Instruction Manual
760001-A
October 2002

Model NGA2000 FID

Flame Ionization Detector Module

ROSEMOUNT® Analytical

EMERSON™ Process Management

http://www.processanalytic.com

ESSENTIAL INSTRUCTIONS
READ THIS PAGE BEFORE PROCEEDING!

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

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

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PREFACE

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

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

DEFINITIONS

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

DANGER

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

WARNING

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

CAUTION

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

NOTE

Highlights an essential operating procedure, condition or statement.

SAFETY SUMMARY

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

AUTHORIZED PERSONNEL

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

DANGER

ELECTRICAL SHOCK HAZARD

Do not operate without doors and covers secure. Servicing requires access to live parts which can cause death or serious injury. Refer servicing to qualified personnel. For safety and proper performance this instrument must be connected to a properly grounded three-wire source of power.

WARNING

POSSIBLE EXPLOSION HAZARD

This equipment is used in the analysis of sample gases which may be flammable, and the burner fuel used in the ionization process is flammable. A continuous dilution purge system is factory-installed (in accordance with Standard ANSI/NFPA 496-1993, Chapter 6, and it must be functional at all times during operation. Do not disable this purge system.

WARNING

FLAMMABLE SAMPLES

Consult the factory if flammable samples will be measured.

WARNING

PARTS INTEGRITY

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

WARNING

HAND INJURY HAZARD

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

WARNING

POSSIBLE EXPLOSION HAZARD

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

CAUTION

PRESSURIZED GAS

This module requires periodic use of pressurized gas. See General Precautions for Handling and Storing High Pressure Gas Cylinders, page P-5.

CAUTION

PURGE AIR REQUIREMENT

This Analyzer Module must be used in conjunction with a device (Control Module or PC Interface) that can actively monitor network variables related to pressure or flow of the continuous dilution purge, or the front panel LEDs of the Analyzer Module, as installed, must be visible. The purpose of this requirement is to maintain adherence to ANSI/NFPA 496 standard which assures the continued viability of the purge system. Under no circumstances should any pressure or flow indicator be connected to the PURGE AIR OUT outlet of the Analyzer Module because this may affect the sealing performance of the module.

CAUTION

OVER-VOLTAGE SPIKING

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

CAUTION

STATIC ELECTRICITY

Circuit boards in this instrument are static-sensitive. Take all static precautions when handling the circuit boards

NOTE

This Analyzer Module is completely leak-tested at the factory for gas leakage. The user is responsible for testing for leakage at the inlet and outlet fittings on the rear panel (with a test procedure chosen by the user). The user is also responsible for leak-testing periodically and if any internal pneumatic components are adjusted or replaced. See leak test instructions in Section2-4d on page 2-6.

GENERAL PRECAUTIONS FOR HANDLING AND STORING HIGH PRESSURE GAS CYLINDERS

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

Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, Virginia 22202

Used by Permission

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

DOCUMENTATION

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

760001 Instruction Manual (this document)

COMPLIANCES

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

The certification marks appear on the product name-rating plate.

FM
APPROVED

97-C219

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

CE

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

GLOSSARY OF TERMS

Analyzer Module

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

Backplane

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

Control Module

The Operator Interface plus the Controller Board.

Controller Board

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

Distribution Assembly

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

Expansion Module

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

I/O Module

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

Operator Interface

The Display and Keyboard.

Platform

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

Power Supply

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

Primary Variable

The measured species concentration value from an Analyzer Module.

Secondary Variable

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

Softkeys

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

System

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

SECTION 1
DESCRIPTION AND SPECIFICATIONS

1-1 OVERVIEW

This manual describes the Flame Ionization Detector (FID) Analyzer Module of Rosemount Analytical's NGA2000 Series of gas analysis components. See Figure 1-1 below and Figure 1-2 on page 1-2.

The FID Analyzer Module is designed to continuously determine the concentration of hydrocarbons in a flowing gaseous mixture. The concentration is expressed in parts-per-million or percent of volume.

The entire FID 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 monitoring of atmospheric air for low-level hydrocarbon contaminants and determining the hydrocarbon content of exhaust emissions from internal combustion engines are examples of typical applications for the FID Analyzer Module.

1-3 THEORY OF TECHNOLOGY

This Analyzer Module uses the flame ionization method of detection. The sensor is a burner in which a regulated flow of sample gas passes through a flame sustained by regulated flows of a fuel gas (hydrogen or a hydrogen/diluent mixture) and air.

Within the flame, the hydrocarbon components of the sample stream undergo a complex ionization that produces electrons and positive ions. Polarized electrodes collect these ions, causing current to flow through an electronic measuring circuit

The ionization current is proportional to the rate at which carbon atoms enter the burner, and is therefore a measure of the concentration of hydrocarbons in the sample. This measure of concentration is placed on the network, where it is can be shown on the Platform Display or on other data acquisition devices.

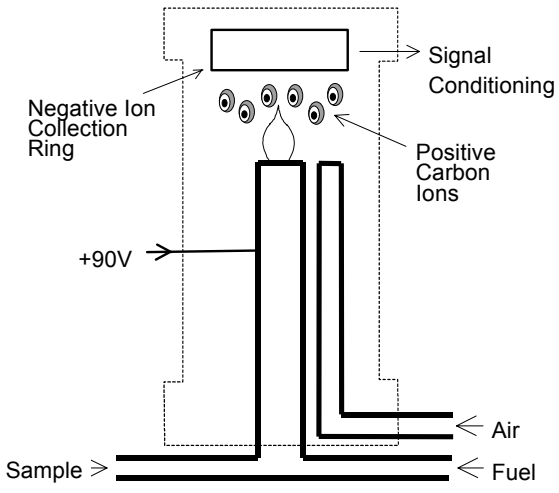


Figure 1-1. Flame Ionization Detection Technology

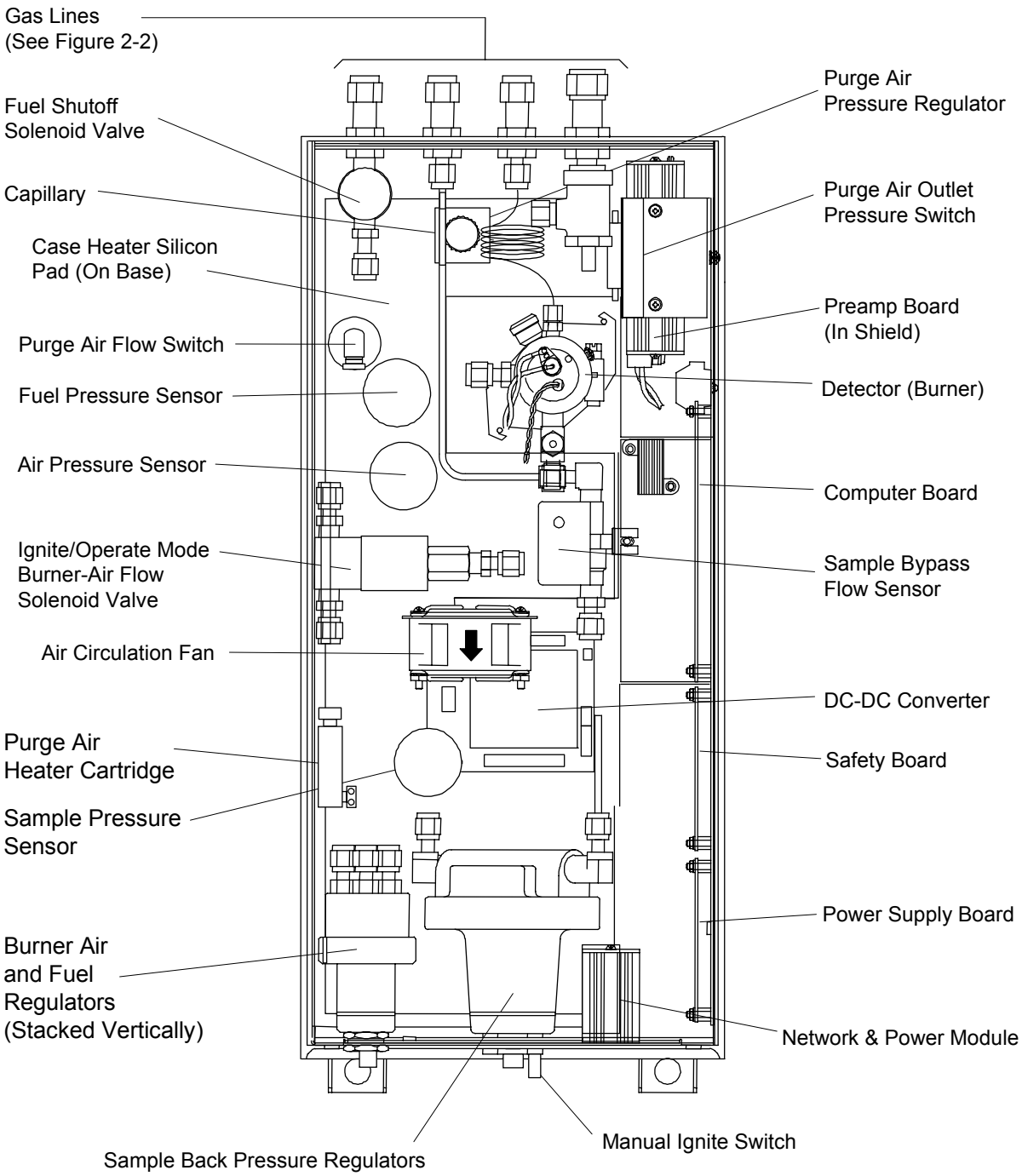


Figure 1-2. FID Component Locations – Top View

1-4 GAS SAFETY FEATURES

The FID Analyzer Module is designed with a factory installed continuous dilution purge system in accordance with standard ANSI/NFPA 496 - 1993, Chapter 6. Front-panel LEDs indicate that the burner flame is lit and that the purge system is enabled. In addition, fuel gas is automatically shut off when a flame-out condition occurs or the safety system is disabled.

The purge system is enabled only if there is proper purge gas flow in, purge gas pressure, and internal case pressure, and after five times the case volume has been exchanged.

All tubing ahead of the burner is rigid metallic tubing assembled with ferrule/nut type compression fittings. However, should an internal fuel leak occur, a worst-case leak would be dissipated below 25% of the LEL of hydrogen through the combination of an inlet fuel flow restrictor and purge gas flow.

This module is designed to use 100% hydrogen fuel or 40% H_2/60% He fuel at a maximum inlet pressure of 3446 hPa-gauge (50 psig). A different flow restrictor is used for each fuel type.

A standard FID Analyzer Module is only equipped to analyze a non-flammable sample, below 100% of the LEL.

WARNING

POSSIBLE EXPLOSION HAZARD

Protection against explosion depends upon a special fuel flow restrictor in the fuel inlet fitting. Do not remove fuel inlet restrictor. Use the correct fuel flow restrictor for the fuel being used. Do not use 100% hydrogen fuel in a 40% H_2/60% He configured Analyzer Module. Replace only with factory supplied fitting.

1-5 FUEL GAS OPTION

The standard FID Analyzer Module requires 40% hydrogen/60% helium burner fuel gas. As an option, the analyzer module can be equipped to use 100% hydrogen fuel. The particular application and characteristics of the sample gas to be measured will dictate the preferred type of fuel. The following guidelines can be used for determining fuel gas type:

1. For measuring low-level hydrocarbons in ambient air or in other sample gas with relatively constant oxygen content, 100% hydrogen is preferable. It provides the highest obtainable sensitivity and maximum stability. Zero drift caused by ambient temperature variations of the fuel cylinder is somewhat lower for 100% hydrogen than for mixed fuel. (With either fuel, it is desirable to maintain a constant cylinder temperature.)

2. For monitoring internal combustion exhaust emissions or other sample gas with varying oxygen content, mixed fuel is preferable. In fact, a hydrogen/helium mixture is more desirable than a hydrogen/nitrogen mixture. With this type of sample, the use of mixed fuel gas minimizes the error introduced by oxygen synergism.

An effective way to reduce the effect of internal oxygen is to dilute it with an inert gas. This can be accomplished with a constant dilution of sample and calibration gases upstream from the burner. But it is simpler and more accurate to provide that diluent in the form of premixed fuel. Both nitrogen and helium have been used as a diluent, but helium has proven to be most effective in improving the quality of response to the various species of hydrocarbons.

As indicated earlier the flame output signal is optimum when the ratio of hydrogen flow to inert flow is about 40/60. Therefore, this is the chosen composition for hydrogen/helium premixed fuel.

The sample flow is kept low to maximize the dilution effect while still providing adequate sensitivity. The burner air flow is normally about four times the fuel flow, and changes have little effect on signal strength. For a

given flow, the signal can be optimized by adjusting the fuel flow rate.

Typical flow rates with premixed fuel:

Fuel	100 cc/min
Sample	7 cc/min
Air	400 cc/min

Note that with a 40/60 premixed fuel, the above flow rates amount to 40 cc (8%) hydrogen, 67 cc (13%) inert plus sample and 400 cc (79%) air, which compare closely to the 30 cc (8%) hydrogen, 45 cc (12%) inert/sample and 300 cc (80%) air noted earlier for straight hydrogen fuel.

Since sample flow in the case of mixed fuel operation is only about 1/6 of that with straight hydrogen fuel, higher sensitivity is obtained with the latter. However, in any application where the sample contains more than one species of hydrogen and/or a varying concentration of oxygen, mixed fuel is preferred.

The mixed fuel is recommended, not only for sample containing variable concentrations of oxygen, but also for a specific pure gas application. If straight oxygen samples are used with straight hydrogen fuel, the mixture entering the burner is essentially 40% H_2/60% O_2, which tends to produce an unstable signal. The mixed fuel works better. Note that the choice of fuel determines certain analyzer characteristics, as shown in Table 1-1 below.

ANALYZER CHARACTERISTICS	FUEL GAS	
	100% H_2	**40% H_2/60% He**
Fullscale Sensitivity	1 ppm, CH_4 to 2%, CH_4	4 ppm, CH_4 to <5%, CH_4
Fuel Consumption	35 to 40 cc/min	75 to 80 cc/min
Operating Range	276 to 345 hPa-gauge (4 to 5 psig)	207 to 345 hPa-gauge (3 to 5 psig)

Table 1-1. Analyzer Characteristics Relative to Fuel Gas

1-6 SPECIFICATIONS

a. General

Measurement Species..... Total hydrocarbons

Ranges ..... 0 to 100 ppm (output scalable down to 0-2 ppm fullscale)

- H2/He fuel..... low range: 0 to 4 ppm CH_4, through 0 to 1% CH_4
  high range: 0 to 50 ppm CH_4, through 0 to <5% CH_4
- H2 fuel[1] ..... low range: 0 to 1 ppm CH_4, through 0 to 2500 ppm CH_4
  high range: 0 to 10 ppm CH_4, through 0 to 2% CH_4

Repeatability..... ≤1% of fullscale at a constant temperature, sample flow and fuel, burner air and sample pressure

Minimum Detectable Level

- H2/He fuel..... 0.04 ppm
- H2 fuel [1] ..... 0.01 ppm H_2 fuel

Noise ..... ≤1% of fullscale, peak to peak

Linearity..... ≤ ±1% of fullscale for H_2/He fuel and He fuel

Response Time

- CEMS ..... ≤30 sec. For 10% to 90% of fullscale, with sample bypass flow at 0.5 L/min. (non-flammable sample)
- ICEE ..... ≤1 sec. For 10% to 90% of fullscale, with sample bypass flow at 0.5 L/min. (non-flammable sample)

Zero Drift..... ≤ ±1% of fullscale/24 hours at constant temperature, hydrocarbon concentration of supply gases, sample flow and fuel, burner air and sample pressure

Span Drift..... ≤ ±1% of fullscale/24 hours at constant temperature, hydrocarbon concentration of supply gases, sample flow and fuel, burner air and sample pressure

Effect of Temperature..... ≤ ±2% of fullscale for any temperature change of 10°C and rate of change less than 10°C/hour

Operating Temperature ..... 32°F to 113°F (0°C to 45°C)

Power Requirements..... +24 VDC ±5%, 120 W max.. direct to analyzer module;
Ripple and Noise: <100 mV peak to peak
Line and Load Regulations: <±1%

[1] Option

b. Gas Requirements

Sample ..... Non-flammable, below 100% of LEL
- Flow rate ..... 0.5 to 40 ml/min.
- THC ..... ≤0.5 ppm, CH_4
- Supply pressure ..... 483 to 1035 hPa-gauge (7 to 15 psig)
- Temperature ..... 32°F to 132°F (0°C to 55°C), <20°C variance/24 hours, <10°C variance/hour
- Particulates ..... Filtered to <2 microns
- Dewpoint ..... <45°C

Purge Air ..... Instrument air, nitrogen or other non-flammable gas (refer to ANSI/NFPA 496 for the requirements for the Protective Gas System)
- Flow rate: ..... 16 to 18 L/min.
- Supply pressure: ..... 689 to 1378 hPa-gauge (10 to 20 psig)

Fuel Gas (Standard) ..... Premixed 40% hydrogen and 60% helium
- Flow rate ..... 75 to 80 ml/min.
- THC ..... ≤0.5 ppm, CH_4
- Supply pressure ..... 2415 to 3450 hPa-gauge (35 to 50 psig)

WARNING

POSSIBLE EXPLOSION HAZARD

Unless this Analyzer Module is factory- or field-configured specifically for using 100% hydrogen fuel, DO NOT USE PURE HYDROGEN FUEL. An explosion resulting in severe personal injury or death could occur. Also, each Analyzer Module is factory-configured for either mixed or pure hydrogen fuel, and cannot use the fuel for which it was not configured unless field reconfiguration is done.

Fuel Gas (H_2 option) ..... Zero-grade hydrogen
- Flow rate ..... 35 to 40 ml/min.
- THC ..... ≤0.5 ppm, CH_4
- Supply pressure ..... 2415 to 3450 hPa-gauge (35 to 50 psig)

Burner Air ..... Zero-grade air
- Flow rate ..... 350 to 400 ml/min
- THC ..... ≤ ppm, CH_4

Supply pressure ..... 1725 to 3450 hPa-gauge (25 to 50 psig)

c. Physical

Case Classification:	General purpose for installation in weather-protected area
Maximum Separation	1600m (1 mile) from Analyzer Module to Platform
Materials in Contact With Sample	Stainless steel, Teflon, glass-filled Teflon, brass, neoprene, Kynar
Dimensions	See Outline and Mounting Dimensions, Figure 2-5 on page 2-7
Weight	10.43 kg (23 lbs.)
Mounting	Horizontal, inside a Platform or custom installed in a panel

d. Gas Connections

Sample In:	1/4" O.D. tube fitting, stainless steel
Regulated Air In:	1/4" O.D. tube fitting, brass
Burner Air In:	1/4" O.D. tube fitting, brass
Fuel In:	1/4" O.D. tube fitting, stainless steel
Purge Air In:	3/8" O.D. tube fitting, brass
Purge Air Out:	3/8" O.D. tube fitting, brass
Bypass Out:	1/4" O.D. tube fitting, stainless steel
Burner Exhaust Out:	1/2 inch O.D. tube connection, Tygon or equivalent (this connection shall slope downward 6° minimum from horizontal)

Pressure Relief Valve

CAUTION

PRESSURE RELIEF VALVE RESTRICTION

No connection shall be made to this fitting. If this caution is ignored, damage to the case seals may occur, and the instrument will not operate properly.

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

SECTION 2
INSTALLATION

2-1 UNPACKING

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

2-2 ASSEMBLY

If the Analyzer Module requires assembly with other components (e.g., the Platform and associated I/O Modules), do so at this time.

Following the guides on the bottom left and bottom center of the Platform, carefully slide the Analyzer Module halfway into place.

CAUTION

HAND INJURY HAZARD

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

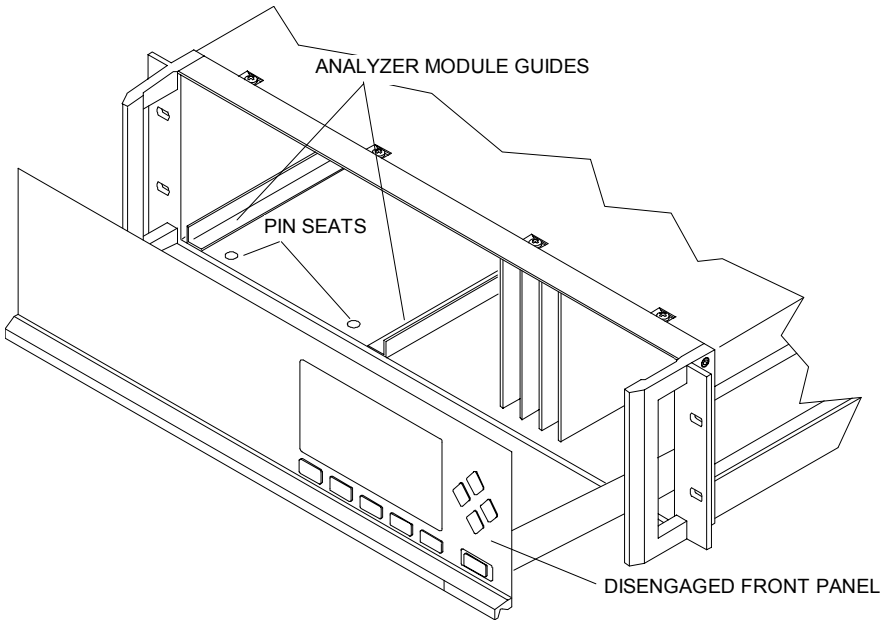


Figure 2-1. Analyzer Module Installation Into Platform

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

Connect the network cable to either the NETWORK 1 or NETWORK 2 connection on the Analyzer Module (see Figure 2-4 on page 2-4), and the NETWORK connection on the Backplane (see Platform manual). Connect the power cable to both the Analyzer Module front panel and to the Backplane.

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

WARNING

INSTALLATION RESTRICTIONS

For safety, the Analyzer Module should be installed in a non-confined, ventilated space. Do not block any of the rear panel outlets as they are part of the safety system.

Operating ambient temperature is 0°C to 45°C, limited to temperature changes of less than 10°C/hr. Acceptable dewpoint range is less than 95% relative humidity, but not in excess of 45°C wet bulb temperature.

The cylinders of fuel, air, and calibration gas(es) and the source of purge air should be located in an area of relatively constant ambient temperature.

2-3 LOCATION

Install the Analyzer Module in a clean, weather-proofed, non-hazardous, vibration free location free from extreme temperature variations. For best results, install the Analyzer Module near the sample stream to minimize sample transport time.

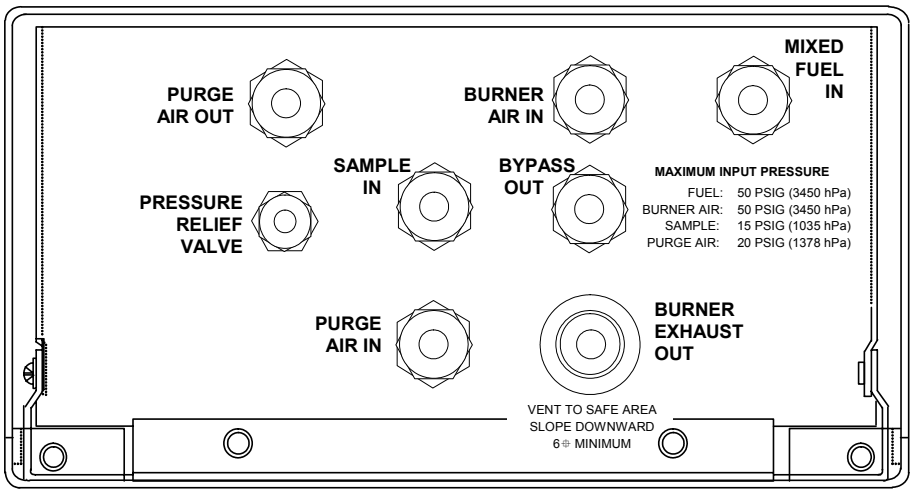


Figure 2-2. Back Panel Connections

2-4 GASES

a. Overview

During normal operation, the Analyzer Module requires fuel and air to maintain the burner flame as well as suitable standard gases for calibration and instrument air for purge requirements. Criteria for selection of these gases follow in 2-4c on page 2-5.

After initial startup or after startup following a prolonged shutdown, the analyzer may display baseline drift for a considerable period of time, particularly on the most sensitive range. Commonly, the drift is caused by small amounts of hydrocarbons in the inner walls of the tubing in both the internal flow system and the external gas supply system. Drift results from any factor influencing the equilibrium of these absorbed hydrocarbons, such as temperature or pressure.

Note that this type of drift occurs only when the flame is burning. If drift occurs when the flame is extinguished, the electronic circuitry is at fault. To minimize drift, use clean fuel and air, keep the analyzer clean, and locate the gas cylinders in an area of relatively constant ambient temperature.

The cylinders supplying all gases each should be equipped with a clean, hydrocarbon free, two stage regulator and a shutoff valve.

All new external gas tubing (except for PURGE IN/OUT and SAMPLE BYPASS) is strongly recommended, preferably precleaned, stain-less steel, gas chromatograph grade tubing. Thoroughly clean before use. if a hydrocarbon based cleaning solvent such as acetone is used, purge tubing with dry nitrogen or helium for several minutes before using.

Gas line connections are compression fittings. Do not use pipe thread tape.

Since the oxidation of hydrogen is accompanied by the formation of water vapor, the Exhaust tubing always should be slanted downward at least 6 degrees from horizontal. Otherwise, water may accumulate in the line, causing back pressure and noisy readings, or may back up in the line and flood the burner.

If the sample is toxic or noxious, or is to be reclaimed, connect the Bypass outlet to a suitable disposal system. Do not use any device that may cause back pressure in the line.

Purge air and burner air should be supplied from separate sources.

b. Connections

Reference Figure 2-2 on page 2-2. Connect inlet and outlet lines for sample, burner fuel and air, exhaust, bypass, and purge to appropriately labeled fittings on the rear panel. All connections are 1/4 inch ferrule type compression fittings except the PURGE AIR IN and OUT connections, which are 3/8 inch compression fittings. The BURNER EXHAUST OUT is a 1/2 inch connection. Burner exhaust, bypass and purge air out must be vented at atmospheric pressure to a non-classified location in accordance with ANSI/NFPA-496.

It is recommended that no connection be made to the PURGE AIR OUT port. If, however, the analyzer's location requires interconnection with a venting system, the 3/8" O.D. line should be kept as short as possible, and no longer than four feet.

CAUTION

POSSIBLE INSTRUMENT DAMAGE

No connection should be made to the PRESSURE RELIEF VALVE fitting. Doing so may cause damage to the instrument.

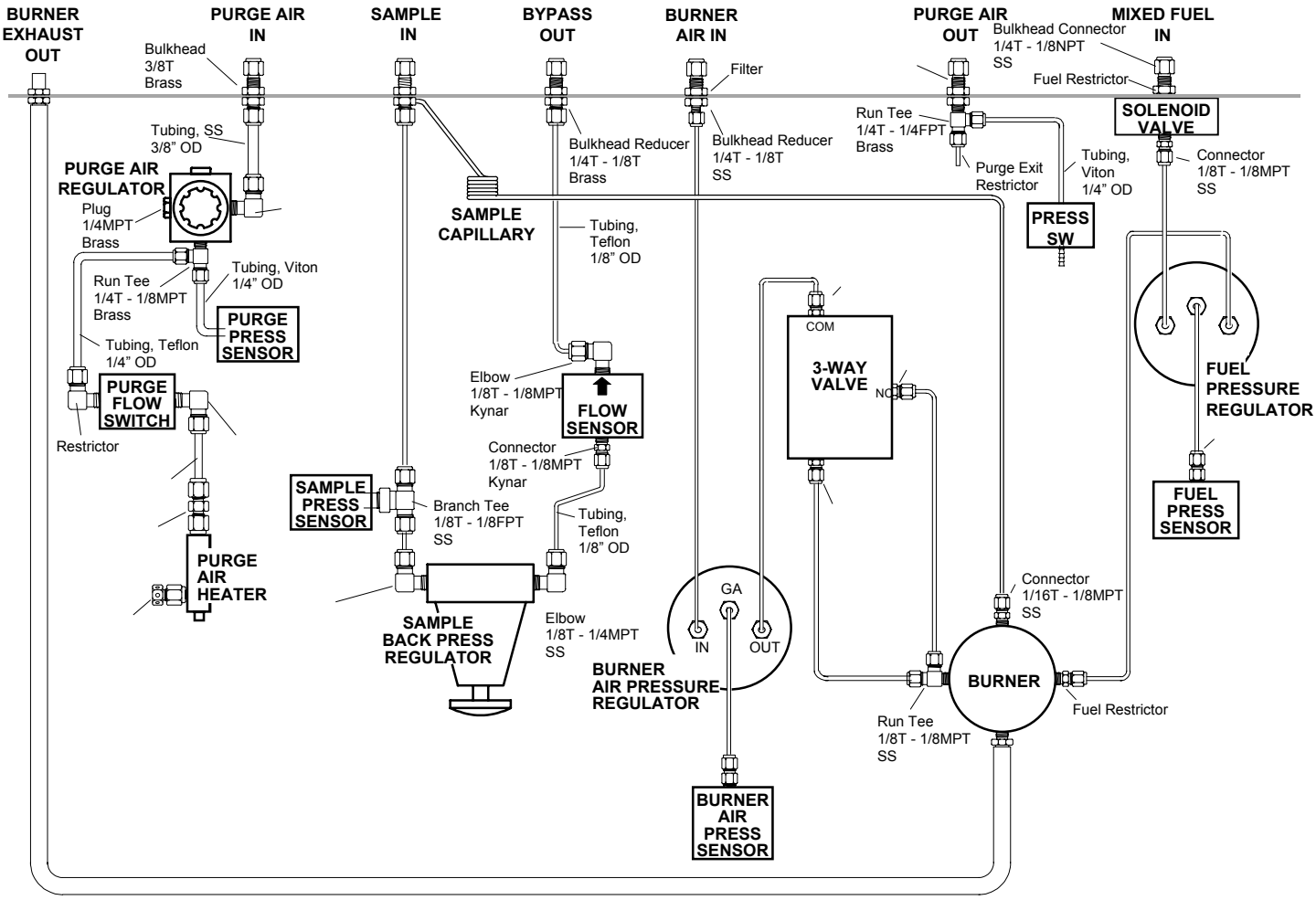


Figure 2-3. FID Module Flow Diagram

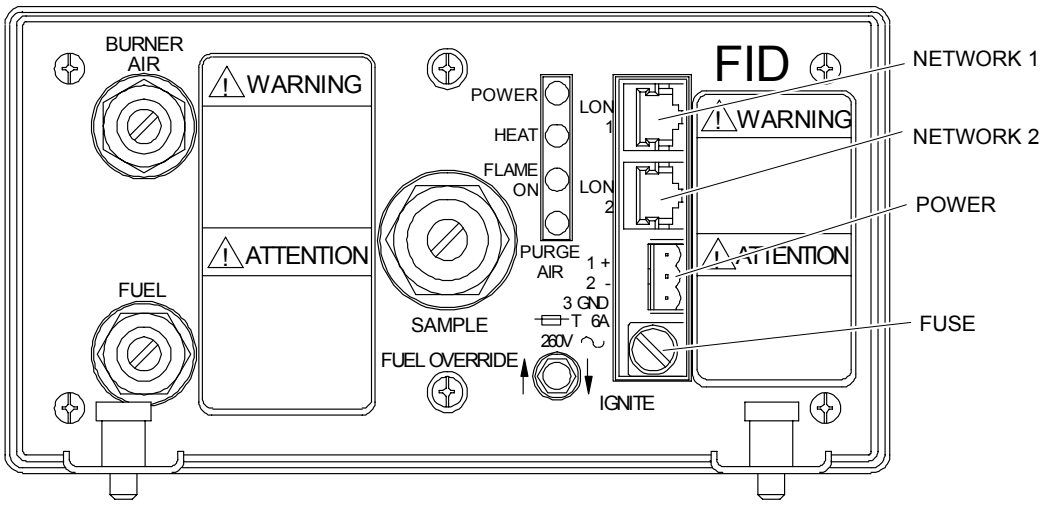


Figure 2-4. Front Panel Connections, Controls and Indicators

c. Specifications

Fuel Gas

Standard analysis usually requires mixed fuel, i.e., 40% (±2%) hydrogen and 60% helium. H2/He mixed fuel is recommended over H2/N2 fuel because of better linearity in concentration output. Such blends are supplied by many gas vendors specifically for this use, with a guaranteed maximum total hydrocarbon content of 0.5 ppm, measured as methane. This specification should be used when obtaining these mixtures.

NOTE

The fuel restrictor is marked with a red dot, and the sample capillary is marked with a red or green dot for mixed fuel applications.

Some applications require the use of 100% hydrogen fuel. When using this option, always ensure that sample pressure (4 to 5 psig) is present when fuel flow is present. Otherwise, the detector tip may be damaged.

The fuel restrictor and sample capillary are marked with a white dot for 100% hydrogen fuel applications.

Burner Air

In order to ensure a low background signal, burner air should contain less than 1 ppm maximum total hydrocarbon content. An alternate source for burner air and zero gas (see CALIBRATION GASES below) is a combination diaphragm pump and heated palladium catalyst. This process continuously removes moderate amounts of hydrocarbons and carbon monoxide from ambient air.

Purge Air

Instrument quality air, nitrogen, or other nonflammable gas is required for the safety purge system.

Calibration Gases

Calibration method and gases depends on the type of fuel gas used, the operating range, and the desired measurement accuracy. In all methods, zero and span gases are used, and are introduced through the sample inlet at the rear of the module.

ZERO GAS - Analysis is affected by the background gas of the sample. Therefore, it is recommended to use zero gas with as close to the background composition of the sample as possible. Normally less than 0.5 THC as CH_4 is sufficient.

If the burner fuel is 100% hydrogen, the zero gas, background gas of the sample or background gas of the span gas cannot be hydrogen or oxygen. These gases combined with pure hydrogen fuel would generate excessive heat in the burner, causing deterioration of the internal components of the burner.

SPAN GAS - Span gas consists of a specified concentration of methane or other hydrocarbon in a background gas such as nitrogen. ***Analysis is affected by the background gas of the sample. Therefore, span gas containing the same background gas as the sample is recommended. Then, the background effect is canceled out.***

SAMPLE GAS - Sample gas should be nonflammable (below 100% of the sample's LEL). For high sensitivity applications requiring background gas compensation, contact the factory.

FLOW RATE - The sample flow rate must be between 0.5 L/min. and 2 L/min. Flow rate for purge air should be 16 to 18 L/min.

PRESSURIZATION/FILTRATION - Sample pressure at the SAMPLE inlet should be within the range of 483 to 1035 hPa-gauge (7 to 15 psig), and internally, should be 345 hPa-gauge (5 psig) nominally. Burner fuel pressures should be:

1725 to 3450 hPa-gauge (25 to 50 psig) for cylinder regulator, 1518 to 1723 hPa-gauge (22 to 25 psig) internal. Burner air pressures should be: 1725 to 3450 hPa-gauge (25 to 50 psig) for cylinder regulator, 965 to 1103 hPa-gauge (14 to 16 psig) internal. Purge air (external supply) pressure should be between 689 and 1378 hPa-gauge (10 and 20 psig), 689 to 827 hPa-gauge (10 to 12 psig) nominal. The internal purge air regulator pressure is factory preset at a nominal setting of 551 hPa-gauge (8 psig) with a supply pressure of 689 hPa-gauge (10 psig). Noncompliance with these specifications, particularly those concerning purge air, could cause over-pressure damage to the module. The nominal internal case pressure is about 0.5 to 1.0 inch of water, and the pressure relief valve is set at 1/3 psig (nominal).

At the very least, the module's safety system, which requires a certain volume of purge air flowing through the case before allowing burner ignition, will not allow the instrument to operate.

All internal pressure settings are preset at the factory, but the operator should check for accuracy. Sample should be filtered for particulates down to two microns.

d. LEAK TEST

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

2-5 ELECTRICAL CONNECTIONS

Two electrical connections are required on the Analyzer Module: POWER and NETWORK. See Figure 2-4 on page 2-4. On the Analyzer Module, two NETWORK connectors are available, either of which is appropriate for: 1) interconnection with the Backplane of the Platform or 2) "daisy-chaining" with other NGA2000 components. Connect Analyzer Module POWER to Backplane POWER or external 24 VDC power source.

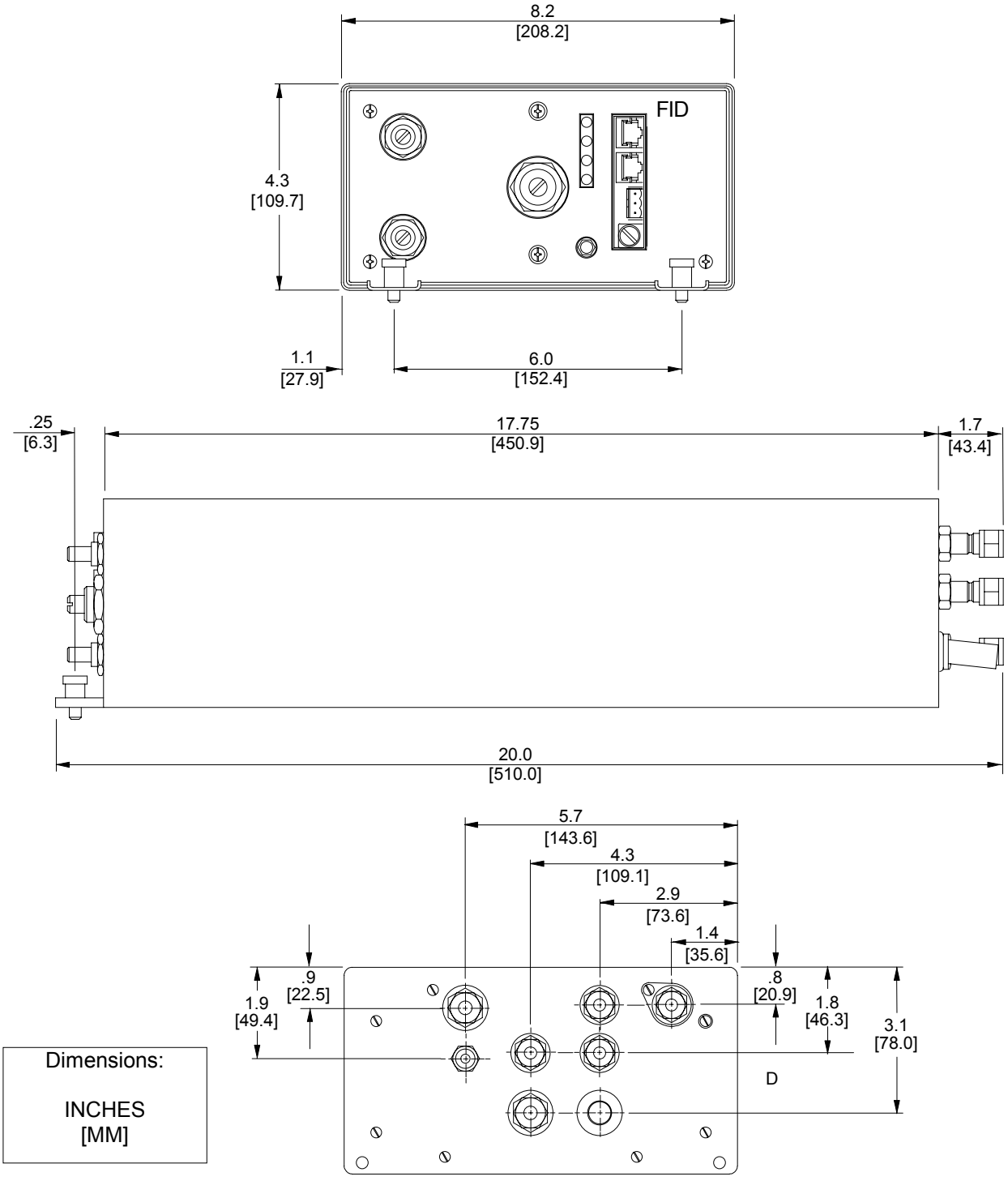


Figure 2-5. Outline and Mounting Dimensions

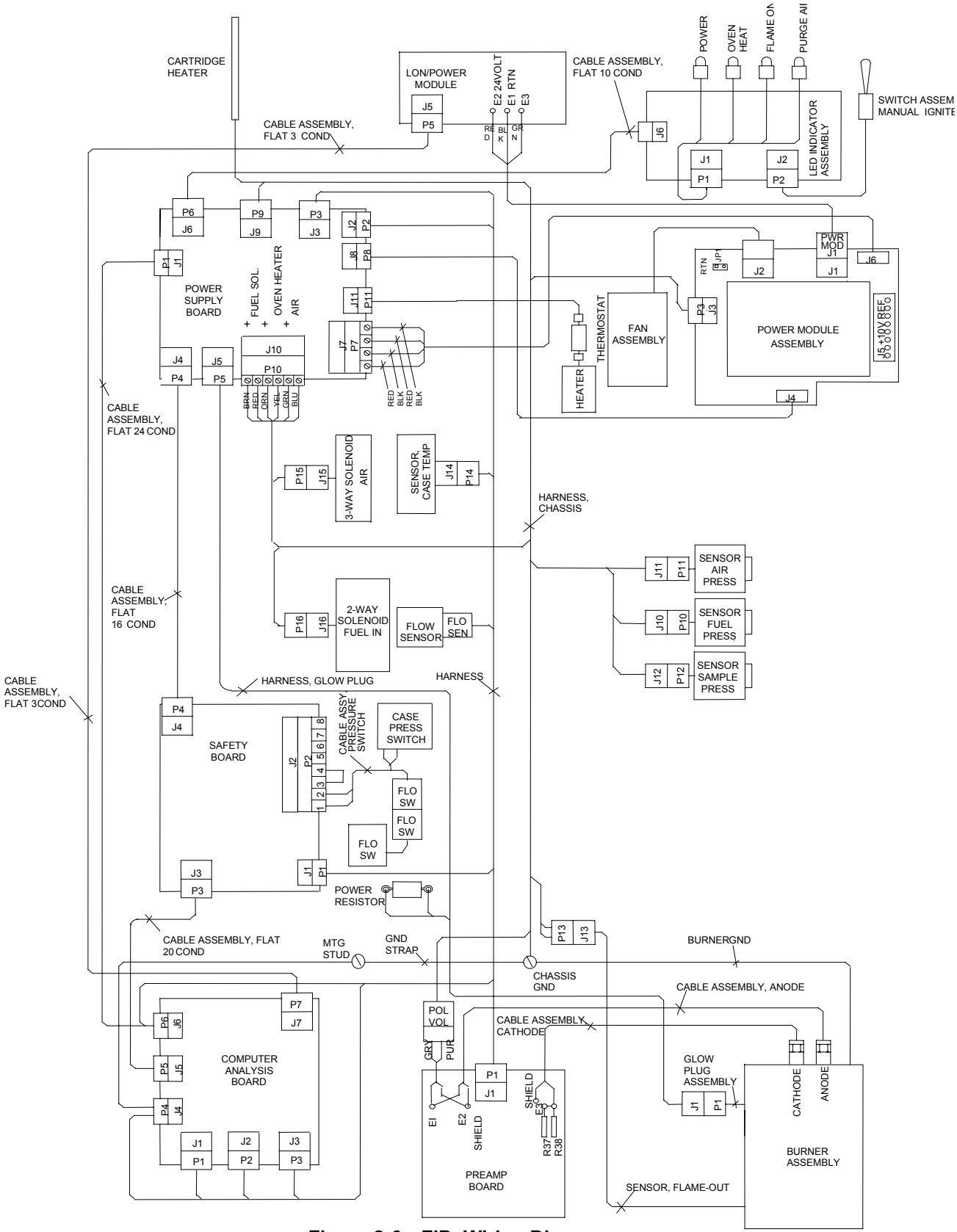


Figure 2-6. FID Wiring Diagram

SECTION 3
OPERATION

3-1 OVERVIEW

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

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

(For a complete description of Platform Front Panel controls and indicators, see Section 1 of the Platform instruction manual.)

3-2 DISPLAYS

Three kinds of Display screens are available to the user:

- Run Mode
- Menu
- Help

3-3 RUN MODE DISPLAY

The Run Mode is the normal mode of operation. In this mode, the display (see Figure 3-1 below) will show current gas measurement, the component of interest, user-selectable (up to four) secondary variables, the current operations of the softkeys, and a graphic bar representing the displayed concentration as a percent of fullscale.

If more than one Analyzer Module is connected to the system, another Run Mode display will show up to four gas measurements at once. Alarm messages may also appear on the display (See Table 3-1 on page 3-4).

3-4 MENU DISPLAYS

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

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

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

3-5 HELP DISPLAYS

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

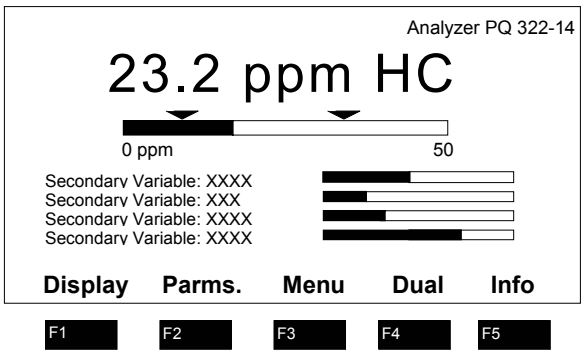


Figure 3-1. Run Mode Display

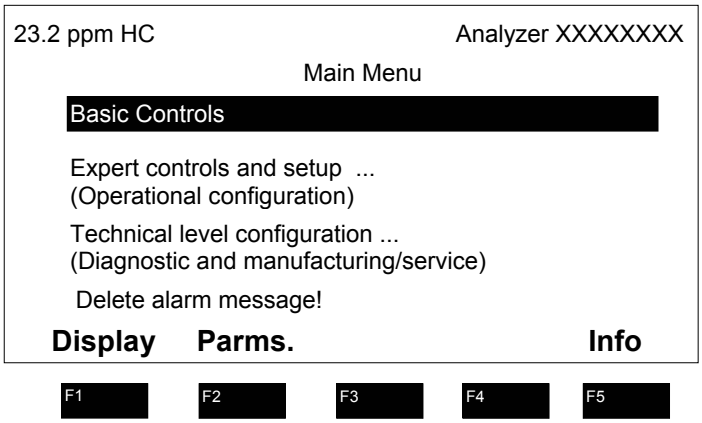


Figure 3-2. Main Menu Display

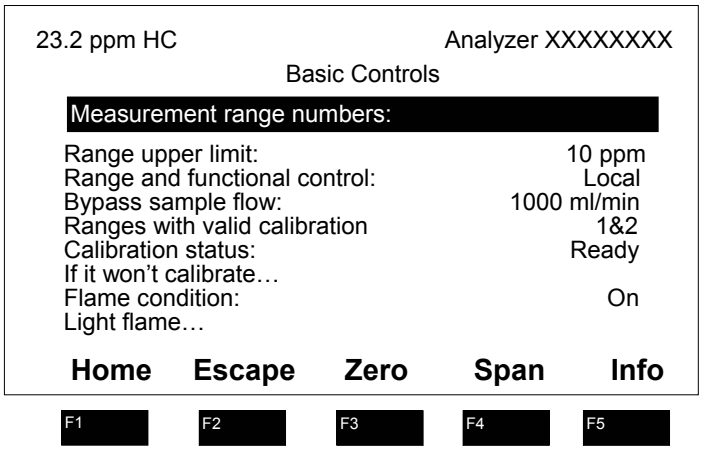


Figure 3-3. Basic Controls Menu Display

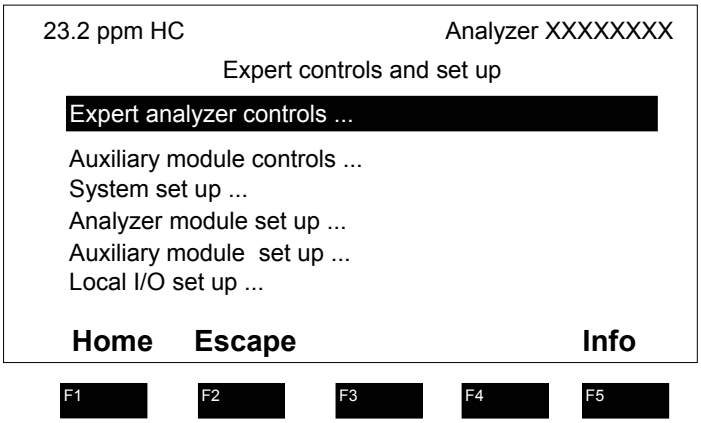


Figure 3-4. Expert Controls and Setup Menu Display

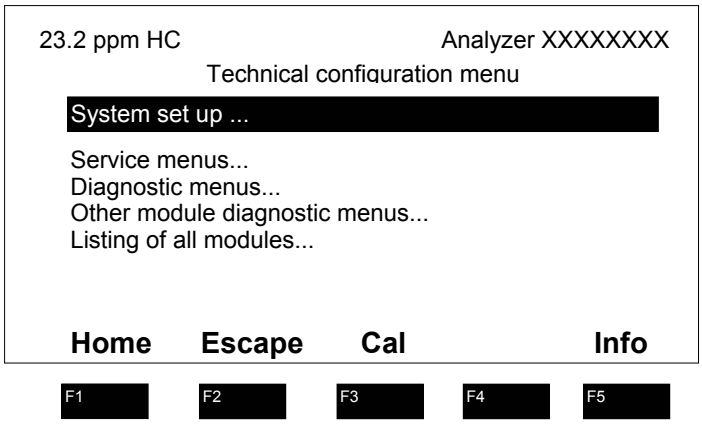


Figure 3-5. Technical Configuration Menu Display

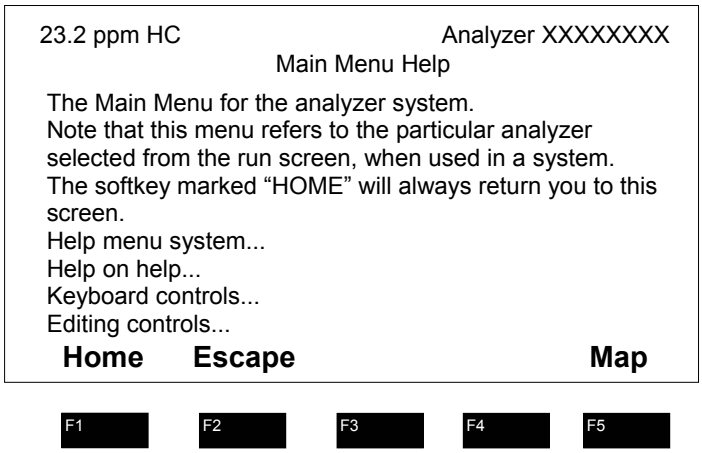


Figure 3-6. Typical Help Screen

DISPLAY MESSAGE	DESCRIPTION	TYPE
AIR FET	FID Air FET current	WARNING
AIR PRESS	FID Air Pressure	WARNING
BAIR FLOW	Burner Air Flow	WARNING
BAROMETER	System Barometer	WARNING
BFUEL FLOW	Burner Fuel Flow	WARNING
BLOCK FET	Heater current	WARNING
CASE TEMP	Case Temperature	WARNING
CRUDE NOISE	Calculated Noise	WARNING
CURRENTRNGHI	Current, High Range	WARNING
CURRENTRNGLO	Current, Low Range	WARNING
CURRENTSFAC	Current Range	WARNING
FLAME TEMP	Flame Temperature	WARNING
FUEL PRES	Fuel Pressure	WARNING
LIN ERROR	Linearizer Error	WARNING
N15 VOLTS	Power Supply -15V	WARNING
P10 VOLTS	Power Supply +10V REF	WARNING
P15 VOLTS	Power Supply +15V	WARNING
POL VOLTS	Polarizing Volts	WARNING
SAMP PRES	Sample Pressure	WARNING
CALRESULT	Calibration Error	FAILURE
PURGE AIR	FID Purge Air	FAILURE
SW ERROR	Software Error	FAILURE

Table 3-1. FID Analyzer Module Alarms

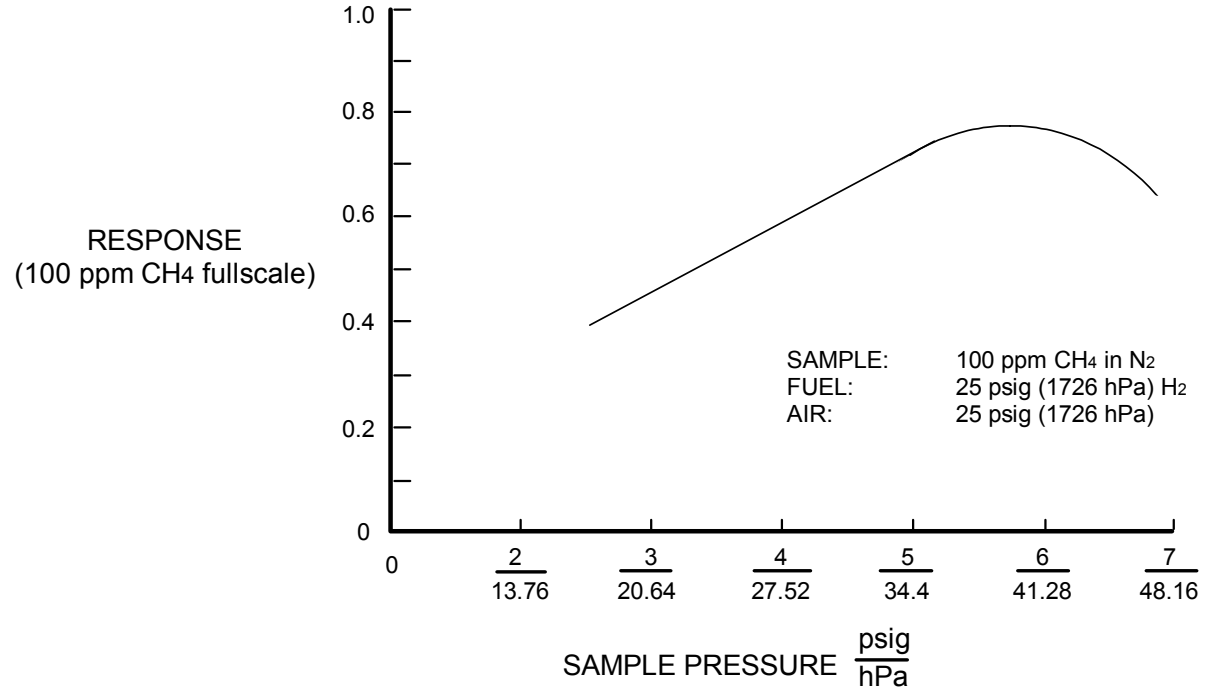


Figure 3-7. Typical Curves of Module Response vs. Pressure Setting on Sample Pressure Regulator

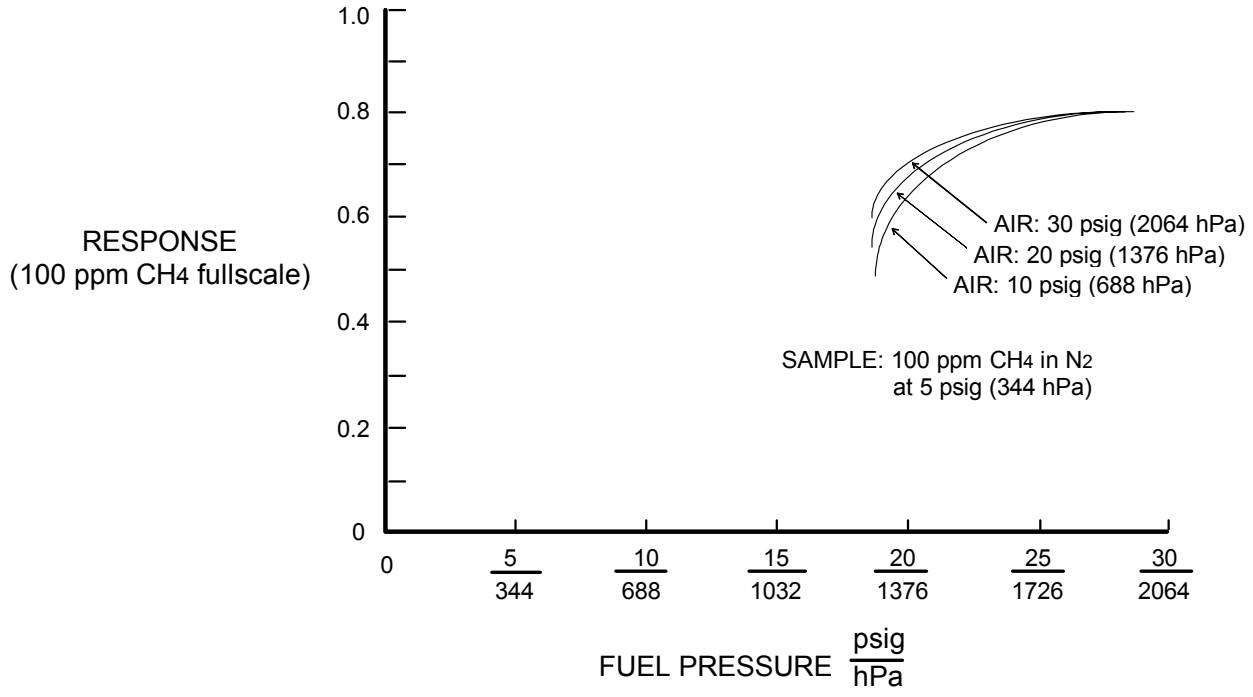


Figure 3-8. Typical Curves of Module Response vs. Pressure Setting on Fuel Pressure Regulator

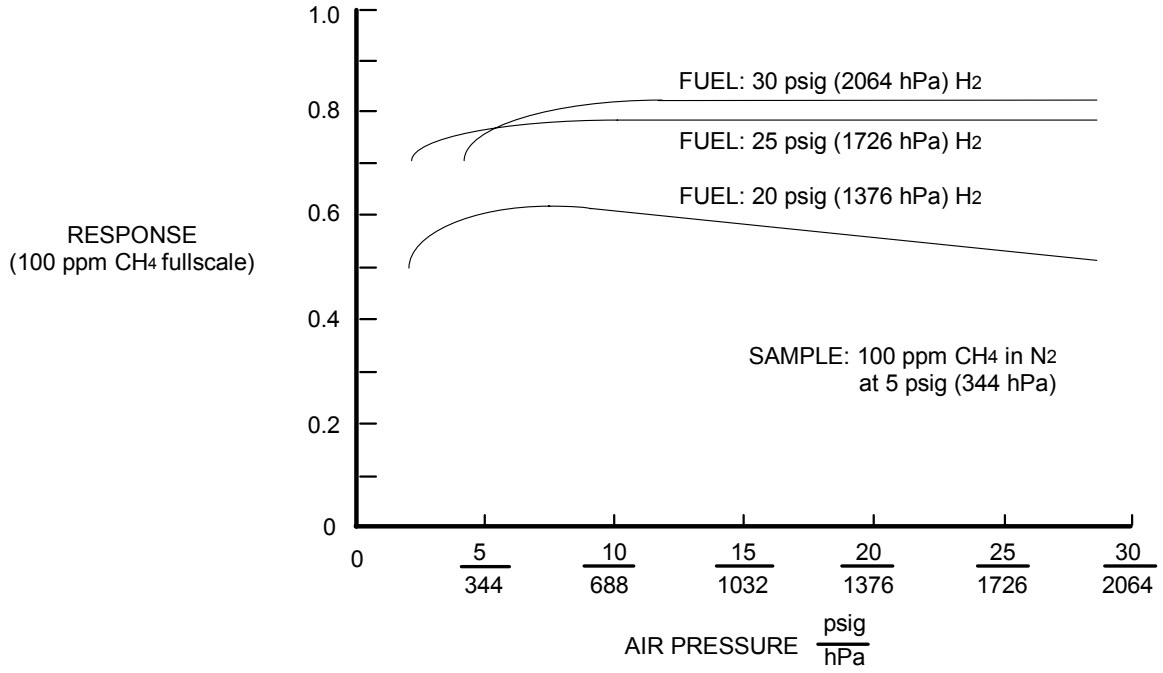


Figure 3-9. Typical Curves of Module Response vs. Pressure Setting on Air Pressure Regulator

3-6 STARTUP PROCEDURE

Apply power to the FID 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 FID Analyzer Module will be energized.

If the user's system contains only one Analyzer Module, all system components, the Controller Board and the network "self-install" (bind together) during initial startup. If the system contains more than one Analyzer Module, the startup sequence will interrogate the network to locate and identify all components on the network. The user will have to bind appropriate combinations of components after the startup sequence (see Section 3-7 on page 3-9).

After the warm-up period (about one hour for the FID Analyzer module), all modules are completely functional.

Before introducing gases to the FID, the user should check the general health of the analyzer module's electronics by reviewing the results of its self test sequence. These test results can be found by selecting the following from the Main Menu: Technical Level Configuration, Diagnostic Menus, Analyzer Module Diagnostics, Self Test. All tested parameters should indicate "Pass."

Descriptions of the tests performed follow:

- **EEPROM test** - Checks the EEPROM on the Analysis Computer PCB.
- **EPROM test** - Checks the EPROM on the Analysis Computer PCB.
- **RAM test** - Checks the RAM on the Analysis Computer PCB.
- **Power supply test** - Verifies that all internal DC voltages are within the required tolerances.
- **Network test** - Checks the internal network interface.
- **20 bit ADC test** - Checks the 20-bit ADC on the Analysis Computer PCB by sending a DC signal through the Preamp PCB and reading the signal back with the 20-bit ADC.
- **12 bit ADC test** - Checks the 12-bit ADC on the Analysis Computer PCB by sending a DC signal and reading the signal back with the 12-bit ADC.
- **Power Supply PCB test** - Checks the presence of the Power Supply PCB by activating the 3-way air solenoid.
- **Safety PCB test** - Checks the presence of the Safety PCB by sending a command and reading it back.
- **Case temperature test** - Compares the temperature read between the Preamp temperature sensor and the case temperature sensor. They must be within 10°C of each other. This test sometimes fails if the case is opened. The sensor in the Preamp will take longer to cool off since it is in an enclosure. Re-running the self-test after thermal equilibrium will produce a positive result if the sensors are working properly.

The self-test can be repeated at any time by activating the TEST softkey in the Self Test Results menu.

Set the Range Number (Expert Controls sub-menu) to the desired setting. Introduce all gases at suitable pressures (see Section 1-6 Specifications, on page 1-5).

Check/set internal pressure regulators according to the following specifications:

Internal Pressure Regulator	Typical Operating Pressures
Burner Air	965 to 1103 hPa-gauge (14 to 16 psig)
Fuel	1516 to 1723 hPa-gauge (22 to 25 psig)
Sample (100% H2)	276 to 345 hPa-gauge (4 to 5 psig)
Sample (Mixed Fuel)	207 to 345 hPa-gauge (3 to 5 psig)

Purge air of the following specifications must be present:

Flow: 16 to 18 L/min.

Supply Pressure: 689 to 1378 hPa-gauge (10 to 20 psig).

Noncompliance could cause damage to the module. At the very least, the module's safety system, which requires a certain volume of purge air flowing through the case before allowing burner ignition, will not allow the instrument to operate. The lowest purge air flow/pressure setting possible during burner operation is preferable. Thus, the user should set the external purge air pressure initially at 689 hPa-gauge (10 psig). Check the Miscellaneous Control Parameters screen under Technical Diagnostics, and note whether the Purge Gas (switch) variable is "ON." If it is "OFF," increase purge air supply by 69 hPa-gauge (1 psig), and recheck the Purge Gas variable until it reads "ON." ***DO NOT EXCEED 1378 hPa-GAUGE (20 PSIG*)**. If the maximum setting is reached, and the Purge Gas variable does not read "ON," contact factory. If the safety system is initiated successfully (Purge Gas variable is "ON"), continue with the remainder of the startup procedure.

NOTE

Do not restrict the PURGE OUT port and the pressure relief valve. They must be vented to atmospheric pressure.

Two methods of burner ignition are possible: auto-ignition and manual ignition. Note the four LEDs on the front panel of the Analyzer Module. They provide necessary information for either ignition procedure. The LEDs, when illuminated, denote the following information:

Green - unit powered on

Amber - constant illumination indicates case temp. is within 5% of operating temp. setpoint (i.e., 50°C with burner off, 54°C with burner on);otherwise, LED will blink

Green - Flame on

Green - purge air system intact (it has filled five volumes of the module interior)

Auto-ignition provides fuel override and three attempted ignitions (default setting), if necessary. Manual ignition requires that the Platform front panel, if used, be disengaged.

CAUTION

HAND INJURY HAZARD

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

The manual ignition switch on the Analyzer Module front panel must be manipulated in the following ways:

1. Press up and hold for one minute. This opens burner fuel and air solenoids.
2. Press down to ignite burner glow plug for up to 10 seconds.

3. Repeat as necessary (if fuel and air sources are farther away than 10 feet, several more attempts may be necessary).

4. Flame on is defined true when the flame temperature exceeds 115°C (239°F).

5. If the flame has been lit, but the flame temperature increases slowly, perform the following steps:

   a. After igniting flame, release switch for 2 sec.

   b. Press switch down for 2 sec.

   c. Repeat release switch and press down steps as necessary.

3-7 BINDING

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

3-8 CALIBRATION

See Section 2-4c on page 2-5 for a description of the method for choosing calibration zero and span gases.

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

1. If more than one Analyzer Module is functional and the split Run Mode display is shown, press the DISPLAY softkey until the desired Analyzer's Run Mode display is acquired.

2. Press the MENUS softkey to enter the Main Menu.

3. Verify the fuel type in the Miscellaneous Control Parameters menu (under the Technical Configuration menu structure, select the following from the Main Menu: Diagnostic menus, Analyzer Module Diagnostics and then Miscellaneous Control Parameters).

4. Verify the capillary type in the Analyzer Manufacturing Data menu (under the Technical Configuration menu structure, select the following from the Main Menu: Technical Level Configuration, Service Menus, Manufacturing Data, Analyzer Module Data).

5. In the Calibration Gas List menu (from the Main Menu, select Expert Controls and Setup, Analyzer Module Setup, then Calibration Gas List), enter necessary data, including the Operational Sample Pressure and the Calibration Gas HC Response Factor. Common HC factors are: methane (CH_4), 1.0, ethane (C_2H_6), 1.90, propane (C_3H_8), 3.00. These factors are not used to compensate the reading, but are used to select the proper preamp sense resistor.

6. Press HOME to re-enter the Main Menu, enter the Basic Controls menu, introduce zero gas and allow its response to stabilize, press the ZERO softkey to enter the Analyzer Zero menu, press ZERO again and wait.

7. Press the SPAN softkey to enter the Analyzer Span menu, introduce span gas and allow its response to stabilize, press SPAN again and wait.

8. Press the HOME softkey to re-enter the Main Menu.

9. Press DISPLAY softkey for the Run Mode display.

If the user is unable to calibrate the Analyzer Module (i.e., when ZERO or SPAN is initiated, nothing happens), several possible solutions present themselves. One solution relates to the use of an incorrect gas for zeroing or spanning (e.g., using a high concentration gas to zero or a zero gas to span the Analyzer Module). Simply recalibrating with the appropriate gas(es) will not correct the problem because the ZERO OFFSET or SPAN FACTOR

has been set to an extreme value in the process.

To remedy the problem, do the following:

1. Verify that correct zero and span calibration gases are being used properly. If so, attempt to recalibrate according to instructions at the beginning of this section, ensuring that case temperature and displayed measurement reading are stable before initiating the calibration routine. If incorrect gases were used in the initial, failed calibration, skip to Step 2.

2. Make the following selections from the Main Menu: Expert Controls and Setup, Analyzer Module Setup, then Calibration Parameters. Disable Calibration Adjustment Limits.

3. Recalibrate the analyzer module according to instructions at the beginning of this section, ensuring that case temperature and displayed measurement reading are stable before initiating the calibration routine.

4. Enable Calibration Adjustment Limits in the Calibration Parameters menu.

3-9 ROUTINE OPERATION

After binding and calibration, proceed as follows:

Supply sample gas to SAMPLE INLET. Adjust external flow controller or throttle valve so that flow discharged from the BYPASS outlet is between 0.5 and 2.0 L/min. The reading on the SAMPLE BYPASS pressure gauge should be the same as that used during adjustment of the span control. Adjust, if necessary.

Adjust the Range Number setting. The Analyzer Module will now automatically and continuously output the measured hydrocarbon content of the sample. Output is in terms of the particular hydrocarbon present in the span gas. Note that readings obtained during operation depend on the concentration of total hydrocarbons in the sample.

If maximum sensitivity is required from the FID Analyzer Module, use an optimum combination of settings on the SAMPLE, FUEL, and AIR pressure regulators. Settings must be determined experimentally, but the curves in Figure 3-7 on page 3-5, Figure 3-8 on page 3-5and Figure 3-9 on page 3-6 may be used as guides.

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

During shutdown, always turn off fuel gas first, then the air and sample gases. The flame can also be turned off by setting Ignition System Enable to "Off" in the Light Flame menu. Subsequently, remember to set Ignition System Enable to "On" before attempting to ignite the flame.

After initial startup, or startup following a prolonged shutdown, the Analyzer Module requires about one day's continuous operation to stabilize. For several days afterwards, calibrate daily. The frequency of subsequent calibrations can be reduced as experience dictates, consistent with the accuracy requirements of the particular application.

3-10 SAFETY SYSTEM

The FID Analyzer Module safety system will not allow ignition or continuous burner function unless the following conditions are present:

- Internal purge gas pressure is at least 380 hPa-gauge (5.5 psig). (Monitor display message, Purge Gas Pressure in Physical Measurements menu, for the proper setting.)

- Internal fuel pressure is less than 2064 hPa-gauge (30 psig). (Monitor display messages, Fuel Supply Pressure in

Physical Measurements menu and Fuel Pressure Status "ON" in Miscellaneous Control Parameters menu for proper settings. If the internal fuel pressure has exceeded 2064 hPa-gauge [30 psig], check that the external pressure is less than 3450 hPa-gauge [50 psig]. The +24 VDC power to the Analyzer Module must be cycled to continue operation.)

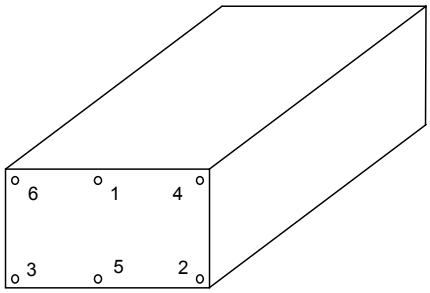
- Flow rate for purge air in is at least 16 L/min. and case pressure is greater than 0.5 inch of water. (Monitor display message, Purge Gas "ON" in Miscellaneous Control Parameters menu for correct state. Proper sealing hardware must be used in order to obtain the required purge air in flow rate and case pressure.)

- Five case volumes of purge air have been achieved and the three above conditions are present. The time duration to achieve a safe system is a minimum of 6 min. The elapsed time can be monitored in the Technical Startup Analyzer menu. (Monitor the Purge Air Green LED "ON," Purge Control Status "ON," or Purge Air Alarm for indication of the state of the safety system.)

As stated above, proper sealing hardware is crucial to the successful operation of the safety system. Therefore, a specific torque sequence (as shown in Figure 3-10 below) must be followed when the front panel of the module is being reinstalled after removal. All front and rear panel screws must be installed.

NOTE

Do not over-torque rear panel screws.



Torque Sequence:
Screw #1, 4 to 5 turns
Screw #2, 4 to 5 turns
Screw #3, 4 to 5 turns
Screw #4, 4 to 5 turns
Screw #5, 4 to 5 turns
Screw #6, 4 to 5 turns

Repeat torque sequence until all screws are tight.

The gasket must fill in between the front panel plate and the enclosure.

Figure 3-10. Front Panel Torque Sequence

SECTION 4
MAINTENANCE AND SERVICE

4-1 BURNER DISASSEMBLY AND CLEANING

Disassemble the burner only if contaminants must be removed. Combustion products or other contaminants which accumulate inside the burner may form electrical leakage paths between the collector and the burner contact, resulting in noisy readings.

If the instrument is to be operated at the highest sensitivity, traces of such contaminants can cause erroneous readings. For best performance, clean the burner per the following procedure:

Disassembly

1. Power OFF the module.

2. Shut fuel gas, air and sample gases OFF.

3. Slide Analyzer Module from the Platform (if applicable).

CAUTION

HAND INJURY HAZARD

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

4. On the combustion chamber, disconnect the polarizing voltage cable and amplifier input cable.

5. Disconnect the four connectors attached to the burner (one to glow plug, two to preamp board , and one to thermistor).

6. Disconnect the four gas supply tubes (two air, one fuel and one sample).

7. Disconnect the exhaust tube.

8. Remove the burner assembly by loosening the two securing nuts.

9. Unscrew the burner cap retainer ring, and remove burner cap.

10. Loosen clamp; lifting straight up, remove combustion chamber-chimney assembly from the manifold.

NOTE

If the old burner tip assembly is to be used again, do not touch it with bare hands or any materials likely to contaminate it with hydrocarbons, salt, etc. Additionally, all items used for cleaning (tweezers, swabs, etc.) must be absolutely free of contamination.

11. Unscrew and remove burner tip assembly.

Cleaning

1. Clean chimney assembly, combustion chamber, and burner tip assembly with acetone or methyl ethyl ketone.

2. Follow cleaning with a distilled water wash.

Reassembly

Using care not to touch any internal parts, reassemble the burner per the following procedure.

1. Holding with clean tissue, screw burner tip assembly finger-tight into manifold.

2. Push combustion chamber/chimney assembly down onto manifold, taking care

not to hit burner tip. Tighten clamp on combustion chamber chimney assembly.

3. Replace burner cap (and flameout sensor assembly), with flameout sensor assembly in-line with burner exhaust.

4. Install burner onto module base.

5. Connect all leads and tubing. Replace module cover and install module into Platform.

NOTE

Fittings using Teflon pipe seal tape: Replace Teflon pipe seal tape to maintain a tightly sealed burner assembly.

4-2 COMPONENT REPLACEMENT

Components which may require replacement include; sample capillary, fan, fuses, EPROM, printed circuit boards and front panel LED's.

Replacement of each of these components require sliding out the bottom chassis from the enclosure.

Three fuses that may be replaced are located on; 1) the Network/Power Assembly, 2) the Safety Board and 3) the Power Supply Board. If the thermal fuse on the Safety Board or the Power Supply Board require replacement, this indicates a overheating condition, which denotes a wider problem requiring troubleshooting.

EPROM's should only be replaced by qualified electronics personnel because special tools and knowledge are required.

For accessibility when replacing printed circuit boards, the printed circuit board mounting panel has been designed to swing down.

4-3 BURNER STARTUP TROUBLESHOOTING

If unable to startup burner, check the following:

1. All supply gas cylinder pressures are within specifications (see Section 1-6 Specifications on page 1-5).

2. Correct gases are being supplied to each back panel inlet.

3. Air, not zero gas (if nitrogen), is being supplied to burner.

4. Burner exhaust is being vented to atmospheric pressure, and is not tied to either purge air exhaust or another FID exhaust.

5. Burner exhaust continuously slopes downward until reaching atmospheric pressure vent.

6. Parameters "IS/WAS" match in the Physical Measurement Parameters screen (see page 7-13); use NEXT softkey to view all parameters.

NOTE

As a last resort, check burner fittings for leaks (purge air pressure is higher than the pressure in any of the lines connected to the burner; thus, any leak would be *into* the fitting rather than *out* of it).

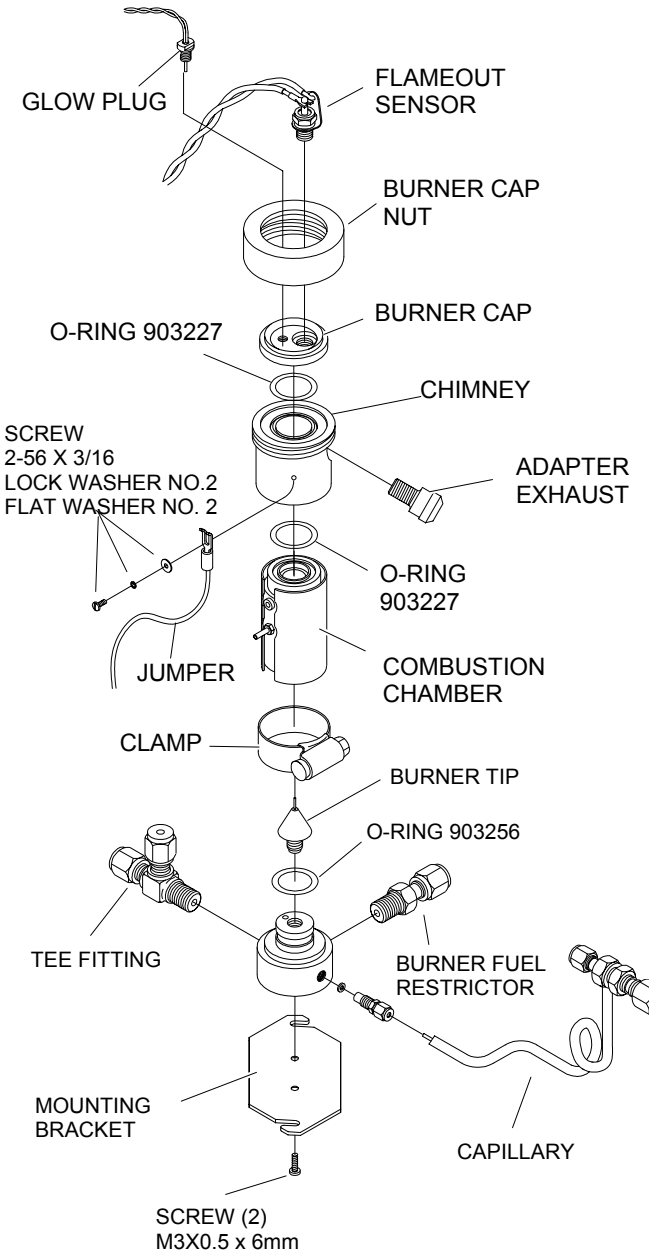


Figure 4-1. FID Burner Assembly – Exploded View

SECTION 5
REPLACEMENT PARTS

WARNING

PARTS INTEGRITY

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

5-1 REPLACEMENT PARTS

a. Electronics

655588	Computer Board
655796	Preamp Board
655596	Safety Board
655764	Power Supply Board
657540	DC-DC Power Board
813344	Fuse 6A
903107	Fuse Thermal
657029	LED Indicator Assembly
657053	Switch Assembly
656026	Case Temperature Sensor
655468	DC-DC Converter (+5V, ±15V)

b. Burner Assembly and Components

655779	Burner Assembly, Mixed Fuel[1]
655784	Burner Assembly, 100% Fuel[2]
655803	Flameout Sensor
655801	Glow Plug
100194	Gasket, Connector - Sample
810156	Fitting, Tee
655782	Burner Cap
656217	Burner Manifold
656364	Chimney
630354	Exhaust Adapter
652995	Connector, Restrictor - Mixed Fuel
073616	Burner Tip
656365	Combustion Chamber
903227	O-Ring, Viton
903256	O-Ring, Viton

c. Electro-Mechanical

902833	Fan
655760	Case Heater
656347	Purge Air Heater

d. O-Rings and Gaskets

011167	O-Ring, Buna-N (LED)
010177	O-Ring, Buna-N (Switch)
903124	O-Ring, Buna-N (1/4" Bulkhead)
008025	O-Ring, Buna-N (Fuel, Air Regulator, 3/8" Bulkhead)
656167	Front Panel Gasket

e. Pneumatics

657448	Kit, Capillary - Mixed Fuel Low Range[1]
657777	Kit, Capillary - Mixed Fuel High Range[2]
657776	Kit, Capillary - 100% Fuel Low Range[1]
017154	Filter, Burner Air & Sample
902832	Regulator, Fuel and Burner Air
655269	Regulator, Sample - Brass
655513	Regulator, Sample - Stainless steel
871672	Regulator, Purge Air
615598	Restrictor, Bulkhead - Mixed[1]
656890	Restrictor, Bulkhead - 100% Fuel[1]
655794	Restrictor, Air Ignite
656888	Restrictor, Air Measurement
630669	Restrictor, Burner - Mixed Fuel[1]
630662	Restrictor, Burner - 100% Fuel[1]
902931	Sensor, Flow 400- 2000 ml/min.
656444	Sensor, Fuel Pressure
656443	Sensor, Burner Air Pressure
656418	Sensor, Sample Pressure
656218	Solenoid - Fuel
656219	Solenoid, 3-Way - Air
657126	Switch, Flow - Purge Air
903690	Switch, Pressure - Purge Air
903128	Valve, Pressure Relief

[1] Select per application fuel. Restrictor and sample capillary must display the same color code.

[2] Select per application. The sample capillary displays a green color marking. The restrictor displays a red color marking (mixed fuel).

5-2 MATRIX

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

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

FID	FID HYDROCARBON ANALYZER

Code	Software Version
01	Current Software
02	2.2.2 Version Software
03	3X Version Software - specify version

Code	Configurations
A	Mixed Fuel, Calibrated Ranges 0-10, 0-25, 0-100, 0-250 ppm
B	Mixed Fuel, Calibrated Ranges 0-10, 0-30, 0-100, 0-300 ppm
C	Mixed Fuel, Calibrated Ranges 0-4, 0-10, 0-40, 0-100 ppm
D	Hydrogen Fuel, Calibrated Ranges 0-1, 0-2.5, 0-10, 0-25 ppm
E	Mixed Fuel, Calibrated Ranges 0-250, 0-1000, 0-2500, 0-10000 ppm
F	Mixed Fuel, Calibrated Ranges 0-300, 0-1000, 0-3000, 0-10000 ppm
G	Mixed Fuel, Calibrated Ranges 1000, 2500, 10000, 25000
9	Special Calibration Ranges

Code	Materials
1	Brass and Neoprene Back Pressure Regulator 5 psig
2	Brass and Neoprene Back Pressure Regulator 2 psig
3	Stainless Steel and Viton Back Pressure Regulator 5 psig
4	Stainless Steel and Viton Back Pressure Regulator 2 psig
9	Special

Code	Flow Path
01	Standard (no flow sensor)
02	Integral Flow Sensor (400 – 2000 cc/min.)
99	Special

Code	Special Requirements
00	None
01	Customer Option
99	Special

FID	01	A1	01	00	Example

SECTION 6
RETURN OF MATERIAL

6-1 RETURN OF MATERIAL

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

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

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

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

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

6-2 CUSTOMER SERVICE

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

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

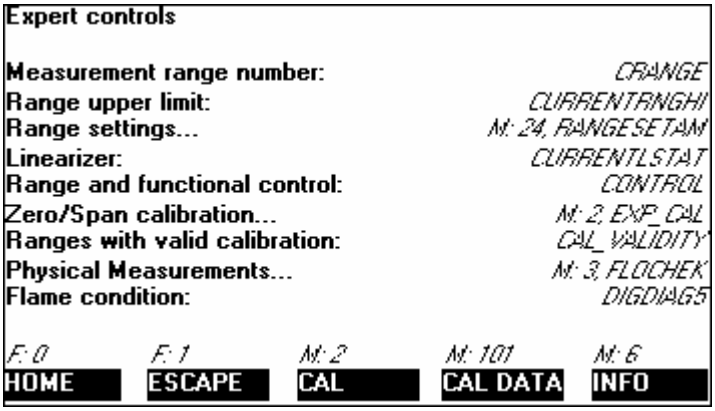
6-3 TRAINING

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

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

SECTION 7
APPENDIX A – MENU SCREENS

Menu: 0 ANALOP



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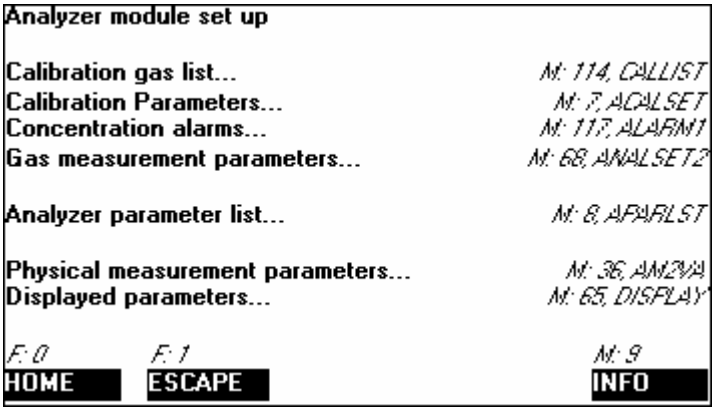
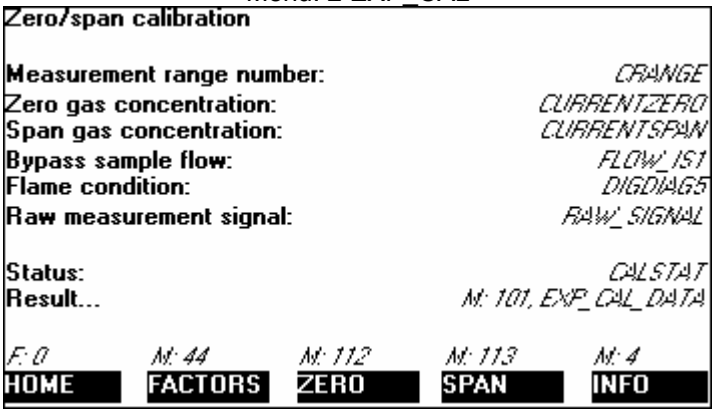
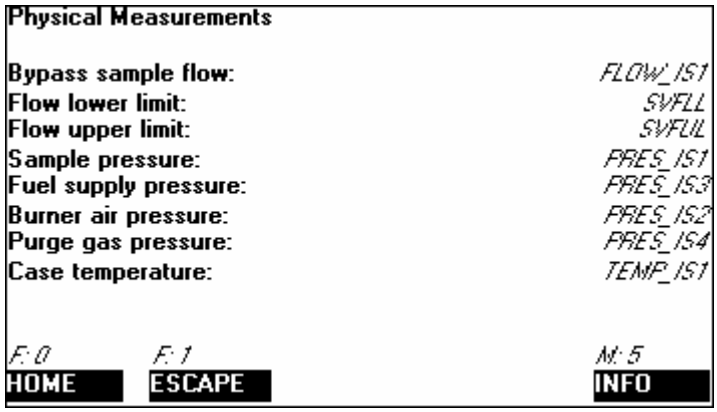


Menu: 2 EXP_CAL



Menu: 3 FLOCHEK



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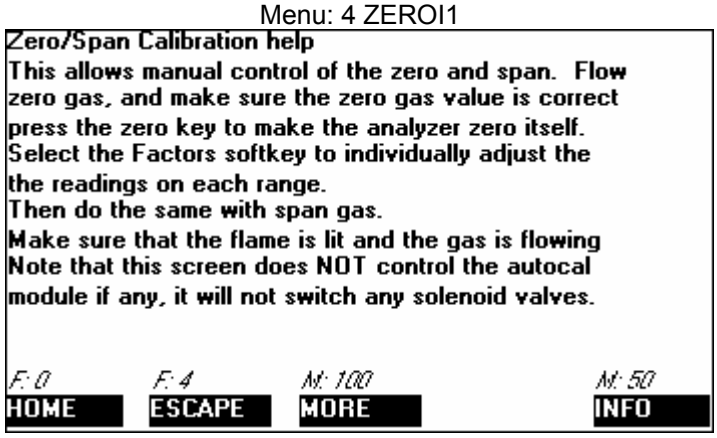
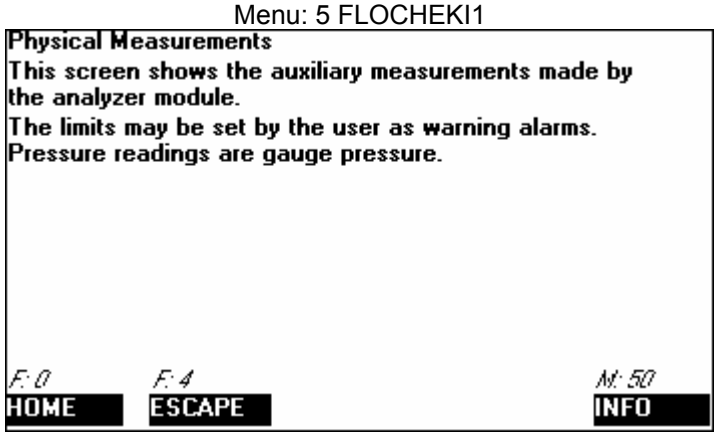
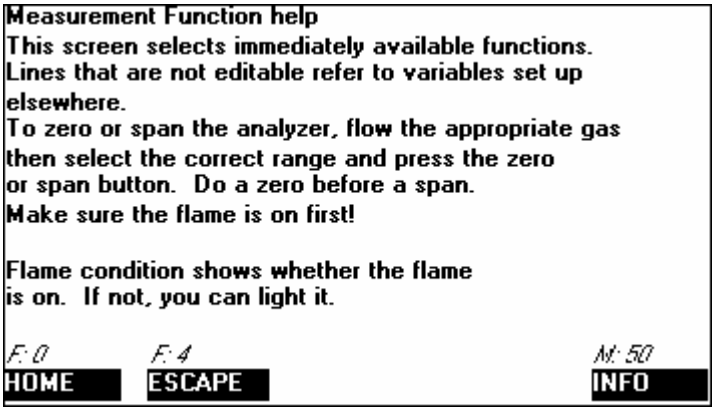


Menu: 5 FLOCHEKI1



Menu: 6 ANALOPI1



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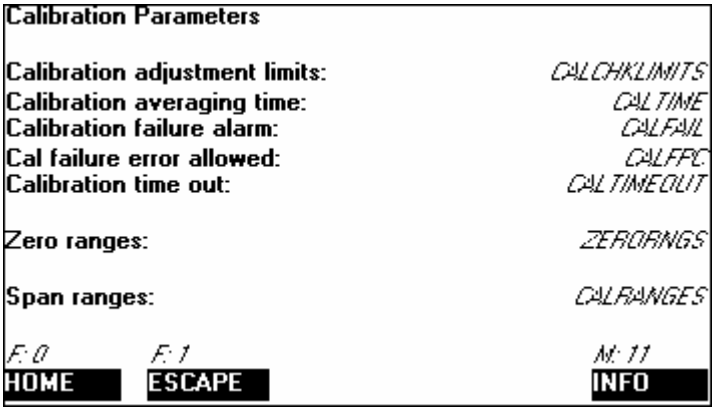
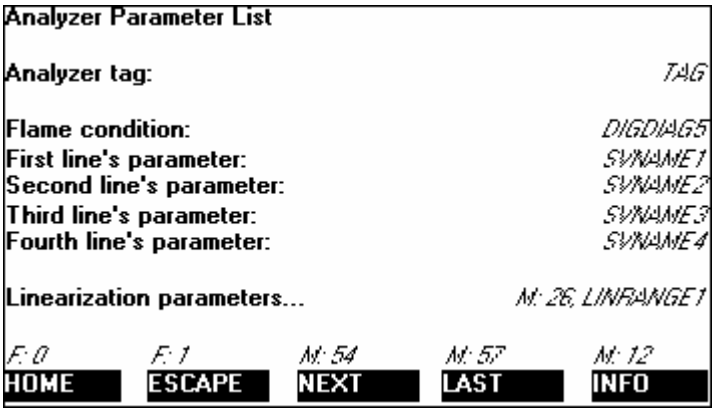


Menu: 8 APARLST



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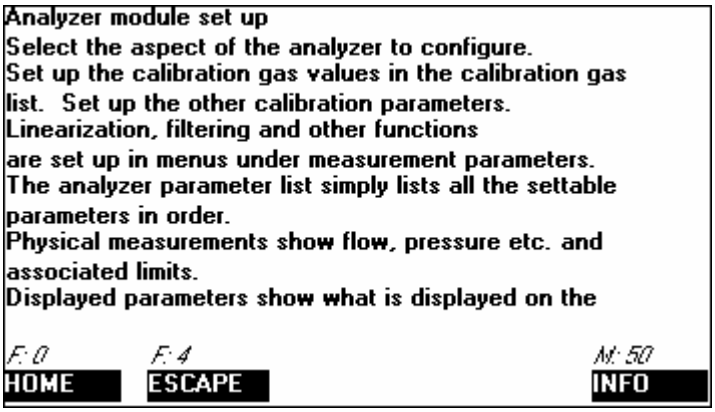

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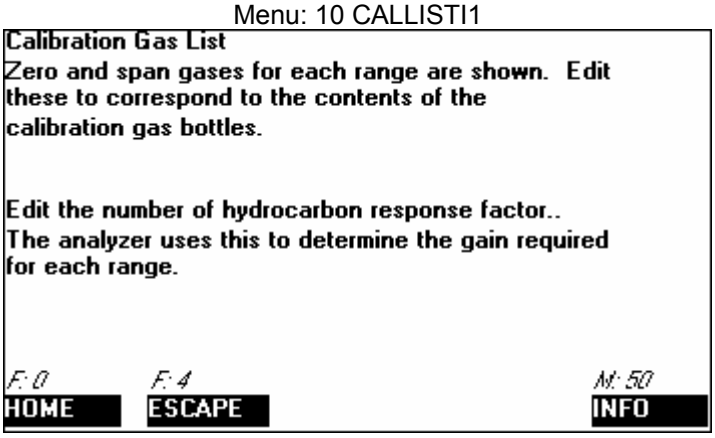

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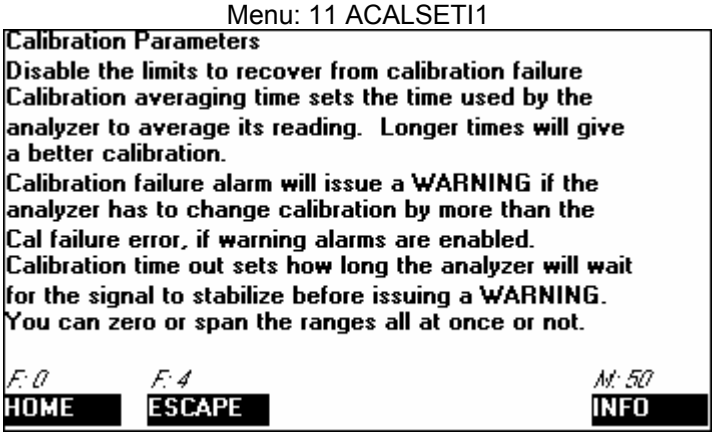

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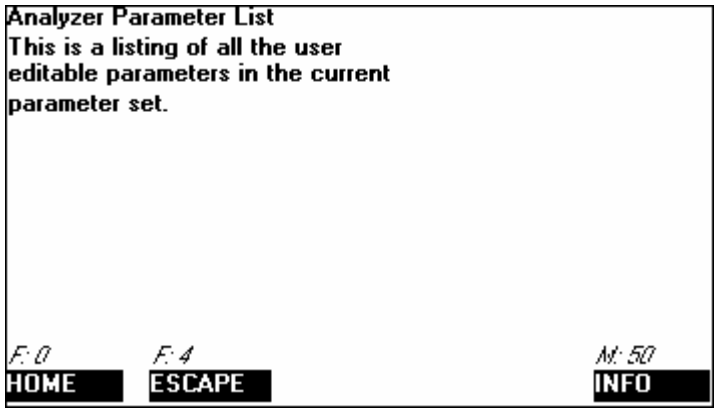
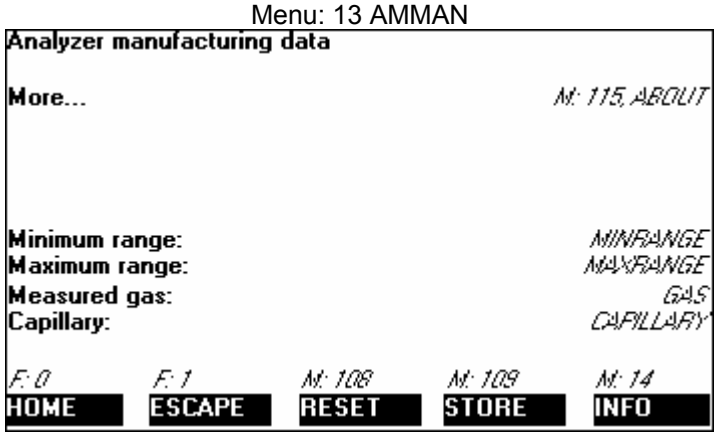


Menu: 13 AMMAN



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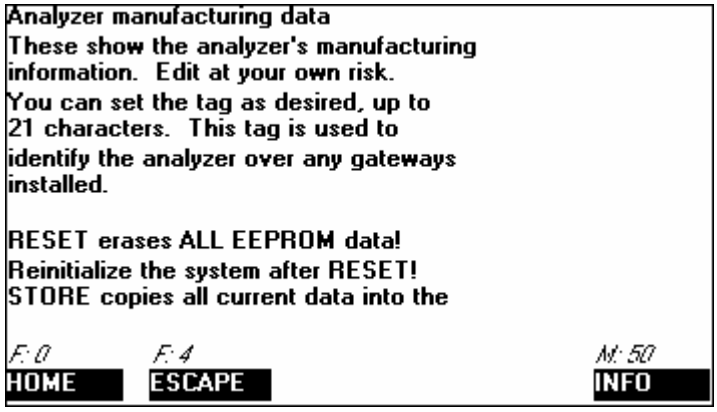

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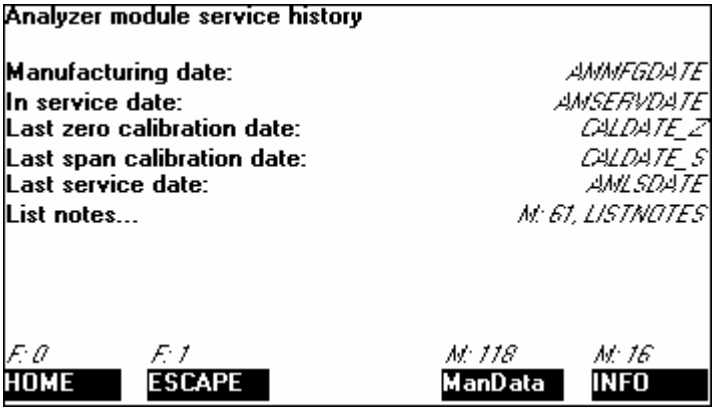

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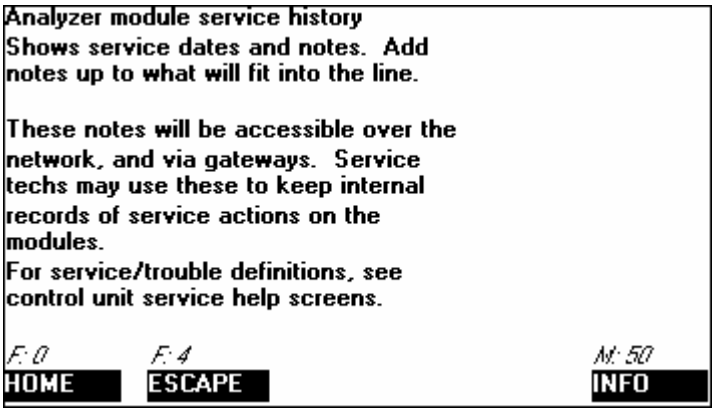
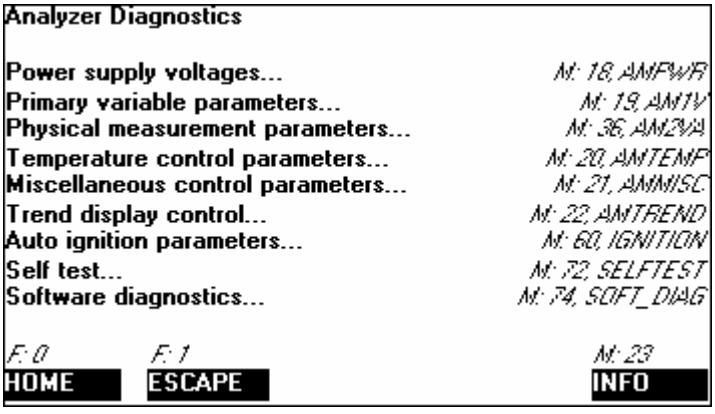


Menu: 17 ADIAG



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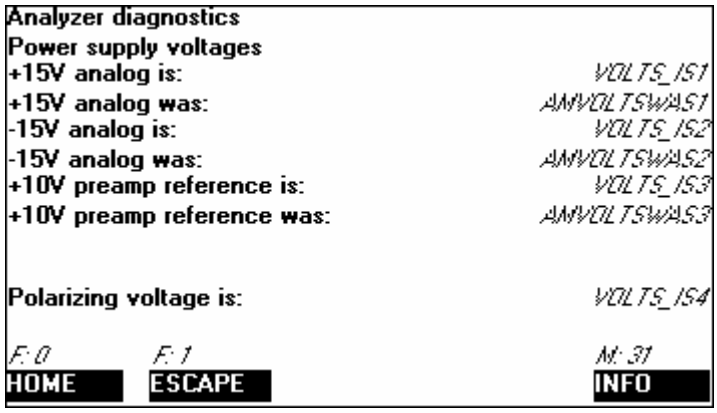

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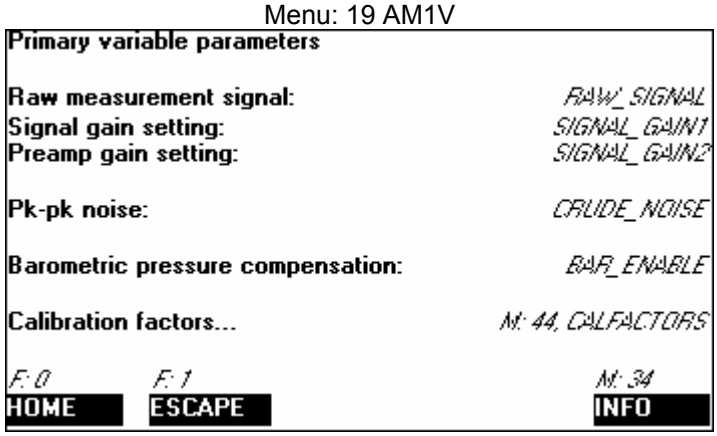

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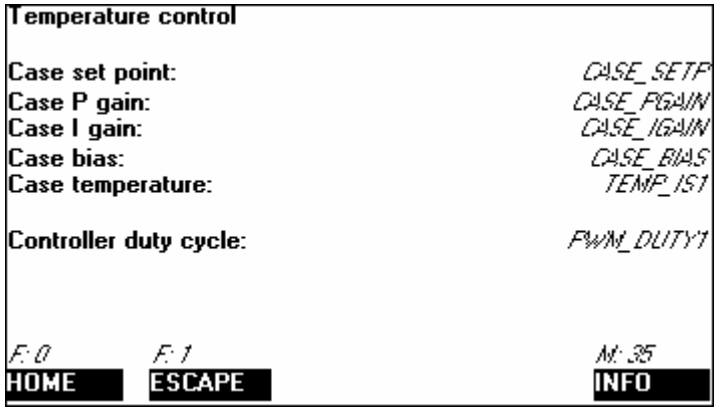

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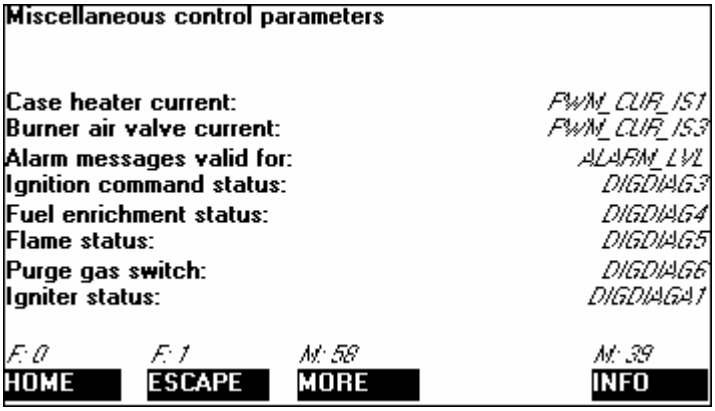
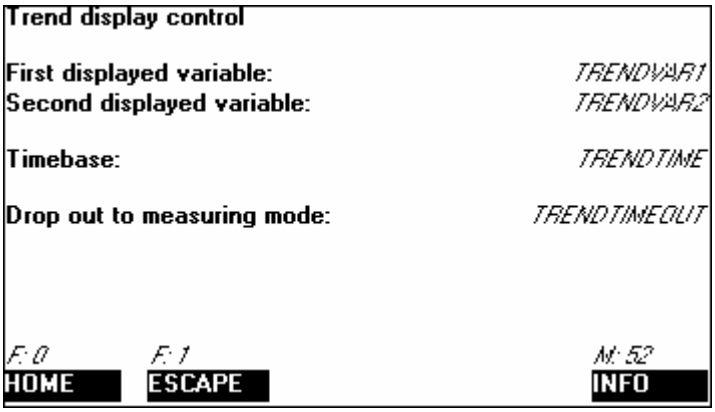


Menu: 22 AMTREND



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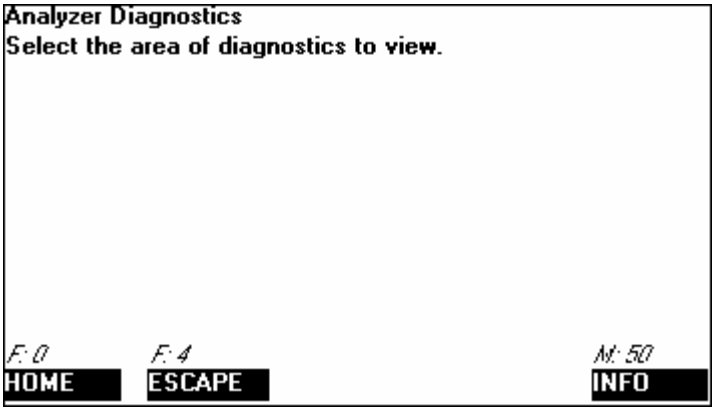
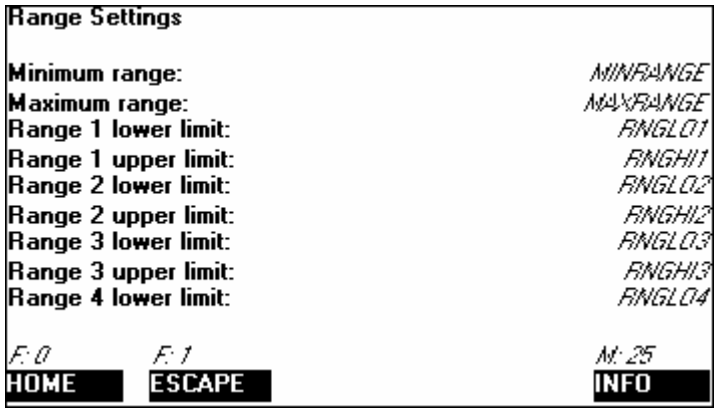


Menu: 24 RANGESETAM



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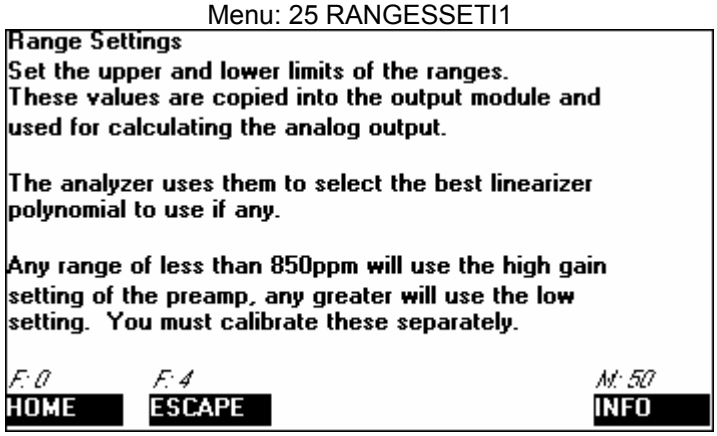
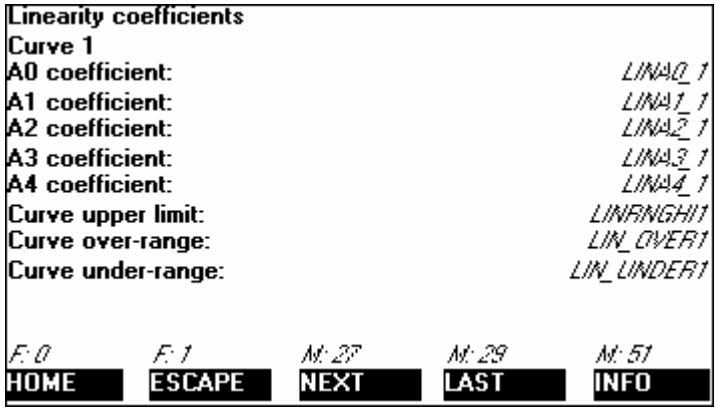


Menu: 26 LINRANGE1



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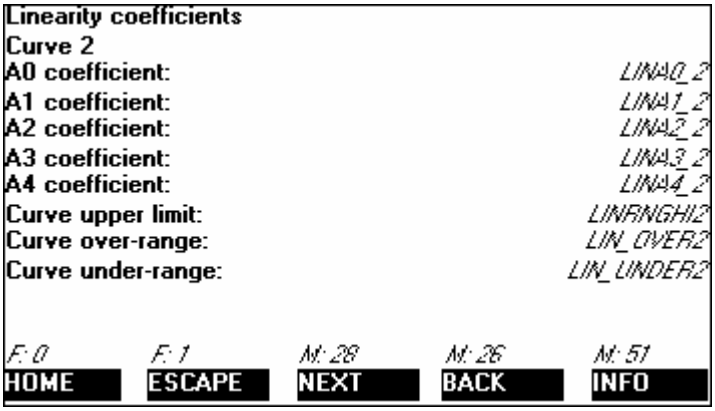

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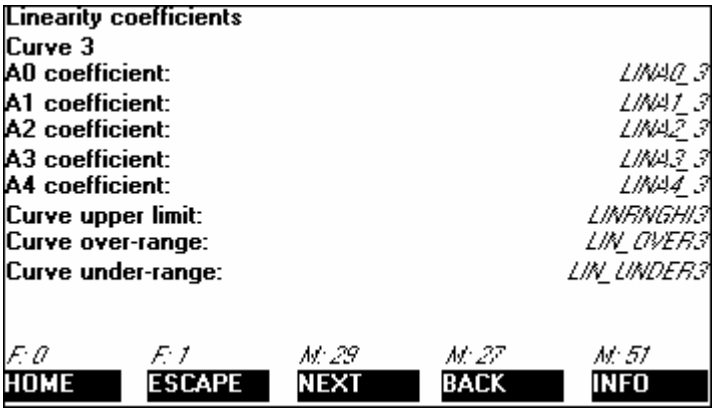

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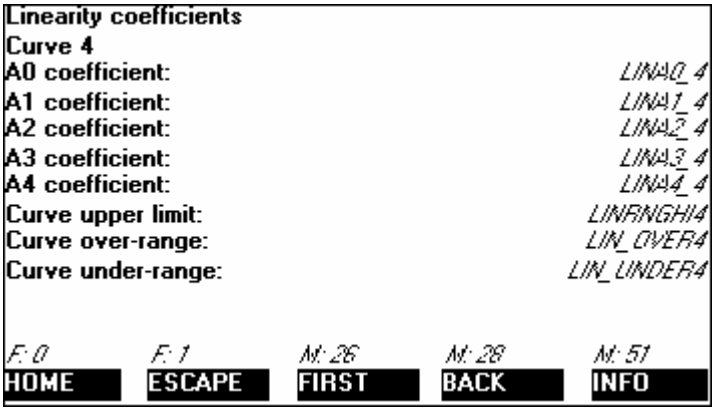
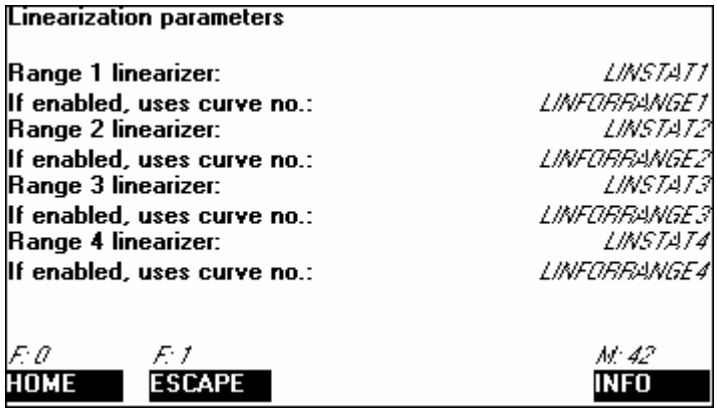
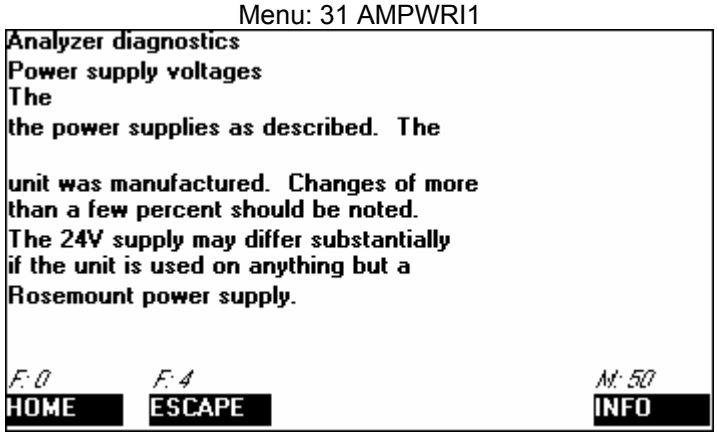


Menu: 30 LINRANGE0



Menu: 31 AMPWRI1



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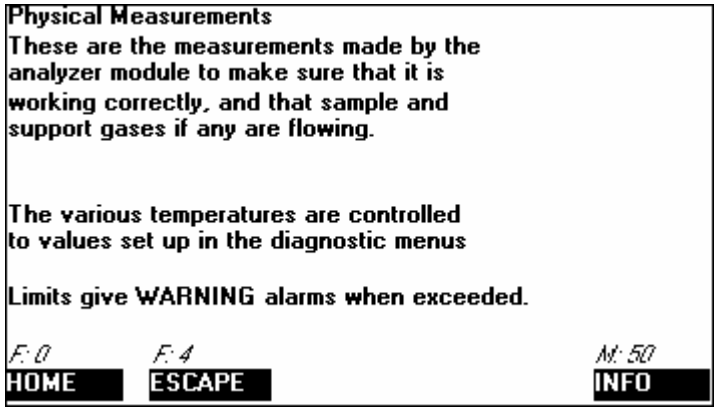
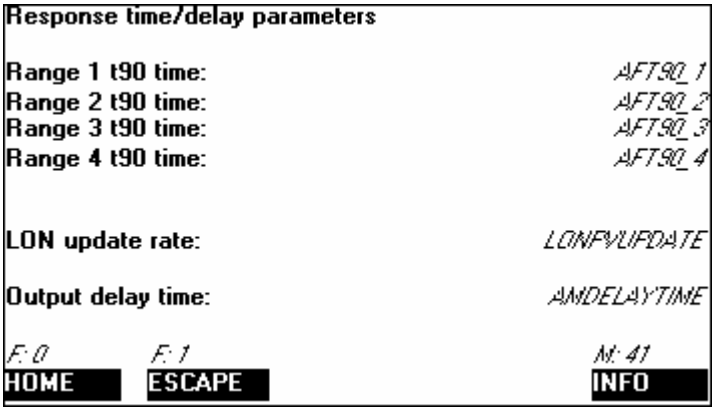
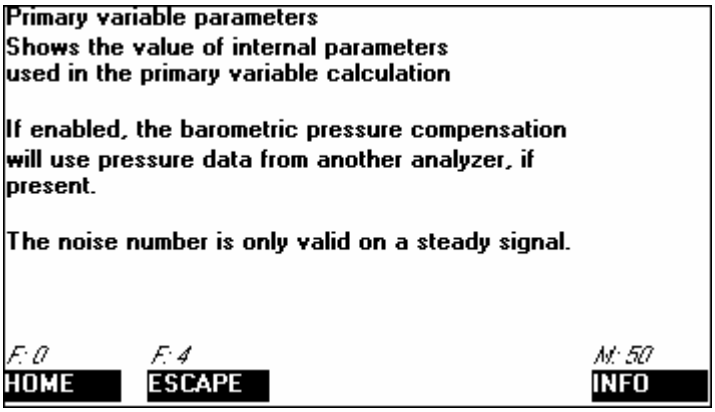


Menu: 33 FILTER



Menu: 34 AM1VI1



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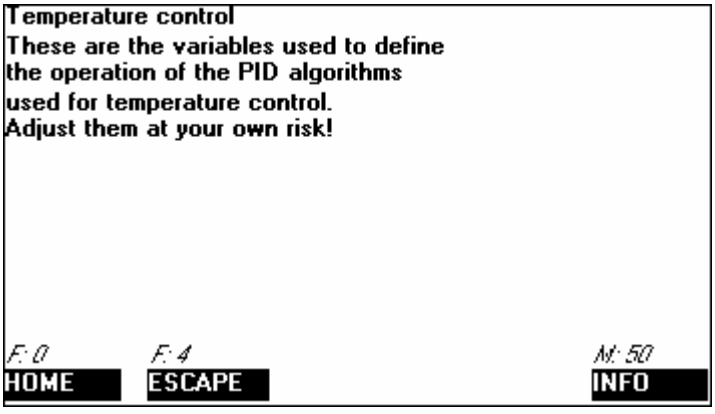
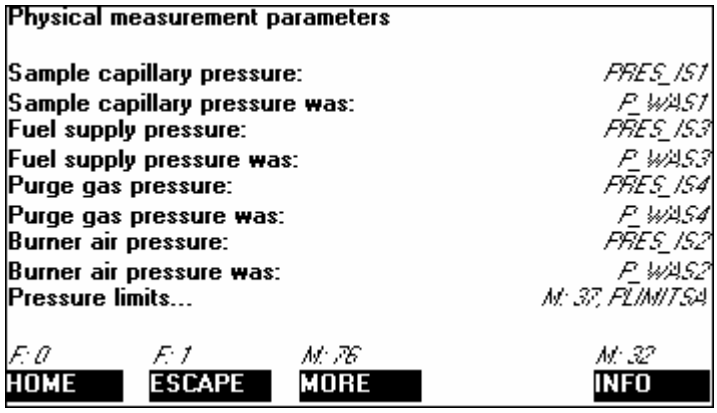
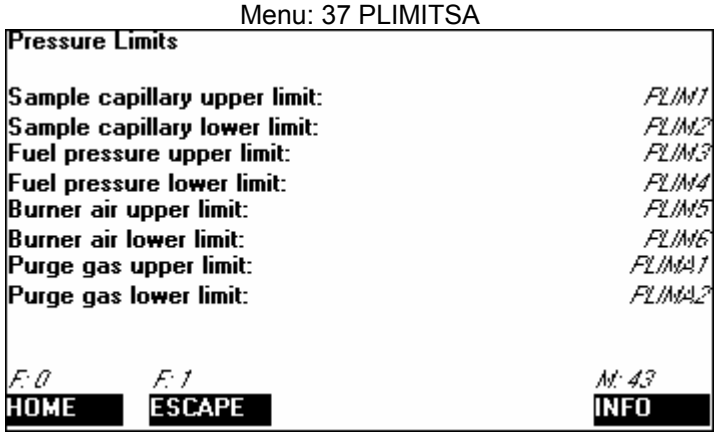


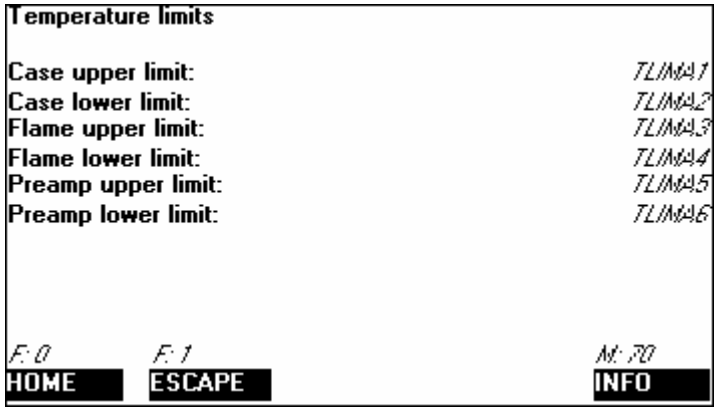
Menu: 36 AM2VA



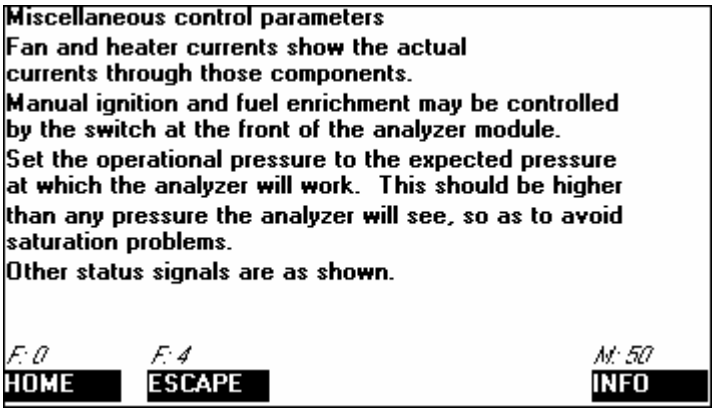
Menu: 37 PLIMITSA



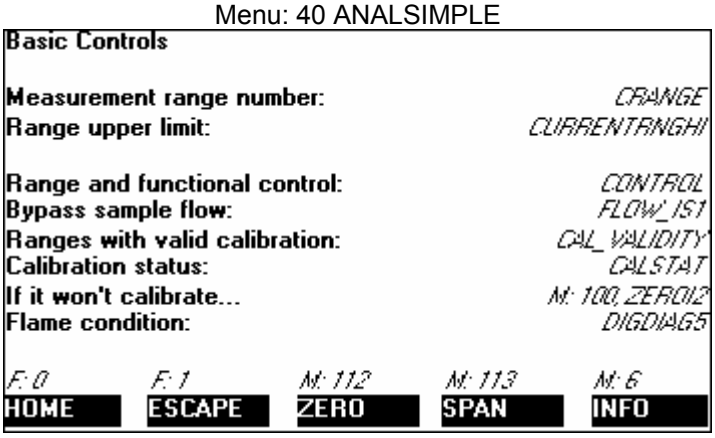
Menu: 38 TLIMITSA



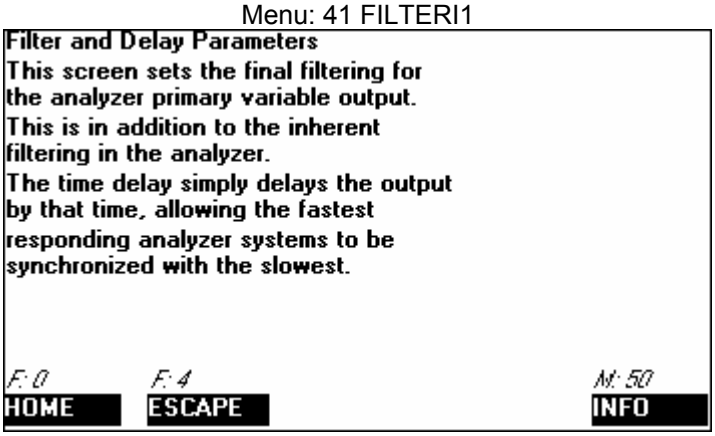
Menu: 39 AMMISCI1



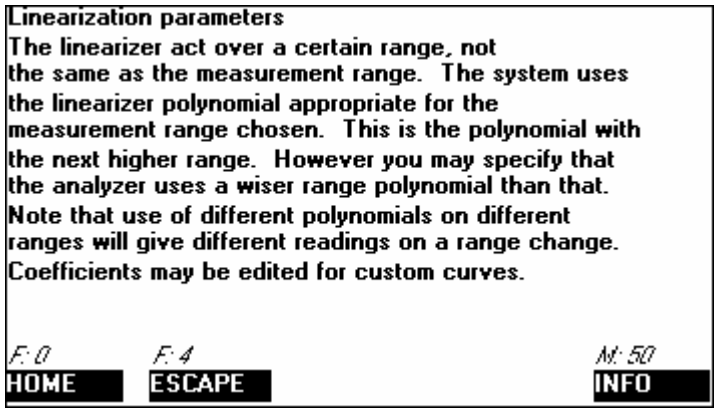
Menu: 40 ANALSIMPLE



Menu: 41 FILTERI1



Menu: 42 LINRANGE0I1



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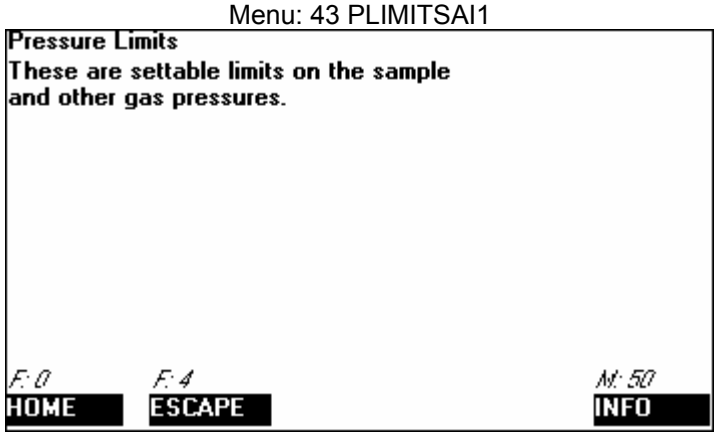
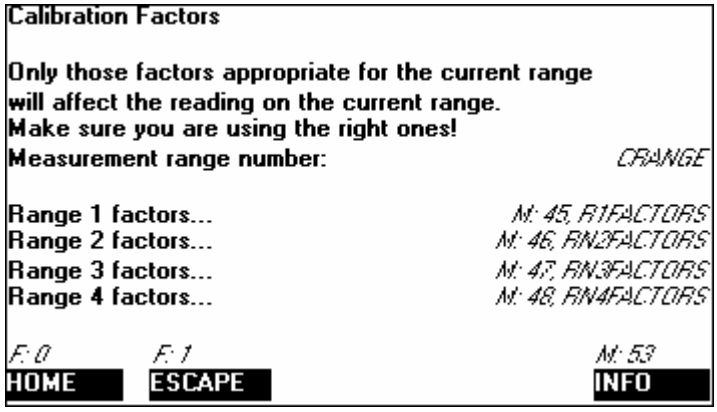
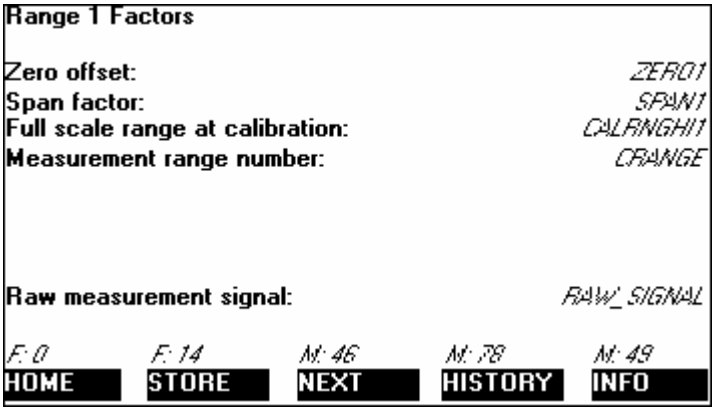


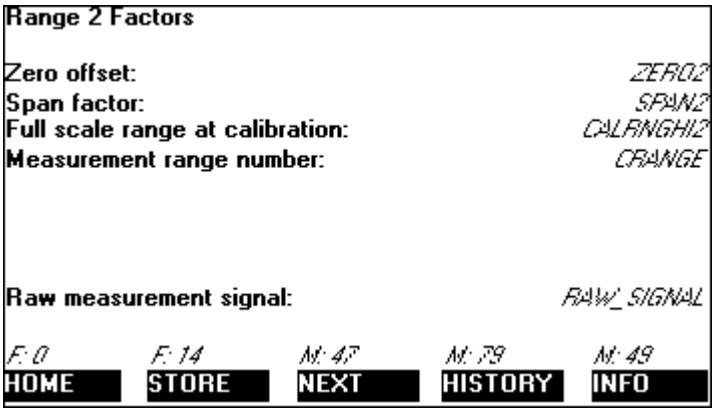
Menu: 44 CALFACTORS



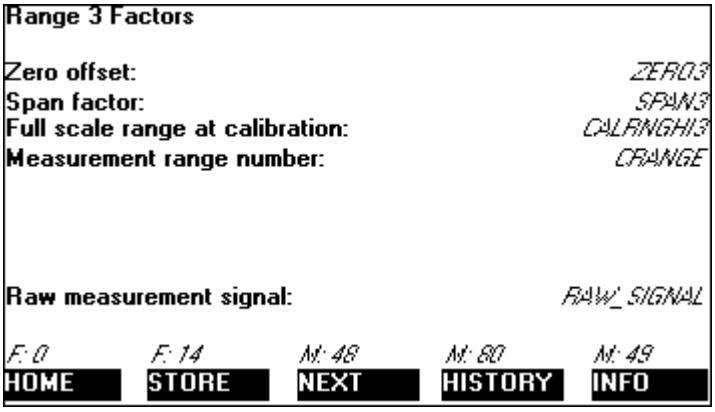
Menu: 45 R1FACTORS



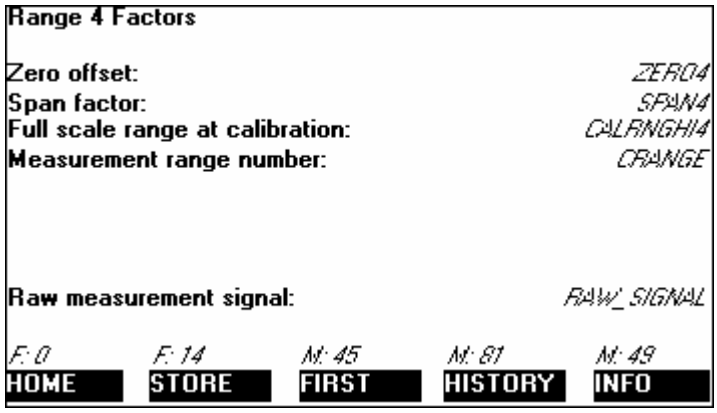
Menu: 46 RN2FACTORS



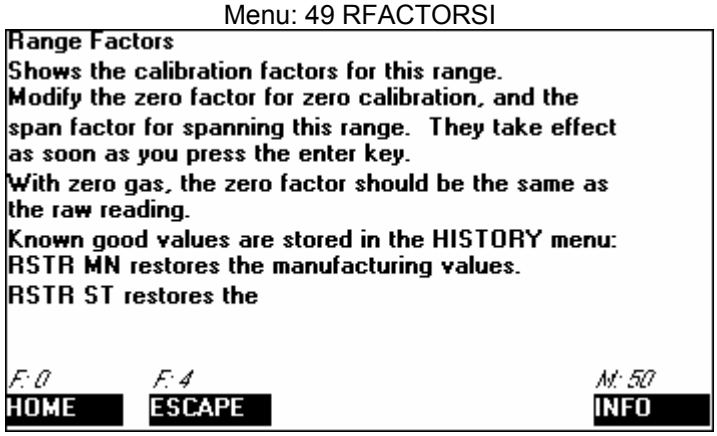
Menu: 47 RN3FACTORS



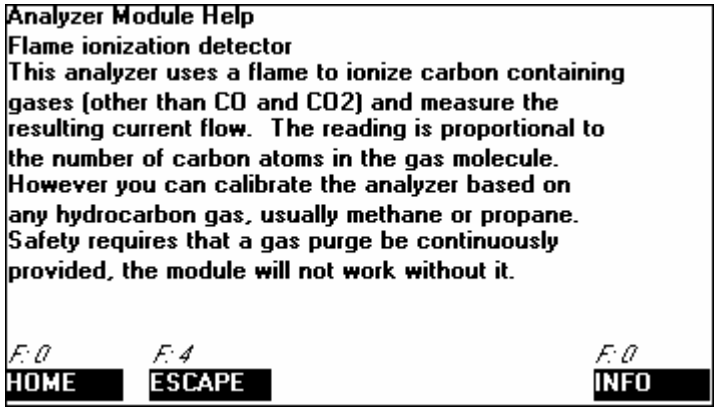
Menu: 48 RN4FACTORS



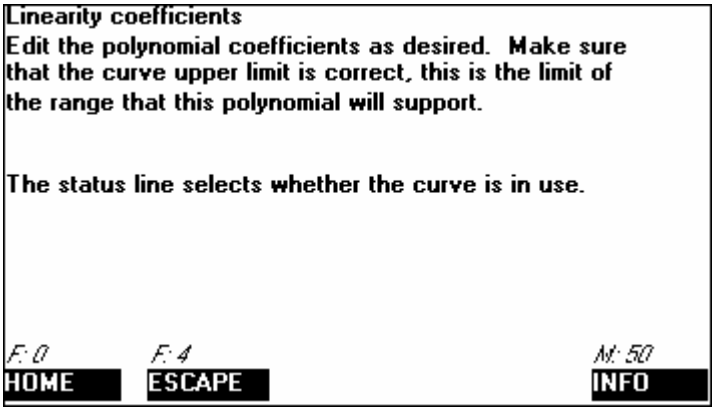
Menu: 49 RFACTORSI



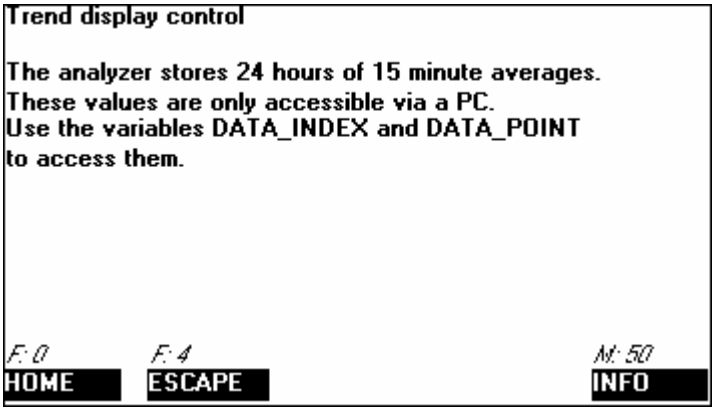
Menu: 50 AMHELPINDEX



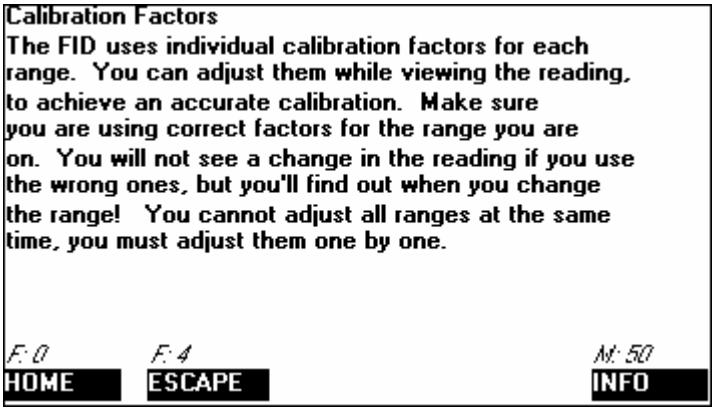
Menu: 51 LINRANGE1I1



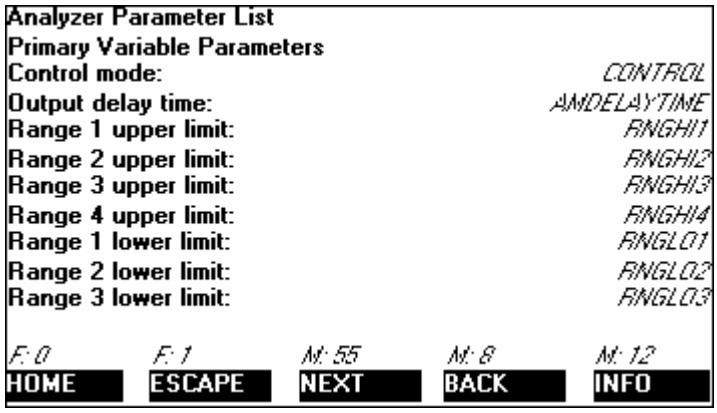
Menu: 52 AMTRENDI1



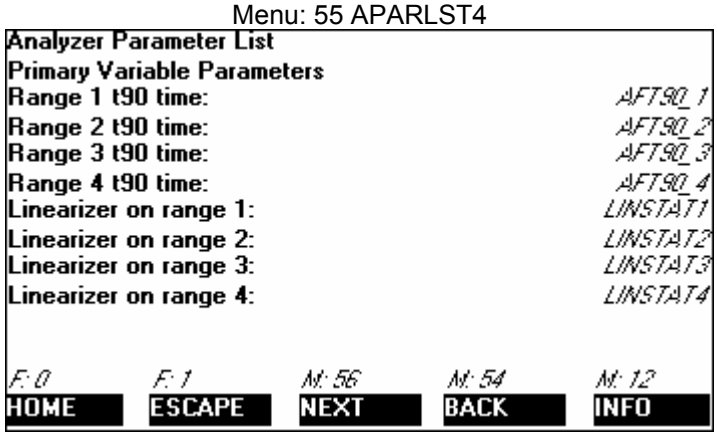
Menu: 53 CALFACTORSI1



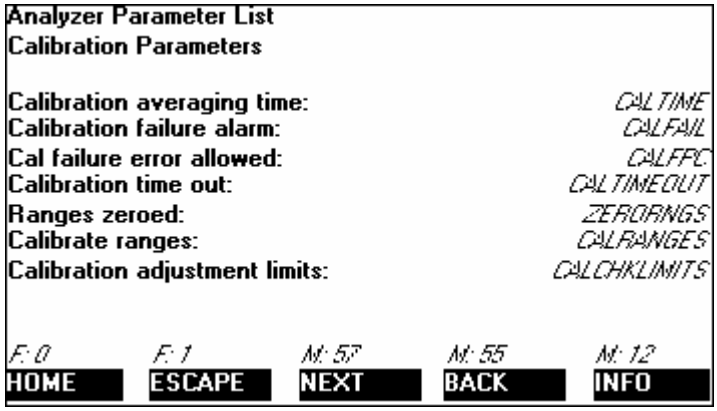
Menu: 54 APARLST2



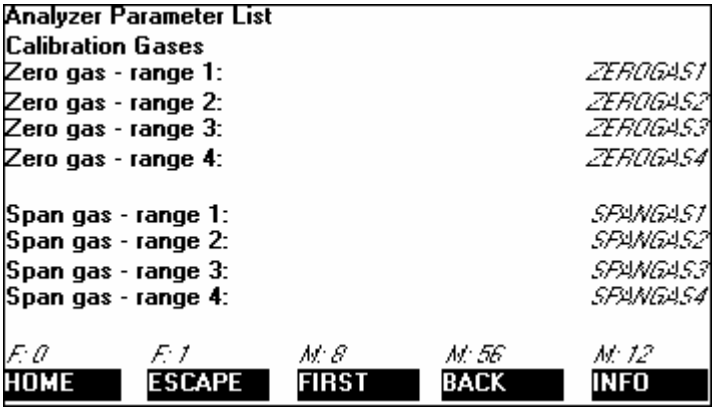
Menu: 55 APARLST4



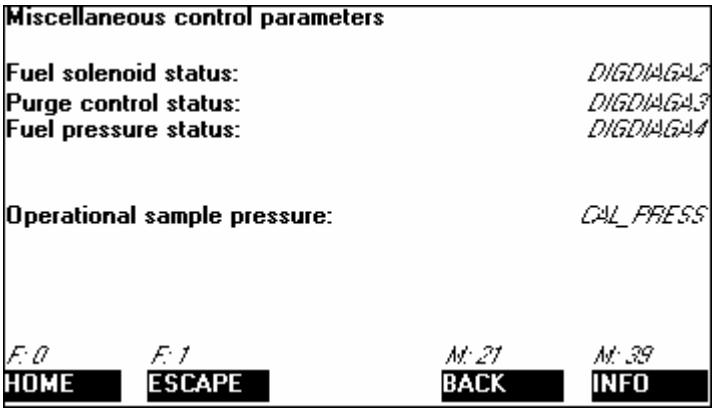
Menu: 56 APARLST5



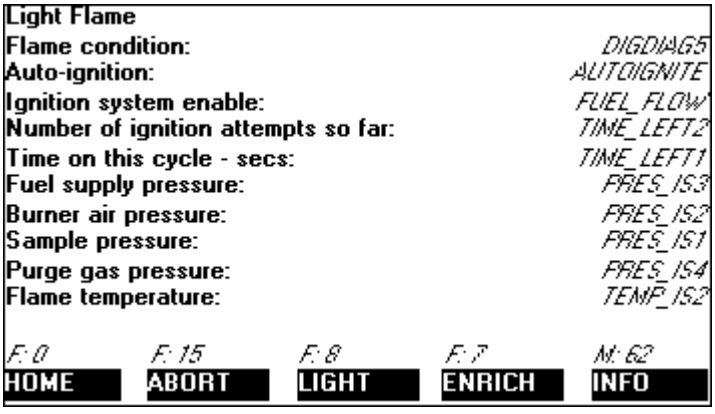
Menu: 57 APARLST6



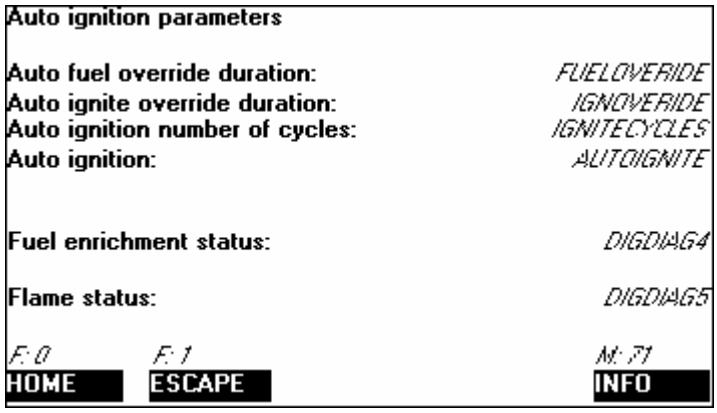
Menu: 58 AMMISC2



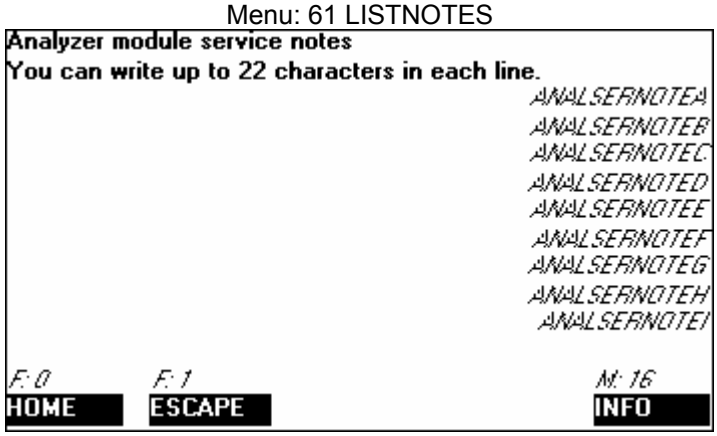
Menu: 59 LIGHTFLAME



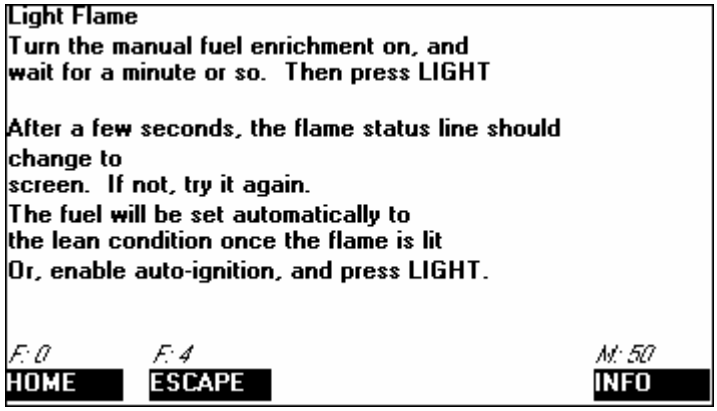
Menu: 60 IGNITION



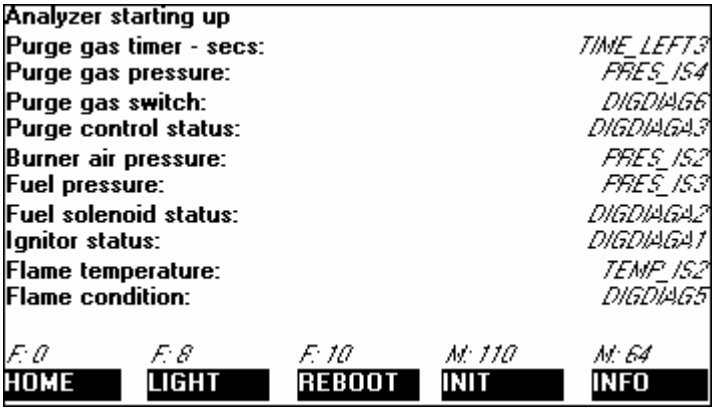
Menu: 61 LISTNOTES



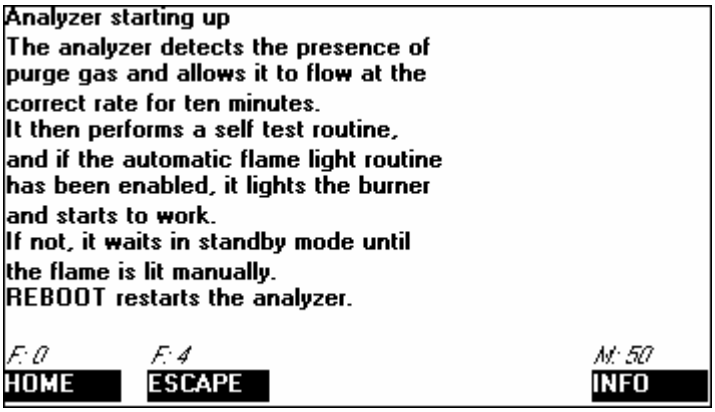
Menu: 62 LIGHTFLAMEI1



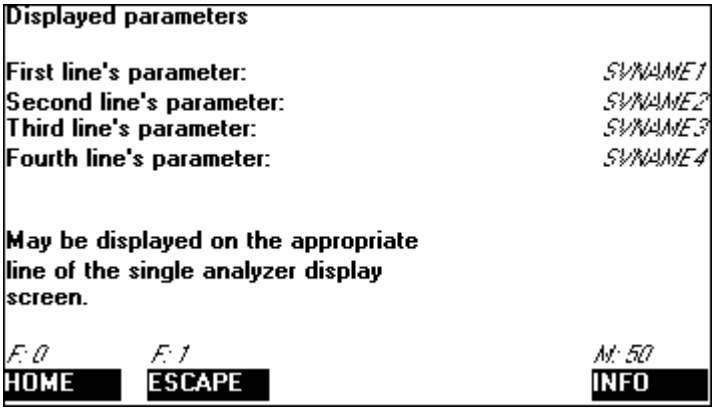
Menu: 63 AUTOFLAME



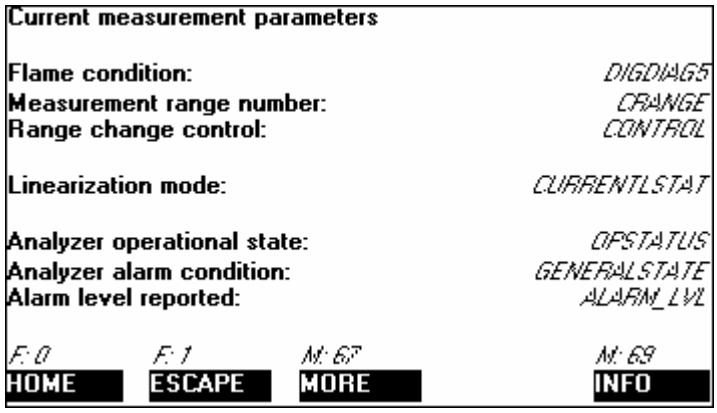
Menu: 64 AUTOFLAMEI1



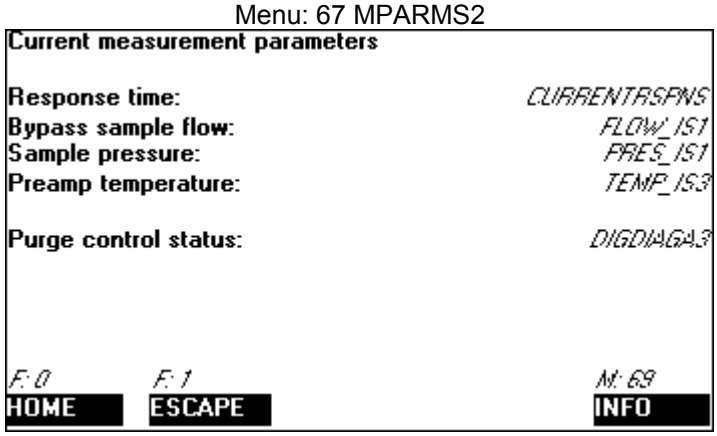
Menu: 65 DISPLAY



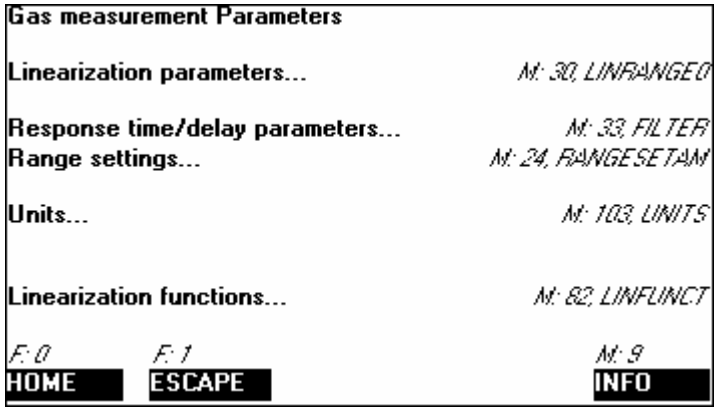
Menu: 66 MPARMS



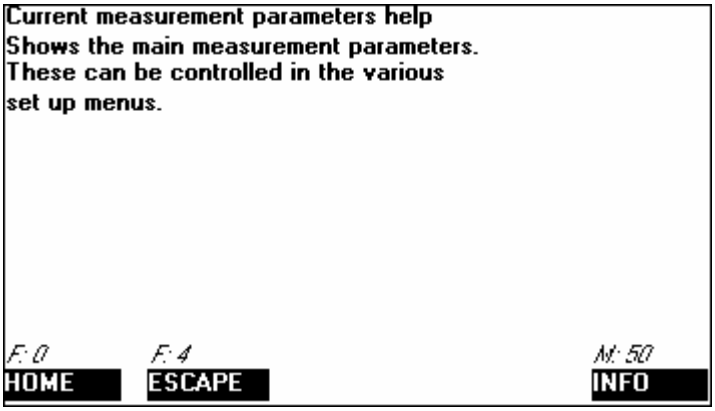
Menu: 67 MPARMS2



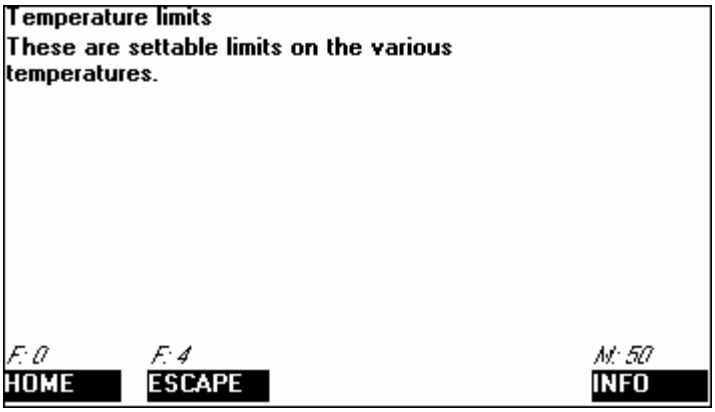
Menu: 68 ANALSET2



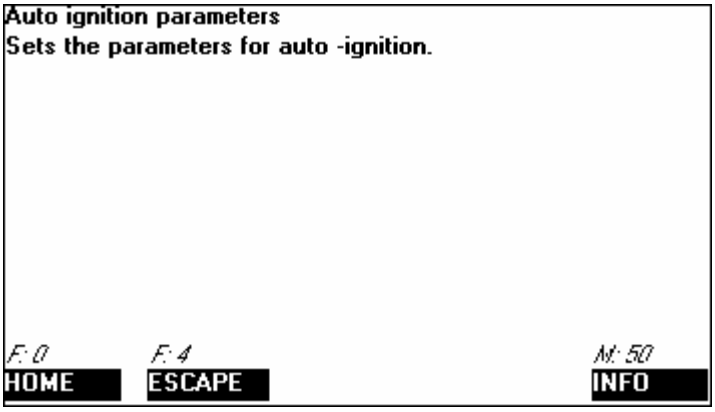
Menu: 69 MPARMSI1



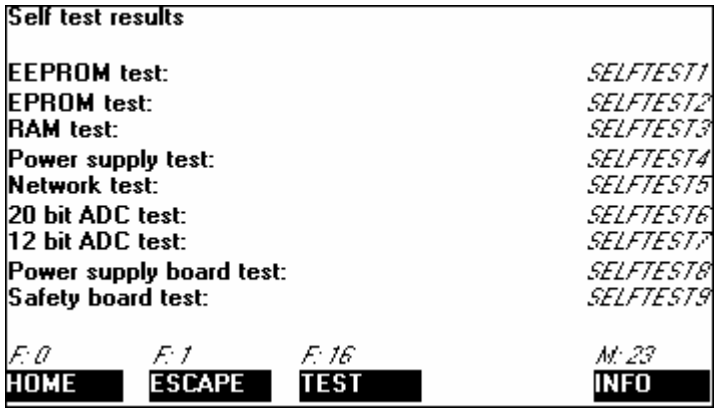
Menu: 70 TLIMITSAI1



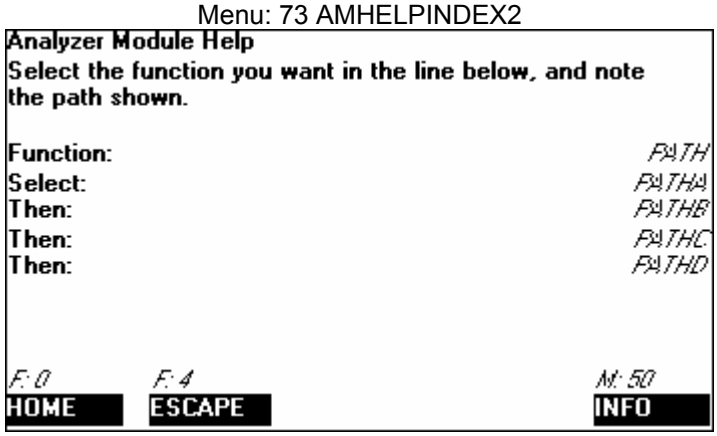
Menu: 71 IGNITIONI1



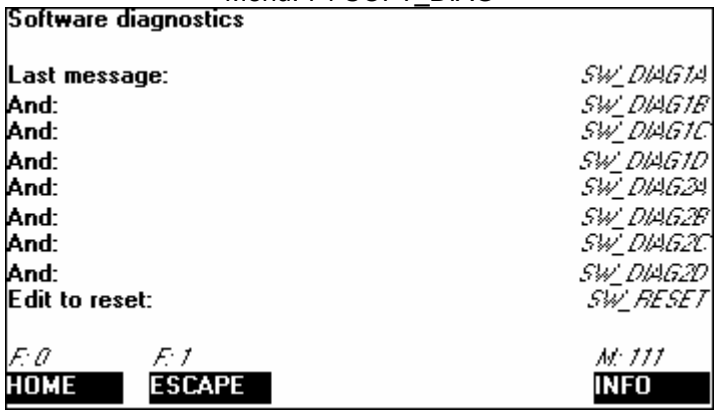
Menu: 72 SELFTEST



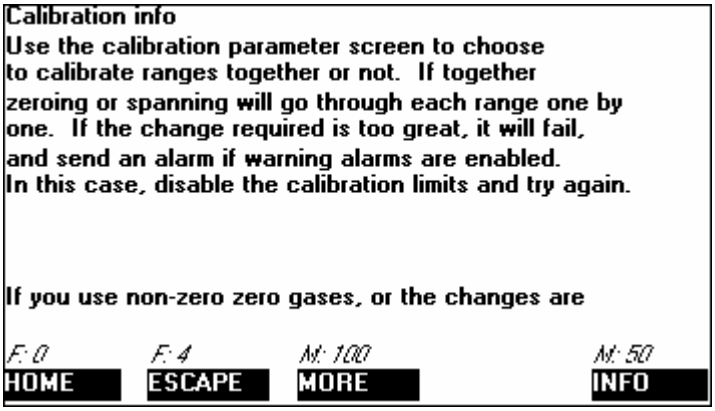
Menu: 73 AMHELPINDEX2



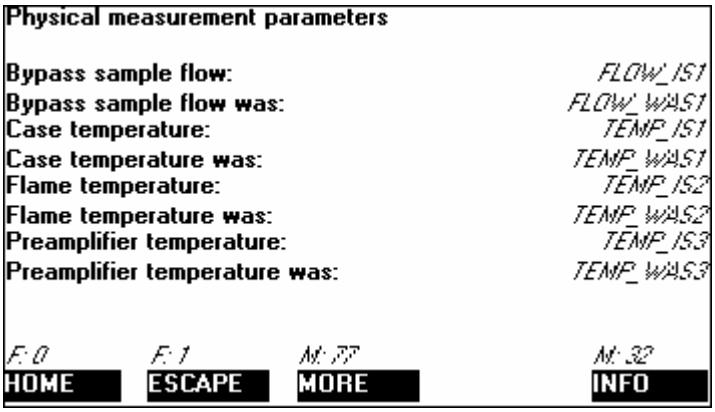
Menu: 74 SOFT_DIAG



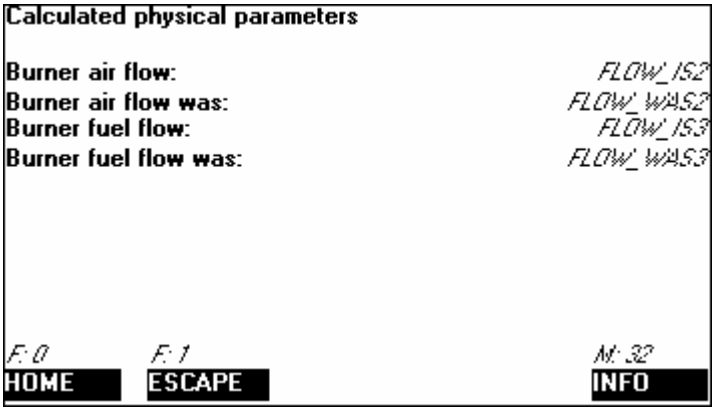
Menu: 75 CALI1



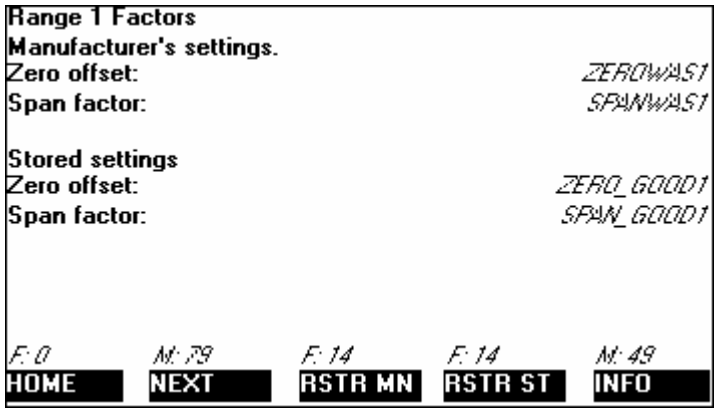
Menu: 76 AM2VC



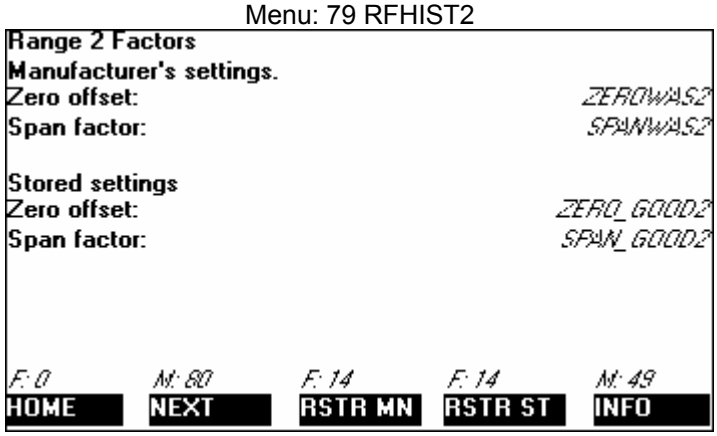
Menu: 77 AM2VD



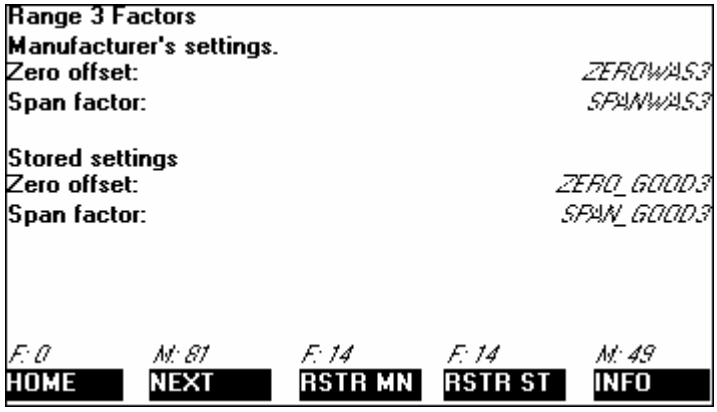
Menu: 78 RFHIST



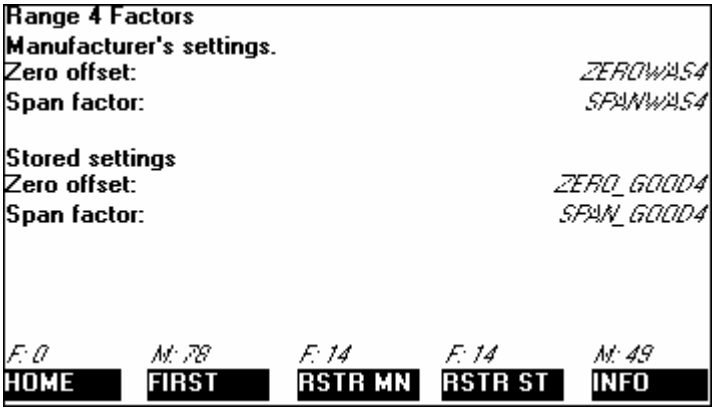
Menu: 79 RFHIST2



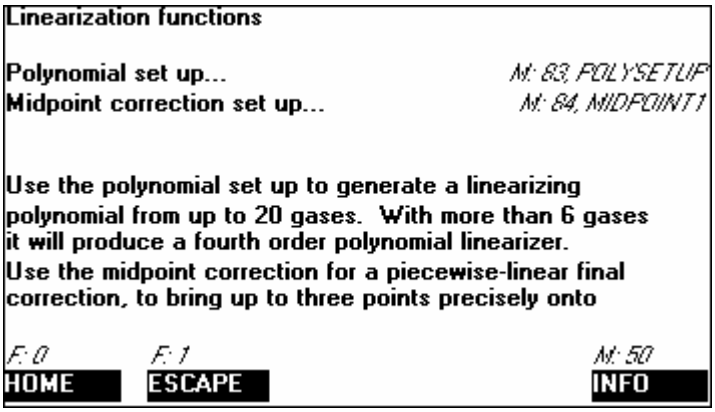
Menu: 80 RFHIST3



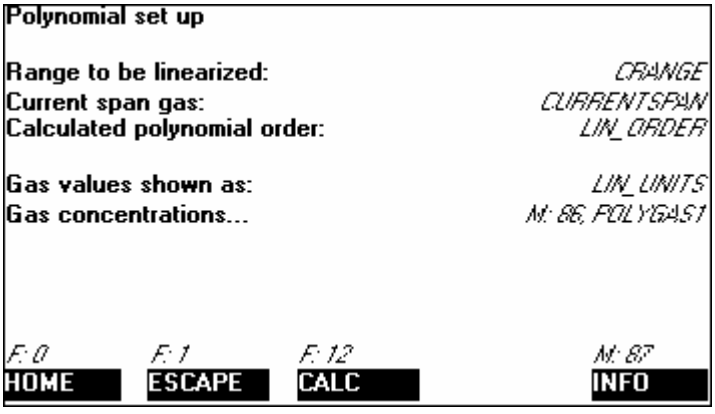
Menu: 81 RFHIST4



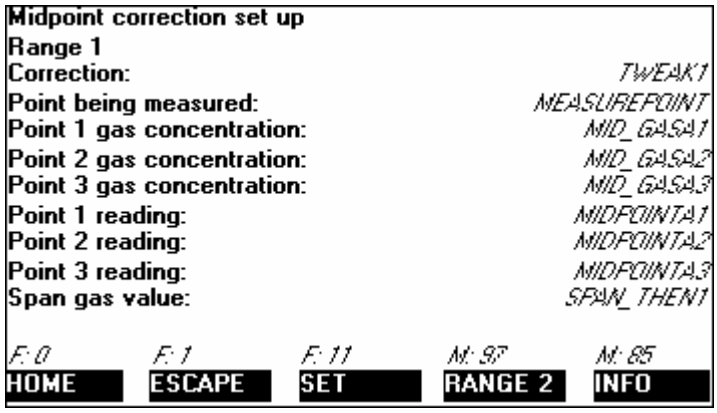
Menu: 82 LINFUNCT



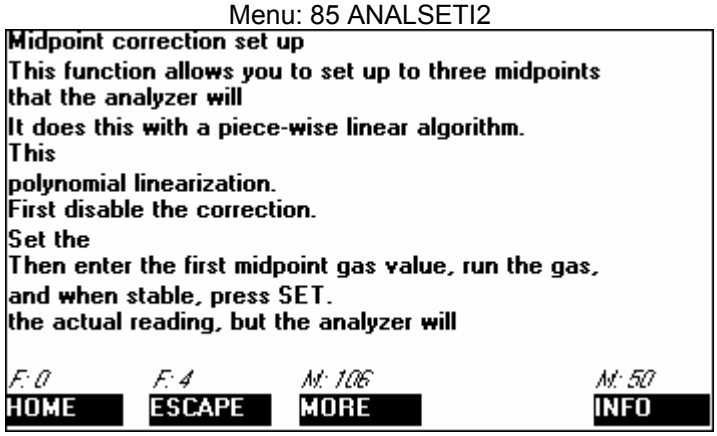
Menu: 83 POLYSETUP



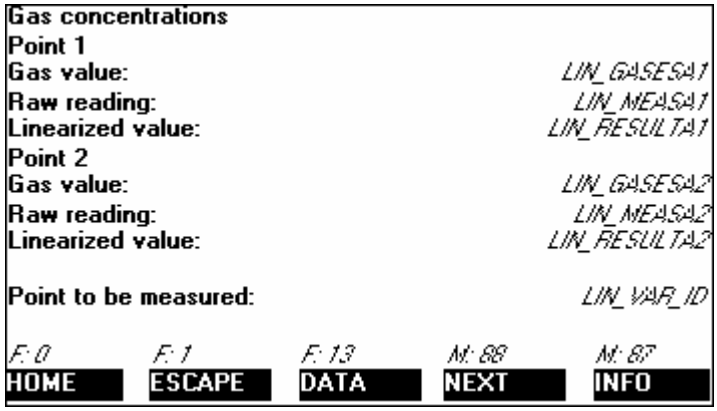
Menu: 84 MIDPOINT1



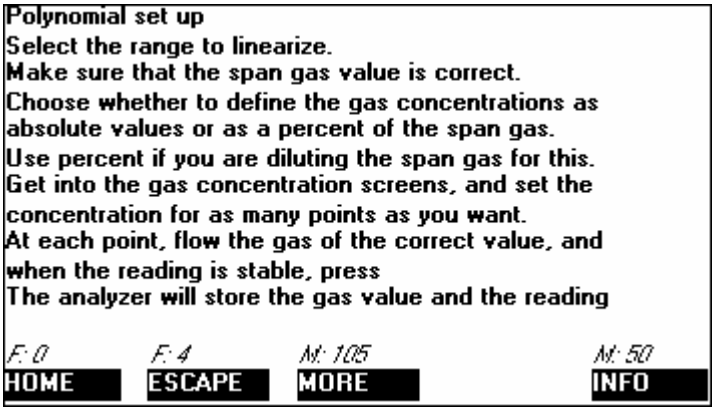
Menu: 85 ANALSETI2



Menu: 86 POLYGAS1



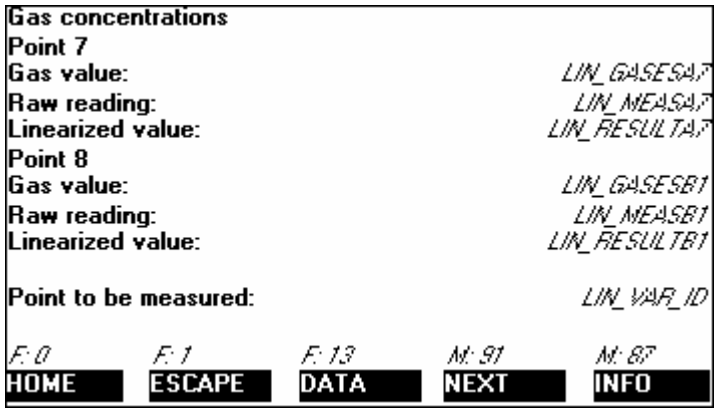
Menu: 87 POLYSETI1



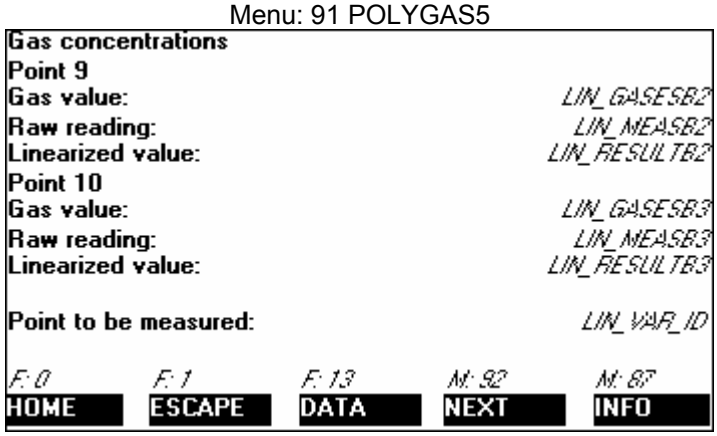
Menu: 88 POLYGAS2

Menu: 89 POLYGAS3

Menu: 90 POLYGAS4



Menu: 91 POLYGAS5



Menu: 92 POLYGAS6

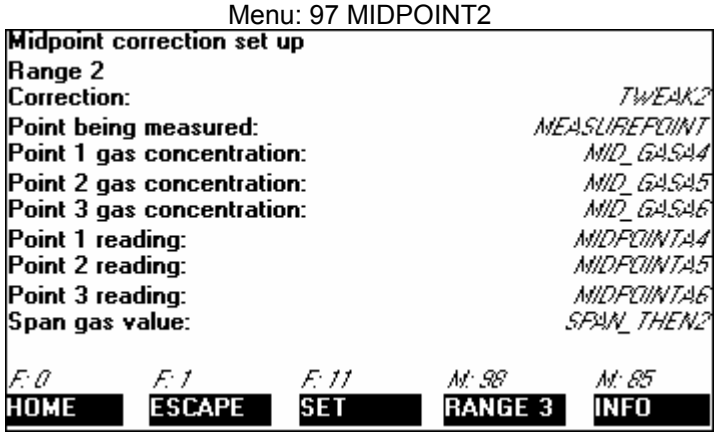
Menu: 93 POLYGAS7

Menu: 94 POLYGAS8

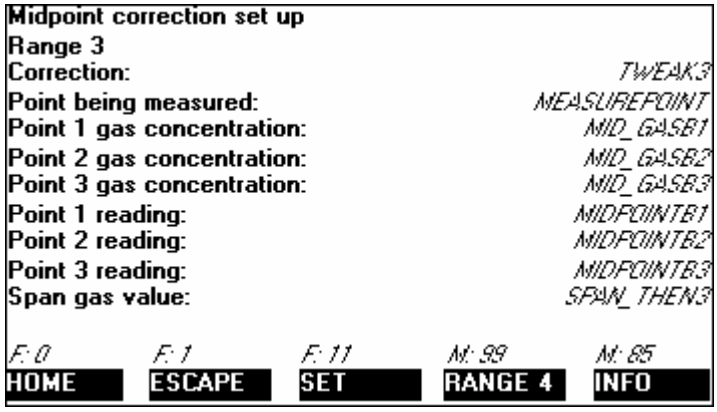
Menu: 95 POLYGAS9

Menu: 96 POLYGAS0

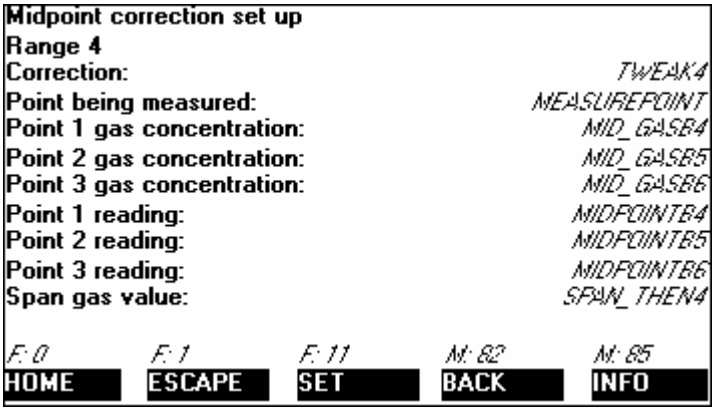
Menu: 97 MIDPOINT2



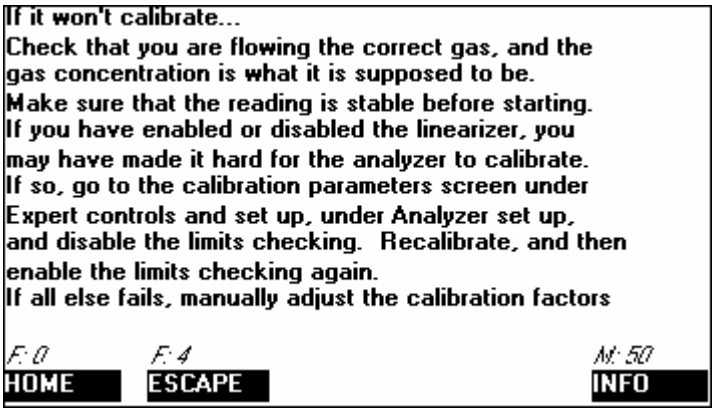
Menu: 98 MIDPOINT3



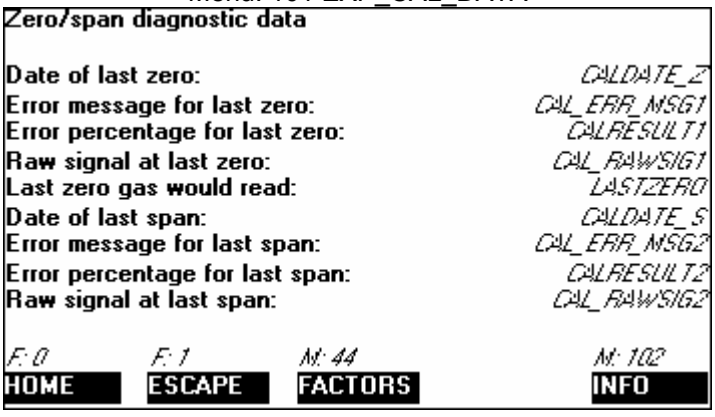
Menu: 99 MIDPOINT4



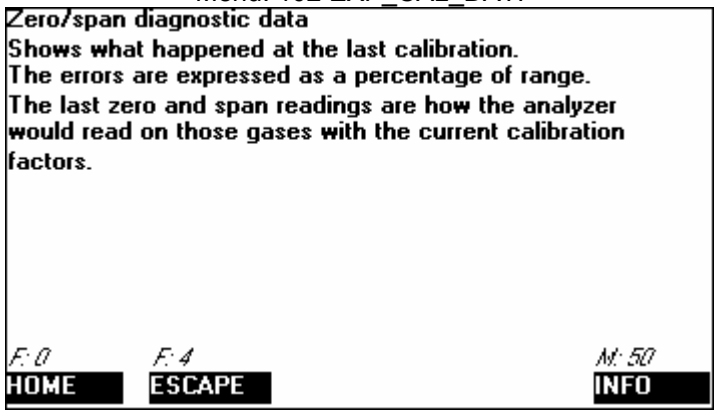
Menu: 100 ZEROI2



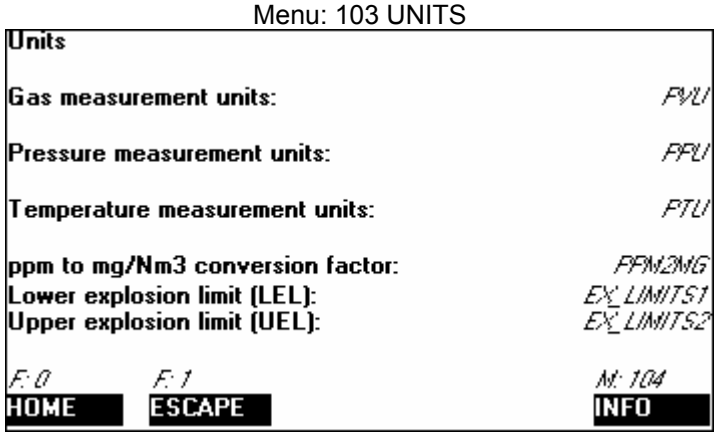
Menu: 101 EXP_CAL_DATA



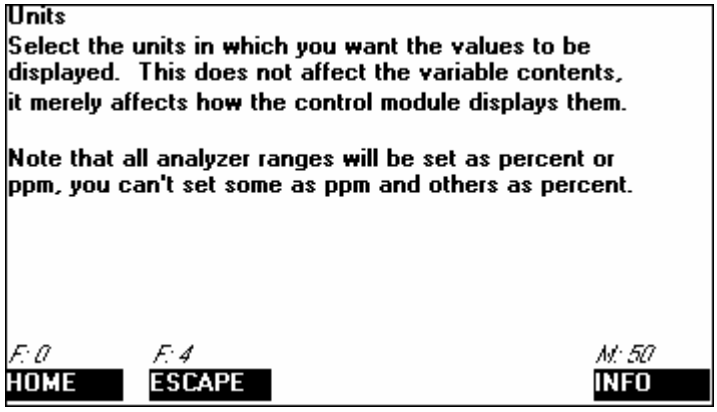
Menu: 102 EXP_CAL_DATI



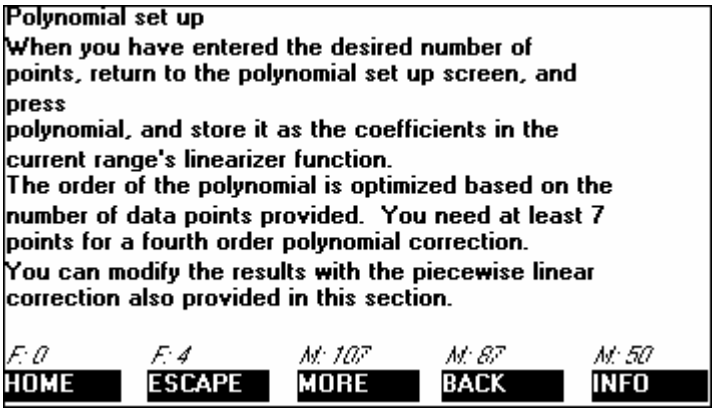
Menu: 103 UNITS



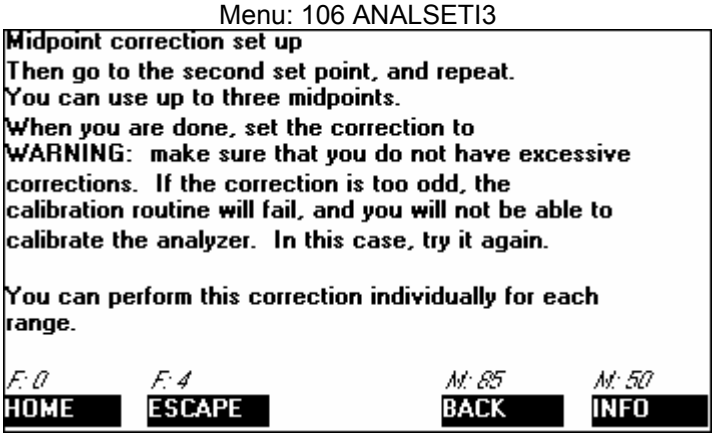
Menu: 104 UNITSI1



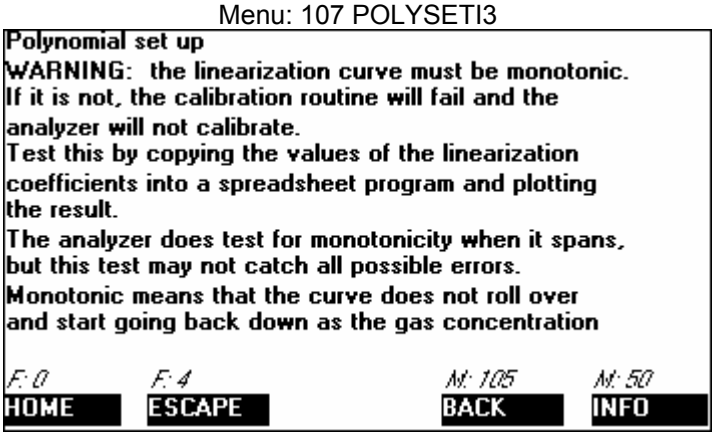
Menu: 105 POLYSETI2



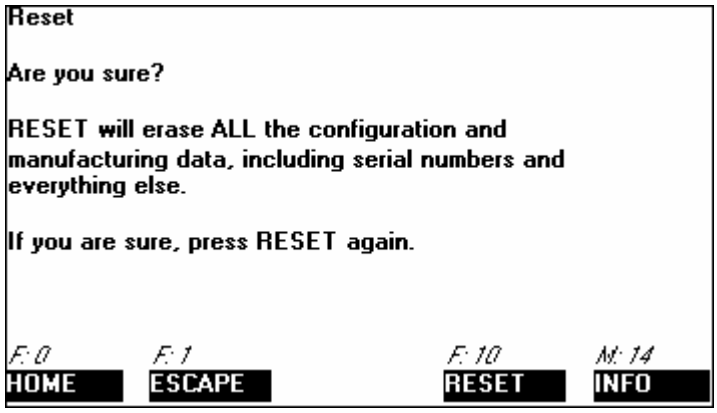
Menu: 106 ANALSETI3



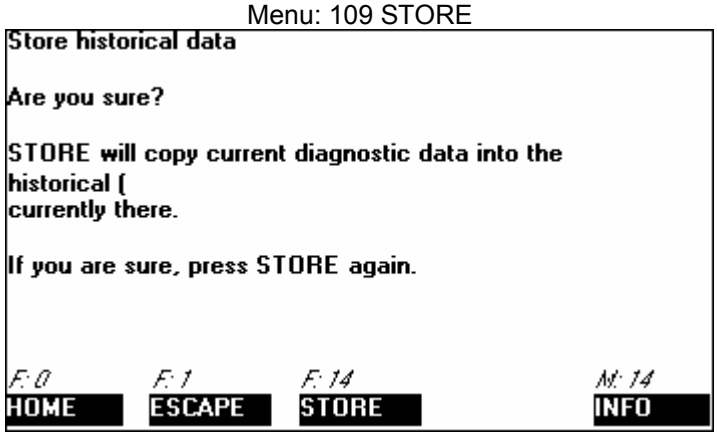
Menu: 107 POLYSETI3



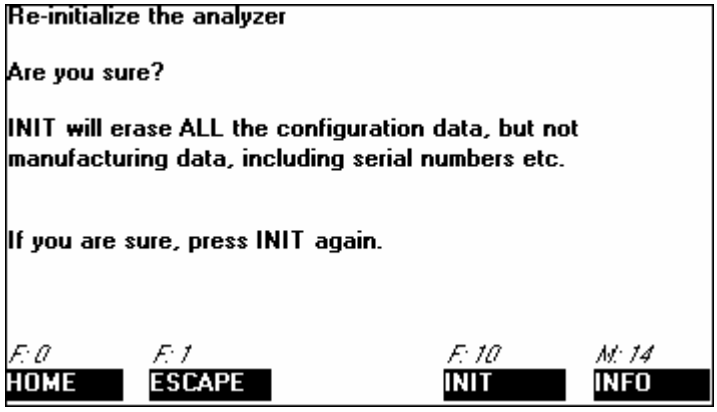
Menu: 108 RESET



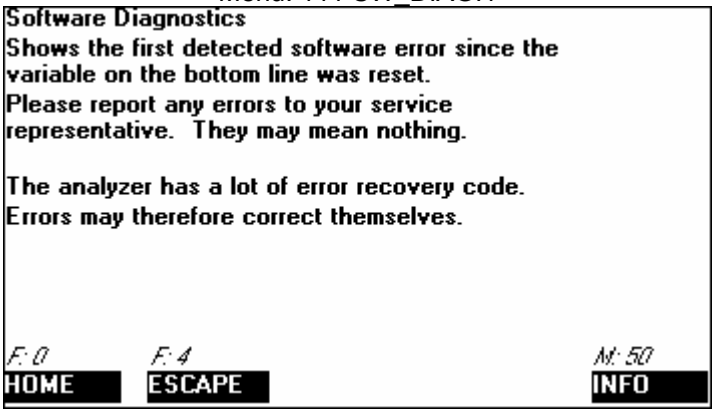
Menu: 109 STORE



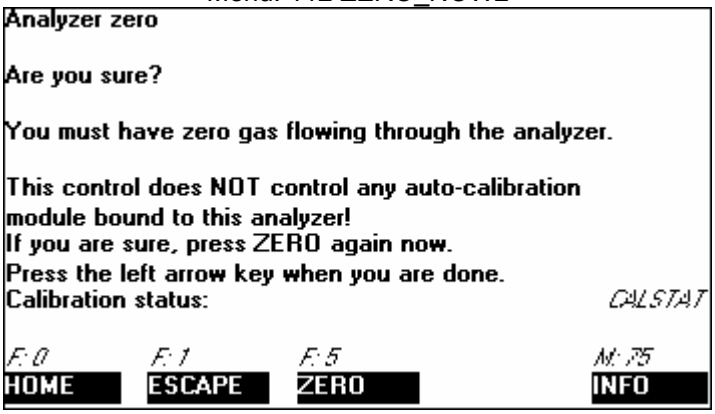
Menu: 110 REBOOT



Menu: 111 SW_DIAGI1



Menu: 112 ZERO_NOW2



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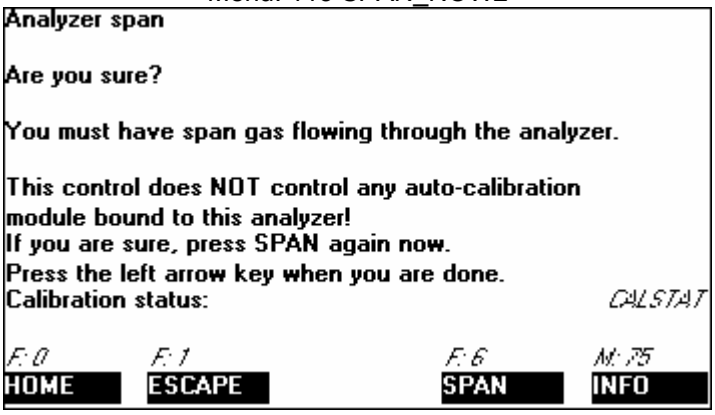

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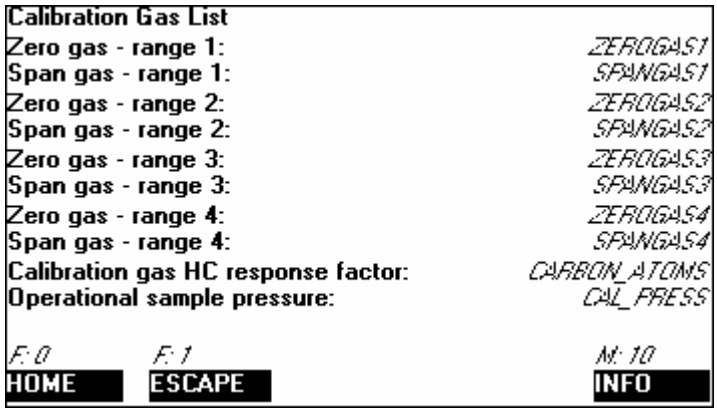

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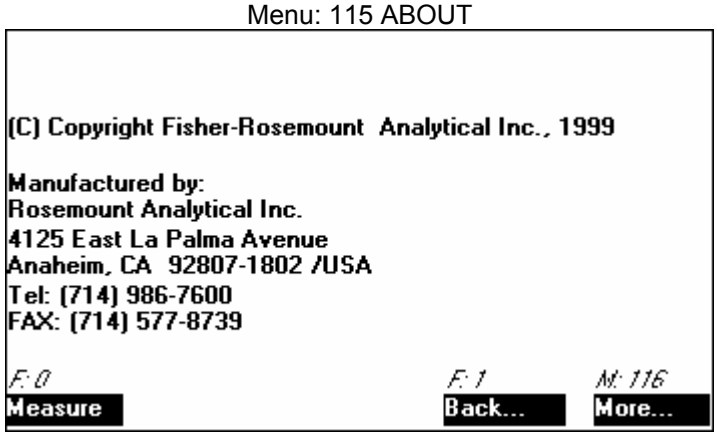

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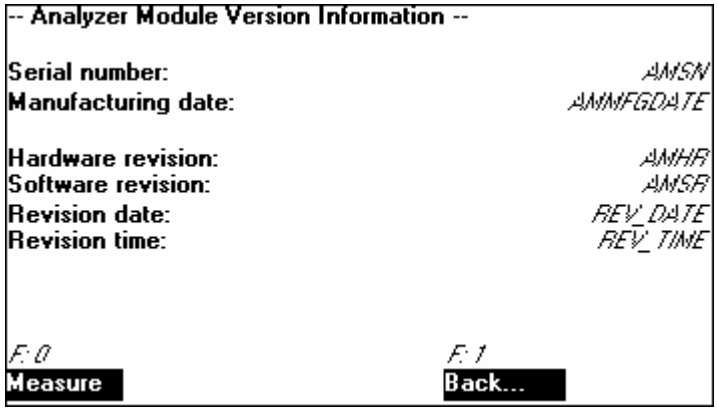
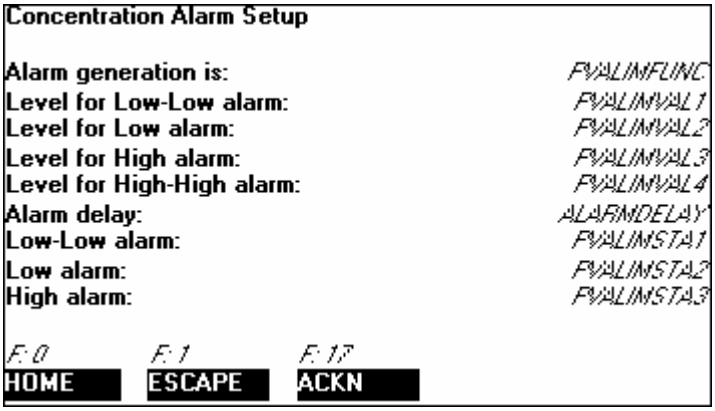


Menu: 117 ALARM1



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WARRANTY

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

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

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

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

Instruction Manual
760001-A
October 2002

Model NGA2000 FID

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