DET TRONICS

[redacted]

INSTRUCTIONS

Detector/Controller for
Ultraviolet Fire Detection Systems
U7600A, B

[redacted]

10/80 Form 95-8213-03

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INSTRUCTIONS

Oi*

Detector/Controller for Ultraviolet Fire Detection Systems U7600A, B

SYSTEM APPLICATION

The Detector Electronics model U7600 Unitized Detector/Controller is an ultraviolet fire detector and controller housed in a single, explosion-proof enclosure. It is designed for protection of hazardous locations and provides a highly reliable means of instantaneous response to fire by detecting ultraviolet radiation generated by flames. A patented "Oi" feature* (optional) provides supervision of optical surfaces and critical components, for assurance that the entire fire detection system is operational. See Figure 1.

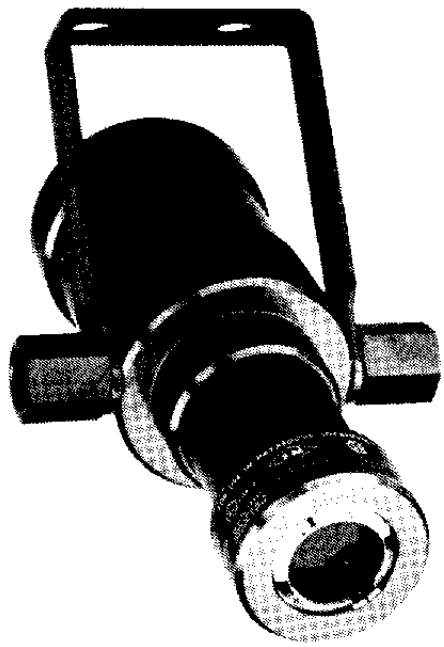


Figure 1—Basic U7600 Detector.

*Oi is Detector Electronics' Trademark for its patented Optical Integrity Systems. U.S. Patent 3,952,196, United Kingdom Patent 1,534,969, Canadian Patent 1,059,598 (1979).

Typical applications for the Det-Tronics ultraviolet fire detection system are:

- Wherever highly combustible materials are involved
- Where there is a need for highly reliable and 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
—Hydrogen fires in ammonia production and refinery re-formers

Solid Materials
—Munitions production such as illuminating flare material, TNT, black powder and other propellants
—Electrostatic powder coating booths

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

FEATURES

- Fast response - Typical response to an intense ultraviolet source is less than 25 milliseconds. Systems are available for applications where response times of less than 10 milliseconds are needed. Write for additional information.
- Insensitive to solar radiation and normal artificial lighting.
- Wide range of input voltages and frequencies available for applications worldwide, including optional 12 volt and 24 volt d.c.
- Will operate under adverse weather conditions such as wind, rain, snow and extremes of temperature.
- Detector includes built-in swivel bracket for ease of installation and positioning.
- Detector enclosure is available in anodized copper-free aluminum, nickel-plated brass, or stainless steel.
- Sensor tube module is shock and vibration mounted to meet industrial applications.
- Low power consumption. Typically 0.5 watt in standby condition and a maximum of 4 watts required during actuation.
- Worldwide distribution and service.

OPTIONS

– **Oi** - optical integrity feature provides monitoring of circuitry and optical surfaces from a remote location.

– Two relays - may be Instant and Timed relays or Power Monitor and Timed relays.

– Power Monitor - Continuously checks the electronic module and gives an alarm if there is a failure.

– Light Emitting Diode (LED) to indicate Detector actuation.

SYSTEM DESCRIPTION

The basic Det-Tronics UV fire detection system consists of a UV sensor and controller housed in an explosion-proof, corrosion resistant enclosure, incorporating all electronic switching components. It contains one relay for controlling an external load.

Oi - Optical Integrity

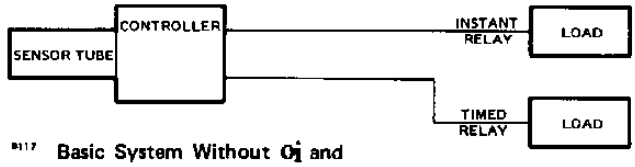
The patented Optical Integrity feature, known as the "**Oi**" feature, was developed and patented by Detector Electronics. It provides a single means of assuring that the fire detection system is operational and ready to respond to fire or explosion, by checking the detector's optical surfaces as well as the associated electrical circuitry in the controller, to provide early warning of system faults so corrective maintenance can be performed.

To make use of the **Oi** feature, a separate bypass switch, mounted remotely from the detector, is required. We recommend use of a remote test station such as the W5005 Test Station or the W5006 Explosion-Proof Housing Test Station for monitoring of the detectors and the electronic circuitry.

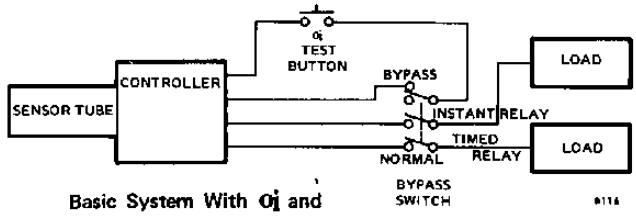
See Figure 2 for block diagram of basic systems with timed relay and power monitor relay.

If the system selected does not use the **Oi** feature, a W866 Portable Test Lamp (explosion-proof) for manual supervision of the system is available.

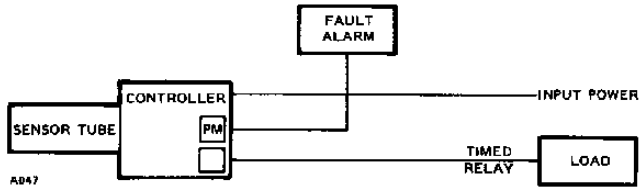
Each detector, with or without the **Oi** feature, should be tested on a schedule established by the user. See "Periodic Checkout Procedure" section.



Basic System Without Oi and Optional Instant Relay



Basic System With Oi and Optional Instant Relay



Basic System With Optional Power Monitor Relay

Figure 2—Block Diagrams.

Controller

The controller section contains all the electronic circuitry for converting signals from the UV sensor unit to actuate the relay that may be used to control a fire alarm or fire protection equipment. The standard U7600 unit has one timed delay relay, field adjustable from 0 to 30 seconds.

NOTE

When using the standard U7600 without power monitor, the W5005 or W5006 station should be used to provide supervision of the high voltage circuitry.

The controller may also be furnished with two relay options to provide flexibility in various applications.

First option - An instant relay and a timed delay relay, which is adjustable from 0 to 30 seconds. The instant relay provides instant response to a fire and the time delay relay actuates when the detector "sees" UV for the duration of the time delay selected.

Second option - Power monitor relay and timed delay relay. The power monitor circuit monitors the electronics of the controller and de-energizes the power monitor fault relay if there is a failure. The timed relay activates when the detector "sees" UV for the duration of the time delay selected.

UV Sensor Tube

The UV sensor tube responds to ultraviolet radiation. When UV strikes the sensor tube, a signal is sent to the controller.

If the UV sensitivity setting of the controller is exceeded, an output circuit is actuated.

SPECIFICATIONS

ELECTRICAL RATINGS–

Input Voltages - 120 vac, 50/60 Hz
220/240 vac, 50/60 Hz

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

12 vdc (tolerance is 10.5 to 16.0 vdc peak repetitive voltage.)

24 vdc (tolerance is 18.0 to 38.0 vdc peak repetitive voltage.)

Tolerance on dc models is absolute maximum peak repetitive voltage.

Power Consumption: Standby condition typically 0.5 watt, ac or dc. Maximum required during actuation is 4 watts.

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

Optional Power Monitor Relay Contact Rating:
0.5 ampere at 120 volts ac
1 ampere at 24 volts dc

SPECTRAL SENSITIVITY RANGE–

The Det-Tronics UV detector responds to ultraviolet radiation in a range of 1850 to 2450 Angstroms. Detectors are insensitive to direct or reflected sunlight and to normal artificial lighting. (See "Theory of Operation" for special radiation applications.)

CONTROLLER SENSITIVITY–

Controller sensitivity is not field adjustable. Detectors may be ordered with counts per second (cps) of 10, 25, 50 or 100, such that a reference flame (consisting of a gasoline fire generated from a one-square foot surface) can be detected at distances ranging from less than 15 feet (5 meters) to greater than 45 feet (14 meters). (See "Theory of Operation" section for explanation of count rate.)

TEMPERATURE RATING–

Operating: -40 to +70°C (-40 to +158°F)
Storage: -55 to +77°C (-67 to +170°F)

DIMENSIONS–

Refer to Figure 3.

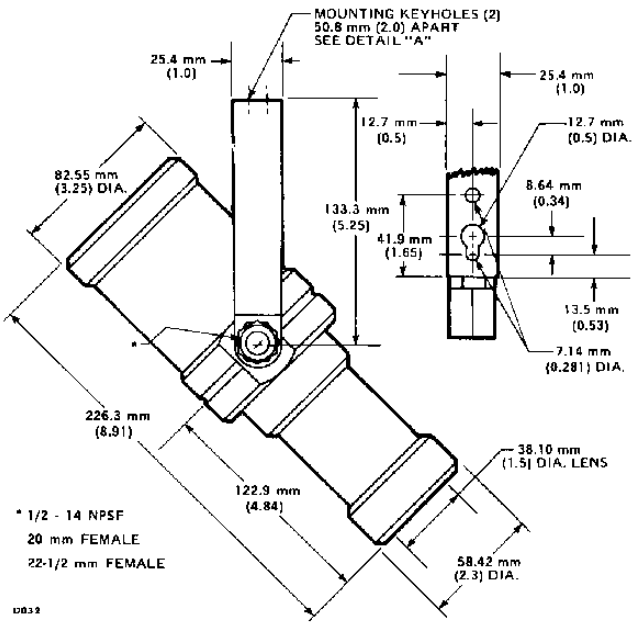


Figure 3–U7600 Dimensions.

SHIPPING WEIGHT–

4-1/2 pounds (aluminum housing) 2 kilograms
7 pounds (brass or stainless steel housing) 3.15 kilograms.

CONE OF VISION–

The detector has a nominal 80 degree cone of vision, with the highest sensitivity lying along its central axis, as shown in Figure 4. This drawing provides a composite view of the cone of vision and relative response for different controller sensitivity settings.

These detector output response curves can be directly related to distance as shown in the chart of gasoline reference fires, Figure 7. For proper coverage of a hazardous area, both viewing distance and cone of vision must be considered along with other factors, when selecting a detector location and sensitivity setting. Note that UV radiation from a fire increases as the fire grows. Therefore, a small fire may emit radiation below the detector system's sensitivity setting, but will produce system actuation when it grows larger.

ENCLOSURE RATING–

Watertight - Dust tight - designed to meet NEMA Standards for Type 4 enclosures. CSA certified Enclosure 4.
Hazardous locations - Factory Mutual (FM) approved for Class I, Groups A, B, C and D; Class II, Groups E, F and G. Canadian Standards Association (CSA) certified for Class I, Groups C and D; Class II, Groups E, F and G. British Approvals Service (BASEEFA) certified for Group IIc (Hydrogen).

WIRING REQUIREMENTS–

Three wires are necessary to power all ac powered detectors. These wires must meet local electrical codes and should not be smaller than 18 gauge with a 600 volt insulation rating minimum. DC models only require two power wires. See Figure 8. The three relay connections should be made with wire that is capable of handling the power load from the fire alarm system and the fire protection equipment up to the contact rating of the relays.

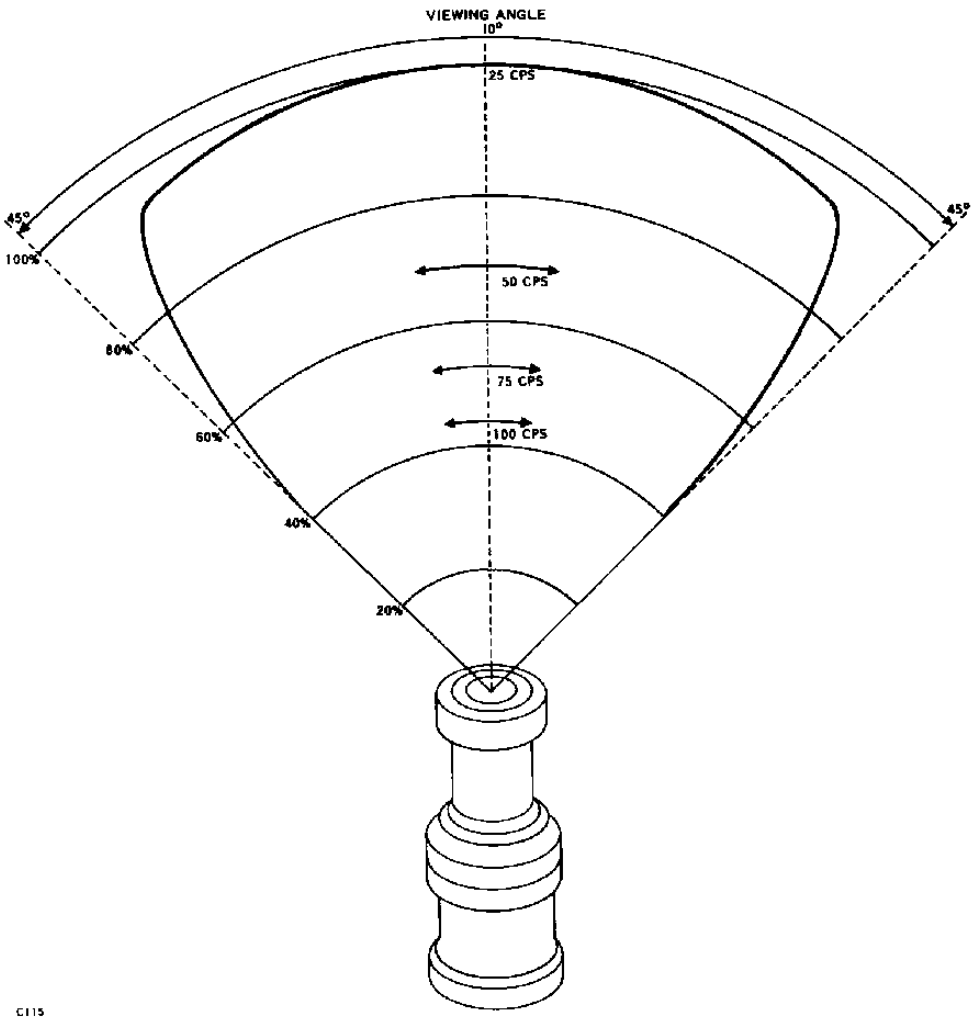


Figure 4–UV Fire Detector Cone of Vision.

DESCRIPTION OF OPERATION

Basic Detection System Applications

When a detecting unit "sees" an amount of ultraviolet radiation greater than the sensitivity setting of the controller (factory pre-set), a relay is energized after a predetermined (field adjustable) time delay. The relay may be wired to alarm, extinguishing equipment, or other types of equipment. See Figure 5 for basic system.

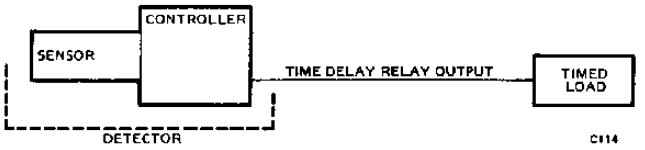


Figure 5—Basic U7600 Detection System.

Actuation Source Light (Option)

All U7600 Detectors are available with an optional LED actuation source light that is used to indicate which sensor detected a fire. The LED comes on when the sensor "sees" a fire and will remain on until the sensor is de-energized for five seconds during "reset." When an LED is turned on it may be seen by looking through the quartz window.

THEORY OF OPERATION

General Information

In applying any type of sensing device as a fire detector, it is important to know those things 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 will provide very fast response to the presence of ultraviolet radiation from a flame. In addition, it is the only type of sensor that is not affected by sun, wind, high humidity, snow, extremes of temperature, extremes of pressure or normal artificial lighting. The Det-Tronics UV Detector is "solar blind" because it does not react to UV radiation with wavelengths above 2450 angstroms.

Considering the above, it can be seen that there are fire detection applications where only ultraviolet sensors would be 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 an intense source of ultraviolet radiation, and care must be taken to ensure that arc welding is not performed in protected areas without securing the detectors.

Lightning is also an intense source of UV, but normally is of very short duration. For outdoor applications, the extinguishing equipment should be connected to a time delayed relay with at least a 2 second delay. In addition, UV detectors should not be positioned so that their cone of vision coincides with the horizon, rather, they should be directed down or over the protected area.

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 physical obstructions out of the line of view, and additionally for an ultraviolet detector, ultraviolet absorbing gases or vapors must not be allowed to accumulate 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, ultraviolet detectors should not be used alone.

It must be noted that malfunctions can occur in any type of electronic or mechanical 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 be perfect. The highest reliability with regard to response to a fire is achieved when a hazardous area is supervised by more than one detector, and each detector can independently register an alarm.

Detector

The Det-Tronics Ultraviolet Fire Detector uses a Geiger-Mueller type sensor tube designed to respond to UV radiation over a wavelength of 1850 to 2450 Angstrom units. (10,000 Angstroms = 1 micron = 0.001 millimeter.)

Figure 6 illustrates the sensor tube's range of sensitivity, and compares this range to other forms of radiation. Note the UV radiation from the sun reaching the earth does not extend into the detector's region of sensitivity. In addition, radiation from the outer envelope of normal artificial lighting, such as fluorescent, mercury-vapor and incandescent lamps does not extend into the detector's spectral range. As a result, the tube is insensitive to these forms of radiation. Because of these factors, the detector may be used outdoors in direct sunlight, or it may be used in areas of normal artificial lighting.

The closer the sensor is to a fire, the smaller the flame needed to actuate the system. Figure 7 shows the relation between counts per second (cps) and distance. 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 sensor tube to generate 20 cps. The same fire at 40 feet (12 meters) will generate about 50 cps. Another example would be if a 2 ft^2 (0.18 m^2) fire at 20 feet (6 meters) generated 100 cps, it would generate 8 cps at 70 feet (21 meters). Because of the complexity of the

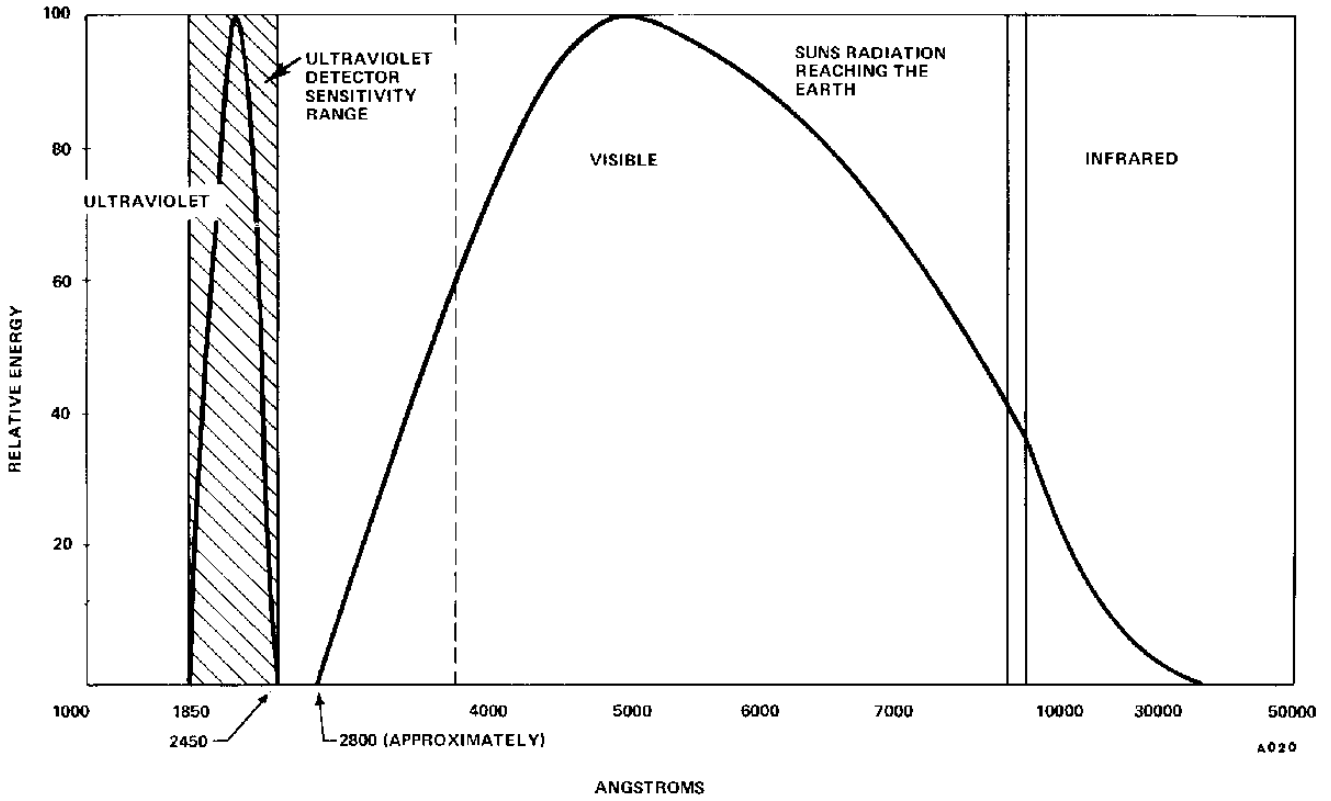


Figure 6—UV Detector's Range of Sensitivity in Reference to Other Forms of Radiation.

combustion process, the UV 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 tube count rate is increased by approximately 60 percent.

Selection of controller sensitivity and the time delay to be used in a given application is dependent on the level of hazard present and the action to be taken in event of a fire. The sensitivity and time delay features of the U7600 Detector/Controller system allow it to meet the requirements of virtually any application. (For time delay adjustment information, see the INSTALLATION section of this manual.)

CAUTIONS

As previously stated, all UV detectors are sensitive to welding, and if this type of interference can be expected, it must be controlled through proper application. Successful application techniques include careful positioning or shielding of the detectors and using a controller with a low sensitivity (high count) setting. Also, lightning is a source of intense UV radiation of short duration and for outdoor applications, extinguishing equipment should be connected to a time delay relay with at least a 2 second delay.

Since the UV sensor of this device is a Geiger-Mueller type, it will respond to any radiation which can penetrate the tube 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 tube will produce a count. If the X-ray or gamma ray flux is sufficient to produce a count rate higher than the detection system sensitivity setting, a fire alarm will occur. Data on sensitivity of the detector to various radiation intensities is impossible to relate to a typical detector exposure due to the many variables which are needed to specify any given exposure. The normal precaution against false actuation due to X-ray or gamma ray 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 this is done since the protected area will then not be covered.

Controller - Electronic Package

The standard U7600 Controller contains one independent relay. The relay is energized if the detector signal exceeds the pre-set count level for a pre-set time. This time delay is field adjustable over the range of 0 to 30 seconds.

The controller circuitry is contained on four interconnected circuit boards. The functions of these boards are as follows:

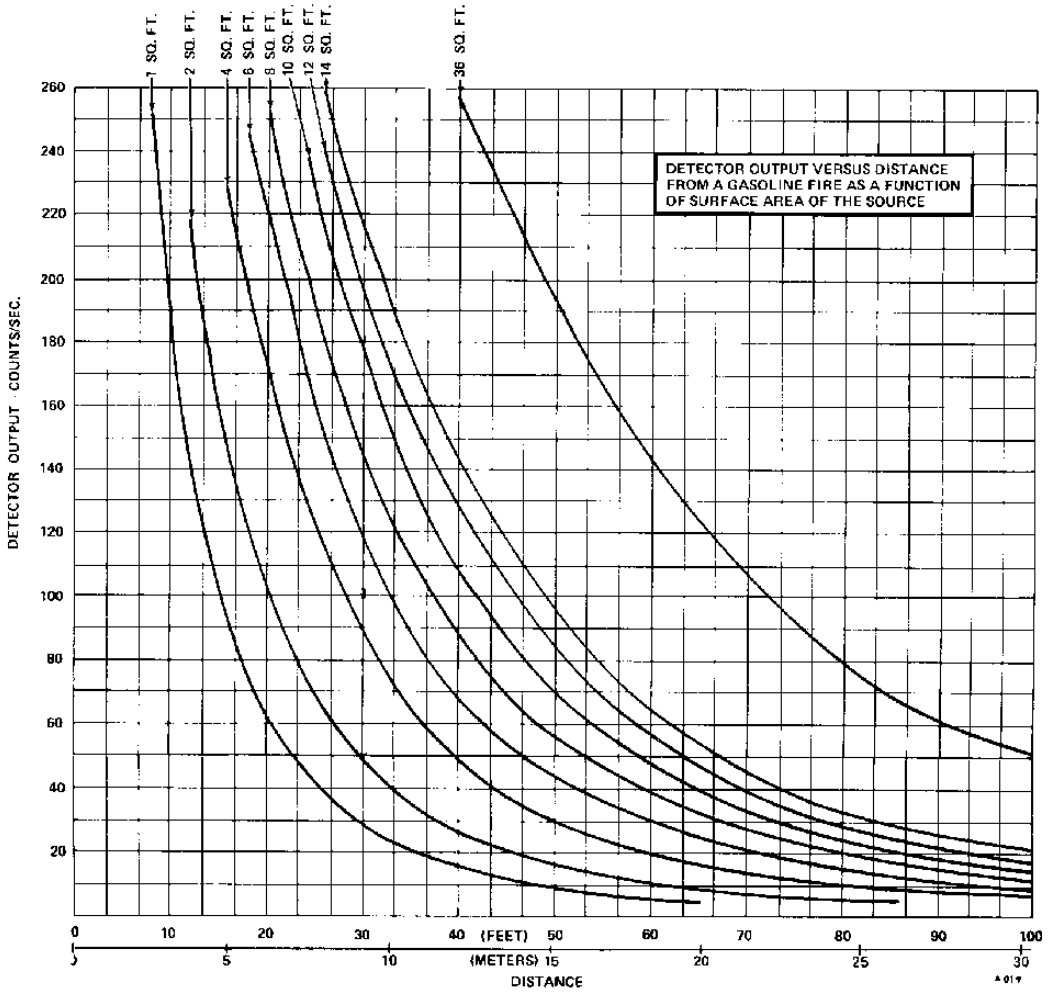


Figure 7—Sensitivity to a Gasoline Reference Fire.

Power Source Circuit Board

1. Transformer circuit board with module interconnecting plug is used for a.c. models.
2. DC regulator circuit board with module interconnecting plug is used for dc models.

Relay Circuit Board

This board contains the optional instantaneous relay (K1) and timed relay (K2), relay terminal block (TB3), and a bridge rectifier and filter capacitor for the ac models. If the U7600 has an optional power monitor, this board provides a timed relay (K2) and a power monitor relay (K3).

High Voltage Power Supply Board

This board provides circuitry to generate +290 Vdc for the sensor tube module.

Signal Processing Circuit Board

This board provides the following:

- A +8 volt dc power supply
- Pulse shaping and amplifier circuit used to process the pulse generated by the UV detector module
- Integrating capacitor and comparator circuitry that determines the threshold level for triggering the Instantaneous and/or Timed Relay drive circuits
- Instantaneous Relay drive circuit
- Adjustable time delay and Timed Relay drive circuit
- LED drive circuit monitors when the instant relay actuates and turns on the LED.

INSTALLATION

Detector Positioning and Density

General

As previously stated, the Det-Tronics U7600 Detector has a nominal 80° cone of vision. What this means in practical terms is understood by reference to a typical installation: Consider an installation such as a gasoline loading rack having a height of 20 feet (6 meters) and assume it is desired to have complete detector coverage at a level 10 feet (3 meters) above ground. If a detector is mounted at the top and pointed down, the distance from the detector to the designated level would be 10 feet (3 meters). Because of the nominal 80° cone of vision, the detector covers a circular area having a diameter of approximately 17 feet (5 meters). A simple layout of the area to be covered will show the number of detectors required to completely supervise the designated area.

CAUTION

Detectors should be pointed down to avoid the possibility of "receiving" spurious radiation caused by distant arc welding or lightning. In general, detectors should be placed as close as practical to the probable hazard. Det-Tronics systems may be ordered factory set at various sensitivity levels so they respond at a pre-determined detector tube count rate. This count rate is dependent upon the intensity of ultraviolet radiation reaching the detector, which is a function of fuel, flame size and distance from the detector. Selecting a low count rate setting results in high system sensitivity. Conversely, selecting a high count rate results in low sensitivity.

A 25 count per second setting is normal for most indoor and outdoor applications. For most outdoor applications a minimum time delay of 2 seconds is required. However, 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 practical for the application involved without introducing undue risk of not "seeing" an actual fire. Referring to Figure 7 and considering the conditions described above, the criteria for selecting a correct system sensitivity adjustment can be established.

The curves of Figure 7 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. For example, jet fuel radiates approximately 85 percent as much ultraviolet as gasoline. Fires involving nitrocellulose, black powder or other propellants have a much higher ultraviolet content than gasoline, which makes possible immediate detection of relatively small fires involving these substances. Information regarding UV emission level of other materials may be obtained from Detector Electronics Corporation (Det-Tronics).

Detector Mounting and Wiring

The U7600 may be mounted in any position (see Figure 3 for mounting and the caution statement under INSTALLATION for advice on aiming). However, care must be taken so that dirt or other foreign material will not accumulate and obscure the quartz window. In addition, a buildup of some types of contamination, e.g. petroleum film, on the detector quartz window surface will absorb ultraviolet radiation and seriously reduce the amount of UV getting through to the detector tube. When the film buildup is thick enough, the detector is effectively "blind." Note that a film layer great enough to "blind" the detector, can be virtually undetectable to the human eye. The Automatic Optical Integrity (AOI) system was designed to provide a fault indication when approximately 50 percent of the sensitivity is lost.

When the detectors are mounted in outdoor locations, or locations with high humidity, all electrical connections must be made through electrical conduit with explosion-proof drains and breathers. This type of installation will automatically bleed off water accumulation in the conduit and prevent damage to the equipment. All wiring must comply with local codes, regulations, and ordinances.

See Figures 8 and 9 for diagrams of internal wiring used in different models. These diagrams are also in the controller housing. The following steps should be used for mounting and wiring the detector.

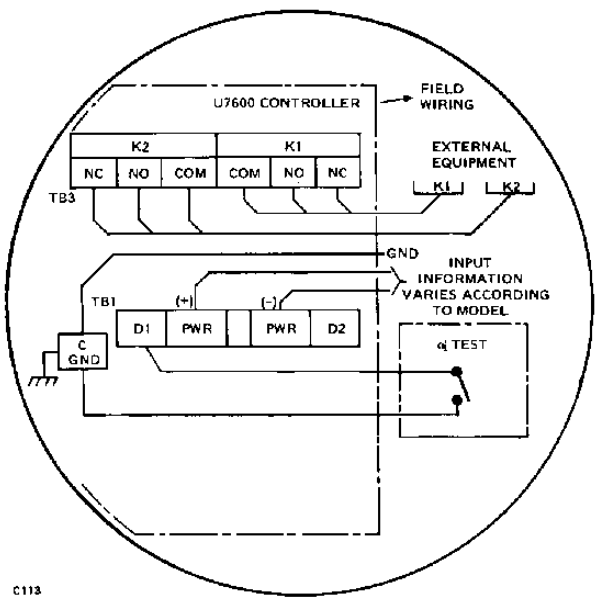


Figure 8—U7600 Internal Wiring Diagram.

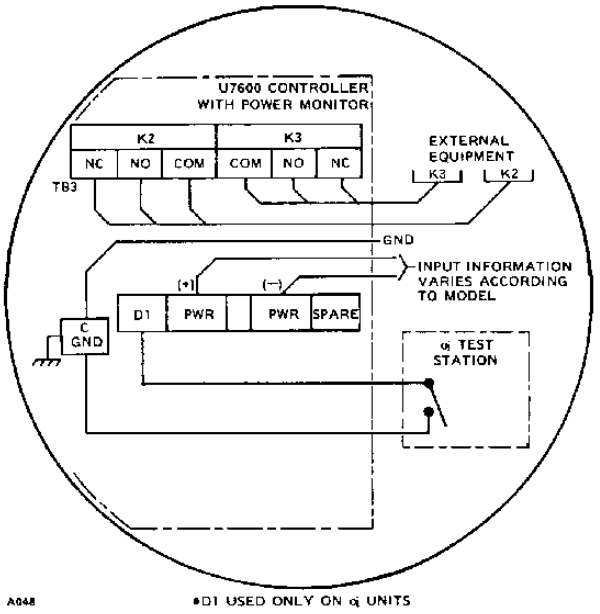


Figure 9—U7600 Internal Wiring Diagram Showing K2 - K3 Timed - Power Monitor Relays.

1. Mount detector on a surface that will not collapse or be damaged when 1/4 inch (no. 6 m) self-tapping screws with a length of at least 1 inch (25.0 mm) are screwed into it. Be sure the location of the mounting bracket allows the detector to be positioned to cover the area to be protected.

2. Remove sensor tube housing (see Figure 10).

3. Remove controller housing.

4. Remove controller module by loosening, but not removing, the four mounting screws and carefully lift it away from the cable connector.

5. Install power cable through open nipple on side of bulkhead and connect to power terminal strip, observing polarity. The ground lead (green lead) is connected to the ground screw. See Figures 8 and 9 for location.

6. Install leads from the "oi" test station to D1 on the power terminal strip and terminal GND on the controller module side of the bulkhead.

7. Install power cables from external fire protection equipment through the open nipple, forming leads away from power terminal strip and between mounting bracket for controller module.

8. Re-install controller module and tighten the four mounting screws.

9. Install power connections from external equipment to appropriate terminals on terminal strip on the side of the controller module. See Figures 8 and 9.

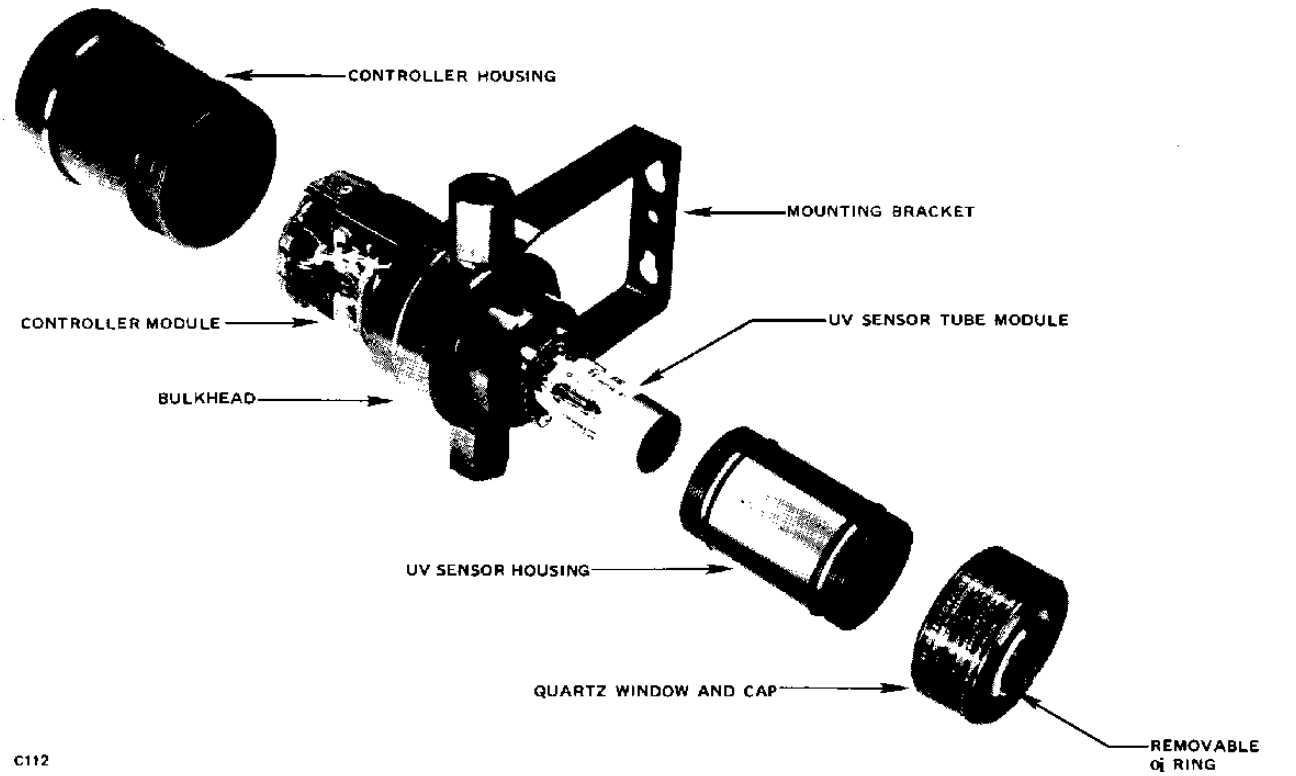


Figure 10—U7600 Detector Assembly.

10. Remove sensor tube module from carton, **cut jumper "J"** and install with four screws furnished. Observe index pin when installing. **JUMPER "J" MUST BE CUT!**

11. Re-install sensor tube housing.

12. Re-install controller housing.

TYPICAL SYSTEMS APPLICATIONS

The following typical applications showing both block diagram and simple wiring diagram are examples only.

Installation 1 - Normally Energized Load

The Normally Closed (NC) contacts of the relay in the detector are used to keep a load energized until the detector "sees" UV. The load could be an electrically operated valve, pump, etc. When the detector "sees" a fire, the relay is energized, opening the NC contacts so the load is de-energized. This application allows the user to tie many detectors in series, and if one detector "sees" a fire the load is de-energized. The bypass switch at the test station allows testing the detectors without de-energizing the load. See Figure 11 for block diagram and Figure 12 for typical wiring diagram.

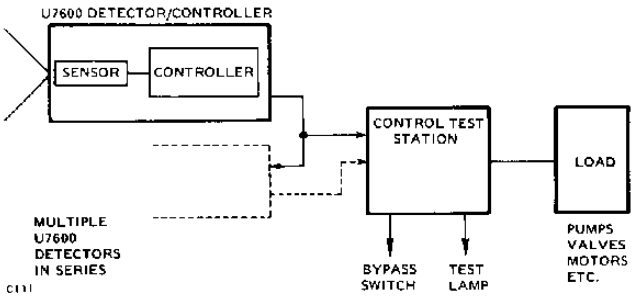


Figure 11—Block Diagram - Normally Energized Load.

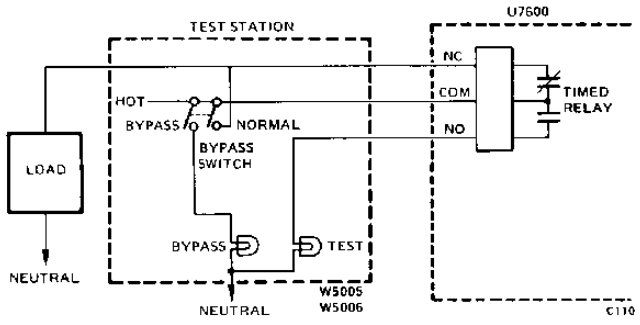


Figure 12—Typical Wiring Diagram - Normally Energized Load.

Installation 2 - Normally De-energized Load

The Normally Open (NO) contacts of the relay in the detector are used to energize the load when the detector "sees" a fire. The load could be alarm systems, bells, fire-fighting equipment, etc. When the detector "sees" a fire, the relay is energized, closing the NO contacts so that the load is energized. This application allows the user to tie many detectors in parallel and any detector can energize the load. The bypass switch at the control station allows testing the detector(s) without energizing the load. See Figure 13 for block diagram and Figure 14 for typical wiring diagram.

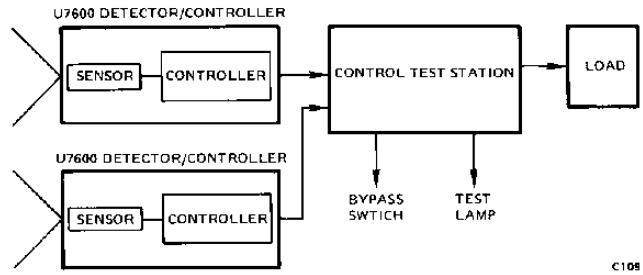


Figure 13—Block Diagram - Normally De-energized Load.

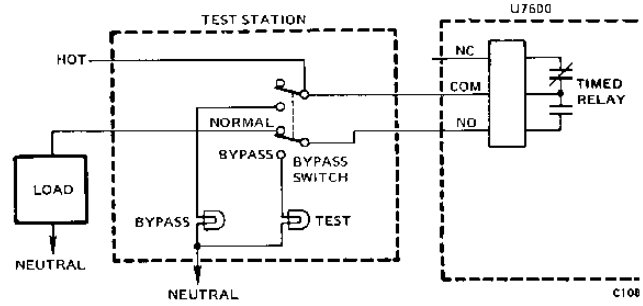


Figure 14—Typical Wiring Diagram - Normally De-energized Load.

Installation 3 - Two U7600 Detector/Controllers Used with W5005A/W5006A Test Station and Power Monitor

The installation diagram of Figure 15 shows both the U7600 instant and timed relays operating their respective loads from the Normally Open (NO) contacts. The Normally Closed (NC) contacts are available for other applications. When either U7600 "sees" sufficient UV, the instant relay energizes, closing the NO contacts to activate an external alarm. After the U7600 "sees" sufficient UV for a predetermined amount of time, the timed relay energizes closing the NO contacts to activate external fire protection equipment. The power monitor in the W5005/W5006 Test Station continuously monitors both U7600's for an electronic failure. If a failure occurs in either U7600, the power monitor relay in the Test Station de-energizes, turning on an external "fault" alarm. A bypass switch at the W5005/W5006 Test Station allows testing both U7600's without energizing the external loads. See Figure 16 for wiring diagram for the W5005/W5006.

W5005/W5006 Test Station (Optional)

The W5005 Test Station is for use in normal, non-hazardous locations. The W5006 Test Station is for use in Class I Group D, Class II Groups E, F and G hazardous locations and uses the same internal connections as shown in the diagram of connections for the W5005A. Write for further information if this type installation is required.

The test station provides a means for checking U7600 Detector/Controller without energizing external loads. It also provides a power monitor circuit that monitors the high voltage in the U7600 Controllers. The test station may be used with any model of U7600 with or without the oi feature.

NOTE

When using a U7600A (without oi) with the W5005 or W5006 Test Station, the TEST switches on the test station do not have any effect. The TEST switch is only for use with the U7600B model (with oi).

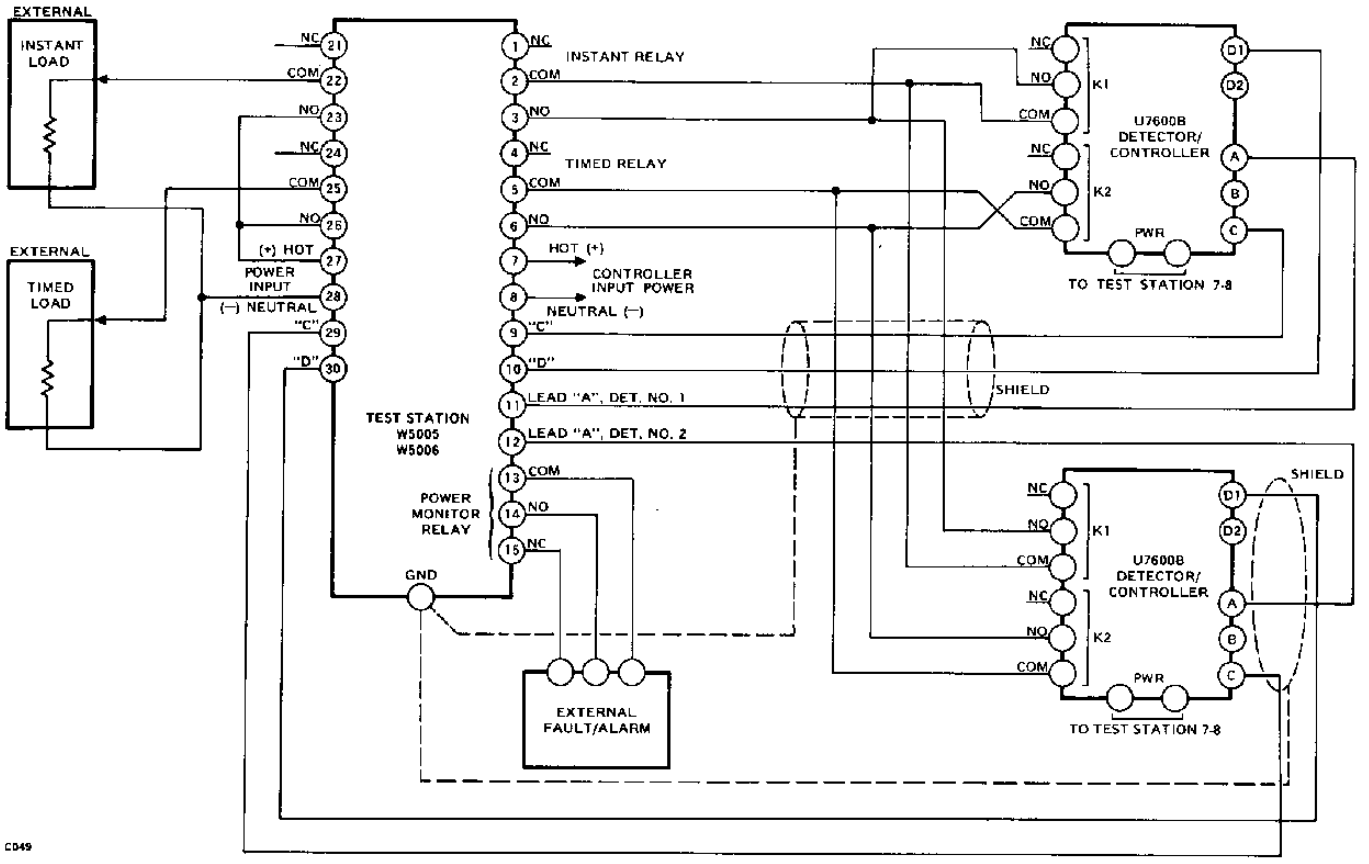


Figure 15—Normally Unenergized Load Circuit in the U7600 Detector/Controllers, Either U7600 May Activate the Loads.

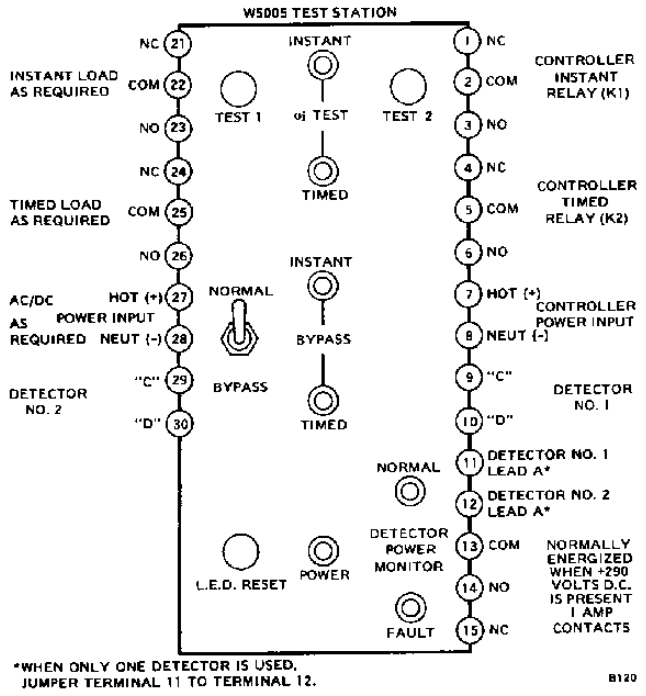


Figure 16—W5005 Test Station.

To Operate - without oi

1. Put NORMAL/BYPASS switch in BYPASS position.

2. INSTANT and TIMED lamps in the middle of control station marked BYPASS turn on, indicating test station and U7600 are in BYPASS. If both lamps do not turn on it indicates a failure in one of the coils of the relays in the test station. **Perform no more tests** until the defective relay is replaced.

3. Turn on the W866 Test Lamp (available as an option) and aim into quartz window of first detector. (The UV output from the W866 represents a one square foot flame of gasoline.) The distance from the detector to the W866 Test Lamp is originally recorded on the test form on the inside of the back cover during the Startup Procedure. Instant lamp at top of the test station lights and timed lamp lights after the delay has passed.

4. Turn off the W866 Test Lamp. Optional LED in U7600 stays on. Test lamps go out. Push RESET switch for five seconds to turn off optional LED.

5. Turn on the W866 Test Lamp and aim into the quartz window from proper distance for second detector and repeat steps 3 and 4.

6. Return BYPASS switch to normal position after LED lights for the two relays have gone out to prevent false activation.

When operating the test station using a U7600B with oi, the switches on the test station are used to test each detector.

To Operate - With oi

1. Put NORMAL/BYPASS switch in BYPASS position.

2. INSTANT and TIMED lamps in the middle of the control station marked BYPASS turn on. If both lamps do not turn on it indicates a failure in the coil of one of the relays in the control station. **Perform no more tests** until the defective relay is replaced.

3. Push test switch No. 1 - the INSTANT lamp at the top of the test station comes on, and after the time delay passes, the TIMED lamp comes on.

4. Release test switch No. 1, turning off the INSTANT and TIMED test lamps.

5. If two detectors are used, push test switch No. 2 and repeat step No. 3.

6. Release the test switch.

7. Push LED RESET switch for 5 seconds turning off the LED in the U7600.

8. Put NORMAL/BYPASS switch in NORMAL position after LED lamps for the two relays have gone out to prevent false actuation.

STARTUP PROCEDURE WITHOUT TEST STATION

The following startup procedure should be performed immediately after installation of the equipment is completed. It should be performed by authorized personnel only.

1. Disable actuation systems.

2. Turn on the input power to the U7600.

3. From maximum distance, turn on the W866 Test Lamp and sine into the window of the U7600.

4. The relay(s) in the U7600 energize. If the relay(s) does not energize, move closer until relay(s) energizes. Record distance on test form inside the back cover.

5. Optional LED in the U7600 turns on indicating unit "sees" UV.

6. Turn off the W866 Test Lamp.

7. The relay(s) in the U7600 de-energize.

8. If optional LED is used, turn off input power for 5 seconds to turn off LED.

9. If detector fails to pass the test, refer to the Troubleshooting section of this manual.

10. When all detectors have been checked for normal operation, they should be checked to see if they adequately cover the protected areas for complete fire protection.

11. Move to a position at the maximum distance from each detector.

12. Turn on the W866 UV Test Lamp and shine towards quartz window of each detector.

13. If the detector has the optional LED, it comes on if the detector is sensitive enough at that distance. If the LED does not come on, move toward the detector with the test lamp turned on until the LED lights. Record these distances for future checking of sensitivity. See back cover for recommended test form for recording information. If the detector does not have the optional LED, it is necessary to have someone listen for the relay contacts closing or temporarily wiring a bell across the contacts.

14. Activate the fire protection system at the completion of the Startup Procedure.

NOTE

It is the responsibility of the authorized personnel to see that the fire protection equipment is de-energized while all tests are performed and that the equipment is activated at the end of testing.

STARTUP PROCEDURE WITH TEST STATION

1. Put NORMAL/BYPASS switch in BYPASS position.

2. Turn on input power to test station and U7600.

3. BYPASS lamps in middle of test station light (even if only one relay in U7600). NORMAL lamp lights. If the NORMAL lamp does not light and the FAULT lamp lights, there is a failure in the U7600. See Troubleshooting section for corrective action.

4. Turn on the W866 Test Lamp and shine into the window of the U7600.

5. The relay(s) in the U7600 energize.

6. If the U7600 has only one relay, the TIMED lamp at the test station lights. If two relays, the INSTANT lamp lights and after the delay, the TIMED lamp lights.

7. Optional LED in the U7600 turns on indicating unit has seen UV.

8. Turn off the W866 Test Lamp.

9. Test lamp(s) on test station turns off.

10. The relay(s) in the U7600 de-energize.

11. If the U7600 has optional LED, push LED RESET button for 5 seconds to turn it off.

12. If a detector fails to pass the test, refer to the Troubleshooting section of this manual.

13. When the detector has been checked for normal operation, it should be checked to see if they adequately cover the protected area for complete fire protection.

14. Move to a position at the maximum distance from each detector.

15. Turn on the W866 UV Test Lamp and shine towards the quartz window of each detector.

16. If the detector has the optional LED, it comes on at the same time the INSTANT lamp at the test station comes on. If only one relay in the U7600, the TIMED lamp at the test station comes on only after the timed delay passes. If the LED in the U7600 does not come on, move toward the detector with the test lamp turned on until the LED lights. Record these distances for future checking of sensitivity. See back cover for recommended test form for recording information.

17. Turn off the W866 Test Lamp.

18. Test lamps at top of the test station go out.

19. After test lamps go out, put NORMAL/BYPASS switch to NORMAL position. BYPASS lamps in middle of test station go out.

NOTE

It is the responsibility of the authorized personnel to see that the fire protection equipment is de-energized while all tests are performed and activating the equipment at the end of the performed testing.

Adjusting the Time Delay Relay

All U7600 time delay relays are factory set for 5 seconds. If it is desired to change the setting of the relay, perform the following steps:

NOTE

Adjusting the relay in a hazardous location requires removal of input power before removing controller

housing and re-installation of housing before applying input power to check new setting.

1. Disarm the alarm and fire protection equipment.

2. If used with W5005 Test Station and with **oi** feature, put BYPASS switch in BYPASS position and push **oi** test switch.

   Without **oi** feature, use W866 UV Test Lamp and shine into the quartz window of the detector.

3. If the U7600 has optional LED, it comes on immediately. If the W5005 Test Station is used and the U7600 has both the Instant and Timed relay, the Instnat lamp at the W5005 comes on.

4. Begin timing of the timed delay relay. Original delay setting should be approximately 5 seconds. Listen for "click" of the relay being energized at the U7600 or observe the lamp at the top of the test station.

5. Turn off the W866 UV Test Lamp or release the **oi** test switch.

6. Remove input power.

7. Remove controller housing (see Figure 10).

8. To reduce the time delay, turn adjustment control shown in Figure 18 counterclockwise (CCW). Small adjustments (approximately 1/4 turn) will make significant changes in the time setting (approximately 1 to 2 seconds).

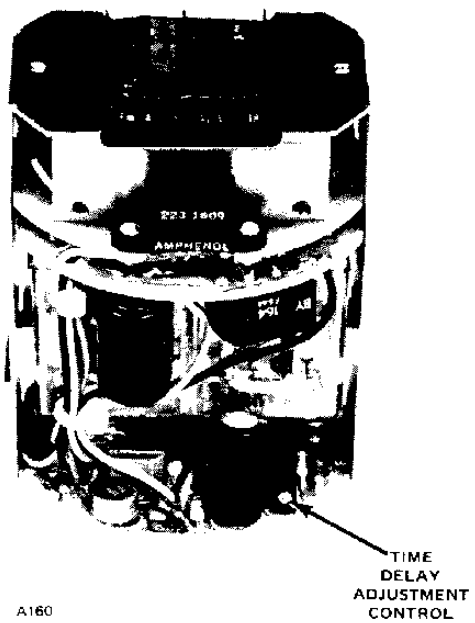


Figure 17—Location of the U7600 Time Delay Adjustment.

9. To increase the time, turn adjustment control clockwise (CW). (If in a hazardous location, proceed to step 12.)

10. Apply input power.

11. Repeat steps 2 through 5 for new control setting.

12. Re-install controller housing.

13. Repeat steps 2 through 5 for new control setting.

14. Re-arm the alarm and fire protection equipment.

PERIODIC CHECKOUT PROCEDURE

A periodic system checkup should be scheduled to ensure the system is operating properly. The period between checkups depends on the potential hazard and environmental conditions encountered. Frequent checkups increase the dependability of the system.

To check detectors for contamination of the UV sensor and quartz window and electronics in the controller requires a means of disarming or disconnecting the alarm and fire protection equipment while a test is made. The simplest method would be a remote switch that disconnects the alarm and fire protection equipment from the detector. See Figure 2 for block diagram. Other methods are shown in the Typical Application section. We recommend use of our W5005 or W5006 Test Stations which have been specifically designed for this application.

To test the detectors, two methods are available. For detectors having the **oi** feature, a tiny ultraviolet test lamp inside the detector, screened by an optical shield, emits UV rays through the quartz window to a reflector ring, and back through the quartz window to the UV sensor tube. For detectors not having the **oi** feature, use of the (optional) Det-Tronics W866 UV Test Lamp is recommended. Turn on the test lamp and aim into the quartz window of each detector so the UV radiation from the test lamp is "seen" by the UV sensor tube. Controller response indicates a clean quartz window and sensor tube and all electronic circuits are operational. Lack of response indicates sensitivity is reduced due to contamination on the quartz window, defective UV sensor tube module, or electronic circuit problems. See Troubleshooting section for procedure for isolating the trouble.

TROUBLESHOOTING

Check steps 1 through 7 **before** disassembly of the unit.

1. Inspect each quartz window and **oi** reflector ring for dirt, oil film, or other forms of contamination. The U7600B has a removable **oi** ring. It is easily removed by depressing one of the ears that project and gently

pulling outward. This facilitates cleaning of both the Oi ring and all surfaces of the window. Clean the ring and window with Det-Tronics window cleaner. (Order part no. 001680-01.) **Do not use commercial window cleaners** as they may leave a residue on the window and Oi ring.

NOTE

If the Oi ring is corroded or otherwise damaged, replace with a new Oi ring. Order part number 001811-01.

2. Check input power to the detector. (If using W5005/W5006, check power lamp.)

3. If using the W5005/W5006 Test Station place the NORMALY/BYPASS switch in the BYPASS position.

4. Turn on the W866 Test Lamp and hold close to the U7600 detector window.

5. Instant lamp on the W5005/W5006 comes on if the U7600 has the instant relay. Timed lamp comes on after the time delay. If no test station is used, listen to the U7600 for the relay click.

6. Turn off the W866 UV Test Lamp.

7. Instant and Timed lamps on the W5005/W5006 turn off. If lamps respond, proceed to step 20. If lamps do not respond, proceed to step 8.

8. Turn off input power.

9. Remove UV sensor tube housing of the U7600.

10. Remove four screws holding sensor tube module to the bulkhead.

11. Remove old sensor tube module and replace it with a new module. Re-insert four mounting screws and tighten. Be sure replacement module has the same model number or is a direct replacement type.

12. Replace UV sensor tube housing and repeat steps 3 through 7.

13. If lamps of the W5005/W5006 still do not respond, turn off input power and remove controller housing of the U7600.

14. Loosen four mounting screws holding controller module.

15. Slide defective controller module from bulkhead, disconnecting connector.

16. Install new controller module. Make sure the connector mates tightly into the bulkhead. Be sure the replacement module is the same part number as module being replaced.

17. Tighten four mounting screws holding controller module.

18. Re-install controller housing.

19. Turn on input power and repeat steps 3 through 7.

20. Place NORMAL/BYPASS switch of the W5005/W5006 in NORMAL position.

21. Push reset button on the W5005/W5006 to turn off FAULT LED display. Do not attempt to repair the UV sensor tube module or the controller module. Return all faulty components to the factory for repair.

After troubleshooting the detector, the complete Startup Procedure should be performed before returning the system to normal operation.

Do not attempt to repair the sensor tube module or the controller. Return all faulty components to the factory for repair.

ORDERING INFORMATION

When ordering specify:

model with Oi	U7600B
model without Oi	U7600A
input voltage	120 volts, 50/60 Hz 220/240 volts, 50/60 Hz 12 volts dc 24 volts dc
sensitivity	10 counts per second 25 counts per second 50 counts per second 100 counts per second
relays	one (timed relay only) two (instant and timed)
power monitor	one timed relay and one power monitor relay
housing material	copper-free red anodized aluminum nickel-plated brass 316 stainless steel

Options

W866 Explosion-Proof UV Portable Test Lamp

W5005 Test Station (General Purpose Housing)

W5006 Test Station (Explosion-Proof Housing)

Also available front insertion mounts for the U7600 with mounting flanges, quick-connect coupling and air shields for "dirty" applications.

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

Detector Electronics Corporation
Sales and Application Engineering
6901 West 110th Street
Minneapolis, Minnesota 55438 U.S.A.
Phone: 612/941-5665
Telex: 29-0562

RECOMMENDED SPARE PARTS

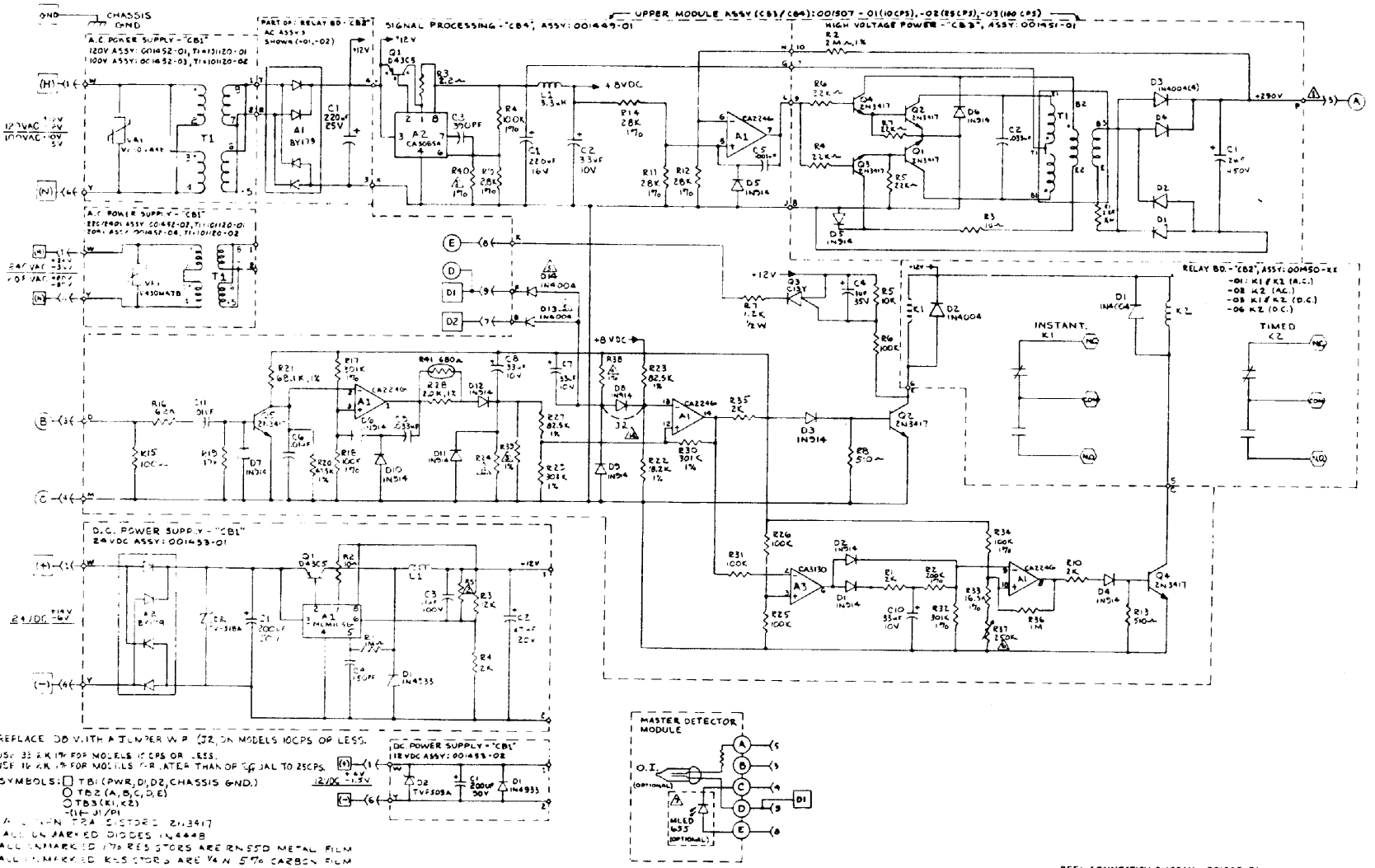
Description	Part No.	Used On	Qty.
Electronic controller plug-in package for U7600 (see OS* number for model part no.)		U7600 A	1
Electronic controller plug-in package for U7600B (see OS* number for model part no.)		U7600B	1
Sensor Tube Assembly			
without LED	DE1666C	U7600A	1
with LED	DE1666D	U7600A	1
without LED	DE1666A	U7600B	1
with LED	DE1666B	U7600B	1
Det-Tronics window cleaner	001680-01	U7600	
Removable O-ring	001811-01	U7600B	1

*OS = Ordering Specifications. Model OS number is stamped on one side of the controller module and the serial number on the opposite side.

DEVICE REPAIR

For devices or components in need of repair, contact your local source or return transportation prepaid to:

Detector Electronics Corporation
Return Goods Department
6901 West 110th Street
Minneapolis, Minnesota 55438 U.S.A.



⚠ REPLACE DIODE WITH A JUMPER WIRE FOR J2, ON MODELS 10CPS OR LESS.

⚠ USE 33.2K 1% FOR MODELS 10 CPS OR LESS.
USE 16.2K 1% FOR MODELS GREATER THAN OR EQUAL TO 25CPS.

12. SYMBOLS: □ TB1 (PWR, D1, D2, CHASSIS GND.)
○ TB2 (A, B, C, D, E)
○ TB3 (K1, K2)
-(1⊢ J1/P1

9. ALL UNMARKED TRANSISTORS 2N3417
10. ALL UNMARKED DIODES IN4448
9. ALL UNMARKED 1% RESISTORS ARE RN55D METAL FILM
5. ALL UNMARKED RESISTORS ARE ¼W 5% CARBON FILM
⚠ MLED 635 MOUNTS ON U.V. DETECTOR CYLINDER

⚠ ADJUST FOR PROPER TIMED DELAY (R37 ON "CB4")
⚠ REMOVE D3 "OR" DIODE 3 (CPS OR LESS.
⚠ GROSS SENSITIVITY ADJUSTMENT (R38 ON "CB4")
⚠ ADJUST FOR PROPER SENSITIVITY (R39 ON "CB4") ON MODELS ≥ 25 CPS.
⚠ ADD R5 ON "CB1", IF NEEDED, TO ADJUST FOR 12 ± 0.5 V (24 VDC MODEL ONLY)
⚠ SELECT VALUE OF R40 ON "CB4" FOR 290V ± 1.5V AT POINT "P" ON "CB3"

REF: CONNECTION DIAGRAM - 001482-01
LABEL, CONN. DIAGRAM - 001485-01

REVISIONS			
LTR	DATE	BY	
A	4-15-76	DLG	
B	5-21-76	DLG	
C	7-27-76	DLG	
D	8-19-76	DLG	
E	9-16-76	DLG	

DETECTOR ELECTRONICS CORP.
MPLS, MINN. 55435
SCHEMATIC, DETECTOR/CONTROLLER
UNITIZED - U7600 A (STD), B (05)
DRAWN D.G. 4-15-76
001478-01 REV E

SCHEMATIC, DETECT-TROLLER - U7600A, U7600B