

MODELS S250 AND S260 SMOKE DETECTORS

DESCRIPTION

The SST Models S250 Ionization and S260 Photoelectric Smoke Detectors are similar units which are used to detect fires by sensing the volatile products of combustion in the vicinity of the fire. The two types are directly interchangeable with each other, and both types can be intermixed on the same detection circuit. The detectors are installed by terminating the detection input wires from the control system on a detector "mounting base". The base is then mounted onto a standard outlet box, and the detector plugs into the base. The detectors are usually located on or near the ceiling of

the protected area, although other locations are possible, as described below. The type of detector to be used (ionization or Photoelectric) depends on the types of fires that may occur in the protected area; it is often desirable to intermix both types of detection in the area. For the photoelectric detector only, an optional model is available which incorporates a thermistor type heat detector, in addition to the smoke detection capability.

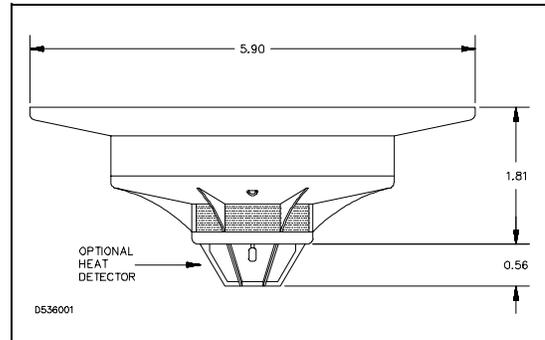


Figure 250-1 Typical Dimensions

PRINCIPLE OF OPERATION

The burning of any substance typically produces ash which remains at the site, and volatile products that mix with the air in the vicinity of the fire. The volatile products consist of a gaseous mixture of minute solid particles and liquid condensates to form what is generally known as smoke. Note that in some cases, the particles in the smoke are so small that the smoke is not visible to the human eye. Two commonly used principles of detecting smoke are the ionization method and the photoelectric method.

The SST Model S250 Ionization Smoke Detectors operate by the principle of sensing a change in the electrical properties of the air in a chamber that contains a minute quantity of a radioactive material. Emissions from this material ionize the air in the chamber, thus rendering it conductive and permitting a small current to flow through the air between two plates in the chamber. Smoke products entering the chamber impede the flow of this ionization current. The change in current is sensed by the detector's circuitry and results in an alarm signal.

The SST Model S260 Photoelectric Smoke Detectors operate by sensing a change in the intensity of light shining on a photoelectric cell in the sensing chamber. A light emitting diode in the chamber is arranged so that its light does not normally shine directly on the cell. When smoke enters the chamber, the smoke particles "scatter" or reflect the light onto the photocell. The intensity of light is sensed by the detector's circuitry and generate an alarm.

ELECTRICAL SPECIFICATIONS

These detectors are “two-wire smoke detectors” which obtain the operating voltage for their electronic circuits from the same two wires that are used to transmit an alarm to the control module. As such, it is important that they be used only with control panels that can provide the proper operating voltages and have compatible circuits. These detectors have been designed to work with Safety Systems Technology NOVA-5000 system modules. The required electrical specifications to insure compatibility are complex. To ease selection, **Compatibility Identifier Numbers** have been assigned to each detector, base and control module. These numbers are listed in Table 250-1. For reliable operation, you must not interconnect components with identifier numbers other than those listed in the table with these devices.

**TABLE 250-1
COMPATIBILITY IDENTIFIER NUMBERS**

PRODUCT/DEVICE DESCRIPTION	COM-PATIBILITY IDENTIFIER NUMBER	MAXIMUM NUMBER DETECTORS PER LOOP
Model S250 Ionization Smoke Detector	I51FE1	
Model S260 Photoelectric Smoke Detector	P55FE1	
Model S260 Photoelectric Smoke Detector with 135° Heat Detector	P56FE1	
Part No. 280-01 Standard Mounting Base	FE51A	55
Part No. 280-02 Remote LED/Test Mounting Base	FE52A	55*
Part No. 280-03 Relay Mounting Base	FE55A	1
Part No. 285 Air Duct Mounting Base	D22FE5	1
Part No. 288-01 Remote Alarm Indicator and Functional Test Switch		75*
Model 5010 Dual Channel Smoke/Fire Detection Module	M310	75
*IMPORTANT NOTE: When detectors use the remote LED options, all detectors on a loop must be equipped with this option.		

ENVIRONMENTAL SPECIFICATIONS

The SST Models S250 and S260 smoke detectors are intended for use in “general purpose” areas, where explosive atmospheres will not be present. It is difficult to specify exact limits on the required environment. However, they have been tested by Underwriters Laboratories for environmental stability. Some of the basic conditions that must be met for UL compliance are listed below. These are provided as application guidelines, indicating typically acceptable environmental conditions.

Temperature

Testing done from 32° to 122° F (0° to 50° C) at 30% to 50% relative humidity. The UL rated temperature range is 32° to 100° F. Operation outside this range is not recommended.

Humidity

85% at 86° F (30° C), 168 hour test, 20% RH to 90% RH at 73° F (23° C) rapid cycle test.

Air Velocity

1000 feet per minute (5 meters per second) continuous, with gusts up to 2000 FPM (10 m/s) for ionization detectors. 4000 FPM maximum for photoelectric detectors.

Air Pressure

2 inches (51 mm) rapid drop of air pressure starting from 31 inches (787 mm) of mercury.

Altitudes

For altitudes up to 7500 feet above sea level.

Corrosive Atmosphere

- a. An atmosphere containing 0.1% hydrogen sulfide by volume in air saturated with water vapor at room temperature for 10 days.
- b. An atmosphere containing 1% carbon dioxide by volume in air saturated with water vapor at room temperature for 10 days.

In all cases, a Safety Systems Technology (SST) technical representative should be consulted if the detectors are to be operated under adverse environmental conditions.

SELECTING THE APPROPRIATE DETECTOR

When laying out a fire protection system, the designer must keep in mind the operating characteristics of the individual detector types as they relate to the area protected. Such factors as type and quantity of fuel, possible ignition sources, ranges of ambient condi-

tions, value of the protected property and life safety are critical in the proper design of the system.

Smoke detectors are best suited for the protection of large open spaces, where the time required for a fire to generate sufficient heat for detection would be excessively long. Model S250 **ionization** Smoke Detectors are particularly suitable where **flaming fires**, exhibiting small products of combustion particles, yet no large particles or appreciable quantities of heat, are expected. Model S260 **Photoelectric** Smoke Detectors are particularly suitable where **smoldering fires** are expected. The Model S260 with optional **heat detector** can provide additional protection when placed directly over hazards where flaming fires could be expected.

INSTALLATION STANDARDS FOR SMOKE DETECTORS

The location and spacing of smoke detectors should be based on good engineering judgement, supplemented by the guidelines provided by the authority having jurisdiction. For most installations, compliance with the applicable sections of NFPA Standard 72, "*National Fire Alarm Code*", "*Smoke-Sensing Fire Detectors*", is required. The following information is provided as a guideline, and is believed by SST to be in compliance with 72. However, in case of any conflict, installation should always comply with the requirements of the authority having jurisdiction.

LOCATION OF DETECTORS

Per the UL Listing and NFPA installation requirements, open area smoke detectors are intended for mounting on a ceiling not less than 6 inches from a wall, or on a wall not less than 4 inches nor more than 6 inches from the ceiling. Where high ceilings (16 feet or greater) are found, smoke travel to the devices may be delayed by air stratification. In this situation, smoke detectors may need to be installed on sidewalls, or suspended below ceiling level. Sloped ceilings also require special considerations. Refer to NFPA 72 for recommended installation details.



CAUTION:

- Model S250 Ionization Smoke Detectors should not be installed in the following locations: areas with excessive exhaust fumes, kitchen areas, near fireplaces or furnace rooms, or within 3 feet of air supply ducts or air diffusers.

SPACING BETWEEN DETECTORS (OPEN AREA LOCATIONS)

The Models S250/S260 series detectors are intended for installation on 30 foot centers maximum, based on a smooth ceilings up to 15 feet high with minimum air circulation. This results in a maximum coverage area of 900 square feet. This figure may be used as a reasonable guide for comparable applications. Where special conditions exist (ceiling obstructions, high air exchange rates, etc.), reduced square footage spacing must be used to achieve adequate protection. Computer rooms and other such installations may require spacing with a maximum of 200 square feet due to high air exchange rates. For additional information, consult National Fire Protection Association Standard 72.

INSTALLING AND WIRING THE DETECTOR BASES

The Detector Bases are designed to mount directly on a standard electrical junction boxes (3, 3 1/2, or 4 inch round, square or octagonal). Two sets of mounting slots on the base permit installing on the various size boxes. Applicable dimensions are shown in Figure 250-2.

Refer to the typical wiring diagram, SST drawing 50002, which shows the proper 2-wire smoke detector wiring methods when using the various mounting bases.

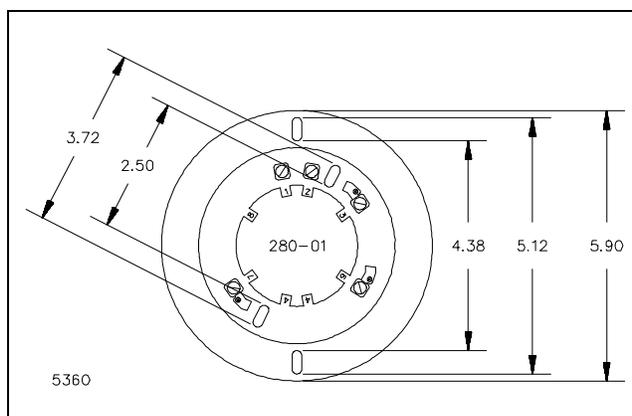


Figure 250-2 Mounting Base Dimensions

Make connections to the screw terminals or colored wires on the base per the wiring diagram. **Be sure to connect two individual wires to terminal number 1 as shown in Figure 250-3. Do not leave these two wires uncut and looped around the screw.** This is to insure that a fault will be signaled if the screw terminal becomes loose and either wire becomes disconnected.

Dress all wires away from the connector terminals on the base that will mate with the detector, then mount the base on the junction box.

After all detector bases are installed, including the end-of-line resistor, check loop continuity. To make the continuity check, a preformed spring jumper wire is supplied with each base, installed between terminals 6 and 7. With the jumper in place on each base, measure the resistance between the two wires at the control panel. (Unplug the input module if the wires are already terminated on the control panel. You should read 3300 ohms, the end-of-line resistor. After loop

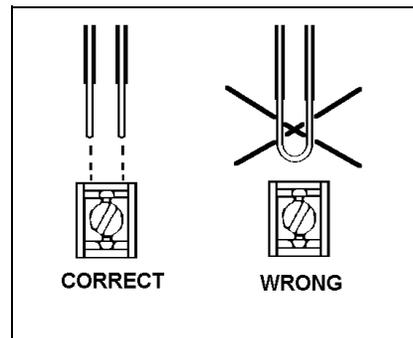


Figure 250-3 Wiring Methods

continuity has been verified, remove and discard the temporary jumper wire between terminals 6 and 7 on the base and install the smoke detector as described below.

Remote Alarm Indicator and Test Switch

These smoke detectors are sometimes installed above a false ceiling, below a “computer” floor, or in other less visible or accessible places. In these cases, the detectors can be installed with SST part number 280-02 bases, and wired to a remote alarm indicating LED and functional test switch. The LED/switch is usually located on a wall in the protected area at eye level. The wiring diagram also shows the proper installation wiring in this case. Install the bases and test the wiring as indicated in Notes above.

- **WARNING:** When using the remote LED option, all smoke detectors on the respective loop must be equipped with that option. Do not use any detectors without the LED option.

Auxiliary Relay and Duct Mounting Options

When detectors are installed with SST part number 280-03 Relay Mounting Base or 285 Air Duct Mounting Base, detection of smoke will operate the relay in the base, in addition to transmitting the normal alarm to the control panel. The relay contacts may be used to perform some local function in the protected area, such as shutting down a critical piece of equipment, turning on emergency lights, etc. When detectors employ these relay options, only one detector may be installed on a loop. This is because of the extra power required to operate the relay. The relay contact symbols (normally open, common, normally closed) on the wiring diagram are in their normal operating condition — with power applied and no alarm.

The relay mounting bases are equipped with color coded wire leads to which you will connect some system wiring. Make all pigtail connections using wire nuts, crimp splices or other approved connection means. Be sure to insulate any unused leads and the end-of-line resistor, if used. Refer to the wiring diagrams for color code and interconnection details. Position wires and connectors in the junction box so as to leave the center of the box as clear as possible. Then complete the base installation as detailed above.

The duct mounting base does not require a junction box; it installs directly on a heating/air conditioning duct. Complete instructions are shipped with the base.

INSTALLATION OF DETECTOR HEAD

- !** **WARNING:** TO PREVENT DETECTOR CONTAMINATION AND SUBSEQUENT WARRANTY CANCELLATION, SMOKE DETECTORS MUST
- REMAIN COVERED UNTIL AREA IS CLEAN AND DUST FREE.

To install the selected head, push the detector head into the base and rotate until the detector key tabs drop into place. Rotate clockwise about 1/2" travel to engage electrical connections. The head will automatically lock into place.

These detector bases also include an optional locking feature that prevents removal of the detector without use of a tool. To eliminate this feature, simply break off the locking tab on the base, then install the detector. To remove the detector from the base when the locking feature is used, insert a small-bladed screwdriver into the slot on the base to push the plastic tab while simultaneously turning the detector head counterclockwise.

DETECTOR ACCEPTANCE TESTS

Before conducting any tests, all persons who would automatically receive an alarm signal should be notified so that unnecessary response will not take place. All releasing devices and extinguishing systems should be disconnected or the appropriate control modules put in the "isolated" mode while the operational test is being performed. At the conclusion of testing, all parties, including the building occupants, should be notified that testing has been concluded.

NFPA Standard 72E requires acceptance testing of 100% of the installed smoke detectors. The specified test is to be a *Calibrated test method (e.g., magnet or probe test manufacturer's calibrated sensitivity instrument) plus test in place functionally*. Perform this test as detailed below.

1. After powering the detector head for approximately 1 minute, check to see that the alarm indicator LED flashes. Failure to flash indicates a nonfunctioning detector or faulty wiring. Recheck wiring and replace detector head if necessary.

2. The built-in test feature of the detector can be activated by using a small permanent magnet. Position the long axis of a test magnet against the side of the detector housing marked "TEST" for at least 15 seconds. The detector should alarm as indicated by steady illumination of the alarm indicator. To return each detector to normal operation, reset the control module.

3. Allow test smoke from a cotton wick or punk or test aerosol to enter the detector sensing chamber for a minimum of 10 seconds and observe the red alarm indicator. When sufficient smoke has entered the chamber, an alarm will be indicated by continuous illumination of the LED. Reset each detector and control unit after it alarms before attempting to test additional detectors in the same zone.

DETECTOR SENSITIVITY TESTS

NFPA Standard 72E requires that the detector sensitivity be checked within one year after installation, and every alternate year thereafter. Each detector is marked with a sensitivity

rating in percent per foot obscuration. The standard requires that any detector found to have a sensitivity 0.25 percent/ft obscuration or more outside the marked sensitivity be replaced.

To conduct sensitivity testing for these smoke detectors, you will need a Model ST001 Sensitivity Test Instrument. The tester is designed for use with a standard digital voltmeter. It acts as an interface between the detector and the voltmeter, and is arranged such that the voltmeter reading in volts is equal to the detector sensitivity in percent per foot obscuration.

The ST001 tester will automatically sense and indicate whether the detector being tested is a photoelectric or ionization type. It has a built-in calibration and self check test routine which is run each time the unit is turned on. A battery status LED is provided, and an automatic power down function shuts the ST001 off shortly after completing each test to prevent unnecessary battery drain.

Before conducting any tests, all persons who would automatically receive an alarm signal should be notified so that unnecessary response will not take place.

IMPORTANT: All releasing devices and extinguishing systems should be disconnected or the appropriate control modules put in the “isolated” mode while the operational test is being performed. At the conclusion of testing, all parties, including the building occupants, should be notified that testing has been concluded. Proceed with test as follows:

1. Remove the detector head from the base and note the % per foot obscuration range marked on the detector label under nominal sensitivity.
2. Reinstall the detector head to the base. Allow 1 minute for stabilization. The alarm indicator should flash approximately once every 4 seconds. No flash indicates a nonfunctioning detector or faulty wiring. Steady illumination indicates an alarm state.
4. Connect the sensitivity tester and voltmeter as described below. Be sure to observe the polarity (+) and (-) markings for all connections.
 - a. Connect test leads between the **Voltmeter** connections on the ST001 tester and the input of a digital voltmeter. Set the digital voltmeter to read 0 to 5 volts DC.
 - b. Connect test leads between the **Detector** connections on the ST001 tester and the two test jacks on the front of the detector. The (+) lead must be plugged into the **round hole** on the detector. The (-) lead must be plugged into the **key shaped hole** on the detector.
5. Turn on the tester by pressing the black circle labeled POWER. Confirm that the battery indicator illuminates steady on. (Replace battery in tester if LED flickers or does not light.)

6. The PHOTO or ION LED should illuminate and a voltage corresponding to the detector sensitivity should appear on the meter. The reading may take up to 20 seconds to stabilize. The sensitivity in percent per foot obscuration is directly read on the meter.

Example:
Meter displays 3.14; then sensitivity = 3.14 %/ft
Meter displays 0.89; then sensitivity = 0.89 %/ft

7. Sensitivity readings that are not within 0.25 %/ft of the marked sensitivity of the detector are unacceptable. First, try cleaning the detector as outlined under maintenance and repeat the tests. If readings are still out of the allowable range, replace the detector.
8. After all the tests are complete, be certain that the complete system is returned to normal.

MAINTENANCE

Maintenance Schedule

1. The recommended requirement for detector maintenance consists of an annual cleaning of dust from the detector head by using the suction of vacuum cleaner. Cleaning programs should be geared to the individual environment in conformance with NFPA Standard 72.

! CAUTION: DO NOT ATTEMPT DISASSEMBLY OF THE FACTORY SEALED SMOKE DETECTOR. THIS ASSEMBLY IS SEALED FOR YOUR PROTECTION AND IS NOT INTENDED TO BE OPENED FOR SERVICING. OPENING OF THE DETECTOR WILL VOID THE WARRANTY.

2. Perform the Sensitivity Metering Test as described above within one year after installation. Confirm that the sensitivity readings are within specified limits on detector label. Thereafter, perform sensitivity tests every 2 years.
3. In alternate years (when sensitivity test is not required), perform a functional test on all smoke detectors, using the test magnet or test smoke to initiate an alarm.

Repair of failed detectors

The ionization detectors contain a small amount of radioactive material. Total radioactivity: 7 microcuries (maximum) Americium 241 shielded by stainless steel housing. No field repair should be attempted. Due to the low cost of these smoke detectors, it is not feasible to repair failed units. Replace failed detectors with new ones.

