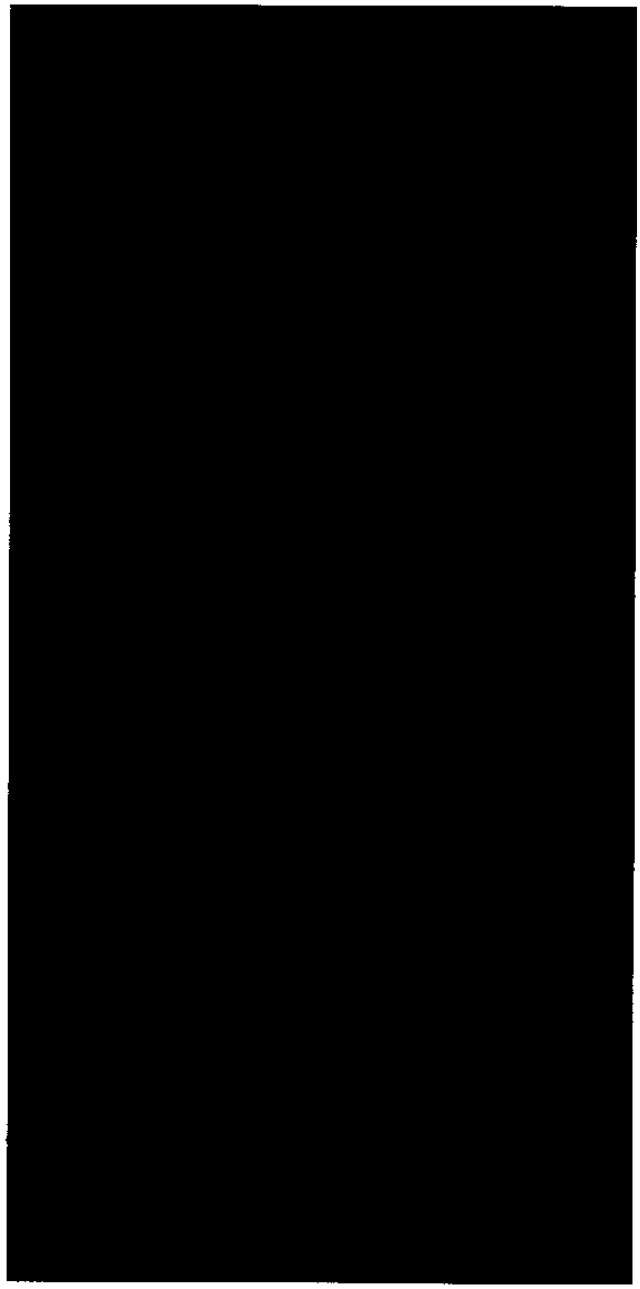
DET TRONICS



INSTRUCTIONS

Ultraviolet Flame Detection System

R7303 Controller

C7050 Detector

9/87 Form 95-8226-04

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DET TRONICS

INSTRUCTIONS

AUTOMATIC oi*

Ultraviolet Flame Detection System

R7303 Controller

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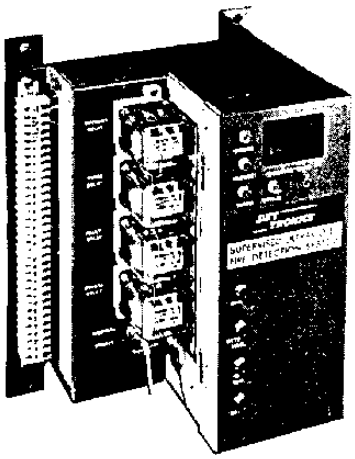

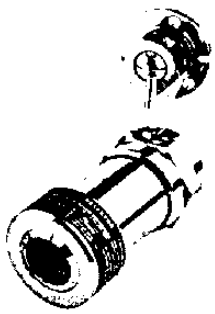

SYSTEM APPLICATION

The R7303/C7050 Ultraviolet Flame Detection System provides instantaneous response to fires that generate ultraviolet (UV) radiation. The system includes Automatic Optical Integrity (**oi**) as a standard feature, an extension and improvement of the manual **oi** feature originally developed by Detector Electronics. Automatic **oi** continuously monitors optical surfaces, detector sensitivity, and system wiring to ensure that the detectors are operational and ready to respond to fire or explosion. Should a malfunction occur, the Fault relay is de-energized and a digital display on the front of the controller identifies the nature of the fault using a numerical code. The C7050 Detector is designed for use in hazardous locations and is suitable for use in a wide variety of both indoor and outdoor applications.

Typical applications for Det-Tronics ultraviolet detection systems are:

—Wherever highly combustible materials are involved
—Where there is a need for instantaneous response to flame
—Wherever unsupervised areas require automated fire protection
—Where there is a large capital investment to be protected.

Examples of actual installations using the Det-Tronics UV detector in automated fire protection systems include:

Petroleum Products

—Gasoline transport loading terminals
—Offshore drilling and production platforms
—Pipeline pumping stations
—Tank farms
—Refineries
—Marine engine rooms
—Jet engine test cells

Gaseous Fuels

—Butane and propane loading and storage
—Pipeline compressor stations
—Gas gathering facilities
—Pipelines in highly populated areas
—LNG and SNG loading, transfer and storage facilities
—LNG marine tankers
—Hydrogen fires in ammonia production and refinery reformers.

Solid Materials

—Munitions production, illuminating flare material, TNT, black powder, other propellants
—Electrostatic powder coating booths
—Styrofoam storage.

Other Processes

—Paint spray booths
—Chemical and petrochemical production

Information on these and a variety of potential applications is available from Detector Electronics.

*oi is Detector Electronics' Trademark for its patented Optical Integrity Systems. U.S. Patent 3,952,196, United Kingdom Patent 1,534,969, Canada Patent 1,059,598.

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FEATURES

- Instantaneous response - Typical response to an intense ultraviolet source is less than 25 milliseconds. Systems that respond in less than 10 milliseconds are also available.
- Continuous monitoring by the automatic **oi** feature verifies proper functioning of critical components.
- Insensitive to solar radiation and normal artificial lighting.
- Field adjustable controller sensitivity.
- Two independent form C relay outputs - first relay responds instantly and second relay has field adjustable time delay.
- Plug-in printed circuit boards and relays for ease of maintenance.
- Detector enclosure available in corrosion resistant nickel-plated brass, 316 stainless steel, or anodized copper-free aluminum.
- Shock and vibration resistant mounting of the sensor tube makes the detector suitable for rugged industrial applications.
- C7050B Detector meets MIL SPEC 810C shock test.
- Sensor tube module is treated to resist fungus growth.
- Low power consumption, typically 12 watts in standby.
- Fault relay for actuating visual and/or audible status indication devices.
- AC input voltages and frequencies are available for applications worldwide.

GENERAL APPLICATION INFORMATION

In applying any type of sensing device as a fire detector, it is important to know of any conditions that may prevent the device from responding to a fire, and also to know what other sources besides fire will cause the device to respond. An ultraviolet detector is useful in fire protection applications because it provides very fast response to the ultraviolet radiation that is produced by a flame. In addition, it is not affected by adverse environmental conditions and is insensitive to the ultraviolet component of solar radiation or normal artificial lighting.

Considering the above, it can be seen that there are fire detection applications where only ultraviolet sensors are suitable. However, success in using an ultraviolet detector is dependent on knowing not only its advantages, but also its limitations. It is important to note that electrical arc welding is an intense source of ultraviolet radiation, and care must be taken to ensure that arc welding is not performed in or near protected areas without securing the detectors. In addition, UV detectors should not be positioned so that their cone of vision coincides with the horizon. Rather, they should be directed down, over the designated hazard area to reduce the likelihood of sensing UV radiation from lightning or other distant sources.

An important fact regarding radiation detectors of any type is that radiation must reach the detectors in order for them to respond. Care must be taken to keep obstructions out of the line of view. For an ultraviolet detector, this means that an accumulation of ultraviolet absorbing gases or vapors, as well as physical obstructions must not be allowed to come between the detector and the protected hazard. Smoke will absorb ultraviolet radiation, and if accumulations of dense smoke can be expected to precede the presence of flame, then ultraviolet detectors should not be used alone.

It must be noted that malfunctions can occur in any type of equipment, and although Det-Tronics systems are subjected to rigorous tests before shipment, no way has yet been found to guarantee that every device will always operate perfectly. Higher reliability with regard to response to a fire is achieved when a hazardous area is supervised by more than one detector, and when each detector can independently register an alarm.

SYSTEM DESCRIPTION

The R7303/C7050 UV fire detection system consists of up to eight UV detectors connected to a remotely mounted controller. See Figure 1 for a block diagram of the system.

C7050 DETECTOR

The C7050 Detector incorporates a sensor tube for detecting the presence of UV radiation, electronic circuitry for generating an output signal, and a UV test lamp for generating a UV test beam. When UV radiation strikes the cathode of the sensor tube, a series of voltage pulses is sent to the controller. The frequency of these pulses increases in proportion to the intensity of the UV radiation.

The detector is housed in an explosion-proof, watertight enclosure that is designed to meet most national and international standards. It is available in various materials to meet the requirements of a variety of hazardous environments. These materials include anodized copper-free aluminum, nickel-plated brass, and 316 stainless steel.

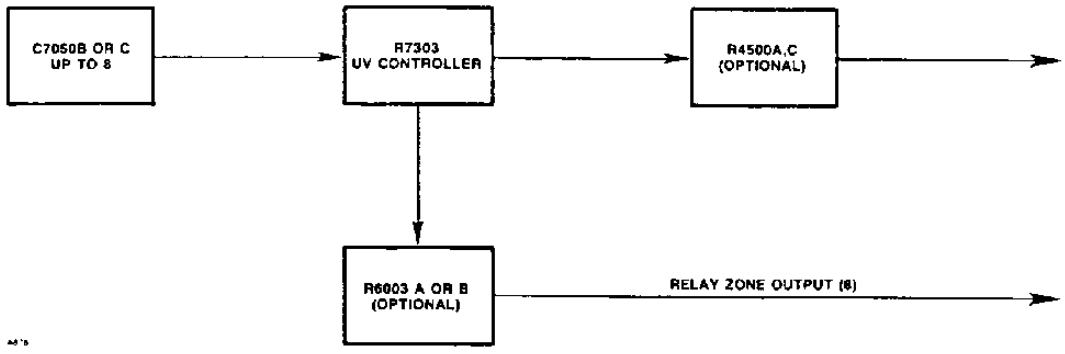


Figure 1—System Block Diagram

Each detector is normally mounted on an optional swivel mounting assembly (model Q9001B), which adjusts to enable the detector to cover up to a 240 degree sweep. Other mounting arrangements are also available, such as a quick-connect front mount for applications involving paint spray or powder coating booths, or for looking inside mixers, kettles, conveyors, and other inaccessible areas.

R7303 CONTROLLER

The controller contains the circuitry for processing the signals from up to eight detectors and for actuating the Instant, Timed, and Fault relays that are used to control fire alarm, extinguishing, and fault response equipment. It also contains the Automatic **oi** circuitry that continuously checks the optical surfaces of each detector in the system, and the automatic fault identification circuitry that responds to malfunctions that can occur in either the detectors or controller. When a fault occurs, a digital display on the controller is activated to provide a numerical readout, which identifies the nature of the fault by code number. See Table 1.

Table 1—R7303 Fault Identification

Digital Code	General Identification
0	Spurious detector discharge (low level UV)
1	DC power malfunction
2	Reduced detector sensitivity
3	Detector monitoring malfunction
4	Detector C-lead fault
5	Module missing or B-lead fault
6	Detector high voltage or A-lead fault
7	Comparator board fault
8	System in bypass or relay fault

A keylock switch is used to put the system in the Bypass mode for a complete manual check of the system. The controller also has a momentary BYPASS switch for a quick manual check of the system. With the system in the Bypass mode, all output relays are disabled, the Automatic **oi** feature is disconnected, and the FAULT LED and digital displays on the controller are turned on. The left digit shows the number of the detector being checked, and the right digit displays the code number of the current system status.

Front Panel

The front panel provides switches for enabling manual **oi** and relay tests. LEDs and digital displays are used for indicating relay actuation and identifying system status. (See Figure 2.)

- —The POWER LED is illuminated when power is applied to the controller.
- —The INSTANT and TIMED relay LEDs are illuminated when their corresponding relays are energized.
- —The BYPASS LED is illuminated when the system is placed in the Bypass mode.
- —The FAULT LED indicates that the normally energized Fault relay has been de-energized.
- —The dual digital display indicates the fault code number on the right hand side and the number of the affected detector (if it applies to a single detector) on the left hand side. In the Test mode, the left display indicates the number of the detector under test.
- —The momentary BYPASS switch puts the system in the Bypass mode for a quick check of the system.
- —The DETECTOR SELECT and **oi** TEST buttons are used to test each detector manually in order to ensure that each detector is able to activate the Instant and Timed relays of the controller. Pushing the DETECTOR SELECT button on the controller sequentially selects each detector for test. Pushing the **oi** TEST button activates the special UV test lamp in the selected detector.
- —The RESET button will re-energize the Fault relay after a fault or system test.
- —The keylock switch allows the system to be put in the Bypass or Normal mode.

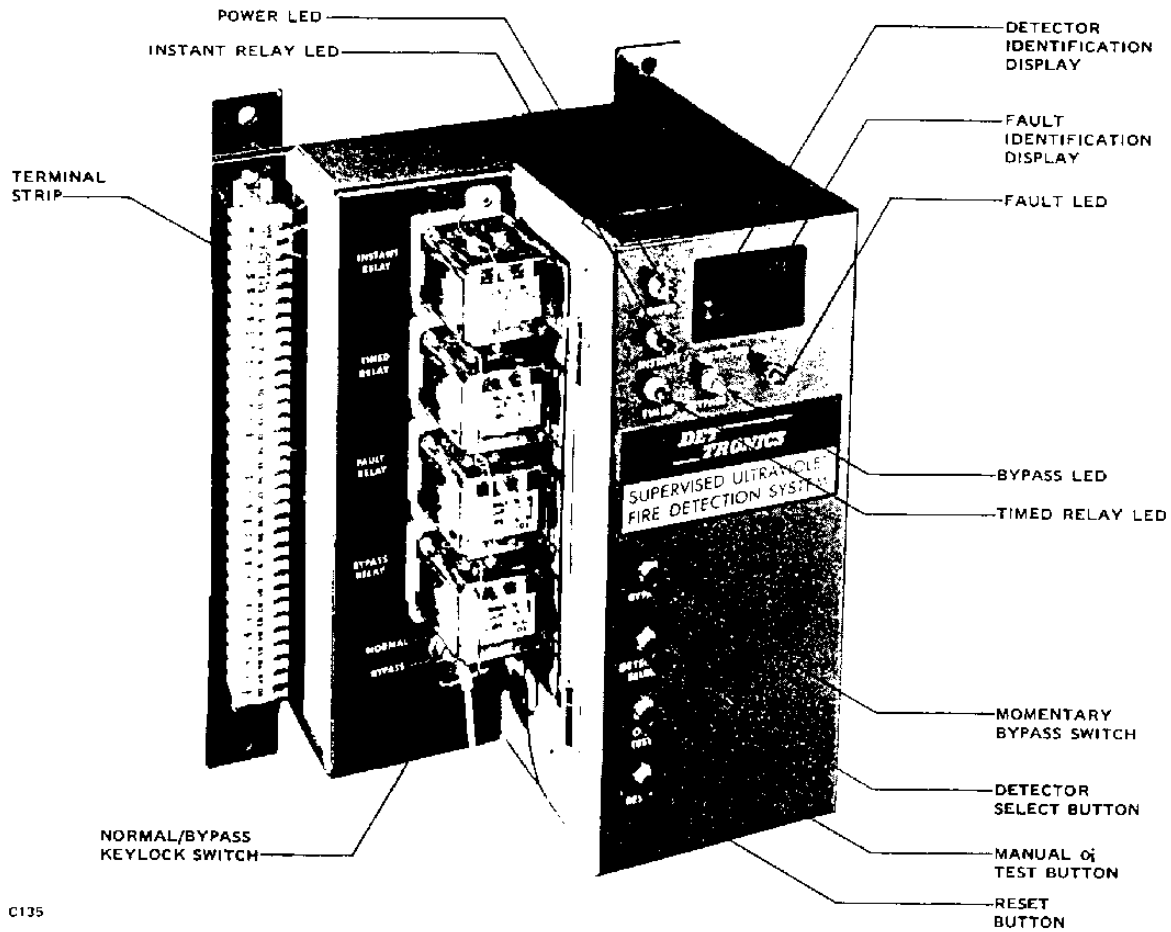


Figure 2—R7303 Controller Switches and Indicators

Relays

The controller contains four independent relays - the Instant relay, the Timed relay, the Fault relay, and the Bypass relay. The relays have form C (normally open/normally closed) contacts and are rated for 10 amperes.

The Instant relay is energized immediately when the controller receives a fire signal from a detector. Typical response to an intense ultraviolet source is less than 25 milliseconds.

The Timed relay is energized if the signal from the detector is continuous for a pre-set time. The time delay is set at the factory for 5 seconds, but is field adjustable over a range of 0.2 to 12 seconds. It can be used, for example, to assure that a fire exists for a minimum length of time before an extinguishing system is energized or to minimize the possibility of actuation by lightning if it should happen to strike close by. In many applications, the Instant relay is used to sound an alarm, stop a process, or cut off the source of fuel to a fire. The Timed relay is then used to activate a fire extinguishing system if the fire continues.

The normally energized Fault relay responds to most system faults that could prevent proper operation in the event of a fire. The Fault relay is normally energized, but will become de-energized if any of the following occurs:

a. Instant, Timed, or Fault relay coils are open, or a relay is removed.
b. A printed circuit board malfunctions or is removed.
c. A detector module becomes insensitive or oversensitive.
d. A leadwire to one of the detectors is open, shorted, or grounded.
e. The system is placed in the Bypass mode.

The Bypass relay is normally de-energized. Its contacts are connected with the contacts of the Instant and Timed relays. When the controller is placed in the Bypass mode, the contacts of the Bypass relay isolate the normally open (NO) contacts of the Instant and Timed relays from the external load and shunt the normally closed (NC) contacts.

Automatic oi

The Automatic **oi** feature provides a means of assuring that the fire detection system is operational and ready to respond to a fire or explosion. A special UV producing test lamp is mounted inside each detector enclosure, but is optically isolated from the UV sensor tube. The con-

troller sends the signals to sequentially turn each test lamp on and off, one at a time, thus continuously testing each detector in the system. When the test lamp receives the signal from the controller, it produces UV radiation that passes through the viewing window, where it encounters a beveled **oi** ring and is reflected back through the window. (See Figure 3.) When the sensor tube detects this UV, it sends a signal to a comparator circuit in the controller. This circuit compares the level of the UV test signal to the fire threshold level of the controller. As long as the signal remains below this threshold level, no fire alarm is generated. When an intense source of UV is detected, such as from a fire or explosion, the threshold level is exceeded and the controller produces a fire output. If the comparator circuit detects a UV test signal that is below the pre-set fault threshold level, indicating an insensitive detector or a dirty window, a fault signal is generated. This process goes on continuously, automatically checking the wiring to the detectors, the cleanliness of the viewing window, and the sensitivity of the sensor tube. Should a fault ever occur, the FAULT LED is illuminated, the Fault relay is de-energized, and the digital display on the front of the controller identifies the nature of the fault using a numerical code.

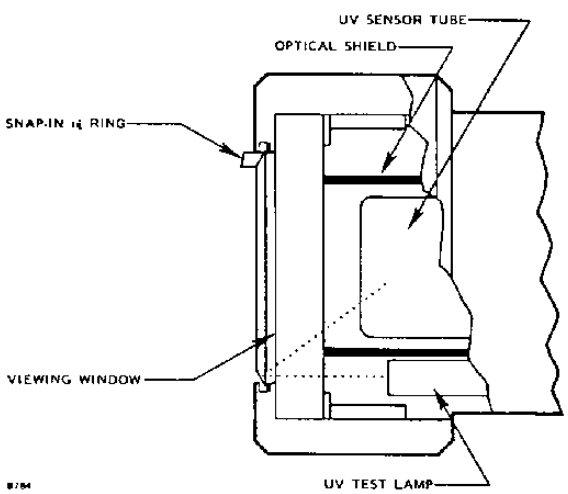


Figure 3—C7050 Detector with **oi**

SYSTEM OPERATION

FIRE DETECTION AND CONTROLLER RESPONSE

When the detector senses UV radiation, a series of voltage pulses is sent to the Integrator and Comparator board in the controller. (See Figure 4.) The pulses are then amplified and used to charge an integrating capacitor. The voltage on the integrating capacitor is proportional to the frequency of the pulses, which is proportional to the intensity of the UV sensed by the detector. A comparator circuit compares this voltage on the integrating capacitor to a preset threshold voltage. When the threshold voltage is exceeded, the comparator sends a fire signal to the Relay Drive board.

At the Relay Drive board, the comparator output signal is amplified to energize the Instant relay and turn on the red INSTANT LED. It also starts a timing sequence that energizes the Timed relay and turns on the red TIMED LED if the UV signal is continuous for the duration of the pre-set time delay. If the fire signal is interrupted before the time delay is completed, the time sequence starts over when UV radiation is again detected.

AUTOMATIC OPTICAL INTEGRITY

An important consideration with any ultraviolet fire detector is that an accumulation of contaminants (oil, gasoline, dirt, etc.) on the viewing window will absorb or block UV radiation. An accumulation of certain UV absorbing materials can completely "blind" the detector, even though it may be virtually undetectable to the human eye.

To ensure that the detectors are operational, the Automatic **oi** circuit continuously cycles through a test of each detector and its wiring. The C7050 Detector incorporates a UV sensor tube and an optically isolated UV test lamp. Actuation of the test lamp causes UV radiation to travel out through the viewing window, where it encounters a reflective **oi** ring and is directed back through the window to the sensor tube. (See Figure 3.) If the window is clean, the sensor tube detects the UV from the test lamp and sends a signal back to the con-

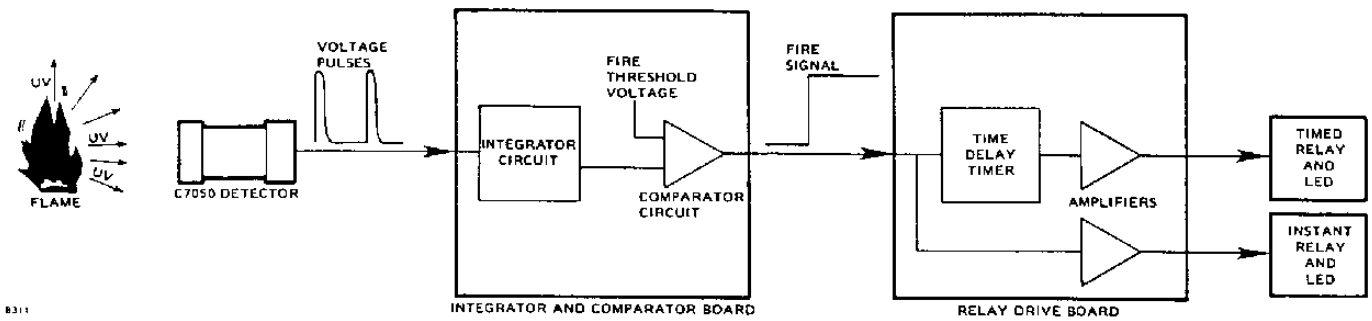


Figure 4—Fire Circuitry Block Diagram

troller to verify that the detector is functioning properly. The Automatic **oi** circuit tests each detector approximately six times per minute (varies with the number of detectors) so that if a fault occurs, it is detected almost instantly.

The basic operation of the Automatic **oi** circuit involves selecting a detector and illuminating its test lamp, sensing a return signal from the detector, turning off the UV test lamp, sensing the termination of the return signal, and then selecting the next detector to be tested and repeating the cycle.

Functionally, the Automatic **oi** circuit can be divided into three sections. Refer to the Automatic **oi** block diagram (Figure 5).

1. Comparator Circuit—The Automatic **oi** comparator circuit is similar to that of the Integrator and Comparator board. It compares the voltage on the integrating capacitor to a pre-set threshold voltage. (The factory-set **oi** test threshold is much lower than the fire threshold.) When the integrating capacitor voltage is less than the **oi** threshold voltage (virtually no UV is being detected), the output of the comparator circuit is a logic 1. When the integrating capacitor voltage is greater than the **oi** threshold voltage (a small amount of UV is being detected), the output is a logic 0.

2. Sensitivity Timers—There are two sensitivity timers. The "0-fault" timer monitors the comparator and generates a fault signal if the comparator output stays at logic 0 (UV continuously being detected) for three seconds or more. The "2-fault" timer also monitors the comparator and generates a fault signal if the comparator output stays at 1 (no UV being detected) for a period determined by the **oi** threshold sensitivity setting.

3. Test Lamp Sequencer/Driver—The sequencer/driver circuit monitors the comparator, and sequentially selects and turns on the UV test lamp of each detector. When the comparator indicates that UV is detected, the driver section turns that test lamp off and the sequencer selects the next test lamp to be driven. When the comparator indicates that UV is no longer being detected, the driver turns on the next test lamp.

To summarize:

a. The comparator circuit monitors the voltage on the integrating capacitor and provides a pulsing output as the voltage on the integrating capacitor rises and falls.

b. The "0-fault" timer monitors the comparator output and generates a fault signal if a detector senses low level UV (below fire threshold) for over three seconds.

c. The "2-fault" timer monitors the comparator output and generates a fault signal if the detector under test does not respond to UV.

d. The sequencer/driver monitors the comparator output and turns on the UV test lamp of each detector in succession.

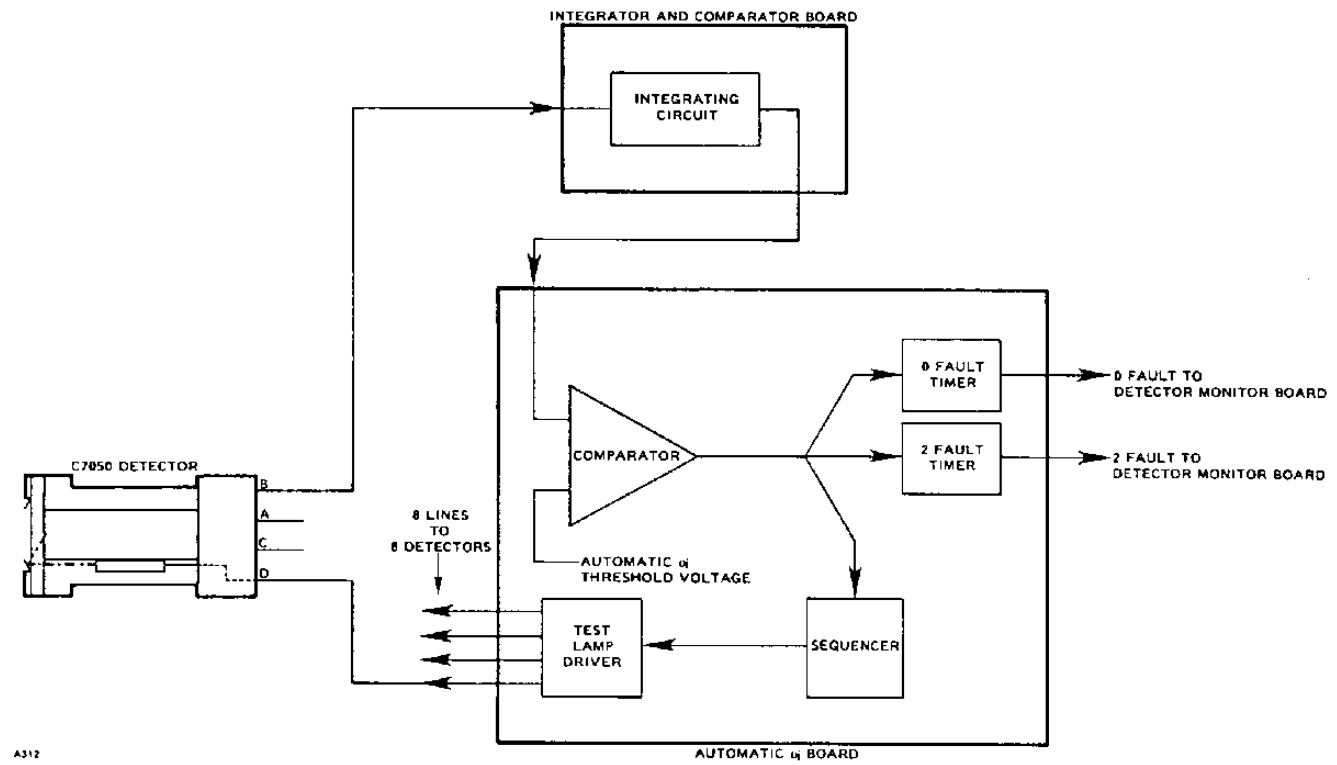


Figure 5—Automatic **oi** Circuitry Block Diagram

FAULT IDENTIFICATION

In the event of a system malfunction, the Fault relay is de-energized, the FAULT LED is illuminated, and the digital display is activated. The right hand display indicates the fault code and the left hand display identifies the number of the affected detector (if a detector fault has occurred).

Should more than one fault occur at the same time, a priority system of identification is automatically employed. The order of priority is:

Highest Priority -	7
	6
	5
	4
	3
	2
	1
	0
Lowest Priority	8

When one fault occurs before another, the code of the first is latched on the digital display until the controller is placed in the Bypass mode. This ensures that identification of a transient fault will not be "lost." In the Bypass mode, the number of the highest priority fault is displayed. As each fault is corrected, the next lower priority fault is displayed.

The fault identification circuitry is located on the Detector Monitor board. The circuitry that decodes the Automatic **oj** sequencer/driver and controls the DETECTOR digital display is on the Automatic **oj** board. The fault and detector identification circuitry can be divided into four sections. Refer to the fault circuitry block diagram (Figure 6).

1. Comparators—Four comparator circuits monitor the wires that connect the detectors to the controller and the position of the detector loop selector (see "Installation" section).

2. Eight Level Priority Encoder—The priority encoder is an integrated circuit that monitors eight input lines and generates a 3-bit binary representation of the highest priority, active input. Four input lines come from the four on-board comparators (mentioned above) and four come from other circuit boards in

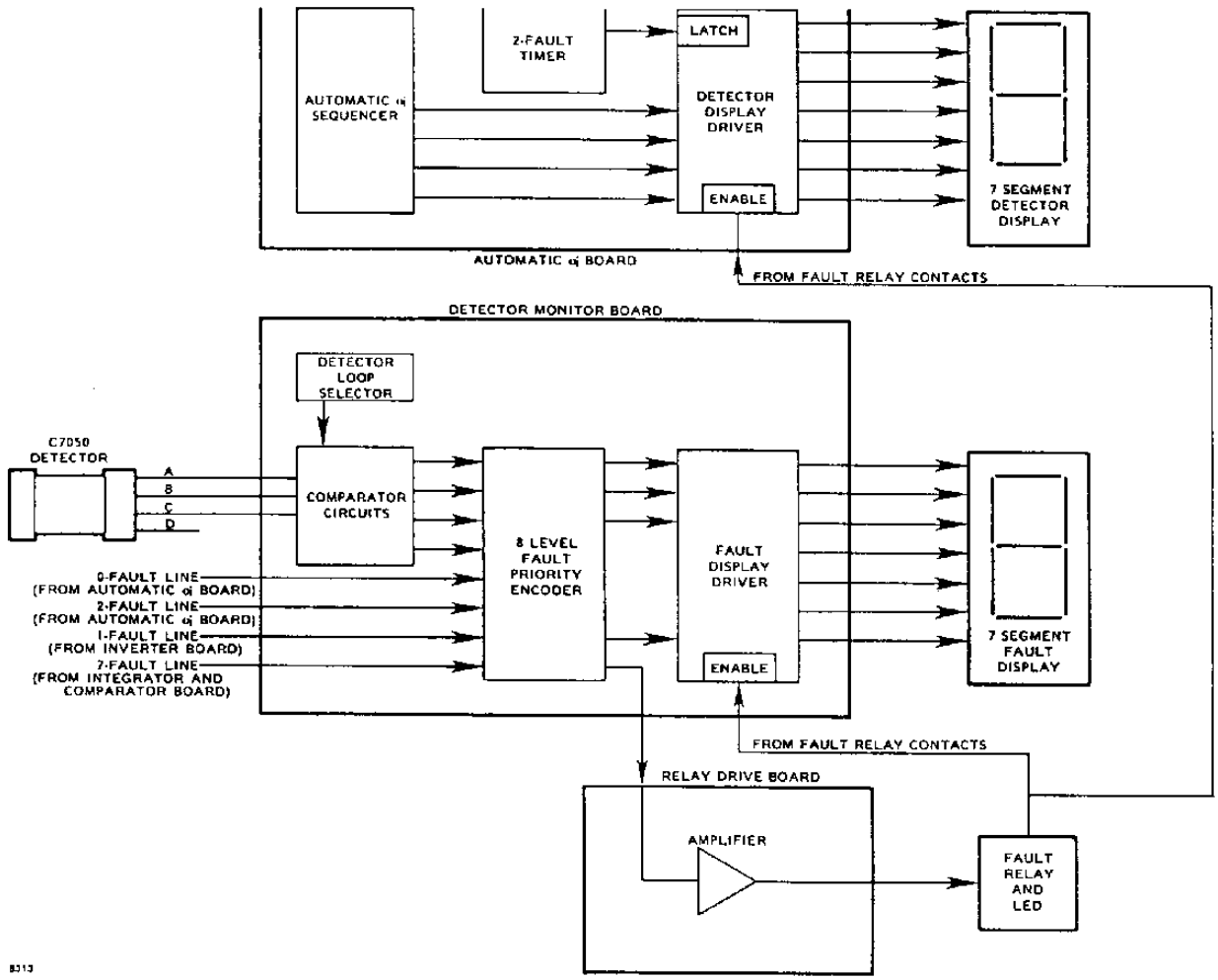


Figure 6—Fault Circuitry Block Diagram

the controller. Two fault lines are connected to the sensitivity timers of the Automatic **oi** board, one is connected to the Integrator and Comparator board, and one is connected to the Inverter board (dc models only). The outputs of the priority encoder are used to generate the fault signal that de-energizes the Fault relay, and to drive the inputs of the FAULT display driver.

3. Fault Display Driver—The driver is an integrated circuit that decodes signals from the priority encoder and illuminates the appropriate digit in the digital FAULT display. Since the priority encoder can only generate a 3-bit binary number (0 to 7, decimal), the driver is wired to default to an output of "8" when there are no other active inputs. (This default condition gives an 8-fault the lowest priority.)

   The fault display driver is enabled only when the Fault relay is de-energized. It will latch to retain an output digit and will not respond to new input information when the NORMAL/BYPASS switch is in the NORMAL position and the Fault relay is de-energized.

4. Detector Display Driver—This driver is physically identical to the fault display driver and is located on the Automatic **oi** board. It monitors the output of the sequencer circuit (mentioned above) and illuminates the number of the failing detector in the digital DETECTOR display when a 2-fault occurs. (See Table 3 in the "Troubleshooting" section for identification of fault codes.)

PRINTED CIRCUIT BOARDS

Relay Drive Board

The Relay Drive board shown in Figure 7 provides the circuitry to operate the Instant, Timed, and Fault relays and contains the time delay adjustment potentiometer.

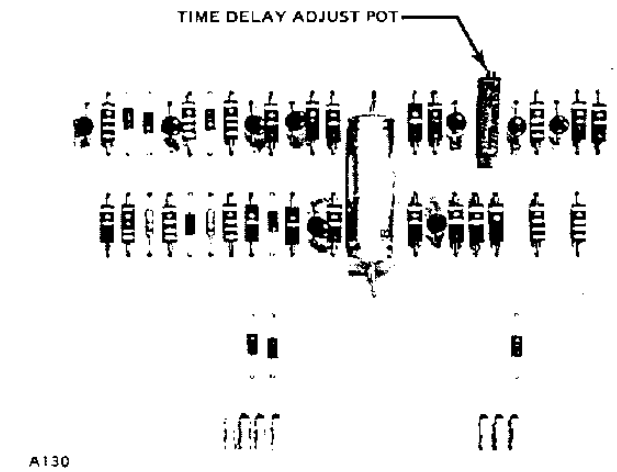


Figure 7—Relay Drive Board

Integrator and Comparator Board

The Integrator and Comparator board (Figure 8) provides the circuitry to perform amplification and integration of the detector signal and contains the sensitivity selection terminal block.

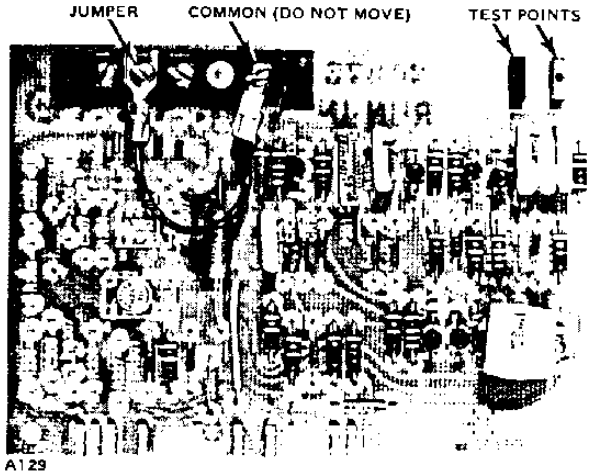


Figure 8—Integrator and Comparator Board

Detector Monitor Board

The Detector Monitor board (Figure 9) contains the circuitry that continuously monitors the wiring between the detectors and the controller, decodes system faults, and drives the right hand (fault identification) digital display. It also contains the detector "loop" selector terminal block (see "Installation" section).

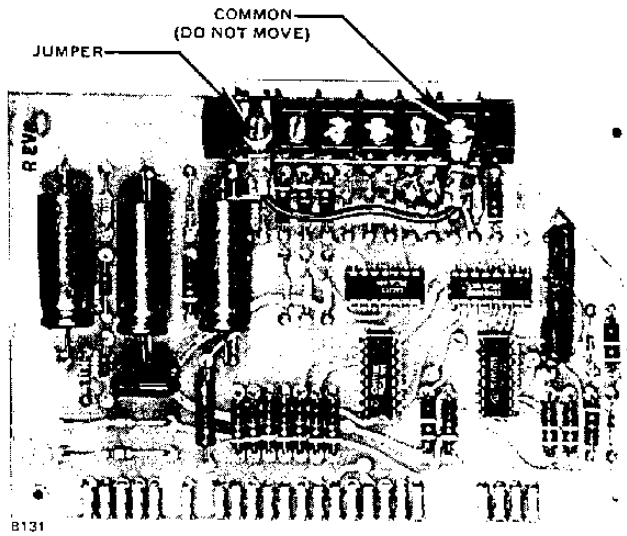


Figure 9—Detector Monitor Board

Power Supply Board

The Power Supply board shown in Figure 10 provides the regulated dc voltage for the amplifiers, the relay drive voltage, and +290 volts dc for the detectors.

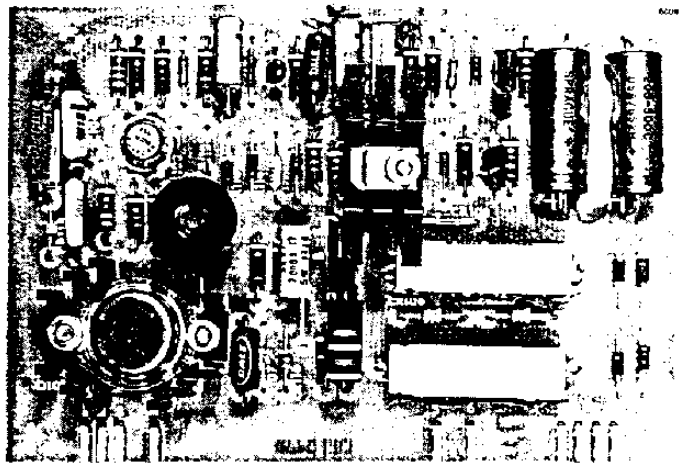


Figure 10—Power Supply Board

Automatic oi Board

The Automatic **oi** board (Figure 11) provides the circuitry for sequentially testing each detector, for sending fault identifications to the Detector Monitor board, and for driving the left hand (detector identification) digital display. It also contains two rocker switch assemblies. The switch assembly with four rockers is used to select the number of detectors connected to the controller. The switch assembly with two rockers sets the low level (Automatic **oi** threshold) sensitivity of the controller. This switch assembly is set at the factory, and under normal conditions does not need to be reset in the field. For further information, consult the Field Support Group at Detector Electronics.

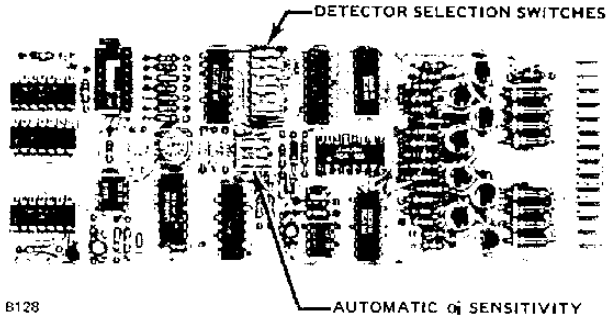


Figure 11—Automatic **oi** Board

Inverter Board

When the controller is powered by a 12 vdc or 24 vdc supply instead of ac line power, it is necessary to use an Inverter board (Figure 12) in place of the power transformer.

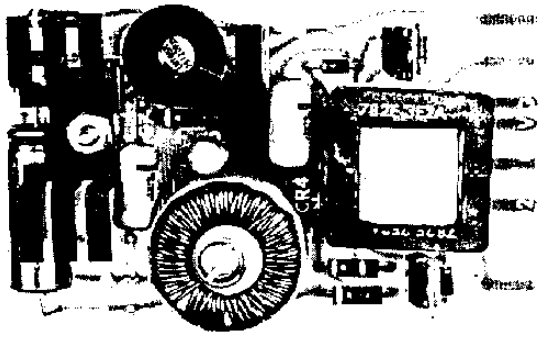


Figure 12—Inverter Board

The 12 vdc version of the controller operates over a range of 10.5 to 16.0 vdc. Maximum peak repetitive voltage is 24 volts. The 24 vdc version operates over a range of 18 to 38 vdc. Maximum peak repetitive voltage is 40 volts.

Power Transformer - A power transformer replaces the Inverter board in controllers that are powered by 120 vac or 220/240 vac. Fluctuations between 85 and 110 percent of rated ac voltage have no effect on system operation.

SPECIFICATIONS

SPECTRAL SENSITIVITY RANGE—
The ultraviolet fire detector responds to radiation over the range of 1850 to 2450 angstroms.

DIMENSIONS—
See Figure 13 for mounting dimensions of the detector and Figure 14 for mounting dimensions of the controller. The controller can be mounted using the four mounting brackets as furnished. The brackets can be rotated 90 degrees if required for ease of installation.

CONTROLLER SENSITIVITY—
Controller sensitivity is field adjustable for 25, 50, 75, and 100 counts per second (cps). The lower the number of pulses required, the greater the sensitivity.

DETECTOR ENCLOSURE MATERIALS—
Models are available in anodized copper-free aluminum, nickel-plated brass, or 316 stainless steel. The aluminum and brass housings are epoxy coated, making them suitable for use in high saline atmospheres, such as offshore platforms.

DETECTOR ENCLOSURE RATINGS—
Watertight, dust-tight, designed to meet NEMA standards Publication ICS6-110.15-1978 for Type 4 enclosures. CSA certified Enclosure 4.

Hazardous locations—FM approved for Class I, Groups B, C, and D; Class II, Groups E, F, and G. CSA certified for Class I, Groups C and D; Class II, Groups E, F, and

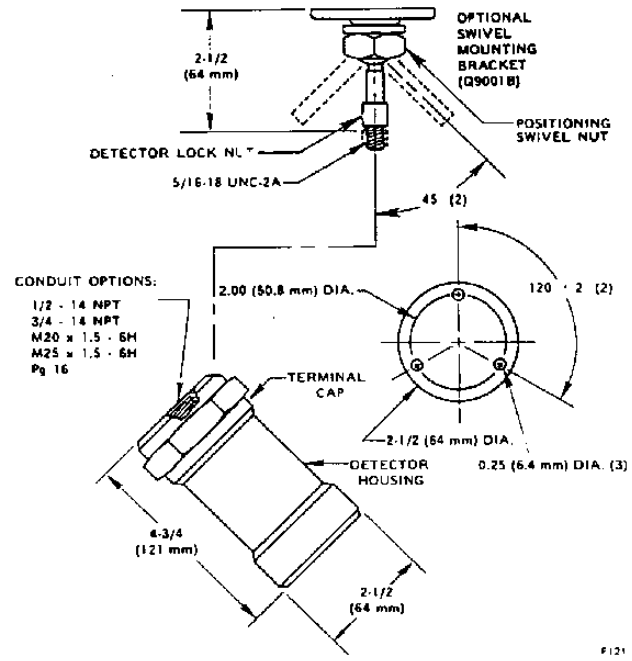


Figure 13—Dimensions of the C7050 Detector in Inches (mm)

G. BASEEFA certified for Group Ex d IIc T6 (hydrogen). PTB approved for Ex Sd2 G5. CENELEC certified EEx d IIB T6. Certified by Lloyd's Register of Shipping to meet their minimum test requirements.

CONTROLLER ELECTRICAL RATINGS—
Input Voltage: 120 vac, 50/60 Hz
220/240 vac, 50/60 Hz
12 vdc
24 vdc

Fluctuations between 85 and 110% of rated ac voltage have no effect on detector sensitivity or system operation.

12 vdc models operate over the voltage range of 10.5 to 16.0 vdc.

24 vdc models operate over the voltage range of 18.0 to 38.0 vdc.

Relay Contact Ratings: Form C (N.O. and N.C.) 10 amperes resistive, 8 amperes inductive.

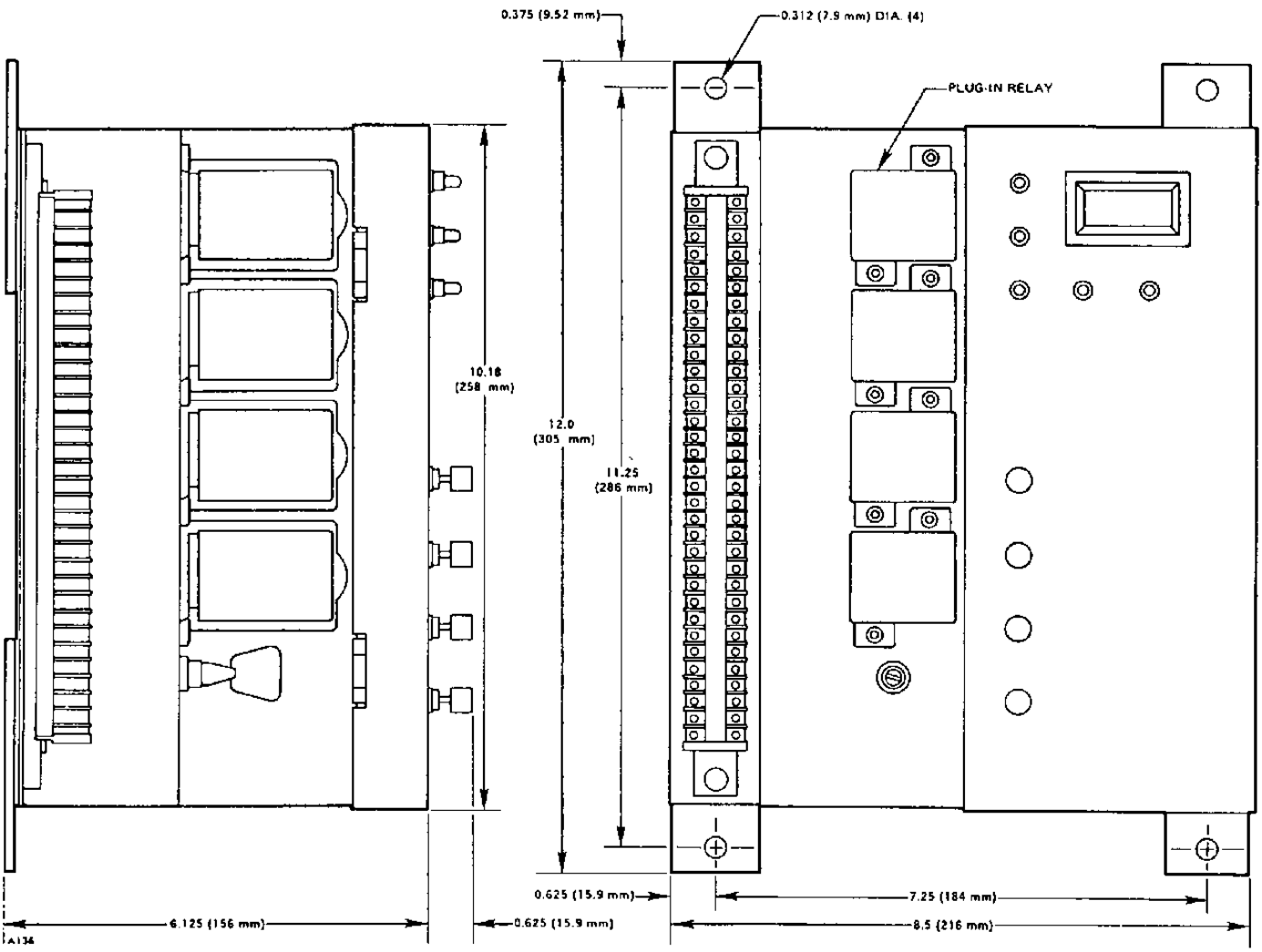


Figure 14—Dimensions of the R7303 Controller in Inches (mm)

Power Consumption (Watts):

	Typical	Maximum
Standby	12	15
Fault	13	18
Fire	20	25
Fault and Fire	21	26

TEMPERATURE RATING—

Operating: −40°F to +170°F (−40°C to +77°C) for detectors
−40°F to +158°F (−40°C to +70°C) for controller

Storage: −67°F to +170°F (−55°C to +77°C) for detectors
−67°F to +158°F (−55°C to +70°C) for controller

SHIPPING WEIGHT (Approximate)—

	Pounds	Kilograms
R7303 Controller	15.0	6.8
C7050B Detector (aluminum)	1.2	0.5
(brass and stainless steel)	2.2	1.0

WIRING REQUIREMENTS—

An 18 gauge cable rated 600 volts rms minimum is required for the detector leads. The A-, B-, and C-leads can be common to all detectors. The B-lead must be shielded. Each detector requires an individual wire for the D-lead. The detectors may be located up to 2000 feet (600 meters) from the controller.

OPTIONS

Solid State Relays

The R7303 Controller can be ordered with solid state relays (function as N.O. contacts) where extremely fast reaction time is required. The dc relay is rated 5 amperes intermittent, 1 ampere continuous at 24 volts dc. The ac relay is rated 1 ampere continuous at 120 volts ac. (Specify the controller model and relay voltages when ordering.)

Hermetically Sealed Relays

The R7303 Controller can be ordered with hermetically sealed relays.

Integrator and Comparator Board

The Integrator and Comparator board is available in several options:

a. The standard version provides selectable sensitivity (25 to 100 counts per second) and non-latching output.

b. The transient arc rejection (TAR) version features protection against false actuation of extinguishing equipment due to short duration, high level UV radiation and also provides selectable sensitivity and non-latching output. This option is normally used in powder coating applications.

c. For applications where increased detector sensitivity is desired, a 10 count per second sensitivity is also available.

Latching Relay Drive Board

The Relay Drive board is available in a configuration that furnishes:

a. Individually selectable latching/non-latching for Instant and Timed relays.

b. Individually selectable time delay for relays in both the instant and timed positions (zero time delay or a range of 0.2 to 12 seconds is available).

Internal Reflection oi

In applications where deterioration of reflective **oi** rings that is caused by corrosive contaminants in the environment results in re-occurring faults, the use of an internal reflection **oi** detector can reduce the resulting downtime and the need for frequent window cleaning. Since the internal reflection detector checks the cleanliness of the viewing window without the use of an external reflective **oi** ring, faults caused by corrosion or contamination on the ring are eliminated. A fault will be indicated only if the window is actually dirty. However, the internal reflection system is able to detect only those substances that will wet the window. It does not detect dry contaminants and, therefore, is not practical for powder coating booths or similar applications where various dry contaminants can obscure the vision of the detector.

Auxiliary Zone Unit

For additional versatility, the R6003 Auxiliary Zone Unit can be added to the system. It is able to provide relay response according to zone and also voting capability to systems using R7303 Controllers and C7050 Detectors. Without the R6003, a single R7303 Controller actuates one Instant relay and one Timed relay when any detector connected to the R7303 detects a fire. With the R6003 in the system, several additional capabilities are possible:

1. A separate relay response occurs for each zone that detects fire (up to 8).

2. Detectors can be used one to a zone or grouped together for redundant coverage.

3. More than one R7303 Controller can be used in such a system to provide additional fire protection.

4. Alarm and extinguishing equipment can be operated either by individual zone or through a common relay output.

5. The R6003 can be programmed to actuate a "voting" relay in response to fire in a minimum of two, three, four, or five zones.

Load Monitoring Relay Assembly

For applications where it is desired to have a continuous checkout of external equipment and its ability to respond to a signal from the controller, the R4500 Load Monitoring Relay Assembly is available. The R4500 is used in conjunction with the R7303 Controller to supply two separate load monitoring relays that continuously supervise the electrical integrity of external loads such as alarms or extinguishing equipment. The relays have form C contacts. If an output circuit should become open, the relays are instantly de-energized. An external device can then be connected to the load monitoring relay to provide a warning or stop a process in the event of a load fault.

SYSTEM SENSITIVITY CONSIDERATIONS

OPTICAL SENSITIVITY RANGE (CONE OF VISION)

The detector has a nominal 80 degree cone of vision with the highest sensitivity along its central axis. Figure 15 provides a composite view of the detector's cone of vision and relative response to a constant UV source for different controller sensitivity settings.

DETECTOR SENSITIVITY

The DetTronics UV fire detector responds to radiation over a range of 1850 to 2450 angstrom units. Figure 16 illustrates the sensitivity range of the sensor tube and compares this range to other forms of radiation. The UV radiation that reaches the earth from the sun does not extend

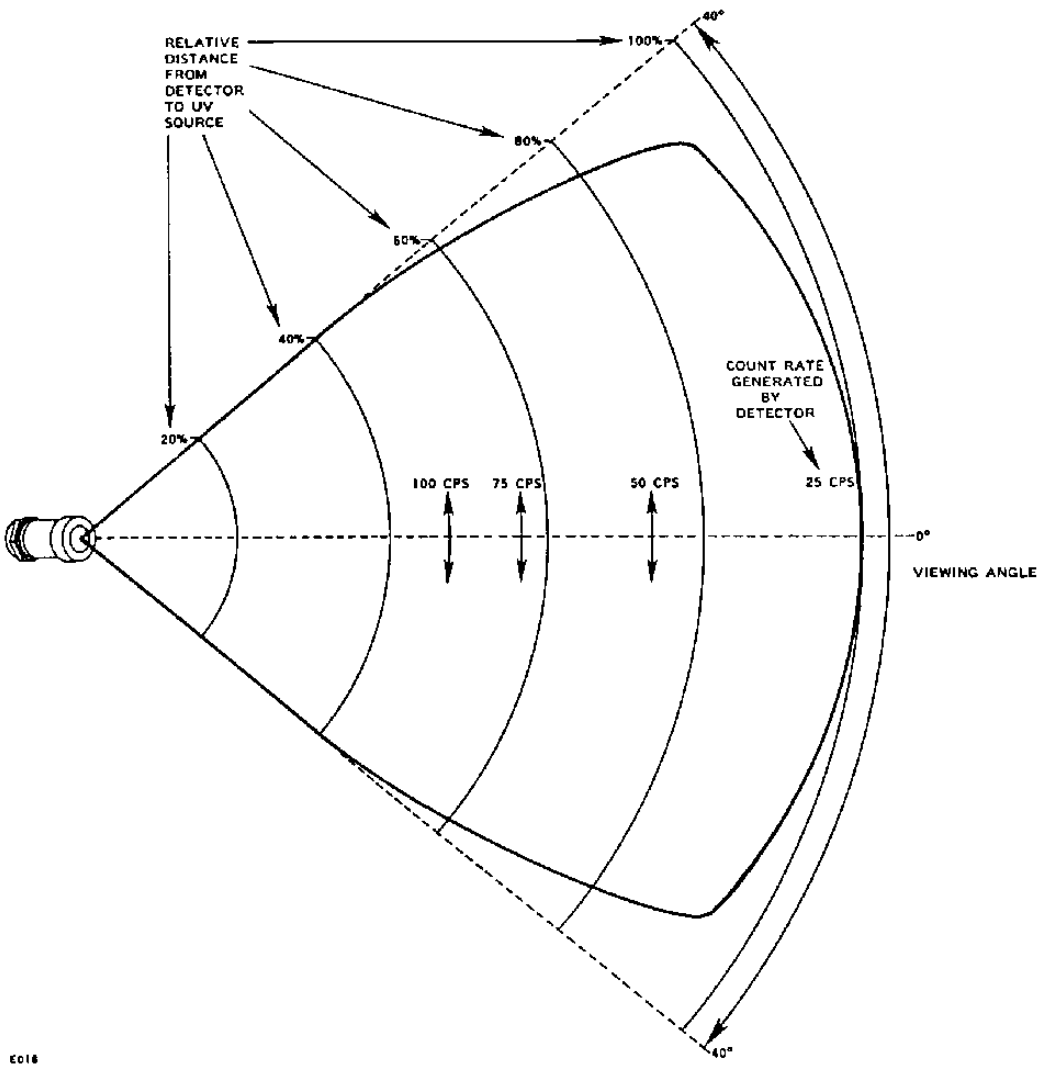


Figure 15—UV Fire Detector Cone of Vision

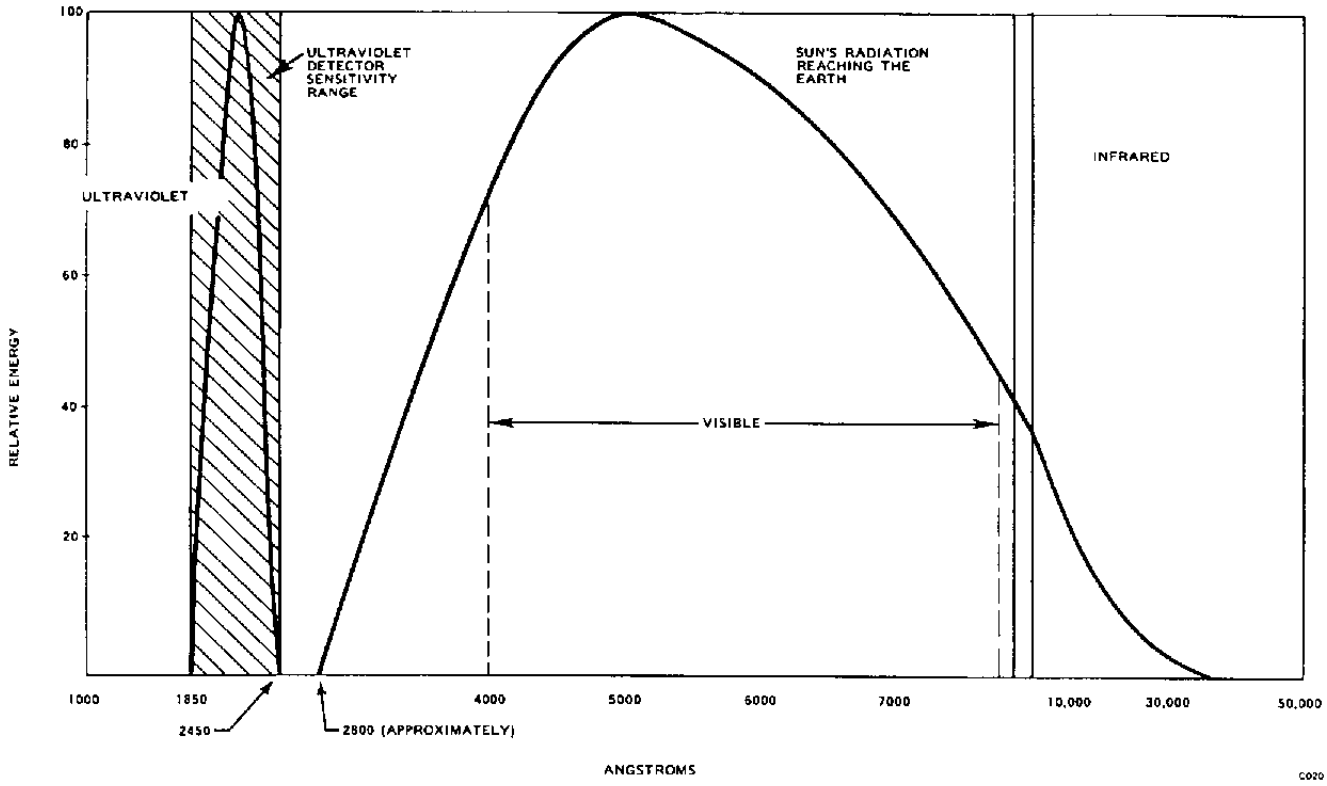


Figure 16—Sensitivity Range of UV Detector

into the detector's region of sensitivity. In addition, radiation from normal artificial lighting does not extend into the detector's spectral range. As a result, the detector may be used in a variety of both indoor and outdoor applications. Some mercury vapor lamps with cracked or otherwise damaged envelopes can operate for extended periods and will emit UV radiation in the frequency response range of the detector. If a detector is in the vicinity, the UV radiation can result in false actuation of the system. Defective mercury vapor lamps can also be harmful to the eyes and should be immediately removed from service.

The UV sensor responds to any radiation that can penetrate its glass envelope and create ion pairs. The glass envelope absorbs most alpha or beta particles, but it permits both gamma and x rays to pass through. If these rays create ion pairs between the electrodes near the cathode, the normal discharge process will occur and the detector will generate an output signal. If the x or gamma ray flux is sufficient to produce a count rate higher than the system sensitivity setting, an undesired response of the system will occur.

Data on sensitivity of the C7050 Detector to various x ray and gamma radiation intensities is impossible to relate to a typical detector exposure. The normal precaution against false actuation due to x rays or gamma radiation is to turn off the detection system when sources of high level radiation are being used in the immediate area. CAUTION MUST BE EXERCISED if the detection system is turned off since the hazardous area will not be protected.

Detector response can be directly related to distance as shown in the chart of a gasoline reference fire, Figure 17, which shows the relation between counts per second (cps), size of fire, and distance from the fire to the detector for gasoline fires. From these curves it can be seen, for example, that a 4 ft^2 (0.37 m^2) gasoline fire at 60 feet (18 meters) will normally cause the detector to generate 20 cps. The same fire at 40 feet (12 meters) will generate about 50 cps. If a 2 ft^2 (0.18 m^2) fire at 20 feet (6 meters) generates 100 cps, the same fire at 70 feet (21 meters) will generate about 8 cps. Because of the complexity of the combustion process, the sensor tube count rate generated by different size fires viewed from the same distance is difficult to predict with a high degree of precision. In general, however, if a fire doubles in size, the sensor tube count rate is increased by approximately 60 percent. Depending upon the intensity of the ultraviolet radiation source, the C7050 can be considered to have a practical application distance of up to about 50 feet (15 meters). Since physical obstructions, smoke accumulation, or UV absorbing chemical vapors will prevent UV from reaching the detectors, they should be mounted as close as practical to the probable hazard. Under certain conditions, detectors may be used at greater distances.

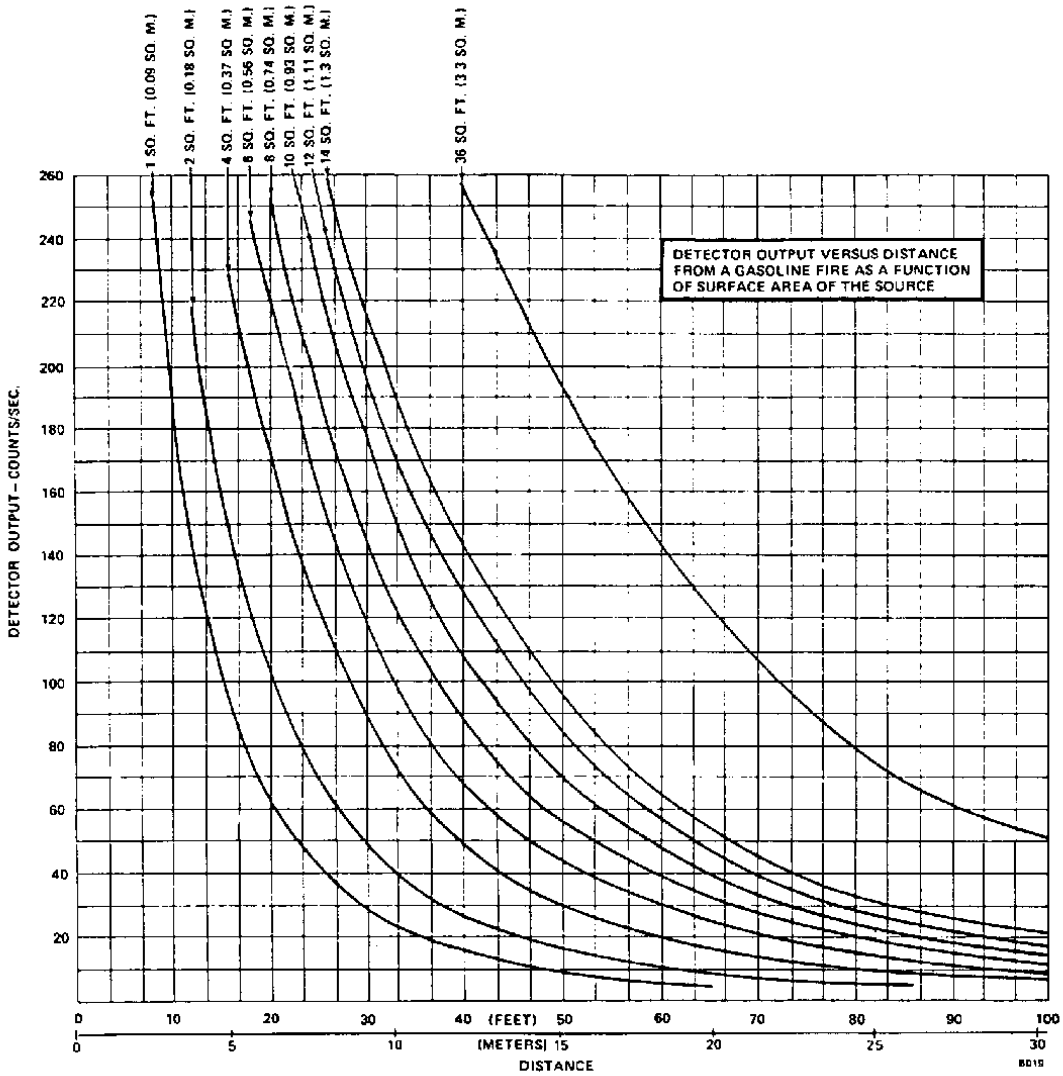


Figure 17—Sensitivity to a Gasoline Reference Fire

CONTROLLER SENSITIVITY

Controller sensitivity is field adjustable for 25, 50, 75, and 100 counts per second (cps). The maximum response distance and greatest sensitivity are achieved at a 25 cps sensitivity setting. The 100 cps setting is the least sensitive. For an application involving high background radiation potential, the system can be desensitized by increasing the count rate required to actuate it.

INSTALLATION

DETECTOR POSITIONING AND DENSITY

The Det-Tronics UV detector has a nominal 80° cone of vision. What this means in practical terms can be understood by reference to a typical installation. Consider an application such as a loading rack with a ceiling height of 25 feet (7.5 meters) and assume it is desired to have complete detector coverage at floor level. If a detector is mounted 2 feet from the ceiling and pointed straight down, the distance from the detector to the designated level would be 23 feet (7 meters). Because of the nominal 80° cone of vision, the detector would cover a circular area with a diameter of 39 feet (12 meters). A simple layout of the area to be covered will readily reveal the number and location of detectors required to completely supervise the designated area.

In general, detectors should be placed as close as practical to the probable hazard. Det-Tronics systems may be adjusted to various sensitivity levels by programming the controller to respond at a predetermined detector count rate. This count rate is dependent upon the intensity of ultraviolet radiation reaching the detector, which is a function of fuel, flame size, distance from the detector, and the amount of UV absorbing vapors that may be present. The presence of UV absorbing vapors must be examined closely. Some chemical and petrochemical vapors have very strong UV absorption characteristics (see Appendix).

Referring to Figure 17 and considering the conditions described above, the criteria for selecting the appropriate system sensitivity can be established. The hazard to be

protected was designated to be at a distance of 23 feet (7 meters) from the detector. Assume that the hazard is gasoline and that it is desired to produce an alarm signal when a fire with a surface area of 1 square foot (0.09 square meter) develops. Reading on the horizontal "Distance" axis of Figure 17, locate the vertical line at approximately 23 feet (7 meters). Follow this line until it intersects the "1 square foot" curve. Note that this occurs at the horizontal line of about 50 counts per second on the vertical "Detector Output" axis. This means that the controller should be adjusted to 50 cps sensitivity in order to respond to this size fire from 23 feet (7 meters). If the detectors were located 30 feet from the hazard, it can be seen that it would be necessary to use the more sensitive (25 cps) setting.

NOTE

Do not mount UV detectors close to the ceiling in enclosed areas if dense smoke may be expected to accumulate at the onset of a fire. Mounting the detector on side walls a few feet (or about 1 meter) down from the ceiling will normally allow time for the detectors to respond before they are affected by smoke rising to the ceiling. It is also advisable to shorten any time delay settings for applications where smoke may accumulate during a fire. If dense smoke may be expected to accumulate prior to the presence of flame (as in an electrical fire), do not use UV detectors alone.

CONTROLLER LOCATION

The R7303 Controller may be mounted in any position. (See Figure 14 for mounting dimensions.) The controller should be mounted in a permanent location where it can be easily monitored and checked regularly. If the controller is mounted outdoors, a weather-resistant enclosure must be provided such as Detector Electronics model Q1016. See form 95-8257 for details. If it is necessary to mount the controller in a hazardous location, an explosion-proof enclosure must be provided such as Detector Electronics model Q1019. See form 95-8279 for details.

WIRING REQUIREMENTS

The wiring to each detector must be at least 18 gauge with a minimum rating of 600 volts rms. Each detector should be located no more than 2000 feet (600 meters) from the controller. The B-lead (detector output) must be shielded and the shield grounded only at the controller. If the B-lead is run in conduit, the conduit should not contain wiring for other electrical equipment. If a multiconductor cable is used for wiring the system, see form 75-1003 for information regarding the prevention of crosstalk within the cable.

An external ground screw is provided on the terminal cap for applications where the local wiring code or actuation of the system caused by static electricity requires that the detector enclosure be connected to earth ground. Do not use the ground terminal on the controller for grounding detector housings.

Cable that is made specifically for harsh, salt-water environments should be used in areas where high humidity or salt water is a problem. In all cases, typical cable insulation resistance should be 100 megohms or more, using a high voltage insulation tester, commonly known as a "megger" or megohmmeter. If the cable's resistance drops below 10 megohms, it should be replaced immediately to avoid shorting.

IMPORTANT

Remove detector and controller leads from the cable before applying megohmmeter to the cable.

Certain guidelines must be followed when installing the detector to maintain the explosion-proof, dust-proof, and moisture-proof qualities of its enclosure. In applications where conduit is used to install the detector in a hazardous location, the use of water-tight conduit seals is required to prevent moisture from entering the detector housing. These seals must be installed even if they are not required by local wiring codes. A seal must be located as close to the detector as possible. In no case should this seal be located more than 18 inches (0.5 meter) from the detector housing. Where an explosion-proof installation is required, an additional seal is also required at any point where the conduit enters a non-hazardous area. When pouring a seal, the use of a fiberdam is necessary to assure proper formation of the seal. The seals should never be poured in temperatures that are below freezing, since the water in the sealing compound will freeze and proper drying will not be possible. Contamination of the detector will then result when temperatures rise above the freezing point and the compound thaws. The shielding of the cable should be stripped back to permit the seal to form around the individual detector leads, rather than around the outside of the shield. This will prevent any siphoning action that might occur through the inside of the shield.

Since moisture can be detrimental to electronic devices, it is essential that the electrical connections of the sensor tube module be kept dry. Moisture in the air can be trapped within sections of conduit and can condense and accumulate at the base of vertical conduit runs. To eliminate this condition, explosion-proof drains and breathers should be installed to automatically bleed off accumulated water.

NOTE

Be certain that all wiring is done in compliance with applicable electrical wiring regulations that relate

to the installation of electrical equipment in a hazardous area.

MOUNTING AND WIRING THE DETECTOR

The following procedure should be used for mounting and wiring the detectors:

1. Detectors should be located for the best unobstructed view of the area to be protected. Detectors must be accessible for cleaning the window and reflector rings. For outdoor applications, the detectors should be pointed downward to prevent the cone of vision from scanning the horizon, since the detectors may be affected by long duration lightning flashes or distant arc welding. When practical, mount the detectors so that the UV test lamp is on top and the slit in the **oi** ring is on the bottom, since accumulation of dirt or moisture between the window and the reflector rings will interfere with the Automatic **oi** function. See Figure 13 for mounting dimensions.

2. Disassemble the detector enclosure by turning the housing cover counterclockwise. If the detector is equipped with a cover locking device, loosen the clamp and disengage the "catch" from the terminal cap. This locking cover feature is required for equipment approved by BASEEFA and PTB. The tool required for the BASEEFA clamp is a 5/32 inch hexagonal (Allen) wrench. For the PTB clamp, a triangular m4 (7 mm) wrench (DIN 22417) must be used. See Figure 18 for an illustration of the detector assembly.

3. Attach the A-, B-, C- and D-leads to the screw connectors on the terminal block. See Figure 19 for identification of the screw terminals. If the shielded cable is to continue to another detector, tie the shields together. Always insulate the shield from the detector housing.

4. Remove the UV sensor tube module from its shipping package and attach it to the terminal block using the procedure described below.

5. Replace the detector housing. If the detectors are equipped with cover locking devices, loosen the clamp sufficiently so that the "catch" can be seated in the blind hole provided on the terminal cap. (See Figure 20.) The clamp must then be fastened securely around the detector barrel by tightening with the proper tool.

6. Thoroughly clean the detector window and the reflective **oi** ring according to the instructions in the "Maintenance" section.

SENSOR TUBE MODULE INSTALLATION

The sensor tube module is attached to the terminal block by either four screws or four nickel-plated banana plugs.

If screws are supplied with the detector:

—Place a lockwasher on each of the screws.

—Slide the screws through the mounting sleeves on the tube module from the sensor side of the printed circuit board. (See Figure 21.)

—Place an O-ring on the ends of the screws to prevent them from falling out. Push the O-ring far enough up the shaft of the screw so that it will not prevent the screw from going into the threaded mounting holes on the terminal cap.

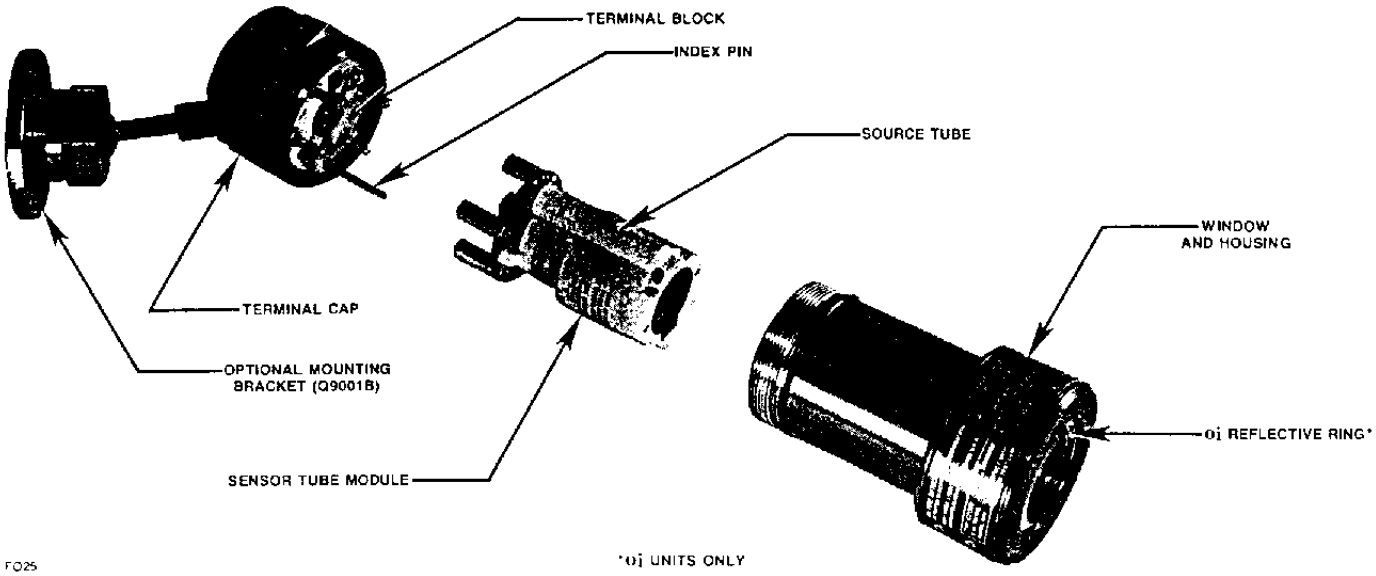


Figure 18—C7050 Detector Assembly

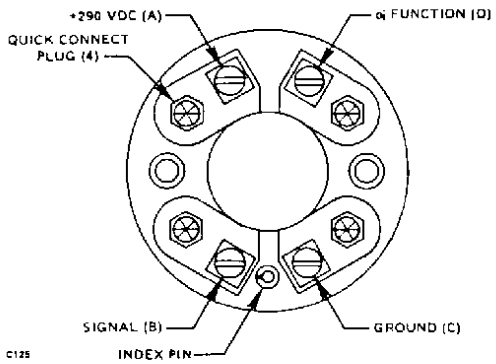


Figure 19—Terminal Block

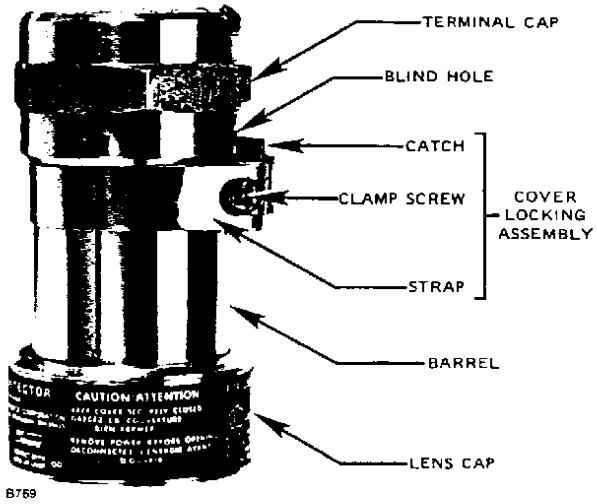


Figure 20—C7050 Detector with Cover Locking Assembly

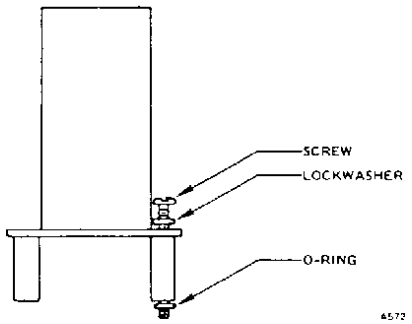


Figure 21—Tube Module Anchoring Screws

—Line up the index pin on the terminal block with the hole in the printed circuit board on the tube module. Hold the module in position and tighten the four screws.

If banana plugs are supplied with the detector, no screws are required. Be sure to push the module as far as it will go on the banana plugs.

Increased speed and convenience will be realized when replacing sensor tube modules in detectors equipped with banana plugs. If it is desired to replace existing screws with banana plugs, this can be accomplished by simply removing the screws and screwing four banana plugs into the holes on the terminal block. Lockwashers should also be used to prevent the plugs from loosening. Nickel-plated banana plugs (part number 001981-001) are available from Detector Electronics.

CONTROLLER WIRING

Figure 22 shows the standard ac terminal configuration of the controller. Figure 23 shows the dc terminal configuration. The ac terminal configuration is as follows:

Terminal 1—Connect to earth ground

Terminal 2—Connect to the neutral side of the input power line

Terminal 3—Connect to the hot side of the input power line

Terminals 4 to 7—Instant relay

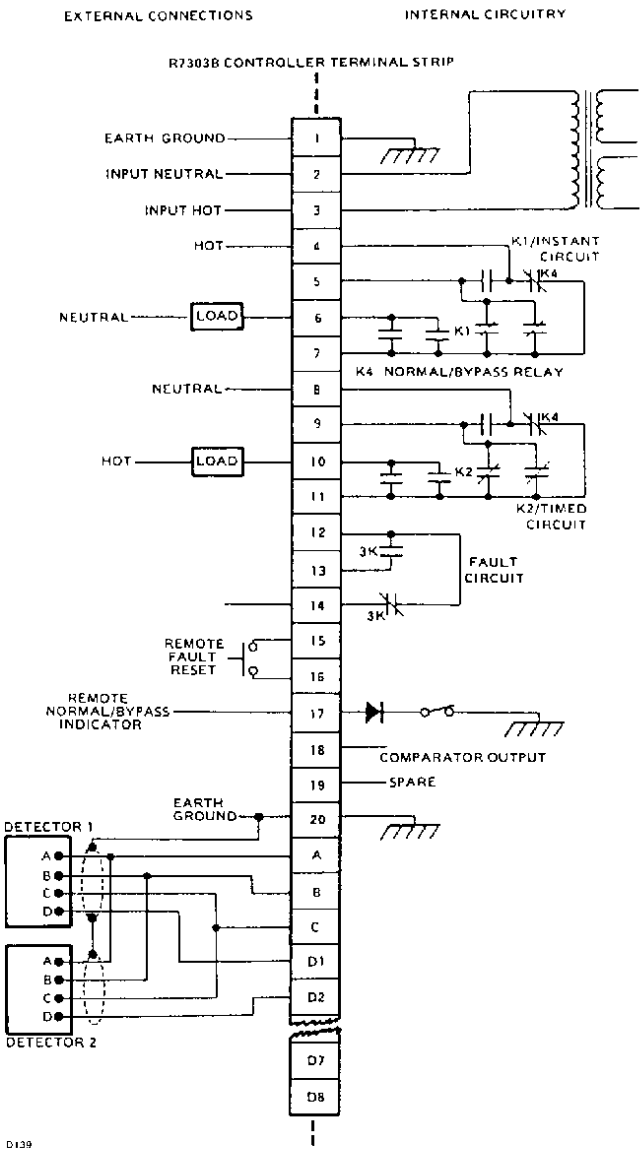


Figure 22—R7303 Controller Terminal Strip, AC Operation

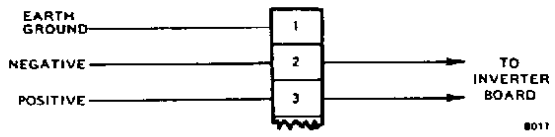


Figure 23—R7303 Controller Terminal Strip, 12/24 VDC Operation

Terminals 8 to 11—Timed relay

Terminals 12 to 14—Fault relay (shown energized, no fault)

Terminals 15 and 16—Remote reset

Terminal 17—Bypass (for remote indication)

Terminal 18—Comparator

Terminal 19—Spare

Terminal 20—Earth ground

Terminal A—Connect to all detector A-leads

Terminal B—Connect to all detector B-leads

Terminal C—Connect to all detector C-leads

Terminal D1—Connect to D-lead from detector 1

Terminal D2—Connect to D-lead from detector 2

Terminal D3—Connect to D-lead from detector 3

Terminal D4—Connect to D-lead from detector 4

Terminal D5—Connect to D-lead from detector 5

Terminal D6—Connect to D-lead from detector 6

Terminal D7—Connect to D-lead from detector 7

Terminal D8—Connect to D-lead from detector 8

The shield on the cable is connected to terminal 20.

The 12 vdc and the 24 vdc models of the R7303 Controller are designed to operate with a negative ground on the batteries. If it is necessary to operate the power supply with a positive ground, a modification of the Inverter board is required as shown in Figure 24.

END OF LINE (EOL) "LOOP" RESISTORS

Each detector is internally wired with EOL lead monitoring resistors between terminals A and B, and A and C. This allows a small control current to flow through the interconnecting wires for checking their continuity. If continuity is ever lost in any of the A-, B-, or C-leads, no current will flow. Likewise, if a short occurs, the amplitude of current will change. When the controller does not detect the amplitude of current that it was programmed to detect, a fault signal is generated. This enables the controller to immediately detect any malfunction that might occur in the detector wiring. Since each detector has its own individual D-lead, its continuity will not be checked in this way. A fault in any of the D-leads will, however, be detected by the Automatic **oj** test.

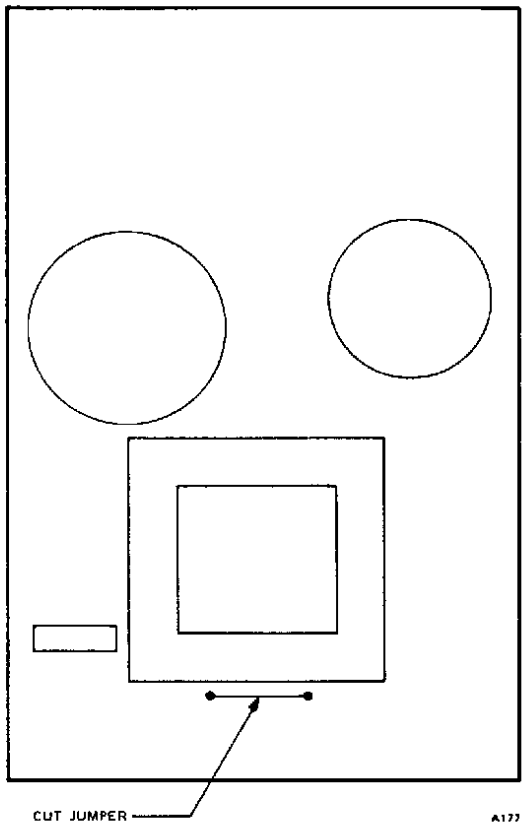


Figure 24—Modification of Inverter Board for Positive Grounded Systems

Refer to Figure 25 for an illustration of EOL resistors. Note that the jumper wire completes the circuit or "loop," which simply connects the EOL resistors between terminals A and B, and A and C of the controller, thus permitting the test current to flow. As long as the end detector in the loop has its jumper connected, this detector and all other detectors in the same loop (wired in parallel) will have their connecting wires checked for continuity.

In order for the system to function properly, each EOL loop must meet the following conditions:

1. The first detector is connected directly to the controller.
2. Each additional detector is connected to the preceding detector.
3. The detector at the "end of the line" must have its jumper installed, allowing current to flow through its EOL resistors.
4. The Detector Monitor board must be programmed for the total number of EOL resistors being used in the system (not just in an individual loop).

Any number of detectors can be wired in a loop; however, since no more than four EOL resistors can be connected (their jumpers are not cut), no more than four loops can be used. It is also permissible to have more than one EOL resistor connected in a given loop.

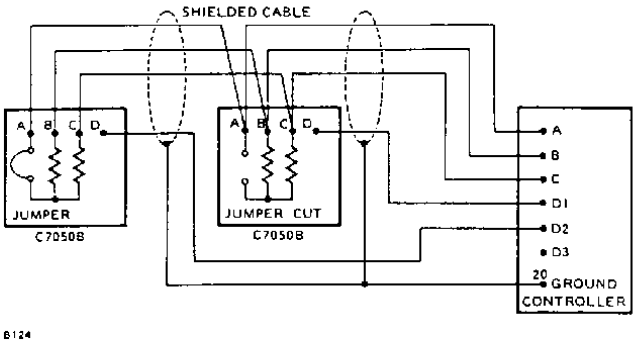


Figure 25—End of Line Resistors

When only one detector is used in a loop, it can be connected directly to the controller by a four-conductor shielded cable. When a loop consists of more than one detector, a three-conductor shielded cable is normally used for the A-, B-, and C-leads and a separate wire is used for the D-lead, since it goes back to the controller rather than to the preceding detector. In order to prevent interference, the B-lead must be shielded and the shield grounded at the controller, not at the detector.

The circuitry that checks for faults in the detector wiring is located on the Detector Monitor Board. When initially setting up the system, it will be necessary to program the Detector Monitor board for the number of EOL resistors being used in the system (no more than four). See the "Programming Controller" section for further information.

Jumper "J" in DE1555 and DE1666 models of the UV sensor module is a wire that is cut in order to remove its EOL resistors from the circuit. See Figure 26. Jumper "J" in models beginning with the DE1777 UV sensor module is a plug which, when installed, connects its EOL resistors. See Figure 27.

TYPICAL APPLICATIONS

The following are examples only and represent some typical applications. All relay contacts and optional external bypass switches are shown in normal (standby) operating position.

An external reset switch may be connected across terminals 15 and 16 (See Figure 22) for returning the fault circuitry to normal operation. A second alternative is to place a jumper across these terminals. This permits the FAULT LED to remain on only while there is a fault condition. The FAULT LED will also turn on momentarily when input power is applied.

NORMALLY ENERGIZED LOAD - INSTANT RELAY

Figure 28 illustrates an example of a normally energized load connected to the Instant relay. Power to the external load is removed when the Instant relay is energized.

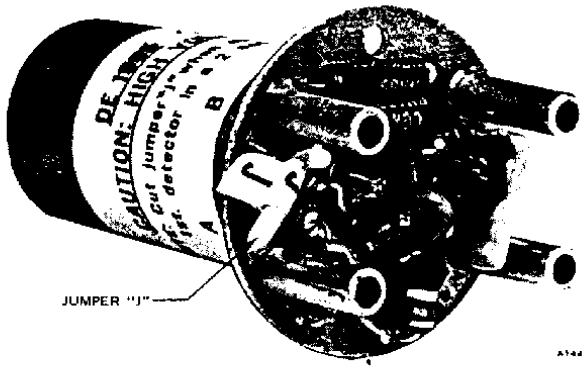


Figure 26—UV Sensor Module with Jumper Wire "J"

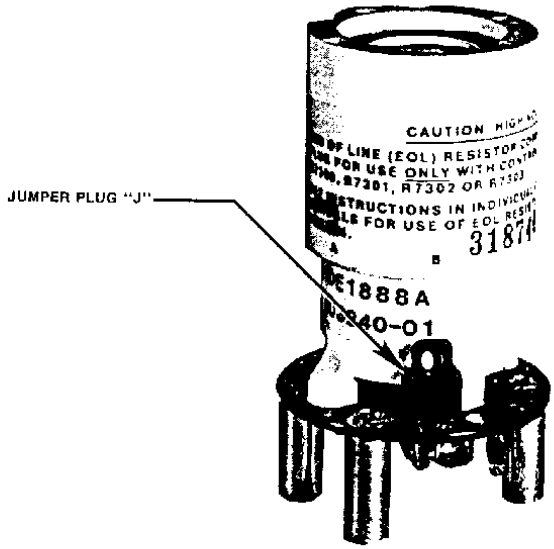


Figure 27—UV Sensor Module with Jumper Plug "J"

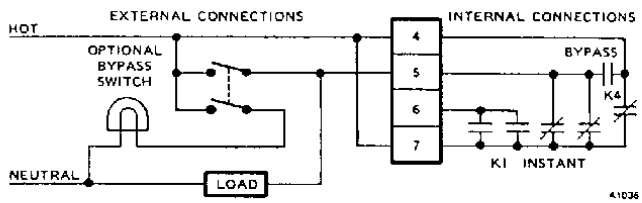


Figure 28—Normally Energized Load Connected to Instant Relay

The example also uses an optional external bypass switch and indicator lamp. Both the internal and external bypass switches in this circuit allow checkout of the Instant relay without interrupting power to the normally energized external load.

If only the normally closed contacts of the Instant relay are in service and **an external bypass switch is not used,** a jumper must be installed between terminals 4 and 7, as shown in the illustration, to prevent a momentary interruption of power to the normally energized load circuit when the internal bypass is activated. If the normally open contacts of the Instant relay are used to

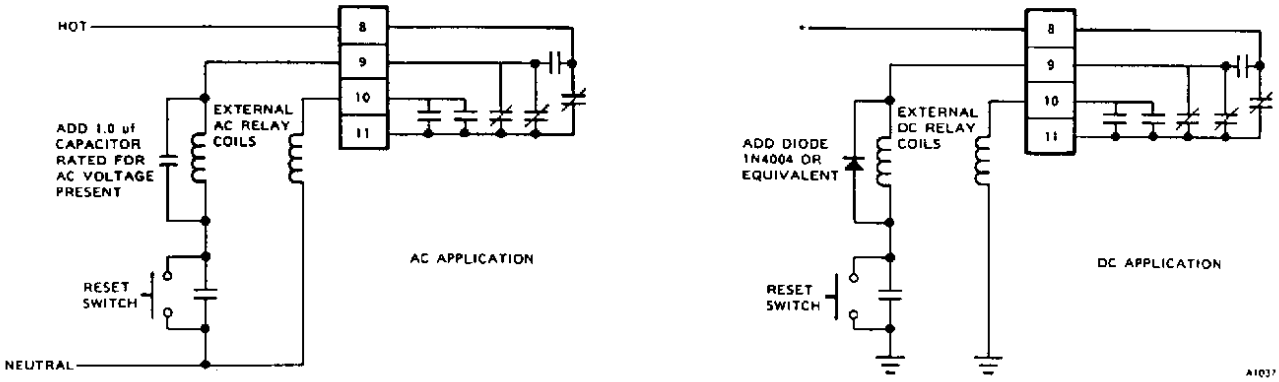


Figure 29—Normally Energized External Relay Connected to Timed Relay

operate external equipment, this jumper must NOT be installed. If it is, the external equipment will operate normally when the controller is in the Bypass mode.

NORMALLY ENERGIZED LOAD - EXTERNAL RELAY

Figure 29 illustrates an example of a normally energized external relay connected to the Timed relay. Note that a self-latching relay is used with the normally closed contacts of the Timed relay. If power is momentarily removed, this relay will de-energize and remain de-energized until it is manually reset. Install either a capacitor or a diode in parallel with the external relay coil as illustrated. This will prevent the self-latching relay from de-latching when the internal bypass is activated, and permit checkout without disturbing the normal operation of the external equipment.

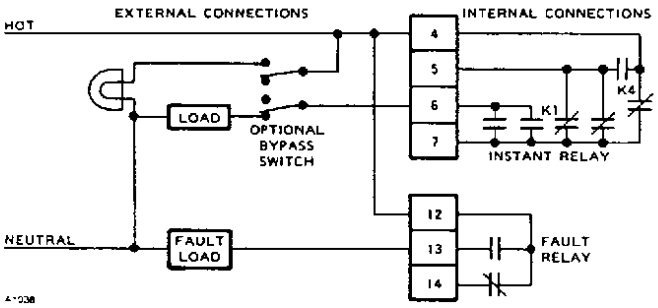


Figure 30—Normally Unenergized Load Connected to Instant Relay

NORMALLY DE-ENERGIZED LOAD

Figure 30 illustrates an example of a normally de-energized load wired to the Instant relay. Actuation of either the internal or optional external bypass switch permits checkout of relay operation without applying power to the normally de-energized load. Also shown is a normally de-energized fault load, which becomes activated when the controller's Fault relay is de-energized.

SOLID STATE RELAYS

Solid state relays can be ordered for applications where extremely fast reaction time is required. Both the ac and dc solid state relays have normally open (form A) contacts and are limited to the two specific operating voltages of 120 vac and 24 vdc. Refer to Figure 31 for an example of a wiring connection using dc solid state relays. Figure 32 illustrates the use of ac relays.

PROGRAMMING CONTROLLER

The following procedure should be performed immediately after the installation of the equipment has been completed. This should be done before power is applied to the system.

CAUTION

Always remove input power before removing printed circuit boards.

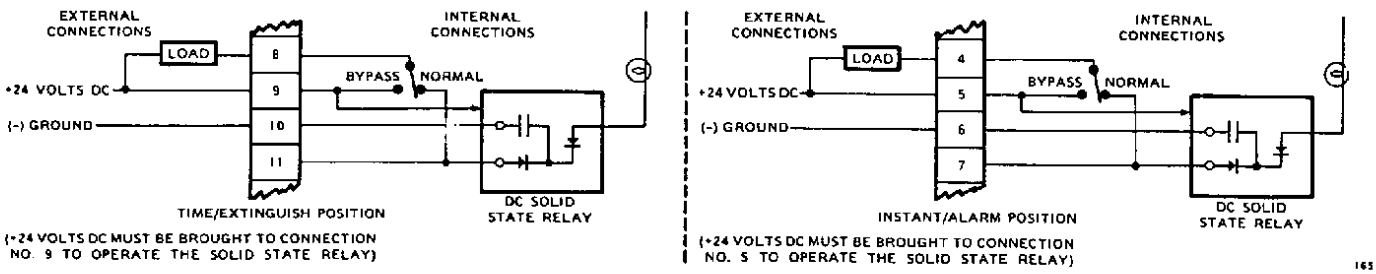


Figure 31—Typical Wiring Connections with DC Solid State Relays

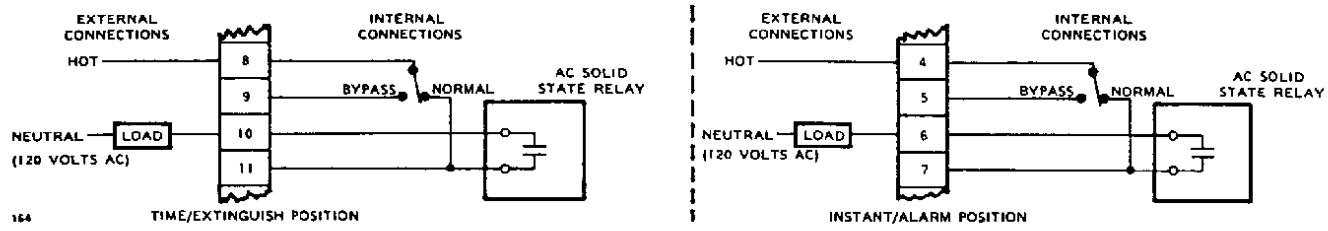


Figure 32—Typical Wiring Connections with AC Solid State Relays

DETECTOR SELECTION

The four-rocker switch assembly on the Automatic **oi** board must be set for the number of detectors connected to the controller. See Figure 11 for location of the switch assembly. This rocker switch assembly is set for eight detectors when shipped from the factory and must be programmed for the number of detectors connected to the controller at the time of installation. The rockers are set in binary code to obtain eight different settings with the four switches. The rocker switches are turned on when they are depressed toward the switch number on the assembly. See Figure 33 for an illustration of the switch assembly. Table 2 shows the switch positions for any number of detectors up to a maximum of eight.

NOTE

If the switch assembly is set for too many detectors, the controller gives a "fault" signal. The left hand display shows the number of the selected but missing detector(s) and the right hand digital display shows the number 2. If the switch assembly is set for too few detectors, the controller performs normally, but only the number of detectors selected are checked by the Automatic **oi** *test. This condition will be found only when performing the manual* **oi** *test procedure. See "Trouble-shooting" and "Checkout Procedure" sections.*

SENSITIVITY ADJUSTMENT

The controller is shipped with the sensitivity set at 25 cps. If this setting must be changed, remove the Integrator and Comparator Board. See Figure 8. Program the controller for the desired sensitivity by moving the spade lug to the appropriate terminal. The numbers near each terminal indicate the sensitivity setting in counts per second (25, 50, 75 or 100). Carefully re-insert the printed circuit board after the adjustment has been made. If the application involves the use of the optional TAR board in an electrostatic powder coating booth, see form 75-1002 for additional information.

END OF LINE RESISTOR (EOL LOOP)

The Detector Monitor board must be programmed for the number of EOL resistors connected to the controller. It is set for one loop when shipped from the factory. If more are to be added, the Detector Monitor Board must be removed from the controller. It is then necessary to position the jumper wire on the appropriate terminal for the number of EOL resistors connected to the controller. (See Figure 9.) Up to eight detectors can be used with one controller, however, they must be arranged in no more than four EOL loops.

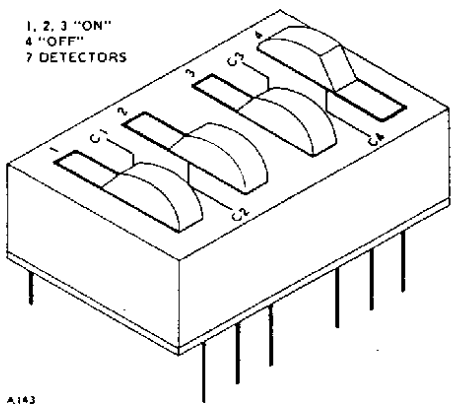


Figure 33—Rocker Switch Assembly

Table 2—Switch Positions for Automatic **oi** Board

Number of Detectors Connected	Rocker Switch Position			
	1	2	3	4
1	on	off	off	off
2	off	on	off	off
3	on	on	off	off
4	off	off	on	off
5	on	off	on	off
6	off	on	on	off
7	on	on	on	off
8	off	off	off	on

TIME DELAY SETTING

NOTE

If the controller is to be mounted in a hazardous area, adjust the time delay to the desired setting before installation. DO NOT apply power to the controller in a hazardous area unless it is completely enclosed in an explosion-proof housing.

The time delay setting is adjusted at the factory for 5 seconds. The adjustment range is from 0.2 to 12 seconds. If it is desired to change the time delay, place the NORMAL/BYPASS switch on the controller in the BYPASS position and turn on the input power. The FAULT LED and the digital displays on the front panel of the controller are illuminated. The number of the detector being monitored is displayed on the left hand side and the number "8" is displayed on the right hand side. Pushing the **oi** TEST button initiates a manual test. (See "Checkout Procedure.") A successful test causes the INSTANT LED to turn on. At the end of the time delay, the TIMED LED also turns on. Adjust the potentiometer on the Relay Drive board to provide the desired time delay between the illumination of the INSTANT and TIMED LEDs. See Figure 7 for the location of the potentiometer. Turning the potentiometer counterclockwise **increases** the time delay and turning clockwise **reduces** the delay. One turn equals approximately one second.

NOTE

UV radiation must be present continuously at the detector during the entire time delay period to actuate the Timed relay. A brief interruption of the UV radiation causes the time delay period to start over again. If there is a chance of dense, heavy smoke during the initial period of combustion, a shorter time delay period may be appropriate.

STARTUP PROCEDURE

After the installation adjustments have been made, the sensitivity of the system should be checked. This requires two people, the use of a W866 Test Lamp (or an equivalent UV source), and a dc voltmeter with at least a 20,000 ohm/volt movement.

1. With the controller in the Bypass mode, turn on the W866 Test Lamp and shine it into the window of detector number 1 from a distance of about 10 feet (3 meters). The INSTANT LED should turn on immediately and the TIMED LED should turn on when the time delay elapses.

2. Turn off the test lamp, move back about 5 feet (1.5 meters) and repeat the above procedure.

3. Repeat this process until the test lamp does not make the controller respond and then move closer to the window until the INSTANT LED turns on.

4. This distance should be recorded for future reference when an overall checkup of the system is scheduled. (See the recommended test form at the back of this manual.)

5. Repeat the above procedure for every detector in the system and record the data.

6. Next, attach a voltmeter to the test points provided on the Integrator and Comparator board. (See Figure 8.)

7. Set the meter on a scale where 0.2 vdc can be read.

   a. When the detectors are not exposed to UV radiation, the voltage should be approximately 0.05 vdc with pulses every 10 to 30 seconds up to 0.2 volts dc.

   b. If the voltage is above this level, see "Intermittent Activation of the Controller" in the "Troubleshooting" section.

CHECKOUT PROCEDURE

The Automatic **oi** system continuously monitors most of the system circuitry, however, it does not monitor the relay contact closure and some portions of the signal processing circuitry. It is important that the system be manually checked on a regular basis, using the manual **oi** checkout procedure described below. The manual **oi** test causes the Instant and (if held on) the Timed relays to energize.

NOTE

With the controller in the Bypass mode, relay contact switching is electrically bypassed and the functioning of external devices is unaffected.

MANUAL oi TEST

1. Place the NORMAL/BYPASS switch in the BYPASS position.

   a. The FAULT LED turns on.

   b. The digital displays are activated. The left display indicates the detector selected for test and the right display indicates Bypass mode (8).

2. Push and **hold** the **oi** TEST button.

   a. The Instant relay is energized and the INSTANT LED turns on.

b. After the preselected time delay, the Timed relay is energized and the TIMED LED turns on.

c. Approximately three seconds after the INSTANT LED turns on, the right hand digital display changes from an "8" to a "0." (If the transient arc rejection option is employed, the "8" does not change to "0.") Any other number that appears on the right hand display indicates a fault condition. If a fault is indicated on the digital display or if the INSTANT or TIMED LED does not turn on, refer to the "Troubleshooting" section of this manual. (See Table 3.)

3. Release the **oi** TEST button. (The INSTANT and TIMED LEDs turn off.)

4. Push the SELECT button to select the next detector to be tested.

5. Repeat the test for each detector in the system.

6. Return the system to normal operation by placing the NORMAL/BYPASS switch in the NORMAL position and pressing the RESET button.

MANUAL SYSTEM CHECKOUT

Periodically check the system with a W866 UV Test Lamp (or equivalent UV source) to make sure that: (a) the detectors are not obstructed, (b) the viewing position of the detector has not changed, and (c) there is not a fault in the **oi** circuit.

1. Place the NORMAL/BYPASS switch in the BYPASS position.

   a. The FAULT LED turns on.

   b. The digital display is activated. The right hand display shows an "8."

2. Move to the same distance from the detectors as recorded during the "Startup Procedure."

3. Turn on the W866 UV Test Lamp and shine into the viewing window of the detector.

   a. The INSTANT LED turns on.

   b. After the time delay, the TIMED LED turns on.

4. Turn off the W866 UV Test Lamp. The INSTANT and TIMED LEDs turn off.

5. Repeat the test at each detector.

If the LEDs on the controller do not turn on, move closer to the detector until they do. Check this distance against the distance originally recorded for that detector. If there is a significant change in the distance, check the location and angle of the detector to see if it has been changed. Also check the viewing window to be sure it is clean. If everything is the same as in the original start-up check and the window is clean, the sensitivity of the UV sensor tube has decreased and it should be replaced. After checking all the detectors and distances against the original distances, return the system to normal operation by placing the NORMAL/BYPASS switch in the NORMAL position and pressing the RESET button. The digital display will become blank and the FAULT LED will turn off.

NOTE

The above tests DO NOT check the electrical closure of the relay contacts or proper functioning of the external loads. It is recommended that all connected loads be periodically tested to assure proper response in the event of a fire. This test should also include actuation of the detectors using a Det-Tronics W866 UV Test Lamp. The resultant action should be closure of the Instant relay followed by closure of the Timed relay. Since the timing circuit is not electrically supervised by the Automatic oi feature, this check is important. Fire extinguishing equipment and any other critical functions such as system shutdown valves or relays must be mechanically or electrically secured during these tests to prevent their release or actuation.

MAINTENANCE

To maintain maximum detector sensitivity, it is necessary to keep the viewing window free of dirt and other foreign materials. Even a small amount of certain UV absorbing materials (which the human eye might not even be able to detect) can cause a substantial reduction in detector sensitivity.

NOTE

The controller will not indicate a "2" fault unless the sensitivity of the detector is reduced below the preset oi threshold level. Thus, it is possible to have a reduction in sensitivity that is not significant enough to cause the controller to register a fault.

Clean the detector windows on a regular basis. Do not wait for the controller to indicate a "2" fault before cleaning. The length of time between regularly scheduled detector window cleanings will be determined by the amount and nature of contamination that is present at the particular installation.

Clean the detector window thoroughly, all the way to the edge. Also clean the reflective **oi** ring. When re-installing the reflective ring, hold it by its tabs in order to avoid leaving fingerprints on the reflective surface. The slit in the ring should be down to prevent the accumulation of moisture or other contaminants. If contaminants in the atmosphere cause the reflective rings to deteriorate to the point where it is impossible to restore them to their original condition, they must be replaced.

Det-Tronics window cleaner solution is designed specifically for cleaning the optical surfaces of the detector. Avoid the use of commercial cleaners, since many of them leave a residue that absorbs UV radiation.

Use a clean cloth or tissue for cleaning the window. DO NOT use comercial glass cleaning tissues. Many of these contain a silicone substance that remains on the cleaned surface and will absorb UV radiation.

NOTE

Remove power to the controller or place the NORMAL/BYPASS switch in the BYPASS position when cleaning the detector windows. It is possible to create a static charge on the windows during cleaning that could cause the detector to respond, thus activating the controller relays.

The following are available for maintenance of the optical surfaces:

001680-001	UV window cleaner squeeze bottle (package of six bottles)
003088-001	Replacement snap-in **oi** ring
002507-001	UV window maintenance kit (2 bottles of cleaner, 8 **oi** snap-in rings)

Two rubber O-rings on the barrel of the detector housing are used to ensure the watertight integrity of the detector. Periodically open the housing and inspect the O-rings for breaks, cracks, or dryness. To test the rings, remove them from the detector housing and stretch them slightly. If cracks are visible, the O-ring should be replaced. If they feel dry to the touch, a thin coating of lubricant should be applied. When re-installing the rings, be sure that they are properly seated in the groove on the housing. It is imperative that these O-rings be properly installed and in good condition. Failure to properly maintain these rings can allow water to enter the detector and cause premature failure. The life expectancy of rubber O-rings can vary considerably, depending on the amount and nature of contaminants that are present in the environment. The person responsible for maintenance of the system must rely on experience and common sense to determine the inspection frequency of the rings.

CAUTION

The O-rings should be lubricated with polyalphaolefin grease, such as GRS-450 made by CPI Engineering. Suitability of other lubricants should be evaluated, since some materials can adversely affect the performance of certain detection devices.

TROUBLESHOOTING

FAILURE OF INSTANT OR TIMED RELAY

When performing the "Checkout Procedure," if the INSTANT LED does not turn on but the TIMED LED does, or if the INSTANT LED turns on, but the TIMED LED does not:

1. Turn off input power and replace the relay. Turn on input power and repeat the test. If this does not correct the fault -
2. Turn off input power and replace the Relay Drive board. Turn on input power and repeat the test. If this does not correct the fault -
3. Turn off input power and replace the Power Supply board. Turn on input power and repeat the "Checkout Procedure."

CAUTION

Do not remove any of the printed circuit boards from the controller unless power is removed from the system.

When replacing a circuit board, be sure that the model number on the replacement board is the same as the number on the original board. In addition, any rocker switches or jumper wires should be in the same position to assure proper system operation. See form 95-8220 for additional information regarding field replacement of printed circuit boards.

FAULT IDENTIFICATION

In the event of a malfunction in the system, the Fault relay is de-energized and the FAULT LED is illuminated. The fault identification circuitry activates the digital display on the front panel, which identifies the nature of the fault on the right side and the detector affected on the left side. See Table 3.

Should more than one fault ever occur at the same time, the code of the first fault to occur will be latched on the display until the controller is placed in the Bypass mode. This ensures the identification of transient faults that otherwise would be "lost". When the controller is placed in the

Table 3—Fault Identification

Display		Type of Fault
Detector (Left)	Fault (Right)	
0* or Blank	0	1. Detectors responding to a UV source that is not large enough to indicate a fire condition. 2. One or more of the detectors is becoming sun sensitive (if detector is located outdoors). 3. High multiple count rate in one or more of the sensor modules. 4. Integrator and Comparator board malfunction. 5. The system has responded to a fire and the Instant and Timed relays have de-energized.
0*	1	1. Inverter board malfunction.
Blank	2	1. Automatic oi board malfunction (or missing).
1 - 8**	2	1. Detector indicated by the left display has reduced sensitivity due to a dirty window or a failure of the UV sensor tube. 2. Integrator and Comparator board malfunction.
0*	3	1. The Detector Monitor board is set for fewer detectors with EOL resistors connected (loops) than are present in the detector circuitry. 2. High current leakage on the C-lead. 3. Malfunction of Detector Monitor board.
0*	4	1. C-lead shorted to ground. 2. C-lead is open or the C-lead is shorted to the B-lead.
0	5	1. The Detector Monitor board has been set for more detectors with EOL resistors connected than are present in the detector circuitry. The "0" in the left display indicates all detectors are operational in this case only.
1 - 8** or ***	5	1. A-lead is open. 2. B-lead is open. 3. B-lead is shorted to ground. 4. UV sensor module is missing in one or more detectors.
***	6	1. The +290 vdc supply not operating. 2. A-lead shorted to B-lead. 3. A-lead shorted to C-lead. 4. A-lead shorted to ground.
0*	7	1. +28 vdc low voltage supply not operating. 2. Integrator and Comparator board malfunction (or not installed).
0*	8	1. Relay Drive board malfunction (or not installed). 2. One of the output relays missing or the coil is open. 3. Controller has not been reset after being placed in Normal mode.
1 - 8**	8	1. System in Bypass mode. Left display indicates detector selected for manual oi test. Pushing TEST button on controller changes right display to a "0". If the right display does not change to "0" when the TEST button is pushed (and the Integrator and Comparator board is not a TAR board) there is a fault in the Automatic oi board.
***	Blank	1. Detector Monitor board malfunction (or not installed).
Blank	Blank	1. Normal operation. Controller in Normal mode and POWER LED is on. 2. All front panel lights off indicates loss of input power. POWER LED should be on whenever power is applied. 3. Power supply board malfunction.

* Indicates "0" normally, although any other number can occur. The number has no significance in this type of fault.

** Number shown on the left display indicates the affected detector.

*** Display cycles through the numeral of the detectors selected on the Automatic oi board switch.

Bypass mode, an internal priority system of fault identification is automatically employed. It will display the code numbers of the faults according to priority, rather than the order in which they occurred. Refer to the table below. As each fault is corrected, the next lower priority fault will be displayed.

Highest Priority	7
	6
	5
	4
	3
	2
	1
	0
Lowest Priority	8

VOLTAGES TO AID IN TROUBLESHOOTING (MEASURED AT CONTROLLER)

A to Ground: 290 vdc.

B to Ground: 0.4 vdc per detector with jumper "J" in place. The manual **oi** test (in the Bypass mode) causes the detector to send a series of voltage pulses to the controller. The waveform on the B-lead when a detector is being tested is illustrated in Figure 34.

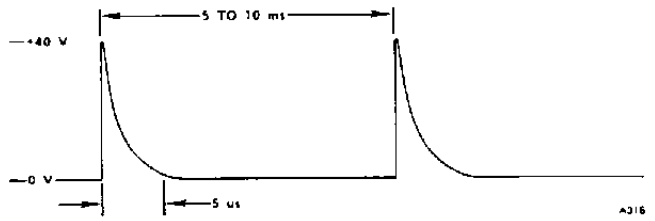


Figure 34—Detector B-Lead Waveform

C to Ground: 1.2 vdc +0.4 vdc per detector with jumper "J" in place.

A to D: **Do not** check when controller is set for NORMAL. To check, place the controller in the Bypass mode. Use a meter with a movement of at east 20,000 ohms/volt.

1. Less than 1 volt dc.

2. 290 vdc when the same D-lead is selected in a manual **oi** test and the **oi** TEST button is pushed.

3. Due to the meter loading factor, the voltage from the D-lead to ground measures approximately +260 vdc. When the **oi** TEST button is depressed (in the Bypass mode), the voltage on the D-lead of the detector under test drops to 0.5 vdc or less (see Figure 35).

Terminal 15 to terminal 1	28 vdc

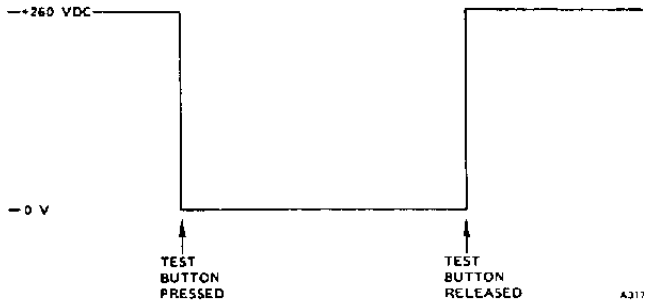


Figure 35—Detector D-Lead Voltage - Manual Test

Test points on Integrator and Comparator board	0.05 vdc when in Bypass and no UV present 0.1 vdc to 0.2 vdc pulsing when in Normal

INTERMITTENT ACTIVATION OF THE CONTROLLER

If the FAULT LED intermittently turns on and the digital display is activated with a "0" displayed on the right side, one or more of the UV sensor tube modules is overly sensitive or is detecting spurious UV radiation that is not strong enough to initiate a fire response.

To check for these conditions, perform the following steps:

1. Place the NORMAL/BYPASS switch in the BYPASS position. The FAULT LED turns on and an "8" appears on the right side of the digital display.

2. Place a voltmeter capable of measuring 0.05 volts dc across the test points provided on top of the Integrator and Comparator board (see Figure 8). Red is "+" and black is " – ".

3. If the voltage pulses over 0.2 vdc every two or three seconds, one or more of the UV sensor modules is overly sensitive or is detecting spurious UV radiation from some other source.

NOTE

It is not unusual for pulses over 0.2 vdc to occur every 10 to 30 seconds. These are random "counts" caused by cosmic radiation. The occurrence of these pulses will increase with the number of detectors connected to the controller.

4. Cover the window of each detector to see if the voltage returns to normal (0.05 volts) and pulses do not occur more often than every 10 to 30 seconds.

   a. If the voltage returns to normal when a detector window is covered, check for other sources of UV radiation. If no source of UV radiation (such as distant arc welding) is found, turn off power to the controller and replace the UV tube module in the detector.

DANGER

Turn off power to the controller before opening the detector housing. Opening the detector in a hazardous area without turning off the input power to the controller may cause a fire or explosion. It also exposes the high voltage potential on the connections of the UV tube module and could cause electrical shocks.

b. If the voltage does not return to normal when all the detector windows are covered, continue with the following steps.

5. Turn off power to the controller.

6. Starting at detector No. 1, open the detector housing and remove the UV sensor tube module. Reassemble the detector housing.

7. Turn on power to the controller. If the voltage at the test points drops to normal (0.05 vdc) and does not pulse over 0.2 vdc more often than every 10 to 30 seconds, replace the UV sensor tube module with a new one. Be sure to **turn off** the input power before removing the detector housing. If there is no change, **turn off** input power to the controller and re-install the original UV sensor tube module. Continue to each detector and repeat steps 5 to 7.

8. After any defective UV tube modules have been replaced, place the NORMAL/BYPASS switch in the NORMAL position. Reset the controller by depressing the RESET switch.

NOTE

It is the responsibility of the user to see that fire protection equipment that is controlled by the R7303 is disabled while tests are performed and is re-enabled at the end of the testing.

After a system fault has been corrected, the "Startup Procedure" should be performed before returning the system to normal operation.

NOTE

Record all faults on the Fault Record Sheet at the rear of this manual.

Do not attempt to repair the UV sensor tube module or the printed circuit boards in the controller. Return all faulty items to the factory for repair.

DEVICE REPAIR AND RETURN

Prior to returning devices or components, contact the nearest local Detector Electronics office so that an RMI (Return Material Identification) number can be assigned. A written statement describing the malfunction must accompany the returned device or component to expedite finding the cause of the failure, thereby reducing the time and cost of the repair to the customer.

Return all equipment transportation prepaid to the Minneapolis location.

Office locations

Detector Electronics Corporation
6901 West 110th Street
Minneapolis, Minnesota 55438 USA
Telephone (612) 941-5665
Telex 29-0562 DETRONICS BLTN or 6879043 DETEL UW
Cable Detronics
Telefax (612) 829-8750

Detector Electronics Corporation
3000 Wilcrest
Suite 145
Houston, Texas 77042 USA
Telephone (713) 782-2172

Detector Electronics (UK) Ltd.
Warwick House
Azalea Drive
Swanley
Kent BR8 8HL
ENGLAND
Telephone (0322) 322-60662/4
Telex 9413808

Detronics Scandinavia AB
Box 81
S-260 83 Vejbystrand
SWEDEN
Telephone 431-53002/53240
Telex 72008

In Rotterdam Telephone 31 10436 2777

Detector Electronics Europe S.r.l.
Via Trivulzio n° 30
20146 Milan
ITALY
Telephone 02-4048641 or 02-4048642
Telex 312625

Detronics A/S
P.O. Box 27
1322 Hovik
NORWAY
Telephone 47-2124305
Telex 77783

ORDERING INFORMATION

When ordering specify model: R7303 Controller
C7050B Detector

Controller input voltage - 120 vac, 50/60 Hz
220/240 vac, 50/60 Hz
12 vdc
24 vdc

Relays - Standard relays
Solid state relays (ac or dc)
Hermetically sealed relays

C7050 Detector Enclosure Material - Nickel-plated brass
316 Stainless steel
Copper-free red anodized aluminum

Cover locking assembly to meet BASEEFA or PTB requirements.

ACCESSORIES

- W866 Explosion-proof Portable UV Test Lamp (see form 95-8169)
- R6003 Auxiliary Zone Unit (see form 95-8227)
- R4500 Load Monitoring Relay Assembly
- Transient Arc Rejection Board (see form 75-1002)
- Q1016 NEMA 4 Enclosure (see form 95-8257)
- Q1019A Explosion-proof Enclosure (see form 95-8279)
- Q9001B Swivel Mounting Bracket for C7050B Detectors
- 001680-001 Detector Window Cleaning Kit (6 squeeze bottles)

REPLACEMENT PARTS

Model Number	Part Number	Description	Recommended Quantity
	003088-001	Replacement oi snap-in ring (316 stainless steel)	†
	107427-004	Rubber O-ring replacement	†††
	002507-001	Detector Cleaning Kit (2 bottles of cleaner, 8 oi snap-in rings)	††
DE1888		UV Sensor Tube Module (replaces DE1666 and DE1777)	1
**DE1049x	**002452-xxx	Relay Drive Board	1
	002395-001	Selectable Latching Relay Drive Board*	1
**DE1048x	**002451-xxx	Integrator and Comparator Board	1
DE1047B	002450-002	Detector Monitor Board	1
DE1046B	002449-001	Power Supply Board	1
DE1529A	002454-001	Automatic oi Board	1
DE7403D	002453-002	Inverter Board (12 vdc)*	1
DE7403C	002453-001	Inverter Board (24 vdc)*	1
	101164-001	Plug-in Relay	1
	101295-001	Hermetically Sealed 24 vdc Relay*	1
	002460-001	Solid State 24 vdc Relay (replaces DE1112)*	1
	101167-001	Solid State 120 vac Relay*	1
	002417-002	Solid State 120 vac Relay*	1
DE1048L	002451-004	Transient Arc Rejection Board (Replaces standard Integrator and Comparator board)*	1

* Optional

** These boards vary according to model. Check board for dash number.

† One per detector.

†† One per controller.

††† Varies according to frequency of replacement, which depends on the type and level of contamination present.

- 002507-001 Detector Window Maintenance Kit (2 bottles cleaner, 8 **oj** snap-in rings)

- Front insertion mounts with mounting flange and quick-connect coupling for the C7050 for use in "dirty" environments (see form 95-8228)

For assistance in ordering a system to fit your application please contact:

Detector Electronics Corporation
Field Support Group
6901 West 110th Street
Minneapolis, Minnesota 55438 U.S.A.
Telephone: (612) 941-5665
Telex 29-0562 DETRONICS BLTN or 6879043 DETEL UW
Cable Detronics
Telefax (612) 829-8750

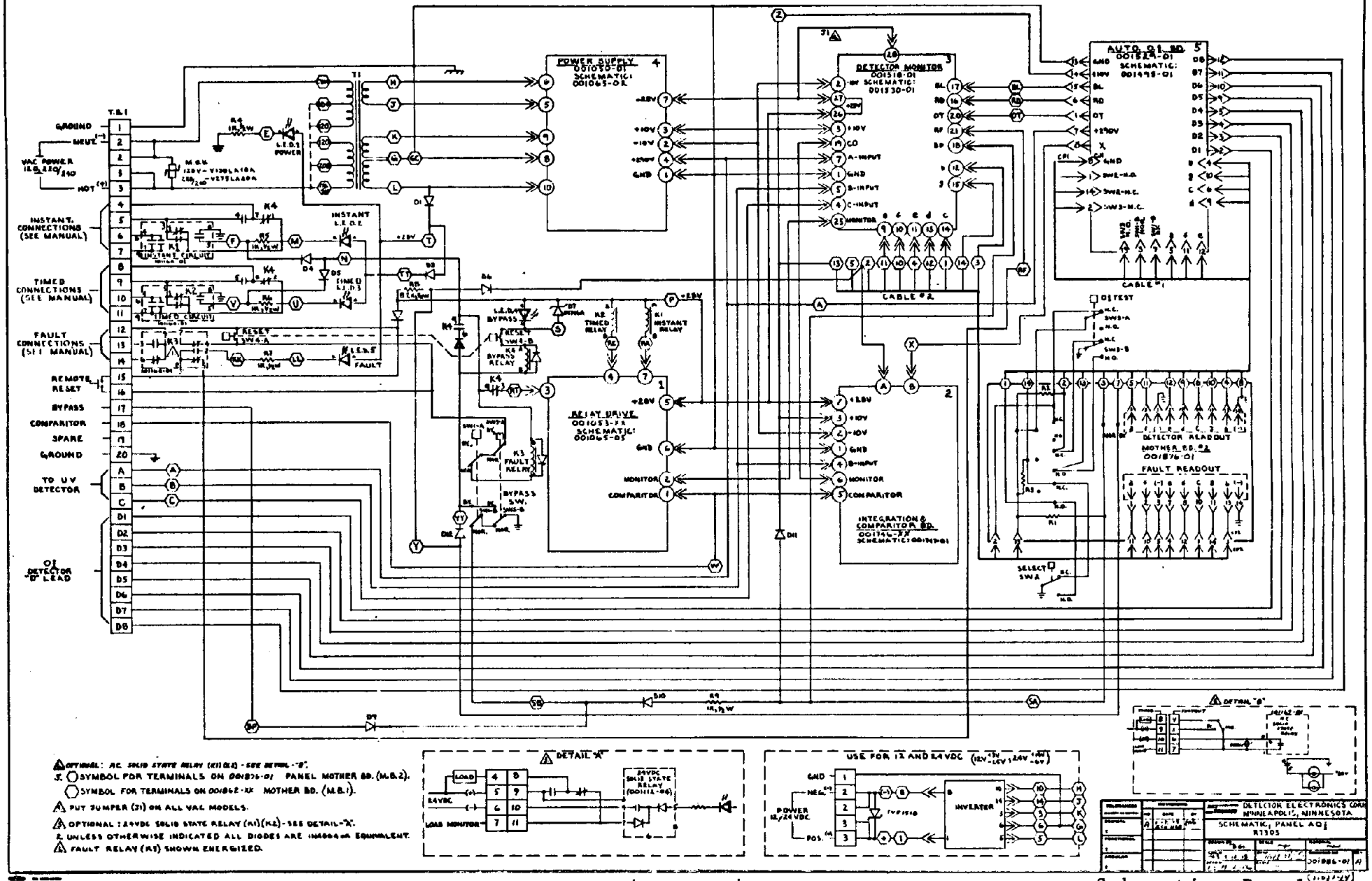
Appendix

UV Absorbing Gases and Vapors

The following 38 substances exhibit significant UV absorption characteristics. These are also generally hazardous vapors.

Acetaldehyde	Methyl Methacrylate
Acetone	Alpha-Methylstyrene
Acrylonitrile	Naphthalene
Ethyl Acrylate	Nitroethane
Methyl Acrylate	Nitrobenzene
Ethanol	Nitromethane
Ammonia	1-Nitropropane
Aniline	2-Nitropropane
Benzene	2-Pentanone
1,3 Butadiene	Phenol
2—Butanone	Phenyl Clycide Ether
Butylamine	Pyridine
Chlorobenzene	Hydrogen Sulfide
1-Chloro-1-Nitropropane	Styrene
Chloroprene	Tetrachloroethylene
Cumene	Toluene
Cyclopentadiene	Trichloroethylene
O-Dichlorobenzene	Vinyl Toluene
P-Dichlorobenzene	Xylene

Substances such as methane, propane, butane, hexane, camphor and octane, for example, are not UV absorbing.



OPTIONAL: AC SOLID STATE RELAY (K1)(K2) - SEE DETAIL - "B".

1. ○ SYMBOL FOR TERMINALS ON 001876-01 PANEL MOTHER BD. (M.B.2).
   ⬡ SYMBOL FOR TERMINALS ON 001862-XX MOTHER BD. (M.B.1).

2. PUT JUMPER (J1) ON ALL VAC MODELS.

3. OPTIONAL: 24 VDC SOLID STATE RELAY (K1)(K2) - SEE DETAIL - "A".

4. UNLESS OTHERWISE INDICATED ALL DIODES ARE IN4004 OR EQUIVALENT.

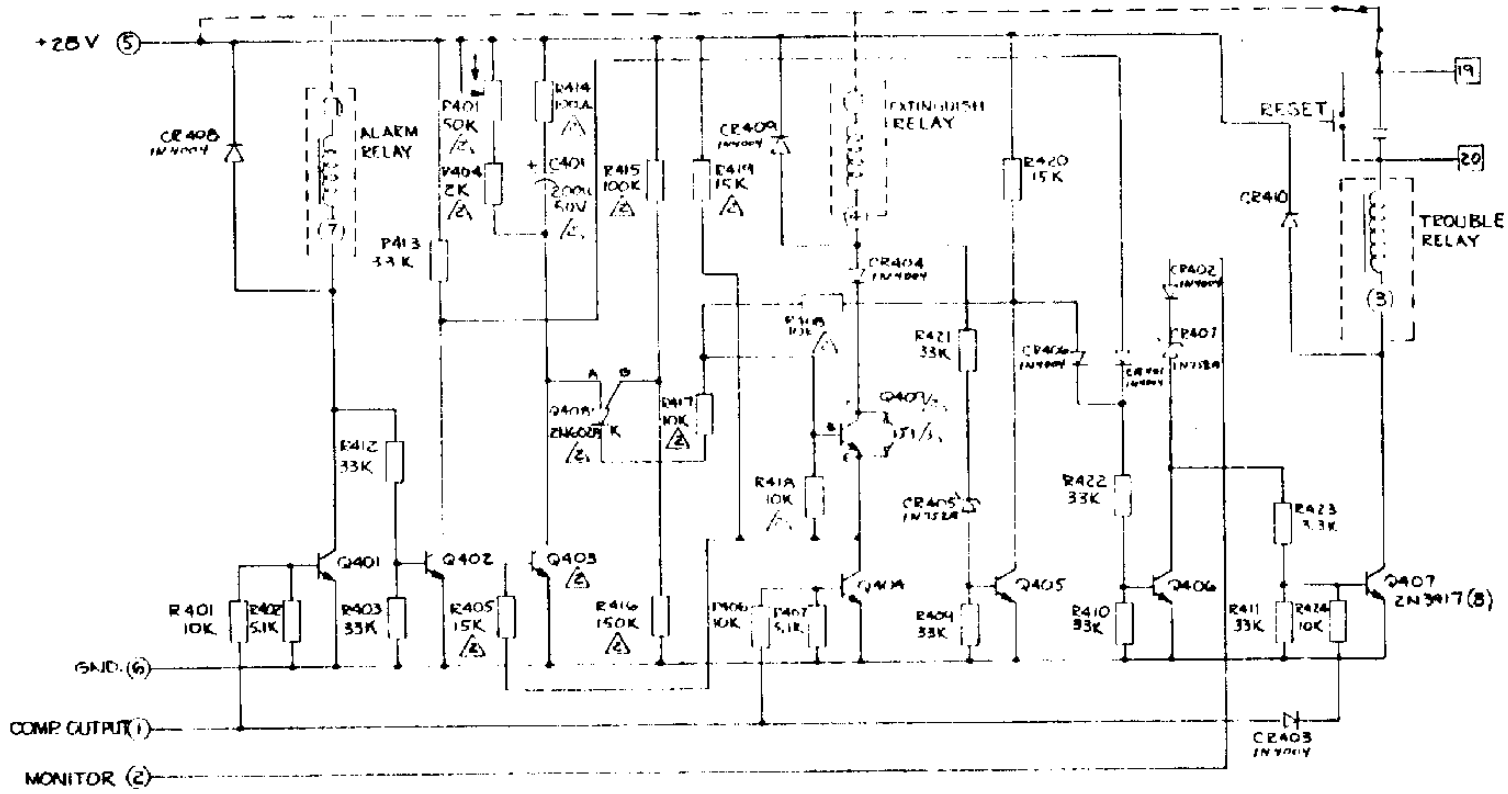
5. FAULT RELAY (K3) SHOWN ENERGIZED.

DETECTOR ELECTRONICS CORP.
MINNEAPOLIS, MINNESOTA
SCHEMATIC, PANEL AOi
R7303

001886-01 A

Schematic, Panel AOi
R7303

ASSY NO.		J1
001053-01	'A'	—
-02	'B'	X
-03	'C'	X



⚠ SEE TAB

2. COMPONENTS REMOVED ON 'B' BOARD

ALL RESISTORS ½W, ± 5% UNLESS OTHERWISE INDICATED.

REVISIONS			
NO.	DATE	BY	
A	12.03.79	D.O.	
B	6.12.79	D.O.	

DET — TRONICS MPLS, MINN.

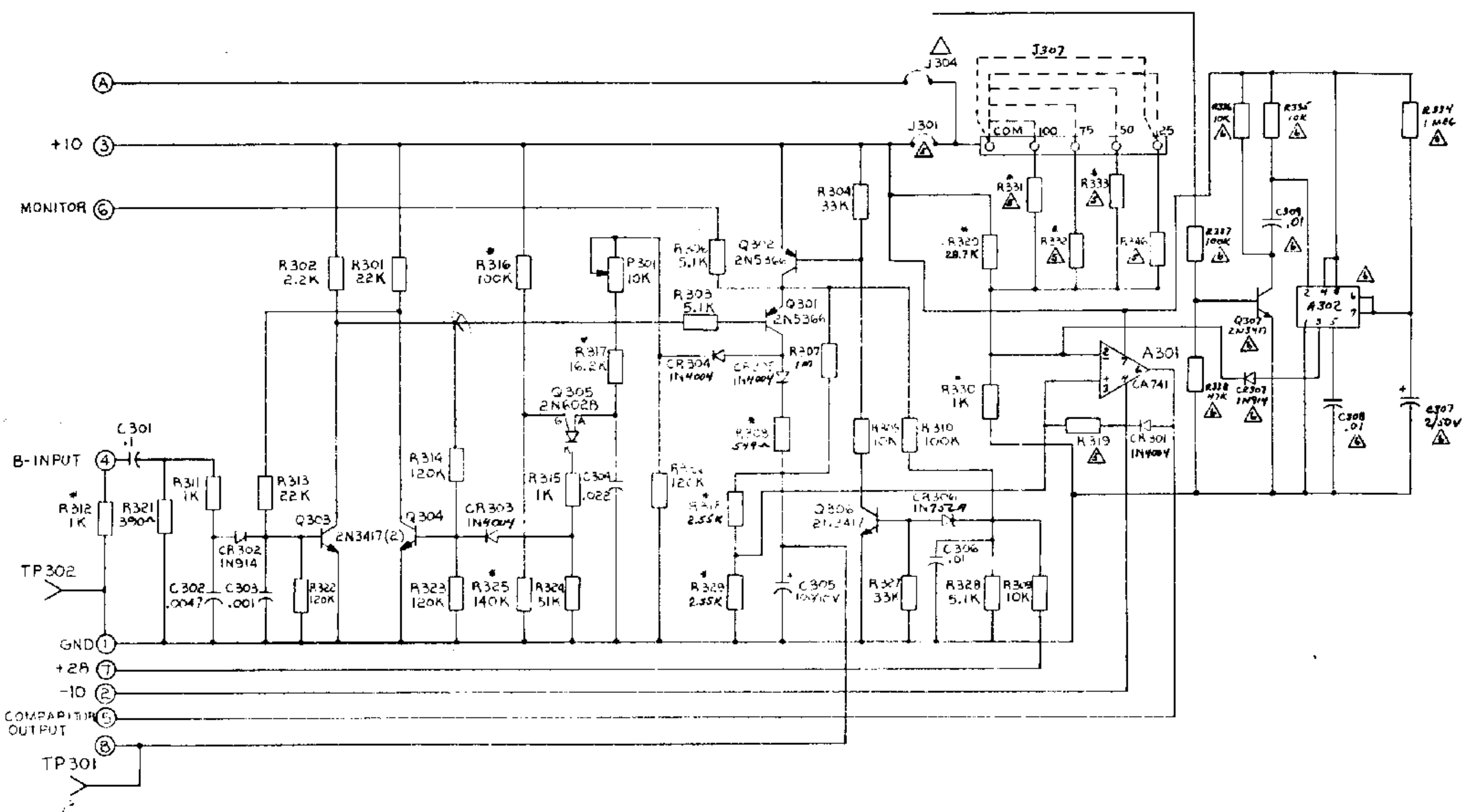
SCHEMATIC, P.C. BD. RELAY DRIVE CPT (P2300, 1, 2, 3)

DRAWN BY D.O.

DRAWING NO. 001053-05 REV C

Schematic - Relay Drive Board (SHEET ONE OF TWO SHEETS)

BOARD	R319	R331	R332	R333	R346	J301	J304	J307		COMMENTS
001746	220K	6.81K	9.09K	14.7K	51.1K	—	1	—		STD O_I B
-	220K	6.81K	9.09K	14.7K	51.1K	1	—	—		STD NON O_I
-0	56.2K	—	—	—	—	—	1	—		10CPS LATCHING
SEE NOTE 6 -04(G)	56.2K	—	—	—	—	—	1	—		10CPS LATCHING/ DELATCHING AND O_I
SEE NOTE 6 -05(P)	36.5K	—	—	—	51.1K	—	1	1		25CPS LATCHING/ DELATCHING AND O_I



A
+10 3
MONITOR 6
B-INPUT 4
TP302
GND 1
+28 7
-10 2
COMPARATOR OUTPUT 5
8
TP301
J304
J307
J301
COM 100 75 50 25
C301 .1
R312 1K
R321 390Ω
R311 1K
CR302 1N914
C302 .0047
C303 .001
R313 22K
R322 120K
Q303
2N3417(2)
Q304
R302 2.2K
R301 22K
R314 120K
R323 120K
R325 140K
CR303 1N4004
R316 100K
Q305 2N6028
R315 1K
R324 51K
C304 .022
P301 10K
R317 16.2K
R303 5.1K
R306 5.1K
Q302 2N5366
Q301 2N5366
CR304 1N4004
CR305 1N4004
R307 1M
R308 549Ω
R326 120K
R304 33K
R327 2.55K
R329 2.55K
C305 10/10V
Q306 2N3417
R305 10K
R310 100K
CR306 1N752A
C306 .01
R327 33K
R328 5.1K
R309 10K
R320 28.7K
R330 1K
R331
R332
R333
R346
A301 CA741
R319
CR301 1N4004
R317 100K
R318 47K
Q307 2N3417
CR307 1N914
R336 10K
R335 10K
C309 .01
A302
C308 .01
R334 1 MEG
C307 2/50V

6. ADD COMPONENTS FOR 001746-04(G) AND 001746-05(P) BOARDS
5. SEE TAB
4. FOR ASSY SEE 001746-XX

2. * INDICATES ± 1% TOLERANCE
1. ALL RESISTORS ½W, ± 5% UNLESS INDICATED OTHERWISE. ALL CAPACITOR VALUES ARE IN MICRO FARADS.
ALL CAPACITORS ARE RATED 100VDC UNLESS INDICATED OTHERWISE.

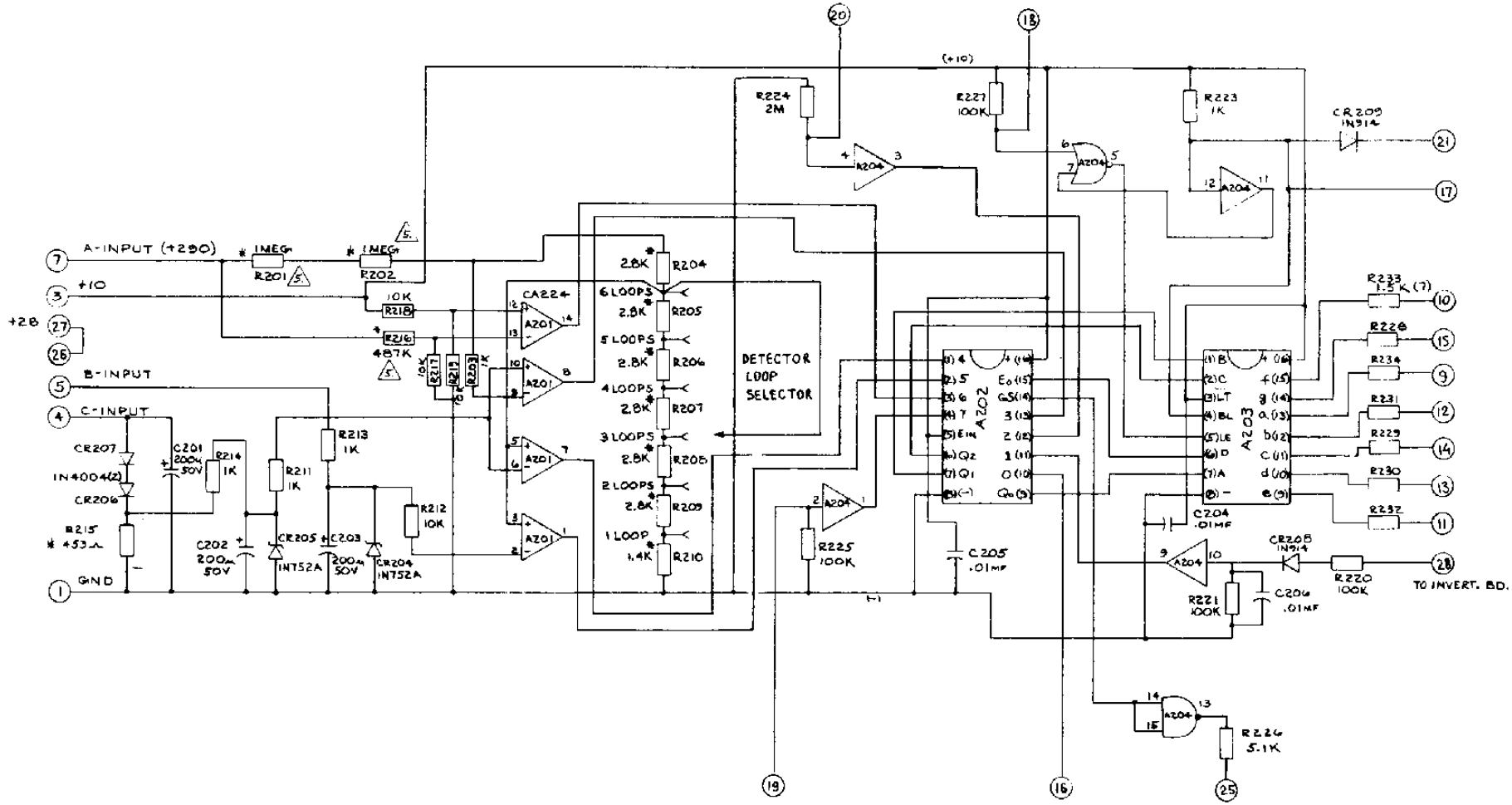
TOLERANCES	REVISIONS			
	NO	DATE	BY	
DECIMAL	A	11-5-78 ECO 1048		
FRACTIONAL	B	5-8-79 ECO 1169		
ANGULAR	C	7-5-79 ECO 1193		

DET-TRONICS DETECTOR ELECTRONICS CORP. MINNEAPOLIS, MINNESOTA

SCHEMATIC, P.C. BD. - INTEG./COMPAR. "CB2" (B,1,2,3)

DRAWING NO 001747-01 REV C

Schematic, P.C. BD.-Integ./Compar."CB2"



△5 INDICATES 350V. RESISTOR.

4. A202(14532), A203(14511), A204(14572)

3. A201 (CA224) PIN 4 (+10), PIN 11 (GND)

2. * INDICATES ± 1% TOLERANCE

1. ALL RESISTOR ½W, ± 5% UNLESS OTHERWISE INDICATED.

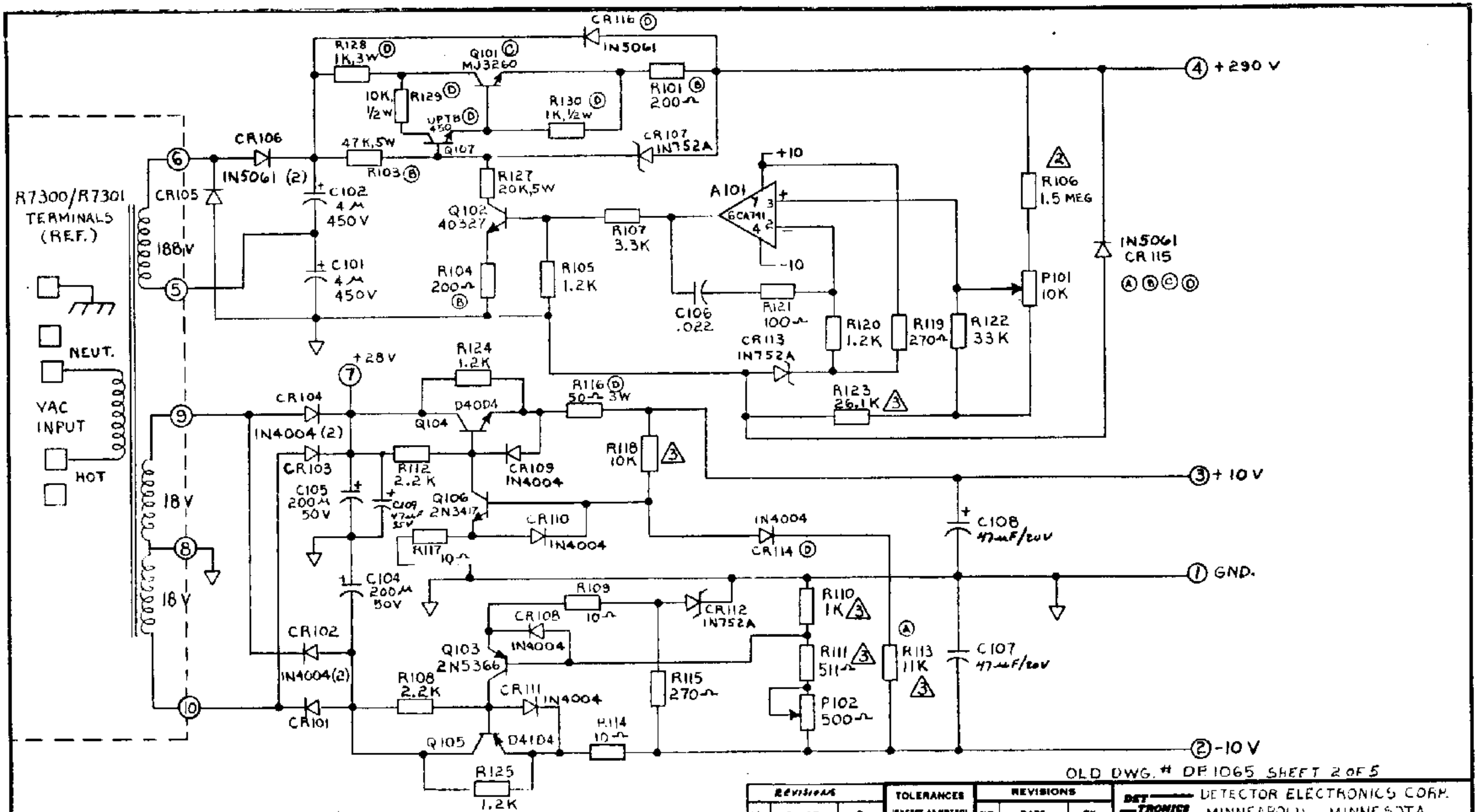
REVISIONS		
NO	DATE	BY
1		
2		
3	11-2-77	
4		
5		

DETECTOR ELECTRONICS CORP.
MPLS, MINN. 55435

SCHEMATIC
DETECTOR MONITOR - AUTO. O.I.

DRAWN BY D. ST.	SCALE	MATERIAL	
CHK'D J.G.	DATE 9-2-76	DRAWING NO 001530-01	REV. 3
TRACED	APP'D		

SCHEMATIC, DETECTOR MONITOR
(CIR.BD.3-A01) - R7302,R7303


CR116 (D)
IN5061
R128 (D)
1K,3W
Q101 (C)
MJ3260
+290 V
R101 (B)
200Ω
10K, 1/2W
R129 (D)
R130 (D)
1K, 1/2W
UPT8 (D)
450
Q107
CR107
IN752A
CR106
IN5061 (2)
47K,5W
R103 (B)
R7300/R7301
TERMINALS
(REF.)
CR105
188V
C102
4 µ
450V
C101
4 µ
450V
R127
20K,5W
Q102
40327
R104
200Ω
R105
1.2K
R107
3.3K
A101
6CA741
+10
-10
R106
1.5 MEG
IN5061
CR115
P101
10K
C106
.022
R121
100Ω
R120
1.2K
R119
270Ω
R122
33K
CR113
IN752A
NEUT.
VAC
INPUT
HOT
+28V
R124
1.2K
D4004
Q104
R116 (D)
50Ω 3W
CR104
IN4004 (2)
CR103
R112
2.2K
CR109
IN4004
R118
10K
R123
26.1K
+10 V
C105
200µ
50V
Q106
2N3417
CR110
IN4004
IN4004
CR114 (D)
C108
47µF/20V
18V
R117
10Ω
C104
200µ
50V
GND.
R109
10Ω
CR112
IN752A
R110
1K
CR102
CR108
IN4004
Q103
2N5366
R111
511Ω
R113
11K
C107
47µF/20V
IN4004(2)
R108
2.2K
CR111
IN4004
R115
270Ω
P102
500Ω
CR101
Q105
D4104
R114
10Ω
-10 V
R125
1.2K

OLD DWG. # DF 1065 SHEET 2 OF 5

4. SYM. O = BD. CONN'S
△3 INDICATES ± 1% TOLERANCE
△2 INDICATES 350 V RESISTOR
1. ALL RESISTORS 1/2 W, ± 5% UNLESS OTHERWISE INDICATED.

Revisions		
No	Date	By
F	11-8-78 ECO 1104	[illegible]

TOLERANCES (EXCEPT AS NOTED)
DECIMAL ±
FRACTIONAL ±
ANGULAR ±

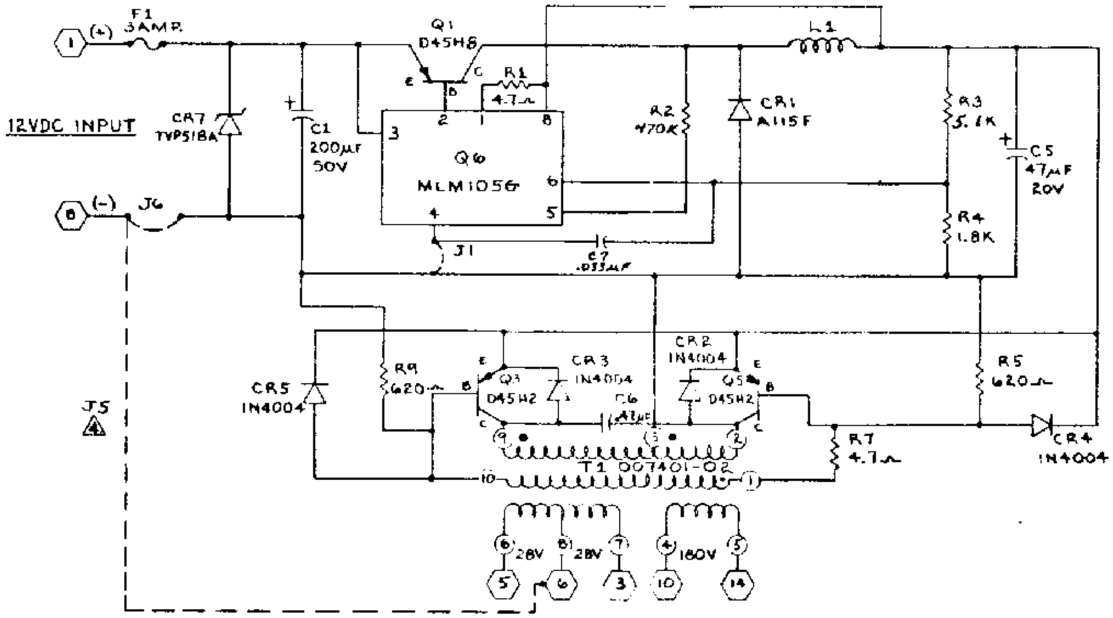
REVISIONS		
NO.	DATE	BY
A	2-25-74	L.B.
B	9-18-74	L.B.
C	1-28-76	D.G.
D	10-12-76	M.D.
E	8-1-78	[illegible]

DET-TRONICS DETECTOR ELECTRONICS CORP. MINNEAPOLIS, MINNESOTA

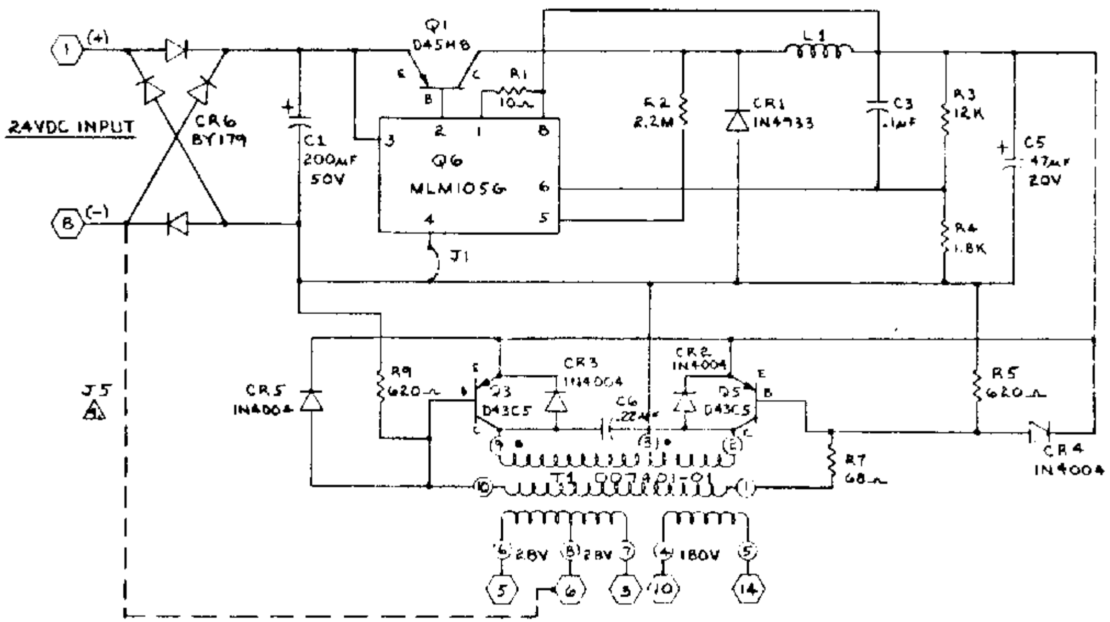
SCHEMATIC, P.C. BD - PWR SUPPLY "CBY" (R7300, 1, 2, 3)

DRAWN BY 7-16-73 R.P. | SCALE | MATERIAL
CHK'D [illegible] | PROD. 7-11-73 T.A.B. | DRAWING NO 001065-02 | REV. F

Schematic, P.C. BD - PUR
Supply



007409-02



007409-01

4. JUMPER USED ON R7300 CONTROLLER.
3. ◯ = TRANSFORMER PINS
2. ⬡ = P.C. BD. TERMINAL CONNECTIONS.
1. ALL RESISTORS ½ WATTS

007409-XX	DEVICE NO.
(24VDC) -01	DE7403 C
(12VDC) -02	DE7403 D

REVISIONS NO.	DATE	BY
F	8/22/77	
F1	6-8-78	
G	10-17-78 ECO 1102	
H	5-10-79 ECO 1263	

REVISIONS NO.	DATE	BY
A	4/2/76	D.G.
B	4/21/76	D.G.
C	6/9/76	D.G.
D	10/6/76	D.G.
E	3/23/77	D.G.

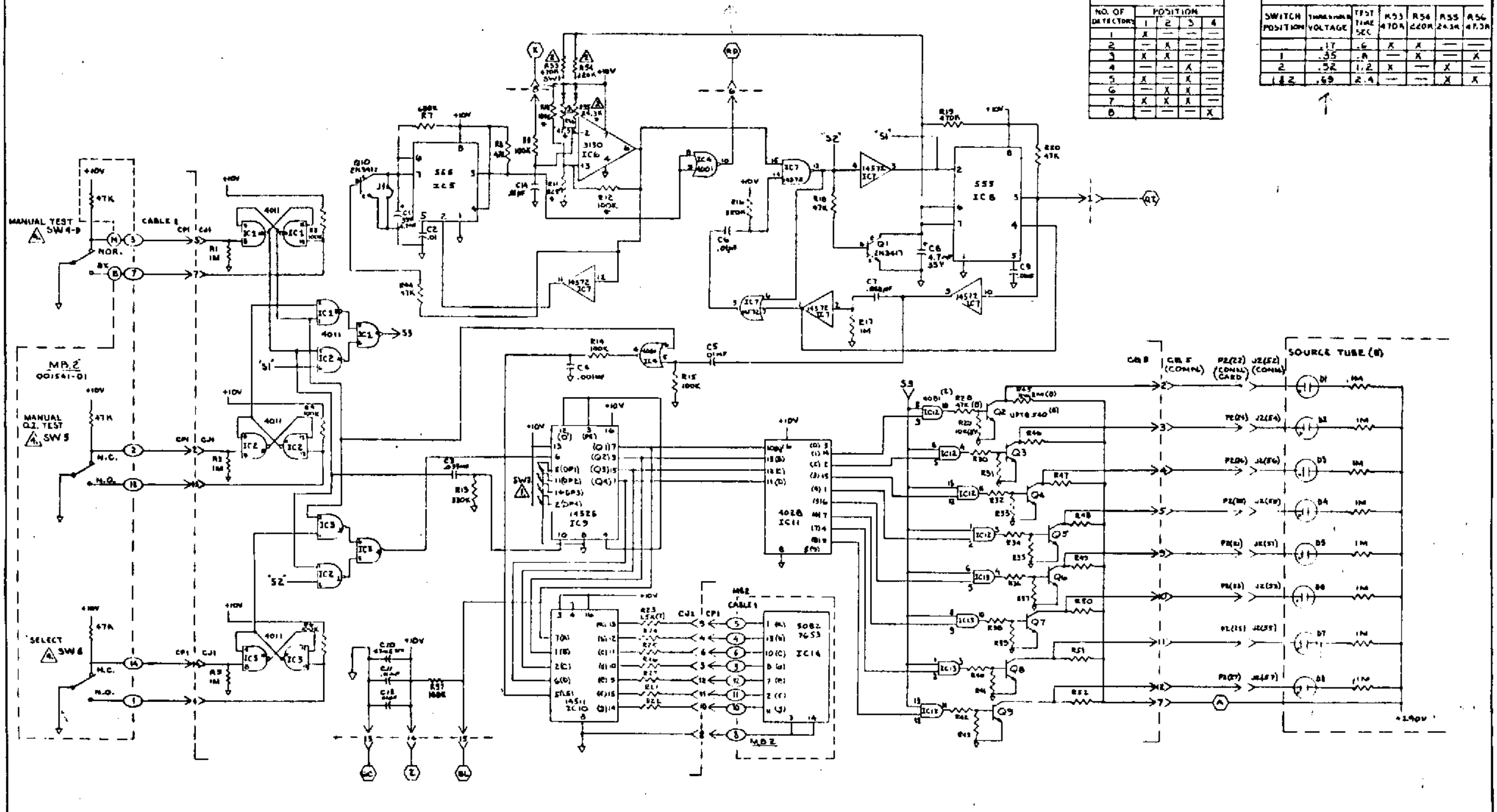
TOLERANCES (UNLESS OTHERWISE NOTED): DECIMAL ± ; FRACTIONAL ± ; ANGULAR ±

DET-TRONICS DETECTOR ELECTRONICS CORP. MINNEAPOLIS, MINNESOTA

SCHEMATIC, P.C. BD - INVERTER, "EVF" (24 & 12 VDC)

DRAWN BY D.G. | SCALE | MATERIAL | DRAWING NO. 007409-XX | REV. H

Schematic, P.C. BD-Inverter, "EVF" (007410-01)



SWITCH & POSITIONS				
NO. OF DETECTORS	POSITION			
	1	2	3	4
1	X	—	—	—
2	—	X	—	—
3	X	X	—	—
4	—	—	X	—
5	X	—	X	—
6	—	X	X	—
7	X	X	X	—
8	—	—	—	X

O.I. THRESHOLD VOLTAGE						
SWITCH POSITION	THRESHOLD VOLTAGE	TEST TIME SEC	R53 470K	R54 220K	R55 24.3K	R56 47.3K
	.17	.6	X	X	—	—
1	.35	.8	—	X	—	X
2	.52	1.2	X	—	X	—
1 & 2	.69	2.4	—	—	X	X

7. ✱ INDICATES 1% RESISTOR.
6. ALL RESISTORS ¼W, ± 5% UNLESS OTHERWISE INDICATED.
5. SYMBOLS: ≫ ≻ - RACK MOUNT CONNECTION CARD (001548-01) AND CONNECTOR (101808-01)
≻ - CABLE CONNECTIONS (CABLE PLUG)(CABLE JACK)
○ - TERMINALS ON 001540-01 (MOTHER BD)
≻ - AUTO. O.I. (CB5) CONNECTIONS /(CB5) CONNECTOR
◯ - MOTHER BD 2 (001541-01) CONNECTIONS
4. SW4-9: TOGGLE SWITCH; SW5 AND SW6; PUSH-BUTTON MOMENTARY SWITCHS.
3. ON 14 PIN DIP - PIN 7 (GND), PIN 14 (+10V); ON 16 PIN DIP - PIN 8 (GND), PIN 16 (+10V)
2. FOR O.I. THRESHOLD VOLTAGE, SEE TAB.
1. SWITCH & POSITIONS ARE DETERMINED BY NUMBER OF DETECTORS REQUIRED. (SEE TAB)

DETECTOR ELECTRONICS CORP.
MPLS, MINN. 55435

SCHEMATIC, P.C.BD-AOI LOGIC, "CB5"
(R7302, R7303)

001435-01 A

Schematic, P.C.BD-AOi
Logic,"CB5"