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**VAULT GAS MONITOR
Model 2400-01
Model 2400-21**

**SMOKE DETECTOR OPTION
MODEL 2404-00**

APPLICABILITY & EFFECTIVITY

This manual provides instructions for the following Sierra Monitor products:

<u>Model</u>	<u>Description</u>
2400-01	Vault Gas Monitor
2400-21	Vault Gas Monitor, Low CO
2404-00	Smoke Detector for 2400

The instructions are effective for the above models as of October 1, 1996

Instruction Manual Part Number: T10007
Rev. B1

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1. PRODUCT DESCRIPTION

1.1 INTRODUCTION

The Model 2400 series Vault Gas Monitors provide continuous monitoring of Methane (and other Combustibles) and Carbon Monoxide gas simultaneously in a confined space to provide safety for personnel and to reduce the hazard of gas explosion. Two versions of the Model 2400 are available. The 2400-01 has a Carbon Monoxide sensor with a range of 50-200 ppm CO. The Low CO version, 2400-21, has a range of 0-100 ppm CO for current OSHA and NIOSH regulations with the Model 2400.

Features of the Model 2400 series products include:

- Local visual and audible alarms.
- Remote Visual Alarm Indication Box (Model 2401 option)
- Ambient temperature change compensation.
- Long-life solid state gas and temperature sensors.
- Battery back-up for uninterrupted power supply.
- Continuous battery voltage monitoring.
- RFI/EMI AC Power Line Filter together with electrical and mechanical design to reduce electro-magnetic interference.
- Five alarm relay contacts.
- User selectable active or passive relay alarm test.
- Single PC board assembly and modular harness construction for easy maintenance.
- Alarm Test button
- Mil Spec Amphenol connectors for AC and alarm lines.
- Smoke Detector (Model 2404-00 option) with battery back-up.
- Fused Battery Charging Circuit.
- Fused Vent Relay (K3).

1.2 GENERAL DESCRIPTION

1.2.1. MECHANICAL

The Model 2400 is housed in a NEMA 3 type hinged enclosure with the input power connector, relay output connector and sensors accessible on the sides and bottom.

SENSORS:

Three sensors are mounted on the bottom of the enclosure. This orientation provides protection

from dust and moisture contamination. The sensors can easily be replaced without removal of the monitor from its permanent mounting. Two of these sensors are for gas detection and the third contains two separate thermocouple devices to permit direct measurement of ambient temperature. The Combustible and Carbon Monoxide sensors are metal-oxide semiconductor type solid state devices for long life. The electrical resistance of the sensors is inversely proportional to the gas concentration.

CARBON MONOXIDE: This sensor is specifically designed to detect carbon monoxide gas. The 2400-01 has a metal-oxide semiconductor type solid state sensor for long life with a calibration range between 50 ppm and 200 ppm. The 2400-21 has an electrochemical type sensor with a calibration range between 10 ppm and 100 ppm. The sensors are relatively insensitive to methane.

METHANE: This metal oxide semiconductor type solid state sensor is designed to detect methane gas and other explosive gases. The calibration range is between 5% and 25% of LEL for methane. The sensor is relatively insensitive to CO.

TEMPERATURE: Each semiconductor type sensor is compensated for variations of ambient temperature over a range of 0 to 40°C.

CONNECTORS:

Mil-Spec Amphenol connectors are used for the relay and remote indicator outputs and for the power input to provide compatibility with vault hardware specifications.

1.2.2. UNINTERRUPTED POWER SUPPLY (UPS)

The AC/DC power supply is factory configured for 120 VAC (60 Hz) operation. An EMI/RFI Line Filter is provided to filter the AC power line from high frequency noise. The power

supply includes a built-in constant current Ni-Cad battery charger with up to one ampere capacity. Batteries can be fully charged in 14 hours. The six "D" size NiCad pack batteries will provide up to nine hours back-up. A 5 volt 0.5 Amp regulator supplies power to the analog and digital sections. The battery voltage is constantly monitored and if it fails, a low battery voltage signal is generated. The UPS and DC electronics are electronically protected against short circuits.

1.2.3. ALARM RELAYS

There are five alarm relays. All are single-pole double-throw with 6 amp dry non-inductive contacts at 120/240 volts AC.

FAILURE RELAY: The failure relay is activated when either gas sensor becomes defective (open sensor resistance or no heater voltage). The failure relay is also activated if both the AC and battery back-up power supplies fail.

CARBON MONOXIDE RELAY: The Carbon Monoxide Relay is activated when the concentration exceeds the calibrated threshold setting (100 ppm CO on the 2400-01 and 25 ppm CO on the 2400-21).

COMBUSTIBLE RELAY: The Methane Relay is activated when the concentration of Methane exceeds the calibrated threshold setting (5000 ppm CH₄).

VENTILATION RELAY: The Ventilation Relay is activated when either the CO or CH₄ gas concentration exceed their calibration levels. The common contact of the ventilation relay is fused with a 4 amp socketed micro-fuse.

REMOTE INDICATOR RELAY: The Remote Indicator Relay is activated when either the Failure Relay or the Ventilation Relay is activated. Any of the following conditions will activate the Remote Indicator Relay which is normally connected to the Remote Indicator box:

- * Excess Carbon Monoxide
- * Excess Methane
- * AC and Battery Failure
- * Carbon Monoxide sensor failure
- * Methane sensor failure.

1.2.4. ALARM INDICATORS

The front panel has one audible alarm, eight annunciator lights and one test button.

AUDIBLE ALARM: The Audible Alarm will sound when either the CO or CH₄ gas concentration exceeds the respective calibrated threshold levels. The Audible Alarm produces a continuous tone of 2900 Hz at 68 dB.

POWER FAILURE ALARM: The Power Failure Alarm consists of two lamps; a Power-On Lamp (green) and a Low Battery Indicator (red). The Power-On indicates that the +5 VDC and 8.2 VDC supplies are present. The Low Battery indicator is activated when the battery voltage drops below +6.2 VDC.

CARBON MONOXIDE STATUS LIGHTS: The three CO status lights are: Safe (green), Alarm (red) and Sensor Failure (red).

COMBUSTIBLE STATUS LIGHTS: The three Combustible status lights are: Safe (green), Alarm (red) and Sensor Failure (red).

1.2.5. TEST SWITCHES

Two test switches are provided to allow functional testing of the monitor outputs:

GENERAL TEST: A momentary push button is provided on the front panel for testing the operation of all lamps, three relays (Ventilation, Combustible gas, and Carbon Monoxide gas) and the Audible Alarm. A slide switch is located on the electronics board to enable or disable the relay portion of this test. In the up position (ON), the test will be active. In the down position (OFF), the test will be passive. (This switch (SW1) is located on the left hand side of the circuit board.

FAILED SENSOR TEST: An auxiliary momentary push button test switch (SW3), located in the bottom right hand corner of the circuit board, is provided for testing the Failure and Remote Indication relays and the Sensor Failure lamps by simulating a sensor failure.

2. INSTALLATION

2.1 UNPACKING AND INSPECTION

Remove the instrument from its packing container and inspect to insure that all items listed on the packing slip have been received in good condition.

Open the door by loosening the two screw clamps. Inspect the internal electronics and wire harnessing to insure that no damage has occurred during shipment. The battery pack connector located above the door hinge is shipped disconnected and should be left open until the monitor is ready to be turned on.

stabilization period and to fully charge the battery pack, allow twenty four hours before connecting the alarm outputs.

ALARM CONNECTION: Connect the twenty four pin connector to the receptacle on the lower left side of the enclosure.

2.2 INSTALLATION AND SET-UP

2.2.1. ENCLOSURE MOUNTING

Mount the enclosure in the selected location by bolting the top and bottom flanges to a vertical surface.

2.2.2. EXTERNAL CONNECTIONS

A.C. POWER PLUG: Connect the three pin amphenol plug to the main (user supplied) AC power cord. Refer to Figure 1 for pin configuration.

ALARM RELAY PLUG: Connect the 24 pin amphenol connector plug to the required (user supplied) signal, light or fan activation lines. Refer to Figure 1 for pin configuration.

2.2.3. START-UP

POWER ON: Connect the three pin power plug to the receptacle on the upper left side of the enclosure. After a short pause the audible alarm will sound (on the Model 2400- c21, only the combustible alarm will sound), the alarm lights will light on the front panel and the calibration lights inside the enclosure will light. The alarms will stabilize within five minutes at which time the audible will cease and the "safe" lights on the front panel will light.

CONNECT BATTERY PACK: Connect the mating parts of the battery pack connector to enable the battery back-up and begin the continuous charging of the batteries. (Initial charge may be low).

MONITOR STABILIZATION: To avoid false alarms during the sensor

3. OPERATION INSTRUCTIONS

The Model 2400 requires no operator intervention except for periodic calibration. The following information can be followed to insure that the initial installation is correct and to insure that the external wiring is correct.

3.1 STATUS INDICATION

Table 1 describes status of each indicator under various conditions:

3.2 FUNCTION TESTS

The following function tests can be performed to confirm the conditions described in Table 1.

TEST LIGHTS: Press the "Test Lights" button and check that all panel lights turn "ON" and that the audible alarm turns on. If the "active " relay test is used the carbon monoxide, combustible and vent relays will activate during this test.

FUNCTION TEST: Apply gas from a cigarette lighter (WITHOUT FLAME) or other high concentration source to the CH4 sensor and check that the Combustible Alarm light goes on.

BATTERY BACK-UP TEST: Disconnect main AC and check that monitor still functions to confirm that the batteries are charged and functional.

SENSOR FAILURE TEST: Open door of enclosure and remove either sensor connector from the receptacle on the board and check front panel for a sensor failure alarm. (NOTE: To remove the sensor connector grip the connector housing with pliers - do not pull the wires)

CONDITION	LIGHTS								RELAYS					AUDIBLE
	<u>SYSTEM</u>		<u>CO</u>		<u>METHANE</u>				CO	CH4	FAIL	VENT	REMOTE	
	POWER	BATT	SAFE	ALM.	FAIL	SAFE	ALM.	FAIL						
<u>AC ON</u>														
SAFE	ON		ON			ON								
CO ALARM	ON			ON		ON			ON		ON	ON	ON	
CH4 ALARM	ON		ON						ON		ON	ON	ON	
CO FAIL	ON				ON	ON				ON		ON		
CH4 FAIL	ON		ON					ON		ON		ON		
LOW BATT	ON	ON	ON			ON				ON		ON		
<u>AC OFF</u>														
BATT OK	ON	<----- SAME AS ABOVE ----->												
BATT LOW		<----- SAME AS ABOVE ----->												
BATT DEAD										ON		ON		
<u>TEST LIGHTS</u>														
ACTIVE	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	
PASSIVE	ON	ON	ON	ON	ON	ON	ON	ON	ON				ON	

**TABLE 1
STATUS INDICATORS**

4. CALIBRATION INSTRUCTIONS

4.1 FREQUENCY OF CALIBRATION

The manufacturer recommends that the Model 2400 be calibrated every 180 days.

4.2 PROCEDURE

PREPARATION: Open the door of the enclosure and locate the two adjusting potentiometers which are immediately above the connectors for the two gas sensors. Adjustment of these potentiometers raises and lowers the sensitivity of the respective gas sensor. Also locate the two LED indicators near the respective potentiometers. The LED on the left is the carbon monoxide calibration indicator, the LED on the right is the combustible calibration indicator.

CALIBRATION - METHANE: Apply 5000 ppm methane calibration gas at 50 cc/minute to the combustible sensor and watch for the calibration indicator to turn on. If the indicator turns on within five seconds of application of the gas and turns off within five seconds of removal of the gas the sensor is correctly calibrated. If the indicator fails to turn on keep the gas on the sensor and adjust the potentiometer clockwise until the calibration indicator turns on. If the indicator turns on too quickly and stays on for too long after removal of the gas adjust the potentiometer counter-clockwise to decrease the sensitivity and repeat the calibration process.

CALIBRATION - CARBON MONOXIDE: Apply carbon monoxide calibration gas to the CO sensor. Calibration gas for the 2400-01 is 100 ppm CO at 50 cc/minute and for the 2400-21 use 25 ppm CO (factory standard), or 35 ppm at 100 cc/minute. Watch for the calibration indicator to turn on. If the indicator turns on within one minute of application of the calibration gas (within two minutes for the 2400-21) and turns off within one minute after removal of the calibration gas (within two minutes for the 2400-21) the sensor is correctly calibrated. Adjust the sensitivity as described in the preceding paragraph.

NOTE: Sierra Monitor Corporation recommends using the Model 26 Gas Sensor Calibrator, Model 1200-26.

4.3 MAINTENANCE

Except for periodic calibration as described above, no routine maintenance is required. The following items may require replacement due to age and deterioration:

SENSOR: Unplug the failed sensor by grasping the top of the white plastic connector housing (use pliers). (Do not grasp the bottom of the housing which is permanently attached to the circuit board.) Pull firmly to unplug the sensor. Remove the large nut which holds the sensor in the enclosure frame. Discard the old sensor and replace by reversing these directions. With the semiconductor sensors allow the new sensor to stabilize for at least one day and re-calibrate. The electrochemical sensor on the 2400-21 will stabilize in less than one hour.

BATTERY PACK: Disconnect the battery harness at the in-line connector on the battery pack. Cut two large "ty-wraps" and lift out the battery pack. Install the new battery pack. Use new "ty-wraps" to secure the pack. Plug in the connector.

5. INFORMATION TO INSTALLERS

5.1 DISCUSSION & BACKGROUND

Field data shows that the Vault Gas Monitor operates extremely well in the installed vault. This is because the environmental conditions and the monitor are stable.

Various minor difficulties occur during the installation and initial check-out due to major variations in climatic conditions and due to the inspection occurring very quickly after the monitor has been turned on.

Upon initial turn-on the monitor requires a stabilization period which varies based on the amount of time it has been stored and the temperature during stabilization. Longer storage times and colder temperatures increase the stabilization time. As the specified lower operating temperature of the monitor is 32 degrees (F) it may not be possible to perform function checks in assembly areas where the temperature is below freezing.

5.2 ELECTRICAL ADJUSTMENTS

The electrical adjustments described below are temporary adjustments to be used only during installation or for temporary adjustment until calibration is performed. For ongoing operation the more accurate calibration method described in this manual should be followed.

1. Connect the common side of a DC voltmeter to the ground loop marked "GT1" on the upper side of the PC board assembly.
2. Use the other meter lead to read the "reference voltage" for the CO channel by touching (test point) TP4 which is one inch from the bottom of the board and slightly left of center. The reference voltage should be approximately 2.5 volts, ± 0.2 volts, for the 2400-01 or approximately 1.5 volts, ± 0.2 volts, for the 2400-21 and varies lower in cold temperature or higher in warm temperature.
3. Read the voltage on TP3 located to the left of TP4 and slightly lower. This voltage is "0" during a failed sensor alarm and is greater than 2.5 volts (2400-01) or greater than 1.5 volts (2400-21) during a CO alarm. The correct set-point for a safe condition is 1.5 volts for the 2400-01 and 1.0 volts for the 2400-21 (25 ppm alarm).

Adjust the voltage using the potentiometer R35 at the lower left corner of the board.

4. Adjustment of the combustible sensor is approximately the same.
 - 4.1. Read the voltage at TP5 (one inch from the bottom of the board and slightly right of center) to confirm that the reference is approximately 2.5 volts.
 - 4.2. Set the voltage at TP6 (right side of board and lower than TP5) at 1.0 volt by adjusting R52 at the lower right corner of the board.
 - 4.3. For Model 2400-01, a rough functional test can be made by applying butane from a cigarette lighter to each sensor (note that the center of the three sensors is the temperature probe and the outer two are the gas sensors). When a small amount of gas is applied to the right sensor the combustible alarm should go on within one or two seconds. When gas is applied to the left hand sensor the CO alarm should go on in 15 seconds or less.
5. To understand the adjustment of the unit the installer can follow this exercise:
 - 5.1 Read and note the reference voltage TP5.
 - 5.2 Attach the meter to TP6 to read the sensor voltage on the combustible sensor. Note that while this voltage is above "0" and below the TP5 value the unit indicates "safe" condition for combustible. Record the TP6 voltage for use in step 5.8 below.
 - 5.3 Adjust the potentiometer R52 so that the TP6 reading drops to "0". Note that the monitor is now in "sensor fail".
 - 5.4 Adjust R52 so that the TP6 reading is in the safe range and apply cigarette lighter gas. Note that the TP6 voltage

increase above the TP5 value and the gas alarm occurs.

- 5.5 If 5000 ppm methane gas is available perform step 4 test using the calibration. Note that the change in voltage is much less dramatic.
- 5.6 It should now be clear that TP6 should be adjusted above "0" to avoid false "sensor fail" alarms and sufficiently below TP5 so that the change due to calibration gas causes TP6 to go higher than TP5 and sets off the alarm.
- 5.7 It is not necessary to repeat the exercise on the CO side of the system but the same actions occur. Usually the voltage at TP3 is adjusted closer to the reference voltage than TP6 because the CO sensitivity is 100 ppm for the 2400-01 (compared to 5000 ppm methane). For the Model 2400-21 the CO sensitivity is 25 ppm.
- 5.8 Return the TP6 voltage to the level recorded in step 5.2 above or re-calibrate using the correct concentration of gas.

6. SMOKE DETECTOR

6.1 PRODUCT DESCRIPTION

The Model 2404 (Figure 3) is a photoelectric, single station Smoke Detector which is designed to be operated in conjunction with the Sierra Monitor Model 2400 Vault Gas Monitor. The Smoke Detector contains the detection electronics, an audible alarm, D.C. power supply and dry contact relay connections.

Power to operate the Model 2404 is provided by the regulated DC power supply installed in the Model 2400. This supply is backed up by the Model 2400 battery pack.

Prewiring of the internal connector in the Model 2400 provides dry contact relay output from the Gas Monitor to indicate loss of power to the smoke detector or a smoke alarm.

6.2 INSTALLATION

MOUNTING: The Model 2404 mounts to a standard single gang or 4" octagonal electrical box. To access the terminal block on the electronics board use a small jewelers screwdriver to depress the cover release tab and open the hinged cover. System wiring fits through the opening in the back of the smoke detector.

WIRING: Install wires from the large connector on the gas monitor to the terminal strip in the smoke detector as follows (see Figure 6):

6.3 OPERATION

The Smoke Detector is designed to operate continuously. Monthly, the hinged cover should be opened and the screen around the optical unit should be cleaned with compressed air or a vacuum. Do not use cleaning solvents. If necessary, water on a cotton swab may be used for cleaning. The red LED on the cover flashes periodically during normal operation.

The Smoke Detector may be tested using the following procedure:

1. Hold a magnet, such as the end of a magnetic screw starter immediately against the center of the flat indent of the case behind the cover hinge.
2. Keep the magnet in place for a couple of seconds until the self-diagnostic routine begins.
3. The self diagnostic routine starts with a series of 4 to 7 LED blinks followed by activation of the alarm relay for five seconds. If the LED blinks more than 7 times the detector is too sensitive, if there are less than 4 blinks the detector is not sensitive enough.
4. If the LED blinks indicate a problem, open the cover and dust the internal components using clean compressed air. If the test still fails, replace the smoke detector.

<u>FUNCTION</u>	<u>SMOKE DETECTOR</u>	<u>GAS MONITOR</u>
DC Positive	Terminal # 1	Connector #N
DC Common	Terminal # 2	Connector #P
Alarm Relay (common)	Terminal # 3	Connector #Q
Alarm Relay (n/open)	Terminal # 4	Connector #R

Figure 6: Wiring Connections - Smoke Detector

7. NICKEL CADMIUM BATTERIES

7.1 NICKEL CADMIUM BATTERY OPERATION

Nickel cadmium batteries such as those used in the Model 2400 Vault Gas Monitor are intended for use in applications where the power demand will be constant over a long (hours) period of time (as opposed to a vehicle battery which is designed for surge demand).

The Model 2400 battery pack is charged with a very slow trickle charge which would take 14 hours from depleted to fully charged. Once the charge is complete the current stops but the charger voltage remains applied to insure full charge at all times. If the batteries are stored in this condition and are seldom used they can be expected to have a lifetime of three to five years. The failure mechanism would be a very gradual loss of capacity so that they may reach a point where only a few minutes of back-up is available compared to the nine hours expected from new battery packs.

The loss of "memory" is accelerated when the batteries are used frequently for short durations (minutes) and then recharged. When this use occurs the battery begins to develop a memory which is equal to the usage time experienced.

As it is expected that CEVs would have reliable AC power the monitor is unlikely to need to operate on the batteries very frequently, and infrequent short demands should not be enough to cause the memory loss described above.

The best maintenance objective is to:

- Preserve the batteries with maximum charge for as many years as possible.
- Be able to determine when batteries are nearing the end of their useful life so that replacement can be a preventative action.

To accomplish both these objectives the batteries should be "deep discharged" approximately once every six months and the length of the run time should be measured. If the run time is less than the expected length of a power failure the battery pack should be replaced.

Test Points (identified as TP7 and TP8) are provided on the lower left hand side of the electronics board to allow measurement of the charging current to the batteries. This is a voltage measurement across a .1 ohm resistor. The charging (or discharging) current can be calculated in amperes by multiplying the voltage across TP7 and TP8 by ten.

8. SPECIFICATIONS

GAS MONITOR

INPUT POWER

120 volts 60 Hz (240V option avail)
12 Watts Max

OPERATING TEMPERATURE

Standard

32 to 104°F (0 - 40°C)

Extended Temperature Option

-4 to 140°F (-20 - 60°C)

CALIBRATION RANGE

Carbon Monoxide: 50 - 200 ppm (2400-01)

Carbon Monoxide: 0 - 100 ppm (2400-21)

Methane: 2,500 - 12,500 ppm (5% - 25% LEL)

FACTORY CALIBRATION

Carbon Monoxide: 100 ppm (2400-01)

Carbon Monoxide: 25 ppm (2400-21)

Methane 5000 ppm

RESPONSE TIME

Less than 30 Seconds

ENCLOSURE

NEMA 3-Type hinged front panel

INPUT CONNECTOR

3 Pin (AMPHENOL) Mil-Spec Type MS 3106A-14S-7s

OUTPUT CONNECTOR

24 Pin (AMPHENOL) Mil-Spec Type MS 3106A-2428S

BATTERIES

Six "D" Size NiCad - 4 Ampere hour

OUTPUT RELAYS

Five SPDT (FORM C)

6 AMP Non-Inducting @120/240VAC

6 AMP Non-Inducting @28VDC

1/8 HP Load

GAS SENSORS

2400-01

Two solid-state metal-oxide semiconductor sensors
in separate housings

2400-21

One solid-state metal-oxide semiconductor sensor

(Methane)

and one electrochemical sensor (CO) in separate housings

TEMPERATURE SENSOR

Two solid state sensors

AUDIBLE ALARM

68db AT 2900 Hz

FUSE

1/4 AMP 250 VAC

SIZE

8 X 8 X 4 Inches (HWD) (20 X 20 X 10 cm)

WEIGHT

12 lb (5.5 Kg)

SMOKE DETECTOR

DETECTION PRINCIPLE

Photoelectric

NOMINAL SENSITIVITY

3.3%/FT.

DIMENSIONS

Diameter: 6.125", Height 2"

WEIGHT

1 pound

INDICATORS

Red LED for power "ON"

Audible warning for alarm (85 dB)

RELAYS

One SPST dry contact (2 amp @ 30VDC)

POWER

6.0 - 8.0 VDC

9. PART NUMBERS & SPARE PARTS LIST

CALIBRATION ACCESSORIES

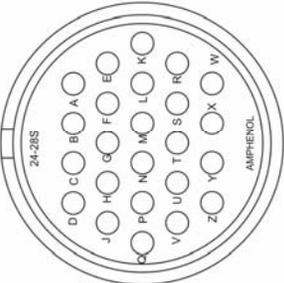
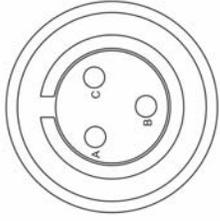
<u>Model No.</u>	<u>Description</u>
1200-26	Gas Sensor Calibrator W/2 gas cylinders
1290-03	Gas Cylinder - Methane 5000 ppm
1290-05	Gas Cylinder - Carbon Monoxide 100 ppm
1290-08	Gas Cylinder - Carbon Monoxide 25 ppm

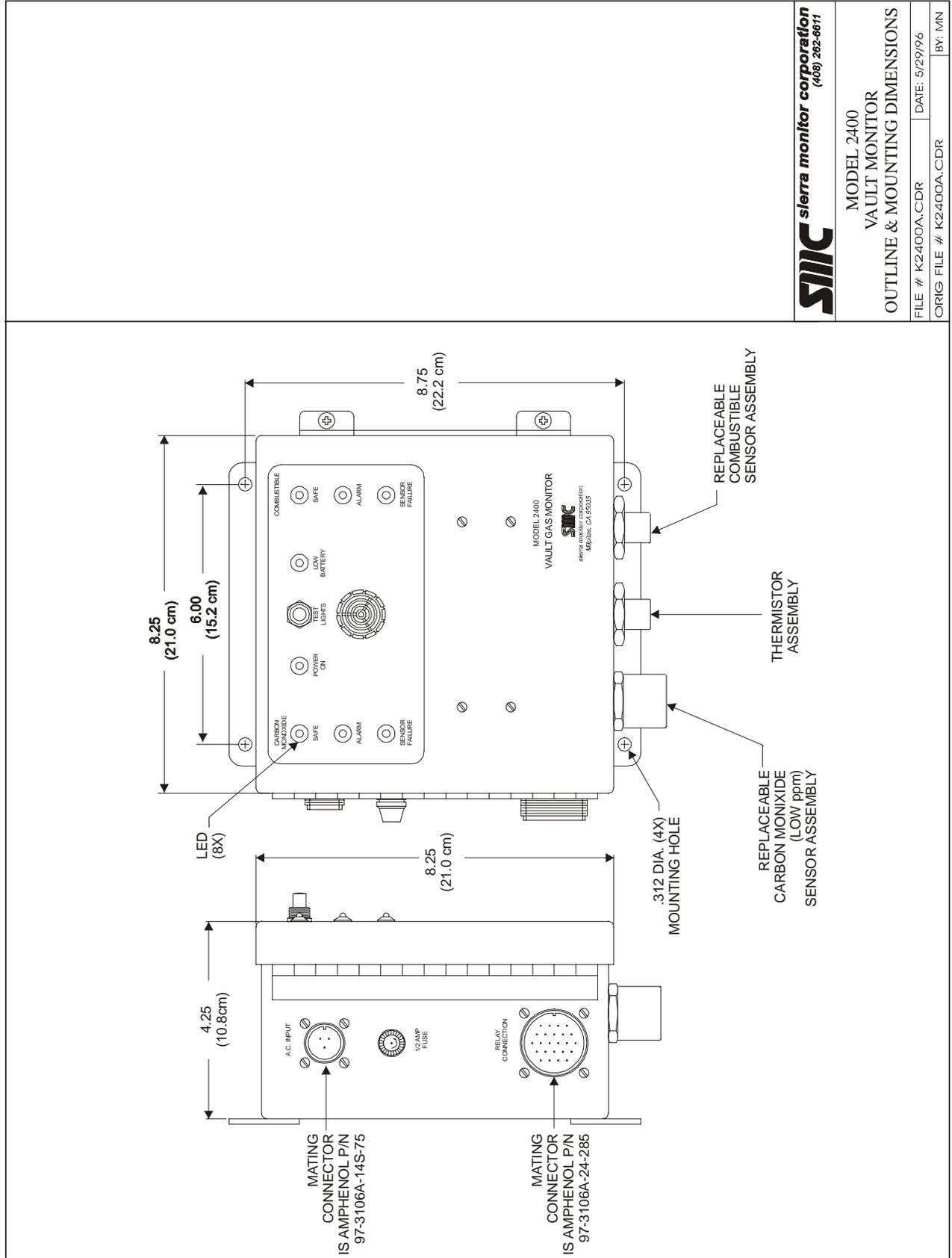
MODEL 2400 SERIES ASSEMBLIES

<u>Model No.</u>	<u>Description</u>
2400-01	Vault Gas Monitor (Modified for Smoke Detector Option)
2400-21	Vault Gas Monitor, LO CO
2401-00	Light Box for Entry Door (remote indicator)
2402-00	Connector Kit (Connector hardware only)
2403-01	Connector Assembly (Includes hardware and wiring)
2404-00	Smoke Detector

MODEL 2400 SERIES SPARE PARTS

<u>Part No.</u>	<u>Description</u>
SPJ21507	Assy: Combustible Sensor
SPJ21510	Assy: Carbon Monoxide Sensor, 50 - 200 ppm
SPJ21511	Assy: Thermistor Set
SPJ21514	Assy: Carbon Monoxide Sensor, 0 - 100 ppm
SPJ22021	Assy: Control Board
SPJ22023-1	Assy: Internal Control Harness
SPJ39039	Battery Bracket
SPJ44003	LED, red, MV5752
SPJ44009	LED, green (front panel)
SPJ44010	LED, red (front panel)
SPJ49005	Alarm, Sonalert SNP2
SPJ49028	Fuse, 1/2 amp
SPJ49071	Line filter, RFI
SPJ49073	Switch, CH8411K11 SPDT (SW1)
SPJ49076	Lense, red, for remote alarm box
SPJ49077	Lense, green, for remote alarm box
SPJ49078	Bulb, Sylvania 120PSB for remote alarm box
SPJ49085	Fuse, 4 Amp (Vent Relay -K3)
SPJ49088	Fuse, 2 Amp (Battery Charging Circuit)
SPJ62001	Washer, for Sonalert alarm
SPJ69025	Fuseholder
SPJ22003	Battery Pack + Ty-Wraps

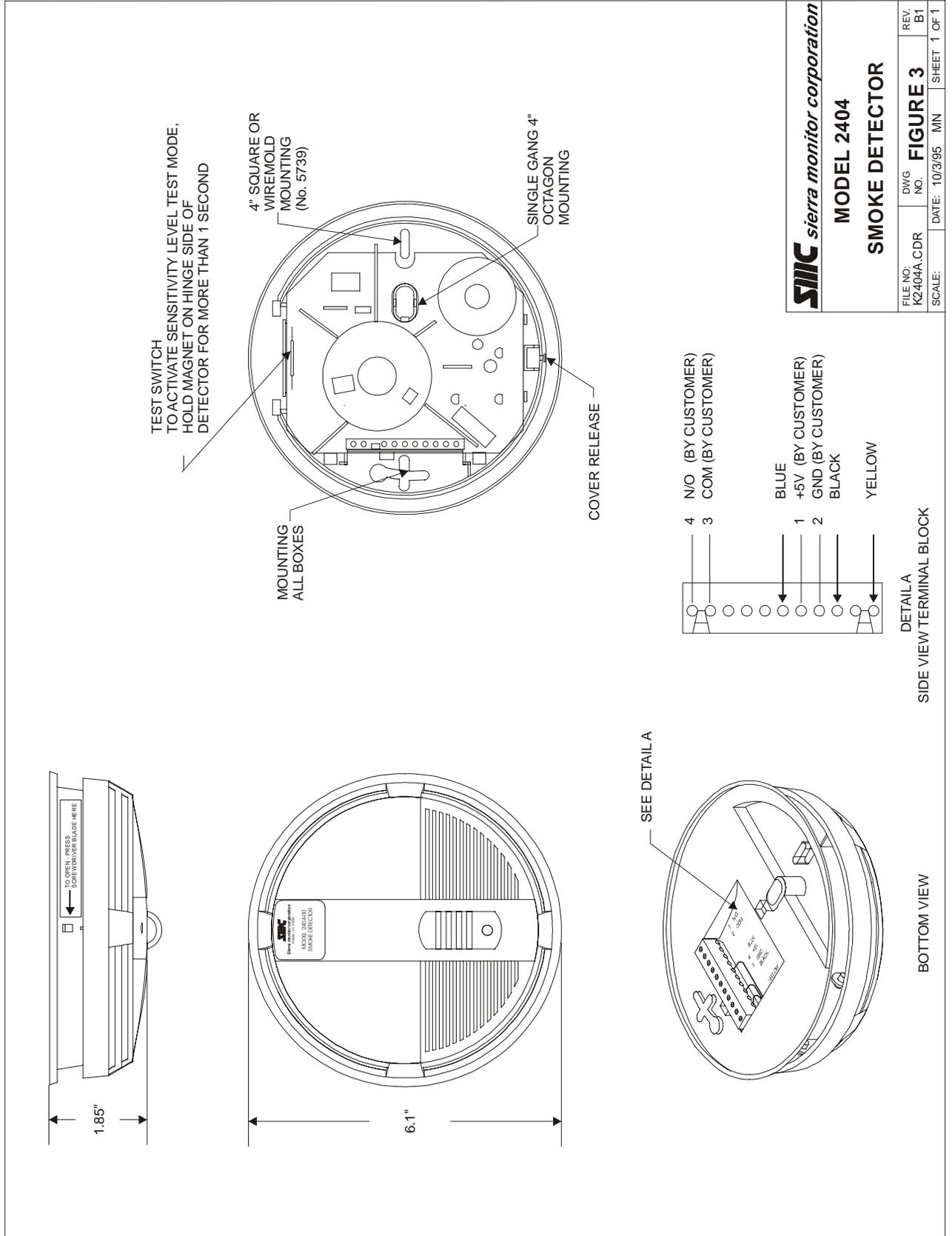
<p>FRONT VIEW ALARM CONNECTOR</p> 	<p>FRONT VIEW POWER CONNECTOR</p> 	<table border="0" style="width: 100%;"> <tr> <td style="text-align: center;"><u>PIN</u></td> <td style="text-align: center;"><u>RELAY</u></td> <td style="text-align: center;"><u>CONTACT</u></td> <td style="text-align: center;"><u>PIN</u></td> <td style="text-align: center;"><u>CONNECTOR</u></td> </tr> <tr> <td style="text-align: center;">A</td> <td>FAIL</td> <td>N/C</td> <td style="text-align: center;">A</td> <td>GROUND</td> </tr> <tr> <td style="text-align: center;">B</td> <td>FAIL</td> <td>COM</td> <td style="text-align: center;">B</td> <td>NEUTRAL</td> </tr> <tr> <td style="text-align: center;">C</td> <td>FAIL</td> <td>N/O</td> <td style="text-align: center;">C</td> <td>HOT</td> </tr> <tr> <td style="text-align: center;">D</td> <td>VENT</td> <td>N/C</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">E</td> <td>VENT</td> <td>COM</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">F</td> <td>VENT</td> <td>N/O</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">G</td> <td>Ch4</td> <td>N/C</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">H</td> <td>Ch4</td> <td>COM</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">J</td> <td>Ch4</td> <td>N/O</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">K</td> <td>CO</td> <td>N/C</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">L</td> <td>CO</td> <td>COM</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">M</td> <td>CO</td> <td>N/O</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">N</td> <td>N/A</td> <td>+DC VOLTAGE</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">P</td> <td>N/A</td> <td>DC GROUND</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Q-W</td> <td>JUMP</td> <td>SMOKE RELAY N/O</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">R-V</td> <td>JUMP</td> <td>SMOKE RELAY COM</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">X</td> <td>REMOTE</td> <td>N/C</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Y</td> <td>REMOTE</td> <td>COM</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Z</td> <td>REMOTE</td> <td>C/O</td> <td></td> <td></td> </tr> </table>	<u>PIN</u>	<u>RELAY</u>	<u>CONTACT</u>	<u>PIN</u>	<u>CONNECTOR</u>	A	FAIL	N/C	A	GROUND	B	FAIL	COM	B	NEUTRAL	C	FAIL	N/O	C	HOT	D	VENT	N/C			E	VENT	COM			F	VENT	N/O			G	Ch4	N/C			H	Ch4	COM			J	Ch4	N/O			K	CO	N/C			L	CO	COM			M	CO	N/O			N	N/A	+DC VOLTAGE			P	N/A	DC GROUND			Q-W	JUMP	SMOKE RELAY N/O			R-V	JUMP	SMOKE RELAY COM			X	REMOTE	N/C			Y	REMOTE	COM			Z	REMOTE	C/O		
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MODEL 2400
 VAULT MONITOR
 OUTLINE & MOUNTING DIMENSIONS

FILE # K2400A.CDR DATE: 5/29/96
 ORIG FILE # K2400A.CDR BY: MN



SUPPLY VOLTAGE

1. TP1 BATTERY CHARGING VOLTAGE:
WITH BATTERIES CONNECTED = 9.5VDC TYP
WITHOUT BATTERIES CONNECTED = 12.5VDC TYP.

2. TB2: REGULATED VOLTAGE 5.0V %p50MV
ADJUST WITH R20.

COMBUSTIBLE GAS VOLTAGE

3. TP5: ALARM REFERENCE 2.4VDC %P.4VDC

4. TP6: SENSOR VOLTAGE: < .2VDC = FAIL
> 2.4VDC = ALARM
ADJUST WITH R52 USING CALIBRATION GAS*

CARBON MONOXIDE VOLTAGE

MODEL-01

5. TP4: ALARM REFERENCE 2.1VDC %P .1VDC

6. TP3: SENSOR VOLTAGE: < .2VDC = FAIL
> 2.4VDC = ALARM
ADJUST WITH R35 USING CALIBRATION GAS*

MODEL-21

5. TP4: ALARM REFERENCE 1.5VDC %P .1VDC

6. TP3: SENSOR VOLTAGE: < .2VDC = FAIL
> 2.4VDC = ALARM
ADJUST WITH R35 USING CALIBRATION GAS*

* "INFORMATION TO INSTALLERS"
OUTLINES AN ELECTRICAL CALIBRATION
PROCEDURE.

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MODEL 2400
VAULT MONITOR
VOLTAGE CHECKS

FILE # K2400-B.CDR DATE: 2/21/03
ORIG FILE # BY: MN

A GT1: GROUND TIE (DC VOLTAGE)

B VENT RELAY FUSE, 4 AMP, F2

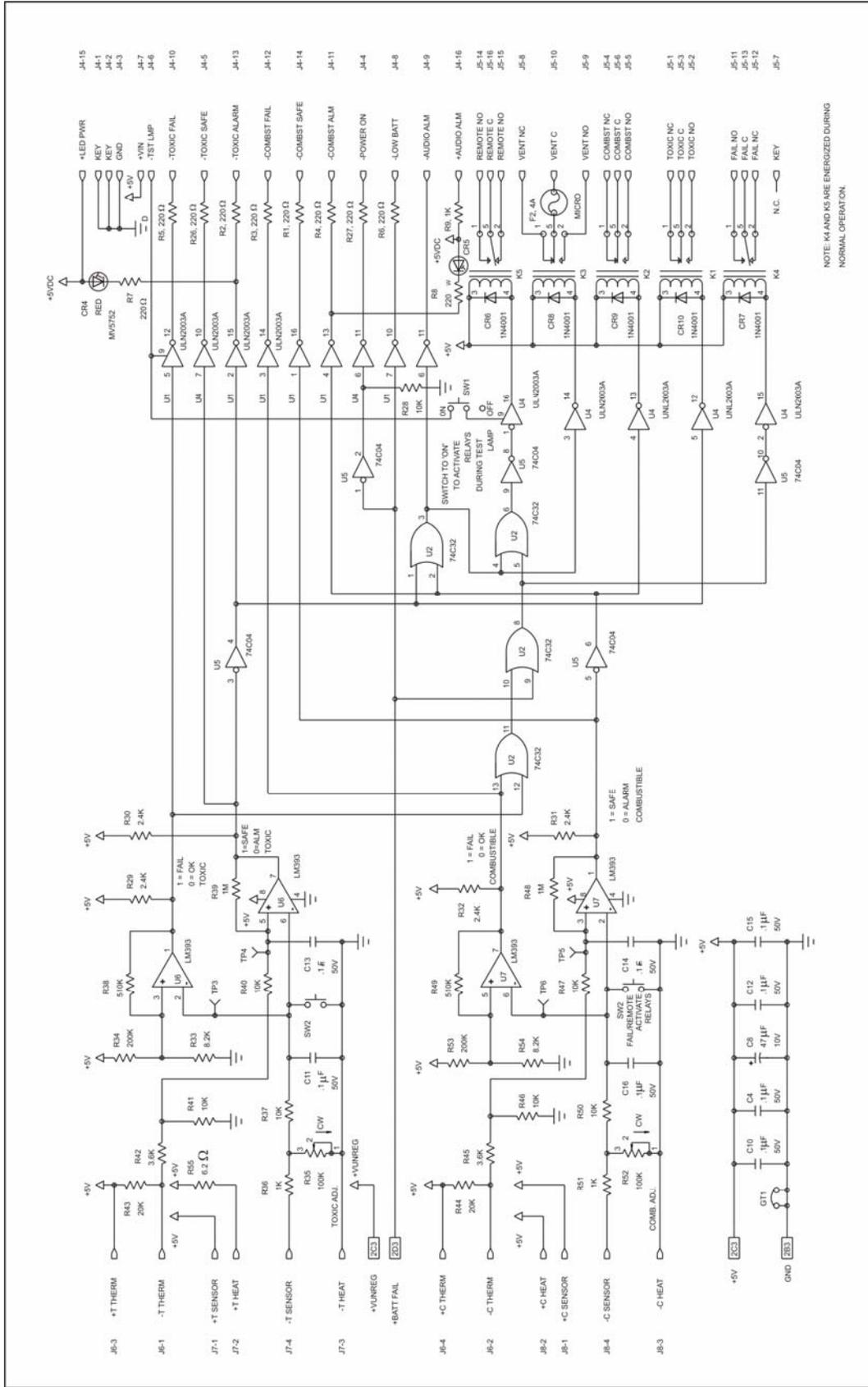
C COMBUSTIBLE GAS SENSOR CONNECTOR

D CARBON MONOXIDE SENSOR CONNECTOR

E BATTERY CHARGING FUSE, 2 AMP, F3

F BATTERY CHARGING VOLTAGE, TP7, TP8

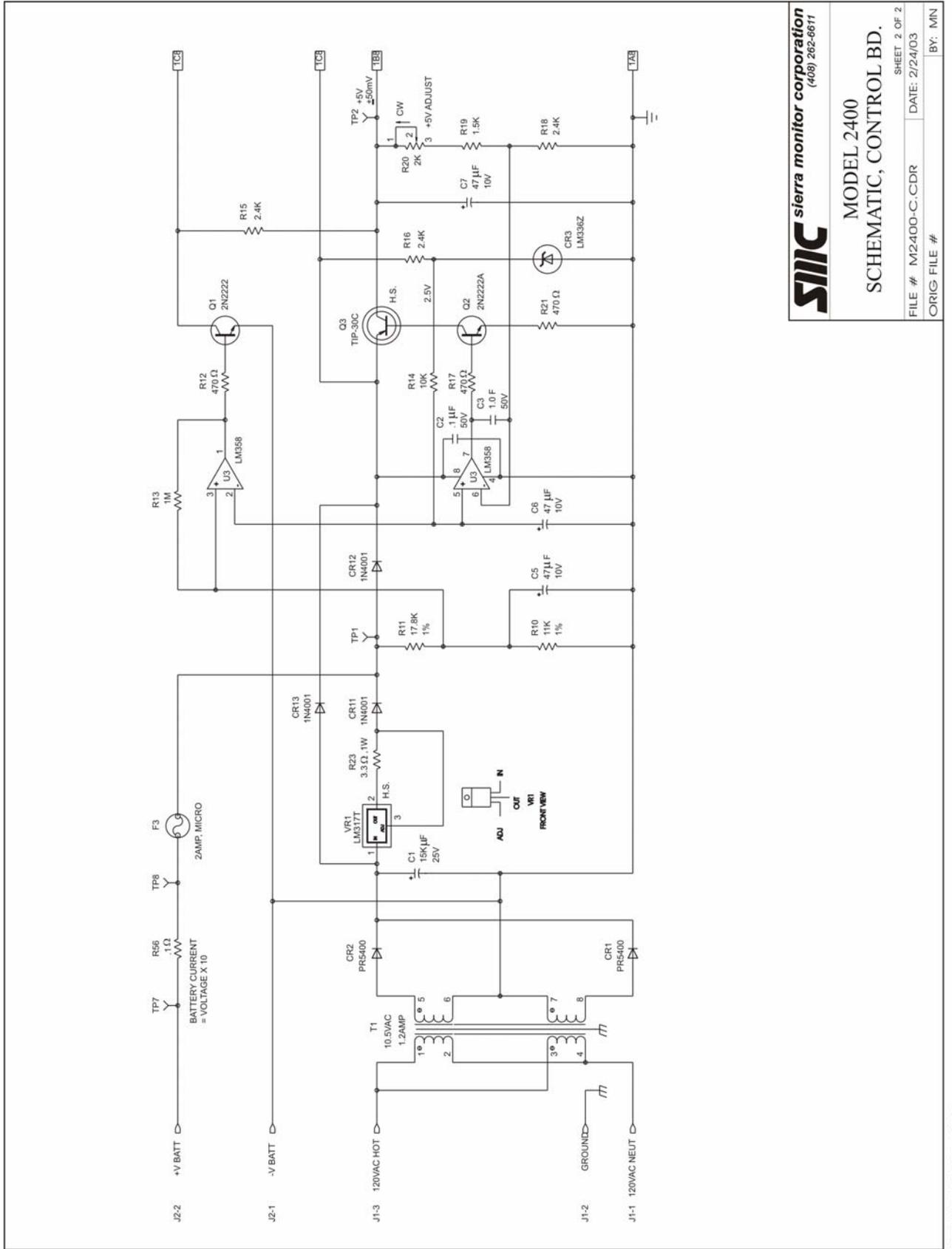
G REV (REVISION) IDENTIFICATION



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MODEL 2400
SCHEMATIC, CONTROL BD.

SHEET 1 OF 2
FILE # M2400-C.CDR DATE: 2/24/03
ORIG FILE # BY: MN



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MODEL 2400
SCHEMATIC, CONTROL BD.

SHEET 2 OF 2
FILE # M2400-C.CDR DATE: 2/24/03
ORIG FILE # BY: MN

