GE
Measurement & Control Solutions

Moisture

Moisture Image Series 1

Programming Manual

imagination at work

910-108P Rev. E
October 2010

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Chapter 1. Features and Capabilities

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Information Paragraphs

- **Note** paragraphs provide information that provides a deeper understanding of the situation, but is not essential to the proper completion of the instructions.
- **Important** paragraphs provide information that emphasizes instructions that are essential to proper setup of the equipment. Failure to follow these instructions carefully may cause unreliable performance.
- **Caution!** paragraphs provide information that alerts the operator to a hazardous situation that can cause damage to property or equipment.
- **Warning!** paragraphs provide information that alerts the operator to a hazardous situation that can cause injury to personnel. Cautionary information is also included, when applicable.

Safety Issues

WARNING! It is the responsibility of the user to make sure all local, county, state and national codes, regulations, rules and laws related to safety and safe operating conditions are met for each installation.

Auxiliary Equipment

Local Safety Standards

The user must make sure that he operates all auxiliary equipment in accordance with local codes, standards, regulations, or laws applicable to safety.

Working Area

WARNING! Auxiliary equipment may have both manual and automatic modes of operation. As equipment can move suddenly and without warning, do not enter the work cell of this equipment during automatic operation, and do not enter the work envelope of this equipment during manual operation. If you do, serious injury can result.

WARNING! Make sure that power to the auxiliary equipment is turned OFF and locked out before you perform maintenance procedures on the equipment.

Qualification of Personnel

Make sure that all personnel have manufacturer-approved training applicable to the auxiliary equipment.

Personal Safety Equipment

Make sure that operators and maintenance personnel have all safety equipment applicable to the auxiliary equipment. Examples include safety glasses, protective headgear, safety shoes, etc.

Unauthorized Operation

Make sure that unauthorized personnel cannot gain access to the operation of the equipment.

Environmental Compliance

Waste Electrical and Electronic Equipment (WEEE) Directive

GE Measurement & Control Solutions is an active participant in Europe's *Waste Electrical and Electronic Equipment* (WEEE) take-back initiative, directive 2002/96/EC.

The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way.

The crossed-out wheeled bin symbol invites you to use those systems.

If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.

Visit **http://www.gesensing.com/environment/weee.htm** for take-back instructions and more information about this initiative.

Chapter 1. Features and Capabilities

1.1 Introduction

The GE Moisture Image Series 1 is a microprocessor based multi-channel analyzer designed to measure dissolved moisture concentration in gases and non-aqueous liquids, and dissolved oxygen concentration in gases. It is a highly advanced industrial analyzer which is versatile and adaptable to many applications.

The Series 1 combines the use of hardware and software to make various measurements. The user connects the needed inputs (moisture probes, oxygen cells, pressure transducers, etc.) to the back panel of the electronics unit using several types of cables. Typically, the user installs moisture probes and oxygen cells into the process using a sample system that is specifically designed for the application. The sample system delivers a sample of the process to the probes. The probes then send a signal to the Series 1 electronics unit, which interprets the signal and converts it into a measurement.

The complete analyzer, including electronics, cables, and measurement probes, forms a “system” which is designed to monitor the process accurately and reliably. The following sections discuss each part of this “system.”

1.2 Electronics Unit

The center of the “system” is the electronics unit. The electronics unit has many components, including terminal blocks for all connections, an RS232 port, a Liquid Crystal Display (LCD), a keypad, and menu keys. See Figure 1-1 on the next page.

The back panel of the electronics unit contains the terminal blocks for connecting moisture probes, oxygen cells, recorders, and optional alarms (standard or hermetically sealed) for up to six channels. The Series 1 also provides connections for two isolated outputs per channel. Input connections for the M Series, TF Series, Moisture Image Series and Delta F oxygen sensors are intrinsically safe.

As an optional feature, the Series 1 provides connections for two auxiliary inputs (not intrinsically safe) on each channel. The auxiliary inputs can accept signals from any 0/4 to 20-mA or 0 to 2-VDC device, including other GE analyzers.

The RS232 port enables the user to connect a remote terminal, printer, or computer to the Series 1. Using an optional Personal Computer (PC) interface software package, the user can also set up and operate one or more analyzers from a remote location, transfer data for further analysis, and create data logs.

The front panel of the electronics unit has a Liquid Crystal Display (LCD) to show data.The LCD is capable of displaying data in a line graph, or a text matrix format.

1.2 Electronics Unit (cont.)

The front panel also has a 16-key keypad that is used to enter data and operate the Series 1. There are four menu keys below the LCD, as shown in Figure 1. The function of a menu key is indicated directly above it on the LCD. The menu key functions change as the user makes menu selections.

The electronics unit with all these features is available in a rack mount, bench mount, panel mount, weatherproof, or explosion-proof versions.

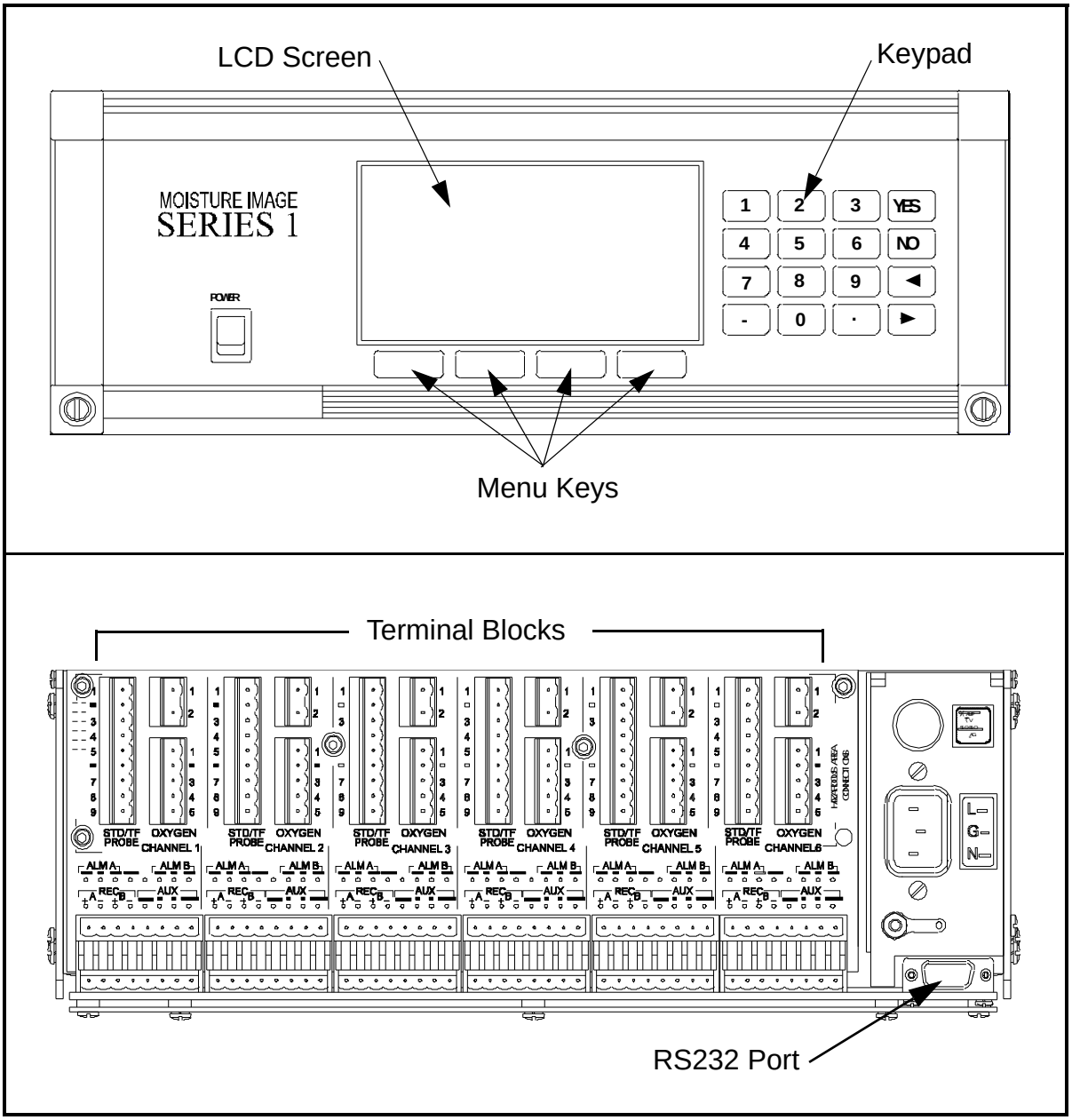

Figure 1: The Series 1 Electronics Unit Features

1.3 BASEEFA Certification

Rack, bench, panel Series 1s s/n 2000 and above and WPF Series 1s s/n 2300 and above are BASEEFA certified to supply intrinsically safe levels. Installation requires that the Series 1 be mounted in a general purpose area only. M Series, TF Series, and Moisture Image Series probes and Delta F oxygen cells are intrinsically safe when connected to the Series 1, allowing for sensor installation in IEC/CENELEC zone 0 areas.

1.4 CSA Certification

Newer versions of rack, bench, panel and WPF Series 1's are CSA-NRTL certified intrinsically safe. Installation requires the Series 1 be mounted in either a NEC CL.1, Div. 2, Group B, C or D hazardous area or a general purpose area. M Series, TF Series, and Moisture Image Series probes and Delta F oxygen cells are intrinsically safe when connected to the Series 1, allowing for sensor installation in NEC CL.1, Div. 1, Groups A, B, C and D hazardous areas.

Note: *Refer to certification labels on your instrument and installation drawing #752-138 to determine the applicable level of certification that your meter carries.*

1.5 Probes

Probes are the part of the system that come into contact with the process flow. The Series 1 uses various types of probes to fit the needs of a wide range of applications.

The term “probe” includes devices such as moisture sensors, pressure transducers, and oxygen cells. Although you can supply your own probes for certain measurements, GE provides the following standard probes to make moisture, temperature, pressure and oxygen measurements:

- Moisture (M) Series - moisture and temperature (in gases and liquids)
- Three Function (TF) Series and Moisture Image Series Probes - moisture, temperature, and pressure (in gases and liquids)
- Delta-F Cells - oxygen measurement (in gases)

The most commonly used probes are discussed in more detail below.

1.5.1 M Series and TF Series Moisture Probes

The M Series and the TF Series probes are very similar. Both probes use GE aluminum oxide sensors to measure moisture, and thermistor beads to measure temperature (the thermistor is optional). The TF Series, however, also has an optional built-in strain-gage-type pressure transducer. The sensor assemblies are secured to a probe mount and are usually protected with a sintered stainless-steel shield (TF-9 probes do not have a shield). Other types of shields are available (refer to Figure 2 below and Figure 3 on page 5).

When using an M Series probe, a separate pressure transmitter is required if in-line pressure measurement is needed. The Series 1 can use any pressure transmitter with a 0/4 to 20 mA or 0 to 2-V output. Alternatively, the user can enter fixed values for temperature and pressure into the Series 1 memory if the process conditions are constant.

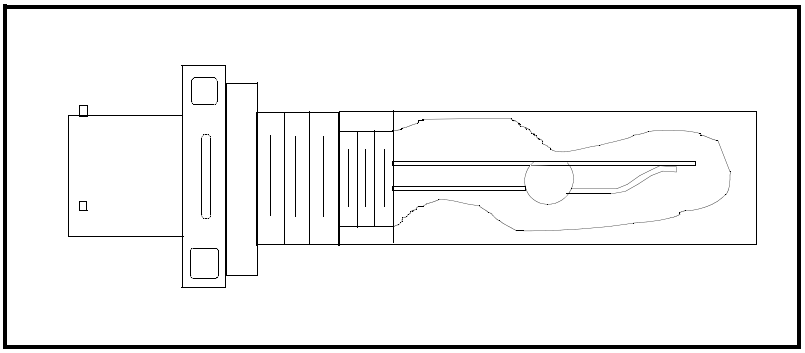

Figure 2: The M Series Probe

1.5.1 M Series and TF Series Moisture Probes (cont.)

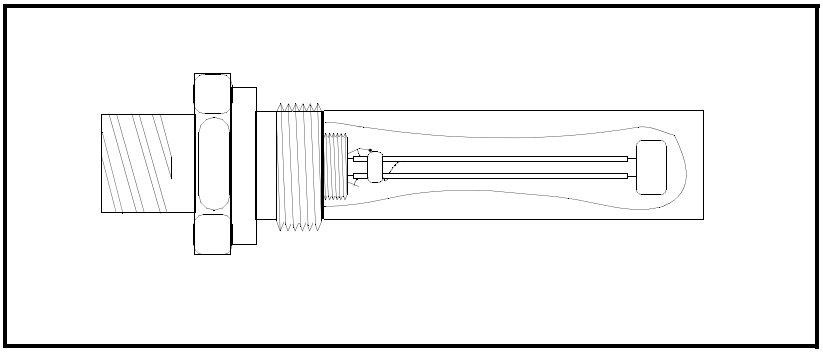

Figure 3: The TF Series Probe

Although the M and the TF Series probes may be installed directly in the process line, more often these probes are inserted into a sample system. The sample system protects the probes and enables the user to easily remove the probes for calibrating, servicing and cleaning. Sample systems also control the flow of the process stream so that it is within the specifications of the measurement probe or cell.

The M and TF Series probes, when used with a BASEEFA-approved Series 1, are intrinsically safe (see Chapter 3, *Specifications*, of the *Startup Guide* for BASEEFA certification numbers) and designed to meet the requirements of IEC/CENELEC zone 0 areas.

When operated with a CSA-NRTL approved Series 1, the M and TF Series probes are intrinsically safe (see Chapter 3, *Specifications*, of the Series 1 *Startup Guide* for CSA-NRTL certification numbers) and designed to meet the requirements of NEC C1.1, Div. 1, Groups A, B, C and D hazardous areas.

The M and TF Series probes measure moisture content in a standard range from –110°C to 20°C (–166°F to 68°F) dew/frost point temperature and optionally from –110°C to 60°C (–166°F to 140°F). Both probes optionally measure temperature in a range of –30°C to 70°C (–22°F to 158°F). The TF probe optionally measures pressure from 30 to 300, 50 to 500, 100 to 1000, 300 to 3000, or 500 to 5000 PSIG.

1.5.2 Moisture Image Series Probe

The Moisture Image Series Probes measure moisture, temperature (optional), and pressure (optional). The MIS Probes have their own electronics module that consists of a built-in microcontroller with 16-bit resolution (see Figure 4).

The electronics module stores the probe calibration and reference data in non-volatile memory; therefore, the user never needs to enter the data by hand. The Moisture Image Series Probes also feature continuous compensation of their own analog circuitry to assure long-term electronic stability.

The Moisture Image Series Probes, when operated with a BASEEFA- approved Series 1, are intrinsically safe (see Chapter 3, *Specifications,* of the *Startup Guide* for BASEEFA certification numbers) and are designed to meet the requirements of IEC/CENELEC zone 0 areas.

The Moisture Image Series Probes, when operated with a CSA-NRTL certified Series 1, are intrinsically safe (see Chapter 3, *Specifications,* of the Series 1 *Startup Guide* for CSA-NRTL certification numbers) and are designed to meet the requirements of NEC C1.1, Div. 1, Groups A, B, C and D hazardous areas.

The Moisture Image Series Probes measure moisture content in a standard range from –110°C to 20°C (–166°F to 68°F) dew/frost point temperature and optionally from –110°C to 60°C (–166°F to 140°F). Additionally, the Moisture Image Series Probes can be used to measure temperature in a range of –30°C to 70°C (–22°F to 158°F) and pressure from 30 to 300, 50 to 500, 100 to 1000, 300 to 3000, or 500-5000 PSIG.

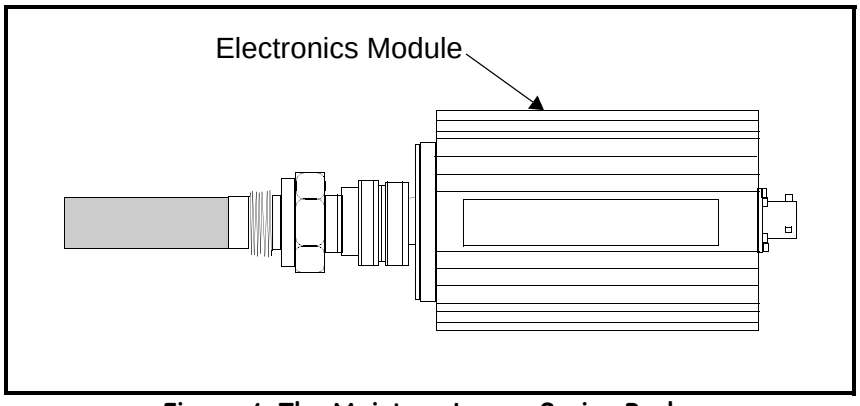

Figure 4: The Moisture Image Series Probe

Figure 5: The Moisture Image Series Probe 2

1.5.3 Delta F Oxygen Cell

The Series 1 standard oxygen measurement probe is the Delta F Cell. Overall oxygen content range is from 0 to 25%. You may choose from seven standard oxygen ranges.The lowest standard range is 0 to 1/10/100 ppm, and the highest standard range is 0 to 25% oxygen. An ultra-low range sensor that covers 0-500 ppb_v and is sensitive to less than 5 ppb is also available. The Series 1 also accepts oxygen inputs from other GE oxygen sensors.

If your application has a high concentration of acid-forming components, GE can supply a STAB-EL option for the Delta F Cell. The STAB-EL option is specially designed to effectively neutralize these components from the sample gas stream.

The Delta F Cell is available in a general purpose model with both a top and bottom drain or only a top drain (see Figure 6). The Delta F Cell is usually installed in its own sample system.The Delta F Cell is available with VCR® fittings, mounted in a Type-4X enclosure for weatherproof/corrosion resistant applications, or mounted in a Type-7 enclosure for hazardous areas.

The Delta F Cell, when operated with a BASEEFA-approved Series 1, is intrinsically safe (see Chapter 3, *Specifications*, of the *Startup Guide* for BASEEFA certification numbers) and designed to meet the requirements of IEC/CENELEC zone 0 areas.

The Delta F Cell, when used with a CSA-NRTL certified Series 1, is intrinsically safe (see Chapter 3, *Specifications, of* the Series 1 *Startup Guide* for CSA-NRTL certification numbers) and designed to meet the requirements of NEC C1.1, Div. 1, Groups A, B, C and D hazardous areas.

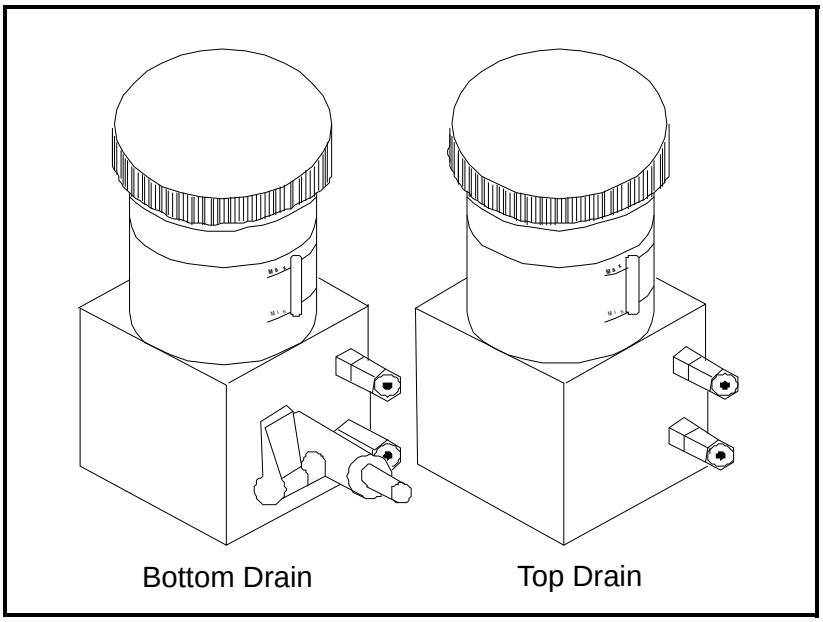

Figure 6: Delta F Oxygen Cells - Bottom and Top Drain

1.6 Cabling

Each probe requires an interconnecting cable. Cables differ depending on the probe. The various cables are discussed below under the appropriate probe type. All of these cable assemblies can be ordered from GE.

1.6.1 M Series and TF Series Probes

The M and the TF Series probes are connected to the analyzer with a special GE shielded cable. Probes can be located up to 600 meters (2000 feet) from the Series 1 (consult GE for distances up to 1200 meters). To measure pressure with a TF probe, the maximum cable length is approximately 152 meters (500 feet). Small electronic offsets, especially with longer cables, are possible and should be corrected as described in *Performing a MH Calibration Test/Adjustment* on page 1-20 of the *Service Manual*.

1.6.2 Moisture Image Series Probes

The Moisture Image Series Probes can be connected to the Series 1 with an unshielded, twisted-pair cable. The probe may be located up to 915 meters (3000 feet) from the analyzer using 22 AWG twisted pair cable. (Consult GE for longer cable lengths.)

1.6.3 Delta F Oxygen Cells

The standard Delta F Cell is connected to the analyzer with a four-wire shielded cable (22 AWG). With 22-AWG cable, oxygen cells with a range from 0 to 1/10/100 ppm_v or 0 to 0.5/5/50 ppm_v can be located up to 90 meters (300 feet) away from the analyzer. All other oxygen cells can be located up to 15 meters (50 feet) away. For greater cable lengths, 20, 18 or 16 AWG wire is required. Consult a factory engineer when a longer length is required.

1.6.4 Pressure Sensors

The Series 1 accepts either pressure transducers or pressure transmitters. Most pressure transducers can be connected with a standard four-wire shielded cable. Most pressure transmitters are connected using either a two or four-wire non-shielded cable and can be either loop or self-powered.

1.6.5 RS232 Communications Port

A personal computer or serial printer can be connected to the Series 1 RS232 communications port using a standard serial cable. A special switch enables the user to configure the unit as Data Terminal Equipment (DTE) or Data Communications Equipment (DCE). (See *Connecting a PC or Printer* in Chapter 1 of the *Service Manual* for details on DTE/DCE configuration.)

1.7 User Program

The Series 1 has a user program that is accessed and controlled by the keypad (to the right of the LCD screen) and the four menu keys (located under the LCD screen).The user program enables the user to enter the necessary probe data, set up the LCD screen, and control the other operational features. The meter stores this data in battery-backed RAM for up to five years, even if power is off.

The user program consists of the following four main menus:

- HELP - provides on-line help for the various menus within the user program.
- SELECT - lets the user select the type of measurement and units to display.
- SETTINGS - enables the user to enter probe data and set up basic functions such as recorders and alarms.
- OPTIONS - enables the user to set up the Series 1 screen to display measurements in matrix or graphic format and perform advanced functions.

The Settings Menu prompts the user to enter a passcode (see *Entering the Passcode* in Chapter 2).

All the functions and features of the Series 1 program are discussed in Chapters 2 and 3, *Basic Programming* and *Advanced Programming*.

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Chapter 2. Basic Programming

2.1 Introduction

The Moisture Image Series 1 is a highly advanced and versatile instrument. Because of this, operation ranges from basic to advanced functions. This section is designed to provide a step-by-step guide to basic operations. For information on other functions, refer to Chapter 3, *Advanced Programming*.

IMPORTANT: *You must install a switch or circuit breaker on the input power line. For greatest safety, locate the circuit breaker or power switch near the electronics console. To comply with the Low Voltage Directive, you must install an external current protection device.*

The following sections cover basic programming functions:

- *Getting Started* - describes how to power up, gives a description of the user program, and explains how to obtain on-line help.
- *Verifying Setup Data* - describes how to verify and, if necessary, enter setup data for moisture, pressure, oxygen, and any other input devices.
- *Displaying Measurements* - explains how to display measurements using different screen formats.
- *Adjusting the Contrast of the Screen* - explains how to adjust the screen for optimal viewing.
- *Setting the Clock and Calendar* - explains how to set the internal clock and calendar.

Note: *Because they are so essential, the instructions covered in the* Getting Started, Verifying and Entering Setup Data *and* Displaying Measurements *sections are also included in the Startup Guide. If you have read this material, you may skip those sections of this chapter.*

2.2 Getting Started

The purpose of this section is to give a brief description of the Series 1 user program and explain how to use its front panel for viewing and entering data. This section includes the following:

- powering up the meter
- entering data into the user program
- screen and key functions
- entering the passcode
- getting on-line help

Read the following sections carefully to properly set up and operate your instrument.

WARNING! **TO ENSURE THE SAFE OPERATION OF THIS UNIT, YOU MUST INSTALL AND OPERATE THE SERIES 1 AS DESCRIBED IN THIS MANUAL. IN ADDITION, BE SURE TO FOLLOW ALL APPLICABLE SAFETY CODES AND REGULATIONS FOR INSTALLING ELECTRICAL EQUIPMENT IN YOUR AREA.**

2.2.1 Powering Up

The Series 1 has a universal power supply that automatically adjusts to line voltages from 90 to 260 VAC. After making electrical connections (including grounding) as described in Chapter 1, *Installation,* of the *Startup Guide,* press the power switch to power up the meter.

IMPORTANT: .*The AC power cord is the main disconnect device. For compliance with the EU's Low Voltage Directive (IEC 1010), this unit requires an external power disconnect device such as a switch or circuit breaker. The disconnect device must be marked as such, clearly visible, directly accessible, and located within 1.8 m (6 ft) of the unit.*

2.2.1 Powering Up (cont.)

CAUTION! **Do not operate the Delta F oxygen cell for extended periods of time at oxygen concentrations that are over range. Trace and low percent range sensors may be damaged if exposed to high levels of oxygen, such as air, for long periods (>1 hour) while the Series 1 is on. If exposure is unavoidable, either disconnect the oxygen cell from the Series 1 or equip the sample system with a valve that allows the cell to be switched to purge gas.**

If the meter passes its self-test, the screen begins displaying measurements in a matrix format similar to the one shown in Figure 7.

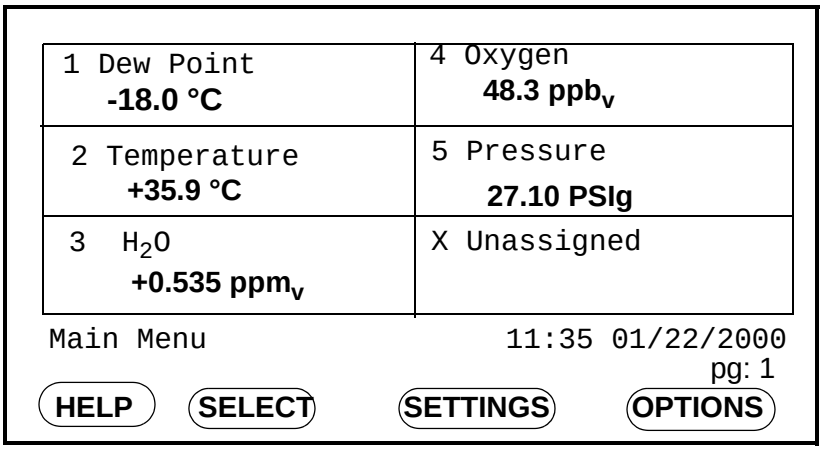

Figure 7: Screen Matrix Format After Power Up

2.2.2 Entering Data into the User Program

The Series 1 has a user program that enables you to enter data to set up alarms, recorders, and probes, as well as its other features.

The user program consists of the following four main menus (refer to Figures 3-17 and 3-18, pages 3-31 and 3-32, for menu maps of the user program):

- HELP - provides on-line help for the various menus of the user program.
- SELECT - lets you select the type of measurement and units to display.
- SETTINGS - enables you to set up recorders and alarms, as well as enter probe data for basic operation. (To enter this menu you must enter the passcode. See page 16.)
- OPTIONS - enables you to set up the screen to display measurements in text or graphical form. It is also used to perform advanced functions.

You can use the screen, four menu keys, and the keypad to enter data into the unit (see Figure 8).

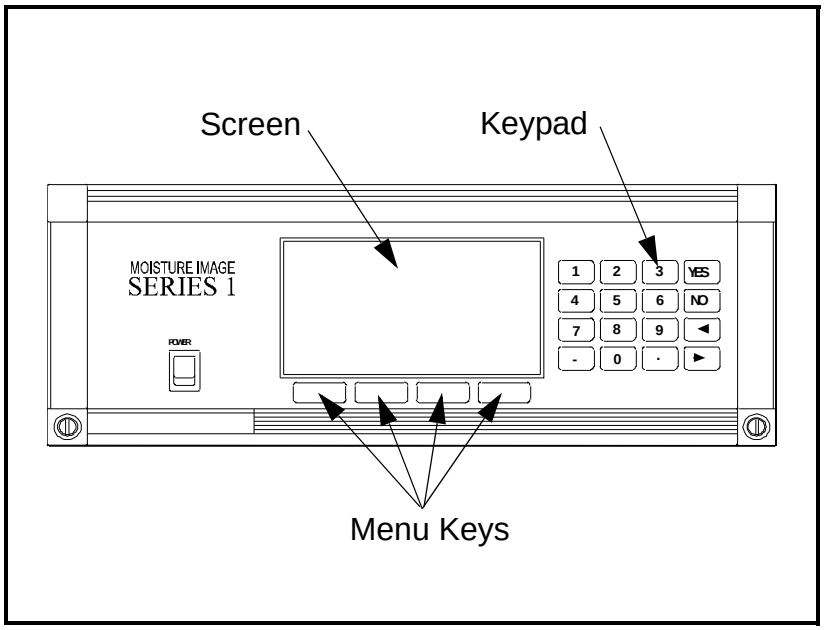

Figure 8: The Moisture Image Series 1 Front Panel

2.2.3 Screen and Key Functions

The screen displays measurements, up to four menu options, system messages, and a **pointer**. The pointer acts as a measurement indicator, as well as a guide during data entry.

While the unit displays measurements in the matrix format, the pointer moves sequentially from box to box to indicate measurement updates. However, while in the user program, you can use the arrow keys to move the pointer to the desired location for data entry.

The menu options appear at the bottom of the screen. Below the screen are the corresponding menu keys (refer to Figure 9). Each **menu key** corresponds to each of the menu options in the user program. Up to four new menu options appear each time you enter a menu.

The line above the menu options is the **message line** (see Figure 9). The message line displays the menu title, the time, and the date. The message line also displays a list of selections depending on the menu option you enter.

The **page indicator** is located in between the message line and the menu keys. Since the Series 1 is capable of displaying up to six pages of data, the page indicator displays the currently selected page.

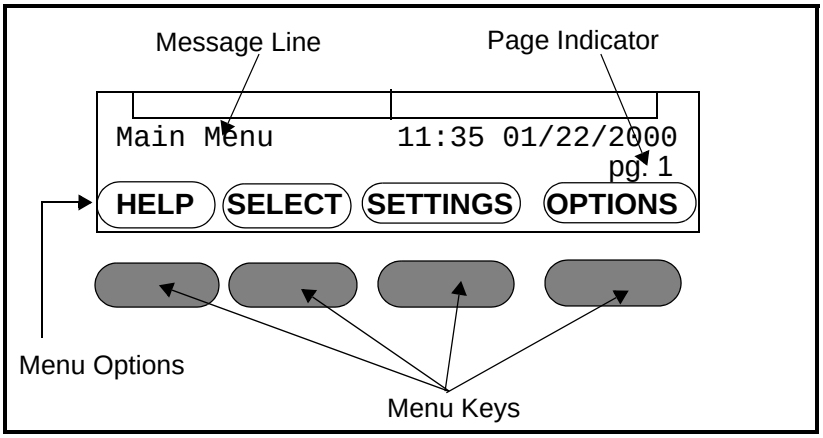

Figure 9: Screen Components

2.2.3 Screen and Key Functions (cont.)

The keypad to the side of the screen consists of 16 keys, including the [.] and [–] symbols, two arrow keys, and two response keys: [YES] and [NO]. The numeric keys are for numeric entry only; however, the arrow and response keys have more than one function.

The arrow keys perform two functions:

- Use either arrow key to move the screen pointer to the desired location for data entry.
- Use the left arrow key as a backspace during number entry.

The response keys perform three functions:

- Use either the [YES] or [NO] key to respond to questions.
- Use the [NO] key to erase data.
- Press [YES] to confirm a number entry or after erasing data to retrieve the previous number.

2.2.4 Entering the Passcode

The Settings Menu is the only menu that requires a **passcode**. The passcode is a four-digit number that enables only authorized users to enter setup data. The Series 1 prompts you to enter the passcode when you enter the Settings Menu. See the end of this chapter for your default passcode.

2.2.5 Getting On-Line Help

The Series 1 offers on-line help screens that contain descriptions and instructions for various topics. The first menu option in most of the menus is HELP.

When you press the HELP menu key, the screen display gives a list of help topics as shown in Figure 2-4. This list enables you to get help for most subjects, regardless of the current menu. To select a topic, use the arrow keys to move the pointer to the topic you want to view, then press [YES]. Use the NEXT and PREVIOUS menu options to scroll from one page to another. The NEXT menu option brings you to the following page and the PREV menu options brings you to the previous page. Press DONE to exit and return to the current menu.

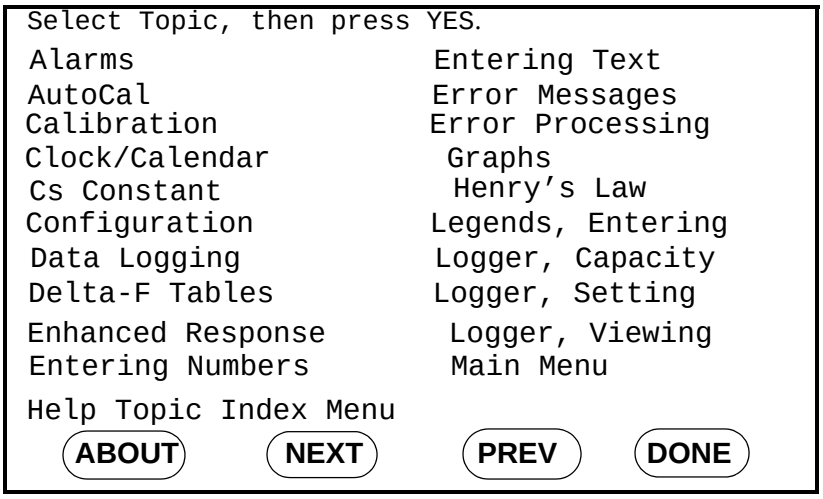

Figure 10: HELP Screen

By pressing the ABOUT key, users can access the history of their particular Series 1: its serial number, PCI number, software revision number and date of manufacture. This information remains part of the HELP file and cannot be changed by the user.

2.3 Verifying and Entering Setup Data

Before the Series 1 can make measurements, it must have the proper setup data entered into its memory. GE has entered all or most of the setup data for each probe before delivery; however, you should verify that all the data is correct and entered into your unit.

Note: *If you want to switch a probe from one channel to another, you must re-enter some or all of the setup data as described in this section.*

Verifying setup data consists of three steps:

- Verify that probes are properly activated in the Probe Configuration Menu as described on page 19.
- Verify that calibration data for all necessary probes is properly entered in the System Calibration Menu as described on page 23.
- Verify that applicable high and low reference values for the Series 1 measurement circuitry are properly entered into the Reference Menu as described on page 32.

CAUTION! **All high and low reference values are factory set and normally do not need adjustment. However, the factory may instruct you to adjust the high and low moisture reference values. If necessary, you should do so as described in *Performing an MH Calibration/Adjustment Test* in the *Service Manual*.**

Use the following sections to properly verify and enter setup data.

IMPORTANT: *While you are reviewing data, you should take the time to record it on the Program Information List supplied in Appendix A of the* Startup Guide*, or on a separate sheet of paper.*

2.3.1 Activating and Changing Probes

Although the probes are physically connected to the back of the electronics unit, you must "tell" the electronics what type of measurements the probe is capable of making. In addition, if you want to use a constant value rather than a live input, you must "tell" the electronics that you are using a constant value.

If you do not activate probes, or if you activate them incorrectly, the unit will display No Probe or other error messages.

Once you verify and/or change configuration data, refer to *Entering Calibration Data* on page 23.

2.3.1a Verifying Probe Configuration Data

IMPORTANT: *You should record this data on the Program Information List supplied in Appendix A of the Startup Guide, or on a separate sheet of paper, and keep it in a safe place.*

1. Enter the Probe Configuration Menu (for a menu map, refer to Figure 47 on page 84). A screen similar to Figure 11 appears.

Table 1: Entering the Probe Configuration Menu

Press the Main Menu key:	To enter the:
SETTINGS*	Settings Menu
SYSTEM	System Settings Menu
CONFIG	Probe Configuration Menu

* The Settings Menu will prompt for a passcode (see page 16).

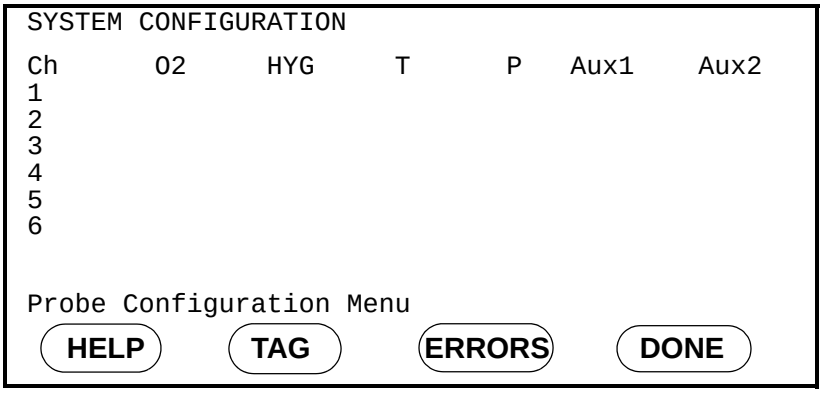

Figure 11: Probe Configuration Menu

2.3.1 Activating and Changing Probes (cont.)

Verify that the correct probe types have been activated for each channel. To do this, make sure a probe is activated for each measurement it is capable of taking. For example, if an MISP2 or a Moisture Image Series Probe with the temperature and pressure functions is connected to channel 1, “MIS” must be selected in the hygrometry, temperature, and pressure columns as shown in Figure 12.

If the optional auxiliary inputs are installed and active, you only need to select whether the input is current or voltage. If you do not select current or voltage, the Series 1 defaults to current.

Note: *If you are using an auxiliary input to measure pressure, activate Au1 (or Au2 depending on which input you are using) in the pressure column for the desired channel; then activate current or voltage in the Aux 1 (or Aux 2) column.*

In addition, if you connect a pressure transducer to the PRESS/OTHER terminal block, you must activate the TF probe in the pressure column for that channel.

If you need to change any data in the Probe Configuration Menu, see the following section, *Entering or Changing Probe Configuration Data*. If the data is correct, refer to *Tagging the Inputs* on page 45.

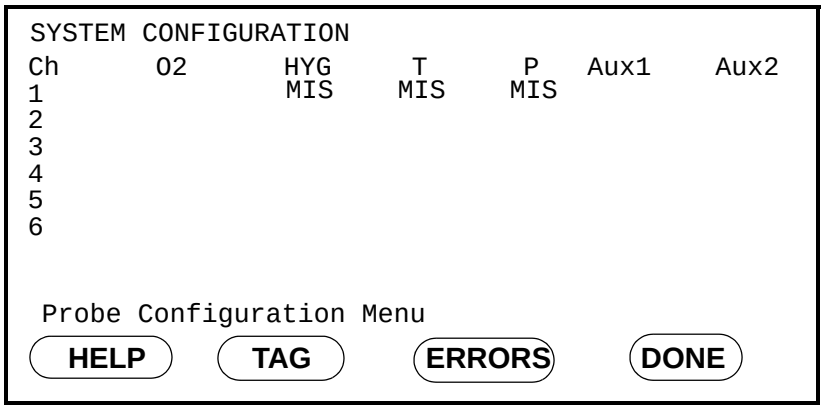

Figure 12: MIS Probe Configuration on Channel 1

2.3.1b Entering or Changing Probe Configuration Data

See Figure 47 on page 84 for a menu map.

1. From the Probe Configuration Menu (Table 1 on page 19), move the pointer to the channel and probe you want to select. The arrow will move only to installed channels.
2. Press [YES].
3. The possible probe types appear on the message line at the bottom of the screen. Table 2 on page 22 shows the available probe types.

If you choose to enter a constant for moisture (Kh), temperature (Kt), or pressure (Kp), you must enter a constant value in the User Constant Menu. See *Entering Constants and User Functions* on page 61 for instructions.

4. Move the brackets to the correct probe type, then press [YES]. The selected probe type displays.
5. Repeat Steps 1 through 4 for each channel.
6. To exit, press the DONE menu key until Main Menu appears on the message line.

Note: *You can only select probes for an installed channel.*

If you are only using Moisture Image Series probes, proceed to *Displaying Measurements* on page 38. If you are using any other type of input device, proceed to *Entering Calibration Data* on page 23.

2.3.1b Entering or Changing Probe Configuration Data (cont.)

Table 2: Probe Types

Measurement Mode	Probe Type
OXY (Oxygen)	– (None) % (Percent) ppM (Parts per Million) ppB (Parts per Billion)
HYG (Hygrometry)	– (None) MIS (MIS Probe) TF (Three-Function Probe) Mxx (M Series Probe) Kh (Constant Dew Point)
T (Temperature)	– (None) MIS (MIS probe) TF (Three-Function probe) Mxx (M-Series probe) Kt (Constant Temperature)
P (Pressure)	– (None) MIS (MIS probe) TF (Three-Function probe) Au1 (Auxiliary 1) Au2 (Auxiliary 2) Kp (Constant Pressure)
Aux1 (Auxiliary 1)	– (None) I (Current) V (Voltage)
Aux2 (Auxiliary 2)	– (None) I (Current) V (Voltage)

2.3.2 Entering Calibration Data

The Series 1 needs calibration data for moisture, oxygen, and pressure probes, as well as auxiliary inputs. GE has already entered calibration data for probes; however, you should verify this data before startup. You will need to enter this data if you:

- sent the probes back to the factory for calibration
- use a different probe
- use a non-GE input

To enter, verify, or change calibration data for any probe type, enter the System Calibration Menu as described in Table 3 below. (see Figure 47 on page 84 for a menu map.)

Table 3: Moving to the System Calibration Menu

Press the Main Menu key:	To enter the:
SETTINGS*	Settings Menu
SYSTEM	System Settings Menu
CALIB	System Calibration Menu

*The Settings Menu will prompt for a passcode (see page 16).

Refer to the appropriate section that follows to verify or enter calibration data for:

- Moisture Probes, page 24
- Delta F Oxygen Cell, page 26
- Pressure Sensor or Transmitter, page 28
- Optional Auxiliary Input(s), page 30

Be sure you have the **Calibration Data Sheets** that are supplied with each GE probe. Each Calibration Data Sheet consists of a list of data points that you will need to enter or verify. Each Calibration Data Sheet lists its corresponding probe serial number, as well as the preassigned channel number. Calibration Data Sheets are usually packed inside the probe cases.

Once you verify and/or enter calibration data for each input, refer to *Entering High and Low Reference Values* on page 32.

IMPORTANT: *Staple Calibration Data Sheets to the Program Information List (Appendix A of the* Startup Guide*) and store them in a safe place. If they are lost, contact GE for a duplicate. If you alter any of the calibration data, make sure you make the change on the Calibration Data Sheet.*

2.3.2a Entering Moisture Probe Calibration Data

You only need to enter calibration data for M and TF Series probes. It is not necessary to enter calibration data for the MISP2 or for the Moisture Image Series Probe unless you send the probe back to GE for calibration without its electronics module. If this is the case, enter the calibration data for the recalibrated probe as described in this section. The Series 1 will automatically download the new calibration data into the Moisture Image Series Probe electronics module.

Note: *You do not need to enter calibration data for the MISP2 or for the Moisture Image Series Probe because it is stored in the probe's electronics module. The Moisture Image Series Probes upload the calibration data into the Series 1 memory when needed.*

Use the procedure below to enter the following data:

- the probe serial number
- the number of data points
- the dew point and MH (or FH, depending on the probe) reading for each data point

Referring to the Calibration Data Sheets, enter calibration data separately for each probe on the designated channel as described below. See Figure 47 on page 84 for a menu map.

Note: *If you want to enter a constant value, refer to* Entering Constants and User Functions *on page 61. It is not necessary to enter the calibration data if you are using a constant.*

1. At the System Calibration Menu (see Table 3 on page 23), press the PROBE menu key until the Moisture Probe Calibration screen appears (see Figure 13).

2. Use the CHANNEL menu key to cycle to the desired channel. The channel number is indicated in the top right-hand corner of the screen.The screen will only display installed channels.

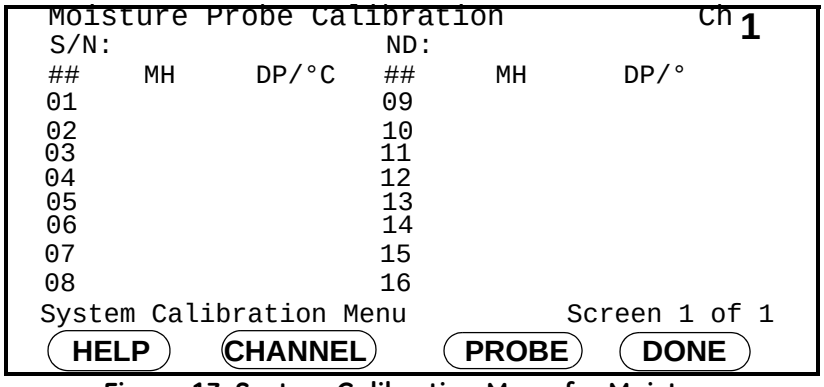

Figure 13: System Calibration Menu for Moisture

2.3.2a Entering Moisture Probe Calibration Data (cont.)

3. Move the pointer to S/N and press [YES].

4. Enter the probe serial number from the Calibration Data Sheet, and press [YES]. (The serial number is also scribed on the hex nut of the moisture probe.) The pointer automatically jumps to ND. Press [YES] again.

5. Enter the number of data points indicated on the Calibration Data Sheet (typically 2-16 points for each probe), and press [YES]. The pointer automatically jumps to the first data point.

6. Move the pointer to 1 and enter the MH (or FH) values and dew point (in °C) for each data point. Make sure you press [YES] after you enter each value.

7. Repeat Step 6 for each data point.

8. Repeat Steps 2 through 7 to enter moisture probe calibration data for the remaining channels.

To enter calibration data for other probes, refer to the following sections. To exit, press the DONE menu key until Main Menu appears on the message line. Then refer to *Entering High and Low Reference Values* on page 32.

2.3.2b Entering Delta F Oxygen Cell Calibration Data

Note: *The information in this section applies to Delta F oxygen cells only. If you are using some other type of oxygen input, refer to* Entering Auxiliary Input Calibration Data *on page 30.*

Your Delta F cell has been factory calibrated using nitrogen as the reference background gas. If you want to use the oxygen cell with a different background gas than the cell was calibrated for, refer to the section *Background Gas Correction Factors for the Delta F Oxygen Cell* in Chapter 2 of the *Service Manual* to determine the correct oxygen current multiplier.

Use the procedure below to enter the following data:

- the probe serial number
- the zero and span range in microamps (µA)
- the zero and span range in parts per million by volume (ppm_v) ppbr, or percent (%)

Note: *Oxygen cells can be ordered to measure in ppm or percent. Select the proper oxygen cell units in the Probe Configuration Menu. The units you select will automatically appear in the second column.*

Procedure for Entering Delta F Cell Calibration Data

Referring to the Calibration Data Sheets, enter calibration data separately for each probe on the designated channel as described below. See Figure 47 on page 84 for a menu map.

IMPORTANT: *Staple Calibration Data Sheets to the Program Information List (Appendix A of the Startup Guide) and store them in a safe place. If they are lost, contact GE for a duplicate. If you alter any of the calibration data, make sure you make the change on the Calibration Data Sheet.*

1. At the System Calibration Menu (see Table 3 on page 23), press the PROBE menu key until the Oxygen Probe Calibration screen appears. See Figure 14 on page 27.

2. Use the CHANNEL menu key to cycle to the desired channel. The channel number is indicated in the top right-hand-corner of the screen. The screen will only display installed channels.

3. Move the pointer to the S/N line and press [YES].

4. Enter the probe serial number from the Calibration Data Sheet, and press [YES].The serial number is also on the side of the oxygen cell.

5. Move the pointer to the Zero µA line and press [YES].

6. Enter the microamp (µA) value and press [YES].

7. Move the pointer to the Zero ppm (or %) line and press [YES].

2.3.2b Entering Delta F Oxygen Cell Calibration Data (cont.)

8. Enter the zero range value, and press [YES]. The range units will be either ppm or %, depending on the cell type/model selected in the Probe Configuration Menu.

9. Repeat Steps 5 through 8 to enter the microamp (µA) and range value for the span line.

IMPORTANT: *Leave the O2 Current Multiplier at 1.00 unless you are using a background gas other than nitrogen. See the section* Background Gas Correction Factors for the Delta F Oxygen Cell *in Chapter 2 of the* Service Manual.

Repeat Steps 1 through 9 to enter oxygen calibration data for the remaining channels.

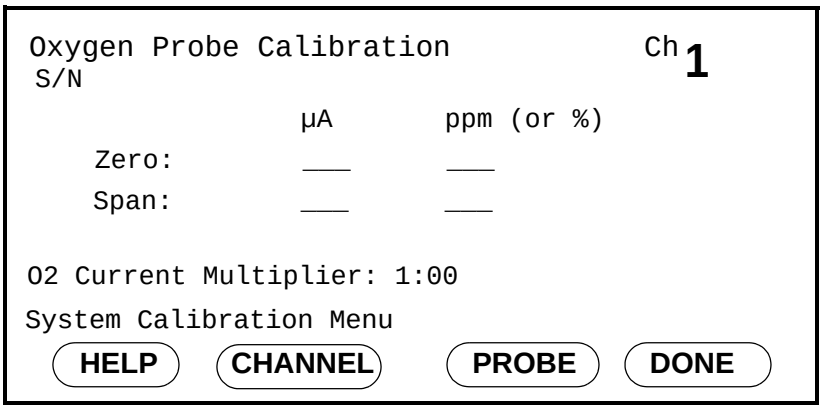

Figure 14: System Calibration Menu for Oxygen Cell

To enter calibration data for other probes, refer to *Entering Moisture Probe Calibration Data* on page 24, *Entering Pressure Calibration Data* on page 28, and *Entering Auxiliary Input Calibration Data* on page 30. To exit, press the DONE menu key until Main Menu appears on the message line. Then refer to *Entering High and Low Reference Values* on page 32.

2.3.2c Entering Pressure Calibration Data

Use this section to enter pressure calibration data for any type of pressure sensor you are using, even if the pressure sensor is connected to an auxiliary input.

To enter pressure calibration data, you must enter

- the probe serial number
- the zero and span range in mV, current, or FP
- the zero and span range in PSIg

Referring to the Calibration Data Sheets supplied by GE or another manufacturer, enter calibration data separately for each probe on the designated channel as described below. See Figure 47 on page 84 for a menu map.

IMPORTANT: *Staple Calibration Data Sheets to the Program Information List (Appendix A of the Startup Guide) and store them in a safe place. If they are lost, contact GE for a duplicate. If you alter any of the calibration data, make sure you make the change on the Calibration Data Sheet.*

Note: *If you want to enter a constant value, refer to* Entering Constants and User Functions *on page 61. It is not necessary to enter the calibration data if you are using a constant.*

1. At the System Calibration Menu (see Table 3 on page 23), press the PROBE menu key until the Pressure Probe Calibration screen appears. See Figure 15.

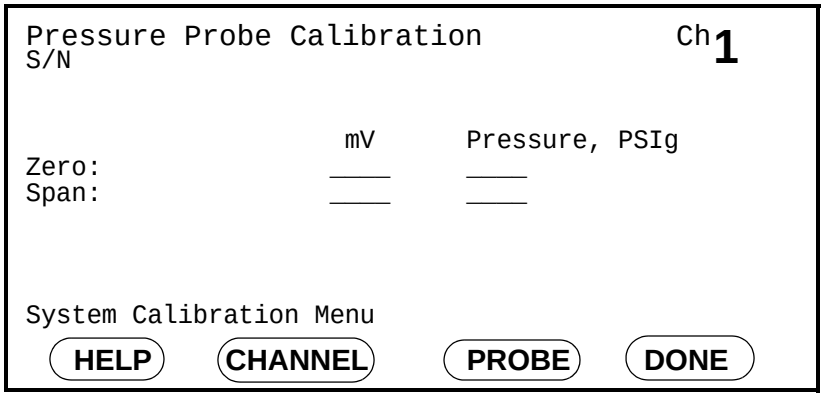

Figure 15: System Calibration Menu for Pressure

2.3.2c Entering Delta F Cell Calibration Data (cont.)

Note: *If you are using an auxiliary input to measure pressure, the first column will be in mA or Volts depending on how you configured the auxiliary input in* Activating and Changing Probes *as described on page 19.*

2. Use the CHANNEL menu key to cycle to the desired channel. The channel number is indicated in the top right-hand corner of the screen. The screen will only display installed channels.

3. Move the pointer to S/N and press [YES].

4. Enter the probe serial number from the Calibration Data Sheet and press [YES].

5. Move the pointer to the Zero mV (mA) line and press [YES].

6. Enter the voltage or current value and press [YES].

7. Move the pointer to the Zero PSIg line and press [YES].

8. Enter the PSIg value and press [YES].

9. Use Steps 5 through 8 to enter the span values.

Repeat steps 1 through 9 to enter pressure calibration data for the remaining channels.

To enter calibration data for other probes, refer to *Entering Moisture Probe Calibration Data* on page 24, *Entering Delta F Oxygen Cell Calibration Data* on page 26, and *Entering Auxiliary Input Calibration Data* on page 30. To exit, press the DONE menu key until Main Menu appears on the message line. Then refer to *Entering High and Low Reference Values* on page 32.

2.3.2d Entering Auxiliary Input Calibration Data

Note: *If you are using an auxiliary input to measure pressure, enter pressure calibration data as described in* Entering Pressure Calibration Data *as described on page 28.*

This section describes how to enter calibration data for an auxiliary input (optional). If your device is not supplied by GE, you will have to obtain the calibration data in order to properly set up the Series 1.

You will need to enter two to 16 data points. If the sensor is linear, you only need to enter two data points. Each data point requires a voltage or current value depending on the probe configuration (see page 19) and a corresponding scale value. Use the procedure below to enter data.

See Figure 47 on page 84 for a menu map.

IMPORTANT: *Enter the auxiliary calibration data on the Program Information List (Appendix A of the* Startup Guide*) and store it in a safe place. If it is lost, contact GE for a duplicate.*

1. At the System Calibration Menu (see Table 3 on page 23), press the PROBE menu key until the Auxiliary Input Calibration screen appears. There is one screen each for Auxiliary Input 1 and Auxiliary Input 2. Make sure you have the correct screen before verifying or entering data (see Figure 16).

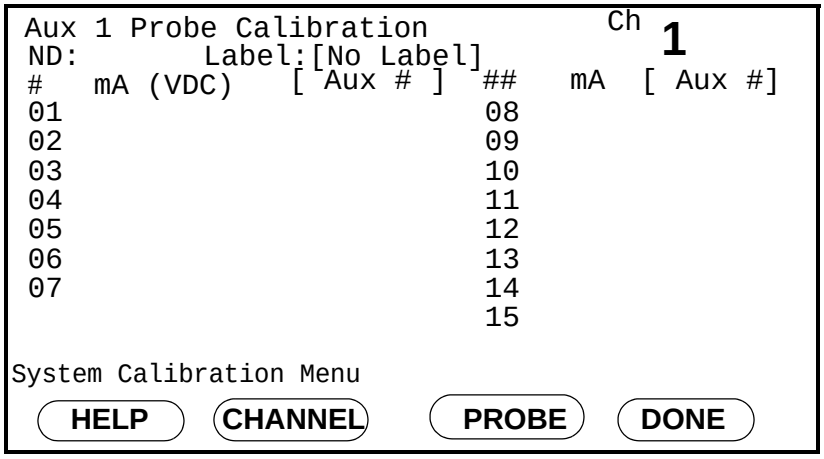

Figure 16: System Calibration Menu for Auxiliary Inputs

2.3.2d Entering Auxiliary Input Calibration Data (cont.)

2. Use the CHANNEL menu key to cycle to the desired channel. The channel number is indicated in the top right-hand corner of the screen. The screen will only display installed channels.

3. Move the pointer to ND and press [YES].

4. Enter the number of data points and press [YES]. The Series 1 requires two to 16 calibration data points. If the sensor is linear you only need to enter two data points.

5. The pointer will move to LABEL. Press [YES] to enter the Label Entry menu and enter or change the Label (as described in "Making Tags" on page 46).

6. Move the pointer to the Units (or [Aux]) column heading. Press [YES] to edit the Units label used when displaying the Auxiliary Input (as described in "Making Tags" on page 46).

7. Move the pointer to the first data point in the mA (or VDC) column and press [YES]. The units for this column will depend on the units you selected in *Activating and Changing Probes* on page 19.

8. Enter the voltage or current value and press [YES].

9. Move the pointer to the Units column and press [YES].

10. Enter the corresponding scale value and press [YES].

11. Use steps similar to 4 through 10 to enter the remaining data point values.

Repeat steps 1 through 9 to enter auxiliary input calibration data for the remaining channels.

To enter calibration data for moisture, temperature, and pressure, refer to the preceding sections. To exit, press the DONE menu key until Main Menu appears on the message line. Then refer to *Entering High and Low Reference Values* on page 32.

2.3.3 Entering High and Low Reference Values

The last step in setup is entering high and low reference values. The Series 1 requires reference values for its measurement circuitry for moisture, oxygen, and pressure inputs. The references are factory calibration values that are specific to each channel card. Reference values are located on a label placed on the side or front of the unit.

Note: *If you receive a channel card replacement or change the instrument program, you need to re-enter the reference data for that channel.*

Table 4 shows the key sequences for entering the Reference Menu. (See Figure 47 on page 84 for a menu map.)

Table 4: Moving to the Reference Menu

Press the Main Menu key:	To enter the:
SETTINGS*	Settings Menu
SERVICE	System Service Menu
REFS	Reference Menu

*The Settings Menu will prompt for a passcode (see page 16).

Use the appropriate section that follows to verify or enter reference values for the probes.

Once you verify and/or enter reference data for each input, refer to *Displaying Measurements* on page 38.

IMPORTANT: *You should record this data on the Program Information List supplied in Appendix A of the* Startup Guide, *or on a separate sheet of paper, and keep it in a safe place.*

2.3.3a Entering Moisture Reference Values

Use the steps below to change the reference values for moisture inputs. (See Figure 47 on page 84 for a menu map.)

CAUTION! **If you modified the supplied cables or are not using GE-supplied cables for moisture probes, you may be required to adjust the moisture reference data as described in *Performing an MH Calibration/Adjustment Test* in the *Service Manual*.**

IMPORTANT: *You should record reference data on the Program Information List supplied in Appendix A of the* Startup Guide*, or on a separate sheet of paper, and keep it in a safe place.*

1. At the Reference Menu (see Table 4 on page 32), press the PROBE menu key until the Moisture Reference Table appears (see Figure 17).

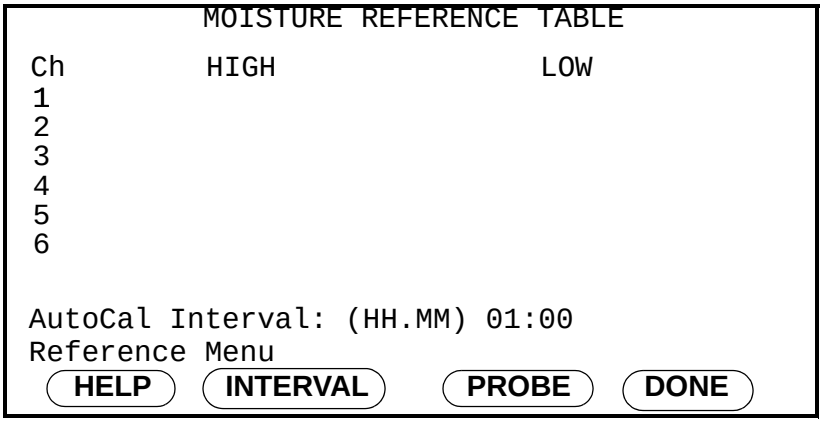

Figure 17: Reference Menu for Moisture

2. Compare the data on the screen to the reference data printed on the label placed on the side or front of the unit, or supplied with a replacement channel card. If the data is incorrect, use the procedure below to correct it. If the data is correct, do one of the following:

- Continue to enter reference values for oxygen cell and pressure inputs as described in the following sections.
- Press the DONE menu key until Main Menu appears on the message line; then refer to *Displaying Measurements* on page 38. When you exit, the Series 1 automatically calibrates each channel.

2.3.3a Entering Moisture Reference Values (cont.)

3. Move the pointer to HIGH for the desired channel, and press [YES].

4. Enter the high reference value for that channel and press [YES].

5. The pointer automatically moves to LOW for the same channel. Press [YES].

6. Enter the low reference value for that channel, and press [YES].

7. Repeat steps 3 through 6 to enter the high and low reference values for the remaining channels.

Note: *You may also enter the Auto-Cal Interval while in the Reference Menu. Simply press the INTERVAL menu key and enter the desired interval. See page 59 for more information.*

To enter reference values for oxygen cell and pressure inputs, refer to the following sections. To exit, press the DONE menu key until Main Menu appears on the message line. Then refer to *Displaying Measurements* on page 38. When you exit, the Series 1 automatically calibrates each channel.

2.3.3b Entering Delta F Oxygen Cell Reference Values

IMPORTANT: *The instructions in this section apply to entering reference data for the Delta F oxygen cell only.*

Use the steps below to change the reference values for oxygen cell inputs. (See Figure 47 on page 84 for a menu map.)

CAUTION! Do not adjust oxygen cell reference data unless instructed to do so by the factory.

IMPORTANT: *You should record this data on the Program Information List supplied in Appendix A of the* Startup Guide, *or on a separate sheet of paper, and keep it in a safe place.*

1. At the Reference Menu (see Table 4 on page 32), press the PROBE menu key until the Oxygen Cell Reference Table appears (see Figure 18).

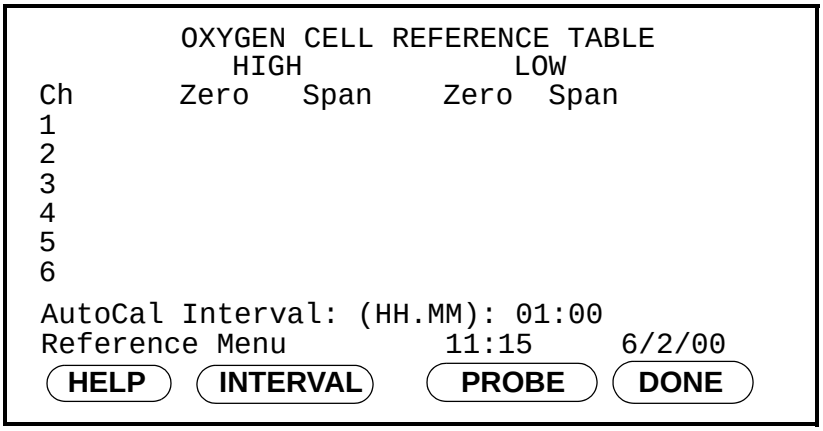

Figure 18: Reference Menu for the Delta F Cell

2. Compare the data on the screen to the reference data printed on the label placed on the side or front of the unit. If the data is incorrect, use the following procedure to correct it. If the data is correct, do one of the following:

- continue to enter reference values for moisture and pressure inputs as described in *Entering Moisture Reference Values* on page 33, and *Entering Pressure Reference Values* on page 37.
- press the DONE menu key until Main Menu appears on the message line; then refer to *Displaying Measurements* on page 38. When you exit, the Series 1 automatically calibrates each channel.

2.3.3b Entering Delta F Oxygen Cell Reference Values (cont.)

3. Move the pointer to the Zero line for the high reference for the desired channel and press [YES].

4. Enter the zero value for the high reference for that channel and press [YES]. The pointer automatically proceeds to the Span line for the high reference for the same channel. Press [YES] again.

5. Enter the span value for the high reference for that channel and press [YES].

6. Move the pointer to the Zero line for the low reference for the desired channel and press [YES].

7. Enter the zero value for the low reference for that channel and press [YES].

8. Move the pointer to the Span line for the low reference for the desired channel and press [YES].

9. Enter the span value for the low reference for that channel and press [YES].

Repeat steps 3 through 9 to enter the high and low reference values for the remaining channels.

To enter reference values for moisture and pressure inputs, refer to *Entering Moisture Reference Values* on page 33 and *Entering Pressure Reference Values* on page 37. To exit, press the DONE menu key until Main Menu appears on the message line. Then refer to *Displaying Measurements* on page 38. When you exit, the Series 1 automatically calibrates each channel.

2.3.3c Entering Pressure Reference Values

Use the steps below to change the reference values for pressure inputs. (See Figure 47 on page 84 for a menu map.)

CAUTION! Do not adjust pressure reference data unless instructed to do so by the factory.

IMPORTANT: *You should record this data on the Program Information List supplied in Appendix A of the Startup Guide, or on a separate sheet of paper, and keep it in a safe place.*

1. At the Reference Menu (see Table 4 on page 32), press the PROBE menu key until the Pressure Reference Table appears (see Figure 19).

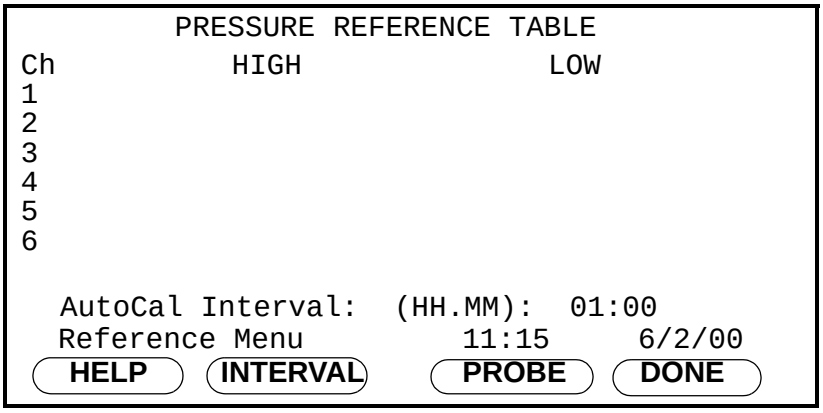

Figure 19: Reference Menu for Pressure

2. Compare the data on the Series 1 screen to the reference data for the pressure input. If the data is incorrect, use the following procedure to correct it. If the data is correct, do one of the following:

- continue to enter reference values for moisture and oxygen inputs as described in *Entering Moisture Reference Values* on page 33 and *Entering the Delta F Oxygen Cell Reference Values* on page 35.
- press the DONE menu key until Main Menu appears on the message line; then see *Displaying Measurements* on page 2-28. When you exit, the Series 1 automatically calibrates each channel.

3. Move the pointer to HIGH for the desired channel and press [YES].

4. Enter the high reference value for that channel and press [YES].

5. The pointer automatically moves to LOW for the same channel. Press [YES].

6. Enter the low reference value for that channel and press [YES].

7. Repeat steps 3 through 6 to enter the high and low reference values for the remaining channels.

To enter reference values for moisture and oxygen inputs, refer to *Entering Moisture Reference Values* on page 33, and *Entering the Delta F Oxygen Cell Reference Values* on page 36. To exit, press the DONE menu key until Main Menu appears on the message line. Then refer to *Displaying Measurements* on page 38. When you exit, the Series 1 automatically calibrates each channel.

2.4 Displaying Measurements

The Series 1 can display measurements in a matrix format or a line graph. The first time you power it up, the screen will display measurements in the **matrix format**. The matrix format has six pages and each page consists of six boxes as shown in Figure 20. You can program each box to display any measurement for any channel.

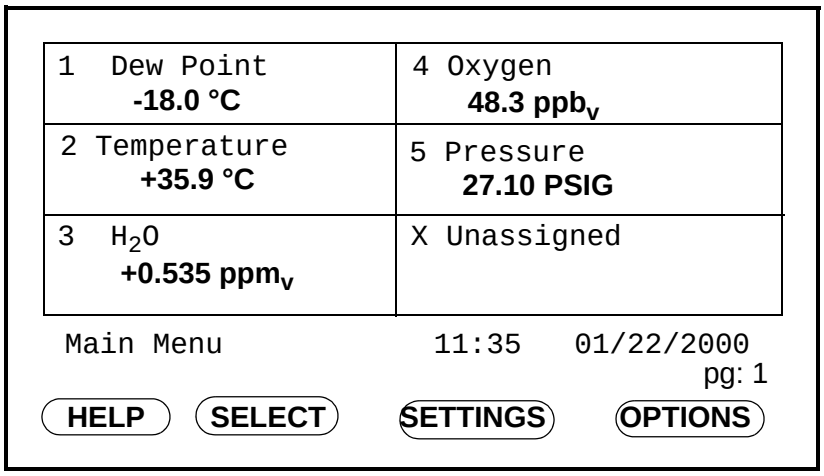

Figure 20: Matrix Format Screen

Each box in the matrix format is either assigned or unassigned. An **assigned box** displays a channel number, measurement mode, units, and a value. An **unassigned box** displays no data. See Figure 21 for examples of each type of box.

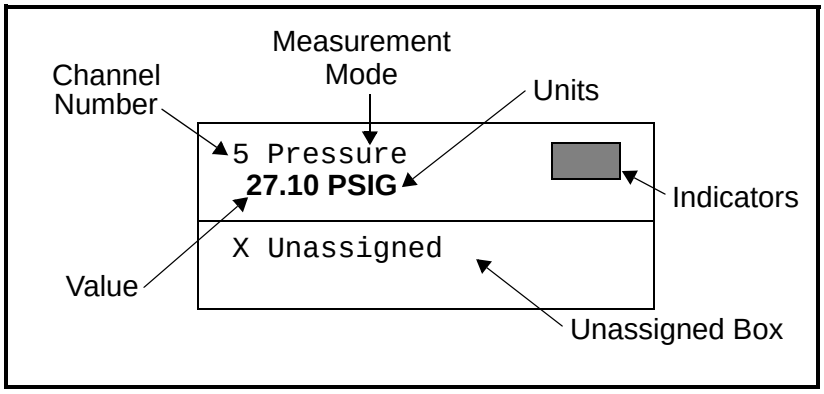

Figure 21: Assigned and Unassigned Boxes

The channel number is from 1 to 6, depending on how many channel cards are installed in the unit. Additional channel cards can be purchased separately and installed later (see *Installing a Channel Card* in the *Service Manual*).

2.4 Displaying Measurements (cont.)

The **measurement mode** is the parameter currently being measured. There are a variety of units for each measurement mode. Table 5 shows a list of the measurement modes and a description of the units for each. The table also shows the measurement modes and units as they are displayed on the screen. An example of a measurement is shown in Figure 22.

When selecting a measurement mode, please remember that some measurement modes require multiple inputs. For example, to display ppm_v, you need moisture and pressure inputs. Table 5 shows a list of measurement modes that require multiple inputs and what you need to program them.

Table 5: Measurement Modes and Required Inputs

To measure:	You need the following inputs:
RH	Temperature and moisture
PPM_V	Moisture and pressure
PPM_W	Moisture, temperature and saturation constant data
MCF/IG	Moisture and pressure
MCF/NG	Moisture and pressure
PPM_V/NG	Moisture and pressure

The shaded area in Figure 22 represents the **indicator** area. When you program the Series 1 with constants or use Enhanced Response, a symbol appears in this area. A “K” indicates a constant is being used in the measurement and an “E” indicates the meter is using Enhanced Response to determine the measurement. An example of a measurement using a constant and Enhanced Response activated is shown in Figure 22 below.

The value is expressed in the units selected for a desired measurement mode.

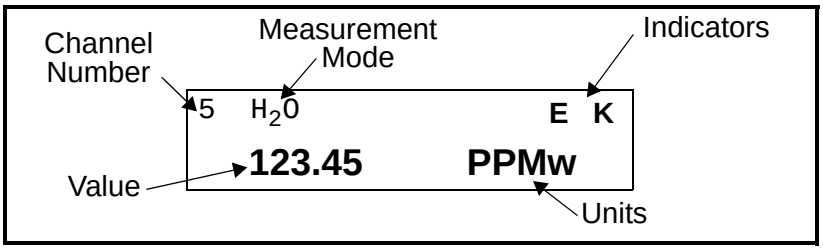

Figure 22: Example of a Displayed Measurement

Table 6: Measurement Modes and Units for the Series 1

Selected Meas. Mode	Description of Units	Displayed Meas. Mode	Displayed Units
Oxygen	O_2%= Percent Oxygen *default*	Oxygen	%
	O_2/ppM = Parts Per Million	Oxygen	ppm_v
	O_2/ppB = Parts Per Billion	Oxygen	ppb_v
	O_2/µA = Microamps (Diagnostic Mode)	Oxygen	µA
	O_2/DVM = Digital Voltmeter (Diagnostic Mode)	Oxygen DVM	VDC
Hygrometry	DP/°C = Dew/Frost Point *default*	Dew Point	°C
	DP/°F = Dew/Frost Point °F	Dew Point	°F
	DP/K = Dew/Frost Point K (Kelvin)	Dew Point	K
	%R.H. = Relative Humidity	Rel. Humidity	%
	H/ppMv = Parts per Million of Water by Volume	H_2O	ppm_v
	H/ppMw = Parts per Million of Water by Weight (for liquids only)	H_2O	ppm_w
	H/ppBv = Parts per Billion of Water by Volume	H_2O	ppb_v
	MCF/IG = Pounds of Water per Million Std. Cubic Feet in Ideal Gas	H_2O/MMSCF NG	lbs
	MCF/NG = Pounds of Water per Million Std. Cubic Feet in Natural Gas	H_2O/MMSCF NG	lbs
	ppMv/NG = Parts Per Million by Volume in Natural Gas	H_2O (Nat. Gas)	ppm_v
	mmHg = Vapor Pressure	Vapor Pressure	mmHg
	Pas = Vapor Pressure	Vapor Pressure	Pas
	MH = MH* (Diagnostic Mode)	H_2O	MH
	H/DVM = Digital Voltmeter (Diagnostic Mode)	Moisture DVM	VDC
	FH = FH* (Diagnostic Mode)	MIS Probe	FH
Temperature	T/°C = Degrees Celsius default	Temperature	°C
	T/°F = Degrees Fahrenheit	Temperature	°F
	T/K = Kelvin	Temperature	K
	T/DVM = Digital Voltmeter (Diagnostic Mode)	Temp DVM	VDC
Pressure	PSIg = Pounds per Square Inch Gauge default	Pressure	PSIg
	Bars = Bars	Pressure	Bars
	mbs = Millibars	Pressure	mbs
	mm/Hg = Millimeters of Mercury	Pressure	mmHg
	Pa(g) = Pascal, gauge	Pressure	Pas
	kPas(g) = KiloPascal, gauge	Pressure	kPas
	P/mV = Pressure in millivolts	Pressure	mV
	P/DVM = Digital Voltmeter (Diagnostic Mode)	Pressure DVM	VDC
	FP = FP** (Diagnostic Mode)	MIS Probe	FP
Auxiliary 1	Aux1/V = Volts default	Aux1	VDC
	Aux1/I = Milliamps	Aux1	mA
	Aux1/User = Function (Displays Aux Label)	Aux1 (Aux Label)	none
Auxiliary 2	Aux2/V = Volts default	AuxX	VDC
	Aux2/I = Milliamps	Aux2	mA
	Aux2/User = Function (Displays Aux Label)	Aux2 (Aux Label)	none
Volt Reference	Vref = Volts default (Diagnostic Mode)	Voltage Reference	VDC
Signal Ground User	Vgnd = Volts default (Diagnostic Mode)	Signal Ground	VDC

*The MH and FH values are the moisture sensors' response values and are the values that are recorded during calibration.

**The FP value is the MIS Probe's response value for pressure and is the value recorded during calibration.

2.4.1 Setting Up the Matrix Format

The matrix format consists of six pages that you can set up to display any combination of channels, measurement modes and measurement units. For example, if you have a six channel unit, you can use each page to display various measurements pertaining to one channel or you can use each page to display one measurement, such as dew point, for all six channels.

This section describes how to:

- switch from a line graph to the matrix format
- set up boxes to display the desired values
- set the Series 1 to manually or automatically scroll through each page

2.4.1a Switching from a Line Graph to the Matrix Format

At the Main Menu, press the keys as shown in Table 7. (See Figure 46 on page 83 for a menu map.) The screen appears similar to Figure 23. Press the DONE menu key until Main Menu appears on the message line.

Table 7: Moving from Matrix Screen Menu to Main Menu

Press the following menu keys:	To enter the:
OPTIONS	Option Menu
SCREEN	Graph/Matrix Screen Menu
MATRIX*	Matrix Screen Menu

*This menu key only appears if you are displaying a line graph.

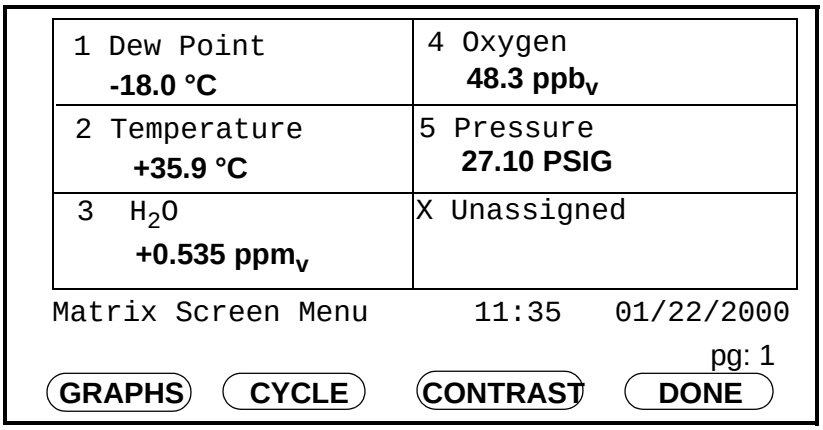

Figure 23: Matrix Screen Menu

2.4.1b Setting Up a Box

Once you switch to the matrix format, you can assign the desired channel, measurement modes and units to any of the boxes. See Figure 46 on page 83 for a menu map.

1. At the Main Menu, press the SELECT menu key. You are now in the Select Menu.

2. Press the PAGE menu key. At the Display Page # prompt, enter the page number and press [YES].

3. Press the MODE menu key. A list of measurement modes appears on the message line (see Table 6 on page 40).

4. Press the PLACE menu key to move the larger pointer to the box you want to change.

5. Move the brackets to the desired measurement mode and press the UNITS menu key. A list of measurement units appears on the message line.

Note: *To clear (un-assign) a box, press* [NO]. *The Series 1 labels the box* X Unassigned *(see Figure 23 on page 41).*

6. Move the brackets to the desired measurement units and press [YES].

7. Enter the desired channel number.

Note: *A "Channel Not Installed" message appears if you select a channel where no channel card is installed. Select a different channel. The meter will emit a buzzing sound.*

Repeat the above steps for each desired box. To exit, press the DONE menu key until Main Menu appears on the message line.

2.4.1c Manually or Automatically Scrolling Through Pages

You can set the Series 1 to automatically scroll through each page or enable you to scroll through each page manually. Use the appropriate section below to set up the scrolling procedure.

See Figure 46 on page 83 for a menu map.

1. At the Main Menu, press the SELECT menu key. You are now in the Select Menu.
2. Press the PAGE menu key. At the Display Page # prompt, enter the page number and press [YES].
3. At the Main Menu, press the OPTIONS menu key.
4. Press the SCREEN menu key.
5. Press the CYCLE menu key.
6. Enter an interval between 0 and 5 minutes and press [YES].

Note: *Enter 0:00 to turn the automatic scroll off.*

7. Press the DONE menu key until Main Menu appears on the message line.

After you enter the interval, the Series 1 begins scrolling through each page. It will automatically skip over pages that consist of all unassigned boxes.

Note: *When you press the* SELECT *menu key, the meter suspends the automatic page scrolling so you can make changes to the screen. It will automatically begin scrolling when you return to the* Main Menu.

2.4.2 Setting Up the Line Graph

A **line graph** displays data for each channel using a point-to-point graph. A line graph is useful for indicating trends or changes in measurements. You can only choose one measurement mode, which you can change at any time, for all channels. Only channels programmed for the selected measurement mode appear.

This section describes how to:

- switch from the matrix format to a line graph
- select the measurement units and mode
- select the X and Y axis scale

2.4.2a Switching from the Matrix Format to a Line Graph

At the Main Menu, press the keys as shown in Table 8. See Figure 46 on page 83 for a menu map. The screen appears similar to Figure 24. Proceed to the appropriate section that follows to change the mode, units or scale. If you do not want to change any of the line graph settings, press the DONE menu key until Main Menu appears on the message line.

Table 8: Moving from Graph Screen Menu to Main Menu

Press the following menu keys:	To enter the:
OPTIONS	Option Menu
SCREEN	Matrix Screen Menu
GRAPHS*	Graph Screen Menu

*This menu key will not appear if your screen is already set up for the graph format. If you switched your screen to display a line graph earlier and are now returning to adjust the graph, press the MATRIX menu key in its place. The screen will switch to the matrix format. Press the DONE menu key once to exit the Matrix Screen Menu. Then press the SCREEN menu key, and the GRAPHS menu key should appear.

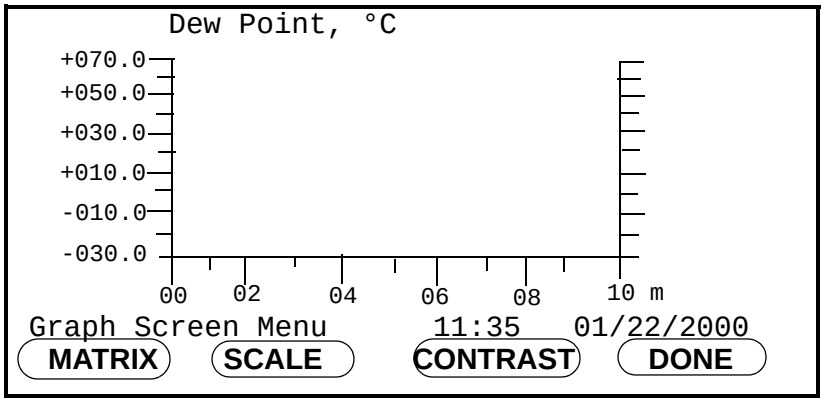

Figure 24: Graph Screen Menu for a Line Graph

2.4.2b Setting Up the X and Y Axis for a Line Graph

See Figure 46 on page 83 for a menu map.

1. At the Graph Screen Menu (see Table 8), press the SCALE menu key, and then the SCALE X and Y axis menu key.
2. The Series 1 prompts for the minimum Y axis. Enter the minimum value to be displayed, and press [YES].
3. The meter then prompts for the maximum Y axis. Enter the maximum value to be displayed, and press [YES].
4. Press the X AXIS (horizontal axis) menu key.
5. Enter the time in minutes, and press [YES]. The Series 1 accepts any value from 1 to 2160 minutes (36 hours).
6. Press the DONE menu key until Main Menu appears on the message line.

2.4.2c Selecting Measurement Mode and Units for a Line Graph

The line graph displays one measurement mode for all channels simultaneously. The meter defaults to dew point as the measurement mode the first time you select the line graph; however, if you change modes, the instrument will default to the last measurement mode selected. See Figure 46 on page 83 for a menu map.

1. At the Main Menu, press the SELECT menu key. You are now in the Select Menu.
2. Press the MODE menu key. A list of measurement modes appears on the message line (see Table 6 on page 40).
3. Select the desired measurement mode, and press [YES].
4. Press the UNITS menu key. A list of units for the selected measurement mode appears on the message line.
5. Select the desired units, and press [YES].
6. Press the DONE menu key until Main Menu appears on the message line.

Note: *You can rescale graph data at any time (without losing data) by entering new X-axis and Y-axis values.*

2.4.3 Tagging the Inputs

The Series 1 enables users to assign tags to customize the display of the input parameters in the matrix or graph formats. The instrument accepts a separate 16 character label for each input. To tag inputs, use Table 9 to enter the System Calibration Menu. (See Figure 47 on page 84 for a menu map.)

Table 9: Moving from Label Entry Menu to Main Menu

Press the following menu keys	To enter the:
SETTINGS*	Settings Menu
SYSTEM	System Settings Menu
CONFIG	Probe Configuration Menu

*The Settings Menu will prompt for a passcode (see page 16).

2.4.3a Making Tags

See Figure 47 on page 84 for a menu map.

Note: *You should have already verified or entered the calibration data for the input before making tags. Making your own tag of any character length overrides the default GE tag for that parameter (i.e., "Dew Point," "Temperature," "Pressure," etc.)*

1. From the Probe Configuration Menu (Table 1 on page 19), move the pointer to the channel and probe you want to select. The arrow will only move to installed channels.

2. Press the TAG menu key. The Label Entry Menu appears as shown in Figure 25. The screen displays a table of the character set available, an Edit Box and four menu options.

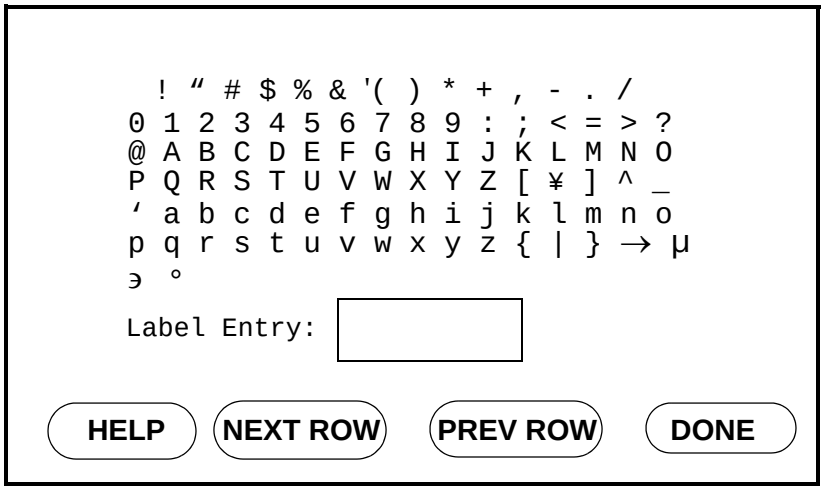

Figure 25: Label Entry Menu

3. A flashing select pointer appears in the upper left corner of the character set. Use the NEXT ROW and PREV ROW menu keys to move the pointer to the desired row.

4. Then use the arrow keys to move the pointer to the desired character and press [YES]. The selected character will appear in the Edit Box. The upper left corner of the character set contains the space character.

5. Repeat steps 3 and 4 until you have entered all the characters for the label.

Note: *Use the numeric keys to enter numbers, decimal points, or minus signs. To erase a character, press the* [NO] *key. The character to the left of the Edit Cursor will be erased.*

6. When you complete entering the label, press the DONE menu key. The Probe Configuration Menu screen appears again, this time with a tag symbol appearing beside the tagged probe. When you return to the Main Menu, the matrix will display the tag name in the assigned channel.

Note: *Tags do not appear for alarm or recorder outputs.*

2.5 Adjusting the Contrast of the Screen

To adjust the screen contrast, press the keys in Table 10. The screen appears similar to Figure 26. See Figure 46 on page 83 for a menu map.

Press the INCR menu key to increase the contrast. Press the DECR menu key to decrease the contrast. Hold INCR or DECR down for large changes or press repeatedly for small changes.

To exit, press the DONE menu key until Main Menu appears on the message line.

Table 10: Moving from Contrast Adjust to Main Menu

Press the following menu keys:	To enter the:
OPTIONS	Option Menu
SCREEN	Screen Menu
CONTRAST	Contrast Adjust Menu

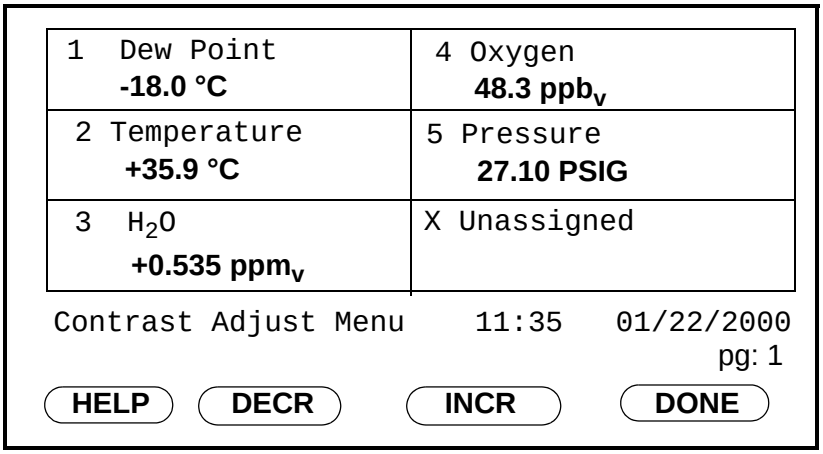

Figure 26: Contrast Adjust Menu

Note: *The screen in Figure 26 above will appear in either the matrix format or a line graph, depending on the screen setup.*

2.6 Setting the Clock and Calendar

Press the keys in Table 11 to reset the clock and calendar; then follow the steps below. The screen appears similar to Figure 27. See Figure 47 on page 84 for a menu map.

Table 11: Moving from System Service to Main Menu

Press the following menu keys:	To enter the:
SETTINGS	Settings Menu
SERVICE	System Service Menu

*The Settings Menu will prompt for a passcode (see page 16).

Use the following steps to set the clock and calendar:

1. Press the CLOCK menu key. The hours are highlighted.
2. Enter the digits for the month, day, year, hours (0-23), minutes, and seconds. If you do not want to change a part of the time or date, press the pointer to skip over it until you complete entering the year.
3. To exit, press the DONE menu key until Main Menu appears on the message line.

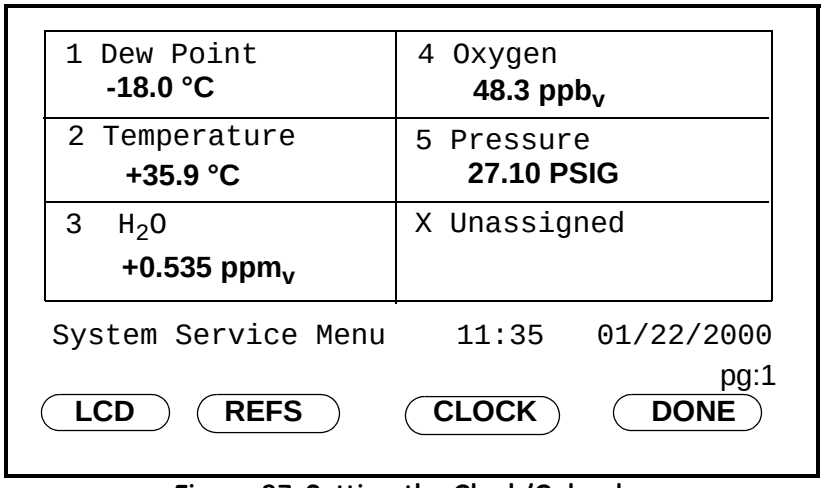

Figure 27: Setting the Clock/Calendar

2.7 Setting the Refresh Interval for the Display

In the event an error with the display occurs, users can select an interval (from 15 seconds to 24 hours) at which the Series 1 refreshes its display. Press the keys in Table 12 to set the refresh interval; then follow the steps below. The screen appears similar to Figure 28. See Figure 47 on page 84 for a menu map.

Table 12: Moving from System LCD to Main Menu

Press the following menu keys:	To enter the:
SETTINGS	Settings Menu
SERVICE	System Service Menu
LCD	LCD Refresh Rate Menu

*The Settings Menu will prompt for a passcode (see page 16).

Complete the following steps to set the refresh rate:

1. From the Service Menu, press the LCD menu key. The menu keys change to SET and DONE. Press SET.

2. Use the numeric and arrow keys to enter the desired interval time in hours (up to 24), minutes, and seconds (at least 15). The default rate is 2 hours.

Note: *If you select a value of less than 15 seconds, the interval will set to 15 seconds. If you select a value of over 24 hours, the interval will set to 24 hours. To disable the refresh sequence entirely, enter the value of 00:00:00 for the interval.*

3. Press [YES] to set the value. To exit, press the DONE menu key until Main Menu appears on the message line.

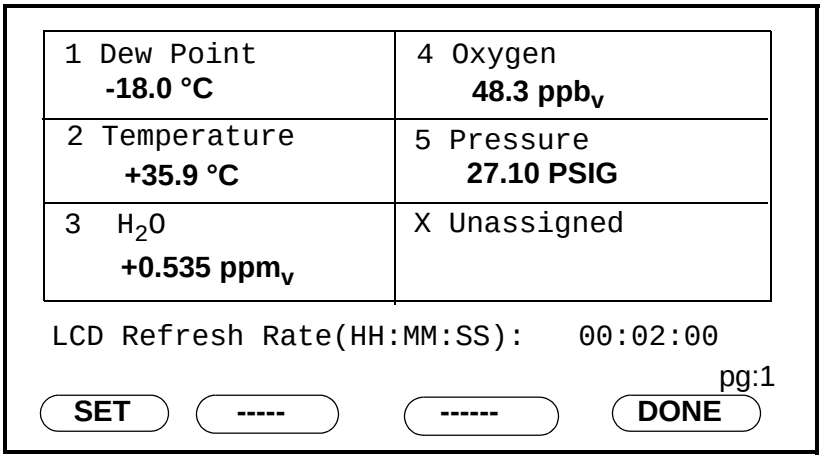

Figure 28: Setting the Refresh Interval

All menus will now experience the LCD controller refresh, indicated by a quick “blink” of the display, at the specified interval.

[no content intended for this page]

Your passcode is 2719.

Please remove this page and put it in a safe place for future reference.

[no content intended for this page]

Chapter 3. Advanced Programming

3.1 Introduction

Now that the Series 1 is running and the screen is set up, you may want to use the other operational features that are listed below:

- Setting Up the Recorders
- Setting Up the Alarms
- Using Automatic Calibration
- Entering Constants and User Functions
- Using Enhanced Response
- Using Data Logging
- Setting Up the RS232 Communications Port
- Setting Error Processing

3.2 Setting Up the Recorders

The Series 1 has two recorder outputs for each channel: Recorder A and Recorder B. To select the measurement mode, units and range for each recorder, press the menu keys as shown in Table 13. The screen appears similar to Figure 29 on page 54. See Figure 47 on page 84 for a menu map.

IMPORTANT: *Switch Blocks must be set to the appropriate positions for output ranges. See* Connecting the Recorder Outputs *in Chapter 1 of the* Service Manual.

To test or trim recorders, refer to *Testing the Recorder Outputs* or *Trimming Recorders* in Chapter 2 of the *Service Manual*.

Table 13: Entering the Recorder Settings Menu

Press the following menu keys:	To enter the:
SETTINGS*	Settings Menu
OUTPUTS	Output Settings Menu
RECORDER	Recorder Settings Menu

* The Settings Menu will prompt for a passcode (see page 16).

3.2 Setting Up the Recorders (cont.)

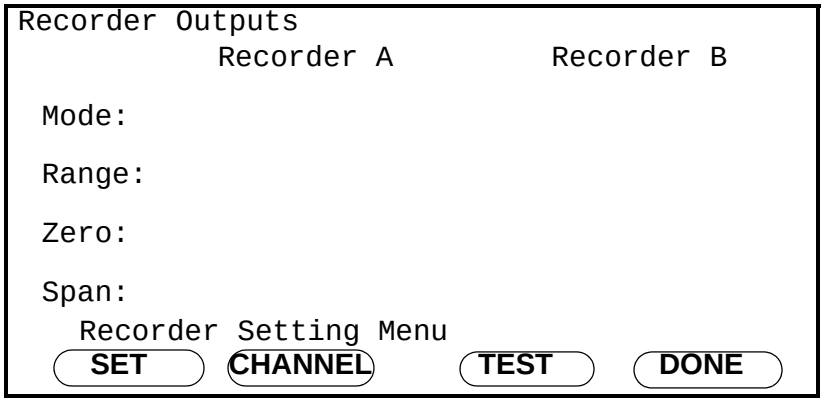

Figure 29: Recorder Settings Menu

IMPORTANT: *You should record this data on the Program Information List supplied in Appendix A of the* Startup Guide*, or on a separate sheet of paper, and keep it in a safe place.*

3.2.1 Selecting Measurement Mode and Units for Recorders

See Figure 47 on page 84 for a menu map.

1. At the Recorder Settings Menu (see Table 13 on page 53), use the CHANNEL menu key to cycle to the desired channel. The channel number is indicated in the top right-hand corner of the screen. The screen will only display installed channels.
2. Press the SET menu key. A box highlights Recorder A, and the menu keys change to [RANGE], [MODE] and [A◄►B].
3. Press the [A◄►B] menu key to move the box to the desired recorder.
4. Press the MODE menu key. A list of available measurement modes appears on the message line. See Table 6 on page 40 for a list of measurement modes.
5. Move the brackets to the desired measurement mode and press the UNITS menu key. A list of the available units appears on the message line.

Note: *An arrow sign at either end of the message line indicates more choices.*

6. Move the brackets to the desired units and press [YES].

3.2.2 Setting the Range for Recorders

See Figure 47 on page 84 for a menu map.

1. At the Recorder Settings Menu (see Table 13 on page 53), press the SET menu key. The menu keys change to [RANGE], [MODE] and [A◄►B].
2. Press the RANGE menu key. A list of the available output ranges appears on the message line.
3. Move the brackets to the desired output range and press [YES].
4. With the arrow key, move the pointer to the Zero line for the desired recorder. Press [YES] to erase the present value.
5. Enter a new value and press [YES].
6. Move the pointer to Span for the desired recorder and press [YES] to erase the current value.
7. Enter a new value and press [YES].
8. Repeat steps 1 through 6 to set up the other recorder.

Repeat all of the above steps to set up recorders for the desired channels.

To exit, press the DONE menu key until Main Menu appears in the message line.

3.3 Setting Up the Alarms

The Series 1 has two optional alarms for each channel. To select the measurement mode, units and set point values for each alarm, press the keys shown in Table 14. A screen appears similar to Figure 30. See Figure 47 on page 84 for a menu map.

To test alarms, refer to *Testing the Alarm Relays* in Chapter 2, *Troubleshooting and Maintenance*, of the *Service Manual*.

Table 14: Moving to Alarm Settings Menu

Press the Main Menu key:	To enter the:
SETTINGS*	Settings Menu
OUTPUTS	Output Settings Menu
ALARMS	Alarm Settings Menu

*The Settings Menu will prompt for a passcode (see page 16).

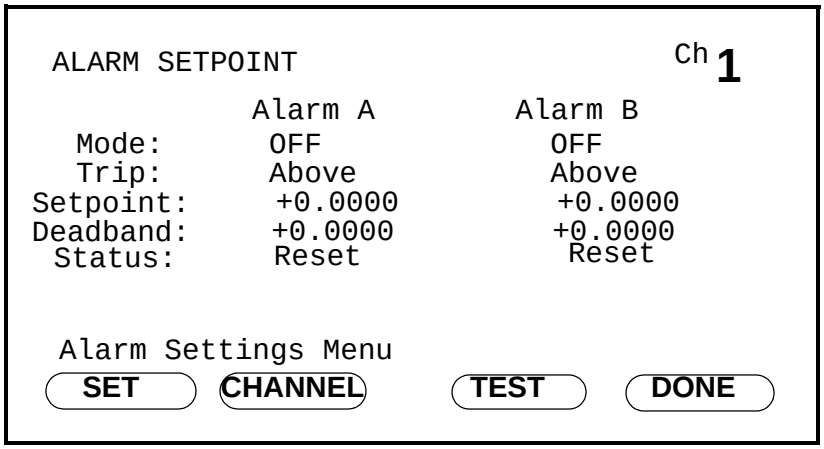

Figure 30: Alarm Settings Menu

Note: *The first time you enter this menu, all alarm relays are OFF. When an alarm value is not entered, the alarm relay is OFF.*

3.3 Setting Up the Alarms (cont.)

IMPORTANT: *You should record this data on the Program Information List supplied in Appendix A of the* Startup Guide, *or on a separate sheet of paper, and keep it in a safe place.*

3.3.1 Selecting the Measurement Mode, Units and High/Low Values for Alarms

See Figure 47 on page 84 for a menu map.

1. At the Alarm Settings Menu (see Table 14 on page 56), press the CHANNEL key to scroll to the channel for the alarm you want to set, and then press SET.

2. Press the [A◄►B] menu key to select the desired alarm.

3. Press the MODE menu key. A list of modes appears on the message line (see Table 6 on page 40).

4. Move the brackets to the desired mode and press the UNITS menu key. A list of units appears on the message line.

5. Move the brackets to the desired units and press [YES].

6. Press the TRIP menu key. The pointer will move to the Trip line. Use the pointer to select [Above] or [Below] and thus determine whether the alarm is a High or Low alarm. Then press [YES] and then the [DONE] key.

3.3.2 Entering the Setpoint and Deadband Values for Alarms

See Figure 47 on page 84 for a menu map.

IMPORTANT: *Select the measurement mode and units before you enter the setpoints. The meter changes the format for the allowable number of digits, depending on the measurement units entered.*

1. At the Alarm Settings Menu (see Table 14 on page 56), press the CHANNEL key to scroll to the channel for the alarm you want to set, and then press SET.

2. Press the [A◄►B] key to select the desired alarm.

Note: *If you have entered the Measurement Mode and Units, you may enter the setpoint at this step. The pointer moves automatically from the Trip to the Setpoint line.*

3. Move the pointer to Setpoint: and press [YES] to erase the existing value.

4. Enter a new setpoint value, and press [YES] to confirm the new value.

Note: *If the alarm set point value is blank or invalid, the old value will be restored.*

The deadband allows users to set a programmable range of (normally small) values beyond the setpoint, so that the Series 1 will not trigger an alarm unless the measured value goes outside the deadband range. On a High alarm, the alarm will trip if the measurement is greater than or equal to the setpoint. It will not RESET until the measurement is less than the setpoint *minus* the deadband. However, on a Low alarm, the alarm will trip if the measurement is less than or equal to the setpoint. It will not RESET until the measurement is greater than the setpoint *plus* the deadband.

5. Move the pointer to the deadband line, and press [YES] to erase the existing value.

6. Enter a new deadband value, and press [YES] to confirm the new value.

To exit, press the DONE menu key until Main Menu appears on the message line.

3.4 Using Automatic Calibration

The Series 1 automatically calibrates the moisture, pressure, and oxygen measurement circuitry (Auto-Cal) at a user selected interval. Auto-Cal compensates for any drift in the electronics. GE recommends setting the Auto-Cal interval to eight hours. Set a smaller interval to Auto-Cal more frequently if the meter is exposed to extreme temperatures or weather conditions.

Note: *If you are using only Moisture Image Series Probes to measure moisture, you do not have to Auto-Cal.*

To set the Auto-Cal interval, press the keys shown in Table 15. The screen appears similar to Figure 31 below. Refer to Figure 47 on page 84 for a menu map.

Table 15: Entering the Reference Menu

Press the Main Menu key:	To enter the:
SETTINGS*	Settings Menu
SERVICE	System Service Menu
REFS	Reference Menu

* The Settings Menu will prompt for a passcode (see page 16).

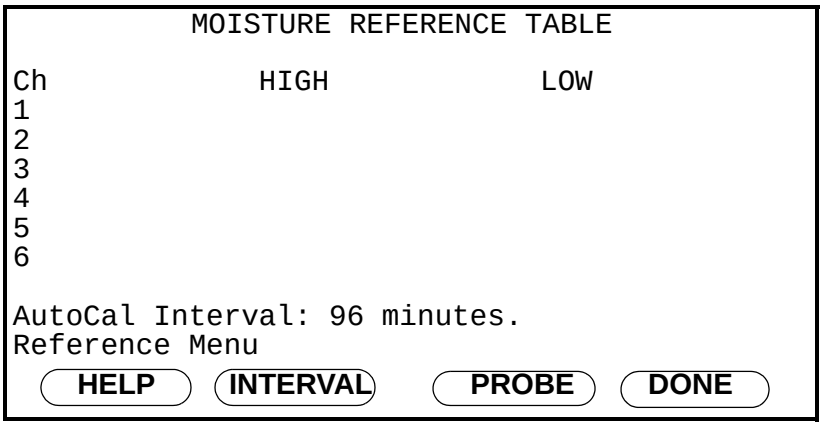

Figure 31: Setting the Auto-Cal Interval

3.4 Using Automatic Calibration (cont.)

To set the Auto-Cal interval, do the following. (See Figure 47 on page 84 for a menu map.)

Note: *The Reference Menu has three tables: one each for moisture, oxygen, and pressure references. You can use any one of these Tables to set the Auto-Cal interval.*

1. At the Reference Menu (see Table 15 on page 59), press the INTERVAL menu key.

2. Using the numeric keys, enter an Auto-Cal interval between 0 and 24 hours and press [YES].

3. Press the DONE menu key. The meter begins Auto-Cal. Wait for the Auto-Cal to complete and continue pressing the DONE menu key until Main Menu appears on the message line.

The next time Auto-Cal occurs will depend on the length of the time interval that was set. See the example below.

EXAMPLE:

The Series 1 establishes a fixed schedule, beginning at midnight, using the interval specified to determine the times of subsequent Auto-Cals. For example, if you enter a 1 hr., 30 min. time interval, Auto-Cal will occur 16 times per day (1 day = 1440 minutes ÷ 90 minutes = 16). The fixed schedule will be as follows:

1. 1:30 a.m.
2. 3:00 a.m.
3. 4:30 a.m.
4. 6:00 a.m.
5. 7:30 a.m.
6. 9:00 a.m.
7. 10:30 a.m.
8. 12:00 p.m. (noon)
9. 1:30 p.m.
10. 3:00 p.m
11. 4:30 p.m.
12. 6:00 p.m.
13. 7:30 p.m.
14. 9:00 p.m.
15. 10:30 p.m.
16. 12:00 a.m. (midnight)

If you set the 1 hr., 30 min. Auto-Cal interval at 6:10 p.m., the next Auto-Cal will occur at 7:30 p.m. (excluding the Auto-Cal performed when first leaving the Reference Menu).

3.5 Entering Constants and User Functions

The Series 1 allows you to enter two types of constants, a user constant and a saturation constant, as well as user-defined functions and tables to manipulate data.

Note: *Refer to the section* Background Gas Current Multipliers for the Delta F Oxygen Cell *in Chapter 2 of the* Service Manual *to enter a current multiplier for oxygen.*

A **user constant** is a fixed value for moisture, temperature, or pressure entered into the meter instead of using a "live" input. For example, if the process runs at a steady pressure, you can enter the constant pressure into the memory rather than using a pressure transmitter. For special applications, you can also multiply the moisture ppm value by a constant value ($K \times ppm_v$).

A reverse video "K" symbol appears in the top-right-hand corner of the box (in matrix format) for channels that are using a user constant value. A symbol does not appear in the graph format.

The other type of constant is a **saturation constant**. The Series 1 requires a saturation constant in order to calculate ppm_w in non-aqueous liquids. If you do not know the saturation constant of the liquid, contact GE.

To extend programming capability, **user functions** allow operators to program up to four desired mathematical equations on each channel. Users can assign any recorder output or alarm relays to user functions on any channel. In addition, they can use any parameter on any channel to calculate a different parameter.

Enter user constants, saturation constants, and user-defined functions and tables through the User Constant Menu. Use Table 16 to enter this menu. See Figure 46 on page 83 for a menu map.

Table 16: Entering the User Constant Menu

Press the Main Menu key:	To enter the:
OPTIONS	Option Menu
USER	User Constant Menu

Use the appropriate section that follows to make entries.

3.5.1 Entering User Constants

The User Constant Menu enables you to enter constants for moisture (Kh), temperature (Kt), and pressure (Kp). In addition, you can multiply the ppm_v value by a specified constant for special purposes. The default multiplier is 1.000.

Note: *In order for the constant to work properly, you should make sure you also configure that channel for a constant as described on page 21.*

Use the following steps to enter user constants. (See Figure 46 on page 83 for a menu map.)

IMPORTANT: *You should record this data on the Program Information List supplied in Appendix A of the* Startup Guide, *or on a separate sheet of paper, and keep it in a safe place.*

1. After entering the User Constant Menu (refer to Table 16 on page 61), press the PAGE menu key until the User Constant Table appears as shown in Figure 32.
2. Move the pointer to the desired channel and constant to enter and press [YES] to erase the present value.
3. Enter the constant value and press [YES].
4. To enter user functions, user tables or saturation constants, press [PAGE] to proceed to the following pages. To exit this menu, press the DONE menu key until Main Menu appears in the message line.

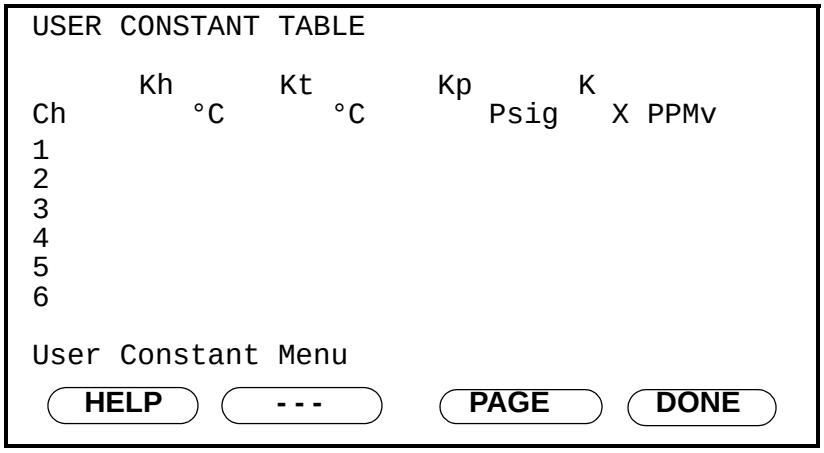

Figure 32: User Constant Menu

3.5.2 Specifying User Functions

User functions enable operators to program up to four desired mathematical equations on each channel. They can also use any parameter on any channel to calculate a different parameter. Use Table 17 to enter this menu, and press the PAGE menu key until the screen is similar to Figure 33.

Table 17: Entering the User Function Menu

Press the Main Menu key:	To enter the:
OPTIONS	Option Menu
USER	User Constant Menu
PAGE	User Function Menu

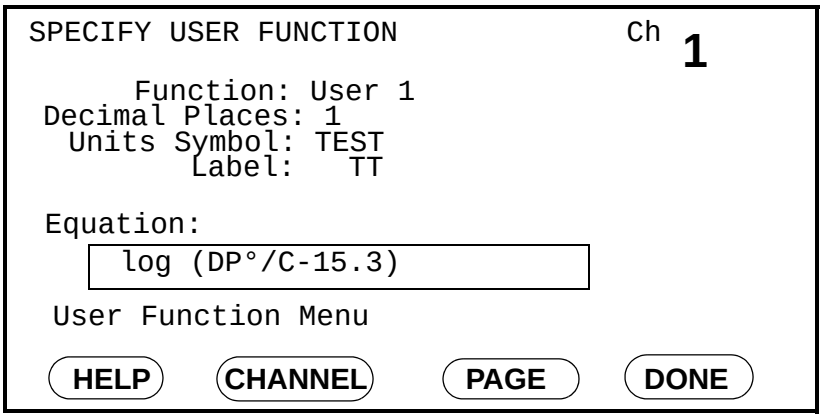

Figure 33: User Function Menu

3.5.2a Selecting Initial Parameters

1. Press the CHANNEL key to scroll to the desired channel, and the PAGE key to scroll to the desired function (or blank page).
2. Move the pointer to the Function line. Press [YES] to remove the function, type in a new entry, and press [YES] to confirm the entry.
3. Move the pointer to the Decimal Places line. Press [YES] to erase any current number, and enter the number of decimal places to the right of the decimal point that you wish to appear. Press [YES] to confirm the entry.
4. Move the pointer to the Units Symbol line. Press [YES] to remove any entry, type in a new entry, and press [YES] to confirm the entry.
5. Move the pointer to the Label line. Press [YES] to remove the function. Type in a new entry, and press [YES] to confirm the entry.

3.5.2b Entering the Equation

1. Move the pointer to the Equation box. Press [YES] to enter the function. The Math Entry Menu appears, as shown in Figure 34.

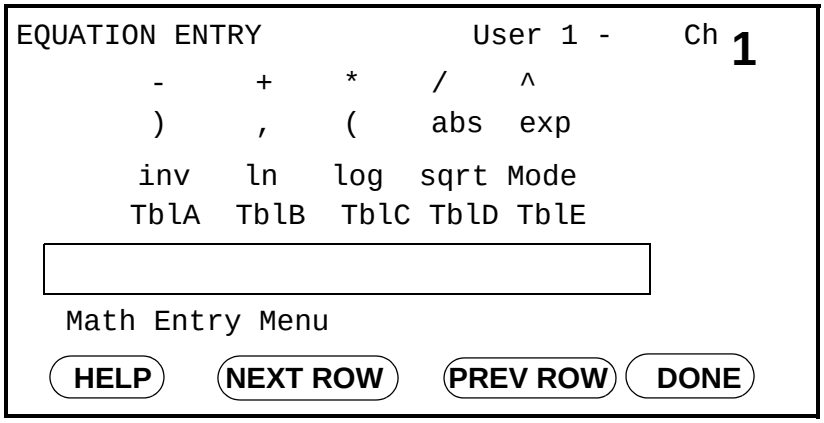

Figure 34: Math Entry Menu

2. In the Math Entry Menu, use the NEXT ROW and PREV ROW keys to scroll to the appropriate row. Then use the arrow key to reach the desired symbol.

3. Once the key is on the symbol, press [YES] to enter the symbol into the equation. Use the number keys to enter numeric values. (Press [NO] to remove any mistaken or unwanted symbols or numbers.)

4. To enter a particular measured parameter into the equation, click on the MODE symbol at the right of the third row. A list of parameters will appear. Scroll through the list until you reach the desired parameter, and press [YES].

5. A list of units will then appear. Scroll through the list with the arrow keys until you reach the desired units, and press [YES].

Note: *If you wish to link a parameter from a particular channel, add "(Ch#)" after you select the parameter. For example, "DP/°C(2)" is the dewpoint in °C on channel 2.*

6. Press the DONE key to confirm the equation. The meter will return to the User Function Menu. However, if the user function contains an error (for example, unbalanced parentheses or a missing operator), the function will be labeled "INVALID."

7. Press DONE to return to the Option Menu, or repeat the procedure to enter functions for other channels or pages.

3.5.3 Entering User-Defined Tables

To support user-defined functions, the Series 1 can hold up to five tables (designated as A through E) of non-linear or empirical data. Users can enter up to 16 X-Y pairs in each table. The user functions can supply an X value with Tbl(). The meter then interpolates the Y value for a given X, and substitutes it for Tbl (X) in the function. (The results are extrapolated if the X value exceeds the bounds of the table.)

To enter the User Function Table Menu, first enter the User Function Menu, and press the PAGE menu key until a screen similar to Figure 35 appears. Press the TABLE menu key to scroll through the five tables.

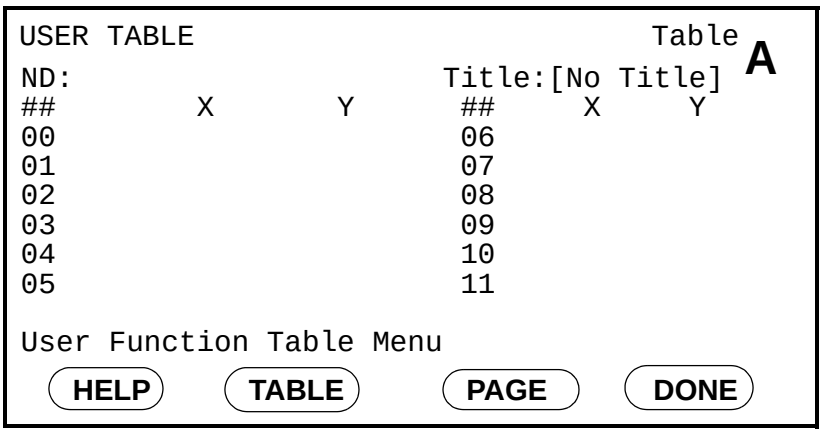

Figure 35: User Function Table Menu

1. The pointer starts at the ND (number of data points) line. Press [YES]. Enter the number of data points desired, and press [YES] to confirm the entry.
2. The pointer moves to the Title entry. Press [YES] and the Label Entry Menu (shown in Chapter 2) appears.

Note: *The title is for information purposes, and does not appear anywhere else.*

3. A flashing select pointer appears in the upper left corner of the character set. Use the NEXT ROW and PREV ROW keys to move the pointer to the desired row. Then use the arrow keys to move the pointer to the desired character. The upper left corner of the character set contains the space character.
4. The pointer moves to the first row for X and Y data points. Press [YES] and enter the data points desired.
5. Press [YES] to confirm each entry and proceed to the next point.
6. Repeat steps 4 and 5 until you have entered all the data points. Then press the [DONE] menu key to return to the Option menu.

3.5.4 Entering Saturation Constants

To enter a saturation constant, you must enter 1 to 6 data points to represent a curve of Cs (saturation constant) versus temperature. Use the following steps to enter a curve for each channel. See Figure 46 on page 83 for a menu map.

IMPORTANT: *You should record this data on the Program Information List supplied in Appendix A of the* Startup Guide, *or on a separate sheet of paper, and keep it in a safe place.*

1. After entering the User Constant Menu (refer to Table 16 on page 61), press the PAGE menu key until a screen similar to Figure 36 appears.

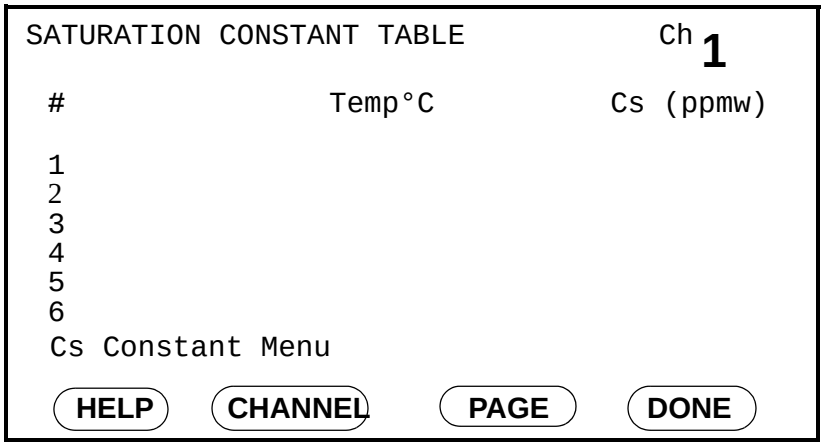

Figure 36: Cs Constant Menu

2. Use the CHANNEL menu key to cycle to the desired channel.

3. Use the arrow keys to go to the first data point for temperature and press [YES].

4. Enter the temperature for the first data point and press [YES]. Then press the pointer to move to Cs.

5. Press [YES] to erase the current value.

6. Enter the desired Cs value and press [YES].

7. Repeat steps 4 through 6 for all the data points and for each channel using a saturation constant.

To exit the Cs Constant Menu, press the DONE menu key until Main Menu appears on the message line.

3.6 Using Computer Enhanced Response

Enhanced Response uses a dynamic moisture calibration technique to extrapolate the moisture level to the end point when making measurements in abrupt “dry down” conditions. The system response time depends on the relative change in dew point and the number of channels. For a change from ambient moisture levels to trace levels, the unit can respond in three to five minutes for single-channel operation.

The accuracy of enhanced response is ±2°C of the reading the sensor would have read if it were allowed to reach equilibrium with the gas. To ensure that computer enhanced software is as accurate as possible, your application should:

- have a reasonably constant final dew point and flow rate.
- have a minimum flow rate of one standard cubic foot per hour (SCFH).
- operate at atmospheric pressure (0 psig).
- have an actual moisture content at or above a dew/frost point of
  - MIS Probe: –85°C
  - M Series or TF Series Probe: –110°C

To activate and use enhanced response, see Figure 46 on page 83 for a menu map and complete the following steps.

1. Allow the sensor to reach equilibrium at ambient moisture levels before being exposed to the dry gas. Exposing the sensor to dew points of 5 to 10°C for 5 to 10 minutes will enable the sensor to reach equilibrium.
2. Use Table 18 to activate the computer enhanced response.

Table 18: Activating the Enhanced Response Option

Press the Main Menu key:	To enter the:
OPTIONS	Option Menu
USER	User Constant Menu

3. If necessary, press the PAGE menu key until the Enhanced Response Menu appears (see Figure 37 on page 68).

3.6 Using Computer Enhanced Response (cont.)

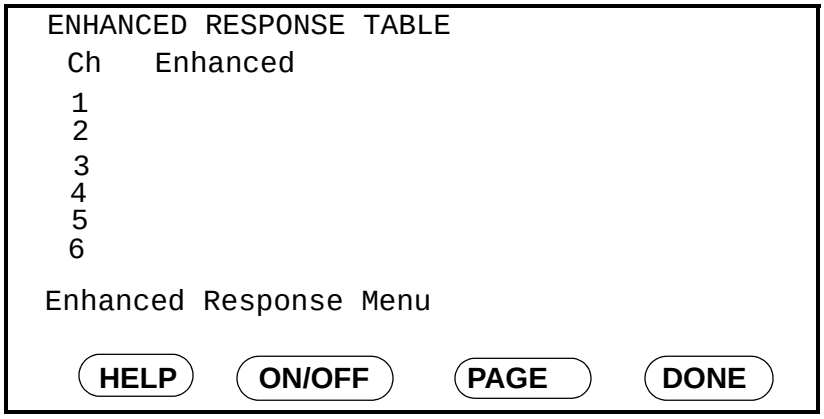

Figure 37: Enhanced Response Menu

4. Use the arrow keys to scroll to the desired channel.

5. Press the ON/OFF menu key to turn enhanced response on (yes) or off (no).

6. Repeat steps 4 and 5 for each desired channel.

7. To exit, press the DONE menu key until Main Menu appears on the message line.

8. Expose the sensor to dry gas.

IMPORTANT: *You must enable enhanced response before you expose the sensor to the dry gas. The meter must see all of the dry down in order to make accurate calculations.*

When activating enhanced response for a channel, a reverse video “E” symbol appears in the top-right-hand corner of the corresponding box when displaying data in the matrix format. When the meter determines the final value, the reverse video “E” changes to a regular “E”. The “E” symbol does not appear in the graph format.

3.7 Setting Up the Data Logger

The Series 1 has a data logging feature that enables you to internally store and view data. Users can log up to 12 parameters on each of six channels, and update the data at intervals as fast as 5 sec.

A 64-kbyte RAM holds logged data; users can also add an optional PCMCIA card to store up to 1 Mbyte of data. The meter has a fixed amount of memory; therefore, the number of parameters you select and the more frequent the time interval, the shorter the log time. Once you specify the log parameters, the meter displays a status screen that lists the number of records, bytes free, bytes used, and the remaining hours and minutes the log will run before the programmed End Time (see Figure 38).

The meter assigns logged data a record and a header. The **record** consists of the date, time, and corresponding logged values. The **header** consists of the selected channels, the selected measurement modes, and the time the log started. It is used to distinguish one log from another.

The Series 1 can store logs in six slots. Thus, if you wish to create a new log when all six slots are filled, you must remove one of the existing logs.

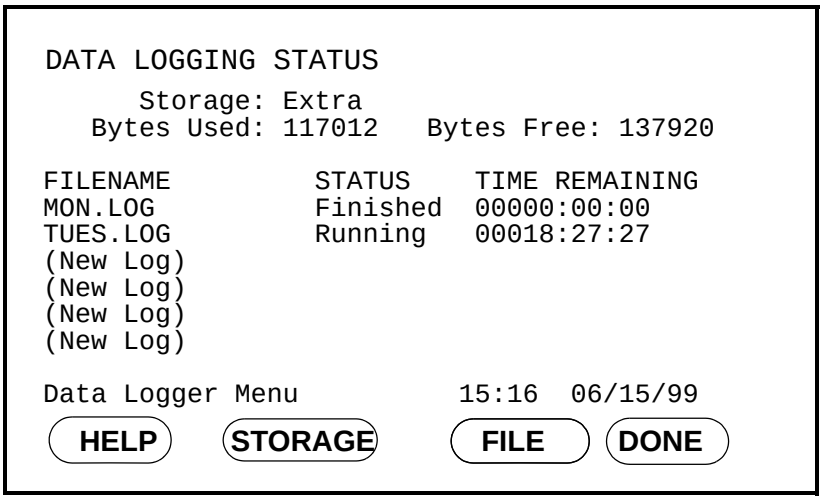

Figure 38: Data Logger Menu

Use the following sub-section to view the data logger status, set up a log, and view logged data.

3.7.1 Viewing the Data Logger Status

Press the keys as shown in Table 19. The screen appears similar to Figure 39. See Figure 46 on page 83 for a menu map. Log statuses include running, stopped, pending (waiting to start) or finished. The screen also displays whether internal or extra (PCMCIA card) memory is in use, as well as the amount of memory available.

Table 19: Entering the Data Logger Menu

Press the Main Menu key:	To enter the:
OPTIONS	Option Menu
LOGGER	Data Logger Menu

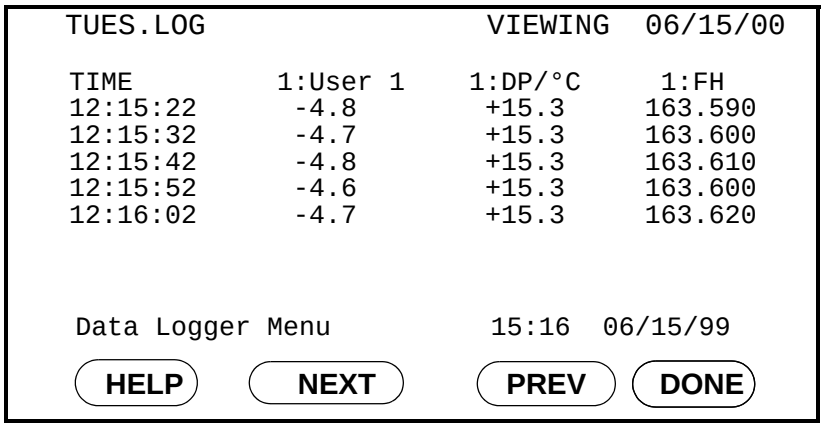

Figure 39: The Data Logger Menu

3.7.2 Viewing Logged Data

To view a specific file from the Data Logger Menu, move the pointer to that file, and then press [YES]. The screen appears similar to Figure 39. See Figure 46 on page 83 for a menu map.

Use the PREV and NEXT menu keys to view the next and previous pages of logged data. To view other records, continue to press the NEXT menu key until <end> appears at the end of the record. If the screen has more than three columns, use the pointer to scroll across the columns.

To exit, press the DONE menu key until Main Menu appears on the message line.

3.7.3 Removing Logged Data

To remove a log, select it with the arrow keys on the Data Logger Menu. Press the [FILE] menu key, and then [REMOVE]. The screen will ask “Are you sure?” Confirm the deletion by pressing [YES].

IMPORTANT: *Deleted logs cannot be retrieved!*

3.7.4 Entering Data Logger Settings

Use the steps below to select the channels, measurement modes and units you want to log, as well as the log interval and whether the log is cyclic or has a definite start and end.

Note: *If all six logs are filled, a log must be deleted to create room for another.*

3.7.4a Naming the Log and Setting Up Start/End Times or Cycles

See Figure 46 on page 83 for a menu map.

1. At the Data Logger Menu (see Table 19 on page 70), select a "New Log" file and press [YES] to enter the Label Entry Menu shown in Figure 40.

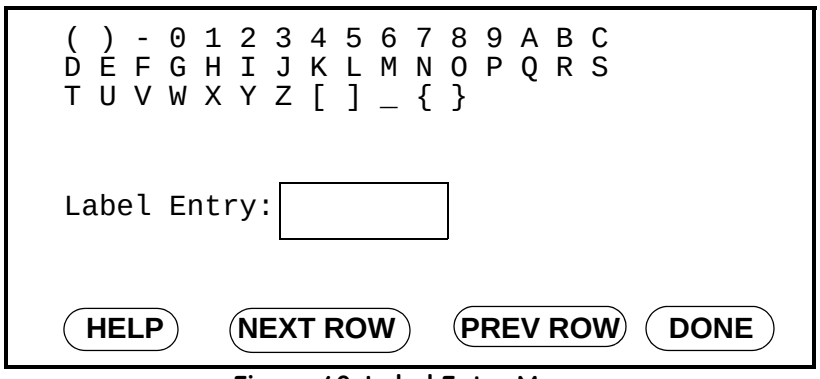

Figure 40: Label Entry Menu

2. Specify the log name. Use the NEXT ROW and PREV ROW menu keys to scroll to the desired line, and then use the arrow keys to reach the desired letters, numbers or symbols. When you have completed the label, press the DONE menu key. The Set Data Logger Menu now appears, as shown in Figure 41.

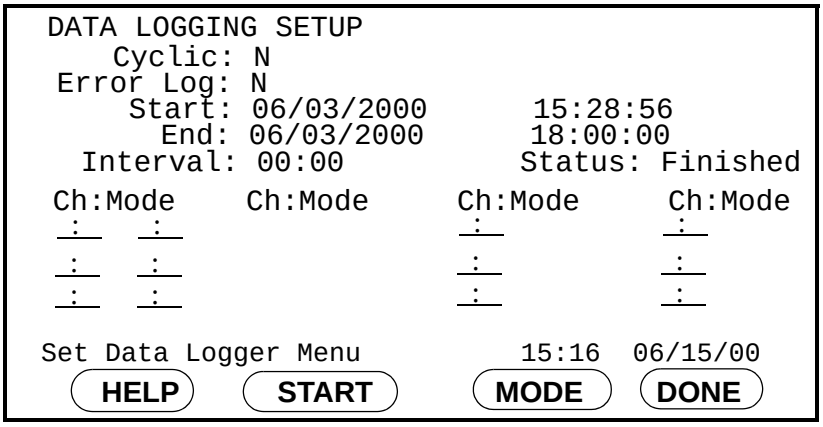

Figure 41: Set Data Logger Menu

3.7.4a Naming the Log and Setting Up Start/End Times or Cycles (cont.)

3. Move the pointer to the CYCLIC row. You can program a log as cyclic (running continuously, with the newest data overwriting the oldest after a certain number of records) or with a definite start and end. Press [YES] to program the log as cyclic, or [NO] to start and end the log at specified times.

4. The pointer moves to the Error Log row. Press [YES] to have the log record only errors, or [NO] to proceed to the Start/End times.

The program now varies, depending on your selection in step 3.

- If you pressed [NO], continue with step 5.
- If you pressed [YES], go to "Entering Settings for a Cyclic Log" below.

5. To specify the start and end times, type in the dates using a Month/Day/Year (MM:DD:YYYY) numeric format (for example, 12/29/1999) and the times in a 24-hour, minute and second (HH:MM:SS) format (for example, 15:33:00). Press [YES] when you have completed entering the data for each time.

6. The pointer then moves to the Interval row. Specify the log interval in minutes and seconds. (The interval can be as short as 5 sec.) Skip steps 7 through 9, and proceed to "Selecting the Channel, Measurement Mode and Units" on the next page.

3.7.4b Entering Settings for a Cyclic Log

The screen now appears similar to Figure 42.

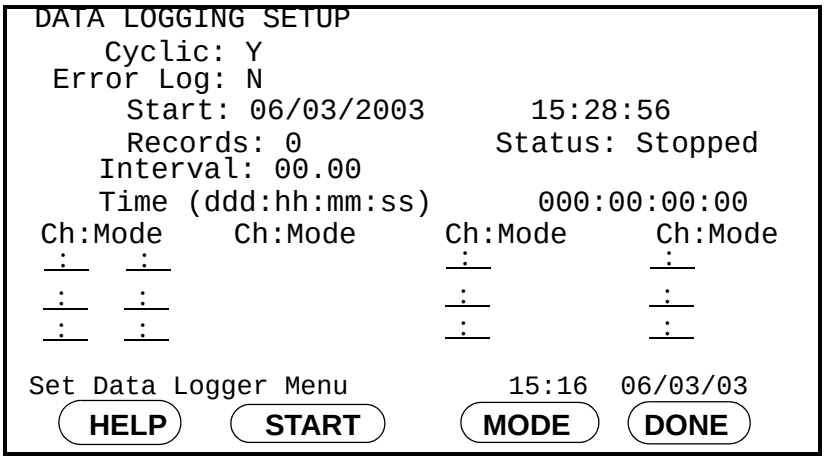

Figure 42: Set Data Logger Menu for a Cyclic Log

7. To specify the start time, type in the date using a Month/Day/Year (MM:DD:YYYY) numeric format (for example, 12/29/1999) and the time in a 24-hour, minute and second (HH:MM:SS) format (for example, 15:33:00). Press [YES] when you have completed entering the data.

8. The pointer moves to the Records row. Specify the number of records you wish for the log.

3.7.4b Entering Settings for a Cyclic Log (cont.)

9. The pointer then moves to the Interval row. Specify the log interval in minutes and seconds. (The interval can be as short as 5 sec., or up to 99 min. and 59 sec.)

10. At the Time row, enter the interval duration set — the amount of time in days, hours, minutes and seconds to complete one measurement cycle. Then proceed to "Selecting the Channel, Measurement Mode and Units" below.

Note: *If a conflict exists between the Time and the interval time, the total Time overrules the selected interval time. To set the total Time with only the record and interval settings, set the Time to all zeros for days, hours, minutes and seconds (000:00:00:00). If dividing the total Time by the number of records does not result in uniform intervals, the Series 1 uses the largest interval that will fit within the total Time, and recalculates the total Time as the largest fitting interval times the number of records.*

3.7.4c Selecting the Channel, Measurement Mode and Units

1. The entry for each log channel and mode appears as ___:____ if blank. Use the arrow keys to move to the entry to change or enter data. Press [NO] to erase a previous entry.

2. Press numeric keys 1 to 6 to select the desired channel.

3. Press the MODE menu key. A list of measurement modes appears on the message line (see Table 6 on page 40).

Note: *Notice the* MODE *menu key changes to* UNIT. *This menu key switches back and forth depending on the parameters you are selecting.*

4. Move the brackets to the desired measurement mode.

5. Press the UNITS key. A list of units appears on the message line.

6. Select the desired units and press [YES].

Repeat steps 1 to 6 until you have selected the desired parameters. Press the [START] menu key to activate the log. Then press the [DONE] menu key to return to the Data Logger Menu. If you wish to check the parameters for a given log, press the [FILE] menu key in the Data Logger Menu (Figure 38 on page 69) and then press the [SETTINGS] menu key.

IMPORTANT: *You cannot change the log parameters once the log has started!*

3.8 Setting Up the RS232 Communications Port

The Series 1 can transmit measurements to a serial printer or personal computer using the RS232 communications port. Before you can transmit data, you must configure the serial port settings as described in this section. This section also includes a sample output and a brief description of its contents.

3.8.1 Configuring the Serial Port

To enter settings for the serial port, press the keys shown in Table 20. (See Figure 47 on page 84 for a menu map.) A screen appears similar to Figure 43.

Table 20: Entering the Port Settings Menu

Press the Main Menu key:	To enter the:
SETTINGS*	Settings Menu
OUTPUTS	Output Settings Menu
PORT	Port Settings Menu

*The Settings Menu will prompt for a passcode (see page 16).

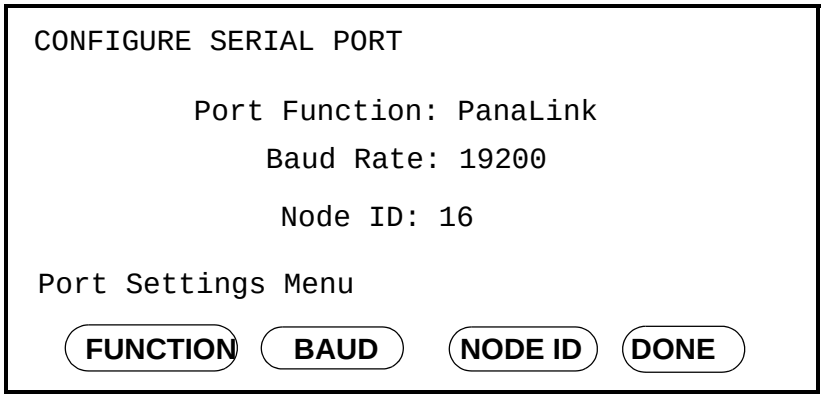

Figure 43: Port Settings Menu

Use the steps that follow to select the function, baud rate, report format and interval for the serial port. Other serial port settings are set and cannot be changed. The fixed settings are as follows:

- 8 bit word length
- no parity
- 1 stop bit
- flow control is not supported

3.8.1a Selecting the Function, Baud Rate and Node ID or Matrix Interval

See Figure 47 on page 84 for a menu map.

1. From the Port Settings Menu (see Table 20 on page 74), press the FUNCTION menu key to scroll through the available port functions (for example, a printer or PanaLink software), and stop at the desired function.

Note: *The third menu key alternates between* NODE ID *for the PanaLink function and* INTERVAL *for the printer function.*

2. Press the BAUD menu key.

3. Move the brackets to the desired baud rate and press [YES].

GE recommends that you do not set the baud rate below 2400. At lower speeds, several seconds are required to transmit data.

Note: *If you are using GE PanaLink software, set the baud rate to 19,200.*

4. The next step will depend upon the function selected in Step 1.

a. If you selected PanaLink as the function, press the NODE ID menu key. Unless you are instructed to change the ID number by GE, please leave the number at the default ID of 16. Press [YES] to confirm the entry.

b. If you selected a printer as the function, press the INTERVAL menu key and enter, in minutes and seconds, the interval at which you wish the meter to transmit matrix report data. Press [YES] to confirm the entry.

5. Press the DONE menu key to return to the Output Settings Menu.

You have completed setting up the communications port. If you selected the printer function, the meter will begin transmitting data at the selected interval. Refer to the following section for a description of a sample output.

3.8.2 Description of a Sample Output

Figure 44 shows what a record would look like for the matrix format shown in Figure 36 on page 66. Each record consists of a Message ID, date, time, channel, mode/unit, data and a carriage return.

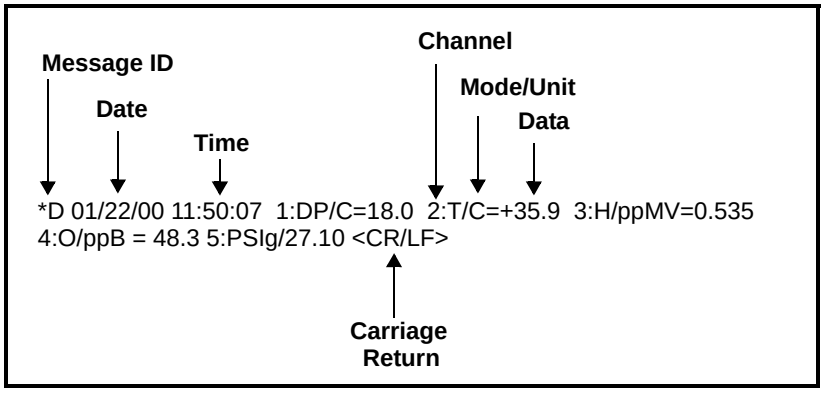

Figure 44: A Sample of One Record

Note: *The line length depends on how many characters your screen or printer has per line, or the width of the page.*

Message ID
Every record begins with the Message ID that consists of an asterisk (*) and the report type. *D denotes a Display (Matrix) report. The Message ID is always followed by one ASCII space.

Date
The date of the report is shown in MM/DD/YY format. The Series 1 uses a zero as a column place holder, so the date will always be eight characters long. The date is always followed by one ASCII space.

Time
The time of the report is shown in HH:MM:SS format. Time is in 24-hour format. The Series 1 uses a zero as a column place holder, so the time will always be eight characters long. The time is always followed by one ASCII space.

Channel
The channel is a single digit from 1 to 6 and is the channel from which the displayed measurement was read. The channel is always followed by a colon (:).

Mode/Unit
The modes or units are represented by an abbreviation. Refer to Table 21 on page 77 for abbreviations. The Mode/Unit is always followed by an equals sign (=).

Data
Data is the actual measurement. The number of digits and the position of the decimal point, if any, will vary with the magnitude and type of data (see Table 21 on page 77 for number formats for each mode/units). Signed values will contain a leading plus (+) or minus (-) sign. Unsigned values (percent oxygen, for example) have no sign. The data is always followed by two ASCII spaces.

<CR/LF>
Every record is terminated with a carriage return/line feed pair (ASCII 13 and 10 decimal, 0D and 0A hexadecimal).

Table 21: Print-Out Symbols and Abbreviations

Mode/Unit	Number Format	Measurement Mode
Oxygen		
O%	XXX.X	Oxygen concentration in percent.
O/ppM	XXXX.XX	Oxygen concentration in parts per million.
O/ppB	XXXXX	Oxygen concentration in parts per billion.
O/A	±XXX.XXX	Oxygen cell current in microamperes.
O/DVM	±X.XXXX	Oxygen circuit voltage in volts DC.
Moisture		
DP/C	±XXX.X	Dew point in degrees Celsius.
DP/F	±XXX.X	Dew point in degrees Fahrenheit.
DP/K	±XXX.X	Dew point in Kelvin.
%R.H.	XXX.X	Relative humidity in percent.
H/ppMv	XXX.XXX	Parts per million of water by volume.
H/ppBv	XXXXX.X	Parts per billion of water by volume.
H/ppMw	XXX.XXX	Parts per million of water by weight.
MCF/IG	X.XXXX	Pounds of water per million standard cubic feet of an ideal gas.
MCF/NG	X.XXXX	Pounds of water per million standard cubic feet of natural gas.
ppMv/NG	XXX.XXX	Parts per million of water by volume in natural gas.
MH	X.XXXX	GE moisture calibration unit for M and TF Series probes.
FH	X.XXXX	GE moisture calibration unit for Moisture Image Series probes.
H/DVM	±X.XXXX	Moisture circuit voltage in volts DC.
Temperature		
T/C	±XXX.X	Temperature in degrees Celsius.
T/F	±XXX.X	Temperature in degrees Fahrenheit.
T/K	±XXX.X	Temperature in Kelvin.
T/DVM	±X.XXXX	Temperature circuit voltage in volts DC.
Pressure		
PSIg	±X.XXX	Pressure in pounds per square inch gauge.
Bars	X.XXXX	Pressure in bars absolute.
mbs	XXXX.X	Pressure in millibars.
mm/Hg	XXX.XXX	Pressure in millimeters of mercury absolute.
Pas	XXXXX	Pressure in Pascals absolute.

Table 21: Print-Out Symbols and Abbreviations (cont.)

Mode/Unit	Number Format	Measurement Mode
Pressure (Continued)		
kPas	XXX.XX	Pressure in kiloPascals absolute.
P/mV	±XXX.XX	Pressure transducer output in millivolts.
FP	XXXX.XX	GE pressure calibration unit in millivolts.
P/DVM	X.XXXX	Pressure circuit voltage in volts DC.
Auxiliary Inputs		
Aux1/V	±X.XXXX	Auxiliary input #1 in volts.
Aux1/I	±XX.XXX	Auxiliary input #1 in milliamperes.
Aux1/F	±XX.XXXX	Auxiliary input #1 in user-defined units.
Aux2/V	±X.XXXX	Auxiliary input #2 in volts.
Aux2/I	±XX.XXX	Auxiliary input #2 in milliamperes.
Aux/F	±XX.XXXX	Auxiliary input #2 in user-defined units.
Other		
Vref	±X.XXXX	Channel card reference voltage.
Vgnd	±X.XXXX	Channel card ground voltage.

Note: *In the formats presented above, the plus/minus (±) symbol indicates that the data is signed and will be preceded by a plus (+) or minus (-) sign.*

The number of decimal places indicated is for nominal values. The instrument will maintain the number of digits by "floating" the decimal point to the right as the magnitude of the number increases. DO NOT "hard-code" the decimal points when using data acquisition software.

3.9 Setting Error Processing

The Series 1 user program includes an *Error Processing* menu that may be used to specify how the recorders/analog outputs and the alarms respond to *Range*, *Signal* and *Calibration* errors.

The meter categorizes **range errors** as *Under Range* if the input signal goes below the probe calibration range or *Over Range* if the input signal goes above the probe calibration range. However, **signal errors** and **Fluid Low errors** are always categorized as *Over Range*, while **calibration errors** are always categorized as *Under Range*.

Note: *See Chapter 2 in the* Service Manual *for a detailed description of Range, Signal and Calibration Errors.*

When an error condition occurs, the meter displays an error message on the screen and it drives the recorders/analog outputs and alarm relays as indicated in Table 22.

Table 22: Error Indicators

Error Type	Screen Error Message	Output & Alarm Relay Response
Range Error	Over Range	Over Range Setting**
	Under Range	Under Range Setting**
Signal Error	"Mode" Fault!*	Over Range Setting**
Calibration Error	Cal Error	Under Range Setting**
Delta F Sensor Fluid Low Error	O2 Fluid Low!***	Over Range setting

* "Mode" indicates one of the available measurement modes
** currently programmed error processing setting (see next section)
*** Displayed at top of box

IMPORTANT: *The factory default setting for* Error Messaging *is* ON, *but the factory default settings for both* Under Range *and* Over Range *errors is* Ignore *(this forces the recorder/analog outputs to 0 mA or 0V).*

3.9.1 Procedure for Setting Error Processing

The Series 1 user program allows you to turn *Error Messaging* either ON or OFF. In addition, if *Error Messaging* is ON, you can program separate *Over Range* and *Under Range* responses for all alarm relays (if installed) and recorder/analog outputs. The error responses are independently programmable for each channel.

Table 23 on page 80 provides instructions for entering the *Error Processing Menu*, and Table 45 on page 80 shows a typical menu screen. To suppress or activate the *Display Messages* function, move the pointer to the *Display Messages* line and use the ACTION menu key to select ON (the default) or OFF.

3.9.1 Procedure for Setting Error Processing (cont.)

If *Display Messages* is set to ON, use the steps below to set up error processing:

Table 23: Entering the Error Processing Menu

Press the Main Menu key:	To enter the:
SETTINGS*	Settings Menu
SYSTEM	System Settings Menu
CONFIG	Probe Configuration Menu
ERRORS	Error Processing Menu
* The Settings Menu will prompt for a passcode (see page 2-6).	

1. Press the keys shown in Table 23, and a screen similar to that in Figure 45 appears (see Figure 3-19 on page 3-32 for a complete menu map of the procedure).

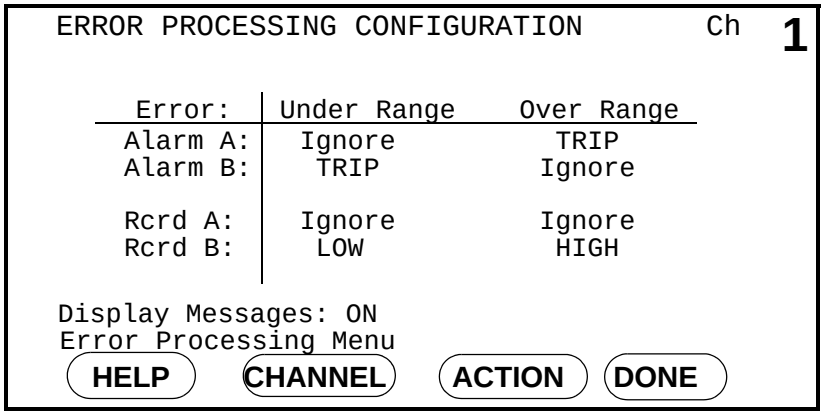

Figure 45: Error Processing Menu

2. Use the CHANNEL menu key to cycle to the desired channel.

3. Move the pointer to the desired range and output.

4. Press the ACTION menu key repeatedly until the desired action appears (**the default setting for all actions is *Ignore***):

- **Alarms:** The available actions are *Trip* and *Ignore*. For the *Ignore* option, the alarms remain in the state they were in at the time a range error occurs.
- **Recorders/Analog Outputs:** The available actions are: *Ignore*, *High*, *Low*, *Hold* (last value), and *Value* (specified by user). For the *Ignore* option, both the A and B analog output signals are forced to 0 mA or 0 V when a range error occurs.

5. Repeat Steps 2-4 for both ranges and for each output on the desired channel(s).

To exit *Error Processing*, press the DONE menu key until Main Menu appears on the message line.

3.10 Loading New Software

At some point, a new version of the MIS1 operating software may be released or your existing software file may become corrupted. To update your own system, use the following guidelines:

1. Record all of the setup, configuration, calibration and reference information from the MIS1, and transfer required logs to a PC.

IMPORTANT: *All of the settings will be lost when the code is updated. Any logs will also be erased.*

2. Obtain the new software file (with a *.cod extension) and save the file to your PC hard drive.
3. Set up the MIS1 with an RS232 cable connected to a COM port (most likely COM1) on a PC having a communications program like Hyperterminal. (See *Setting Up the RS232 Communications Port* in Chapter 3 of this manual, and *Connecting a PC or Printer* in Chapter 1 of the *Service Manual*.)
4. Start the communications program on the PC and select the COM port with the connection to the MIS1.
5. Set the following information:

   Baud Rate = **19200**
   Data Bits = **8**
   Parity = **none**
   Stop Bits = **1**
   Flow Control = **none**.

6. Turn on the power to the MIS1.
7. Press and hold the **0** key.

Note: *The display will indicate a message similar to* Reload Flash via RS232 (Y/N)?

8. Press the **YES** key.
9. Choose the **Transfer** file menu and select **Send File**.
10. Select the XMODEM transfer protocol.
11. Select the file to send: the file that was saved to the PC hard drive.

The meter will reboot and load the new software.

Note: *Once the software is loaded into the MIS1, it will be necessary to reprogram the configuration data, references, recorders, alarms, logs, etc. (See the previous sections in this manual).*

After the reprogramming is complete, the MIS1 is ready for operation.

[no content intended for this page]

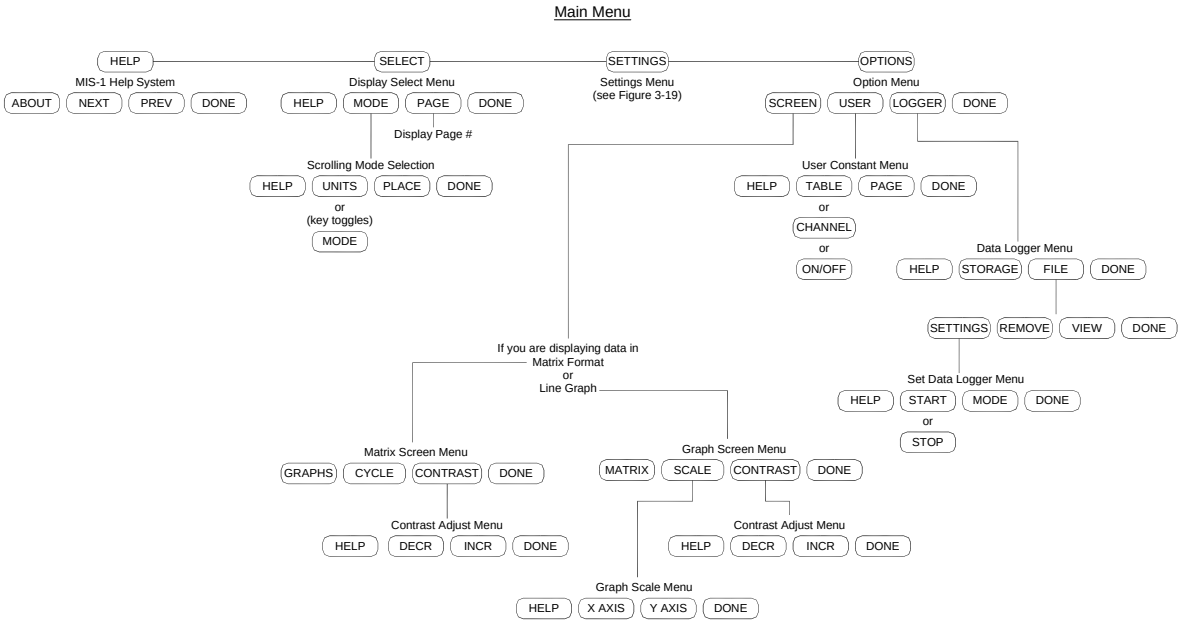

Figure 46: Help, Select and Options Menu

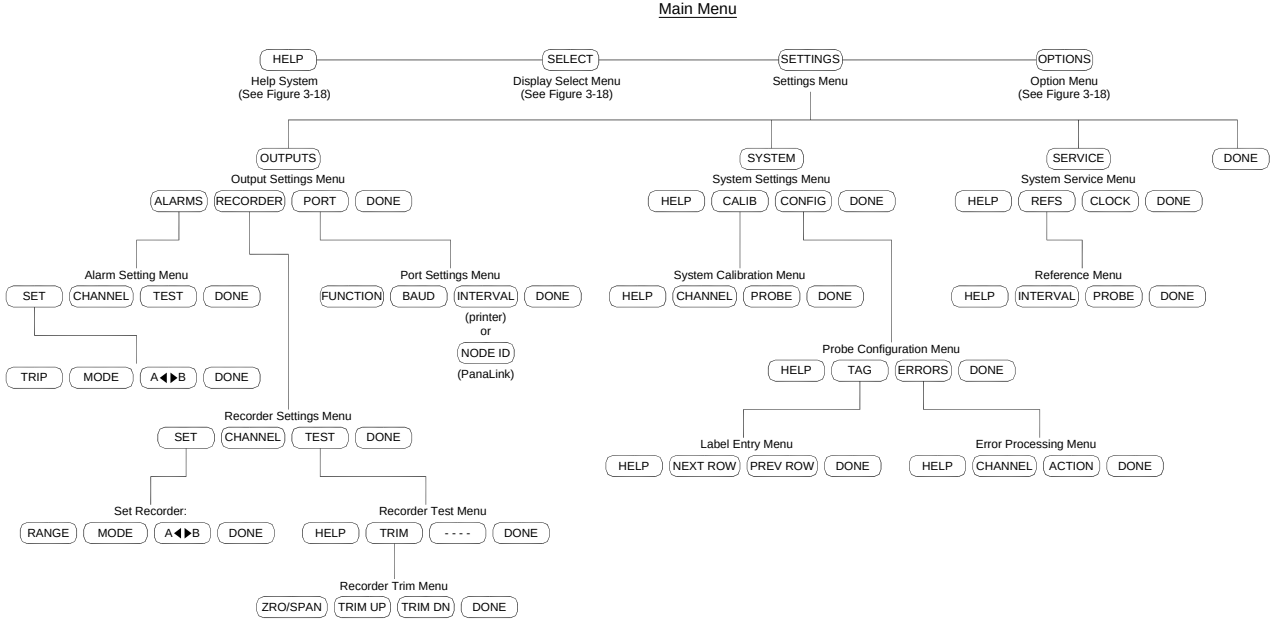

Figure 47: Settings Menu

Chapter 4. Programming with PanaView

4.1 Introduction

The optional PanaView software package enables you to remotely change the programming of the Series 1. In addition to displaying meter measurements on your PC, you can vary the modes and display units on individual pages and channels, and add, change or delete user equations and user tables. For a complete explanation of PanaView's capabilities, see the PanaView *User's Manual*.

IMPORTANT: *Before attempting to display or change programming via the PC, be sure to install PanaView as described in Chapter 1 of the PanaView* User's Manual.

4.2 Changing Measurement Modes and Units

PanaView enables you to actually change the measurements on the matrix display. For example, through the PC, you can switch a window on page 2 from its original programming of measuring oxygen in parts-per-million on Channel 2 to new programming of measuring pressure at psig on Channel 3 — or leave the window entirely blank.

4.2.1 Open the Meter Display Window

1. From the "*File"* menu, click on the "*New Meter Browser*" option.
2. From the network tree, click on the desired communications port (COM 1, etc.) and meter.
3. From the expanded tree, click on the "*Display"* option. A list of six display pages appears. Clicking on any page opens the list of channels, modes (temperature, hygrometry, oxygen, etc.) and display units currently assigned for that page.
4. Double-clicking on any page opens the *"Meter Display"* window, shown in Figure 48. Each individual blue window shows the mode and unit measured in the corresponding window on the Series 1 page, with the assigned channel number in the upper left corner. A line below indicates which page the meter is currently displaying.
5. To scroll to a particular page, click on the left or right pointer buttons at the bottom of the window.
6. If you want to set a particular page as the page currently displayed on the meter, scroll to that page and click on [Set Active Page].

Note: *While each window shows the sensor and units measured, you must click on the* "Text Display" option *from the* "Output" *menu, or view the Series 1 screen, to see the actual measurements at any given time*.

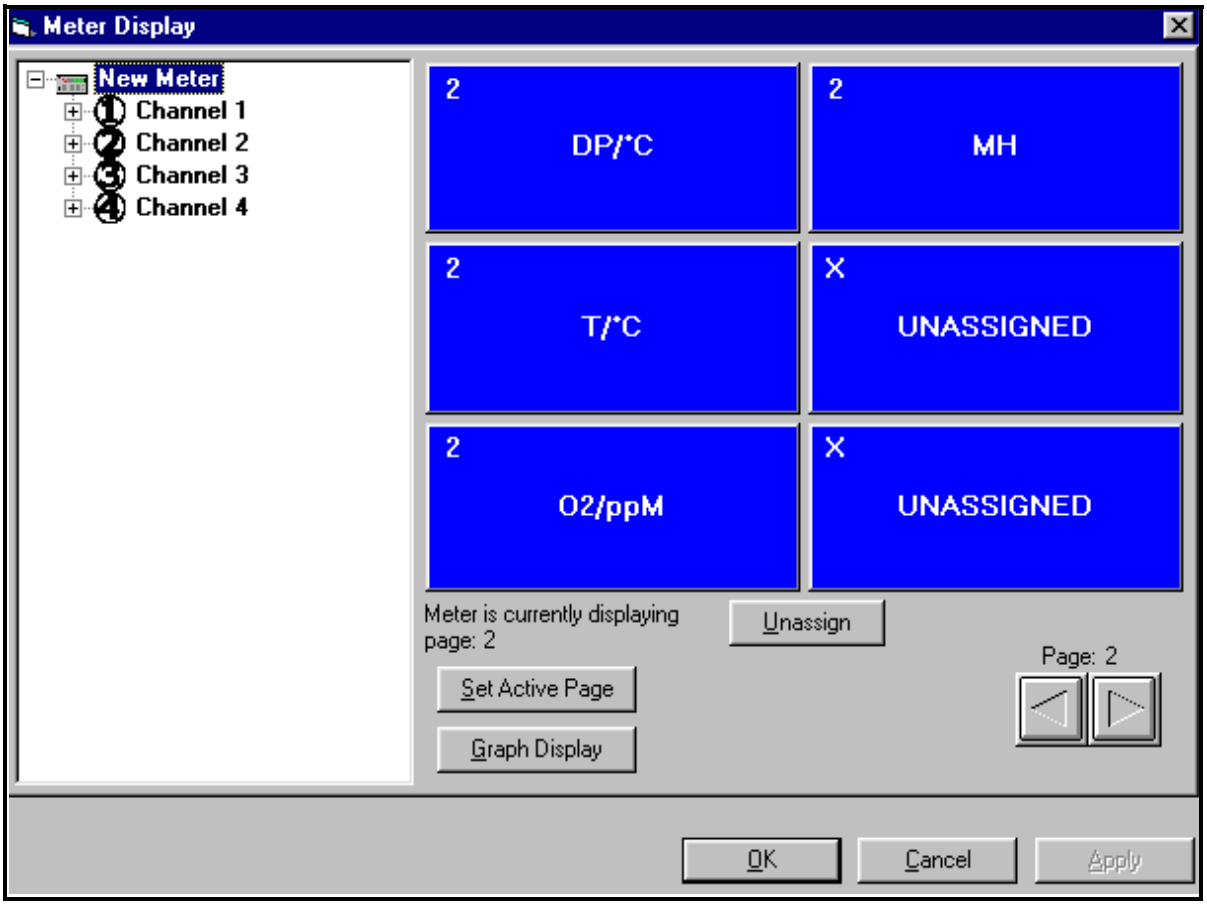

Figure 48: The Meter Display Window

4.2.2 Change Meter Programming

1. To change a particular window, click on it. The selected window turns red.
2. Click on the desired meter on the network tree to the left of the programming window. A list of available channels appears. Click on the channel you wish to apply.
3. The tree expands to show a list of available sensors.
   a. Click on the desired sensor, and the tree expands further to show a list of available units.
   b. Double-click on the unit, and the Series 1 reassigns the selected box, on the Series 1 and in the *"Meter Display"* window.
   c. To unassign a mode and unit without assigning a different sensor, click on the window and then on [Unassign].

Figure 49 shows a typical change on the PC screen from O2/ppm (shown in Figure 48 on page 86) to PSIg.

Note: *For an explanation of abbreviations, see Table 6 on page 40,* Measurement Modes and Units for the Series 1.

4. Click [Apply] to apply the change immediately and continue programming, and [OK] to confirm the change and close the window.

Note: *To return the window to its previous settings, click on the* [Cancel] *button instead of the* [OK] *button.*

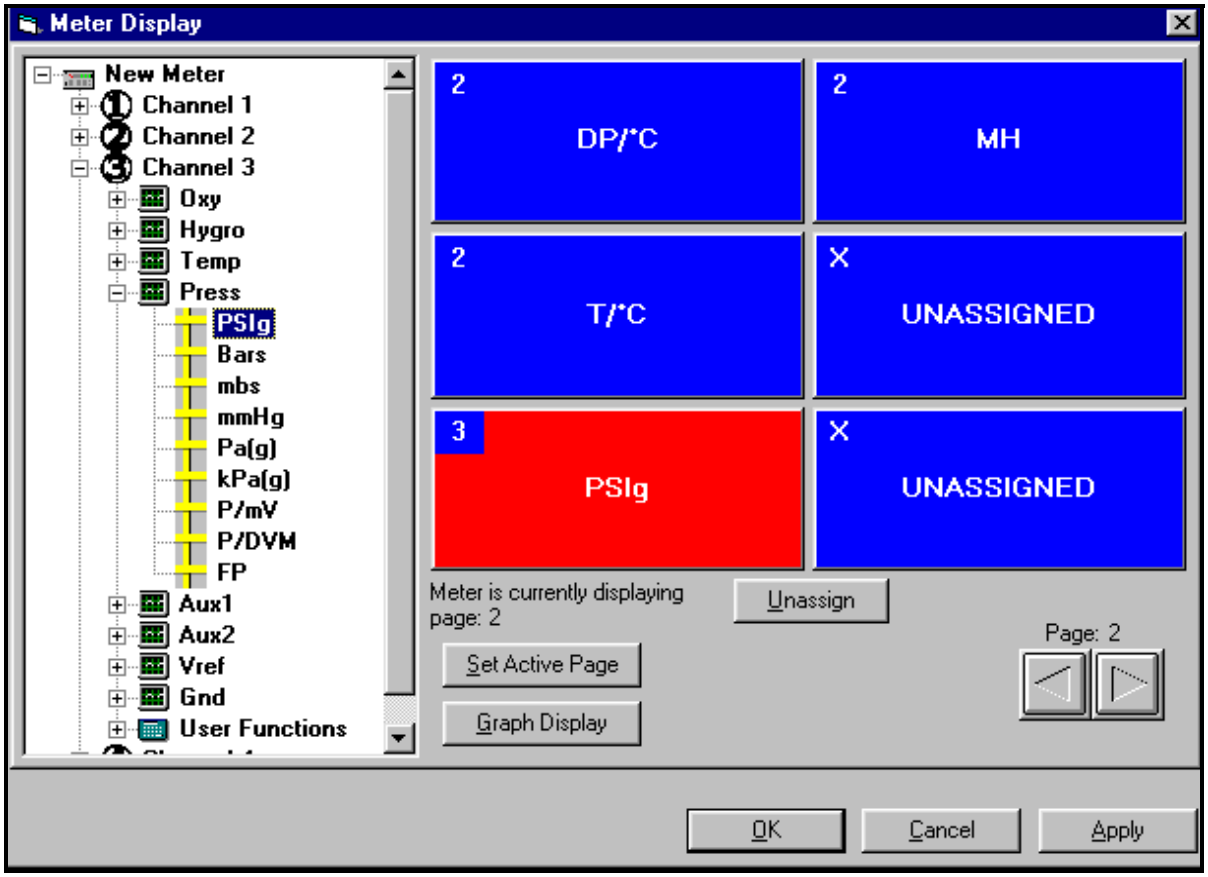

Figure 49: Matrix Display After Programming

4.3 Changing a Matrix Display to a Graph

To set a graph display of a single mode and unit:

1. Click on the [Graph Display] button. The window changes to list the graph parameters.
2. Click on the meter icon to show lists of the available modes and units.
3. Double-click on the desired unit, and enter the parameters for the graph, as shown in Figure 50 below.
4. Click on [Apply] to change the graph, and on [OK] to confirm the change and close the window.
5. Click on the [Set Active Display] button to prompt the Series 1 screen to display the graph.

To toggle between the matrix display and the graph, click on the [Matrix Display] or [Graph Display] buttons. The window returns to the display indicated.

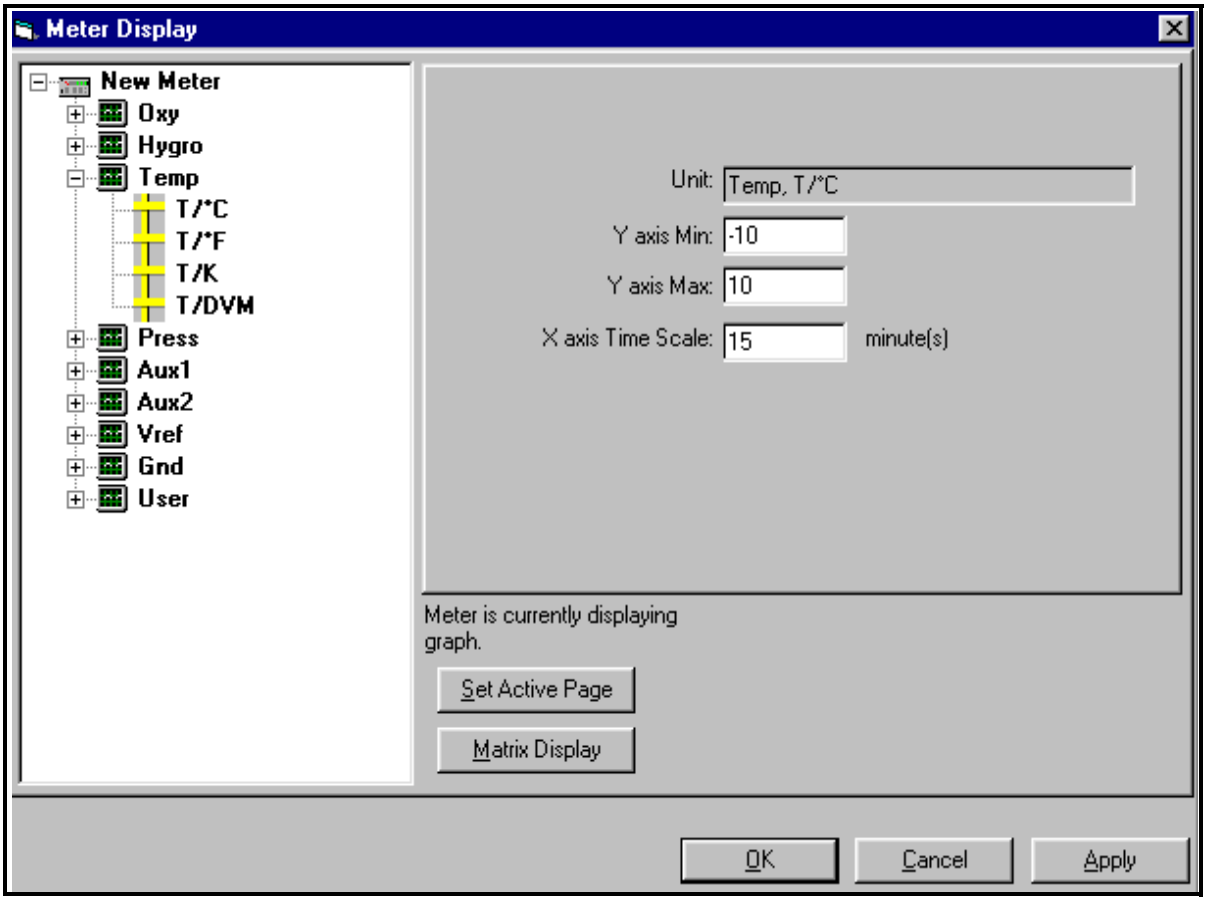

Figure 50: Graph Programming Window

4.4 Changing Alarm Settings

PanaView enables you to set or change alarm settings for the Series 1. You can determine which sensor and unit serve as the alarm, the trip and deadband values, and the alarm's reaction to errors.

1. From the "*New Meter Browser*" option, pull down the desired meter, and click on the desired channel.
2. From the channel menu, click on the "*Alarms*" option, and then on "*Alarm A*" or "*Alarm B*." The Alarm window appears, as shown in Figure 51.
3. To set the alarm sensor and unit
   a. Pull down the "*Sensor*" list box in the lower part of the window.
   b. Then click on the desired sensor type.
   c. A list of units appears. Click on the desired unit.

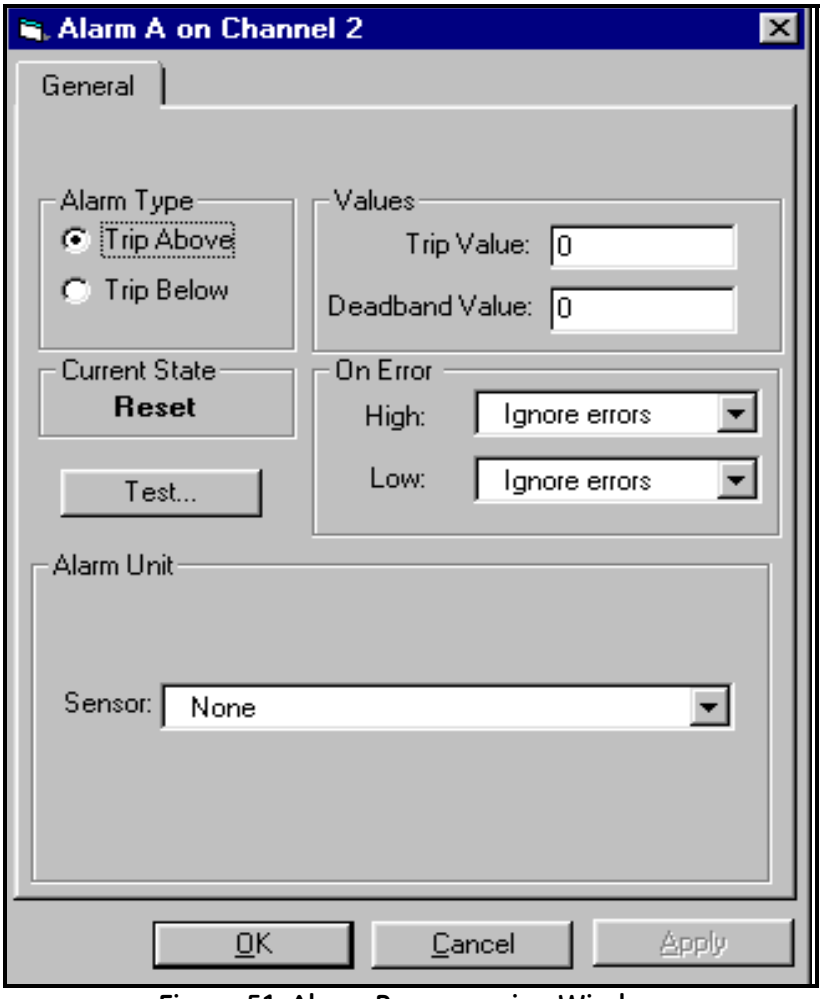

Figure 51: Alarm Programming Window

4.4 Changing Alarm Settings (cont.)

4. To set the alarm type, click on the [Trip Above] or [Trip Below] radio buttons, as desired.

5. To determine the alarm values, enter the Trip and Deadband values in the designated text boxes. (For a definition of the Deadband value, see *Setting Up the Alarms* on page 56.)

6. To determine how the alarm will react when it encounters an error:

a. Pull down the "*High"* list box under the "On Error" line.

b. Then click on the desired option from the listing: "Ignore error," "Trip on error," "Reset on error," or "Hold on last error."

c. Repeat the procedure for the "*Low"* list box.

7. To test the alarm, click on the [Test] button. Click on the [Trip] button to trip the alarm, and on the [Reset] button to reset it.

8. Click on [Apply] to immediately apply the changes, and on [OK] to confirm the changes and close the window. (To return the window to its previous settings, click on the [Cancel] button.)

4.5 Changing Recorder Settings

You can also change the settings of a recorder attached to the Series 1: the input type, zero and span values, and how it performs error handling.

4.5.1 Setting Recorder Values

1. From the "*New Meter Browser*" option, click on the desired meter and channel.
2. From the channel menu, click on the "*Recorders*" option, and then on "*Recorder A*" or "*Recorder B.*" The Recorder Properties window appears, as shown in Figure 52.
3. To set the recorder type, pull down the "*Type*" list box and click on one of the three choices: 0 to 20 mA, 4 to 20 mA and 0 to 2 V.
4. To set the recorder unit, pull down the "*Sensor/Class*" list box and click on the desired sensor. Then pull down the "*Unit*" list box and select from the available units.
5. To establish the input settings, enter the desired values in the "*Zero*" and "*Span*" text boxes.
6. Click on [Apply] to apply the changes immediately, and on [OK] to confirm the changes and close the window. To return the window to its previous settings, click on the [Cancel] button.

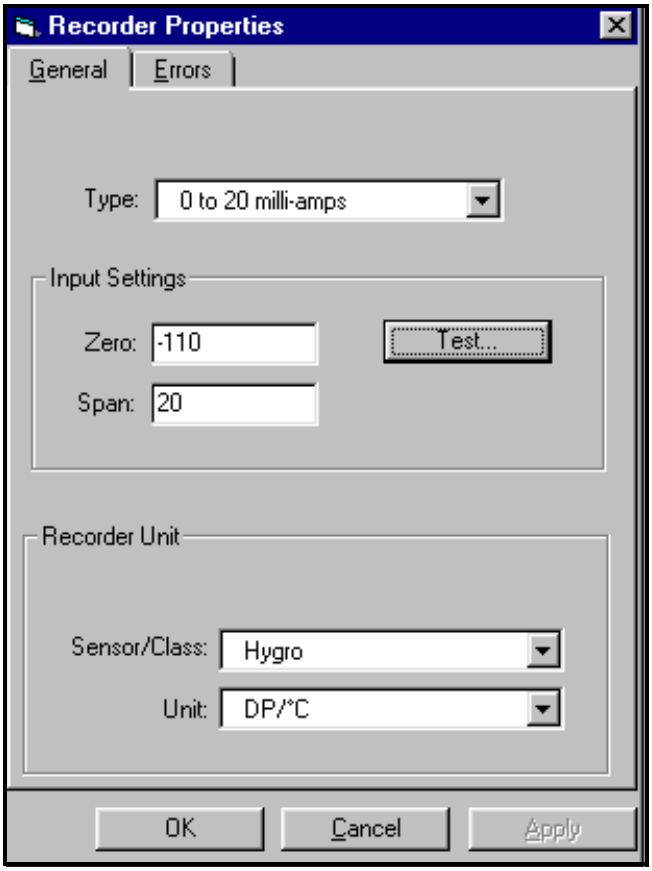

Figure 52: Recorder Programming Window

4.5.2 Testing Recorder Outputs

1. To test the recorder outputs, click on the [Test] button in the "*Recorder Properties*" window (see Figure 52 on page 91). A message appears: "This will suspend Recorder #[X] on Channel [X]. Are you sure you want to test this recorder?" Click on [OK] to continue.
2. The "*Test Recorder"* window appears, as shown in Figure 53. At the top, slide the pointer to the desired percentage of the full scale recorder range, and click on [OK].
3. To trim the recorder outputs, scroll the arrows to the right of the "*Zero"* and "*Span"* windows up or down until you reach the desired values, and click on [OK].

Note: *For a complete discussion of testing and trimming recorder outputs, refer to the sections* Testing the Recorder Outputs *and* Trimming Recorder Outputs *in Chapter 2 of the* Service Manual.

The screen returns to the "*Recorder Properties"* window.

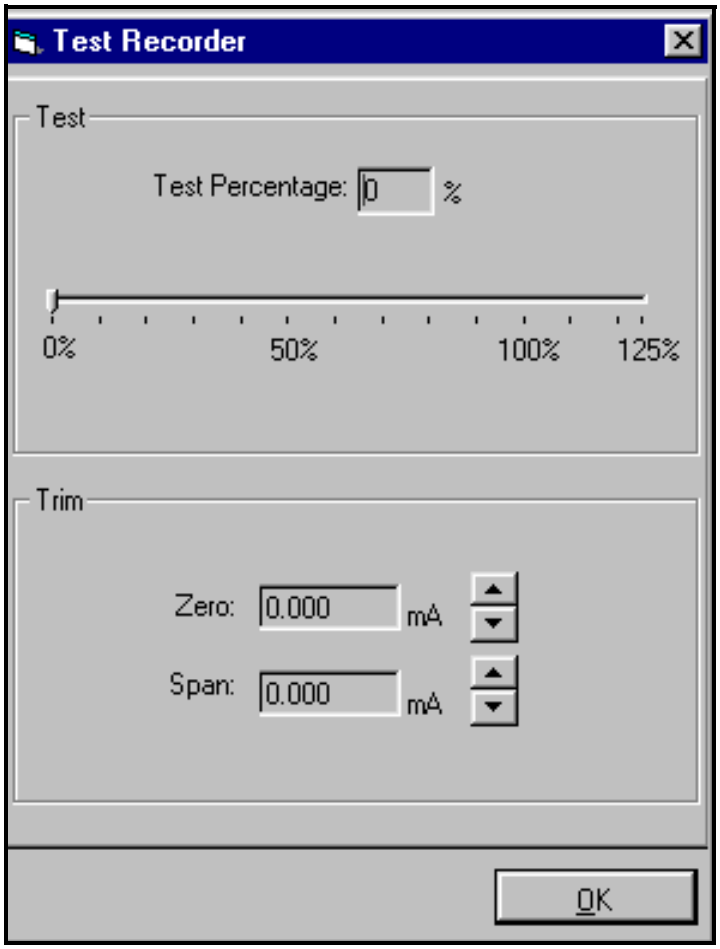

Figure 53: Recorder Test Window

4.5.3 Programming Error Handling

1. To program the Series 1 for error handling, click on the "*Errors*" tab. The screen appears similar to Figure 54.
2. Enter the desired values for the low and high error settings in the appropriate text boxes.
3. To program the meter's response to errors, pull down the "*On Low Error*" list box, and click on one of five options:
   - Ignore error
   - Go to high limit
   - Go to low limit
   - Hold last value
   - Go to error value.
4. Repeat this selection with the "*On High Error*" list box.
5. Click on [Apply] to apply the changes immediately, and on [OK] to confirm the changes and close the window. To return the window to its previous settings, click on the [Cancel] button.

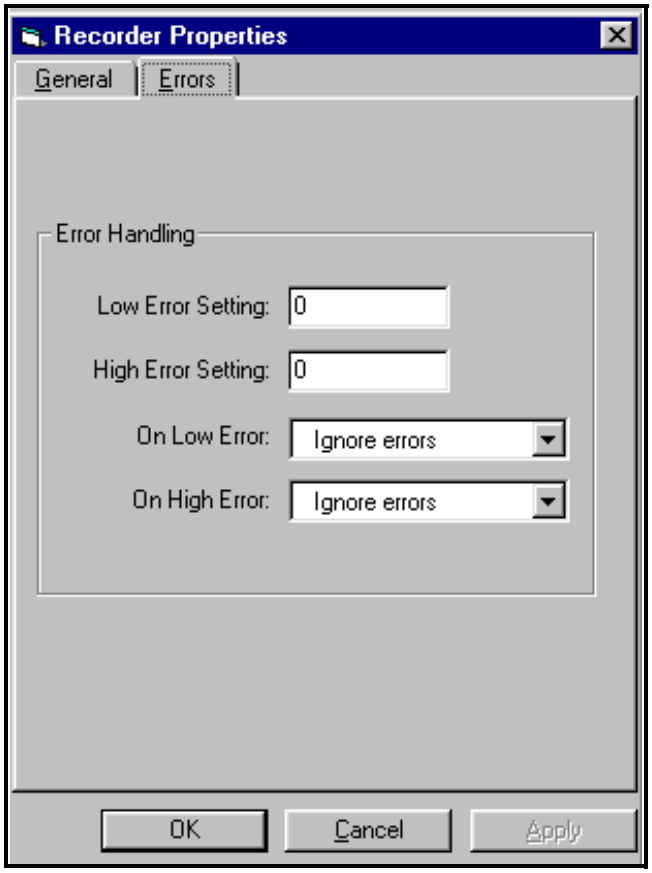

Figure 54: Recorder Properties Window - Error Handling

4.6 Programming User Functions

As explained in *Entering Constants and User Functions* on page 61, user functions enable operators to program up to four desired equations on each channel, or to use any measured parameter to calculate a different parameter. PanaView allows users to program or change user functions and related tables through the PC.

To program a user function:

1. From the "*New Meter Browser"* option, click on the desired communications port, meter, and channel.
2. Click on "*User Functions*," and then double-click on the desired function (1 to 4). The right side of the screen appears similar to Figure 55.
3. Enter three parameters:
   - a function label (of no more than 16 characters)
   - a function symbol (no more than 4 characters), and
   - the number of decimal places desired. [no content intended for this page]
4. To incorporate an existing parameter, pull down the network menu and click on the desired channel, sensor and display unit.

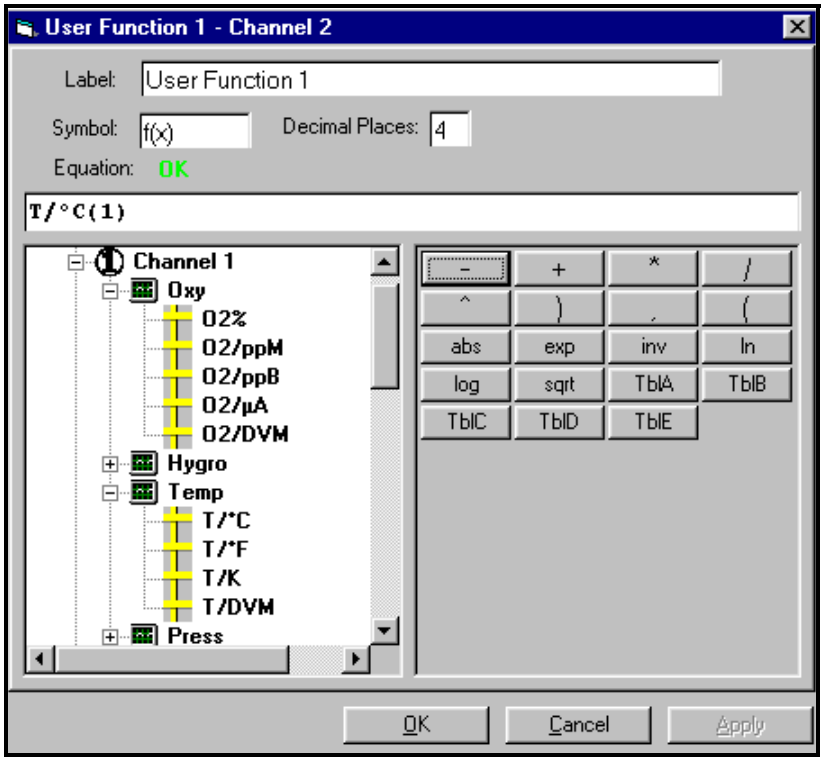

Figure 55: The User Function Window

4.6 Programming User Functions (cont.)

5. To select the desired operation or table, click on the appropriate button. (See *Entering User-Defined Tables* on page 65 for information on entering data for user tables.) Use the cursor in the equation box to position values correctly, or to erase incorrect values or operations.

6. When you have completed entering the function, click on [Apply] to apply the function immediately, and on [OK] to confirm the function and close the window. To return the window to its previous settings, click on the [Cancel] button.

Note: *It may be advisable to use the* [Apply] *button as a means of checking the function's validity. If the function is improperly typed, or if a sensor is under range or not programmed, the Equation line displays "Invalid" with a brief message.*

4.7 Entering User Tables

To support user functions, the Series 1 can hold up to five tables (designated as A through E) of non-linear or empirical data. Users can enter up to 16 X-Y pairs in each table. A user function can supply an X value with Tbl(). The Series 1 then interpolates the Y value for a given X, and substitutes it for Tbl (X) in the function. (See the section *Entering User-Defined Tables* on page 65.)

To enter values for a user table:

1. From the "*New Meter Browser"* option, click on the desired communications port and meter.
2. Click on "*User Tables*," and then double-click on the desired table. The right side of the screen appears similar to Figure 56.

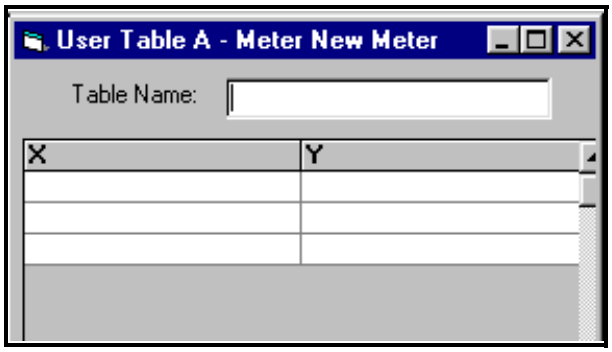

Figure 56: User Table Window

3. Enter a name (up to 13 characters) for the table in the "Table Name" text box, and enter up to 16 X and Y values in the appropriate columns.The table now appears similar to Figure 57.

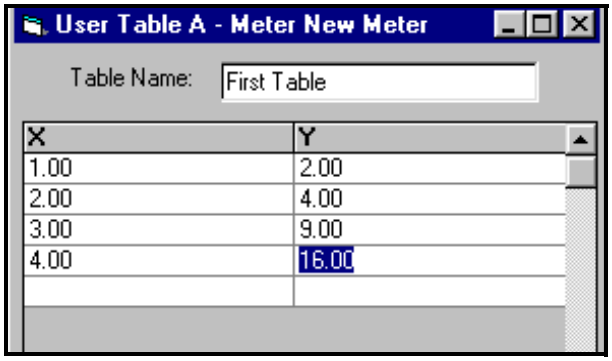

Figure 57: Completed User Table

4. When you have finished entering values, click on [Apply] to apply the table immediately, and on [OK] to confirm the table and close the window. To return the window to its previous settings, click on the [Cancel] button.

4.8 Entering Saturation Constants

To enter a saturation constant, you must enter 1 to 6 data points to represent a curve of Cs (saturation constant) versus temperature. (For more information, see *Entering Saturation Constants* on page 66.) PanaView enables you to enter a saturation constant curve for each channel. To enter a curve:

1. From the "*New Meter Browser*" option, click on the desired communications port, meter, and channel.
2. From the "*Edit*" menu, select the "*Properties*" option.
3. The "*Constant Saturation Table*" window appears, as shown in Figure 58.

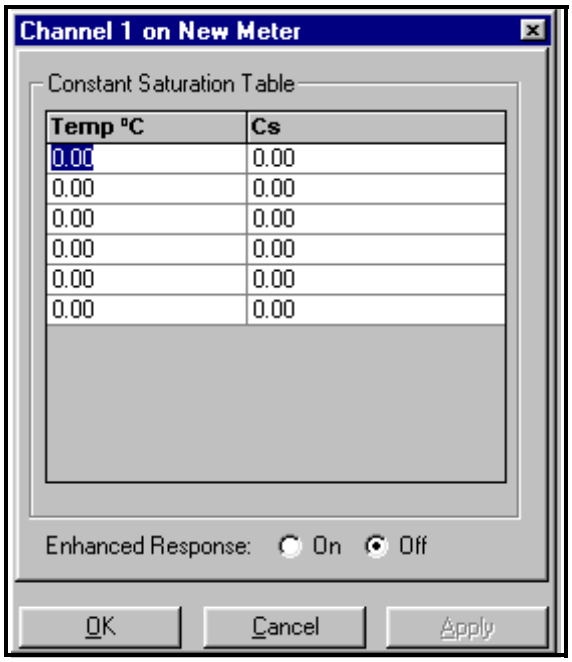

Figure 58: Constant Saturation Window

4. Enter up to six data points in the text boxes to establish a curve of saturation constants versus temperature.
5. The window also allows you to specify whether you wish Enhanced Response for the channel. Enhanced Response uses a dynamic moisture calibration technique to extrapolate the moisture level to the end point when making measurements in abrupt "dry down" conditions. (For more information, refer to *Using Computer Enhanced Response* on page 67.) Click the appropriate radio button to turn Enhanced Response *on* or *off*.
6. When you have finished entering values, click on [Apply] to apply the table immediately, and on [OK] to confirm the table and close the window. To return the window to its previous settings, click on the [Cancel] button.

[no content intended for this page]

A

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M (cont.)

N

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V

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Y

[no content intended for this page]

Warranty

Each instrument manufactured by GE Sensing is warranted to be free from defects in material and workmanship. Liability under this warranty is limited to restoring the instrument to normal operation or replacing the instrument, at the sole discretion of GE Sensing. Fuses and batteries are specifically excluded from any liability. This warranty is effective from the date of delivery to the original purchaser. If GE Sensing determines that the equipment was defective, the warranty period is:

- one year from delivery for electronic or mechanical failures
- one year from delivery for sensor shelf life

If GE Sensing determines that the equipment was damaged by misuse, improper installation, the use of unauthorized replacement parts, or operating conditions outside the guidelines specified by GE Sensing, the repairs are not covered under this warranty.

The warranties set forth herein are exclusive and are in lieu of all other warranties whether statutory, express or implied (including warranties or merchantability and fitness for a particular purpose, and warranties arising from course of dealing or usage or trade).

Return Policy

If a GE Sensing instrument malfunctions within the warranty period, the following procedure must be completed:

1. Notify GE Sensing, giving full details of the problem, and provide the model number and serial number of the instrument. If the nature of the problem indicates the need for factory service, GE Sensing will issue a RETURN AUTHORIZATION NUMBER (RAN), and shipping instructions for the return of the instrument to a service center will be provided.
2. If GE Sensing instructs you to send your instrument to a service center, it must be shipped prepaid to the authorized repair station indicated in the shipping instructions.
3. Upon receipt, GE Sensing will evaluate the instrument to determine the cause of the malfunction.

Then, one of the following courses of action will then be taken:

- If the damage is covered under the terms of the warranty, the instrument will be repaired at no cost to the owner and returned.
- If GE Sensing determines that the damage is not covered under the terms of the warranty, or if the warranty has expired, an estimate for the cost of the repairs at standard rates will be provided. Upon receipt of the owner's approval to proceed, the instrument will be repaired and returned.

[no content intended for this page]

GE Infrastructure
Sensing

ATEX COMPLIANCE

We,

GE Infrastructure Sensing, Inc.
1100 Technology Park Drive
Billerica, MA 01821-4111
U.S.A.

as the manufacturer, declare under our sole responsibility that the product

Moisture Image Series 1 Analyzer

to which this document relates, in accordance with the provisions of ATEX Directive 94/9/EC Annex II, meets the following specifications:

CE 1180 Ex **II 1 G EEx ia IIC (-20°C to +50°C)**
BAS01ATEX7097

Furthermore, the following additional requirements and specifications apply to the product:

- Having been designed in accordance with EN 50014 and EN 50020, the product meets the fault tolerance requirements of electrical apparatus for category "ia".
- The product is an electrical apparatus and must be installed in the hazardous area in accordance with the requirements of the EC Type Examination Certificate. The installation must be carried out in accordance with all appropriate international, national and local standard codes and practices and site regulations for flameproof apparatus and in accordance with the instructions contained in the manual. Access to the circuitry must not be made during operation.
- Only trained, competent personnel may install, operate and maintain the equipment.
- The product has been designed so that the protection afforded will not be reduced due to the effects of corrosion of materials, electrical conductivity, impact strength, aging resistance or the effects of temperature variations.
- The product cannot be repaired by the user; it must be replaced by an equivalent certified product. Repairs should only be carried out by the manufacturer or by an approved repairer.
- The product must not be subjected to mechanical or thermal stresses in excess of those permitted in the certification documentation and the instruction manual.
- The product contains no exposed parts which produce surface temperature infrared, electromagnetic ionizing, or non-electrical dangers.

GE
Sensing

DECLARATION OF CONFORMITY

DOC-0020, Rev. A

We,

GE Sensing
1100 Technology Park Drive
Billerica, MA 01821
USA

declare under our sole responsibility that the

Moisture Image™ Series 1 Moisture Analyzer
Moisture Monitor™ Series 3 Moisture Analyzer

to which this declaration relates, are in conformity with the following standards:

- EN 60079-0: 2007
- EN 60079-11: 2007
- EN50281-1-1: 1998
- II 1 GD EEx ia IIC, Baseefa01ATEX7097 (Baseefa, Buxton, Derbyshire, UK - NoBo 1180)
- EN 61326-1: 2006, Class A, Table 2, Industrial Locations
- EN 61326-2-3: 2006
- EN 61010-1: 2001, Overvoltage Category II, Pollution Degree 2

Other standards Used:

- EN 50014: 1997 +A1, A2:1997
- EN 50020: 2002

following the provisions of the 2004/108/EC EMC, 2006/95/EC Low Voltage and 94/9/EC ATEX Directives.

Where products were initially assessed for compliance with the Essential Health and Safety Requirements of the ATEX Directive 94/9/EC using earlier harmonized standards, a subsequent review has determined that "technical knowledge" is unaffected by the current harmonized standards listed above.

The units listed above and any ancillary equipment supplied with them do not bear CE marking for the Pressure Equipment Directive, as they are supplied in accordance with Article 3, Section 3 (sound engineering practices and codes of good workmanship) of the Pressure Equipment Directive 97/23/EC for DN<25.

Billerica - August 2010
Issued

Mr. Gary Kozinski
Certification & Standards, Lead Engineer

CE

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Member of TÜV NORD Group

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