Simplex®

4098 Detectors, Sensors, and Bases

Application Manual

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Rev. H

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Cautions and Warnings

DO NOT INSTALL ANY SIMPLEX PRODUCT THAT APPEARS DAMAGED. Upon unpacking your Simplex product, inspect the contents of the carton for shipping damage. If damage is apparent, immediately file a claim with the carrier and notify Simplex.

ELECTRICAL HAZARD - Disconnect electrical power when making any internal adjustments or repairs. Servicing should be performed by qualified Simplex Representatives.

STATIC HAZARD - Static electricity can damage components. Therefore, handle as follows:

1. Ground yourself before opening or installing components.
2. Keep uninstalled component wrapped in anti-static material at all times.

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INTRODUCTION

The purpose of this publication is to provide information concerning the proper application of both heat and smoke detectors and sensors in conjunction with fire alarm systems.

The information in this publication is intended to be used only as a technical guide. The requirements of applicable codes and standards, as well as directives of Authorities Having Jurisdiction (AHJs), should be followed.

Before installing detectors/sensors, make a survey of the area to be covered in accordance with information provided in NFPA 72, Chapter 5 (an excerpt of which is provided below). For specific applications, refer to Simplex publication *Common Code Requirements For Fire Alarm Systems* (Publication No. FA2-91-010). For additional information, refer to NFPA 72 and the *NEMA Guide for Proper Use of System Smoke Detectors*.

Refer to each individual section shown in the Table of Contents for information on specific products.

Special Considerations for Smoke Detectors and Sensors

- Is there human occupancy?
- Contents to be protected.
- Type of construction and use.
- Burning characteristics of contents.
- Air movement - stratification.
- Deflections and obstructions.
- Height of ceilings.
- Surface conditions of ceilings.
- Type of ceiling construction.
- Total area.
- Vent locations - velocities - dilution.

Smoke Detector/Sensor Applications

Each detector/sensor is capable of providing up to 900 square feet (84 square meters) of coverage, depending on:

1. Requirements of local codes.
2. Results of engineering evaluation.
3. Physical characteristics of protected area. For examples refer to the following paragraphs of NFPA 72, National Fire Alarm Code 1999:
    - 5-2.4.3 Beam Construction (for heat detector/sensors)
    - 5-3.4.6.1 Flat Ceilings and 5-3.4.6.2 Sloped Ceilings
    - A-5-3.4.6

WHERE TO PLACE DETECTORS/SENSORS

Important: The guidelines in this section are adapted from standards published by the National Fire Protection Association, Quincy, Massachusetts, U. S. A. These standards include NFPA 72, "National Fire Alarm Code"; NFPA 70, "National Electrical Code", Article 760; and NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

To provide effective early warning of a developing fire situation, smoke detectors/sensors should be installed in all areas of the protected premises. Total coverage as defined by NFPA 72 should include all rooms, halls, storage areas, basements, attics, lofts, and spaces above suspended ceilings including plenum areas utilized as part of the HVAC system. In addition, this should include all closets, elevator shafts, enclosed stairways, dumbwaiter shafts, chutes and other subdivisions and accessible spaces.

Fire detection systems installed to meet local codes or ordinances may not be adequate for early warning of the fire. Some codes or ordinances have minimum objectives such as capturing elevators or preventing circulation of smoke through HVAC systems instead of early detection of fire.

You should weigh the costs against the benefits of installing a complete fire detection system when any detection system is being installed. The location, quantity and zoning of detectors/sensors should be determined by what objectives are desired rather than the minimum requirements of any local codes or ordinances.

Detectors/sensors may be omitted from combustible blind spaces when any of the following conditions prevail:

- Where the ceiling is attached directly to the underside of the supporting beams of a combustible roof or floor deck.
- Where the concealed space is entirely filled with noncombustible insulation. (In solid joist construction, the insulation need only fill the space from the ceiling to the bottom edge of the joist of the roof or floor deck.)
- Where there are small concealed spaces over rooms, provided the space in question does not exceed 50 square feet (4.6 square meters).
- In spaces formed by sets of facing studs or solid joists in walls, floors, or ceilings where the distance between the facing studs or solid joists do not exceed 6 inches (15 cm).

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WHERE TO PLACE DETECTORS/SENSORS, *Continued*

Detectors/sensors may also be omitted from below open grid ceilings where all of the following conditions are met:

- The openings of the grid are at least 1/4 inch (6 mm) in the smallest dimension.
- The thickness of the material does not exceed the smallest of the grid openings.
- The openings constitute at least 70% of the area of the ceiling material.

Detectors/sensors are usually required or recommended underneath open loading docks or platforms and their covers, and in accessible underfloor areas in buildings without basements. Detectors/sensors may be omitted from combustible blind spaces when all of the following conditions prevail:

1. The space is not accessible for storage purposes, it is protected against the entrance of unauthorized persons, and it is protected against the accumulation of windblown debris.
2. The space contains no equipment/structures (such as steam pipes, electrical wiring, ducts, shafts, or conveyors) that could potentially ignite or conduct the spread of fire.
3. The floor over the space is tight.
4. Non flammable liquids are processed, handled, or stored on the floor above the space.

"Total coverage," as described in NFPA 72, is the definition of a complete fire detection system. In some of the specified areas of coverage, such as attics, closets, under open loading docks or platforms, a heat detector may be more appropriate than a smoke detector. Careful consideration should be given to the detector manufacturer's instructions and the following recommendations in this guide.

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WHERE TO PLACE DETECTORS/SENSORS, *Continued*

In general, when only one detector/sensor is required in a room or space, the detector/sensor should be placed as close to the center of the ceiling as possible. Central location of the detector/sensor is best for sensing smoke and/or fire in any part of the room. If a center location is not possible, it may be placed no closer than 4 inches (10 cm) from the wall, or if listed for wall mounting, it may be mounted on the wall. Wall mounted detectors/sensors should be located approximately 4 to 12 inches (10 to 30 cm) from the ceiling to the top of the detector, and at least 4 inches (10 cm) from any corner wall junction (see Figure 1).

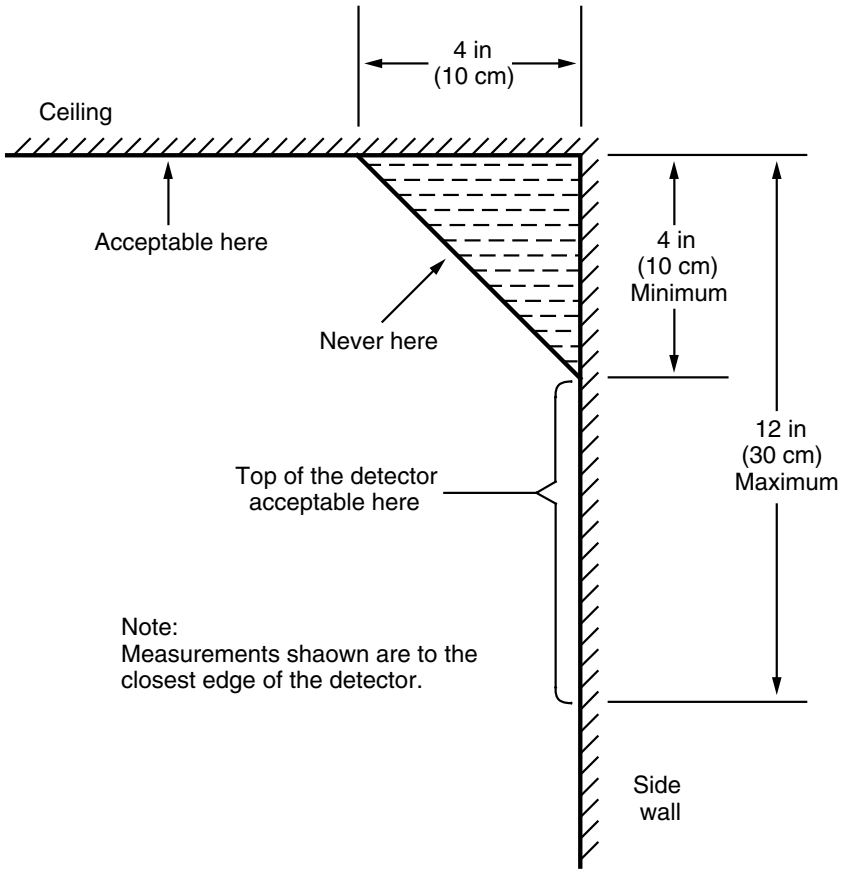

Figure 1. Wall and Ceiling Mounted Detector/Sensor

When an air supply and/or an air return duct opening is present in a room or space, the detector/sensor(s) should be placed in the path of the air flow toward the return air duct opening (see Figure 2).

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WHERE TO PLACE DETECTORS/SENSORS, *Continued*

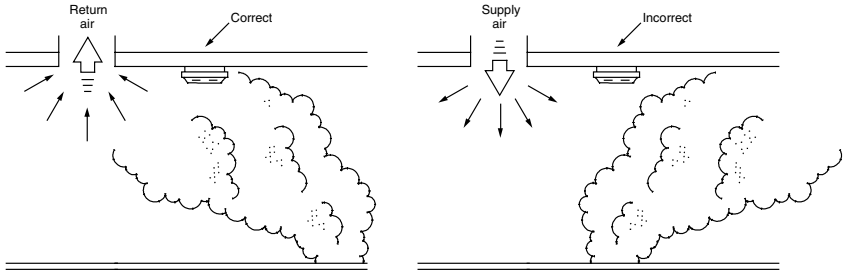

Figure 2. Detector Placement - Air Supply and/or Return Ducts

Smoke tests are helpful in determining proper placement. Special attention should be given to smoke travel directions and velocity, since either can affect detector/sensor performance.

Placement of a detector/sensor near air conditioning or incoming air vents can also cause excessive accumulation of dust and dirt on the detector/sensor. This dirt can cause the detector/sensor to malfunction and cause nuisance alarms. Detectors/sensors should not be located closer than 3 feet (0.9 m) from an air supply diffuser.

Spot type detectors/sensors, in properly engineered systems, may also be placed in return air ducts, or in approved duct detector housings designed for this application. Although duct detectors are not a substitute for open area detectors, they can provide an effective method of initiating building control functions to prevent smoke from being transported from the fire area to other parts of a building.

WHERE NOT TO PLACE DETECTORS/SENSORS

One of the major causes of nuisance alarms is improper placement of detectors/sensors. The best way to avoid nuisance alarms is to not install detectors/sensors in environments that can cause them to malfunction. See Table 1 and examples given below.

Table 1. Environmental Conditions that Influence Detector Response*

Detection Protection	Air Velocity >300′ (91.4m) /min.	Atm. Pressure 3000′(914m) Above Sea Level	Humidity >93%RH	Temp. <32°F (0°C) >100°F (38°C)	Color of Smoke
Ion	X	X	X	X	O
Photo	O	O	X	X	X
Beam	O	O	X	X	O
Air Sampling	O	O	X	X	O

*** See Table A-5-3.6.1.1 in NFPA 72**
X = May affect detector/sensor response
O = Generally does not affect detector/sensor response

DO NOT PLACE DETECTORS/SENSORS:

- In excessively dusty or dirty areas, such as feed rooms, steel mills, etc. Dust and dirt can accumulate on the detector/sensor's sensing chamber and make it overly sensitive, or block the air entrances to the sensing chamber and make the detector/sensor less sensitive to smoke. Be especially careful to avoid areas where fumigants, fog or mist-producing materials, or sweeping and cleaning compounds are used. These substances may cause nuisance alarms.

- Outdoors, in stables, open storage sheds, or other open structures affected by dust, air currents, or excessive humidity and temperature.

- In damp or excessively humid areas, or next to bathrooms with showers. Water droplets can accumulate inside the sensing chamber and make the detector/sensor overly sensitive. A tremendous amount of humid air is produced during a hot shower. The moisture in this humid air can enter the sensing chamber as water vapor, then cool and condense into droplets that can cause a nuisance alarm.

- In elevator lobbies over ashtrays or where people will smoke while waiting for the elevator.

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WHERE NOT TO PLACE DETECTORS/SENSORS, *Continued*

DO NOT PLACE DETECTORS/SENSORS:

- In very cold or very hot environments, or in unheated buildings or rooms where the temperature can fall below or exceed the operating temperature range of the detector/sensor. At temperatures below 32° F (0° C), ice crystals or condensation can appear inside the sensing chamber and make it overly sensitive or cause a nuisance alarm. At temperatures above the operating range of the detector/sensor, greater than 120° F (49° C), its internal components may not function properly.

- In or near areas where combustion particles are normally present, such as in kitchens or other areas with ovens and burners; in garages, where particles of combustion are present in vehicle exhausts; within 15 feet (4.5 meters) of any type of furnace, hot water heater, or gas space heater; or in welding shops or other types of work areas where some form of combustion is used in the activity normally conducted in that area. When a detector must be located in or adjacent to such an area, a fixed temperature heat detector may be appropriate.

- In air streams passing by or through kitchens. Air often enters a residence or a residential unit of an apartment building through cracks around the front and/or back doors. If the air return is in the bedroom hallway or in the bathroom, and if air from the kitchen easily enters the air stream going from the door to the air return, combustion particles from cooking can cause nuisance alarms. Install detectors/sensors so that they protect the bedrooms, but so they are out of the air stream.

- In or near manufacturing areas, battery rooms, or other areas where substantial quantities of vapors, gases or fumes may be present. Strong vapors, like excessive humidity, can make detectors/sensors overly sensitive or less sensitive than normal. In very large concentrations, gases heavier than air, such as carbon dioxide, may make detectors/sensors more sensitive, while gases lighter than air, such as helium, may make them less sensitive. Aerosol particles may collect on detector/sensor chamber surfaces and cause nuisance alarms.

- Insect-infested areas. If insects enter a detector/sensor's sensing chamber, they can cause a nuisance alarm. Take proper insect eradication procedures before installing detectors/sensors in such locations. If spraying is done, do not allow insect spray to enter the detectors/sensors.

- Near fluorescent light fixtures. Electrical noise generated by fluorescent light fixtures may cause nuisance alarms. Install detectors/sensors at least 1 foot (0.3 meters) away from such light fixtures.

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WHERE NOT TO PLACE DETECTORS/SENSORS, *Continued*

Underwriters Laboratories (UL) has three standards for smoke detectors: one for duct detectors/sensors, UL 268A; one for single and multiple station detectors/sensors, UL 217; and one for system type detectors/sensors, UL 268. Detectors/sensors should only be used in the applications for which they are specifically listed.

The 1997 NFPA 101 Life Safety Code notes in Section 7-6.2.10, that single station smoke detectors shall sound an alarm only within an individual living unit or similar area and shall not actuate the building fire alarm system. Section 7-6.1.5 states, "All systems and components shall be approved for the purpose for which they are installed."

In addition to possible code noncompliance, the following deficiencies would exist in a series of residential smoke detectors connected in a fire alarm system mode:

- Since the fire alarm system is not supervised, vandals or others could disconnect a detector or the entire system, leaving a building without protection. The residents would be unaware of the serious life threatening condition.

- Residential detectors do not latch in alarm. In other words, the detector self-resets. One detector in alarm will sound all the detectors connected together. It would be difficult to identify or locate a specific detector that initially put the system into alarm after the alarm condition was cleared.

System detectors/sensors latch in alarm. They do not reset until power is momentarily disconnected. This makes it convenient to identify the location of the detector/sensor that caused the control panel to alarm. In addition, system detectors are specifically designed to connect to a supervised control panel. Two-wire detectors require a UL compatibility review to verify that the detector and panel properly operate together. A typical life safety fire alarm system for an apartment complex would be to use system detectors/sensors and manual fire alarm stations in the hallways and common areas of the complex and residential single station type detectors and heat detectors in the individual apartments. The system detectors/sensors, manual stations and heat detectors would be connected to a supervised control panel, sound a general alarm and automatically notify the proper authorities that a fire condition exists. The residential detectors located in the apartments would be interconnected only within the individual living quarters of each apartment. These residential units would sound an alarm only in the apartment unit.

PRINCIPLES OF OPERATION

This section describes how the different types of detectors and sensors work. For additional information on TrueAlarm sensor operation, refer to the *TrueAlarm Concepts* publication (PER-91-024).

Heat Detector Operation

The heat detector senses the heat or the **rate-of-rise** in the air temperature of the environment in which it is located. The heat detector is comprised of electronic circuitry and a mechanical package that is designed to sense the rate-of-rise of the air temperature in an expedient and reliable fashion. Upon detection of an abnormal increase in air temperature, or rate-of-rise in air temperature, the electronics indicate an alarm by increasing the amount of current draw from the monitor zone it is connected to. The monitor zone is a supervised detection circuit that is tied back to a main control panel that takes appropriate action to indicate an alarm has been reported, if the zone current is substantially increased.

Being of an electronic design, the temperature of the air is sensed by using two negative temperature coefficient thermistors. The resistance of the thermistors goes down with an increase in temperature. One thermistor is placed in a position such as to sense the open air temperature very rapidly (RT1). The second thermistor is positioned in a small cavity that protrudes out from the main body of the detector (RT2). The location of RT2 allows for fast detection of a quick change in the air temperature, but yet for a slow or medium rate of temperature change, the detector will not trip due to the rate-of-rise feature. For a slower change in temperature, the detector trips into alarm due to a set fixed temperature that is sensed by RT1. For a fast temperature rise, when a difference in temperature sensed by RT1 and RT2 has reached a predetermined amount, the detector trips into alarm.

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PRINCIPLES OF OPERATION, *Continued*

Photoelectric Smoke Detectors/Sensors

These devices operate on a light scattering principle. The smoke sensing chamber contains an infrared LED source with a peak spectral emission of 880 nanometers. This source is placed at an angle from a spectrally matched photodiode receiver. During a NO SMOKE condition, only light reflected from the chamber walls enters the receiver and shows up as a small photocurrent. As smoke particles enter the sensing chamber and cross the light beam of the LED, more light reaches the receiver due to scattering. The receiver circuitry converts this photocurrent into a signal voltage. In a detector, when this voltage reaches a preset level, an alarm is produced. In a sensor, this signal voltage goes into an 8-bit, A to D (analog to digital) converter. A digital representation of this signal voltage is then transmitted to the fire alarm panel for further processing.

Ionization Smoke Detectors/Sensors

These devices use a small radiation source, Americium-241, which emits alpha particles that ionize air molecules between two electrically charged electrodes. With the application of a DC voltage to these electrodes, a small ionization current flows within the chamber. As smoke enters the chamber, a decrease in ionization current results. This current is converted into a signal voltage by a transimpedance circuit. In a detector, when this signal voltage drops below a preset level, an alarm is produced. In a sensor, this signal voltage goes into an 8-bit A to D (analog to digital) converter. A digital representation of this signal voltage is then transmitted to the fire alarm panel for further processing.

4098 SMOKE DETECTORS

This section contains specification and mounting information for the smoke detectors shown in Table 2.

CAUTION: Install the detectors described in these instructions in accordance with applicable NFPA standards, local codes, and the Authorities Having Jurisdiction (AHJs). Failure to follow these instructions may result in failure of the detector to initiate an alarm condition. Simplex is not responsible for detectors that have been improperly installed, tested, or maintained.

Limitations of Smoke Detectors: The smoke detectors used with these bases are designed to activate and initiate emergency action, but will do so only when used in conjunction with other equipment. They are designed for installation in accordance with NFPA 72 National Fire Alarm Code 1999.

Smoke detectors will not work without power. AC or DC powered smoke detectors will not work if the power supply is cut off for any reason.

Smoke detectors will not sense fires when smoke does not reach the detectors. Smoke from fires in chimneys, in walls, on roofs or on the other side of closed doors may not reach the smoke detector and alarm it.

A detector may not detect a fire developing on another level of a building. For this reason, detectors should be located on every level of a building.

Smoke detectors have sensing limitations, too. Ionization detectors are better at detecting fast, flaming fires than slow, smoldering fires. Photoelectric detectors sense smoldering fires better than flaming fires. Because fires develop in different ways, and are often unpredictable in their growth, neither type of detector is always best, and a given detector may not always provide warning of a fire. In general, detectors cannot be expected to provide warning for fires resulting from inadequate fire protection practices, violent explosions, escaping gases, improper storage of flammable liquids like cleaning solvents, other safety hazards, or arson.

Smoke detectors cannot last forever. Smoke detectors contain electronic parts. Even though detectors are made to last for many years, any of these parts could fail at any time. Therefore, test your smoke detector system per NFPA 72 at least annually. Clean and take care of your smoke detectors regularly.

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Specifications

Table 2. Smoke Detector Specifications

Specifications	Smoke Detector Data		
Detector PID (4098)	-9601, -9605,	-9602	-9603
Type of Detector	Photoelectric	Photoelectric with Heat	Ionization
Working Voltage (2-wire)	8.5 – 33 VDC	8.5 – 33 VDC	8.5 – 33 VDC
Rated Voltage (4-wire)	15 – 32 VDC	15 – 32 VDC	15 – 32 VDC
Input Ripple Voltage	25% Max.	25% Max.	25% Max.
Max. Alarm Current	86 mA	86 mA	86 mA
Surge Current	<200 μA	<200 μA	<200 μA
Standby Current	<100 μA	<100 μA	<100 μA
Heat Element Rating	N/A	135° F	N/A
Humidity Range (Non-Condensing)	10-95% RH	10-95% RH	10-95% RH
Air Velocity Range	0-2000 FPM	0-2000 FPM	0-300 FPM: UL 0-200 FPM : Recommended

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General Mounting Notes

All smoke detectors identified in Table 2 mount to a detector base (refer to the *4098 Detector Bases* section of this publication for more information). Use the following considerations and Figure 3 when mounting smoke detectors.

IMPORTANT: Smoke must enter the chamber of the detector. Thus, air flow, air stratification, air velocity, air stagnation, and air migration will affect detector efficiency. Therefore:

- Do not install detectors in areas where temperatures are likely to exceed 100° F (38° C) or fall below 32° F (0° C).
- Because the 4098-9602 detector combines heat sensing, DO NOT install this detector in locations where the ambient temperatures exceed 100° F (38° C) or where temperature fluctuations above 6° F/min. occur.
- Do not install detectors on a ceiling within 4 inches (10 cm) of a wall.
- Do not install detectors where forced air ventilation may dilute the smoke before it reaches the detector.
- Do not install detectors in areas where smoke is normally present (kitchens, furnace rooms, laundry rooms, loading docks, rooms with fireplaces, rooms with candles, soldering rooms, etc.).
- Do not install detectors in areas where there is likely to be steam (in hospital patient rooms with vaporizers, near shower rooms, above large sinks, etc.).
- Do not install detectors above ashtrays in elevator lobbies.
- Wall-mounted detectors should be located 4 to 12 inches (10-30.5 cm) from the ceiling to detector head.
- Protect all detector heads during construction to avoid infiltration of construction debris! Remove any protective covers before activating the system.
- If using the adapter plate, tighten the mounting screws without warping the adapter plate.

4098 HEAT DETECTORS

This section contains general notes, specifications, and mounting information for the heat detectors shown in Table 3.

WARNING: Heat detectors are NOT life-safety devices; USE HEAT DETECTORS FOR PROPERTY PROTECTION ONLY! For life-safety requirements, use smoke detectors.

General Notes:

1. For all heat detectors, provide electronic supervision with battery back-up at the fire alarm control panel.
2. Where the possibility of positive airflow from the electrical conduit/junction box exists, seal the conduit openings with 3M Weatherban #606 (or equivalent), a non-flammable sealing compound.
3. Refer to NFPA 72 for application, test, and maintenance requirements.

Heat Detector Types

Fixed Temperature Heat Detectors

Simplex electronic fixed temperature heat detectors use a fast response, thermistor based design to provide temperature sensing that quickly, accurately, and consistently identifies when fixed temperatures are exceeded. For this reason, the fixed temperature detectors are recommended for most applications. With a UL spacing distance of 60 X 60 feet, the fixed temperature electronic heat detectors will replace **both** mechanical fixed as well as mechanical ROR heat detectors.

ROR Temperature Heat Detectors

Simplex electronic rate-of-rise heat detectors detect fixed temperature alarm thresholds the same as the fixed temperature heat detectors, plus detect a rate-of-rise alarm with a patented rate-of-rise detection design that can quickly respond to sudden temperature variations. Due to the nature of the fast response to temperature changes, care must be taken for proper installation of ROR heat detectors. Rate-of-rise heat detectors should be installed in stable environmentally controlled areas. These detectors must not be installed where hot or cold air can be blown on them (near ductwork, industrial equipment, air vents etc.). Rate-of-rise detectors should not be installed where more then 12 deg. F per minute temperature changes can normally occur.

Specifications

FEATURES:

- Rate-of-Rise and Fixed Temperature (see Table 3)
- Alarm LED
- Compatible with 2-Wire Initiating Device Circuits
- Current-Limited Alarm State

ELECTRICAL SPECIFICATIONS:

- Typical Standby Current - 80 Microamps
- Typical Alarm Current - 40 Milliamps
- Maximum Current - 80 Milliamps while in alarm state
- Operating Range - 15-32 VDC
- Maximum Ripple Voltage Allowed - 30%

Continued on next page

Specifications (*continued*)

Table 3. Model / Feature Chart for Heat Detectors

Model	Rating or Class*	Area / Language	Color Code
4098-9612 (UL)	135° F (57° C) FT	English	—
4098-9613 (UL)	135° F (57° C) FT & RR	English	—
4098-9614 (UL)	200° F (93° C) FT	English	White
4098-9615 (UL)	200° F (93° C) FT & RR	English	White
4098-9616E	A1	European	Green
4098-9617E	C	European	Red
4098-9618E	A	Australian	White
4098-9619E	B	Australian	Blue
4098-9621E	D	Australian	Red
4098-9622E	I	Chinese	Green
4098-9624E	134° F (56.7° C) FT	Korean	—
4098-9625E	134° F (56.7° C) FT & RR	Korean	—
4098-9626E	134° F (56.7° C) FT	Taiwanese	—
4098-9627E	134° F (56.7° C) FT & RR	Taiwanese	—
4098-9628E	190° F (87.8° C) FT	Korean	—
4098-9629E	190° F (87.8° C) FT & RR	Korean	—
4098-9630E	190° F (87.8° C) FT	Taiwanese	—
4098-9631E	190° F (87.8° C) FT & RR	Taiwanese	—

* RR abbreviates Rate-of-Rise; FT abbreviates Fixed-Temperature.

All heat detectors identified in Table 4 mount to a detector base (refer to the *4098 Detector Bases* section of this publication for more information). Use the information in Figure 3 when mounting.

Continued on next page

Specifications (*continued*)

Table 4. Heat Detector Specifications

Product ID	Description	Application	Max. Spacing Allowed (UL)	FM
4098-9612	Fixed-Temp. Only, 135° F (57° C)	Unusually violent temp. fluctuations & ceiling temperatures not exceeding 100° F (38° C)	60 X 60 ft (18 X 18 m)	15 X 15 ft (4.6 X4.6 m)
4098-9613	Fixed-Temp. and Rate-of-Rise, 135° F (57° C)	Normal temp. fluctuations & ceiling temperatures not exceeding 100° F (38° C)	70 X 70 ft (21 X 21 m)	30 X 30 ft (9.2 X 9.2 m)
4098-9614	Fixed-Temp. Only, 200° F (93° C)	Unusually violent temp. fluctuations & ceiling temperatures exceeding 100° F (38° C) but not 150° F (68° C)	60 X 60 ft (18 X 18 m)	15 X 15 ft (4.6 X4.6 m)
4098-9615	Fixed-Temp. & Rate-of-Rise, 200° F (93° C)	Normal temp. fluctuations & ceiling temperatures exceeding 100° F (38° C) but not 150° F (68° C)	70 X 70 ft (21 X 21 m)	30 X 30 ft (9.2 X 9.2 m)

4098 BASES

The 4098-9788 base is designed to be used with Simplex smoke and heat detectors, as well as the QuickConnect2 photo sensor. To use a 4-wire configuration, you must use the 4098-9682 relay base. Heat detectors require the 4098-9684 base when used with a remote LED. This section only covers the information necessary to mount and wire these base configurations. Before installing these bases, make a survey of the area to be covered in accordance with information provided in NFPA 72, Chapter 5. For specific applications, refer to the *Common Code Requirements for Fire Alarm Systems* (Simplex Pub. No. FA2-91-010). For additional information, refer to NFPA 72 and the *NEMA Guide for Proper Use of System Smoke Detectors.*

CAUTION: Install the bases in this section in accordance with applicable NFPA standards, local codes, and Authorities Having Jurisdiction (AHJs). Failure to follow these instructions may result in failure of the detector to initiate an alarm condition. Simplex is not responsible for detectors that have been improperly installed, tested, or maintained.

Mounting

The 4098-9788 base mounts to a 4-inch octagonal, 4-inch square, or single gang electrical box. When mounting to a 4-inch square or any surface mounted box, the 4098-9832 adapter plate kit must be used (see Figure 3).

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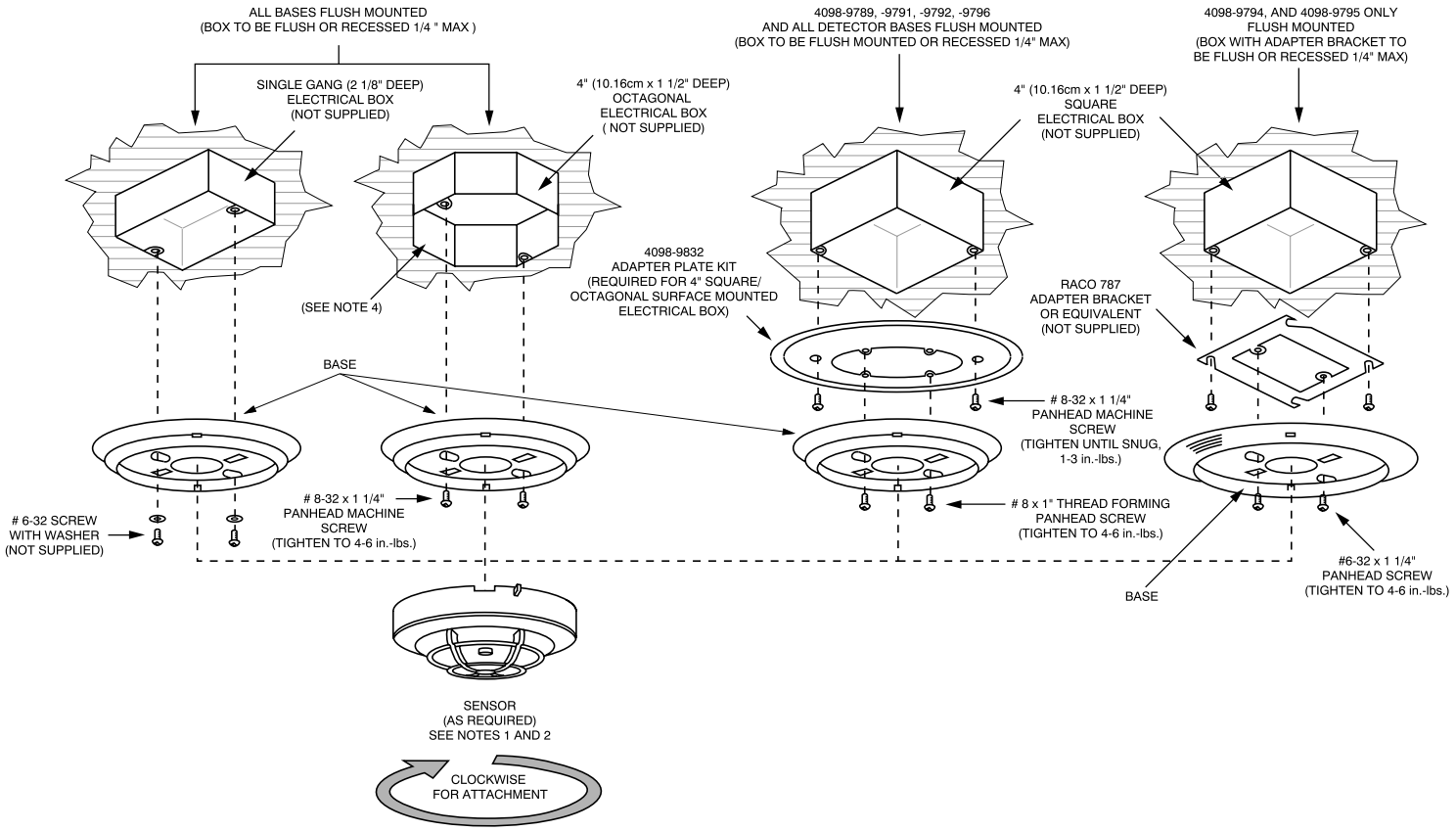
Mounting (*continued*)



Notes:

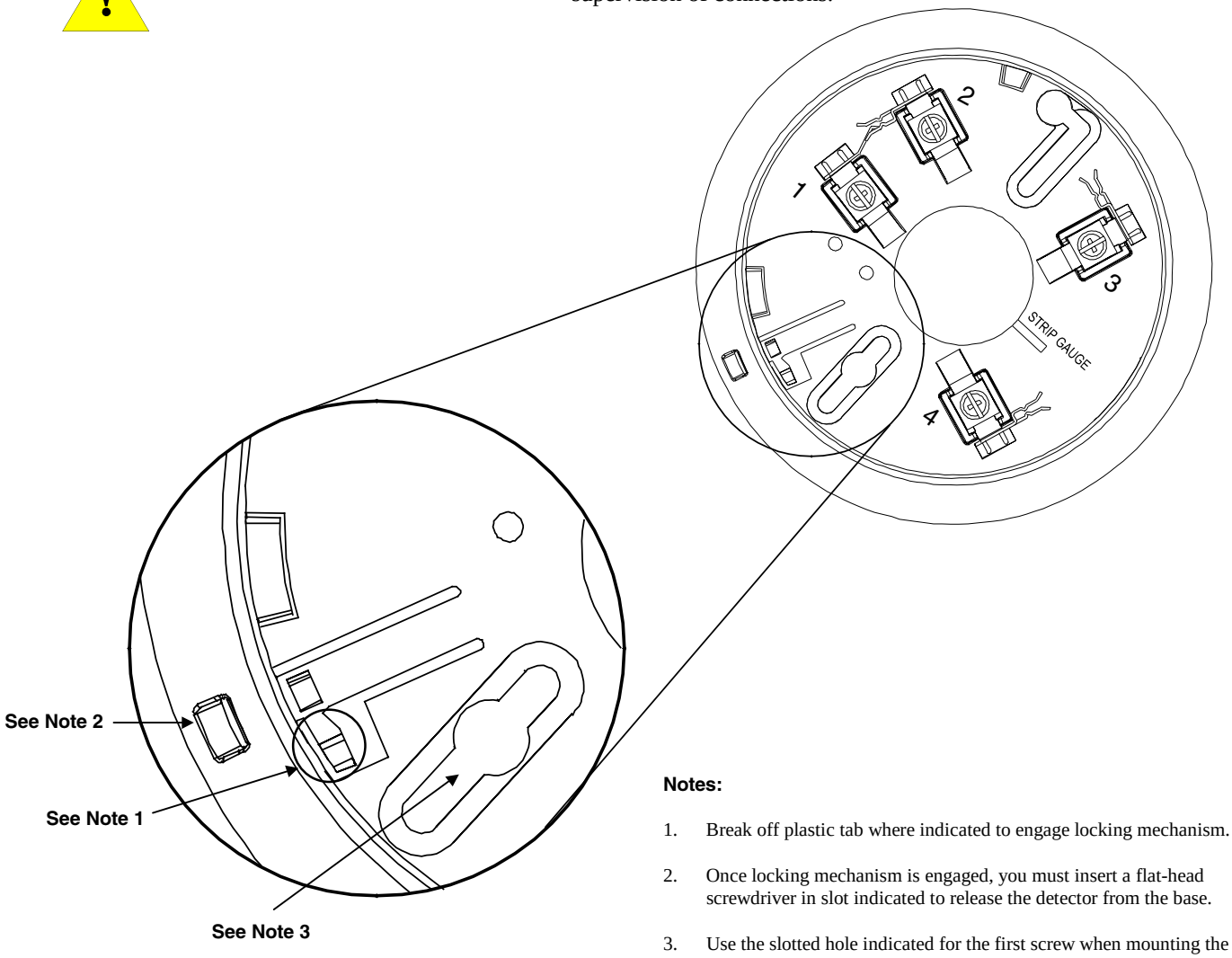
1. Break off plastic lock tab to engage locking mechanism. To lock detector/sensor into base, turn unit until the locking tab clicks into place. To unlock detector/sensor, insert the blade of a screwdriver into this slot and then pull down on handle. This action allows the detector/sensor to be turned and removed (see Figure 4).
2. Refer to the *Compatibility* section of this publication for detailed information on compatible detectors/sensors.
3. Bases with relay modules require an 1 ½-inch extension ring (not supplied) mounted to the 4-inch square or octagonal electrical box to meet the space requirement of the relay cube and its wires. The relay module(s) cannot be used in single-gang electrical box installations. The relay cube 4098-9822 MUST be installed in the electrical box directly behind the sensor base.
4. Use Adapter Plate Kit 4098-9832 when mounting the 4098-9794 and 4098-9795 to a surface mounted 4-inch square or octagonal box. Adapter plate must be installed with textured side towards the electrical box for this installation only.

Figure 3. Typical Detector/Sensor Mounting

Wiring

All screw terminals accommodate 14 to 18 AWG solid or stranded wire. **When tightening screws, the range of torque is 8 to 12 in-lbs.** Connect wiring to the terminals shown in Figure 4. Figures 5 through 8 show typical wiring applications for the 4098 bases.

CAUTION: Do not loop wire under terminals. Break wire run to provide supervision of connections.



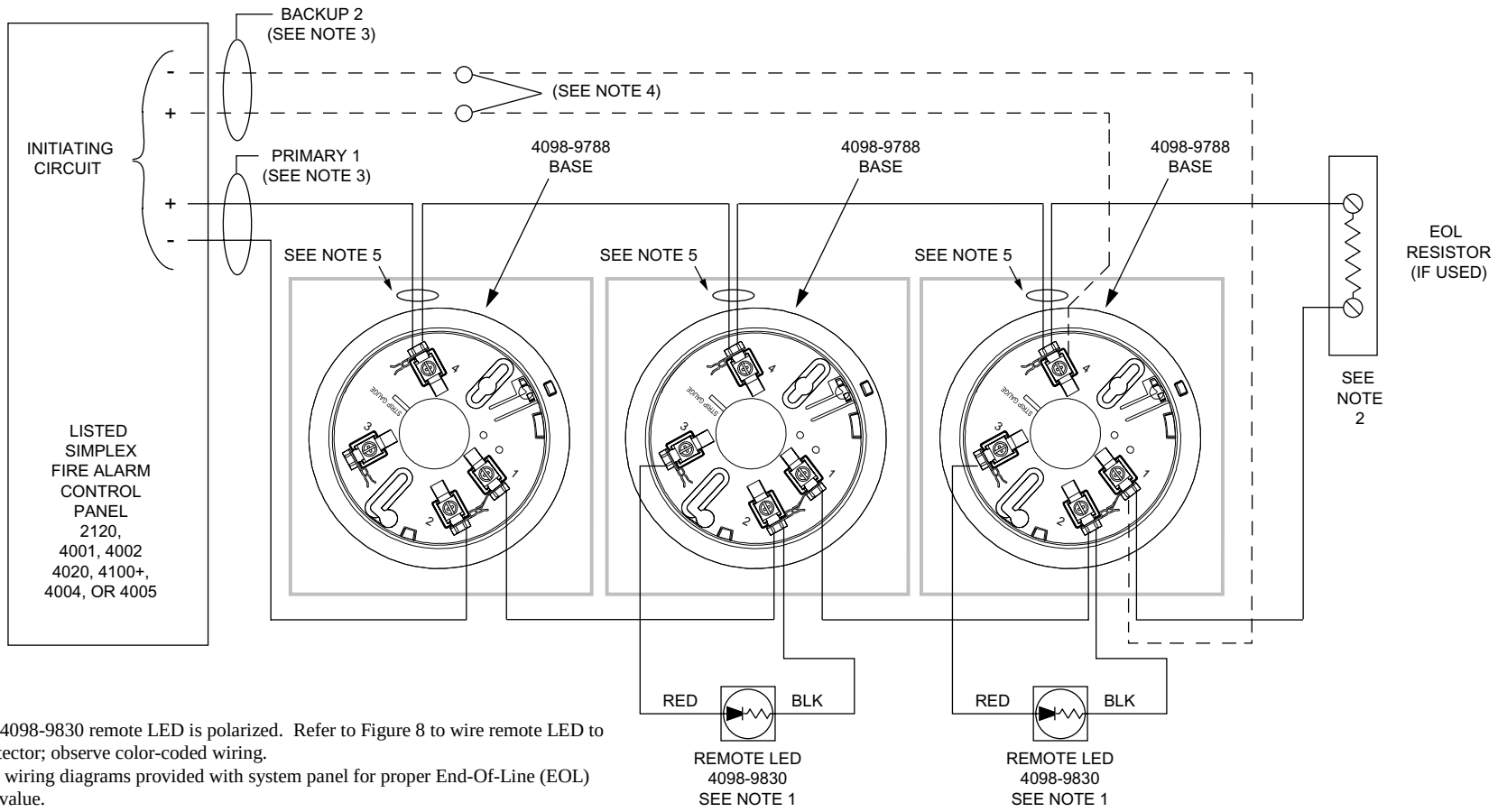
Notes:

1. Break off plastic tab where indicated to engage locking mechanism.
2. Once locking mechanism is engaged, you must insert a flat-head screwdriver in slot indicated to release the detector from the base.
3. Use the slotted hole indicated for the first screw when mounting the base.

Figure 4. Wiring and Mounting the Bases

Continued on next page

Wiring (*continued*)



Notes:

1. If used, 4098-9830 remote LED is polarized. Refer to Figure 8 to wire remote LED to Heat detector; observe color-coded wiring.
2. Refer to wiring diagrams provided with system panel for proper End-Of-Line (EOL) resistor value.
3. It is recommended that the primary-1 and the backup-2 lines be in separate wire runs and in compliance with local requirements.
4. For Style D initiating circuit, wire per dotted lines and do not use EOL resistor.
5. Break wires before connecting to Terminal 4 to maintain supervision. Do not loop wire underneath Terminal 4.

Figure 5. 4098-9788 Base Connections for Style B or D Initiating Circuits

Continued on next page

Wiring *(continued)*

Notes:

1. If used, 4098-9830 remote LED is polarized; refer to Figure 8 to wire remote LED to Heat detector; observe color-coded wiring.
2. Wire only one relay base per initiating circuit.
3. For Style D initiating circuit, wire per dotted lines and do not use EOL resistor. If Style B initiating circuit, refer to wiring diagrams provided with the system panel for proper EOL resistor value.
4. It is recommended that the primary-1 and the backup-2 lines be in separate wire runs and in compliance with local requirements.
5. Aux. Relay contacts, each rated 1 amp at 28 VDC/0.5 amp at 125 VAC, resistive.

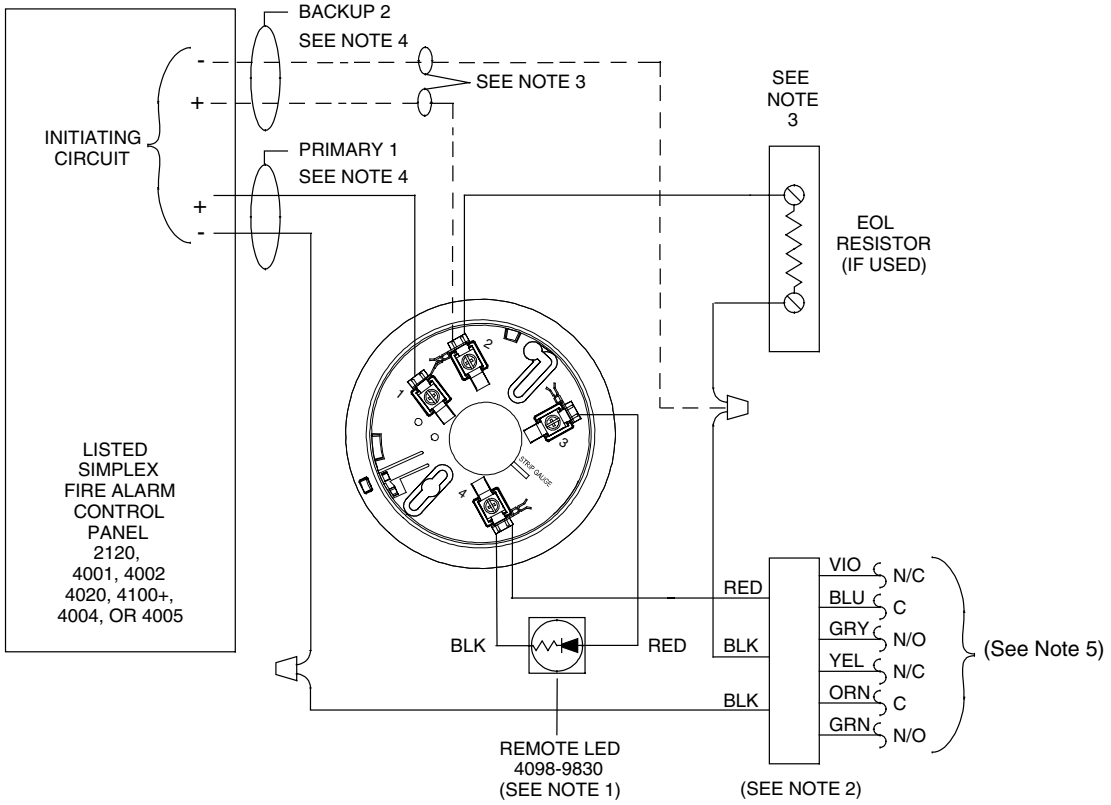
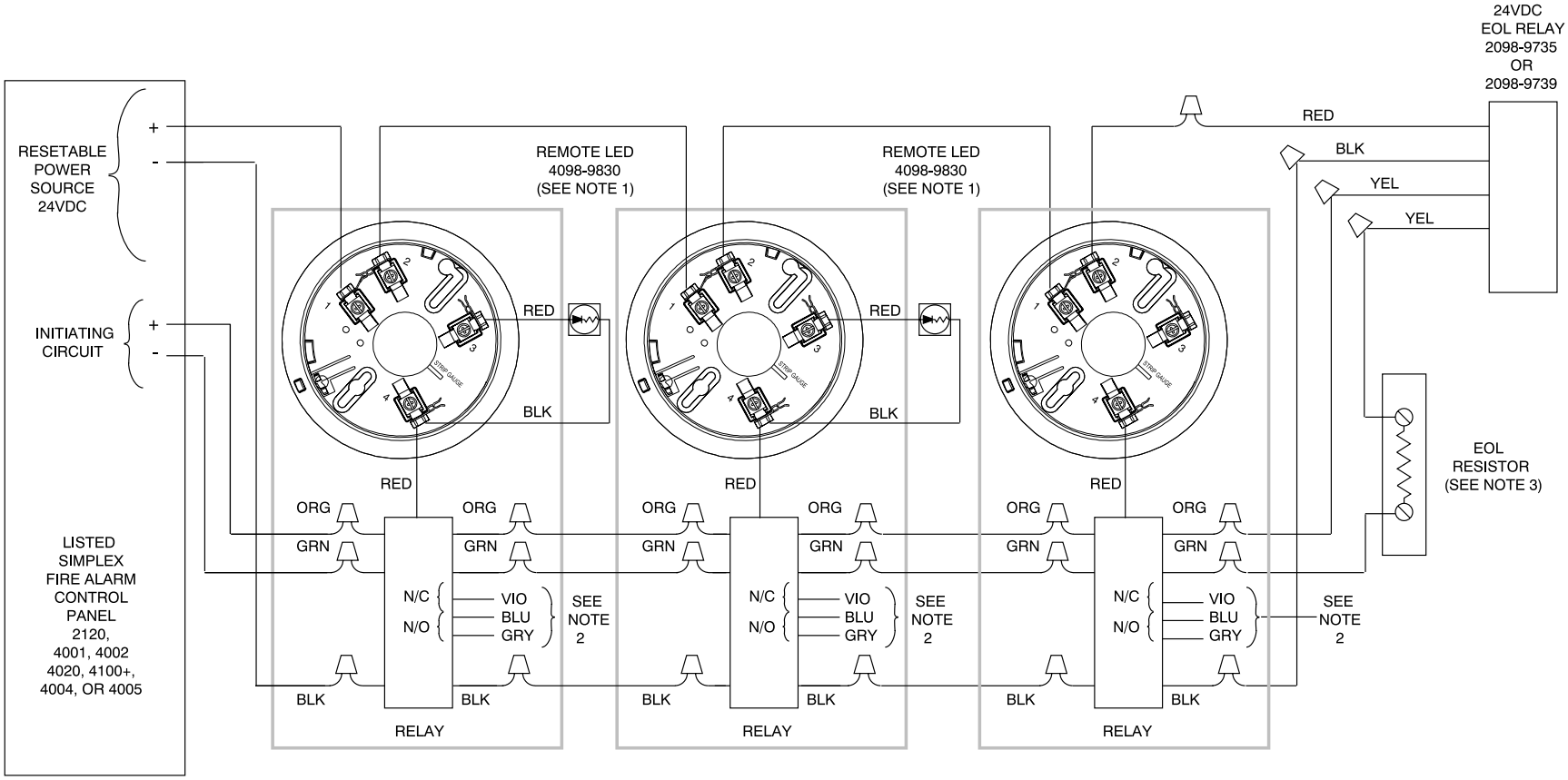


Figure 6. 4098-9683 2-Wire Relay Base Connections for Style B or D Initiating Circuits

Continued on next page

Wiring *(continued)*



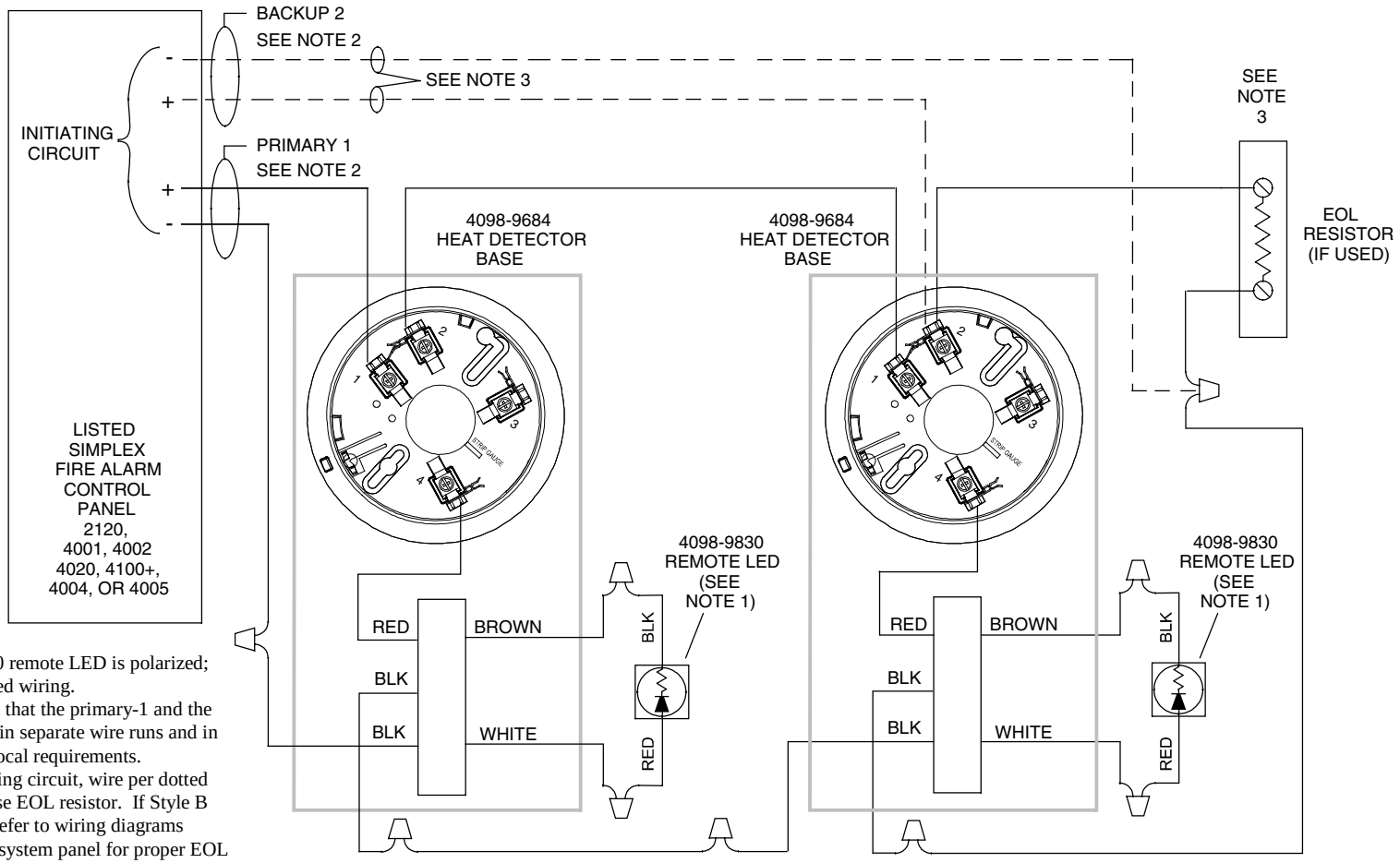
Notes:

1. If used, 4098-9830 remote LED is polarized, observe color-coded wiring. Refer to Figure 8 to wire remote LED to Heat detector.
2. Aux. Alarm contacts - Form C - each rated 3 amps at 28 VDC/115 VAC, resistive.
3. Refer to wiring diagrams provided with system panel for proper EOL resistor value.

Figure 7. 4098-9682 4-Wire Base Connections for Style B Initiating Circuits

Continued on next page

Wiring (*continued*)



Notes:

1. If used, 4098-9830 remote LED is polarized; observe color-coded wiring.
2. It is recommended that the primary-1 and the backup-2 lines be in separate wire runs and in compliance with local requirements.
3. For Style D initiating circuit, wire per dotted lines and do not use EOL resistor. If Style B initiating circuit, refer to wiring diagrams provided with the system panel for proper EOL resistor value.

Figure 8. 4098-9684 Heat Detector LED Base Connections for Style B or D Initiating Circuits

4098 TrueAlarm SENSORS

This section contains general notes, specifications, and mounting information for the TrueAlarm Smoke and Heat Sensors shown in Table 5.

WARNING: Be sure that the location of each smoke sensor and each heat sensor has been planned per local and national fire codes (see NFPA 72, Chapter 5).

General Notes

1. Smoke sensor sensitivities are set and continuously monitored by the control panel. This functionality complies with NFPA 72, Chapter 7. When functional testing of these sensors is required per NFPA 72, use the test methods described in the *Maintenance and Testing* section of this publication.

2. Refer to NFPA 72 for application, test, and maintenance requirements.

3. The 4098-9733 heat sensor and 4098-9754 multi-sensor provide a **rate-of-rise** function that is software programmed and selectable at 15° F (8.3° C) or 20° F (11.1° C) per minute. The 4098-9733 and 4098-9754 also provide general temperature monitoring within the range of 32°-122° F (0°-50° C).

Continued on next page

Specifications

Table 5. TrueAlarm Sensor Specifications

Sensor PID	4098-9714	4098-9717	4098-9733	4098-9754
Type of Sensor	Photoelectric	Ionization	Heat	Photo/Heat
Average Operating Current	80 µA	80 µA	6 µA at 68° F (20°C) 13 µA at 135° F (57° C)	90 µA
UL Temperature Rating*	—	—	135° F (57° C)** 155° F (68° C)†	135° F (57° C)** 155° F (68° C)†
Humidity Range (Non-Condensing)	10-95% RH	10-95% RH	10 -95% RH	10 -95% RH
Air Velocity Range	0-2000 FPM	0-300 FPM: UL 0-200 FPM : Recommended	—	0-2000 FPM

* Fixed temperature functions are software programmed and selectable from the UL temperature rating.
** UL Max. Ambient Ceiling Temp. of 100° F (38° C) at 3600 sq. ft of Max. Coverage.
† UL Max. Ambient Ceiling Temp. of 100° F (38° C) at 1600 sq. ft of Max. Coverage.

Special Applications

1. Smoke sensor sensitivities are set and continuously monitored by the control unit. The sensitivity range (setting) for the 4098-9714 and 4098-9754 sensor is 0.2%/FT to 3.7%/FT smoke obscuration. The sensitivity range (setting) for 4098-9717 sensors is 0.5%/FT to 1.3%/FT.
2. The 0.2%/FT, 0.5%/FT, and 1.0%/FT settings for the 4098-9714 and 4098-9754 sensor and the 0.5%/FT and 0.9%/FT settings for the 4098-9717 sensor are for special applications only. The 0.2%/FT, 0.5%/FT, 0.9%/FT, and 1.0%/FT settings are very sensitive settings: **only use the 0.2%/FT setting when a sensor is located in a totally smoke-free and controlled temperature environment**, such as a computer room or telephone switching exchange.
3. To determine if an area is suitable for the 0.2%/FT setting, set the sensitivity for the installed sensor at 1.5%/FT and monitor the peak values for **90 days**. If you record a peak value of 0.1%FT or higher during the 90 days, **do not use** the 0.2%/FT setting.
4. To determine if an area is suitable for the 0.5%/FT setting, set the sensitivity for the installed sensor at 1.5%/FT and monitor the peak values for **90 days**. If you record a peak value of 0.25%FT or higher during the 90 days, **do not use** the 0.5%/FT setting.
5. To determine if an area is suitable for the 0.9%/FT or 1.0%/FT setting, set the sensitivity for the installed sensor at 1.3%/FT (ION)/ 1.5%/FT (Photo) and monitor the peak values for **90 days**. If you record a peak value of 0.5%FT or higher during the 90 days, **do not use** the 0.9%/FT (ION) or 1.0%/FT (Photo) settings.

Mounting

All sensors identified in Table 5 mount to a sensor base (refer to the *4098 TrueAlarm Bases* section of this publication for more information). Use the following notes and Figure 3 when mounting TrueAlarm sensors.

4098 TrueAlarm SENSOR BASES

General Notes

TrueAlarm smoke/heat sensor bases are connected to a 2120 Multiplex Communicating Device Transponder (CDT), 4020, 4100+, 4120, or 4010 panel by a single wire pair (MAPNET II/IDNet). The 4098-9792, -9789, -9793, and -9796 bases and their sensors obtain both power and data over MAPNET II/IDNet wiring. The 4098-9791 sensor base requires 24VDC power for relay operation and the 4098-9794 and 4098-9795 sensor base with sounder requires 24 VDC or Notification Appliance Circuit (NAC) power. The 4098-9791, -9794, -9795, and -9796 are NOT compatible with the 2120 CDT. The 4098-9793 is only compatible with the 4010 panel.

Specifications

Table 6 contains the specifications for the TrueAlarm Sensor Bases.

Table 6. TrueAlarm Sensor Bases Specifications

Sensor Base PID	4098-9789 (w/ Remote LED)	4098-9791 (w/ Relay and Remote LED)	4098-9792	4098-9793 (Isolator Base)	4098-9794 (Sounder Base)	4098-9795 (Multi-Sensor Sounder Base)	4098-9796 (Multi-Sensor w/ Remote LED)
Working Voltage (MAPNET II/IDNet)	24-40 VDC	24-40 VDC	24-40 VDC	24-40 VDC	24-40 VDC	24-40 VDC	24-40 VDC
24V Working Voltage (Relay or Sounder Power)	—	18 – 32 VDC	—	—	18 – 32 VDC	18 – 32 VDC	—
MAPNET II/IDNet Current *	400 µA	400 µA	400 µA	500 µA	400 µA	500 µA	500 µA
24V Standby Current (Relay or Sounder)	—	270 µA	—	—	270 µA	270 µA	—
24V Current (Relay or Sounder Activated)	—	28 mA	—	—	17 mA	17 mA	—
LED Output	Yes	Yes	—	—	Yes	Yes	Yes
Sounder Output	—	—	—	—	88dBA minimum	88dBA minimum	—

*** MAPNET II/IDNet current with Photo Sensor plugged into Base**

Setting the Base's Address

Each sensor base has a unique address. This address is associated with a custom label that identifies its physical location within a building. The base's address and location must match up with the address listed in the specification sheets of the 2120 Job Configuration Report or the Programmer's Report for the 4020, 4100+, 4120, or 4010 System. See Figure 9 for DIP Switch location for 4098-9789, -9791, -9792, -9793, and -9796 Sensor Bases. See Figure 10 for DIP Switch location for 4098-9794 and 4098-9795.

Continued on next page

Setting the Base Address
(continued)

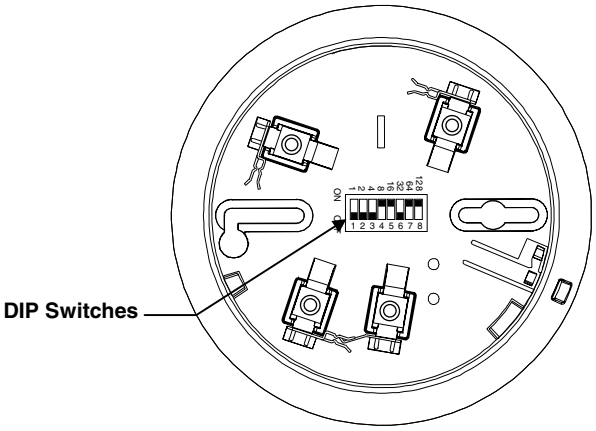
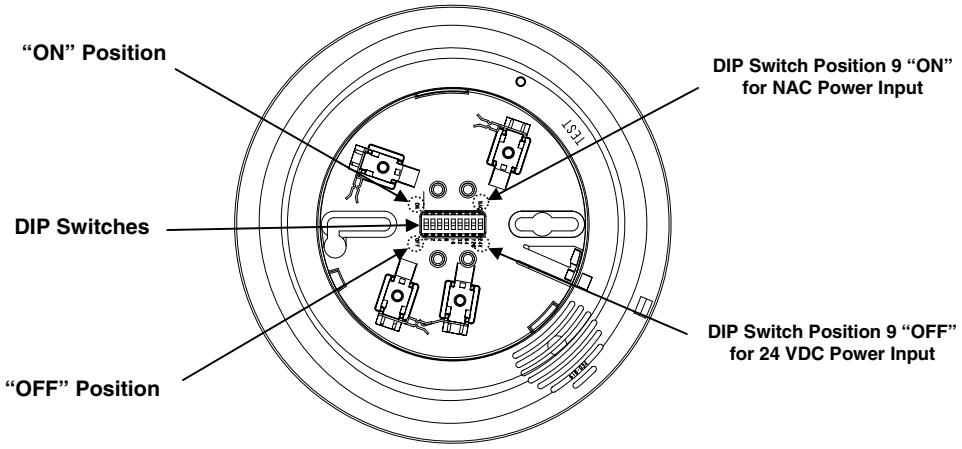


Figure 9. 4098-9789, -9791, -9792, -9793, -9796 Sensor Bases Location of DIP Switches



Note: The 4098-9794 Sounder Base and 4098-9795 Multi-Sensor Sounder Base have a 9-position DIP Switch. The first eight DIP Switches set the sounder base address. Dip Switch position 9 is set to OFF or ON depending upon the sounder base power source. When the sounder base is connected to a 24 VDC power source, DIP switch position 9 is set to "OFF" and the 24 VDC power is supervised by the sounder base. When the sounder base is powered by the panel's Notification Appliance Circuit (NAC), DIP Switch position 9 is set to "ON" and the power is supervised by the NAC and not the sounder base.

Figure 10. 4098-9794 and 4098-9795 Sensor Bases Location of DIP Switches

Address Setting for the 2120 CDT System

1. Using the 2120 Job Configuration Report, find the entry for the sensor base (4098-9792 and 4098-9789 only) you are about to install. The CUSTOM LABEL column provides the location while the DEVICE ADDRESS column provides the switch setting data.

2. Using the switch setting data for the base you are installing, set the base's address. See Figure 9 for location of switches. Use a small screwdriver or pen to set the switches.

3. Double-check the location of the sensor base and its address before proceeding to electrical installation (see Figure 3).

Address Setting for the 4010, 4020, 4100+, or 4120 System

1. Using the Programmer's Report for the 4020 (Figure 11), 4100+, 4120 or 4010 (Figure 12), find the entry for the sensor base you are about to install. The device ADDRESS and CUSTOM LABEL are located in the SYSTEM POINT SUMMARY under "M."

For example, Address M1-7 (for the 4100+, 4120, or 4010 system) is circled in Figure 12. M1 is the addressable channel while -7 is the device address on the channel. For a base with Address M1-7, Address 7 must be set on the base's DIP switches (SW1).

2. Using the example given in Step 1 as guideline, set the base's address using the information in Figure 13. See Figure 9 and 10 for location of switches. Use a small screwdriver or pen to set the switches.

3. Mark an address label with the appropriate address for your base by shading a label box for each base DIP switch in the ON position. Then apply the label to the base near the base's DIP switch.

4. Double-check the location of the sensor base and its address before proceeding to electrical installation.

Continued on next page

Address Setting for the 4010, 4020, 4100+, or 4120 System
(continued)

```
-------------------------------------------------------------------------------
9245001A rev: 1                SYSTEM POINT SUMMARY                      Page   4
DOCUMENTATION                                                 15:40:02, TUE, 05-MAY-92
-------------------------------------------------------------------------------
                                                                        POINT SUMMARY
System Point Summary (ascending by zone name):                             ZONE

                                                          Point    Device  PNIS
Zone Name Custom Label                                    Type     Type    Code
--------- --------------------------------------- ------- -------- -----------
 IO1       MULTI IO CARD 1  POINT IO1                     PULL     MONA
 IO2       MULTI IO CARD 1  POINT IO2                     PULL     MONA
 IO3       MULTI IO CARD 1  POINT IO3                     SSIGNAL  SIGA
 IO4       MULTI IO CARD 1  POINT IO4                     SSIGNAL  SIGA
 M1-1      COMPUTER LAB BLDG 21                           VSMOKE   ION
 M1-2      3RD FLOOR EAST WING  ROOM 18                   SMOKE    GENIAM
 M2-1      2ND FLOOR WEST WING  ROOM 12                   SMOKE    ADRDET
 IO9       BASEMENT EAST WING  ROOM 3  IO9                SFPUMP   MONA
```

Device Address → M1-1

Figure 11. 4020 Programmer's Report

```
                              REPORT  VIEWER
♀
-------------------------------------------------------------------------------
NEW JOB                          SYSTEM POINT SUMMARY                    Page   4
4_20MA node:1 rev:1                                      08:47:10, MON, 26-AUG-96
-------------------------------------------------------------------------------
                                                                        POINT SUMMARY
System Point Summary (ascending by zone name):                             ZONE

                                                          Device   Point   PNIS
Zone Name Custom Label                                    Type     Type    Code
--------- --------------------------------------- ------- -------- -----------
 M1-1      3RD FLOOR EAST WING ROOM 12                    MBZAM    HEAT
 M1-2      3RD FLOOR EAST WING ROOM 13                    MBZAM    FIRE
 M1-3      3RD FLOOR EAST WING ROOM 14                    MBZAM    HEAT
 M1-4      3RD FLOOR EAST WING ROOM 15                    ADRDET   SMOKE
 M1-5      3RD FLOOR EAST WING ROOM 16                    ADRPUL   PULL
 M1-6      3RD FLOOR EAST WING ROOM 17                    MAZAM    SMOKE
 M1-7      3RD FLOOR EAST WING ROOM 18                    PHOTO    SMOKE
 M1-8      3RD FLOOR ESAI WING ROOM 19                    PSMON    TROUBLE
♀
-------------------------------------------------------------------------------
NEW JOB                      DIGITAL PSEUDO POINT SUMMARY                Page   5
   Use cursor keys to view.  Press F to find, R to repeat find, ESC to exit.
 Job 4_20MA NEW JOB, Node 1, Type 4100+, Rev 1
```

Device Address → M1-7

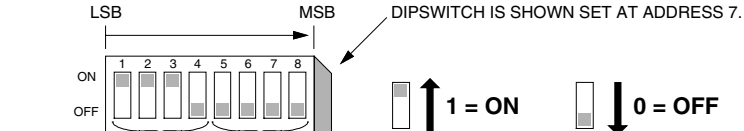
Figure 12. 4100+, 4120, or 4010 Programmer's Report

Continued on next page

Address Setting for the 4010, 4020, 4100+, or 4120 Systems (*continued*)

Figure 13 shows the address DIP switch settings for the 4010, 4020, 4100+, and the 4120 Systems. Refer to the *Compatibility* section of this publication for information on which devices are compatible with the various FACPs.

Note: The 4020, 4100+, and 4120 systems support up to 127 devices on each of their MAPNET II channels. The 4010 supports up to 250 devices on its IDNet channel.



RESERVED FOR FUTURE USE

DIP SWITCHES 5 THRU 8

DIP SWITCHES 1 THRU 4

	0000	1000	0100	1100	0010	1010	0110	1110	0001	1001	0101	1101	0011	1011	0111	1111
0000	0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
1000	1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
0100	2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
1100	3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
0010	4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
1010	5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
0110	6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
1110	7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
0001	8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
1001	9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
0101	10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
1101	11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
0011	12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
1011	13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
0111	14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
1111	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

RESERVED FOR FUTURE USE

Figure 13. 4010, 4020, 4100+, or 4120 MAPNET/IDNet Addresses

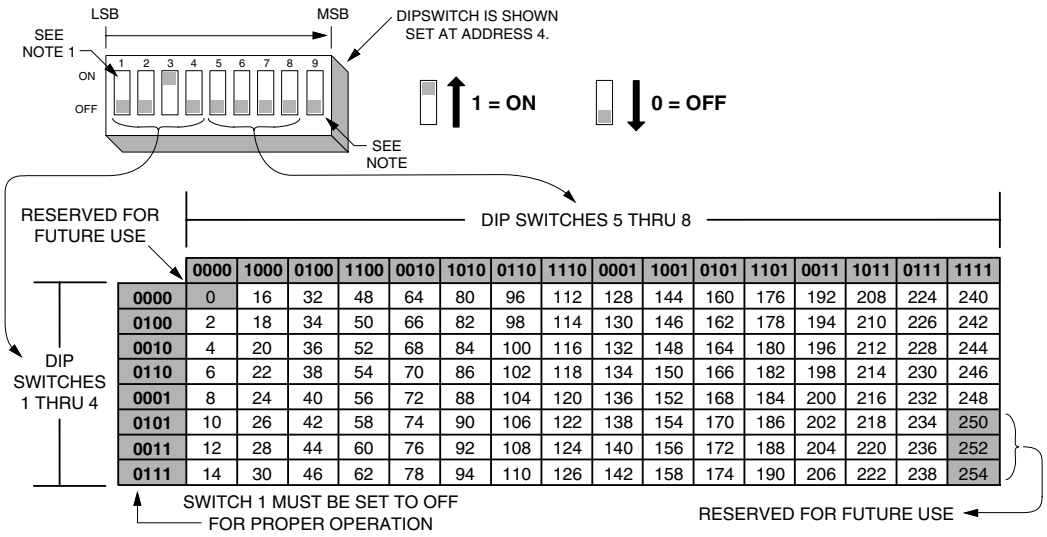
Continued on next page

Multi-Sensor Bases 4098-9795 and 4098-9796

The Multi-Sensor Bases 4098-9795 and -9796 are **only** for use with the 4098-9754 multi-sensor and are **not** compatible with the 2120 CDT. Both bases have remote LED output and the 4098-9795 also has an integrated sounder similar to the 4098-9794 Sounder Base.

The Multi-Sensor Base answers to two addresses, therefore the DIP switch must be set for **even addresses only**. The even address is a photo sensor/sounder base (4098-9795) or a photo sensor/standard base (4098-9796), and the odd address (DIP switch + 1) is a heat sensor/standard base. Figure 14 shows the allowable addresses for the Multi-Sensor Bases.

Important: Switch position 1 is not used and must always be OFF (0) for the Multi-Sensor Bases to function properly. The odd address immediately after the DIP switch setting must not be used by any other sensor base or MAPNET/IDNet device.



	0000	1000	0100	1100	0010	1010	0110	1110	0001	1001	0101	1101	0011	1011	0111	1111
0000	0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
0100	2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
0010	4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
0110	6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
0001	8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
0101	10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
0011	12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
0111	14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254

Note: The 4098-9795 Multi-Sensor Sounder Base has a 9-position DIP switch that is used for setting base address and selecting the sounder power source. See Figure 10 for DIP switch location.

Figure 14. 4098-9795, -9796 Multi-Sensor Base DIP Switch Address Settings

Wiring

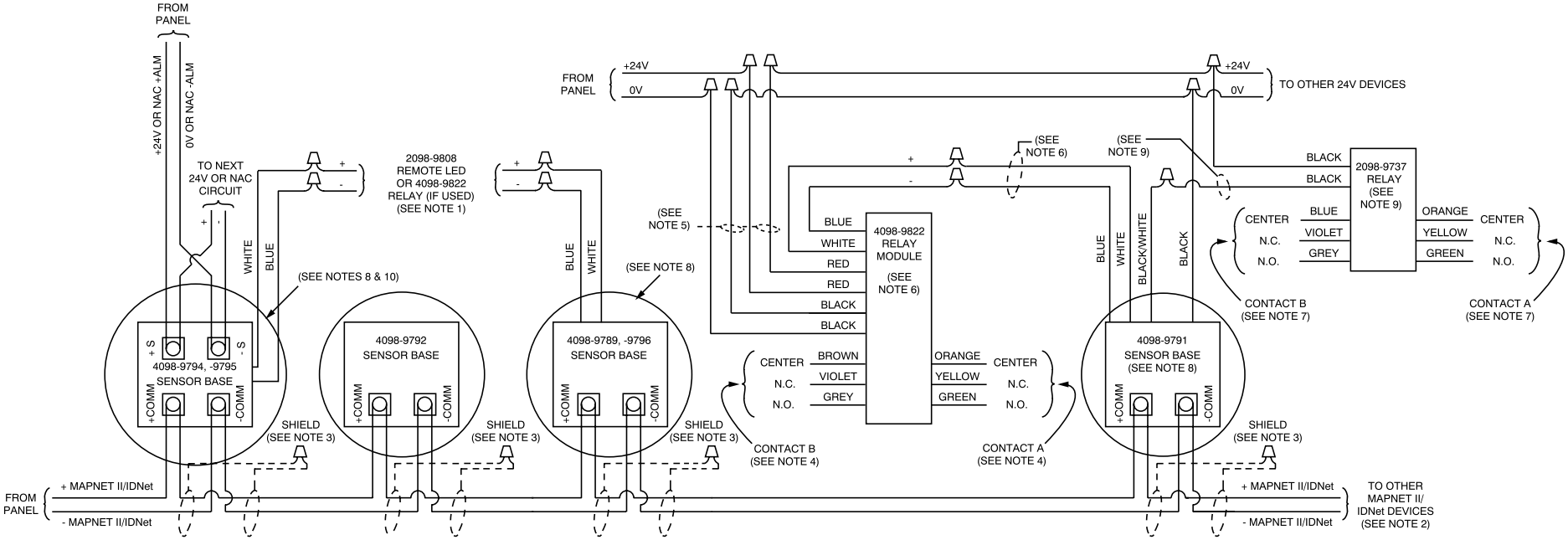
Sensor bases are connected to the fire alarm control panel via a single wire pair for the 4098-9789, -9792, -9793, and -9796, and two pairs of wires for the 4098-9791, -9794, and -9795. Using Figure 15 as a reference, connect the bases to the MAPNET II/IDNet wire pair and 24V power (if used).

Important: For additions to existing installations, remove power from the panel before wiring any bases to avoid damage to equipment.

Continued on next page

Wiring (*continued*)

Caution: Do not loop wire under terminals. Break wire runs to provide supervision.



Notes:

1. Remote LED and relay wires are not supervised.
2. Maximum quantity of devices per circuit is 127 for 4020, 4100+, or 4120, 128 for the 2120 CDT panel, and 250 for the 4010 panel. Maximum quantity of 4098-9795 and -9796 Multi-Sensor bases is 63 with 4020, 4100+, and 4120, and 124 for the 4010 panel. If 4098-9795 output is coded (Temporal code, etc.) via MAPNET II/IDNet control see note 10.
3. If shield is used, twist shield wires together and cap with wire nut. Shield should be insulated from electrical box.
4. Contact A or B: Dry, Form C - each rated 2 amperes at 24 VDC/0.5 amperes at 110 VAC, resistive.
5. 18 to 32 VDC, .008 amperes typical/.013 amperes max.
6. Do not use remote LED if the 4098-9822 relay module is used.
7. Contact A or B: Dry, Form C – Each rated at 3 amperes at 28 VDC/115 VAC, resistive.
8. 4098-9791, 4098-9794, 4098-9795, and 4098-9796 are not compatible with 2120 CDT.
9. Maximum wire length between 4098-9791 sensor base and 2098-9737 relay module is 100 feet.
10. Maximum quantity of sensors with 4098-9794 or 4098- 9795 sounder bases limited to 43 if output is coded (Temporal code, etc.) via MAPNET II/IDNet control. If coding is performed via 24VDC or NAC circuit, see note 2.

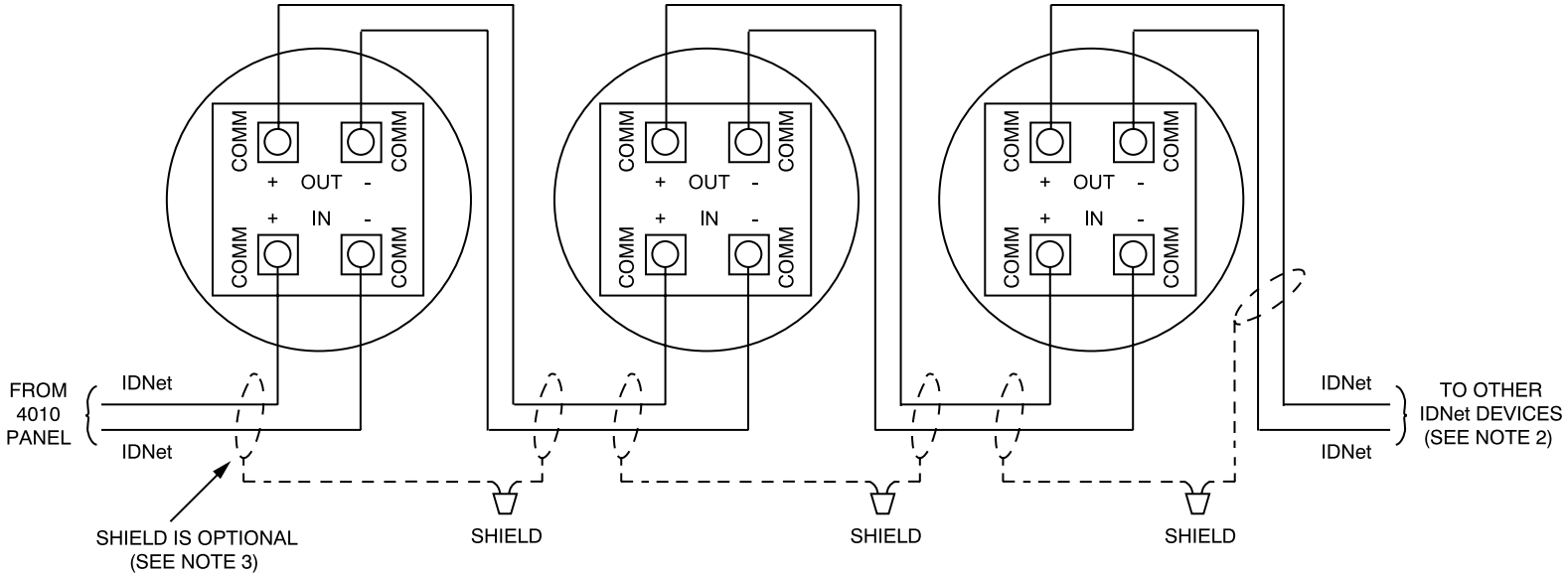
Figure 15. Sensor Base Connections

Continued on next page

Wiring *(continued)*

Figure 16 shows the wiring connections for the isolator sensor base. All screw terminals accept 14 to 18-gauge AWG solid or stranded. **Maximum torque should not exceed 12-inch-pounds.**

Caution: Do not loop wire under terminals. Break wire runs to provide supervision.



Notes:

1. Isolator base compatible with 4010 panel ONLY.
2. Maximum quantity of devices per circuit is 250 for 4010 panel.
3. If shield is used, twist shield wires together and cap with wire nut. Shield should be insulated from electrical box.

Figure 16. 4098-9793 Isolator Sensor Base Connections

4098 TrueAlarm Quick*Connect* SMOKE SENSORS

Overview

This section contains general notes, specifications, and mounting information for the TrueAlarm Quick*Connect* Smoke Sensors shown in Table 7.

WARNING: Be sure that the location of each smoke sensor has been planned per local and national fire codes (see NFPA 72, Chapter 5).

General Notes

1. Smoke sensor sensitivities are set and continuously monitored by the control panel. This functionality complies with NFPA 72, Chapter 7. When functional testing of these sensors is required per NFPA 72, use the test methods described in the *Maintenance and Testing* section of this publication. The sensitivity range (settings) of the 4098-9710 and 4098-9757 sensor are limited to 2.5%/ft to 3.7%/ft smoke obscuration. The sensitivity range of the 4098-9713 sensor is 1.5%/ft to 3.7%/ft smoke obscuration.

2. Refer to NFPA 72 for application, test, and maintenance requirements.

Specifications

Table 7. TrueAlarm Quick*Connect* Smoke Sensor Specifications

Sensor PID	**4098-9710 and 4098-9757**	**4098-9713** (w/ Sounder)
Type of Sensor	Photoelectric	Photoelectric
Operating Current	500 µA max.	500 µA max.*
Humidity Range (Non-Condensing)	10-95% RH	10-95% RH
Air Velocity Range	0-2000 FPM	0-2000 FPM
Working Voltage (Mapnet II and IDNet)	24-40 VDC	24-40 VDC
24V Working Voltage (Sounder Power	—	18-32 VDC
Sounder Output	—	85 dBA min. †
24V Standby Current (Sounder)	—	340 µA max
24V Current (Sounder Activated)	—	30 mA max.
Remote LED Output	NO	YES

***Add 1.5 mA when LED is ON**
†Per UL 268

Continued on next page

Specifications *(continued)*

The 4098-9757 QuickConnect2 sensor requires the 4098-9788 base. 4098-9710 and 4098-9713 Quick*Connect* sensors do not require a base, these sensors are designed for ease of installation without sensor bases.

Quick*Connect* sensors are connected to a 4010, 4020, 4100+, or 4120 panel by a single wire pair (MAPNET II/IDNet). The 4098-9710 QuickConnect sensor and 4098-9757 QuickConnect2 sensor are only compatible with the 4010 and obtains both power and data over IDNet wiring. The 4098-9713 Quick*Connect* Sensor with Sounder also requires the 24 VDC for sounder operation and is NOT compatible with the 2120 CDT.

Setting the Sensor's Address

Each Quick*Connect* sensor has a unique address. This address is associated with a custom label that identifies its physical location within a building. The sensor's address and location must match up with the address listed in the Programmer's Report for the 4010, 4020, 4100+, or 4120 system.

Use the method described in the *"4098 TrueAlarm Sensor Base/Address Setting for the 4010, 4020, 4100+ or 4120"* section of this publication to complete the sensor setup. Refer to Figure 17 for the location of the dip switches. Double-check the location of the Quick*Connect* sensor and its address before proceeding to electrical installation (see Figures 18 and 19).

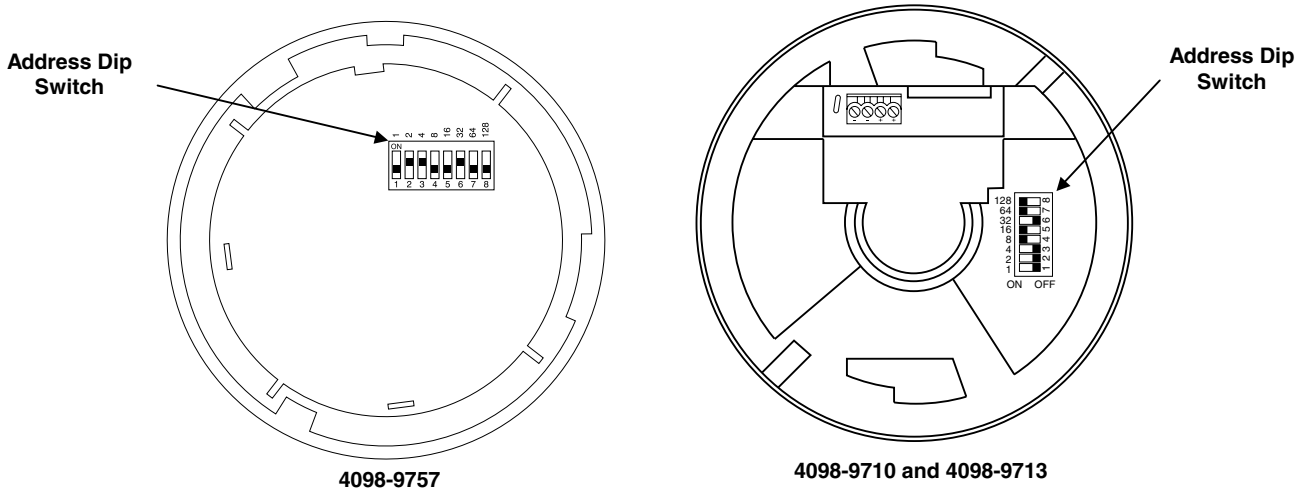


Figure 17. Location of DIP Switches on Quick*Connect* Sensor

Continued on next page

Mounting

Use Figure 18 to mount the 4098-9710 and 4098-9713 Quick*Connect* smoke sensors. The 4098-9757 uses the 4098-9788 two wire base, see Figure 3 to mount base.

Caution: Do not loop wire under terminals. Break wire runs to provide supervision.

Notes:

1. Feed the wires through the hole of the mounting plate.
2. Fasten the mounting plate to the electrical box or adapter plate as shown, with tabs facing towards devices.
3. Connect the wires to the terminal strip (provided loose) according to Figure 18.
4. Connect terminal strip to the pin strip on the Quick*Connect* sensor.
5. Fit the Quick*Connec*t sensor to the adapter plate pushing the wires back into the electrical box and give a clockwise turn to attach.
6. Using the relay module requires a 1½-inch extension ring (not supplied) mounted to the 4-inch square or octagonal electrical box to meet the space requirement of the relay cube and its wires. The relay module cannot be used in single-gang electrical box installations. The relay module 4098-9822 MUST BE installed in the electrical box directly behind the QuickConnect2 sensor.

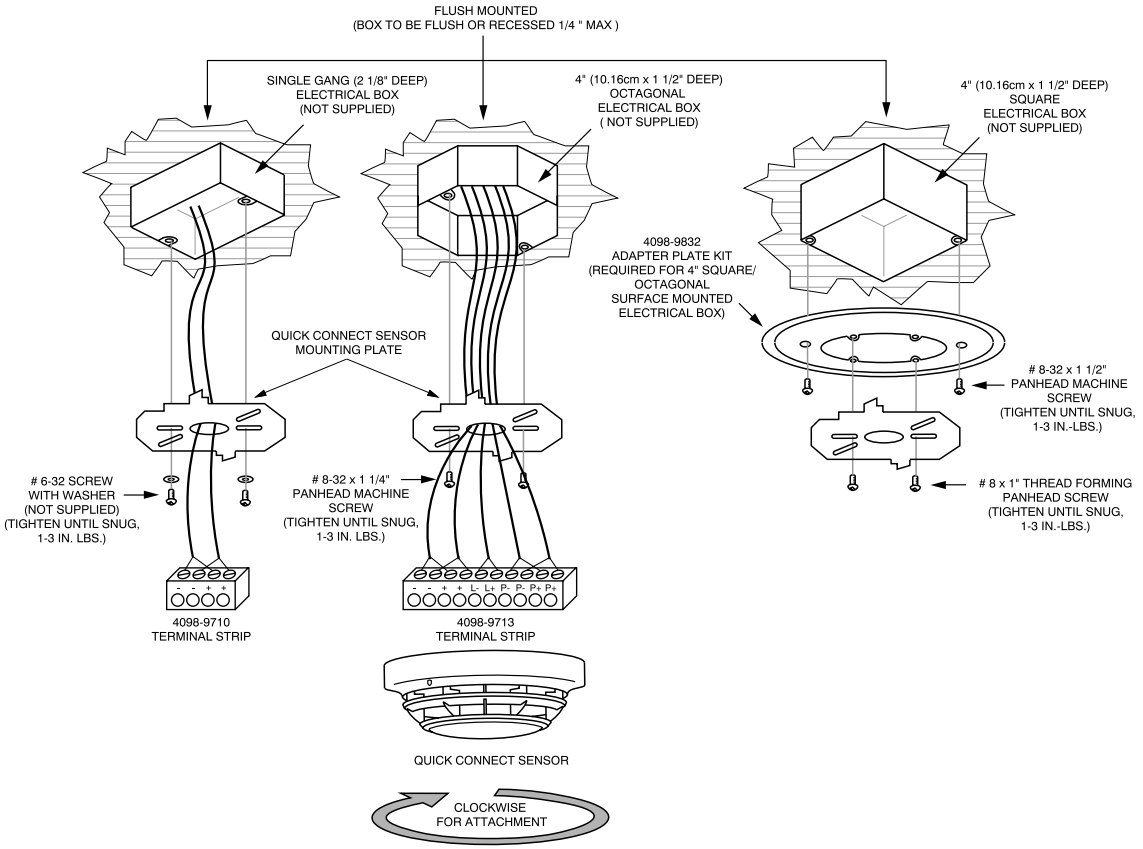


Figure 18. Mounting the Quick*Connect* Sensors

Continued on next page

Wiring

Use the following to wire the Quick*Connect* smoke sensors.

Caution: Do not loop wire under terminals. Break wire runs to provide supervision.

Notes:

1. Remote LED and relay wires are not supervised.
2. Maximum quantity of devices per circuit is 127 for 4020, 4100+, or 4120 panels and 250 for the 4010 panel. Maximum quantity of 4098-9713 sensors when output is coded (Temporal Code) is 43.
3. If shield is used, twist shield wires together and cap with wire nut. Shield should be insulated from electrical box.
4. Contact A or B: Dry, Form C - each rated 2 amperes at 28 VDC/0.5 amperes at 110 VAC, resistive.
5. 18 to 32 VDC, .008 amperes typical/.013 amperes max.
6. When using the 4098-9822 relay module, DO NOT use remote LED.
7. 4098-9710 and 4098-9757 are ONLY compatible with 4010 FACP.
8. 4098-9757 Quick*Connect* sensor uses the 4098-9788 base.

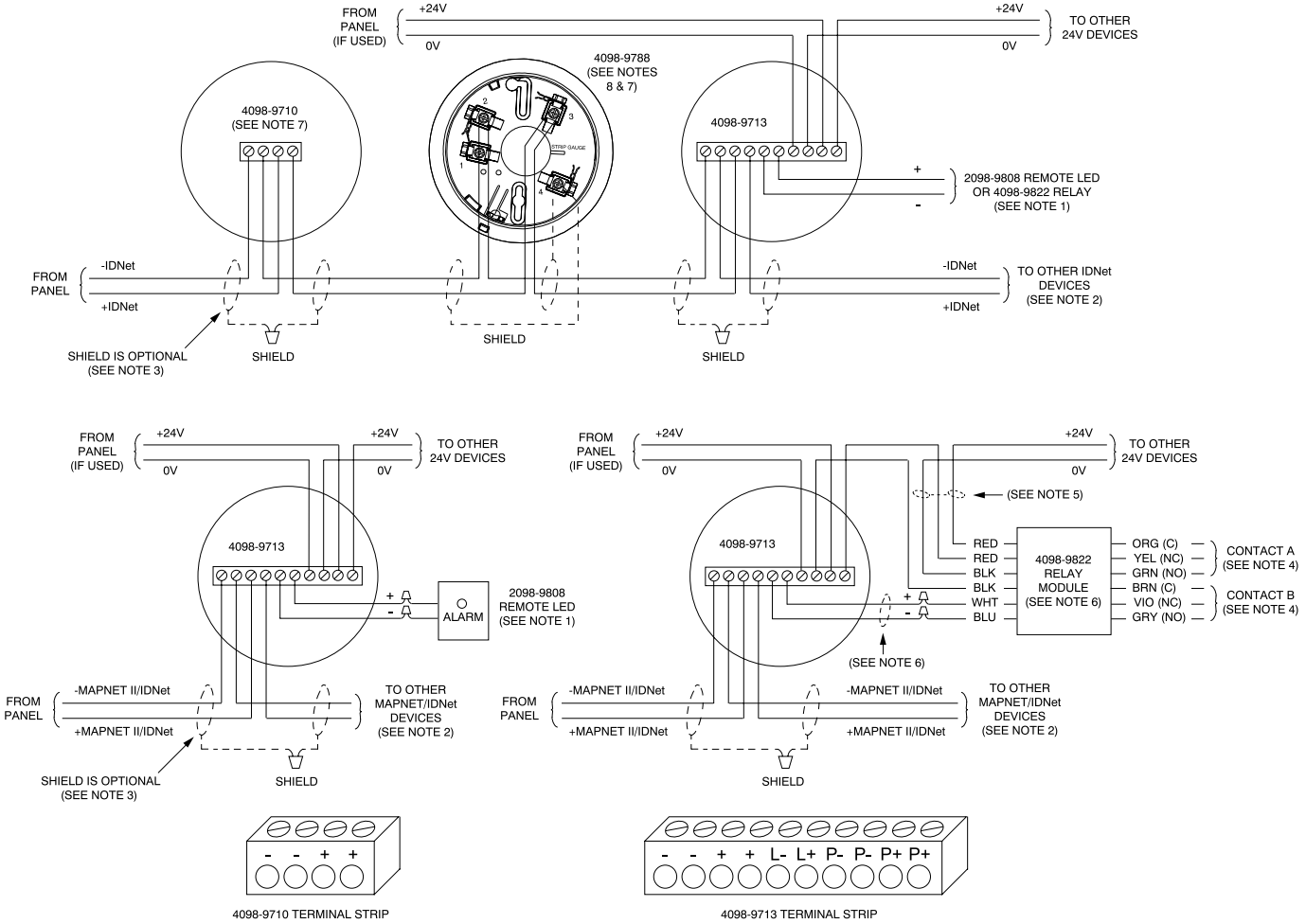


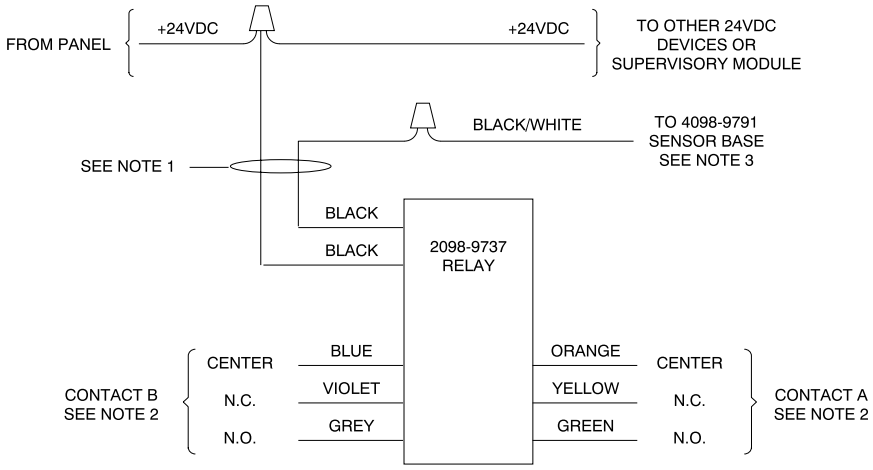
Figure 19. Quick*Connect* Sensor Connections

ACCESSORIES

Relay Modules

2098-9737 Relay Module Wiring

The 2098-9737 Relay module is used with 4098-9791 sensor base. Install the relay module using Figure 15 and 20 as a reference.



Notes:

1. 18 to 32 VDC 24 mA typical/35 mA maximum.
2. Contact A or B: dry, Form C, each rated 3 amps at 28 VDC/115 VAC, resistive.
3. Maximum wire length between sensor and relay module is 100 feet.

Figure 20. 2098-9737 Relay Module Wiring

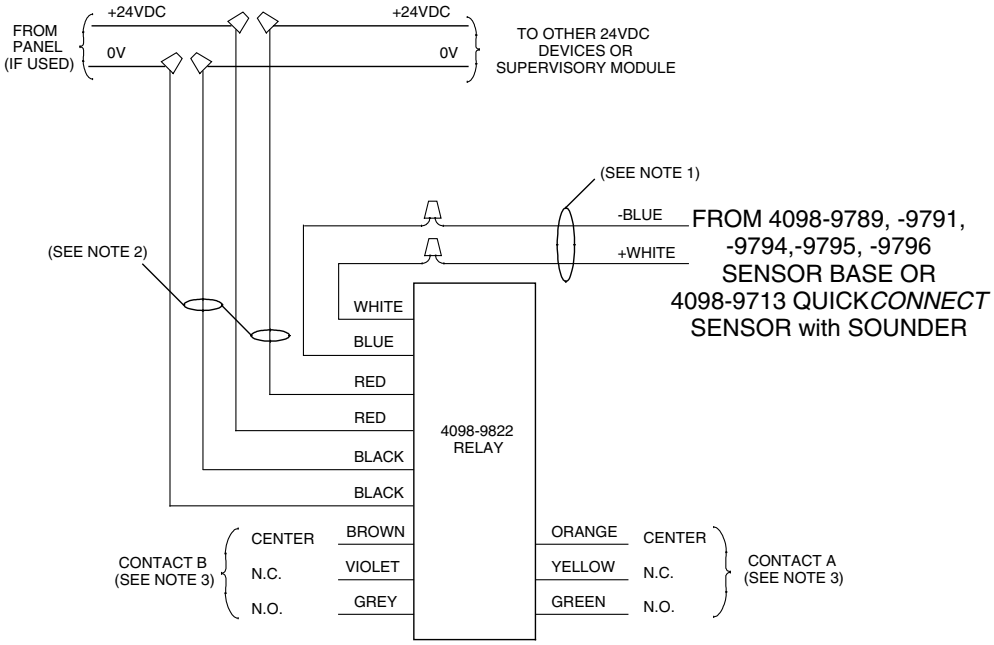
Continued on next page

Relay Modules (*continued*)

4098-9822 Relay Module Wiring

The 4098-9822 Relay Module is used with the 4098-9789, -9791, -9794, -9795, and -9796 Sensor Bases and the 4098-9713 Quick*Connect* Sensor with Sounder. Install the relay module using Figure 15 and 21 as a reference.

Important: Do not use a remote LED if using the 4098-9822 relay module. The 4098-9822 relay module is not supervised and should only be used for non-critical supplementary functions. There is a limit of ten control outputs activated on a MAPNET II/IDNet channel. If the channel capacity is exceeded, the relay module may not function properly.



Notes:
1. Do not use remote LED
2. 18 to 32 VDC, .008 amps typical / .013 amps. Maximum
3. Contact A or B: Dry, Form "C" - each rated 2 amps resistive at 24 VDC/0.5 amps at 110 VAC, resistive.

Figure 21. 4098-9822 Relay Module Wiring

Continued on next page

Relay Modules (*continued*)

Installation

Install the relay module using the following steps:

1. Mount a 1-1/2 inch (3.81 cm) extension ring (not supplied) to an octagonal or square electrical box (not supplied). The extension ring is required to meet the minimum box volume requirement (32.3 cu. inch/529.4 cu. cm) for relay module installation.

2. Mount relay module inside extension ring directly behind base and sensor. **Do not mount remotely**. See Figure 20 or 21 for relay module connections.

Note: Use the exact configuration of electrical box (square or octagonal) with extension to mount sensor base when installing the relay module.

Remote LED Module

The 2098-9808 Remote LED Module is available for the 4098-9789 ,-9791, -9794, -9795, -9796 Sensor Bases and the 4098-9713 Quick*Connect* Sensor with Sounder.

Use Figure 22 as a reference when installing the Remote LED Module to a sensor base.

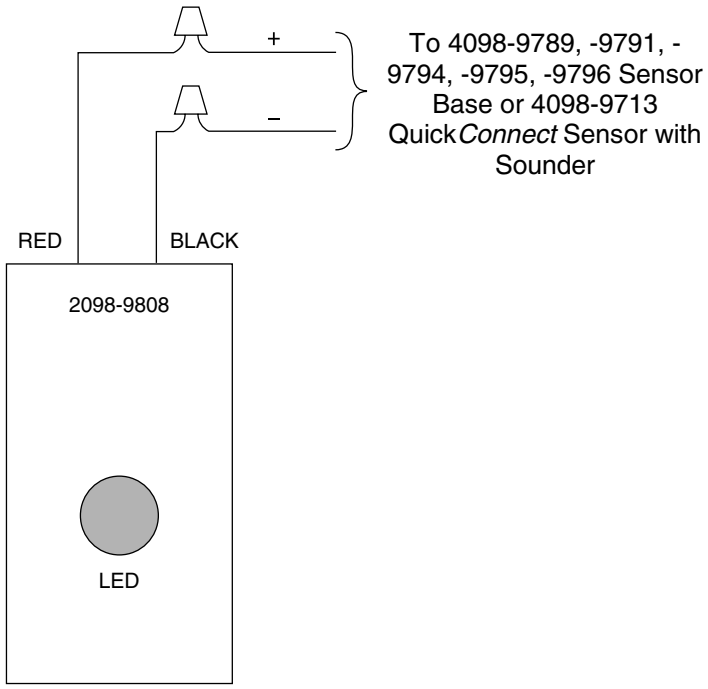


Figure 22. 2098-9808 Remote LED Module Wiring

COMPATIBILITY

4098 Detectors and Detector Bases

This section describes the compatibility between FACPs, detectors, and detector bases.

Table 8. 4098 Detector and Detector Base Compatibility

Detectors	Compatible 2-Wire Detector Base	System	Max. Quantity of Bases per Initiating Circuit
4098-9601 4098-9602 4098-9603 4098-9605 4098-9612 4098-9613 4098-9614 4098-9615	4098-9788 4098-9684 (LED base for Heat Detectors Only)	2120 ET/FADM	25
		2120 FABT/VPBT	18
		2120/4100+ ZAM	20
		4001	18
		4002	30
		4020	30
		4100+/4120/UT	30
		4004/4005	20
		4004/4005 High Current	30
	4098-9683	(Relay base not used with 4004 & 4005 Low Current systems)	1 (see Note 1)

Notes:

1. Relay operation cannot be guaranteed unless it is the only device on that zone.
2. Panel compatibility identification marker is model number of the module or panel.
3. Detector compatibility identification marker is model number found on detector label.
4. For detailed interconnection data, see wiring diagrams for specific panels.

Continued on next page

4098 Sensors and Sensor Bases

This section describes the compatibility between FACPs, sensors, and sensor bases.

Table 9. 4098 Sensor and Sensor Base Compatibility

Sensors	Compatible Bases	Max. Quantity of Devices per Circuit
4098-9714 4098-9717 4098-9733	4098-9789 4098-9791 4098-9792	127 (4020) 127 (4100+) 127 (4120) Addresses 1-127
4098-9714 4098-9717 4098-9733	4098-9789 4098-9792	128 (CDT) Addresses 0-127
4098-9714 4098-9717 4098-9733	4098-9789 4098-9791 4098-9792 4098-9793	250 (4010) Addresses 1-250
4098-9710	not required	250 (4010) Addresses 1-250
4098-9713 (see Note 5)	not required	127 (4020) 127 (4100+) 127 (4120) Addresses 1-127 250 (4010) Addresses 1-250
4098-9714 4098-9717 4098-9733	4098-9794 (see Note 6)	127 (4020) 127 (4100+) 127 (4120) Addresses 1-127 250 (4010) Addresses 1-250
4098-9754	4098-9795 4098-9796	63 (4020,4100+, 4120) Addresses 2 to 126 124 (4010) Addresses 2 to 248
4098-9757	4098-9788	250 (4010) Addresses 1-250

Notes:

1. For detailed interconnection data, see wiring diagrams for specific panels.
2. Panel compatibility identification marker is model number of the module or panel.
3. Sensor compatibility identification marker is model number found on sensor label.
4. 4098-9754 sensor NOT compatible with bases that have a RED DOT located in sensor mounting area.
5. Maximum quantity of 4098-9713 sensors when output is coded (Temporal Code) is 43.
6. Maximum quantity of 4098-9794 Sounder Bases and 4098-9795 Multi-Sensor Sounder Bases when output is coded via MAPNET II/IDNet control (Temporal Code) is 43. If coding is performed via 24 VDC or NAC circuit, use limits specified in Table 9.

MAINTENANCE AND TESTING

Maintenance

The minimal requirement for detector and sensor maintenance should consist of clearing surface dust by using a vacuum cleaner. Cleaning programs should comply with NFPA and local environments. Cleaning of the internal chamber should only be done by a Simplex Technical Representative. For smoke detectors, refer to FSB-458R for maintenance instructions.

For service, return to your local Simplex branch office.

Testing

Smoke sensor sensitivities are set and continuously monitored by the control unit. Dirty or out-or-range sensors are annunciated by the control unit. This functionality complies with NFPA 72, Chapter 7. When functional testing of the detectors and sensors is required per NFPA 72, use the test methods listed below.

Note: When testing detectors/sensors, refer to NFPA 72, Chapter 7 or contact your local Simplex branch office.

Caution: Before functionally testing the detectors/sensors, be sure to disconnect the city connection, releasing devices, and extinguishing systems (or for the 4020, 4010, 4100+, or 4120 panel, put the panel in the Walk Test mode).

Preferred Method of Testing Smoke Detectors/Sensors

NFPA minimally requires annual testing of smoke detectors/sensors at their installed location using smoke. To perform this annual test, use the 553-394 Extendable Smoke Generator. If the device's sensitivity is outside the marked range found on the device's label, clean the device, and then retest.

Important: After testing detectors, reset the fire alarm panel to restore the fire alarm system to normal status. After testing sensors, you must clear the peak values.

Test Equipment Available

2098-9822 (Part No. 553-394) Extendable Smoke Generator
553-406 Punk Sticks
553-673 Smoke Detector Aerosol Tester
553-760 Test and Removal Tool (attached to either the 553-684 four-foot pole or the 553-685 seven-foot pole)
553-805 Removal Adapter head attachment (attaches to the 553-760 tool)
553-810 Magnet Tester (attached to either the 553-684 four-foot pole or the 553-685 seven-foot pole)
553-832 Ion Detector Test Cable
553-605 Gemini Sensitivity Tester

Continued on next page

Testing (*continued*)

Alternate Method of Testing Sensors

The following test method is suitable for functional checks of sensor bases or Quick*Connect* sensors during installation; however, testing with smoke must be performed to comply with NFPA requirements.

For all sensor bases, with the exception of the 4098-9794 and 4098-9795 sounder bases, position the 553-810 Magnet Tester ½" to ¾" counterclockwise from the visible LED found on the sensor base (see Figure 23).

For the 4098-9757 QuickConnect2 photo sensor, position the 553-810 Magnet Tester as shown in Figure 24.

For the 4098-9794 and 4098-9795 sounder bases, position the 553-810 Magnet Tester next to the embossed "TEST" location on the base.

Testing a sensor with a magnet reports a value of 255 for actual / peak (exception 4010 panel). Clear the peak value after testing.

Note: For 4098-9795 and 4098-9796 Multi-Sensor Bases both photo and heat addresses (even and odd) must alarm.

Figure 23. Magnet Test Location for 4098-9789, -9791, -9792, -9793, -9796, -9710, and -9713 Sensor Bases using 553-810 Magnet Tester

Magnetic Test for Photoelectric Detectors

The 4098 photoelectric detectors may be tested by placing a magnet above the location indicated by a "|" mark embossed on the cover (see Figure 24) **for four (4) seconds**. Use the Simplex Magnetic Tester (Part No. 553-810), Table 10, and the following information to test detectors.

Table 10 describes the LED reaction during Normal and MAG TEST modes to the Normal, More Sensitive, Less Sensitive, and Non-Functional states of the detector.

Continued on next page

Testing (*continued*)

Figure 24. Magnet Test Location for 4098-9601, -9602, -9603, -9605 Smoke Detectors using 553-810 Magnet Tester

Table 10. MAG TEST/Normal Modes - States and Reactions

STATE	Normal Mode	MAG TEST Mode		
	(LED flashes every 4 secs.)	LED Flashes Quickly 6 Times	LED Flashes Slowly 4 Times	Latches in Alarm Mode/LED stays "ON"
Normal	X			X
More Sensitive	X	X		X
Less Sensitive	X		X	X
Non-Functional			X	

When placing the magnet at the location indicated by a "|" mark embossed on the cover, the visible LED flashes indicating the detector's condition. The following are descriptions of what you should see when using the MAG TEST.

- NORMAL - When in MAG TEST, the detector latches into alarm if the detector is within calibration range and the visible LED stays ON.

- MORE SENSITIVE - When in MAG TEST, if the detector is more sensitive than the maximum calibration, the visible LED *quickly* flashes, twice a second. Following the sixth flash, the detector latches into alarm and the visible LED stays ON.

Continued on next page

Testing (*continued*)

- LESS SENSITIVE - When in MAG TEST, if the detector is less sensitive than the minimum calibration, the visible LED *slowly* flashes four times, once every two seconds. Following the fourth flash, the detector latches into alarm and the visible LED stays ON.

- NON-FUNCTIONAL DETECTOR - If the detector is less sensitive than the minimum allowable sensitivity or if there is a fault in the temperature sensing circuit (4098-9602), the visible LED does not flash normally. When in MAG TEST, the visible LED *slowly* flashes four times, once every two seconds. After the fourth flash, the detector does NOT latch into alarm and the LED stops flashing and turns OFF.

  If the detector is out of the normal operating range, it should be cleaned. If the detector still indicates as other than normal sensitivity, replace the detector.

Magnetic Test for Ionization Detectors

The 4098 Ionization Detectors may be tested with a magnet to verify proper operation of the Fire Alarm Control Panel.

Note: When ionization detectors alarm, the red LED indicator activates and latches into the ON position.

Place a magnet against the detector's side (over the location marked by a "|" on the head of the ionization detector) and hold **for ten seconds** to activate an internal reed switch. Use the Simplex Magnet Tester (Part No. 553-810).

Ion Detector Sensitivity Test

Plug the 553-832 Ion Detector Test Cable into the Detector's sensitivity voltage pins located on the Ion Detector Head. Perform the following steps to test the Ion detector's sensitivity:

1. Connect a 10M/V digital voltmeter to the 553-832 test cable, connect the negative terminal of the voltmeter to the red wire of the test cable and connect the positive terminal of the voltmeter to the white wire of the test cable. The black wire of the 553-832 test cable is not used.

Continued on next page

Testing *(continued)*

2. The voltage measured by the voltmeter should be within 0.2 and 0.8 volts. Detectors outputting a voltage outside this range should be cleaned or replaced.

3. If the Ion Detector voltage output is outside of the range, it should be removed and cleaned as described in the cleaning section. Re-check the voltage measurement on the Ion Detector; if the Ion Detector is still outside the voltage range after cleaning, replace the device.

Cleaning

If the device's sensitivity is other than what is marked on the device's label, clean the device using a source of oil-free, filtered, compressed air such as Dust-Off, Tech Duster, etc.

Caution: Notify appropriate building personnel prior to removing any detectors/sensors from service.

Photoelectric Smoke Detector/Sensor Cleaning

Blow the compressed air through the open vents around the device so that air enters and cleans the black chamber cover/insect screen assembly (Part No. 677-224) located beneath the white protective cover. If the device sensitivity is still outside the marked range, remove the white protective cover of the device and replace the black chamber cover/insect screen using Steps 1 through 5 below.

1. Using a flat-head screwdriver, release the four locking tabs inside the white protective cover and lift the cover away from the device (see Figure 25).

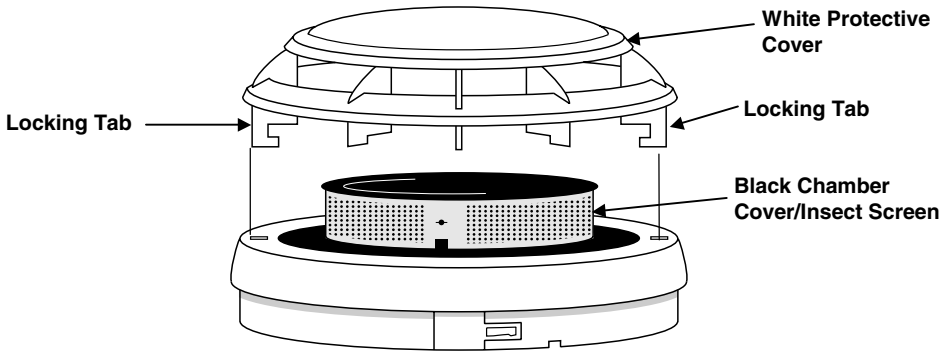


Figure 25. Removing Protective Cover

2. Remove the chamber cover/insect screen by firmly grasping the assembly and, using a gentle rocking motion, free the locking tabs WITHOUT REMOVING THE CHAMBER COVER.

Continued on next page

Cleaning *(continued)*

3. Once all the tabs are unlocked, remove the chamber cover by lifting the assembly straight off of the chamber. DO NOT ANGLE THE COVER TO REMOVE. Make sure the standoffs are not broken or bent. Ensure that the LED and/or Thermistor are in a straight upright position and the Prism is clean and secure in its holder after removing the cover.
4. When replacing the chamber cover - BE CAREFUL TO LINE UP ALL APPROPRIATE SPACES WITH THE LED, PRISM, AND/OR THERMISTOR. THE CHAMBER COVER MUST BE FULLY SEATED.

If the device's sensitivity is still other than what is marked on the device's label, replace the device. If the sensitivity is within the marked range, go to Step 5.

5. Replace the white protective cover by lining up the locking tabs, the positioning triangles (Δ), and the LED and/or thermistor with appropriate holes in the cover, and then press the white cover into place.

SPECIAL CONSIDERATIONS FOR QUICKCONNECT SENSORS

Quick*Connect* sensors are intended to be cleaned in place by using a source of oil-free, filtered, compressed air such as Dust-Off, Tech Duster, etc. If the device's sensitivity is still other than what is marked on the device's label, replace the device.

SPECIAL CONSIDERATIONS FOR ION DETECTOR/SENSORS

Note: Do not remove the Ion Detector/ Sensor protective cover.

Blow compressed air through the open vents around the device so that air enters and cleans the black chamber cover assembly located beneath the white protective cover. If the device sensitivity is still outside the marked range replace the device and return the failed device to 130 Perinton Parkway, Fairport, NY 14450-9199.

Important: Once cleaned, the detector/sensor should be tested with smoke per NFPA 72, Chapter 7.

Trouble Indications for TrueAlarm Sensors

The TrueAlarm smoke sensor is a measuring device that sends data regarding smoke density to the 4010, 4020, 4100, 4100+, and 2120 fire alarm control panels (FACPs). The TrueAlarm heat sensor operates in a similar fashion, but sends temperature data instead of smoke density data. The FACP uses this data to determine whether a trouble has occurred.

The TrueAlarm sensor has two automatic trouble indications:

- Dirty
- Excessively Dirty

A "Smoke Sensor Dirty" trouble condition is reported any time the average value on an individual sensor reaches a set threshold value. At this time, the FACP is still compensating for environmental factors and is holding the set sensitivity level.

A "Smoke Sensor is Excessively Dirty" trouble condition is reported anytime the average value of an individual sensor reaches a slightly higher set threshold level. At this point, the FACP can no longer compensate for environmental factors, and the sensitivity level may begin to drift. Although an "excessively dirty" trouble is reported, the sensor continues to operate and reports an alarm condition when one is detected.

In addition to the two automatic trouble conditions, the FACPs have digital pseudo points that must be turned ON to allow a TrueAlarm sensor that is close to being a dirty sensor to report as if it is "almost dirty." This is useful when maintenance is being scheduled for dirty sensors, as it provides a means of seeing if other sensors are approaching a dirty state.

Once a minute, the FACP software performs a self-alarm test of each TrueAlarm sensor. The self-alarm test raises the value of each sensor to a value that simulates an alarm condition. If the sensor reports back a value that is not within the alarm range, a "self-test abnormal" trouble is displayed for the specific sensor.

Table 11 shows your responsibilities when certain trouble indications occur.

Continued on next page

Trouble Indications for TrueAlarm Sensors
(continued)

Table 11. TrueAlarm Troubles and Descriptions

Trouble Indication	Description
Almost Dirty	Using the front panel keys, it is possible for a Simplex Technical Representative to turn ON a digital pseudo point in the FACP that allows an "almost dirty" sensor to report a trouble. Although the "almost dirty" sensor is holding its sensitivity level, you can schedule maintenance for the sensor before the dirty sensor trouble occurs.
Dirty	A "dirty" indication means that the sensor is holding its sensitivity level, but that you should schedule maintenance for the sensor. Clean the sensor as required and, when necessary, call Simplex for service.
Excessively Dirty	The "excessively dirty" indication means that the sensor is no longer compensating for dirt and dust. Because nuisance alarms are possible with this condition, sensors must be cleaned or replaced immediately. When necessary, call Simplex for service.
Self-Test Abnormal	All FACP system sensors are automatically tested once every minute. When a sensor fails to report properly to the FACP, a "Self-Test Abnormal" condition occurs. Since the sensor is not working properly, it must be replaced. Replace it, or call Simplex for service.

Fire Alarm Trouble & Maintenance Log

DATE	TIME	EVENT/DESCRIPTION	INITIALS

Simplex

Rev. H

Simplex Time Recorder Co., • Simplex Plaza • Westminster, Massachusetts 01441-0001 U.S.A.
Simplex International Time Equipment, Co., LTD. • Mississauga, Ontario, Canada

574-709