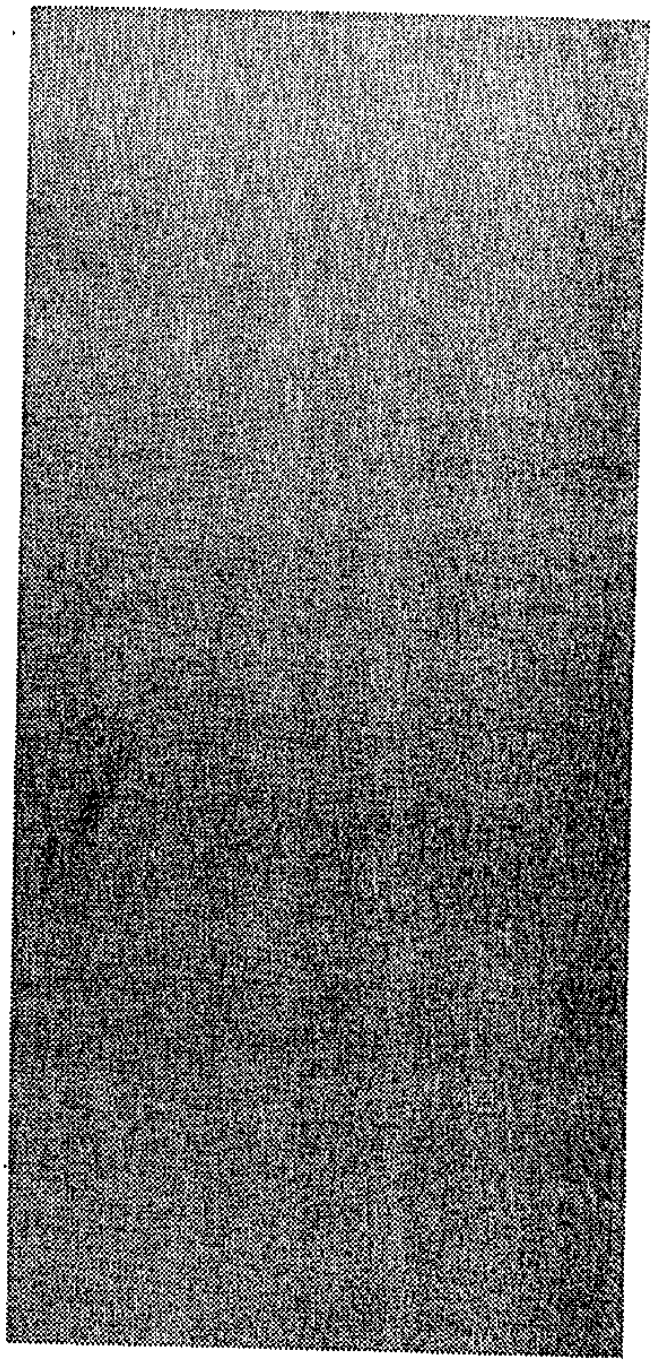
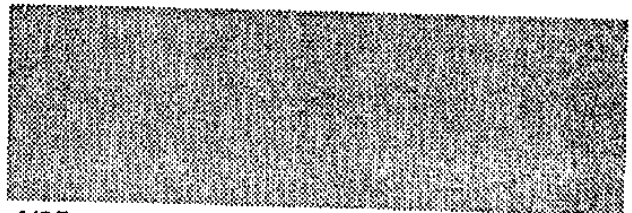
DET TRONICS



INSTRUCTIONS

Combustible Gas Detection System

Model 820



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Form 95-8299

IMPORTANT WARNING

Rexnord's gas-detection systems are detection devices, and like any piece of equipment, will perform as designed only if installed, used, and serviced in accordance with the manufacturer's instructions. This manual must be carefully read by all individuals who have or will have responsibility for installing, using, or servicing the units. The warranties made by Rexnord with respect to this product are voided if the equipment is not installed, used, or serviced in accordance with the instructions in this manual.

Customer is responsible for connecting the Model 820 Gas Detection System with customer-provided safety equipment. Rexnord is not responsible for operation or maintenance of customer-provided safety equipment.

CONTENTS

ILLUSTRATIONS

ILLUSTRATIONS

TABLES

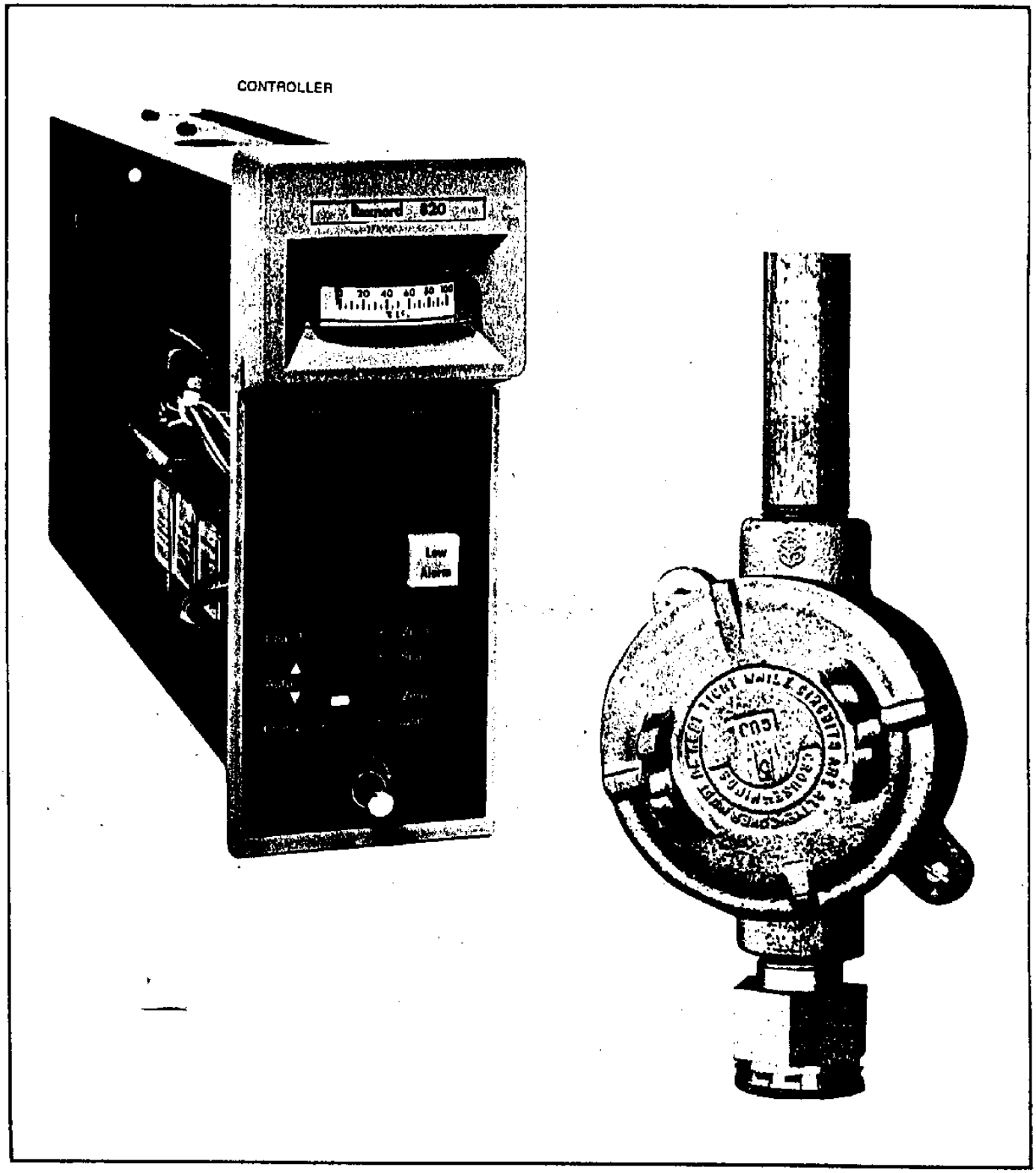


Figure 1-1. Model 820 Gas Detection System

SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains all information required to install, operate, calibrate, and service the Model 820 Gas Detection System, a dual-channel 3-wire system (Figure 1-1). The various sections of the manual provide information as follows:

a. SECTION 2, INSTALLATION, provides information relative to power and mounting of the system.

b. SECTION 3, OPERATION, provides information relative to operating the system.

c. SECTION 4, THEORY OF OPERATION, provides information on the functional operation of the system.

d. SECTION 5, MAINTENANCE, provides information required to properly calibrate, check out, and troubleshoot the system.

e. SECTION 6, RECOMMENDED SPARES, provides a list of suggested spare parts and recommended quantities to maintain the system.

f. SECTION 7, OPTIONS AND ACCESSORIES, provides information relative to options and accessories available for use with the system.

1.2 GENERAL DESCRIPTION

The Model 820 Gas Detection System consists of one dual-channel controller, two conduit boxes, and two sensors as shown in Figure 1-2. Each sensor incorporates a flame arrester. The conduit boxes provide interface and mounting facilities for the sensors and for the optional remote calibration unit.

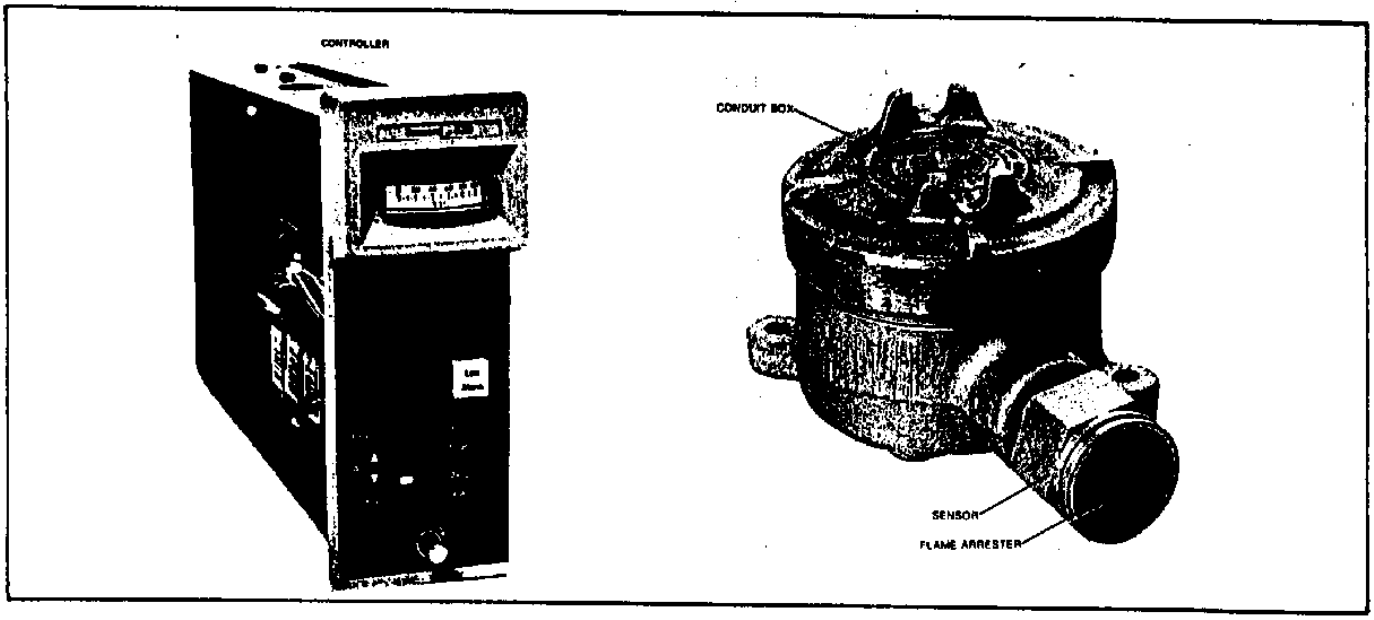
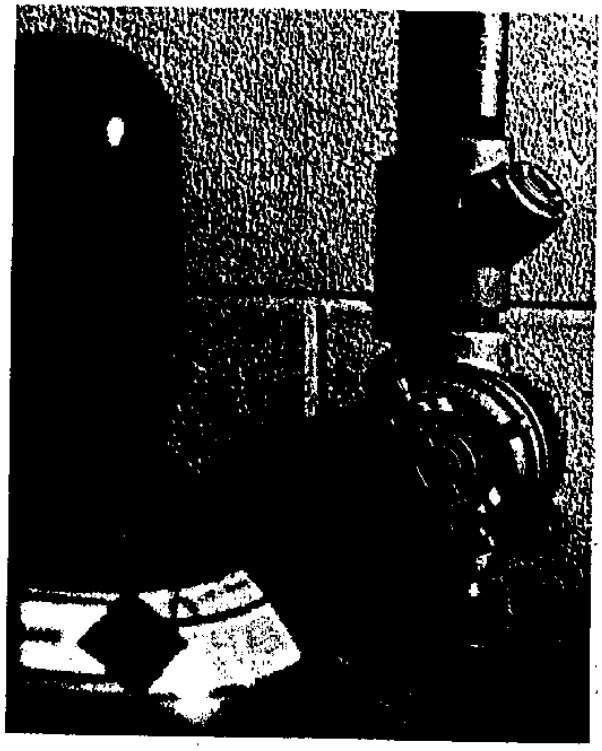


Figure 1-2. Major Components



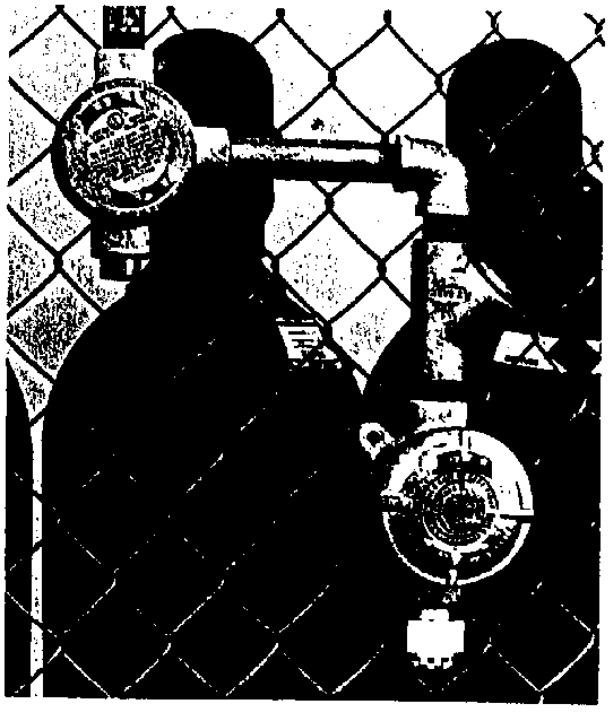


Figure 2-1. Normal Installations for the Model 820 Conduit Box

SECTION 2
INSTALLATION

2.1 INSTALLING THE SENSOR CONDUIT BOXES

WARNING

Installation and maintenance of the Model 820 Gas Detection System should be performed only by technically-qualified persons.

The explosion-proof sensor conduit boxes house the connections for the sensor that detects the presence of the combustible gas (and houses the remote calibration option when it is used). The two most important factors that determine where the sensor conduit boxes are to be situated are the expected flow pattern of the gases (which is a function of the molecular weights of the gases and the ventilation system) and the most probable location of gas leakage. If the gases are lighter than air, the conduit boxes should be placed above the spots where the leaks are most likely to occur; if the gases are heavier than air, the conduit boxes should be placed below the spots where the leaks are most likely to occur.

As a rule, the sensor is screwed into a 3/4-inch NPT threaded opening on one side of the conduit box, and the conduit is screwed into a second 3/4-inch NPT threaded opening on the opposite side of the conduit box. The conduit boxes can be bolted to a wall or a post, or they can be suspended by the conduit. See Figure 2-1 for various typical installation configurations.

WARNING

Regardless of the method used to install the conduit box, the conduit box *must* be oriented with the sensor down as shown in Figure 2-1. If it is not, erroneous readings will result and the sensor could be damaged.

In installing the conduit boxes, make sure that all local electrical codes are observed.

2.2 AC LINE TRANSFORMER AND RECTIFIED OUTPUT

Either 117 or 234 Vac, 50 or 60 Hz nominal power may be used with this unit. For 117 Vac operation, jumpers W1 and W3 (see schematic diagram, Figure 5-3) must be installed (no W2 jumper). Refer to Figure 3-2 for location of the jumpers on the PWB. Check inside the front cover of this manual to determine proper operating voltage. For 234 Vac operation, *only* jumper W2 should be installed. The output from T1 is rectified and filtered and is nominally 12 Vdc. A standard 12 Vdc lead acid battery capable of supplying 2 amps for each 820 used can be connected in parallel with the 12 Vdc rectified output so that (1) the battery will be kept charged while there is ac line voltage, and (2) the system can be operated from the battery should the ac line voltage fail. The system can also operate from a 12 Vdc power supply.

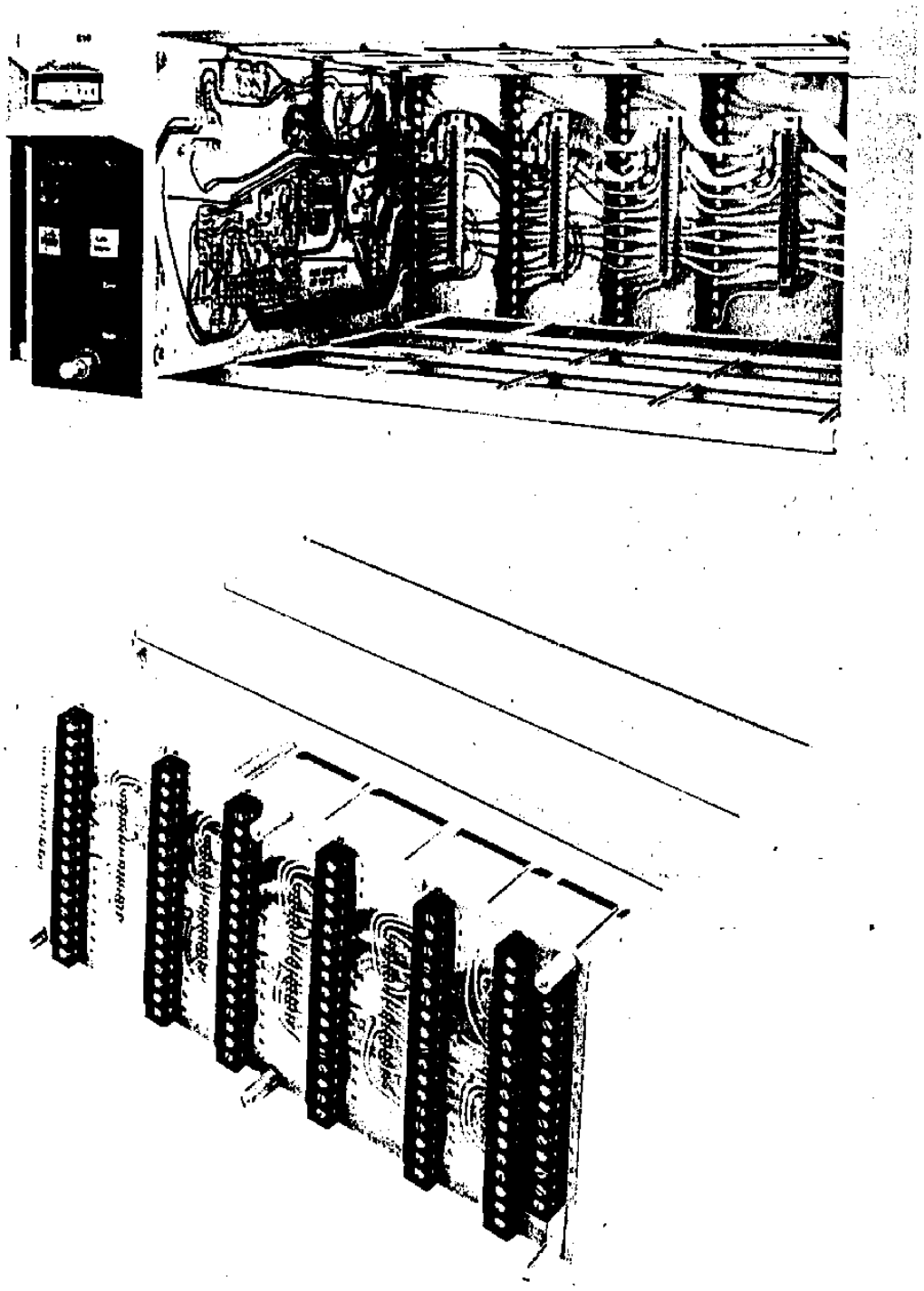


Figure 2-2 Front and Rear Views of the 19-Inch Rack Installation

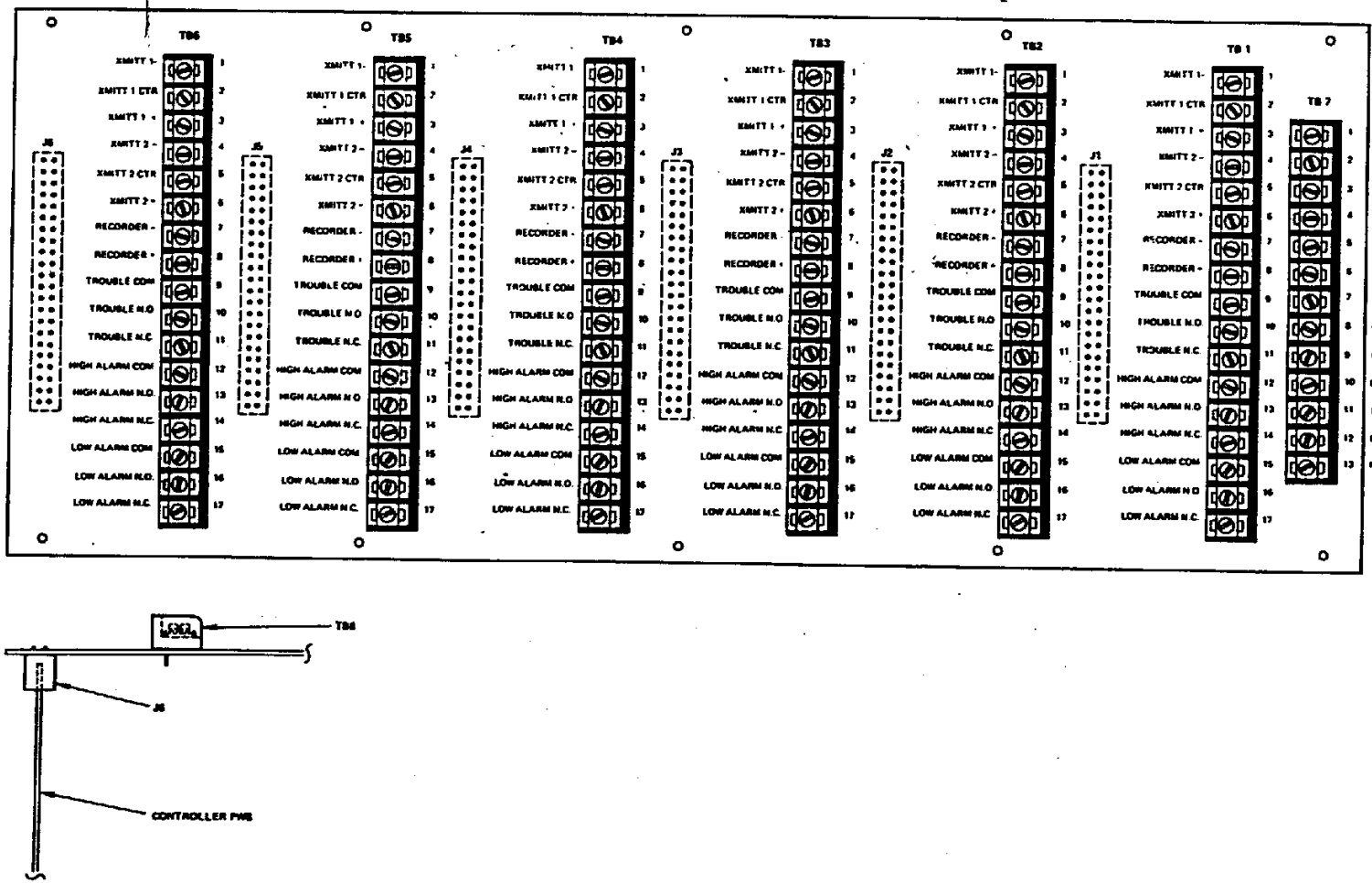


Figure 2-3. Barrier Strips, 19-Inch Rack Configuration

2.3 INSTALLING THE CONTROLLER HOUSING

There are four standard controller housings:

a) a standard 19-inch rack configuration

b) a weather-proof wall mount configuration (NEMA 3)

c) an explosion-proof housing configuration (NEMA 7)

d) a panel configuration

Low alarm relay contacts, high alarm relay contacts, and trouble relay contacts are associated with each controller. The relays are located on the controller printed wiring board (PWB) and their contacts brought through PWB traces to fingers at the back of the board. Each relay has a pair of SPDT contacts, both of which are electrically isolated from each other and from all other circuits on the controller board.

2.3.1 19-Inch Rack Configuration

The 19-inch rack configuration will accept as many as six controllers, either single-channel or dual channel, in any combination. Figure 2-2 shows a front and rear view of the 19-inch rack. At the back of the rack, there are six barrier strips, labeled TB1, TB2, etc., and a common barrier strip, labeled TB7. A detailed drawing of these barrier strips is shown in Figure 2-3. Barrier strip TB1 is associated with controller No. 1, TB2 with controller No. 2, etc. Barrier strip TB7 is common to all. The 19-inch rack is designed so that when the controller is plugged in, one of the pair of isolated SPDT contacts at each controller is automatically connected to its associated barrier strip, and the common contact and the normally-open contact of the other SPDT contacts are automatically connected in parallel with the TB7 strip.

Each of the six barrier strips, TB1-TB6, provides the following:

- Three 3A, 120 Vac or 30 Vdc SPDT electrically-isolated relay contacts: one for the low alarm, one for the high alarm, and one for the trouble circuit of the controller associated with that barrier strip.

- Three connections for each sensor used with the controller and a pair of connections for an analog recorder (see Figure 2-4 for the connection diagram for the 19-inch rack configuration).

Barrier strip TB7 provides the following:

- Three 3A, 117 Vac SPST paralleled normally-open, electrically-isolated, relay contacts: one for the low alarm, one for the high alarm, and one for the trouble circuit for all the controllers in the rack.

- A pair of connections for the ac supply voltage to each controller.

- A pair of connections for 12 Vdc battery standby power to each controller.

- A pair of connections for system reset.

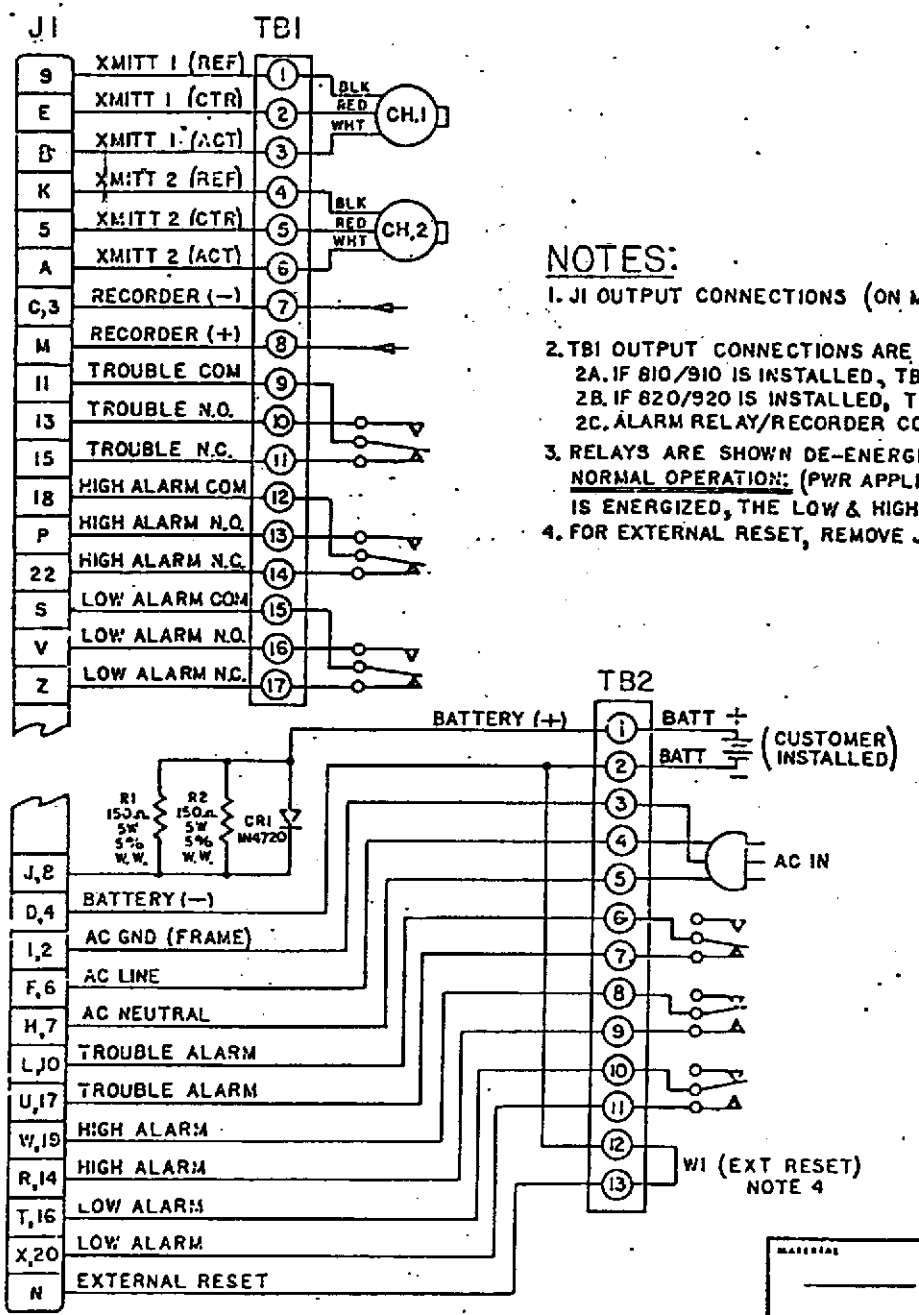
There is a recorder connection on dual-channel systems. However, no signal is provided to show which channel is being recorded.

Figure 2-5 shows a NEMA 12 and a NEMA 7 housing.

2.3.2 Weatherproof Wall Mount Configuration

The weather proof wall mount configuration will accept as many as twelve controllers, either single-channel or dual-channel, in any combination. Figure 2-5 shows a front view of the wall mount unit. When the front door

APPLICATION					
MFG'S ASSY	MODEL	ISSUE	DESCRIPTION	SIGNATURE	DATE
225481	800/900 SR	A	PROD. REL.	[signature]	9-25-75
225413	LEVEL 3				
225415	LEVEL 7				

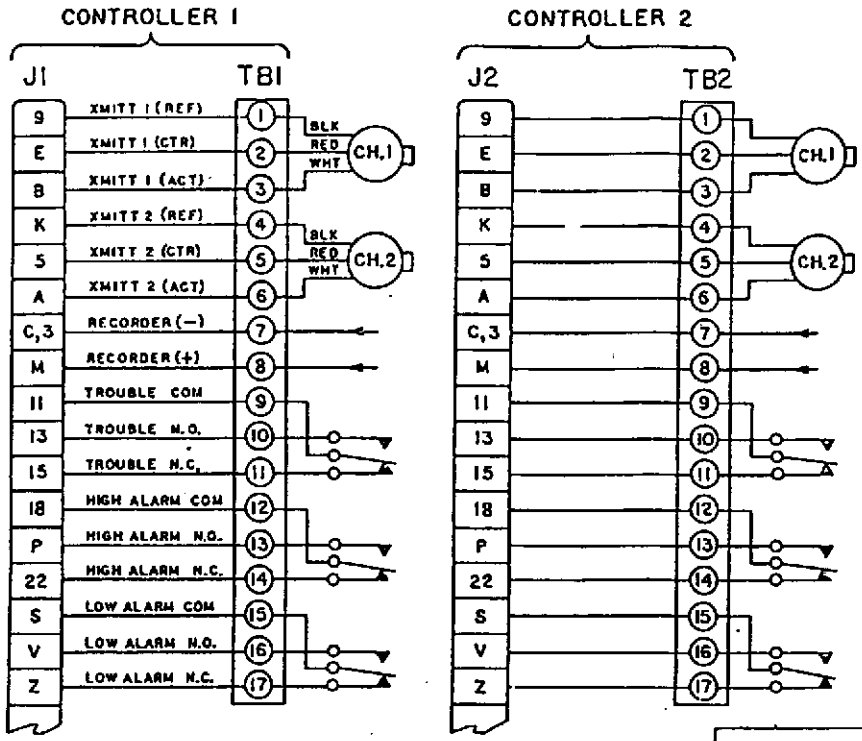


NOTES:

1. J1 OUTPUT CONNECTIONS (ON MOTHER BOARD).
2. TB1 OUTPUT CONNECTIONS ARE FOR CUSTOMER SYSTEM CONFIGURATIONS.
   - 2A. IF 810/910 IS INSTALLED, TB1 PINS 1-3 ARE CONNECTED.
   - 2B. IF 820/920 IS INSTALLED, TB1 PINS 1-6 ARE CONNECTED.
   - 2C. ALARM RELAY/RECORDER CONTACTS ARE FOR CUSTOMER OPTIONS.
3. RELAYS ARE SHOWN DE-ENERGIZED.
   NORMAL OPERATION: (PWR APPLIED, NO ALARMS), THE TROUBLE RELAY IS ENERGIZED, THE LOW & HIGH ALARM RELAYS ARE DE-ENERGIZED.
4. FOR EXTERNAL RESET, REMOVE JUMPER (W1) AND INSERT A N.C. SWITCH.

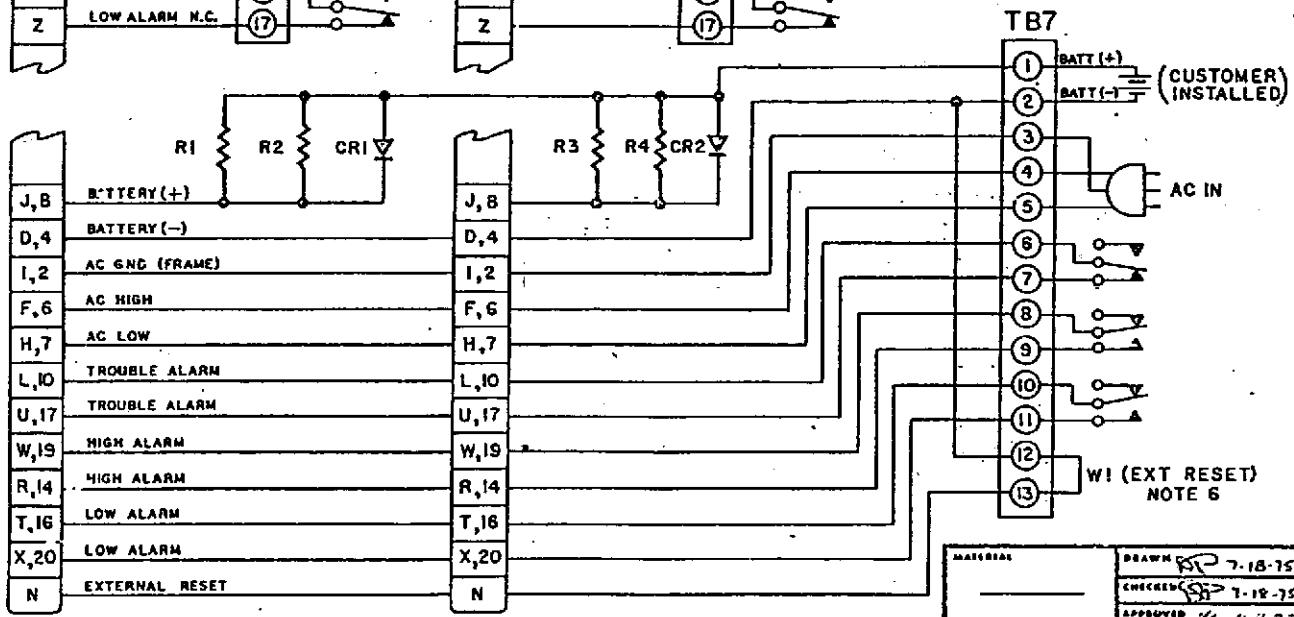
MATERIAL: —	DRAWN 9-25-75	Gas Detection Products	
FINISH: —	CHECKED 9-26-75		
	APPROVED 9-26-75	TITLE: INTERCONNECTION DIAGRAM CONTROLLER, SINGLE UNIT	
	APPROVED	SCALE: —	SIZE: C
	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .XXX ± ANGLES ±	SHEET 1 OF 1	DRAWING NO. 225483

APPLICATION		REVISIONS			
NEXT ASSY	MODEL	ISSUE	DESCRIPTION	SIGNATURE	DATE
225133	800/900SER	A	PROD. REL.		7-18-75



NOTES:

1. J1 OUTPUT CONNECTIONS (ON MOTHER BOARD) ARE TYPICAL FOR BOTH CONTROLLERS.
2. TB1, TB2, TB7 OUTPUT CONNECTIONS ARE FOR CUSTOMER SYSTEM CONFIGURATIONS.
   2A. IF 810/910 IS INSTALLED, ONLY CH.1 (TB x) PINS 1–3 ARE CONNECTED.
   2B. IF 820/920 IS INSTALLED, CH.1 & CH.2 (TB x) PINS 1–6 ARE CONNECTED.
   2C. ALARM RELAY/RECORDER CONTACTS ARE FOR CUSTOMER OPTIONS.
3. RELAYS ARE SHOWN DE-ENERGIZED.
   NORMAL OPERATION: (PWR. APPLIED, NO ALARMS), THE TROUBLE RELAY IS ENERGIZED, THE LOW & HIGH ALARM RELAYS ARE DE-ENERGIZED.
4. RESISTORS R1–R4 ARE 150Ω, 5W, 5%, WW.
5. DIODES CR1–CR2 ARE IN4720.
6. FOR EXTERNAL RESET, REMOVE JUMPER (W1) AND INSERT A N.C. SWITCH.



MATERIAL	DRAWN RP 7-18-75	Scully/Metrotech DIVISIONS OF DICTAPHONE
FINISH	CHECKED RP 7-18-75	TITLE INTERCONNECTION DIAGRAM – CONTROLLER, RACK, 2 UNIT
	APPROVED 7-9-75	SCALE —
	APPROVED 7-11-75	SIZE C DRAWING NO. 225487
	UNLESS OTHERWISE SPECIFIED; DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .XXX ± ANGULAR	SHEET 1 OF 1

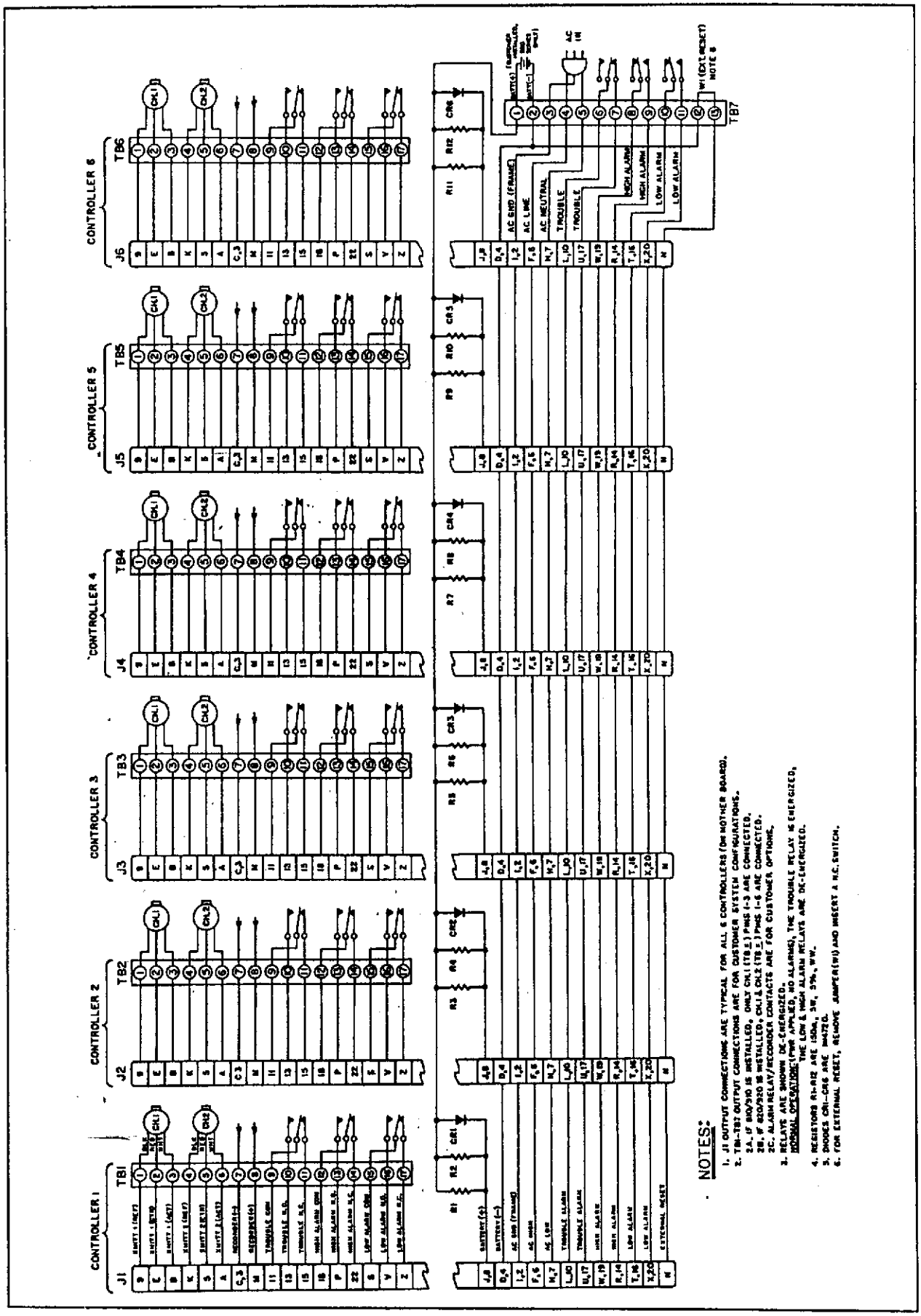
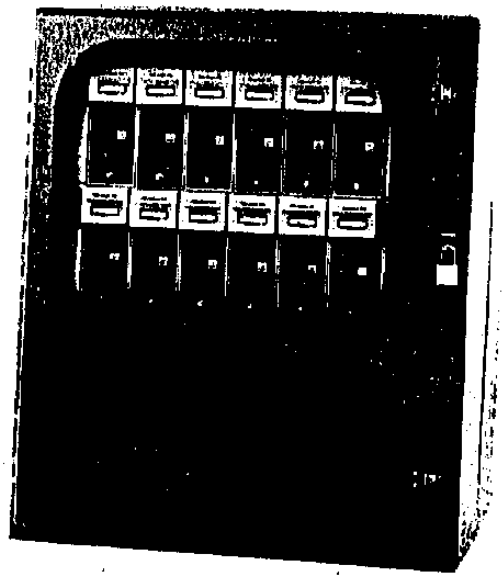


Figure 2-4. Interconnections for 19-Inch Rack Configuration

NEMA 12
WEATHERPROOF HOUSING



NEMA 7
EXPLOSION-PROOF HOUSING

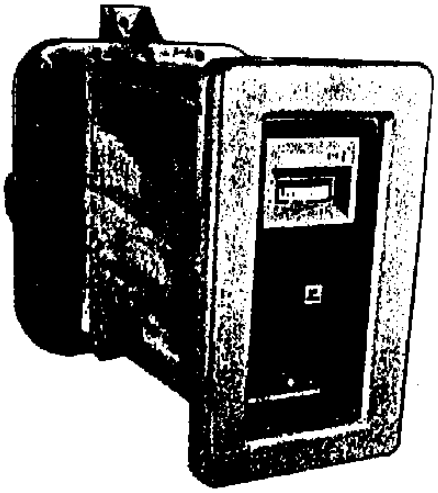


Figure 2-5. NEMA 3 , NEMA 7, and Panel Mount Housing

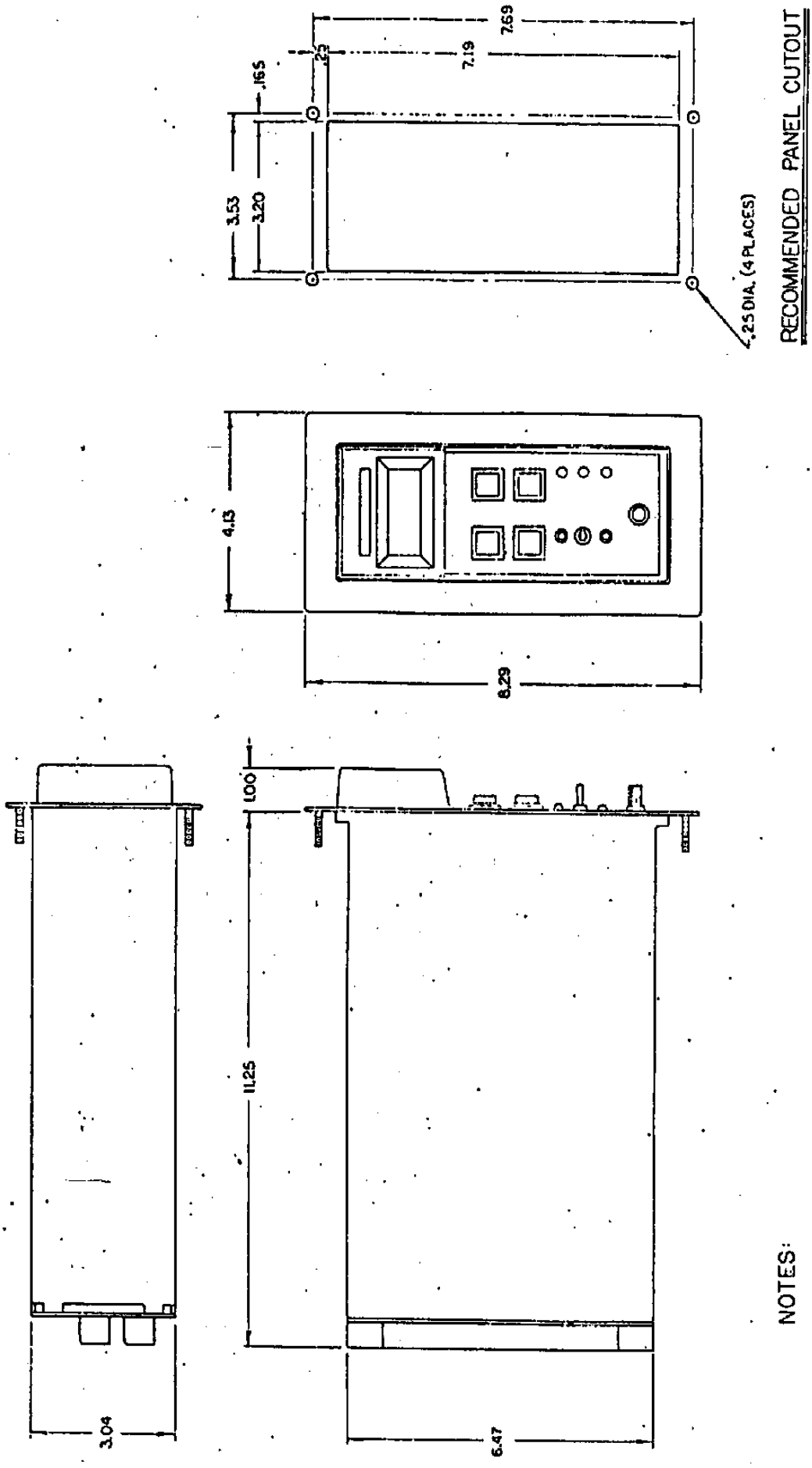
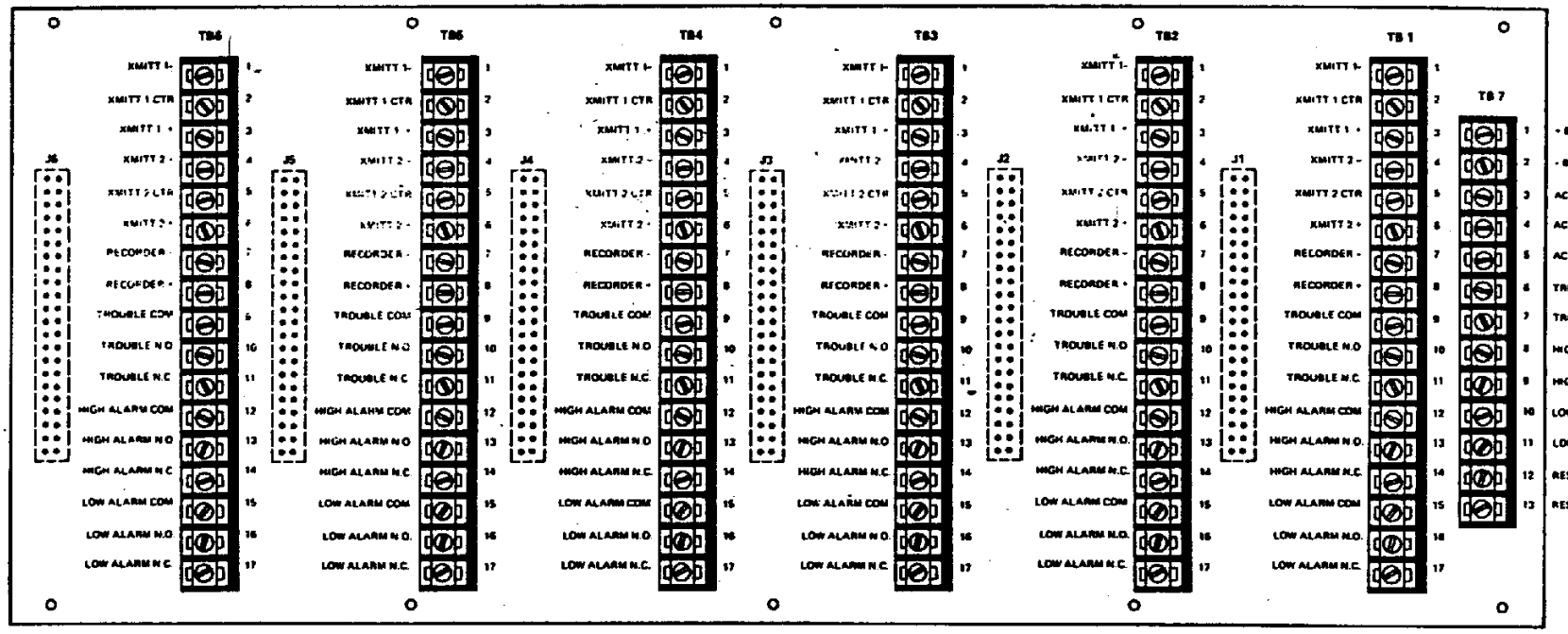


FIGURE 2-5A-SINGLE UNIT PANEL MOUNT
OUTLINE DIAGRAM

NOTES:

1. PANEL MOUNT ASSY. NO. IS 225457-01.
2. MAXIMUM WEIGHT (LESS CONTROLLER) IS 2.25 LBS.
3. REF WIRING DIAGRAM : 225433



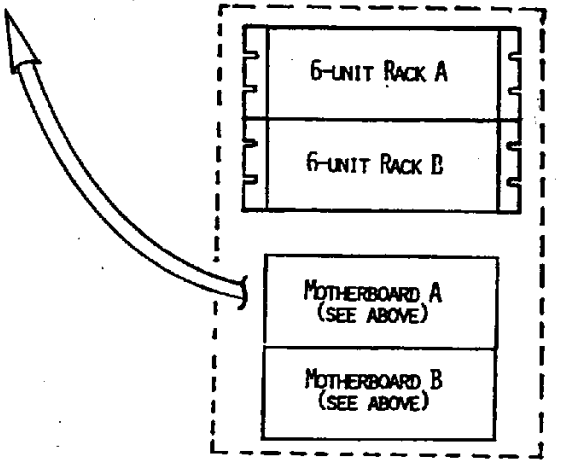


Figure 2-6. Weatherproof 12-unit Wall Mount Configuration and Motherboard diagram.

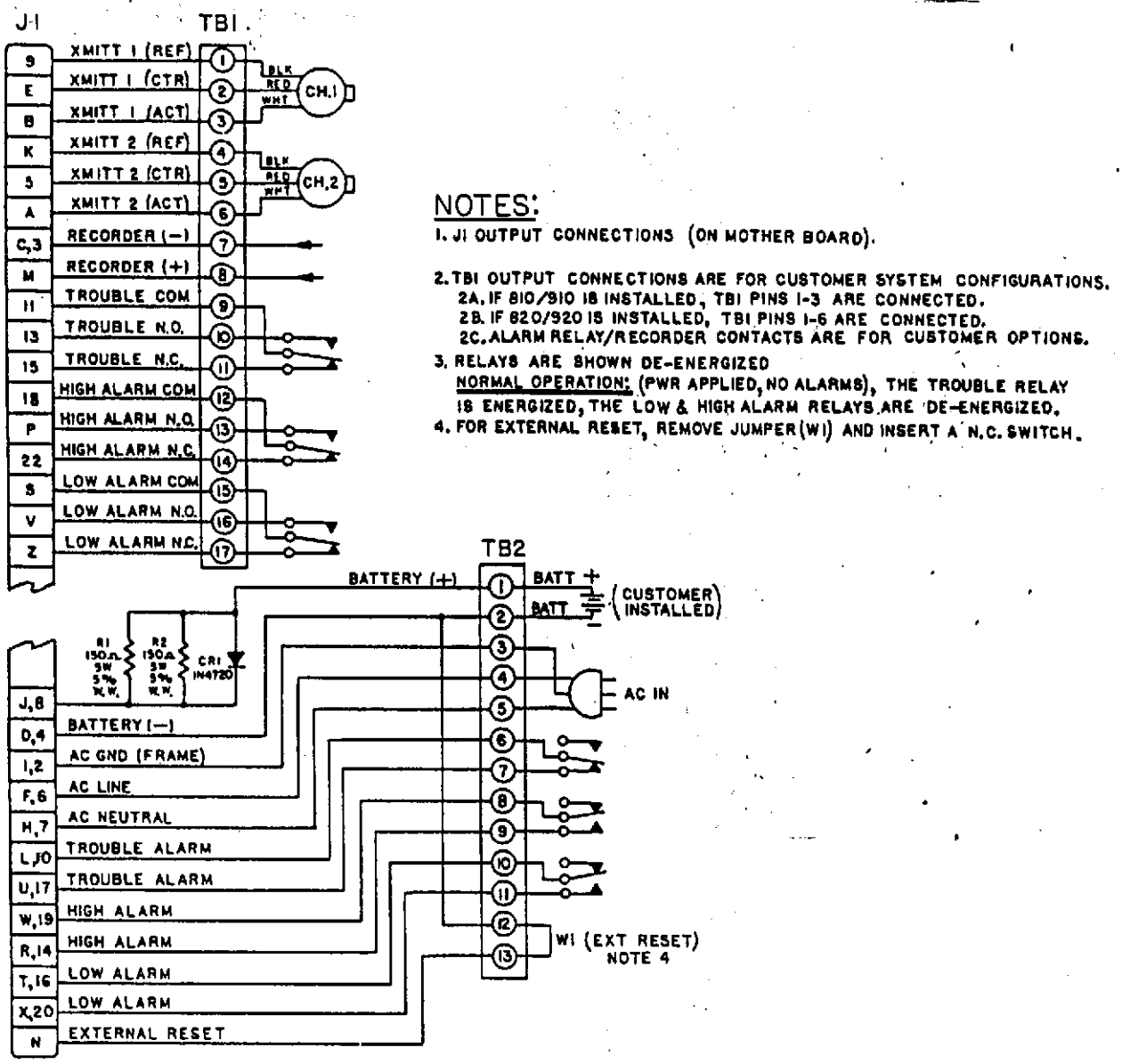


Figure 2-7 . Panel Mount Interconnection Diagram

is opened, twelve barrier strips labeled TB1, TB2, etc. and a smaller barrier strip labeled TB7 are accessible. A detailed drawing of these barrier strips is shown in Figure 2-6. Barrier strip TB1 is associated with controller No. 1, TB2 with controller No. 2, etc. Barrier strip TB7 is common to all.

The unit is designed so that when the controller is plugged in, one of the pair of isolated SPDT contacts at each controller is automatically connected to its associated barrier strip, and the common contact and the normally-open contact of the other SPDT contacts are automatically connected in parallel with the TB7 strip.

Each of the twelve barrier strips, TB1 through TB6 for each rack provides the following:

- Three 3A, 117 Vac or 30 Vdc SPDT electrically-isolated relay contacts: one for the low alarm, one for the high alarm and one for the trouble circuit of the controller associated with that barrier strip.
- A pair of connections for each transmitter used with the controller (for two-wire systems, no connection is required to the pins labeled XMITT 1 CTR and XMITT 2 CTR) and a pair of connections for an analog recorder.

Barrier strip TB 7 for each rack provides the following:

- Three 3A pairs, 117 Vac or 30 Vdc SPST paralleled normally-open, electrically isolated, relay contacts: one for the low alarm, one for the high alarm, and one for the trouble circuit for all the controllers in the unit.
- A pair of connections for the AC and/or DC supply voltage to each controller.
- A pair of connections for system reset.

2.4 WIRE SIZE TABLE

The sensor requires three wires for operation. Two of the wires are used to supply electrical power from the controller to the sensor and the third wire is used to send the signal from the sensor to the controller. The two electrical power wires must be chosen from the wire size table (Table 2-1). The third wire can be any wire that is 24 gage or larger for all applications. Figure 2-8 shows a block diagram of the sensor and controller and identifies the wires connecting them.

Table 2-1 shows the maximum distance that a sensor may be located from the controller for several wire sizes. This wire size table takes into account that two electrical power wires are necessary between the controller and the sensor.

To demonstrate the use of the wire size table an example is given below.

Example:
A sensor is to be located 350 feet from its controller. What is the smallest wire size that can safely be used? Number 20 wire or larger must be used since the next smaller wire size shown in the table can only be used for a sensor located not more than 300 feet from its controller.

Table 2-1. Wire Size Versus Distance

AWG Wire Size	Maximum Distance Sensor May Be Located From Controller (in feet)
24	200
22	300
20	500
18	750
16	1200
14	2000
12	3200
10	5000
8	8000

The resistance of pure annealed copper wire changes considerably with changes in its temperature. The wire size table takes this into account. The maximum distances between a sensor and its controller for a given wire size are valid over the entire operating temperature range of the system. The system has been designed so that changes in the resistance of the copper wire will have no significant effect on the system's operation.

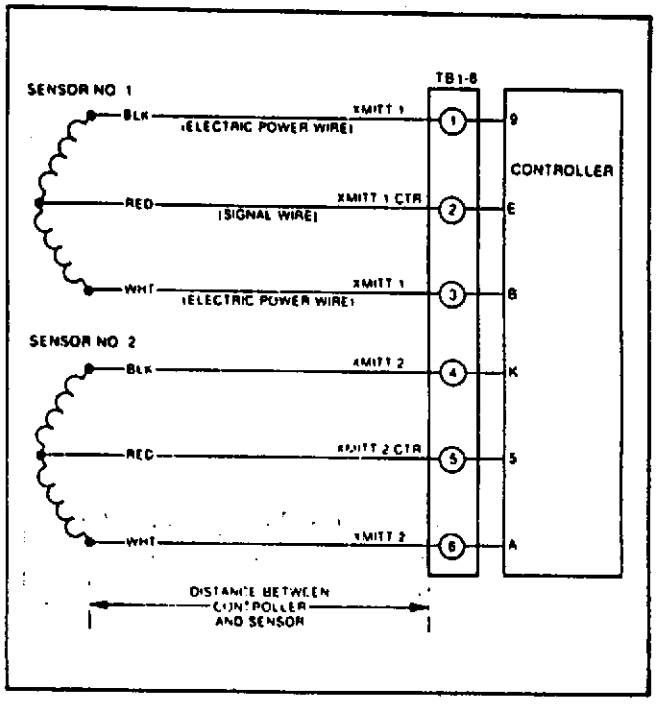


Figure 2-8. Interconnection Wiring Between Sensor and Controller

2.5 INSTALLING THE CONTROLLER

The system has a switch on the PWB that is used to program different modes of operation. The system is normally shipped with switch S4 programmed for "passive alarm test". Switch S4 is programmed for operation without remote calibration if the system is purchased without this option, or it is programmed for operation with remote calibration if the system is purchased with this option. A program diagram for this switch is shown in Table 2-2. See Section 3 for description of this switch and see Figure 3-2 for its location on the PWB. Figure 2-9 is a photograph of the back of the controller. To install the controller, slide the controller PWB into the rack card guides until the PWB fingers come in contact with the connector; then push the PWB in as far as it will go (approximately 0.25 inch). If the connector in the rack is connected to the line voltage or battery, and is properly wired, the *Trouble* lamp will go on. The *Trouble* lamp, when lit at this time, simply indicates that the sensors need to be installed.

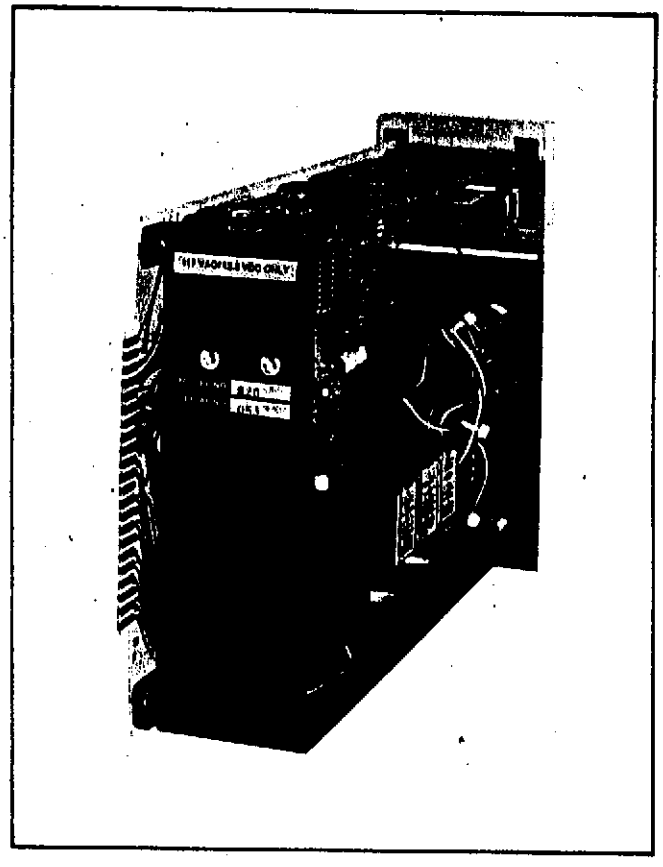


Figure 2-9. Controller, Rear View

WARNING

It is mandatory that switch S4 be programmed properly or signals from the sensor will not be displayed on the meter and the alarm circuits will not work.

Table 2-2. Program Diagrams for Switch S4

	Note 1 S4-1	S4-2	S4-3	S4-4	S4-5	S4-6	S4-7
Channel 1 with Remote Calibration Option		off/ open	on/ closed	off/ open			
Channel 1 without Remote Calibration Option		on/ closed	off/ open	on/ closed			
Channel 2 with Remote Calibration Option					off/ open	on/ closed	off/ open
Channel 2 without Remote Calibration Option					on/ closed	off/ open	on/ closed
Passive Alarm Test	on/ closed						
Active Alarm Test	off/ open						

NOTES: 1."Off/Open" and "On/Closed" are used interchangeably because of switch availability. Some switches say "ON" or "OFF" while others say "OPEN" or "CLOSED".

2.6 INSTALLING THE SENSOR

1. Remove the cover of the sensor conduit box. Check to see that there are three wires coming out of the conduit and that these are connected to points labeled *White*, *Black* and *Red* on the barrier strip inside the box.

2. Screw the sensor into the 3/4-inch opening at the bottom of the conduit box and tighten the sensor securely with a wrench. (See Figure 2-10.) Use a dust cover (available as an option with the 820) over the sensor if the area is dusty. Plug the connector from the sensor into the mating receptacle located on the motherboard bolted to the bottom of the sensor conduit

c1 to 1.1mA output.
from sensor to controller.

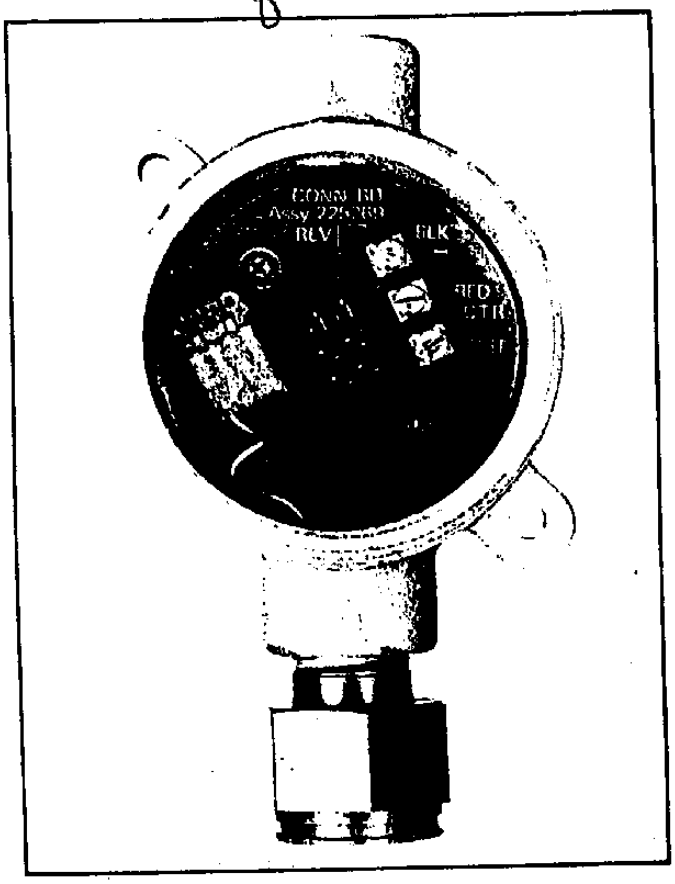


Figure 2-10. Conduit Box and Sensor

box. Make sure that the connector is indexed properly before it is inserted into this receptacle; do not force it into place.

WARNING

A sintered-metal cover which acts as a flame arrester is an integral part of the Model 820 Gas Detection System combustible gas sensor. Do *NOT* operate the system if the sintered-metal cover is damaged.

NOTE

The large receptacle is available for use when the remote calibration option is used. When this option is not used, a shunt plug (supplied) must be installed in the large receptacle before the system will work properly.

2.7 REMOTE CALIBRATION OPTION

If the remote calibration option is being used, install the remote calibration PWB, Figure 2-11, by inserting the connector pins on the bottom of this board into the mating receptacle on the motherboard bolted to the bottom of the sensor conduit box.

2.8 CALIBRATION

Each system shipped from the factory has been calibrated for the gas specified on the inside of the front cover of this manual. Immediately upon installation, the unit should be recalibrated in accordance with the routine calibration procedures to verify that the installation has not damaged this calibration.

The system will also have to be calibrated regularly (about once every 60 to 90 days) and will have to be recalibrated whenever the sensor is replaced. Routine calibration is described in Subsection 5.1 (or 5.2 if the remote calibration option is used); recalibration is described in Subsection 5.3.

NOTE

Disconnect power to the system when replacing the sensor to prevent false alarms.

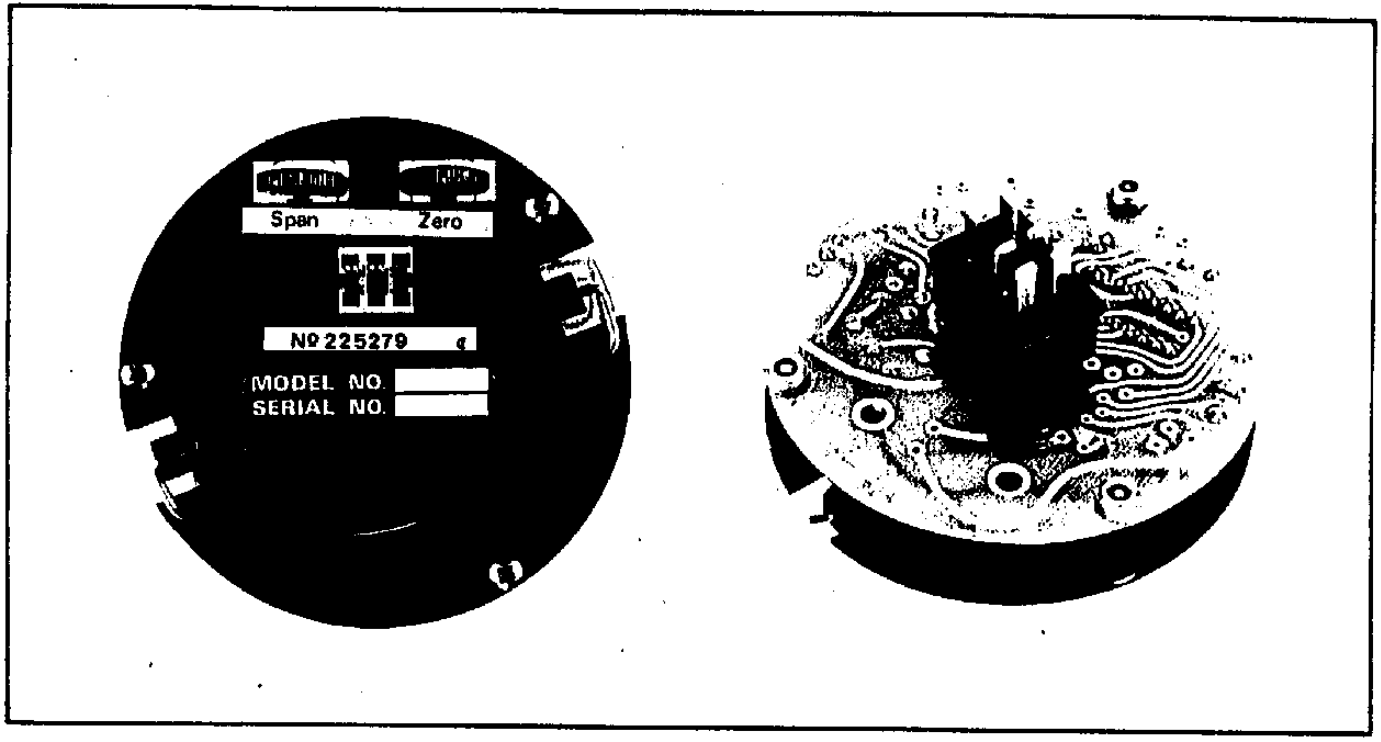


Figure 2-11. Remote Calibration Option, Top and Bottom Views

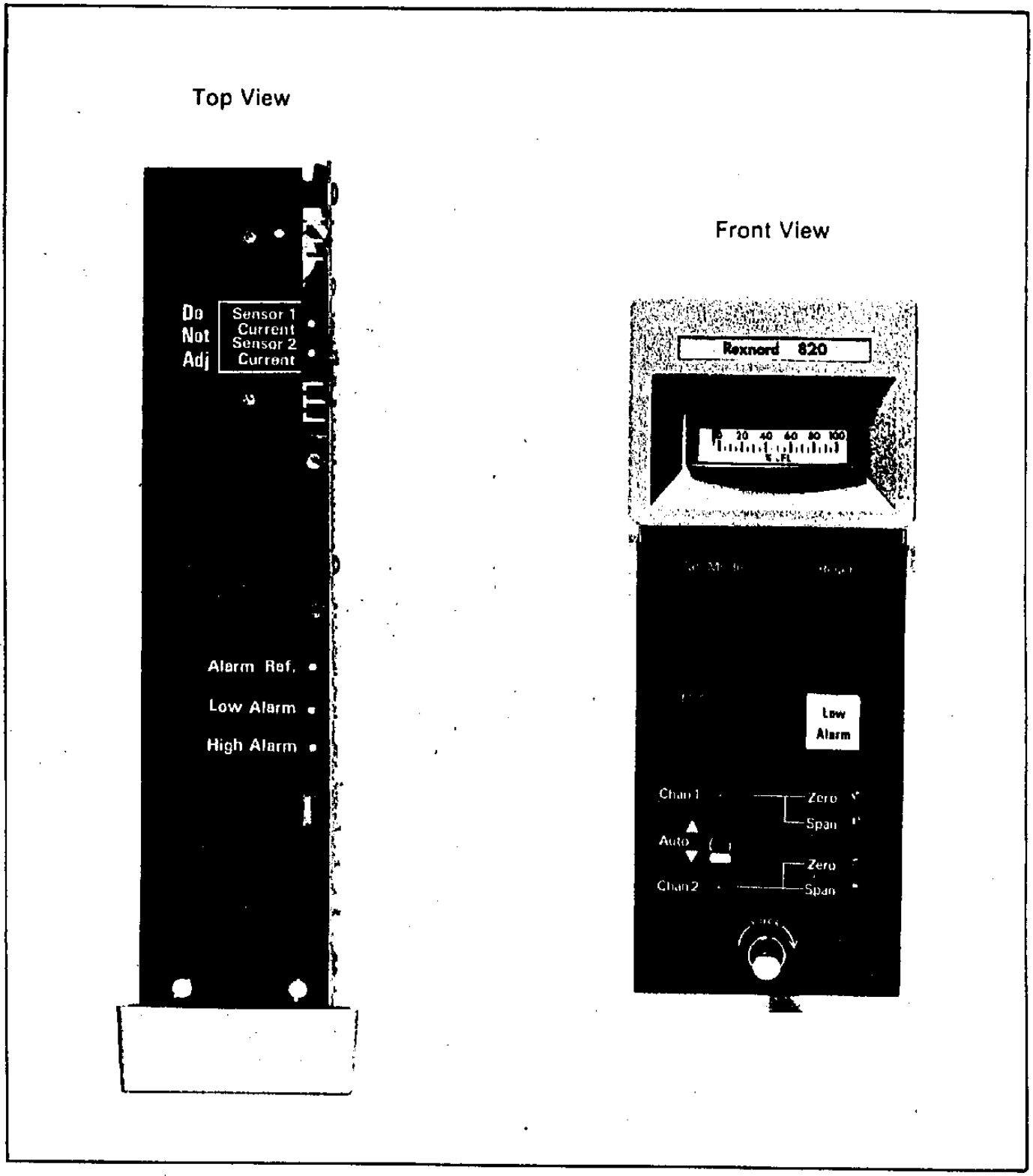


Figure 3-1. Model 820 Controls and Indicators

SECTION 3
OPERATION

3.1 GENERAL

Operating controls of the 820 Controller are located on the front panel (see Figure 3-1). Three screwdriver adjustable potentiometers are located on the top of the unit. They are *Alarm Ref.*, *Low Alarm*, and *High Alarm*. Additional controls are the two programming switches located on the controller PWB.

NOTE

The two adjustments labeled Sensor 1 Current *and* Sensor 2 Current *are factory adjustments and should not be disturbed.*

3.2 CONTROLS AND INDICATORS

The panel has the following indicators:

- a meter (0 to 100% LFL)
- a *Low Alarm* lamp (yellow)
- a *High Alarm* lamp (red)
- a *Trouble* lamp (blue)
- a *Power* lamp (green)
- an indicator lamp (red) for channel 1
- an indicator lamp (red) for channel 2

The panel has the following controls:

- a momentary *Cal. Mode* pushbutton
- a momentary *Reset* pushbutton
- a three-position momentary channel selector switch
- a channel 1 *Zero* screwdriver adjustment*
- a channel 1 *Span* screwdriver adjustment*
- a channel 2 *Zero* screwdriver adjustment*
- a channel 2 *Span* screwdriver adjustment*

* These adjustments become inoperative when the controller is programmed for the remote calibration option.

Meter

The meter indicates the concentration of gas, as a percentage of the lower flammable limit (% LFL) of that gas, at the sensor where the gas concentration is higher. If the channel corresponding to the higher gas concentration is not functioning properly, the meter will indicate the % LFL at the other sensor.

Power Indicator Lamp

There is no on/off switch; the system is on whenever it is wired, plugged in, and has power applied to it. The *Power* lamp is lit when the system is plugged in, *and* at least one channel is working, *and* the meter reading is below the low alarm set point. The *Power* lamp is off under all other conditions.

Low Alarm Lamp

When the % LFL indicated on the meter exceeds the preset low alarm value, control circuitry that operates customer-installed warning or safety devices (e.g., lights, buzzers, or fans) is activated by an electrically isolated relay in the controller, and the *Low Alarm* lamp lights. If the meter subsequently drops below this set point, the *Low Alarm* lamp will remain on until the *Reset* control is pressed.

High Alarm Lamp

When the % LFL indicated on the meter exceeds the preset high alarm value, control circuitry that operates customer-installed safety systems (e.g., fog sprays, CO_2 deluge units, or plant shutdown systems) is activated by a relay in the controller, and the *High Alarm* lamp lights. If the meter subsequently drops below this set point, the *High Alarm* lamp will remain lit until the *Reset* control is pressed. When the *High Alarm* lamp lights, the *Low Alarm* lamp goes off* but the control circuitry in the low alarm system remains activated.

Trouble Indicator Lamp

If there is a circuit failure in either channel 1 or channel 2, the *Trouble* lamp lights and the controller switches over to the good channel if it is not already monitoring that channel. The channel indicator lamp of the operating channel lights and the faulty channel is indicated by the extinguished channel indicator lamp. If there is a circuit failure in both channels, the *Trouble* lamp lights and the trouble relay is activated. In addition the relays that control all the warning and safety systems are deactivated. When the system is turned on, or when it goes back on after a power interruption (line voltage and battery voltage removed), the *Trouble* lamp lights and remains lit for nominally 20 seconds until the system warms up. During this time, the high and low alarm relays are inoperative.

Three-Position Channel Selector Switch and the Two Channel Indicator Lamps

The *Auto* position is the normal state for the channel selector toggle switch; the *chan 1* and *chan 2* positions are momentary states. With the switch in the *Auto* position, the meter automatically indicates the % LFL of the gas at the sensor where the gas concentration is higher, the indicator lamp corresponding to the channel associated with that sensor is on, and the indicator lamp corresponding to the other channel is off. If, however, the channel corresponding to the higher gas concentration is not functioning properly, the meter will automatically indicate the % LFL at the other sensor, the indicator lamp corresponding to that channel will be lit, the other channel light will be off; and the selector switch cannot be used to select channels.

If the channel 1 indicator lamp is lit and you wish to know the gas concentration at the channel 2 sensor, move the selector switch to the down position, hold it in place, and read the % LFL on the meter. If the channel 2 lamp is lit and you wish to know the gas concentration at the channel 1 sensor, move the selector switch to the up position, hold it in place, and read the % LFL on the meter. If both channel 1 and channel 2 are not functioning properly, the two channel indicator lamps will not light, regardless of the position of the switch.

Cal. Mode Switch

This pushbutton switch has three functions:

1. It is used in the procedure for setting the low alarm trip level and the high alarm trip level. (See Subsection 3.3.) *Cal. Mode* is abbreviation for calibration mode.

2. It is used in the procedure for determining whether the *Trouble*, *Low Alarm*, and *High Alarm* lamps are working properly. (See Subsection 5.4, "Indicator Lamps".)

3. It is used when the system is programmed for "active alarm test" to cause customer-installed safety equipment to be actuated.

*There is only one situation in which both the *High Alarm* and *Low Alarm* lamps can be lit at the same time, and that is when the meter reading exceeds the high alarm value *and* the *Cal. Mode* control is pressed and held in and the system is programmed for "Passive Alarm Test." (See Subsection 5.4, "Indicator Lamps.")

When switch S4 is programmed for "passive alarm test" and the *Cal. Mode* button is pressed and held in, the *Trouble* lamp lights and the low alarm relays are electronically inhibited, thereby preventing the warning and safety systems from operating. Pressing this button, however, does not prevent the *Low Alarm* and *High Alarm* lamps from lighting if the *Alarm Ref* control is adjusted above the high alarm trip point. When S4 is programmed for "active alarm test" and the *Cal. Mode* pushbutton is pressed and held in, the *Trouble* lamp lights. However, the low alarm and high alarm relays are not electronically inhibited, and will be actuated if the *Alarm Ref.* control is adjusted above the high alarm trip point. All customer-installed safety equipment will be actuated.

Reset Switch

If the meter indicates a value greater than the high alarm (or low alarm) trip point, but subsequently drops below this trip point, the alarm lamp and the safety and/or warning systems will remain on until the *Reset* pushbutton is pressed.

NOTE

The alarm cannot be reset if the meter reading is higher than the alarm set points.

Alarm Ref. Control*

When the *Cal. Mode* pushbutton is pressed and held in and switch S4 is programmed for "passive alarm test", the operator can use the *Alarm Ref.* adjustment to adjust the % LFL reading indicated on the meter without introducing gas into the system or setting off alarms or safety devices. Turning the *Alarm Ref.* control clockwise increases the % LFL reading, turning the control counterclockwise decreases the % LFL reading.

WARNING

When S4 is programmed for "active alarm test", alarms or safety devices will be activated if *Alarm Ref.* is adjusted above either or both alarm levels.

Low Alarm Control*

The *Low Alarm* control is used to set the low alarm trip point. Turning the *Low Alarm* control clockwise decreases the low alarm trip level; turning the control counterclockwise increases the low alarm trip level.

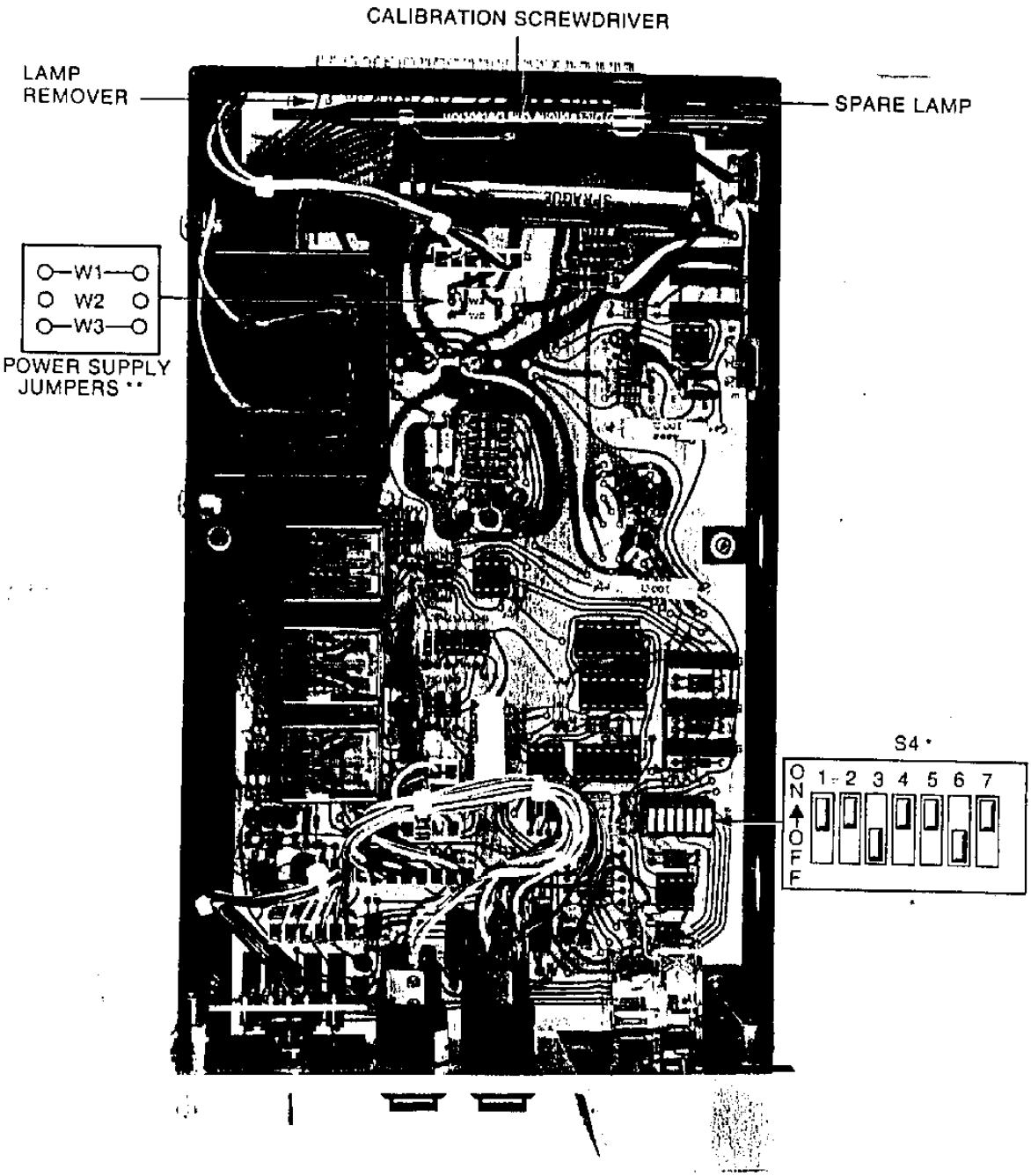
High Alarm Control*

The *High Alarm* control is used to set the high alarm trip point. Turning the *High Alarm* control clockwise decreases the high alarm trip level; turning the control counterclockwise increases the high alarm trip level.

Program Switch S4

This switch is located on the PWB inside the controller (see Figure 3-2). This switch allows the operator to program the system so that it can be used with or without the remote calibration or with passive or active alarm test. Table 2-2 shows how switch S4 must be programmed for these alternatives.

* During operation, the *Alarm Ref. Low Alarm* and *High Alarm* controls can be adjusted only by using an extender card with the controller (see Subsection 3.3).



*See Table 2-2 for programming data
**Shown jumpered for 117 Vac.

Figure 3-2. Controller PWB

WARNING

It is mandatory that switch S4 be programmed properly or signals from the sensor will not be displayed on the meter and the alarm circuits will not work.

3.3 SETTING THE LOW ALARM TRIP LEVEL

With the sensors hooked-up and power applied to the system, set the low alarm trip level as follows:

1. Remove the controller and install the extender card (part number 225203) being sure the card is right-side up, Figure 3-3.

2. Plug the controller into the extender card.

3. Press the *Cal. Mode* pushbutton and hold it in.

4. Adjust the *Alarm Ref.* control until the desired % LFL reading appears on the meter.

5. If the *Low Alarm* lamp is lit, turn the *Low Alarm* control counterclockwise to the point where the lamp just goes off; if the *Low Alarm* lamp is off, turn the *Low Alarm* control clockwise to the point where the lamp just goes on.

6. Check the *High Alarm* lamp.

a) If it is *not* on, release the *Cal. Mode* pushbutton. The low alarm trip level is now set.

b) If the *High Alarm* lamp is lit, turn the *High Alarm* control counterclockwise until the *High Alarm* lamp goes off; then turn the *High Alarm* control one more turn counterclockwise and release the *Cal. Mode* pushbutton. The low alarm trip level is now set, but the high alarm trip level is out of adjustment. Set the high alarm trip level in the manner described below.

NOTE

Step 6b ensures that the high alarm trip level is above the low alarm trip level. The system will not work properly if the high alarm trip level is below the low alarm trip level.

3.4 SETTING THE HIGH ALARM TRIP LEVEL

With the sensors hooked-up and power applied to the system, set the high alarm trip level as follows:

1. Remove the controller and install the extender card (part number 225203) being sure the card is right-side up.

2. Plug the controller into the extender card.

3. Press the *Cal. Mode* pushbutton and hold it in.

4. Adjust the *Alarm Ref.* control until the desired % LFL reading appears on the meter.

5. If the *High Alarm* lamp is lit, turn the *High Alarm* control counterclockwise to the point where the lamp just goes off; if the *High Alarm* lamp is off, turn the *High Alarm* control clockwise to the point where the lamp just goes on.

6. Check the *Low Alarm* lamp.

a) If it is lit, release the *Cal. Mode* pushbutton. The high alarm trip level is now set.

b) If the *Low Alarm* lamp is not lit, turn the *Low Alarm* control clockwise until the *Low Alarm* lamp goes on; then turn the control one more turn clockwise and release the *Cal. Mode* pushbutton. The high alarm trip level is now set, but the low alarm trip level is out of adjustment. Set the low alarm trip level in the manner described in "Setting the Low Alarm Trip Level".

NOTE

Step 6b ensures the low alarm trip level is below the high alarm trip level. The system will not work properly if the low alarm trip level is above the high alarm trip level.

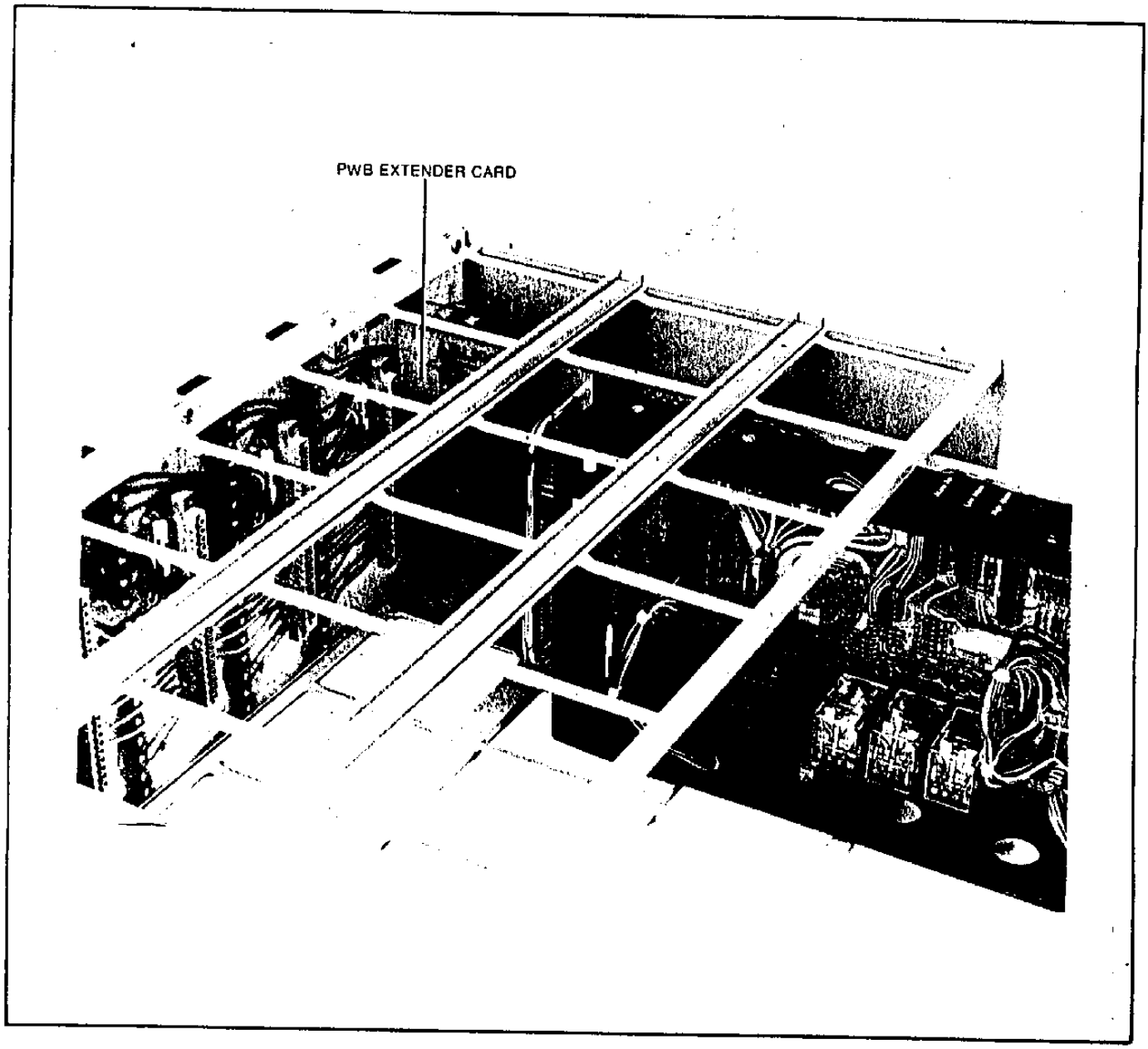


Figure 3-3. Controller Mounted On PWB Extender Card

SECTION 4
THEORY OF OPERATION

4.1 BASIC DEFINITIONS

A combustible gas is one that will burn when mixed with air (or oxygen) and ignited.

The lower explosive limit (LEL) or lower flammable limit (LFL) of a combustible gas is defined as the smallest amount of the gas that will support a self-propagating flame when mixed with air (or oxygen) and ignited. In gas-detection systems, the amount of gas present is specified in terms of % LFL —0% LFL being a gas-free atmosphere and 100% LFL being an atmosphere in which the gas is at its lower flammable limit. The relationship between % LFL and % by volume differs from gas to gas. The following data is from NFPA 5th Edition 325M.

Hydrogen (H_2) 100% LFL = 4.0% by volume in air
Methane (CH_4) 100% LFL = 5.0% by volume in air
Ethane (C_2H_6) 100% LFL = 3.0% by volume in air
Ethylene (C_2H_4) 100% LFL = 2.7% by volume in air
Pentane (C_5H_8) 100% LFL = 1.5% by volume in air

For data on other gases, refer to NFPA 5th Edition 325M. Typical settings for the alarm circuit are 20% for the low alarm and 40% for the high alarm.

The LFL of a gas is affected by the temperature and pressure: as the temperature increases, the LFL decreases and hence the explosion hazard increases; the relationship between LFL and pressure is fairly complex, but at approximately one atmosphere a pressure increase usually lowers the LFL. The LFL of a gas is not significantly affected by the humidity fluctuations normally encountered in the operation of a gas-detecting system.

* Not shown in the block diagram in Figure 4-1.

4.2 BLOCK DIAGRAM DISCUSSION

The following discussion explains the operation of the 820 Controller and refers to the block diagram shown in Figure 4-1.

4.2.1 Power Supplies

The 820 Controller contains four power supplies:

- a precision 6 Vdc power supply to provide accurate voltage in precision circuits*
- a negative 6 Vdc power supply to permit the output of the signal amplifiers to be referenced to ground (not floating) and to provide a negative bias for the current sources. This allows the maximum compliance voltage for the system and hence the maximum loop resistance in the wires to the sensors.*
- two sensor power supplies which are constant current sources to provide a nominal 340 mA current for the two sensors.

The sensor power supplies are current sources, each of which is set to provide a nominal 340 mA. Each sensor has its own current source. The compliance voltage is the rectified and filtered output voltage from the ac line transformer or the output voltage from a nominal 12 Vdc lead acid battery. As a result, the compliance voltage varies, depending on the ac line voltage and the charge condition of the lead acid battery. Under all normal operating conditions, the compliance voltage is never less than 10 Vdc nor greater than 15.5 Vdc, and is normally about 12 Vdc. The two current sources are identical.

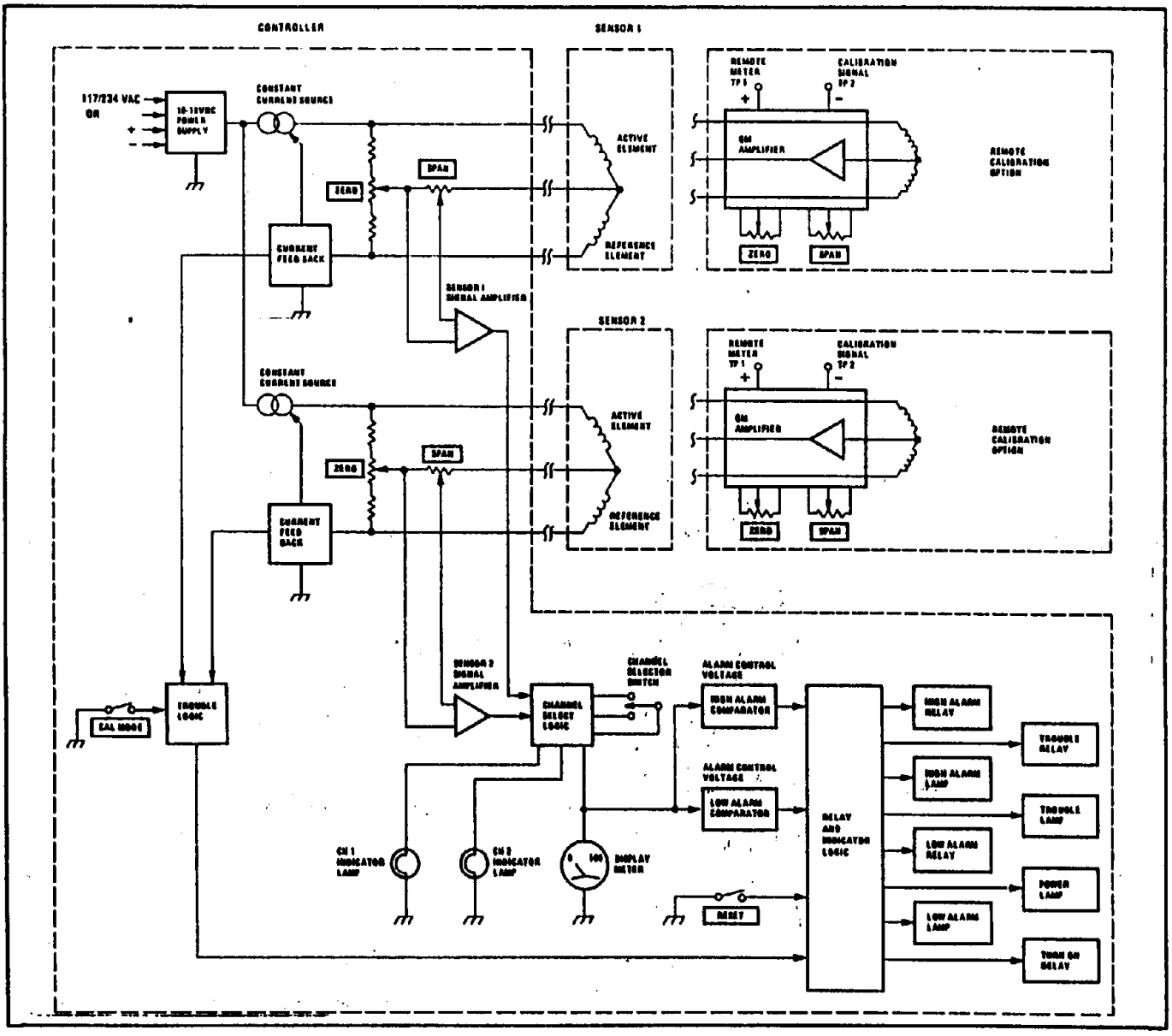


Figure 4-1. Model 820 Gas Detection System Block Diagram

4.2.2 Turn-On Delay Circuit

The turn-on delay circuit delays operation of the alarm relays until the sensors reach operating temperature. When the system is turned on or when there has been a power interruption (line voltage and battery voltage removed), the *Trouble* lamp lights and remains lit until the system warms up. During this time, the high and low alarm relays are inoperative (the high and low alarm indicator lamps are operative).

4.2.3 Signal Amplifier Circuitry

There are two identical signal amplifiers in the Model 820. Each sensor has somewhat different charac-

teristics. When no gas is present, the zero offset voltage varies slightly from sensor to sensor. When the sensors are exposed to a specific concentration of gas, the signal voltage varies somewhat from sensor to sensor. The *Zero* and *Span* potentiometers (Figure 4-1) are used to compensate for the variables in the sensors. The sensor is connected to the controller with either copper or aluminum wire, the resistance of which varies with changes in ambient temperature. As a result, there will be some common mode voltage change with temperature. The output from the sensor amplifiers is referenced to controller ground.

4.2.4 Higher Reading Select Circuit

The higher reading select circuit compares the outputs from the two sensor amplifiers and determines which is the higher. The output of the higher reading select circuit comparator is negative when the output voltage of the signal amplifier of sensor 1 is more positive than the output voltage of the signal amplifier of sensor 2. The output of the higher reading select circuit comparator is positive when the output voltage of the signal amplifier of sensor 1 is more negative than the output voltage of the signal amplifier of sensor 2. The comparator output is fed into logic circuitry.

Depending on the position of the channel selector switch and other parameters, the output of the logic circuits is used to turn on solid-state switches to light the corresponding channel 1 or channel 2 indicator lamp. The logic allows only one channel indicator lamp to light at a time.

4.2.5 Channel Select Logic Circuits

The output of the comparator, as discussed under Higher Reading Select Circuit, is either high or low depending upon whether the signal amplifier for channel 1 is higher or lower than the signal from channel 2. When both channels are working properly and the channel selector switch is in the *Auto* position, the output of the comparator causes the higher reading to be fed to the display meter and to the alarm circuits. It also causes the channel 1 indicator lamp to light (if the channel 1 signal is higher than the channel 2 signal) or the channel 2 indicator lamp to light (if the channel 2 signal is higher).

Exceptions to this performance can be caused by operating the channel selector switch. Pushing the channel selector switch to the *Chan 2* position connects the common arm to the +12 Vdc regulated supply, regardless of the output of the comparator. This simulates a channel 2 signal amplifier output higher than the channel 1 signal amplifier output and forces the system to read the output of the signal amplifier of channel 2. Pushing the channel selector switch to the *Chan 1* position grounds the common arm, regardless of the output of the comparator. This simulates a channel 1 signal amplifier output higher than the channel 2 output.

If either of the two transmitter circuits (channel 1 or channel 2) develops an open circuit, the channel select logic will automatically switch to the remaining channel. The channel selector switch cannot be used to force the channel select logic to read the malfunctioning channel. If both channels fail, both channel indicator lamps will be out, the *Trouble* lamp will be lit, and the trouble relay will be de-energized.

4.2.6 Trouble Logic

In the Model 820, much of the trouble circuitry is the same for both channels. The trouble circuitry is designed so that the trouble relay is energized under all conditions except the simultaneous failure of both channels, in which case the trouble relay will de-energize.

If either channel alone fails, the current feedback circuit signals the trouble logic and *Trouble* lamp lights. If both channels fail, the *Trouble* lamp lights, the trouble relay is energized, and the alarm circuits are de-energized. The output of the trouble circuit also goes to the channel select logic circuits as explained earlier.

4.2.7 Alarm Circuits

The low and high alarm circuits are identical. The low alarm circuit consists of a differential comparator, a variable-voltage divider from the precision 6 Vdc supply, and an alarm relay. The voltage output (alarm control voltage) from the variable voltage divider is adjustable over a range of 0V to a little more than 1V. This corresponds to a reading on the display meter of 0-100% LFL.

The alarm control voltage is applied to the negative input of the comparator. When the voltage on the positive input of the comparator (the signal from the higher reading select circuit) exceeds the voltage set on the negative input, the output of the comparator energizes the relay and lights the indicator lamp associated with that comparator.

4.3 REMOTE CALIBRATION OPTION

The remote calibration option allows the user to convert any standard 810 or 820 so that the controller can be calibrated by one person at the sensor location.

The signal from the sensor is amplified so that the 100% LFL = 1.0 Vdc across TP1 and TP2. The signal across TP1 and TP2 is converted to a current which is linearly proportional to the gas concentration on the sensor. This current is sent to the controller.

SECTION 5
MAINTENANCE

WARNING

Maintenance should *not* be performed if there is any indication of combustible gas at the sensors.

WARNING

The system has no way to determine a test gas from a true gas leak. Therefore, when a test gas is applied, the equipment operated by the alarm relays should be disabled, or the extender card mentioned in Subsection 3.3 should be used.

5.1 ROUTINE CALIBRATION WITHOUT THE REMOTE CALIBRATION OPTION

Each unit shipped from the factory has been calibrated for the gas specified on the inside of the front cover of this manual. Immediately upon installation, the unit should be recalibrated in accordance with the routine calibration procedures to verify that the installation or shipment has not damaged this calibration.

The system will also have to be calibrated regularly (about once every 60 to 90 days) and will have to be recalibrated whenever the sensor is replaced. Routine calibration is described in Subsection 5.1 (or 5.2 if the remote calibration option is used); recalibration is described in Subsection 5.3.

The following equipment is needed for a routine calibration of the system: an adapter fitting for applying the test gas and a Rexnord calibration gas kit (or the equivalent). The Rexnord calibration gas kit and meter are optional accessories. The adapter fitting is contained in the calibration kit.

1. Make sure that the gas gauge indicates there is gas in the container.

2. Use a portable gas detector to verify no combustible gas is present at sensor location.

3. Push and hold channel selector switch to sensor channel to be calibrated.

4. Adjust *Zero* adjustment control with a screwdriver until LFL meter on front pannel reads zero.

5. Release the channel selector switch.

WARNING

Switch S4 must be programmed for "passive alarm test". When S4 is programmed for "active alarm test", alarms or safety devices will be activated.

6. If a dust cover is used, remove it from the end of the sensor associated with channel just zeroed.

WARNING

Check that the small hole in the side of the Rexnord calibration gas kit adapter fitting is clear. If the hole is obstructed, a calibration error can result.

7. Snap on the adapter fitting over sensor.

WARNING

If the sintered disc is not in place in the adapter fitting, 10 to 15% calibration error can result.

8. Attach hose from gas container to hose barb on adapter fitting, if it is not already attached.

NOTE

It is recommended that all calibration be performed with the gas that the sensor is going to monitor.

9. Check the regulator to insure it is firmly secured on container. To break seal, push in and apply a ¼-turn to the valve located on the side of the regulator to start the flow of gas. Gas will flow at the proper rate for calibration.

10. After calibration meter reaches a stable level adjust Span adjustment control at controller with a screwdriver until the meter indicates the % LFL as indicated on the container (typically 50%LEL)

11. To stop the flow of gas, turn the valve until it pops out.

12. Remove the adapter fitting from the sensor, and reinstall the dust cover on sensor (if a dust cover is used).

The *Span* control setting (i.e., the gain) must be changed (increased) over the life of the sensor since the catalyst is slowly consumed during the course of operation of the system. Under normal circumstances, the sensor will last several years.

If, at any given calibration, it is necessary to change the *Span* control setting by more than 15% LFL but less than 25% LFL, the test gas should be removed and the system should be allowed to stabilize for two or three minutes. Repeat steps 3 through 12.

If, at any given calibration, it is necessary to change the *Span* adjustment by more than 25% LFL, the sensor should be replaced and the system should be recalibrated as described above when it was necessary to change the *Span* control setting by more than 15% LFL but less than 25% LFL. Refer to section 8 if this condition has occurred for possible problems and suggestions.

Check the condition of the dust cover, and if necessary, clean the dust cover prior to replacing it. A description of how the dust cover is cleaned is found in Subsection 5.4.

5.2 ROUTINE CALIBRATION WITH THE REMOTE CALIBRATION OPTION

The calibration procedure for instruments with the remote calibration option is detailed below. Figure 5-1 illustrates the steps required when using the Rexnord calibration gas kit. The photographs are numbered in the same sequence as the procedural steps.

5.2.1 Calibration Procedure Using the Rexnord Calibration Gas Kit

1. Make sure gas gauge indicates there is gas in the container.

2. Use a portable gas detector to verify no combustible gas is present at sensor location.

WARNING

This location must be declassified as non-hazardous prior to calibration.

3. Remove the cover from the conduit box.

NOTE

When the Rexnord meter is plugged into the PWB, the two Shunt terminals are shorted. This prevents the remote calibration option from sending signals back to the controller (thereby causing accidental alarm conditions). If the Shunt terminals were not shorted, the alarm signals at the controller would not be deactivated and false alarms would be possible. Do not unplug the meter until the reading is below the alarm trip levels.

4. Plug the calibration meter into four terminals labeled *Shunt* and *Cal Meter* on Remote Calibration Assembly.

5. If a dust cover is used, remove it from the end of the sensor.

WARNING

Check that the small hole in the side of the Rexnord calibration gas kit adapter fitting is clear. If the hole is obstructed, a calibration error can result.

6. Adjust "zero" thumbwheel to indicate 0 % LFL on calibration meter.

WARNING

If the sintered disc is not in place in the adapter fitting, a 10 to 15% calibration error can result.

7. Snap on adapter fitting over sensor.

NOTE

It is recommended that all calibration be performed with the gas that the sensor is going to monitor.

8. Attach hose from gas container to hose barb on adapter fitting if it is not already attached.

9. Check to insure regulator is firmly secured on container. To break the seal, push in and apply a ¼-turn to the valve located on the side of the regulator to start the flow of gas. Gas will flow at the proper rate for calibration.

10. After meter reaches a stable level adjust the *Span* control on assembly until the meter indicates the same % LEL as indicated on container (typically 50% LEL).

11. To stop the gas flow, turn the valve until it pops out.

12. Remove the adapter fitting from the sensor, and reinstall the dust cover on the sensor (if a dust cover is used).

13. When meter is at least 5% LEL below low alarm set point, remove the meter and reinstall cover on conduit box.

The *Span* control setting (i.e., the gain) will have to be changed (increased) over the life of the sensor since the catalyst is slowly consumed during the course of operation of the system. Under normal circumstances, the sensor will last several years.

If, at any given calibration, it is necessary to change the *Span* control setting by more than 15% LFL but less than 25% LFL, the system should be recalibrated in the manner described in subsection 5.3.

If, at any given calibration, it is necessary to change the *Span* adjustment by more than 25% LFL, the sensor should be replaced, and the system should be recalibrated (see subsection 5.3). Refer to section 8 if this condition has occurred for possible problems and suggestions. Check the condition of the dust cover, and if necessary, clean the dust cover prior to replacing it. A description of how the dust cover is cleaned is found in Subsection 5.4.

5.2.2. Calibration Procedure Using Other Than Rexnord Calibration Equipment

1. If using other than REXNORD calibration equipment, make sure that the flow rate of the test gas is always between 1.5 and 2.0 ft^3/hr (42.5 to 56.7 liter/hr).

2. Make sure that there is not combustible gas at the sensor location.

WARNING

This location must be declassified as non-hazardous prior to calibration.

3. Connect a voltmeter across the "+" and "-" calibration terminals on the remote calibration PWB, Figure 5-2. (The voltmeter should have good resolution between 0 and 1V, 2% accuracy full scale, and an impedance of 1000 ohms or greater). Short the two center pins of the card edge connector.

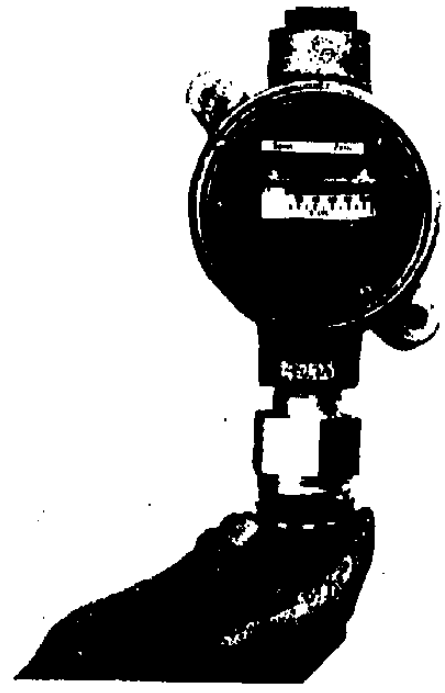
4. Remove the dust cover from the end of the sensor.

5. Adjust the "zero" thumbwheel to read 0% LEL on calibration meter.

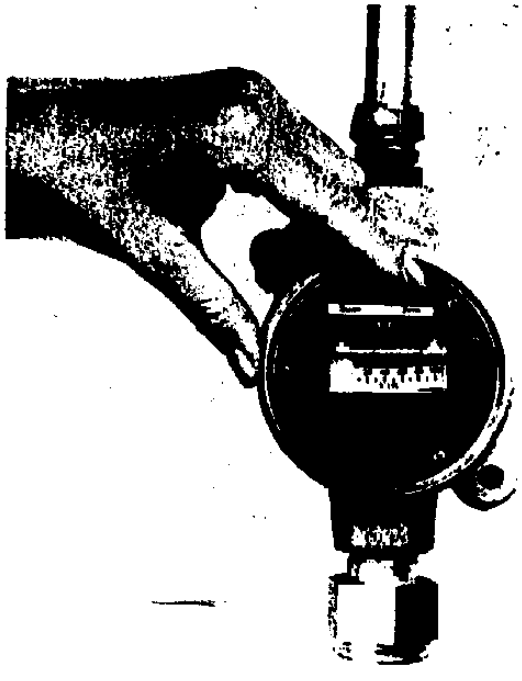
WARNING

If the sintered disc is not in place in the adapter fitting, a 10 to 15% calibration error can result.

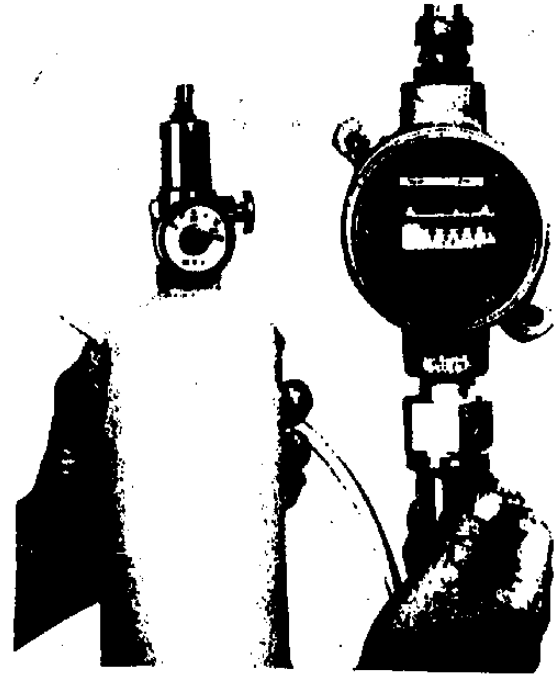
Step 1



Steps 2 3 & 4

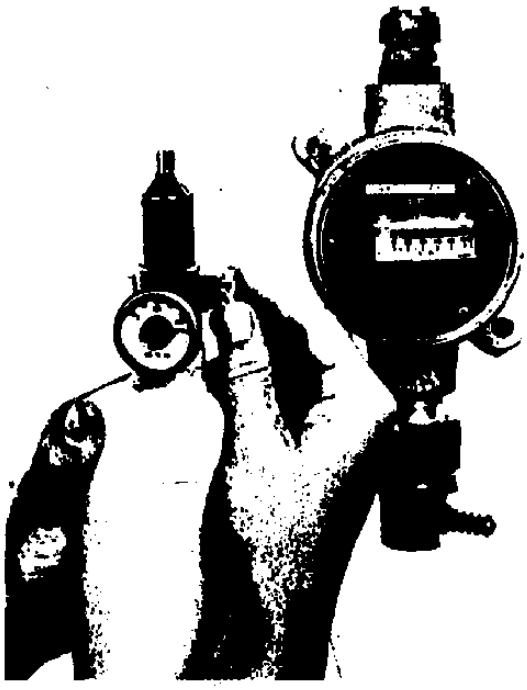


Step 5

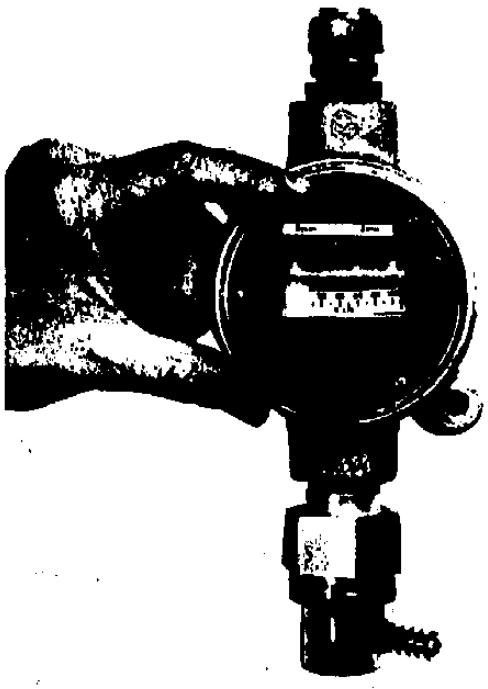


Step 6

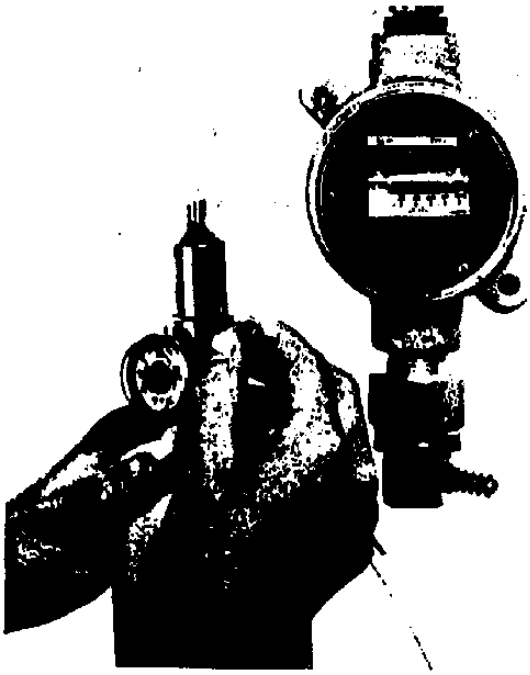
Figure 5-1. Remote Calibration Procedure, Steps 1 - 6



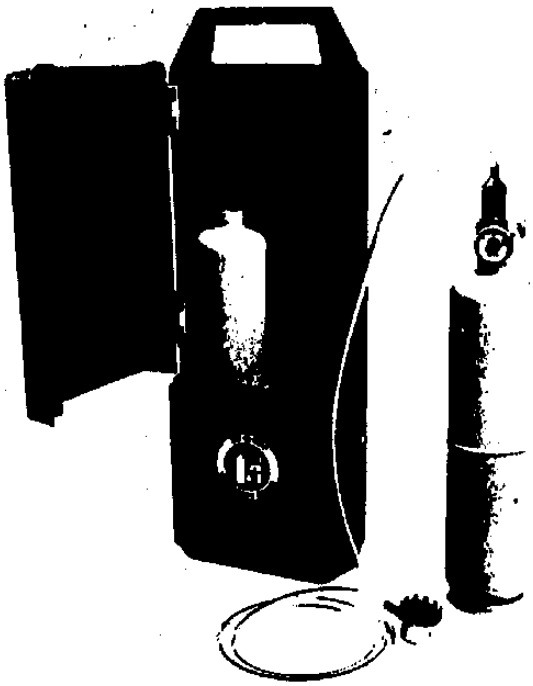
Step 7



Step 8



Step 9



Rexnord Calibration Gas Kit

Figure 5-1. Remote Calibration Procedure, Steps 7 - 9

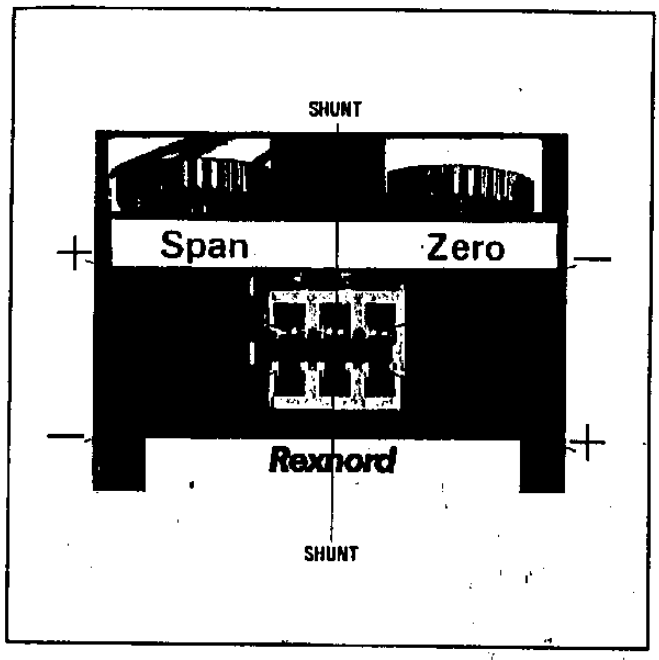


Figure 5-2. Edge Connector on Remote Calibration Unit

6. Snap the adapter fitting over the sensor in place of the dust cover. If no dust cover is to be used, remove the sintered disc from the adapter fitting and replace it with the O-ring supplied with the kit.

WARNING

Unless the sintered disc is removed from the adapter fitting when no dust cover is used, or if the sintered disc is not in place in the adapter fitting when a dust cover is used, 10 to 15% calibration error can result.

7. Attach one end of a length of hose to the adapter fitting and the other end to the souce of calibration gas.

8. Adjust the flow rate of teh gas to 1.5 to 2.0 ft^3/hr (42.5 to 56.7 liters/hr).

NOTE

It is recommended that all calibration be performed with the gas that the sensor is going to monitor.

9. Adjust the Span control of the PWB until the voltage indicatd by the meter, when multiplied by 100, is the same as the percentage LFL of the test gas. (A reading of 1 volt is equivalent to 100% LFL.)

10. Turn off the valve on the calibration container.

11. Remove the adapter fitting from the sensor and re-install the dust cover on the sensor.

12. Remove the meter and re-install the cover on the conduit box.

The Span control setting (i.e., the gain) will have to be changed (increased) over the life of rhe sensor since the catalyst is slowly consumed during the course of operation of the system. Under normal circumstances, the sensor will last several years.

If, at any given calibration, it is necessary to change the Span control setting by more than 15% LFL, but less than 25% LFL, the system should be recalibrated in the manner described in Subsection 5.3. If, at any given calibration, it is necessary to change the Span adjustment by more than 25% LFL, the sensor should be replaced, and the system should be recalibrated (see Subsection 5.3). Refer to section 8 for problems and solutions, if this condition has occurred.

Check the condition of the dust cover, and if necessary, clean the dust cover prior to replacing it. A description of how the dust cover is cleaned is found in Subsection 5.4.

5.3 RECALIBRATION AFTER CHANGING THE SENSOR

The recalibration procedure is identical to the routine calibration with the remote calibration option, except that Step 5 is replaced with the following:

If using other than Rexnord calibration meter:

5. Adjust the *Zero* knob on the remote calibration PWB until the meter reads +30 to +40 mV, and move the *Span* knob in the increasing direction until the meter reading does not change with *Span* adjustment. Then adjust the *Zero* knob until the meter reads 0V.

5.4 ROUTINE MAINTENANCE

5.4.1 Indicator Lamps

To determine whether the indicator lamps are working, proceed as follows:

1. Check the *Power* lamp. If the controller is plugged in, the sensors are connected and operating properly, and any gas concentrations at the sensors are below the low alarm trip levels, the *Power* lamp should be lit. If it is not, replace the lamp by snapping off the plastic lens cap and using the lamp remover provided with the system to pull the lamp straight out. (A lamp remover and a spare lamp are provided in a clip inside the back frame of each controller.)

2. Press the *Cal. Mode* pushbutton, hold it in, and turn the *Alarm Ref.* control to a point slightly above the high alarm trip level. The *Trouble, Low Alarm,* and *High Alarm* lamps should light. If they do not, replace the lamp(s) in the same manner as described in Step 1 above.

3. If the new lamps installed in Step 2 do not light, reset the alarm trip levels as described in Subsection 3.3 and repeat Step 2.

5.4.2 Dust Covers

The optional dust cover is recommended for sensors used in dirty areas. The dust cover prevents the sensor flame arresters from becoming clogged. These dust covers must be cleaned periodically—the dirtier the environment, the more often they need to be cleaned. Clean the dust covers as follows:

1. Snap off the dust cover by grasping the outer ring and pulling.

2. If there is a light accumulation of dust, it can be removed by tapping the dust cover against a hard surface.

If there is a heavy accumulation of dust, the dust cover should be soaked in a non-flammable solvent, such as trichloroethylene, and then blown out with compressed air. Should this procedure fail to result in a clean dust cover, the cover must be replaced.

CAUTION

Whenever a sensor is replaced in Models 810 & 820, the sensor may be damaged by plugging into a powered system – therefore,

Deactivate the system by pulling out the controller at the panel, or switching off the power to the panel; also, the sensor can be damaged if the shorting plug or transmitter is pulled out at the junction bow when power is on.

5.5 TROUBLESHOOTING

The following is a summary of the common problems that can occur in the Model 820 and the solutions to these problems.

PROBLEM 1

The power is on, the meter is reading below both alarm levels, but the *Power* lamp is off.

Cause 1:
The lamp may either be burned out or not seated properly in its socket.

Solution 1:
A spare lamp and a lamp-removing tool are located in a clip on the back of the frame of each module. The burned-out lamp can be replaced by snapping the plastic cover off (pulling straight out) and using the lamp-removing tool to remove the old lamp. Be sure to seat the new lamp in as far as it will go to ensure good electrical contact.

PROBLEM 2

The *Trouble* lamp is on.

Cause:
If the *Trouble* lamp is on, there is either a bad sensor or a broken wire to the sensor.

Solution:
It is usually easiest to change the sensor first and see if this cures the problem. If it does not, there is an open circuit in the wiring.

NOTE

Disconnect power to the system when replacing the sensor to prevent false alarms.

PROBLEM 3

The meter reads downscale when calibration gas is applied.

Cause:
The sensor is connected backwards.

Solution:
Reverse the connection of the black wire and the white wire that are part of the sensor assembly.

PROBLEM 4

There is not enough span adjustment to make the % LFL indication on the meter as high as the % LFL of the calibration gas.

Cause 1:
The test gas was improperly mixed, or the container is empty.

Solution 1:
Obtain a properly mixed test gas in a container that is known not to be empty.

Cause 2:
The sensor has insufficient sensitivity.

Solution 2:
Replace the sensor.

PROBLEM 5

With the *Power* lamp on, pressing the *Cal. Mode* button does not change the meter reading and causes no additional lamps to go on.

Cause:
If the *Power* lamp is on and the *Cal. Mode* button is pressed, the *Trouble* lamp should go on. If it does not, replace it. (Read PROBLEM 1 for the discussion of the lamp-replacing procedure.) If the meter does not move upscale, the *Alarm Ref.* signal has not been adjusted.

Solution:
Remove the controller and install the extender card. Plug the controller into the extender card. Press the *Cal. Mode* button. Adjust the *Alarm Ref.* signal pot clockwise, until both the low and high alarm lamps go on. The *Alarm Ref.* adjust pot should always be left adjusted this way so the indicator lamps can be quickly tested. If the low and high alarm lamps do not go on by the time the meter is adjusted to read 100% LFL, then either the alarm levels are incorrectly set or the lamps are burned out. Since checking the alarm trip levels is easier than changing lamps, refer to Subsection 3.3 in the manual on setting the alarms. Repeat this procedure. If this does not solve the problem, replace the lamp. (Read PROBLEM 1 for discussion on lamp replacing procedure.)

PROBLEM 6

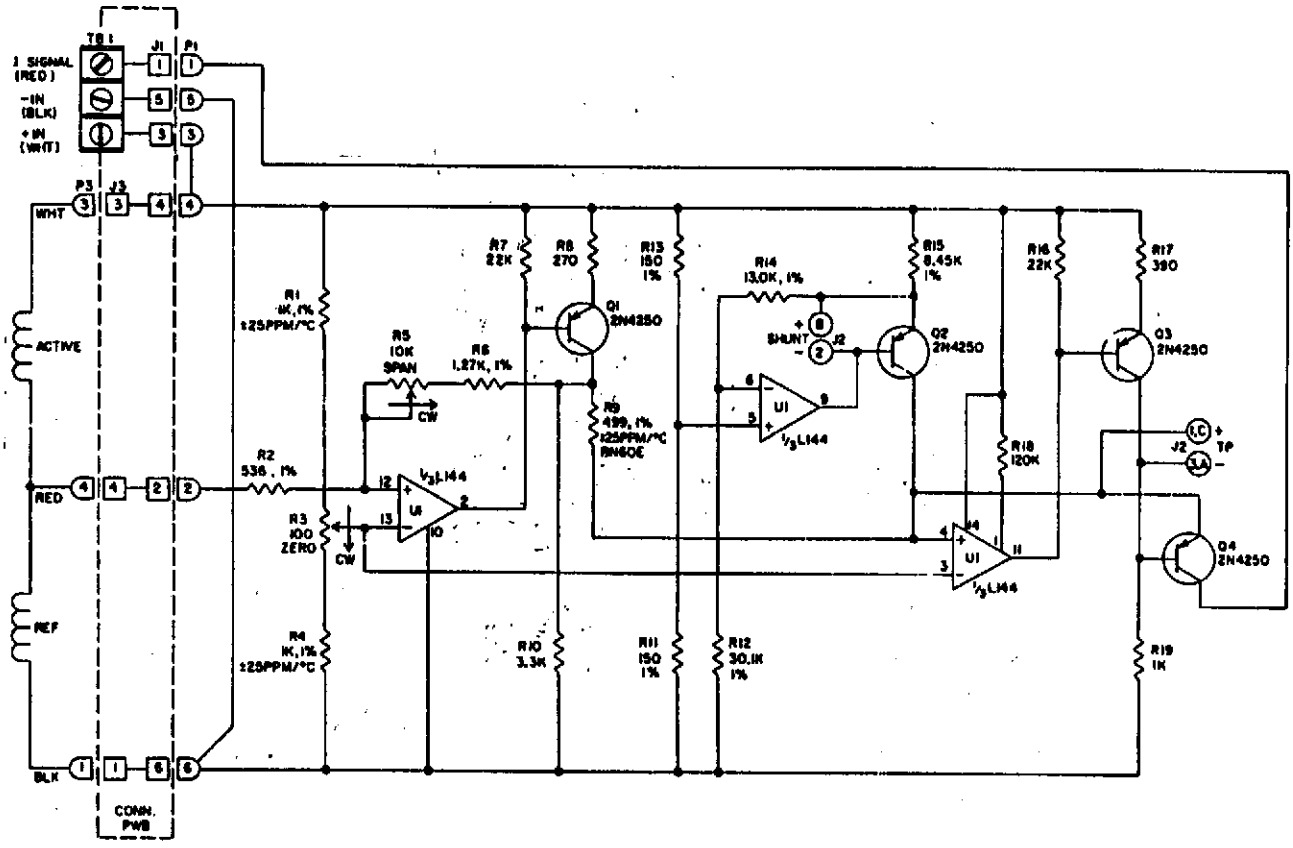
There is not enough zero adjustment range. The *Zero* pot adjustment has a range of only 5 to 10% LFL.

Cause:
The *Span* adjustment is set too low.

Solution:
Turn the *Span* control clockwise a few turns. Now try to rezero the meter. If the *Span* adjustment was too low, the zero adjustment should have more range. Turn the *Span* control clockwise eight or nine times and recalibrate the sensor associated with that channel. Refer to Subsection 5.1 or 5.2 for directions on sensor calibration.

5.6 SCHEMATIC DIAGRAM

The schematic diagram, Figure 5-3, may be used as a troubleshooting aid to locate a defective component once a trouble has been isolated to a specific circuit.



NOTES: UNLESS SPECIFIED OTHERWISE
1. ALL RESISTORS ARE 1/4 W, 5%.
2. ALL RESISTANCE IN OHMS.
3. ALL 1% RESISTORS ARE RN55 OR EQUIV

Figure 5-3. Remote Calibration Unit Schematic Drawing

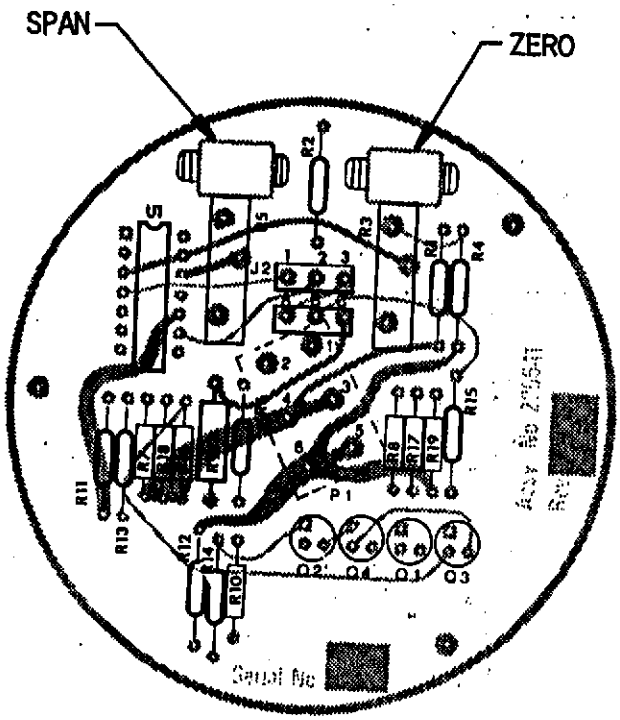


FIGURE 5-4: 800 REMOTE CALIBRATION TRANSMITTER COMPONENT LAYOUT

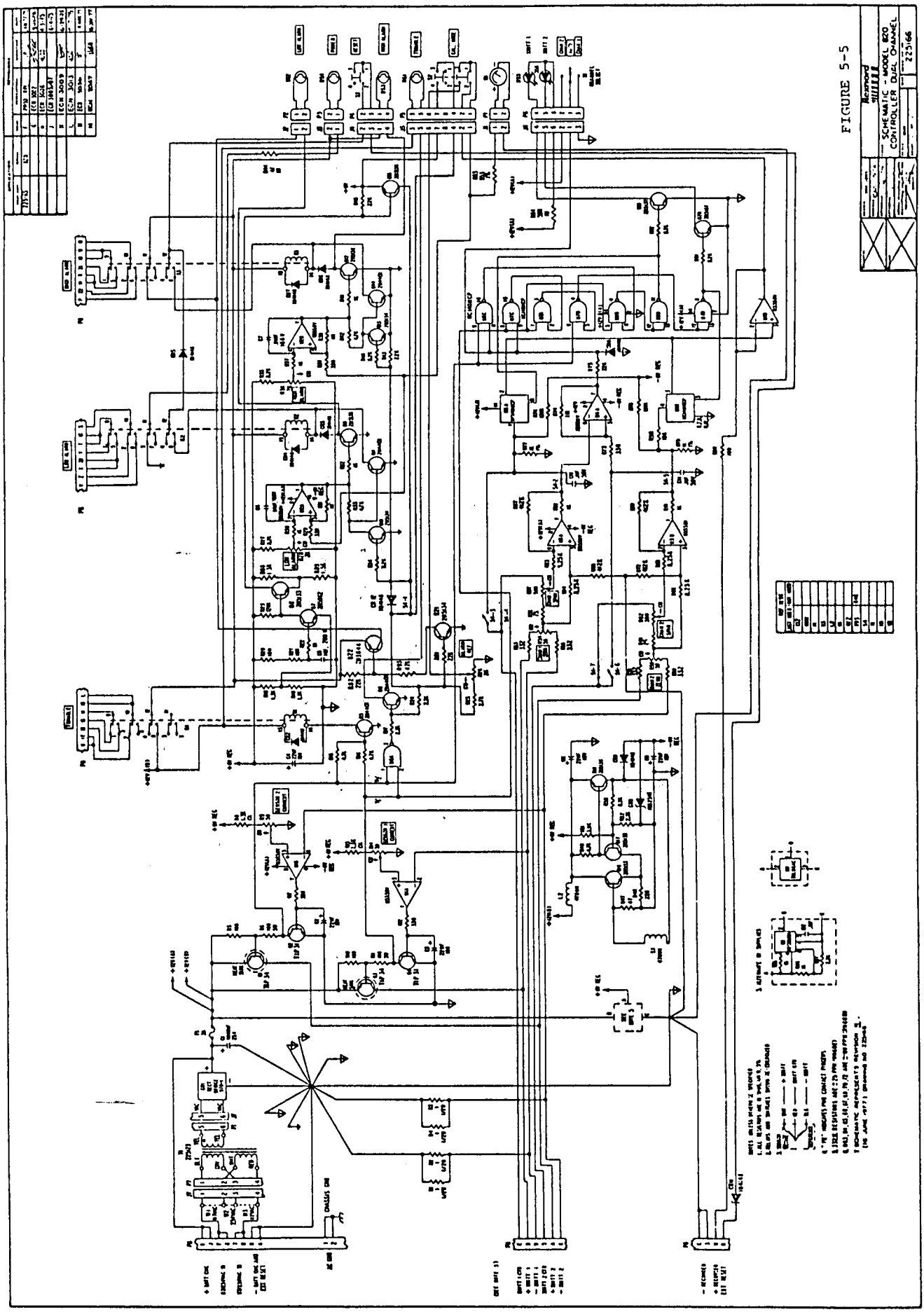
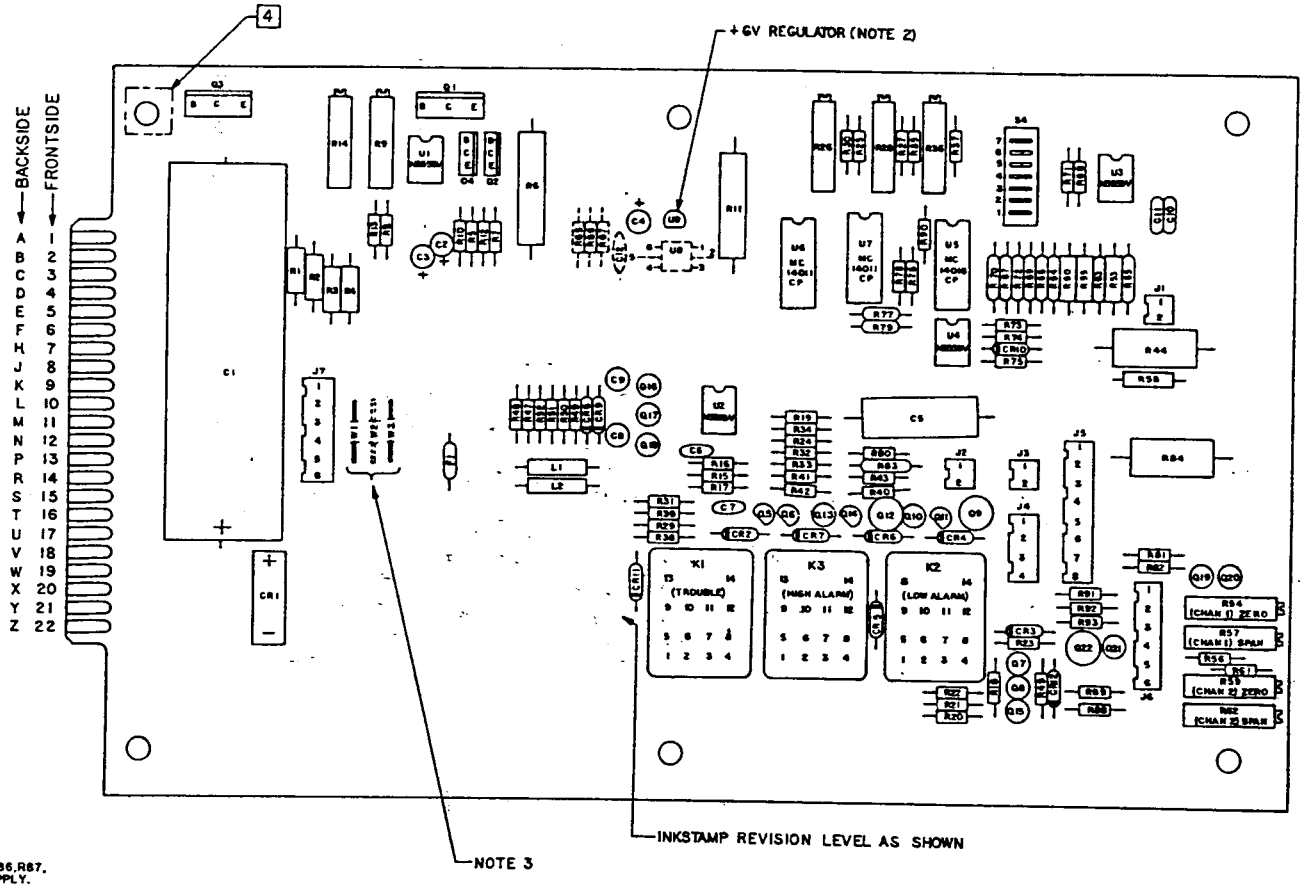


FIGURE 5-5

APPLICATION		REVISIONS			
NEXT ASSY	MODEL	ISSUE	DESCRIPTION	SIGNATURE	DATE
225240	820	S	REDRAWN		10-1-82



NOTES:

1. PART NO. IS 225165-11.
2. WHEN U9 IS NOT USED USE R85,R86,R87, C12 AND U8 AS ALTERATE 6V SUPPLY.
3. INSTALL 'W1' & 'W3' FOR 117VAC OPERATION. INSTALL 'W2' FOR 230VAC OPERATION.
4. MOUNTING HOLE TO BE MASKED PRIOR TO CONFORMAL COATING.(BOTH SIDES).

FIGURE 5-6

DRAWN BY	Raymond	
CHK'D BY		
APP'D BY	TITLE	ASSY. CONTROLLER, 820
APP'D BY		
NEXT ASSY 225240	SCALE 2:1	SIZE D — 225165 — ISSUE S
MODEL 820	SHEET 1 OF 1	

SECTION 6
RECOMMENDED SPARES

The recommended quantity and type of suggested spare parts depends upon the total number of instruments used in the system. The minimum spare parts recommended are shown below in Table 6-1 together with their part numbers.

Table 6-1. Recommended Spares

Item	Part Number	Manufacturer Part Number	Manufacturer Code	Quantity	
				Minimum	Each 20 Units
820 Controller	225240				1
800 Remote Calibration Unit	225279				1
Lamp, indicator	162345	7382AS-25	05464	1 per unit	10
Sensor	225006			1 per 5 units	5
Relay	156077	67R4-12DC	78277	1 per 10 units	2
Dust cover	225312			1 per 5 units	10

Table 6-2. Manufacturers Code Numbers and Addresses

Code	Manufacturer	Address
05464	Industrial Electronic Engineers, Inc.	Van Nuys, Calif
78277	Sigma Instruments, Inc.	Braintree, Mass

A detailed illustrated parts list is available upon request.

SECTION 7
OPTIONS AND ACCESSORIES

7.1 GENERAL

This section describes the options and accessories available for use with the Rexnord gas detection systems.

7.2 REMOTE CALIBRATION UNIT

The remote calibration unit, Figure 7-1, is available as an option for the Model 810 or 820 systems. It provides the means for calibration of the system at the sensor location by one person. This eliminates the need for a second person at the controller location and the two-way communications which may otherwise be required.

7.3 PWB EXTENDER CARD

The PWB extender card, Figure 7-2, is required to provide access to the *Alarm Ref.*, *Low Alarm*, and *High Alarm* adjustments, located on the top of the Model 810 and 820 Controllers, during adjustment procedures.

7.4 CALIBRATION GAS KIT

The Rexnord calibration gas kit, Figure 7-3, provides a convenient and reliable method of calibrating the gas detection system. The kit consists of the specified type of gas, a gauge which indicates the quantity of gas in the sphere, an adapter, and a carrying case.

7.5 CALIBRATION METER

The calibration meter, Figure 7-4, is used with the calibration gas kit for system calibration.

7.6 DUST COVER

The dust cover is available as an option to prevent the sensor flame arrester from becoming clogged when operated in dusty or dirty areas.

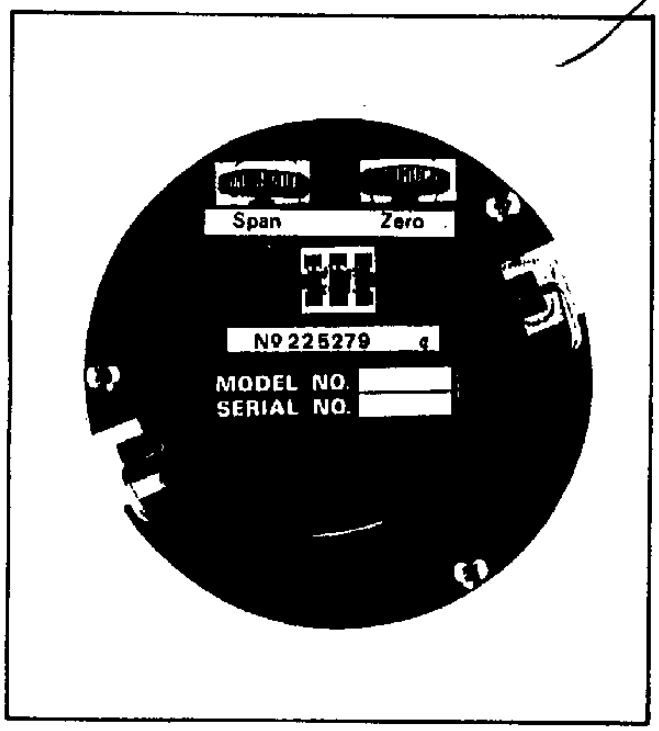


Figure 7-1. Remote Calibration Unit

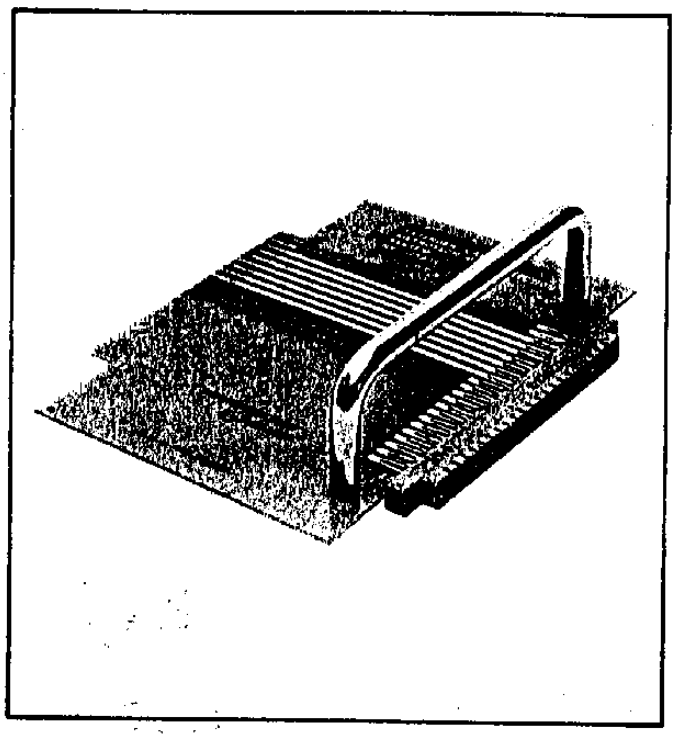


Figure 7-2. PWB Extender Card

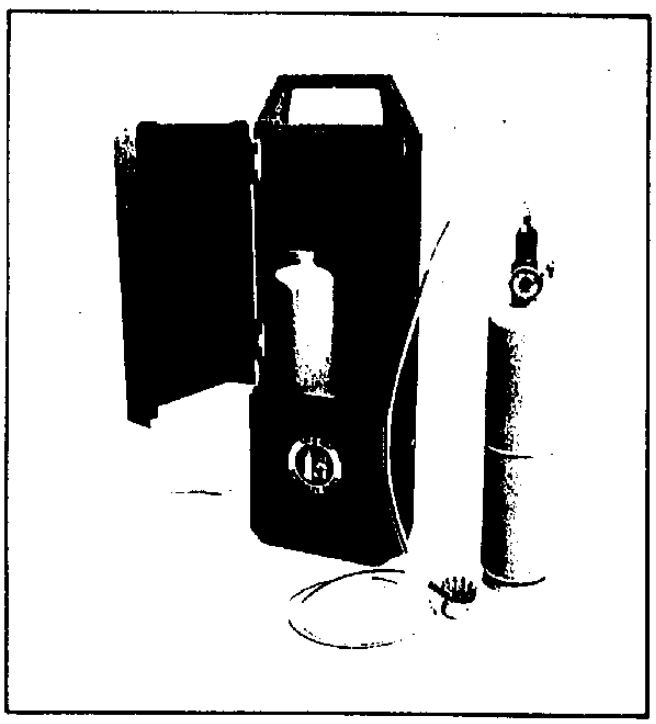


Figure 7-3. Calibration Gas Kit

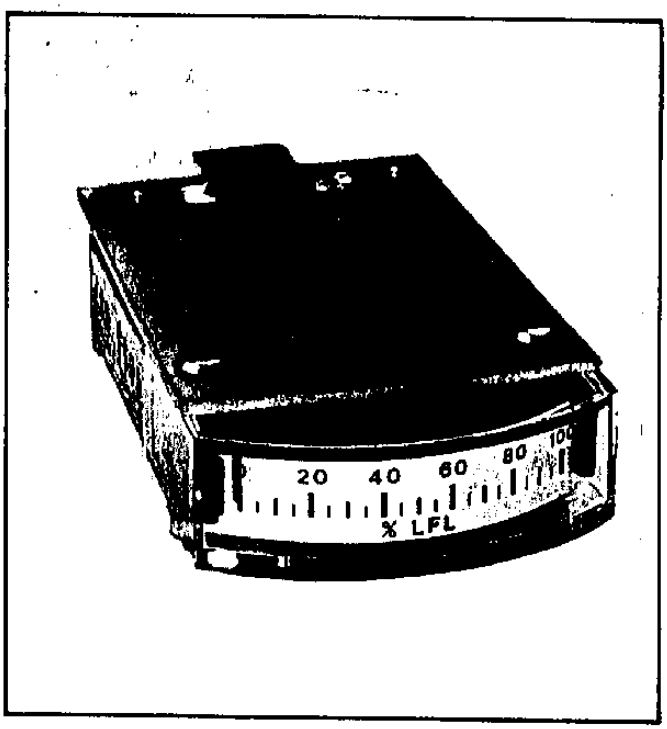


Figure 7-4. Calibration Meter

SECTION 8

CAUSES OF SIGNAL LOSS IN CATALYTIC TYPE COMBUSTIBLE GAS SENSORS

Interfering or contamination gases or substances which may adversely affect proper operation of the instrument are as follows:

A. Materials that may clog the pores of the flame arrestor thereby reducing the gas diffusion rate into the sensor are:

1) Dirt and Oil
   a. A dust cover should be installed to protect the flame arrestor whenever these conditions exit.
   b. The dust cover can be cleaned as part of routine maintenance. Clean in an organic solvent using an ultrasonic bath.

2) Corrosion Products.
   a. This occurs when Cl_2 (chlorine) or HCl are present. A dust cover provides some protection.
   b. Replace the dust cover as part of routine maintenance.

3) Flame arrestor clogged during painting and house cleaning.
   a. The sensor should be covered by a plastic bag. Remove the bag as soon as possible. Make this a check point in your maintenance procedures.

4) Polymer formation in the flame arrestor.
   a. This sometimes occurs where monomer vapors such as 1, 3 butadiene, styrene, isoprene, etc., are present.

B. Substances that cover or tie up the active sites on the catalytic surface of the sensor's active element.

This occurs in the presence of volatile metal organics, gases, or vapors of hydrides, and volatile compounds containing phosphorous, boron, silicon, etc.

EXAMPLES:

lead tetraethyl
phosphine
diborane
silane
trimethyl chlorsilane
hydrogen fluoride
boron trifluoride
phosphate esters
silicone oils and greases
RTV silicone sealants

C. The catalytic metals are removed from the sensor's active elements.

1) Some substances react with the catalytic metal forming a volatile compound. This erodes the metal from the surface and, given sufficient exposure to these types of material, all or most of the metal catalyst can be removed from the surface of the sensor's active element.

2) Halogens and halogen containing compounds are materials of this nature.

EXAMPLE:

Chlorine
Bromine
Iodine
Hydrogen chloride, bromide or iodide
Organic halides
Trichloroethylene
dichlorobenzene
vinyl chloride
freons
Halon 1301 (Bromotrifluromethane)

3) A brief exposure to one of these materials may increase the sensitivity of the sensor. This is usually a temporary effect as a result of etching the catalytic surface.

This is sometimes used as a means to activate a sensor that has a degraded signal. *THIS IS A PRACTICE THAT IS UNRELIABLE AND MAY GIVE A FALSE SENSE OF SECURITY.*

D. Extended exposure to high concentrations of combustible gases and air.

1) Extended exposure of a detector element to certain concentrations of combustible gases and/or air can introduce stress to the element that may seriously affect its performance, and therefore re-calibration should be carried out or the sensor replaced, or both, after an alarm due to an indication of a high concentration.

E. The degree of damage to a sensor is a combination of the type of contaminant, its concentration in the ambient atmosphere and the length of time the sensor is exposed.

1) The loss of sensitivity is generally discovered when the sensor is calibrated. When this occurs, first ascertain whether the calibration has been correctly carried out, the calibration system is functioning properly, and the correct gas mixture is being used.

2) The calibration schedule should reflect the probable exposure of the sensor to known conditions that affect the quality of sensor signal.

3) When it is known that the sensor has been exposed to high concentrations of a poison, extended exposure to high concentrations of combustible gas/air mixtures, or other unusual conditions, it should be recalibrated at that time and a few days later to look for a significant shift in its sensitivity.