



Flame Detection / Releasing System with X-Series Flame Detectors

CAUTION

- 1. The wiring procedures in this manual are intended to ensure proper functioning of the device under normal conditions. However, because of the many variations in wiring codes and regulations, total compliance to these ordinances cannot be guaranteed. Be certain that all wiring complies with applicable regulations that relate to the installation of electrical equipment in a hazardous area. If in doubt, consult a qualified official before wiring the system.*
- 2. The devices in this system contain semiconductor devices that are susceptible to damage by electrostatic discharge. An electrostatic charge can build up on the skin and discharge when an object is touched. Therefore, use caution when handling the device, taking care not to touch the terminals or electronic components. Observe normal precautions for handling electrostatic sensitive devices.*
- 3. The fault detection circuitry does not monitor the operation of external response equipment or the external wiring to these devices. It is important that these devices be checked periodically to ensure that they are operational.*

SYSTEM DESCRIPTION

Det-Tronics Flame Detection/Releasing System (FDRS) combines flame detection, signal processing, relay and detonation output devices into a single system (Figure 5). In addition to the Det-Tronics flame detectors, the FDRS accepts inputs from devices such as heat and smoke sensors, and manual trip stations. The FDRS

provides alarm and fault relay outputs, a detonator output that provides high speed output for direct connection to a deluge valve, and extinguishing agent release signals for connection to a releasing panel. The system includes:

- X2200 UV Flame Detector with Pulse Output
- X9800 IR Flame Detector with Pulse Output
- X5200 UV/IR Flame Detector with Pulse Output
- X3301 Multispectrum IR Flame Detector with Pulse Output
- R7404 Standard Controllers
(system capacity up to 4 controllers, up to 8 flame detectors per controller)
- R7494 Flame Controllers (system capacity up to 4 controllers, up to 8 flame detectors per controller)
- R6006 Relay Output Module
- R1425 Detonator Module
- Power Supply/Battery Charger and Battery Backup
- W2400 Ground Fault Monitor Module
- BFD Battery Failure Detector
- NEMA Rated Enclosure
- System Drawings

The FDRS is FM approved per ANSI/NFPA-72 National Fire Alarm Code:

1. Equivalent to Class B, Style A initiating device circuit (IDC) when detector is installed in single detector configuration.
2. Equivalent to Class A, Style D initiating device circuit (IDC) when detectors are installed in a redundant configuration (two detectors monitor exactly the same area). The configuration continues to provide area coverage via the second detector in the event a single circuit fault disables one of the detectors/circuits.



Figure 1A—X3301 Multispectrum IR Flame Detector



Figure 1B—X2200 UV Flame Detector

SYSTEM POWER AND WIRING

The R7404, R7494, R6006, R1425 and W2400 are all mounted within a mounting rack that is located within a NEMA Rated enclosure. System interconnection within the enclosure is completed as shown on the System Drawings. (Figure 6 identifies external circuit wiring). A terminal strip is provided for field wiring. The power supply/battery charger and backup batteries convert 120 vac supply voltage to +24 vdc to power the system. Refer to the System Drawings for wiring details of the specific system.

MAJOR COMPONENT DESCRIPTIONS

X-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 detector. In typical applications, the four wire X-Series detector can utilize all existing system wiring.



Figure 1C—X9800 IR Flame Detector



Figure 1D—X5200 UV/IR Flame Detector

X Series Flame Detectors include the following:

X3301 Multispectrum IR Detector — See Figure 1A.

X2200 UV Detector — See Figure 1B.

X9800 IR Detector — See Figure 1C.

X5200 UV/IR Detector — See Figure 1D.

COMMON X-SERIES CHARACTERISTICS

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

Outputs

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

A tricolor LED on the detector faceplate indicates normal, fire alarm and fault conditions.

Automatic Oi

The detector includes the Automatic Optical Integrity (oi) feature — a calibrated performance test that is automatically performed once per minute to verify complete detector operation capabilities. The detector automatically performs the same test that a maintenance person with a test lamp would perform — once every minute, 60 times per hour.

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.

Data Logging

Data logging capability is also provided. Status conditions such as normal, faults and alarms are recorded. Each event is time and date stamped. 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. The RS-485 supports MODBUS protocol.

Integral Wiring Compartment

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

R7404 CONTROLLER

Each standard R7404 Controller monitors up to 8 X-Series Pulse Output Flame Detectors. The R7404/X-Series flame detector systems feature automatic optical integrity (oi), which provides a continuous check of detector optical surfaces, detector sensitivity, and electronic circuitry of the detector/controller system and automatic fault identification, which monitors the system for proper operation and provides a digital display of system status using a numerical code. Other features include individual zone identification and “voting” capability, as well as manual oi testing. See Figure 2. Voting of 2 or more UV flame detectors is required for compliance to ANSI/NFPA 72 to maintain ground fault monitoring integrity.

R7494 CONTROLLER

The R7494 Controller is also used with all X-Series Pulse Output Flame Detectors. Up to 8 detectors can be used with each controller, with up to 4 controllers for the system. The microprocessor based controller provides features such as front panel LEDs and digital displays, automatic oi, count test mode and voting capability.

R6006 RELAY OUTPUT MODULE

The R6006 Relay Output Module receives inputs from solid state switching devices and provides load relay switching in response to the input signals. The R6006 has as many as eight relay output circuits that can be programmed for instant or time delayed operation. The relays have Form C contacts which can operate alarms, solenoids or other equipment that draw 3 amperes or less at up to 30 vdc or up to 250 vac. Each relay is represented on the R6006 front panel by an LED, which indicates whether or not it is activated. Four different models are available, each with a different relay output configuration. See Figure 3.

R1425 DETONATOR MODULE

The R1425 Detonator Module is used with a flame detector and R7404/R7494 Controller to provide a high speed response for explosion suppression systems in hazardous applications such as munitions manufacturing. The R1425 provides two independent zones of protection. Each zone has one output circuit that can be used “as is” with internal capacitors providing one joule of energy. For continuous output

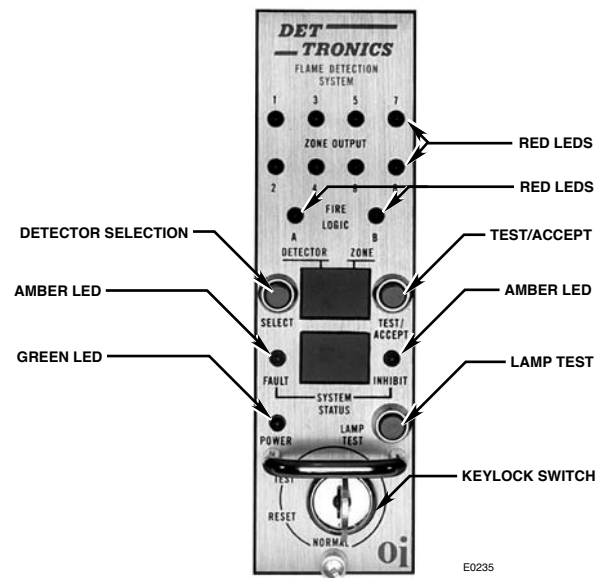
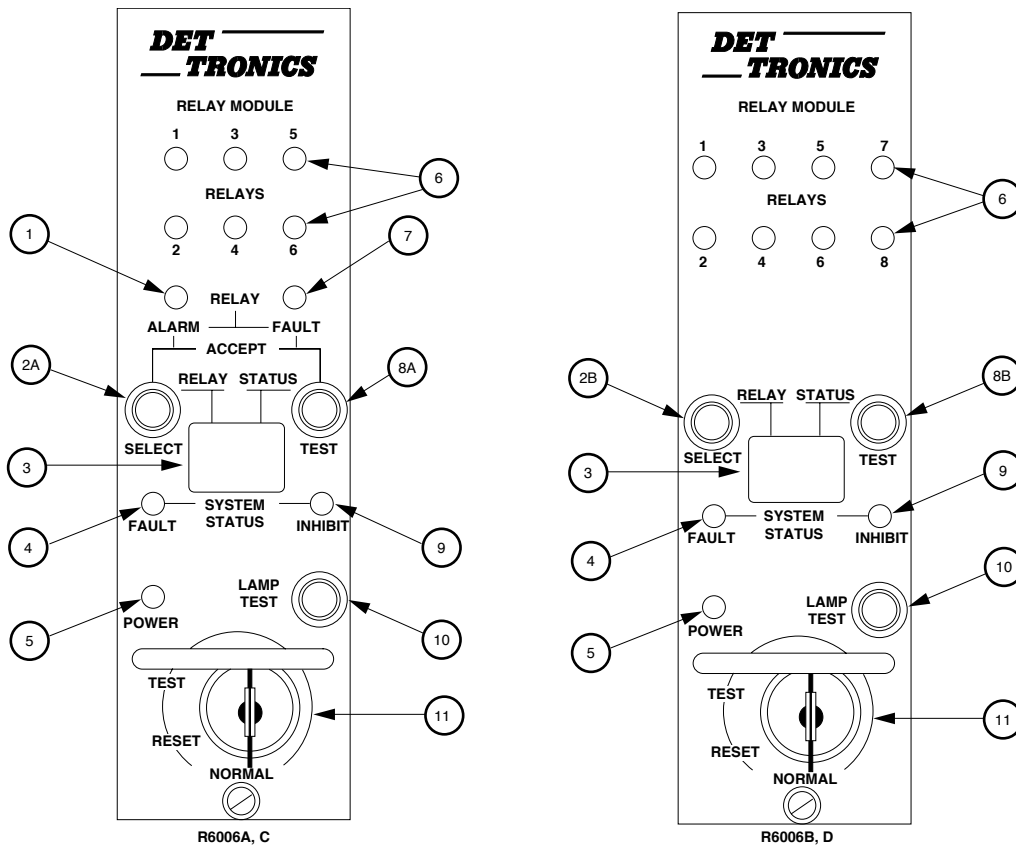


Figure 2—R7404/R7494 Flame Controller Front Panel



- | | |
|----|---|
| 1 | RED ALARM RELAY LED, NORMALLY OFF—BLINKS WHEN RELAY ENERGIZED, ON (STEADY) WHEN RELAY DE-ENERGIZED, (ALARM ACCEPT) |
| 2A | SELECT/ALARM ACCEPT BUTTON—IN NORMAL MODE, DE-ENERGIZES ALARM RELAY – IN TEST MODE, SELECTS NEXT RELAY CIRCUIT FOR TEST |
| 2B | SELECT BUTTON—SELECTS RELAY CIRCUIT IN TEST MODE |
| 3 | DIGITAL DISPLAY—NORMALLY OFF—TURNS ON TO INDICATE STATUS CHANGE AND RELAY AFFECTED |
| 4 | AMBER SYSTEM FAULT LED, NORMALLY OFF—ON TO INDICATE SYSTEM FAULT |
| 5 | GREEN POWER LED, NORMALLY ON WHEN UNIT IS POWERED |
| 6 | RED FIRE RELAY LEDS, NORMALLY OFF (RELAY UN-ENERGIZED)—BLINK WHEN RELAY ENERGIZED—ON (STEADY) WHEN RELAY DE-ENERGIZED |
| 7 | AMBER FAULT RELAY LED, NORMALLY OFF (RELAY ENERGIZED) BLINKS WHEN RELAY DE-ENERGIZED—ON (STEADY) WHEN RE-ENERGIZED (FAULT ACCEPT) |
| 8A | TEST/FAULT ACCEPT BUTTON—IN NORMAL MODE, RE-ENERGIZES FAULT RELAY—IN TEST MODE, ACTIVATES RELAY DRIVE CIRCUITRY IN TEST MODE |
| 8B | TEST BUTTON—ACTIVATES RELAY DRIVE CIRCUITRY IN TEST MODE |
| 9 | AMBER INHIBIT LED, NORMALLY OFF—ON TO INDICATE RELAYS ARE INHIBITED |
| 10 | LAMP TEST BUTTON—TESTS ALL LEDS AND DIGITAL DISPLAY |
| 11 | KEYLOCK SWITCH—SELECTS NORMAL, RESET, TEST MODES |

Figure 3—R6006 Relay Output Module Front Panel

applications, such as solenoid activated valves, an external power supply can be used. The R1425 monitors its own internal circuits, and the status of external input devices. The R1425 also monitors detonators that are connected to it for opens, shorts to ground, and low voltage conditions. System status is shown on front panel indicators. See Figure 4.

W2400 GROUND FAULT MONITOR MODULE

The W2400 Ground Fault Monitor is a dedicated module in the Flame Detection/Releasing System that protects the integrity of the system power wiring by monitoring for ground faults. Detection of a ground fault condition is indicated by actuation of a solid state output and illumination of LEDs on the faceplate of the module.

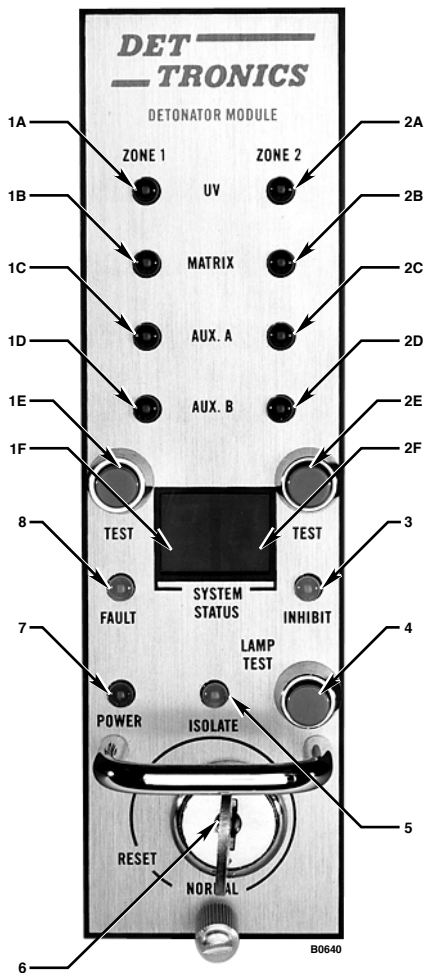


Figure 4—R1425 Detonator Module Front Panel

POWER SUPPLY/BATTERY BACKUP

The power supply/battery charger and backup batteries convert 120 vac supply voltage to +24 vdc (nominal), 10 or 30 amperes to power the system. This includes:

- + 24 volts dc, 10 or 30 amperes power supply/battery charger
- Two 12 vdc, sealed batteries connected in series.

If the backup batteries are not supplied by Det-Tronics, they must meet the requirements of Figure 5 and ANSI/NFPA-72.

Refer to the “Specifications” section for current and back-up battery requirements.

BATTERY FAILURE DETECTOR

The Battery Failure Detector (BFD) monitors up to four battery strings in real time. Batteries can age or deteriorate more quickly than expected due to high temperature, over-voltage, deep discharges, and other

environmental and operating conditions. As a result, battery failures can occur, decreasing battery capacity and the ability to provide the necessary system operating power.

The BFD monitors the overall battery voltage and the mid-point voltage of each battery string in the system. It reports an alarm if the monitored voltage is outside the acceptable limits, indicating a battery problem.

The front of the BFD has a set of four switches, a series of eight indicator LEDs and a 4-digit alphanumeric display. The user interface menu is accessible using the switches and display on the front panel. External connections are made at the back of the BFD.

MOUNTING RACK

The R7404, R7494, R6006, and R1425 Modules fit into a mounting rack, which is located within the system enclosure. Two mounting rack types are available:

- Q4004 Universal Mounting Cage - standard rack, holds all system modules (up to six)
- Q1020 Wall Mount Metal Enclosure - standard rack inside IP55 rated enclosure provides added protection.

SYSTEM ENCLOSURE

An enclosure is provided that contains the external wiring terminal strip and the mounting rack with all R7404(s), R7494(s), the R6006, and the R1425 included. Refer to the System Drawings for details and mounting dimensions.

SYSTEM OPERATION

A brief description of a typical application is provided below. Refer to the instruction manual for each device for more detailed operational information.

In a typical application of the Fire Detection/Releasing System, a fire sensed by the flame detectors and processed by the R7404/R7494 Controller will cause an assigned R6006 relay to energize, providing a relay output to a fire panel. At the same time, the fire signal will also cause the R1425 Detonator module to activate a deluge valve. Manual trip stations and heat detectors connect directly to the R1425, which will also cause the deluge valve to release when those alarms are tripped and provide a signal to the R6006, which in turn provides a relay output to the fire panel. Because each system is custom designed, input and output devices vary. Refer to the System Drawings for further information.

SPECIFICATIONS

A partial list of system specifications is provided here. For detailed specifications, refer to the applicable manual for the device or contact the factory.

POWER SUPPLY/BATTERY CHARGER—

Input: 120 volts ac, 60 Hz.

Output: 18 to 36 vdc (24 vdc, nominal), 10 amperes.

Refer to Table 1 for specifications of the EQ21XXPS Series power supplies.

NOTE

Although components are rated 18 to 38 vdc, the system output voltage has been rated at 18 to 36 vdc for maintaining ground fault monitoring capabilities.

RELAY CONTACT RATINGS—

28 vdc or 120 vac at 5 amperes.

CERTIFICATION—

FM Approved per ANSI/NFPA 72-1996, National Fire Alarm Code. Reference Figure 5 for FM Approval system details. (Reference the specific product manuals for detailed specifications.)

CURRENT REQUIREMENTS—

Use Tables 2 and 3 to determine current requirements at +24 vdc.

BACK-UP BATTERY REQUIREMENTS—

Use Table 4 or Table 5 to determine the backup battery amp hour requirement.

ENCLOSURE DIMENSIONS—

See specific System Drawings for mounting dimensions.

INSTALLATION

A set of System Drawings is supplied with each system and is specific to that system. These drawings detail system wiring, terminal assignments, enclosure dimensions, standard symbols and wiring specifications. Refer to these drawings when installing the system. Dashed lines within the System Drawings indicate wiring that must be completed in the field. Installation of the Flame Detection/Releasing System involves:

1. Mounting the enclosure that contains the prewired system - mounting dimensions are included in the System Drawings - Enclosure Mechanical Layout sheet.
2. Installing and wiring the detector - system wiring details are included in the System Drawings - Detector Field Wiring sheet. Refer to the appropriate Instruction Manual for detailed instructions on locating, mounting and wiring the detectors:

X2200 UV Flame Detector with Pulse Output 95-8552

X9800 IR Flame Detector with Pulse Output 95-8555

X5200 UV/IR Flame Detector with Pulse Output 95-8547

X3301 IR Flame Detector with Pulse Output 95-8528

3. Installing and/or wiring other field devices (manual pull stations, valves, annunciating/indicating/alarm response devices, fire panels, etc.) - wiring details are included in the System Drawings - UV System R7404/R7494, R6006, R1425 Wiring sheets.

Table 1—Specifications of EQ21xxPS Series Power Supplies

Characteristic	Power Supply		
	EQ2110PS (A36DAN-10A-24V-A1)	EQ2130PS (A36DAN-30A-24V-ABD1)	EQ2175PS (A36DAN-75A-24V-ABD1)
Input Voltage	120 vac	120/208/240 vac	120/208/240 vac
Input Current	4 Amps	11/5/6 Amps	26/13/15 Amps
Input Frequency	60 Hz	60 or 50 Hz	60 or 50 Hz
Output Voltage Rating	24 vdc	24 vdc	24 vdc
Output Current Rating	10 Amps	30 Amps	75 Amps
Maximum Alarm Current	10 Amps	30 Amps	75 Amps
Maximum Standby Current	3.33 Amps	10 Amps	25 Amps
Battery Recharge Current	6.67 Amps	20 Amps	50 Amps
Maximum Battery Capacity	100 AmpHours	300 AmpHours	750 AmpHours
Maximum Deluge Standby Current	1 Amp	3 Amps	7.5 Amp

Table 2—Standby Current Requirements at +24 vdc

Device Type	No. of Devices	x	Standby Current	=	Total Current for Device Type
X2200		x	0.104	=	
X9800		x	0.087	=	
X5200		x	0.116	=	
X3301		x	0.167	=	
R7404A/B		x	0.062	=	
R7494		x	0.063	=	
R6006		x	0.104	=	
R1425		x	0.104	=	
W2400		x	0.015	=	
BFD		x	0.160	=	
Resistor Network Load		x	0.012	=	
Heat Sensor		x		=	
Manual Pull		x		=	
Other		x		=	
Total Standby Current for System in Amperes				=	

Table 3—Alarm Current Requirements at +24 vdc

Device Type	No. of Devices	x	Alarm Current	=	Total Current for Device Type
X2200		x	0.187	=	
X9800		x	0.146	=	
X5200		x	0.200	=	
X3301		x	0.192	=	
R7404A/B		x	0.167	=	
R7494		x	0.146	=	
R6006		x	0.292	=	
R1425		x	0.292	=	
W2400		x	0.015	=	
BFD		x	0.160	=	
Resistor Network Load		x	0.300	=	
Heat Sensor		x		=	
Manual Pull		x		=	
Other		x		=	
Other		x		=	
Total Solenoid Load (Valve Coil)				+	
Total Signaling Load				+	
Total Alarm Current for System in Amperes				=	

Table 4—Back-Up Battery Requirements for Deluge and Pre-Action Applications

Standby Current: _____	X	Standby Time: 90 Hours	=	Standby Amp Hours: _____
Alarm Current: _____	X	10 Minute Alarm Time: 0.17 Hour	=	Alarm Amp Hours: _____
Sum of Standby and Alarm Amp Hours			=	
10% Safety Factor			x	1.1
Total Battery Amp Hour Requirement			=	

Table 5—Back-up Battery Requirements for Automatic Release of Extinguishing Systems Except Deluge

Standby Current: _____	X	Standby Time: 24 Hours	=	Standby Amp Hours: _____
Alarm Current: _____	X	5 Minute Alarm Time: 0.083 Hour	=	Alarm Amp Hours: _____
Sum of Standby and Alarm Amp Hours			=	
10% Safety Factor			x	1.1
Total Battery Amp Hour Requirement			=	

4. Providing system power as shown in the System Drawings - Power Distribution sheet.
5. Refer to the C7050/R7404 Ultraviolet Flame Detection System manual (Form 95-8242), "Startup Procedure" for startup information.

SWITCH SETTING

The Flame Detection/Releasing System is shipped with the switches on the R7404, R7494, R6006 and R1425 devices set according to system specifications. Once in the field and operating, however, some settings may need to be adjusted. Instructions for setting switches are included in the applicable manual (see below) in the "Installation, Switch Setting" section. Refer to these manuals for detailed information.

C7050/R7404	Detector/Controller	Form 95-8242
X2200	Detector w. Pulse Out.	Form 95-8552
X9800	Detector w. Pulse Out.	Form 95-8555
X5200	Detector w. Pulse Out.	Form 95-8547
X3301	Detector w. Pulse Out.	Form 95-8528
C7052J/R7494	Detector/Controller	Form 95-8311
R6006	Relay Module	Form 95-8244
R1425	Detonator Module	Form 95-8254
W2400	Ground Fault Monitor	Form 95-8481

TROUBLESHOOTING AND MAINTENANCE

Refer to the applicable device manual (listed above) for troubleshooting and maintenance information.

R7404, R6006, R1425 REMOVAL/REPLACEMENT

The R7404, R7494, R6006, and R1425 are not designed to be repaired in the field, however, field replacement can be accomplished by following the instructions below. If a problem should develop, first carefully check for proper wiring and switch settings. If it is determined that the problem is caused by a defect in the module, the device must be returned to the factory for repair. Follow the instructions below to remove the defective module.

1. Locate the defective device using the troubleshooting procedures in the applicable instruction manual.
2. Secure all output devices connected to the system.
3. Remove all power to the enclosure.

4. Loosen the captive screw at the bottom of the front panel of the module and slide it out of the mounting rack.
5. Return to the factory for repair as instructed in the "Repair and Return" section of this manual. Replace with a serviceable controller.

NOTE

When replacing a controller, be sure that the rocker switches of the replacement are the same as the original.

ORDERING INFORMATION

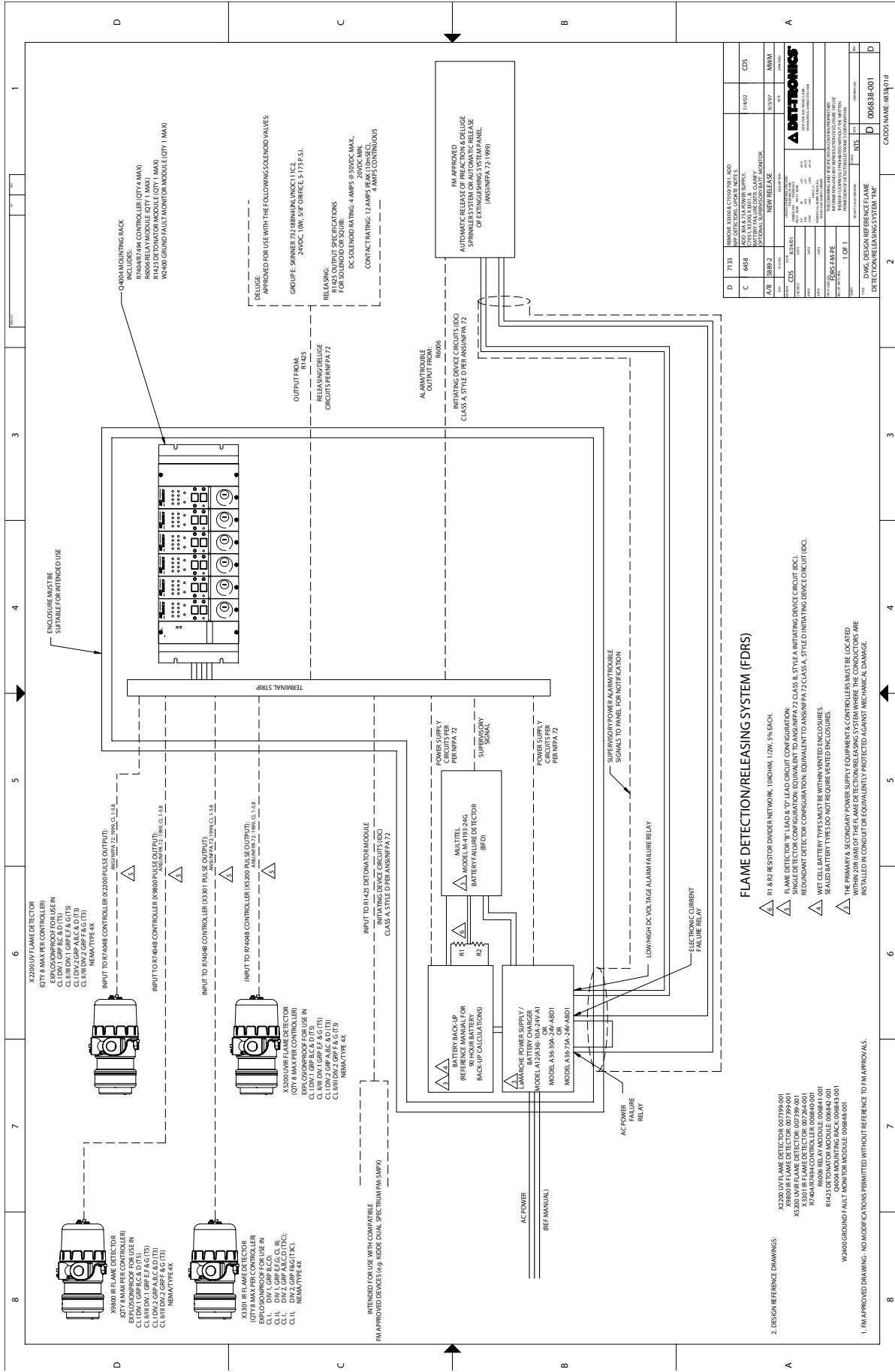
For assistance in ordering, please contact:

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.det-tronics.com
E-mail: det-tronics@det-tronics.com

DEVICE REPAIR AND RETURN

Prior to returning devices or components, contact the nearest local Detector Electronics office so that an RMI (Return Material Identification) number can be assigned. A written statement describing the malfunction must accompany the returned device or component to expedite finding the cause of the failure, thereby reducing the time and cost of the repair. Pack the controller circuit boards using sufficient packing material in addition to an anti-static bag or aluminum-backed cardboard as protection from antistatic discharge.

Return all equipment transportation prepaid to the Minneapolis location.



D	7133	REWORK XIMBA CONTROL 400	14/02	CDS
C	648	NEW RELEASE	20/97	MMVA
AB	5892	NEW RELEASE	20/97	MMVA

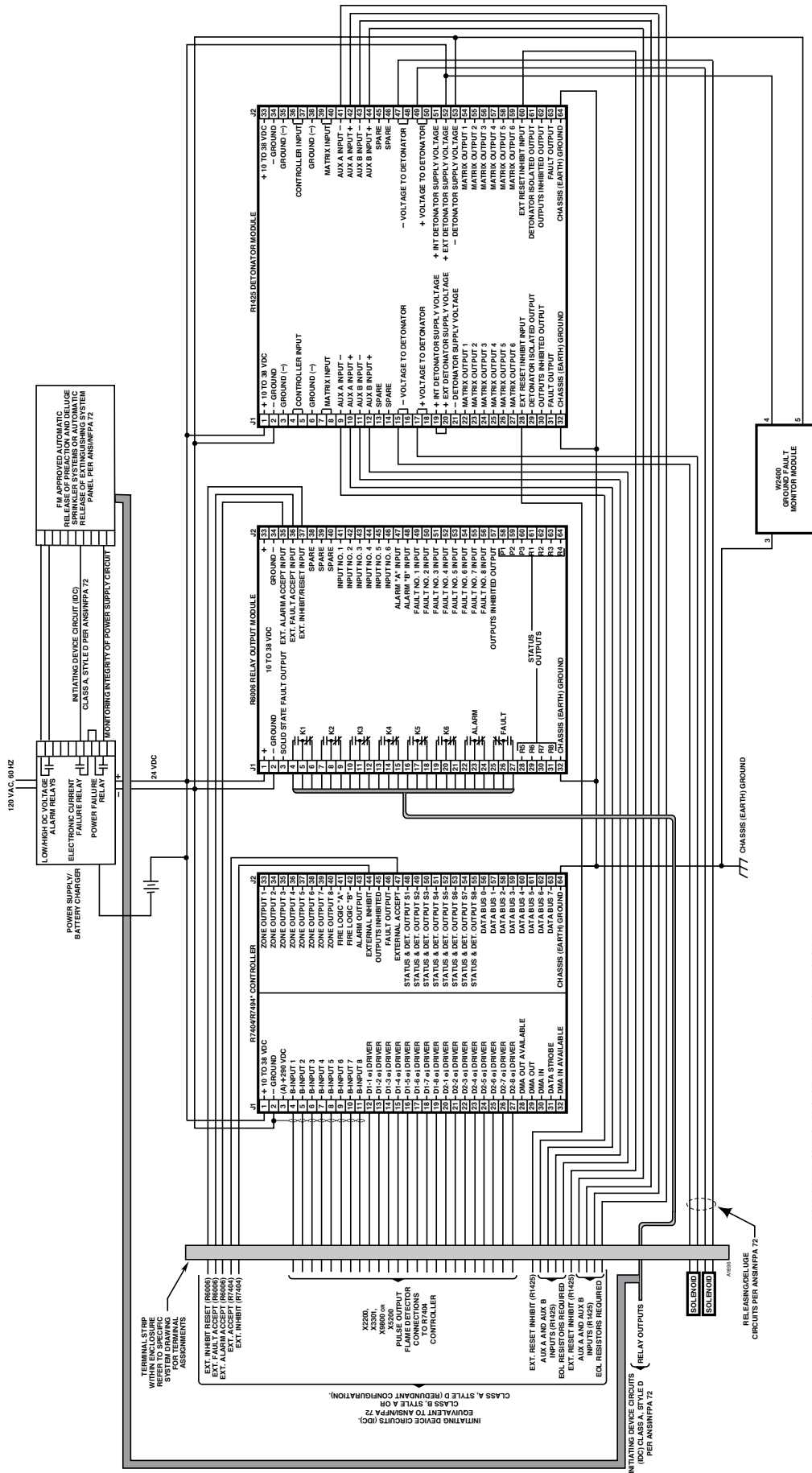
REVISIONS: 1 OF 1
 DATE: 14/02/02
 DRAWN BY: [Name]
 CHECKED BY: [Name]
 APPROVED BY: [Name]
 PROJECT: [Name]
 SHEET: [Name]
 DWG. DESIGN REFERENCE: JAME
 DETECTION/RELEASING SYSTEM (FDRS)
 CADDS NAME: 006838-001

FLAME DETECTION/RELEASING SYSTEM (FDRS)

- △ R1 & R2 RESISTOR DIVIDER NETWORK, 120W, 5W EACH.
- △ FLAME DETECTOR "B" LEAD & "D" LEAD CIRCUIT CONFIGURATION.
- △ SINGLE DETECTOR CONFIGURATION: EQUIPMENT TO ANS/NFPA 72 CLASS B, STYLE A INITIATING DEVICE CIRCUIT (IDCI).
- △ REDUNDANT DETECTOR CONFIGURATION: EQUIPMENT TO ANS/NFPA 72 CLASS A, STYLE D INITIATING DEVICE CIRCUIT (IDCI).
- △ WET CELL BATTERY TYPES DO NOT REQUIRE VENTED ENCLOSURES.
- △ THE PRIMARY & SECONDARY POWER SUPPLY EQUIPMENT & CONTROLLERS MUST BE LOCATED WITHIN 20R (6M) OF THE FLAME DETECTION/RELEASING SYSTEM WHERE THE CONDUCTORS ARE INSTALLED IN CONJUNCTION WITH EQUIPMENT PROTECTED AGAINST MECHANICAL DAMAGE.

2. DESIGN REFERENCE DRAWINGS:
- X2300 IIR FLAME DETECTOR, 07395-001
 - X2300 IIR FLAME DETECTOR, 07395-001
 - R2408A IIR FLAME DETECTOR, 07395-001
 - R2408B IIR FLAME DETECTOR, 07395-001
 - R2408C IIR FLAME DETECTOR, 07395-001
 - R2408D IIR FLAME DETECTOR, 07395-001
 - R2408E IIR FLAME DETECTOR, 07395-001
 - R2408F IIR FLAME DETECTOR, 07395-001
 - R2408G IIR FLAME DETECTOR, 07395-001
 - R2408H IIR FLAME DETECTOR, 07395-001
 - R2408I IIR FLAME DETECTOR, 07395-001
 - R2408J IIR FLAME DETECTOR, 07395-001
 - R2408K IIR FLAME DETECTOR, 07395-001
 - R2408L IIR FLAME DETECTOR, 07395-001
 - R2408M IIR FLAME DETECTOR, 07395-001
 - R2408N IIR FLAME DETECTOR, 07395-001
 - R2408O IIR FLAME DETECTOR, 07395-001
 - R2408P IIR FLAME DETECTOR, 07395-001
 - R2408Q IIR FLAME DETECTOR, 07395-001
 - R2408R IIR FLAME DETECTOR, 07395-001
 - R2408S IIR FLAME DETECTOR, 07395-001
 - R2408T IIR FLAME DETECTOR, 07395-001
 - R2408U IIR FLAME DETECTOR, 07395-001
 - R2408V IIR FLAME DETECTOR, 07395-001
 - R2408W IIR FLAME DETECTOR, 07395-001
 - R2408X IIR FLAME DETECTOR, 07395-001
 - R2408Y IIR FLAME DETECTOR, 07395-001
 - R2408Z IIR FLAME DETECTOR, 07395-001

1. FM APPROVED DRAWING - NO MODIFICATIONS PERMITTED WITHOUT REFERENCE TO FM APPROVALS.



NOTE: IF R7484M-24H-1 CONTROLLER IS USED, TERMINAL 3 PROVIDES +24 VDC NOMINAL.

Figure 6—Fire Detection/Releasing System External Circuits Wiring Identification (Does not show internal system interconnection – this will vary with each system according to customer requirements. Refer to specific system drawing for details.)