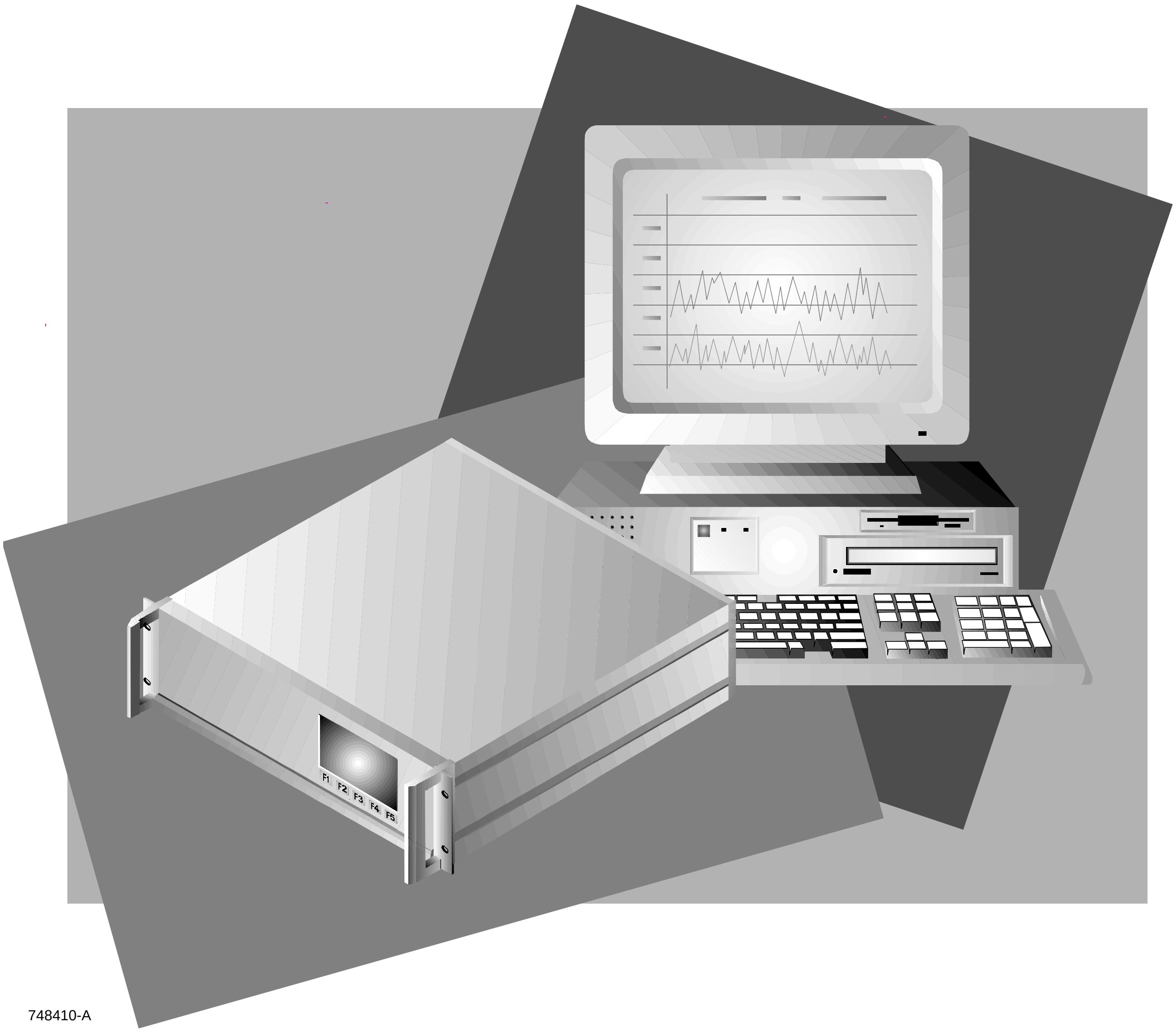
CHEMILUMINESCENSE DETECTOR ANALYZER MODULE



748410-A

NOTICE

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

Rosemount Analytical's system of NGA 2000 Modular Gas Analyzers and Controllers are patented, under U.S. Patent 5.787.015.

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PURPOSE/SAFETY SUMMARY

The purpose of this manual is to provide the procedures for the installation, operation and maintenance of the Platform and the System Accessories of the NGA 2000 System.

Read this instruction manual completely before attempting to install any components into the NGA 200 System.

WARNING: 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.

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

DANGER is used to indicate the presence of a hazard which **will** cause **severe** personal injury, death, or substantial property damage if the warning is ignored

WARNING is used to indicate the presence of a hazard which **can** cause **severe** personal injury, death, or substantial property damage if the warning is ignored.

CAUTION is used to indicate the presence of a hazard which **will** or **can** cause **minor** personal injury or property damage if the warning is ignored.

NOTE is used to indicate installation, operation, or maintenance information which is important but not hazard-related.

WARNING: 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: TOXIC AND OXIDIZING GAS

This module generates ozone which is toxic by inhalation and is a strong irritant to throat and lungs. Ozone is also a strong oxidizing agent. Its presence is detected by a characteristic pungent odor.

The module's exhaust contains both ozone and nitrogen dioxide, both toxic by inhalation, and may contain other constituents of the sample gas which may be toxic. Such gases include various oxides of nitrogen, unburned hydrocarbons, carbon monoxide and other products of combustion reactions. Carbon monoxide is highly toxic and can cause headache, nausea, loss of consciousness, and death.

Avoid inhalation of the ozone produced within the module, and avoid inhalation of the sample and exhaust products transported within the module. Avoid inhalation of the combined exhaust products at the exhaust fitting.

Keep all tube fittings tight to avoid leaks. See section 2.4.3, page 9, for leak test information.

Connect rear exhaust outlet to outside vent with stainless steel or Teflon line. Check vent line and connections for leakage.

WARNING: PARTS INTEGRITY

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

CAUTION: PRESSURIZED GAS

This module requires periodic use of pressurized gas. See General Precautions for Handling and Storing High Pressure Gas Cylinders at the rear of this manual

WARNING: OVERBALANCE HAZARD

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

WARNING: INTERNAL ULTRAVIOLET LIGHT

Ultraviolet light from the ozone generator can cause permanent eye damage. Do not look directly at the ultraviolet source. Use of ultraviolet filtering glasses is recommended.

WARNING: TOXIC CHEMICAL HAZARD

The ozone generator lamp contains mercury. Lamp breakage could result in mercury exposure. Mercury is highly toxic if absorbed through the skin or ingested, or if vapors are inhaled.

Handle lamp assembly with extreme care. If the lamp is broken, avoid skin contact and inhalation in the area of the lamp or the mercury spill.

Immediately clean up and dispose of the mercury spill and lamp residue as follows:

- ***Wearing rubber gloves and goggles, collect all droplets of mercury by means of a suction pump and aspirator bottle with a long capillary tube. (Alternately, a commercially available mercury spill clean-up kit, such as J.T. Baker product No. 4439-01, is recommended.)***
- ***Carefully sweep any remaining mercury and lamp debris into a dust pan. Carefully transfer all mercury, lamp residue and debris into a plastic bottle which cab be tightly capped.***
- ***Label and return to hazardous material reclamation center. Do not place in the trash, incinerate or flush down the sewer.***
- ***Cover any fine droplets of mercury in non-accessible crevices with calcium polysulfide and sulfur dust***

WARNING: HAND INJURY HAZARD

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

WARNING: POSSIBLE EXPLOSION HAZARD

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

CAUTION: 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.

WARNING: POSSIBLE EXPLOSION HAZARD

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

CAUTION: EXTERNALLY RESTRICT SAMPLE FLOW TO LESS THAN 2200 CC/MIN.

No restrictor is provided in the sample inlet of this module. For those users who cannot externally limit sample flow, accessory restrictor PN 657300 is available from Rosemount Analytical.

To obtain this accessory, call 800-441-7245.

GLOSSARY

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 NGA 2000 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.

Softkeys

The five function keys 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).

SPECIFICATIONS - GENERAL

MEASUREMENT SPECIES:	NO, NOx
RANGES:	0 to 10 ppm through 0 to 10,000 ppm NO, NOx
REPEATABILITY:	±0.5% of fullscale (at constant temperature)
MIN. DETECTABLE LEVEL:	0.1 ppm
NOISE:	<1% of fullscale, peak to peak
LINEARITY:	±1% of fullscale
RESPONSE TIME:	<1 sec. for 90% of fullscale for ranges of 25 ppm or greater <3 sec. for 90% of fullscale for ranges of less than 25 ppm
ZERO DRIFT: (AT CONSTANT TEMPERATURE)	<±1% of fullscale/24 hours, <±2% of fullscale/week
SPAN DRIFT: (AT CONSTANT TEMPERATURE)	<±1% of fullscale/24 hours, <±3% of fullscale/week
EFFECT OF TEMPERATURE:	<2% of fullscale (over any 10°C ambient temperature variation interval for a rate of change no greater than 10°C/hour)
AMBIENT TEMPERATURE:	0°C to 45°C (32°F to 113°F)
POWER REQUIREMENTS:	24V DC 120W

SPECIFICATIONS - PHYSICAL

CASE CLASSIFICATION:	General purpose for installation in weather-protected area
DIMENSIONS:	See Outline and Mounting Dimensions, Figure 2-4
WEIGHT:	8.1 kg (18 lbs.)
MOUNTING:	Inside a Platform or custom-installed in a panel
MAX. LENGTH OF LON CABLE:	1600m (1 mile) between Analyzer Module and Platform

SPECIFICATIONS - SAMPLE

TEMPERATURE:	0°C to 55°C (32°F to 131°F)
TOTAL FLOW RATE:	(Externally measured) 900 to 2200 cc/min. with backpressure regulator pressure adjusted to 344 hPa (5 psig)
PARTICLES:	Filtered to <2 microns
DEWPOINT:	5.5°C below ambient temperature, no entrained liquid
MATERIALS IN CONTACT WITH SAMPLE:	Stainless steel, Teflon, glass, brass and neoprene Optional: Stainless steel, Teflon, glass and Kynar
OZONATOR GAS:	Clean, dry air or oxygen; flow rate: 1 L/min. maximum; pressure: 689 hPa to 1034 hPa-gauge (10 to 15 psig); maintain a constant pressure ±34 hPa (±0.5 psig)

SPECIFICATIONS - GAS CONNECTIONS

OZONE AIR:	1/4" O.D. tube fitting, brass
EXHAUST:	1/4" O.D. tube fitting, stainless steel
SAMPLE IN:	1/4" O.D. tube fitting, stainless steel

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

CUSTOMER SERVICE, TECHNICAL ASSISTANCE AND FIELD 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

RETURNING PARTS TO THE FACTORY

Before returning parts, contact the Customer Service Center and request a Returned Materials Authorization (RMA) number. Please have the following information when you call: *Model Number, Serial Number, and Purchase Order Number or Sales Order Number.*

Prior authorization by the factory must be obtained before returned materials will be accepted. Unauthorized returns will be returned to the sender, freight collect.

When returning any product or component that has been exposed to a toxic, corrosive or other hazardous material or used in such a hazardous environment, the user must attach an appropriate Material Safety Data Sheet (M.S.D.S.) or a written certification that the material has been decontaminated, disinfected and/or detoxified.

Return to:

Rosemount Analytical Inc.
4125 East La Palma Avenue
Anaheim, California 92807-1802

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.
Phone: 1-714-986-7600
FAX: 1-714-577-8006

DOCUMENTATION

The following Chemiluminescense Detector Analyzer Module instruction materials are available. Contact Customer Service or the local representative to order.

748410 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.

FM APPROVED   NRTL /C   97-C219

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.

N96

1.1 OVERVIEW

This manual describes the Chemiluminescence (CLD) Analyzer Module of Rosemount Analytical's NGA 2000 Series of gas analysis components (See Figures 1-1 and 1-2).

The CLD Analyzer Module is designed to continuously determine the concentration of nitric oxide and oxides of nitrogen (NO plus nitrogen dioxide [NO2]) in a flowing gaseous mixture. The concentration is expressed in parts-per-million.

The CLD 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 CLD Analyzer Module has specific applications in the following areas:

- Oxides of nitrogen emissions from the combustion of fossil fuels in:
    - Vehicle engine exhaust
    - Incinerators
    - Boilers
    - Gas appliances
    - Turbine exhaust

Nitric acid plant emissions

De-NOx control system

Nitric oxide emissions from decaying organic material (e.g., landfills).

1.3 THEORY OF TECHNOLOGY

The CLD Analyzer Module uses the chemiluminescence method of detection. This technology is based on NO's reaction with ozone (O_3) to produce NO_2 and oxygen (O_2). Some of the NO_2 molecules thus produced are in an electronically excited state ((NO_2* - the "*" refers to the excitation)). These revert immediately to the ground state, with emission of photons (essentially, red light). The reactions involved are:

$NO + O_3 \rightarrow NO2^* + O_2$

$NO_2^* \rightarrow NO_2$ + red light

As NO and O3 mix in the reaction chamber, the intensity of the emitted red light is measured by a photodiode and is proportional to the concentration of NO in the original gas sample.

To measure NOx (NO + NO_2), any NO_2 in the sample is reduced to NO (at <95% efficiency) by being continuously passed through a heated bed of vitreous carbon (this occurs before the sample gas is presented to the ozone). Any NO initially present in the sample passes through this converter stage unchanged before being routed to the reaction chamber.

The photodiode generates a DC current, which is then amplified, conditioned and expressed on the network as the Primary Variable.

1.4 FEATURES

Among the features included in the CLD Analyzer Module are: 1) ozonator air loss shutoff and 2) NO/NOx mode capability.

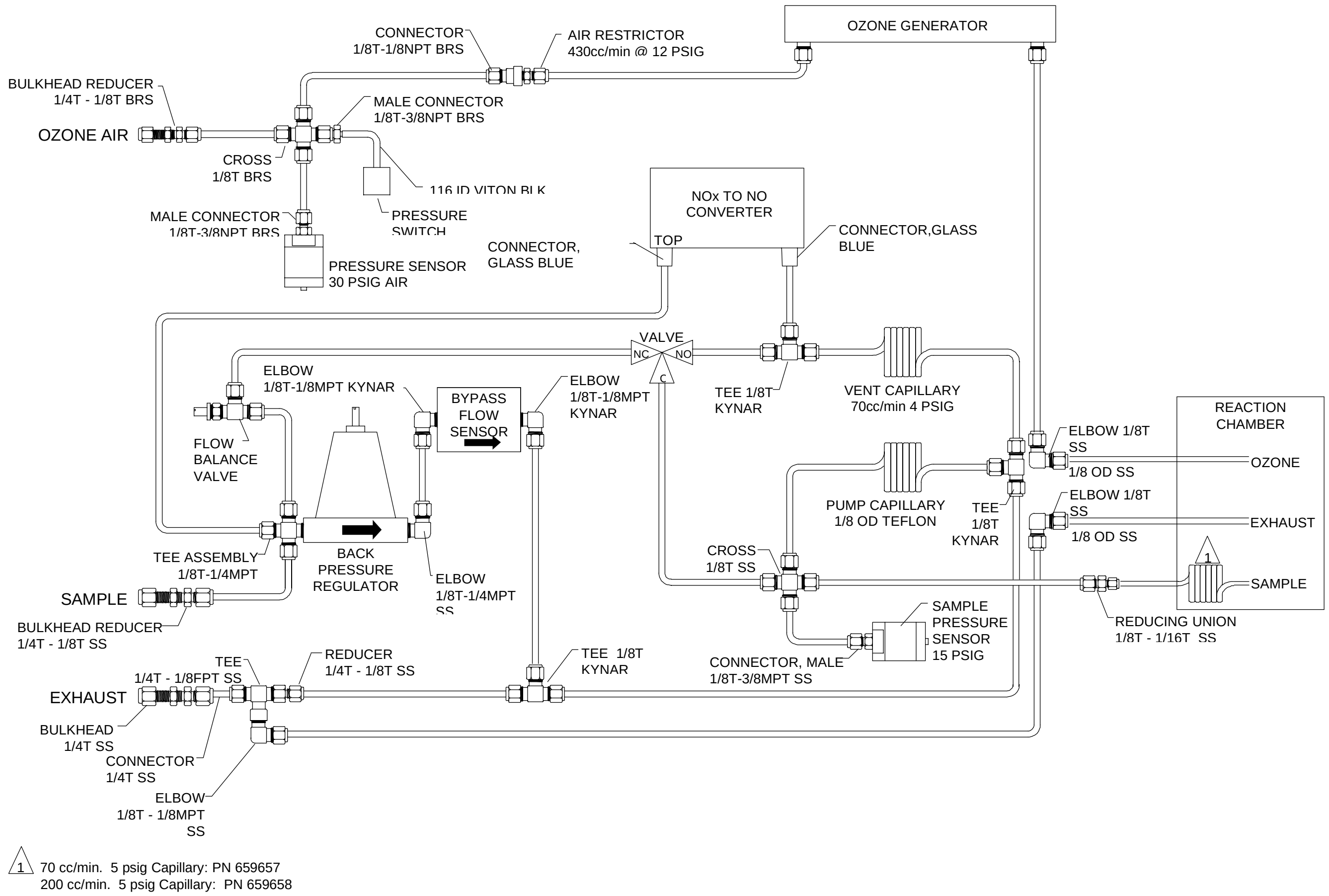


FIGURE 1-1. CLD ANALYZER MODULE FLOW DIAGRAM

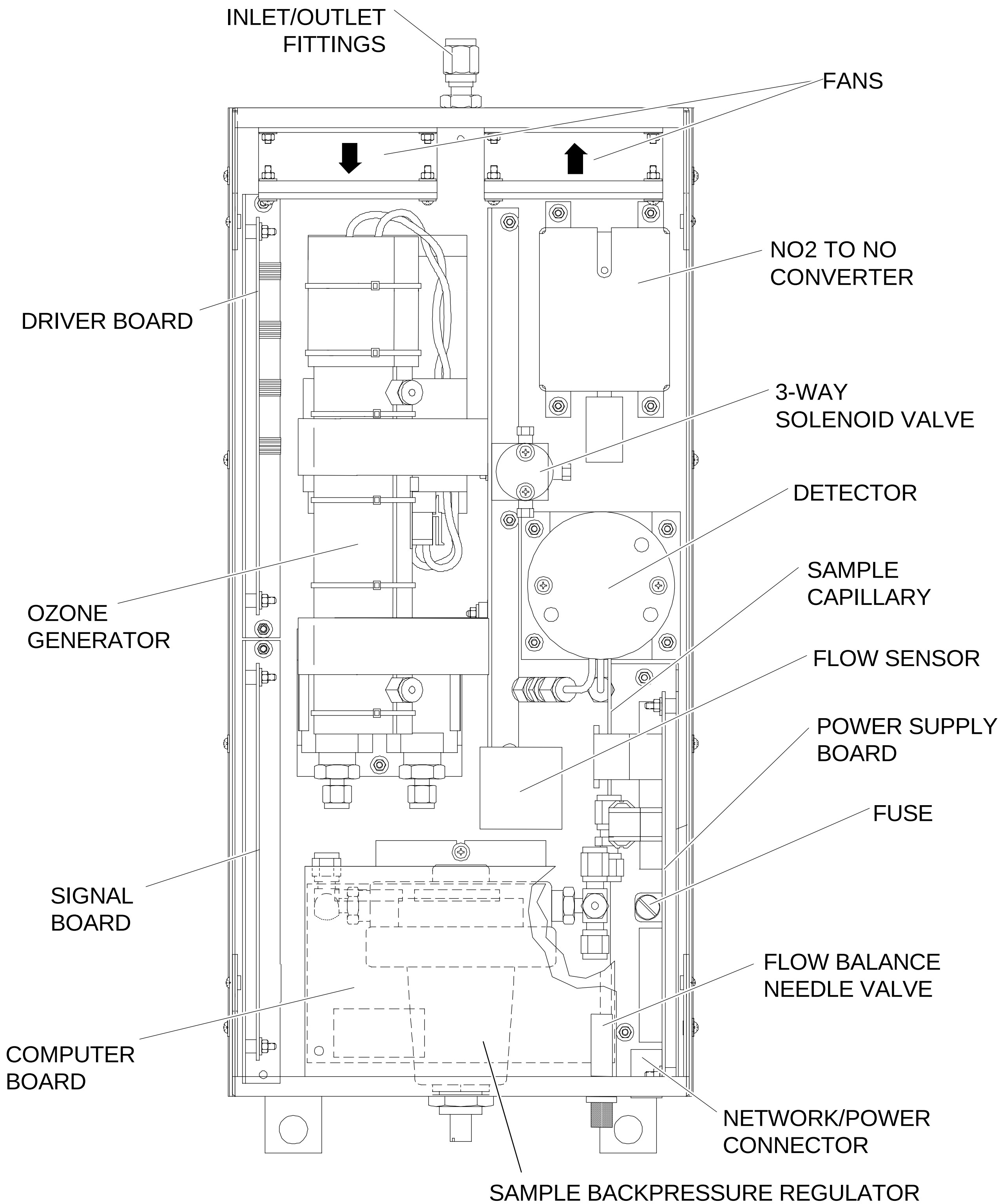


FIGURE 1-2. CLD ANALYZER MODULE - TOP VIEW

2.1 UNPACKING

If the Chemiluminescence (CLD) 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 CLD Analyzer Module are operational.

2.2 ASSEMBLY

If the CLD 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.

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

Lift the spring-loaded pins on the front of the Analyzer Module, and carefully slide it the rest of the distance. Secure the module in position by releasing the pins, which seat in the available holes in the bottom of the case (see Figure 2-1). 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.

Refer to Section 2-4 for electrical connections.

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.

2.3 LOCATION

Install the CLD Analyzer Module in a clean, weather-protected, vibration-free location free from extreme temperature variations and moisture. For best results, install the instrument near the sample stream to minimize sample transport time.

The analyzer should be installed within ±15° of horizontal.

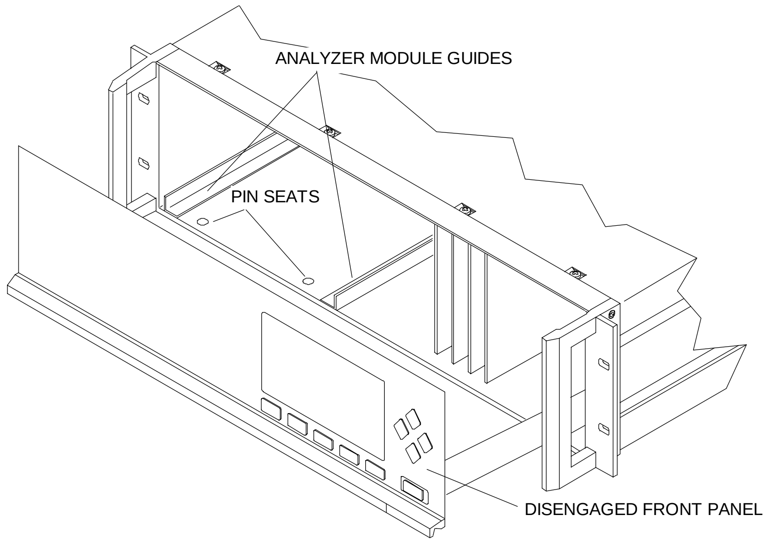


FIGURE 2-1. ANALYZER MODULE INSTALLATION INTO INSTRUMENT PLATFORM

NOTE

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

Operating ambient temperature is 0°C to 45°C (32°F to 113°F). Temperature change should not exceed 10°C (18°F) per hour. The same temperature range restrictions apply to the location of the air and span gas cylinders.

2.4 GASES

2.4.1 OVERVIEW

See Table 2-1. The CLD Analyzer Module requires two cylinder gases: 1) breathing grade air or oxygen and 2) a standard of accurately known composition for use as a span gas.

Each gas should be supplied from a cylinder equipped with a clean, non-corrosive, two-stage regulator. A shutoff valve is recommended.

2.4.2 CONNECTIONS

(See Figure 2-2.) Connect inlet and outlet lines for sample, air, and exhaust to appropriately labeled fittings on the rear panel, each of which is a 1/4-inch ferrule-type compression fitting.

Stainless steel or Teflon tubing is recommended for the sample line. Exhaust tubing should be 1/4 inch (6.3 mm) or larger, and made of stainless steel or Teflon.

MAXIMUM NOX LEVEL IN PARTS PER MILLION	GAS SUPPLIED TO REAR PANEL AIR INLET	SETTING ON OZONE PRESSURE GAUGE (PRESSURE VALUES: GAUGE)	SETTING ON SAMPLE PRESSURE GAUGE (PRESSURE VALUES: GAUGE)
800	Air	690 hPa (10 psig); provides flow of approximately 500 cc/min. to ozone generator	344 hPa (5 psig); provides flow of approximately 200 cc/min. to reaction chamber
2,500	Air	690 hPa (10 psig); provides flow of approximately 1000 cc/min. to ozone generator.	344 hPa (5 psig); provides flow of approximately 70 cc/min to reaction chamber.
10,000	Oxygen	1035 hPa (15 psig); provides flow of approximately 1000 cc/min to ozone generator.	103 hPa (1.5 psig); provides flow of approximately 20 cc/min. to reaction chamber.

CAUTION: EXTERNALLY LIMIT SAMPLE FLOW RATE TO LESS THAN 2200 CC/MIN.

TABLE 2-1. GAS SPECIFICATIONS

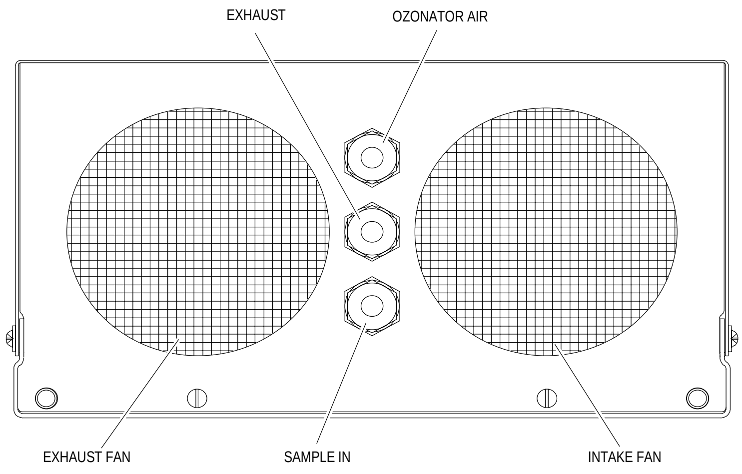


FIGURE 2-2. CLD REAR PANEL CONNECTIONS

2.4.3 SPECIFICATIONS

Calibration Gases

Either U.S.P. breathing grade air or nitrogen is recommended for use as zero gas. A mixture of NO or NO_2 in a background of nitrogen is recommended as span gas. For maximum accuracy, the concentration of NO in the span gas should be about the same as that in the expected sample stream.

Ozonator Source Gas

For analyzers with ranges less than 0 to 2,500 ppm, U.S.P. breathing grade air should be used for generation of the ozone required for the chemiluminescence reaction. For ranges greater than 0 to 2,500 ppm, breathing grade oxygen is required.

Sample

The sample must be clean and dry before entering the Analyzer Module. Sample should be filtered for particulates down to two microns, and should have a dew point 5^oC (13^oF) below coldest ambient temperature.

NOTE

At no time should sample flow exceed 2200 cc/min. Damage to internal components may occur if this flow level is exceeded.

CAUTION: EXTERNALLY RESTRICT SAMPLE FLOW TO LESS THAN 2200 CC/MIN.

No restrictor is provided in the sample inlet of this module. For those users who cannot externally limit sample flow, accessory restrictor PN 657300 is available from Rosemount Analytical.

To obtain this accessory, call 800-441-7245.

Pressure

Between 690 and 1035 hPa-gauge (10 and 15 psig) of ozonator air (or oxygen, if appropriate) should be present at the rear panel of the module. Bypass sample gas flow rate should be between 700 and 2000 cc/min. with backpressure regulator pressure (see Capillary Pressure in Current Measurement Parameters menu, which can be viewed by selecting the PARMS softkey in Main Menu) adjusted to 344 hPa (5 psig).

Zero/span gases should be introduced at the SAMPLE IN fitting at normal sample inlet flow rate.

NOTE

At no time should ozonator gas pressure exceed 2070 hPa-gauge (30 psig). Damage to internal components may occur if this pressure level is exceeded.

Leak Test

The CLD 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. Periodically, the user should do an internal leak test (with a test procedure chosen by the user).

Contaminants

White crystal deposits on the windows of the reaction chamber, and the clogging of capillaries and vent are usually due to sample contaminates such as ammonia reacting with the high ozone levels and NO components.

To eliminate the contaminates, the sampling system should be reworked or a preventive maintenance program developed (if dropout is not excessive). Another source of crystalline formation is contaminated air.

2.5 ELECTRICAL CONNECTIONS

NOTE

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

Refer to Figure 2-3. Two electrical connections are required on the Analyzer Module: POWER and NETWORK. On the Analyzer Module, two NETWORK connectors are available, either of which is appropriate for:

1. Interconnection with the Backplane of the Platform. (See instruction manual for the NGA 2000 Platform).
2. "Daisy-chaining" with other NGA 2000 components.

Connect Analyzer Module POWER to 24 VDC, 120 Watt power source, either the Platform or external power source.

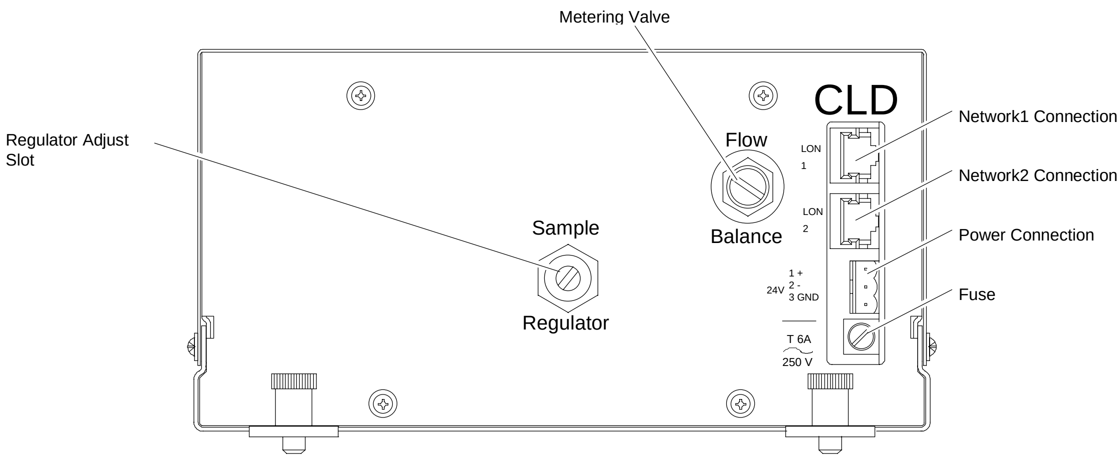


FIGURE 2-3. FRONT PANEL CONTROLS AND ELECTRICAL CONNECTIONS

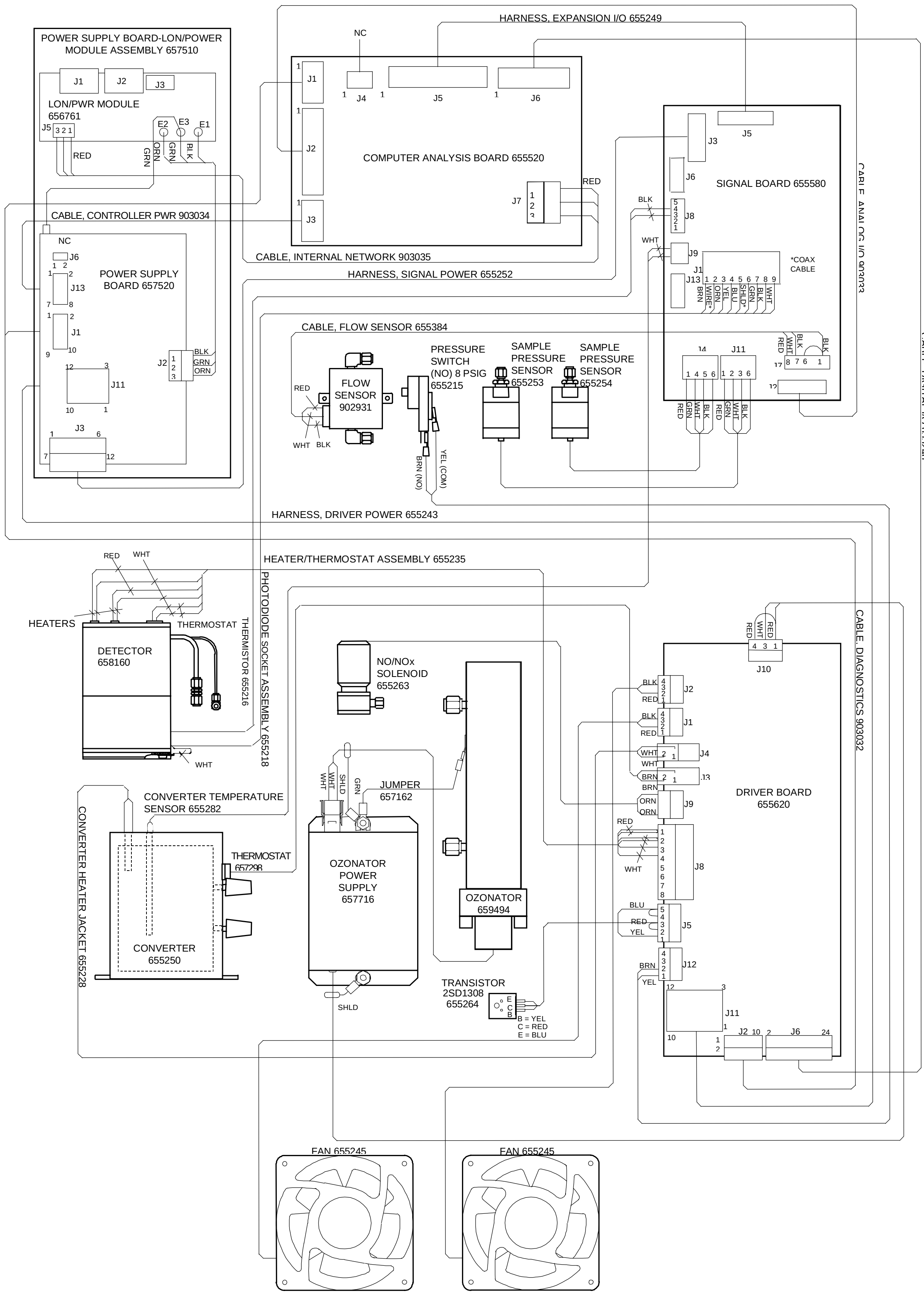
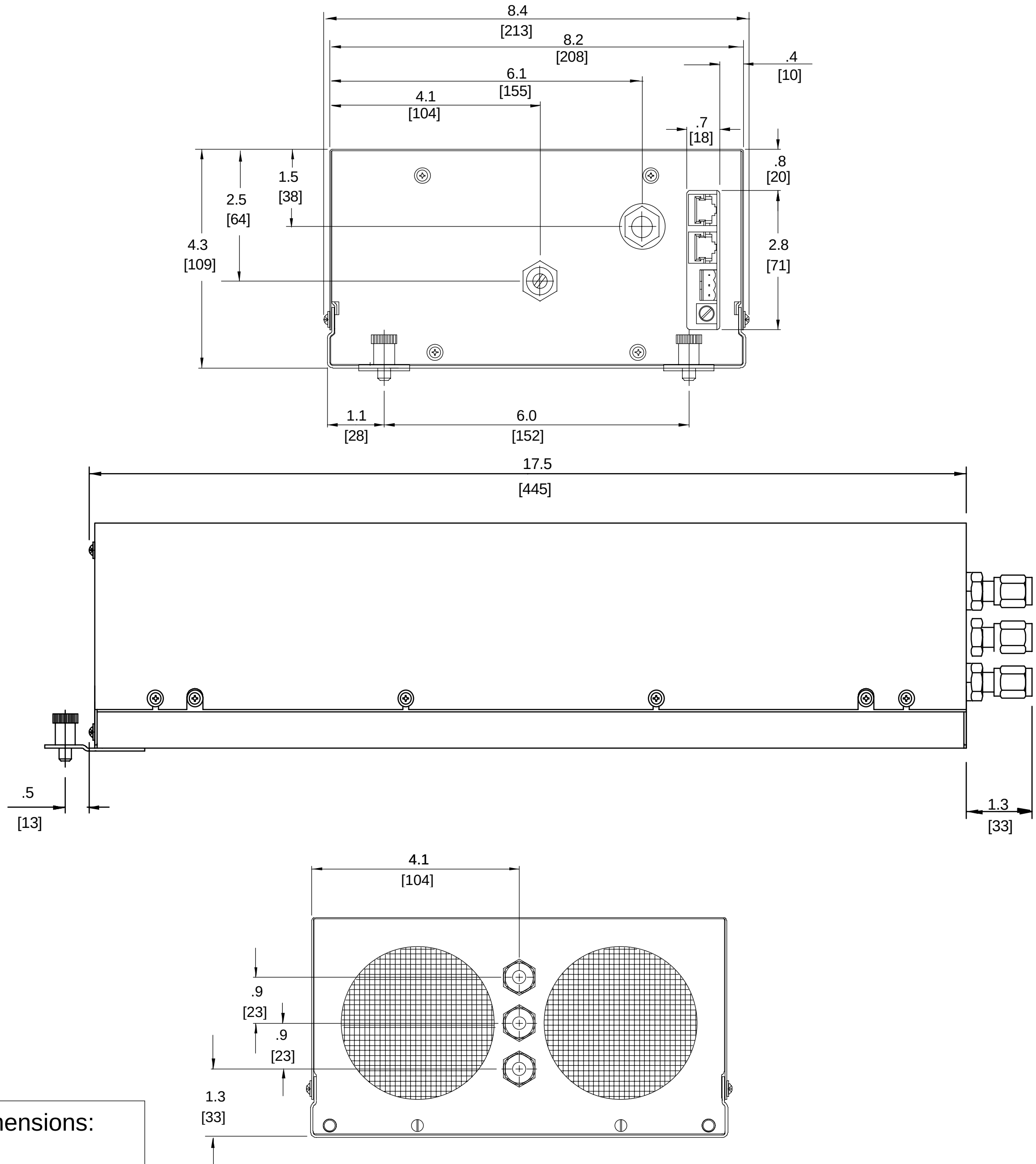


FIGURE 2-4. CLD WIRING DIAGRAM



Dimensions:

INCHES
[MM]

FIGURE 2-5. OUTLINE AND MOUNTING DIMENSIONS

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 DISPLAYS

Three kinds of Display screens are available to the user (see Figures 3-1 through 3-6.):

- Run Mode
- Menu
- Help

3.2.1 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, and a graphic bar representing the displayed concentration as a percent of fullscale.

3.2.2 MENU DISPLAYS

The Menu structure enables the user to access data and functions, and put information onto the network. From the Run Mode display, press the MENUS softkey to gain access to the Main Menu.

The Main Menu (see Figure 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 Figures 3-3 through 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.)

DISPLAY MESSAGE	DESCRIPTION	TYPE
BAROMETER	System Barometer	WARNING
BLOCK FET	Heater Current	WARNING
BLOCK THRESH	CLD Threshold Temperature	WARNING
BLOK TEMP	Block Temperature	WARNING
CONV FET	Converter Heater Temperature	WARNING
CONV TEMP	Converter Temperature	WARNING
CRUDE NOISE	Calculated Noise	WARNING
LIN ERROR	Linearizer Error	WARNING
N15 VOLTS	Power Supply, -15V	WARNING
OZON PRES	CLD Ozone Supply Pressure	WARNING
P10 VOLTS	Power Supply, +10V Ref	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
RAW SIGNAL	Raw Signal	WARNING
SAMP PRES	Sample Pressure	WARNING
SVFLOW	Sample Bypass Flow	WARNING
PELT TEMP	CLD Peltier Cooler Temperature	FAILURE
SW ERROR	Software Error	FAILURE

TABLE 3-1. CLD ANALYZER MODULE ALARMS

3.2.3 HELP DISPLAYS

The Help structure is on-line "tutorial," context-sensitive and topic-interconnected, so that the user can practically operate NGA 2000 without need of an instruction manual. Press the INFO softkey for help. (See Figure 3-6.)

3.3 STARTUP PROCEDURE

Apply power to the CLD 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 button. Once power has been supplied to the Platform, the CLD Analyzer Module will be energized.

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

After the warm-up period (about one hour for the CLD Analyzer Module), all modules are completely functional. Establish that correct ozonator air pressure and sample flow rate are within specifications (see the Specifications page in the Preface section of this manual). Calibrate and adjust converter efficiency, and begin routine operation as the following sections indicate.

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.

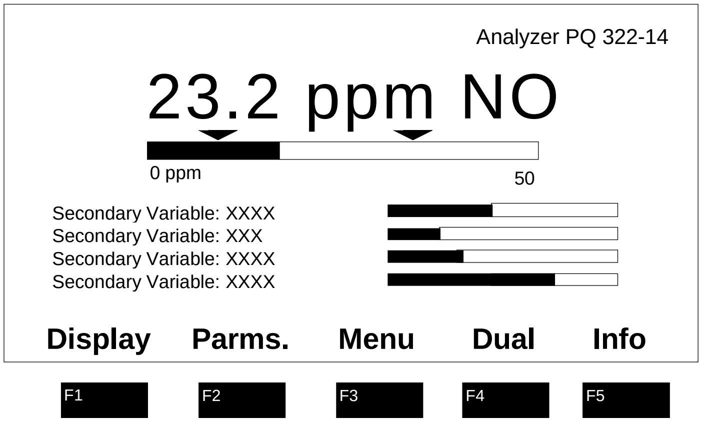


FIGURE 3-1. RUN MODE DISPLAY

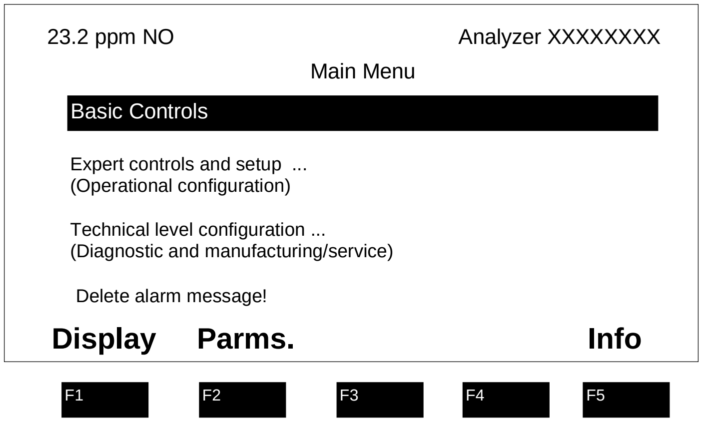


FIGURE 3-2. MAIN MENU DISPLAY

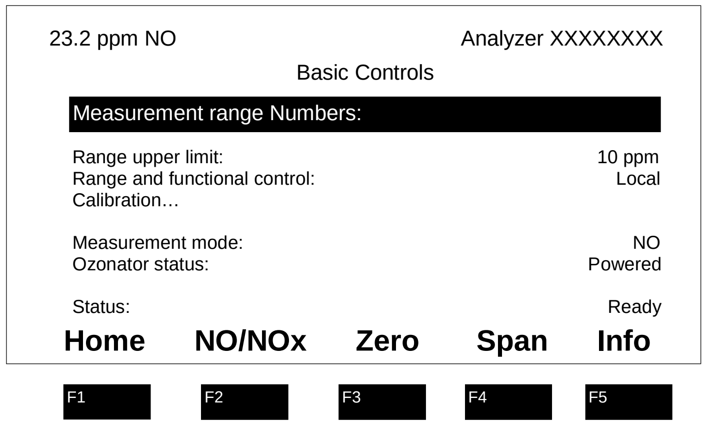


FIGURE 3-3. BASIC CONTROLS MENU

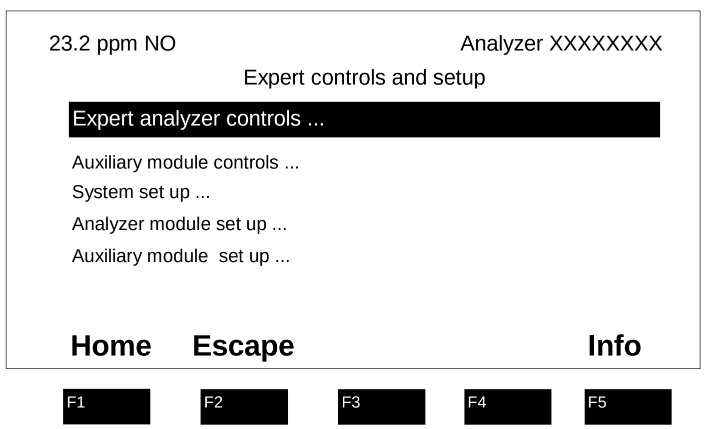


FIGURE 3-4. EXPERT CONTROLS AND SETUP MENU

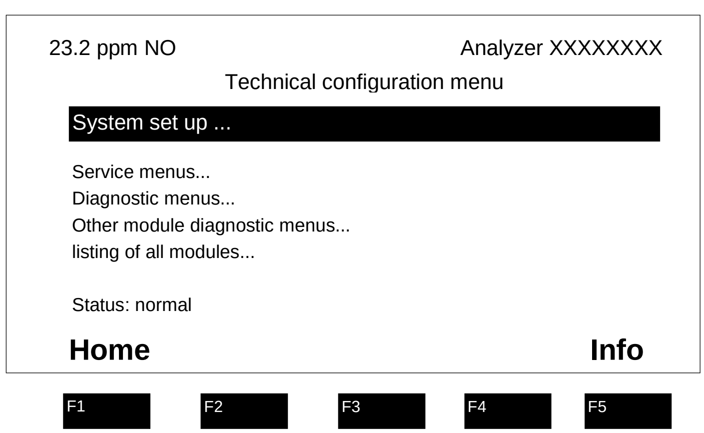


FIGURE 3-5. TECHNICAL LEVEL CONFIGURATION MENU

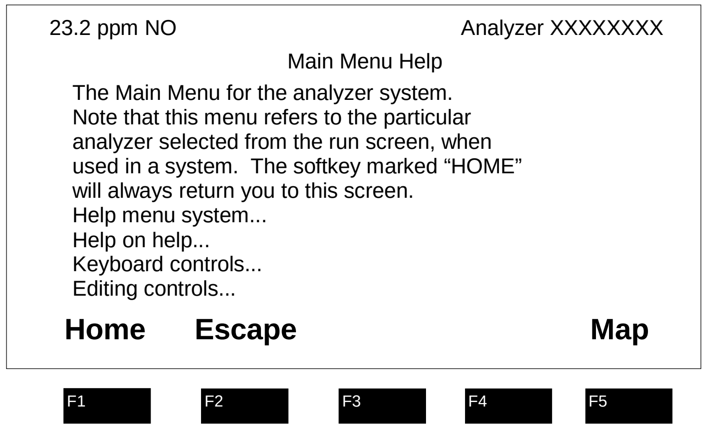


FIGURE 3-6. TYPICAL HELP SCREEN

3.5 CALIBRATION

Under the Expert Controls and Setup menu, use the ↓ arrow key to select Analyzer Module Setup, then select Calibration Gas List. Input appropriate data here.

Under the Expert Controls and Setup menu, select Expert Analyzer Controls and then Range Settings. Select the range that will be used during sample analysis.

Introduce zero gas into the SAMPLE INLET, and, after a stable reading is reached, do the following:

1. If the multi-Analyzer Module, split Run Mode display is shown, use the arrow keys to highlight the Analyzer Module to be calibrated and press the select key. The desired Analyzer Module's Run Mode display is then shown.
2. Press the MENUS softkey to enter the Main Menu.
3. Make the following selections from the Main Menu: Expert Controls and Setup, Expert Analyzer Controls, and Zero/Span Calibration.
4. Press the ZERO softkey to enter the Analyzer Zero menu.
5. Press the ZERO softkey and wait.
6. Introduce a suitable span gas into the SAMPLE INLET.
7. Press the SPAN to enter the Analyzer Span menu, press SPAN again and wait.
8. Press the HOME softkey to re-enter the Main Menu.
9. Press DISPLAY softkey for the Run Mode display.

It is recommended, after initial startup, that the CLD Analyzer Module is calibrated at least once every eight hours. This practice should continue until experience indicates that some other interval is more appropriate depending on the analytical accuracy required.

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:

1. Select the following from the Main Menu: Expert Controls and Setup, Analyzer Module Set Up, and Calibration Parameters.
2. Using the ↓ arrow, select Zero Ranges, press ENTER and, using the up/down arrows, toggle to SEPARATE. Do the same for the Span Ranges selection. Do not press ESCAPE at any time unless retention of prior settings is desired.
3. Return to the Main Menu and make the following selections: Expert Controls and Setup, Expert Analyzer Controls, Zero/Span Calibration, FACTORS softkey, and Range 1 (2, 3, 4) Factors (do Steps 4 and 5 for each range).
4. Select Zero Offset, press ENTER, adjust the value to 32700 with the ↑ and ↓ arrow keys, and press ENTER. Do not press ESCAPE at any time unless retention of prior settings is desired.
5. Select Span Factor, press ENTER, adjust the value to 0.00015 with the ↑ and ↓ arrow keys, and press ENTER. Do not press ESCAPE unless retention of prior settings is desired.
6. Attempt to recalibrate the Analyzer Module according to the procedure outlined at the beginning of Section 3.4. If recalibration fails, return to the Range Factors menu, readjust Zero Offset and Span Factor values, and try calibrating again.

3.6 CONVERTER TEMPERATURE ADJUSTMENT PROCEDURE

The vitreous carbon converter used in this analyzer module must be checked periodically to assure that it is working at peak efficiency. The efficiency of the converter is typically 95% to 98%, that is, 95% to 98% of the nitrogen dioxide introduced to the module is reduced to nitric oxide. That is well above the 90% minimum required by the Environmental Protection Agency. (Refer to 40 CFR 60, App. A, Method 20, Paragraph 5.6.)

Two conditions reduce the efficiency of the converter:

- the converter is operating at too low a temperature and the efficiency drops or

- the converter is operating at too high a temperature and the nitrogen dioxide is reduced to nitrogen, which is not detectable by the chemiluminescence reaction.

Initially, an interval of one week between converter efficiency checks is recommended because high temperature operation changes conditions inside the converter. The active surface area of the vitreous carbon increases through use. Initially, when the surface area is low, the temperature at which converter efficiency peaks is relatively high. This peak temperature moves downscale as surface area increases, and less external energy is required to cause adequate conversion.

The nominal range of converter operational temperatures is 300°C to 400°C (572°F to 752°F). The current converter temperature can be located in the Physical Measurement menu by selecting the following from the Main Menu: Expert Controls and Setup, Analyzer Module Setup and Physical Measurement Parameters.

Follow this procedure to optimize the operating temperature of the converter:

1. Power up the module and allow it to stabilize at operating temperature (about one hour).
2. Check the Converter Temperature in the Physical Measurements menu (as noted above). Note the value for future reference.
3. Introduce a calibration gas of known (NO_2) concentration into the analyzer and note the concentration value determined when the full response has been achieved.
4. Change Converter Setpoint in the Temperature Control menu to 300°C by selecting the following from the Main Menu: Technical Configuration Menu, Diagnostic Menus, Analyzer Module Diagnostics, Temperature Control Parameters. Allow module 15 minutes to stabilize, recheck the concentration value and note the value for later use.
5. Increase the Converter Setpoint value by 20°C, wait 15 minutes, and note the concentration value. Repeat this step until either a converter efficiency of between 95% and 98% is obtained or the final 20°C increment produces an efficiency increase of less than one percent.
6. Decrease the Converter Setpoint value by 5°C, which places the converter at a temperature suitable for low ammonia interference and efficient NO_2 conversion.
7. Recheck the Converter Temperature value in the Physical Measurements menu, and compare it to the initially recorded value.

NOTE

Converter temperature is not a direct measure of converter efficiency. Temperature measurement is for reference purposes only.

3.7 MEASUREMENT OF CONVERTER EFFICIENCY

It is the responsibility of the user to measure efficiency of the NO_2-to-NO converter during initial startup and thereafter at intervals appropriate to the application (normally once a month).

The reactant material used in the converter provides the optimum combination of high conversion efficiency and low ammonia interference. Unlike most competitive analyzers, the NGA 2000 CLD Analyzer Module utilizes a reactant material that gradually becomes more efficient at a given temperature. Thus, after a period of use, operation at a lower temperature setpoint than initially required is certain.

3.7.1 TEST SETUP FOR MEASUREMENT OF CONVERSION EFFICIENCY

A typical setup for measurement of conversion efficiency is shown in Figure 3-7. The test setup includes:

A cylinder of nitric oxide standard gas consisting of NO in N_2

The concentration of NO in the standard gas should be about the fullscale value of the range under test. The test sample supplied to the analyzer should contain a concentration of NO comparable to that in the samples that are to be analyzed. Alternatively, a higher concentration NO standard may be used if the test setup includes provision for diluting it appropriately with zero air. Suitable standard gases are available from various suppliers. Stainless steel cylinders are commonly used, but specially treated aluminum is preferred for low parts-per-million NO samples.

An ozone generator utilizing an ultraviolet lamp, not a corona discharge

A corona discharge ozone generator is undesirable because it may produce oxygen atoms, which can then combine with atmospheric nitrogen to form NO. The result can be an erroneously high value for the measured conversion efficiency.

3.7.2 TEST PROCEDURE

1. Measure converter temperature in the sub-menu structure as described in Section 3.6. Note present reading as a reference for comparison with subsequent readings.

2. Lower converter temperature to 300°C as described in Section 3.5, Step 4, and wait 15 minutes for temperature equilibration.

3. (See Figure 3-7) Connect the Model 958 Converter Efficiency Tester to the CLD Module, and follow Steps 4 through 17 below (as adapted from 40 CFR 60):

4. Attach the NO/N_2 supply to C2, the air supply to C1, and the CLD Module inlet fitting to C3.

5. With the variable transformer off, switch the CLD Module to NO mode, and close valve MV1.

6. Open valve MV2 until the CLD Module SAMPLE Pressure Gauge reaches operating pressure and the BYPASS flowmeter indicates some bypass flow. Wait until stable readings are obtained by the CLD Module.

7. Zero and span the Analyzer output to indicate the value of the NO concentration being used. This value should be about 80% of fullscale. Record this concentration.

8. Open valve MV1 (air supply metering valve) and adjust to blend enough air to lower the NO concentration (as noted above) about 10%. Record this concentration.

9. Power up the ozonator, and increase its supply voltage until the NO concentration noted in Step 8 is reduced to about 20 percent of the concentration noted in Step 7. Wait for stabilization. NO_2 is now being formed from the NO + O_3 reaction. There must always be at least 10 percent unreacted NO at this point. Record this concentration.

10. Switch the CLD Module to NOx mode. Total NOx concentration is now output to the network for display. Record this concentration.

11. Turn off the ozonator, and allow the Analyzer reading to stabilize. Total NOx concentration of the dilute NO span gas initially used is displayed. Record this concentration.

12. Close valve MV1. The NO concentration should be equal to or greater than the reading in Step 7. This indicates whether the NO contains any NO_2.

13. Calculate the efficiency of the NO converter by substituting the concen-trations obtained during the test in the equation below:

$$\% \text{ Efficiency} = 1 + \left(\frac{a - b}{c - d} \right) 100$$

Where:

a = recorded concentration in Step 10
b = recorded concentration in Step 11
c = recorded concentration in Step 8
d = recorded concentration in Step 9

In the example in Figure 3-7B, the following calculations would apply:

$$\% \text{ Efficiency} = 1 + \left(\frac{80 - 85}{80 - 20} \right) 100 = 92\%$$

Efficiency checks should be made on each analyzer range, using an NO span gas concentration appropriate to the instrument range.

NOTE ***In the initial measurement, after lowering the temperature setpoint in Step 2, the efficiency will normally be less than 92%.***

14. Reset converter temperature setpoint 20°C higher, wait 15 minutes for temperature equilibration, and measure conversion efficiency by repeating Steps 3 through 13. Conversion efficiency should be improved.

15. Repeat Step 14 until: a) 95% to 98% efficiency is attained or b) the final 20°C converter temperature adjustment yields an increase in efficiency of less than 1%.

16. Reset converter temperature setpoint 5°C lower. Converter temperature is now set to the front edge of the plateau on the efficiency-vs.-temperature curve. (See Figure 3-8.) This setting should provide the optimum combination of high conversion efficiency and low ammonia interference.

17. Wait 15 minutes for temperature equilibration, and check converter temperature. Compare present temperature with original value. Normally, converter temperature should be in the range of 300°C to 400°C (572°F to 752°F).

3.7.3 SUBNORMAL CONVERSION EFFICIENCY

If a measured conversion efficiency of between 95% and 98% is unobtainable within the normal temperature range, the most probable cause is depletion of the catalytic material within the converter.

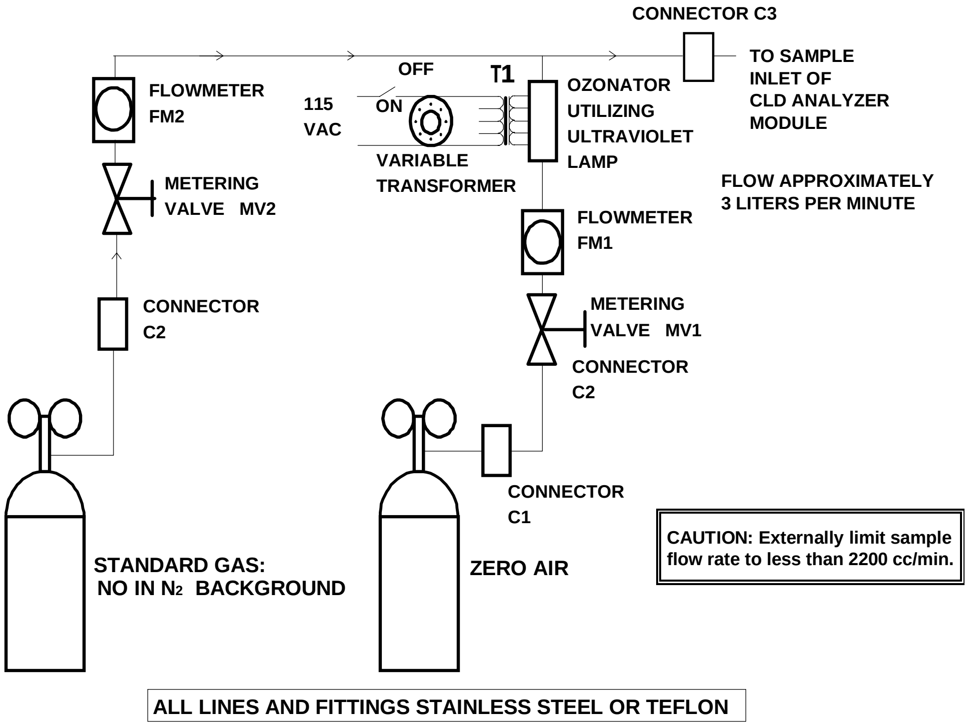
However, before concluding that the converter is defective, ensure that the conversion efficiency measurement is accurate. Though the measured efficiency is less than the 95% to 98% range, the actual efficiency may be somewhat higher.

An apparent subnormal efficiency can be due to a problem external to the Analyzer Module, perhaps located either within the test setup or between it and the Analyzer Module. Check the following:

1. Leakage.

2. Loss of NO_2 between test setup and Analyzer Module. Such loss can occur by reaction with a rubber diaphragm in a pressure regulator or flow controller. Stainless steel diaphragms are preferred. Loss can also occur during passage through filter media.

A. TYPICAL TEST SETUP



B. TYPICAL TEST RESULTS

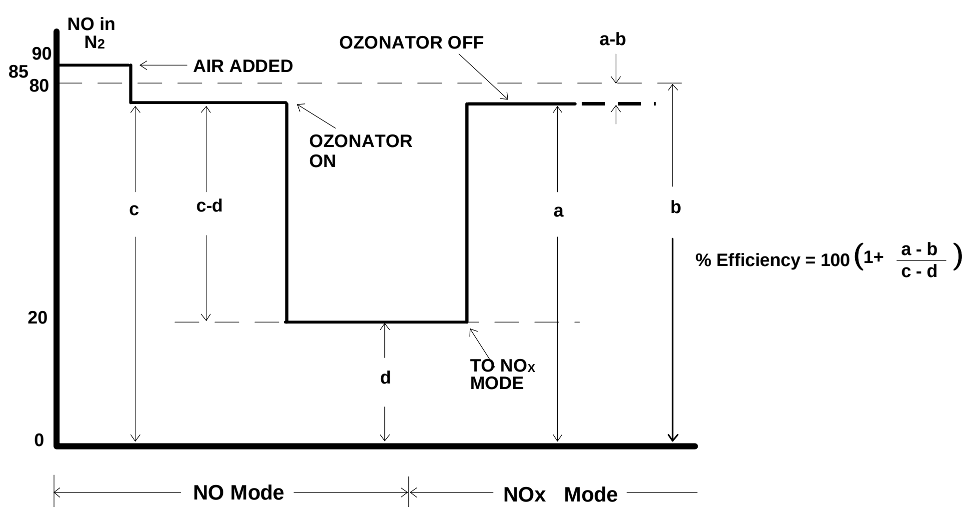


FIGURE 3-7. MEASURING EFFICIENCY OF NO_2 TO NO CONVERTER

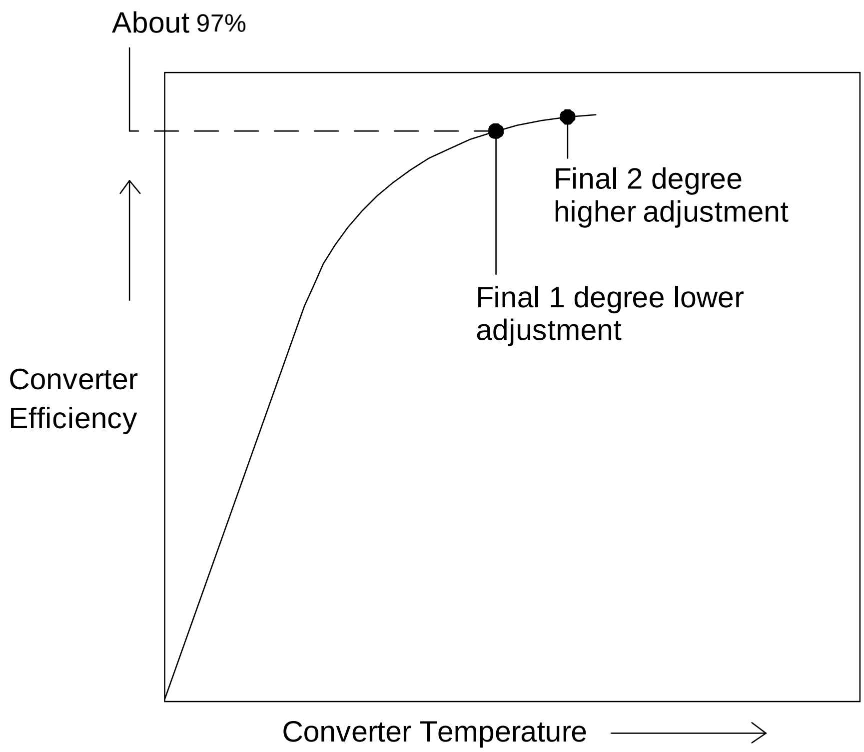


FIGURE 3-8. CONVERSION EFFICIENCY AS A FUNCTION OF CONVERTER TEMPERATURE

3.7.4 REPLACEMENT OF CONVERTER

If the subnormal conversion efficiency is real, and not due to measurement error introduced by the test setup, the converter must be replaced. See Section 4.

The usual cause of converter failure is destruction of a large part of the catalytic material by excessive heat. This is due either to an excessively high temperature setpoint or failure of the converter temperature control circuitry.

3.7.5 CAPILLARIES

Replacement vent and pump capillaries should be installed finger-tight. Use of a wrench can constrict capillaries, thus changing flow rate. Sample capillary is metal; use a wrench for tightening.

3.7.6 TEA SCRUBBER

The presence of NO_2 in the NO cylinders can cause inaccurate converter efficiency values. The TEA Scrubber accessory (P/N NL635741) can be used to remove residual NO_2 from the NO cylinders. Use of this accessory allows an NO_2-free NO calibration gas.

3.8 ROUTINE OPERATION

The CLD Analyzer Module is designed to continuously analyze the sample stream. Normally, it is never powered off except for servicing or for a prolonged shutdown.

Maximum permissible interval between calibrations depends on the analytical accuracy required, and therefore cannot be specified. Initially, the instrument should be calibrated at least once every eight hours. This practice should continue until experience indicates that some other interval is more appropriate.

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, and Analyzer Module Data. Select Maximum Range, and use the arrow keys to scroll the indicated value. The same applies for the Minimum Range value.

NOTES

WARNING: ELECTRICAL SHOCK HAZARD

Disconnect power to the module(s) prior to replacing components.

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

4.1 OVERVIEW

The CLD Analyzer Module requires very little maintenance during normal operation.

Occasionally, the intake fan screen may require cleaning, refer to Section 4.3.

Also, the detector's reaction chamber and sapphire window may require cleaning, refer to Section 4.7.

White crystal deposits on the windows of the reaction chamber and plugging of capillaries and vent are usually due to sample contaminates such as ammonia reacting with the high ozone levels and NO components. To eliminate the contaminates, the sampling system should be reworked or a preventive maintenance program developed (if dropout is not excessive). Another source of crystalline formation is contaminated air.

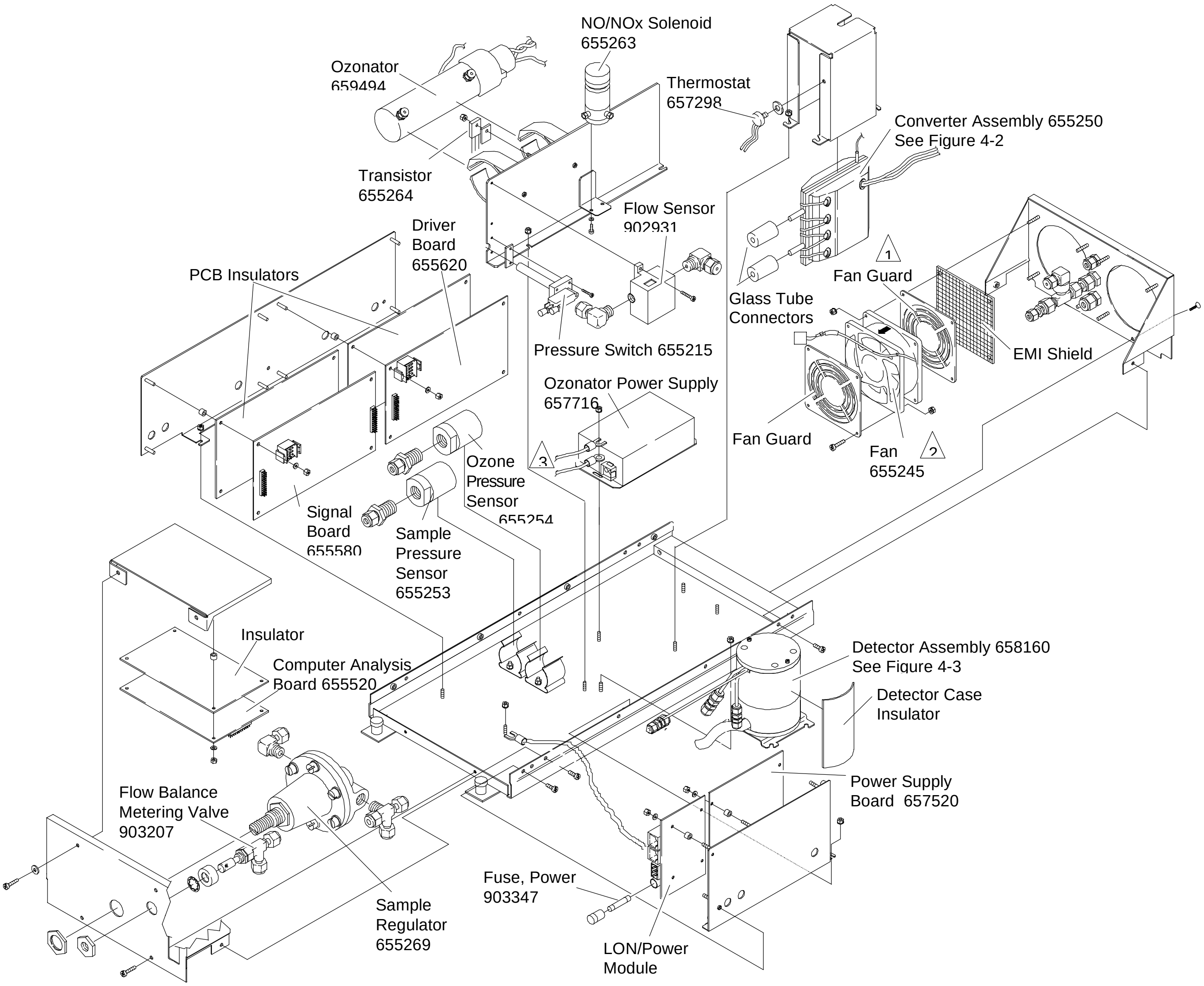
Several components may require replacement. These are discussed in the following sections.

4.2 FUSES

The main power fuse may require replacement.

NOTE ***Before replacing the fuse, remove power to the Analyzer Module.***

See Figure 1-2 for the location of the Power Supply Board main power fuse, which protects 24 VDC input to the module.



△3 Ground wires from ozonator shown.

△2 Flow direction of intake fan (shown) is into case. Flow direction of exhaust fan is out of case.

△1 Fan guard between fan and EMI filter is on the intake fan only (shown).

FIGURE 4-1. CLD MODULE ASSEMBLY

4.3 FANS

Refer to Figure 4-1. To replace either rear panel fan, remove the cover of the Analyzer Module and then the rear panel. Disconnect connectors and remove screws. Assemble in reverse order.

4.4 CONVERTER

Refer to Figures 4-1 and 4-2. To replace the converter or sensor, disconnect the two pneumatic tubes and two electrical connections. Unlace the heater blanket, and remove the converter. Reassemble in reverse order, ensuring that the converter is oriented with the glass cloth at the bottom and the sensor is oriented correctly inside the heater jacket.

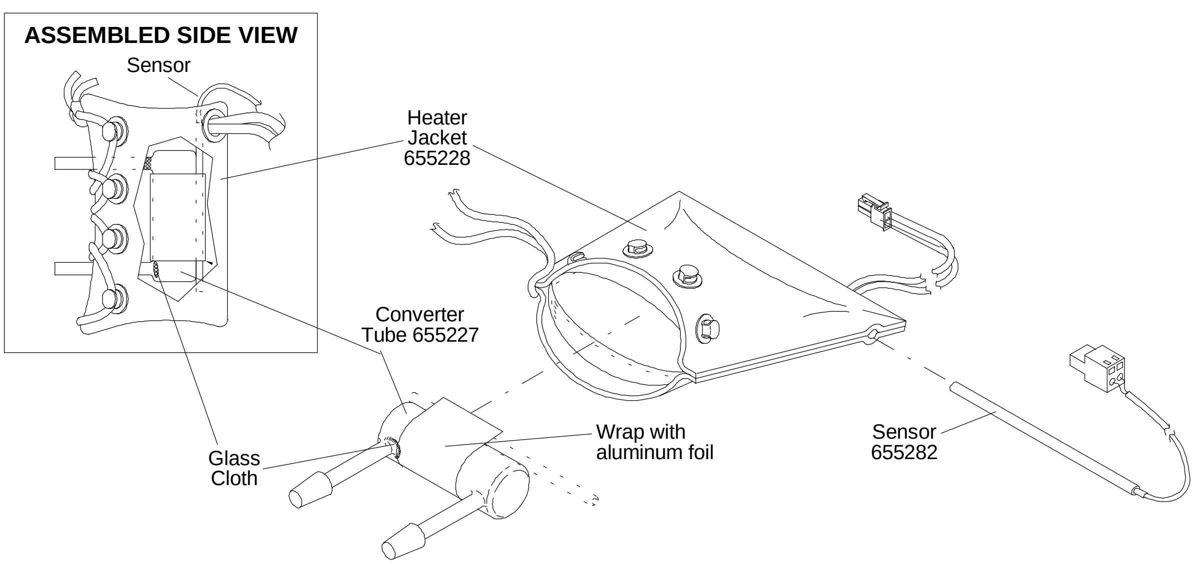


FIGURE 4-2. CONVERTER ASSEMBLY

4.5 OZONATOR

Refer to Figure 4-1.To replace the ozonator, remove the two large straps and all tie-wraps, and disconnect the one electrical connection. Reassemble in reverse order.

4.6 PRINTED CIRCUIT BOARDS

All four printed circuit boards can be replaced, if necessary. Refer to Figure 4-1 for location of the Driver, Power Supply, Signal and Computer Boards.

To remove any PCB (*except* the Computer Board), disassemble the enclosure side first. Ribbon and other cables are long enough to allow the entire side to be folded out from the remainder of the components. This makes PCB removal much simpler.

Tag each connector and its location before disconnecting any wiring. This helps in reassembly.

4.7 DETECTOR DISASSEMBLY

Refer to Figure 4-3.

Reaction Chamber Removal

Disconnect the stainless steel tubing lines at the Gyrolok fittings. Remove the (4) nuts holding the Detector Assembly to the chassis. Disconnect the plug from connector J1 on the Signal Board and remove the assembly from the chassis.

NOTE

Care should be taken to avoid getting heatsink compound on optical surfaces. If this substance is removed during the disassembly process, a zinc-oxide-filled, silicone grease (e.g., Dow Corning 340 or EG&G Wakefield Engineering's Series 120 Thermal Joint Compound) be reapplied in the reassembly of this component.

Although the heater and thermostat can be removed to facilitate handling, contact with the white heatsink compound can be minimized by leaving these items in place. Remove the (2) screws holding the top plate of the Detector , and move the plate along the wires and away from the Detector .

Remove the (2) screws holding the tube assembly in place. Hold the tubing with one hand while inverting the Detector Housing with the other, allowing the Reaction Chamber O-ring and window to be removed from below.

Reaction Chamber Installation

To reinstall, hold the housing in the inverted position while sliding the Reaction Chamber O-ring and window into position and the tubing into the slot in the housing. Hold the Reaction Chamber in place while rotating the housing upright. Replace the hold-down screws.

NOTE ***The procedure described above is for the purpose of maintaining the relative positions of windows and O-ring to the Reaction Chamber during installation.***

Replace the top cap and screws. Reverse the removal procedure to reinstall the Detector Assembly into the Analyzer Module.

Photodiode Removal

Remove the Detector Assembly as described above. Invert the housing to access the mounting bracket. Remove the (3) screws and shoulder washers from the bracket. Remove the bracket, insulating disk and bottom plate as a unit to minimize the spread of the heatsink compound.

Remove the (2) screws holding the lower section of the Detector Housing, then slide the section along the cable and remove.

Remove the (2) screws holding the socket, thermistor and photodiode in place, being careful not to lose the washers that are used as shims.

Grasp the socket and photodiode base while slowly rotating to separate the photodiode from the housing. Some friction will be felt as an O-ring is used around the photodiode as a seal.

Photodiode Installation

To replace the photodiode, carefully remove the diode from the green socket, and replace with a new one. Before mounting the new diode, the top cap of the enclosure should be temporarily removed and the (2) screws holding the Reaction Chamber loosened about two turns. This allows air which is trapped between the O-ring seals to escape when the diode is inserted. It also maintains the position of the O-ring and window in the upper compartment.

The new photodiode should be slowly inserted into the housing while gradually rotating the body. This allows the O-ring to properly seat. Continue replacing screws, washers, thermistors, etc., with the thicker shim (washer) on the opposite side of the socket from the thermistor.

Replace the lower section of the housing, then the bottom cover, insulator and bracket with the shoulder washers and screws.

Re-tighten the screws in the Reaction Chamber (upper section). Replace the top cap and its screws.

To reinstall in the Analyzer Module, reverse the procedure for removal as indicated above.

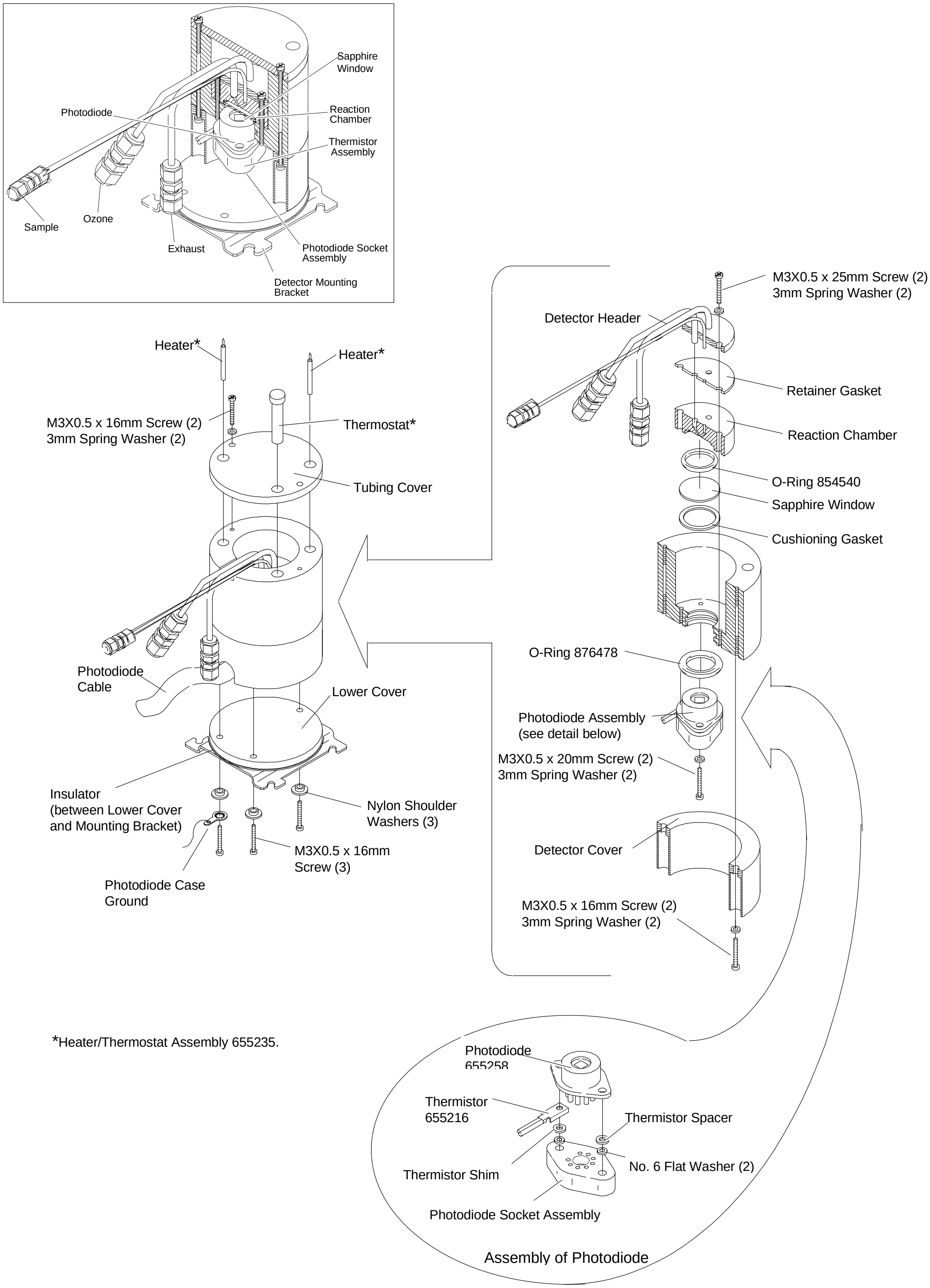


FIGURE 4-3. DETECTOR ASSEMBLY

NOTES

CAUTION: 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 REPLACEMENT PARTS

NL655215	Pressure Switch
NL655245	Fan (Exhaust and Intake)
NL655250	Converter (see below)
NL655253	Sample Pressure Sensor
NL655254	Ozone Pressure Sensor
NL655263	NO/NOx Solenoid
NL655264	Transistor Assembly
NL655269	Regulator, Back Pressure – Brass/Neoprene
NL659063	Regulator, Back Pressure – Stainless Steel/Viton
NL655287	Prom
NL655520	Computer Board
NL655580	Signal Board
NL655620	Driver Board
NL657298	Thermostat 80°C
NL657473	Pump Capillary
NL657520	Power Supply Board
NL657716	Ozonator Power Supply
NL659494	Ozone Generator
NL658157	Air Restrictor 430 cc/min 12 psig
NL659657	Sample Capillary 70 cc/min. 5 psig
NL659658	Sample Capillary 200 cc/min. 5 psig
NL659753	Detector 70 cc/min.
NL659754	Detector 200 cc/min.
NL902931	Flow Sensor
NL903207	Metering Valve
NL903347	Fuse, Main Power 6A 250V

655250 CONVERTER REPLACEMENT PARTS

NL655228	Heater Jacket
NL655227	Tube, Aged
NL655282	Temperature Sensor

659753, 659754 DETECTOR REPLACEMENT PARTS

NL655235	Heater/Thermostat Assembly
NL655216	Thermistor
NL655258	Photodiode
NL854540	O-Ring, Viton .739ID .875OD
NL876478	O-Ring, Viton .737ID .943OD

Each analyzer is configured per the customer sales order. Below is the CLD 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.

C	CHEMILUMINESCENCE NO/NOx ANALYZER - CLD

Code	Language
A	English
X	Special

Code	Configuration Identifier
A10	Calibrated Low Ranges: 0-10, 0-25, 0-100, 0-250 ppm
A20	Calibrated High Ranges: 0-250, 0-1000, 0-2500, 0-10000
B10	Calibrated Low Ranges: 0-10, 0-30, 0-100, 0-300 ppm
B20	Calibrated High Ranges: 0-300, 0-1000, 0-3000, 0-10000 ppm
C10	Calibrated Low Ranges: 0-10, 0-50, 0-100, 0-500 ppm
C20	Calibrated High Ranges: 0-500, 0-1000, 0-5000, 0-10000 ppm

Code	Materials
A00	Brass and Neoprene Back Pressure Regulator
B00	Stainless Steel and Viton Back Pressure Regulator
C00	Brass and Neoprene Back Pressure Regulator with Sample Inlet Restrictor (Recommended if External Flow Control Device is not used.)
D00	Stainless Steel and Viton Back Pressure Regulator with Sample Inlet Restrictor (Recommended if External Flow Control Device is not used.)

ZZZZ	No Selection

C	A	A10	A00	ZZZZ	Example

NOTES

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.

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WARRANTY

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

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

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

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

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

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FIELD SERVICE AND REPAIR FACILITIES

Field service and repair facilities are located worldwide.

U.S.A.

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National Response Center
1-800-654-7768

INTERNATIONAL

Contact your local Rosemount Sales and Service office for service support.

FACTORY

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

RETURNING PARTS TO THE FACTORY

Before returning parts, contact the Customer Service Center and request a Returned Materials Authorization (RMA) number. Please have the following information when you call: *Model Number, Serial Number, and Purchase Order Number or Sales Order Number.*

Prior authorization by the factory must be obtained before returned materials will be accepted. Unauthorized returns will be returned to the sender, freight collect.

When returning any product or component that has been exposed to a toxic, corrosive or other hazardous material or used in such a hazardous environment, the user must attach an appropriate Material Safety Data Sheet (M.S.D.S.) or a written certification that the material has been decontaminated, disinfected and/or detoxified.

Return to:

Rosemount Analytical Inc.
4125 East La Palma Avenue
Anaheim, California 92807-1802

Rosemount Analytical

SAMPLE INLET FLOW RATE RESTRICTION

FOR NGA 2000 CLD ANALYZER MODULE

NOTICE

CAUTION

EXTERNALLY RESTRICT SAMPLE FLOW TO LESS THAN 2200 CC/MIN.

NO RESTRICTOR IS PROVIDED IN THE SAMPLE INLET OF THIS MODULE. FOR THOSE USERS WHO CANNOT EXTERNALLY LIMIT SAMPLE FLOW, ACCESSORY RESTRICTOR PN 657300 IS AVAILABLE FROM ROSEMOUNT ANALYTICAL. TO OBTAIN THIS ACCESSORY, CALL 800-441-7245.

Rosemount Analytical Inc.
4125 East La Palma Avenue • Anaheim, California 92807-1802 • (714) 986-7600 • FAX (714) 577-8006
June 1997 015-748335-B Printed in U.S.A.

Rosemount Analytical

ADDENDUM

CLD INSTRUCTION MANUAL 748410

This addendum serves as an amendment to the CLD Instruction Manual 748410. The following information should be considered part of the manual, and supersedes any conflicting information in the body of the manual.

Read this information and note the conflicts.

MENU DISPLAYS

Menu: 0 MAIN

Expert controls				
Measurement range number:				CRANGE
Range upper limit:				CURRENTRNGHI
Range settings...				M: 24, RANGESETAN
Range and functional control:				CONTROL
Measurement mode:				NO_NOX
Ozonator status:				OZON_STATUS
Ozonator power:				OZONATOR
Zero/Span calibration...				M: 88, EXP_CAL
Ranges with valid calibration:				CAL_VALIDITY
F: 0	F: 1	M: 88	F: 5	M: 5
HOME	ESCAPE	CAL	NO/NOx	INFO

Menu: 1 ANALSET

Analyzer module set up				
Calibration gas list...				M: 9, CALLIST
Calibration parameters...				M: 6, ACALSET
Concentration alarms...				M: 123, ALARM1
Gas measurement parameters...				M: 62, ANALSET2
Analyzer parameter list...				M: 7, APARLST
Physical measurement parameters...				M: 37, AM2VA
Displayed parameters...				M: 61, DISPLAY
F: 0	F: 1			M: 8
HOME	ESCAPE			INFO

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Menu: 2 FLOCHEK

Physical Measurements

Bypass sample flow:	*FLOW_IS*
Flow lower limit:	*SVFLL*
Flow upper limit:	*SVFUL*
Sample pressure:	*PRES_IS1*
Ozone supply pressure:	*PRES_IS2*
Sensor block temperature:	*TEMP_IS2*

F: 0	*F: 1*	*F: 5*	*M: 4*
HOME	ESCAPE	NO/NOx	INFO

Menu: 3 ZEROI1

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 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.

F: 0	*F: 4*	*M: 69*	*M: 47*
HOME	ESCAPE	CALINFO	INFO

Menu: 4 FLOCHEKI1

Physical Measurements

This screen shows the auxiliary measurements made by the analyzer module.
The limits may be set by the user as warning alarms.
Pressure readings are gauge pressure.

Toggle the NO/NOx softkey while looking at the sample pressure for flow balance adjustment.

F: 0	*F: 4*	*M: 47*
HOME	ESCAPE	INFO

Menu: 5 ANALOPI1

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 appropriate gas,
select the correct range and press the zero
or span button. Do a zero before a span!
Measurement mode enables the NOx converter,
and therefore whether the analyzer measures
NOx (if it is) or NO.
Ozonator status shows whether the ozonator is

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 6 ACALSET

Calibration Parameters

Calibration adjustment limits:	*CALCHKLIMITS*
Calibration averaging time:	*CALTIME*
Calibration failure alarm:	*CALFAIL*
Cal failure error allowed:	*CALFFC*
Calibration time out:	*CALTIMEOUT*
Zero ranges:	*ZERORNGS*
Span ranges:	*CALRANGES*

F: 0	F: 1	M: 11
HOME	ESCAPE	INFO

Menu: 7 APARLST

Analyzer Parameter List

Analyzer tag:	*TAG*
Ozonator status:	*OZON_STATUS*
Ozonator power:	*OZONATOR*
First line's parameter:	*SVNAME1*
Second line's parameter:	*SVNAME2*
Third line's parameter:	*SVNAME3*
Fourth line's parameter:	*SVNAME4*

F: 0	F: 1	M: 51	M: 55	M: 12
HOME	ESCAPE	NEXT	LAST	INFO

Menu: 8 ANALSETI1

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 other calibration parameters in their menu.
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

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 9 CALLIST

Calibration Gas List

Zero gas - range 1:	*ZEROGAS1*
NO Span gas - range 1:	*NOSPANGAS1*
NOx Span gas - range 1:	*NOXSPANGAS1*
Zero gas - range 2:	*ZEROGAS2*
NO Span gas - range 2:	*NOSPANGAS2*
NOx Span gas - range 2:	*NOXSPANGAS2*

F: 0	F: 1	M: 50	M: 10
HOME	ESCAPE	MORE	INFO

Menu: 10 CALLISTI1

Calibration Gas List
Zero and span gases for each range are shown. Edit these to correspond to the contents of the right calibration gas bottles. Note that NO and NOx must be entered separately.

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 11 ACALSETI1

```
Calibration Parameters
Disable the limits to recover from calibration failure
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.

F: 0        F: 4                              M: 47
HOME        ESCAPE                            INFO
```

Menu: 12 APARLSTI1

```
Analyzer Parameter List
This is a listing of all the user
editable parameters in the current
parameter set.

F: 0        F: 4                              M: 47
HOME        ESCAPE                            INFO
```

Menu: 13 AMMAN

```
Analyzer manufacturing data

More...                                M: 124, ABOUT

Bench configuration code:                       AMBC

Minimum range:                              MINRANGE
Maximum range:                              MAXRANGE
Diode s/n, block s/n:                   DIOD_BLOK_SN
Capillary:                              CAP_FLOWRATE

F: 0        F: 1       M: 98      M: 99       M: 14
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!
Reinitialize the system after RESET!

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 15 AMSVC

Analyzer module service history

Manufacturing date:	*AMMFGDATE*
In service date:	*AMSERVDATE*
Last zero calibration date:	*CALDATE_Z*
Last span calibration date:	*CALDATE_S*
Total hours of operation:	*OPHOURS1*
Converter installation date:	*CONV_DATE*
Converter hours of operation:	*OPHOURS2*
Last service date:	*AMLSDATE*
List notes...	*M: 56, LISTNOTES*

F: 0	F: 1	M: 113	M: 126	M: 16
HOME	ESCAPE	NEW CON	ManData	INFO

Menu: 16 AMSVCI1

Analyzer module service history
Shows service dates and notes. Add notes up to what will fit into the line.
These notes will be accessible over the network, and via gateways. Service techs may use these to keep internal records of service actions on the modules.
For service/trouble definitions, see control unit service help screens.

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 17 ADIAG

Analyzer Diagnostics	
Power supply voltages...	*F: 16, DIAG_VOLTS_*
Primary variable parameters...	*M: 19, AM1V*
Physical Measurements...	*M: 37, AM2VA*
Temperature control parameters...	*M: 20, AMTEMP*
NO/NOx flow balance...	*M: 114, FLOWBALANCE*
Miscellaneous control parameters...	*M: 21, AMMISC*
Trend display control...	*M: 22, AMTREND*
Software diagnostics...	*M: 68, SOFT_DIAGS*
Alarm messages valid for:	*ALARM_LVL*
Start up analyzer...	*M: 57, AMMISC2*

F: 0	*F: 1*		*M: 23*
HOME	**ESCAPE**		**INFO**

Menu: 18 AMPWR

Analyzer diagnostics	
Power supply voltages	
+15V analog is:	*VOLTS_IS1*
+15V analog was:	*AMVOLTSWAS1*
-15V analog is:	*VOLTS_IS2*
-15V analog was:	*AMVOLTSWAS2*
+5V digital is:	*VOLTS_IS3*
+5V digital was:	*AMVOLTSWAS3*
+24V power is:	*VOLTS_IS4*
+24V power was:	*AMVOLTSWAS4*
+12V analog is:	*VOLTS_IS5*

F: 0	*F: 1*	*M: 65*	*M: 31*
HOME	**ESCAPE**	**MORE**	**INFO**

Menu: 19 AM1V

Primary variable parameters	
Raw measurement signal:	*RAW_SIGNAL*
Signal gain setting:	*SIGNAL_GAIN*
Current range:	*CRANGE*
Barometric pressure compensation:	*BAR_ENABLE*
Pk-pk noise:	*CRUDE_NOISE*
Peltier device voltage:	*PELT_OV*
Reference duty cycle:	*REF_DUTY_CYC*
Duty cycle coefficient:	*DUTY_COEFF*
(Temperature compensation coefficients.)	

F: 0	*F: 1*		*M: 35*
HOME	**ESCAPE**		**INFO**

Menu: 20 AMTEMP

Temperature control	
Converter set point:	*CONV_SETP*
Converter P gain:	*CONV_PGAIN*
Converter I gain:	*CONV_IGAIN*
Converter bias:	*CONV_BIAS*
Converter temperature:	*TEMP_IS1*
Detector set point:	*BLOK_SETP*
Detector P gain:	*BLOK_PGAIN*
Detector I gain:	*BLOK_IGAIN*
Detector bias:	*BLOK_BIAS*

F: 0 **HOME** | *F: 1* **ESCAPE** | *M: 67* **MORE** | *M: 36* **INFO**

Menu: 21 AMMISC

Miscellaneous control parameters	
Ozonator status:	*OZON_STATUS*
Ozonator power:	*OZONATOR*
Peltier device voltage:	*PELT_OV*
Converter current:	*PWM_CUR_IS2*
Block heater current:	*PWM_CUR_IS1*
Converter heater duty cycle:	*PWM_DUTY2*
Detector block duty cycle:	*PWM_DUTY3*
Fan duty cycle:	*PWM_DUTY1*
Ozonator duty cycle:	*PWM_DUTY4*

F: 0 **HOME** | *F: 1* **ESCAPE** | *M: 40* **INFO**

Menu: 22 AMTREND

Trend display control	
First displayed variable:	*TRENDVAR1*
Second displayed variable:	*TRENDVAR2*
Timebase:	*TRENDTIME*
Drop out to measuring mode:	*TRENDTIMEOUT*

F: 0 **HOME** | *F: 1* **ESCAPE** | *M: 110* **INFO**

Menu: 23 ADIAGI1

Analyzer Diagnostics
Select the area of diagnostics to examine.

Start up analyzer will restart the warm- up sequence.
This will take about 45 minutes.

The NOx converter efficiency menu helps this test.

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 24 RANGESETAM

Range Settings

Minimum range:	*MINRANGE*
Maximum range:	*MAXRANGE*
Range 1 lower limit:	*RNGLO1*
Range 1 upper limit:	*RNGHI1*
Range 2 lower limit:	*RNGLO2*
Range 2 upper limit:	*RNGHI2*
Range 3 lower limit:	*RNGLO3*
Range 3 upper limit:	*RNGHI3*
Range 4 lower limit:	*RNGLO4*

F: 0	F: 1	M: 25
HOME	ESCAPE	INFO

Menu: 25 RANGESSETI1

Range Settings
Set the upper and lower limits of the ranges.
These values are copied into the output module and
used for calculating the analog output.

The analyzer uses them to select which linearizer
polynomial to use if any.

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 26 LINRANGE1

Linearity coefficients	
Curve 1	
A0 coefficient:	*LINA0_1*
A1 coefficient:	*LINA1_1*
A2 coefficient:	*LINA2_1*
A3 coefficient:	*LINA3_1*
A4 coefficient:	*LINA4_1*
Curve upper limit:	*LINRNGHI1*
Curve over-range:	*LIN_OVER1*
Curve under-range:	*LIN_UNDER1*

F: 0	*F: 1*	*M: 27*	*M: 29*	*M: 48*
HOME	**ESCAPE**	**NEXT**	**LAST**	**INFO**

Menu: 27 LINRANGE2

Linearity coefficients	
Curve 2	
A0 coefficient:	*LINA0_2*
A1 coefficient:	*LINA1_2*
A2 coefficient:	*LINA2_2*
A3 coefficient:	*LINA3_2*
A4 coefficient:	*LINA4_2*
Curve upper limit:	*LINRNGHI2*
Curve over-range:	*LIN_OVER2*
Curve under-range:	*LIN_UNDER2*

F: 0	*F: 1*	*M: 28*	*M: 26*	*M: 48*
HOME	**ESCAPE**	**NEXT**	**BACK**	**INFO**

Menu: 28 LINRANGE3

Linearity coefficients	
Curve 3	
A0 coefficient:	*LINA0_3*
A1 coefficient:	*LINA1_3*
A2 coefficient:	*LINA2_3*
A3 coefficient:	*LINA3_3*
A4 coefficient:	*LINA4_3*
Curve upper limit:	*LINRNGHI3*
Curve over-range:	*LIN_OVER3*
Curve under-range:	*LIN_UNDER3*

F: 0	*F: 1*	*M: 29*	*M: 27*	*M: 48*
HOME	**ESCAPE**	**NEXT**	**BACK**	**INFO**

Menu: 29 LINRANGE4

```
Linearity coefficients
Curve 4
A0 coefficient:                    LINA0_4
A1 coefficient:                    LINA1_4
A2 coefficient:                    LINA2_4
A3 coefficient:                    LINA3_4
A4 coefficient:                    LINA4_4
Curve upper limit:                 LINRNGHI4
Curve over-range:                  LIN_OVER4
Curve under-range:                 LIN_UNDER4

F: 0     F: 1     M: 26    M: 28    M: 48
HOME     ESCAPE   FIRST    BACK     INFO
```

Menu: 30 LINRANGE0

```
Linearization parameters

Range 1 linearizer:                LINSTAT1
If enabled, uses curve no.:        LINFORRANGE1
Range 2 linearizer:                LINSTAT2
If enabled, uses curve no.:        LINFORRANGE2
Range 3 linearizer:                LINSTAT3
If enabled, uses curve no.:        LINFORRANGE3
Range 4 linearizer:                LINSTAT4
If enabled, uses curve no.:        LINFORRANGE4

F: 0     F: 1                      M: 44
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.

F: 0     F: 4                      M: 47
HOME     ESCAPE                    INFO
```

Menu: 32 FLOCHEK1I1

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.

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 33 FILTER

Response time/delay parameters

Range 1 t90 time:	AFT90_1
Range 2 t90 time:	AFT90_2
Range 3 t90 time:	AFT90_3
Range 4 t90 time:	AFT90_4
LON update rate:	LONPVUPDATE
Output delay time:	AMDELAYTIME

F: 0	F: 1	M: 43
HOME	ESCAPE	INFO

Menu: 34 NONOXEFFIC

NOx converter efficiency

Converter temperature:	TEMP_IS1
Converter set point:	CONV_SETP
Capillary pressure:	PRES_IS1
Measurement mode:	NO_NOX
Measurement:	PVA
Last temperature reading:	CONV_TEMPWAS
Last measurement (other mode):	PVAWASMODE

F: 0	F: 1	F: 5	M: 41
HOME	ESCAPE	NO/NOx	INFO

Menu: 35 AM1VI1

```
Primary variable parameters
Shows the value of internal parameters
used in the primary variable calculation

Barometric pressure compensation may be enabled
if another analyzer has a pressure measurement
device, and is set to report its reading.

F: 0        F: 4                        M: 47
HOME        ESCAPE                      INFO
```

Menu: 36 AMTEMPI1

```
Temperature control
Parameters used by the two temperature
control PID algorithms.

F: 0        F: 4                        M: 47
HOME        ESCAPE                      INFO
```

Menu: 37 AM2VA

```
Physical Measurements
Sample capillary pressure:                 PRES_IS1
Ozone supply pressure:                     PRES_IS2
Ozonator status:                        OZON_STATUS
Ozonator power:                            OZONATOR
Bypass flow:                                FLOW_IS
Converter temperature:                     TEMP_IS1
Ozonator temperature:                      TEMP_IS4
Sensor temperature:                        TEMP_IS3
Block temperature                          TEMP_IS2
Capillary flow rate:                   CAP_FLOWRATE

F: 0        F: 1        M: 122      M: 70       M: 32
HOME        ESCAPE      MORE        HISTORY     INFO
```

Menu: 38 PLIMITSA

Pressure Limits	
Sample capillary upper limit:	*PLIM1*
Sample capillary lower limit:	*PLIM2*
Ozone supply upper limit:	*PLIM3*
Ozone supply lower limit:	*PLIM4*
Barometric pressure:	*BAROMETER*
F: 0 HOME *F: 1* ESCAPE	*M: 45* INFO

Menu: 39 TLIMITSA

Temperature limits	
Converter upper limit:	*TLIMA1*
Converter lower limit:	*TLIMA2*
Ozonator upper limit:	*TLIMAO1*
Ozonator lower limit:	*TLIMAO2*
Sensor upper limit:	*TLIMA3*
Sensor lower limit:	*TLIMA4*
Block upper limit:	*TLIMA5*
Block lower limit:	*TLIMA6*
F: 0 HOME *F: 1* ESCAPE	*M: 45* INFO

Menu: 40 AMMISCI1

Miscellaneous control parameters

Ozonator status shows whether the ozonator is powered or not.
The converter current is the current through the converter heater.
The Peltier warning and shutdown refer to the Peltier cooler device for the detector.
The block heater is the detector block heater - this stabilizes the cooler.

F: 0 HOME   *F: 4* ESCAPE   *M: 47* INFO

Menu: 41 NONOXEFFICI1

NOx converter efficiency

Use this screen to optimize the converter efficiency.
Set the temperature, let it stabilize.

Apply a test gas, and select NO or NOx mode with the softkey marked NO/NOx.

Allow the reading to stabilize and press NO/NOx again. The reading and temperature at the time of pressing the button are stored, and displayed on the Last reading lines. Compare these with the readings presently displayed.
Change the converter set point as desired.

F: 0	F: 4			M: 47
HOME	ESCAPE			INFO

Menu: 42 ANALSIMPLE

Basic Controls

Measurement range number:	*CRANGE*
Range upper limit:	*CURRENTRNGHI*
Range and functional control:	*CONTROL*
Ranges with valid calibration:	*CAL_VALIDITY*
Calibration status:	*CALSTAT*
If it won't calibrate...	*M: 95, ZEROI3*
Status:	*OPSTATUS*
Measurement mode:	*NO_NOX*
Ozonator status:	*OZON_STATUS*

F: 0	F: 5	M: 111	M: 112	M: 5
HOME	NO/NOx	ZERO	SPAN	INFO

Menu: 43 FILTERI1

Filter and Delay Parameters

This screen sets the final filtering for the analyzer primary variable output.

This is in addition to the inherent filtering in the analyzer.

The time delay simply delays the output by that time, allowing the fastest responding analyzer systems to be synchronized with the slowest.

The median filter order must be an odd number.

F: 0	F: 4			M: 47
HOME	ESCAPE			INFO

Menu: 44 LINRANGE0I1

```
Linearization parameters
The linearizer polynomials act over a 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.
Note that use of different polynomials on different
ranges will give different readings on a new range.
Coefficients may be edited for custom curves.


F: 0        F: 4                                M: 47
HOME        ESCAPE                              INFO
```

Menu: 45 PLIMITSAI1

```
Pressure and temperature limits
These are settable limits on the pressure and
temperature measurements.  If exceeded, they will
generate WARNING alarms.


F: 0        F: 4                                M: 47
HOME        ESCAPE                              INFO
```

Menu: 46 CALFACTORS

```
Calibration Factors

Only those factors appropriate for the current range
will affect the reading on the current range.
Make sure you are using the right ones!
Measurement range number:                      CRANGE

Range 1 factors...                M: 104, RFACTORS
Range 2 factors...               M: 105, R2FACTORS
Range 3 factors...             M: 106, RN3FACTORS
Range 4 factors...             M: 109, RN4FACTORS

F: 0        F: 1                                M: 49
HOME        ESCAPE                              INFO
```

Menu: 47 AMHELPINDEX

Analyzer Module Help
CLD module
This module detects NO by reacting it with ozone and measuring the light produced. It can reduce NO2 to NO and then measure the total amount of NO, this measurement is called NOx. It uses a converter to do this, and it makes its own ozone with an ozonator. It is vital that the temperatures of these are correct.
It is necessary to replace the converter periodically.

Finding your way in the CLD menus... *M: 63, AMHELPINDEX2*

F: 0	*F: 4*	*M: 63*	*F: 0*
HOME	ESCAPE	MORE	INFO

Menu: 48 LINRANGE1I1

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.

F: 0	*F: 4*	*M: 47*
HOME	ESCAPE	INFO

Menu: 49 CALFACTORSI1

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

F: 0	*F: 4*	*M: 47*
HOME	ESCAPE	INFO

Menu: 50 CALLIST2

Calibration Gas List	
Zero gas - range 3:	*ZEROGAS3*
NO Span gas - range 3:	*NOSPANGAS3*
NOx Span gas - range 3:	*NOXSPANGAS3*
Zero gas - range 4:	*ZEROGAS4*
NO Span gas - range 4:	*NOSPANGAS4*
NOx Span gas - range 4:	*NOXSPANGAS4*

F: 0	*F: 1*	*M: 9*		*M: 10*
HOME	ESCAPE	BACK		INFO

Menu: 51 APARLST2

Analyzer Parameter List	
Primary Variable Parameters	
Control mode:	*CONTROL*
Output delay time:	*AMDELAYTIME*
Range 1 upper limit:	*RNGHI1*
Range 2 upper limit:	*RNGHI2*
Range 3 upper limit:	*RNGHI3*
Range 4 upper limit:	*RNGHI4*
Range 1 lower limit:	*RNGLO1*
Range 2 lower limit:	*RNGLO2*
Range 3 lower limit:	*RNGLO3*

F: 0	*F: 1*	*M: 52*	*M: 7*	*M: 12*
HOME	ESCAPE	NEXT	BACK	INFO

Menu: 52 APARLST4

Analyzer Parameter List	
Primary Variable Parameters	
Range 1 t90 time:	*AFT90_1*
Range 2 t90 time:	*AFT90_2*
Range 3 t90 time:	*AFT90_3*
Range 4 t90 time:	*AFT90_4*
Linearizer on range 1:	*LINSTAT1*
Linearizer on range 2:	*LINSTAT2*
Linearizer on range 3:	*LINSTAT3*
Linearizer on range 4:	*LINSTAT4*

F: 0	*F: 1*	*M: 53*	*M: 51*	*M: 12*
HOME	ESCAPE	NEXT	BACK	INFO

Menu: 53 APARLST5

Analyzer Parameter List
Calibration Parameters

Calibration averaging time:	*CALTIME*
Calibration failure alarm:	*CALFAIL*
Cal failure error allowed:	*CALFFC*
Calibration time out:	*CALTIMEOUT*
Ranges zeroed:	*ZERORNGS*
Calibrate ranges:	*CALRANGES*
Calibration adjustment limits:	*CALCHKLIMITS*

F: 0	*F: 1*	*M: 54*	*M: 52*	*M: 12*
HOME	**ESCAPE**	**NEXT**	**BACK**	**INFO**

Menu: 54 APARLST6

Analyzer Parameter List
Calibration Gases

Zero gas - range 1:	*ZEROGAS1*
Zero gas - range 2:	*ZEROGAS2*
Zero gas - range 3:	*ZEROGAS3*
Zero gas - range 4:	*ZEROGAS4*

F: 0	*F: 1*	*M: 55*	*M: 53*	*M: 12*
HOME	**ESCAPE**	**NEXT**	**BACK**	**INFO**

Menu: 55 APARLST7

Analyzer Parameter List
Calibration Gases

NO Span gas - range 1:	*NOSPANGAS1*
NO Span gas - range 2:	*NOSPANGAS2*
NO Span gas - range 3:	*NOSPANGAS3*
NO Span gas - range 4:	*NOSPANGAS4*
NOx Span gas - range 1:	*NOXSPANGAS1*
NOx Span gas - range 2:	*NOXSPANGAS2*
NOx Span gas - range 3:	*NOXSPANGAS3*
NOx Span gas - range 4:	*NOXSPANGAS4*

F: 0	*F: 1*	*M: 7*	*M: 54*	*M: 12*
HOME	**ESCAPE**	**FIRST**	**BACK**	**INFO**

Menu: 56 LISTNOTES

Analyzer module service notes
You can write up to 22 characters in each line.

ANALSERNOTEA
ANALSERNOTEB
ANALSERNOTEC
ANALSERNOTED
ANALSERNOTEE
ANALSERNOTEF
ANALSERNOTEG
ANALSERNOTEH
ANALSERNOTEI

F: 0	F: 1	M: 16
HOME	ESCAPE	INFO

Menu: 57 AMMISC2

Analyzer start up
(Press INIT to re-initialize the EEPROM data)

Analyzer state: *OPSTATUS*

Sensor temperature: *TEMP_IS3*

Detector block temperature: *TEMP_IS2*
Target temperature: *BLOK_SETP*

Converter temperature: *TEMP_IS1*

F: 0	F: 1	F: 8	M: 100	M: 58
HOME	ESCAPE	REBOOT	INIT.	INFO

Menu: 58 AMMISCI2

Start up screen - CLD analyzer
This screen shows the actual and target temperatures
of the critical internal components.

To restart, press the center softkey.

Run zero gas through the analyzer during
this time: the NO reading should be 0.

Press INIT to re-initialize the EEPROM data.

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 59 MPARMS

Current measurement parameters

Analyzer gas measured:	*GAS*
Measurement range number:	*CRANGE*
Range change control:	*CONTROL*
Linearization mode:	*CURRENTLSTAT*
Analyzer operational state:	*OPSTATUS*
Analyzer alarm state:	*GENERALSTATE*
Alarms reported:	*ALARM_LVL*

F: 0	*F: 1*	*M: 60*	*M: 64*
HOME	**ESCAPE**	**MORE**	**INFO**

Menu: 60 MPARMS2

Current measurement parameters

Response time:	*CURRENTRSPNS*
Bypass flow:	*FLOW_IS*
Capillary pressure:	*PRES_IS1*
Detector temperature:	*TEMP_IS3*

F: 0	*F: 1*	*M: 59*	*M: 64*
HOME	**ESCAPE**	**MORE**	**INFO**

Menu: 61 DISPLAY

Displayed parameters

First line's parameter:	*SVNAME1*
Second line's parameter:	*SVNAME2*
Third line's parameter:	*SVNAME3*
Fourth line's parameter:	*SVNAME4*

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

F: 0	*F: 1*	*M: 47*
HOME	**ESCAPE**	**INFO**

Menu: 62 ANALSET2

Gas Measurement Parameters	
Linearization parameters...	*M: 30, LINRANGE0*
Response time/delay parameters...	*M: 33, FILTER*
Range setting...	*M: 24, RANGESETAM*
Units...	*M: 91, UNITS*
Linearization functions...	*M: 71, LINFUNCT*

F: 0 **HOME** *F: 1* **ESCAPE** *M: 66* **INFO**

Menu: 63 AMHELPINDEX2

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

Function:	*PATH*
Select:	*PATHA*
Then:	*PATHB*
Then:	*PATHC*
Then:	*PATHD*

F: 0 **HOME** *F: 4* **ESCAPE** *M: 47* **INFO**

Menu: 64 MPARMSI1

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

F: 0 **HOME** *F: 4* **ESCAPE** *M: 47* **INFO**

Menu: 65 AMPWR2

Analyzer diagnostics
Power supply voltages

+10V analog is:	*VOLTS_IS6*
+10V analog was:	*AMVOLTSWAS6*
+5V reference is:	*REFVOLTS_IS1*
+5V reference was:	*REFVOLTSWAS1*
+10V reference is:	*REFVOLTS_IS2*
+10V reference was:	*REFVOLTSWAS2*

F: 0 **HOME** *F: 1* **ESCAPE** *F: 1* **BACK** *M: 121* **INFO**

Menu: 66 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 analyzer outputs in time.
Set the upper and lower range limits in Range settings.

F: 0 **HOME** *F: 4* **ESCAPE** *M: 47* **INFO**

Menu: 67 AMMISC3

Temperature control

Ozonator setpoint:	*OZON_SETP*
Ozonaotor P gain:	*OZON_PGAIN*
Ozonator I gain:	*OZON_IGAIN*
Ozonator bias:	*OZON_BIAS*
Ozonator temperature:	*TEMP_IS4*
Minimum full-on block FET current:	*BLOCK_THRESH*

F: 0 **HOME** *F: 1* **ESCAPE** *M: 36* **INFO**

Menu: 68 SOFT_DIAGS

Software diagnostics	
Last message:	*SW_DIAG1A*
And:	*SW_DIAG1B*
And:	*SW_DIAG1C*
And:	*SW_DIAG1D*
And:	*SW_DIAG2A*
And:	*SW_DIAG2B*
And:	*SW_DIAG2C*
And:	*SW_DIAG2D*
Edit to reset:	*SW_RESET*

F: 0 HOME — *F: 1* ESCAPE — *M: 47* INFO

Menu: 69 CALI1

Calibration info

In the calibration parameter screen 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 limits and try again.
First check that your calibration gases are correct.

If you use non-zero zero gases, or the changes are

F: 0 HOME — *F: 4* ESCAPE — *M: 47* INFO

Menu: 70 AM2VB

Physical Measurements	
Manufacturer's settings.	
Sample capillary pressure:	*HIST2V_1*
Ozone supply pressure:	*HIST2V_2*
Converter temperature:	*HIST2T_1*
Sensor temperature:	*HIST2T_2*
Block temperature:	*HIST2T_3*

F: 0 HOME — *F: 1* ESCAPE — *M: 32* INFO

Menu: 71 LINFUNCT

Linearization functions

Polynomial set up...	*M: 72, POLYSETUP*
Midpoint correction set up...	*M: 73, MIDPOINT1*

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

F: 0	*F: 1*	*M: 47*
HOME	ESCAPE	INFO

Menu: 72 POLYSETUP

Polynomial set up

Range to be linearized:	*CRANGE*
Current span gas:	*CURRENTSPAN*
Calculated polynomial order:	*LIN_ORDER*
Gas values shown as:	*LIN_UNITS*
Gas concentrations...	*M: 74, POLYGAS1*

F: 0	*F: 1*	*F: 10*	*M: 75*
HOME	ESCAPE	CALC	INFO

Menu: 73 MIDPOINT1

Midpoint correction set up
Range 1

Correction:	*TWEAK1*
Point being measured:	*MEASUREPOINT*
Point 1 gas concentration:	*MID_GASA1*
Point 2 gas concentration:	*MID_GASA2*
Point 3 gas concentration:	*MID_GASA3*
Point 1 reading:	*MIDPOINTA1*
Point 2 reading:	*MIDPOINTA2*
Point 3 reading:	*MIDPOINTA3*
Span gas value:	*SPAN_THEN1*

F: 0	*F: 1*	*F: 9*	*M: 85*	*M: 96*
HOME	ESCAPE	SET	RANGE 2	INFO

Menu: 74 POLYGAS1

Gas concentrations	
Point 1	
Gas value:	*LIN_GASESA1*
Raw reading:	*LIN_MEASA1*
Linearized value:	*LIN_RESULTA1*
Point 2	
Gas value:	*LIN_GASESA2*
Raw reading:	*LIN_MEASA2*
Linearized value:	*LIN_RESULTA2*
Point to be measured:	*LIN_VAR_ID*

F: 0	*F: 1*	*F: 11*	*M: 76*	*M: 75*
HOME	ESCAPE	DATA	NEXT	INFO

Menu: 75 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

F: 0	*F: 4*	*M: 93*		*M: 47*
HOME	ESCAPE	MORE		INFO

Menu: 76 POLYGAS2

Gas concentrations	
Point 3	
Gas value:	*LIN_GASESA3*
Raw reading:	*LIN_MEASA3*
Linearized value:	*LIN_RESULTA3*
Point 4	
Gas value:	*LIN_GASESA4*
Raw reading:	*LIN_MEASA4*
Linearized value:	*LIN_RESULTA4*
Point to be measured:	*LIN_VAR_ID*

F: 0	*F: 1*	*F: 11*	*M: 77*	*M: 75*
HOME	ESCAPE	DATA	NEXT	INFO

Menu: 77 POLYGAS3

Gas concentrations	
Point 5	
Gas value:	*LIN_GASESA5*
Raw reading:	*LIN_MEASA5*
Linearized value:	*LIN_RESULTA5*
Point 6	
Gas value:	*LIN_GASESA6*
Raw reading:	*LIN_MEASA6*
Linearized value:	*LIN_RESULTA6*
Point to be measured:	*LIN_VAR_ID*

F: 0	*F: 1*	*F: 11*	*M: 78*	*M: 75*
HOME	**ESCAPE**	**DATA**	**NEXT**	**INFO**

Menu: 78 POLYGAS4

Gas concentrations	
Point 7	
Gas value:	*LIN_GASESA7*
Raw reading:	*LIN_MEASA7*
Linearized value:	*LIN_RESULTA7*
Point 8	
Gas value:	*LIN_GASESB1*
Raw reading:	*LIN_MEASB1*
Linearized value:	*LIN_RESULTB1*
Point to be measured:	*LIN_VAR_ID*

F: 0	*F: 1*	*F: 11*	*M: 79*	*M: 75*
HOME	**ESCAPE**	**DATA**	**NEXT**	**INFO**

Menu: 79 POLYGAS5

Gas concentrations	
Point 9	
Gas value:	*LIN_GASESB2*
Raw reading:	*LIN_MEASB2*
Linearized value:	*LIN_RESULTB2*
Point 10	
Gas value:	*LIN_GASESB3*
Raw reading:	*LIN_MEASB3*
Linearized value:	*LIN_RESULTB3*
Point to be measured:	*LIN_VAR_ID*

F: 0	*F: 1*	*F: 11*	*M: 80*	*M: 75*
HOME	**ESCAPE**	**DATA**	**NEXT**	**INFO**

Menu: 80 POLYGAS6

Gas concentrations	
Point 11	
Gas value:	*LIN_GASESB4*
Raw reading:	*LIN_MEASB4*
Linearized value:	*LIN_RESULTB4*
Point 12	
Gas value:	*LIN_GASESB5*
Raw reading:	*LIN_MEASB5*
Linearized value:	*LIN_RESULTB5*
Point to be measured:	*LIN_VAR_ID*

F: 0	*F: 1*	*F: 11*	*M: 81*	*M: 75*
HOME	**ESCAPE**	**DATA**	**NEXT**	**INFO**

Menu: 81 POLYGAS7

Gas concentrations	
Point 13	
Gas value:	*LIN_GASESB6*
Raw reading:	*LIN_MEASB6*
Linearized value:	*LIN_RESULTB6*
Point 14	
Gas value:	*LIN_GASESB7*
Raw reading:	*LIN_MEASB7*
Linearized value:	*LIN_RESULTB7*
Point to be measured:	*LIN_VAR_ID*

F: 0	*F: 1*	*F: 11*	*M: 82*	*M: 75*
HOME	**ESCAPE**	**DATA**	**NEXT**	**INFO**

Menu: 82 POLYGAS8

Gas concentrations	
Point 15	
Gas value:	*LIN_GASESC1*
Raw reading:	*LIN_MEASC1*
Linearized value:	*LIN_RESULTC1*
Point16	
Gas value:	*LIN_GASESC2*
Raw reading:	*LIN_MEASC2*
Linearized value:	*LIN_RESULTC2*
Point to be measured:	*LIN_VAR_ID*

F: 0	*F: 1*	*F: 11*	*M: 83*	*M: 75*
HOME	**ESCAPE**	**DATA**	**NEXT**	**INFO**

Menu: 83 POLYGAS9

Gas concentrations	
Point 17	
Gas value:	*LIN_GASESC3*
Raw reading:	*LIN_MEASC3*
Linearized value:	*LIN_RESULTC3*
Point 18	
Gas value:	*LIN_GASESC4*
Raw reading:	*LIN_MEASC4*
Linearized value:	*LIN_RESULTC4*
Point to be measured:	*LIN_VAR_ID*

F: 0	*F: 1*	*F: 11*	*M: 84*	*M: 75*
HOME	**ESCAPE**	**DATA**	**NEXT**	**INFO**

Menu: 84 POLYGAS0

Gas concentrations	
Point 19	
Gas value:	*LIN_GASESC5*
Raw reading:	*LIN_MEASC5*
Linearized value:	*LIN_RESULTC5*
Point 20	
Gas value:	*LIN_GASESC6*
Raw reading:	*LIN_MEASC6*
Linearized value:	*LIN_RESULTC6*
Point to be measured:	*LIN_VAR_ID*

F: 0	*F: 1*	*F: 11*	*M: 72*	*M: 75*
HOME	**ESCAPE**	**DATA**	**BACK**	**INFO**

Menu: 85 MIDPOINT2

Midpoint correction set up	
Range 2	
Correction:	*TWEAK2*
Point being measured:	*MEASUREPOINT*
Point 1 gas concentration:	*MID_GAS4*
Point 2 gas concentration:	*MID_GAS5*
Point 3 gas concentration:	*MID_GAS6*
Point 1 reading:	*MIDPOINTA4*
Point 2 reading:	*MIDPOINTA5*
Point 3 reading:	*MIDPOINTA6*
Span gas value:	*SPAN_THEN2*

F: 0	*F: 1*	*F: 9*	*M: 86*	*M: 96*
HOME	**ESCAPE**	**SET**	**RANGE 3**	**INFO**

Menu: 86 MIDPOINT3

Midpoint correction set up				
Range 3				
Correction:				*TWEAK3*
Point being measured:				*MEASUREPOINT*
Point 1 gas concentration:				*MID_GASB1*
Point 2 gas concentration:				*MID_GASB2*
Point 3 gas concentration:				*MID_GASB3*
Point 1 reading:				*MIDPOINTB1*
Point 2 reading:				*MIDPOINTB2*
Point 3 reading:				*MIDPOINTB3*
Span gas value:				*SPAN_THEN3*
F: 0	*F: 1*	*F: 9*	*M: 87*	*M: 96*
HOME	**ESCAPE**	**SET**	**RANGE 4**	**INFO**

Menu: 87 MIDPOINT4

Midpoint correction set up				
Range 4				
Correction:				*TWEAK4*
Point being measured:				*MEASUREPOINT*
Point 1 gas concentration:				*MID_GASB4*
Point 2 gas concentration:				*MID_GASB5*
Point 3 gas concentration:				*MID_GASB6*
Point 1 reading:				*MIDPOINTB4*
Point 2 reading:				*MIDPOINTB5*
Point 3 reading:				*MIDPOINTB6*
Span gas value:				*SPAN_THEN4*
F: 0	*F: 1*	*F: 9*	*M: 71*	*M: 96*
HOME	**ESCAPE**	**SET**	**BACK**	**INFO**

Menu: 88 EXP_CAL

Zero/span calibration				
Measurement range number:				*CRANGE*
Zero gas concentration:				*CURRENTZERO*
Span gas concentration:				*CURRENTSPAN*
Sample flow:				*FLOW_IS*
Raw measurement signal:				*RAW_SIGNAL*
Measurement gas:				*NO_NOX*
NO/NOx toggle!				*F: 5, NO_NOXTOGGLE*
Status:				*CALSTAT*
Result...				*M: 89, EXP_CAL_DAT*
F: 0	*M: 46*	*M: 111*	*M: 112*	*M: 3*
HOME	**FACTORS**	**ZERO**	**SPAN**	**INFO**

Menu: 89 EXP_CAL_DAT

Zero/span diagnostic data

Date of last zero:	*CALDATE_Z*
Error message for last zero:	*CAL_ERR_MSG1*
Error percentage for last zero:	*CALRESULT1*
Raw signal at last zero:	*CAL_RAWSIG1*
Last zero gas would read:	*LASTZERO*
Date of last span:	*CALDATE_S*
Error message for last span:	*CAL_ERR_MSG2*
Error percentage for last span:	*CALRESULT2*
Raw signal at last span:	*CAL_RAWSIG2*

F: 0	F: 1	M: 46	M: 90
HOME	ESCAPE	FACTORS	INFO

Menu: 90 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.

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 91 UNITS

Units

Gas measurement units:	*FVU*
Pressure measurement units:	*FPU*
Temperature measurement units:	*FTU*
ppm to mg/Nm3 conversion factor:	*PPM2MG*
Lower explosion limit (LEL):	*EX_LIMITS1*
Upper explosion limit (UEL):	*EX_LIMITS2*

F: 0	F: 1	M: 92
HOME	ESCAPE	INFO

Menu: 92 UNITSI1

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.

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 93 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.

F: 0	F: 4	M: 94	M: 75	M: 47
HOME	ESCAPE	MORE	BACK	INFO

Menu: 94 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

F: 0	F: 4	M: 93	M: 47
HOME	ESCAPE	BACK	INFO

Menu: 95 ZEROI3

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.

F: 0 HOME | F: 4 ESCAPE | M: 47 INFO

Menu: 96 TWEAKI1

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

F: 0 HOME | F: 4 ESCAPE | M: 97 MORE | M: 47 INFO

Menu: 97 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.

F: 0 HOME | F: 4 ESCAPE | M: 96 BACK | M: 47 INFO

Menu: 98 RESET

```
REBOOT

Are you sure?

REBOOT will erase ALL the configuration and
manufacturing data, including serial numbers and
everything else.

If you are sure, press RESET again.

F:0         F:1                          F:8         M:14
HOME        ESCAPE                       REBOOT      INFO
```

Menu: 99 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.

F:0         F:1         F:12                         M:14
HOME        ESCAPE      STORE                        INFO
```

Menu: 100 INIT

```
INIT

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.

F:0         F:1         F:8                          M:14
HOME        ESCAPE      INIT.                        INFO
```

Menu: 101 RFACTORSI

```
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

F: 0      F: 4                          M: 47
HOME      ESCAPE                        INFO
```

Menu: 102 RFHIST

```
Range 1 Factors
Manufacturer's settings.
Zero offset:                         ZEROWAS1
Span factor:                         SPANWAS1

Stored settings
Zero offset:                       ZERO_GOOD1
Span factor:                       SPAN_GOOD1

F: 0      M: 103    F: 12     F: 12     M: 101
HOME      NEXT      RSTR MN   RSTR ST   INFO
```

Menu: 103 RFHIST2

```
Range 2 Factors
Manufacturer's settings.
Zero offset:                         ZEROWAS2
Span factor:                         SPANWAS2

Stored settings
Zero offset:                       ZERO_GOOD2
Span factor:                       SPAN_GOOD2

F: 0      M: 107    F: 12     F: 12     M: 101
HOME      NEXT      RSTR MN   RSTR ST   INFO
```

Menu: 104 RFACTORS

Range 1 Factors

Zero offset:	*ZERO1*
Span factor:	*SPAN1*
Full scale range at calibration:	*CALRNGHI1*
Measurement range number:	*CRANGE*
Raw measurement signal:	*RAW_SIGNAL*

F: 0	*F: 12*	*M: 105*	*M: 102*	*M: 101*
HOME	**STORE**	**NEXT**	**HISTORY**	**INFO**

Menu: 105 R2FACTORS

Range 2 Factors

Zero offset:	*ZERO2*
Span factor:	*SPAN2*
Full scale range at calibration:	*CALRNGHI2*
Measurement range number:	*CRANGE*
Raw measurement signal:	*RAW_SIGNAL*

F: 0	*F: 12*	*M: 106*	*M: 103*	*M: 101*
HOME	**STORE**	**NEXT**	**HISTORY**	**INFO**

Menu: 106 RN3FACTORS

Range 3 Factors

Zero offset:	*ZERO3*
Span factor:	*SPAN3*
Full scale range at calibration:	*CALRNGHI3*
Measurement range number:	*CRANGE*
Raw measurement signal:	*RAW_SIGNAL*

F: 0	*F: 12*	*M: 109*	*M: 107*	*M: 101*
HOME	**STORE**	**NEXT**	**HISTORY**	**INFO**

Menu: 107 RFHIST3

Range 3 Factors	
Manufacturer's settings.	
Zero offset:	*ZEROWAS3*
Span factor:	*SPANWAS3*
Stored settings	
Zero offset:	*ZERO_GOOD3*
Span factor:	*SPAN_GOOD3*

F: 0	*M: 108*	*F: 12*	*F: 12*	*M: 101*
HOME	**NEXT**	**RSTR MN**	**RSTR ST**	**INFO**

Menu: 108 RFHIST4

Range 4 Factors	
Manufacturer's settings.	
Zero offset:	*ZEROWAS4*
Span factor:	*SPANWAS4*
Stored settings	
Zero offset:	*ZERO_GOOD4*
Span factor:	*SPAN_GOOD4*

F: 0	*M: 102*	*F: 12*	*F: 12*	*M: 101*
HOME	**FIRST**	**RSTR MN**	**RSTR ST**	**INFO**

Menu: 109 RN4FACTORS

Range 4 Factors	
Zero offset:	*ZERO4*
Span factor:	*SPAN4*
Full scale range at calibration:	*CALRNGHI4*
Measurement range number:	*CRANGE*
Raw measurement signal:	*RAW_SIGNAL*

F: 0	*F: 12*	*M: 104*	*M: 108*	*M: 101*
HOME	**STORE**	**FIRST**	**HISTORY**	**INFO**

Menu: 110 STOREPVA

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.

F: 0	F: 4	M: 47
HOME	ESCAPE	INFO

Menu: 111 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: *CALSTAT*

F: 0	F: 1	F: 6	M: 69
HOME	ESCAPE	ZERO	INFO

Menu: 112 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: *CALSTAT*

F: 0	F: 1	F: 7	M: 69
HOME	ESCAPE	SPAN	INFO

Menu: 113 NEW_CONV

New converter

Are you sure?

Pressing the
date as the installation date for the converter and will reset the converter hours of operation counter to zero. This should only be done when a new converter has just been installed.

Converter installation date: *CONV_DATE*

F: 0	*F: 1*	*F: 13*	*M: 16*
HOME	ESCAPE	NEW CONV	INFO

Menu: 114 FLOWBALANCE

NO/NOx flow balance

NOx correction factor: *FLOW_BALANCE*

Calculate factor using pressure ratio... *M: 115, FLOWBALCALC1*

Calculate factor using span gas response ratio... *M: 116, FLOWBALCALC*

F: 0	*F: 1*	*M: 117*
HOME	ESCAPE	INFO

Menu: 115 FLOWBALCALC1

Calculate factor using pressure ratio

This procedure will calculate the NO/NOx flow balance correction factor by measuring the capillary head pressure used in both the NO and NOx modes and using the ratio between the two pressures as the correction factor.

Press the CALC softkey to start the measurement and calculation.

F: 0	*F: 1*	*F: 14*	*M: 117*
HOME	ESCAPE	CALC	INFO

Menu: 116 FLOWBALCALC2

Calculate factor using span gas response ratio

This procedure will calculate the NO/NOx flow balance correction factor by flowing a span gas in both modes and using the ratio between the readings as the correction factor.

Press the CALC sofkey when span gas is flowing to the analyzer to start the measurement and calculation.

F: 0	F: 1	F: 14	M: 117
HOME	ESCAPE	CALC	INFO

Menu: 117 FLOWBALI1

NO/NOx flow balance

Since the sample flows through different paths in the NO and NOx modes of analysis, there are differences in the flows entering the reaction chamber in the two modes. The CLD analyzer uses a correction factor in NOx mode to compensate for the reduced flow rate. This correction factor can be entered manually or it can be calculated by the analyzer using one of two methods: One is based on adjusting to respond equally to a span gas and the other is based on adjusting for

F: 0	F: 1	M: 118	M: 117
HOME	ESCAPE	MORE	INFO

Menu: 118 FLOWBALI2

NO/NOx flow balance

To start an automatic measurement/calculation cycle, enter the appropriate menu (choose either pressure or span gas based correction), and follow the directions on the screen.

It is recommended that you flow the gas at the same pressure and flow rate as your sample gas.

F: 0	F: 1	M: 117	M: 117
HOME	ESCAPE	BACK	INFO

Menu: 119 DIAG_VOLTS_

Enter your text here
Power supply voltages M: 18, AMPWR
Power supply voltages M: 120, AMPWR_CLD2

F: 15, DIAG_VOLTS_L

M: 0 F: 1 M: 117 M: 117
HOME ESCAPE MORE BACK INFO

Menu: 120 AMPWR_CLD2

Analyzer diagnostics
Power supply voltages
+15V analog is: VOLTS_IS1
+15V analog was: AMVOLTSWAS1
-15V analog is: VOLTS_IS2
-15V analog was: AMVOLTSWAS2
+5V digital is: VOLTS_IS3
+5V digital was: AMVOLTSWAS3

+12V analog is: VOLTS_IS5

F: 0 F: 1 M: 65 M: 121
HOME ESCAPE MORE INFO

Menu: 121 AMPWRI1_CLD2

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.

F: 0 F: 4 M: 47
HOME ESCAPE INFO

Menu: 122 AM2VA2

Temperature limits... *M: 39, TLIMITSA*

F: 0 HOME | *F: 1* ESCAPE | *M: 70* HISTORY | *M: 32* INFO

Menu: 123 ALARM1

Concentration Alarm Setup

Alarm generation is:	*FVALIMFUNC*
Level for Low-Low alarm:	*FVALIMVAL1*
Level for Low alarm:	*FVALIMVAL2*
Level for High alarm:	*FVALIMVAL3*
Level for High-High alarm:	*FVALIMVAL4*
Alarm delay:	*ALARMDELAY*
Low-Low alarm:	*FVALIMSTA1*
Low alarm:	*FVALIMSTA2*
High alarm:	*FVALIMSTA3*

F: 0 HOME | *F: 1* ESCAPE | *F: 17* ACKN

Menu: 124 ABOUT

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F: 0 Measure | *F: 1* Back... | *M: 125* More...

Menu: 125 ABOUT1

-- Analyzer Module Version Information --	
Serial number:	*AMSN*
Manufacturing date:	*AMMFGDATE*
Hardware revision:	*AMHR*
Software revision:	*AMSR*
Revision date:	*REV_DATE*
Revision time:	*REV_TIME*
F: 0	*F: 1*
Measure	**Back...**

Menu: 126 MANDATA

-- Manufacturing data...--	
Serial number:	*AMSN*
Set manufacturing date!	*F: 18, AMSETMDATE*
Actual date:	*AM_TIME*
F: 0	*F: 1*
Measure	**Back...**

NOTES