



Quad Gas[®] II Gas Monitor

instruction manual

WARNING

THIS MANUAL MUST BE CAREFULLY READ BY ALL INDIVIDUALS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR INSTALLING, USING, OR SERVICING THIS PRODUCT. Like any piece of complex equipment, this product will perform as designed only if installed, used and serviced in accordance with the manufacturer's instructions. OTHERWISE, IT COULD FAIL TO PERFORM AS DESIGNED AND PERSONS WHO RELY ON THIS PRODUCT FOR THEIR SAFETY COULD SUSTAIN SEVERE PERSONAL INJURY OR DEATH.

The warranties made by Mine Safety Appliances Company with respect to this product are voided if the product is not installed, used and serviced in accordance with the instructions in this manual. Please protect yourself and others by following them. We encourage our customers to write or call regarding this equipment prior to use or for any additional information relative to use or repairs.

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In Canada 1-800-267-0672 or FAX (416) 663-5908
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Manufactured by
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TORONTO, ONTARIO M3N 1X8

Distributed by
MINE SAFETY APPLIANCES COMPANY
PITTSBURGH, PENNSYLVANIA 15230

MSA

Permanent Instrument Warranty

1. **Warranty-** Seller warrants that this product will be free from mechanical defect or faulty workmanship for a period of eighteen (18) months from date of shipment or one (1) year from installation, whichever occurs first, provided it is maintained and used in accordance with Seller's instructions and/or recommendations. This warranty does not apply to expendable or consumable parts whose normal life expectancy is less than one (1) year such as, but not limited to, non-rechargeable batteries, filament units, filter, lamps, fuses etc. The Seller shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee or representative of the Seller has any authority to bind the Seller to any affirmation, representation or warranty concerning this product. Seller makes no warranty concerning components or accessories not manufactured by the Seller, but will pass on to the Purchaser all warranties of manufacturers of such components. **THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. SELLER**

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3. **Exclusion of Consequential Damage-** Purchaser specifically understands and agrees that under no circumstances will seller be liable to purchaser for economic, special, incidental or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of nonoperation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct or any other cause of action against seller.

General Warnings and Cautions

▲ WARNINGS

1. The Quad Gas II Gas Monitor described in this manual must be installed, operated and maintained in strict accordance with their labels, cautions, warnings, instructions, and within the limitations stated.
2. To prevent ignition of a hazardous atmosphere, the cover of an explosion-proof model of the Quad Gas II Gas Monitor must be kept tightly closed when power is applied. Before removing the cover for maintenance or calibration, ensure the surrounding atmosphere is and remains free of toxic or combustible gases until the cover is closed.
3. The Quad Gas II Gas Monitor with remote sensors is designed to detect gases or vapors in air. The sensors cannot measure the concentration of gases or vapors in steam or inert or oxygen-deficient atmospheres. The oxygen sensor can measure oxygen-deficient atmospheres.
4. Electrochemical sensors are sealed units which contain a corrosive electrolyte. Should a sensor develop leakage, it must be immediately removed from service; then, remove it from the sensing head and discard it properly. Caution must be exercised so that the electrolyte does not contact skin, eyes, clothing or circuitry; otherwise, serious personal injury (burns) and/or equipment damage may result.
5. Use only genuine MSA replacement parts when performing any maintenance procedures provided in this manual. Failure to do so may seriously impair instrument performance. Repair or alteration of the Quad Gas II Gas Monitor, beyond the scope of these maintenance instructions or by anyone other than a authorized MSA service personnel, could cause the product to fail to perform as designed and persons who rely on this product for their safety could sustain serious personal injury or death.
6. Do not locate the general-purpose enclosure models in an area which may

contain a flammable mixture of gas and air; otherwise, an explosion may occur. The general-purpose Quad Gas II Gas Monitors can be a source of ignition and must not be mounted in an area where a flammable mixture of combustible gas and air may be present; otherwise, an explosion may occur. If such a location must be monitored, use an explosion-proof Quad Gas II Gas Monitor model.

Failure to follow the above can result in serious personal injury or death.

▲ CAUTIONS

1. As with all gas sensors of this type, high levels of, or long exposure to, certain compounds in the tested atmosphere could contaminate the sensors. In atmospheres where a sensor may be exposed to such materials, calibration should be performed frequently to ensure that operation is dependable and display indications are accurate.
2. The Quad Gas II Gas Monitor's remote sensors must not be painted. If painting is done in an area where the remote sensors are located, care must be exercised to ensure that paint is not deposited on the sintered, metal flashback arrestor in the inlet fitting of the remote sensors, if so equipped. Such paint deposits would interfere with the diffusion process, whereby a sample of the atmosphere being monitored diffuses into the sensor.
3. The only absolute method to ensure proper overall operation of an Quad Gas II Monitor is to check the remote sensors with a known concentration of the gas for which it has been calibrated. Consequently, calibration checks should be included as part of the routine inspection of the system.
4. Protect the Quad Gas II Gas Monitor from extreme vibration. Do not mount the unit or sensor in direct sunlight as this may cause overheating.

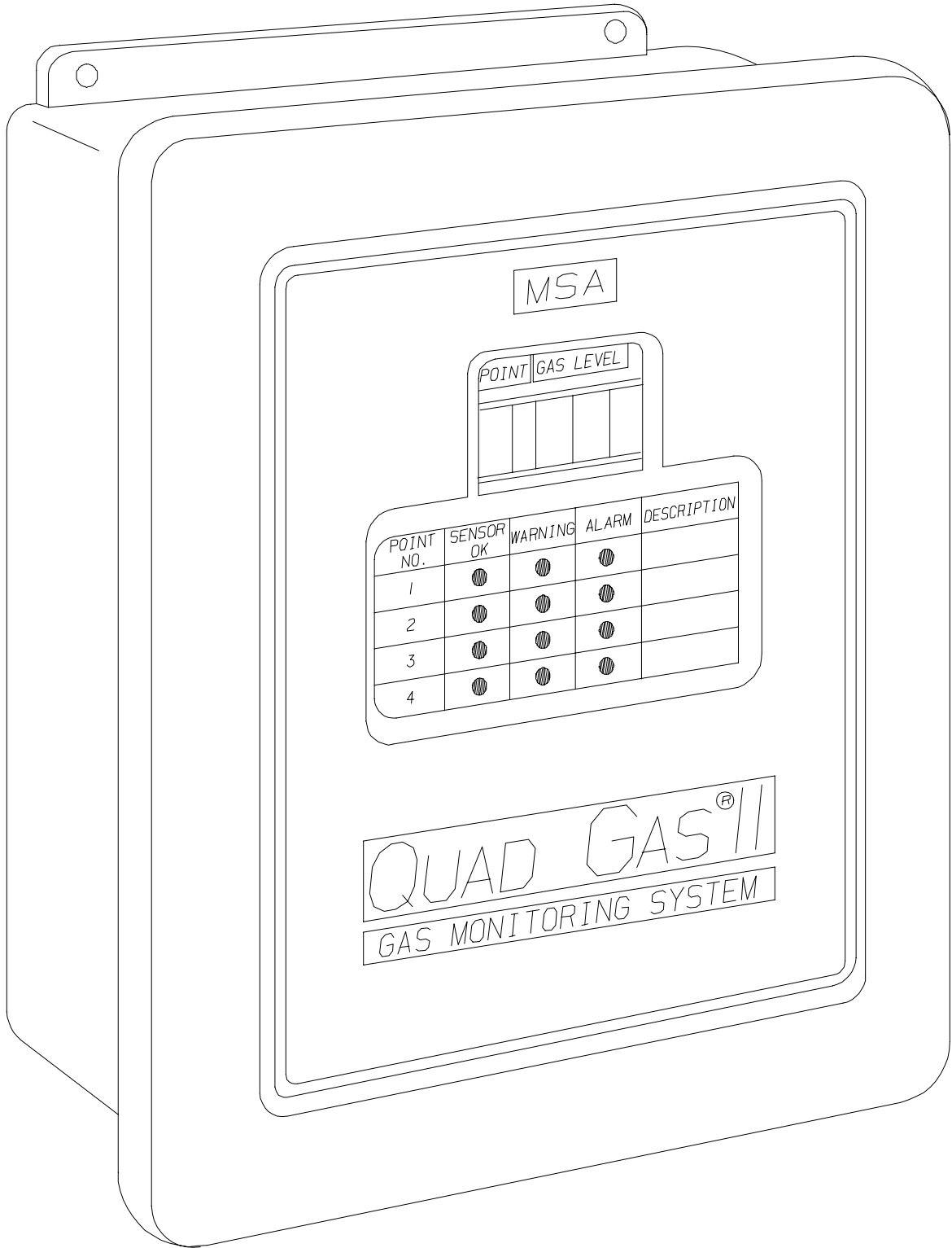


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Section 1

General Information

Introduction

The Quad Gas II Gas Monitor is designed to accept up to four sensors. These sensors communicate with the Quad Gas II Monitor via:

- Industry-standard 4 to 20 milliamp analog signal or
- Digital RS-485 signal.

This enables any remote sensor with an output of a 4 to 20 milliamp analog signal or an RS-485 signal to be connected to the Monitor.

The Quad Gas II Gas Monitor (with appropriate sensors) can monitor gas build-up at:

- Sewage treatment plants
- Parking garages
- Confined or limited access areas.

In addition, the Ultima[®] Gas Monitor with Ultima Sample Draw Module can be connected to the Quad Gas II Gas Monitor to sample gas build-up in areas that are:

- Too hot
- Too cold or
- Inaccessible.

When used with the Ultima Duct Mount Kit, the Quad Gas II Gas Monitor can draw gas samples from ducts carrying combustible gas, oxygen or toxic gas in applications such as:

- Wet wells
- Printing drying ovens
- Blanking or inerting operations
- Process ducts, vents or stacks.

Regardless of sensor type used, the Quad Gas II Gas Monitor scans its active (enabled) sensor channels for two seconds. If all four sensor inputs are used and enabled, the unit scans all sensors in eight seconds.

The large front-panel LED display (FIGURE 1-1) shows:

- Sensor number (first digit on the display)
- Current gas concentration level (next three digits on the display).

There are two Quad Gas II Gas Monitor models. See the label on the side of your unit to identify your model (FIGURE 1-1):

P/N 215345 and P/N 216322 contain:

- One common Alarm relay
- Four Warning relays
- One Horn relay and
- One Sensor Fail or Trouble relay.

P/N 215346 and P/N 216323 contain:

- Four Alarm relay
- Four Warning relays
- One Horn relay and
- One Sensor Fail or Trouble relay.

P/N 216322 and P/N 216323 are powered from 220 Volts AC. For complete details regarding sensor calibration and setup, refer to your individual sensor manuals. See Appendix A for the Quad Gas II Gas Monitor Installation Outline Drawing to help you mount and wire the unit.

Definition of Terms

Terms used in this manual:

CAL or CALIBRATION - The process of ensuring that instrument responds properly to a known concentration of gas, usually by zeroing and spanning the instrument.

ZERO - A zero (0) indication on the meter display. Usually indicates ambient air present or no hazardous gases present.

ZEROING - The process of placing a zero indication on the meter display.

SPAN - A full-scale or up-scale reading on the meter display.

SPANNING - The process of placing a full-scale or up-scale meter reading on the display by using calibration SPAN gas from cylinders.

SPAN GAS VALUE - The gas concentration which gives the instrument an up-scale or full-scale value. This value is usually printed on the gas cylinder containing the gas.

ELECTROCHEMICAL or TOXIC SENSOR - A type of sensor employing the reactions of

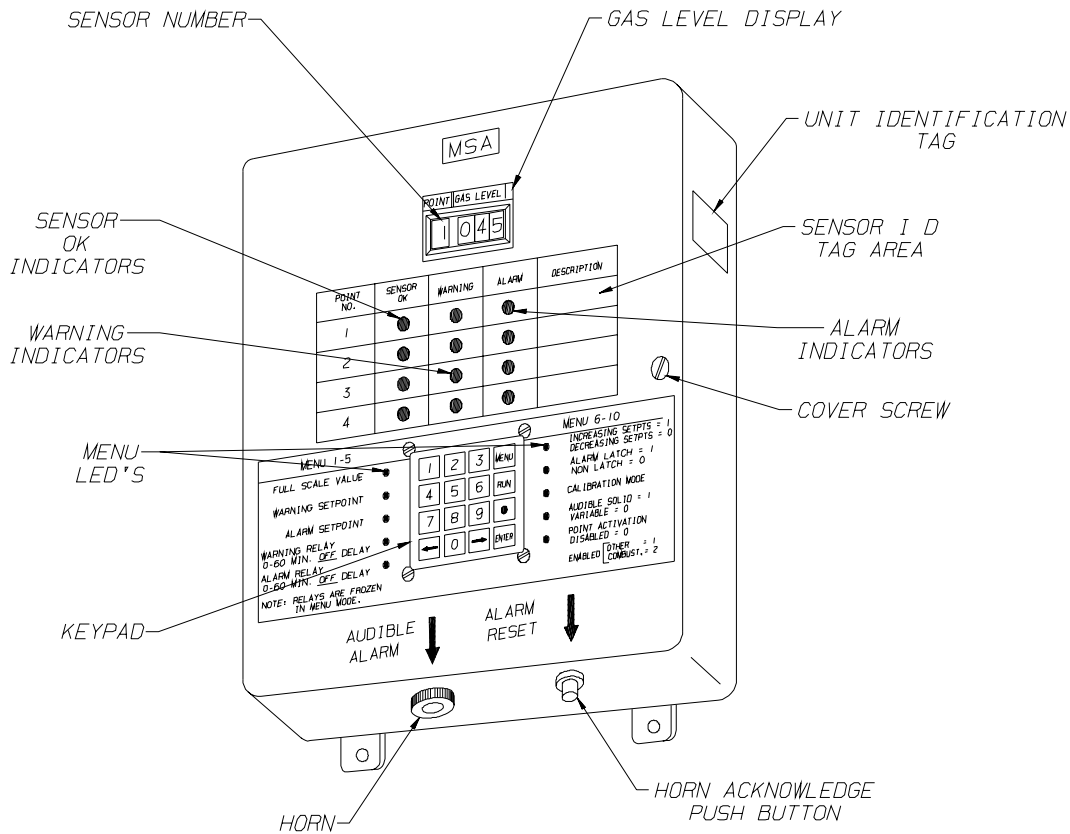


Figure 1-1. Front Panel

chemicals generating electric currents to detect certain gases including:

- Carbon Monoxide
- Hydrogen Sulfide
- Nitrogen Dioxide
- Oxygen
- Sulfur Dioxide
- Hydrogen Cyanide
- Chlorine
- Chlorine Dioxide
- Ammonia
- Nitric Oxide
- Hydrogen Chloride.

SENSOR mA - sensor output signal expressed as milliamps and read by the Quad Gas II Monitor. Signal range for sensors connecting to the Quad Gas II Monitor is 4 to 20 milliamps.

RS-485 SENSOR - The digital output signal from the sensor and read by the Quad Gas II Monitor.

WARNING SETPOINT - When the signal from the sensors exceeds the Quad Gas II Monitor preset Warning setpoint, the warning indicator and the discrete warning relay activate.

ALARM SETPOINT - When the signal from the sensors exceeds the Quad Gas II Monitor preset Alarm setpoint, the alarm indicator, common horn relay and (if equipped) discrete alarm relays activate.

HORN RELAYS - A horn relay is activated when any of the four channels go into an alarm condition. It is de-activated when the Horn Acknowledge/Reset button is pressed.

Normally De-energized Relay

- If there is **no** warning or alarm condition present:
 - **no** power is applied to the relay.
- If there **is** a warning or alarm condition present:
 - power **is** applied to activate the relay.

Normally Energized Relay

- If there is **no** warning or alarm condition present:

- power **is** applied to the relay.
- If there **is** a warning or alarm condition present:
 - power **is removed** to deactivate the relay.
- This Normally Energized Relay configuration is useful when operating the instrument in a fail-safe condition.

INSTRUMENT SOCIETY OF AMERICA (ISA) SPECIFICATIONS - A specification outlining gas detection operation in North America.

The following is a brief description of the ISA specification as it applies to the Quad Gas II Monitor. Refer to the complete standard ANSI/ISA S12.13 1986 for additional details.

ISA SPECIFICATIONS WITH AUTOMATIC RESET ALARMS

In this specification, when an alarm condition occurs:

- Alarm relay activates
- Front-panel Alarm indicator flashes
- Horn relay activates.

This state continues until the Horn Acknowledge/Reset button is pressed. When this button is pressed and the alarm condition continues to exist, the following occurs:

- Alarm relay remains active
- Front-panel Alarm indicator is now steady ON
- Horn and horn relay de-activates.

When the alarm conditions ceases to exist, the alarm relay de-activates and the front-panel Alarm indicator goes OFF.

ISA SPECIFICATIONS WITH MANUAL RESET ALARMS

In this specification, when an alarm condition occurs:

- Alarm relay activates
- Front-panel Alarm indicator flashes
- Horn relay activates.

This state continues until the Reset button is pressed and the alarm condition continues to exist; then:

- Alarm relay remains active
- Front-panel Alarm indicator is now steady ON
- Horn and horn relay de-activates.

When the alarm condition ceases to exist:

- There is no change to the Alarm relay status
- The front-panel indicator starts flashing.

When the Horn Acknowledge/Reset button is pressed and the alarm condition does not exist:

- Alarm relay de-activates and
- Front-panel indicator turns OFF.

Controls and Indicators

The following list outlines the Quad Gas II Monitor controls and indicators (FIGURE 1-1):

HORN/ACKNOWLEDGE PUSH-BUTTON -

- Acknowledges any warning or alarm condition
- Resets the horn relay.

GAS CONCENTRATION READ-OUT - The four-digit display that shows:

- Actual gas concentration of the channel being monitored
- Sensor failure condition
- Direct reading from sensor
- Channel number of the displayed sensor gas value.

SENSOR OK INDICATORS - Four green LED indicators that turn ON when the associated channel's gas sensor is within it operating range.

These indicators turn OFF when the associated channel encounters a fault situation such as:

- Broken or shorted cable from the sensor to the Quad Gas II Control unit
- Sensor element unplugged from its printed circuit board
- 4 to 20 mA sensor below 3.5 mA or above 22 mA.
- Two sensors have the same RS-485 address.

WARNING INDICATORS - Four yellow LED indicators turn ON when the associated channel's gas concentration exceeds the Warning setpoint.

ALARM INDICATORS - Four red LED indicators that flash when the associated channel's gas concentration exceeds the Alarm setpoint.

- The indicators stop flashing and remain steadily ON when the Horn/Acknowledge push-button is pressed.

**Table 1-1.
P/N 215345 and P/N 216322 Quad Gas II Monitor General Specifications**

POWER SUPPLY		120 VAC, 60 Hz @ 0.5 amps or 220 VAC, 50/60 Hz at 0.25 Amps	
		Optional 24 Volts DC line power	
SENSOR CAPACITY		Up to four sensors	
READ-OUT		Four-digit LED scanning display showing the channel number and the gas level at two-second intervals (7/16" digits)	
SETPOINTS	HAZARD LEVEL	Two Hazard setpoints per channel (Warning and Alarm) with indicating LEDs	
	FULL-SCALE INDICATION	Variable 0.1 to 99.9 or 999	
HYSTERESIS		Accomplished using a five-second ON-delay for all relays	
RELAYS	WARNING	One discrete for each sensor input (four total)	
	ALARM	One common	
	HORN	One common	
	TROUBLE	One common	
	STATUS	All have one LED to indicate coil voltage	
	TERMINALS	#12 gauge maximum wire size	
	CONTACTS	Single-pole, double-throw (Form C) Rated 125 VAC, 10 amps, resistive	
AUDIBLE ALARM		Piezo electric horn; approximately 105 decibels at one foot	
SENSOR INPUT		4 to 20 mA; three-wire or two-loop powered or RS-485, four-wire	
OPERATING RANGE	RELATIVE HUMIDITY	15 to 95%	
	TEMPERATURE	OPERATING	-41 to 131°F (-40 to 55°C)
		STORAGE	-41 to 131°F (-40 to 55°C)
WEIGHT		Approximately 11 lbs. (5 KG)	

**Table 1-2.
P/N 215346 and P/N 216323 Quad Gas II Monitor General Specifications**

POWER SUPPLY		120 VAC, 60 Hz @ 0.5 amps or 220 VAC, 50/60 Hz at 0.25 Amps	
		Optional 24 Volts DC line power	
SENSOR CAPACITY		Up to four sensors	
READ-OUT		Four-digit LED scanning display showing the channel number and the gas level at two-second intervals (7/16" digits)	
SETPOINTS	HAZARD LEVEL	Two Hazard setpoints per channel (Warning and Alarm) with indicating LEDs	
	FULL-SCALE INDICATION	Variable 0.1 to 99.9 or 999	
HYSTERESIS		Accomplished using a five-second ON-delay for all relays	
RELAYS	WARNING	One discrete for each sensor input (four total)	
	ALARM	One discrete for each sensor input (four total)	
	HORN	One common	
	TROUBLE	One common	
	STATUS	All have one LED to indicate coil voltage	
	TERMINALS	#12 gauge maximum wire size	
	CONTACTS	Single-pole, double-throw (Form C) Rated 125 VAC, 10 amps, resistive	
AUDIBLE ALARM		Piezo electric horn; approximately 105 decibels at one foot	
SENSOR INPUT		4 to 20 mA; three-wire or two-loop powered or RS-485, four-wire	
OPERATING RANGE	RELATIVE HUMIDITY	15 to 95%	
	TEMPERATURE	OPERATING	-41 to 131°F (-40 to 55°C)
		STORAGE	-41 to 131°F (-40 to 55°C)
WEIGHT		Approximately 11 lbs. (5 KG)	

SENSOR ID TAG AREA - Use this area to identify the sensor connected to that particular channel.

MENU LEDs - These LEDs light individually when configuring the Quad Gas II Gas Monitor.

KEYPAD- This keypad allows configuration of:

- Alarm, warning and full scale information to the Quad Gas II Gas Monitor
- Proper setup of relays and indicators.
 - Full scale Value
 - Warning Setpoint

- Alarm Setpoint
- Warning Relay - OFF Delay
- Alarm Relay - OFF Delay
- Increasing/Decreasing Setpoints
- Alarm-Latch/Nonlatching
- Calibration Mode
- Audible - Solid/Variable
- Point Activation - Disable/Enable

AUDIBLE ALARM - The horn is located on the bottom of the case to prevent water and dust from affecting its operation.

Section 2 Installation

Unpacking

1. Carefully open the carton containing the Quad Gas II Gas Monitor.
2. Remove the Monitor and inspect for physical damage.
3. Check the shipping container for additional items that may have been included with the Quad Gas II Monitor, such as:
 - Sensors
 - Calibration equipment.
4. Unscrew the two door screws securing the Monitor cover (FIGURE 2-1) and open the outer enclosure lid. Loosen the cover

screw (FIGURE 1-1) and open the inner front panel.

5. Examine the inside of the Quad Gas II Monitor for loose or broken items. If physical damage is evident, immediately file a claim with the shipping carrier.
6. Compare the items received with the items listed on the packing slip to ensure all ordered items were received; report incorrect or missing items to:

In the USA:

***MSA Instrument Division
PO Box 427
Pittsburgh, PA 15230
(Phone: 1-800-MSA-INST)
(Fax: 1-724-776-3280)***

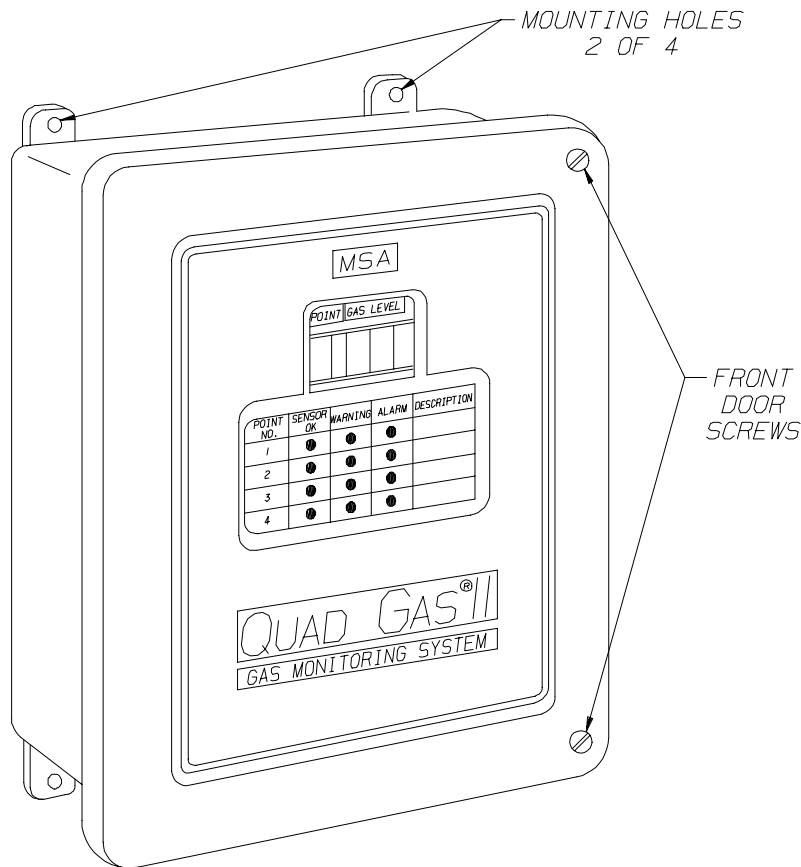


Figure 2-1. Front View

In Canada:

MSA Canada Inc.,
Toronto, Ontario, M3N 1X8
(Phone: 1-800-267-0672)
(Fax: 1-416-663-5908)

International:

MSA International
PO Box 426
Pittsburgh, PA 15230
(Phone: 1-412-967-3228 or
1-800-MSA-7777)

Installation

Initial Installation Considerations

Determine the type of sensors being connected to the Quad Gas II Gas Monitor:

- 4-20 mA output sensors or
- RS-485 output sensors.

These two types can be used simultaneously. However, care must be taken when wiring and configuring the unit for this type of operation. When using the 4 to 20 mA and the RS-485 sensors, the 4 to 20 mA sensors take precedence over the RS-485 sensors.

For example:

- If a 4 to 20 mA sensor is wired to position 2:
 - An RS-485 sensor must *not* be assigned address number 2.
- If a 4 to 20 mA and an RS-485 sensor are wired to the same position and address:
 - The RS-485 sensor signal is ignored.

Sensor Marking Identification

1. Before installing a Quad Gas II Monitor, assign sensors to a specific channel.
 - Four areas on the front panel correspond to the four channels on the Monitor.
 - a. Using indelible ink, write the location (ID) of each sensor on its corresponding front-panel area (FIGURE 1-1).
 - b. Mark the same ID on the sensor before installation.
2. Look on the side of your unit for the identifying tab or label to determine the number of relays in your unit (FIGURE 1-1).

P/N 215345 or P/N 216322 contain seven total relays:

- 4 warning relays
- 1 common alarm relay
- 1 horn relay and
- 1 trouble relay.

P/N 215346 or P/N 216323 contain ten total relays:

- 4 warning relays
- 4 alarm relays
- 1 horn relay and
- 1 trouble relay.

3. Determine the relay operation of the Quad Gas II Gas Monitor and decide which equipment will be connected to the relays.
 - a. Investigate the equipment ratings of devices to be connected to the relays.
 - b. If the rating exceeds the capacity of the monitor relays, it may be necessary to connect a slave relay to the Quad Gas II Gas Monitor relays.
4. Before installing the unit, drill or punch the required holes or entries in the Quad Gas II Monitor enclosure for the sensors, power and relay wiring.
 - The 4 to 20 milliamp sensor wiring entry is usually on the left side of the enclosure.
 - The RS-485 sensor wiring entry is on the bottom of the enclosure.
 - The power and relay wiring entry is usually located on the right side of the enclosure.

⚠ CAUTION

Exercise care when drilling or punching entries for the sensors and power wiring through the Quad Gas II Monitor enclosure. Use proper conduit fittings to maintain the NEMA 4X weatherproof rating; otherwise, damage to the instrument can occur or its rating will be compromised.

The Quad Gas II Monitor can be powered from:

- 120 Volts AC
- 220 Volts AC
- 24 Volts DC (specified when ordered)
- 120 or 220 Volts AC primary with 24 Volts battery backup.

⚠ CAUTION

Improper primary power selection can damage the unit. If unsure of the available power, contact the local power utility for clarification.

Quad Gas II Monitor Installation

(All models)

1. Locate the Quad Gas II Monitor in a clean and accessible, vibration-free location.
 - The Quad Gas II Monitor enclosure:
 - Is non-corrosive and rated as NEMA 4X, suitable for indoor or outdoor installation
 - Does not require splash or drip shields for outdoor installations
 - Must be fitted with a sun shade to prevent unit from overheating if mounted in direct sunlight.

⚠ CAUTION

Ensure the door of the Quad Gas II Monitor unit is not blocked or obscured.

2. Using 1/4-20 or 6 mm mounting screws or bolts, mount the Quad Gas II Monitor to a wall or suitable structure via the four mounting brackets attached to the back of the instrument (FIGURE 2-1).

Location of Gas Monitor Wiring Terminals and Controls

Wiring terminals are exposed when the front cover and inside front panel are open (FIGURE 2-2).

MAIN POWER SWITCH -

- When toggle switch handle is in the **left position**:
 - Power is applied to the unit and the **monitor is ON**.
- When toggle switch handle is in the **right position**:
 - No power is applied to the unit and **monitor is OFF**.

MAIN POWER FUSE -

- Covered to prevent accidental contact
- For 120 Volt AC Models:
Rated at 500 mA, Slo-Blo at 120 Volts AC (MDL 1/2 or equivalent).
- For 220 Volt AC Models:
Rated at 250 mA, Slo-Blo at 220 Volts AC (MDL 1/4 or equivalent).

POWER WIRING TERMINALS - (FIGURE 2-2):

- Main power is obtained via terminal connection at the upper-right section of unit.

- Ground connection (green wire) is not made to this connector but to the green screw located to the right of the power wiring terminals.

⚠ WARNING

Connect the Ground or green wire from the primary power to the green screw. Do not connect the ground to any other position or connection. Failure to do so will cause a shock hazard which may cause injury or death.

RELAY WIRING TERMINALS - all relay connections are made to the relay wiring terminals located on the right-hand side of the printed circuit board.

ENERGIZED/DE-ENERGIZED JUMPERS - this bank of jumpers (H1) controls relay operation; see Section 3 for jumper configuration.

SENSOR WIRING TERMINALS (FIGURE 2-2) -

- For 4 to 20 mA sensor:
 - Wiring terminals are located on the **left side** of the unit.
- For RS-485 sensor:
 - Wiring terminals are located at the **bottom** of the unit.

Electrical Power Connection

The Quad Gas II Monitor can be powered from:

- 120 Volts AC
- 220 Volts AC
- 24 Volts DC (specified when ordered)
- 120 or 220 Volts AC primary with 24 Volts DC battery backup.

It is possible to use either of the AC voltages along with the 24 Volts DC battery backup, which permits the Quad Gas II Monitor to operate if primary AC power is lost.

To connect the Quad Gas II Monitor to:

- Primary AC power:
 - See "AC Power Wiring Connection" procedure

The Quad Gas II Gas Monitor is factory-configured for 120 or 220 AC Volt operation.

- See proper wiring procedure to correctly wire your unit for the power provided (TABLE 2-1).
- See power requirement specifications in TABLE 1-1.

- Ensure all power sources have sufficient capacity to operate the Quad Gas II Monitor.

Table 2-1. Power Wiring Procedures	
POWER SOURCE	SEE PROCEDURE
110 Volts AC	1
220 Volts AC	2
120 or 220 Volts AC with 24 Volts DC Battery Backup	3

**Procedure 1:
110 Volt AC Power Wiring Connection**

1. Loosen the two door screws securing the Quad Gas II Monitor outer door (FIGURE 2-1) and open the enclosure lid. Loosen the single cover screw and open the front panel (FIGURE 1-1).
2. Verify that necessary holes or entries for the power wiring are punched or drilled in the Quad Gas II Monitor enclosure. Use proper conduit fittings to maintain the unit's NEMA 4X weatherproof rating.
3. Verify that the jumper on the power supply board corresponds to the voltage supplying the Quad Gas II Monitor (FIGURE 2-3):

⚠ CAUTION

Improper primary power selection can damage the unit. If unsure of available power, contact your local power utility for clarification. Jumpers are factory-set in the 120-Volt AC position.

4. Route a three-conductor power cable (not supplied) through the electrical entry made previously in the Quad Gas II Monitor; guide cable to the AC power wiring connector.
 - Use proper mounting hardware to ensure a good connection.
 - If attaching conduit, follow all applicable wiring codes.
5. Connect cable to power wiring connector (TABLE 2-2 and FIGURE 2-4).

Table 2-2. Cable Connection	
TERMINAL STRIP CONNECTION	DESCRIPTION
L	AC (L)
N	ACN (N)
TO GROUND LUG	ACG

6. Using proper hardware, connect the AC ground to the AC grounding stud (FIGURE 2-4).

- The ground or green wire is connected to the green screw (on the right of the power wiring connector).
- Do not connect the ground or the green wire to the center position of the power wiring connector.
 - This position on the wiring connector is not connected to ground.

⚠ WARNING

Connect the power ground to the green grounding lug. Failure to connect the power ground to this lug will cause a shock hazard resulting in injury or death.

**Procedure 2:
220 Volt AC Power Wiring Connection**

1. Loosen the two door screws securing the Quad Gas II Monitor outer door (FIGURE 2-1) and open the enclosure lid. Loosen the single cover screw and open the front panel (FIGURE 1-1).
2. Verify that necessary holes or entries for the power wiring are punched or drilled in the Quad Gas II Monitor enclosure.
 - Use proper conduit fittings to maintain the unit's NEMA 4X weatherproof rating.
3. Verify that the jumper on the power supply board corresponds to the voltage supplying the Quad Gas II Monitor (FIGURE 2-3):

⚠ CAUTION

Improper primary power selection can damage the unit. If unsure of the available power, contact your local power utility for clarification. These jumpers are factory-set in the 220-Volt AC position.

4. Route a three-conductor power cable (not supplied) through the electrical entry made previously in the Quad Gas II Monitor and guide the cable to the AC power wiring connector.
 - Use proper mounting hardware to ensure a good connection.
 - If attaching conduit, follow all applicable wiring codes.
5. Connect the cable to the power wiring connector as shown in TABLE 2-2 and FIGURE 2-4.
6. Using proper hardware, connect the AC ground to the AC grounding stud (FIGURE 2-4).

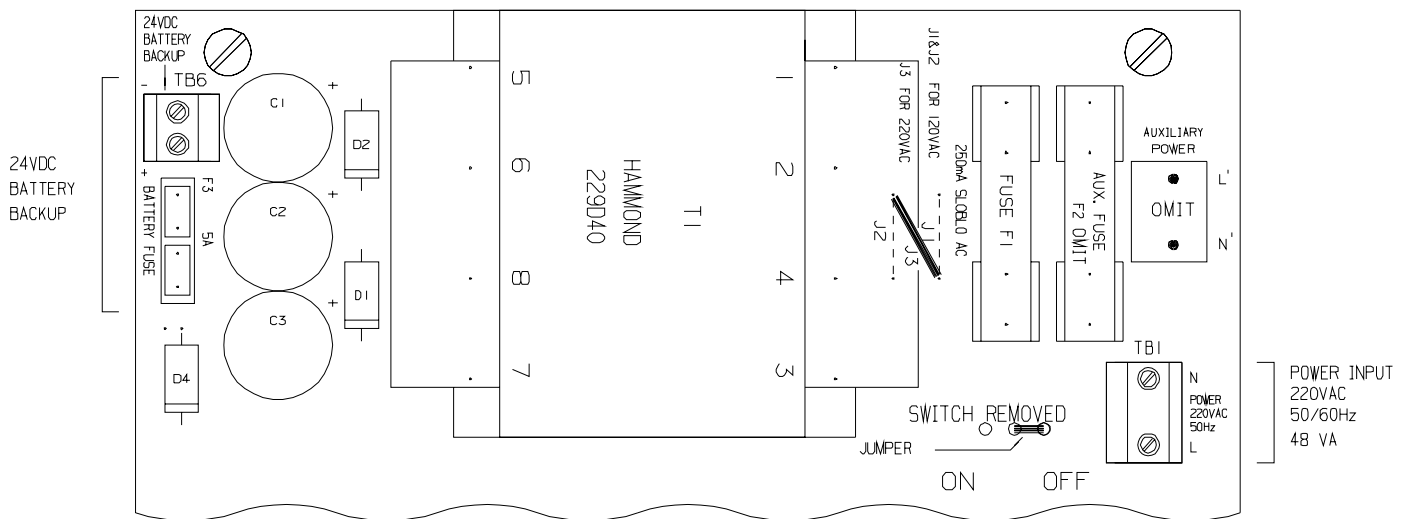
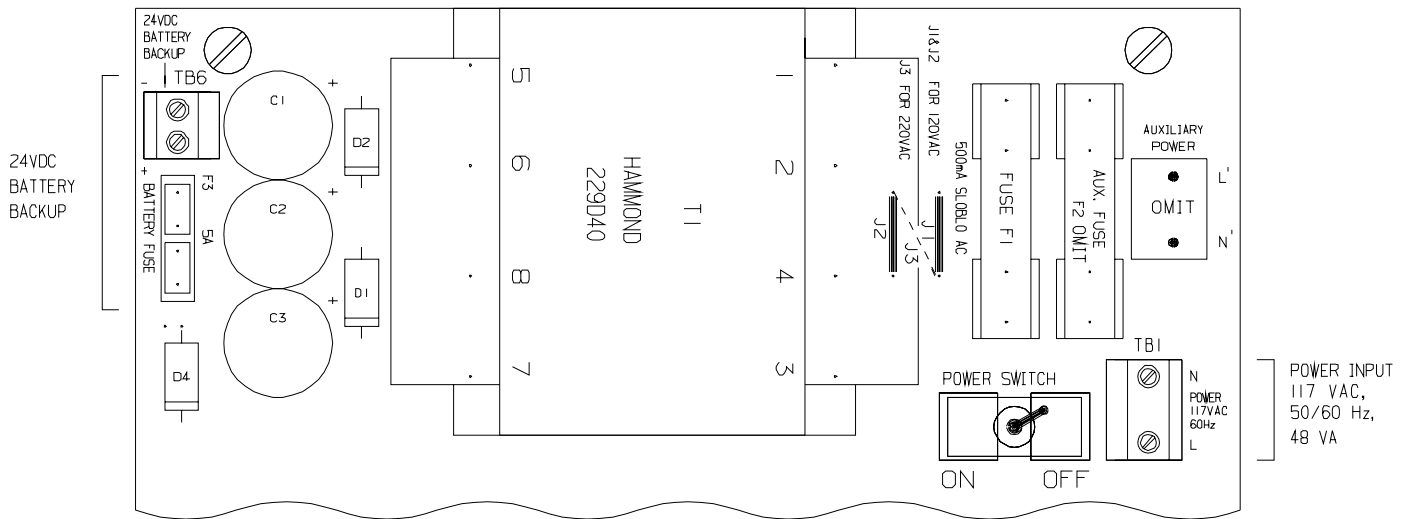


Figure 2-3. Factory-Configured Power Selection Jumpers

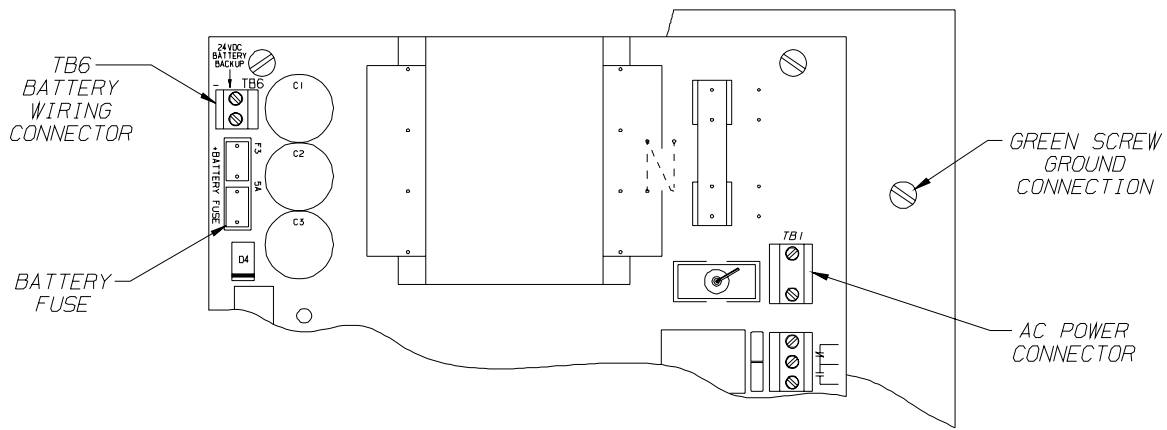


Figure 2-4. Battery Power Wiring Connections

- The ground or green wire is connected to the green screw to the right of the power wiring connector.
- Do not connect the ground or the green wire to the center position of the power wiring connector. This position on the wiring connector is not connected to ground.

⚠ WARNING

Connect the power ground to the green grounding lug. Failure to connect the power ground to this lug will cause a shock hazard which may result in injury or death.

Procedure 3: 120 or 220 Volts AC with 24 Volts Battery Backup

1. Follow "Procedure 1" or "Procedure 2" to wire the primary AC power.
2. Verify that necessary hole or entry for the battery wiring is punched or drilled in the Quad Gas II Monitor enclosure.
 - Use proper conduit fittings to maintain the unit's NEMA 4X weatherproof rating.
3. Route a two-conductor power cable (not supplied) through the electrical entry made previously in the Quad Gas II Monitor; guide the cable to the battery wiring connector, TB6.
 - Use proper mounting hardware to ensure a good connection.
 - If attaching conduit, follow all applicable wiring codes.
4. Connect the cable to the battery wiring connector (TABLE 2-3 and FIGURE 2-4).

Table 2-3. Battery Connection

TERMINAL STRIP CONNECTION	DESCRIPTION
+	Positive 24 Volt Battery
-	Negative 24 Volt Battery

Sensor Wiring Connection

- Refer to the sensor manual to determine:
 - Optimal sensor placement
 - Required wire size for your particular sensors
 - Number of conductors required for proper operation.
- Follow all applicable codes and regulations when wiring the sensors.
- The 4 to 20 mA sensors use either a two- or three-wire cable for connection to the Quad Gas II Gas Monitor (FIGURE 2-5).
- The RS-485 sensors always use a four-conductor cable.

⚠ CAUTION

Ensure that all sensor connections are correct. Carefully wire the sensors to ensure that wires or conductors are not mixed or crossed. Use correct wiring technique and ensure that no wire strands are contacting other conductors. Failure to wire the sensors correctly (especially an RS-485 sensor) may result in an inoperative or damaged sensor or Quad Gas II Gas Monitor.

1. Assign the sensors to a specific channel on the Quad Gas II Monitor and use indelible ink to write the location (ID) of

each sensor on the front label (FIGURE 1-1).

- When using 4 to 20 mA and RS-485 sensors on one unit, ensure that the two sensors do not share the same address.

Each RS-485 sensor must be assigned a unique address between 1 and 4.

- Two sensors must not share a common address.
- Do not assign an address already used by a 4 to 20 mA sensor.
- See your RS-485 sensor manual for specific address assignment information.

2. Verify that necessary holes or entries for sensor wiring are punched or drilled in the Quad Gas II Monitor.

- Use proper conduit fittings to maintain the unit's NEMA 4X weatherproof rating.

3. For 4 to 20 mA sensors:

Wire each individual sensor to its terminal within the unit.

NOTE: It is not necessary to provide a jumper wire between any terminals for two-wire sensors.

For RS-485 sensors:
Wire the four-conductor cable in a daisy chain fashion (FIGURE 2-6).

4. Re-check all sensor wiring.

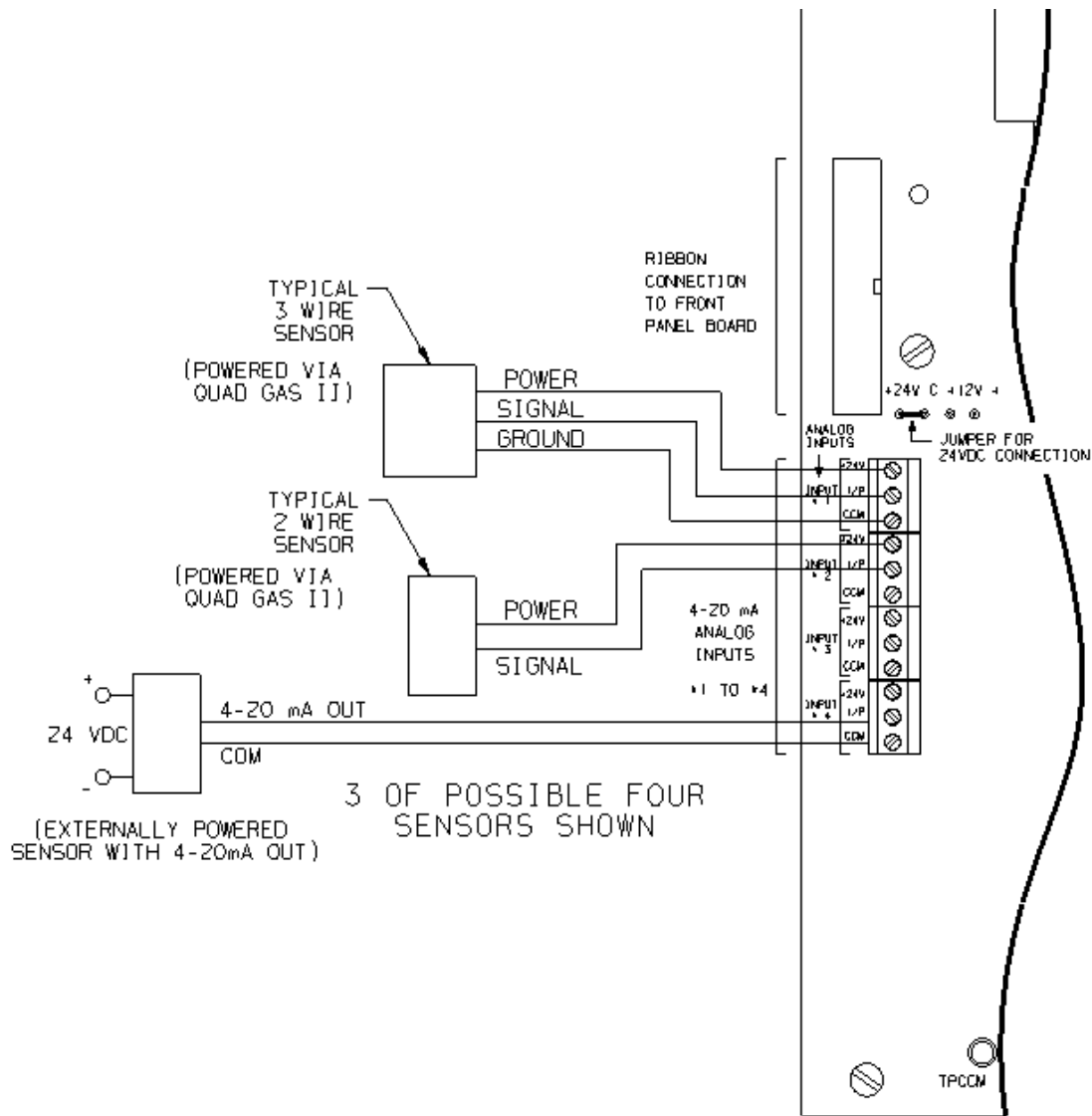


Figure 2-5. 4 to 20 mA Sensor Connections

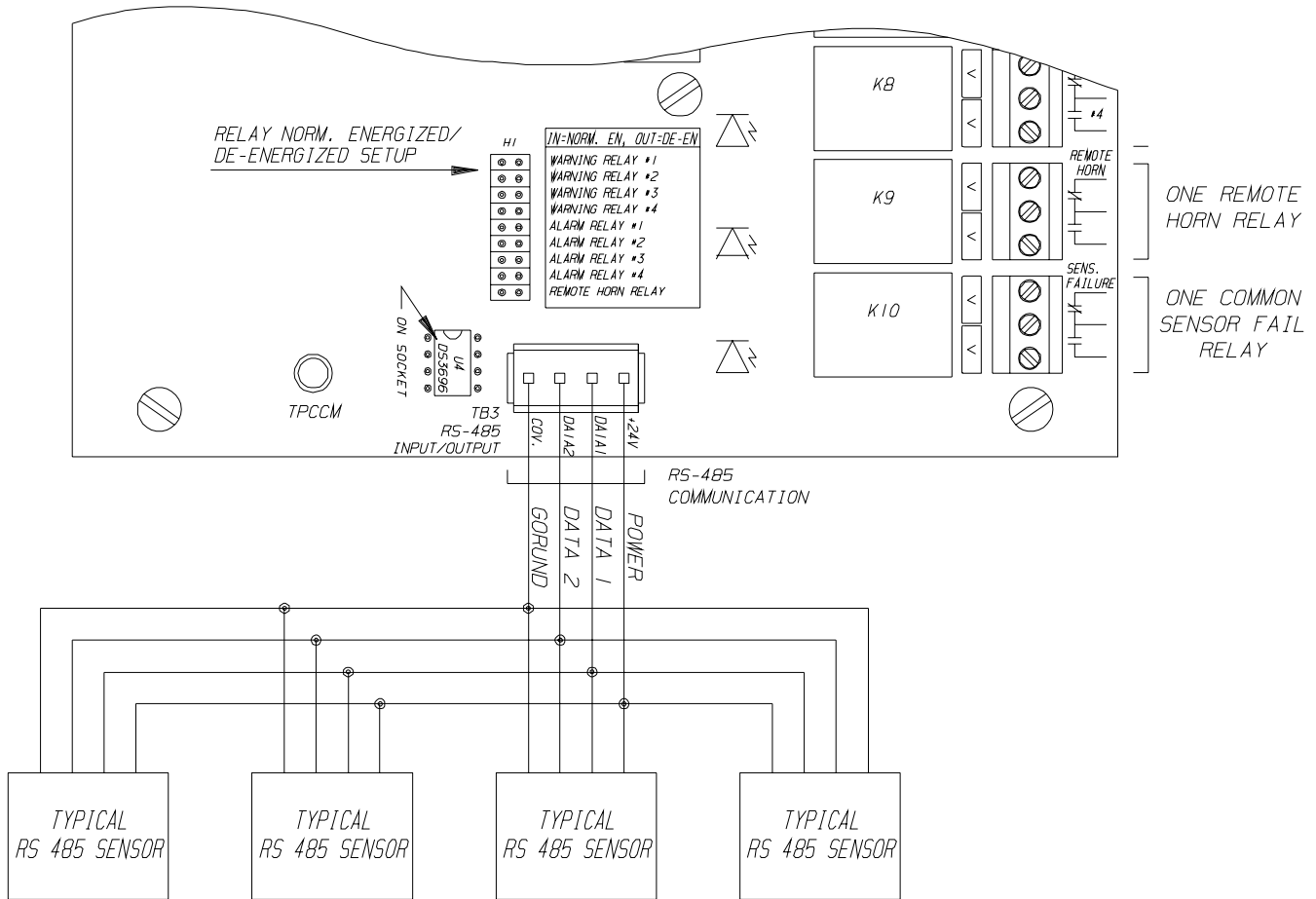


Figure 2-6. RS 485 Sensor Connection

Relay Wiring Connection

All relays in the Quad Gas II Gas Monitor are single-pole, double-throw type. This means that each relay has a single set of:

- normally open (NO)
- normally closed (NC) and
- common (C) contacts.

The markings on the printed circuit board outline the relay contacts (FIGURE 2-7).

Decide on the number and function of relays required before wiring them to any external devices.

- Some devices (e.g., fans, horns and lights) are normally connected between:
 - The common (C) and the normally open (NO) contacts.

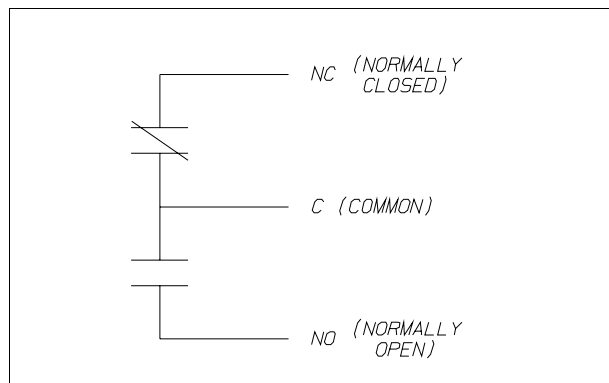


Figure 2-7. Relay Contacts

- Other devices (e.g., motors and other control equipment) are normally connected between:
 - The common (C) and the normally closed (NC) contacts.

All relays in the Quad Gas II Gas Monitor are rated at:

- 10 amps at 125C Volts A 1/8 HP or
- 6 amps at 277 Volts AC 1/8 HP
- 5 amps at 30 Volts DC.

Check equipment ratings of units to be connected to the Quad Gas II Gas Monitor relays.

- Ensure equipment ratings do not exceed the Monitor relay ratings.
- Slave relays, contactors or other devices must be used when equipment ratings exceed the relay capacity.

When assigning relays, complete TABLE 2-4. This table is a relay wiring record and can be referred to if the device connected to the relay becomes inoperative.

On P/N 215345 or P/N 216322 (FIGURE 2-8) there are:

- Four Warning relays
- One Horn relay
- One Trouble relay
- One Common Alarm relay.

On P/N 215346 or P/N 216323 (FIGURE 2-9) there are:

- Four Warning relays
- Four Alarm relays
- One Horn relay and
- One Trouble relay.

Relay Wiring

⚠ WARNING

Disconnect power before wiring; otherwise, injury, shock or death may occur.

Perform the following steps to wire the relays in the Quad Gas II Monitor:

1. Determine the relay functions desired (TABLE 2-4) and relays to be wired (FIGURES 2-8 and 2-9).
2. Verify that the necessary wiring holes or entries are punched or drilled in the right side of the Quad Gas II Monitor enclosure.
 - Use proper conduit fittings to maintain the unit's NEMA 4X weatherproof rating.
3. Loosen (but do not remove) the screws from the top of the relay wiring terminal connectors.
4. Guide the field relay cable to the appropriate relay wiring connector.
5. Insert the wire into the wiring connector and tighten the screw.
6. Wire all relays in a similar manner; when finished, close the front panel cover and tighten the screw to secure the cover to the unit.

Table 2-4. Sensor Relay Wiring Connection

SENSOR	RELAY	WIRING CONNECTIONS
1	WARNING	NC
		NO
		C
	ALARM	NC
		NO
		C
2	WARNING	NC
		NO
		C
	ALARM	NC
		NO
		C
3	WARNING	NC
		NO
		C
	ALARM	NC
		NO
		C
4	WARNING	NC
		NO
		C
	ALARM	NC
		NO
		C
COMMON ALARM		NC
		NO
		C
HORN		NC
		NO
		C
TROUBLE		NC
		NO
		C

RIBBON CONNECTION TO FRONT PANEL BOARD

4-20 mA ANALOG INPUTS #1 TO #4

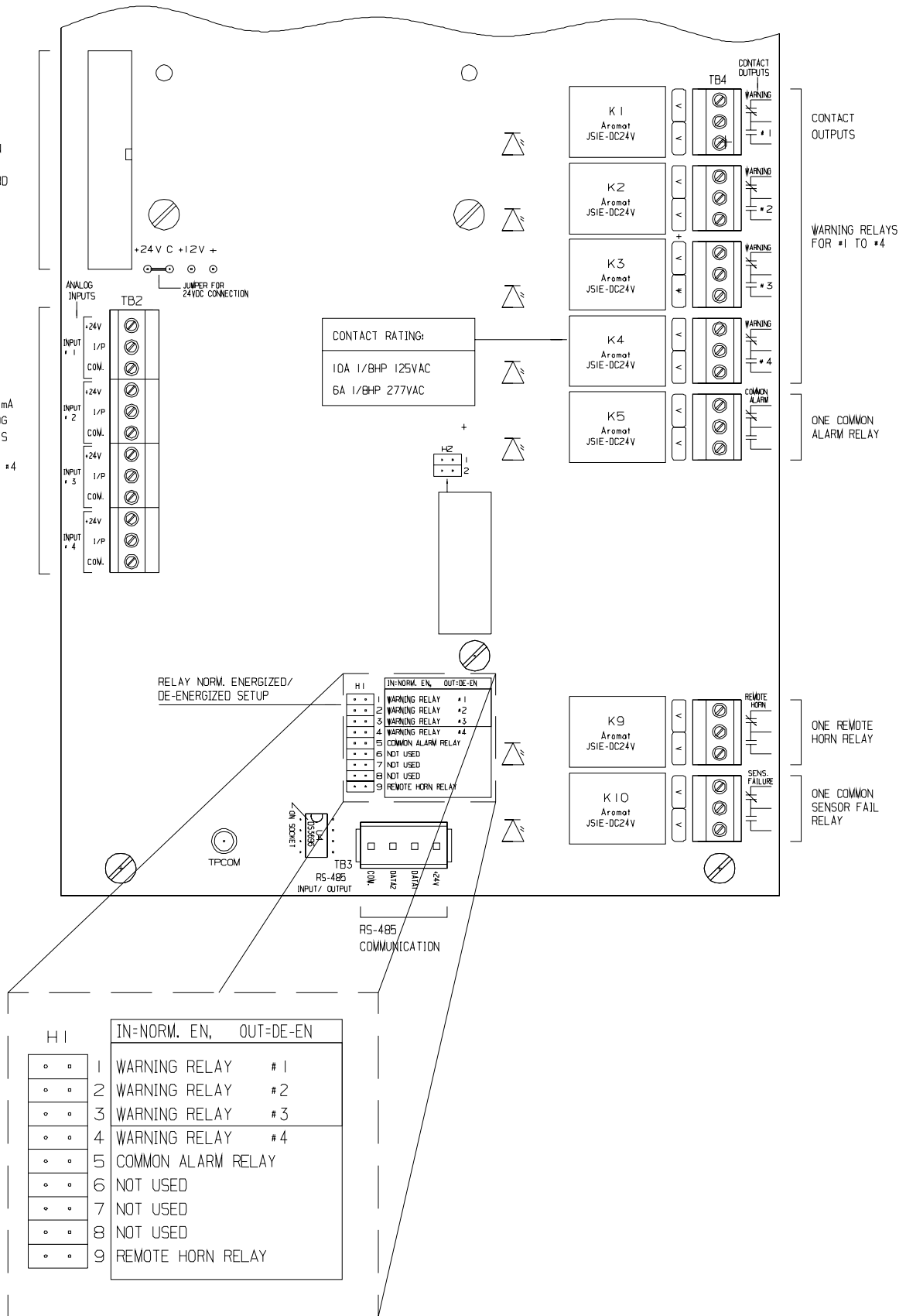


Figure 2-8. (P/N 215345 or P/N 216322) Quad Gas

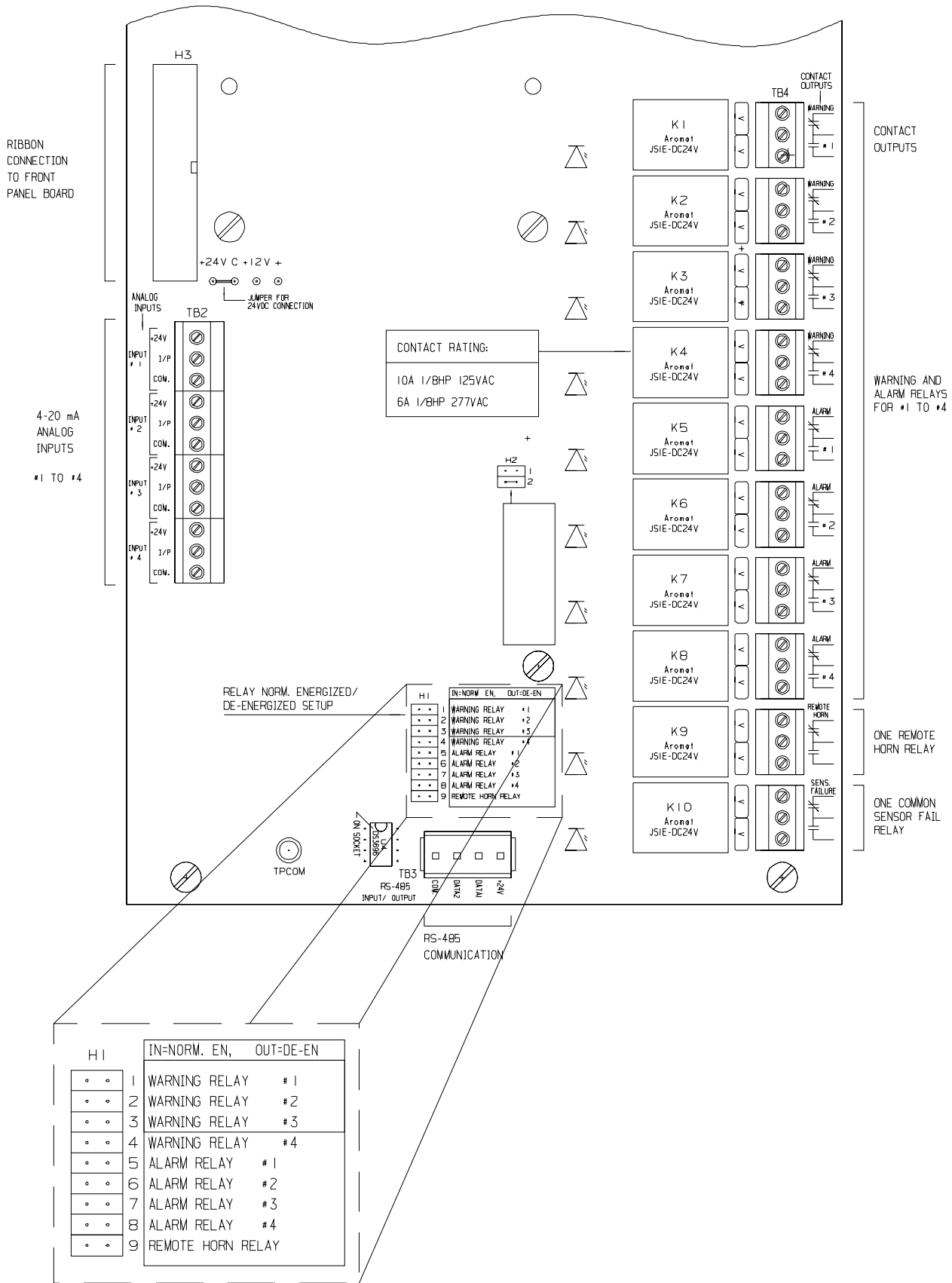


Figure 2-9. (P/N 215346 or P/N 216323) Quad Gas

Section 3

Start-up, Initial Adjustments & Calibration

General

Once the unit is wired for the proper power and relay connections, the Quad Gas II Gas Monitor is ready to be configured. However, before applying power to the monitor, it is necessary to:

- Understand the instrument configuration mode and
- Determine the configuration necessary for your application of the unit and its sensors.

Configuration Mode

The Quad Gas II Gas Monitor configuration mode can be entered at any time during instrument operation.

- Configuration mode is password-protected to prevent unauthorized changes or tampering.
- Changes made in the configuration mode take effect automatically.
- Configuration mode consists of 10 menus.
- Each menu selection is made via the keypad.
- Front-panel LED indicators show which menu is currently active.
- Possible entries are shown on the front panel; most are single-digit entries.
- When configuration is complete, pressing the RUN key returns the Quad Gas II Gas Monitor to normal operation.

More information on entering the operational parameters is given later in this Section under "Configuring the Quad Gas II Gas Monitor."

NOTE: To determine the operational configuration necessary for your Quad Gas II Gas Monitor installation, become familiar with the following operational parameters.

Sensor Range

The Quad Gas II Gas Monitor has individually adjustable sensor ranges:

- A different range is possible on each of the four sensors.
- These ranges are adjustable via the front panel.

If RS-485 Sensors are Used:

- The sensor range is automatically set.
- Each sensor sends its range to the unit.
- The Quad Gas II Gas Monitor adjusts its full-scale range automatically.

Warning and Alarm Setpoint

The Quad Gas II Gas Monitor has individual setpoints for warning and alarm levels for each sensor.

- These setpoints may be set to any level between zero and the maximum sensor range value.
- If a setpoint is set above the maximum sensor range value, it will be reduced to the maximum sensor range value.

If a Combustible Gas Sensor is Connected to the Channel, Use the Combustible Gas Mode on that Channel:

- The setpoints may only be set to a maximum of 60% of the sensor's full-scale value.
- Any higher entry for this sensor type will not be accepted.
- The current value will default to 60% of full-scale.

If RS-485 Sensors are Connected to the Channel:

- Its warning and alarm setpoint value is automatically down-loaded to the sensor.
 - The Quad Gas II Gas Monitor need not be in the configuration mode for this to occur.

Warning Relay Off Delay

The warning relays have an "Off Delay" feature, adjustable from zero to 60 minutes in one-minute increments.

- Even if no delay or a zero delay was entered, a minimum five-second delay is always present to prevent relays from chattering ON and OFF when the gas is at (or goes through) the setpoint level.
- This feature is used primarily when the relays are connected to fans and motors, thereby preventing constant starting and stopping of the motors.

- The Warning relay is held active for a preset amount of time to reduce energy maintenance cost.

Alarm Relay Off Delay

The Alarm relays have an "Off Delay" feature, also adjustable from zero to 60 minutes. This feature is the same as the "Warning Off Delay."

Increasing and Decreasing Setpoints

Increasing Setpoint

- With an increasing setpoint, a warning or alarm event occurs:
 - When the gas concentration level is **higher** than the setpoint value.

NOTE: With an increasing setpoint, the Alarm setpoint must be at a **higher** level of concentration than the Warning setpoint for proper operation.

Decreasing Setpoint

- With a decreasing setpoint, a warning or alarm event only occurs:
 - When the gas concentration level is **lower** than the setpoint value.
 - This type of alarm point configuration is useful for oxygen deficiency monitoring.

NOTE: With a decreasing setpoint, the alarm setpoint must be at a lower level or concentration than the warning setpoint for proper operation.

Alarm Latching or Non-latching Operation

Individual Alarm setpoints can be configured to the latching or non-latching position.

In the Latching Mode:

- The associated Alarm relay and front-panel LEDs remain active even if the gas alarming event ends.
- To reset Alarm relays to the inactive state, the Horn Acknowledge/Alarm Reset button must be pressed.
 - When the button is pressed before the gas alarming event ends, it only silences the horn and de-activates the Horn relay.

In the Non-latching Mode:

- The alarms cannot be reset; they are automatically reset when the gas alarming event ends.
 - Pressing the Horn Acknowledge/Alarm Reset button only silences the horn and de-activates the Horn relay.

Calibration

No entries are possible in the Calibration Menu.

- This menu provides user feedback to aid in sensor calibration or sensor testing without activating any relays.
- The Quad Gas II Gas Monitor remains in this menu for up to 60 minutes after the last keystroke.
- Be sure to exit from this menu when finished.

Horn Operation

The audible horn on the Quad Gas II Gas Monitor sounds when an alarm event occurs.

- The Alarm relay and horn activate at the same time.

There are two different modes of horn operation:

In the Constant ON Mode:

- The horn sounds continuously when an alarm event occurs.

In the Variable ON Mode:

- The horn beeps more continuously as the gas concentration level rises above the Alarm setpoint.

For example:

If a sensor has a maximum full-scale value at 100 ppm and an Alarm setpoint at 50 ppm:

- If an alarm event occurs with the detection of 60 ppm gas:
 - The audible horn sounds for 1.25 seconds and turns OFF for 6.75 seconds.
 - The formula is:

$On\ time = (Alarm\ event\ gas\ concentration - alarm\ setpoint) \div 8$
(where 8 equals the cycle time for the horn)

- If the gas concentration level in the above example rises to 80 ppm:
 - the horn sounds for 3.75 seconds
 $(80-50) \div 8$ the horn is silent for 4.25 seconds.
- The variable horn feature provides an audible indication of the gas concentration level above the Alarm setpoint:
 - The longer the beep is within eight seconds, the higher the gas concentration.

If some sensors are configured in the Constant ON Horn mode and others are configured in the Variable ON Horn mode:

- When both have alarm events activated:
 - The constant ON Horn mode takes precedence over the variable mode .

Channel Enable or Disable

Each of the four channels can be enabled (activated) or disabled (de-activated).

- A channel is disabled when no sensor is attached to that channel.
 - This is used when only one, two or three sensors are connected to the Quad Gas II Gas Monitor.

There are three choices (0, 1, or 2) when activating a channel:

- 0 = No sensor
- 1 = Oxygen or Toxic Sensor is attached to that channel
- 2 = Combustible Gas Sensor is attached to that channel.

Choose the proper code for your particular sensor attached to that channel.

Relays Normally Energized or De-energized

Each relay (except the Trouble relay) can be set for:

- Normally energized operation or
- Normally de-energized operation.

Normally Energized Relays

- Are powered when no warning or alarm event is present
- Relay changes state when an event occurs
- Are for fail-safe operation.
 - If the main power is removed, the relay change states to signal an Alarm event.

Normally De-energized Relays

- Are un-powered when no warning or alarm event is present.
- Relay changes state when an event occurs.
- Are for operation when power outages are not a source of Warn or Alarm events.

Recording the Operational Parameters

Record the startup and operational information for each channel in TABLE 3-1 to help:

- Configure the Quad Gas II Gas Monitor
- Serve as a record for future reference.

Initial Jumper Settings

Most unit configuration is done after power is applied. However, one bank of jumpers (located inside the unit on the printed circuit board - FIGURE 3-1) must be configured for your application before power is applied.

- These jumpers set the normally energized or normally de-energized relay function.
- See TABLE 3-1 to determine your operational configuration for normally energized or normally de-energized relays.

The normally energized or de-energized relay jumpers:

- Are factory-set as normally de-energized (except the Trouble relay)
 - The Trouble relay:
 - Is always normally energized
 - Has no jumper
 - Cannot be changed.

1. To access these jumpers, loosen the screw securing the Monitor cover (FIGURE 1-1) and open the enclosure lid.
2. Locate the jumpers on the printed circuit board.
3. For each relay:
 - a. **For Normally Energized Relays:** Move the jumper to cover **both** jumper pins.
 - b. **For Normally De-energized Relays:** Move the jumper to the right (one jumper pin will **not** be covered).

Initial Start-Up

Before applying power to the monitor, determine the operational configuration of the unit and its sensors by recording the information on TABLE 3-1 for future reference.

Confirming Quad Gas II Monitor Wiring

Before starting up the Quad Gas II Monitor, perform the following checks:

1. Loosen the two screws securing the Quad Gas II Monitor cover (FIGURE 1-1), and open the enclosure lid; loosen single cover screw and open the front panel.
2. Check power wiring connections (FIGURE 2-4).
3. Ensure that power supplied to the Quad Gas II Monitor is the proper voltage with

Table 3-1. Start-up and Operational Data

UNIT IDENTIFICATION						INITIALS	
Quad Gas II GAS MONITOR SERIAL NUMBER							
DATE INSTALLED							
DATE POWERED UP							
DATE CALIBRATED							
OPERATIONAL PARAMETERS	MENU NUMBER	CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4	POSSIBLE ENTRIES	FACTORY SETTINGS
GAS SENSOR INSTALLED							
FULL SCALE GAS RANGE, PPM OR %	1					0 to 999 or 0 to 99.9	100
WARNING SETPOINT VALUE	2					0 to 999 or 0 to 99.9	25
ALARM SETPOINT VALUE	3					0 to 999 or 0 to 99.9	50
WARNING RELAY, OFF DELAY,	4					0 to 60 minutes	2 minutes
ALARM RELAY, OFF DELAY	5					0 to 60 minutes	5 seconds
INCREASING (1) OR DECREASING (0) ALARM AND WARNING SETPOINT ACTIVATION	6					1=increasing setpoints 0=decreasing setpoints	1
ALARM LATCHING (1) OR NON-LATCHING (0)	7					1=alarm setpoint latching, 0=alarm setpoint nonlatching	0
CALIBRATION	8	N/A	N/A	N/A	N/A	No entry possible	N/A
STEADY AUDIBLE HORN (1) OR VARIABLE TONE HORN (0)	9					1=Audible horn on solid, 0=audible horn is variable	1
CHANNEL ACTIVATION	10					0= disabled 1= Oxygen and toxic sensors 2= Combustible gas	1
ALARM RELAY NORMALLY ENERGIZED (E) OR NORMALLY DE-ENERGIZED (N)						E = energized N = de-energized	N
WARNING RELAY NORMALLY ENERGIZED (E) OR NORMALLY DE-ENERGIZED (N)						E = energized N = de-energized	N
COMMON ALARM RELAY NORMALLY ENERGIZED (E) OR NORMALLY DE-ENERGIZED (N)						E =e nergized N =d e-energized	N

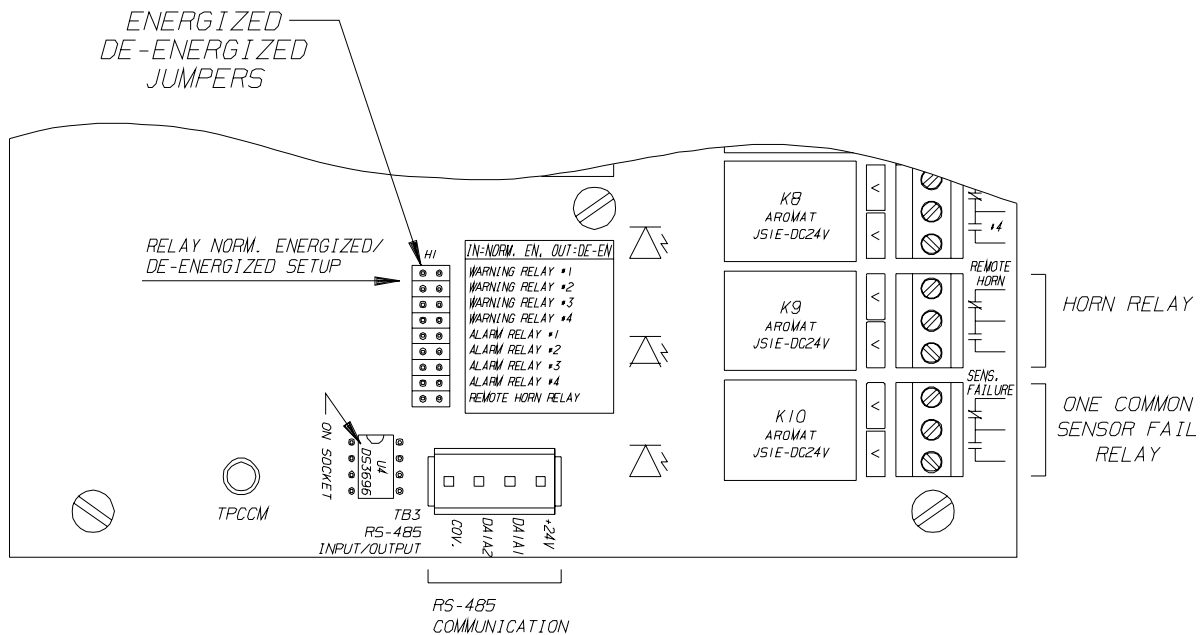


Figure 3-1.
Internal Relay Jumpers

- sufficient current capacity to operate the instrument (TABLE 1-1).
4. Check sensor wiring connections (FIGURE 2-5 or 2-6).
 5. Check relay wiring connections (FIGURE 2-7, 2-8 or 2-9).
 6. If all wiring is proper, proceed to "Applying Power."
 - If not, fix or correct any wiring errors before proceeding.

Applying Power

When power is applied, the warning or alarm relays may activate.

CAUTION

If the relays in the Quad Gas II Monitor are wired to external devices (e.g.: horns, exhaust fans and fire suppression systems), these devices may activate while adjustments are performed during the initial start-up procedures. To prevent activation while adjusting the Quad Gas II Monitor, place these devices in the STANDBY mode, or remove the wire from the connector. Consult the equipment instruction manual for further details. Return all devices to normal operation or return wiring to the connector the Quad Gas II Monitor adjustment is complete.

1. At the electrical panel, close or connect the circuit breaker supplying the main power to the Quad Gas II Gas Monitor.
2. Move the power switch handle (located inside the unit, on the printed circuit board) to the ON position (FIGURE 2-2).
3. Close the front-panel cover and secure it with its single screw.

NOTE: It may take a few minutes for the sensors to warm up.

Configuring the Quad Gas II Monitor

Introduction

The Quad Gas II Gas Monitor is configured:

- Via the front-panel keypad
- At any time (not only during startup).

To prevent accidental or unauthorized instrument configuration, a password is needed.

- The password is shown in Appendix B, "Configuration Password." This password cannot be changed
- Remove Appendix B from this manual and store it in a secure place.

To prevent the instrument from being inadvertently left in the Configuration Mode:

- If one minute passes without keypad entry, the instrument leaves the Configuration Mode and returns to normal operation.
- However, this one-minute time-out is extended to 60 minutes while in the **Calibration Menu** of the Configuration Mode.

While the unit is in the Configuration Mode:

- It is **not** monitoring any sensors
- All relays are locked in the state they were in when the Configuration Mode was entered:
- Relays do not activate or de-activate while unit is in the Configuration Mode, even if the sensor detects a warning or alarm event.

⚠ WARNING

The instrument is not monitoring while in the Configuration Mode. Ensure that the monitored areas do not have a gas build-up situation. Otherwise, toxic or combustible gas may unknowingly build up which may cause an injury or death.

The configuration mode consists of 10 menus.

- Each menu has a selection or entry made via the keypad number keys
- The selection enters instrument memory when the Enter button is pressed.
- The first number entered appears at the left-most position on the display.
 - **For example:**
If entering a value of "35":
 - It is necessary to enter a "0" followed by "3" and "5"
 - Pressing the Enter key stores a value of "35" in the instrument.

The non-numbered keys are:

- **LEFT OR RIGHT ARROW:**
Scrolls through each sensor in the currently active menu.
- **MENU:**
Advances to the next menu. Menu 1 is active when advancing from menu number 10.
- **ENTER:**
Enters typed number into instrument memory.
- **RUN:**
Returns instrument to normal operation.
- **·:**
Used as decimal point for decimal numbers.

NOTE: See TABLE 3-1 before configuring your unit.

Configuring the Unit

1. To enter the configuration mode, simply enter the password on the keypad.
 - If a mistake is made, re-enter the code.
 - It is not necessary to press the ENTER key when finished.
2. **MENU #1 - FULL SCALE RANGE**
 - Menu #1 is the first active menu.
 - A small, front-panel LED turns ON next to the words "Full Scale Value."
 - The left digit on the display is the sensor point number
 - The next three digits are the sensor full-scale range.
 - a. Refer to TABLE 3-1; use the keypad to enter the full-scale value for this sensor.
 - b. Press ENTER key when finished.
3. Press the LEFT or RIGHT Arrow key to scroll to the next sensor.
 - a. Refer to TABLE 3-1; use the keypad to enter the full-scale value for this sensor.
 - b. Press ENTER when finished.
 - c. Repeat this step until all full-scale values are entered for each sensor.
 - d. Press the MENU button to advance to the next menu.
4. **MENU #2 - WARNING SETPOINT VALUE**
 - Menu #2 is the next active menu.
 - The small LED turns ON by the front-panel words "Warning Setpoint".
 - The left digit on the display is the sensor point number
 - the next three digits represent its Warning Setpoint value.
 - a. Refer to TABLE 3-1; use the keypad to enter the Warning Setpoint value for this sensor.
 - b. Press ENTER when finished.
5. Press the LEFT or RIGHT Arrow key to scroll to the next sensor.
 - a. Refer to TABLE 3-1; use the keypad to enter the Warning Setpoint value for this sensor.
 - b. Press ENTER when finished.

- c. Repeat this step until all Warning Setpoint values for each sensor are entered.
 - d. Press the MENU button to advance to the next menu.
6. **MENU #3 - ALARM SETPOINT VALUE**
- Menu #3 is the next active menu.
 - A small, front-panel LED turns ON next to the words "Alarm Setpoint."
 - The left digit on the display is the sensor point number
 - The next three digits represent the Alarm Setpoint value.
- a. Refer to TABLE 3-1; use the keypad to enter the Alarm Setpoint value for this sensor.
 - b. Press ENTER when finished.
7. Press the LEFT or RIGHT Arrow key to scroll to the next sensor.
- a. Refer to TABLE 3-1; use the keypad to enter the Alarm Setpoint value for this sensor.
 - b. Press the ENTER key when finished.
 - c. Repeat this step until all Alarm Setpoint values for each sensor are entered.
 - d. Press the MENU button to advance to the next menu.
8. **MENU #4 - WARNING RELAY OFF DELAY VALUE**
- Menu #4 is the next active menu.
 - The small LED turns ON by the front-panel words "Warning Relay Off Delay".
 - The left digit on the display is the sensor point number
 - The right two digits is its Off delay value.
- a. Refer to TABLE 3-1; use the keypad to enter the Warning Relay Off Delay value for this sensor.
 - b. Press ENTER when finished.
9. Press the LEFT or RIGHT Arrow key to scroll to the next sensor.
- a. Refer to TABLE 3-1, use the keypad to enter the Warning Relay Off Delay value for this sensor.
 - b. Press ENTER when finished.
 - c. Repeat this step until all Warning Relay Off Delay values for each sensor are entered.
- d. Press the MENU button to advance to the next menu.
10. **MENU #5 - ALARM RELAY AND HORN OFF DELAY VALUE**
- Menu 5 is the next active menu.
 - The small LED turns ON by the front-panel words "Alarm Relay and Horn Off."
 - The left side digit on the display is the sensor point number
 - The other two digits represent its Off Delay value.
- a. Refer to TABLE 3-1; use the keypad to enter the Alarm Relay and Horn Off Delay value for this sensor.
 - b. Press ENTER key when finished.
11. Press the LEFT or RIGHT Arrow key to scroll to the next sensor.
- a. Refer to TABLE 3-1; use the keypad to enter the Alarm Relay and Horn Off value for this sensor.
 - b. Press ENTER key when finished.
 - c. Repeat this step until all Alarm Relay and Horn Off values for each sensor are entered.
 - d. Press the MENU button to advance to the next menu.
12. **MENU #6 - INCREASING OR DECREASING SETPOINT VALUE**
- Menu 6 is the next active menu.
 - The small LED will be ON by the front-panel words "Increasing or Decreasing Setpoint".
 - The left digit on the display is the sensor point number
 - The other two digits represent its increasing or decreasing value.
- a. Refer to TABLE 3-1; use the keypad to enter the Increasing or Decreasing Setpoint Value for this sensor.
 - b. Press ENTER key when finished.
13. Press the LEFT or RIGHT Arrow key to scroll to the next sensor.
- a. Refer to TABLE 3-1; use the keypad to enter the Increasing or Decreasing Setpoint Value for this sensor.
 - b. Press ENTER key when finished.
 - c. Repeat this step until all Increasing or Decreasing Setpoint Values for each sensor are entered.

- d. Press the MENU button to advance to the next menu.
14. **MENU #7 - ALARM LATCHING OR NON-LATCHING VALUE**
- Menu 7 is the next active menu.
 - The small front-panel LED turns ON by the words "Alarm Latching or Non-latching".
 - The left digit on the display is the Sensor Point Number.
 - The other two digits represent its latching or non-latching value.
- a. Refer to TABLE 3-1; use the keypad to enter the Alarm Latching or Non-latching Value for this sensor.
- b. Press ENTER key when finished.
15. Press the LEFT or RIGHT Arrow key to scroll to the next sensor.
- a. Refer to TABLE 3-1; use the keypad to enter the Alarm Latching or Non-latching Value for this sensor.
- b. Press ENTER key when finished.
- c. Repeat this step until all Alarm Latching or Non-latching Values for each sensor are entered.
- d. Press the MENU button to advance to the next menu.
16. **MENU #8 - CALIBRATION**
- Menu 8 is the next active menu.
 - The small front-panel LED turns ON by the word "Calibration".
 - The left digit on the display is the Sensor Point Number.
 - The other two or three digits represent its mA current reading (for calibration only).
 - There are no entries in this menu.
 - This menu is useful for checking out sensors, especially after adding or repairing sensors.
 - The Quad Gas II Gas Monitor locks on the chosen sensor for up to 60 minutes. Its reading is also locked on the display.
17. Press the LEFT or RIGHT Arrow key to scroll to the next sensor.
- Its reading locks on the display for up to 60 minutes.
- When finished viewing all of the sensor outputs, press the MENU button to advance to the next menu.

18. **MENU #9 - AUDIBLE SOLID OR VARIABLE VALUE**
- Menu 9 is the next active menu.
 - The small front-panel LED turns ON by the words "Audible Solid or Variable".
 - The left digit on the display is the sensor point number
 - the other two digits represent its Audible solid or variable value.
- a. Refer to TABLE 3-1; use the keypad to enter the Audible Solid or Variable Value for this sensor.
- b. Press ENTER when finished.
19. Press the LEFT or RIGHT Arrow key to scroll to the next sensor.
- a. Refer to TABLE 3-1; use the keypad to enter the Audible Solid or Variable Value for this sensor.
- b. Press ENTER key when finished.
- c. Repeat this step until all Audible Solid or Variable Values for each sensor are entered.
- d. Press the MENU button to advance to the next menu.
20. **MENU #10 - POINT ACTIVATION MODE**
When using a combustible sensor on a channel, configure that channel for combustible gas, selection 2:
- This allows the setpoint to be set no higher than 60% of full-scale
 - This allows compliance with the applicable ISA specifications
 - Menu 10 is the next active menu
 - The small front-panel LED turns ON by the words "Point Activation"
 - The left digit on the display is the Sensor Point Number
 - The other two digits represent its Point Activation Value.
- a. Refer to TABLE 3-1; Use the keypad to enter the Point Activation Value for this sensor.
- b. Press ENTER when finished.
21. Press the LEFT or RIGHT Arrow key to scroll to the next sensor.
- a. Refer to TABLE 3-1; use the keypad to enter the Point Activation Value for this sensor.
- b. Press ENTER key when finished.
- c. Repeat this step until all Point Activation Values for each sensor are entered.

-
- d. Press the MENU button to advance to the first menu.
 22. Check through each menu and sensor setting to ensure that the proper settings are stored in the unit.
 23. When all channels are configured and verified, press the front-panel RUN key to place the instrument into operation.
 - The instrument immediately starts monitoring all activated channels.
 - If any front-panel "SENSOR OK" LEDs turn OFF, a wiring difficulty may be indicated.
 - Refer to the Section 5, "Troubleshooting Guidelines" for corrective action.
 - If the front-panel display shows # ---:
 - Sensor(s) is/are in a calibration mode; when power is first applied to the unit, some types of sensors go into a calibration mode for three minutes.
 24. When finished, close the front lid and secure it with the two clamps.

Section 4

General Sensor Calibration

Calibration Introduction

All Quad Gas II Monitor calibration is done at the sensor location. Perform sensor calibration as outlined in the sensor instruction manual.

- Perform calibration regularly, and maintain a log of calibration adjustments.
- Increase the sensor calibration frequency when any calibration shows as much as 10% variance from the test gas concentration.
- More frequent sensor calibrations may be required when the sensor is new or approaches its end-of-life.
- Also perform sensor calibration when installing or changing the sensor.
- The necessary sensor calibration frequency depends on the sensor's operating time and chemical exposures.
 - Calibrate newly installed sensors more often, until the calibration records prove sensor stability.
 - The calibration frequency can then be reduced to a schedule set by the safety officer or facility manager.

If sensor calibration cannot be performed at any step, see Section 5, "Troubleshooting Guidelines" in this manual and in the applicable sensor manual to localize and fix the problem or replace the inoperative component.

MSA offers:

- On-site service
- On-demand repair service
- Contract maintenance service (often the most cost-effective way to repair and maintain your instrument)
- For more information, please call MSA Repair and Customer Service Department:
World-wide: 1-800-MSA-INST
Canada: 1-800-267-0672.

Depending on the sensor type used when configuring the monitor, the Warning and Alarm relays may not activate.

- Certain sensors output a distinctive signal when they are being calibrated/configured.

- The Monitor recognizes this signal and prevents all relays from activating in order to prevent any configuration/calibration adjustments from operating any equipment connected to the Monitor relays.

Other sensors do not output a distinctive signal during calibration or configuration and require special attention.

- When calibrating or configuring these sensors, relays within the Quad Gas II Monitor may activate.
- Menu #8 is designed for these sensors.
- Placing the Quad Gas II Gas Monitor into configuration Menu #8 locks the relays in the current state.
- As long as the unit is in Menu #8, the relays will not activate.
- Take care to ensure that any relay activation does not cause equipment connected to those relays to operate.

⚠ CAUTION

If relays in the Quad Gas II Monitor are wired to external devices (e.g.: horns, exhaust fans and fire suppression systems), these devices may activate while adjustments are made during sensor calibration. To prevent activation while adjusting the Quad Gas II Monitor, place these devices in the STANDBY mode, or remove the wire from the wiring connector within the unit. Consult the sensor instruction manual for further details. Return all devices to normal operation or rewire the connector when the Quad Gas II Monitor adjustment is complete.

Sensor Calibration

1. Obtain the necessary sensor calibration equipment and test gas cylinders. Also, locate and identify the sensor location.

⚠ CAUTION

If the relays in the Quad Gas II Monitor are wired to external devices (e.g., horns, exhaust fans, and fire suppression systems), these devices may activate while adjustments are performed during sensor calibration. To prevent activation while adjusting the Quad Gas II Monitor, place these devices in the STANDBY mode, or

remove the wire from the wiring connector within the unit. Consult the sensor instruction manual for further details. Return all devices to normal operation or rewire the connector when the Quad Gas II Monitor adjustment is complete.

2. Refer to the sensor instruction manual for complete calibration specifications and instruction.
 - If necessary, place the Quad Gas II Gas Monitor into Menu #8 within the configuration mode.
 - Generally, it is good practice to manually place the instrument into this menu even if the sensors do it automatically.
3. Calibrate all sensors connected to the monitor.

- Refer to the sensor instruction manual for complete calibration specifications and instructions.

If the sensor calibration procedure cannot be performed at any step, consult the "Troubleshooting Guidelines" in this manual and in the applicable sensor manual to localize the problem and replace the inoperative component.

Routine Calibration Procedure

Sensor calibration is still required and can be done at the sensor site.

- Refer to the sensor manual for the routine sensor calibration information.

Section 5 Operation

General Instrument Operation

In normal operation, the Quad Gas II Monitor continuously scans all four channels. It remains on a particular channel for two seconds before moving to the next channel.

- The Sensor Fault relay is energized
- The Sensor Fault Relay LED on the printed circuit board is ON; this is normal.

If a particular channel's green LED is OFF, that channel's gas concentration signal is in error. Possible causes may be a broken wire or a sensor that must be calibrated.

- The gas reading for that particular channel will be "---".
- The Fault or Sensor relay de-energizes.
- Since this relay is normally energized, the relay LED inside the unit turns OFF.

Once the cause of the signal error is corrected:

- The Trouble relay returns to its normal position
- The green LED turns ON.

If an alarm or warning condition occurs on a channel which is not displayed, the Quad Gas II Monitor immediately:

- Activates the front-panel indicators.
- Activates the appropriate relays after any preset delays.

Press the Horn/Acknowledge button on the enclosure bottom to:

- De-activate the Horn relay and
- Change the front-panel indicators, depending on the Quad Gas II Monitor configuration.

Once the Warning or Alarm condition clears:

- Press the Horn/Acknowledge button again to reset all relays.

Push buttons

The keypad buttons are not active during normal unit operation.

- A password is needed to activate keypad buttons.

The Horn/Acknowledge button:

- Resets the horn
- Acknowledges or resets any warning or alarm which has cleared.

Interpreting Front Panel Display Indications

TABLE 5-1 identifies all indicators and front-panel LED indications (FIGURE 1-1).

If the Quad Gas II Monitor displays "---" for a particular channel:

- The Quad Gas II Monitor continues scanning all channels and displays this code when dwelling on an inoperative channel

Table 5-1. Front Panel Display Indications

INDICATOR	INDICATION	MEANING	DESCRIPTION
METER	---	FAILURE	Over- or Under-range signal
METER	CURRENT SENSOR VALUE	CALIBRATE	The sensor is in calibration
WARNING LED	ON	WARNING	WARNING indication
ALARM LED	ON	ALARM	Acknowledge alarm indication
	BLINKING	ALARM	Un-acknowledge alarm indication
SENSOR OK LED	OFF	FAILURE	Failure indication
	ON	POWER	Sensor is operative

- Once the difficulty is corrected, the reading displays the gas concentration value.

TABLE 5-2 identifies possible sensor problems on that channel:

- Sensor wiring may be open or shorted
- Sensor signal may be above or below the allowable limits
- Sensing element may be removed from the sensor housing.

Table 5-2. Troubleshooting Guidelines

SYMPTOM	PROBABLE CAUSE	POSSIBLE SOLUTION
NO FRONT PANEL LIGHTS	Customer input power interrupted	*Check and correct input power
	Bad connection between power cable & terminal block	*Check power terminal block
	Inoperative display board	*Check connection or replace printed circuit board
FAIL (---) INDICATION LIGHTS	Open or shorted cable between the control unit & the sensor assembly	Check for sensor cable continuity, or tighten sensor-to-PC board connections
	Uncalibrated sensor	Calibrate sensor
	Inoperative sensor	Replace sensor
	Blown sensor fuse	Replace sensor fuse
	Loose sensor connections	Tighten sensor-to-PC board connections
	Inoperative processor board	Replace processor board
KNOWN WARNING AND/OR ALARM CONDITIONS EXIST AND DIGITAL READ-OUT IS CORRECT, BUT DESCRIPTORS (LEDs) DO NOT TURN ON	Warning and/or Alarm setpoints set too high	Re-set setpoints
DIGITAL READ-OUT DOES NOT INDICATE CONDITION	Uncalibrated sensor	Calibrate sensor
	Inoperative or dirty sensor	Replace sensor
	Disabled processor board	Verify and re-power the instrument; replace board if necessary
DIGITAL READ-OUT BLANK	Incorrect or no power	Apply power
WARNING AND/OR ALARM DESCRIPTORS (LEDs) DO NOT TURN OFF, AND DIGITAL READ-OUT INDICATES NON-HAZARD CONDITION	Latched function selected	Reset
	Improperly set Warning and/or Alarm setpoints	Re-adjust setpoints
	Printed circuit board failure	Replace processor board
REMOTE DEVICES FAIL TO OPERATE	Remote devices improperly connected	Verify remote device wiring connections
	Configuration improperly set	Re-configure the unit
HORN RELAY DOES NOT ACTIVATE WHEN HAZARD CONDITION EXISTS	Improperly set level points	Re-set setpoint levels; then, verify
	Loose interconnecting cables	Re-connect interconnecting cables
	Inoperative PC board	Replace PC board
*WARNING: Exercise caution as potential shock hazard exists.		

Relays

The two Quad Gas II Monitor models are:

- **COMMON ALARM RELAY MODEL** - equipped with seven relays consisting of:
 - One common Alarm relay
 - One common Horn relay
 - One Sensor Fail relay and
 - Four Warning relays.
- **DISCRETE RELAY MODEL** - equipped with 10 relays consisting of:
 - Four Warning relays
 - Four Alarm relays
 - One common Horn relay and
 - One Sensor Fail relay.

Determine which model you have by counting the number of relays inside the unit (FIGURE 2-8 or 2-9).

Common Relay Model

- When a Warning setpoint on a particular channel is activated:
 - Only the Warning relay activates for that particular channel.
- When an Alarm setpoint on any channel is activated:
 - Only the common Alarm relay activates.
- When any alarm condition is activated:
 - The Horn relay activates.
- When any Fault or Trouble is detected with any of the sensors:
 - The Fault relay activates.

Discrete Relay Model

Every alarm and warning on the instrument has an associated relay.

- **For example:**
When a Warning occurs on Channel 1:
 - Only Warning relay number 1 activates or deactivates, depending on the position of Jumper H1.

Since there is only one Fault relay:

- When a Fault or Trouble is detected in any sensor, the Fault relay activates (i.e., common to all channels).
- When any Alarm condition is detected, the common Horn relay activates.

Responding to a Warning or Alarm Condition

When a Warning or Alarm condition occurs on the Quad Gas II Monitor, immediate action to correct the condition is necessary.

⚠ WARNING

Do not ignore any Alarms or Warning indications from the Quad Gas II Monitor. Failure to correct any alarming or warning condition can cause serious personal injury or death.

- Press the Horn/Acknowledge push-button on the front door to de-activate the Horn relay.
 - This silences any siren or alarming device connected to the Horn relay.
- Look at the Alarm or Warning LEDs and the ID tag label (FIGURE 1-1) through the front-panel window to determine:
 - Which channel is causing the Warning or Alarm condition
 - The sensor location.

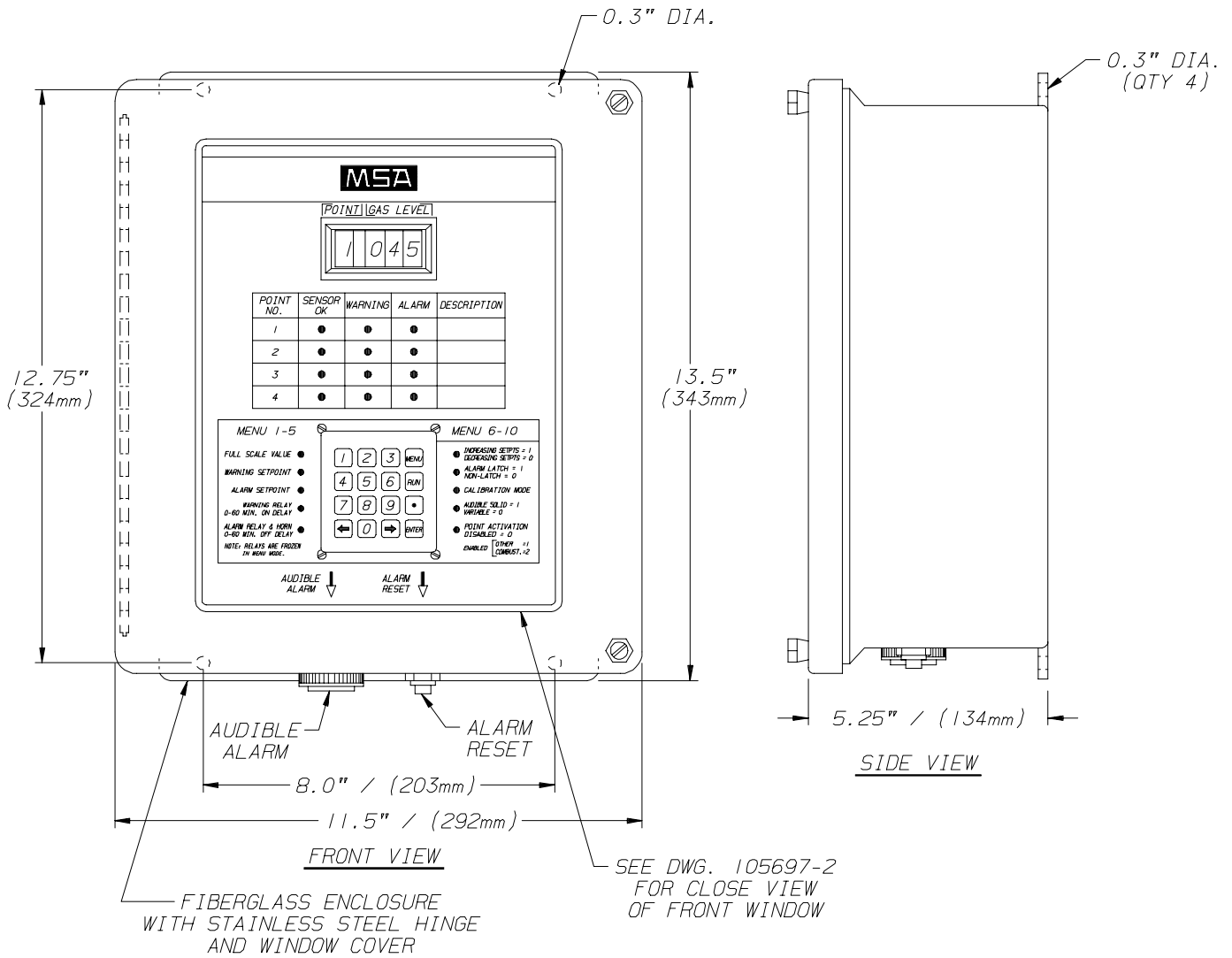
After correcting the condition:

- If unit is configured in the **Non-latching Mode:**
 - There is no need to press the front-door Horn/Acknowledge push-button to reset the relay.
- If unit is configured in the **Latching Mode:**
 - Press the front-door Horn/Acknowledge push-button to reset the appropriate relays.

Table 5-3. Quad Gas II Monitor Assembly

ITEM	PART NO.
Enclosure (Pre-drilled), Quad Gas II Monitor	216326
Processor Printed Circuit Board, Quad Gas II Monitor (117 VAC)	216327
Processor Printed Circuit Board, Quad Gas II Monitor (117 VAC) Discrete Relay	216328
Processor Printed Circuit Board, Quad Gas II Monitor (230 VAC)	216329
Processor Printed Circuit Board, Quad Gas II Monitor (230 VAC) Discrete Relay	216330
Interconnecting Cable, Quad Gas II Monitor	216331
Microprocessor	216332
Microprocessor, Discrete Relay	216333
Keypad, Quad Gas II Monitor	216334
LED display, Quad Gas II Monitor	216335
Display Printed Circuit Board, Quad Gas II Monitor	216336
Fuse (0.5 amps)	F05440
Fuse (0.25 amps)	F05263
Horn	216337
Reset Button	216338
Boot for Reset Button	216339

Appendix A Installation Outline Drawing



Appendix B Configuration Password

The configuration password is:

10794.

Keep this password in a secure place.