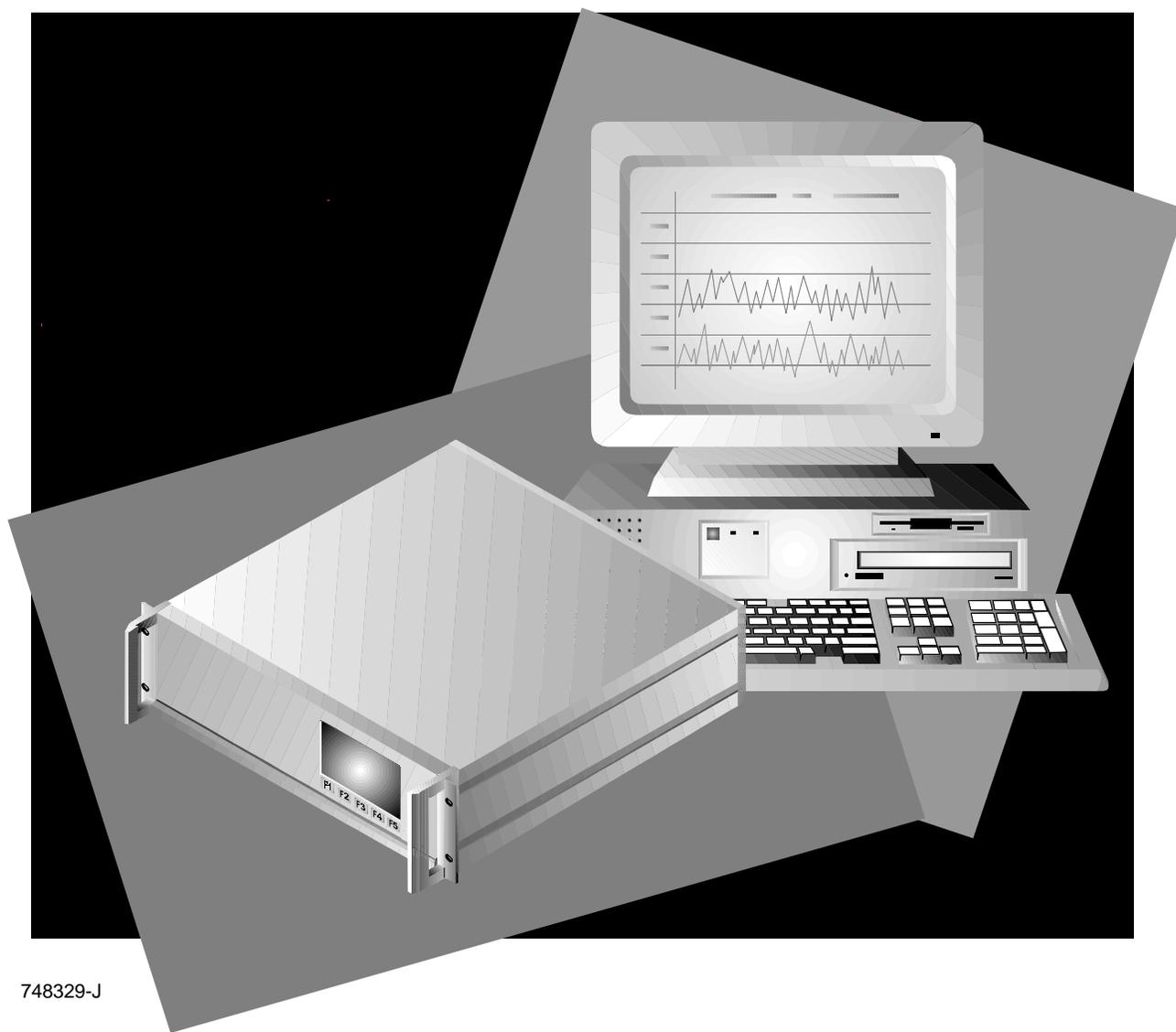


PLATFORM

Rosemount Analytical



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CONTENTS

PREFACE

| | |
|--|------|
| PURPOSE/SAFETY SUMMARY | P-1 |
| GLOSSARY | P-3 |
| SPECIFICATIONS - PLATFORM | P-9 |
| SPECIFICATIONS - I/O MODULE | P-9 |
| SPECIFICATIONS - 30 A BULK POWER SUPPLY | P-10 |
| CUSTOMER SERVICE, TECHNICAL ASSISTANCE AND FIELD SERVICE | P-11 |
| RETURNING PARTS TO THE FACTORY | P-11 |
| TRAINING | P-11 |
| DOCUMENTATION | P-11 |
| COMPLIANCES | P-12 |

SECTION 1. INTRODUCTION

| | |
|--|------|
| 1.1 INTRODUCTION TO THE NGA CONCEPT | 1-1 |
| 1.2 THE DIGITAL COMMUNICATION SYSTEM - AN INTRODUCTION | 1-2 |
| 1.3 PLATFORM OVERVIEW | 1-2 |
| 1.4 THE LON - THE NGA 2000 DIGITAL COMMUNICATIONS NETWORK | 1-4 |
| 1.5 PC INTERFACE..... | 1-5 |
| 1.6 INSTRUCTION MANUALS | 1-5 |
| 1.6.1 Platform Components Manual..... | 1-6 |
| 1.6.2 Analyzer Module Manuals | 1-6 |
| 1.6.3 NGA Reference Manual | 1-7 |
| 1.7 PLATFORM COMPONENTS..... | 1-8 |
| 1.7.1 Operator Interface | 1-8 |
| 1.7.2 Platform Controller Board..... | 1-9 |
| 1.7.3 Power Input Module/Power Supply | 1-10 |
| 1.7.4 Distribution Assembly Components | 1-11 |

SECTION 1. (CONTINUED)

| | |
|--|------|
| 1.8 SOFTWARE/DISPLAYS | 1-12 |
| 1.9 MULTIPLE MODULE COMPONENTS AND SYSTEM INTEGRATION..... | 1-13 |
| 1.10 I/O MODULE OVERVIEW..... | 1-20 |
| 1.10.1 I/O Module General Description | 1-20 |
| 1.10.2 Analog Functions And I/O Connections..... | 1-23 |
| 1.10.3 Additional I/O Modules | 1-25 |

SECTION 2. INSTALLATION

| | |
|--|-----|
| 2.1 SHIPPING CARTON INSPECTION | 2-1 |
| 2.2 LOCATION..... | 2-1 |
| 2.3 ELECTRICAL REQUIREMENTS | 2-2 |
| 2.4 GAS REQUIREMENTS..... | 2-3 |
| 2.5 I/O REQUIREMENTS..... | 2-3 |
| 2.6 I/O MODULE INSTALLATION PROCE | 2-3 |
| 2.7 I/O MODULE REMOVAL PROCEDURE | 2-4 |
| 2.8 I/O MODULE SOFTWARE CONFIGURATION..... | 2-4 |
| 2.9 I/O MODULE BINDING PROCEDURE | 2-4 |
| 2.10 I/O MODULE BINDING PROCEDURE - SOFTWARE V2.3 AND HIGHER..... | 2-6 |
| 2.11 SAMPLE HANDLING | 2-8 |

SECTION 3. STARTUP AND OPERATION

| | |
|-----------------------------------|-----|
| 3.1 OVERVIEW..... | 3-1 |
| 3.2 SOFTWARE MENU STRUCTURE | 3-1 |
| 3.3 SECURITY | 3-3 |
| 3.4 USING THE USER INTERFACE..... | 3-3 |
| 3.4.1 Using The Menus | 3-4 |
| 3.4.2 Using The Help Screens..... | 3-5 |
| 3.5 START UP | 3-6 |
| 3.6 DISPLAY SETUP..... | 3-7 |
| 3.7 OPERATION | 3-7 |
| 3.8 CORRECT OPERATION | 3-8 |

SECTION 4. MAINTENANCE AND TROUBLESHOOTING

| | |
|--|-----|
| 4.1 MAINTENANCE OVERVIEW | 4-1 |
| 4.2 FUSE REPLACEMENT | 4-2 |
| 4.3 CONTROLLER BOARD REPLACEMENT | 4-2 |
| 4.4 POWER INPUT MODULE REPLACEMENT | 4-3 |
| 4.5 POWER SUPPLY REPLACEMENT | 4-3 |
| 4.6 FRONT PANEL ASSEMBLY REPLACEMENT | 4-3 |
| 4.7 SYSTEM TROUBLESHOOTING | 4-4 |

SECTION 5. REPLACEMENT PARTS

| | |
|---|-----|
| 5.1 REPLACEMENT PARTS | 5-1 |
| 5.2 MULTI-MODULE COMPONENT PARTS LIST | 5-1 |

SECTION 6. ANALOG I/O MODULE

| | |
|---|------|
| 6.1 ANALOG I/O MODULE DESCRIPTION | 6-1 |
| 6.2 ANALOG I/O MODULE ALARM DESCRIPTION - V2.2 | 6-2 |
| 6.3 ANALOG I/O MODULE ALARM DESCRIPTION - V2.3 | 6-5 |
| 6.4 ANALOG I/O MODULE INSTALLATION | 6-7 |
| 6.4.1 Analog I/O Module Initial Setup procedure..... | 6-7 |
| 6.4.2 Analog I/O Module Calibration Procedure..... | 6-13 |
| 6.4.3 Analog Output Over/Under Limits | 6-15 |
| 6.5 ANALOG I/O MODULE TRACK AND HOLD FEATURE | 6-15 |
| 6.6 ANALOG I/O MODULE: RELAY OPERATION CHECK PROCEDURE..... | 6-17 |
| 6.7 ANALOG I/O MODULE RANGE CONTROL DISCUSSION | 6-18 |
| 6.8 ANALOG I/O MODULE OUTPUT CONNECTIONS..... | 6-19 |

SECTION 7. SINGLE ANALYZER ANALOG AUTO CAL I/O MODULE

| | |
|--|-----|
| 7.1 SINGLE ANALYZER ANALOG AUTO CAL DESCRIPTION | 7-1 |
| 7.2 SINGLE ANALYZER ANALOG AUTO CAL I/O MODULE INSTALLATION | 7-3 |
| 7.3 SINGLE ANALYZER ANALOG AUTO CAL I/O MODULE OPERATION..... | 7-8 |

SECTION 8. SYSTEM AUTO CALIBRATION I/O MODULE

8.1 SYSTEM AUTO CALIBRATION I/O MODULE DESCRIPTION 8-1
8.2 SYSTEM AUTO CALIBRATION I/O MODULE INSTALLATION 8-3

SECTION 9. EXCEL-BASED PV INTERFACE

9.1 EXCEL-BASED PC INTERFACE DESCRIPTION 9-1
9.2 EXCEL-BASED PC INTERFACE GENERAL REQUIREMENTS 9-1
9.3 EXCEL-BASED PC INTERFACE SOFTWARE REQUIREMENTS 9-2
9.4 EXCEL-BASED PC INTERFACE HARDWARE REQUIREMENTS 9-2
9.5 EXCEL-BASED PC INTERFACE SOFTWARE PRODUCT SPECIFICATIONS 9-2
9.6 PC INTERFACE PACKAGE 9-3
9.7 EXCEL-BASED PC INTERFACE INSTALLATION 9-3
9.8 NGA VARIABLE LIBRARY 9-5
9.9 EXCEL-BASED PC INTERFACE MULTIPLE PLATFORM SYSTEMS 9-6

SECTION 10. NGA MODBUS

10.1 NGA MODBUS INTRODUCTION 10-1
10.2 NGA MODBUS IMPLEMENTATION 10-1
10.3 MODBUS ADDRESSING 10-3
 10.3.1 ModBus Device Addressing (DA) 10-3
 10.3.2 ModBus Register Addressing 10-4
10.4 MODBUS FUNCTION CODE DESCRIPTIONS 10-8
 10.4.1 Function 03 (decimal) - Read Holding Registers 10-8
10.5 MODBUS CONFIGURATION 10-3
 10.5.1 ModBus User Defined Addressing 10-13
 10.5.2 ModBus configuration - Front Panel Menu 10-17

SECTION 11. LOCAL I/O MODULE

| | |
|---|------|
| 11.1 LOCAL I/O MODULE DESCRIPTION..... | 11-1 |
| 11.2 LOCAL I/O MODULE BINDING | 11-2 |
| 11.3 LOCAL I/O MODULE INSTALLATION | 11-2 |
| 11.4 LOCAL I/O MODULE SETUP | 11-2 |
| 11.5 LOCAL I/O MODULE CALIBRATION PROCEDURE | 11-5 |
| 11.6 LOCAL I/O MODULE TROUBLESHOOTING | 11-6 |
| 11.7 LOCAL I/O MODULE CONNECTIONS..... | 11-7 |

APPENDIX A. NGA MENU STRUCTURE

APPENDIX B. USER INTERFACE HELP

APPENDIX C. PLATFORM IDENTIFICATION MATRIX

WARRANTY

FIELD SERVICE AND REPAIR FACILITIES

FIGURES

| | |
|--|------|
| 1-1. Single Analyzer Display..... | 1-8 |
| 1-2. Multiple Analyzer Display (Showing Two Analyzers)..... | 1-9 |
| 1-3. Rear View Of Power Input Module..... | 1-10 |
| 1-4. Measurement Screen Display..... | 1-12 |
| 1-5. Dual Analyzer Enclosure..... | 1-15 |
| 1-6. Dual Analyzer Enclosure With Two Analyzers..... | 1-16 |
| 1-7. Dual Analyzer Enclosure With One Analyz..... | 1-16 |
| 1-6. Dual Analyzer Enclosure With Two Analyzers..... | 1-16 |
| 1-8. Wiring NGA Systems..... | 1-18 |
| 1-9. Supporting Multi Platform Integration..... | 1-19 |
| 1-10. I/O Modules Location In Platform (Instrument Configuration)..... | 1-20 |
| 1-11. I/O Module Location In Platform – Rear Panel View (Instrument Configuration)..... | 1-21 |
| 1-12. Analog I/O Module Component Location And Mounting Dimensions..... | 1-21 |
| 1-13. Analog I/O Module Backplane Connector Pin Assignments..... | 1-22 |
| 1-14. Analog I/O Module Output Connector/Adapter Pin Assignments..... | 1-24 |
| 3-1. Main Menu..... | 3-1 |
| 3.2 Typical Menu..... | 3-4 |
| 3-3. First Help Menu..... | 3-5 |
| 3-4. Single Analyzer Display..... | 3-7 |
| 6-1. Analog Output Module Setup Menu..... | 6-7 |
| 6-2. Analog Output Parameter Menu..... | 6-8 |
| 6-3. V2.2 Alarm Parameter Menu..... | 6-9 |
| 6-4. V2.2 Concentration Alarm Parameters..... | 6-9 |
| 6-5. Analog Output Module Setup Menu - V2.3..... | 6-11 |
| 6-6. Alarm Condition Menu - V2.3..... | 6-11 |
| 6-7. Concentration Alarm Parameters Menu - V2.3..... | 6-12 |
| 6-8. Typical Concentration Alarm Parameter Menu - V2.3..... | 6-12 |
| 6-9. Voltage Output Calibration Menu..... | 6-13 |
| 6-10. Current Output Calibration Menu..... | 6-13 |
| 6-11. Output Parameters Menu..... | 6-15 |
| 6-12. First Relay State Menu..... | 6-17 |
| 6-13. Analog I/O Module Output Connector/Adapter Pin Assignments..... | 6-19 |
| 7-1. Autocalibration Module Setup Menu..... | 7-4 |
| 7-2. Autocalibration Module Timing Parameters Menu..... | 7-4 |
| 7-3. Typical Gas Valve Control Menu..... | 7-6 |
| 7-4. General Valve Parameters Menu..... | 7-7 |
| 7-5. Automatic Calibration Menu..... | 7-8 |
| 7-6 Manual Calibration Menu..... | 7-8 |
| 7-7. Output Connector/Adapter Pin Assignments..... | 7-9 |
| 8-1. Output Connector/Adapter Pin Assignments..... | 8-4 |
| 9-1. Using The PC Interface With Multiple NGA Systems..... | 9-6 |
| 11-1. Output Calibration Menu..... | 11-5 |

TABLES

| | |
|--|-------|
| 1-1. Node Count And Power Consumption For NGA 2000 System Integration | 1-14 |
| 1-2. I/O Module Features | 1-22 |
| 1-3. Analog I/O Module Specifications | 1-23 |
| 2-1 User Tag Numbers | 2-5 |
| 6-1. Available Functions – Analog Output with 3 Alarms I/O Module V2.2 | 6-3 |
| 6-2. Alarm Relay Configuration Matrix V2.2 | 6-3 |
| 6-3. Available Functions – Analog Output with 3 Alarms I/O Module V2.3 | 6-5 |
| 6-4. Available Alarms – Analog Output with 3 Alarms I/O Module V2.3 | 6-6 |
| 7-1. Autocalibration Module - Input Line Range Control | 7-2 |
| 7-2. Available Functions – Single Analyzer Autocalibration I/O Module V2.2 | 7-3 |
| 8-1. Available Functions - System Autocalibration I/O Module V2.2 | 8-2 |
| 9-1. Variables For Use In Excel Spreadsheets | 9-5 |
| 10-1. NGA Modbus Functions | 10-2 |
| 10-2. Event Assignment | 10-4 |
| 10-3. Modbus “All Variable” Address Table | 10-5 |
| 10-4. “Must Be Supported” Register Addresses | 10-6 |
| 10-5. Modbus “User Defined” Register Address Example | 10-6 |
| 10-6. Modbus Function 03 Message | 10-8 |
| 10-7. Modbus Function 03 Response From The Slave Device | 10-8 |
| 10-8. Modbus Function 04 Message | 10-9 |
| 10-9. Modbus Function 04 Response From The Slave Device | 10-9 |
| 10-10. Modbus Function 06 Message | 10-10 |
| 10-11. Modbus Function 06 Response From The Slave Device | 10-10 |
| 10-12. Modbus Function 08 Message | 10-11 |
| 10-13. Function 08 Response From The Slave Device | 10-11 |
| 10-14. Modbus Function 16 Message | 10-12 |
| 10-15. Modbus Function 16 Response From The Slave Device | 10-12 |
| 10-16. Modbus ASCII And RTU Comparison | 10-13 |
| 10-17. Modbus Configuration Variables | 10-14 |
| 10-18. Modbus Configuration Variable Addresses | 10-15 |
| 10-19. Modbus Address Assignment Example | 10-16 |
| 11-1. Local I/O Module Alarm Functionality | 11-4 |
| 11-2. 25 Pin Sub-D Connector Pin Identification | 11-7 |
| 11-3. 9 Pin Sub-D Connector Pin Identification | 11-8 |

NOTES

PREFACE

PURPOSE/SAFETY SUMMARY

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

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



WARNING: AUTHORIZED PERSONNEL

To avoid explosion, loss of life, personal injury and damage to this equipment and on-site property, all personnel authorized to install, operate and service the NGA 2000 Platform should be thoroughly familiar with and strictly follow the instructions in this manual. SAVE THESE INSTRUCTIONS.

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

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

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

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

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



WARNING: ELECTRICAL SHOCK HAZARD

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

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

Platforms with two power supplies require disconnection of BOTH power cords to remove power from the platform.



WARNING: POSSIBLE EXPLOSION HAZARD

This equipment may contain modules used in the analysis of sample gases which may be flammable. If used for analysis of such gases, the module must be protected by a continuous dilution purge system in accordance with Standard ANSI/NFPA 496-1993, Chapter 6.



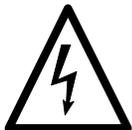
CAUTION: HAND INJURY HAZARD

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.



WARNING: PARTS INTEGRITY

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



WARNING: STATIC SENSITIVE COMPONENTS

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

Note: If this Platform is stored in an environment whose ambient temperature is below 5°C (41°F), it must be moved into a room temperature environment for 24 hours prior to powering up. If not, moisture may form inside the LCD display.

GLOSSARY

30 A BULK POWER SUPPLY

A power supply that is mounted in an enclosure capable of supplying power (+24 VDC @ 30 Amperes) to up to ten Analyzer Modules installed in the NGA 2000 System.

AK

A serial interface protocol, popular in Europe in the automotive industry.

AMSN

Network variable name containing the module Serial number. This should be the same as the number physically marked on the unit.

ALARM

An indication (normally) of an out-of-normal circumstance. This covers status indications, concentration limit violation, internal limit violations or an internal problem. Alarms may be indicated to the user either visually or through a relay contact closure.

ANALYZER MODULE

Self contained analysis modules that are designed to be installed into the NGA 2000 System. One Analyzer Module can be installed into a Single Enclosure containing the Platform Module. Two Analyzer Modules can be installed into a Dual Enclosure. The simplest NGA 2000 System consists of one Analyzer Module.

BACKPLANE

The Controller Board, Power Supply Board, I/O Board(s) and Expansion Board(s) are plugged into the Backplane

BASIC CONTROLS

In the NGA menu system, refers to the controls appropriate for normal operator use. These include such things as range changing, zeroing the analyzer, and lighting the flame on a FID analyzer.

BENCH

The physical measuring device within the analyzer module. It comes from the term Optical Bench, describing the specialized optical components used in the original analyzers.

BINDING

A process by which analyzer modules and I/O modules are instructed with whom to communicate over the LON. Once bound, variable updates from one module are automatically transferred to the other.

CALIBRATE

In Internal Combustion Exhaust Emissions monitoring, to zero, span and linearize an analyzer. In other industries, to zero and span an analyzer.

CALIBRATION CYCLE

A procedure for making an analyzer read sample gases correctly. It involves flowing zero gas, waiting for stabilization, causing the analyzer to adjust its zero offset, and then doing the same for one or more span gases with adjustment of span factors as required.

CLD

Chemiluminescence Detector - a term for the type of analyzer that measures nitrogen oxides by measuring the light emitted when nitric oxide reacts with ozone.

CONTROL MODULE

A Platform containing a Controller computer, a display and a keyboard. Used to view analyzer data, and configure and troubleshoot the entire NGA system.

CONTROLLER BOARD

The Controller Board in the Platform which runs the software program that operates the Display, Keypad and Network Manager. The Controller Board plugs into the Backplane from the Platform front.

DDE

Dynamic Data Exchange - a Microsoft Windows function that allows programs to talk to other programs. It is rather slow and primitive, but is a recognized standard.

DDE SERVER

A program running under Windows that provides DDE communication to Windows applications. The Rosemount DDE server allows such applications to communicate seamlessly to NGA analyzers.

DIO

Digital input/output board, a special I/O Module that works with the platform to provide many digital I/O lines.

DISTRIBUTION ASSEMBLY

The Distribution Assembly consists of the Backplane and the card cages in the Platform Module that contain I/O Board(s) and Expansion Board(s).

EXPANSION BOARD

The Expansion Board performs special features not related to I/O functions. The Expansion Board plugs into the Backplane from the Platform front.

EXPERT

Refers to the controls and configuration capability appropriate for engineering personnel.

FAILURE

A form of alarm: Failure indicates an unrecoverable hardware or software failure such as some component not responding to network communications or a safety related failure such as lack of purge air in a Flame Ionization Detection Analyzer Module.

FID

Flame Ionization Detector - refers to the hydrocarbon analyzer. This ionizes hydrocarbons in a flame, and measures the resultant current.

HOME

The main menu, the top menu of the NGA menu system. Pressing the HOME softkey always returns to this point.

I/O BOARD

The optional I/O Board(s) provide input/output functions. The I/O Board(s) plug into the Backplane from the rear of the Platform.

I/O MODULE

An auxiliary module that provides some sort of interface to the outside world. I/O modules may include analog outputs, relay contacts, and digital interfaces. In general, they are mounted in platforms as options.

INFO

Refers to the help screens in the menu system.

INRUSH CURRENT LIMITING

It is sometimes necessary to limit the current drawn by a piece of electronics when it is first switched on. Special devices are available to do this. The NGA multi-module power supply uses them.

IR

Infra-red, also short for NDIR or Non-dispersive Infra-red analyzer. Uses the absorption of infra-red energy by certain gases as a means of measuring the concentration.

LINEARIZATION

The application of a mathematical formula to the analyzer's signal with the intention of compensating for the analyzer's inherent non-linear response. Normally a fourth order polynomial is used.

LON

The LON is the Local Operating Network which is used to provide a communications link between the I/O Module(s), Analyzer Module(s) and the Controller Board in the Platform.

MAIN MENU

The top menu in the NGA menu system. The "HOME" key in all other menus returns you to this.

MENU

A screen full of information. Menus contain any or all of text, variables, function controls, or jumps to other menus.

NDIR

Infra-red, also short for NDIR or Non-dispersive Infra-red analyzer. Uses the absorption of infra-red energy by certain gases as a means of measuring the concentration.

NGA

Next Generation Analyzer, a term describing Rosemount Analytical's digital analyzer system.

PARAMAGNETISM

The quality of certain materials, particularly oxygen, of being attracted to a magnetic field, like a very weak form of iron. Most gases are diamagnetic, meaning that they are very weakly repelled by a magnetic field.

PARMS

Parameters, information that either tells you how the analyzer is operating, or how it has been configured.

PHYSICS

Refers to the physical measurement components within the analyzer. Also the study of the natural world.

PLATFORM

Any combination of the NGA case, the display and computer board, power supply, and I/O modules. In general, it could be considered to be anything in the NGA system other than the analyzer modules.

4PLATFORM MODULE

A module that provides operator command and control via a local network to one or more Analyzer Modules connected to the NGA 2000 System.

PMD

Paramagnetic Detector, the name used for the NGA paramagnetic oxygen analyzer module.

POLYNOMIAL

A mathematical term meaning an expression (a function of a variable) containing several terms, each of which contains a power of the variable. $A + B X x + C X (x X x)$ is a second order polynomial in x . A, B and C are its zeroth, first and second coefficients. "X" means multiply, as usual.

POWER SUPPLY BOARD

The Power Supply Board that plugs into the front of the Backplane capable of supplying power (+24 VDC @ 5 Amperes) to the platform components and just one analyzer module mounted within the platform.

PRIMARY VARIABLE

The measured species concentration value from an Analyzer Module.

RANGE

The bounds of concentration over which the analyzer's reading is accurate, or possible. Traditionally this is set by the analyzer circuitry or its physics: in NGA, it is often merely a mathematical fiction provided for operational convenience.

RESPONSE FACTOR

The relative response of the analyzer to different gases to which it is sensitive. In the case of the FID this refers to its response to various hydrocarbons, which is roughly in proportion to the number of carbon atoms contained in the gas' molecule.

SAFETY FAILURE

Indicates a failure of the analyzer safety system, with resultant shut down of the analyzer.

SECONDARY VARIABLE

The current status data placed on the network by an Analyzer Module. The includes sample flow, source voltage and other diagnostic information.

SERIAL NUMBER

A number assigned to the module at time of manufacture. It is stored in the network variable AMSN, and marked on a label on the module enclosure.

SOFTKEYS

The five function keys located below the front panel display. The menu function for each softkey is displayed directly above it and is controlled by the software.

SOLENOID VALVES

A gas switching element controlled by electrical current. It is used to control the flow of sample or calibration gas to an analyzer.

SPAN

The range over which something works, or the act of standardizing the upper end of the range.

SYSTEM

A NGA 2000 System consisting of one (or more) Analyzer Modules, an optional Platform, one or more optional I/O Boards, an optional Expansion Board and an Optional 30 A Bulk Power Supply.

SYSTEM INTEGRATOR

An individual or organization who designs and builds analytical systems. Typically these are panels containing one or more analyzers together with the sample system components and any other devices required for stand-alone operation.

TAG

The name of a module. This may be defined by the user. It is used to identify the module both in the menu system and through the PC interface. See also AMSN, or Serial number.

TECHNICAL LEVEL

In the NGA menu system, refers to the controls and configuration capability, and diagnostic information appropriate for analyzer technicians.

THC

Total Hydrocarbons, a term for the total quantity of hydrocarbons present, regardless of their type.

TWEAK

A slang term meaning to adjust. Used in the NGA system specifically to describe a process of modifying the linearity of an NGA analyzer.

VALIDITY

A concept used to describe a condition in which gas concentration values present on the Operator Interface or output lines should be considered valid or invalid. The Analyzer Module alerts the system that an error in gas concentration is present. Causes include failure or lack of calibration, flame out in a FID, or a not-from-process gas applied by a sample control module.

VBA

Visual Basic for Applications - Microsoft's version of Visual Basic that they supply built into their main applications such as Excel or Word. It is similar but not identical to the stand-alone Visual Basic, and each variety has its own idiosyncrasies.

WARNING

A form of alarm: a warning indicates one or more software configured limits on any network variable (other than gas concentration) has been exceeded. Examples of these secondary variables are flow rate and internal voltage. A warning indicates that the analyzer reading may not be correct.

ZERO

To make the analyzer read zero on zero gas, by calibrating its offset. Also the operation that accomplishes this.

SPECIFICATIONS - PLATFORM

POWER REQUIREMENTS

85 to 264 VAC, 50/60 Hz; 24 VDC (optional); 150 W max.

ENCLOSURE DIMENSIONS

Standard: 133 mm x 483 mm x 522 mm (5.2" x 19" x 20.5") H x W x D
Extended: 133 mm x 483 mm x 649 mm (5.2" x 19" x 25.5") H x W x D

WEIGHT (FULLY CONFIGURED; NO ANALYZER, I/O, OR EXPANSION MODULES)

Standard: 10.0 kg (22 lbs.)
Extended: 10.5 kg (23 lbs.)

ENCLOSURE MOUNTING

Horizontal rack or bench (kit is available for bench mounting)

ENVIRONMENT

Location - Class B controlled, indoor, non-hazardous

ALTITUDE

Up to 2000 m.

POLLUTION DEGREE

2

INSTALLATION CATEGORY (OVER-VOLTAGE CATEGORY)

II

OPERATING TEMPERATURE

0 °C to 45 °C (32 °F to 113 °F)

OPERATING HUMIDITY

20 to 90 % Relative Humidity, non-condensing

SPECIFICATIONS - I/O MODULE

POWER REQUIREMENTS

24 VDC; 5 W max.

RELAY CONTACT RATING

1A, 24VDC; resistive load only.

RELAY CONTACTS

3 SPDT; 4 SPST

CURRENT OUTPUT

-2 to +22 mA max.; 0 - 20 mA range or 4 - 20 mA range; 600 Ohms maximum load.

VOLTAGE OUTPUT

-9 to + 9 V max.; 0 - 5V range; 10K Ohm minimum load.

SPECIFICATIONS - 30 A BULK POWER SUPPLY

AC POWER INPUT

115/230 VAC (selectable), 47 to 440 Hz, 12/8 Amperes: Brown-out Voltage: 80/160VAC. Efficiency is 80% minimum.

FUSES

2 fuses each: 110V T12A; 230V T8A

LINE REGULATION

1.2 % maximum.

LOAD REGULATION

0.6 % maximum.

DC VOLTAGE OUTPUT

+24 VDC.

DC CURRENT OUTPUT

30 Amperes maximum.

RIPPLE & NOISE

Less than 100 mV peak-to-peak maximum.

OPERATING TEMPERATURE

0 to 45 °C.

STORAGE TEMPERATURE

-20 °C to 75 °C.

SAFETY

The power supply unit within the enclosure is UL Recognized; CSA Certified.

WEIGHT

8.7 kg (19.2 lbs.).

See the appropriate Analyzer Module manuals for specifications regarding the analyzer (e.g., drift, noise, repeatability).

CUSTOMER SERVICE, TECHNICAL ASSISTANCE AND FIELD SERVICE

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

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

RETURNING PARTS TO THE FACTORY

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

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

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

Return to:

**Rosemount Analytical Inc.
4125 East La Palma Avenue
Anaheim, California 92840-1802**

TRAINING

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

**Rosemount Analytical Inc.
Phone: 1-714-986-7600
FAX: 1-714-577-8006**

DOCUMENTATION

The following NGA 2000 Platform instruction materials are available. Contact Customer Service or the local representative to order.

748329 Instruction Manual (this document)

COMPLIANCES

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



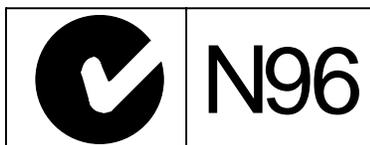
Rosemount Analytical Inc. has satisfied all obligations from the European Legislation to harmonize the product requirements in Europe.



This product complies with the standard level of NAMUR EMC Recommendation (May 1993).

NAMUR

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



1 INTRODUCTION

1.1 INTRODUCTION TO THE NGA CONCEPT

NGA stands for "Next Generation Analyzer". It describes a new concept in gas analyzer design. The basis for this concept is the division of the traditional analyzer functions into modular parts, connected by a digital communication link called LON.

Traditional analyzers contain the "physics" - the mechanism for detecting the gas in question - and a means of controlling the operation of and getting data from the physics. This normally consists of a display with associated controls on the front of the box, and "I/O" (input/output) consisting of an analog or sometimes RS232 output, together with some relay contacts, on the back. Power is supplied by an AC connection to the wall plug. Each analyzer in a system has to contain all of these components.

In the NGA concept, the physics is separated from everything else into an "Analyzer module", and a single "Control module" or "Platform" (so called) contains the control, display, I/O and power supply components.

Communication between the Analyzer module and the Control module is by means of a sophisticated digital communication system made by the Echelon corporation, called LONWORKS™ or LON™. There are many subtleties involved in such systems, but the NGA and the LON hide almost all of these from the user. A great deal of the sophistication of the NGA concept is involved in making the communication system extremely simple to use and in removing the complexity that, for example, your MIS administrator has to deal with while managing the LAN (Local Area Network) you probably have to use at work!

A typical NGA system then consists of a number of different types of Analyzer modules connected to a single Platform, with some selection of I/O provided according to the particular needs of the user. Control of the entire system takes place through the single Platform, and any I/O to the system goes through it. (It is also possible for a computer to talk directly to the Analyzer Modules without the need of a Platform, but that is outside the scope of this document.)

1.2 THE DIGITAL COMMUNICATION SYSTEM - AN INTRODUCTION

The NGA uses a proprietary digital communication system made by Echelon corporation, called LONWORKS™ or LON™ for short. It is a sophisticated system that deals with most of the subtleties required without user intervention or knowledge, but there are certain aspects of it of which you should be aware.

The LON sends data in packets called "Variables". These are named, so that, for example, the main output of an analyzer is contained in a variable called "PVA". Its range is contained in a variable called "CRANGE". These variables are emitted by the source and read by other modules on the network that are interested in them.

I/O Modules contain input variables of the same name, and when the I/O is "bound" to an Analyzer Module, the contents of the Analyzer's PVA are automatically communicated to the I/O's PVA, so that it now knows what the analyzer's reading is. It can convert it to a 4-20mA signal, or whatever it is configured to do. Obviously it is important that the I/O Module knows which analyzer to listen to!

The way we tell the I/O Module which analyzer it should pay attention to is to "bind" it to that analyzer. This process selects an analyzer, selects an I/O Module, and ties them together so that the set of analyzer variables is bound to the equivalent set of I/O variables, and the two act as if they are one unit. The process itself is described below, and it is much easier in V2.3 than in V2.2 and earlier versions. It is the only thing you have to do to configure the LON.

The other thing to realize is that the LON is extremely reliable. Any apparent problem with it has always been proved to be from some obvious error, like a broken wire. It is possible to overload it, and there is information in this and the reference manual about this, but once a system has been setup the LON itself keeps working. If there is a problem, look for other things besides the LON to be at fault!

1.3 PLATFORM OVERVIEW

This manual describes the Control and I/O capabilities of the Platform part of an NGA system.

NGA system consists of three basic elements:

- Platform components
- Analyzer Modules
- Input/Output (I/O) Modules

The Platform serves as a local operator interface for up to six (ten for V2.3 and higher) Analyzer Modules. It consists of a group of components that can be assembled in many different configurations depending on the user's needs. It can be composed of any workable collection of the following:

- Operator Interface - Front Panel, Display and Keypad
- Power Input Module/ Power Supply Board
- Platform Controller Computer
- One or more of a number of I/O Modules
- Enclosure.

The Platform is also available in a dual version, with two complete independent sets of electronics in one enclosure. Such dual versions act as two separate Platforms and allow two independent analyzer systems to be run from one place. The front panel in this case consists of two half panels directly mounted on the chassis with no hinges.

The NGA 2000 family of gas Analyzer Modules utilizes proven methodologies such as:

- Non-dispersive infrared (NDIR) to measure gases such as carbon monoxide (CO), carbon dioxide (CO₂) and sulfur dioxide (SO₂)
- Paramagnetic (PMD) for measurement of oxygen
- Chemiluminescence (CLD) for measurement of nitrogen oxides (NO and NO_x)
- Flame ionization detection (FID) for measurement of total hydrocarbons (THC).
- Further modules made in Europe and described in their own manuals. These include the MLT (a multi-analysis module) and the NGA II series.

These gas detectors are packaged in standard sized modules that can be linked together via the LON communications network. The modularity of NGA 2000 allows for the use of multiple interchangeable Analyzer Modules with no change in overall operational characteristics.

The I/O Modules provide signal input and output capability outside of the NGA 2000 communications network and are designed for easy installation in the Platform. I/O Module options provide analog and digital signals, dry contact closures for alarms and calibration valve sequencing, and accept remote signals for range change and calibration initiation. These I/O Modules contain a small computer that operates autonomously providing I/O capability through the LON connection without burdening the Analyzer module computers.

The SIO Board and DIO Board are extensions to the Platform Controller Board. They plug into the back of the Platform just as do the I/O Moduleboards, but they do not contain on board intelligence. The Platform will only accept one SIO board but it is possible to add up to four DIO boards - but only if the software in the Platform is V3.3, or higher. (At the time of writing, this software is not available in the USA.)

The LON I/O Module boards allow for external LON connections to the Platform.

Components that comprise the Platform and the I/O Modules can be assembled in other configurations depending on user needs.

NOTE

The Platform controller board software must be of a later major revision than any Analyzer Module software. For example, a V2.2 Platform controller board will work with V2.2.1 Analyzer Modules, but not with V2.3 Analyzer Modules. The ".1" after the V2.2 refers to a minor revision, which is compatible with the V2.2 Platform controller board software.

NOTE

It is strongly recommended that you note the actual software revisions that you have. Service or support people will be able to diagnose any problem you may have more easily if this information is immediately available. The revision is marked on each component, as well as noted in their Manufacturing data menus.

1.4 THE LON - THE NGA 2000 DIGITAL COMMUNICATIONS NETWORK

The NGA 2000 Digital Communications Network operates over a bi-directional, peer-to-peer, two-wire system at a rate of 78 kbps. Modules are connected with RJ-45 modular connectors and UL level 4, 100 Ohm LAN cable. This means that there is a single wire connection between all the modules on the network. It plugs into each module using a plug much like standard telephones use. (In fact the wiring is not critical, plain wire connections will work well over reasonably short distances such as 100 feet.)

The network utilizes LONWORKS®, an open control networking technology developed by the Echelon Corporation. This uses the LONTALK™ protocol. The combination of the NGA 2000 modular architecture with the robust LONTALK™ protocol allows the capability to “multi-drop” nodes to create a distributed network. This is to say that it is possible to connect many devices onto the same network, and the network protocol keeps everything working without conflicts.

Every Analyzer Modules or I/O Module node that communicates to the network contains a NEURON® CHIP. This chip integrates three microprocessors, ROM, RAM, and EEPROM memories, timers, multifunctional I/O, and the network interface. From the user perspective the inner complexities of the LON are thoroughly hidden from view and can safely be ignored.

The network is self-installing upon startup. The control module acts as a Network Manager, assigning addresses and generating its own database automatically. Manual intervention is only needed to determine linkages (“binding”) between Analyzer Modules and I/O Modules. This means that all you have to do is to connect everything

and power it up, and then tell it which I/O Module is connected to which analyzer. Once this has been done once, it never needs to be done again unless modules are exchanged or added.

Each NGA 2000 Analyzer Module transmits over two hundred pieces of data (called variables) that are characteristic of its specific gas detection methodology. In addition to the main reading - the primary or process variable (gas concentration), many other parameters and pieces of diagnostic information are available. This data includes:

- Manufacturing data such as serial number and software revision
- Configuration setup for calibration control, component temperature and other alarm set points, and linearization parameters
- Operational status conditions such as faults and calibration
- Secondary variables such as type of gas measured, flow, temperature, and pressure readings
- Historical data such as known good calibration values and factory configuration settings

1.5 PC INTERFACE

There are several ways of using the NGA system with a PC. The Platform can support RS232 or RS485 interfaces, using either AK or ModBus as the protocol. ModBus is described in detail in this manual, and AK is touched on here and more extensively in the NGA Reference manual.

It is also possible to setup a PC to communicate directly with the LON. The easiest way is to use the Rosemount Analytical DDE Server, together with a set of suitable hardware. This is described briefly in the NGA Reference manual, and in detail in the DDE Server manual.

1.6 INSTRUCTION MANUALS

Each module has its own instruction manual that describes the functionality of that specific module. The Rosemount Analytical part numbers for these manuals are as follows:

Pre-V2.2 Software:

- 748270 - Platform & I/O
- 748271 - Analyzer Module, PMD
- 748272 - Analyzer Module, FID
- 748273 - Analyzer Module, NDIR
- 748274 - Analyzer Module, CLD
- 748275 - I/O Modules

Software V2.2:

- 748329 - Platform Components (this document)
- 748330 - Analyzer Module, PMD
- 748331 - Analyzer Module, FID
- 748332 - Analyzer Module, NDIR
- 748333 - Analyzer Module, CLD
- 748313 - Analyzer Module, Wet NOx
- 748297 - Analyzer Module, Heated FID
- 748356 - Analyzer Module, McFID
- 748384 - NGA Reference Manual
- 748368 - DDE Server Manual

The manuals for any given collection of modules together constitute the single instruction manual for that system. All manuals should be read and understood before operation.

1.6.1 PLATFORM COMPONENTS MANUAL

This manual describes:

- The general characteristics and specifications of Platform components
- Installation guidelines
- Display and keypad functions
- General operation procedures
- I/O boards available
- I/O Module specifications
- Interconnections with internal and external devices
- Display menus and keypad functions that are I/O specific
- Recommended replacement parts.

1.6.2 ANALYZER MODULE MANUALS

The Analyzer Module manuals describe:

- Theory of technology and typical applications
- Module specifications
- Gas connection installation

- Sample conditioning specifications
- Start-up procedures
- Calibration routines
- Operational functions, including analyzer-specific displays and keypad procedures
- Troubleshooting and maintenance information, and
- Recommended replacement parts.

1.6.3 NGA REFERENCE MANUAL

The NGA Reference Manual provides a detailed discussion of the inner workings of the NGA software and its application to the NGA analyzers. It includes:

- Discussion of typical calibration issues
- In depth discussion of network issues
- Troubleshooting information
- Analyzer variable reference

This latter refers to the technical description of the pieces of data - "variables" - available over the LON from each of the Analyzer Modules.

1.7 PLATFORM COMPONENTS

1.7.1 OPERATOR INTERFACE

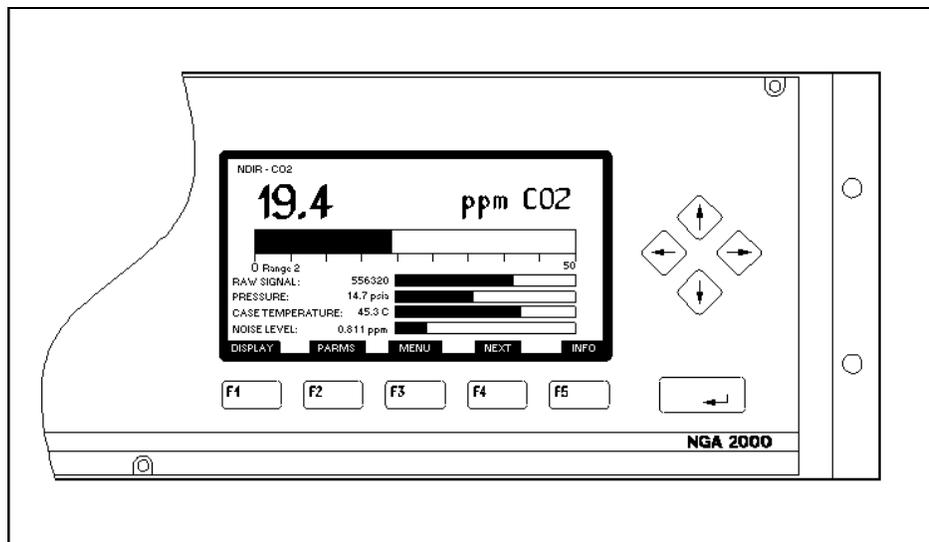


FIGURE 1-1. SINGLE ANALYZER DISPLAY

The Front Panel Display is a 128- by 240-pixel liquid crystal graphics display with cold cathode back lighting. During normal analysis operation (Single analyzer measurement mode), the Display indicates:

- The current concentration of the component of interest,
- A single-line, horizontal bar graph indicating the component concentration in percent of fullscale format,
- Four secondary parameters (e.g., Sample flow), selectable from either the Analyzer Module or its associated I/O Modules.
- Current functions for the five "softkeys" located below the display.

It may also indicate the following data for each of up to five analyzers in the multiple analyzer measurement mode (V2.3 software, four analyzers for V2.2):

- The current concentration of the component of interest,
- The name of the gas measured,
- The Analyzer module TAG,
- A single-line, horizontal bar graph indicating the component concentration in percent of fullscale format.

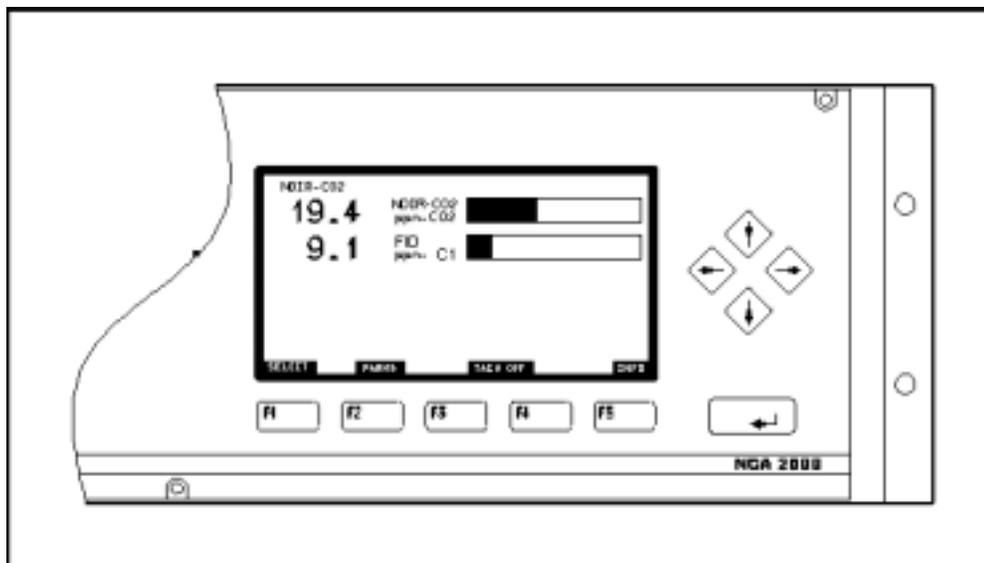


FIGURE 1-2. MULTIPLE ANALYZER DISPLAY (SHOWING TWO ANALYZERS)

It is possible to page through multiple analyzer measurement screens if more than five analyzers are present - with V2.3 software. Select an analyzer with the arrow keys or SELECT softkey to drop to the Single analyzer display screen for that analyzer.

Ten push-button keys provide the user complete access to the functionality of NGA 2000. They are:

5 Softkeys

dependent for their function on the Display labels directly above them

4 Arrow Keys

(←, ↑, →, ↓) multi-functional; a fundamental function is scrolling input data

Enter Key

(↵) executes menu items and data input by the user.

1.7.2 PLATFORM CONTROLLER BOARD

The Controller Circuit Board acts as a network manager and provides user interaction with NGA 2000 components through the Display and Keypad.

V2.3 and higher Controller boards come with additional memory and can support up to 10 Analyzer Modules with their associated I/O Modules. This board can be re-programmed locally through a PC serial port if desired to upgrade its software.

If the Platform Controller Board malfunctions, the Operator Interface will be affected, but the Analyzer Module will continue to produce an accurate Primary Variable and I/O Modules can still send accurate data to external recording devices. If the controller loses contact with an analyzer, it indicates this fact with the phrase “No Data” replacing the normal analyzer reading.

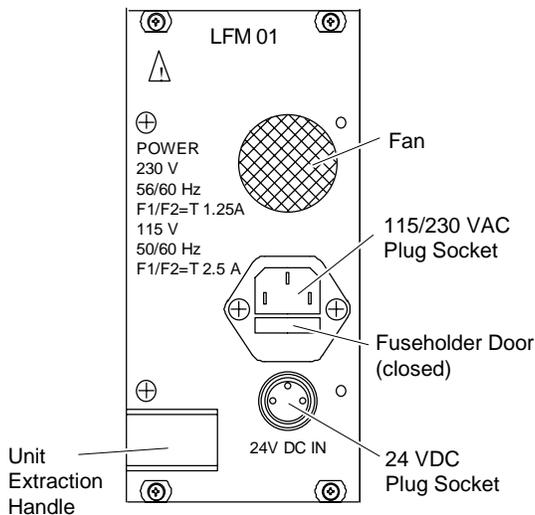


FIGURE 1-3. REAR VIEW OF POWER INPUT MODULE

1.7.3 POWER INPUT MODULE/POWER SUPPLY

Power can be supplied to all NGA 2000 components through the Power Input Module, which plugs into the Backplane. External line voltage (85 to 264 VAC, 50 to 60 Hz) is supplied to the Power Input Module and conditioned for usage by other NGA 2000 components. See Figure 1-3 and Figure 1-10.

The Power Supply Board also plugs into the Backplane and conditions incoming power for usage by all modules (only one Analyzer Module). The Power Supply Board provides +24 VDC at 5A.

Alternatively, the user may supply regulated 24 VDC directly to the Platform through the Power Input Module. If multiple Analyzer Modules are used, a larger 30 A power supply is required to power the system.

If the user initially applies AC power and then applies DC power, the DC circuitry assumes control, and all components may continue operating without interruption but may reset depending on the current draw. If the user initially applies DC power,

application of AC power will have no effect. DC power will remain in control. If both AC and DC power have been applied, removal of DC power will reset the system, and AC circuitry will then assume control.



WARNING: IMPROPER CONNECTION

The internal LON connection is for use with internally mounted and powered analyzers only. Using this connection for external analyzers or LON components could result in short-circuiting the 24V Power Supply Module through the cable, with resultant damage. Use the LON I/O board for external Analyzer Module connections (see Section 1.10.3).

1.7.4 DISTRIBUTION ASSEMBLY COMPONENTS

The Backplane is the backbone of much of the NGA 2000 Series' modularity. The Controller Board, Power Input Module, Power Supply and I/O Modules all plug into the Backplane. Identifying ground pins allow I/O Modules to identify their slot position.

NOTE

Earlier I/O Modules did not support slot identification. If so they will indicate slot 0 no matter where they are placed.

1.8 SOFTWARE/DISPLAYS

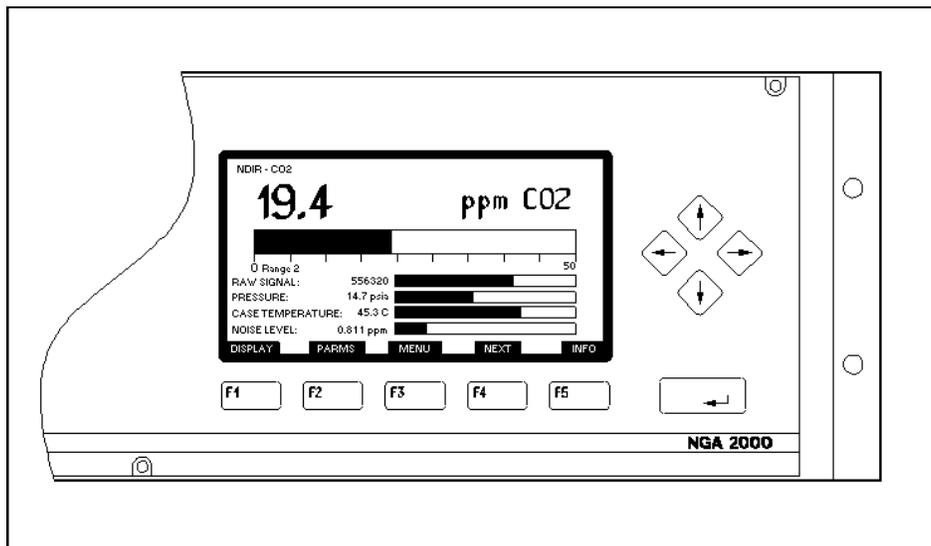


FIGURE 1-4. MEASUREMENT SCREEN DISPLAY

The User interface is an extensive menu structure. Three types of screens may appear on the Front Panel Display:

1. Measurement (Single or multiple analyzer displays)
2. Menus
3. Info (Help)

The Measurement screen is the actual operational screen in which the measured component concentration is shown. Up to four (five with V2.3 software and higher) measurements can be shown on the multiple analyzer measurement screen at once. If an Analyzer Module has lost communication with the network, the screen will display "No Data."

From the Single analyzer measurement screen you can either select the menus by pressing the "MENUS" softkey (or right arrow key), or you can select a couple of screens that provide essential information about the analyzer. Access these by pressing the "PARMS" (short for parameters) softkey.

The Menu screens include all of the data and functions necessary to interrogate and operate the Analyzer and I/O Modules. The selected menu line is highlighted in inverse video. Use the ↑ and ↓ keys to highlight the desired menu line. Press the Enter (↵) key, and depending on the item selected, one of the following will occur:

If the highlighted item ends with a colon and a value on the right side of the display screen, the item will become editable.

If the highlighted item includes an ellipsis (...), Another menu will appear.

If the line is not editable or executable (it is there for information only), nothing will occur, and in fact you will not be able to select it.

If the first of the above possibilities occurs, only the right-hand portion of the menu line will then be highlighted. Use the ↑ and ↓ keys to scroll the data. Under certain circumstances, the cursor is movable with the → and ← keys. This allows you to edit specific characters within a numerical or string (alphabetic) variable. Press → to start individual character editing, and then → or ← to select the character to edit: edit it with the ↑ or ↓ keys. Press Enter (↵) when you are done, or press the ESCAPE softkey to abort the editing and return to the original value.

To escape from a menu, either press the left arrow key (←), the ESCAPE soft key, or to jump all the way back to the Main menu, press the HOME softkey.

Help screens contain comprehensive, context-sensitive information about all functions. Press the softkey labeled INFO once and receive data concerning the current screen. Press INFO twice and receive information about the overall system.

Each menu screen has at least one help screen. The user can move directly from one help screen to another through an interrelated structure of functional titles.

1.9 MULTIPLE MODULE COMPONENTS AND SYSTEM INTEGRATION

The Rosemount Analytical NGA 2000 architecture provides significant system integration capabilities.

The compact 5.25" height and component modularity allow for space efficient mounting, thus decreasing the required panel or rack space required by conventional analyzers. The Analyzer Modules may be mounted virtually anywhere inside a panel; they can be rack mounted, floor mounted, installed inside the Platform, or even externally located.

Since a single Platform can accommodate up to ten Analyzer Modules and up to five I/O Modules, the total number of "Nodes" allowed in any one Platform group is fifteen. This combination of Nodes may consist of any number of Analyzer Modules and I/O

Modules which total fifteen or less. Should addition I/O Modules be required, these may be housed in an ancillary analyzer enclosure. Additionally, some Analyzer Modules, such as the MCFID (Multi Component Flame Ionization Detector), or MLT (Multi Method Multi Component) Analyzer Modules, actually provide discrete analysis of more than a single component and thus are considered, by the Platform, to be more than a single analyzer. Once a "Node Group" has been configured it may be networked with additional Node Groups by means of a Router Assembly (see Figure 1-9) which provides a discrete address for that Node Group and isolates it from other Node Groups.

Individual Analyzer Modules require 24 VDC power. As shown in Figure 1-8, this power may be provided by individual power supplies located in the Platform or by the Bulk Power Supply which can provide up to 30 amps of 24 VDC power. The Bulk Power Supply can provide power for up to 10 NGA 2000 components.

Table 1-1 may be used to calculate the total number of Analyzer Modules and I/O Modules which may be supported by a single Platform (Node count ≤ 15), and the total power requirements for any single Node Group (Bulk Power Supply ≤ 30 Amps).

| | NDIR | PMD | FID | CLD | HFID | WCLD | MCFID | MLT ¹ | PLATFORM |
|----------------------------|------|------|------|------|------|------|--------------------|--------------------|----------|
| Node Count | 1 | 1 | 1 | 1 | 1 | 1 | 1 - 5 ³ | 1 - 5 ⁴ | 1 |
| Average Power ² | 2.4A | 2.4A | 3.4A | 3.5A | 3.9A | 3.5A | 4.0A | 2-4A | 2.0A |
| Average Power ² | 3.1A | 3.0A | 3.7A | 4.2A | 4.8A | 3.7A | 4.9A | 3A - 5A | 2.5A |

¹ Calculate MLT power consumption as follows:

MLT1 ≤3.0 A

MLT2 ≤3.0 A

MLT3 (without internal power supply) ≤5.0 A

MLT4 ≤5.0 A.

² Total power consumed may not exceed 30 Amps for interconnection to any single Bulk Power Supply.

³ MCFID must be counted as one to five nodes depending upon the number of components measured.

⁴ MLT must be counted as one to five nodes depending upon the number of measurement channels specified.

TABLE 1-1. NODE COUNT AND POWER CONSUMPTION FOR NGA 2000 SYSTEM INTEGRATION

The following accessories can be used to design a NGA 2000 system:

- *DUAL ANALYZER ENCLOSURE* used to house two Analyzer Modules for either standard or extended lengths
- *SINGLE ANALYZER ENCLOSURE* used to house one Analyzer Module and up to 5 I/O Modules.
- *DUAL PLATFORM ENCLOSURE* to allow control of two independent systems from one location
- *5 A POWER INPUT MODULE* to be used in the single analyzer compartment enclosure to power the housed Analyzer Module
- *30 A BULK POWER SUPPLY* which is capable of providing power for up to 10 NGA 2000 components

The number of I/O Modules that can be housed in a Platform or single analyzer enclosure is limited to five.

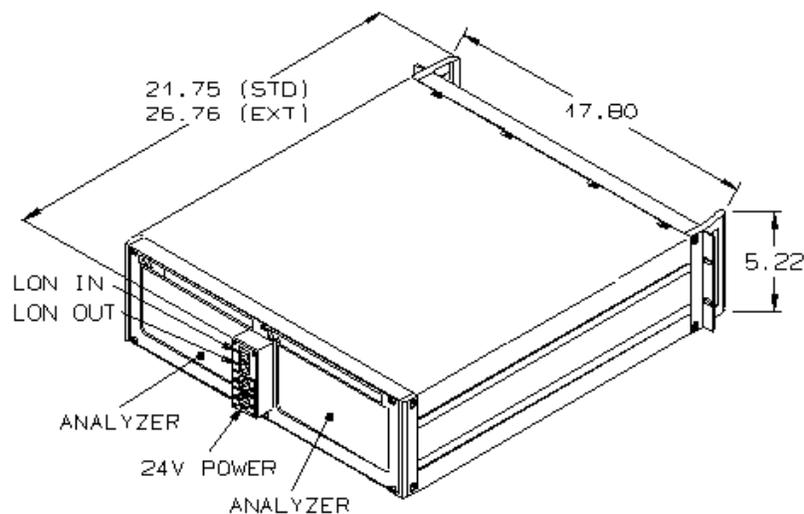


FIGURE 1-5. DUAL ANALYZER ENCLOSURE

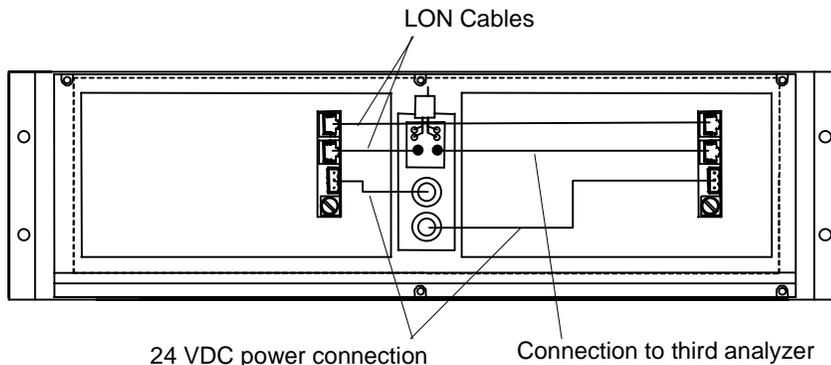


FIGURE 1-6. DUAL ANALYZER ENCLOSURE WITH TWO ANALYZERS (FRONT VIEW, COVER REMOVED)

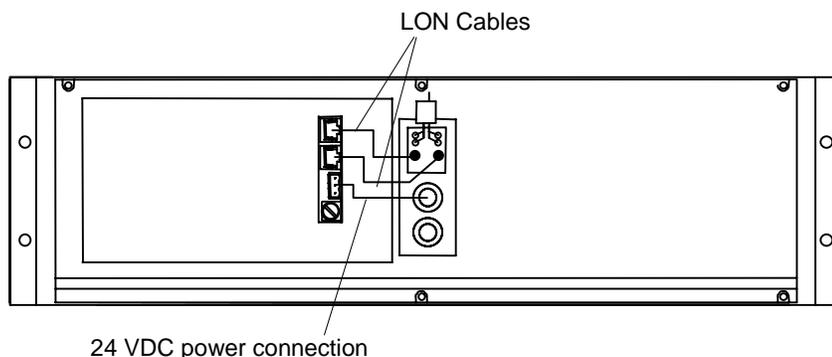


FIGURE 1-7. SINGLE ANALYZER ENCLOSURE WITH ONE ANALYZER (FRONT VIEW, COVER REMOVED)

The **Dual Analyzer Enclosure** simply provides space for two Analyzer Modules as well as rear panel power and network connections for both. The front is a blank panel. Note the following about the Dual Analyzer Enclosure:

- If two Analyzer Modules are installed, the network connection *between* the two analyzers *must* be made
- If only one Analyzer Module is installed, only one cable need be connected to the network or Platform supporting the Analyzer Module

If a standard Platform is used in conjunction with multiple module components, power should be connected to the Platform's 24 VDC connector on the Power Input Module and the network cable should be connected to the Network Port (see Figure 1-3. Rear view of power entry module).

The **Single Analyzer Enclosure** provides additional flexibility in system design. It is a standard Platform (with room for one Analyzer Module) with no front panel display. It

can be ordered with or without a 5 A Power Supply Module, depending on whether the user can provide 24 VDC power.

The **Bulk Power Supply** provides the additional 24 VDC energy necessary to power an entire system (standard Platform, I/O Modules, and multiple Analyzer Modules) where the standard integral 5A Power Supply Module housed inside the Platform is not sufficient. The supplemental Bulk Power Supply is capable of powering up to 10 NGA components, but is limited to 30 Amps (refer to Table 1-1)



WARNING: OVERHEATING HAZARD

To prevent the Bulk Power Supply from overheating, ventilation openings on the top, bottom and rear of the enclosure should not be blocked.

note

Early multi-module power supplies were supplied with 5A fuses installed, these fuses were inadequate for the HFID (Heated FID) and WNX (Wet NOx) Analyzer Modules. When powering these modules, 8A fuses are recommended. The internal wiring is adequate for this current, early supplemental supplies are, however, limited to 25 A total.

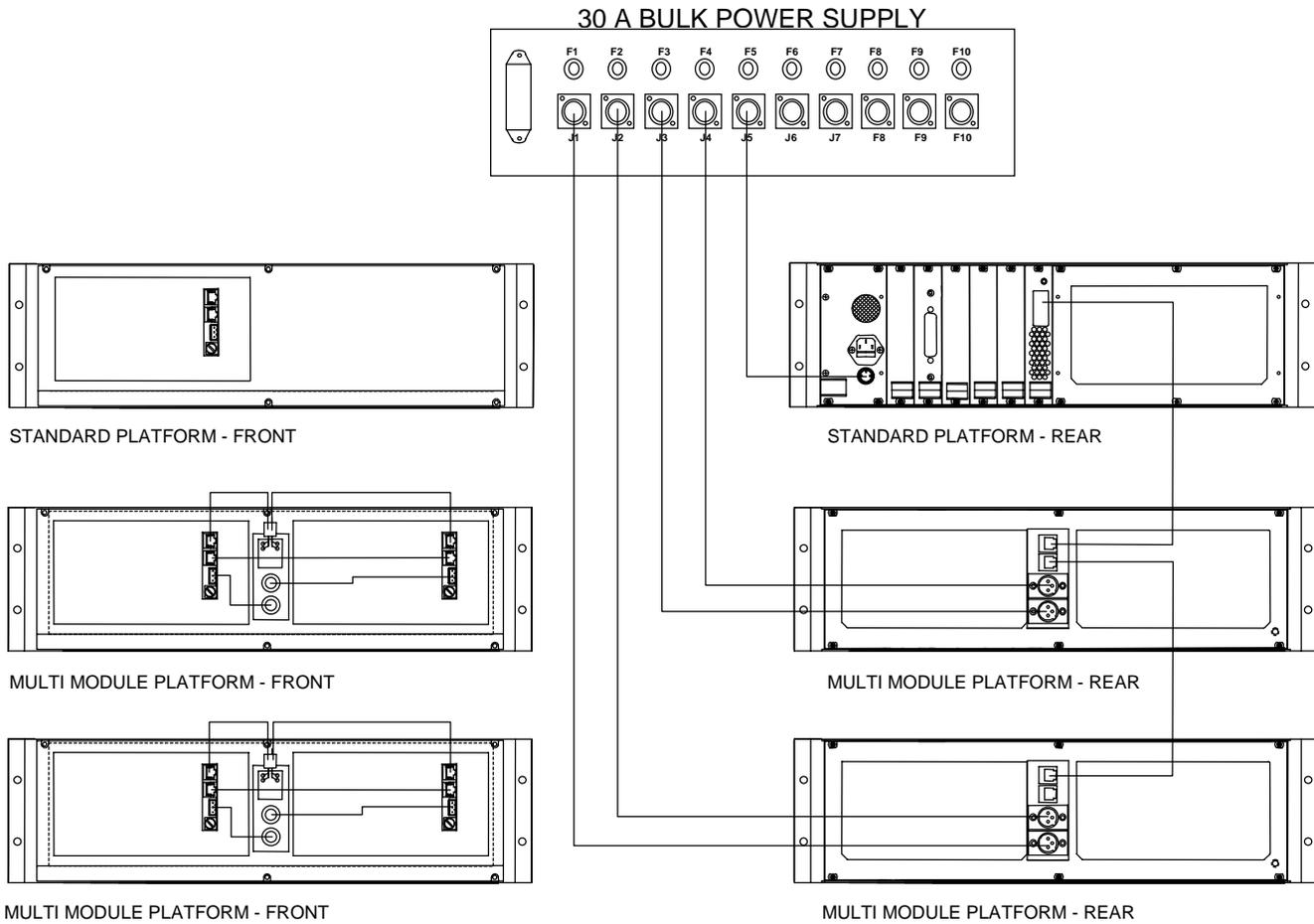


FIGURE 1-8. WIRING NGA SYSTEMS

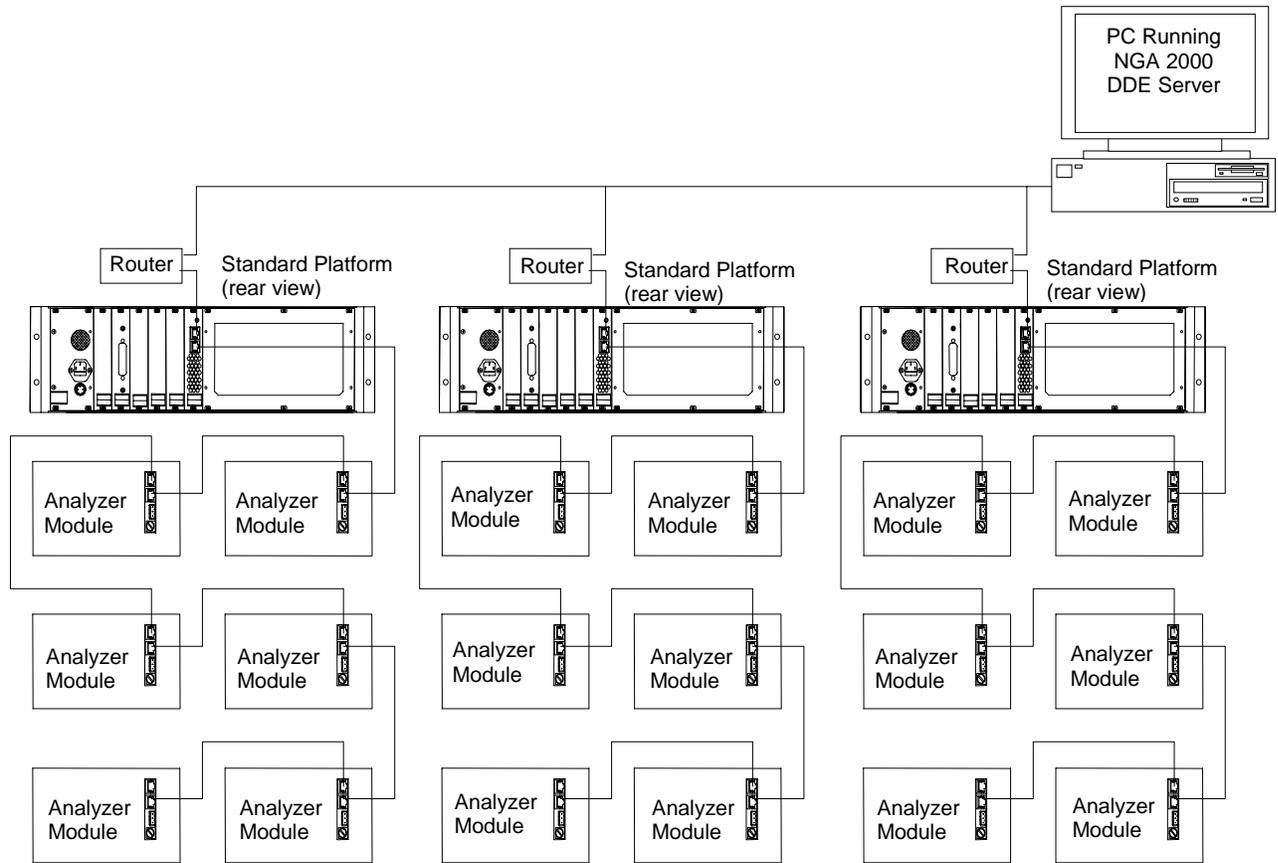


FIGURE 1-9. SUPPORTING MULTI PLATFORM INTEGRATION

1.10 I/O MODULE OVERVIEW

1.10.1 I/O MODULE GENERAL DESCRIPTION

The I/O Modules are plugged into the Backplane of the Platform. Up to five I/O Modules can be installed into the Backplane of the Platform as shown in Figures 1-10 and 1-11.

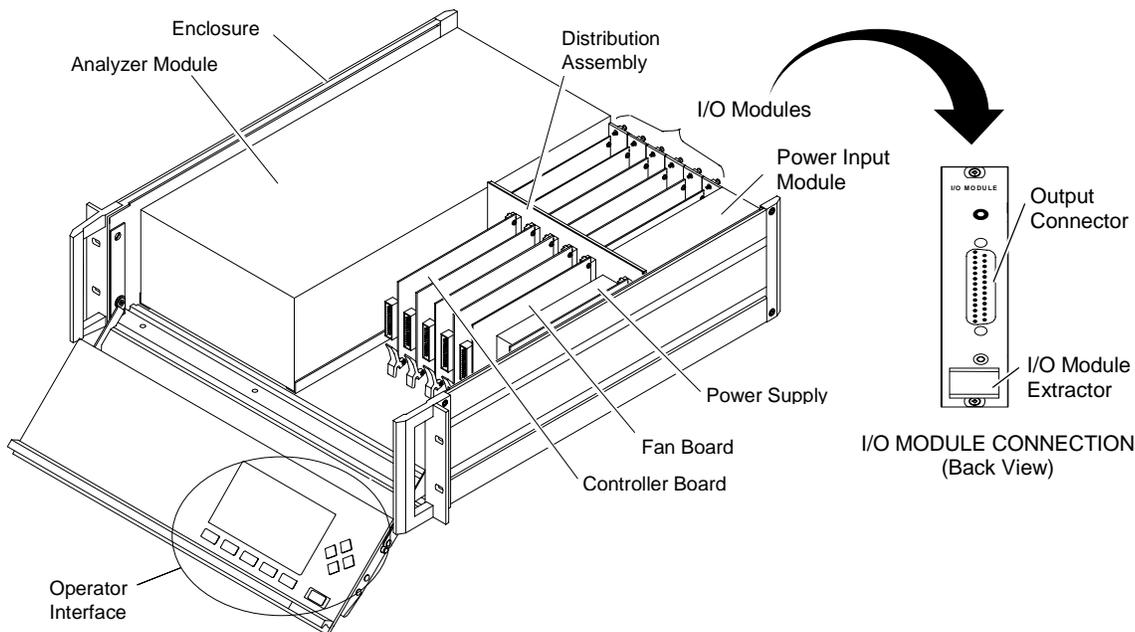


FIGURE 1-10. I/O MODULES LOCATION IN PLATFORM (INSTRUMENT CONFIGURATION)

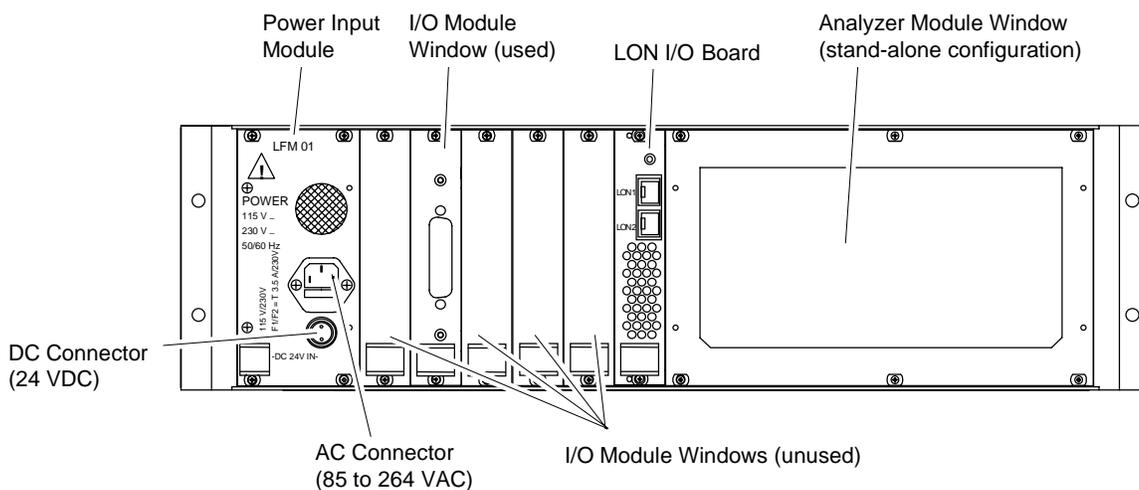


FIGURE 1-11. I/O MODULE LOCATION IN PLATFORM – REAR PANEL VIEW (INSTRUMENT CONFIGURATION)

Each I/O Module contains a NEURON™ CHIP microprocessor which acts as a Node on the Local Operating Network (LON). The NEURON CHIP also controls the functions of the I/O Module in accordance with the installed software on the I/O Module. These functions can be modified via the Operator Interface of the Platform. The SIO and DIO boards are controlled by menus contained within the Platform Controller board menus.

The I/O Modules can provide a variety of digital and analog inputs and outputs via the connectors located on the rear panel of the I/O Module. A typical I/O Module Rear Panel is shown on Figure 1-10 under the arrow on the right side of the figure.

Figure 1-12 provides the I/O Module component locations and mounting dimensions.

The available input and output functions include voltage outputs (0 to +5 VDC), current outputs (0 to 20 mA and 4 to 20 mA), alarms (3), auto calibration, remote range change and identification and gateway translations such as the ModBus protocol.

Figure 1-13 provides the I/O Module backplane (not the external!) connector pin assignments. This data is provided for oem user reference only and is not required information for normal customer use. This information is *NOT* the user interconnect diagram. See Section 1.10.2 for user connection information.

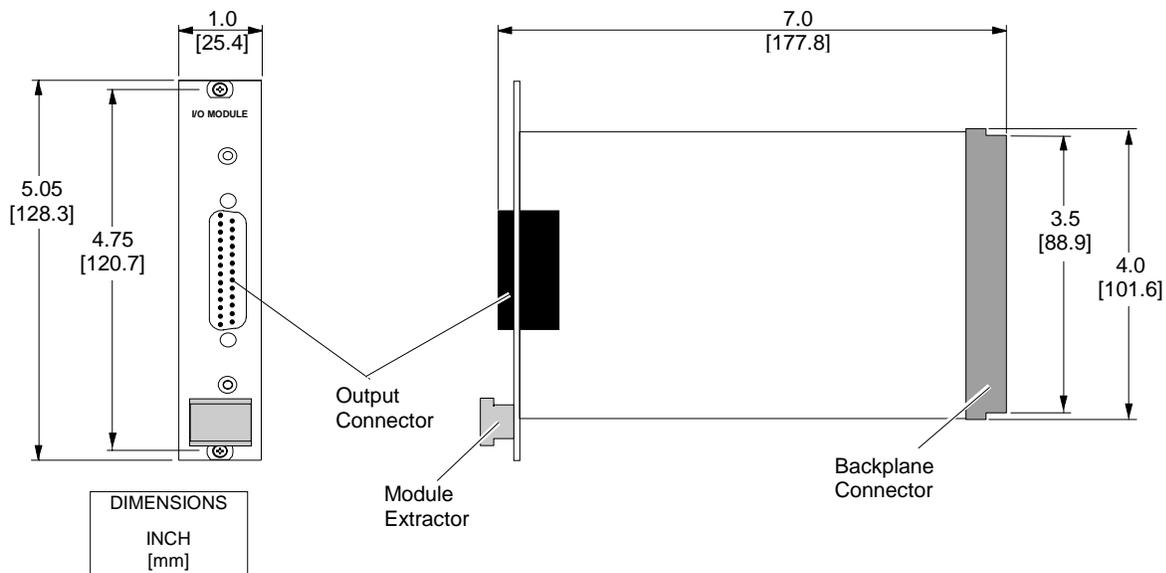


FIGURE 1-12. ANALOG I/O MODULE COMPONENT LOCATION AND MOUNTING DIMENSIONS

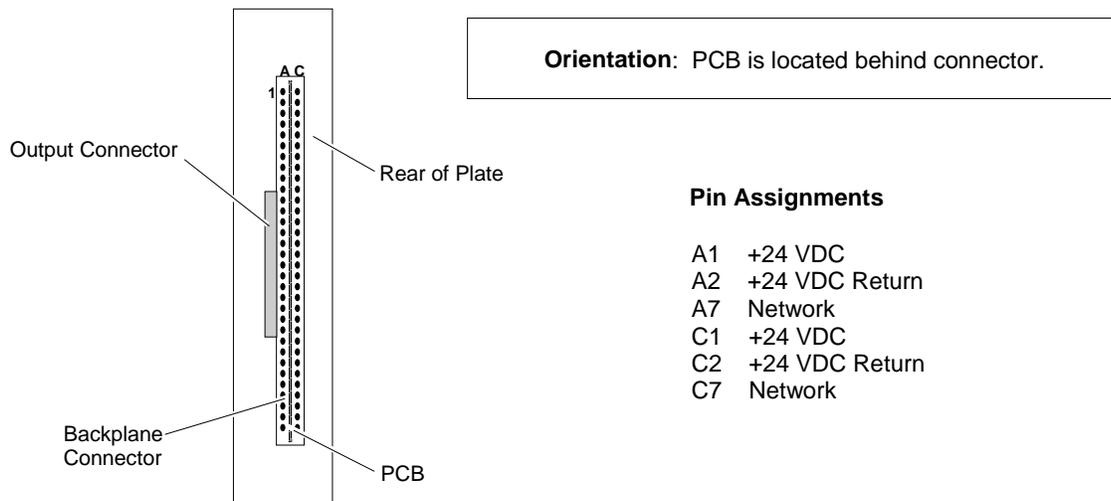


FIGURE 1-13. ANALOG I/O MODULE BACKPLANE CONNECTOR PIN ASSIGNMENTS

| FEATURE | ANALOG I/O | AUTOCALIBRATION | | LON I/O | SERIAL I/O |
|--------------------------------|--------------------|-----------------------|-------------------------|----------|----------------|
| | | SINGLE | SYSTEM | | |
| ANALOG OUTPUT | 1 | 1 | None | None | 2 (to 6) |
| AUTO RANGE CHANGE | Yes | No | No | No | No |
| ALARM OUTPUT | Yes - programmable | No | No | No | Yes - fixed |
| SERIAL OUTPUT | No | No | No | Yes - V2 | Yes (optional) |
| DIGITAL INPUT | Yes - programmable | Yes - fixed | Yes - fixed | No | No |
| LON I/O | No | No | No | Yes | No |
| CALIBRATION GAS CONTROL | No | Yes - single analyzer | Yes - up to 4 analyzers | No | No |

TABLE 1-2. I/O MODULE FEATURES

1.10.2 ANALOG FUNCTIONS AND I/O CONNECTIONS

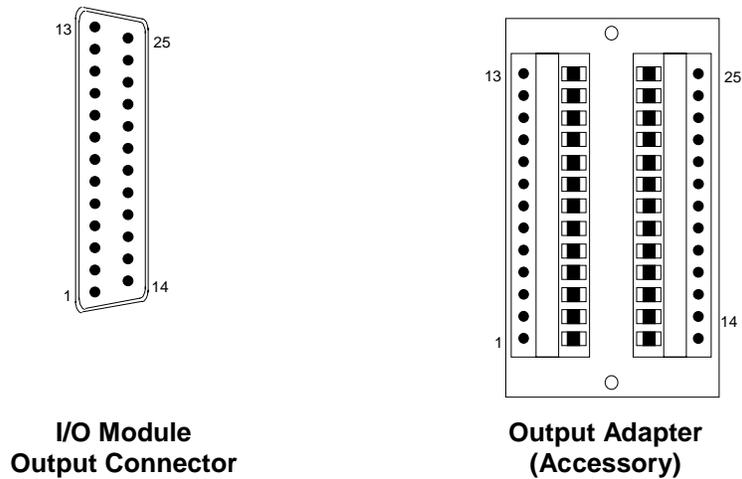
The I/O Modules that include analog functions provide seven relay contact (contacts are rated 24 VDC at 1 Ampere resistive) outputs [three single-pole, double-throw (SPDT) and four single-pole, single-throw (SPST)], one analog output and six digital inputs. Figure 1-14. Provides the I/O Module output connector and adapter pin assignments. Table 1-3 provides the I/O Module Input, Output and Power Specifications. If the I/O Module is installed in a Platform, the 24 VDC power is derived from the Platform and no external power is required.

Note that the connector on the I/O Module is a male 25 pin sub D shielded connector. It is equipped with EMC protection devices, but it is essential that no more than 24V be applied to any of its pins. This includes the analog output which is isolated from the metallic shield, but which also has EMC devices which restrict the maximum common mode voltage allowed.

I/O Modules can provide standard automatic range change between high and low ranges. A user-adjustable time delay is available to prevent range switching caused by a noisy environment.

| FEATURE | DESCRIPTION |
|---------------------------|---|
| OUTPUT RELAYS | 7 relay contacts (3 relays SPDT, 4 relays SPST) Contacts rated at 24 VDC, 1 amp resistive. |
| INPUT | 6 digital inputs and 24 VDC return, 5 mA resistive. |
| STANDARD OUTPUT | 0 to 5 VDC or 0/4 to 20 mA (isolated, software-selectable) |
| POWER REQUIREMENTS | 24 VDC, 3 Watts maximum |

TABLE 1-3. ANALOG I/O MODULE SPECIFICATIONS



PIN ASSIGNMENTS

| | | | |
|----|-----------------------------|----|-------------------|
| 1 | Analog Current Output | 14 | SPST Relay 4 (NO) |
| 2 | Analog Voltage Output | 15 | SPST Relay 5 (NO) |
| 3 | Analog Return for Pins 1, 2 | 16 | SPST Relay 6 (NO) |
| 4 | Analog Chassis Ground | 17 | SPST Common |
| 5 | SPST Relay 1 (NC) | 18 | SPST Relay 7 (NO) |
| 6 | SPST Relay 1 (C) | 19 | Digital Input 1 |
| 7 | SPST Relay 1 (NO) | 20 | Digital Input 2 |
| 8 | SPST Relay 1 (NC) | 21 | Digital Input 3 |
| 9 | SPST Relay 1 (C) | 22 | Digital Input 4 |
| 10 | SPST Relay 1 (NO) | 23 | Digital Input 5 |
| 11 | SPST Relay 1 (NC) | 24 | Digital Input 6 |
| 12 | SPST Relay 1 (C) | 25 | Digital Common |
| 13 | SPST Relay 1 (NO) | | |

FIGURE 1-14. ANALOG I/O MODULE OUTPUT CONNECTOR/ADAPTER PIN ASSIGNMENTS

1.10.3 ADDITIONAL I/O MODULES

There are several additional I/O options available. These include the SIO board, the DIO board, and the LON I/O board.

The SIO is described in its own section of this manual. It can provide up to 8 channels of analog output at once. It can also provide an RS-232 or RS-485 digital link.

The DIO can provide up to 24 channels of discrete digital signals via pull-down transistors. It can provide specific alarm indication for V2.3 or later Analyzer Modules. ***It cannot work with V2.2 analyzers or earlier than V3.3 Platforms.***

The LON I/O board provides two LON connections, as well as ventilation holes for the Platform. The LON connections are paralleled. They allow the internal LON of the Platform to be connected to external analyzers.

NOTES

2 INSTALLATION

2.1 SHIPPING CARTON INSPECTION

Carefully examine the shipping carton and contents for signs of damage. Notify the shipping carrier immediately if the carton or contents is damaged. Retain the carton and packing material until the Platform components and associated modules are operational.

2.2 LOCATION

Install Platform components in weather-proofed, non-hazardous, vibration-free locations isolated from extreme temperature variations. For best results, install near the sample stream to minimize sample transport time if the Platform contains an Analyzer Module.

note

If this Platform is stored in an environment whose ambient temperature is below 5°C (41°F), it must be moved into a room temperature environment for 24 hours before powering up. Otherwise, moisture may form inside the LCD display.

note

Unrestricted air flow in the rear of the Platform is critical to the component's performance and reliability. The bulk power module requires unrestricted air flow vertically through itself. It should therefore not be placed between other modules which restrict this flow.



WARNING: POSSIBLE EXPLOSION HAZARD

This equipment may contain modules used in the analysis of sample gases which may be flammable. If used for analysis of such gases, the module must be protected by a continuous dilution purge system in accordance with Standard ANSI/NFPA 496-1993, Chapter 6.

**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.

Although the NGA 2000 Flame Ionization Detectors (FID and HFID) contain Type Z purge equipment due to the presence of an internal source of flammable gas, the instruments are designed for non-hazardous locations. Type Z continuous dilution purge is designed to provide protection in accordance with standard ANSI/NFPA 496 (1993), Chapter 6 when sampling non-flammable gases. Do not place this (or any general purpose) analyzer in a hazardous environment.

2.3 ELECTRICAL REQUIREMENTS

The NGA 2000 Series Platform and Multi-Module Power Supplies can operate on any AC line voltage between 85 and 134 VAC, and between 218 and 264 VAC and the Platform and Analyzer Modules can also operate on any regulated 24 \pm 5% VDC power source. Power consumption (wattage) is dependent on the number and type of modules connected together as a system. Wiring used must meet the current draw requirements of the analyzers concerned.

Earlier versions of the Power Input Module were factory-equipped with 115 VAC fuses (2 required). In this case, if available line voltage is 230 VAC, replace the fuses with the accessory fuses found in the shipping kit that accompanied the Platform. Current Platforms are equipped with a Power Entry Module that does not require such a fuse change.

24 Volt power wiring must be connected individually to each Analyzer Module in a star configuration (i.e. an individual set of wires to each analyzer), using appropriate gauge wire to tolerate the current draw. The ground connection must be made to each Analyzer Module and returned to a high quality common ground point. This connection should not be used as the power return wire.

The LON connection wiring may be made in a daisy chain fashion. If the total length of the LON connection exceeds a few meters, the configuration should be restricted to a daisy chain, with LON termination devices at each end of the connection. Distances of less than about ten meters are not as critical, and such connections may be made in a star formation. The wiring used must be level 4 LAN twisted pair wiring, (100 ohm impedance), preferably shielded. Standard 8 pin RJ45 telephone plugs and jacks are used, with pins 1 and 2 carrying the signal, all others being unused. Terminal block connections are permissible for junction boxes, if desired.

A dual version of the Platform is available by special order. This contains two complete sets of Platform electronics including AC input and power supply. Note that both AC connections must be removed to disconnect power from this unit.

The 30 A Bulk Power Supply is factory-configured for 115 VAC input. A 230 VAC version (PN 659310) is also available.



WARNING: ELECTRICAL SHOCK HAZARD

When using the Bulk Power Supply, use a power cord rated at 13 A, 125 V and 1625 W or better. A cord with a lower rating may overheat and cause a fire hazard.

2.4 GAS REQUIREMENTS

Since gas requirements (e.g., flow rate, flow pressure and connections) vary between the available Analyzer Modules, information concerning this can be found in each Analyzer Module manual.

2.5 I/O REQUIREMENTS

Input/Output requirements (including connections) are dependent on Analyzer Modules and applications. Information concerning these requirements can be found in the I/O Module section of this manual.

Various adapters are available for use with the I/O Module DB25 connector. See the spare parts list. Contact the factory for availability.

2.6 I/O MODULE INSTALLATION PROCEDURE

Remove power from all the components of the NGA 2000 System before installing an I/O Module.

To install an I/O Module into the Platform, perform the following steps:

1. Remove a blank panel from one of the unused I/O Module slots as shown in Figure 1-11. Retain the blank panel for future use.
2. Hold the I/O Module by the rear panel and insert it into the open slot making sure that the printed circuit board is aligned with the card guides at both the top and the bottom.
3. Push the I/O Module completely into the slot to insure that the module connector mates with the Backplane connector.
4. Tighten the two captive screws on the I/O Module Rear Panel.

2.7 I/O MODULE REMOVAL PROCEDURE

Remove power from all the components of the NGA 2000 System before removing an I/O Module.

To remove an I/O Module from the Platform, perform the following steps:

1. Loosen the two captive screws on the I/O Module Rear Panel.
2. Push down on the extractor handle to extract the I/O Module from the backplane connector. Carefully pull the module out of the slot.
3. Install a Blank Panel to cover the slot.

2.8 I/O MODULE SOFTWARE CONFIGURATION

Configuring the software for an I/O Module is performed using the Platform Display and Keyboard. First, an I/O Module must be bound to the associated Analyzer Module. If only one Analyzer Module is used, all installed I/O Modules are automatically bound to the Analyzer Module. The second step consists of custom configuration of the I/O Module and selection of desired options and parameters.

2.9 I/O MODULE BINDING PROCEDURE

In an NGA 2000 System that contains only one Analyzer Module, binding between that module and any I/O Module(s) will occur automatically upon startup.

If the system contains multiple Analyzer Modules it will be necessary to bind each Analyzer Module to the associated I/O Module(s). To bind a newly installed I/O Module to an Analyzer Module perform the following steps:

1. From the Main Menu, make the following selections: *Technical Level Configurations, Listing of All Modules*. The *Listing of All Modules* screen shows all NGA 2000 components (Analyzer Modules, I/O Modules and Platform [Control Module]) recognized during the initialization of the network. Any module connected (or disconnected) after initialization will not be recognized until the system is reinitialized. Ensure that the system recognizes all modules on the network. If it does not, the problem must be isolated and corrected before continuing further.
2. On the *Listing of All Modules* screen, ensure that each module has a unique user tag number. Later I/O modules will be able to add their slot ID to their TAG as shown on this screen. If so, you do not need to otherwise identify them. It is this tag number that is used to bind an I/O Module to an Analyzer Module. The user tag number can be set as shown in the example below. For example, in a system consisting of two NDIR modules, two FID modules and one CLD module, the tags could be chosen from Table 2-1.

| ANALYZER MODULE TAG NO. | I/O MODULE TAG NO. |
|-------------------------|--------------------------|
| NDIR-CO ₂ | I/O -IR1-CO ₂ |
| NDIR-CO | I/O - IR2-CO |
| FID-HIGH | I/O - THC1-HIGH |
| FID-LOW | I/O - THC2-LOW |
| CLD-NO _x | I/O - NO _x |

TABLE 2-1 USER TAG NUMBERS

The user tag numbers should be somewhat logical in their description to avoid confusion. They should not contain a period (.) so as to avoid confusing PC software that attempts to communicate with the NGA system.

Note

From the Listing of All Modules screen, the diagnostics of a selected module can be selected. The I/O Module diagnostics displays the I/O Module tag number and allows it to be changed if necessary. To change the Analyzer Module tag number, however, access the Analyzer Manufacturing Data screen by making the following selections: Technical Level Configuration, Service Menus, Manufacturing Data, or Expert Menu, Analyzer Module Setup, Analyzer Module Tag. The initial Analyzer Module tag number is set during production test and may be meaningless from the user's standpoint. I/O Module tag numbers initially will probably each read "Analog I/O, Autocal I/O, SCAL", etc.

- Once all Analyzer Modules and I/O Modules have unique tag numbers, binding can begin. Note that earlier I/O Modules were not identified as to which slot each one occupied in the Platform (later units had this function enabled). The slot number would always read "0." To remedy this condition, remove all but one I/O Module, reinitialize the system and note which I/O Module tag number remains on the List of All Modules screen. Edit the tag numbers in some unique fashion to aid in subsequent recognition. Reinsert each I/O Module one at a time and reinitialize the system. Note or edit the tag numbers that appear each time.
- Note the physical location of each I/O Module for future reference. A common problem in multiple Analyzer Module systems is the assumption that a module is not responding (no output response - voltage, current, alarms) when actually the wrong I/O Module was being accessed.
- Select the top level display that shows multiple module output. Select the Analyzer Module to be bound to an I/O Module, ensuring that it is identified with the correct tag number.

6. From the *Main Menu*, make the following selections: *Technical Level Configuration, System Setup, Module Binding, Select Modules*.
7. Ensure that the Analyzer Module selected is, in fact, the one to which an I/O Module is to be bound. Select the I/O Module to be bound. The screen will appear as "Proposed New Bind". If the proposal is correct, press the "BIND" softkey. If incorrect, return to the *Module Binding* screen and re-select the correct I/O Module. When the "BIND" softkey is pressed, the system will reinitialize automatically.
8. To achieve binding between other Analyzer Modules and I/O Modules, return to the top level display screen, select the next Analyzer Module and repeat steps 5 through 7. As I/O Modules are bound, they disappear from the *Select I/O Module* screen because they are no longer available for binding. In a system with only one Analyzer Module, no I/O Module would appear in the *Select Module* screen since they are automatically bound upon initialization of the system.

Note

Do not press the "UNBIND" softkey, doing so would unbind all modules, requiring the user to repeat the complete binding procedure. However, if a binding mistake is made, the only way to correct the mistake is to press "UNBIND" and repeat the binding procedure. Also, do not press the "RE-INIT" softkey during any of the automatic re-initializations in the binding process. If the "RE-INIT" softkey is pressed, this will abort the binding process and all prior binds will be removed.

9. Verify all bindings by selecting *View Bindings* in the *Module Binding* screen. A "miss-bound" module can lead to confusion and mis-diagnosis of system problems. Use the NEXT softkey to move from one Analyzer Module to another in this screen.

2.10 I/O MODULE BINDING PROCEDURE - SOFTWARE V2.3 AND HIGHER

In an NGA 2000 System that contains only one Analyzer Module, binding between that Analyzer Module and any I/O Module(s) will occur automatically upon startup.

If the system contains multiple Analyzer Modules it will be necessary to bind each Analyzer Module to the associated I/O Module(s). To bind a newly installed I/O Module to an Analyzer Module perform the following steps:

1. From the Main Menu, make the following selections: *Technical Level Configurations, Listing of All Modules*. The *Listing of All Modules* screen shows all NGA 2000 components (Analyzer Modules, I/O Modules and Platform [Control Module]) recognized during the initialization of the network. Any module connected (or disconnected) after initialization will not be recognized until the system is

reinitialized. Ensure that the system recognizes all modules on the network. If it does not, the problem must be isolated and corrected before continuing further.

2. On the *Listing of All Modules* screen, ensure that each module has a unique user tag number. Later I/O modules will be able to add their slot ID to their TAG as shown on this screen. If so, you do not need to otherwise identify them. It is this tag number that is used to bind an I/O Module to an Analyzer Module. The user tag number can be set as shown in the example below. For example, in a system consisting of two NDIR modules, two FID modules and one CLD module, the tags could be chosen from Table 2-1.

The user tag numbers should be somewhat logical in their description to avoid confusion. They should not contain a period (.) so as to avoid confusing PC software that attempts to communicate with the NGA system.

Note

From the Listing of All Modules screen, the diagnostics of a selected module can be selected. The I/O Module diagnostics displays the I/O Module tag number and allows it to be changed if necessary. To change the Analyzer Module tag number, however, access the Analyzer Manufacturing Data screen by making the following selections: Technical Level Configuration, Service Menus, Manufacturing Data, or Expert Menu, Analyzer Module Setup, Analyzer Module Tag. The initial Analyzer Module tag number is set during production test and may be meaningless from the user's standpoint. I/O Module tag numbers initially will probably each read "Analog I/O, Autocal I/O", etc.

3. Once all Analyzer Modules and I/O Modules have unique tag numbers, binding can begin. Note that earlier I/O Modules were not identified as to which slot each one occupied in the Platform (later units had this function enabled). The slot number would always read "0." To remedy this condition, remove all but one I/O Module, reinitialize the system and note which I/O Module tag number remains on the *List of All Modules* screen. Edit the tag numbers in some unique fashion to aid in subsequent recognition. Reinsert each I/O Module one at a time and reinitialize the system. Note or edit the tag numbers that appear each time.
4. If not identified, note the physical location of each I/O Module for future reference. A common problem in multiple Analyzer Module systems is the assumption that a module is not responding (no output response - voltage, current, alarms) when actually the wrong I/O Module was being accessed.
5. From the *Main Menu*, make the following selections: *Technical Level Configuration, System Setup, Module Binding*.
6. The screen shows one or more analyzer modules. Select one, and press the **ADD** softkey (or the right arrow). The screen will now list available I/O modules.

7. Select one, and press **Enter** (↵). The menu listing analyzer modules will reappear, with the selected I/O module indented under the analyzer module.
8. Continue the process until all desired I/O modules have been selected for all analyzers. Note that this screen scrolls to show further analyzer modules, simply press the down arrow key to see more.
9. Press the **BIND** softkey. The system will re-initialize itself, binding all the modules as instructed.
10. To abort the process, or correct a mistake, press the Left arrow (←) or the **HOME** softkey.

2.11 SAMPLE HANDLING

Rosemount Analytical offers many different sample handling systems, either assembled or as loose components. Sample handling is dependent on the requirements of the particular application and the preferences of the individual user.

Typical sample handling systems incorporate such components as pumps, valves, needle valves, flowmeters and filters in order to provide a clean, dry sample to the Analyzer Module.

There are some general sample handling issues that must be addressed. It must be possible to control the sample flow into the analyzers, and also this flow must in general not be made to pass through analyzers in succession, but rather through them in parallel. The analyzer reading is sensitive to sample pressure changes, so care must be taken to make sure that such changes do not occur, and that the span gas pressure is the same as the sample pressure.

Excessive sample flow can destroy the flow sensor within the Analyzer Module; bring the flow up from zero, rather than down from wide open when starting them up.

Solenoid valves used for zero and span gas control are prone to leaking. If they do so it will be impossible to get good readings from the system.

Sample systems must be designed to make it impossible for water to get into the analyzer. Heated sample lines should be heated the entire length, and care must be taken to make sure that any water dropped out is drained from the sample line. Unheated lines must slope down to the analyzer - water will collect in the low points and be subsequently entrained in the sample. The same is true of exhaust lines - particularly for the FID analyzers. It must be impossible for condensate to freeze or flow back into the analyzer, or provide a slug of water whose effect will be to provide pressure changes as the bubbles go through it.

There are many such issues. Sample system design is rather an arcane skill, and it is worth having an experienced person or company design such a system. Most analyzer problems are in fact sample handling system problems.

3 STARTUP AND OPERATION

3.1 OVERVIEW

The Platform can perform a narrow set of active functions within the NGA 2000 Series range of operations. That set of functions includes the following:

- Supply power to a single internal Analyzer Module, and any integral I/O Modules, if equipped with an integral power supply
- Output data to the front panel display
- Hold and maintain network configuration data

Most other functions are performed by other modules. For instance, the Analyzer Module(s) performs all functions related to gas concentration measurement, and therefore places on the network all related data. This data (which appears on the Run Mode, Menu and Diagnostic display screens) is Analyzer Module-specific. Refer to the respective Analyzer Module instruction manuals for descriptions of those operational functions. Multiple Analyzer module systems require an additional source of 24 VDC power.

3.2 SOFTWARE MENU STRUCTURE

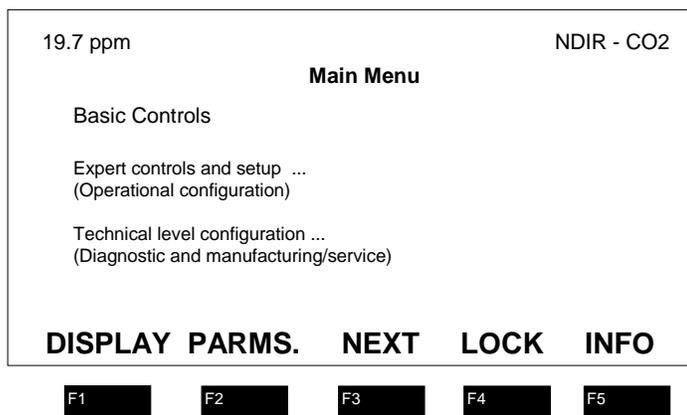


FIGURE 3-1. MAIN MENU

The displayed menu structure is divided into three levels, based on which personnel is likely to use it:

Basic Controls:

- Range selection
- Control mode (e.g., local/remote)
- Zero and span

Expert Controls:

- Detailed Analyzer Module controls such as calibration gases, calibration mode, flow, pressure and temperature range limits
- Setup and configuration screens

Technical Controls:

- System setup (e.g., system reset, front panel controls such as Module binding, LCD brightness, time and date)
- Service menus (e.g., manufacturing and service history)
- Diagnostic menus (e.g., network, I/O, and analysis diagnostic data)

Each menu also shows the current reading and the current Analyzer Module tag on the top line. It also has a set of softkey labels on the bottom line. In the above example, DISPLAY leads back to the single Analyzer Module display screen; PARMS. Leads to a pair of screens showing the important secondary parameters, such as flow, pressures, alarm status etc.; NEXT jumps to the menu structure for the next Analyzer Module in a multi-analyzer system; LOCK disables access to menus whose security function has been enabled; and INFO jumps into the Platform help menus.

See Appendix D for Platform-related screens in the menu structure.

For information specific to Analyzer Modules, refer to Section 3 of the Analyzer Module manual(s). Analyzer Module screens are shown in the appropriate Appendices A.

3.3 SECURITY

In Software V2.2 and later, three levels of keypad lockout are available, corresponding to the menu structure divisions.

To record a security code, select the following from the *Main Menu: Technical Level Configuration...*, *System Set Up...*, and *Security Codes...*. In the *Record Security Codes* menu, enable whichever level security is required, select Record **XXXXX** Level Security Code (where **XXXXX** is Basic, Expert or Technical) and follow screen instructions.

Note

During routine operation of this component, the user will be prompted to enter a security code only if that particular level of security has been enabled in the Record Security Codes menu.

3.4 USING THE USER INTERFACE

The user interface consists of the screen, four arrow keys (←, ↑, →, ↓) an Enter key (↵), and five "softkeys". These latter are the keys marked F1 through F5 under the display. Their function depends on the menu currently showing, and is indicated by the reverse video word immediately above the key on the bottom line of the screen.

The general concept of the menu system is that the menus deal with one Analyzer Module at a time, together with any system components related to that Analyzer Module. Since the control module is common to all Analyzer Modules in the system, its menus are always available and in fact constitute the first layer of menus, such as the *Main menu* above.

To reorganize the Analyzer Modules on the multiple display screen, once you have selected one (the > caret appears next to the one you have selected), press the Enter key (↵) and this Analyzer Module will move to the top of the Analyzer Module list.

Toggle the TAGs (showing the names of the Analyzer Modules) with the TAGS ON or TAGS OFF softkey.

To enter the menus from the multiple Analyzer Module display, use the up and down keys to select an Analyzer Module. Press the SELECT softkey (the one on the left) to select the Analyzer Module, then SELECT again (or the right arrow key) to see the single Analyzer Module display screen.

3.4.1 USING THE MENUS

Menus can contain any of the following elements: Text, data, editable data, functions or jumps to another menu.

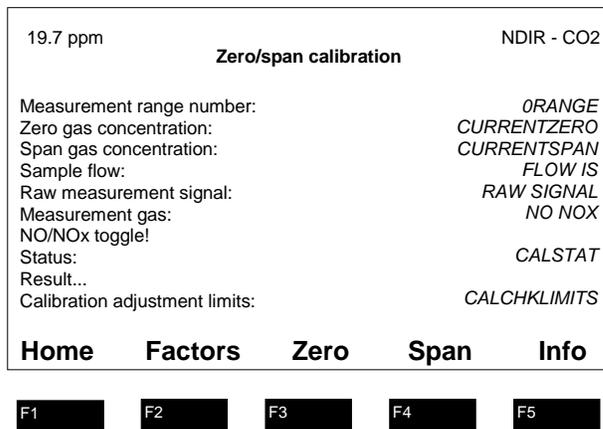


FIGURE 3.2 TYPICAL MENU

Data, either informational or editable, is described by a phrase ending with a colon, as in "Measurement range number:". If the line can be selected with the up or down key, it will highlight with inverse video when selected.

Measurement range number: 3

Pressing either the Enter key or the right arrow key at this point will allow you to edit the variable whose data is showing, highlighting the variable only.

Measurement range number: 3

At this point you can scroll the variable through its possible values with the up (↑) and down (↓) keys.

Certain variables such as string variables, only allow you to scroll each letter with the up and down keys, moving within the variable with the left (←) or right (→) arrow keys. Some numerical variables also allow you to scroll each number, by pressing the left or right arrow key, and then the up and down key when a single element is highlighted.

Press the Enter key (↵) when you are done, or, if you are not scrolling particular letters or numbers, press the left (←) arrow key.

Pressing the ESCAPE softkey will abort this editing session and return the variable to the value it had before you started editing it.

Menus are identified by phrases containing three periods at the end, as in "Result...". Selecting these with either the right (→) arrow key, or the Enter (↵) key, will jump you into the appropriate menu.

Functions cause the module to do something, such as zero itself. These are identified with a final exclamation point, such as *"NO/NOX toggle!"*. Highlight the function line with the up and down keys, and start the function with the right (→) arrow key or the Enter (↵) key.

Softkeys are identified in reverse video on the bottom line. As it happens, all the softkeys in the example above are menu jumps, but they may also initiate a function. If in the example shown you press the ZERO softkey, it will lead to an "Are you sure?" menu, which itself has another ZERO softkey. This softkey, if pressed, will initiate the zero function.

In the appendices showing menus, for simplicity, the softkeys are not shown in inverse video, and the very top line showing the current reading and Analyzer Module tag is also not shown. In fact these exist on all menus.

If alarms are enabled, and an alarm appears, the softkeys are replaced by a single ACK key. At this point all you can do is acknowledge the alarm. Once you have done this the normal softkeys will reappear.

3.4.2 USING THE HELP SCREENS

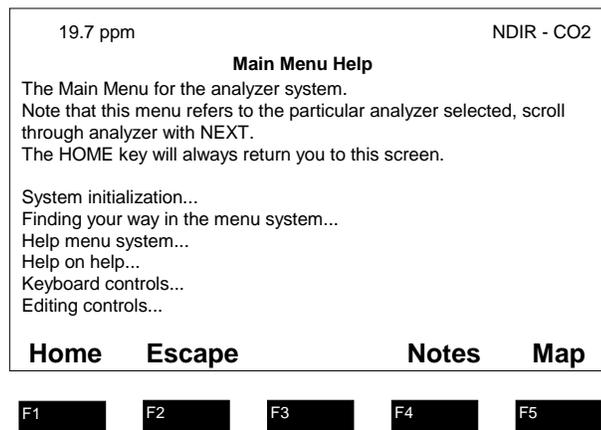


FIGURE 3-3. FIRST HELP MENU

There is an extensive set of help menus that can be accessed from each functional menu. There is also an overall set of help menus headed by the example above which provide an overview into the operation of the user interface itself. Feel free to explore this, it contains a lot of useful information.

One of the features provided is accessed by pressing the MAP softkey in the example above. It leads to a menu that shows the sequence of menus necessary to find about twenty possible configuration or data elements commonly sought.

Pressing HOME will return you to the Main menu, pressing ESCAPE or the left arrow key (←) will return you to the menu from which you entered the help system.

3.5 START UP

1. Check the sample system operation, and make sure that flows are correct. Be careful not to destroy the analyzer flow sensor with excessive flow (maximum 2 l/min).

Note

Ensure that all flow and pressure settings are at or below their recommended values before applying gas or power to the Analyzer Modules. Instrument damage can occur if maximum values are exceeded.

2. Check the power connections, and LON connections, and power up the system. Do not initiate any PC LON software yet.
3. The Platform should interrogate the system, and build its database. See the NGA Reference manual for troubleshooting information if anything goes wrong.
4. Systems are normally provided already setup, but if not done, bind the I/O modules to the Analyzer Modules using the procedure outlined in the NGA Reference manual.
5. Check that the Platform has found all the Analyzer Modules and I/O modules, and all have been correctly bound.
6. Go through each Analyzer Module checklist (Appendix D in the Analyzer Module manuals), setting up each Analyzer Module as desired. Set up their I/O modules as desired.
7. Set the clock in the Platform, and setup any display, security and editing options desired. See Appendix B for path details.
8. Set up any calibration modules as desired.
9. Set up any PC interface components.
10. Verify the operation of the Analyzer Modules on zero and span gases, and then on the sample itself.
11. Verify the Analyzer Module linearity on mid-scale span gases.
12. Verify the operation of the sample system.

3.6 DISPLAY SETUP

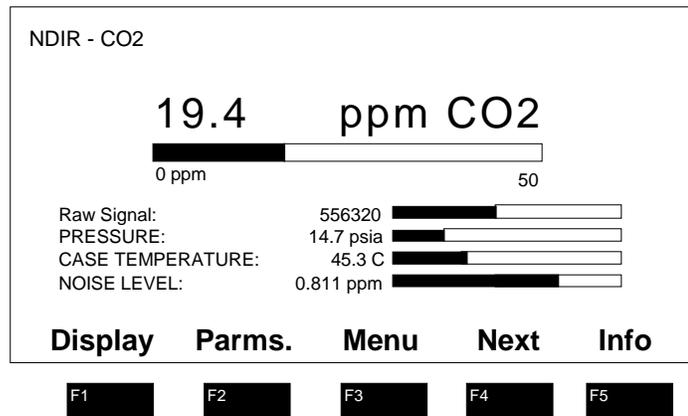


FIGURE 3-4. SINGLE ANALYZER DISPLAY

The single Analyzer Module display screen shows four auxiliary lines below the main reading bar graph. These lines are configurable. They can come from data in any module bound to the Analyzer Module, including the Analyzer Module itself, and in each module each line is itself selectable. Also the number of digits displayed on the screen as the main reading is configurable.

For details on this see the NGA Reference manual.

As a default, the auxiliary lines are set to read the selections from the Analyzer Module. To change these, enter *Expert controls and set up, Analyzer Module set up, Analyzer parameters list*.

3.7 OPERATION

Once an NGA system has been properly installed, it will need little attention. The Analyzer Modules will need to be calibrated at intervals, and the sample system will have to be maintained. Calibration gas information will have to be entered into the Calibration gas menus for each Analyzer Module whenever gas bottles are changed.

Calibration information is given both in the Analyzer Modules manuals and in the NGA reference manual.

Certain Analyzer Modules require periodic maintenance: CLD Analyzer Modules need new converter material and occasional ozonator replacement; FIDs need their flame towers cleaned; NDIR Analyzer Modules require periodic sample cell cleaning. See their appropriate manuals for details.

It is possible to use several means of making digital communication between the NGA system and a PC.

This communication can be via AK or ModBus over RS 232 or RS 485, or directly over the LON. Using any of these the PC may be setup to control the operation of the system, and to download calibration information as desired.

If an NGA component is changed out, the Platform and also the PC interface must be told about it. The simplest way to tell the Platform is to power it down and back up again. It will re-interrogate the network and load the new component into its database. If it runs out of memory during this operation, it will hang, and you will have to reset it, and then rebind everything. See the NGA Reference manual for details.

A PC LON interface will also have to be reset; AK and ModBus will have to be re-addressed also due to the change in the database.

3.8 CORRECT OPERATION

The following is a summary of what you should expect from an NGA system.

The response of the screen to user inputs - such as changing menus or editing variables - should be immediate, with new menus appearing well within one second.

The main reading should show stable numbers on zero or span gas, except at its lowest range where the 1% of range noise level may be noticeable. Analyzers should hold their calibration to at least 1% of range per day (see their specifications for details on this).

There may be a perceptible delay in indication of secondary values, such as flow and pressure. Some of these may take as much as five seconds to be reported.

Analyzer flow rates should be stable and should be controlled similarly on zero, span and sample. The Analyzer Module should respond to its span gases at its specification (depending on its filter settings), but bear in mind the exponential time response and allow ten time constants for real stability.

The main screen will wash out in direct sunlight, but it should be bright enough to read in complete darkness or ordinary room light.

Analyzers should warm up within about an hour, and should show stability within one day, other than Trace O₂s or FIDs which have special considerations.

Analyzers should show no sign of wetness in their sample tubing. FIDs will show water condensate in their exhaust.

Analyzers should not be too hot to touch, except possibly for heated FIDs.

There should be no perceptible stepping on the trace of a chart recorder from an I/O module (as normally configured).

The system should remember how it is configured no matter how it is powered up or down, and it should always be possible to enter any module's menus.

It is normal for a Platform to run out of memory if it is given too many Analyzer Modules to deal with, or Analyzer Modules are replaced too often without resetting it. V2.2 Platforms can deal with about 6 Analyzer Modules, and V2.3 or later with about 10 (when used with the increased RAM Platform Controller board). The symptom of this is that the Platform hangs up while starting up, or continuously restarts itself. In this case, you need a hardware upgrade, and should call Rosemount Service.

NOTES

4 MAINTENANCE AND TROUBLESHOOTING

4.1 MAINTENANCE OVERVIEW



WARNING: ELECTRICAL SHOCK HAZARD

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



CAUTION: QUALIFIED PERSONNEL

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



WARNING: STATIC SENSITIVE COMPONENTS

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

The components that may require removal or replacement during the life of the Platform include:

- Fuses (Power Input Module)
- Power Supply Board (Backplane)
- Platform Controller Board (Backplane)
- Front Panel Assembly
- I/O Modules

Analyzer Modules are covered under their own manuals.

4.2 FUSE REPLACEMENT

To replace the general protection fuses of the Platform, do the following:

1. Remove the power cord from the back of the Platform. (Remove both power cords in the case of the dual Platform.)
2. Open the fuse holder door located on the base of the AC power cord socket on the Power Input Module.
3. Remove the current fuses by pressing each individual restraining tab toward its holder and pulling. There are two individual fuse holders in the receptacle.
4. If the current fuses have blown, replace them with ones of the same type and value (see Section 5 parts list). Note that both fuses are required for protection, and both should be replaced.
5. If the operator, during initial installation, is switching to 230 VAC, and the Platform module is an earlier unit with individual fuses for the two voltage ratings, use the appropriate fuses and fuse holders found in the shipping kit. Note that two fuses are required for protection, and both should be replaced. If the fuses are already marked as 230V AC, they do not need to be replaced.
6. Secure the fuse holder door.

4.3 CONTROLLER BOARD REPLACEMENT

To replace the Controller Board, refer to Figure 1-10 and do the following:

1. Remove the six screws securing the Front Panel, and swing it completely open into the locked position. (Dual Platforms have no hinge - simply remove the appropriate side's front panel.)



WARNING: HAND INJURY HAZARD

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

2. Disconnect the display ribbon cable from the controller board by unhooking the black hold down clips on top and bottom of the connector. Pushing the clip back will aid in extracting the connector.
3. Remove the board by pushing down on the PCB Extractor (the red lever at the bottom of the board)

Note

The battery on the Controller board is a Lithium type. The battery is a permanently attached component and should only be replaced by qualified service personnel. If replaced, use appropriate hazardous material disposal procedures.

4. Replace by reversing Steps 1 and 3.

4.4 POWER INPUT MODULE REPLACEMENT

To replace the Power Input Module, do the following:

1. Remove power cable from its socket on the Power Input Module.
2. Remove the four securing screws near the corners of the Power Input Module face plate.
3. Using the extraction handle, gently pull the Power Input Module from the Platform.
4. Replace the unit by reversing steps 1 through 3, ensuring that Backplane connections are seated properly.

4.5 POWER SUPPLY REPLACEMENT

To replace the Power Supply, do the following:

1. Remove power cable from its socket on the Power Input Module.
2. Loosen the six securing screws on the front panel of the Platform module.
3. Locate the Power Supply on the extreme right of the Backplane inside the front of the Platform module. It is a black metal box mounted on a circuit card.
4. Press down on the red tab and gently pull the Power Supply from the Platform.
5. Replace the unit by reversing steps 1 through 4, ensuring that Backplane connections are seated properly.

4.6 FRONT PANEL ASSEMBLY REPLACEMENT

To replace the Front Panel assembly, do the following:

1. Remove power from the Platform.
2. Remove the six screws securing the Front Panel, and swing it completely open into the locked position. (Dual Platforms do not have such a hinge. In this case, remove both halves of the front panel.)

**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.

3. Remove the ribbon cable connector from the Display Board.
4. Remove the four screws securing the Front Panel to the L-bracket attached to the hinge.
5. Replace the Front Panel assembly by reversing steps 1 through 4.

4.7 SYSTEM TROUBLESHOOTING

Most Analyzer Module problems stem from sample system issues. A lot of these are addressed in the NGA Reference Manual, and in the Analyzer Module manuals themselves.

The NGA Reference Manual also contains operational details that should assist you to diagnose faults not covered in this present section or the Analyzer manuals themselves. Each section of the NGA Reference Manual contains specific troubleshooting tips: this section will simply try to point out the area of concern for a given symptom.

Control module hangs up on start up

Out of memory. Reset it. See System Setup in the NGA Reference Manual. Also, not enough RAM for a large system. Use the Controller board with RAM expansion.

Also, an Analyzer Module may have lost power or connection during the initialization process. Power down the system and try again. Check each Analyzer Module with the Platform one at a time to see which one hangs up the system.

Can't enter menus

Network error or module gone dead (or an earlier than V2.2 I/O Module). Check for power failure for an absent module, bad connection, or failed module. Upgrade an early I/O Module.

Also, excessive network traffic. Reduce update rate - see the NGA Reference Manual section titled Response time.

If the LON length is greater than about ten meters, make sure that you have LON terminations in place.

Control module shows “No Data”

Analyzer module no longer responding. Check its LON connection, power connection, power fuse.. Open it up and see if the red LED's on its Analysis Computer Board are on or blinking. If so, power it down and back up, and if it still doesn't communicate, replace the board or the entire Analyzer Module. Try connecting the bad Analyzer Module by itself to the Platform using a new cable.

No analog output, or wrong output

Check the binding of the I/O module, and check that you are monitoring the correct one. In its diagnostic menus, check the analog output of the I/O module. If it is reported as being OK, the problem is in the wiring or in the recording device. See I/O module section.

Calibration problems

See the calibration I/O module sections of this manual, and the zeroing and spanning sections of the NGA Reference Manual.

Analyzer stability problems

Check the Analyzer Module power and grounding, the ambient temperature, and the sample system. Check for ambient gas interference - CO₂ in the atmosphere, etc. Check the exhaust pressure stability. Generally make sure that the environment is satisfactory before assuming that the Analyzer Module is at fault. See the NGA Reference generally, and the Analyzer Module manuals in particular for further hints.

Analyzer Linearity Problems

See the appropriate sections in the NGA Reference manual.

User programmed data is lost after momentary power loss to Platform

The Controller board in the Platform uses a long life lithium battery to maintain user programmed data in the event of a power loss. The battery voltage must be 3.38 VDC or greater for proper operation. If the battery voltage is less than 3.38 VDC it must be replaced by qualified service personnel or the Controller board replaced by the user.

NOTES

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

| | |
|--------|--|
| 655407 | Power Input Module |
| 655420 | Backplane Board |
| 659954 | Controller Board (v2.4 software) |
| 658185 | Controller Board with RAM Expansion |
| 656237 | Front Panel Assembly |
| 902762 | Power Supply Board |
| 903217 | Fuse, 115 VAC, 2.5 A, Time-Lag (T Type), UL/CSA Recognized |
| 903218 | Fuse, 230 VAC, 1.25 A, Time-Lag (T Type), SEMCO Recognized |
| 656871 | Fan Card Board |

5.2 MULTI-MODULE COMPONENT PARTS LIST

| | |
|--------|--|
| 656264 | Dual Analyzer Platform - Standard |
| 656265 | Dual Analyzer Platform - Extended |
| 656875 | Single Analyzer Enclosure - Standard |
| 656876 | Single Analyzer Enclosure - Extended |
| 659090 | 30 A Bulk Power Supply |
| 656193 | Analog/Alarm I/O Module |
| 658085 | Analog I/O Module v2.3 |
| 656194 | Single Analyzer Autocalibration I/O Module |
| 656586 | System Autocalibration I/O Module |
| 656318 | 25 Pin Adapter (Sub-D To Wires) |
| 904362 | 25 Pin Adapter (Sub-D To Wires). Narrow Version. |

REPLACEMENT PARTS

| | |
|--------|-----------------------------------|
| 904390 | 2-Channel SIO I/O Module |
| 904393 | 2-Channel Analog Expansion Module |
| 904391 | RS-232 Adapter Module |
| 904392 | RS-485 Adapter Module |
| 904394 | DIO Digital I/O Module |
| 656236 | I/O Slot Cover |
| 656103 | LON I/O Module |

ANALOG I/O MODULE

6

6.1 ANALOG I/O MODULE DESCRIPTION

Refer to Section 1 for instructions on how to install and bind the Basic Analog I/O Module.

Software V2.0, V2.1 and V2.2 Analog I/O Modules provide an analog output signal, up to three alarm contacts, four contacts that are used to indicate the current range of operation of its associated analyzer, and six digital inputs, of which four are used to determine which range to use. V2.3 and later allow the user to configure all of the relay outputs and digital inputs to whatever functionality is desired.

In V2.3, special software allows the I/O module to track the special functions supported by the analyzer, and to show on its control screens whatever the analyzer can provide or accept in the way of digital indication or control. Any of the relay outputs or digital inputs can be assigned to any function that the analyzer can support.

Note

V2.2 Platform software only supports V2.2 I/O Modules. V2.3 Platform software supports both V2.2 and 2.3 I/O Module software, but only V2.3 I/O Module software has the special features mentioned here.

The analog output signal is bound to the analyzer's PVA variable, i.e. its main output reading. The analog output is scaled to the current operating range (or to a specific operating range if desired). It may be connected as either a voltage output (0-5V) or as a current output (0 or 4 - 20mA). In any case both the zero and span are live, which is to say that the output can go below the zero point or above the fullscale point.

There are three SPDT relay outputs which can be used as alarms. SPDT refers to a type of relay which allows connection to the Common (C), Normally Open (NO) and Normally Closed (NC) contacts. These designations refer to the state of the contacts when the relay is un-powered.

In V2.2 and earlier, four more SPST relay outputs are used to indicate the active range of the I/O module. This is normally the same as the range used by the analyzer, unless the user has chosen to operate the I/O module on a constant range. Only one of these relays will be energized at one time. These relays may retain this function in V2.3, or they can be re-assigned to other functions.

There are also digital inputs that may be used to control which range the I/O module or analyzer is on. In V2.3 they may be made to control any specific functionality supported by the bound analyzer, such as to light the flame in the case of the FID.

Note

Use the path Expert controls and setup..., Auxiliary module setup... to access the I/O module setup menus. The section called Local I/O setup... accesses only the SIO card controls, and will not affect any other I/O module.

6.2 ANALOG I/O MODULE ALARM DESCRIPTION - V2.2

This section describes the alarm capability in V2.2. V2.3 added some significant features which are described in the next section.

There are three alarm relays each of which may be programmed to respond to any of the following categories.

- Concentration
- Warning
- Failure
- Control Status
- Validity

Concentration alarms respond to the analyzer primary reading, its measured gas concentration. The alarm can be set to trigger above or below a set point, and the relay can be set to operate in normal or fail-safe (powered when in the normal state) operation. The set point may be expressed either as an absolute value, or as a percent of the current range, in which case the concentration at which it alarms will depend on the range.

The alarm deadband may also be programmed with an upper limit of 20% of fullscale.

| ITEM | FUNCTION | NOTES |
|---------------|--------------------------------|---|
| Output | Analog, 0 to 5 V, 0/4 to 20 mA | Supports auto-range changing, or independent range selection from that of the analyzer. |
| Alarm relay 1 | Programmable function | SPDT |
| Alarm relay 2 | Programmable function | SPDT |
| Alarm relay 3 | Programmable function | SPDT |
| Alarm relay 4 | Powered when output on range 1 | SPST |
| Alarm relay 5 | Powered when output on range 2 | SPST |
| Alarm relay 6 | Powered when output on range 3 | SPST |
| Alarm relay 7 | Powered when output on range 4 | SPST |
| Input line 1 | High sets range to 1 | |
| Input line 2 | High sets range to 2 | |
| Input line 3 | High sets range to 3 | |
| Input line 4 | High sets range to 4 | |
| Input line 5 | No action | |
| Input line 6 | No action | |

TABLE 6-1. AVAILABLE FUNCTIONS – ANALOG OUTPUT WITH 3 ALARMS I/O MODULE V2.2

| ALARM TYPE | COMMENTS |
|----------------|---|
| Concentration | Programmable high/low, fail-safe/normal. |
| Warning | Tied to analyzer WARNING alarms, if analyzer alarm reporting is enabled. |
| Failure | Tied to analyzer FAILURE alarms, if analyzer alarm reporting is enabled. |
| System Failure | Loss of communication with any module in the system. |
| Control Status | Shows that remote control of range inputs is enabled. |
| Validity | Valid if: Analyzer operational state is normal; last span and zero did not fail, the analyzer is looking at the sample gas (not a calibration gas), no internal analyzer alarms are reported, the sample flow is greater than the lower limit, and the detector temperatures are within limits (except for the CLD). There are other analyzer specific problems which may affect validity also, such as flame out in a FID. |

TABLE 6-2. ALARM RELAY CONFIGURATION MATRIX V2.2

Concentration

Can be expressed as a percentage of the current range or as an absolute value of gas concentration measured. Alarms can be set to alert the user of low concentration, high concentration and percent of range values.

Warning

Indicates one or more software-configured limits on any network variable (other than gas concentration) has been exceeded. Examples of these secondary variables are flow rate and internal voltage. A software reset or other resolved software failure would also be reported.

In the event of a Warning alarm, gas concentration values displayed on the Operator Interface or present on output lines may not be accurate.

Failure

Indicates an unrecoverable hardware or software failure such as some component not responding to network communications or a safety related failure such as lack of purge air in a Flame Ionization Detection Analyzer Module.

In the event of a Failure alarm, gas concentration values displayed on the Operator Interface or present on output lines will not remain accurate.

Control Status

Indicates that the analyzer control has been set to remote, in which case the input lines on the I/O module are enabled.

Validity

Describes a condition in which gas concentration values present on the Operator Interface or output lines should be considered invalid. The Analyzer Module alerts the system that an error in gas concentration is present. Causes include failure or lack of calibration, flame out in a FID, or a not-from-process gas applied by a sample control module.

The Analog I/O Module has the capability of tracking a set range regardless of which range the Analyzer Module is on. It is therefore possible to use several Analog modules bound to one analyzer to provide multiple outputs at the same time.

6.3 ANALOG I/O MODULE ALARM DESCRIPTION - V2.3

V2.3 of the Analog I/O Module software added the ability to define the operation of each of the seven relays, and to include analyzer-specific alarm indication. Each analyzer module has a list of possible specific alarm indications, such as flow failure or flame-out. Software in the 2.3 or later control module allows the menu for the I/O module to include these alarm descriptions as if they were known to the I/O module in advance, providing a transparent means of controlling these alarms.

Possible alarm indications include low flow, high flow, under- and over-range, the status alarms as above, and specific analyzer alarms such as flame out for a FID or NO mode for a CLD. The specifics are determined by the relevant analyzer module.

The default setting of the alarms is identical to those in the V2.2 Alarm I/O Module described in the previous setting, but it is possible to change them as desired.

1. Enter the *Main* menu
2. Select *Expert controls and setup...*
3. Select *Auxiliary module setup...*
4. Select the Analog I/O Module
5. Select *Alarm conditions...*
6. Select the relay to be configured
7. For each relay, use the up/down softkeys to select the signal to which it responds.
8. When the desired signal is shown, press ENTER softkey to set.

| ITEM | FUNCTION | NOTES |
|-------------------|--------------------------------|---|
| Output | Analog, 0 to 5 V, 0/4 to 20 mA | Supports auto-range changing, or independent range selection from that of the analyzer. |
| Alarm relay 1 - 7 | Programmable function | SPDT |
| Input line 1 - 6 | Programmable function | Depends on analyzer bound |

TABLE 6-3. AVAILABLE FUNCTIONS – ANALOG OUTPUT WITH 3 ALARMS I/O MODULE V2.3

| STANDARD ALARM | FUNCTION |
|---------------------------|--|
| Normal | Shows no other alarm |
| Maintenance request | Indicates a warning alarm |
| Failure | Indicates a failure alarm |
| Calibration in progress | Indicates a bound Autocalibration module is in its calibration sequence |
| Zero in progress | Indicates the analyzer is performing a zero calibration |
| Span in progress | Indicates the analyzer is performing a span calibration |
| Zero failure | Indicates the last zero calibration failed |
| Span failure | Indicates the last span calibration failed |
| Range overflow | Indicates the reading is higher than the current range |
| Range underflow | Indicates the reading is lower than the high limit of the next lower range |
| Flow low | Indicates the flow is less than its low limit |
| Flow high | Indicates the flow is higher than its high limit |
| Concentration limit 1 - 4 | Only supported on MLT modules |
| Range 1 - 4 | Indicates analyzer is on range 1 to range 4 |
| Validity | Shows invalid readings, see previous section |
| Failure | Indicates analyzer hardware failure |
| System failure | Indicates loss of communication with one or more LON modules |
| Control status | Indicates remote or local control |
| CLD only - Ozonator out | See CLD manual |
| CLD only - NO/NOx mode | See CLD manual |
| FID only - Purge failure | See FID manual |
| FID only - Flame out | See FID manual |

TABLE 6-4. AVAILABLE ALARMS – ANALOG OUTPUT WITH 3 ALARMS I/O MODULE V2.3

6.4 ANALOG I/O MODULE INSTALLATION

If the Analog I/O 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 are operational.

To install the Analog I/O Module, perform the General Procedure in Section 2. Bind the Analog I/O Module to an Analyzer Module as detailed in Section 2.

Perform the procedures in Sections 6.4.1 and 6.4.2.

6.4.1 ANALOG I/O MODULE INITIAL SETUP PROCEDURE

1. Enter the menus.
2. Select *Expert controls and setup...*
3. Select *Auxiliary module setup...*
4. Select the analog I/O module

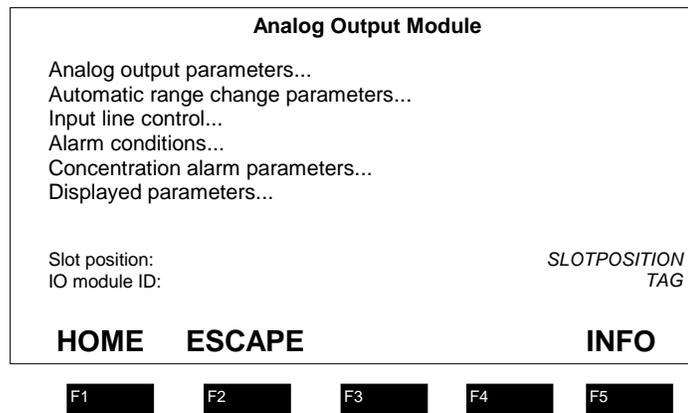


FIGURE 6-1. ANALOG OUTPUT MODULE SETUP MENU

5. Select Analog output parameters...
6. Select Voltage or current:
7. Select Output value on analyzer failure — if the analyzer dies, do you want the output to go to zero, fullscale, or hold its last value? This could have safety implications.

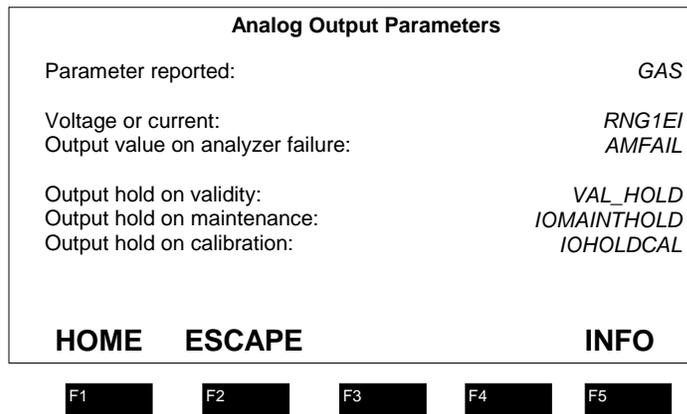


FIGURE 6-2. ANALOG OUTPUT PARAMETER MENU

8. Select whether the output holds its value when any of the three alternatives shown happens. If the reading becomes invalid, if a calibration is underway or if the menus are entered (maintenance), you can make the output hold its last value. This may be undesirable, so consider this carefully.

Setting up automatic range change parameters

Go back one menu (into the Analog I/O Module setup menu), then select Automatic range change parameters...

You can setup how it calculates its range change points. These are calculated as a percent of the lower of the two ranges, always.

Note

In V2.2, the range down calculation was incorrect. Do not use the automatic range change feature with V2.2 I/O modules.

You can also select the hold off times. The first hold off time is the delay before it changes range the first time, and the toggle hold off time is a further delay when it tries to change back immediately. All of these settings are normally best left in their default values.

You can also make the output track the analyzer range, or make it stay in one range despite what range is being used by the analyzer. Set this on the "Output on range:" line.

In *Auxiliary module setup*, with the analog I/O module selected:

1. Select Alarm conditions...
2. Select a condition for each alarm relay. In V2.2, Analyzer specific alarms do not work (refer to Table 6-2 for available alarms).
3. Go back one screen, and if you have selected any concentration alarms, select General concentration alarm parameters...
4. In this screen, select whether to alarm as percentage of range or on absolute values. If the former, the alarm set point will change with each range. If the latter, there will be a single alarm point, no matter what range is selected.
5. Select the hysteresis. This is the difference between the “on” point and the “off” point, expressed as a percentage of the on point. E.g., in the case of a high alarm, if the alarm is set at 80ppm, it will trip when the reading goes above 80ppm. When it comes back down if the hysteresis is set to 10%, the alarm won’t go back off until the reading gets below 72 ppm. The 10% default is usually satisfactory.
6. Select the Delay till alarm actuates: This adds a time delay, preventing nuisance alarms on short term spikes in the reading.
7. Go back up one screen, and select Relay 1 (or 2 or 3) concentration alarm parameters....
8. Set the alarm level in either absolute or percentage of range. You can select both, and then the alarm set point will perhaps change as you select whichever mode you want.
9. Select the alarm type, as high or high high, or low or low low. High high goes off at a higher value than high, but it doesn’t matter if you get it wrong.
10. Select the alarm operation, fail-safe or not. Fail-safe means that the relay is powered when in non-alarm mode, which means that it generates an alarm signal when the power goes off, or when the software is reset.

All alarms other than concentration alarms are automatically in fail-safe mode.

Setting up alarm relays - V2.3

V2.3 allows you to set each relay individually to any of the possible alarm conditions.

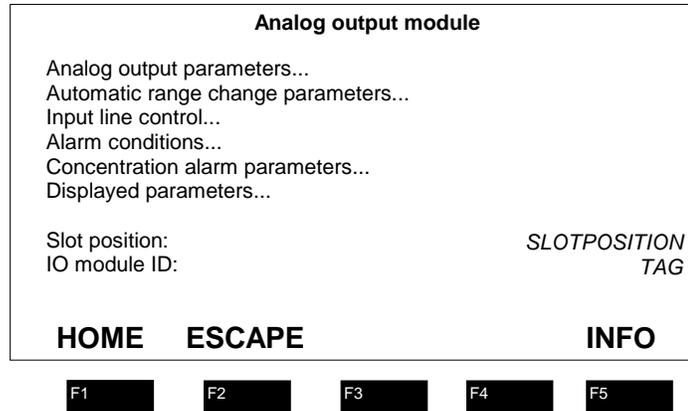


FIGURE 6-5. ANALOG OUTPUT MODULE SETUP MENU - V2.3

1. Select the *Analog output module* setup menu as above.
2. Select *Alarm conditions...*

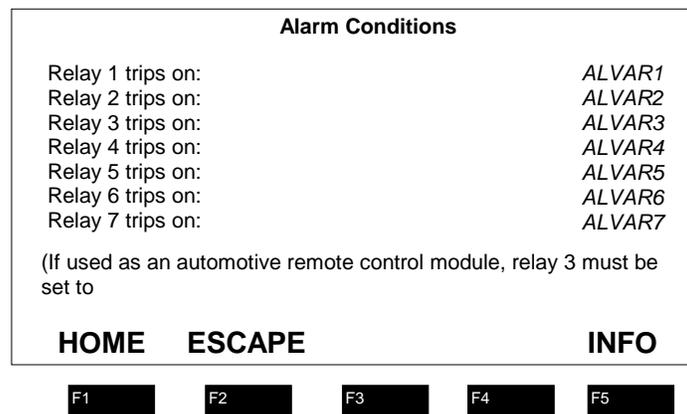


FIGURE 6-6. ALARM CONDITION MENU - V2.3

3. Choose the operation of each relay
4. (If you have selected any concentration alarms) Go back one menu and select Concentration alarm parameters...

6.4.2 ANALOG I/O MODULE CALIBRATION PROCEDURE

Perform the Output signal zero and span calibration procedures as follows:

| Voltage output calibration | |
|---|---------------|
| Voltage/current mode: | RNG1E1 |
| Desired output voltage: | |
| Measured output voltage: | IODIAG3 |
| Zero offset: | |
| Gain factor: | |
| Set to test for calibration: | TESTMODE2 |
| Set desired output voltage: adjust the measured voltage with the zero and gain factors. Then set to auto. | |
| HOME | ESCAPE |
| | INFO |

F1 F2 F3 F4 F5

FIGURE 6-9. VOLTAGE OUTPUT CALIBRATION MENU

| Current output calibration | |
|---|---------------|
| Voltage/current mode: | RNG1E1 |
| Desired output current: | |
| Measured output current: | IODIAG6 |
| Zero offset: | |
| Gain factor: | |
| Set to test for calibration: | TESTMODE2 |
| Set desired output current: adjust the measured voltage with the zero and gain factors. Then set to auto. | |
| HOME | ESCAPE |
| | INFO |

F1 F2 F3 F4 F5

FIGURE 6-10. CURRENT OUTPUT CALIBRATION MENU

1. Enter the Analog Output Parameters menu by making selections in the following path: *Main Menu, Technical Level Configuration Menu, Diagnostic Menu, [choose] Analog I/O [module], Analog Output Menu* and either *Voltage Output Calibration Menu* or *Current Output Calibration Menu*.
2. To perform both the zero and span calibration procedures, the operator must use output values obtained from a calibrated digital voltmeter or other sensing device connected to the I/O Module output. The Measured values shown by the I/O module itself are not accurate enough to calibrate the output circuitry.
3. In the I/O Module Analog Output Diagnostics Menu, choose Voltage Output Calibration or Current Output Calibration, depending on output requirements.

4. Choose Test on the Set to Test for Calibration line.
5. If the operator is performing a Voltage Output Calibration, do steps 6 through 9. If the operator is performing a Current Output Calibration, do steps 10 through 13.
6. Voltage calibration: perform the zero calibration procedure first. Set the Desired Output Voltage to 0.
7. Observe and record the output value.
8. Adjust, if necessary, the output value by scrolling the Zero Offset until the output value is 0.
9. Perform the span calibration. Change the Desired Output Voltage to 5, and scroll the Gain Factor until the output value is 5. Skip the remaining steps.
10. Current calibration: perform the zero calibration first. Set the Desired Output Current to 0 (no matter whether the module is set to operate on 0 - 20 mA or 4 - 20 mA).
11. Observe and record the output value.
12. Adjust, if necessary, the output value by scrolling the Zero Offset until the output value is the zero value (0 mA).
13. Perform the span calibration procedure. Change the Desired Output Current to 20, and scroll the Gain Factor until the output value is 20.

After completing the span calibration procedure, the operator should recheck and readjust, if necessary, the zero calibration values.

Note

The measured output current or voltage is not measured with enough precision to do more than tell you whether the output circuit is working or not. Don't try to use it to calibrate the output. On the other hand, if it does show a value, but you don't detect one in your monitoring device, it means that either the output connector, or EMC components on the I/O module are bad, or there is an error in the wiring. The measured signal does in fact measure the output signal, it is not merely calculated from the value the output is supposed to be putting out.

6.4.3 ANALOG OUTPUT OVER/UNDER LIMITS

The analog output can be configured with live zero/span or "clipped" zero/span by setting the over limit and under limit of the voltage or current output signal.

In the *I/O Module Analog Output Diagnostics* menu, select *Diagnostic limits* (see Section 6.4.2). There will be various current and voltage limit selections to choose from. Edit the appropriate set of over and under limit values that pertain to the analog output you have selected.

The minimum current under limit is -2.0 and -6.0 while the maximum current over limit is 25 mA. The minimum voltage under limit is -90 V and the maximum voltage over limit is 10.0 V.

Setting the under limit and over limit values is essentially setting the minimum and maximum signal output.

The analog I/O Module is now fully operable and read for use.

6.5 ANALOG I/O MODULE TRACK AND HOLD FEATURE

An I/O Module function critical to certain applications (such as CEMS) is the track and hold feature.

| Analog output parameters | |
|-----------------------------------|---------------|
| Parameter reported: | GAS |
| Voltage or current: | RNG1EI |
| Output value on analyzer failure: | AMFAIL |
| Output hold on validity: | VAL_HOLD |
| Output hold on maintenance: | IOMAINTHOLD |
| Output hold on calibration: | IOHOLDCAL |
| List range limits: | |
| HOME | ESCAPE |
| | INFO |

F1 F2 F3 F4 F5

FIGURE 6-11. OUTPUT PARAMETERS MENU

The three "Output Hold..." selections on the Analog Output Parameters Menu refer to the I/O Module capacity to maintain or hold the output of the gas concentration value despite a change in the state of the Analyzer Module.

If *Output Hold on Validity* is enabled and the state of the Analyzer Module becomes invalid, the last gas concentration value measured during the valid state is held and

output from the I/O Module. When the Analyzer Module state returns to valid, the gas concentration value is updated instead of held.

If *Output Hold on Maintenance* is enabled and the state of the Analyzer Module is either maintenance or standby, the last gas concentration value measured during the valid state is held and output from the I/O Module. When the Analyzer Module state returns to valid, the gas concentration value is updated instead of held.

If *Output Hold on Calibration* is enabled, three selections are available; Disabled, Enabled and CEMS. These selections operate as follows:

If **Disabled**, the gas concentration value is updated while the Analyzer Module is in the calibration state.

If **Enabled**, and when the Analyzer Module is in the calibration state or the QC check state, the last gas concentration value measured during the valid state is held and output.

If **CEMS**, and when the Analyzer Module is in the calibration state, the gas concentration value is updated throughout the zero and/or span cycles. The calibration factors are held until the calibration cycle is over. Therefore the output responds to the reading of the calibration gases using the factors from the previous calibration, as if the analyzer were simply measuring them rather than calibrating itself. Only when the calibration cycle is over does the analyzer use the new calibration factors. This allows the user to determine how much drift has occurred.

6.6 ANALOG I/O MODULE: RELAY OPERATION CHECK PROCEDURE

For troubleshooting, it is convenient to check the measured state of the relays when they don't seem to be working.

The circuitry actually measures the unused contacts of the relays.

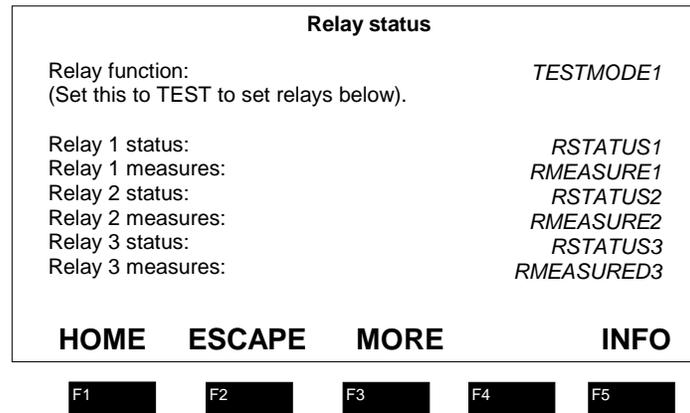


FIGURE 6-12. FIRST RELAY STATE MENU

You can see what their state is, and you can manually set them to a state:

1. Get into Technical level configuration...
2. Select Diagnostic menus...
3. Select the I/O module
4. Select Relay status...
5. Set Relay function: to TEST. This allows you to edit the relay states, but it will automatically reset itself to auto after a minute.
6. Look at each relay, and if desired edit its status line to ON or OFF. After a moment you should see its measure line change state too. Check to see if the reporting device sees this. If not, you either have a wiring error, or there is a failure in the EMC circuitry or output connector.

Note

V2.2 I/O modules report the state of relays 1, 2 and 3 reversed from reality - that is to say they report the contact open when it is in fact closed, and vice versa.

6.7 ANALOG I/O MODULE RANGE CONTROL DISCUSSION

The whole question of ranges in the NGA system is rather complex. Analyzers themselves support four ranges, but these are mostly software considerations only, and mainly result in the application of different calibration and linearization parameters to the same sensor signals. Certain analyzers do make hardware changes as a result of range changes, and these are described in the appropriate manuals and the NGA reference manual.

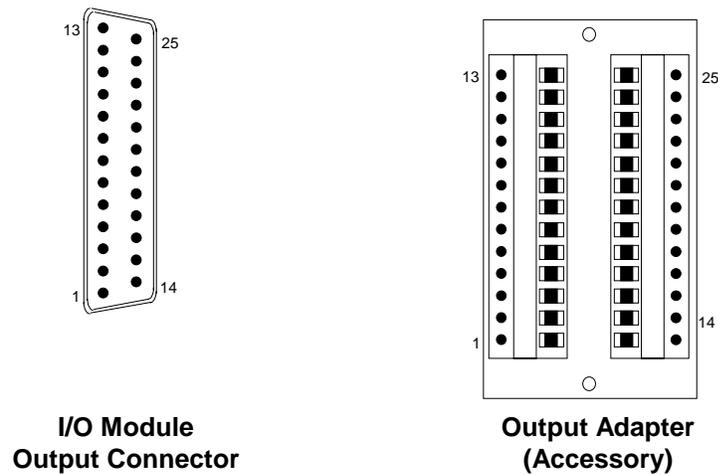
The Analog I/O module can be made to track the range of operation of the analyzer, or to operate independently of it. It can also control the range of the analyzer, either automatically or as a result of external input through the digital input lines.

If the module is made to control the operation of the analyzer, allowance must be made for the delay associated with the LON communication system. It may take as much as a second for the analyzer to respond to an external range change request. During this time the reading may not relate to the requested range. Any control system relying on an instantaneous range change will produce an error during this time.

If this fact cannot be dealt with in the control system software, the Analog I/O module should be set to operate independently of the analyzer. In this mode, the output scaling corresponds to the range requested by the digital input line, but the analyzer's range is not affected. As long as the analyzer's range is wider than those of the Analog I/O module, the system will operate correctly, except that of course any specific calibration or linearization performed on the other ranges by the analyzer will not be used. In this case the response time to a requested range change by a 2.3 V Analog I/O module will be variable but always less than 100mSec, typically 40mSec.

The preferred solution, of course, is to get the output of the analyzer directly from the LON, where these considerations do not apply, and the analyzer can be operated on one or several ranges as desired

6.8 ANALOG I/O MODULE OUTPUT CONNECTIONS



PIN ASSIGNMENTS

| | | | |
|----|-----------------------------|----|-------------------|
| 1 | Analog Current Output | 14 | SPST Relay 4 (NO) |
| 2 | Analog Voltage Output | 15 | SPST Relay 5 (NO) |
| 3 | Analog Return for Pins 1, 2 | 16 | SPST Relay 6 (NO) |
| 4 | Analog Chassis Ground | 17 | SPST Common |
| 5 | SPDT Relay 1 (NC) | 18 | SPST Relay 7 (NO) |
| 6 | SPDT Relay 1 (C) | 19 | Digital Input 1 |
| 7 | SPDT Relay 1 (NO) | 20 | Digital Input 2 |
| 8 | SPDT Relay 2 (NC) | 21 | Digital Input 3 |
| 9 | SPDT Relay 2 (C) | 22 | Digital Input 4 |
| 10 | SPDT Relay 2 (NO) | 23 | Digital Input 5 |
| 11 | SPDT Relay 2 (NC) | 24 | Digital Input 6 |
| 12 | SPDT Relay 2 (C) | 25 | Digital Common |
| 13 | SPDT Relay 2 (NO) | | |

FIGURE 6-13. ANALOG I/O MODULE OUTPUT CONNECTOR/ADAPTER PIN ASSIGNMENTS

NOTES

SINGLE ANALYZER ANALOG AUTOCAL I/O MODULE

7

7.1 SINGLE ANALYZER ANALOG AUTOCAL DESCRIPTION

Refer to Section 2 to install and bind the Single Analyzer Analog Autocal I/O Module (also known as the Single Analyzer Analog Autocal I/O Module).

The standard calibration procedure in the Analyzer Module Menu Structure (under “Basic controls”) is not automatic. When you press “ZERO” or “SPAN”, the analyzer assumes that you are flowing the appropriate gas. It does not itself change any gas flow, nor does it communicate to the Autocal module described in this or the next section.

The Single Analyzer Analog Autocal I/O Module allows the user to either manually or automatically perform the calibration procedures for the Analyzer Module. The calibration procedures can be either initiated manually or automatically.

The Single Analyzer Analog Autocal I/O Module also provides analog signal outputs.

Up to four span solenoid valves and one zero solenoid valve (customer supplied) can be energized at set time intervals. The frequency and duration of the calibration cycle is software programmable, allowing many varied sequences, a few of which follow:

- **zero** x times, then **span**.
- **zero**, then **span**.
- **zero**, **span**, then check on a **midpoint**.

Four SPST and two SPDT relays are used to drive solenoid valves that control the flow of zero and span calibration gases to the Analyzer Module. The seventh relay indicates an in-calibration condition. Relay output definitions:

- **Relay 1** - sample bypass: closed when the sample should **not** be flowing through the Analyzer Module.
- **Relay 2** - zero gas: closed when the zero gas should be flowing.
- **Relay 3** - calibration in progress: closed when any zero, span or calibration cycle is being executed.
- **Relay 4** - span gas 1: closed when span gas 1 should be flowing.

- **Relay 5** - span gas 2: closed when span gas 2 should be flowing.
- **Relay 6** - span gas 3: closed when span gas 3 should be flowing
- **Relay 7** - span gas 4: closed when span gas 4 should be flowing

The Auto Calibration Module has six digital input lines for remotely initiated calibration. The function of each line:

- **Line 1** - do zero calibration
- **Line 2** - do span on the selected range
- **Line 3** - do a zero and/or span, as programmed
- **Lines 4 & 5** - select the desired range in the following binary fashion (for Line 2 above ONLY):

| RANGE | LINE 4 | LINE 5 |
|-------|--------|--------|
| 1 | OFF | OFF |
| 2 | ON | OFF |
| 3 | OFF | ON |
| 4 | ON | ON |

TABLE 7-1. AUTOCALIBRATION MODULE - INPUT LINE RANGE CONTROL

- **Line 6** - disables calibration instruction and allows only a check to occur

Note the following:

- ✓ These remote functions will apply only if the remote controls are enabled through this I/O Module.
- ✓ Lines 4 and 5 control only the desired range of the span function as described in Line 2.
- ✓ If the digital lines described above are not connected, the Line 2-related span function will only select Range 1; it will not calibrate any other range. However, the Line 3 function will span or check ranges as setup in the module's programming.
- ✓ After calibration, the Analyzer Module will be returned to the range it was operating on previous to calibration.

| ITEM | FUNCTION | NOTES |
|---------------|--------------------------------------|--|
| Output | Analog, 0 to 5 V, 0/4 to 20 mA | Supports independent range selection from that of the analyzer (no auto-range) |
| Alarm relay 1 | Calibration in progress | SPDT |
| Alarm relay 2 | Calibration gas / sample gas | SPDT |
| Alarm relay 3 | Zero gas valve | SPDT |
| Alarm relay 4 | Span gas valve 1 | SPST |
| Alarm relay 5 | Span gas valve 2 | SPST |
| Alarm relay 6 | Span gas valve 3 | SPST |
| Alarm relay 7 | Span gas valve 4 | SPST |
| Input line 1 | Perform a zero cycle | |
| Input line 2 | Perform a span cycle | |
| Input line 3 | Perform a complete calibration cycle | |
| Input line 4 | Range selection | |
| Input line 5 | Range selection | |
| Input line 6 | Calibration / Check selection | |

TABLE 7-2. AVAILABLE FUNCTIONS – SINGLE ANALYZER AUTOCALIBRATION I/O MODULE V2.2

7.2 SINGLE ANALYZER ANALOG AUTOCAL I/O MODULE INSTALLATION

If this I/O 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 are operational.

To install this I/O Module, follow general installation guidelines in Section 2 and then do the following:

AUTOCALIBRATION SEQUENCE SETUP

OVERALL TIMING

The calibration sequence is; wait until the calibration time; indicate a calibration sequence; purge with zero gas; tell the analyzer to zero itself; wait until it says it's

done; purge with the first span gas; tell the analyzer to change range (if necessary); tell the analyzer to span this range; wait until it says it's done; purge with the next span gas and repeat up to a total of four spans; purge with sample gas; indicate the calibration sequence is over.

Before setting these parameters, make sure the system clock is set correctly. This is to be found in *Technical level configuration...*, *System setup...*, *Date and time....*

1. Enter the *Main menu*
2. Enter *Expert controls and setup...*
3. Enter *Auxiliary module setup...*
4. Select the Autocalibration module

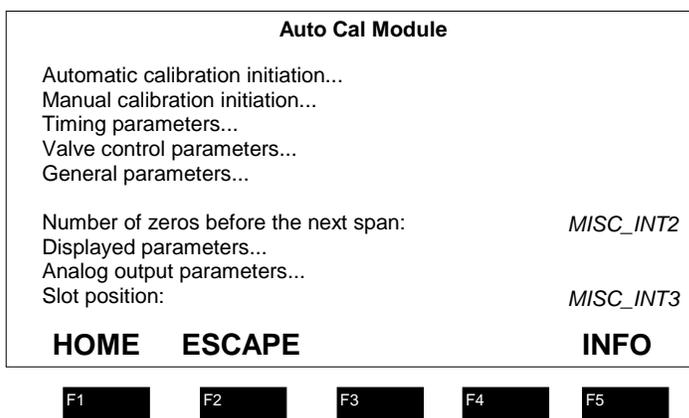


FIGURE 7-1. AUTOCALIBRATION MODULE SETUP MENU

5. Enter Timing parameters...

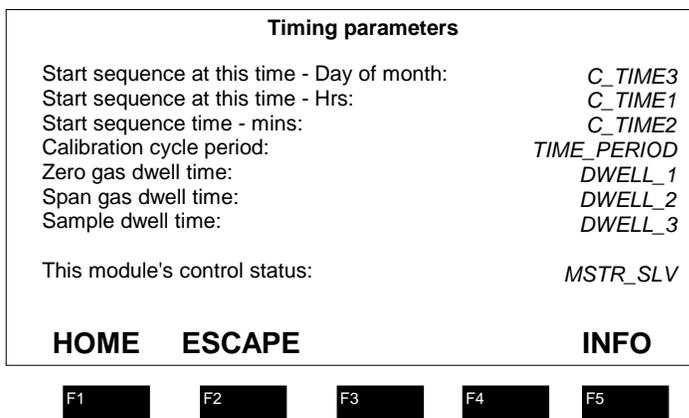


FIGURE 7-2. AUTOCALIBRATION MODULE TIMING PARAMETERS MENU

6. Set the day of the month, and the time of day to start the calibration sequence. The unit will automatically calibrate thereafter at a suitable period set below. Make sure you have chosen a day and time in the future! Otherwise it will wait a month.
7. Set the calibration cycle period. This is the length of time it will wait between calibrations. 24 hours is traditional, but it can be programmed to 255 hours. You can set it to zero at this period, but to span only every so many zeros, see below.
8. Set the zero gas dwell time. It should be long enough that the analyzer reaches a good stable zero point. If in doubt make it longer.
9. Set the span gas dwell time. This has to be long enough for the analyzer to become stable at the span point. This time is normally shorter than the zero time.
10. Set the sample gas dwell time. This is the time it will wait after its last span before releasing the "In Calibration signal" (either the relay or the PROCESS variable). This time should be long enough to allow the reading to get to within its error tolerance of the actual reading, normally shorter than the other two times.
11. Set the control status. This module can be slaved to another Autocalibration module, or it can be a master for a group of two or more such modules, or it can be independent of them. If it is a master, it will make all the other slaves start a calibration when this one does: if a slave it will wait until it is told to calibrate before doing so. If independent it will ignore any other Autocalibration modules and calibrate on its own sequence as setup above.

Note

Only the start time is common to master/slave groups. Because of the differing times taken by the analyzer modules over their zero and span functions, the spans and the end times will probably not occur simultaneously. This means that in general you cannot use a single span gas valve for multiple analyzers when using multiple single-Autocalibration modules. Use the system Autocalibration module instead.

In the Timing parameters screen, the following should be considered: If Start sequence at this time - Day of month is 0, calibration will occur every day and If Calibration cycle period is 0, auto cal is disabled.

ZERO AND SPAN OPTIONS

1. Press the left arrow key to get back into the Autocalibration module setup screen.
2. Select Valve control parameters...
3. Select Zero gas valve...

| Zero gas valve | | | | |
|---|---------------|-------------|----|----|
| Operates on ranges as selected in the analyzer. | | | | |
| Operation performed: | SV_OP_5 | | | |
| Current status: | CALSTATA | | | |
| HOME | ESCAPE | INFO | | |
| F1 | F2 | F3 | F4 | F5 |

FIGURE 7-3. TYPICAL GAS VALVE CONTROL MENU

Edit *Operation performed*; this may be CAL or QC Check. The former causes the analyzer to do a zero, whereas the latter simply flows gas but does not cause the analyzer to do a zero. Normally this is left as CAL!

The next line shows the current status of the system.

Press the left arrow key, and then select *Span valve 1...*

Edit the analyzer range to be used on this span gas.

Edit the operation to be performed: Cal, QC check, or disabled (to skip this value)

Press the NEXT button to go directly to the Span valve 2 screen, and continue until all are setup as desired.

GENERAL FUNCTIONS

1. From the Autocalibration module setup screen, select *General parameters...*

| General parameters | |
|-------------------------------|---------------|
| Timed function: | CAL_OR_QC1 |
| Zero checks per span checks: | MISC_INT1 |
| Input line control: | ILINE_CNTRL |
| | |
| This module's control status: | MSTR_SLV |
| | |
| HOME | ESCAPE |
| | |
| INFO | |
| | |
| F1 | F2 |
| F3 | F4 |
| F5 | |

FIGURE 7-4. GENERAL VALVE PARAMETERS MENU

2. Edit the *Timed function:* line. This may be CHECK, or CAL. If set to CHECK, no zero or span will be performed automatically, the gases will flow but no commands will be given to the analyzers to zero or span, no matter how the zero and span valve screens have been configured. If set to CAL, those zero and span valve screens will control the operation.
3. Set the *Zero checks per span checks:* as desired. If set to 1, the module will do the span functions every time it does the zero functions. If set to another number, it will count zeros and only do a span once it has done the desired number of zeros. This saves on span gas.

Edit *Input line control:* to enable or disable the operation of the discrete input lines. If enabled, a contact closure can initiate a calibration sequence.

Set the master/slave/independent status here also.

For analog output calibration, see the Analog I/O module description in section 6.

7.3 SINGLE ANALYZER ANALOG AUTOCAL I/O MODULE OPERATION

INITIALIZING A CALIBRATION

There are three ways to initiate a calibration sequence:

- Let the timer do it automatically.
- Make a suitable contact closure with the Input line control enabled.
- Enter the Calibration initiation screens.

The first two have already been described. To do the last one, read on.

You can either start an automatic calibration, or you can force the system to behave as you want through the manual calibration screen. In either screen you can watch the operation.

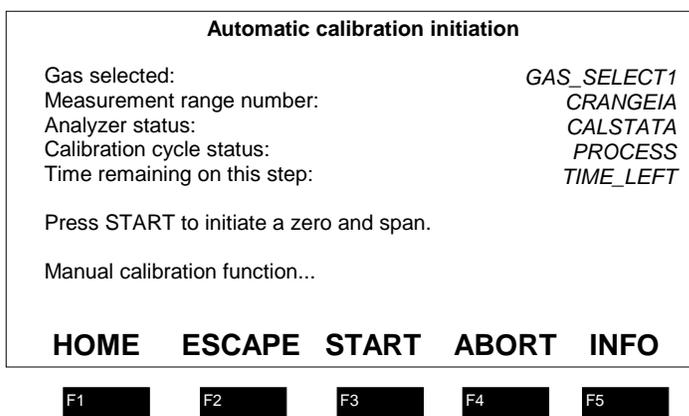


FIGURE 7-5. AUTOMATIC CALIBRATION MENU

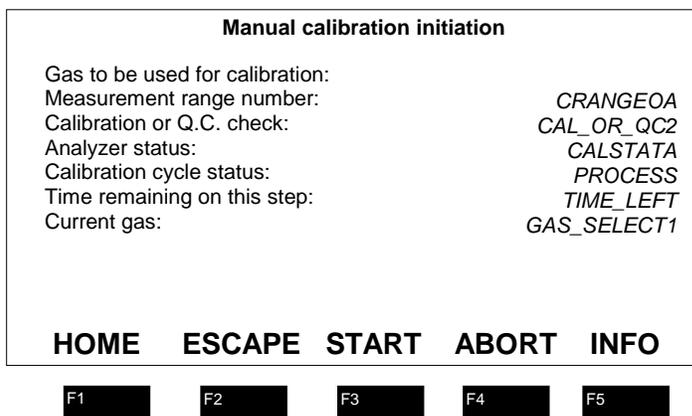
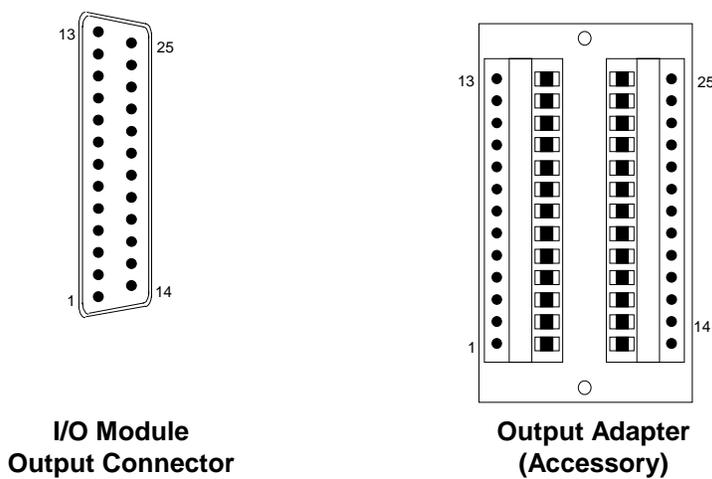


FIGURE 7-6 MANUAL CALIBRATION MENU

These screens are accessible either through the *Auxiliary module setup...* screen or through *Auxiliary module controls...* under *Expert setup and controls...*

Enter the *Automatic calibration initiation* screen, and press START. You can abort the sequence by pressing ABORT, and you can cut short the resultant sample purge time by pressing ABORT a second time.

To make the system perform a particular operation such as zeroing or spanning, and thus avoiding the normal sequence, enter *Manual calibration*. Select the operation desired, and the gas source desired, and press START as above.



PIN ASSIGNMENTS

| | | | |
|----|-----------------------------|----|-------------------|
| 1 | Analog Current Output | 14 | SPST Relay 4 (NO) |
| 2 | Analog Voltage Output | 15 | SPST Relay 5 (NO) |
| 3 | Analog Return for Pins 1, 2 | 16 | SPST Relay 6 (NO) |
| 4 | Analog Chassis Ground | 17 | SPST Common |
| 5 | SPDT Relay 1 (NC) | 18 | SPST Relay 7 (NO) |
| 6 | SPDT Relay 1 (C) | 19 | Digital Input 1 |
| 7 | SPDT Relay 1 (NO) | 20 | Digital Input 2 |
| 8 | SPDT Relay 2 (NC) | 21 | Digital Input 3 |
| 9 | SPDT Relay 2 (C) | 22 | Digital Input 4 |
| 10 | SPDT Relay 2 (NO) | 23 | Digital Input 5 |
| 11 | SPDT Relay 2 (NC) | 24 | Digital Input 6 |
| 12 | SPDT Relay 2 (C) | 25 | Digital Common |
| 13 | SPDT Relay 2 (NO) | | |

FIGURE 7-7. OUTPUT CONNECTOR/ADAPTER PIN ASSIGNMENTS

NOTES

8 SYSTEM AUTO CALIBRATION I/O MODULE

8.1 SYSTEM AUTO CALIBRATION I/O MODULE DESCRIPTION

See the Introduction for information that applies to all I/O Modules.

The System Auto Calibration I/O Module allows the user to automatically calibrate up to four Analyzer Modules at once. A typical application would be a CEMS-type calibration for all Analyzer Modules at once, in sequence or in varied combinations.

Four calibration cycles (software configurable) can be executed:

- Manually-initiated zero cycle
- Manually-initiated span cycle
- Manually-initiated auto calibration cycle (zero and up to four span functions)
- Time-initiated auto calibration cycle (based on the network's clock)

Up to four span solenoid valves and one zero solenoid valve (customer supplied) can be triggered at set time intervals. The frequency and duration of the calibration cycle is software programmable, allowing many varied sequences, a few of which follow:

- **zero** x times, then **span**
- zero, then span
- **zero**, **span**, then check on a **midpoint**

Four SPST and two SPDT relays are used to drive solenoid valves that control the flow of zero and span calibration gases to the Analyzer Modules. The seventh relay indicates an in-calibration condition on the network. Here are the relay output definitions:

- **Relay 1** - sample bypass: closed when the sample should not be flowing through the Analyzer Module.
- **Relay 2** - zero gas: closed when the zero gas should be flowing.
- **Relay 3** - calibration in progress: closed when any zero, span or calibration cycle is being executed.
- **Relay 4** - span gas 1: closed when span gas 1 should be flowing.
- **Relay 5** - span gas 2: closed when span gas 2 should be flowing.

- **Relay 6** - span gas 3: closed when span gas 3 should be flowing.
- **Relay 7** - span gas 4: closed when span gas 4 should be flowing.

The System Auto Cal Module has six digital input lines for remotely initiated calibration. The function of each line is the following:

Line 1 - do zero calibration on current range as setup in the Analyzer Module

Line 2 - currently unused

Line 3 - complete up to four (4) cycles, as programmed

Line 4 - local/remote selection: 0 = local, 1 = remote (used to set the dwell times for gases)

Line 5 - currently unused

Line 6 - Calibration or QC check: 0 = as setup in the Auto Cal Module, 1 = QC check only

After calibration, the output signal is then corrected for zero and span. The System Auto Cal I/O does not provide an analog signal output. (See for a complete list of functions.)

| ITEM | FUNCTION | NOTES |
|---------------|--------------------------------------|---------------------|
| Output | None | No output available |
| Alarm relay 1 | Calibration in progress | SPDT |
| Alarm relay 2 | Calibration gas / sample gas | SPDT |
| Alarm relay 3 | Zero gas valve | SPDT |
| Alarm relay 4 | Span gas valve 1 | SPST |
| Alarm relay 5 | Span gas valve 2 | SPST |
| Alarm relay 6 | Span gas valve 3 | SPST |
| Alarm relay 7 | Span gas valve 4 | SPST |
| Input line 1 | Perform a zero cycle | |
| Input line 2 | Unused | |
| Input line 3 | Perform a complete calibration cycle | |
| Input line 4 | Local / remote timing selection | |
| Input line 5 | Unused | |
| Input line 6 | Calibration / Check selection | |

TABLE 8-1. AVAILABLE FUNCTIONS - SYSTEM AUTOCALIBRATION I/O MODULE V2.2

8.2 SYSTEM AUTO CALIBRATION I/O MODULE INSTALLATION

If this I/O 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 are operational.

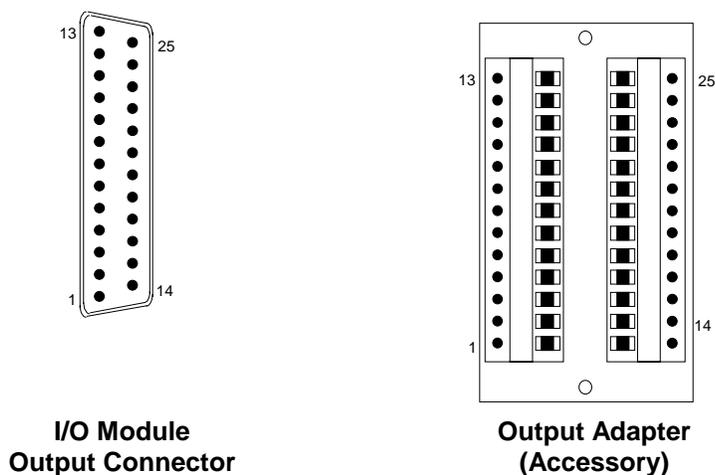
To install this I/O Module, follow general installation guidelines in Section 2 and then bind each Analyzer Module to the System Auto Cal I/O Module. Do this through each Analyzer Module's menu structure. See the binding section of Section 2 for details.

Configure System Auto Cal parameters as follows:

1. Enter the System Auto Cal Module menu structure by making selections in the following path: *Main Menu*, *Expert Controls and Setup* menu, *Auxiliary Module Controls* or *Auxiliary Module Setup* menus, and [choose] System Auto Cal [module].
2. In the *Auxiliary Module Controls* menu and subsequent submenus, set parameters relative to calibration gas selection and calibration mode (local/remote/external). Local and remote selections allow the operator to switch between a local calibration gas injection point and a remote one. This choice sets the dwell time according to the distance that the calibration gas must travel. The external selection allows the use of an external digital signal carried by digital line 4 (for instance, from a simple front panel switch) to quickly set either local or remote mode.
3. In the *Auxiliary Module Setup* menu and subsequent submenus, set additional parameters such as sequencing cycles, valve control for zero and span gases, analyzer identification and range upper/lower limits, and zero vs. span check ratio.

Note

In the Timing parameters screen, the following should be considered: If Start sequence at this time - Day of month is 0, calibration will occur every day and If Calibration cycle period is 0, auto cal is disabled.



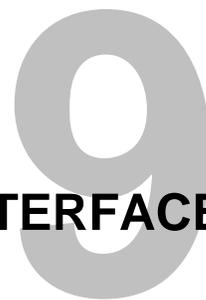
PIN ASSIGNMENTS

| | | | |
|----|-----------------------------|----|-------------------|
| 1 | Analog Current Output | 14 | SPST Relay 4 (NO) |
| 2 | Analog Voltage Output | 15 | SPST Relay 5 (NO) |
| 3 | Analog Return for Pins 1, 2 | 16 | SPST Relay 6 (NO) |
| 4 | Analog Chassis Ground | 17 | SPST Common |
| 5 | SPDT Relay 1 (NC) | 18 | SPST Relay 7 (NO) |
| 6 | SPDT Relay 1 (C) | 19 | Digital Input 1 |
| 7 | SPDT Relay 1 (NO) | 20 | Digital Input 2 |
| 8 | SPDT Relay 2 (NC) | 21 | Digital Input 3 |
| 9 | SPDT Relay 2 (C) | 22 | Digital Input 4 |
| 10 | SPDT Relay 2 (NO) | 23 | Digital Input 5 |
| 11 | SPDT Relay 2 (NC) | 24 | Digital Input 6 |
| 12 | SPDT Relay 2 (C) | 25 | Digital Common |
| 13 | SPDT Relay 2 (NO) | | |

Note Analog outputs are not supported on the System Autocalibration I/O module.

FIGURE 8-1. OUTPUT CONNECTOR/ADAPTER PIN ASSIGNMENTS

EXCEL-BASED PC INTERFACE



9.1 EXCEL-BASED PC INTERFACE DESCRIPTION

NGA 2000 PC Interface packages consist of software and hardware elements that allow communication between NGA components and a personal computer (PC). These packages allow the user bi-directional or read-only communication with commercially available software or Rosemount operating software for the PC Workstation package.

The Excel-based PC Interface is a package that uses Microsoft Corporation's Excel spreadsheet software for its interface functionality. It has bi-directional capabilities (i.e., it can place as well as read data on the network).

The PC Interface addresses the network through the network port (the I/O panel labeled LON MODULE, which is usually located in the I/O slot nearest to the Analyzer Module opening in the Platform's back panel), and achieve data transfer through Echelon's LONWORKS communication protocol.

PC Interfaces have access to all network variables. Due to its bi-directional nature and based on the power of the Excel software, the Excel-based PC Interface can carry out many standard I/O Module functions like setting alarms and triggering calibration functions.

Through Excel's functionality, you can create custom screens that display data in groupings specific to your application.

9.2 EXCEL-BASED PC INTERFACE GENERAL REQUIREMENTS

PC Interface Packages support operation of the complete line of NGA 2000 products including all of the analyzer modules, and it also allows reading of Platform and I/O module variables.

It does not support operation with non-Rosemount Echelon based devices; however the Rosemount DDE server itself does emulate the operation of the Echelon DDE server, allowing upgrading systems designed around the latter.

9.3 EXCEL-BASED PC INTERFACE SOFTWARE REQUIREMENTS

PC Interfaces require Microsoft MS-DOS V5.0 or higher, Windows V3.1 or 95, and Excel V5.0 (all supplied by customer). Note it does NOT support Windows NT™!

PC Interfaces also require the Rosemount DDE Server driver software, the Serial LONTALK Adapter (SLTA) driver (or the single channel PCLTA and driver) (all supplied by Rosemount Analytical).

9.4 EXCEL-BASED PC INTERFACE HARDWARE REQUIREMENTS

The minimum PC hardware required to support this package consists of an IBM compatible, 25 MHz 486 PC with 4 MB RAM, a 60 MB hard drive (all supplied by customer) and one available COM port. For optimal performance, 8 MB RAM and 100 MB of hard drive space is preferable. PC Interface software occupies up to 10 MB of hard drive space. Lengthy Excel logging spreadsheets can easily occupy many tens of megabytes.

The LONWORKS gateway hardware is an Echelon Model 73000 Serial LONTALK Adapter (SLTA). This device provides communications between the NGA digital network to the PC.

An alternative device is the Echelon PCLTA ISA bus internal LONWORKS adapter.

A router device, the Echelon Model 71000 Router, is required when more than one NGA Platform is interfaced to a single PC (one router for each Platform). This will eliminate conflicts with node assignments between analyzer modules and their respective Platforms. This device requires the use of some specialized software which is available from Rosemount (MAKE_API.EXE and SET_LOCN.EXE).

9.5 EXCEL-BASED PC INTERFACE SOFTWARE PRODUCT SPECIFICATIONS

The Microsoft Excel Spreadsheet Start-up Kit supports NGA 2000 analyzers in this way:

- Allows access to all NGA 2000 network variables
- Updates variable displays
- Provides basic trending graphics
- Archives variable data
- Prints reports

- Extracts internally logged data within each analyzer module
- Provides alternative configurations for analyzers

This kit includes four example files that the user can copy to create customized worksheets. The four example files include:

- NGALOG.XLS - NGA data-logging worksheet that allows variable data collection and averaging for a user-selectable time duration
- NGACHECK.XLS - NGA Analyzer Module diagnostic worksheet that depicts detailed analyzer module diagnostics
- NGAPARM.XLS - NGA Analyzer module parameter set control worksheet that allows loading different sets of configuration parameters into analyzers
- NGATREND.XLS - NGA internal datalog extraction spreadsheet that extracts 24 hours of 15 minute averaged data from an analyzer.

9.6 PC INTERFACE PACKAGE

The Excel-based PC Interface package is comprised of the following:

- P/N 903659 - Echelon Model 73000 Serial LONTALK Adapter (SLTA) kit
- P/N 903661 - 6-foot, 9-pin AT serial cable
- P/N 657176 - Rosemount Analytical NGA Database Setup diskette
- P/N 657177 - Rosemount Analytical Excel Spreadsheet Start-up Kit diskette
- Complete NGA analyzer module variable tag name library
- P/N 903660 - Echelon Model 71000 Router (optional)

9.7 EXCEL-BASED PC INTERFACE INSTALLATION

Carefully examine all shipping cartons and their contents for signs of damage. Immediately notify the shipping carrier if the cartons or contents are damaged. Retain the cartons and packing material until all components are operational.

The Excel-based PC Interface package comes with its own manual. The following instructions are shortened for this manual, and are provided for reference only.

To install the Excel-based PC Interface package, do the following:

1. Start Microsoft Windows.
2. Install the DDE server program. Running Windows, insert the first disk, and enter File |Run... in the program manager. Enter "a:setup", and press OK. Answer as desired to the prompts; if the default selections are chosen, the program will set itself up in a directory called "NGASUITE". Under this directory will be a "DOCS" and an "EXAMPLES" directory. Under the latter will be an "EXCEL" directory.

Note

The SLTA's PC communications setting is normally COM1. Some PCs assign COM1 to a mouse or other pointing device. If this is the case, the user must manually change the following item in the PCs CONFIG.SYS file to reflect another available COM port (typically COM2):

DEVICE=C:\ECHELON\BIN\LDVSLTA.SYS /pn /d1 /a

where /pn is the option switch that determines the device's COM port, n being the port number. Valid port numbers are 1 through 4. For additional information, refer to the SLTA instruction manual. Using an editing software, change the CONFIG.SYS file to an appropriate setting.

3. Exit WINDOWS and reboot the PC.
4. Re-enter Windows, and double click on the DDE server icon. The server will start to interrogate the network in the same manner as the control module, and build itself a database.
5. Depending on PC microprocessor speed (e.g., 386, 486, 25 MHz, or 100 MHz) and the number of nodes on the NGA 2000 network, this could require as little as 2 minutes for a small system or as much as 10 minutes for a large system.
6. When it has finished, the DDE server will minimize itself. If desired, open it by double clicking on its icon at the bottom of the screen, and click on File in it. Select Nodelist... to see which nodes were found.
7. If desired, edit the node location or TAG. If you change the TAG, the Excel spreadsheets (which use the TAG to identify analyzers) will not work, so exit the DDE server and restart it to refresh the now changed database.
8. Start the Microsoft Excel program.
9. Open the Excel example worksheet file: **NGALOG.XLS** in the EXCEL directory under EXAMPLES.
10. Press the "Record Data" button on the Variable Select sheet. Answer all the prompts as desired.
11. Open the other Excel example worksheet, **NGACHECK.XLS**, **NGAPARMS.XLS** and **NGATREND.XLS**, found in the EXCEL directory. Press the "Analyze Network" button on these, and follow the directions. Save these files under different names as desired.

Note

The macros that operate these spreadsheets are hidden. Unhide them by selecting Format | Sheet | Unhide. The macros are written in Visual Basic for Applications™, and may be modified or copied as desired.

Save the files as appropriate at the end of the Excel session. The Excel-based PC Interface package is fully functional.

9.8 NGA VARIABLE LIBRARY

The complete NGA Reference Manual that identifies all variable tag names by description, units and variable type is provided as a separate document in the PC Interface package. Use these variables in the linked Excel spreadsheets to create application-specific screens and functions.

Seven types of variables can be used in the Excel spreadsheets. They are as follows:

| TYPE | DEFINITION |
|----------------------|--|
| Floating Point | Accurate number value with decimal point and significant figures. All primary and secondary variables are this type |
| Floating Point Array | Up to 7 accurate numbers with decimal point and significant figures packaged in an array and separated by commas |
| Integer | Integer value (0 to 65,535) |
| Integer Array | Up to 10 integers packaged in an array and separated by commas |
| Enumerated | Integer value which equates to a pre-determined phrase within the NGA phraseology. Enable/ disable messages and certain status variables are this type |
| Enumerated Array | Up to 10 enumerated variables packaged in an array and separated by commas |
| String | Alphanumeric value that contains up to 31 characters. Manufacturing dates, serial numbers and service information are this type. |

TABLE 9-1. VARIABLES FOR USE IN EXCEL SPREADSHEETS

9.9 EXCEL-BASED PC INTERFACE MULTIPLE PLATFORM SYSTEMS

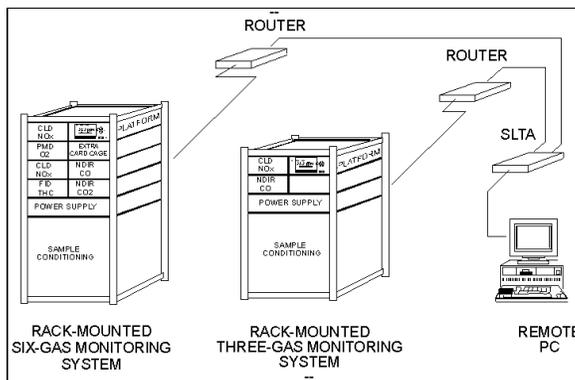


FIGURE 9-1. USING THE PC INTERFACE WITH MULTIPLE NGA SYSTEMS

See Figure 9-1 for an illustration of how a multiple-Platform system might be configured in conjunction with a PC Interface package.

Note the daisy-chaining function of the Echelon Model 71000 Router, which interconnects with the Platform on one side and both routers and SLTAs on the other.

The router must be configured correctly. The program called MAKE_API.EXE can do this, among other things. Run it in a DOS window, using the switch -R, as in "MAKE_API -R". It will detect and configure any routers present. The program can be interrupted once it has done this.

10

NGA ModBUS

10.1 NGA MODBUS INTRODUCTION

This section explains the operation of the Rosemount implementation of the ModBus Protocol per Modicon document PI-MBUS-300 Rev. E (1993) and Modicon Field Service Bulletin FSB-0984-098 implemented in the NGA product series. This section supplements the NGA product series Instruction Manuals. It is not the scope nor the intent of this section to instruct the user on the effect of accessing the NGA network variables. For that, see the NGA Reference Manual. The intent is however for the reader to gain an understanding of the ModBus implementation in the NGA and “how” to access the network variables. It is assumed that the reader already has some background or general understanding of the ModBus protocol.

The hardware connection required is a straightforward 9-pin Serial cable that can be obtained at any computer store. This connects the serial output on either the SIO card or the LON Serial card to a suitable ModBus host, such as a PC or PLC.

Under *Local I/O setup* under *Expert controls and setup*, *Auxiliary module setup*, set the *Module installed* line to Yes, and then select the *Serial Interface setup*. Make the appropriate selections, not least of which is selecting ModBus as the communication protocol in use!

10.2 NGA MODBUS IMPLEMENTATION

The Rosemount implementation of the ModBus protocol provides a standard form of digital communications for the NGA product series in the RTU mode of transmission. The ModBus protocol provides for the passing of measured and calculated variables, configuration information, and diagnostics in data registers. Data is transferred in these registers as integers, enums, strings, and floating-point values to and from Network Variables (NV).

Note

The ASCII mode is not supported in V2.3.

The following table lists the ModBus functions (commands) implemented in the NGA product series:

| FUNCTION CODE (DECIMAL) | FUNCTION | VARIABLE TYPE | MODBUS NOMENCLATURE |
|----------------------------|----------|---|--------------------------------------|
| 03 | READ | 16 bit Integer 16 bit Enum 16 bit string 16/32 bit float | Read Holding Registers (4xxxx) |
| 04 | READ | Same as FCT 03 | Read Input Registers (3xxxx) |
| 06 | WRITE | Same as FCT 03 | Preset Single Register (4xxxx) |
| 08 | TEST | Echo received info | Loopback test |
| 16 | WRITE | Same as FCT 03 | Preset Multiple Registers (4xxxx) |

TABLE 10-1. NGA MODBUS FUNCTIONS

With these functions, the user may access all network variables in an NGA system. As will be discussed later, the fundamental network variable types are 16 bit Integers, ENUMS, Strings and 16 or 32 bit Floats. The differentiation in the type is included in the address of the register. Briefly, then, to access a particular variable the user would include the Device Address (also discussed later), the register address (which includes the type) and the function code. Also discussed is the use of User Defined register addressing, which allows the user to select registers of interest and assign those registers to a contiguous block of addresses. This function allows the user to customize the placement of important registers and access the information with a single ModBus command.

Note

Throughout this document the \$ is used as a prefix to a hexadecimal number.

10.3 MODBUS ADDRESSING

10.3.1 MODBUS DEVICE ADDRESSING (DA)

The first 8-bits of information of a valid ModBus Query message (following the Start delimiter) is the Device Address of the node. This information is used in conjunction with the Register Address (discussed later) to identify a unique register location. This 8-bits of information allow for a calculated maximum of 256 device addresses. Of these addresses, 248 - 256 are reserved per the MODICON ModBus PROTOCOL REFERENCE GUIDE and \$00 is reserved for broadcasting messages to all of the remaining addressable entities. This leaves valid single device addresses as 1 - 247.

Each subnode within the system is considered an entity and is further described as part of a node - subnode pair. For example if two subnodes (0, 1) exist on node 5, they would be described as node 5 subnode 0, and node 5 subnode 1. As another example, for a single subnode existing on node 3, it would be described as node 3 subnode 0.

This node - subnode combination is encoded to form the Device Address. The encoding scheme is incremental at initial boot time and is based upon the order in which each node is recognized by the Control Module. The node - subnode (entity) assignment process consists of building a table in the node in which the ModBus port resides. The table includes the Neuron ID and Program ID (NPID) of each node and the Device Address to which it is assigned. In addition, each subnode within that node is added to that address to complete the Device Address for the node - subnode pair. The two types of nodes currently capable of being accessed as a ModBus port are the Control Module (CM) and any of the Analyzer Modules (AM).

In addition, to allow the user some means of assigning the Devices Address range, a menu selection will be available to select an offset called the Base Device Address. The final value of the Device Address assigned to each entity will be as an offset from this value incrementally. The default value of this variable is 208 (\$D0). The value of 208 was set to allow the user to operate the NGA system with the default device address unchanged and leave enough valid addresses (209 - 247) available for assignment by the system.

The Device Address assignment process of a CM is as follows:

| | |
|---|---------------------------------------|
| Power up Re-boot (clean database) | |
| Self Recognition | NPID / DA = X + \$00* |
| Different Node Recognition | NPID / DA = X + \$01 |
| Subnode \$0 on this Node | NPID / DA = X + \$01 + \$0 = X + \$01 |
| Subnode \$1 on this Node | NPID / DA = X + \$01 + \$1 = X + \$02 |
| Different Node Recognition | NPID / DA = X + \$03 |
| Subnode \$0 on this Node | NPID / DA = X + \$03 + \$0 = X + \$03 |
| Continue until all Nodes are recognized | |

TABLE 10-2. EVENT TABLE ASSIGNMENT

X = the value of the Base Device Address. The Base Device Address is limited to values the range of 1 - 208.

Note

DA \$00 is reserved as a broadcast address in which all nodes are being addressed. The Base Device Address has a lower limit of 1 and an upper limit of 208 (decimal).

10.3.2 MODBUS REGISTER ADDRESSING

For each analyzer node there is a list of Network Variables (NV) that are used to pass information about the analysis being performed. Accessing and/or manipulating these NV's via the serial port is ultimately the goal of the ModBus implementation. Each of these variables are assigned a ModBus address that is unique for that variable, node - subnode (entity). The assignment of these NV's to ModBus addresses is automatic and occurs at initialization. In addition there is a range of ModBus Addresses reserved for user definition, whereby the user may assign any of the NV's to these addresses in any order that is useful. This function allows the user to assign only those NV's of interest to a sequential block of addresses making it possible to access the block with a single ModBus request.

The NV's are contained in five types of data registers. The five types of data registers currently supported on the NGA product series are 16 bit Integers, 16 bit ENUMS, 16 Strings, and 32 bit Floats. Furthermore, the 32 bit floats are accessible as two 16 bit registers or a single 32 bit register. It is also possible to access part of a float as a single 16 bit register, but it is not advised.

ModBus defines registers as input 3xxxx or output 4xxxx. The NGA implementation does not distinguish between inputs and outputs, function codes as they apply to numeric values refer to the same data registers. For example, a function code of 03 to register 40001 and a function code of 04 to register 3001 would be reading the same NGA ModBus internal register.

The register addresses as later described will not use the prefix 3 or 4 to describe register 3xxxx or 4xxxx. Only the xxxx part will be referenced and the 3 or 4 should be assumed. For example, when a register number of 56 is referenced the ModBus register number is 30056 or 40056.

There is also a group of NV's defined that Must Be Supported (MBS) on each analyzer node. These NV's are a subset of the entire group of NV's available through ModBus, and are given their own range of ModBus Addresses to help identify them. This category of registers are not currently available for assignment to User Defined register addresses. This does not limit the users visibility to any of the network variables as the MBS category is a subset of the entire group of NV's.

The 3 groups of Network Variables are as follows:

- ALL VARIABLE
- MUST BE SUPPORTED
- USER DEFINED

1) “ALL VARIABLE”

The ALL VARIABLE group of registers include all of the Network Variables. They are assigned register addresses, in decimal, as follows:

| | | |
|-------------|-----------------|-----------------------------------|
| 0001 - 0750 | 16 bit Integers | |
| 1001 - 1750 | 16 bit ENUMS | |
| 2001 - 3500 | 16 Strings | (see discussion below on Strings) |
| 4001 - 4750 | 16 bit Floats | (accessed as 2 registers) |
| 5001 - 5750 | 32 bit Floats | |

TABLE 10-3. MODBUS “ALL VARIABLE” ADDRESS TABLE

2) "MUST BE SUPPORTED"

The "MUST BE SUPPORTED" group of registers include a subset of the Network Variables.

They represent a group of variables that are known to be of significance to the customer and are available from each analyzer. A description of the entire list is in the NGA Reference Manual The 'stand alone' Control Module is not required to adhere to this group since it is technically not an analyzer. They are assigned register addresses, in decimal, as in the table following.

| | | |
|-------------|-----------------|-----------------------------------|
| 0751 - 1000 | 16 bit Integers | |
| 1751 - 2000 | 16 bit ENUMS | |
| 3501 - 4000 | 16 Strings | (see discussion below on Strings) |
| 4751 - 5000 | 16 bit Floats | (accessed as 2 registers) |
| 5751 - 6000 | 32 bit Floats | |

TABLE 10-4. "MUST BE SUPPORTED" REGISTER ADDRESSES

3) "USER DEFINED"

The "USER DEFINED" group of registers are assigned by the user. The user may assign any of the registers addresses in the "ALL VARIABLE" group to any of the register addresses in the "USER DEFINED" group. At present, for each node in the system (including the Control Module) a total of 20 USER DEFINED register have been allocated.

The entire register address range, in decimal, is as follows:

7001 - 8000 Any register from the "ALL VARIABLE" group

An example list of ModBus register addresses and their corresponding NV's for a CLD analyzer is as follows:

| MODBUS ADDRESS | NV NAME | VARIABLE TYPE |
|----------------|------------|---------------|
| 0001 | AMFN | INTEGER |
| 1001 | ALARM_LVL | ENUM |
| 2017 | AMHR | STRING |
| 4011 | AMVOLTSWAS | 16 BIT FLOAT |
| 5006 | AMVOLTSWAS | 32 BIT FLOAT |

TABLE 10-5. MODBUS "USER DEFINED" REGISTER ADDRESS EXAMPLE

A Special Note About Accessing Strings

The ModBus protocol is historically used for communications in a PLC driven environment and had little use for ASCII text. In addition the majority of ModBus messages are 16 bit based accesses. To allow traditional ModBus systems visibility to the ASCII text stored in the NGA, STRING accesses are in 16 bit portions. Each 16 bits contains two 8 bit ASCII characters. So, in order to access an entire STRING variable of 32 characters, 16 registers are required. The maximum string variable size in the NGA system is actually 31 characters; however, a single null character is appended to the string for ModBus communications. This also accounts for the larger address range assigned to the string category.

10.4 MODBUS FUNCTION CODE DESCRIPTIONS

10.4.1 FUNCTION 03 (DECIMAL) - READ HOLDING REGISTERS

This function is used to read the value of the Network Variables stored at ModBus registers. Following is an example of a read message and a response.

| FIELD NAME | EXAMPLE DATA (HEX) |
|---------------------|--------------------|
| Device Address | \$D1 |
| Function Code | \$03 |
| Starting Address HI | \$00 |
| Starting Address LO | \$01 |
| No. Of Registers HI | \$00 |
| No. Of Registers LO | \$02 |
| CRC HI | \$xx |
| CRC LO | \$xx |

TABLE 10-6. MODBUS FUNCTION 03 MESSAGE

| FIELD NAME | EXAMPLE DATA (HEX) |
|----------------|--------------------|
| Device Address | \$D1 |
| Function Code | \$03 |
| Byte Count | \$04 |
| Data HI | \$00 |
| Data LO | \$2C |
| Data HI | \$00 |
| Data LO | \$04 |
| CRC HI | \$xx |
| CRC LO | \$xx |

TABLE 10-7. MODBUS FUNCTION 03 RESPONSE FROM THE SLAVE DEVICE

This example shows that two 16 bit Integers at register addresses 40002 and 40003 have values of \$002C and \$0004 respectively.

10.4.2 MODBUS FUNCTION CODE DESCRIPTIONS: FUNCTION 04 (DECIMAL) - READ INPUT REGISTERS

This function is used to read the value of the Network Variables stored at ModBus registers.

Following is an example of a read message and a response.

| FIELD NAME | EXAMPLE DATA (HEX) |
|---------------------|--------------------|
| Device Address | \$D1 |
| Function Code | \$04 |
| Starting Address HI | \$00 |
| Starting Address LO | \$01 |
| No. of Registers HI | \$00 |
| No. of Registers LO | \$01 |
| CRC HI | \$xx |
| CRC LO | \$xx |

TABLE 10-8. MODBUS FUNCTION 04 MESSAGE

| FIELD NAME | EXAMPLE DATA (HEX) |
|----------------|--------------------|
| Device Address | \$D1 |
| Function Code | \$04 |
| Byte Count | \$02 |
| Data HI | \$00 |
| Data LO | \$2C |
| CRC HI | \$xx |
| CRC LO | \$xx |

TABLE 10-9. MODBUS FUNCTION 04 RESPONSE FROM THE SLAVE DEVICE

This example shows that a single 16 bit Integer at register addresses 30002 has a value of \$002C.

10.4.3 MODBUS FUNCTION CODE DESCRIPTIONS: FUNCTION 06 (DECIMAL) - PRESET SINGLE REGISTERS

This function is used to write the value of the Network Variables stored at ModBus registers.

Following is an example of a write message and a response.

| FIELD NAME | EXAMPLE DATA (HEX) |
|---------------------|--------------------|
| Device Address | \$D1 |
| Function Code | \$06 |
| Starting Address HI | \$00 |
| Starting Address LO | \$01 |
| Preset Data HI | \$00 |
| Preset Data LO | \$02 |
| CRC HI | \$xx |
| CRC LO | \$xx |

TABLE 10-10. MODBUS FUNCTION 06 MESSAGE

| FIELD NAME | EXAMPLE DATA (HEX) |
|---------------------|--------------------|
| Device Address | \$D1 |
| Function Code | \$06 |
| Starting Address HI | \$00 |
| Starting Address LO | \$01 |
| Preset Data HI | \$00 |
| Preset Data LO | \$02 |
| CRC HI | \$xx |
| CRC LO | \$xx |

TABLE 10-11. MODBUS FUNCTION 06 RESPONSE FROM THE SLAVE DEVICE

This example shows that the 16 bit Integer at register address 40002 has been set to the value of \$0002.

10.4.4 MODBUS FUNCTION CODE DESCRIPTIONS: FUNCTION 08 (DECIMAL) - LOOPBACK TEST

This function is used to create a virtual loopback in the slave device. It is commonly used as an initial indication of the health of the device to which it is targeted.

Following is an example of a Loopback Test message and a response.

| FIELD NAME | EXAMPLE DATA (HEX) |
|-----------------|--------------------|
| Device Address | \$D1 |
| Function Code | \$08 |
| Sub-function HI | \$00 |
| Sub-function LO | \$00 |
| Data HI | \$A5 |
| Data LO | \$5A |
| CRC HI | \$xx |
| CRC LO | \$xx |

TABLE 10-12. MODBUS FUNCTION 08 MESSAGE

| FIELD NAME | EXAMPLE DATA (HEX) |
|-----------------|--------------------|
| Device Address | \$D1 |
| Function Code | \$08 |
| Sub-function HI | \$00 |
| Sub-function LO | \$00 |
| Data HI | \$A5 |
| Data LO | \$5A |
| CRC HI | \$xx |
| CRC LO | \$xx |

TABLE 10-13. FUNCTION 08 RESPONSE FROM THE SLAVE DEVICE

This example shows that the response to a Loopback Test message is the same as the Loopback Test message itself.

10.4.5 MODBUS FUNCTION CODE DESCRIPTIONS: FUNCTION 16 (DECIMAL) - PRESET MULTIPLE REGISTERS

This function is used to write the value of the Network Variables stored at ModBus registers.

Following is an example of a write message and a response.

| FIELD NAME | EXAMPLE DATA (HEX) |
|---------------------|--------------------|
| Device Address | \$D1 |
| Function Code | \$10 |
| Starting Address HI | \$00 |
| Starting Address LO | \$01 |
| No. of Registers HI | \$00 |
| No. of Registers LO | \$02 |
| CRC HI | \$xx |
| CRC LO | \$xx |

TABLE 10-14. MODBUS FUNCTION 16 MESSAGE

| FIELD NAME | EXAMPLE DATA (HEX) |
|----------------|--------------------|
| Device Address | \$D1 |
| Function Code | \$10 |
| Byte Count | \$04 |
| Data HI | \$00 |
| Data LO | \$2C |
| Data HI | \$00 |
| Data LO | \$04 |
| CRC HI | \$xx |
| CRC LO | \$xx |

TABLE 10-15. MODBUS FUNCTION 16 RESPONSE FROM THE SLAVE DEVICE

This example shows that two 16 bit Integers at register addresses 40002 and 40003 have been set to the values of \$002C and \$0004 respectively.

10.5 MODBUS CONFIGURATION

The ModBus port on the NGA product series must be configured and enabled from the Control Module prior to use.

| MODE | ASCII | RTU |
|-------------------|-------------------------------------|---------------------------------|
| Coding System | Hexadecimal | Binary |
| # of data bits | 7 | 8 |
| Start bits | 1 | 1 |
| Stop bits | 1 or 2 | 1 or 2 |
| Parity | Odd, even, or none | Odd, even, or none |
| Transmission Rate | Up to 1 sec gaps allowed | Continuous stream |
| Error Checking | LRC (Longitudinal Redundancy Check) | CRC (Cyclical Redundancy Check) |

TABLE 10-16. MODBUS ASCII AND RTU COMPARISON

The ModBus protocol supports two modes of transmission, RTU (Remote Terminal Unit) or ASCII (American Standard Code for Information Interchange). **The version implemented in the NGA system supports only the RTU mode.** For reference, a comparison of the two transmission modes is shown in the following table.

In addition to the choice of transmission mode and associated configuration parameters, the communications port must be configured for a transmission speed or baud rate. Allowable baud rates include: 4800, 9600, 19.2k. This must be configured from the Control Module prior to use.

Note

The V2.3 release of ModBus for the NGA supports ONLY the RTU mode.

10.5.1 MODBUS USER DEFINED ADDRESSING

Overview

The NGA ModBus implementation provides the user with a means of customizing the data exchange between ModBus master and slave using User Defined register addressing.

As a matter of convention, the network variables are aligned in alphabetical order. This convention is useful for the internal software procedures, but may not fit the same ordering convention each user might prefer. The User Defined registers may be used to change this situation. The user may assign any of the network variables in the "ALL VARIABLE" category to any of the User Defined registers, in any order that is useful.

Since, the ModBus protocol allows only multiple register access to contiguous registers, if two or more variables need to be accessed that are not in direct sequence, multiple ModBus messages must be sent to access them. However, by assigning the variables of interest to sequential User Defined registers, a single ModBus message may be used to access the entire group of variables.

There are 3 methods of configuring the User Defined registers, all sharing a similar sequence of actions. The 3 methods are:

1. Configure via the front panel menu “ModBus User Defined Variable Assignment”.
2. Configure using ModBus messages to the front panel NETWORK VARIABLES.
3. Configure using ModBus User Defined registers.
4. The sequence of actions for configuring via the front panel menu are:

| ACTION | NETWORK VARIABLE |
|--|------------------|
| Select a User Defined register address | MB_DECADR_UD |
| Set the “Register address action” to ASSIGN. | MB_VU_ASIN |
| Select the Device Address of the variable of interest. | MB_DEVADR |
| Select the register address of the variable of interest. | MB_DECADR_AV |
| Set the “Register address action” to VIEW.* | MB_VU_ASIN |

TABLE 10-17. MODBUS CONFIGURATION VARIABLES

If the user neglects to reset the “Register address action” to VIEW, a time-out feature will reset it in less than a minute.

The sequence of actions for configuring using ModBus messages to the front panel menu NETWORK VARIABLES is:

Write to the same variables in the same order as described for “configuring via the front panel menu” using the ModBus interface and function 16. This would require multiple ModBus messages.

Note

This assumes that the Base Device Address has already been set to its final value.

The sequence of actions for configuring using ModBus User Defined registers is:

Assign the NETWORK VARIABLES listed in the section “configuring via the front panel menu” to a contiguous block of User Defined register addresses. This may be done either via the front panel or by using ModBus messages. The only odd thing about it is that, the registers that are used to configure User Defined registers are the registers that will be assigned to the User Defined registers.

For example, the configuration of a block of User Defined registers beginning at 7030 that will support this operation are as follows:

| USER DEFINED ADDRESS | NETWORK VARIABLE | “ALL VARIABLE” ADDRESS |
|----------------------|------------------|------------------------|
| 7030 | MB_DECADR_AV | 0096 INT |
| 7031 | MB_DECADR_UD | 0097 INT |
| 7032 | MB_DEVADR | 0098 INT |
| 7033 | MB_VU_ASIN | 1013 ENUM |

TABLE 10-18. MODBUS CONFIGURATION VARIABLE ADDRESSES

With the preceding configuration setup it is now possible to assign additional User Defined registers with a single ModBus message. However, in this case, the MB_VU_ASIN value is written as \$AA.

An example of this type of access is as follows:

To assign the AMFN “ALL VARIABLE” register address 0001 on a MFD analyzer, at device address 209 (209 decimal, \$D1 hex) to the ModBus “USER DEFINED” register address of 7001, the following ModBus message would be used:

| MSG FIELD | HEX | DESCRIPTION | NETWORK VARIABLE |
|---------------------|--------|---|------------------|
| Device Address | \$D1 | MFD Device Address | |
| Function | \$10 | 16 (decimal) Preset multiple registers | |
| Starting Address HI | \$1B | Set to the first register address in this | |
| Starting Address LO | \$75 | “USER DEFINED” block | |
| No. of Registers HI | \$00 | Number of registers to access | |
| No. of Registers LO | \$04 | | |
| Byte Count | \$08 | Number of bytes in the Data section | |
| Data | \$0001 | AMFN “ALL VARIABLE” reg. Addr | MB_DECADR_AV |
| | \$1B59 | “USER DEFINED” register address | MB_DECADR_UD |
| | \$00D1 | “Device Address” | MB_DEVADR |
| | \$00AA | Assignment setting | MB_VU_ASIN |

TABLE 10-19. MODBUS ADDRESS ASSIGNMENT EXAMPLE

To un-assign a “USER DEFINED” register address follow the same procedure for assigning a valid “ALL VARIABLE” address but, instead use the invalid address value 0000.

10.5.2 MODBUS CONFIGURATION - FRONT PANEL MENU

The ModBus User Defined register assignment menu is used for the following ModBus features:

- Configuring the Base Device Address
- Assigning ModBus registers from the "ALL VARIABLE" to the "USER DEFINED" categories.

Configuring The Base Device Address

The ModBus Base Device Address is the first ModBus device address of the NGA system. In ModBus terms this is a slave address. The base address is presently assigned to the Control Module, and the subsequent device addresses are assigned incrementally from the base address to any other node-subnode pair in the system. The assignment of NGA Network Variables to ModBus register addresses involves the device address of each node, which is derived from the Base Device Address. In addition, when an assignment to a User Defined register address is made, it also involves the device address. For this reason, it is necessary to CONFIGURE the Base Device Address BEFORE making assignments to User Defined registers. The Default Base Device Address is 208, which is the decimal equivalent of \$D0 (hex). The ModBus system will operate normally if left with the default device address, but it is recommended that the user configure the Base Device Address to some other lower value.

To CONFIGURE the Base Device Address to something other than the default value, select the Base "DEVICE ADDRESS" on the front panel menu "ModBus User Defined Variable Assignment". After selecting it use the arrow keys to scroll the display value to the desired Base Device Address. Then press ENTER.

Once a Base Device Address has been entered that is different from the default, to change it to a different value it must first be reconfigured as the default value of 208 (decimal). After it has been reconfigured as the default value it may again be configured for the new desired value.

Assigning Modbus Registers From The "ALL VARIABLE" To The "USER DEFINED" Categories.

In the ModBus protocol, in order to access multiple registers with a single message, the registers must be in sequence incrementally from each other. However, it is unlikely that the order in which the Network Variables are automatically assigned ModBus registers is exactly the order in which every customer would prefer. The User Defined registers are available to overcome this and allow for multiple register access. The User Defined registers allow the user to assign the register address of any of the Network Variables, to any of the User Defined register addresses. Some of the

Network Variables are assigned as both "ALL VARIABLE" and "MUST BE SUPPORTED" registers, however, only the "ALL VARIABLE" register addresses may be assigned to the User Defined registers. This "re-mapping" of register addresses allows the user to "PICK AND CHOOSE" which Network Variables on which nodes are important and to access them with a single ModBus message.

The assignment process was discussed earlier in the section titled "ModBus User Defined Addressing".

11

LOCAL I/O MODULE

11.1 LOCAL I/O MODULE DESCRIPTION

The Local I/O module, also called an SIO board, is a circuit card that plugs into the rear of the Platform. However unlike the other I/O modules it itself contains no processing power, it merely allows the computer in the Platform to control various I/O functions.

The functions provided are as follows:

- Dual channel analog output
- Optional analog output sub-modules for up to eight channels
- RS-232 or RS-485 optional output sub-modules
- Three programmable relays.

The analog outputs can be assigned to one of many optional readings from any analyzer module connected to the Platform. The relays can be assigned to any of a number of discrete signals from any analyzer module connected to the Platform.

The RS-232 or RS-485 outputs can support either ModBus or AK, and can be used to communicate to any analyzer connected to the Platform.

Menus controlling the operation of the local I/O module can be found under *Expert controls and setup...*, *Auxiliary module setup...*, *Local I/O module...*

Note

V2.2 Platform software supports only the analog output and a limited version of AK on the local I/O module. V2.3 Platform software supports the features mentioned here.

11.2 LOCAL I/O MODULE BINDING

Since the local I/O module is not a LON module as are the other I/O modules and analyzers, it is not bound to the analyzers in the same way.

Instead, tell the Platform that the Local I/O module is installed, and then assign its outputs to the signals desired.

11.3 LOCAL I/O MODULE INSTALLATION

If the Local I/O 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 are operational.

Verify that any optional sub-modules have been installed. These include the RS-232 or RS-485 module, and any additional analog output modules.

To install the Local I/O Module, perform the General Installation Procedure in Section 2.

11.4 LOCAL I/O MODULE SETUP

1. Enter Expert controls and setup...
2. Enter *Auxiliary module setup...*
3. Enter *Local I/O module...*
4. Edit *Module installed* to **Yes**
5. Enter *Analog output setup...*
6. Edit *Output number* to the channel desired
7. Enter *Select source module...*
8. Select the analyzer source for this output channel
9. (The previous menu will automatically appear)
10. Enter *Select Signal...*
11. Select the analyzer signal for this output channel
12. (The previous menu will automatically appear)
13. Setup the output range of the signal as desired

14. Select the type of output desired (0-20mA, 4-20mA, or 0 - 5V)
15. Choose whether to hold the output during calibration
16. Verify that the choices shown on the lower three lines are correct.
17. Press the **ADJUST** key to calibrate this output channel
18. Repeat for any other output channels installed.
19. Press the left arrow key to return to the previous menu
20. Select *Relay output setup...*
21. Go through the same procedure to select the signals desired for each relay (this function is not supported by all modules)
22. Select *Serial interface setup...*
23. Verify the correct transmission settings
24. Select AK or ModBus protocols
25. If using ModBus, Enter *MODBUS User Defined Variable Assignment..*
26. See the chapter on ModBus for further details.

| STANDARD ALARM | FUNCTION |
|--------------------------|--|
| Normal | Shows no other alarm |
| Maintenance request | Indicates a warning alarm |
| Failure | Indicates a failure alarm |
| Calibration in progress | Indicates a bound Autocalibration module is in its calibration sequence |
| Zero in progress | Indicates the analyzer is performing a zero calibration |
| Span in progress | Indicates the analyzer is performing a span calibration |
| Zero failure | Indicates the last zero calibration failed |
| Span failure | Indicates the last span calibration failed |
| Range overflow | Indicates the reading is higher than the current range |
| Range underflow | Indicates the reading is lower than the high limit of the next lower range |
| Flow low | Indicates the flow is less than its low limit |
| Flow high | Indicates the flow is higher than its high limit |
| Concentration limit 1 | Only supported on MLT modules |
| Concentration limit 2 | Only supported on MLT modules |
| Concentration limit 3 | Only supported on MLT modules |
| Concentration limit 4 | Only supported on MLT modules |
| Range 1 | Indicates analyzer is on range 1 |
| Range 2 | Indicates analyzer is on range 2 |
| Range 3 | Indicates analyzer is on range 3 |
| Range 4 | Indicates analyzer is on range 4 |
| Validity | Shows invalid readings, see previous section |
| Failure | Indicates analyzer hardware failure |
| System failure | Indicates loss of communication with one or more LON modules |
| Control status | Indicates remote or local control |
| CLD only - Ozonator out | See CLD manual |
| CLD only - NO/NOx mode | See CLD manual |
| FID only - Purge failure | See FID manual |
| FID only - Flame out | See FID manual |

TABLE 11-1. LOCAL I/O MODULE ALARM FUNCTIONALITY

11.5 LOCAL I/O MODULE CALIBRATION PROCEDURE

Perform the Output signal zero and span calibration procedures as follows:

| Output calibration | |
|----------------------------------|---------------|
| Output number: | 1 |
| Operation mode: | NORMAL |
| Fine adjustment for 0% output: | 4095 |
| Fine adjustment for 100% output: | 10 |
| HOME | ESCAPE |
| BACK | INFO |
| F1 | F2 |
| F3 | F4 |
| F5 | |

FIGURE 11-1. OUTPUT CALIBRATION MENU

1. Select the output channel to calibrate by editing the *Output number:* line.
2. Enter the *Output calibration* menu by making selections in the following path: *Main Menu, Expert controls and setup Menu, Auxiliary module setup Menu, Local I/O setup Menu, Analog Output Setup Menu* and press **ADJUST** softkey.
3. To perform both the zero and span calibration procedures, the operator must use output values obtained from a calibrated digital voltmeter or other sensing device connected to the I/O Module output.
4. In the *Analog Output* Menu, choose the desired current range, depending on output requirements.
5. Measure the output either on the voltage or the current terminals as desired.
6. Choose **Adjust 0V** on the *Operation mode* line.
7. Measure the output voltage and edit the number shown on *Fine adjustment for 0% output:* until the output is zero.
8. Set Operation mode to **Adjust 10V**.
9. Adjust, if necessary, the output value by scrolling the *Fine adjustment for 0% output:* until the output value is 10V (or full scale).
10. Repeat for the other output channels

After completing the span calibration procedure, the operator should recheck and readjust, if necessary, the zero calibration values.

Note

The Local I/O module does not measure its own output signal as does the Analog I/O module.

11.6 LOCAL I/O MODULE TROUBLESHOOTING

No Output From Module

Verify that the module is marked as present in the *Local I/O setup* menu. Verify that the right number of analog output sub-modules are present. Verify that the output is assigned to a real signal from a real analyzer.

No Digital Output

Verify that the serial output sub-module is present. Verify that the module itself is marked as present in the *Local I/O module setup* menu. Verify that the communication settings are correct in the *Serial interface setup* menu. Verify that AK or ModBus is selected in this menu. Make sure that you have a standard serial cable to connect to this module. Verify that the PC (or whatever device is used) serial settings match those of the Local I/O module.

11.7 LOCAL I/O MODULE CONNECTIONS

| PIN | SIGNAL NAME |
|-----|---------------------------------|
| 1 | Voltage output 1 |
| 2 | Current output 1 |
| 3 | Voltage output 2 |
| 4 | Current output 2 |
| 5 | Ground for Voltage output 1 & 2 |
| 6 | Ground for Current output 1 & 2 |
| 7 | Voltage output 3 |
| 8 | Current output 3 |
| 9 | Voltage output 4 |
| 10 | Current output 4 |
| 11 | Ground for Voltage output 3 & 4 |
| 12 | Ground for Current output 3 & 4 |
| 13 | Shield |
| 14 | Voltage output 5 |
| 15 | Current output 5 |
| 16 | Voltage output 6 |
| 17 | Current output 6 |
| 18 | Ground for Voltage output 5 & 6 |
| 19 | Ground for Current output 5 & 6 |
| 20 | Voltage output 7 |
| 21 | Current output 7 |
| 22 | Voltage output 8 |
| 23 | Current output 8 |
| 24 | Ground for Voltage output 7 & 8 |
| 25 | Ground for Current output 7 & 8 |

TABLE 11-2. 25 PIN SUB-D CONNECTOR PIN IDENTIFICATION

| PIN | SIGNAL NAME | |
|-----|--------------|--------------|
| | RS-232 | RS-485 |
| 1 | NC | RxD- Input |
| 2 | RxD Input | RxD+ input |
| 3 | TxD Output | TxD+ Output |
| 4 | NC | TxD- Output |
| 5 | Ground | Shield |
| 6 | Relay 1 NO | Relay 1 NO |
| 7 | Relay 2 NO | Relay 2 NO |
| 8 | Relay 3 NO | Relay 3 NO |
| 9 | Relay common | Relay common |

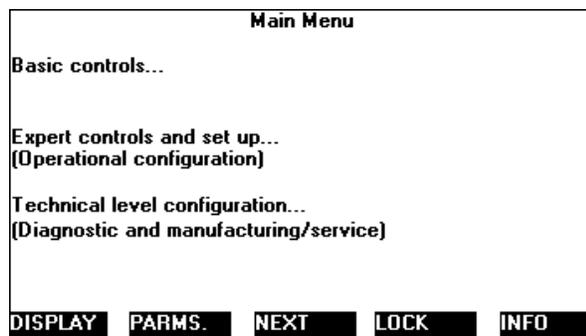
TABLE 11-3. 9 PIN SUB-D CONNECTOR PIN IDENTIFICATION

APPENDIX A. NGA MENU STRUCTURE

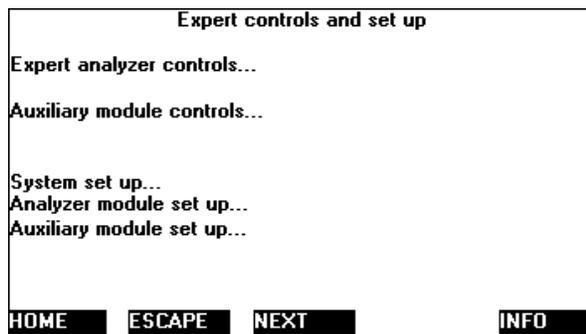
A.1 NGA MENU STRUCTURE INTRODUCTION

This Appendix contains a listing of the menus belonging to the Platform and I/O modules. It also lists the available configuration elements, and where they are to be found.

A.2 NGA CONTROL MODULE MENUS

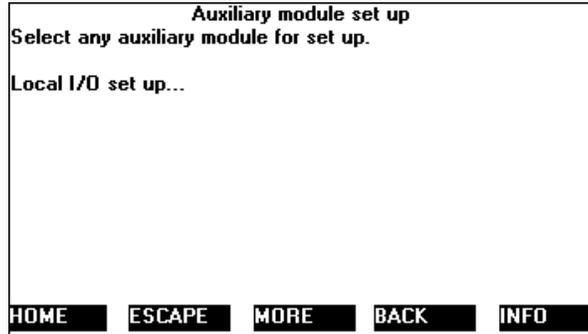


Basic controls... jumps into the Basic controls menu in the relevant analyzer menu structure.



The lines mentioning analyzer features jump into the analyzer module menus, while the auxiliary module lines jump into the I/O module menus via a special menu that allows you to select which I/O module to deal with.

Initiate automatic calibration through the *Auxiliary module controls...* line. SIO menus are to be found under Auxiliary module setup under *Local I/O setup...*



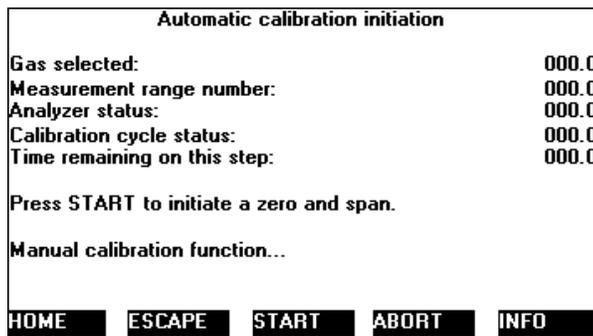
This screen like many similar ones lists I/O modules. Select them with the arrow keys, and a right arrow key or Enter will enter the relevant menu in that module. The example above shows newer modules with slot ID enabled. Modules may be named by the user, so your screen will differ from this.

System setup... leads to a restricted set of control module configuration menus. These are duplicated and expanded in the Technical level configuration branch of the menus.

A.3 I/O MODULE CONTROL SCREENS.

The Analog I/O Module has no active control screen. Both autocalibration modules have such screens however.

The Single autocal module control screen:



Leading to this:

| Manual calibration initiation | |
|---|-------|
| Gas to be used for calibration: | 000.0 |
| Measurement range number: | 000.0 |
| Calibration or Q.C. check: | 000.0 |
| Analyzer status: | 000.0 |
| Calibration cycle status: | 000.0 |
| Time remaining on this step: | 000.0 |
| Current Gas: | 000.0 |
| <p>HOME ESCAPE START ABORT INFO</p> | |

Press **ABORT** to quit the present operation, and press it again to leave the final purging time.

The System Autocalibration Module control screens are similar:

| Automatic calibration initiation | |
|---|-------|
| Gas selected: | 000.0 |
| Calibration mode: | 000.0 |
| Analyzer status: | 000.0 |
| Calibration cycle status: | 000.0 |
| Time remaining on this step: | 000.0 |
| Manual calibration function... | |
| Analyzer calibration status... | |
| <p>HOME ESCAPE START ABORT INFO</p> | |

Leading to this:

| Manual calibration initiation | |
|---|-------|
| Gas to be used for calibration: | 000.0 |
| Calibration mode: | 000.0 |
| Analyzers affected: | 000.0 |
| Calibration or Q.C. check: | 000.0 |
| Analyzer status: | 000.0 |
| Calibration cycle status: | 000.0 |
| Time remaining on this step: | 000.0 |
| Current Gas: | 000.0 |
| Analyzer calibration status... | |
| <p>HOME ESCAPE START ABORT INFO</p> | |

The *Analyzer Calibration status* lines lead to a menu showing how the various analyzers are doing:

| Analyzer Calibration Status | |
|---|-------|
| Calibration cycle status: | 000.0 |
| Time remaining on this step: | 000.0 |
| Current Gas: | 000.0 |
| Analyzer 1 output: | 000.0 |
| Analyzer 1 calibration status: | 000.0 |
| Analyzer 2 output: | 000.0 |
| Analyzer 2 calibration status: | 000.0 |
| Analyzer 3 output: | 000.0 |
| Analyzer 3 calibration status: | 000.0 |
| Analyzer 4 output: | 000.0 |
| Analyzer 4 calibration status: | 000.0 |
| <div style="display: flex; justify-content: space-between;"> HOME ESCAPE INFO </div> | |

A.3.1 ANALOG I/O MODULE CONFIGURATION SCREENS

Analog output parameters allows you to setup how the analog output works. Access *analyzer output module* under the *auxiliary module set up* in the *expert controls and setup* menu.

| Analog output module | |
|---|------------------|
| Analog output parameters... | M: 0, RANGESET |
| Automatic range change parameters... | M: 2, RANGCHNG |
| Input line control... | M: 1, ILINECTRL |
| Alarm conditions... | M: 6, ALFMTBIP |
| Concentration alarm parameters... | M: 34, GENRLYPRM |
| Displayed parameters... | M: 42, DISPLAY |
| Slot position: | SLOTPOSITION |
| IO module ID: | M: 15 |
| <div style="display: flex; justify-content: space-between;"> HOME ESCAPE INFO </div> | |

| Analog output Parameters | |
|---|-------|
| Parameter reported: | 000.0 |
| Voltage or current: | 000.0 |
| Output value on analyzer failure: | 000.0 |
| Output hold on validity: | 000.0 |
| Output hold on maintenance: | 000.0 |
| Output hold on calibration: | 000.0 |
| Output on range: | 000.0 |
| <div style="display: flex; justify-content: space-between;"> HOME ESCAPE INFO </div> | |

This leads to the *Range limits* menu.

| Range List | |
|-------------------------|---------------|
| Range 1 lower limit: | 000.0 |
| Range 1 upper limit: | 000.0 |
| Range 2 lower limit: | 000.0 |
| Range 2 upper limit: | 000.0 |
| Range 3 lower limit: | 000.0 |
| Range 3 upper limit: | 000.0 |
| Range 4 lower limit: | 000.0 |
| Range 4 upper limit: | 000.0 |
| Analyzer minimum range: | 000.0 |
| HOME | ESCAPE |
| | INFO |

Automatic range change parameters allows you to setup the levels at which it will change the analyzer range, and also whether the range change will affect the analyzer or merely change the output scaling of the I/O module without changing the analyzer range at all.

| Automatic range change parameters | |
|------------------------------------|---------------|
| Range change control: | CONTROL |
| If auto, change down at -%: | RNGPAR1 |
| If auto, change up at -%: | RNGPAR2 |
| (Percentage of LOWER range) | |
| Time delay on auto change -secs: | RNGPAR3 |
| Toggle hold off -secs: | RNGPAR4 |
| Output on range: | OP_RANGE |
| (Separates IO range from analyzer) | |
| | M: 5 |
| HOME | ESCAPE |
| | INFO |

Input line control interacts with the analyzer to show what the input digital lines will do. You can select from the available functions, some of which are analyzer specific.

| Input line control | |
|---------------------------|---------------|
| Line 1 analyzer function: | 000.0 |
| Line 2 analyzer function: | 000.0 |
| Line 3 analyzer function: | 000.0 |
| Line 4 analyzer function: | 000.0 |
| Line 5 analyzer function: | 000.0 |
| Line 6 analyzer function: | 000.0 |
| HOME | ESCAPE |
| | INFO |

Alarm conditions sets the operation of the output relays. If they are set to be concentration alarms, the subsequent menu (*Concentration alarm parameters*) applies.

```

Alarm Conditions
Relay 1 trips on:          ALWAYS1
Relay 2 trips on:          ALWAYS2
Relay 3 trips on:          ALWAYS3
Relay 4 trips on:          ALWAYS4
Relay 5 trips on:          ALWAYS5
Relay 6 trips on:          ALWAYS6
Relay 7 trips on:          ALWAYS7
(If used as an automotive remote control module,
relay 3 must be set to Control.)
                                                                    M: F
HOME  ESCAPE  INFO
    
```

```

Concentration alarm parameters
Relay 1 concentration alarm parameters...
Relay 2 concentration alarm parameters...
Relay 3 concentration alarm parameters...
Relay 4 concentration alarm parameters...
Relay 5 concentration alarm parameters...
Relay 6 concentration alarm parameters...
Relay 7 concentration alarm parameters...
HOME  ESCAPE  INFO
    
```

```

Relay 1 concentration alarm parameters
Alarm trip point - absolute ppm:      000.0
Alarm trip point -% range:           000.0
Alarm type:                           000.0
Alarm operation:                      000.0
Trips as % of range or absolute:     000.0
Hysteresis:                           000.0
Delay till alarm activates:           000.0
HOME  ESCAPE  NEXT  LAST  INFO
    
```

Similar menus exist for the other relays.

| Displayed parameters | |
|---|---------|
| First line's parameter: | SYNAME1 |
| Second line's parameter: | SYNAME2 |
| Third line's parameter: | SYNAME3 |
| Fourth line's parameter: | SYNAME4 |
| May be displayed on the appropriate line of the single analyzer display screen. Select whether the IO module or the analyzer module lines are displayed in the control module setup menus. | |
| HOME | ESCAPE |
| | INFO |

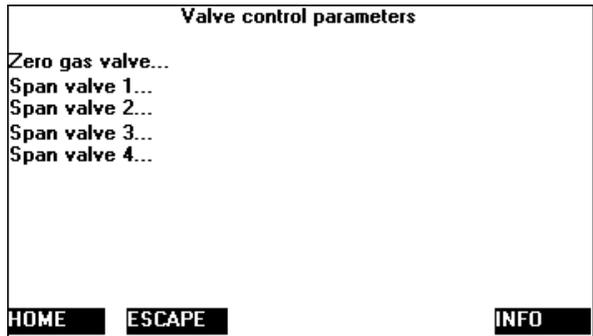
A.3.2 SINGLE AUTOCALIBRATION I/O MODULE CONFIGURATION SCREENS

| Auto Cal Module | |
|---------------------------------------|--------|
| Automatic calibration initiation... | |
| Manual calibration initiation... | |
| Timing parameters... | |
| Valve control parameters... | |
| General parameters... | |
| Number of zeros before the next span: | 000.0 |
| Displayed parameters... | |
| Analog output parameters... | |
| Slot position: | |
| HOME | ESCAPE |
| | INFO |

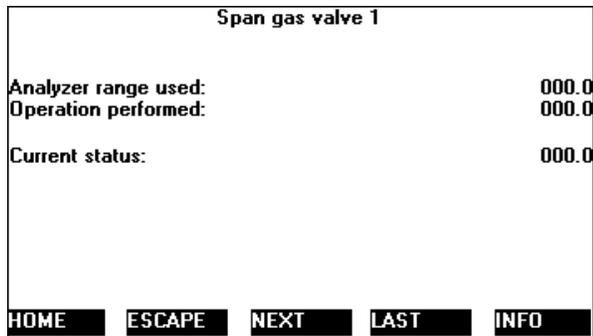
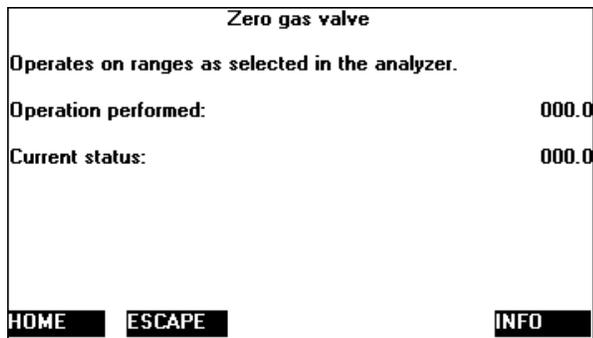
The first two lines lead to the control menus also accessible under *I/O module control*.

Timing parameters allows you to set the duration of the stages, the time of day and interval of the overall calibration cycle; *Valve control parameters* let you set the operation of each valve, and *General parameters* sets certain general functions of the overall calibration cycle.

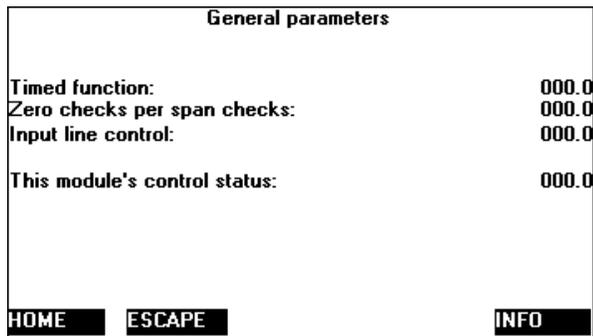
| Timing parameters | |
|---|--------|
| Start sequence at this time - Day of month: | 000.0 |
| Start sequence at this time - Hrs: | 000.0 |
| Start sequence time - mins: | 000.0 |
| Calibration cycle period: | 000.0 |
| Zero gas dwell time: | 000.0 |
| Span gas dwell time: | 000.0 |
| Sample dwell time: | 000.0 |
| This module's control status: | 000.0 |
| HOME | ESCAPE |
| | INFO |



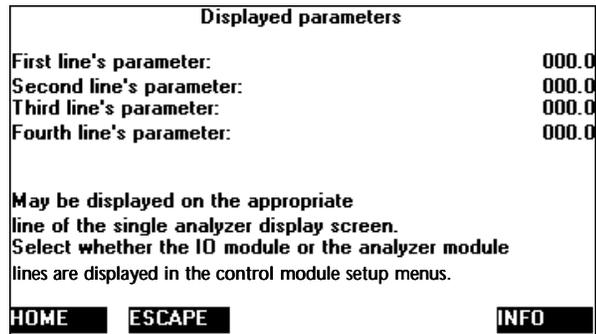
This leads to the *zero gas valve* control and the *span gas valve* control menus:



And back to the *General parameters* menu.

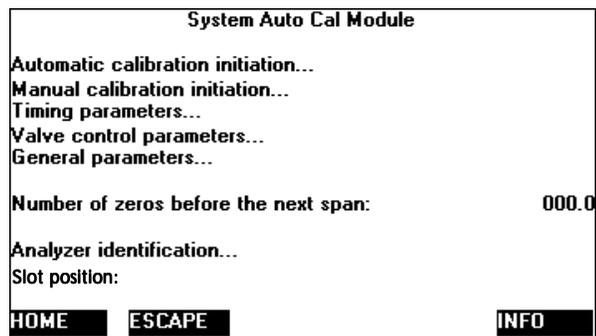


The *Analog output parameters* menu is the same as in the Analog I/O Module, except that it does not allow automatic range control.



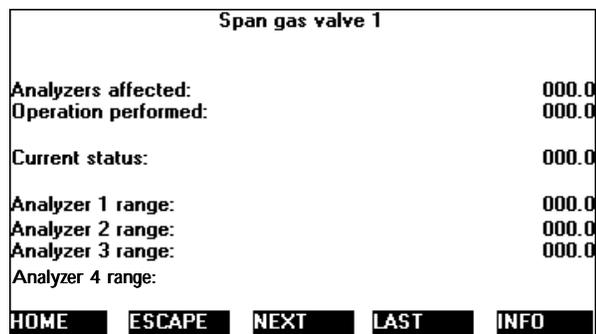
A.3.3 SYSTEM AUTOCALIBRATION I/O MODULE CONFIGURATION SCREENS

This is almost identical to the Single Autocalibration I/O Module. The setup screen is the same:

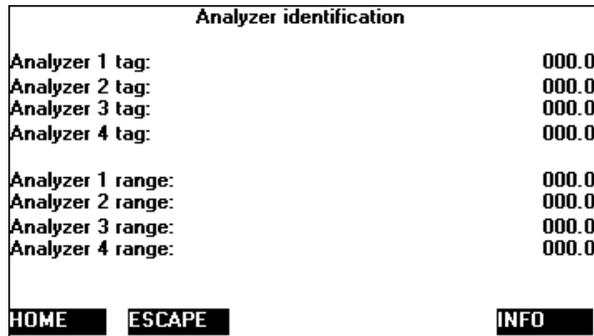


Note the absence of any analog output menu.

The valve control menus differ, since they now control up to four analyzers: a typical one follows.



Analyzer identification allows you to determine which analyzer is referred to as Analyzer 1, etc.



A.3.4 TECHNICAL LEVEL CONFIGURATION SCREENS

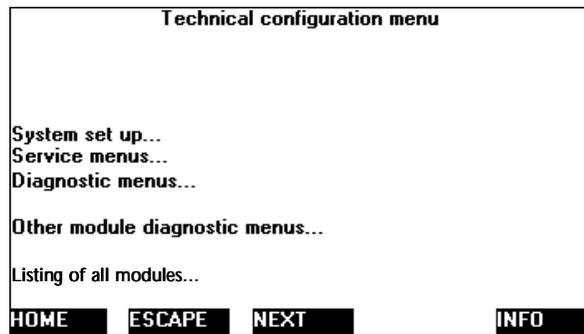
In this menu, *System setup...* leads to a complete set of system functions.

Service menus... leads to service notes and manufacturing data menus.

Diagnostic menus... leads to the analyzer and I/O module diagnostics (the analyzer whose tag is shown on the top of the screen), as well as to the control module software diagnostic screen.

Other module diagnostic menus... provides for future use, presumably allowing for non-NGA module to be used with the NGA system.

Listing of all modules... is a diagnostic feature. It lists all modules found by the control module, no matter how they are bound. Selecting any such module will jump into its diagnostic screen, where among other things you will be able to edit its tag. The other listing menus (other than the binding menus) show only modules bound to the current analyzer module, or that module itself.



SYSTEM SETUP

System Set Up

Main display configuration...
Front panel control...
Date and time...

Module binding...

Security codes...

System reset...
System tag:

HOME **ESCAPE** **INFO**

Main display configuration

Display resolution...

Auxiliary lines...
Units...

Editing controls...

HOME **ESCAPE** **INFO**

Display resolution

Maximum total number of digits: 000.0
Digits after the decimal point: 000.0

HOME **ESCAPE** **INFO**

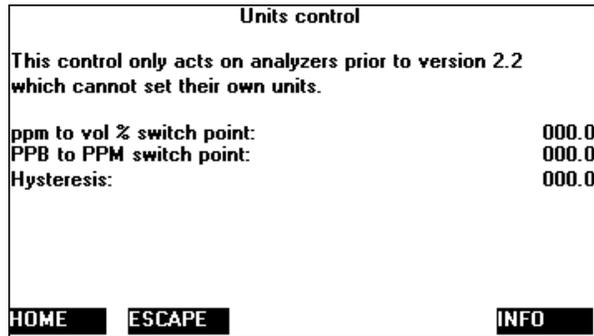
Auxiliary lines

First auxiliary line: 000.0
Second auxiliary line: 000.0
Third auxiliary line: 000.0
Fourth auxiliary line: 000.0

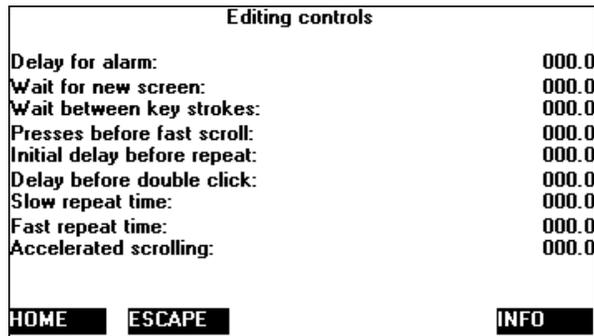
First line source...
Second line source...
Third line source...
Last line source...

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

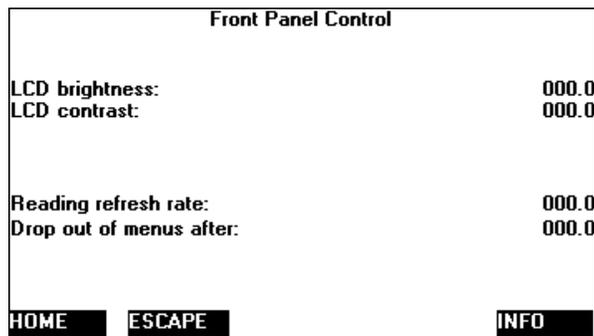
The *First line source...* and similar lines go to selection menus.



This controls the main reading's units for pre-V2.2 analyzers.



This allows customizing the editing functions.



Enter the constituents of the date and time, then press SET.

| Date and Time | |
|------------------------------|--------------------------------------|
| Time display format (am/pm): | 000.0 |
| Network updating: | 000.0 |
| Minutes: | 000.0 |
| Hours: | 000.0 |
| (Entered as 24Hrs format) | |
| Day: | 000.0 |
| Month: | 000.0 |
| Year: | 000.0 |
| Current time: | |
| HOME | ESCAPE SET INFO |

The module binding menu lists analyzers and I/O modules, so that its appearance is unpredictable.

| System Reset | |
|---|---------------------------|
| Are you sure? | |
| Re-initializing will destroy all the binds!!! | |
| System reset! | |
| Re-initialize network! | |
| HOME | ESCAPE INFO |

System reset will reload the control module with updated variable data; re-initializing the network will destroy all the binding information and erase the memory of any missing analyzer or I/O modules.

| Record security codes | |
|---|---|
| Basic level security: | 000.0 |
| Expert level security: | 000.0 |
| Technical level security: | 000.0 |
| Record basic level security code... | |
| Record expert level security code... | |
| Record technical level security code... | |
| HOME | BASIC EXPERT TECH. INFO |

Enable security for any or all of the three branches of the menus, and record a security code for each.

A typical security menu:

Record technical level security code

Press five softkeys in any order to define the code

The actual code is represented by the order in which they are pressed, and shown numerically below.

Press the left arrow key when you are done.

Actual code number:

| | | | | |
|--------|--------|--------|--------|--------|
| ABCDE1 | FGHIK2 | LMNOP3 | QRSTU4 | VWXYZ5 |
|--------|--------|--------|--------|--------|

SERVICE MENUS

```

Service Menu
-----
Manufacturing data...
Service history...

In maintenance since:                000.0
Record security codes...

HOME  ESCAPE  INFO

```

Both the *Manufacturing data...* and *Service history...* lines lead to module selection menus. The *In maintenance since:* line shows how long you have been in the menus. You can also record security codes from here.

```

Control Unit Manufacturing Data
-----
Control unit serial number:          000.0
Manufacturing date code:            000.0
Hardware revision number:           000.0
Software revision number:           000.0

Revision notes...

User tag number:

HOME  ESCAPE  INFO

```

The revision notes line shows the current revision level of software.

```

Control Module Service History
-----
Manufacturing date:                 000.0
In service date:                   000.0

Last service date:                 000.0

List notes...

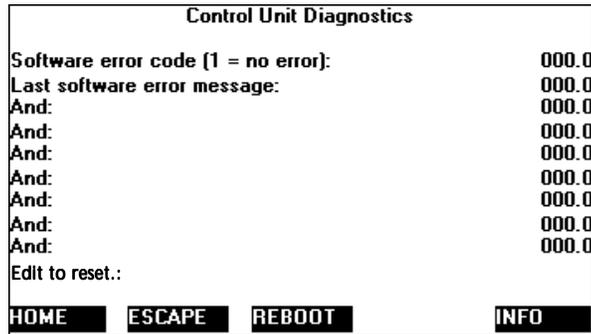
Add service date!

HOME  ESCAPE  INFO

```

The *List notes...* line leads to menus that you may use to record any desired data into.

CONTROL MODULE DIAGNOSTICS



This screen, identical to similar analyzer screens, shows the information provided by the **first** software error to be detected. It will consist of several phrases strung together in an apparently random way. Generally, errors result from excessive network traffic, and are self correcting, but if the system is not working right, reporting the contents of this menu will assist Rosemount Analytical determine what the bug is.

I/O MODULE DIAGNOSTIC SCREENS

The I/O Module diagnostic screens are common to all the I/O Modules, except for the absence of analog output related screens in the System Autocalibration Module.

```

Analog output module

Power supplies...           M: 11, IOPOWER
Analog output...          M: 12, IOANALOG
Relay status...           M: 13, IORELAYSTAT
Digital input lines...    M: 32, INPUTLINES

Slot position:             SLOTPOSITION
Current range:             CRANGE

IO module ID:
M: 14

HOME  ESCAPE  INFO
    
```

```

Analog module power supplies

+15V analog is:           000.0
+15V analog was:          000.0
-15V analog is:           000.0
-15V analog was:          000.0
+5V digital is:           000.0
+5V digital was:          000.0

HOME  ESCAPE  SET  INFO
    
```

```

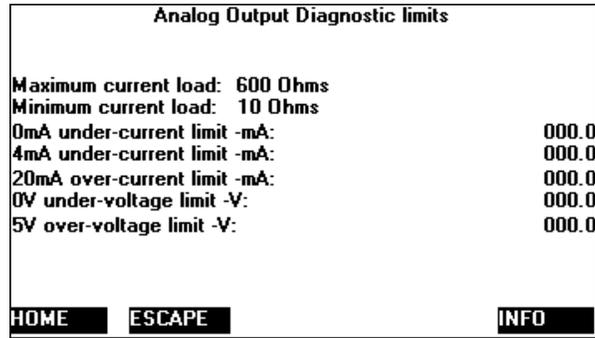
IO Module Analog Output Diagnostics

Theoretical output voltage -V:  IO DIAG 1
Theoretical output current -mA: IO DIAG 2
Measured output voltage -V:     IO DIAG 3
Voltage on current terminals -V: IO DIAG 4
Output load -ohms:              IO DIAG 5
Calculated output current -mA:  IO DIAG 6
Diagnostic limits...            M: 19, IO DIAGSOP LMT
Voltage output calibration...    M: 29, VOLT_CAL
Current output calibration...

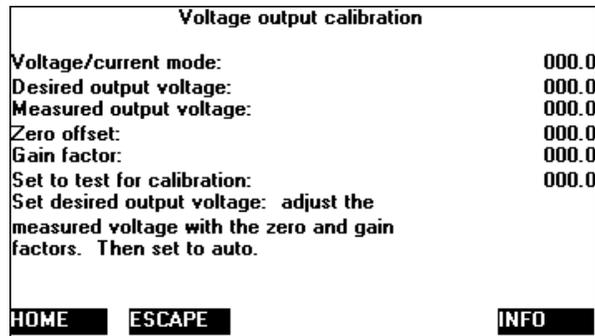
M: 16

HOME  ESCAPE  INFO
    
```

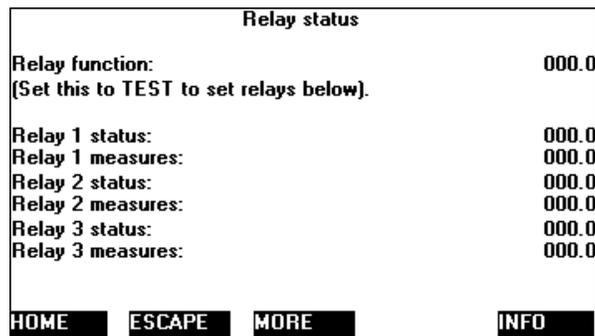
Leading to the Diagnostic limits and Voltage output calibration and Current output calibration menus:



These values limit the range of the output signal.



The *Current output calibration* is similar. Use a DVM to measure the actual current or voltage output, and make its zero and span ends correct. You can only calibrate one output at once, the other will be meaningless.



The relay status can be measured and manually set so as to test the operation of whatever is connected to them. Set *Relay function* to TEST, and then edit the various status lines. After about a minute the Relay function line will reset itself to AUTO and the relays will no longer respond to your input. This saves you from leaving the span gas on for a month!

MORE LEADS TO:

| Relay status | |
|-------------------|-------|
| (SPST relays) | |
| Relay 4 status: | 000.0 |
| Relay 4 measures: | 000.0 |
| Relay 5 status: | 000.0 |
| Relay 5 measures: | 000.0 |
| Relay 6 status: | 000.0 |
| Relay 6 measures: | 000.0 |
| Relay 7 status: | 000.0 |
| Relay 7 measures: | 000.0 |

HOME ESCAPE BACK INFO

The input lines can be monitored also:

| Input line status | |
|--------------------------------------|-------|
| Line 1 status: | 000.0 |
| Line 2 status: | 000.0 |
| Line 3 status: | 000.0 |
| Line 4 status: | 000.0 |
| Line 5 status: | 000.0 |
| Line 6 status: | 000.0 |
| Common range indication and control: | 000.0 |

HOME ESCAPE INFO

The last line shows the presence of the jumpers used to meet the requirement for common range indication and control lines used by some automotive companies.

NOTES

APPENDIX B. USER INTERFACE HELP



USER INTERFACE HELP INSTRUCTIONS

This section provides a means of rapidly finding any desired function or configuration factor in the menu system.

The NGA menu system is necessarily complex due to the wide variety of configuration possibilities available with the NGA architecture.

This section consists of a series of titles describing the function or configuration desired, with a series of menu titles that show the path taken to that function.

The menu selections are sometimes abbreviated; *Basic Controls* is referred to as *Basic* for example, *Expert controls and setup* as *Expert*, and *Technical level as well as Technical*.

MENU ITEMS

| ITEM | PATH | NOTES |
|----------------------------|---|------------|
| Add a service date | Technical - Service menus - Service history - Control module history - Add service date! | |
| Alarm enabling | Technical - Diagnostics - Analyzer module diagnostics - See analyzer | |
| Alarm setting | Expert - Auxiliary module setup - Select Analog output module - Alarm conditions - Concentration alarm parameters | |
| Analyzer specific alarms | Expert - Auxiliary module setup - Select Analog output module - Alarm conditions | v 2.3 only |
| Analyzer calibration setup | Expert - Auxiliary module setup - Select autocalibration module - Valve control parameters | |
| Analyzer diagnostics | Technical - Diagnostic menus - Analyzer module diagnostics | |
| Analyzer specific controls | Expert - Auxiliary module setup - Select Analog output module - Input line control | v 2.3 only |

| ITEM | PATH | NOTES |
|---------------------------------|---|--|
| Automatic Calibration | Expert - Auxiliary module setup - Select autocalibration module | Setup here |
| Automatic calibration start | Expert - Auxiliary module controls - Select autocalibration module – automatic calibration initiation - START | NOT Basic controls! |
| Automatic range change | Expert - Auxiliary module setup - Select Analog output module - Automatic range change parameters | Need an Analog I/O Module |
| Auxiliary line enabling | Technical - System setup - Main display configuration - Auxiliary lines | Choose lines in analyzer and I/O modules too. |
| Auxiliary line source | Technical - System setup - Main display configuration - Auxiliary lines | |
| Binding | Technical - System setup - Module Binding | |
| Calibrate output | Technical - Diagnostic menus - Select I/O Module - Analog output - Voltage output calibration (Current output calibration) | |
| Calibration status | Expert - Auxiliary module setup - Select autocalibration module -Automatic (or Manual) Calibration initiation - (Analyzer calibration status) | |
| Calibration timing | Expert - Auxiliary module setup - Select autocalibration module - Timing parameters | |
| Date and time | Technical - System setup - Date and time | |
| Drop out of menus time delay | Technical - System setup - Front panel control | |
| I/O Module displayed parameters | Expert - Auxiliary module setup - Select Analog output module - Displayed parameters | |
| I/O Module slot position | Expert - Auxiliary module setup - Select Analog output module Also Technical - Listing of all modules. | |
| Key press timing | Technical - System setup - Main display configuration - Editing controls | Be careful! |
| List of detected NGA modules | Technical - Listing of all modules | Jumps from there into their diagnostic screens |
| | | |

| ITEM | PATH | NOTES |
|--|---|--------------------------------|
| Manual calibration start | Expert - Auxiliary module controls - Select autocalibration module - Manual calibration - START | |
| Monitor analyzer calibration | Expert - Auxiliary module setup - Select autocalibration module -Automatic (or Manual) Calibration initiation - (Analyzer calibration status) | Last - system calibration only |
| Output hold | Expert - Auxiliary module setup - Select Analog output module - Analog output parameters | |
| Power supply voltages (I/O) | Technical - Diagnostic menus - Select I/O Module - Power supplies | |
| Record service codes | Technical - Service menus - Service history - Control module history - List notes | |
| Release notes | Technical - Service menus - Manufacturing data - Control module data - Revision notes | |
| Reset system | Technical - System setup - System reset | |
| Resolution of main reading | Technical - System setup - Main display configuration - Display resolution | |
| Screen brightness | Technical - System setup - Front panel control | Not effective in v2.2 |
| Screen contrast | Technical - System setup - Front panel control | |
| Security | Technical - System setup - Security Codes | Set for each type of access. |
| Separate analog output range from analyzer | Expert - Auxiliary module setup - Select Analog output module - Analog output parameters | |
| Service codes | Technical - Service menus - Service history - Control module history - Info - Service code list | |
| Set automatic range change | Expert - Auxiliary module setup - Select Analog output module - Automatic range change parameters | Need an Analog I/O Module |
| Skipping spans | Expert - Auxiliary module setup - Select autocalibration module - General parameters | Edit Number of zeros per span |
| | | |

| ITEM | PATH | NOTES |
|-----------------------------|---|---------------------|
| Slot position | Expert - Auxiliary module setup - Select Analog output module Also Technical - Listing of all modules. | |
| Software diagnostics | Technical - Diagnostic menus - Control module diagnostics | |
| Software revision level | Technical - Service menus - Manufacturing data - Control module data | |
| Start automatic calibration | Expert - Auxiliary module controls - Select autocalibration module – automatic calibration initiation - START | NOT Basic controls! |
| Start Manual calibration | Expert - Auxiliary module controls - Select autocalibration module - Manual calibration initiation - START | |
| System manufacturing data | Technical - Service menus - Manufacturing data - Control module data | |
| System tag | Technical - System setup | |
| Test digital input lines | Technical - Diagnostic menus - Select I/O Module - Digital input lines | |
| Test relay operation | Technical - Diagnostic menus - Select I/O Module - Relay status | |
| Voltage or current output | Expert - Auxiliary module setup - Select Analog output module - Analog output parameters | |



APPENDIX C. PLATFORM IDENTIFICATION MATRIX

The NGA Platform is configured per the customer sales order. Below is the Platform sales matrix which lists the various configurations available.

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

| Code | Enclosure Type |
|------|---|
| S | Standard EMC, General Purpose, 19" Rack Mountable |
| L | Extended EMC, General Purpose, 19" Rack Mountable |

| Code | Language |
|------|----------|
| 1 | English |
| 9 | Special |

| Code | Internal Power Supply [Powers Platform + Analyzer Module(s)] |
|------|--|
| 1 | Standard 5A, (Powers One Analyzer Module) |
| 9 | Special |
| 0 | None |

| Code | Input/Output Selection 1 |
|------|--|
| A | Basic Analog: Alarms (3) Remote Range Change, Range ID |
| B | Analog Output with Auto Calibration |
| C | System Auto-Cal |
| D | Basic Analog: Alarms (3) Remote Range Change, Range ID (GM Option) |
| E | SI/O w/2 Analog Outputs |
| F | SI/O w/2 Analog Outputs & RS232 |
| G | SI/O w/4 Analog Outputs |
| H | SI/O w/4 Analog Outputs & RS232 |
| I | SI/O w/6 Analog Outputs |
| J | SI/O w/6 Analog Outputs & RS232 |
| K | SI/O w/8 Analog Outputs |
| L | SI/O w/8 Analog Outputs & RS232 |
| M | DI/O w/8 Digital Inputs & 24 Digital Outputs |
| X | Special |
| Z | None |

| Code | Input/Output Selection 2, 3, 4, 5 |
|------|---|
| | Select from only A, B, C, D, X or Z in Position 4 |

| Code | LON/Digital Interface |
|------|----------------------------|
| A | Standard LON I/O Interface |
| Z | None |

| | |
|---|--------------|
| Z | No Selection |
|---|--------------|

| Code | Software Version |
|------|---------------------------|
| Z | Standard |
| 9 | Special (Earlier Version) |

| | |
|---|--------------|
| Z | No Selection |
|---|--------------|

| | | | | | | | | | |
|---|---|---|---|------|---|---|---|---|--|
| S | 1 | 1 | B | ZZZZ | A | Z | Z | Z | |
|---|---|---|---|------|---|---|---|---|--|

NOTES

WARRANTY

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

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Customer Service Center
1-800-433-6076**

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