

Instructions

95-8528

Protect•IR® Multispectrum IR Flame Detector
with Pulse Output
X3301



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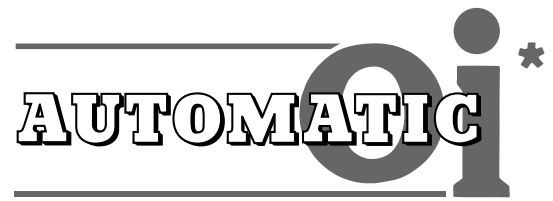
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Protect•IR®
Multispectrum IR Flame Detector
with Pulse Output
X3301

IMPORTANT

Be sure to read and understand the entire instruction manual before installing or operating the flame detection system.

ATTENTION

*The X3301 includes the Automatic Optical Integrity (oi) feature — a calibrated performance test that is automatically performed once per minute to verify complete detector operation capabilities. **No testing with an external test lamp is required.***

**DESCRIPTION**

The X3301 Protect•IR® with pulse/relay output is a multispectrum infrared (IR) flame detector that is designed for use in controller based systems. In addition to use in new systems, it can serve as a direct field replacement for Det-Tronics controller based flame detectors that generate a pulse output (not compatible with R7484 and R7409B/C).

When used as a field replacement, all operating features of the current controller are retained in addition to gaining the advanced features of the X3301 detector. In typical applications, the four wire X3301 can utilize all existing system wiring.

The X3301 contains three IR sensors and provides unsurpassed detection of flames from light to heavy hydrocarbon fuels combined with the highest degree of false alarm rejection.

The detector has Division and Zone explosion-proof ratings and is suitable for use in indoor and outdoor applications. The X3301 housing is available in copper-free aluminum or stainless steel, with NEMA 4X and IP66 rating.

*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.
X3301 technology advancements are covered under the following U.S. Patents: 5,995,008, 5,804,825 and 5,850,182.

OUTPUTS

Relays

The detector is furnished with fire and fault relays. The relays are rated 5 amperes at 30 VDC.

The Fire Alarm relay has redundant terminals and normally open / normally closed contacts, normally de-energized operation, and latching or non-latching operation.

The Fault relay has redundant terminals and normally open contacts, normally energized operation, and latching or non-latching operation.

NOTE

Relay latching/non-latching operation is selected using Detector Inspector™ Software.

LED

A tricolor LED on the detector faceplate indicates normal, fire alarm and fault conditions. Table 1 indicates the condition of the LED for each detector status.

OPTICAL INTEGRITY (Oi)

Automatic Oi

The X3301 includes the Automatic Optical Integrity (oi) feature — a calibrated performance test that is automatically performed once per minute to verify complete detector operation capabilities. No testing with an external test lamp is required. The detector automatically performs the same test that a maintenance person with a test lamp would perform — once every minute, 60 times per hour. A successful automatic oi test **does not** produce an alarm condition.

The Protect•IR signals a fault condition when less than 50% of the detection range remains, as determined by three consecutive oi checks. This is indicated by the amber color of the LED on the face of the detector. See the “Troubleshooting” section for further information.

Magnetic oi / Manual oi

The detector also incorporates both magnetic oi and manual oi features that provide the same calibrated test as the automatic oi, and in addition actuates the Alarm relay to verify output operation for preventive maintenance requirements. These features can be performed at any time and eliminate the need for testing with a non-calibrated external test lamp.

CAUTION

This test requires bypass of all extinguishing devices to avoid release resulting from a successful test.

The magnetic oi test is performed by placing a magnet by the marked location (mag oi) on the outside of the detector. The manual oi test is accomplished by connecting the oi lead (terminal 22) to power supply minus via an external switch. The magnet or switch must be held in place for a minimum of 6 seconds to complete the test. Either of these test methods activates the calibrated IR emitters. If the resulting signal meets the test criteria, indicating that greater than half of the detection range remains, the Alarm relay changes state and the indicating LED changes to red. This condition remains until the magnet is removed or the switch is released. If the alarm relay is configured for non-latching operation, it will change states and the red LED will turn to green. If the unit has latching relays, they can be reset by removing input power (0.1 second minimum) or by momentarily applying the magnet or manual oi switch.

If less than half of the detection range remains, no alarm is produced and a fault is generated. The fault indication can be reset by momentarily applying the magnet or manual oi switch.

NOTE

Refer to the Appendix for FM verification of Det-Tronics' patented Optical Integrity oi™ function.

COMMUNICATION

The X3301 is furnished with an RS-485 interface for communicating status and other information with external devices. The RS-485 supports MODBUS protocol, with the detector configured as a slave device.

Table 1—Detector Status Indicator

Detector Status	LED Indicator
Power On/Normal Operation (no fault or fire alarm)	Green
Fault	Amber
Fire (Alarm)	Red
Medium Sensitivity	Two Amber Flashes During Power-up
Very High Sensitivity	Four Amber Flashes During Power-up

DATA LOGGING

Data logging capability is also provided. Status conditions such as normal, power down, general and **o**i faults, pre-alarm, fire alarm, time and temperature are recorded. Each event is time and date stamped, along with the temperature and input voltage. Event data is stored in non-volatile memory when the event becomes active, and again when the status changes. Data is accessible using the RS-485 port.

INTEGRAL WIRING COMPARTMENT

All external wiring to the device is connected within the integral junction box. The screw terminals accept wiring from 12 to 22 AWG. The detector is furnished with four conduit entries, with either 3/4 inch NPT or 25 mm threads.

GENERAL APPLICATION INFORMATION

RESPONSE CHARACTERISTICS

Response is dependent on distance, type of fuel, temperature of the fuel, and time required for the fire to come to equilibrium. As with all fire tests, results must be interpreted according to an individual application.

See Appendix A for fire test results.

IMPORTANT APPLICATION CONSIDERATIONS

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 fire, and also to know what other sources besides fire can cause the device to respond.

Welding

Arc welding should not be performed within 40 feet of the very high sensitivity detector (10 feet for medium sensitivity detector). It is recommended that the system be bypassed during welding operations in situations where the possibility of a false alarm cannot be tolerated. Gas welding mandates system bypass, since the gas torch is an actual fire. Arc welding rods can contain organic binder materials in the flux that burn during the welding operation and are detectable by the X3301. Welding rods with clay binders do not burn and will not be detected by the X3301. However, system bypass is always recommended, since the material being welded may be contaminated with organic substances (paint, oil, etc.) that will burn and possibly trigger the X3301.

Artificial Lighting

The X3301 should not be located within 3 feet of artificial lights. Excess heating of the detector could occur due to heat radiating from the lights.

EMI/RFI Interference

The X3301 is resistant to interference by EMI and RFI, and is EMC Directive compliant. It will not respond to a 5 watt walkie-talkie at distances greater than 1 foot. Do not operate a walkie-talkie within 1 foot of the X3301.

Non-Carbon Fires

The X3301 is a multiple spectrum IR device with detection limited to carbonaceous fuels. It should not be used to detect fires from fuels that do not contain carbon, such as hydrogen, sulfur and burning metals.

IMPORTANT SAFETY NOTES

WARNING

Do not open the detector assembly in a hazardous area when power is applied. The detector contains limited serviceable components and should never be opened. Doing so could disturb critical optical alignment and calibration parameters, possibly causing serious damage. This type of damage could be undetected and could result in failure to see a fire and/or false alarm.

CAUTION

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 the NEC as well as all local ordinances. If in doubt, consult the authority having jurisdiction before wiring the system. Installation must be done by a properly trained person.

CAUTION

To prevent unwanted actuation or alarm, extinguishing devices must be disconnected prior to performing detection system tests or maintenance.

ATTENTION

Remove the protective cap from the front of the detector before activating the system.

ATTENTION

Observe precautions for handling electrostatic sensitive devices.

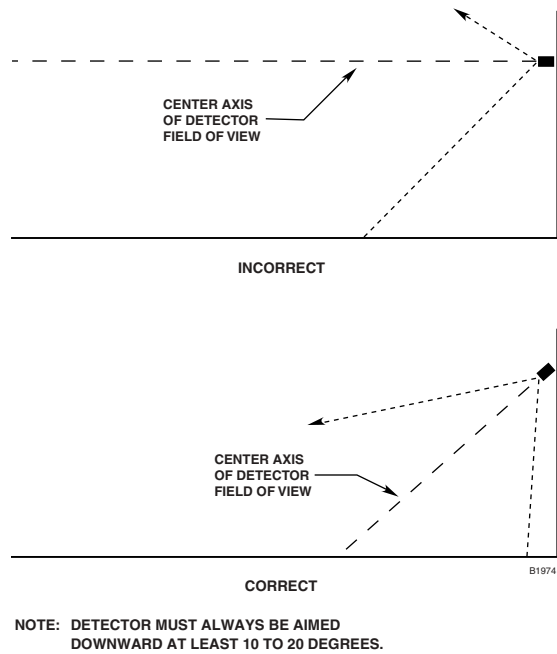


Figure 1—Detector Orientation Relative to Horizon

INSTALLATION

DETECTOR POSITIONING

Detectors should be positioned to provide the best unobstructed view of the area to be protected. The following factors should also be taken into consideration:

- Identify all high risk fire ignition sources.
- Be sure that enough detectors are used to adequately cover the hazardous area.
- Locate and position the detector so that the fire hazard(s) are within both the field of view and detection range of the device. Refer to Appendix A for specific information.
- Be sure that the unit is easily accessible for cleaning and other periodic servicing.
- The detector should be aimed downward at least 10 to 20 degrees to allow lens openings to drain. See Figure 1. **The detector should be positioned so that its field of view does not cover areas outside the hazardous area.** This will minimize the possibility of false alarms caused by activities outside the area requiring protection.
- For best performance, the detector should be mounted on a rigid surface in a low vibration area.
- Dense fog, rain or ice can absorb IR radiation and reduce the sensitivity of the detector.

- Although IR detectors are less affected by smoke than other detectors, the X3301 should not be placed where rising combustion products can obscure its vision. If smoke is expected before fire, smoke or other alternative detectors should be used in conjunction with the X3301. For indoor applications, if dense smoke is expected to accumulate at the onset of a fire, mount the detector on a side wall at least a few feet (approximately 1 meter) down from the ceiling.
- If possible, fire tests should be conducted to verify correct detector positioning and coverage.

DETECTOR ORIENTATION

Refer to Figure 2 and ensure that the **oi** plate will be oriented as shown when the X3301 is mounted and sighted. This will ensure proper operation of the **oi** system and will also minimize the accumulation of moisture and contaminants between the **oi** plate and the viewing windows. The **oi** plate includes an arrow, which should be pointed in the up direction, indicating that the **oi** plate and detector are correctly oriented.

IMPORTANT

*The **oi** plate **must** be securely tightened to ensure proper operation of the **oi** system (40 oz./inches recommended).*

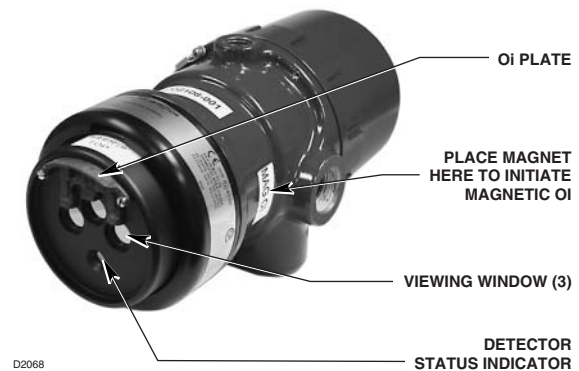


Figure 2—Front View of the X3301

WIRE SIZE AND TYPE

The system should be wired using a 12 to 22 gauge (2.5 to 0.3 mm²) cable. The wire size selected should be based on the number of detectors connected, the supply voltage and the cable length. In some cases where the X3301 is replacing existing pulse output detectors, the wiring and power supplies may not be adequate. Consult the factory for assistance.

IMPORTANT

A minimum input voltage of 18 vdc must be present at the X3301.

The use of shielded cable is required to protect against interference caused by EMI and RFI. When using cables with shields, terminate the shields as shown in Figures 6 through 10. Consult the factory if not using shielded cable.

The “B” (pulse output) and “D” (oi driver) leads from each detector should be shielded from the “B” and “D” leads of all other detectors in order to prevent false alarms resulting from crosstalk between zones. It is recommended that the “A” and “C” leads also be shielded to provide maximum immunity to EMI/RFI. (See Figures 6 to 10.)

In applications where the wiring cable is installed in conduit, the conduit should not be used for wiring to other electrical equipment.

CAUTION

Installation of the detector and wiring should be performed only by qualified personnel.

PROTECTION AGAINST MOISTURE DAMAGE

It is important to take proper precautions during installation to ensure that moisture will not come in contact with the electrical connections or components of the system. The integrity of the system regarding moisture protection must be maintained for proper operation and is the responsibility of the installer.

If conduit is used, drains must be installed at water collection points to automatically drain accumulated moisture. Conduit breathers should be installed at upper locations to provide ventilation and allow water vapor to escape. At least one breather should be used with each drain.

Conduit raceways should be inclined so that water will flow to low points for drainage and will not collect inside enclosures or on conduit seals. If this is not possible, install conduit drains above the seals to prevent the

collection of water or install a drain loop below the detector with a conduit drain at the lowest point of the loop.

Conduit seals may be required for compliance with explosion-proof installation requirements. Units with M25 thread must use an IP66 washer to prevent water ingress.

WIRING PROCEDURE

IMPORTANT

If installing an X3301 in place of an existing detector, be sure to move the “A” Lead (detector power) at the controller from the +290 VDC source to the +24 VDC source. Do not apply 290 VDC to the X3301.

Follow the instructions below to install the X3301.

1. Install the swivel mounting bracket assembly on the wall. The installation surface should be free of vibration and suitable to receive 1/4 inch (M6) screws with a length of at least 1 inch (25 mm). Refer to Figure 3 for dimensions.
2. Make field connections following local ordinances and guidelines in this manual.

Figure 4 shows the wiring terminal strip located inside the detector's integral junction box.

Figure 5 shows the wiring terminal identification for the X3301 detector with pulse output.

Leave the shield open at the detector end and permanently isolate it from accidental contact with the case and/or other conductors. At the controller/fire panel end, connect the shield and power minus (–) to chassis (earth) ground either directly or through a 0.47 µF 400 Volt non-polarized capacitor (not supplied). (Refer to Figures 6 through 10.)

Figures 11A and 11B provide examples of typical installations with a X3301 wired to a fire alarm panel.

Figure 12 shows an EOL resistor installed within the integral wiring compartment of the detector (refer to “EOL Resistors” for details).

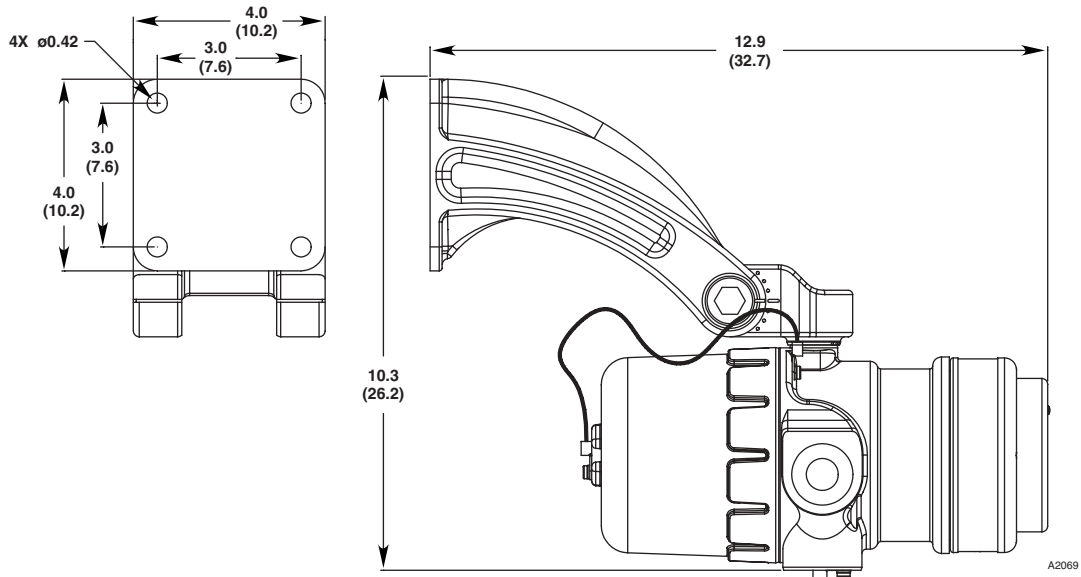


Figure 3—Q9033B Mounting Bracket Dimensions in Inches (cm)
(See Figure 1 for Correct Detector Orientation.)

3. Check all field wiring to be sure that the proper connections have been made.

IMPORTANT

Do not test any wiring connected to the detector with a meg-ohmmeter. Disconnect wiring at the detector before checking system wiring for continuity.

4. Make the final sighting adjustments and ensure that the mounting bracket hardware is tight.



Figure 4—X3301 Terminal Block

EOL RESISTORS

To ensure that the insulating material of the wiring terminal block will not be affected by the heat generated by EOL resistors, observe the following guidelines when installing the resistors.

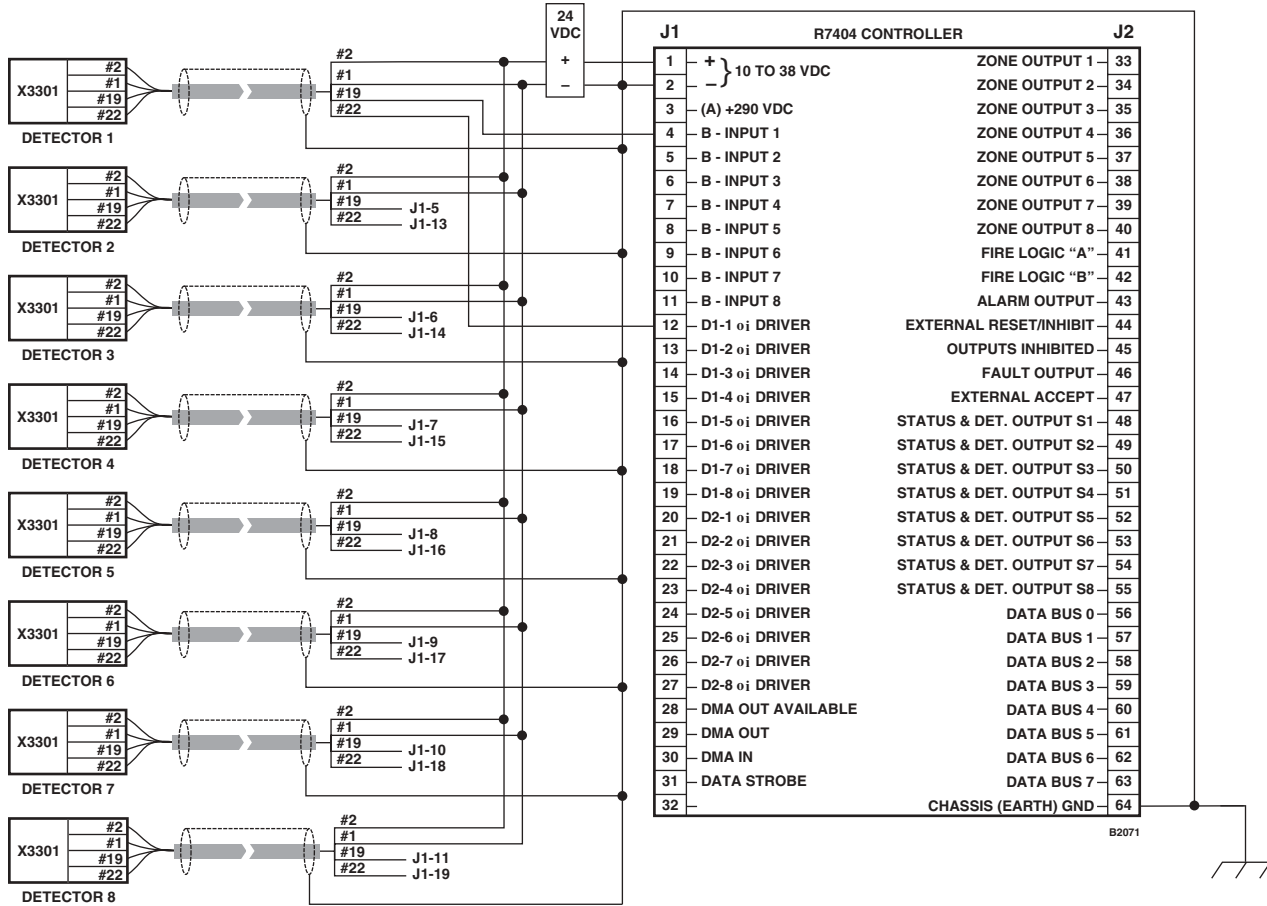
1. Required EOL resistor power rating must be 5 watts minimum.
2. Resistor leads should be cut to a length of approximately 1 1/2 inches (40 mm).
3. Bend the leads and install the EOL resistor as shown in Figure 12.
4. Maintain a 3/8 inch (10 mm) minimum gap between the resistor body and the terminal block or any other neighboring parts.

9		19	PULSE OUT	SPARE	29
8		18		SPARE	28
7	COM FIRE	17			27
6	N.O. FIRE	16			26
5	N.C. FIRE	15			25
4	COM FAULT	14		RS-485 A	24
3	N.O. FAULT	13		RS-485 B	23
2	24 VDC +	12		MAN Oi	22
1	24 VDC -	11		24 VDC -	21

A2070

Figure 5—X3301 Wiring Terminal Identification

NOTE: DO NOT CONNECT THE X3301 "A" LEAD (#2/12) TO TERMINAL J1-3 (290 VDC).



TERMINAL IDENTIFICATION FOR X3301 WITH PULSE OUTPUT.

TERMINAL NO.	FUNCTION
1/11	DC- ("C" LEAD)
2/12	DC+ ("A" LEAD)
19	SIGNAL ("B" LEAD)
22	Oi ("D" LEAD)

NOTE: IF THE POWER SUPPLY MINUS CANNOT BE CONNECTED TO CHASSIS (EARTH) GROUND, CONNECT A 0.47 μF 250 VDC NON-POLARIZED CAPACITOR BETWEEN J1-2 AND J2-64.

NOTE: 2.5 AMPERES @ 24 VDC REQUIRED PER EIGHT DETECTORS.

NOTE: DETECTOR/CONTROLLER CIRCUITS MEET CLASS B, STYLE 0.5 REQUIREMENTS (SIGNALLING LINES A AND C).

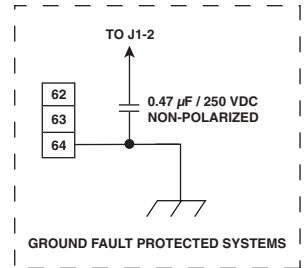
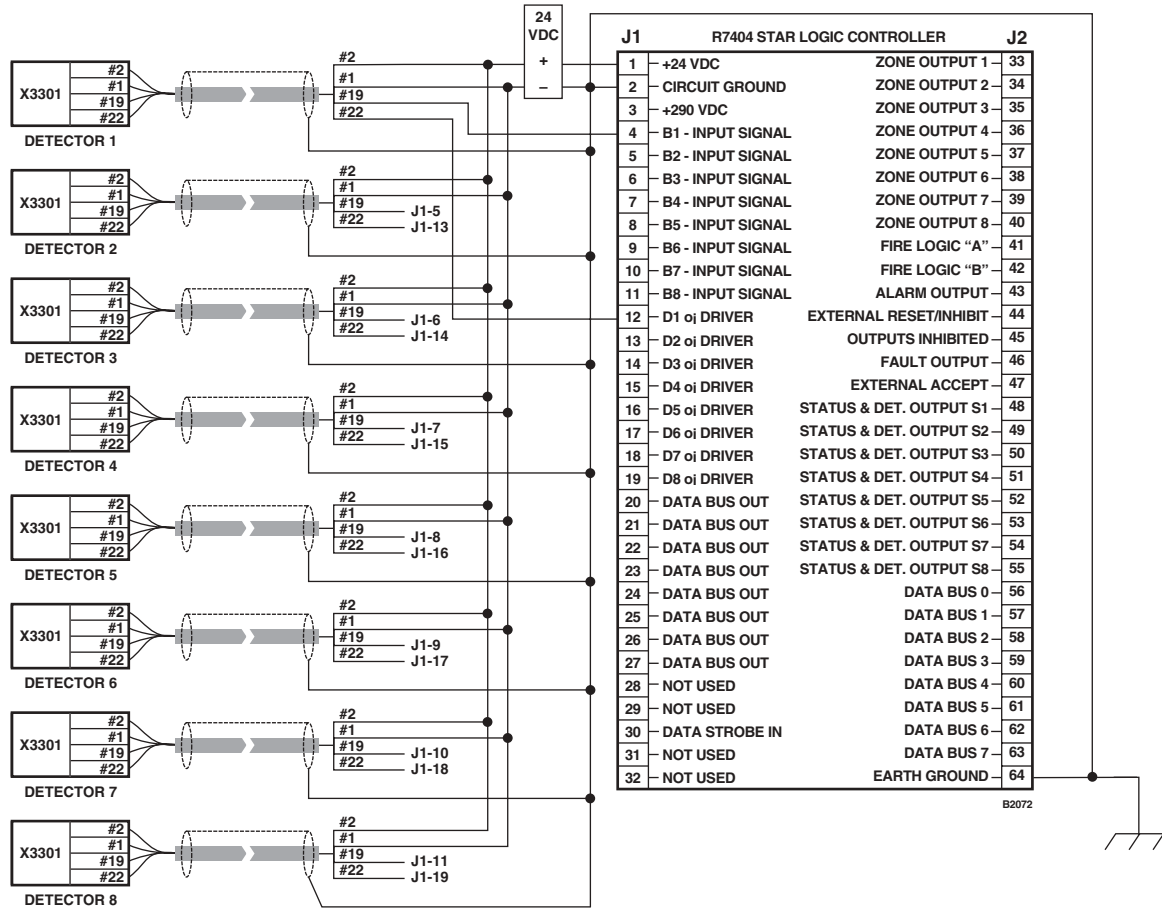


Figure 6—A Typical System, X3301 Detectors Wired to R7404 Controller

NOTE: DO NOT CONNECT THE X3301 "A" LEAD (#2/12) TO TERMINAL J1-3 (290 VDC).



TERMINAL IDENTIFICATION FOR X3301 WITH PULSE OUTPUT.

TERMINAL NO.	FUNCTION
1/11	DC- ("C" LEAD)
2/12	DC+ ("A" LEAD)
19	SIGNAL ("B" LEAD)
22	OI ("D" LEAD)

NOTE: IF THE POWER SUPPLY MINUS CANNOT BE CONNECTED TO CHASSIS (EARTH) GROUND, CONNECT A 0.47 μF 250 VDC NON-POLARIZED CAPACITOR BETWEEN J1-2 AND J2-64.

NOTE: 2.5 AMPERES @ 24 VDC REQUIRED PER EIGHT DETECTORS.

NOTE: DETECTOR/CONTROLLER CIRCUITS MEET CLASS B, STYLE 0.5 REQUIREMENTS (SIGNALING LINES A AND C).

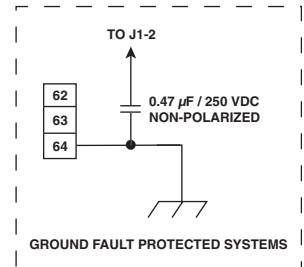
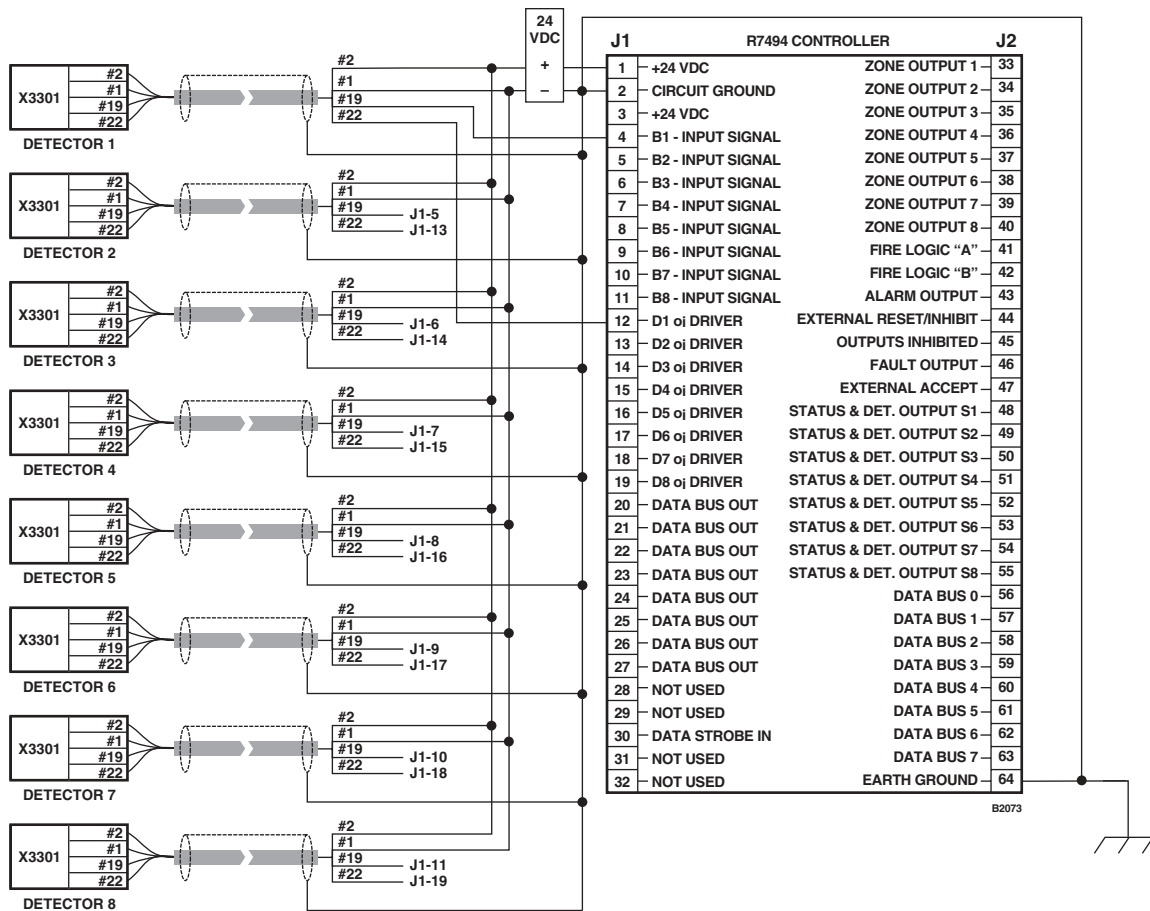


Figure 7—A Typical System, X3301 Detectors Wired to R7404 Star Logic Controller



TERMINAL IDENTIFICATION FOR X3301 WITH PULSE OUTPUT.

TERMINAL NO.	FUNCTION
1/11	DC- ("C" LEAD)
2/12	DC+ ("A" LEAD)
19	SIGNAL ("B" LEAD)
22	Oi ("D" LEAD)

NOTE: IF THE POWER SUPPLY MINUS CANNOT BE CONNECTED TO CHASSIS (EARTH) GROUND, CONNECT A 0.47 μ F 250 VDC NON-POLARIZED CAPACITOR BETWEEN J1-2 AND J2-64.

NOTE: 2.5 AMPERES @ 24 VDC REQUIRED PER EIGHT DETECTORS.

NOTE: DETECTOR/CONTROLLER CIRCUITS MEET CLASS B, STYLE 0.5 REQUIREMENTS (SIGNALLING LINES A AND C).

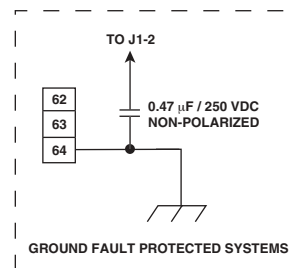


Figure 8—A Typical System, X3301 Detectors Wired to R7494 Controller

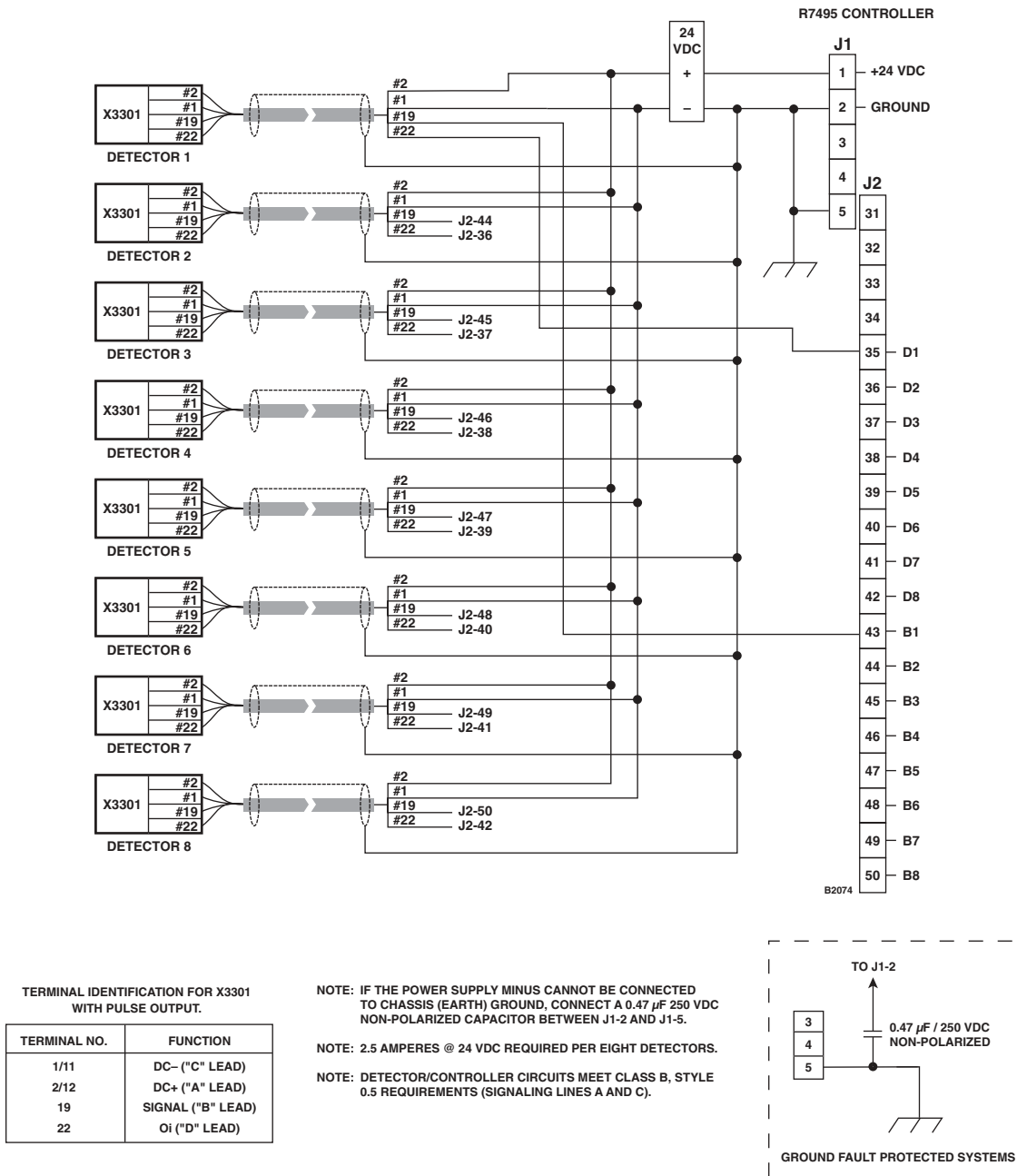
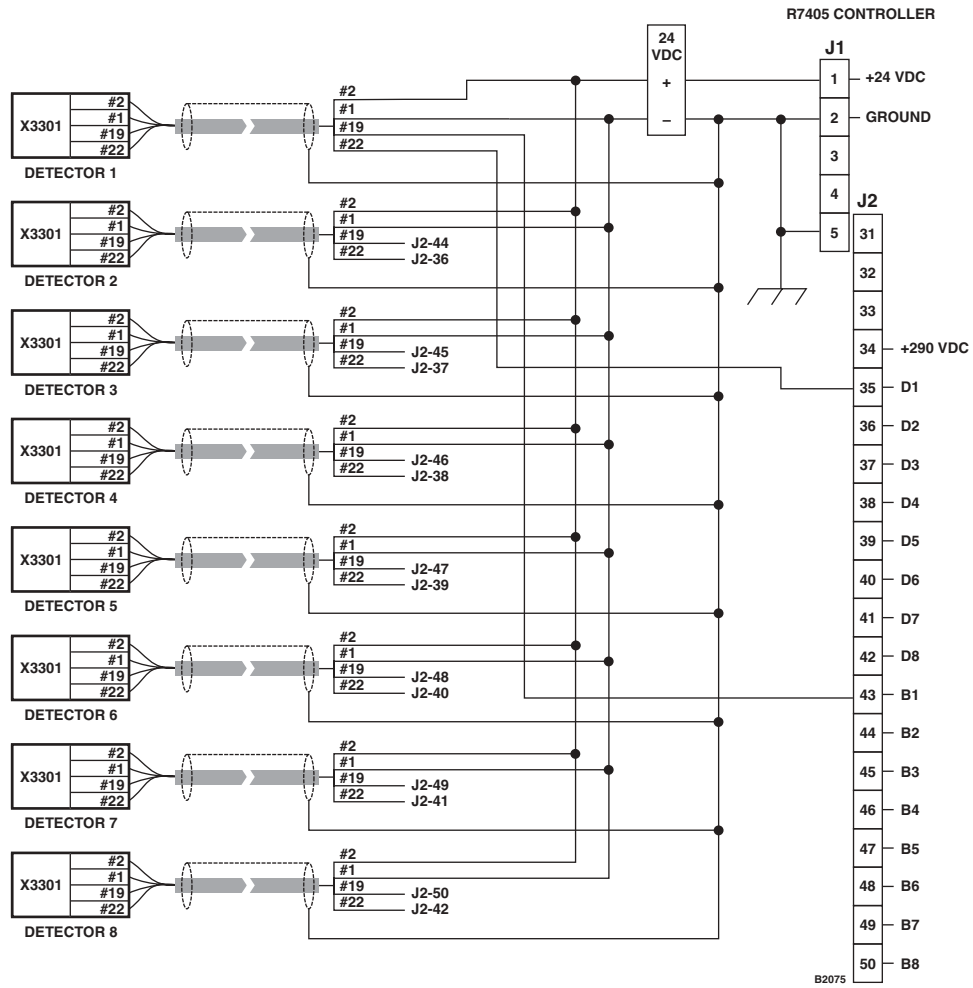


Figure 9—A Typical System, X3301 Detectors Wired to R7495 Controller

NOTE: DO NOT CONNECT THE X3301 "A" LEAD (#2/12) TO TERMINAL J2-34 (290 VDC).



TERMINAL IDENTIFICATION FOR X3301 WITH PULSE OUTPUT.

TERMINAL NO.	FUNCTION
1/11	DC- ("C" LEAD)
2/12	DC+ ("A" LEAD)
19	SIGNAL ("B" LEAD)
22	O _i ("D" LEAD)

NOTE: IF THE POWER SUPPLY MINUS CANNOT BE CONNECTED TO CHASSIS (EARTH) GROUND, CONNECT A 0.47 μF 250 VDC NON-POLARIZED CAPACITOR BETWEEN J1-2 AND J1-5.

NOTE: 2.5 AMPERES @ 24 VDC REQUIRED PER EIGHT DETECTORS.

NOTE: DETECTOR/CONTROLLER CIRCUITS MEET CLASS B, STYLE 0.5 REQUIREMENTS (SIGNALING LINES A AND C).

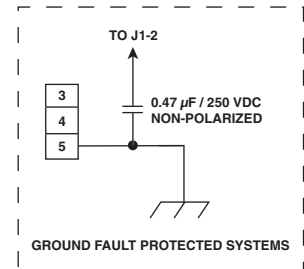
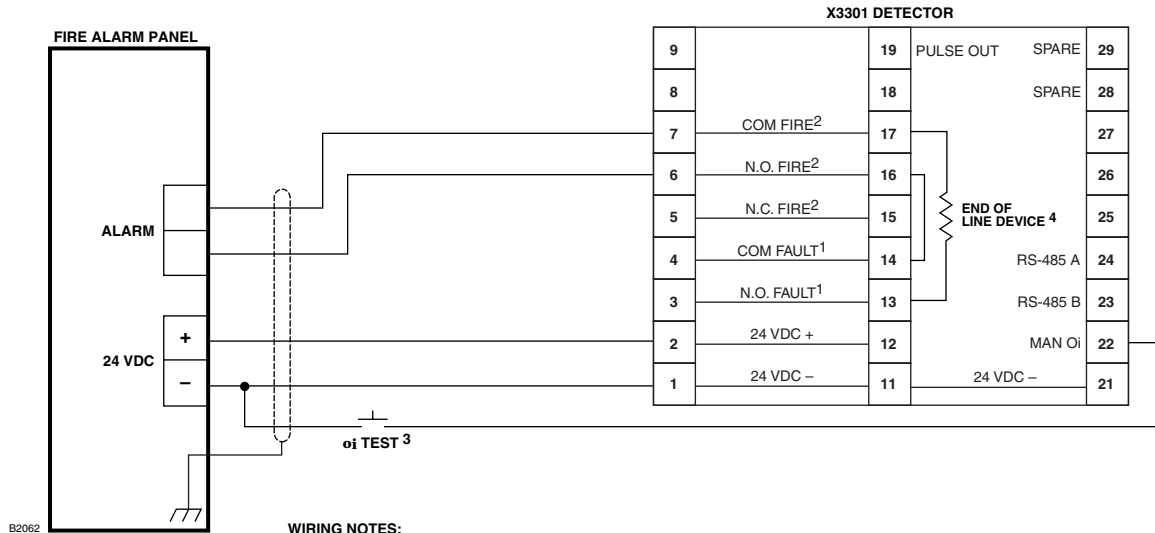


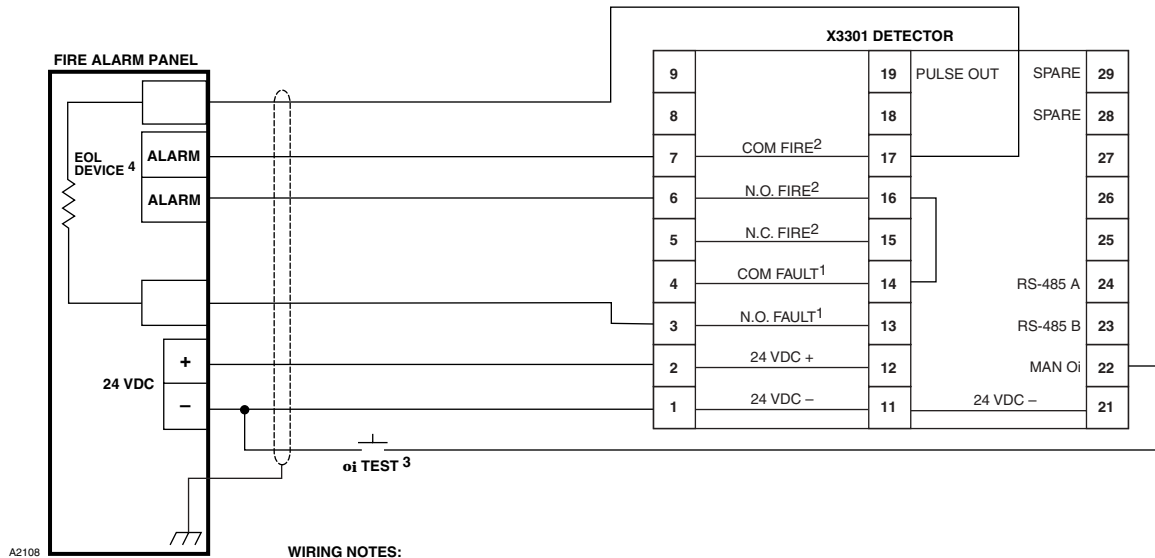
Figure 10—A Typical System, X3301 Detectors Wired to R7405 Controller



WIRING NOTES:

- 1 IN NORMAL OPERATION WITH NO FAULTS OCCURRING, THE FAULT RELAY COIL IS ENERGIZED AND THE CONTACTS ARE CLOSED.
- 2 ALARM RELAY IS NORMALLY DE-ENERGIZED WITH NO ALARM CONDITION PRESENT.
- 3 INDIVIDUAL MANUAL oi TEST SWITCHES CAN BE INSTALLED REMOTELY OR A DETECTOR SELECTOR AND ACTIVATION SWITCH CAN BE INSTALLED AT THE FIRE PANEL. TEST SWITCHES ARE NOT SUPPLIED.
- 4 REFER TO SPECIFICATIONS SECTION FOR EOL RESISTOR VALUES. REFER TO EOL RESISTORS SECTION FOR INSTALLATION DETAILS.

Figure 11A—EEx d Wiring Option



WIRING NOTES:

- 1 IN NORMAL OPERATION WITH NO FAULTS OCCURRING, THE FAULT RELAY COIL IS ENERGIZED AND THE CONTACTS ARE CLOSED.
- 2 ALARM RELAY IS NORMALLY DE-ENERGIZED WITH NO ALARM CONDITION PRESENT.
- 3 INDIVIDUAL MANUAL oi TEST SWITCHES CAN BE INSTALLED REMOTELY OR A DETECTOR SELECTOR AND ACTIVATION SWITCH CAN BE INSTALLED AT THE FIRE PANEL. TEST SWITCHES ARE NOT SUPPLIED.
- 4 EOL RESISTOR SUPPLIED BY PANEL.

Figure 11B—EEx e Wiring Option

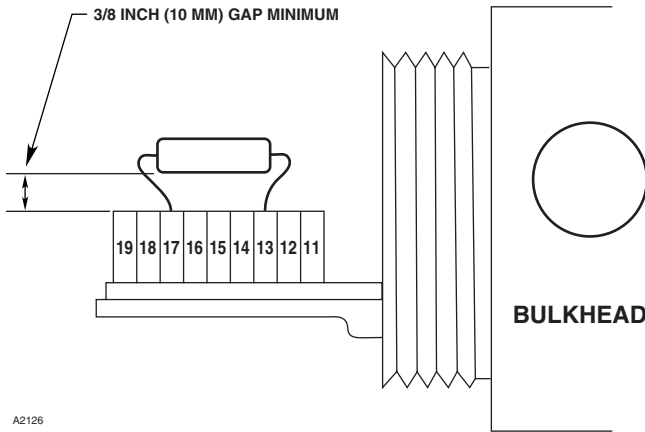


Figure 12—EOL Resistor Installation

STARTUP PROCEDURE

When installation of the equipment is complete, perform the “Manual **oi** Test,” “Count Test Mode” and/or “Fire Alarm Test” below.

Allow 20 to 30 minutes for the detector’s heated optics to reach equilibrium.

MANUAL **O_i** TEST (Output to Controller)

1. Place the keylock switch in the TEST position.
2. Press the SELECT button to display the desired zone on the ZONE indicator on the front panel of the controller.
3. Press and hold the TEST button to energize the test lamps for the selected detector. The ZONE OUTPUT LED for the tested zone flashes and the SYSTEM STATUS display indicates a “6” (fire condition) if the test is successful.
4. Release the TEST button. The ZONE OUTPUT LED for the tested zone should remain on steadily.
5. Return to step 2 to test the next detector.

If the system responds differently than indicated above, proceed with the count test for the problem zone to verify detector and wiring operation.

COUNT TEST MODE (Output to Controller)

The detector can be tested using the Count Test mode. When in the Count Test mode, the frequency of the digital pulses from the detector is displayed on the ZONE and DETECTOR indicators on the controller faceplate. The Count Test mode may be used to check

the **oi** signal strength, the signal (cps) from a test fire, or false alarm source. This can be useful during system set-up for sensitivity and time delay settings. This test is performed in the following manner:

1. Place the keylock switch in the TEST position.
2. Simultaneously press and release the SELECT and TEST buttons. The Status display will change from a “1” to an “8” indicating that the controller is in the Count Test mode of operation.
3. Press the SELECT button until the desired zone is displayed on the ZONE indicator on the controller front panel.
4. Press and hold the TEST button to energize the **oi** source lamps for the selected detector. The DETECTOR/ZONE display indicates the counts per second (cps) received from the detector. If the counts per second exceeds 99, the FIRE LOGIC LEDs are illuminated to indicate that the number shown on the display must be multiplied by 10. **The normal reading for an **oi** test is 80 to 110 cps. For a live fire test, 270 - 330 cps will be generated.**

A zero reading may indicate a dirty window, **oi** problem, faulty detector or defective wiring.

Release the Test button, the ZONE and DETECTOR display should drop to a reading of 0 to 1 counts per second.

FIRE ALARM TEST (Output to Fire Alarm Panel)

1. Disable any extinguishing equipment that is connected to the system.
2. Apply input power to the system.
3. Initiate an **oi** test. (See “Magnetic **oi** / Manual **oi**” under Optical Integrity in the Description section of this manual.
4. Repeat this test for all detectors in the system. If a unit fails the test, refer to the “Troubleshooting” section.
5. Verify that all detectors in the system are properly aimed at the area to be protected. (The Det-Tronics Q1201C Laser Aimer is recommended for this purpose.)
6. Enable extinguishing equipment when the test is complete.

TROUBLESHOOTING

WARNING

The “front” half of the detector contains no user serviceable components and should never be opened.

1. Disable any extinguishing equipment that is connected to the unit.
2. Inspect the viewing windows for contamination and clean as necessary. The detector is relatively insensitive to airborne contaminants, however, thick deposits of ice, dirt, or oil will reduce sensitivity. (Refer to the “Maintenance” section for complete information regarding cleaning of the detector viewing windows.)
3. Check input power to the unit.
4. If the fire protection system has a logging function, check it for status information.
5. Turn off the input power to the detector and check all wiring for continuity. **Important:** Disconnect wiring at the detector before checking system wiring for continuity.
6. If all wiring checks out and cleaning of the **oi** plate/window did not correct the fault condition, check for high levels of background IR radiation by covering the detector with the factory supplied cover or aluminum foil. If the fault condition clears within 6 minutes or less, extreme background IR is present. Re-adjust the view of the detector away from the IR source or relocate the detector.

If none of these actions corrects the problem, contact the factory.

NOTE

It is highly recommended that a complete spare be kept on hand for field replacement to ensure continuous protection.

PERIODIC CHECKOUT PROCEDURE

A checkout of the system using the manual or magnetic **oi** feature should be performed on a regularly scheduled basis to ensure that the system is operating properly. To test the system, perform the “Manual **oi** Test,” “Count Test Mode” or “Fire Alarm Test” as described in the “Startup Procedure” section of this manual.

MAINTENANCE

IMPORTANT

Periodic flamepath inspections are not recommended, since the product is not intended to be serviced and provides proper ingress protection to eliminate potential deterioration of the flamepaths.

WARNING

The “front” half of the detector contains no user serviceable components and should never be opened.

To maintain maximum sensitivity, the viewing windows of the X3301 must be kept relatively clean. Refer to the procedure below for cleaning instructions.

CLEANING PROCEDURE

CAUTION

Disable any extinguishing equipment that is connected to the unit to prevent unwanted actuation.

To clean the windows and **oi** plate, use Det-Tronics window cleaner (part number 001680-001) and a soft cloth, cotton swab or tissue and refer to the procedure below.

1. **Disable any extinguishing equipment that is connected to the unit.**
2. Since the X3301 is less affected by contamination than other detectors, removal of the **oi** plate is needed only under extreme conditions. In addition, it is not necessary to achieve perfect cleanliness, because IR is not significantly absorbed by slight films of oil and/or salt. If a fault condition is still indicated after cleaning, remove and clean the **oi** plate using the following procedure.
3. Clean all three viewing windows and reflector surfaces thoroughly using a clean cloth, cotton swab or tissue and Det-Tronics window cleaning solution. If a stronger solution is needed, isopropyl alcohol may be used.

oi PLATE REMOVAL

1. Loosen the two captive screws, then grasp the **oi** plate by the visor and remove it from the detector. See Figure 13.
2. Thoroughly clean the **oi** plate reflective surfaces, holding it by its edges to avoid leaving fingerprints on the inside reflective surface.
3. Re-install the **oi** plate. Ensure that the plate is flat on the detector surface. Tighten the **oi** plate screws securely (40 oz/inches).

NOTE

*If the **oi** plate is removed, be sure to install the original **oi** plate. **oi** plates are not interchangeable and should not be mixed with **oi** plates from other detectors. If corrosive contaminants in the atmosphere cause the **oi** plate surface to deteriorate to the extent that it is no longer possible to restore it to its original condition, it must be replaced. Consult factory for **oi** plate replacement procedure.*

CLOCK BATTERY

The real time clock has a backup battery that will operate the clock with no external power for nominally 10 years. It is recommended that the battery be replaced every 7 years. Consult the factory for replacement procedure.

FEATURES

- Long detection range to carbonaceous fires.
- Unequaled false alarm rejection.
- Responds to a fire in the presence of modulated blackbody radiation (i.e. heaters, ovens, turbines) without false alarm.
- Pulse output for compatibility with controller based systems.
- Microprocessor controlled heated optics for increased resistance to moisture and ice.
- Automatic, manual or magnetic optical integrity (**oi**) testing.
- Easily replaceable **oi** plate.
- Fire and fault relays.
- Tricolor LED indicates normal operation, fire and fault conditions.
- Operates under adverse weather conditions and in dirty environments.

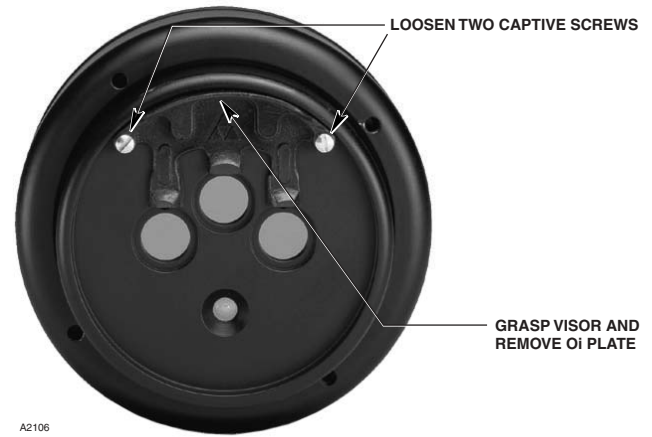


Figure 13—Oi Plate Removal

- Mounting swivel allows easy sighting.
- Integral wiring compartment for ease of installation.
- Explosion-proof/flame-proof detector housing. Meets FM, CSA, CENELEC (ATEX Directive Compliant), and CE certification requirements.
- Class A wiring per NFPA-72 (relay version). (Pulse output version is equivalent to class A when detectors are installed in a redundant configuration).
- Meets NFPA-33 response requirement for under 0.5 second (available when model selected).
- 5 year warranty.
- RFI and EMC Directive Compliant.

SPECIFICATIONS

OPERATING VOLTAGE—

24 volts dc nominal (18 vdc minimum, 32 vdc maximum).

POWER CONSUMPTION—

Without heater: 4 watts at 24 vdc nominal;
4.6 watts at 24 vdc in alarm.
4.5 watts at 32 vdc nominal;
5.9 watts at 32 vdc in alarm.

Heater only: 8 watts maximum.

Total Power: 17 watts at 32 vdc with EOL resistor installed and heater on maximum.

EOL resistor must be ceramic, wirewound type, rated 5 watts minimum, with actual power dissipation not to exceed 2.5 watts.

POWER UP TIME—

Fault indication clears after 0.5 second; device is ready to indicate an alarm condition after 30 seconds.

OUTPUT RELAYS—

Fire Alarm relay, Form C, 5 amperes at 30 vdc:

The Fire Alarm relay has redundant terminals and normally open / normally closed contacts, normally de-energized operation, and latching or non-latching operation.

Fault relay, Form A, 5 amperes at 30 vdc:

The Fault relay has redundant terminals and normally open contacts, normally energized operation, and latching or non-latching operation.

TEMPERATURE RANGE—

Operating: -40°F to +167°F (-40°C to +75°C).

Storage: -67°F to +185°F (-55°C to +85°C).

Hazardous location ratings from -55°C to +125°C.

HUMIDITY RANGE—

0 to 95% relative humidity, can withstand 100% condensing humidity for short periods of time.

CONE OF VISION—

The detector has a 90° cone of vision (horizontal) with the highest sensitivity lying along the central axis. Unlike conventional detectors, the X3301 provides full coverage at a minimum of 70% of the maximum detection distance.

Perfect cone of vision for methane fire detection — 100 feet on and off axis on “very high” setting.

Refer to Appendix A for FM Approved cone of vision data.

RESPONSE TIME—

Typical response times are under 10 seconds. Models are available that can respond to automotive paint gun fires in under 0.5 seconds. See Appendix A for actual response times.

ENCLOSURE MATERIAL—

Copper-free aluminum (red-painted) or 316 stainless steel.

DIMENSIONS—

See Figure 14.

WIRING—

12 AWG (2.5 mm²) to 22 AWG (0.3 mm²) shielded cable is recommended.

Important: 18 vdc minimum must be available at the detector. For ambient temperatures below -10°C and above +60°C use field wiring suitable for both minimum and maximum ambient temperature.

THREAD SIZE—

Conduit connection: 3/4 inch NPT or M25.

SHIPPING WEIGHT (Approximate)—

Aluminum: 6 pounds (2.7 kilograms).

Stainless Steel: 10 pounds (4.5 kilograms).

WARRANTY PERIOD—

5 years.

CERTIFICATION—

For complete FMR certification details, refer to Appendix A.



Class I, Div. 1, Groups B, C and D;
Class II, Div. 1, Groups E, F, and G;
Class I, Div. 2, Groups A, B, C and D (T3C);
Class II, Div. 2, Groups F and G (T3C);
Class III.
Enclosure NEMA/Type 4X.

Increased Safety Model

0539 Ex II 2 GD
EEx de IIC T5-T6
DEMKO 01 ATEX 130204
T6 (T_{amb} = -55°C to +60°C).
T5 (T_{amb} = -55°C to +75°C).
IP66.

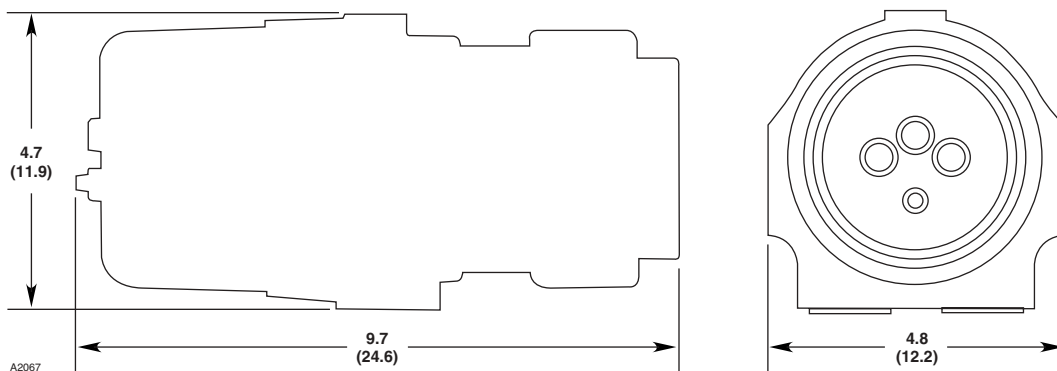


Figure 14—X3301 Dimensions in Inches (cm)

Flameproof Model
0539 Ex II 2 GD
EEx d IIC T4–T6
DEMKO 01 ATEX 130204
T6 ($T_{\text{amb}} = -55^{\circ}\text{C}$ to $+60^{\circ}\text{C}$).
T5 ($T_{\text{amb}} = -55^{\circ}\text{C}$ to $+75^{\circ}\text{C}$).
T4 ($T_{\text{amb}} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$).
IP66.

NOTE

Refer to “EOL Resistors” section for installation details. All cable entry devices and blanking elements shall be certified to “E-generation” or “ATEX” standards, in type of explosion protection increased safety “e” or flameproof enclosure “d” (as applicable), suitable for the conditions of use and correctly installed. They shall maintain the degree of ingress protection IP66 for the apparatus. Unused apertures shall be closed with suitable blanking elements.

NOTE

Operational performance verified from -40°C to $+75^{\circ}\text{C}$.

REPLACEMENT PARTS

The detector is not designed to be repaired in the field. If a problem should develop, refer to the Troubleshooting section. If it is determined that the problem is caused by an electronic defect, the device must be returned to the factory for repair.

DEVICE REPAIR AND RETURN

Prior to returning devices, contact the nearest local Detector Electronics office so that a Service Order 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.

Pack the unit 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 factory in Minneapolis.

NOTE

It is highly recommended that a complete spare be kept on hand for field replacement to ensure continuous protection.

ORDERING INFORMATION

When ordering, please specify:

X3301 IR Flame Detector with Pulse Output

Specify **Sensitivity:**

- Very High
- Medium

Specify **Relay Programming:**

Standard relay configuration is:

- Fire Relay Non-latching, De-energized;
 - Fault Relay Non-latching, Energized.
- Consult the Factory for other relay configurations.

Specify **Enclosure Material:**

- Aluminum (red-painted)
- 316 stainless steel.

Specify **Thread Size:**

- 3/4 inch NPT
- M25.

ACCESSORIES

Q9033B Swivel Mount Assembly is required for mounting the detector.

Q1116A Air Shield for use in dirty environments.

Q1201C Laser Aimer is recommended for verifying detector aiming.

Weather Shield is recommended for outdoor environments.

REPLACEMENT PARTS

Part Number	Description
-------------	-------------

001680-001	Window cleaner squeeze bottle (package of six bottles)
005003-001	Silicone-free grease

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

Detector Electronics Corporation
6901 West 110th Street
Minneapolis, Minnesota 55438 USA
Operator: (952) 941-5665 or (800) 765-FIRE
Customer Service: (952) 946-6491
Fax: (952) 829-8750
Web site: www.detronics.com
E-mail: detronics@detronics.com

APPENDIX A

Factory Mutual (FM) Approvals Description and Performance Report

THE FOLLOWING ITEMS, FUNCTIONS AND OPTIONS DESCRIBE THE FM APPROVAL:

- Explosion-proof for Class I, Div. 1, Groups B, C and D Hazardous (Classified) Locations per FM 3615.
- Dust-ignition proof for Class II/III, Div. 1, Groups E, F and G Hazardous (Classified) Locations per FM 3615.
- Explosion-proof for Class I, Div. 2, Groups A, B, C and D (T3C) Hazardous (Classified) Locations per FM 3611.
- Explosion-proof for Class II, Div. 2, Groups F and G (T3C) Hazardous (Classified) Locations per FM 3611.
- Enclosure rating NEMA Type 4X per NEMA 250.
- Ambient Temperature Limits: -40°F to +167°F (-40°C to +75°C).
- Automatic Fire Alarm Signaling Performance verified per FM 3260 (2000).

The following performance criteria were verified:

Factory Mutual (FM) Approval Description and Performance Report – Continued

RESPONSE CHARACTERISTICS:

Very High Sensitivity

Fuel	Size	Distance (feet)	Average Response Time (seconds)
n-Heptane	1 x 1 foot	210*	10
n-Heptane**	1 x 1 foot	210*	6
n-Heptane	1 x 1 foot	100	3
n-Heptane	6 in. x 6 in.	80	2.6
Isopropanol	6 in. x 6 in.	70	3.3
Diesel**	1 x 1 foot	150*	13
Methanol	6 in. x 6 in.	40	2.1
Methanol	1 x 1 foot	150*	18
Methanol**	1 x 1 foot	150*	7
Methane	30 inch plume	100	2
JP-5**	1x1 foot	150*	2
JP-5**	2 x 2 foot	210*	3
JP-5**	2 x 2 foot	100	2
Office Paper 0.5 lb.	19" x 19" x 8"	100	4
Corrugated Panel	18" x 36"	100	7

* Outdoor test condition.

** Pre-burn from ignition.

Medium Sensitivity

Fuel	Size	Distance (feet)	Average Response Time (seconds)
n-Heptane	1 x 1 foot	100	11
n-Heptane	1 x 1 foot	50	2
Diesel**	1 x 1 foot	70	4
Methanol	1 x 1 foot	70	9
Methane	30 inch plume	65	2.5
Methane	30 inch plume	55	2
JP-5**	2 x 2 foot	100	2
Office Paper 0.5 lb.	19" x 19" x 8"	50	5
Corrugated Panel	18" x 36"	50	1

** Pre-burn from ignition.

Factory Mutual (FM) Approval Description and Performance Report – Continued

OPTICAL INTEGRITY TEST:

The detector generated an optical fault in the presence of contamination on any single or combination of lens surfaces resulting in a loss of approximately 50% of its detection range, verifying that the detector performs a calibrated Automatic optical integrity (**oi**) test for each sensor. Upon removal of the contamination, the detector fault was cleared and the detector was verified to detect a fire.

The Manual / Magnetic **oi** performs the same calibrated test as the Automatic **oi**, and additionally actuates the alarm relay to verify output operation. If there is a 50% loss of its detection range, an alarm signal is not generated.

RESPONSE CHARACTERISTICS IN THE PRESENCE OF FALSE ALARM SOURCES:

Very High Sensitivity

False Alarm Source	Distance (feet)	Fire Source	Distance (feet)	Average Response Time (seconds)
Sunlight, direct, modulated, reflected	—	6-inch propane	6	< 10
Vibration	N/A	3-inch propane	10.5	< 10
Radio frequency interference	1	3-inch propane	12	< 10
Arc welding, #7014	40	1 x 1 foot n-Heptane	40	4
6 kw heater, modulated	80	1 x 1 foot n-Heptane	80	1
6 kw heater, unmodulated	10	1 x 1 foot n-Heptane	80	2
250 w vapor lamp, modulated	3	1 x 1 foot n-Heptane	80	2
300 w incandescent lamp, modulated	3	1 x 1 foot n-Heptane	80	7
500 w shielded quartz halogen lamp, modulated	8	1 x 1 foot n-Heptane	80	2
500 w unshielded quartz halogen lamp, modulated	8	1 x 1 foot n-Heptane	80	3
1500 w electric radiant heater, modulated	10	1 x 1 foot n-Heptane	80	5
Two 34 w fluorescent lamps, modulated	3	1 x 1 foot n-Heptane	80	2.5

Medium Sensitivity

False Alarm Source	Distance (feet)	Fire Source	Distance (feet)	Average Response Time (seconds)
Sunlight, direct, modulated, reflected	—	6-inch propane	6	< 4
Vibration*	N/A	N/A	N/A	N/A
Radio frequency interference	1	6-inch propane	6	< 1
Arc welding, #7014	10	1 x 1 foot n-Heptane	40	3
6 kw heater, modulated	60	1 x 1 foot n-Heptane	60	2
6 kw heater, unmodulated	10	1 x 1 foot n-Heptane	60	2
250 w vapor lamp, modulated	3	1 x 1 foot n-Heptane	60	1
300 w incandescent lamp, modulated	3	1 x 1 foot n-Heptane	60	1
500 w shielded quartz halogen lamp, modulated	8	1 x 1 foot n-Heptane	60	1
500 w unshielded quartz halogen lamp, modulated	8	1 x 1 foot n-Heptane	60	1
1500 w electric radiant heater, modulated	10	1 x 1 foot n-Heptane	60	6
Two 34 w fluorescent lamps, modulated	3	1 x 1 foot n-Heptane	60	2

* Fire was verified with very high sensitivity only.

Factory Mutual (FM) Approval Description and Performance Report – Continued

FALSE ALARM IMMUNITY:

Very High Sensitivity

False Alarm Source	Distance (feet)	Modulated Response	Unmodulated Response
Sunlight, direct, reflected	—	No alarm	No alarm
Vibration	N/A	No alarm	N/A
Radio frequency interference	1	No alarm (keyed)	No alarm (steady)
Arc welding	40	No alarm	No alarm
6 kw heater	3	No alarm	No alarm
250 w vapor lamp	3	No alarm	No alarm
300 w incandescent lamp	3	No alarm	No alarm
500 w unshielded quartz halogen lamp	8	No alarm	No alarm
500 w shielded quartz halogen lamp	8	No alarm	No alarm
1500 w electric radiant heater	3	No alarm	No alarm
Two 34 w fluorescent lamps	3	No alarm	No alarm

Medium Sensitivity

False Alarm Source	Distance (feet)	Modulated Response	Unmodulated Response
Sunlight, direct, reflected	—	No alarm	No alarm
Vibration	N/A	No alarm	N/A
Radio frequency interference	1	No alarm (keyed)	No alarm (steady)
Arc welding	10	No alarm	No alarm
6 kw heater	3	No alarm	No alarm
250 w vapor lamp	3	No alarm	No alarm
300 w incandescent lamp	3	No alarm	No alarm
500 w unshielded quartz halogen lamp	8	No alarm	No alarm
500 w shielded quartz halogen lamp	3	No alarm	No alarm
1500 w electric radiant heater	3	No alarm	No alarm
Two 34 w fluorescent lamps	3	No alarm	No alarm

Factory Mutual (FM) Approval Description and Performance Report – Continued

FIELD OF VIEW:

Very High Sensitivity

Fuel	Size	Distance (feet)	Horizontal (degrees)	Avg. Horiz. Response Time (seconds)	Vertical (degrees)	Avg. Vert. Response Time (seconds)
n-Heptane	1 x 1 foot	150*	+45 -45	11 14	+45 -30	12 5
n-Heptane	1 x 1 foot	100	+45 -45	6 2.5	+45 -30	2 2
n-Heptane	6 in. x 6 in.	80	+45 -45	4.6 5.4	+45 -30	3.6 3.4
Isopropanol	6 in. x 6 in.	70	+45 -45	4.5 4.4	+45 -30	3.4 5.5
Diesel**	1 x 1 foot	100	+45 -45	2 2	+45 -30	4 2
Methanol	6 in. x 6 in.	40	+45 -45	3.1 5.4	+45 -30	2.9 2.8
Methanol	1 x 1 foot	110	+45 -45	9 7	+45 -30	8 2
Methane	30 inch plume	100	+45 -45	6 2	+45 -30	2 2
JP-5**	1 x 1 foot	100	+45 -45	2 3	+45 -30	3 2
JP-5**	2 x 2 feet	180*	+45 -45	1 4.5	+45 -30	2 2
JP-5**	2 x 2 feet	90	+45 -45	2 3	+45 -30	1 2
Office Paper 0.5 lb.	19" x 19" x 8"	80	+45 -45	3 2	+45 -30	2 1
Corrugated Panel	18" x 36"	80	+45 -45	1 1	+45 -30	2 2

* Outdoor test condition.

** Pre-burn from ignition.

Factory Mutual (FM) Approval Description and Performance Report – Continued

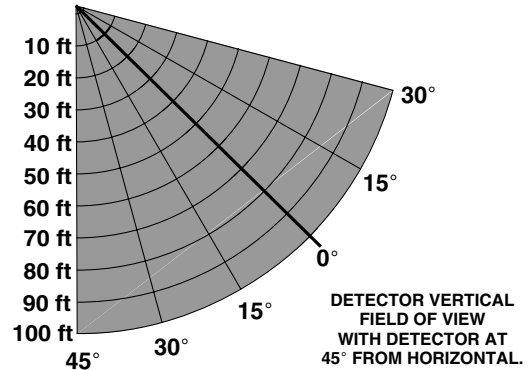
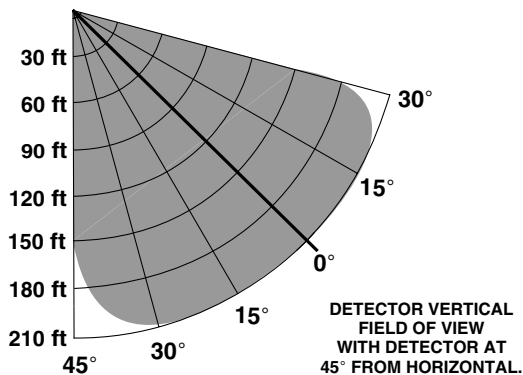
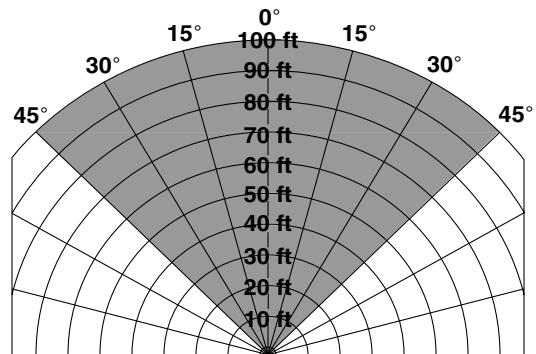
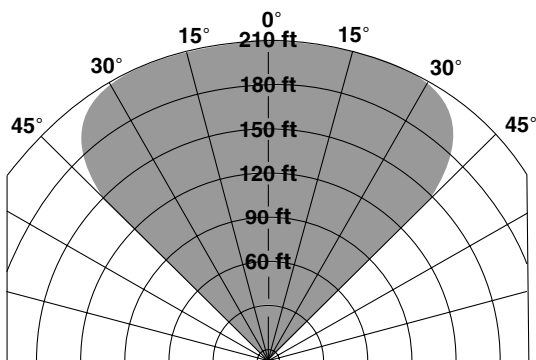
Medium Sensitivity

Fuel	Size	Distance (feet)	Horizontal (degrees)	Avg. Horiz. Response Time (seconds)	Vertical (degrees)	Avg. Vert. Response Time (seconds)
n-Heptane	1 x 1 foot	75	+45 -45	9 6	+45 -30	9 6
n-Heptane	1 x 1 foot	50	+45 -45	4 3	+45 -30	2 2
Diesel**	1 x 1 foot	60	+45 -45	3 3	+45 -30	4 2
Methanol	1 x 1 foot	50	+45 -45	9 3	+45 -30	8 1
Methane	30 inch plume	45	+45 -45	2 2	+45 -30	6 1
JP-5**	2 x 2 feet	90	+45 -45	3.5 2	+45 -30	2 2
Office Paper 0.5 lb.	19" x 19" x 8"	40	+45 -45	1 1	+45 -30	1 0.5
Corrugated Panel	18" x 36"	40	+45 -45	1 0.5	+45 -30	0.5 0.5

* Outdoor test condition.

** Pre-burn from ignition.

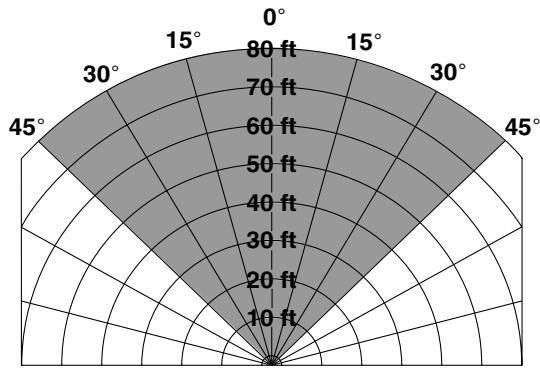
HIGH RESOLUTION FIELD OF VIEW



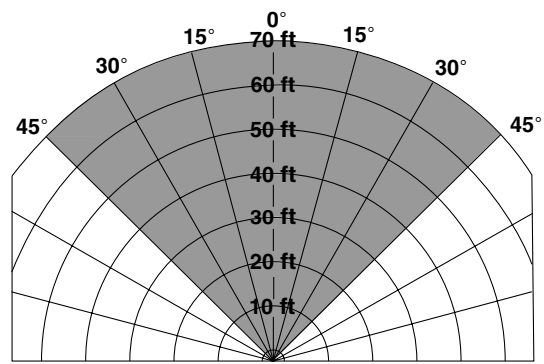
Field of View at Indicated Distance in Feet for **n-Heptane** at **Very High** Sensitivity (1 x 1 foot)

Field of View at Indicated Distance in Feet for **Methane** at **Very High** Sensitivity (30 inch plume)

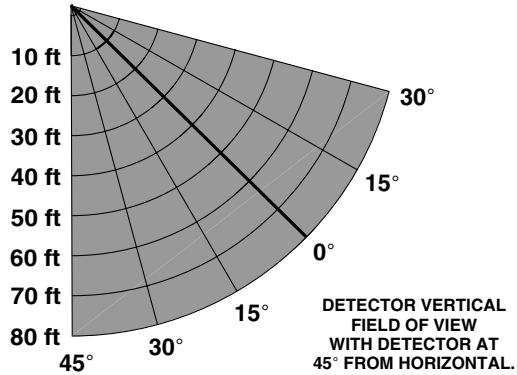
Factory Mutual (FM) Approval Description and Performance Report – Continued



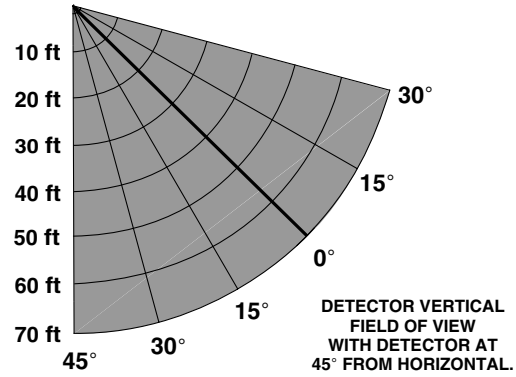
Field of View at Indicated Distance in Feet for **n-Heptane** at **Very High Sensitivity** (6 in. x 6 in.)



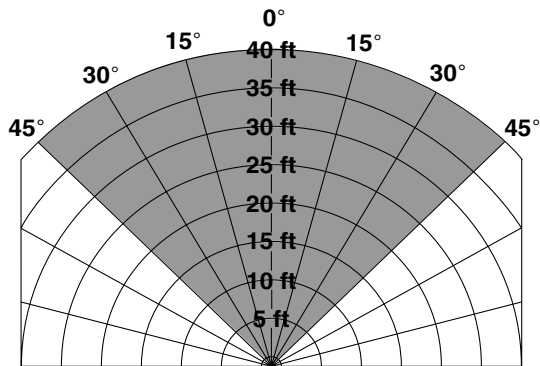
Field of View at Indicated Distance in Feet for **Isopropanol** at **Very High Sensitivity** (6 in. x 6 in.)



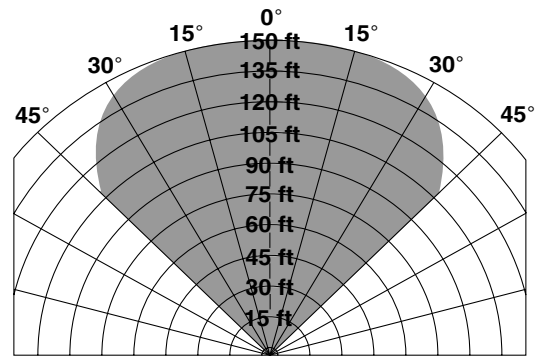
DETECTOR VERTICAL FIELD OF VIEW WITH DETECTOR AT 45° FROM HORIZONTAL.



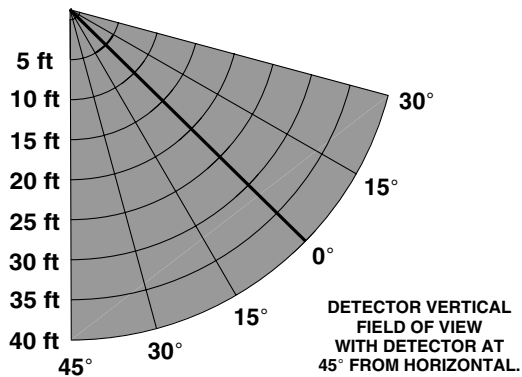
DETECTOR VERTICAL FIELD OF VIEW WITH DETECTOR AT 45° FROM HORIZONTAL.



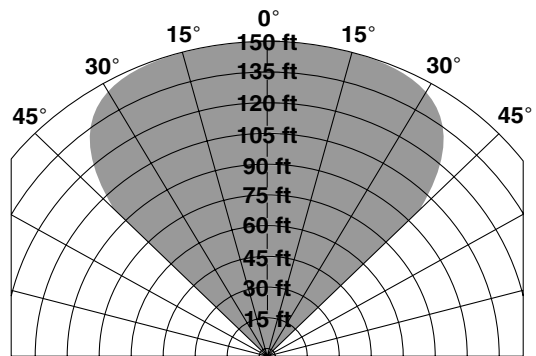
Field of View at Indicated Distance in Feet for **Methanol** at **Very High Sensitivity** (6 in. x 6 in.)



Field of View at Indicated Distance in Feet for **Methanol** at **Very High Sensitivity** (1 x 1 foot)

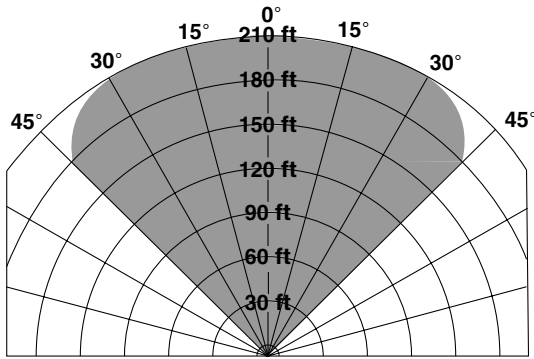


DETECTOR VERTICAL FIELD OF VIEW WITH DETECTOR AT 45° FROM HORIZONTAL.

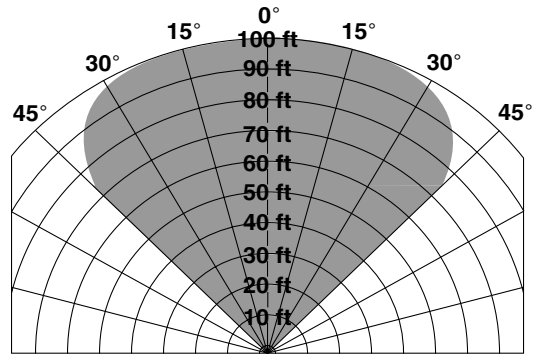


Field of View at Indicated Distance in Feet for **Diesel** at **Very High Sensitivity** (1 x 1 foot)

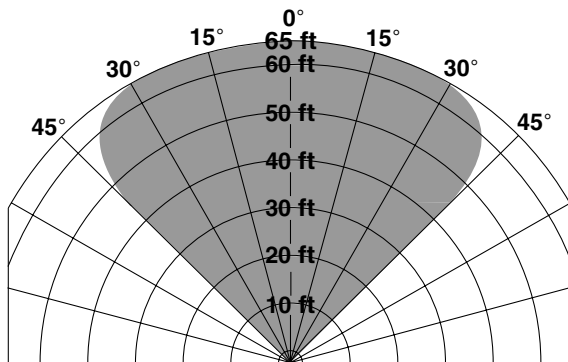
Factory Mutual (FM) Approval Description and Performance Report – Continued



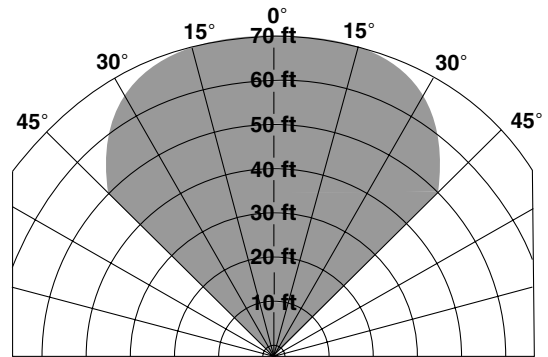
Field of View at Indicated Distance in Feet for **JP-5 at Very High Sensitivity (2 x 2 feet)**



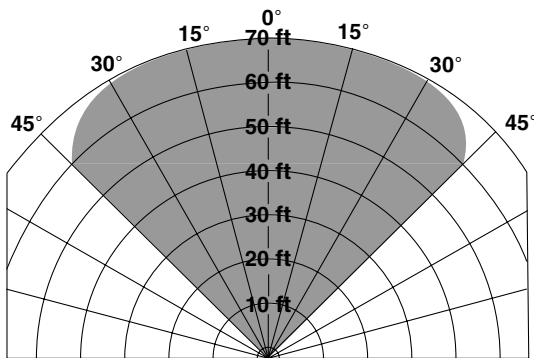
Field of View at Indicated Distance in Feet for **n-Heptane at Medium Sensitivity (1 x 1 foot)**



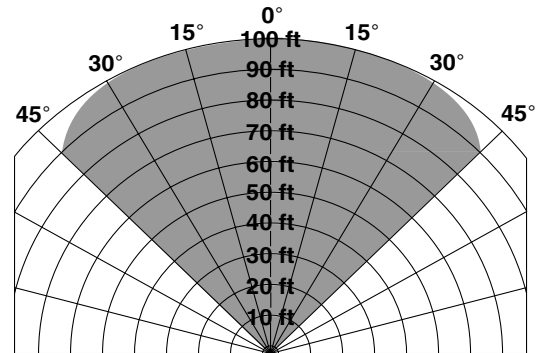
Field of View at Indicated Distance in Feet for **Methane at Medium Sensitivity (30 inch plume)**



Field of View at Indicated Distance in Feet for **Methanol at Medium Sensitivity (1 x 1 foot)**



Field of View at Indicated Distance in Feet for **Diesel at Medium Sensitivity (1 x 1 foot)**



Field of View at Indicated Distance in Feet for **JP-5 at Medium Sensitivity (2 x 2 feet)**

NOTE

Factory Mutual Research minimum requirements are response distance measurements at 0° (on axis) and the limits of the field of view. These high resolution field of view diagrams show the measured response distances at all the indicated angles in the horizontal plane.