MODEL 520

Dual Channel

Combustible Gas Monitor

0783

GENERALMONITOR, INC.

26776 Simpatica Cir.
El Toro, Ca. 92630
Tele: (714) 581-4464
Fax: (714) 581-1151 Telex: 678-372

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GENERAL MONITORS

MODEL 520

DUAL CHANNEL COMBUSTIBLE GAS MONITORING SYSTEM

I. INTRODUCTION

The GENERAL MONITORS Model 520 Controller is a fully solid-state electronic instrument. It is designed to take advantage of the most recent advances in electronic packaging techniques. The printed circuit card construction eliminates many of the problems associated with conventional point-to-point wiring. Plug-in relays permit easy field replacement if ever required.

Any GENERAL MONITORS proven low temperature catalytic sensing assemblies can be used with the Model 520. These include sensors for monitoring most hydrocarbon gases, vapors and hydrogen.

Mounting configurations for the Model 520 Controller include single controller wall or panel installation or eight-channel 19" rack installation. All external connections are to terminal screws located on the rear-mounted terminal strips. The controller operates on either 117 VAC, 60 Hz, or 12 VDC without any adjustments or added accessories. If desired, the 12 VDC input can be used to provide battery backup giving continuous protection during commercial power outages. (See Battery Backup Section, Page 7 for details). The controller is also available in a 220/240 VAC version.

Individual CHANNEL IDENTIFICATION lamps with clear lens are provided for each channel. Both channels share the blue MALFUNCTION lamp. Alarm indicator lamps are Amber colored for LOW ALARM and Red colored for HIGH ALARM. ZERO and SPAN potentiometers for each channel are located behind the front panel. Adjustments can be made through the front panel, using a small screwdriver.

One HIGH ALARM and one LOW ALARM relay is provided - common to both channels. Whenever the sensor signal (meter readout) of either channel exceeds the LOW or HIGH ALARM setpoint, that alarm circuit is activated. The Standard Model 520 has latching (Manual Reset) of both High and Low Alarms. An alternate feature is Non Latching (Automatic Reset) of either High or Low Alarm, or both.

The alarm setpoint pots, marked HIGH and LOW, are located on the left hand side when facing the instrument. Access and adjustments can be accomplished by sliding the Controller slightly forward out of its mounting. The CHANNEL SELECT switch is located on the front panel, below the RESET switch. This switch permits observation of either channel reading. Meter readings will coincide with whichever channel was selected. In the center position, the meter reads ONLY the higher of the two channels, identified by the illuminated Channel Identification Light.

II. OPERATING INSTRUCTIONS

INSTALLATION of the Model 520 Controller should be made in a non-hazardous area in a protected environment. It may be mounted in any of the follcwing fixtures:

Panel Mount Frame for a single unit, P/N 18-01-220
Wall Mounting Bracket for a single unit, P/N 18-01-217-1
Wall Mounting Bracket and Dust Enclosure, P/N 18-01-217-3
Rack Mounting Frame for up to four units, P/N 17-02-000

Blank panels, P/N 18-01-222, are available to cover unused positions in the rack mounting frame. The mounting should be as free from shock and vibration as possible. Consult the factory when mounting controllers or sensors in vibration or shock environments.

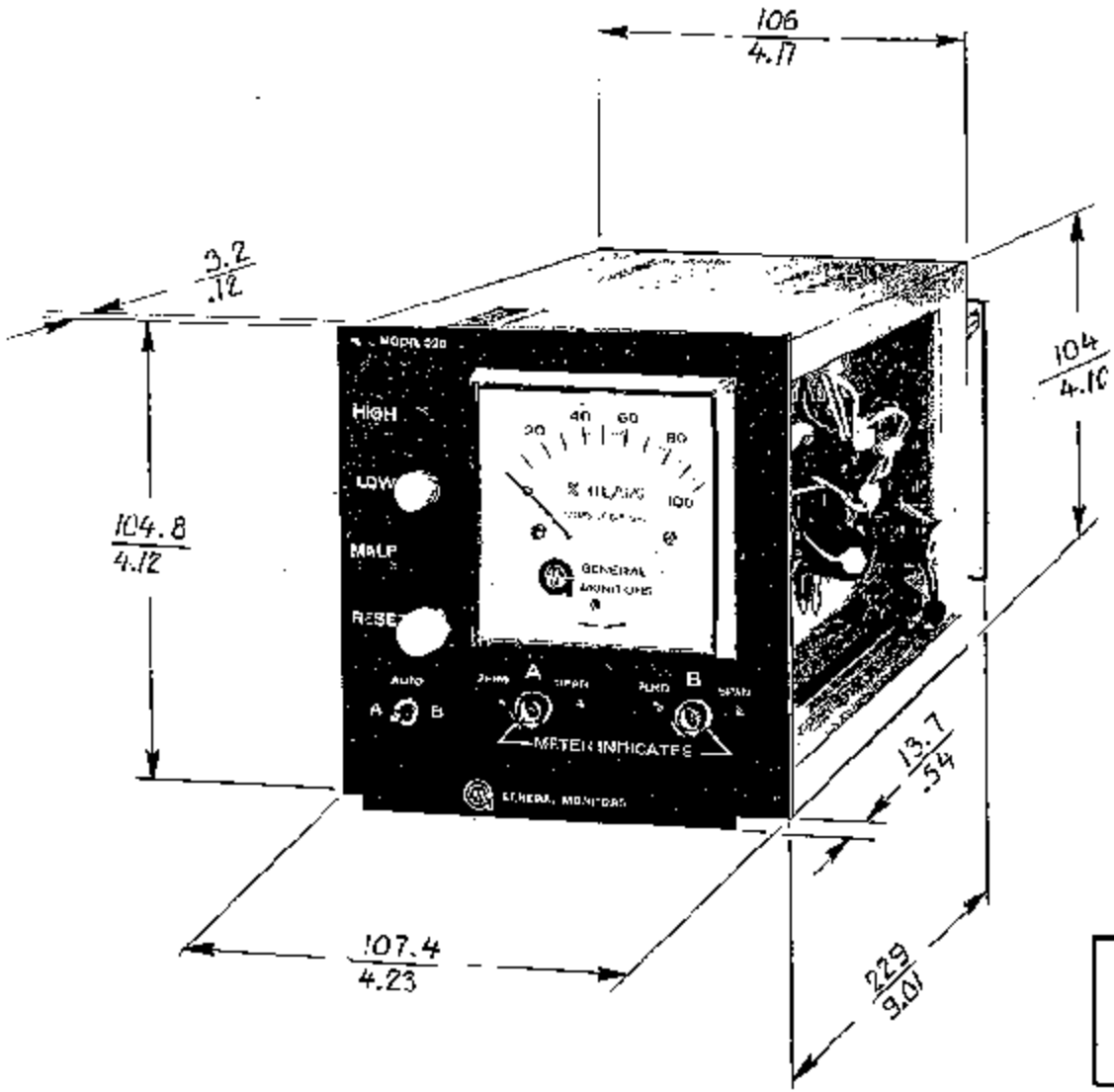
AC POWER connections are made to TB-1 terminals #7, 8 and 9 (Line, Neutral and Ground respectively), using accepted commercial wiring practices. (See Figure 1). No power ON/OFF switch is provided on the instrument; therefore, the Power should not be connected until all remaining connections are made.

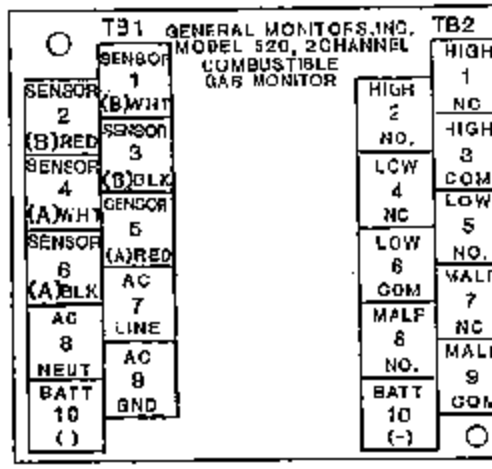
CAUTION: CARE SHOULD BE EXERCISED TO INSURE ADEQUATE VENTILATION. DO NOT MOUNT IN A CONFIGURATION SUCH AS TO RESTRICT THE NATURAL CONVECTION AIR FLOW WITH NORMAL AMBIENT AIR. CONTROLLER OPERATING TEMPERATURE RANGE (INCLUDING SELF-HEATING) IS 0°F TO 150°F.

The Model 520 Controller may also be powered by a 12 Volt battery. Connections are made to TB-1, terminal #10(+), and TB-2, terminal #10(-). If AC power and DC power are to be used, refer to the BATTERY BACKUP section on Page 7.

CAUTION: UNDER NO CIRCUMSTANCES SHALL AC AND DC POWER BE APPLIED SIMULTANEOUSLY TO THE CONTROLLER WITHOUT FOLLOWING THE SPECIAL INSTRUCTIONS OUTLINED IN THE BATTERY BACKUP SECTION.

The Standard Industrial Sensing Assembly is comprised of Sensor Housing P/N 10252 and Sensing Element P/N 10001-1. If ordered, it will have a sintered stainless steel Dust Cover P/N 1600822 or a Disposable Porex Dust Cover P/N 10071 for protection from dust, dirt or contaminants.





REAR VIEW

DIMENSIONS
mm
INCH

(REF 1801231A)

FIG. 1

OUTLINE DRAWING & REAR TERMINAL CONNECTION

II. OPERATING INSTRUCTIONS (Cont'd.)

To connect the cable at the sensor, remove the P/N 10252 housing lid to reveal the terminal strip. The sensor is connected in the housing according to the color designations shown in Figure 2. (The green and orange positions are not used).

The sensor assembly must be conduit mounted when installed in a hazardous area. The instrument cable need not be shielded unless it runs near high-powered electrical circuits or equipment. When shielded cable is used: (1) it should be grounded only at the controller AC ground terminal, (TB1 #9), and (2) ensure that the outer braid does not contact the conduit or junction boxes.

Sensor cables are connected at the controller to the terminal blocks located on the rear of the controller. (See Figure 1). The channel numbers (A and B) are identified on the terminal block. Connect the cable so that the terminal color at the sensor housing matches the terminal color at the controller as follows:

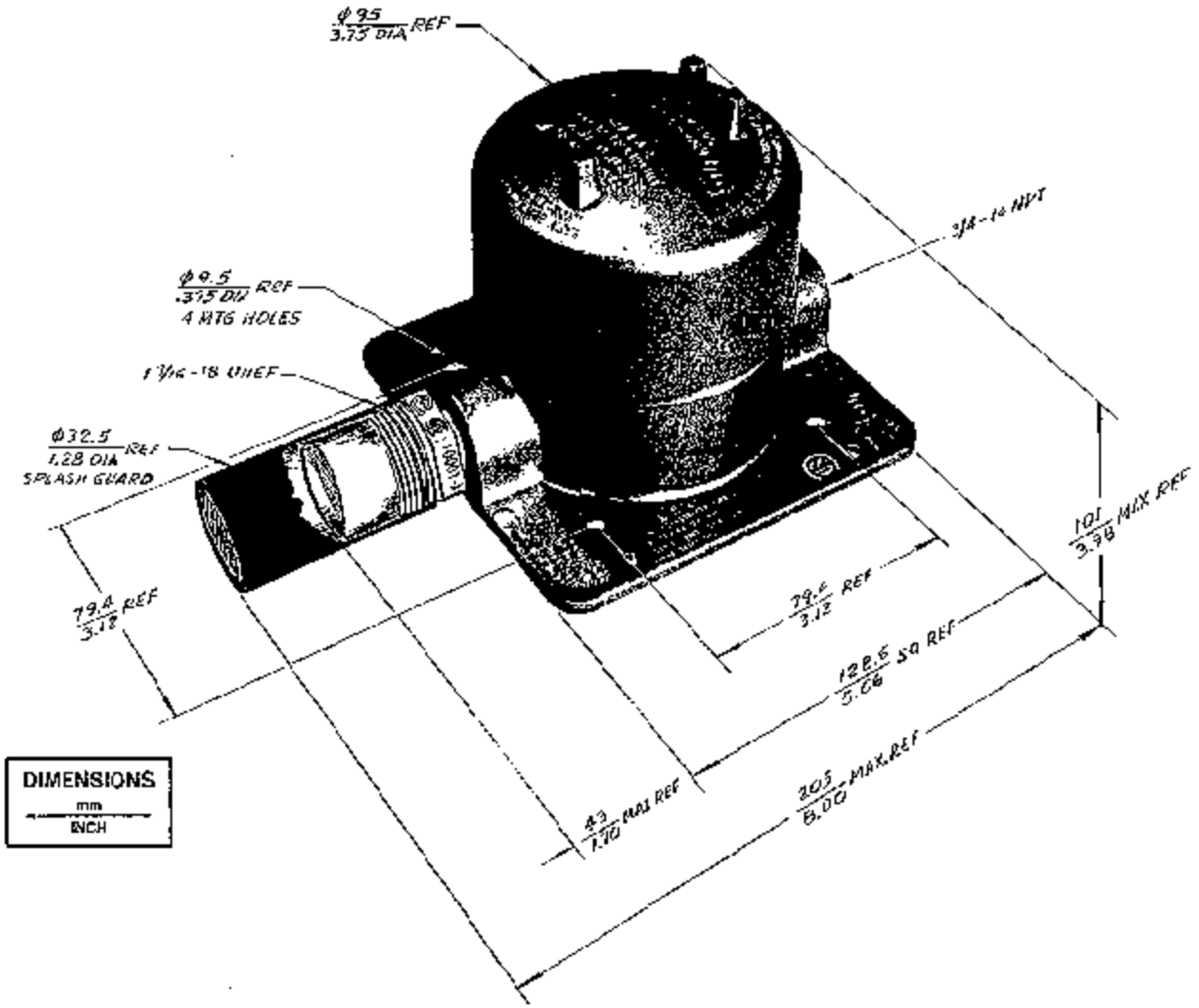
Cable Wire Color	Sensor Housing Terminal	TB-1 Terminal Number Sensor A	Sensor B
Black	BLK	6	3
Red	RED	5	2
White	WHT	4	1

CABLE RUNS for either type of sensing assembly should not exceed the following distances:

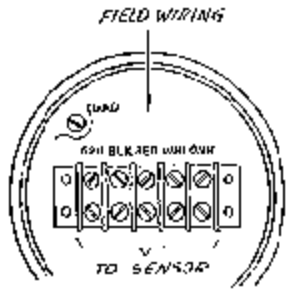
Conductor Gauge AWG #	Maximum Cable Run, Feet
20	400
18	800
16	1200
14	1800
12	2800

Regardless of wire size, the one-way cable resistance should be less than 5Ω/conductor. Avoid splices where possible. If required, they must be of highest quality and soldered.

CAUTION: SENSORS SHOULD ALWAYS BE MOUNTED POINTING DOWNWARD SO THAT WATER WILL NOT ACCUMULATE ON THE SENSOR HEAD. MOUNTING SHOULD BE AS FREE FROM SHOCK AND VIBRATION AS POSSIBLE, AND SHOULD BE CONVENIENT FOR CALIBRATION CHECKS IN PLACE. THE SENSOR HOUSING MUST NEVER BE OPENED WHEN POWER IS ON, OTHERWISE THE EXPLOSION-PROOF INTEGRITY OF THE SENSOR ASSEMBLY IS VIOLATED. THE THREADS ON THE HOUSING LID MUST BE FULLY ENGAGED.



SENSOR GUARDS	
P/N NUMBER	DESCRIPTION
18 00 822	DUST GUARD, SINTER
10 117	SPLASH CABLE
10 110	DUST GUARD W/DISPOSABLE SCREEN



WIRING DETAIL
(COVER REMOVED)

3. JUNCTION BOX ASSY (WITHOUT SENSOR) PN 10252.
2. SENSOR INSTALLATION - LUBRICATE THREADS AND DO NOT USE WRENCH; HAND TIGHTEN ONLY.
1. BEFORE INSTALLING LID, LUBRICATE THREAD STACK.

(REF 10266C)

FIG. 2

JUNCTION BOX ASSY-SENSOR

ALARM CONTACTS for customer use are brought out to the rear of the controller according to the following: (See Figure 1)

ALARM RELAY	NO	COM	NC
Malfunction, TB-2	8	9	7
LOW alarm, TB-2	5	6	4
HIGH alarm, TB-2	2	3	1

Contacts are SPDT rated 2A, 28 VDC; or 2A, 117 VAC resistive. They may be used to operate auxiliary alarms. The Low and High alarm relays are normally de-energized.

NOTE: The Malfunction relay is normally energized.

Having followed the foregoing installation and operation instruction, you are now ready to apply power to the system. When first connected, one of the CHANNEL IDENTIFICATION lamps will illuminate. This initially indicates that the power is on. The % LEL meter may rise during the initial time delay period, while the sensing elements are stabilizing. The HIGH ALARM and LOW ALARM circuits will not energize until the 20-25 second time delay period is over, thus preventing false alarms. During this time delay period, the % LEL meter will settle back to zero unless a gas condition exists. If the blue MALFUNCTION lamp lights, there is a defect in the sensing assembly circuit not showing an illuminated CHANNEL IDENTIFICATION lamp.

NOTE: A defect in one sensor circuit will not affect the operation of the other circuit.

If the blue MALFUNCTION lamp lights, and both CHANNEL IDENTIFICATION lamps are illuminated, both sensing assembly circuits are defective.

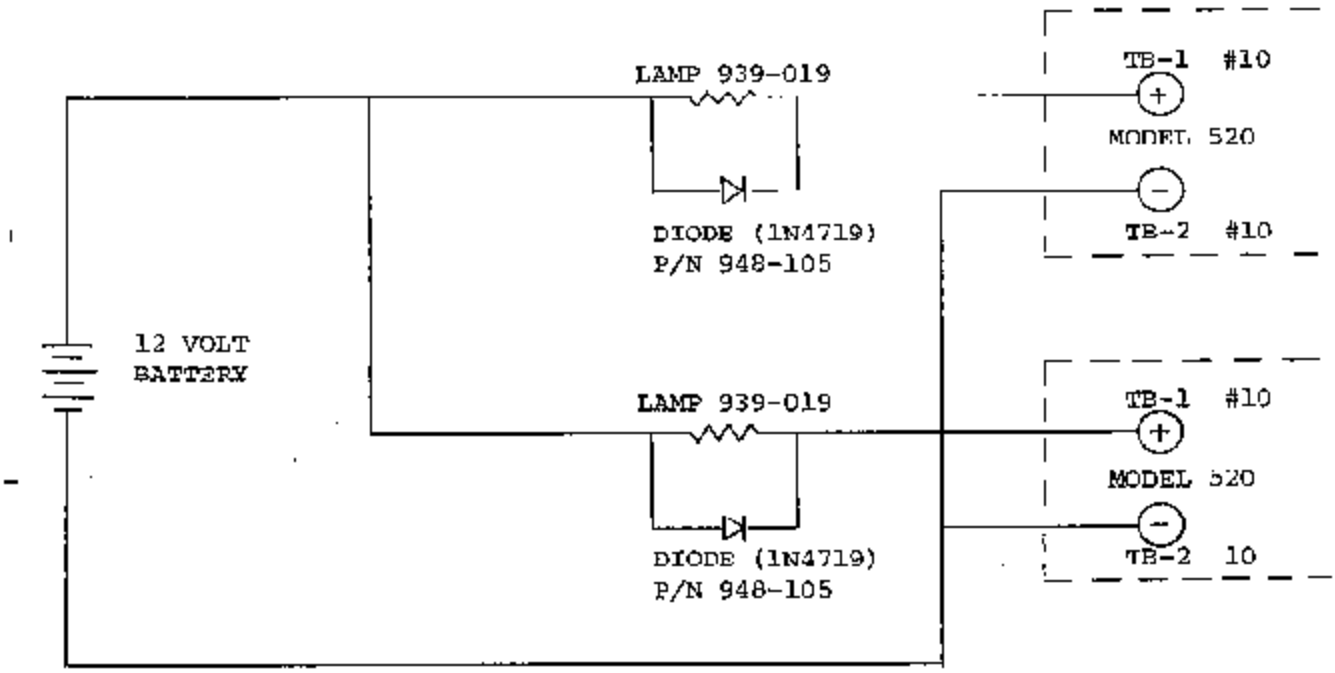
GENERAL MONITORS

III. BATTERY BACKUP

BATTERY BACKUP is easily provided for the Model 520. No manual or relay switching is required.

The battery is simply floated across the Model 520 power supply (which has sufficient capacity to trickle-charge up to 0.25 amperes into the battery). The blocking diode and current limiting lamp network MUST BE mounted externally to the controller as shown in the schematic.

NOTE: The schematic is complete for a total of TWO (2) Controllers. A separate lamp/diode network MUST be used for EACH Model 520.



IV. CALIBRATION

CALIBRATION to your particular gas is initially done at the factory. We recommend that the Model 520 system be recalibrated at least every 90 days. Each channel should be calibrated to the sensing element with which it will be used. The calibration procedure is as follows:

1. Locate the ZERO and SPAN potentiometer screwdriver access openings on the lower portion of the front panel, adjacent to the channel identification lamps.

2. Assure that the sensing assembly is in "clean" air.

3. Hold the spring-loaded CHANNEL SELECT switch in the proper position to read the channel you wish to calibrate first.

4. Adjust the 25 turn ZERO pot such that the % LEL meter reads zero, using a small thin-blade screwdriver. Note that changing the ZERO pot setting has absolutely no effect on the channel sensitivity, or SPAN. It simply shifts the position of the meter point.

5. Zero the other channel in the same manner, then release the CHANNEL SELECTOR SWITCH.

6. Expose one of the sensors to calibration gas using the Purge Calibrator (for methane, hydrogen, etc.), P/N 14-00-150, or the Calibration Chamber, P/N 14-00-200 (for all other combustible gases and vapors).

7. Adjust the SPAN pot for that channel to bring the % LEL meter deflection to the correct value for the calibration gas used. When making this adjustment, do not manually switch the CHANNEL SELECTOR switch. (NOTE: Calibration gas is supplied in containers labeled either in % LEL or % of the gas. Refer to NFPA Standards No. 325M or other authority for conversions if required. For methane, 50% LEL = 2.5% gas by volume; for hydrogen, 50% LEL = 2.0% by volume).

8. Remove the calibration gas, allowing the sensor to return to clean air. Re-zero if necessary, and again expose the sensor to calibration gas. Re-check the SPAN and the calibration or this channel is completed.

9. Repeat the foregoing three steps for the other channel.

ALARM SETPOINTS are electronic, and may be set by adjustment of the HIGH and LOW ALARM pots located on the left-hand circuit board. These pots are identified by HIGH and LOW markings on the board. Both alarm circuits are common to both channels. To change the setpoints, advance the ZERO pot of either channel until the % LEL meter reads the value you wish to use as the LOW set-

IV. CALIBRATION (Cont'd.)

point - usually about 35%. Then adjust the LOW alarm pot until the amber LOW alarm lamp just turns on. Further advance the ZERO pot until the HIGH set-point value is reached on the % LEL meter - usually about 65%. Then adjust the HIGH alarm pot until the red HIGH alarm lamp just comes on. Turn the ZERO pot counter-clockwise until the meter again reads zero. These alarm circuits may be of the latching or non-latching (manual or automatic) reset type, depending upon how the instrument was initially ordered. If the latching (manual) type is ordered, a reset switch is provided in the lower left side of the instrument panel to reset the alarm circuits. Your Model 520 system is now in operation.

SENSOR CURRENT settings rarely require adjusting in the field. Should it become necessary, proceed as follows:

1. Slide instrument forward from its mounting until the SENSOR CURRENT pots are exposed. These pots are identified on the schematic drawing as follows: Channel A, R2; Channel B, R9.

2. To set CHANNEL A Sensor Current, connect a 20,000 ohm/volt volt meter across resistor R3. (See Page 11). Adjust CHAN A CUR-ADJ potentiometer R2 to 1.25VDC. To adjust CHANNEL A Bias, remove the top aluminum extrusion by removing two screws from the "face plate" and three screws from the "rear plate". (See Page 11). Next, "fold" the extrusion (movement limited by wiring harness) to the right side of the controller. (See Page 12). This will expose BIAS POTS R37 and R38. Turn CHANNEL "A" SPAN pot fully counter-clockwise (25 turn pot) until it "clicks" (no stop). Next, adjust CHANNEL A BIAS pot R37 until the % LEL METER reads "zero". YOU MUST HOLD CHANNEL SELECTOR SWITCH IN THE "A" POSITION WHEN ADJUSTING THE BIAS POT. Reset "SPAN" pot to about 6 turns clockwise (CW).

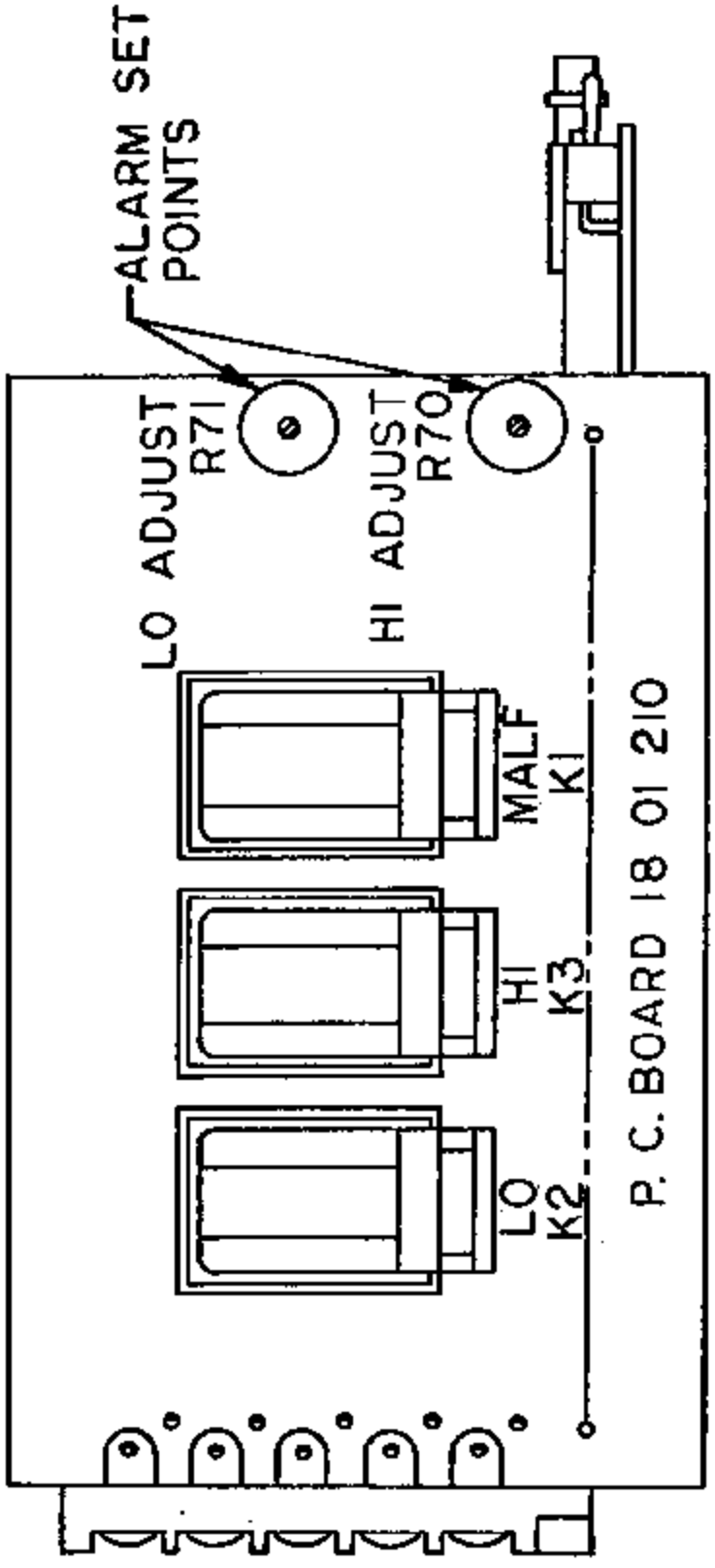
3. Repeat above procedure for the other channel.

4. THE SYSTEM MUST NOW BE RECALIBRATED IN ACCORDANCE WITH THE PREVIOUS SECTION ON CALIBRATION.

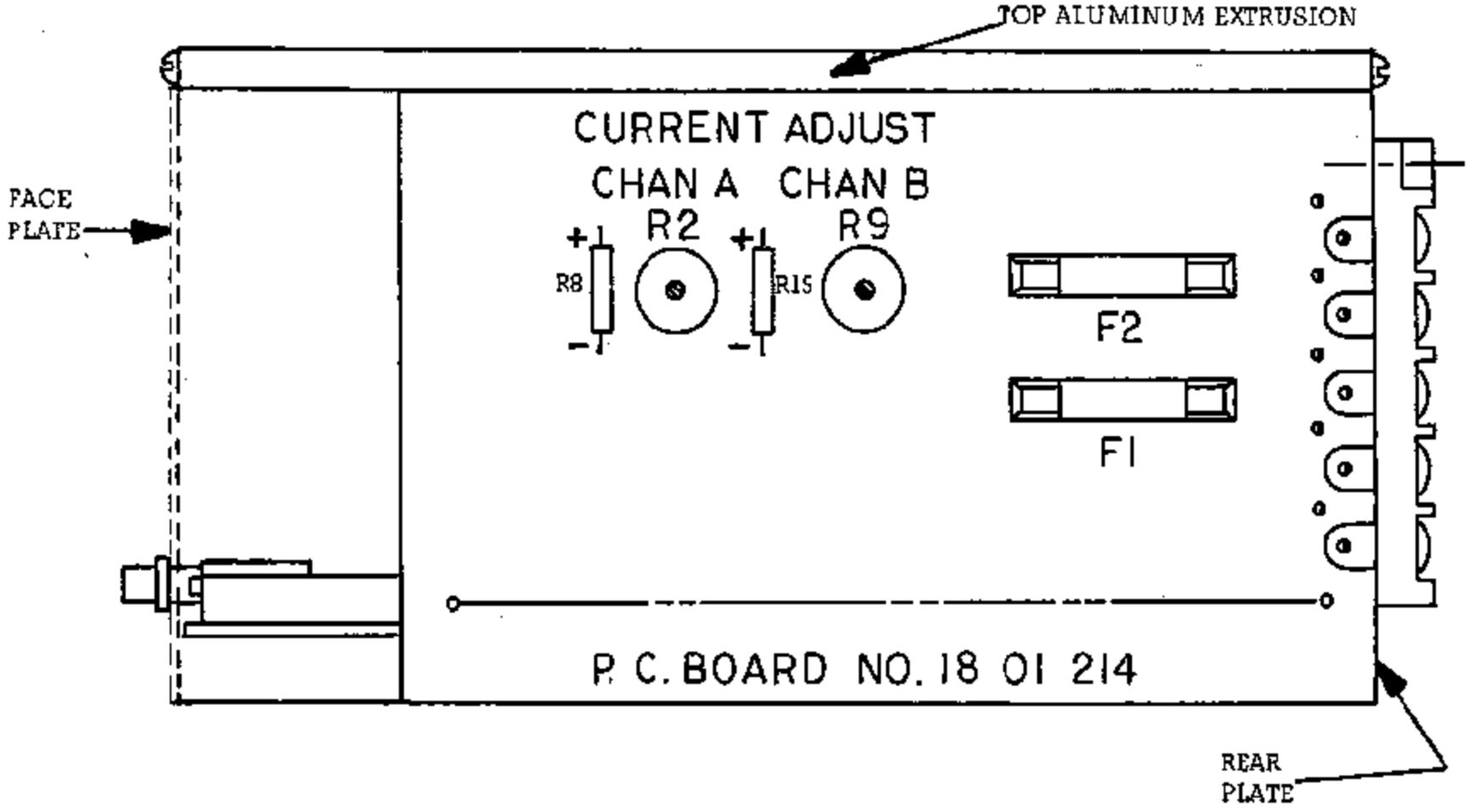
V. CIRCUIT DESCRIPTION

The operation of the Model 520 system is most easily understood by reference to the Block Diagram. (See Page 9).

The voltage output from the power supply is fed through constant current regulators to the remote sensors. Each sensor contains an active resistance bead and a reference resistance bead. These beads form two legs of a Wheatstone bridge with the remaining two legs located in the controller.

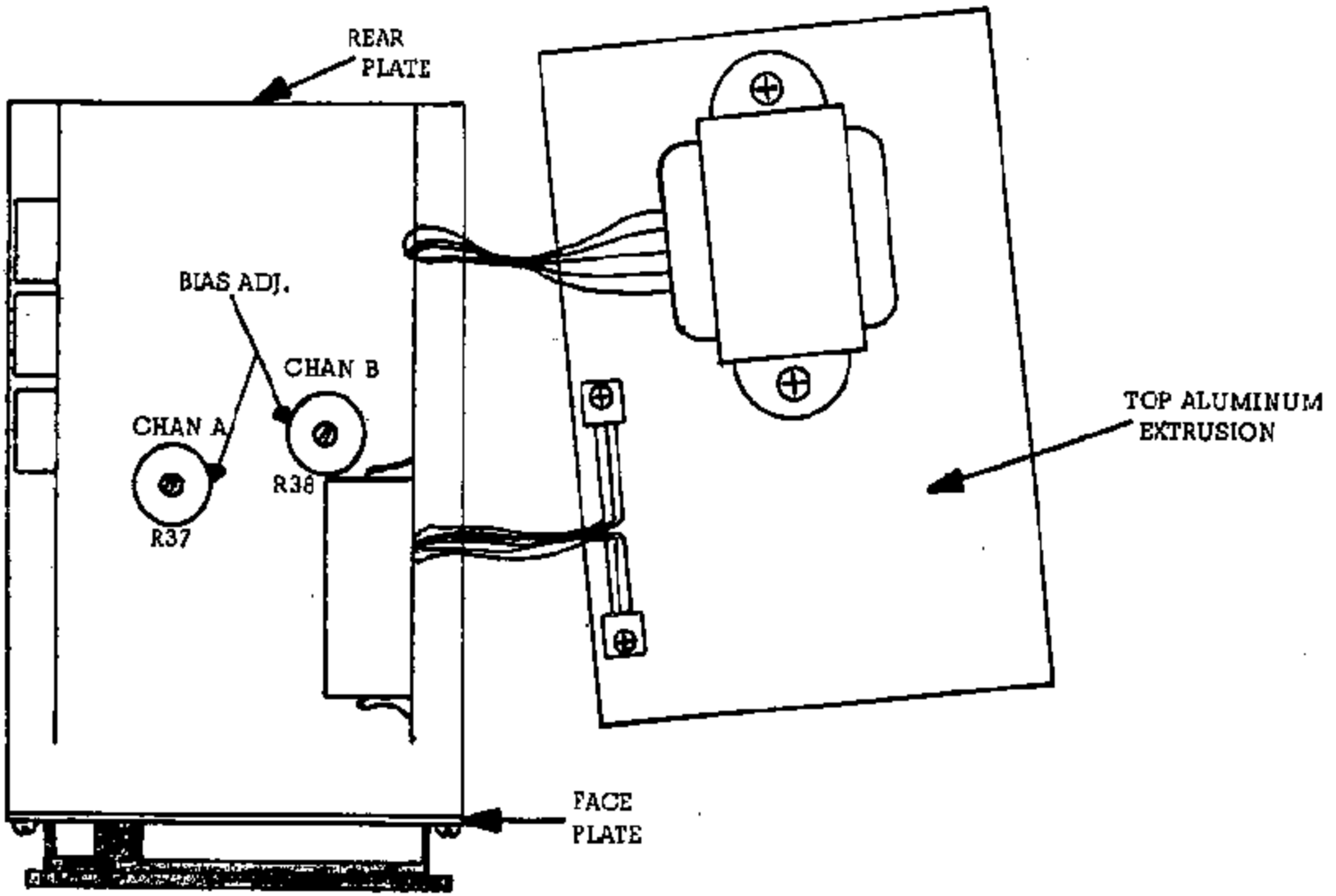


MODEL 520
ALARM SET POINTS



MODEL 520

CHANNEL CURRENT ADJUSTMENTS



MODEL 520
CHANNEL BIAS ADJUSTMENTS

V. CIRCUIT DESCRIPTION (Cont'd.)

Constant current is independently supplied to both remote sensors. With clean air (no gas accumulation) at the sensors, the bridge is adjusted to balance, (the voltage input to A_1 and A_2 is zero). A combustible gas/air mixture diffusing through the flame arrestor oxidizes on the low temperature catalytically-treated active bead. This causes a change in bead temperature and electrical resistance in proportion to the gas/air ratio. The reference bead, which is inert to combustible gases, compensates for ambient temperature variations, humidity changes and pressure differences. This difference in resistance of the active and reference beads is converted into bridge output voltages.

These voltages are applied to the input of A_1 and A_2. Outputs of A_1 and A_2 are connected to the input of A_3 (the comparator). The comparator switches the higher reading channel output to the % LEL meter. The meter has been calibrated to read 100% LEL (full scale).

An analog output of approximately 0-1 VDC is available at points on the circuit boards marked TP1 and TP2. Minimum loading of 10,000 ohms is required. Neither output terminal, TP1 or TP2, is grounded; therefore, a differential-input type recorder or DVM should be used if the controller is battery-powered.

A time-delay circuit disables the HIGH and LOW ALARM relays for 20-25 seconds after power is first applied or restored. This prevents false alarms during the time required for the sensing circuitry to stabilize.

All alarm circuits are shared by both channels.

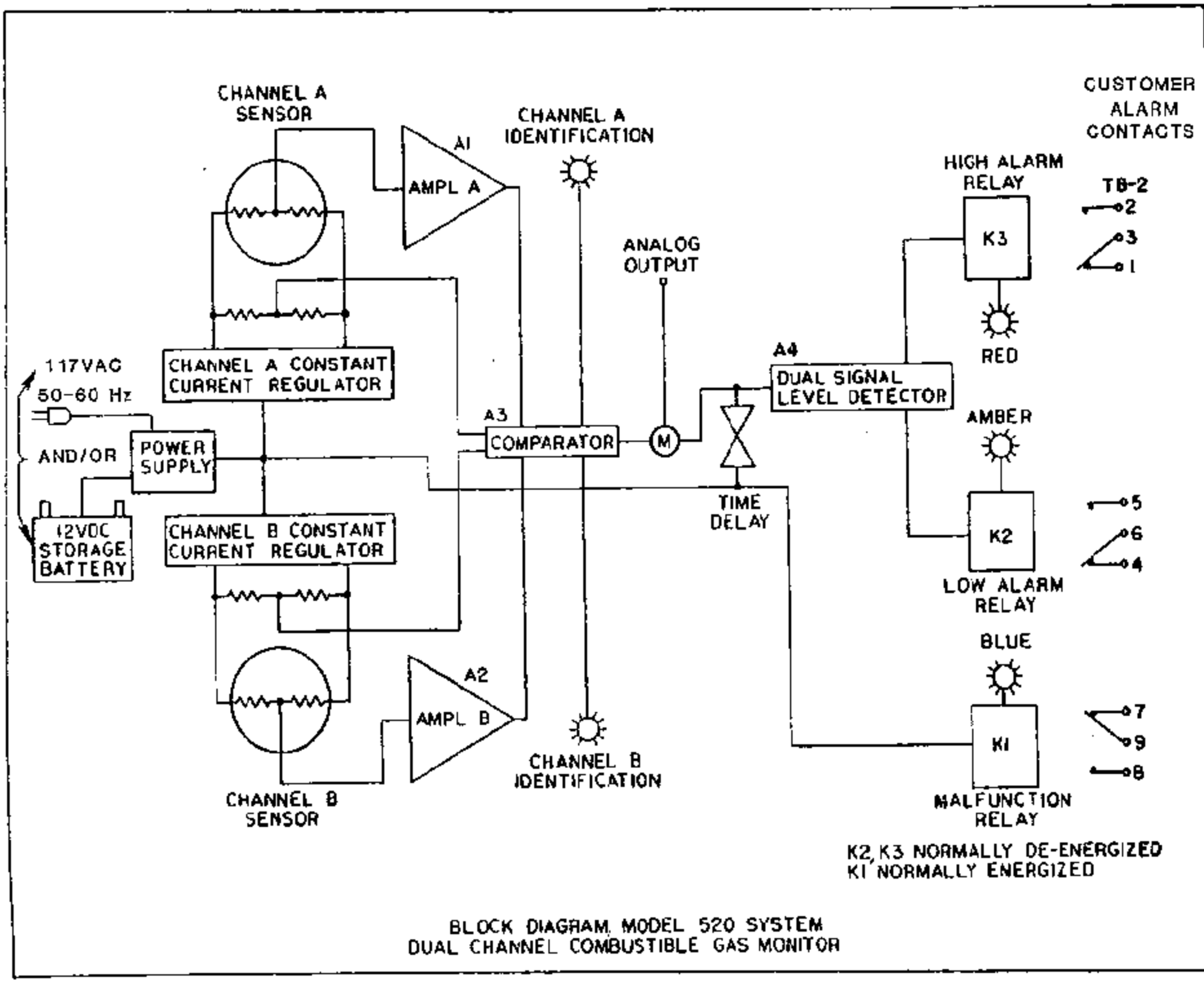
The MALFUNCTION relay K1 switches when sensor current in either channel is disrupted. When this occurs, the blue MALFUNCTION lamp is illuminated. This relay is normally energized, and also serves as a power failure indicator. If one channel malfunctions, the controller will monitor the remaining good channel. Should both channels malfunction, the blue malfunction lamp and both CHANNEL IDENTIFICATION lamps will be illuminated.

The LOW ALARM and HIGH ALARM relays, K2 and K3, are controlled by the dual signal level detector, A4. This integrated circuit provides accurate and stable control of alarm setpoint levels. The amber LOW ALARM and red HIGH ALARM lamps are illuminated by relay closures. Customer relay contacts are provided at the rear-mounted terminal strips. External connections to the SPDT customer relay contacts are as follows:

CONTACT CONFIGURATION — TERMINAL STRIP TB-2

	MALFUNCTION	HIGH ALARM	LOW ALARM
CLOSED	7	1	4
OPEN	8	2	5
C	9	3	6

These SPDT contacts are rated at 28 VDC, 5A resistive; or 117 LAC, 3A resistive. Hermetically sealed relays are available as an option.



BLOCK DIAGRAM, MODEL 520 SYSTEM
DUAL CHANNEL COMBUSTIBLE GAS MONITOR

VI. MODEL 520 TROUBLE-SHOOTING

INTRODUCTION:

This section is intended to be a guide in correcting problems which may arise in the field. This section is not all-inclusive, and General Monitors should be contacted for assistance if the corrective actions listed in this section do not eliminate the problem. If equipment or qualified personnel required for various tests are not available, it is recommended that the defective unit be returned to General Monitors for repair. A complete written description of the problem should be included.

Be sure to disconnect external alarm wiring before making any check which might send the unit into alarm if an alarm condition will create problems.

NOTE: If the equipment is under warranty, any repairs performed by persons other than General Monitors' authorized personnel may void the warranty. Please read the warranty statement carefully.

	PROBLEM		POSSIBLE CAUSE(S)		CORRECTIVE ACTION
1.	Neither channel indicator lamp lights after application of power.	1.	Low input power.	1.	Insure proper power supply to controller.
		2.	1/2 AMP AC fuse (F1) is defective.	2.	Replace F1.
		3.	2 AMP DC fuse (F2) is defective.	3.	Replace F2.
		4.	Channel bulbs are burned out.	4.	Replace bulbs.
2.	The controller does not "time out" within 25-30 seconds after applicaation of power or after the unit comes out of the malfunction mode. HIGH, LOW and MALF lamps are not lit.	1.	Low input power	1.	Insure proper power supply to controller.
		2.	1/2 AMP AC fuse (F1) is defective.	2.	Replace F1.
		3.	2 AMP DC fuse (F2) is defective.	3.	Replace F2.
		4.	Channel bulbs are burned out.	4.	Replace bulbs.
		5.	MALFunction bulb is burned out. (If bulb is lit, proceed to Problem #3 Section below).	5.	Replace bulb.

MODEL 520 TROUBLE-SHOOTING (Cont'd.)

	PROBLEM		POSSIBLE CAUSE(S)		CORRECTIVE ACTION
3.	Controller is in malfunction-mode (blue MALF lamp is lit). This indicates that one of the leads is open. The channel lamp which is not lit is the channel in which the malfunction has occurred. If both lamps are out, there is a malfunction in both channels.	1.	Terminal(s) loose on sensor cable.	1.	Tighten all terminals.
		2.	Black lead is open	2.	Check to see if the % LEL Meter is driven hard downscale. Check the voltage across R4. It should be zero volts. Check the voltage across terminals 1 and 3 or 4 and 6 on TB1 on the controller. It should read approximately 12 volts. Proceed to Paragraph 5 below.
		3.	White lead is open.	3.	Check to see if the % LEL Meter is driven hard upscale. Check to see if the voltage across R4 is zero volts. Check to see if the voltage across terminals 1 and 3 or 4 and 6 on TB1 on the controller is approximately 12 volts. Proceed to Paragraph 5 below.
		4.	Red lead is open.	4.	Check to see whether there is no meter deflection with a combustible gas present, or with a zero or span adjustment. Check to see whether the voltage across terminals 1 and 3 or 4 and 6 on TB1 on the controller is approximately 4.5 - 6 volts, and across terminals 1 and 2 or 4 and 5 approximately one half that across terminals 1 and 3 or 4 and 6. Proceed to Paragraph 5 below.
				5.	Disconnect any external alarm wiring. Determine where the break in the sensor circuit has occurred as follows: a) Short the white to black leads at terminals 1 and 3 or 4 and 6 on TB1 on the controller. If the MALF lamp goes off, the controller is operating correctly. If the lamp remains on, the problem is in the controller. General Monitors should be contacted and/or the unit should be returned for repair. b) If the lamp went off in a) above, the open is in the sensor cable. Inspect the cable and correct the condition. c) Short terminals 1 and 2 or 4 and 5 at the controller. If the meter goes hard upscale, the open is in the sensor cable. Inspect the cable and correct the open condition.

MODEL 520 TROUBLE-SHOOTING (Cont'd.)

PROBLEM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
		5. (Cont'd.) d) Short the white and black leads at the sensor. If the MALF light goes out, the sensor is defective. Replace the sensor. If the light stays on, the open is in the sensor cable. Inspect the cable and correct the open condition.
4. LOW and/or HIGH alarm lamps do not turn 'on' when LEL Meter reads above alarm set point.	1. Lamp(s) burned out.	1. Replace lamp(s). Check lamp sockets for +12 VDC by using terminal 10 on TB2 (rear of controller) as common (-) point.
	2. Sensor red lead is open or broken.	2. Check sensor cable for continuity in red conductor.
	3. Span potentiometer is turned to full CCW position.	3. Normal setting of SPAN pot is minimum of 4 turns CW from CCW end.
	4. Alarm circuits are not operating properly.	4. Refer to the schematic on Page 25 of the manual. Contact General Monitors and/or return the controller for repair if the problem cannot be resolved with available test equipment and personnel.

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VII. WARRANTY

GENERAL MONITORS warrants all of its products to be free from defects in workmanship or material under normal use and service within two (2) years after date of shipment. GENERAL MONITORS will repair or replace, without charge, any equipment found to be defective during the warranty period. Final determination of the nature and responsibility for defective or damaged equipment will be made by GENERAL MONITORS' personnel.

Gas detection elements which have been poisoned by contaminants are not included in this warranty.

In all cases, this warranty is limited to the cost of the equipment.

All warranties hereunder are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without GENERAL MONITORS' approval, or which have been subjected to neglect, accident, improper installation or application, or on which the original identification marks have been removed or altered.

GENERAL MONITORS' responsibility under the above warranty shall be limited to the repair or replacement at GENERAL MONITORS option, at no cost to the purchaser for parts and labor, of any component which fails during the two (2) year period provided that the purchaser has promptly reported such failure to GENERAL MONITORS in writing and GENERAL MONITORS, upon inspection, found such component to be defective. The purchaser must obtain shipping instructions for the return of any item under this warranty provision and compliance with such instruction shall be a condition of this warranty.

EXCEPT FOR THE EXPRESS WARRANTY STATED ABOVE, GENERAL MONITORS DISCLAIMS ALL WARRANTIES WITH REGARD TO THE PRODUCTS SOLD HEREUNDER INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS AND THE EXPRESS WARRANTIES STATED HEREIN ARE IN LIEU OF ALL OBLIGATIONS OR LIABILITIES ON THE PART OF GENERAL MONITORS FOR DAMAGES INCLUDING BUT NOT LIMITED TO CONSEQUENTIAL DAMAGES ARISING OUT OF/OR IN CONNECTION WITH, THE USE OR PERFORMANCE OF THE PRODUCT.

VIII. WARNING

GENERAL MONITORS through engineering design, testing, manufacturing techniques and rigid quality control, delivers the finest gas detection systems available. The user must recognize his responsibility for maintaining the gas detection system in operational condition.

1. GENERAL MONITORS recommends "calibration" on a regular schedule. "Calibration" should be conducted at least every ninety (90) days. This is the only method of insuring proper system operation and response.

   "Calibration" is defined as the procedure of applying a known concentration of gas to the system sensor (or sensors) while observing the monitor. The visual display will indicate the gas concentration and activate alarm indicators/circuits in direct relationship to gas concentration. "Calibration" adjustments must be made if results are at variance. (See CALIBRATION section of this manual).

2. GENERAL MONITORS cautions, as with all equipment of this type, that high levels or long exposure to certain atmospheres will "poison" the sensor catalyst and eventually affect sensitivity. "Poison atmospheres" are: halides (compounds containing fluorine, chlorine, iodine or bromine), sulphur, silicone and lead. Use in this type of atmosphere requires "calibration" on a more frequent schedule.

3. GENERAL MONITORS' sensors and sensor housings are designed and tested for use in certain classes of hazardous atmosphere. Explosion-proof integrity cannot be maintained if sensors and sensor housings are operated in other than the "as designed" condition. Terminal access covers of sensor housings must be secured in place. Sensor housings must be installed in accordance with National Electrical Code acceptable practice for the class of hazardous atmosphere.

4. Sensors are designed with sintered-metal or screen covers which act as flame arrestors. Do not operate sensors without screen or sintered-metal parts in place.

5. Some GENERAL MONITORS' controllers have a "test" switch. The user is cautioned that this "test" switch checks out electronics only and gives no indication of a sensor condition chemically.

6. GENERAL MONITORS' gas detection systems are primarily SAFETY devices for the protection of personnel and facilities, and must be "always ready". With proper calibration, maintenance and installation, the system will provide continuous monitoring of hazardous areas. The user will assume all liability for misuse of GENERAL MONITORS' gas detection systems by its employees or other persons.

IX. RECOMMENDED SPARE PARTS LIST

ONE MODEL 520

UP TO TWO YEARS IN SERVICE

CIRCUIT SYMBOL	DESCRIPTION	PART NUMBER	QUANTITY
DS 2,3	Lamp (Channel ID)	939-012	2
DS 1,4,5	Lamp (Status)	939-009	3
K 1,2,3	Relay	945-001	1
S 2	Pushbutton Switch	951-034	1
F 1	Fuse (3AG, 1/2AMP, FB)	951-200	2
F 2	Fuse (3AG, 2AMP, FB)	951-015	2
S 1	Toggle Switch	951-035	1
---	Sensor Housing	10252	1
---	Sensor	As Required	1

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X. SENSORS

The following is a list of GMI sensors available for use with the Model 520 System:

P/N	
10001-1	Standard Industrial Combustible Gas Sensor. Used for most hydrocarbons and hydrogen. Temperature range - -55°C to 93°C (-65°F to +200°F).
10001-1R	Same as P/N 10001-1 except greatly improved resistance to poisons such as HMDS (Hexamethyldisiloxane) and H_2S.
10014-1	High Temperature Standard Industrial Combustible Gas Sensor. Same as P/N 10001-1 except it may be usd at temperatures up to 200°C (400°F).
10058-1	Same as P/N 10001-1 except sensor body is stainless steel.
10058-1R	Same as P/N 10058-1 except greatly improved resistance to poisons such as HMDS (Hexamethyldisiloxane) and H_2S.
10022-1	Similar to P/N 10001-1 except PTB approved.
10059-1	Same as P/N 10022-1 except body is constructed of stainless steel.
10015-1	High temperature equivalent of P/N 10022-1. It may be used in temperatures up to 200°C (400°F).

P/N 10001-1, 10058-1, 10022-1, and 10059-1 sensors are CSA C22.2 No. 152-1976 certified.

P/N 10252 sensor housing is normally used in the Western Hemisphere. Special PTB approved housings are normally used in Europe.

XI. ACCESSORIES

A. CALIBRATION EQUIPMENT

Calibration accessories may be purchased from GMI. Contact the factory or your local representative for technical or ordering information.

The P/N 1400200 Portable Calibration Chamber is used to calibratte sensors for any specific combustible vapor which has a flash point below ambient temperature. The customer must provide his own sample of the liquid to use with the chamber. GMI provides a microliter syringe for exact measurement of volumes to be used. Instructions for use are provided with the chamber.

GMI P/N 1400150 portable purge calibrators are available for several common gases, including hydrogen, methane, ethane, propane, butane, pentane, and hexane. The portable purge calibrator is a ready-for-use assembly including a lecture bottle containing approximately 50% LEL of the gas ordered, plus regulator and an adaptor which fits over the sensor. Replacement cylinders are also available.

B. SENSOR COVERS

The information below is of a general nature. GMI or your local representative should be contacted for specific recommendations.

NOTE: If sensor covers are used, they should remain in place during calibration. If they are going to be cleaned, the sensor should be recalibrated after the sensor cover is re-installed. Although several of the available covers do not effect sensitivity or response time themselves, accumulations of dust, dirt, water, etc., may do so.

(1) Dust Guard Assembly (P/N 10110)

The dust guard assembly is a simple, threaded stainless steel (type 303) cylinder with a disposable wire screen at one end. It is easily unscrewed for cleaning and/or replacement of the screen. The screen material is stainless steel (type 316) with a nominal 40 micron mesh. This accessory is specially designed to prevent dust and particulate matter from reaching the sensor flame arrestor. Such debris can plug the screen and limit the amount of gas reaching the active surface of the sensor. When the dust guard is installed, this problem is minimized and sensor response is virtually unchanged. The dust guard is also available in a kit (P/N 10044) with twelve replaceable screens. It can be used as an effective windscreen, and is recommended for corrosive, windy or high temperature environments. A typical application would be in the area surrounding a drying oven.

B. SENSOR COVERS (cont'd.)

(2) Porex Dust Cover (P/N 10071)

This cover is a disposable porous plastic dust guard which eliminates the problem of fine particles plugging the sensor flame arrestor. The material used is high density polyethylene with a 250 micron mesh. It consists of a cylindrical barrel with one end closed, which screws in place on the sensor body. Due to the small pore size which restricts the gas diffusion path, porex dust covers may depress sensor response by as much as 40% and increase response time by a few seconds. Because of this, the sensor must never be calibrated with the porex dust cover off. The porex dust cover is inexpensive and therefore may be considered a disposable item, although it may be cleaned and re-used several times. It is recommended for extremely dusty or windy environments, but should not be used for applications in which it will be exposed to temperatures in excess of 80°C (180°F).

(3) Sintered Stainless Steel Dust Guard (P/N 1800822)

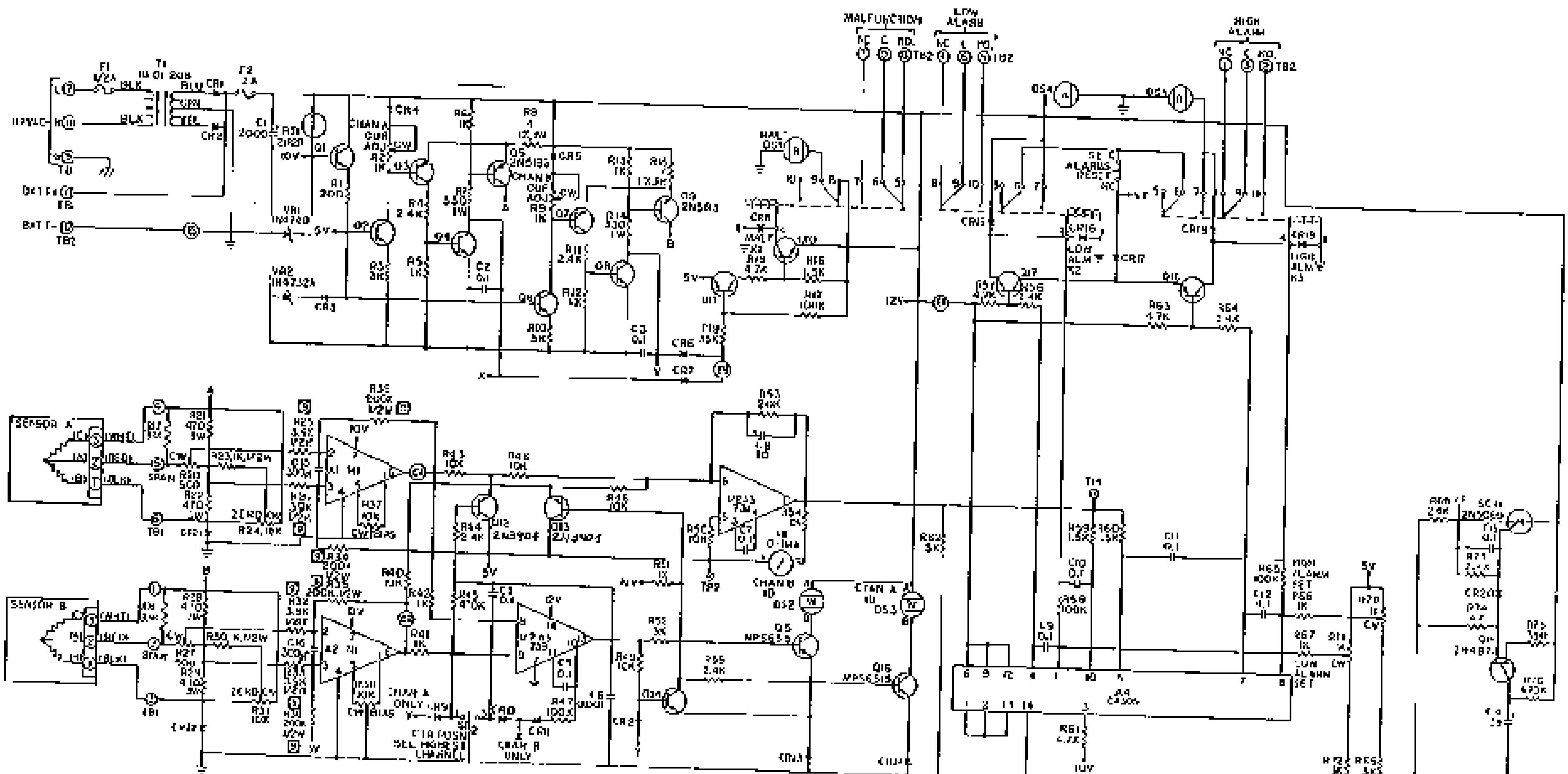
The construction of this accessory is similar to P/N 10110 above, but it has a 3mm (1/8") thick sintered stainless steel disc at one end. The body material is stainless steel. It has an internal thread for installation on the sensor body. This dust guard provides protection from fine particulates and windy environments. It should be used only in dry locations because of the tendency of the sintered disc to absorb water, which would then act as a gas diffusion barrier until the disc dried out again. This dust guard reduces sensor response, so it must never be removed for calibration.

(4) Splash Guard (P/N 10117)

The Splash Guard is a rugged ABS plastic cylinder which screws into place over the sensor body. It contains a series of internal baffles which are designed to deflect water away from the sensor flame arrestor. A stainless steel mesh may be inserted into the open end of the Splash Guard. The Splash Guard is recommended for areas where heavy rain or frequent equipment hosedowns occur.

(5) Sensor Flow Chamber (P/N 10066)

The General Monitors' Sensor Flow Chamber is constructed of aluminum (optional stainless steel construction available). The chamber has an internal thread into which a sensor may be screwed, and two threaded ports which accept 1/4 inch tube fittings. The chamber is designed for insertion into a sampling system.



NOTES: UNLESS OTHERWISE SPECIFIED

1. NEXT ASSY
2. DIODES CR1, 2, 10, 13, 4, 15, 16, 17, 18, 19, 20, 21, 22 ARE 1N4003
3. DIODES CR3, 4, 5, 6, 7, 9 AND 12 ARE 1N4148
4. MALFUNCTION RELAY (K1) IS ENERGIZED IN NORMAL OPERATION
5. ALL CAPACITANCE IS IN MICROFARADS
6. NPN TRANSISTORS ARE 2N3904
7. PNP TRANSISTORS ARE 2N3906
8. FOR 3 WIRE MALFUNCTION SCHEMATIC SEE
9. ALL RESISTANCE IS IN OHMS ± 5%, 1/4W
10. MATCHED WITHIN

11. FOR NON LATCHING OPERATION REMOVE CR15 AND CR18

(REF 1801203M)

FIG. 3

SCHEMATIC

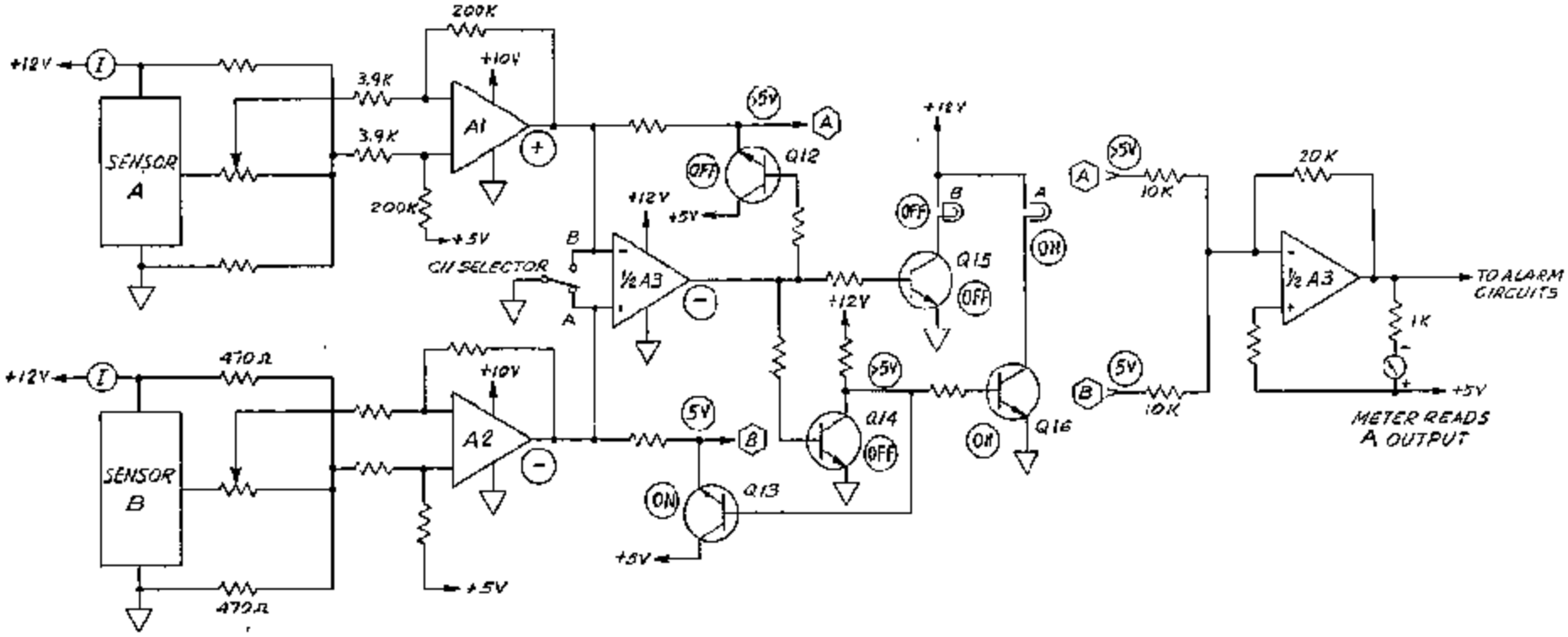


FIG. 4

OUTPUT FROM SENSOR A > SENSOR B

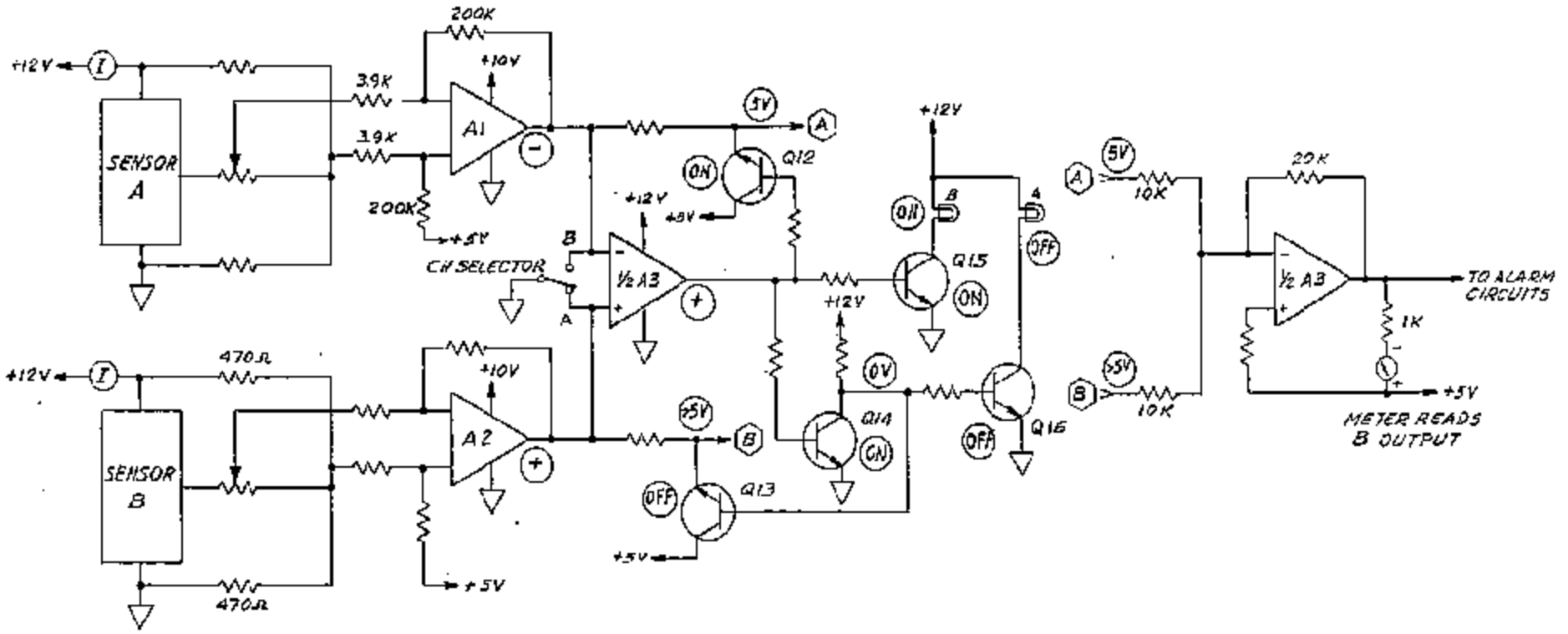


FIG. 5

OUTPUT FROM SENSOR B > SENSOR A

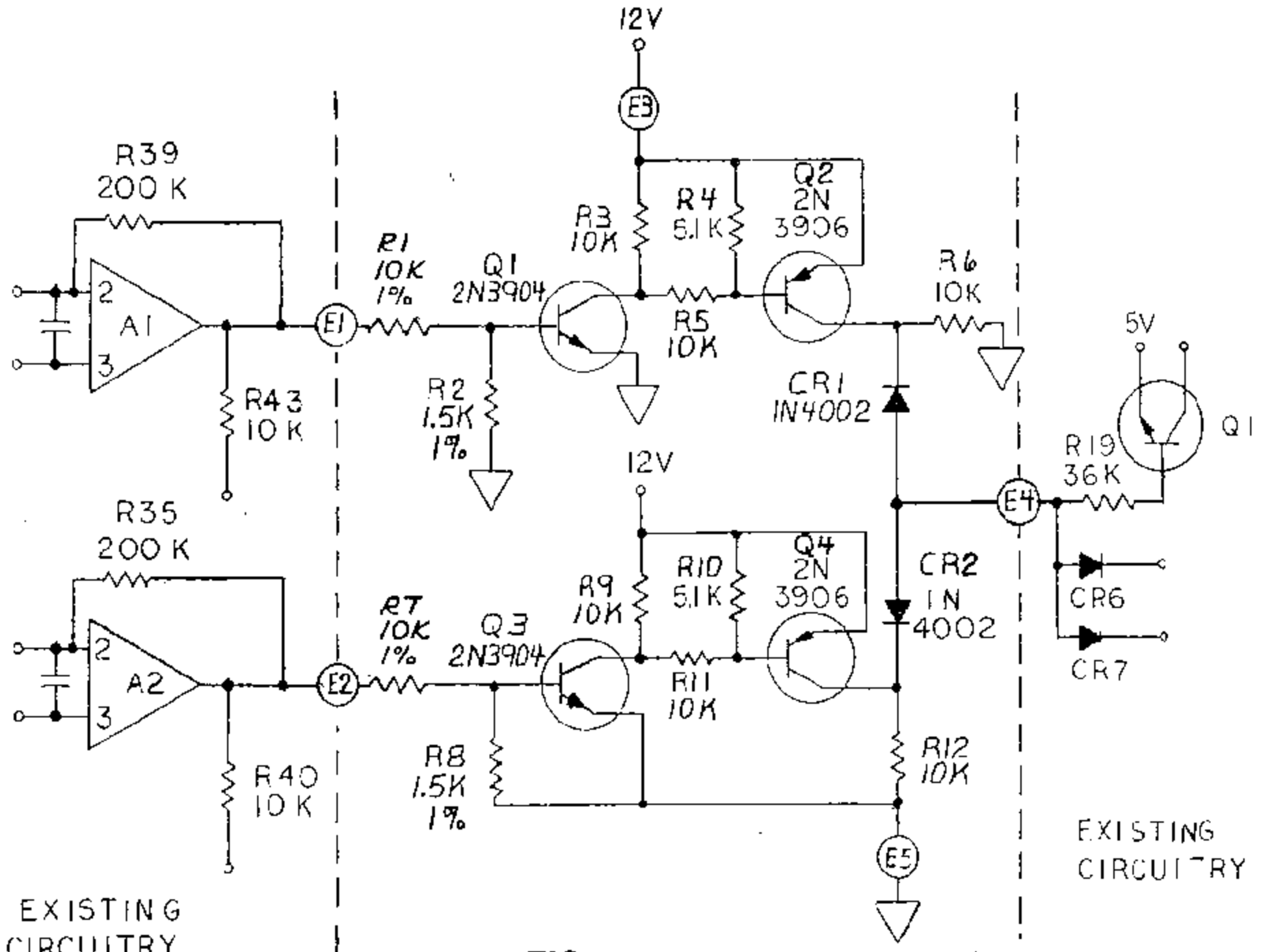


FIG. 6

SCHEMATIC,
MALFUNCTION MODULE -3 WIRE

(REF 1801287C)