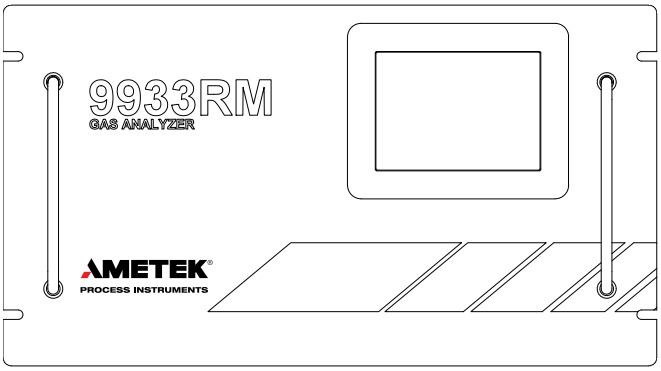
AMETEK®
PROCESS INSTRUMENTS

MANUAL SUPPLEMENT

9933RM Gas Analyzer



PN 903-8808 Rev A

To obtain a PDF of this manual, visit our Products page at www.ametekpi.com.

Contents

Section/Chapter	Page(s)	Instructions
Warnings, Cautions, Notes	ix	Use the Warnings below in place of the first three Warnings in the 9933 Gas Analyzer *User Manual* (Part No. 10398-15-5).

Warnings, Cautions, Notes

Before installing, operating, and performing any maintenance, service, and/or troubleshooting on the analyzer, read and follow all safety information in this document (and in the main analyzer User Manual). Misuse of this product could result in personal injury and/or damage to the equipment or its installation site. ***All regulatory agency and personnel safety procedures for your jurisdiction must be followed.***

All covers must be tightly fastened with all screws and the Measuring Cell/Optical Bench Assemblies must remain in place while the circuits are live.

If installed in a hazardous classified area and it is necessary to remove the analyzer's cover while the circuits are live, first test the area for flammable gases and proceed only when the area is safe.

When the Analyzer Enclosure's cover is off, take appropriate precautions to avoid electrical shock. Hazardous voltages are present inside.

Always disconnect mains AC (or DC) power and/or alternate power sources (example, for relay contacts) to the analyzer before removing any covers on the analyzer, before making any wiring or cable connections, and before and before removing any components from the analyzer.

Section/Chapter	Page(s)	Instructions
Warnings, Cautions, Notes	x	Disregard the Caution about the Environmental Purge option in the 9933 Gas Analyzer *User Manual*. Add the section below.

Special Conditions for Use (ATEX and IECEx)

- The equipment shall be installed in an enclosure that provides a degree of protection not less than IP 54, as defined in accordance with IEC/EN 60079-15.
- The equipment shall only be used in an area of not more than Pollution Degree 2, as defined in IEC 60664-1.

Section/Chapter	Page(s)	Instructions
Electromagnetic Compatibility (EMC)	xiii	Use the Electromagnetic Compatibility (EMC) information below in place of the EMC information in the 9933 Gas Analyzer *User Manual*.

Electromagnetic Compatibility (EMC)

Read and follow the recommendations in this section to avoid performance variations or damage to the internal circuits of this equipment when installed in harsh electrical environments.

The various configurations of the 9933RM Analyzer should not produce, or fall victim to, electromagnetic disturbances as specified in the European Union's EMC Directive. Strict compliance to the EMC Directive requires that certain installation techniques and wiring practices are used to prevent or minimize erratic behavior of the Analyzer or its electronic neighbors. Below are examples of the techniques and wiring practices to be followed.

In meeting the EMC requirements, the various Analyzer configurations described in this document rely heavily on the use of metallic shielded cables used to connect to the customer's equipment and power. Foil and braid shielded I/O and DC power cables are recommended for use in otherwise unprotected situations. In addition, hard conduit, flexible conduit, and armor around non-shielded wiring also provides excellent control of radio frequency disturbances. However, use of these shielding techniques is effective only when the shielding element is connected to the equipment chassis/earth ground at both ends of the cable run. This may cause ground loop problems in some cases. These should be treated on a case-by-case basis. Disconnecting one shield ground may not provide sufficient protection depending on the electronic environment. Connecting one shield ground via a 0.1 microfarad ceramic capacitor is a technique allowing high frequency shield bonding while avoiding the AC (or DC) ground metal connection. In the case of shielded cables, the drain wire or braid connection must be kept short. A 5 cm (two-inch) connection distance between the shield's end and the nearest grounded chassis point, ground bar or terminal is highly recommended. An even greater degree of shield performance can be achieved by using metallic glands for shielded cable entry into metal enclosures. Expose enough of the braid/foil/drain where it passes through the gland so that the shield materials can be wrapped backwards onto the cable jacket and captured inside the gland, and tightened up against the metal interior.

Inductive loads connected to the low voltage "Alarm Contacts" are not recommended. However, if this becomes a necessity, adhere to proper techniques and wiring practices. Install an appropriate transient voltage suppression device (low voltage MOV, "Transzorb," or R/C) as close as possible to the inductive device to reduce the generation of transients. Do not run this type of signal wiring along with other I/O or DC in the same shielded cable. Inductive load wiring must be separated from other circuits in conduit by using an additional cable shield on the offending cable.

In general, for optimum protection against high frequency transients and other disturbances, do not allow installation of this Analyzer where its unshielded I/O and DC circuits are physically mixed with AC mains (or DC) or any other circuit that could induce transients into the Analyzer or the overall system. Examples of electrical events and devices known for the generation of harmful electromagnetic disturbances include motors, capacitor bank switching, storm related transients, RF welding equipment, static, and walkie-talkies.

Section/Chapter	Page(s)	Instructions
Supplier's Declaration of Conformity	xiv	Use the Supplier's Declaration of Conformity information below in place of the corresponding information (including the FCC statement) in the 9933 Gas Analyzer *User Manual*.

Supplier's Declaration of Conformity

47 CFR § 2.1077 Compliance Information
Unique Identifier: (e.g., 9933RM Gas Analyzer)
Responsible Party – Contact Information:
AMETEK
2876 Sunridge Way NE
Calgary, AB, Canada T1Y 7H9
Tel: +1 403 235 8400
ametekpi.com

FCC Compliance Statement (9933RM Gas Analyzer subject to Part 15):
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

Section/Chapter	Page(s)	Instructions
Special Warnings and Information	xv	Replace the first Warning in the 9933 Gas Analyzer *User Manual* with the information below. Replace the last paragraph with the information below

Explosion Hazard – Substitution of Components May Impair Suitability for Class I, Division 2; Class I, Zone 2; and ATEX/IECEx Zone 2.

Risque d'explosion – La substitution de composants peutrendre ce materiel inacceptable pour les emplacements de Classe I, Division 2; Classe I, Zone 2; et ATEX/IECEx Zone 2.

All input and output wiring must be in accordance with wiring methods authorized for the area classification by the authority having jurisdiction. Although the probability of leaks of the sample system is very low, a loose fitting could allow hazardous sample gas to flow into the Analyzer Enclosure and the wiring area. Tests have indicated that with the sample system completely disconnected at the Rear Panel, all covers/doors installed/closed and on a table at atmospheric pressure, with an inlet pressure of 13 PSI applied to both inlet and vent ports, the pressure in the enclosure will rise to 0.5 mBar (0.2" WC). This is very low pressure and normally would not pose any hazard, but the installer must consider that if the analyzer is installed in a sealed Type 3 or IP54 enclosure, pressure at the wireway ends could build up to a level as high as the sample system inlet.

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Overview

Using the Analyzer *User Manual* and this *Manual Supplement*

- The 9933RM (Rack Mount) Gas Analyzer *Manual Supplement* (AMETEK Part No. 903-8808) is intended to supplement – and directly replace information in – the 9933 (WM, or Wall Mount) Gas Analyzer *User Manual* (AMETEK Part No. 10398-15-5) when the 9933RM Gas Analyzer model is purchased. Only the major differences between the Rack Mount and Wall Mount versions of the 9933 Analyzer are discussed in this document (i.e., locations of components, preventive maintenance procedures, specifications, etc.).

  While working on the 9933RM Gas Analyzer, use the main 9933WM Gas Analyzer *User Manual* as your main source of information for operations and maintenance, and use this *Manual Supplement* for information that describes physical differences to the layout, and operational differences, of the analyzer.

- The analyzer *User Manual* and this *Manual Supplement* contain references about operating this equipment in Hazardous Locations and how to safely perform maintenance on the analyzer in these locations. Read and follow these Warnings and Cautions to ensure safe handling and maintenance of the analyzer at all times while operating and performing maintenance on it. Certain safety precautions in the 9933 Analyzer *User Manual* do not directly apply to 9933RM Analyzer applications, but safe handling and maintenance of the analyzer must be considered at all times while operating and performing maintenance on it.

- While the physical makeup of the 9933RM is significantly different from the standard 9933WM version, the general operations are the same.

- This *Manual Supplement* includes the same chapter names as those in the "standard" 9933 Gas Analyzer *User Manual* (AMETEK Part No. 10398-15-5) to make it easier to locate differences between the standard (Wall Mount, or WM) 9933 Analyzer and the 9933RM (Rack Mount) Analyzer.

- This *Manual Supplement* contains information, drawings, and photographs that are intended to replace information and Figures in the analyzer manual.

  In cases where this supplement references a drawing that is in the analyzer *User Manual*, the Figure number will also include the same Chapter number (e.g., 1-2.1 or 1-3).

To use this Supplement:

- The **Section/Chapter** heading refers to the *Section* title and the *Chapter* number (or *Appendix*) in the 9933 Gas Analyzer *User Manual* for which information/drawings are to be replaced by information in this *Manual Supplement*.

- The **Page(s)** heading refers to the analyzer *User Manual's* page number on which the information in the analyzer manual is to be replaced by information in this Supplement.

- The **Instructions** heading lists the exact information from the analyzer *User Manual* that is to be replaced by information in this Supplement.

Example of instructional headings:

Section/Chapter	Page(s)	Instructions
Installing the Analyzer and its Optical Bench Assembly (Chapter 2)	2-6–2-9	Use the section "Analyzer Installation Guidelines" and figures below in place of the corresponding information and figures in the 9933 Gas Analyzer *User Manual*.

Example side note: *Use this Warning in place of the Warning in the 9933 Gas Analyzer* User Manual.

- On pages that are the same, with the exception of, for example, a single paragraph or a Warning, a side note (see example at left) will indicate only the specific information to use for the 9933RM Analyzer, in place of the information in the 9933RM Gas Analyzer *User Manual*.

General Differences with the 9933RM Gas Analyzer

The Rack Mount and Wall Mount versions of the 9933 Analyzer operate in much the same manner. The most notable difference with the Rack Mount version is that there is only one cabinet (known as the Analyzer Enclosure) that houses the entire array of electronics (including the Optical Bench), much of the sample system, and the HMI (Human-Machine Interface), while the Wall Mount version has three different enclosures that house all of the analyzer components.

The 9933RM Gas Analyzer uses photometric analysis to continuously monitor H_2S levels in pipeline quality natural gas, and can also use various sensor technologies to measure the concentration of one or multiple gas species – i.e., hydrogen (H_2), carbon dioxide (CO_2), and/or total hydrocarbons (THC) – in a gas stream. The measurements can be viewed using the analyzer's built-in Human-Machine Interface (HMI).

The 9933RM Gas Analyzer is intended for use in Class I, Division 2; Class I, Zone 2; and ATEX/IECEx Zone 2 classified hazardous locations.

The maintenance/service of the 9933RM Analyzer is generally the same as the 9933WM Analyzer, the main differences being the location of certain components and the procedures to remove those components. This *Manual Supplement* discusses these different procedures.

When referring to the 9933WM Analyzer User Manual*, disregard all references to the Electronics Enclosure, Oven Enclosure, and Sample Flow Enclosure; all components that make up the entire Rack Mount analyzer are located within the Analyzer Enclosure.*

Refer to appropriate Figures in this Supplement for locations of all electronics (including the Optical Bench), sample system components, and the HMI. Notable differences for the 9933RM Analyzer include:

The following descriptions from the main 9933WM Gas Analyzer *User Manual* do not apply to the Rack Mount version:

- Electronics Enclosure, Oven Enclosure, and Sample Flow Enclosure:
  For the 9933RM Analyzer, substitute all references pertaining to the Electronics Enclosure with "Analyzer Enclosure".

  The 9933RM Analyzer does not have an Oven Enclosure or Sample Flow Enclosure. Disregard all drawings that illustrate one or more of these enclosures, and refer to this Supplement for the 9933RM "Analyzer Enclosure".

- Doors/Covers:
  The 9933RM Analyzer has only one main cover (on top, referred to as the Analyzer Enclosure Cover) and a Rear Access Plate that can be removed, while the 9933WM Analyzer has three separate enclosures, each with its own hinged door.
- Backpan:
  The 9933RM Analyzer is contained within a single enclosure that is intended to be mounted in a rack, not mounted on a backpan.
- Optical Bench Assembly is shipped in a separate box.
  In the 9933RM Analyzer, the Optical Bench Assembly is shipped *installed* in the analyzer.
- Over-Temperature Control Module:
  This device is not used on the 9933RM Analyzer; disregard all mentions of it in the 9933RM Gas Analyzer *User Manual*.
- Oven Heater:
  This device is not used on the 9933RM Analyzer; disregard all mentions of it in the 9933RM Gas Analyzer *User Manual*.

Other notable differences between the Rack Mount version and the Wall Mount version:

- The Rack Mount version is available in 120 VAC and 240 VAC models and a 24 VDC model (see the Specifications in this *Manual Supplement* for details).

  In certain topics, substitute DC for AC if your system operates on 24 VDC.
- On the Rack Mount version, all plumbing (Sample Inlet, Vent lines, and Zero Gas) connections are made on its Rear Panel, while on the Wall Mount version, the Sample and Vent line connections are made on the left side of the Analyzer Oven, and other plumbing connections (for Calibration and Zero gases) are made on the bottom of the Sample Flow Enclosure.
- On the Rack Mount version, all power, signal, and other wiring connections are made on its Rear Panel (power) or via the Rear Access Plate (power, signal, and other wiring), while on the Wall Mount version, all wiring connections are made through the Cable/Conduit Entries plate on bottom of the Analyzer Enclosure.
- On the Rack Mount version, the USB flash drive is located on the inside of the Analyzer Enclosure, to the right of the HMI (Human-Machine Interface) when viewed from the front

Section/Chapter	Page(s)	Instructions
About the Analyzer Electronics (Chapter 1)	1-3–1-5	Use the information and Figures below (Pages 5, 6, 7 in this *Manual Supplement*) in place of the corresponding information in the table in the 9933 Gas Analyzer *User Manual*. Continue to use the information on Page 1-2 in the 9933 Gas Analyzer *User Manual*.

Component	Function
Customer I/O Board	The **Customer I/O** board is a customer interface board that provides four (4) isolated analog outputs, four (4) dry contact inputs isolated as a group, and five (5) status relay outputs. The analog outputs are selectable as 0–20 mADC, 4–20 mADC, 0–5 VDC, or 1–5 VDC. Each of the contact inputs can be configured to initiate an action (e.g., Zero-Calibration) or to indicate a sample system state (e.g., on sample stream or on calibration gas). The status relays can be set up to be triggered on a combination of analyzer detectable **Fault** or **Warning** condition, **calibration in progress** state, **bench setup in progress**, or **process alarm**.
Process Sensor Controller Board (Optional)	The **Process Sensor Controller** board is used when optional gas sensors are added to the analyzer. The **Process Sensor Controller** board communicates directly with the **UV Bench Controller** board. If an additional gas sensor is installed, the vent Pressure Sensor is also included. If your system uses the optional gas sensors, refer to the "993X Gas Sensors" *Manual Supplement* (AMETEK Part No. 10939-15-5) for details.
Analog Output Signal Channels	Four (4) Analog Output channels, isolated as a group, not individually. Each channel is user-configurable individually as a voltage output (0–5 VDC or 1–5 VDC) or current output (0–20 mADC or 4–20 mADC). When configured as 1–5 VDC or 4–20 mADC output, an option is available to clamp the output from going below 1 VDC or 4 mADC. Each channel can be assigned a signal from a list of measured parameters, and each channel can be calibrated individually. The standard configuration for the analyzer is one 4–20 mA output which is set for the H_2S concentration. Additional signals are available for assignment to the analog outputs when optional Gas Sensors are installed.
Relay Contacts	Five (5) Relay Contacts, Form A (SPST), Normally Open (NO). User-configurable as Status alarms and Process alarms.
Contact Inputs	Up to four (4) dry (potential free) contact inputs. The inputs are configurable to trigger one of these actions: Zero-Calibration, Span-Calibration, Bench Auto Setup, Track-Hold, an on- or off-process stream, or backpurge.

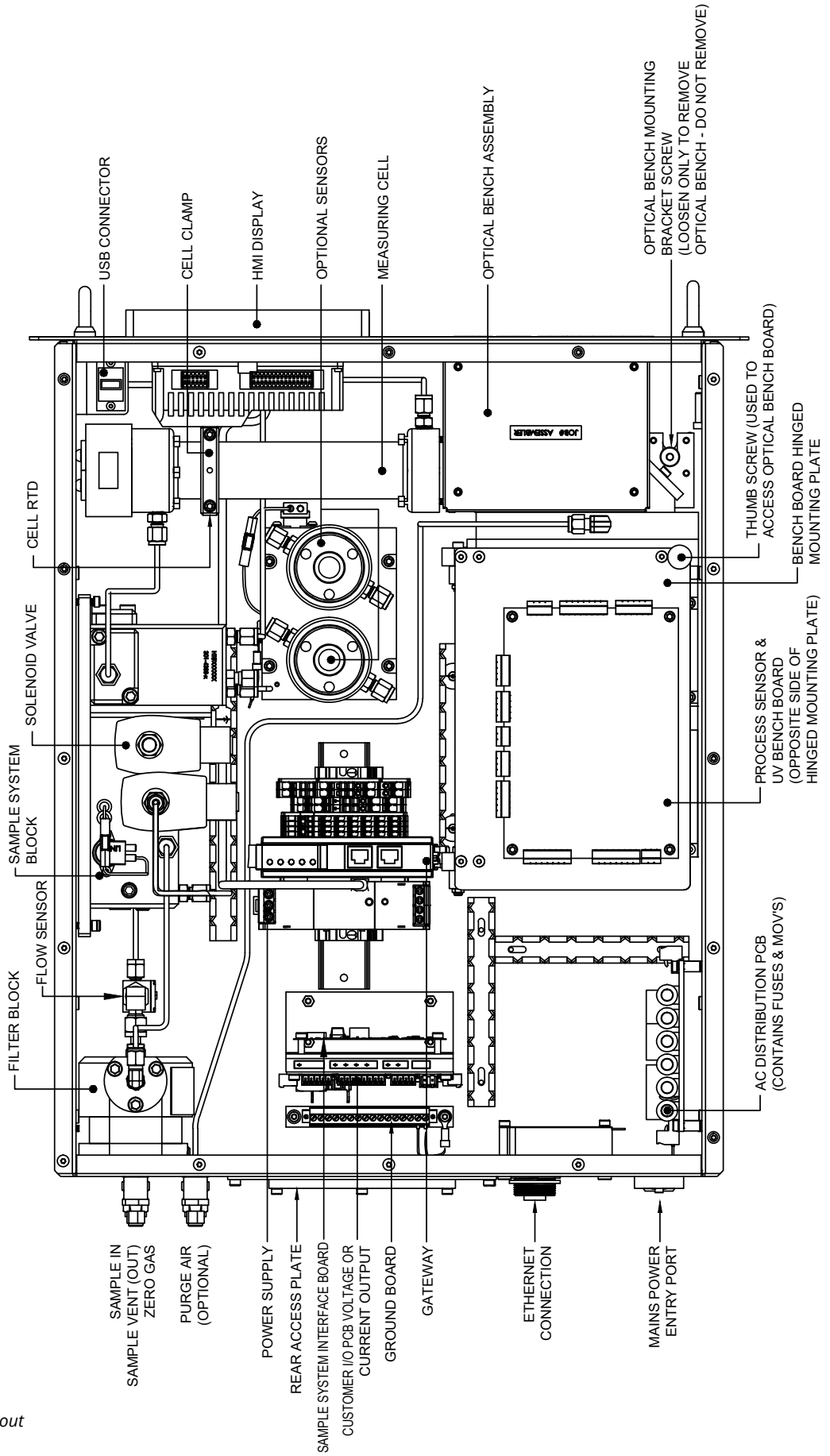


Figure 1-2.1.
Internal component layout
(all options shown).

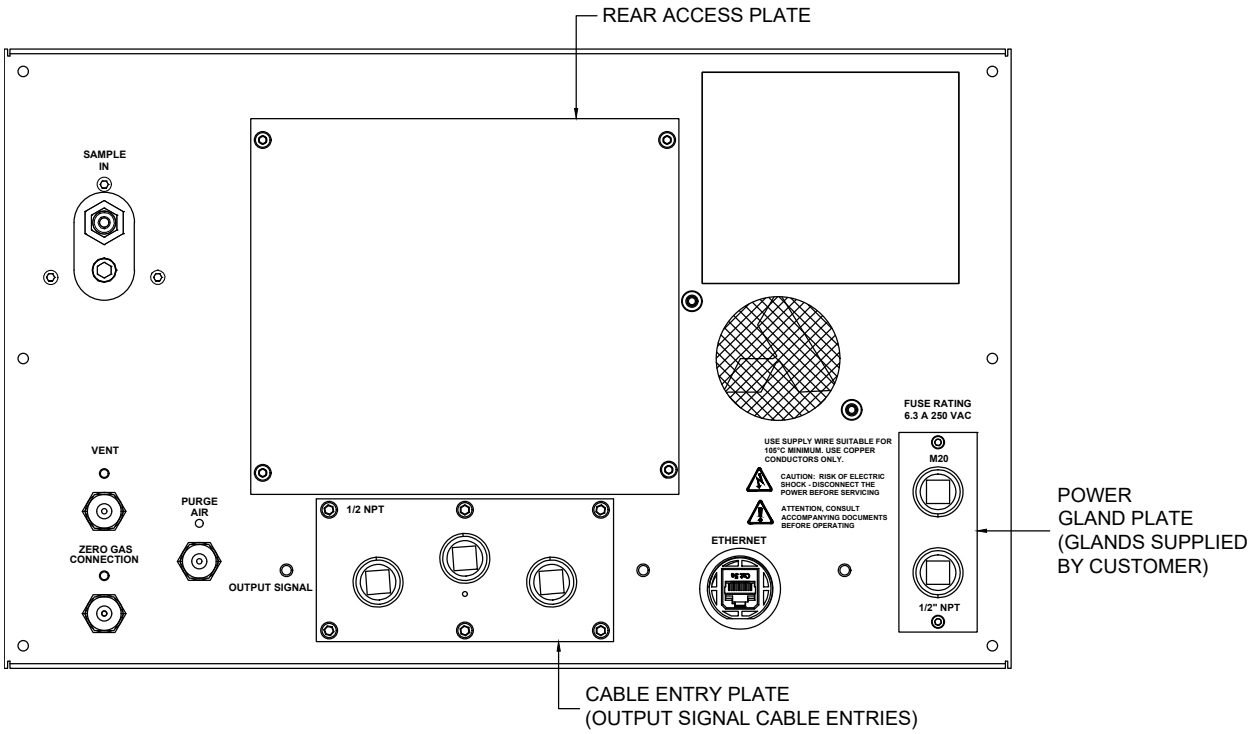
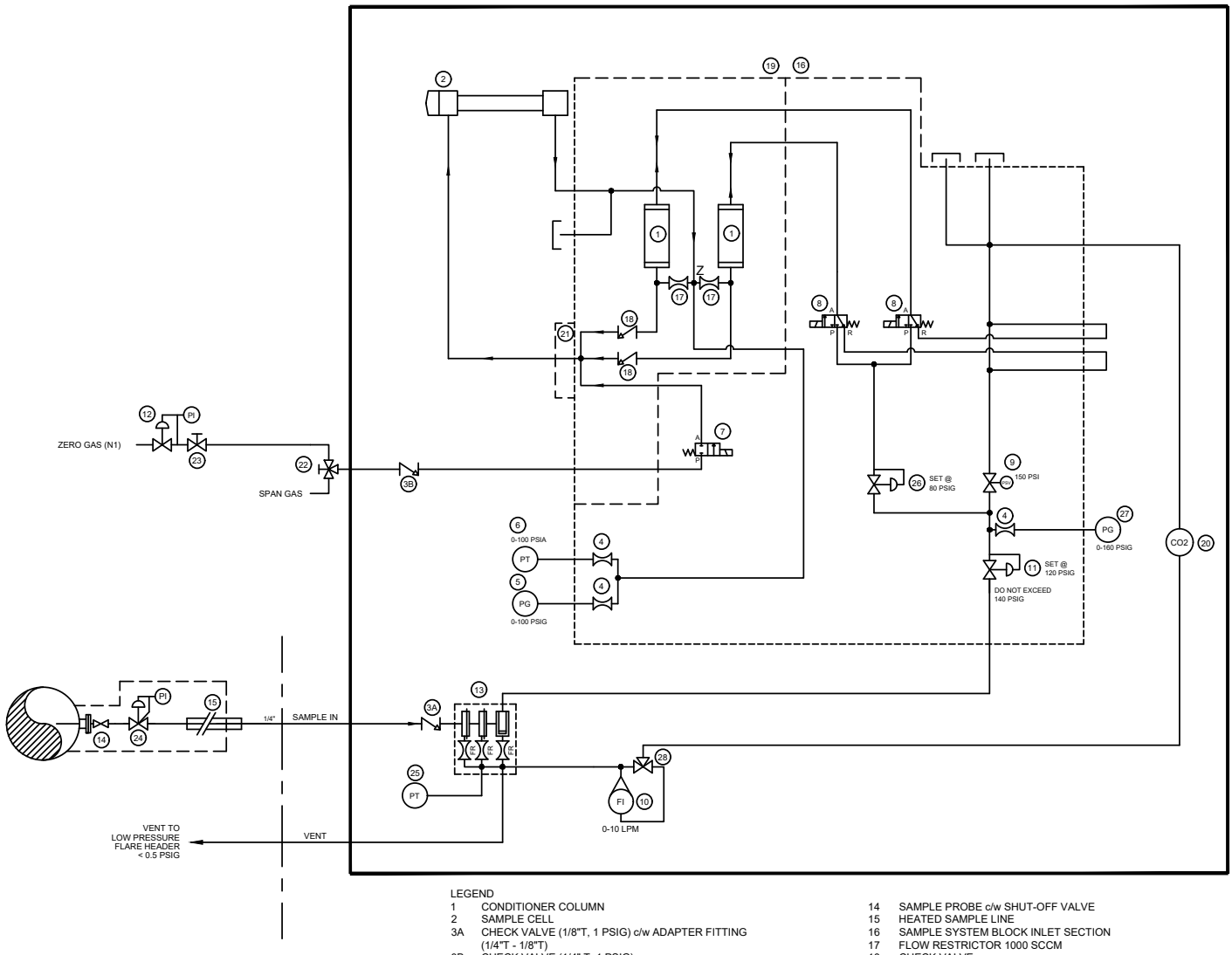


Figure 1-2.2.
External component layout: conduit entries, AC (or DC) power connection, analyzer Rear Panel.

Section/Chapter	Page(s)	Instructions
About the Analyzer Sample System (Chapter 1)	1-7–1-8	Use the information and Figure 1-3 below (Pages 8 and 9 in this *Manual Supplement*) in place of the corresponding information in the 9933 Gas Analyzer *User Manual*.

About the Analyzer Sample System

The 9933 UV Analyzer has been type-certified to meet the electrical classification requirements for use in Class I, Division 2; Class I, Zone 2; and ATEX/IECEx Zone 2 locations specific to this analyzer's intended application. Depending on the application, some of these features may not be available for your analyzer.



NOTE 1: SET ZERO GAS APPROXIMATELY 5-10 PSIG ABOVE THE SAMPLE PRESSURE.

LEGEND

1 CONDITIONER COLUMN
2 SAMPLE CELL
3A CHECK VALVE (1/8"T, 1 PSIG) c/w ADAPTER FITTING (1/4"T - 1/8"T)
3B CHECK VALVE (1/4" T, 1 PSIG)
4 FLOW RESTRICTOR 100 SCCM
5 SAMPLE/CELL PRESSURE GAUGE
6 SAMPLE/CELL PRESSURE TRANSDUCER (0-100 PSIA)
7 2 WAY SOLENOID (ZERO)
8 3 WAY SOLENOID (COLUMN SWITCHING)
9 RELIEF VALVE
10 FLOW INDICATOR (ROTAMETER), OPTIONAL OR FLOW METER
11 OPTIONAL SAMPLE GAS PRESSURE REGULATOR
12 ZERO GAS REGULATOR
13 FILTERBLOCK
14 SAMPLE PROBE c/w SHUT-OFF VALVE
15 HEATED SAMPLE LINE
16 SAMPLE SYSTEM BLOCK INLET SECTION
17 FLOW RESTRICTOR 1000 SCCM
18 CHECK VALVE
19 SAMPLE SYSTEM BLOCK COLUMN SECTION
20 OPTIONAL CO2 SENSOR
21 CHECK VALVE COVER
22 3-WAY BALL VALVE
23 2-WAY BALL VALVE
24 HEATED PRESSURE REGULATOR (SET @ 10 barg)
25 OPTIONAL SENSOR PRESSURE TRANSDUCER (0-60 PSIA)
26 SAMPLE CELL PRESSURE REGULATOR
27 OPTIONAL REGULATOR INLET PRESSURE GAUGE
28 3-WAY BALL VALVE (ROTAMETER BY-PASS)

Figure 1-3.
9933RM Analyzer plumbing/ flow diagram.

Component	Function
Sample System	The sample system components are configurable for gas applications. A typical configuration for the sample system consists of Sample Inlet and Outlet (Vent) connection points on the analyzer, a Sample and a Vent line (supplied by AMETEK or by customer), the Measuring (Sample) Cell, and a flow sensor. See Figure 1-3. With reference to Figure 1-3, when Auto-Zero is activated, the Zero solenoid is energized and the two (2) column solenoids are de-energized. The Zero gas comes through the Zero Gas Connection port, flushes the Measuring Cell, both columns, and the remainder of the Sample System, and then flows out the Vent outlet. With a 3-way manual valve installed before the Zero Gas Connection port, Span gas can also be injected. The sample system can also include additional ancillary sensor measurements (Cell Temperature and Pressure, Flow Rate), optional Process Sensor measurements (e.g., H_2, CO_2, Sensor Pressure), a particulate filter, sample dryer, and other application dependent components. Information about optional components that make up the analyzer or its sample system are included either in this manual or in separate *Manual Supplements*, part of the *Documentation Package* folder shipped with the analyzer.

Section/Chapter	Page(s)	Instructions
Communicating With the Analyzer/ Transferring Data (Chapter 1)	1-9	Use the information below in place of the corresponding information in the 9933 Gas Analyzer *User Manual*.

Component	Function
USB Ports	The HMI's USB Flash Drive – located on the inside of the Analyzer Enclosure, to the right of the HMI (Human-Machine Interface) when viewed from the front – is used to transfer stored analyzer data (every 3–4 months) to a desktop computer or to upgrade the HMI Display firmware. Otherwise, removing the USB drive is not recommended. There is also one (1) Micro-USB port included on each installed Controller board, used only to upgrade the individual Controller board operation firmware. These USB ports do not have any other functionality for normal analyzer operation.

Section/Chapter	Page(s)	Instructions
Pre-Installation Requirements (Chapter 2)	2-2–2-5	Use the sections below (Pages 11 and 12 in this *Manual Supplement*) in place of the corresponding sections in the 9933 Gas Analyzer *User Manual* (Part No. 10398-15-5).

Unpacking and Inspecting the Analyzer and its Optical Bench Assembly

The standard analyzer system weighs approximately 30.0 kg (66.1 lb) (specific weight varies, depending on system). Lift the analyzer out of its shipping container only by grasping it from the sides or bottom. Do not use the handles on the front of the analyzer to lift it out of its shipping container, or to transport it.

Upon receiving the analyzer system, remove it from the shipping container and check the exterior of the analyzer for damage. Remove the top cover from the Analyzer Enclosure and check all of the components on the analyzer's exterior and within its enclosure to ensure they are secure and there is no physical damage. **Note that the Optical Bench Assembly is shipped *installed* in the 9933RM Analyzer. Carefully observe it for damage too.**

Analyzer Site Preparation

The 9933RM Analyzer is approved for installation in hazardous areas classified as Class I, Division 2; Class I, Zone 2; and ATEX/IECEx Zone 2.

Observe the following guidelines when selecting an analyzer installation location:

- Select a readily accessible position for the analyzer to allow for routine maintenance.
- Regardless of which installation method is used, the location should be free from excessive vibration and the ambient temperature should be maintained within the limits listed in the specifications.
- **Division 2/Zone 2 Applications:**
  The 9933RM Analyzer Enclosure provides ingress protection IP40 per IEC 60529. The customer is required to provide additional ingress protection to IP54 when installing the 9933RM Analyzer in Division 2 or Zone 2 classified hazardous areas more than Pollution Degree 2.

Add this information (replaces "Space Requirements" in the 9933 Gas Analyzer User Manual*).*

Analyzer Rear Panel Ventilation Requirements

When installing the 9933RM Analyzer in its mounting rack, ensure there is a minimum of 5 cm (2") clearance at the back of the analyzer to allow for adequate ventilation.

Tools, Equipment, and Supplies Required for Installation

To install the analyzer, you need the following:

- **For Division 2/Zone 2 Analyzers:**
  One power-disconnect switch (**supplied and installed by the customer/end user**), rated for appropriate supply voltage of the analyzer and at the installation site, and certified for the hazardous location. To satisfy local electrical codes, the switch must be certified by the local authority for the appropriate hazardous location.

- One AC (or DC) breaker (**supplied and installed by the customer/end user**), rated for appropriate supply voltage of the analyzer and at the installation site, and certified for the hazardous location. To satisfy local electrical codes, the breaker must be certified by the local authority for the appropriate hazardous location.

- Strain relief or Cable Glands (**supplied and installed by the customer/end user**), to install in Division 2/Zone 2 Termination Enclosure (on the **AC Distribution** board) to secure the supply power wiring. The Strain relief or Cable Glands must be approved by the local authority for the appropriate hazardous location and must be rated for the maximum wattage for the analyzer (marked on the Product Label on the analyzer Rear Panel).

- Supply of adequately-sized electrical supply cable, which must be approved for the local wiring regulations and electrical codes for the hazardous location, **and which must be rated at 600 Volts and 105 °C (221 °F)**.

Section/Chapter	Page(s)	Instructions
Installing the Analyzer and its Optical Bench Assembly (Chapter 2)	2-6–2-10	Use the section "Analyzer Installation Guidelines" and Figures 2-1 and 2-2 below – Pages 11 and 12 in this *Manual Supplement* – in place of the corresponding information and figures in the 9933 Gas Analyzer *User Manual*. Disregard Figures 2-3 and 2-4 in the 9933 Gas Analyzer *User Manual*.

Analyzer Installation Guidelines

Note that the Optical Bench comes installed in the 9933RM Analyzer; disregard the procedure "Installing the Optical Bench Assembly" in the 9933WM Analyzer User Manual.

- The 9933RM Analyzer must be installed in a temperature-controlled shelter (by customer). Always maintain the shelter temperature at least 5 °C above the maximum expected sample dewpoint temperature.
- The complete analyzer is contained within a single, standard enclosure, known as the Analyzer Enclosure. For Rack Mount applications, a slide mount is mounted on each side of the analyzer. See Figure 2-1 for analyzer dimensions, Figure 2-2 for the layout of the internal components, and Figure 2-8 for the Rear Panel Layout.
- All external connections to the analyzer are made through the Rear Panel. When mounting the analyzer into a rack, allow sufficient room behind the analyzer for the Sample Line and Vent Line and for the cable or conduit carrying wiring to the analyzer's cable entry ports.
- When chassis slides are used, the Sample and Vent Line tubes, Zero gas tube, Ethernet cable, and signal cable(s) must be flexible and long enough to allow removal of the analyzer from the rack.
- Always install the analyzer in a location that is as free as possible from vibrations.
- The Power cable is routed into the Analyzer Enclosure through the Cable Entry Ports at the analyzer Rear Panel and terminated at the Power Distribution/MOV board.
- **The valve configuration and the flow control associated with Calibration gases are to be supplied by the customer.**

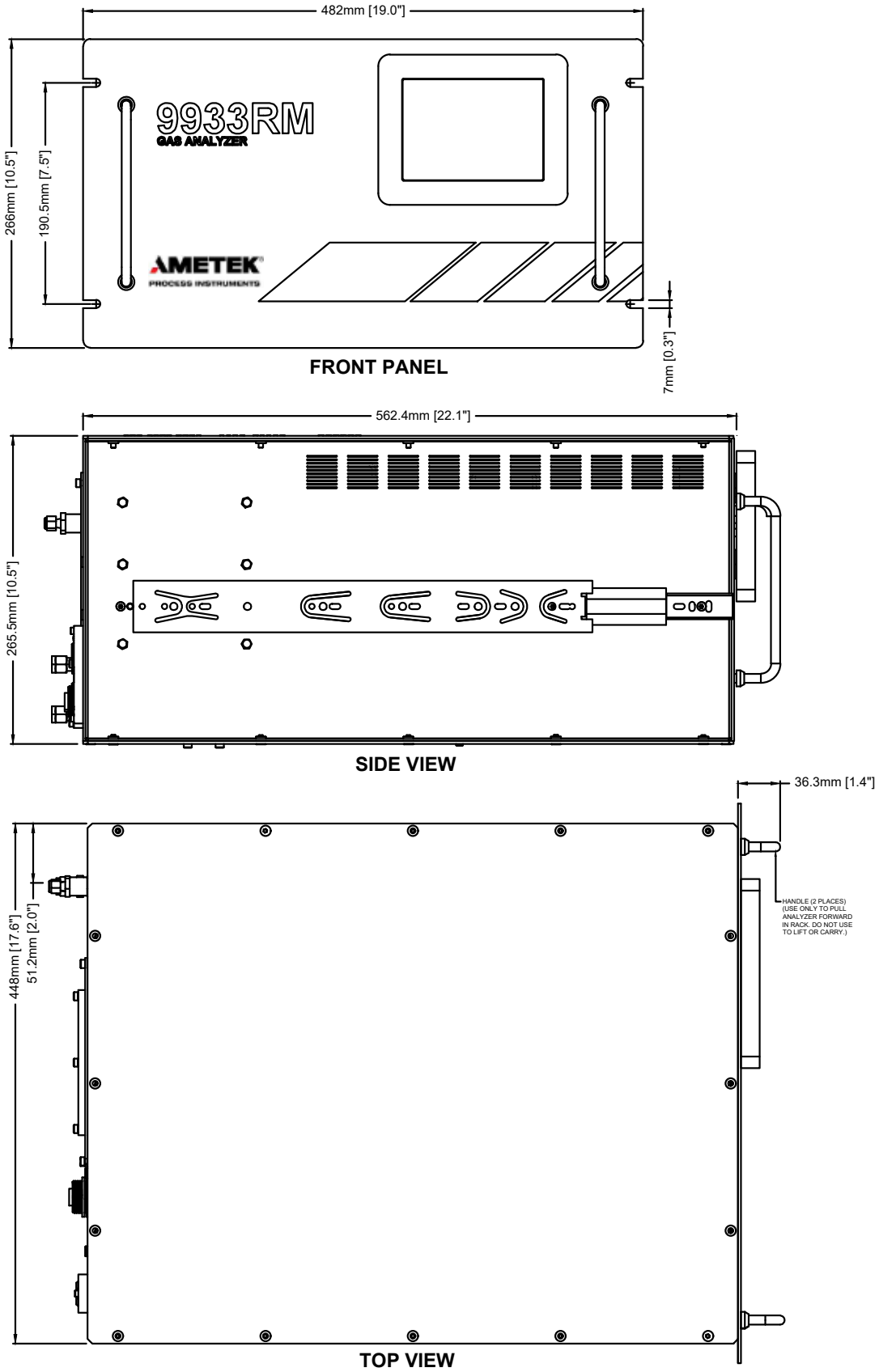


Figure 2-1.
9933RM Gas Analyzer dimensions.

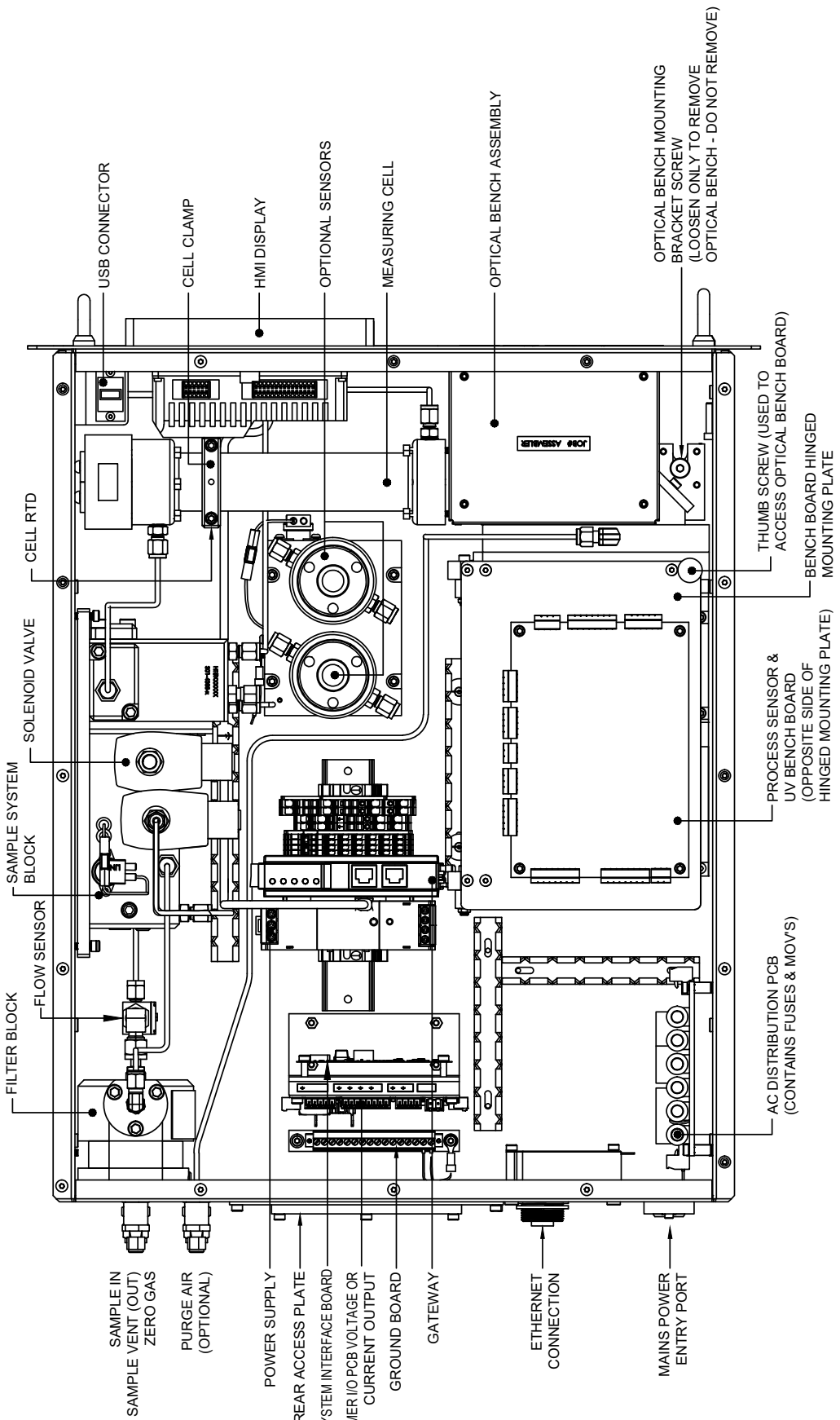


Figure 2-2.
Internal component layout
(all options shown).

Section/Chapter	Page(s)	Instructions
Installing a Power-Disconnect Switch and/or Breaker (Supplied by Customer/End User) (Chapter 2)	2-15	Use the information below in place of the corresponding in the 9933 Gas Analyzer *User Manual*.

Installing a Power-Disconnect Switch and/or Breaker (Supplied by Customer/End User)

See details on the power-disconnect switch under "Tools, Equipment, and Supplies Required for Installation" – earlier in this Manual Supplement – before installing this equipment.

Install the power-disconnect switch (**supplied and installed by the customer/end user**), rated appropriately for either 120 VAC/250 Watts, 240 VAC/250 Watts or 24 VDC/400 Watts.

This switch must be connected to and mounted near the 9933RM Analyzer, in an easily accessible area. The power-disconnect switch must be clearly labeled (e.g., "AMETEK 9933RM Analyzer Mains AC (or DC) Power-Disconnect Switch"). For safety reasons during maintenance, the power-disconnect switch allows the mains AC (or DC) power to be disconnected from the analyzer prior to performing service on the analyzer.

Install the AC (or DC) breaker (**supplied and installed by the customer/end user**), rated for appropriate supply voltage of the analyzer and at the installation site.

This breaker must be connected upstream of the 9933RM Analyzer power-disconnect switch. The breaker must be clearly labeled (e.g., "AMETEK 9933RM Analyzer Mains AC (or DC) Power Breaker"). For safety reasons during maintenance, this breaker allows the mains AC (or DC) power to be disconnected from the analyzer prior to performing service on the analyzer.

For safety reasons during maintenance, this breaker allows the mains power to be disconnected from the analyzer prior to performing service on the analyzer.

Section/Chapter	Page(s)	Instructions
Installing the Sample System (Chapter 2)	2-16–2-20	Use the information below in place of the section "Installing the Sample System" in the 9933 Gas Analyzer *User Manual*, except where noted. Continue to use the information under "Sample Prerequisites" in the 9933 Gas Analyzer *User Manual*.

Installing the Sample System

All regulatory agency, personnel safety procedures, and installation/removal procedures must be followed during the installation/removal of the sample system components. A breathing apparatus must be worn when installing/removing equipment from the sample gas extraction point. The sample stream may be under positive pressure, and injury or death from inhaling toxic gases in the sample stream could result from attempting to install/remove equipment without the use of a breathing apparatus.

The analyzer is supplied with fittings for Sample, Vent, and Zero gas line connections (Figure 2-8). The Sample Inlet/Vent Outlet connections are on the Rear Panel.

Installing the Sample Probe

If the Sample Probe is supplied by AMETEK, refer to the Final "As-Built" drawings in the analyzer Documentation Package shipped with the analyzer. If it is supplied by the customer, refer to instructions shipped with the probe.

Installing and Connecting the Sample and Vent Lines

Sample and Vent lines are either supplied by AMETEK or by customer.

The analyzer is supplied with Sample Line Inlet and Vent Line Outlet connection fittings, which are mounted on the analyzer Rear Panel (Figure 2-8). Unless otherwise specified, the sample system fittings are 1/4-inch Swagelok® connectors.

The connectors required for connecting to the customer's sample system are also 1/4-inch Swagelok® tube fittings.

Appropriate ferrules for the tubing material must be used – supplied by customer.

Install the Zero gas line at the same time as you make the Sample and Vent Line connections to the analyzer.

To install the Sample and Vent Lines:

1. Route the Sample Line from the analyzer to the gas sample probe on the sample gas extraction point.

   Route the Vent Line (if used) from the analyzer to an appropriate gas dispersal location (example, vent to atmosphere).

   Ensure there are no loops, sags, or other traps in the Sample and Vent Lines. Provide support where needed.

2. Make the connection for the Sample Line at the analyzer and at the gas sample probe.

   Make the connection for the Vent Line at the analyzer and at the dispersal location (vent pipe to atmosphere).

If solenoids are added to the sample system to control the flow of sample and calibration gases, it is the responsibility of the customer.

Connecting the Zero Gas

The analyzer is supplied with a Zero gas inlet connection fitting on the analyzer Rear Panel (see Figure 2-8 in this *Manual Supplement*).

Install the Zero gas line at the same time as you make the Sample and Vent Line connections to the analyzer.

Zero gas connection requirements:

- The Zero gas must be dry and must not contain any components which absorb ultraviolet light (radiation) at the wavelengths employed by the analyzer, nor contain any components which might react with components in the sample gas mixture. Nitrogen (UHP) or Instrument Air (as per ANSI/ISA S7.0.01 (1996) Quality Standard for Instrument Air) that meets these requirements are suitable for use as a Zero gas for the analyzer.
- A supply of 1/4-inch non-rigid tubing, such as Teflon, for the Zero gas line. Length will vary, depending on the distance between the analyzer and the Zero gas cylinder. Appropriate ferrules for the tubing material must be used. **Supplied/installed by the customer/end user.**
- Adjust the Zero gas pressure to 550 kPa (80 PSIG) prior to initiating an Auto-Zero.

To install the Zero gas line:

1. Purge the line to remove any liquids or particulate in it before connecting it to the analyzer.
2. Route the Zero gas line from the analyzer to the Zero gas cylinder.
3. Connect the Zero gas line to the Zero gas cylinder and to the Zero gas inlet on the analyzer Rear Panel (see Figure 2-8 in this *Manual Supplement*).

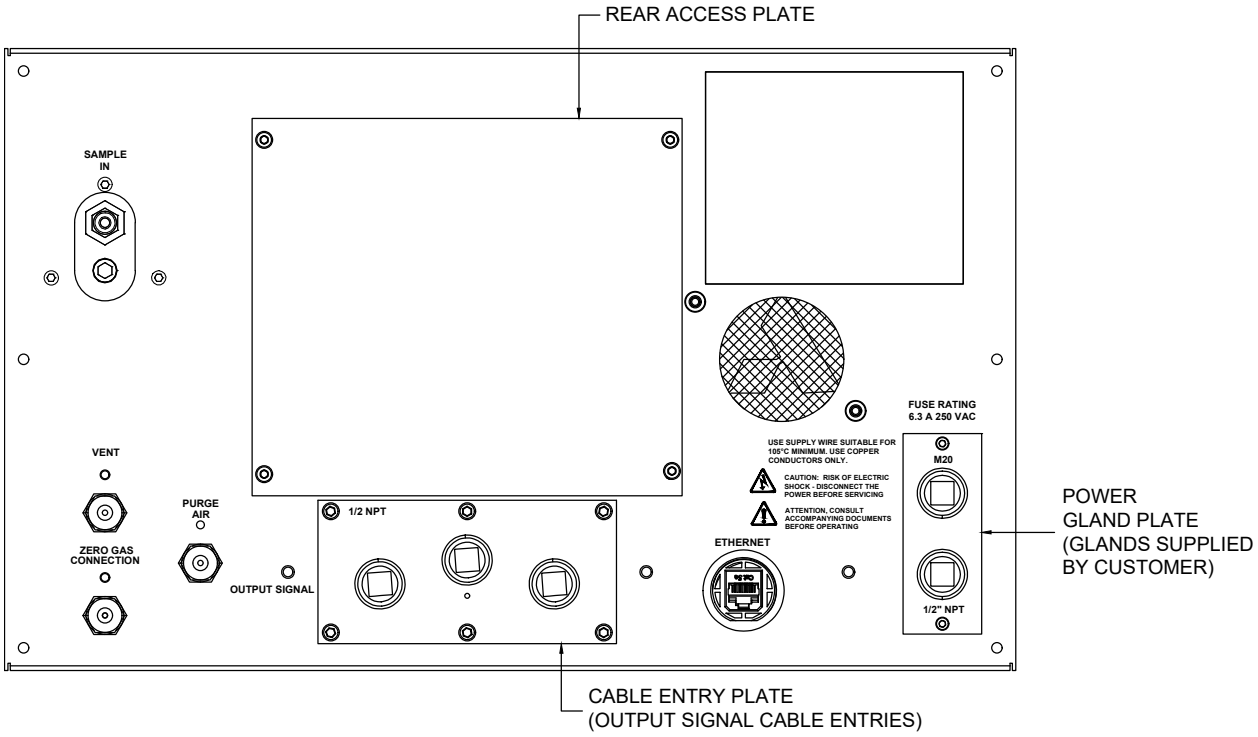


Figure 2-8.
Sample Inlet and Outlet, Zero Gas and optional Environmental Purge Air connections, and AC (or DC) power connection conduit entries, analyzer Rear Panel.

Section/Chapter	Page(s)	Instructions
AC Power and Signal Connections (Chapter 2)	2-21–2-30	Use the entire section "AC (or DC) Power and Signal Connections" and Figures below – Pages 21 through 31 in this *Manual Supplement* – in place of the section "AC Power and Signal Connections" and figures in the 9933 Gas Analyzer *User Manual*, except where noted.

AC (or DC) Power and Signal Connections

The nominal operating voltage and power consumption is indicated on the Product Label on the analyzer Rear Panel (Figure 2-8). Verify that the operating voltage indicated on the label agrees with the operating voltage indicated on the documentation supplied with the analyzer. The analyzer is intended for use in Installation Category II (Overvoltage Category) and AC (or DC) power requirements for each analyzer system are specified on the system electrical drawings. The AC (or DC) electrical supply cable must be approved for the local wiring regulations and electrical codes for the hazardous location, **and must be rated at 600 Volts and 105 °C (221 °F)**.

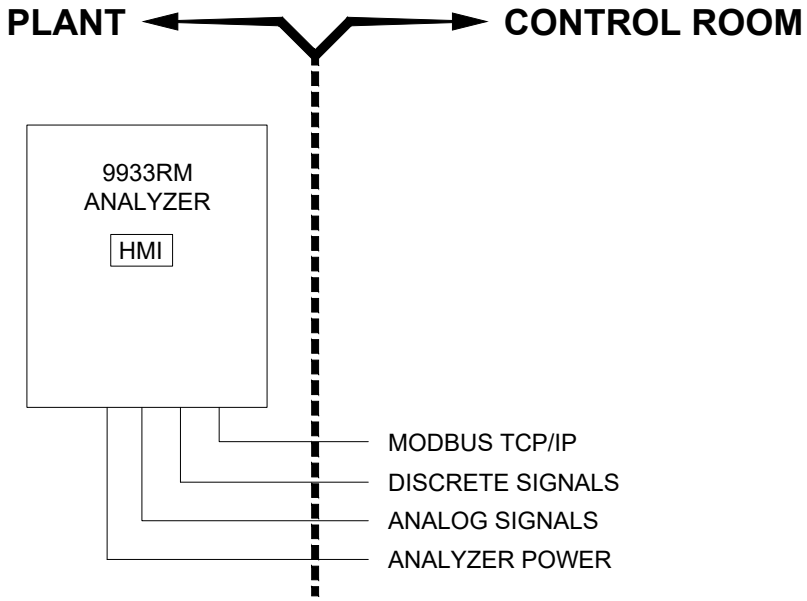


Figure 2-9.
Conduit entries, AC (or DC) power connection, analyzer Rear Panel.

Digital Communication

Under "Digital Communication" use this Warning in place of the Warning in the 9933 Gas Analyzer User Manual.

WARNING

Always disconnect mains AC (or DC) power and/or alternate power sources (example, for relay contacts) to the analyzer before removing any covers on the analyzer, before making any wiring or cable connections, and before and before removing any components from the analyzer.

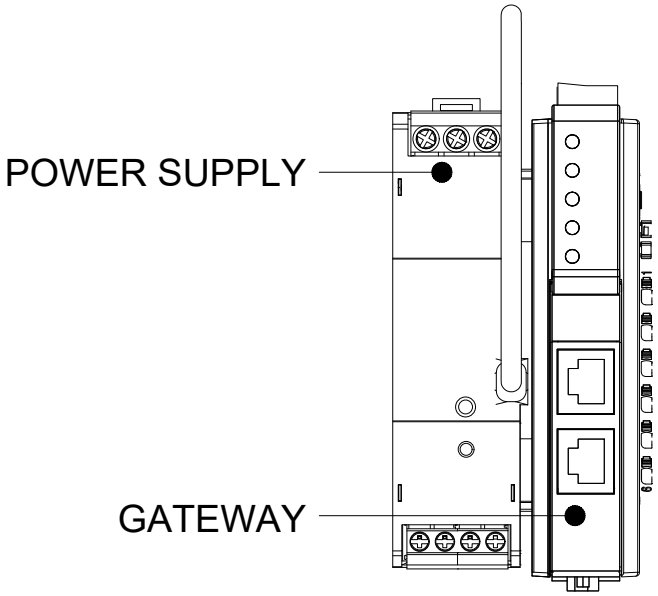


Figure 2-10.
Digital Communication option.

Connections for Modbus® RTU on the RS-485 (Optional)

The RS-485 port can be used for remote communication with a Distributed Control System (DCS) or, Data Acquisition System (DAS), or Programmable Logic Controller (PLC) using Modicon Modbus RTU protocol. The Modbus RTU protocol can be used with the analyzer operating as a slave device, responding to Modbus queries within one second, and providing full access to all registers. See Figure 2-10 for the location of the RS-485 terminals inside the Analyzer Enclosure. Also, refer to the Customer Connections diagram (Figure 2-12.1), and to the "993X Gas Analyzers Modbus Map" *Manual Supplement* (AMETEK Part No. 903-8811) for the Modbus register map.

After the analyzer installation is complete (including all I/O Signal, Relay Contact, and AC (or DC) Power connections), if the optional Modbus RTU is being used, configure and enable the RS-485 port for Modbus® communications as described in "Start-Up and Verification" (Powering Up the Analyzer) later in this document.

Connections for Permanent Ethernet Connection (Optional)

When using the Ethernet interface (using Modbus-TCP) on the analyzer, the minimum requirements for the Ethernet cable is a shielded CAT 5e cable to connect the analyzer to the network, up to a maximum of 100 m from the hub/switch/router. The Ethernet interface supports a 10Base-T/100Base-TX connection. For hazardous locations and/or lengths greater than 100 m, special requirements may be necessary. Contact your network administrator for information.

Connect the Ethernet cable between the RJ-45 Ethernet port on the back of the analyzer (see Figure 2-8) and the network. **If the RJ-45 Ethernet connection is not used, the customer/end user is required to install an Ethernet Port Mating Cover on the connector. (Conec Part No. 17-10002 or 17-10014 may be used.)**

The Ethernet cable normally has a very low voltage rating; therefore, for user safety, ensure that it is physically prevented from crossing or touching any wiring carrying AC (or DC) Power.

After the analyzer installation is complete (including all I/O Signal, Relay Contact, and AC (or DC) Power connections), if the optional Ethernet Interface is being used, configure and enable the Ethernet parameters.

Removing/Replacing the USB Flash Drive

The USB Flash Drive comes inserted in its high-retention USB connector, beside the analyzer HMI (Human-Machine Interface), inside the Analyzer Enclosure (see Figure 2-2 in this *Manual Supplement*). The USB Flash Drive can be used to transfer data from the analyzer to a desktop computer, or when upgrading the HMI-Display firmware. Otherwise, removing the USB drive is not recommended.

Always disconnect mains AC (or DC) power and/or alternate power sources (example, for relay contacts) to the analyzer before removing any covers on the analyzer, before making any wiring or cable connections, and before removing any components from the analyzer.

If using the USB connection, confirm the USB Flash Drive or cable is secured in its high-retention USB connector.

About the Micro-USB Ports on the Controller Boards

One (1) Micro-USB port is included on each Controller board installed, and is used only to upgrade the individual Controller board analyzer firmware. These ports should not be used for normal analyzer operation. If necessary, contact AMETEK Service.

Connecting I/O Signals, Relay Contacts, and AC (or DC) Power

The power gland plate comes with one M20 cable entry port and one 1/2-inch NPT cable entry port. Plug each unused cable entry port with an appropriate threaded plug (supplied by AMETEK).

Shielding is required to maintain EMC compliance. If shielded cable is used it should be terminated only at the end of the user device. ***The cable glands must meet the requirements of local wiring regulations and electrical codes.***

If external solenoids are added to the sample system, to control the flow of sample and calibration gases, the customer/end user is responsible for ensuring proper installation, wiring, and control requirements.

Input/Output Signal and Relay Contact Connections

The terminal blocks for connection to the digital input and output signals, analog output signals, and the status relay contacts are located on the **Customer I/O** board. See Figures 2-8 and 2-9 for the location of Cable Entry Ports, and Figure 2-12.1 for the connection points.

Signal wires, contained within cable that is approved locally for the hazardous area, enter the Analyzer Enclosure through one of the Cable Entry Ports on the analyzer Rear Panel. The terminal assignments are identified in the Customer Connections diagram (Figure 2-12.1).

To terminate the input/output signals and relay contacts:

1. Remove the Rear Access Plate to access the **Customer I/O** board.

2. Route cable or conduit carrying the input/output and relay contact wiring to the Cable Entry Ports at the analyzer Rear Panel.

   Route the wiring through one of the Cable Entry Ports and then to the **Customer I/O** board.

   Connect the strain relief or cable gland to the Cable Entry Ports, and then terminate the wiring at the **Customer I/O** board using the supplied connectors (blank connectors inserted in the **Customer I/O** board).

Customer Connections – Terminal Torque Specifications

Torque specifications for the terminals on the **Customer Connections** board:

- Terminals on Connectors **TB4** and **TB7** require 0.5–0.6 Nm.
- Terminals on Connectors **TB1**, **TB2**, **TB3**, and **TB6** require 0.22–0.25 Nm.

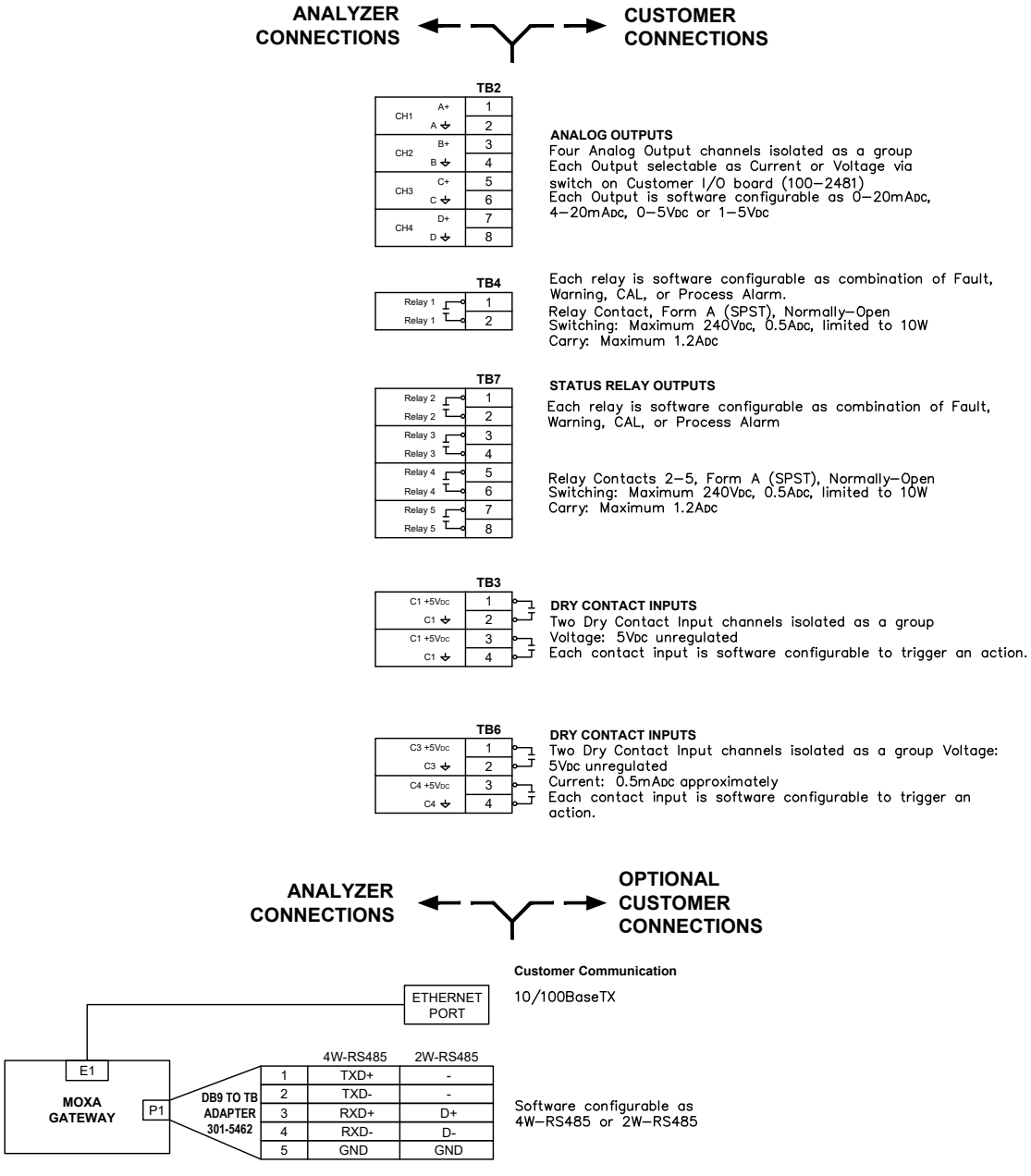


Figure 2-12.1.
Customer Connections.

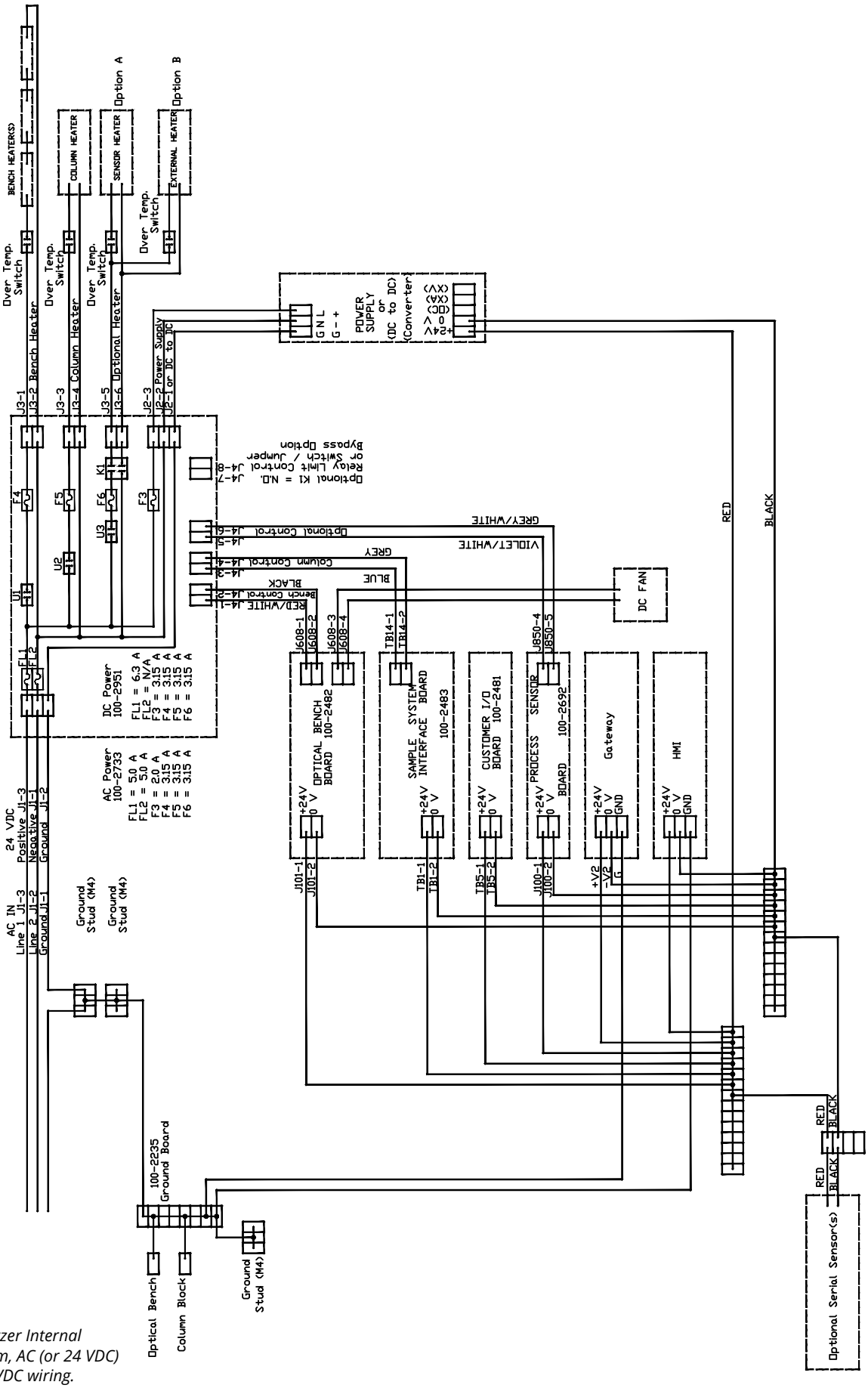


Figure 2-12.2.
9933RM Analyzer Internal Wiring diagram, AC (or 24 VDC) input and 24 VDC wiring.

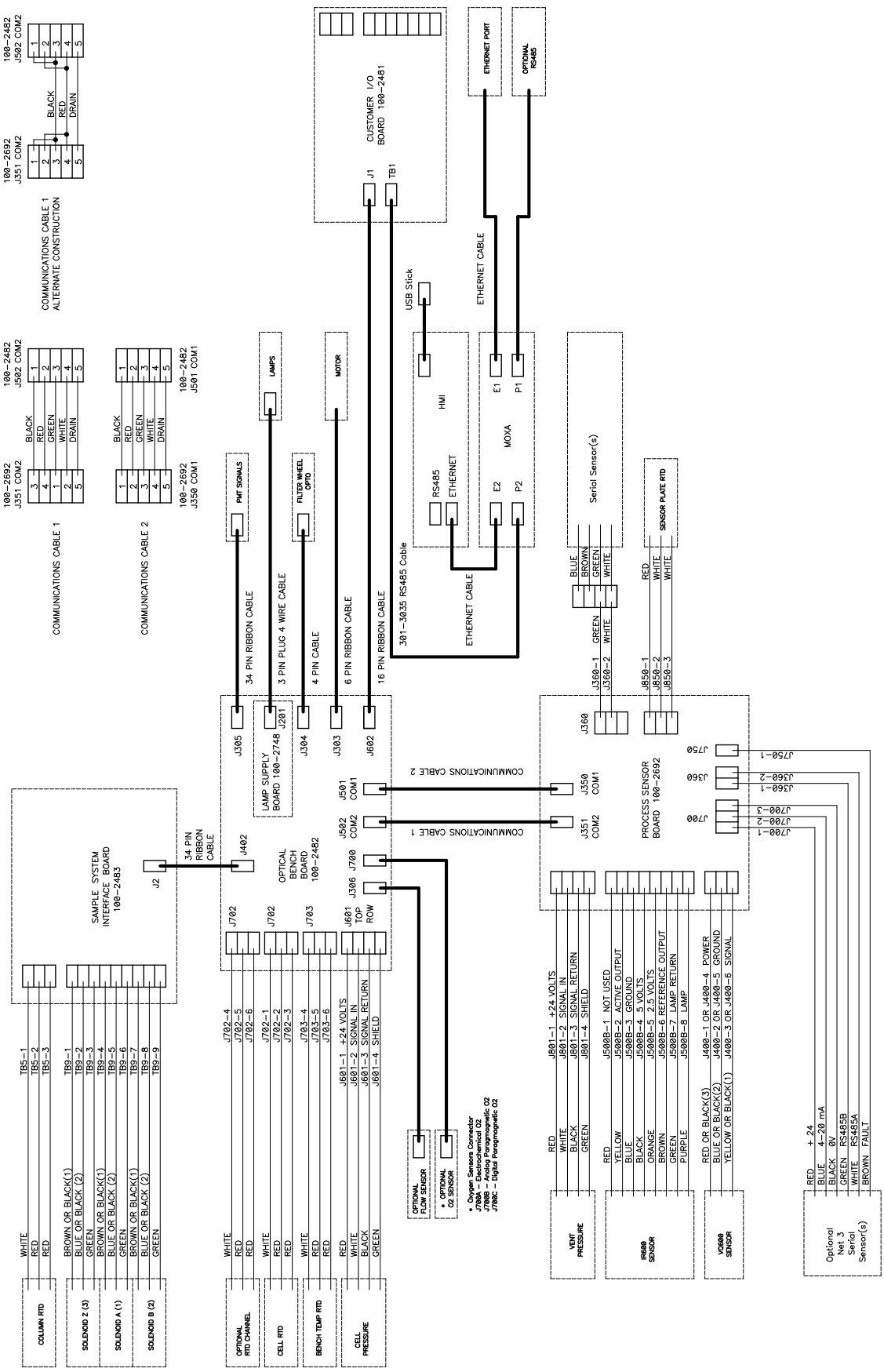


Figure 2-12.3.
9933RM Analyzer Sensor Wiring diagram.

Making AC (or DC) Power Connections

The operating voltage of the analyzer is indicated on the Product Label on the analyzer Rear Panel. Verify the operating voltage on the label agrees with the operating voltage indicated on the documentation supplied with the analyzer. If there is a discrepancy, contact the local distributor or the factory.

The 9933RM Analyzer is available in three operating voltage configurations (120 VAC, 240 VAC, or 24 VDC), configured by AMETEK at the factory per customer/end user requirements.

See the Product Label on the analyzer Rear Panel (Figure 2-8 in this Manual Supplement*) for the operating voltage for your analyzer before working on the analyzer.*

For electric-shock protection, the analyzer must be operated from a grounded power source that has a securely connected protective-ground contact.

Never operate the analyzer with the protective ground disconnected.

To connect AC (or DC) Power to the Division 2/Zone 2 analyzer:

1. Remove the top cover from the Analyzer Enclosure.
2. Remove the M20 or 1/2-inch plug from the Power Gland Plate.

*The power-disconnect switch (**supplied and installed by the customer/end user**), rated for appropriate supply voltage of the analyzer and at the installation site, and certified for the hazardous location (to satisfy local electrical codes, the switch must be certified by the local authority for the appropriate hazardous location). This switch is to be connected to and mounted near the 9933RM Analyzer, in an easily accessible area. The power-disconnect switch must be clearly labeled (e.g., "AMETEK 9933RM Analyzer Mains AC (or DC) Power-Disconnect Switch"). For safety reasons during maintenance, the power-disconnect switch allows the mains AC (or DC) power to be disconnected from the analyzer prior to performing service on the analyzer.*

*The breaker (**supplied and installed by the customer/end user**), rated for appropriate supply voltage (AC or DC) of the analyzer and at the installation site, and certified for the hazardous location (to satisfy local electrical codes, the breaker must be certified by the local authority for the appropriate hazardous location). This breaker must be connected upstream of the 9933RM analyzer power-disconnect switch. The breaker must be clearly labeled (e.g., "AMETEK 9933RM Analyzer Mains AC (or DC) Power Breaker"). For safety reasons during maintenance, this breaker allows the mains AC (or DC) power to be disconnected from the analyzer prior to performing service on the analyzer.*

*Strain relief or Cable Glands (**supplied and installed by the customer/end user**), to install in Division 2/Zone 2 Termination Enclosure (on the **AC Distribution** board) to secure the AC (or DC) Power wiring. The Strain relief or Cable Glands must be approved by the local authority for the appropriate hazardous location.*

3. The customer/end user must provide a strain relief or cable gland acceptable to the local inspection authority and certified for the area classification. **The customer/end user must also provide AC or DC Power using adequately sized wiring rated at 600 Volts and 105 °C (221 °F) and approved for the area classification.**

   Wiring and methods of connection must meet the requirements of the local inspection authority. Power must be provided via a mains breaker using adequately sized wiring and a Disconnect Switch rated for the area classification must be provided within close proximity of the analyzer to remove power to the device if servicing is required.

4. Feed the power cable through the Power Entry Port on the analyzer Rear Panel (see Figures 2-8 and 2-9).

   Connect the **GND** wire to the **Ground Stud** (see Figures 2-2, 2-12.2, and 2-12.3).

   Connect the **L1** and **L2(N)** wires to the terminals on the **AC Distribution** board (see Figures 2-2, 2-12.2, and 2-12.3).

5. Replace the top cover on the Analyzer Enclosure.

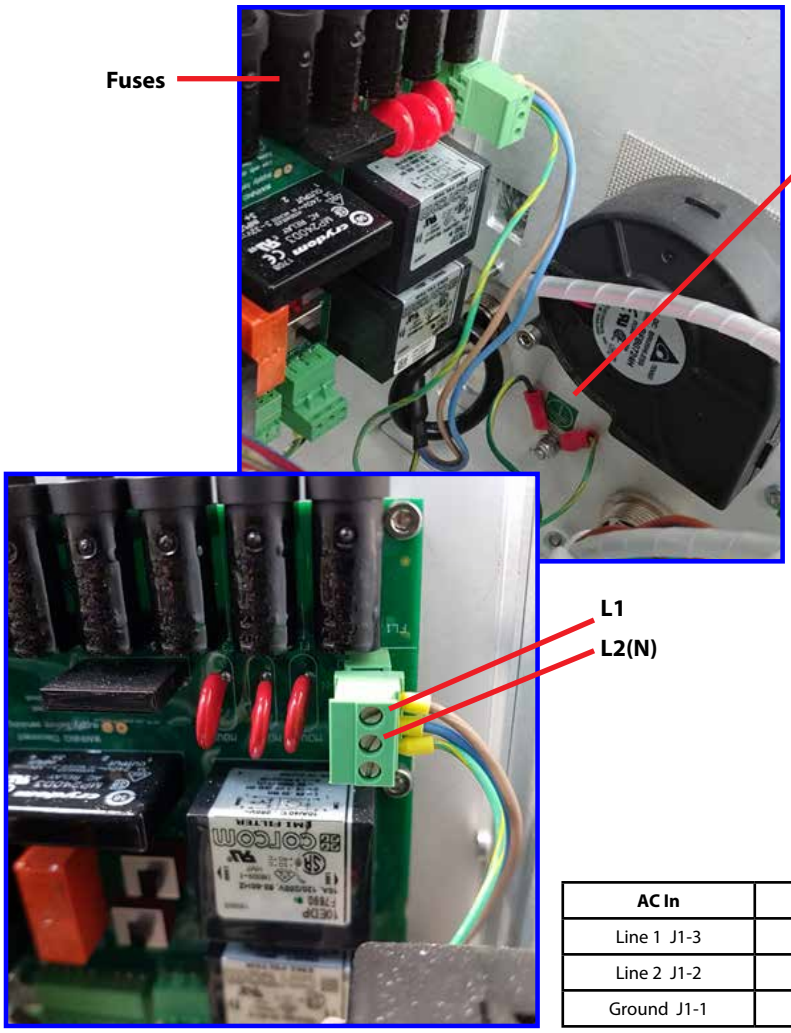


Figure 2-12.3.
AC Wiring, AC Distribution board, ground terminal/stud, and fuses.

AC In	24 VDC
Line 1 J1-3	Positive J1-3
Line 2 J1-2	Negative J1-1
Ground J1-1	Ground J1-2

Figure 2-12.4.
Fuse Label, 120/240 VAC 9933RM Analyzers, AC Distribution board.

F6 SPARE 3.15A 250V	F5 COLUMN 3.15A 250V	F4 BENCH 3.15A 250V	F3 DC PS 3.15 A 250V	FL2 LINE2 6.3 A 250V	FL1 LINE1 6.3 A 250V

Figure 2-12.5.
Fuse Label, 24 VDC 9933RM Analyzers, AC Distribution board.

F6 SPARE 3.15A 250V	F5 COLUMN 3.15A 250V	F4 BENCH 3.15A 250V	F3 PS 6.3A 250V

301-5714-A

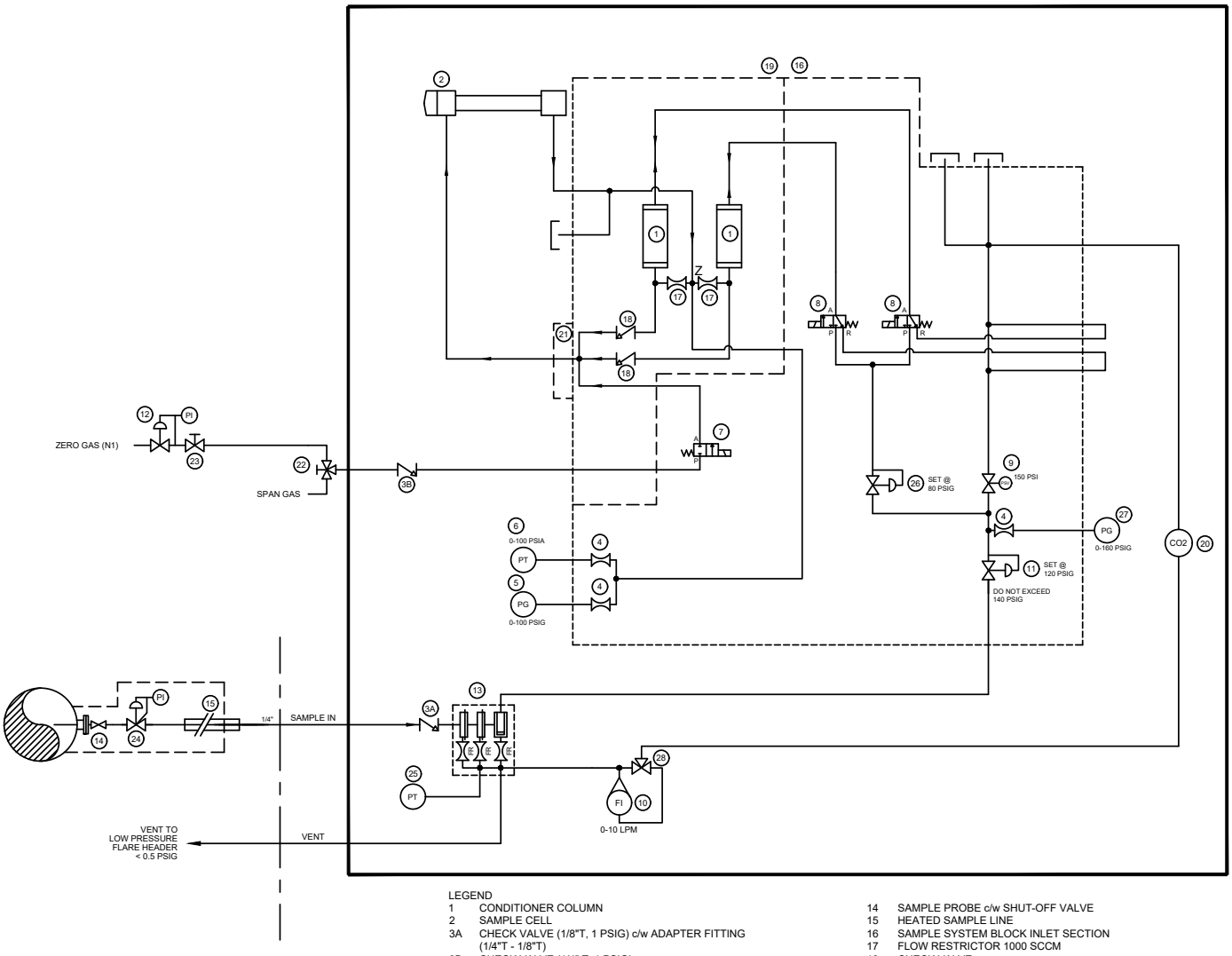
FL1 LINE1 12.5A 250V

Section/Chapter	Page(s)	Instructions
Pressure Leak Check (Chapter 2)	2-31	Use the information below in place of the corresponding information in the 9933 Gas Analyzer *User Manual*. Continue to use all other information under "Pressure Leak Check" in the 9933 Gas Analyzer *User Manual*, except where instructed in this *Manual Supplement*.

Pressure Leak Check

The analyzer has been checked at the factory for pressure leaks. However, fittings can loosen during transport, and are loosened/retightened whenever the Measuring Cell assembly has been removed and reinstalled (i.e., for service). Therefore, the entire analyzer sample system must be checked for leaks before any sample gas is introduced into the system for the first time or following the replacement of any tubes/lines/fittings or Measuring Cell parts, or after the removal/replacement of the Measuring Cell .

Section/Chapter	Page(s)	Instructions
Pressure Leak Check (Chapter 2)	2-32	In Step 3, use Figure 2-13.2 below in place of Figure 2-13.2 in the 9933 Gas Analyzer *User Manual*.



NOTE 1: SET ZERO GAS APPROXIMATELY 5-10 PSIG ABOVE THE SAMPLE PRESSURE.

LEGEND

1 CONDITIONER COLUMN
2 SAMPLE CELL
3A CHECK VALVE (1/8"T, 1 PSIG) c/w ADAPTER FITTING (1/4"T - 1/8"T)
3B CHECK VALVE (1/4" T, 1 PSIG)
4 FLOW RESTRICTOR 100 SCCM
5 SAMPLE/CELL PRESSURE GAUGE
6 SAMPLE/CELL PRESSURE TRANSDUCER (0-100 PSIA)
7 2 WAY SOLENOID (ZERO)
8 3 WAY SOLENOID (COLUMN SWITCHING)
9 RELIEF VALVE
10 FLOW INDICATOR (ROTAMETER), OPTIONAL OR FLOW METER
11 OPTIONAL SAMPLE GAS PRESSURE REGULATOR
12 ZERO GAS REGULATOR
13 FILTERBLOCK
14 SAMPLE PROBE c/w SHUT-OFF VALVE
15 HEATED SAMPLE LINE
16 SAMPLE SYSTEM BLOCK INLET SECTION
17 FLOW RESTRICTOR 1000 SCCM
18 CHECK VALVE
19 SAMPLE SYSTEM BLOCK COLUMN SECTION
20 OPTIONAL CO2 SENSOR
21 CHECK VALVE COVER
22 3-WAY BALL VALVE
23 2-WAY BALL VALVE
24 HEATED PRESSURE REGULATOR (SET @ 10 barg)
25 OPTIONAL SENSOR PRESSURE TRANSDUCER (0-60 PSIA)
26 SAMPLE CELL PRESSURE REGULATOR
27 OPTIONAL REGULATOR INLET PRESSURE GAUGE
28 3-WAY BALL VALVE (ROTAMETER BY-PASS)

Figure 2-13.2.
9933RM Analyzer plumbing/ flow diagram.

Section/Chapter	Page(s)	Instructions
Pressure Leak Check (Chapter 2)	2-33	In Step 4, disregard the information below. Typically, the Zero Gas Inlet fitting will be used to supply the Zero gas.

If the Sample Line is connected to the analyzer, disconnect it from the Sample Inlet fitting and connect Zero gas to the Sample Inlet fitting.

Section/Chapter	Page(s)	Instructions
Pressure Leak Check (Chapter 2)	2-33	In Step 5, use the Warning below in place of the Warning in the 9933 Gas Analyzer *User Manual*.

To avoid damaging the pressure transducer, do not set the pressure higher than the pressure transducer rating, either 0–210 kPa (0–30 PSIA), 0–700 kPa (0–100 PSIA), or 1380 kPa (200 PSIA) for the 0–3450 kPa (0–500 PSIA) transducer.

1380 kPa (200 PSIA) is the maximum Cell Pressure allowed for the analyzer certification. Refer to system drawings for your system's pressure transducer rating.

Section/Chapter	Page(s)	Instructions
Pressure Leak Check (Chapter 2)	2-35	In Step 10, disregard the information below. Typically, the Zero Gas Inlet fitting will be used to supply the Zero gas.

Disconnect the Zero gas from the Sample Inlet fitting and reconnect it to the Zero Gas fitting on the analyzer.

Reconnect the Sample Line to the Sample Inlet fitting on the analyzer. Keep the Sample Inlet valve closed.

Section/Chapter	Page(s)	Instructions
Powering Up the Analyzer (Chapter 2)	2-38–2-41	In Step 1, use the paragraphs below in place of the corresponding paragraphs in the 9933 Gas Analyzer *User Manual*. Continue to use all other information under "Powering up the Analyzer" in the 9933 Gas Analyzer *User Manual*, except where instructed in this *Manual Supplement*.

Powering Up the Analyzer

1. **Division 2/Zone 2 Analyzers:**
   Close the analyzer's AC (or DC) breaker, then switch the analyzer power disconnect switch to the On position. This will also apply power to the analyzer and its HMI.

   If the *splash* screen or **Connecting to controllers...** screen do not appear within approximately 30 seconds, cycle the analyzer power Off then On again. If this screen still does not appear, check the AC (or DC) power connection to the analyzer, and check the LEDs on the 24 VDC Power Supply. If they are Off, check the AC (or DC) power to ensure it is present, and check for blown fuses.

   If the HMI displays the message "**UV 99xx Controller not connected to HMI unit**" check the Communications Cables between the **Optical Bench** board and the Modbus Gateway on **P2** or between the Modbus Gateway on **E1** and the HMI to ensure they are properly connected (see the terminal assignments in the Customer Connections diagram, Figure 2-12.1 in this *Manual Supplement*). Also, see the Analyzer Internal Component Layout drawing (Figure 2-2) and the Analyzer Internal Wiring Diagram (Figure 2-12.2) for the locations of the connection points on the **Optical Bench** board and the Modbus Gateway.

   If the Communications Cables are properly connected between the **Optical Bench** board and the Modbus Gateway, the display will power up properly and will automatically switch to the **HOME** screen.

Section/Chapter	Page(s)	Instructions
Performing Start-Up Diagnostic Checks (Chapter 2)	2-42	Use the information below in place of the corresponding information in the 9933 Gas Analyzer *User Manual*. Continue to use the remaining Start-Up Diagnostic Checks in the 9933 Gas Analyzer *User Manual*.

Performing Start-Up Diagnostic Checks

Problem Encountered
Temperature zone values do not increase.

Corrective Action
Take appropriate safety precautions and:

- Check the fuses for the temperature zones to ensure they have not blown. These fuses are located on the **AC Distribution** board in the Analyzer Enclosure (see Figures 2-2 and 2-12.3).
- Check for proper wiring terminations for the appropriate temperature zone.

CONFIG→UV Bench Temp Control

Problem Encountered
The **Bench** or **Cell** temperature zone value is greater than 3 °C of its setpoint temperature (view the **UV Bench Temperature Control** screen to check its **Setpoint** value). A high temperature value may indicate a faulty RTD for the related temperature zone.

Corrective Action
Take appropriate safety precautions and check the related RTD for a short or an open circuit. If necessary, replace the RTD with an AMETEK-approved replacement part. Contact AMETEK Service for assistance.

Section/Chapter	Page(s)	Instructions
Viewing and Changing Sensor Data (Chapter 3)	3-45	Use the UV99XX Sensor screen and information below in place of the corresponding information in the 9933 Gas Analyzer *User Manual* (Part No. 10398-15-5).

UV99XX Sensors button

Press this button to view the **UV99XX Sensor Setup** screen, where you can configure sensor parameters.

CONFIG→Sensor Setup →UV99XX →Pres | Flow

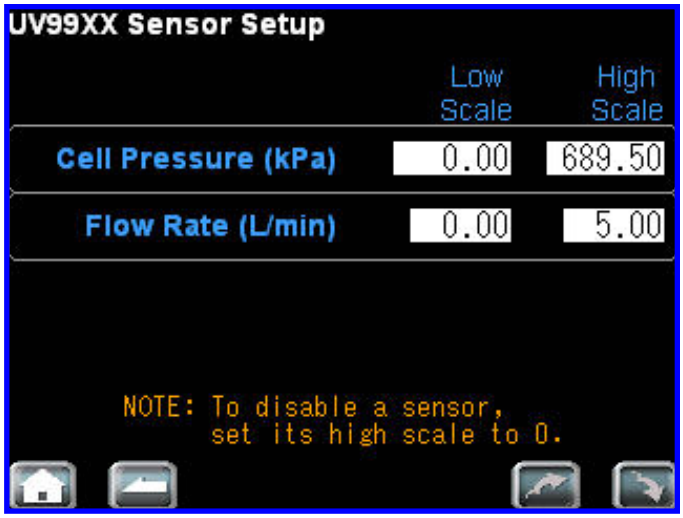


Figure 3-12.2. UV99XX Sensor Setup screen, 9933RM Analyzers.

To disable a sensor, set its high scale value to '0'.

Cell Pressure (mmHg)

Displays the **Cell Pressure *Low Scale*** and ***High Scale*** values.

Flow Rate (L/min)

Displays the **Flow Rate *Low Scale*** and ***High Scale*** values.

To set up sensor scaling parameters, enter a new **Low Scale** and/or **High Scale** value for **Cell Pressure** and/or **Flow Rate**. Press  to save the new values, or press  to cancel the changes and restore the previous values.

Section/Chapter	Page(s)	Instructions
Viewing and Changing Sample System Parameters (Chapter 3)	3-50	Use the Contact Device screen and information, below, in place of the corresponding information in the 9933 Gas Analyzer *User Manual*.

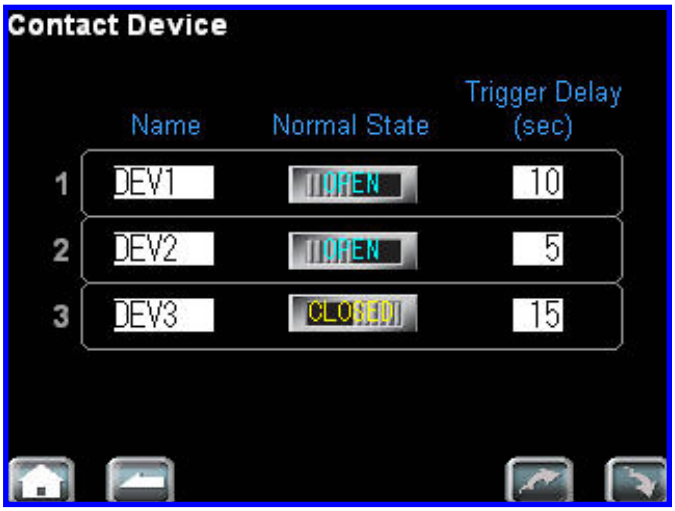


Figure 3-14.4.
Contact Device setup screen.

Name

This is used to enter a name for the contact device assigned to each solenoid, which is normally external equipment for the 9933RM Analyzer. A maximum of six characters can be used). The Normal State and Trigger Delay functionality is as described in the in the 9933 Gas Analyzer *User Manual*.

Section/Chapter	Page(s)	Instructions
Viewing and Changing Sample System Parameters (Chapter 3)	3-52	Disregard the Flow input and its description, shown below, in the 9933 Gas Analyzer *User Manual*. For the 9933RM Analyzer the Flow Sensor setup information, which is standard on 9933RM Analyzers, is displayed on the UV99XX Sensor Setup screen.

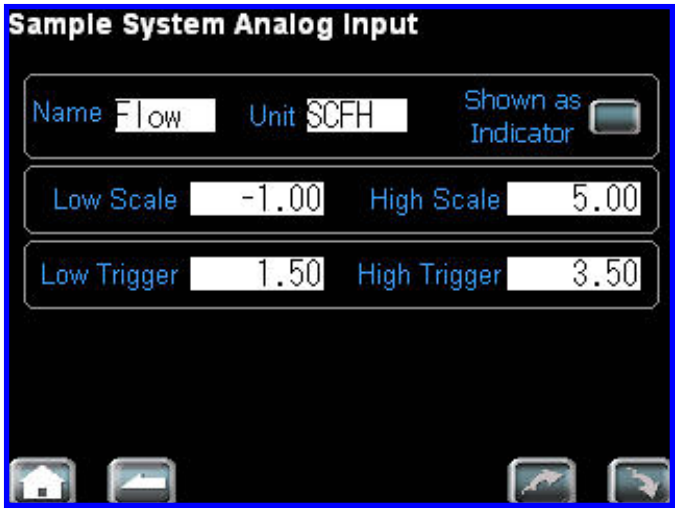


Figure 3-14.6.
Sample System Analog Input screen.

Name

This is used to enter a name for the contact device assigned to each solenoid, which is normally external equipment for the 9933RM Analyzer. A maximum of six characters can be used). The Normal State and Trigger Delay functionality is as described in the in the 9933 Gas Analyzer *User Manual*.

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Section/Chapter	Page(s)	Instructions
Analyzer Fuses, Spare Parts (Chapter 4)	4-6	Use the fuses and part numbers in "Analyzer Fuses, Spare Parts" below in place of the corresponding list in the 9933 Gas Analyzer *User Manual.* Use all other spare parts listed in the 9933 Gas Analyzer *User Manual* (Part No. 10398-15-5) for the 9933RM Analyzer.

Analyzer Fuses, Spare Parts

	120/240 V			24 V		
Part Description	**Part No.**	**Fuse Type**	**Chapter/ Figure No.***	**Part No.**	**Fuse Type**	**Chapter/ Figure No.***
Main (FL1)	301-0863	6.3 A	2-2, 2-12.3, 2-12.4	301-5763	12.5 A	2-2, 2-12.3, 2-12.5
Main (FL2)	301-0863	6.3 A	2-2, 2-12.3, 2-12.4	N/A	N/A	—
DC Power Supply (F3)	300-9245	3.15 A	2-2, 2-12.3, 2-12.4	301-0863	6.3 A	2-2, 2-12.3, 2-12.5
Optical Bench (F4)	300-9245	3.15 A	2-2, 2-12.3, 2-12.4	300-9245	3.15 A	2-2, 2-12.3, 2-12.5
Column Heater (F5)	300-9245	3.15 A	2-2, 2-12.3, 2-12.4	300-9245	3.15 A	2-2, 2-12.3, 2-12.5
Spare (F6)	300-9245	3.15 A	2-2, 2-12.3, 2-12.4	300-9245	3.15 A	2-2, 2-12.3, 2-12.5

* Figure numbers are in this *Manual Supplement*.

Section/Chapter	Page(s)	Instructions
Column Block Assembly Spare Parts (Chapter 4)	4-7	Use the parts and part numbers in "Column Block Assembly Spare" below in place of the corresponding list in the 9933 Gas Analyzer *User Manual.* Use the notes in the 9933 Gas Analyzer *User Manual*.

Column Block Assembly Spare Parts

Description	Part No.	Chapter/ Figure No.*
Check Valve (Qty 2 required)	100-1788	4-7.2
Check Valve Cover O-ring, Size 020 O-ring	301-4381	4-7.2
Flow Restrictor, Set of 2 (See Note 1) c/w O-ring, Aflas, Size 008 (Part No. 300-6241)	100-1794	4-7.2
Flow Restrictor Cover O-ring, Size 022 O-ring	301-4379	4-7.2
Column Block – Inlet Block O-rings: Size 006 O-ring (Qty 2 required) Size 020 O-ring (Qty 2 required) Size 021 O-ring (Qty 1 required)	 300-6244 301-4381 301-4380	4-7.2
1-Turn Column (See Note 2)	100-2886	4-7.3
2-Turn Column (See Note 2)	100-2887	4-7.3
4-Turn Column (See Note 2)	100-2888	4-7.3
Column O-rings, Size 022 O-ring (Qty 3 required for each Column) (See Note 3) – Order these if reusing Columns	301-4378	4-7.3
Balston Filter (Qty 2)	100-2868	4-7.3

* Figure numbers are in the 9933 Gas Analyzer *User Manual.*

Section/Chapter	Page(s)	Instructions
Cleaning and Replacing Parts (Chapter 4)	4-16–4-17	Use the information in "Cleaning and Replacing Parts" in the 9933 Gas Analyzer *User Manual,* substituting "Analyzer Enclosure" in place of the three separate enclosures used by the 9933 Gas Analyzer.

Section/Chapter	Page(s)	Instructions
Safely Powering Down the 9933 Gas Analyzer to Perform Maintenance (Chapter 4)	4-18–4-19	Use the information below for the 9933RM Analyzer in place of the corresponding information in the 9933 Gas Analyzer *User Manual*.

Safely Powering Down the 9933RM Gas Analyzer to Perform Maintenance

This section describes how to safely prepare the analyzer and power it down before performing maintenance/service procedures on it.

For certain maintenance procedures, the analyzer AC or DC mains power must be removed.

Before powering down the analyzer read and follow the Warnings and Cautions under "Safety Considerations" in the Maintenance and Troubleshooting chapter of the 9933 Gas Analyzer User Manual*, and under "Warnings, Cautions, and Notes" following the Table of Contents near the beginning of the* User Manual.

Hazardous Locations
Before proceeding, test the area around the analyzer for explosive gases and proceed only when the area is found to be safe.

Do not power up/down the analyzer or any computer if there is an explosive gas atmosphere present.

To safely power down the analyzer and prepare it for maintenance:

1. From the **Calibration** screen, tap the **Z** button to energize the Zero solenoid, which forces the **Flow Control** to ***Zero Gas Flow*** mode.

   Allow the analyzer to purge its sample system with Zero gas for 2–3 minutes to clear the Measuring Cell and tubing of process gas.

2. After the purge is complete, close the valve on the Sample Inlet line to isolate the analyzer from the sample stream.

3. From the **Calibration** screen, press **NS** (***Non-Sampling***) to shut off the sample gas flow (de-energizes all Flow Control solenoids).

   Bleed down the sample system to atmospheric pressure (check gauge).

To avoid tearing the Membrane Filters in the Filterblock, always bleed down the sample system pressure on the downstream (outlet) side of the Filterblock. Pressure differentials of more than 210 kPa (30 PSI) from the inlet side to the outlet side can tear the Filters and they will have to be replaced.

Close the valve on the Vent Line (or remove the Vent Line and cap the Vent Outlet).

Hazardous Locations
Before continuing with Step 4, test the area around the analyzer for explosive gases and proceed only when the area is found to be safe.

Do not power up/down the analyzer or any computer if there is an explosive gas atmosphere present.

4. Power down the analyzer.

   Switch the analyzer power-disconnect switch to the Off position, then Open the analyzer's breaker.

Wait 5 minutes to allow the high-voltage capacitors in the source-lamp power supply to discharge.

5. Remove the Analyzer Enclosure cover.

The components inside the analyzer enclosures are hot. Allow the components to cool down enough to ensure safe handling before servicing. Use high temperature gloves if necessary.

   The analyzer is ready to be worked on.

6. Complete the required maintenance on the analyzer (discussed later in this chapter) and then take all necessary steps to power up the analyzer and return it to normal operation, as discussed in the section "Safely Powering Up the 9933 Gas Analyzer Following Maintenance" in this chapter.

Section/Chapter	Page(s)	Instructions
Safely Powering Up the 9933 Gas Analyzer to Perform Maintenance (Chapter 4)	4-20	Use the information below for the 9933RM Analyzer in place of the corresponding information in the 9933 Gas Analyzer *User Manual*.

Safely Powering Up the 9933RM Gas Analyzer Following Maintenance

This procedure assumes all maintenance or service on the analyzer has been completed as described in the maintenance procedures described later in this chapter.

Hazardous Locations
Before proceeding, test the area around the analyzer for explosive gases and proceed only when the area is found to be safe.

Do not power up/down the analyzer or any computer if there is an explosive gas atmosphere present.

To power up the analyzer and prepare it for normal operation:

1. If gas fittings were disconnected/reconnected while servicing the analyzer, perform a leak (pressure) check on the sample system fittings to ensure there are no leaks in the sample system. Refer to "Pressure Leak Check" in this *Manual Supplement*.

   After you are sure there are no leaks, return to this procedure and continue with the remaining steps.

2. Replace the Analyzer Enclosure cover and secure it with its screws.

3. Close the analyzer's breaker, then switch the analyzer power-disconnect switch to the On position. This will also apply power to the analyzer's HMI. The analyzer will start up and begin its warming period.

   If there are problems encountered during power-up, see the "Performing Start-Up Diagnostics Checks" in Chapter 2 of the 9933 Gas Analyzer *User Manual* (and this *Manual Supplement*) for help in diagnosing and correcting problems.

4. Allow the analyzer to warm up (approximately 2–4 hours) and stabilize.

5. Open the valve on the Vent Line (or remove the cap from the Vent Outlet and reconnect the Vent Line to the analyzer).

   From the **Calibration** screen, tap the **Z** button to energize the Zero solenoid, which forces the **Flow Control** to ***Zero Gas Flow*** mode.

   Purge the analyzer sample system with Zero gas for 2–3 minutes.

6. Change the **Flow Control** to ***Auto*** (Analyzer Automatic Control) for normal operating conditions.

   Open the Sample Inlet valve to allow the flow of sample gas into the analyzer sample system.

The analyzer is ready to begin sampling gas.

Section/Chapter	Page(s)	Instructions
Measuring Cell Maintenance (Chapter 4)	4-22	Use Step 2 below in place of Step 2 in the section "Measuring Cell Maintenance" in the 9933 Gas Analyzer *User Manual*.

2. With the Analyzer Enclosure cover removed (Figure 4-3), remove the Measuring Cell from the analyzer. To do this:

Before removing the Measuring Cell, note the position of the sample tube fittings. This will be helpful when replacing the Cell later. If it is safe to do so, take a picture of the tubing from the Measuring Cell to the Sample System Block before beginning.

Various lengths of screws are encountered during disassembly. Take note of where each length is used and be sure to replace the appropriate screws in their original locations when reassembling the Measuring Cell later.

a. Disconnect the Sample Inlet Line fitting on the Reflector Block end of the Cell. Disconnect the fitting on the other end of the Sample Inlet tube (on the top of the Sample System Block). Remove the tubing.

b. Disconnect the Vent Line fitting from the Cell (near the Optical Bench Assembly). Disconnect the fitting on the other end of the Vent Line tube (on the side of the Sample System Block). Remove the tubing.

c. Remove the six (6) M45 x 35 screws that secure the Cell to the Optical Bench.

d. Remove the two (2) screws from the blue Cell Clamp and remove the top part of the clamp, taking care not to let the Mirrored Window drop out when removing it. **Do not touch the Mirror surface with your fingers. Use a soft, lint-free cloth to grasp the Mirrored Window.**

   Grasp the edge of the Mirrored Window and carefully remove it, **then place it on a lint-free cloth Mirror side up**. Remove the o-rings from the Cell Body and Optical Bench Aperture Plate.

   Remove the Cell from the analyzer and take it to a workbench to work on it.

Section/Chapter	Page(s)	Instructions
Measuring Cell Maintenance (Chapter 4)	4-23	Use Figure 4-3 below in place of Figure 4-3 in the 9933 Gas Analyzer *User Manual*.

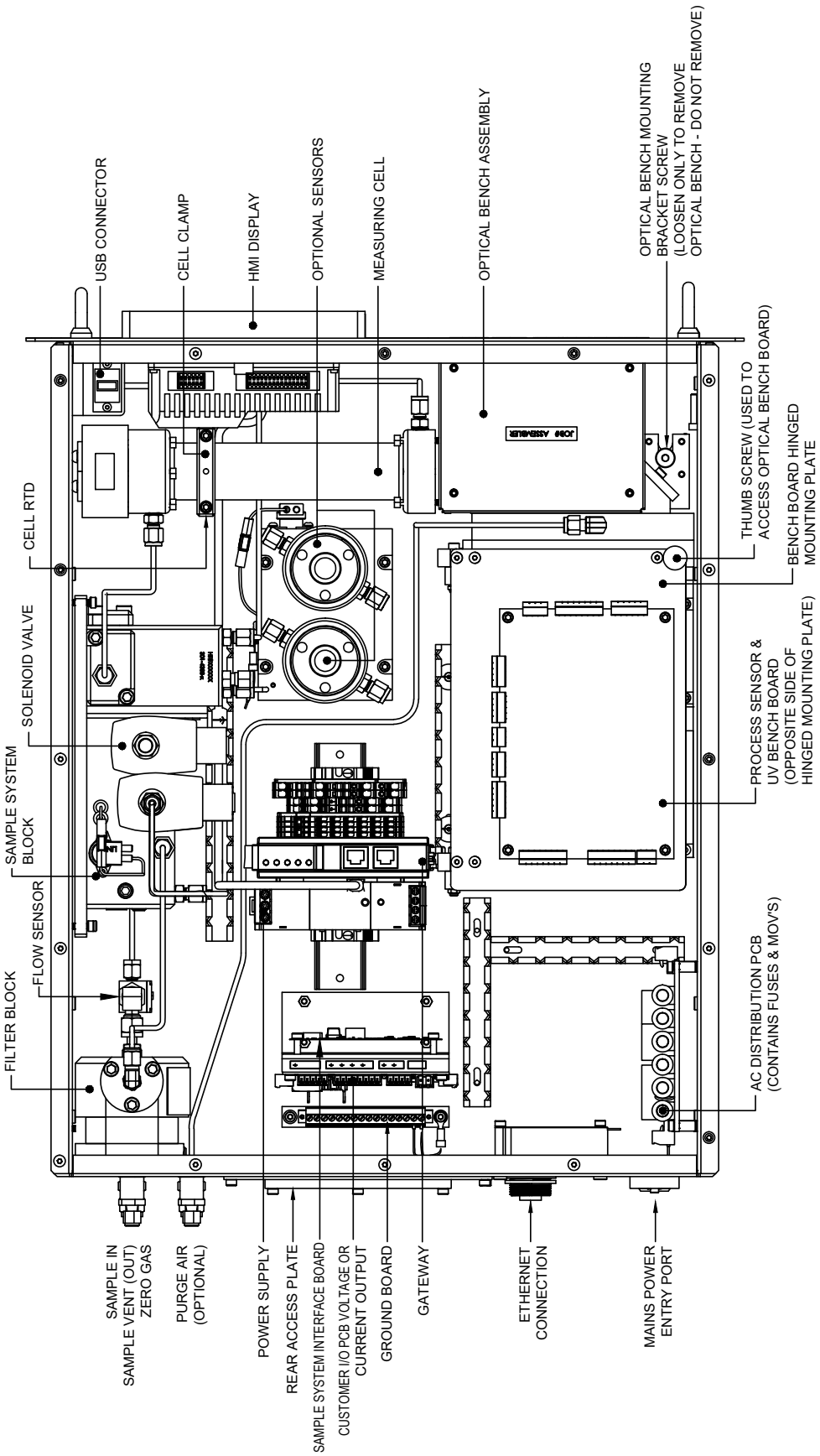


Figure 4-3. Analyzer internal component layout, all options shown.

Section/Chapter	Page(s)	Instructions
Measuring Cell Maintenance (Chapter 4)	4-26	Omit Step 3-a in the section "Measuring Cell Maintenance" in the 9933 Gas Analyzer *User Manual*. This step does apply to the 9933RM Analyzer.

Section/Chapter	Page(s)	Instructions
Measuring Cell Maintenance (Chapter 4)	4-27	Use Step 4-b below in place of Step 4-b in the section "Measuring Cell Maintenance" in the 9933 Gas Analyzer *User Manual*.

b. **Standard Range Cell** and **Low Range Cell**:
Install (1) new o-ring (Part No. 100-2009) in the end of the Measuring Cell and one (1) new o-ring (Part No. 100-2009) in the Optical Bench Aperture Plate.

Section/Chapter	Page(s)	Instructions
Measuring Cell Maintenance (Chapter 4)	4-28	Use Step 5 below in place of Step 5 in the section "Measuring Cell Maintenance" in the 9933 Gas Analyzer *User Manual*.

5. Replace and secure the Measuring Cell to the Optical Bench in the Analyzer Enclosure. To do this:

   a. **Taking care to grasp the Mirror only by its edge**, place the Mirrored Window (Part No. 300-6288) – oriented with the Mirror side away from the Measuring Cell – on the Cell. Taking care to ensure the Window does not slide out of position, and with the Cell properly oriented (Sample Inlet fitting on the Reflector Block end facing toward the Sample System Block), place the Cell against the Optical Bench Aperture Plate, and secure it to the Optical Bench Aperture Plate with the six (6) M5 x 35 screws removed earlier.

      Tighten the screws in a cross pattern to secure the Measuring Cell assembly to the Optical Bench.

   b. Replace the Vent Line tubing. Hand-tighten the connection near the Optical Bench Assembly and then the connection on the side of the Sample System Block). Tighten both fittings.

   c. Replace the Sample Inlet Line tubing. Hand-tighten the connection near the Reflector Block end of the Cell and then the connection on the top of the Sample System Block. Tighten both fittings.

Section/Chapter	Page(s)	Instructions
Replacing the UV Lamps and Performing an Auto Setup (Chapter 4)	4-30–4-36	For the 9933RM Analyzer, the Optical Bench must be removed to replace the Lamps. When replacing the lamps in the 9933RM, use the procedure below in place of the section "Replacing the UV Lamps and Performing an Auto Setup" in the 9933 Gas Analyzer *User Manual*.

Replacing the UV Lamps and Performing an Auto Setup

See Figures 4-3 (in this *Manual Supplement*) and 4-5.2 (in the 9933RM Gas Analyzer *User Manual*) for assistance in locating and identifying the hardware components encountered while replacing the UV lamps.

The Optical Bench must be removed from the analyzer when replacing its UV lamps. While replacing the UV lamps, refer also to the section "Replacing the UV Lamps and Performing an Auto Setup" in the 9933 Gas Analyzer User Manual.

To replace the UV lamps and perform an Auto Setup:

1. Take all necessary steps to safely prepare the analyzer and power it down before performing this procedure. See "Safely Powering Down the 9933RM Gas Analyzer to Perform Maintenance" (in this *Manual Supplement*) for details.

Hazardous Locations
Before proceeding, test the area around the analyzer for explosive gases and proceed only when the area is found to be safe.

Do not power up/down the analyzer or any computer if there is an explosive gas atmosphere present.

2. Remove the Analyzer Enclosure cover and remove the Optical Bench/Measuring Cell assembly:

    a. Loosen the thumbscrew on the Optical Bench and swing the hinged Bench Board Mounting Plate (see Figure 4-3 in this *Manual Supplement*) upward to access the **UV Bench Controller** board **(**mounted on the backside of the Bench Board Mounting Plate).

b. Disconnect the four wiring connectors (indicated with purple arrows in Figure 4-5.3):

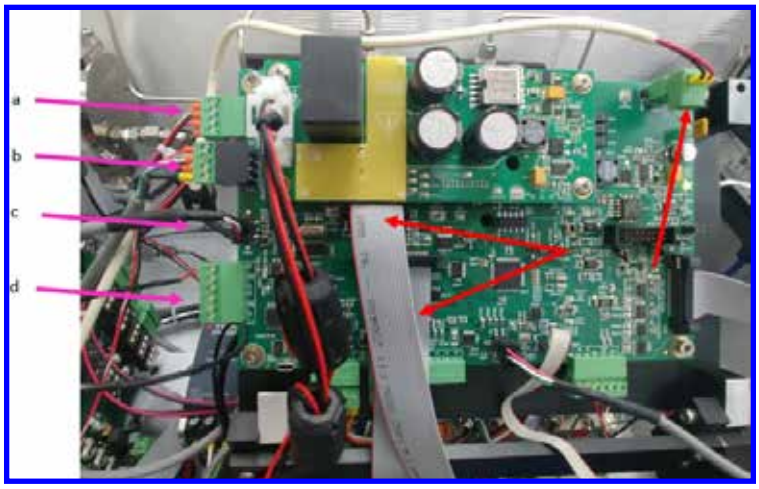


Figure 4-5.3.
Locating the wiring connectors.

i. Locate the Fan wires and disconnect its connector from the upper four-pin connector at location '**a**' on the **Optical Bench** board.

ii. Locate the Vent Pressure Transducer wires and disconnect its keyed connector (upper location of the BLACK four-pin header) at location '**b**'. Note that the lower location on this connector is not used.

iii. Locate the Flow Sensor cable connector and disconnect it at location '**c**' (**J306**, see Flow Sensor in Figure 4-5.4).

Figure 4-5.4.
Locating the Flow Sensor cable.

iv. Locate the Cell Temperature cable connector and disconnect it at location '**d**'.

c. Locate and disconnect the two ribbon cables and the two-pin connector with RED and BLACK wires (see red arrows in Figure 4-5.3).

d. Locate the 5-pin Serial/Ethernet cable, from the Gateway Serial/Ethernet Module (noted by red arrow – shown disconnected – in Figure 4-5.5).

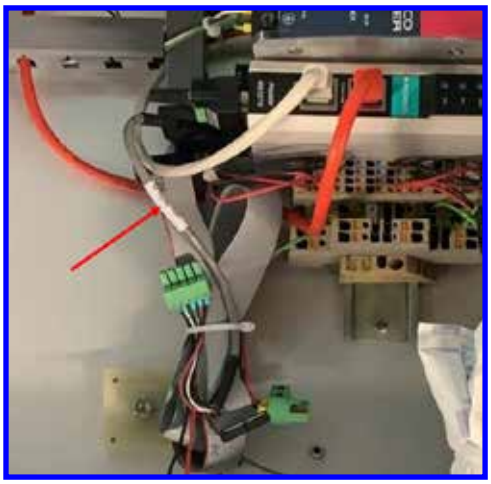


Figure 4-5.5.
Locating the 5-pin Serial/ Ethernet cable.

Disconnect this 5-pin Serial/Ethernet cable from **J501** on the **Optical Bench** board (middle connector, as shown in Figure 4-5.6).

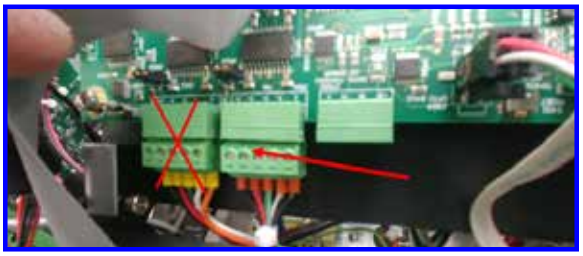


Figure 4-5.6.
Locating the 5-pin Serial/ Ethernet cable (connects to the Optical Bench board).

e. Locate the Ground terminal shown in Figure 4-5.7 and disconnect it from the Ground terminal on the Optical Bench.

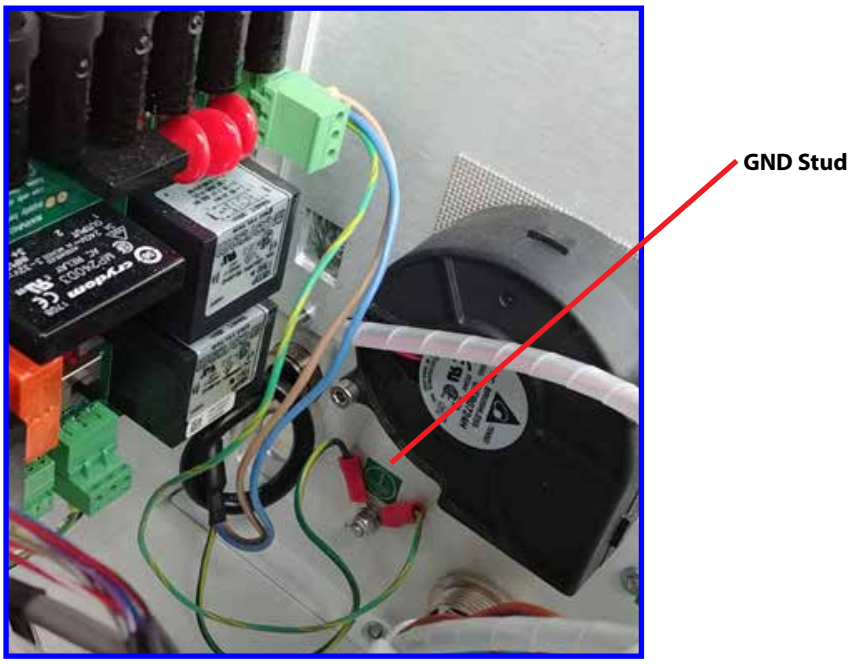


Figure 4-5.7.
Locating the ground terminal (stud).

f. Note the locations of the Swagelok fittings and the positions of the tubing between the Measuring Cell and the sample system components. Disconnect the fittings at the Measuring Cell and the fittings at the sample system components, and remove the tubes.

g. Remove the two (2) screws from the blue Measuring Cell Mounting Bracket (location '**a**', Figure 4-5.8) and remove the top part (Cell Clamp). Set these parts aside.

Locate the two (2) screws used to anchor the Optical Bench (locations '**b**' and '**c**' in Figure 4-5.8, and 4-5.9 with Optical Bench removed). Loosen – **but do not remove** – the two (2) anchor screws just enough to allow them to move away from the blue slotted anchors on the Optical Bench.

*To access the anchor screw under the Optical Bench (location '**c**', Figure 4-5.8), loosen the thumb screw and swing the hinged mounting plate upward, then use a ball driver to loosen the screw.*

Figure 4-5.8.
Locating the Optical Bench anchor screws and blue Measuring Cell Mounting Bracket and Cell Clamp.

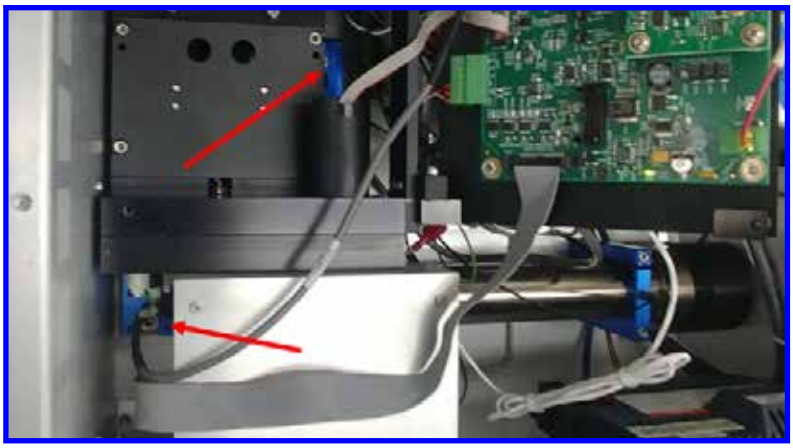


Figure 4-5.9.
Optical Bench mounting locations, shown with the hinged mounting plate in the "up" position.

The mounting plate must be down and secured when removing/replacing the Optical Bench.

Lower the hinged Bench Board Mounting Plate and tighten its thumb-screw, then slide the Optical Bench/Measuring Cell assembly toward the rear of the analyzer (away from the front of the analyzer) until it is free of the slots.

Carefully lift the Optical Bench/Measuring Cell assembly upward and out of the Analyzer Enclosure.

3. Take the Optical Bench/Measuring Cell assembly to a static-safe work bench to work on it.

4. Replace the lamps.

   Refer to Step 2 in the section "Replacing the UV Lamps and Performing an Auto Setup" in the 9933 Gas Analyzer *User Manual* to replace the lamps, then return to this procedure and continue with Step 5.

5. Replace the Optical Bench/Measuring Cell assembly.

   a. Carefully lower the Optical Bench/Measuring Cell assembly into the analyzer enclosure, while aligning the Measuring Cell with its blue Cell Mounting Bracket and the two (2) anchor screws on the bottom of the Analyzer Enclosure with the blue slotted anchors on the Optical Bench (Figure 4-5.9). Slide the assembly toward the front of the analyzer until the Optical Bench anchor screws are fully engaged in the two blue slotted anchors.

*To access the anchor screw under the Optical Bench (location '**c**', Figure 4-5.8), loosen the thumb screw and swing the hinged mounting plate upward, then use a ball driver to tighten the screw.*

   b. Ensure the Cell is seated properly in its blue Mounting Bracket and then tighten the two (2) anchor screws to lock the Optical Bench into place. Replace the Cell Clamp and the two (2) screws to secure the Cell in place.

      Replace the tubing sections, then reconnect the Swagelok fittings to the Measuring Cell and tighten them.

      Locate the Ground terminal shown in Figure 4-5.7 and connect it to the Ground terminal on the Optical Bench.

c. Replace the Lamp Cover, being careful not to damage the lamp wires for the lamps.

d. Connect the 5-pin Serial/Ethernet cable – from the Gateway Serial/Ethernet Module (noted by red arrow – shown disconnected in Figure 4-5.5) – to **J501** on the **Optical Bench** board (middle connector, as shown in Figure 4-5.6).

e. Connect the two ribbon cables and the two-pin connector with RED and BLACK wires on the **Optical Bench** board (see red arrows in Figure 4-5.3).

f. Connect the remaining four connectors shown in Figure 4-5.3 (indicated with purple arrows), as follows:

   i. Connect the Fan wiring connector to the upper four-pin connector at location '**a**' on the **Optical Bench** board.

   ii. Connect the Vent Pressure Transducer wiring connector to its keyed connector (will only connect to the upper location of the black four-pin header) at location '**b**'. Note that the lower location on this connector is not used.

   iii. Connect the Flow Sensor cable connector at location '**c**'.

   iv. Connect the Cell Temperature cable connector) at location '**d**'. This should be installed last.

   v. Check to ensure all connectors and wires have been connected/terminated.

6. Carefully lower the **Optical Bench** board mounting bracket into place and secure it using its thumb screw.

7. Perform a leak (pressure) check on the gas fittings that were disconnected/reconnected to ensure there are no leaks in the sample system. Refer to "Pressure Leak Check" in this *Manual Supplement* and in the 9933 Gas Analyzer *User Manual* for information on how to perform the leak check.

   After you are sure there are no leaks, return to this procedure and continue with the remaining steps to complete the lamp replacement.

8. Take the necessary steps to safely power up the analyzer and allow it to stabilize for approximately five (5) minutes before continuing.

9. Purge the analyzer with Zero gas for 2–3 minutes and continue to flow Zero gas until the end of this procedure.

10. While referring to the section "Replacing the UV Lamps and Performing an Auto Setup" in the 9933 Gas Analyzer *User Manual*:

    a. Follow Step 5 to perform an Auto-Setup.

    b. Follow Step 6 to align and adjust the position of the lamps.

    c. Follow Step 7 to tighten the Locking Screw.

    d. Follow Step 8 to tighten the Lamp Adjusting Screw.

    e. Follow Step 9 to perform another Auto-Setup.

11. Replace the Analyzer Enclosure cover and secure it with its screws.

12. Manually Zero and Span the analyzer.

13. Return the analyzer **Flow Control** mode to ***Auto***.

14. Open the isolation valve on the Sample Probe and the Vent Valve to allow the flow of sample gas through the sample system.

15. Adjust the sample gas flow rate to the normal operating flow rate.

The procedure is complete.

Section/Chapter	Page(s)	Instructions
Sample System Block/Column Block Maintenance (Chapter 4)	4-38	Use Steps 1–3 and Figure 4-7.1 below (and Page 58) in place of Steps 1–3 and Figure 4-7.1 in the 9933 Gas Analyzer *User Manual*. Continue to use the remaining information – including Figure 4-7.2 – in the 9933 Gas Analyzer *User Manual*.

Sample System Block/Column Block Maintenance

To clean and replace parts in the Sample System Block/Column Block (Figures 4-7.1 in this *Manual Supplement* and 4-7.2 in the 9933 Gas Analyzer *User Manual*):

1. Take all necessary steps to safely prepare the analyzer and power it down before performing this procedure. See "Safely Powering Down the 9933RM Gas Analyzer to Perform Maintenance" in this *Manual Supplement* for details.

Hazardous Locations
Before proceeding, test the area around the analyzer for explosive gases and proceed only when the area is found to be safe.

Do not power up/down the analyzer or any computer if there is an explosive gas atmosphere present.

2. Disconnect and remove all tubing sections to and from the Column Block, including the Teflon tube to the Filterblock. Do not bend the tubing to make room when removing the Sample System Block/Column Block assembly.

3. Loosen – but do not remove – the four (4) screws that secure the Sample System Block/Column Block mounting plate to the Analyzer Enclosure wall. Note that there are two (2) key hole slots on the right side and two (2) open screw slots on the left side.

   Slide the Sample System Block/Column Block assembly toward the Rear Panel and then pull the assembly outward to release it from its mounting screws. Remove the assembly from the Analyzer Enclosure and rest it on top of the Analyzer Enclosure's front corner to work on it (**use a Top Cover Panel screw in one of the screw holes to secure it to the Analyzer Enclosure**).

Follow Steps 4–7 in the 9933 Gas Analyzer User Manual *to clean and replace parts in the Sample System Block/Column Block assembly. Note that not all parts may require replacement; perform only the parts required.*

After cleaning and replacing parts in this assembly, return to this Manual Supplement *to replace the assembly in the analyzer, discussed in the next section.*

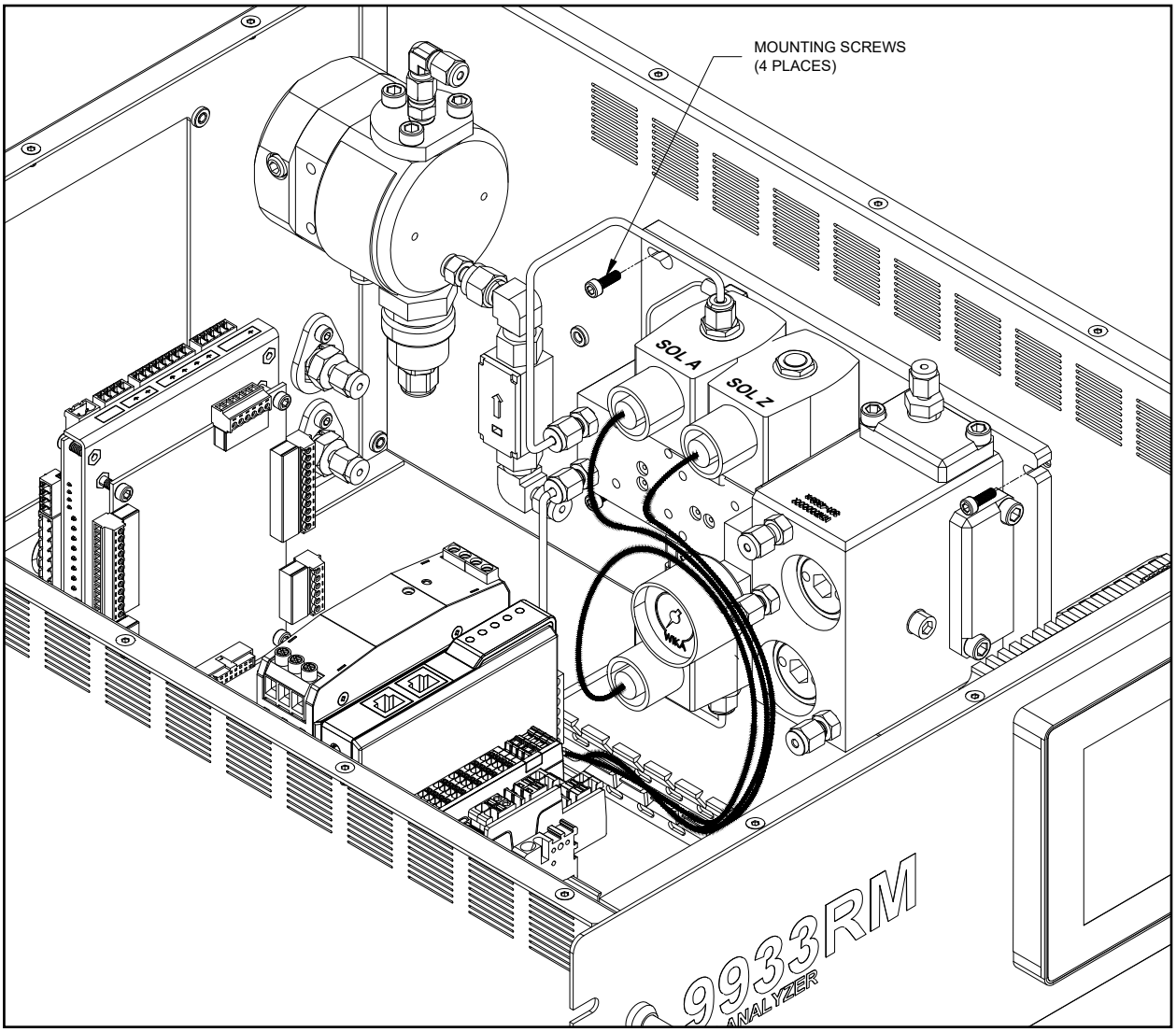


Figure 4-7.1.
Sample System Block/Column Block assembly removal, 9933RM Analyzer.

Section/Chapter	Page(s)	Instructions
Sample System Block/Column Block Maintenance (Chapter 4)	4-42	Use Steps 8–9 below in place of Steps 8–9 in the 9933 Gas Analyzer *User Manual*. Use Figure 4-7.2 from the *User Manual*.

After cleaning and replacing parts in this assembly, prepare to replace the assembly back in the analyzer by removing the screw that was used to secure it to the top of the Analyzer Enclosure.

8. Grasp the Sample System Block/Column Block assembly and lower it into the Analyzer Enclosure. Align the two (2) open slots on the right side of the assembly with two (2) right-side mounting screws and move the assembly toward the front of the analyzer until the other two (2) screws are over the key hole slots on the left side of its mounting plate. Move the assembly toward the enclosure wall, then slide the assembly toward the front of the analyzer to fully engage all four (4) screws in their slots. Tighten the screws to secure the Sample System Block/Column Block assembly to the enclosure wall.

   Replace and reconnect all tubing sections, including the Teflon tube to the Filterblock, to and from the Column Block. Take care to avoid bending the tubing.

9. Take all necessary safety precautions and perform a leak check on the sample system fittings that were disconnected. Refer to "Pressure Leak Check" in this *Manual Supplement* and in the 9933 Gas Analyzer *User Manual* for information on how to perform the leak check.

   After you are sure there are no leaks, power up the analyzer and prepare it for normal operation, as described under "Safely Powering Up the 9933RM Gas Analyzer Following Maintenance" in this *Manual Supplement*.

The procedure is complete.

Section/Chapter	Page(s)	Instructions
Replacing Parts in the Filterblock (Chapter 4)	4-43–4-45	Use Steps 1–3, Step 6, Step 8, and Figure 4-8 below and in the following pages in place of Steps 1–3, Step 6, Step 8, and Figure 4-8 in the 9933 Gas Analyzer *User Manual*. Continue to follow all other Steps in the 9933 Gas Analyzer *User Manual*.

Replacing Parts in the Filterblock

To clean and replace parts in the Filterblock (Figure 4-8):

1. Take all necessary steps to safely prepare the analyzer and power it down before performing this procedure. See "Safely Powering Down the 9933RM Gas Analyzer to Perform Maintenance" in this *Manual Supplement* for details.

Hazardous Locations
Before proceeding, test the area around the analyzer for explosive gases and proceed only when the area is found to be safe.

Do not power up/down the analyzer or any computer if there is an explosive gas atmosphere present.

2. Disconnect and remove the Sample Inlet tube from the Sample Inlet port on the analyzer Rear Panel.

   Disconnect the fitting at the top of the Filterblock and at the Sample System Block/Column Block assembly. Remove the tube. Do not bend the tubing to make room when removing the Filterblock.

   Disconnect and remove the Vent outlet fitting (black Teflon tube) from the Vent fitting bulkhead inside the analyzer.

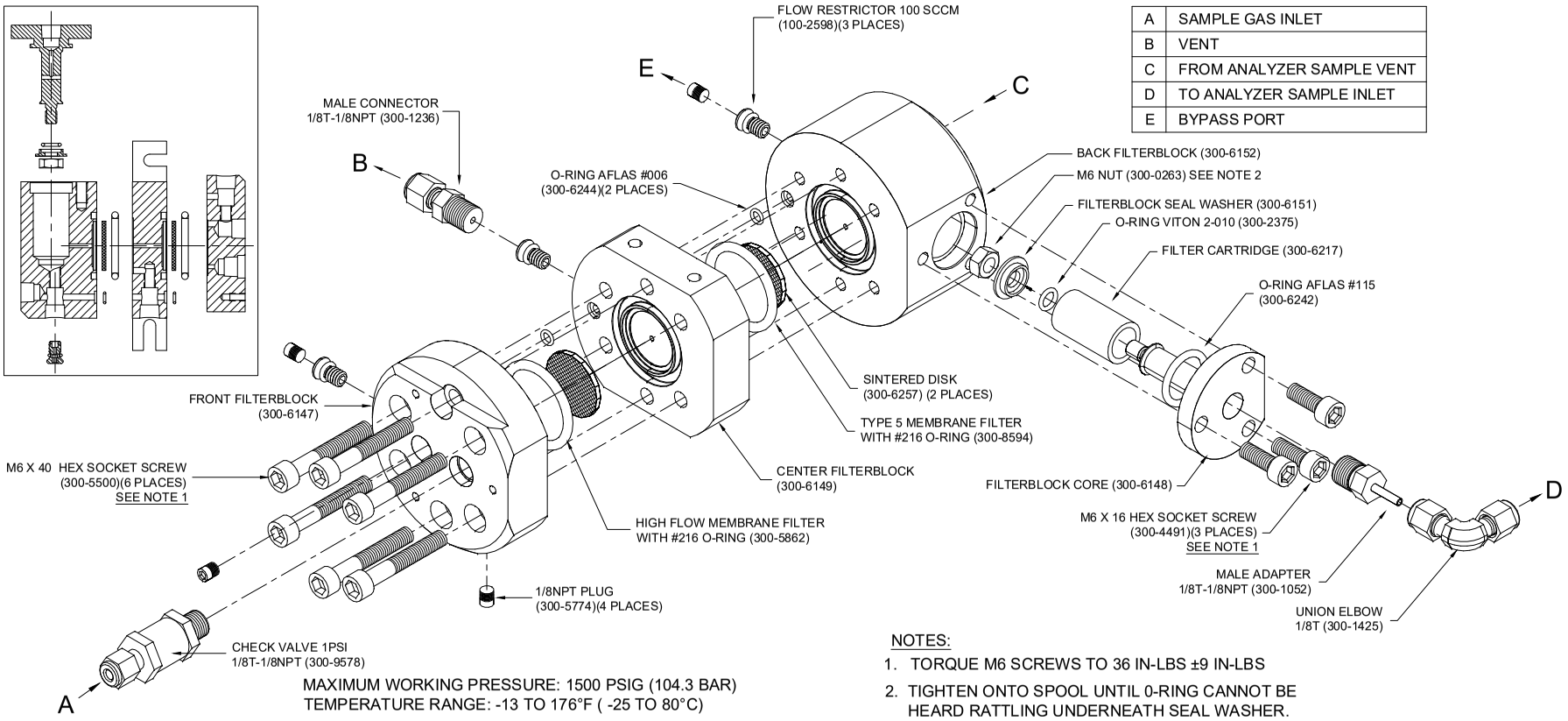
   On the front side of the Filterblock, remove the fitting that runs to the Flow Sensor. Back off the Flow Sensor and lay it on the bottom of the analyzer.

3. On the outside of the Rear Panel, remove the three (3) screws that secure the Filterblock to the Rear Panel and remove the Filterblock from the Analyzer Enclosure.

Follow Steps 4–7 in the 9933 Gas Analyzer User Manual *(substitute Step 6 with Step 6 in this* Manual Supplement*) to clean and replace parts in the Sample System Block/Column Block assembly. Note that not all parts may require replacement; perform only the parts required.*

After cleaning and replacing parts in this assembly, return to this Manual Supplement *to replace the assembly in the analyzer, discussed in the next section.*

Figure 4-8.
Filterblock assembly,
9933RM Analyzer.



6. Remove the Male Connector and Fitting from the bottom of the Center Filterblock section and remove the Flow Restrictor (comes with o-ring). Remove the 1/8 NPT Plug (1 each) from the Front and Back Filterblock section and remove the Flow Restrictor from each Filterblock section. Be careful not to damage the 1/8" NPT threads.

If previous sample gas flow rates suggest possible plugging of the Filterblock Flow Restrictors, replace them with new ones. If there was an excessive amount of liquid in the first membrane filter stage, replace the first Flow Restrictor.

8. Install one (1) Flow Restrictor (Part No. 100-2598, comes with o-ring) in each – three (3) – Filterblock section and hand-tighten them. Replace the 1/8 NPT Plug (1 each) in the Front and Back Filterblock sections, and the Male Connector in the Center Filterblock section.

Section/Chapter	Page(s)	Instructions
Replacing Parts in the Filterblock (Chapter 4)	4-46	Use Steps 14–15 below in place of Steps 14–15 in the 9933 Gas Analyzer *User Manual.* Continue to follow all other Steps in the 9933 Gas Analyzer *User Manual*.

14. Replace the assembled Filterblock in the Analyzer Enclosure with its Sample Inlet fitting through the hole in the Rear Panel. Use the three (3) screws removed earlier to secure the Filterblock to the Rear Panel.

    Replace and reconnect all tubing sections to and from the Filterblock. Take care to avoid bending the tubing.

15. Take all necessary safety precautions and perform a leak check on the sample system fittings that were disconnected. Refer to "Pressure Leak Check" in this *Manual Supplement* and in the 9933 Gas Analyzer *User Manual* for information on how to perform the leak check.

    After you are sure there are no leaks, power up the analyzer and prepare it for normal operation, as described under "Safely Powering Up the 9933RM Gas Analyzer Following Maintenance" in this *Manual Supplement*.

The procedure is complete.

Section/Chapter	Page(s)	Instructions
Chopper (Filter) Wheel Maintenance (Chapter 4)	4-47	Use the information below in place of the corresponding paragraph and Caution in the section "Chopper (Filter) Wheel Maintenance" in the 9933 Gas Analyzer *User Manual*. All other information in the *User Manual* can be used for this procedure.

Chopper (Filter) Wheel Maintenance

When replacing parts in the Chopper Wheel, the Optical Bench/Measuring Cell assembly must be removed to work on it. See Figures 4-3 (in this *Manual Supplement*) and 4-9.5 (in the 9933 Gas Analyzer *User Manual*) for assistance in locating and identifying the hardware components encountered while replacing the Drive Belt and Bearings in the Optical Bench.

While removing the Optical Bench from the analyzer, take care not to damage any components, wires, or cables within the Analyzer Enclosure. Do not lift the Optical Bench using its circuit boards or the hinged Bench Board Mounting Plate.

To replace the Drive Belt and Bearings:

1. Take all necessary steps to safely prepare the analyzer and power it down before performing this procedure. See "Safely Powering Down the 9933RM Gas Analyzer to Perform Maintenance" in this *Manual Supplement* for details.

Hazardous Locations
Before proceeding, test the area around the analyzer for explosive gases and proceed only when the area is found to be safe.

Do not power up/down the analyzer or any computer if there is an explosive gas atmosphere present.

Section/Chapter	Page(s)	Instructions
Chopper (Filter) Wheel Maintenance (Chapter 4)	4-48, 4-49	Disregard Step 2 in the 9933 Gas Analyzer *User Manual*. Disregard Step 3 in the 9933 Gas Analyzer *User Manual* (to remove the Optical Bench from the analyzer). Instead, use Step 2 from the section "Replacing the UV Lamps and Performing an Auto Setup" in this *Manual Supplement* (to remove the Optical Bench/Measuring Cell assembly from the 9933RM Analyzer). Then, return to this section to continue.

For the 9933RM Analyzer, it is best to remove the entire Optical Bench/ Measuring Cell assembly when replacing parts in the Optical Bench.

After removing the Optical Bench/Measuring Cell assembly, continue with Steps 4 and 5 from the 9933 Gas Analyzer User Manual.

Section/Chapter	Page(s)	Instructions
Chopper (Filter) Wheel Maintenance(Chapter 4)	4-49	Use Steps 4 and 5 from the 9933 Gas Analyzer *User Manual* (to remove the Chopper Cover from the Beam Splitter Assembly and the Chopper Wheel Drive Belt).
	4-50	Disregard Figures 4-9.3 and 4-9.4 in the 9933 Gas Analyzer *User Manual.*
	4-51	Use Figure 4-9.5 in the 9933 Gas Analyzer *User Manual,* while replacing parts in the Optical Bench.
	4-52	Use Steps 6, 7, and 8 from the 9933 Gas Analyzer *User Manual* (to replace the Bearings and the Chopper Wheel Drive Belt, and to reassemble the Beam Splitter Assembly and the Chopper Wheel Drive Belt and Chopper Cover).
	4-52–4-54	Disregard Step 9 in the 9933 Gas Analyzer *User Manual* (to replace the Optical Bench in the analyzer). Instead, use Steps 5 and 6 from the section "Replacing the UV Lamps and Performing an Auto Setup" in this *Manual Supplement* (to replace the Optical Bench/Measuring Cell assembly in the 9933RM Analyzer). Then, return to this section to continue.

Section/Chapter	Page(s)	Instructions
Chopper (Filter) Wheel Maintenance (Chapter 4)	4-54	Use Step 10 below in place of Step 10 in the 9933 Gas Analyzer *User Manual*.

10. Take all necessary safety precautions and perform a leak check on the sample system fittings that were disconnected/reconnected to ensure there are no leaks in the sample system. Refer to "Pressure Leak Check" in the 9933 Gas Analyzer *User Manual* for information on how to perform the leak check.

    After you are sure there are no leaks, take the necessary steps to safely power up the analyzer and prepare it for normal operation, as described under "Safely Powering Up the 9933RM Gas Analyzer Following Maintenance" in this *Manual Supplement*.

The procedure is complete.

Section/Chapter	Page(s)	Instructions
Viewing UV Analysis Results Diagnostic Information (Chapter 4)	4-62	Use the paragraph, below, in place of the corresponding paragraph in the 9933 Gas Analyzer *User Manual*.

The **UV Analysis Results** diagnostic screen displays the real-time (**Live**) concentration result and the current Track-Hold (**T-H**) concentration result for each component being measured, including optional sensor data. Note that the Live results displayed here is the same information that is displayed on the **HOME** screen but with more digits after the decimal point.

Section/Chapter	Page(s)	Instructions
Status Code 3 Screens and Diagnostics (Chapter 4)	4-101	Add the **O2 sensor error** and **Flow rate range error** alarm condition descriptions to the corresponding "Reserved" alarms in the 9933 Gas Analyzer *User Manual*.

Status Code 3 Alarm Condition (hexadecimal code)	Alarm Description / Trigger Condition / Corrective Action
O2 sensor error (0x0800) *This status code condition applies only to analyzers with the optional **O2 Sensor** installed.* *CONFIG→Sensor Setup*	The O_2 Sensor temperature is 15 °C below or 10 °C above of the **UV Bench Controller** board temperature. ***Trigger Condition:*** • Problem with O_2 Sensor cable. • Problem with O_2 Sensor. • Problem with the **UV Bench Controller** board. ***Corrective Action:*** • From the HMI, view the **UV99XX Sensor Setup** screen and check the **O2 Concentration *High/Low* Scale** to verify they are within acceptable levels. Compare the readings to the values listed on the "*Configuration Sheet*" document. • Take appropriate safety precautions, remove the top cover from the analyzer Enclosure, and check the O_2 Sensor cable to ensure it is properly connected at the **UV Bench Controller** board (**J700**). Inspect the cable for damage (cuts, nicks, burn marks, etc.). • Test the O_2 Sensor for proper operation and replace it if necessary. Refer to the O_2 Sensor manual shipped with the analyzer for information on how to verify proper sensor operation. • Take appropriate safety precautions, isolate the analyzer sample system, and cycle the analyzer mains power Off-On to reset the analyzer; this may also clear any problems with the **UV Bench Controller** board. • Contact AMETEK if: - The cable appears damaged or the O_2 Sensor does not appear to be operating properly – order a new part and replace it. - Cycling the mains power Off-On does not reset the condition. This can indicate a problem with the Oxygen Sensor Signal Conditioning Circuit on the **UV Bench Controller** board. - You need to verify operation or to order replacement parts, or you require replacement instructions.

Status Code 3 Alarm Condition (hexadecimal code)	Alarm Description / Trigger Condition / Corrective Action
Flow rate range error (0x0400) *DIAG→Sensors →UV99XX Sensors* *CONFIG→Sensor Setup→UV99XX Sensors*	The measured flow rate is outside ±1 % of the full-scale range of the Flow Sensor. ***Trigger Condition:*** • Problem with sample flow (e.g., plugging, or faulty regulator). • Problem with Flow Sensor scaling parameters. • Problem with the Flow Sensor cable. • Problem with the Flow Sensor. ***Corrective Action:*** • From the HMI: - View the **UV99XX Sensor Signals** diagnostic screen and check the **Flow Rate** reading to verify there is a flow of sample gas. If there is no flow or low flow, it may indicate a plug in the sample system. Refer also to "Detecting/Locating a Plug or Leak in the Sample System" in the in the 9933 Analyzer *User Manual*. Unplug the lines if necessary. - View the **UV99XX Sensor Setup** screen and check the **Flow Rate *Low Scale/ High Scale*** parameters. Compare the readings to the value listed on the *"Configuration Sheet"* and adjust the scaling parameters if necessary. • Take appropriate safety precautions, open the Electronics Enclosure door, and check the Flow Sensor cable to ensure it is properly connected at the **UV Bench Controller** board (**J306**). Inspect the cable for damage (cuts, nicks, burn marks, etc.). • Check the Flow Regulator to ensure it is working properly; replace if necessary. • Take appropriate safety precautions, isolate the analyzer sample system, power down the analyzer, and: - Test the Flow Sensor for proper operation and replace it if necessary. Refer to the Flow Sensor documentation shipped with the analyzer for information on how to verify proper sensor operation. After this check has been made, cycle the analyzer mains power back On; this will also reset the analyzer; this may also clear any problems with the **UV Bench Controller** board. • Contact AMETEK if: - The cable appears damaged or the Flow Sensor does not appear to be operating properly – order a new part and replace it. - Cycling the mains power Off-On does not reset the condition. This can indicate a problem with the Flow Sensor Signal Conditioning Circuit on the **UV Bench Controller** board. - You need to verify operation or to order replacement parts, or you require replacement instructions.

Specifications

Section/Chapter	Page(s)	Instructions
9933 Gas Analyzer Specifications (Chapter 5)	5-1–5-4	The Specifications information in the 9933 Gas Analyzer *User Manual* (Part No. 10398-15-5) is generally the same for the 9933RM Analyzer, except as noted below. The information below also includes information that is in the 9933 Analyzer *User Manual* but does not apply to the 9933RM (this information is marked "Not applicable to 9933RM Analyzers").

Specifications included in this chapter are typical for the ranges listed. For custom ranges/applications, consult with your AMETEK representative.

9933RM Gas Analyzer Specifications

Specification	Description
Ranges	**Extra-Low Range Cell Option (4-Pass, 140 cm):** Not applicable to 9933RM Analyzers; this cell not used with 9933RM Analyzers.
24-Hour Zero Drift	**Extra-Low** (Cell) range: Not applicable to 9933RM Analyzers; the Extra-Low Range Cell is not used with 9933RM Analyzers.
User Interface	5.7", Color, LCD touch screen
Customer Outputs	**Analog Outputs** Four (4) Analog Output channels, isolated as a group, not individually. Each channel is user configurable individually as: • 0–20 mADC • 4–20 mADC • 0–5 VDC • 1–5 VDC **Relay Contacts** Five (5) Form A (SPST), Normally Open (NO), user configurable as Status alarms and Process Alarms. • Switching: Maximum 240 VDC, 0.5 ADC, limited to 10 W • Carry: Maximum 1.2 ADC *Notes:* *Analog and alarm relay contact outputs are available on the **Customer I/O** board.*

Specification	Description
Electrical	The 9933RM Analyzer is available in three (3) configurations, configured at the factory per customer/end user requirements, as follows: **AC Models:** • 120 VAC ±10 %, 50/60 Hz, 250 W Maximum, or • 240 VAC ±10 %, 50/60 Hz, 250 W Maximum **DC Model:** • 24 VDC ±5 %, 400 W Maximum
Environmental	Ambient Temperature: 0–50 °C (32–122 °F) Relative Humidity: 5–90 %, non-condensing Maximum Altitude: 2000 meters Installation Category II: Overvoltage Category Pollution Degree 2: Maximum
Ingress Protection	The Analyzer Enclosure provides ingress protection IP40 per IEC 60529. The customer is required to provide additional ingress protection to IP54 when installing the analyzer in Division 2 or Zone 2 classified hazardous areas.
Zero Gas	Instrument zero purity carbon dioxide, UHP nitrogen, or UHP methane. Recommended Auto-Zero interval is once per 24 hours. More frequent Auto-Zeroing can be used to reduce temperature drift in installations with widely varying ambient temperatures.
Sample Pressure Requirements	690–13790 kPag (100–2000 PSIG) at analyzer Sample Inlet port. 690–10342 kPag (100–1500 PSIG) (CRN Version) *Notes:* • *With the Columns requiring about 552 kPag (80 PSIG) to regenerate properly, the sample gas pressure is regulated down by an integrated (internally installed) regulator.* • *Typically sample gas pressure is reduced at the sample probe to about 827 kPag (120 PSIG) with a heated regulator. It provides adequate headroom for the integrated regulator to operate effectively.* • *For sample inlet pressure above 1379 kPag (200 PSIG), the high pressure regulator option must be selected to provide first stage pressure reduction.*
Physical Dimensions	Height: 266 mm (10.5") Width: 482 mm (19") Depth: 603 mm (23.7") including handles Weight: Maximum 30 kg (66.1 lb) (may vary, depending on system configuration and options selected)
Analyzer Enclosures	Electronics Enclosure, Oven Enclosure, Sample Flow Enclosure: Disregard all references to these enclosures in the 9933 Gas Analyzer *User Manual*. The 9933RM Gas Analyzer has only one enclosure, referred to as the Analyzer Enclosure.
Backpan	Standard Backpan: Disregard all references to Backpan in the 9933 Gas Analyzer *User Manual*. The 9933RM Gas Analyzer is mounted in a rack and does not have a Backpan.

Section/Chapter	Page(s)	Instructions
Directives and Standards (Chapter 5)	5-5, 5-6	Use the Directives and Standards information below (and Figure 5-1) in place of the Directives and Standards information (and Figure 5-1) in the 9933 Analyzer *User Manual*.

9933RM Gas Analyzer Directives and Standards

Directive	Standards / Notes
Electromagnetic Compatibility (EMC) 2014/30/EU	IEC/EN 61326-1 IEC/EN 55011 (CISPR 55011) IEC/EN 55011 (CISPR 55011) IEC/EN 61000-3-2 IEC/EN 61000-3-3 IEC/EN 61000-4-2 IEC/EN 61000-4-3 IEC/EN 61000-4-4 IEC/EN 61000-4-5 IEC/EN 61000-4-6 IEC/EN 61000-4-8 IEC/EN 61000-4-11
Restriction of Hazardous Substances Directive 2011/65/EU	Including 2015/863/EU
Low Voltage Directive 2014/35/EU	IEC/EN 61010-1
Directive 2014/34/EU and IECEx	ATEX Certificate No.: ITS-I 22 ATEX 33037X IECEx Certificate No.: IECEx ETL 22.0016X IEC 60079-0:2017 Ed. 7.0 IEC 60079-15:2017

Analyzer Marking

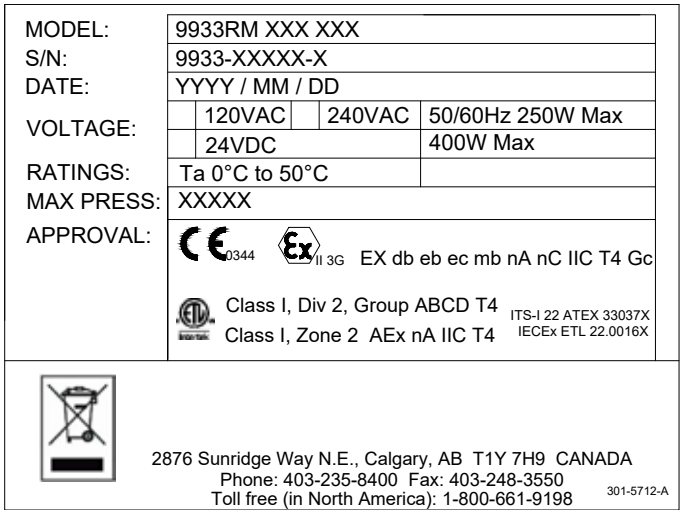


Figure 5-1.
9933RM Gas Analyzer label.

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Section/Chapter	Page(s)	Instructions
Manually Zero Calibrate the Analyzer, and View the Results (Chapter 6)	6-6	Use Figure 6-3.4 below in place of Figure 6-3.4 in the 9933 Gas Analyzer *User Manual* (Part No. 10398-15-5).

The Zero gas connection on the 9933RM Analyzer is on its Rear Panel.

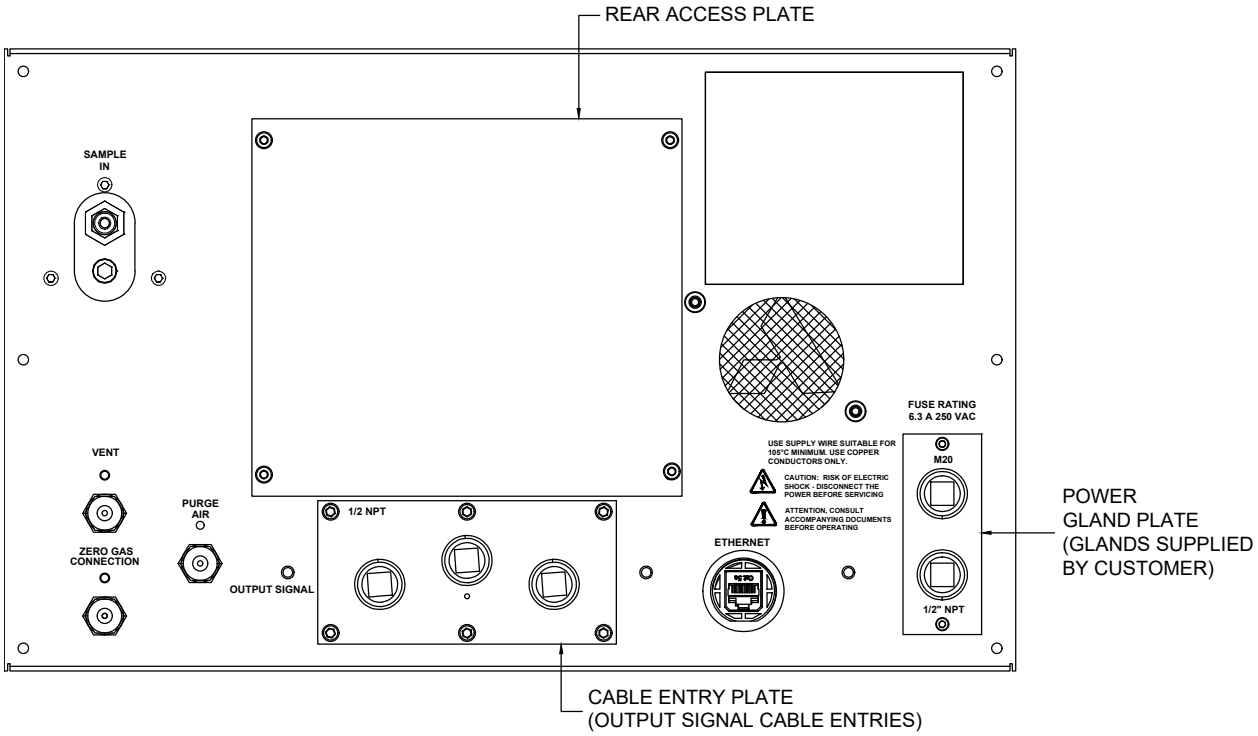

Figure 6-3.4.
Zero gas Inlet port location.

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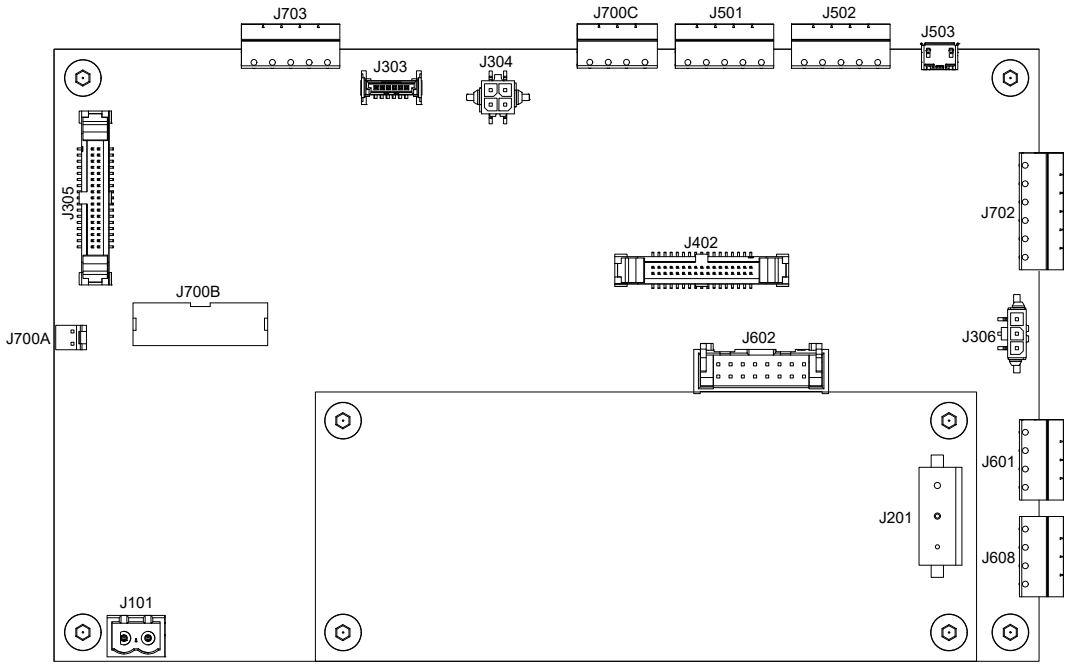
Appendix A – Board Drawings and Test Points

Section/Chapter	Page(s)	Instructions
Board Drawings and Test Points (Appendix A)	A-1–A-12	Use the drawings and information in the 9933 Gas Analyzer *User Manual* (Part No. 10398-15-5) as it applies to the 9933RM Gas Analyzer, and add the following drawing to Page 12.

UV Bench Controller Board Connections



Connector	Description	Connector	Description
J700A	Electrochemical O2 Sensor (Optional)	J503	USB
J700B	Analyzer Paramagnetic O2 Sensor (Optional)	J702	Cell RTD/Optional RTD Channel
J305	PMT Signal (Ribbon Cable)	J306	Flow Sensor (Optional)
J703	Bench Temperature RTD	J601	Cell Pressure
J303	Filter Wheel Motor	J608	SSR Relay Control
J304	Filter Wheel Opto-interruptor	J201	Lamps (Optical Bench)
J700C	Analyzer Paramagnetic O2 Sensor (Optional)	J602	Ribbon Cable, from Customer I/O Board (J1)
J501	Process Sensor Board, from J351/COM2	J402	Ribbon Cable, from Sample System Interface Board (J2)
J502	Process Sensor Board, from J350/COM1	J101	DC Power Line

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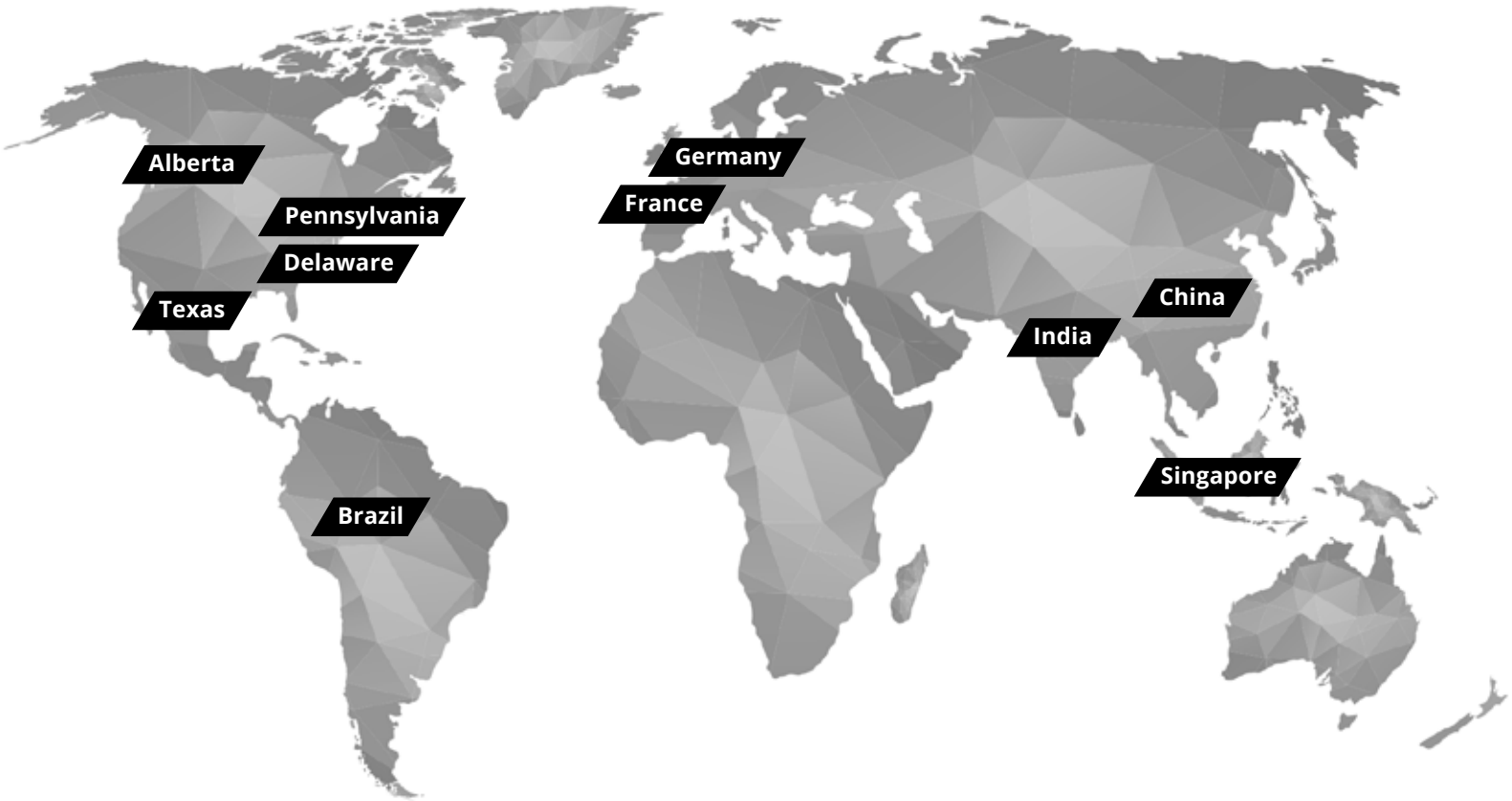

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