Model FL801

Multi Channel
Flame Detection
System
05/88

GENERAL MONITORS

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GENERAL MONITORS

F1 801 MANUAL

I. INTRODUCTION

A. NOTICE

All information contained in this instruction manual may be used only to install and operate the Model F1 801 System provided by GENERAL MONITORS, INC. (GMI). The sale of the instrument does not license the user to reproduce GMI drawings, or to utilize any information in this manual without prior written permission.

The Model F1 801 System is easy to install and operate. However, this manual should be read in full, and the information contained herein understood, before attempting to place the system in service.

B. GENERAL

Fire is a phenomenon of combustion. Combustion is the continuous chemical reaction of a reducing agent (fuel) and an oxidizing agent (oxygen, etc.) with the evolution of thermal energy (heat). Fire is usually manifested in heat (IR), smoke, light (Visible), and flame (UV).

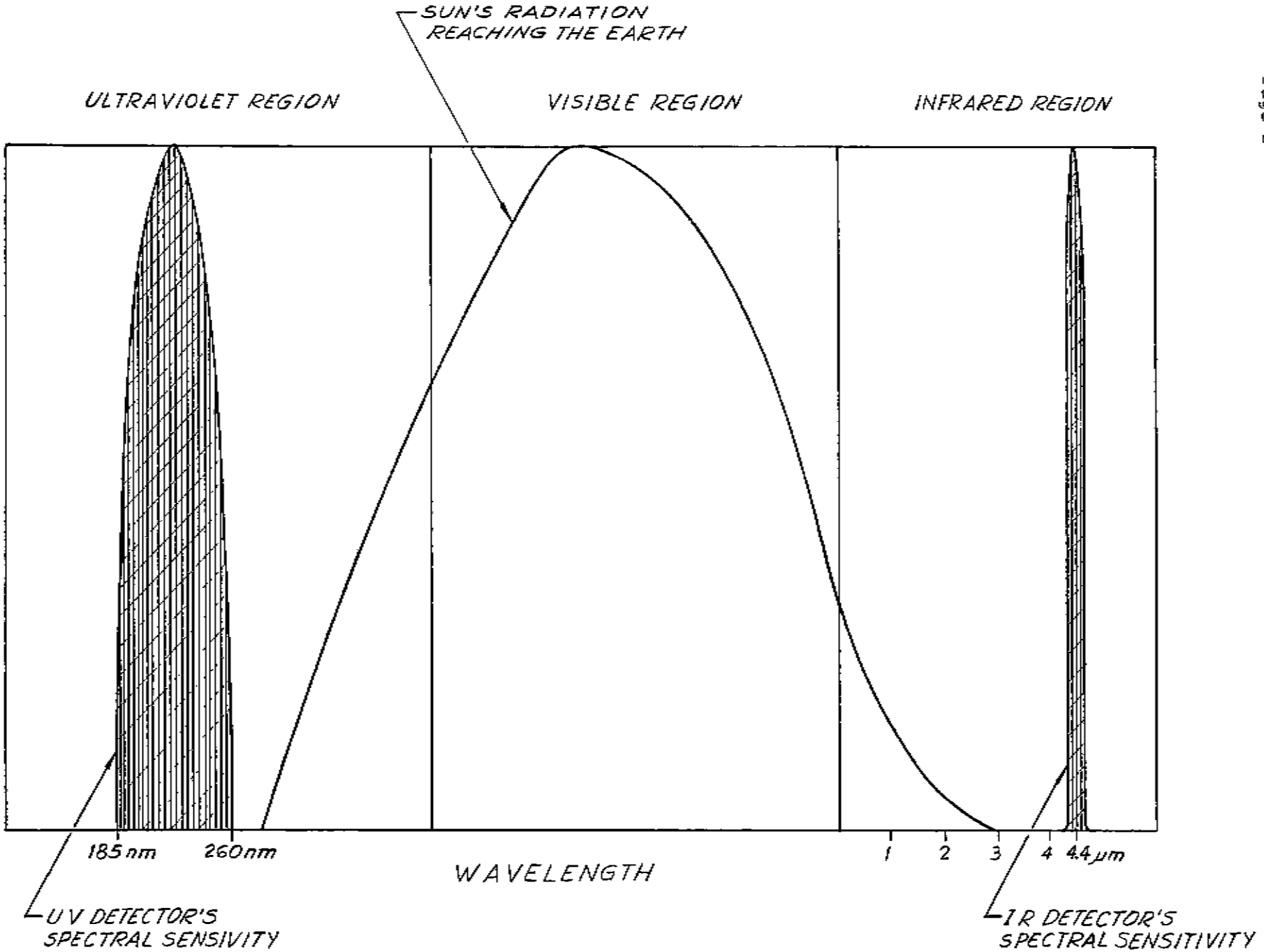
Flame is the gaseous region of a fire where vigorous combustion chain reactions take place. These reactions emit radiation covering the Infrared, Ultraviolet and the Visible Spectral Regions.

The GMI Model F1 801 Eight Channel Flame Detection System employs eight remote detectors which sense the presence of Flame Radiation. Should this Radiation exceed preset levels, controller alarm circuits will be activated. These Detectors see flame radiation and are insensitive to sunlight and ordinary room lighting.

C. DETECTOR OPERATING PRINCIPLE

1) Ultraviolet (UV) Flame Detector:

The UV detectors contain phototubes which respond to Radiation in the 185 to 260 nanometer region. When radiation from a flame strikes the cathode within one of th tubes, electrons are ejected. These electrons in turn strike a molecule of an ionizable gas, with which the tube is filled, thereby emitting more electrons. An "avalanche" condition occurs. More electrons are released which creates a momentary electron flow from the cathode to the anode. This momentary current (pulse) recurs at a rate proportional to the intensity of the UV Radiation. The frequency of this pulse is converted to a voltage within the Detector and transmitted back to the Controller.



SPECTRAL RESPONSE OF U.V. AND I.R. DETECTORS

C. DETECTOR OPERATING PRINCIPLE (cont'd.)

2) Ultraviolet/Infrared (UV/IR) Flame Detector:

The UV/IR detector is a discriminating flame detector which makes use of an ultraviolet radiation sensitive phototube in addition to a pyroelectric infrared detector to provide a flame detection system which is highly immune to false alarms caused by lightning, arc-welding, hot objects and other sources of radiation.

The UV portion of the detector as described in 1) above is combined with a pyroelectric detector which responds to a change in intensity of infrared radiation. By sensing very specific wavelengths in both the UV and the IR spectra and then electronically processing these signals, a very high degree of discrimination is achieved.

Since a flame is a copious source of both ultraviolet and infrared radiation, discrimination is provided when both UV and IR emissions are detected. If only UV is detected, as in the case of arc-welding, no alarm is given. If only IR is detected, such as from the sun or other hot object, no alarm is given. However, if both conditions are met, a fire is identified and an alarm is given.

Incorporated into the IR channel of the detector is a flicker discrimination circuit. This permits the detector to ignore steady static IR sources such as hot objects. The inherent flickering of a flame provides the necessary modulation to activate the IR circuit.

The Controller compares the transmitted voltage it receives from the detector to a preset threshold voltage. If the threshold is exceeded, the Controller "WARN" alarm circuit is activated. Should the WARN condition exist for a length of time (seconds) set by the "alarm delay" potentiometer, the "ALARM" circuit is activated.

The interaction of the UV/IR circuits gives rise to a situation which can cause false alarms under certain conditions, and it is important for this to be understood by the user.

A threshold detector triggers in the presence of very strong UV, such as would occur due to local welding operations or lightning. The IR circuit will prevent an alarm signal under these conditions since it requires fluctuation characteristics of a fire before initiating the IR signal.

The false alarm can occur if a hot body is also present (such as inside a compressor station), and a modulation of this hot body signal occurs to cause the IR circuity to interpret it as the flicker of a fire. This may be caused by very simple acts, such as, personnel walking close (one or two feet) to the detector or even moving a hand very close to the detector IR window since the human body is also a source of IR radiation.

C. DETECTOR OPERATING PRINCIPLE (cont'd.)

2) Ultraviolet/Infrared (UV/IR) Flame Detector: (cont'd.)

Even though the UV/IR detector has been designed to be highly immune to false alarms created by arc-welding, under certain conditions this may not always be true. Arc-welding done very close to a UV/IR detector (approximately 20 feet) creates a large amount of UV radiation. Depending on the type of welding being done, it can also generate a sufficient amount of heat to trip the IR circuity and cause an alarm.

As an option, General Monitors provides UV/IR detectors with a special arc-welding inhibit feature for those customers who request it. This feature increases the detector's discrimination against false alarms due to arc-welding at a distance of 20 feet or less. The circitry establishes a preset threshold which is exceeded by the intense ultraviolet radiation emitted from an arc-welder in close proximity thereby inhibiting the output of the detector and preventing a "Warning" or "Alarm" condition from being signaled. This output will remain inhibited until the source of radiation is absent for 5 seconds.

If the arc-welding is further than 20 feet from the detector, the output is not inhibited and a fire will be detected.

If your detectors have been ordered with the special arc-welding inhibit circuitry, it is important to understand that when the detector is inhibited, it will give no indication of a fire regardless of its size.

A self-testing feature called COPM (Continuous Optical Path Monitoring) checks the optical path, the detector tubes, and the related electronic circuitry once every minute. If foreign material impairs the optical path, the controller will indicate malfunction.

NOTE: Since the optical path is checked once per minute, it may take up to one minute to detect an obstruction. Also, when power is first applied it may take up to one minute for the unit to come out of malfunction.

D. CONTROLLER OPERATIONAL FEATURES

The Model FL 801 is an eight channel system in which the controller continuously monitors the inputs from eight detectors. Each detector is monitored independently, i.e., they are not scanned nor are the signals summed. Each channel has intrinsically* safe outputs to the detector for Power, Signal and Common leads.

A green "READY" LED is provided on the front panel and is "illuminated" only when all channels are properly connected (wired) to detectors or disabled at the controller.

All channels share the common front panel LED indicators for ALARM (flashing Red), WARN (flashing Amber), and MALF (flashing White). Each channel has a front panel LED (steady Amber) for channel identification when an ALARM, WARN or MALF condition exists. Whenever a "WARN" is indicated, the corresponding channel identification LED will latch until the alarm RESET button on the front panel is depressed.

Should a MALF condition exist, the flashing white LED will turn on, one (or more) channel I.D. red LED's will turn on, and the green READY LED will turn off. The common (to all channels) MALF relay alarm circuit is activated. The red channel LED's indicate channels which are in malfunction. All channels not in malfunction continue to operate in a normal manner. Should a true alarm condition develop before the malfunction corrective action is completed, the WARN LED will turn on (flashing). At the same time, the channel red LED's will switch reporting functions and display only those channels detecting an alarm condition. As soon as the alarm/warning condition is corrected, the channel I.D. LED's will indicate any channels that may still be malfunctioning.

> **NOTE**
>
> A malfunction will not cause the channel ID LED's to latch.

The front panel has the RESET push-button to clear the latching ALARM circuit and the channel identification LED's, if latched. The WARN circuit is non-latching. A front panel recessed toggle switch will "Inhibit" the alarm relays. The MALF light will flash on/off when in the Inhibit mode. This prevents undesirable false alarm conditions when checking the system for correct operation. This switch is left in the "normal" mode for normal system operation.

* External cable between controller and detector.

D. CONTROLLER OPERATIONAL FEATURES (cont'd)

The eight channel Fl 801 controller operates in a Single Zone or Dual Zone mode as programmed by Switch S1 (left side PC Board. See Figure 3, Sheet 1). In the Single Zone mode, channels 1 through 8 operate in Zone 1. Thus any channel in an alarm condition (WARN or ALARM) will activiate the appropriate Zone 1 relay (WARN or ALARM). To operate the Fl 801 in the Dual Zone mode, switch S1 to the Dual Zone position. In the Dual Zone mode, channels 1 through 4 remain in Zone 1. Channels 5 through 8 are transferred to Zone 2. Thus Zone 2 channels will activate the appropriate Zone 2 relays should an alarm condition exist.

Both alarm threshold levels (WARN circuit) are field adjustable. Normally it is recommended that the WARN circuit be set at 2.5V for maximum sensitivity. Each time delay circuit can be set per customer preference between 50 milliseconds and 20 seconds. This delay controls the time between the WARN and ALARM circuit activation. R 87 adjusts Zone 1 delay and R 88 adjusts Zone 2. R 87 and R 88 are located on the left side PC Board.

Vote switch S2 (located near the middle of the control board. See Figure 3, sheet 1) has two positions. In the position marked "1", any detector in a given zone which sees a flame, will give a corresponding "warning" indication. In the position marked "2", two detectors within the same zone must see a flame before a "warning" is indicated.

If it is desired that less than eight detectors be used, any detector or detectors may be disabled within the controller by S3. S3 consists of an eight position dip switch with each individual switch numbered from 1 to 8. These numbers correspond to the channel number. To disable any channel, move the corresponding switch to the "ON" position (labeled on the switch). No external connections are required to disable a channel.

NOTE

If a detector is connected to a given channel and that channel is disabled, it will not respond to a flame or test lamp.

II. INSTALLATION INSTRUCTIONS

A. LOCATION OF THE CONTROLLER

The Model Fl 801 Controller should be installed in a weather protected*, non-hazardous area. The following mounting hardware is available to facilitate installation:

1.	Panel Mount Frame (controller), 98 mm (4") wide	P/N 10199-1
2.	Rack Frame (up to 4 controllers), 483 mm (19") wide	P/N 10200-1
	Blank Panel (for unused position)	P/N 10191
3.	Wall Mount Bracket (one controller)	P/N 10202-1
4.	Weatherproof Enclosure (one controller)	P/N 10259-1
5.	NEMA 7 Explosion Proof Enclosure (one controller)	P/N 10099
6.	Desk Top Cabinet (up to 4 controllers)	P/N 914-006

Mounting should be as free from shock and vibration as possible. Care should be taken to mount the controller away from radio transmitters or similar equipment, even though the controller is RFI/EMI resistant. Provide a wiring service loop (controller to field wiring) to facilitate access to controller adjustments located on the PC Board. This service loop could also provide easy controller disconnect from the front side of the master panel. Care should be taken to assure adequate ventilation. Do not mount the controller in a manner which will restrict the natural convection air flow from normal ambient air. The controller operating range is 0°C to 60°C (32°F to 140°F).

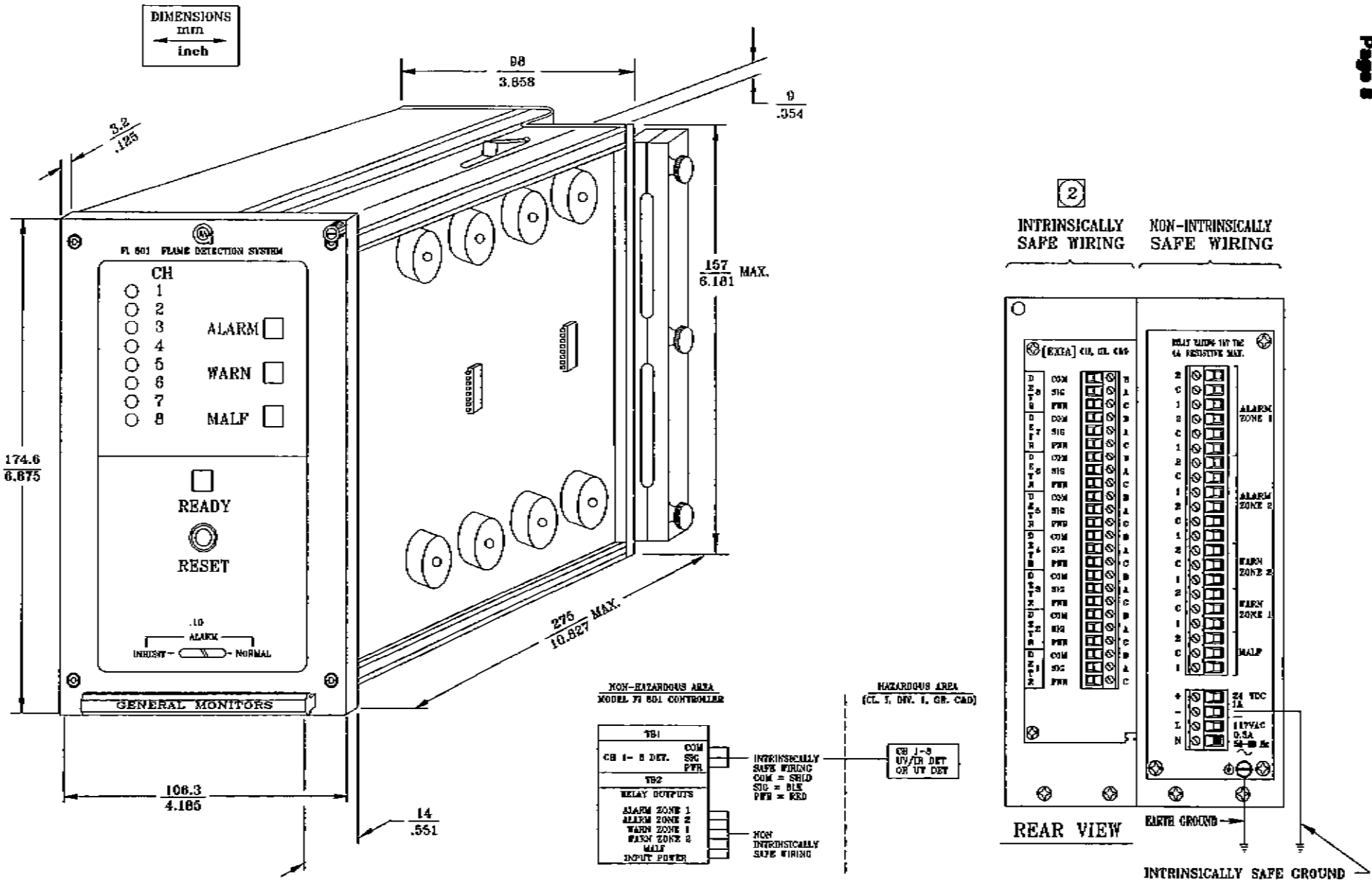
B. POWER AND INTRINSCIALLY SAFE GROUND CONNECTIONS

The system operates on nominal line power of 117VAC, 50/60 Hz. Power consumption is 12 Watts nominal to 18 Watts maximum (alarm conditions). Power must remain disconnected until all other wiring connections are made. (Note: No power ON/OFF switch is provided. This is done to prevent accidental/un-authorized system shut-down).

If AC power is used, connect the power line to the terminals labeled "Line and Neutral" (L and N)" located on the rear of the controller. The chassis ground (⏚) terminal must be connected to an earth ground. Refer to Figure 1. Also see items 6 and 7 of the Special Warning Section on page 19.

NOTE

The compression type terminals on the Model Fl 801 will accept wire size #14 or smaller.



NO CHANGES
WITHOUT AUTHORIZATION
OF FACTORY MUTUAL

(REF 70210 C)

FIG. 1

OUTLINE DRAWING AND REAR TERMINAL CONNECTIONS

B. POWER AND INTRINSICALLY SAFE GROUND CONNECTIONS (Cont'd.)

Primary DC power may be used instead of AC Power. Use any 24 Volt (nominal) DC supply with a minimum capacity of 1 ampere. No. 14 gauge wire should be used to prevent excessive voltage drop and the run should be as short as possible. Connect the "positive" supply to the 24VDC + terminal and the "negative" to the 24VDC - terminal. An internal diode protects the system in the event the DC polarity is reversed.

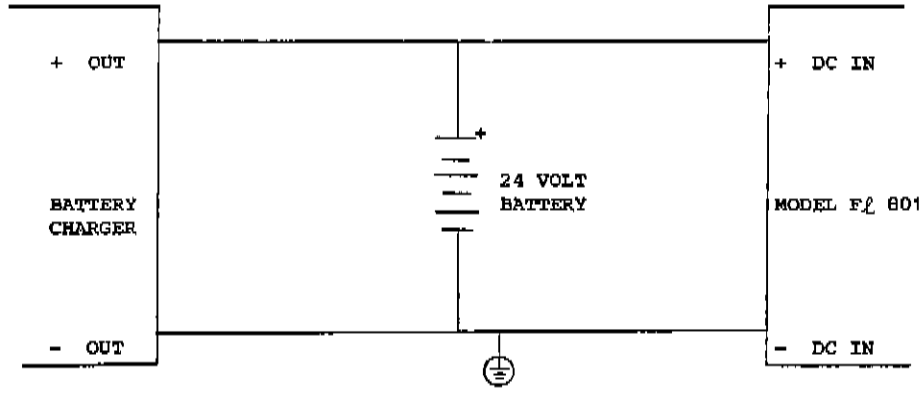
NOTE:

The negative (-) 24 VDC terminal must be connected to an intrinsically safe (earth) ground, whether or not primary DC power is used. For installations where only a floating 24 Volt DC power supply is available, a DC-DC converter P/N 940-015 or equivalent must be used to isolate the intrinsically safe ground.

C. BATTERY BACKUP

An emergency battery backup may be employed on a system normally powered by AC. The customer furnished battery may be connected as shown. No manual or relay switching is required. Note that there is no provision for battery charging. A customer furnished battery charger should be used to keep the battery charged to the battery manufacturer's recommended level. The cable length (battery to controller) should be as short as possible. Should an AC power failure occur, the 24 Volt battery supplies current through the diode to the controller circuitry. DO NOT USE MORE THAN A 24 VOLT BATTERY.

The battery rating (ampere-hour capacity) is dictated by the length of time you expect power outages to last. A Model Fl 801 requires approximately 0.8 ampere (peak) at 24VDC. General Monitors recommends that a Lead-Acid type battery be used. This type battery can be expected to last for several years with minimum maintenance.



Intrinsically safe (earth) ground.

D. CHOOSING DETECTOR LOCATIONS

Several variables are involved in selecting the proper locations to install detectors to assure the detection of flame. There are no hard and fast rules defining the optimum location. However, the following general suggestions should be considered in regard to particular conditions at the site a Model Fl 801 is being installed.

*(1) Detector "Field of Vision"

Each UV detector has a 150° (maximum) "Field of Vision". (The UV/IR detector is limited to 120°). This "Field" has its vertex at the center of the Detector.

(2) Optical Sensitivity Range

The distance at which the detector will respond to a flame is a function of the intensity of that source. The maximum distance is 50 ft. for a gasoline fire with a surface area of one square foot.

(3) Environmental Factors

Avoid installing detectors where they will be unnecessarily exposed to shock or vibration. Detectors mounted in "dirty" atmospheric conditions will require more frequent inspection, cleaning, and sensitivity checking. Observe the ambient temperature range of -40°C to +70°C (-40°F to 158°F). Mount the detector in a downward plane to minimize the effect of dust/moisture build-up on the detector's UV lens. Also be sure that the COPM "Finger" containing the source tube is at the top of the detector when mounting, as a build-up of dust/moisture on the "Finger" will defeat the action of the COPM circuitry.

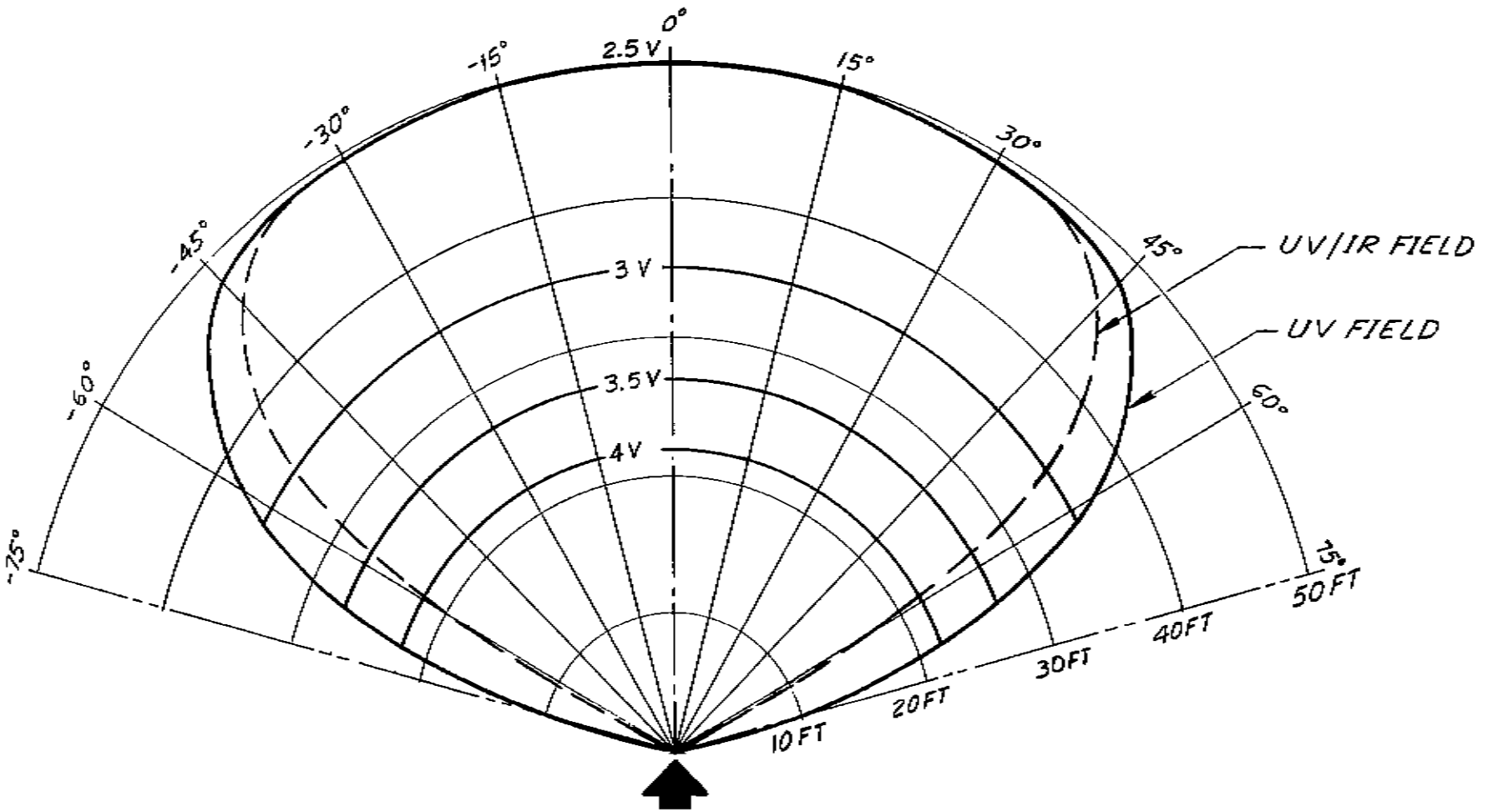
E. DETECTOR INSTALLATION

All detector assemblies, P/N 70100 (Type V) and P/N 70116 (Type VI) are rated intrinsically safe (including detector/controller cable run) for NEC Class I, Division 1, Groups C and D hazardous areas.

The Type V and Type VI detectors are supplied with a 450mm (18 inch) long cable that is 2-conductor (stranded), shielded and contains a drain wire. (See Figures 9 and 10 for details on these types).

Use either #14 or #16 AWG cable ** for proper termination to the detector assembly. Maximum cable run of 1000 ft. (one way) for each detector.

*Detector S/N PP0001 thru PP0100 have a 90° (maximum) "Field of Vision".
**Belden cable #9316 or equivalent.



DISTANCES SHOWN FOR APPROX. 1 SQ. FOOT FIRE

UV AND UV/IR DETECTOR – FIELD OF VIEW

E. DETECTOR INSTALLATION (Cont'd.)

For connection of the cable at the detector , follow the color code and the "A", "B", "C" identifications shown on Figures 9 and 10.

The cable from a Type V or Type VI detector should be terminated in a junction box located near the installed detector head. General Monitors' universal sensor housing P/N 10252 is recommended for this application.

Detector cables are connected at the controller to the terminal blocks located on the left half of the rear panel. (See Figure 1). The channel numbers are identified as DETR 1 through DETR 8. The cable conductors A, B and C from the detector should be matched to A, B and C on the rear of the controller.

Detectors should be mounted pointing downward with the COPM "Finger" on top so that water and airborne debris will not accumulate on the UV window nor on the source tube. Mounting should be as free from shock and vibration as possible and convenient for visual inspection/cleaning. General Monitors recommends that swivel mounting hardware similar to that shown on figure 11 be employed for this purpose. The 3/4-14 NPT thread shown on the end of the swivel elbow is compatible with the threaded bosses on the universal sensor housing P/N 10252.

CAUTION: If the swivel elbow and union assembly recommended above has been ordered, a thread lubricant should be employed during installation. These parts are all aluminum so that an appropriate anti-seize compound should be used when installing them.

It is also recommended that General Monitors UV window cleaner be used as a cleaning fluid for the detector lens and the COPM source tube following the instructions in the maintenance section of this manual (Section IV-B).

NOTE: It is most important that a wetting solution be used for cleaning the window as wiping it with a dry cloth may cause a buildup of static charges which may in turn cause false alarms.

F. ALARM WIRING CONNECTIONS

The Warn (low) and Alarm (high) relay contacts for customer use are DPDT and rated 3 amps resistive (117VAC or 30VDC). The malfunction alarm relay contacts for customer use are SPDT and also rated 3 amps resistive (117 VAC or 30VDC). Customer relay contacts are brought out to rear terminals as follows (See figure 1).

	CONTACT CONDITION		
ALARM RELAY	OPEN	COM	CLOSED
Malfunction	1	C	2
Warn	2	C	1
Alarm	2	C	1

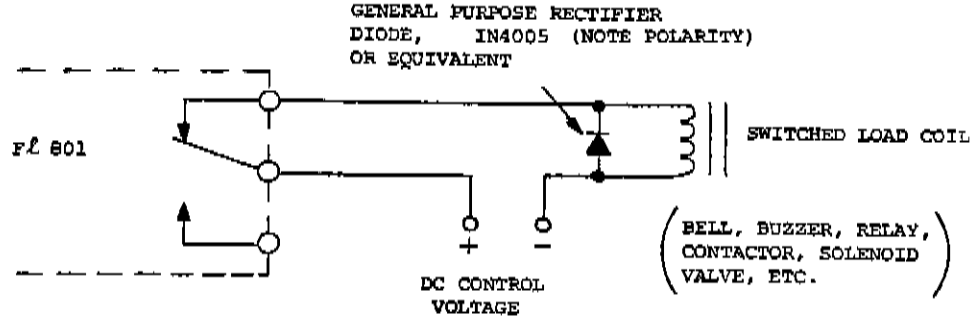
F. ALARM WIRING CONNECTIONS (cont'd)

The above chart shows the high and low alarm contacts in the standard de-energized state (with power applied). These two alarm relays are normally de-energized. The malfunction relay is always supplied normally energized.

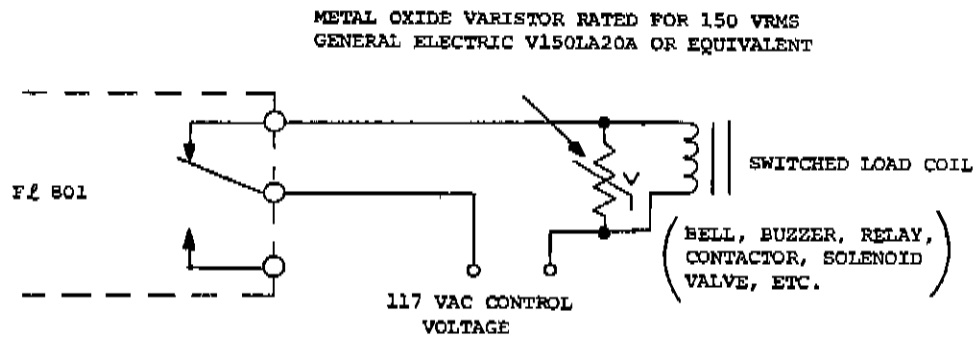
CAUTION

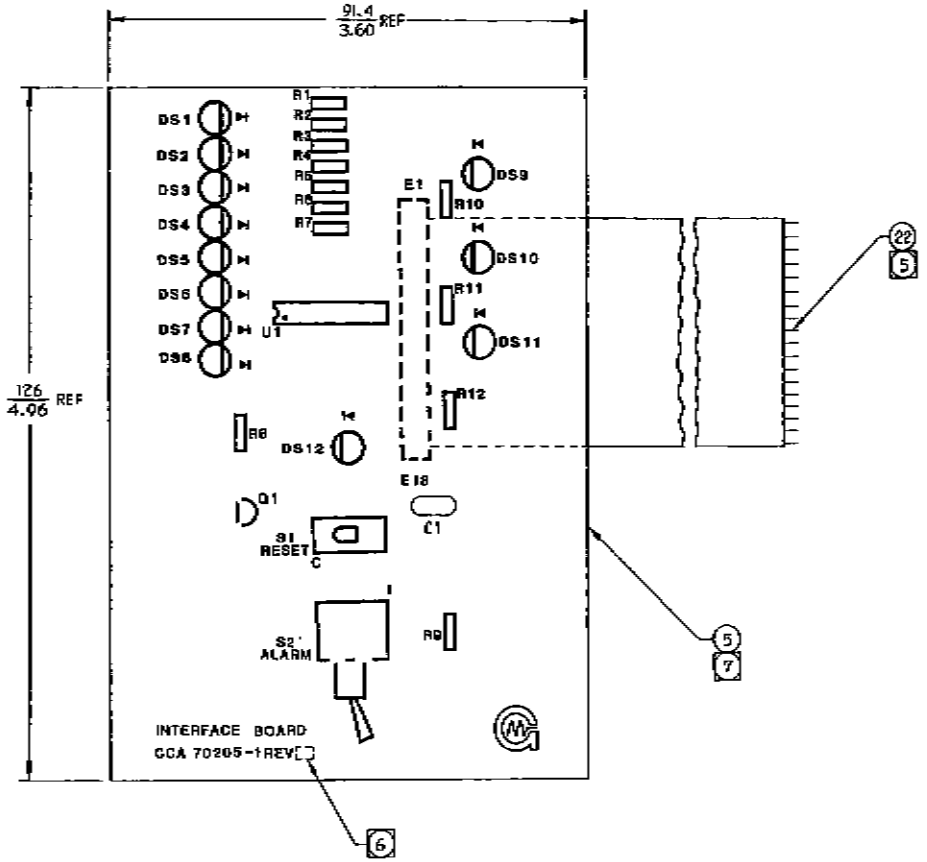
Inductive loads (bells, buzzers, relays, etc.) on the dry relay contacts must be clamped down per the following diagram. Unclamped inductive loads can generate voltage spikes in excess of 1000 Volts. Spikes of this magnitude may cause false alarms and contact damage.

Protection circuit for relay contacts when switching a DC load.



Protection circuit for relay contacts when switching an AC load.



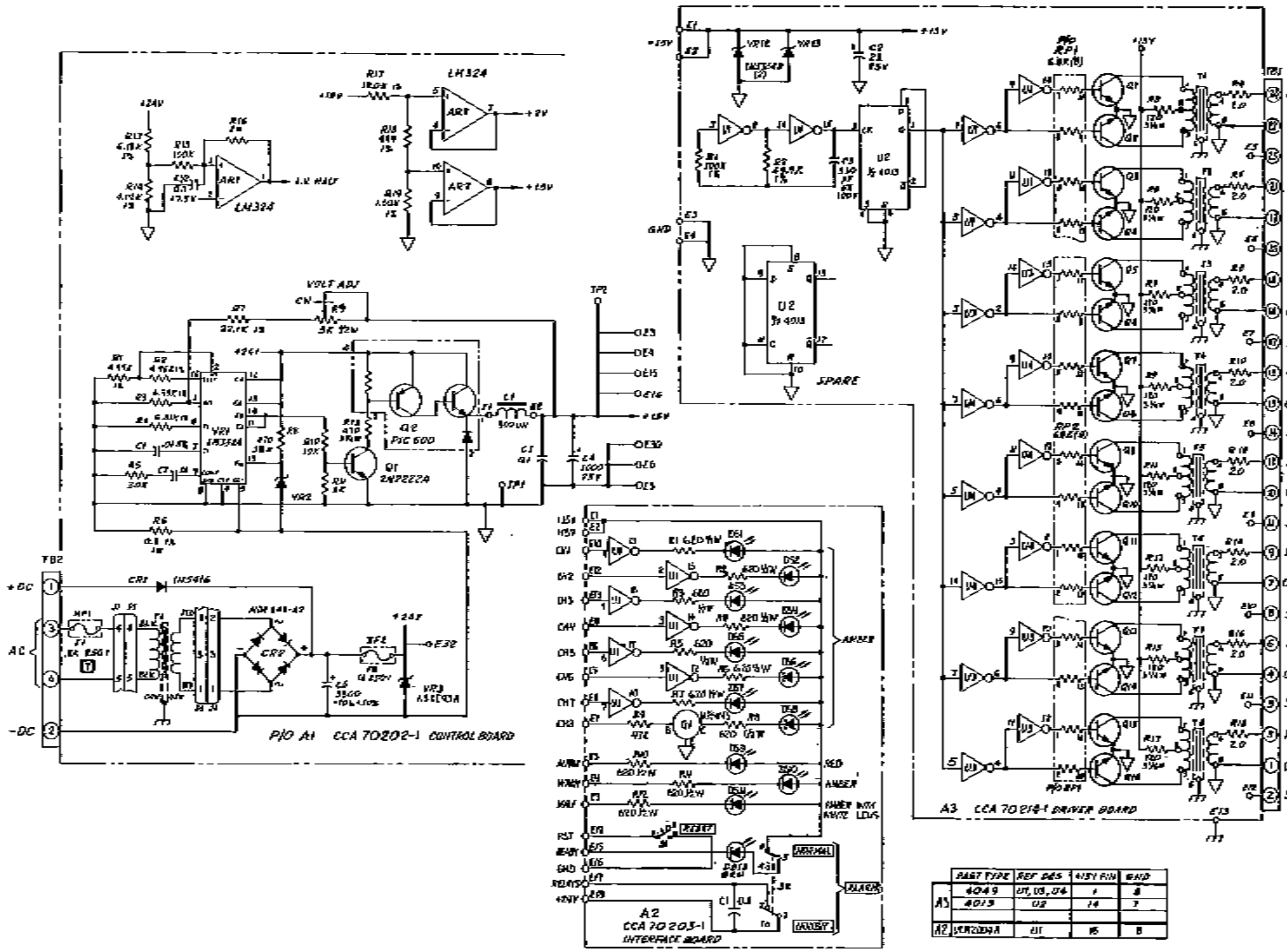


AR	932-002	CONFORMAL COATING		23
1	10 207-5	JUMPER, FLEXSTRIP 18 - COND	W9	22
				21
1	951-311	SWITCH, TOGGLE, DPDT	S2	20
1	951-417	SWITCH, PUSH BUTTON, SPDT	S1	19
				18
1	948-250	TRANSISTOR, NPSW45	Q1	17
				16
N	947-160	RES. 620Ω, 1/2W, 5%	R1-8, 10-12	15
1	947-043	RES. 47K, 1/4W, 5%	R9	14
1	915-033	CAPACITOR 0.1UF, 10%, 50V	C1	13
				12
1	931-425	I.C. DARLINGTON DR. ULN2004A	U1	11
				10
1	948-328	LED, GREEN	DS 12	9
1	948-327	LED, RED	DS 9	8
10	948-329	LED, AMBER	DS1-8, 10, 11	7
				6
1	70206-1	CCD, INTERFACE BOARD		5
REFO	70201	SCHEMATIC DIAGRAM		4
				3
				2
—	-1	CCA, INTERFACE BOARD		1
QTY.	PART NO.	DESCRIPTION	REF.	ITEM

(REF 70205 D)

FIG.5

CCA INTERFACE BOARD



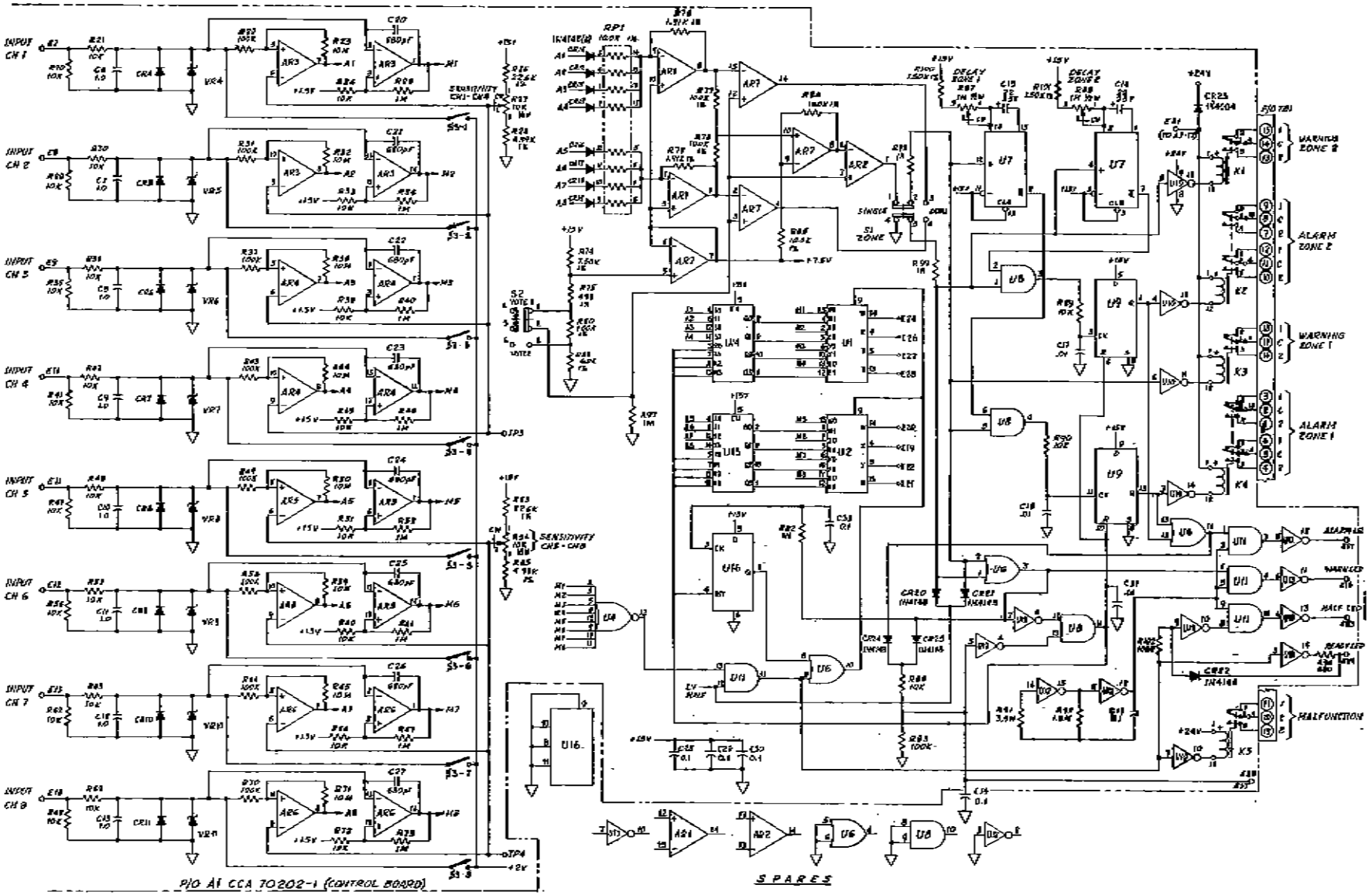
REFERENCE DESIGNATION	A1	A2	A3	A1	A2	A3
	HIGHEST			NOT USED		
AR	AR7	—	—			
C	C33	[illegible]	C3			C1
CR	CR23	—	—	CR3		
H	[illegible]	[illegible]	-	[illegible]		
DS	-	DS14	-			
E	E32	E19	E13			
F	F2	—	—			
J	J1	—	—			
K	K5	—	—			
L	L1	—	—			
Q	Q2	Q1	Q16			
R	R15(?)	R12	R18	[illegible]		
S	S9	S8	—			
T	T1	—	T8			
TB	TB2	—	TB1			
TP	TP4	—	-			
U	U16	U1	U4	U1,3		
VR	VR4	—	VR13			
XF	XF2	—	—			
P	P1	—	—			
RP	RP1	—	RP2	RP2		

A1			
PART TYPE	REF DES	+15V PIN	GND PIN
LM324	AR1–AR7	4	11
ULN2004A	U3	9	8
MC14537	U1, U8	16	7, 8
MC14013	U4	14	7
MC14081	U6, U11	14	7
MC14071	U16	14	7
MC14538	U7	16	8
MC14013	U9, U14	14	7
MC14093	U12	1	8
MC14043	U11, U15	15	8

	PART TYPE	REF DES	+15V PIN	GND
A3	4049	U1, U3, U4	1	8
	4013	U2	14	7
A2	ULN2004A	U1	15	8

(REF 70201 G) FIG.6 SHT 1

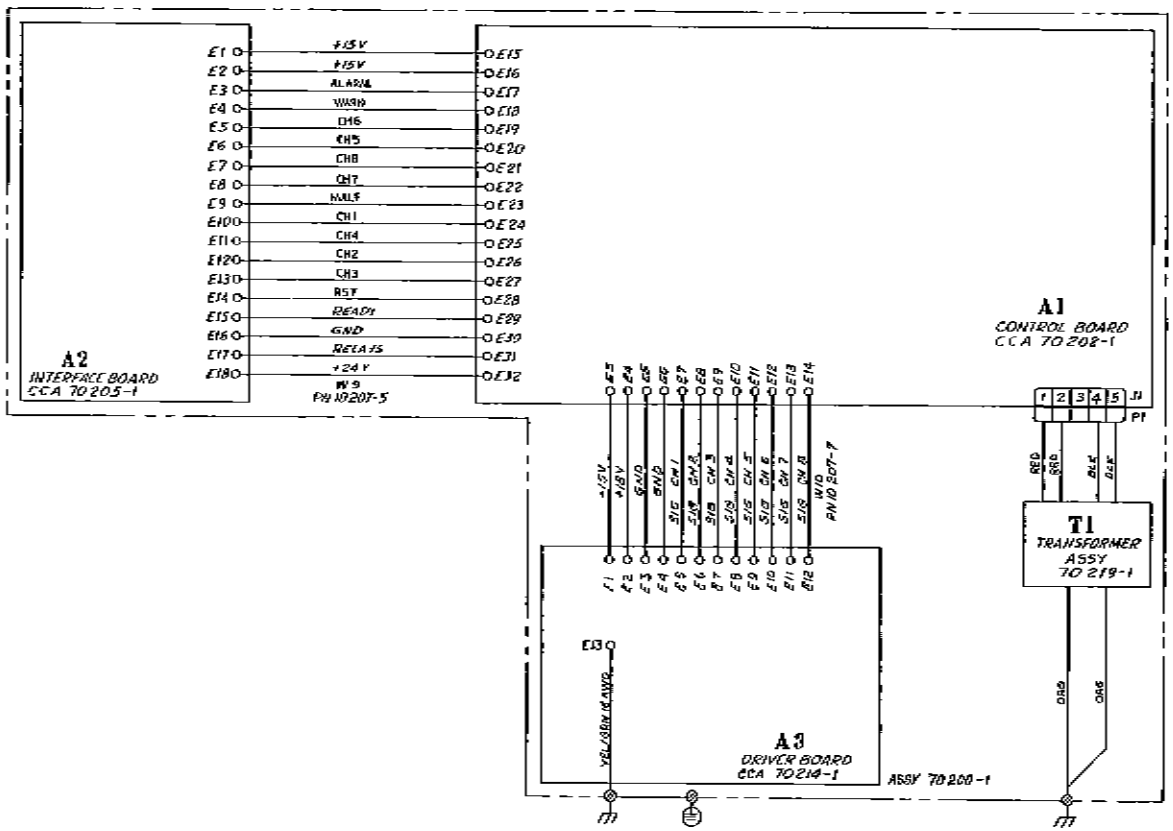
SCHEMATIC DIAGRAM FLAME DETECTION CONTROLLER



(REF 70201 G)

FIG.6 SHT 2

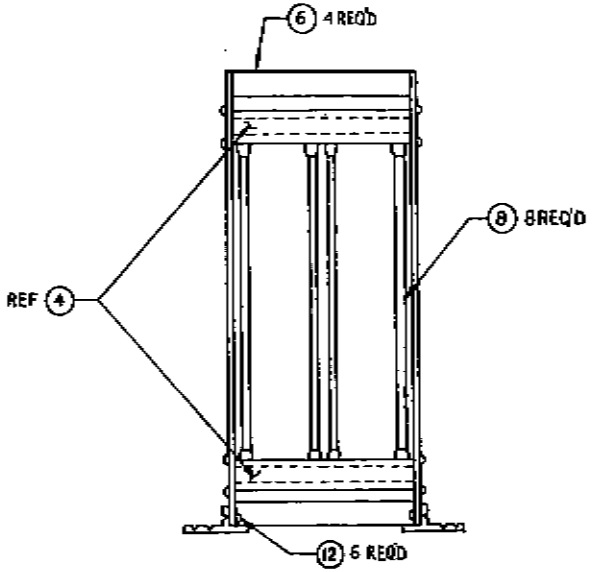
SCHEMATIC DIAGRAM FLAME DETECTION CONTROLLER

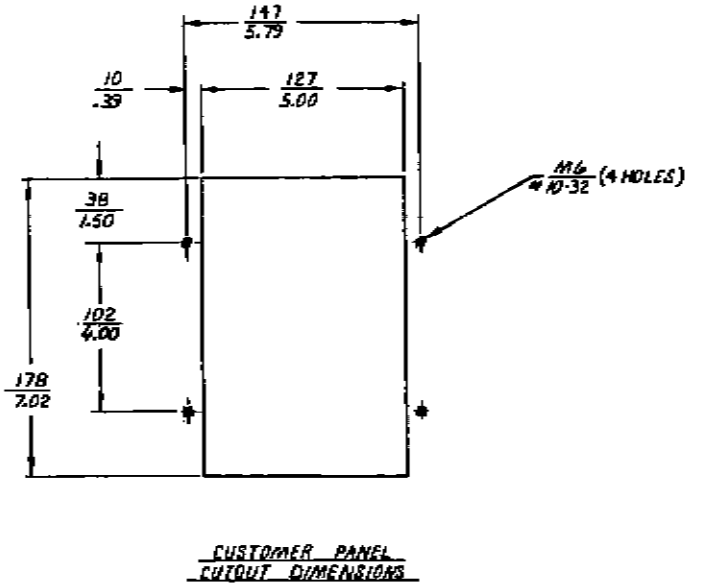


(REF 70220 B)

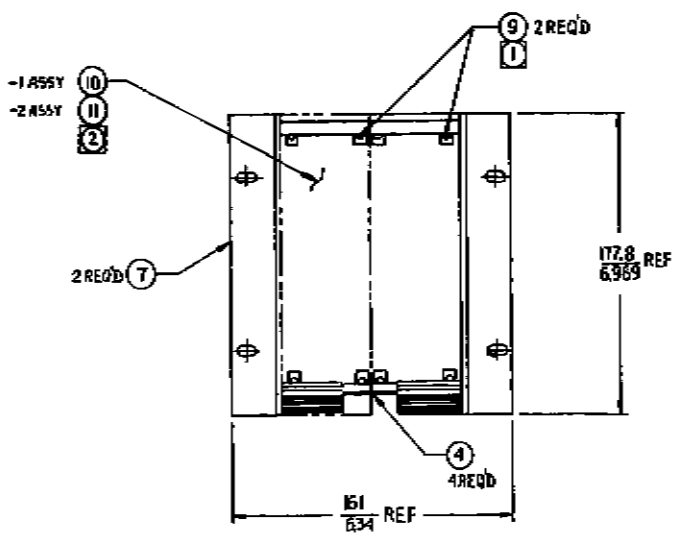
FIG. 7

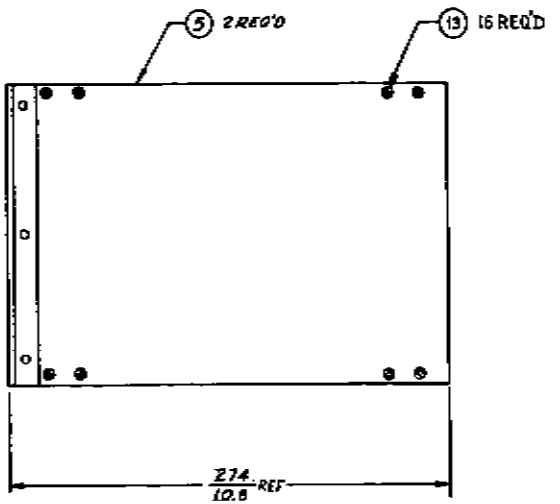
INTERCONNECT DIAGRAM





CUSTOMER PANEL
CUTOUT DIMENSIONS

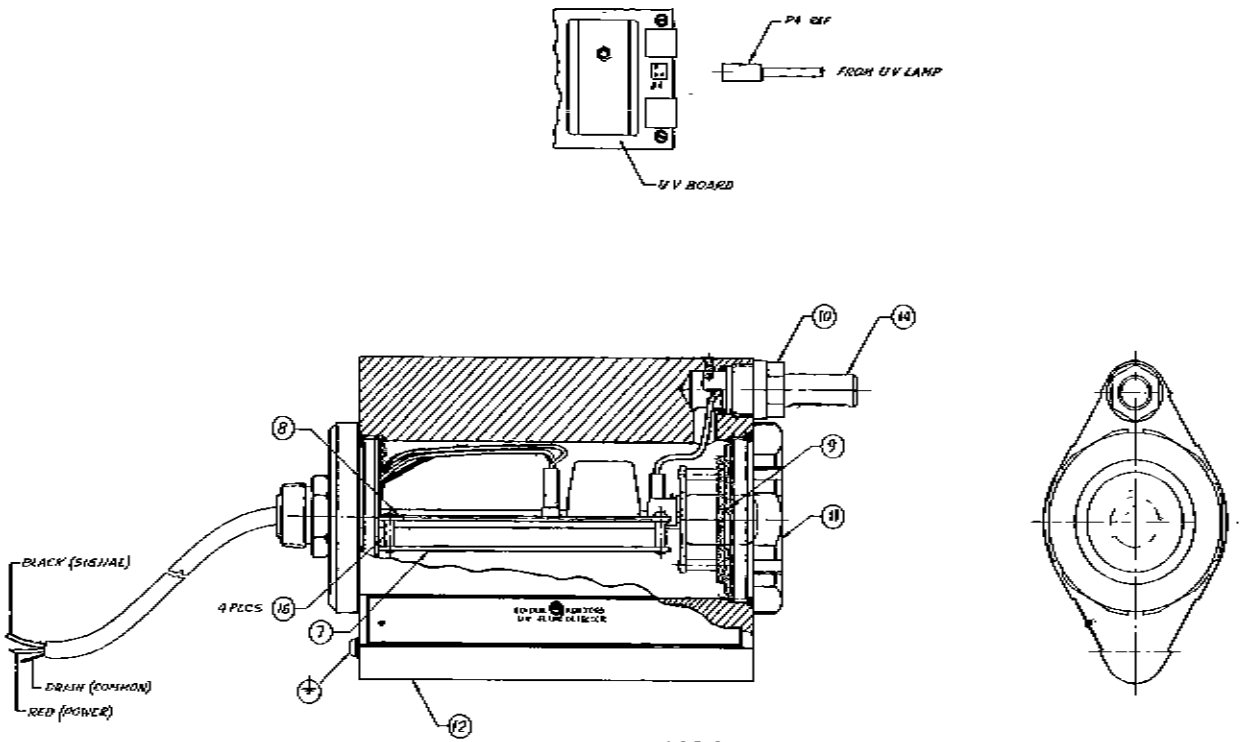




(REF 10199 D)

FIG.8

RACK ASSY
PANEL MOUNT - 98

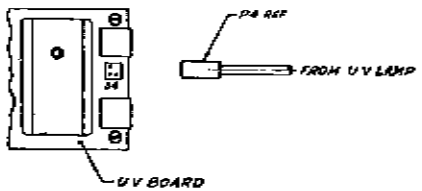


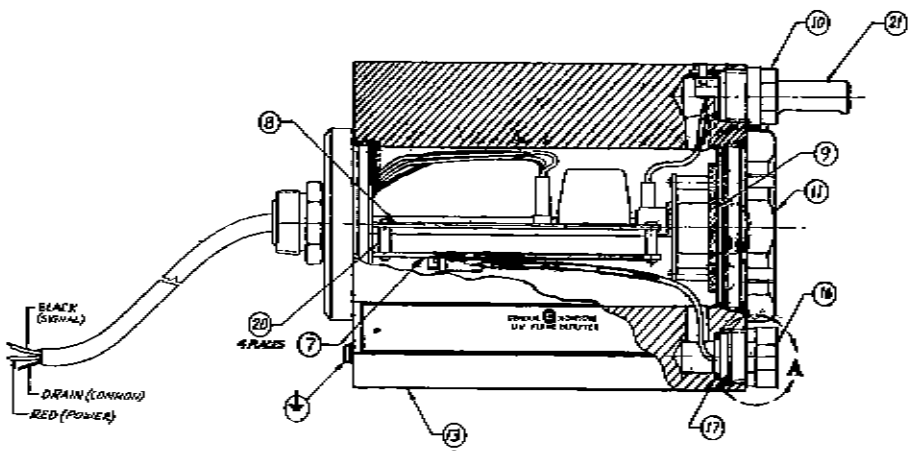
-2 ASSY

4	928-419	SPACER, NYLON .180 DIA x .375 LG	16
			15
1	70152-1	LAMP ASSY, UV	14
			13
1	70120-1	HOUSING ASSY, DET HEAD - TYPE V	12
1	70148-1	COVER ASSY, LENS	11
1	70131-1	BUSHING, UV LAMP	10
1	70107-1	CCA, DETECTOR BOARD, SINGLE TUBE REVC	9
1	70124-2	CCA, UV CONTROL BOARD, SINGLE TUBE REV D	8
1	70127-1	CCA, IR CONTROL BOARD - TYPE V REVE	7
			6
INFO	70117	OUTLINE DRAWING	5
INFO	70118	SCHEMATIC DIAGRAM	4
			3
			2
—	-2	FINAL ASSY, DETECTOR HEAD - TYPE V, SINGLE TUBE	1
QTY.	PART NO.	DESCRIPTION	ITEM

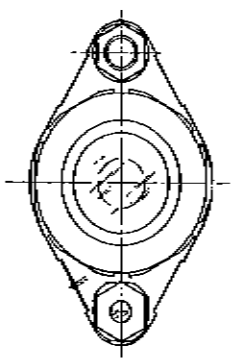
(REF 70100C)

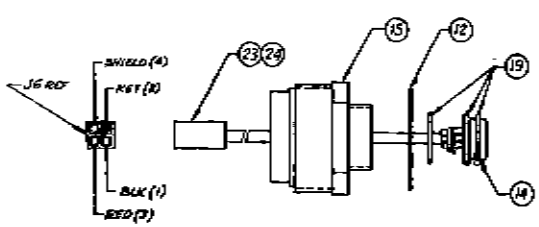
FIG.9 **FINAL ASSY, DETECTOR HEAD - TYPE V**





-2 ASSY





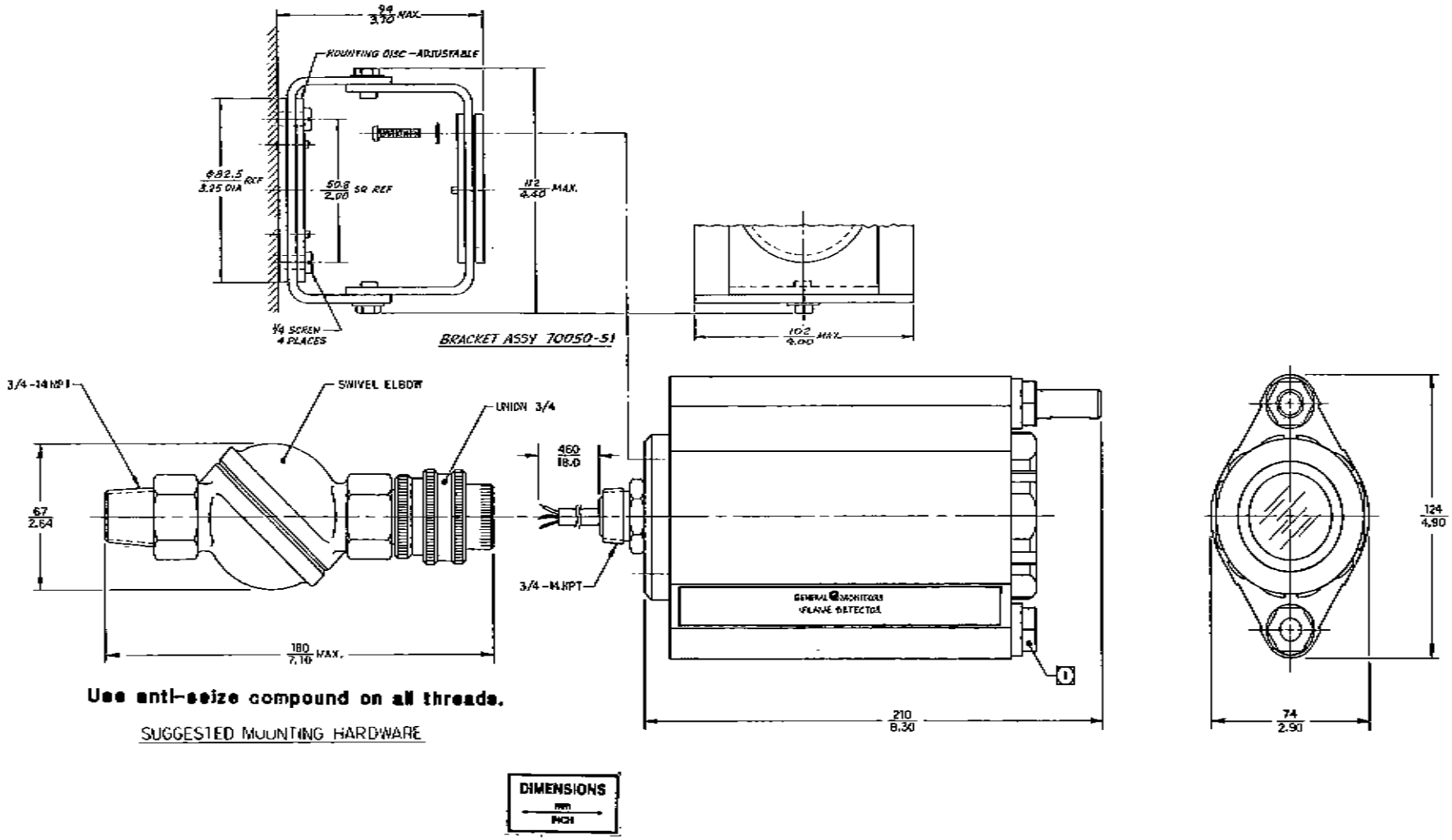
DETAIL A
(OMITTING ITEM 16)

4	931-744	KEY, POLARIZING	J8	24
1	931-798	HOUSING, CONTACT, 4-POS	J6	23
				22
1	70152-1	LAMP ASSY, UV		21
4	928-419	SPACER, NYLON .180 DIA x .375 LG		20
3	925-259	"O" RING, .315 I.D./8mm I.D.		19
				18
1	925-569	"O" RING, .562 I.D./14.28mm I.D.		17
1	70137-1	CAP ASSY, IR		16
1	70136-1	BUSHING, IR DETECTOR		15
1	70185-1	DETECTOR SUBASSY, IR		14
1	70120-2	HOUSING ASSY, DET HEAD - TYPE VI		13
1	70138-1	GASKET, CAP, IR DETECTOR		12
1	70148-1	COVER ASSY, LENS		11
1	70131-1	BUSHING, UV LAMP		10
1	70107-1	C C A, DETECTOR BOARD, SINGLE TUBE , REV C		9
1	70124-2	C C A, UV CONTROL BOARD SINGLE TUBE, REV D		8
1	70127-2	C C A, IR CONTROL BOARD - TYPE VI REV C		7
				6
REF	70117	OUTLINE DRAWING		5
REF	70118	SCHEMATIC DIAGRAM		4
				3
				2
—	-2	FINAL ASSY, DETECTOR HEAD - TYPE VI SINGLE TUBE		1
QTY.	PART NO.	DESCRIPTION		ITEM

(REF 70116C)

FIG.10

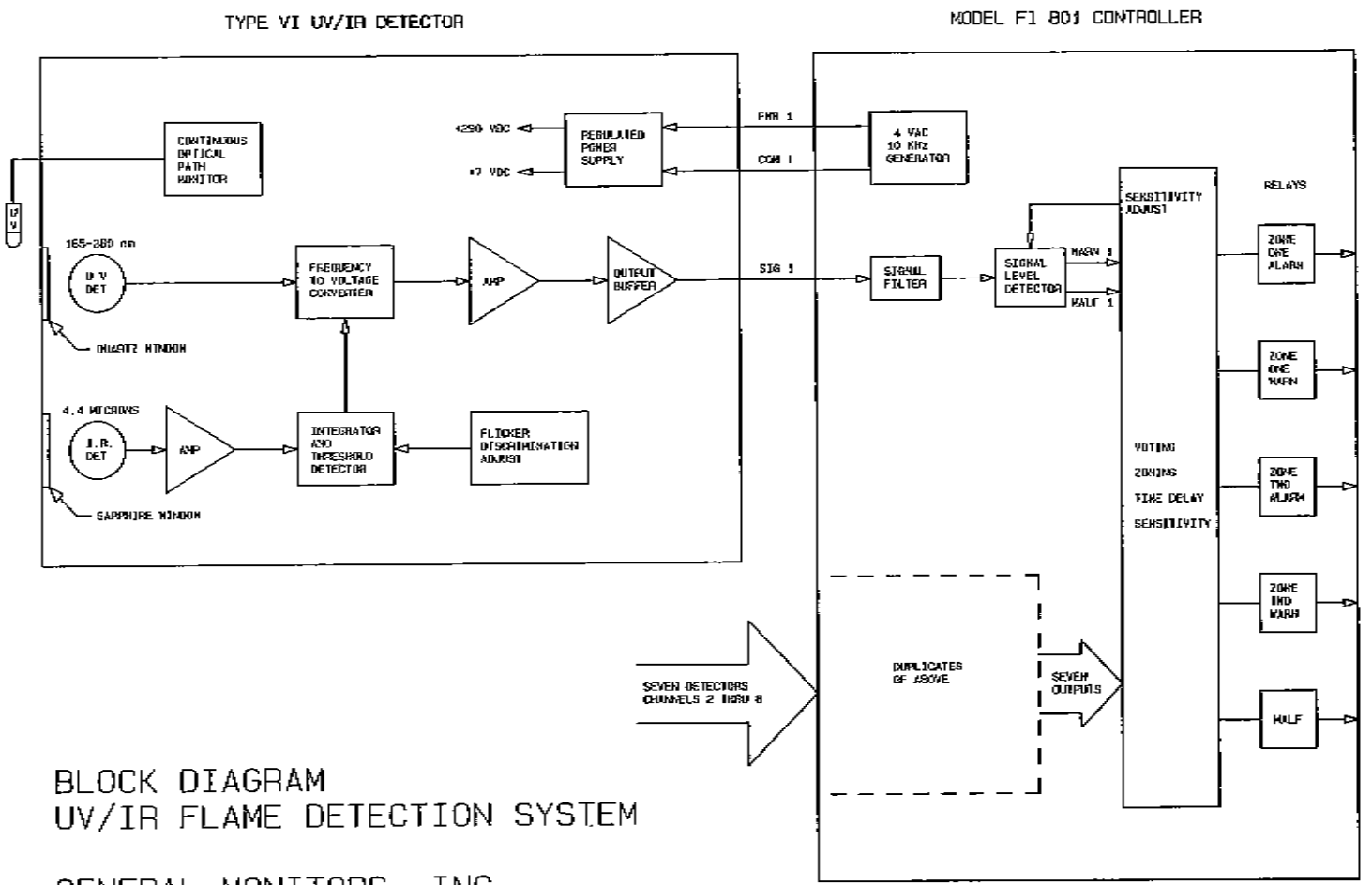
**FINAL ASSY,
DETECTOR HEAD - TYPE VI**



(REF 70117B)

FIG. 11

OUTLINE DRAWING
DETECTOR HEAD, FLAME



BLOCK DIAGRAM
UV/IR FLAME DETECTION SYSTEM

GENERAL MONITORS, INC.
COSTA MESA, CALIFORNIA

FIG. 12

GENERAL MONITORS

III. START-UP AND OPERATION

A. INITIAL APPLICATION OF POWER

Before applying power for the first time, double-check all wiring components/connections.

When power is first applied, the green "READY" LED' will illuminate if the respective channels are properly connected (wired) to their detector. This then indicates a "Ready" condition. Should the white "MALF" LED illuminate (flashing), there is a malfunction in the channel with the steady (no flashing) illuminated amber LED. Check the Trouble-shooting Section of this manual for corrective action.

> NOTE
>
> A malfunction in one channel's circuit will not affect the operation of the other channels.

B. CHECKING FACTORY ADJUSTMENTS

Refer to Figure 3, Sheet 1 in back of this manual.

The following adjustments are factory set, and normally do not require adjustment in the field. Should a system not operate properly, then check and adjust (if necessary) per the following instructions. A digital voltmeter (3-1/2 digit) will be adequate for the voltage measurements. All measurements and adjustments are made on the left hand side of the controller when viewed from the front. Slide the controller forward until the appropriate components are exposed. All voltage measurements are referenced to Ground at Test Point (TP 1).

(1) 15VDC Supply

Measure the voltage from Test Point (TP 2) to Ground. If adjustment is needed, turn potentiometer R9 until the voltmeter reads 15±.05 VDC.

(2) Sensitivity Setting

The system is factory set for maximum sensitivity which is 2.5VDC at (TP 3) and (TP 4). Adjust potentiometer R27 for Channels 1-4 and and potentiometer R54 for Channels 5-8. When operating in the single zone mode, both adjustments must still be made.

B. CHECKING FACTORY ADJUSTMENTS (Cont'd.)

(3) Time Delay

A 5 second alarm delay setting is a standard factory setting. This delay (between WARN and ALARM circuits) is adjusted by potentiometer R87 for Zone 1 and potentiometer R88 for Zone 2. The adjustable range is from approximately 50 milliseconds to 20 seconds. For delays less than 1 second, an oscilloscope is desirable for checking actual time. Using an oscilloscope, measure the Zone 1 time delay between U7 Pin 12 and U7 Pin 9. For Zone 2, measure the delay between U7 Pin 4 and U7 Pin 7.

C. SYSTEM SENSITIVITY CHECK

CAUTION

The following System Check will activate the WARN and ALARM Relays. To disable these relays, move the front panel switch* (recessed) to the "Inhibit" position. This will cause the MALF LED to flash on/off. The system will now respond to alarm input signals in a normal manner, but not activate the two alarm relays.

*Reset any latched alarm. Then return the front panel switch to the "Normal" position after completing the system sensitivity check.

General Monitors provides two types of test lamps, Models TL 100 and TL 101. The selection of these lamps depends upon which type of detector head is utilized. For a Type V UV Detector, a GMI TL 100 Ultraviolet Test Lamp is recommended. At a distance of approximately 35 feet, point the TL 100 directly at the window of the detector and press the rocker switch forward into the "HI" position. The "WARN" LED should turn on immediately and the "ALARM" LED should turn on after the time delay interval. Turn off the test lamp. In some applications a less intense test lamp may be beneficial. For this reason a low intensity setting is provided by pressing the rocker switch to the rear "LO" position. This should activate the alarms from approximately 20 feet.

A fully charged Model TL 100 will operate up to 2 hours depending upon the intensity used. A "Low Bat" LED indicates when recharging is required. Charging time is 14 to 16 hours. For Type VI UV/IR detectors, the Model TL 101 UV/IR Test Lamp is recommended.

The TL 101 is a portable re-chargeable explosion-proof test lamp designed specifically to test General Monitors' UV/IR flame detectors. It consists of a high energy, broadband radiation source which emits sufficient energy in both the ultraviolet and the infrared spectra to activate the UV/IR detector. To simulate the flickering of a fire, the test lamp automatically flashes at a rate of approximately once per second.

C. SYSTEM SENSITIVITY CHECK (cont'd)

A fully charged TL 101 will operate between 15 and 30 minutes continuously. The total amount of test time available is highly dependent upon the manner in which the testing is performed. The intensity of the TL 101 lamp causes a large drain on the battery and for this reason several precautions should be used to lengthen its usable time between charges.

1) The effective operating distance for the Model TL 101 is up to 25 feet when the battery is fully charged.

2) To check a detector, aim the TL 101 directly at the window and press the "ON" button. The high intensity beam should strike the detector face directly and within several flashes activate the alarm indication on the controller display.

3) To aid in accurately aiming the TL 101, it is recommended that the above procedure not be performed in bright sunlight or artificial light. This will make the spot of visible light from the TL 101 Test Lamp easier to see and thus easier to direct into the detector lens.

4) As soon as the alarm indication is received, release the "ON" button and move to the next detector to be tested.

When the battery voltage drops below the level required to maintain the proper intensity of the lamp, an internal low voltage circuit will lock it off until the battery is recharged. Re-charging requires 12 to 14 hours so that it is important to always start a series of TL 101 checks with a fully charged unit.

Recharging the TL 101

The TL 101 Test Lamp has been designed to be explosion proof during normal usage. To recharge, the lamp requires partial disassembly which defeats the explosion proof integrity of the unit and thus recharging must be done only in a safe, unclassified area.

The charging receptacle is located inside the housing adjacent to the "ON" button. To gain access, it is necessary to unscrew the knurled plug from the body of the unit. This plug is secured to the "ON" button by a safety strap to keep it from being lost. After the plug is removed, the charging plug can be inserted into the receptacle. It is recommended that the TL101 be kept on charge continuously when not in use to prevent excessive battery discharge. The batteries may be recharged an average of 500 times and the battery pack is replaceable.

Be sure to replace the plug to restore the explosion proof integrity of the Model TL 101 prior to using it in a classified environment.

IV. SYSTEM PROBLEMS AND TROUBLE-SHOOTING

A. GENERAL

It is recommended that a spare detector be on hand at all times to minimize the potential for downtime. A full complement of other GMI recommended spare parts should also be on hand. It is also recommended that defective controllers be returned to the factory for repair even if the warranty has expired.

B. MAINTENANCE

Once installed, the Model Fl 801 system requires little or no routine maintenance other than periodic sensitivity checks and cleaning of the UV window and the source tube in the COPM "Finger". GMI recommends that a schedule be established and adhered to.

CAUTION:

The removal of particulate matter and any film buildup on the UV window and the source tube is necessary to ensure proper sensitivity of the system. It is recommended that the window and the source tube be cleaned at least every 30 days or more frequently if the detector is located in a particularly dirty environment. It is also recommended that the channel be disabled by Switch S3 while the detector is being cleaned to eliminate potential false alarms.

Directions:

A clean, soft, lint-free cloth or tissue should be used to apply the cleaning solution.

1. Wet the window with the solution.
2. Rub until the window is clean.
3. Completely dry the window with a dry cloth.
4. Repeat steps 1,2 & 3 for the source tube in the COPM "Finger".

It is important that the window not be cleaned with a dry cloth or tissue. This may cause a static charge buildup and in turn cause false alarms.

The cleaning solution should be General Monitors P/N 10272 or can be made using the following formulation:

B. MAINTENANCE (cont'd)

UV WINDOW CLEANING SOLUTION

(Approximate percentage in volumes)

Aerosol 22	0.08 %
Aquet Liquid Detergent	0.85 %
Ethyl alcohol	7 %
Isopropyl alcohol	23 %
Distilled water	69 %

Aerosol 22 is the trade name of a wetting agent manufactured by American Cyanamid Company and supplied by Fisher Scientific.

Aquet Liquid Detergent is supplied by Manostat, 519 Eighth Ave., New York, NY 10018. This liquid detergent is 25% solution in water of an aromatic polyglycol ether which is non-toxic and non-sensitizing to the skin.

When not in use, the bottle should be tightly capped.

DO NOT USE A COMMERCIAL GLASS CLEANER

C. TROUBLE-SHOOTING TABLE

The information presented in the following table is designed to correct the more common problems which appear during system startup and operation. Should the various actions suggested in the table fail to restore normal operation, we recommend that the factory be consulted and, if necessary, that the system be returned to the factory for repair.

GENERAL MONITORS

MODEL F1 801 TROUBLE-SHOOTING

SYMPTOM	POSSIBLE CAUSE	ACTION
1. No front panel LED's lit.	1. A.C. or D.C. fuse blown or loss of primary voltage.	1. Check 0.3 amp A.C. and 1.0 amp D.C. fuse on P.C. board. Check wiring for loss of power or open circuit.
2. Front panel LED malfunction indication.	2. a) Dirty or obscured optical path (UV window or source tube).	2. a) Clean UV window and source tube.
	b) Primary A.C. or D.C. voltage too low.	b) Restore primary voltage to recommended value.
	c) Controller is in "ALARM INHIBIT" mode.	c) Move lever switch to "ALARM NORMAL" mode.
	d) Open or shorted conductor or shorted to ground in either detector cable.	d) Check detector cables and connections for opens and shorts.
	e) Open or short circuit within detector.	e) Replace detector.
3. ALARM or WARN LED's and associated relays not in functional agreement.	3. Voting switch in incorrect position.	3. Move voting switch to correct position.
4. WARN LED lit with no known radiation to detector.	4. a) Radiation still at detector.	4. a) Check for radiation at detector
	b) Fault in electronics.	b) Replace detector and/or controller.

SPECIAL WARNING

Through engineering design, testing, manufacturing techniques, and rigid quality control, General Monitors supplies the finest flame detection systems available. The user must recognize his responsibility for maintaining the flame detection system in operational condition.

(1) GENERAL MONITORS recommends a sensitivity check on a regular schedule. The sensitivity check should be conducted at least once every thirty (30) days. This is the only method of insuring proper system operation and response to flame. A sensitivity check is defined as the procedure of applying a known level of Radiation to the system detectors while observing the controller. Sensitivity adjustments must be made if results are at variance.

(2) GENERAL MONITORS cautions, as with all equipment of this type, that exposure to certain atmospheres will eventually affect sensitivity (see Section II D for specific information). Use in such atmospheres requires sensitivity checks on a more frequent schedule than normal. General Monitors should be consulted for an application feasibility determination before installing a system in such atmospheres.

(3) GENERAL MONITORS' detectors are designed and tested for use in certain classes of hazardous atmospheres. Intrinsic safe integrity cannot be maintained if detectors are operated in other than the "as designed" condition. Detectors must be installed in accordance with National Electrical Code acceptable practices.

(4) GENERAL MONITORS' flame detection systems are primarily SAFETY devices for the protection of personnel and facilities, and must be "always ready". With proper installation and maintenance, the system will provide continuous monitoring of hazardous areas. The user must assume all liability for misuse of GENERAL MONITORS' flame detection systems.

(5) The system's full one year warranty will be voided if customer personnel or third parties damage the system during repair attempts.

(6) Intrinsically safe procedures must be followed to insure proper and safe operation of the FI 801 system. These procedures may be found in the following standards and specifications.

ISA RP 12.6
NFPA 493
CSA C 22.2 No 157-1979
UL 913
FM Intrinsically Safe Apparatus.

(7) The chassis ground (⏚) terminal must be connected to an earth ground. The The negative (-) 24 VDC terminal must be connected to an intrinsically safe (earth) ground whether or not primary DC power is used.

GENERAL MONITORS

WARRANTY

GMI warrants all of its products to be free from defects in workmanship or material under normal use and service within two (2) years (Gas Detection) and (1) year (Flame Detection) from date of shipment. GMI 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 GMI 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 GMI 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. GMI's responsibility under the above warranty shall be limited to the repair or replacement at GMI's option at no cost to the purchaser for parts or labor, of any component which fails during the warranty period provided that the purchaser has promptly reported such failure to GMI in writing and GMI, 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, GMI 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 GMI FOR DAMAGES INCLUDING, BUT NOT LIMITED TO, CONSEQUENTIAL DAMAGES ARISING OUT OF/OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE PRODUCT.

GENERAL SPECIFICATIONS

CONTROLLER

Dimensions	102mm x 178mm x 292mm (4"W x 7"H x 11.5"D)
Weight	3.2 kg (7 lbs.)
Mounting Configurations	Rack, Panel, Wall, Weatherproof enclosure
Temperature Range	0°C to 60°C (32°F to 140°F)
Power	105-130 VAC/50-60 Hz 205-255 VAC/50-60 Hz 22-30 VDC 12 watts nominal/18 watts maximum
Alarm Delay	Adjustable from 50m Sec to 20 Sec.
Alarm Circuits	ALARM (each zone - DPDT 4 amp, 117VAC resistive, normally de-energized. WARN (each zone) SPDT 4 amp, 117VAC resistive, normally de-energized. MALF-SPDT 4 amp, 117VAC resistive, normally energized.
Status Indicators	ALARM - Flashing Red LED WARN - Flashing Amber LED MALF - Flashing White/Amber LED READY - Green LED Channel I.D. - Amber LED's (8)
Electrical Classification	General purpose, non-hazardous
Warranty	One (1) year

GENERAL MONITORS

TYPE V UV DETECTOR - P/N 70100

Electrical Classification:	Intrinsically safe, Class I, Division 1, Groups C and D.
Temperature Range:	-40°C to 70°C (-40°F to 158 F).
Field of View:	150° maximum.
Spectral Sensitivity Range:	185 to 260 nanometers.
Optical Sensitivity:	1 sq. ft. Gasoline fire at 50 ft.
Response Time:	100 ms. to saturating signal (minimum).
Input Power:	4 VAC, 10 KHZ, Current Limited (from F1 201/801 controllers only).
Cable Length:	330 meters (1000 feet) maximum. 2 conductor shielded #14-16 AWG (per detector) Belden #9316 or equivalent.
Output Signal:	0-5 VDC.
Malfunctions Monitored:	Dirty window, open or short circuits in field wiring.
Dimensions:	213 mm (8.4 inches) long. 124 mm (4.9 inches) high. 74 mm (2.9 inches) wide.
Weight:	1.6 kg (3.5 pounds).
Mounting:	3/4" x 14 NPT.
Warranty:	One (1) year.

GENERAL MONITORS

TYPE VI UV/IR DETECTOR - P/N 70116

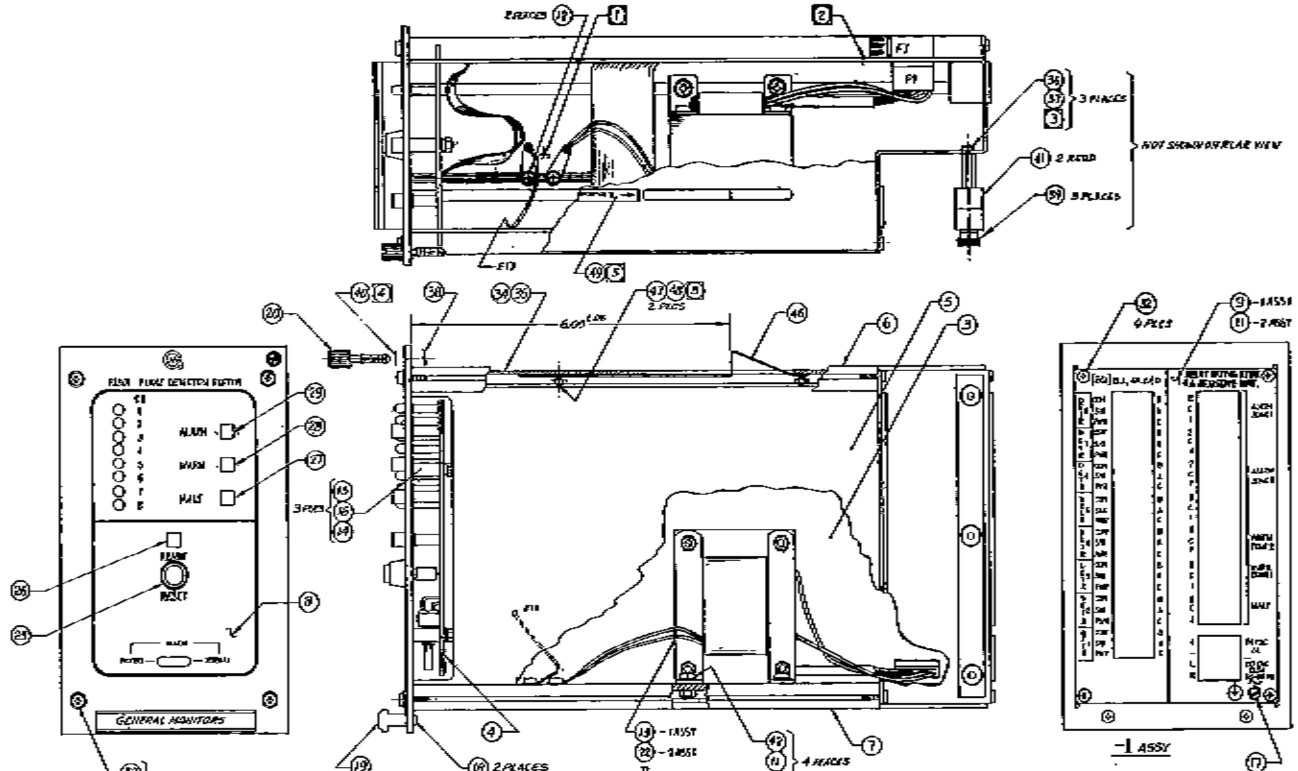
Electrical Classification:	Intrinsically safe, Class I, Division 1, Groups C and D.
Temperature Range:	-40°C to 70°C (-40°F to 158°F).
Field of View:	120° maximum.
Spectral Sensitivity Range	185 to 260 nanometers & 4.4 microns.
Optical Sensitivity:	1 sq. ft. Gasoline fire at 50 ft.
Response Time:	100 ms. to saturating signal (minimum).
Input Power:	4 VAC, 10 KHZ, Current Limited (from F1 201/801 controllers only).
Cable Length:	330 meters (1000 feet) maximum. 2 conductor shielded #14-16 AWG (per detector). Belden #9316 or equivalent.
Output Signal:	0-5VDC.
Malfunctions Monitored:	Dirty window, open or short circuits in field wiring.
Dimensions:	213 mm (8.4 inches) long. 124 mm (4.9 inches) high. 74 mm (2.9 inches) wide.
Weight:	1.6 kg (3.5 pounds).
Mounting:	3/4" x 14 NPT
Warranty:	One (1) year.

GENERAL MONITORS

RECOMMENDED SPARE PARTS

QTY	DESCRIPTION	PART NUMBER
1	Lens - Amber	939-048
1	Lens - Red	939-049
1	Lens - Green	939-047
1	Lens - Clear	939-051
2	Fuse - 0.3A	951-011
2	Fuse - 1A	951-013
1	*Detector - Type V	70100
1	*Detector - Type VI	70116

*Select type depending upon original order.



QTY-2	QTY-1	PART NO.	DESCRIPTION	ITEM
1	1	70225-1	LABEL, CONTROLLER, 801	35
1	1	10209	CAUTION LABEL, CSA, DISL - FRENCH	34
				33
8	8		SCREW, SELF TAP, 4 x 1/4 PAN-PHIL - STL-ZN PLT	32
.				31
4	4		WASHER, FLAT NO 6 STL-CAD PLT	30
1	1	938-045	LENS - LED, RED	29
1	1	938-048	LENS - LED, AMBER	28
1	1	938-051	LENS - LED, CLEAR	27
1	1	938-047	LENS - LED, GREEN	26
1	1	928-715	DRESS NUT WITH WHITE CAP	25
1	—	951-020	FUSE, MINIATURE 0.2A F1	24
—	1	951-021	FUSE, MINIATURE 0.3A F1	23
1	—	70219-2	TRANSFORMER ASSY, POWER 230VAC T2	22
1	—	70211-2	PANEL, REAR, 230VAC	21
1	1	10283-2	SCREW, CAPTIVE ...	20
1	1	10158-1	HANDLE, UNIVERSAL - 76, WITH NAME	19
2	2		SCREW, SELF TAP 6-20 x 3/8 PAN STL-ZN PLT-PHIL	18
1	1	928-310	SCREW, GUILLOTINE 6-32 X 3/8	17
3	3	928-414	SPACER, NYLON Ø6.3mm/.25 x ...	16
3	3		WASHER, FLAT M3 FIBER	15
3	3		NUT, HEX M3 . STL-CAD-PLT	14
—	1	70219-1	TRANSFORMER ASSY, POWER 117VAC T1	13
2	2		SCREW, MACH 6-32 x 5/16 PAN HD-SST-PHIL	12
9	9		WASHER, INT TOOTH No. 6 STL-CAD-PLT	11
4	4		NUT, HEX 6-32 STL-CAD-PLT	10
—	1	70211-1	PANEL, REAR, 117VAC	9
1	1	70208-1	PANEL, FRONT - PAINTED & SILKSCREENED	8
1	1	70222-1	PLATE, MOUNTING, BOTTOM	7
1	1	70223-1	PLATE, MOUNTING, TOP	6
1	1	70214-1	CCA, DRIVER BOARD A3	5
1	1	70205-1	CCA, INTERFACE BOARD A2	4
1	1	70202-1	CCA, CONTROL BOARD A1	3
—		-2	FINAL ASSY FL DETECTION 8CHAN - 230VAC	2
	—	-1	FINAL ASSY FL DETECTION 8CHAN - 117VAC	1

QTY-2	QTY-1	PART NO.	DESCRIPTION	ITEM
1	1	10166-1	LABEL, SAFETY LATCH, RACK MOUNTING	49
2	2		NUT, HEX No. 6 STL-CAD PLT	48
2	2	1040	SCREW, SET 6-32 x 3/16 SST-HEX SO-CP	47
1	1	10165-1	SAFETY LATCH, RACK MTG	46
INFO	INFO	70240	OUTLINE DRAWING & REAR TERM. CONN.	45
INFO	INFO	70220	INTERCONNECT DIAGRAM CONT FJ 801	44
INFO	INFO	70201	SCHEMATIC DIAGRAM	43
4	4		SCREW, MACH 6-32 x 3/8 PAN-SST-PHIL	42
2	2	70217-1	STRAIN RELIEF, CABLE	41
5	5	1045	WASHER, .128 I.D. x .249 O.D. NY	40
3	3	928-769	NUT, THUMB, KNURLED #6-32	39
1	1		GRIP RING, ETF .500 DIA SHAFT	38
3	3	928-533	STANDOFF, ALUMINUM 1/4 HEX x 5/8 #6-32 FEMALE	37
3	3		SCREW, MACH 6-32 x 1 3/4 PAN HD-SST PHIL	36

(REF 70200 D)

FIG. 2

FINAL ASSY
FLAME DETECTOR CONTROL
8-CHANNEL

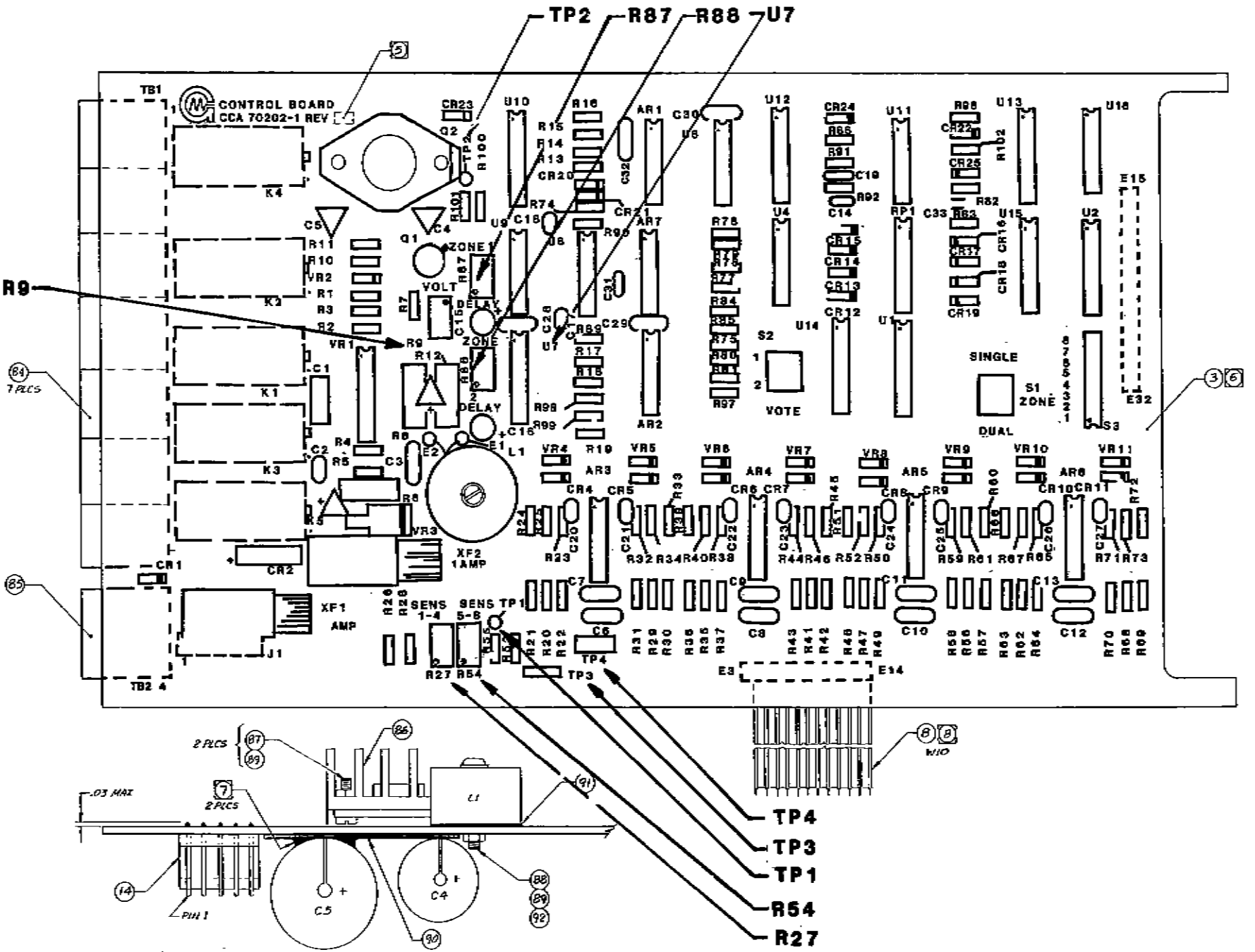


FIG. 3 SHT 1

CCA CONTROL ELECTRONICS

QTY.	PART NO.	DESCRIPTION		ITEM
				160
				159
				158
				157
				156
				155
				154
				153
				152
				151
				150
				149
				148
				147
				146
				145
				144
				143
				142
				141
				140
				139
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				123
				122
				121
				120
				119
				118
				117
				116
				115
				114
				113
				112
				111
				110
				109
				108
				107
				106
				105
				104
				103
				102
				101

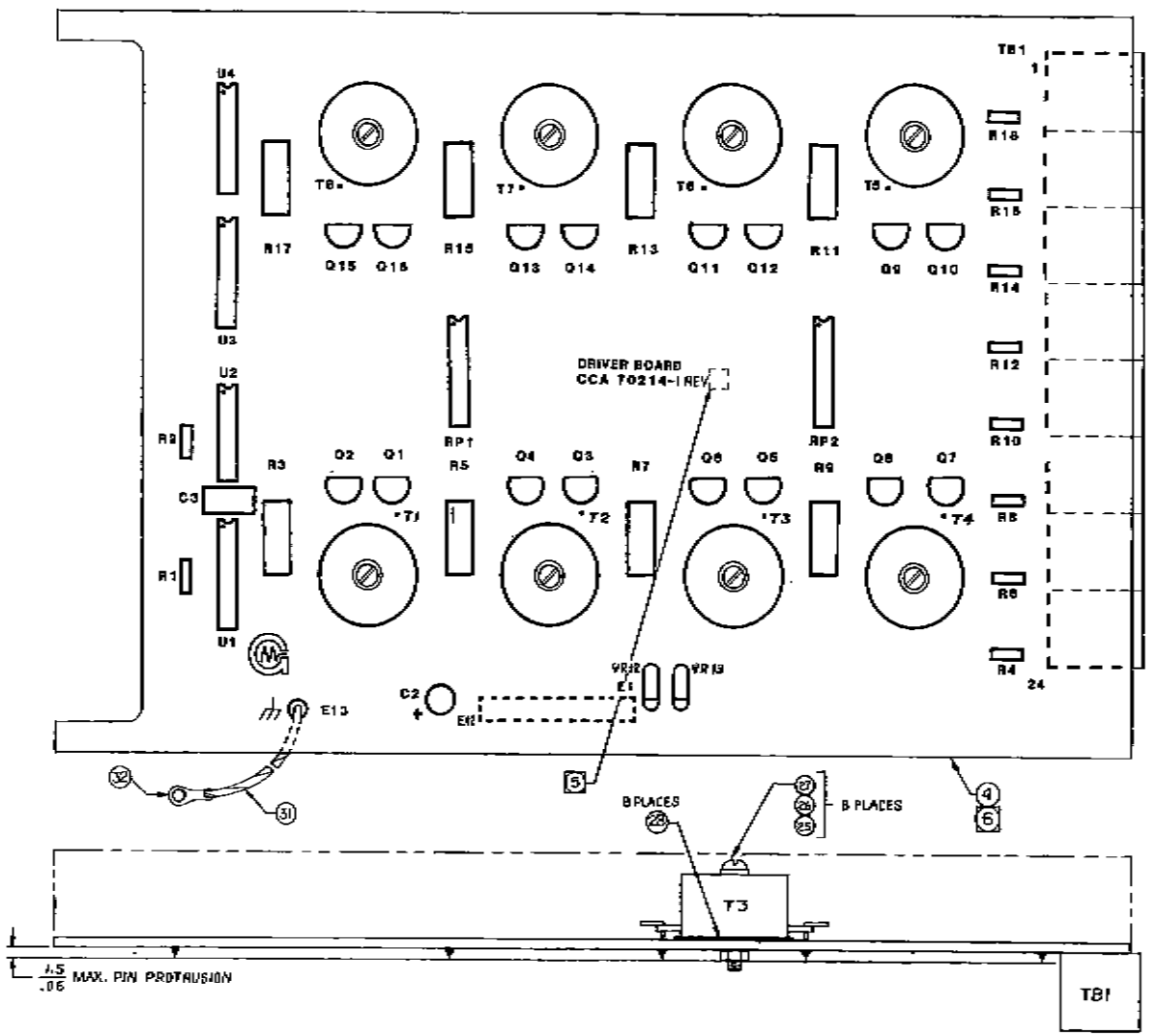
QTY.	PART NO.	DESCRIPTION		ITEM
AR	932-002	CONFORMAL COATING		100
				99
				98
				97
				96
				95
				94
				93
1		WASHER, FLAT NO.6, [illegible] / .38 INL O.D., FIBER		92
1	931-049	INSULATOR PAD		91
1		SPACER, 25 MIL ([illegible])		90
3		NUT, HEX M3 [illegible] NY		89
1		SCREW, MACH M3X20 PAN-HY-SL		88
2		SCREW, MACH M3x10 PAN-HY-SL		87
1	948-412	HEATSINK, TO-66		86
1	921-335	TERMINAL BLOCK, 4POS	TB2	85
1	921-376	TERMINAL BLOCK, 3POS	TB1	84
1	948-225	TRANSISTOR, NPN 2N2222A	Q1	83
				82
1	10 207-7	JUMPER, FLEXSTRIP 12 COND	W10	81
				80
2	951-301	SWITCH, SLIDE DPDT	S1, S2	79
1	951-600	SWITCH, 8 POS. DIP	S3	78
1	947-910	RESISTOR, PACK 10.0K [illegible]	RP1	77
				76
1	947-661	RESISTOR, 22.1K, RN55D, 1%	R7	75
2	947-602	22.6K, RN55D, 1%	R26, 53	74
1	947-319	15.0K, RN55D, 1%	R17	73
1	947-640	6.19K, RN55D, 1%	R13	72
4	947-301	10.0K, RN55D, 1%	R17, 18, 69, 85	71
3	947-318	1.50K, RN55D, 1%	R13, 100, 101	70
1	947-311	150K, RN55D, 1%	R74	69
5	947-349	4.99K, RN55D, 1%	R1, 2, 3, 28, 35	68
1	947-305	402K, RN55D, 1%	R14	67
2	947-302	1.91K, RN55D, 1%	R16, 79	66
1	947-528	1.00K, RN55D, 1%	R80	65
2	947-397	499 Ω, RN55D, 1%	R10, 15	64
1	947-610	6.04K, RN55D, 1%	R81	63
1	947-461	0.1 Ω, 1W, 1%	R6	62
2	947-411	470 Ω, 3/4W, 5%	R8, 12	61
1	947-080	2M, 1/4W, 5%	R6	60
8	947-082	10M, 1/4W, 5%	[illegible]	59
10	947-076	1M, 1/4W, 5%	[illegible]	58
11	947-018	100K, 1/4W, 5%	[illegible]	57
1	947-073	3.9M, 1/4W, 5%	R51	56
1	947-059	1.5M, 1/4W, 5%	R92	55
1	947-096	30K, 1/4W, 5%	R3	54
28	947-036	10K, 1/4W, 5%	[illegible]	52
1	947-385	6.81K, RN55D, 1%	R4	51
1	947-027	2K, 1/4W, 5%	R11	50
1	947-022	RESISTOR, 680 Ω, 1/4W, 5%	R95	49
2	947-024	RESISTOR 1K, 1/4W 5%	R98, 99	48
				47
5	945-039	RELAY, DPDT 24V 4AMP	K1 THRU K5	46
				45
1	947-541	POTENTIOMETER, 5K, VERT ADJ, [illegible]	R5	44
2	947-551	POTENTIOMETER, 10K, VERT ADJ, [illegible]	R27, 54	43
2	947-577	POTENTIOMETER, 1M, VERT ADJ, [illegible]	R87, 88	42
				41

QTY.	PART NO.	DESCRIPTION		ITEM
				40
1	931-337	I.C. SWITCHING REG PIC600	Q2	39
2	931-425	DARLINGTON DRIVERS ULN2003A	U10, 13	38
1	931-412	QUAD 2 INPUT OR GATE MC14071BCP	U6	37
2	931-413	QUAD INPUT NOR GATE MC14001BCP	U8, 11	36
1	931-472	HEX INVERTER MC14049UBCP	U12	35
2	931-423	DUAL "D" FLIP-FLOP MC14013B	U9, 16	34
1	931-432	DUAL MONOSTABLE MC14538	U7	33
1	931-430	8-INPUT "NOR" MC14078BCP	U4	32
2	931-318	8-CHANNEL MUX MC14051B	U1, 2	31
2	931-456	QUAD LATCH MC14043B	U14, 15	30
1	931-316	I.C. AMP-OP, QUAD LM324N	[illegible]	29
				28
				27
2	921-607	FUSEHOLDER	XF1, 2	26
1	951-013	FUSE, 1A 250V	F2	25
				24
1	931-379	VOLTAGE REG. LM3524N	VR1	23
1	948-037	DIODE, ZENER 1.5KE43A	VR3	22
9	948-014	ZENER 1N4740A	VR2, 4 THRU 11	21
13	948-104	SIGNAL 1N4148	CR12-22, 24, 25	20
9	948-123	RECTIFIER 1N4004	CR4 THRU 11 & 23	19
1	948-115	RECTIFIER 1N5416	CR1	18
1	948-107	DIODE, BRIDGE MDA942-A2	CR2	17
				16
				15
1	921-715	CONN 50 PIN MALE FRC 125-50M	J1	14
				13
1	913-172	CAPACITOR, 3300 UF, 50V	C5	12
8	915-036	1.0UF, 50V	C6 THRU 13	11
8	915-033	0.1 UF, 50V	C3, 14, 19, 28, 29, 30, 32, 33	10
4	915-031	.01 UF, 50V	C2, 17, 18, 31	9
1	915-120	1000 UF, 25V	C4	8
2	915-171	22 UF, 25V	C15, 16	7
1	915-068	.01UF, 5%	C1	6
8	915-046	CAPACITOR, 680 PF	C20 THRU 27	5
1	50 628	INDUCTOR, 500 UH	L1	4
1	70 203-1	CCD, CONTROL BOARD		3
INFO	70 201	SCHEMATIC DIAGRAM		2
—	-1	CCA - CONTROL BOARD		1

(REF 70202 F)

FIG. 3 SHT 2

CCA CONTROL ELECTRONICS



(REF 70214 D)

FIG. 4 SHT 1

CCA DRIVER BOARD

FOR PARTS LIST SEE COMPUTER BOM 70214-

PART#.....	QTY	MFG-PART#.....	DESC.....	REV	REV-DATE	ITM	REFDES .....
70201	INFO		SCHEMATIC DIAGRAM FL801	G	04-01-87		
70215-1	1		CCD DRIVER BOARD FL801	D	04-01-87	4	
915-171	1	199D226X9025DB1	CAP 22UF 25V 20% TANT				C2
915-067	1	DM10331J	CAP 330 PF 100WV 5% DIP MICA				C3
931-422	3	MC14049UB	IC HEX BUFFERS CMOS MC14049UB				U1,3,4
931-423	1	MC14013BCP	IC FLIP-FLOP DUAL TYPE D 14 PIN				U2
947-010	8		RES 2 OHM 1/4W 5% CARBON				R4,6,8,10,12,14,16,18
947-410	8	4394	RES 120 OHM 3 1/4W 5%				R3,5,7,9,11,13,15,17
947-372	1		RES 49.9K 1% RN55D METAL FILM				R2
947-316	1		RES 100K 1% RN55D METAL FILM				R1
947-911	2	898-3-R6.8K	RES NETWORK 6.8K 16 PIN DIP 8 R				RP1,2
921-326	8	TOP 1.5 GS/3 #48	TERM BLOCK 3 POS P.C.				TB1
931-040	8	7403-09-FR-28	INSULATOR PAD			28	
932-002	AR	8267	COATING CONFORMAL			29	
921-510	1	501-H-#8	TERM LUG #8 LOCKING			32	
948-245	16	MPS 8099	TRANS MPS 8099 NPN				Q1-16
948-042	2	1N5354B	DIODE 1N5354B 5W 17V 5%				VR12,13
9115	8		WASH #6 FLT FBR			25	
12553	8		SCR M3X0.5X20 SLOT PAN HD NYL			26	
12517	8		NUT M3X0.5 NYLON HEX			27	
9347	.3		WIRE YELLOW/GREEN STRIP 20 AWG			31	
70017-1	8		XFMR POWER FL201-801 10KHZ	A	08-19-82		

(REF 70214D) FIG. 4 SHT 2 **CCA DRIVER BOARD**