



GENERAL MONITORS

MODEL FL802

Multi-Channel Flame Detection
Readout/Relay Module



The information and technical data disclosed in this document may be used and disseminated only for the purposes and to the extent specifically authorized in writing by General Monitors and may not be used or disseminated except as provided in the foregoing sentence. Note: The Model FL802 is easy to install, however, this manual should be read in full and understood before attempting to install or operate the system.

INSTRUCTION MANUAL 09/92

General Monitors reserves the right to change published specifications and designs without prior notice.

Part No.
Revision

MANFL802
D/09-92



GENERAL MONITORS

Model FL802

Warranty

General Monitors warrants all of its products to be free from defects in workmanship or material under normal use and service within the periods specified in the individual data sheets. General Monitors will repair or replace without charge any such equipment found to be defective during the warranty period. Full determination of the nature of, and responsibility for defective or damaged equipment will be made by General Monitors personnel. Defective or damaged equipment must be shipped prepaid to General Monitors' plant or representative from which shipment was made. In all cases this warranty is limited to the cost of the equipment manufactured by General Monitors. The customer will assume all liability for the misuse of this equipment by its employees or other personnel.

All warranties are contingent upon proper use in the application for which the product was intended, and do not cover products which have been modified or repaired without General Monitors' approval, or which have been subjected to neglect, accident, improper installation or application, or on which the original identification marks have been removed or altered. Except for the express warranty stated above, General Monitors disclaims all warranties with regard to the products sold, including all implied warranties of merchantability and fitness, and the express warranties stated herein are in lieu of all obligations or liabilities on the part of General Monitors for damages including, but not limited to, consequential damages arising out of/ or in connection with the use or performance of the product.



GENERAL MONITORS

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04 May 1995

To All FL802 Users:

The Model FL802 Instruction Manual does not reflect the recent upgrade to the new UV Window cleaning solution. This manual is in the process of being updated, and in order to continue servicing you on this product, please make note of the following changes:

- P/N 10272-1 no longer contains special ingredients, like Aerosol 22 or Aquet Liquid Detergent.
- P/N 10272-1 is now the same as "Industrial Strength Windex® with Ammonia D".
- Other commercial glass cleaner should not be used to clean General Monitors' Flame Detector UV Windows.

If you have any questions, please contact your General Monitors' Sales Representative or the factory direct. Thank you.

Respectfully,

Charles Simek
Technical Writer



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Introduction

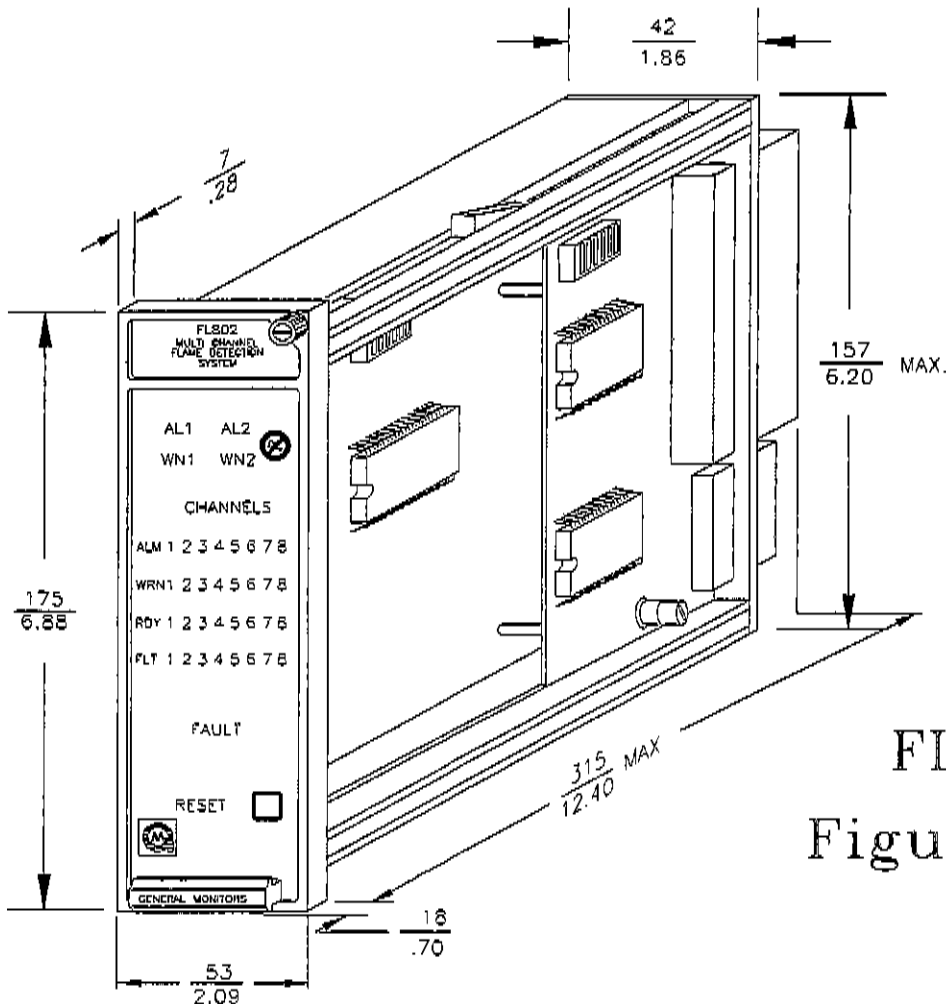
1-1 General Description

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 General Monitors' Model FL802 Multi Channel Flame Detection Readout/Relay Module (See Figure 1-A) employs eight remote detectors (*FL3000, FL3001, and/or FL3002*) which sense the presence of flame radiation.

Should this flame radiation exceed preset levels in the detector, the Model FL802's alarm circuits will be activated. These detectors sense flame radiation and are insensitive to sunlight and ordinary room lighting.



FL802

Figure 1-A



GENERAL MONITORS

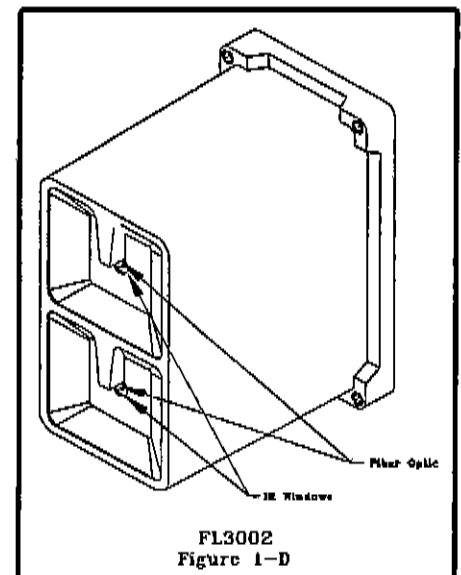
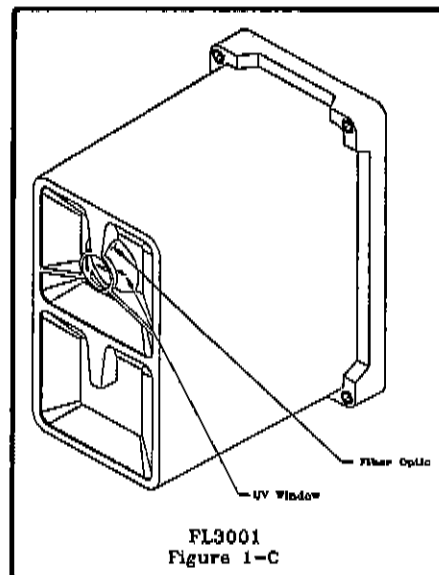
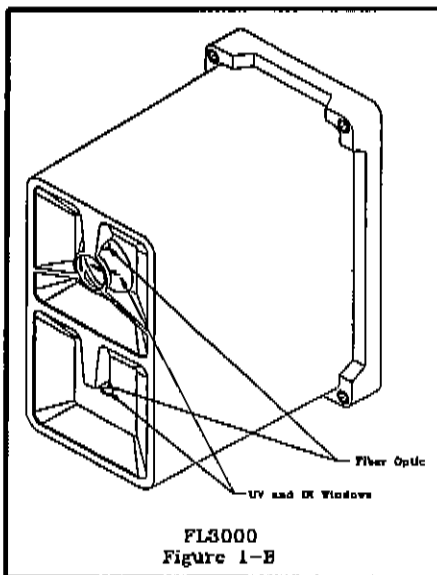
Model FL802

Introduction

The General Monitors Model FL3000 is an Ultraviolet/ Infrared (UV/IR) Flame Detector. A companion unit, the Model FL3001 is an Ultraviolet (UV) Flame Detector. The Model FL3002 is an Enhanced Infrared (IR/IR) Flame Detector. All three of these units have features which include:

- explosion/ flame-proof
- complete unitization
- microcomputer based electronics

The Model FL3000 (See *Figure 1-B*) detects the ultraviolet and infrared spectral regions of a flame to produce a system which is highly immune to false alarms caused by lightning, arc welding, hot objects, and other sources of radiation. The Model FL3001 (See *Figure 1-C*) only responds to UV spectra and has been optimized for speed of response. The Model FL3002 (See *Figure 1-D*) responds to the intensity and the rate of change in IR radiation. This unit has been optimized for flame detection under smoky conditions.





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Model FL802

Introduction

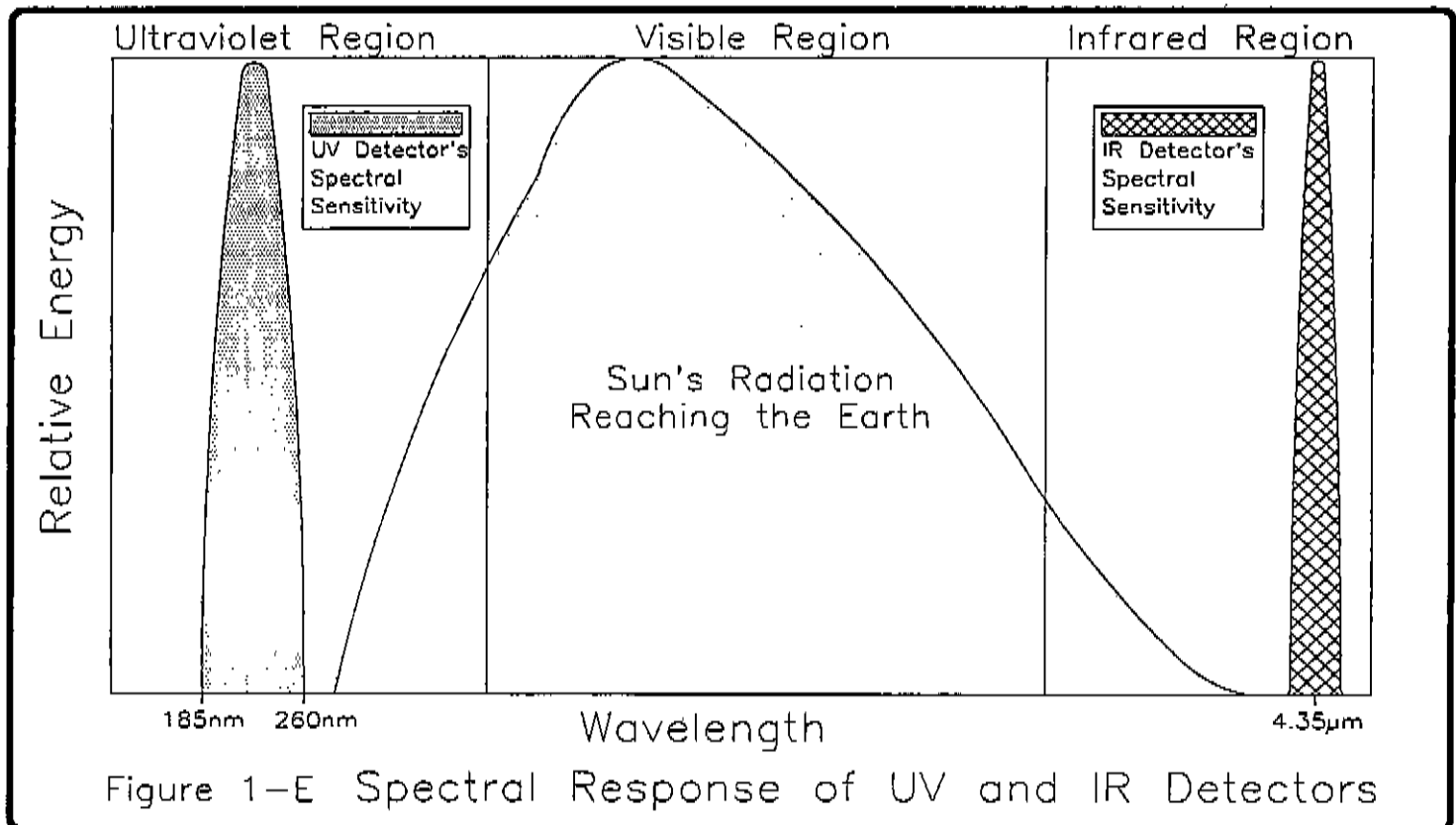
1-2 Detector Principle of Operation

UV Detector, FL3000 and FL3001

The Model FL3001 is a UV detector which contains a photo tube that responds to radiation in the 185 to 260 nanometers region (See *Figure 1-E*). When radiation from a flame strikes the cathode plate within a UV detector tube, electrons are ejected from the cathode plate. These electrons are accelerated towards the positively-charged anode of the tube. They collide with molecules of an ionizable gas with which the tube is filled, thereby emitting more electrons, and producing an 'avalanche' condition.

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 Model FL3001 UV Flame Detector processes these UV tubes with a microcomputer and produces the following outputs:

- 4-20mA signal
- immediate WARN relay contacts
- immediate WARN open collector
- time delayed ALARM relay contacts
- time delayed ALARM open collector
- FAULT relay contacts
- FAULT open collector





Introduction

UV/IR Flame Detector, FL3000

The Model FL3000 is a discriminating UV/IR Flame Detector which makes use of an ultra-violet radiation sensitive photo tube in addition to a pyroelectric infrared detector. This combination provides a flame detection system which is highly immune to false alarms.

The UV portion of the detector as described in UV Detector, FL3000 and FL3001, is combined with a pyroelectric detector which responds to a change in intensity of infrared radiation. By sensing very specific wave lengths in both the UV and the IR spectra (See *Figure 1-E*) and then processing these signals with a microcomputer, a very high degree of discrimination is achieved.

Incorporated in the IR circuitry 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. Infrared radiation from a fire is detected by the temperature-compensated IR detector which is mounted behind a sapphire window on the front of the enclosure directly under the UV window.

Since a flame is a copious source of both ultraviolet and infrared radiation, discrimination is provided when both UV and IR emitters 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 in the correct combination and intensity determined by an algorithm in the microcomputer, a fire is identified and an alarm is given.

Enhanced IR Flame Detector, FL3002

The Model FL3002 is a discriminating IR/IR Flame Detector which makes use of a thermopile IR detector and a pyroelectric IR detector which are sensitive to infrared radiation occurring on a center wavelength of 4.35 microns. The pyroelectric IR detector responds to a change in the intensity of infrared radiation and is discussed previously in UV/IR Flame Detector, FL3000. The thermopile IR detector measures the intensity of infrared radiation.

Simply translated, the thermopile sees the intensity of IR, while the pyroelectric sees the flicker rate of IR. These two infrared devices combine to produce an Enhanced IR detector optimized for detection of fires under dirty/smoky conditions.



Introduction

COPM Circuitry

A self-testing feature called COPM (*Continuous Optical Path Monitoring*) checks the optical path, the detector(s), and the related electronic circuitry once every minute. If foreign material impairs the optical path of the UV detector tube or the IR detector(s), depending on the model, for two consecutive checks, the unit will indicate a FAULT.

The FAULT outputs are:

- 0mA signal
- de-energizing of the FAULT relay
- activating the FAULT open collector output

After a COPM FAULT, a COPM check is performed every eight seconds until the optical path obstruction is removed. Then the COPM check will resume a once per minute check.

NOTE: *Since the optical path is checked once per minute and it requires two check failures to produce a FAULT, it may take up to two minutes for the unit to detect an obstruction.*

1-3 Controller Principle of Operation

The Model FL802 is a Multi-Channel System in which the Readout/ Relay Module continuously monitors the inputs from eight detectors. Each detector is monitored independently (*i.e. they are not scanned*). The signal from each channel is in the form of a 0 to 20 mA analog input. A 0 to 0.5mA signal indicates a FAULT condition, a 4.0mA ($\pm 0.5mA$) signal indicates a READY status, a

16.0mA ($\pm 0.5mA$) signal indicates a WARN condition, and a 20mA ($\pm 0.5mA$) signal indicates an ALARM condition.

1-4 Indicators Switches & Functions

The status of each of the eight detectors is individually displayed on the front panel by a set of four colored **green, yellow, orange, and red** LED's, which correspond to the controller channel position connected to the detector.

READY: (A 4.0mA signal) when the green LED is illuminated, it indicates that the flame detector connected to the corresponding channel number is functioning correctly.

FAULT: (A 0mA signal) when the yellow LED is illuminated it indicates that the flame detector connected to the corresponding channel number is malfunctioning. The same corresponding green LED will turn off.

The yellow back lit FAULT flashes when any of the detectors is in the malfunction mode, or the + 24VDC of the Model FL802 drops below 17 volts.

WARN: (A 16.0mA signal) when the orange LED is illuminated it indicates that a warning situation exists at the site of the corresponding detector.

ALARM: (A 20.0mA signal) when the red LED is illuminated it indicates that an alarm situation exists at the site of the corresponding detector.

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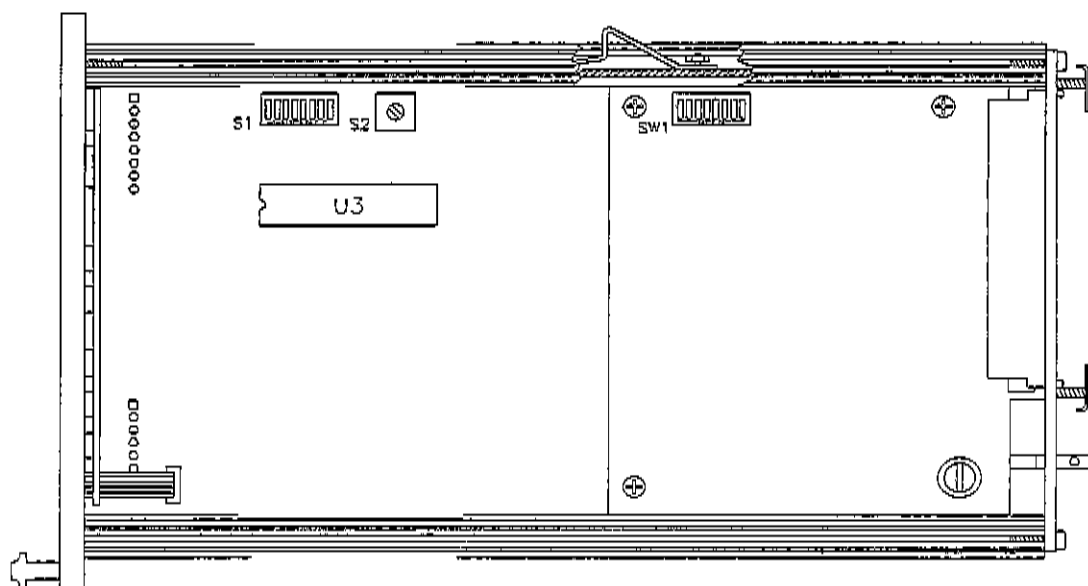
Two sets of eight DIP switches and a ten position switch (See Figure 1-F) are accessible to program the controller as follows:

If it is desired that less than eight detectors be used, any detector or detectors may be disabled within the Readout/Relay Module by S1. S1 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 **closed** position. No external connections are required to disable a channel.

If a detector is connected to a given channel and that channel is disabled, it will not respond to a flame or test lamp because more of the outputs are activated.

The S2 ten position switch is used to inhibit the Model FL802's alarm relays while testing the functionality of the detectors. The S2 switch positions are numbered from 0 to 9. When S2 is set to position 0, the controller is operating in the normal mode and the alarm inhibit light on the front panel is off. When S2 is set to any position between 1 and 8, the detector connected to the corresponding channel number will have its alarm relay inhibited. When S2 is set to position 9, all of the eight channels will have their alarm relays inhibited. The alarm inhibit light on the front panel is on when the S2 switch is set to any position from 1 to 9.

Note: The description of the options switch (SW1) is contained in section 3-10.



FL802 (side view)

Figure 1-F



Introduction

1-5 System Components

ITEM	PART#
FL802 Multi-Channel Readout/ Relay Module	70235-1
FL3000 UV/ IR Flame Detector (with Relays)	70550-1
FL3000 UV/ IR Flame Detector (without Relays)	70550-2
FL3000 UV/ IR Flame Detector (High-Temperature)	70550-3
FL3001 UV Flame Detector (with Relays)	70585-1
FL3001 UV Flame Detector (without Relays)	70585-2
FL3001 UV Flame Detector (High-Temperature)	70585-3
FL3002 Enhanced IR Flame Detector (with Relays)	70520-1
FL3002 Enhanced IR Flame Detector (without Relays)	70520-2
Bracket Assembly	70580-1
Swivel Elbow - 3/ 4" NPT	961-003
TL100 UV Test Lamp	70300-1
TL102 UV/ IR Test Lamp	70325-2
UV window cleaning solution	10272-1
Instruction Manual	MANFL802



Specifications

2-1 System Specifications

Description: 8 Channel Flame Detection System (Readout/ Relay Module)

Dimensions: 2.1W x 6.9H x 11.5L
(53mm x 175mm x 294mm)

Weight: Approximately 2.5 lb.
(1.2kg) max.

Mounting: Rack, Panel, and Wall

Temperature: 0°F to 158°F Range
(-18°C to 70°C)

Humidity: 0 to 99% non-condensing

2-2 Electrical Specifications

Input Signal:

FAULT: 0 to 0.5mA

READY: 4.0 \pm 0.5mA

WARN: 16.0 \pm 0.5mA

ALARM: 20.0 \pm 0.5mA

Outputs common to all 8 channels:

ALARM - DPDT, latching/ non-latching,
energized/ de-energized, 250VAC 4A
3A @ 30VDC max.

WARN - DPDT, latching/ non-latching,
energized/ de-energized, 250VAC 4A
3A @ 30VDC max.

FAULT - SPDT, normally energized,
250VAC 4A/ 3A @ 30VDC max.

Open Collector Outputs (100mA @ 30VDC):

ALARM1 WARN1

ALARM2 WARN2

Discrete ALARM channels 1 to 8

Discrete WARN channels 1 to 8

Discrete FAULT channels 1 to 8

Common Front Panel Indications:

AL1 (Alarm Zone 1)

AL2 (Alarm Zone 2)

WN1 (Warn Zone 1)

WN2 (Warn Zone 2)

Discrete Front Panel Indications:

ALARM (channels 1 to 8)

WARN (channels 1 to 8)

READY (channels 1 to 8)

FAULT (channels 1 to 8)

RESET (flashing)

ALARM RELAYS INHIBIT

Power requirement:

20 to 35VDC @ 1/4 amp (plus 1/4 amp
for each active channel)



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Specifications

Reset:

front panel and remote

Functions set by DIP switch:

Alarm Zoning:

single 8 channel zone or

two 4 channel zones

Voting:

one or two votes per zone

Alarm Time Delay:

0, 1, 4 or 8 seconds

Channel Disable:

each channel disabled individually

Applications that include, but are not limited to:

- Refineries
- Drilling Platforms
- Gas Collection Facilities
- Petrochemical Plants
- Chemical Plants
- Compressor Stations
- Aircraft Hangars
- Storage Areas
- Fuel Loading Platforms



Installation

3-1 On Receipt of Your Equipment

All equipment shipped by General Monitors is pre-packed in shock absorbing containers which provide considerable protection against physical damage. The contents should be carefully removed and checked against the packing slip. If any damage has occurred or there is a discrepancy in the order, please notify General Monitors as soon as possible. All subsequent correspondence with General Monitors must specify the equipment part number and the serial number.

Each Model FL802 is completely checked by the factory, however, a complete check-out is necessary upon initial installation and start-up to ensure system integrity.

3-2 Choosing Controller Location

The Model FL802 should be installed in a weather protected, non-hazardous area. Mounting should be as free from shock and vibration as possible. Care should be taken to mount the Readout/Relay Module away from radio transmitters or similar equipment, even though the Model FL802 is RFI/EMI resistant.

Provide a wiring service loop (*FL802 to field wiring*) to facilitate access to the Readout/Relay Module adjustments (*DIP switches*) located on the PC board. This service loop could also provide an easy Readout/Relay Module disconnection at the front side of the master panel.

Care should be taken to ensure that adequate ventilation is provided. Do not mount the Model FL802 in a manner which will restrict the natural convection air flow from normal ambient air. The operating temperature for the Readout/Relay Module is -18°C to $+70^{\circ}\text{C}$ (0°F to 158°F).

3-3 Power Requirement

The system operates with a nominal input voltage of 24VDC, and a minimum capacity of 1/4 Amp (*plus 1/4 Amp for each active channel*). Power must remain disconnected until all wiring connections are made.

NOTE: There is no power on/off switch. This is to prevent an accidental and/or unauthorized shutdown.

No. 14 AWG wire should be used to prevent excessive voltage drop and the cable run should be as short as possible. Connect the **positive** side of the power supply to the **+ 24 VDC IN** terminal, and the **negative** side to the **COM IN** terminal. An internal diode protects the system in the event the DC polarity is reversed.



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Installation

3-4 Choosing Detector Location

Several variables are involved in selecting the proper locations to install detectors to ensure the detection of flame. There are no hard or fast rules defining the optimum location. However, the following general suggestions should be considered in regard to particular conditions at the site where the Model FL802 is being installed.

a) Detector 'Field of Vision'

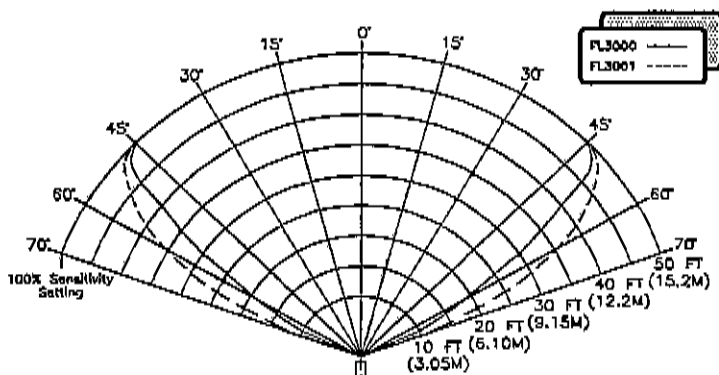
Each FL3000 detector has a maximum of 120° cone of vision. The cone of vision for the FL3001 is 140°. The cone of vision for the FL3002 is 100°. This cone has its vertex at the center of the detector (see figure 3-A).

b) Optical Sensitivity Range

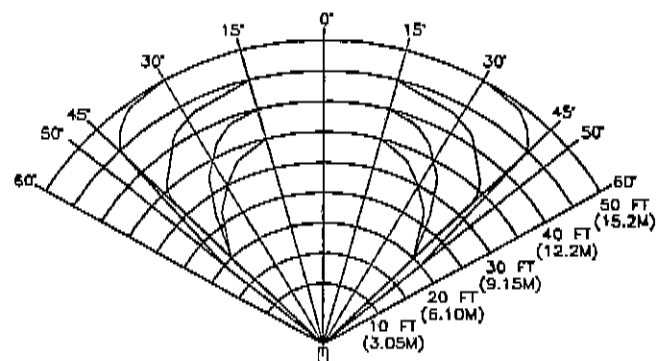
The distance at which the detector will respond to a flame is a function of the intensity of that flame. The maximum distance is 50 feet (15.2m) for a gasoline fire with a surface area of 1 sq. ft. (30 x 30cm).

c) Environmental Factors

Avoid installing detectors in locations 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 for the specific model. Mount the detector in a downward plane to minimize the effect of dust and/or moisture build-up on the detector's UV and IR windows.



UV and UV/IR Detector - Field of View



Enhanced IR Detector - Field of View

Figure 3-A



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Model FL802

Installation

3-5 Detector Installation

The Model FL3000, FL3001, and FL3002 detectors are explosion-proof assemblies that are rated for use in Class I, Division 1, Group B, C and D areas. Detectors should be mounted pointing downward so that water and airborne debris will not accumulate on the UV and IR windows. The detector should be mounted in a location which will inhibit people or objects from obscuring the detector's cone of vision. Mounting should be as free from shock and vibration as possible and convenient for visual inspection and cleaning.

It is recommended that General Monitors UV window cleaner (*P/N 10272-1*) be used as a cleaning fluid for the detector lens and the COPM source tube, following the instructions in Section 4-2 **Cleaning the Lenses and COPM Source Tube.**

3-6 Terminal Connections

All wire connections are made to the terminal blocks, which will accept 16 AWG to 22 AWG stranded or solid core wire (*14 AWG wire can be used but extreme care must be taken in that the connection space would be very tight*

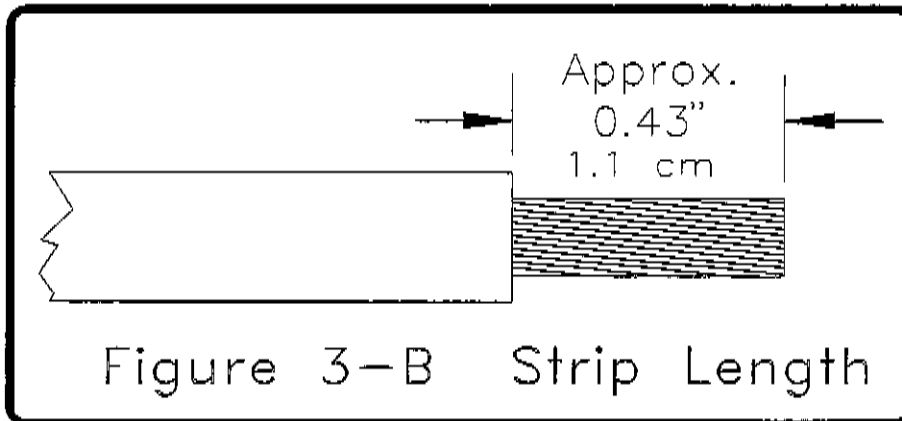
for that gauge of wire). Each wire should be stripped as shown below in figure 3-B.

The Model FL802 furnishes the + 24VDC and ground (*common*) connections to, as well as receiving the 4 to 20mA output signal from the Models FL3000, FL3001, and/ or FL3002.

There are seventy-eight possible terminal connections as shown on the next page in Figure 3-C.

The plugs associated with the connections are identified as P1, P2, P3 and P4. P1 and P3 contain two vertical rows of sixteen terminations each, and each row is identified as row *d* or row *z*. Additionally, the rows are identified in pairs using even numbers from 2 through 32. For example, termination P1-2z is the upper right-hand terminal of plug P1 and termination P1-32d is the lower left-hand termination of plug P1.

P2 and P4 each contain a single row of seven terminations. By similar example, termination P2-1 is the top terminal of plug P2 and P2-7 is the bottom. All four of the plugs are keyed to fit only in their proper locations.



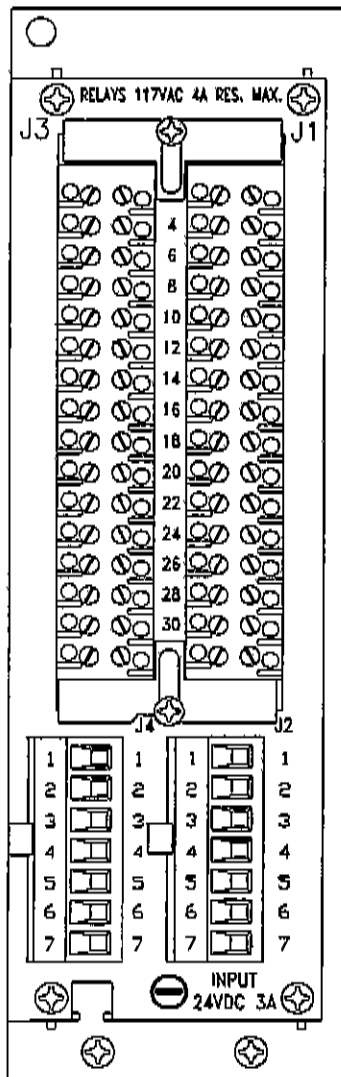


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P3		d	z	
WARN OC 1	2	2		ALARM OC 1
WARN OC 2	4	4		ALARM OC 2
WARN OC 3	6	6		ALARM OC 3
WARN OC 4	8	8		ALARM OC 4
WARN OC 5	10	10		ALARM OC 5
WARN OC 6	12	12		ALARM OC 6
WARN OC 7	14	14		ALARM OC 7
WARN OC 8	16	16		ALARM OC 8
ALARM COM	18	18		ALARM COM
ALARM 1	20	20		ALARM 3
ALARM 2	22	22		ALARM 4
WARN COM	24	24		WARN COM
WARN 1	26	26		WARN 3
WARN 2	28	28		WARN 4
WN ZN OC 1	30	30		AL ZN OC 1
WN ZN OC 2	32	32		AL ZN OC 2

P4	
COMMON	1
COMMON	2
COMMON	3
NC	4
COMMON	5
COMMON	6
KEY	7



P1		d	z	
CH1 4-20mA	2	2		CH2 4-20mA
CH1 COM	4	4		CH2 COM
CH1 +24 VDC	6	6		CH2 +24 VDC
CH3 4-20mA	8	8		CH4 4-20mA
CH3 COM	10	10		CH4 COM
CH3 +24 VDC	12	12		CH4 +24 VDC
CH5 4-20mA	14	14		CH6 4-20mA
CH5 COM	16	16		CH6 COM
CH5 +24 VDC	18	18		CH6 +24 VDC
CH7 4-20mA	20	20		CH8 4-20mA
CH7 COM	22	22		CH8 COM
CH7 +24 VDC	24	24		CH8 +24 VDC
FAULT OC 1	26	26		FAULT OC 5
FAULT OC 2	28	28		FAULT OC 6
FAULT OC 3	30	30		FAULT OC 7
FAULT OC 4	32	32		FAULT OC 8

P2	
KEY	1
FAULT COM	2
FAULT 1	3
FAULT 2	4
REMOTE RESET	5
+24 VDC IN	6
COM IN	7

REAR VIEW

Figure 3-C



Installation

With reference to figure 3-C, the description for each termination is as follows:

Plug P1

- **Terminal 2d** = 4-20mA from ch # 1
- **Terminal 4d** = Common for ch # 1
- **Terminal 6d** = + 24 VDC for ch # 1
- **Terminal 8d** = 4-20mA from ch # 3
- **Terminal 10d** = Common for ch # 3
- **Terminal 12d** = + 24 VDC for ch # 3
- **Terminal 14d** = 4-20mA from ch # 5
- **Terminal 16d** = Common for ch # 5
- **Terminal 18d** = + 24 VDC for ch # 5
- **Terminal 20d** = 4-20mA from ch # 7
- **Terminal 22d** = Common for ch # 7
- **Terminal 24d** = + 24 VDC for ch # 7
- **Terminal 26d** = OC FAULT for ch # 1
- **Terminal 28d** = OC FAULT for ch # 2
- **Terminal 30d** = OC FAULT for ch # 3
- **Terminal 32d** = OC FAULT for ch # 4
- **Terminal 2z** = 4-20mA from ch # 2
- **Terminal 4z** = Common for ch # 2
- **Terminal 6z** = + 24 VDC for ch # 2
- **Terminal 8z** = 4-20mA from ch # 4
- **Terminal 10z** = Common for ch # 4
- **Terminal 12z** = + 24 VDC for ch # 4
- **Terminal 14z** = 4-20mA from ch # 6
- **Terminal 16z** = Common for ch # 6
- **Terminal 18z** = + 24 VDC for ch # 6
- **Terminal 20z** = 4-20mA from ch # 8
- **Terminal 22z** = Common for ch # 8
- **Terminal 24z** = + 24 VDC for ch # 8
- **Terminal 26z** = OC FAULT for ch # 5
- **Terminal 28z** = OC FAULT for ch # 6
- **Terminal 30z** = OC FAULT for ch # 7
- **Terminal 32z** = OC FAULT for ch # 8

Terminals 2d, 2z, 8d, 8z, 14d, 14z, 20d, and 20z are the discrete 4-20mA inputs from each detector. Terminals 4d, 4z, 10d, 10z, 16d, 16z, 22d, and 22z are the discrete Common connections for each detector. Terminals 6d, 6z, 12d, 12z, 18d, 18z, 24d, and 24z are the discrete + 24VDC connections for each detector. Terminals 26d, 26z, 28d, 28z, 30d, 30z, 32d, and 32z are the discrete FAULT Open Collector Outputs for each channel.

Plug P2

- **Terminal 1** = KEYED
- **Terminal 2** = FAULT Relay, Common
- **Terminal 3** = FAULT Relay, Connection 1, Normally Open
- **Terminal 4** = FAULT Relay, Connection 2, Normally Closed
- **Terminal 5** = Remote Reset Connection
- **Terminal 6** = 24 VDC, positive connection
- **Terminal 7** = 24 VDC, common connection

Terminal 1 is a keyed connection that allows P2 (*and only P2*) to be connected to the J2 connection. Terminal 2, 3 and 4 are the connections to the SPDT FAULT Relay. Terminal 5 is the remote RESET SWITCH connection for the FL802 when it is configured in the latching mode. Terminals 6 and 7 are the + 24VDC input and 24VDC Common input respectively to the Model FL802.



Installation

Plug P3

- Terminal 2d = OC WARN for ch # 1
- Terminal 4d = OC WARN for ch # 2
- Terminal 6d = OC WARN for ch # 3
- Terminal 8d = OC WARN for ch # 4
- Terminal 10d = OC WARN for ch # 5
- Terminal 12d = OC WARN for ch # 6
- Terminal 14d = OC WARN for ch # 7
- Terminal 16d = OC WARN for ch # 8
- Terminal 18d = ALARM Relay, Common
- Terminal 20d = ALARM Relay, Conn 1
- Terminal 22d = ALARM Relay, Conn 2
- Terminal 24d = WARN Relay, Common
- Terminal 26d = WARN Relay, Conn 1
- Terminal 28d = WARN Relay, Conn 2
- Terminal 30d = OC WARN ZONE 1
- Terminal 32d = OC WARN ZONE 2
- Terminal 2z = OC ALARM for ch # 1
- Terminal 4z = OC ALARM for ch # 2
- Terminal 6z = OC ALARM for ch # 3
- Terminal 8z = OC ALARM for ch # 4
- Terminal 10z = OC ALARM for ch # 5
- Terminal 12z = OC ALARM for ch # 6
- Terminal 14z = OC ALARM for ch # 7
- Terminal 16z = OC ALARM for ch # 8
- Terminal 18z = ALARM Relay, Common
- Terminal 20z = ALARM Relay, Conn 3
- Terminal 22z = ALARM Relay, Conn 4
- Terminal 24z = WARN Relay, Common
- Terminal 26z = WARN Relay, Conn 3
- Terminal 28z = WARN Relay, Conn 4
- Terminal 30z = OC ALARM ZONE 1
- Terminal 32z = OC ALARM ZONE 2

Terminals 2d, 4d, 6d, 8d, 10d, 12d, 14d, and 16d are the discrete WARN Open Collector Outputs. Terminals 2z, 4z, 6z, 8z, 10z, 12z, 14z, and 16z are the discrete ALARM Open Collector Outputs.

Terminals 18d, 18z, 20d, 20z, 22d, and 22z are the connections for the DPDT ALARM Relay. Terminals 24d, 24z, 26d, 26z, 28d, and 28z are the connections for the DPDT WARN Relay.

With a normally energized condition, the WARN & ALARM Relay connections numbered 1 and 3 are normally open and the connections numbered 2 and 4 are normally closed. With a normally de-energized condition, the WARN & ALARM Relay connections numbered 1 and 3 are normally closed and the connections numbered 2 and 4 are normally open.

Terminals 30d, 30z, 32d, and 32z, are the common Open Collector Outputs for WARN & ALARM, ZONE 1 & ZONE 2.

Plug P4

- Terminal 1 = COMMON
- Terminal 2 = COMMON
- Terminal 3 = COMMON
- Terminal 4 = NO CONNECTION
- Terminal 5 = COMMON
- Terminal 6 = COMMON
- Terminal 7 = KEYED

Terminals 1, 2, 3, 5, and 6 are COMMON connections. Terminal 4 does not provide any connection. Terminal 7 is a keyed connection that allows P4 (*and only P4*) to be connected to the J4 connection.



Model FL802

Installation

Interconnections to the Models FL3000/ FL3001/ FL3002

The Model FL802 is designed to provide the power outputs required by the FL3000, FL3001, and/or FL3002 Flame Detectors. To power the Models FL3000, FL3001, and/or FL3002, the Model FL802 must be located within a maximum distance of 3000 feet (1000 meters) from the detectors, and the maximum permissible loop resistance is 20 ohms at +24VDC using 16AWG cable. The interconnection is made from the P1 rear connector block terminations of the Model FL802 identified as **CH X + 24VDC** (*X stands for the appropriate channel number 1 to 8*), and common, **CH X COM** (*refer to Plug P1 and figure 3-C in this section*).

The 4-20mA output signals from the flame detectors are interconnected with the Model FL802 Readout/ Relay Module to provide:

- 1 indication in the control room, or at a remote location, the operation and alarm conditions of the flame detector,
- 2 ALARM Relays for audible or visual indications or other relay type of functions desired by the user, and
- 3 Open Collector Output signals for FAULT, WARN, and ALARM.

Alarm Wiring Connections

Alarm wiring connections are also made at designated connectors located on the rear panel of the Model FL802. The ALARM and WARN relay contacts (*dry*) are DPDT and rated 4 amps @ 250VAC, resistive. They may be latching (*manual reset*) or non-latching (*automatic reset*), and normally energized or normally de-energized (*with power applied to the Readout/ Relay Module*). Each of these operations can be selected by DIP switches in the Model FL802. The FAULT relay contacts (*dry*) are SPDT and rated 4 amps @ 250VAC resistive. The FAULT relay is always provided as non-latching and normally energized (*with power applied to the Readout/ Relay Module*).

Open Collector Outputs

An Open Collector Output can simply be thought of as a SPST switch connected so that one terminal is connected to the system common and the other terminal is the output. The load to be driven is connected between the Open Collector Output and a supply voltage that is positive with respect to the system common. When the output is not activated, as in a normally de-energized relay, there is no current flow (*the switch is open*). For an active output the switch is closed permitting current to flow. It is very important that the load is selected so that the maximum current flow is less than the rated value. This is especially true for loads with high surge currents such as incandescent lamps.



Installation

The ALARM and WARNIng Open Collector Outputs can be normally energized (*sink current*) or normally de-energized (*not sinking current*). They can also be latching or non-latching. These settings are DIP switch selectable. The FAULT open collector is always energized (*sinking current*) and non-latching. The open collectors are rated at 100mA @ 30VDC max. The maximum output leakage current is 50uA. To connect an open collector, see figures 3-D & 3-E.

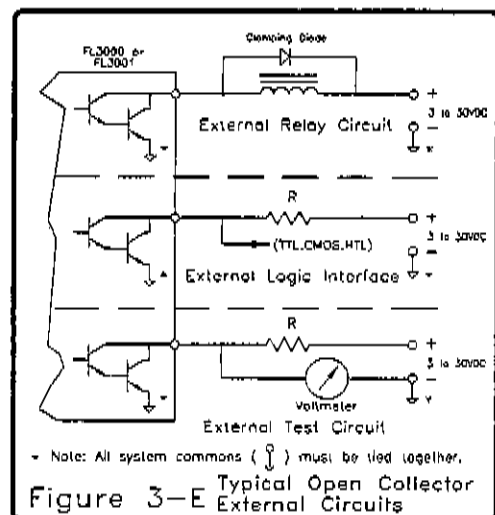
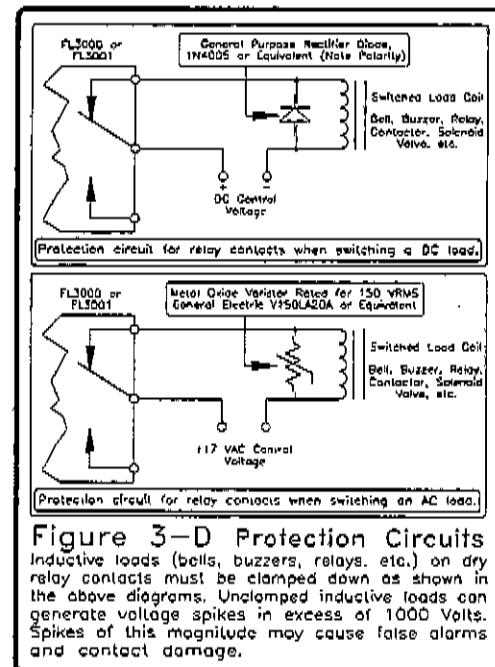
3-7 Reset Switch

Any relay and Open Collector Output which is set for LATCHING operation, and its associated alarm indicator, will stay in the alarm condition even if the alarm condition is not present anymore at the Flame Detector site. When the RESET indication appears on the front panel of the Model FL802, the alarm condition can be canceled by depressing the RESET SWITCH located on the front panel adjacent to the RESET indicator. Depressing the switch has no effect if the alarm condition is still present at the flame detector site.

3-8 Alarm Output Inhibit

Alarm circuits can be inhibited to prevent activation of the WARN and ALARM Relays and the associated discrete Open Collector Outputs when testing the complete Model FL3000/FL3001/FL3002 - FL802 Flame Detection System. To do so, slide the Model FL802 forward and activate the internal ALARM INHIBIT rotary switch (S2) located on the main printed circuit board.

When in this mode the symbol AL will appear just to the right of the digital display on the front panel. Switch S2 has ten positions. Position 0 is not active. The switch should be in this position for all channel alarms to be active. Position 1 through 8 will inhibit each of the associate channels. Position 9 will inhibit all of the channels. Inhibiting a single channel will have no effect on any other channel.





Installation

3-9 Relay Operation Selection

The Model FL802 provides optional relay operation for the WARN and ALARM Relays. These various operations are switch selectable by the customer through the use of switch SW1, which is an eight section, two position DIP switch mounted on the auxiliary PC board. The selection is covered in Section 1-3 Controller Operational Features.

Positions 7 & 8 control the time delay of the FL802. This time delay is the amount of time between a WARNING signal and an ALARM output. If a 16mA signal is received for the period specified by the time delay or if a 20mA signal is received, the FL802 will go into ALARM. *EXCEPTION: If both positions are closed, the time delay will be determined by the detector.*

3-10 Switch Selectable Options

The options of the SW1 8 position DIP switch are as follows:

If either of the relays is to be de-energized, the associated connections numbered 1 & 3 will normally be closed (NC), and the connections numbered 2 & 4 will normally be open (NO). If the relays are to be energized, 1 & 3 will normally be open (NO), and 2 & 4 will normally be closed (NC).

<u>SWITCH POSITION</u>	<u>OPTION</u>	<u>OPEN</u>	<u>CLOSED</u>
1	Zoning	Single Zone	Dual Zone
2	Voting	One Vote per Zone	Two Votes per Zone
3	ALARM(energ/ de-energ)	De-Energized	Energized
4	WARN(energ/ de-energ)	De-Energized	Energized
5	ALARM(latch/ non-latch)	Latching	Non-Latching
6	WARN(latch/ non-latch)	Latching	Non-Latching

<u>POSITION 7</u>	<u>POSITION 8</u>	<u>TIME DELAY</u>
CLOSED	CLOSED	ALARM OVERRIDE
OPEN	CLOSED	1 SECOND DELAY
CLOSED	OPEN	4 SECOND DELAY
OPEN	OPEN	8 SECOND DELAY



Maintenance

4-1 General Maintenance

Each Model FL802 is completely checked by the factory. However, a complete check-out is necessary upon initial installation and startup to assure system integrity. Once correctly installed, the Model FL802 requires little or no routine maintenance, other than periodic cleaning of the UV window and the source tube in the COPM Fiber Optic. General Monitors recommends that a schedule be established and adhered to.

CAUTION: The removal of particulate matter and any film build-up 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 S1 while the detector is being cleaned to eliminate potential false alarms.

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

4-2 Cleaning the Lenses and COPM Source Tube

A clean, soft, lint-free cloth and cotton swab should be used to apply the cleaning solution.

- 1 Wet the window with the solution using a cotton swab.
- 2 Rub with a dry cloth until the window is clean.
- 3 Completely dry the window.
- 4 Repeat steps 1, 2 and 3 for the source tube in the COPM Fiber Optic. (See figure 4-A).

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

The cleaning solution should be General Monitors P/N 10272-1, or can be made using the following formula:

UV WINDOW CLEANING SOLUTION

(Approximate % in volumes)

- | | | |
|---|-------------------|--------|
| 1 | Distilled water | 69.00% |
| 2 | Isopropyl alcohol | 23.00% |
| 3 | Ethyl alcohol | 7.00% |
| 4 | Detergent | 0.85% |
| 5 | Aerosol 22 | 0.08% |
| 6 | Aquet Liquid | 0.07% |



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Maintenance

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 Avenue

New York, New York 10018

This liquid detergent is 25% solution in water of an aromatic polyglycol ether which is non-toxic and nonsensitizing to the skin. When not in use, the bottle should be tightly capped.

DO NOT USE A COMMERCIAL GLASS CLEANER: *the lenses are not glass. The UV lens material is quartz and the IR lens is sapphire.*

CAUTION: *Lens cleaner contains alcohols. It is very volatile and harmful if ingested!*

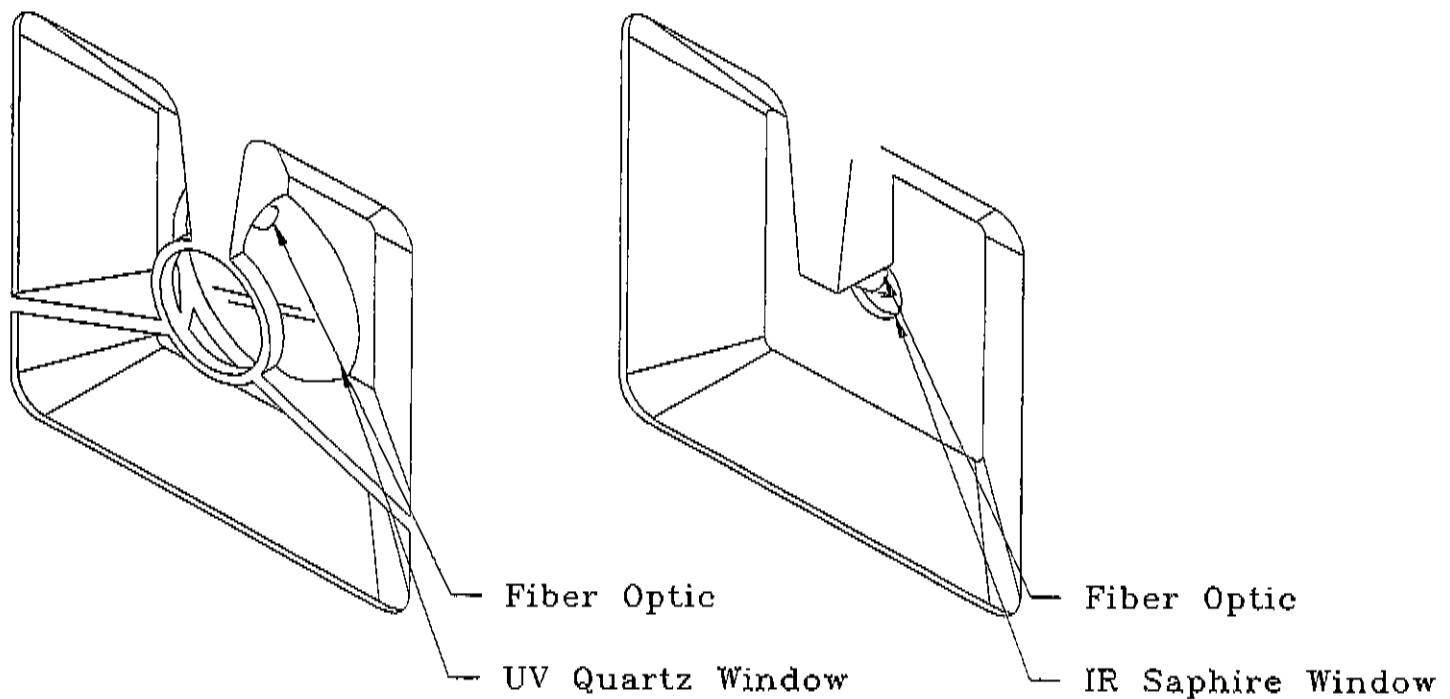


Figure 4-A



Troubleshooting

5-1 Troubleshooting

CAUTION: *Be sure to place instrument in Alarm Inhibit Mode or disconnect external wiring before making any check which might send the unit into alarm, if an alarm condition will create problems.*

If equipment or qualified personnel required to troubleshoot are not available, it is recommended that the defective unit be returned to General Monitors for repair even if the warranty has expired. A complete written description of the problem should be included with all returned equipment.

GMI's warranty will be voided if damage results from repair efforts other than routine replacement of recommended spare parts. **NOTE:** *If equipment is under warranty, any repairs performed by persons other than General Monitors authorized personnel may*

void the warranty. Please read the warranty statement carefully.

It is highly recommended that a spare detector be available at all times. A full complement of other General Monitors recommended spare parts should also be available.

5-2 Troubleshooting Chart

The information presented in the Troubleshooting Chart (See figure 5-A) is designed to correct the more common problems which appear during system startup and operation. If the various actions suggested in the chart fail to restore normal operation, it is recommended that the factory be consulted, and, if necessary, that the system be returned to the factory for repair.

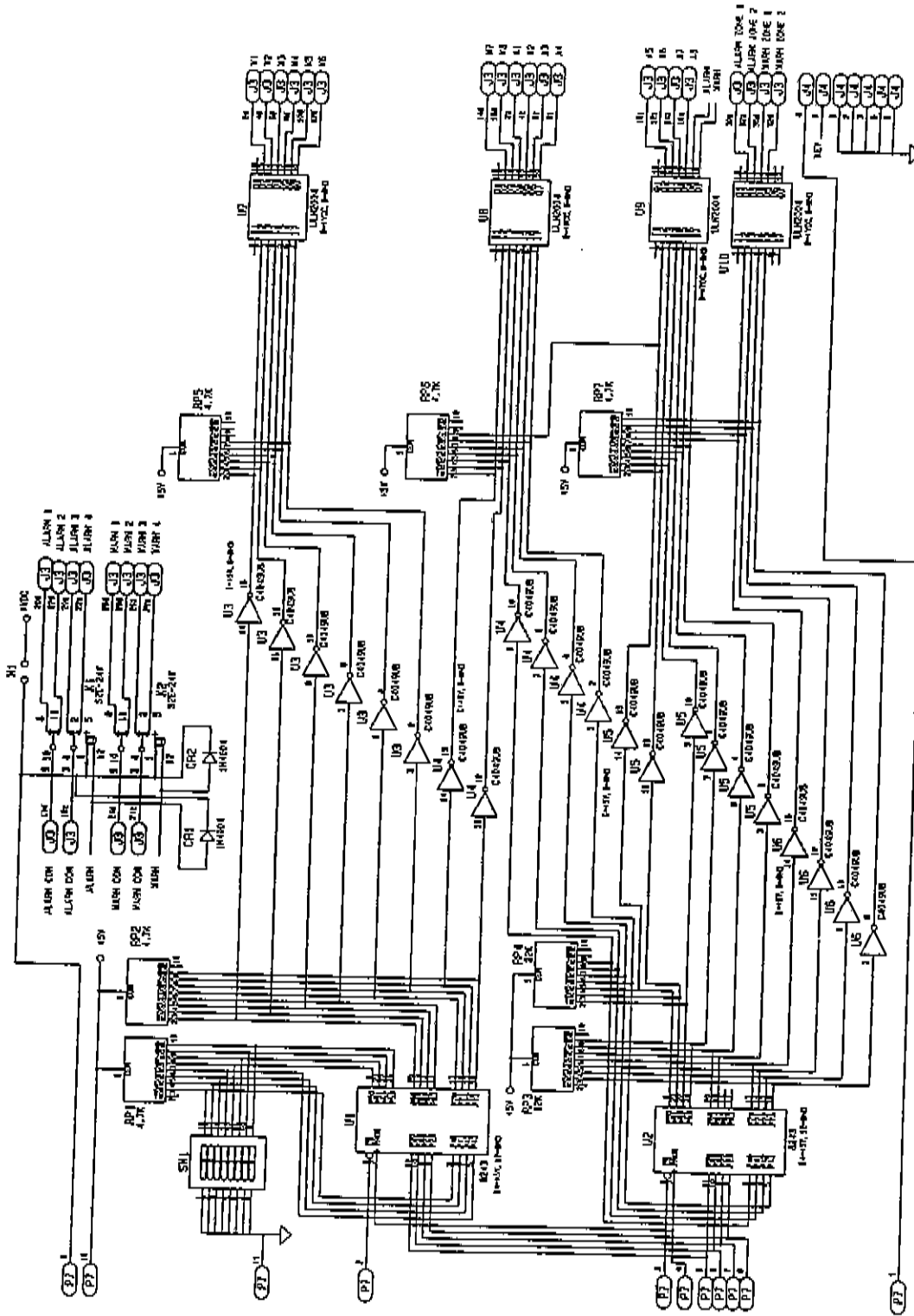
Troubleshooting Chart

Symptom	Probable Cause	Action
1. No front panel LEDs lit.	1. Fuse blown or loss of power.	1a. Check fuse on the PC Board.
		1b. Check wiring for loss of power and/or open circuit(s).
2. Front panel LED FAULT indication.	2a. Dirty or obscured optical path (COPM).	2a. Clean UV/IR window and source tube.
	2b. DC voltage too low.	2b. Return DC voltage to recommended value.
	2c. Open or shorted detector cable.	2c. Check connections and cable for opens and/or shorts.

Figure 5-A



Troubleshooting



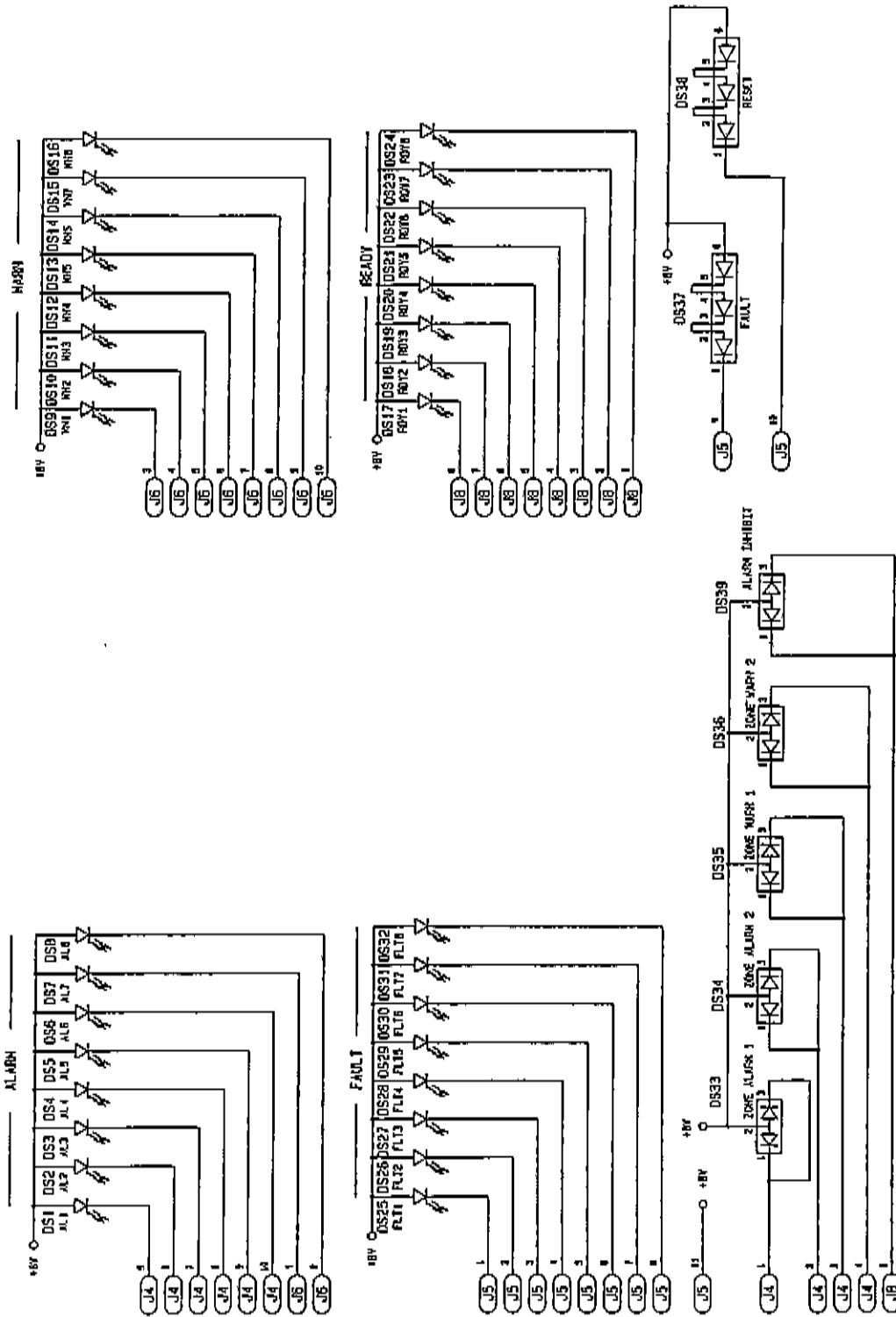
Section 5-3

Figure 5-C

Auxillary Board, Schematic



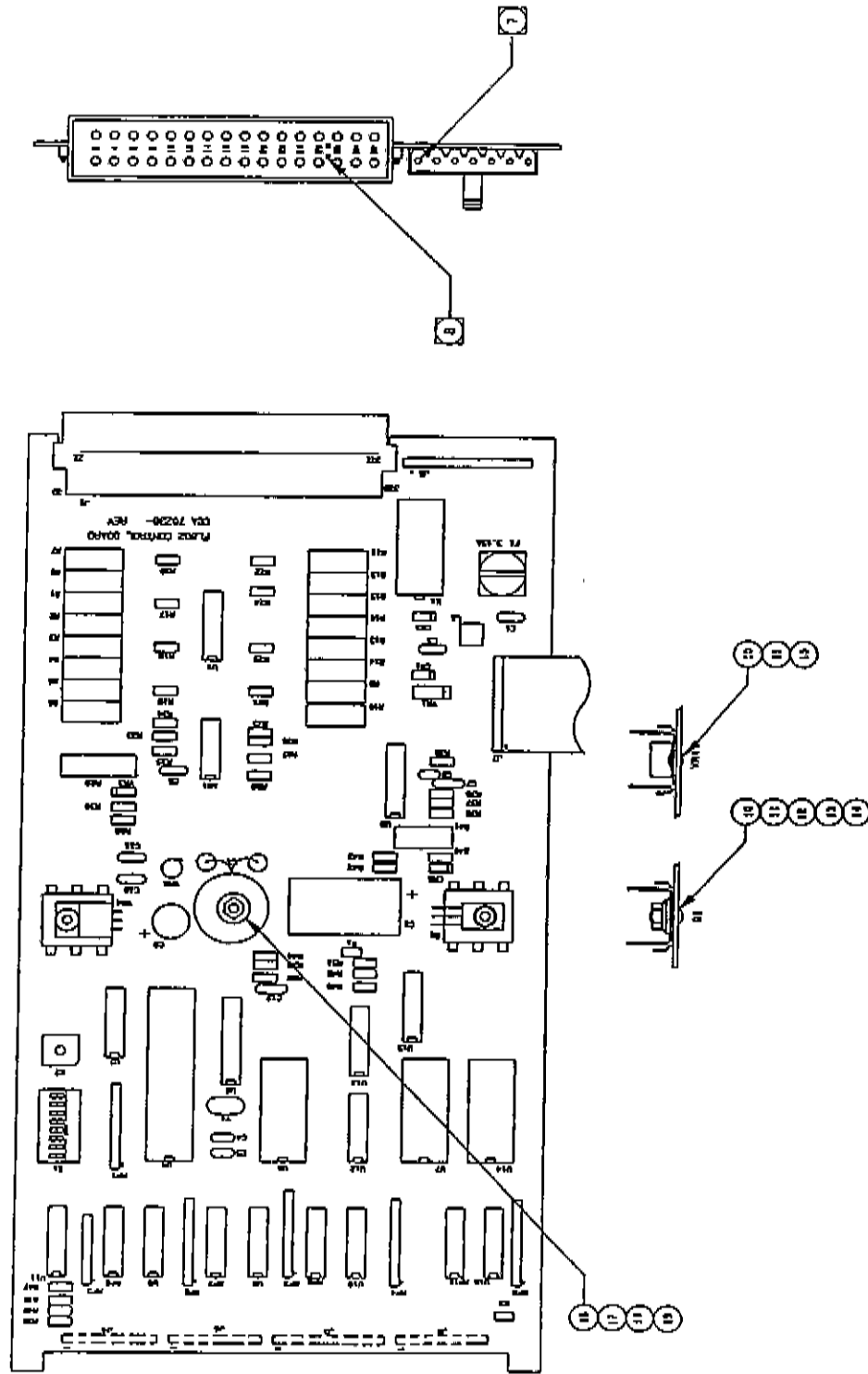
Troubleshooting



Section 5-3
Figure 5-D
Display Board, Schematic



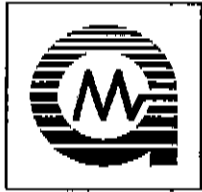
Troubleshooting



Section 5-4
Figure 5-E
Control Board, CCA

**Troubleshooting****Control Board Parts List (70238-1)**

<u>Reference Designator</u>	<u>Part #</u>	<u>Description</u>
R1 thru R16	947-419	Resistor, 250 Ohm, 1%, 1 Watt
R42, R44, R46	947-301	Resistor, 10K Ohm, 1%, Metal Film
R70	947-659	Resistor, 4.32 KOhm, 1%, Metal Film
R36	947-316	Resistor, 100 KOhm, 1%, Metal Film
R37, R38	947-325	Resistor, 20 KOhm, 1%, Metal Film
R43	947-396	Resistor, 4.53 KOhm, 1%
R41	947-203	Resistor, 330 Ohm, 5%, 1 Watt, Carbon
R28, R40	947-617	Resistor, 100 Ohm, 1%, Carbon
R25	947-345	Resistor, 15 KOhm, 1%, Metal Film
R26	947-327	Resistor, 2 KOhm, 1%, Metal Film
R34	947-626	Resistor, 24.3 KOhm, 1%, Metal Film
R33	947-625	Resistor, 21.0 KOhm, 1%
R30, R68	947-328	Resistor, 1 KOhm, 1%, Metal Film
R29	947-438	Resistor, 180 Ohm, 1%, 1 Watt
J1	921-376	Terminal Block Header, 32 Position
R17 thru R24, R39	947-033	Resistor, 5.6 KOhm, 5%, Carbon
R45 thru R50	947-018	Resistor, 330 Ohm, 5%, Carbon
R27	947-076	Resistor, 1 MOhm, 5%, Carbon
R35	947-070	Resistor, 4.7 MOhm, 5%, Carbon
VR5	948-043	Diode, Reference Voltage, 2.5 volts
RP2, RP3, RP4, RP9	947-914	Resistor Network, 22 KOhm, 10 pin SIP
RP1	947-912	Resistor Network, 4.7 KOhm, 10 pin SIP
U8 thru U13, U16	931-425	IC, Darlington Transistor Array, Hi/Volt
U6, U7, U14	931-441	IC, Input/Output Expander, 24 pin DIP
U1, U2	931-428	IC, Analog MUX/DMUX SGL 8 Channel
U3	931-386	IC, Voltage Regulator, PWM
U15	931-496	IC, Decoder/Multiplexer
S1	951-600	Switch, 8 Position DIP
F1	951-213	Fuse, 3.15 Amp, 250 Volt, Fast Acting
F1	921-618	Fuse Holder with Fuse Carrier
C1, C3, C6, C10, C11	915-033	Capacitor, 0.1 uf, 50 volt, Ceramic
C2	915-159	Capacitor, 1000 uf, 50 volt, Aluminum
C9	915-179	Capacitor, 220 uf, 25 volt, Aluminum, Electrolytic
C8	915-031	Capacitor, .01 uf, 50 volt, Monolithic, Ceramic
C7, C12	915-027	Capacitor, 150 pf, 100 volt, Dipped Mica
C4, C5	915-026	Capacitor, 20 pf, 500 volt
AR1	931-354	IC, Quad Voltage Comparator, LM339
CR1, CR3	948-123	Diode, 400 volt, 1 Amp, Rectifier, 1N4004
VR1	948-035	Diode, Zener Transient Suppression, 39 volt, 5%
VR3	948-034	Diode, Zener, 1N5226B
CR2	948-124	Diode, 100 volt, 1 Amp, Rectifier, 1N4934



GENERAL MONITORS

Model FL802

Troubleshooting

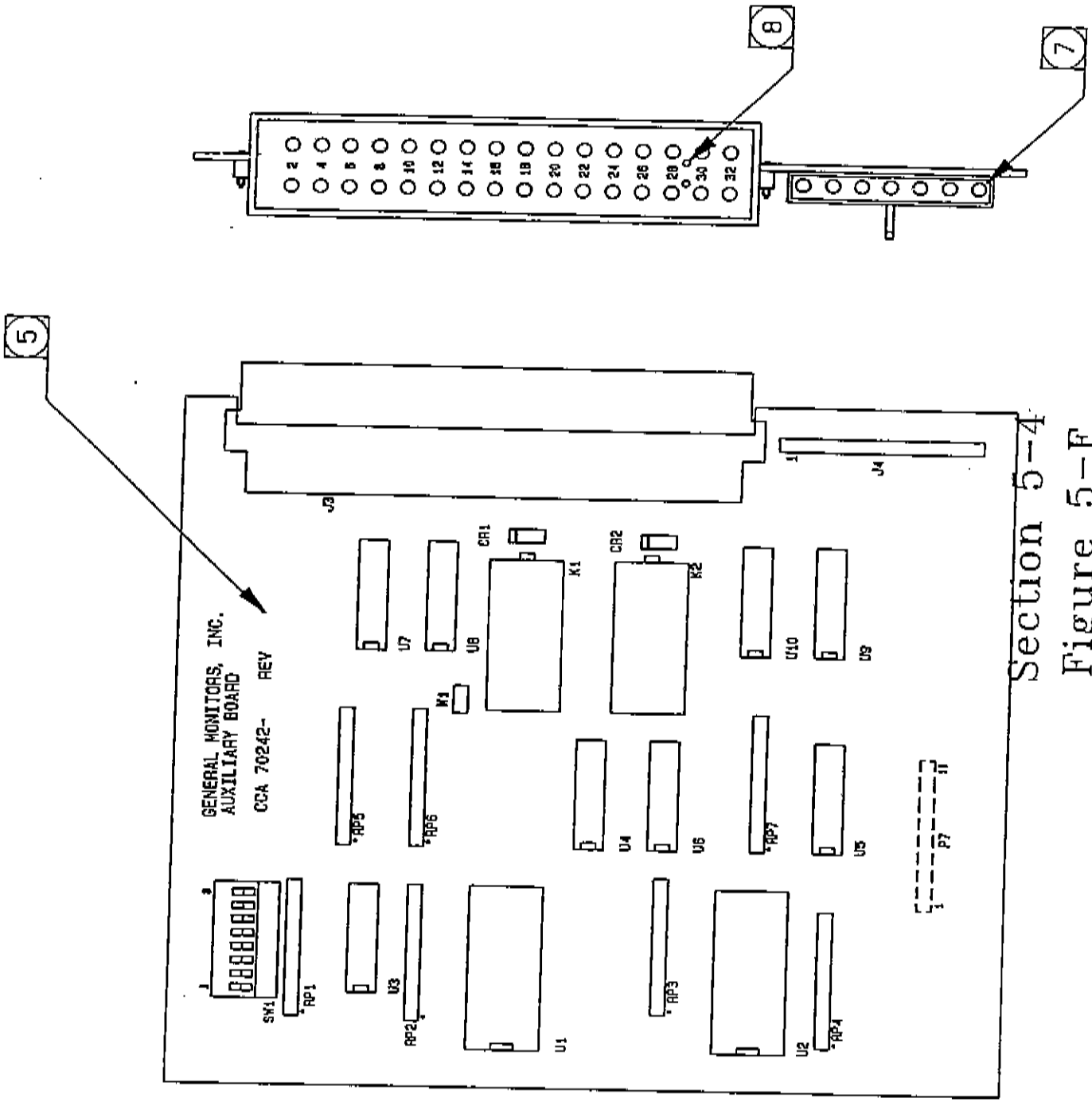
Control Board Parts List (70238-1)

<u>Reference Designator</u>	<u>Part #</u>	<u>Description</u>
VR4	931-353	IC, Voltage Regulator, 5 volt, 3 Terminal
J2	921-365	Terminal Block, Plug-In Header, 7 Position
J7	10207-1	Jumper, 3" Flexstrip, 11 Conductor
S2	951-602	Switch, Micro-DIP, Rotary, 10 Position
Y1	923-001	Crystal, 3 Mega-Hertz
RP5	947-907	Resistor Network, 22 KOhm, 8 pin SIP
L1	918-008	Core Ferrite
K1	945-039	Relay, 24 Volt, 4 Amp, DPDT, 2850 Ohm SLD
U5	931-427	IC, Analog to Digital Converter, 8 bit, 20 pin
Q1	948-238	Transistor, PNP, 60 Volt, 4 Amp, 2N5194
W1	921-518	Jumper, Test Point, .100 Spacing
S3	921-726	Connector, 2 Position, .100 Center, Gold Wafer
L2	30011-1	Inductor, 2 mH
RP6, RP7, RP8	947-924	Resistor Network, 330 Ohm 16 pin

<u>ITEM</u>	<u>Part#</u>	<u>Description</u>
10	948-410	Heatsink
11	931-036	Insulator Pad, .75" X .5"
12	12571	Screw, Stainless Steel Phillips Pan Head, M3X.5X10
13	9419	Washer, Aluminum Cupped
14	12516	Nut, Nylon Insert-S-C Lock, M3X.5
15	1401	
16	12553	Screw, Nylon Slotted Pan Head, M3X.5X20
17	12517	Nut, Nylon Hex, M3X.5
18	9115	Washer, #6 Flat Fiber
19	931-063	Insulator Pad .812X.145



Troubleshooting



Section 5-4

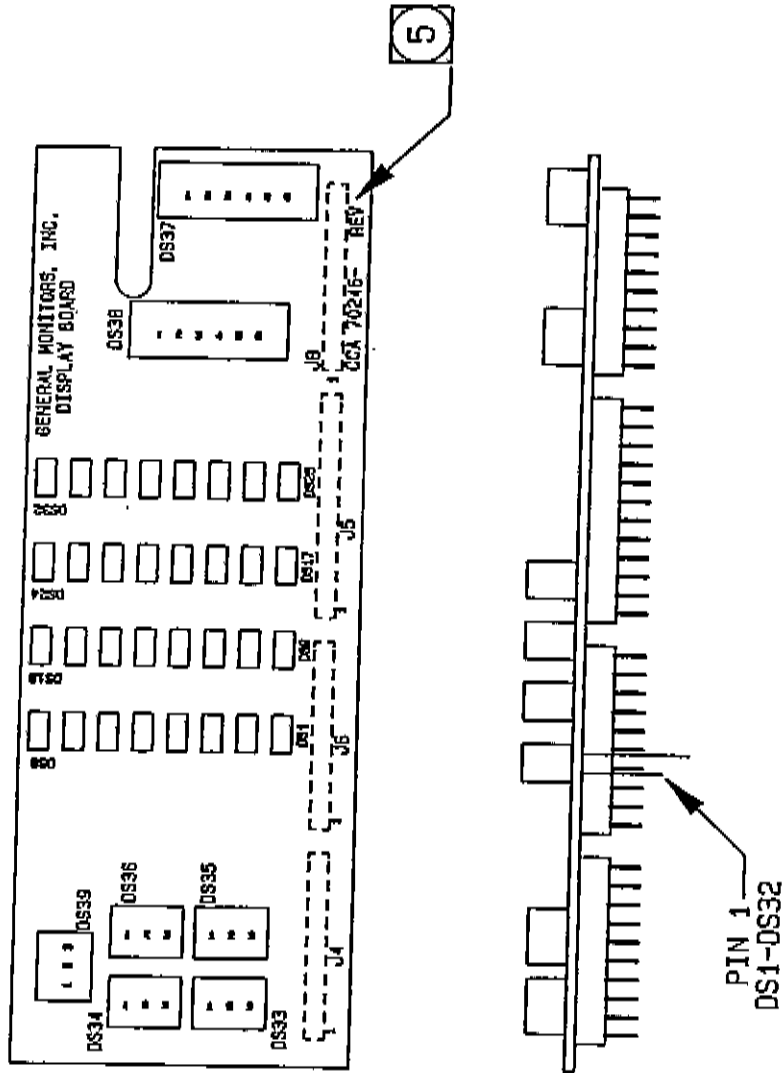
Figure 5-F
Auxiliary Board, CCA

**Troubleshooting****Auxillary Board Parts List (70242-1)**

<u>Reference Designator</u>	<u>Part #</u>	<u>Description</u>
J4	921-365	Terminal BLock, Plug-In Header, 7 Position
RP1, RP2, RP5, RP6 RP7	947-912	Resistor Network, 4.7 KOhm, 10 pin SIP
RP3, RP4	947-914	Resistor Network, 22 KOhm, 10 pin SIP
J3	921-376	Terminal Block Header, 32 Position DIN
U3, U4, U5, U6	931-422	IC, CMOS Hex Buffers, MC14049UB
U1, U2	931-441	IC, Input/Output Expander, 24 pin DIP
SW1	951-600	Switch, 8 Position DIP
U7, U8, U9, U10	931-425	IC, Darlington Transistor Array, Hi/Volt
K1, K2	945-035	Relay, 24 Volt, 4 Amp, DPDT, 2850 Ohm SLD
CR1, CR2	948-123	Diode, Rectifier, 100 Volt, 1 Amp, 1N4004
W1	921-518	Jumper, Test Point, .100 Spacing



Troubleshooting



Section 5-4
Figure 5-G
Display Board, CCA

**Troubleshooting****Display Board Parts List (70246-1)**

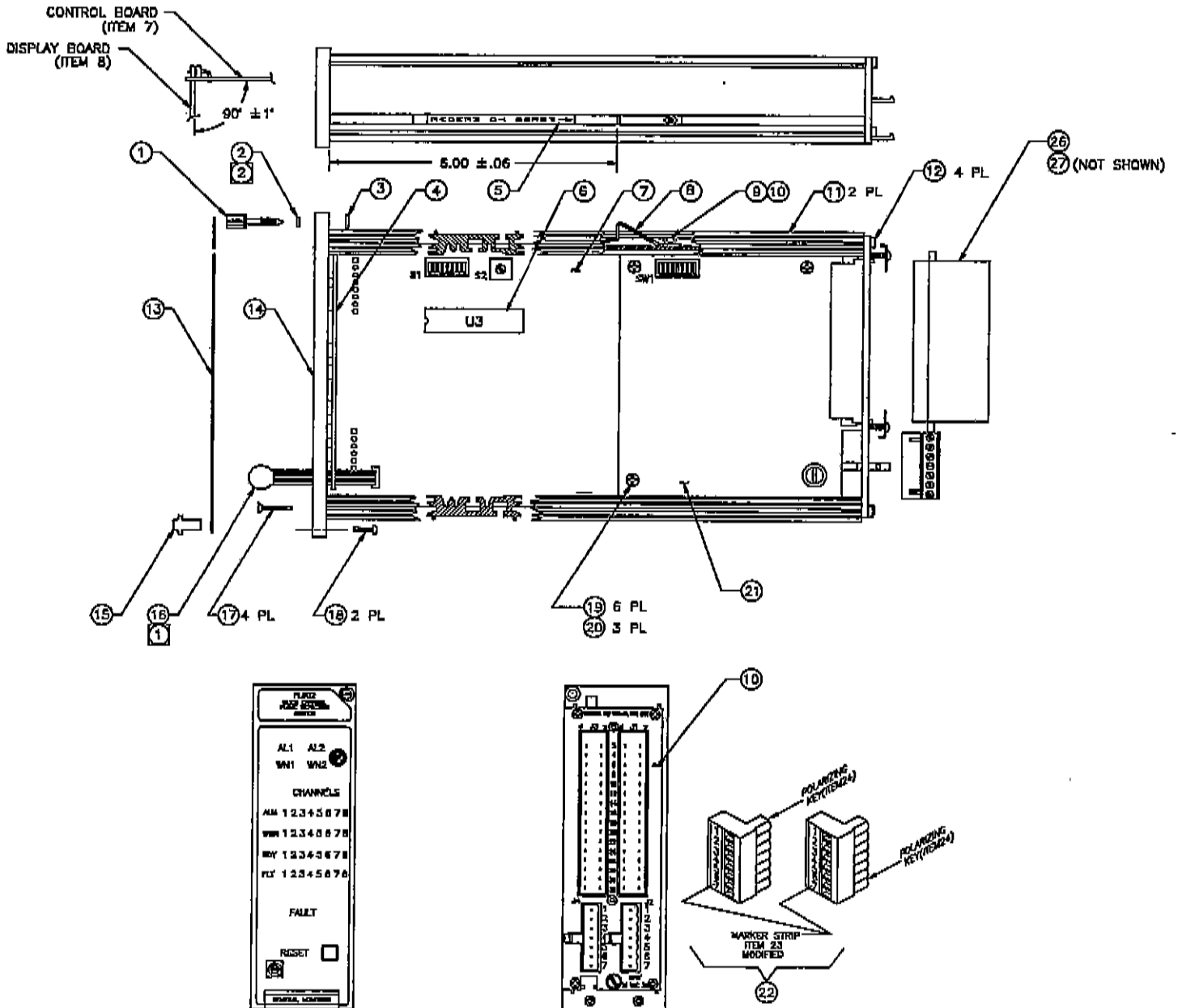
<u>Reference Designator</u>	<u>Part #</u>	<u>Description</u>
DS1 thru DS8	948-365	LED, Red Rectangle
DS9 thru DS16	948-368	LED, Orange Rectangle
DS17 thru DS24	948-367	LED, Green Rectangle
DS25 thru DS32	948-366	LED, Yellow Rectangle
DS38	948-340	LED, Red, 6 pin, Super Bright
DS37	948-335	LED, Yellow Bar Module, MU4-4101
DS33, DS34, DS39	948-364	LED, Red Bar Module, Light
DS35, DS36	948-349	LED, Orange Bar Module, 3 pin
J4, J6, J8	921-848	Connector Header, 10 Position 100 Ctr RA
J5	921-849	Connector Header, 12 Position .100 Ctr RA



GENERAL MONITORS

Model FL802

Troubleshooting



Section 5-5, Figure 5-H
Final Assembly, FL802

**Troubleshooting****Final Assembly Parts List (70235-1)**

<u>Item Number</u>	<u>Part #</u>	<u>Description</u>
1	10283-1	Screw, Captive, M4-.274 THL Plastic Panel
2	1043	Washer, Nylon, .128 X .245
3	1044	Grip Ring, External, .100 Diameter Shaft
4	70246-1	CCA, Display Board
5	10166-1	Label, Safety Latch Rack Mounting
6	10284-19	Micro-Computer, Programmed, FL802, (U4)
7	70238-1	CCA, Control Board
8	10165-1	Safety Latch Rack Mounting Controller Instrument
9	9096	Nut, Hex, #6-32, Steel, Cad Plated
10	1040	Screw, #6-32X.1875 SKT CP PT SST HXSO
11	10179	Plate, Mounting, -49 Top & Bottom
12	9420	Screw, 4X.5 PAN HD SELF TAP ZINC
13	70249-1	Inlay, Front Panel
14	70251-1	Panel, Front, Molded
15	10159-1	Handle, Universal, -38 CO. NAME
16	30113-1	Membrane Switch Assembly
17	9488	Screw, 4X.5 PHIL FLT HD SELF TAP ZN
18	1042	Screw, #6-20X.375 PH PAN TY 25 ST ZN
19	9042	Screw, #6-32X.375 PHIL PN HD SST
20	928-539	STDF, 6-32X.25X.75 NY
21	70242-1	CCA, Auxillary Board
22	921-364	Terminal Block, Plug-In, 7 Position
23	10381-1	Marker Strip 1-26
24	921-384	Key, Pin Type, CS-MSTB Nylon
25	30147-1	Panel, Rear Assembly
26	70254-1	Connector Assembly, 32 Postion
27	70254-2	Connector Assembly, 32 Position



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Spare Parts

6-1 Spare Parts

Part Number	Description	Quantity
951-213	Fuse, 3.15 Amp	1