b></td> </tr> </table>		<b>HOME</b>	<b>ESCAPE</b>	<b>INFO</b>
<b>HOME</b>	<b>ESCAPE</b>	<b>INFO</b>		

Menu: 44 AMMISCI1

Miscellaneous control parameters				
<p>These are diagnostic variables used to determine if the analyzer is operating correctly.</p> <p>Enable alarms if desired.</p>				
<table border="0" style="width: 100%;"> <tr> <td style="width: 33%; text-align: center;"><b>HOME</b></td> <td style="width: 33%; text-align: center;"><b>ESCAPE</b></td> <td style="width: 33%; text-align: center;"><b>INFO</b></td> </tr> </table>		<b>HOME</b>	<b>ESCAPE</b>	<b>INFO</b>
<b>HOME</b>	<b>ESCAPE</b>	<b>INFO</b>		

Menu: 45 ANALSIMPLE

Basic Controls	
Measurement range number:	000.0
Range upper limit:	000.0
Range and functional control:	000.0
Zero gas concentration:	000.0
Span gas concentration:	000.0
Sample flow:	000.0
Ranges with valid calibration:	000.0
Calibration status:	000.0

**HOME** **ESCAPE** **ZERO** **SPAN** **INFO**

Menu: 46 FILTER11

**Filter and Delay Parameters**

This screen sets the final filtering for the analyzer primary variable output. This is in addition to the inherent filtering in the analyzer. The time delay simply delays the output by that time, allowing the fastest responding analyzer systems to be synchronized with the slowest.

**HOME** **ESCAPE** **INFO**

Menu: 47 LINSET111

**Primary Variable Parameters**

Allows the setting of linearizer coefficients, definition of parameter sets, and filtering and delay. These all apply to the reporting of the analyzer primary variable.

**HOME** **ESCAPE** **INFO**

# Model NGA2000 PMD

Menu: 48 LINRANGE01

**Set Linearity curve**

The linearizer polynomials act over a certain range, not the same as the measurement range. The system uses the linearizer polynomial appropriate for the measurement range chosen. This is the polynomial with the next higher linearizer range than the measurement range.  
Polynomial coefficients may be edited for custom curves.

HOME
ESCAPE
INFO

Menu: 49 PLMITSAI1

**Pressure and flow Limits**

These are settable limits on the sample gas pressure and flow. The force alarms to occur and also act as end points on the bar graph display of their variable.

HOME
ESCAPE
INFO

Menu: 50 CALFACTORS

**Calibration Factors**

Range 1 factors...  
Range 2 factors...  
Range 3 factors...  
Range 4 factors...

Zero compensation factor:	000.0
Span compensation factor:	000.0

HOME
ESCAPE
INFO

Menu: 51 R1FACTORS

Range 1 Factors	
Zero offset:	000.0
Span factor:	000.0
Full scale range at calibration:	000.0
Measurement range number:	000.0
Hardware zero offset:	000.0
Raw measurement signal:	000.0
<b>HOME</b>	<b>STORE</b>
<b>NEXT</b>	<b>HISTORY</b>
<b>INFO</b>	

Menu: 52 RN2FACTORS

Range 2 Factors	
Zero offset:	000.0
Span factor:	000.0
Full scale range at calibration:	000.0
Measurement range number:	000.0
Hardware zero offset:	000.0
Raw measurement signal:	000.0
<b>HOME</b>	<b>STORE</b>
<b>NEXT</b>	<b>HISTORY</b>
<b>INFO</b>	

Menu: 53 RN3FACTORS

Range 3 Factors	
Zero offset:	000.0
Span factor:	000.0
Full scale range at calibration:	000.0
Measurement range number:	000.0
Hardware zero offset:	000.0
Raw measurement signal:	000.0
<b>HOME</b>	<b>STORE</b>
<b>NEXT</b>	<b>HISTORY</b>
<b>INFO</b>	

# Model NGA2000 PMD

Menu: 54 RN4FACTORS

Range 4 Factors	
Zero offset:	000.0
Span factor:	000.0
Full scale range at calibration:	000.0
Measurement range number:	000.0
Hardware zero offset:	000.0
Raw measurement signal:	000.0
<div style="display: flex; justify-content: space-between; padding: 0 10px;"> <span>HOME</span> <span>STORE</span> <span>FIRST</span> <span>HISTORY</span> <span>INFO</span> </div>	

Menu: 55 RFACTORSI

Range Factors	
<p>Shows the calibration factors for this range.                      Modify the zero factor for zero calibration, and the span factor for spanning this range. The take effect as soon as you press the enter key.</p> <p>With zero gas, the raw reading should be the same as the zero offset.</p> <p>Then do a complete recalibration.</p>	
<div style="display: flex; justify-content: space-between; padding: 0 10px;"> <span>HOME</span> <span>ESCAPE</span> <span>INFO</span> </div>	

Menu: 56 AMHELPINDEX

Analyzer Module Help	
<p><b>Paramagnetic Oxygen detector</b>                      This device uses the paramagnetic nature of oxygen as a measurement technique. Other gases are usually diamagnetic and the detector responds only weakly to them. Nitrogen oxides are the only common exceptions.                      The analyzer is sensitive to vibration and should be installed with care.</p>	
<div style="display: flex; justify-content: space-between; padding: 0 10px;"> <span>HOME</span> <span>ESCAPE</span> <span>INFO</span> </div>	

Menu: 57 LINRANGE111

**Linearity coefficients**

Edit the polynomial coefficients as desired. Make sure that the curve upper limit is correct, this is the limit of the range that this polynomial will correct.  
The status line selects whether the curve is in use.

**HOME    STORE    INFO**

Menu: 58 CALFACTORS11

**Calibration Factors**

The analyzer uses calibration factors for each range. You can adjust them while viewing the reading, to achieve an accurate calibration. Make sure the factors are correct for the range you are on. You will not see a change in the reading if you use the wrong ones, but you'll find out when you change the range! You cannot adjust all ranges at the same time, you must adjust them one by one.

**HOME    ESCAPE    INFO**

Menu: 59 APARLST2

**Analyzer Parameter List**

**Primary Variable Parameters**

Control mode:	000.0
Output delay time:	000.0
Range 1 upper limit:	000.0
Range 2 upper limit:	000.0
Range 3 upper limit:	000.0
Range 4 upper limit:	000.0
Range 1 lower limit:	000.0
Range 2 lower limit:	000.0
Range 3 lower limit:	000.0

**HOME    ESCAPE    NEXT    BACK    INFO**



# Model NGA2000 PMD

Menu: 60 APARLST4

Analyzer Parameter List	
<b>Primary Variable Parameters</b>	
Range 1 t90 time:	000.0
Range 2 t90 time:	000.0
Range 3 t90 time:	000.0
Range 4 t90 time:	000.0
Linearizer on range 1:	000.0
Linearizer on range 2:	000.0
Linearizer on range 3:	000.0
Linearizer on range 4:	000.0

HOME    ESCAPE    NEXT    BACK    INFO

Menu: 61 APARLST5

Analyzer Parameter List	
<b>Calibration Parameters</b>	
Calibration averaging time:	000.0
Calibration failure alarm:	000.0
Cal failure error allowed:	000.0
Calibration time out:	000.0
Ranges zeroed:	000.0
Calibrate ranges:	000.0

HOME    ESCAPE    NEXT    BACK    INFO

Menu: 62 APARLST6

Analyzer Parameter List	
<b>Calibration Gases</b>	
Zero gas – range 1:	000.0
Zero gas – range 2:	000.0
Zero gas – range 3:	000.0
Zero gas – range 4:	000.0
Span gas – range 1:	000.0
Span gas – range 2:	000.0
Span gas – range 3:	000.0
Span gas – range 4:	000.0

HOME    ESCAPE    FIRST    BACK    INFO

Menu: 63 DISPLAY

Displayed parameters	
First line's parameter:	000.0
Second line's parameter:	000.0
Third line's parameter:	000.0
Fourth line's parameter:	000.0
Displayed concentration digits:	000.0
Digits after decimal point:	000.0

**HOME**   **ESCAPE**   **INFO**

Menu: 64 MPARMS

Current measurement parameters	
Analyzer gas measured:	000.0
Measurement range number:	000.0
Range change control:	000.0
Linearization mode:	000.0
Analyzer operational status:	000.0
Analyzer alarm state:	000.0
Alarm reporting level:	000.0

**HOME**   **ESCAPE**   **MORE**   **INFO**

Menu: 65 MPARMS2

Current measurement parameters	
Response time:	000.0
Sample flow:	000.0
Sample pressure:	000.0
Detector temperature:	000.0

**HOME**   **ESCAPE**   **INFO**

# Model NGA2000 PMD

Menu: 66 MPARMS1

**Current measurement parameters help**

Shows the main measurement parameters.  
These can be controlled in the various  
set up menus.

**HOME**
**ESCAPE**
**INFO**

Menu: 67 BAROM\_PARMS

**Barometric pressure parameters**

Pressure transducer:	000.0
Barometric pressure compensation:	000.0
Measured pressure:	000.0
Transducer offset:	000.0
Transducer slope:	000.0
Transducer PGA gain:	000.0

**HOME**
**ESCAPE**
**INFO**

Menu: 68 BAROM\_PARM1

**Barometric pressure parameters**

Shows whether the optional pressure transducer is installed or not. Also this screen allows you to set the transducer. Use the offset at atmospheric pressure, and pull a vacuum of about 25cm H2O on the transducer, and use the slope to make it read correctly.

Choose whether to enable barometric compensation, and whether to allow the analyzer to emit the pressure value. Only one analyzer at a time in a

**HOME**
**ESCAPE**
**INFO**

Menu: 69 TLIMITSIA1

**Temperature limits**

The limits on the temperature beyond which the analyzer will send a warning message.

The also act as end points to the bar graph display.

The various temperatures are controlled to values set up in the diagnostic menus.

**HOME**   **ESCAPE**   **INFO**

Menu: 70 SW\_DIAG

**Software diagnostics**

Last message:	000.0
And:	000.0
And:	000.0
And:	000.0
And:	000.0
And:	000.0
And:	000.0
And:	000.0
Edit to reset:	000.0

**HOME**   **ESCAPE**   **INFO**

Menu: 71 LISTNOTES

**Analyzer module service notes**

You can write up to 22 characters in each line.

	000.0
	000.0
	000.0
	000.0
	000.0
	000.0
	000.0
	000.0
	000.0
	000.0

**HOME**   **ESCAPE**   **INFO**

# Model NGA2000 PMD

Menu: 72 FLOWLIMITS

Flow limits				
Sample flow upper limit:	000.0			
Sample flow lower limit:	000.0			
<table border="0"> <tr> <td><b>HOME</b></td> <td><b>ESCAPE</b></td> <td><b>INFO</b></td> </tr> </table>		<b>HOME</b>	<b>ESCAPE</b>	<b>INFO</b>
<b>HOME</b>	<b>ESCAPE</b>	<b>INFO</b>		

Menu: 73 AMPATH

Analyzer Module Help				
Select the function you want in the line below, and not the path shown.				
Function:	000.0			
Select:	000.0			
Then:	000.0			
Then:	000.0			
Then:	000.0			
<table border="0"> <tr> <td><b>HOME</b></td> <td><b>ESCAPE</b></td> <td><b>INFO</b></td> </tr> </table>		<b>HOME</b>	<b>ESCAPE</b>	<b>INFO</b>
<b>HOME</b>	<b>ESCAPE</b>	<b>INFO</b>		

Menu: 74 CALI1

Calibration info					
Use the calibration parameter screen to choose to calibrate ranges together or not. If together, zeroing or spanning will go through each range one by one. If the change is too great, it will fail, and send an alarm if warning alarms are enabled. In this case, disable calibration limit checking and try again.					
If you use non-zero zero gases, or the changes are					
<table border="0"> <tr> <td><b>HOME</b></td> <td><b>ESCAPE</b></td> <td><b>MORE</b></td> <td><b>INFO</b></td> </tr> </table>		<b>HOME</b>	<b>ESCAPE</b>	<b>MORE</b>	<b>INFO</b>
<b>HOME</b>	<b>ESCAPE</b>	<b>MORE</b>	<b>INFO</b>		

Menu: 75 LINFUNCT

**Linearization functions**

Polynomial set up...  
Midpoint correction set up...

Use the polynomial set up to generate a linearizing polynomial from up to 20 gases. With more than 6 gases it will produce a fourth order polynomial linearizer. Use the midpoint correction for a piecewise-linear final correction, to bring up to three points precisely onto

**HOME**   **ESCAPE**   **INFO**

Menu: 76 POLYSETUP

**Polynomial set up**

Range to be linearized:	000.0
Current span gas:	000.0
Calculated polynomial order:	000.0
Gas values shown as:	000.0
Gas concentrations...	

**HOME**   **ESCAPE**   **CALC**   **INFO**

Menu: 77 MIDPOINT1

**Midpoint correction set up**

Range 1	
Correction:	000.0
Point being measured:	000.0
Point 1 gas concentration:	000.0
Point 2 gas concentration:	000.0
Point 3 gas concentration:	000.0
Point 1 reading:	000.0
Point 2 reading:	000.0
Point 3 reading:	000.0
Span gas value:	000.0

**HOME**   **ESCAPE**   **SET**   **NEXT**   **INFO**

# Model NGA2000 PMD

Menu: 78 POLYGAS1

Gas concentrations	
Point 1	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point 2	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point to be measured:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>DATA</b>	<b>NEXT</b>
<b>INFO</b>	

Menu: 79 POLYSET1

Polynomial set up	
<p>Select the range to linearizer.                      Make sure that the span gas value is correct.                      Choose whether to define the gas concentrations as absolute values or as a percent to the span gas.                      Use percent if you are diluting the span gas for this.                      Get into the gas concentrations screens, and set the concentration for as many points as you want.                      At each point, flow the gas of the correct value, and when the reading is stable, press                      The analyzer will store the gas value and the reading</p>	
<b>HOME</b>	<b>ESCAPE</b>
<b>MORE</b>	<b>INFO</b>

Menu: 80 POLYGAS2

Gas concentrations	
Point 3	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point 4	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point to be measured:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>DATA</b>	<b>NEXT</b>
<b>INFO</b>	

Menu: 81 POLYGAS3

Gas concentrations	
Point 5	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point 6	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point to be measured:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>DATA</b>	<b>NEXT</b>
<b>INFO</b>	

Menu: 82 POLYGAS4

Gas concentrations	
Point 7	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point 8	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point to be measured:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>DATA</b>	<b>NEXT</b>
<b>INFO</b>	

Menu: 83 POLYGAS5

Gas concentrations	
Point 9	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point 10	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point to be measured:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>DATA</b>	<b>NEXT</b>
<b>INFO</b>	



# Model NGA2000 PMD

Menu: 84 POLYGAS6

Gas concentrations	
Point 11	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point 12	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point to be measured:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>DATA</b>	<b>NEXT</b>
<b>INFO</b>	

Menu: 85 POLYGAS7

Gas concentrations	
Point 13	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point 14	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point to be measured:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>DATA</b>	<b>NEXT</b>
<b>INFO</b>	

Menu: 86 POLYGAS8

Gas concentrations	
Point 15	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point 16	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point to be measured:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>DATA</b>	<b>NEXT</b>
<b>INFO</b>	

Menu: 87 POLYGAS9

Gas concentrations	
Point 17	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point 18	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point to be measured:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>DATA</b>	<b>NEXT</b>
<b>INFO</b>	

Menu: 88 POLYGAS0

Gas concentrations	
Point 19	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point 20	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point to be measured:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>DATA</b>	<b>BACK</b>
<b>INFO</b>	

Menu: 89 MIDPOINT2

Midpoint correction set up	
Range 2	
Correction:	000.0
Point being measured:	000.0
Point 1 gas concentration:	000.0
Point 2 gas concentration:	000.0
Point 3 gas concentration:	000.0
Point 1 reading:	000.0
Point 2 reading:	000.0
Point 3 reading:	0.000
Span gas value:	000.0
<b>HOME</b>	<b>ESCAPE</b>
<b>SET</b>	<b>NEXT</b>
<b>INFO</b>	

Menu: 90 MIDPOINT3

Midpoint correction set up	
Range 3	
Correction:	000.0
Point being measured:	000.0
Point 1 gas concentration:	000.0
Point 2 gas concentration:	000.0
Point 3 gas concentration:	000.0
Point 1 reading:	000.0
Point 2 reading:	000.0
Point 3 reading:	000.0
Span gas value:	000.0

HOME   ESCAPE   SET   NEXT   INFO

Menu: 91 MIDPOINT4

Midpoint correction set up	
Range 4	
Correction:	000.0
Point being measured:	000.0
Point 1 gas concentration:	000.0
Point 2 gas concentration:	000.0
Point 3 gas concentration:	000.0
Point 1 reading:	000.0
Point 2 reading:	000.0
Point 3 reading:	000.0
Span gas value:	000.0

HOME   ESCAPE   SET   BACK   INFO

Menu: 92 EXP\_CAL

Zero/span calibration	
Measurement range number:	000.0
Zero gas concentration:	000.0
Span gas concentration:	000.0
Sample flow:	000.0
Raw measurement signal:	000.0
Ranges with valid calibration:	000.0
Status:	000.0
Result...	

HOME   FACTORS   ZERO   SPAN   INFO

Menu: 93 EXP\_CAL\_DAT

Zero/span diagnostic data	
Date of last zero:	000.0
Error message for last zero:	000.0
Error percentage for last zero:	000.0
Raw signal at last zero:	000.0
Last zero gas would read:	000.0
Date of last span:	000.0
Error message for last span:	000.0
Error percentage for last span:	000.0
Raw signal at last span:	000.0

HOME FACTORS INFO

Menu: 94 EXP\_CAL\_DATI

Zero/span diagnostic data	
Shows what happened at the last calibration. The errors are expressed as a percentage of range. The last zero and span readings are how the analyzer would read on those gases with the current calibration factors.	

HOME ESCAPE INFO

Menu: 95 UNITS

Units	
Gas measurement units:	000.0
Pressure measurement units:	000.0
Temperature measurement units:	000.0
Ppm to mg/Nm3 conversion factor:	000.0
Lower explosion limit (LEL):	000.0
Upper explosion limit (UEL):	000.0

HOME ESCAPE INFO

## Model NGA2000 PMD

Menu: 96 UNITS1

**Units**

Select the units in which you want the values to be displayed. This does not affect the variable contents, it merely affects how the control module display them.

Note that all analyzer ranges will be set as percent or ppm, you can't set some as ppm and others as percent.

**HOME    ESCAPE    INFO**

Menu: 97 POLYSETI2

**Polynomial set up**

When you have entered the desired number of points, return to the polynomial set up screen, and press **Polynomial**, and store it as the coefficients in the current range's linearization function. The order of the polynomial is optimized based on the number of data points provided. You need at least 7 points for a fourth order polynomial correction. You can modify the results with the piecewise linear correction also provided in this section.

**HOME    ESCAPE    MORE    BACK    INFO**

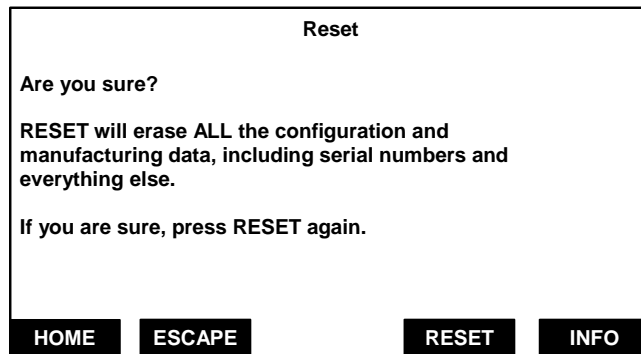
Menu: 98 POLYSETI3

**Polynomial set up**

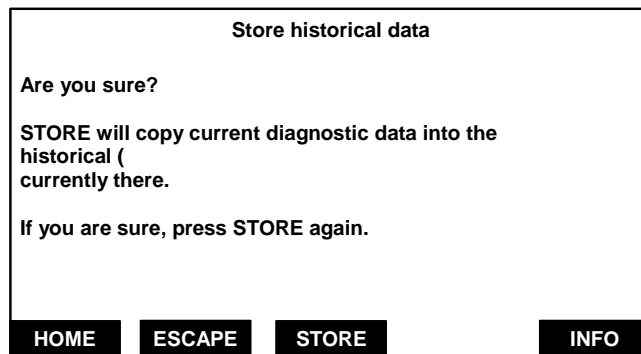
**WARNING:** The linearization curve must be monotonic. If it is not, the calibration routine will fail and the analyzer will not calibrate. Test this by copying the values of the linearization coefficients into a spreadsheet program and plotting the result. The analyzer does test for monotonicity when it spans, but this test may not catch all possible errors. Monotonic means that the curve does not roll over and start going back down as the gas concentration

**HOME    ESCAPE    BACK    INFO**

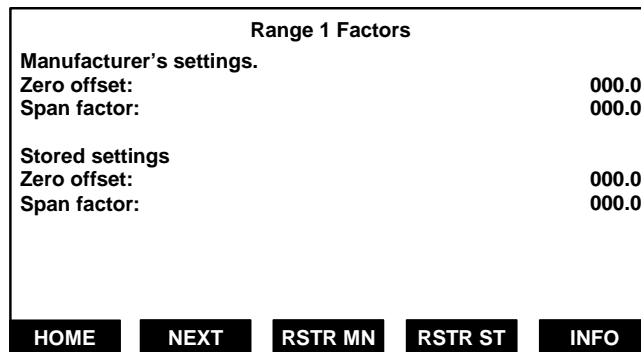
Menu: 99 RESET



Menu: 100 STORE



Menu: 101 RFHIST1A



# Model NGA2000 PMD

Menu: 102 RFACTORSA

**Range Factors**

Shows the calibration factors for this range.  
 Modify the zero factor for zero calibration, and the span factor for spanning this range. The take effect as soon as you press the enter key.  
 With zero gas, the zero factor should be the same as the raw reading.  
 RSTR MN restores the manufacturing values.  
 RSTR ST restore the stored values.

**HOME**
**ESCAPE**
**INFO**

Menu: 103 RFHIST2A

**Range 2 Factors**

Manufacturer's settings.

Zero offset:	000.0
Span factor:	000.0

Stored settings

Zero offset:	000.0
Span factor:	000.0

**HOME**
**NEXT**
**RSTR MN**
**RSTR ST**
**INFO**

Menu: 104 RFHIST3A

**Range 3 Factors**

Manufacturer's settings.

Zero offset:	000.0
Span factor:	000.0

Stored settings

Zero offset:	000.0
Span factor:	000.0

**HOME**
**NEXT**
**RSTR MN**
**RSTR ST**
**INFO**

Menu: 105 RFHIST4A

Range 4 Factors	
<b>Manufacturer's settings.</b>	
Zero offset:	000.0
Span factor:	000.0
<b>Stored settings</b>	
Zero offset:	000.0
Span factor:	000.0

HOME    NEXT    RSTR MN    RSTR ST    INFO

Menu: 106 TWEAK1

**Midpoint correction set up**

This function allows you to set up to three midpoints that the analyzer will do this with a piece-wise linear algorithm. This polynomial linearization. First disable the correction. Set the Then enter the first midpoint gas value, run the gas, and when stable, press SET. the actual reading, but the analyzer will

HOME    ESCAPE    MORE    INFO

Menu: 107 ANALSET13

**Midpoint correction set up**

Then go to the second set point, and repeat. You can use up to three midpoints. When you are done, set the correction to **WARNING: make sure that you do not have excessive corrections. If the correction is too odd, the calibration routine will fail, and you will not be able to calibrate the analyzer. In this case, try it again.**

You can perform this correction individually for each range.

HOME    ESCAPE    BACK    INFO



# Model NGA2000 PMD

Menu: 108 ACALSET11A

**Calibration Parameters**

Disable the limits to recover from calibration failure  
 Calibration averaging time sets the time used by the analyzer to average its reading. Longer times will give a better calibration.  
 Calibration failure alarm will issue a WARNING if the analyzer has to change calibration by more than the Cal failure error, if warning alarms are enabled.  
 Calibration time out sets how long the analyzer will wait for the signal to stabilize before issuing a WARNING.  
 You can zero or span the ranges all at once or not.

HOME
ESCAPE
INFO

Menu: 109 INIT

**Re-initialize the analyzer**

Are you sure?

INIT will erase ALL the configuration data, including manufacturing data, serial numbers etc.

If you are sure, press INIT again.

HOME
ESCAPE
INIT
INFO

Menu: 110 SWDIAG1

**Software Diagnostics**

Shows the first detected software error since the variable on the bottom line was reset.  
 Please report any errors to your service representative. They may mean nothing.

The analyzer has a lot of error recovery code.  
 Errors may therefore correct themselves.

HOME
ESCAPE
INFO

Menu: 111 STOREDPVA

**Trend display control**

The analyzer stores 24 hours of 15 minute averages.  
These values are only accessible via a PC.  
Use the variables DATA\_INDEX and DATA\_POINT  
to access them.

**HOME**   **ESCAPE**   **INFO**

Menu: 112 ZERO\_NOW

**Analyzer zero**

Are you sure?

You must have zero gas flowing through the analyzer.

This control does NOT control any auto-calibration  
module bound to this analyzer!  
If you are sure, press ZERO again now.  
Press the left arrow key when you are done.

Calibration status: 000.0

**HOME**   **ESCAPE**   **ZERO**   **INFO**

Menu: 113 SPAN\_NOW

**Analyzer span**

Are you sure?

You must have span gas flowing through the analyzer.

This control does NOT control any auto-calibration  
module bound to this analyzer!  
If you are sure, press SPAN again now.  
Press the left arrow key when you are done.

Calibration status: 000.0

**HOME**   **ESCAPE**   **SPAN**   **INFO**

# Model NGA2000 PMD

Menu: 114 CALFAIL

**If it won't calibrate...**

Check that you are flowing the correct gas, and the gas concentration is what it is supposed to be. Make sure that the reading is stable before starting. If you have enabled or disabled the linearizer, you may have made it hard for the analyzer to calibrate. If so, go to the calibration parameters screen under Expert controls and set up, under Analyzer set up, and disable the limits checking. Recalibrate, and then enable the limits checking. Recalibrate, and then enable the limits checking again. If all else fails, manually adjust the calibration factors

HOME
ESCAPE
INFO

Menu: 115 ABOUT

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 Tel: (714) 986-7600  
 FAX: (714) 577-8739

Measure
Back...
More...

Menu: 116 ABOUT1

-- Analyzer Module Version Information --

Serial number:	000.0
Manufacturing date:	000.0
Hardware revision:	000.0
Software revision:	000.0
Revision date:	000.0
Revision time:	000.0

Measure
Back...

Menu: 117 ALARM1

Concentration Alarm Setup	
Alarm generation is:	000.0
Level for Low-Low alarm:	000.0
Level for Low alarm:	000.0
Level for High alarm:	000.0
Level for High-High alarm:	000.0
Alarm delay:	000.0
Low-Low alarm:	000.0
Low alarm:	000.0
High alarm:	000.0
<b>HOME</b> <b>ESCAPE</b> <b>ACKN</b>	

Menu: 118 MANDATA

-- Manufacturing data... --	
Serial number:	000.0
Set manufacturing date!	
<hr/>	
Actual date:	000.0
<b>Measure</b>	<b>Back...</b>

Menu: 119 AUTORANGE

-- Automatic Range Control --	
Actual switch levels...	
Switch level hysteresis:	000.0
Usage of range -1:	000.0
Usage of range -2:	000.0
Usage of range -3:	000.0
Usage of range -4:	000.0
Automatic range change control:	000.0
<hr/>	
Absolute, range upper limit:	000.0
<b>Measure</b>	<b>Back...</b>

# Model NGA2000 PMD, NDIR

## VAISALA BAROMETRIC PRESSURE TRANSDUCER

This addendum serves as an amendment to the Model NGA 2000 PMD and NDIR instruction manuals. The following information should be considered part of the manual, if your instrument has a Vaisala Barometric Pressure Transducer installed in it, or if you are retrofitting a PMD or NDIR with a Vaisala transducer kit.

The Vaisala PTB100 series Analog Barometer is a N.I.S.T. traceable precision silicon capacitive atmospheric pressure transducer. The sensor delivers an analog voltage output that is inversely proportional to its inlet pressure. It has an operational ambient pressure range of 800 to 1060 hPa.

The original PMD and NDIR instruments were designed for use with a resistance bridge type of pressure transducer requiring an external gain amplifier with an offset trim. The Vaisala transducer contains an integral gain amplifier that is scaled for a 0 to +5 Vdc output. The 661380 "Interface Board" contains the circuitry to convert the Vaisala single ended 0 to +5 V dc output into the referenced bridge 0 to +0.625 V dc output configuration that is required by the Analyzer module's Computer Analysis Board. The Vaisala transducer kit is backward compatible with the original Rosemount pressure transducer.

### ***Vaisala Interface Board Circuit Function:***

The Vaisala Interface Circuit board adapts the single ended analog output of the Vaisala sensor into a Precision Voltage referenced, balanced bridge (at 1 atmosphere) input configuration. A "Bridge Balance" pot on the Vaisala Interface Circuit board provides the fine trim "Bridge Balancing" calibration adjustment that is required to set up each indi-

vidual transducer at a known ambient air pressure. Test points are provided on the circuit board for this adjustment.

The Vaisala transducer output range is 0 to +5 Vdc.

The Vaisala analog output voltage is inverted and fed into a balanced summing node that is referenced by a precision regulator. The summing node voltage is 0.000 Vdc at 1013 hPa (1 atmosphere ambient air pressure). The summing node voltage is then buffered, inverted, and gain reduced by a factor of 8 to produce the Pressure Compensation Output voltage at J12-1 for the Computer Analysis board.

Low noise, Low input current offset Op-Amps, and common substrate resistors are used to reduce gain tracking errors and null thermal coefficient effects.

### **1-1 INSTALLATION & RETROFIT INSTRUCTIONS**

1. Remove the original Rosemount transducer circuit board assembly, located on the motherboard at J12 and J13 (if present).
2. Install the transducer with the pressure inlet facing the rear of the instrument using the mounting studs provided on left-hand side of the detector housing.
3. Install the Interface board into its mating sockets (J12 and J13) on the motherboard.
4. Connect the 4-pin cable (P1) from the interface board (noting pin polarity) to the Vaisala Pressure Transducer.

## Addendum

748461-B

April 2003

# Model NGA2000 PMD, NDIR

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5. Connect the instrument sample inlet tubing to the Vaisala Pressure Inlet port.
6. Enable the Barometric Pressure Compensation and the Use Local Reading options via the Expert Controls – Analyzer Module Diagnostics – Barometric Pressure Compensation menus of the instrument. The instrument will automatically detect and report the 'Presence' of the Pressure Compensation Option.

### 1-2 ADJUSTMENT PROCEDURE

Circuit adjustment can be made using Barometric Pressure menu display, or an external Digital voltmeter.

#### Display Method

With no sample inlet lines connected and the instrument exhaust ported to atmosphere, adjust R1 on the 661380 Interface board until the Barometric Pressure reading on the

Barometric Pressure menu reads the correct ambient air pressure.

#### DMM Method

Connect the DMM (+) to TP1 on the 661380 Interface board, (-) to TP2. Set the DMM to measure mVDC. With no sample inlet lines connected and the instrument exhaust ported to atmosphere, adjust R1 on the Interface board until the DMM reads  $0.000 \text{ Vdc} \pm 0.001 \text{ V}$ . The instrument is now calibrated at 1 ATM.

### 1-3 HIGH ALTITUDE VERSION OPTION

For applications where the instrument is to be used above 5400 Feet (MSL) an alternate transducer option is available from the factory. This version consists of a Vaisala model PTB100B transducer (900-1100 hPa range). Please contact the factory if you require this option.

## 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.

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## Instruction Manual

760007-A

July 2003

# Model NGA2000 PMD

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