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Alameda County Hazardous Materials SUBJECT: Gas Detection, Alarm, and Ventilation
Unit System Safety Manual for Bay Center,
470 27th Street Emeryville
Oakland, CA 94612

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GAS DETECTION, ALARM, AND
VENTILATION SYSTEM SAFETY MANUAL
FOR
BAY CENTER, EMERYVILLE

Prepared for:

Alameda County Hazardous Materials Unit
and
Emeryville Fire Department

December 1, 1987

Revised January 28, 1988

Prepared by:

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1. PRECAUTIONARY GAS MONITORING AND VENTILATION

The Bay Center apartments and offices have been designed for subsurface methane gas monitoring and ventilation of low enclosed spaces (e.g., elevator shafts, PG&E boxes, electrical rooms). The subject monitoring and ventilation is an extra level of precaution, to protect building occupants from the risk of explosion and fire in the unlikely event of gas migration and potential accumulation beneath the concrete foundations.

Such an event is considered extremely unlikely in view of the most recent gas investigations that indicate near absence of subsurface soil gas and precursor materials that could form such gas. These recent gas investigation findings are summarized in Section 2. Subsequent sections of this report describe the methane gas detection hardware, installations, and functions.

The risk of fire in the elevator shafts or other confined areas is unlikely, even in the event of subsurface gas migration and penetration through the foundation. The ventilation system is continuous and designed to provide outdoor air in the shaft bottom at the rate of five air changes per hour. This ventilation is sufficient to keep gas accumulation well below 20 percent of the lower explosive limit (LEL). The most gas that was measured in pilot pile holes was ten percent of the LEL, in unventilated eight foot deep holes. Furthermore, every indication is that gas production on site has ceased (refer to Section 2.)

2. GAS INVESTIGATION FINDINGS

Preliminary methane gas and volatiles measurements were performed by the Certified Industrial Hygienist in the context of worker protection at the Bay Center Office construction site. Gas concentrations in pilot pile holes were found in the range of 2,700 to 4,700 ppm, or 10 percent of the Lower Explosive Limit (LEL).

Subsequent gas investigations were performed by GSF, Inc. The subsequent gas investigations concluded that soil gas constituents originated from petroleum fuels including gasoline and diesel fuel. Soil gas constituents did not originate from decomposing organic material. Soil gas was found at very low concentrations, and is expected to be dissipating since the sources of petroleum fuels have been excavated and removed. GSF stated its opinion that gas emissions at the site are negligible.

In support of this above opinion, GSF measurements of site excavation spoils indicate little material that could create landfill (methane) gas. Cellulose precursors were not detected at the 0.2 percent detection limit. Volatiles were less than 1.4 percent.

3. GAS DETECTION AND ALARM SYSTEMS

Integrated gas monitoring and alarm systems have been installed at the Bay Center apartments and offices, which monitor elevator pits, electrical rooms, and PG&E boxes, for methane gas concentrations. As an extra level of precaution, the gas detection system will alert monitoring personnel in the unlikely event of gas accumulation.

Each gas detection system has two (2) alarm levels. The first alarm level will be preset to telephone security monitoring personnel at five (5) percent of the lower explosive limit (LEL). Security monitoring personnel will be responsible for calling building management. A portable gas analyzer then will be brought to the alarm probe to check for actual gas or false alarm.

The second alarm level will be preset to sound at twenty (20) percent of the LEL. At the second level of alarm, fire alarm bells will sound only for the 20 percent alarm. Security monitoring personnel will call building management and initiate evacuation. A portable gas analyzer will be used to verify gas accumulation or false alarm. The 20 percent alarm will dispatch the Fire Department via a street fire alarm circuit, but only in the event of a water flow. This condition was requested by the Fire Chief. In the event of no water flow but confirmed gas accumulation, reentry into the building will not be allowed until emergency personnel can vent the gas and certify that additional gas accumulation in the building has ceased.

The Scene Coordinator shall be determined in the following progressive hierarchical order according to who is present on the scene:

1. Security Monitor
2. Building Manager
3. Emergency personnel (e.g., Safety Engineer or Hygienist assigned to investigate potential gas leaks)
4. Fire Department personnel

In any event of evacuation, final approval for reentry will reside with the building management, after approvals by the Fire Department and/or Safety Engineer.

BAY CENTER APARTMENTS

The unlikely event of methane gas accumulation in the elevator shafts of the Bay Center apartments is controlled and monitored continuously. The elevator shafts themselves are ventilated continuously. Ventilation is in the form of outdoor air which is mechanically pulled by a fan, one for each shaft, down the shaft toward the ground floor level from the roof. The bottom of each shaft, located at approximately four feet below grade, contains one methane gas probe (see Figures 1, 4, 5, and 6).

Ventilation air from each shaft is exhausted into the open parking garage through diffusers. There is no chance of accumulation in the parking garage, because the garage is open to the air.

The control panel that monitors each elevator pit is placed in the security office that is located in the main lobby. Details of the gas detection and alarm hardware are provided in Section 4.

Seven (7) 50 cfm fans, one for each of seven (7) shafts, are installed to ventilate all elevator shafts to minimize potential gas buildup during off hours/weekends when the HVAC is not functioning. The fans are capable of providing approximately five (5) airchange per hour in each shaft. This exhaust system removes any potential methane gas from the elevator pits, as described above.

BAY CENTER OFFICES

The unlikely event of methane gas accumulation in low enclosed areas of the Bay Center offices also is controlled and monitored continuously. Ventilation is in the form of infiltration air which is mechanically pulled by a fan, one for each building, up the ductwork on the outside of the shaft and toward the roof from the ground floor level. There is one penetration in the shaft at approximately four feet above the pit bottom, through which the duct enters into the shaft space. At the bottom of each shaft there is a methane gas probe (see Figures 2 and 3).

Ventilation air from each shaft is exhausted to the rooftop through the explosion proof fans. There will be no hazard of accumulation at the rooftops, as dispersal from the roof will rapidly dilute the exhausts.

Control panels that monitor the elevator pits are located in the electrical room on the ground floor of each office building (Building A and Building B). Details of the gas detection and alarm hardware are provided in Section 4.

Two (2) one sixth horsepower motors have been installed in Building A and Building B. The roof mounted fan on Building A is rated at 375 cfm. The roof mounted fan on Building B is rated at 250 cfm. Building A has three elevators in one common shaft, and Building B has two elevators in one common shaft. Each fan is capable of providing approximately five (5) air changes per hour.

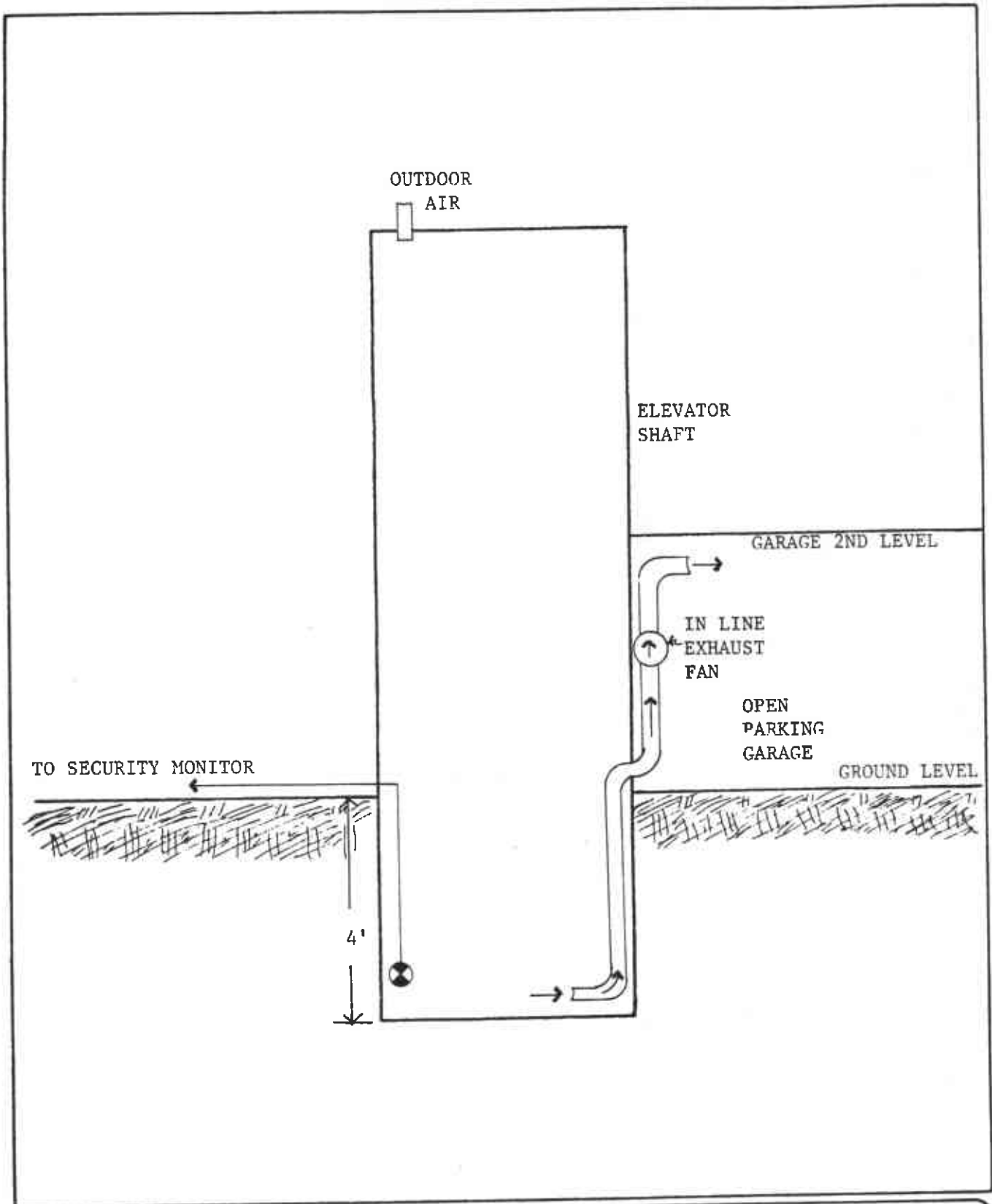


FIGURE 1. SCHEMATIC DRAWING OF SHAFT VENTILATION AND GAS DETECTION AT BAY CENTER APARTMENTS

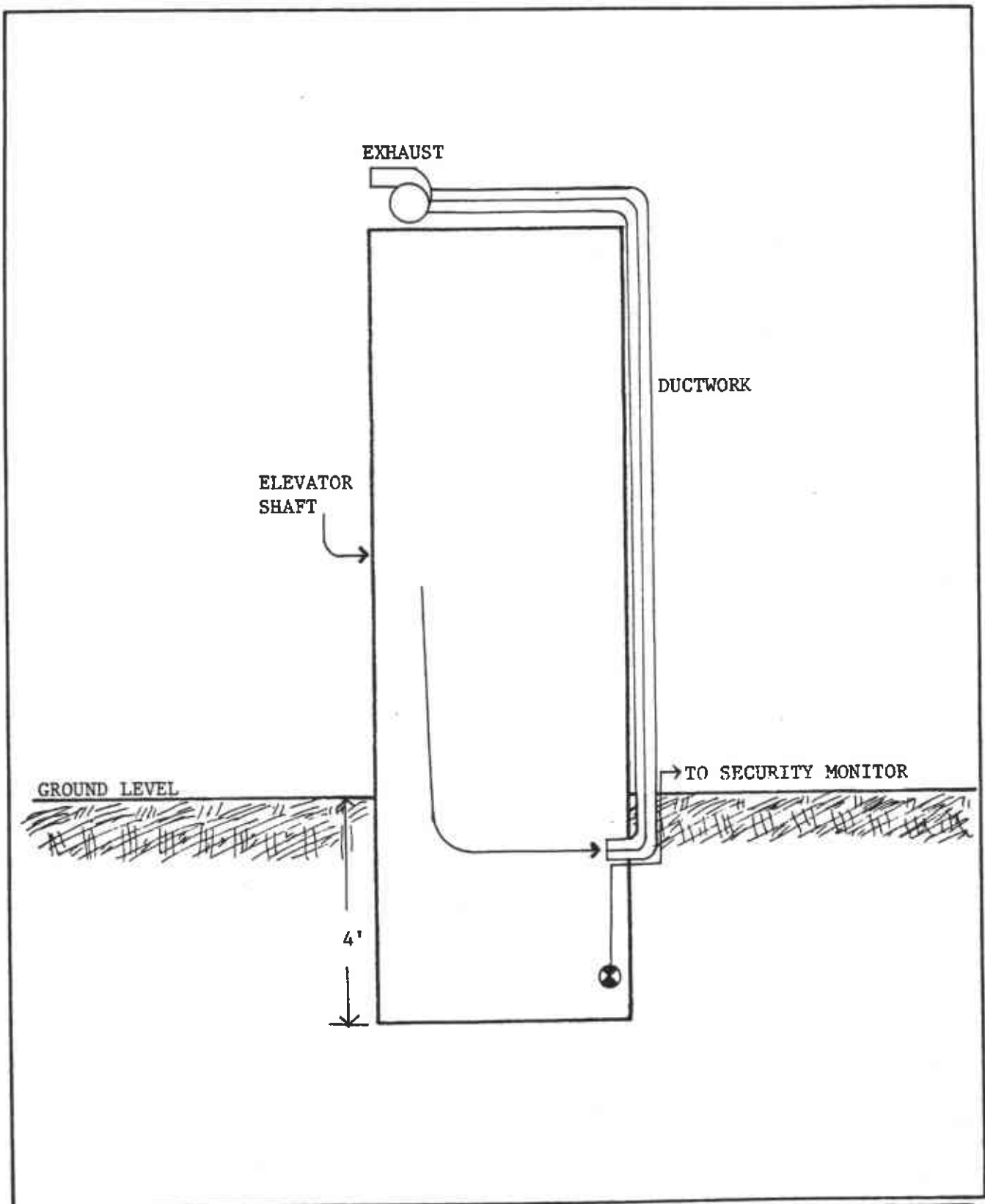
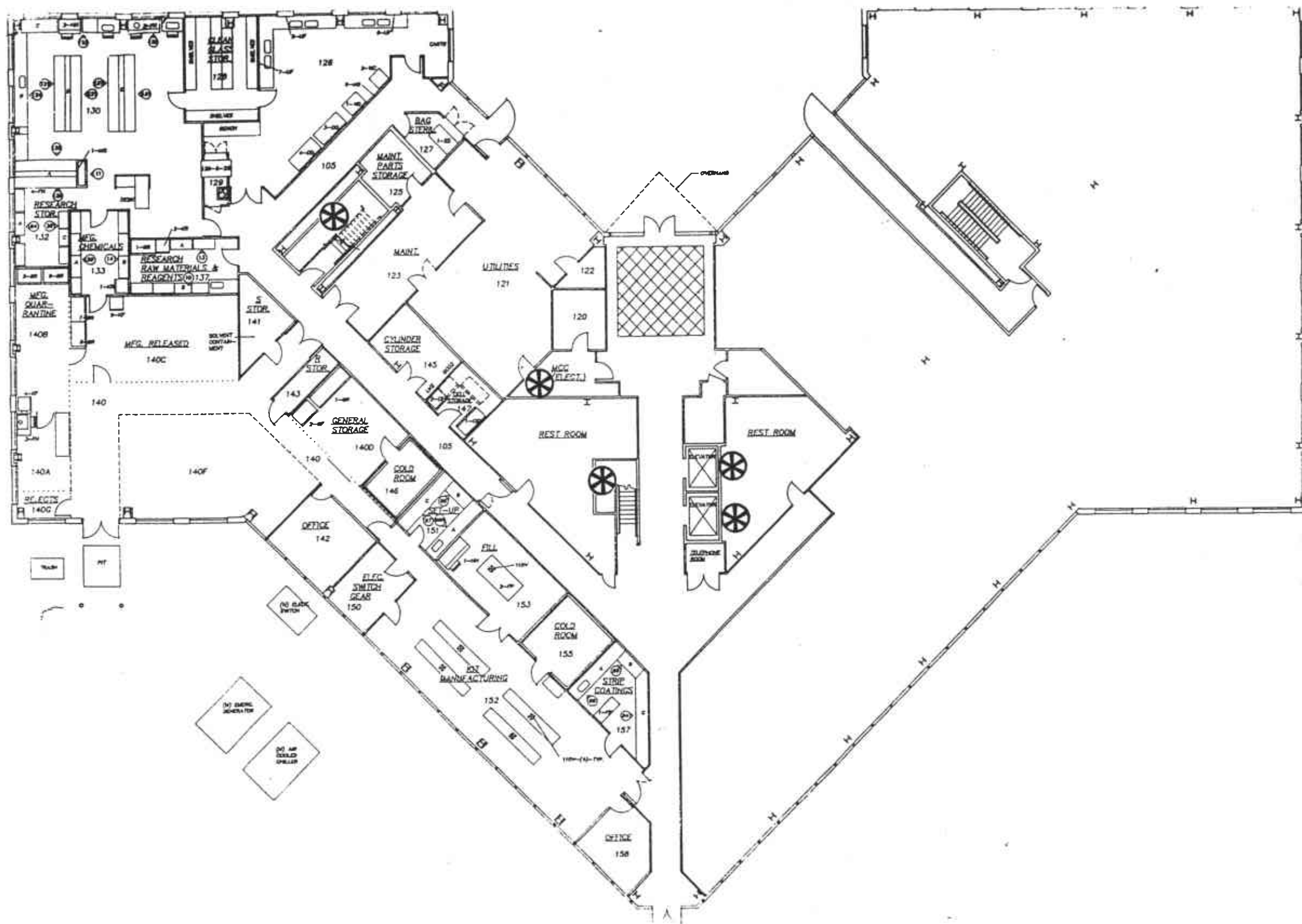




FIGURE 2. SCHEMATIC DRAWING OF SHAFT VENTILATION AND GAS DETECTION AT BAY CENTER OFFICES, EMERYVILLE

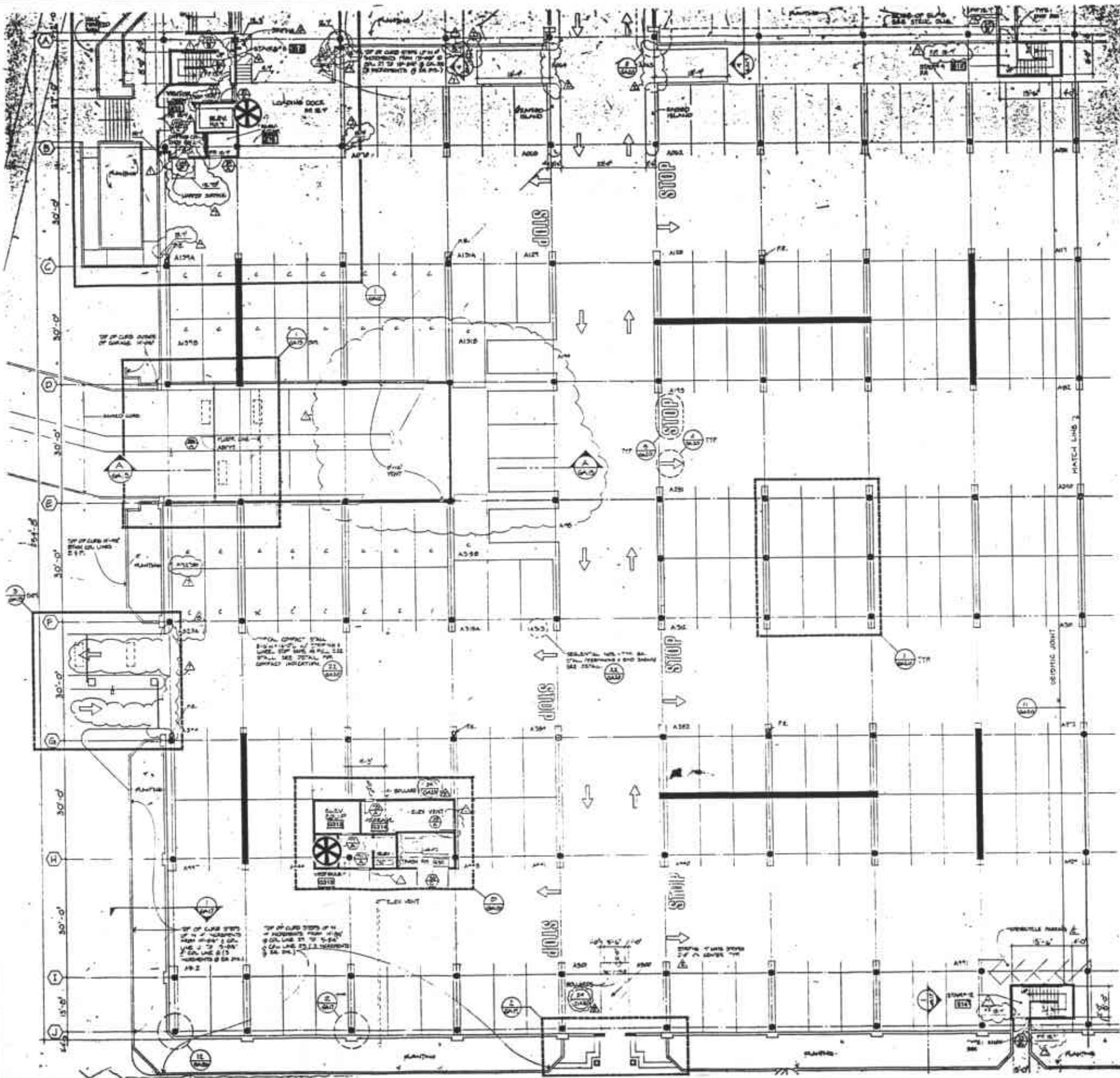


 GAS DETECTOR PROBE

FIGURE 3.
 BAY CENTER OFFICES GAS DETECTOR
 PROBE LOCATIONS

NO
SCALE

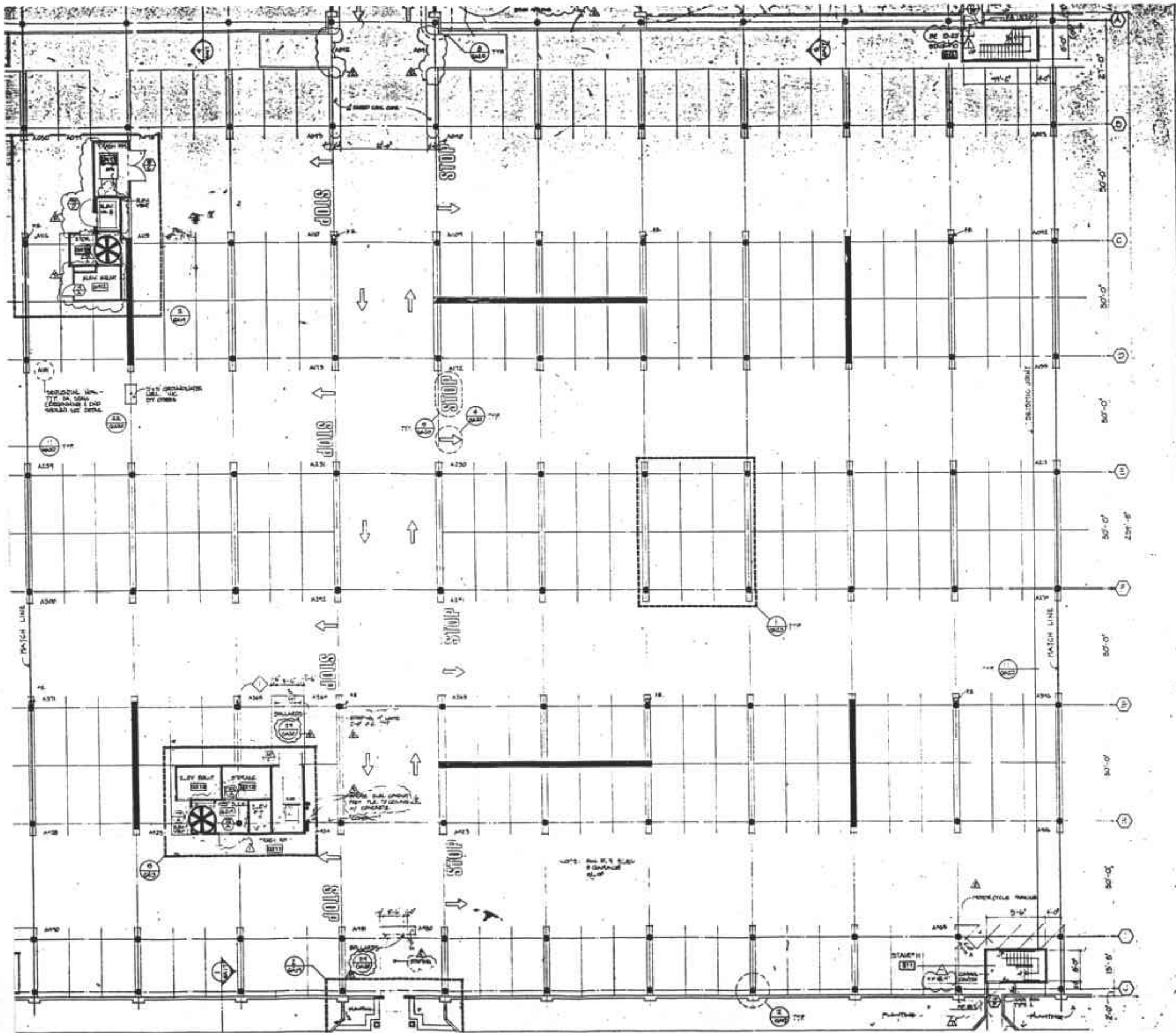


 GAS DETECTOR PROBE

FIGURE 4.
 DETECTOR PROBE LOCATIONS AT
 BAY CENTER APARTMENTS GROUND
 FLOOR GARAGE PLAN NORTH



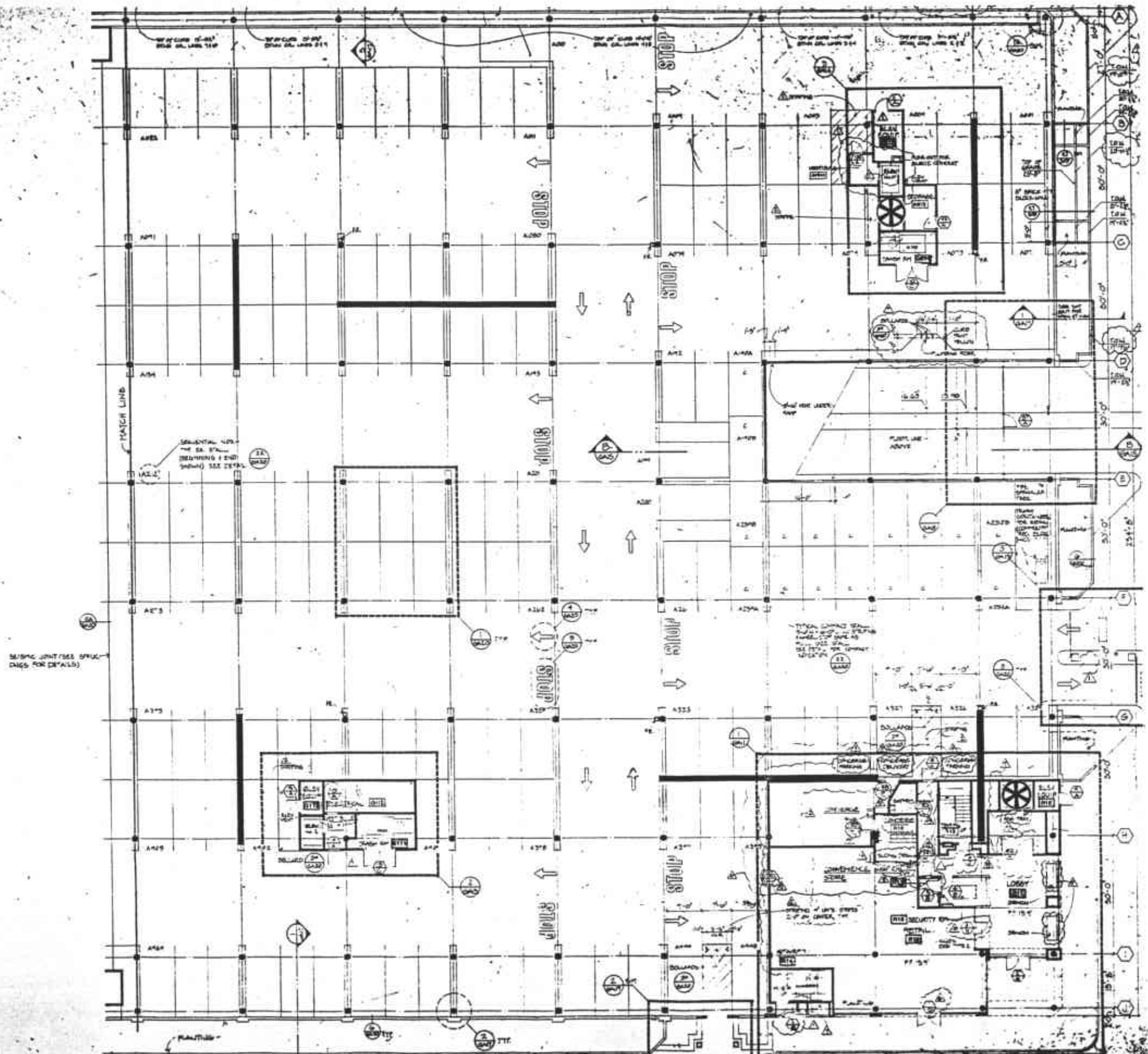
NO
SCALE



 GAS DETECTOR PROBE

FIGURE 5.
GAS DETECTOR PROBE LOCATIONS
AT BAY CENTER APARTMENTS GROUND
FLOOR GARAGE PLAN CENTER.

	 NO SCALE
---	--



 GAS DETECTOR PROBE

FIGURE 6.
 GAS DETECTOR PROBE LOCATIONS
 AT BAY CENTER APARTMENTS GROUND
 FLOOR GARAGE PLAN SOUTH

  NO SCALE

5. GAS MONITORING AND VENTILATION MAINTENANCE RECOMMENDATIONS

GAS DETECTION/ALARM SYSTEM

The Routine Maintenance/Quality Assurance Program will include periodic checks to insure that the system remains on zero and is responsive to gas. The following schedule is recommended:

1. Daily
 - a) Verify pilot light operation. (If the amber light is out, the system is not functioning.)
 - b) Verify recorder operation.
2. Weekly
 - a) Check for meter reading on zero.
3. Quarterly (Recommended to be performed by Gas Tech or other trained personnel.)
 - a) With a known calibration gas sample, recheck and reset sensitivity.
 - b) Expose detector to combustible gas and confirm operability of indication and alarm systems.
4. As required (Recommended to be performed by Gas Tech or other trained personnel.)
 - a) Readjust zero whenever meter drifts more than 5 percent.
 - b) Replace detector whenever it becomes impossible to complete zero or calibration steps.

The gas monitoring system is factory calibrated for the gas or gases that are to be detected. However, the calibration should be checked periodically by trained personnel using a known gas mixture. The procedure is as follows:

1. Zero the meter carefully.
2. Expose detector to calibrating sample and note reading.
3. If reading is not correct, adjust the SPAN potentiometer to give the known reading.

The accessibility of parts through Gas Tech, Inc. should not present any problems. Replacement sensors and chart paper could optionally be kept on site to provide immediate replacement capability.

VENTILATION SYSTEM

Fans and fan connections should be checked monthly to assure proper function. Maintenance should follow the manufacturer's specification. A spare fan or fans could optionally be kept on site to provide immediate replacement capability.

4. HARDWARE SPECIFICATIONS

The system hardware is manufactured and serviced by Gas Tech Inc. in Newark, California. Two (2) Model 1220B gas detection and alarm systems are installed at the Bay Center offices. Two (2) Model 1565-6 gas detection and alarm systems are being installed at the Bay Center apartments. Instruction manuals and schematic installation drawings are provided for the four (4) Gas Tech Inc. detection/alarm systems in the Appendix.

DATA RECORDING

Detectors in the elevator pits will employ recorders to record potential methane gas discharge.

MAINTENANCE REQUIREMENTS

The gas detection unit housing itself requires no normal maintenance. The metallic oxide sensor(s) will normally last for many years. If a replacement is necessary, then a new sensor is substituted, heater voltage is checked and unit is allowed to stabilize for a day or two. It is then necessary to recalibrate using a test gas sample.

The hardware installed at the Bay Center offices and apartments has undergone the initial calibration procedure. Recalibration is recommended according to the maintenance schedule described in Section 5.

TROUBLE SHOOTING

The systems employ a self-activating fail safe protection system. If the pilot light goes out, this provides a visual indication that i) the unit is unplugged, ii) power failure, or iii) one of the sensors has burned out. The amber light can easily be checked daily to assure proper functioning.

Should a problem occur with an individual channel, the trouble can be isolated by switching circuit cards from one position to another. A defective card can be sent to the factory for repairs. Since cards and sensors are calibrated together, both should be sent together if repair is needed.

INSTRUCTION MANUAL

GASTECH GAS ALARM SYSTEM

MODEL 1220B-130263

WALL-MOUNTING TYPE WITH ONE
COMBUSTIBLE GAS DETECTION CIRCUIT
DUAL ALARM WITH LOCK-IN ALARM CIRCUIT
TROUBLE RELAY AND LIGHT
WALL-MOUNTING RECORDER ACCESSORY

SERIAL : 87573 and 87574
VOLTAGE : 115 V 60 Hz
CALIBRATED ON : Methane
ALARM SETTINGS : 5% LEL (Warning)
 : 20% LEL (High)
DETECTOR VOLTAGE : 6.0V DC

MADE BY:

GASTECH INC.
8445 CENTRAL AVENUE
NEWARK, CA 94560
PHONE: (415) 794-6200
FAX: (415) 794-6210
TELEX: 334-462

OPTIONAL FEATURES

The following optional features are available in the Model 1220B. See the checked boxes for identification of the features included in the specific instrument supplied with this manual, serial 87573 and 87574.

<u>Feature</u>	<u>Included</u>	<u>Page Ref.</u>
115/230V AC Power	[X]	1
Standby Power 18-32V DC	[]	2
LEL Circuit, Single Alarm	[]	3
LEL Circuit, Dual Alarm	[X]	3
Meter illumination	[]	
Recorder output (4-20 mA)	[]	2
High alarm relay	[X]	2
Warning alarm relay	[X]	2
Trouble relay	[X]	4
Trouble light	[X]	4
Lock-in alarm	[X]	3
Silence feature	[X]	4
Junction box, detector	[]	5
Sample-drawing adapter	[]	
Recorder accessory	[X]	Supplement

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IV. MAINTENANCE, LEL SECTION	8
V. PARTS LIST	9

SUPPLEMENTARY INSTRUCTIONS

MODEL 1220B SERIAL NOS. 87573 and 87574

RECORDER OUTPUT

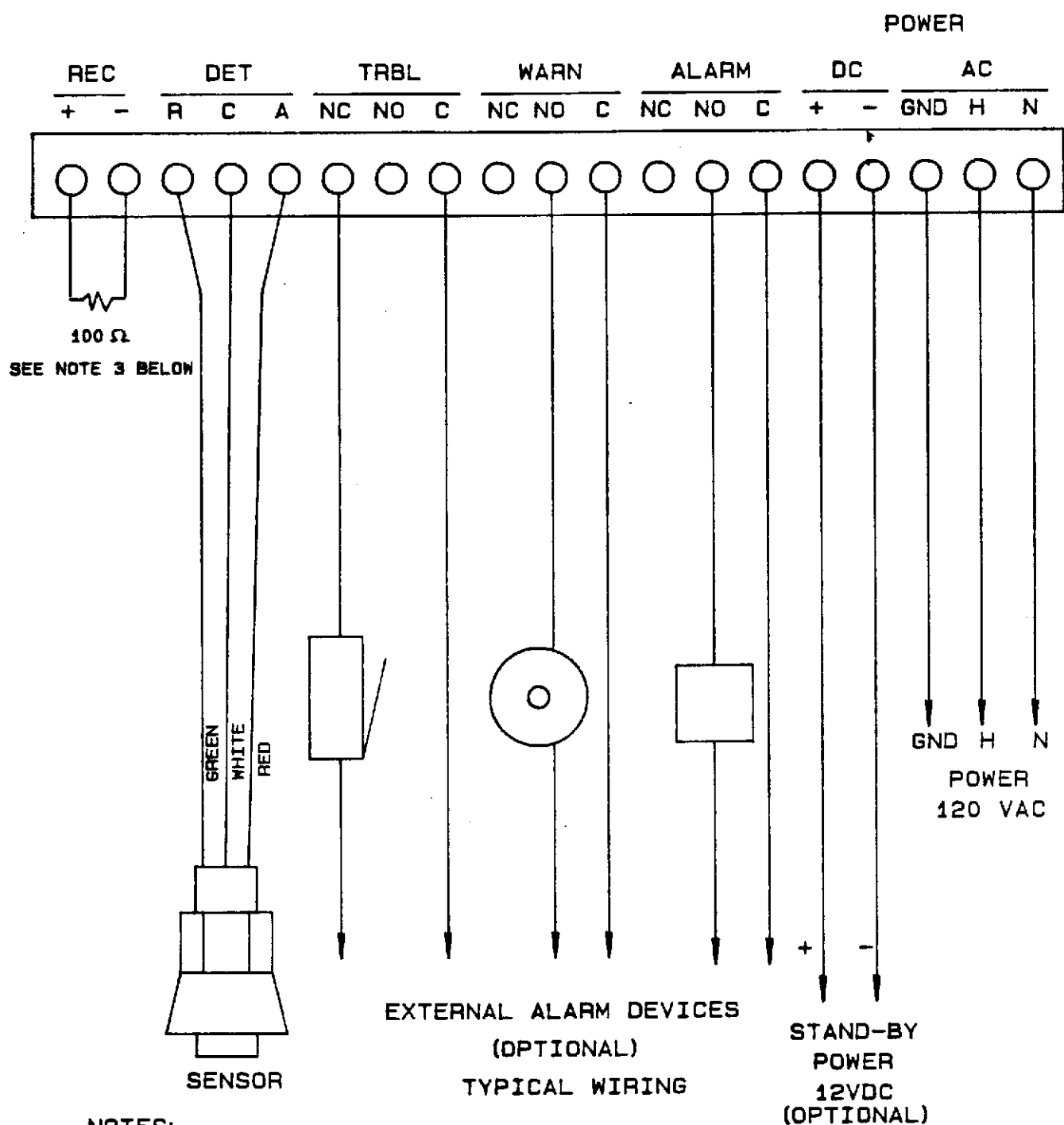
This instrument is a standard Model 1220B which has been modified to provide a 0-1 mA signal at Recorder Output terminals for connection of an external 0-1 mA recorder (See Figure B). Output is in series with meter and 0-1.0 mA signal correspond to the full-scale meter display.

When recorder is connected to its terminals, the entire meter current flows through and is repeated in the recorder. The Rustrak Model 288 Recorder (0-1mA) supplied with this instrument should be connected in this way, with the resistor removed. Full scale of the recorder will track with full scale of the meter.

If recorder is not to be used, then connect a 100 ohm resistor between the recorder terminals to serve as a dummy load. For convenience, a 100 ohm resistor is installed at this point prior to shipment, and must be removed when the recorder is connected.

If preferred, a high-impedance DC millivolt recorder may be used. In this case, a 0-100 millivolt output is produced across the resistor, with the resistor left in place.

In all other respects, this instrument remains as described in accompanying Model 1220 Instruction Manual.



NOTES:

1. ALARM RELAYS ARE ISOLATED FORM C CONTACTS (MAX. . 3AMP)
2. TROUBLE RELAY IS ENERGIZED IN NORMAL OPERATION
3. WITH 100 OHM RESISTOR IN PLACE, RECORDER OUTPUT IS 0-100mV. WITH RESISTOR REMOVED, RECORDER OUTPUT IS 0-1mA. RESISTOR OR 0-1mA RECORDER MUST BE IN PLACE FOR PROPER METER READING.

L.T.R.	REVISION	DO NOT SCALE DRAWING			GASTECH INC. NEWARK, CALIFORNIA 94560	
		DEBURR	BREAK EDGES ± .015 R		TITLE 1220B EXTERNAL WIRING WITH 100Ω RESISTOR ACROSS RECORDER OUTPUT	
		TOLERANCES & FINISHES UNLESS OTHERWISE NOTED:		SCALE NONE	DR. BY MJS	DRAWING NO.
		.XX ± .010	ANGLES ± 0°30'	DATE 8-27-87	CKD. BY BP	3414-A30
		.XXX ± .005	CONC. .010 TR	REV		
		FRACTIONS ± .015	FINISH 125 ✓	REV		
		FINISH FOR 'O' RING GROOVES, 3 SIDES 32 ✓		REV		

INSTRUCTIONS
GASTECH MODEL 4609
EXTERNAL RECORDER ACCESSORY

I. INTRODUCTION

The Model 4609 external recorder accessory consists of a Rustrak Model 288 Strip-Chart Recorder installed in a wall-mounting enclosure complete with terminals for power connection and wiring to the recorder output terminals of a GasTech analyzer.

Full scale of the recorder corresponds to a 0-1 mA signal at the 1mA + and - terminals in the recorder housing. If a resistor has been added in series with the + 1mA terminal, then the range is converted to a voltage dependent upon the resistance. See Section III. B.2: Wiring.

II. DESCRIPTION

A. Housing

The recorder housing is a weather- and corrosion-resistant NEMA 4X case with a hinged, gasketed door and an over-center door latch. It has flanges top and bottom for mounting and a 1/2" conduit hub on bottom for wire entry.

B. When the housing door is unlatched and swung open, the following components can be found:

1. Rustrak Model 288 Recorder, mounted by means of four slotted screws to the back of the housing. See Rustrak Model 288 Recorder Instruction Manual supplied, for further information regarding this recorder.
2. Terminal strip, five point, for connection of 115V AC power and positive (+) and negative (-) recorder output signal lines from the GasTech analyzer. Strip is located directly below the recorder and is covered by a plexiglass shield, mounted on standoffs, to avoid inadvertent contact with high voltage.

III. INSTALLATION

A. Housing (See Figure A)

Mount housing by means of 1/4" screws, through mounting holes, or hang on hooks, on a flat, vertical surface adjacent to the analyzer. Be sure to leave room at the sides for opening door and at bottom for wire entry.

B. Wiring (See Figure B)

1. Connect 115V AC power supply to H (hot) and N (neutral) terminals on the recorder terminal strip.
2. Run two wires from Recorder Output + and - terminals on the analyzer to SIGNAL + and - terminals, respectively, on the recorder terminal strip. Recorder must be supplied with a 0-1 mA signal, corresponding to zero to full scale on the analyzer meter. For GasTech instruments with a standard recorder output of 0-100 mV, a 0-1 mA signal can be produced by removing the 100 ohm resistor connected between the 0-100mV Recorder + and - terminals in the analyzer. This will cause the entire meter current to flow through and be repeated in the recorder.
3. For GasTech instruments having a 0-1 volt output, the recorder is converted to a 0-1 volt range by addition of a 900 ohm resistor in series with the + SIGNAL lead. If supplied with this conversion, the range "0-1 VOLT" will be marked adjacent to terminal strip. However, any 0-1 mA recorder can be converted to 0-1 volt by addition of a 900 ohm resistor.

IV. OPERATION

Supply power to the recorder housing. Full scale of the Recorder will track with full scale of the instrument meter and chart output can be read using meter dial supplied on the recorder, or if chart is removed from recorder, using meter card, a hand-held reproduction of the recorder meter scale.

For full operation of the recorder, see the Rustrak Model 288 Instruction Manual.

V. REPLACEMENT PARTS LIST

<u>Stock Number</u>	<u>Description</u>
82-5053	Model 288 Rustrak Recorder
82-5055	Model 4609 Wall-Mounting Recorder
82-5101	Recorder Chart Paper, style WA

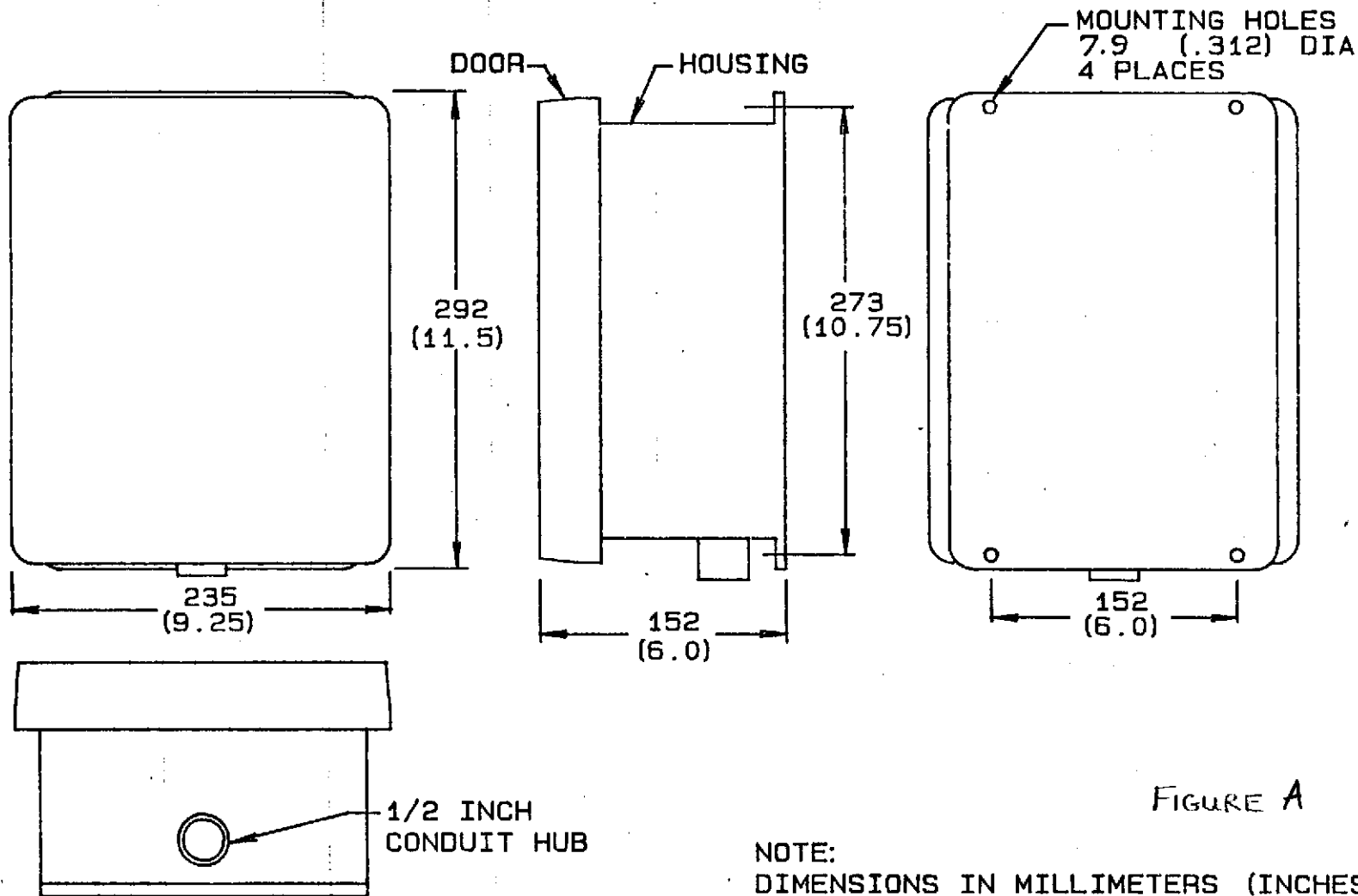
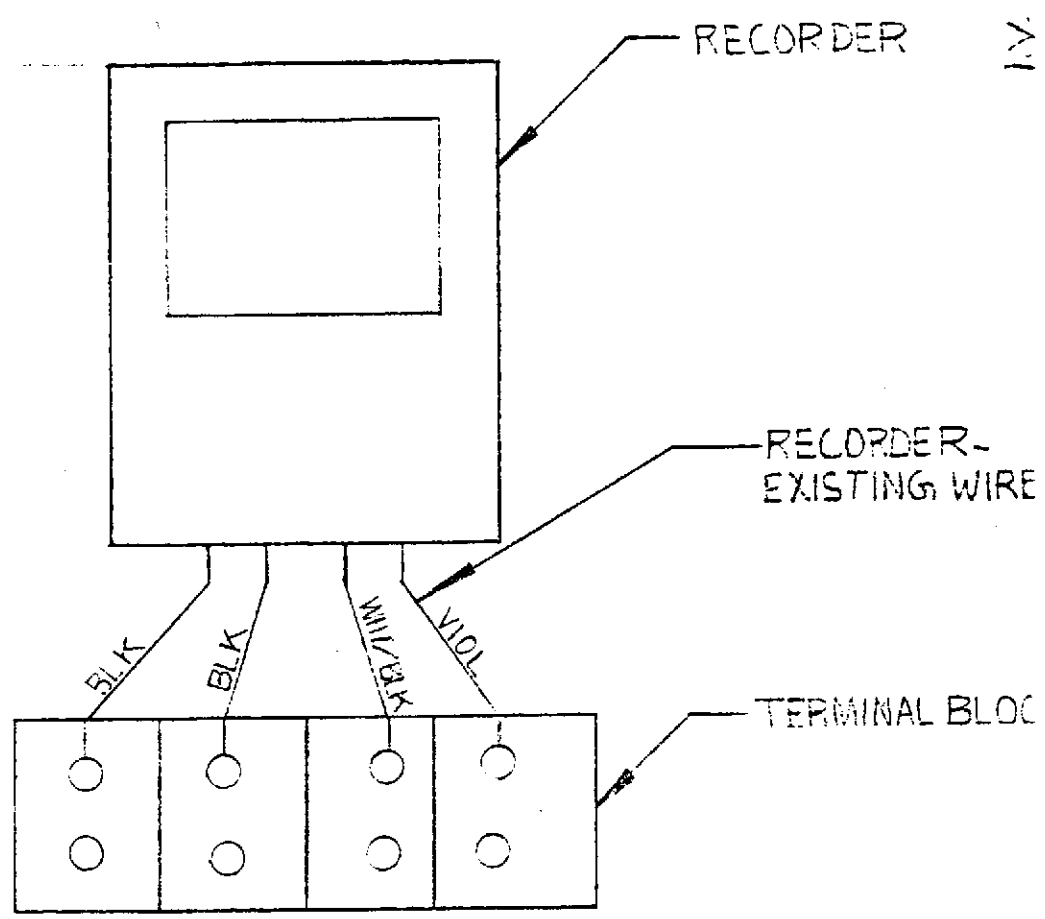


FIGURE A


NOTE:
DIMENSIONS IN MILLIMETERS (INCHES)

LTR.	REVISION	DO NOT SCALE DRAWING		GASTECH	GASTECH INC. NEWARK, CALIFORNIA 94560	
		DEBURR	BREAK EDGES ± .015 R			
		TOLERANCES & FINISHES UNLESS OTHERWISE NOTED:		TITLE <u>RECORDER HOUSING</u>		
		.XX ± .010	ANGLES ± 0°30'	OUTLINE AND MOUNTING DIMENSIONS		
		.XXX ± .005	CONC. .010 TIR	SCALE 1/4	DR. BY <u>KRG</u>	DRAWING NO.
		FRACTIONS ± .015	FINISH #25 ✓	DATE 2/10/87	CK'D. BY <u>BP</u>	44194-A10
		FINISH FOR 'O' RING GROOVES, 3 SIDES 32 ✓				REV.



H	N	-	+
115V. AC POWER		SIGNAL	

FIGURE B

L.T.R.	REVISION	DO NOT SCALE DRAWING			GASTECH INC. NEWARK, CALIFORNIA 94560		
		DEBURR	BREAK EDGES ± .015 R				
		TOLERANCES & FINISHES UNLESS OTHERWISE NOTED: .XX ± .010 ANGLES ± 0°30' .XXX ± .005 CONC. .010 TIR FRACTIONS ± .015 FINISH 125 ✓		TITLE		DRAWING NO.	REV
		FINISH FOR 'O' RING GROOVES. 3 SIDES 32 ✓		WIRING DIAGRAM, RECORDER SCALE NONE DR. BY M.A. DATE 1/30/27 CKD. BY P.P.			

I. GENERAL DESCRIPTION

The Model 1220B Gas Alarm System is a versatile series of diffusion-sampling instruments for detection of combustible gas. Use of modern integrated circuits and a master printed circuit board pre-etched for all possible combinations provides all needed indication, alarm and fail-safe functions with simplicity of operation, durability of construction and low cost.

The following instruction pages relate both to the basic instrument and to those specific circuit functions found in the instrument corresponding to the serial number on the front cover of this manual. See summary on Contents page for listing of the features applicable to this instrument. Additional features not included originally can be added at low cost upon return of the instrument for modification.

A. Basic Instrument

The Model 1220B is a wall-mounting instrument, assembled into a dust-resistant fiberglass case with hinged gasketed door. As generally supplied, the meter, the indicator lights, the reset switch and the alarm buzzer are mounted on the front door.

Indicator lights are of the light indicating diode (LED) type, for long life, ruggedness and low power consumption. Buzzer is a solid-state device with no arcing contacts.

All components except those mentioned above are assembled to the instrument circuit board, which is a heavy-weight epoxy-glass two-sided etched board. Principal circuit components, arranged in groups and with slotted shaft potentiometers identified by etched lettering, are:

1. Power Supply

The basic power supply uses a three-pin voltage regulator integrated circuit to reduce the voltage from a nominal 12 volts DC to a regulated value which may be set between 5.5 and 8.0 volts, to suit the specific detector application. A voltage adjustment potentiometer is used to make the final adjustment at installation.

Generally, the Model 1220B operates from the AC power line, and a step-down transformer and rectifier are included to permit operation from either a 115 or a 230 volt AC power source. Jumpers are soldered to marked terminals to select the input voltage, whether 115 or 230.

When operating from the AC power line, a 12V DC standby power source may also be connected to the DC terminals. This will automatically pick up the load in case the line power fails.

Two fuses are used in the Model 1220B. The AC fuse is a cartridge type, mounted in clips just below the transformer. It protects the AC power circuits. A second fuse of the same type serves the DC circuits, and is mounted just above the power terminal strip.

An optional switching regulator is available to allow DC input voltages in the 18 to 32 volt range. This option allows a standby power of 24V DC to be used instead of the nominal 12V DC.

2. Alarm Relays

Sockets are provided into which relays may be plugged, for control of external alarm circuits. Normally closed and normally open terminals are provided on terminal strip. One socket is included for each level of alarm.

Relays are furnished only when specified, as the basic Model 1220B may be used without auxiliary alarm circuit, since it has light and buzzer indication of combustible gas.

Alarm circuits may be supplied either in self-resetting or in lock-in forms. In the lock-in version, a pushbutton switch is supplied on the front door, which must be pressed to release the alarm circuit after the gas concentration has been reduced below the alarm setting.

See following pages for details of alarm functions as supplied with this specific instrument.

3. Detection Circuit

For details of the detection circuit provided in this specific instrument, see following pages.

4. Recorder Output

Terminals are provided for connection of a separate DC recorder. Standard connection gives an output of 0-100 millivolts corresponding to the meter range of 0-100% LEL.

As an option, the output can be converted to 4-20 mA DC, by an internal change.

B. Detection Circuit

1. Detection Principle

Detection is by catalytic oxidation on a heated platinum element. The element, installed at the point where gas is to be detected, is connected as one leg of a balanced Wheatstone bridge. A second, non-catalytic, element is installed in the same environment for thermal compensation, and the two elements are surrounded by a sintered stainless steel flame arrestor to form a complete detector assembly. The detector connects to marked terminals on the circuit board.

Two fixed precision resistors and a Zero Adjust potentiometer on the circuit board complete the Wheatstone bridge circuit. Output is fed to an operational amplifier which steps the voltage up to the 0-0.5 volt range, for actuation of the meter and the alarm circuits. A Span potentiometer is provided to set the sensitivity to a correct value, using a known calibrating sample.

2. Alarm Circuits

Electronic switching circuits are available, as follows:

- a) High LEL alarm, which can be set to actuate the alarm buzzer (and relay if used) at a preset gas concentration such as 50% LEL. When the alarm level is reached, the HIGH alarm light comes on and the buzzer produces a pulsating sound, which continues as long as the concentration remains above the set point. The relay also pulls in and holds on as long as the alarm condition exists.

If the lock-in feature is included, the alarm circuit holds in until the RESET button is pressed. If concentration remains above the alarm setting, the circuit cannot be reset.

- b) Warning (Low) alarm, which can also be set to actuate the buzzer (and a separate relay, if desired) at a lower gas concentration such as 20% LEL. When this level is reached, the Warn light comes on, and buzzer sounds in the pulsating mode. Also, relay pulls in.

If Silence feature is provided, with lock-in alarm, this is put into effect by pressing the RESET button. This will cause the buzzer to stop sounding, and the relay will be de-energized. However, the WARN light will commence blinking, and stay in this condition until the concentration drops below the alarm setting.

Alarm levels are initially set as shown on the cover page of this manual. However, they are field-adjustable using the corresponding Alarm Set potentiometers.

c) Trouble alarm, is indicated by a steady tone from the buzzer, and by steady illumination of the yellow TROUBLE light, if included. Trouble alarm is put into effect in several ways:

- 1) If circuit is unbalanced in the downscale direction by 10% or more,
- 2) If a break occurs in any of the wires leading to the detector, or within the detector itself,
- 3) In the event of power supply failure, the trouble relay (if used) will be de-energized.

If a trouble relay is included, it will become de-energized, and thus can be used to actuate a remote trouble signal.

2. Meter Indication

The alarm circuits are independent of the meter, and the meter is provided as a convenience in zero and calibration adjustment, as well as a means of evaluating gas concentrations below or above the alarm setting. Meter scale reads 0-100% LEL, with 100% representing the lower explosive limit, the least concentration that will support a self-propagating flame, or explosion, if ignited.

II. INSTALLATION

A. Control Housing

1. Mount the housing to a vertical surface, using screws through holes in mounting flange. (See Figure A). Mount housing at approximately eye level, preferably in a reasonably clean, sheltered area. However, housing is dust- and weather-resistant, so can safely be installed in any suitable instrument location.

B. Combustible Detector

1. Detector assembly is potted into an aluminum or stainless steel casting with flared guard or skirt, used to shed water. It is provided with three connection wires, and the upper end has 1/2" male conduit threads.

Detector may in some cases be screwed directly into the 1/2" conduit opening in the bottom of the control housing. It may be mounted remotely in which case it should be mounted in the lower opening of a 1/2" junction box. Suitable explosionproof boxes are available from GasTech.

Always mount the detector with the sintered metal flame arrestor pointing downward.

Select a detector location that is typical of the atmosphere to be monitored, or is close as possible to the anticipated source of gas. For light gases such as hydrogen or methane, a location close to the ceiling is often chosen. For heavy gases or for vapors from liquids, a position close to the floor is usually used.

C. Wiring (Refer to Figure B)

1. AC Power

Verify that power supply voltage is same as shown on nameplate, whether 115 or 230V AC. Jumpers, below transformer, are used to select proper voltage, and can be changed in the field if necessary.

Connect power to the three AC power terminals H, N, GND. (Note that the adjacent AC fuse is covered with a removable insulating plate to prevent accidental contact with high voltage. All other circuit points are low voltage and may be touched with safety).

2. DC Power

For DC-powered systems, and for installations where stand-by power is needed, connect a 12V DC battery to the 12V DC terminals + and -. Polarity must be correct for proper operation; however, circuit is protected by a diode against damage due to a wrong connection.

3. External Alarms (Optional)

If any external alarm functions are desired, instrument must be equipped with relays. For each alarm function (High, Warning LEL or Trouble) connect through the relay terminals NO, NC, C. NO and C are normally open, connected on alarm. NC and C are normally connected, open on alarm. Trouble relay is energized in normal operation, so NO and C are connected during normal operation. Relays must be installed in sockets for external alarm terminals to be active. If no relay was included in original purchase, it may be ordered from the description on Parts List, Section V.

4. Detector (LEL)

Run three wires from each remote detector to the corresponding terminals in control box, using the following color code (referring to the three wires on detector):

<u>Terminal</u>	<u>Color Code</u>
A	Red
C	White
R	Green

Recommended minimum wire sizes are as follows, for red and green wires:

0 - 200'	-	#16
200 - 500'	-	#14
500 - 1000'	-	#12

The third (white) wire can be as small as #18, for any distance.

When making connections, be sure to use a firm clamp-type connector, or solder the joints. If the #18-0205 junction box is purchased, a suitable terminal block is included.

III. PLACING IN OPERATION

A. LEL Circuits

1. Connect power source, to energize system. Verify operation of pilot light.
2. At this stage, one or more alarms may come on. Inspection of the indicator lights will show which alarm functions have been actuated. Turn ZERO pot to bring meter to approximately zero. If alarm is of lock-in type, press RESET button to reset and silence alarm.
3. Check voltage across detector wires (red and green), at detector. Adjust to value shown on cover (5.5 or 6.0), using the VOLT Adj. potentiometer. This is the small potentiometer mounted as a part of the power supply group, above the heat sink.
4. Allow system to warm up and stabilize for a period of at least 15 minutes, preferably for one to two hours. Then set zero accurately.
5. System is now in operation:
 - a) If gas is detected, meter will show concentration, in percent LEL.
 - b) If Warning alarm level is reached, WARN light will come on and alarm buzzer will sound in pulsing mode. WARN relay, if provided, will also close. If instrument is provided with Lock-in and Silence feature, then pressing RESET at this point will silence audible alarm, de-energize relay and cause light to start blinking. This will continue until gas condition is cleared.
 - c) If High alarm level is reached, HIGH light will come on, and buzzer will again sound. HIGH relay, if provided, will close.

Instrument will remain in High alarm condition until reset, and it cannot be reset if gas concentration persists.
 - d) If any detector is disconnected or broken, a steady alarm tone will result, and TROUBLE light will come on. Trouble relay, if used, will be de-energized.

Same action will occur if either circuit is set down-scale, or drifts below zero by more than 10 percent of scale.

6. Meter Readings

Meter will continuously show output of circuit in percent LEL.

IV. MAINTENANCE, LEL SECTION

A. Calibration

System is factory-calibrated for the gas or gases shown on the front cover of this manual. Calibration should be checked periodically using a known calibrating gas mixture. (Prepared gas mixtures in pressurized disposable cylinders are available from GasTech Inc.). To calibrate:

1. Set zero carefully.
2. Expose detector to calibrating sample and note reading.
3. If reading is not correct, adjust SPAN potentiometer to give desired reading.

B. Alarm Adjustment

System is initially adjusted to the alarm settings shown on front cover. Alarm settings are readily changed in the field, by rotation of the two potentiometers, identified as ALARM and WARN. Adjust by trial, keeping in mind that clockwise rotation raises the alarm setting.

C. Routine Maintenance

Maintenance consists primarily of periodic checks to be sure that system remains on zero, and is responsive to gas. The following schedule is suggested:

1. Daily
 - a) Verify pilot light operation.
2. Weekly
 - a) Check for meter reading on zero.
 - b) Expose detector to combustible gas, and confirm operability of indication and alarm systems.
3. Quarterly
 - a) With known calibrating sample, recheck and reset sensitivity. Sample gas cylinders are available from factory.
4. As required
 - a) Readjust zero whenever meter drifts more than 5%.
 - b) Replace detector whenever it becomes impossible to complete zero or calibration steps.

V. PARTS LIST

<u>Stock No.</u>	<u>Description</u>
43-0431	Switch, reset (for instruments with lock-in alarm)
43-4110	Fuse, DC, 3AG 1/2A
43-4140	Fuse, Power, 3AG 1A
44-0100	Relay, Plug-in
48-0925	Transformer, Signal DPC 16-640
50-1230	Meter
51-0531	Pilot Light, Green
51-0535	Alarm Light, Red
51-0536	Warn Light, Amber
51-0537	Trouble Alarm, Yellow
52-1005	Buzzer
57-5109	Voltage Regulator
61-0101	Detector Assembly, conduit-mounting
81-0221	Calibration kit, (specify serial number of instrument, gas to be detected)

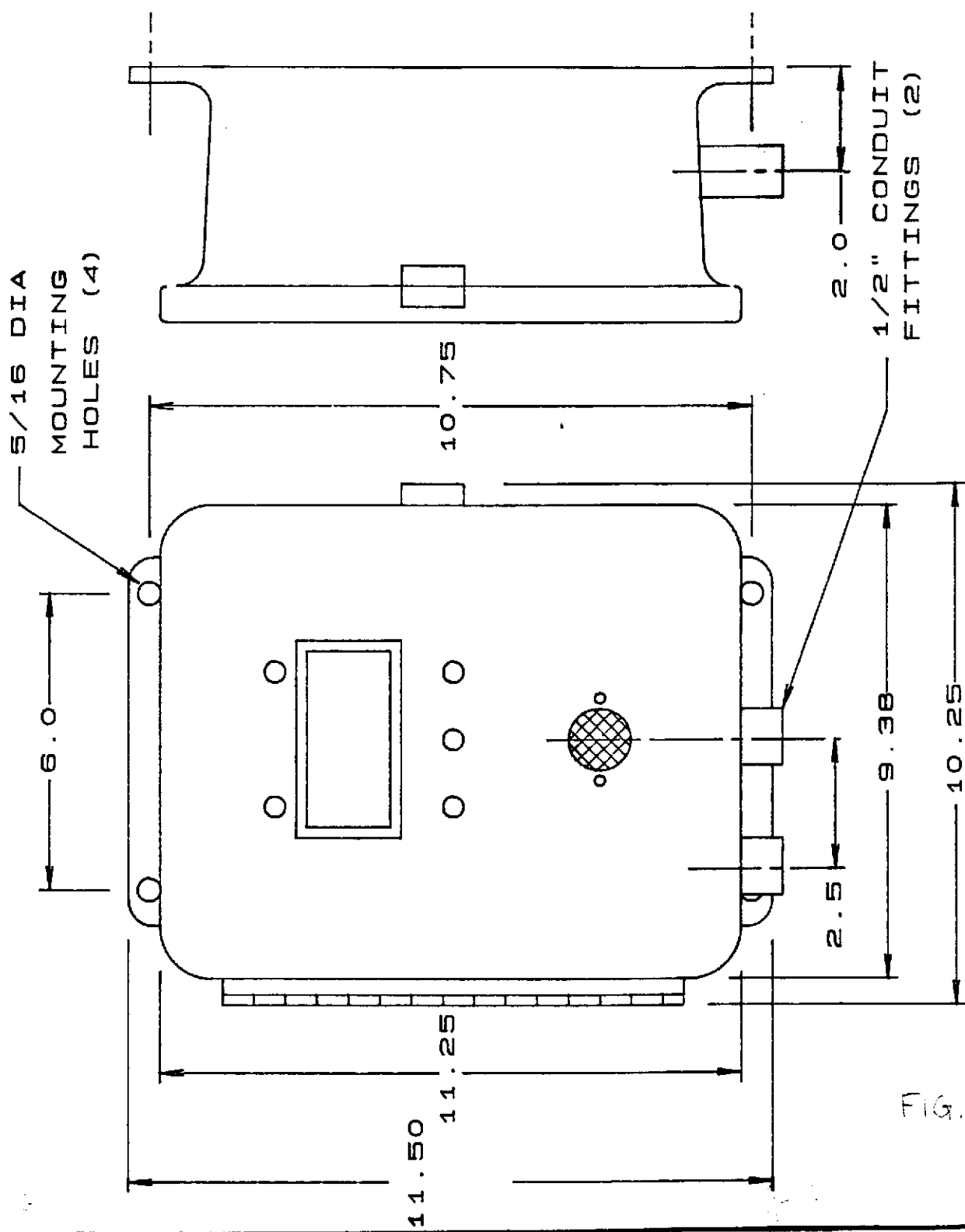
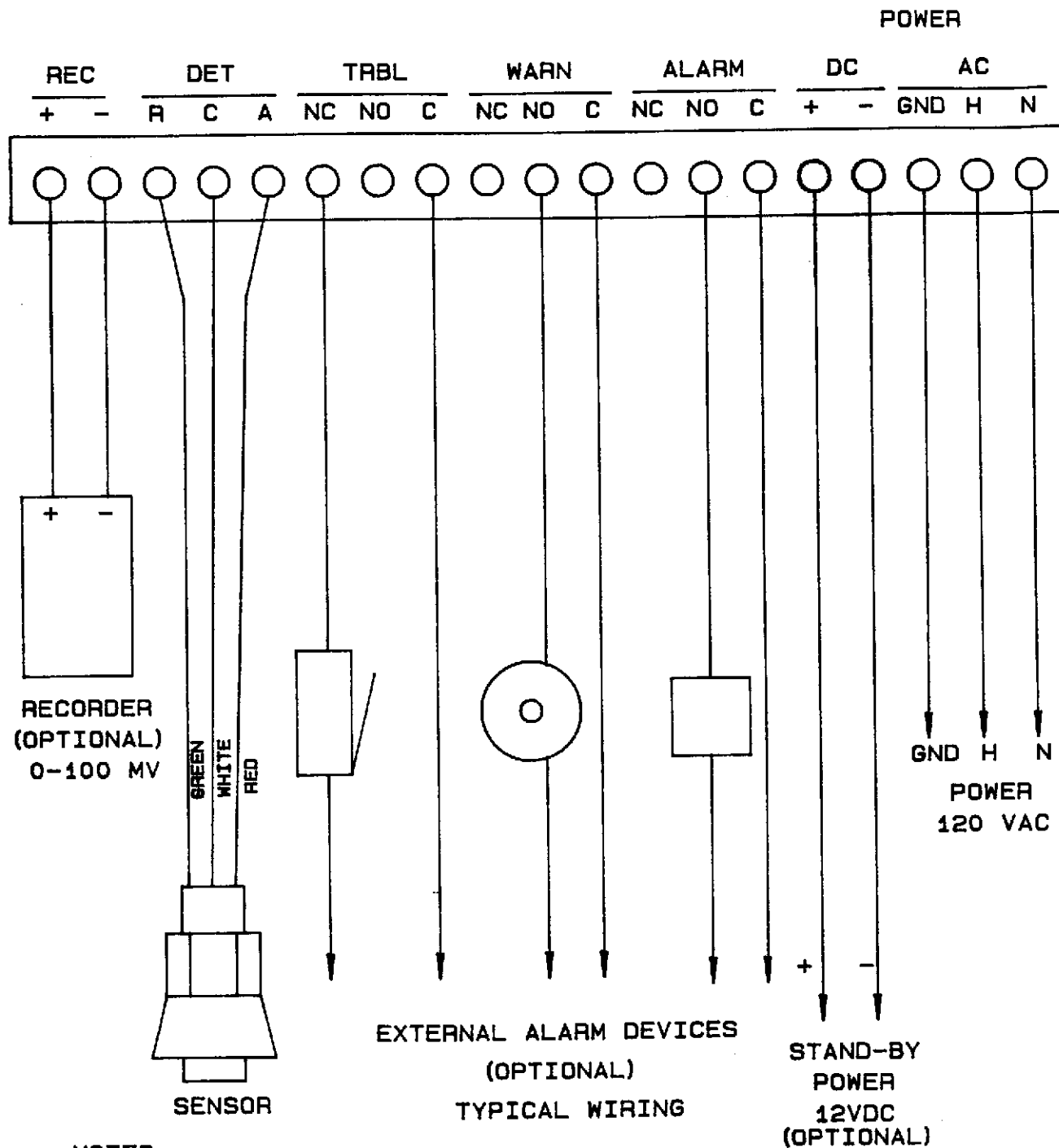


FIG. A

TR.	REVISION	DO NOT SCALE DRAWING		GASTECH	GASTECH INC. NEWARK, CALIFORNIA 94560			
	A	MISSING 2-3-87 BP REDRAWN 3-8-87 KRG	DEBURR					BREAK EDGES ± .015 R
		TOLERANCES & FINISHES UNLESS OTHERWISE NOTED:			SCALE NONE	DR. BY FM	DRAWING NO.	REV.
		.XX ± .010	ANGLES ± 0°30'		DATE 9-19-84	CKD. BY R	3414-A6	A
		.XXX ± .005	CONC. .010 TIR					
		FRACTIONS ± .015	FINISH 125 ✓					
		FINISH FOR 'O' RING GROOVES, 3 SIDES 32 ✓						

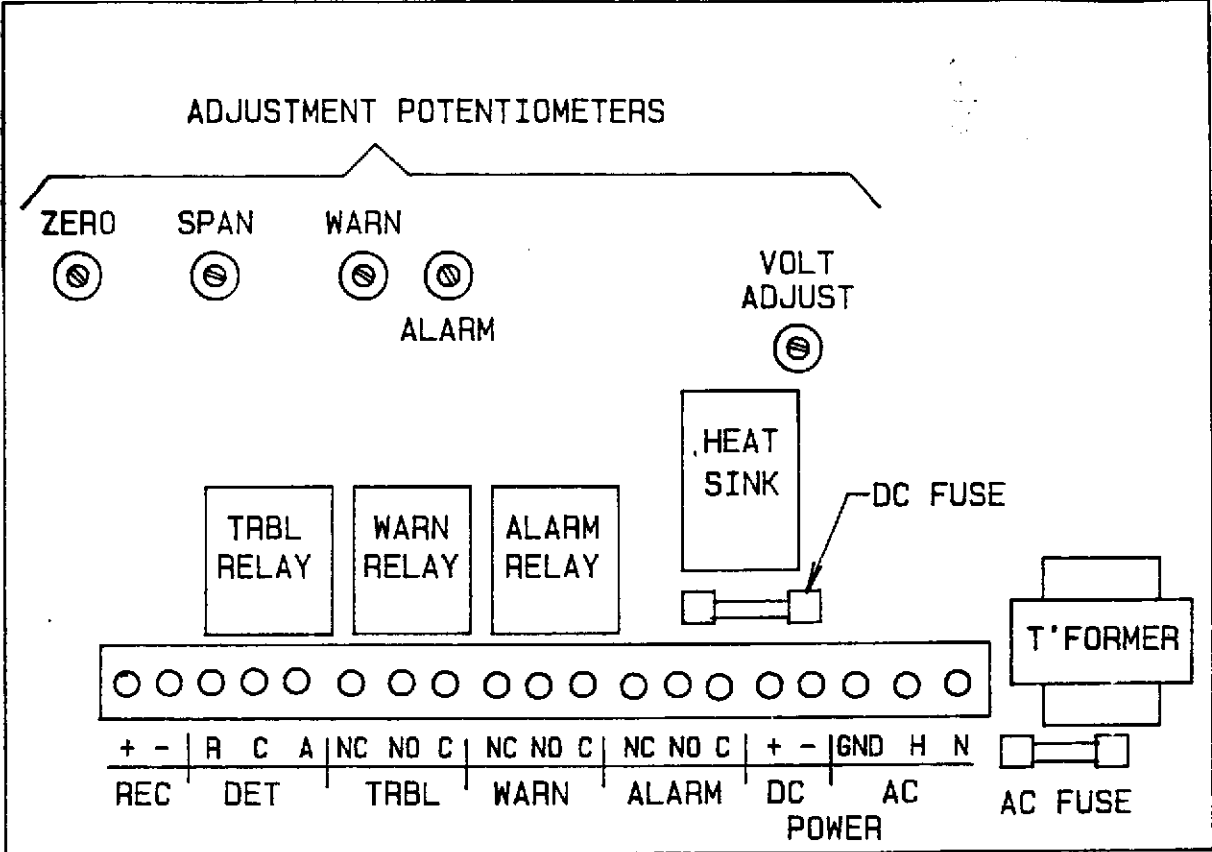


NOTES:

1. ALARM RELAYS ARE ISOLATED FORM C CONTACTS (MAX. 3AMP)
2. TROUBLE RELAY IS ENERGIZED IN NORMAL OPERATION

FIGURE B

LTR.	REVISION	DO NOT SCALE DRAWING		GASTECH INC.	
		DEBURR BREAK EDGES ± .015 R		MOUNTAIN VIEW, CALIFORNIA 94043	
		TOLERANCES & FINISHES UNLESS OTHERWISE NOTED:		TITLE MODEL 1220B	
		.XX ± .010 ANGLES ± 0°30'	EXTERNAL WIRING DIAGRAM		
		.XXX ± .005 CONC. .010 TIR	SCALE NONE	DR. BY <i>DMW</i>	DRAWING NO.
		FRACTIONS ± .015 FINISH 125 ✓	DATE 9-19-84	CKD. BY <i>DMW</i>	3414-A7
		FINISH FOR 'O' RING GROOVES, 3 SIDES 32 ✓			REV

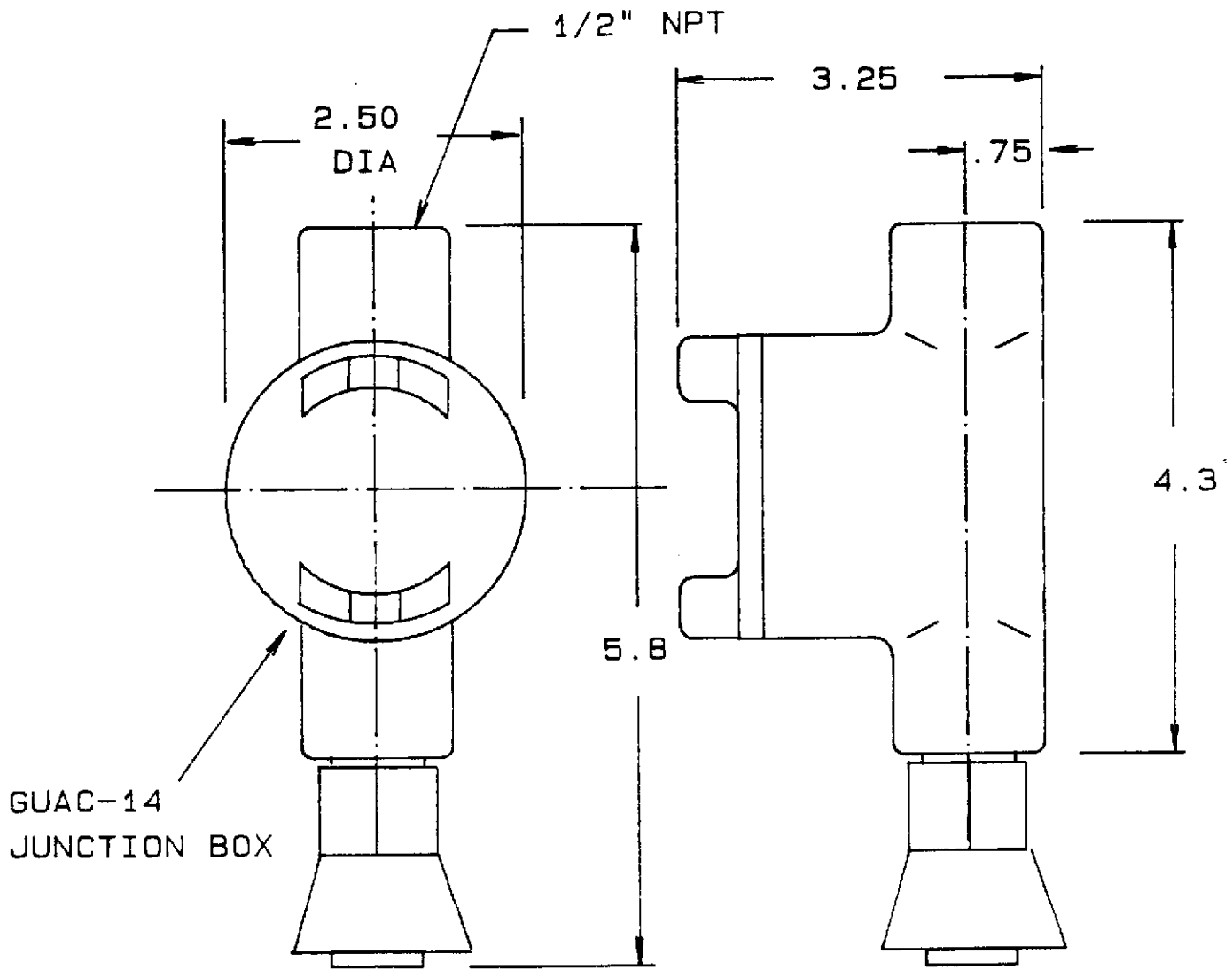


NOTE:

1. RELAY CONTACTS ARE FORM "C" ISOLATED
RATED AT 3 AMPS INDUCTIVE LOAD
2. TROUBLE RELAY IS ENERGIZED DURING NORMAL OPERATION

FIGURE C

L.T.R.	REVISION	DO NOT SCALE DRAWING			GASTECH INC.			
	A MISSING 2-13-87 BP REDEANN 5-8-87 KBG	DEBURR	BREAK EDGES ± .015 R		NEWARK, CALIFORNIA 94560			
		TOLERANCES & FINISHES UNLESS OTHERWISE NOTED:		TITLE MODEL 1220 B				
		.XX ± .010	ANGLES ± 0°30'	COMPONENT LOCATION				
		.XXX ± .005	CONC. .010 TIR	SCALE NONE	DR. BY FM	DRAWING NO.	REV.	
		FRACTIONS ± .015	FINISH 125 ✓	DATE 9-19-84	CKD. BY BP	3414-A3	A	
		FINISH FOR 'O' RING GROOVES. 3 SIDES 32 ✓						



NOTES:

1. MOUNT ASSEMBLY IN POSITION SHOWN USING CLAMPS ON 1/2" CONDUIT.
2. ALL DIMENSIONS IN INCHES

WEIGHT:

1.75 LBS.
0.8 KILO

FIGURE D

REVISION B REDRAWN TO CORRECT OUTLINE 9/1/87 KBG	DO NOT SCALE DRAWING			GASTECH INC. NEWARK, CALIFORNIA 94560	
	DEBURR	BREAK EDGES ± .015 R			
	TOLERANCES & FINISHES UNLESS OTHERWISE NOTED:				
	XX ± .010	ANGLES ± 0°30'			
	.XXX ± .005	CONC. .010 TR	TITLE OUTLINE AND MTG. DIMENSIONS DETECTOR / J-BOX CLASS I GRP. C/D		
	FRACTIONS ± .015	FINISH 125 ✓	SCALE 0.7	DR. BY KBG	DRAWING NO.
	FINISH FOR O' RING GROOVES. 3 SIDES 32 ✓		DATE 9.1.87	CKD. BY BP	1295-A20
					REV. R

SERVICE POLICY

GasTech Inc. maintains an instrument service facility at the factory. Some GasTech distributors also have repair facilities; however, GasTech assumes no liability for service performed by other than GasTech personnel. Should your instrument require non-warranty repair, you may contact the distributor from which it was purchased, or you may contact GasTech directly.

If GasTech is to do the repair work for you, you may send the instrument, prepaid, to GasTech Inc., 8445 Central Avenue, Newark, CA 94560, Attn: Service Department. Always include your address, purchase order number, shipping and billing information and a description of the defect as you perceive it. If you wish to set a limit to the authorized repair cost, state a "not to exceed" figure. If you must have a price quotation before you can authorize the repair cost, so state, but understand that this involves extra cost and extra handling delay. GasTech's policy is to perform all needed repairs to restore the instrument to full operating condition, including reactivation of all out-of-warranty electrochemical cells.

To expedite the repairs operation, it is preferable to call in advance to GasTech Customer Service, (415)794-6200, obtain a Return Authorization Number (RA#), describe the nature of the problem and provide a purchase order number.

If this is the first time you are dealing directly with the factory, you will be asked to provide credit references or prepay, or authorize COD shipment.

Pack the instrument and all its accessories (preferably in its original packing). Enclose your Purchase Order, shipping and billing information, RA#, and any special instructions.

GasTech Inc.

Standard Warranty

Gas Detection Instruments

We warrant gas alarm equipment manufactured and sold by us to be free from defects in materials, workmanship and performance for a period of one year from date of shipment to ultimate user. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, f.o.b. factory. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired or replaced on a routine basis. Such items may include:

- a) Lamp bulbs and fuses
- b) Pump diaphragms and valves
- c) Absorbent cartridges
- d) Filter elements
- e) Batteries
- f) Most catalytic and electrochemical sensors are covered by a separate warranty of 6, 12, or 24 months.

Warranty is voided by abuse including rough handling, mechanical damage, alteration or repair procedures not in accordance with instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs or contingent expenses incurred without our prior approval.

GasTech Inc.'s obligation under this warranty shall be limited to repairing or replacing any product which GasTech Inc. Material Review Board examination shall disclose to its satisfaction to have been defective. To receive warranty consideration, all products must be returned to GasTech Inc. at its manufacturing facilities with transportation charges prepaid.

This warranty is expressly in lieu of any and all other warranties and representations, expressed or implied, and all other obligations or liabilities on the part of GasTech Inc. including but not limited to, the warranty of fitness for a particular purpose. In no event shall GasTech Inc. be liable for direct, incidental or consequential loss or damage of any kind connected with the use of its products or failure of its product to function or operate properly.

This warranty covers instruments and parts sold (to users) only by authorized distributors, dealers and representatives as appointed by Gas Tech.

INSTRUCTION MANUAL
MODEL 1565-6
GASTECH MULTICHANNEL SOLVENT VAPOR ALARM
WITH DUAL LEVEL ALARM

SERIAL : 86886

POWER : 115V AC 60 Hz

<u>Channel</u>	<u>Calibrated for</u>	<u>Alarm #1 Setting</u>	<u>Alarm #2 Setting</u>	<u>Sensor Type/No.</u>	<u>Sensor Voltage</u>
1	Methane	5% LEL	20% LEL	813/2098	5.0
2	"	"	"	813/2102	"
3	"	"	"	813/2103	"
4	"	"	"	813/2104	"
5	"	"	"	813/2107	"
6	Not Furnished				

GASTECH, INC.
8445 CENTRAL AVENUE
NEWARK, CALIFORNIA 94560
PHONE (415) 794-6200

I. INTRODUCTION

The Model 1565 Solvent Vapor Alarm is a warning system for toxic or flammable gases or vapors in a workspace. It monitors the ambient atmosphere and actuates audible and visual signals if the gas or vapor concentration exceeds a preset level. The multi-channel, dual level alarm Model 1565 has provision for up to six independent points of detection, each of which may be independently calibrated and set for a high and a low alarm level. All channels actuate one common audible alarm signal, two common alarm relays (one for each level of alarm), and also share a common trouble relay.

I. DESCRIPTION

The Model 1565 utilizes a solid-state metallic-oxide semiconductor detecting element which undergoes a drastic change in resistance when exposed to solvent vapors. This change in resistance is used to produce a DC voltage signal, and to actuate an alarm at a preset level.

The multi-channel instrument is housed in a surface-mounting molded fiberglass case with mounting flanges at top and bottom. It is normally secured to a wall at an appropriate height by means of four screws. The sensing element is connected to a cable or conduit which enters the housing through holes provided by the factory, unless otherwise specified by the customer.

On the front of housing, visible through a transparent window, will be noted the following components:

- a) Pilot light, amber, to show that power is on and that channel is in operation.
- b) Alarm lights, red, two per channel, to show that instrument is in alarm condition.

These lights are mounted on the edge of the circuit card for each channel, so are present only for active channels.

The following will be noted in lower portion of front door, set flush in an opening in door:

- c) Buzzer, solid state, to produce a pulsating signal whenever the instrument is in alarm condition.

When housing is opened, by releasing latch and swinging door open, the following further components will be seen:

- d) Main circuit board, which includes the power and alarm components, the sockets and terminals including the six circuit card sockets into which the channel circuit boards plug. These components include:
 - 1) Channel sockets, edge-type circuit card connectors, one for each channel. They mount the circuit cards in position so that the lights are visible through window when cover is closed. All sockets are prewired for the maximum number of channels.
 - 2) Transformer, which provides low voltage for operation of the six detection channels.
 - 3) Terminals, for connection of external alarm circuits, power and sensors.
 - 4) Three relays, plug-in double-throw type. One relay is activated whenever any one of the six channels is in alarm #1 condition. The second relay is activated whenever any one of the six channels is in alarm #2 condition. The third relay is normally activated, and will de-activate to indicate any trouble in the system, such as a power failure or a disconnected sensor.
- e) Channel Circuit Card, one per channel, is a plug-in module which includes all necessary electronic elements to provide regulated power to the detector, respond to signals from the detector and actuate the alarm circuits if gas is detected. Principal components of interest from the standpoint of operation and maintenance are:

- 1) Pilot light, amber, an LED-type angle-mounted indicator that comes on when the channel is energized and in operation.
- 2) Alarm lights, red, two per channel, similar indicator lights that come on whenever the channel is in alarm condition. Just one (#1) alarm light on indicates the gas level has exceeded its low alarm preset value and both red lights on (#1 plus #2) means it has exceeded its high alarm preset value. All three lights are mounted at edge of board for good visibility from the front of housing.
- 3) Alarm adjust potentiometers, angle-mounted controls positioned at edge of board for easy adjustment when the housing is opened. These are the primary operating controls and are used to set the alarm to be actuated at preset levels of gas concentration.
- 4) Sensitivity adjust, factory set, used to set basic amplifier gain corresponding to gas to be detected. This is factory set, and is normally left in original position. It can be adjusted by use of a long narrow screwdriver to reach the lower edge of board.
- 5) Voltage adjust, a multi-turn potentiometer in the power supply circuit, is used to set the operating voltage of sensor. This control is just below pilot light.
- 6) Test jacks, + and -, into which voltmeter test prods can be plugged for checking output during calibration, are also provided along outer edge of circuit card, where they are accessible while housing cover is removed.

III. INSTALLATION

A. Control Housing

1. Mount the housing to a vertical surface, using screws through holes in mounting flanges, as shown in Fig. A. Mount housing at approximately eye level in the most central convenient location, preferably in a reasonably clean, sheltered area. However, housing is dust- and weather-resistant, so can safely be installed in any suitable instrument location. If housing does not already have conduit or cable openings in the bottom, these should be drilled prior to mounting the housing.

B. Detectors

1. Detectors are of the plug-in type, and install in an MS 3106A-14S-6S socket, supplied.
Socket can be mounted to a junction box cover or to a similar flat surface. Please refer to Figure D at the end of this manual for mounting dimensions.

2. Mount the detector to a vertical or horizontal surface, using screws provided. Choose a detector location that is representative of the area to be monitored, and where the detector is protected from water spray and from mechanical damage.
3. As supplied, detector is furnished connected to a socket with short wires which are color-coded to indicate required connection. A 4-point screw terminal block is attached, for convenient connection to interconnecting wiring.

C. Wiring (See Fig. 2)

1. Bring AC power wiring into housing and connect to AC power terminals H and N, with grounded neutral to N. Verify that voltage matches nameplate, 115 or 230 volts 50/60 Hz.
2. Run four wires to each remote detector, using minimum wire size as follows, for various maximum distances.

<u>Terminal</u>	<u>Color</u>	<u>20'</u>	<u>50'</u>	<u>100'</u>	<u>500'</u>
A	Red	20	18	16	14
B	White	20	20	20	18
C	Green	20	20	20	18
D	Black	20	18	16	14

Larger wires can always be used without difficulty. Wires can be run in conduit or cable, and shielding is not required.

3. Connect external alarm circuits as desired, using NC-NO-C terminals of ALARM and TROUBLE (FAILURE) relays. These terminals serve all circuit cards in common. Alarm relays are normally de-energized, and energize in case of alarm at any point. Thus an external circuit connected through NO and C will be turned on in alarm; a circuit connected through NC and C will be energized except on alarm. If an external trouble alarm is desired, connect it in the same way. However, remember that the trouble relay is energized in normal operation, so NO and C are connected except during malfunction conditions.

IV. PLACING IN OPERATION

- A. If they have been removed, plug circuit cards into corresponding sockets. Note that detectors and circuit cards are tested and calibrated in sets, so should be kept together for best results.
- B. Connect AC power. For each circuit card, amber pilot will come on, and soon the red light and the buzzer will come on. This alarm condition is a normal warmup reaction, and may continue for several minutes.
- C. Check heater voltage for each detector, at the detector, by measuring between A and D (red and black wires). The desired voltage is marked on front page. It is adjustable by turning the VOLT ADJ Potentiometer (see Fig. B). Turn counter clockwise to increase.
- D. Temporarily disconnect the red or black wire leading to one detector; note that pilot light goes out after a moment, and Trouble relay is de-energized. This shows the action in case of sensor failure or a break in wiring to detector.
- E. Instrument is now ready to operate, and will monitor continuously without attention.
- F. Expose small sample of vapor to open end of each detector. Verify that alarm comes on.

V. MAINTENANCE

The Model 1565 requires no normal maintenance.

Output may be checked by plugging a 5 V. meter into the test jacks. Normal reading on fresh air is less than 2 volts.

Alarm setting may be changed as desired, but do not change it unless a test gas sample is available. Calibration gas kits and cylinders are available from GasTech, Inc. Kit includes an adapter and a humidifier, since compressed gas samples must be humidified for normal response.

Allow sample to flow at a low rate (0.5 scfh) through humidifier and then over porous metal surface of sensing element. Watch meter and observe when meter reading stabilizes. Then turn ALARM potentiometer clockwise until alarm just comes on. See Fig. B for location of Alarm #1 and Alarm #2 potentiometers.

Recommended alarm #1 setting is about 3.0 volts. Alarm #2 voltage setting will depend on the gas concentration that it is calibrated to, but will always be higher than Alarm #1 voltage. Output at the alarm level can be adjusted by use of the sensitivity potentiometer. This should only be changed after careful tests with a calibration sample.

Sensor normally will last for many years. If replacement is necessary, however, all that should be required is to connect new sensor, check heater voltage as described in part C section IV, allow to stabilize for a day or two, and recalibrate using a test gas sample as described above.

For problem with any one channel, it should be possible to isolate the trouble to that channel by switching circuit cards from one position to another. A defective card can be sent back for repair. Since cards and sensors are calibrated together, they should be kept together whenever possible, and the card and detector should be returned together for repair and calibration.

Note: The pilot light in the Model 1565 comes on only when the instrument is in normal operation, with the sensor connected. Thus an unplugged, disconnected or burned-out sensor will cause the pilot light to go out. Do not attempt to use or rely on instrument unless the amber pilot light is showing.

VI. PARTS LIST

<u>STOCK NO.</u>	<u>DESCRIPTION</u>
61-1121	Detector, plug-in (specify required calibration)
44-0100	Relay, plug-in
44-0101	Relay, plug-in, sealed
72-1565	Circuit card
81-1565	Calibration Kit (specify gas and desired alarm point.)

When ordering parts or accessories, always specify model and serial number of instrument.

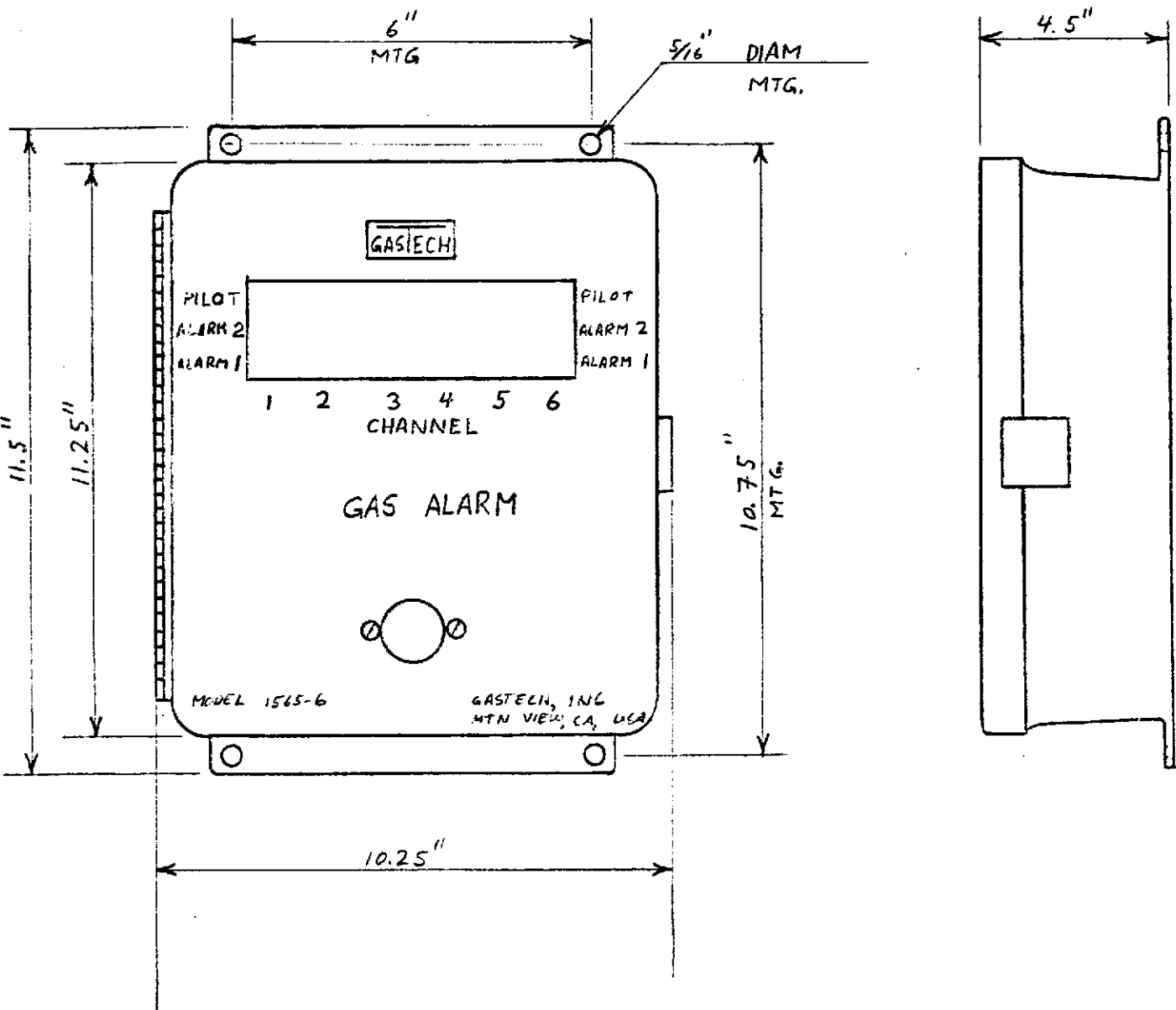


FIG. A

REVISIONS	GASTECH INC. JOHNSON INSTRUMENT DIV. MOUNTAIN VIEW, CALIFORNIA		
	TITLE 1565-6 DUAL ALARM OUTLINE & MTG. DIM		
	SCALE NONE	DR. BY BP	DRAWING NO. 1994-A19

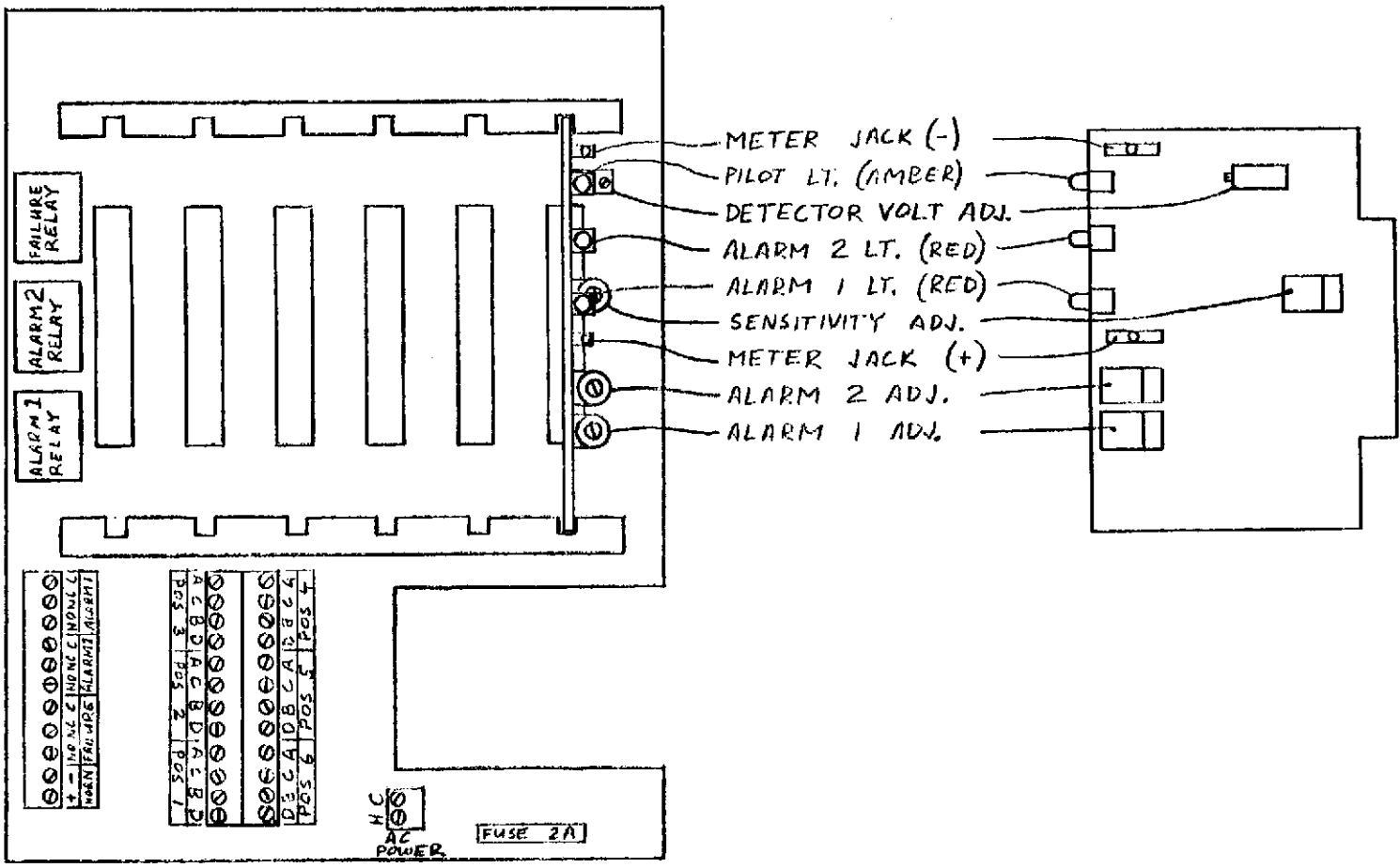


FIG. B

REVISIONS		GASTECH INC.	
		JOHNSON INSTRUMENT DIV.	
		MOUNTAIN VIEW, CALIFORNIA	
		TITLE CONTROLS LAYOUT	
SCALE 1/2	DR. BY BP	DRAWING NO. 1994-A20	
		DATE 10/18/50	

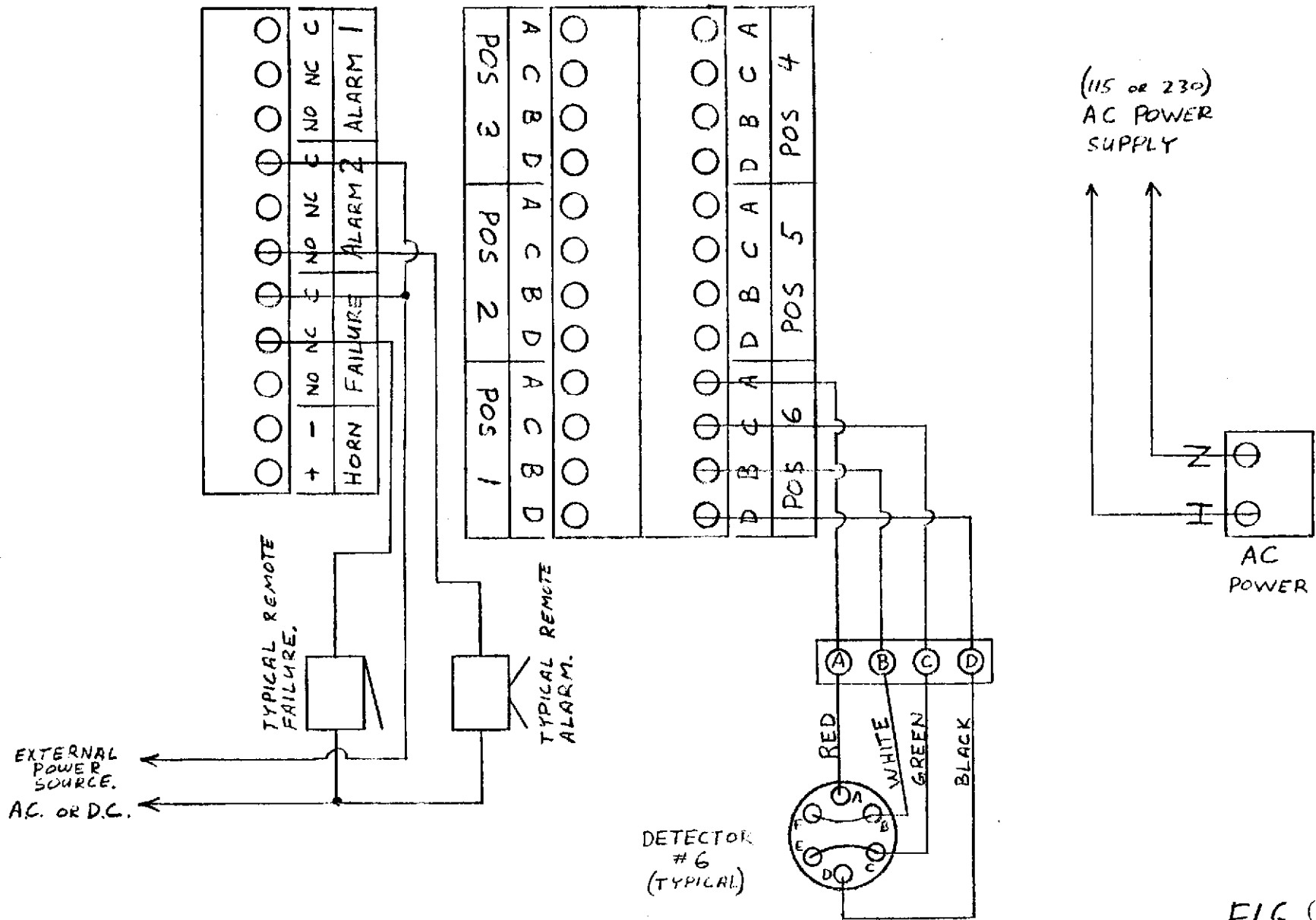
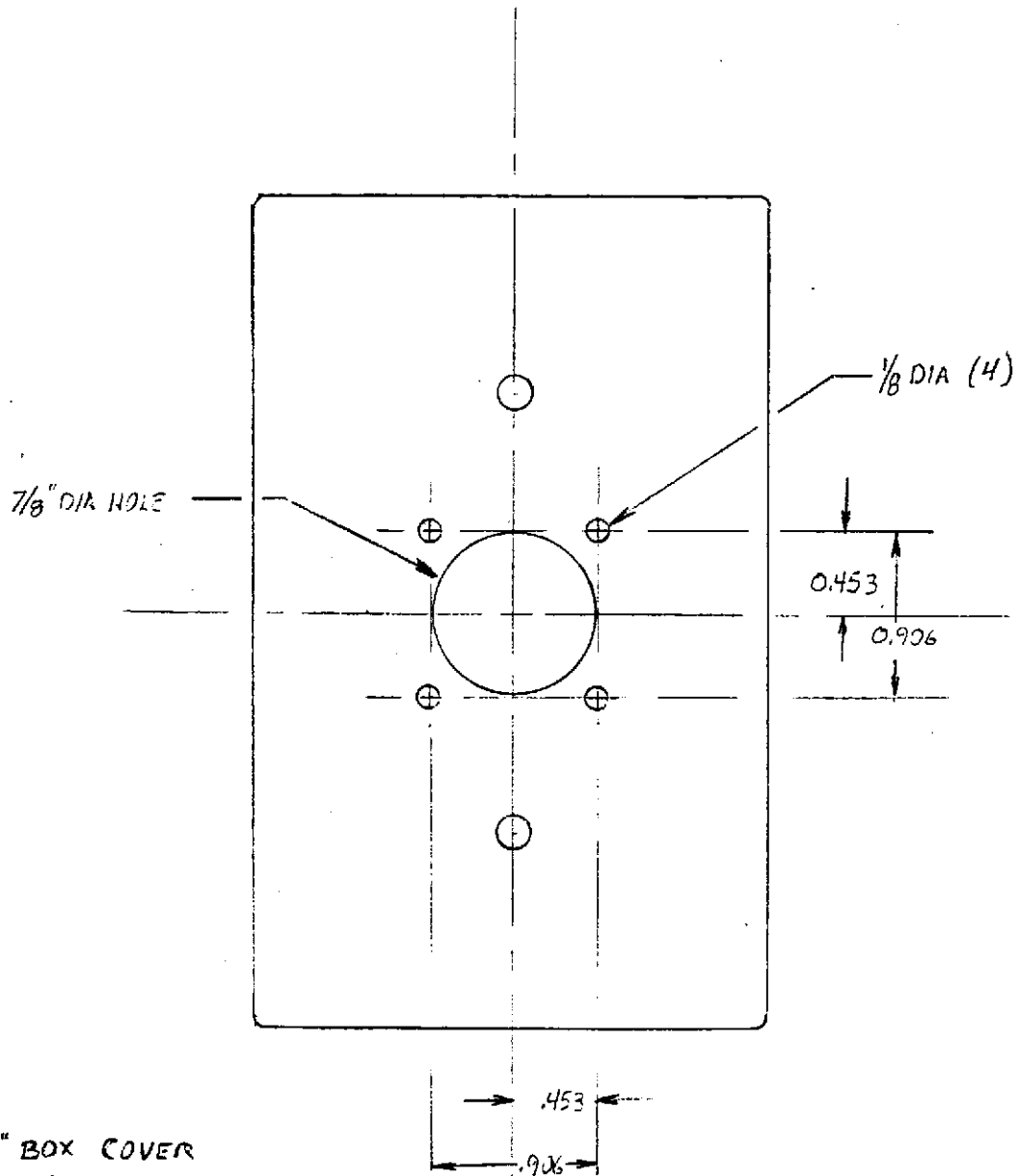


FIG. C

REVISIONS	GASTECH INC.		
	JOHNSON INSTRUMENT DIV.		
	MOUNTAIN VIEW, CALIFORNIA		
	TITLE		
	1565-6 EXTERNAL WIRING		
	SCALE NONE	DR. BY BP	DRAWING NO.
			1001-A21



MATERIAL: "J" BOX COVER
(STAINLESS)

FINISH: PRESERVE EXISTING

DIMENSIONS PERTAIN TO
SOCKET MOUNTING ONLY

FIG. D

STOCK NO. 18-0327

REVISIONS	GASTECH INC.		
	JOHNSON INSTRUMENT DIV.		
	MOUNTAIN VIEW, CALIFORNIA		
	TITLE		
	DETECTOR MOUNT PLATE DRILLING		
	SCALE FULL	DR. BY DMW	DRAWING NO.
	DATE 7-12-72	CK'D. BY RM	1738-A 11

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To expedite the repairs operation, it is preferable to call in advance to GasTech Customer Service, (415)794-6200, obtain a Return Authorization Number (RA#), describe the nature of the problem and provide a purchase order number.

If this is the first time you are dealing directly with the factory, you will be asked to provide credit references or prepay, or authorize COD shipment.

Pack the instrument and all its accessories (preferably in its original packing). Enclose your Purchase Order, shipping and billing information, RA#, and any special instructions.

GasTech Inc.

Standard Warranty

Gas Detection Instruments

We warrant gas alarm equipment manufactured and sold by us to be free from defects in materials, workmanship and performance for a period of one year from date of shipment to ultimate user. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, f.o.b. factory. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired or replaced on a routine basis. Such items may include:

- a) Lamp bulbs and fuses
- b) Pump diaphragms and valves
- c) Absorbent cartridges
- d) Filter elements
- e) Batteries
- f) Most catalytic and electrochemical sensors are covered by a separate warranty of 6, 12, or 24 months.

Warranty is voided by abuse including rough handling, mechanical damage, alteration or repair procedures not in accordance with instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs or contingent expenses incurred without our prior approval.

GasTech Inc.'s obligation under this warranty shall be limited to repairing or replacing any product which GasTech Inc. Material Review Board examination shall disclose to its satisfaction to have been defective. To receive warranty consideration, all products must be returned to GasTech Inc. at its manufacturing facilities with transportation charges prepaid.

This warranty is expressly in lieu of any and all other warranties and representations, expressed or implied, and all other obligations or liabilities on the part of GasTech Inc. including but not limited to, the warranty of fitness for a particular purpose. In no event shall GasTech Inc. be liable for direct, incidental or consequential loss or damage of any kind connected with the use of its products or failure of its product to function or operate properly.

This warranty covers instruments and parts sold (to users) only by authorized distributors, dealers and representatives as appointed by GasTech.

INSTRUCTION MANUAL
MODEL 1565-6
GASTECH MULTICHANNEL SOLVENT VAPOR ALARM
WITH DUAL LEVEL ALARM

SERIAL : 86885

POWER : 115V AC 60 Hz

<u>Channel</u>	<u>Calibrated for</u>	<u>Alarm #1 Setting</u>	<u>Alarm #2 Setting</u>	<u>Sensor Type/No.</u>	<u>Sensor Voltage</u>
1	Methane	5% LEL	20% LEL	813/2108	5.0
2	"	"	"	813/2109	"
3	"	"	"	813/2110	"
4	"	"	"	813/2112	"
5	"	"	"	813/2115	"
6	Not Furnished				

GASTECH, INC.
8445 CENTRAL AVENUE
NEWARK, CALIFORNIA 94560
PHONE (415) 794-6200

I. INTRODUCTION

The Model 1565 Solvent Vapor Alarm is a warning system for toxic or flammable gases or vapors in a workspace. It monitors the ambient atmosphere and actuates audible and visual signals if the gas or vapor concentration exceeds a preset level. The multi-channel, dual level alarm Model 1565 has provision for up to six independent points of detection, each of which may be independently calibrated and set for a high and a low alarm level. All channels actuate one common audible alarm signal, two common alarm relays (one for each level of alarm), and also share a common trouble relay.

I. DESCRIPTION

The Model 1565 utilizes a solid-state metallic-oxide semiconductor detecting element which undergoes a drastic change in resistance when exposed to solvent vapors. This change in resistance is used to produce a DC voltage signal, and to actuate an alarm at a preset level.

The multi-channel instrument is housed in a surface-mounting molded fiberglass case with mounting flanges at top and bottom. It is normally secured to a wall at an appropriate height by means of four screws. The sensing element is connected to a cable or conduit which enters the housing through holes provided by the factory, unless otherwise specified by the customer.

On the front of housing, visible through a transparent window, will be noted the following components:

- a) Pilot light, amber, to show that power is on and that channel is in operation.
- b) Alarm lights, red, two per channel, to show that instrument is in alarm condition.

These lights are mounted on the edge of the circuit card for each channel, so are present only for active channels.

The following will be noted in lower portion of front door, set flush in an opening in door:

- c) Buzzer, solid state, to produce a pulsating signal whenever the instrument is in alarm condition.

When housing is opened, by releasing latch and swinging door open, the following further components will be seen:

- d) Main circuit board, which includes the power and alarm components, the sockets and terminals including the six circuit card sockets into which the channel circuit boards plug. These components include:
 - 1) Channel sockets, edge-type circuit card connectors, one for each channel. They mount the circuit cards in position so that the lights are visible through window when cover is closed. All sockets are prewired for the maximum number of channels.
 - 2) Transformer, which provides low voltage for operation of the six detection channels.
 - 3) Terminals, for connection of external alarm circuits, power and sensors.
 - 4) Three relays, plug-in double-throw type. One relay is activated whenever any one of the six channels is in alarm #1 condition. The second relay is activated whenever any one of the six channels is in alarm #2 condition. The third relay is normally activated, and will de-activate to indicate any trouble in the system, such as a power failure or a disconnected sensor.
- e) Channel Circuit Card, one per channel, is a plug-in module which includes all necessary electronic elements to provide regulated power to the detector, respond to signals from the detector and actuate the alarm circuits if gas is detected. Principal components of interest from the standpoint of operation and maintenance are:

- 1) Pilot light, amber, an LED-type angle-mounted indicator that comes on when the channel is energized and in operation.
- 2) Alarm lights, red, two per channel, similar indicator lights that come on whenever the channel is in alarm condition. Just one (#1) alarm light on indicates the gas level has exceeded its low alarm preset value and both red lights on (#1 plus #2) means it has exceeded its high alarm preset value. All three lights are mounted at edge of board for good visibility from the front of housing.
- 3) Alarm adjust potentiometers, angle-mounted controls positioned at edge of board for easy adjustment when the housing is opened. These are the primary operating controls and are used to set the alarm to be actuated at preset levels of gas concentration.
- 4) Sensitivity adjust, factory set, used to set basic amplifier gain corresponding to gas to be detected. This is factory set, and is normally left in original position. It can be adjusted by use of a long narrow screwdriver to reach the lower edge of board.
- 5) Voltage adjust, a multi-turn potentiometer in the power supply circuit, is used to set the operating voltage of sensor. This control is just below pilot light.
- 6) Test jacks, + and -, into which voltmeter test prods can be plugged for checking output during calibration, are also provided along outer edge of circuit card, where they are accessible while housing cover is removed.

III. INSTALLATION

A. Control Housing

1. Mount the housing to a vertical surface, using screws through holes in mounting flanges, as shown in Fig. A. Mount housing at approximately eye level in the most central convenient location, preferably in a reasonably clean, sheltered area. However, housing is dust- and weather-resistant, so can safely be installed in any suitable instrument location. If housing does not already have conduit or cable openings in the bottom, these should be drilled prior to mounting the housing.

B. Detectors

1. Detectors are of the plug-in type, and install in an MS 3106A-14S-6S socket, supplied.

Socket can be mounted to a junction box cover or to a similar flat surface. Please refer to Figure D at the end of this manual for mounting dimensions.

2. Mount the detector to a vertical or horizontal surface, using screws provided. Choose a detector location that is representative of the area to be monitored, and where the detector is protected from water spray and from mechanical damage.
3. As supplied, detector is furnished connected to a socket with short wires which are color-coded to indicate required connection. A 4-point screw terminal block is attached, for convenient connection to interconnecting wiring.

C. Wiring (See Fig. 2)

1. Bring AC power wiring into housing and connect to AC power terminals H and N, with grounded neutral to N. Verify that voltage matches nameplate, 115 or 230 volts 50/60 Hz.
2. Run four wires to each remote detector, using minimum wire size as follows, for various maximum distances.

<u>Terminal</u>	<u>Color</u>	<u>20'</u>	<u>50'</u>	<u>100'</u>	<u>500'</u>
A	Red	20	18	16	14
B	White	20	20	20	18
C	Green	20	20	20	18
D	Black	20	18	16	14

Larger wires can always be used without difficulty. Wires can be run in conduit or cable, and shielding is not required.

3. Connect external alarm circuits as desired, using NC-NO-C terminals of ALARM and TROUBLE (FAILURE) relays. These terminals serve all circuit cards in common. Alarm relays are normally de-energized, and energize in case of alarm at any point. Thus an external circuit connected through NO and C will be turned on in alarm; a circuit connected through NC and C will be energized except on alarm. If an external trouble alarm is desired, connect it in the same way. However, remember that the trouble relay is energized in normal operation, so NO and C are connected except during malfunction conditions.

IV. PLACING IN OPERATION

- A. If they have been removed, plug circuit cards into corresponding sockets. Note that detectors and circuit cards are tested and calibrated in sets, so should be kept together for best results.
- B. Connect AC power. For each circuit card, amber pilot will come on, and soon the red light and the buzzer will come on. This alarm condition is a normal warmup reaction, and may continue for several minutes.
- C. Check heater voltage for each detector, at the detector, by measuring between A and D (red and black wires). The desired voltage is marked on front page. It is adjustable by turning the VOLT ADJ Potentiometer (see Fig. B). Turn counter clockwise to increase.
- D. Temporarily disconnect the red or black wire leading to one detector; note that pilot light goes out after a moment, and Trouble relay is de-energized. This shows the action in case of sensor failure or a break in wiring to detector.
- E. Instrument is now ready to operate, and will monitor continuously without attention.
- F. Expose small sample of vapor to open end of each detector. Verify that alarm comes on.

V. MAINTENANCE

The Model 1565 requires no normal maintenance.

Output may be checked by plugging a 5 V. meter into the test jacks. Normal reading on fresh air is less than 2 volts.

Alarm setting may be changed as desired, but do not change it unless a test gas sample is available. Calibration gas kits and cylinders are available from GasTech, Inc. Kit includes an adapter and a humidifier, since compressed gas samples must be humidified for normal response.

Allow sample to flow at a low rate (0.5 scfh) through humidifier and then over porous metal surface of sensing element. Watch meter and observe when meter reading stabilizes. Then turn ALARM potentiometer clockwise until alarm just comes on. See Fig. B for location of Alarm #1 and Alarm #2 potentiometers.

Recommended alarm #1 setting is about 3.0 volts. Alarm #2 voltage setting will depend on the gas concentration that it is calibrated to, but will always be higher than Alarm #1 voltage. Output at the alarm level can be adjusted by use of the sensitivity potentiometer. This should only be changed after careful tests with a calibration sample.

Sensor normally will last for many years. If replacement is necessary, however, all that should be required is to connect new sensor, check heater voltage as described in part C section IV, allow to stabilize for a day or two, and recalibrate using a test gas sample as described above.

For problem with any one channel, it should be possible to isolate the trouble to that channel by switching circuit cards from one position to another. A defective card can be sent back for repair. Since cards and sensors are calibrated together, they should be kept together whenever possible, and the card and detector should be returned together for repair and calibration.

Note: The pilot light in the Model 1565 comes on only when the instrument is in normal operation, with the sensor connected. Thus an unplugged, disconnected or burned-out sensor will cause the pilot light to go out. Do not attempt to use or rely on instrument unless the amber pilot light is showing.

VI. PARTS LIST

<u>STOCK NO.</u>	<u>DESCRIPTION</u>
61-1121	Detector, plug-in (specify required calibration)
44-0100	Relay, plug-in
44-0101	Relay, plug-in, sealed
72-1565	Circuit card
81-1565	Calibration Kit (specify gas and desired alarm point.)

When ordering parts or accessories, always specify model and serial number of instrument.

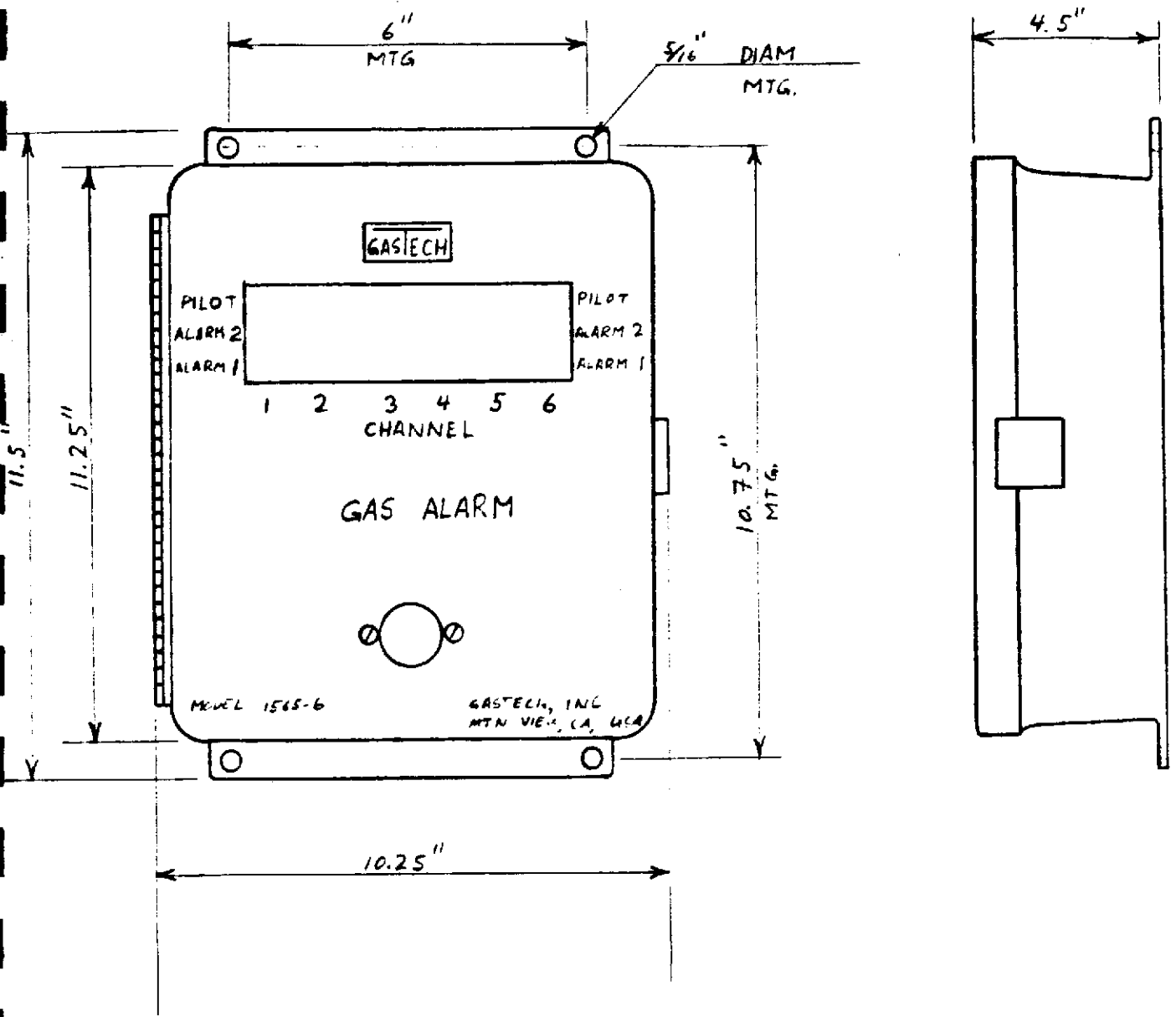


FIG. A

REVISIONS	GASTECH INC.		
	JOHNSON INSTRUMENT DIV.		
	MOUNTAIN VIEW, CALIFORNIA		
	TITLE 1565-6 DUAL ALARM OUTLINE & MTG. DIA		
	SCALE NONE	DR. BY BP	DRAWING NO.
			1994 - A19

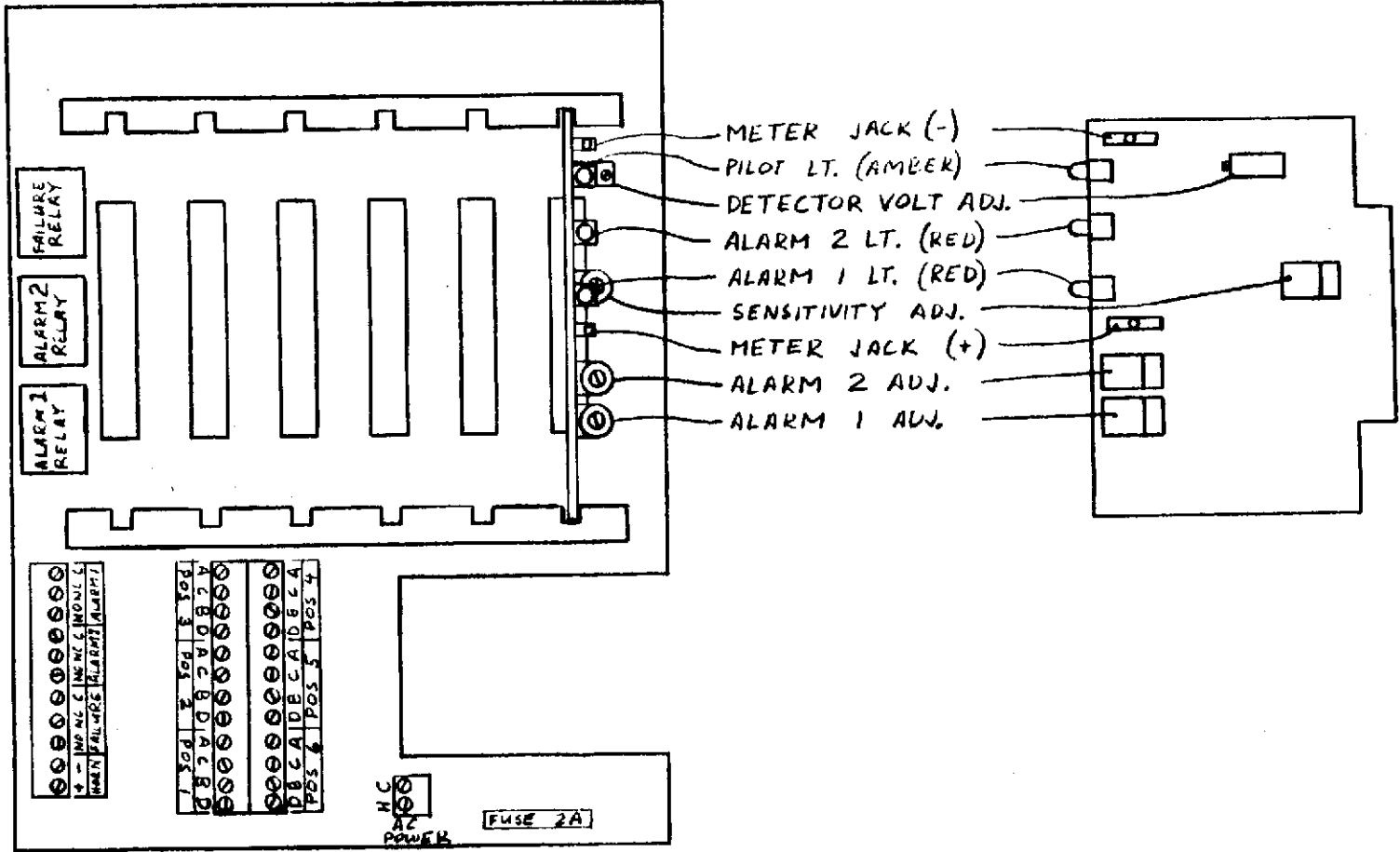


FIG. B

REVISIONS		GASTECH INC.	
		JOHNSON INSTRUMENT DIV.	
		MOUNTAIN VIEW, CALIFORNIA	
		TITLE CONTROLS LAYOUT	
		SCALE 1/2	DR. BY BP
		DRAWING NO. 1994-A20	

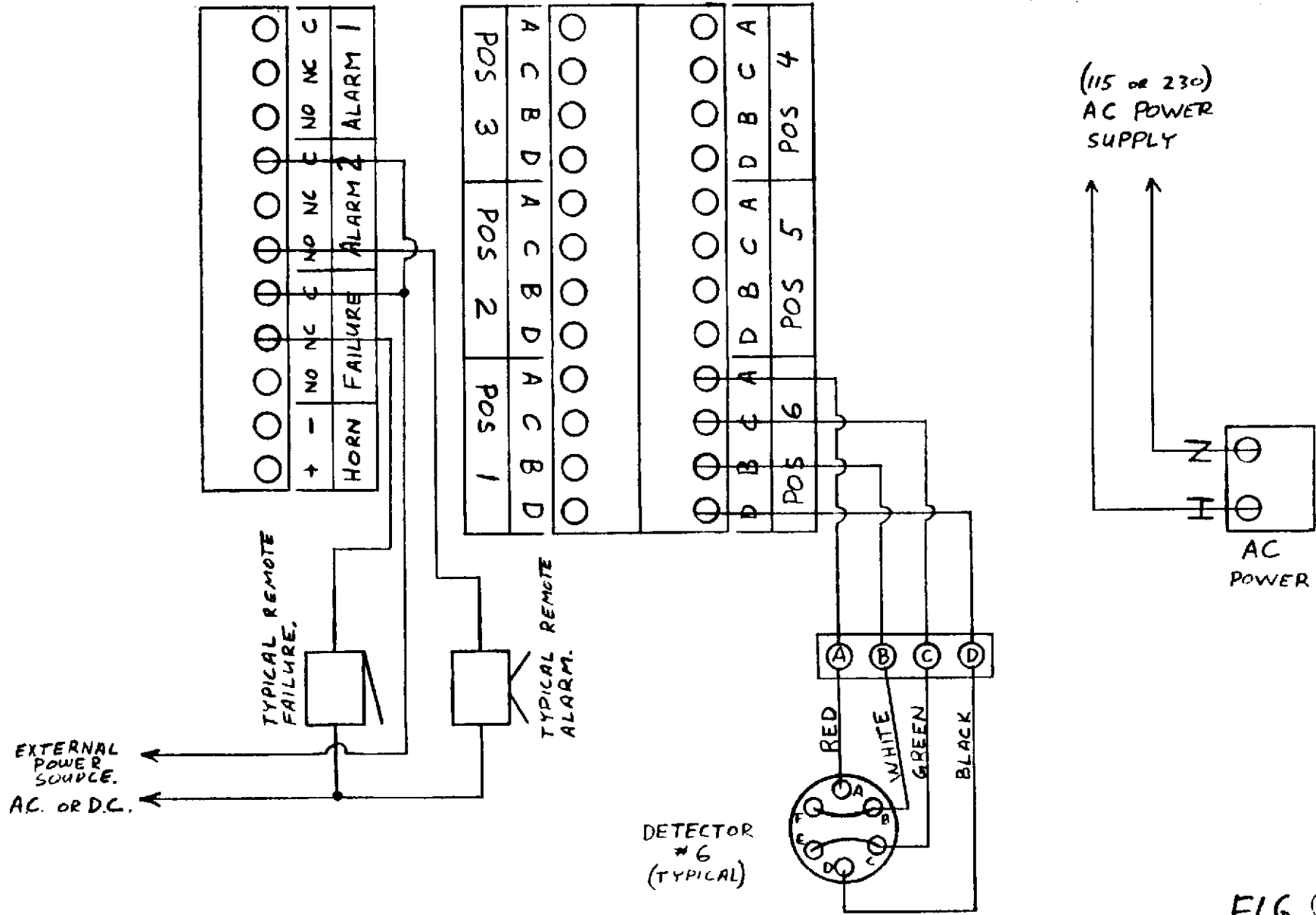
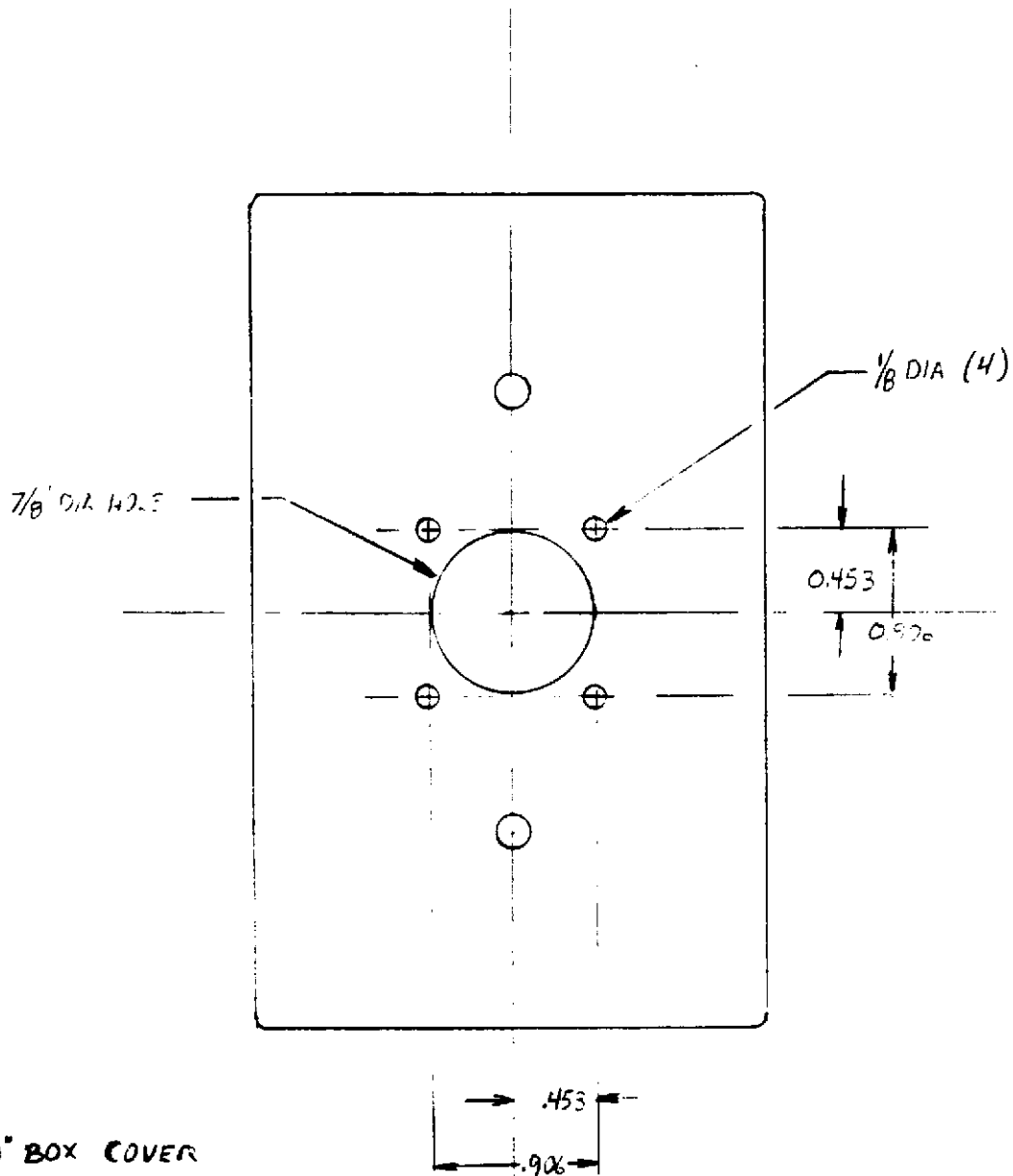


FIG. C

REVISIONS		GASTECH INC.	
		JOHNSON INSTRUMENT DIV.	
		MOUNTAIN VIEW, CALIFORNIA	
TITLE		1565-6 EXTERNAL WIRING	
SCALE NONE	DR. BY BP	DRAWING NO.	
		1994-A21	



MATERIAL: "J" BOX COVER
(STAINLESS)

FINISH: PRESERVE EXISTING
DIMENSIONS PERTAIN TO
SOCKET MOUNTING ONLY

FIG. D

STOCK NO. 18-0327

REVISIONS	GASTECH INC.		
	JOHNSON INSTRUMENT DIV.		
	MOUNTAIN VIEW, CALIFORNIA		
	TITLE DETECTOR MOUNT PLATE DRILLING		
	SCALE FULL	DR. BY DMJ	DRAWING NO.
DATE 7-10-78	CK'D. BY RA	1738-A11	

SERVICE POLICY

GasTech Inc. maintains an instrument service facility at the factory. Some GasTech distributors also have repair facilities; however, GasTech assumes no liability for service performed by other than GasTech personnel. Should your instrument require non-warranty repair, you may contact the distributor from which it was purchased, or you may contact GasTech directly.

If GasTech is to do the repair work for you, you may send the instrument, prepaid, to GasTech Inc., 8445 Central Avenue, Newark, CA 94560, Attn: Service Department. Always include your address, purchase order number, shipping and billing information and a description of the defect as you perceive it. If you wish to set a limit to the authorized repair cost, state a "not to exceed" figure. If you must have a price quotation before you can authorize the repair cost, so state, but understand that this involves extra cost and extra handling delay. GasTech's policy is to perform all needed repairs to restore the instrument to full operating condition, including reactivation of all out-of-warranty electrochemical cells.

To expedite the repairs operation, it is preferable to call in advance to GasTech Customer Service, (415)794-6200, obtain a Return Authorization Number (RA#), describe the nature of the problem and provide a purchase order number.

If this is the first time you are dealing directly with the factory, you will be asked to provide credit references or prepay, or authorize COD shipment.

Pack the instrument and all its accessories (preferably in its original packing). Enclose your Purchase Order, shipping and billing information, RA#, and any special instructions.

GasTech Inc.

Standard Warranty

Gas Detection Instruments

We warrant gas alarm equipment manufactured and sold by us to be free from defects in materials, workmanship and performance for a period of one year from date of shipment to ultimate user. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, f.o.b. factory. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired or replaced on a routine basis. Such items may include:

- a) Lamp bulbs and fuses
- b) Pump diaphragms and valves
- c) Absorbent cartridges
- d) Filter elements
- e) Batteries
- f) Most catalytic and electrochemical sensors are covered by a separate warranty of 6, 12, or 24 months.

Warranty is voided by abuse including rough handling, mechanical damage, alteration or repair procedures not in accordance with instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs or contingent expenses incurred without our prior approval.

GasTech Inc.'s obligation under this warranty shall be limited to repairing or replacing any product which GasTech Inc. Material Review Board examination shall disclose to its satisfaction to have been defective. To receive warranty consideration, all products must be returned to GasTech Inc. at its manufacturing facilities with transportation charges prepaid.

This warranty is expressly in lieu of any and all other warranties and representations, expressed or implied, and all other obligations or liabilities on the part of GasTech Inc. including but not limited to, the warranty of fitness for a particular purpose. In no event shall GasTech Inc. be liable for direct, incidental or consequential loss or damage of any kind connected with the use of its products or failure of its product to function or operate properly.

This warranty covers instruments and parts sold (to users) only by authorized distributors, dealers and representatives as appointed by Gas Tech.