DET TRONICS

INSTRUCTIONS

Unitized Ultraviolet Detector/Controller

U7602

7/95 **Form 95-8239-03**

DET TRONICS

SERVICE MEMO

Precautions for Handling Electrostatic Sensitive Devices

With the trend toward increasingly widespread use of microprocessors and a wide variety of other electrostatic sensitive semiconductor devices, the need for careful handling of equipment containing these devices deserves more attention than it has received in the past.

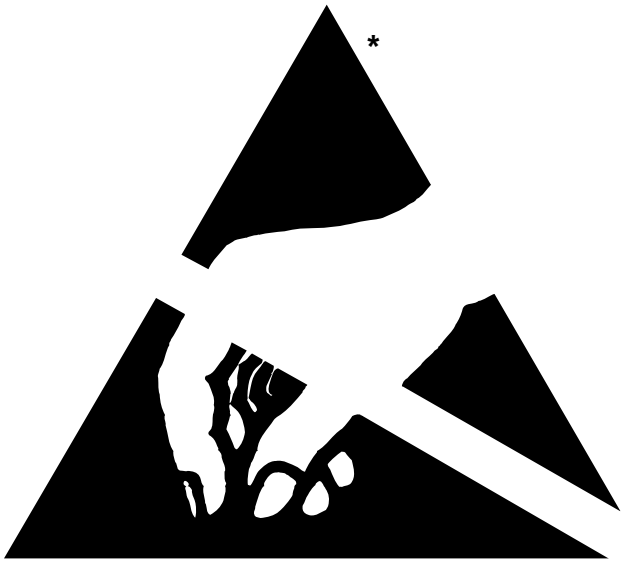
Electrostatic damage can occur in several ways. The most familiar is by physical contact. Touching an object causes a discharge of electrostatic energy that has built up on the skin. If the charge is of sufficient magnitude, a spark will also be visible. This voltage is often more than enough to damage some electronic components. Some devices can be damaged without any physical contact. Exposure to an electric field can cause damage if the electric field exceeds the dielectric breakdown voltage of the capacitive elements within the device.

In some cases, permanent damage is instantaneous and an immediate malfunction is realized. Often, however, the symptoms are not immediately observed. Performance may be marginal or even seemingly normal for an indefinite period of time, followed by a sudden and mysterious failure.

Damage caused by electrostatic discharge can be virtually eliminated if the equipment is handled only in a static safeguarded work area and if it is transported in a package or container that will render the necessary protection against static electricity.

Det-Tronics modules that might be damaged by static electricity are carefully wrapped in a static protective material before being packaged. Foam packaging blocks are also treated with an antistatic agent.

If it should ever become necessary to return the module, it is highly recommended that it be carefully packaged in the original carton **and static protective wrapping**.



Since a static safeguarded work area is usually impractical in most field installations, caution should be exercised to handle the module by its metal shields, taking care not to touch electronic components or terminals.

In general, always exercise all of the accepted and proven precautions that are normally observed when handling electrostatic sensitive devices.

A warning label is placed on the packaging, identifying those units that use electrostatic sensitive semiconductor devices.

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DET TRONICS

INSTRUCTIONS

AUTOMATIC oi*

Unitized Ultraviolet Detector/Controller

U7602

SYSTEM APPLICATION

The Det-Tronics U7602 Unitized Detector/Controller model is an ultraviolet (UV) flame detector and controller housed in a single, explosion-proof enclosure. It provides fast, reliable flame detection in a wide variety of applications. The U7602 uses the Automatic Optical Integrity (oi) feature, which provides a continuous check of detector optical surfaces and detector/controller circuitry. The oi test is automatically performed once each second, for assurance that the entire fire detection system is operating.

The U7602 Detector/Controller responds instantly to the ultraviolet radiation that is emitted by a flame. It is designed for use in hazardous locations and is particularly suitable for use in outdoor applications because it is not affected by wind or rain, and is insensitive to solar radiation. In addition, the detector does not respond to normal artificial light.

Typical applications for the Det-Tronics ultraviolet fire 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 Det-Tronics UV detectors in automated fire protection systems include:

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

*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.

- Pipeline compressor stations
- Pipelines in highly populated areas
- Gas gathering facilities
- LNG loading, transfer and storage facilities
- Hydrogen and ammonia production and refinery reformers
- Electrostatic powder coating booths
- Outdoor storage of plastic packaging materials.

FEATURES

- Fast response. Typical response to an intense ultraviolet source is less than 25 milliseconds.
- Automatic oi feature provides automatic self-checking of circuitry and optical surfaces.
- Time delayed fire relay (field adjustable from 0.025 to 30 seconds) and fault relay.
- Operates under adverse weather conditions such as wind, rain, snow, high humidity and extremes of temperature or pressure.
- Current output for indication of fire and fault conditions.
- Insensitive to solar radiation and normal artificial lighting.
- Low power consumption — standby condition 1.5 watts typical, alarm condition 5.0 watts maximum.

- Designed to meet MIL-STD-810C for shock and vibration.
- Designed for use in hazardous locations (explosion-proof enclosure).
- Bracket mounted with swivel for ease of installation and positioning.
- Enclosure material available in red anodized copper-free aluminum or 316 stainless steel.
- Model available with 3 amp relay contact rating and 4 to 20 ma current output.
- Optional LED indicators.

GENERAL APPLICATION INFORMATION

In applying any type of sensing device as a fire detector, it is important to know of any conditions that can prevent the device from responding to a fire, and also to know what other sources besides fire will cause the device to respond. A UV detector is useful in fire protection applications because it will provide very fast response to the presence of ultraviolet radiation emitted by a flame. In addition, it is not affected by environmental conditions such as wind, rain or extremes of temperature and pressure. The Det-Tronics UV system is also insensitive to the ultraviolet component of solar radiation.

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 not only on knowing its advantages, but also its limitations. It is important to note that electric arc welding is a source of intense ultraviolet radiation, and care must be taken to ensure that arc welding is not performed in protected areas without securing the fire detection system. Other sources of UV radiation such as x-rays and radioactive substances must also be considered when using UV flame detection equipment. When x-rays or radioactive substances are present in the area being protected, the UV system must be disabled until those sources are removed. For installations in which these sources are present, systems are available from Det-Tronics that can maintain uninterrupted protection.

Periodic lightning or sparks in the area being protected can be effectively ignored by the UV system using the Fire Relay time delay (the factory setting of 5 seconds is usually sufficient to ignore these sources).

UV detectors should not be positioned so that their cone of vision can scan the horizon. Rather, they should be directed down over the designated hazardous area to reduce the likelihood of picking up UV radiation from distant sources.

An important fact regarding radiation detectors of any type is that the 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 UV absorbing gases or vapors as well as physical obstructions must not be allowed to come between the detector and the protected hazard (see Table 1). Smoke will absorb UV radiation, and if accumulations of dense smoke can be expected to precede the presence of flame, then ultraviolet detectors that are used in enclosed areas should be mounted on the wall approximately 3 feet (1 meter) from the ceiling where the accumulation of smoke is reduced. Glass and plexiglass windows also significantly attenuate UV radiation and must not be located between the detector and a potential flame source. If the window cannot be eliminated or the detector location changed, contact Detector Electronics for recommendations regarding window materials that will not attenuate UV radiation.

Table 1—UV Absorbing Gases and Vapors

The following 38 substances exhibit significant UV absorption characteristics. These are also generally hazardous vapors. While usually of little consequence in small amounts, these gases can restrict UV detection if they are in the atmosphere in heavy concentrations. It should also be determined whether or not large amounts of these gases may be released as a result of a fire-causing occurrence.

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

If UV-absorbing gases can be a factor in a given application, precautionary measures should be taken. Detectors can be placed closer to the potential hazard area, and/or the sensitivity of the detection system can be increased. Contact the factory for further details.

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

The highest 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 U7602 fire detection system consists of a UV detector module and a controller module housed in a single explosion-proof enclosure. Both the controller module, which contains signal processing, automatic optical integrity and output circuitry, and the UV detector module, which consists of a UV sensor, UV test lamp and some signal processing circuitry, are easily replacable modules. See Figure 1.

DETECTOR

The UV detector portion of the U7602 responds to UV radiation over the range of 1850 to 2450 angstroms. It is insensitive to direct or reflected sunlight and to normal artificial lighting.

In response to UV radiation, the DE1888 detector produces a series of voltage pulses or "counts." The frequency of this signal is directly proportional to the intensity of the radiation being detected and is measured in counts per second (cps). The cps signal is sent to the controller portion of the U7602 for processing. If Led indicators are desired, an optional detector tube module must be specified (i.e. DE1888B).

Automatic Optical Integrity (oi)

The U7602 is equipped with the Automatic oi feature, which is illustrated in Figure 2. A UV test lamp is mounted in the same enclosure with the UV sensor, but is optically isolated from the sensor by a cylindrical optical shield. When the test lamp is actuated by a signal from the controller, it generates a UV test signal (indicated by the dashed line in Figure 2) that travels out through the viewing window, where it encounters the reflective snap-in oi ring and is directed back through the window to the sensor. The controller evaluates the strength of the return signal to determine the relative condition of the detector and its optical surfaces. Since this UV test signal must pass through the same portion of the viewing window as UV radiation generated by a flame, a reliable test of the ability of the detector to "see" a fire is achieved.

The U7602 continuously executes the automatic oi test approximately once per second. If a fault should occur in the detector/controller, it is quickly detected and indicated by the Fault Relay contacts opening.

CONTROLLER

The standard U7602 controller module contains two independent relays and circuitry that produces a current output signal. An optional U7602 controller module with Form C relays (normally open/normally closed contacts) and a 4 to 20 ma output is also available. The controller circuit is contained on five interconnected circuit boards that together make up an easily replaceable, plug-in controller module (see Figures 3 and 4). The controller module contains a terminal block (TB3) that allows easy connection to the Fire and Fault relay contacts and the current output.

When UV radiation received by the U7602 exceeds a preset sensitivity level for a field adjustable time delay

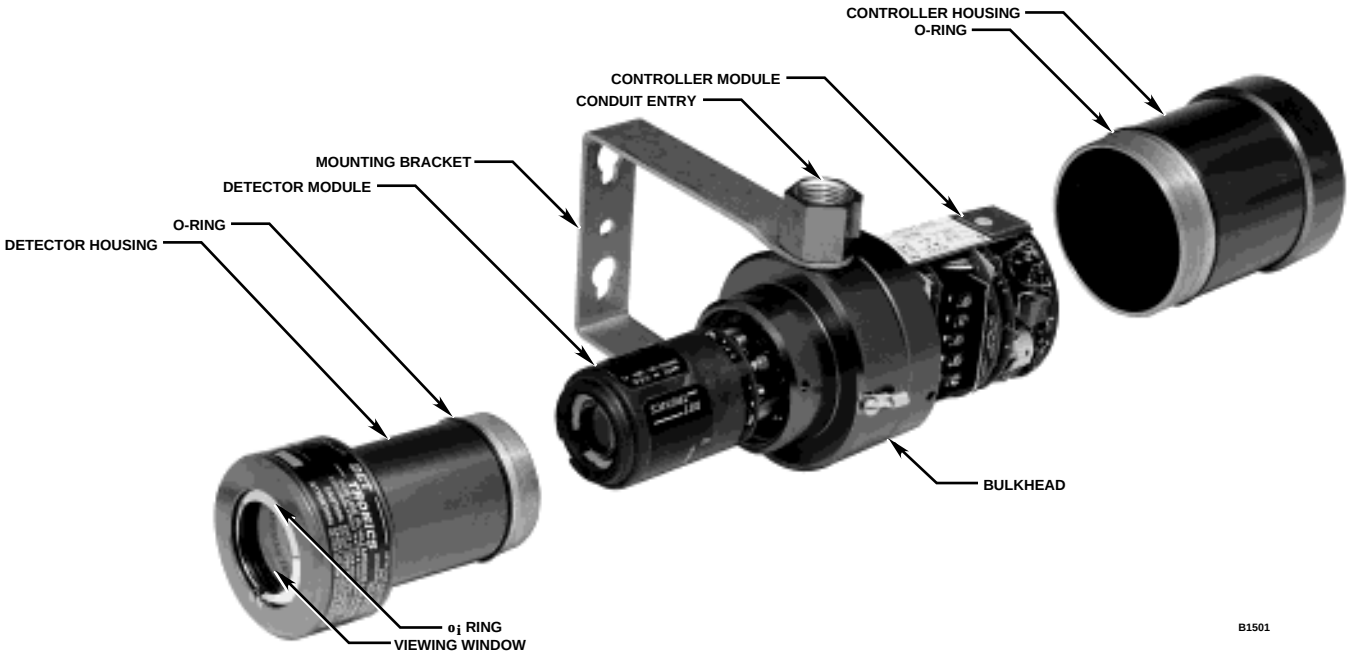


Figure 1—U7602 Detector/Controller Components

period, the Fire relay is energized and the current output signal rises to a level indicating that the U7602 is seeing a fire. If the detector module is equipped with an LED, it will illuminate. The Fire relay time delay (the time between when a flame is detected and the Fire relay is energized) is factory-set at 5 seconds, but is field adjustable from 0.025 to 30 seconds so that it can be set to fit each particular installation. The Fire relay is non-latching (unless otherwise specified) and resets when UV is no longer being sensed. If latching Fire relay is specified, power must be removed from the detector for more than 0.5 second to reset.

The Fault relay is normally energized (contacts closed), indicating a no fault condition. If a fault occurs in the U7602 or power is lost, the Fault relay is de-energized and its contacts open. The Fault relay is non-latching so if the fault is no longer present, the relay will energize (contacts close). During **oi** faults the Fault relay energizes and de-energizes approximately once every 2 seconds. The Fault relay contacts close approximately 4 seconds after power is applied to the detector provided a fault is not present.

NOTE

*When a manually activated **oi** test is performed, the Fault relay will open momentarily after the test switch is released and the Fire relay resets (no problems detected), which will result in a nuisance fault annunciation if the external monitoring equipment does not have a time delay.*

The current signal output line can be wired to an external meter for remote monitoring of fire/fault conditions in the U7602. Table 2 shows the conditions that various current signal output levels represent for both standard and optional 4 to 20 ma output models.

ENCLOSURE

The U7602 enclosure is explosion-proof and suitable for use in hazardous/classified areas both indoors and outdoors. The U7602 is a dust-tight and water-tight unit that is designed to meet most national and international standards. It is available in anodized aluminum and 316 stainless steel. The aluminum housing is epoxy coated, making it suitable for use in high saline atmospheres, such as offshore platforms. Conduit entries are available in 1/2 inch NPT, 3/4 inch NPT, 20 mm, 25 mm and Pg16.

SPECIFICATIONS

SPECTRAL SENSITIVITY RANGE—
Det-Tronics UV detectors respond to UV radiation over a wavelength of 1850 to 2450 angstroms. The detectors are insensitive to direct or reflected sunlight and to normal artificial lighting.

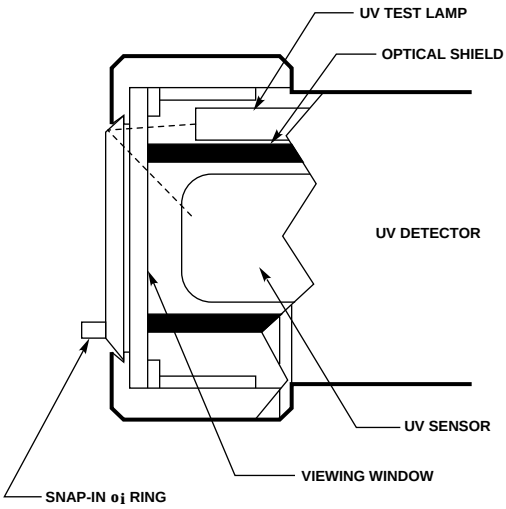


Figure 2—Detector with **oi**

Figure 3—TB3 on Standard Controller Module


Figure 4—TB3 on Optional Form C and 4 to 20 ma Output Controller Modules

CONE OF VISION—
The U7602 detector has a nominal 90 degree cone of vision, with the highest sensitivity lying along its central axis, as shown in Figure 5.

SYSTEM SENSITIVITY—
The U7602 Detector/Controller is set at the factory for 25 cps (counts per second). Other sensitivity settings are available as an option. When the sensitivity is set at 25 cps, the U7602 can respond to a gasoline flame with a one-square-foot burning surface area (0.09 square meter) at a distance of 35 feet (10.7 meters).

RESPONSE TIME—
The response time of the detector is a function of fuel, fire size, distance, orientation of the fire source, alarm threshold (cps) setting and the field adjustable time delay setting. Response times to an intense fire signal are field adjustable from 0.025 to 30 seconds.

INPUT VOLTAGE—
Models available:
12 vdc (10.5 to 16 vdc)
24 vdc (18.0 to 38.0 vdc)
120 vac, 50/60 Hz (Accepts fluctuations between 85 and 110 percent of voltage rating.)
220/240 vac, 50/60 Hz (Accepts fluctuations between 85 and 110 percent of voltage rating.)

RELAY CONTACT RATINGS—
Form A (normally open), 0.2 ampere maximum at 50 vdc. Optional form C (normally open and normally closed), 3 amperes maximum at 30 vdc or 120 vac.

WIRING REQUIREMENTS—
From three to nine wires are required depending on the capability of the external control system, as shown in Figure 6. Wires must be 22 gauge minimum. If used, the current signal output line must be a separate, shielded wire.

TEMPERATURE RATING—
Operating: –40°F to +167°F (–40°C to +75°C).
Storage: –67°F to +185°F (–55°C to +85°C).

HUMIDITY—
0 to 95% relative humidity.

DIMENSIONS—
Refer to Figure 7.

SHIPPING WEIGHT—
Aluminum enclosure: 2.0 kilograms (4 1/2 pounds).
Stainless steel enclosure: 3.15 kilograms (7 pounds).

CURRENT OUTPUT—
From 0 to 400 microamperes (standard).
4 to 20 ma output (optional).

Table 2—Current Signal Output Levels

Standard Current Signal (µa)	Optional 4 to 20 ma Output (ma)*	Type of Fault
0	0	Open or shorted signal output line, or loss of power to U7602
40	4	Normal operation
80	6	Dirty windows and/or oi reflector ring — detector tube circuit not functioning — low detector sensitivity
120	8	Some background UV present, spurious detector discharges – high detector sensitivity
160	10	High voltage fault (power monitor)
320	Over 19	Fire indication
Over 400		Over current

* ±5%

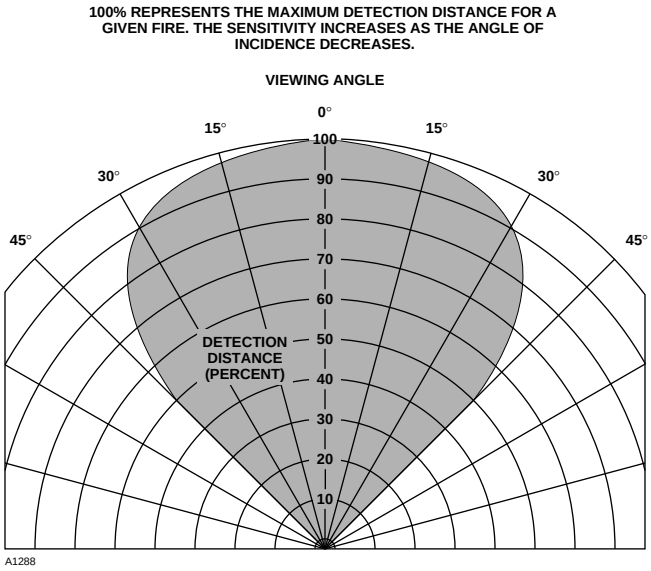


Figure 5—U7602 Cone of Vision

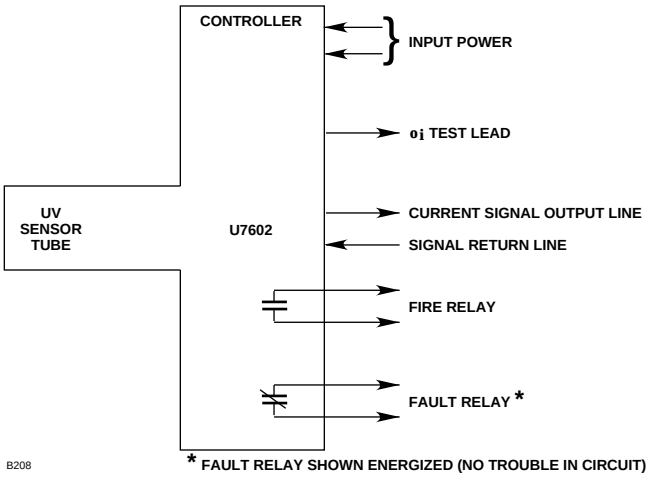


Figure 6—Standard U7602 Detector/Controller System

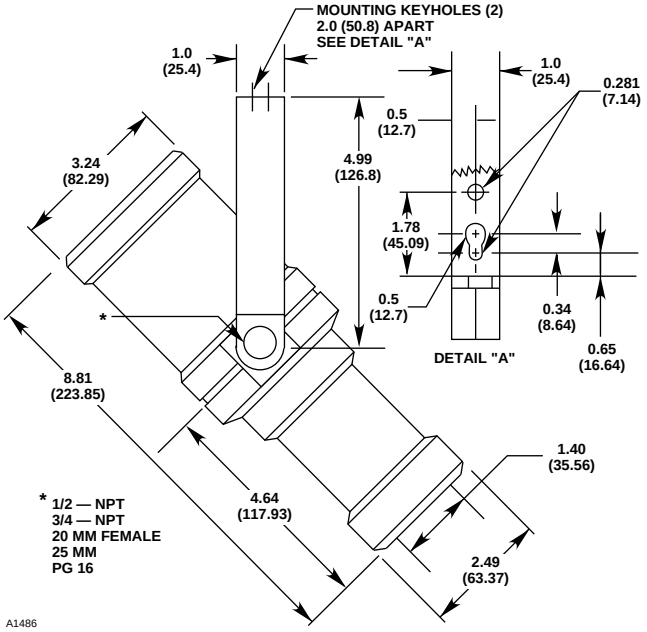


Figure 7—U7602 Dimensions in Inches (Millimeters)

POWER CONSUMPTION—
Standby: 1.5 watts, typical.
Fire: 5.0 watts, maximum.

ENCLOSURE MATERIALS—
Models are available in anodized copper-free aluminum or 316 stainless steel.

CONDUIT THREAD SIZE—
One or two conduit entries can be provided on each unit for incoming and outgoing field wiring. Entry sizes available are: 1/2 inch NPT, 3/4 inch NPT, 20 mm, 25 mm or Pg16.

VIBRATION—
Designed to meet MIL SPEC 810C, method 514.2, procedure X, curve AW (5 to 200 Hz, 1.5 g).

ENCLOSURE RATINGS—
Watertight, dust-tight NEMA 4 enclosure. 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 G. BASEEFA/ CENELEC certified for EExd IIB T6 (T_{amb} –40°C to +75°C) when ordered with a locking cover assembly. Enclosure rated IP66. Listed product of the Australian Scientific Services Laboratory (SSL). VDS (Germany) approved.

DETECTOR SENSITIVITY

The UV flame detector responds to radiation over wavelengths of 185 to 245 nanometers (1850 to 2450 angstroms). Figure 8 illustrates the range of sensitivity, and compares this range to other forms of radiation. Note that UV radiation reaching the earth from the sun does not extend into the sensitivity region of the detector. In addition, radiation from normal artificial lighting, such as fluorescent, mercury vapor, and incandescent lamps does not extend into the detector's spectral range. As a result, the detector is insensitive to these forms of radiation and can be used outdoors or indoors.

NOTE

Some types of high intensity lamps can operate for extended periods with cracked or otherwise damaged envelopes, and will then emit UV radiation in the frequency response range of the detector. Defective mercury vapor lamps 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 produce a count. 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 can occur.

Data on sensitivity of the U7602 Detector/Controller 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. If continuous flame detection is required, contact Detector Electronics for information on flame detection systems that can provide continuous flame detection capabilities in these types of applications.

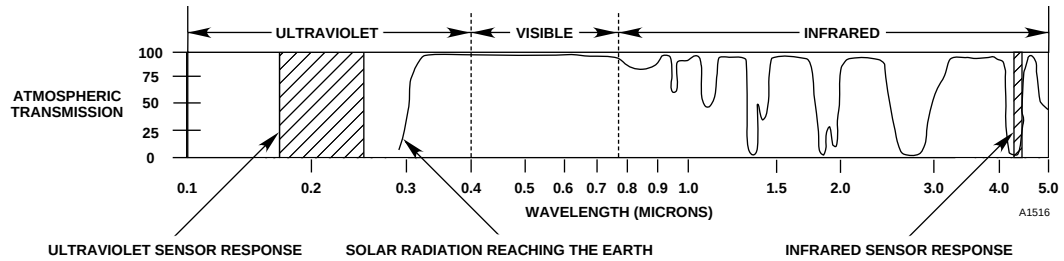


Figure 8—Detector Range of Sensitivity

NOTE

Ultraviolet detectors are very sensitive to arc welding, and if this type of radiation can be expected, it must be controlled through proper application. Successful application techniques include careful positioning and shielding of the detector/controllers.

INSTALLATION

U7602 DETECTOR/CONTROLLER POSITIONING AND DENSITY

The detector has a nominal 90° 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 (0.6 meter) from the ceiling and pointed straight down, the distance from the detector to the designated level would be 23 feet (7 meters). Because of its 90° cone of vision, the detector would cover a circular area with a diameter of 46 feet (14 meters) at the designated level. A simple layout of the area to be covered will easily reveal the number of detectors required to completely supervise the designated area. In general, detectors should be placed as close as practical to the probable hazard.

NOTE

Do not mount UV detectors close to the ceiling in enclosed areas if dense smoke can 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 can accumulate during a fire. If dense smoke can be expected to accumulate prior to the presence of flame (as in an electrical fire), do not use UV detectors alone.

A 25 count per second sensitivity setting is standard on the U7602 and is appropriate for most indoor and outdoor applications. Other sensitivity settings are available, however, sensitivity requirements must be carefully determined. The more sensitive the setting, the more likely extraneous UV sources such as arc welding in the area can affect the system. Therefore, the sensitivity setting selected should be the least sensitive that is practical for the application involved without introducing undue risk of not “seeing” an actual fire. Figure 9 shows the UV detector response in counts per second to gasoline fires of different sizes and at varying distances from the detector. Refer to Figure 9 and consider the factors described above (distance to potential fire, probable fire size, extraneous UV presence) to establish the correct system sensitivity requirements.

NOTE

The curves of Figure 9 represent typical gasoline fires. The fire size refers to the surface area of exposed fuel. For fire involving other materials, the values obtained from the curve must be modified.

The time delay on the U7602 is adjustable, but is typically set for 5 seconds. For most outdoor applications a minimum time delay of 2 seconds is required in order to ignore UV generated from lightning strikes.

Detectors should be located for the best unobstructed view of the area to be protected. Detectors must be accessible for cleaning the viewing window and reflector rings. Care must be taken so that dirt or other foreign material will not accumulate and obscure the detector viewing window. For outdoor applications, the detectors should be pointed downward to prevent the cone of vision from scanning the horizon, since the detectors can 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, since dirt accumulation between the window and the reflector ring can interfere with the Automatic oi function. See Figure 7 for mounting dimensions.

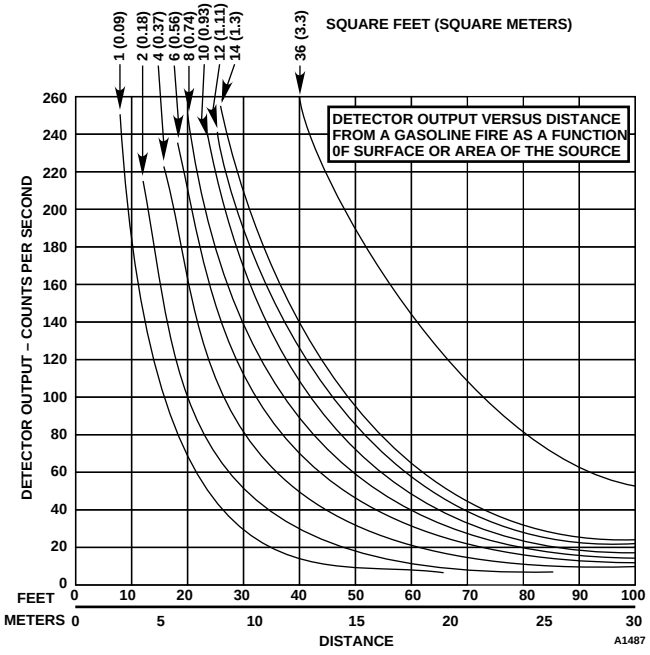


Figure 9—Sensitivity to a Gasoline Reference Fire

WIRING REQUIREMENTS

The system should be wired using a 16 to 22 gauge (1.5 to 0.5 mm^2) cable. If the current signal output line is used, it must be a separate shielded wire to protect against interference. In applications where the wiring cable is installed in conduit, the conduit should not be used for wiring to other electrical equipment.

NOTE

It is important to use cable that is suitable for the installation environment. In applications involving high humidity or saltwater, use a cable that is made specifically for harsh, saltwater environments. In all cases, typical cable insulation resistance should be at least 100 megohms. If the resistance drops below 10 megohms, the cable could be deteriorating and should be replaced to avoid shorting out the system. When testing the insulation resistance, disconnect the leads from the detector/controller before connecting the megohmmeter (insulation tester) to the cable.

Since moisture can be detrimental to electronic devices, it is important that moisture not be allowed to come in contact with the electrical connections of the system. Moisture in the air can become trapped within sections of conduit, therefore the use of conduit seals is required to prevent damage to electrical connections caused by condensation within the conduit. These seals must be watertight and explosion-proof and are to be installed even if they are not required by local wiring codes. A seal must be located more than 18 inches (46 cm) from the unit. When an explosion-proof installation is required, an additional seal must also be installed at any point where the conduit enters a non-hazardous area.

When pouring a seal, the use of a fiberdam is required to assure proper seal formation. The seals should never be poured in temperatures that are below freezing, since the water in the sealing compound will freeze and the compound will not dry properly. Contamination problems can 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 leads, rather than around the outside of the shield. This will prevent any siphoning action that might occur through the inside of the shield.

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. When using steel wire armored or mineral-insulated copper-sheathed cables, select an approved gland with a watertight compression stage and an overall gland shroud for outdoor applications. A sealing washer must be fitted between the gland and the conduit entry to ensure IP66 rating.

WIRING AND MOUNTING PROCEDURE

After determining the correct positioning and density of the U7602(s), use the procedure below for mounting and wiring the unit(s). For reference, Figure 10 shows TB1 power and **oi** test connections, Figure 11 shows the TB3 configuration for standard relay and current outputs and Figure 12 shows the optional Form C relay and 4 to 20 ma current outputs. Figures 13 and 14 show typical U7602 wiring diagrams for systems that use end of line resistors. See Figure 15 for systems that use end of line capacitors.

NOTE

When the U7602 is used with external monitoring equipment, the equipment that monitors the Fault relay contacts should have a 5 second time delay during power-up to avoid nuisance fault annunciation.

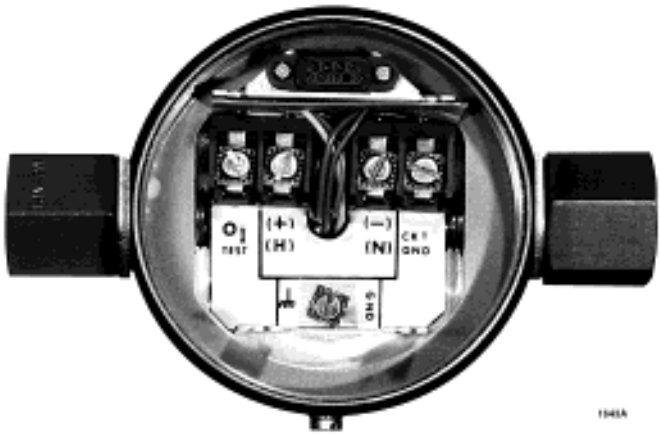


Figure 10—TBI, Power and **oi** Test Connections

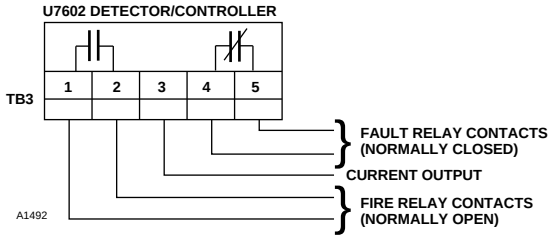


Figure 11—TB3, Relay and Current Outputs
for Standard Controller Module

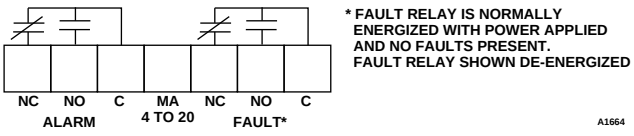


Figure 12—TB3, Relay and Current Outputs
for Optional Form C and 4 to 20 ma Controller Modules

NOTE

The wiring procedures in this manual are intended to ensure proper functioning of the device under normal conditions. However, because of the many variations in wiring codes and regulations, total compliance to these ordinances cannot be guaranteed. Be certain that all wiring complies with applicable regulations that relate to the installation of electrical equipment in a hazardous area. If in doubt, consult a qualified official before wiring the system.

1. Mount the bulkhead and mounting bracket assembly of the detector/controller. See Figure 7 for dimensions. The mounting surface must be free of vibration and suitable to receive 1/4 inch (M6) screws with a length of at least 1 inch (25 mm).

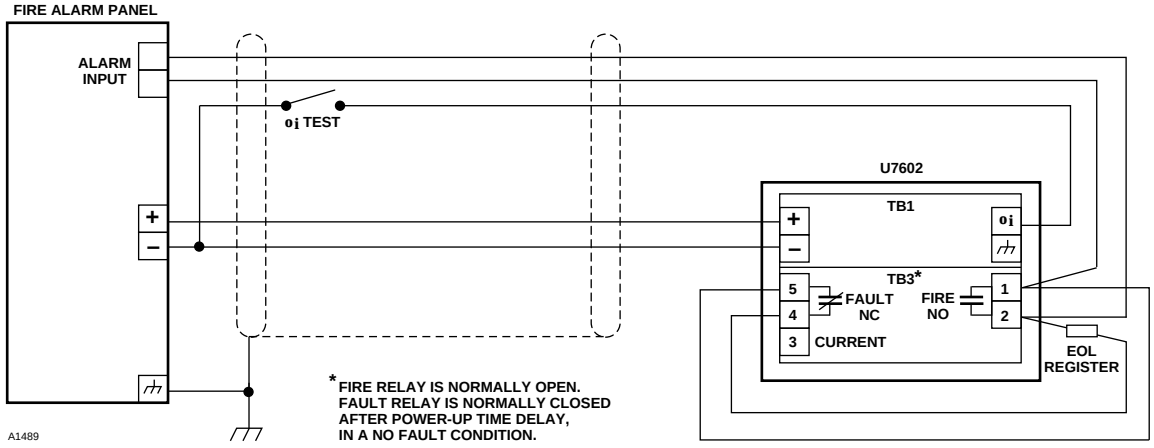


Figure 13—Typical Wiring Diagram

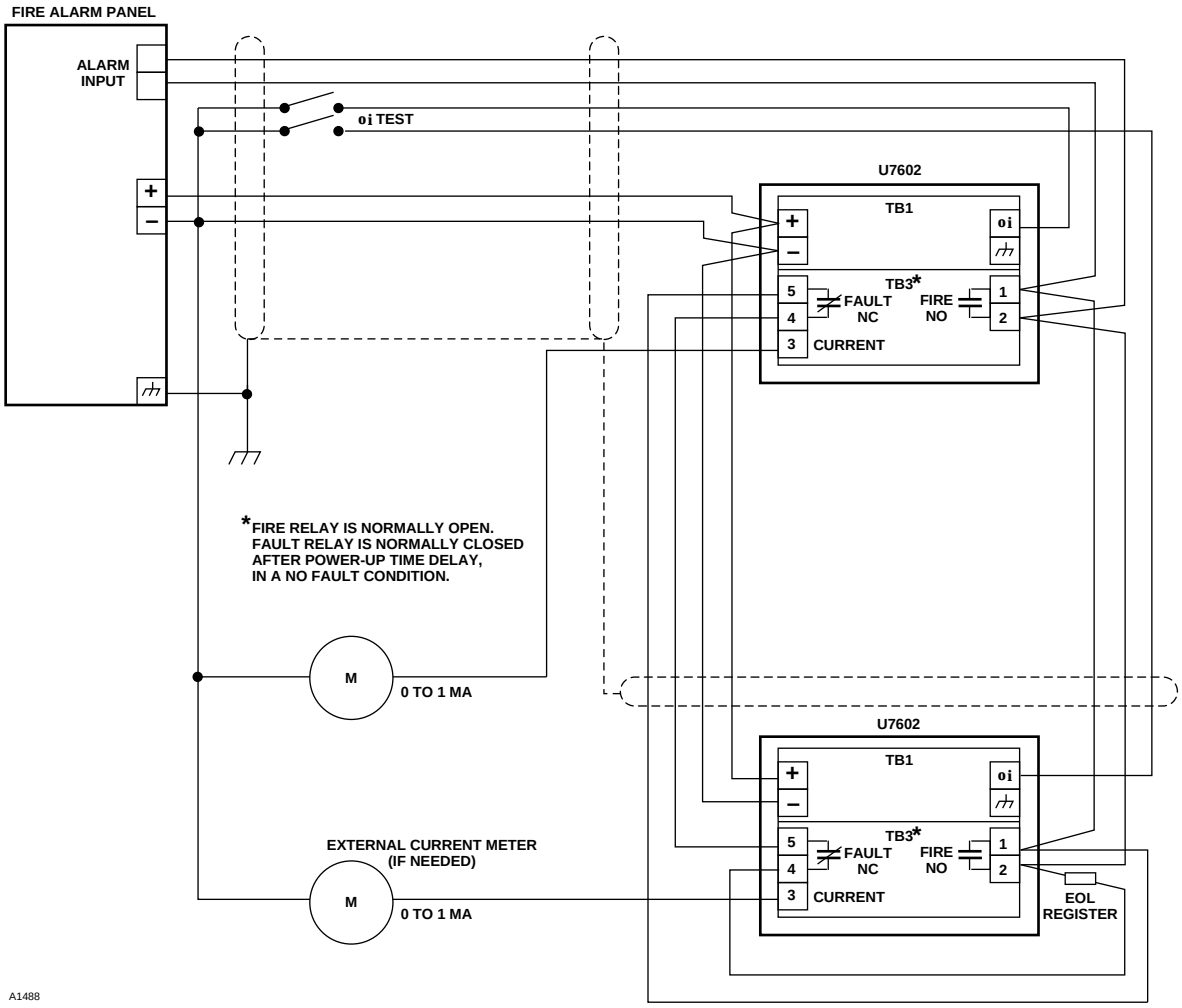


Figure 14—Typical Multiple Unit Configuration with End of Line Resistors

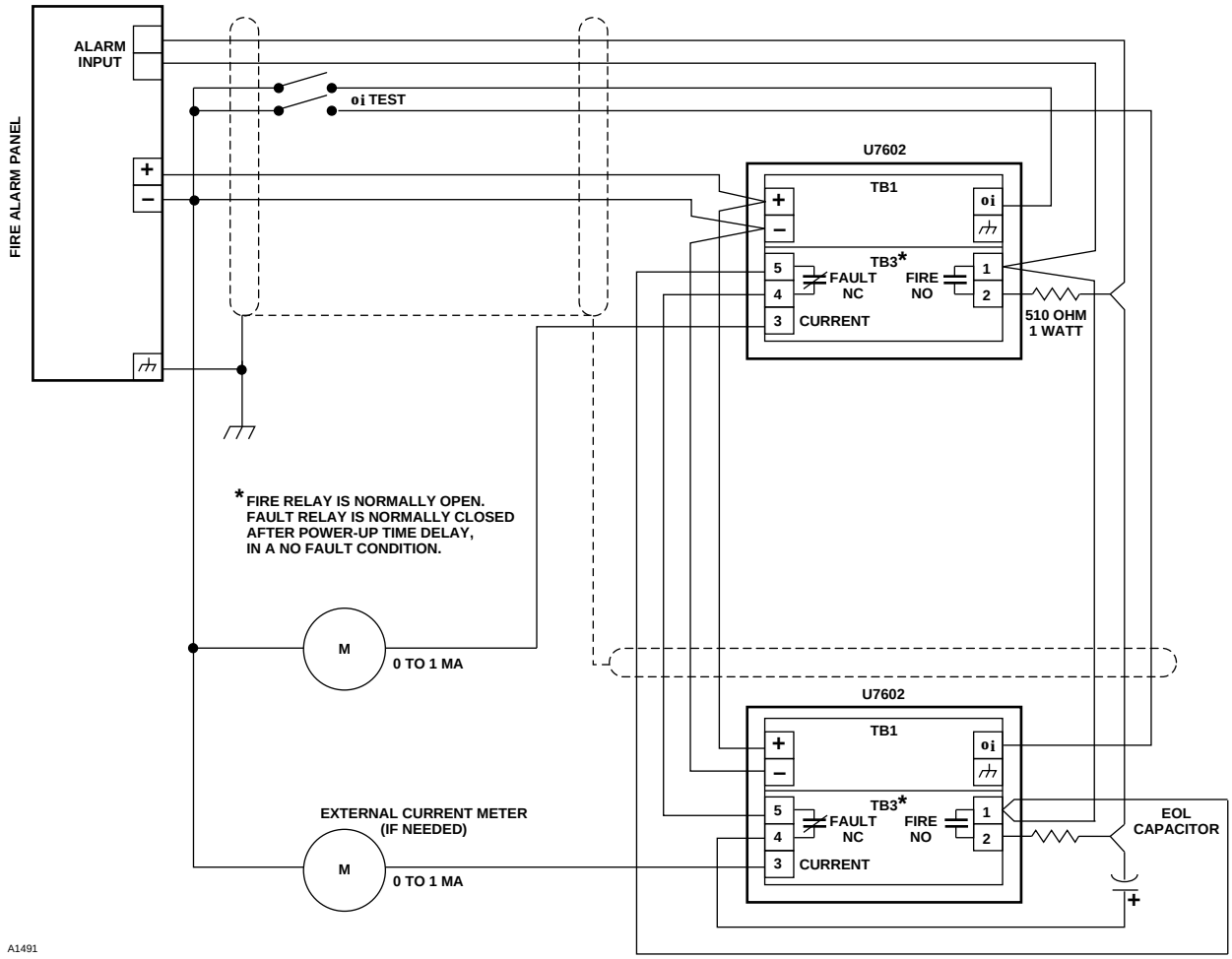


Figure 15—Typical Multiple Unit Configuration with End of Line Capacitors

2. If the unit is equipped with a cover locking clamp, loosen it with a 5/32 hexagonal (Allen) wrench and move the clamp "catches" out of the blind holes located in the bulkhead. See Figure 16.

3. Remove the controller housing and sensor housing from the bulkhead by turning them counterclockwise.

NOTE

The U7602 contains semiconductor devices that are susceptible to damage by electrostatic discharge. An electrostatic charge can build up on the skin and discharge when an object is touched. Therefore, use caution when handling the U7602, taking care not to touch the terminals or electronic components.

4. Route the field wiring through the detector conduit entry. Refer to Figure 13 for wiring a single unit and Figure 14 for a multiple configuration using end of line resistors. Figure 15 shows a multiple configuration using end of line capacitors.

IMPORTANT

Current limiting resistors must be used as shown in Figure 15 when using end of line capacitors. Failure to do so can result in the relay contact ratings being exceeded, and subsequent welded relay contacts.

5. Connect the power wires to terminals + (H) and – (N) on TB1 inside the housing, ensuring that the proper polarity is observed. Voltage requirements for each unit are printed on the label on the sensor housing and on the top of the controller module. Figure 10 shows TB1 connections (power, circuit ground and **oi**). If the earth ground wire is used, it should be connected to the chassis ground screw (GND) provided (this is not located on TB1).

6. To use the manual **oi** feature, connect a normally open switch between circuit ground and the **oi** TEST terminal on TB1. Each U7602 must have its own **oi** test switch.

7. If the current signal output is used, it must be in a separate shielded cable. Connect the shield of this cable to the CKT GND terminal on TB1.

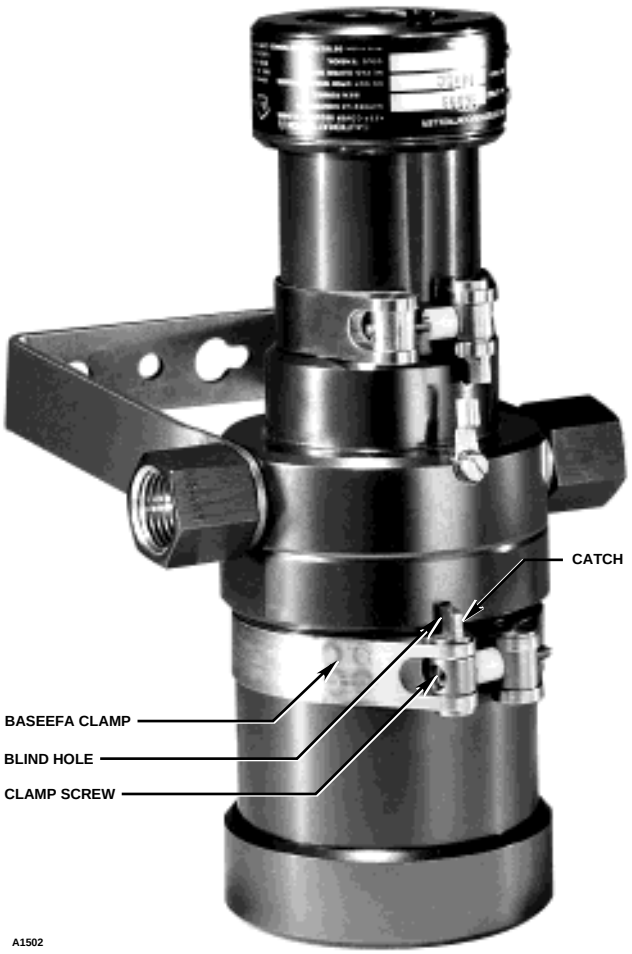


Figure 16—Cover Locking Clamp

8. The remaining wires (relay output wires and current output wire) are connected to TB3 on the controller module after it has been installed. Route these remaining wires between the upright bracket arms opposite the connector plug.

9. Remove the controller module from its shipping container. Loosen, but do not remove, the four mounting screws at the base of the controller module.

10. On the bulkhead, hold the relay and current output wires between the upright bracket arms opposite the connector plug while folding the terminal protector flap down so that it covers TB1. Press the controller module firmly into the mounting bracket so that the screws on the controller module fit into the four slots on the bracket with the connector plug connected. Tighten the four mounting screws to hold the controller module in place.

11. Connect the relay and current wires as appropriate. Terminals 1 and 2 are the normally open Fire Alarm relay contacts. Terminals 3 and 4 are the Fault relay contacts, which are closed when no faults are indicated (with no power applied, the Fault relay is normally open, when power is applied the contacts close after a 5 second time delay). Terminal 3 is the current output. Attach the wires to the appropriate screw terminals on the terminal block. Figure 11 shows TB3 connections (relay and current output) for the standard controller module as described above. Figure 12 shows TB3 connections for the optional Form C and 4 to 20 ma controller modules.

12. Check all field wiring to be sure that the proper connections have been made. Replace the controller housing.

13. Remove the UV Detector module from its shipping package. When handling the UV Detector Module, be careful not to touch the sensor tube since oil from the skin can attenuate UV radiation, reducing the sensitivity of the tube.

IMPORTANT

Some Det-Tronics UV Detector modules have a black jumper plug installed on the circuit board connecting two gold pins together. This jumper must not be installed when the module is used in the U7602. If the jumper is installed in the location indicated on Figure 17 (jumper pins), remove it by pulling straight upward (if necessary, use the hole at the top of the jumper to pry it off). Discard the jumper.

14. Using the guide pin as a reference, install the detector module on the terminal block (see Figure 17). Press the detector module firmly in place, making sure that the four legs fit snugly against the plastic terminal block.

15. Re-assemble the detector housing. Ensure that the housing is tightened with the O-ring fully seated to maintain the watertight and explosion-proof integrity of the detector. 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 16). The clamp must then be fastened securely around the detector barrel by tightening with the proper tool.

16. Once the U7602 is assembled, check the viewing window surface (Figure 18) and ensure that (1) the split in the **oi** reflective ring is not aligned with the source tube on the detector module and (2) that the split in the **oi** ring is directed downward to prevent a buildup of contaminants between the **oi** ring and the viewing window.

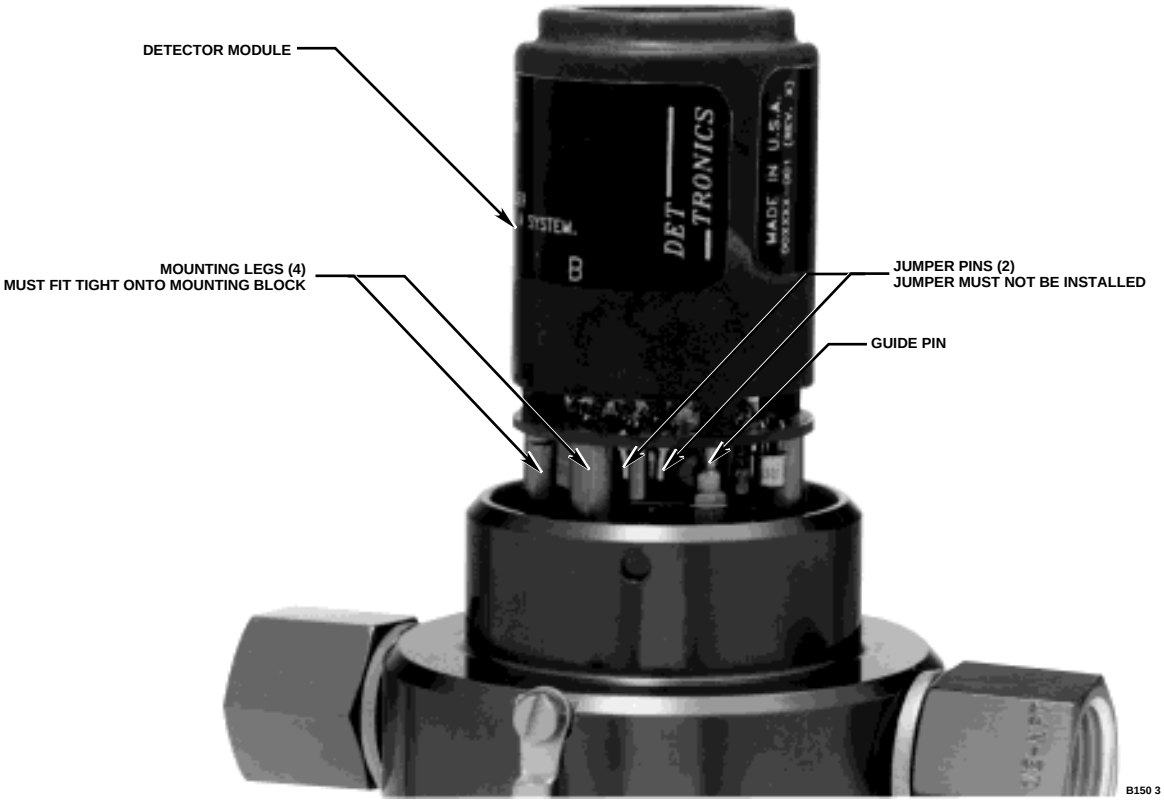
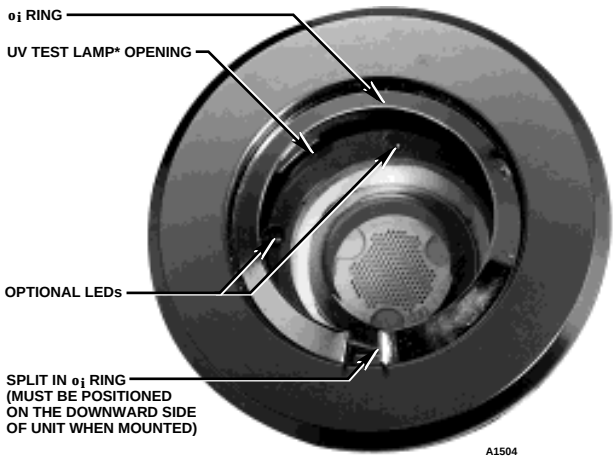


Figure 17—Detector Module Mounting



*** UV TEST LAMP* OPENING MUST NOT BE ALIGNED ON TOP OF SPLIT IN oi RING**

Figure 18—U7602 Detector/Controller Viewing Window

SYSTEM STARTUP/ oi TEST PROCEDURE

NOTE

When a manual **oi** *test is performed, the Fault relay will open momentarily after the test switch is released and the Fire relay resets (no problems detected), which will result in a nuisance fault annunciation if the external monitoring equipment does not have a time delay.*

When installation is complete, the following startup procedure should be performed.

1. Disable any alarm and extinguishing equipment being controlled by the U7602.

2. Apply input power to the U7602. Allow a five second power-on delay.

3. Turn a UV source (such as the Det-Tronics model W8066 UV Test Lamp) on or, if the **oi** feature is being used (a switch wired between the **oi** TEST terminal on TB1 and circuit ground), press the **oi** test button for 5 to 10 seconds. The Fire Relay will energize and, if the detector module is equipped with an LED, the LED will illuminate.

4. Remove the UV source (or release the **oi** test button). The Fire Relay will de-energize. If the detector module has an LED, power must be removed from the detector to reset (turn off) the LED.

5. Repeat this test for all U7602 Detector/Controllers in the system.

6. Double check all detectors in the system to be sure that they are properly aimed at the potential hazard.

7. If conduit is used, pour the conduit seals and allow them to dry (see “Wiring Requirements” section).

8. Turn on all extinguishing equipment connected to the system.

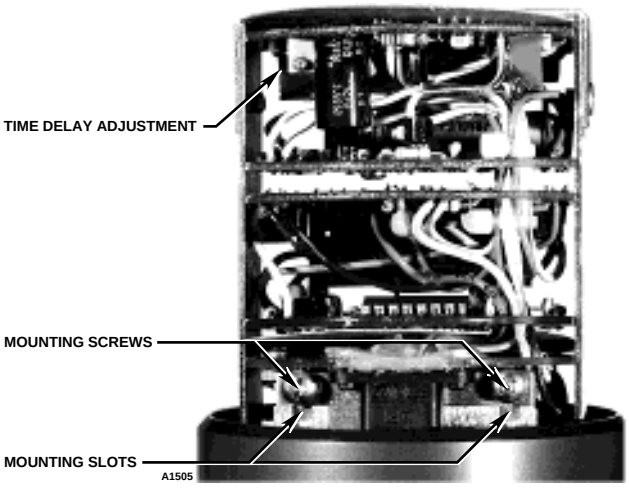


Figure 19—Controller Module Showing Time Delay Adjust

FIRE RELAY TIME DELAY ADJUSTMENT

Unless specified otherwise, the time delay for the Fire relay is factory set for 5 seconds. To change the delay setting of the Fire relay, follow the procedure below.

NOTE

Adjusting the time delay for the Fire relay in a hazardous location requires making the area temporarily non-hazardous or disconnecting the input power before removing the U7602 housing to make the adjustment, and re-assembly of the housing before applying input power to check the new setting.

1. Disable any alarm and extinguishing equipment being controlled by the U7602.

2. Turn a UV source (such as the Det-Tronics model W8066 UV Test Lamp) on or, if the **oi** feature is being used (a switch wired between the **oi** TEST terminal on TB1 and circuit ground), press the **oi** test button and begin timing. The Fire relay will energize after the time delay has expired.

3. If it is necessary to adjust the time delay, remove input power to the U7602.

4. Remove the controller module housing. See Figure 1.

5. Adjust the time delay potentiometer (refer to Figure 19 for location) using a screwdriver. To reduce the time delay, turn the potentiometer counterclockwise (ccw). To increase the time delay, turn potentiometer clockwise (cw). Small adjustments make significant changes in the time setting (approximately 1 to 2 seconds per 1/4 turn).

WARNING

If the U7602 is in a hazardous location, re-install the controller housing before turning power on.

6. Apply input power to the U7602.

7. Repeat steps 2 to 6 until the desired time delay is achieved.

8. Re-install the U7602 controller module housing, if not done in a previous step. Ensure that the housing is tightened with the O-ring fully seated to maintain the watertight and explosion-proof integrity of the detector.

9. Turn on all extinguishing equipment that is connected to the system.

MAINTENANCE

The U7602 requires no periodic calibration. However, to maintain maximum sensitivity, the viewing window must be kept clean at all times. The length of time between periodic cleaning will be determined by the nature and amount of contaminants present in the environment.

Remove the **oi** ring from the detector housing and clean the viewing window thoroughly, all the way to the edge (see Figure 18). Also clean the inside of the **oi** ring. When re-installing the reflective **oi** ring, hold it by its tabs to avoid leaving fingerprints on the reflective surface. Re-install the ring so that the opening is not aligned with the **oi** test lamp on the detector module (indicated by a very small hole at the edge of the detector module's top surface). The opening in the **oi** ring should be pointed downward to prevent a buildup of contaminants. If corrosive contaminants in the atmosphere cause the reflective rings to deteriorate to the extent that it is no longer possible to restore them to their original condition, they must be replaced.

To clean the window, use a clean cloth or tissue and Det-Tronics window cleaning solution.

NOTE

Remove input power when cleaning the detector windows to prevent unwanted output activation.

Rubber O-rings are used to ensure the watertight integrity of the detector housing. Periodically, the housings should be opened and the O-rings inspected for breaks, cracks or dryness. To test the O-rings, remove them from the detector housing and stretch them slightly. If cracks are visible, they should be replaced. If they feel dry to the touch, a thin coating of lubricant should be applied. When re-installing the O-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 the O-rings can allow water to enter the housing 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.

A coating of lubricant should also be applied to the threads on the detector enclosure before re-assembling the detector housing. This will both lubricate the threads and help to prevent moisture from entering the detector housing. Do not use silicon based lubricant. Lubricant is available from Det-Tronics.

TROUBLESHOOTING

NOTE

When the U7602 is used with external monitoring equipment, the equipment that monitors the Fault relay contacts should have a 5 second time delay during power-up to avoid nuisance fault annunciation.

When a fault is indicated by the U7602, the first steps that should be taken to correct the condition are:

1. Check to make sure that power is reaching the unit.

2. Make sure that all optical surfaces (the viewing window and oi ring on the detector housing) are clean and in good condition. Clean these surfaces regardless of how they appear, as some UV absorbing substances are not readily visible.

3. Check to make sure that there are no sources of extraneous UV in the area that may be causing problems.

If the problem is not in the wiring or power supply, all optical surfaces are clean, and there is no extraneous UV present in the area, then further troubleshooting is necessary. The procedure below allows the defective component (either the detector module or the controller module) to be isolated. Table 3 contains a description of conditions, and a corresponding explanation and remedy to the problem. Knowing the current output is a helpful tool when using Table 3 to troubleshoot. The current output is available at terminal 3 on TB3 (see Figure 11 or 12).

CAUTION

All fire protection equipment for extinguishing systems controlled by the U7602 must be disabled before beginning this phase of troubleshooting.

In hazardous locations, input power must be disconnected before removing the U7602 housings.

For protection from shock hazards, always disconnect input power before removing or replacing modules.

1. Perform the "System Startup/oi Test" procedure. If the detector remains inoperative:

   a. Remove input power to the U7602.

   b. Remove detector housing and detector module.

   c. Install a known good detector module, replace the detector housing and repeat the "System Startup/Manual oi Test" procedure.

2. If the detector remains inoperative the controller section should be checked.

   a. Remove input power to the U7602.

   b. Remove controller housing.

   c. Remove controller module as follows:

      1. Loosen four mounting screws holding controller module.

      2. Slide controller module from bulkhead, disengaging the connector (see Figure 1).

   d. Inspect for broken or loose wires. Correct any faults and re-install the controller module, making sure it is securely mounted in the bulkhead and that the connector is engaged (see Figure 1).

   e. If no faults were found in step 2.d. above, install a new controller module, making sure it is securely mounted in the bulkhead and that the connector is engaged.

   f. Replace controller housing. Ensure that the housing is tightened with the O-ring fully seated to maintain the watertight and explosion-proof integrity of the detector.

   g. Apply input power and repeat the "System Startup/oi Test" procedure.

After troubleshooting and correcting any faults in the detector or controller, the complete "System Startup/oi Test" procedure should be performed before returning the system to normal operation.

Do not attempt to repair the detector module or controller module. Return all faulty modules to the factory for repair.

Table 3—Troubleshooting Guide

Operating Mode	Fire Relay	Fault Relay	LED (if equipped)	Current Output (standard)	4 to 20 ma Output (if equipped)
Normal	**open**	**closed**	**on**	**40 microamps**	**4 milliamperes**
Reason and Corrective Action: U7602 was not reset after fire or fault condition, oi test, or background radiation detected and problem corrected.					
Normal	**closed**	**closed**	**off**	**40 microamps**	**4 milliamperes**
Reason and Corrective Action: If there is no fire but the Fire relay contacts are closed and the system is otherwise operating normally, remove power from the U7602. If the Fire relay contacts remain closed, their ratings may have been exceeded and the contacts are welded shut. Ensure that devices connected to the relays do not exceed relay ratings. Be especially careful of end-of-line-capacitor type fire panels as these connections often exceed the U7602 relay contact rating. Replace the controller module and return the defective one to the factory for repair.					
Fault	**open**	**open or opening and closing intermittently**	**on**	**80 microamps or cycling 40 to 80 to 40**	**6 milliamperes**
Reason and Corrective Action: An oi fault has occurred. The first step in correcting this problem is to clean the viewing window and oi ring on the detector housing following the instructions in the "Maintenance" section. Remove the oi ring and clean and inspect the underside for a pitted or corroded surface. If the reflective surface has been damaged at all, replace the oi ring. Re-install the oi ring (making sure that the oi test lamp and the split in the oi ring are not aligned) and perform an oi test using the procedure described in the "System Startup Procedure/oi Test" section. If the fault persists, replace the detector module.					
Fault	**open**	**open**	**on**	**120 microamps**	**8 milliamperes**
Reason and Corrective Action: Background radiation is being detected or the detector module is too sensitive. Check for extraneous sources of UV radiation. If none are present, replace the detector module. If extraneous UV sources are present, try to eliminate them or try to reposition the detector/controller so that the extraneous UV sources are outside of its cone of vision, while its view of the hazardous area is maintained. If these methods don't work, consider modifying the module to eliminate fault conditions due to high levels of background UV (per "Modifications to Eliminate High Background UV Faults" procedure), or replace the detector module with the DE1888T2 model, which has a lower sensitivity and is designed for this type of application.					
Fault	**open**	**open**	**on**	**160 microamps**	**10 milliamperes**
Reason and Corrective Action: This fault indicates a malfunction in the high voltage circuitry (which supplies the detector module) in the controller module. To isolate the source of the problem, perform the "Troubleshooting" procedure described in detail in this manual.					
Fault	**open**	**open**	**off**	**0 microamps**	**0 milliamperes**
Reason and Corrective Action: Input power not applied to detector/controller or defective controller module. Apply input power or replace defective controller module.					

MODIFICATIONS TO ELIMINATE HIGH BACKGROUND UV FAULTS

In applications where high background UV radiation causes the U7602 to produce a fault response, it may be necessary to disable the high sensitivity signal.

While the module will continue to perform the automatic optical integrity (oi) test and to produce a fault indication in the event of low detector sensitivity, it is important to note that this modification disables the ability of the U7602 to respond to high sensitivity symptoms that could indicate background UV, spurious detector response, or a faulty, over-sensitive detector module. An over-sensitive detector module can cause a system actuation when no fire exists.

To disable the U7602 high sensitivity signal line:

1. Remove U7602 input power.
2. Remove the controller housing (Figure 1).
3. Cut out the white wire that joins connection point 7 on the third circuit board down from the top as indicated in Figure 20, and connection point 5 on the fourth circuit board from the top as indicated in Figure 21. Remove the wire.
4. Re-install the controller housing.
5. Restore U7602 input power.

Figure 20—White Wire at the Third Circuit Board

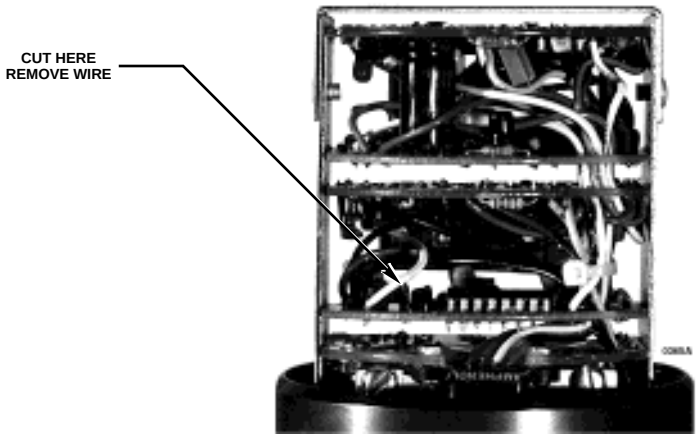


Figure 21—White Wire at the Fourth Circuit Board

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 time and repair costs. Pack the unit or component properly. Use sufficient packing material in addition to an antistatic bag or aluminum-backed cardboard as protection from electrostatic discharge.

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 or (800) 765-FIRE
Telex 6879043 DETEL UW
Cable DETRONICS
Facsimile (612) 829-8750

Detector Electronics Corporation
13949 Williams Road
P. O. Box 1329
Glen Ellen, CA 95442 USA
Telephone (707) 996-0196
Facsimile (707) 996-0197
Voice Mail Box Number 930

Detector Electronics Corporation
466 Conchester Highway
Aston, Pennsylvania 19014 USA
Telephone (610) 497-5593
Facsimile (610) 485-2078

Detector Electronics Corporation
3000 Wilcrest
Suite 145
Houston, Texas 77042 USA
Telephone (713) 782-2172
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Telephone 33 1 3497 0650
Facsimile 33 1 3497 0648

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Facsimile 31 (0)317 427308

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Gipronii Ran
Kidde Graviner
RUSSIA
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Deugra GmbH
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D-4030 Ratingen 1
GERMANY
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Direct 49 2102 405152
Facsimile 49 2102 405109
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Ciodue – FSI
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Telephone 02 90362148
Telephone 0336 339748
Facsimile 02 90361068

Detector Electronics
108, Sai Prasad Complex
Opp. Khar Railway Station
Khar (W)
Bombay 400 052
INDIA
Telephone (91) 22 604 6142
Facsimile (91) 22 649 7775

Det-Tronics Scandinavia AB
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S-260 83 Vejbystrand
SWEDEN
Telephone 431-53002/53240
Facsimile 431-52236

Detector Electronics Corporation
C/O Walter Kidde Aerospace
143 Cecil Street
#15-01 G. B. Building
SINGAPORE 0106
Telephone (65) 220-1355
Facsimile (65) 226-16305

Det-Tronics Middle East
P O Box 44026
Abu Dhabi
U.A.E.
Telephone 971 2 313304
Facsimile 971 2 393248

Det-Tronics South America.
AV17 Con Calle 72, No. 71-92
Apartado 10055
Maracaibo, VENEZUELA
Telephone 58-61-521274, -529154, -529749
Facsimile 58-61-529144
Telex 61331

Detector do Brasil
Avenida Geremario Dantas 493
Rio de Janeiro 22740-011
BRAZIL
Telephone (55) 21 392 9633
Facsimile (55) 21 392 5568

ORDERING INFORMATION

When ordering, specify:

Model—
U7602 Detector/Controller

Detector Module Requirements—
DE1888 - (LED optional)

Input voltage—
120 vac, 50/60 Hz
220/240 vac, 50/60 Hz
12 vdc
24 vdc

Sensitivity—
25 counts per second (cps)
50 counts per second (cps)
75 counts per second (cps)
100 counts per second (cps)

Housing Material—
Copper-free red anodized aluminum
316 stainless steel

Conduit entry threads—
1/2-inch NPT
3/4-inch NPT
20 mm
25 mm
Pg16
Specify stop plug if required (when only one conduit entry is being used).

Cover locking assembly—
Meets BASEEFA requirements (see Figure 12).

Approval Requirements—
FM
CSA
BASEEFA/CENELEC
SSL
VDS

ACCESSORIES

W8066 Portable UV Test Lamp
Q1113 Air Shield
Q1201 Holder and T2P laser (COV tester)

RECOMMENDED SPARE PARTS

Description	Qty.
Controller module See part number on module.	1 per 10 units
DE1888 Detector module (See letter designator on module)	1 per 10 units
Snap-in oi ring	1 per 10 units
UV window cleaner (6 bottle pack)	1 per 10 units
Grease for O-rings (1 oz. bottle)	1 per 10 units
O-rings (small and large)	2 each per 10 units

For assistance in ordering a system to meet the needs of a specific application, please contact the Minneapolis location:

Detector Electronics Corporation
6901 West 110th Street
Minneapolis, Minnesota 55438 USA
Telephone (612) 941-5665 or (800) 765-FIRE
Telex 6879043 DETEL UW
Cable DETRONICS
Facsimile (612) 829-8750