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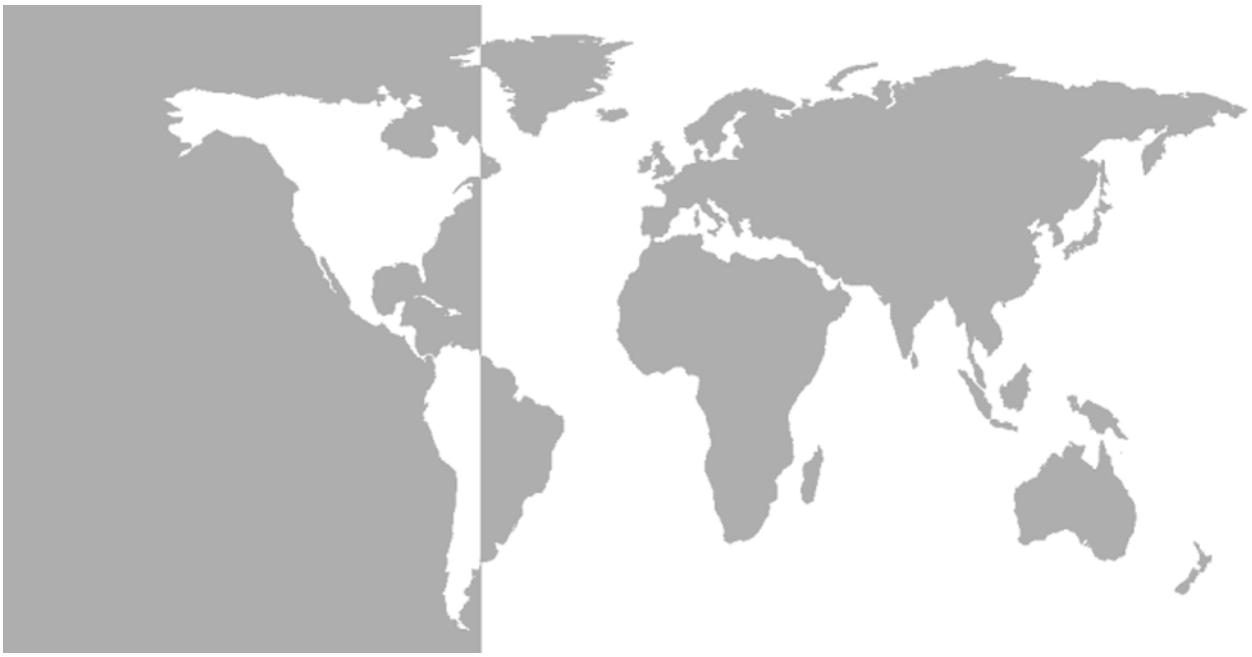
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GE Industrial
Sensing



Moisture Monitor Series 3

Hygrometer

Abridged Manual

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GE Industrial
Sensing

Moisture Monitor Series 3

Hygrometer



Abridged Manual

914-110A4
August 2004

Moisture Monitor Series 3 Hygrometer is a GE Panametrics product. GE Panametrics has joined other GE high-technology sensing businesses under a new name—GE Industrial, Sensing.

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Warranty

Each instrument manufactured by GE Infrastructure Sensing, Inc. 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 Infrastructure Sensing, Inc. Fuses and batteries are specifically excluded from any liability. This warranty is effective from the date of delivery to the original purchaser. If GE Infrastructure Sensing, Inc. determines that the equipment was defective, the warranty period is:

- one year for general electronic failures of the instrument
- one year for mechanical failures of the sensor

If GE Infrastructure Sensing, Inc. 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 Infrastructure Sensing, Inc., 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 of merchantability and fitness for a particular purpose, and warranties arising from course of dealing or usage or trade).

Return Policy

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

1. Notify GE Infrastructure Sensing, Inc., 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 Infrastructure Sensing, Inc. will issue a RETURN AUTHORIZATION number (RA), and shipping instructions for the return of the instrument to a service center will be provided.
2. If GE Infrastructure Sensing, Inc. 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 Infrastructure Sensing, Inc. 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 Infrastructure Sensing, Inc. 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.

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Chapter 1

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General Information

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Introduction

The GE Infrastructure Sensing, Inc. Moisture Monitor Series 3 is a one- or two-channel analyzer designed to measure dissolved moisture concentration in gases and non-aqueous liquids, and dissolved oxygen concentration in gases.

A microprocessor-based instrument, the Series 3 combines hardware and software to make various measurements. The user connects the needed inputs (moisture probes, pressure transmitters, oxygen cells, etc.) to the back panel of the electronics unit using the appropriate 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 gas or liquid to the probes. The probes then send signals to the Series 3 electronics unit, which interprets the signals and converts them into measurements.

Users typically install the Series 3 as part of a complex process system, which includes components such as filters, pumps, and pressure regulators. In such an environment, probes and other parts of the system may be subjected to environmental hazards, such as high temperature, pressure extremes, corrosive elements, and mechanical vibrations.

!WARNING!
To ensure the safe operation of this unit, you must install and operate the Series 3 as described in this manual. In addition, be sure to follow all applicable safety codes and regulations for installing electrical equipment in your area.

Unpacking the Series 3

Upon receipt, unpack the Series 3 and make sure all the parts and documentation listed on the packing slip are included. The packing slip may not list the *Calibration Data Sheet(s)*, which are usually packed in the plastic storage case with the moisture, oxygen, and pressure probes. You may also find the *Calibration Data Sheet(s)* in an envelope taped to the Series 3. There should be one *Calibration Data Sheet* for each probe.

Be sure to inspect each component, including the sample system, for evidence of mishandling. If anything has been damaged, report this to the carrier and to GE Infrastructure Sensing, Inc. immediately. You should leave the plastic caps on the probes and the pressure transmitters when they are not installed in the process stream. If anything is missing, contact GE Infrastructure Sensing, Inc. immediately.

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Checking the Delta F Oxygen Cell for Leakage

Before connecting the Delta F Oxygen Cell(s), you must check it for damage and/or leakage. Depending on the application, the oxygen cell may have a top drain or both a top and bottom drain for the electrolyte reservoir. It is important to identify your cell for the following procedure. Use Figure 1-1 below to identify your cell.

1. Remove the top of the electrolyte reservoir.

IMPORTANT: *If your cell also has a bottom drain, make sure that the electrolyte discharge valve, mounted on the rear of the oxygen cell, is closed (in the vertical position). See Figure 1-1 below.*

2. Add approximately three ounces (100 ml) of distilled water to the reservoir and replace the top.

3. Using the min/max window (see Figure 1-2 on the next page) on the oxygen cell, check the water level. The water should cover about 60% of the window.

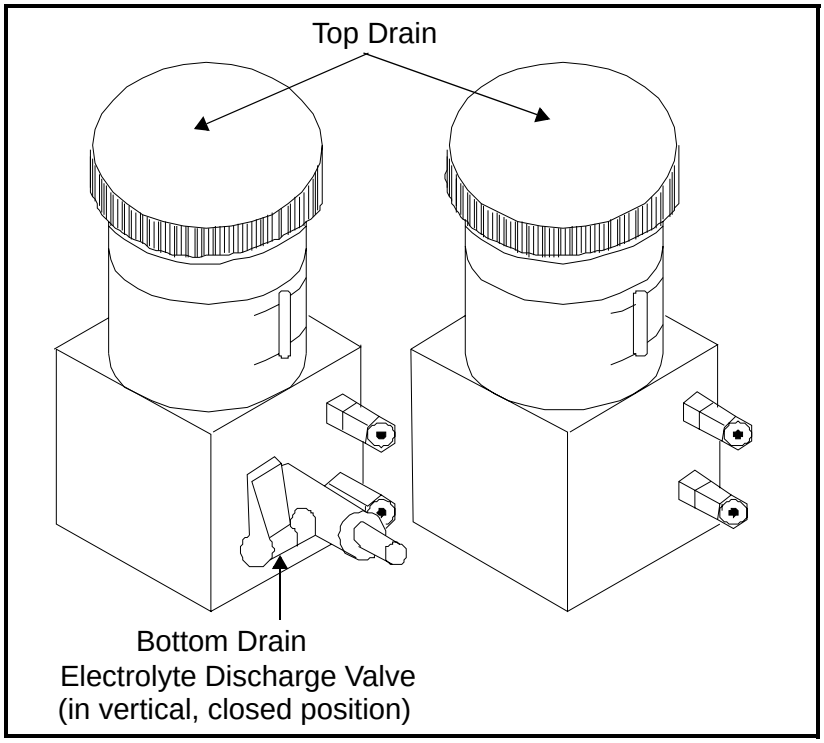


Figure 1-1: Delta F Oxygen Cell - Drain Locations

4. Let the oxygen cell stand for about 6 hours; then check for any leakage.

5. If there is no leakage, drain the cell completely.

If the cell leaks, see the warranty information at the beginning of this manual.

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Checking the Delta F Oxygen Cell for Leakage (cont.)

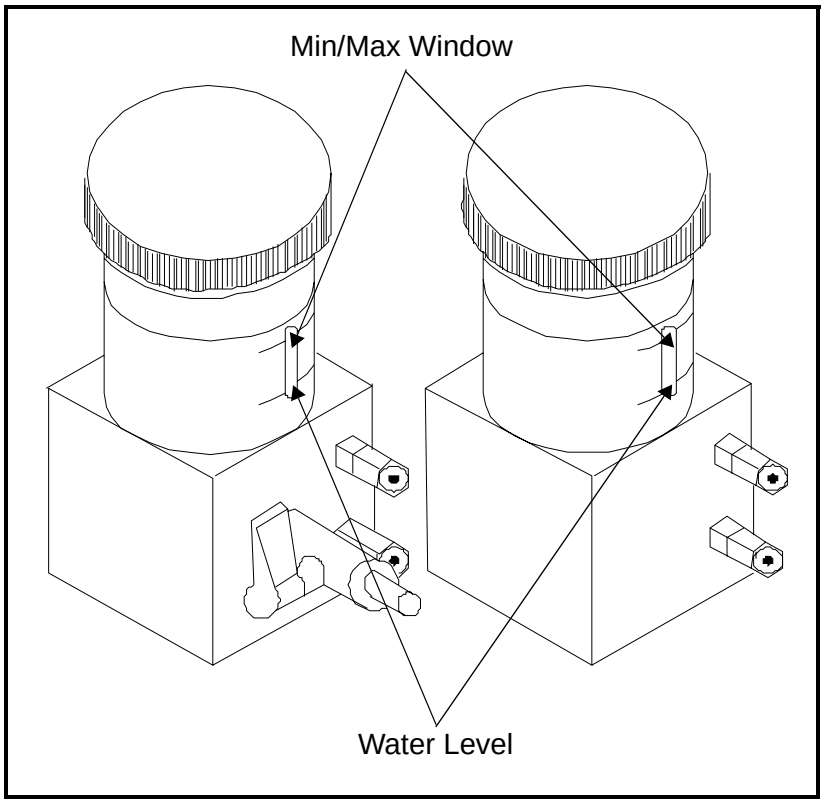


Figure 1-2: Min/Max Window and Water Level

Choosing a Site

The Series 3 is available in rack, bench or panel mounts that are suitable for most indoor installations, as well as weatherproof and explosion-proof configurations. See the drawings at the end of this chapter for an example of each enclosure.

You should have discussed environmental and installation factors with an applications engineer or field sales person by the time you receive the Series 3. The equipment should be suited to the application and installation site.

Before installing the unit, read the guidelines below to verify that you have selected the best installation site.

IMPORTANT: *For compliance with the EU's Low Voltage Directive (IEC 1010), this unit requires an external power disconnect device. The disconnect device for this unit is its power cord.*

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Choosing a Site (cont.)

!WARNING!
Division 2 applications may require special installation. Consult the National Electric Code and/or the Canadian Electrical Code for proper installation requirements. The analyzer must be configured in a suitable equipment enclosure and installed according to the sections of the National Electric Code, Article 500, and Canadian Electrical Code, Section 18, that pertain to the hazardous environment classification in which the electronics will be used.

- Choose an installation site for the probes and sample systems that is as close to the process line as possible. Avoid long runs of connecting tubing. If long distances are unavoidable, a fast sampling by-pass loop is recommended. Do not install any other components, such as filters, ahead of the probes or sample system unless instructed by GE Infrastructure Sensing, Inc. to do so.
- Observe all normal safety precautions. Use probes within their maximum pressure and temperature ratings.
- Although the Series 3 may not need to be accessed during normal operation, install the electronics unit at a convenient location for programming, testing and servicing. A control room or instrument shed are typical locations.
- Locate the electronics unit away from high temperatures, strong electrical transients, mechanical vibrations, corrosive atmospheres, and any other conditions that could damage or interfere with the Series 3 operation.
- Protect the probe cables from excessive physical strain (bending, pulling, twisting, etc.). In addition, do not subject the cables to temperatures above 65°C (149°F) or below –50°C (–58°F).
- Observe the proper cable restrictions for the probes as follows:
  - The M Series and TF Series probes require specially shielded cable. You can locate the M and TF probes up to 600 m (2,000 ft) from the Series 3. If you are measuring pressure with a TF probe, the cable length should not exceed 152 m (500 ft).
  - The Delta-F Oxygen Cell uses a four-wire shielded cable 22 AWG). 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 15 m (50 ft) away. All other cells can be located up to 91 m (300 ft) away.

Consult GE Infrastructure Sensing, Inc. for remote location of the oxygen cell and cable restrictions for other sensors.

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Grounding the Series 3

The Series 3 case is grounded to the electrical system safety ground through the third wire in the power connector and cord (refer to Figure 1-3 below). This ground should not be removed.

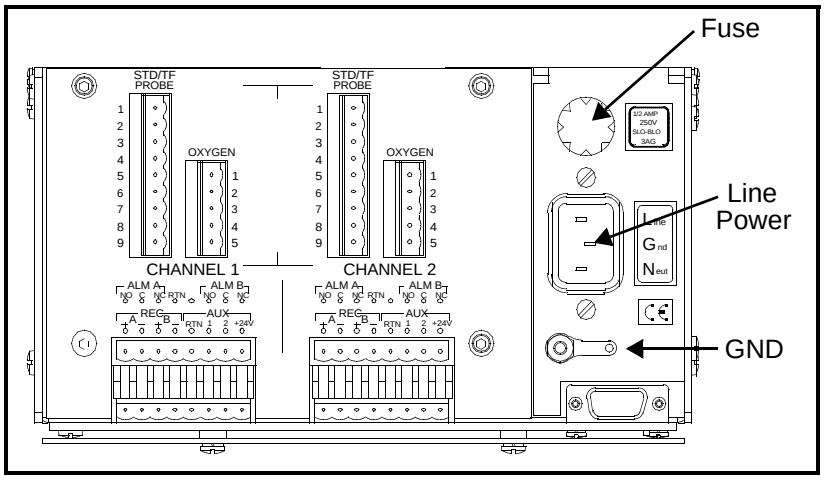


Figure 1-3: Series 3 Back Panel - Ground Location

Moisture/Temperature Probe Considerations

The M Series and TF Series probes consist of an aluminum oxide sensor mounted on a connector head. Standard probe mounts include a protective stainless-steel shield.

The probe sensor materials and housing maximize durability and insure a minimum of water-adsorbing surfaces in the vicinity of the aluminum oxide surface. A sintered stainless-steel shield is used to protect the sensor from high flow rates and particulate matter. The shield should not be removed except upon advice from GE Infrastructure Sensing, Inc..

The sensor has been designed to withstand normal shock and vibration. You should make sure that the active sensor surface is never touched or allowed to come into direct contact with foreign objects, since this may adversely affect performance.

Observing these few simple precautions will result in a long and useful probe life. GE Infrastructure Sensing, Inc. recommends that probe calibration be checked routinely, at 6-month intervals, or as recommended by our applications engineers for your particular application.

The probe will measure the water vapor pressure in its immediate vicinity; therefore, readings will be influenced by its proximity to the system walls, materials of construction, and other environmental factors. The sensor can be operated under vacuum or pressure, flowing or static conditions.

Observe the environmental precautions noted on the next page.

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Temperature Range

The standard probe is operable from –110°C to +70°C (–166°F to 158°F).

Moisture Condensation

Be sure the temperature is at least 10°C (18°F) higher than the dew/frost point temperature. If this condition is not maintained, moisture condensation could occur on the sensor or in the sample system, which will cause reading errors. If this happens, dry out the probe following the procedures outlined in Chapter 3.

Static or Dynamic Use

The sensor performs equally well in still air or where considerable flow occurs. Its small size makes it ideal for measuring moisture conditions within completely sealed containers or dry boxes. It will also perform well under gas flow conditions as high as 10,000 cm/sec and liquid flow conditions to 10 cm/sec. Refer to Table 1-1 below and Table 1-2 on the next page for maximum flow rates in gases and liquids.

Table 1-1: Maximum Gas Flow Rates

Based on the physical characteristics of air at a temperature of 77°F and a pressure of 1 atm, the following flow rates will produce the maximum allowable gas stream linear velocity of 10,000 cm/sec in the corresponding pipe sizes.

Inside Pipe Diameter (in.)	Gas Flow Rate (cfm)
0.25	7
0.50	27
0.75	60
1.0	107
2.0	429
3.0	966
4.0	1,718
5.0	2,684
6.0	3,865
7.0	5,261
8.0	6,871
9.0	8,697
10.0	10,737
11.0	12,991
12.0	15,461

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Static or Dynamic Use (cont.)

Table 1-2: Maximum Liquid Flow Rates

Based on the physical characteristics of benzene at a temperature of 77°F, the following flow rates will produce the maximum allowable fluid linear velocity of 10 cm/sec in the corresponding pipe sizes.

Pipe I.D. (in.)	Flow Rate (gal/hr)	Flow Rate (l/hr)
0.25	3	11
0.50	12	46
0.75	27	103
1.0	48	182
2.0	193	730
3.0	434	1,642
4.0	771	2,919
5.0	1,205	4,561
6.0	1,735	6,567
7.0	2,361	8,939
8.0	3,084	11,675
9.0	3,903	14,776
10.0	4,819	18,243
11.0	5,831	22,074
12.0	6,939	26,269

Pressure

The moisture probe always senses the correct water vapor pressure regardless of total ambient pressure. The moisture sensor measures water vapor under vacuum or high pressure conditions from as little as 5 µm Hg to as high as 5,000 psi total pressure.

Long-Term Storage & Operational Stability

Sensors are not affected by continuous abrupt humidity changes or damaged by exposure to saturation conditions even when stored. However, you should store probes in their original shipping container in a clean, dry location. If the probe is saturated during storage, refer to *Moisture Condensation* on later in this chapter before installing the probe. For best performance, do not store probes longer than one to two years from their calibration date.

Freedom from Interference

The sensor is completely unaffected by the presence of a wide variety of gases or organic liquids. Large concentrations of hydrocarbon gases, Freon®, ozone, carbon dioxide, carbon monoxide, and hydrogen have no effect on sensor water vapor indications. The sensor will operate properly in a multitude of gaseous or non-conductive liquid environments.

Corrosive Materials

Avoid all materials that are corrosive or otherwise damaging to aluminum or aluminum oxide. These include strongly acidic or basic materials and primary amines.

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Sample System Guidelines

A sample system is required for oxygen measurement and, although not mandatory, is highly recommended for moisture measurement. The purpose of a sample system is to condition or control a sample stream to within the specifications of a probe. The application requirements determine the design of the sample system. GE Infrastructure Sensing, Inc. applications engineers will make recommendations based on the following general guidelines.

Moisture Sample Systems

Typically, sample systems should contain as few components as possible and all or most of those components should be located downstream of the measurement probe. Figure 1-4 below shows an example of a basic sample system consisting of an explosion-proof housing with a sample cell, a filter, a flow meter, a vent valve and two-shut off valves, one at the inlet and one at the outlet.

The sample system components should not be made of any material that will affect measurements. A sample system may include a filter to remove particulates from the sample stream or a pressure regulator to reduce or control the pressure of the stream. However, most common filters and pressure regulators are not suitable for sample systems because they have wetted parts that may absorb or release components (such as moisture) into the sample stream. They may also allow ambient contamination to enter the sample stream. In general, you should use stainless steel material for all wetted parts.

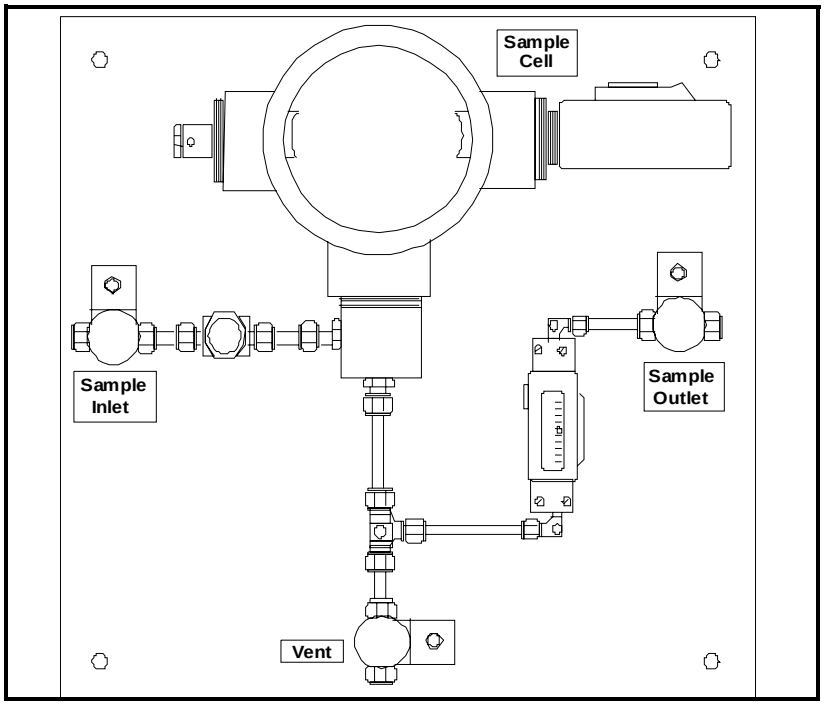


Figure 1-4: Typical Moisture Sample System

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Oxygen Sample Systems

Oxygen sample systems are required and can be be ordered from GE Infrastructure Sensing, Inc. for bench or wall mounting, or you can build your own sample system by using the following guidelines.

IMPORTANT: *The GE Infrastructure Sensing, Inc. warranty is void, if the sample system does not have a relief valve.*

The basic sample system requirements are (see Figure 1-5 below):

1. The oxygen cell requires a sample gas flow of 2.0 to 2.5 SCFH.
2. The sample gas pressure in the cell must be between 0.0 and 1.0 psig. The pressure must not exceed 1.0 psig.
3. A 10 psig pressure relief valve installed upstream of the oxygen cell is required to prevent over-pressure.
4. A flow meter is required to measure the flow.
5. A pressure gauge is required to measure the pressure.
6. A flow regulating or needle valve is required to regulate flow and should be located upstream of the cell.
7. A pressure regulator is required for sample gas supplies of 50 psig or greater.

If a sample pump is required to draw a sample to the oxygen cell, the pump should be installed downstream of the oxygen cell. This will also require you to install a vacuum relief valve set at 1.0 psig between the oxygen cell and the pump.

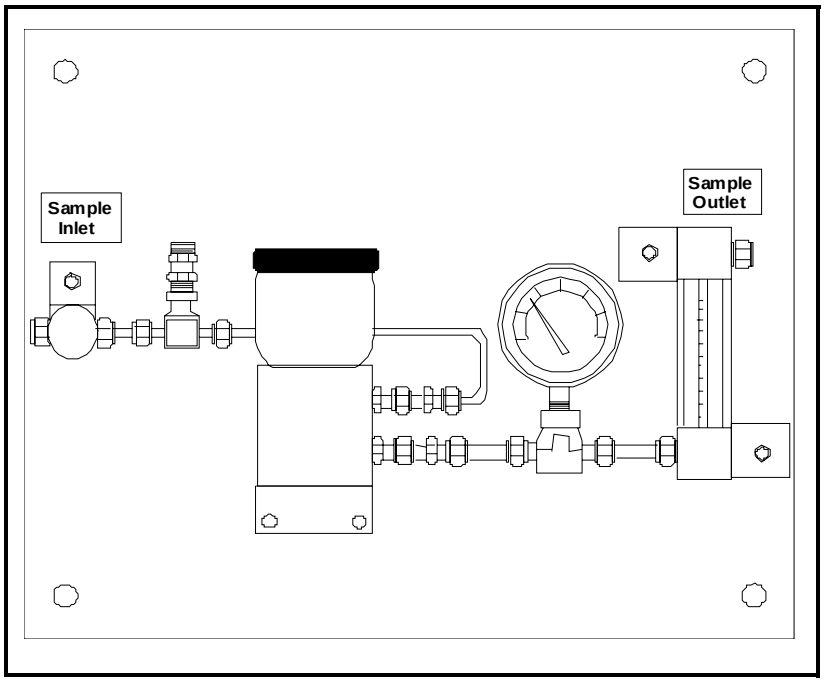


Figure 1-5: Typical Oxygen Cell Sample System

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Chapter 2

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Installation

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Installing the Probes 2-2

Making Basic Electrical Connections 2-5

Establishing a Gas Flow Through the Oxygen Cell 2-14

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Mounting the Hygrometer System

Mounting the hygrometer system consists of mounting the electronics unit, the probes, and the sample system(s). Refer to Figures 2-14 to 2-16 on pages 2-19 to 2-21 for the dimensions of your unit.

Mounting the Electronics Unit

Use the outline and dimension drawings at the end of this chapter to mount the Series 3. These drawings provide clearance and other mounting dimensions needed to prepare the site for mounting.

IMPORTANT: *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 Series 3. The power cord is the main disconnect device.*

Be sure to follow the guidelines outlined in *Choosing a Site* in Chapter 1 before mounting the enclosure.

Note: *You may want to make probe, Delta F Oxygen Cell, recorder, and alarm connections before mounting the enclosure, if the installation location does not provide enough room for these connections to be made easily after installation.*

Mounting the Sample System

The sample system is normally fastened to a metal plate that has four mounting holes. GE Infrastructure Sensing, Inc. also provides the sample system in an enclosure if requested. In either case, mount the sample system plate or enclosure with four bolts — one in each corner. If you ordered sample system outline and dimensions drawings, they will be included in your shipment.

Connect the sample system inlet/outlet to the process/return using the appropriate fittings or an appropriate NPT adapter.

Caution!
Do not start a flow through the system until all probes and transmitters are properly installed.

Mounting the Oxygen Cell Assembly

If your oxygen cell is not mounted into a sample system, refer to Figure 2-18 on page 2-23 to mount the cell.

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Installing the Probes

After you mount the sample system you must insert moisture probes into the sample cells. In addition, you must check, prepare, and connect oxygen cells (if used) to the gas line.

Moisture Probes

GE Infrastructure Sensing M Series and TF Series moisture probes have 3/4-16 straight threads with an o-ring to secure the probes into the sample system or directly into the process line.

Caution!
If mounting the moisture probes directly into the process line, you must consult the factory for proper installation instructions and precautions.

Moisture probes are usually installed into a sample system to protect the probes from coming into contact with damaging elements in the process. The sample system includes a sample cell (see Figure 2-1 below) for mounting the moisture probe. For easy identification, the sample cell is labeled on the sample system plate. To install a moisture probe in the sample cell, insert it so that the probe is perpendicular to the sample inlet. Screw the probe into the cell, making sure not to cross thread it, and tighten it securely.

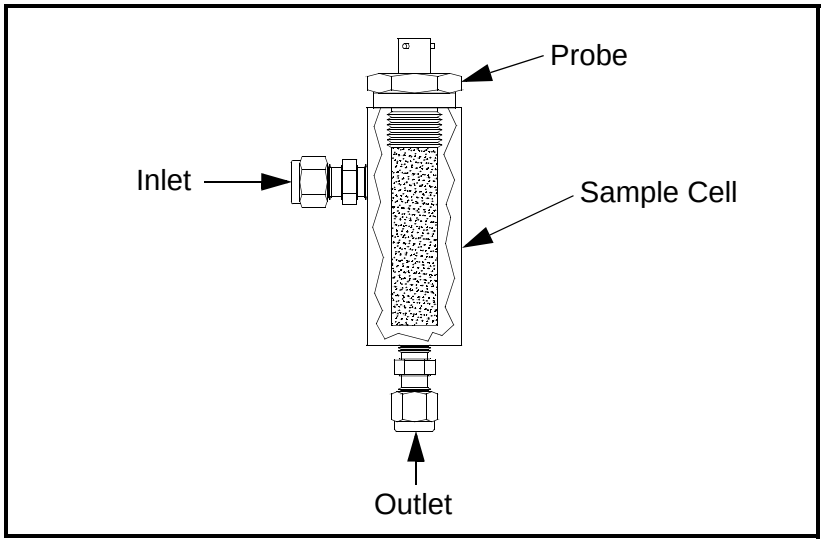


Figure 2-1: Moisture Probe Installed in Sample Cell

Note: *Standard moisture probes have a sintered stainless-steel shield that protects the aluminum oxide sensor. Leave the shield in place for maximum protection.*

IMPORTANT: *You must eliminate all leaks for safety reasons and to be sure that measurements are not affected by ambient contamination. For gas applications, you should check for leaks using a soap bubble solution.*

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Pressure Sensor

If a pressure measurement is required, and for some reason the TF probe pressure option is not used, you can connect a separate pressure sensor to an auxiliary input. The Series 3 uses any type of 0/4 to 20 mA or a 0 to 2 V pressure transducer or transmitter. GE Infrastructure Sensing, Inc. offers two types of pressure transmitters: the P40 and P40X. The P40 has a 1/4-inch threaded NPTM fitting and the P40X has a 1/2-inch threaded NPTF fitting for mounting directly into the process line or into a sample system.

Caution!

If mounting the pressure transmitters directly into the process line, consult the factory for proper installation instructions and precautions.

Always mount the pressure transmitter directly downstream of the moisture probe to measure the pressure as close as possible to the point of the moisture measurement.

Delta F Oxygen Cell

Although the Series 3 can use other oxygen devices as auxiliary inputs, it is designed to accept oxygen inputs directly from the *Delta F Oxygen Cell*. There are three steps for installing the Delta F Oxygen Cell: preparing the oxygen cell for operation, calibrating the oxygen cell, and then connecting the cell to the gas line.

The Delta F Oxygen Cell is available in various enclosure types; however, the cell itself looks like either of the cells shown in Figure 2-2 below. The oxygen cell may have both a bottom and top drain or only a top drain.

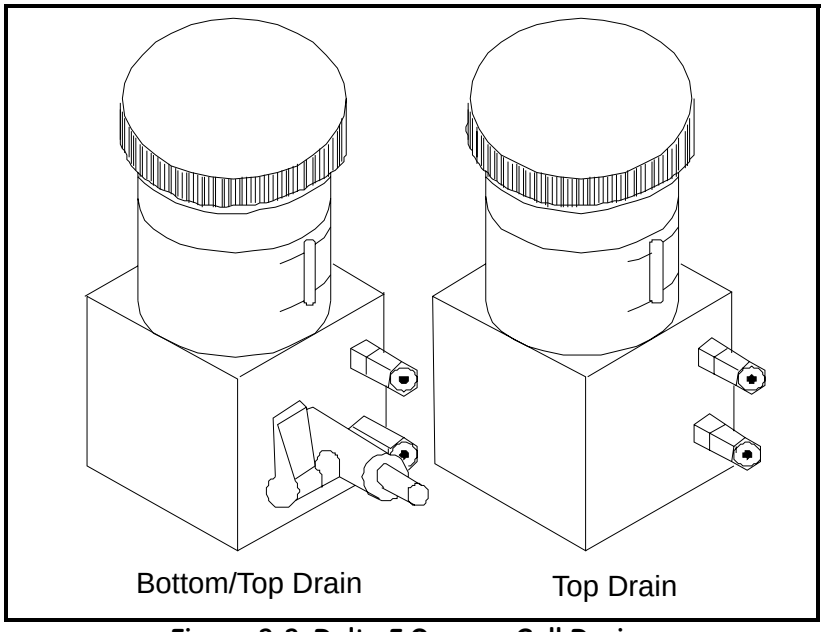


Figure 2-2: Delta F Oxygen Cell Drains

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Preparing the Oxygen Cell

Prepare the oxygen cell for operation by filling it with the electrolyte that has been supplied in a plastic bottle (see Figure 2-3 below).

!WARNING!
The electrolyte contains potassium hydroxide, which is harmful if it comes in contact with eyes or skin. Consult your company safety personnel for proper procedures for handling the electrolyte.

1. Unscrew the top on the reservoir. If you are using an explosion-proof or bottom-top drain cell, make sure the electrolyte discharge valve is in the vertical (closed) position.

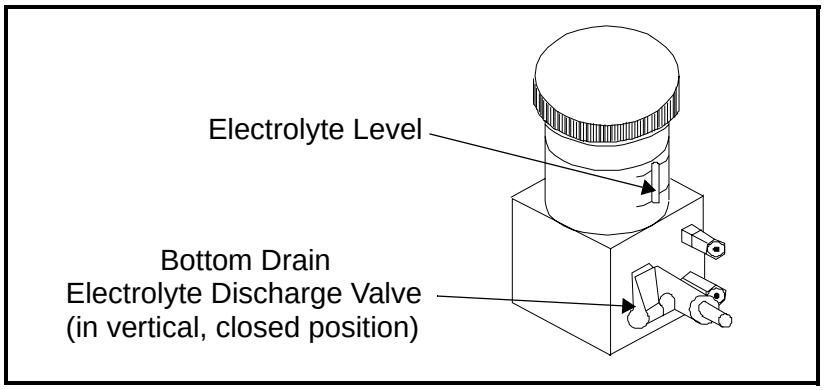


Figure 2-3: Bottom Drain Delta F Oxygen Cell

2. Slowly add the entire contents of the bottle, approximately three ounces (90 ml), making sure not to spill any on the outside of the cell. Be especially careful that the electrolyte does not come in contact with any of the cell's electrical connections.
3. Using the min/max window on the oxygen cell, check the electrolyte level. The electrolyte should cover about 60% of the window. The cell is now ready to be connected to the gas line.
4. Replace the top cover of the oxygen cell.

Note: *DO NOT add additional electrolyte to the reservoir. If the level falls below the minimum level,see page 4-4 for instructions on electrolyte maintenance.*

5. Calibrate the oxygen cell as described on page 4-4. After you calibrate the cell, connect it to the gas line as described in the following section.

Note: *Oxygen cells are calibrated using nitrogen. If you plan to use your cell with a gas other than nitrogen, you must enter a current multiplier as described on page 4-7.*

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Connecting the Oxygen Sample System to the Gas Line

To connect the oxygen sample system to the process line, attach 1/8" tubing to the sample gas inlet fitting using a Swagelok® or equivalent mating connector. Avoid using plastic or rubber for any tubing or fittings that are included in the inlet gas lines.

Caution!

Do not connect the oxygen cell outlet to flow restricting devices, pressure lines, or vacuum lines. Pressure differentials across the cell sensor in excess of 1 psig could damage the cell.

If the sample gas is not a safety hazard, vent it to atmosphere at the sample system outlet. If venting the gas to atmosphere causes a safety hazard, vent the gas to a safe location. Make sure the venting system does not create a back pressure for the oxygen cell.

Note: *The vented sample will not be corrosive if you install and operate the oxygen cell properly.*

Making Basic Electrical Connections

!WARNING!

To ensure the safe operation of this unit, you must install and operate the Series 3 as described in this manual. In addition, be sure to follow all applicable safety codes and regulations for installing electrical equipment in your area.

Turn the Series 3 OFF before making any connections.

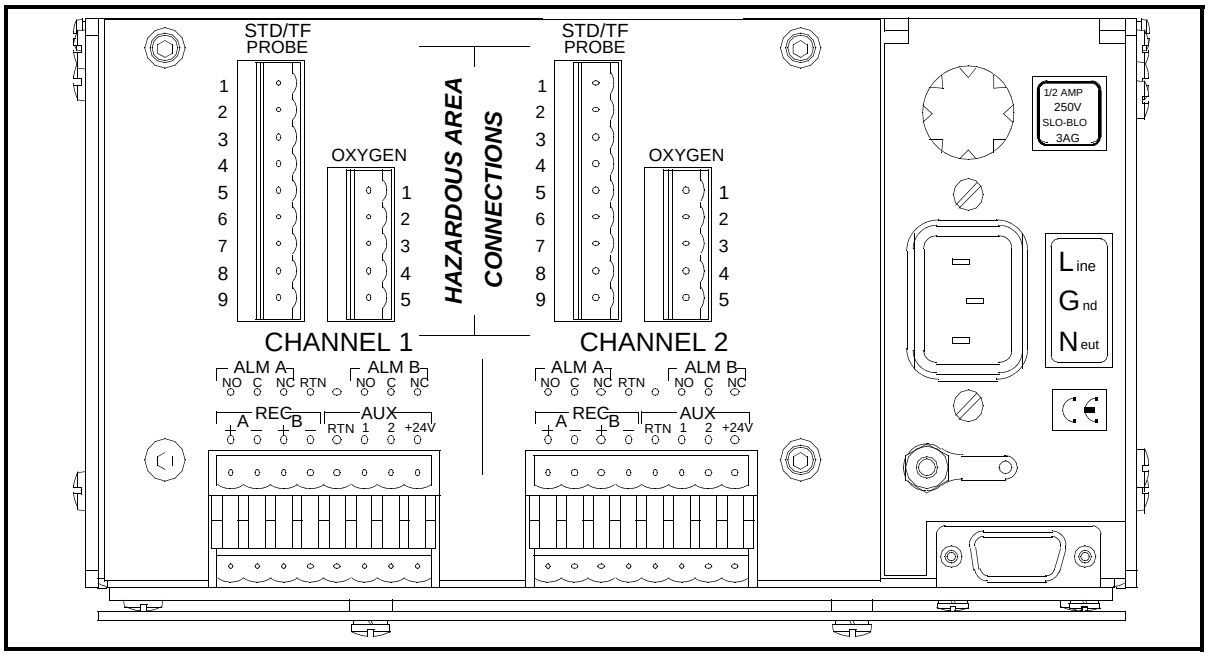


Figure 2-4: Series 3 Back Panel

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Making Channel Connections

Make all connections to the back of the meter (see Figure 2-4 on the previous page and Figure 2-17 on page 2-22). The larger panel is separated into two sections, one for each channel. Make connections by placing the press lock lever into the desired terminal (one press-lock lever is supplied with each terminal block). Press and hold the lever against the terminal block and insert the stripped and tinned portion of the wire into the terminal. Then, release the lever to secure the connection.

IMPORTANT: *To maintain good contact at each terminal block and to avoid damaging the pins on the connector, pull the connector straight off (not at an angle), make cable connections while the connector is away from the unit, and push the connector straight on (not at an angle) when the wiring is complete.*

Proper connections and cabling are extremely important for accurate measurements. Be sure to use the correct cable type for each probe, and make sure that the cables are not damaged during installation. If you are not using a factory-supplied cable, or you are using a modified cable, read the following section carefully.

Connecting the Power

!WARNING!
Division 2 applications may require special installation. Consult the National Electric Code and/or the Canadian Electrical Code for proper installation requirements. The analyzer must be mounted in a suitable equipment enclosure and installed according to the sections of the National Electric Code, Article 500, and Canadian Electrical Code, Section 18, that pertain to the hazardous environment classification in which the electronics will be used.

Note: *The power line is the main disconnect device. However, GE Infrastructure Sensing, Inc. does not provide power supply cords with CSA Div. 2 hygrometers.*

IMPORTANT: *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 Series 3.*

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Connecting Moisture Probes

GE Infrastructure Sensing, Inc. manufactures a variety of moisture probes for the Series 3. The most commonly used are the M Series and TF Series. If you ordered one or more of these probe types, the probe setup data has been entered on a preassigned channel. Channel designations and probe serial numbers are listed on the *Calibration Data Sheet* that is shipped with each probe. The serial number is also engraved on the probe hex nut, as shown in Figure 2-5 below.

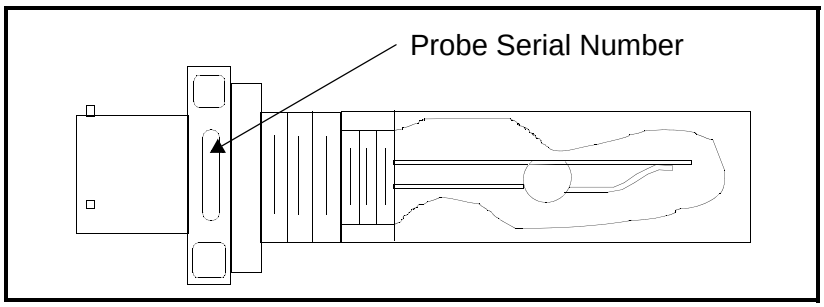


Figure 2-5: Moisture Probe Serial Number

M Series Probes

M Series probes are primarily used for moisture measurement, but they can be also equipped with an optional thermistor to measure temperature. The optional temperature thermistor is included in the moisture probe and requires an additional connection.

The M Series Probe is connected with a four-wire shielded cable having a bayonet-type connector and a length of up to 600 m (2,000 ft). Consult the factory for longer cables. Before making the electrical connections, connect the cable to the probe by inserting the bayonet-type connector onto the probe and twisting the shell clockwise until it snaps into a locked position (approximately 1/8 of a turn). If you are not using a factory-supplied cable, refer to Figure 2-6 below to make proper pin connections to a bayonet-type connector.

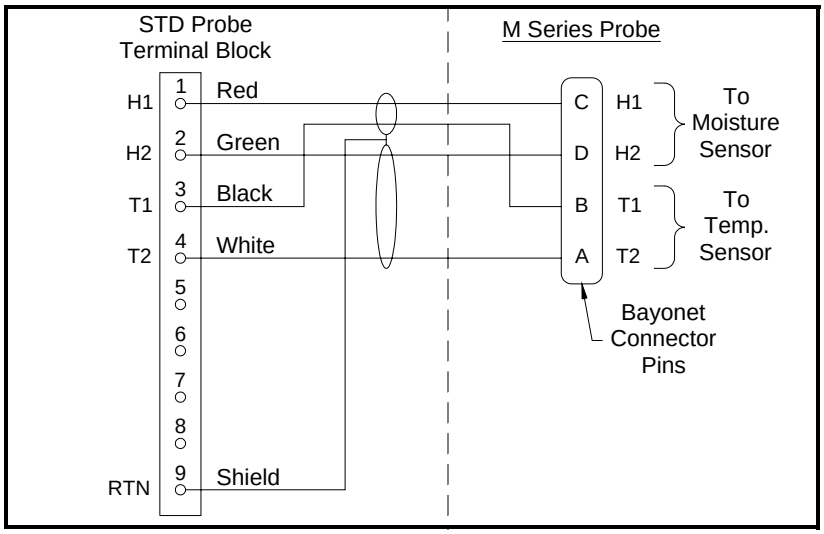


Figure 2-6: M Series Probe Cable Assembly

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M Series Probes (cont.)

NOTICE FOR BASEEFA CERTIFICATION

The M Series probe may not be capable of withstanding the 500 V insulation test required by clause 5.7 of EN50 020 when installed in the process media. This must be taken into account in any installation in which it is used. (See Cert. # Ex95C2002X in its entirety.) Copies of official BASEEFA documentation (certificates of compliance, licenses, etc.) are to be made in their entirety.

IMPORTANT: *To maintain good contact at each terminal block and to avoid damaging the pins on the connector, pull the connector straight off (not at an angle), make cable connections while the connector is away from the unit, and push the connector straight on (not at an angle) when the wiring is complete.*

Use Table 2-1 below to connect the remaining end of the cable to the terminal block labeled STD/TF PROBE on the back of the electronics unit (see Figure 2-4 on page 2-5 for the terminal block location). All the connections listed in the table must be made, even if you do not have the temperature option.

IMPORTANT: *For intrinsically safe installations, refer to Figure 2-19 on page 2-24.*

Table 2-1: M Series Probe Connections

Connect:	To STD/TF PROBE TB:
red wire (moisture H1)	pin 1
green wire (moisture H2)	pin 2
white wire (temperature T1)	pin 3
black wire (temperature T2)	pin 4
shield	pin 9

After you connect the cables, perform a calibration test, as described on page 4-1, to compensate for any small electrical offsets in the cable.

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TF Series Probe

Using the special factory-supplied cable, connect the TF Series Probe to the designated terminal blocks on the back panel of the Series 3. For moisture and temperature measurements, the TF Series Probe may be located to 600 m (2,000 ft) from the meter. For pressure measurements, the cable length should not exceed 152 m (500 ft).

Connect the cable to the probe by inserting the connector onto the probe and securing it. If you are not using a factory-supplied cable, refer to Figure 2-7 below to make proper pin connections to a bayonet-type connector.

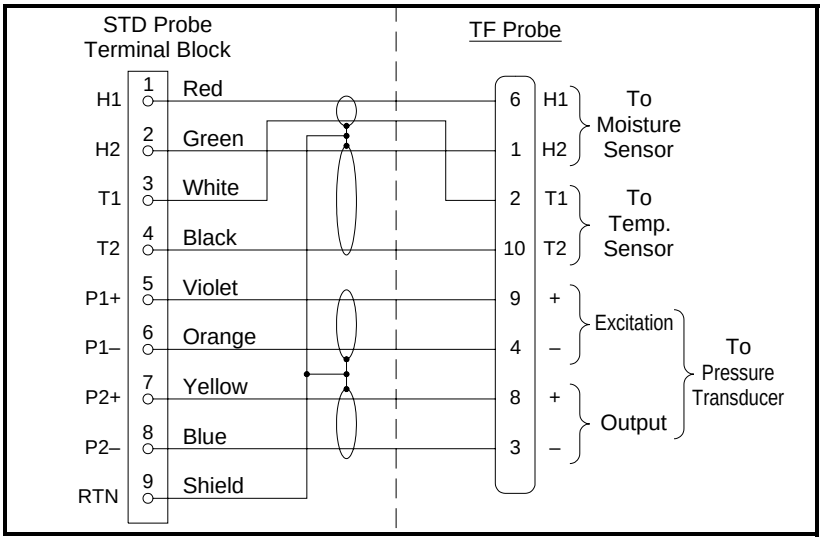


Figure 2-7: Cable Assembly for TF Series Probe

IMPORTANT: *To maintain good contact at each terminal block and to avoid damaging the pins on the connector, pull the connector straight off (not at an angle), make cable connections while the connector is away from the unit, and push the connector straight on (not at an angle) when the wiring is complete.*

NOTICE FOR BASEEFA CERTIFICATION

The TF Series probe may not be capable of withstanding the 500 V insulation test required by clause 5.7 of EN50 020 when installed in the process media. This must be taken into account in any installation in which it is used. (See Cert. # Ex95C2002X in its entirety.) Copies of official BASEEFA documentation (certificates of compliance, licenses, etc.) are to be made in their entirety.

IMPORTANT: *For intrinsically safe installations, refer to Figure 2-19 on page 2-24.*

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TF Series Probe (cont.)

Use Table 2-2 below to connect the remaining end of the cable to the terminal blocks labeled STD/TF PROBE on the back of the electronics unit (see Figure 2-4 on page 2-5 for the terminal block location).

Table 2-2: TF Series Probe Connections

Connect:	To STD/TF PROBE TB:
red wire (moisture H1)	pin 1
green wire (moisture H2)	pin 2
white wire (temperature T1)	pin 3
black wire (temperature T2)	pin 4
violet wire (IN +)	pin 5
orange wire (IN -)	pin 6
yellow wire (OUT +)	pin 7
blue wire (OUT -)	pin 8
shield	pin 9

After you connect the probe, perform a calibration test. as described on page 4-1, to compensate for any small electrical offsets in the cable.

Connecting the Delta F Oxygen Cell

The *Delta F Oxygen Cell* is available in a general purpose model with standard or VCR® fittings. The oxygen cell can also be mounted in a weatherproof enclosure (R4) for outdoor applications or an explosion-proof enclosure (R7) for hazardous areas.

Caution!

Do not power up your Series 3 without establishing a flow through the Delta F Oxygen Cell (see page 2-14).

Each oxygen cell has a set of sensing and secondary electrodes that must be connected to the terminal block labeled OXYGEN on the back of the meter (see Figure 2-4 on page 2-5). Instructions for connecting each type of cell are given in the following sections (for intrinsically safe installations, refer to the following section and to Figure 2-19 on page 2-24, for special installation requirements.

Caution!

The Delta F Oxygen Cell is BASEEFA approved for use in intrinsically safe areas when connected to a BASEEFA approved Series 3 Hygrometer.The certification numbers are as follows: Series 3 I.S. Cert. Ex95D242432/2Delta F Oxygen Cell Ex96D2191XInstall the apparatus so the terminals are protected to at least the requirements of IP20. Copies of official BASEEFA documentation (certificates of compliance, licenses, etc.) are to be made in their entirety.

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Standard Delta-F Oxygen Cells and Cells with VCR Fittings

Figure 2-8 below shows the standard oxygen cell and identifies the sensing and secondary electrodes.

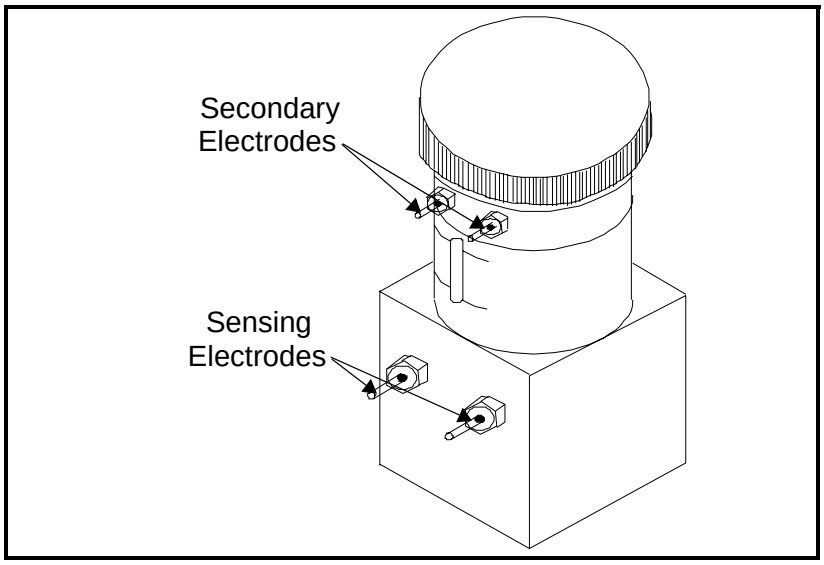


Figure 2-8: Standard Delta F Oxygen Cell

IMPORTANT: *To maintain good contact at each terminal block and to avoid damaging the pins on the connector, pull the connector straight off (not at an angle), make cable connections while the connector is away from the unit, and push the connector straight on (not at an angle) when the wiring is complete.*

Make oxygen cell connections for to the OXYGEN terminal block on the back of the meter using Table 2-3 below. For each set of electrodes use a four-wire shielded (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 50 ft (15 m) away from the analyzer. All other oxygen cells may be located up to 300 ft (100 m) away.

Table 2-3: Standard Delta F Oxygen Cell Connections*

Connect:	To Delta F Oxygen Cell:	To OXYGEN TB:
red wire	+ sensing electrode	pin 1
green wire	– sensing electrode	pin 2
white wire	+ secondary electrode	pin 3
black wire	– secondary electrode	pin 4
shield	cable shield	pin 5
*includes cells with VCR Fittings		

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Weatherproof Oxygen Cell

Figure 2-9 below shows the weatherproof oxygen cell and the terminal block for wiring the sensing and secondary electrodes.

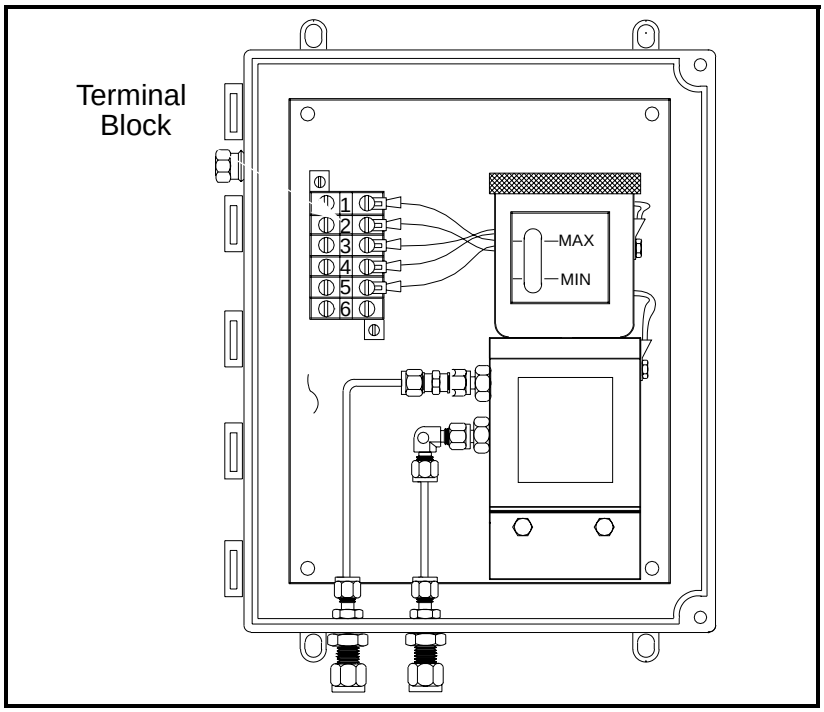


Figure 2-9: Weatherproof Delta F Oxygen Cell

IMPORTANT: *To maintain good contact at each terminal block and to avoid damaging the pins on the connector, pull the connector straight off (not at an angle), make cable connections while the connector is away from the unit, and push the connector straight on (not at an angle) when the wiring is complete.*

Using Table 2-4 below, connect each set of electrodes using a four-wire shielded (22 AWG) cable. Connect one end of the cable to the terminals in the oxygen cell enclosure and the other end of the cable to the OXYGEN terminal block on the back of the meter (see Figure 2-4 on page 2-5). 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 50 ft (15 m) from the analyzer; all other oxygen cells can be located up to 300 ft (100 m) away.

Table 2-4: Weatherproof Delta F Oxygen Cell Connections

Connect:	To Delta F Enclosure:	To OXYGEN TB:
red wire (+sensing)	pin 1	pin 1
green wire (–sensing)	pin 3	pin 3
white wire (+secondary)	pin 4	pin 4
black wire (–secondary)	pin 5	pin 5
shield	pin 2	pin 2

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Explosion-Proof Oxygen Cell

Figure 2-10 below shows an explosion-proof oxygen cell and the terminal block for wiring the sensing and secondary electrodes.

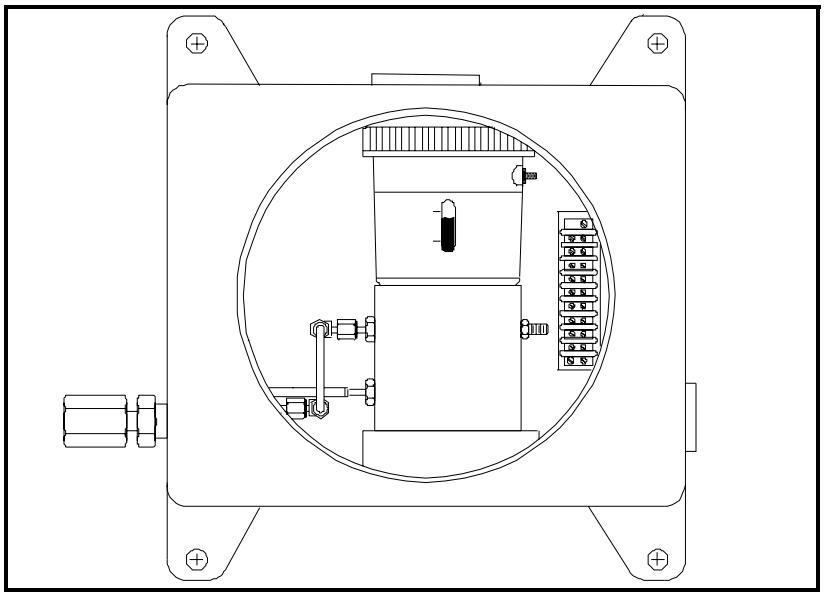


Figure 2-10: Explosion-proof Oxygen Cell

IMPORTANT: *To maintain good contact at each terminal block and to avoid damaging the pins on the connector, pull the connector straight off (not at an angle), make cable connections while the connector is away from the unit, and push the connector straight on (not at an angle) when the wiring is complete.*

Using Table 2-5 below, connect each set of electrodes using a four-wire shielded (22 AWG) cable. Connect one end of the cable to the terminals in the oxygen cell enclosure and the other end of the cable to the OXYGEN terminal block on the back of the meter (see Figure 2-4 on page 2-5). 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 50 ft (15 m) from the analyzer; all other oxygen cells can be located up to 300 ft (100 m) away.

Table 2-5: Explosion-Proof Oxygen Cell Connections

Connect:	To Oxygen Cell TB:	To OXYGEN TB:
red wire (+sensing)	pin 1	pin 1
green wire (–sensing)	pin 2	pin 2
white wire (+secondary)	pin 3	pin 3
black wire (–secondary)	pin 4	pin 4
shield	N/C	pin 5

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Establishing a Gas Flow Through the Oxygen Cell

Caution!

Establish a gas sample flow before you power up the Series 3 or damage may occur to the oxygen cell.

If you are using an oxygen cell, you must establish a gas flow through the cell before powering up (if you are not using an oxygen cell, proceed directly to the *Startup Procedure* on page 3-1). The oxygen cell requires a flow rate of 2-2.5 SCFH through the cell, and the oxygen cell inlet pressure should be 0.2-1.0 psig. Refer to Figure 2-11 below when establishing a gas sample flow.

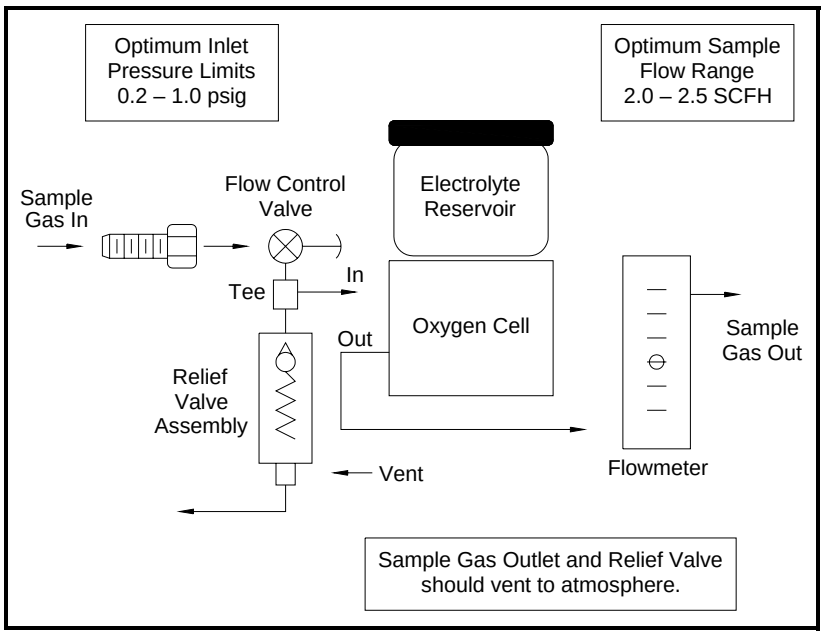


Figure 2-11: Gas Flow Schematic

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 3 is on. If exposure is unavoidable, either disconnect the oxygen cell from the Series 3 or equip the sample system with a valve that allows the cell to be switched to purge gas.

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Establishing a Gas Flow Through the Oxygen Cell (cont.)

To establish the gas flow, complete the following steps:

1. Close the flow control valve and adjust the upstream pressure as required. GE Infrastructure Sensing, Inc. recommends about 2-10 psig upstream of the flow control valve, depending on the type of valve installed in the sample system.
2. To safeguard against over-pressurizing the oxygen cell, install a relief valve rated at 10 psig into the gas flow system. If the pressure exceeds 10 psig, the relief valve will open; therefore, there should be no restrictions downstream of the oxygen cell. Use 1/4-inch tubing or larger on the oxygen cell outlet and relief valve outlet. Both outlets should vent to atmosphere if possible.

Caution!

Do not connect the relief valve and oxygen cell outlet to a common outlet line smaller than 1/4 inch. This pressure restriction will damage the oxygen cell. In addition, a relief valve should be installed in the oxygen sample system. If either of these conditions is not met, the Delta F oxygen cell warranty is void.

3. Slowly open the flow control valve until the recommended flow of 2 to 2.5 SCFH is established on the flow meter.
4. When the proper flow is achieved, make sure the relief valve is closed by placing an object (e.g., your finger, if the gas is non-corrosive) over the relief valve vent. Cover and uncover the relief valve vent and verify that the flow meter shows no change in the flow rate. Keep the relief valve closed during operation to minimize leakage in the sample system.

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Connecting Optional Recorder Outputs

The Series 3 has two optically isolated recorder outputs. These outputs provide either a current or voltage signal, as selected by switch blocks on the channel card. Although the Series 3 is configured to your specifications at the factory, you should check the switch block positions before making connections. Refer to Figure 2-12 below and check or reset these switch blocks as follows:

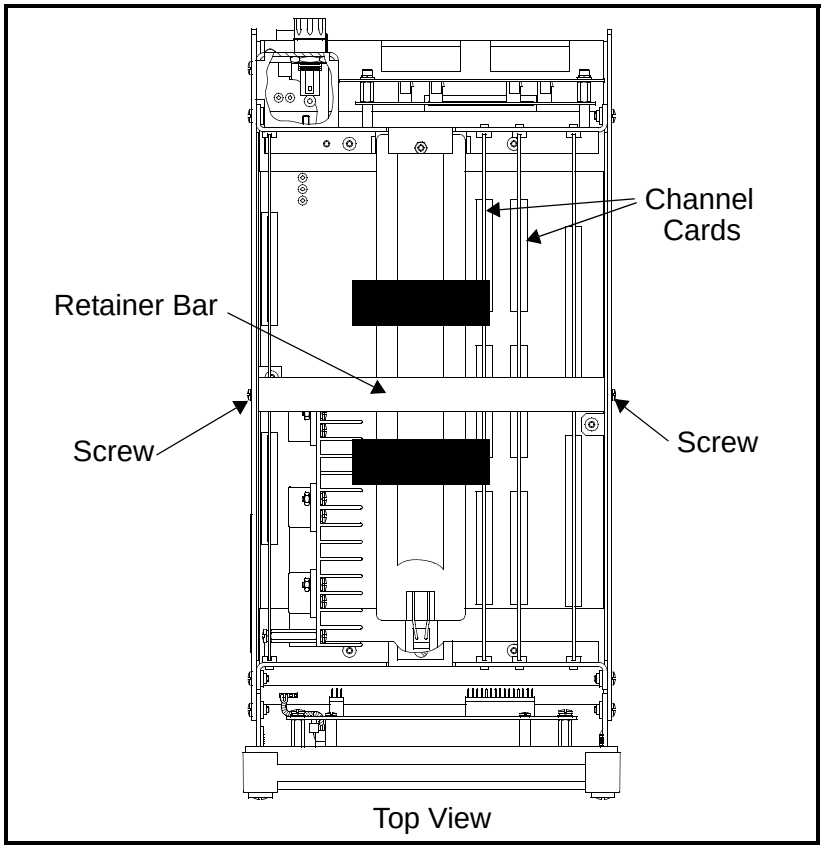


Figure 2-12: Channel Cards Location

Accessing the Channel Cards

1. Remove the screws on the Series 3 front panel and slide the electronics unit out of its enclosure.
2. Remove the retainer bar by removing the two screws on the outside of the chassis.
3. Remove the desired channel card by sliding it straight up.

Setting the Switch Blocks

1. Locate switch blocks S2 and S3 (see Figure 2-13 on the next page). Switch block S2 controls the output signal for Recorder A and switch block S3 controls the output signal for Recorder B.
2. Set the switch blocks to the appropriate positions: **I for current** or **V for voltage**.

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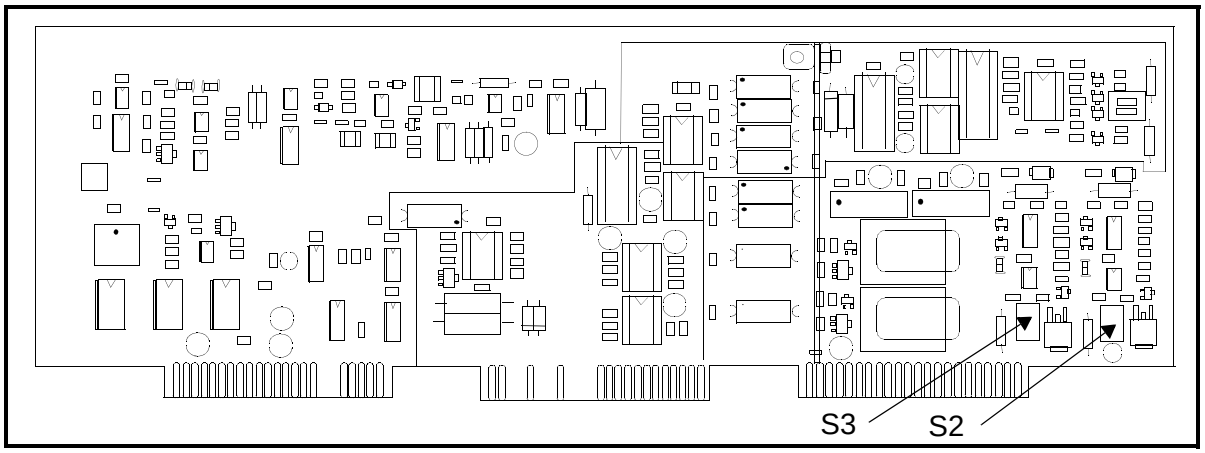


Figure 2-13: Channel Card - S2 and S3 Locations

Replacing the Channel Card

1. Once the switches are set, replace the channel card.

Note: *If you intend to connect pressure inputs or other input devices to the Series 3, do not replace the retainer bar and cover, because you will need to set switches on the channel card for those inputs as well.*

2. Replace the retainer bar. Make sure the slots on the retainer bar are seated correctly against the printed circuit boards. Secure the bar with the two screws that were previously removed.

3. Slide the electronics units into its enclosure and reinstall the screws. Tighten the screws until they are snug, but do not over tighten them.

Connecting the Recorders

Connect the recorders to the REC terminal block on the back panel (see Figure 2-4 on page 2-5). Use Table 2-6 below to make the recorder connections

IMPORTANT: *To maintain good contact at each terminal block and to avoid damaging the pins on the connector, pull the connector straight off (not at an angle), make cable connections while the connector is away from the unit, and push the connector straight on (not at an angle) when the wiring is complete.*

Table 2-6: Recorder Connections

Connect:	To REC Terminal Block:
Recorder A out (+)	pin A+
Recorder A return (–)	pin A–
Recorder B out (+)	pin B+
Recorder B return (–)	pin B–

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Connecting Optional Alarms

You can order the Series 3 with optional high and low alarm relays in either general-purpose or hermetically-sealed styles. Each alarm relay is a single-pole, double throw relay with the following contacts:

- normally-closed (NC)
- armature/common (C)
- normally-open (NO)

Make connections for the high and low alarm relays on the desired channel terminal blocks labeled ALM A and ALM B on the back panel of the electronics unit (see Figure 2-4 on page 2-5). Use Table 2-7 below to make the alarm connections.

IMPORTANT: *To maintain good contact at each terminal block and to avoid damaging the pins on the connector, pull the connector straight off (not at an angle), make cable connections while the connector is away from the unit, and push the connector straight on (not at an angle) when the wiring is complete.*

Table 2-7: Alarm Connections

Connect Low Alarm:	To ALM A Terminal Block:
NC contact	pin NC
C contact	pin C
NO contact	pin NO
Connect High Alarm:	**To ALM B Terminal Block:**
NC contact	pin NC
C contact	pin C
NO contact	pin NO

Note: *The alarm terminal block has an additional Return connection that you can use to ground the alarms if desired.*

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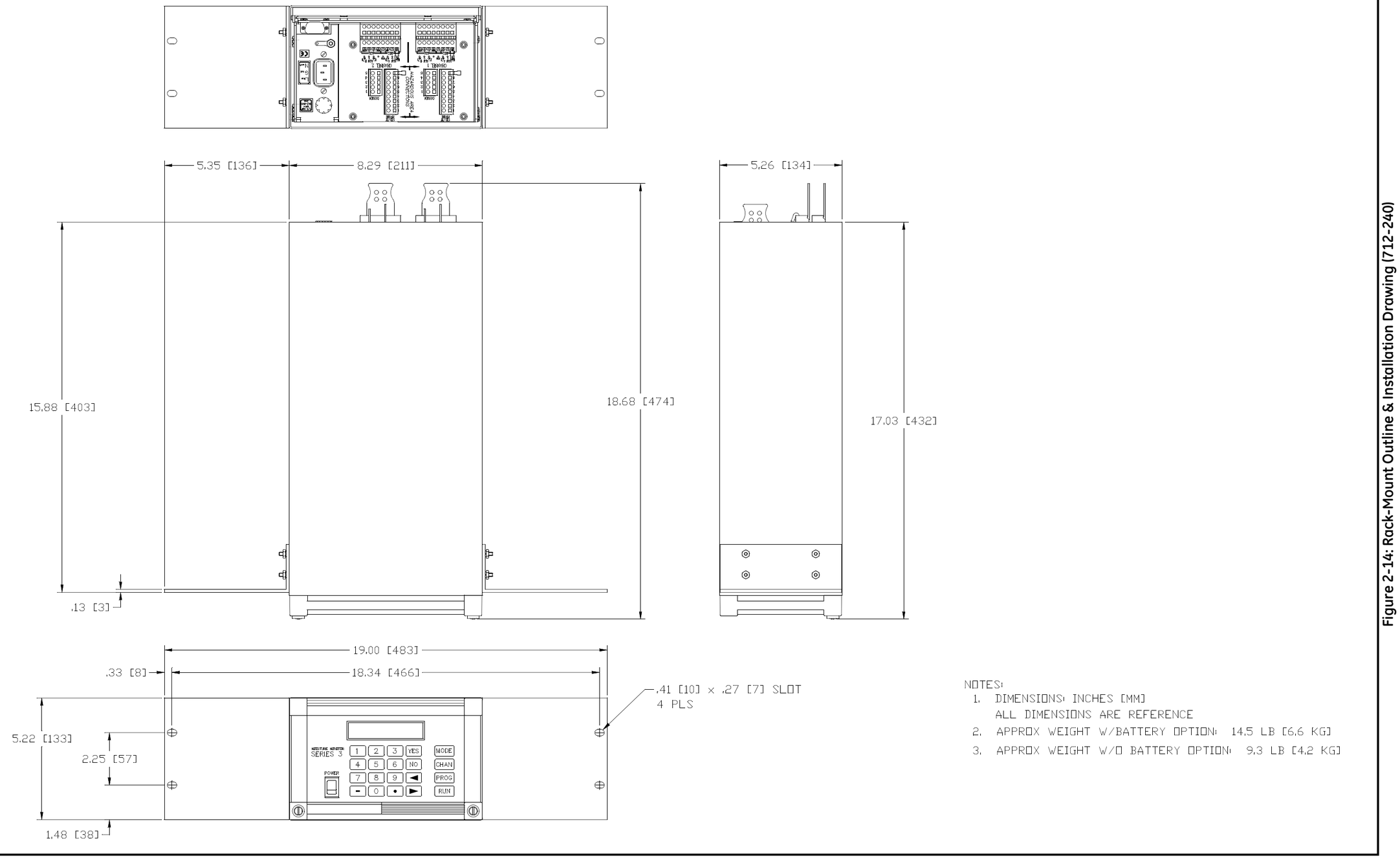


Figure 2-14: Rack-Mount Outline & Installation Drawing (712-240)

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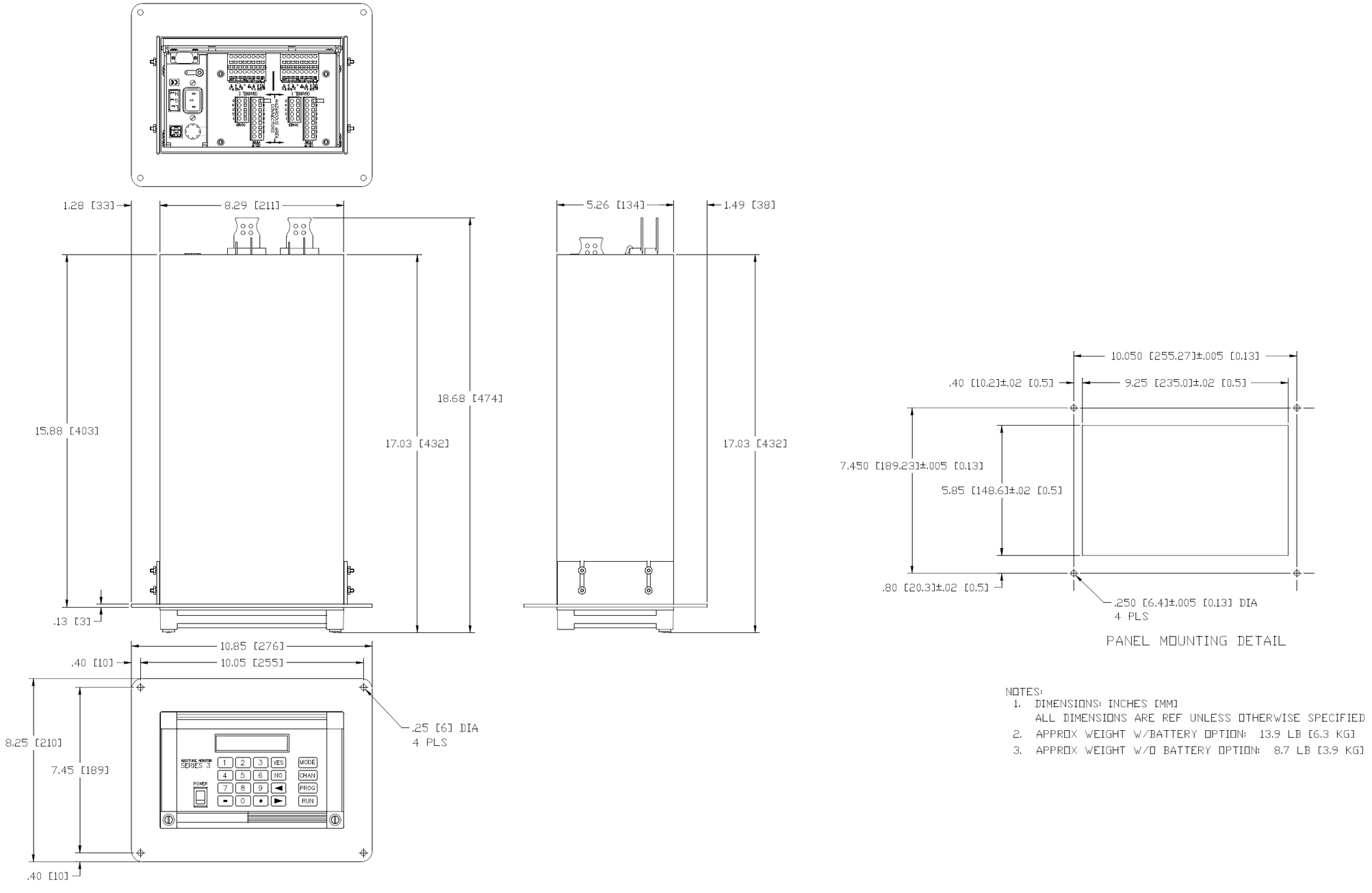
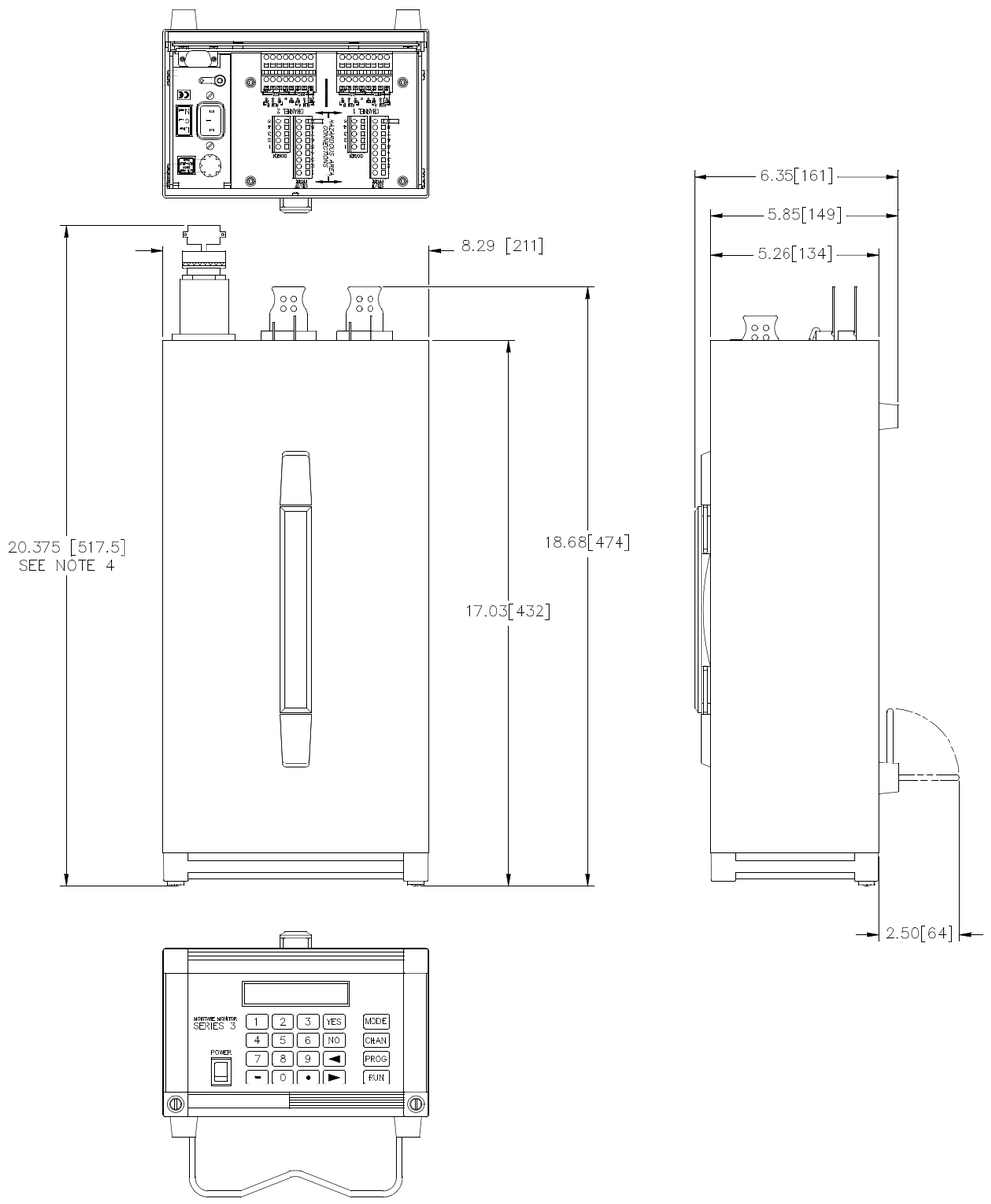


Figure 2-15: Panel-Mount Outline & Installation Drawing (712-241)

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NOTES:

1. DIMENSIONS: INCHES [MM]
   ALL DIMENSIONS ARE REFERENCE
2. APPROX WEIGHT W/BATTERY OPTION: 13.2 LB [6.0 KG]
3. APPROX WEIGHT W/O BATTERY OPTION: 8.0 LB [3.6 KG]
4. OVERALL LENGTH WITH CSA DIV 2 CONNECTOR

Figure 2-16: Bench-Mount Outline & Installation Drawing (712-242)

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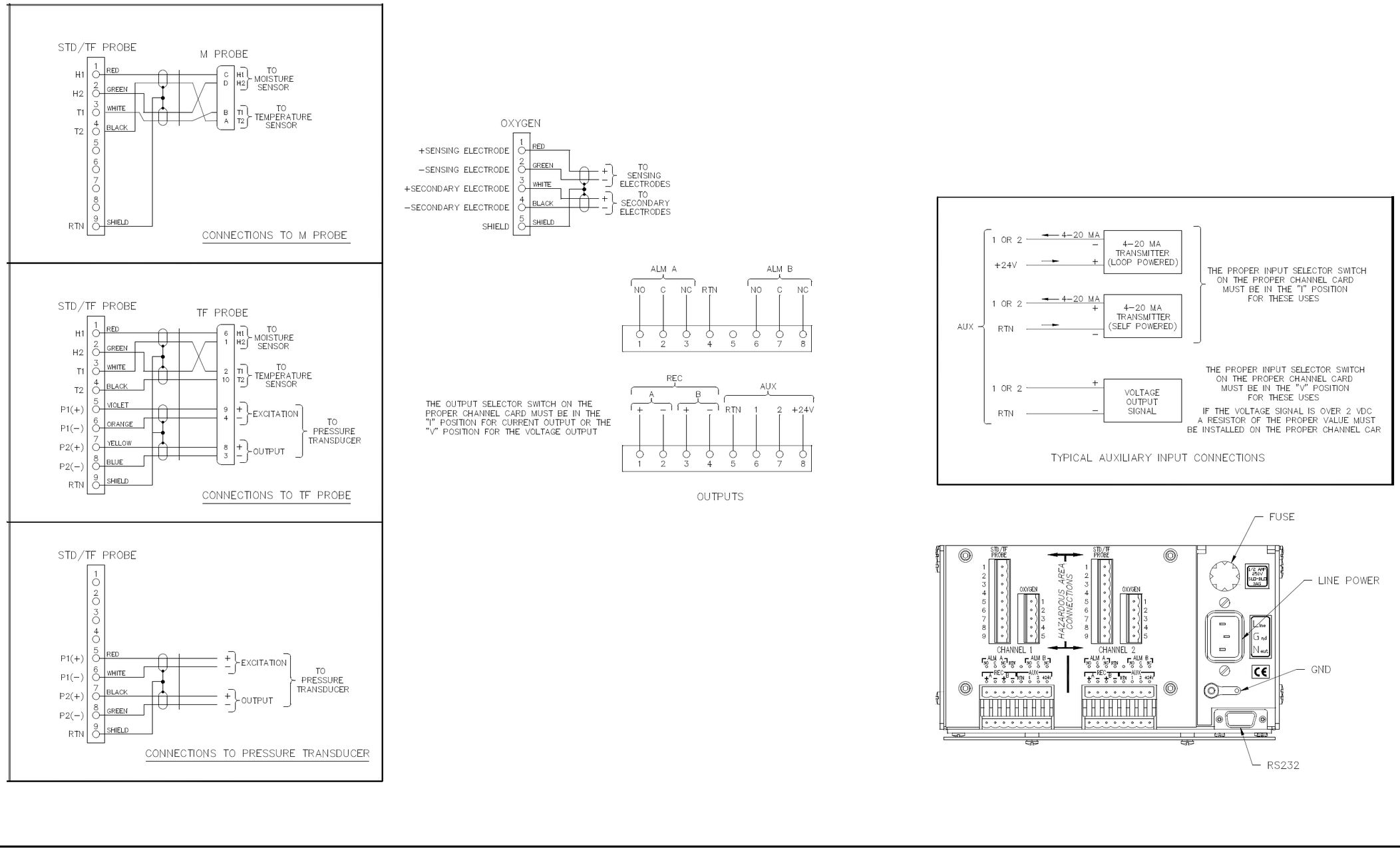
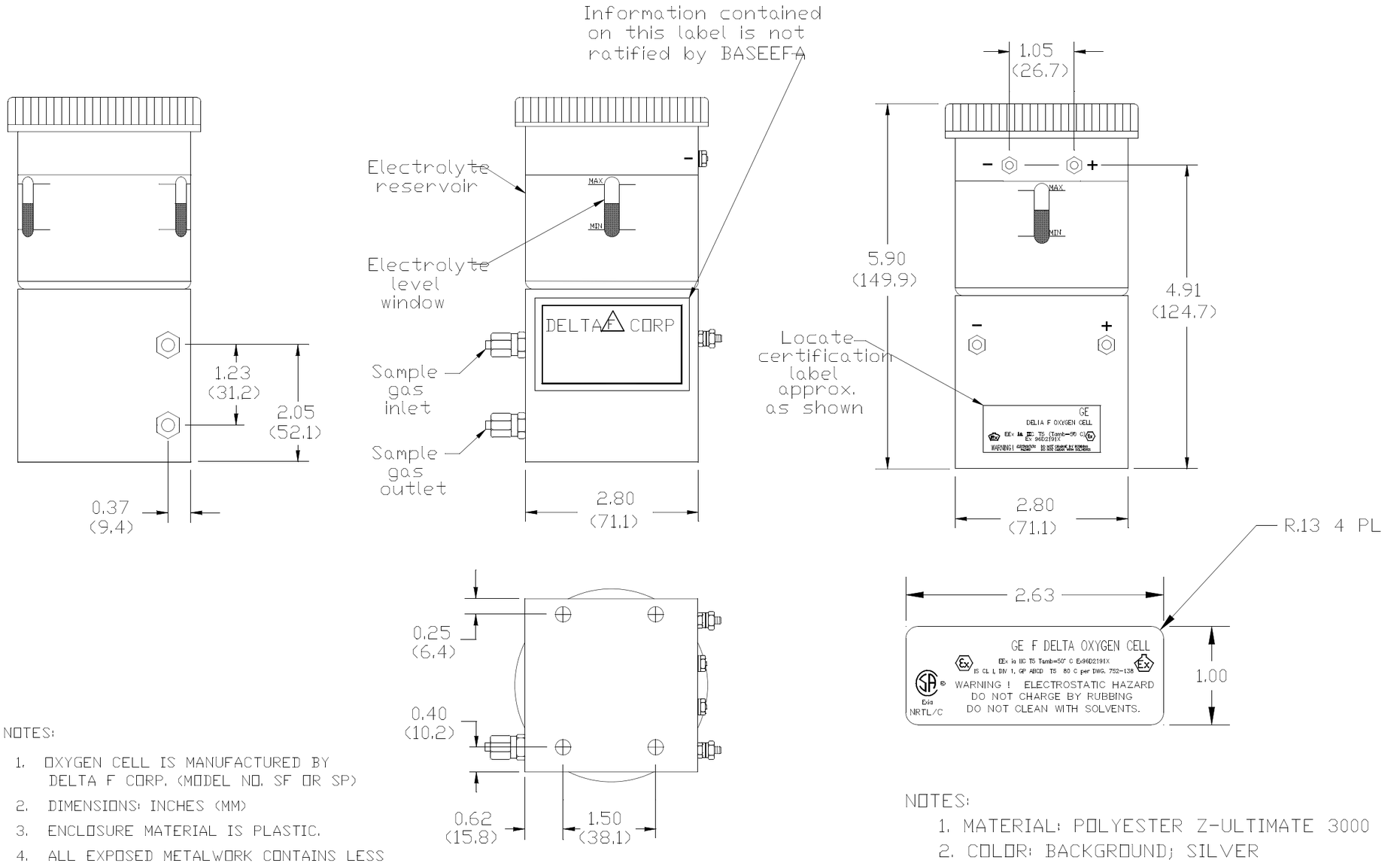


Figure 2-17: Interconnection Diagram (702-196)

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NOTES:

1. OXYGEN CELL IS MANUFACTURED BY DELTA F CORP. (MODEL NO. SF OR SP)
2. DIMENSIONS: INCHES (MM)
3. ENCLOSURE MATERIAL IS PLASTIC.
4. ALL EXPOSED METALWORK CONTAINS LESS THAN 6% MAGNESIUM BY WEIGHT.
5. CERTIFICATION LABEL MATERIAL IS ULTRA DESTRUCTIBLE TYPE.

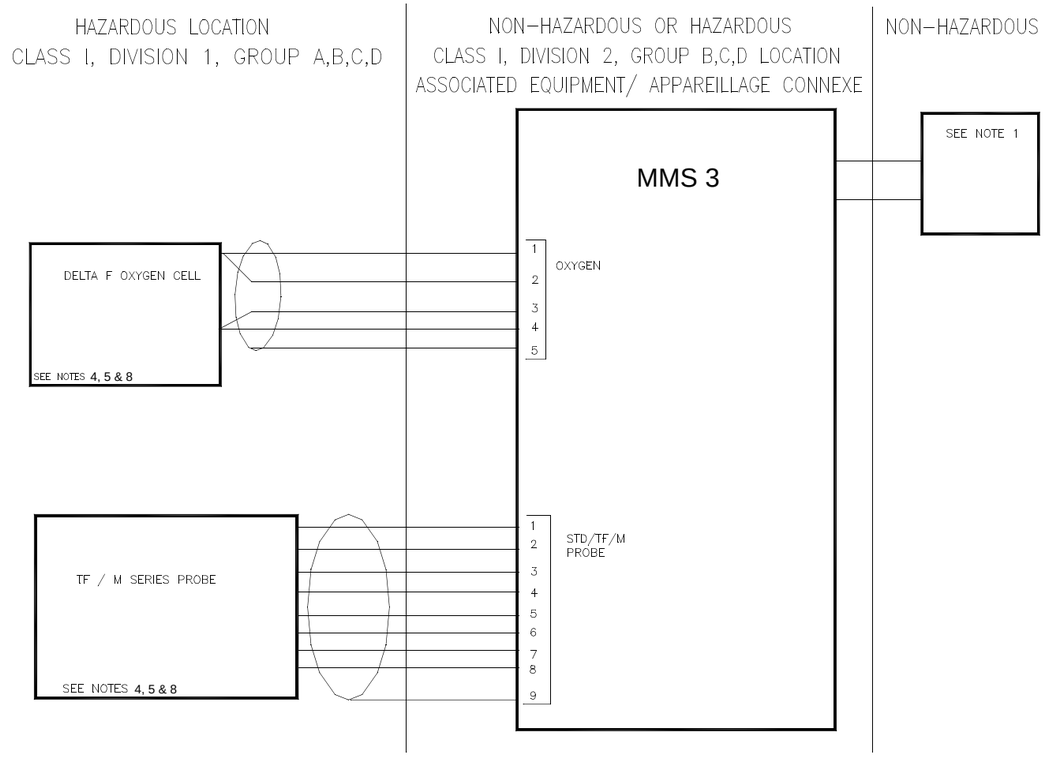
CHANGES TO THIS DRAWING REQUIRE PRIOR AUTHORIZATION FROM BASEEFA

NOTES:

1. MATERIAL: POLYESTER Z-ULTIMATE 3000
2. COLOR: BACKGROUND; SILVER
   TEXT; BLACK
3. FOR IN HOUSE ZEBRA SYSTEM ONLY.

Figure 2-18: Delta F Oxygen Cell (Ref. 752-064

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CSA CONTROLLED DOCUMENT DO NOT ALTER WITHOUT CSA AUTHORIZATION

NOTES:

1. APPARATUS WHICH IS UNSPECIFIED EXCEPT THAT IT MUST NOT USE OR GENERATE MORE THAN 250VRMS OR 250VDC. FOR DIVISION 2 APPLICATIONS POWER TO THE MIS 1, MIS 2 OR MMS 3 MUST BE SUPPLIED IN ACCORDANCE WITH DIVISION 2 WIRING METHODS AS DOCUMENTED IN THE CEC.
2. REFER TO CANADIAN ELECTRICAL CODE FOR ALLOWABLE CABLE PARAMETERS AND LENGTHS AND ALL INSTALLATIONS MUST BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE PART 1.
3. WARNING – SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
   AVERTISEMENT – LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SECURITE INTRINSEQUE.
4. TF/M SERIES PROBE, MIS PROBE AND THE DELTA F OXYGEN SENSOR ARE INTRINSICALLY SAFE FOR USE IN CLASS I, DIVISION 1, GROUP A,B,C,D HAZARDOUS LOCATIONS WHEN INSTALLED IN ACCORDANCE WITH THIS DRAWING.
5. OPERATING AMBIENTS:

TF/M SERIES PROBES	70°C	T4
MIS PROBE	80°C	T4
DELTA F OXYGEN SENSOR	50°C	T5
MIS 1, MIS 2 & MMS 3	50°C	T5

6. DO NOT CONNECT OR DISCONNECT INPUT POWER OR REMOVE FUSE UNLESS POWER HAS BEEN SWITCHED OFF OR IF AREA IS KNOWN TO BE NON-HAZARDOUS.
7. THE MIS 2 AND MMS 3 HAVE AN OPTIONAL POWER SOURCE, A 12V, 5Ah, RECHARGABLE BATTERY.
8. A SINGLE DELTA F OXYGEN SENSOR AND SINGLE TF/M SERIES PROBE MAY CONNECT TO THE DESIGNATED TERMINALS OF THE MMS 3.
9. "WARNING – EXPLOSION HAZARD – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2" and, "AVERTISSEMENT – RISQUE D'EXPLOSION – LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIAL INACCEPTABLE POUR LES EMPACEMENTS DE CLASSE I, DIVISION 2."

"WARNING – EXPLOSION HAZARD – DO NOT REPLACE FUSE UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS" and "AVERTISSEMENT – RISQUE D'EXPLOSION – COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNE NON DANGEREUX AVANT DE REPLACER LE FUSE.

"WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS" and "AVERTISSEMENT – RISQUE D'EXPLOSION – AVANT DE DECONNECTER L'EQUIPEMENT, COUPER

Figure 2-19: Intrinsically-Safe Installation Requirements (752-138)

Chapter 3

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Setup & Operation

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Startup Procedure

Sensor configuration and system calibration data for your Series 3 are entered at the factory. After you unpack the unit, use the sections that follow to verify that your system is working properly and to set up the screen to display the desired measurements.

Powering Up

The Series 3 has a universal power supply that automatically adjusts to line voltages from 95-260 VAC. After making the electrical connections as described in Chapter 2, *Installation*, press the [ON] switch to power up the unit.

IMPORTANT: *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 Series 3. The power line is the main disconnect device.*

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 3 is on. If exposure is unavoidable, either disconnect the oxygen cell from the Series 3 or equip the sample system with a valve that allows the cell to be switched to purge gas.

Using the Keypad and Passcode

Use the following sections to become familiar with the key functions and the passcode number used to access the user program.

Key Functions

The function keys to the right of the keypad are used as follows:

- [MODE] - modifies or selects the measurement mode to display.
- [CHAN] - toggles between channels (only works with units that have two channels installed).
- [PROG] - accesses the User Program.
- [RUN] - exits the Modify Display Mode or the User Program (except during numeric entry) and returns to displaying measurements.

The keypad beneath the Series 3 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.

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Key Functions (cont.)

The ***arrow keys*** perform three functions:

- [◀] or [▶] - scroll through the screen selections by moving the brackets forward or backward to the desired location.
- [◀] - moves backward and erases during numeric entry.
- [▶] - moves the cursor to the desired location during numeric entry and accepts a change at the present location.

The ***response keys*** perform three functions:

- [YES] or [NO] - respond to questions and/or exit a screen
- [YES] - confirms an entry or retrieves a previous number
- [NO] - moves backward through the menu

IMPORTANT: *After pressing a key, wait for the unit to perform the desired function before pressing another key.*

Passcode

To enter the *User Program* you must enter a **passcode.** The passcode prevents unauthorized users from changing data (**the default passcode for this unit is 2719**).

Displaying Measurements

The Series 3 begins displaying measurements in a two-line format immediately after power-up. Due to display size limitations, the Series 3 uses the abbreviations shown in Table 3-1 below to represent the displayed measurement mode and units.

Table 3-1: DSP Modes

Display Abbreviation	Measurement Mode
O	Oxygen
H	Hygrometry
T	Temperature
P	Pressure
AUX1	Auxiliary 1
AUX2	Auxiliary 2
USER	User Function
VREF	Volt Reference
GND	Signal Ground

Proceed to the next section for instructions on selecting the measurement mode for each display line.

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Displaying Measurement Mode and Units

Press the [MODE] key to enter the *Modify DSP* mode.

Display Page: 1 Press YES to Edit

The Series 3 can display six pages of measurements, each showing two different parameters. Use the numeric keys to enter the desired page and press [YES].

Modify DSP Mode P1 LINE1 [LINE2]

Use the arrow keys to move the brackets to the desired line and press [YES].

Line 2 DSP Mode P1 [CH 1] CH 2

Use the arrow keys to move the brackets to the desired channel and press [YES].

Select DSP Mode P1 ◀[H] T P Aux1▶

Use the arrow keys to move the brackets to the desired DSP mode and press [YES].

Note: *See Table 3-1 on page 3-2 for the available DSP modes.*

Select HYGRO Unit P1 [DP/°C] DP/°F▶

Use the arrow keys to move the brackets to the measurement units and press [YES].

Note: *Those measurement units listed in Table 3-2 below require multiple inputs to obtain proper readings.* If the Series 3 displays No Data, you may have to reconfigure the channel.

Table 3-2: Measurement Units Requiring Multiple 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

For a list of all the available measurement units, see Table 3-3 on the next page. Repeat the above procedure to set up the other line, and when you are done press [RUN].

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Table 3-3: Measurement Modes and Units

Selected Meas. Mode	Description of Units	Displayed Meas. Mode	Displayed Units
Oxygen	%= Percent Oxygen *default*	O	%
	ppm_v = Parts Per Million by volume	O	PPMv
	µA = Microamps (Diagnostic Mode)	O	µA
	DVM = Digital Voltmeter (Diagnostic Mode)	O	VDC
Hygrometry	°C = Dew/Frost Point *default*	DP	°C
	°F = Dew/Frost Point °F	DP	°F
	K = Dew/Frost Point K (Kelvin)	DP	K
	R.H. = Relative Humidity	H	%
	H/ppMv = Parts per Million of Water by Volume	H	HPMv
	H/ppMw = Parts per Million of Water by Weight (for liquids only)	H	ppMw
	MCF/IG = Pounds of Water per Million Std. Cubic Feet in Ideal Gas	H	Ilbs
	MCF/NG = Pounds of Water per Million Std. Cubic Feet in Natural Gas	H	Nlbs
	ppMv/NG = Parts Per Million by Volume in Natural Gas	H	NPMv
	Pw/mmHg = Vapor Pressure of Water in mmHg	H	mmHg
	Pw/Pa = Vapor Pressure of Water in Pascals	H	Pa
	MH = MH* (Diagnostic Mode)	H	MH
	DVM = Digital Voltmeter (Diagnostic Mode)	H	VDC
Temperature	°C = Degrees Celsius *default*	T	°C
	°F = Degrees Fahrenheit	T	°F
	K = Kelvin	T	K
	DVM = Digital Voltmeter (Diagnostic Mode)	T	VDC
Pressure	PSIg = Pounds per Square Inch Gauge *default*	P	PSIg
	Bars = Bars	P	Bars
	mbs = Millibars	P	mbs
	mm/Hg = Millimeters of Mercury	P	mmHg
	Pas = Pascal	P	Pg
	kPas = KiloPascal	P	KPg
	pMV = Pressure in millivolts	P	mV
	DVM = Digital Voltmeter (Diagnostic Mode)	P	VDC
Auxiliary 1	VDC	X1	VDC
	mA	X1	mA
	Func	X1	none
Auxiliary 2	VDC	X2	mV
	mA	X2	mA
	Func	X2	none
Volt Reference	VREF = Volts *default* (Diagnostic Mode)	VR	VDC
Signal Ground	GND = Volts *default* (Diagnostic Mode)		

*The MH value is the moisture sensor's response value and is the value which is recorded during calibration.

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Menu Map

Figure 3-1 below is a menu map of the *User Program* options that are discussed in this manual.

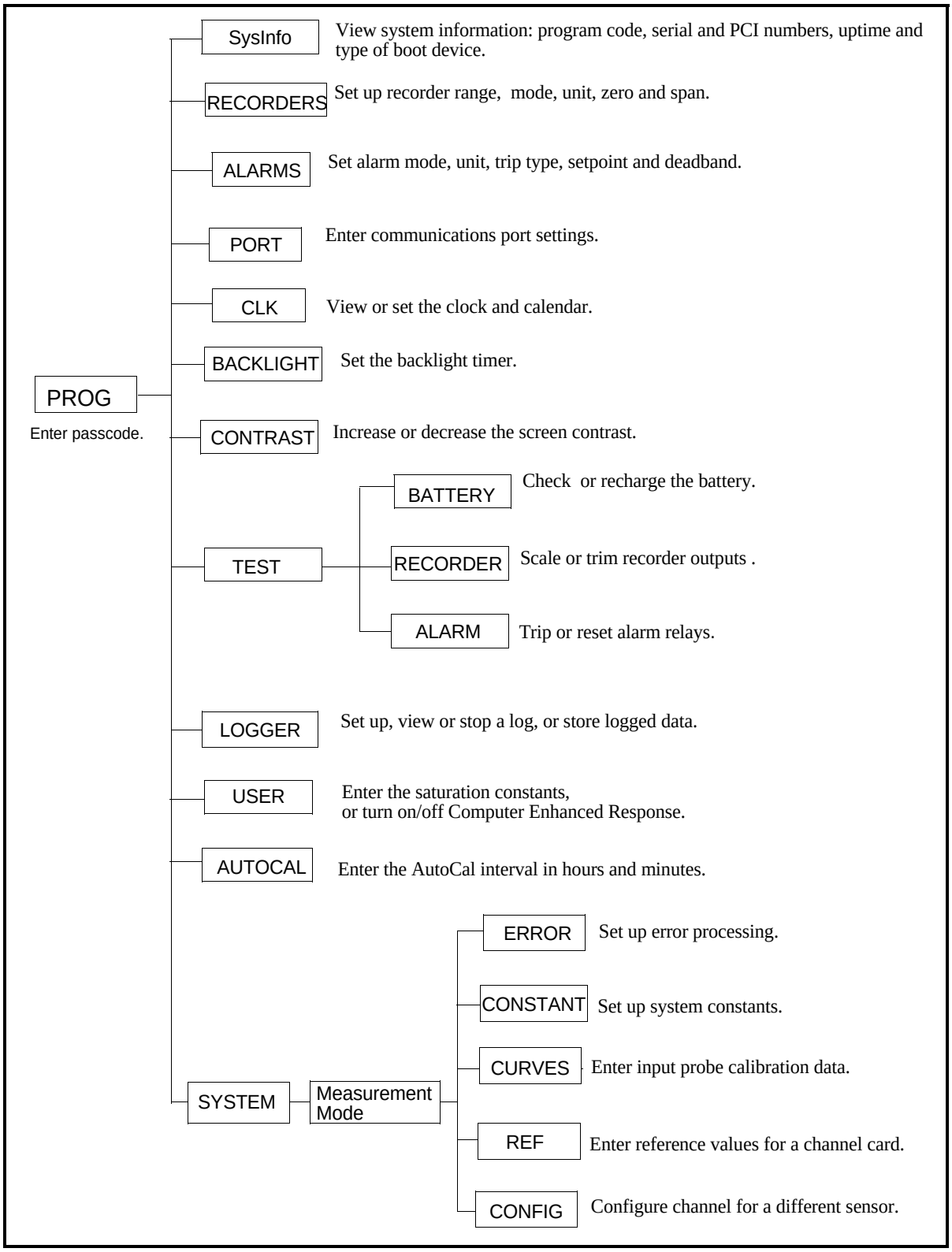


Figure 3-1: Series 3 User Program Menu Map

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Adjusting the Screen Contrast

To adapt to various ambient lighting conditions, the Series 3 provides a screen contrast adjustment. To make this adjustment, press the [PROG] key to enter the user program:

Enter Passcode: XXXX	Enter the passcode.

Note: *Refer to Figure 3-1 on page 3-5 to navigate to the* Contrast *option.*

Programming Menu 1 ◀ TEST [CONTRAST]▶	Use the arrow keys to move the brackets to CONTRAST and press [YES].
Contrast Control 1 [INCR] DECR	Use the arrow keys to move the brackets to one of the options.

Press and hold [YES] until the required contrast is achieved.

Entering System Constants

A system constant is a fixed value for moisture (Kh), temperature (Kt), or pressure (Kp) entered into the Series 3 in lieu of a "live" input. For example, if the process runs at a steady pressure, that pressure is entered into the Series 3 memory rather than using a pressure transmitter. In addition, you can multiply the ppm_v value by a constant for special purposes (the default multiplier is 1.000).

Note: *You must use a current multiplier for oxygen if you are using a different background gas than the one for which the cell was calibrated (see page 4-7).*

IMPORTANT: *In order for the constant to work properly, you must make sure you also configured the channel for a constant (Kh, Kt or Kp) as described on page 4-9.*

To enter a system constant, press the [PROG] key to enter the *User Program* and proceed as follows:

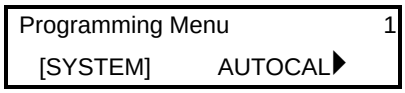
Enter Passcode: XXXX	Enter the passcode.

Note: *After you enter the user program, see Figure 3-1 on page 3-5 to navigate to the* System *menu.*

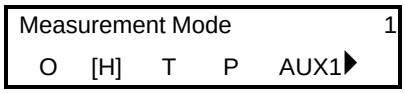
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Entering System Constants (cont.)

Be sure the number displayed in the upper right-hand corner of the screen is the channel you want to program. If not, press the [CHAN] key to select the desired channel.



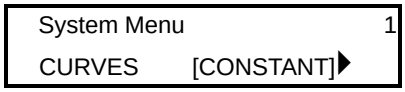
Use the arrow keys to move the brackets to SYSTEM and press [YES].



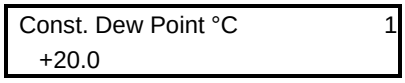
Use the arrow keys to move to the desired measurement mode (see Table 3-4 below) and press [YES].

Table 3-4: Available Measurement Modes

Display Abbreviation	Measurement Mode
O*	Oxygen
H	Hygrometry
T	Temperature
P	Pressure
AUX1*	Auxiliary 1
AUX2*	Auxiliary 2
CNST-PPMV	PPMv Multiplication Factor
*System constants are not available for these measurement modes.	



Use the arrow keys to move the brackets to CONSTANT and press [YES].



Enter the constant value and press [YES].

Note: *The resulting screen display varies, depending on the measurement mode selected.*

When the Series 3 displays measurements that are using a constant, it replaces the first letter of the mode on the display with “K.” For example, the Series 3 will display DP as KP (dew point) or H as KH (hygrometry).

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Entering a Saturation Constant

The Series 3 requires a saturation constant to calculate parts per million by weight (ppm_w) in non-aqueous Henry's law type liquids. To enter a saturation constant, the user must enter 1-6 data points of a Cs (saturation constant) vs. temperature curve for each channel. To accomplish this, press the [PROG] key and proceed as follows:

Enter Passcode: XXXX

Enter the passcode.

Note: *After you enter the user program, see Figure 3-1 on page 3-5 to navigate to the* User *menu.*

Be sure the number displayed in the upper right-hand corner of the screen is the channel you want to program. If not, press the [CHAN] key to select the desired channel.

Programming Menu	1
◀[USER] LOGGER▶	

Use the arrow keys to move the brackets to USER and press [YES].

User Menu	1
[SAT-CONST] ▶	

Use the arrow keys to move the brackets to SAT-CONST and press [YES].

#	T(°C)	Cs	1
1	+56	0	

To enter data at the data point displayed, use the right arrow key to move the bracket to T/°C. Otherwise, enter the desired data point number and press [YES] to confirm the entry. Then press the right arrow key.

#	T(°C)	Cs	1
1	+56	33	

Enter the desired temperature and press [YES] to confirm the entry. Press the right arrow key.

#	T(°C)	Cs	1
1	+56	33	

Enter the corresponding saturation constant. Press [YES] to confirm the entry.

Repeat the last three steps to enter each data point (1-6 points). Enter the next data point number over the present data point number and press the right arrow key. When you do this, T/°C and Cs display values of the current saturation constant curve. This indicates you are ready to begin entering information for the selected data point.

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Setting Up the Recorders

The Series 3 has two recorder outputs (A and B) for each channel. To set up these outputs, press the [PROG] key to enter the user program:

IMPORTANT: *The switch blocks must be set to the appropriate positions for current or voltage output (see page 2-16).*

Enter Passcode: XXXX

Enter the passcode.

Note: *After you enter the user program, see Figure 3-1 on page 3-5 to navigate to the* Recorder *menu.*

Programming Menu 1
◀[RECORDERS]▶

Use the arrow keys to move the brackets to RECORDER and press [YES].

If necessary, press the [CHAN] key to display the desired channel in the upper right-hand corner of the screen.

Select Recorders 1
[A] B

Use the arrow keys to move the brackets to the desired recorder and press [YES].

Select RCD Range 1
[0-20mA] 4-20mA ▶

Use the arrow keys to move the brackets to the desired recorder range and press [YES].

Select Mode 1
O [H] T P Aux1▶

Use the arrow keys to move the brackets to the desired mode (see Table 3-5 below) and press [YES].

Table 3-5: Available Measurement Modes

Display Abbreviation	Measurement Mode
O	Oxygen
H	Hygrometry
T	Temperature
P	Pressure
Aux 1	Auxiliary 1
Aux 2	Auxiliary 2
User*	User Function
Vref	Volt Reference
Gnd	Signal Ground
*User functions are available only through PanaView software.	

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Setting Up the Recorders (cont.)

Select Units 1
[DP/°C] DP/°F▶

Use arrow keys to move the brackets to the desired units and press [YES].

Note: *The measurement choices and the available units vary depending on the measurement mode selected.*

Set RCD-A OUTPUT 1
[ZERO] SPAN

Use the arrow keys to move the brackets to ZERO and press [YES].

RCD-A Zero Setup 1
20.0

Enter the zero value and press [YES]. Then press [NO] to return to the previous screen.

Repeat the above two steps to enter the span value.

Setting Up the Alarms

The Series 3 can be equipped with an optional high and low alarm relay for each channel. To set up your alarms, press the [PROG] key and proceed as follows:

Enter Passcode: XXXX

Enter the passcode.

Note: *After you enter the user program, see Figure 3-1 on page 3-5 to navigate to the* Alarms *menu.*

Programming Menu 1
◀ [ALARMS] ▶

Use the arrow keys to move the brackets to ALARMS and press [YES].

If necessary, press the [CHAN] key to display the desired channel in the upper right-hand corner of the screen.

Select Alarm 1
[A] B

Use the arrow keys to move the brackets to the desired alarm (A or B) and press [YES].

The Series 3 briefly flashes a message Relay Status -- Reset and then displays the following prompt.

Select Mode 1
O [H] T P Aux1▶

Use the arrow keys to move the brackets to the desired mode (see Table 3-6 on the next page) and press [YES].

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Setting Up the Alarms (cont.)

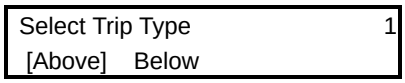
Table 3-6: Available Measurement Modes

Display Abbreviation	Measurement Mode
O	Oxygen
H	Hygrometry
T	Temperature
P	Pressure
Aux 1	Auxiliary 1
Aux 2	Auxiliary 2
User*	User Function
Vref	Volt Reference
Gnd	Signal Ground
*User functions are available only through PanaView software.	

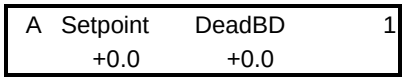


Use arrow keys to move the brackets to the desired units and press [YES].

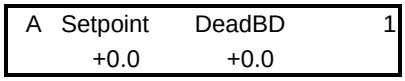
Note: *The measurement choices and the available units vary depending on the measurement mode selected.*



Use the arrow keys to move the brackets to the desired trip type (Above or Below) and press [YES].



Use the numeric keys to enter the Setpoint (the alarm trip point) and press [YES].



To enter a Deadband value, press the right arrow key. Then use the numeric keys to enter the value and press [YES].

Note: *The* Deadband *is a range of (normally small) values, beyond the setpoint, within which the Series 3 will not trigger the alarm. For a high alarm, the alarm will trip if the measurement exceeds the setpoint, but it will not reset until the measurement is less than the setpoint minus the deadband. For a low alarm, the alarm will trip if the measurement is below the setpoint, but it will not reset until the measurement is greater than the setpoint plus the deadband.*

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Chapter 4

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Calibration & Maintenance

Aluminum Oxide Moisture Probes 4-1

Delta F Oxygen Cells 4-3

Setting Up a New Probe or Sensor 4-9

Setting Up a New Channel Card 4-17

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Aluminum Oxide Moisture Probes

The most common probe used with the Series 3 is the aluminum oxide moisture probe. This section describes the procedures for calibrating and maintaining the probe and its cable.

Probe Cable Calibration

Whenever a moisture probe cable is modified or replaced, the Series 3 must be calibrated to compensate for any offset introduced by the cable. This procedure should also be performed after the initial installation of either a factory-supplied or a use-supplied cable.

Before starting the cable calibration, do the following:

- Power up the Series 3.
- Set up the screen to display the MH values for each channel that you will be calibrating.
- Note the high, low and zero reference values that are recorded on the sticker located on the Series 3 chassis.

Perform the calibration by completing the following steps:

1. Disconnect the cable from the moisture probe, but leave the cable connected to the Series 3. Verify that the displayed MH value equals the ***zero reference value*** within ±0.0003 MH.
   - If the reading is within specification, no adjustment is required.
   - If the reading is less than the zero reference value on the sticker ±0.0003, add this difference to the low reference value.
   - If the reading is greater than the zero reference value on sticker ±0.0003, subtract this difference from the low reference value.
2. Record the final, corrected low reference value.
3. If a change was necessary, program the Series 3 with the new, corrected low reference value.
4. Verify that the cable is not connected to the probe and verify that the zero reference reading is now within ±0.0003 MH.
5. Fill out a new high and low reference sticker with the final low reference value. Make sure you record the information below:

   HIGH REF = ORIGINAL VALUE
   LOW REF = NEW CORRECTED VALUE
   ZERO REF = ORIGINAL RECORDED VALUE
6. Reconnect the probe to the cable.

This completes the procedure. Be sure to repeat the cable calibration whenever any changes are made to the cable.

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Probe Cleaning

Other than periodic calibration checks, little or no routine moisture probe maintenance is required. However, any electrically conductive contaminant trapped on the aluminum oxide sensor will cause inaccurate moisture measurements. If such a situation develops, return of the moisture probe to the factory for analysis and recalibration is recommended. In an emergency, cleaning of the moisture probe in accordance with the following procedure may be attempted by a qualified technician or chemist.

IMPORTANT: *Moisture probes must be handled carefully and cannot be cleaned in any fluid that will attack their components. The probe's materials of construction are Al, Al_2O_3, nichrome, gold, stainless steel, glass and Viton® A. Also, the sensor's aluminum sheet is very fragile and can be easily bent or distorted. Do not permit anything to touch it!*

The following items are needed to properly complete the moisture probe cleaning procedure:

- approximately 300 ml of reagent grade hexane or toluene
- approximately 300 ml of distilled (not deionized) water
- two glass containers to hold above liquids (metal containers should not be used).

To clean the moisture probe, complete the following steps:

1. Record the dew point of the ambient air.
2. Making sure not to touch the sensor, carefully remove the protective shield from the sensor.
3. Soak the sensor in the distilled water for ten (10) minutes. Be sure to avoid contact with the bottom and the walls of the container!
4. Remove the sensor from the distilled water and soak it in the clean container of hexane or toluene for ten (10) minutes. Again, avoid all contact with the bottom and the walls of the container!
5. Remove the sensor from the hexane or toluene, and place it face up in a low temperature oven set at 50°C ±2°C (122°F ±4°F) for 24 hours.
6. Repeat steps 3-5 for the protective shield. During this process, swirl the shield in the solvents to ensure the removal of any contaminants that may have become embedded in the porous walls of the shield.

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Probe Cleaning (cont.)

After the cleaning steps have been completed, continue as follows:

1. Carefully replace the probe's protective shield, making sure not to touch the sensor.
2. Connect the probe cable to the probe, and record the dew point of the ambient air, as in step 1 on the previous page. Compare the two recorded dew point readings to determine if the reading after cleaning is a more accurate dew point value.
3. If the sensor is in proper calibration (±2°C accuracy), reinstall the probe in the sample cell and proceed with normal operation of the hygrometer.
4. If the sensor is not in proper calibration, repeat the cleaning steps, using time intervals 5 times those used in the previous cleaning cycle. Repeat this procedure until the sensor is in proper calibration.

A trained laboratory technician should determine if all electrically conductive compounds have been removed from the aluminum oxide sensor and that the probe is properly calibrated. Probes which are not in proper calibration must be recalibrated. It is recommended that all moisture probes be recalibrated by GE Infrastructure Sensing, Inc. approximately once a year, regardless of the probe's condition.

Delta F Oxygen Cells

The Delta F oxygen cell is a very reliable sensor, but it can only provide accurate results if it is properly maintained. This section discusses the necessary procedures to maintain the cell. Refer to Figure 4-1 below and proceed to the next page for instructions

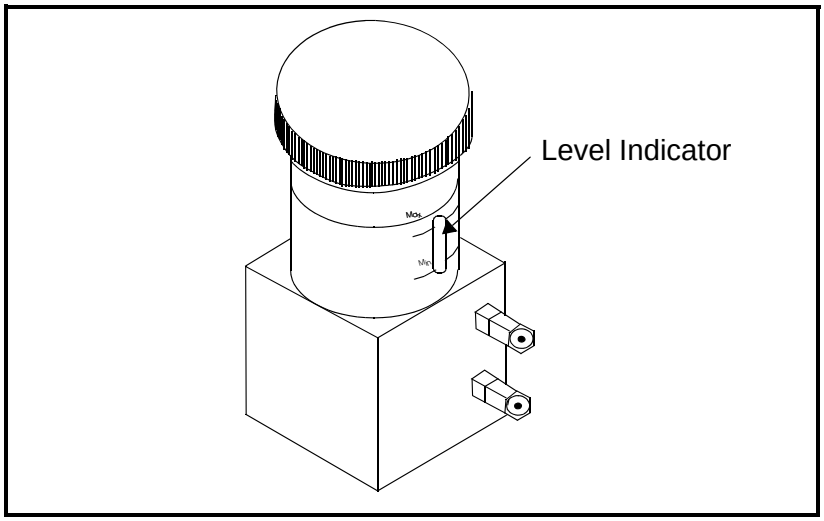


Figure 4-1: Delta F Oxygen Cell Electrolyte Level

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Electrolyte Maintenance

Over time, particularly when monitoring dry gases, there will be a gradual loss of water from the electrolyte in the Delta F oxygen cell. Thus, the electrolyte level should be checked at regular intervals and adjusted if necessary.

Note: *Some applications require that the electrolyte be completely changed periodically (consult the factory for details).*

!WARNING!
The electrolyte contains a strong caustic ingredient that is harmful if it comes in contact with skin or eyes. Follow proper procedures for handling the caustic (potassium hydroxide) solution. Consult your company safety personnel for recommendations.

Using the min/max window on the oxygen cell (see Figure 4-1 on the previous page), check to be sure the electrolyte covers about 60% of the window. If it is necessary to raise the fluid level in the reservoir, add ***DISTILLED WATER*** slowly in small amounts. Check the level as you add the distilled water, making sure you do not overfill the reservoir.

Calibrating the Delta F Oxygen Cell

The Delta F oxygen cell should be calibrated upon initial installation and about once a month thereafter for the first three months. Additional calibrations should be performed as needed and whenever the electrolyte is changed. The process includes:

- checking the calibration
  - Your system must have a calibration gas inlet valve.
  - You must know the PPMv value of the calibration gas.
- entering the new span value
  - GE Infrastructure Sensing, Inc. recommends that the calibration gas value be 80-100% of the span of the sensor's overall range (e.g., 80-100 PPMv oxygen for a 0-100 PPMv oxygen sensor).
  - GE Infrastructure Sensing, Inc. recommends that the calibration gas be in a background of nitrogen.

Note: *If your measurement range is significantly lower than your span gas value, you may elect to directly input the PPMv oxygen content of the span gas and the measured µA value as an alternative to the following procedure.*

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Checking the Oxygen Cell Calibration

To check the oxygen cell calibration, complete the following steps:

1. Determine which channel is connected to the Delta F oxygen cell
2. Set up the display to read the oxygen content in PPMv and µA.
3. Start the flow of calibration gas through the oxygen cell.
4. Read the PPM_v value. If it is correct, your oxygen cell is properly calibrated. However, if the reading is incorrect, you must calculate the new span reading (x) as follows:

$$x = IO_c + \frac{(OX_1 - OX_c)(IO_c - IO_0)}{(OX_c - OX_0)}$$

where, OX_c = correct PPMv for the calibration gas
OX_0 = zero value in PPMv*
OX_1 = span value in PPMv*
O_c = actual reading for calibration gas in µA
O_0 = zero value in µA*
x = new span reading in µA

*See the *Calibration Data Sheet* for the oxygen cell to obtain the applicable zero and span values.

Example: If the calibration data for your cell is as follows:
OX_c = 75 PPMv
OX_0 = 0.050 PPMv
OX_1 = 100 PPMv
IO_c = 290 µA
O_0 = 0.4238 µA

Then, $$x = 290 + \frac{(100 - 75)(290 - 0.4238)}{(75 - 0.05)}$$

The new span value (x) is 100 $PPM_v \cong$ 387 µA. Enter the new value as described in the next section.

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Entering the New Span Value

To enter the new span value calculated on the previous page, press the [PROG] key and proceed as follows:

Enter Passcode: XXXX	Enter the passcode.

Be sure the number displayed in the upper right-hand corner of the screen is the channel you want to program. If not, press the [CHAN] key to select the desired channel.

Programming Menu 1 [SYSTEM] AUTOCAL▶	Use the arrow keys to move the brackets to SYSTEM and press [YES].
Measurement Mode 1 [O] H T P Aux1▶	Use the arrow keys to move the brackets to O and press [YES].
System Menu 1 ◀ [CURVES] CONSTANT▶	Use the arrow keys to move the brackets to CURVES and press [YES].
O2 Curve Menu 1 S/N [CURVE] BkGd	Use the arrow keys to move the brackets to CURVE and press [YES].
O2 Curve Menu 1 S/N [CURVE] BkGd	Use the arrow keys to move the brackets to SPAN and press [YES].
#1 O(ua) O(%) 1 0.721 0.0000	Enter the new span percentage value and press [YES]. Then press the left arrow key.
#1 O(ua) O(%) 1 0.721 0.0000	Enter the new span microamp value and press [YES].

To exit the *User Program*, press the [RUN] key.

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Entering Background Gas Calibration Data

The factory calibration for Delta F oxygen cells uses nitrogen as the reference background gas, and the Series 3 will yield inaccurate oxygen measurements if a background gas other than nitrogen is used. However, you may use a background gas other than nitrogen if you first recalibrate the Series 3 for the desired background gas.

To recalibrate your Series 3 for a different background gas, look up the current multiplier for your background gas in Table 4-1 below and proceed to the next page to enter this multiplier into your meter.

Table 4-1: Background Gas Current Multipliers

Background Gas	Current Multiplier*			
	≤ 1000 PPM	5000-10,000 PPM	2.5% to 10%	25%
Argon (Ar)	0.97	0.96	0.95	0.98
Hydrogen (H_2)	1.64	1.96	2.38	1.35
Helium (He)	1.72	2.13	2.70	1.39
Methane (CH_4)	1.08	1.09	1.11	1.05
Ethane (C_2H_6)	0.87	0.84	0.81	0.91
Propylene (C_3H_6)	0.91	0.88	0.87	0.93
Propane (C_3H_8)	0.79	0.76	0.72	0.58
Butene (C_4H_8)	0.69	0.65	0.60	0.77
Butane (C_4H_{10})	0.68	0.63	0.58	0.76
Butadiene (C_6H_6)	0.71	0.66	0.62	0.79
Acetylene (C_2H_2)	0.95	0.94	0.93	0.97
Hexane (C_6H_{14})	0.57	0.52	0.89	0.67
Cyclohexane (C_6H_{12})	0.64	0.58	0.54	0.72
Vinyl Chloride (CH_2CHCl)	0.74	0.69	0.65	0.81
Vinylidene Chloride ($C_2H_2F_2$)	0.77	0.73	0.69	0.83
Neon (Ne)	1.18	1.23	1.28	1.11
Xenon (Xe)	0.70	0.65	0.61	0.78
Krypton (Kr)	0.83	0.79	0.76	0.88
Sulfur Hexaflouride (SF_6)	0.54	0.49	0.44	0.64
Freon 318 (C_4F_8)	0.39	0.34	0.30	0.49
Tetrafluoromethane (CF_4)	0.62	0.57	0.52	0.71
Carbon Monoxide (CO)	0.99	0.99	0.98	0.99

* To use the current multipliers in this table, your *Calibration Data Sheet* must contain calibration data for nitrogen. If your *Calibration Data Sheet* contains calibration data for a background gas other than nitrogen, contact the factory for the nitrogen calibration data.

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Entering Background Gas Calibration Data (cont.)

The oxygen cell factory calibration values, referenced to nitrogen, are stored in the Series 3 *User Program* and a default current multiplier of 1.00 is applied to these values. To enter the new current multiplier, as determined on the previous page, press the [PROG] key and proceed as follows:

Enter Passcode: XXXX	Enter the passcode.

Be sure the number displayed in the upper right-hand corner of the screen is the channel you want to program. If not, press the [CHAN] key to select the desired channel.

Programming Menu 1 [SYSTEM] AUTOCAL▶	Use the arrow keys to move the brackets to SYSTEM and press [YES].
Measurement Mode 1 [O] H T P Aux1▶	Use the arrow keys to move the brackets to O and press [YES].
System Menu 1 ◀ [CURVES] CONSTANT▶	Use the arrow keys to move the brackets to CURVES and press [YES].
O2 Curve Menu 1 S/N CURVE [BkGd]	Use the arrow keys to move the brackets to BkGd and press [YES].
O2 uA Multiplier 1 1.00	Use the numeric keys to enter the Current Multiplier. Press [YES] to confirm your entry.

To exit the *User Program*, press the [RUN] key.

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Setting Up a New Probe or Sensor

Whenever you connect a new probe or sensor to the Series 3 or move an existing probe or sensor to a different channel, the meter must be reconfigured. This section provides the necessary instructions.

Reconfiguring a Channel for a New Sensor

If you decide to connect a different type of sensor to one of the channels of your unit, you must reconfigure that channel. To do so, press the [PROG] key and complete the following steps:

Note: *If you are using a probe capable of multiple inputs or using more than one input (including a constant), you must configure the channel to measure all the possible inputs (see the* Multiple Input Instructions *on page 4-11).*

Enter Passcode: XXXX

Enter the passcode.

Be sure the number displayed in the upper right-hand corner of the screen is the channel you want to program. If not, press the [CHAN] key to select the desired channel.

Programming Menu 1
[SYSTEM] AUTOCAL▶

Use the arrow keys to move the brackets to SYSTEM and press [YES].

Measurement Mode 1
[O] H T P Aux1▶

Select the desired measurement mode and press [YES]. (See Table 4-2 below for the available measurement modes).

Table 4-2: Available Measurement Modes

Display Abbreviation	Measurement Mode
O	Oxygen
H	Hygrometry
T	Temperature
P	Pressure
AUX1	Auxiliary 1
AUX2	Auxiliary 2
CNST-PPMV	PPMv Multiplication Factor

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Reconfiguring a Channel for a New Sensor (cont.)

System Menu	1
[CONFIG]	REF ▶

Use the arrow keys to move the brackets to CONFIG and press [YES].

Note: *The word* HYGRO *in the nest display is just an example. Your actual sensor type will be shown instead.*

Sel. HYGRO sensor	1
--- TF	[Mxx]▶

Use the arrow keys to move the brackets to desired configuration and press [YES] (see Table 4-3 below).

Table 4-3: Probe Types and Configuration Options

Probe Type	Configurations
Oxygen	N/A
	% (percent)
	PPMv (parts per million by volume)
Hygrometry	N/A
	TF (Three-Function probe)
	Mxx (M Series probe)
	Kh (constant dew point)
Temperature	N/A
	TF (Three-Function probe)
	Mxx (M-Series probe)
	Kt (constant temperature)
Pressure	N/A
	TF (Three-Function probe)
	X1 (Auxiliary 1)
	X2 (Auxiliary 2)
	Kp (constant pressure)
Auxiliary 1	N/A
	I (current)
	V (voltage)
Auxiliary 2	N/A
	I (current)
	V (voltage)

IMPORTANT: *Be sure to enter the calibration data for the new probe/sensor after configuring the channel (see page 4-12).*

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Multiple Input Instructions

Table 4-4 below shows a list of measurement modes that require multiple inputs and what you need to display them. For example, if you are using a TF Probe, you must configure its channel for moisture, temperature and pressure. To do this, you must select TF under the CONFIG option for the H, T and P measurement modes.

Note: *When activating pressure sensors, you must select the input (Aux 1 or Aux 2) used for the pressure sensor. After selecting the input, the display will prompt you to enter the probe signal in either current (I) or volts (V).*

Table 4-4: Measurement Modes, Required Inputs and Configuration Information

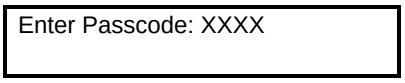
To measure:	Use these inputs:	Provided by:	Configure the channel for:
RH	temperature and moisture	TF Probe	TF (H, T, & P)
		M Series Probe w/ temp. opt.	Mxx (H) and Kt (T)
		M Series Probe & constant temperature	Mxx (H & T)
PPMv	moisture and pressure	TF Probe w/ pressure option	TF (H, T & P)
		M Series Probe & aux pressure input	Mxx (H) and X1 (P)
		M Series Probe & pressure constant	Mxx (H) and Kp (P)
PPMw	moisture, temperature and saturation constant	TF Probe w/ temp. option and sat. constant	TF (H & T) and sat. const.
		M Series Probe w/ temp. option & sat. constant	Mxx (H & T) and sat. const.
		TF Probe, constant temp. & sat. constant	TF (H), Kt (T) and sat. const.
		M Series Probe, constant temp. & sat. constant	M (H), Kt (T) and sat. const.
MCF/IG	moisture and pressure	TF Probe w/pressure option	TF (H, T & P)
		M Series Probe & aux. pressure input	Mxx (H) and X1 (P)
		M Series Probe & pressure constant	Mxx (H) and Kp (P)
MCF/NG	moisture and pressure	lTF Probe w/pressure option	TF (H, T & P)
		M Series Probe & aux. pressure input	Mxx (H) and X1 (P)
		M Series Probe & pressure constant	Mxx (H) and Kp (P)
PPMv/NG	moisture and pressure	TF Probe w/pressure option	TF (H, T & P)
		M Series Probe & aux. pressure input	Mxx (H) and X1 (P)
		M Series Probe & pressure constant	Mxx (H) and Kp (P)

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Entering Calibration Data for New Probes/Sensors

For a new probe or sensor to function properly, you must configure the channel AND enter the calibration data. This data, which is a list of 1 to 16 data points, is found on the *Calibration Data Sheet* that is supplied with each probe or sensor. To enter the calibration data, press the [PROG] key and complete the following steps:

Note: *If you choose to enter a constant value for moisture, temperature, pressure, or PPMv multiplier, it is not necessary to enter the calibration data for the sensor.*

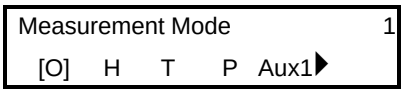


Enter the passcode.

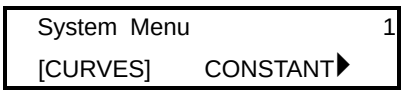
Be sure the number displayed in the upper right-hand corner of the screen is the channel you want to program. If not, press the [CHAN] key to select the desired channel.



Use the arrow keys to move the brackets to SYSTEM and press [YES].



Use the arrow keys to move the brackets to the desired measurement mode and press [YES]. (See Table 4-2 on page 4-9 for the available modes).



Use the arrow keys to move the brackets to CURVES and press [YES].

The remaining prompts depend on the type of sensor you are using. Refer to one of the following sections to complete the data entry:

- *Entering Moisture Curve Data* on page 4-13
- *Entering Oxygen Curve Data* on page 4-14
- *Entering Pressure Curve Data* on page 4-15
- *Entering Auxiliary Inputs Curve Data* on page 4-16

Note: *You do not have to enter data for a temperature curve.*

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Entering Moisture Curve Data

1MH Curve Menu [S/N] #PTS CURVE

Use the arrow keys to move the brackets to S/N and press [YES].

Probe Serial # 1 H: 123456

Enter the serial number and press [YES]. Then press [NO] to return to the Curve menu.

1MH Curve Menu S/N [#PTS] CURVE

Use the arrow keys to move the brackets to #PTS and press [YES].

1Enter Total #PTS 14

Enter the total number of data points (1 to 16) and press [YES]. Then press [NO] to return to the Curve menu.

1MH Curve Menu S/N #PTS [CURVE]

Use the arrow keys to move the brackets to CURVE and press [YES].

Note: *The data points on the* Calibration Data Sheet *begin numbering at 0 (zero). Thus, the Series 3 displays the selected number of data points you entered minus 1.*

#	DP/°C	MH	1
12	+0.0	0.0000	

To begin entering data at the point displayed, press the right arrow key to move the bracket to DP/°C. Otherwise, enter the desired data point number, press [YES], and then press the right arrow key.

#	DP/°C	MH	1
12	+20.0	0.0000	

Enter the dew point. Then press [YES] and press the right arrow key.

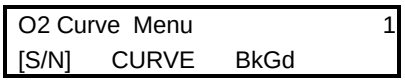
#	DP/°C	MH	1
12	+20.0	1.046	

Enter the corresponding MH value. Then press [YES] and press the right arrow key.

Repeat the last three steps until all of the data points are entered.

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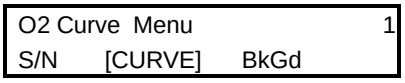
Entering Oxygen Curve Data



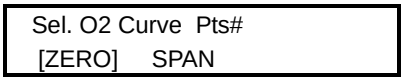
Use the arrow keys to move the brackets to S/N and press [YES].



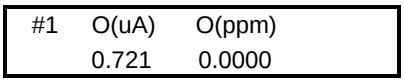
Enter the serial number and press [YES]. Then press [NO] to return to the Curve menu.



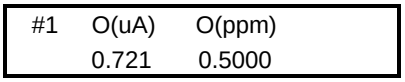
Use the arrow keys to move the brackets to CURVE and press [YES].



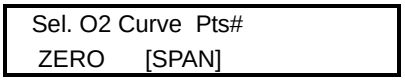
Use the arrow keys to move the brackets to ZERO and press [YES].



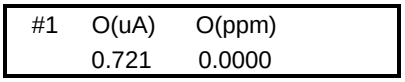
Enter the zero microamp value (IO0). Press [YES] and then press the right arrow key.



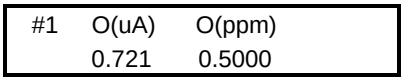
Enter the zero ppmv or % value (OX0) and press [YES]. Then press [NO].



Use the arrow keys to move the brackets to SPAN and press [YES].



Enter the span microamp value (IO1). Press [YES] and then press the right arrow key.



Enter the zero ppmv or % value (OX1) and press [YES]. Then press [NO].

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Entering Pressure Curve Data

O2 Curve Menu 1 [S/N] CURVE	Use the arrow keys to move the brackets to S/N and press [YES].
Probe Serial # 1 O2: 123456	Enter the serial number and press [YES]. Then press [NO] to return to the Curve menu.
Pressure Curve Menu 1 S/N [CURVE]	Use the arrow keys to move the brackets to CURVE and press [YES].
# mA Psig 1 1 +0.000 0.000	Making sure the cursor is positioned below the # sign, enter a 1 to indicate the zero point. Press [YES] and then press the right arrow key.
# mA Psig 1 1 +1.000 0.000	Enter the mA value. Press [YES] and press the right arrow key.
# mA Psig 1 1 +1.000 2.000	Enter the psig value. Then, press [YES].
# mA Psig 1 2 +0.000 0.000	Making sure the cursor is positioned below the # sign, enter a 2 to indicate the span point. Press [YES] and then press the right arrow key.
# mA Psig 1 2 +4.000 0.000	Enter the mA value. Press [YES] and press the right arrow key.
# mA Psig 1 2 +4.000 8.000	Enter the psig value. Then, press [YES].

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Entering Auxiliary Input Curve Data

Aux Curve Menu 1
[AUX1] AUX2

Use the arrow keys to move the brackets to AUX1 (or AUX2), depending on where the sensor is connected, and press [YES].

Aux Curve Menu 1
[#PTS] CURVE

Use the arrow keys to move the brackets to #PTS and press [YES].

1Enter Total #PTS
2

Enter the number of data points and press [YES]. Then press [NO] to return to the Curve menu.

Note: *For linear devices only two data points are required, but up to eight data points may be entered for other devices. Each data point requires a current or voltage value with a corresponding scale value in the desired output units.*

Aux Curve Menu 1
#PTS [CURVE]

Use the arrow keys to move the brackets to CURVE and press [YES].

mA/VDC Units 1
2 +0.000 0.000

To begin entering data at the data point displayed, press the right arrow key to move the bracket to X1 (mA or V). Otherwise, enter the desired data point number. Press [YES] and press the right arrow key.

mA/VDC Units 1
2 +1.000 0.000

Enter the mA/VDC value. Press [YES] and press the right arrow key.

mA/VDC Units 1
2 +1.000 20.000

Enter the Units value and press [YES].

Repeat the last three steps until all of the remaining data has been entered.

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Setting Up a New Channel Card

If you replace a channel card, you will have to re-enter the high and low reference values for moisture, oxygen, and pressure. The reference values are unit-specific factory calibration values that are located on a label placed on the left side of the Series 3 chassis. Enter the new reference values from the label or tag attached to the new channel card by pressing the [PROG] key and proceeding as follows:

Enter Passcode: XXXX	Enter the passcode.

IMPORTANT: *Be sure the number displayed in the upper right-hand corner of the screen is the channel you want to program. If not, press the* [CHAN] *key to select the desired channel.*

Programming Menu 1 [SYSTEM] AUTOCAL▶	Use the arrow keys to move the brackets to SYSTEM and press [YES].
Measurement Mode 1 O [H] T P Aux1▶	Use the arrow keys to move the brackets to the desired measurement mode and press [YES]. (See Table 4-2 on page 4-9 for the available modes).
System Menu 1 CONFIG [REF]▶	Use the arrow keys to move the brackets to REF and press [YES].

The remaining prompts depend on the measurement mode you selected. Refer to one of the following sections on the next page to properly program your unit:

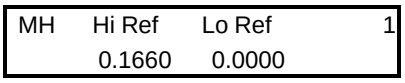
Note: *You do not have to enter reference data for temperature, auxiliary 1, auxiliary 2, or constant ppmv.*

- *Entering Moisture Reference Data*
- *Entering Oxygen Reference Data*
- *Entering Pressure Reference Data*

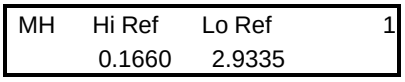
Note: *The reference values shown on the following page are only examples. You must enter the actual reference values supplied with the new channel card.*

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Entering Moisture Reference Data

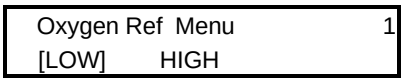


Enter the low reference value. Press [YES] and then press the left arrow key.

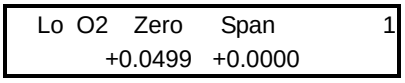


Enter the high reference value and press [YES].

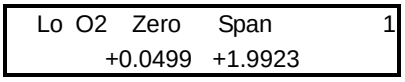
Entering Oxygen Reference Data



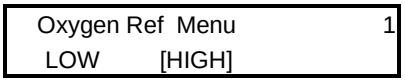
Use the arrow keys to move the brackets to LOW and press [YES].



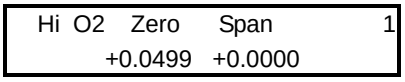
Enter the low oxygen zero value. Press [YES] and then press the right arrow key.



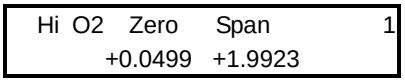
Enter the low oxygen span value. Press [YES] and then press the [NO] key.



Use the arrow keys to move the brackets to HIGH and press [YES]

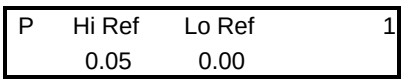


Enter the high oxygen zero value. Press [YES] and then press the right arrow key.

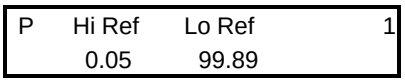


Enter the high oxygen span value. Press [YES] and then press the [NO] key.

Entering Pressure Reference Data



Enter the low pressure value. Press [YES] and then press the left arrow key.



Enter the high pressure value and press [YES].

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GE Industrial
Sensing

DECLARATION OF CONFORMITY

We,

Panametrics Limited
Shannon Industrial Estate
Shannon, County Clare
Ireland

declare under our sole responsibility that the

Moisture Image Series 1 Analyzer
Moisture Image Series 2 Analyzer
Moisture Monitor Series 3 Analyzer

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

- EN 50014:1997+A1+A2:1999
- EN 50020:1994
- II (1) G [EEx ia] IIC
  BAS01ATEX7097
  Baseefa (2001) Ltd/EECS, Buxton SK17 9JN, UK
- EN 61326:1998, Class A, Annex A, Continuous Unmonitored Operation
- EN 61010-1:1993+A2:1995, Overvoltage Category II, Pollution Degree 2

following the provisions of the 89/336/EEC EMC Directive, the 73/23/EEC Low Voltage Directive and the 94/9/EC ATEX Directive.

The *units listed above and any sensors and ancillary sample handling systems 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.

Shannon - July 1, 2003

Mr. James Gibson
GENERAL MANAGER

I.S. EN ISO 9002
Shannon

TÜV ESSEN
ISO 9001
U.S.

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GE Industrial
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 Monitor Series 3 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.

CE Ex

CERT-ATEX-D (Rev. August 2004)

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Shannon, County Clare
Ireland



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