

## Addendum

Det-Tronics X-Series Flame Detectors  
with Pulse Output

---



# Table of Contents

DESCRIPTION . . . . .	1
Outputs . . . . .	2
<b>oi</b> (Optical Integrity) . . . . .	2
GENERAL APPLICATION INFORMATION . . . . .	3
Response Characteristics . . . . .	3
Important Application Considerations . . . . .	3
IMPORTANT SAFETY NOTES . . . . .	3
WIRING PROCEDURE . . . . .	3
Wire Size and Type . . . . .	3
Detector Wiring . . . . .	4
STARTUP PROCEDURE . . . . .	10
Manual <b>oi</b> Test (Output to Controller) . . . . .	10
Count Test Mode (Output to Controller) . . . . .	10
Fire Alarm Test (Pulse Output to Fire Alarm Panel) . . . . .	10
MAINTENANCE . . . . .	11
Periodic Checkout Procedure . . . . .	11
Certification . . . . .	11
MODEL MATRIX . . . . .	12

**Det-Tronics X-Series Flame Detectors  
with Pulse Output** **WARNING**

Be sure to read and understand the entire instruction manual before installing or operating the flame detection system. Any deviation from the recommendations in this manual may impair system performance and compromise safety.

**ATTENTION**

The X-Series flame detectors include the Automatic **oi**® (Optical Integrity) feature — a calibrated performance test that is automatically performed once per minute to verify complete detector operation capabilities. **Testing with an external test lamp is not approved or required.**



This addendum provides details on the pulse/relay output communication of the X-Series flame detectors. See each model's individual instruction manual for installation, operational, and troubleshooting details:

**DESCRIPTION**

The X3301, X3302, X2200, X5200, and X9800 (X-Series) series flame detectors with pulse/relay output are designed for use in controller based systems. In addition to use in new systems, they 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 X-Series Flame Detector. In typical applications, the four wire detector can utilize all existing system wiring.

X3301 Series - 95-8704 or 95-8527  
X3302 Series - 95-8768 or 95-8576  
X2200 Series - 95-8549  
X5200 Series - 95-8546  
X9800 Series - 95-8554

## OUTPUTS

### Relays

The detectors are 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.

An alarm condition will normally override a fault condition, unless the nature of the fault condition impairs the ability of the detectors to generate or maintain an alarm output, i.e., loss of operating power.

### **O<sub>i</sub>** (OPTICAL INTEGRITY)

#### Automatic **O<sub>i</sub>**

Each X-Series flame detector includes the Automatic **O<sub>i</sub>** 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 detectors automatically perform the same test that a maintenance person with a test lamp would perform — once every minute, 60 times per hour. However, a successful Automatic **O<sub>i</sub>** test does not produce an alarm condition.

The detectors signal a fault condition when less than half of the detection range remains. This is indicated by the Fault output and is evident by the yellow color of the LED on the face of the detectors. The **O<sub>i</sub>** fault condition is self-clearing if the optical contamination is temporary. If the contamination is not automatically cleared and the **O<sub>i</sub>** fault remains, the detectors may require cleaning or service. See the "Troubleshooting" section in this manual for further information.

#### Magnetic **O<sub>i</sub>** / Manual **O<sub>i</sub>**



#### **CAUTION**

*These tests require disabling of all extinguishing devices to avoid release resulting from a successful test.*

The detectors incorporate both Magnetic **O<sub>i</sub>** (Mag **O<sub>i</sub>**) and Manual **O<sub>i</sub>** (Man **O<sub>i</sub>**) test capabilities. These tests provide pulses (80 to 110 CPS) to the controller (R7404 or R7494) when the detector is not in fault. If the test is

successful, the controller indicates a fire and the appropriate zone output is active.

#### **NOTE**

*If a detector is in a fault condition, a successful Mag **O<sub>i</sub>** or Man **O<sub>i</sub>** test cannot be performed.*

The Mag **O<sub>i</sub>** test is initiated by placing a magnet at the location marked "MAG **O<sub>i</sub>**" on the outside of the detectors (see Figure 2). This action causes the detector to immediately send pulses to the controller. Controller response is as follows:

- The Zone LED blinks.
- The digital display indicates which Zone is in alarm.
- The status indicator shows "6" (fire).

#### **IMPORTANT**

*Mag **O<sub>i</sub>** can be performed with the controller's (R7404/R7494) keylock switch in either the NORMAL or TEST position. In NORMAL, the controller goes into alarm and activates its outputs. If no controller alarm output is desired, place the keylock switch in the TEST position before touching the magnet to the outside of the detector.*

*Man **O<sub>i</sub>** operates only with the keylock switch in the TEST position.*

During the entire test, the detector gives no indication of alarm.

To reset the controller status and alarms, place the keylock switch in RESET. Return the keylock switch to NORMAL when testing is complete.

The Man **O<sub>i</sub>** test is nearly identical to the Mag **O<sub>i</sub>** test, except for the manner in which the test is initiated:

- Place the keylock switch on the controller (R7404/R7494) in the Test position.
- Press the Select button to select the appropriate detector for test.
- Press the Test/Accept button to initiate the test.

Controller and detector responses are identical to the Mag **O<sub>i</sub>** test described above.

To reset the controller status and alarms, place the keylock switch in RESET. Return the keylock switch to NORMAL when testing is complete.

#### **NOTE**

*The **O<sub>i</sub>** function is FM verified. See Appendix A in each models instruction manual for details.*

## GENERAL APPLICATION INFORMATION

### RESPONSE CHARACTERISTICS

Response is dependent on the detector's sensitivity setting, 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, the FM Approval and Performance Report, in each models manual for third-party approved fire test results. Additional fire test results are available from Det-Tronics.

### 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. See each X-Series flame detectors instruction manual for important information on application considerations specific to each model, as well as sensitivity options.

## 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.*

### 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 disabled prior to performing system tests or maintenance.*

### CAUTION

*The X-Series flame detectors are to be installed in places where the risk of mechanical damage is low.*

### ATTENTION

*Remove the protective cover from the front of the detector before activating the system.*

### ATTENTION

*Observe precautions for handling electrostatic sensitive devices.*

### ATTENTION

*For models X2200, X2200M, X5200, and X5200M flame detectors, the source tube is a flame-sealed gas tube containing Neon, Hydrogen, and a trace amount of Krypton 85 (Kr85), a radioactive material. The total volume of gas within the tube is 0.6 ml per tube, making the gas mixture inside the tube nonflammable. If the gas envelope is broken, it will not produce a flammable mixture, and the gas immediately disperses into the air and is unlikely to present any type of hazard. Krypton gas and its radioactive isotope are inert and are not absorbed by the body. No special handling measure or personal protection equipment is needed for the UV detectors.*

## WIRING PROCEDURE

### Wire Size and Type

The system should be wired according to local codes. The wire size selected should be based on the number of detectors connected, the supply voltage, and the cable length. Typically 16 AWG, 2.5 mm<sup>2</sup> shielded cable is recommended. Wires should be stripped 1/2 inch (12 mm). In some cases where the X-Series flame detector 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 detector.*

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 3 through 7. Consult the factory if not using shielded cable.

The "B" (pulse output) and "D" (o<sub>1</sub> 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 3 through 7.)

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

If disconnection of power is required, separate disconnect capability must be provided.

**⚠ WARNING**

*All entries must contain appropriately rated plugs or fittings. It is required that each plug or fitting be wrench-tightened to an appropriate installation torque and meet the minimum thread engagement requirements per the applicable local standards, codes, and practices in order to retain the defined ratings. PTFE sealant or equivalent should be used on NPT threads.*

**IMPORTANT**

*Devices certified for hazardous locations shall be installed in accordance with EN/IEC 60079-14 and NEC 505.*

**⚠ CAUTION**

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

**Detector Wiring**

**IMPORTANT**

*If installing an X-Series flame detector 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 X-Series flame detector.***



Figure 1—X-Series Flame Detector Terminal Block

9		19	PULSE OUT	29	SPARE
8		18		28	SPARE
7	COM FIRE	17	COM FIRE	27	
6	NO FIRE	16	NO FIRE	26	
5	NC FIRE	15	NC FIRE	25	
4	COM FAULT	14	COM FAULT	24	RS485 A
3	NO FAULT	13	NO FAULT	23	RS485 B
2	+Vin	12	+Vin	22	MAN O <sub>i</sub>
1	-Vin	11	-Vin	21	-Vin

Figure 2—X-Series Flame Detector Pulse Wiring Terminal Identification

1. Make field connections following local ordinances and guidelines in this manual.

Figure 1 shows the wiring terminal strip located inside the detector’s integral junction box.

Figure 2 shows the wiring terminal identification for a X-Series flame 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 3 through 7.)

See each model’s instruction manual for examples of typical installations with a X-Series flame detector wired to a fire alarm panel.

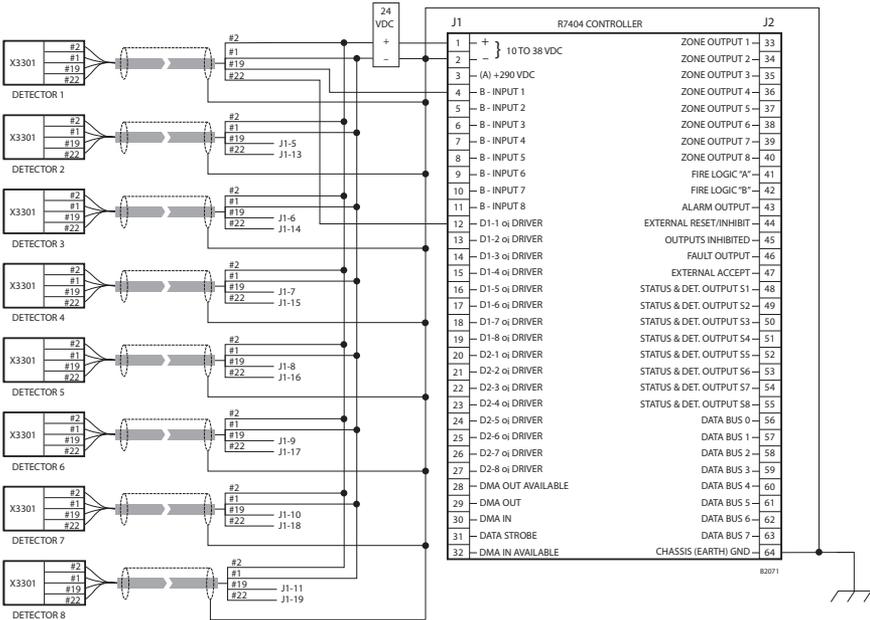
2. Check all field wiring to be sure that the proper connections have been made.

**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.*

3. Make the final sighting adjustments and use a 14 mm hex wrench to ensure that the mounting arm assembly is tight.

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



TERMINAL IDENTIFICATION FOR X-SERIES DETECTOR 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  $\mu$ F 400 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).

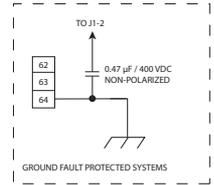
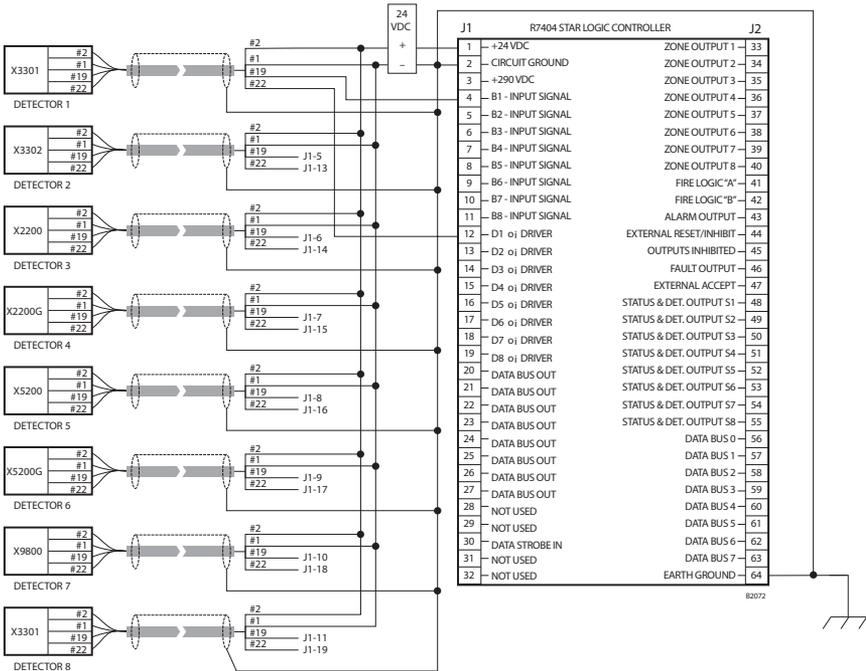


Figure 3—A Typical System, X3301 Detectors Wired to R7404 Controller

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



TERMINAL IDENTIFICATION FOR X-SERIES DETECTOR WITH PULSE OUTPUT.

TERMINAL NO.	FUNCTION
1/11	DC- ("C" LEAD)
2/12	DC+ ("A" LEAD)
19	SIGNAL ("B" LEAD)
22	O1 ("D" LEAD)

NOTE: IF THE POWER SUPPLY MINUS CANNOT BE CONNECTED TO CHASSIS (EARTH) GROUND, CONNECT A 0.47 μF 400VDC 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).

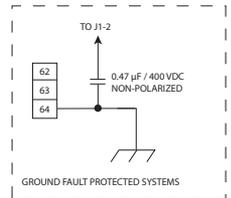
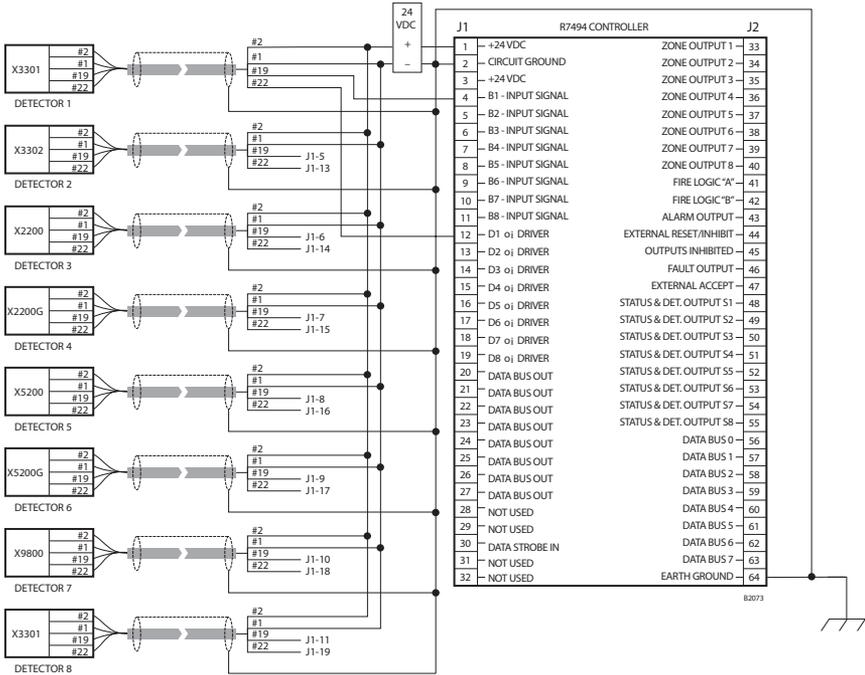


Figure 4—A Typical System, X-Series Flame Detectors Wired to R7404 Star Logic Controller



TERMINAL IDENTIFICATION FOR X-SERIES FLAME DETECTOR WITH PULSE OUTPUT.

TERMINAL NO.	FUNCTION
1/11	DC- ("C" LEAD)
2/12	DC+ ("A" LEAD)
19	SIGNAL ("B" LEAD)
22	0 ("D" LEAD)

NOTE: IF THE POWER SUPPLY MINUS CANNOT BE CONNECTED TO CHASSIS (EARTH) GROUND, CONNECT A 0.47 μF 400 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).

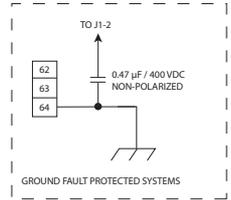
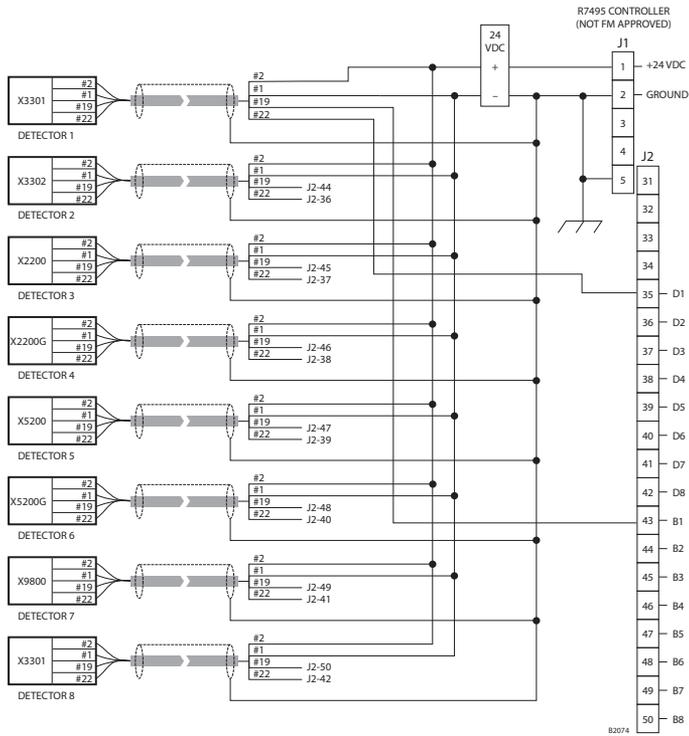


Figure 5—A Typical System, X-Series Flame Detectors Wired to R7494 Controller



TERMINAL IDENTIFICATION FOR X-SERIES FLAME DETECTOR 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 / 400 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).

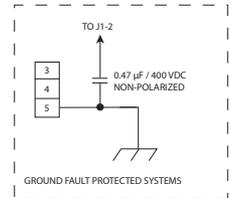
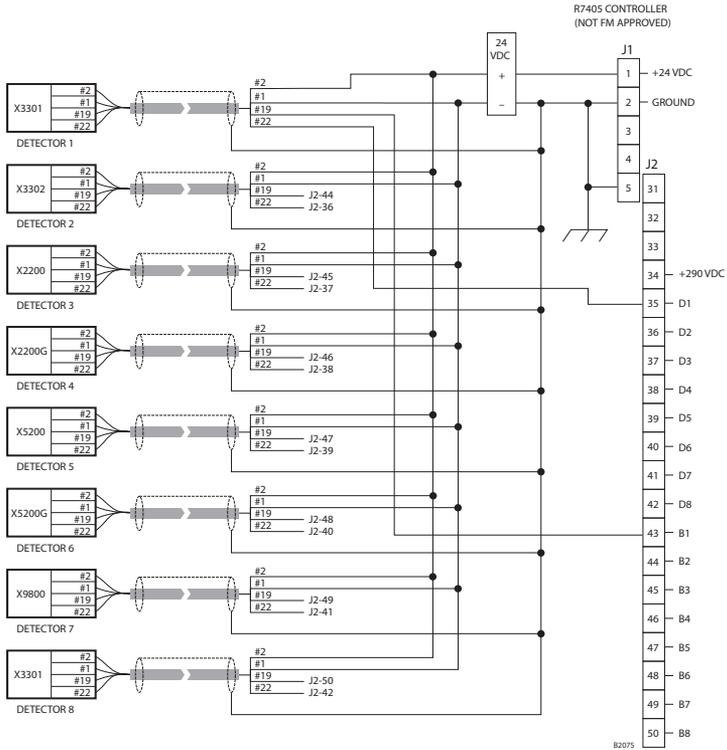


Figure 6—A Typical System, X-Series Flame Detectors Wired to R7495 Controller

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



B2075

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	0V ("D" LEAD)

NOTE: IF THE POWER SUPPLY MINUS CANNOT BE CONNECTED TO CHASSIS (EARTH) GROUND, CONNECT A 0.47 µF 400 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).

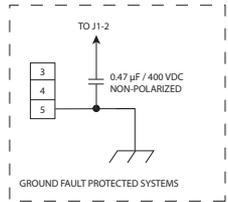


Figure 7—A Typical System, X-Series Flame Detectors Wired to R7405 Controller

## STARTUP PROCEDURE

When installation of the equipment is complete, perform one or more of the following tests:

- Man **oi** Test — Tests detector output and wiring, without generating a fire alarm.
- Count Test Mode — Measures actual detector output to controller (cps), without generating a fire alarm.
- Fire Alarm Test — For complete system test including detector relays. Generates fire alarm output.

### MANUAL **oi** 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. 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)

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 signal (cps) from a test fire or false alarm source. This can be useful during system setup 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. 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 (Pulse 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 a live fire test or a Mag **oi** test (see "Magnetic **oi** / Manual **oi**" 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 Q1201C Laser Aimer is recommended for this purpose.)
6. Enable extinguishing equipment when the test is complete and the detectors have returned to normal operation.

## 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

*To avoid a potential electrostatic discharge (ESD), the painted surface of the detector should only be cleaned with a damp cloth.*



### WARNING

*The sensor module (“front” half of the detector) contains no user serviceable components and should never be tampered with.*

To maintain maximum sensitivity and false alarm resistance, the viewing windows of the X-Series flame detectors must be kept relatively clean. Refer to each model's instruction manual for cleaning, and **oi** reflector plate removal and replacement instructions.

### NOTE

*The R-Series controller may not show an **oi** fault cleared for up to two minutes.*

## PERIODIC CHECKOUT PROCEDURE

A checkout of the system using the Mag **oi** or Man **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.

## CERTIFICATION—

The X-Series flame detectors with relay and pulse output (output type 15) are INMETRO, CSA, FM, ATEX, and IECEx approved. See each models instruction manual for INMETRO, CSA, FM, ATEX, and IECEx certification details.

**X-SERIES FLAME DETECTOR MODEL MATRIX**

<b>MODEL</b>	<b>DESCRIPTION</b>	
<b>X3301</b>	Multispectrum IR Flame Detector	
<b>X3302</b>	Multispectrum IR Flame Detector	
<b>X2200</b>	UV Flame Detector	
<b>X2200M</b>	UV Flame Detector with Molybdenum Tube	
<b>X2200G</b>	UV Flame Detector with Kr85 Free Source Tube	
<b>X5200</b>	UV/IR Flame Detector	
<b>X5200M</b>	UV/IR Flame Detector with Molybdenum Tube	
<b>X5200G</b>	UV/IR Flame Detector with Kr85 Free Source Tube	
<b>X9800</b>	IR Flame Detector	
	<b>TYPE</b>	<b>MATERIAL</b>
	<b>A</b>	Aluminum
	<b>S</b>	Stainless Steel
	<b>TYPE</b>	<b>THREAD TYPE</b>
	<b>4M</b>	4 Port, Metric M25
	<b>4N</b>	4 Port, 3/4" NPT
	<b>TYPE</b>	<b>OUTPUTS</b>
	<b>15</b>	Relay and Pulse
	<b>TYPE</b>	<b>APPROVALS</b>
	<b>B</b>	INMETRO (Brazil)
	<b>W</b>	FM/CSA/ATEX/IECEX
	<b>C</b>	CSA
	<b>E</b>	ATEX/IECEX
	<b>TYPE</b>	<b>CLASSIFICATION</b>
	<b>1</b>	Division / Zone Ex d e
	<b>2</b>	Division / Zone Ex d





95-8736



FlexSonic® Acoustic  
Leak Detector



X3301 Multispectrum  
IR Flame Detector



PointWatch Eclipse® IR  
Combustible Gas Detector



FlexVu® Universal Display  
with GT3000 Toxic Gas Detector



Eagle Quantum Premier®  
Safety System

Specifications subject to change without notice.

All trademarks are the property of their respective owners.

© 2020 Carrier. All rights reserved.



**Corporate Office**  
6901 West 110<sup>th</sup> Street  
Minneapolis, MN 55438 USA  
[www.det-tronics.com](http://www.det-tronics.com)

Phone: +1 952.941.5665  
Toll-free: +1 800.765.3473  
Fax: 952.829.8750  
[det-tronics@carrier.com](mailto:det-tronics@carrier.com)