

Instructions

95-8373-02

Infrared Fire Detection System

R7484/C7098B

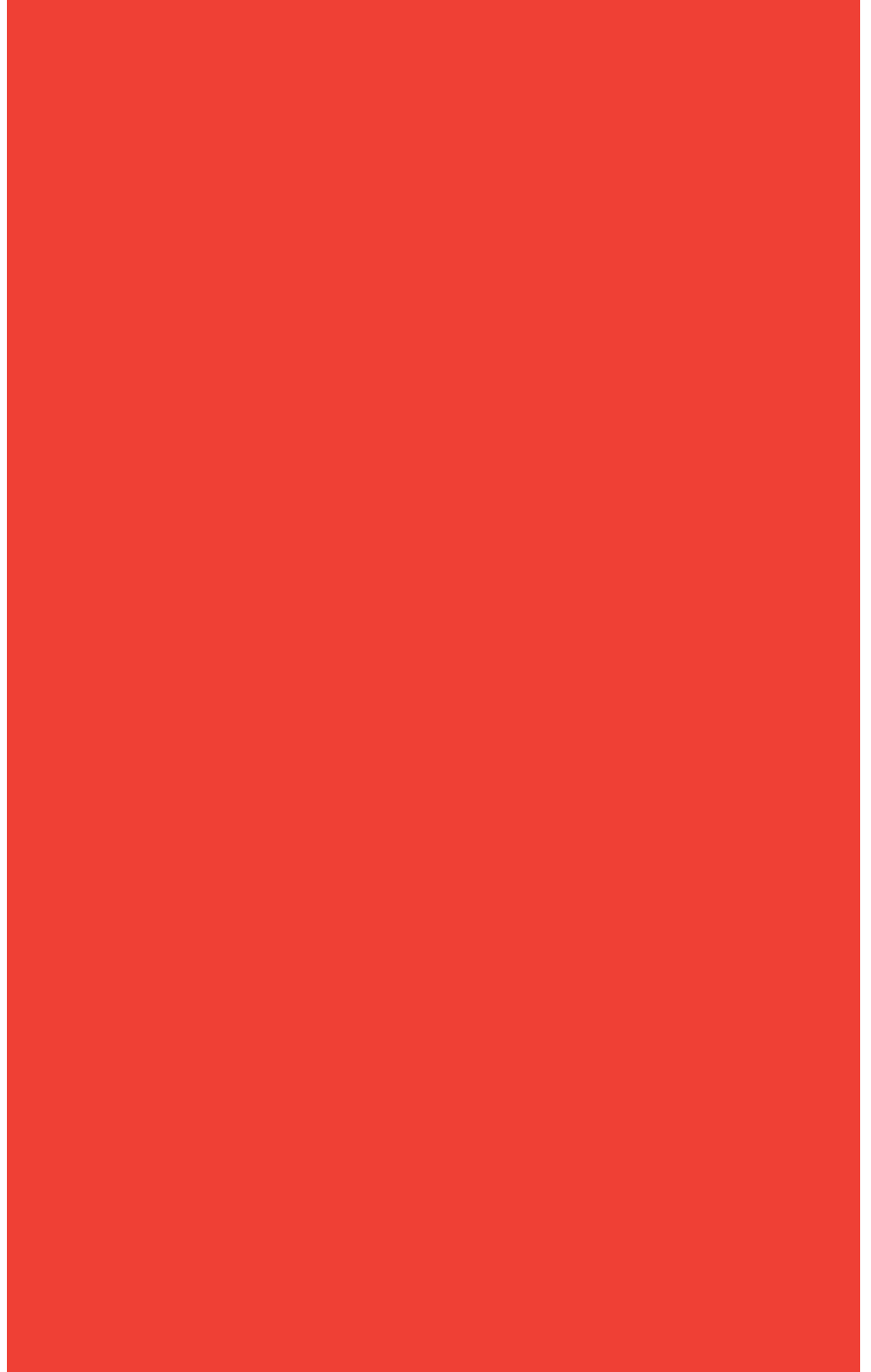


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AUTOMATIC **oi***

Infrared Fire Detection System

R7484/C7098B

NOTE

Not compliant to FM 3260 (2000).

APPLICATION

The R7484/C7098B Infrared Flame Detection System is designed to provide continuous and automated fire protection while ensuring system operation through the patented Automatic Optical Integrity (**oi**) feature.

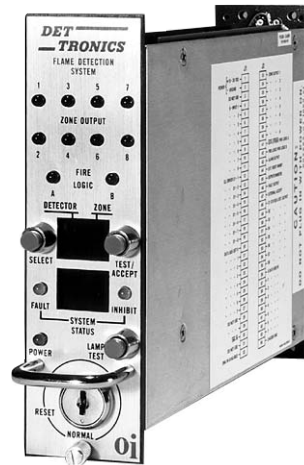
Typical applications for the R7484/C7098B system include areas where:

- Harsh salt water conditions exist
- Arc welding or lightning is common
- A high concentration of ultraviolet attenuating vapors or oil films are present
- A hazardous environment requires a detector with an explosion-proof/flame-proof enclosure.

FEATURES

- Solar blind detector.
- Will not false alarm to lightning, arc welding, x-rays or artificial lighting.
- Controller continuously monitors up to eight detectors.
- Ideally suited for dirty environments where oil films and dirt buildup are common.
- Detector is designed to meet FM, CSA, and BASEEFA/CENELEC explosion-proof/flame-proof requirements.
- Each detector can independently register an alarm.
- Voting circuitry for improved false alarm rejection.
- Front panel LEDs indicate fire response and general system status.
- Microprocessor control provides continuous diagnostics and automatic fault identification.
- User-selectable automatic Optical Integrity (**oi**) or manual **oi** to ensure system reliability.

***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.



SPECIFICATIONS

SPECTRAL SENSITIVITY RANGE—

The C7098B is equipped with a series of optical filters to narrow the sensitivity range to 4.4 microns, a spectral area for fire detection.

CONE OF VISION—

The C7098B has a 70 degree cone of vision with the highest sensitivity lying along its central axis. See Figure 1.

RESPONSE TIME—

The response time of the detector is a function of fuel, fire size, distance, controller sensitivity and time delay settings, and orientation of the fire source. The fastest response time to an IR (fire) source is 0.5 second. A three second time delay is recommended for most applications to minimize the potential of false alarms.

FLAME SENSITIVITY—

Responds to a 1 square foot gasoline fire at 65 feet (approximately 0.1 square meter at 20 meters). A controller sensitivity setting of 48 counts per second (cps) and a 3 second time delay are recommended for most applications.

CONTROLLER TEMPERATURE RANGE—

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

DETECTOR TEMPERATURE RANGE—

Storage: -40°F to +185°F (-40°C to +85°C)
 Operating: -40°F to +167°F (-40°C to +75°C).

DETECTOR VIBRATION—

Meets MIL-STD 810C for vibration.

INPUT VOLTAGE—

24 vdc nominal, 18 to 32 vdc maximum.

DETECTOR HUMIDITY RANGE—

0 to 95%.

POWER CONSUMPTION—

Controller: 1.5 watts typical, 3.5 watts maximum.
 Detector: 0.5 watt typical, 2.0 watts maximum.

OUTPUT CIRCUIT RATINGS—

Open collector transistor outputs are rated 100 milliamperes dc at 60 vdc. For load monitoring, install a 100 kilohm resistor from the output to ground.

DIMENSIONS—

See Figures 2 and 3.

ENCLOSURE MATERIALS—

Anodized aluminum or 316 stainless steel.

ENCLOSURE RATINGS—

Meets FM and CSA requirements for Class I, Div. 1, Groups C and D, Class II, Div. 1, Groups E, F and G. NEMA 4 (dust-tight, watertight) enclosure rating. BASEEFA/CENELEC approved flame-proof/explosion-proof EExd IIB T6 (with T ambient rating of -40°C to +75°C) to BS 5501 parts 1 and 5 (EN50014 and EN50018). IP66 to BS5490. BASEEFA certificate number 87B1269.

SHIPPING WEIGHT—

R7484 Controller:
 4.4 pounds (2.0 kilograms).

C7098B Detector:
 Aluminum: 4.0 pounds (1.8 kilograms).
 Stainless Steel: 8.1 pounds (3.7 kilograms).

100% REPRESENTS THE MAXIMUM RANGE FOR A GIVEN FIRE. THE SENSITIVITY INCREASES AS THE ANGLE OF INCIDENCE DECREASES.

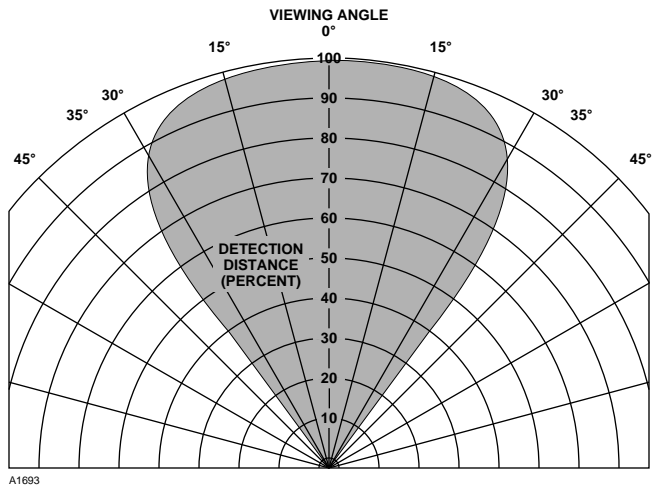


Figure 1—C7098B Cone of Vision

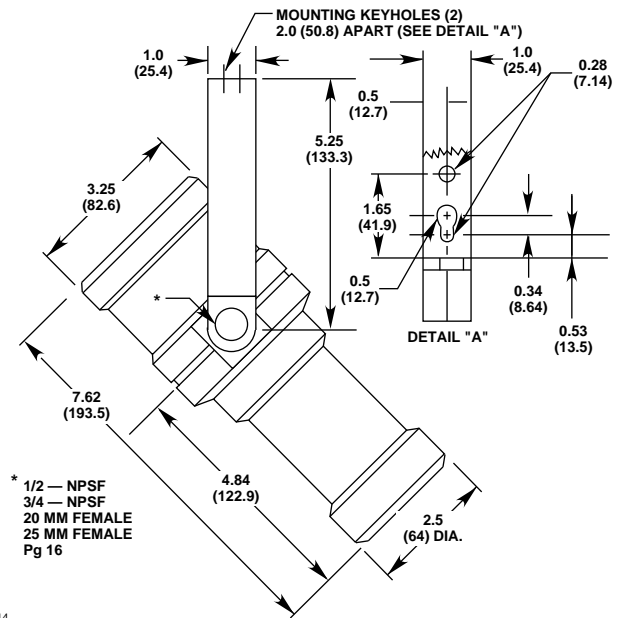


Figure 2—C7098B Mounting Dimensions in Inches (MM)

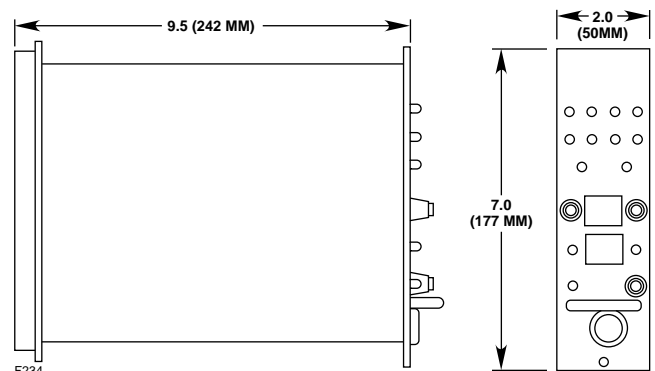


Figure 3—Dimensions of the R7484 Controller in Inches (MM)

OPTIONS

W4220 Voltage Converters and 000507-XXX power supplies are available for operating the R7484 and C7098B from line (mains) voltage.

The Q4004 Mounting Cage is designed for holding up to eight micro-module devices and is recommended for ease of installation and servicing. Mounting cages that hold fewer modules are also available. Optional filler panels (part number 002188-001) can be used to cover unused sections of the mounting cage.

Locking devices must be used on detector housings to comply with applicable regulations in some areas.

Q1113 Air Shields for areas where there is an abnormally high level of airborne contaminants.

Q1101 Air Shield for front mounted operation of the C7098C.

R6006/R6007 Relay Output Modules provide relay outputs operated by the R7484 solid state outputs. Various configurations are available.

ENGINEERING SPECIFICATIONS

The IR flame detection system shall have a microprocessor-based controller that can operate up to 8 detectors and provide relay outputs through the use of a relay output module. The controller shall be field programmable for selecting manual or automatic optical integrity (**oi**) testing, time delay period, sensitivity, voting output configuration, and latching or non-latching operation. The system shall operate on 24 vdc. The IR flame detection system shall be capable of responding to a 1 foot by 1 foot gasoline fire at a distance of 65 feet. It shall not respond to radiation generated by arc welding, x rays, artificial lighting or distant lightning strikes. The IR flame detector shall have a **stainless steel enclosure**¹. The detector shall be the Det-Tronics Model C7098B, no equal. The controller and relay output module shall be the Det-Tronics model R7484 Controller and the **R6006 Relay Output Module with digital display and field adjustable settings**² that fit in the Det-Tronics model Q4004 Mounting Rack, no equal.

The controller shall have visual annunciation of fire and fault conditions. The controller shall have a digital display for indication of system status, first detector to respond to a fire, actual signal level (cps) being sensed by a detector, and numerical code for type of fault present and detectors with faults. The controller shall have eight red LEDs for individual detector alarm indications, one green LED for power indication, one yellow LED for fault indication, a second yellow LED to indicate when

the outputs are inhibited, and two red LEDs for fire logic (voting) output indication. The controller shall have solid state transistor outputs that connect to a relay output module. Relay outputs shall be provided for **fire alarm outputs for each of the 8 detectors**³, 2 voting outputs, an **oi** fault output and a system fault output.

The controller shall have a method of being locked in the normal mode with a removable key.

The signal processing shall require the flickering IR radiation to exceed the field adjustable threshold level and time delay of 0.5 to 15 seconds before signalling an alarm condition.

The IR flame detector shall signal a fire condition in response to flickering radiation at the 4.4 micron wavelength from a hydrocarbon fire. The detector shall have a 70 degree cone of vision and be of a modular plug-in design that allows the IR sensor module to be easily field replaced. The detector shall have field-selectable manual or automatic optical testing capabilities. During the optical test, a beam of radiation shall be transmitted out of the detector housing, be reflected off of a reflector ring, back into the detector housing through the sensor's viewing window, and stimulate the sensor. Films that blind the IR sensor shall cause a failure of the optical test. When automatic optical testing is selected, the controller shall test the optics of each detector and annunciate failures by de-activating the fault output, turning on the yellow FAULT LED and by indicating in the digital display the actual detector number and fault code.

The detector shall be provided with two **20 mm⁴** (female) cable/conduit entries and a swivel mounting bracket that provides a means to easily sight the detector.

The IR flame detector shall be rated for an operating temperature range of -40° F to +167°F (-40°C to +75°C) and a storage temperature range of -40°F to +185°F (-40°C to +85°C). It shall be suitable for use over a humidity range of 0 to 95% RH. The IR flame detector shall have all printed circuit boards coated to provide protection from environmental conditions. The IR flame detector shall meet Mil STD 810C for vibration and have a swivel mounting bracket to provide a means to easily mount and aim the detector.

The IR flame detector shall be **explosion-proof for Class I, Division 1, Groups C and D; Class II, Division 1, Groups E, F and G. The device shall be rated NEMA 4 (dust-tight, watertight). The detector shall be FM approved and CSA certified**⁵.

An explosion-proof UV/IR test lamp shall be provided to allow field testing of the IR flame detection system. The

test lamp shall be FM approved for use in Class I, Division 1, Groups C and D hazardous areas. The explosion-proof UV/IR test lamp shall be the Det-Tronics model W867, no equal.

The following options can be substituted for the item in bold:

- 1 or: **"an anodized copper-free aluminum enclosure."**
- 2 or: **"R6007 Relay Output Module."**
- 3 this section may be deleted if the option is not desired.
- 4 or: **"1/2 inch NPT"** or **"3/4 inch NPT"** or **"25 mm"** or **"Pg 16."**
- 5 or: **"flame-proof for EEx d IIB. The device shall be rated IP66 (dust-tight/water-tight). The detector shall be BASEEFA/CENELEC certified."**

SYSTEM DESCRIPTION

The IR Flame Detection System consists of an R7484 Controller and up to eight C7098B Detectors.

DETECTOR

Every fire has characteristics or elements that distinguish it as a fire such as heat, smoke, visible light, invisible (to the human eye) ultraviolet (UV) and infrared (IR) radiation, and flame flicker. These characteristics are important because fire is a chemical process and chemical processes can vary significantly, depending on the elements and conditions present. A simple fire detector can be designed to detect any one of the elements but unless this detector can discriminate, it will be subject to false alarms. Discrimination can be achieved by using more than one element as criteria to determine a fire.

The C7098B detects two elements of fire: IR radiation and flame flicker. IR radiation is found throughout nature, but few things emit IR at the flicker frequency of a fire, which makes the C7098B a reliable fire detector. To further enhance the reliability of the C7098B, optical

filters are incorporated that narrow IR response to the 4.4 micron bandwidth. This bandwidth is significant for two reasons:

1. Hydrocarbon fires emit intense IR radiation in this band. See Figure 4.
2. Atmospheric transmission of IR from the sun at 4.4 microns is practically zero, making the C7098B solar blind. See Figure 5.

See Figure 6. A pyroelectric sensor converts infrared energy to an electrical output. The flicker filter circuit rejects any signal that does not meet the flicker frequency requirements, such as steady state emission of infrared radiation. The electrical signal is sent to the controller for processing. If the field programmed sensitivity and time delay of the controller are met, a fire signal is generated.

The detector is equipped with the patented Optical Integrity (**oi**) feature. The controller is field selectable for automatic or manual **oi** testing. The automatic **oi** test checks the viewing window for cleanliness, as well as the proper functioning of the sensor and electronic components of the detector. The testing frequency of the detector can be set in the field. The controller can be set to cycle through all zones in from one minute up to eight hours. If the detector should fail this test three consecutive times, a fault condition is indicated by a digital display on the front panel of the controller.

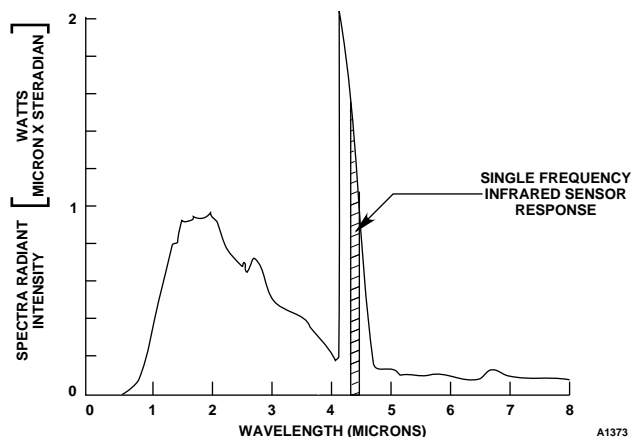


Figure 4—Radiation Spectra from a Hydrocarbon Fuel Fire

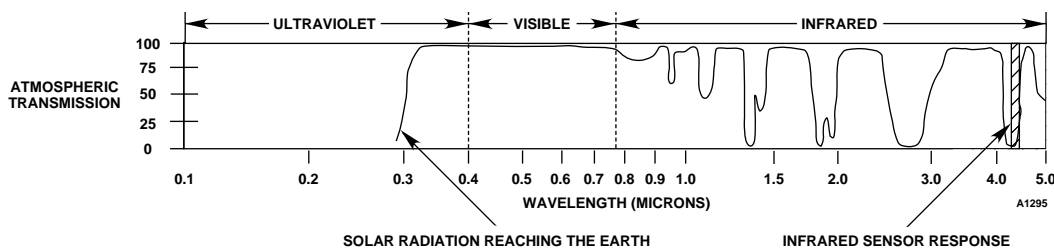


Figure 5—Detector Sensitivity Range

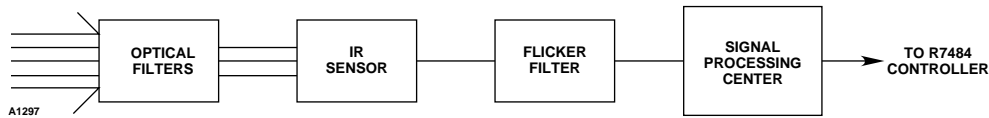


Figure 6—C7098B Block Diagram

The **oi** test is initiated by a signal from the controller, which causes actuation of test lamps that are located inside each detector enclosure (see Figure 7). The sensor and test lamp are optically arranged to prevent the test beam from reaching the sensor directly. Instead, it must pass through the viewing window and outside of the detector housing where it encounters a reflective ring (**oi** ring). The reflected test beam then passes through the window a second time on its way to the sensor.

The controller evaluates the return signal from the detector and generates an **oi** Fault Output if the amplitude of the return signal indicates an **oi** failure. If selected, an **oi** fault will also cause a General Fault Output. Since the test beam must pass through the same portion of the viewing window as radiation produced by a fire, this test of the ability of the detector to “see” a flame has a high degree of reliability.

The C7098B features an explosion-proof housing that is designed for installation in hazardous locations in both indoor and outdoor environments.

CONTROLLER

The microprocessor-based controller continuously monitors the outputs of all detectors connected to it. If a fire is detected, the appropriate outputs are actuated.

Programming Switches

Rocker switches that are located on the side of the controller are used for selecting various options that the R7484 offers:

1. Number of detectors connected to the controller (up to eight)
2. Time Delay
3. Sensitivity
4. Optical Integrity (**oi**)
5. Fire Logic (voting arrangement)
6. Latching/non-latching outputs.
7. Intercontroller voting.
8. **oi** fault activation of Fault output.

Controller Outputs

ZONE OUTPUTS

Each of the eight detectors has its own independent Zone output that is energized upon detection of a fire

that exceeds the selected sensitivity and time delay. An LED on the front panel of the controller will blink rapidly to show the zone output is active.

FIRE LOGIC OUTPUT(S)

If the fire signals from the responding detectors satisfy the selected voting requirements, actuation of the Fire Logic output(s) will also occur. This voting logic feature allows detectors to be “grouped” and generate a Fire Logic output if the minimum number of detectors respond to a fire.

The detectors can be grouped in one of two ways:

1. Separate Voting

The eight fire zones (detectors) are divided into two groups: Fire Logic A (zones 1 to 4) and Fire Logic B (zones 5 to 8). The controller can then be programmed to produce a logic output when either one or two of the four zones in a group detects a fire.

2. Common Voting

Up to eight controllers can be connected by way of the data bus to allow inter-controller voting. The controllers are connected in series so alarm information from the first controller (master) is sent to the second (slave) and then down the line to the following slave controllers (see Figure 8). Note that the information transfer moves in one direction only. Alarm information from the end controller does not return to the master controller. Each controller in

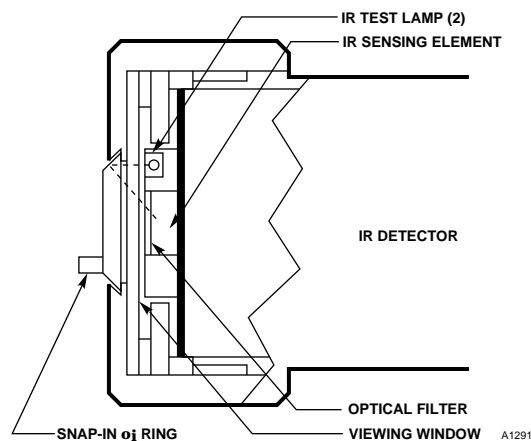


Figure 7—Automatic Optical Integrity Feature of the C7098B

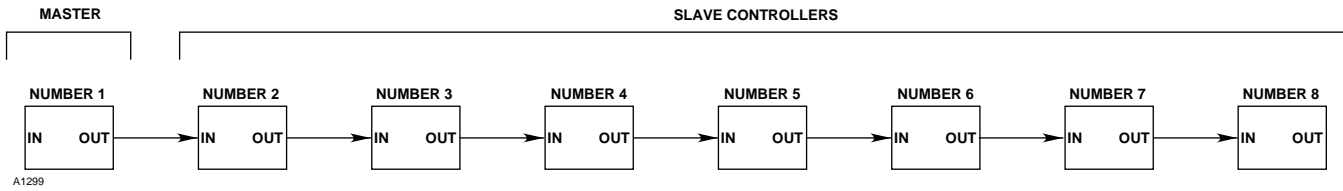


Figure 8—Intercontroller Communication

the series can be programmed to energize its Logic B output when the minimum number of detectors (one to seven) connected to it and/or “upstream” controllers detect a fire. The last slave controller in the sequence should be programmed for the required voting criteria to provide the final voted output (Fire Logic B).

A data bus test is automatically executed by the controller fault detection circuitry to verify correct connections of the data bus lines and proper functioning of the inter-controller communication circuitry.

This voting logic feature allows different combinations of detectors to fulfill the logic requirements, and provides the best balance between dependable fire detection and freedom from false alarms.

oi FAULT OUTPUT

A normally energized solid state **oi** Fault output is de-energized for controlling an external fault annunciation device.

OUTPUTS INHIBITED

Connecting an indicating device to terminal 45 provides a signal when the outputs are inhibited due to the controller keylock switch in the RESET or TEST position or by an External Reset/Inhibit switch input on terminal 44.

GENERAL (NON-oi) FAULT OUTPUT

A normally energized solid state Fault output is de-energized for controlling an external fault annunciation device. The output can be driven by the **oi** Fault output if desired.

STATUS AND DETECTOR OUTPUTS

Status and Detector solid state outputs provide binary output representations of the front panel digital displays for zone, detector, and system status. See Tables 1 and 2.

All outputs of the R7484 Controller are open collector transistor outputs and are rated for 100 milliamperes maximum at +60 vdc. An internal 100 kilohm resistor from output to ground for lead monitoring is provided.

External equipment that can generate transients when switching (such as relays) should have a transient suppression device connected across the coil at the time of installation to safeguard the output transistors against possible damage (see Figure 9). If the application requires the use of relay contacts, the R6007 Auxiliary Relay Output Assembly can be ordered for use in conjunction with the R7484 Controller. If supervised relay outputs or load monitoring capabilities are needed, the R6006 Auxiliary Relay Output Module must be used. Contact the Field Support Group at Detector Electronics for assistance in ordering a system to meet the needs of a particular application. Rocker switches on the side of the controller allow selection of time delay and latching or non-latching outputs.

Table 1—Relationships of ZONE and DETECTOR Display to the Status Outputs

Front Panel Display		Status Outputs				
Zone	Detector	S1	S2	S3	S4	S5
1	1	1	0	0	0	X
2	1	0	1	0	0	X
3	1	1	1	0	0	X
4	1	0	0	1	0	X
5	1	1	0	1	0	X
6	1	0	1	1	0	X
7	1	1	1	1	0	X
8	1	0	0	0	1	X

X = NOT USED

Table 2—Relationships of SYSTEM STATUS Display to Status Outputs

Front Panel Display	Status Outputs				
System Status	S6	S7	S8	Fault	Outputs Inhibited
0	0	0	0	0	1
1	1	0	0	0	1
2	0	1	0	0	0
3	1	1	0	1	0
4	0	0	1	0	0
6	0	1	1	1	0
7	1	1	1	0	1
8	0	0	0	0	1
Blank and No Fault	0	0	0	1	0
Status Outputs S1 – S8, Fault Outputs Inhibited	Logic 0 = 100 kilohms to 0 volts Logic 1 = Less than 25 ohms to 0 volts				

Front Panel

The front panel of the R7484 provides switches for selecting mode of operation and initiating test functions. It also provides LEDs and digital displays for indicating system status information. Figure 10 illustrates the front panel of the controller.

1. A ZONE OUTPUT LED is provided for each detector to indicate that a fire has been detected. With non-latching operation selected, the LEDs blink rapidly while the zone output is active and stay on steady when the output turns off. With latching operation selected, the LEDs blink continuously after the output is active.
2. The FIRE LOGIC LEDs signal actuation of the corresponding Logic outputs.
3. The ZONE display indicates the number of the first detector that responds to fire, or the number of the detector selected for test, or the number of the detector that has a fault condition.
4. The SYSTEM STATUS display uses a numerical code to identify system status (see Table 3).
5. Illumination of the FAULT LED indicates a system malfunction (or controller in Reset or Test mode).
6. The INHIBIT LED is energized in the Test or Reset mode or when the External Reset/Inhibit (terminal 44) input is pulled low to show that the outputs of the controller are inhibited.
7. The POWER LED is illuminated when power is applied to the system.
8. The SELECT button is pressed to select the desired detector for test when in the Test Mode.
9. In the Test mode the TEST/ACCEPT button initiates a manual **oi** test for the selected detector.
10. The LAMP TEST button illuminates all LEDs and all segments of the digital displays. In the Reset mode, it initiates a complete microprocessor reset.
11. The keylock switch selects NORMAL, RESET, or TEST mode.

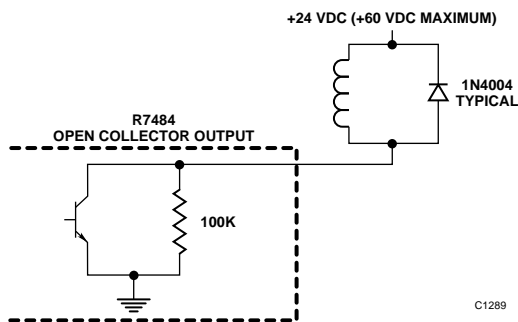


Figure 9—Open Collector Outputs with Transient Suppression Device Connected



Figure 10—Front Panel of the R7484

NORMAL MODE

In the Normal operating mode, the R7484 Controller monitors the outputs of all detectors connected to it and compares the detector output signals to a selected sensitivity level and time delay to determine whether a fire condition exists. Diagnostic circuitry continuously checks the system for wiring continuity as well as faults that could prevent proper response to a fire. The Zone and Fire Logic outputs are de-energized. The Fault and **oi** Fault outputs are energized, as long as no system malfunctions are detected. None of the LEDs except the POWER LED are illuminated and the digital displays are blank, unless an alarm or a fault condition exists.

If automatic **oi** is selected (rocker switch 3-8 open), the system optically tests each detector to determine if the viewing window is clean and to ensure that the sensor module will respond to IR radiation (an **oi** fault will occur when approximately 50 percent of the normal detection range has been lost due to the viewing window being obscured or a degraded IR module). The frequency of the **oi** test is determined by programming switch assembly 3 (rocker switches 3-6 through 3-1). If a detector fails to pass the **oi** test three consecutive times, a 2-fault is indicated for that zone and the **oi** Fault output is de-energized. If selected, the Fault output will also de-activate in response to a 2-fault (rocker switch 3-7 open).

Table 3—Relationship of Zone and Status Codes

Zone	System Status	Condition
0	0	Keylock switch is in RESET position, or the external inhibit being used. (Outputs inhibited, except Status Outputs.)
1 to 8	1	Keylock switch is in TEST position. (Outputs inhibited, except Status Outputs.) Zone display indicates the detector selected for testing.
1 to 8	2	oi fault - either the oi ring and/or the window of the zone indicated in the upper right display is dirty, or the detector module has lost sensitivity.
Blank	3	One or more detectors are responding to an IR source that is over the sensitivity setting but has not yet exceeded the time delay setting. FAULT LED is not turned on. Affected ZONE OUTPUT LED blinks slowly (1 per second). This status does not latch on. The normally energized Fault output remains energized.
Blank	4	Indicates either a wiring fault between the detector and controller, a defective or missing detector, or controller is programmed for more detectors than are connected.
Blank	6	Fire Output Signal - Blinking ZONE OUTPUT LED indicates fire location. Blinking ZONE OUTPUT LED indicates that the sensitivity and time delay have been exceeded and the Zone Output Signal activated. Steady ZONE OUTPUT LED indicates that the detector in that zone has responded to an IR signal, but is no longer responding.
Blank	7	Data Bus fault
1 to 8	8	Controller has been placed in "count" mode (see "Checkout" section). Pushing and releasing both SELECT and TEST/ACCEPT buttons at the same time while the keylock switch is in the TEST position changes the lower display to a numeral "8" - the count mode for checking the count rate of each zone.
Blank or Blank	Blank or 9	FAULT LED is on, indicating a problem in the R7484 microprocessor circuitry, power up failure, switches incorrectly set or internal power supply failure. Place keylock switch in RESET, push and release LAMP TEST pushbutton. If operation does not return to normal, replace the entire R7484. BE SURE the new R7484 is programmed the same as the R7484 being replaced.

The IR module continuously sends approximately 10 to 16 counts per second to the controller to monitor system wiring. A wiring break, wiring short, loss of detector power, or missing or defective IR module will result in a 4-status (fault) for that zone and the Fault output will de-energize.

If a fault is detected:

1. A normally energized solid state General Fault output is de-energized for controlling an external fault annunciation device. Note: If the fault is a 2-fault (**oi** fault), the Fault output will be de-energized only if rocker switch 3-7 is open.
2. If the fault is a 2-fault (**oi** fault), a normally energized solid state **oi** Fault output is de-energized for controlling an external **oi** fault annunciation device.
3. A FAULT LED on the front panel of the controller is illuminated to provide a visual indication that a system fault has occurred.
4. The STATUS display uses numerical code to indicate the nature of the fault. (see Table 3).

NOTE

Fault does not override fire. If the detection system is still capable of responding to the fire even though a fault condition is present, a fire output will be activated.

RESET MODE

Any existing system status indications are preserved and the controller outputs are returned to normal operating condition (after the radiation source is removed or the fault is corrected) in one of the following ways:

1. Place the keylock switch in the RESET position, then return it to NORMAL.
2. Close the optional remote reset switch connected to controller terminal 44 and the minus side of the controller power supply (terminal 2).

TEST MODE

In the normal mode the Automatic **oi** feature (if selected) continuously checks the detectors for proper operation. Additional manual **oi** testing capabilities are provided by using the controller Test mode. Among the possible tests are:

1. A manual **oi** test, which individually tests the selected detector and its electronic circuitry.

2. A count test mode, which displays the output frequency of an individual detector using the SYSTEM STATUS and ZONE displays on the front panel of the controller.
3. A bus test mode, which tests the data bus wiring and indicates results on the front panel of the controller when intercontroller voting is used.

These test features make it possible to more easily pinpoint a system malfunction. For full details on performing these tests, refer to the "Troubleshooting" section of this manual.

APPLICATION GUIDELINES

As part of the application for the R7484/C7098B, it is important to know of any conditions that may prevent the detector from responding to fire and also to know what source besides fire will cause the detector to respond. The system provides reliable response to infrared radiation emitted from hydrocarbon fires while remaining insensitive to solar radiation and artificial lighting.

Any object with a temperature greater than 0° Kelvin (-273°C) emits infrared radiation. The hotter the object, the greater the intensity of IR radiation emitted at 4.4 microns (see Figure 11). The C7098B ignores steady state infrared sources that do not have a flicker frequency characteristic of a fire. It should be noted that if these steady state infrared sources are hot enough to emit adequate amounts of infrared radiation at 4.4 microns and if this radiation becomes interrupted from the view of the C7098B in a pattern characteristic of a flickering flame, the detector can respond and go into alarm. The closer the infrared source is to the C7098B and the stronger the source, the greater the potential of a false alarm.

Arc welding should be conducted no nearer than 10 feet from a C7098B Detector. Though the level of radiation emitted by the welding in the 4.4 micron range is low, the heated metal can become a false alarm source.

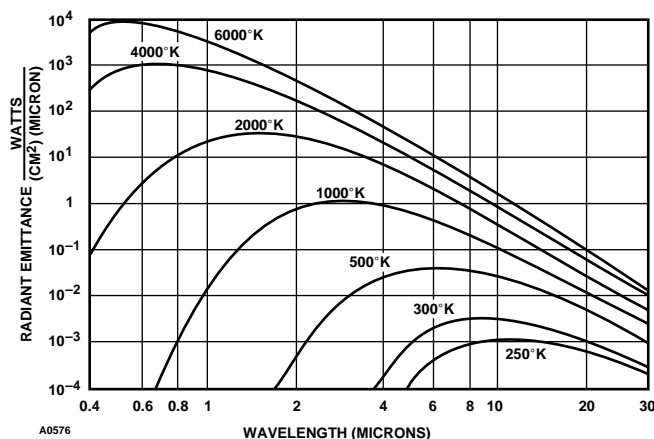


Figure 11—Blackbody Spectral Emittance

The C7098B is a single frequency infrared device with detection limited to the hot CO₂ emission peaks, therefore, it cannot be used to detect fires that do not contain carbon, such as hydrogen, sulfur, and some burning metals. Because accumulation of smoke and ice buildup on the window of the C7098B are shown to diminish its response, IR fire detection should be thought of as resistant to, rather than immune from, attenuation.

The response time of the detector is a function of fuel, fire size, distance, orientation of the fire source, and the field programmable controller settings. As with all fire tests, results must be interpreted according to the individual application, taking into account all possible variables. Typical response distances of the C7098 Detector to various fuels are listed in Table 4.

INSTALLATION

POSITIONING AND DENSITY

Complete supervision of an area depends on the level of protection and the distance from the detector to the hazard. The C7098B has a 70 degree cone of vision and covers an elliptical area when it is angled to cover the probable source of a fire. As the distance increases from the detector to the probable source, so does the

Table 4—C7098 Typical Response Distance

Fuel	Fire Size	Distance
Methane	30 inch flame	30 feet (9.1 meters)
Methane-intense fire source	30 inch flame	10 feet (3 meters)
Methanol	1 ft. by 1 ft.	30 feet (9.1 meters)
Acetone	1 ft. by 1 ft.	45 feet (13.7 meters)
Gasoline	1 ft. by 1 ft.	65 feet (19.8 meters)
Diesel	1 ft. by 1 ft.	40 feet (12.2 meters)
Wood Stack (Crib)	1 ft. by 1 ft.	50 feet (15.2 meters)
Wood Shavings (Excelsior)	2 ft. by 2 ft. (1 pound)	50 feet (15.2 meters)
JP-4	2 ft. by 2 ft	100 feet (30.5 meters)

response time for a given fire. For outdoor applications, the detector should be aimed downward to prevent the cone of vision from scanning the horizon. This minimizes the response to distant infrared sources outside the protected area.

Even though infrared systems are less affected by accumulations of smoke, the C7098B should not be placed in an area where rising CO₂ and particulates will obscure its vision. For indoor applications, if dense smoke is expected to accumulate at the onset of a fire, mounting the detector on a side wall a few feet (1 meter) down from the ceiling will normally allow time for the unit to respond before it is affected by rising smoke. All hazardous materials should be fire tested to determine correct detector positioning and coverage.

FIELD WIRING CONNECTOR

The R7484 Controller is furnished with a field wiring connector backplate that incorporates pressure type screw terminals for connecting the external wiring and two circuit board edge connectors for attaching to the controller. The Q4004 Mounting Cage is recommended for mounting the controller. The controller backplate attaches to the rear of the cage to allow easy removal of the controller without disturbing the wiring. The controller is designed for installation in a non-hazardous area.

R7484 Controller models that do not include a backplate are designed to be used with the R6006 Relay Output Assembly. The R6006 Relay Output Assemblies include a double-wide backplate for controller and field wiring connections.

MOISTURE-PROOF/FLAME-PROOF MOUNTING AND WIRING

Certain guidelines must be followed when installing the C7098B to maintain the moisture-proof/flame-proof qualities of its enclosure. When using steel wire armored or mineral-insulated copper-sheathed cables, select an approved gland with a watertight compression stage and an overall gland shroud for outdoor applications. A sealing washer must be fitted between the gland and the conduit entry to ensure IP66 rating.

When the C7098B is wired in conduit and mounted in outdoor locations or locations with high humidity, use explosion-proof seals, drains, and breathers. This type of installation will automatically bleed off water accumulation in the conduit and prevent damage to the equipment.

Rigid metal conduit use requires water-tight conduit seals to prevent moisture from entering the detector

housing. These seals must be installed even if not required by local wiring codes. Seals must be located no further than 18 inches from the C7098B housing. Explosion-proof installations require an additional seal at any point where conduit enters a non-hazardous area. When pouring a seal, use a fiberdam to assure proper formation. Seals should never be poured in below freezing temperatures because the water in the sealing compound will freeze and prevent proper drying. Contamination of the detector will then result when the temperature rises above the freezing point. Cable shielding should be stripped back to permit the seal to form around the individual detector leads, rather than around the outside of the shield, to prevent siphoning action through the inside of the shield.

The standard C7098B has a single conduit entry on one side of the detector and a stop plug on the other. A second conduit entry adapter can be added by replacing the stop plug with an adapter. BASEEFA certification requires that Detector Electronics stop plugs be used on Detector Electronics products. The adapter and plug are also used to tighten the detector to the mounting bracket in a fixed position.

WIRE AND CABLE TYPE

Use 16 to 22 gauge (1.5 to 0.5 mm²) cable to connect the C7098B. Foil-type shielded cable is recommended to protect from electromagnetic interference. The size and length of cable should be taken into account when wiring to ensure the system has a minimum of 18 vdc at the detector. When using 22 gauge wire, the maximum controller to detector distance is 2000 feet. When using cables with shields, it is preferred that the shield be cut back and not connected to the ground of each detector. All wiring must comply with local codes, regulations, and standards. Minimum requirements are for the B-SIG (signal) lead to be shielded. It is preferred that the +V, -V, and D-**o**i leads also be shielded to provide maximum immunity to EMI/RFI.

NOTE

It is important to use cable that is applicable to the installation environment. For example, in applications with high humidity of salt water, use cable made specifically for harsh, salt water environments. In all cases, typical cable insulation resistance should be 100 megohms or more. If resistance drops below 10 megohms, the cable may be deteriorating and should be replaced to avoid shorting out the system. When testing the insulation resistance, disconnect the detector leads before applying a megohmmeter (insulation tester) to the cable.

MOUNTING PROCEDURE

The following procedure should be used for mounting and wiring the detectors. Refer to Figure 12.

1. Detectors should be located to provide the best unobstructed view of the area to be protected. Ensure that the detectors are accessible for cleaning. Attention must be paid to false alarm sources such as IR radiation through the rotating blades of a fan or surface vibration of an IR source causing flickering signals within the cone of vision. Dense fog, rain or ice can absorb IR radiation, which can reduce the capability of the system. For outdoor applications, aim the detectors downward to prevent the cone of vision from scanning the horizon. This minimizes response to distant infrared sources outside the protected area and also helps to prevent moisture buildup on the optical surfaces.
2. Mount the detector bulkhead and mounting bracket assembly on the wall or ceiling. The surface must be free of vibration and suitable to receive 1/4 inch (M6) screws with a length of at least 1 inch (25 mm). The mounting bracket provided with the detector has three mounting holes to provide optimum alignment of the detector. A screw placed in the center of the mounting bracket allows the detector to pivot on the mounting surface. Once the detector has been properly aligned to view the area to be protected, two additional screws should be used in the remaining holes to provide a solid mount.
3. If the detector is equipped with cover locking clamps, loosen the clamps with a 5/32 hexagonal (Allen) wrench and move the clamp "catches" out of the blind holes located in the bulkhead. See Figure 13.
4. Remove the terminal housing and the sensor housing by turning them counterclockwise from the bulkhead.

DETECTOR TO CONTROLLER WIRING

Minimum requirements are for the B-SIG lead (signal) to be shielded. It is preferred that the +V, -V, and D-**o**i leads also be shielded to provide maximum immunity to EMI/RFI. Figure 14 shows the preferred method of cable shield connection, including installation of a 0.47 microfarad, 250 vdc capacitor.

IMPORTANT

- *Be certain that the shield is NOT connected to the detector at terminal "-V" or any other points (unless required by local codes).*

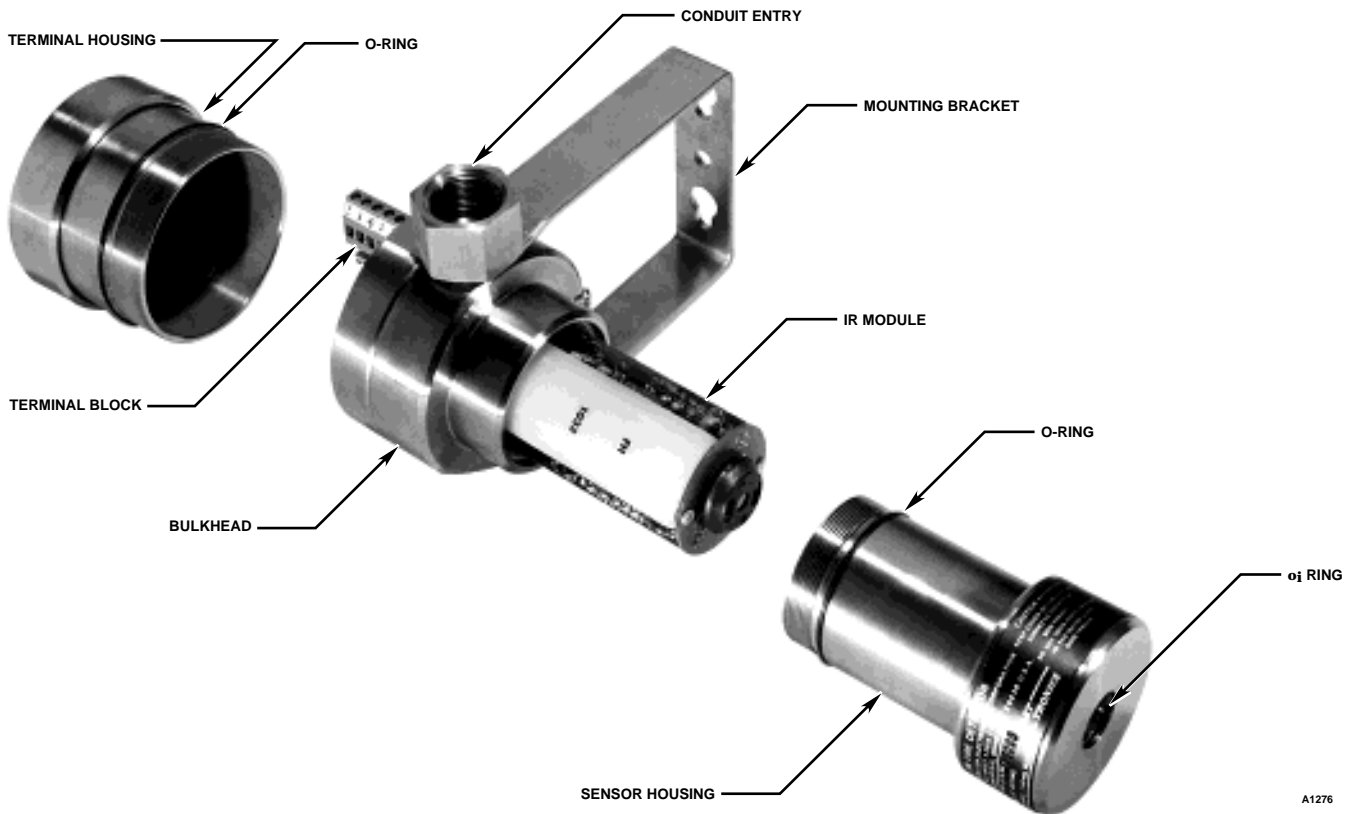


Figure 12—C7098B Detector Assembly

A1276

- Connect a non-polarized 0.47 microfarad 250 vdc capacitor from terminal 64 to terminal 2. This places the chassis and the power supply negative at the same ac potential, minimizing induction of noise into the system through the detector cable.

Route the field wiring from the conduit or gland, through the conduit entry on the detector assembly. Wire the detectors to the controller as shown in Figure 15.

The six terminals labeled SP1, SP2 and SP3 in the C7098 are spare terminals for wiring convenience. They have a common link between them, SP1 is jumpered to SP1, SP2 to SP2, etc. (See Figure 16).

IR SENSOR INSTALLATION

1. Remove the IR module from its shipping package.
2. Thread the wire leads and keyed connector plug through the slotted opening on the IR module, then plug the IR module into the two banana plugs in the bulkhead.

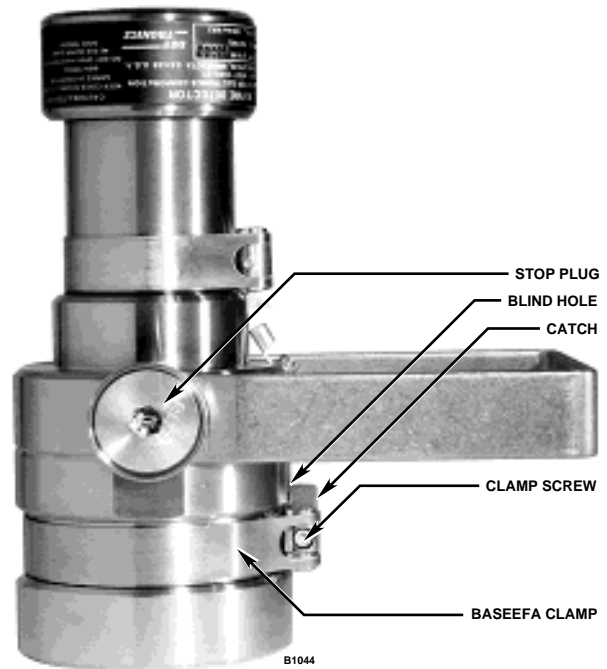


Figure 13—BASEEFA Approved Cover Locking Clamp

CAUTION

The detector should be positioned so that the *oi* test lamps are on the top in order to prevent moisture and contaminants from accumulating between

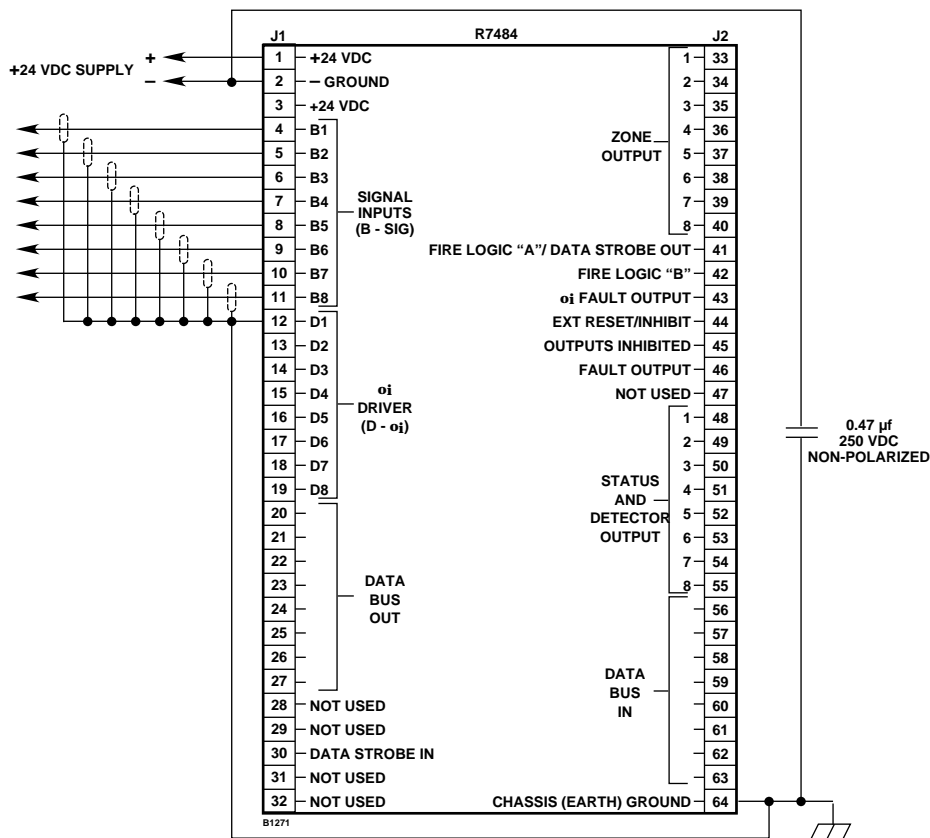


Figure 14—Typical Detector Cable Shield Connection

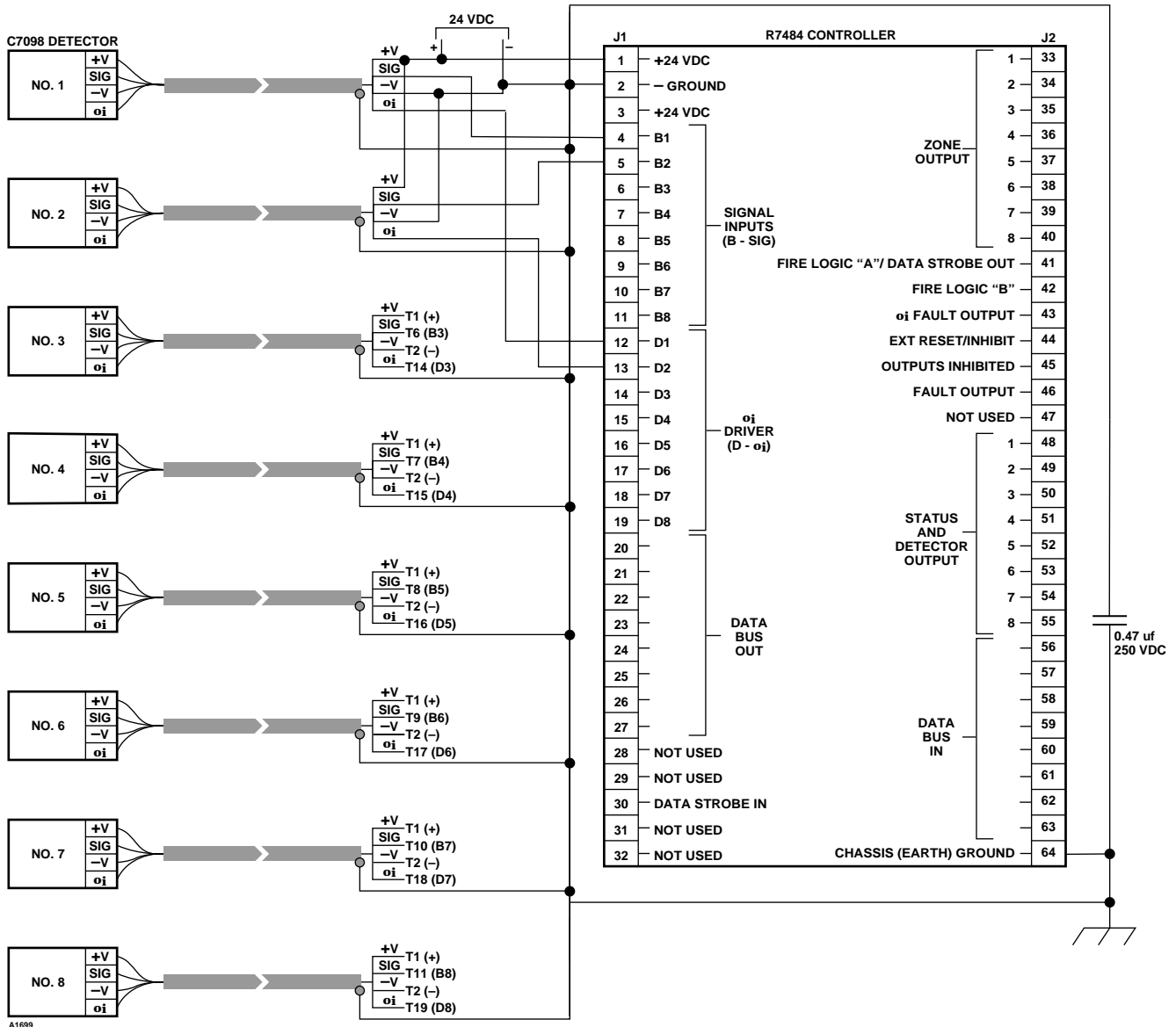


Figure 15—Detector and Power Connections

the **oi** lamps and the **oi** ring, which can reduce the **oi** test signal. Ensure that the opening in the **oi** ring is opposite the test lamp (on the bottom of the detector housing) and opening downward so accumulated moisture will drain. If necessary, the IR module can be rotated 180° and re-installed.

3. Connect the keyed connector plug to the 4-pin connector on the IR module. Tuck wires from the connector into the opening between the printed circuit board and the plastic bracket. Ensure that wires do not rub on the sensor housing when the housing is screwed on.
4. Replace the terminal housing and the sensor housing. Tighten the housings to the point that the O-rings create a seal to ensure housing integrity is maintained for moisture-proof and explosion-proof

ratings. If the detector is equipped with cover locking clamps, loosen the clamps sufficiently so that the clamp catches can be seated in the blind holes on the bulkhead. Then fasten the clamps securely around the sensor housing and the terminal housing by tightening with a 5/32 inch hexagonal (Allen) wrench. See Figure 13.

5. Check all field wiring to ensure that the proper connections have been made. If conduit is used, pour the conduit seals and allow them to dry.

NOTE

When handling or disassembling the detector housing, always check the O-rings for breaks, cracks, or dryness. A defective O-ring can cause failure by allowing water to enter the housing. To test an O-ring, remove it and stretch it slightly. If



Figure 16—Detector Terminal Block

cracks are visible, it should be replaced (see "Recommended Spare Parts"). If the O-ring feels dry to the touch, lubricate it with polyalphaolefin grease being careful not to get grease on the window of the sensor. When re-inserting the ring, make sure it is properly seated in the groove on the housing.

CONTROLLER LOCATION

The R7484 Controller must be mounted in a non hazardous area. The optional Q4004 Mounting Cage is designed to hold up to eight modules in a 19 inch instrument rack. This mounting cage can also house relay output modules, voltage converters, or other micro-module equipment that is used in conjunction with the R7484 Controller as part of the total protection system. See Figure 17 for illustration and dimensions.

CONTROLLER ELECTRICAL CONNECTIONS

All electrical connections are made to the field wiring connector that is furnished with the controller. Figure 18 shows the terminal configuration for the controller. Power to the R7484 Controller and C7098B Detectors may be furnished by external 24 volt batteries, a regulated dc power supply, or optional Det-Tronics voltage converters.

RACK TYPE	PART NUMBER 005269-XXX	CONTROLLER POSITIONS FOR:		HT:	DIM. (A)		DIM. (B)		DIM. (C)		DIM. (D)		DIM. (E)		WEIGHT	
		FIRE	GAS		INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	LB	KG
4U	-001	8	16	4U	19.00	482.6	18.30	464.8	17.36	440.9	4.00	101.6	6.97	177.1	9.3	4.2
4U	-002	6	12	4U	15.06	382.6	14.36	364.7	13.42	340.9	↓	↓	↓	↓	7.6	3.5
4U	-003	4	8	4U	11.13	282.6	10.43	264.9	9.49	241.1	↓	↓	↓	↓	5.9	2.7
4U	-004	3	6	4U	9.16	232.7	8.46	214.9	7.52	191.0	↓	↓	↓	↓	5.1	2.3
4U	-005	2	4	4U	7.19	182.7	6.49	164.9	5.55	141.0	↓	↓	↓	↓	4.2	1.9
4U	-006	1	2	4U	5.22	132.6	4.52	114.8	3.58	90.9	↓	↓	↓	↓	3.1	1.4

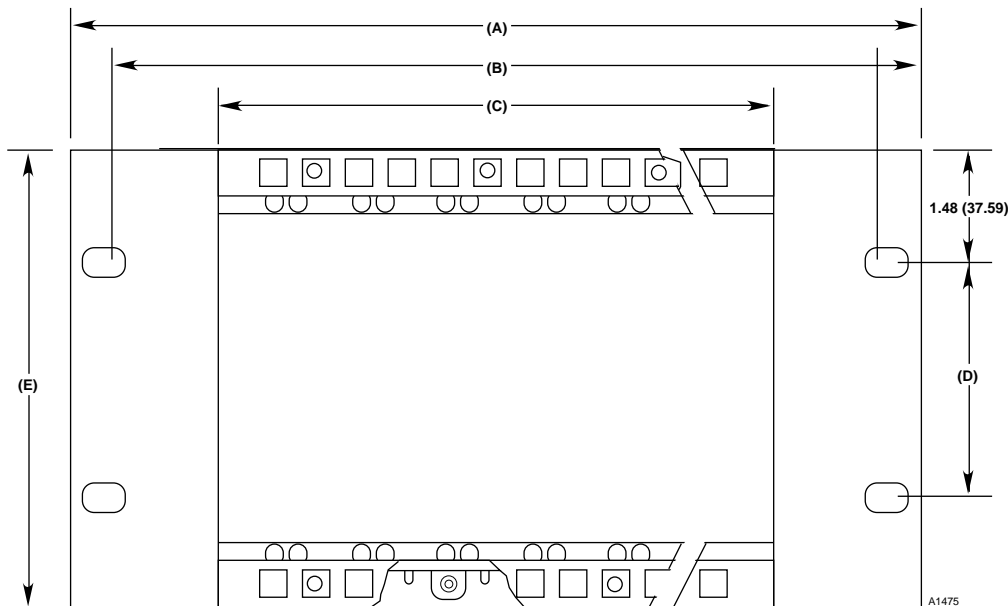


Figure 17—Q4004 Mounting Cage Dimensions in Inches (MM)

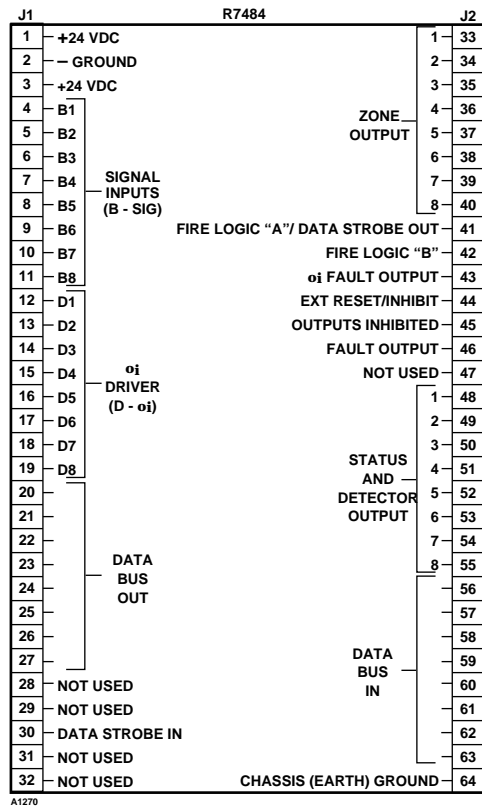


Figure 18—R7484 Controller Terminal Configuration

- Terminal 1 — Connect to the positive (+) side of an external 24 vdc power source.
- Terminal 2 — Connect to the negative (-) side of the dc power source.
- Terminal 3 — +24 vdc (Internally jumpered to terminal 1 to provide an additional +24 vdc connection).
- Terminal 4 to 11 — Connect to the SIG terminals of the corresponding detectors.
- Terminal 12 to 19 — Connect to the oi terminals of the corresponding detectors.
- Terminal 20 to 27 — Data Bus Out - Connect to the "Data Bus In" terminals of the next "downstream" controller when common (intercontroller) voting is chosen.
- Terminal 28 and 29 — Do not use.
- Terminal 30 — Data Strobe In — Connect to the "Data Strobe Out" terminal (terminal 41) of the previous "upstream" controller when common (intercontroller) voting is chosen.

- Terminal 31 and 32 — Do not use.
- Terminal 33 to 40 — Corresponding solid state zone (detector) outputs.
- Terminal 41 — Fire Logic A/Data Strobe. Fire Logic A solid state output is used when separate controller voting is chosen. Data Strobe output is connected to next "downstream" controller when common (intercontroller) voting is chosen (switch 4-1 open).
- Terminal 42 — Fire Logic B solid state output is used when either separate or common voting is chosen.
- Terminal 43 — oi Fault output, for connecting an indicating device to signal when an oi fault condition develops. The oi Fault output is activated (energized) when power is applied to the system and de-activated (de-energized) by loss of power or oi fault condition. This output is separate from the Fault output.
- Terminal 44 — External Reset/Inhibit, a switch connected between terminal 44 and circuit ground (terminal 2) allows the controller to be reset or inhibited from a remote location.
- Terminal 45 — Outputs Inhibited, for connecting an indicating device to signal when the outputs are inhibited such as when the controller keylock switch is in the TEST or RESET position or the External Reset/Inhibit switch is activated.
- Terminal 46 — General Fault output, for connecting an indicating device to signal when a fault condition develops. The Fault output is activated (energized) when power is applied to the system and de-activated (de-energized) by loss of power or other fault conditions.
- Terminal 47 — Do not use.

Terminal 48 to 55 — Status and Detector solid state outputs provide binary output representations of the front panel digital displays for zone, detector and system status. Tables 1 and 2 list the identification codes and the logic states of the “Fault” and “Outputs Inhibited” bits for the various status conditions. Note: Under “normal” (no-fault) conditions, the Fault output is energized (logic 1).

Terminal 56 to 63 — Data Bus In, connect to “Data Bus Out” terminals of the previous “upstream” controller when common (intercontroller) voting is chosen.

Terminal 64 — Chassis Ground (earth).

PROGRAMMING THE CONTROLLER

The R7484 Controller must be programmed for use in each individual installation. This is accomplished by setting rocker switches that are located on the left side of the controller. The rockers are opened or closed to identify those zones having a detector connected and to select voting logic, output latching, sensitivity, time delay and **oi** cycle time options.

The individual rocker switches are identified by numbers 1-1, 1-2, 1-3, etc. in this manual. The number preceding the dash indicates the number of the switch assembly. The number following the dash identifies the specific rocker on the switch assembly.

Each rocker switch assembly contains eight separate rocker switches. The rockers are identified by the numbers one through eight on one side of the assembly. The word “open” can be seen on the opposite side. The switch is open when depressed in the direction of the word “open” and closed when depressed in the direction of the numbers.

The rocker switches must be set before power is applied to the system. Do not plug the controller in or remove it from the mounting rack while power is turned on.

CAUTION

Use care when setting the rocker switches on the controller. An incorrectly set rocker switch can result in an obvious controller malfunction, or the controller could appear to be functioning normally, but not produce the desired output in response to the input conditions. (Some of the rocker switches on the R7484 are not used. These rockers should be left open.)

Figure 19 illustrates the left side of the R7484 and briefly explains the switches.

Detector Selection - Rocker Switches 1-1 to 1-8

The number after the dash corresponds to the number of each zone. Open the rocker for each zone that has a detector connected to it. Care must be taken when setting these rockers. If a rocker is set open, but no detector is connected in that location, the controller will indicate a fault. If a rocker is set closed when a detector is connected, the controller will appear to be operating correctly and will produce an alarm condition if the corresponding detectors sense a fire. However, that detector will be eliminated from the Automatic **oi** test sequence, and any faults occurring in its circuitry or wiring will not be indicated.

Sensitivity and Time Delay Programming - Rocker Switches 2-1 to 2-8

The appropriate sensitivity and time delay for an application is dependent upon the intensity of radiation expected to reach the detector, which is a function of fuel, flame size, and distance from the detector. High sensitivity implies that the system will respond to smaller fires, but is also more susceptible to false alarms caused by radiation sources other than fire. A judgement must be made concerning the size of fire and amount of non-fire radiation that can be tolerated.

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

Response of the C7098B to various flammable materials at different distances is shown as a graph in Figure 20. Fuel for the methanol and gasoline fires are approximately one pint of liquid and are burned in a 1 foot by 1 foot steel pan. Methane gas fire is performed to FM standard, with the flame approximately 30 inches high and 6 to 8 inches in diameter. The C7098B was sited to observe the fire at center axis ± 10 degrees. Response times for these fires are typically less than 10 seconds.

Values shown in Figure 20 are average C7098B responses in counts per second (cps). Actual values will fluctuate as the fire flickers. The controller sensitivity setting should be adjusted for 50 to 75 percent of the average cps value to ensure proper response. For example, the average cps value for a one square foot gasoline fire at a distance of 65 feet is 100 cps (shown in Figure 20). Therefore, for a gasoline fire of this size and distance, the controller sensitivity should be set for approximately 48 cps (switches 2-3 and 2-2 closed). The average cps value for a square foot methanol fire at a distance of 30 feet is 80 cps (shown in Figure 20).

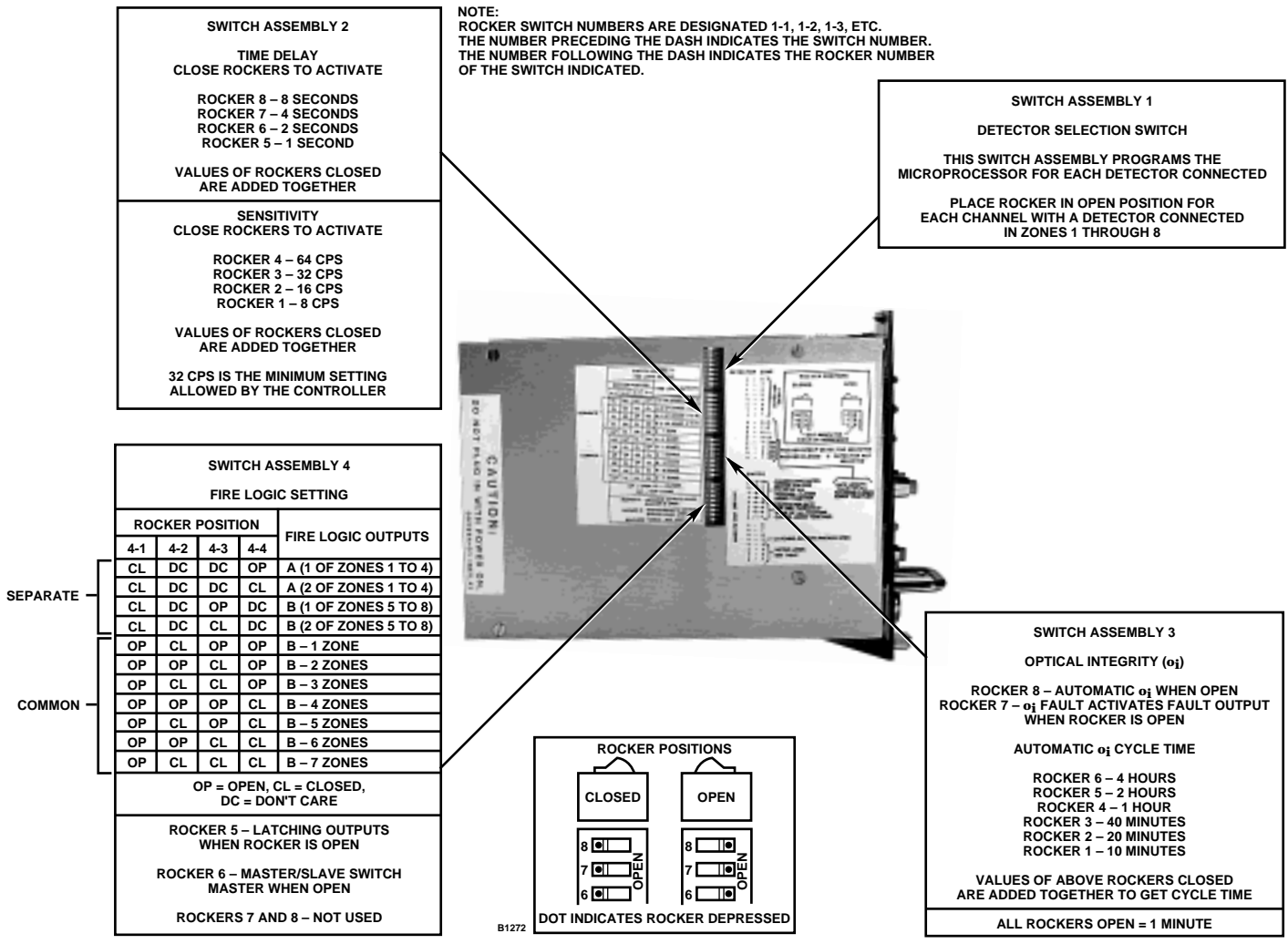


Figure 19—Rocker Switch Setting

Therefore, for a methanol fire of this size and distance, the controller sensitivity should be set for approximately 48 cps (switches 2-3 and 2-2 closed).

Rocker switch assembly 2 controls time delay and sensitivity:

TIME DELAY

- Rocker 2-8 - 8 seconds
- Rocker 2-7 - 4 seconds
- Rocker 2-6 - 2 seconds
- Rocker 2-5 - 1 second

All open = 0.25 second time delay

The value of the closed switches are added together to obtain the total time delay.

NOTE

A three second time delay (2-5 and 2-6 closed) is recommended for most applications.

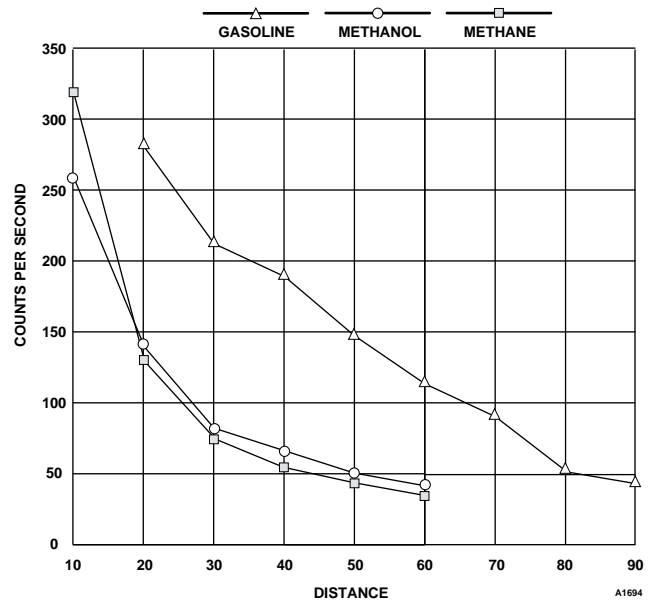


Figure 20—Typical Detector Output for Differing Fuels at Various Distances

SENSITIVITY

Rocker 2-4 - 64 counts per second (cps)
Rocker 2-3 - 32 cps
Rocker 2-2 - 16 cps
Rocker 2-1 - 8 cps

All open = 32 cps

The value of the closed switches are added together to obtain the sensitivity setting. The minimum setting is 32 cps. Any setting below 32 will default to 32 cps.

NOTE

A 48 cps sensitivity setting (2-4 closed) is recommended for most applications.

CAUTION

The 32 cps setting is extremely sensitive. Do not use outdoors or where other IR sources could be found.

Each of these variables affects system response, as do the variables of detector placement, and the area and intensity of potential flame or explosion.

After the rocker switches are set, the system should be tested to be sure that it is functioning correctly. In addition, testing for response to greater quantities of radiation, such as that given off by a fire, should be performed to ensure that the sensitivity level is adequate.

Optical Integrity (oi) - Rocker Switches 3-1 to 3-8

These rockers select whether optical integrity will be manually operated or automatically cycle through all zones, whether the Fault relay will be activated in the event of an oi fault and the oi test cycle time.

AUTOMATIC oi

Rocker 3-8 - Open = Automatic oi is selected.
Closed = Manual oi is selected.

NOTE

Manual oi testing can be performed regardless of switch setting, when the keylock switch of the controller is in the TEST mode.

oi FAULT - FAULT RELAY ACTIVATION

Rocker 3-7 Open = oi fault (2-fault) activates a general fault output (terminal 46).
Closed = oi fault (2-fault) does not activate a general fault output.

NOTE

oi Fault Output (terminal 43) is not affected by this switch setting.

oi CYCLE TIME

Rocker 3-6 - 4 hours
Rocker 3-5 - 2 hours
Rocker 3-4 - 1 hour
Rocker 3-3 - 40 minutes
Rocker 3-2 - 20 minutes
Rocker 3-1 - 10 minutes

Values of closed rockers are added together to get oi cycle time. All rockers open equals one minute cycle time. Values shown are approximate.

Fire Logic Selection - Rocker Switches 4-1 to 4-4

Rocker switches 4-1 to 4-4 are used to program the controller for the particular voting arrangement to be used. (Refer to the "System Description" section of this manual for a description of the options available with the fire logic feature.) Refer to Figure 19 (Switch Assembly 4) to determine the correct positions for rocker switches 4-1 to 4-4.

SEPARATE - FOR SEPARATE VOTING

Rocker 4-1 is closed.

Rocker 4-2 is not used in this voting arrangement.

Rocker 4-3 programs Fire Logic B output (zones 5, 6, 7, 8)

— open, one of four

— closed, two of four.

Rocker 4-4 programs Fire Logic A output (zones 1, 2, 3, 4)

— open, one of four

— closed, two of four.

COMMON — FOR INTERCONTROLLER VOTING THROUGH THE FIRE LOGIC B OUTPUT

CAUTION

If common voting is selected, do not connect a load to terminal 41 (Fire Logic A/Data Strobe). In the common voting mode, terminal 41 is Data Strobe Out that is connected to the next controller's Data Strobe In, terminal 30.

Rocker 4-1 – is open
Rocker 4-2 – 1 zone
Rocker 4-3 – 2 zones
Rocker 4-4 – 4 zones.

Rockers 4-2, 4-3, and 4-4 have values of 1, 2 and 4 respectively. Positioning them to closed has a cumulative effect. For example, if 4-2 (1 zone) and 4-4 (4 zones) are closed, then the total number of zones responding to fire required to produce a Fire Logic B output would be 5 zones.

**Outputs Latching/Non-latching -
Rocker Switch 4-5**

Once energized, an output will remain on until the controller is reset if rocker 4-5 is set open.

NOTE

When in the Normal mode and the outputs are set for non-latching operation, the voting process will actuate the Fire Logic output(s) only if the pre-selected number of detectors “see” fire at the same time. When the outputs are set for latching operation, the voting process will actuate the Fire Logic output(s) when voting criteria have been met, even if a fire is not being seen by each detector at the same time.

When in the Test mode, the voting criteria may be tested by using the manual test function. The controller operates as though it has been set for latching regardless of the switch setting. When in the Test mode, no outputs are activated, only the faceplate LEDs are activated.

**Master/Slave -
Rocker Switch 4-6**

The controller is designated Master when it is first in a multiple controller configuration using intercontroller voting. It is also designated Master when intercontroller voting is not used, or when only a single controller is used in the system. The controller is designated Slave when it is in a multiple controller configuration using intercontroller voting and is not the first (Master) controller.

- Rocker 4-6 Open = Controller is designated Master
- Rocker 4-6 Closed = Controller is designated Slave

Rockers 4-7 and 4-8 are not used.

When the proper position for each of the rocker switches has been determined, record this information carefully on the system layout chart in Figure 21. This provides a means of double checking switch positions before power is applied to the controller, and to provide a record of switch positions for future reference.

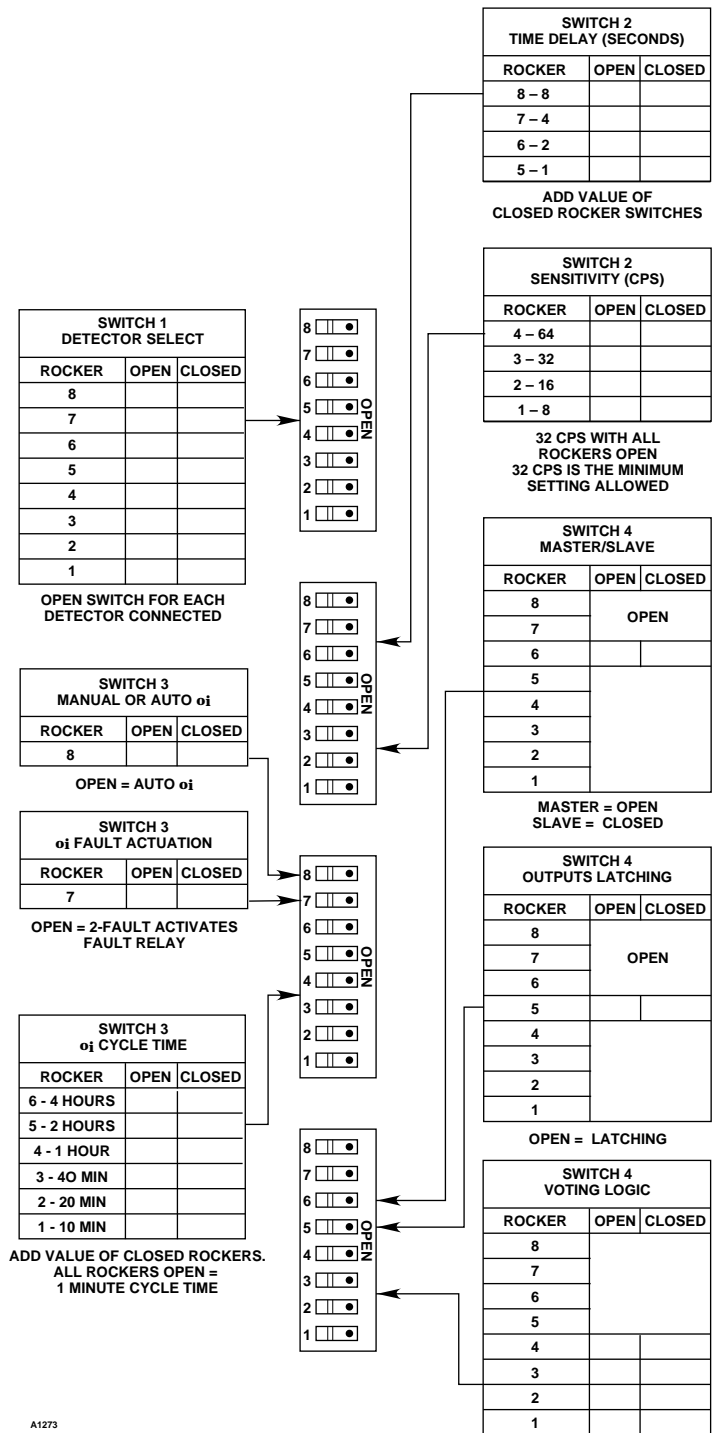


Figure 21—System Layout Chart

TYPICAL SYSTEM

The following application is an example only. For assistance in adapting a system to your individual requirements, contact the Field Support Group at Detector Electronics.

Power is supplied to the system by a 24 volt dc power supply. A four conductor shielded cable is used to connect the detectors to the controller as shown in Figure 15. Terminals +V and -V are Common to all the detectors in the system. The SIG and **o_i** leads of each detector are connected to their corresponding "B-SIG" (signal) and "D-**o_i**" (**o_i** driver) terminals on the controller. The shields are tied together and grounded at terminal 64, with a 0.47 microfarad, 250 volt capacitor placed between terminal 64 and terminal 2 (see Figure 14). Figure 22 is a block diagram of an IR fire detection system with sixteen C7098B Detectors, two R7484 Controllers, and one R6006 Relay Output Module, which provides relay switching to external devices.

Figure 23 illustrates a system that has been connected for intercontroller voting. Note that the first controller in the system is designated as the master and all others are slaves. The last slave, with its switches set for the required voting criteria, provides the final voted output in common voting (Fire Logic B).

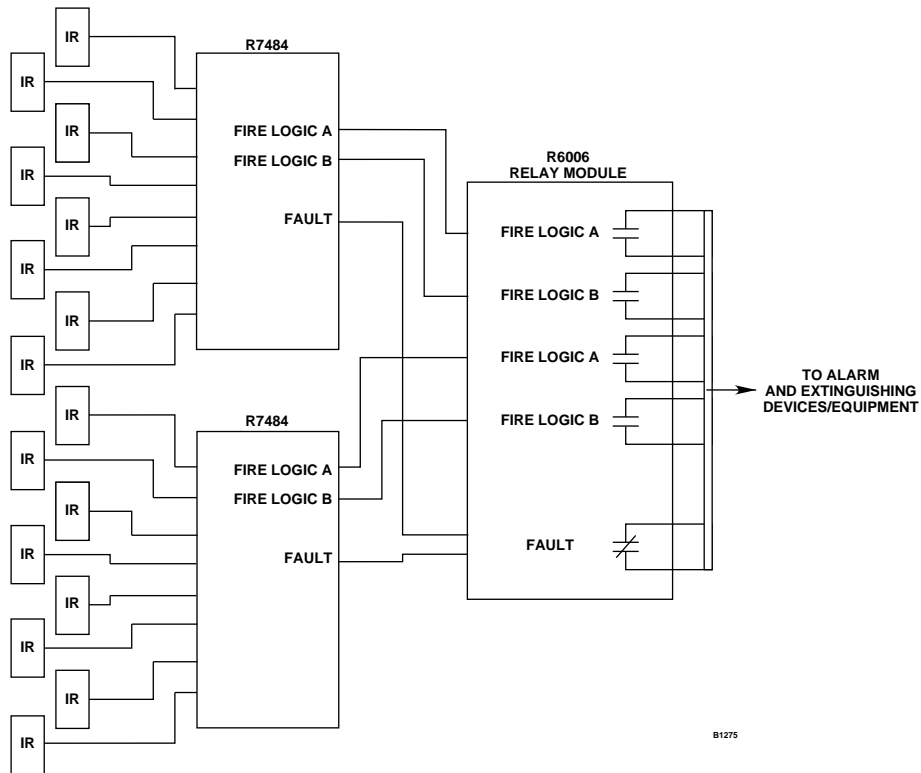


Figure 22—Block Diagram of a Typical R7484 System Application

STARTUP PROCEDURE

The startup procedure should be performed after installation of the equipment is complete.

1. After making the electrical connections and setting the switches, plug the controller into the wiring connector.
2. Disable any extinguishing system connected to the system.
3. Turn on the input power to the system and perform the "Initial and Periodic Checkout Procedure."
4. If the controller is operating normally and is programmed correctly, remove any mechanical blocking devices and restore power to the extinguishing loads.

INITIAL AND PERIODIC CHECKOUT PROCEDURE

1. Place the Mode switch in the TEST position. The FAULT and INHIBIT LEDs will be illuminated.

CAUTION

Placing the controller in the Test mode inhibits the output relays, rendering the system incapable of actuating any extinguishing or alarm circuits that are connected to it. However, for maximum safety,

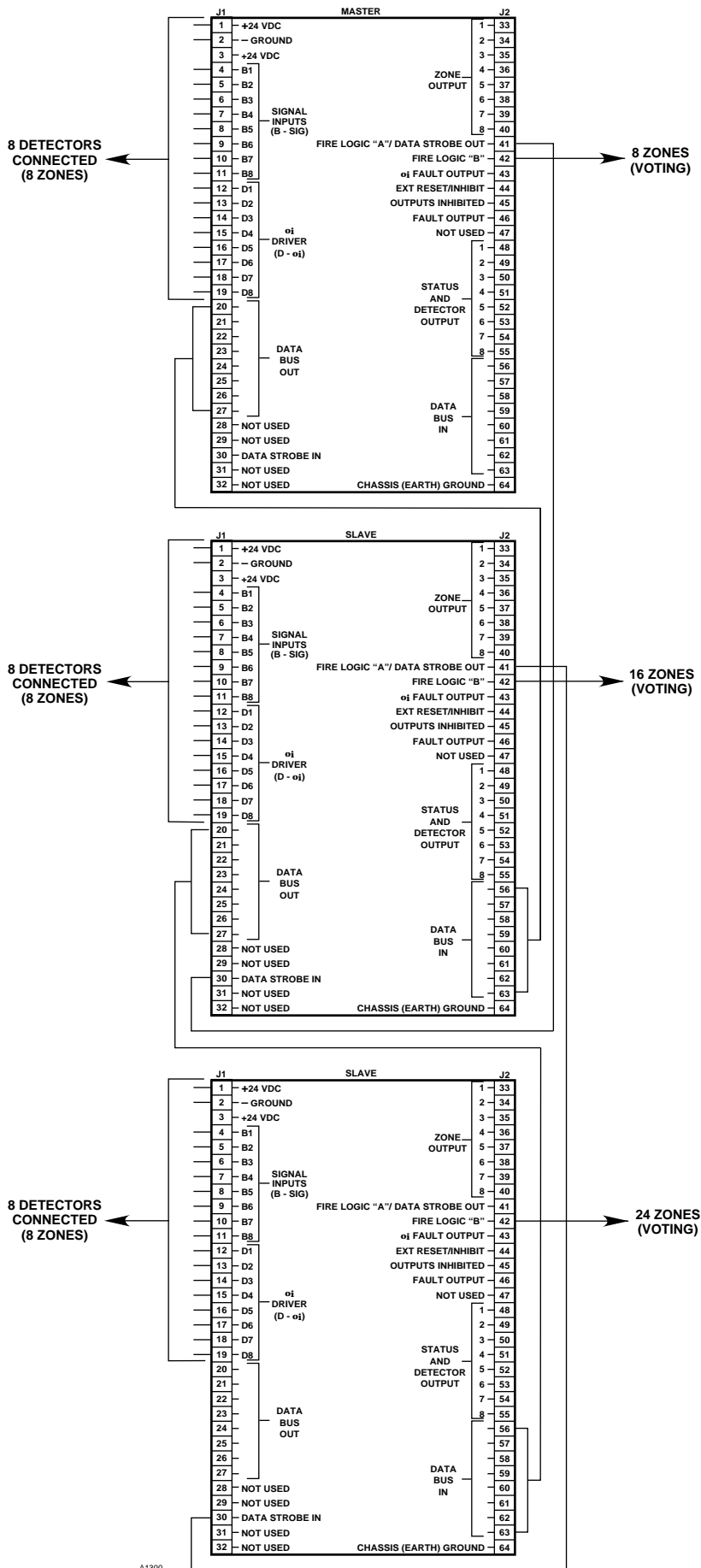


Figure 23—Data Bus Wiring

secure the output loads that would normally be actuated by the system before performing the checkout procedure.

2. Shine an IR test lamp (such as the Det-Tronics model W867) into the viewing window of the detector under test. The corresponding DETECTOR (Zone) LED blinks.
3. If the voting requirements are met, the appropriate FIRE LOGIC LED(s) is also illuminated.
4. Turn off the IR source. The FIRE LOGIC LED remains on if it was previously illuminated. The DETECTOR LED remains on.
5. Repeat steps 2 through 4 for each detector in the system.
6. After all detectors have been checked, reset the system by placing the Mode switch in NORMAL. All LEDs except the POWER LED are off.
7. Restore power to the output loads and remove any mechanical blocking devices.

MAINTENANCE

The C7098B Detector requires no periodic calibration. However, to maintain maximum sensitivity, the viewing windows and **o****i** rings should be thoroughly cleaned on a regular basis. The length of time between periodic cleanings will be determined by the nature and amount of contaminants present in the environment.

Remove the **o****i** ring from each detector and clean the viewing window thoroughly, all the way to the edge. Also clean all surfaces of the **o****i** ring. When re-installing the reflective ring, hold it by its tabs to avoid leaving fingerprints on the reflective surface. Re-install the rings, making sure that the gap in the **o****i** ring is pointed downward. Ensure that the **o****i** test lamps are not located at the bottom side of the detector window. If necessary, remove the sensor housing from the detector, unplug the IR module, rotate it 180° so that the **o****i** source lamps are on top and replace the sensor housing. If corrosive contaminants in the atmosphere cause the reflective rings to deteriorate to the extent that it is no longer possible to restore them to their original condition, they must be replaced.

Use a clean cloth or tissue to clean the window. Do not use commercial glass cleaning tissues. Many of these contain a silicone substance that remains on the cleaned surface and will absorb radiation. Det-Tronics window cleaning solution (part number 001680-001) is mixed specifically for cleaning the optical surfaces of the detector.

NOTE

Remove power to the controller or place unit in Test mode when cleaning the detector windows. The cleaning process could cause an unwanted activation of the controller outputs.

Two rubber O-rings on each of the detector housings (see Figure 12) are used to ensure the watertight integrity of the detector. Periodically, the housing should be opened and the O-rings inspected for breaks, cracks, and dryness. To test them, remove the rings from the detector housing and stretch them slightly. If cracks are visible, the ring should be replaced. If they feel dry to the touch, a thin coating of lubricant should be applied. When re-installing the rings, be sure that they are properly seated in the groove on the housing. It is imperative that these O-rings be properly installed and in good condition. Failure to maintain these rings can allow water to enter the detector and cause failure. The life expectancy of rubber o-rings can vary considerably, depending on the amount and nature of contaminants that are present in the environment.

CAUTION

The O-rings should be lubricated with polyalphaolefin grease (Detector Electronics part number 005143-001). Suitability of other lubricants should be evaluated, since some materials can adversely affect the performance of detection devices. Under no circumstances should the O-rings be lubricated with any material that contains silicone.

TROUBLESHOOTING

The Automatic **o****i** feature tests all detectors in the system according to how the **o****i** cycle was programmed, checking window cleanliness, sensor sensitivity, and detector circuitry. Automatic diagnostic circuitry in the controller checks for various other malfunctions. The occurrence of a fault is indicated by illumination of the FAULT LED. If the fault involves a detector, the ZONE display identifies the zone affected. The STATUS display indicates the code number for the type of fault and is intended to serve as an aid in locating the source of a system malfunction (see Table 3). The R7484 Controller is not designed to be repaired by the customer in the field, but should be returned to the factory in the event of a malfunction. Refer to the "Maintenance" section of this manual for information regarding servicing of the detector.

MANUAL **o****i** TEST

To manually test each detector and the system circuitry:

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) after the programmed time delay has been exceeded. The controller requires a minimum of 24 counts per second from the detector during manual **oi** testing to activate the zone.
4. Release the TEST button. The ZONE OUTPUT LED for the tested zone should continue blinking.

NOTE

*When voting requirements are satisfied, the FIRE LOGIC A and B LEDs will illuminate. In the Test mode, Fire Logic A and B operate as if they were programmed for latching operation. This allows the voting requirements to be tested by manually **oi** checking the appropriate number of detectors.*

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

5. Return to step 2 to test the next detector.

COUNT TEST MODE

The IR sensor can be tested using the Count Test mode. When in the Count Test mode, the frequency of the digital pulses from the IR sensor is displayed in the ZONE indicator on the controller faceplate. The Count Test mode may be used to check the **oi** signal strength or actual signal (cps) from a test fire. This can be very 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.
3. Press the SELECT button until the desired zone is displayed in 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 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. Normal readings should be 40 to 100 cps.

If the reading is less than 40, a dirty window or **oi** ring may be causing the problem. An **oi** fault is signalled in

the Normal mode when less than 24 cps is measured during the automatic **oi** test three consecutive times.

If no reading is obtained, either the IR detector or the wiring to the controller may be defective.

If the count rate exceeds the maximum, check for a radiation source in the environment to see if the IR detector is responding to an external source in addition to the **oi** source lamp. If the detector has an abnormally high or low count rate for no apparent reason, the sensor module should be replaced.

Release the Test button. The ZONE display should drop to a reading of 7 to 16 counts per second. This is the normal cps output from the IR detector. The controller monitors this rate to verify system integrity. If the reading periodically jumps to a larger number, a potential IR false alarm source is being sensed and should be investigated further.

NOTE

The sensor should register a range of 7 to 16 counts per second after the TEST button is released. If no counts are indicated on the display, there may be a problem with the detector, its wiring, or supply voltage.

DATA BUS TEST MODE

To ensure that the communication wiring between controllers is operational in an intercontroller (common) voting system, the Bus Test should be performed. This is accomplished in the following manner:

1. Place the keylock switch in the TEST position on each controller.
2. Simultaneously press and release the SELECT and TEST buttons on each controller. Begin with the last slave controller (farthest from the master) and work toward the master controller.
3. Press and hold the SELECT button. Then press and hold the TEST button.

Simultaneously release the SELECT and TEST buttons. (Again, start with the last slave controller in the series and work toward the master controller.) The digital displays should be blank and the FAULT and INHIBIT LEDs should be illuminated.

4. The master controller generates a test signal, which is sent along the data bus line to each controller in the series. Each controller will have two faceplate LEDs illuminated at a time. The LEDs should be continually sequencing in the following order.

- a. ZONE OUTPUT LEDs 1 and 2
- b. ZONE OUTPUT LEDs 2 and 3
- c. ZONE OUTPUT LEDs 3 and 4
- d. ZONE OUTPUT LEDs 4 and 5
- e. ZONE OUTPUT LEDs 5 and 6
- f. ZONE OUTPUT LEDs 6 and 7
- g. ZONE OUTPUT LEDs 7 and 8
- h. ZONE OUTPUT LEDs 8 and 1
- i. Return to first step of sequence.

The faceplate LEDs of the slave controllers are illuminated in response to actuation of their corresponding data bus inputs. If the digital displays are not blank or the faceplate LEDs are not sequencing correctly, check the data bus wiring for opens, shorts or incorrect connections. A ZONE LED that is constantly on indicates an open wire. A ZONE LED that will not light indicates a shorted lead.

- 5. Place the keylock switch on the master controller back in the NORMAL position, then place the remaining controllers in the Normal mode one at a time starting with the controller closest to the master controller and ending with the last controller in the sequence.

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

Return all equipment transportation prepaid to the factory in Minneapolis.

ORDERING INFORMATION

When ordering, specify:

- R7484 Controller
- C7098B Detector
- Number detectors needed
- Detector housing materials
 - Anodized copper-free aluminum
 - 316 stainless steel
- Type of approval required.

ACCESSORIES

- Q4004 Mounting Cage accommodates up to eight modules (Controllers) and fits standard 19-inch instrument rack. See Figure 17.
- Filler panels for empty spaces in the Q4004 Mounting Cage
- W4220 Voltage Converter and 000507-XXX power supplies
- R6006 Relay Output Module
- R6007 Relay Output Module
- Q1113 Air Shield
- W867 UV/IR Test Lamp

RECOMMENDED SPARE PARTS

Description	Part Number
Replacement o i ring	003525-001
Single Frequency IR Module (electronics)	005600-002
O-rings	
small	107427-004
large	107427-007
conduit entry	107427-022
Window Cleaner Kit (six bottles)	011680-001

APPLICATION ASSISTANCE

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