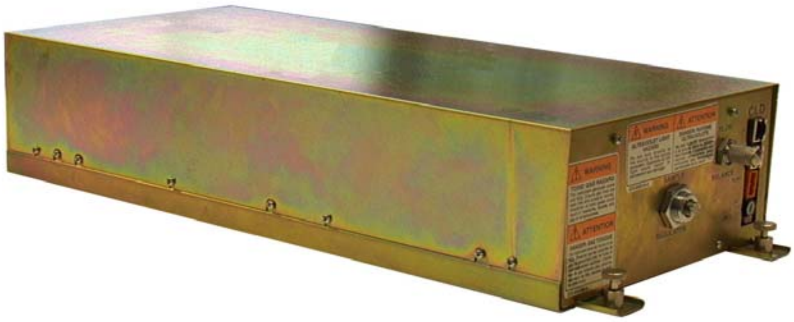
Instruction Manual
HAS60E-IM-HW
04/2008

Instruction Manual

Chemiluminescence Detector
CLD Analyzer Module (combined with NGA 2000 Platform,
MLT, CAT 200 or TFID Analyzer)

2nd Edition 04/2008



ROSEMOUNT® Analytical

www.EmersonProcess.com

EMERSON™ Process Management

ESSENTIAL INSTRUCTIONS

READ THIS PAGE BEFORE PROCEEDING!

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

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

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

1st Edition 06/2007
2nd Edition 04/2008

Emerson Process Management
GmbH & Co. OHG
Industriestrasse 1
D-63594 Hasselroth
Germany
T +49 (0) 6055 884-0
F +49 (0) 6055 884-209
Internet: www.EmersonProcess.com

Cert. Reg. No. 254969 QM

EMERSON
Process Management

Table of Contents

PREFACE

The purpose of this manual is to provide information concerning the components, functions, installation and maintenance of the NGA 2000 CLD and the System Accessories of the NGA 2000 System.

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

DEFINITIONS

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

WARNING

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

CAUTION

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

NOTE

Highlights an essential operating procedure, condition or statement.

IMPORTANT

SAFETY INSTRUCTIONS
WIRING AND INSTALLATION OF THIS APPARATUS

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

1. Adequate earth connections should be made to all earthing points, internal and external, where provided.
2. After installation or troubleshooting, all safety covers and safety grounds must be replaced. The integrity of all earth terminals must be maintained at all times.
3. To ensure safe operation of this equipment, connection to the mains supply should only be made through a circuit breaker which will disconnect all circuits carrying conductors during a fault situation. The circuit breaker may also include a mechanically operated isolating switch. Circuit breakers or switches must comply with a recognized standard such as IEC947. All wiring must conform with any local standards.
4. Where equipment or covers are marked with the symbol to the right, hazardous voltages are likely to be present beneath. These covers should only be removed when power is removed from the equipment — and then by trained service personnel only.

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

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

7. Further graphical symbols used in this product:

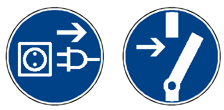
Elektrostatic discharge (ESD)

Explosion Hazard!

UV Source!

Harmful (to Health)!

Toxic!



Disconnect from Mains!

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

OPERATING AND MAINTAINING THIS APPARATUS

This instrument has left the factory in compliance with all applicable safety regulations.
To maintain this operating condition, the user must strictly follow the instructions and consider the warnings in this manual or provided on the instrument.

Before switching on the instrument, verify that the electrical supply voltage matches the instrument´s operating voltage as set in the factory.

Any interruption in the instrument´s ground line, whether inside or outside the instrument, or removal or interruption of its ground line connection, could result in hazardous operating conditions. Intentionally interrupting the instrument´s protective ground is strictly prohibited.

Opening cover panels could expose voltage-carrying components. Connectors may also be under voltage. The instrument must be disconnected from all electrical supplies before attempting any calibrations, maintenance operations, repairs or component replacements requiring opening of the instrument. Any calibrations, maintenance operations, or repairs that need the instrument to be opened while connected to electrical supplies should be subject to qualified technicians familiar with the hazards involved only!

Use only fuses of the correct type and current ratings as replacements. Using repaired fuses and short circuiting of fuse holders is prohibited.

Observe all applicable regulations when operating the instrument from an auto-transformer or variac.

Substances hazardous to health may emerge from the instrument‘s exhaust.

Please pay attention to the safety of your operation personnel. Protective measures must be taken, if required.

NOTE

Software compatibility is necessary for all NGA 2000 components in your system to work together. The version of your Platform’s software must be equal to or greater than the version of any other module(s) for successful compatibility.

You can locate the version of each NGA 2000 component as follows:

<u>Platform Controller Board</u>

Turn power ON. The display should show „Control Module V3. ...“. This is the software version.

<u>Analyzer Module</u>

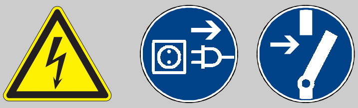
See note on the name plate label located on the right side of the Analyzer Module case.

SAFETY SUMMARY

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

AUTHORIZED PERSONNEL

To avoid loss of life, personal injury and damage to this equipment and on-site property, do not operate or service this instrument before reading and understanding this instruction manual and receiving appropriate training. Save these instructions.



WARNING

ELECTRICAL SHOCK HAZARD !

Do not operate without covers secure. Do not open while energized. Installation and/or servicing requires access to live parts which can cause death or serious injury.

Refer servicing to qualified personnel.

For safety and proper performace 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. The user is responsible for leakage testing only at the inlet and outlet fittings on the rear panel.

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

WARNING

OVERBALANCE HAZARD

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

CAUTION

Tampering with or unauthorized substitution of components may adversely affect the safety of this instrument. Use only factory documented/approved components for repair.

Because of the danger of introducing additional hazards, do not perform any unauthorized modification to this 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.

WARNING

POSSIBLE EXPLOSION HAZARD

Ensure that all gas connections are made as labeled and described within this manual and leak free. Improper gas connections may cause explosion, serious injury or death.

CAUTION

HIGH TEMPERATURES !

While working at thermostated components inside the analyzer modules hot components may be accessible!

CAUTION

Do not interchange gas inlets and outlet! All gases must be conditioned before supplying! When supplying corrosive gases ensure that gas path components are not affected!

Exhaust lines must be installed in a descending way, need to be pressureless, frost-protected and in compliance with applicable legislative requirements!

WARNING

Before opening gas paths they must be purged with ambient air or neutral gas (N_2) to avoid hazards caused by toxic, flammable, explosive or harmful to health sample gas components!

WARNING

INTERNAL UV SOURCE !

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

WARNING

TOXIC CHEMICAL HAZARD!

The optional UV 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 is recommended.)**
- **Carefully sweep any remaining mercury and lamp debris into a dust pan. Carefully transfer all mercury, lamp residue and debris into a platic 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.**

GASES AND GAS CONDITIONING (SAMPLE HANDLING)

WARNING

Take care of the safety instructions applicable for the gases (sample gases, test gases and ozonator air)!

CAUTION

PRESSURIZED GAS

This module requires periodic use of pressurized gas. See General Precautions for Handling and Storing High Pressure Gas Cylindes, page P-6.

CAUTION

EXTERNALLY RESTRICT SAMPLE FLOW TO LESS THAN 2,200 cc/min.

No restrictor is provided in the inlet of this module. For those users who cannot externally limit sample flow, contact your local service or sales office.

POWER SUPPLY

CAUTION

Verify the power voltage at site of installation corresponds to the analyzer module´s rated voltage as given on the nameplate label!

Verify the safety instruction given by power supply unit manufacturer !

CAUTION

The mains socket has to be nearby the power supply unit and easily accessible! Disconnecting from power requires unplugging the power connector!

To comply with the CE mark requirements use only power supply units of type SL10 or equivalent units. Equivalent units must provide SELV output voltages!

Verify proper polarity when connecting DC 24 V operated analyzer modules !

ELECTROSTATIC DISCHARGE

CAUTION

The electronic parts of the Analyzer Module can be irreparably damaged if exposed to electrostatic discharge (ESD).

The instrument is ESD protected when the covers have been secured and safety precautions observed. When the housing is open, the internal components are not ESD protected anymore.

Although the electronic parts are reasonable safe to handle, you should be aware of the following considerations:

Best ESD example is when you walked across a carpet and then touched an electrical grounded metal doorknob. The tiny spark which has jumped is the result of electrostatic discharge (ESD).

You prevent ESD by doing the following:

Remove the charge from your body before opening the housing and maintain during work with opened housing, that no electrostatic charge can be built up.

Ideally you are opening the housing and working at an ESD - protecting workstation. Here you can wear a wrist trap.

However, if you do not have such a workstation, be sure to do the following procedure exactly:

Discharge the electric charge from your body. Do this by touching a device that is grounded electrically (any device that has a three - prong plug is grounded electrically when it is plugged into a power receptacle).

This should be done several times during the operation with opened housing (especially after leaving the service site because the movement on a low conducting floors or in the air might cause additional ESDs).

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 52 °C (125 °F). A flame should never be permitted to come in contact with any part of a compressed gas cylinder.
8. Do not place cylinders where they may become part of an electric circuit. When electric arc welding, precautions must be taken to prevent striking an arc against the cylinder.

DOCUMENTATION

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

HAS60E-IM-HW	Instruction Manual NGA 2000 CLD (this document)
HAS60E-IM-SW39	Software Manual NGA 2000 CLD
90002496	Instruction Manual NGA 2000 Platform

COMPLIANCES

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

C US
185562

97-C219

Emerson Process Management 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

SUITABILITY TESTS

NO: 134 mg/Nm³
NO_2: 205 mg/Nm³

TÜV Rheinland
No. 936/806017/C
dated 8.2.1999

MCERTS
No. Sira MC 050055/00
dated 4.2.2005

GLOSSARY OF TERMS

Analyzer Module

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

Backplane

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

Control Module

The Operator Interface plus the Controller Board.

Controller Board

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

Distribution Assembly

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

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.

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, temperature and pressure.

Softkeys

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

System

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

ANALYZER SYSTEM ARCHITECTURE

The NGA 2000 CLD is available as a "stand-alone analyzer" or as a "blind" Analyzer Module (AM). The CLD analyzer module can be part of the stand-alone analyzer or a component of an analyzers system (Fig. A-1).

The NGA 2000 system made it possible, to configure the CLD as a flexible "stand-alone analyzer" consisting of a CLD "Analyzer Module", a Platform (complete with front panel display/operator interface), and input/output (I/O) modules.

The “analyzer module” is a “blind” analysis unit but retains all the advanced design features. The AM variant is designed for integration as part of a NGA 2000 analysis system or special customer developed networks.

The platform/MLT´s front panel can act as operator interface for a stand-alone analyzer or as the a central interface for multiple Analyzer Modules. In multi analyzer systems, this feature eliminates duplication of the display/operator interface. In addition to the obvious operational benefits there are significant cost and system packaging advantages not possible with conventional analyser configurations.

This flexible network communication architecture is shown in the schematic of Fig. A-2.

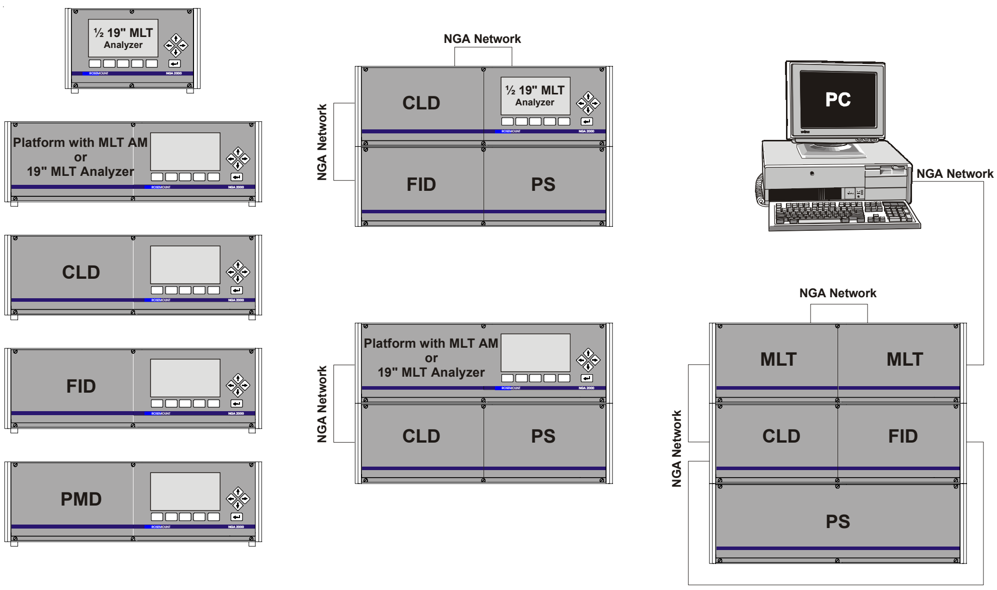


Figure A-1: From separate analyzers to analyzer system

The modular configurable bi-directional network offers the following options:

❑ Stand-alone analyzers (Single devices)

- analyzer modules in a platform including optional inputs and outputs (SIO/DIO).

❑ Simple interconnection of analyzer modules to an analyzer system based on one of the three structures - see below.

These structures can be distinguished by acting of the host

- with platform as host including system inputs and outputs (SIO/DIO)
- with MLT/TFID/CAT 200 analyzer as controller including system inputs and outputs (SIO/DIO)
- with customer owned specific control units (not described in this manual, consult factory)

For combination possibilities of NGA 2000 I/O´s see table A-1.

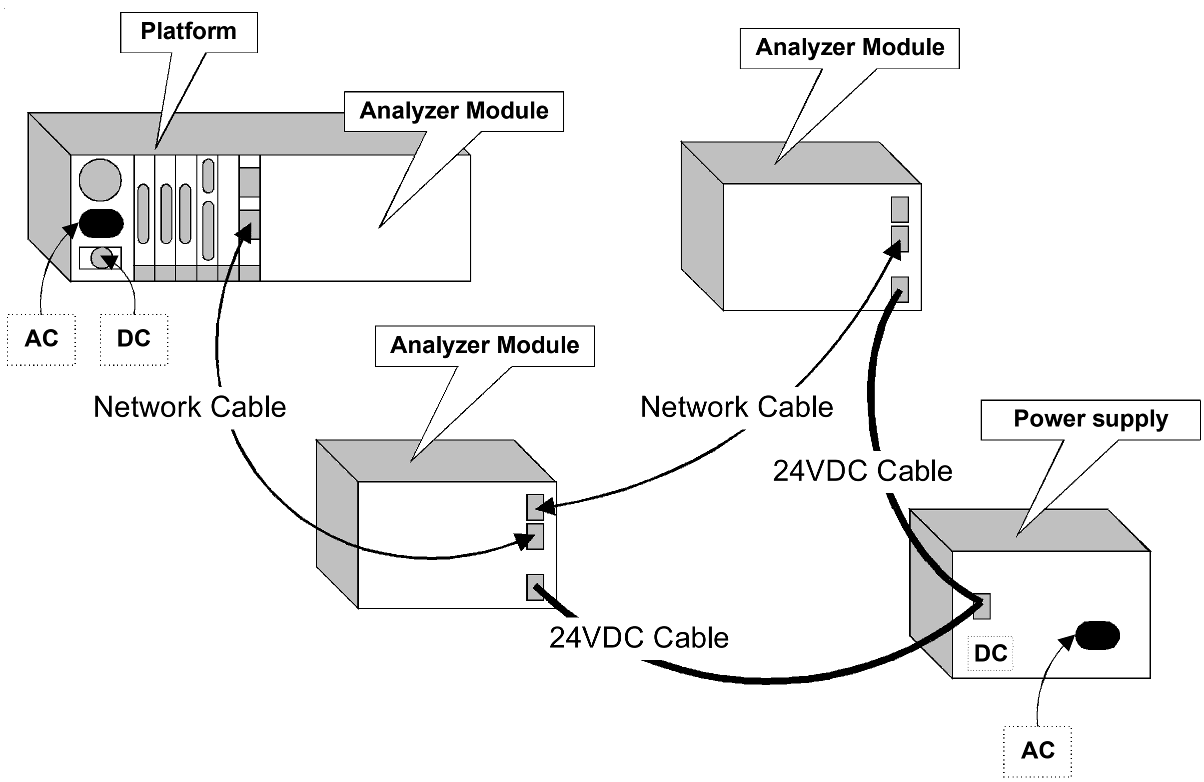


Figure A-2: Example of NGA cabling

Based on a platform, MLT or TFID analyzer the schematic on Figure A-3 illustrates the simplicity of a networked system which incorporates AM's, such as Chemiluminesence Detectors, MLT's (NDIR/UV/VIS plus Oxygen or TCD) and Flame Ionisation Detectors.

The system I/O modules (SIO, DIO) of the platform (or MLT/TFID analyzer) support all integrated analyzer modules with analog, digital and serial interfaces as well as relay outputs.

Other system functionality includes links to associated sample handling (PLC) and Data Acquisition Systems such as WinControl.

Local I/O are existing to MLT, TFID and CAT 200 analyzers only and support the corresponding analyzer module only.

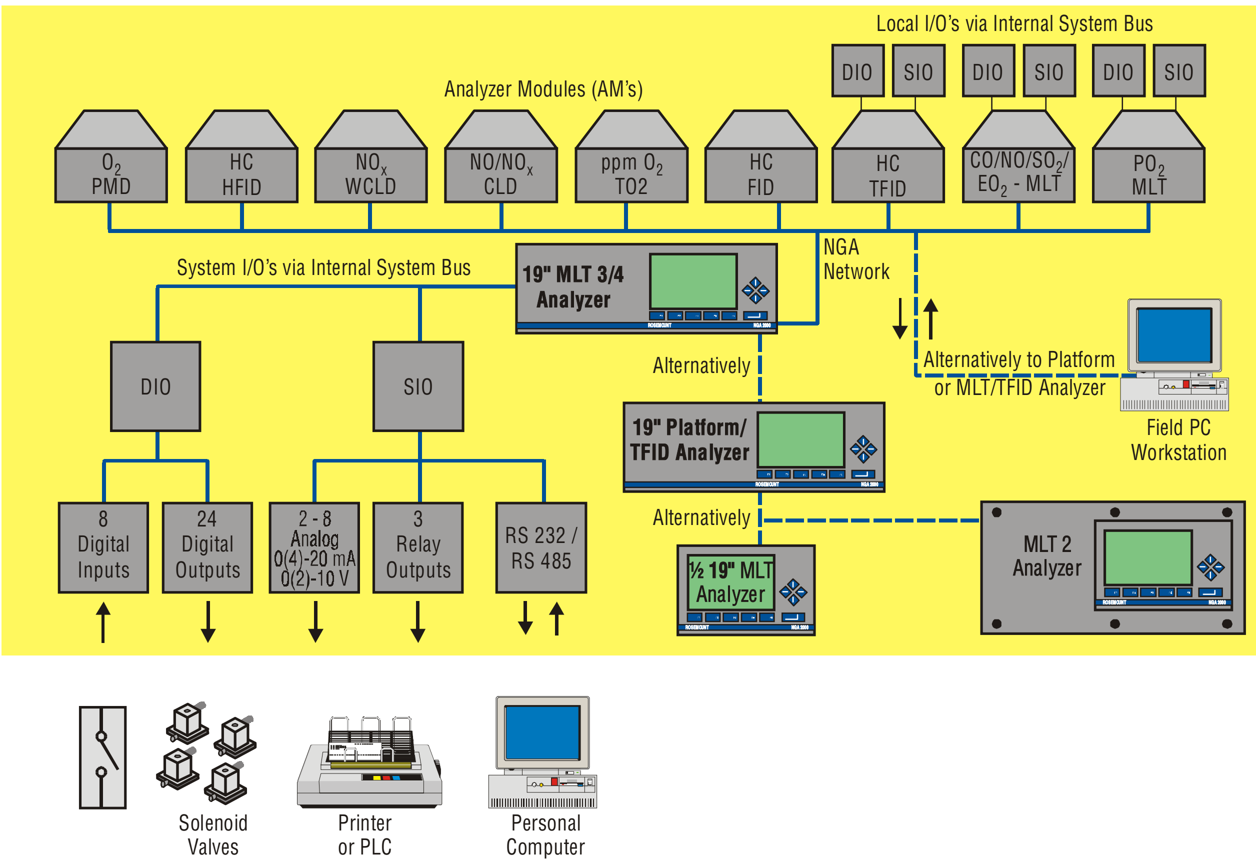


Figure A-3: Example/Possibilities of NGA Analyzer Systems

System unit	SIO/DIO-Configuration
CLD/FID/HFID analyzer module (AM): • without front panel, i.e. without control unit (host) • can be combined with a platform, a MLT analyzer, a TFID analyzer; a CAT 200 analyzer or a customer developed control unit	• **No local CLD/FID/HFID I/O's**
Platform (Control Module Software): • Control unit with front panel • Without measurement channels	• 1 SIO and up to 4 DIO's (or 5 DIO's) can be installed in the platform (CM I/O's) • SIO and DIO's can be configured for all AM channels connected to the platform
CLD analyzer • CLD analyzer module into a platform with front panel • CLD analyzer module combined with MLT/TFID/CAT 200 analyzer	• 1 SIO and 4 DIO's (or 5 DIO's) can be installed in the platform • 1 SIO and 1 DIO (or 2 DIO's) can be installed in the MLT/TFID/CAT 200 analyzer (CM I/O) • SIO and DIO can be configured for all AM's connected to the MLT/TFID/CAT 200 analyzer

Table A-1: Possibilities of NGA 2000 I/O combinations

SECTION 1
DESCRIPTION AND SPECIFICATIONS

1-1 OVERVIEW

This manual describes the Chemiluminescence (CLD) Analyzer Module of Emerson Process Mangement´s NGA 2000 Series of gas analysis components (See Figure 1-2, Figure 1-3 and Figure 1-4).

The CLD Analyzer Module is designed to continously determine the concentration of Nitric Oxide and oxides of Nitrogen (NO plus Nitrogen Dioxide [NO_2]) 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-NO_x 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 the reaction of NO 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:

$$NO + O_3 \rightarrow NO_2^* + O_2$$

$$NO_2^* \rightarrow NO_2 + \text{red light}$$

As NO and O_3 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 NO_x (NO + NO_2), any NO_2 in the sample is reduced to NO (at < 95 % efficiency) by being continously 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.

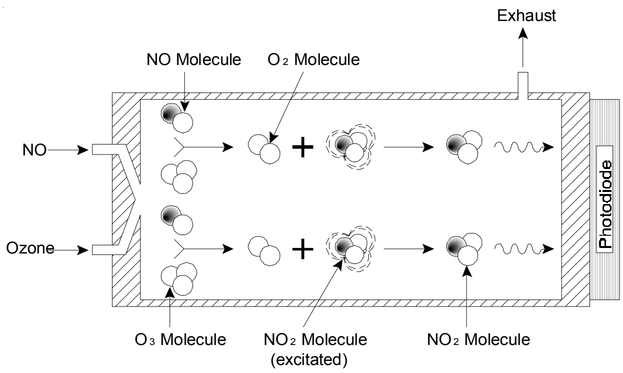


Figure 1-1: Function Principle of CLD Measurement

1-4 FEATURES

Among the features included in the CLD Analyzer Module are:

- 1) ozonator air loss shutoff and
- 2) NO/NO_x mode capability.

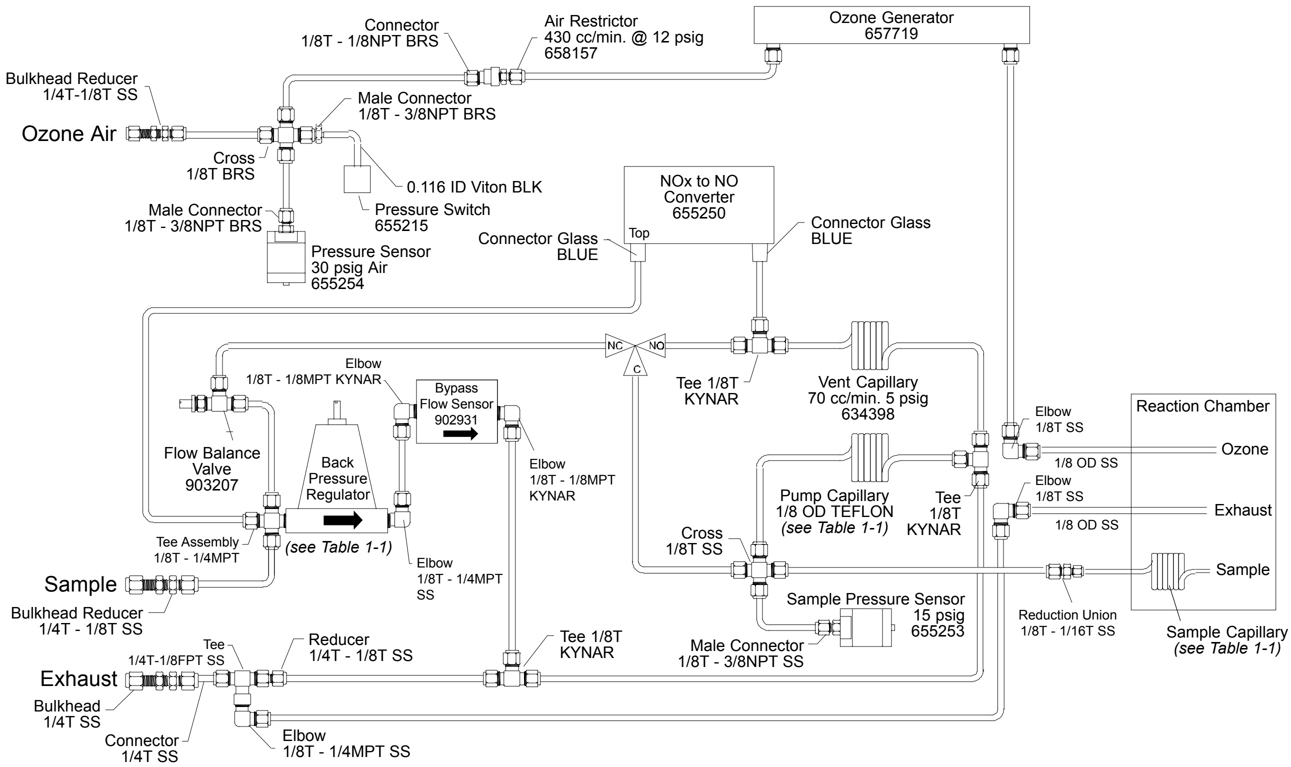


Figure 1-2: Flow Diagram - CLD Analyzer Module with Bypass Flow Sensor

Brief Description	Part Number
Sample Capillaries	
Sample Capillary 200 cc/min. @ 5 psig	659658
Sample Capillary 200 cc/min. @ 2 psig	660404
Sample Capillary 70 cc/min. @ 5 psig	659657
Sample Capillary 70 cc/min. @ 2 psig	660403
Pump Capillaries	
Pump Capillary 200 cc/min. @ 5 psig	657473
Pump Capillary 200 cc/min. @ 2 psig	660405
Back Pressure Regulators	
Back Pressure Regulator Brass 5 psig	655269
Back Pressure Regulator Stainless Steel 5 psig	659063
Back Pressure Regulator Brass 2 psig	660400
Back Pressure Regulator Stainless Steel 2 psig	660401

Table 1-1: Components depending on Module Configuration

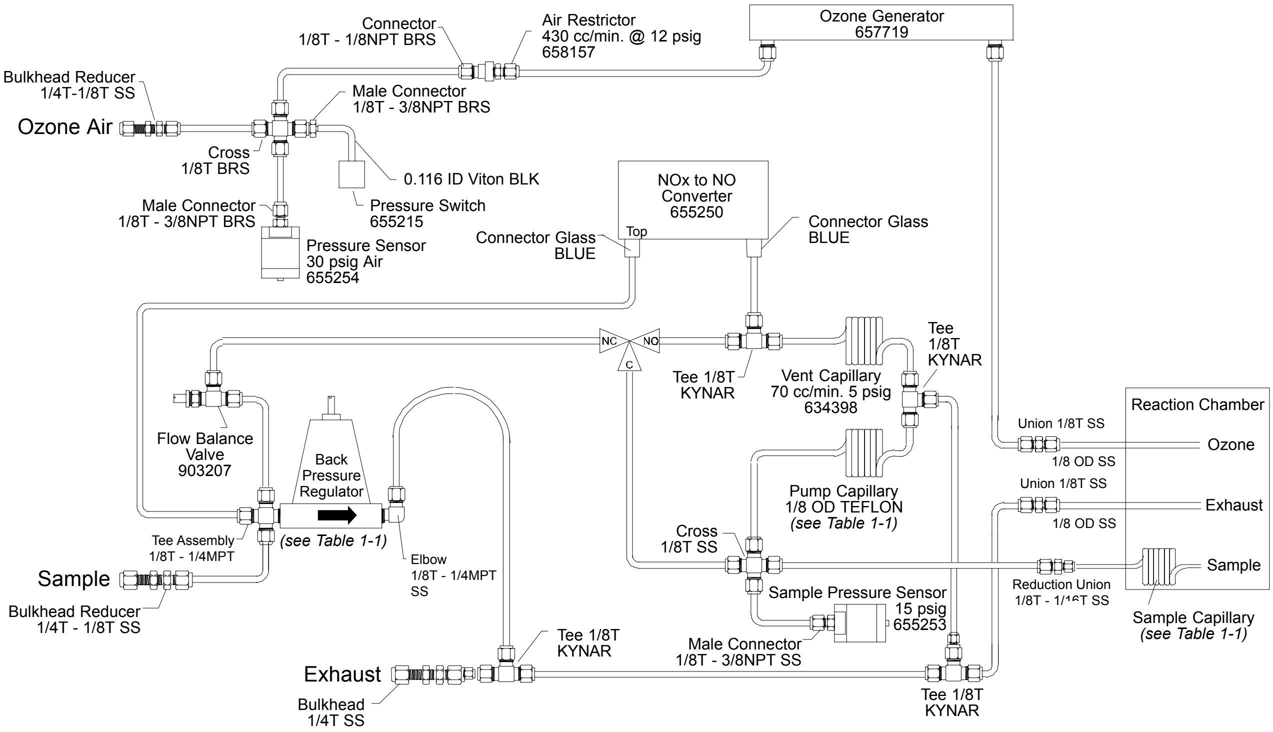


Figure 1-3: Flow Diagram - CLD Analyzer Module without Bypass Flow Sensor

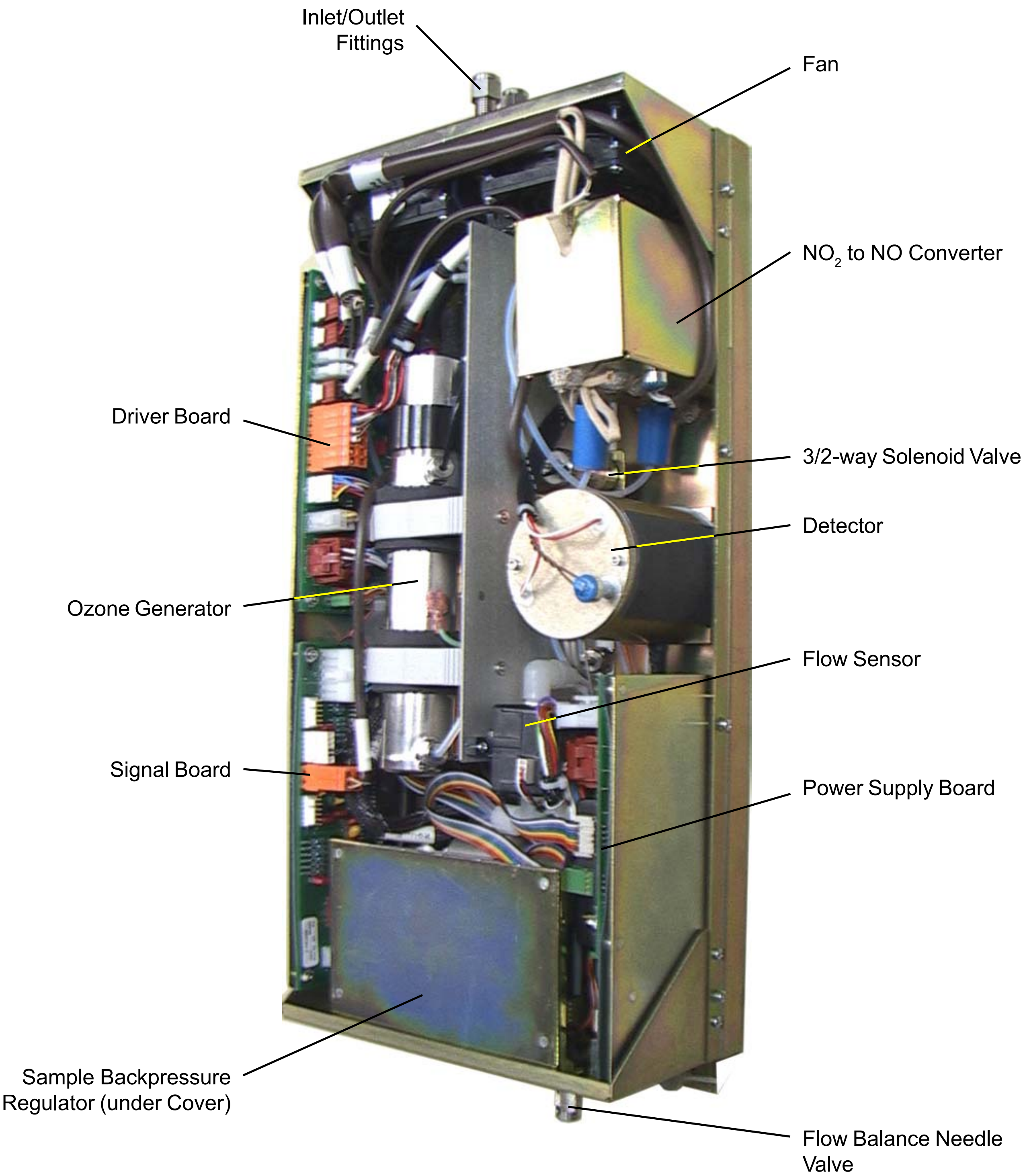


Figure 1-4: CLD Analyzer Module - Top View

1-5 SPECIFICATIONS

a. General

Measurement Species:	NO, NOx
Ranges:	0 to 5 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
t90 Response	1-2 sec.
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)
Rated Power:	24V DC 150W

b. Physical

Case Classification:	General purpose for installation in weather-protected area
Dimensions:	See Figure 2-5: Outline and Mounting Dimensions
Weight:	8.1 kg (18 lbs.)
Mounting:	Inside a Platform or custom-installed in a panel
Max. Length of LON Cable:	1,600m (1 mile) between Analyzer Module and Platform

c. Sample

Temperature:	0 °C to 45 °C (32 °F to 131 °F)
Total Flow Rate:	(Externally measured) 900 to 2,200 cc/min. with backpressure regulator pressure adjusted to 1,344 hPa (5 psig) or to 1,138 hPa (2 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 1,034 hPa-gauge (10 to 15 psig); maintain a constant pressure ± 34 hPa (± 0.5 psig)

d. Gas Connections

Ozone Air:	1/4" O.D. tube fitting, stainless steel
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 manual for specifications regarding Platform-related components (e.g., case dimensions) and the I/O Module manual for specifications regarding I/O (e.g., relay outputs).

SECTION 2
INSTALLATION

WARNING

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

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.

To install the CLD Analyzer Module into a Platform:

1. Loosen the six fastening screws for the front panel of the Platform, hold the handles, and swing the front panel to the farest right.
2. Following the guides on the bottom left and bottom center of the Platform, carefully slide the CLD Analyzer Module halfway into place
3. Lift the spring-loaded pins on the front of the CLD Analyzer Module, and carefully slide in the rest of the distance.

   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.
4. Secure the module in position by releasing the pins, which seat in the available holes in the bottom of the case (see Figure 2-1, below).
5. Connect network cable and power cable to the Analyzer Module (refer to Section 2-5 for electrical connections).
6. After startup and calibration have been performed, secure the front panel of the Platform with the six screws provided.

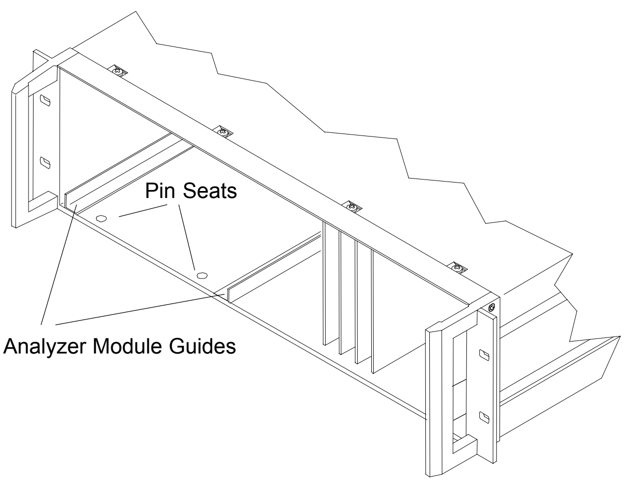


Figure 2-1: Analyzer Module Installation into Instrument Platform *(view without front panel)*

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.

NOTE

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

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

a. Gas Conditioning (Sample Handling)

NOTE

All gases must be conditioned before supplying!

The gases must be
- dry
- free of dust (filtered for particulates down to two microns)
- free of aggressive components affecting gas paths materials (e.g. by corrosion)
- free of Ammonia etc. in order to prevent crystallin formation

before entering the Analyzer Module.

The gases should have a dew point 5 °C (13 °F) below coldest ambient temperature.

CAUTION

EXTERNALLY RESTRICT SAMPLE/CALIBRATION GAS FLOW TO LESS THAN 2,200 cc/min.

Damage to internal components may occur if this flow level is exceeded.

No restrictor is provided in the sample inlet of this module. For those users who cannot externally limit sample flow, contact your local service or sales office.

MAXIMUM NO_x 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 1,000 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 1,000 cc/min to ozone generator.	103 hPa (1.5 psig); procides flow of approximately 20 cc/min. to reaction chamber.

Table 2-1: Gas Specifications

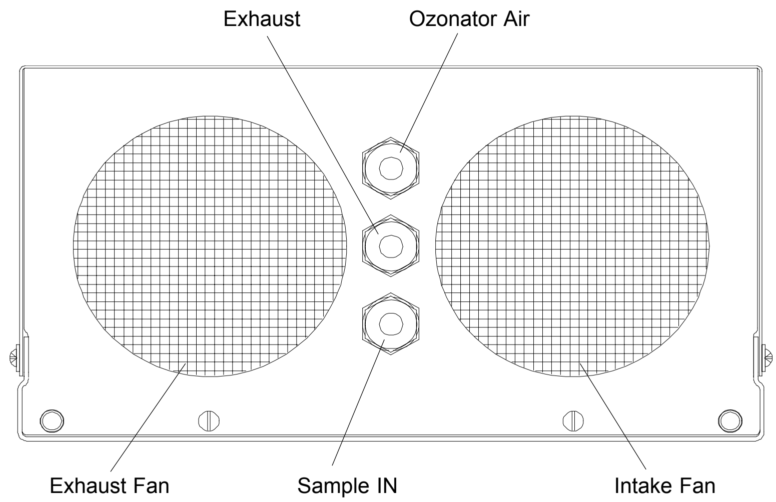


Figure 2-2: CLD Rear Panel Connections

b. Connections

Connect inlet and outlet lines for sample, ozonator air, and exhaust to appropriately labeled fittings on the rear panel (see Figure 2-2) , 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.

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

c. Specifications

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

Zero Gas

Nitrogen (N_2) is recommended for use as zero gas. Alternatively synthetic air or NO_x free ambient air can be used.

Calibration Gas

A mixture of NO in a background of nitrogen is recommended as span gas. For maximum accurancy, the concentration of NO in the span gas should be about 80 % to 100 % of full scale range.

Ozonator Source Gas

For analyzers with ranges less than 0 to 2,500 ppm NO_x free ambient air should be used for generation of the ozone required for the chemiluminescence reaction. For ranges higher than 0 to 2,500 ppm, NO_x free oxygen is required. See Table 2-1 for correct pressure settings.

When using ambient air an external air conditioning unit (LAM) can optionally be used (contact your local service or sales office).

CAUTION

At no time should ozonator gas pressure exceed 2,070 hPa-gauge (30 psig). Damage to internal components may occur if this pressure level is exceeded.

Sample Gas Pressure

See Table 2-1 for correct pressure settings.

Bypass Sample Gas Flow

Bypass sample gas flow rate should be between 700 and 2,000 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).

Leak Test

The CLD Analyzer Module is completely tested at the factory for gas leakage (leakage rate - 7.5 hPa/min. with He or - 2.5 hPa/min. with N_2). The user is responsible for leakage testing at the inlet and outlet fittings on the rear panel minimum twice a year (see Section 4-8).

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.

NOTE

Contamination is a result of a not properly working sample handling systrem and is not be covered by Emerson Process Management warranty.

2-5 ELECTRICAL CONNECTIONS

NOTE

Electrical installation must be in compliance with the requirements of NAMUR and DIN VDE and/or any applicable national or local codes (like local electricity supply enterprises (ESE)).

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 a 24 VDC, 10 A power source, either the Platform or external power source.

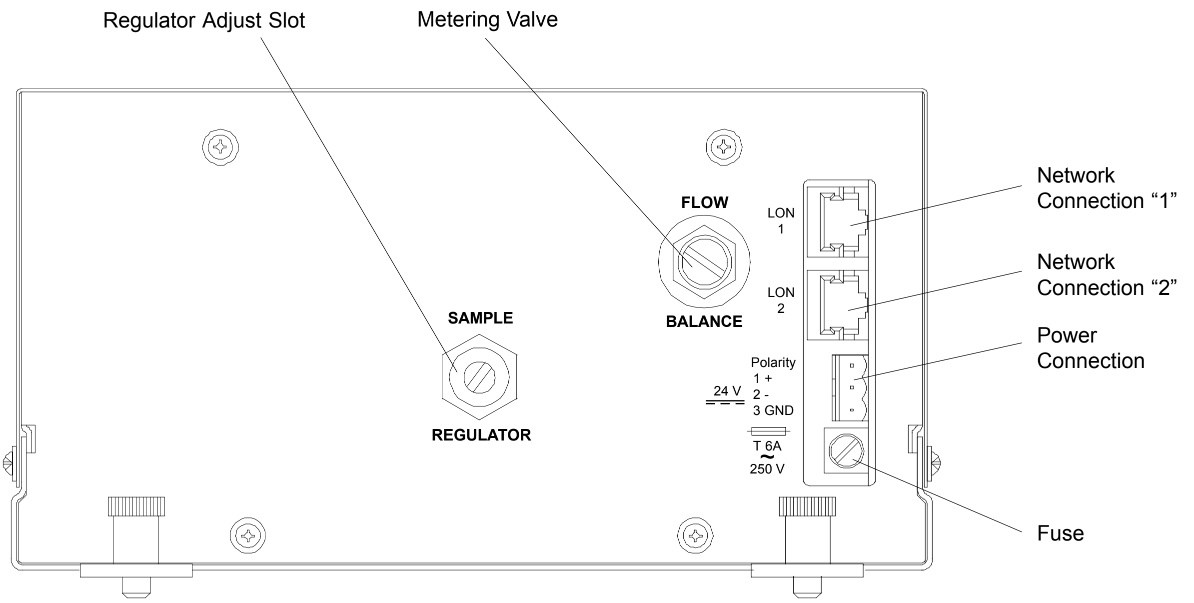
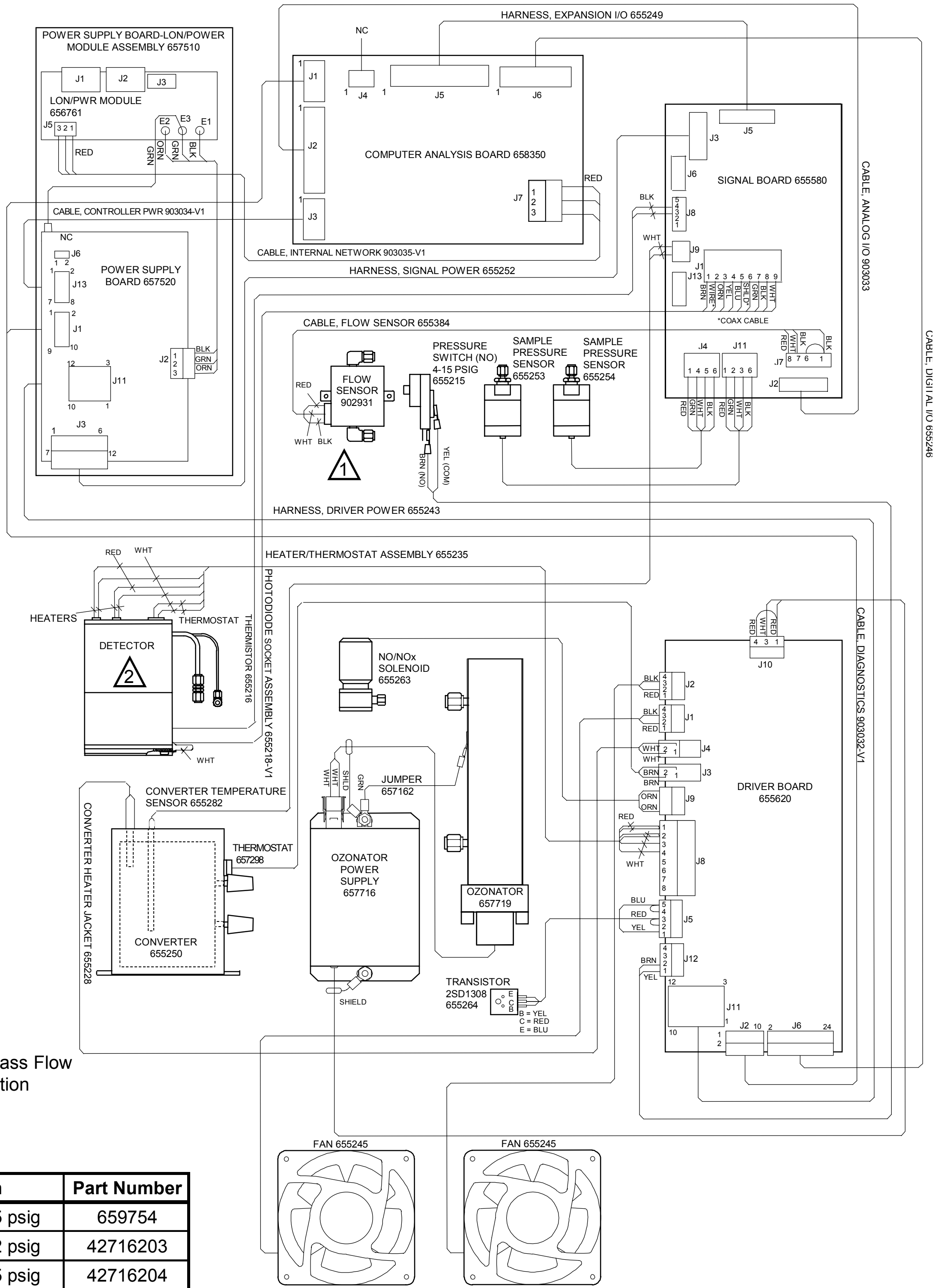


Figure 2-3: Front Panel Controls and Electrical Connections



Brief Description	Part Number
Detector 200 cc/min. @ 5 psig	659754
Detector 200 cc/min. @ 2 psig	42716203
Detector 70 cc/min. @ 5 psig	42716204
Detector 70 cc/min. @ 2 psig	42716205

Figure 2-4: CLD Wiring Diagram

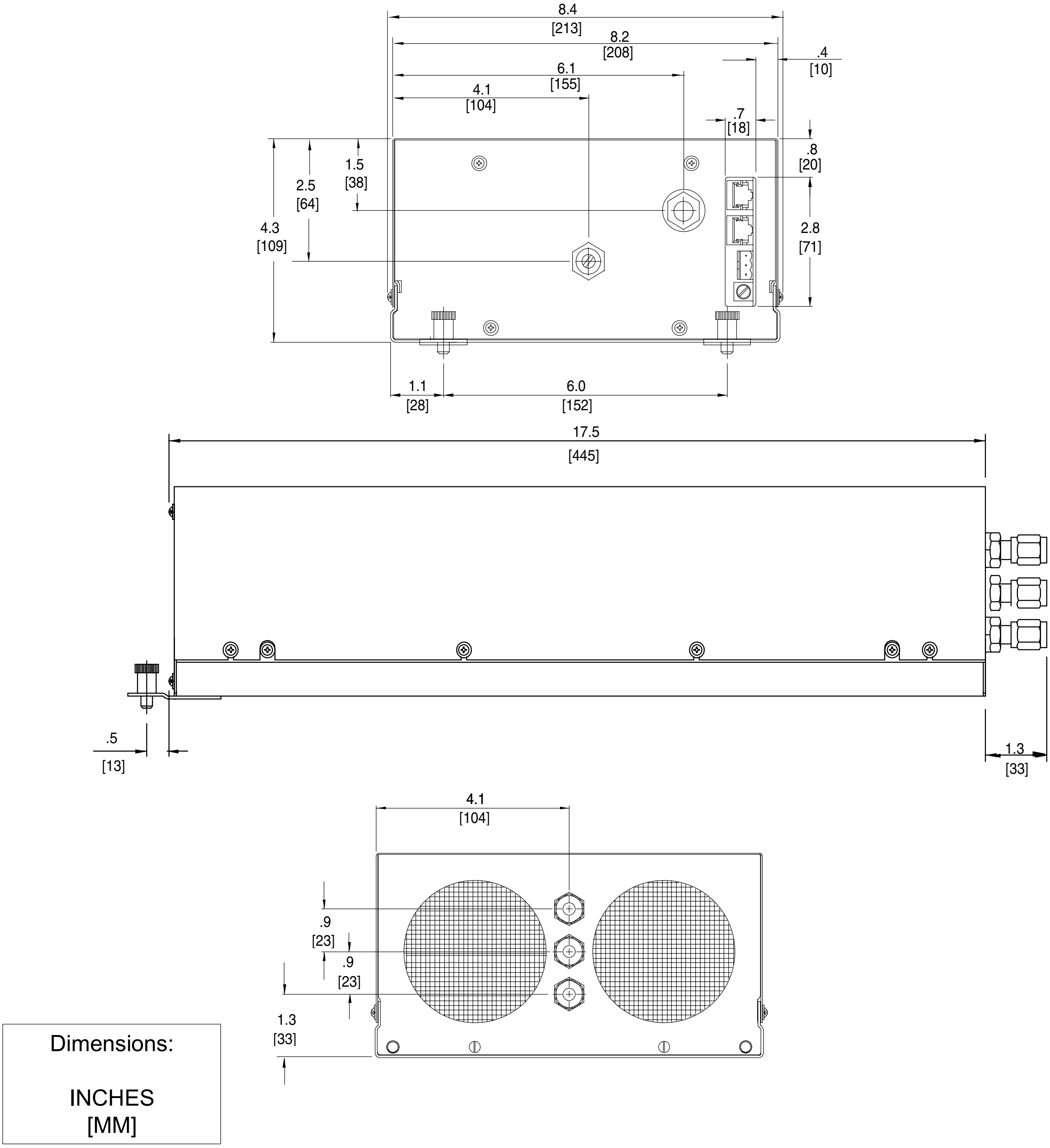


Figure 2-5: Outline and Mounting Dimensions

SECTION 3
OPERATION

3-1 OVERVIEW

Once the CLD has been correctly assembled and installed, the analyzer is ready for operation.

Before operating the system, verify that the Leak Checks have been performed in accordance with Section 2-4.

In this section, all operations for starting up the analyzer are explained. For more detailed information about software screens see associated Software Manual.

For the remainder of this section, Analyzer Module interconnection with a Platform or some interfacing component is assumed. Display and Keypad information refers to that which the user can expect to see and do with regard to the Front Panel of the Platform.

Depending from the software version that is installed, menu layout can change, whereas the principle of operation always stays the same.

This instruction manual is based on menus of software version 3.7.1.

3-2 STARTUP & INITIALIZATION

Apply LON connection and 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.

After switching on the CLD, the analyzer will begin its booting procedure which is apparent on the CLD screen. The first part of the initialization procedure is a self check of the software and analyzer components. Various displays will show the status of the initialization including revision notes, "Initializing network interface", "Searching for nodes", "Scanning Module 2: CLD, 12 % Complete", and "Calculating bindings".

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. See the Platform manual for instructions on binding combinations of modules.

Pressing the F1 key during initializing will reset the CLD brightness and contrast to factory settings. Pressing the F3 softkey will abort the network initializing, aborting any connection to other analyzers. In that case, only the menus of the local analyzer will be available.

At the end of the initializing routine the "measure" screen will display. This screen is the access to all other channels, menus and submenus. The actual display may differ from that shown depending on any custom configuration.

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 Section 1-5). Calibrate and adjust converter efficiency, and begin operation as the following sections indicate.

3-3 PREPARATIONS

After performing start-up and initialization that is described in Section 3-2, operating variables must be adjusted, i.e. the Analyzer Module is to be calibrated.

In the following, analyzer function control and calibration procedure is described step-by-step.

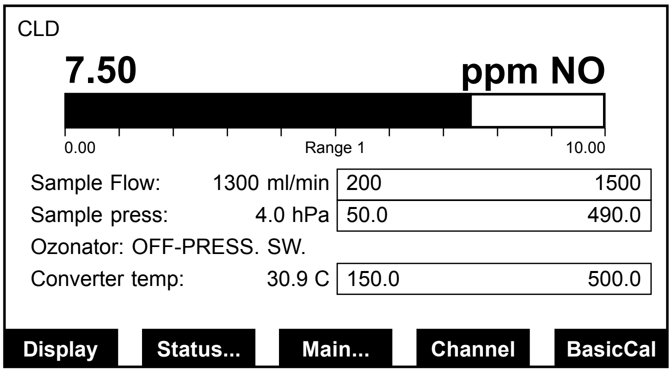


Figure 3-1: Measure Mode Display

After starting up the Analyzer Module, the Measure Mode Display is displayed as shown in figure 3-1.

To now check back physical parameters of the CLD Analyzer Module with the values defined in your Test Data Sheet, that you received with the analyzer, you have to select the "Physical Measurements"-Menu.

Enter the diagnostics menu "Physical Measurements" as follows, using the softkeys F1 through F5:

Main (Menu)...

Expert Controls and Setup...

Analyzer Module Setup...

Physical Measurements...

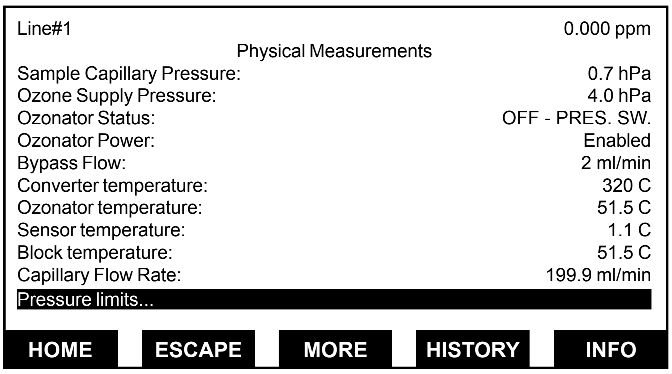


Figure 3-2: Physical Measurements Display

The menu "Physical Measurements" lets you monitor physical measurement parameters of the CLD analyzer.

During warm-up time of the analyzer, you can observe temperature values (sensor temperature, block temperature...) of internal components.

After warm up, check

- Block Temperature
- Detector Temperature
- Converter Temperature

with the operating values given by yout Test Data Sheet. You will find an excerpt of a Test Data Sheet as an example on the next page in figure 3-3.

NOTE:

As long as operating temperatures are not yet reached by the internal components of the analyzer, it is not ready for operation. Warm-up can last up to one hour.

After warm-up or during warm-up procedure of the analyzer you can connect all gas supply lines to the back of the analyzer.

Supply gases at the pressures given in the Test Data Sheet and restrict flow by an external flow limiter to 1.3 through 1.5 l/min.

Internal sample gas and ozonator pressures:

> You will find internal physical paramters in the Test Data Sheet that you have received with the analyzer. Externally supply gases at the given pressures with an external adjustment.

Option Bypass Flow:

> Depending on measuring capillary, bypass flow should by 900 - 2,000 cc/min. If no bypass is installed, restrict flow externally to 1.3 - 1.5 l/min.

External physical parameters are adjusted as follows

Supply Pressure Ozonator Gas	**870,00**	hPa	**12,62**	psig
Supply Pressure Sample Gas	**1000,00**	hPa	**14,50**	psig
Sample Flow			**1500**	cc/min

The following parameters can be checked in menu "Physical Measurements"

Operation: Main Menu...
Expert Controls and Setup...
Analyzer Module Setup...
Physical Measurements...

Internal physical parameters are adjusted as follows

Sample Pressure		**210,00**	hPa	**3,05**	psig
Sensor Temperature				**0,3**	°C
Block Temperature				**51,5**	°C
Capillary Flow Rate				**200**	cc/min
Bypass Flow				**no sensor**	cc/min
NO/NOx Flow Balance	NO	**202,70**	hPa	**2,94**	psig
	NOx	**208,70**	hPa	**3,03**	psig

Figure 3-3: Excerpt of a Test Data Sheet with values that are to be compaired with physical measurements.

3-4 CALIBRATION PROCEDURE

The CLD analyzer module may require periodic calibration with known zero and span gases in order to maintain a desire level of analytical accurancy. It is recommended, after initial startup, that the CLD Analyzer Module is calibrated at least once every eight hours.

This practice should continue until evidence indicates that some other interval is more appropriate depending on the analytical accurancy required.

Calibration is the process of flowing known zero or span calibration gas into the analyzer for a specified period (averaging time), after which the analyzer will automatically set its zero or span factors so that the concentration measurement equals the calibration gas value. A limit can be set, beyond which any attempt by the analyzer to reset its concentration measurement will cause a warning alarm. In this case, user intervention would be required to reset the alarm and attempt another calibration.

a. Calibration Setup

Calibration Gas List

This menu is used to set the concentration values of the calibration gases for each range.

Main (Menu)...
Analyzer and I/O expert controls & setup...
Analyzer module setup...
Calibration gas list...

Line#1	0.000 ppm
Calibration Gas List	
Zero gas - range 1:	0.00 ppm
NO Span gas - range 1:	10.00 ppm
NOx Span gas - range 1:	10.00 ppm
Zero gas - range 2:	0.00 ppm
NO Span gas - range 2:	19.90 ppm
NOx Span gas - range 2:	19.90 ppm
Calibration...	
HOME ESCAPE MORE	INFO

Figure 3-4: Calibration Gas List Channels 1 and 2

MORE...

Line#1	0.000 ppm
Calibration Gas List	
Zero gas - range 3:	0.00 ppm
NO Span gas - range 3:	101.0 ppm
NOx Span gas - range 3:	101.0 ppm
Zero gas - range 4:	0.00 ppm
NO Span gas - range 4:	250.0 ppm
NOx Span gas - range 4:	250.0 ppm
Calibration...	
HOME ESCAPE MORE	INFO

Figure 3-5: Calibration Gas List Channels 3 and 4

If not yet done, put in the ozonator and zero gas concentrations that you supply to the analyzer. See gas cylinder certification for exact values.

In case that measuring ranges differ from ordering code, put in the measuring ranges:

Main (Menu)...
Analyzer and I/O, expert controls & setup...
Analyzer module setup...
Gas measurement parameters...
Range settings...

Line#1	0.000 ppm
Range Settings	
Minimum Range:	9.9 ppm
Maximum Range:	999.0 ppm
Range 1 lower limit:	0.0 ppm
Range 1 upper limit:	10.2 ppm
Range 2 lower limit:	0.0 ppm
Range 2 upper limit:	24.9 ppm
Range 3 lower limit:	0.0 ppm
Range 3 upper limit:	100.0 ppm
Range 4 lower limit:	0.0 ppm
Range 4 upper limit:	500.0 ppm
HOME ESCAPE	INFO

Figure 3-6: Range Settings Menu

NOTE

In case that only one measuring range is in use, we suggest to set all other measuring ranges to the same value to prevent calibration failure. When doing so, set also all test gas values to the same value.

Calibration Parameters

This menu provides various parameter settings for all calibration performed from Basic or Expert modes.

Main (Menu)...
Analyzer and I/O expert controls & setup...
Analyzer module setup...
Calibration parameters...

Line#1	0.000 ppm
Calibration Parameters	
Calibration adjustment limits:	Disabled
Calibration averaging time:	9 s
Calibration failure alarm:	Yes
Cal failure error allowed:	50 %
Calibration time out:	59 s
Zero ranges:	SEPARATELY
Span ranges:	SEPARATELY

HOME | ESCAPE | CAL | NO/NOx | INFO

Figure 3-7: Calibration Parameters Display

Calibration adjustment limits:

Set to "Disable" to recover from a calibration failure.

Calibration averaging time:

Set the time used by the analyzer to average its reading during calibration. A longer time will give a better calibration.

When using a system calibration, take care that averaging time is long enough for the analyzer to reach a settled reading. Otherwise, calibration may fail !

Calibration failure alarm:

When turned on ("yes"), issues a warning if the analyzer has to change its calibration by more than the Cal Failure Error, if warning alarms are enabled.

Cal failure error allowed:

The percentage by which the calibration can change before an alarm is triggered if the Calibration Failure Alarm is enabled.

Calibration time out:

Sets how long the analyzer will wait for the signal to stabilize before issuing a Warning.

Zero (Span) ranges:

Used to select wether to calibrate ranges "TOGETHER" or "SEPARATELY". 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 Adjustment Limits and try again. First check that the calibration gases are correct. If non-zero gases are used, or the changes are great, zero and span may have to be repeated a few times.

In case that a system calibration is used, set all ranges to "SEPARATELY".

Please note that Software will accept only span gas values that are a factor of 10-110% of the measuring range. From that, it is possible, that not all of the four measuring ranges can be calibrated altogether. In that case you will have to set the option to "SEPARATELY".

In case that a calibration is not possible because the difference of display to the true value is too great, switch of the "CalCheck" option.

b. Flow Balance Adjustment:

To adjust the Flow Balance Valve, select:

Main (Menu)...
Analyzer basic controls (calibration) & setup...

Line#1	0.000 ppm
Basic Controls	
Measurement range number:	1
Range upper limit:	24.9 ppm
Automatic range change control:	Disabled
Ranges with valid calibration:	1&2
Calibration status:	READY
Span gas concentration:	10.0 ppm
Status:	NORMAL
Measurement Mode:	NOx mode
Ozonator status:	OFF -PRES. SW.
Ozonator power:	Enabled

HOME | NO/NOx | ZERO | SPAN | INFO

Figure 3-8: Basic Controls Menu

To adjust the flow balance, select the measuring range that is really in use and do a Zero- / Span adjust in NO mode.

Zero Adjustment

In the Basic Controls menu, push the F3 softkey and enter the Analyzer Zero menu.

Line#1	0.000 ppm
Analyzer Zero	
Are you sure ?	
You must have zero gas flowing through the analyzer.	
Calibration time:	24 s
Measurement range number:	1
Zero ranges:	SEPARATELY
Calibration status:	READY
Error message for last zero:	CAL OK

HOME | ESCAPE | ZERO | INFO

Figure 3-9: Analyzer Zero Menu

Push the F3 softkey again, to start the zeroing process. Be sure to have zero gas flowing through your analyzer and to have it purged it from sample gas before.

When the zeroing process is finished, "Calibration status" will turn to "READY".

Span Adjustment

After that, do a Span adjust in the same measuring range.

For that, push the F4 softkey in the Basic Controls menu, so that the Analyzer Span menu turns up:

Line#1	0.000 ppm
Analyzer Span	
Are you sure ?	
You must have span gas flowing through the analyzer.	
Calibration time:	24 s
Measurement range number:	1
Span ranges:	SEPARATELY
Calibration status:	READY
Error message for last span:	CAL OK

HOME | NO/NOx | SPAN | INFO

Figure 3-10: Analyzer Span Menu

Push the softkey F4 again to start the spanning sequence. Be sure to have span gas flowing through your analyzer and to have it purged before.

When the spanning sequence is finished, the "Calibration status" will turn to "READY".

When having completed the zero- and span adjust in NO mode, switch over to NOx mode by pressing the F2 softkey in the Basic Controls menu. Observe the measuring value after switching into NOx mode:

- If the measuring value **stays constant** (maybe after a short peak immediately after switching into NOx mode), your flow balance is perfectly adjusted and your analyzer is ready for measurement.
- If the measuring value **changes** after switching to NOx mode, turn the flow balance valve carefully until the difference between measuring values in NO mode and NOx mode is minimized.

To make sure that your analyzer is correctly calibrated, switch back to NO mode, if necessary, repeat zero- and span adjustment and check for an existing difference between measurement in NO mode and in NOx mode.

NOTE:

If you are using a span gas that has different concentrations of NO and NO_x, measuring value changes when switching between measuring modes NO and NOx, obey the following laws:

- Measuring value in NO mode:
  Concentration of NO in span gas

- Measuring value in NOx mode:
  Concentrations of ($NO+NO_2$) in span gas

3-5 SYSTEM & NETWORK I/O MODULE CONTROLS (SETUP) - SYSTEM SIO

To adjust SIO functions, select

Main (Menu)...
Analyzer and I/O, expert controls & setup...
System & network I/O module controls...
System SIO module...

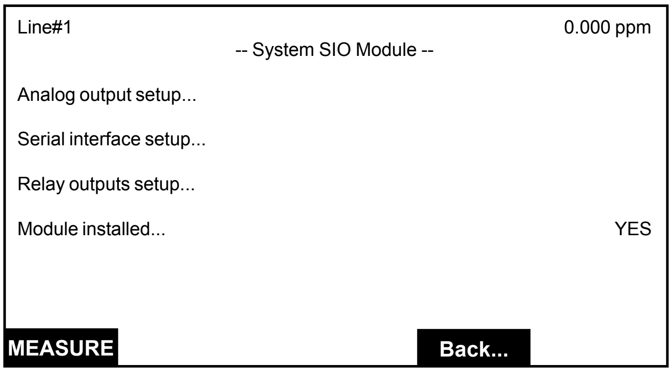


Figure 3-11: System SIO Module Menu

System SIO module menu allows you to adjust different SIO functions, like analog outputs and serial interfaces.

a. Analog Output Setup

In the System SIO Module menu (Figure 3-11) select "Analog output setup..."

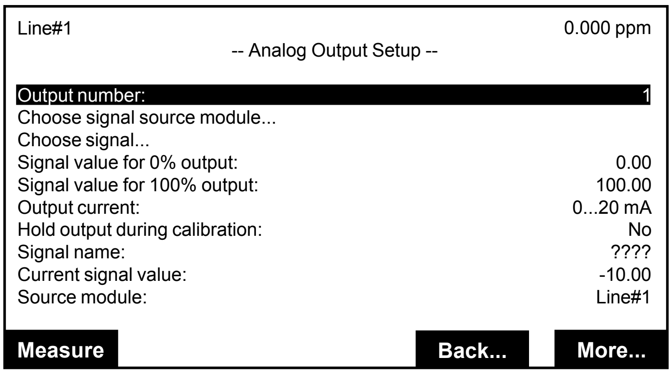


Figure 3-12: Analog Output Setup Menu

Output number:

Choose the desired analog output (1-8) to set the parameters. The number of outputs depends on the analyzer configuration as 2, 4, 6 or 8.

Choose signal source module...

Select the "Analyzer Modules" submenu by selecting the "Choose signal source module..." line and pressing the Return (↵) softkey.

Select the tag of the desired reference channel with the ↑ or ↓ softkeys and then press the ↵ or → softkey. The display will return to the previous menu automatically and the selected reference channel will be displayed in the "Source module:" line.

The available selections may be different depending on the installed modules.

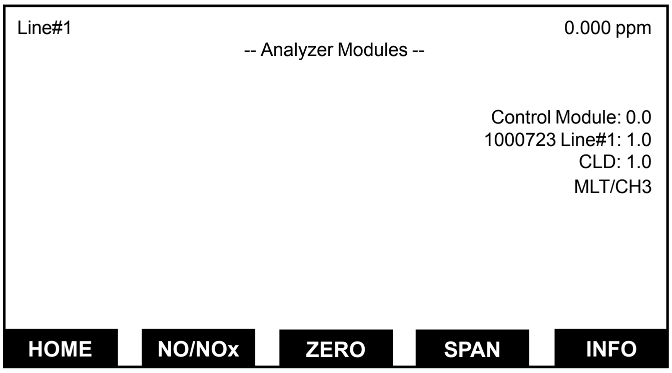


Figure 3-13: Analyzer Modules Menu

Choose Signal...

Select the "Signals" submenu by selecting the "Choose Signal..." line and pressing the ↵ softkey. (The list of signals will depend on the module chosen.)

Press the F5 softkey to go to additional menus to choose the Primary Variable signal for the analog output. The Primary Variable is the actual NO or NOx concentration.

See Section 5.2.1.1 of CLD Software Manual for complete list of signals.

The signal chosen here will be applied to the analog output (1-8) chosen above.

```
Line#1                                   0.000 ppm
                 -- Signals --

                                      Sample flow:
                                     Sample press.:
                                         Ozonator:
                                  Converter temp.:
                                      Block temp.:
                                   Detector temp.:
                                         NO/NOx:
                                      Noise level:
Measure          <<<       Back...       >>>
```

>>>

```
Line#1                                   0.000 ppm
                 -- Signals --

                                         t90 time:
                                Output delay time:
                                Calibration status
                                       Linearizer:
                                Measurement mode:
                                Operational state:
                                           Health:
                                     Interference:
Measure          <<<       Back...       >>>
```

Figure 3-14: Signals Menu

Signal value for 0% (100%) output:

It is possible to set the signal value for 0 % output and for 100% output so as to output only a portion of the entire range.

Example:

- Range from 0 to 1,000 ppm
- 0% value to be 400 ppm,
  100% value to be 700 ppm.
- Analog output normally:
  0 V = 0 ppm, 10 V = 1,000 ppm
- After changing the output scaling:
  0 V = 400 ppm, 10 V = 700 ppm.

Move the cursor to the "Signal value for 0 % output:" line and adjust the value to 400. Then change to the "Signal value for 100 % output:" line and adjust the value to 700.

NOTE

If the measurement range is changed, the settings done in this menu will revert back to the standard values of the range. The output values can be changed permanently in the menu "Range Settings."

NOTE

The signal range of the analog output should be less than the smallest range of the channel. Otherwise the analog output may exhibit excessive noise.

Output current:

Select the desired output range in the "Output current range:" line. The options are 0...20 mA or 4...20 mA.

Hold output during calibration:

Enable this option to hold the analog output to the last value during calibration.

Pressing the F5 (More...) softkey changes the to the submenus "Output Signal if Assigned Module Fails" and "Fine Adjustment."

```
Line#1                                                0.000 ppm
         -- Output Signal If Assigned Module Fails --
Output(s) value on analyzer failure:      BeginOfRange - 10%

                  -- Fine Adjustment --
Output number:                                            1
Operation mode:                                      Normal
Fine adjustment for 0% output:                         4096
Fine adjustment for 100% output:                        819
Measure                              Back...       More...
```

Figure 3-15: Output Signal If Assigned Module Fails Menu

Output(s) value on analyzer failure:

Choose the desired signal level to cause a failure condition. The choices are:

- Acutal
- BeginOfRange
- EndOfRange
- BeginOfRange-10%
- BeginOfRange+10%

Output number:

Choose the output number (1-8) for setting the fine adjustment.

Operation mode:

Normal: The absolute measurement signal will be sent to the analog output.

Adjust 0V: Used to set the display equal to the analog output for 0 V and 0 mA. Life zero signals (4 - 20 mA and 2 - 10 V) are set automatically and cannot be adjusted.

Adjust 10V: Used to set the display equal to the analog output for 10V und 20mA.

Select the "Fine adjustment for 0% output" and/or "Fine adjustment for 100 % output" lines with the ↵ or → softkey. Adjust to the desired value with the ↑ or ↓ softkey and confirm with the ↵ softkey.

The range of values are:

- 3,000 to 6,000 for 0 % (default 4096)
- 600 to 1,000 for 100 % (default 819)

The last three lines of the "Analog Output Setup" menu are displayed only for configuration values of the analog output.

Signal name: The name of the signal chosen the "Choose signal" menu.

Current signal value: The current value of the variable.

Source module: The name of the module chosen in the "Choose signal source module" menu.

Pressing the F5 (More...) softkey changes to the submenu "Special Scaling for Concentration Signal"

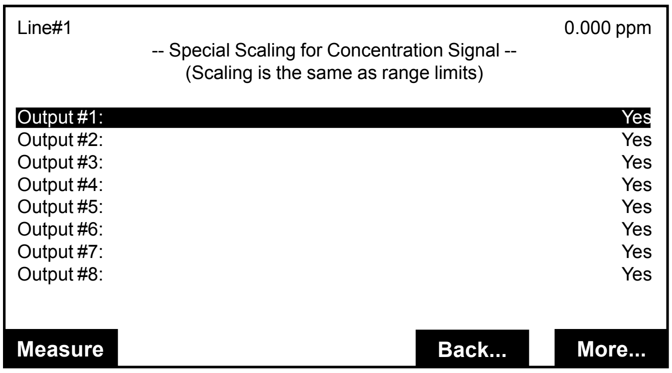


Figure 3-16: Special Scaling for Concentration Signal Menu

This menu allows for the setting of each of the 8 outputs to be the same as the range limits "Yes" or as to set on the previous menus.

Pressing the F5 (More...) softkey changes to the submenu "Analog Output Updates per Second."

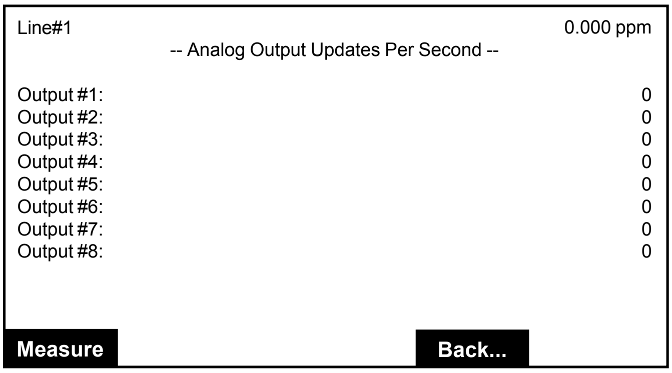


Figure 3-17: Analog Output Updates per Second Menu.

This menu allows for the setting of the update rate for each of the 8 outputs.

b. Serial interface Setup

The submenu "Serial interface Setup" is used to set the parameters for data transfer between the analyzer and external devices. The choices in this menu depend on the configuration of the analyzer. The full specification of the serial interface is described in its own manual.

In the System SIO Module menu (Figure 3-11) select "Serial interface setup..."

Line#1	0.000 ppm
-- Serial Interface Setup --	
Baud rate:	19200
Data bits:	8
Stop bits:	1
Parity:	None
Echo mode:	Disabled
Handshake:	Xon/Xoff
Transmission delay:	0
Type of installed serial interface:	RS232
Communication protocol:	AK
Special protocol definitions...	
Measure	**Back...**

Figure 3-18: Serial Interface Setup Menu

Options:

- Baud rate:
  300, 1200, 2400, 4800, 9600, 19200
- Data bits: 7, 8
- Stop bits: 1, 2
- Parity: None, Even, Odd
- Echo mode: Enabled, Disabled
- Handshake: None, Xon, Xoff
- Transmission delay: 0...100.

Type of installed serial interface: RS232, RS485/2w, RS485/4w, RS485/4w bus, None.

Communication protocol: AK, MODBUS RTU, None (not applicable to CLD)

NOTE

The "special protocol definitions..." line accesses a submenu for setting the parameters of the AK and MODBUS RTU (not available yet) communication protocols.

Line#1		0.000 ppm
-- AK Protocol Deifinitions --		
Device address (RS-485 only):		1
Measure	**Back...**	**More...**

Figure 3-19: AK Protocol Definitions Menu

The value can range from 1 to 50.

c. Relay Outputs Setup

There are three relays on the SIO board. The contact logic can be set with a jumper on the SIO board to select NO (normally open) or NC (normally closed). Full details of the SIO board are contained in its own manual.

In the System SIO Module menu (Figure 3-11) select "Relay outputs setup..."

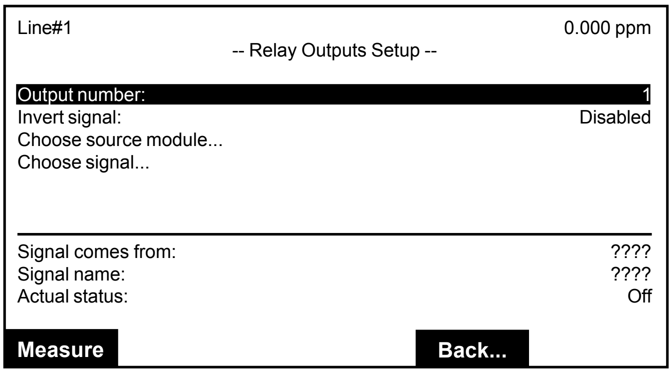


Figure 3-20: Relay Outputs Setup Menu

Output number:

Corresponds to the relay number 1-3.

Invert signal:

"Disabled" signal is normal, "Enabled" signal is inverted.

Choose source module...

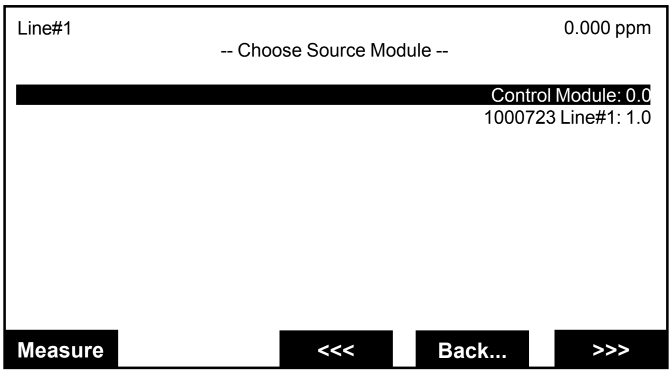


Figure 3-21: Choose Source Module Menu

Choose desired source module for the relay output number (1-3) being configured.

The list of modules will depend on the installed modules.

Choose signal...

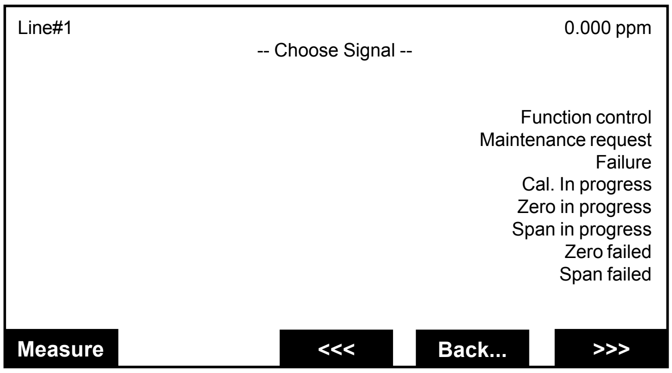


Figure 3-22: Choose Signal Menu

Choose desired signal for the relay output number (1-3) being configured.

The list of signals will depend on the chosen module. If available, press the >>> (F5) softkey for additional signals.

The three lines displayed at the bottom of the "Relay Outputs Setup" menu show the current status of the selected relay output.

Signal comes from: The module chosenfrom the "Choose Source Module" menu.

Signal name: The signal chosen from the "Choose Signal" menu.

Actual status: The current status of the signal; Off or On.

3-6 CONVERTER TEMPERATURE ADJUSTMENT

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 several Environmental Protection Agency.

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 temperature is 300 °C to 400 °C (572 °F to 752 °F). The current converter temperature can be viewed in the "Physical measurement" menu. To access the converter temperature adjustment:

Main (Menu)...

Analyzer and I/O expert controls & setup...

Analyzer module setup...

Physical measurements 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 on the Physical Measurements menu (see Section 3-3). Note the value for future reference.
3. Introduce a calibration gas of known (NO_2) concentration into the analyzer and note concentration value determined when the full response has been achieved.
4. Change Converter Setpoint in the "Temperature Control" menu to 300 °C. 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 possible.

a. Test Setup for Measurement of Conversion Efficiency

A typical setup for measurement of conversion efficiency is shown in figure 3-23. The test setup includes:

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

The concentration on NO in the standard gas should be about the full-scale 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 aluminium 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 erroneously high value for the measured conversion efficiency.

b. Test Procedure

1. Measure converter temperature in the sub-menu structure.
   Note present reading as a reference for comparison with subsequent readings.
2. Lower converter temperature to 300 °C by setting control parameters, and wait 15 minutes for temperature equilibration.
3. Connect a Converter Efficiency Tester (e.g. Model 958) to the CLD Module (see figure 3-23), and follow Steps 4 through 17 below:
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 full-scale.
   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 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 un-reacted NO at this point. Record this concentration.
10. Switch the CLD Module to NO_x mode. Total NO_x 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 NO_x 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 concentrations obtained during the test in the equation below:

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

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 3-23 the following calculations would apply:

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

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 3-23). 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).

c. Subnormal Conversion Efficiency

If 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 reagulator or flow controller. Stainless steel diaphragms are preferred. Loss can also occur during passage through filter media.

d. 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 4-6.

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

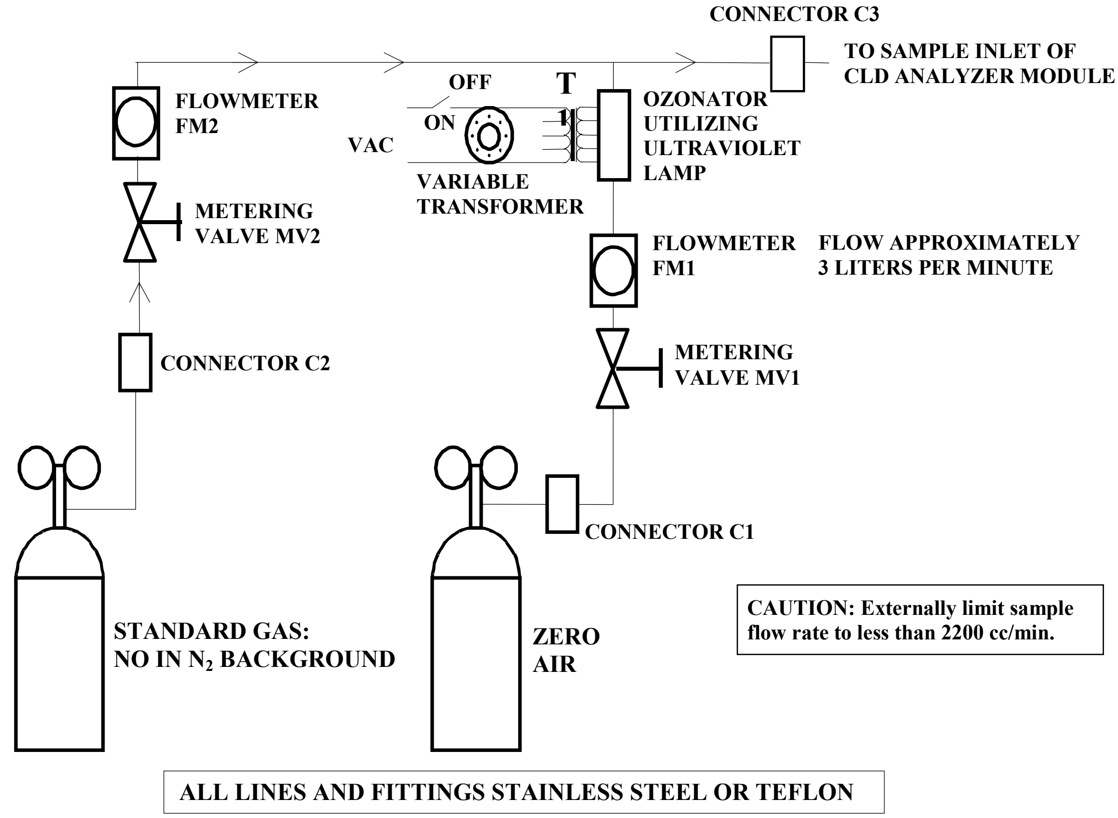
e. Capillaries

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

f. TEA Scrubber

The presence on NO_2 in the NO cylinders can cause inaccurate converter efficiency values. The TEA Scrubber accessory can be used to remove residual NO_2 from the NO cylinders. Use of this accessory allows a NO_2-free NO calibration gas.

A. TYPICAL TEST SETUP



B. TYPICAL TEST RESULTS

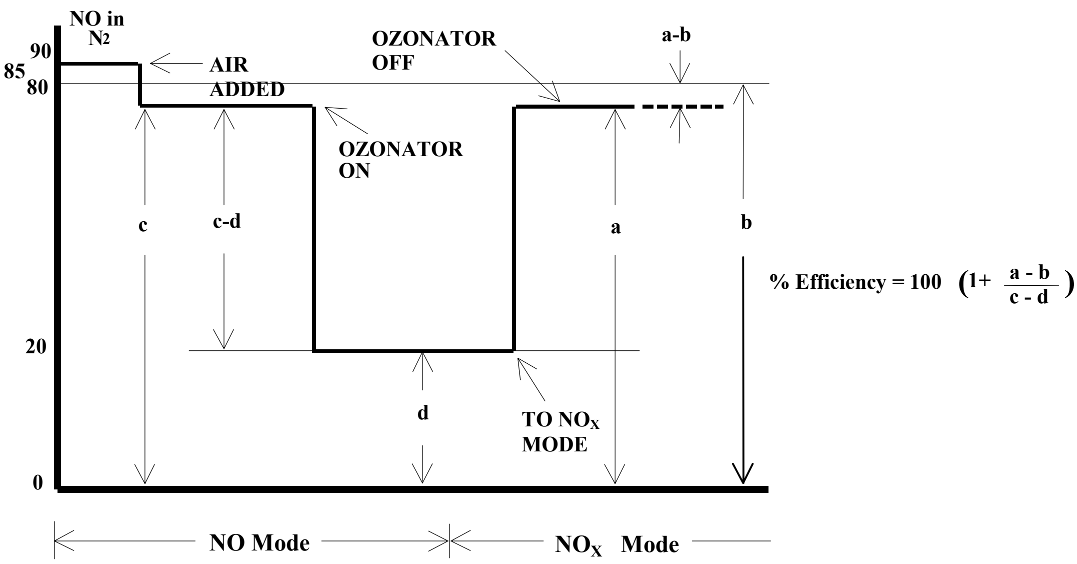


Figure 3-23: Converter Test Setup

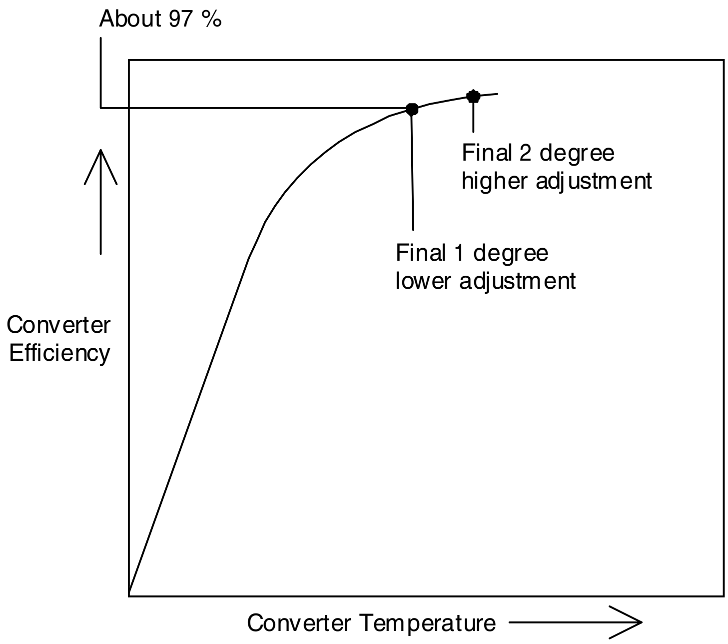


Figure 3-24: Converter Temperature Adjustment

SECTION 4
MAINTENANCE AND SERVICE

WARNING

Before starting work, read the "Essential instructions" on the inside cover and the Safety Summary beginning on page P-2.
Failure to follow the safety instructions could result in serious injury or death.

WARNING

Do not operate without covers secure.

Do not open while energized.

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.

CAUTION

Tampering with or unauthorized substitution of components may adversely affect the safety of this instrument. Use only factory documented/approved components for repair.

Because of the danger of introducing additional hazards, do not perform any unauthorized modification to this instrument!

4-1 OVERVIEW

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

The gas path system should be leak tested at least twice a year and after maintenance, replacement or repair of gas path parts.

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 excessive). Another source of crystalline formation is contaminated air.

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

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

4-2 FUSES

The main power fuse may require replacement.

NOTE

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

See figure 2-3 for the location of the main power fuse [T 6A 250 V (6x32 mm)], which protects 24 VDC input to the module.

NOTE

Use only fuses of the correct type and current ratings as replacements. Using repaired fuses and short circuiting of fuse holders is prohibited.

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 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.

4-5 PRINTED CIRCUIT BOARDS

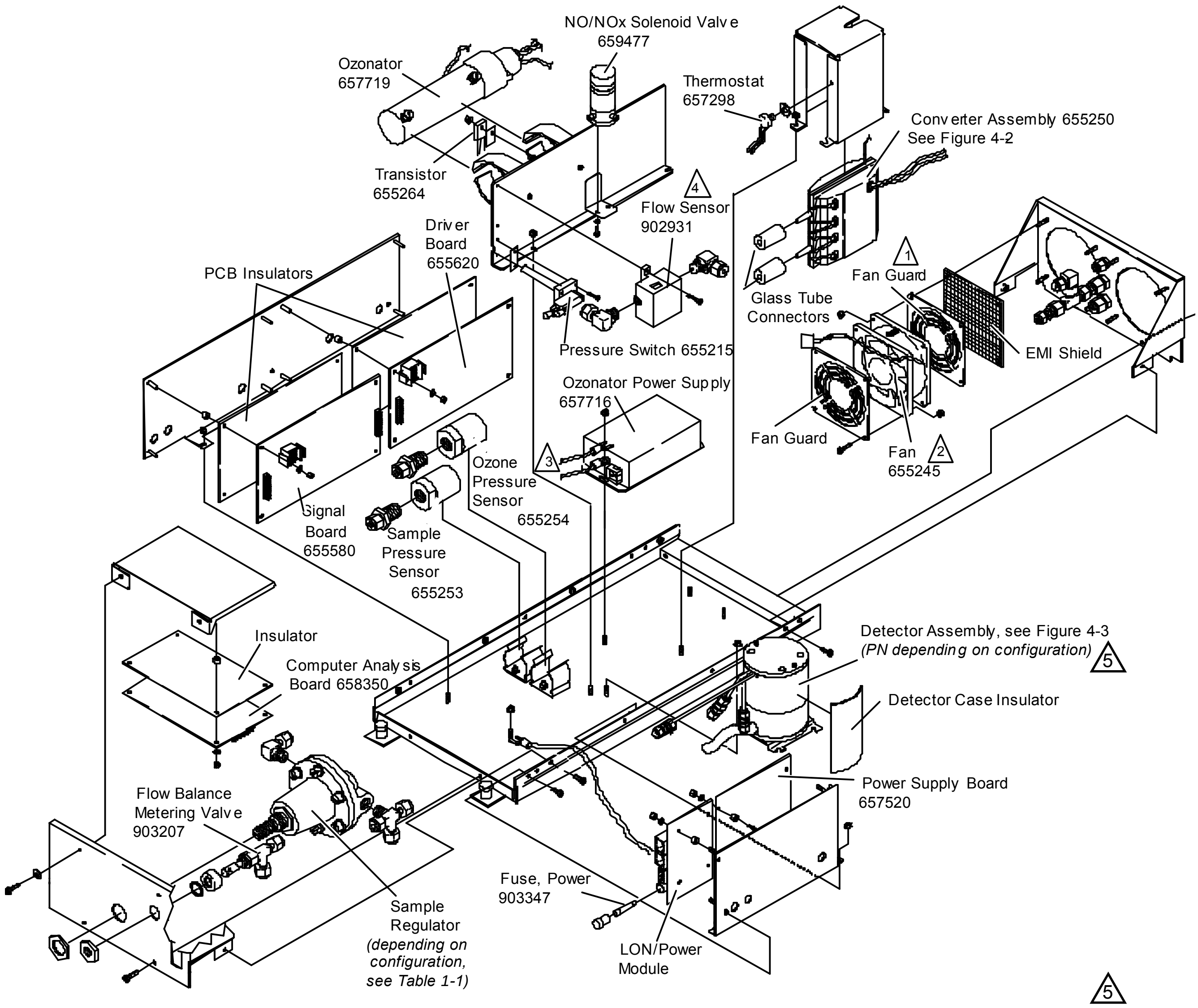
CAUTION

The electronic parts of the Analyzer Module can be irreparably damaged if exposed to electrostatic discharge (ESD).

The instrument is ESD protected when the covers have been secured and safety precautions observed. When the housing is open, the internal components are not ESD protected anymore.

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.



5

Brief Description	Part Number
Detector 200 cc/min. @ 5 psig	659754
Detector 200 cc/min. @ 2 psig	42716203
Detector 70 cc/min. @ 5 psig	42716204
Detector 70 cc/min. @ 2 psig	42716205
Detector assembly without capillary	659754X

4 Optional Bypass Flow Sensor

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 in on the intake fan only (shown).

Figure 4-1: CLD Module Assembly

4-6 CONVERTER

> **CAUTION**
>
> **HIGH TEMPERATURES !**
>
> **While working at thermostated components inside the Analyzer Modules hot components may be accessible!**

Refer to figure 4-1 and figure 4-2. To replace the converter or temperature 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.

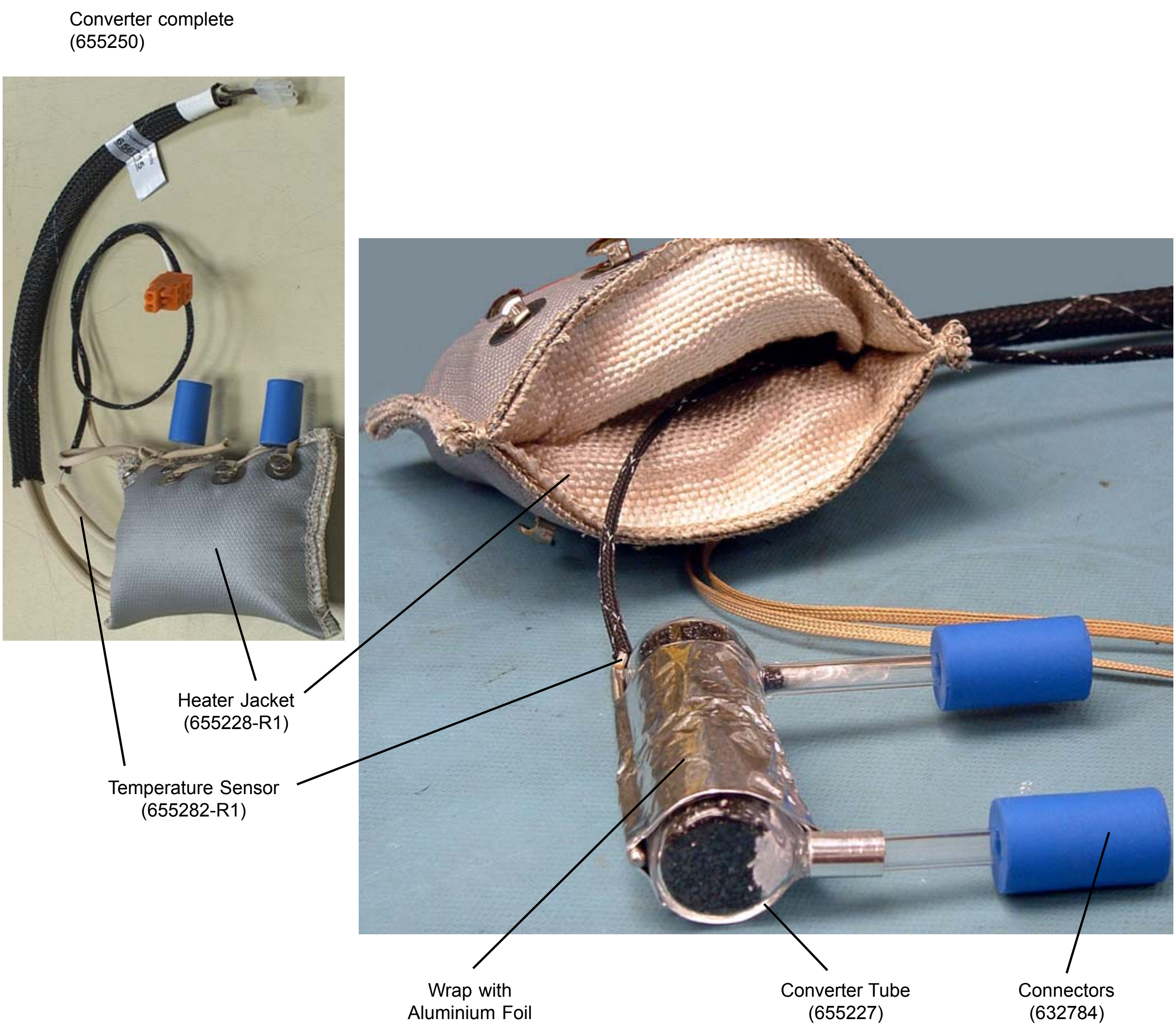


Figure 4-2: Converter Assembly

4-7 DETECTOR DISASSEMBLY

Refer to figure 4-3.

a. Reaction Chamber Removal

Disconnect the stainless steel tubing lines at the 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 re-assembly 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.

b. 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.

c. 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, 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.

d. 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.

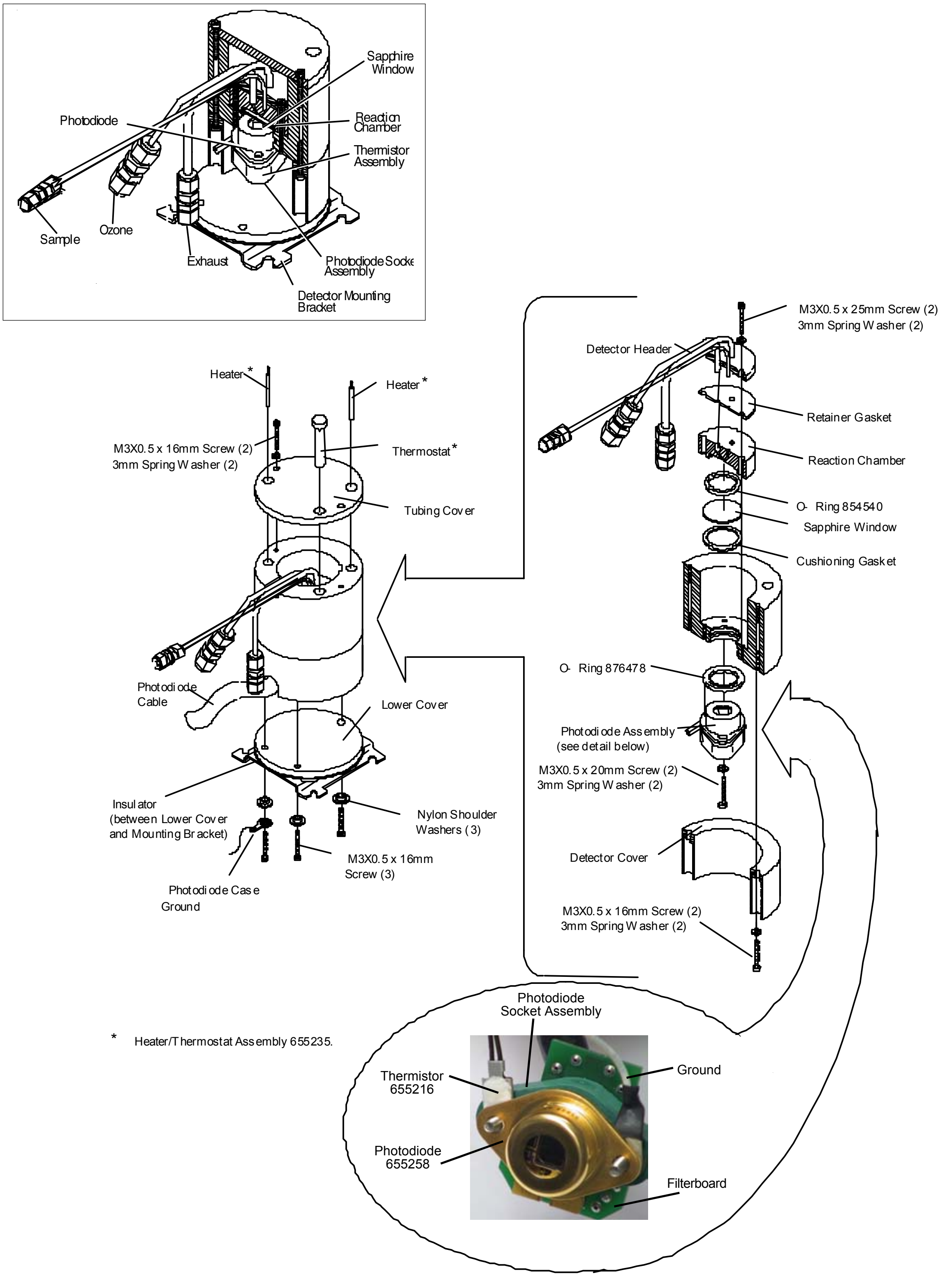


Figure 4-3: Detector Assembly

4-8 LEAKAGE TEST

The gas path system should be leak tested at least twice a year and after maintenance, replacement or repair of gas path parts.

a) Required Tools

- Test Medium
- external Manometer
- Swagelok® Blind Unions (2)

b) Procedure

To perform aleakage testing, proceed as follows (see figure 4-4):

1. Close sample and ozonator air supply
2. Disconnect the gas connections
3. Close sample inlet and ozonator inlet with blind unions
4. Connect a pressure meter to the exhaust fitting
5. Connect test medium supply (N_2 or He) to the pressure meter
6. Supply Analyzer Module with the test medium with a pressure of approx. 2,000 hPa (15 psig) and close supply .
   Since CLD internal it comes to equalization of pressure, supply is to open and to close repeatedly until manometer doesn't show pressure changes.
7. Watch the manometer.
   Over a period of about 15 minutes the pressure drop may not be higher than 7.5 hPa/min. using Helium (He) or 2.5 hPa/min. using Nitrogen (N_2)

If the specifications (see table 4-1) were adhered to, then the test is finished.

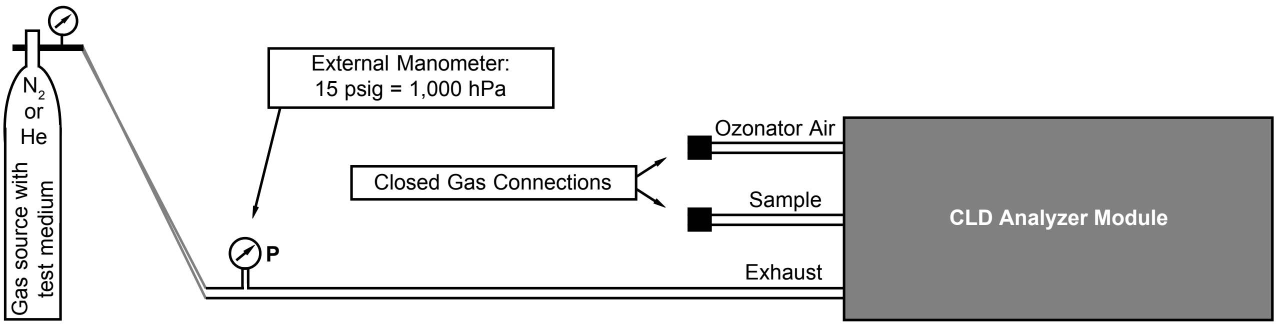


Figure 4-4: Principle Leakage Test Assembly

Test Medium	Nitrogen (N_2)	Helium (He)
Test Pressure	15 psig / 2,000 hPa / 1 bar	15 psig / 2,000 hPa / 1 bar
Test Time	15 min	15 min
permissible Drop in Pressure	2.5 hPa / min	7.5 hPa / min

Table 4-1: Leakage Test Specifications

If there is a leakage, then proceed as follows:

a) Using Helium (He) for test medium

- Supply Analyzer Module with the test medium with a pressure of approx. 2,000 hPa (15 psig).
- Look for the leak with a helium leak detector.

b) Using Nitrogen (N_2) for test medium

- Supply Analyzer Module with the test medium with a pressure of approx. 2,000 hPa (15 psig).
- Liberally cover all fittings, seals, and other possible sources of leakage with a suitable leak test liquid such as SNOOP. Bubbling or foaming indicates leakage.

- Remove the source of leak.
- Perform a leakage test once more as decribed obove.

.

SECTION 5
TROUBLESHOOTING

5-1 OVERVIEW

Liberally cover all fittings, seals, and other possible sources of leakage with a suitable leak test liquid such as SNOOP. Bubbling or foaming indicates leakage. Checking for bubbles will locate most leaks but could miss some, as some areas are inaccessible to the application of SNOOP. For positive assurance that system is leak free, perform one of the tests above.

SECTION 6
REPLACEMENT PARTS

CAUTION

Tampering with or unauthorized substitution of components may adversely affect the safety of this instrument. Use only factory documented/approved components for repair.

Because of the danger of introducing additional hazards, do not perform any unauthorized modification to this instrument!

6-1 MATRIX

Each analyzer is configured per the customer sales order.

To identify the configuration of an analyzer, locate the analyzer name plate label. The analyzer matrix appears on the analyzer name plate label.

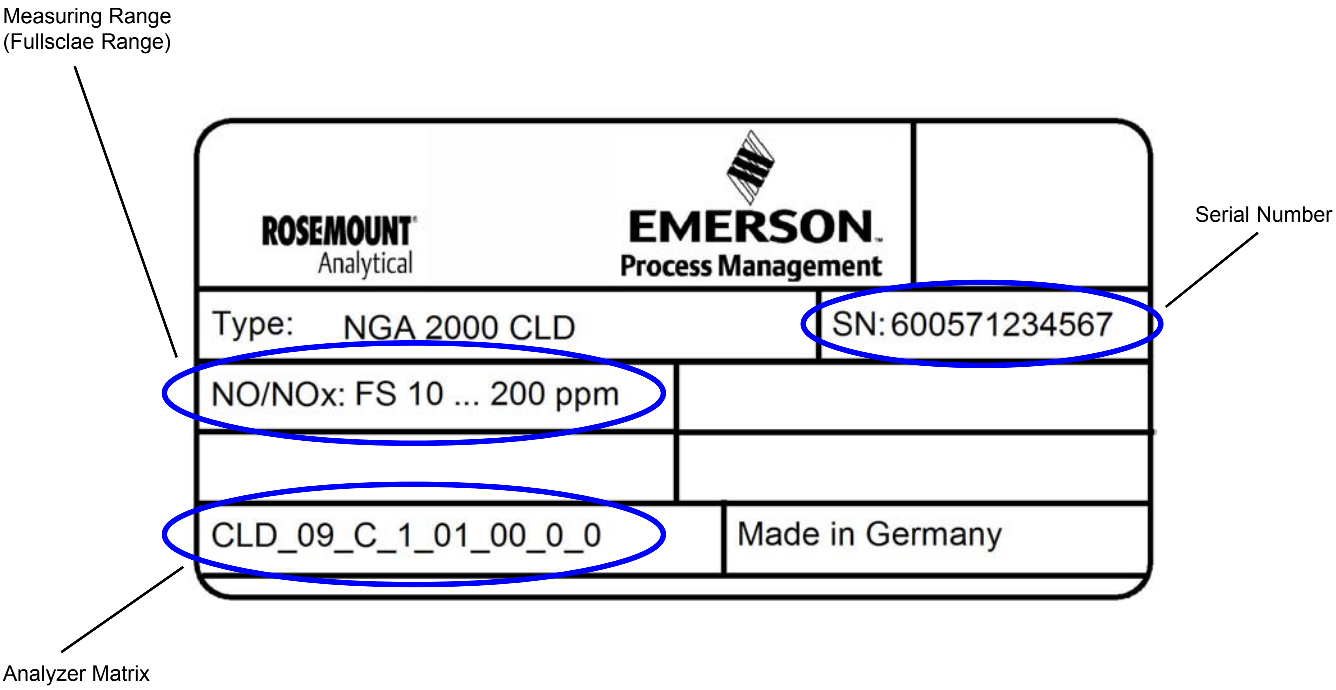


Figure 6-1: Name Plate Label

6-2 REPLACEMENT PARTS

658157	Air Restrictor, 430 cc/min. @ 12 psig
655269	Back pressure regulator, Brass/Neoprene, 5 psig
659063	Back pressure regulator, Stainless steel/Viton, 5 psig
660400	Back pressure regulator, Brass/Neoprene, 2 psig
660401	Back pressure regulator, Stainless steel/Viton, 2 psig
655246	Cable, 24-pin Flat ribbon, Comp Bd.--Driver Bd.
903032-V1	Cable, 10-pin Flat ribbon, Comp Bd.--Power Supply Bd--Driver Bd
903033	Cable, 24-pin Flat ribbon, Comp Bd.--Signal Bd.
655249	Cable, 30-pin Flat ribbon, Comp Bd.--Signal Bd.
903034-V1	Cable, 8-pin Flat ribbon, Comp Bd.--Power Supply Bd.
634398	Capillary, Vent, 70 cc/min @ 5 psig
657473	Capillary, Pump, 200 cc/min. @ 5 psig
660405	Capillary, Pump, 200 cc/min. @ 2 psig
659658	Capillary, Sample, 200 cc/min. @ 5 psig
660404	Capillary, Sample, 200 cc/min. @ 2 psig
659657	Capillary, Sample, 70 cc/min. @ 5 psig
660403	Capillary, Sample, 70 cc/min. @ 2 psig
658350	Computer Board PCB
655250	Converter, complete
659754	Detector, compl., 200 cc/min. @ 5 psig
42716203	Detector, compl., 200 cc/min. @ 2 psig
42716205	Detector, compl., 70 cc/min. @ 5 psig
42716206	Detector, compl., 70 cc/min. @ 2 psig
655620	Driver Board PCB
655245	Fan 24 VDC (Exhaust and Intake)
846761	Fan Guard
655512	Filter, EMI, Fan
902931	Flow sensor, 400 cc/min. - 2,000 cc/min.
903347	Fuse, Main Power T 6A 250V
656761	LON/PWR Board PCB
903207	Needle valve, 1/8", Flow Balance
659494	Ozon Generator (Spiral lamp only)
657719	Ozon Generator
657716	Power Supply Ozon Generator
657720	Power Supply PCB
655253	Pressure sensor, 0-15 psig (Sample)
655254	Pressure sensor, 0-30 psig (Ozone)
655215	Pressure switch, Pressure 500 hPa
659287	PROM SW-Version 2.2.1
659287-R1	PROM SW-Version 2.3
659895-R1	PROM SW-Version 3.3.0
659895-R2	PROM SW-Version 3.3.1
659895-R3	PROM SW-Version 3.3.3
659895-R4	PROM SW-Version 3.3.4
659895-R5	PROM SW-Version 3.6
659895-R6	PROM SW-Version 3.7.0
659895-R7	PROM SW-Version 3.7.1
659895-R8	PROM SW-Version 3.7.2
659895-R9	PROM SW-Version 3.9.3
659895-R10	PROM SW-Version 3.9.4
655580	Signal Board PCB
659477	Solenoid valve assembly, 24 VDC, NO/NOx
657298	Thermostat assembly Converter 80 °C
655264	Transistor assembly, NPN

655250	**Converter Replacement Parts**
655227	Glas tube, filled and conditioned
655228-R1	Heater Jacket
655282-R1	Temperature Sensor, Platinum

	Detector Replacement Parts
655218-V1	Cable Photodiode
659754X	Detector assembly (without Capillary)
655235	Heater/Thermostat Assembly
854540	O-Ring, Viton 0.739 ID 0.87 OD
876478	O-Ring, Viton 0.737 ID 0.94 OD
655258	Photodiode
655216	Temperature Sensor

SECTION 7 RETURN OF MATERIAL

7-1 RETURN OF MATERIAL

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

1. Secure a return authorization from a Emerson Processs Management Sales Office or Representative before returning the equipment. Equipment must be returned with complete identification in accordance with Emerson instructions or it will not be accepted.
2. In no event will Emerson be responsible for equipment returned without proper authorization and identification.
3. Carefully pack the defective unit in a sturdy box with sufficient shock absorbing material to ensure no additional damage occurs during shipping.
4. In a cover letter, describe completely:
   a. The symptoms that determined the equipment is faulty.
   b. The environment in which the equipment was operating (housing, weather, vibration, dust, etc.).
   c. Site from where the equipment was removed.
   d. Whether warranty or non-warranty service is expected.
   e. Complete shipping instructions for the return of the equipment.
5. Enclose a cover letter and purchase order and ship the defective equipment according to instructions provided in the Emerson Return Authorization, prepaid, to:

EMERSON Process Management
Process Analytic Division
Customer Service Center
USA: +1 (800) 433-6076

EMERSON Process Management
GmbH & Co. OHG
D-63594 Hasselroth, Germany
Industriestrasse 1
EU: +49 (6055) 884-0 Fax: -209

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

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

7-2 CUSTOMER SERVICE

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

EMERSON Process Management
Process Analytic Division
Customer Service Center
USA: +1 (800) 433-6076
EU: +49 (6055) 884-470

7-3 TRAINING

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

EMERSON Process Management
GmbH & Co. OHG
D-63594 Hasselroth, Germany
Industriestrasse 1
EU: +49 (6055) 884-470/-472 Fax: -469

EMERSON Process Management
Process Analytic Division
Customer Service Center
USA: +1 (800) 433-6076

LIST OF FIGURES AND TABLES

1 LIST OF FIGURES

2 LIST OF TABLES

APPENDIX Declaration of Conformity

EC DECLARATION OF CONFORMITY

Document number: RAE/CLD-E9
Date: February 2008

We,

Emerson Process Management GmbH & Co. OHG

located at

Industriestrasse 1, D-63594 Hasselroth, Germany

declare under our sole responsibility that our gas analyzer, type

CLD

to which this declaration relates is in conformity with the provisions of:

89/336/EEC **EMC Directive** **(changed by directive 91/263/EEC 92/31/EEC and 93/68/EEC)**
with the application of the harmonized standards:

EN 61326-1:1997 + A1:1998 + A2:2001 + A3:2003	Electrical equipment for measurement, control and laboratory use - EMC requirements

---

97/23/EC **Pressure Equipment Directive**
This analyzer has been designed and manufactured considering article 3, paragraph 3 of the above mentioned directive and therefore CE marking does not refer to this directive.

This document covers all CLD modules to be operated with NGA analyzers.

Hasselroth, February 2008

....
(Signature)

Andy Kemish
(Name)

VP Rosemount Analytical Europe
(Function name)

ROSEMOUNT Analytical

EMERSON Process Management

This declaration confirms the compliance with announced directives but does not include the assurance of properties.
The safety and installation instructions of the documentation have to be followed.

WORLD HEADQUARTERS
ROSEMOUNT ANALYTICAL EUROPE
Emerson Process Management
GmbH & Co. OHG
Industriestrasse 1
63594 Hasselroth
Germany
T 49 6055 884 0
F 49 6055 884209

Emerson Process Management
Rosemount Analytical Inc.
6565 P Davis Industrial Parkway
Solon, OH 44139 USA
T 440.914.1261
Toll Free in US and Canada 800.433.6076
F 440.914.1271
e-mail: gas.csc@EmersonProcess.com
www.raihome.com

GAS CHROMATOGRAPHY CENTER
AND LATIN AMERICA
Emerson Process Management
Rosemount Analytical Inc.
11100 Brittmoore Park Drive
Houston, TX 77041
T 713 467 6000
F 713 827 3329

EUROPE, MIDDLE EAST AND AFRICA
Emerson Process Management
Shared Services Limited
Heath Place
Bognor Regis
West Sussex PO22 9SH
England
T 44 1243 863121
F 44 1243 845354

ASIA-PACIFIC
Emerson Process Management
Asia Pacific Private Limited
1 Pandan Crescent
Singapore 128461
Republic of Singapore
T 65 6 777 8211
F 65 6 777 0947
e-mail: analytical@ap.emersonprocess.com

EMERSON
Process Management