

<p style="text-align: center;">Technical Bulletin SD-100-2W/SD-100-4W Series 2-Wire/4-Wire Photoelectric Smoke and Heat Detector</p>

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Introduction

The SD-100-2W/4W series includes 2-wire and 4-wire detectors, which provide fast and reliable response for photoelectric smoke and heat (135°F/57.2°C) detection. While the smoke and heat detection circuits operate independently, their outputs being “OR” connected, the SD-100-2W/4W series detectors provide the fire detection performance by acting as a smoke sensor and/or a 135°F/57.2°C heat detector at the same location. Features of SD-100-2W/4W series detectors are depicted as follows:

SD-100-2WP	2-wire photoelectric smoke alarm with remote LED output
SD-100-2WT	2-wire photoelectric smoke alarm and heat alarm with remote LED output
SD-100-4WP	4-wire photoelectric smoke alarm with Relay Output
SD-100-4WT	4-wire photoelectric smoke alarm and heat alarm with Relay Output

All of the SD-100-2W/4W series detectors meet the requirements of UL 268 for use in fire alarm signaling systems. They are intended for use in 2-wire/4-wire Class A or B supervised zone circuits. The SD-100-2W/4W series detectors are subject to panel compatibility limits and compliance with corresponding NFPA 72E standards, local codes, and ordinances. Be sure to check for correct detector placement, zoning and special circuit arrangements. Please refer to NFPA 72E for proper use of smoke detector.

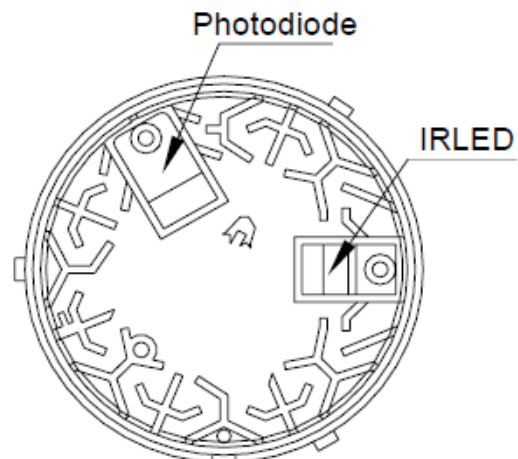
Operating Principles for Smoke Detectors

Both an infrared light emitting diode (IRLED) as light source and a photodiode as light receiver are installed in the chamber of SD-100-2W/4W smoke detector. The IRLED is positioned at an angle of 120° to the photodiode. There is a plastic rod between the IRLED and photodiode to prevent the light from IRLED shining directly onto the photodiode. In normal operation the photodiode will not receive any light from IRLED, therefore, no current is induced by the photodiode. In case of fire accident, when the smoke gets into the detector chamber, the scattering effect of light from IRLED by fine smoke particulates takes place. The scattered light getting into the photodiode will induce the change of its impedance so as to vary the level of photoelectric current.

Inside the smoke detector chamber, maze-like black plastic rods are arranged to avoid any incidence of light from the surrounding area. The chamber is fenced by a metal screen with 0.5 mm (dia.) openings to avoid dusts or small insects getting into the chamber.

In the alarm condition the red LED is lit continuously.

In normal operation the smoke detector's dual bicolor LED flashed green once in about every 5-7 seconds, the detector's IRLED emitted once in about every 5-7 seconds



Heat Sensor Operating Principle

Heat sensor used in the SD-100-2W/4W series detector is an accurate, fast-response, high-reliability NTC thermistor, which protrudes through the detector cover in view of ensuring good air convection. A vane guard is used to protect the thermistor from unwanted mechanical damage.

The thermistor connects to a resistor in series, so the variable voltage would be detected by cpu when the thermistor reaches the alarm temperature of 135°F/57.2°C, the detector latches from standby state into alarm state and keeps the circuit at normal-close state. Meanwhile, the current changes from 100μA to 50mA whereas the voltage keeps 24V. To reset the detector one must set the voltage below 1 volt for over 3 second.

Performance

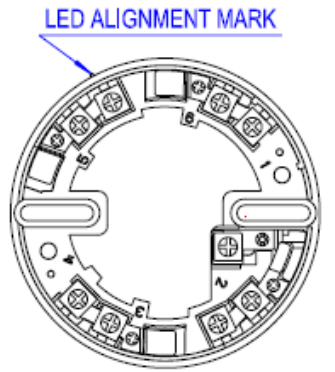
The sensitivity of the smoke detector set by manufacturer is of 2.10%/foot and has field limits of 1.62 to 2.58%/foot for UL gray smoke. The detector meets the requirements of an ordinary 135°F/57.2°C fixed temperature heat detector rated for 50 foot spacing. The detector operates under normal ambient temperature within -10°C to 37.8°C subject to no icing and the humidity not exceeding 95% RH.

Base Compatibility

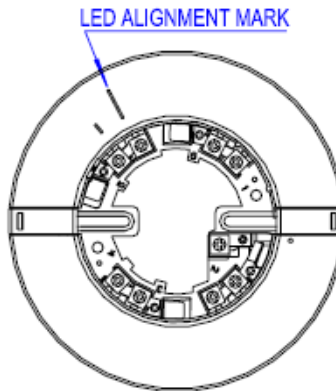
SD-100-2W/4W series smoke and heat detector is compatible with the following SD-100-2W/4W series mounting bases, none of which are supplied with the detector and should be separately ordered.

Detector Model	Base Spec.	Model Number
SD-100-2WP*	8 terminals	P/N SDB-106-4 or P/N SDB-104-2
SD-100-4WP	8 terminals	P/N SDB-106-4 or P/N SDB-104-4
SD-100-2WT*	8 terminals	P/N SDB-106-4 or P/N SDB-104-2
SD-100-4WT	8 terminals	P/N SDB-106-4 or P/N SDB-104-4

* For remote indicator type



MODEL P/N SDB-104-4



MODEL P/N SDB-106-4

Fig. 1 Drawing for Mounting Base Model P/N SDB-104-4 and SDB-106-4

Each detector is supplied with two 3/16 screws, which can be used to secure the detector to a base when the detector is mounted on a low ceiling. The detector plugs into the base with a simple clockwise twist by hand. For correct mounting the detector LED alignment mark should be aimed to the alignment mark on the base.

For 2-wire models, each base has four terminals, two for line L1 (point 2 as shown in Fig. 2) and two for line L2 (point 5 in Fig. 2). The line L1 is used to monitor the open circuit. These detectors are polarity insensitive. The typical wiring arrangement for supervised zone is shown in Fig. 2.

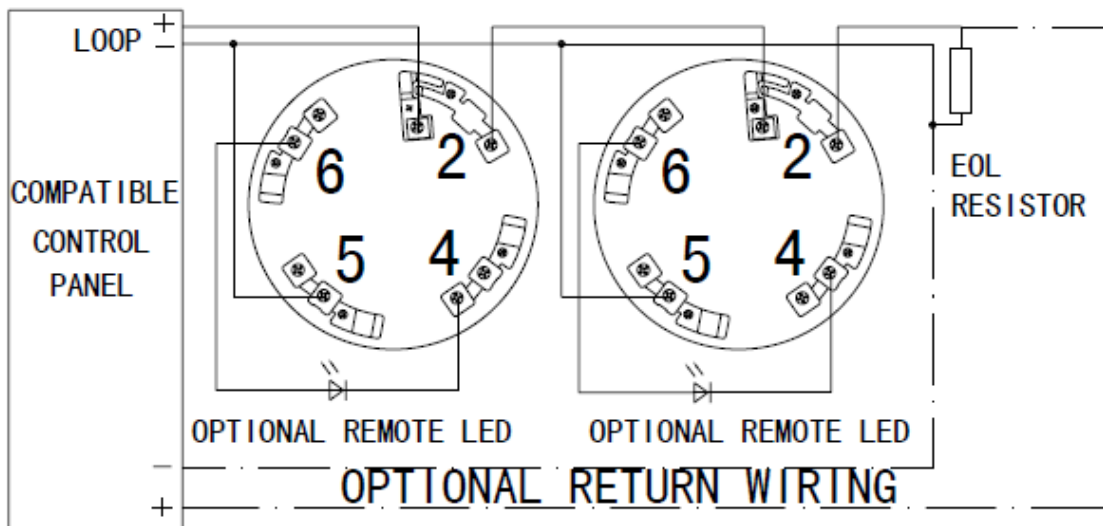


Fig. 2. Typical wiring arrangement of 2-wire detectors for supervised zone

For 4-wire models, each base has 8 terminals, including two for Power-plus (point 2 as shown in Fig. 3), two for Power-minus (point 5), two for Initiating-loop-plus (point 3 and 4), and two for Initiating-loop-minus (point 1 and 6). Similarly, the line L1 is used to monitor the open circuit. The typical wiring diagram of 4-wire detectors for Class B supervising zone is shown in Fig. 3.

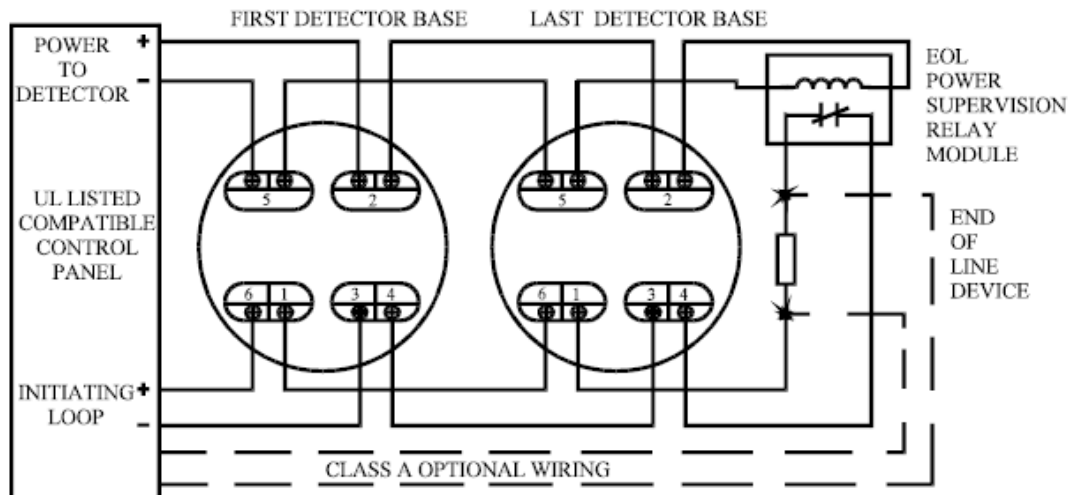


Fig. 3 Typical circuitry wiring diagram of 4-wire detectors for Class B supervising zone

Panel Compatibility

The detector is designed for use with panels providing Class A or Class B supervising zone circuits with compatible voltage and current characteristics. In standby the detector requires a power supply in range of 12 to 28 volts for SD-100-2W Series and 10.5 to 33.0V for SD-100-4W Series. A minimum current of 10 mA is required to latch and hold an alarm.

Application of Detector

Fire alarm system applications of the SD-100-2W/4W series detector include industrial, commercial, and institutional buildings when installed on ceilings in accordance with UL 268, NFPA 72E and all local codes and ordinances.

Locations for Installing Detectors

By following the items listed in NFPA 72E, assure to be in accordance with the number and location of detectors on an engineering survey of the area to be protected. The survey should include, but not necessary be limited to, consideration of the following:

- Human occupancy involved
- Escape routes and time
- Contents to be protected
- Burning characteristics of contents
- Total area
- Space involved
- Height of ceiling
- Types of construction and use
- Surface conditions of ceilings

- Air flow rate or stratification
- Deflections and obstructions
- Vent locations, velocities, and dilution
- Temperature extremes
- Humidity extremes

In order for the SD-100-2W/4W series detector to operate properly, smoke must enter the detector or the surrounding air temperature must exceed 135°F/57.2°C. Air flow, stratification, velocity, stagnation, and migration all affect the efficiency and reliability of the installation.

The detectors should not install in the following locations:

- (1) Areas where temperature is likely to exceed 37.8°C or fall below -10°C.
- (2) Locations closer than 4 inches to a side wall.
- (3) Places where forced ventilation can dilute the smoke from a fire.
- (4) Known areas in presence of combustion such as kitchens, furnace rooms, and so forth.

Areas where there is a known risk that potentially explosive gases or vapors may exist. Alternatively, approved explosion proof or intrinsically safe fire detection system should be applied in such areas.

Installation Dos and Don'ts

Do:

1. Verify that 2-wire smoke detectors to be used have been tested and listed for compatibility with the equipment to which they are connected. If necessary, connect the manufacturer for this information.
2. Locate any end-of-line devices electrically at the end of the circuit, beyond all initiating devices.
3. Use caution when utilizing 2-wire detectors with integral relays, because they may require more power than the initiating device circuit can supply. This could result in the inability of the relay to control auxiliary equipment to which it is connected.
4. When using wireless detectors, follow the manufacturer's installation instructions to assure proper radio communication between the smoke detector and the control panel.
5. Observe polarity when required.
6. Protect detectors against contamination during construction or renovation.
7. Carefully follow the manufacturer's installation instruction.

Don't:

1. T-tap smoke detector or circuit conductors, except when specifically permitted by the manufacturer as part of an intelligent/addressable system.
2. Loop uncut installation conductors around screw terminations.
3. Exceed the maximum resistance permitted for the initiating device system.

Base Installation

The base of smoke detector can be mounted directly onto electrical box such as octagonal (3", 3.5") or round (3") type. Ceiling base should be mounted at least 4 inches from the wall. Bases mounted on a wall should be sited between 4 and 12 inches from the ceilings. The steps for installing a base are listed as follows:

1. Hold the base to make the alignment mark (raise line) observable to you so that the LED will be easily aligned to the alignment mark.
2. Secure the base to the electrical box with two 8-32 pan-head, zinc-plated steel screws (not supplied), as shown in Fig. 4.

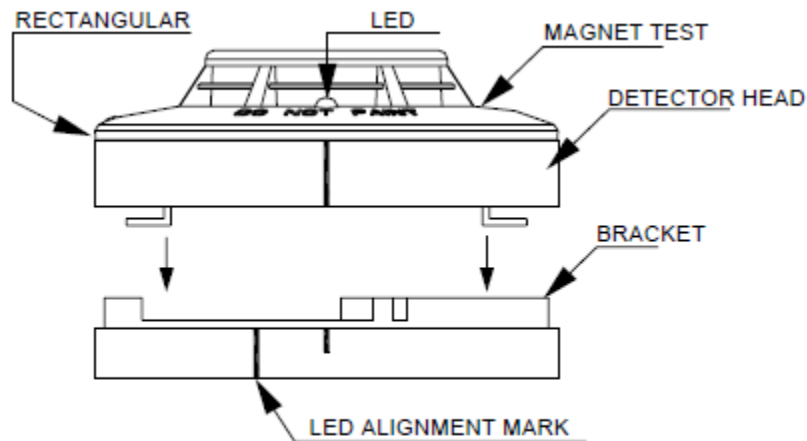


Fig. 4 Schematic of installing the base

Base Wiring

NOTE: Be sure to turn off power supply for the control panel before installing the base or detector.

Before connecting any detectors on an input zone circuit, check that the wiring complies with National Electrical Code NFPA 70, and state and local building code requirements. Wiring must be shielded or run in separate grounded conduit. Check that wiring has been successfully tested for continuity and insulation resistance.

Connect the bases to the input zone of the fire panel in accordance with the zone wiring diagram and the panel manufacturer's instructions. Do not use spur wiring to connect a base. When making connections, break wire run to provide supervision, strip about 3/8 inch insulation from the end of the wire, slide the base ends under the terminal's wire clamp, and tighten the screw.

Installing the Detector onto the Base

The steps for installing the detector onto the base are listed as follows:

1. Align the LED alignment mark of the detector to the alignment mark (half rise line) on the base.
2. Place the detector onto the base and turn counterclockwise until base alignment mark is fitted (arise line). Make sure that the detector is completely fitted into the base.

3. Remove the detector's dust cover when the construction is complete. (NOTE: Be sure the air is clean.) Wipe clean all detector heads before the zone is powered up and tested.

Detector Specification

Smoke Sensitivity: 1.62 – 2.58%/ft OBSCURATION.	Reset Voltage : Less than 1 volt.
Heat Sensor Setting: (SD-100-2WT, SD-100-4WT) 135°F/57.2°C	Reset Time: Less than 3 second.
Ceiling Spacing: 50 foot rating for heat sensor.	Alarm Indicator: Red LED (continuously lit in alarm)
Supply Voltage: 2-wire: 12.0 - 28.0 volts dc. 4-wire: 10.5 – 33.0 volts dc.	Temperature range: -10°C to 37.8°C.
Standby Current: 2-wire: 140µA Maximum. 4-wire: 140µA Maximum.	Remote Output: 15 mA max. ,diode gate
Start-Up Current: 2-wire: 200µA Maximum. 4-wire: 200µA Maximum.	Permissible Current: 2-wires model : 90mA. 4-wires model : 48mA
Alarm Current: 2-wires model : 65 - 90mA. 4-wires model : 32 - 48mA.	Humidity: 0 to 95% RH (no Condensation or icing).
Start-Up Time: 60 seconds maximum.	Weight: 130g/set with base.
Alarm Verification: 10 seconds.	Dimensions: 4 in (diameter) × 1.8 in (height) / with base.
	Alarm Contact: (for 4-wire) Form A: 1.0A @30VDC / 0.5A @125VAC.

Smoke Detector Sensitivity Testing

The Smoke Detector Tester (Solo A3/A4 aerosol generator, manufactured by No Climb Products LTD) or similar is used to carry out the function test on the detector's photoelectric smoke sensor.

Before testing the detector, turn off automatic extinguishing program of the control unit. Refer to the operation manual supplied by the manufacturer on how to test the detector function. Test the detector following the instruction. The red LED shall illumine continuously after test. If the detector fails the test under the correct operation, please insert a replacement and return the failing one for repair. Recover automatic extinguishing program of the control after test.

1. Set the Gemini 501 to the lower value of %/foot sensitivity given on the label of the detector minus the measurement uncertainty (0.4%/foot). Conduct the sensitivity test according to the instruction in the Gemini Operation Manual. If the detector goes

into alarm within 30 seconds it is too sensitive and needs to be returned to the distributor for servicing. Proceed to the next testing if the detector does not go into alarm mode.

2. Set the Gemini 501 to the upper value of %/foot sensitivity given on the label of the detector plus the measurement uncertainty (0.4%/foot). Conduct the sensitivity test according to the instructions in the Gemini Operation Manual. If the detector fails to go into alarm mode within 30 seconds, it is too insensitive and requires to be returned to the distributor for servicing. If the detector goes into alarm within 30 seconds, goes on holding the shroud in place, turn the pump off and wait another 5-10 seconds while the aerosol concentration reduces to zero. Remove the shroud and shut off the blower.

3. While detector is still in alarm, check that the red LED is lit as well as that the control panel and all audible and visible alarm devices operated correctly. Reset the detector from the control panel. The sensitivity of the detector is within its specification limits if it does not go into alarm mode in the test procedure (1) and does go into alarm mode in the test procedure (2).

Heat Sensor Test

For the heat sensor test the electrical blower can be used. The testing temperature should be within the range of 149°F to 180°F. The steps for testing the heat sensor are listed as follows:

1. Open the warm airflow and check that temperature is correct and stable.
2. The blower is positioned 6 inches normal to the surface of the heat sensor. The detector should go to alarm mode within 30 seconds.
3. Once the alarm mode is initiated, remove the blower away from the heat sensor and check that the red LED is lit as well as that the control panel and all audible and visible alarm devices operated correctly. Reset the detector from the control panel.
4. If the detector fails to go into alarm within 30 seconds under the correct temperature setting (135°F/57.2°C), it is too insensitive and requires to be returned to the distributor for servicing.
5. After testing, check that the system is set for normal operation and notify the appropriate authorities that the testing operation is complete and the system is active again.

Detector Maintenance

At least once every 12 months remove the detector for close inspection and, if found to be necessary cleaning, clean the detector more frequently if environment contains appreciable sources of dusts, dirt or corrosive agents.

IMPORTANT: Before removing a detector for maintenance, notify the appropriate authorities that fire alarm system or a specific zone of the system will be temporarily out of service. Disable the zone or system undergoing maintenance to prevent unwanted alarms. To maintain a smoke detector the following steps can be applied:

1. Remove the detector head from its base.
2. Use a screwdriver to push up the rectangular hole located on the side between the front cover and base to remove the front cover on the detector (see Fig. 4)
3. Be careful to remove the cover of smoke chamber. Do not damage the heat sensor for the heat detector models.
4. Use the vacuum cleaner to remove any dirt from the metal screen, the baffles inside the chamber, and the assembly containing the infrared LED as well as the photodiode. A clean artist's paintbrush may be used to loosen dust, particles that cannot be removed by the vacuum cleaner. Always finish cleaning using a vacuum cleaner.
5. Check that thermistor bead is free from dirt or dust, if necessary, gently wipe it with a clean tissue paper.
6. After cleaning the detector, place the cover onto the detector chamber again. Be sure not to tangle the leads of thermistor.
7. Replace the white smoke lid. Check thermistor head in standing upright in the center of its plastic protective guard.
8. Install the detector into its base again.
9. Test the sensitivity of the smoke detector.
10. Test the operation of the heat sensor.
11. Enable the zone or system again and notify the appropriate authorities that the maintenance operation is complete and the system is active again.

Smoke detectors are designed to be as maintenance-free as possible. However, dust and dirt particles can accumulate inside a detector's sensing head and influence its sensitivity. They can become either more sensitive, which may cause false (nuisance) alarms, or less sensitive, which could reduce the amount of warning time given in case of a fire. Both are undesirable. Therefore, detectors should be tested periodically and maintained at regular intervals. Follow closely the manufacturer's recommended procedures for maintenance and testing and refer to the NFPA 72.

Nuisance alarms can result from a number of causes, such as improper installation locations, inadequate maintenance, building maintenance or renovation, lightning storms, and vandalism or mischievous acts. If an alarm occurs and a fire does not exist, the alarm should be silenced, the problem unit located, and the alarm system controls reset so that the effectiveness of the detection system is restored. Make sure that all the detectors in the zone that shows an alarm are checked before deciding that it is a false alarm. If a fire does exist, more than one detector may be in the alarm state, although no signs of fire may be evident in the vicinity of the first activated detector. The fire could be overlooked. All alarms should be entry of a report into alarm log sheets which are used to indicate which individuals responded to the alarm and whether they took proper actions.

Detector Removal

Reverse the installation procedures. Remember to unlock the head by inserting a 3/16 inch hex wrench into the head locking screw and turning it counterclockwise. Turn the detector counterclockwise to remove it.

Warning and Limitations

Smoke and heat detectors will not work without power. SD-100-2W/4W series smoke detector will not work if the power supply or connections to the fire control panel are disconnected or cut off for any reason. Interconnecting wiring must be able to carry the total indicating appliance current, in alarm, without excessive voltage drop.

Smoke and/or heat must reach the detector. Smoke and/or heat from fires in enclosed unprotected places, roof voids, or behind closed doors may not reach the detector to latch the alarm mode.

Fire detectors may not sense all fires. Rapidly spreading fires or explosions caused by escaping gas and improper storage of flammable materials or arson may not be detected.

Fire detectors wear out. Fire detectors contain electronic parts that fail at any time. Test your fire detector system in accordance with NFPA 72E at least every 6 months.

Service or Repair Information

For service or repair, return the SD-100-2W/4W detector head intact, stating the reason for return and details of any fault, to the distributor who supplied the product, or to either of the following locations:

Manufacturer:

Mircom Group of Companies
25 Interchange Way Vaughan (Toronto), Ontario
L4K 5W3

Tel: 1-888-660-4655

Fax: 1-888-660-4113

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