

Instruction Manual

748417-C

April 2003

Model NGA2000 NDIR

Non-Dispersive Infrared 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.**

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PREFACE

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

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

DEFINITIONS

The following definitions apply to 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

If this equipment is used in a manner not specified in these instructions, protective systems may be impaired.

AUTHORIZED PERSONNEL

To avoid explosion, loss of life, personal injury and damage to this equipment and on-site property, all personnel authorized to install, operate and service the this equipment should be thoroughly familiar with and strictly follow the instructions in this manual. **SAVE THESE INSTRUCTIONS.**

DANGER

ELECTRICAL SHOCK HAZARD

Do not operate without doors and 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.

WARNING

POSSIBLE EXPLOSION HAZARD

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

Ensure that all gas connectors are made as labeled and are leak free. Improper gas connections could result in explosion or death.

WARNING

OVER-VOLTAGE SPIKING

If this Analyzer Module is used with a non-Rosemount Analytical power supply, adding Rosemount Analytical PN 903341 Current Protector in series with the 24V positive power line will prevent over-voltage spiking and resultant fuse blowing when powering up the instrument.

CAUTION

PRESSURIZED GAS

This module requires periodic calibration with a known standard gas. See General Precautions for Handling and Storing High Pressure Gas Cylinders on page P-4.

CAUTION

HAND INJURY HAZARD

Dropping the front panel of the Platform while hand or fingers are inside either case handle can cause serious injury.

CAUTION

PARTS INTEGRITY

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

CAUTION

OVERBALANCE HAZARD

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

CAUTION

POSSIBLE CELL DAMAGE

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

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 NDIR instruction materials are available. Contact Customer Service Center or the local representative to order.

748417 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.



This product complies 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 NDIR

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 Non-Dispersive Infrared (NDIR) Analyzer Module of Rosemount Analytical's NGA2000 Series of gas analysis components.

The NDIR Analyzer Module is designed to continuously determine the concentration of oxygen in a flowing gaseous mixture. The concentration is expressed in one of three fashions:

- parts-per-million
- percent of composition
- percent of fullscale

The user can obtain an output that is linear with concentration by initiating a linearizer, which is based on a fourth-order polynomial. The linearizer is incorporated in the Analyzer Module's electronic circuitry and is adjustable through interconnection with the network.

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

The NDIR Analyzer Module is designed to cover a wide range of process, stack and automotive applications. Typical measurements include:

Chemical and Petroleum

- Carbon dioxide: Manufacture of ethylene oxide, phthalic anhydride and ammonia; nitrogen generation; and producer gas monitoring
- Carbon Monoxide: Stack monitoring

- Methane: Ammonia manufacture
- Acetylene: Manufacture of acetylene, acrylonitrile, and vinyl chloride
- Sulfur Dioxide: Sulfuric acid stack gas

Food and Agriculture

- Carbon Dioxide and Water Vapor: Blanketing of perishables, fermentation processes, photosynthesis studies, personnel protection

Aerospace and Oceanography

- Carbon Dioxide, Carbon Monoxide, and Water Vapor: Diving and space chambers

Metals and Ceramics

- Carbon Dioxide: Monitoring of producer gas, steel converting, manufacture of cement, soaking pit, heat treating
- Carbon Monoxide: Inert gas generation, producer gas monitoring, rotary kiln roasting, tin plate annealing, steel converting, aluminum power processing, porcelain kilns, tunnels
- Water Vapor: Heat treating, hydrogen brazing, nickel and chrome plating
- Sulfur Dioxide: Flash smelting
- Ammonia: Ammonia dissociation

1-3 THEORY OF TECHNOLOGY

Inside of the Analyzer Module, two equal-energy infrared beams are directed through two parallel optical cells, a flow-through sample cell and a reference cell. The reference cell may be sealed or may contain a continuously flowing reference gas. (See Figure 1-1 below.)

The infrared radiation is interrupted by a chopper at a frequency of 5 Hz.

During analysis, a portion of the infrared radiation is absorbed by the component of interest in the sample. The quantity of infrared radiation that is absorbed is proportional to the component concentration.

The detector is a "gas microphone" based on the Luft principle. The detector is generally filled with the same gas being analyzed. The infrared energy is therefore absorbed at the same wavelengths in the detector as that in the sample cell, making the detector specific for the analyzed component. The detector converts the difference in energy between sample and reference cells to a capacitance change. This

change, which is proportional to component concentration, is processed and expressed as the primary variable on the network.

Other modules comprising the NGA2000 unit then use this variable for a variety of purposes (e.g., expressing the gas concentration on the Front Panel Display or sending it to external data acquisition devices).

For a general understanding of the electrical interconnections in the NDIR Analyzer Module, see Figure 2-4 on page 2-5.

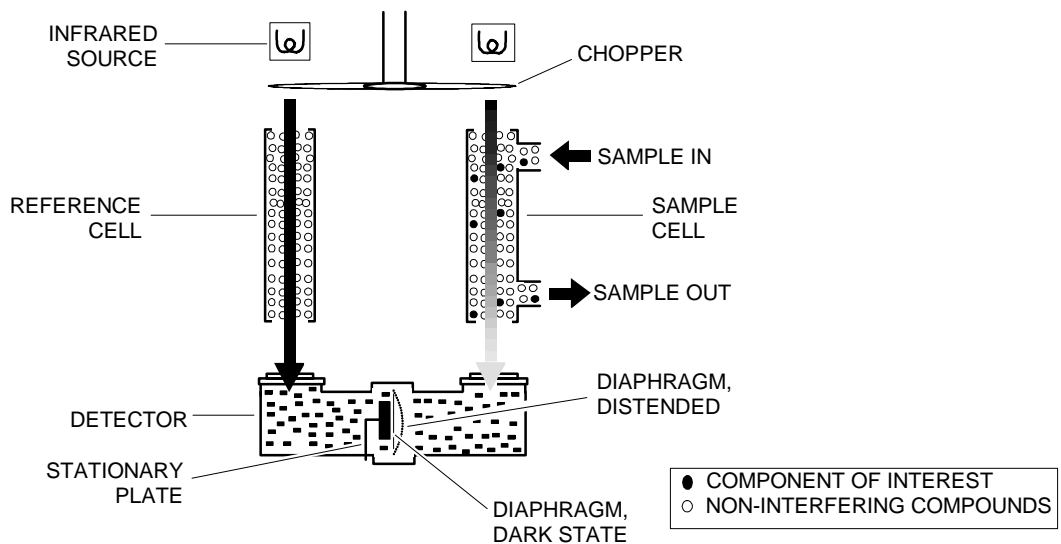


Figure 1-1. NDIR Technology

Model NGA2000 NDIR

1-4 SAMPLE REQUIREMENTS

Maximum allowable sample pressure is 690 hPa-gauge (10 psig) for a standard configuration NDIR that has a flow restrictor which sets the flow at between 0.5 L/min. to 1 L/min. Special high pressure cells (up to 10,350 hPa-gauge, 150 psig) are available. Sample temperature range is 0°C to 55°C, and maximum dewpoint is 40°C. The sample must be filtered to exclude particulates larger than 2 microns in size. Consult factory for special configurations with specifications outside of those listed above.

1-5 PURGE KITS

A purge kit for the motor source or motor source/flowing reference cell accompanies some NDIR modules. The purpose of these kits is to improve performance and accuracy through the reduction of ambient CO₂

interference. ***They do not provide protection from explosion hazard.*** The purge gas vents into the case, which has no outlet fitting for these types of purge gases.

1-6 FEATURES

Among the features available in the NDIR Analyzer Module are:

- Pressure compensation for barometric fluctuations (optional)
- Flow sensing

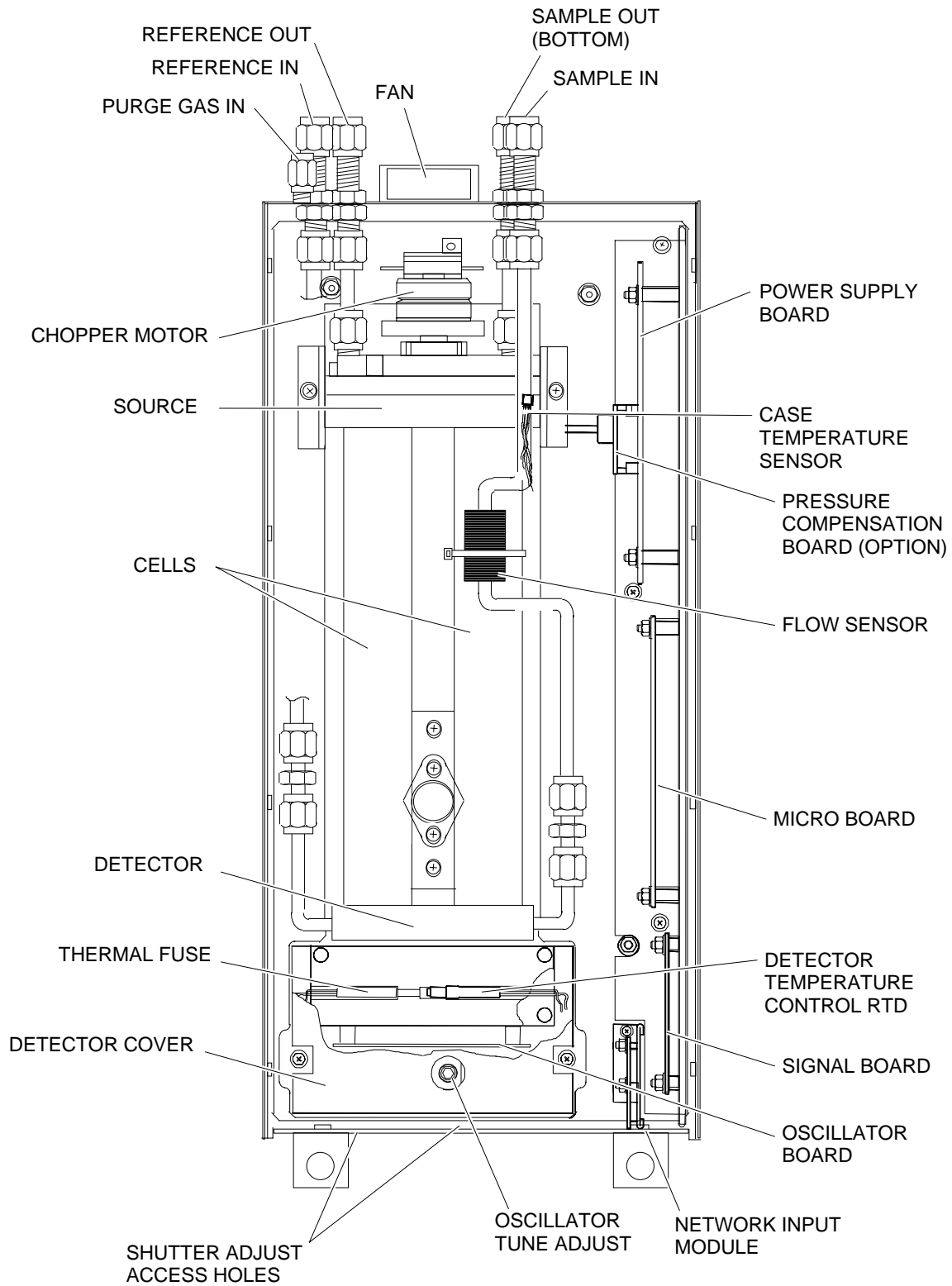


Figure 1-2. NGA2000 NDIR Analyzer Module (Typical - Actual Configuration May Vary)

Model NGA2000 NDIR

1-7 SPECIFICATIONS

a. General

Measurement Species:.....	Heteroatomic gases such as ammonia (NH ₃), carbon dioxide (CO ₂), carbon monoxide (CO), carbon dioxide + carbon dioxide ethylene (C ₂ H ₄), hexane (C ₆ H ₁₄), methane (CH ₄), nitric oxide (NO) and sulfur dioxide (SO ₂)
Ranges:	10 ppm fullscale to 100% fullscale (application-dependent); 4 fullscale selections, including suppressed zero ranges
Repeatability:.....	±1% of fullscale (at constant temperature)
Minimum Detectable Level:	0.1% CO ₂ (at 1 atm. sample pressure; application dependent)
Noise:	<1% of fullscale, peak-to-peak
Linearity:.....	±1% of fullscale with 4th order polynomial
Response Time:05 to 30 seconds (selectable) for 0 to 90% of fullscale
Drift (Zero and Span):.....	<±1% of fullscale/24 hours at constant temperature (application dependent); <±2% of fullscale/week at constant temperature (application dependent)
Effect of Temperature:.....	<±1% of fullscale over any 10°C interval for rate of change no greater than 10°C per hour (application dependent)
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 ≤250 ml/min. (No effect if flow rate is between 0 and 500 ml/min.)
Power Requirements:.....	24 VDC ±5%, 100 W max.; ripple and noise: <100 mV peak-to-peak; line and load regulations: <±1%

b. Physical

Case Classification:.....	General purpose for installation in weather-protected areas
Dimensions:.....	See Outline and Mounting Dimensions, Figure 2-5 on page 2-6
Weight:	Standard: 11 kg (24.2 lbs.); extended: 12.5 kg (27.5 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

c. Sample

Temperature:.....	Non-flammable 0°C to 55°C (32°F to 138°F)
Flow Rate:	500 to 1400 ml/min.
Pressure:	Maximum 690 hPa-gauge (10 psig), higher pressure in pressurized cell applications
Particulates:.....	filtered to <2 microns
Dewpoint:.....	<40°C (104°F), no entrained liquid
Materials in Contact with Sample:.	Gold plated Pyrex, sapphire, quartz, Irtran, FEP Teflon, Viton-A, 316 stainless steel

See the Preface section of the Platform manual for specifications regarding Platform-related components (e.g., case dimensions) and the I/O Module manual for specifications regarding I/O (e.g., relay outputs).

SECTION 2 INSTALLATION

WARNING

Before starting to install this equipment, read the “Essential Instructions” on the inside cover and the Safety Summary beginning on page P-2. Failure to follow the safety instructions could result in serious injury or death.

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.

2-1 UNPACKING

If the NDIR 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.

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.

2-2 ASSEMBLY

If the NDIR 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.

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.

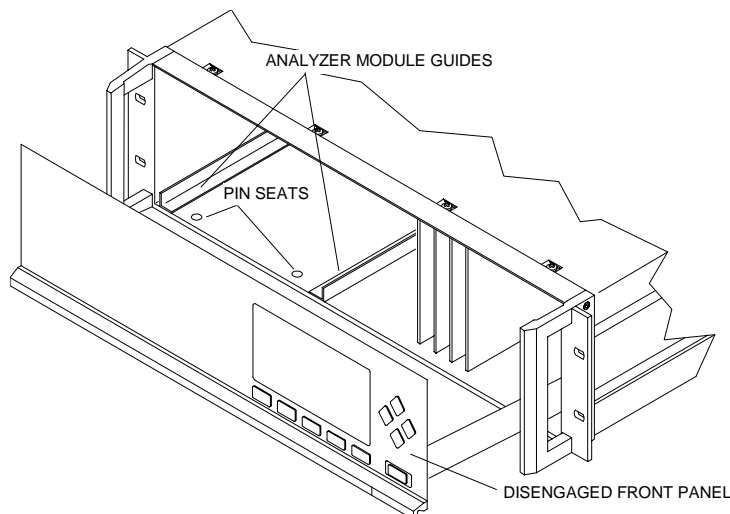


Figure 2-1. Analyzer Module Installation into Instrument Platform

2-3 LOCATION

Install the NDIR Analyzer Module in a clean, non-hazardous, weather protected, vibration free location free from extreme temperature variations. For best results, install the instrument near the sample stream to minimize sample transport time. Operating ambient temperature is 0°C to 45°C (32°F to 113°F). Sample dewpoint is 40°C or less.

NOTE

Unrestricted air flow in the rear of the Analyzer Module is critical to its performance and reliability..

2-4 GAS SPECIFICATIONS

a. Calibration Gases

All applications require a zero standard gas to set the zero point on the display and external data acquisition devices. If the factory provided Calibration and Data Sheet (in the rear of the manual) specifies a background gas, use this as a zero gas. If a background gas is not specified, use dry nitrogen.

Span gas should be between 75% and 100% of fullscale span. Flowing reference (if used) should be dry nitrogen.

b. Flow Rate

Recommended sample flow rate is 1 to 2 SCFH (500 TO 1000 cc/min). A lower flow rate will not affect readings but may result in an undesirable time lag. Excessive flow can produce increases cell pressurization and reading error.

At higher cell pressures, the nonlinearity of the calibration curve increases. Therefore, the calibration curve should be redrawn for higher flow rates. Also, the effect of increased cell pressurization can be

negated if the same flow rate is used for sample, zero and span gases. But, if flow is high enough to cause elevated pressure, careful control (tighter tolerance) of flow rate is required to avoid errors.

If flow is kept at or below 2 SCFH (1 L/min), sample and instrument temperatures reach equilibrium regardless of stream temperature (within specifications; 0 to 55°C). At extremely high flow rates, this may not be true, although no such effect has been noted up to 18 SCFH (9 L/min).

See Table 2-1 on page 2-3 for cell purging times at atmospheric sample pressure.

c. Sample Pressure/Filtration

Sample should be introduced to the Analyzer Module at a maximum 690 hPa-gauge (10 psig). Pressurized applications are available, which require pressurized cells and careful control of flow rates, consult factory for these applications. Sample should be filtered for particulates down to two microns.

d. Leak Test

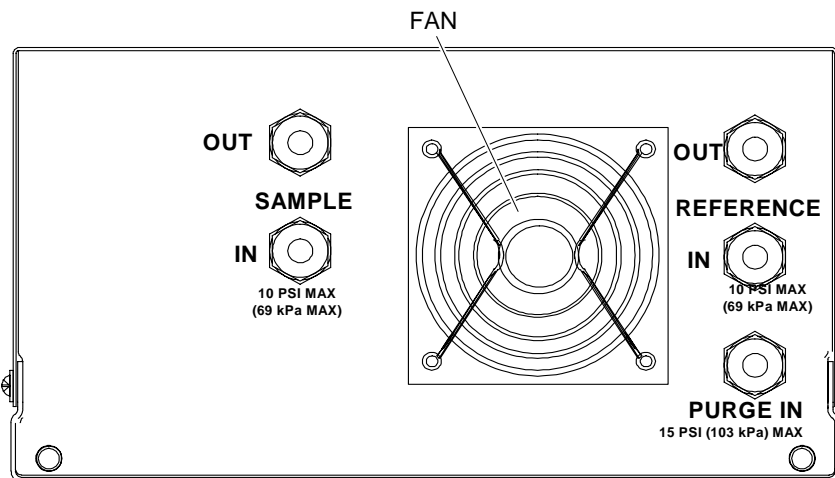
The Analyzer Module is completely tested at the factory for gas leakage. The user is responsible for testing for leakage only at the inlet and outlet fittings on the rear panel. The user is also responsible for internal leak testing periodically and if any internal pneumatic components are adjusted or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

2-5 GAS CONNECTIONS

(See Figure 2-2 on page 2-3) Connect inlet and outlet lines for sample/zero/span and flowing reference (if applicable) to appropriately labeled fittings on the rear panel. All four connections are 1/4 inch ferrule-type compression fittings.

CELL LENGTH		CELL VOLUME CC	TOTAL VOLUME CC	TIME FOR 2 VOLUMES @ 2 SCFH (1L/MIN)
mm	inch	without inlet tube	cell with inlet tube	at 750 mm Hg
3	0.118	0.85	12	2 sec.
4	0.157	1.14	12	2 sec.
8	0.315	2.28	13	2 sec.
16	0.630	3.56	16	2 sec.
32	1.25	9.12	20	2 sec.
64	2.52	18.24	25	3 sec.
128	4.03	35.48	44	3 sec.
232	9.13	65.12	73	6 sec.
343	13.50	97.76	105	13 sec.
381	15.00	108.60	116	14 sec.

Table 2-1. Cell Purging Times at Atmospheric Sample Pressure



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

Figure 2-2. NDIR Back Panel

2-6 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 2-3 below. 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.

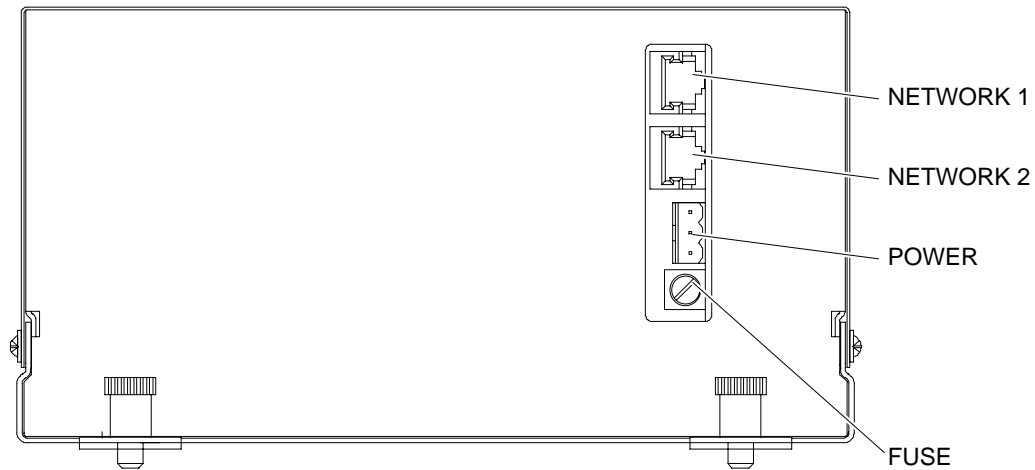


Figure 2-3. NDIR Front Panel Electrical Connections

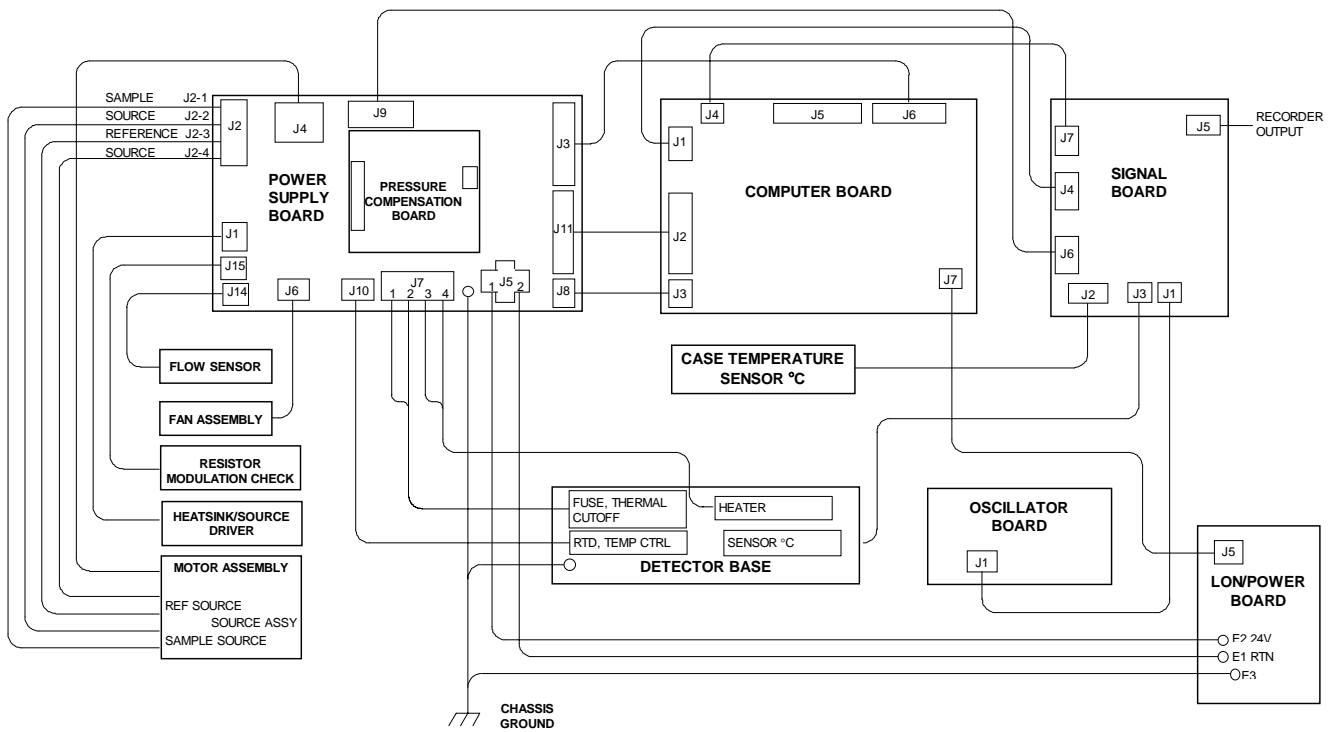
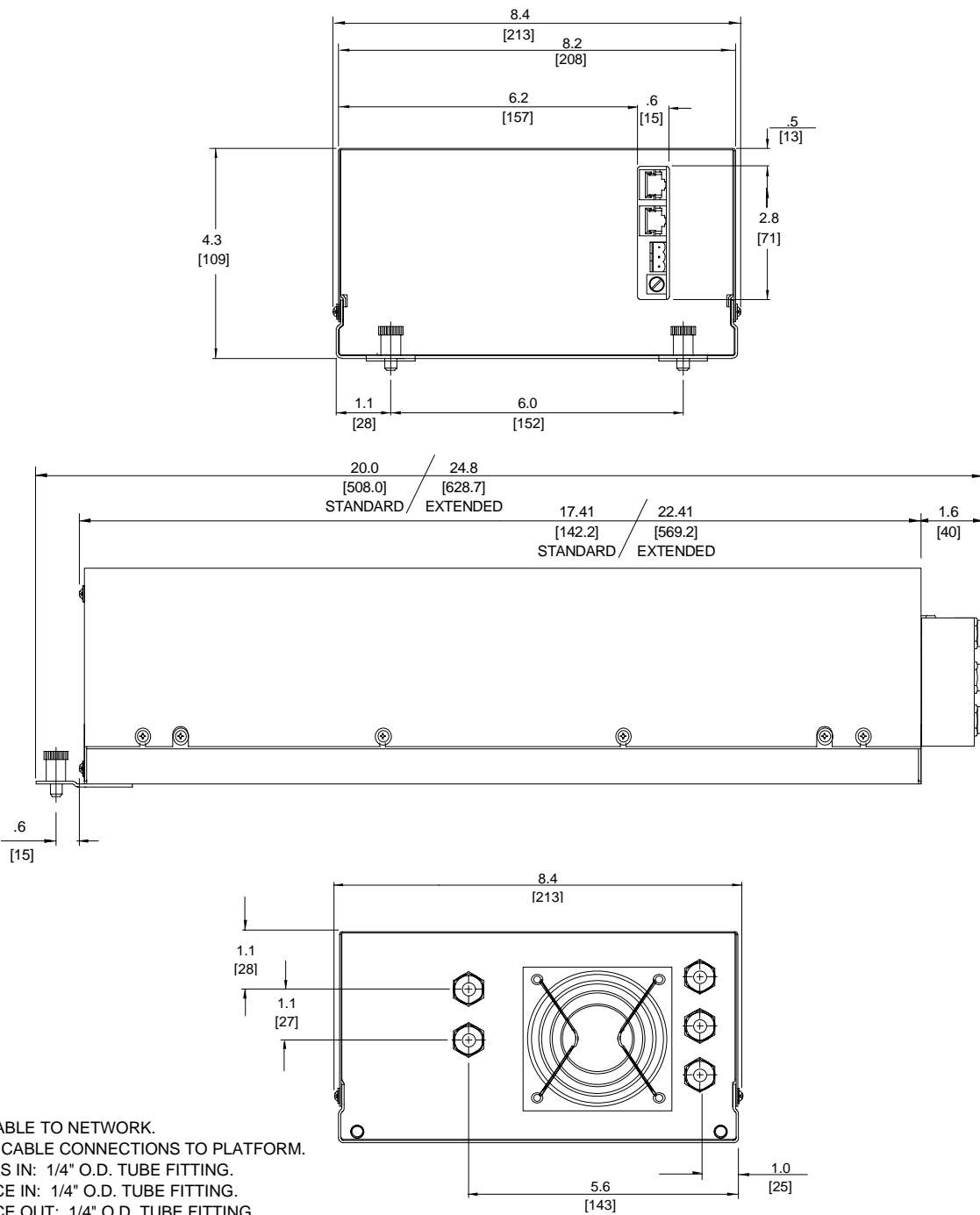


Figure 2-4. NDIR Wiring Diagram



- G. POWER CABLE TO NETWORK.
- F. NETWORK CABLE CONNECTIONS TO PLATFORM.
- E. PURGE GAS IN: 1/4" O.D. TUBE FITTING.
- D. REFERENCE IN: 1/4" O.D. TUBE FITTING.
- C. REFERENCE OUT: 1/4" O.D. TUBE FITTING.
- 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: 24.2 LB (11.0 kg).

DIMENSIONS

INCH
[mm]

Figure 2-5. Outline and Mounting Dimensions

SECTION 3 STARTUP AND OPERATION

3-1 OVERVIEW

Prior to initial startup, the user should leak test the module as outlined in Section 2.

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 Platform Front Panel controls and indicators, see Section 1 of the Platform Components instruction manual.)

3-2 DISPLAY SCREENS

Three kinds of Display screens are available to the user (See Figure 3-3 through Figure 3-6.):

- Run Mode
- Menu
- Help

a. Run Mode Display

The Run Mode is the normal mode of operation. In this mode, the Display will show current gas measurement, the component of interest, the current operations of the softkeys, a graphic bar representing the displayed concentration as a percent of fullscale, and up to 4 user-selectable secondary variables and associated bargraphs.

If more than one Analyzer Module is connected to the system, the Run Mode display will show as many as four gas measurements on a single screen. Alarm messages may also appear on the display (See Table 3-1 on page 3-5)

b. Menu Displays

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

The Main Menu (see Figure 3-2 on page 3-2) 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 Controls. (See Figure 3-3 through Figure 3-5.) Many layers of the menu structure are described at appropriate places throughout this manual.

From the Run Mode display, press the MENUS softkey to gain access to the Main Menu. (See Figure 3-2 on page 3-2.)

c. Help Displays

The Help structure is on-line "tutorial," context-sensitive and topic-interconnected, so that the user can practically operate NGA2000 without need of an instruction manual.

3-3 STARTUP PROCEDURE

Introduce zero gas into SAMPLE INLET and reference and source purge gas, if applicable, into their respective inlets. Ensure that gas pressures are set to requirements listed on the Specifications page of the Preface section of this manual.

Apply power to the NDIR 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 has been supplied to the Platform, the NDIR 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 procedure 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 (about one hour for the NDIR Analyzer Module), all modules are completely functional.

Check the tune and detector signal values against the factory settings listed in the

Diagnostic Service menus. If both settings are within $\pm 5\%$ tolerance of factory setting, go to Section 3-4 below for binding and Section 3-5 on page 3-4 for calibration. If not, refer first to Section 4-11 on page 4-6 for instructions about oscillator tune/source balance shutter adjustments.

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 Set Up portion of the **Technical Configuration Menu** in software.

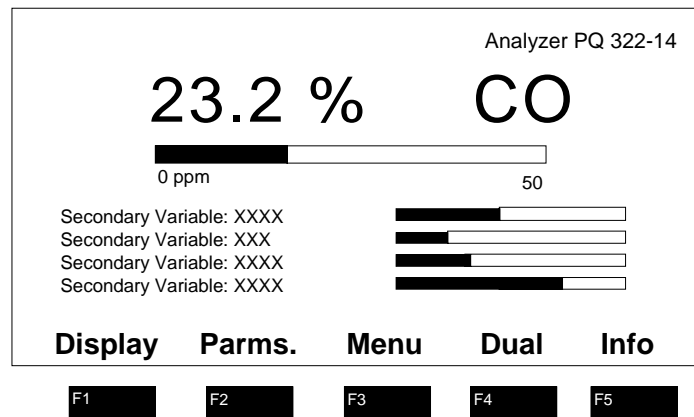


Figure 3-1. Run Mode Display

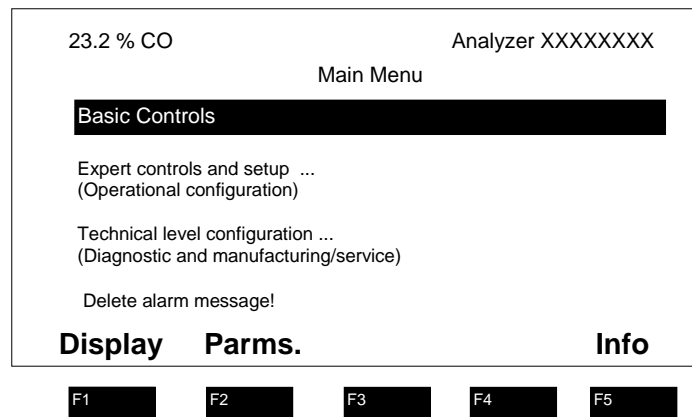


Figure 3-2. Main Menu Display

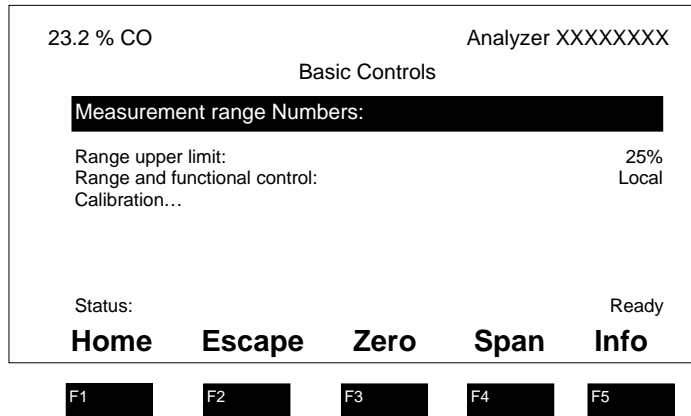


Figure 3-3. Basic Controls Menu

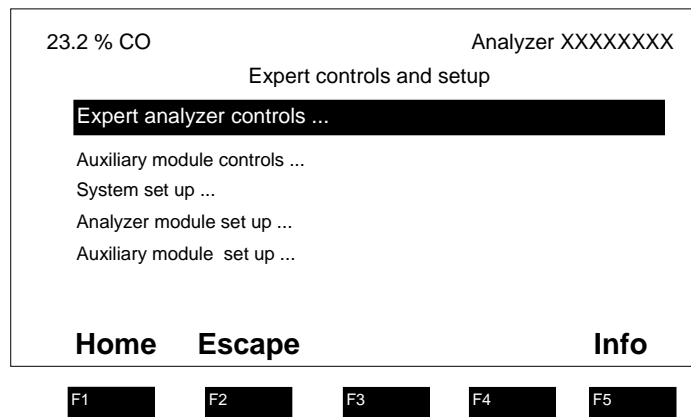


Figure 3-4. Expert Controls and Setup Menu

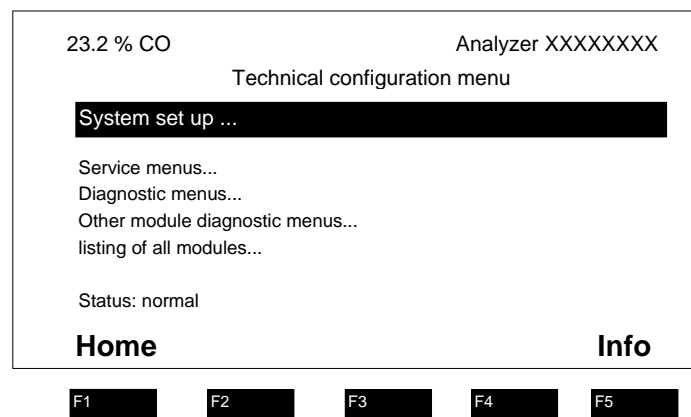


Figure 3-5. Technical Level Configuration Menu

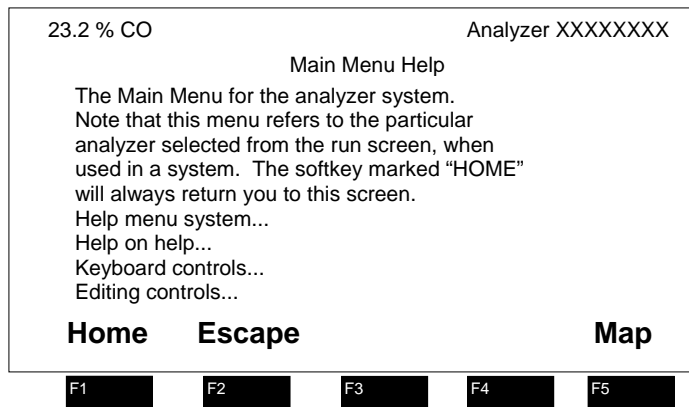


Figure 3-6. Typical Help Screen

3-5 CALIBRATION

Calibration can be executed from the **Basic Controls** menu. Calibration gas data can be entered only through **the Expert Controls and Setup** menu.

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

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.

Press the MENUS softkey to enter the **Main Menu** and make the following selections from the **Main Menu**: Expert Controls and Setup, Analyzer Module Setup, Calibration Gases.

Input appropriate data in the **Calibration Gas List** menu.

Press the HOME softkey to return to the **Main Menu**.

Use the ↓ arrow key to select Basic Controls.

Press the ZERO softkey to enter the **Analyzer Zero** menu, press ZERO again and wait.

Introduce span gas into the SAMPLE INLET, press SPAN softkey to enter the **Analyzer Span** menu, press SPAN again and wait.

Press HOME to re-enter the **Main Menu**.

Press DISPLAY softkey for the Run Mode display.

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). Simply 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:

Select the following from the **Main Menu**: Expert Controls and Setup, Analyzer Module Set Up, and Calibration Parameters.

Using the ↓ arrow, select Zero Ranges, press ENTER and, using the up/down arrows, toggle to SEPARATE. Do the same for the Calibrate Ranges selection. Do not press

Model NGA2000 NDIR

ESCAPE at any time unless retention of prior settings is desired.

Return to the **Main Menu** and make the following selections: Expert Controls and Setup, Expert Controls, CAL DATA softkey, FACTORS softkey, and Range 1 (2, 3, 4) Factors (do Steps 4 and 5 for each range).

Select Zero Offset, press ENTER, adjust the value to 500000 with the ↑ and ↓ arrow keys, and press ENTER. Do not press ESCAPE at any time unless retention of prior settings is desired.

Refer to the Data Sheet in the rear of this manual for Span Factors as originally set at the factory. Select Span Factor, press ENTER, adjust the value to match the values

on the Data Sheet with the ↑ and ↓ arrow keys, and press ENTER. If Data Sheet is not available, enter 0.000015 with the ↑ and ↓ arrow keys, and press ENTER. Do not press ESCAPE unless retention of prior settings is desired.

Attempt to recalibrate the Analyzer Module according to the procedure outlined at the beginning of Section 3-5 on page 3-4. If recalibration fails, return to the **Range Factors** menu, readjust factors and try calibrating again.

Another cause of failure to calibrate is the following: The value for "Maximum range" is lower than the upper limit value for the range in use. See the **Range Settings** menu for this information.

DISPLAY MESSAGE	DESCRIPTION	TYPE
BAROMETER	System Barometer	WARNING
CASE TEMP	Case Temperature	WARNING
CHOP SPEED	Chopper Speed	WARNING
CRUDE NOISE	Calculated Noise	WARNING
DET SIG	Detector Signal	WARNING
DET TEMP	Detector Temperature	WARNING
LIN ERROR	Linearizer Error	WARNING
N15 VOLTS	Power Supply, -15V	WARNING
P12 VOLTS	Power Supply, +12V	WARNING
P15 VOLTS	Power Supply, +15V	WARNING
P24 VOLTS	Power Supply, +24V	WARNING
P5 VOLTS	Power Supply, +5V	WARNING
PERCENT MOD	Percent Modulation	WARNING
RAW SIGNAL	Raw Signal	WARNING
SVFLOW	Sample Bypass Flow	WARNING
SW ERROR	Software Error	FAILURE

Table 3-1. NDIR Analyzer Module Alarms

3-6 LINEARIZATION

The NDIR Analyzer Module can be operated in linear and non-linear mode. Linearization can be toggled ON/OFF in *the Expert Controls* menu. In the OFF position, linearization is disabled for all ranges, and the component of interest is measured in percent of fullscale. In the ON position, measurement is in engineering units: Either ppm or percent of concentration.

The NDIR Analyzer Module is linearized with the following fourth-order polynomial:

$$Y = A_0 + A_1X + A_2X^2 + A_3X^3 + A_4X^4$$

Where:

X = the normalized non-linear input

A₀, A₁, A₂, A₃, A₄ = linearization coefficients

Y = the normalized linear output

Linearization coefficients can be developed and stored for each range through the *Expert Controls* menu. The operating range is selected by entering RANGE = 1, 2, 3 or 4 in the Range Mode section that that menu.

Coefficients for each selected range are automatically used when the module is in Linearization Mode. The user instructs the Analyzer Module as to which set of coefficients are to be used for each range. Maximum dynamic range is 3:1.

When ordered, special linearization coefficients for non-standard fullscale ranges are entered in the appropriate range(s) at the factory. If a range is not specified, the set of coefficients will be for Range 4.

The operator may want the module to output measurement in engineering units (ppm). This response is linear over the operating range. The following coefficients will make no correction to the non-linear response, but will cause the NDIR Analyzer Module to output gas measurement in engineering units:

- A0 = 0.00000
- A1 = 1.00000
- A2 = 0.00000
- A3 = 0.00000
- A4 = 0.00000

To calculate linearization coefficients other than those installed at the factory, take a minimum of 11 data points. (A more accurate curve can be obtained as the user approaches 21 data points. If urgent, a curve can be created with as few as four points, but this is only a temporary fix. A more accurate curve should be created as soon as possible.)

These data points can be obtained with an accurate gas divider or other flow mixing device. Before calculating coefficients, the data must be normalized to ranges of 0 to 1 units for both percent and concentration readings. Then, the axis must be reversed as illustrated in Figure 3-7 on page 3-7 and Figure 3-8 on page 3-7. A multiple linear regression is then used to calculate coefficients. (For example: If the range is 0 to 5000 ppm and readings are 0 to 100%, then divide all of the concentrations by 5000 and the readings by 100. Put the normalized concentrations on the Y-axis and the normalized readings on the X-axis.)

These data points can be entered into any program capable of computing a fourth-order polynomial curve. This curve will be the mirror image of the curve on the Calibration and Data Sheet provided in the rear of this manual; however, the linearization coefficients will be different. Use the coefficients calculated with the curve in the polynomial shown on the previous page.

After taking the data points, the operator may determine coefficients for user-specific gas by either using any program capable of calculating a fourth-order curve fit or calling the factory to have the specific coefficients calculated.

When entering the operator-determined coefficients, note that the microprocessor only recognizes five significant digits to the right of the decimal point (e.g., 0.12345).

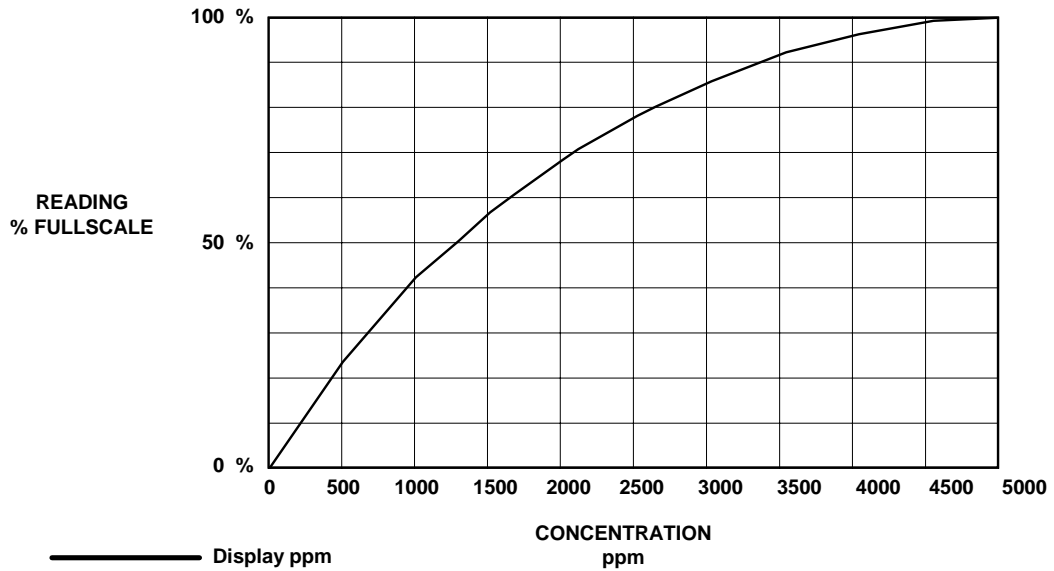


Figure 3-7. Typical Linearization Curve, Linearizer OFF

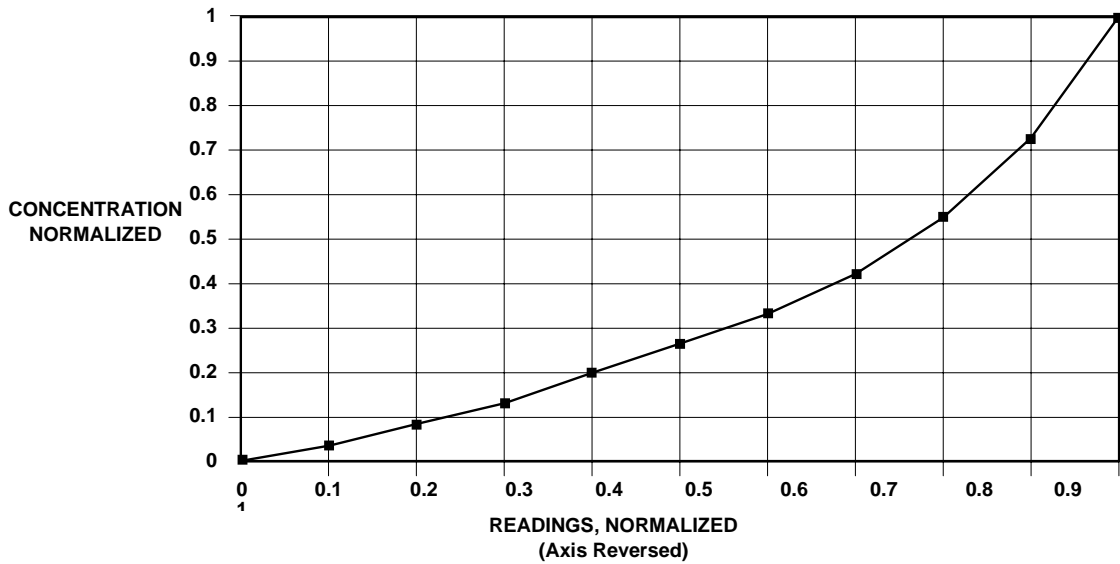


Figure 3-8. Operator-Determined Linearization Curve (Normalized)

3-7 ROUTINE OPERATION

Set the NDIR Analyzer Module for desired operating range. Zero and span the module, and then supply sample gas to the SAMPLE INLET at the rear of the module. The NDIR Analyzer Module will now automatically and continuously analyze the sample stream.

As a check of instrument performance, the operator should keep a log of zero/span status.

Maximum permissible interval between calibrations depends on the analytical accuracy required. A frequency of once every 24 hours is recommended initially, and that practice should be continued unless experience indicates that some other interval is more appropriate.

Readout accuracy is directly proportional to change in barometric pressure (i.e., a change in cell pressure of 7.6mm of mercury will result in a readout error of about 1% of reading). Therefore, if barometric pressure changes significantly, a recheck of calibration against a span gas is advised. Also, an optional Pressure Compensation Board is available that electronically compensates.

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 Manufacturing Data. Select Maximum Range, and use the arrow keys to scroll the indicated value. The same applies for "minimum range" setting.

SECTION 4 MAINTENANCE AND TROUBLESHOOTING

DANGER

ELECTRICAL SHOCK HAZARD

Servicing requires access to live parts which can cause death or serious injury. Refer servicing to qualified personnel.

4-1 OVERVIEW

NDIR Analyzer Module components that may require cleaning or replacement include:

- all printed circuit boards
- power fuse
- the module fan
- the chopper motor
- the source
- the detector
- flow sensor
- case temperature sensor
- Analysis cells and optical components
- RTD - detector temp. controller
- thermal fuse

The only components that may require adjustment are the oscillator tune and shutter

balance adjustments. These are factory-set, and should be adjusted only in the following cases:

if the operator has changed sources, oscillator board or detector

if the operator disassembles the bench to any degree.

Also available for maintenance adjustment through the Front Panel display and keypad are the source current, preamplifier gain (referred to as Signal Gain on the sub-menu) and the modulation check.

4-2 PCB REPLACEMENT

Refer to Figure 4-1 on page 4-2 for locations of the Signal, Micro, Power Supply, Oscillator and optional Pressure Compensation boards.

All PCBs, except the Oscillator Board and the LON Power Board, are secured to a side of the analyzer module that folds out while interconnect wiring is still in place. Remove the securing screws and fold out the entire panel.

To remove a particular board on the fold-out panel, label and unplug all interconnect wiring, and remove securing hardware. (See to Figure 4-1 on page 4-2.) Do the reverse to install a new board. Use caution when installing connectors by observing correct position (polarity) and alignment of pins.

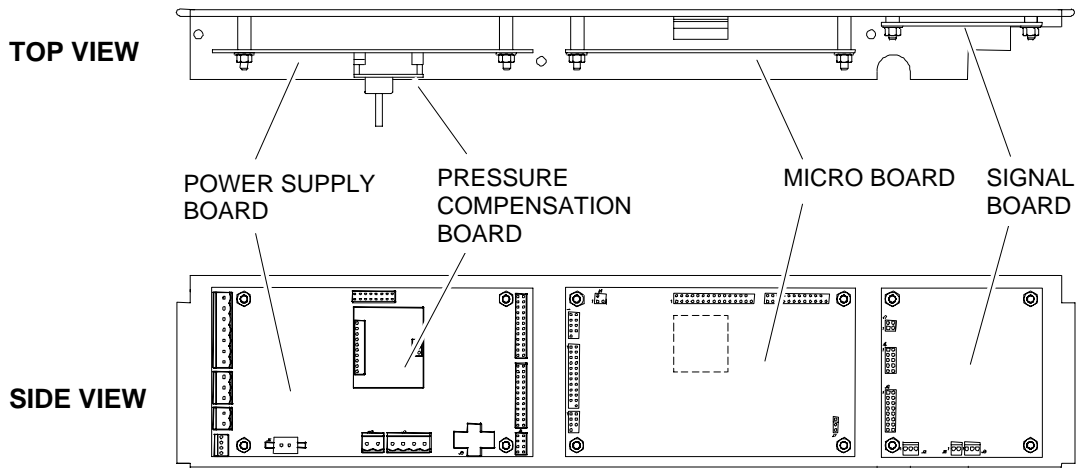


Figure 4-1. Printed Circuit Board Fold-Out Panel Views

4-3 POWER FUSE REPLACEMENT

Remove power to the Analyzer Module prior to fuse replacement. To replace the Power Fuse, view the front panel of the Analyzer Module, as

shown in Figure 4-2 below, and push and turn the fuseholder cap 1/4 turn counterclockwise. Remove and replace the fuse as required.

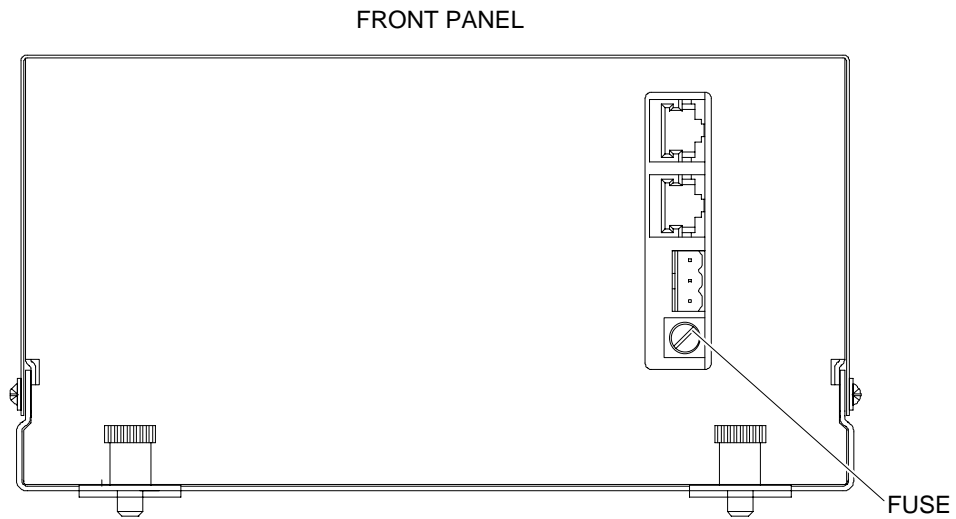


Figure 4-2. Power Fuse Location

4-4 MODULE FAN REPLACEMENT

The Analyzer Module fan assembly is disassembled as shown in Figure 4-3 below.

Before doing so, the entire optical bench must be removed. See Figure 4-5 on page 4-5.

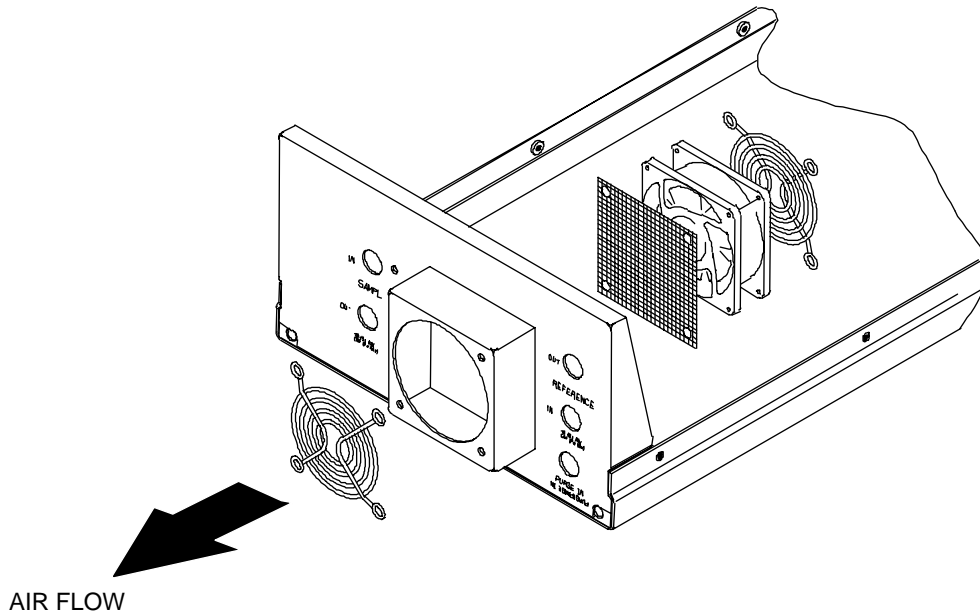


Figure 4-3. Fan Assembly

4-5 CHOPPER MOTOR REPLACEMENT

See Figure 4-4 below for a exploded view of the Motor/Source Assembly. The entire optical bench must be removed to perform this replacement.

4-6 SOURCE REPLACEMENT

See Figure 4-4 below for a exploded view of the Motor/Source Assembly. The entire optical bench must be removed to perform this replacement.

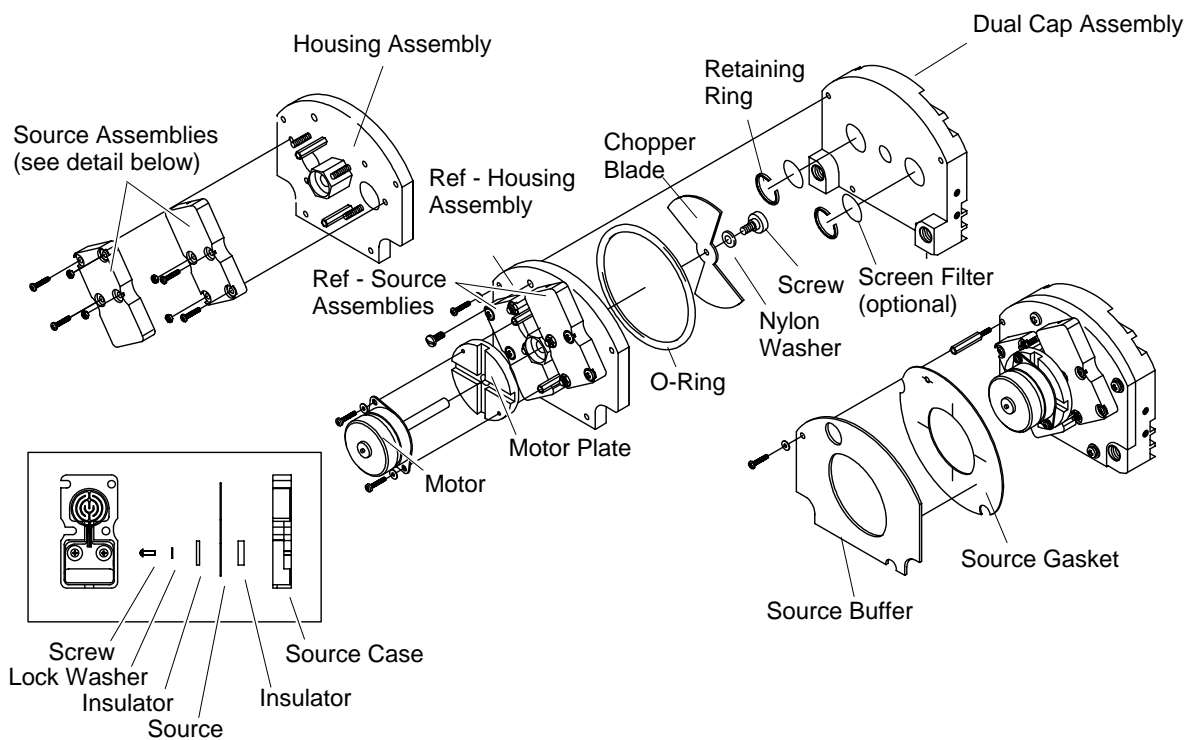


Figure 4-4. Motor/Source Assembly

4-7 DETECTOR REMOVAL

See Figure 4-5 below and Figure 4-8 on page 4-9 for breakdowns of the optical bench. The entire optical bench

must be removed in order to perform this disassembly.

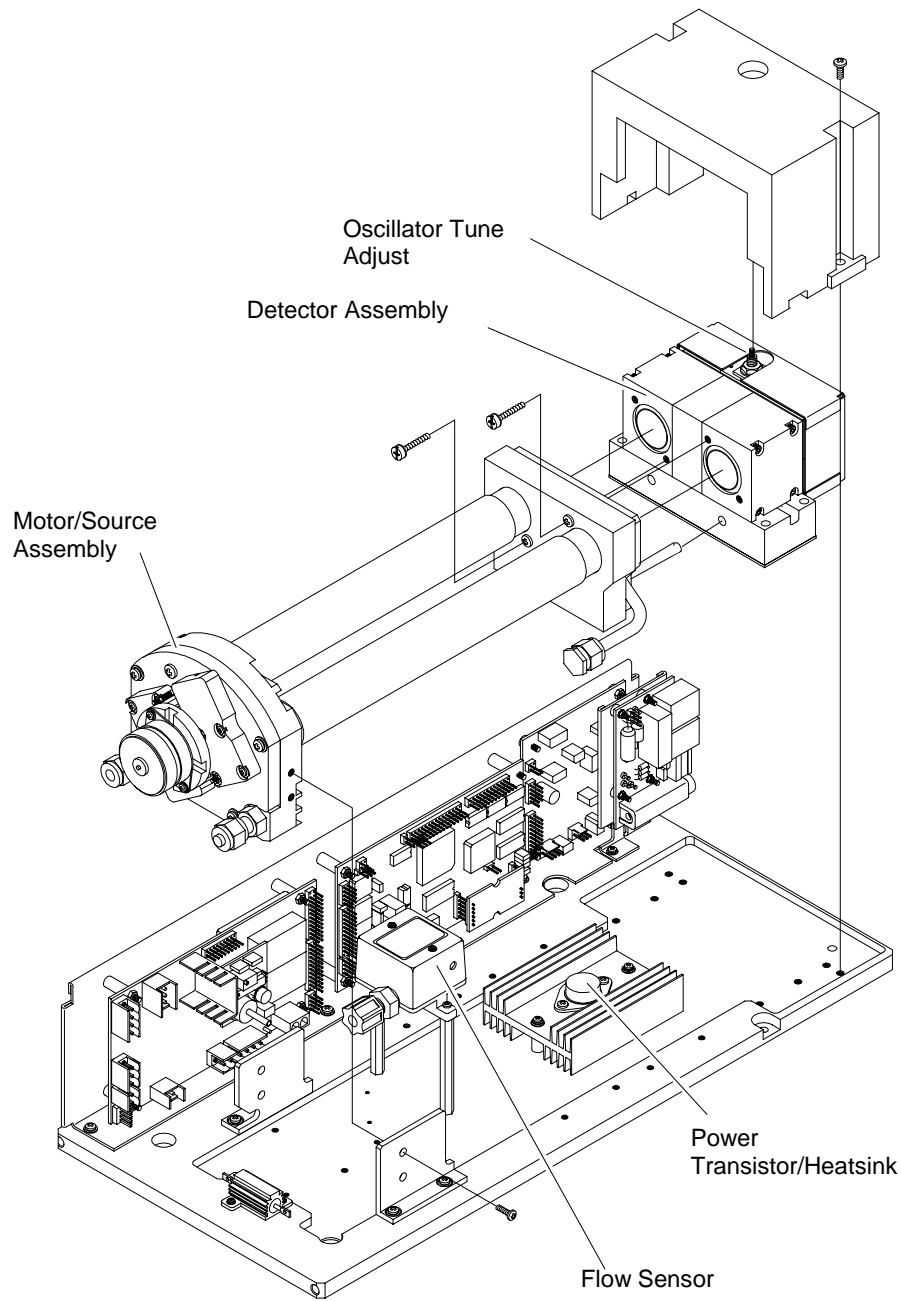


Figure 4-5. Cell, PCB Assembly – Exploded View

4-8 FLOW SENSOR REPLACEMENT

See Figure 4-5 on page 4-5 for Flow Sensor location. To replace Flow Sensor, remove all connecting hardware and undo connections to the sample line.

4-9 CASE TEMPERATURE SENSOR REPLACEMENT

Case Temperature Sensor is attached to the motor source assembly. To replace this sensor, cut the Ty-Rap binder and disconnect the sensor connector. Reverse these instructions by reconnecting the new sensor and attaching with a new Ty-Rap.

4-10 THERMAL FUSE REPLACEMENT

Disassemble and reassemble the Detector block according to Figure 4-7 on page 4-7 to replace the Detector Thermal Fuse.

4-11 OSCILLATOR TUNE/SOURCE BALANCE SHUTTER ADJUSTMENT

The Analyzer Module is calibrated, tuned and balanced at the factory. If the diagnostic values for oscillator tune and detector signals are within $\pm 5\%$ of the factory settings in Primary Variable Parameters and Modulation Check menus, no adjustment is necessary. If not, see Figure 4-5 on page 4-5 and Figure 4-6 on page 4-7 for Oscillator Tune and Source Balance Shutter adjustments, and do the following:

Open Platform front panel, if present.

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.

Open Analyzer Module front panel

Access the oscillator tune value in the Primary Variable Parameters menu.

Adjust oscillator tune knob to its maximum setting and then turn it counterclockwise to 80 % of that maximum setting.

Access the detector signal value in the Modulation Check menu.

Flow zero gas (nitrogen) through the sample cell until the display reading stabilizes.

CAUTION

DELICATE COMPONENTS

The shutter is a delicate component with only a six-degree rotation. Take care when making the required adjustments.

Using an appropriate screwdriver that will fit through the Source Balance Adjustment Screw Holes (see Figure 4-5 on page 4-5), rotate the sample shutter adjust screw until a minimum reading on the display is obtained. (A typical reading is 0.2 through 0.5.)

Add 0.5 V to the value obtained in Step 7 by adjusting the sample shutter adjust screw clockwise. (If this reading exceeds 1.2 V, then a cell cleaning is necessary; see Section 4-12 on page 4-8.)

Rotate the shutter adjust screw clockwise until the display reads the value obtained in Step 8.

Reassemble the Analyzer Module and, if appropriate, the Platform.

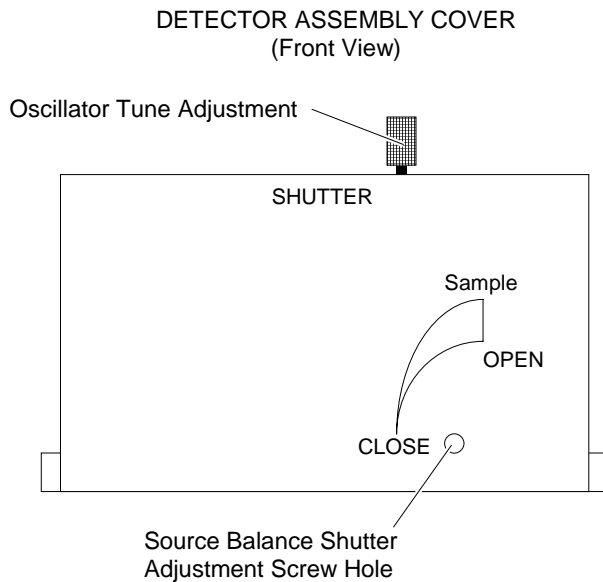


Figure 4-6. Oscillator Tune, Source Balance Shutter Adjustments

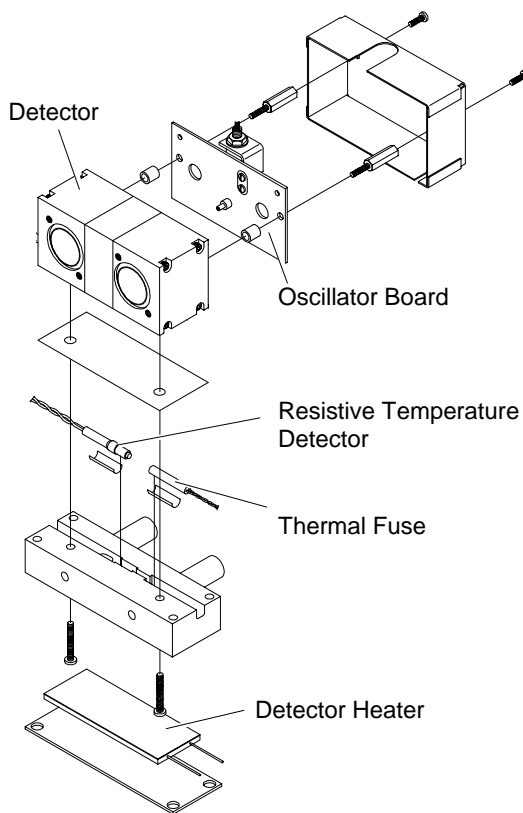


Figure 4-7. Detector Block (Exploded View)

4-12 CLEANING CELLS

When zero gas is introduced in the SAMPLE IN inlet and the Detector signal is greater 1.2V, the cells and windows require cleaning. To do this, follow this procedure:

See Figure 4-8 on page 4-9 to identify which detail drawing best matches the configuration in question.

Fold out the PCB panel.

Disassemble the optical bench according to Figure 4-5 on page 4-5 and the cells according to Figure 4-8 on page 4-9.

Rinse the cell with acetone. If this does not remove all foreign matter, use a soft brush. Do not use any metallic object inside the cell because it will scratch the gold plating. Loss of gold plating may require cell replacement.

After all matter has been removed, rinse the cell with distilled water and allow to air dry. Do not use towels.

Inspect the cell inside by holding it up to a bright light. If particles are seen, repeat Steps 5 and 6 as often as necessary.

After cleaning cell, examine O-rings at the source, detector and end caps. If damaged, replace with new O-rings.

Remove any contaminants from windows with a lint-free cloth soaked in acetone. Do not use alcohol or other solvents. Allow to air dry.

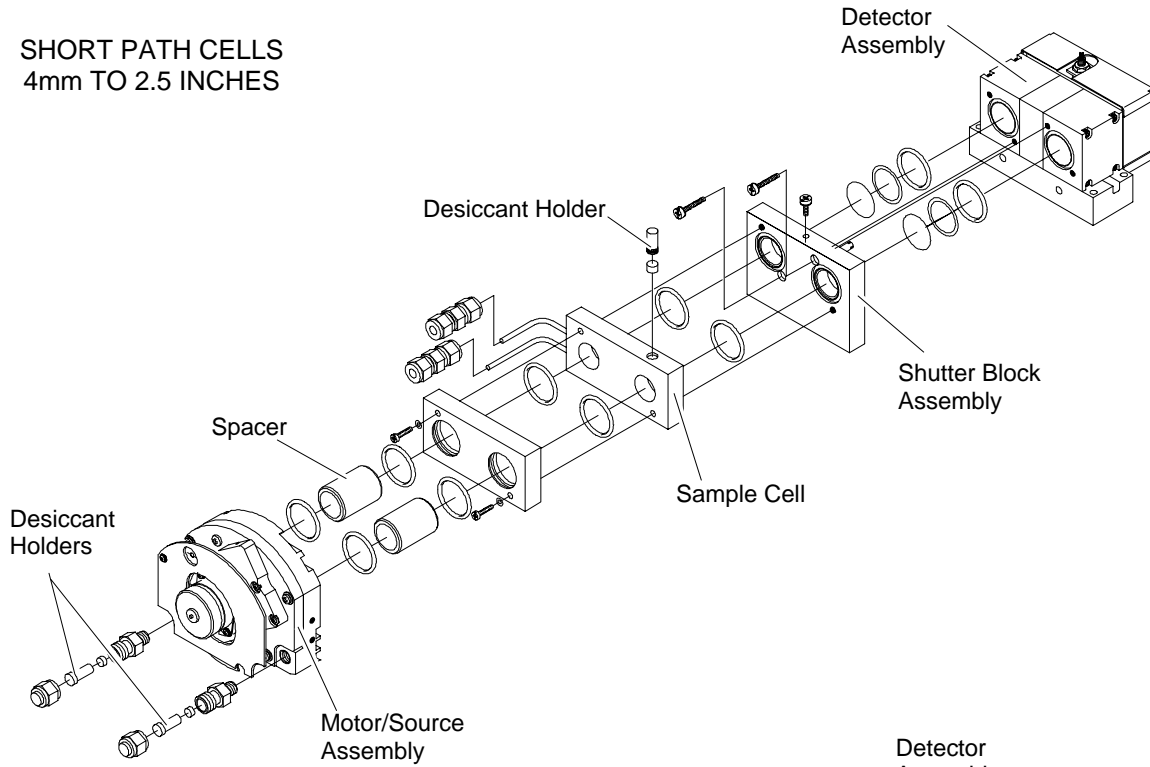
Reverse disassemble instructions to reassemble the unit.

Perform a leak check.

Replace desiccant if required. (See Section 4-13 on page 4-10.)

After cleaning cells, the Analyzer Module must be optically aligned if the diagnostic values for oscillator tune and detector signals are not within $\pm 5\%$ of the factory settings. If they are not within that range, follow Steps 7 through 10 of Section 4-11 on page 4-6.

SHORT PATH CELLS 4mm TO 2.5 INCHES



LONG PATH CELLS

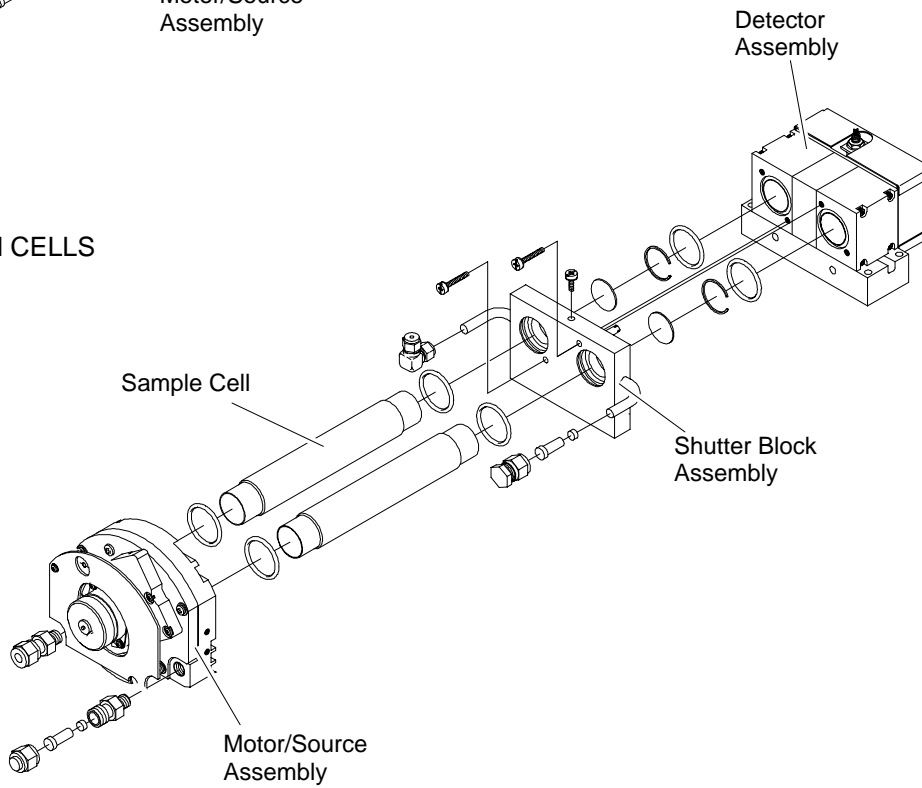


Figure 4-8. Cell Assembly

4-13 CELL DESICCANT

The reference cell may use a flowing reference. If so, desiccant is required. A desiccant holder is used on the inlet and

outlets to keep moisture from entering the reference cell (see Figure 4-7 on page 4-7). The desiccant should be replaced each time the cell is opened, refer to Table 4-1 below. Before inserting desiccant, purge cell with dry inert gas (i.e., N₂).

GAS	DESICCANT	PART NUMBER
CO ₂	Cardoxide	096218
CO	Mg (C10 ₄) ₂	096217
H ₂ O	Mg (C10 ₄) ₂	096217
SOS	Mg (C10 ₄) ₂	096217
CH ₄	Mg (C10 ₄) ₂	096217
Hexane	Mg (C10 ₄) ₂	096217
CO + CO ₂	Cardoxide + Mg (C10 ₄) ₂	096217/096218

Table 4-1. Cell Desiccant

4-14 MODULATION CHECK

The modulation check is a measure of the energy absorption capacity of a gas mixture, where total absorbency is 100% modulation and zero absorbency is 0% modulation. The modulation check can be used as a tool for tracking the sensitivity of the Analyzer Module and for discovering potential detector/source problems.

To perform a modulation check, do the following:

Access the Primary Variable Parameters menu.

Select Modulation Check.

Follow the *Instructions* and *Then* line commands, which are the following:

Flow zero gas, press START softkey and wait.

Flow span gas when prompted, press START softkey and wait.

When the *Instructions* line again prompts the user to flow zero gas, the modulation check is finished.

Note the value on the *Percent Modulation* line.

Find the Percent Modulation value on the Data Sheet in the rear of this manual. Some standard Analyzer Modules will not have a value. If a value is present, compare this to the new value.

If 100% span gas was used during the modulation check, the new value should be within $\pm 10\%$ of value on the Data Sheet. If it is out of this range, call the factory for further interpretation. If modulation checks are used for trending, variance from check to check should not exceed $\pm 20\%$ per month.

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 NDIR sales matrix which lists the various configurations available.

To identify the configuration of an analyzer, locate the analyzer name-rating plate. The 12-position sales matrix identifier number appears on the analyzer name-rating plate..

NDIR	SINGLE CHANNEL INFRARED MEASUREMENT (ANALYZER MODULE)				
	Code	Software Version			
	01	Current Version Software			
	02	2.2.4 Version Software			
	03	3X Version Software - specify version			
		Code	Configuration Identifier		
			[] Configurations utilize EXTENDED housings.		
			09, 10, 12, 20, 22, 23, 29, 30, 36, 38		
			[06], 07, 08, 11, 21, [24], 26, 76, 63		
			[16], [28], 19, [25], [27], 31, [37], 39, 41, [44]		
			[14], [15], [46], 54, 64, 65, [66], 67, 73		
			[56], 74, [75], 83, 84, [85], 88		
		99	SPECIAL		
			Code	Linearized Non-Standard Range Selection	
			01	Four Standard Ranges	
			R1	One Non-Standard Range	
			R2	Two Non-Standard Ranges	
			R3	Three Non-Standard Ranges	
			R4	Four Non-Standard Ranges	
			99	Special	
				Code	Flow Path
				01	Standard (No Flow Sensor)
				02	400 - 2000 cc/min
				99	Special
NDIR	01	10	R1	01	Example

5-2 REPLACEMENT PARTS

While the following sections list parts which are common to all NDIR Analyzer Modules, the **configuration number** is required when ordering parts which are specific to an individual application. The configuration number is on the Data Sheet in the rear of this manual.

623998	Oscillator Board
657466	LON/Power Board
655729	Detector Heater
622917	Temperature Sensor, Detector
898733	Thermal Fuse with Q Pad
902931	Flow Sensor
655943	Case Temperature Sensor
655630	Power Supply Board
655670	Pressure Compensation Board
658350	Computer Analysis Board
655610	Signal Board
655893	Fan
655891	Chopper Motor
655925	Source (Matched Pair)

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 MAIN
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 gases...
Calibration Parameters...
Concentration alarms...
Gas measurement parameters...
Analyzer parameter list...
Physical measurement parameters...
Displayed physical parameters...

HOME ESCAPE INFO

Menu: 2 FLOCHEK

Physical Measurements

Sample flow:	000.0
Flow lower limit:	000.0
Flow upper limit:	000.0
Barometric pressure:	000.0
Case temperature:	000.0

HOME ESCAPE INFO

Menu: 3 ZERO1

Zero/Span Calibration help

This allows manual control of the zero and span. Flow zero gas, and make sure the zero gas value is right: press the zero key to make the analyzer zero. Or select Calibration factors and individually adjust the the readings on each range. 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 what it would have been on the zero gas with the current span.

HOME ESCAPE CAL INFO INFO

Menu: 4 FLOCHEK1

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

Menu: 5 ANALOPI1

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, select the correct range and press the zero or span button. Do a zero before a span.

Remote control does not disable local control.

Make sure the correct gas is flowing before trying to zero or span.

HOME

ESCAPE

INFO

Menu: 6 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: 7 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

Linearization parameters...

HOME

ESCAPE

NEXT

LAST

INFO

Menu: 8 ANALSET1

Analyzer module set up
Select the aspect of the analyzer you wish to change. Set up the calibration gas values in the calibration gas list. Set up the other calibration parameters. Linearization, filtering and other functions are set up in menus under measurement parameters. The analyzer parameter list simply lists all the settable parameters in order. Physical measurements show flow, pressure etc. and associated limits. Displayed parameters show what is displayed on the

HOME **ESCAPE** **INFO**

Menu: 9 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**

Menu: 10 CALLIST1

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

HOME **ESCAPE** **INFO**

Menu: 11 ACALSET11

Calibration Parameters

Factors that control how the calibration works.
 Calibration averaging time sets the time used by the analyzer to average its reading. A longer time will give a better calibration.
 Calibration failure alarm will issue a **WARNING** if the analyzer has to change its 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: 12 APARLST11

Analyzer Parameter List

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

HOME **ESCAPE** **INFO**

Menu: 13 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: 14 AMMANI1

Analyzer manufacturing data
These show the analyzer's manufacturing information. Edit at your own risk.
You can set the tag as desired, up to 21 characters. This tag is used to identify the analyzer over any gateways installed.

RESET erases ALL EEPROM data!
Re initialize the system after RESET!

HOME **ESCAPE** **INFO**

Menu: 15 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**

Menu: 16 AMSVC1

Analyzer module service history
Shows the analyzer service history.
For details on service codes, see the control module's service history help.

HOME **ESCAPE** **INFO**

Model NGA2000 NDIR

Menu: 17 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: 18 AMPWR

Analyzer diagnostics	
Power supply voltages	
+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
+12V analog is:	000.0
HOME	ESCAPE INFO

Menu: 19 AM1V

Primary variable parameters	
Signal gain setting:	000.0
Oscillator tune:	000.0
Source current:	000.0
Percent modulation:	000.0
HOME	ESCAPE INFO

Menu: 20 AMTEMP

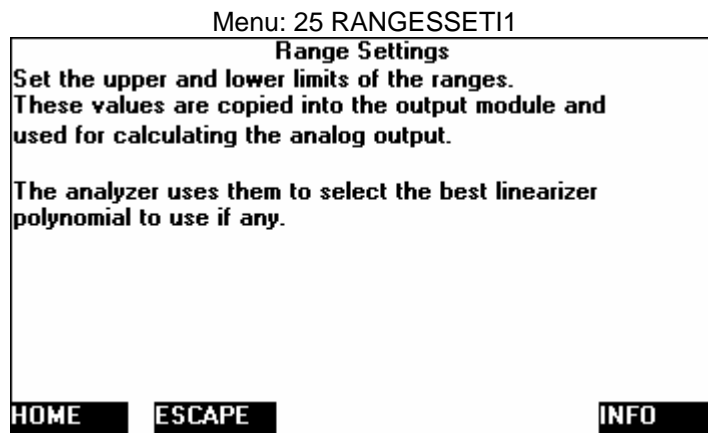
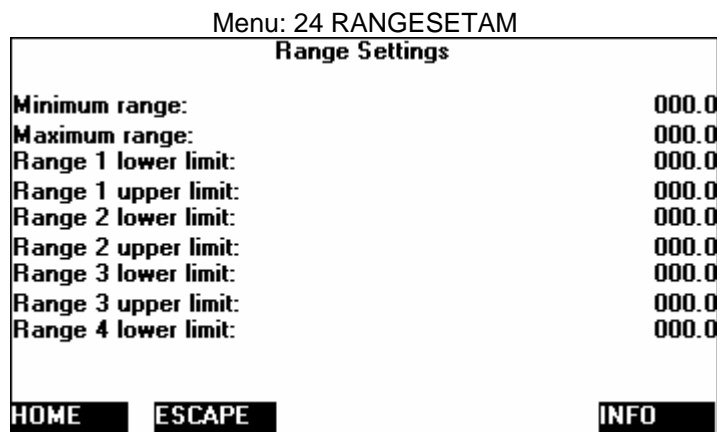
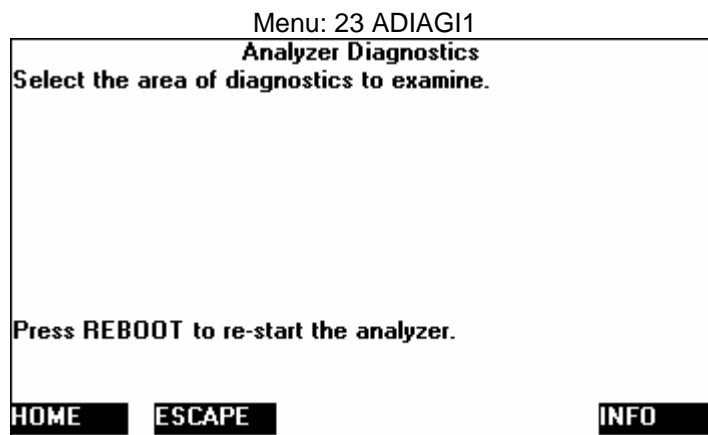
Temperature control	
Fan lower set point:	000.0
Fan upper set point:	000.0
Minimum fan duty cycle:	000.0
Case temperature:	000.0
Detector set point:	000.0
Detector P gain:	000.0
Detector I gain:	000.0
Detector bias:	000.0
HOME	ESCAPE
INFO	

Menu: 21 AMMISC

Miscellaneous control parameters	
Fan current:	000.0
Fan duty cycle:	000.0
Heater current:	000.0
Heater duty cycle:	000.0
Source current pot setting:	000.0
Actual source current:	000.0
HOME	ESCAPE
INFO	

Menu: 22 AMTREND

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



Menu: 26 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					
<table border="0"> <tr> <td>HOME</td> <td>ESCAPE</td> <td>NEXT</td> <td>LAST</td> <td>INFO</td> </tr> </table>		HOME	ESCAPE	NEXT	LAST	INFO
HOME	ESCAPE	NEXT	LAST	INFO		

Menu: 27 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					
<table border="0"> <tr> <td>HOME</td> <td>ESCAPE</td> <td>NEXT</td> <td>BACK</td> <td>INFO</td> </tr> </table>		HOME	ESCAPE	NEXT	BACK	INFO
HOME	ESCAPE	NEXT	BACK	INFO		

Menu: 28 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					
<table border="0"> <tr> <td>HOME</td> <td>ESCAPE</td> <td>NEXT</td> <td>BACK</td> <td>INFO</td> </tr> </table>		HOME	ESCAPE	NEXT	BACK	INFO
HOME	ESCAPE	NEXT	BACK	INFO		

Menu: 29 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 BACK INFO

Menu: 30 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
Case temperature for coefficients:	000.0
HOME	ESCAPE INFO

Menu: 31 AMPWRI1

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: 32 FLOCHEK111

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

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

Limits give WARNING alarms when exceeded.

HOME **ESCAPE** **INFO**

Menu: 33 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: 34 AM1VI1

Primary variable parameters
Shows the parameters used to calculate the primary reading.

HOME **ESCAPE** **INFO**

Menu: 35 AMTEMP1

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: 36 AM2VA

Physical Measurements

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

HOME **ESCAPE** **INFO**

Menu: 37 PLIMITSA

Pressure Limits

Sample pressure upper limit:	000.0
Sample pressure lower limit:	000.0

HOME **ESCAPE** **INFO**

Menu: 38 TLIMITSA

Temperature limits	
Case upper limit:	000.0
Case lower limit:	000.0
Detector upper limit:	000.0
Detector lower limit:	000.0

HOME ESCAPE INFO

Menu: 39 AMMISCI1

Miscellaneous control parameters	
These are diagnostic variables used to determine if the analyzer is operating correctly.	
The target source current is the set point for the current that flows through the two infra-red sources. The actual source current shows what is really flowing. This current may be adjusted for best sensitivity or best life (the source lasts longer if it is less hot).	

HOME ESCAPE INFO

Menu: 40 MODTEST

Modulation check	
Measurement range number:	000.0
Detector signal:	000.0
Signal gain setting - modulation check:	000.0
Status:	000.0
Instructions:	000.0
Then:	000.0
Time remaining on this step:	000.0
Percent modulation:	000.0

HOME ESCAPE START INFO

Menu: 41 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					
Ranges with valid calibration:	000.0					
Calibration status:	000.0					
If it won't calibrate...						
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">HOME</td> <td style="padding: 2px;">ESCAPE</td> <td style="padding: 2px;">ZERO</td> <td style="padding: 2px;">SPAN</td> <td style="padding: 2px;">INFO</td> </tr> </table>		HOME	ESCAPE	ZERO	SPAN	INFO
HOME	ESCAPE	ZERO	SPAN	INFO		

Menu: 42 FILTER1

Filter and Delay Parameters			
<p>This screen sets the final filtering for the analyzer primary variable output. This is in addition to the inherent filtering in the analyzer.</p> <p>The time delay simply delays the output by that time, allowing the fastest responding analyzer systems to be synchronized with the slowest.</p>			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">HOME</td> <td style="padding: 2px;">ESCAPE</td> <td style="padding: 2px;">INFO</td> </tr> </table>	HOME	ESCAPE	INFO
HOME	ESCAPE	INFO	

Menu: 43 LINRANGE01

Linearization parameters			
<p>The linearizer acts 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 range. However you may specify that the analyzer uses a wider range polynomial than that.</p> <p>Note that use of different polynomials on different ranges will give different readings on a range change. Coefficients may be edited for custom curves.</p>			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">HOME</td> <td style="padding: 2px;">ESCAPE</td> <td style="padding: 2px;">INFO</td> </tr> </table>	HOME	ESCAPE	INFO
HOME	ESCAPE	INFO	

Menu: 44 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: 45 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

HOME STORE NEXT HISTORY INFO

Menu: 46 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

HOME STORE NEXT HISTORY INFO

Model NGA2000 NDIR

Menu: 47 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
HOME	STORE
NEXT	HISTORY
INFO	

Menu: 48 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
HOME	STORE
FIRST	HISTORY
INFO	

Menu: 49 AMHELPINDEX

Analyzer Module Help	
<p>The NGA2000 NDIR analyzer may be set up to measure a one of several different gases. The particular gas and the range of concentrations available are viewable in the manufacturing data screens in the technical set up menus.</p> <p>This analyzer works by passing infra-red energy through a measurement and a reference gas cell, and measuring the difference. This is proportional to the amount of measured gas present. The sensor used is specific to the gas measured.</p>	
HOME	ESCAPE
INFO	

Menu: 50 LINRANGE11

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 support.

The last line selects whether the curve is in use.

HOME **ESCAPE** **INFO**

Menu: 51 AMTRENDI1

Trend display control
Select the two variables to be displayed
Select the timebase.
The analyzer will now start recording these variables at a rate of 240 points over that time base, averaging them.
To display the chart, select display

HOME **ESCAPE** **INFO**

Menu: 52 CALFACTORSI1

Calibration Factors
The analyzer uses individual calibration factors for each range, if so desired.
Select which range to examine.

HOME **ESCAPE** **INFO**

Model NGA2000 NDIR

Menu: 53 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

Menu: 54 APARLST4

Analyzer Parameter List	
Primary Variable 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
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: 55 APARLST5

Analyzer Parameter List	
Calibration Parameters	
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
Calibration adjustment limits:	000.0
HOME	ESCAPE NEXT BACK INFO

Menu: 56 APARLST6

Analyzer Parameter List	
Calibration Gases	
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: 57 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

HOME ESCAPE INFO

Menu: 58 MPARMS2

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

HOME ESCAPE INFO

Menu: 59 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

May be displayed on the appropriate line of the single analyzer display screen.

HOME **ESCAPE** **INFO**

Menu: 60 ANALSET2

Measurement Parameters

Linearization parameters...

Response time/delay parameters...

Range settings...

Units...

Linearization functions...

HOME **ESCAPE** **INFO**

Menu: 61 ESCAPE_HELP

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

Menu: 62 MPARMS11

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

HOME **ESCAPE** **INFO**

Menu: 63 TLIMITSIA1

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

HOME **ESCAPE** **INFO**

Menu: 64 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**

Model NGA2000 NDIR

Menu: 65 ANALSETI2

Gas Measurement Parameters

Linearization parameters lets you set up the linearizer coefficients, and which set of coefficients is used for which range.

Response time/delay parameters lets you adjust the filtering and output delay times, so as to align outputs in time.
Set the upper and lower range limits in Range settings.

HOME **ESCAPE** **INFO**

Menu: 66 AMHELPINDEX2

Analyzer Module Help

Select the function you want in the line below, and note the path shown.

Function:	000.0
Select:	000.0
Then:	000.0
Then:	000.0
Then:	000.0

HOME **ESCAPE** **INFO**

Menu: 67 MODTESTI1

Modulation check

Flow zero gas through the analyzer and allow it to stabilize. Then press the START softkey, and wait while the analyzer goes through its test sequence. You can see the variable on the line titled Status change as it does so. The analyzer will require you to flow span gas at one point. When it is done, it will calculate the percent modulation for you.

Percent modulation means the amount of absorption of light by the span gas compared with the complete lack of light from the measurement cell's source (when

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.

Make sure that only one analyzer in a system is set to transmit its barometric pressure information.

HOME **ESCAPE** **INFO**

Menu: 69 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: 70 CALI1

Calibration info
Use the calibration parameter menu to select whether to calibrate ranges together or not. If together, zeroing or spanning will go through each range one by one. If the change required 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

HOME **ESCAPE** **INFO**

Menu: 71 AM1VHIST

Primary variable parameters	
Raw measurement signal:	000.0
Signal gain setting:	000.0
Oscillator tune:	000.0
Chopper speed:	000.0
Source current:	000.0
Modulation check...	
Percent modulation:	000.0
Detector signal:	000.0
Pk-pk noise:	000.0
HOME	ESCAPE
HISTORY	INFO

Menu: 72 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: 73 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: 74 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	RANGE 2
INFO	

Menu: 75 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:	000.0
Span gas value:	000.0
HOME	ESCAPE
SET	RANGE 3
INFO	

Menu: 76 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	RANGE 4
INFO	

Menu: 77 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					
<table border="1"> <tr> <td>HOME</td> <td>ESCAPE</td> <td>SET</td> <td>BACK</td> <td>INFO</td> </tr> </table>		HOME	ESCAPE	SET	BACK	INFO
HOME	ESCAPE	SET	BACK	INFO		

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					
<table border="1"> <tr> <td>HOME</td> <td>ESCAPE</td> <td>DATA</td> <td>NEXT</td> <td>INFO</td> </tr> </table>		HOME	ESCAPE	DATA	NEXT	INFO
HOME	ESCAPE	DATA	NEXT	INFO		

Menu: 79 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					
<table border="1"> <tr> <td>HOME</td> <td>ESCAPE</td> <td>DATA</td> <td>NEXT</td> <td>INFO</td> </tr> </table>		HOME	ESCAPE	DATA	NEXT	INFO
HOME	ESCAPE	DATA	NEXT	INFO		

Menu: 80 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
HOME	ESCAPE
DATA	NEXT
INFO	

Menu: 81 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
HOME	ESCAPE
DATA	NEXT
INFO	

Menu: 82 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
HOME	ESCAPE
DATA	NEXT
INFO	

Menu: 83 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
HOME	ESCAPE
DATA	NEXT
INFO	

Menu: 84 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
HOME	ESCAPE
DATA	NEXT
INFO	

Menu: 85 POLYGAS8

Gas concentrations	
Point 15	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point16	
Gas value:	000.0
Raw reading:	000.0
Linearized value:	000.0
Point to be measured:	000.0
HOME	ESCAPE
DATA	NEXT
INFO	

Menu: 86 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
HOME	ESCAPE
DATA	NEXT
INFO	

Menu: 87 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
HOME	ESCAPE
DATA	BACK
INFO	

Menu: 88 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: 89 ZEROI2

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 changed the range full scale value, or any linearizer coefficients, or enabled or disabled it, or done anything else that would affect how it measures the gas, you may have made it hard for the algorithm to get to a calibration. In this case, manually adjust the coefficients until the readings are close to correct, and try again.

HOME

ESCAPE

INFO

Menu: 90 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

ESCAPE

FACTORS

INFO

Menu: 91 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: 92 UNITS

Units	
Gas measurement units:	000.0
Pressure measurement units:	000.0
Temperature measurement units:	000.0
ppm to mg/Nm ³ conversion factor:	000.0
Lower explosion limit (LEL):	000.0
Upper explosion limit (UEL):	000.0

HOME ESCAPE INFO

Menu: 93 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 displays 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: 94 RESET

Reset
Are you sure?
RESET will erase ALL the configuration and manufacturing data, including serial numbers and everything else.
If you are sure, press RESET again.

HOME ESCAPE RESET INFO

Menu: 95 STORE
Store historical data

Are you sure?

STORE will copy current diagnostic data into the historical (currently there.

If you are sure, press STORE again.

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

Menu: 96 RFHIST1A
Range 1 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: 97 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. They 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 restores the

HOME **ESCAPE** **INFO**

Menu: 98 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: 99 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: 100 RFHIST4A

Range 4 Factors	
Manufacturer's settings.	
Zero offset:	000.0
Span factor:	000.0
Stored settings	
Zero offset:	000.0
Span factor:	000.0
HOME	FIRST
RSTR MN	RSTR ST
INFO	

Model NGA2000 NDIR

Menu: 101 TWEAK11

Midpoint correction set up

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

HOME ESCAPE MORE INFO

Menu: 102 INIT

Re-initialize the analyzer

Are you sure?

INIT will erase ALL the configuration data, but not manufacturing data, including serial numbers etc.

If you are sure, press INIT again.

HOME ESCAPE INIT INFO

Menu: 103 SW_DIAG11

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: 104 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: 105 ZERO_NOW2

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: 106 SPAN_NOW2

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**

Menu: 107 POLYSETI1

Polynomial set up

Select the range to linearize.
 Make sure that the span gas value is correct.
 Choose whether to define the gas concentrations as absolute values or as a percent of the span gas.
 Use percent if you are diluting the span gas for this.
 Get into the gas concentration 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

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

Menu: 108 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 linearizer 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: 109 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: 110 ANALSETI3

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**

Menu: 111 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 state:	000.0
Analyzer alarm state:	000.0
Alarm reporting level:	000.0

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

Menu: 112 FLOWLIMITS

Flow limits

Flow lower limit:	000.0
Flow upper limit:	000.0

HOME **ESCAPE** **INFO**

Menu: 113 PLIMITSAI1

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

HOME **ESCAPE** **INFO**

Menu: 114 ABOUT

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Measure **Back...** **More...**

Menu: 115 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: 116 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
HOME	ESCAPE ACKN

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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.

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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.

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Instruction Manual

748417-C

April 2003

Model NGA2000 NDIR

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